

List of products

QUARTZ CRYSTAL UNITS

XTAL

CLK OSC

VCXO

TCXO

VCTCXO

MCF

	XTAL	11SMX	Page	XTAL	21SMX	Page	XTAL	22SMX	Page
Package									
Frequency	24.000 MHz ~ 80.000 MHz			20.000 MHz ~ 80.000 MHz			16.000MHz ~ 80.000 MHz		
Freq. Tolerance (+25°C)	±30 ppm			±30 ppm			±30 ppm		
Freq. Stability / O.T.	±30 ppm			±30 ppm			±30 ppm		
Load Capacitance (CL)	7 pF, Typical			8 pF, Typical			8 pF, Typical		
Ope. Temperature (O.T.)	-20°C ~ +70°C			-20°C ~ +70°C			-20°C ~ +70°C		
Custom Specs.	Custom designed 11SMX			Custom designed 21SMX			Custom designed 22SMX		

	XTAL	32SMX(A)	Page	XTAL	32SMX(B)	Page	XTAL	53SMX(B)	Page
Package									
Frequency	12.000 MHz ~ 150.000 MHz			9.840 MHz ~ 50.000 MHz			10.000MHz ~ 300.000 MHz		
Freq. Tolerance (+25°C)	±30 ppm			±30 ppm			±50 ppm		
Freq. Stability / O.T.	±30 ppm			±30 ppm			±50 ppm		
Load Capacitance (CL)	10 pF, Typical			10 pF, Typical			14 pF, Typical		
Ope. Temperature (O.T.)	-20°C ~ +70°C			-20°C ~ +70°C			-20°C ~ +70°C		
Custom Specs.	Custom designed 32SMX(A)			n.a.			Custom designed 53SMX(B)		

	XTAL	53SMX(C)	Page	XTAL	53SMX(D)	Page	XTAL	97SMX(A)	Page
Package									
Frequency	8.000MHz ~ 60.000 MHz			10.000MHz ~ 50.000 MHz			9.000MHz ~ 150.000 MHz		
Freq. Tolerance (+25°C)	±50 ppm			±50 ppm			±50 ppm		
Freq. Stability / O.T.	±50 ppm			±50 ppm			±50 ppm		
Load Capacitance (CL)	14 pF, Typical			14 pF, Typical			16 pF, Typical		
Ope. Temperature (O.T.)	-20°C ~ +70°C			-20°C ~ +70°C			-20°C ~ +70°C		
Custom Specs.	n.a.			n.a.			n.a.		

	XTAL	97SMX(B)	Page	XTAL	97SMX(C)	Page	XTAL	94SMX(B)	Page
Package									
Frequency	12.000 MHz ~ 50.000 MHz			10.000 MHz ~ 67.000 MHz			8.000MHz ~ 10.000 MHz		
Freq. Tolerance (+25°C)	±50 ppm			±50 ppm			±50 ppm		
Freq. Stability / O.T.	±50 ppm			±50 ppm			±50 ppm		
Load Capacitance (CL)	16 pF, Typical			16 pF, Typical			16 pF, Typical		
Ope. Temperature (O.T.)	-20°C ~ +70°C			-20°C ~ +70°C			-20°C ~ +70°C		
Custom Specs.	n.a.			n.a.			Custom designed 94SMX(B)		

	XTAL	94SMX(C)	Page	XTAL	94SMX(D)	Page	XTAL	93SMX	Page
Package									
Frequency	6.000 MHz ~ 70.000 MHz			6.000 MHz ~ 70.000 MHz			4.000 MHz ~ 50.000 MHz		
Freq. Tolerance (+25°C)	±50 ppm			±50 ppm			±50 ppm		
Freq. Stability / O.T.	±50 ppm			±50 ppm			±50 ppm		
Load Capacitance (CL)	16 pF, Typical			16 pF, Typical			16 pF, Typical		
Ope. Temperature (O.T.)	-20°C ~ +70°C			-20°C ~ +70°C			-20°C ~ +70°C		

	XTAL	92SMX(CN)	Page	XTAL	92SMX(D)	Page	XTAL	86SMX(LPN)	Page
Package									
Frequency	3.579545 MHz ~ 25.000 MHz			3.579545 MHz ~ 25.000 MHz			3.579545 MHz ~ 32.000 MHz		
Freq. Tolerance (+25°C)	±50 ppm			±50 ppm			±50 ppm		
Freq. Stability / O.T.	±50 ppm			±50 ppm			±50 ppm		
Load Capacitance (CL)	16 pF, Typical			16 pF, Typical			16 pF, Typical		
Ope. Temperature (O.T.)	-20°C ~ +70°C			-20°C ~ +70°C			-20°C ~ +70°C		

	XTAL	86SMX(MC)	Page	XTAL	86SMX(MM)	Page	XTAL	4HLB	Page
Package									
Frequency	3.579545 MHz ~ 32.000 MHz			3.579545 MHz ~ 32.000 MHz			3.579545 MHz ~ 80.000 MHz		
Freq. Tolerance (+25°C)	±50 ppm			±50 ppm			±50 ppm		
Freq. Stability / O.T.	±50 ppm			±50 ppm			±50 ppm (AT) ±100 ppm (BT)		
Load Capacitance (CL)	16 pF, Typical			16 pF, Typical			18 pF, Typical		
Ope. Temperature (O.T.)	-20°C ~ +70°C			-20°C ~ +70°C			-20°C ~ +70°C (AT) -10°C ~ +60°C (BT)		

	XTAL	3HLB	Page	XTAL	25HLB	Page	XTAL	HC-49/U-2H	Page
Package									
Frequency	3.579545 MHz ~ 80.000 MHz			3.579545 MHz ~ 80.000 MHz			3.579545 MHz ~ 61.000 MHz		
Freq. Tolerance (+25°C)	±50 ppm			±50 ppm			±50 ppm		
Freq. Stability / O.T.	±50 ppm (AT) ±100 ppm (BT)			±50 ppm (AT) ±100 ppm (BT)			±50 ppm		
Load Capacitance (CL)	18 pF, Typical			18 pF, Typical			16 pF, Typical		
Ope. Temperature (O.T.)	-20°C ~ +70°C (AT) -10°C ~ +60°C (BT)			-20°C ~ +70°C (AT) -10°C ~ +60°C (BT)			-20°C ~ +70°C		

XTAL

CLK SOC

VCXO

TCXO

VCTCXO

MCF

List of products

QUARTZ CRYSTAL UNITS

XTAL

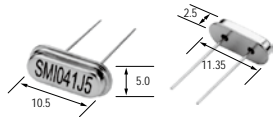
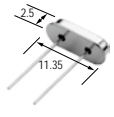
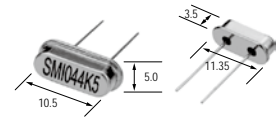
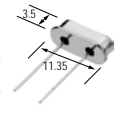
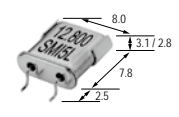

CLK OSC

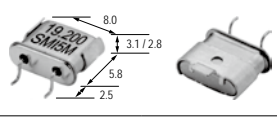

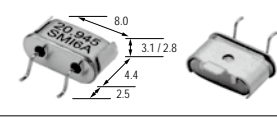

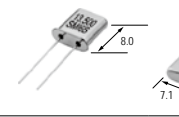
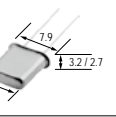
VCXO

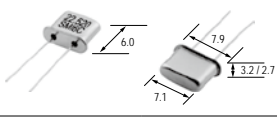
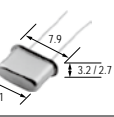
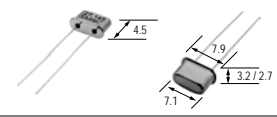
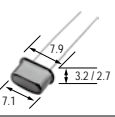
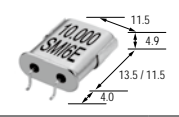

TCXO

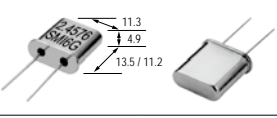

VCTCXO

MCF

	XTAL	HC-49/U-3H	Page	XTAL	HC-49/U-4H	Page	XTAL	UM-1(MJ) UM-1S(MJ)	Page
Package									
Frequency	3.579545 MHz ~ 61.000 MHz			3.579545 MHz ~ 61.000 MHz			6.000 MHz ~ 200.000 MHz		
Freq. Tolerance (+25°C)	±50 ppm			±50 ppm			±5 ppm ~ ±20 ppm		
Freq. Stability / O.T.	±50 ppm			±50 ppm			±10 ppm ~ ±30 ppm		
Load Capacitance (CL)	16 pF, Typical			16 pF, Typical			16 pF, Typical		
Ope. Temperature (O.T.)	-20°C ~ +70°C			-20°C ~ +70°C			-20°C ~ +70°C		

	XTAL	UM-5(MJ) UM-5S(MJ)	Page	XTAL	UM-4(MJ) UM-4S(MJ)	Page	XTAL	UM-1 UM-1S	Page
Package									
Frequency	10.000 MHz ~ 200.000 MHz			20.000 MHz ~ 200.000 MHz			1.000 MHz ~ 1.200 MHz 6.000 MHz ~ 200.000 MHz		
Freq. Tolerance (+25°C)	±5 ppm ~ ±20 ppm			±5 ppm ~ ±20 ppm			±3 ppm ~ ±50 ppm		
Freq. Stability / O.T.	±10 ppm ~ ±30 ppm			±10 ppm ~ ±30 ppm			±10 ppm ~ ±100 ppm		
Load Capacitance (CL)	16 pF, Typical			16 pF, Typical			16 pF, Typical		
Ope. Temperature (O.T.)	-20°C ~ +70°C			-20°C ~ +70°C			-10°C ~ +60°C (SL-Cut) -20°C ~ +70°C (AT-Cut)		

	XTAL	UM-5 UM-5S	Page	XTAL	UM-4 UM-4S	Page	XTAL	HC-49/U(MJ) HC-49/UT(MJ)	Page
Package									
Frequency	10.000 MHz ~ 200.000 MHz			20.000 MHz ~ 200.000 MHz			1.84320 MHz ~ 200.000 MHz		
Freq. Tolerance (+25°C)	±3 ppm ~ ±20 ppm			±3 ppm ~ ±20 ppm			±5 ppm ~ ±50 ppm		
Freq. Stability / O.T.	±10 ppm ~ ±50 ppm			±10 ppm ~ ±50 ppm			±10 ppm ~ ±50 ppm		
Load Capacitance (CL)	16 pF, Typical			16 pF, Typical			20 pF, Typical		
Ope. Temperature (O.T.)	-20°C ~ +70°C			-20°C ~ +70°C			-10°C ~ +60°C -20°C ~ +70°C		

	XTAL	HC-49/U HC-49/UT	Page
Package			
Frequency	1.84320 MHz ~ 200.000 MHz		
Freq. Tolerance (+25°C)	±5 ppm ~ ±50 ppm		
Freq. Stability / O.T.	±10 ppm ~ ±50 ppm		
Load Capacitance (CL)	20 pF, Typical		
Ope. Temperature (O.T.)	-10°C ~ +60°C -20°C ~ +70°C		

List of products

QUARTZ CRYSTAL UNITS 32.768 kHz

	XTAL	110SMX	Page	XTAL	212SMX	Page	XTAL	31SMX	Page
Package									
Frequency	32.768 kHz			32.768 kHz			32.768 kHz		
Freq. Tolerance (+25°C)	±10 ppm ~ ±30 ppm			±20 ppm ~ ±50 ppm			±10 ppm ~ ±30 ppm		
Freq. Stability / O.T.	-			-			-		
Load Capacitance (CL)	9.0 or 12.5 pF			6.0, 7.0, 9.0 or 12.5 pF			6.0, 9.0 or 12.5 pF		
Ope. Temperature (O.T.)	-40°C ~ +85°C			-40°C ~ +85°C			-40°C ~ +85°C (Standard) -40°C ~ +105°C (Option) -40°C ~ +125°C (Option)		

	XTAL	415SMX	Page	XTAL	52SMX	Page	XTAL	124SMX	Page
Package									
Frequency	32.768 kHz			32.768 kHz			32.768 kHz		
Freq. Tolerance (+25°C)	±20 ppm ~ ±50 ppm			±20 ppm ~ ±50 ppm			±5 ppm ~ ±50 ppm		
Freq. Stability / O.T.	-			-			-		
Load Capacitance (CL)	7.0, 9.0 or 12.5 pF			7.0, 9.0 or 12.5 pF			3.7, 4.4, 6.0, 7.0 or 12.5 pF		
Ope. Temperature (O.T.)	-40°C ~ +85°C			-40°C ~ +85°C			-40°C ~ +85°C		

	XTAL	90SMX(N)	Page	XTAL	90SMX(S)	Page	XTAL	95SMX	Page
Package									
Frequency	32.768 kHz			32.768 kHz			30.000 kHz ~ 100.000 kHz		
Freq. Tolerance (+25°C)	±5 ppm ~ ±50 ppm			±5 ppm ~ ±30 ppm			±20 ppm ~ ±100 ppm		
Freq. Stability / O.T.	-			-			-		
Load Capacitance (CL)	6.0 or 12.5 pF			6.0 or 12.5 pF			12.5 pF		
Ope. Temperature (O.T.)	-40°C ~ +85°C			-40°C ~ +85°C			-40°C ~ +85°C		

	XTAL	26(LF)MJ	Page	XTAL	26(LF)	Page	XTAL	1.2x4.7 mm	Page
Package									
Frequency	32.768 kHz			32.768 kHz			32.768 kHz		
Freq. Tolerance (+25°C)	±15 ppm ~ ±50 ppm			±15 ppm ~ ±50 ppm			±10 ppm ~ ±30 ppm		
Freq. Stability / O.T.	-			-			-		
Load Capacitance (CL)	12.5 pF			8.0, 10.0 or 12.5 pF			8.0 pF		
Ope. Temperature (O.T.)	-40°C ~ +85°C			-40°C ~ +85°C			-20°C ~ +60°C		

XTAL
 CLK OSC
 VCXO
 TCXO
 VCTCXO
 MCF

List of products

QUARTZ CRYSTAL UNITS 32.768 kHz

XTAL

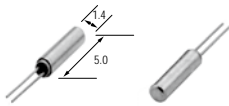
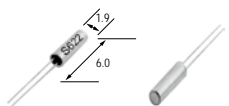
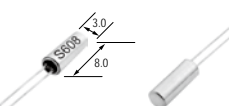
CLK OSC

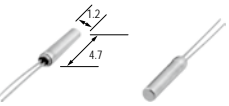
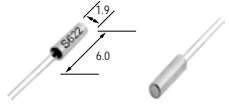
VCXO

TCXO

VCTCXO

MCF

	XTAL	1.4x5 mm	Page	XTAL	2x6 mm	Page	XTAL	3x8 mm	Page
Package									
Frequency	32.768 kHz			32.768 kHz			32.768 kHz		
Freq. Tolerance (+25°C)	±10 ppm ~ ±30 ppm			±10 ppm ~ ±30 ppm			±10 ppm ~ ±30 ppm		
Freq. Stability / O.T.	-			-			-		
Load Capacitance (CL)	8.0 pF			12.5 pF			12.5 pF		
Ope. Temperature (O.T.)	-20°C ~ +60°C			-20°C ~ +70°C			-20°C ~ +70°C		

	XTAL	1.2x4.7 mm	Page	XTAL	2x6 mm	Page
Package						
Frequency	30.000 kHz ~ 100.000 kHz			30.000 kHz ~ 100.000 kHz		
Freq. Tolerance (+25°C)	±20 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm		
Freq. Stability / O.T.	-			-		
Load Capacitance (CL)	Series or 10 pF			12.5 pF		
Ope. Temperature (O.T.)	-20°C ~ +60°C			-20°C ~ +70°C		

List of products

CRYSTAL CLOCK OSCILLATORS

	CLK OSC	21SMO	Page	CLK OSC	22SMO	Page	CLK OSC	32SMO	Page
Package									
Output	CMOS			CMOS			CMOS		
Frequency	1.5 MHz ~ 80.000 MHz			1.0 MHz ~ 160.000 MHz			1.6 MHz ~ 170.000 MHz		
Freq. Stability (overall)	±20 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-10°C ~ +70°C (Standard) -20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option) -40°C ~ +125°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option) -40°C ~ +125°C (Option)		

	CLK OSC	21SMOLC	Page	CLK OSC	22SMOLC	Page	CLK OSC	32SMOLC	Page
Package									
Output	CMOS			CMOS			CMOS		
Frequency	6.0 MHz ~ 40.000 MHz			1.250 MHz ~ 50.000 MHz			1.250 MHz ~ 50.000 MHz		
Freq. Stability (overall)	±25 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm		
Supply Voltage (V _{DD})	+1.8V			+0.8V ~ +1.5V			+0.8V ~ +1.5V		
Ope. Temperature (O.T.)	-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)		

	CLK OSC	99SMO	Page	CLK OSC	97SMO	Page	CLK OSC	22SMOHG	Page
Package									
Output	CMOS			CMOS			CMOS		
Frequency	1.0 MHz ~ 220.000 MHz			1.0 MHz ~ 220.000 MHz			4.0 MHz ~ 55.000 MHz		
Freq. Stability (overall)	±20 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm			±8 ppm ~ ±15 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +5.0V			+1.8V ~ +5.0V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)			-40°C ~ +85°C (Standard)		

	CLK OSC	32SMOHG	Page	CLK OSC	99SMOHG	Page	CLK OSC	97SMOHG	Page
Package									
Output	CMOS			CMOS			CMOS		
Frequency	4.0 MHz ~ 55.000 MHz			4.0 MHz ~ 55.000 MHz			4.0 MHz ~ 55.000 MHz		
Freq. Stability (overall)	±8 ppm ~ ±15 ppm			±8 ppm ~ ±15 ppm			±10 ppm ~ ±15 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-40°C ~ +85°C (Standard)			-40°C ~ +85°C (Standard)			-40°C ~ +85°C (Standard)		

XTAL

CLK OSC

VCXO

TCXO

VCTCXO

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List of products

CRYSTAL CLOCK OSCILLATORS

XTAL

CLK OSC

	CLK OSC	97SMOHGU	Page	CLK OSC	99SMOHGU	Page	CLK OSC	32SMOHGU	Page
Package									
Output	CMOS			CMOS			CMOS		
Frequency	55 MHz ~ 160.000 MHz			55 MHz ~ 160.000 MHz			55 MHz ~ 160.000 MHz		
Freq. Stability (overall)	±8 ppm ~ ±15 ppm			±8 ppm ~ ±15 ppm			±8 ppm ~ ±15 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-40°C ~ +85°C (Standard)			-40°C ~ +85°C (Standard)			-40°C ~ +85°C (Standard)		

VCXO

	CLK OSC	57SMO	Page	CLK OSC	32SMO-LVP	Page	CLK OSC	99SMO-LVP	Page
Package									
Output	LVPECL			LVPECL			LVPECL		
Frequency	13.500 MHz ~ 400.000 MHz			5.000 MHz ~ 170.000 MHz			5.000 MHz ~ 250.000 MHz		
Freq. Stability (overall)	±20 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm		
Supply Voltage (V _{DD})	+2.5V or +3.3V			+2.5V or +3.3V			+2.5V or +3.3V		
Ope. Temperature (O.T.)	-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option)		

TCXO

	CLK OSC	67SMO	Page	CLK OSC	32SMO-LVD	Page	CLK OSC	99SMO-LVD	Page
Package									
Output	LVDS			LVDS			LVDS		
Frequency	13.500 MHz ~ 350.000 MHz			5.000 MHz ~ 170.000 MHz			5.000 MHz ~ 250.000 MHz		
Freq. Stability (overall)	±20 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm		
Supply Voltage (V _{DD})	+2.5V or +3.3V			+2.5V or +3.3V			+2.5V or +3.3V		
Ope. Temperature (O.T.)	-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option)		

VCTCXO

	CLK OSC	77SMO	Page	XTAL	32SMO-HCS	Page	XTAL	99SMO-HCS	Page
Package									
Output	HCSL			HCSL			HCSL		
Frequency	13.500 MHz ~ 220.000 MHz			13.500 MHz ~ 170.000 MHz			13.500 MHz ~ 220.000 MHz		
Freq. Stability (overall)	±20 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm			±20 ppm ~ ±100 ppm		
Supply Voltage (V _{DD})	+2.5V or +3.3V			+2.5V or +3.3V			+2.5V or +3.3V		
Ope. Temperature (O.T.)	-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option)		

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CRYSTAL CLOCK OSCILLAORS 32.768 kHz

	CLK OSC	327SMO(E)	Page	CLK OSC	327SMO(J)	Page	CLK OSC	327SMO(C)	Page
Package									
Output	CMOS			CMOS			CMOS		
Frequency	32.768 kHz			32.768 kHz			32.768 kHz		
Freq. Stability	+30 ppm ~ -10 ppm at +25°C			+28 ppm ~ -18 ppm at +25°C			±20 ppm ~ ±30 ppm overall		
Supply Voltage (V _{DD})	+1.5V ~ +5.5V			+1.5V ~ +3.6V			+1.8V ~ +5.0V		
Input Current	1.5 μA max.			0.8 μA max.			160 μA max.		
Ope. Temperature (O.T.)	-40°C ~ +85°C (Standard)			-40°C ~ +85°C (Standard)			-40°C ~ +85°C (Standard)		
	CLK OSC	327SMO(D)	Page	CLK OSC	327SMO(F)	Page	CLK OSC	327SMO(G)	Page
Package									
Output	CMOS			CMOS			CMOS		
Frequency	32.768 kHz			32.768 kHz			32.768 kHz		
Freq. Stability (overall)	±20 ppm ~ ±30 ppm			±20 ppm ~ ±30 ppm			±20 ppm ~ ±30 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +5.0V			+1.8V ~ +5.0V			+1.8V ~ +5.0V		
Input Current	100 μA max.			80 μA max.			80 μA max.		
Ope. Temperature (O.T.)	-40°C ~ +85°C (Standard)			-40°C ~ +85°C (Standard)			-40°C ~ +85°C (Standard)		

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CLK OSC

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VOLTAGE CONTROLLED CRYSTAL OSCILLATOR

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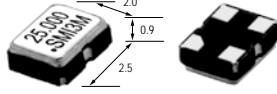
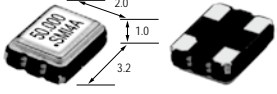
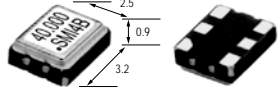
CLK OSC

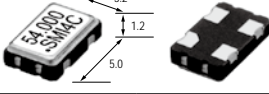
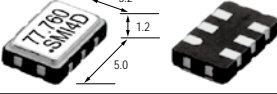
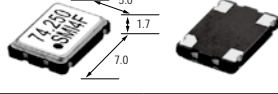
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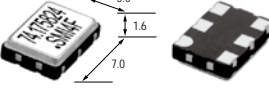
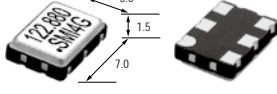
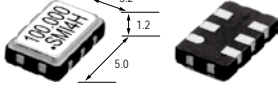
TCXO

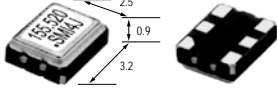
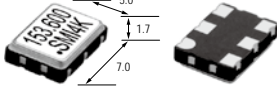
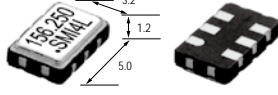
VCCTXO

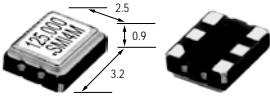
MCF

	VCXO	22SMOVD	Page	VCXO	32SMOVD	Page	VCXO	32SMOVF	Page
Package									
Output	CMOS			CMOS			CMOS		
Frequency	1.3 MHz ~ 100.000 MHz			1.300 MHz ~ 55.000 MHz			1.250 MHz ~ 62.000 MHz 62.000 MHz ~ 170.000 MHz		
Freq. Stability (overall)	±20 ppm ~ ±50 ppm			±20 ppm ~ ±50 ppm			±20 ppm ~ ±50 ppm		
Pulling Range	±90 ppm min.			±90 ppm min.			±90 ppm min. ±100 ppm min.		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+3.3V		
Ope. Temperature	-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)		

	VCXO	99SMOVD	Page	VCXO	99SMOVF	Page	VCXO	97SMOVD	Page
Package									
Output	CMOS			CMOS			CMOS		
Frequency	1.000 MHz ~ 55.000 MHz			1.000 MHz ~ 62.000 MHz 62.000 MHz ~ 170.000 MHz			1.250 MHz ~ 170.000 MHz		
Freq. Stability (overall)	±20 ppm ~ ±50 ppm			±20 ppm ~ ±50 ppm			±20 ppm ~ ±50 ppm		
Pulling Range	±110 ppm min.			±110 ppm min. ±100 ppm min.			±100 ppm min.		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+3.3V			+3.3V		
Ope. Temperature	-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)		

	VCXO	97SMOVH	Page	VCXO	57SMOVH	Page	VCXO	55SMOVH	Page
Package									
Output	CMOS			LVPECL			LVPECL		
Frequency	1.250 MHz ~ 170.000 MHz			20.000 MHz ~ 250.000 MHz			30.000 MHz ~ 170.000 MHz		
Freq. Stability (overall)	±20 ppm ~ ±50 ppm			±20 ppm ~ ±50 ppm			±20 ppm ~ ±50 ppm		
Pulling Range	±100 ppm min.			±80 ppm min.			±80 ppm min.		
Supply Voltage (V _{DD})	+3.3V			+3.3V			+3.3V		
Ope. Temperature	-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)		

	VCXO	53SMOVH	Page	VCXO	67SMOVH	Page	VCXO	65SMOVH	Page
Package									
Output	LVPECL			LVDS			LVDS		
Frequency	10.000 MHz ~ 250.000 MHz			30.000 MHz ~ 250.000 MHz			30.000 MHz ~ 250.000 MHz		
Freq. Stability (overall)	±20 ppm ~ ±50 ppm			±20 ppm ~ ±50 ppm			±20 ppm ~ ±50 ppm		
Pulling Range	±70 ppm min.			±80 ppm min.			±80 ppm min.		
Supply Voltage (V _{DD})	+3.3V			+2.5V or +3.3V			+2.5V or +3.3V		
Ope. Temperature	-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option) -40°C ~ +105°C (Option)			-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)		

	VCXO	63SMOVH	Page
Package			
Output	LVDS		
Frequency	40.000 MHz ~ 170.000 MHz		
Freq. Stability (overall)	±20 ppm ~ ±50 ppm		
Pulling Range	±70 ppm min.		
Supply Voltage (V _{DD})	+3.3V		
Ope. Temperature	-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)		

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	TCXO	SXO-1612	Page	VC-TCXO	SXO-1612V	Page	TCXO	SXO-1612HG	Page
Package									
Output	CLIPPED SINE			CLIPPED SINE			CLIPPED SINE		
Frequency	19.200 MHz ~ 52.000 MHz			19.200 MHz ~ 52.000 MHz			19.200 MHz ~ 52.000 MHz		
Freq. Stability / O.T.	±2.0 ppm			±2.0 ppm			±0.5 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	n.a.			±8.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or ±1V)			n.a.		

	VC-TCXO	SXO-1612HGV	Page	TCXO	SXO-2016	Page	VC-TCXO	SXO-2016V	Page
Package									
Output	CLIPPED SINE			CLIPPED SINE			CLIPPED SINE		
Frequency	19.200 MHz ~ 52.000 MHz			13.000 MHz ~ 52.000 MHz			13.000 MHz ~ 52.000 MHz		
Freq. Stability / O.T.	±0.5 ppm			±2.0 ppm			±2.0 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	±8.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or ±1V)			n.a.			±8.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or ±1V)		

	TCXO	SXO-2016HG	Page	VC-TCXO	SXO-2016HGV	Page	TCXO	SXO-2016ED	Page
Package									
Output	CLIPPED SINE			CLIPPED SINE			CLIPPED SINE		
Frequency	13.000 MHz ~ 52.000 MHz			13.000 MHz ~ 52.000 MHz			13.000 MHz ~ 52.000 MHz		
Freq. Stability / O.T.	±0.5 ppm			±0.5 ppm			±2.0 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	n.a.			±8.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or ±1V)			n.a.		

	TCXO	SXO-2016HGED	Page	TCXO	SXO-2200	Page	VC-TCXO	SXO-2200V	Page
Package									
Output	CLIPPED SINE			CLIPPED SINE			CLIPPED SINE		
Frequency	13.000 MHz ~ 52.000 MHz			13.000 MHz ~ 52.000 MHz			13.000 MHz ~ 52.000 MHz		
Freq. Stability / O.T.	±0.5 ppm			±2.0 ppm			±2.0 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	n.a.			n.a.			±8.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or ±1V)		

	TCXO	SXO-2200HG	Page	VC-TCXO	SXO-2200HGV	Page	TCXO	SXO-2200HGED	Page
Package									
Output	CLIPPED SINE			CLIPPED SINE			CLIPPED SINE		
Frequency	13.000 MHz ~ 52.000 MHz			13.000 MHz ~ 52.000 MHz			13.000 MHz ~ 52.000 MHz		
Freq. Stability / O.T.	±0.5 ppm			±0.5 ppm			±0.5 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	n.a.			±8.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or ±1V)			n.a.		

	VC-TCXO	SXO-2200HGEDV	Page	TCXO	SXO-3200	Page	VC-TCXO	SXO-3200V	Page
Package									
Output	CLIPPED SINE			CLIPPED SINE			CLIPPED SINE		
Frequency	13.000 MHz ~ 52.000 MHz			10.000 MHz ~ 40.000 MHz			10.000 MHz ~ 40.000 MHz		
Freq. Stability / O.T.	±0.5 ppm			±2.5 ppm			±2.5 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	±8.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or ±1V)			n.a.			±8.0 ppm ~ ±15 ppm (1/2 V _{DD} ±1V)		

	TCXO	SXO-3200HG	Page	VC-TCXO	SXO-3200HGV	Page	TCXO	SXO-5200	Page
Package									
Output	CLIPPED SINE			CLIPPED SINE			CLIPPED SINE		
Frequency	10.000 MHz ~ 40.000 MHz			10.000 MHz ~ 40.000 MHz			6.000 MHz ~ 45.000 MHz		
Freq. Stability / O.T.	±0.5 ppm			±0.5 ppm			±2.5 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+2.8V ~ +5.0V		
Ope. Temperature (O.T.)	-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	n.a.			±8.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or ±1V)			n.a.		

	VC-TCXO	SXO-5200V	Page	TCXO	SXO-7100	Page	VC-TCXO	SXO-7100V	Page
Package									
Output	CLIPPED SINE			CLIPPED SINE			CLIPPED SINE		
Frequency	6.000 MHz ~ 45.000 MHz			10.000 MHz ~ 26.000 MHz			10.000 MHz ~ 26.000 MHz		
Freq. Stability / O.T.	±2.5 ppm			±2.5 ppm			±2.5 ppm		
Supply Voltage (V _{DD})	+2.8V ~ +5.0V			+2.8V ~ +5.0V			+2.8V ~ +5.0V		
Ope. Temperature (O.T.)	-30°C ~ +75°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	±8.0 ppm min. (±1.5V ±1V)			n.a.			±8.0 ppm min. (±1.5V ±1V)		

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	TCXO	SXO-2520	Page	TCXO	SXO-3225	Page	TCXO	SXO-5032	Page
Package									
Output	CMOS			CMOS			CMOS		
Frequency	4.000 MHz ~ 54.000 MHz			4.000 MHz ~ 54.000 MHz			4.000 MHz ~ 54.000 MHz		
Freq. Stability / O.T.	±2.5 ppm			±2.5 ppm			±2.5 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	n.a.			n.a.			n.a.		

	TCXO	SXO-7050	Page	TCXO	SXO-4053CS	Page	VC-TCXO	SXO-4053CSV	Page
Package									
Output	CMOS			CLIPPED SINE			CLIPPED SINE		
Frequency	4.000 MHz ~ 54.000 MHz			13.000 MHz ~ 52.000 MHz			13.000 MHz ~ 52.000 MHz		
Freq. Stability / O.T.	±2.5 ppm			±0.5 ppm ~ ±2.5 ppm			±0.5 ppm ~ ±2.5 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	n.a.			n.a.			±8.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or ±1V)		

	TCXO	SXO-4053CSED	Page	TCXO	SXO-4053CM	Page	VC-TCXO	SXO-4053CMV	Page
Package									
Output	CLIPPED SINE			CMOS			CMOS		
Frequency	13.000 MHz ~ 52.000 MHz			13.000 MHz ~ 52.000 MHz			13.000 MHz ~ 52.000 MHz		
Freq. Stability / O.T.	±0.5 ppm ~ ±2.5 ppm			±0.5 ppm ~ ±2.5 ppm			±0.5 ppm ~ ±2.5 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-30°C ~ +75°C (Standard) -30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	n.a.			n.a.			±8.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or ±1V)		

	TCXO	SXO-4053CMED	Page	TCXO	SXO-4075CS	Page	VC-TCXO	SXO-4075CSV	Page
Package									
Output	CMOS			CLIPPED SINE			CLIPPED SINE		
Frequency	13.000 MHz ~ 52.000 MHz			10.000 MHz ~ 40.000 MHz			10.000 MHz ~ 40.000 MHz		
Freq. Stability / O.T.	±0.5 ppm ~ ±2.5 ppm			±0.5 ppm ~ ±2.0 ppm			±0.5 ppm ~ ±2.0 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+1.8V ~ +3.3V		
Ope. Temperature (O.T.)	-30°C ~ +75°C (Standard) -30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	n.a.			n.a.			±9.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or 1V)		

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	TCXO	SXO-4075CM	Page	VC-TCXO	SXO-4075CMV	Page	TCXO	SXO-9000C-CS	Page
Package									
Output	CMOS			CMOS			CLIPPED SINE		
Frequency	10.000 MHz ~ 40.000 MHz			10.000 MHz ~ 40.000 MHz			10 MHz ~ 40.000 MHz		
Freq. Stability / O.T.	±0.5 ppm ~ ±2.5 ppm			±0.5 ppm ~ ±2.5 ppm			±0.1 ppm ~ ±0.28 ppm		
Supply Voltage (V _{DD})	+1.8V ~ +3.3V			+1.8V ~ +3.3V			+2.7V ~ +5.5V		
Ope. Temperature (O.T.)	-30°C ~ +75°C (Standard) -30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-30°C ~ +75°C (Standard) -30°C ~ +85°C (Standard) -40°C ~ +85°C (Option)			-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)		
Voltage Control (V _{DD})	n.a.			±9.0 ppm ~ ±15 ppm (1/2 V _{DD} ±0.8V or ±1V)			n.a.		

	VC-TCXO	SXO-9000C-CSV	Page	TCXO	SXO-9000C-CM	Page	VC-TCXO	SXO-9000C-CMV	Page
Package									
Output	CLIPPED SINE			CMOS			CMOS		
Frequency	10 MHz ~ 40.000 MHz			10 MHz ~ 40.000 MHz			10 MHz ~ 40.000 MHz		
Freq. Stability / O.T.	±0.1 ppm ~ ±0.28 ppm			±0.1 ppm ~ ±0.28 ppm			±0.1 ppm ~ ±0.28 ppm		
Supply Voltage (V _{DD})	+2.7V ~ +5.5V			+2.7V ~ +5.5V			+2.7V ~ +5.5V		
Ope. Temperature (O.T.)	-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)			-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)			-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)		
Voltage Control (V _{DD})	±5.0 ppm ~ ±20 ppm (+1.65V ±1.65V)			n.a.			±5.0 ppm ~ ±15 ppm (+1.65V ±1.65)		

	TCXO	SXO-9000D-CS	Page	VC-TCXO	SXO-9000D-CSV	Page	TCXO	SXO-9000D-CM	Page
Package									
Output	CLIPPED SINE			CLIPPED SINE			CMOS		
Frequency	10 MHz ~ 40.000 MHz			10 MHz ~ 40.000 MHz			10 MHz ~ 40.000 MHz		
Freq. Stability / O.T.	±0.1 ppm ~ ±0.28 ppm			±0.1 ppm ~ ±0.28 ppm			±0.1 ppm ~ ±0.28 ppm		
Supply Voltage (V _{DD})	+2.7V ~ +5.5V			+2.7V ~ +5.5V			+2.7V ~ +5.5V		
Ope. Temperature (O.T.)	-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)			-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)			-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)		
Voltage Control (V _{DD})	n.a.			±5.0 ppm ~ ±20 ppm (+1.65V ±1.65V)			n.a.		

	VC-TCXO	SXO-9000D-CMV	Page	TCXO	SXO-9000E-CS	Page	VC-TCXO	SXO-9000E-CSV	Page
Package									
Output	CMOS			CLIPPED SINE			CLIPPED SINE		
Frequency	10 MHz ~ 40.000 MHz			10 MHz ~ 40.000 MHz			10 MHz ~ 40.000 MHz		
Freq. Stability / O.T.	±0.1 ppm ~ ±0.28 ppm			±0.1 ppm ~ ±0.28 ppm			±0.1 ppm ~ ±0.28 ppm		
Supply Voltage (V _{DD})	+2.7V ~ +5.5V			+2.7V ~ +5.5V			+2.7V ~ +5.5V		
Ope. Temperature (O.T.)	-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)			-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)			-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)		
Voltage Control (V _{DD})	±5.0 ppm ~ ±15 ppm (+1.65V ±1.65V)			n.a.			±5.0 ppm ~ ±20 ppm (+1.65V ±1.65V)		

XTAL

CLK OSC

VCXO

TCXO

VCTCXO

MCF

List of products

TEMPERATURE COMPENSATED CRSYTAL OSCILLATORS

XTAL

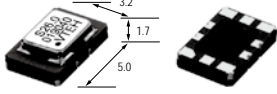
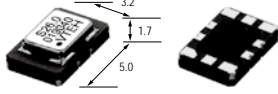
CLK OSC

VCXO

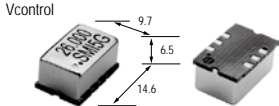
TCXO

VCTCXO

MCF

	TCXO	SXO-9000E-CM	Page	VC-TCXO	SXO-9000E-CMV	Page
Package						
Output	CMOS			CMOS		
Frequency	10 MHz ~ 40.000 MHz			10 MHz ~ 40.000 MHz		
Freq. Stability / O.T.	±0.1 ppm ~ ±0.28 ppm			±0.1 ppm ~ ±0.28 ppm		
Supply Voltage (V _{DD})	+2.7V ~ +5.5V			+2.7V ~ +5.0V		
Ope. Temperature (O.T.)	-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)			-10°C ~ +70°C (Standard) -40°C ~ +85°C (Standard)		
Voltage Control (V _{DD})	n.a.			±5.0 ppm ~ ±15 ppm (+1.65V ±1.65V)		

OVEN CONTROLLED CRYSTAL OSCILLATOR

	OCXO	SXO-8000K	Page
Package			
Output	CMOS		
Frequency	5.000 MHz ~ 40.000 MHz		
Freq. Stability / O.T.	±10 ppb ~ ±50 ppb		
Supply Voltage (V _{DD})	+3.3V		
Ope. Temperature (O.T.)	-20°C ~ +70°C (Standard) -40°C ~ +85°C (Option)		
Voltage Control (V _{DD})	±5.0 ppm min. (+1.65V ±1.65V)		

XTAL

CLK OSC

VCXO

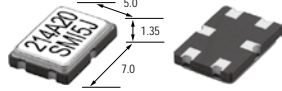
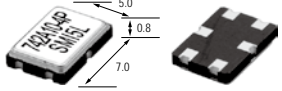
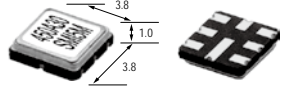
TCXO

VCTCXO

MCF

List of products

MONOLITHIC CRYSTAL OSCILLATORS

XTAL	Package		96SMF	Page		96SMF	Page		38SMF	Page
	Frequency (MHz)	14.575 MHz ~ 150.000 MHz			21.400 MHz ~ 90.000 MHz			45 or 46.350 MHz		
	No. of Pole	2-pole			4-pole			2-pole		

CLK OSC

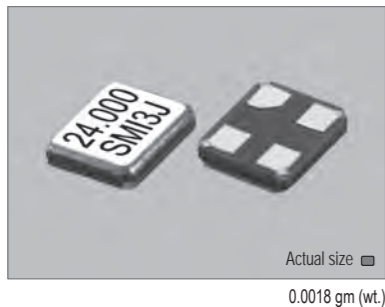
VCXO

TCXO

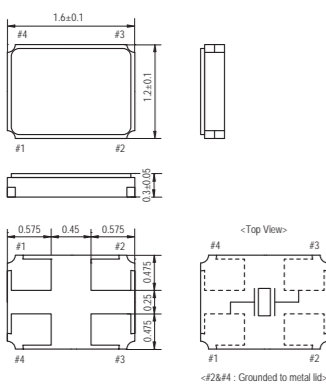
VCTCXO

MCF

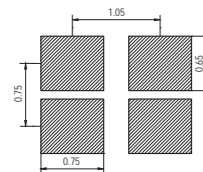
11SMX



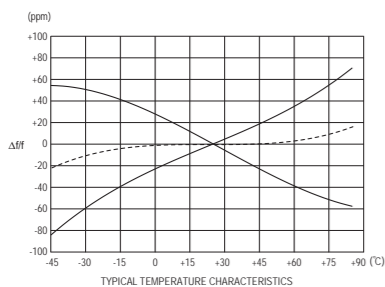
11SMX



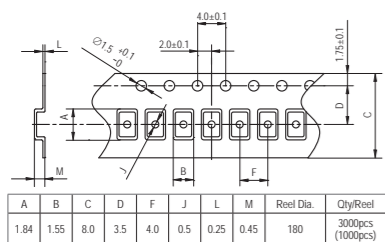
SOLDERING PATTERN



AT-CUT



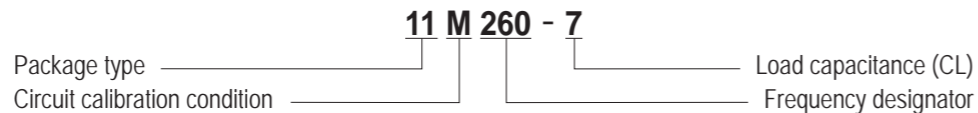
TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

Item	Specifications
Package type	11SMX
Frequency range	24.000 MHz to 80.000 MHz
Frequency tolerance	±30 ppm at +25°C ±3°C
Temperature stability (referred to +25°C)	±30 ppm over -20°C to +70°C
Load capacitance (CL)	7 pF, Typical
Shunt capacitance (C0)	5 pF max.
Drive level (P)	100 µW max. (10 µW for testing)
Aging	±5 ppm max. at +25°C ±3°C per year
Cut / Oscillation mode	AT-Cut / Fundamental
Reflow condition	10 seconds max. at +250°C ±10°C

PART NUMBERING GUIDE



Example

SMI Part No.	Package	Circuit Calibration Condition	Frequency
11M260-7	11 = 11SMX	M = Parallel resonance CL= 7 pF	260 = 26.000 MHz
11S384	11 = 11SMX	S = Series resonance	384 = 38.400 MHz

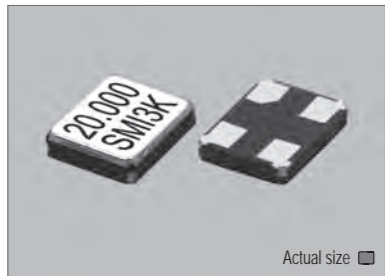
PACKAGE DATA

Item	Package	11SMX
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

11SMX STANDARD FREQUENCIES

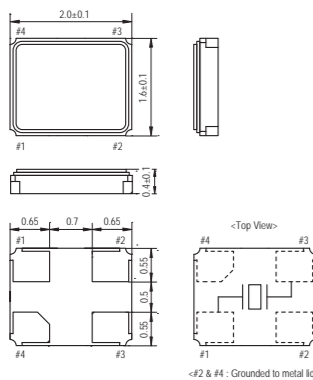
Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms (Ω) ESR
24.000000	240	150
26.000000	260	150
32.000000	320	100
36.000000	360	100
38.400000	384	80
40.000000	400	80
48.000000	480	80

21SMX

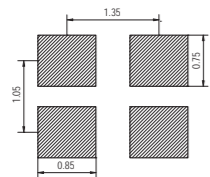


Actual size 
0.00568 gm (wt.)

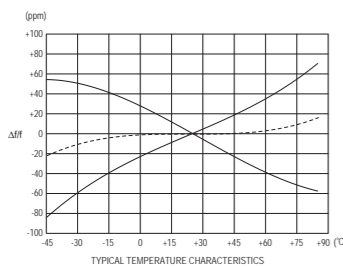
21SMX



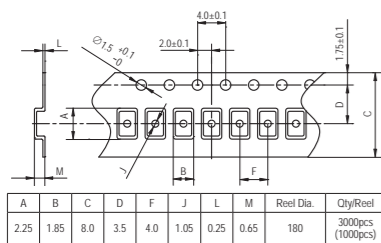
SOLDERING PATTERN



AT-CUT



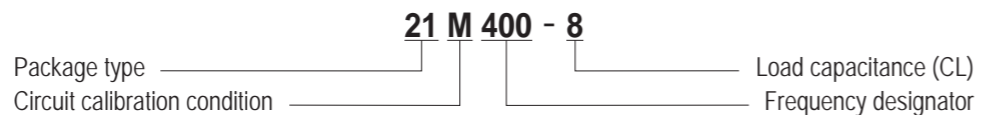
TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

Item	Specifications
Package type	21SMX
Frequency range	20.000 MHz to 80.000 MHz
Frequency tolerance	±30 ppm at +25°C ±3°C
Temperature stability (referred to +25°C)	±30 ppm over -20°C to +70°C
Load capacitance (CL)	8 pF, Typical
Shunt capacitance (C0)	5 pF max.
Drive level (P)	100 μW max. (10 μW for testing)
Aging	±5 ppm max. at +25°C ±3°C per year
Cut / Oscillation mode	AT-Cut / Fundamental
Reflow condition	10 seconds max. at +250°C ±10°C

PART NUMBERING GUIDE



Example

SMI Part No.	Package	Circuit Calibration Condition	Frequency
21M400-8	21 = 21SMX	M = Parallel resonance CL= 8 pF	400 = 40.000 MHz
21S270	21 = 21SMX	S = Series resonance	270 = 27.000 MHz

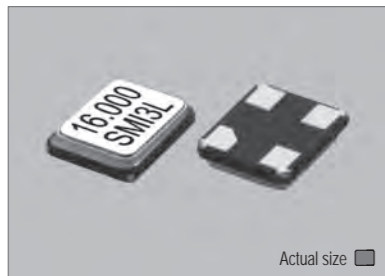
PACKAGE DATA

Item	Package	21SMX
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

21SMX STANDARD FREQUENCIES

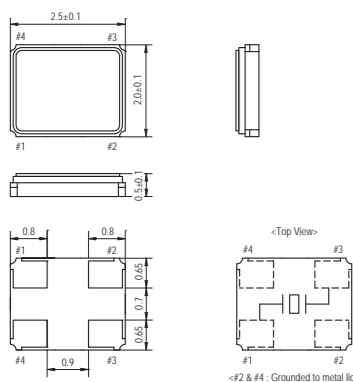
Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms (Ω) ESR
20.000000	200	100
24.000000	240	80
25.000000	250	80
26.000000	260	60
27.000000	270	60
27.120000	271	60
28.636300	286	60
30.000000	300	60
32.000000	320	60
36.000000	360	60
38.400000	384	60
40.000000	400	50
42.000000	420	50
44.545000	44545	50
48.000000	480	50

22SMX

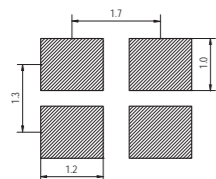


Actual size
0.00953 gm (wt.)

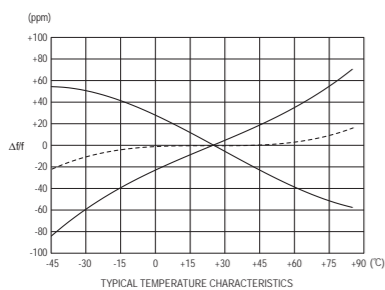
22SMX



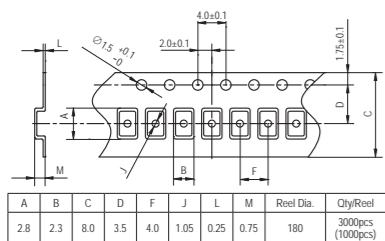
SOLDERING PATTERN



AT-CUT



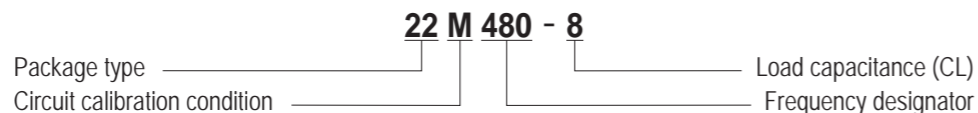
TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

Item	Specifications
Package type	22SMX
Frequency range	16.000 MHz to 80.000 MHz
Frequency tolerance	±30 ppm at +25°C ±3°C
Temperature stability (referred to +25°C)	±30 ppm over -20°C to +70°C
Load capacitance (CL)	8 pF, Typical
Shunt capacitance (C0)	5 pF max.
Drive level (P)	100 μW max. (10 μW for testing)
Aging	±5 ppm max. at +25°C ±3°C per year
Cut / Oscillation mode	AT-Cut / Fundamental
Reflow condition	10 seconds max. at +250°C ±10°C

PART NUMBERING GUIDE



Example

SMI Part No.	Package	Circuit Calibration Condition	Frequency
22M480-8	22 = 22SMX	M = Parallel resonance CL= 8 pF	480 = 48.000 MHz
22S320	22 = 22SMX	S = Series resonance	320 = 32.000 MHz

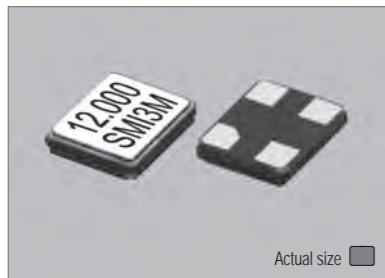
PACKAGE DATA

Item	Package	22SMX
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

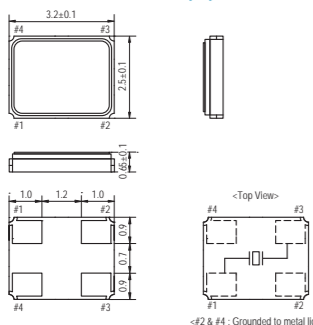
22SMX STANDARD FREQUENCIES

Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms (Ω) ESR
16.000000	160	80
16.367660	1636	80
18.000000	180	80
19.200000	192	80
20.000000	200	60
20.250000	2025	60
22.000000	220	60
22.579200	2257	60
24.000000	240	60
24.545400	2454	60
24.576000	245	60
25.000000	250	60
26.000000	260	60
27.000000	270	60
27.120000	271	60
28.636360	2863636	60
30.000000	300	50
32.000000	320	50
33.000000	330	50
33.868800	338	50
36.000000	360	40
38.400000	384	40
40.000000	400	40
44.000000	440	40
45.000000	450	40
48.000000	480	40
52.000000	520	40
54.000000	540	40
74.100000	741	40
80.000000	800	40

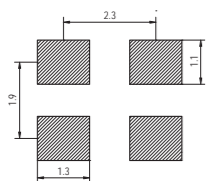
32SMX(A)



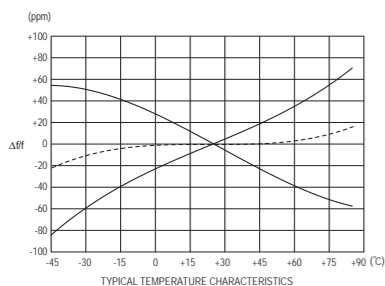
32SMX(A)



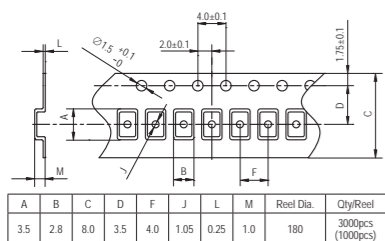
SOLDERING PATTERN



AT-CUT



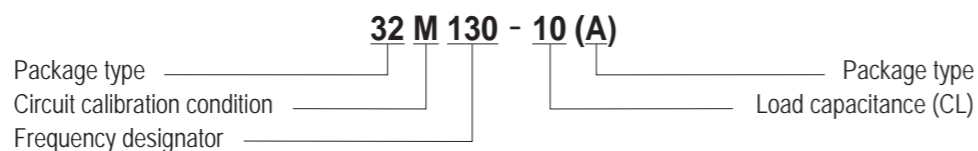
TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

Item	Specifications
Package type	32SMX(A)
Frequency range	9.843 MHz to 60.000 MHz (Fundamental) 60.000 MHz to 150.000 MHz (3rd overtone)
Frequency tolerance	±30 ppm at +25°C ±3°C
Temperature stability (referred to +25°C)	±30 ppm over -20°C to +70°C
Load capacitance (CL)	10 pF, Typical (Fundamental) Series resonance (3rd overtone)
Shunt capacitance (C0)	5 pF max.
Drive level (P)	100 μW max. (10 μW for testing)
Aging	±5 ppm max. at +25°C ±3°C per year
Cut / Oscillation mode	AT-Cut / Fundamental / 9.843MHz to 60.000MHz AT-Cut / 3rd overtone / 60.000MHz to 150.000MHz
Reflow condition	10 seconds max. at +250°C ±10°C

PART NUMBERING GUIDE



Example

SMI Part No.	Package	Circuit Calibration Condition	Frequency
32M130-10(A)	32(A) = 32SMX(A)	M = Parallel resonance CL = 10 pF	130 = 13.000 MHz

PACKAGE DATA

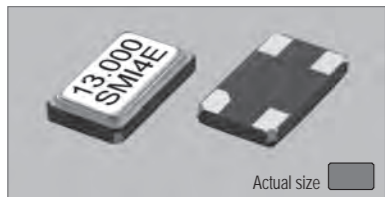
Item	Package	32SMX(A)
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

32SMX(A) STANDARD FREQUENCIES

Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms(Ω) ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms(Ω) ESR
12.000000	120	100	25.400000	254	50
12.288000	122	100	25.804800	258	50
12.500000	125	100	26.000000	260	50
12.679170	126	100	27.000000	270	50
13.000000	130	80	27.120000	271	50
13.08148	1308	80	27.456000	2745	50
13.500000	135	80	28.224000	2822	50
13.560000	1356	80	28.375000	283	50
14.318180	143	80	28.636360	2863636	50
14.745600	147	80	30.000000	300	50
15.360000	153	80	32.000000	320	50
16.000000	160	80	32.256000	3225	50
16.368000	16368	80	32.736000	3273	50
16.369000	16369	80	32.768000	32768	50
16.384000	163	80	33.000000	330	50
16.670000	1667	80	33.330000	3333	50
16.756990	1675	80	33.333300	333333	50
16.920000	1692	80	33.600000	336	50
16.934400	1693	80	33.750000	337	50
17.634160	1763	80	33.868800	338	50
18.432000	184	80	36.000000	360	50
18.870000	188	80	36.480000	3648	50
19.069928	19069928	80	38.000000	380	50
19.200000	192	80	38.400000	384	50
19.440000	194	80	39.000000	390	50
19.500000	195	80	40.000000	400	50
19.660800	196	80	40.500000	405	50
19.680000	1968	80	40.659300	4065	50
19.800000	198	80	41.000000	410	50
20.000000	200	50	41.600000	416	50
20.480000	2048	50	44.000000	440	50
20.500000	205	50	48.000000	480	50
21.948718	2194	50	49.152000	491	50
22.000000	220	50	50.000000	500	50
22.118400	221	50	52.000000	520	50
22.579200	2257	50	54.000000	540	50
23.104000	23104	50	55.466700	5546	50
24.000000	240	50	67.500000	675	140 (3rd OT)
24.190660	2419	50	114.285000	114.285	100 (3rd OT)
24.545400	2454	50	141.302083	141.302	100 (3rd OT)
24.576000	245	50			
25.000000	250	50			

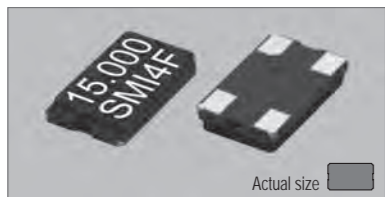
XTAL

97SMX(A)



Actual size
0.0585 gm (wt.)

97SMX(B)



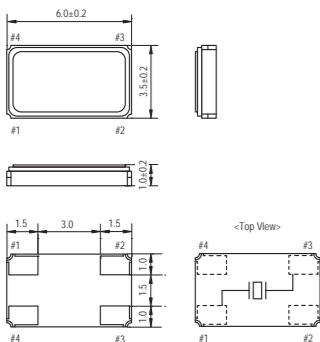
Actual size
0.0531 gm (wt.)

97SMX(C)

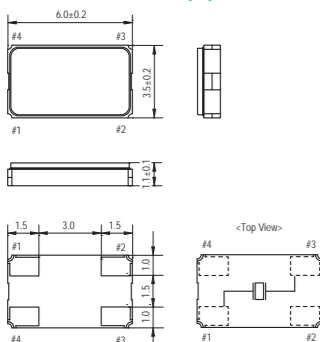


Actual size
0.0549 gm (wt.)

97SMX(A)



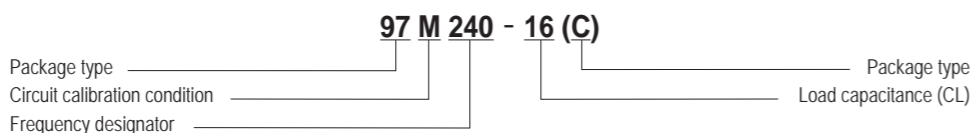
97SMX(B)



STANDARD SPECIFICATIONS

Item	Specifications		
	97SMX(A)	97SMX(B)	97SMX(C)
Package type	97SMX(A)	97SMX(B)	97SMX(C)
Frequency range	9.0 MHz to 150.0 MHz	12.0 MHz to 50.0 MHz	10.0 MHz to 67.0 MHz
Frequency tolerance	±50 ppm at +25°C ±3°C		
Temperature stability (referred to +25°C)	±50 ppm over -20°C to +70°C		
Load capacitance (CL)	16 pF, Typical		
Shunt capacitance (C0)	5 pF max.		
Drive level (P)	100 µW max. (10 µW for testing)		
Aging	±5 ppm max. at +25°C ±3°C per year		
Cut / Oscillation mode	AT-Cut / Fundamental / 9.000 MHz to 54.000 MHz		
	AT-Cut / 3rd overtone / 44.000 MHz to 150.000 MHz		
Reflow condition	10 seconds max. at +250°C ±10°C		

PART NUMBERING GUIDE



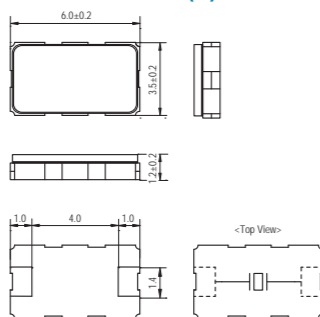
Example

SMI Part No.	Package	Circuit Calibration Condition	Frequency
97M120-10(A)	97(A) = 97SMX(A)	M = Parallel resonance CL = 10 pF	120 = 12.000 MHz
97S250(B)	97(B) = 97SMX(B)	S = Series resonance	250 = 25.000 MHz
97M240-16(C)	97(C) = 97SMX(C)	M = Parallel resonance CL = 16 pF	240 = 24.000 MHz

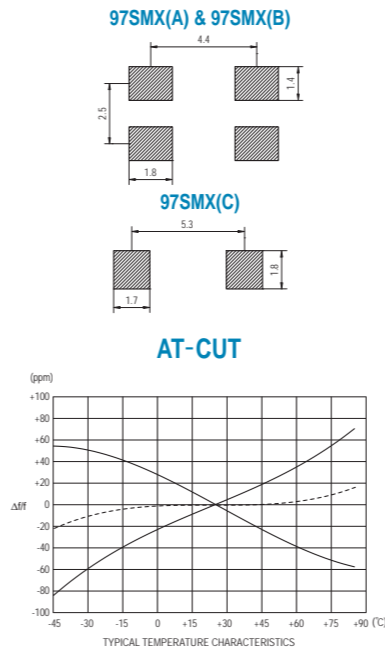
PACKAGE DATA

Item	Package	97SMX(A)	97SMX(B)	97SMX(C)
Lid		Metal	Ceramic	Ceramic
Base		Ceramic	Ceramic	Ceramic
Sealing		Seam	Epoxy	Epoxy
Terminal		Tungsten (metalized)	Tungsten (metalized)	Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)	Gold / Nickel (surface) / (under)	Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)	Compliant (Pb-free)	Compliant (Pb-free)

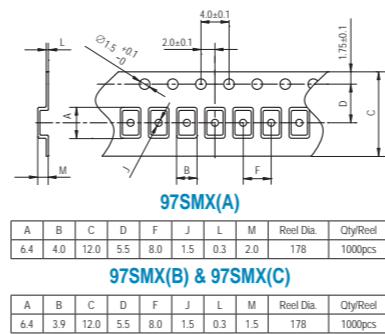
97SMX(C)



SOLDERING PATTERN



TAPE SPECIFICATIONS



97SMX STANDARD FREQUENCIES

Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms(Ω) ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms(Ω) ESR
9.84375000	0984	60	19.800000	198	40
10.000000	100	60	20.000000	200	40
10.368000	103	60	20.400000	204	40
10.752000	1075	60	20.480000	2048	40
11.059200	1105	50	20.600000	206	40
11.289600	1128	50	20.657500	2065	40
11.298000	11298	50	20.945000	20945	40
12.000000	120	40	21.250000	2125	40
12.288000	122	40	21.700000	217	40
12.504000	12504	40	22.000000	220	40
12.582910	125	40	22.118400	221	40
12.600000	126	40	23.920000	2392	40
12.750000	1275	40	24.000000	240	40
12.779520	1277	40	24.545400	2454	40
12.800000	128	40	24.553500	2455	40
12.989690	129	40	24.576000	245	40
13.000000	130	40	25.000000	250	40
13.248000	132	40	25.488330	2548	40
13.400000	134	40	25.808400	258	40
13.454880	1345	40	26.000000	260	40
13.500000	135	40	26.195833	2619	40
13.514400	1351	40	27.000000	270	40
13.560000	1356	40	27.820800	2782	40
13.567000	13567	40	28.636363	2863	40
13.567200	135672	40	28.800000	288	40
13.568750	13568	40	29.498928	2949892	40
13.700200	137	40	30.000000	300	40
13.824000	138	40	32.000000	320	40
14.318180	143	40	32.768000	32768	40
14.400000	144	40	33.333300	333333	40
14.725000	14725	40	36.000000	360	40
14.745600	147	40	38.880000	388	40
14.850000	1485	40	39.000000	390	40
14.900000	149	40	40.000000	400	40
15.000000	150	40	44.000000	440	100 (3rd OT)
15.360000	153	40	44.545000	445	100 (3rd OT)
15.600000	156	40	48.000000	480	100 (3rd OT)
16.000000	160	40	49.152000	491	40
16.367000	16367	40	50.000000	500	40
16.368000	16368	40	52.074000	5207	100 (3rd OT)
16.384000	163	40	54.000000	540	40
16.524800	1652	40	70.933300	7093	100 (3rd OT)
16.800000	168	40	78.587500	7858	100 (3rd OT)
17.792000	1779	40	78.737500	7873	100 (3rd OT)
18.000000	180	40	78.780000	7878	100 (3rd OT)
18.080000	1808	40	87.395000	8739	100 (3rd OT)
18.414000	1841	40	106.250000	106.25	100 (3rd OT)
18.432000	184	40	125.000000	125	100 (3rd OT)
19.069900	1906	40			
19.200000	192	40			
19.440000	194	40			
19.660800	196	40			
19.680000	1968	40			

XTAL

CLK OSC

VCXO

TCXO

OCXO

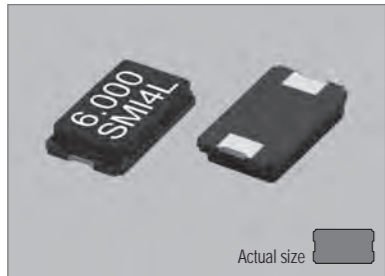
MCF

Quartz Crystal Units
93SMX FAMILY

STANDARD SMD CRYSTALS

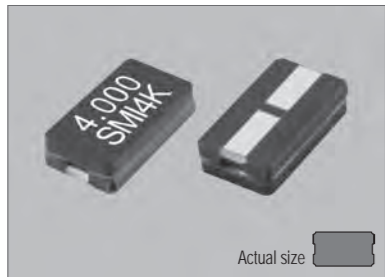
XTAL

93SMX(A)



Actual size
0.1667 gm (wt.)

93SMX(B)

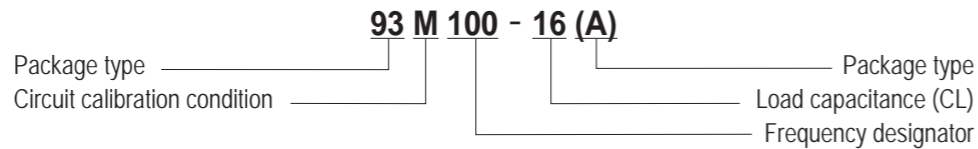


Actual size
0.208 gm (wt.)

STANDARD SPECIFICATIONS

Item	Specifications	
	93SMX(A)	93SMX(B)
Package type	93SMX(A)	93SMX(B)
Frequency range	4.000 MHz to 50.000 MHz	4.000 MHz to 8.000 MHz
Frequency tolerance	±50 ppm at +25°C ±3°C	
Temperature stability (referred to +25°C)	±50 ppm over -20°C to +70°C	
Load capacitance (CL)	16 pF, Typical	
Shunt capacitance (C0)	5 pF max.	
Drive level (P)	300 µW max. (10 µW for testing)	
Aging	±5 ppm max. at +25°C ±3°C per year	
Cut / Oscillation mode	AT-Cut / Fundamental	
Reflow condition	10 seconds max. at +250°C ±10°C	

PART NUMBERING GUIDE



Example

SMI Part No.	Package	Circuit Calibration Condition	Frequency
93M100-16(A)	93 = 93SMX	M = Parallel resonance CL = 16 pF	100 = 10.000 MHz
93S360(A)	93 = 93SMX	S = Series resonance	360 = 36.000 MHz
93M040-8(B)	93(B) = 93SMX(B)	M = Parallel resonance CL = 8 pF	040 = 4.000 MHz

PACKAGE DATA

Item	Package	93SMX(A)	93SMX(B)
Lid		Ceramic	Ceramic
Base		Ceramic	Ceramic
Sealing		Glass	Glass
Terminal		Tungsten (metalized)	Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)	Gold / Nickel (surface) / (under)
RoHS		Compliant	Compliant

93SMX STANDARD FREQUENCIES

Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms (Q) ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms (Q) ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms (Q) ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms (Q) ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms (Q) ESR
4.000000	040	300	13.500000	135	50	17.258400	1725	50	24.557200	2455	50	35.468800	354688	50
5.000000	050	250	13.560000	1356	50	17.262700	172	50	24.576000	245	50	35.637500	356	50
5.175000	0517	250	13.564980	13564	50	17.664000	176	50	24.858900	248	50	35.795500	357	50
5.845000	0584	250	13.567178	135671	50	17.734475	1773	50	25.000000	250	50	36.000000	360	50
6.000000	060	250	13.567200	135672	50	18.000000	180	50	25.140000	2514	50	36.200000	362	50
6.750000	0675	250	13.568750	135687	50	18.080000	1808	50	25.670000	2567	50	36.818178	36818178	50
7.200000	072	250	13.568800	135688	50	18.105600	181	50	25.804800	258	50	36.818200	368182	50
7.372800	073	250	13.570300	1357	50	18.300000	183	50	26.000000	260	50	36.864000	3686	50
7.500000	075	250	13.570313	135703	50	18.355000	1835	50	26.800000	268	50	37.500000	375	50
8.000000	080	200	13.574000	13574	50	18.425200	1842	50	26.973050	26973	50	38.000000	380	50
8.192000	08192	200	13.575600	13575	50	18.432000	184	50	26.973100	2697	50	38.035000	3803	50
8.664000	086	200	13.575630	135756	50	18.437500	18437	50	26.980000	2698	50	38.352000	3835	50
9.000000	090	200	13.577000	13577	50	18.544000	18544	50	27.000000	270	50	38.400000	384	50
9.185183	091	200	13.577400	135774	50	18.937500	1893	50	27.120000	271	50	40.000000	400	50
9.216000	092	200	13.577500	135775	50	19.000000	190	50	27.500000	275	50	40.190000	401	50
9.509375	095	120	13.580000	1358	50	19.069920	1906992	50	27.700000	277	50	40.320000	403	50
9.510000	0951	120	13.580600	135806	50	19.069929	19069929	50	27.823900	27823	50	40.500000	405	50
9.830400	098	120	13.580625	1358062	50	19.138600	1913	50	27.870000	2787	50	40.737600	407	50
9.843750	0984	120	13.585500	13585	50	19.170000	1917	50	28.000000	280	50	41.600000	416	50
9.845310	09845	120	13.750000	1375	50	19.176000	19176	50	28.125000	281	50	42.954540	4295	50
9.859380	0985	120	13.824000	138	50	19.200000	192	50	28.224000	282	50			
9.861818	098618	120	13.912800	139	50	19.247000	1924	50	28.244000	2824	50			
9.861820	09861	120	14.000000	140	50	19.260000	1926	50	28.322000	2832	50			
9.864375	0986437	120	14.129688	1412	50	19.390000	193	50	28.350000	2835	50			
9.864380	09864	120	14.187500	1418	50	19.500000	195	50	28.375000	283	50			
9.874380	0987	120	14.237500	1423	50	19.660800	196	50	28.496100	284	50			
10.000000	100	100	14.250000	142	50	19.670000	1967	50	28.500000	285	50			
10.000500	100005	100	14.264000	1426	50	19.687500	19687	50	28.604900	28604	50			
10.178000	1017	100	14.284800	1428	50	19.800000	198	50	28.625000	2862	50			
10.178125	101781	100	14.318180	143	50	19.968000	199	50	28.636363	2863	50			
10.250000	1025	100	14.464063	1446	50	19.990000	1999	50	28.724000	287	50			
10.260000	1026	100	14.721000	1472	50	19.993700	19993	50	28.900000	289	50			
11.000000	110	100	14.745600	147	50	20.000000	200	50	29.000000	290	50			
11.059200	1105	100	14.750000	1475	50	20.250000	2025	50	29.491200	294	50			
11.150000	1115	100	15.000000	150	50	20.480000	2048	50	29.498900	294989	50			
11.250000	1125	100	15.360000	153	50	20.499800	2049	50	29.498928	2949892	50			
11.289600	1128	100	15.954500	1595	50	20.500000	205	50	29.700000	297	50			
11.298000	11298	100	15.968000	1596	50	20.736000	2073	50	30.000000	300	50			
11.894400	11894	100	15.974400	1597	50	20.945000	20945	50	30.275000	3027	50			
11.895100	11895	100	15.992000	1599	50	21.000000	210	50	30.720000	307	50			
11.895104	118951	100	16.000000	160	50	21.047200	2104	50	31.000000	310	50			
11.968000	1196	100	16.069900	1606	50	21.047236	21047	50	31.104000	31104	50			
11.980800	1198	100	16.110000	1611	50	21.120000	211	50	31.400000	314	50			
11.995200	1199	100	16.128000	1612	50	21.213000	2121	50	31.948800	31948	50			
12.000000	120	80	16.200000	162	50	21.250000	2125	50	31.987500	3198	50			
12.288000	122	80	16.384000	163	50	21.477270	2147	50	32.000000	320	50			
12.331800	1233	80	16.500000	165	50	21.544400	215	50	32.223200	3222	50			
12.500000	125	80	16.647300	1664	50	21.544415	2154	50	32.720000	327	50			
12.580000	1258	80	16.656000	1665	50	21.667000	216	50	32.768000	32768	50			
13.000000	130	50	16.666000	1666	50	22.118400	221	50	33.000000	330	50			
13.083600	130836	50	16.667000	166	50	22.450000	224	50	33.145300	331	50			
13.083840	1308384	50	16.670000	1667	50	22.579200	2257	50	33.231000	332	50			
13.125000	1312	50	16.777000	1677	50	22.909088	229	50	33.333000	33333	50			
13.225000	13225	50	16.777200	167	50	23.000000	230	50	33.333333	33333333	50			
13.225600	132256	50	16.900000	169	50	23.040000	2304	50	33.528000	3352	50			
13.333300	133333	50	16.915000	1691	50	24.000000	240	50	33.868800	338	50			
13.333333	13333333	50	16.920000	1692	50	24.000100	240001	50	34.560000	345	50			
13.400000	134	50	16.934400	1693	50	24.545400	245454	50	35.328000	3532	50			
			17.177600	171	50	24.545454	24545454	50	35.468750	354687	50			

CLK OSC

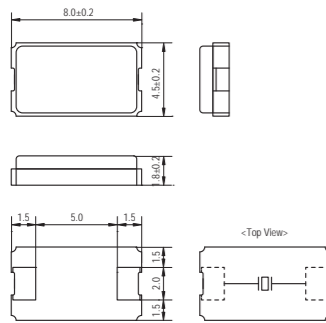
VCXO

TCXO

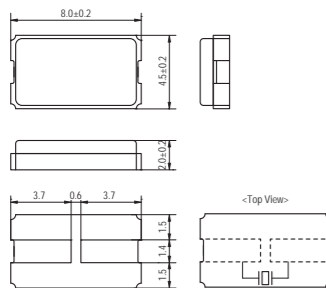
OCXO

MCF

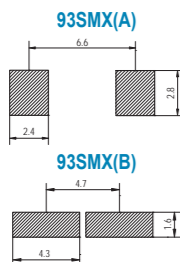
93SMX(A)



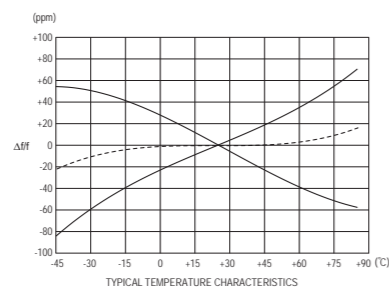
93SMX(B)



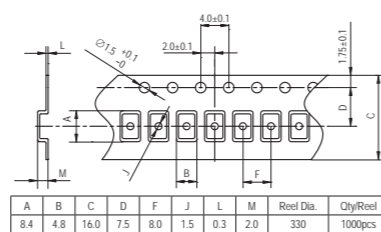
SOLDERING PATTERN



AT-CUT



TAPE SPECIFICATIONS



XTAL

CLK OSC

VCXO

TCXO

OCXO

MCF

XTAL

CLK OSC

VCXO

TCXO

OCXO

MCF

XTAL

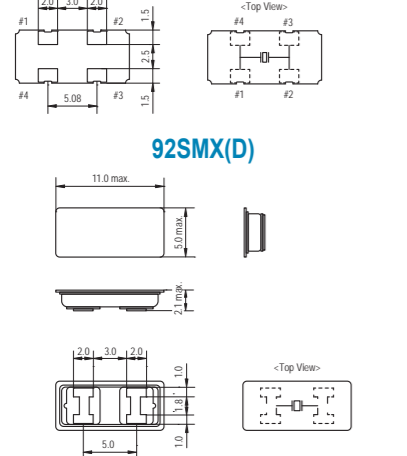
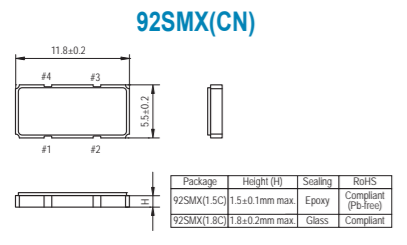
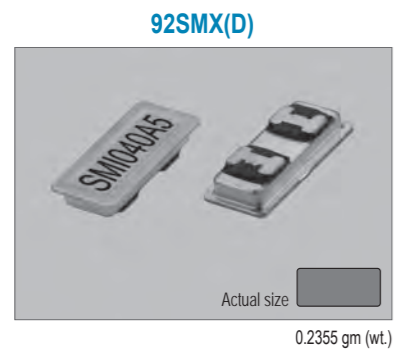
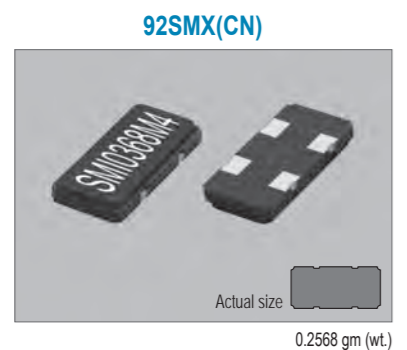
CLK OSC

VCXO

TCXO

OCXO

MCF

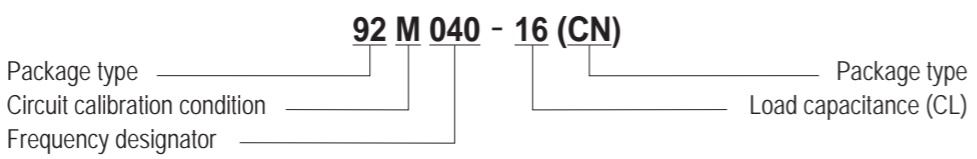


STANDARD SPECIFICATIONS

Item	Specifications	
	92SMX(CN)	92SMX(D)*
Package type	92SMX(CN)	92SMX(D)*
Frequency range	3.579545 MHz to 30.0 MHz	3.579545 MHz to 40.0 MHz
Frequency tolerance	±50 ppm at +25°C ±3°C	
Temperature stability (referred to +25°C)	±50 ppm over -20°C to +70°C	
Load capacitance (CL)	16 pF, Typical	
Shunt capacitance (C0)	5 pF max.	
Drive level (P)	300 µW max. (10 µW for testing)	
Aging	±5 ppm max. at +25°C ±3°C per year	
Cut / Oscillation mode	AT-Cut / Fundamental	
Reflow condition	10 seconds max. at +250°C ±10°C	

*Formerly 49SMX-CB(N)

PART NUMBERING GUIDE



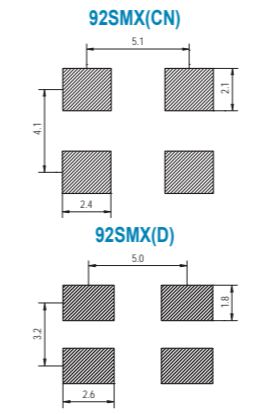
Example

SMI Part No.	Package	Circuit Calibration Condition	Frequency
92M040-16(CN)	92(CN) = 92SMX(CN)	M = Parallel resonance CL = 16pF	040 = 4.000 MHz
92M060-20(D)	92(D) = 92SMX(D)	M = Parallel resonance CL = 20pF	060 = 6.000 MHz

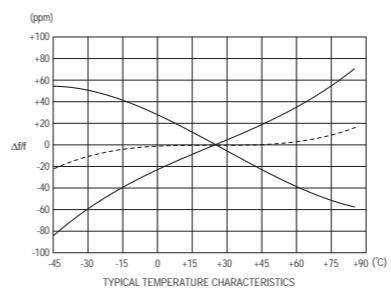
PACKAGE DATA

Item	Package	92SMX(CN)	92SMX(D)
Lid / Cover		Ceramic	Metal
Base		Ceramic	Glass on Metal
Insulator		n.a.	n.a.
Sealing		See drawing	Resistance
Terminal		Tungsten (metalized)	Alloy (FeNiCo)
Terminal plating		Gold / Nickel (surface) / (under)	Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)	Compliant (Pb-free)

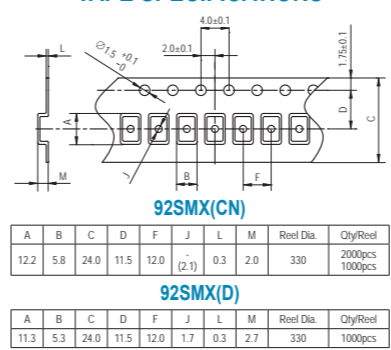
SOLDERING PATTERN



AT-CUT



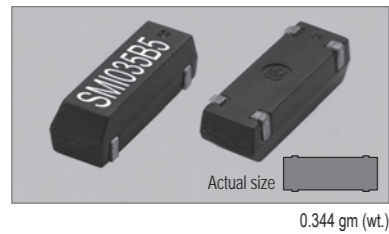
TAPE SPECIFICATIONS



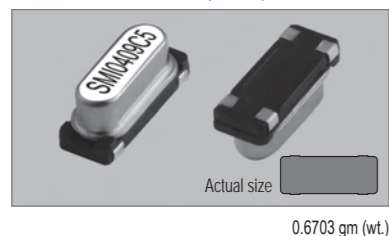
92SMX STANDARD FREQUENCIES

Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms(Ω)ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms(Ω)ESR
3.579545	035	200	24.000000	240	50
3.648000	0364	200	24.576000	245	50
3.686400	0368	200	25.000000	250	40
4.000000	040	150	26.540000	2654	40
4.032000	0403	150	27.000000	270	40
4.096000	0409	150	28.636363	2863	40
4.194304	041	150	29.491200	294	40
4.433619	044	150	30.000000	300	40
4.800000	048	150	32.000000	320	40
4.915200	049	150	33.000000	330	40
5.000000	050	150	35.468950	354	40
5.333000	05333	150	36.864000	368	40
5.699623	056	150	37.745000	377	40
6.000000	060	100	39.000000	390	40
6.144000	061	100	40.000000	400	40
6.176000	0617	100			
7.372800	073	100			
7.600000	076	100			
7.680000	0768	100			
8.000000	080	100			
8.192000	08192	100			
8.400000	084	100			
9.000000	090	100			
9.216000	092	100			
9.600000	096	100			
9.830400	098	100			
10.000000	100	80			
10.202000	102	80			
10.245000	10245	80			
11.059200	1105	80			
12.000000	120	80			
12.288000	122	80			
13.000000	130	80			
13.248000	132	80			
13.500000	135	80			
14.000000	140	50			
14.318180	143	50			
14.400000	144	50			
14.745600	147	50			
15.000000	150	50			
15.360000	153	50			
16.000000	160	50			
16.384000	163	50			
17.700000	177	50			
17.734475	1773	50			
18.000000	180	50			
18.432000	184	50			
19.660800	196	50			
20.000000	200	50			
20.480000	2048	50			
22.118400	221	50			
23.000000	230	50			

86SMX(LPN)



86SMX(CSM)



STANDARD SPECIFICATIONS

Item	Specifications	
	86SMX(LPN)	86SMX(CSM)
Package type	86SMX(LPN)	86SMX(CSM)
Frequency range	3.579545 MHz to 32.000 MHz	
Frequency tolerance	±50 ppm at +25°C ±3°C	
Temperature stability (referred to +25°C)	±50 ppm over -20°C to +70°C	
Load capacitance (CL)	16 pF, Typical	
Shunt capacitance (C0)	5 pF max.	
Drive level (P)	100 µW max. (10 µW for testing)	
Aging	±5 ppm max. at +25°C ±3°C per year	
Cut / Oscillation mode	AT-Cut / Fundamental	
Reflow condition	10 seconds max. at +250°C ±10°C	

PART NUMBERING GUIDE

86 M 0368 -16 (LPN)

Package type _____ Package type
 Circuit calibration condition _____ Load capacitance (CL)
 Frequency designator _____

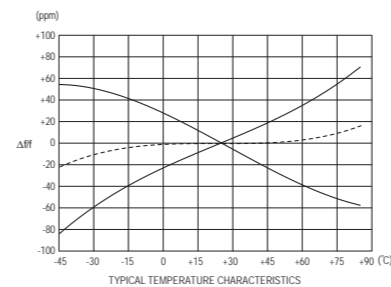
Example

SMI Part No.	Package	Circuit Calibration Condition	Frequency
86M0368-16(LPN)	86(LPN) = 86SMX(LPN)	M = Parallel resonance CL = 16pF	0368 = 3.68640 MHz
86M073-18(CSM)	86(CSM) = 86SMX(CSM)	M = Parallel resonance CL = 18pF	073 = 7.37280 MHz

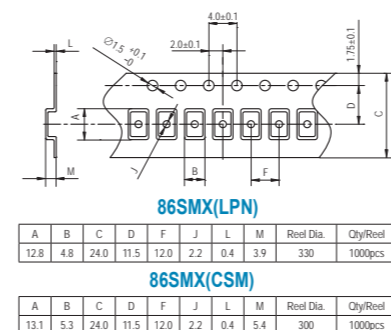
PACKAGE DATA

Item	86SMX(LPN)	86SMX(CSM)
Outer Package / Cover	Plastic	Metal
Base	n.a.	Metal
Insulator	n.a.	46 nylon
Sealing	Press-fit (3x10mm built-in)	Resistance
Terminal lead frame	42 alloy	42 alloy
Terminal plating	Tin / Nickel (surface) / (under)	Tin
RoHS	Compliant	Compliant (Pb-free)

AT-CUT



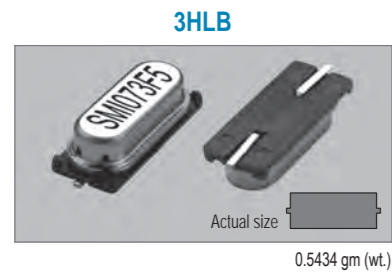
TAPE SPECIFICATIONS



86SMX STANDARD FREQUENCIES

Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms(Ω)ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance Ohms(Ω)ESR
3.579545	035	200	18.543000	18543	50
3.600000	036	200	19.200000	192	50
3.686400	0368	200	19.660800	196	50
4.000000	040	150	20.000000	200	40
4.032000	0403	150	20.480000	2048	40
4.096000	0409	150	20.940000	2094	40
4.194304	041	150	21.425660	214	40
4.433619	044	150	22.118400	221	40
4.608000	046	150	23.438000	234	40
4.800000	048	150	23.961600	239	40
4.915200	049	150	24.000000	240	40
5.000000	050	120	24.576000	245	40
5.068800	0506	120	25.000000	250	40
5.120000	0512	120	27.000000	270	40
5.256200	0525	120	28.224000	282	40
6.000000	060	100	29.491200	294	40
6.144000	061	100	30.000000	300	40
6.400000	064	100	32.000000	320	40
6.650000	0665	100			
7.372800	073	80			
7.441400	074	80			
7.621000	0762	80			
7.680000	0768	80			
8.000000	080	80			
8.192000	08192	80			
9.216000	092	60			
9.537500	095	60			
9.600000	096	60			
9.830400	098	60			
10.000000	100	60			
10.240000	1024	60			
10.752000	1075	60			
11.000000	110	60			
11.059200	1105	60			
12.000000	120	60			
12.288000	122	60			
12.296000	1229	60			
12.800000	128	60			
13.105000	131	50			
13.500000	135	50			
13.560000	1356	50			
14.250000	142	50			
14.318180	143	50			
14.745600	147	50			
15.000000	150	50			
15.360000	153	50			
16.000000	160	50			
16.384000	163	50			
16.588000	1658	50			
16.667000	166	50			
16.934400	1693	50			
17.734475	1773	50			
18.432000	184	50			

XTAL



CLK OSC

VCXO

TCXO

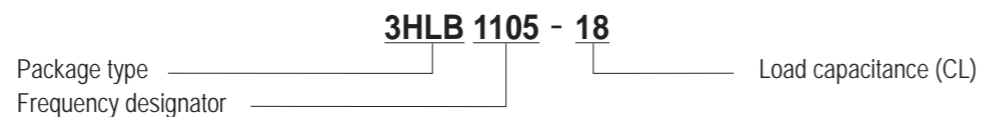
OCXO

MCF

STANDARD SPECIFICATIONS

Item	Specifications		
	4HLB	3HLB	25HLB
Package type	4HLB	3HLB	25HLB
Frequency range	3.579545 MHz to 80.000 MHz		
Frequency tolerance	±50 ppm at +25°C ±3°C		
Temperature stability (referred to +25°C)	± 50 ppm over -20°C to +70°C (AT-Cut) ±100 ppm over -10°C to +60°C (BT-Cut)		
Load capacitance (CL)	18 pF, Typical		
Shunt capacitance (C0)	5 pF max.		
Drive level (P)	100 µW max. (10 µW for testing)		
Aging	±5 ppm max. at +25°C ±3°C per year		
Cut / Oscillation mode	AT-Cut / Fundamental / 3.579545 MHz to 40.000 MHz		
	BT-Cut / Fundamental / 28.636363 MHz to 54.000 MHz		
	AT-Cut / 3rd overtone / 26.690000 MHz to 80.000 MHz		
Reflow condition	10 seconds max. at +250°C ±10°C		

PART NUMBERING GUIDE



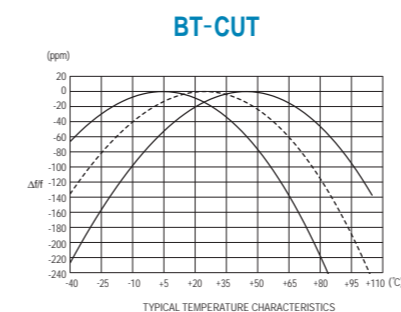
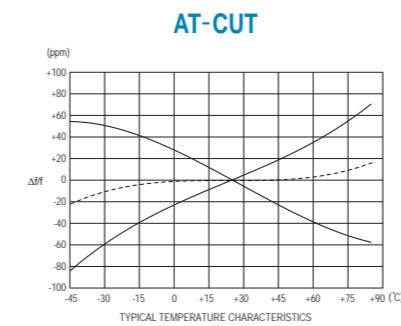
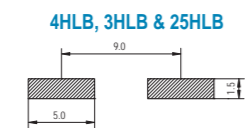
Example

SMI Part No.	Package	Circuit Calibration Condition	Frequency
4HLB400-16	4HLB	Parallel resonance CL = 16pF	400 = 40.00000 MHz
3HLB1105-18	3HLB	Parallel resonance CL = 18pF	1105 = 11.05920 MHz
25HLB360S	25HLB	S = Series resonance	360 = 36.00000 MHz

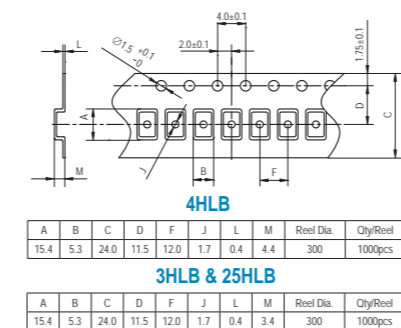
PACKAGE DATA

Item	Package	4HLB	3HLB	25HLB
Cover		Metal	Metal	Metal
Base		Metal	Metal	Metal
Insulator		PPS	PPS	PPS
Sealing		Resistance	Resistance	Resistance
Terminal lead		Alloy (FeNiCo)	Alloy (FeNiCo)	Alloy (FeNiCo)
Terminal plating		SnCu	SnCu	SnCu
RoHS		Compliant (Pb-free)	Compliant (Pb-free)	Compliant (Pb-free)

SOLDERING PATTERN



TAPE SPECIFICATIONS



LB STANDARD FREQUENCIES

Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance (Ω) ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance (Ω) ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance (Ω) ESR
3.579545	035	200	13.410000	1341	50	30.800000	308	40
3.580000	0358	200	13.500000	135	50	31.708000	317	40
3.648000	0364	200	13.544375	1354	50	32.000000	320	40
3.686400	0368	200	13.560000	1356	50	32.110000	321	40
3.840000	0384	200	13.567200	135672	50	32.768000	32768	40
3.932160	039	200	13.577000	13577	50	33.000000	330	40
4.000000	040	150	14.000000	140	50	33.177600	3317	40
4.032000	0403	150	14.316000	14316	50	33.333000	33333	40
4.096000	0409	150	14.318180	143	50	33.868800	338	40
4.194304	041	150	14.400000	144	50	35.468950	354	40
4.433000	0443	150	14.580000	1458	50	36.000000	360	40
4.433619	044	150	14.745600	147	50	36.864000	368	40
4.500000	045	150	15.000000	150	50	37.745000	377	40
4.608000	046	150	15.360000	153	50	38.000000	380	40
4.800000	048	150	15.980000	1598	50	40.000000	400	40
4.906250	04906	150	16.000000	160	50	40.685000	4068	40
4.915200	049	150	16.384000	163	50	40.750000	4075	40
5.000000	050	120	16.588000	1658	50	43.391670	4339	40
5.089062	0508	120	16.934400	1693	50	45.000000	450	40 (BT-Cut)
5.333000	05333	120	17.700000	177	50	48.000000	480	40 (BT-Cut)
5.333333	053	120	17.734470	1773447	50	49.860000	4986	40 (BT-Cut)
5.699623	056	120	17.734475	1773	50	50.000000	500	40 (BT-Cut)
6.000000	060	100	18.000000	180	50	50.032000	50032	40 (BT-Cut)
6.144000	061	100	18.432000	184	50	50.803200	508	40 (BT-Cut)
6.176000	0617	100	19.069929	19069929	50	54.000000	540	40 (BT-Cut)
6.480000	0648	100	19.200000	192	50	61.000000	610	40 (BT-Cut)
6.745800	0674	100	19.260000	1926	50			
6.764300	067643	100	19.312000	193	50			
6.764380	0676	100	19.440000	194	50			
6.776170	0677	100	19.608000	19608	50			
6.783600	0678	100	19.660800	196	50			
7.372800	073	80	19.680000	1968	50			
7.500000	075	80	20.000000	200	40			
7.680000	0768	80	20.250000	2025	40			
8.000000	080	80	20.250800	202508	40			
8.190000	0819	80	20.476000	20476	40			
8.192000	08192	80	20.480000	2048	40			
8.400000	084	80	20.945000	20945	40			
9.000000	090	60	22.118400	221	40			
9.031600	0903	60	22.425000	22425	40			
9.216000	092	60	22.525000	22525	40			
9.600000	096	60	22.787500	227875	40			
9.690900	096909	60	22.887500	22887	40			
9.690990	0969099	60	23.000000	230	40			
9.718750	0971	60	23.600000	236	40			
9.830400	098	60	23.975000	23975	40			
9.843750	0984	60	24.000000	240	40			
10.000000	100	60	24.576000	245	40			
10.111000	101	60	25.000000	250	40			
10.202000	102	60	26.500000	265	40			
10.245000	10245	60	26.540000	2654	40			
10.368000	103	60	26.800000	268	40			
10.781200	1078	60	26.998435	26998	40			
11.000000	110	60	27.000000	270	40			
11.059200	1105	60	27.145000	27145	40			
11.290000	1129	60	27.586000	2758	40			
12.000000	120	60	28.000000	280	40			
12.270000	1227	60	28.224000	282	40			
12.288000	122	60	28.636000	28636	40			
12.296000	1229	60	28.636300	286363	40			
12.334375	12334	60	28.636363	2863	40			
13.000000	130	50	28.920000	2892	40			
13.234370	1323	50	29.000000	290	40			
13.248000	132	50	29.491200	294	40			
13.401560	13401	50	29.498900	294989	40			
13.406250	13406	50	30.000000	300	40			

XTAL

CLK OSC

VCXO

TCXO

OCXO

MCF

Quartz Crystal Units

HC-49/U-2H, HC-49/U-3H & HC-49/U-4H FAMILY

STANDARD THROUGH-HOLE CRYSTALS

XTAL

CLK OSC

VCXO

TCXO

OCXO

MCF

XTAL

CLK OSC

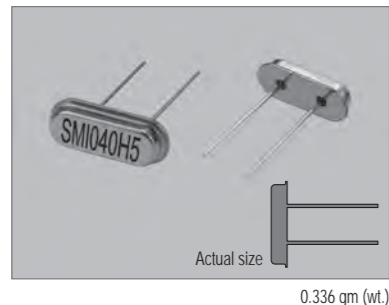
VCXO

TCXO

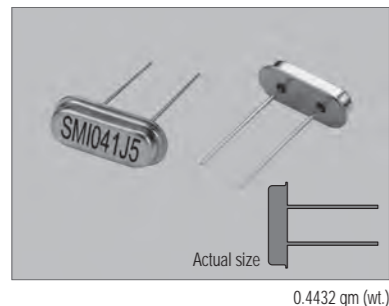
OCXO

MCF

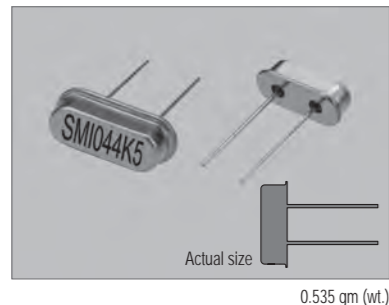
HC-49/U-2H



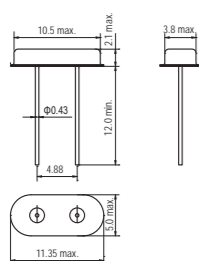
HC-49/U-3H



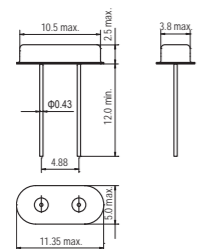
HC-49/U-4H



HC-49/U-2H



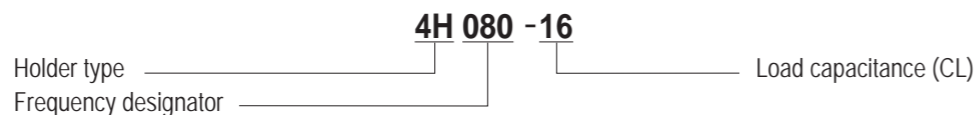
HC-49/U-3H



STANDARD SPECIFICATIONS

Item	Specifications
Holder type	HC-49/U-2H, HC-49/U-3H & HC-49/U-4H
Frequency range	3.579545 MHz to 61.000 MHz
Frequency tolerance	±50 ppm at +25°C ±3°C
Temperature stability (referred to +25°C)	±50 ppm over -20°C to +70°C
Load capacitance (CL)	16 pF, Typical
Shunt capacitance (C0)	5 pF max.
Drive level (P)	100 µW max. (10 µW for testing)
Aging	±5 ppm max. at +25°C ±3°C per year
Cut / Oscillation mode	AT-Cut / Fundamental / 3.579545 MHz to 40.000 MHz
	BT-Cut / Fundamental / 28.636363 MHz to 50.000 MHz
	AT-Cut / 3rd overtone / 26.690000 MHz to 61.000 MHz

PART NUMBERING GUIDE



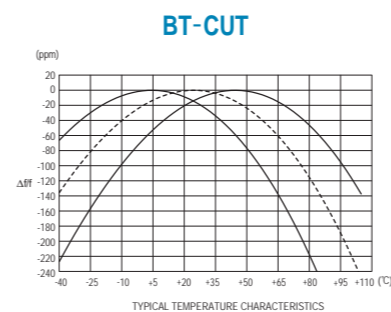
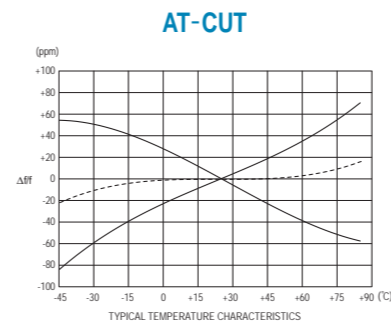
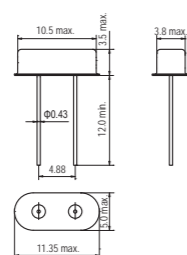
Example

SMI Part No.	Holder	Circuit Calibration Condition	Frequency
2H221-18	2H = HC-49/U-2H	Parallel resonance CL = 18 pF	221 = 22.1184 MHz
3H450S	3H = HC-49/U-3H	S = Series resonance	450 = 45.000 MHz
4H080-16	4H = HC-49/U-4H	Parallel resonance CL = 16 pF	080 = 8.000 MHz

HOLDER DATA

Item	Holder	HC-49/U-2H	HC-49/U-3H	HC-49/U-4H
Cover		Metal	Metal	Metal
Base		Metal	Metal	Metal
Sealing		Resistance	Resistance	Resistance
Terminal lead		Alloy (FeNiCo)	Alloy (FeNiCo)	Alloy (FeNiCo)
Terminal plating		SnCu	SnCu	SnCu
RoHS		Compliant (Pb-free)	Compliant (Pb-free)	Compliant (Pb-free)

HC-49/U-4H



HC-49/U-2H, 3H & 4H STANDARD FREQUENCIES

Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance (Ω) ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance (Ω) ESR	Frequency MHz	Frequency Designator	Max. Equivalent Series Resistance (Ω) ESR
3.579545	035	200	13.410000	1341	50	30.800000	308	40
3.580000	0358	200	13.500000	135	50	31.708000	317	40
3.648000	0364	200	13.544375	1354	50	32.000000	320	40
3.686400	0368	200	13.560000	1356	50	32.110000	321	40
3.840000	0384	200	13.567200	135672	50	32.768000	32768	40
3.932160	039	200	13.577000	13577	50	33.000000	330	40
4.000000	040	150	14.000000	140	50	33.177600	3317	40
4.032000	0403	150	14.316000	14316	50	33.333000	33333	40
4.096000	0409	150	14.318180	143	50	33.868800	338	40
4.194304	041	150	14.400000	144	50	35.468950	354	40
4.433000	0443	150	14.580000	1458	50	36.000000	360	40
4.433619	044	150	14.745600	147	50	36.864000	368	40
4.500000	045	150	15.000000	150	50	37.745000	377	40
4.608000	046	150	15.360000	153	50	38.000000	380	40
4.800000	048	150	15.980000	1598	50	40.000000	400	40
4.906250	04906	150	16.000000	160	50	40.685000	4068	40 (BT-Cut)
4.915200	049	150	16.384000	163	50	40.750000	4075	40 (BT-Cut)
5.000000	050	120	16.588000	1658	50	43.391670	4339	40 (BT-Cut)
5.089062	0508	120	16.934400	1693	50	45.000000	450	40 (BT-Cut)
5.333000	05333	120	17.700000	177	50	48.000000	480	40 (BT-Cut)
5.333333	053	120	17.734470	1773447	50	49.860000	4986	40 (BT-Cut)
5.699623	056	120	17.734475	1773	50	50.000000	500	40 (BT-Cut)
6.000000	060	100	18.000000	180	50	50.032000	50032	40 (BT-Cut)
6.144000	061	100	18.432000	184	50	50.803200	508	40 (BT-Cut)
6.176000	0617	100	19.069929	19069929	50	54.000000	540	40 (BT-Cut)
6.480000	0648	100	19.200000	192	50	61.000000	610	40 (BT-Cut)
6.745800	0674	100	19.260000	1926	50			
6.764300	067643	100	19.312000	193	50			
6.764380	0676	100	19.440000	194	50			
6.776170	0677	100	19.608000	19608	50			
6.783600	0678	100	19.660800	196	50			
7.372800	073	80	19.680000	1968	50			
7.500000	075	80	20.000000	200	40			
7.680000	0768	80	20.250000	2025	40			
8.000000	080	80	20.250800	202508	40			
8.190000	0819	80	20.476000	20476	40			
8.192000	08192	80	20.480000	2048	40			
8.400000	084	80	20.945000	20945	40			
9.000000	090	60	22.118400	221	40			
9.031600	0903	60	22.425000	22425	40			
9.216000	092	60	22.525000	22525	40			
9.600000	096	60	22.787500	227875	40			
9.690900	096909	60	22.887500	22887	40			
9.690990	0969099	60	23.000000	230	40			
9.718750	0971	60	23.600000	236	40			
9.830400	098	60	23.975000	23975	40			
9.843750	0984	60	24.000000	240	40			
10.000000	100	60	24.576000	245	40			
10.111000	101	60	25.000000	250	40			
10.202000	102	60	26.500000	265	40			
10.245000	10245	60	26.540000	2654	40			
10.368000	103	60	26.800000	268	40			
10.781200	1078	60	26.998435	26998	40			
11.000000	110	60	27.000000	270	40			
11.059200	1105	60	27.145000	27145	40			
11.290000	1129	60	27.586000	2758	40			
12.000000	120	60	28.000000	280	40			
12.270000	1227	60	28.224000	282	40			
12.288000	122	60	28.636000	28636	40			
12.296000	1229	60	28.636300	286363	40			
12.334375	12334	60	28.636363	2863	40			
13.000000	130	50	28.920000	2892	40			
13.234370	1323	50	29.000000	290	40			
13.248000	132	50	29.491200	294	40			
13.401560	13401	50	29.498900	294989	40			
13.406250	13406	50	30.000000	300	40			

UM-1(MJ)

UM-5(MJ)

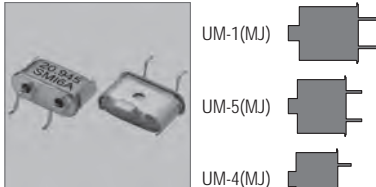


0.41 gm (wt.)

0.336 gm (wt.)

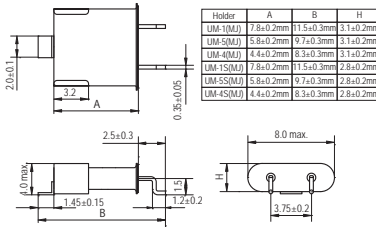
UM-4(MJ)

ACTUAL SIZE

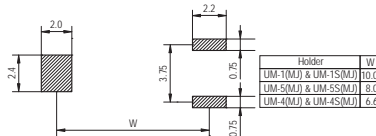


0.31 gm (wt.)

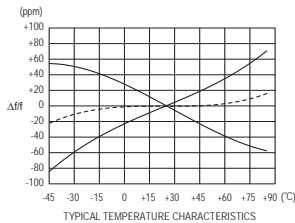
UM-1(MJ), UM-5(MJ), UM-4(MJ)
UM-1S(MJ), UM-5S(MJ), UM-4S(MJ)



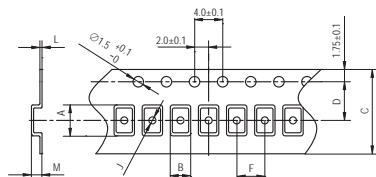
SOLDERING PATTERN



AT-CUT



TAPE SPECIFICATIONS



UM-1(MJ) & UM-1S(MJ)

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
12.4	8.2	24.0	11.5	12.0	1.5	0.4	3.3	330	1000pcs

UM-5(MJ) & UM-5S(MJ)

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
10.6	8.2	24.0	11.5	12.0	1.5	0.4	3.3	330	1000pcs

UM-4(MJ) & UM-4S(MJ)

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
9.2	8.2	16.0	7.5	12.0	1.5	0.4	3.3	330	1000pcs

STANDARD SPECIFICATIONS

Item	Symbol	Specifications
Package type		UM-1(MJ), UM-1S(MJ), UM-4(MJ), UM-4S(MJ), UM-5(MJ), UM-5S(MJ)
Frequency range	F	6.000 MHz to 200.000 MHz (UM-1 & UM-1S) 10.000 MHz to 200.000 MHz (UM-5 & UM-5S) 20.000 MHz to 200.000 MHz (UM-4 & UM-4S)
Frequency tolerance (at +25°C ±3°C)	Δf/F	J : ±5 ppm Q : ±15 ppm O : ±10 ppm R : ±20 ppm
Temperature stability (referred to +25°C) Note : Contact for other temperature stabilities and operating temperature ranges.		TTiii : ±30 ppm over -20°C to +70°C RRiii : ±20 ppm over -20°C to +70°C QQiii : ±15 ppm over -20°C to +70°C OOiii : ±10 ppm over -20°C to +70°C
Load capacitance	CL	16 pF, Typical
Equivalent series resistance	ESR	

Fundamental		3rd overtone		5th overtone	
6 to 10 MHz	10 to 60 MHz	24 to 60 MHz	60 to 180 MHz	80 to 120 MHz	120 to 200 MHz
40 Ω max.	25 Ω max.	60 Ω max.	40 Ω max.	80 Ω max.	70 Ω max.

Fundamental		3rd overtone		5th overtone	
10 to 20 MHz	20 to 60 MHz	24 to 30 MHz	30 to 60 MHz	60 to 180 MHz	80 to 120 MHz
30 Ω max.	25 Ω max.	80 Ω max.	60 Ω max.	40 Ω max.	100 Ω max.

Fundamental		3rd overtone		5th overtone	
20 to 60 MHz	60 to 90 MHz	90 to 180 MHz	100 to 200 MHz		
30 Ω max.	80 Ω max.	60 Ω max.	100 Ω max.		

Shunt capacitance	C0	7.0 pF max.
Drive level	P	1 mW max. (10 μW for testing)
Aging (for first year)	Δf/F	±3 ppm max. at +25°C ±3°C per year
Cut		AT-Cut

PART NUMBERING GUIDE

UM1(MJ) / 12.288M - 16 / Q / TTiii



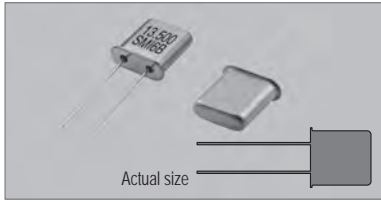
Example

SMI Part No.	Package	Circuit Calibration Condition	Frequency	Frequency Tolerance	Temperature Stability
UM1(MJ)/12.2880M-16/Q/TTiii	UM1(MJ) = UM-1(MJ)	Parallel resonance CL = 16pF	12.288 MHz	Q = ±15 ppm	TTiii = ±30 ppm
UM5S(MJ)/10.0000M-12/R/OOiii	UM5S(MJ) = UM-5S(MJ)	Parallel resonance CL = 12pF	10.000 MHz	R = ±20 ppm	OOiii = ±10 ppm
UM4(MJ)/22.57920M-S/J/QQiii	UM4(MJ) = UM-4(MJ)	S = Series resonance	22.5792 MHz	J = ±5 ppm	QQiii = ±15 ppm

PACKAGE DATA

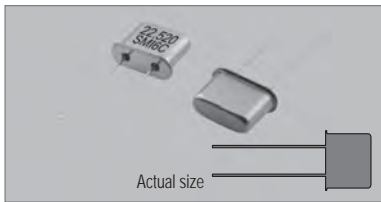
Item	Package	UM-1(MJ)/1S(MJ), UM-5(MJ)/5S(MJ) & UM-4(MJ)/4S(MJ)
Cover		Metal
Base		Metal
Sealing		Resistance
Metal clamp		C7521R-0
Metal clamp plating		Tin / Copper (surface) / (under)
Terminal lead		Alloy (FeNiCo)
Terminal lead plating		Gold
RoHS		Compliant (Pb-free)

UM-1



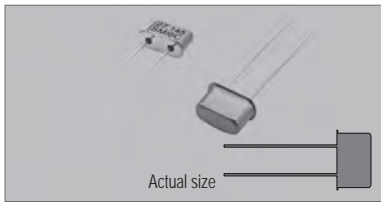
0.354 gm (wt.)

UM-5



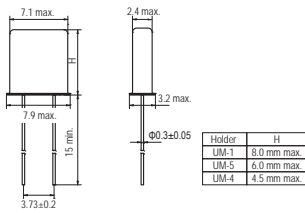
0.295 gm (wt.)

UM-4

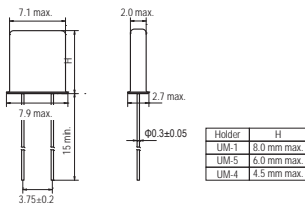


0.254 gm (wt.)

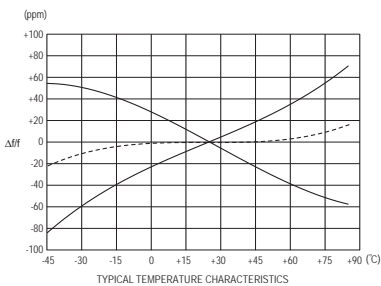
UM-1, UM-5 & UM-4



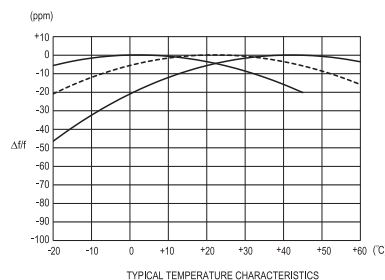
UM-1S, UM-5S & UM-4S



AT-CUT



SL-CUT



HOLDER DATA

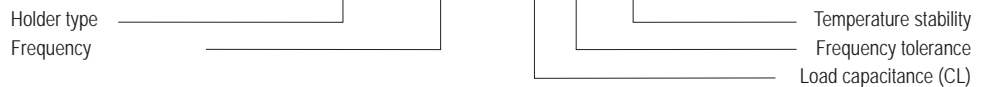
Item	Holder	UM-1/1S, UM-5/5S & UM-4/4S
Cover		Metal
Base		Metal
Sealing		Resistance
Terminal lead		Alloy (FeNiCo)
Terminal lead plating		Gold
RoHS		Compliant (Pb-free)

STANDARD SPECIFICATIONS

Item	Symbol	Specifications																																																												
Holder type		UM-1, UM-1S, UM-4, UM-4S, UM-5 & UM-5S																																																												
Frequency range	F	1.000 MHz to 1.200 MHz (UM-1) 6.000 MHz to 200.000 MHz (UM-1 & UM-1S) 10.000 MHz to 200.000 MHz (UM-5 & UM-5S) 20.000 MHz to 200.000 MHz (UM-4 & UM-4S)																																																												
Frequency tolerance (at +25°C ±3°C)	Δf/F	F : ±3 ppm J : ±5 ppm O : ±10 ppm Q : ±15 ppm R : ±20 ppm X : ±50 ppm																																																												
Temperature stability (referred to +25°C) Note : Contact for other temperature stabilities and operating temperature ranges.		CC1ggg : ±100 ppm over -10°C to +60°C TTiii : ± 30 ppm over -20°C to +70°C RRiii : ± 20 ppm over -20°C to +70°C QQiii : ± 15 ppm over -20°C to +70°C OOiii : ± 10 ppm over -20°C to +70°C																																																												
Load capacitance	CL	16 pF, Typical																																																												
Shunt capacitance	CO	7.0 pF max.																																																												
Drive level	P	1 mW max. (10 μW for testing)																																																												
Aging (for first year)	Δf/F	±5 ppm max. at +25°C ±3°C per year (SL-Cut) ±3 ppm max. at +25°C ±3°C per year (AT-Cut)																																																												
Cut		SL-Cut / 1.000 MHz to 1.200 MHz AT-Cut / 6.000 MHz to 200.000 MHz																																																												
Equivalent series resistance	ESR	<table border="1"> <thead> <tr> <th></th> <th>Frequency</th> <th>UM-1 & 1S</th> <th>UM-5 & 5S</th> <th>UM-4 & 4S</th> </tr> </thead> <tbody> <tr> <td>Fundamental</td> <td>1.000 to 1.200 MHz</td> <td>5k Ω max.</td> <td>n.a.</td> <td>n.a.</td> </tr> <tr> <td>Fundamental</td> <td>6.000 MHz+</td> <td>40 Ω max.</td> <td>n.a.</td> <td>n.a.</td> </tr> <tr> <td>Fundamental</td> <td>10.000 MHz+</td> <td>25 Ω max.</td> <td>30 Ω max.</td> <td>n.a.</td> </tr> <tr> <td>Fundamental</td> <td>20.000 MHz+</td> <td>25 Ω max.</td> <td>25 Ω max.</td> <td>30 Ω max.</td> </tr> <tr> <td>3rd overtone</td> <td>24.000 MHz+</td> <td>60 Ω max.</td> <td>80 Ω max.</td> <td>30 Ω max. (fund.)</td> </tr> <tr> <td>3rd overtone</td> <td>30.000 MHz+</td> <td>60 Ω max.</td> <td>60 Ω max.</td> <td>30 Ω max. (fund.)</td> </tr> <tr> <td>3rd overtone</td> <td>60.000 MHz+</td> <td>40 Ω max.</td> <td>40 Ω max.</td> <td>80 Ω max.</td> </tr> <tr> <td>5th overtone</td> <td>80.000 MHz+</td> <td>80 Ω max.</td> <td>100 Ω max.</td> <td>80 Ω max.</td> </tr> <tr> <td>5th overtone</td> <td>90.000 MHz+</td> <td>80 Ω max.</td> <td>100 Ω max.</td> <td>60 Ω max.</td> </tr> <tr> <td>5th overtone</td> <td>100.000 MHz+</td> <td>80 Ω max.</td> <td>100 Ω max.</td> <td>100 Ω max.</td> </tr> <tr> <td>5th overtone</td> <td>120.000 MHz+</td> <td>70 Ω max.</td> <td>80 Ω max.</td> <td>100 Ω max.</td> </tr> </tbody> </table>		Frequency	UM-1 & 1S	UM-5 & 5S	UM-4 & 4S	Fundamental	1.000 to 1.200 MHz	5k Ω max.	n.a.	n.a.	Fundamental	6.000 MHz+	40 Ω max.	n.a.	n.a.	Fundamental	10.000 MHz+	25 Ω max.	30 Ω max.	n.a.	Fundamental	20.000 MHz+	25 Ω max.	25 Ω max.	30 Ω max.	3rd overtone	24.000 MHz+	60 Ω max.	80 Ω max.	30 Ω max. (fund.)	3rd overtone	30.000 MHz+	60 Ω max.	60 Ω max.	30 Ω max. (fund.)	3rd overtone	60.000 MHz+	40 Ω max.	40 Ω max.	80 Ω max.	5th overtone	80.000 MHz+	80 Ω max.	100 Ω max.	80 Ω max.	5th overtone	90.000 MHz+	80 Ω max.	100 Ω max.	60 Ω max.	5th overtone	100.000 MHz+	80 Ω max.	100 Ω max.	100 Ω max.	5th overtone	120.000 MHz+	70 Ω max.	80 Ω max.	100 Ω max.
	Frequency	UM-1 & 1S	UM-5 & 5S	UM-4 & 4S																																																										
Fundamental	1.000 to 1.200 MHz	5k Ω max.	n.a.	n.a.																																																										
Fundamental	6.000 MHz+	40 Ω max.	n.a.	n.a.																																																										
Fundamental	10.000 MHz+	25 Ω max.	30 Ω max.	n.a.																																																										
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3rd overtone	24.000 MHz+	60 Ω max.	80 Ω max.	30 Ω max. (fund.)																																																										
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3rd overtone	60.000 MHz+	40 Ω max.	40 Ω max.	80 Ω max.																																																										
5th overtone	80.000 MHz+	80 Ω max.	100 Ω max.	80 Ω max.																																																										
5th overtone	90.000 MHz+	80 Ω max.	100 Ω max.	60 Ω max.																																																										
5th overtone	100.000 MHz+	80 Ω max.	100 Ω max.	100 Ω max.																																																										
5th overtone	120.000 MHz+	70 Ω max.	80 Ω max.	100 Ω max.																																																										

PART NUMBERING GUIDE

UM1 / 15.360M - 16 / J / OOiii



Example

SMI Part No.	Holder	Circuit Calibration Condition	Frequency	Frequency Tolerance	Temperature Stability
UM1/15.360M-16/J/OOiii	UM1 = UM-1	Parallel resonance CL = 16pF	15.360 MHz	J = ±5 ppm	OOiii = ±10 ppm
UM5S/20.945M-30/Q/QOiii	UM5S = UM-5S	Parallel resonance CL = 30pF	20.945 MHz	Q = ±15 ppm	QOiii = ±15 ppm
UM4S/21.480M-20/O/RRiii	UM4S = UM-4S	Parallel resonance CL = 20pF	21.480 MHz	O = ±10 ppm	RRiii = ±20 ppm

XTAL

CLK OSC

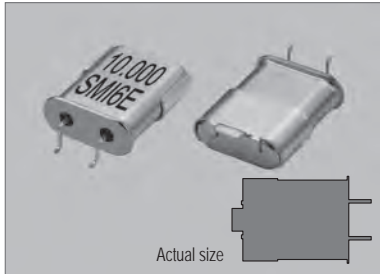
VCXO

TCXO

OCXO

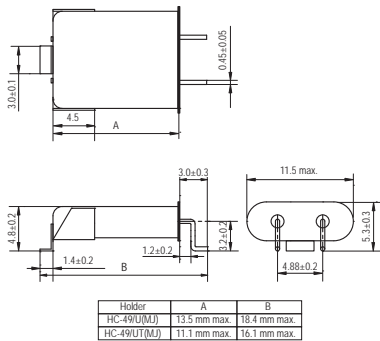
MCF

HC-49/U(MJ) & HC-49/UT(MJ)

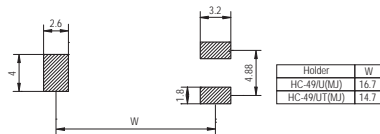


1.275 gm (wt.)...HC-49/U(MJ)
1.13 gm (wt.)...HC-49/UT(MJ)

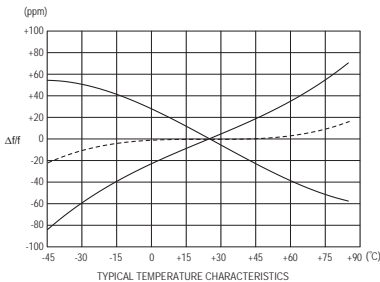
HC-49/U(MJ) & HC-49/UT(MJ)



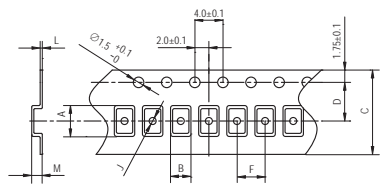
SOLDERING PATTERN



AT-CUT



TAPE SPECIFICATIONS



A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
19.0	12.0	24.0	11.5	16.0	1.5	0.4	6.0	330	1000pcs

HC-49/UT(MJ)

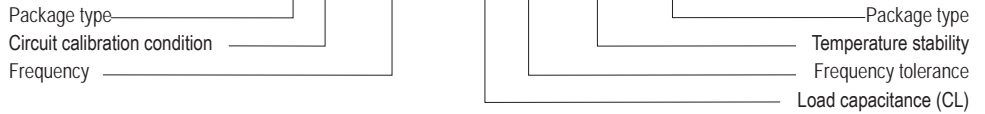
A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
17.8	12.0	24.0	11.5	16.0	2.0	0.4	5.6	330	1000pcs

STANDARD SPECIFICATIONS

Item	Symbol	Specifications	
Package type		HC-49 / U(MJ) & HC-49 / UT(MJ)	
Frequency range	F	1.8432 MHz to 200.000 MHz	
Frequency tolerance (at +25°C ±3°C)	Δf/F	J : ±5 ppm O : ±10 ppm Q : ±15 ppm R : ±20 ppm T : ±30 ppm X : ±50 ppm	
Temperature stability (referred to +25°C)		XXggg : ±50 ppm over -10°C to +60°C TTiii : ±30 ppm over -20°C to +70°C RRiii : ±20 ppm over -20°C to +70°C QQiii : ±15 ppm over -20°C to +70°C OOiii : ±10 ppm over -20°C to +70°C	
Note : Contact for other temperature stabilities and operating temperature ranges.			
Load capacitance	CL	20 pF, Typical	
Shunt capacitance (Typical)	C0	7.0 pF max.	
Drive level	P	3 mW max.	
Aging	Δf/F	±5 ppm max. at +25°C ±3°C per year	
Cut		AT-Cut	
Equivalent Series Resistance	Fundamental	ESR	1.8432 MHz+ : 500 Ω max.
			2.000 MHz+ : 400 Ω max.
			2.500 MHz+ : 250 Ω max.
			3.000 MHz+ : 180 Ω max.
			3.500 MHz+ : 100 Ω max.
			4.000 MHz+ : 80 Ω max.
			4.500 MHz+ : 60 Ω max.
			5.000 MHz+ : 50 Ω max.
			6.000 MHz+ : 40 Ω max.
			7.000 MHz+ : 30 Ω max.
			9.000 MHz+ : 25 Ω max.
			13.000 MHz+ : 20 Ω max.
	3rd overtone		20.000 to 120.000 MHz : 60 Ω max.
	5th overtone		80.000 to 200.000 MHz : 80 Ω max.

PART NUMBERING GUIDE

49 M 1.8432M - 13 / X / XXggg (MJ)



Example

SMI Part No.	Package	Circuit Calibration Condition	Frequency	Frequency Tolerance	Temperature Stability
49M1.8432M-13/X/XXggg(MJ)	49(MJ) = HC-49/U(MJ)	M = Parallel resonance CL = 13 pF	1.8432 MHz	X = ±50 ppm	XXggg = ±50 ppm
49M4.000M-20/T/XXggg(MJ)	49(MJ) = HC-49/U(MJ)	M = Parallel resonance CL = 20 pF	4.000 MHz	T = ±30 ppm	XXggg = ±50 ppm
49S15.000M/O/QOiii(MJ)	49(MJ) = HC-49/U(MJ)	S = Series resonance	15.000 MHz	O = ±10 ppm	QOiii = ±15 ppm

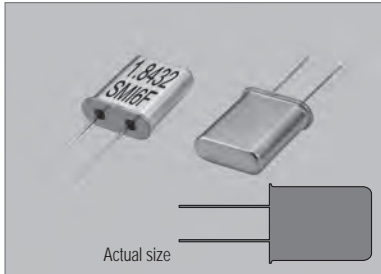
PACKAGE DATA

Item	Package	HC-49/U(MJ) & HC-49/UT(MJ)
Cover		Metal
Base		Metal
Sealing		Resistance
Metal clamp		C7521R-0
Metal clamp plating		Tin / Copper (surface) / (under)
Terminal lead		Alloy (FeNiCo)
Terminal lead plating		SnCu
RoHS		Compliant (Pb-free)

Quartz Crystal Units

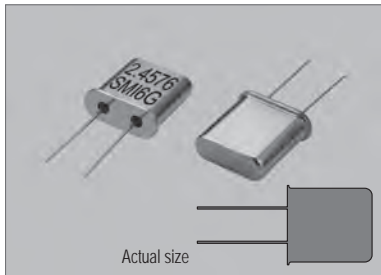
HC-49/U & HC-49/UT FAMILY STANDARD THROUGH-HOLE CRYSTALS

HC-49 / U



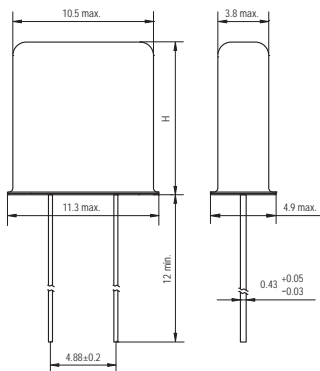
0.975 gm (wt.)

HC-49 / UT



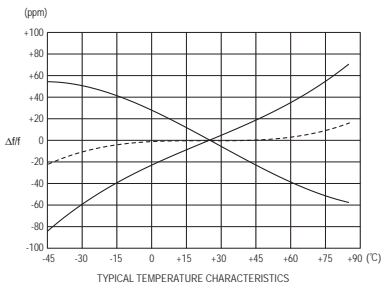
0.9075 gm (wt.)

HC-49 / U, HC-49 / UT



Holder	H
HC-49/U	13.5 mm max.
HC-49/UT	11.2 mm max.

AT-CUT



STANDARD SPECIFICATIONS

Item	Symbol	Specifications	
Holder type		HC-49/U HC-49/UT	
Holder height		13.5 mm max. 11.2 mm max.	
Frequency range	F	1.8432 MHz to 200.000 MHz	
Frequency tolerance (at +25°C ±3°C)	$\Delta f/F$	J : ±5 ppm O : ±10 ppm Q : ±15 ppm R : ±20 ppm T : ±30 ppm X : ±50 ppm	
Temperature stability (referred to +25°C)		XXggg : ±50 ppm over -10°C to +60°C TTiii : ±30 ppm over -20°C to +70°C RRiii : ±20 ppm over -20°C to +70°C QQiii : ±15 ppm over -20°C to +70°C OOiii : ±10 ppm over -20°C to +70°C	
Note : Contact for other temperature stabilities and operating temperature ranges.			
Load capacitance	CL	20 pF, Typical	
Shunt capacitance	C0	7.0 pF max.	
Drive level	P	3 mW max.	
Aging (for first year)	$\Delta f/F$	±5 ppm max. at +25°C ±3°C per year	
Cut		AT-Cut	
Equivalent Series Resistance	Fundamental	ESR	1.8432 MHz+ : 500 Ω max.
			2.000 MHz+ : 400 Ω max.
			2.500 MHz+ : 250 Ω max.
	3rd overtone		20.000 to 120.000 MHz : 60 Ω max.
	5th overtone		80.000 to 200.000 MHz : 80 Ω max.
			3.000 MHz+ : 180 Ω max.
			3.500 MHz+ : 100 Ω max.
			4.000 MHz+ : 80 Ω max.
			4.500 MHz+ : 60 Ω max.
			5.000 MHz+ : 50 Ω max.
			6.000 MHz+ : 40 Ω max.
			7.000 MHz+ : 30 Ω max.
			9.000 MHz+ : 25 Ω max.
			13.000 MHz+ : 20 Ω max.

PART NUMBERING GUIDE

49 M 2.4576M - 16 / T / XXggg



Example

SMI Part No.	Holder	Circuit Calibration Condition	Frequency	Frequency Tolerance	Temperature Stability
49M2.4576M-16/T/XXggg	49 = HC-49/U	M = Parallel resonance CL = 16pF	2.4576 MHz	T = ±30 ppm	XXggg = ±50 ppm
49M9.84375M-20/Q/TTiii	49 = HC-49/U	M = Parallel resonance CL = 20pF	9.84375 MHz	Q = ±15 ppm	TTiii = ±30 ppm
49TS19.6608M/O/QQiii	49T = HC-49/UT	S = Series resonance	19.6608 MHz	O = ±10 ppm	QQiii = ±15 ppm

HOLDER DATA

Item	Holder	HC-49/U & HC-49/UT
Cover		Metal
Base		Metal
Sealing		Resistance
Terminal lead		Alloy (FeNiCo)
Terminal lead plating		SnCu
RoHS		Compliant (Pb-free)

XTAL

CLKOSC

VCXO

TCXO

OCXO

MCF

XTAL

CLK OSC

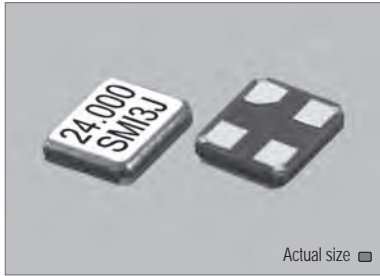
VCXO

TCXO

OCXO

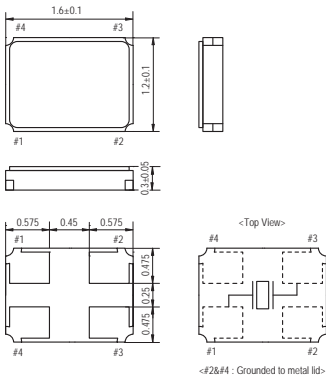
MCF

11SMX

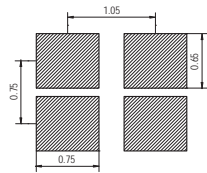


Actual size
0.0018 gm (wt.)

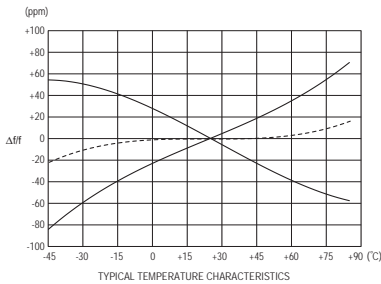
11SMX



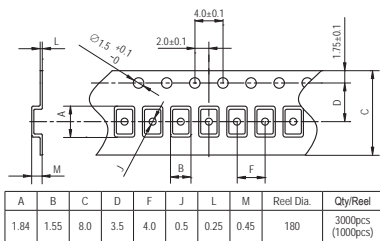
SOLDERING PATTERN



AT-CUT



TAPE SPECIFICATIONS



A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
1.84	1.55	8.0	3.5	4.0	0.5	0.25	0.45	180	3000pcs (10000pcs)

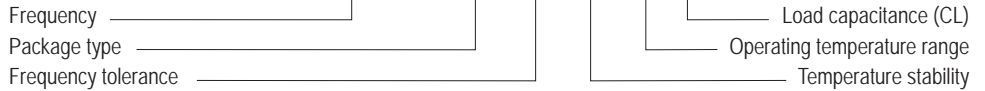
CUSTOM SPECIFICATIONS

Item	Specifications																																																																																																																																																																																																																																					
Package type	11SMX																																																																																																																																																																																																																																					
Frequency range	24.000 MHz to 80.000 MHz																																																																																																																																																																																																																																					
Frequency tolerance (at +25°C ±3°C)	O : ±10 ppm Q : ±15 ppm R : ±20 ppm																																																																																																																																																																																																																																					
Temperature stability (referred to +25°C)	<table border="1"> <thead> <tr> <th>Temp. Stability(ppm)</th> <th>±3.0</th> <th>±5.0</th> <th>±7.5</th> <th>±10.0</th> <th>±15.0</th> <th>±20.0</th> <th>±30.0</th> <th>±50.0</th> <th>±100.0</th> <th>±150.0</th> </tr> <tr> <th>Open Temperature Range</th> <th>FF</th> <th>JJ</th> <th>LL</th> <th>OO</th> <th>QQ</th> <th>RR</th> <th>TT</th> <th>XX</th> <th>CC1</th> <th>GG1</th> </tr> </thead> <tbody> <tr><td>0°C to +45°C (edd)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>0°C to +50°C (eee)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>0°C to +60°C (egg)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>0°C to +70°C (eii)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-10°C to +50°C (gee)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-10°C to +60°C (ggg)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-10°C to +70°C (gii)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-10°C to +75°C (gjj)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-20°C to +70°C (iii)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-20°C to +75°C (ijj)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-30°C to +75°C (kjj)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-30°C to +80°C (kkk)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-30°C to +85°C (kll)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-35°C to +80°C (lkk)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-40°C to +85°C (mll)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-40°C to +90°C (mmm)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-40°C to +105°C (mpp)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-40°C to +125°C (mit)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> </tbody> </table>										Temp. Stability(ppm)	±3.0	±5.0	±7.5	±10.0	±15.0	±20.0	±30.0	±50.0	±100.0	±150.0	Open Temperature Range	FF	JJ	LL	OO	QQ	RR	TT	XX	CC1	GG1	0°C to +45°C (edd)	○	○	○	○	○	○	○	○	○	○	0°C to +50°C (eee)	○	○	○	○	○	○	○	○	○	○	0°C to +60°C (egg)	○	○	○	○	○	○	○	○	○	○	0°C to +70°C (eii)	○	○	○	○	○	○	○	○	○	○	-10°C to +50°C (gee)	○	○	○	○	○	○	○	○	○	○	-10°C to +60°C (ggg)	○	○	○	○	○	○	○	○	○	○	-10°C to +70°C (gii)	○	○	○	○	○	○	○	○	○	○	-10°C to +75°C (gjj)	○	○	○	○	○	○	○	○	○	○	-20°C to +70°C (iii)	○	○	○	○	○	○	○	○	○	○	-20°C to +75°C (ijj)	○	○	○	○	○	○	○	○	○	○	-30°C to +75°C (kjj)	○	○	○	○	○	○	○	○	○	○	-30°C to +80°C (kkk)	○	○	○	○	○	○	○	○	○	○	-30°C to +85°C (kll)	○	○	○	○	○	○	○	○	○	○	-35°C to +80°C (lkk)	○	○	○	○	○	○	○	○	○	○	-40°C to +85°C (mll)	○	○	○	○	○	○	○	○	○	○	-40°C to +90°C (mmm)	○	○	○	○	○	○	○	○	○	○	-40°C to +105°C (mpp)	○	○	○	○	○	○	○	○	○	○	-40°C to +125°C (mit)	○	○	○	○	○	○	○	○	○	○
Temp. Stability(ppm)	±3.0	±5.0	±7.5	±10.0	±15.0	±20.0	±30.0	±50.0	±100.0	±150.0																																																																																																																																																																																																																												
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0°C to +50°C (eee)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
0°C to +60°C (egg)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
0°C to +70°C (eii)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-10°C to +50°C (gee)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-10°C to +60°C (ggg)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-10°C to +70°C (gii)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-10°C to +75°C (gjj)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-20°C to +70°C (iii)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-20°C to +75°C (ijj)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-30°C to +75°C (kjj)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-30°C to +80°C (kkk)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-30°C to +85°C (kll)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-35°C to +80°C (lkk)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-40°C to +85°C (mll)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-40°C to +90°C (mmm)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-40°C to +105°C (mpp)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
-40°C to +125°C (mit)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																												
Equivalent series resistance (ESR)	150 Ω max. / 24.000 MHz to 32.000 MHz 100 Ω max. / 32.000 MHz to 38.000 MHz 80 Ω max. / 38.000 MHz to 80.000 MHz																																																																																																																																																																																																																																					
Shunt capacitance (C0)	5 pF max.																																																																																																																																																																																																																																					
Drive level (P)	100 μW max. (10 μW for testing)																																																																																																																																																																																																																																					
Aging	±2 ppm max. at +25°C ±3°C for first year																																																																																																																																																																																																																																					
Cut / Oscillation mode	AT-Cut / Fundamental																																																																																																																																																																																																																																					
Reflow condition	10 seconds max. at +250°C ±10°C																																																																																																																																																																																																																																					

○ : Available (The extremes depend on actual frequencies.)

PART NUMBERING GUIDE

38.400MHz 11SMX O / OO / iii / 7



Example

SMI Part No.	Frequency	Package	Frequency Tolerance	Temperature Stability	Operating Temperature Range	Load Capacitance
38.400MHz 11SMX O/OO/iii/7	38.400 MHz	11SMX	O = ±10 ppm	OO = ±10 ppm	iii = -20°C to +70°C	CL = 7 pF

PACKAGE DATA

Item	Package	11SMX
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metallized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

XTAL

CLK OSC

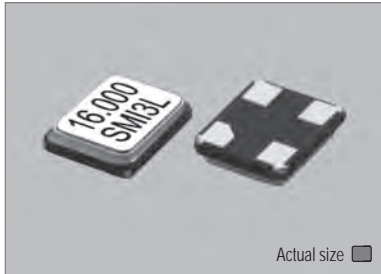
VCXO

TCXO

OCXO

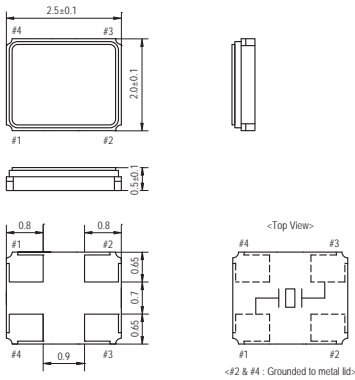
MCF

22SMX

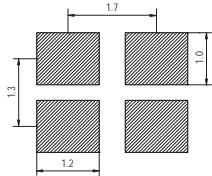


Actual size
0.00953 gm (wt.)

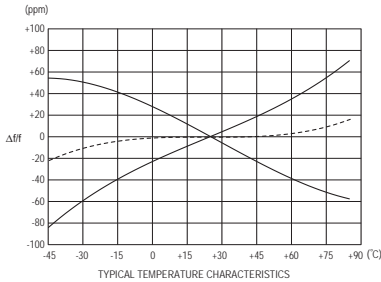
22SMX



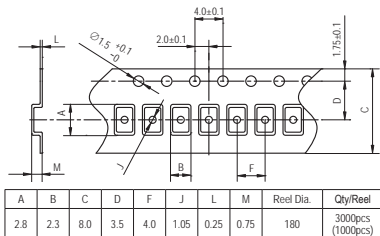
SOLDERING PATTERN



AT-CUT



TAPE SPECIFICATIONS

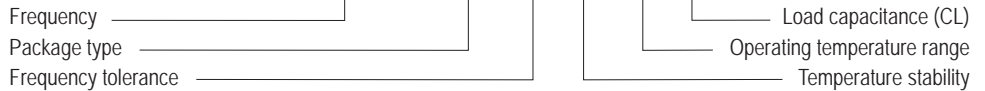


CUSTOM SPECIFICATIONS

Item	Specifications									
Package type	22SMX									
Frequency range	16.000 MHz to 80.000 MHz									
Frequency tolerance (at +25°C ±3°C)	O : ±10 ppm Q : ±15 ppm R : ±20 ppm									
Temperature stability (referred to +25°C)										
Temp. Stability(ppm)	±3.0	±5.0	±7.5	±10.0	±15.0	±20.0	±30.0	±50.0	±100.0	±150.0
Qpe. Temperature Range	FF	JJ	LL	OO	QQ	RR	TT	XX	CC1	GG1
0°C to +45°C (edd)	○	○	○	○	○	○	○	○	○	○
0°C to +50°C (eee)	○	○	○	○	○	○	○	○	○	○
0°C to +60°C (egg)	○	○	○	○	○	○	○	○	○	○
0°C to +70°C (eii)	○	○	○	○	○	○	○	○	○	○
-10°C to +50°C (gee)	○	○	○	○	○	○	○	○	○	○
-10°C to +60°C (ggg)	○	○	○	○	○	○	○	○	○	○
-10°C to +70°C (gii)	○	○	○	○	○	○	○	○	○	○
-10°C to +75°C (gjj)	○	○	○	○	○	○	○	○	○	○
-20°C to +70°C (iii)	○	○	○	○	○	○	○	○	○	○
-20°C to +75°C (ijj)	○	○	○	○	○	○	○	○	○	○
-30°C to +75°C (kjj)	○	○	○	○	○	○	○	○	○	○
-30°C to +80°C (kkk)	○	○	○	○	○	○	○	○	○	○
-30°C to +85°C (kll)	○	○	○	○	○	○	○	○	○	○
-35°C to +80°C (lkk)	○	○	○	○	○	○	○	○	○	○
-40°C to +85°C (mll)	○	○	○	○	○	○	○	○	○	○
-40°C to +90°C (mmm)	○	○	○	○	○	○	○	○	○	○
-40°C to +105°C (mpp)	○	○	○	○	○	○	○	○	○	○
-40°C to +125°C (mit)	○	○	○	○	○	○	○	○	○	○
○ : Available (The extremes depend on actual frequencies.)										
Equivalent series resistance (ESR)	80 Ω max. / 16.000 MHz to 20.000 MHz 60 Ω max. / 20.000 MHz to 30.000 MHz 50 Ω max. / 30.000 MHz to 35.000 MHz 40 Ω max. / 35.000 MHz to 80.000 MHz									
Shunt capacitance (C0)	5 pF max.									
Drive level (P)	100 μW max. (10 μW for testing)									
Aging	±2 ppm max. at +25°C ±3°C for first year									
Cut / Oscillation mode	AT-Cut / Fundamental									
Reflow condition	10 seconds max. at +250°C ±10°C									

PART NUMBERING GUIDE

48.000MHz 22SMX Q / TT / mll / 8



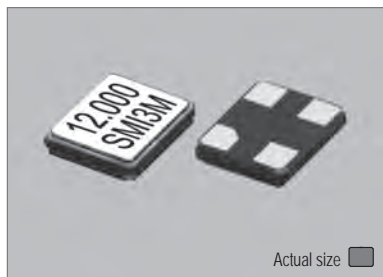
Example

SMI Part No.	Frequency	Package	Frequency Tolerance	Temperature Stability	Operating Temperature Range	Load Capacitance
48.000MHz 22SMX Q/TT/ml/8	48.000 MHz	22SMX	O = ±15 ppm	TT = ±30 ppm	ml = -40°C to +85°C	CL = 8 pF
18.000MHz 22SMX R/JJ/egg/10	18.000 MHz	22SMX	R = ±20 ppm	JJ = ±5.0 ppm	egg = 0°C to +60°C	CL = 10 pF

PACKAGE DATA

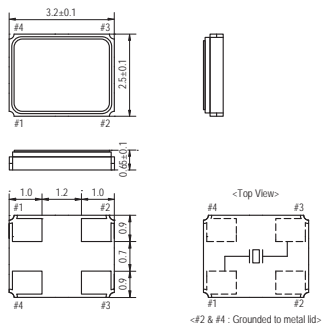
Item	Package	22SMX
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

32SMX(A)

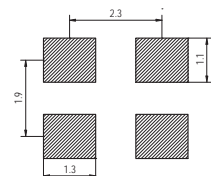


Actual size 0.0165 gm (wt.)

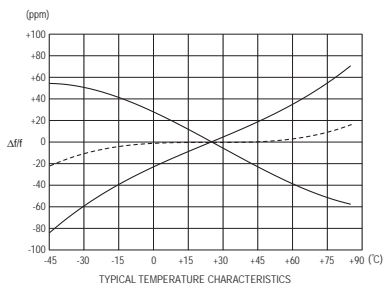
32SMX(A)



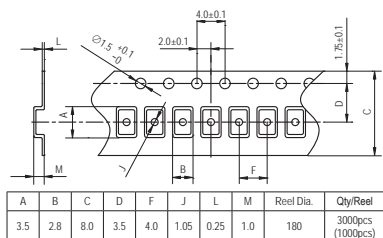
SOLDERING PATTERN



AT-CUT



TAPE SPECIFICATIONS



CUSTOM SPECIFICATIONS

Item	Specifications									
Package type	32SMX(A)									
Frequency range	10.000 MHz to 150.000 MHz									
Frequency tolerance (at +25°C ±3°C)	O : ±10 ppm Q : ±15 ppm R : ±20 ppm									
Temperature stability (referred to +25°C)										
Temp. Stability(ppm)	±3.0	±5.0	±7.5	±10.0	±15.0	±20.0	±30.0	±50.0	±100.0	±150.0
Opn. Temperature Range	FF	JJ	LL	OO	QQ	RR	TT	XX	CC1	GG1
0°C to +45°C (edd)	○	○	○	○	○	○	○	○	○	○
0°C to +50°C (eee)	○	○	○	○	○	○	○	○	○	○
0°C to +60°C (egg)	○	○	○	○	○	○	○	○	○	○
0°C to +70°C (eii)		○	○	○	○	○	○	○	○	○
-10°C to +50°C (gee)		○	○	○	○	○	○	○	○	○
-10°C to +60°C (ggg)		○	○	○	○	○	○	○	○	○
-10°C to +70°C (gii)		○	○	○	○	○	○	○	○	○
-10°C to +75°C (gjj)			○	○	○	○	○	○	○	○
-20°C to +70°C (iii)			○	○	○	○	○	○	○	○
-20°C to +75°C (ijj)			○	○	○	○	○	○	○	○
-30°C to +75°C (kij)				○	○	○	○	○	○	○
-30°C to +80°C (kkk)				○	○	○	○	○	○	○
-30°C to +85°C (kll)				○	○	○	○	○	○	○
-35°C to +80°C (lkk)					○	○	○	○	○	○
-40°C to +85°C (mll)					○	○	○	○	○	○
-40°C to +90°C (mmm)					○	○	○	○	○	○
-40°C to +105°C (mpp)					○	○	○	○	○	○
-40°C to +125°C (mtt)					○	○	○	○	○	○

○ : Available (The extremes depend on actual frequencies.)

Equivalent series resistance (ESR)	300 Ω max. / 10.000 MHz to 12.000 MHz (Fundamental) 100 Ω max. / 12.000 MHz to 13.000 MHz (Fundamental) 80 Ω max. / 13.000 MHz to 20.000 MHz (Fundamental) 50 Ω max. / 20.000 MHz to 60.000 MHz (Fundamental) 140 Ω max. / 40.000 MHz to 100.000 MHz (3rd overtone) 100 Ω max. / 100.000 MHz to 150.000 MHz (3rd overtone)
Shunt capacitance (C0)	5 pF max.
Drive level (P)	100 μW max. (10 μW for testing)
Aging	±2 ppm max. at +25°C ±3°C for first year
Cut / Oscillation mode	AT-Cut / Fundamental / 10.000 MHz to 60.000 MHz AT-Cut / 3rd overtone / 40.000 MHz to 150.000 MHz
Reflow condition	10 seconds max. at +250°C ±10°C

PART NUMBERING GUIDE

24.576MHz 32SMX(A) R / TT / ijj / 8



Example

SMI Part No.	Frequency	Package	Frequency Tolerance	Temperature Stability	Operating Temperature Range	Load Capacitance
24.576MHz 32SMX(A) R/TT/ijj/8	24.576 MHz	32SMX(A)	R = ±20 ppm	TT = ±30 ppm	ijj = -20°C to +75°C	CL = 8 pF

PACKAGE DATA

Item	Package	32SMX(A)
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

XTAL

CLKOSC

VCXO

TCXO

OCXO

MCF

XTAL

CLK OSC

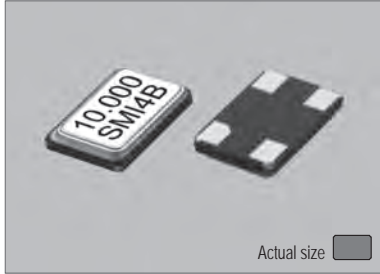
VCXO

TCXO

OCXO

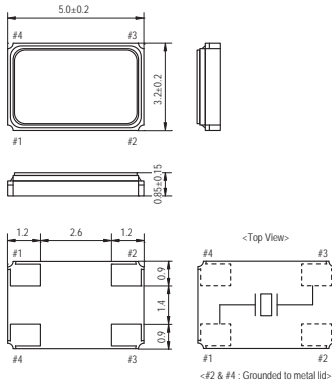
MCF

53SMX(B)

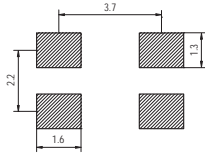


Actual size
0.0238 gm (wt.)

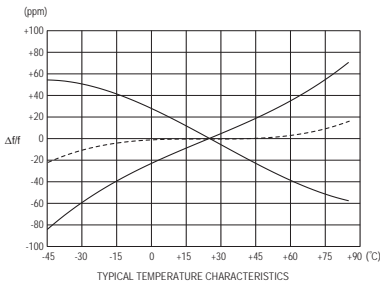
53SMX(B)



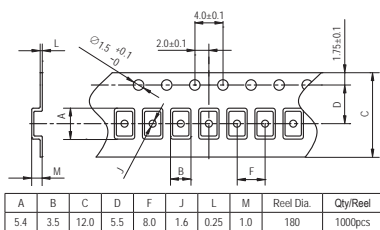
SOLDERING PATTERN



AT-CUT



TAPE SPECIFICATIONS



CUSTOM SPECIFICATIONS

Item	Specifications
Package type	53SMX(B)
Frequency range	10.000 MHz to 300.000 MHz
Frequency tolerance (at +25°C ±3°C)	O : ±10 ppm Q : ±15 ppm R : ±20 ppm T : ±30 ppm
Temperature stability (referred to +25°C)	

Temp. Stability(ppm)	±3.0	±5.0	±7.5	±10.0	±15.0	±20.0	±30.0	±50.0	±100.0	±150.0
Spec. Temperature Range	FF	JJ	LL	OO	OO	RR	TT	XX	CC1	GG1
0°C to +45°C (edd)	○	○	○	○	○	○	○	○	○	○
0°C to +50°C (eee)	○	○	○	○	○	○	○	○	○	○
0°C to +60°C (egg)	○	○	○	○	○	○	○	○	○	○
0°C to +70°C (eii)		○	○	○	○	○	○	○	○	○
-10°C to +50°C (gee)		○	○	○	○	○	○	○	○	○
-10°C to +60°C (ggg)		○	○	○	○	○	○	○	○	○
-10°C to +70°C (gii)		○	○	○	○	○	○	○	○	○
-10°C to +75°C (gjj)			○	○	○	○	○	○	○	○
-20°C to +70°C (iii)			○	○	○	○	○	○	○	○
-20°C to +75°C (ijj)			○	○	○	○	○	○	○	○
-30°C to +75°C (kjj)				○	○	○	○	○	○	○
-30°C to +80°C (kkk)				○	○	○	○	○	○	○
-30°C to +85°C (kll)				○	○	○	○	○	○	○
-35°C to +80°C (lkk)					○	○	○	○	○	○
-40°C to +85°C (mll)					○	○	○	○	○	○
-40°C to +90°C (mmm)					○	○	○	○	○	○
-40°C to +105°C (mpp)					○	○	○	○	○	○
-40°C to +125°C (mit)					○	○	○	○	○	○

○ : Available (The extremes depend on actual frequencies.)

Equivalent series resistance (ESR)	60 Ω max. / 10.000 MHz to 11.000 MHz (Fundamental) 50 Ω max. / 11.000 MHz to 12.000 MHz (Fundamental) 40 Ω max. / 12.000 MHz to 70.000 MHz (Fundamental) 80 Ω max. / 60.000 MHz to 170.000 MHz (3rd overtone) 120 Ω max. / 170.000 MHz to 300.000 MHz (5th overtone)
Shunt capacitance (C0)	5 pF max.
Drive level (P)	100 μW max. (10 μW for testing)
Aging	±3 ppm max. at +25°C ±3°C for first year
Cut / Oscillation mode	AT-Cut / Fundamental / 10.000 MHz to 70.000 MHz AT-Cut / 3rd overtone / 60.000 MHz to 170.000 MHz AT-Cut / 5th overtone / 170.000 MHz to 300.000 MHz
Reflow condition	10 seconds max. at +250°C ±10°C

PART NUMBERING GUIDE

13.000MHz 53SMX(B) O / OO / kkk / 10



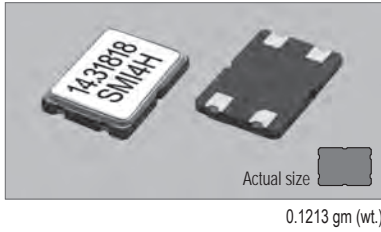
Example

SMI Part No.	Frequency	Package	Frequency Tolerance	Temperature Stability	Operating Temperature Range	Load Capacitance
13.000MHz 53SMX(B) O/OO/kkk/10	13.000 MHz	53SMX(B)	O = ±10 ppm	OO = ±10 ppm	kkk = -30°C to +80°C	CL = 10 pF
15.360MHz 53SMX(B) Q/LL/ggg/9	15.360 MHz	53SMX(B)	Q = ±15 ppm	LL = ±7.5 ppm	ggg = -10°C to +60°C	CL = 9 pF

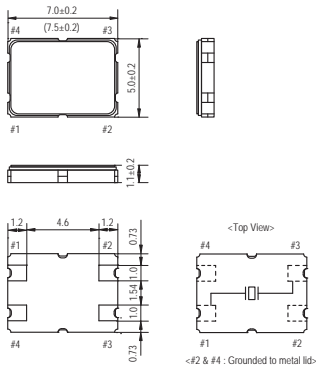
PACKAGE DATA

Item	Package	53SMX(B)
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

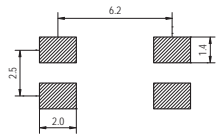
94SMX(B)



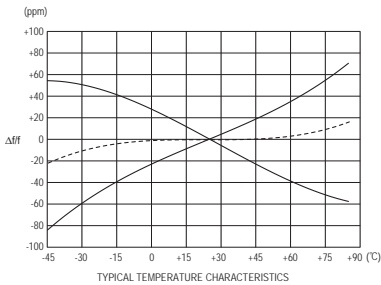
94SMX(B)



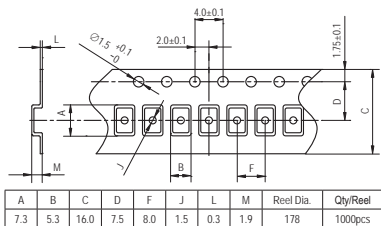
SOLDERING PATTERN



AT-CUT



TAPE SPECIFICATIONS



CUSTOM SPECIFICATIONS

Item	Specifications																																																																																																																																																																																																																																						
Package type	94SMX(B)																																																																																																																																																																																																																																						
Frequency range	8.000 MHz to 100.000 MHz																																																																																																																																																																																																																																						
Frequency tolerance (at +25°C ±3°C)	O : ±10 ppm Q : ±15 ppm R : ±20 ppm T : ±30 ppm																																																																																																																																																																																																																																						
Temperature stability (referred to +25°C)	<table border="1"> <thead> <tr> <th>Temp. Stability(ppm)</th> <th>±3.0</th> <th>±5.0</th> <th>±7.5</th> <th>±10.0</th> <th>±15.0</th> <th>±20.0</th> <th>±30.0</th> <th>±50.0</th> <th>±100.0</th> <th>±150.0</th> </tr> <tr> <th>Spec. Temperature Range</th> <th>FF</th> <th>JJ</th> <th>LL</th> <th>OO</th> <th>QQ</th> <th>RR</th> <th>TT</th> <th>XX</th> <th>CC1</th> <th>GG1</th> </tr> </thead> <tbody> <tr><td>0°C to +45°C (edd)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>0°C to +50°C (eee)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>0°C to +60°C (egg)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>0°C to +70°C (eii)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-10°C to +50°C (gee)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-10°C to +60°C (ggg)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-10°C to +70°C (gii)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-10°C to +75°C (gjj)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-20°C to +70°C (iii)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-20°C to +75°C (ijj)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-30°C to +75°C (kij)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-30°C to +80°C (kkk)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-30°C to +85°C (kll)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-35°C to +80°C (lkk)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-40°C to +85°C (mll)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-40°C to +90°C (mmm)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-40°C to +105°C (mpp)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> <tr><td>-40°C to +125°C (mtt)</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr> </tbody> </table>											Temp. Stability(ppm)	±3.0	±5.0	±7.5	±10.0	±15.0	±20.0	±30.0	±50.0	±100.0	±150.0	Spec. Temperature Range	FF	JJ	LL	OO	QQ	RR	TT	XX	CC1	GG1	0°C to +45°C (edd)	○	○	○	○	○	○	○	○	○	○	0°C to +50°C (eee)	○	○	○	○	○	○	○	○	○	○	0°C to +60°C (egg)	○	○	○	○	○	○	○	○	○	○	0°C to +70°C (eii)	○	○	○	○	○	○	○	○	○	○	-10°C to +50°C (gee)	○	○	○	○	○	○	○	○	○	○	-10°C to +60°C (ggg)	○	○	○	○	○	○	○	○	○	○	-10°C to +70°C (gii)	○	○	○	○	○	○	○	○	○	○	-10°C to +75°C (gjj)	○	○	○	○	○	○	○	○	○	○	-20°C to +70°C (iii)	○	○	○	○	○	○	○	○	○	○	-20°C to +75°C (ijj)	○	○	○	○	○	○	○	○	○	○	-30°C to +75°C (kij)	○	○	○	○	○	○	○	○	○	○	-30°C to +80°C (kkk)	○	○	○	○	○	○	○	○	○	○	-30°C to +85°C (kll)	○	○	○	○	○	○	○	○	○	○	-35°C to +80°C (lkk)	○	○	○	○	○	○	○	○	○	○	-40°C to +85°C (mll)	○	○	○	○	○	○	○	○	○	○	-40°C to +90°C (mmm)	○	○	○	○	○	○	○	○	○	○	-40°C to +105°C (mpp)	○	○	○	○	○	○	○	○	○	○	-40°C to +125°C (mtt)	○	○	○	○	○	○	○	○	○	○
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-10°C to +60°C (ggg)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																													
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-10°C to +75°C (gjj)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																													
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-30°C to +80°C (kkk)	○	○	○	○	○	○	○	○	○	○																																																																																																																																																																																																																													
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Equivalent series resistance (ESR)	60 Ω max. / 8.000 MHz to 10.000 MHz (Fundamental) 40 Ω max. / 10.000 MHz to 15.000 MHz (Fundamental) 30 Ω max. / 15.000 MHz to 40.000 MHz (Fundamental) 80 Ω max. / 30.000 MHz to 100.000 MHz (3rd overtone)																																																																																																																																																																																																																																						
Shunt capacitance (C0)	5 pF max.																																																																																																																																																																																																																																						
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Reflow condition	10 seconds max. at +250°C ±10°C																																																																																																																																																																																																																																						

PART NUMBERING GUIDE

90.000MHz 94SMX(B) Q / CC1 / mpp / 12



Example

SMI Part No.	Frequency	Package	Frequency Tolerance	Temperature Stability	Operating Temperature Range	Load Capacitance
90.000MHz 94SMX(B) Q/CC1/mpp/12	90.000 MHz	94SMX(B)	Q = ±15 ppm	CC1 = ±100 ppm	mpp = -40°C to +105°C	CL = 12 pF
16.9344MHz 94SMX(B) R/TT/iii/16	16.934 MHz	94SMX(B)	R = ±20 ppm	TT = ±30 ppm	iii = -20°C to +70°C	CL = 16 pF

PACKAGE DATA

Item	Package	94SMX(B)
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

XTAL

CLKOSC

VCXO

TCXO

OCXO

MCF

XTAL

CLK OSC

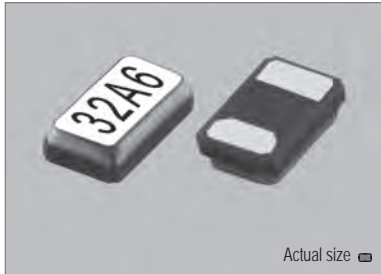
VCXO

TCXO

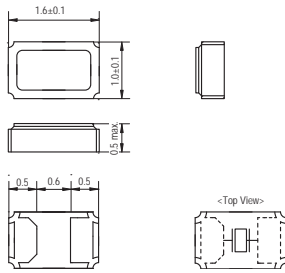
OCXO

MCF

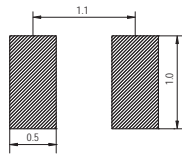
110SMX



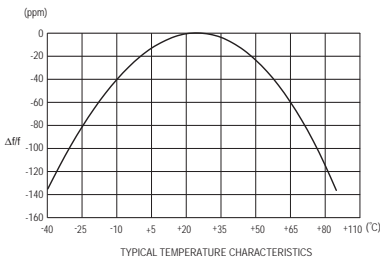
110SMX



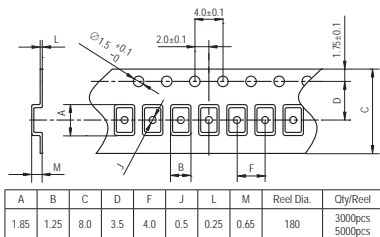
SOLDERING PATTERN



XY-CUT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

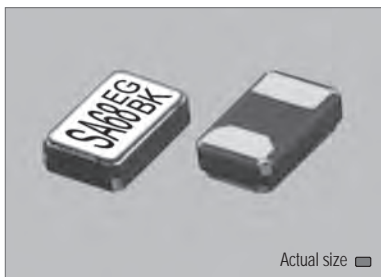
Item	Symbol	Specifications
Part number	P/N	110M327*
Package type		110SMX
Nominal frequency	F	32.768 kHz
Frequency tolerance (at +25°C)	$\Delta f/F$	AA : ± 10 ppm A : ± 15 ppm B : ± 20 ppm C : ± 30 ppm (Standard)
Load capacitance	CL	12.5 pF : 110M327 (Standard) 9.0 pF : 110M327-9 7.0 pF : 110M327-7
Equivalent series resistance	ESR	90 k Ω max.
Drive level	P	0.1 μ W (0.5 μ W for max.)
Turnover temperature	Tt	+25°C \pm 5°C
Temperature coefficient	β	-0.035 ppm / °C ² , Typical.
Aging (for first year)	$\Delta f/F$	± 3 ppm max. at +25°C ± 3 °C
Insulation resistance	Ri	500 M Ω min. at 100V DC ± 15 V
Cut		XY-Cut
Operating temperature range	To	-40°C to +85°C
Storage temperature range	Ts	-55°C to +125°C
Shock resistance	$\Delta f/F$	± 5 ppm max.
Vibration resistance	$\Delta f/F$	± 5 ppm max.
IR reflow resistance	$\Delta f/F$	± 10 ppm max.
Reflow condition		10 seconds max. at +250°C ± 10 °C

(*) No pattern path underneath the 110SMX

PACKAGE DATA

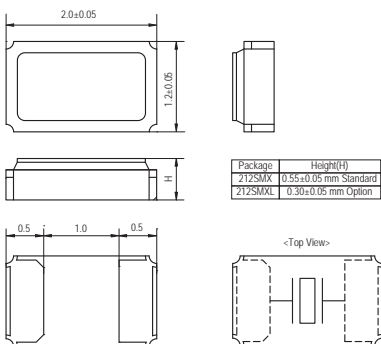
Item	Package	110SMX
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

212SMX

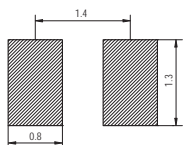


Actual size
0.0055 gm (wt.)

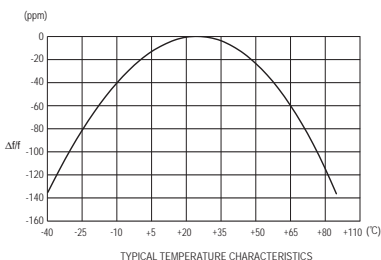
212SMX



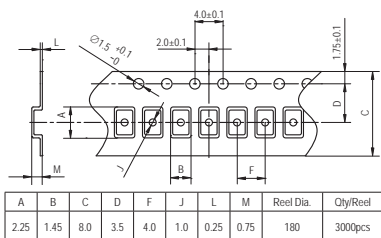
SOLDERING PATTERN



XY-CUT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

Item	Symbol	Specifications
Part number	P/N	212M327*
Package Type		212SMX
Nominal frequency	F	32.768 kHz
Frequency tolerance (at +25°C)	$\Delta f/F$	AA : ±10 ppm A : ±15 ppm B : ±20 ppm C : ±30 ppm (Standard)
Load capacitance	CL	12.5 pF : 212M327 (Standard) 9.0 pF : 212M327-9 7.0 pF : 212M327-7
Equivalent series resistance	ESR	90k Ω max. (To : -40°C to +85°C)
Drive level	P	0.1 μ W (0.5 μ W for max.)
Turnover temperature	Tt	+25°C ±5°C
Temperature coefficient	β	-0.034 ppm / °C ² , Typical
Quality factor	Q	20000 min.
Shunt capacitance	C0	1.2 pF, Typical
Motional capacitance	C1	0.003 pF, Typical
Capacitance ratio	γ	400, Typical
Aging (for first year)	$\Delta f/F$	±3 ppm max. at +25°C ±3°C
Insulation resistance	Ri	500 M Ω min. at 100V DC ±15V
Cut		XY-Cut
Operating temperature range	To	-40°C to +85°C
Storage temperature range	Ts	-55°C to +125°C
Shock resistance	$\Delta f/F$	±5 ppm max.
Vibration resistance	$\Delta f/F$	±5 ppm max.
IR reflow resistance	$\Delta f/F$	±10 ppm max.
Reflow condition		10 seconds max. at +250°C ±10°C

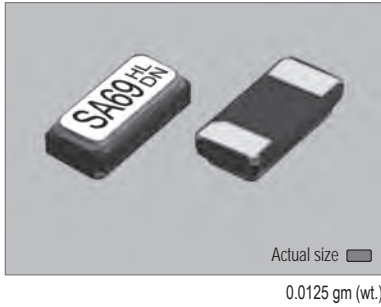
(*) No pattern path underneath the 212SMX

PACKAGE DATA

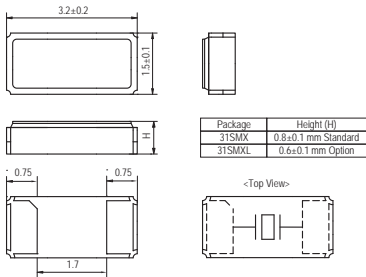
Item	Package	212SMX
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

XTAL
CLKOSC
VCXO
TCXO
OCXO
MCF

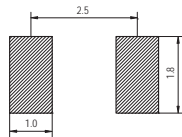
31SMX



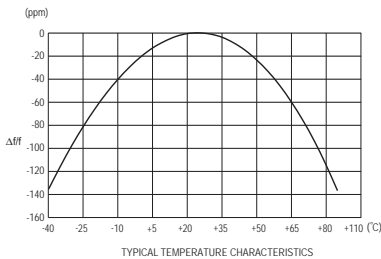
31SMX



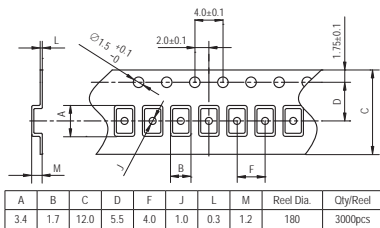
SOLDERING PATTERN



XY-CUT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

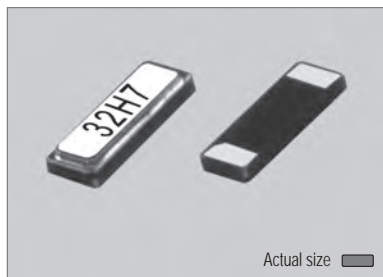
Item	Symbol	Specifications
Part number	P/N	31M327*
Package Type		31SMX
Nominal frequency	F	32.768 kHz
Frequency tolerance (at +25°C)	Δf/F	AAA : ± 5 ppm AA : ±10 ppm A : ±15 ppm B : ±20 ppm C : ±30 ppm (Standard)
Load capacitance	CL	12.5 pF : 31M327 (Standard) 9.0 pF : 31M327-9 7.0 pF : 31M327-7 6.0 pF : 31M327-6
Equivalent series resistance	ESR	70k Ω max. (To : -40°C to +85°C) (Standard) 80k Ω max. (To : -40°C to +105°C) (Option) 80k Ω max. (To : -40°C to +125°C) (Option) 50k Ω max. (To : -40°C to +85°C) (R = Option)
Drive level	P	0.1 μW (0.5 μW max.)
Turnover temperature	Tt	+25°C ±5°C
Temperature coefficient	β	-0.034 ppm / °C ² , Typical
Quality factor	Q	20000 min.
Shunt capacitance	C0	1.05 pF, max.
Motional capacitance	C1	0.0038 pF, Typical
Capacitance ratio	γ	273, Typical
Aging (for first year)	Δf/F	±3 ppm max. at +25°C ±3°C
Insulation resistance	Ri	500 MΩ min. at 100V DC ±15V
Cut		XY-Cut
Operating temperature range	To	-40°C to +85°C (Standard) -40°C to +105°C (W = Option) -40°C to +125°C (WW = Option)
Storage temperature range	Ts	-55°C to +125°C
Shock resistance	Δf/F	±5 ppm max.
Vibration resistance	Δf/F	±5 ppm max.
IR reflow resistance	Δf/F	±10 ppm max.
Reflow condition		10 seconds max. at +250°C ±10°C

(*) Formerly 31M327(C)
(*) No pattern path underneath the 31SMX

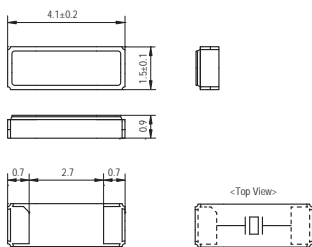
PACKAGE DATA

Item	Package	31SMX
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

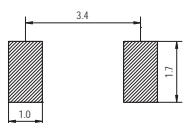
415SMX



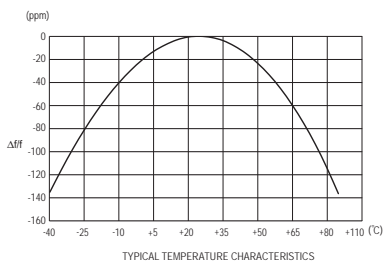
415SMX



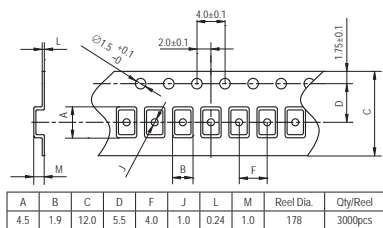
SOLDERING PATTERN



XY-CUT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

Item	Symbol	Specifications
Part number	P/N	415M327*
Package type		415SMX
Nominal frequency	F	32.768 kHz
Frequency tolerance (at +25°C)	$\Delta f/F$	B : ± 20 ppm C : ± 30 ppm (Standard)
Load capacitance	CL	12.5 pF : 415M327 (Standard) 9.0 pF : 415M327-9 7.0 pF : 415M327-7
Equivalent series resistance	ESR	70 k Ω max.
Drive level	P	1 μ W max.
Turnover temperature	Tt	+25°C \pm 5°C
Temperature coefficient	β	-0.034 ppm / °C ² , Typical
Quality factor	Q	30000 min.
Shunt capacitance	C0	1.1 pF, Typical
Motional capacitance	C1	0.002 pF, Typical
Capacitance ratio	γ	550, Typical
Aging (for first year)	$\Delta f/F$	± 3 ppm max. at +25°C \pm 3°C
Insulation resistance	Ri	500 M Ω min. at 100V DC \pm 15V
Cut		XY-Cut
Operating temperature range	To	-40°C to +85°C
Storage temperature range	Ts	-55°C to +125°C
Shock resistance	$\Delta f/F$	± 5 ppm max.
Vibration resistance	$\Delta f/F$	± 5 ppm max.
IR reflow resistance	$\Delta f/F$	± 10 ppm max.
Reflow condition		10 seconds max. at +250°C \pm 10°C

(*) No pattern path underneath the 415SMX

PACKAGE DATA

Item	Package	415SMX
Lid		Metal
Base		Ceramic
Sealing		AuSn
Terminal		Tungsten (metallized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

XTAL

CLKOSC

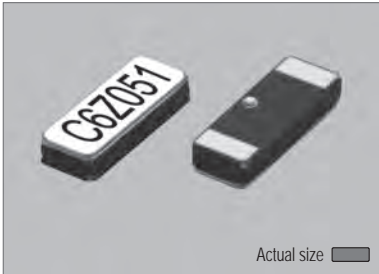
VCXO

TCXO

OCXO

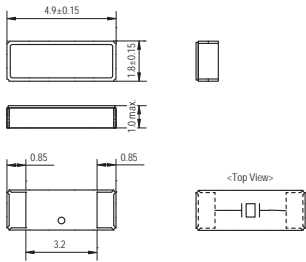
MCF

52SMX

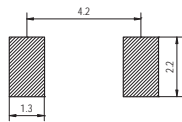


0.0257 gm (wt.)

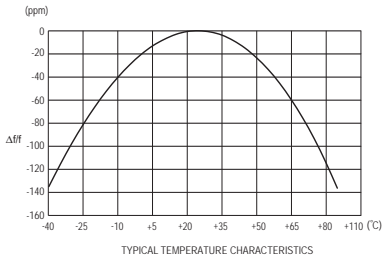
52SMX



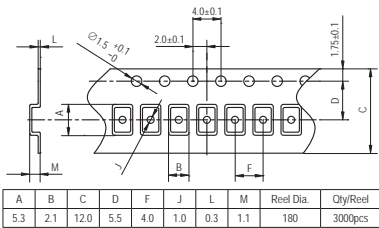
SOLDERING PATTERN



XY-CUT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

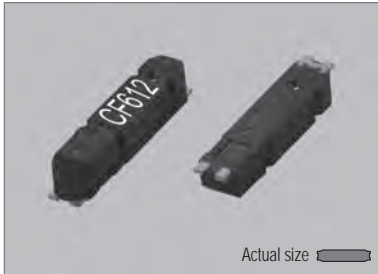
Item	Symbol	Specifications
Part number	P/N	52M327*
Package Type		52SMX
Nominal frequency	F	32.768 kHz
Frequency tolerance (at +25°C)	$\Delta f/F$	B : ± 20 ppm C : ± 30 ppm (Standard) D : ± 50 ppm
Load capacitance	CL	12.5 pF : 52M327 (Standard) 9.0 pF : 52M327-9 7.0 pF : 52M327-7
Equivalent series resistance	ESR	70k Ω max. (To : -40°C to +85°C)
Drive level	P	1 μ W max.
Turnover temperature	Tt	+25°C ± 5 °C
Temperature coefficient	β	-0.034 ppm / °C ² , Typical
Quality factor	Q	40000 min.
Shunt capacitance	C0	1.3 pF, Typical
Motional capacitance	C1	0.0021 pF, Typical
Capacitance ratio	γ	619, Typical
Aging (for first year)	$\Delta f/F$	± 3 ppm max. at +25°C ± 3 °C
Insulation resistance	Ri	500 M Ω min. at 100V DC ± 15 V
Cut		XY-Cut
Operating temperature range	To	-40°C to +85°C
Storage temperature range	Ts	-55°C to +125°C
Shock resistance	$\Delta f/F$	± 5 ppm max.
Vibration resistance	$\Delta f/F$	± 5 ppm max.
IR reflow resistance	$\Delta f/F$	± 10 ppm max.
Reflow condition		10 seconds max. at +250°C ± 10 °C

(*) No pattern path underneath the 52SMX

PACKAGE DATA

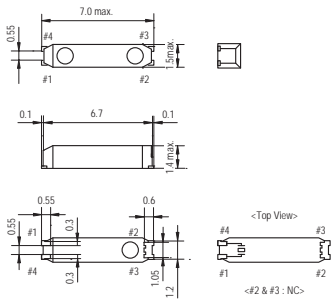
Item	Package	52SMX
Lid		Metal
Base		Ceramic
Sealing		AuSn
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

124SMX

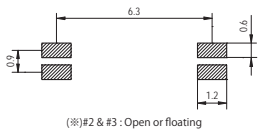


0.0295 gm (wt.)

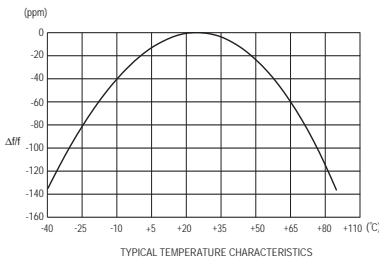
124SMX



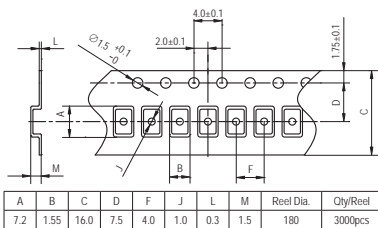
SOLDERING PATTERN



XY-CUT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

Item	Symbol	Specifications
Part number	P/N	124M327* ¹
Package Type		124SMX* ²
Nominal frequency	F	32.768 kHz
Frequency tolerance (at +25°C)	$\Delta f/F$	AAA : ± 5 ppm AA : ± 10 ppm A : ± 15 ppm B : ± 20 ppm C : ± 30 ppm (Standard)
Load capacitance	CL	12.5 pF : 124M327 (Standard) 9.0 pF : 124M327-9 7.0 pF : 124M327-7 (Standard) 6.0 pF : 124M327-6 4.4 pF : 124M327-4.4 3.7 pF : 124M327-3.7
Equivalent series resistance	ESR	65k Ω max. / To : -40°C to +85°C (Standard) 50k Ω max. / To : -40°C to +85°C (R = Option)
Drive level	P	0.1 μ W (1 μ W max.)
Turnover temperature	Tt	+25°C ± 5 °C
Temperature coefficient	β	-0.035 ppm / °C ² , Typical
Quality factor	Q	40000 min.
Shunt capacitance	C0	0.8 pF, Typical
Motional capacitance	C1	0.0019 pF, Typical
Capacitance ratio	γ	420, Typical
Aging (for first year)	$\Delta f/F$	± 3 ppm max. at +25°C ± 3 °C
Insulation resistance	Ri	500 M Ω min. at 100V DC ± 15 V
Cut		XY-Cut
Operating temperature range	To	-40°C to +85°C
Storage temperature range	Ts	-55°C to +125°C
Shock resistance	$\Delta f/F$	± 5 ppm max.
Vibration resistance	$\Delta f/F$	± 5 ppm max.
IR reflow resistance	$\Delta f/F$	± 10 ppm max.
Reflow condition		10 seconds max. at +250°C ± 10 °C (2 times)

(*1) No pattern path underneath the 124SMX.

(*2) The crystal metal body may be visible inside the mold. It does not affect the crystal performance.

PACKAGE DATA

Item	Package	124SMX
Outer package		Epoxy
Sealing		Press-fit (1.2 x 4.7 mm built in)
Terminal		42 alloy
Terminal plating		Sn
RoHS		Compliant

XTAL

CLKOSC

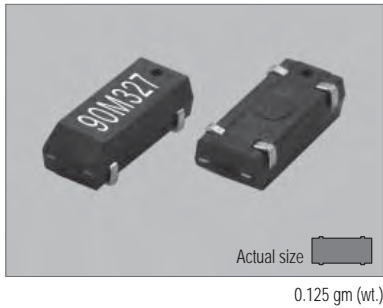
VCXO

TCXO

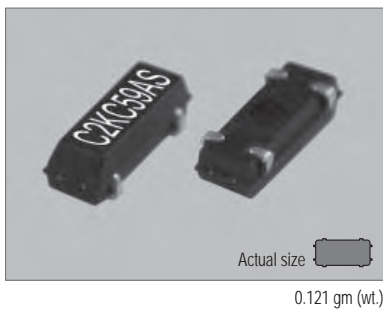
OCXO

MCF

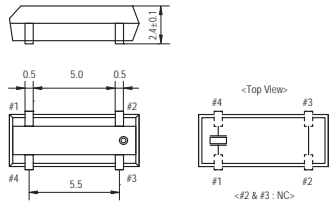
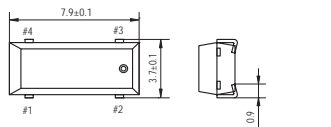
90SMX(N)



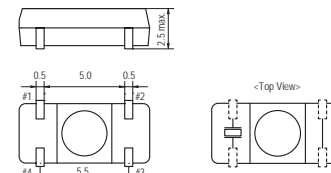
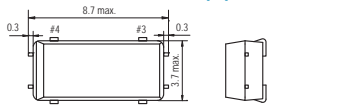
90SMX(S)



90SMX(N)

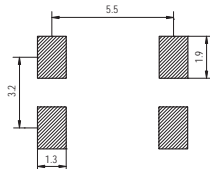


90SMX(S)



SOLDERING PATTERN

90SMX(N) & 90SMX(S)



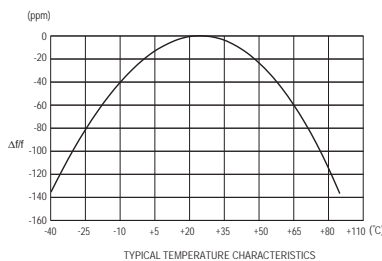
STANDARD SPECIFICATIONS

Item	Symbol	Specifications	
Part number	P/N	90M327(N)	90M327(S)
Package type		90SMX(N)	90SMX(S)
Nominal frequency	F	32.768 kHz	
Frequency tolerance (at +25°C)	$\Delta f/F$	AAA : ± 5 ppm AA : ± 10 ppm A : ± 15 ppm B : ± 20 ppm C : ± 30 ppm (Standard)	
Load capacitance	CL	12.5 pF : 90M327(N) & 90M327(S) (Standard) 6.0 pF : 90M327-6(N) & 90M327-6(S)	
Equivalent series resistance	ESR	50 k Ω max. (To : -40°C to +85°C)	
Drive level	P	1 μ W max.	
Turnover temperature	Tt	+25°C $\pm 5^\circ$ C	
Temperature coefficient	β	-0.034 ppm / °C ² , Typical	-0.035 ppm / °C ² , Typical
Quality factor	Q	50000 min.	
Shunt capacitance	C0	1.35 pF, Typical	1.0 pF, Typical
Motional capacitance	C1	0.003 pF, Typical	0.0019 pF, Typical
Capacitance ratio	γ	450, Typical	520, Typical
Aging (for first year)	$\Delta f/F$	± 3 ppm max. at +25°C $\pm 3^\circ$ C	
Insulation resistance	Ri	500 M Ω min. at 100V DC ± 15 V	
Cut		XY-Cut	
Operating temperature range	To	-40°C to +85°C	
Storage temperature range	Ts	-55°C to +125°C	
Shock resistance	$\Delta f/F$	± 5 ppm max.	
Vibration resistance	$\Delta f/F$	± 5 ppm max.	
IR reflow resistance	$\Delta f/F$	± 10 ppm max.	
Reflow condition		10 seconds max. at +250°C $\pm 10^\circ$ C	

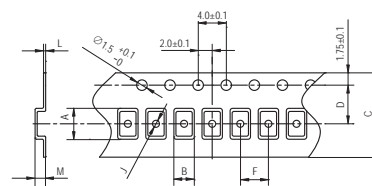
PACKAGE DATA

Item	Package	90SMX(N)	90SMX(S)
Outer package		Epoxy compound	Plastic
Sealing		Press-fit (2x6 mm built in)	Press-fit (2x6 mm built in)
Terminal lead frame		Brass (CuZn)	42 alloy
Terminal plating		SnAg	Sn
RoHS		Compliant	Compliant

XY-CUT



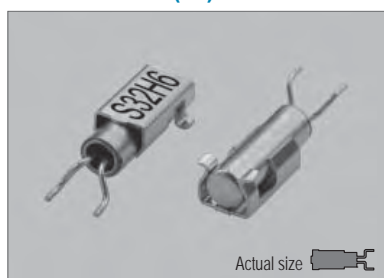
TAPE SPECIFICATIONS



90SMX(N)									
A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
8.3	4.0	16.0	7.5	8.0	1.6	0.3	2.7	330	3000pcs

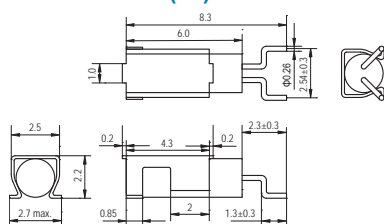
90SMX(S)									
A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
8.7	3.9	16.0	7.5	8.0	-	0.4	2.7	330	3000pcs

26(LF)MJ

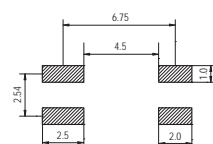


0.079 gm (wt.)

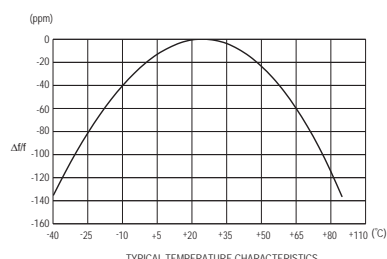
26(LF)MJ



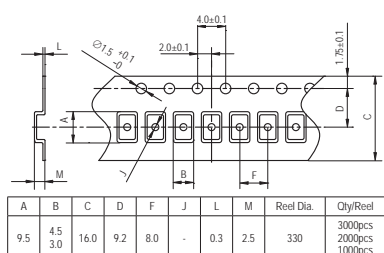
SOLDERING PATTERN



XY-CUT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

Item	Symbol	Specifications
Part number	P/N	26(LF)327MJ*1
Package Type		26(LF)MJ*2
Nominal frequency	F	32.768 kHz
Frequency tolerance (at +25°C)	Δf/F	A : ±15 ppm B : ±20 ppm C : ±30 ppm (Standard) D : ±50 ppm
Load capacitance	CL	12.5 pF
Equivalent series resistance	ESR	50k Ω max. (To : -40°C to +85°C)
Drive level	P	1 μW max.
Turnover temperature	Tt	+25°C ±5°C
Temperature coefficient	β	-0.034 ppm / °C ² , Typical
Quality factor	Q	50000 min.
Shunt capacitance	C0	1.45 pF, Typical
Motional capacitance	C1	0.003 pF, Typical
Capacitance ratio	γ	480, Typical
Aging (for first year)	Δf/F	±5 ppm max. at +25°C ±3°C
Insulation resistance	Ri	500 MΩ min. at 100V DC ±15V
Cut		XY-Cut
Operating temperature range	To	-40°C to +85°C
Storage temperature range	Ts	-55°C to +125°C
Shock resistance	Δf/F	±10 ppm max.
Vibration resistance	Δf/F	±10 ppm max.
IR reflow resistance	Δf/F	±10 ppm max.
Reflow condition		10 seconds max. at +250°C ±10°C

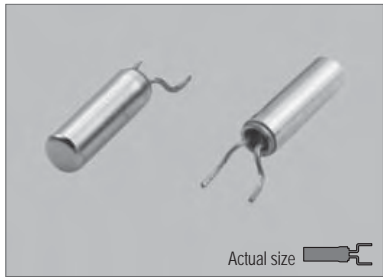
(*1) Formerly 26STF327(LF)MJN
(*2) Formerly 2x6(LF)MJN

PACKAGE DATA

Item	Package	26(LF)MJ
Cover		Metal
Base		Glass
Sealing		Press-fit
Metal clamp		CuSn
Metal clamp plating		Gold
Terminal lead		Kovar
Terminal lead plating		Sn-90Pb
RoHS		Compliant

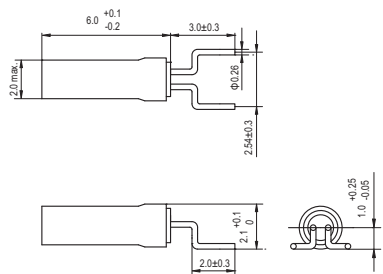
XTAL
CLK OSC
VCXO
TCXO
OCXO
MCF

26(LF)

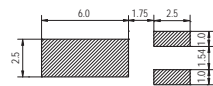


Actual size 0.0535 gm (wt.)

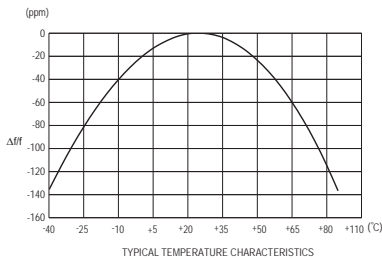
26(LF)



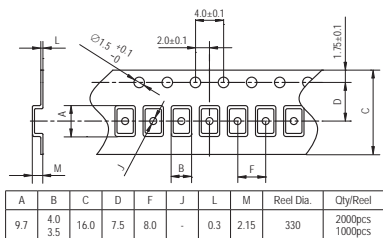
SOLDERING PATTERN



XY-CUT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

Item	Symbol	Specifications
Part number	P/N	26(LF)327*1
Package Type		26(LF)**2
Nominal frequency	F	32.768 kHz
Frequency tolerance (at +25°C)	$\Delta f/F$	A : ± 15 ppm B : ± 20 ppm C : ± 30 ppm (Standard) D : ± 50 ppm
Load capacitance	CL	12.5 pF : 26(LF)327 (Standard) 10.0 pF : 26(LF)327-10 8.0 pF : 26(LF)327-8
Equivalent series resistance	ESR	50k Ω max. (To : -40°C to +85°C)
Drive level	P	1 μ W max.
Turnover temperature	Tt	+25°C $\pm 5^\circ$ C
Temperature coefficient	β	-0.034 ppm / °C ² , Typical.
Quality factor	Q	50000 min.
Shunt capacitance	C0	1.45 pF, Typical
Motional capacitance	C1	0.003 pF, Typical
Capacitance ratio	γ	480, Typical
Aging (for first year)	$\Delta f/F$	± 5 ppm max. at +25°C $\pm 3^\circ$ C
Insulation resistance	Ri	500 M Ω min. at 100V DC ± 15 V
Cut		XY-Cut
Operating temperature range	To	-40°C to +85°C
Storage temperature range	Ts	-55°C to +125°C
Shock resistance	$\Delta f/F$	± 10 ppm max.
Vibration resistance	$\Delta f/F$	± 10 ppm max.
IR reflow resistance	$\Delta f/F$	± 10 ppm max.
Reflow condition		10 seconds max. at +250°C $\pm 10^\circ$ C

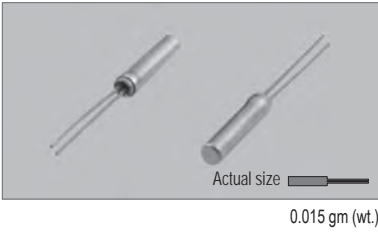
(*1) Formerly 26STF327(LF)H

(*2) Formerly 2x6(LF)H

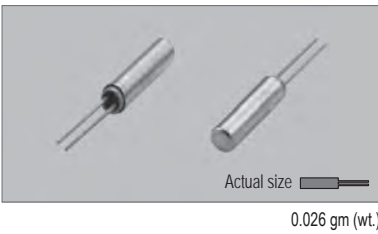
PACKAGE DATA

Item	Package	26(LF)
Cover		Metal
Base		Glass
Sealing		Press-fit
Terminal lead		Kovar
Terminal lead plating		Sn-90Pb
RoHS		Compliant

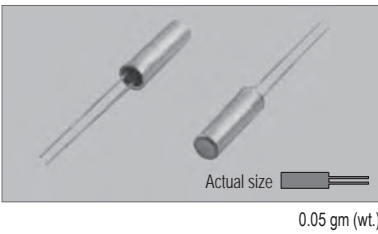
1.2 x 4.7 mm



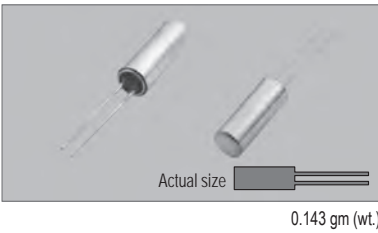
1.4 x 5.0 mm



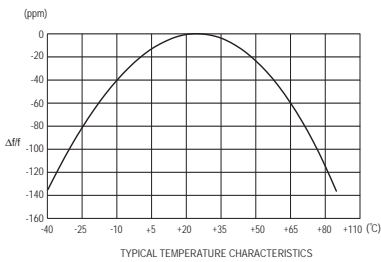
2.0 x 6.0 mm



3.0 x 8.0 mm



XY-CUT



STANDARD SPECIFICATIONS

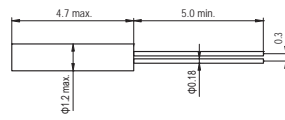
Item	Symbol	Specifications			
Part number	P/N	1247STF327	145STF327	26STF327	38STF327
Package Type		1.2x4.7 mm	1.4x5 mm	2x6 mm	3x8 mm
Nominal frequency	F	32.768 kHz			
Frequency tolerance (at +25°C)	$\Delta f/F$	AA: ± 10 ppm A: ± 15 ppm B: ± 20 ppm (Standard) C: ± 30 ppm			
Load capacitance	CL	8.0 pF, Typical		12.5 pF, Typical	
Equivalent series resistance	ESR	50k Ω max.	40k Ω max.	35k Ω max.	
Drive level	P	1 μ W max.			
Turnover temperature	Tt	+25°C to $\pm 5^\circ$ C			
Temperature coefficient (Typical)	β	-0.035 ppm / °C ²		-0.034 ppm / °C ²	
Quality factor (Typical)	Q	60000	85000	70000	85000
Shunt capacitance (Typical)	C0	0.8 pF	1.0 pF	1.3 pF	1.6 pF
Motional capacitance (Typical)	C1	0.002 pF	0.0025 pF	0.003 pF	0.0035 pF
Capacitance ratio (Typical)	γ	400	400	450	460
Aging (for first year)	$\Delta f/F$	± 3 ppm max. at +25°C $\pm 3^\circ$ C			
Insulation resistance	Ri	500 M Ω min. at 100V DC ± 15 V			
Cut		XY-Cut			
Operating temperature range	To	-20°C to +60°C	-20°C to +70°C		
Storage temperature range	Ts	-30°C to +70°C	-40°C to +85°C		
Shock resistance*1	$\Delta f/F$	± 5 ppm max.			
Vibration resistance	$\Delta f/F$	± 5 ppm max.			

(*1) Shock is defined "three drops from a height of 75cm onto hardwood."

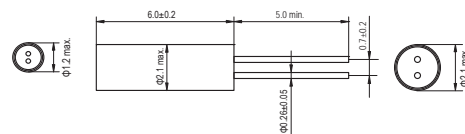
PACKAGE DATA

Item	Package	1247STF327	145STF327	26STF327	38STF327
Cover		Metal	Metal	Metal	Metal
Base		Glass	Glass	Glass	Glass
Sealing		Press-fit	Press-fit	Press-fit	Press-fit
Terminal lead		Alloy (FeNiCo)	Alloy (FeNiCo)	Alloy (FeNiCo)	Alloy (FeNiCo)
Terminal plating		SnCu	SnCu	SnCu	SnCu
RoHS		Compliant (Pb-free)	Compliant (Pb-free)	Compliant (Pb-free)	Compliant (Pb-free)

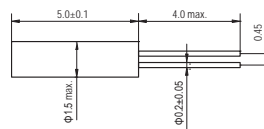
1.2x4.7mm



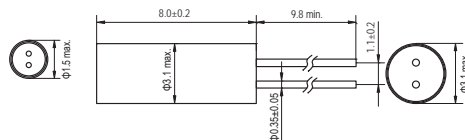
2.0x6.0 mm



1.4x5.0 mm



3.0x8.0 mm



XTAL

CLKOSC

VCXO

TCXO

OCXO

MCF

XTAL

CLK OSC

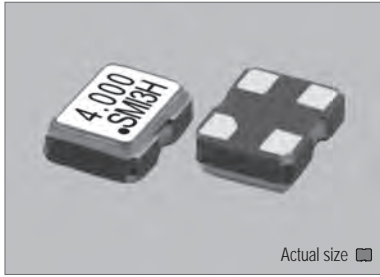
VCXO

TCXO

OCXO

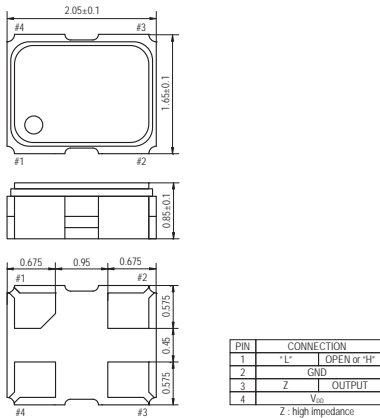
MCF

21SMO

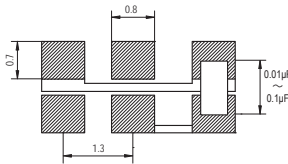


Actual size 0.008 gm (wt.)

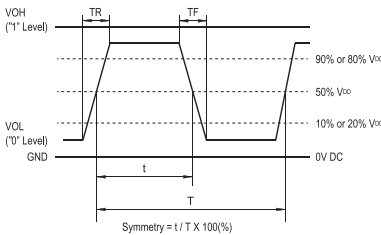
21SMO



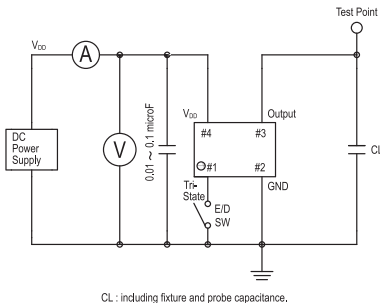
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

● CMOS OUTPUT
● PACKAGE SIZE 2.0x1.6 mm

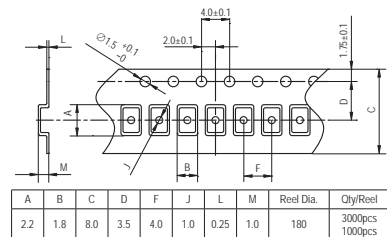
Item	Specifications		
General part number	21SMO*1		
Frequency range	1.500 MHz to 80.000 MHz		
Frequency stability (over all conditions)	21SMO(A) : ±100 ppm over -10°C to +70°C 21SMO(B) : ±50 ppm over -10°C to +70°C 21SMO(C) : ±30 ppm over -10°C to +70°C 21SMO(D) : ±25 ppm over -10°C to +70°C 21SMO(E) : ±20 ppm over -10°C to +70°C 21SMO(AW) : ±100 ppm over -40°C to +85°C 21SMO(BW) : ±50 ppm over -40°C to +85°C		
Operating Conditions	Operating temperature	-10°C to +70°C (Standard) -20°C to +70°C (SW = Standard) -40°C to +85°C (W = Option) -40°C to +105°C (WW = Option)	
	Supply voltage (V _{DD})	+1.8V, +2.5V, +3.0V or +3.3V DC ±5%	
	Stand-by control voltage (Pin#1)	V _{IH} : 70% V _{DD} min. V _{IL} : 30% V _{DD} max.*2	
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC	
	Storage temperature	-55°C to +100°C	
Input current (max. mA) (Pin#1 = Open or V _{IH}) No load	V _{DD}	Frequency	1.5M+ 10M+ 20M+ 30M+ 40M+ 50M+ 60M+ 70M+
		+1.8V	1.8 2.1 2.5 3.5 4.0 4.5 6.0 6.5
+2.5V	2.5 3.0 3.5 4.5 5.0 5.5 6.5 7.0		
+3.0V	3.0 3.5 4.0 5.0 5.5 6.0 7.5 8.5		
+3.3V	3.5 4.0 4.5 5.5 6.0 6.5 8.0 9.0		
Stand-by current*2	10 µA max. (Pin#1 = V _{IL})		
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level	
	Rise and fall times	6 ns max. (10% V _{DD} to 90% V _{DD} level)	
	"0" Level	V _{OL} : 10% V _{DD} max.	
	"1" Level	V _{OH} : 90% V _{DD} min.	
Load	15 pF max. (CMOS)		
Disable delay time	150 ns max.		
Enable delay time	10 ms max.		
Start-up time	10 ms max.		
SSB phase noise (at V _{DD} = +3.3V & 40.000 MHz)	-143 dBc/Hz, Typical at 1 kHz offset -157 dBc/Hz, Typical at 100 kHz offset		
Aging	±5 ppm max. at +25°C ±3°C for first year		
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)		

(*1) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 21SMO(2.5VC) 10.000MHz
(*2) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

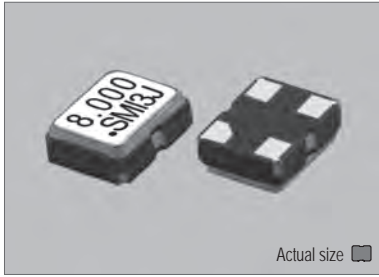
PACKAGE DATA

Item	Package	21SMO
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS

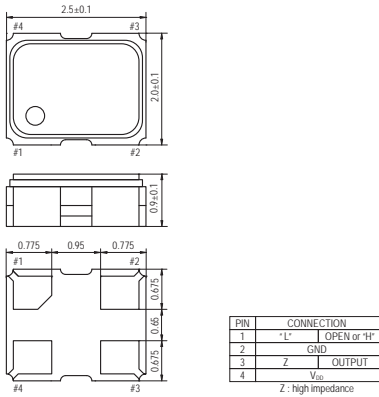


22SMO

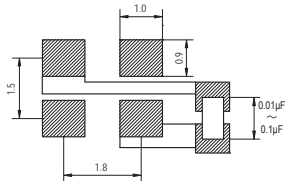


Actual size 0.014 gm (wt.)

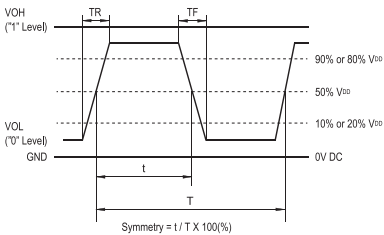
22SMO



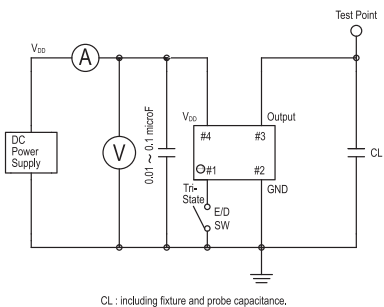
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

- WIDE FREQUENCY RANGE
- CMOS OUTPUT
- PACKAGE SIZE 2.5x2.0 mm

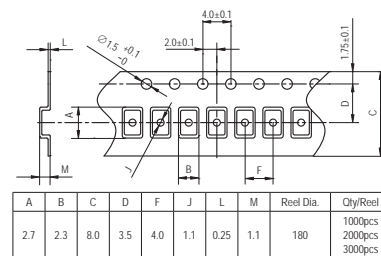
Item		Specifications																																								
General part number		22SMO* ¹																																								
Frequency range		1.500 MHz to 135.000 MHz	133.000 MHz to 170.000 MHz																																							
Frequency stability (over all conditions)		22SMO(A) : ±100 ppm over -20°C to +70°C 22SMO(B) : ±50 ppm over -20°C to +70°C 22SMO(C) : ±30 ppm over -20°C to +70°C 22SMO(D) : ±25 ppm over -20°C to +70°C 22SMO(E) : ±20 ppm over -20°C to +70°C 22SMO(AW) : ±100 ppm over -40°C to +85°C 22SMO(BW) : ±50 ppm over -40°C to +85°C 22SMO(CW) : ±30 ppm over -40°C to +85°C 22SMO(DW) : ±25 ppm over -40°C to +85°C																																								
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option) -40°C to +105°C (WW = Option) 1.500 MHz to 80.000 MHz -40°C to +125°C (WWW = Option) 1.500 MHz to 80.000 MHz																																								
	Supply voltage (V _{DD})	+1.8V, +2.5V, +3.0V or +3.3V DC ±5%	+2.5V, +3.0V or +3.3V DC ±5%																																							
	Stand-by control voltage (Pin#1)	V _H : 70% V _{DD} min. V _L : 30% V _{DD} max.* ²																																								
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC																																								
	Storage temperature	-55°C to +125°C																																								
Input current (max. mA) (Pin#1 = Open or V _H) No load		<table border="1"> <thead> <tr> <th rowspan="2">V_{DD}</th> <th colspan="7">Frequency</th> </tr> <tr> <th>1.0M+</th> <th>10M+</th> <th>40M+</th> <th>75M+</th> <th>85M+</th> <th>101M+</th> <th>135M+</th> </tr> </thead> <tbody> <tr> <td>+1.8V</td> <td>1.5</td> <td>2.0</td> <td>5.0</td> <td>7.0</td> <td>7.5</td> <td>10</td> <td>n.a.</td> </tr> <tr> <td>+2.5V</td> <td>2.0</td> <td>2.3</td> <td>6.0</td> <td>8.0</td> <td>8.5</td> <td>12</td> <td>25.5</td> </tr> <tr> <td>+3.3V</td> <td>2.4</td> <td>3.5</td> <td>7.0</td> <td>9.0</td> <td>10.5</td> <td>15</td> <td>29.5</td> </tr> </tbody> </table>		V _{DD}	Frequency							1.0M+	10M+	40M+	75M+	85M+	101M+	135M+	+1.8V	1.5	2.0	5.0	7.0	7.5	10	n.a.	+2.5V	2.0	2.3	6.0	8.0	8.5	12	25.5	+3.3V	2.4	3.5	7.0	9.0	10.5	15	29.5
V _{DD}	Frequency																																									
	1.0M+	10M+	40M+	75M+	85M+	101M+	135M+																																			
+1.8V	1.5	2.0	5.0	7.0	7.5	10	n.a.																																			
+2.5V	2.0	2.3	6.0	8.0	8.5	12	25.5																																			
+3.3V	2.4	3.5	7.0	9.0	10.5	15	29.5																																			
Stand-by current* ²		10 µA max. (Pin#1 = V _H) ... -40°C to +85°C 20 µA max. (Pin#1 = V _L) ... -40°C to +105°C / +125°C																																								
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level																																								
	Rise and fall times	6 ns max. (10% V _{DD} to 90% V _{DD} level)	3 ns max. (10% V _{DD} to 90% V _{DD} level)																																							
	"0" Level	V _{OL} : 10% V _{DD} max.																																								
	"1" Level	V _{OH} : 90% V _{DD} min.																																								
	Load	15 pF max. (CMOS)																																								
Disable delay time		200 ns max.																																								
Enable delay time		10 ms max.																																								
Start-up time		10 ms max.																																								
SSB phase noise (at V _{DD} = +3.3V & 40.000 MHz)		-140 dBc / Hz, Typical at 1 kHz offset -160 dBc / Hz, Typical at 1 MHz offset																																								
RMS jitter (12 kHz to 20.000 MHz band)		500 fs max. (180 fs, Typical at 40.000 MHz)																																								
Aging		±5 ppm max. at +25°C ±3°C for first year																																								
Reflow condition		+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)																																								

(*¹) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 22SMO(2.5V BW) 27.000MHz
 (*²) Internal crystal oscillation to be halted (Pin#1 = V_L)

PACKAGE DATA

Item	Package	22SMO
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metallized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLK OSC

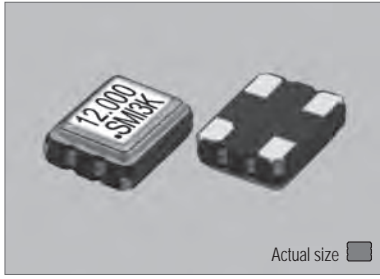
VCXO

TCXO

OCXO

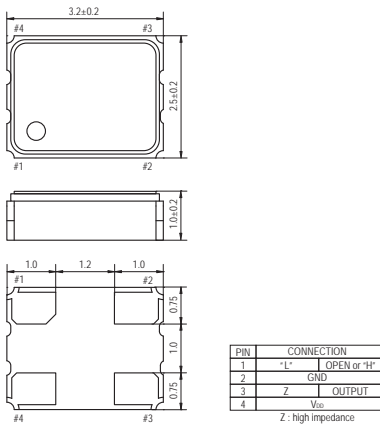
MCF

32SMO

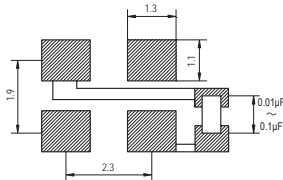


Actual size 0.025gm (wt.)

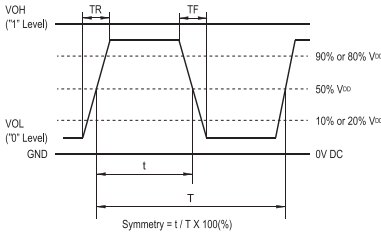
32SMO



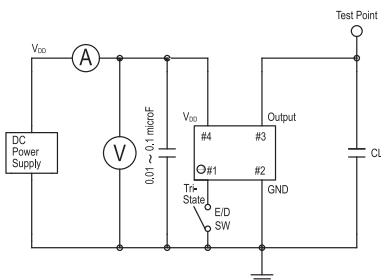
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



CL: including fixture and probe capacitance.

STANDARD SPECIFICATIONS

- WIDE FREQUENCY RANGE
- CMOS OUTPUT
- PACKAGE SIZE 3.2x2.5 mm

Item		Specifications						
General part number		32SMO ^{*1}						
Frequency range		1.500 MHz to 135.000 MHz	133.000 MHz to 170.000 MHz					
Frequency stability (over all conditions)		32SMO(A) : ±100 ppm over -20°C to +70°C 32SMO(B) : ±50 ppm over -20°C to +70°C 32SMO(C) : ±30 ppm over -20°C to +70°C 32SMO(D) : ±25 ppm over -20°C to +70°C 32SMO(E) : ±20 ppm over -20°C to +70°C 32SMO(AW) : ±100 ppm over -40°C to +85°C 32SMO(BW) : ±50 ppm over -40°C to +85°C 32SMO(CW) : ±30 ppm over -40°C to +85°C 32SMO(DW) : ±25 ppm over -40°C to +85°C						
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option) -40°C to +105°C (WW = Option) 1.500 MHz to 80.000 MHz -40°C to +125°C (WWW = Option) 1.500 MHz to 80.000 MHz						
	Supply voltage (V _{DD})	+1.8V, +2.5V, +3.0V or +3.3V DC ±5%	+2.5V, +3.0V or +3.3V DC ±5%					
	Stand-by control voltage (Pin#1)	V _{IH} : 70% V _{DD} min. V _{IL} : 30% V _{DD} max. ^{*2}						
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC						
	Storage temperature	-55°C to +125°C						
Input current (max. mA) (Pin#1 = Open or V _{IH}) No load	V _{DD}	Frequency						
		1.0M+	10M+	40M+	75M+	85M+	101M+	135M+
Stand-by current ^{*2}	+1.8V	1.5	2.0	5.0	7.0	7.5	10	n.a.
	+2.5V	2.0	2.3	6.0	8.0	8.5	12	25.5
	+3.3V	2.4	3.5	7.0	9.0	10.5	15	29.5
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level						
	Rise and fall times (10% V _{DD} to 90% V _{DD} level)	6 ns max.			3 ns max.			
	"0" Level	V _{OL} : 10% V _{DD} max.						
	"1" Level	V _{OH} : 90% V _{DD} min.						
Load	15 pF max. (CMOS)							
Disable delay time	200 ns max.							
Enable delay time	10 ms max.							
Start-up time	10 ms max.							
SSB phase noise (at V _{DD} = +3.3V & 133.000 MHz)	-135 dBc / Hz, Typical at 1 kHz offset -158 dBc / Hz, Typical at 1 MHz offset							
RMS jitter (12 kHz to 20.000 MHz band)	500 fs max. (80 fs, Typical at 133.000 MHz)							
Aging	±5 ppm max. at +25°C ±3°C for first year							
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)							

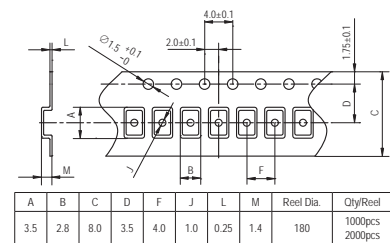
(*1) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 32SMO(1.8VD) 24.000MHz

(*2) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	32SMO
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS

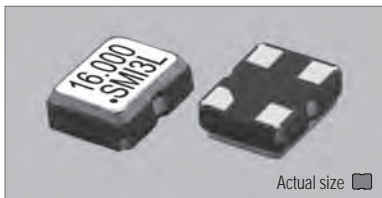


Crystal Clock Oscillators

SPXO $V_{DD} = +0.8$ to $+1.8V$ 1.25 to 50 MHz 2.5x2.0 & 3.2x2.5 mm LOW POWER CMOS

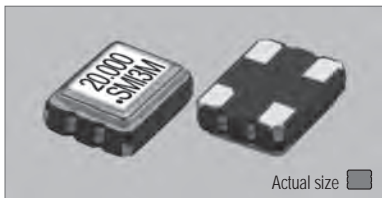
22SMOLC & 32SMOLC (+0.8V, +1.2V, +1.5V or +1.8V FIXED MODELS) 2.5x2.0 mm 3.2x2.5 mm STANDARD SMD CLOCK OSCILLATORS

22SMOLC



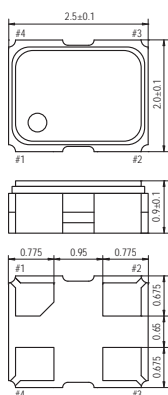
Actual size 0.014 gm (wt.)

32SMOLC

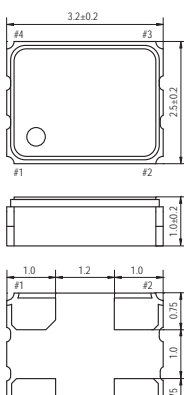


Actual size 0.025 gm (wt.)

22SMOLC



32SMOLC



PIN	CONNECTION
1	"1" OPEN or "H"
2	GND
3	Z
4	V_{DD} OUTPUT

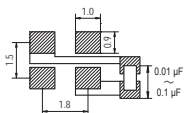
Z: High impedance

PIN	CONNECTION
1	"1" OPEN or "H"
2	GND
3	Z
4	V_{DD} OUTPUT

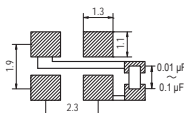
Z: High impedance

SOLDERING PATTERN

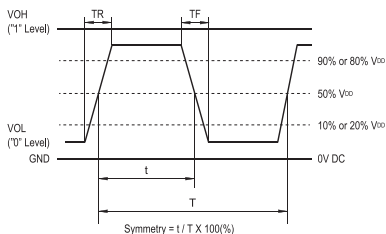
22SMOLC



32SMOLC



OUTPUT WAVEFORM



STANDARD SPECIFICATIONS

- CMOS OUTPUT
- LOW VOLTAGE OPERATION
- LOW POWER CONSUMPTION
- PACKAGE SIZE 2.5x2.0 mm & 3.2x2.5 mm

Item		Specifications
General part number		22SMOLC* ¹ 32SMOLC* ¹
Frequency range		1.250 MHz to 50.000 MHz
Frequency stability (over all conditions)		22SMOLC(A) & 32SMOLC(A) : ± 100 ppm over $-20^{\circ}C$ to $+70^{\circ}C$ 22SMOLC(B) & 32SMOLC(B) : ± 50 ppm over $-20^{\circ}C$ to $+70^{\circ}C$ 22SMOLC(C) & 32SMOLC(C) : ± 30 ppm over $-20^{\circ}C$ to $+70^{\circ}C$ 22SMOLC(D) & 32SMOLC(D) : ± 25 ppm over $-20^{\circ}C$ to $+70^{\circ}C$ 22SMOLC(E) & 32SMOLC(E) : ± 20 ppm over $-20^{\circ}C$ to $+70^{\circ}C$ 22SMOLC(AW) & 32SMOLC(AW) : ± 100 ppm over $-40^{\circ}C$ to $+85^{\circ}C$ 22SMOLC(BW) & 32SMOLC(BW) : ± 50 ppm over $-40^{\circ}C$ to $+85^{\circ}C$ 22SMOLC(CW) & 32SMOLC(CW) : ± 30 ppm over $-40^{\circ}C$ to $+85^{\circ}C$ 22SMOLC(DW) & 32SMOLC(DW) : ± 25 ppm over $-40^{\circ}C$ to $+85^{\circ}C$
Operating Conditions	Operating temperature	$-20^{\circ}C$ to $+70^{\circ}C$ (Standard) $-40^{\circ}C$ to $+85^{\circ}C$ (W = Option)
	Supply voltage (V_{DD})	+0.8V, +1.2V, +1.5V or +1.8V DC $\pm 5\%$
	Stand-by control voltage (Pin#1)	V_{IH} : 70% V_{DD} min. V_{IL} : 30% V_{DD} max.* ²
Absolute Max. Ratings	Supply voltage	$-0.5V$ to $+4.0V$ DC
	Storage temperature	$-55^{\circ}C$ to $+100^{\circ}C$
Input current (no load) (Pin#1 = Open or V_{IH})		1.4 mA max. ($V_{DD} = +0.8V$) 2 mA max. ($V_{DD} = +1.2V$) 3 mA max. ($V_{DD} = +1.5V$ & $+1.8V$)
Stand-by current* ²		100 μA max. (Pin#1 = V_{IL})
Output ($-40^{\circ}C$ to $+85^{\circ}C$)	Symmetry	45% to 55% at 1/2 V_{DD} level
	Rise and fall times	4 ns max. (20% V_{DD} to 80% V_{DD} level)
	"0" Level	V_{OL} : 20% V_{DD} max.
	"1" Level	V_{OH} : 80% V_{DD} min.
Load		15 pF max. (CMOS)
Disable delay time		50 μs max.
Enable delay time		10 ms max.
Start-up time		10 ms max.
Aging		± 5 ppm max. at $+25^{\circ}C \pm 3^{\circ}C$ for first year.
SSB phase noise (at $V_{DD} = +1.2V$ & 48.000 MHz)		-130 dBc / Hz, Typical at 1 kHz offset
Reflow condition		$+250^{\circ}C \pm 10^{\circ}C$ for 10 seconds $+170^{\circ}C \pm 10^{\circ}C$ for 1 to 2 minutes (preheating)

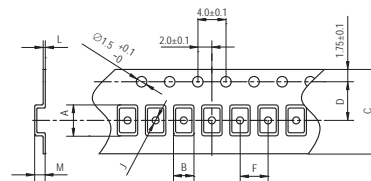
(*¹) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 22SMOLC(1.2VD) 27.000MHz

(*²) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	22SMOLC & 32SMOLC
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



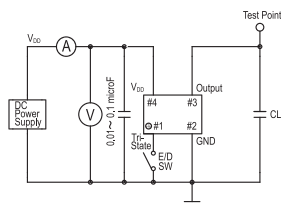
22SMOLC

A	B	C	D	F	J	L	M	Reel Dia.	Cly/Reel
2.7	2.3	8.0	3.5	4.0	1.1	0.25	1.1	180	1000pcs 2000pcs 3000pcs

32SMOLC

A	B	C	D	F	J	L	M	Reel Dia.	Cly/Reel
3.5	2.8	8.0	3.5	4.0	1.0	0.3	1.4	180	1000pcs 2000pcs

TEST CIRCUIT



CL: including fixture and probe capacitance.

XTAL

CLK OSC

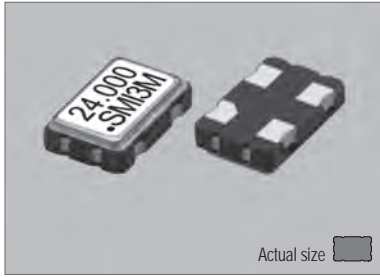
VCXO

TCXO

OCXO

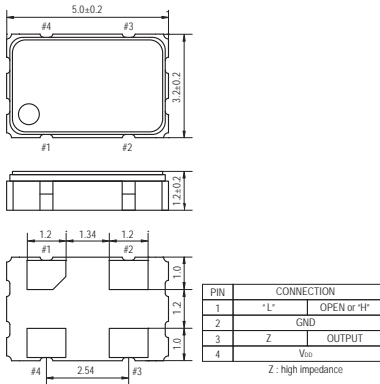
MCF

99SMO

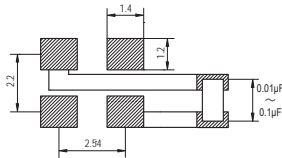


Actual size 0.052 gm (wt.)

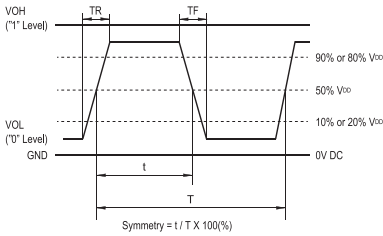
99SMO



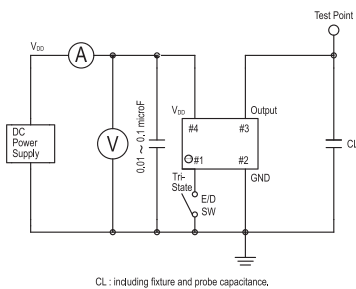
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

- CMOS OUTPUT
- WIDE FREQUENCY RANGE
- PACKAGE SIZE 5.0x3.2 mm

Item		Specifications							
General part number		99SMO ^{*1*2}							
Frequency range		1.600 MHz to 165.000 MHz	1.600 MHz to 220.000 MHz	1.600 MHz to 220.000 MHz	1.000 MHz to 60.000 MHz				
Frequency stability ^{*2} (over all conditions)		99SMO(A) : ±100 ppm over -20°C to +70°C 99SMO(B) : ±50 ppm over -20°C to +70°C 99SMO(C) : ±30 ppm over -20°C to +70°C 99SMO(D) : ±25 ppm over -20°C to +70°C 99SMO(E) : ±20 ppm over -20°C to +70°C 99SMO(AW) : ±100 ppm over -40°C to +85°C 99SMO(BW) : ±50 ppm over -40°C to +85°C 99SMO(CW) : ±30 ppm over -40°C to +85°C 99SMO(DW) : ±25 ppm over -40°C to +85°C							
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option) -40°C to +105°C (WW = Option)...1.6 MHz to 133.0 MHz							
	Supply voltage (V _{DD})	+1.8V DC ±5%	+2.5V DC ±5%	+3.3V DC ±5%	+5.0V DC ±10%				
	Stand-by control voltage (Pin#1)	V _{IH} : 70% V _{DD} min. V _{IL} : 30% V _{DD} max. ^{*3}							
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC		-0.5V to +7.0V DC					
	Storage temperature	-55°C to +100°C							
Input current (max.mA) (Pin#1 = Open or V _{IH}) No load	V _{DD}	Frequency							
		1.0M+	20M+	35M+	45M+	80M+	100M+	110M+	155M+
Stand-by current ^{*3}	+1.8V	1.5	2.0	2.5	7.5	15	25	35	45
	+2.5V	2.0	2.5	3.0	9.5	20	30	40	70
	+3.3V	2.5	3.5	8.5	14	30	40	50	90
	+5.0V	15	20	30	52	n.a.	n.a.	n.a.	n.a.
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level 40% to 60% at 1/2 V _{DD} level (V _{DD} = +1.8V / F = 135.000 MHz to 165.000 MHz)							
	Rise and fall times	5 ns max. (10% V _{DD} to 90% V _{DD} level)							
	"0" Level	V _{OL} : 10% V _{DD} max.							
	"1" Level	V _{OH} : 90% V _{DD} min.							
	Load	15 pF max. (CMOS, V _{DD} = +5.0V / 30 pF max.)							
Disable delay time	200 ns max.								
Enable delay time	10 ms max.								
Start-up time	10 ms max.								
Aging	±5 ppm max. at +25°C ±3°C for first year								
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)								

(*1) Formerly 99SMOM

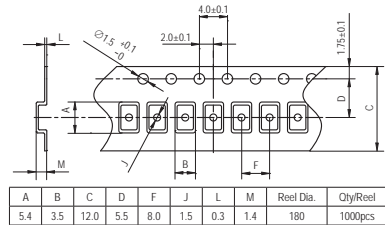
(*2) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency.
e.g. 99SMO(2.5VC) 20.000MHz

(*3) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

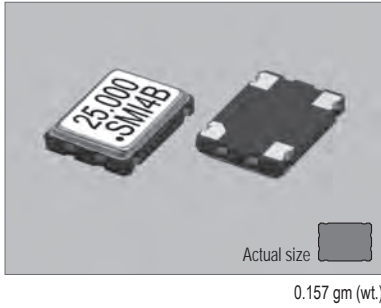
PACKAGE DATA

Item	Package	99SMO
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

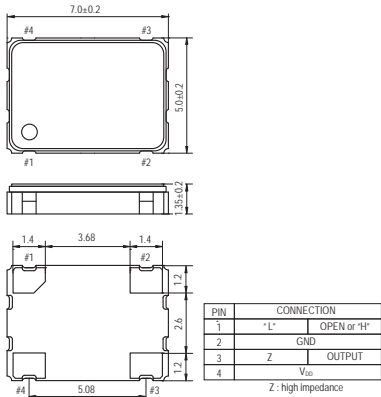
TAPE SPECIFICATIONS



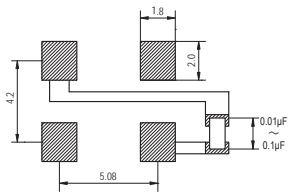
97SMO



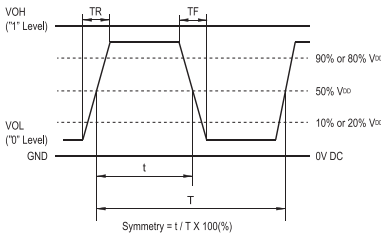
97SMO



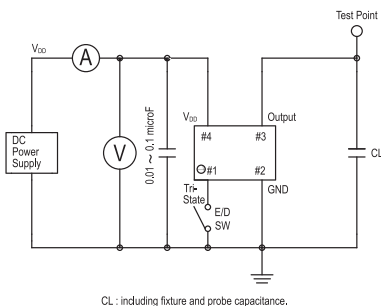
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



CL: including fixture and probe capacitance.

STANDARD SPECIFICATIONS

- CMOS OUTPUT
- WIDE FREQUENCY RANGE
- PACKAGE SIZE 7.0x5.0 mm

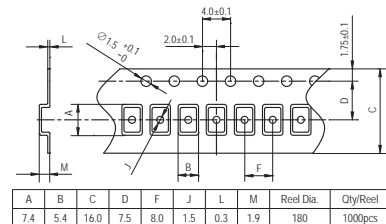
Item	Specifications									
General part number	97SMO ^{*1,2}									
Frequency range	1.600 MHz to 165.000 MHz	1.600 MHz to 220.000 MHz	1.600 MHz to 220.000 MHz	1.000 MHz to 60.000 MHz						
Frequency stability (over all conditions)	97SMO(A) : ±100 ppm over -20°C to +70°C 97SMO(B) : ±50 ppm over -20°C to +70°C 97SMO(C) : ±30 ppm over -20°C to +70°C 97SMO(D) : ±25 ppm over -20°C to +70°C 97SMO(E) : ±20 ppm over -20°C to +70°C 97SMO(AW) : ±100 ppm over -40°C to +85°C 97SMO(BW) : ±50 ppm over -40°C to +85°C 97SMO(CW) : ±30 ppm over -40°C to +85°C 97SMO(DW) : ±25 ppm over -40°C to +85°C									
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)								
	Supply voltage (V _{DD})	+1.8V DC ±5%	+2.5V DC ±5%	+3.3V DC ±5% +5.0V DC ±10%						
	Stand-by control voltage (Pin#1)	V _{HI} : 70% V _{DD} min. V _{LI} : 30% V _{DD} max. ^{*3}								
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC		-0.5V to +7.0V DC						
	Storage temperature	-55°C to +100°C								
Input current (max. mA) (Pin#1 = Open or V _{HI}) No load	V _{DD}	Frequency								
		1.0M+	20M+	35M+	45M+	80M+	100M+	110M+	155M+	
		+1.8V	1.5	2.0	2.5	7.5	15	25	35	45
		+2.5V	2.0	2.5	3.0	9.5	20	30	40	70
+3.3V	2.5	3.5	8.5	14	30	40	50	90		
+5.0V	15	20	30	52	n.a.	n.a.	n.a.	n.a.		
Stand-by current ^{*3}	10 µA max. (Pin#1 = V _{LI}) ... -40°C to +85°C									
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level 40% to 60% at 1/2 V _{DD} level (V _{DD} = +1.8V / F = 135.000 MHz to 165.000 MHz)								
	Rise and fall times	5 ns max. (10% V _{DD} to 90% V _{DD} level)								
	"0" Level	V _{OL} : 10% V _{DD} max.								
	"1" Level	V _{OH} : 90% V _{DD} min.								
Load	15 pF max. (CMOS, V _{DD} = +5.0V / 30 pF max.)									
Disable delay time	200 ns max.									
Enable delay time	10 ms max.									
Start-up time	10 ms max.									
Aging	±5 ppm max. at +25°C ±3°C for first year +250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)									
Reflow condition										

(^{*1}) Formerly 97SMO(K)
 (^{*2}) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 97SMO(3.3VCW) 16.000MHz
 (^{*3}) Internal crystal oscillation to be halted (Pin#1 = V_{LI})

PACKAGE DATA

Item	Package	97SMO
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLK OSC

VCXO

TCXO

OCXO

MCF

XTAL

CLK OSC

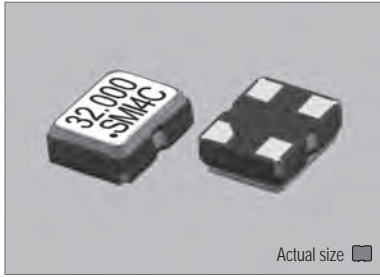
VCXO

TCXO

OCXO

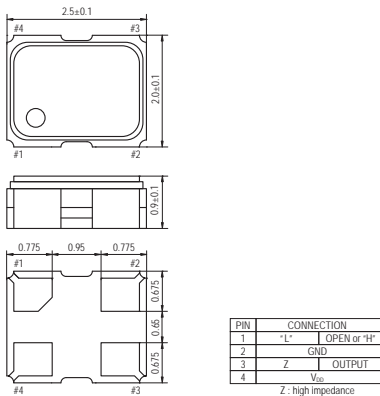
MCF

22SMOHG

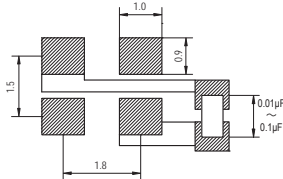


Actual size 0.014 gm (wt.)

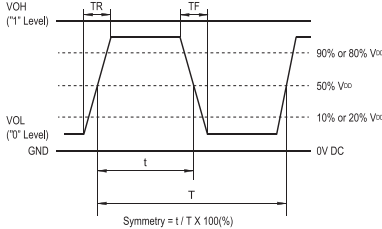
22SMOHG



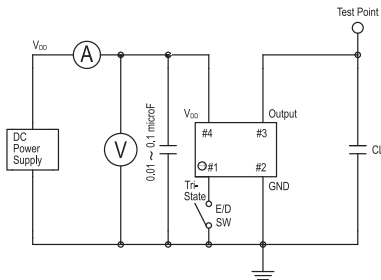
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



CL : including fixture and probe capacitance.

STANDARD SPECIFICATIONS

● HIGH STABILITY CMOS OUTPUT
● PACKAGE SIZE 2.5x2.0 mm

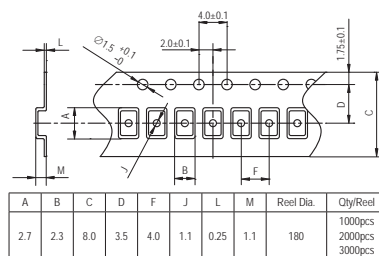
Item	Specifications	
General part number	22SMOHG ^{*1}	
Frequency range	4.000 MHz to 55.000 MHz	
Standard frequencies (MHz)	5.000, 10.000, 12.000, 16.000, 20.000, 24.000, 32.000, 40.000, 44.000	
Frequency stability ^{*2} (over all conditions)	22SMOHG(F) : ±15 ppm over -40°C to +85°C 22SMOHG(G) : ±10 ppm over -40°C to +85°C 22SMOHG(H) : ±8 ppm over -40°C to +85°C	
Operating Conditions	Operating temperature	-40°C to +85°C (Standard)
	Supply voltage (V _{DD})	+1.8V, +2.5V, +3.0V or +3.3V DC ±10%
	Stand-by control voltage (Pin#1)	V _H : 70% V _{DD} min. V _L : 30% V _{DD} max. ^{*3}
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC
	Storage temperature	-40°C to +85°C
Input current (Pin#1 = Open or V _H)	6 mA max. (no load)	
Stand-by current ^{*3}	10 µA max. (Pin#1 = V _L)	
Output (-40 C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level
	Rise and fall times	5 ns max. (10% V _{DD} to 90% V _{DD} level)
	"0" Level	V _{OL} : 10% V _{DD} max.
	"1" Level	V _{OH} : 90% V _{DD} min.
Load	15 pF max. (CMOS)	
Disable delay time	100 ns max.	
Enable delay time	10 ms max.	
Start-up time	10 ms max.	
SSB phase noise (at V _{DD} = +2.5V & 48.000 MHz)	-135 dBc / Hz, Typical at 1 kHz offset -159 dBc / Hz, Typical at 1 MHz offset	
RMS jitter (12 kHz to 20.000 MHz band)	181 fs, Typical (at V _{DD} = +2.5V & 48.000 MHz)	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

(^{*1}) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 22SMOHG(3.0V) 20.000MHz
(^{*2}) The frequency stability is inclusive of frequency tolerance (+25°C), temperature stability (-40°C to +85°C), input voltage change, load change, reflow frequency shift and aging (1st year at +25°C).
(^{*3}) Internal crystal oscillation to be halted (Pin#1 = V_L)

PACKAGE DATA

Item	Package	22SMOHG
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLK OSC

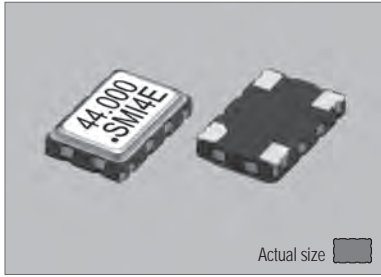
VCXO

TCXO

OCXO

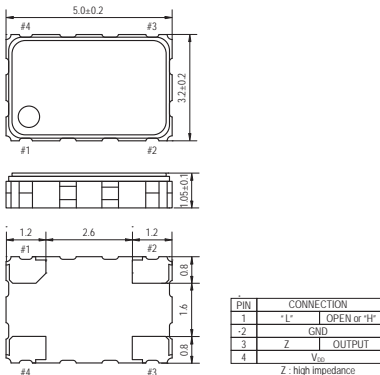
MCF

99SMOHG

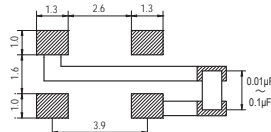


Actual size
0.052 gm (wt.)

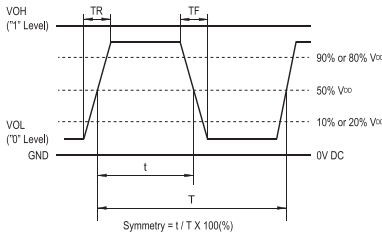
99SMOHG



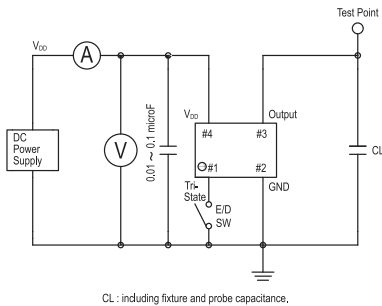
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

- HIGH STABILITY CMOS OUTPUT
- PACKAGE SIZE 5.0x3.2 mm

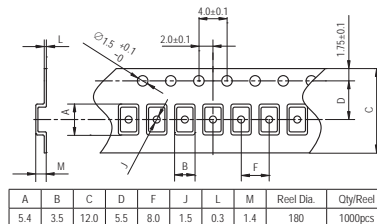
Item	Specifications	
General part number	99SMOHG ^{*1}	
Frequency range	4.000 MHz to 55.000 MHz	
Standard frequencies (MHz)	5.000, 10.000, 12.000, 16.000, 20.000, 24.000, 32.000, 40.000, 44.000	
Frequency stability ^{*2} (over all conditions)	99SMOHG(F) : ±15 ppm over -40°C to +85°C 99SMOHG(G) : ±10 ppm over -40°C to +85°C 99SMOHG(H) : ±8 ppm over -40°C to +85°C	
Operating Conditions	Operating temperature	-40°C to +85°C (Standard)
	Supply voltage (V _{DD})	+1.8V, +2.5V, +3.0V or +3.3V DC ±10%
	Stand-by control voltage (Pin#1)	V _H : 70% V _{DD} min. V _L : 30% V _{DD} max. ^{*3}
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC
	Storage temperature	-40°C to +85°C
Input current (Pin#1 = Open or V _H)	7.5 mA max. (no load)	
Stand-by current ^{*3}	10 µA max. (Pin#1 = V _L)	
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level
	Rise and fall times	5 ns max. (10% V _{DD} to 90% V _{DD} level)
	"0" Level	V _{OL} : 10% V _{DD} max.
	"1" Level	V _{OH} : 90% V _{DD} min.
Load	15 pF max. (CMOS)	
Disable delay time	100 ns max.	
Enable delay time	10 ms max.	
Start-up time	10 ms max.	
SSB phase noise (at V _{DD} = +1.8V & 48.000 MHz)	-135 dBc / Hz, Typical at 1 kHz offset -162 dBc / Hz, Typical at 1 MHz offset	
RMS jitter (12 kHz to 20.000 MHz band)	168 fs, Typical (at V _{DD} = +1.8V & 48.000 MHz)	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

(*1) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 99SMOHG(3.0V) 40.000MHz
(*2) The frequency stability is inclusive of frequency tolerance (+25°C), temperature stability (-40°C to +85°C), input voltage change, load change, reflow frequency shift and aging (1st year at +25°C).
(*3) Internal crystal oscillation to be halted (Pin#1 = V_L)

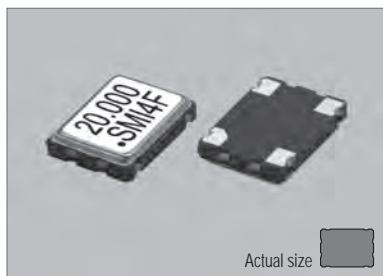
PACKAGE DATA

Item	Package	99SMOHG
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS

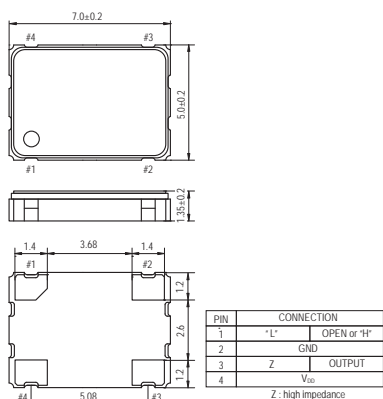


97SMOHG

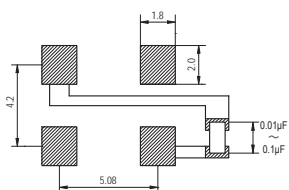


0.157 gm (wt.)

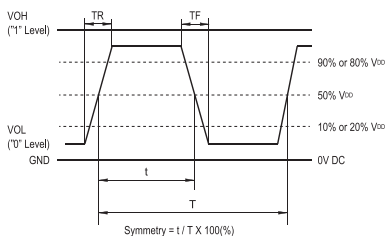
97SMOHG



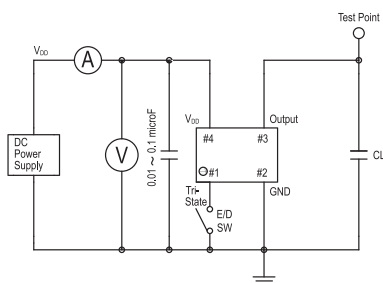
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



CL: including fixture and probe capacitance.

STANDARD SPECIFICATIONS

● HIGH STABILITY CMOS OUTPUT
● PACKAGE SIZE 7.0x5.0 mm

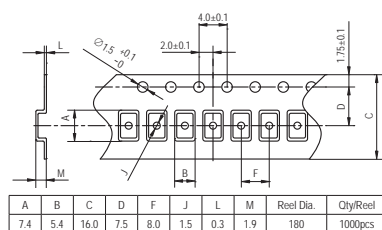
Item	Specifications	
General part number	97SMOHG ^{*1}	
Frequency range	4.000 MHz to 55.000 MHz	
Standard frequencies (MHz)	5.000, 10.000, 12.000, 16.000, 20.000, 24.000, 32.000, 40.000, 44.000	
Frequency stability ^{*2} (over all conditions)	97SMOHG(F) : ±15 ppm over -40°C to +85°C 97SMOHG(G) : ±10 ppm over -40°C to +85°C	
Operating Conditions	Operating temperature	-40°C to +85°C (Standard)
	Supply voltage (V _{DD})	+1.8V, +2.5V, +3.0V or +3.3V DC ± 10%
	Stand-by control voltage (Pin#1)	V _{IH} : 70% V _{DD} min. V _{IL} : 30% V _{DD} max. ^{*3}
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC
	Storage temperature	-40°C to +85°C
Input current (Pin#1 = Open or V _{IH})	8 mA max. (no load)	
Stand-by current ^{*3}	10 μA max. (Pin#1 = V _{IL})	
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level
	Rise and fall times	5 ns max. (10% V _{DD} to 90% V _{DD} level)
	"0" Level	V _{OL} : 10% V _{DD} max.
	"1" Level	V _{OH} : 90% V _{DD} min.
Load	15 pF max. (CMOS)	
Disable delay time	100 ns max.	
Enable delay time	10 ms max.	
Start-up time	10 ms max.	
SSB phase noise (at V _{DD} = +3.3V & 48.000 MHz)	-136 dBc / Hz, Typical at 1 kHz offset -160 dBc / Hz, Typical at 1 MHz offset	
RMS jitter (12 kHz to 20.000 MHz band)	168 fs, Typical (at V _{DD} = +3.3V & 48.000 MHz)	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

(^{*1}) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 97SMOHG(3.0VF) 40.000MHz
(^{*2}) The frequency stability is inclusive of frequency tolerance (+25°C), temperature stability (-40°C to +85°C), input voltage change, load change, reflow frequency shift and aging (1st year at +25°C).
(^{*3}) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	97SMOHG
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



Crystal Clock Oscillators

SPXO ± 8 to ± 15 ppm 55 to 160 MHz 7.0x5.0, 5.0x3.2 & 3.2x2.5 mm CMOS

97 / 99 / 32SMOHGU (+1.8V to +3.3V HIGH STABILITY FIXED MODELS)

3.2x2.5 mm
5.0x3.2 mm
7.0x5.0 mm

STANDARD SMD CLOCK OSCILLATORS

XTAL

CLK OSC

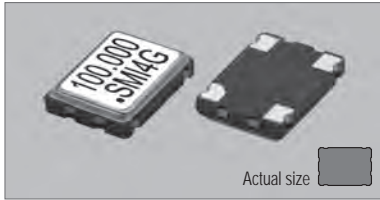
VCXO

TCXO

OCXO

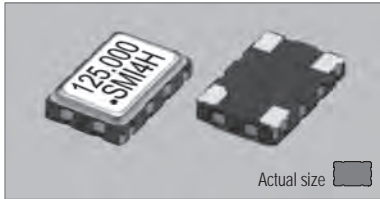
MCF

97SMOHGU



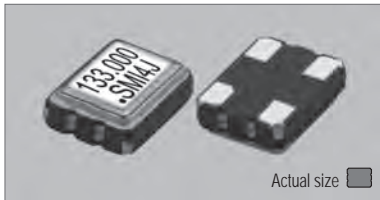
Actual size
0.157 gm (wt.)

99SMOHGU



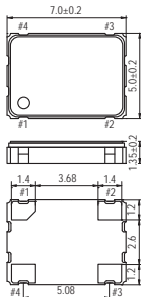
Actual size
0.052 gm (wt.)

32SMOHGU



Actual size
0.025 gm (wt.)

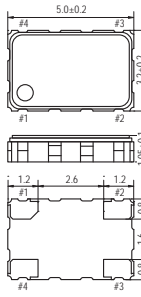
97SMOHGU



PIN	CONNECTION
1	"L" OPEN or "H"
2	GND
3	Z OUTPUT
4	V _{DD}

Z: high impedance

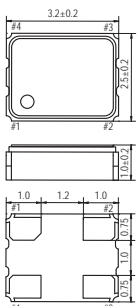
99SMOHGU



PIN	CONNECTION
1	"L" OPEN or "H"
2	GND
3	Z OUTPUT
4	V _{DD}

Z: high impedance

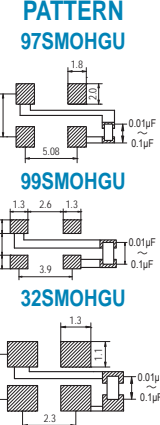
32SMOHGU



PIN	CONNECTION
1	"L" OPEN or "H"
2	GND
3	Z OUTPUT
4	V _{DD}

Z: high impedance

SOLDERING PATTERN



STANDARD SPECIFICATIONS

- HIGH FREQUENCY
- HIGH STABILITY CMOS OUTPUT
- PACKAGE SIZE 7.0x5.0, 5.0x3.2 & 3.2x2.5 mm

Item		Specifications		
General part number*1		97SMOHGU	99SMOHGU	32SMOHGU
Frequency range		55.000 MHz to 160.000 MHz		
Frequency stability*2 (over all conditions)		97 / 99 / 32SMOHGU(F) : ±15 ppm over -40°C to +85°C 97 / 99 / 32SMOHGU(G) : ±10 ppm over -40°C to +85°C 97 / 99 / 32SMOHGU(H) : ±8 ppm over -40°C to +85°C		
Operating Conditions	Operating temperature	-40°C to +85°C (Standard)		
	Supply voltage (V _{DD})	+1.8V, +2.5V, +3.0V or +3.3V DC ±10%		
	Stand-by control voltage (Pin#1)	V _{IH} : 80% V _{DD} min. V _{IL} : 20% V _{DD} max.*3		
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC		
	Storage temperature	-40°C to +85°C		
Input current		30 mA max. (Pin#1 = Open or V _{IH})		
Stand-by current*3		10 µA max. (Pin#1 = V _{IL})		
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level		
	Rise and fall times	6 ns max. (10% V _{DD} to 90% V _{DD} level)		
	"0" Level	V _{OL} : 10% V _{DD} max.		
	"1" Level	V _{OH} : 90% V _{DD} min.		
Load		15 pF max. (CMOS)		
Disable delay time		200 ns max.		
Enable delay time		4 ms max.		
Start-up time		10 ms max.		
SSB phase noise (at V _{DD} = +3.3V & 80.000 MHz)		-135 dBc / Hz, Typical at 1 kHz offset		
Reflow condition		+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)		

(*1) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 97SMOHGU(3.0V) 80.000MHz

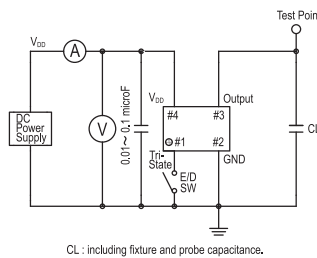
(*2) The frequency stability is inclusive of frequency tolerance (+25°C), temperature stability (-40°C to +85°C), input voltage change, load change, reflow frequency shift and aging (1st year at +25°C).

(*3) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

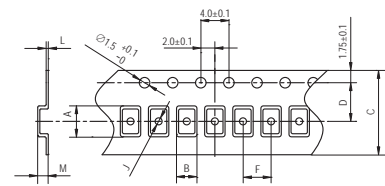
Item	Package	97 / 99 / 32SMOHGU
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TEST CIRCUIT



CL: including fixture and probe capacitance.

TAPE SPECIFICATIONS



97SMOHGU

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
7.4	5.4	16.0	7.5	8.0	1.5	0.3	1.9	180	1000pcs

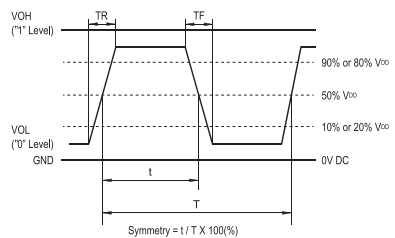
99SMOHGU

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
5.4	3.5	12.0	5.5	8.0	1.5	0.3	1.4	180	1000pcs

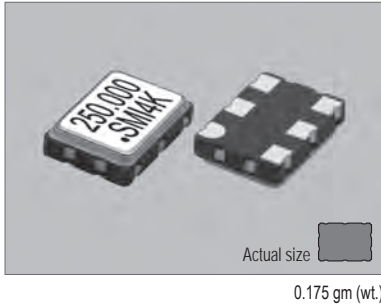
32SMOHGU

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
3.5	2.8	8.0	3.5	4.0	1.0	0.25	1.4	180	1000pcs 2000pcs

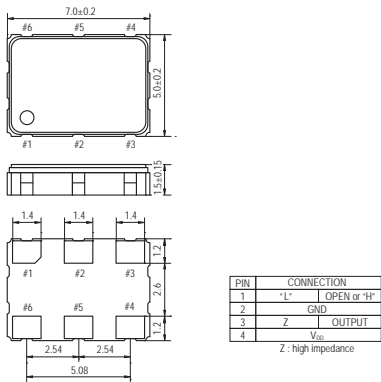
OUTPUT WAVEFORM



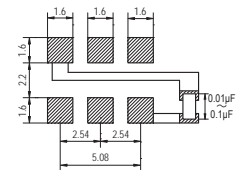
57SMO



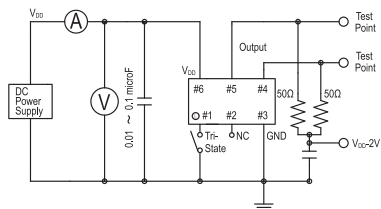
57SMO



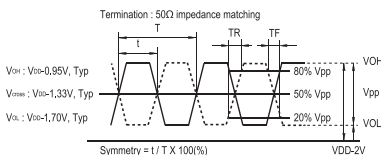
SOLDERING PATTERN



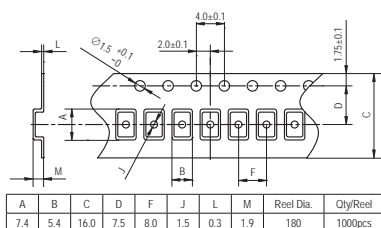
TEST CIRCUIT



OUTPUT WAVEFORM



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

● LVPECL OUTPUT
 ● PACKAGE SIZE 7.0x5.0 mm

Item	Specifications	
General part number	57SMO* ¹	
Frequency range	13.500 MHz to 400.000 MHz	
Frequency stability (over all conditions)	57SMO(A) : ±100 ppm over -20°C to +70°C 57SMO(B) : ±50 ppm over -20°C to +70°C 57SMO(C) : ±30 ppm over -20°C to +70°C 57SMO(D) : ±25 ppm over -20°C to +70°C 57SMO(E) : ±20 ppm over -20°C to +70°C 57SMO(AW) : ±100 ppm over -40°C to +85°C 57SMO(BW) : ±50 ppm over -40°C to +85°C 57SMO(CW) : ±30 ppm over -40°C to +85°C 57SMO(DW) : ±25 ppm over -40°C to +85°C	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option) -40°C to +105°C (WW = Option)
	Supply voltage (V _{DD})	+2.5V DC ±5% +3.3V DC ±5%
	Stand-by control voltage (Pin#1)	V _{IH} : 70% V _{DD} min. V _{IL} : 30% V _{DD} max.* ²
Absolute Max. Ratings	Supply voltage	-0.5V to +5.0V DC
	Storage temperature	-50°C to +125°C
Input current (Pin#1 = Open or V _{IH})	88 mA max. (55mA, Typical)	
Stand-by current* ² (Pin#1 = V _{IL})	30 µA max.	
Output (-40°C to +85°C)	Symmetry (at crossing point)	45% to 55% (13.500 MHz to 350.000 MHz) 40% to 60% (350.000 MHz to 400.000 MHz)
	Rise and fall times (20% to 80% of amplitude)	0.7 ns max. (0.3 ns, Typical)
	"0" Level	V _{OL} : +0.67V to +1.195V V _{OL} : +1.47V to +1.745V
	"1" Level	V _{OH} : +1.415V to +1.760V V _{OH} : +2.215V to +2.42V
Load	50 Ω into V _{DD} -2V	
Start-up time	10 ms max.	
SSB phase noise (at V _{DD} = +3.3V & 155.520 MHz)	-147 dBc / Hz, Typical at 100 kHz offset	
RMS jitter (12 kHz to 20.000 MHz band) (at V _{DD} = +3.3V & 155.520 MHz)	0.5 ps max.	
Disable delay time	200 ns max.	
Enable delay time	2 ms max.	
Differential output voltage	0.4Vp-p min.	
Aging	±5 ppm max. at +25°C ±3°C for first year	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

(*¹) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 57SMO(3.3VBW) 155.520MHz
 (*²) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	57SMO
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

XTAL

CLK OSC

Vcxo

TCXO

OCXO

MCF

XTAL

CLK OSC

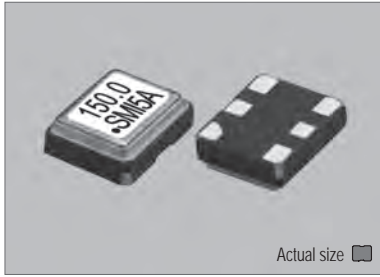
VCXO

TCXO

OCXO

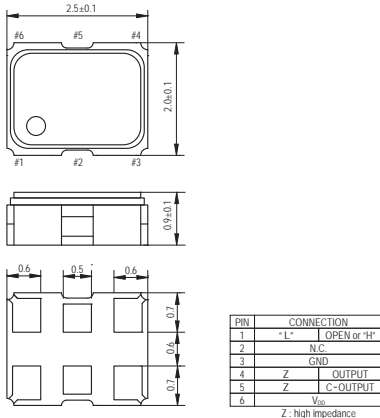
MCF

22SMO-LVP

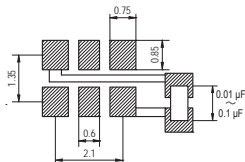


Actual size 0.015 gm (wt.)

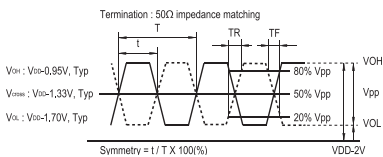
22SMO-LVP



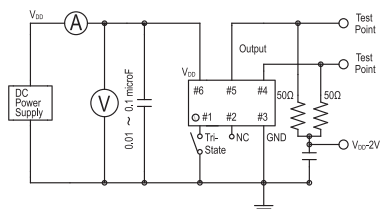
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

● LVPECL OUTPUT
 ● PACKAGE SIZE 2.5x2.0 mm

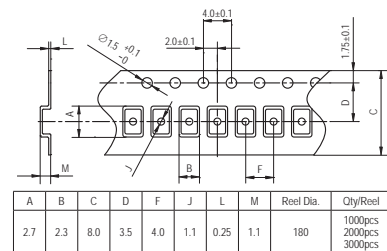
Item	Specifications	
General part number	22SMO-LVP ^{*1}	
Frequency range	6.000 MHz to 175.000 MHz	
Frequency stability (over all conditions)	22SMO-LVP(A) : ±100 ppm over -20°C to +70°C 22SMO-LVP(B) : ±50 ppm over -20°C to +70°C 22SMO-LVP(C) : ±30 ppm over -20°C to +70°C 22SMO-LVP(D) : ±25 ppm over -20°C to +70°C 22SMO-LVP(E) : ±20 ppm over -20°C to +70°C 22SMO-LVP(AW) : ±100 ppm over -40°C to +85°C 22SMO-LVP(BW) : ±50 ppm over -40°C to +85°C 22SMO-LVP(CW) : ±30 ppm over -40°C to +85°C 22SMO-LVP(DW) : ±25 ppm over -40°C to +85°C	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)
	Supply voltage (V _{DD})	+2.5V DC ±5% +3.3V DC ±5%
	Stand-by control voltage (Pin#1)	V _{IH} : 70% V _{DD} min. V _{IL} : 30% V _{DD} max. ^{*2}
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC
	Storage temperature	-50°C to +125°C
Input current (Pin#1 = Open or V _{IH})	45 mA, Typical. (70 mA max.)	
Stand-by current ^{*2} (Pin#1 = V _{IL})	15 μA max.	
Output (-40°C to +85°C)	Symmetry	45% to 55% at crossing point
	Rise and fall times (20% to 80% of amplitude)	0.25 ns, Typical / 0.5 ns max.
	"0" Level	V _{OL} : V _{DD} - 1.810V to V _{DD} - 1.620V
	"1" Level	V _{OH} : V _{DD} - 1.025V to V _{DD} - 0.88V
Load	50 Ω into V _{DD} -2V	
Start-up time	10 ms max.	
SSB phase noise (at V _{DD} = +3.3V & 155.520 MHz)	-153 dBc / Hz, Typical at 100 kHz offset	
RMS jitter (12 kHz to 20.000 MHz band)	0.5 ps max.	
Disable delay time	200 ns max.	
Enable delay time	4 ms max.	
Aging	±5 ppm max. at +25°C ±3°C for first year	
Reflow condition	+250°C ±10°C for 10 seconds +175°C ±10°C for 1 to 2 minutes (preheating)	

(^{*1}) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 22SMO-LVP(3.3VDW) 156.250MHz
 (^{*2}) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	22SMO-LVP
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

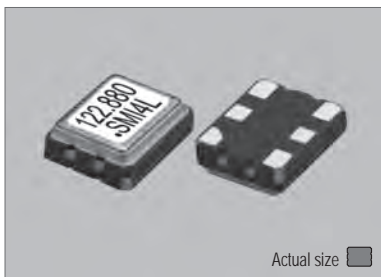
TAPE SPECIFICATIONS



32SMO-LVP & 99SMO-LVP (+2.5V or +3.3V FIXED LVPECL MODELS) 3.2x2.5 mm 5.0x3.2 mm

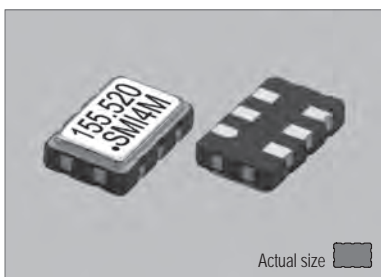
STANDARD SMD CLOCK OSCILLATORS

32SMO-LVP



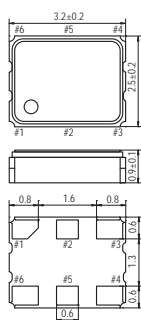
Actual size
0.024 gm (wt.)

99SMO-LVP



Actual size
0.051 gm (wt.)

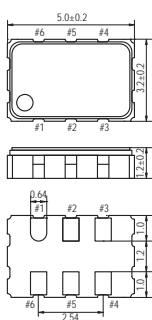
32SMO-LVP



PIN	CONNECTION
1	"L" OPEN or "H"
2	N.C.
3	GND
4	Z OUTPUT
5	Z C-OUTPUT
6	V _{DD}

Z: high impedance

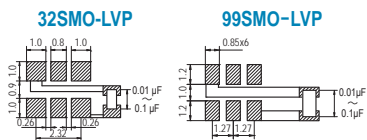
99SMO-LVP



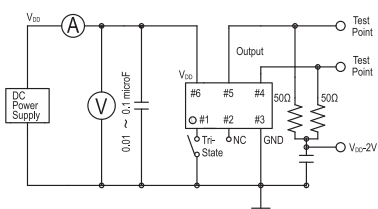
PIN	CONNECTION
1	"L" OPEN or "H"
2	N.C.
3	GND
4	Z OUTPUT
5	Z C-OUTPUT
6	V _{DD}

Z: high impedance

SOLDERING PATTERN



TEST CIRCUIT



STANDARD SPECIFICATIONS

● LVPECL OUTPUT
● PACKAGE SIZE 3.2x2.5 & 5.0x3.2 mm

Item	Specifications	
General part number	32SMO-LVP*1	99SMO-LVP*1
Frequency range	5.000 MHz to 175.000 MHz	5.000 MHz to 250.000 MHz
Frequency stability (over all conditions)	32SMO-LVP(A) & 99SMO-LVP(A) : ±100 ppm over -20°C to +70°C 32SMO-LVP(B) & 99SMO-LVP(B) : ±50 ppm over -20°C to +70°C 32SMO-LVP(C) & 99SMO-LVP(C) : ±30 ppm over -20°C to +70°C 32SMO-LVP(D) & 99SMO-LVP(D) : ±25 ppm over -20°C to +70°C 32SMO-LVP(E) & 99SMO-LVP(E) : ±20 ppm over -20°C to +70°C 32SMO-LVP(AW) & 99SMO-LVP(AW) : ±100 ppm over -40°C to +85°C 32SMO-LVP(BW) & 99SMO-LVP(BW) : ±50 ppm over -40°C to +85°C 32SMO-LVP(CW) & 99SMO-LVP(CW) : ±30 ppm over -40°C to +85°C 32SMO-LVP(DW) & 99SMO-LVP(DW) : ±25 ppm over -40°C to +85°C	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)
	Supply voltage (V _{DD})	+2.5V DC ±5% +3.3V DC ±5%
	Stand-by control voltage (Pin#1)	V _{IH} : 70% V _{DD} min. V _{IL} : 30% V _{DD} max.*2
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC
	Storage temperature	-50°C to +125°C
Input current (Pin#1 = Open or V _{IH})	70 mA max.	
Stand-by current*2 (Pin#1 = V _{IL})	15 µA max.	
Output (-40°C to +85°C)	Symmetry	45% to 55% at crossing point
	Rise and fall times (20% to 80% of amplitude)	0.5 ns max. (0.25 ns, Typical)
	"0" Level	V _{OL} : V _{DD} -1.81V to V _{DD} -1.62V
	"1" Level	V _{OH} : V _{DD} -1.025V to V _{DD} -0.88V
Load	50 Ω into V _{DD} -2V	
Start-up time	10 ms max.	
SSB phase noise (at V _{DD} = +3.3V & 156.250 MHz)	-145 dBc / Hz, Typical at 100 kHz offset	
RMS jitter (12 kHz to 20.000 MHz band)	0.5 ps max.	
Disable delay time	200 ns max.	
Enable delay time	4 ms max.	
Differential output voltage	0.4Vp-p min.	
Aging	±5 ppm max. at +25°C ±3°C for first year	
Reflow condition	+250°C ±10°C for 10 seconds	
	+170°C ±10°C for 1 to 2 minutes (preheating)	

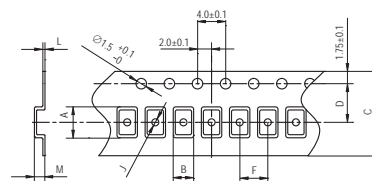
(*1) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 99SMO-LVP(3.3VDD) 156.250MHz

(*2) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	32SMO-LVP & 99SMO-LVP
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metallized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



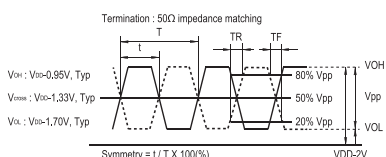
32SMO-HCS

A	B	C	D	F	J	L	M	Reel Dia.	Oly/Reel
3.5	2.8	8.0	3.5	4.0	1.0	0.25	1.4	180	1000pcs 2000pcs

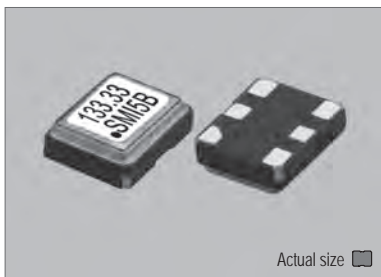
99SMO-HCS

A	B	C	D	F	J	L	M	Reel Dia.	Oly/Reel
5.4	3.5	12.0	5.5	8.0	1.5	0.3	1.4	180	1000pcs

OUTPUT WAVEFORM

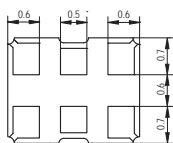
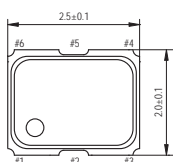


22SMO-LVD



Actual size 0.015 gm (wt.)

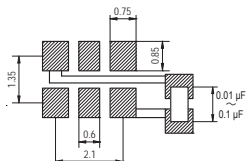
22SMO-LVD



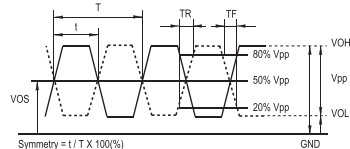
PIN CONNECTION	
1	"L" OPEN or "H"
2	N.C.
3	GND
4	Z OUTPUT
5	Z C-OUTPUT
6	V _{DD}

Z: high impedance

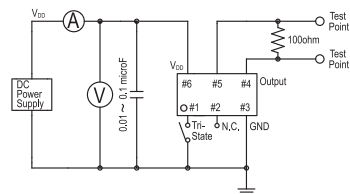
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

● LVDS OUTPUT
● PACKAGE SIZE 2.5x2.0 mm

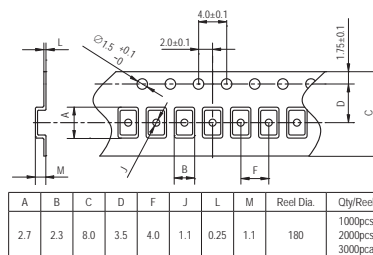
Item	Specifications	
General part number	22SMO-LVD*1	
Frequency range	6.000 MHz to 175.000 MHz	
Frequency stability (over all conditions)	22SMO-LVD(A) : ±100 ppm over -20°C to +70°C	
	22SMO-LVD(B) : ±50 ppm over -20°C to +70°C	
	22SMO-LVD(C) : ±30 ppm over -20°C to +70°C	
	22SMO-LVD(D) : ±25 ppm over -20°C to +70°C	
	22SMO-LVD(E) : ±20 ppm over -20°C to +70°C	
	22SMO-LVD(AW) : ±100 ppm over -40°C to +85°C	
22SMO-LVD(BW) : ±50 ppm over -40°C to +85°C		
22SMO-LVD(CW) : ±30 ppm over -40°C to +85°C		
22SMO-LVD(DW) : ±25 ppm over -40°C to +85°C		
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)
	Supply voltage (V _{DD})	+2.5V DC ±5% +3.3V DC ±5%
	Stand-by control voltage (Pin#1)	V _{IH} : 70% V _{DD} min. V _{IL} : 30% V _{DD} max.*2
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC
	Storage temperature	-50°C to +125°C
Input current (Pin#1 = Open or V _{IH})	40 mA max.	
Stand-by current*2 (Pin#1 = V _{IL})	15 µA max.	
Output (-40°C to +85°C)	Symmetry	45% to 55% at crossing point
	Rise and fall times (20% to 80% of amplitude)	0.4 ns max.
	"0" Level	V _{OL} : +1.1V, Typical (+0.9V min.)
	"1" Level	V _{OH} : +1.43V, Typical (+1.6V max.)
	Load	100 Ω (OUT-OUTN)
Start-up time	10 ms max.	
SSB phase noise (at V _{DD} = +3.3V & 156.25 MHz)	-155 dBc / Hz, Typical at 10 MHz offset	
RMS jitter (12 kHz to 20.000 MHz band)	500 fs max. (100 fs, Typical at V _{DD} = +3.3V & 156.25 MHz)	
Disable delay time	200 ns max.	
Enable delay time	4 ms max.	
Differential output voltage	+0.33Vp-p, Typical (+0.25Vp-p min.)	
Aging	±5 ppm max. at +25°C ±3°C for first year	
Reflow condition	+250°C ±10°C for 10 seconds	
	+175°C ±10°C for 1 to 2 minutes (preheating)	

(*1) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency.
e.g. 22SMO-LVD(2.5VC) 164.355MHz
(*2) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	22SMO-LVD
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLK OSC

VCXO

TCXO

OCXO

MCF

32SMO-LVD & 99SMO-LVD (+2.5V or +3.3V FIXED LVDS MODELS) 3.2x2.5 mm 5.0x3.2 mm

STANDARD SMD CLOCK OSCILLATORS

XTAL

CLK OSC

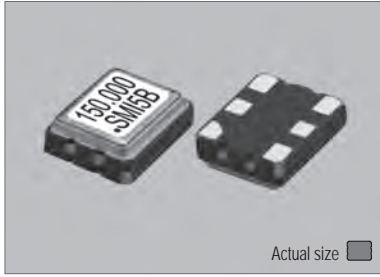
VCXO

TCXO

OCXO

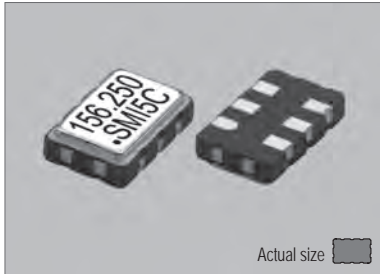
MCF

32SMO-LVD



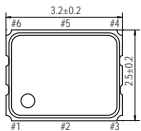
Actual size
0.025 gm (wt.)

99SMO-LVD

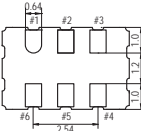
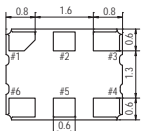
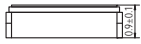
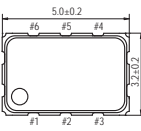


Actual size
0.051 gm (wt.)

32SMO-LVD



99SMO-LVD



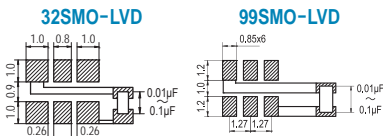
PIN	CONNECTION
1	"L" OPEN or "H"
2	N.C.
3	GND
4	Z OUTPUT
5	Z C-OUTPUT
6	V _{DD}

Z: high impedance

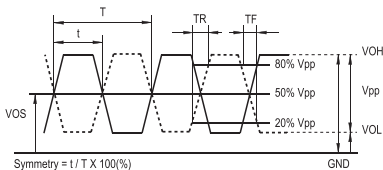
PIN	CONNECTION
1	"L" OPEN or "H"
2	N.C.
3	GND
4	Z OUTPUT
5	Z C-OUTPUT
6	V _{DD}

Z: high impedance

SOLDERING PATTERN



OUTPUT WAVEFORM



STANDARD SPECIFICATIONS

● LVDS OUTPUT
● PACKAGE SIZE 3.2x2.5 & 5.0x3.2 mm

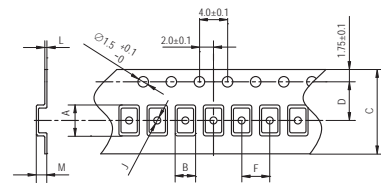
Item		Specifications	
General part number		32SMO-LVD* ¹	99SMO-LVD* ¹
Frequency range		5.000 MHz to 175.000 MHz	5.000 MHz to 250.000 MHz
Frequency stability (over all conditions)		32SMO-LVD(A) & 99SMO-LVD(A) : ±100 ppm over -20°C to +70°C 32SMO-LVD(B) & 99SMO-LVD(B) : ±50 ppm over -20°C to +70°C 32SMO-LVD(C) & 99SMO-LVD(C) : ±30 ppm over -20°C to +70°C 32SMO-LVD(D) & 99SMO-LVD(D) : ±25 ppm over -20°C to +70°C 32SMO-LVD(E) & 99SMO-LVD(E) : ±20 ppm over -20°C to +70°C 32SMO-LVD(AW) & 99SMO-LVD(AW) : ±100 ppm over -40°C to +85°C 32SMO-LVD(BW) & 99SMO-LVD(BW) : ±50 ppm over -40°C to +85°C 32SMO-LVD(CW) & 99SMO-LVD(CW) : ±30 ppm over -40°C to +85°C 32SMO-LVD(DW) & 99SMO-LVD(DW) : ±25 ppm over -40°C to +85°C	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)	
	Supply voltage (V _{DD})	+2.5V DC ±5% or +3.3V DC ±5%	
	Stand-by control voltage (Pin#1)	V _{IH} : 70% V _{DD} min. V _{IL} : 30% V _{DD} max.* ²	
Absolute Max. Ratings	Supply voltage	-0.5V to +4.0V DC	
	Storage temperature	-50°C to +125°C	
Input current (Pin#1 = Open or V _{IH})		40 mA max. (32SMO-LVD) 75 mA max. (99SMO-LVD)	
Stand-by current* ² (Pin#1 = V _{IL})		15 µA max.	
Output (-40°C to +85°C)	Symmetry	45% to 55% at crossing point	
	Rise and fall times (20% to 80% of amplitude)	0.4 ns max.	
	"0" Level	V _{OL} : +1.1V, Typical (+0.9V min.)	
	"1" Level	V _{OH} : +1.43V, Typical (+1.6V max.)	
	Load	100 Ω (OUT-C OUT)	
Start-up time		10 ms max.	
SSB phase noise (at V _{DD} = +3.3V & 133.000 MHz)		-153 dBc / Hz, Typical at 100 kHz offset	
RMS jitter (12 kHz to 20.000 MHz band) (at V _{DD} = +3.3V & 133.000 MHz)		500 fs max. (125 fs, Typical)	
Disable delay time		200 ns max.	
Enable delay time		4 ms max.	
Differential output voltage		+0.33Vp-p Typical (+0.25Vp-p min.)	
Aging		±5 ppm max. at +25°C ±3°C for first year +250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Reflow condition			

(*¹) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency.
e.g. 99SMO-LVD(2.5VC) 164.355MHz
(*²) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	32SMO-LVD & 99SMO-LVD
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



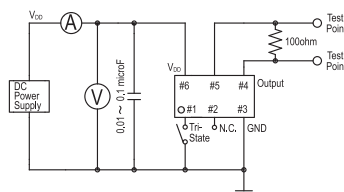
32SMO-LVD

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
3.5	2.8	8.0	3.5	4.0	1.0	0.25	1.4	180	1000pcs 2000pcs

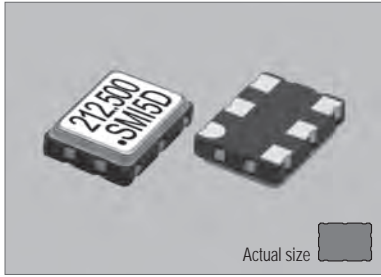
99SMO-LVD

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
5.4	3.5	12.0	5.5	8.0	1.5	0.3	1.4	180	1000pcs

TEST CIRCUIT

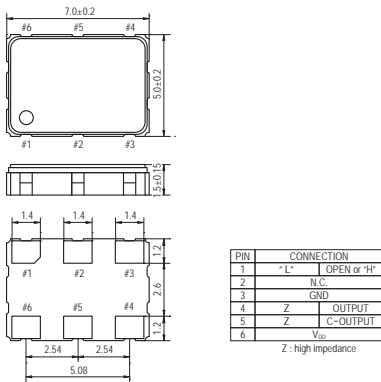


77SMO

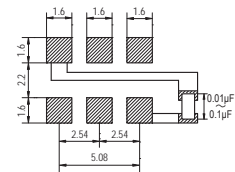


0.175 gm (wt.)

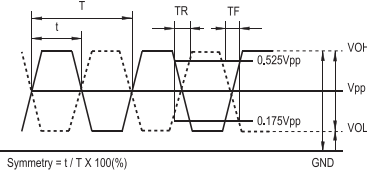
77SMO



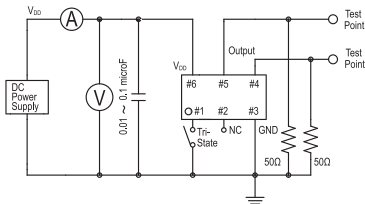
SOLDERING PATTERN



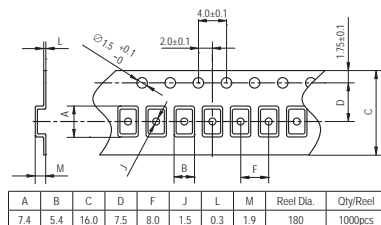
OUTPUT WAVEFORM



TEST CIRCUIT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

● HCSL OUTPUT
● PACKAGE SIZE 7.0x5.0 mm

Item	Specifications	
General part number	77SMO*1	
Frequency range	13.5000 MHz to 220.000 MHz	
Frequency stability (over all conditions)	77SMO(A) : ±100 ppm over -20°C to +70°C	
	77SMO(B) : ±50 ppm over -20°C to +70°C	
	77SMO(C) : ±30 ppm over -20°C to +70°C	
	77SMO(D) : ±25 ppm over -20°C to +70°C	
	77SMO(E) : ±20 ppm over -20°C to +70°C	
	77SMO(AW) : ±100 ppm over -40°C to +85°C	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)
	Supply voltage (V _{DD})	+2.5V DC ±5% +3.3V DC ±5%
Absolute Max. Ratings	Stand-by control voltage (Pin#1)	V _H : 70% V _{DD} min. V _L : 30% V _{DD} max.*2
	Supply voltage	-0.3V to +4.0V DC
Input current (Pin#1 = Open or V _H)	Storage temperature	-50°C to +125°C
	Stand-by current*2 (Pin#1 = V _L)	60 mA max.
Output (-40°C to +85°C)	Symmetry	15 µA max.
	Rise and fall times (+0.175 V to +0.525 V DC level)	45% to 55% at crossing point
	"0" Level	0.5 ns max.
	"1" Level	V _{OL} : -150mV to +150mV
	Load	V _{OH} : +580mV to +850mV
Start-up time	50 Ω	
SSB phase noise (at V _{DD} = +3.3V & 155.520 MHz)	10 ms max.	
RMS jitter (12 kHz to 20.000 MHz band) (at V _{DD} = +3.3V & 155.520 MHz)	-133 dBc / Hz, Typical at 1 kHz offset	
Disable delay time	500 fs max. (85 fs, Typical)	
Enable delay time	200 ns max.	
Differential output voltage	2 ms max.	
Aging	+0.60Vp-p min. +0.65Vp-p min.	
Reflow condition	±5 ppm max. at +25°C ±3°C for first year	
	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

(*1) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 77SMO(3.3VBW) 100.000MHz
(*2) Internal crystal oscillation to be halted (Pin#1 = V_L)

PACKAGE DATA

Item	Package	77SMO
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

XTAL

CLK OSC

VCXO

TCXO

OCXO

MCF

32SMO-HCS & 99SMO-HCS (+2.5V or +3.3V FIXED HCSSL MODELS) 3.2x2.5 mm 5.0x3.2 mm

STANDARD SMD CLOCK OSCILLATORS

XTAL

CLK OSC

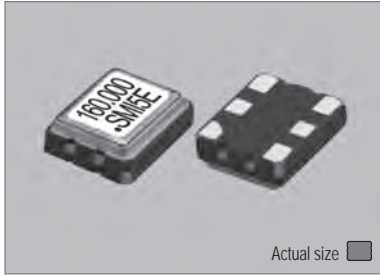
VCXO

TCXO

OCXO

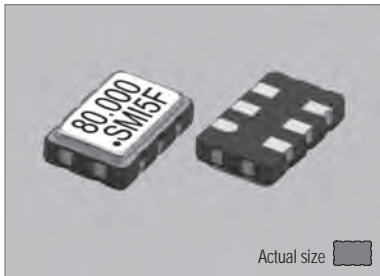
MCF

32SMO-HCS



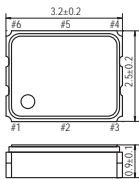
Actual size
0.025 gm (wt.)

99SMO-HCS

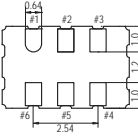
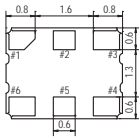
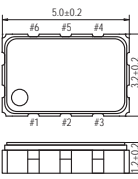


Actual size
0.051 gm (wt.)

32SMO-HCS



99SMO-HCS



PIN	CONNECTION
1	"L" OPEN or "H"
2	N.C.
3	GND
4	Z OUTPUT
5	Z C-OUTPUT
6	V _{DD}

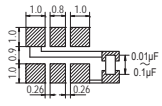
Z: high impedance

PIN	CONNECTION
1	"L" OPEN or "H"
2	N.C.
3	GND
4	Z OUTPUT
5	Z C-OUTPUT
6	V _{DD}

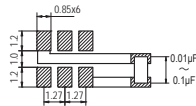
Z: high impedance

SOLDERING PATTERN

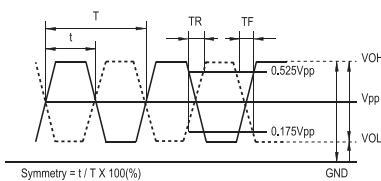
32SMO-HCS



99SMO-HCS



OUTPUT WAVEFORM



STANDARD SPECIFICATIONS

● HCSSL OUTPUT
● PACKAGE SIZE 3.2x2.5 & 5.0x3.2 mm

Item		Specifications	
General part number		32SMO-HCS*1	99SMO-HCS*1
Frequency range		13.500 MHz to 175.000 MHz	13.500 MHz to 220.000 MHz
Frequency stability (over all conditions)		32SMO-HCS(A) & 99SMO-HCS(A) : ±100 ppm over -20°C to +70°C 32SMO-HCS(B) & 99SMO-HCS(B) : ±50 ppm over -20°C to +70°C 32SMO-HCS(C) & 99SMO-HCS(C) : ±30 ppm over -20°C to +70°C 32SMO-HCS(D) & 99SMO-HCS(D) : ±25 ppm over -20°C to +70°C 32SMO-HCS(E) & 99SMO-HCS(E) : ±20 ppm over -20°C to +70°C 32SMO-HCS(AW) & 99SMO-HCS(AW) : ±100 ppm over -40°C to +85°C 32SMO-HCS(BW) & 99SMO-HCS(BW) : ±50 ppm over -40°C to +85°C 32SMO-HCS(CW) & 99SMO-HCS(CW) : ±30 ppm over -40°C to +85°C 32SMO-HCS(DW) & 99SMO-HCS(DW) : ±25 ppm over -40°C to +85°C	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option) -40°C to +105°C (WW = Option)	
	Supply voltage (V _{DD})	+2.5V DC ±5%	+3.3V DC ±5%
	Stand-by control voltage (Pin#1)	V _{IH} : 70% V _{DD} min. V _{IL} : 30% V _{DD} max.*2	
Absolute Max. Ratings	Supply voltage	-0.3V to +4.0V DC	
	Storage temperature	-50°C to +125°C	
Input current*2 (Pin#1 = Open or V _{IH})		60 mA max.	
Stand-by current (Pin#1 = V _{IL})		15 µA max.	
Output (-40°C to +85°C)	Symmetry	45% to 55% at crossing point	
	Rise and fall times (+0.175V to +0.525V DC level)	0.5 ns max.	
	"0" Level	V _{OL} : -150mV to +150mV	
	"1" Level	V _{OH} : +580mV to +850mV	
	Load	50 Ω	
Start-up time		10 ms max.	
SSB phase noise (at V _{DD} = +3.3V & 155.520 MHz)		-139 dBc / Hz, Typical at 100 kHz offset	
RMS jitter (12 kHz to 20.000 MHz band) (at V _{DD} = +3.3V & 155.520 MHz)		500 fs max. (107 fs, Typical)	
Disable delay time		200 ns max.	
Enable delay time		2 ms max.	
Differential output voltage		+0.4Vp-p min.	
Aging		±5 ppm max. at +25°C ±3°C for first year +250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Reflow condition			

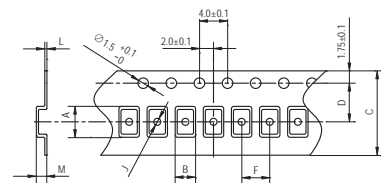
(*1) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 99SMO-HCS(2.5VC) 164.355MHz

(*2) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	32SMO-HCS & 99SMO-HCS
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



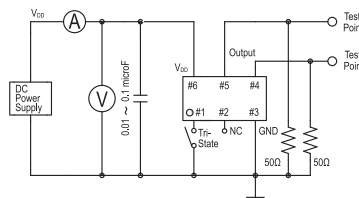
32SMO-HCS

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
3.5	2.8	8.0	3.5	4.0	1.0	0.25	1.4	180	1000pcs 2000pcs

99SMO-HCS

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
5.4	3.5	12.0	5.5	6.0	1.5	0.3	1.4	180	1000pcs

TEST CIRCUIT



327SMO(E) & 327SMO(J) (+1.5V to +5.0V 32.768 kHz MODELS) 3.2x2.5 mm 3.2x1.5 mm

STANDARD SMD CLOCK OSCILLATORS

XTAL

CLK OSC

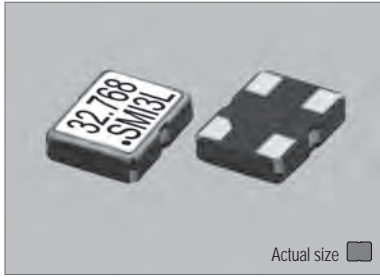
VCXO

TCXO

OCXO

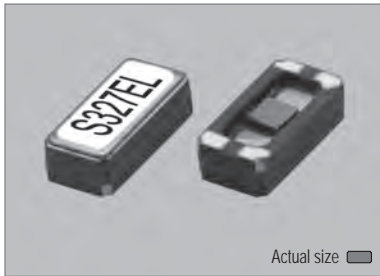
MCF

327SMO(E)



0.022 gm (wt.)

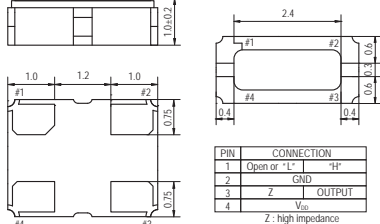
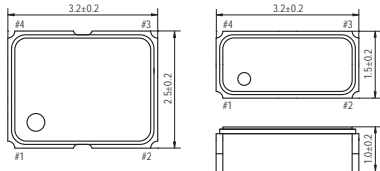
327SMO(J)



0.015 gm (wt.)

327SMO(E)

327SMO(J)

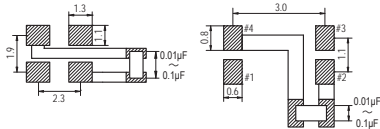


PIN	CONNECTION
1	Open or "L" "H"
2	GND
3	Z OUTPUT
4	V _{DD}

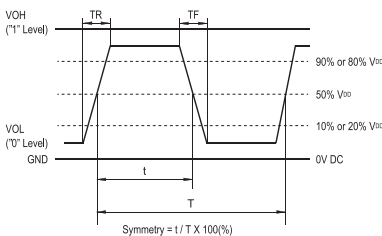
Z: high impedance

SOLDERING PATTERN

327SMO(E) 327SMO(J)



OUTPUT WAVEFORM



STANDARD SPECIFICATIONS

- 32.768 kHz CMOS OUTPUT
- LOW POWER CONSUMPTION
- TUNING FORK CRYSTAL BUILT-IN
- PACKAGE SIZE 3.2x2.5 & 3.2x1.5 mm

Item		Specifications	
General part number*1		327SMO(E)*1	327SMO(J)*1
Output frequency		32.768 kHz	
Frequency tolerance (at +25°C)		+30 ppm to -10 ppm (V _{DD} = +1.5V to +5.5V)	+28 ppm to -18 ppm (V _{DD} = +1.5V to +3.6V)
Frequency vs. supply voltage change		±0.5 ppm max. (V _{DD} = +1.5V to +5.5V)	±2.0 ppm max. (V _{DD} = +1.5V to +3.6V)
Temperature stability		A: +10 ppm to -120 ppm (-20°C to +70°C ref. to +25°C) B: +10 ppm to -150 ppm (-40°C to +85°C ref. to +25°C)	
Operating Conditions	Operating temperature	-40°C to +85°C (Standard)	
	Supply voltage (V _{DD})	+1.5V to +5.5V DC	+1.5V to +3.6V DC
	Stand-by control voltage (Pin#1)	V _{IH} : 90% V _{DD} min. V _{IL} : 10% V _{DD} max.*2	
Absolute Max. Ratings	Supply voltage	-0.3V to +7.0V DC	-0.3V to +4.0V DC
	Storage temperature	-55°C to +125°C	
Input current (-40°C to +85°C)		1 µA, Typical (1.5 µA max.) at V _{DD} = +3.3V no load (Pin #1 = V _{IH})	0.8 µA, Typical (1.5 µA max.) at V _{DD} = +3.3V no load (Pin #1 = V _{IH})
Stand-by current*2		250 nA max. (no load)	0.35 µA, Typical (no load)
Output (-40°C to +85°C)	Symmetry (1/2 V _{DD} level)	40% to 60%	45% to 55%
	Rise and fall times (10% V _{DD} to 90% V _{DD} level)	200 ns max. (CL = 15 pF at +25°C)	100 ns max. (CL = 15 pF at +25°C)
	"0" Level (CL = 15 pF)	V _{OL} : 10% V _{DD} max.	
	"1" Level (CL = 15 pF)	V _{OH} : 90% V _{DD} min.	
Load		15 pF max. (CMOS)	
Disable delay time		100 ns max.	
Enable delay time		1 sec max. (V _{DD} = +3.3V at +25°C)	
Start-up time (-40°C to +85°C)		1 sec max. (V _{DD} = +3.3V)	
Aging (at +25°C ±3°C for first year)		±5 ppm max.	±3 ppm max.
Reflow condition		+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

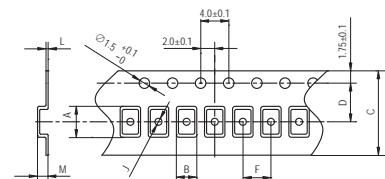
(*1) Final part number to be assigned with package type, input voltage and frequency stability.
e.g. 327SMO(1.8VE)A

(*2) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	327SMO(E) & 327SMO(J)
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

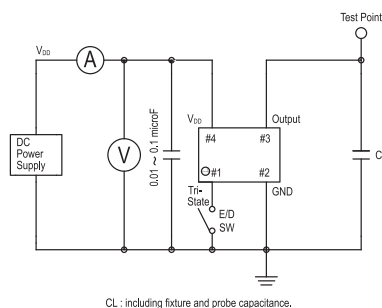
TAPE SPECIFICATIONS



A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
3.4	2.7	8.0	3.5	4.0	1.0	0.25	1.4	178	1000pcs

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
3.4	1.7	8.0	3.5	4.0	1.0	0.25	1.4	180	3000pcs

TEST CIRCUIT

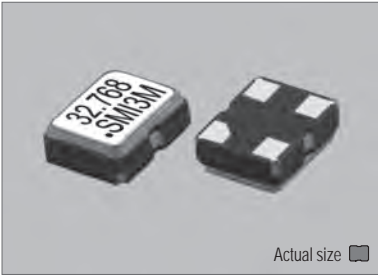


Crystal Clock Oscillators

SPXO ± 25 to ± 30 ppm 32.768 kHz 2.5x2.0 mm & 3.2x2.5 mm CMOS

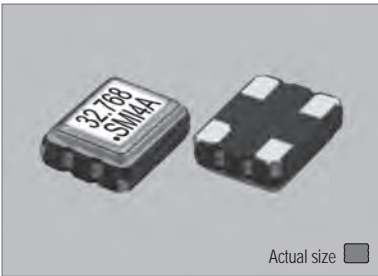
327SMO(C) & 327SMO(D) (+1.8V to +5.0V 32.768 kHz MODELS) 2.5x2.0 mm 3.2x2.5 mm STANDARD SMD CLOCK OSCILLATORS

327SMO(C)



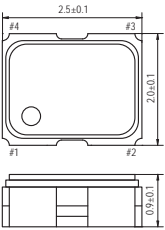
Actual size 0.014 gm (wt)

327SMO(D)

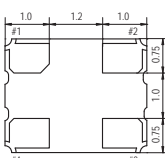
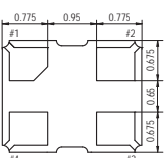
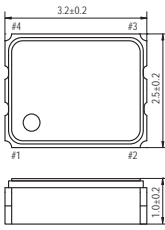


Actual size 0.025 gm (wt)

327SMO(C)



327SMO(D)



PIN	CONNECTION
1	"L" OPEN or "H"
2	GND
3	Z OUTPUT
4	V _{DD}

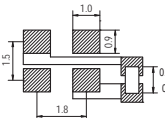
Z: high impedance

PIN	CONNECTION
1	"L" OPEN or "H"
2	GND
3	Z OUTPUT
4	V _{DD}

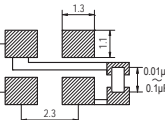
Z: high impedance

SOLDERING PATTERN

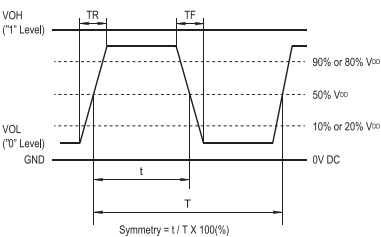
327SMO(C)



327SMO(D)



OUTPUT WAVEFORM



STANDARD SPECIFICATIONS

- 32.768 kHz CMOS OUTPUT
- HIGH STABILITY
- AT-CUT CRYSTAL BUILT-IN
- PACKAGE SIZE 2.5x2.0 mm & 3.2x2.5 mm

Item	Specifications	
General part number ^{*1}	327SMO(C) ^{*1}	327SMO(D) ^{*1}
Output frequency	32.768 kHz	
Frequency stability (over all conditions)	327SMO(C)C or 327SMO(D)C : ± 30 ppm over -40°C to +85°C 327SMO(C)D or 327SMO(D)D : ± 25 ppm over -40°C to +85°C	
Operating Conditions	Operating temperature	-40°C to +85°C (Standard)
	Supply voltage (V _{DD})	+1.8V, +2.5V, +3.0V, +3.3V or +5.0V DC ±5%
	Stand-by control voltage (Pin#1)	V _{IH} : 90% V _{DD} min. V _{IL} : 10% V _{DD} max. ^{*2}
Absolute Max. Ratings	Supply voltage	-0.3V to +7.0V DC
	Storage temperature	-55°C to +100°C
Input current (Pin#1 = Open or V _{IH})	327SMO(C) : 125 µA, Typical (160 µA max.) / -40°C to +85°C 327SMO(D) : 80 µA, Typical (100 µA max.) / -40°C to +85°C	
Stand-by current ^{*2}	10 µA max. (Pin #1 = V _{IL})	
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level
	Rise and fall times	12 ns max. (10% V _{DD} to 90% V _{DD} level)
	"0" Level	V _{OL} : 10% V _{DD} max.
	"1" Level	V _{OH} : 90% V _{DD} min.
Load	30 pF max. (CMOS)	
Disable delay time	2 µs max.	
Enable delay time	0.5 ms max.	
Start-up time	1 ms max.	
Aging	±5 ppm max. at +25°C ±3°C for first year	
	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Reflow condition		

(^{*1}) Final part number to be assigned with package type, input voltage and frequency stability.

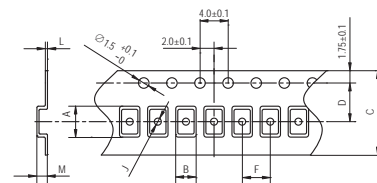
e.g. 327SMO(3.0V)C

(^{*2}) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	327SMO(C) & 327SMO(D)
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metallized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

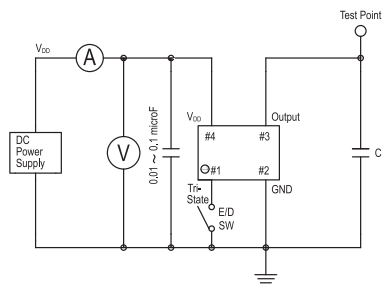
TAPE SPECIFICATIONS



327SMO(C)									
A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
2.7	2.3	8.0	3.5	4.0	1.1	0.25	1.1	180	1000pcs 2000pcs 3000pcs

327SMO(D)									
A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
3.5	2.8	8.0	3.5	4.0	1.0	0.25	1.4	180	1000pcs 2000pcs

TEST CIRCUIT



CL : including fixture and probe capacitance.

XTAL

CLK OSC

VCXO

TCXO

OCXO

MCF

327SMO(F) & 327SMO(G) (+1.8V to +5.0V 32.768 kHz MODELS) 5.0x3.2 mm 7.0x5.0 mm

STANDARD SMD CLOCK OSCILLATORS

XTAL

CLK OSC

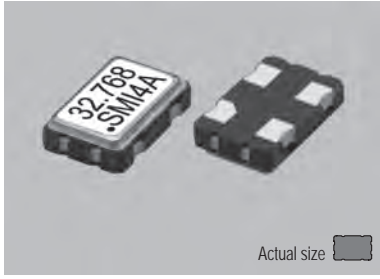
VCXO

TCXO

OCXO

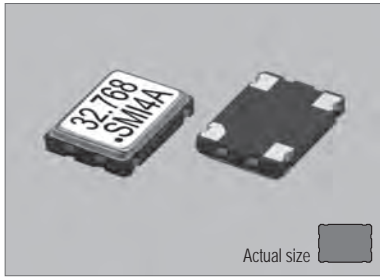
MCF

327SMO(F)

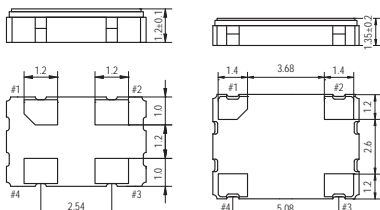
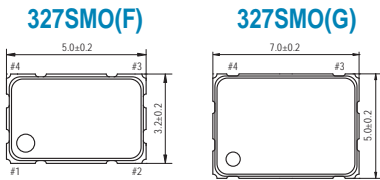


Actual size
0.0586 gm (wt.)

327SMO(G)



Actual size
0.151 gm (wt.)

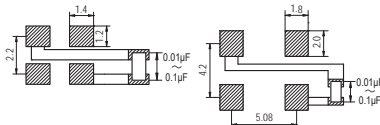


PIN	CONNECTION
1	"1" OPEN or "H"
2	GND
3	Z OUTPUT
4	V _{DD}

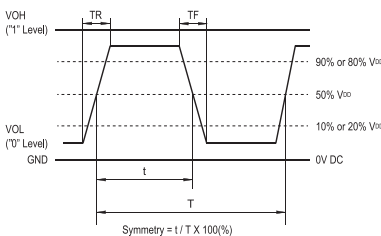
Z: high impedance

SOLDERING PATTERN

327SMO(F) 327SMO(G)



OUTPUT WAVEFORM



STANDARD SPECIFICATIONS

- 32.768 kHz CMOS OUTPUT
- HIGH STABILITY
- AT-CUT CRYSTAL BUILT-IN
- PACKAGE SIZE 5.0x3.2 & 7.0x5.0 mm

Item		Specifications	
General part number*1		327SMO(F)*1	327SMO(G)*1
Output frequency		32.768 kHz	
Frequency stability (over all conditions)		327SMO(F)C or 327SMO(G)C : ± 30 ppm over -40°C to +85°C 327SMO(F)D or 327SMO(G)D : ± 25 ppm over -40°C to +85°C	
Operating Conditions	Operating temperature	-40°C to +85°C (Standard)	
	Supply voltage (V _{DD})	+1.8V, +2.5V, +3.0V, +3.3V or +5.0V DC ±5%	
	Stand-by control voltage (Pin#1)	V _{IH} : 90% V _{DD} min. V _{IL} : 10% V _{DD} max.*2	
Absolute Max. Ratings	Supply voltage	-0.3V to +7.0V DC	
	Storage temperature	-55°C to +100°C	
Input current (Pin#1 = Open or V _{IH})		60 μA, Typical (80 μA max.) / -40°C to +85°C	
Stand-by current*2		10 μA max. (Pin #1 = V _{IL})	
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level	
	Rise and fall times	12 ns max. (10% V _{DD} to 90% V _{DD} level)	
	"0" Level	V _{OL} : 10% V _{DD} max.	
	"1" Level	V _{OH} : 90% V _{DD} min.	
	Load	30 pF max. (CMOS)	
Disable delay time		2 μs max.	
Enable delay time		0.5 ms max.	
Start-up time		1 ms max.	
Aging		±5 ppm max. at +25°C ±3°C for first year	
Reflow condition		+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

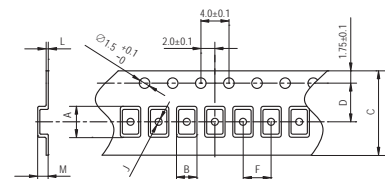
(*1) Final part number to be assigned with package type, input voltage and frequency stability.
e.g. 327SMO(3.0VF)E

(*2) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	327SMO(F) & 327SMO(G)
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



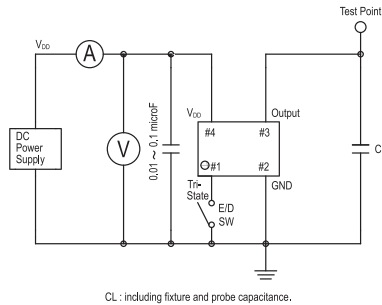
327SMO(F)

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
5.4	3.5	12.0	5.5	8.0	1.5	0.3	1.4	180	1000pcs

327SMO(G)

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
7.65	5.75	16.0	7.5	8.0	2.0	0.3	1.9	180	1000pcs

TEST CIRCUIT



XTAL

CLK OSC

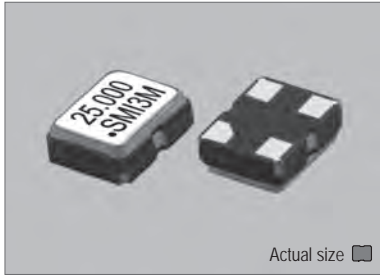
VCXO

TCXO

OCXO

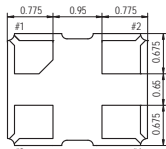
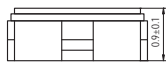
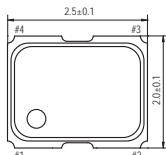
MCF

22SMOV



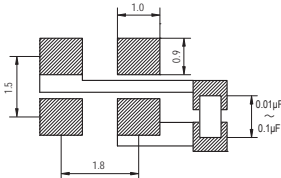
Actual size

22SMOV

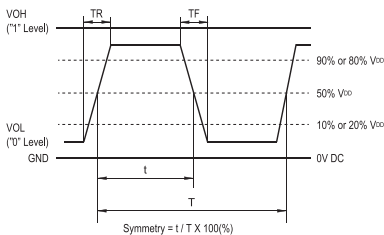


PIN	CONNECTION
1	Vcontrol
2	GND
3	OUTPUT
4	VDD

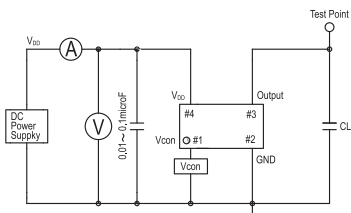
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



CL: including fixture and probe capacitance.

STANDARD SPECIFICATIONS

- WIDE FREQUENCY RANGE
- CMOS OUTPUT
- PACKAGE SIZE 2.5x2.0 mm

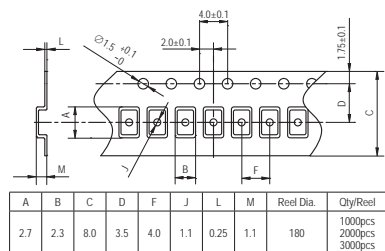
Item		Specifications	
General part number		22SMOV ^(*)	
Frequency range		1.300 MHz to 55.000 MHz	55.000 MHz to 100.000 MHz
Frequency stability (over all conditions)		22SMOV(B) : ±50 ppm over -20°C to +70°C 22SMOV(C) : ±30 ppm over -20°C to +70°C 22SMOV(D) : ±25 ppm over -20°C to +70°C 22SMOV(E) : ±20 ppm over -20°C to +70°C 22SMOV(BW) : ±50 ppm over -40°C to +85°C 22SMOV(CW) : ±30 ppm over -40°C to +85°C 22SMOV(DW) : ±25 ppm over -40°C to +85°C	
		Vcon = 1/2 VDD	
Frequency pulling range	VDD = +1.8V Vcon = +0.9V ±0.9V	±120 ppm min.	n.a.
	VDD = +2.5V Vcon = +1.25V ±1.25V	±120 ppm min.	n.a.
	VDD = +2.8V Vcon = +1.4V ±1.4V	±130 ppm min.	±90 ppm
	VDD = +3.3V Vcon = +1.65V ±1.65V	±130 ppm min.	±90 ppm
Frequency change vs. input voltage		±2 ppm max. (VDD ±10%)	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)	
	Supply voltage (VDD)	+1.8V (Max. 55 MHz), +2.5V, +2.8V DC ±5% or +3.3V DC ±10%	
	Control voltage (Vcon = Pin#1)	1/2 VDD ±1/2 VDD DC	
Absolute Max. Ratings	Supply voltage	-0.5V to +5.0V DC	
	Vcontrol voltage	-0.5V to VDD +0.5V DC	
	Storage temperature	-40°C to +100°C	
Input current (no load)	VDD = +1.8V	2 mA max.	
	VDD = +2.5V	3 mA max.	14 mA max. (VDD = +2.8V)
	VDD = +3.3V	5 mA max.	19 mA max. (VDD = +3.3V)
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 VDD level	
	Rise and fall times (20% VDD to 80% VDD level)	6 ns max. (VDD = +1.8V)	n.a.
	"0" Level	VOL : 20% VDD max.	
	"1" Level	VOH : 80% VDD min.	
	Load	15 pF max. (CMOS)	
Start-up time	10 ms max.		
Frequency linearity	10 % max.		
Frequency slope	Positive		
Modulation bandwidth (-3 dB)	20 kHz, Typical (15 kHz min.)		
SSB phase noise (at VDD = +3.3V & 27.000 MHz)	-130 dBc / Hz, Typical at 1 kHz offset		
Vcon input impedance (Vcon-GND)	10 MΩ min.	5 MΩ min.	
Aging	±5 ppm max. at +25°C ±3°C for first year +250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)		
Reflow condition			

(*) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 22SMOV(3.3VB) 27.000MHZ

PACKAGE DATA

Item	Package	22SMOV
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

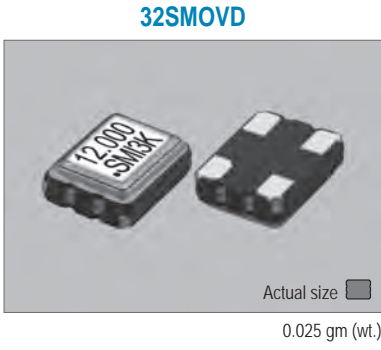
TAPE SPECIFICATIONS



Voltage Controlled Crystal Oscillators

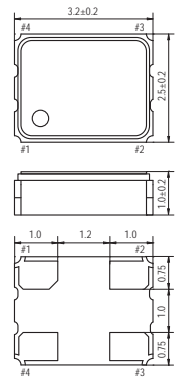
VCXO WIDE FREQ. RANGE 1.3 to 170 MHz $V_{DD} = +1.8V$ to $+3.3V$ 3.2x2.5 mm CMOS

32SMOVD (+1.8V, +2.5V or +3.3V FIXED MODELS) 3.2x2.5 mm STANDARD SMD VCXO



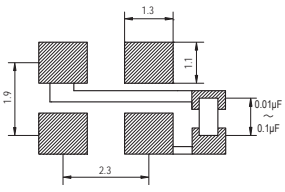
32SMOVD

32SMOVD

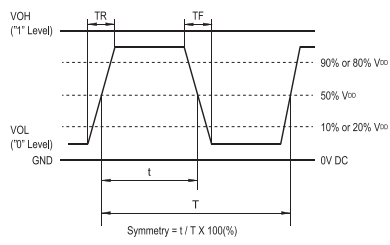


PIN	CONNECTION
1	Vcontrol
2	GND
3	OUTPUT
4	V _{DD}

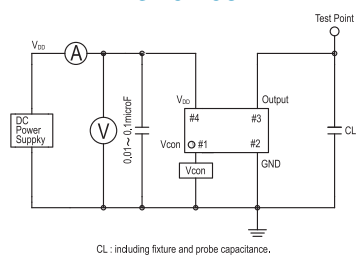
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

- CMOS OUTPUT
- WIDE FREQUENCY RANGE
- PACKAGE SIZE 3.2x2.5 mm

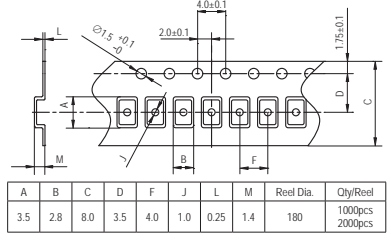
Item	Specifications	
General part number	32SMOVD ^{*1}	
Frequency range	1.300 MHz to 55.000 MHz	55.000 MHz to 170.000 MHz
Frequency stability (over all conditions)	32SMOVD(B) : ±50 ppm over -20°C to +70°C 32SMOVD(C) : ±30 ppm over -20°C to +70°C 32SMOVD(D) : ±25 ppm over -20°C to +70°C 32SMOVD(E) : ±20 ppm over -20°C to +70°C 32SMOVD(BW) : ±50 ppm over -40°C to +85°C 32SMOVD(CW) : ±30 ppm over -40°C to +85°C 32SMOVD(DW) : ±25 ppm over -40°C to +85°C Vcon = 1/2 V _{DD}	
Frequency pulling range	$V_{DD} = +1.8V$ $V_{con} = +0.9V \pm 0.9V$ $V_{DD} = +2.5V$ $V_{con} = +1.25V \pm 1.25V$ $V_{DD} = +3.3V$ $V_{con} = +1.65V \pm 1.65V$	±100 ppm min. n.a. ±110 ppm min. n.a. ±130 ppm min. ±90 ppm min.
Frequency change vs. input voltage	±2 ppm max. (V _{DD} ±5%)	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)
	Supply voltage (V _{DD})	+1.8V, +2.5V DC ±5% or +3.3V DC ±10% +3.3V DC ±10%
	Control voltage (Vcon = Pin#1)	1/2 V _{DD} ± 1/2 V _{DD} DC
Absolute Max. Ratings	Supply voltage	-0.3V to +5.0V DC
	Vcontrol voltage	-0.3V to V _{DD} +0.5V DC
	Storage temperature	-40°C to +100°C
Input current (no load)	2 mA max. (V _{DD} = +1.8V)	n.a.
	3 mA max. (V _{DD} = +2.5V)	n.a.
	5 mA max. (V _{DD} = +3.3V)	20 mA max. (V _{DD} = +3.3V)
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level
	Rise and fall times (20% V _{DD} to 80% V _{DD} level)	6 ns max. (V _{DD} = +1.8V) n.a. 5 ns max. (V _{DD} = +2.5V & +3.3V) 4 ns max. (V _{DD} = +3.3V)
	*0" Level	V _{OL} : 20% V _{DD} max.
	*1" Level	V _{OH} : 80% V _{DD} min.
	Load	15 pF max. (CMOS)
Start-up time	10 ms max.	
Frequency linearity	10 % max.	
Frequency slope	Positive	
Modulation bandwidth (-3 dB)	20 kHz min.	
SSB phase noise	-130 dBc / Hz, Typical at 1 kHz offset (at 27.000 MHz & V _{DD} = +3.3V) -125 dBc / Hz, Typical at 1 kHz offset (at 122.880 MHz & V _{DD} = +3.3V)	
Vcon input impedance (Vcon-GND)	10 MΩ min.	
Aging	±5 ppm max. at +25°C ±3°C for first year	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

(*1) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 32SMOVD(1.8VC) 54.000 MHz

PACKAGE DATA

Item	Package	32SMOVD
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metallized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLKOSC

VCXO

TCXO

OCXO

MCF

XTAL

CLK OSC

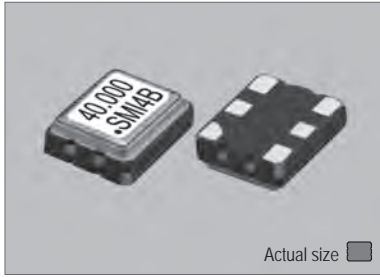
VXCO

TCXO

OCXO

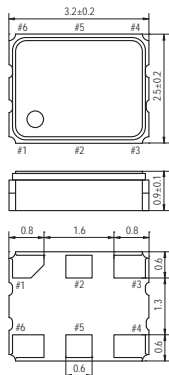
MCF

32SMOVF



Actual size 0.024 gm (wt.)

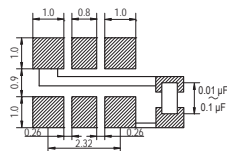
32SMOVF



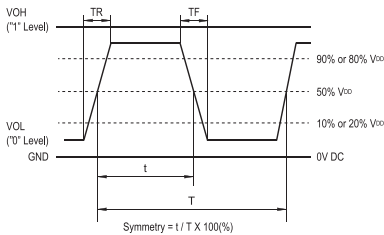
PIN	CONNECTION
1	Vcontrol
2	"L", "OPEN" or "H"
3	GND
4	Z OUTPUT
5	N.C.
6	V _{DD}

Z: High impedance

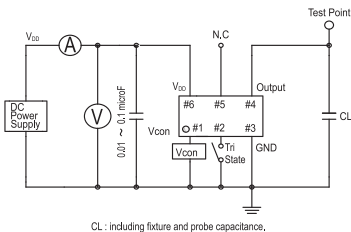
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

- CMOS OUTPUT
- WIDE FREQUENCY RANGE
- PACKAGE SIZE 3.2x2.5 mm

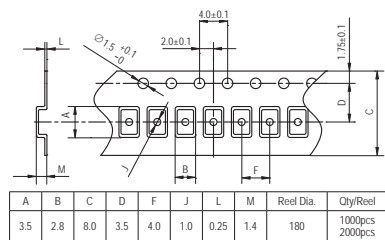
Item	Specifications	
General part number	32SMOVF ^(*)	
Frequency range	1.250 MHz to 62.000 MHz	62.000 MHz to 170.000 MHz
Frequency stability (over all conditions)	32SMOVF(3.3VB) : ±50 ppm over -20°C to +70°C 32SMOVF(3.3VC) : ±30 ppm over -20°C to +70°C 32SMOVF(3.3VD) : ±25 ppm over -20°C to +70°C 32SMOVF(3.3VE) : ±20 ppm over -20°C to +70°C 32SMOVF(3.3VBW) : ±50 ppm over -40°C to +85°C 32SMOVF(3.3VCW) : ±30 ppm over -40°C to +85°C 32SMOVF(3.3VDW) : ±25 ppm over -40°C to +85°C	
Frequency pulling range	V _{DD} = +3.3V V _{con} = +1.65V ±1.65V	±120 ppm min. (1.250 MHz to 40.000 MHz) ±110 ppm min. (40.000 MHz to 62.000 MHz)
Frequency change vs. input voltage	±2 ppm max. (V _{DD} ±5%)	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)
	Supply voltage (V _{DD})	+3.3V DC ±10%
	Control voltage (V _{con} = Pin#1)	1/2 V _{DD} ±1/2 V _{DD} DC
	Stand-by control voltage (Pin#2)	V _H : 70% V _{DD} min. V _L : 30% V _{DD} max. ^(**)
Absolute Max. Ratings	Supply voltage	-0.3V to +5.0V DC
	Vcontrol voltage	-0.3V to V _{DD} +0.3V DC
	Storage temperature	-40°C to +100°C
Input current (no load)	5 mA max. (V _{DD} = +3.3V)	25 mA max.
Stand-by current (Pin#2 = "L")	10 µA max.	
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level
	Rise and fall times (10% V _{DD} to 90% V _{DD} level)	6 ns max. (1.25 MHz to 40.000 MHz) 5 ns max. (40.000 MHz to 62.000 MHz)
	"0" Level	V _{OL} : 10% V _{DD} max.
	"1" Level	V _{OH} : 90% V _{DD} min.
Load	15 pF max. (CMOS)	15 pF max. (CMOS)
Start-up time	10 ms max.	
Frequency linearity	10 % max.	
Frequency slope	Positive	
Modulation bandwidth (-3 dB)	15 kHz min. (25 kHz, Typical)	20 kHz min. (40 kHz, Typical)
SSB phase noise (at V _{DD} = +3.3V)	-135 dBc / Hz, Typical at 1 kHz offset (40.000 MHz)	-125 dBc / Hz, Typical at 1 kHz offset (155.520 MHz)
	-160 dBc / Hz, Typical at 10.000 MHz offset (40.000 MHz)	-158 dBc / Hz, Typical at 10.000 MHz offset (155.520 MHz)
Disable delay time	200 ns max.	
Enable delay time	2 ms max.	
Vcon input impedance (Vcon-GND)	10 MΩ min.	10MΩ min. (62.000 MHz to 100.000 MHz) 5 MΩ min. (100.000 MHz to 170.000 MHz)
Aging	±5 ppm max. at +25°C ±3°C for first year	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

(*) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 32SMOVF(3.3VD) 122.880 MHz
 (***) Internal crystal oscillation to be halted (Pin#2=V_H).

PACKAGE DATA

Item	Package	32SMOVF
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metallized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



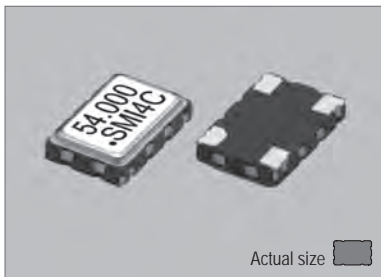
Voltage Controlled Crystal Oscillators

VCXO WIDE FREQ. RANGE 1 to 170 MHz 5.0x3.2 mm CMOS

99SMOVD (+1.8V, +2.5V, +2.8V or +3.3V FIXED MODELS) 5.0x3.2 mm

STANDARD SMD VCXO

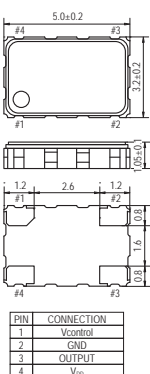
99SMOVD



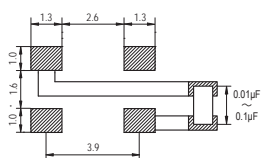
Actual size

0.052 gm (wt.)

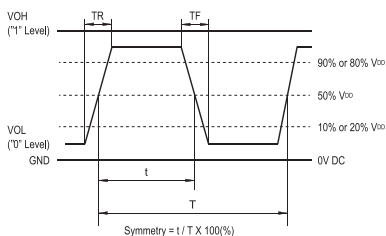
99SMOVD



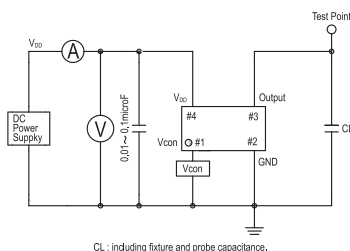
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

- CMOS OUTPUT
- WIDE FREQUENCY RANGE
- PACKAGE SIZE 5.0x3.2 mm

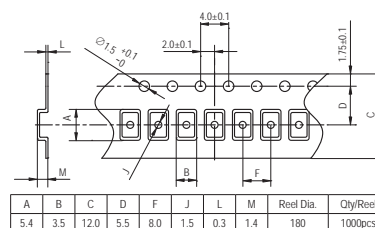
Item	Specifications		
General part number	99SMOVD ¹		
Frequency range	1.000 MHz to 55.000 MHz	55.000 MHz to 170.000 MHz	
Frequency stability (over all conditions)	99SMOVD(B) : ±50 ppm over -20°C to +70°C		
	99SMOVD(C) : ±30 ppm over -20°C to +70°C		
	99SMOVD(D) : ±25 ppm over -20°C to +70°C		
	99SMOVD(E) : ±20 ppm over -20°C to +70°C		
	99SMOVD(BW) : ±50 ppm over -40°C to +85°C		
99SMOVD(CW) : ±30 ppm over -40°C to +85°C			
99SMOVD(DW) : ±25 ppm over -40°C to +85°C			
Vcon = 1/2 VDD			
Frequency pulling range	VDD = +1.8V Vcon = +0.9V ±0.9V	±110 ppm min.	n.a.
	VDD = +2.5V Vcon = +1.25V ±1.25V	±110 ppm min.	n.a.
	VDD = +2.8V Vcon = +1.4V ±1.4V	±110 ppm min.	n.a.
	VDD = +3.3V Vcon = +1.65V ±1.65V	±110 ppm min.	±90 ppm min.
Frequency change vs. input voltage	±2 ppm max. (VDD ±5%)		
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)	
	Supply voltage (VDD)	+1.8V, +2.5V, +2.8V, +3.3V DC ±10%	+3.3V DC ±10%
	Control voltage (Vcon = Pin#1)	1/2 VDD ± 1/2 VDD DC	
Absolute Max. Ratings	Supply voltage	-0.3V to +5.0V DC	
	Vcontrol voltage	-0.3V to VDD +0.5V DC	
	Storage temperature	-40°C to +100°C	
Input current (no load)	2 mA max. (VDD = +1.8V)	n.a.	
	3 mA max. (VDD = +2.5V & +2.8V)	n.a.	
	5 mA max. (VDD = +3.3V)	20 mA max. (VDD = +3.3V)	
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 VDD level	
	Rise and fall times (20% VDD to 80% VDD level)	6 ns max. (VDD = +1.8V)	n.a.
		4 ns max. (VDD = +2.5V, +2.8V & +3.3V)	4 ns max. (VDD = +3.3V)
	"0" Level	VOL : 20% VDD max.	
	"1" Level	VOH : 80% VDD min.	
Load	15 pF max. (CMOS)		
Start-up time	10 ms max.		
Frequency linearity	10 % max.		
Frequency slope	Positive		
Modulation bandwidth (-3 dB)	20 kHz min.		
SSB phase noise	-131 dBc / Hz, Typical at 1 kHz offset (at 40.000 MHz & VDD = +3.3V) -130 dBc / Hz, Typical at 1 kHz offset (at 122.880 MHz & VDD = +3.3V)		
Vcon input impedance (Vcon-GND)	10 MΩ min.		
Aging	±5 ppm max. at +25°C ±3°C for first year		
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)		

(*) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency.
e.g. 99SMOVD(3.3VD) 27.000 MHz

PACKAGE DATA

Item	Package	99SMOVD
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLK OSC

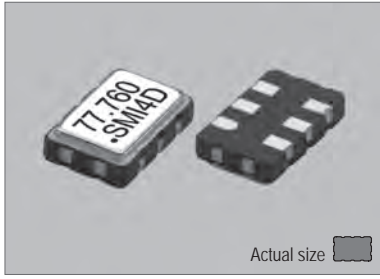
VCXO

TCXO

OCXO

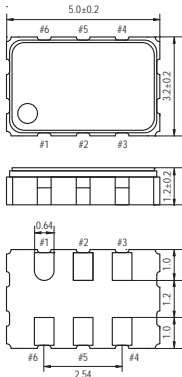
MCF

99SMOVF



Actual size 0.058 gm (wt.)

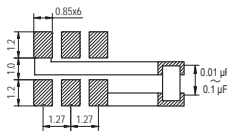
99SMOVF



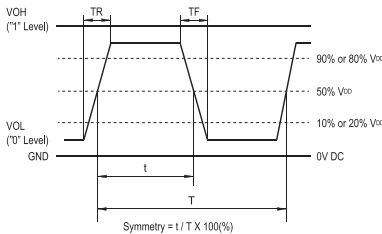
PIN	CONNECTION
1	V _{control}
2	*"L" OPEN or "H"
3	GND
4	Z OUTPUT
5	N.C.
6	V _{cc}

Z : high impedance

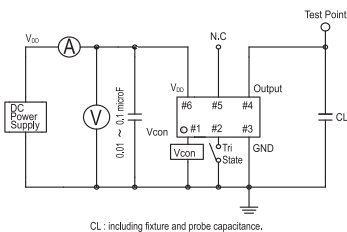
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



CL : including fixture and probe capacitance.

STANDARD SPECIFICATIONS

- CMOS OUTPUT
- WIDE FREQUENCY RANGE
- PACKAGE SIZE 5.0x3.2 mm

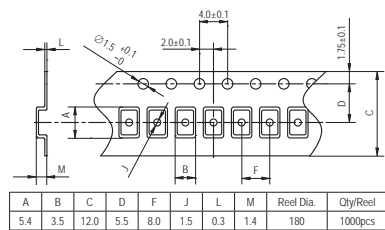
Item	Specifications		
General part number	99SMOVF ^(*)		
Frequency range	1.000 MHz to 62.000 MHz	62.000 MHz to 170.000 MHz	
Frequency stability (over all conditions)	99SMOVF(3.3VB) : ±50 ppm over -20°C to +70°C 99SMOVF(3.3VC) : ±30 ppm over -20°C to +70°C 99SMOVF(3.3VD) : ±25 ppm over -20°C to +70°C 99SMOVF(3.3VE) : ±20 ppm over -20°C to +70°C 99SMOVF(3.3VBW) : ±50 ppm over -40°C to +85°C 99SMOVF(3.3VCW) : ±30 ppm over -40°C to +85°C 99SMOVF(3.3VDW) : ±25 ppm over -40°C to +85°C V _{con} = 1/2 V _{DD}		
Frequency pulling range	V _{DD} = +3.3V V _{con} = +1.65V ±1.65V	±110 ppm min. ±90 ppm min.	
Frequency change vs. input voltage	±2 ppm max. (V _{DD} ±5%) ±2 ppm max. (V _{DD} ±10%)		
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)	
	Supply voltage (V _{DD})	+3.3V DC ±10%	
	Control voltage (V _{con} = Pin#1)	1/2 V _{DD} ±1/2 V _{DD} DC +1.65V ±1.65V DC	
	Stand-by control voltage (Pin#2)	V _H : 70% V _{DD} min. V _L : 30% V _{DD} max. ^(*)	
Absolute Max. Ratings	Supply voltage	-0.3V to +5.0V DC	
	V _{control} voltage	-0.3 to V _{DD} +0.3V DC	
	Storage temperature	-40°C to +100°C	
Input current (no load)	5 mA max.	25 mA max.	
Stand-by current (Pin#2 = "L")	10 μA max.		
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level	
	Rise and fall times (10% V _{DD} to 90% V _{DD} level)	6 ns max. (1.000 MHz to 40.000 MHz) 5 ns max. (40.000 MHz to 62.000 MHz)	4 ns max. (62.000 MHz to 100.000 MHz) 2.4 ns max. (100.000 MHz to 170.000 MHz)
	"0" Level	V _{OL} : 10% V _{DD} max.	
	"1" Level	V _{OH} : 90% V _{DD} min.	
	Load	15 pF max. (CMOS)	
Start-up time	10 ms max.		
Frequency linearity	10 % max.		
Frequency slope	Positive		
Modulation bandwidth (-3 dB)	15 kHz min. (25 kHz, Typical)	20 kHz min. (40 kHz, Typical)	
SSB phase noise (at V _{DD} = +3.3V)	-135 dBc / Hz, Typical at 1 kHz offset (40.000MHz) -160 dBc / Hz, Typical at 10 MHz offset (40.000MHz)	-125 dBc / Hz, Typical at 1 kHz offset (155.520 MHz) -158 dBc / Hz, Typical at 10 MHz offset (155.520 MHz)	
Disable delay time	200 ns max.		
Enable delay time	2 ms max.		
V _{con} input impedance (V _{con} -GND)	10 MΩ min.		
Aging	±5 ppm max. at +25°C ±3°C for first year		
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)		

(*) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 99SMOVF(3.3VCW) 74.250 MHz
 (**) Internal crystal oscillation to be halted. (Pin#2 = V_{IL})

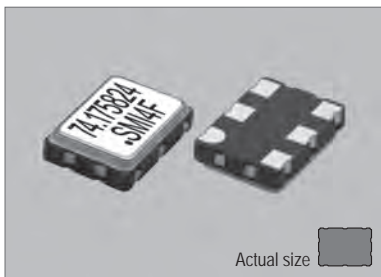
PACKAGE DATA

Item	Package	99SMOVF
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



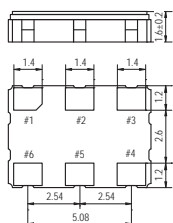
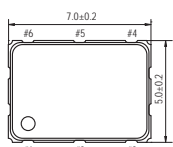
97SMOVH



Actual size

0.182 gm (wt.)

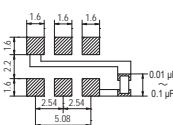
97SMOVH



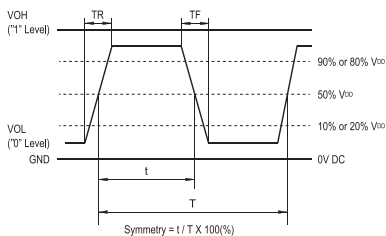
PIN	CONNECTION
1	Vcontrol
2	*"L" OPEN or "H"
3	GND
4	OUTPUT
5	N.C.
6	VDD

Z : high impedance

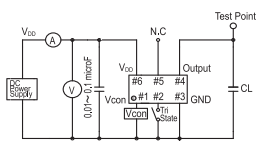
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



CL : including fixture and probe capacitance.

STANDARD SPECIFICATIONS

- CMOS OUTPUT
- WIDE FREQUENCY RANGE
- PACKAGE SIZE 7.0x5.0 mm

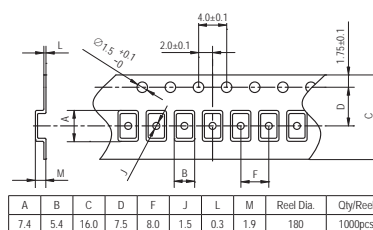
Item	Specifications	
General part number	97SMOVH ¹	
Frequency range	1.250 MHz to 170.000 MHz	
Frequency stability (over all conditions)	97SMOVH(3.3VB) : ±50 ppm over -20°C to +70°C 97SMOVH(3.3VC) : ±30 ppm over -20°C to +70°C 97SMOVH(3.3VD) : ±25 ppm over -20°C to +70°C 97SMOVH(3.3VE) : ±20 ppm over -20°C to +70°C 97SMOVH(3.3VBW) : ±50 ppm over -40°C to +85°C 97SMOVH(3.3VCW) : ±30 ppm over -40°C to +85°C 97SMOVH(3.3VDW) : ±25 ppm over -40°C to +85°C Vcon = 1/2 VDD	
Frequency pulling range	VDD = +3.3V Vcon = +1.65V ±1.65V ±100 ppm min.	
Frequency change vs. input voltage	±2 ppm max. (VDD ±10%)	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)
	Supply voltage (VDD)	+3.3V DC ±10%
	Control voltage (Vcon = Pin#1)	+1.65V ±1.65V DC
	Stand-by control voltage (Pin#2)	V _{IH} : 70% VDD min. V _{IL} : 30% VDD max.*2
Absolute Max. Ratings	Supply voltage	-0.3V to +5.0V DC
	Vcontrol voltage	-0.5V to VDD +0.5V DC
	Storage temperature	-40°C to +100°C
Input current (no load)	25 mA max.	
Stand-by current (Pin#2 = "L")	10 µA max.	
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 VDD level
	Rise and fall times (10% VDD to 90% VDD level)	5 ns max.
	"0" Level	V _{OL} : 10% VDD max.
	"1" Level	V _{OH} : 90% VDD min.
Load	15 pF max. (CMOS)	
Start-up time	10 ms max.	
Frequency linearity	10 % max.	
Frequency slope	Positive	
Modulation bandwidth (-3 dB)	10 kHz, Typical : 1.250 MHz to 30.000 MHz 20 kHz, Typical (15 kHz min.) : 30.000 MHz to 170.000 MHz	
SSB phase noise (at VDD = +3.3V & 155.520 MHz)	-162 dBc / Hz, Typical at 10 MHz offset	
Disable delay time	200 ns max.	
Enable delay time	2 ms max.	
Vcon input impedance (Vcon-GND)	5 MΩ min. (1.250 MHz to 30.000 MHz) 10 MΩ min. (30.000 MHz to 170.000 MHz)	
Aging	±5 ppm max. at +25°C ±3°C for first year	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

(¹) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 97SMOVH(3.3VBW) 27.000 MHz
(²) Internal crystal oscillation to be halted (Pin#2 = V_{IH}).

PACKAGE DATA

Item	Package	97SMOVH
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLKOSC

VCXO

TCXO

OCXO

MCF

XTAL

CLK OSC

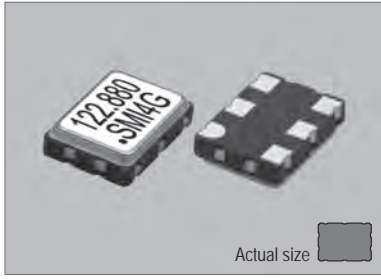
VCXO

TCXO

OCXO

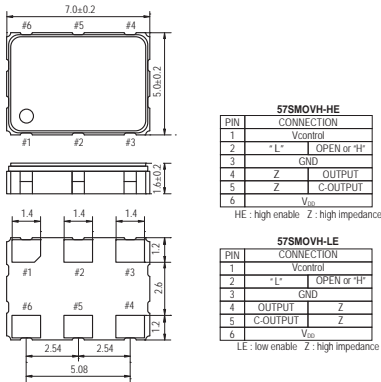
MCF

57SMOVH

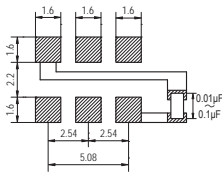


Actual size 0.175 gm (wt.)

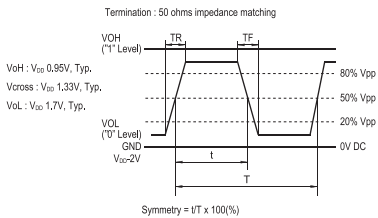
57SMOVH



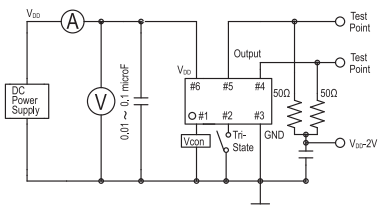
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

- LVPECL VCXO
- WIDE FREQUENCY RANGE
- PACKAGE SIZE 7.0x5.0 mm

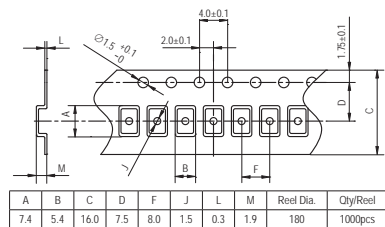
Item	Specifications	
General part number	57SMOVH ^(*)	
Frequency range	30.000 MHz to 200.000 MHz	
Frequency stability (over all conditions)	57SMOVH(3.3VB) : ±50 ppm over -20°C to +70°C 57SMOVH(3.3VC) : ±30 ppm over -20°C to +70°C 57SMOVH(3.3VD) : ±25 ppm over -20°C to +70°C 57SMOVH(3.3VE) : ±20 ppm over -20°C to +70°C 57SMOVH(3.3VBW) : ±50 ppm over -40°C to +85°C 57SMOVH(3.3VCW) : ±30 ppm over -40°C to +85°C 57SMOVH(3.3VDW) : ±25 ppm over -40°C to +85°C Vcon = 1/2 V _{DD}	
Frequency pulling range	V _{DD} = +3.3V Vcon = +1.65V ±1.65V ±80 ppm min.	
Frequency change vs. input voltage	±2 ppm max. (V _{DD} ± 10%)	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)
	Supply voltage (V _{DD})	+3.3V DC ±10%
	Control voltage (Vcon = Pin#1)	+1.65V ±1.65V DC
	Stand-by control voltage (Pin#2)	V _{HH} : 70% V _{DD} min. V _{LL} : 30% V _{DD} max. ^(**)
Absolute Max. Ratings	Supply voltage	-0.3V to +5.0V DC
	Vcontrol voltage	-0.3V to V _{DD} +0.3V DC
	Storage temperature	-40°C to +100°C
Input current (Pin#2 = HE or LE)	90 mA max.	
Stand-by current (Pin#2 = LD or HD) ^(**)	5.0 mA max.	
Output (-40°C to +85°C)	Symmetry	45% to 55% at crossing point
	Rise and fall times (20% to 80% of amplitude)	1.0 ns max.
	"0" Level (0°C to +85°C)	V _{OL} : +1.68V max. (+1.49V min.)
	"1" Level (0°C to +85°C)	V _{OH} : +2.42V max. (+2.275V min.)
	"0" Level (-40°C to 0°C)	V _{OL} : +1.745V max. (+1.49V min.)
	"1" Level (-40°C to 0°C)	V _{OH} : +2.42V max. (+2.215V min.)
Load	50 Ω into V _{DD} -2V	
Start-up time	10 ms max.	
Frequency linearity	10 % max.	
Frequency slope	Positive	
Modulation bandwidth (-3 dB)	20 kHz min.	
SSB phase noise (at V _{DD} = +3.3V & 122.880 MHz)	-157 dBc / Hz, Typical at 10 MHz offset	
RMS jitter (12 kHz to 20.000 MHz band)	0.3 ps max.	
Disable delay time	200 ns max.	
Enable delay time	20 μs max.	
Vcon input impedance (Vcon - GND)	10 MΩ min.	
Differential output voltage	+0.4V min.	
Aging	±5 ppm max. at +25°C ±3°C for first year	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

(*) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 57SMOVH-HE(3.3VCW) 156,250 MHz
 (**) Internal crystal oscillation to be halted.
 LD: Low disable
 HD: High disable

PACKAGE DATA

Item	Package	57SMOVH
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



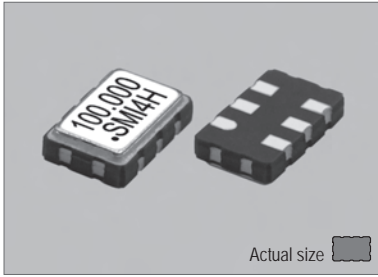
Low Voltage Positive Emitter Coupled Logic VCXO

VCXO WIDE FREQ. RANGE 30 to 170 MHz 5.0x3.2 mm LVPECL

55SMOVH (+3.3V FIXED LVPECL VCXO) 5.0x3.2 mm

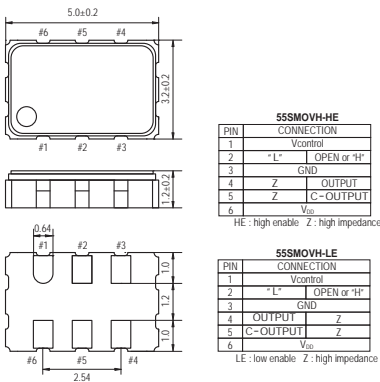
STANDARD SMD VCXO

55SMOVH

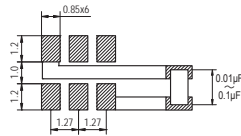


Actual size
0.051 gm (wt.)

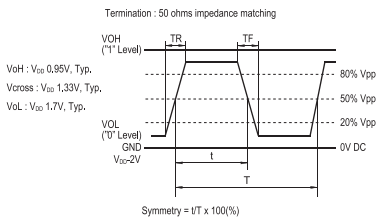
55SMOVH



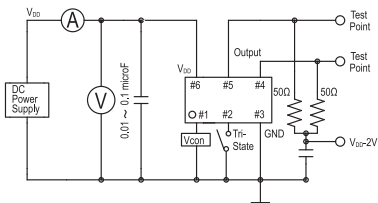
SOLDERING PATTERN



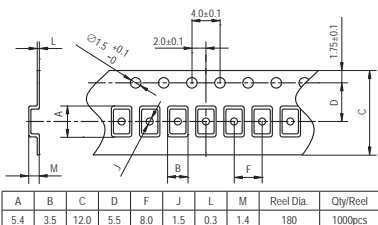
OUTPUT WAVEFORM



TEST CIRCUIT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

- LVPECL VCXO
- WIDE FREQUENCY RANGE
- PACKAGE SIZE 5.0x3.2 mm

Item	Specifications	
General part number	55SMOVH ^(*)	
Frequency range	30.000 MHz to 170.000 MHz	
Frequency stability (over all conditions)	55SMOVH(3.3VB) : ±50 ppm over -20°C to +70°C 55SMOVH(3.3VC) : ±30 ppm over -20°C to +70°C 55SMOVH(3.3VD) : ±25 ppm over -20°C to +70°C 55SMOVH(3.3VE) : ±20 ppm over -20°C to +70°C 55SMOVH(3.3VBW) : ±50 ppm over -40°C to +85°C 55SMOVH(3.3VCW) : ±30 ppm over -40°C to +85°C 55SMOVH(3.3VDW) : ±25 ppm over -40°C to +85°C Vcon = 1/2 VDD	
Frequency pulling range	VDD = +3.3V Vcon = +1.65V ±1.65V ±80 ppm min.	
Frequency change vs. input voltage	±2 ppm max. (VDD ±10%)	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)
	Supply voltage (VDD)	+3.3V DC ±10%
	Control voltage (Vcon = Pin#1)	+1.65V ±1.65V DC
	Stand-by control voltage (Pin#2)	VIH : 70% VDD min. VIL : 30% VDD max. ^(**)
Absolute Max. Ratings	Supply voltage	-0.3V to +5.0V DC
	Vcontrol voltage	-0.3V to VDD +0.3V DC
	Storage temperature	-40°C to +100°C
Input current (Pin#2 = HE or LE)	90 mA max.	
Stand-by current (Pin#2 = LD or HD) ^(**)	5.0 mA max.	
Output (-40°C to +85°C)	Symmetry	45% to 55% at crossing point
	Rise and fall times (20% to 80% of amplitude)	1.0 ns max.
	"0" Level (-40°C to +85°C)	VOL : +1.68V max. (+1.49V min.)
	"1" Level (-40°C to +85°C)	VOH : +2.42V max. (+2.275V min.)
	"0" Level (-40°C to 0°C)	VOL : +1.745V max. (+1.49V min.)
	"1" Level (-40°C to 0°C)	VOH : +2.42V max. (+2.215V min.)
Load	50 Ω into VDD -2V	
Start-up time	10 ms max.	
Frequency linearity	10 % max.	
Frequency slope	Positive	
Modulation bandwidth (-3 dB)	20 kHz min.	
SSB phase noise (at VDD = +3.3V & 122.880 MHz)	-157 dBc / Hz, Typical at 10 MHz offset	
RMS jitter (12 kHz to 20.000 MHz band)	0.3 ps max.	
Disable delay time	200 ns max.	
Enable delay time	20 μs max.	
Vcon input impedance (Vcon-GND)	10 MΩ min.	
Differential output voltage	+0.4V min.	
Aging	±5 ppm max. at +25°C ±3°C for first year	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

(*) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 55SMOVH-HE(3.3VE) 155.520 MHz
(**) Internal crystal oscillation to be halted.
LD : Low disable
HD : High disable

PACKAGE DATA

Item	Package	55SMOVH
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

XTAL

CLKOSC

VCXO

TCXO

OCXO

MCF

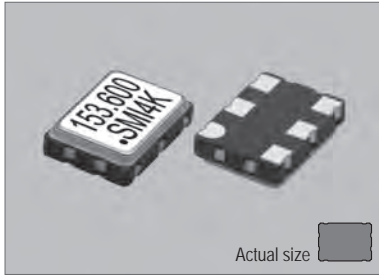
Low Voltage Differential Signaling VCXO

VCXO WIDE FREQ. RANGE 30 to 170 MHz 7.0x5.0 mm LVDS

67SMOVH (+2.5V or +3.3V FIXED LVDS VCXO) 7.0x5.0 mm

STANDARD SMD VCXO

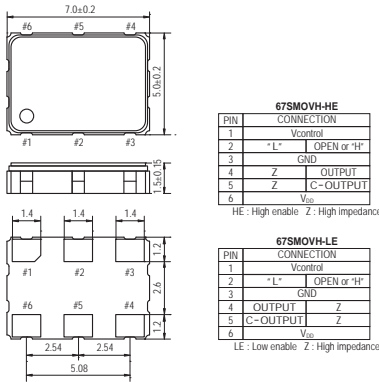
67SMOVH



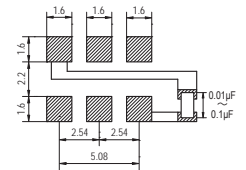
Actual size

0.182 gm (wt.)

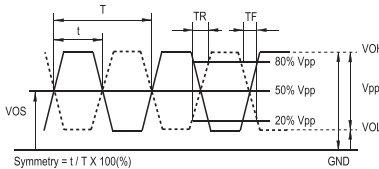
67SMOVH



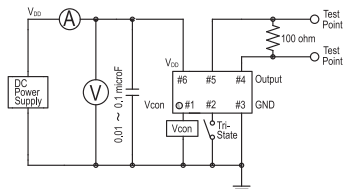
SOLDERING PATTERN



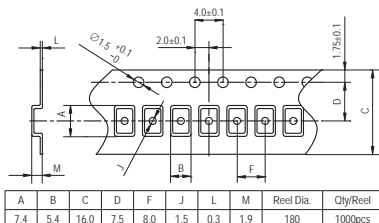
OUTPUT WAVEFORM



TEST CIRCUIT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

- LVDS VCXO
- WIDE FREQUENCY RANGE
- PACKAGE SIZE 7.0x5.0 mm

Item	Specifications	
General part number	67SMOVH ^(*)	
Frequency range	30.000 MHz to 170.000 MHz	
Frequency stability (over all conditions)	67SMOVH(3.3VB) : ±50 ppm over -20°C to +70°C 67SMOVH(3.3VC) : ±30 ppm over -20°C to +70°C 67SMOVH(3.3VD) : ±25 ppm over -20°C to +70°C 67SMOVH(3.3VE) : ±20 ppm over -20°C to +70°C 67SMOVH(3.3VBW) : ±50 ppm over -40°C to +85°C 67SMOVH(3.3VCW) : ±30 ppm over -40°C to +85°C 67SMOVH(3.3VDW) : ±25 ppm over -40°C to +85°C Vcon = 1/2 VDD	
Frequency pulling range	VDD = +3.3V Vcon = +1.65V ± 1.65V ±80 ppm min.	
Frequency change vs. input voltage	±2 ppm max. (VDD ±10%)	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option) -40°C to +105°C (WW = Option)
	Supply voltage (VDD)	+2.5V DC ±10% +3.3V DC ±10%
	Control voltage (Vcon = Pin#1)	+1.25V ±1.25V DC +1.65V ±1.65V DC
Absolute Max. Ratings	Stand-by control voltage (Pin#2)	V _{HH} : 70% VDD min. V _{LL} : 30% VDD max. ^(**)
	Supply voltage	-0.3V to +5.0V DC
Input current (Pin#2 = Open or V _{HH})	Vcontrol voltage	-0.3V to VDD +0.3V DC
	Stand-by current (Pin#2 = "LD or HD")	Storage temperature -40°C to +100°C
Output (-40°C to +85°C)	Supply voltage	40 mA max.
	Symmetry	7 mA max.
	Rise and fall times (20% to 80% of amplitude)	45% to 55% at crossing point
	"0" Level	0.7 ns max.
Start-up time	"1" Level	V _{OL} : +1.1V, Typical (+0.9 V min.)
	Load	V _{OH} : +1.43V, Typical (+1.6 V max.)
Frequency linearity	100 Ω (OUT-OUTN)	
Frequency slope	10 ms max.	
Modulation bandwidth (-3 dB)	10 % max.	
SSB phase noise (at VDD = +3.3V & 122.880 MHz)	Positive	
RMS jitter (12 kHz to 20.000 MHz band)	20 kHz min.	
Disable delay time	-128 dBc / Hz, Typical at 1 kHz offset	
Enable delay time	0.3 ps max. (90 fs, Typical at 122.880 MHz)	
Vcon input impedance (Vcon - GND)	200 ns max.	
Differential output voltage	2 ms max.	
Offset voltage	10 MΩ min.	
Aging	+0.35V, Typical	
Reflow condition	+1.25V, Typical	
	±5 ppm max. at +25°C ±3°C for first year	
	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	

(*) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 67SMOVH(3.3VCW) 164.355 MHz
 (**) Internal crystal oscillation to be halted.
 LD : Low disable
 HD : High disable

PACKAGE DATA

Item	Package	67SMOVH
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

XTAL

CLKOSC

VCXO

TCXO

OCXO

MCF

XTAL

CLK OSC

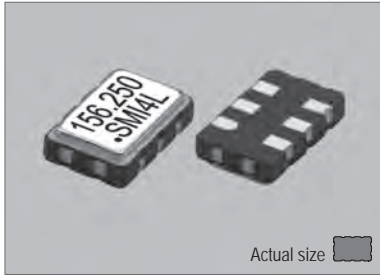
VCXO

TCXO

OCXO

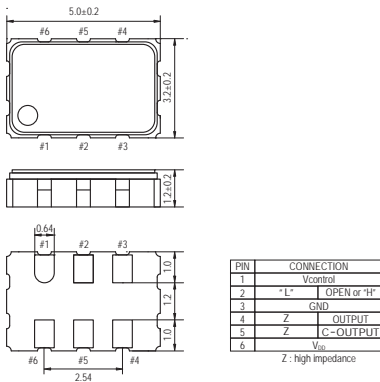
MCF

65SMOVH

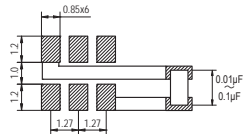


Actual size 0.051 gm (wt.)

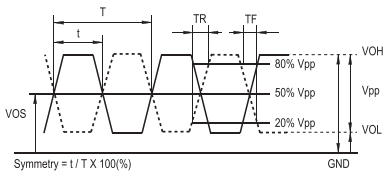
65SMOVH



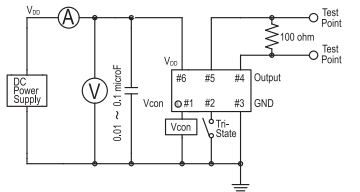
SOLDERING PATTERN



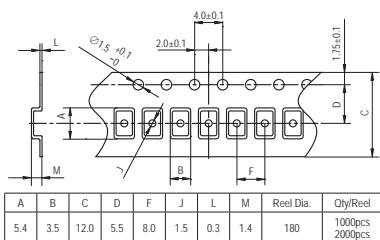
OUTPUT WAVEFORM



TEST CIRCUIT



TAPE SPECIFICATIONS



STANDARD SPECIFICATIONS

- LVDS VCXO
- WIDE FREQUENCY RANGE
- PACKAGE SIZE 5.0x3.2 mm

Item	Specifications	
General part number	65SMOVH ^(*)	
Frequency range	30.000 MHz to 170.000 MHz	
Frequency stability (over all conditions)	65SMOVH(3.3VB) : ±50 ppm over -20°C to +70°C 65SMOVH(3.3VC) : ±30 ppm over -20°C to +70°C 65SMOVH(3.3VD) : ±25 ppm over -20°C to +70°C 65SMOVH(3.3VE) : ±20 ppm over -20°C to +70°C 65SMOVH(3.3VBW) : ±50 ppm over -40°C to +85°C 65SMOVH(3.3VCW) : ±30 ppm over -40°C to +85°C 65SMOVH(3.3VDW) : ±25 ppm over -40°C to +85°C Vcon = 1/2 VDD	
Frequency pulling range	VDD = +3.3V Vcon = +1.65V ±1.65V ±80 ppm min.	
Frequency change vs. input voltage	±2 ppm max. (VDD ±10%)	
Operating Conditions	Operating temperature	-20°C to +70°C (Standard) -40°C to +85°C (W = Option)
	Supply voltage (VDD)	+2.5V DC ±10% +3.3V DC ±10%
	Control voltage (Vcon = Pin#1)	+1.25V ±1.25V DC +1.65V ±1.65V DC
	Stand-by control voltage (Pin#2)	V _H : 70% VDD min. V _L : 30% VDD max. ^(**)
Absolute Max. Ratings	Supply voltage	-0.3V to +5.0V DC
	Vcontrol voltage	-0.3V to VDD +0.3V DC
	Storage temperature	-40°C to +100°C
Input current (Pin#2 = Open or V _H)	40 mA max.	
Stand-by current (Pin#2 = "L")	7 mA max.	
Output (-40°C to +85°C)	Symmetry	45% to 55% at crossing point
	Rise and fall times (20% to 80% of amplitude)	0.7 ns max.
	"0" Level	V _{OL} : +1.1V, Typical (+0.9V min.)
	"1" Level	V _{OH} : +1.43V, Typical (+1.6V max.)
Load	100 Ω (OUT-OUTN)	
Start-up time	10 ms max.	
Frequency linearity	10 % max.	
Frequency slope	Positive	
Modulation bandwidth (-3 dB)	20 kHz min.	
SSB phase noise (at VDD = +3.3V & 122.880 MHz)	-128 dBc / Hz, Typical at 1 kHz offset	
RMS jitter (12 kHz to 20.000 MHz band)	0.3 ps max. (90 fs, Typical at 122.880 MHz)	
Disable delay time	200 ns max.	
Enable delay time	20 ms max.	
Vcon input impedance (Vcon-GND)	10 MΩ min.	
Differential output voltage	+0.35V, Typical	
Offset voltage	+1.25V, Typical	
Aging	±5 ppm max. at +25°C ±3°C for first year	
Reflow condition	+250°C ±10°C for 10 seconds	
	+170°C ±10°C for 1 to 2 minutes (preheating)	

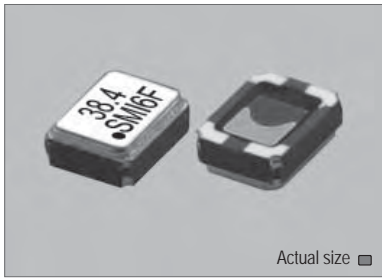
(*) Final part number to be assigned with package type, input voltage, frequency stability, operating temperature and frequency. e.g. 65SMOVH(3.3VE) 160.000 MHz

(**) Internal crystal oscillation to be halted (Pin#2 = V_L).

PACKAGE DATA

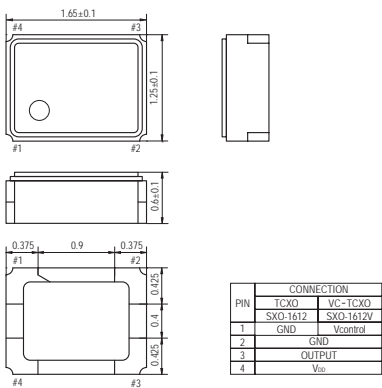
Item	Package	65SMOVH
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

SXO-1612

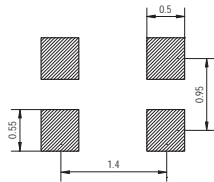


Actual size
0.005 gm (wt.)

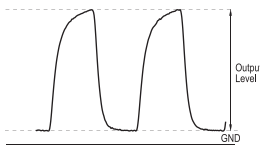
SXO-1612



SOLDERING PATTERN

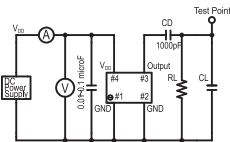


OUTPUT WAVEFORM



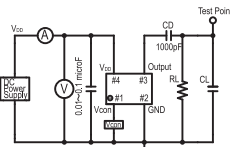
TEST CIRCUIT

SXO-1612



CD : DC-Cut capacitance
RL : 10kOhm ± 10%
CL : 10pF ± 10% including fixture and probe capacitance

SXO-1612V



CD : DC-Cut capacitance
RL : 10kOhm ± 10%
CL : 10pF ± 10% including fixture and probe capacitance

STANDARD SPECIFICATIONS

● CLIPPED SINE WAVEFORM
● PACKAGE SIZE 1.6x1.2 mm

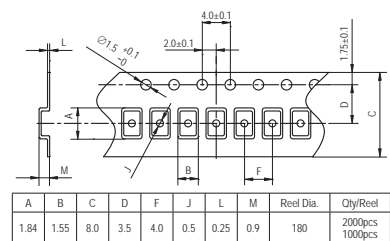
Item	Specifications	
General part number	SXO-1612* ¹	SXO-1612V* ¹
Frequency range	19.200 MHz to 52.000 MHz	
Initial frequency tolerance at +25°C ±2°C	±1.5 ppm max.* ²	±1.5 ppm max.(Vcon = 1/2 VDD)* ²
TCXO or VC-TCXO	TCXO	VC-TCXO
Frequency Stability	Temperature range	±2 ppm max. over -30°C to +85°C (referred to +25°C)* ³
	Input voltage change	±0.2 ppm max. at VDD ±5% DC
	Output load change	±0.2 ppm max. at 10 kΩ ±10% with 10 pF ±10%
	Aging	±1 ppm max. per year at +25°C ±3°C
Operating Conditions	Operating temperature	-30°C to +85°C (Standard) -40°C to +85°C (W = Option, frequency dependent)
	Supply voltage (VDD)	D = +1.8V, F = +2.5V, H = +2.8V (Standard), J = +3.0V, K = +3.3V DC ±5%
	Control voltage (Vcon)	n.a. +0.9V ±0.8V (VDD = +1.8V) 1/2 VDD ±1V DC (VDD = +2.5V to +3.3V)
Absolute Max. Ratings	Supply voltage	-0.6V to +4.6V DC
	Vcontrol voltage (Vcon)	n.a. -0.6V to VDD +0.6V DC
	Storage temperature	-40°C to +85°C
Input current	1.5 mA max. (19.200 MHz to 30.000 MHz) 1.7 mA max. (30.000 MHz to 52.000 MHz)	
	Output (-40°C to +85°C)	Level: 0.8 Vp-p min. Load: 10 kΩ // 10 pF Waveform: Clipped sine wave (DC-coupling)
Frequency adjustment voltage control (Vcon)	n.a.	
	±8 ppm to ±13 ppm (VDD = +1.8V) ±9 ppm to ±15 ppm (VDD = +2.5V to +3.3V)	
Frequency slope	n.a. Positive	
Harmonic distortion	-5 dBc max.	
Start-up time	2 ms max. (Vout ≥ 90%Vp-p)	
SSB phase noise	-135 dBc / Hz, Typical at 1 kHz offset	
IR reflow resistance	±1 ppm max. (referred to frequency before reflow)	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Standard frequencies (MHz)	19.200, 26.000, 38.400, 52.000	
Optional Operating Temperature* ⁴	Low limit / Symbol	-10°C / g -15°C / h -20°C / i -25°C / j -30°C / k -35°C / l -40°C / m
	High limit / Symbol	+55°C / ff +60°C / gg +65°C / hh +70°C / ii +75°C / jj +80°C / kk +85°C / ll

(*¹) Final part number to be assigned with package type, TCXO or VC-TCXO, input voltage, operating temperature and frequency. e.g. SXO-1612V-J-S-38.400MHz
(*²) Referred to nominal frequency before reflow soldering.
(*³) At Vcon = 1/2 VDD DC for SXO-1612V.
(*⁴) Select "low limit" and "high limit" for new operating temperature combination from the lists.

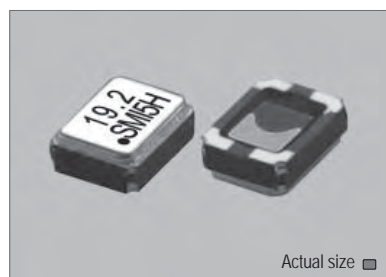
PACKAGE DATA

Item	Package	SXO-1612
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS

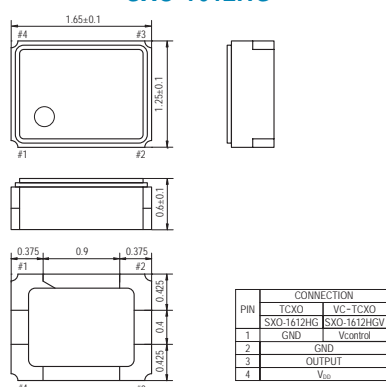


SXO-1612HG

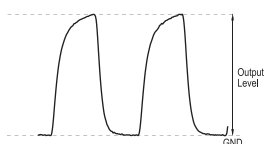


Actual size 0.005 gm (wt.)

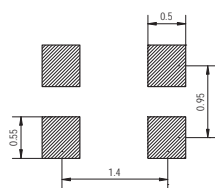
SXO-1612HG



OUTPUT WAVEFORM

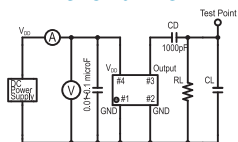


SOLDERING PATTERN



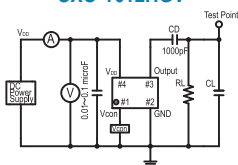
TEST CIRCUIT

SXO-1612HG



CD : DC-Out capacitance
RL : 10kΩm ± 10%
CL : 10pF ± 10% including fixture and probe capacitance

SXO-1612HGV



CD : DC-Out capacitance
RL : 10kΩm ± 10%
CL : 10pF ± 10% including fixture and probe capacitance

STANDARD SPECIFICATIONS

● CLIPPED SINE WAVEFORM
● PACKAGE SIZE 1.6x1.2 mm

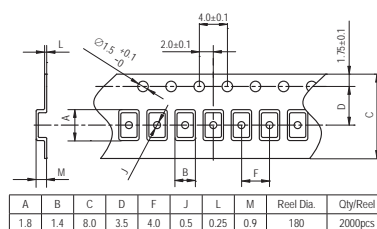
Item	Specifications	
General part number	SXO-1612HG ^{*1}	SXO-1612HGV ^{*1}
Frequency range	19.200 MHz to 52.000 MHz	
Initial frequency tolerance at +25°C ±2°C	±1.5 ppm max. ^{*2}	±1.5 ppm max. (Vcon = 1/2 VDD) ^{*2}
TCXO or VC-TCXO	TCXO	VC-TCXO
Frequency Stability	Temperature range	±0.5 ppm max. over -30°C to +85°C (referred to +25°C) ^{*3}
	Input voltage change	±0.1 ppm max. at VDD ±5% DC
	Output load change	±0.1 ppm max. at 10 kΩ ±10% with 10 pF ±10%
	Aging	±1 ppm max. per year at +25°C ±3°C
Operating Conditions	Operating temperature	-30°C to +85°C (Standard) -40°C to +85°C (W = Option, frequency dependent)
	Supply voltage (VDD)	D = +1.8V, F = +2.5V, H = +2.8V (Standard), J = +3.0V, K = +3.3V DC ±5%
	Control voltage (Vcon)	n.a. +0.9V ± 0.8V (VDD = +1.8V) 1/2 VDD ± 1V DC (VDD = +2.5V to +3.3V)
Absolute Max. Ratings	Supply voltage	-0.6V to +4.6V DC
	Vcontrol voltage (Vcon)	n.a. -0.6V to VDD +0.6V DC
	Storage temperature	-40°C to +85°C
Input current	1.5 mA max. (19.200 MHz to 30.000 MHz) 1.7 mA max. (30.000 MHz to 52.000 MHz)	
	Output	0.8 Vp-p min.
Output (-40°C to +85°C)	Level	0.8 Vp-p min.
	Load	10 kΩ // 10 pF
	Waveform	Clipped sine wave (DC-coupling)
Frequency adjustment voltage control (Vcon)	n.a.	±8 ppm to ±13 ppm (VDD = +1.8V) ±9 ppm to ±15 ppm (VDD = +2.5V to +3.3V) Positive
	n.a.	Positive
Frequency slope	n.a.	
Harmonic distortion	-5 dBc max.	
Start-up time	2 ms max. (Vout ≥ 90%Vp-p)	
SSB phase noise	-135 dBc / Hz, Typical at 1 kHz offset	
IR reflow resistance	±1 ppm max. (referred to frequency before reflow)	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
	Standard frequencies (MHz)	
Optional Operating Temperature ^{*4}	Low limit / Symbol	-10°C / g -15°C / h -20°C / i -25°C / j -30°C / k -35°C / l -40°C / m
	High limit / Symbol	+55°C / ff +60°C / gg +65°C / hh +70°C / ii +75°C / jj +80°C / kk +85°C / ll

(^{*1}) Final part number to be assigned with package type, TCXO or VC-TCXO, input voltage, operating temperature and frequency. e.g. SXO-1612HG-D-S-26MHz
(^{*2}) Referred to nominal frequency before reflow soldering.
(^{*3}) At Vcon = 1/2 VDD DC for SXO-1612HGV.
(^{*4}) Select "low limit" and "high limit" for new operating temperature combination from the lists.

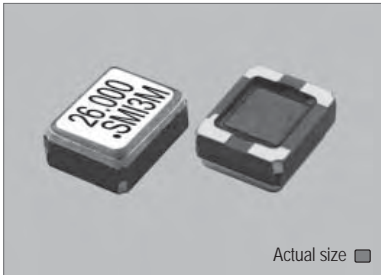
PACKAGE DATA

Item	Package	SXO-1612HG
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS

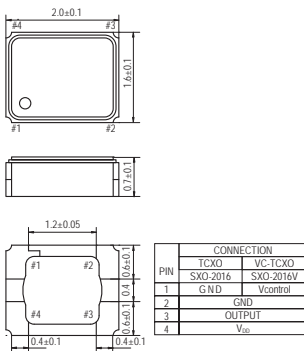


SXO-2016

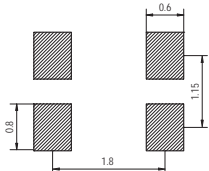


0.0086 gm (wt.)

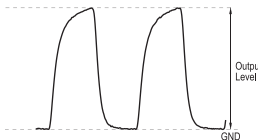
SXO-2016



SOLDERING PATTERN

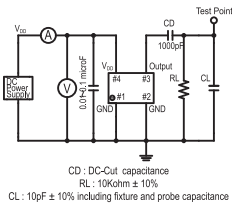


OUTPUT WAVEFORM

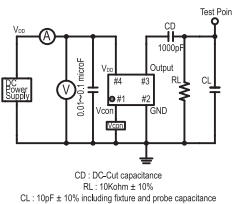


TEST CIRCUIT

SXO-2016



SXO-2016V



STANDARD SPECIFICATIONS

● CLIPPED SINE WAVEFORM
● PACKAGE SIZE 2.0x1.6 mm

Item	Specifications	
General part number	SXO-2016* ¹	SXO-2016V* ¹
Frequency range	13.000 MHz to 52.000 MHz	
Initial frequency tolerance at +25°C ±2°C	±1.5 ppm max.* ²	±1.5 ppm max.(Vcon = 1/2 VDD)* ²
TCXO or VC-TCXO	TCXO	VC-TCXO
Frequency Stability	Temperature range	±2 ppm max. over -30°C to +85°C (referred to +25°C)* ³
	Input voltage change	±0.2 ppm max. at VDD ± 5% DC
	Output load change	±0.2 ppm max. at 10 kΩ ±10% with 10 pF ±10%
	Aging	±1 ppm max. per year at +25°C ±3°C
Operating Conditions	Operating temperature	-30°C to +85°C (Standard) -40°C to +85°C (W = Option, frequency dependent)
	Supply voltage (VDD)	D = +1.8V, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC ±5%
	Control voltage (Vcon)	n.a. / +0.9V ±0.8V (VDD = +1.8V) 1/2 VDD ±1V (VDD = +2.5V to +3.3V)
Absolute Max. Ratings	Supply voltage	-0.6V to +4.6V DC
	Vcontrol voltage (Vcon)	n.a. / -0.6V to VDD +0.6V DC
	Storage temperature	-40°C to +85°C
Input current	1.5 mA max. (13.000 MHz to 30.000 MHz) 1.7 mA max. (30.000 MHz to 40.000 MHz) 2 mA max. (40.000 MHz to 52.000 MHz)	
Output (-40°C to +85°C)	Level	0.8 Vp-p min.
	Load	10 kΩ // 10 pF
	Waveform	Clipped sine wave (DC-coupling)
Frequency Adjustment	Voltage control (Vcon)	n.a. / ±8 ppm to ±13 ppm (VDD = +1.8V)
		±9 ppm to ±15 ppm (VDD = +2.5V to +3.3V)
Frequency slope	n.a.	Positive
Harmonic distortion	-5 dBc max.	
Start-up time	2 ms max.	
SSB phase noise (26.000 MHz)	-135 dBc / Hz, Typical at 1 kHz offset	
Short-term frequency stability	±1 ppb max. (Allan variance Tau = 0.1 sec.)	
IR reflow resistance	±1 ppm max. (referred to frequency before reflow)	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Standard frequencies (MHz)	16.368, 16.369, 19.200, 26.000, 27.456, 33.600, 38.400, 52.000	
Optional Operating Temperature* ⁴	Low limit / Symbol	-10°C / g -15°C / h -20°C / i -25°C / j -30°C / k -35°C / l -40°C / m
	High limit / Symbol	+55°C / ff +60°C / gg +65°C / hh +70°C / ii +75°C / jj +80°C / kk +85°C / ll

(*¹) Final part number to be assigned with package type, TCXO or VC-TCXO, input voltage, operating temperature and frequency. e.g. SXO-2016V-H-16.368MHz

(*²) Referred to nominal frequency before reflow soldering.

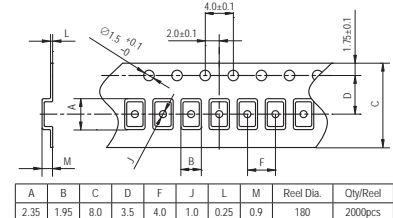
(*³) At Vcon = 1/2 VDD DC for SXO-2016V.

(*⁴) Select "low limit" and "high limit" for new operating temperature combination from the lists.

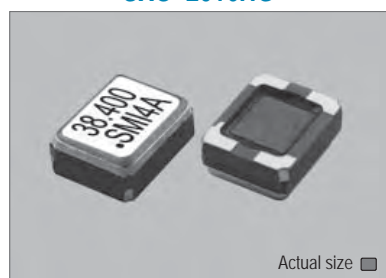
PACKAGE DATA

Item	Package	SXO-2016
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metallized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS

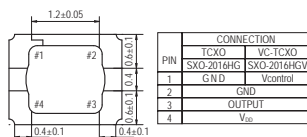
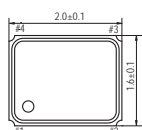


SXO-2016HG

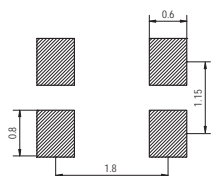


Actual size 0.0086 gm (wt.)

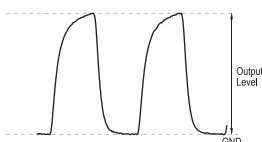
SXO-2016HG



SOLDERING PATTERN

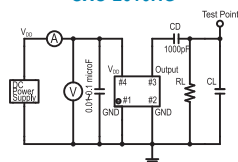


OUTPUT WAVEFORM



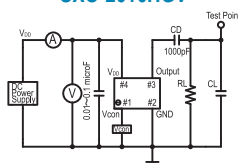
TEST CIRCUIT

SXO-2016HG



CD : DC-Out capacitance
RL : 10kOhm ± 10%
CL : 10pF ± 10% including fixture and probe capacitance

SXO-2016HGV



CD : DC-Out capacitance
RL : 10kOhm ± 10%
CL : 10pF ± 10% including fixture and probe capacitance

STANDARD SPECIFICATIONS

- GPS APPLICATION
- CLIPPED SINE WAVEFORM
- PACKAGE SIZE 2.0x1.6 mm

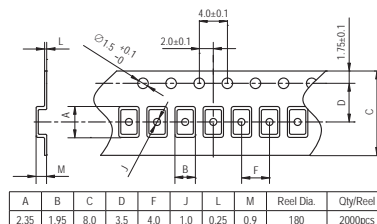
Item	Specifications	
General part number	SXO-2016HG*1	SXO-2016HGV*1
Frequency range	13.000 MHz to 52.000 MHz	
Initial frequency tolerance at +25°C ± 2°C	±1.5 ppm max.*2	±1.5 ppm max. (Vcon = 1/2 VDD)*2
TCXO or VC-TCXO	TCXO	VC-TCXO
Frequency Stability	Temperature range	±0.5 ppm max. over -30°C to +85°C (referred to +25°C)*3
	Input voltage change	±0.1 ppm max. at VDD ±5% DC
	Output load change	±0.1 ppm max. at 10 kΩ ±10% with 10 pF ±10%
	Aging	±1.0 ppm max. per year at +25°C ±3°C
Operating Conditions	Operating temperature	-30°C to +85°C (Standard) -40°C to +85°C (W = Option, frequency dependent)
	Supply voltage (VDD)	D = +1.8V, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC ±5%
	Control voltage (Vcon)	n.a. +0.9V ± 0.8V (VDD = +1.8V) 1/2 VDD ± 1V (VDD = +2.5V to +3.3V)
Absolute Max. Ratings	Supply voltage	-0.6V to +4.6V DC
	Vcontrol voltage (Vcon)	n.a. -0.6V to VDD +0.6V DC
	Storage temperature	-40°C to +85°C
Input current	1.5 mA max. (13.000 MHz to 30.000 MHz) 1.7 mA max. (30.000 MHz to 40.000 MHz) 2 mA max. (40.000 MHz to 52.000 MHz)	
	Level	0.8 Vp-p min.
	Load	10 kΩ // 10 pF
Output (-40°C to +85°C)	Waveform	Clipped sine wave (DC-coupling)
	Frequency Adjustment	n.a. ±8 ppm to ±13 ppm (VDD = +1.8V) ±9 ppm to ±15 ppm (VDD = +2.5V to +3.3V)
Frequency slope	n.a.	Positive
Harmonic distortion	-5 dBc max.	
Start-up time	2 ms max. (Vout ≥ 90%Vp-p) 2 ms max. (within ±0.5 ppm)	
SSB phase noise	-135 dBc / Hz, Typical at 1 kHz offset	
Frequency slope vs. temperature	±0.1 ppm / °C max. : (-20°C to +75°C) ±0.3 ppm / °C max. : (-30°C to +85°C)	
	Short-term frequency stability	±1 ppb max. (Allan variance Tau = 0.1 sec.)
IR reflow resistance	±1 ppm max. (referred to frequency before reflow)	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Standard frequencies (MHz)	16.368, 16.369, 19.200, 26.000, 27.456, 33.600, 38.400, 52.000	
Optional Operating Temperature*4	Low limit / Symbol	-10°C / g -15°C / h -20°C / i -25°C / j -30°C / k -35°C / l -40°C / m
	High limit / Symbol	+55°C / ff +60°C / gg +65°C / hh +70°C / ii +75°C / jj +80°C / kk +85°C / ll

(*1) Final part number to be assigned with package type, TCXO or VC-TCXO, input voltage, operating temperature and frequency. e.g. SXO-2016HG-J-S-16.369MHz
 (*2) Referred to nominal frequency before reflow soldering.
 (*3) At Vcon = 1/2VDD DC for SXO-2016HG
 (*4) Select "low limit" and "high limit" for new operating temperature combination from the lists.

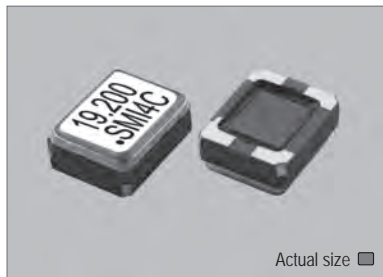
PACKAGE DATA

Item	Package	SXO-2016HG
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metallized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS

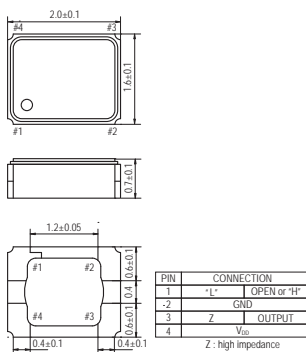


SXO-2016HGED

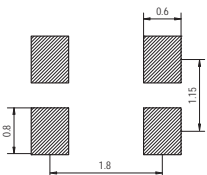


Actual size
0.0086 gm (wt.)

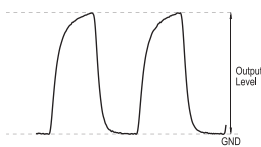
SXO-2016HGED



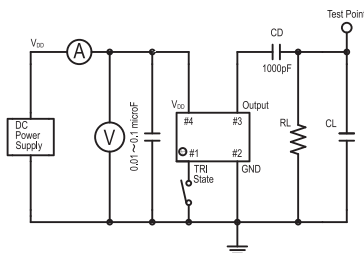
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



CD: DC-Cut capacitance
RL: 10Kohm ± 10%
CL: 10pF ± 10% including fixture and probe capacitance

STANDARD SPECIFICATIONS

- ENABLE / DISABLE OUTPUT CONTROL
- GPS APPLICATION
- CLIPPED SINE WAVEFORM
- PACKAGE SIZE 2.0x1.6 mm

Item	Specifications	
General part number	SXO-2016HGED ^{*1}	
Frequency range	13.000 MHz to 52.000 MHz	
Initial frequency tolerance at +25°C ±2°C	±1.5 ppm max. ^{*2}	
Frequency Stability	Temperature range	±0.5 ppm max. over -30°C to +85°C (referred to +25°C)
	Input voltage change	±0.1 ppm max. at V _{DD} ±5% DC
	Output load change	±0.1 ppm max. at 10 kΩ ±10% with 10 pF ±10%
	Aging	±1 ppm max. per year at +25°C ±3°C
Operating Conditions	Operating temperature	-30°C to +85°C (Standard) -40°C to +85°C (W = Option, frequency dependent)
	Supply voltage (V _{DD})	D = +1.8V, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC ±5%
	E/D control voltage (Pin#1)	V _{IH} : 80% V _{DD} min. (Enable) V _{IL} : 20% V _{DD} max. (Disable)
Absolute Max. Ratings	Supply voltage	-0.6V to +4.6V DC
	E/D control voltage (Pin#1)	-0.6V to V _{DD} +0.6V (+4.6V max.)
Input current	Storage temperature	-40°C to +85°C
	Disable current	2 μA max. (Pin#1 = V _{IL})
	Output (-40°C to +85°C)	Level: 0.8 V _{p-p} min. Load: 10 kΩ // 10 pF Waveform: Clipped sine wave (DC-coupling)
Harmonic distortion	-5 dBc max.	
Start-up time	2 ms max.	
SSB phase noise	-135 dBc / Hz, Typical at 1 kHz offset	
Short-term frequency stability	±1 ppb max. (Allan variance Tau = 0.1 sec.)	
IR reflow resistance	±1 ppm max. (referred to frequency before reflow)	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Standard frequencies (MHz)	16.368, 16.369, 19.200, 26.000, 27.456, 33.600, 38.400, 52.000	
Optional Operating Temperature ^{*3}	Low limit / Symbol	-10°C / g -15°C / h -20°C / i -25°C / j -30°C / k -35°C / l -40°C / m
	High limit / Symbol	+55°C / ff +60°C / gg +65°C / hh +70°C / ii +75°C / jj +80°C / kk +85°C / ll

(^{*1}) Final part number to be assigned with package type, input voltage, operating temperature and frequency.
e.g. SXO-2016HGED-F-W-26MHz

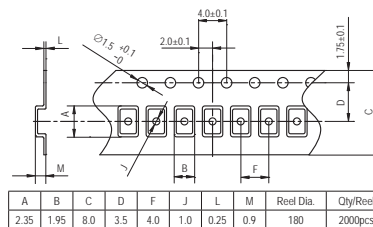
(^{*2}) Referred to nominal frequency before reflow soldering.

(^{*3}) Select "low limit" and "high limit" for new operating temperature combination from the lists.

PACKAGE DATA

Item	Package	SXO-2016HGED
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLK OSC

VCXO

TCXO

OCXO

MCF

SXO-2200 SERIES (+1.8V to +3.3V FIXED MODELS) 2.5x2.0 mm

STANDARD SMD TCXO

XTAL

CLK OSC

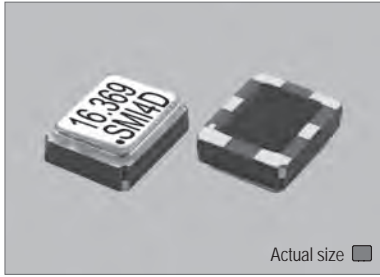
VCXO

TCXO

OCXO

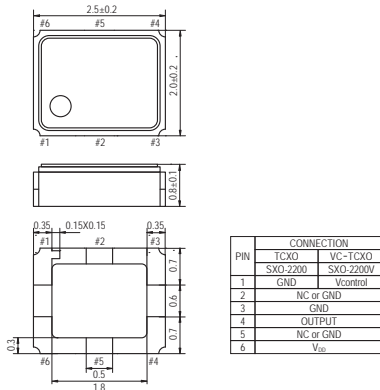
MCF

SXO-2200

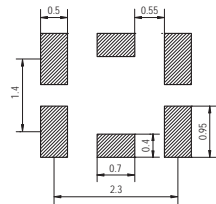


Actual size
0.014 gm (wt.)

SXO-2200



SOLDERING PATTERN

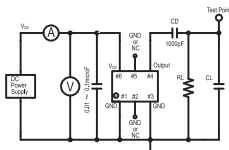


OUTPUT WAVEFORM



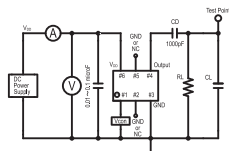
TEST CIRCUIT

SXO-2200



CD : DC-Cut capacitance
RL : 10kOhm ± 10%
CL : 10pF ± 10% including fixture and probe capacitance

SXO-2200V



CD : DC-Cut capacitance
RL : 10kOhm ± 10%
CL : 10pF ± 10% including fixture and probe capacitance

STANDARD SPECIFICATIONS

● CLIPPED SINE WAVEFORM
● PACKAGE SIZE 2.5x2.0 mm

Item	Specifications	
General part number	SXO-2200* ¹	SXO-2200V* ¹
Frequency range	13.000 MHz to 52.000 MHz	
Initial frequency tolerance at +25°C ±2°C	±1.5 ppm max.* ²	±1.5 ppm max. (V _{CON} = 1/2 V _{DD})* ²
TCXO or VC-TCXO	TCXO	VC-TCXO
Frequency Stability	Temperature range	±2 ppm max. over -30°C to +85°C (referred to +25°C)* ³
	Input voltage change	±0.2 ppm max. at V _{DD} ± 5% DC
	Output load change	±0.2 ppm max. at 10 kΩ ±10% with 10 pF ±10%
	Aging	±1 ppm max. per year at +25°C ±3°C
Operating Conditions	Operating temperature	-30°C to +85°C (Standard) -40°C to +85°C (W = Option, frequency dependent)
	Supply voltage (V _{DD})	D = +1.8V, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC ± 5%
	Control voltage (V _{CON})	n.a. +0.9V ± 0.8V (V _{DD} = +1.8V) 1/2 V _{DD} ± 1V (V _{DD} = +2.5V to +3.3V)
Absolute Max. Ratings	Supply voltage	-0.6V to +4.6V DC
	V _{control} voltage (V _{CON})	n.a. -0.6V to V _{DD} +0.6V DC
	Storage temperature	-40°C to +85°C
Input current	1.5 mA max. (13.000 MHz to 30.000 MHz) 1.7 mA max. (30.000 MHz to 40.000 MHz) 2 mA max. (40.000 MHz to 52.000 MHz)	
Output (-40°C to +85°C)	Level	0.8 V _{p-p} min.
	Load	10 kΩ // 10 pF
	Waveform	Clipped sine wave (DC-coupling)
Frequency Adjustment	Voltage control (V _{CON})	±8 to ±13 ppm (V _{DD} = +1.8V)
		±9 to ±15 ppm (V _{DD} = +2.5V to +3.3V)
Frequency slope	n.a.	Positive
Harmonic distortion	-5 dBc max.	
Start-up time	2 ms max.	
SSB phase noise (26.000 MHz)	-135 dBc / Hz, Typical at 1 kHz offset	
Short-term frequency stability	±1 ppb max. (Allan variance Tau = 0.1 sec.)	
IR reflow resistance	±1 ppm max. (referred to frequency before reflow)	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Standard frequencies (MHz)	16.368, 16.369, 19.200, 26.000, 27.456, 33.600, 38.400, 52.000	
Optional Operating Temperature* ⁴	Low limit / Symbol	-10°C / g -15°C / h -20°C / i -25°C / j -30°C / k -35°C / l -40°C / m
	High limit / Symbol	+55°C / ff +60°C / gg +65°C / hh +70°C / ii +75°C / jj +80°C / kk +85°C / ll

(*¹) Final part number to be assigned with package type, TCXO or VC-TCXO, input voltage, operating temperature and frequency. e.g. SXO-2200-F-W-26MHz

(*²) Referred to nominal frequency before reflow soldering.

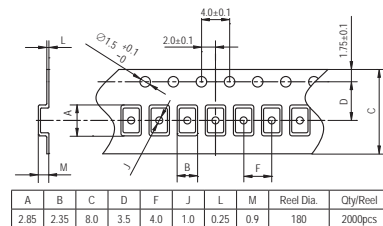
(*³) At V_{CON} = 1/2 V_{DD} DC for SXO-2200V

(*⁴) Select "low limit" and "high limit" for new operating temperature combination from the lists.

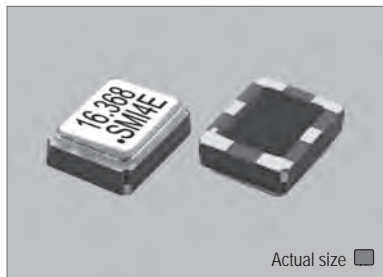
PACKAGE DATA

Item	Package	SXO-2200
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS

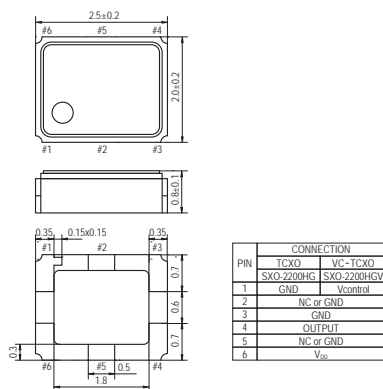


SXO-2200HG

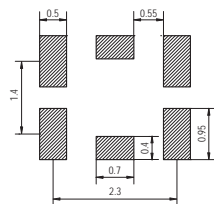


Actual size 0.014 gm (wt.)

SXO-2200HG



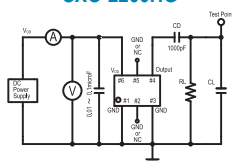
SOLDERING PATTERN



OUTPUT WAVEFORM

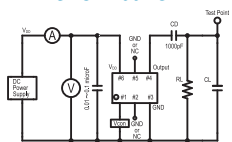


TEST CIRCUIT SXO-2200HG



CD : DC-Cut capacitance
RL : 10Kohm ± 10%
CL : 10pF ± 10% including fixture and probe capacitance

SXO-2200HGV



CD : DC-Cut capacitance
RL : 10Kohm ± 10%
CL : 10pF ± 10% including fixture and probe capacitance

STANDARD SPECIFICATIONS

- GPS APPLICATION
- CLIPPED SINE WAVEFORM
- PACKAGE SIZE 2.5x2.0 mm

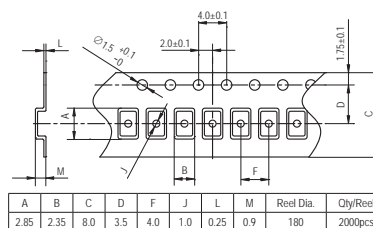
Item	Specifications	
General part number	SXO-2200HG* ¹	SXO-2200HGV* ¹
Frequency range	13.000 MHz to 52.000 MHz	
Initial frequency tolerance at +25°C ±2°C	±1.5 ppm max.* ²	±1.5 ppm max. (V _{CON} = 1/2 V _{DD})* ²
TCXO or VC-TCXO	TCXO	VC-TCXO
Frequency Stability	Temperature range	±0.5 ppm max. over -30°C to +85°C (referred to +25°C)* ³
	Input voltage change	±0.2 ppm max. at V _{DD} ±5% DC
	Output load change	±0.2 ppm max. at 10 kΩ ±10% with 10 pF ±10%
	Aging	±1 ppm max. per year at +25°C ±3°C
Operating Conditions	Operating temperature	-30°C to +85°C (Standard) -40°C to +85°C (W = Option, frequency dependent)
	Supply voltage (V _{DD})	D = +1.8V, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC ±5%
	Control voltage (Vcon)	n.a. +0.9V ±0.8V (V _{DD} = +1.8V) 1/2 V _{DD} ±1V (V _{DD} = +2.5V to +3.3V)
Absolute Max. Ratings	Supply voltage	-0.6V to +4.6V DC
	Vcontrol voltage (Vcon)	n.a. -0.6V to V _{DD} +0.6V DC
	Storage temperature	-40°C to +85°C
Input current	1.5 mA max. (13.000 MHz to 30.000 MHz) 1.7 mA max. (30.000 MHz to 40.000 MHz) 2 mA max. (40.000 MHz to 52.000 MHz)	
	Output (-40°C to +85°C)	Level: 0.8 Vp-p min. Load: 10 kΩ // 10 pF Waveform: Clipped sine wave (DC-coupling)
	Frequency Adjustment	Voltage control (Vcon): n.a. ±8 ppm to ±13 ppm (V _{DD} = +1.8V) ±9 ppm to ±15 ppm (V _{DD} = +2.5V to +3.3V)
Frequency slope	n.a.	Positive
Harmonic distortion	-5 dBc max.	
Start-up time	2 ms max.	
SSB phase noise (26.000 MHz)	-135 dBc / Hz, Typical at 1 kHz offset	
Short-term frequency stability	±1 ppb max. (Allan variance Tau = 0.1 sec.)	
IR reflow resistance	±1 ppm max. (referred to frequency before reflow)	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Standard frequencies (MHz)	16.368, 16.369, 19.200, 26.000, 27.456, 33.600, 38.400, 52.000	
Optional Operating Temperature* ⁴	Low limit / Symbol	-10°C / g -15°C / h -20°C / i -25°C / j -30°C / k -35°C / l -40°C / m
	High limit / Symbol	+55°C / ff +60°C / gg +65°C / hh +70°C / ii +75°C / jj +80°C / kk +85°C / ll

(*¹) Final part number to be assigned with package type, TCXO or VC-TCXO, input voltage, operating temperature and frequency. e.g. SXO-2200HG-H-38.4MHz
 (*²) Referred to nominal frequency before reflow soldering.
 (*³) At Vcon = 1/2 V_{DD} DC for SXO-2200HGV.
 (*⁴) Select "low limit" and "high limit" for new operating temperature combination from the lists.

PACKAGE DATA

Item	Package	SXO-2200HG
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



SXO-2200HGED SERIES (+1.8V to +3.3V FIXED MODELS) 2.5x2.0 mm

STANDARD SMD TCXO

XTAL

CLK OSC

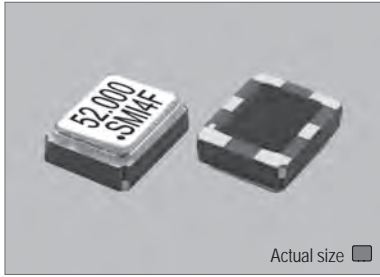
VCXO

TCXO

OCXO

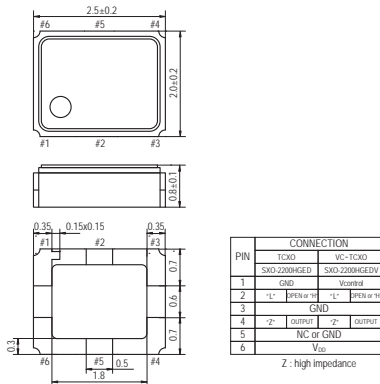
MCF

SXO-2200HGED

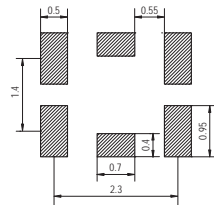


0.014 gm (wt.)

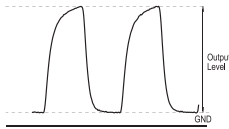
SXO-2200HGED



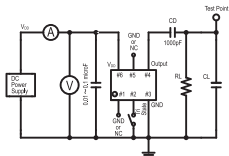
SOLDERING PATTERN



OUTPUT WAVEFORM

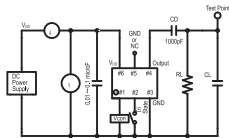


TEST CIRCUIT SXO-2200HGED



CD : DC-Cut capacitance
RL : 10kΩ±10%
CL : 10pF ±10% including fixture and probe capacitance

SXO-2200HGEDV



CD : DC-Cut capacitance
RL : 10kΩ±10%
CL : 10pF ±10% including fixture and probe capacitance

STANDARD SPECIFICATIONS

- ENABLE / DISABLE OUTPUT CONTROL
- GPS APPLICATION
- CLIPPED SINE WAVEFORM
- PACKAGE SIZE 2.5x2.0 mm

Item		Specifications	
General part number		SXO-2200HGED*1	SXO-2200HGEDV*1
Frequency range		13.000 MHz to 52.000 MHz	
Initial frequency tolerance at +25°C ±2°C		±1.5 ppm max.*2	±1.5 ppm max. (Vcon = 1/2 VDD)*2
TCXO or VC-TCXO		TCXO	VC-TCXO
Frequency Stability	Temperature range	±0.5 ppm max. over -30°C to +85°C (referred to +25°C)*3	
	Input voltage change	±0.2 ppm max. at VDD ±5% DC	
	Output load change	±0.2 ppm max. at 10 kΩ ±10% with 10 pF ±10%	
	Aging	±1 ppm max. per year at +25°C ±3°C	
Operating Conditions	Operating temperature	-30°C to +85°C (Standard) -40°C to +85°C (W = Option, frequency dependent)	
	Supply voltage (VDD)	D = +1.8V, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC ±5%	
	Control voltage (Vcon)	n.a.	+0.9V ±0.8V (VDD = +1.8V) 1/2 VDD ±1V (VDD = +2.5V to +3.3V)
	E/D control voltage (Pin#2)	V _H : 80% VDD min. (Enable) V _L : 20% VDD max. (Disable)	
Absolute Max. Ratings	Supply voltage	-0.6V to +4.6V DC	
	Vcontrol voltage (Vcon)	n.a.	-0.6V to VDD +0.6V DC
	E/D control voltage (Pin#2)	-0.6V to VDD +0.6V (+4.6V max.)	
Input current	Storage temperature	-40°C to +85°C	
	Supply current	1.5 mA max. (13.000 MHz to 30.000 MHz) 1.7 mA max. (30.000 MHz to 40.000 MHz) 2 mA max. (40.000 MHz to 52.000 MHz)	
Disable current		2 μA max. (Pin#2 = V _L)	
Output (-40°C to +85°C)	Level	0.8 Vp-p min.	
	Load	10 kΩ // 10 pF	
	Waveform	Clipped sine wave (DC-coupling)	
Frequency Adjustment	Voltage control (Vcon)	n.a.	±8 ppm to ±13 ppm (VDD = +1.8V) ±9 ppm to ±15 ppm (VDD = +2.5V to +3.3V)
	Frequency slope	n.a.	Positive
Harmonic distortion		-5 dBc max.	
Start-up time		10 ms max.	
SSB phase noise (26.000 MHz)		-135 dBc / Hz, Typical at 1 kHz offset	
Frequency slope vs. temperature		±0.1 ppm / °C max. (-20°C to +75°C) ±0.3 ppm / °C max. (-30°C to +85°C)	
Short-term frequency stability		±1 ppb max. (Allan variance Tau = 0.1 sec.)	
IR reflow resistance		±1 ppm max. (referred to frequency before reflow)	
Reflow condition		+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Standard frequencies (MHz)		16.368, 16.369, 19.200, 26.000, 27.456, 33.600, 38.400, 52.000	
Operational Operating Temperature*4	Low limit / Symbol	-10°C / g	-15°C / h
	High limit / Symbol	+55°C / ff	+60°C / gg
		+20°C / i	+25°C / j
		+30°C / k	+35°C / l
		+40°C / m	+45°C / n
		+50°C / o	+55°C / p
		+60°C / q	+65°C / r
		+70°C / s	+75°C / t
		+80°C / u	+85°C / v

(*1) Final part number to be assigned with package type, TCXO or VC-TCXO, input voltage, operating temperature and frequency. e.g. SXO-2200HGED-J-52MHz

(*2) Referred to nominal frequency before reflow soldering.

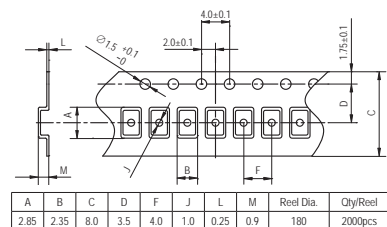
(*3) At Vcon = 1/2 VDD DC for SXO-2200HGEDV.

(*4) Select "low limit" and "high limit" for new operating temperature combination from the lists.

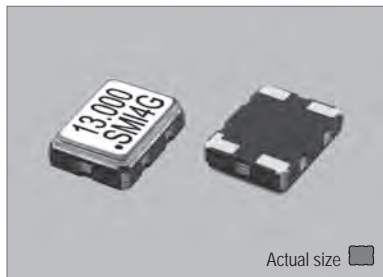
PACKAGE DATA

Item	Package	SXO-2200HGED
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS

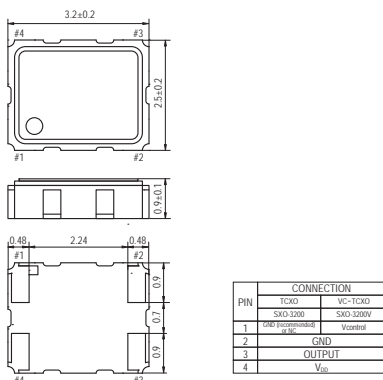


SXO-3200

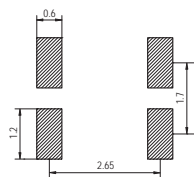


Actual size
0.024 gm (wt.)

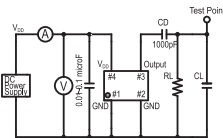
SXO-3200



SOLDERING PATTERN

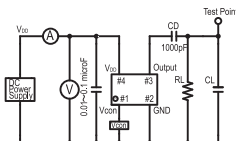


TEST CIRCUIT SXO-3200



CD: DC-Cut capacitance
RL: 10kΩ ± 10%
CL: 10pF ± 10% including fixture and probe capacitance

SXO-3200V



CD: DC-Cut capacitance
RL: 10kΩ ± 10%
CL: 10pF ± 10% including fixture and probe capacitance

STANDARD SPECIFICATIONS

- CLIPPED SINE WAVEFORM
- PACKAGE SIZE 3.2x2.5 mm

Item	Specifications							
General part number	SXO-3200 ^{*1}	SXO-3200V ^{*1}						
Frequency range	10.000 MHz to 40.000 MHz							
Initial frequency tolerance at +25°C ±2°C	± 1.5 ppm max. ^{*2}	± 1.5 ppm max. (Vcon = 1/2 VDD) ^{*2}						
TCXO or VC-TCXO	TCXO	VC-TCXO						
Frequency Stability	Temperature range	±2.5 ppm max. over -30°C to +75°C (referred to +25°C) ³						
	Input voltage change	±0.3 ppm max. at VDD ±5% DC						
	Output load change	±0.2 ppm max. at 10 kΩ ±10% with 10 pF ±10%						
	Aging	±1 ppm max. per year at +25°C ± 3°C						
Operating Conditions	Operating temperature	-30°C to +75°C (Standard) -40°C to +85°C (W = Option, frequency dependent)						
	Supply voltage (VDD)	D = +1.8V, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC ±5%						
Absolute Max. Ratings	Control voltage (Vcon)	n.a. 1/2 VDD ±0.8V (VDD = +1.8V) 1/2 VDD ±1V (VDD = +2.5V to +3.3V)						
	Supply voltage	-0.6V to +4.6V DC						
Input current	Vcontrol voltage (Vcon)	n.a.						
	Storage temperature	-40°C to +85°C						
Output (-40°C to +85°C)	Supply voltage	-0.6V to +4.6V DC						
	Vcontrol voltage (Vcon)	n.a.						
	Storage temperature	-40°C to +85°C						
Frequency Adjustment	Level	1.5 mA max. (10.000 MHz to 30.000 MHz) 1.7 mA max. (30.000 MHz to 40.000 MHz)						
	Load	0.8 Vp-p min. 10 kΩ // 10 pF						
	Waveform	Clipped sine wave (DC-coupling)						
Frequency slope	Voltage control	n.a.	±8 ppm to ±13 ppm (VDD = +1.8V) ±9 ppm to ±15 ppm (VDD = +2.5V to +3.3V)					
		n.a.	positive					
Harmonic distortion	-5 dBc max.							
Start-up time	2 ms max.							
SSB phase noise (26.000 MHz)	-135 dBc / Hz, Typical at 1 kHz offset							
Short-term frequency stability	±1 ppb max. (Allan variance Tau = 0.1 sec.)							
IR reflow resistance	±1 ppm max. (referred to frequency before reflow)							
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)							
Standard frequencies (MHz)	10.000, 12.000, 12.288, 12.800, 13.000, 14.000, 14.7456, 15.000, 15.360, 16.000, 16.384, 16.639, 16.800, 18.000, 19.000, 19.440, 19.680, 20.000, 21.250, 22.400, 24.000, 24.576, 25.000, 26.000, 38.400, 40.000							
Optional Operating Temperature ^{*4}	Low limit / Symbol	-10°C / g	-15°C / h	-20°C / i	-25°C / j	-30°C / k	-35°C / l	-40°C / m
	High limit / Symbol	+55°C / ff	+60°C / gg	+65°C / hh	+70°C / ii	+75°C / jj	+80°C / kk	+85°C / ll

(*) Final part number to be assigned with package type, TCXO or VC-TCXO, input voltage, operating temperature and frequency. e.g. SXO-3200V-K-40MHz

(*) Referred to nominal frequency before reflow soldering.

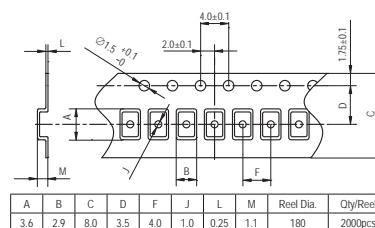
(*) At Vcon = 1/2 VDD DC for SXO-3200V.

(*) Select "low limit" and "high limit" for new operating temperature combination from the lists.

PACKAGE DATA

Item	Package	SXO-3200
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metallized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLK OSC

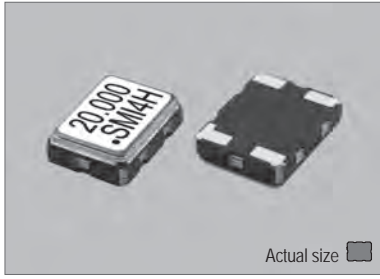
VCXO

TCXO

OCXO

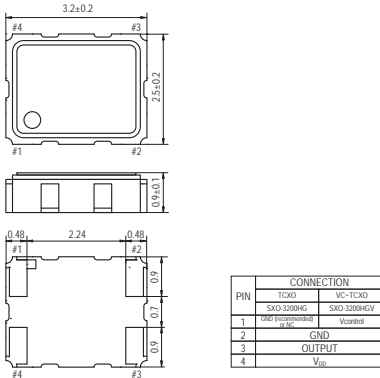
MCF

SXO-3200HG

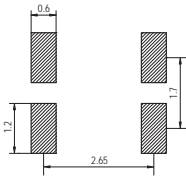


Actual size
0.024 gm (wt.)

SXO-3200HG



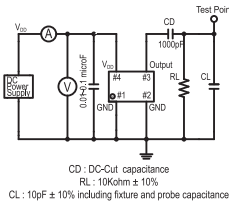
SOLDERING PATTERN



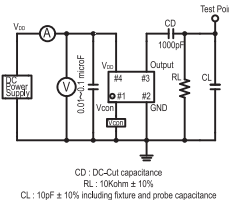
OUTPUT WAVEFORM



TEST CIRCUIT
SXO-3200HG



SXO-3200HGV



STANDARD SPECIFICATIONS

- GPS APPLICATION
- CLIPPED SINE WAVEFORM
- PACKAGE SIZE 3.2x2.5 mm

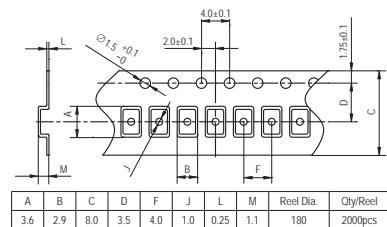
Item		Specifications						
General part number		SXO-3200HG*1	SXO-3200HGV*1					
Frequency range		10.000 MHz to 40.000 MHz						
Initial frequency tolerance at +25°C ±2°C		± 1.5 ppm max.*2	± 1.5 ppm max. (VCON = 1/2 VDD)*2					
TCXO or VC-TCXO		TCXO	VC-TCXO					
Frequency Stability	Temperature range	±0.5 ppm max. over -30°C to +85°C (referred to +25°C)*3						
	Input voltage change	±0.2 ppm max. at VDD ±5% DC						
	Output load change	±0.2 ppm max. at 10 kΩ ±10% with 10 pF ±10%						
	Aging	±1 ppm max. per year at +25°C ±3°C						
Operating Conditions	Operating temperature	-30°C to +85°C (Standard) -40°C to +85°C (W = Option, frequency dependent)						
	Supply voltage (VDD)	D = +1.8V, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC ±5%						
	Control voltage (Vcon)	n.a.	1/2 VDD ±0.8V (VDD = +1.8V) 1/2 VDD ± 1V (VDD = +2.5V to +3.3V)					
Absolute Max. Ratings	Supply voltage	-0.6V to +4.6V DC						
	Vcontrol voltage (Vcon)	n.a.						
	Storage temperature	-40°C to +85°C						
Input current		1.5 mA max. (10.000 MHz to 30.000 MHz) 1.7 mA max. (30.000 MHz to 40.000MHz)						
Output (-40°C to +85°C)	Level	0.8 Vp-p min.						
	Load	10 kΩ // 10 pF						
	Waveform	Clipped sine wave (DC-coupling)						
Frequency Adjustment	Voltage control (Vcon)	n.a.	±8 ppm to ±13 ppm (VDD = +1.8V) ±9 ppm to ±15 ppm (VDD = +2.5V to +3.3V)					
Frequency slope		n.a.	Positive					
Harmonic distortion		-5 dBc max.						
Start-up time		10 ms max.						
SSB phase noise (26.000 MHz)		-135 dBc / Hz, Typical at 1 kHz offset						
Short-term frequency stability		±1 ppb max. (Allan variance Tau = 0.1 sec.)						
IR reflow resistance		±1 ppm max. (referred to frequency before reflow)						
Reflow condition		+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)						
Standard frequencies (MHz)		10.000, 13.000, 16.367667, 16.368, 16.369, 16.800, 19.200, 20.000, 23.104, 24.5536, 25.000, 26.000, 38.400						
Optional Operating Temperature*4	Low limit / Symbol	-10°C / g	-15°C / h	-20°C / i	-25°C / j	-30°C / k	-35°C / l	-40°C / m
	High limit / Symbol	+55°C / ff	+60°C / gg	+65°C / hh	+70°C / ii	+75°C / jj	+80°C / kk	+85°C / ll

(*1) Final part number to be assigned with package type, TCXO or VC-TCXO, input voltage, operating temperature and frequency. e.g. SXO-3200HG-B-26MHz
 (*2) Referred to nominal frequency before reflow soldering.
 (*3) At Vcon = 1/2 VDD DC for SXO-3200HGV.
 (*4) Select "low limit" and "high limit" for new operating temperature combination from the lists.

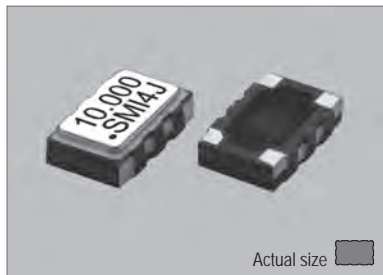
PACKAGE DATA

Item	Package	SXO-3200HG
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS

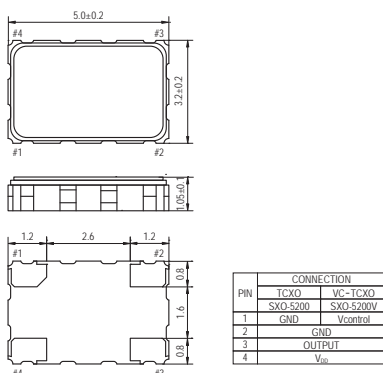


SXO-5200

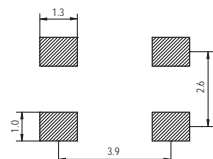


Actual size
0.06 gm (wt.)

SXO-5200



SOLDERING PATTERN

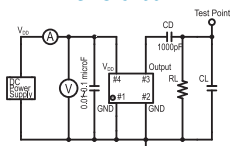


OUTPUT WAVEFORM



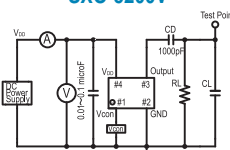
TEST CIRCUIT

SXO-5200



CD: DC-Cut capacitance
RL: 10kΩm ± 10%
CL: 10pF ± 10% including fixture and probe capacitance

SXO-5200V



CD: DC-Cut capacitance
RL: 10kΩm ± 10%
CL: 10pF ± 10% including fixture and probe capacitance

STANDARD SPECIFICATIONS

● CLIPPED SINE WAVEFORM
● PACKAGE SIZE 5.0x3.2 mm

Item	Specifications	
General part number	SXO-5200 ^{*1}	SXO-5200V ^{*1}
Frequency range	6.000 MHz to 45.000 MHz	
Initial frequency tolerance at +25°C ±2°C	±0.5 ppm max. ^{*2}	± 0.5 ppm max. (V _{CON} = ±1.5V) ^{*2}
TCXO or VC-TCXO	TCXO	VC-TCXO
Frequency Stability	Temperature range	±2.5 ppm max. over -30°C to +75°C (referred to +25°C) ^{*3}
	Input voltage change	±0.2 ppm max. at V _{DD} ±5% DC
	Output load change	±0.2 ppm max. at 10 kΩ ±10% with 10 pF ±10%
	Aging	±1 ppm max. per year at +25°C ±3°C
Operating Conditions	Operating temperature	-30°C to +75°C (Standard) -40°C to +85°C (W = Option, frequency dependent)
	Supply voltage (V _{DD})	H = +2.8V, J = +3.0V, K = +3.3V, N = +5.0V DC ±5%
	Control voltage (V _{CON})	n.a. / +1.5V ±1V
Absolute Max. Ratings	Supply voltage	-0.6V to +6.0V DC
	V _{control} voltage (V _{CON})	n.a. / -0.6V to V _{DD} +0.6V DC
	Storage temperature	-40°C to +85°C
Input current	1.5 mA max. (6.000 MHz to 20.000 MHz) 2 mA max. (20.000 MHz to 32.000 MHz) 2.5 mA max. (32.000 MHz to 45.000 MHz)	
Output (-40°C to +85°C)	Level	0.8 V _{p-p} min.
	Load	10 kΩ // 10 pF
	Waveform	Clipped sine wave (DC-coupling)
Frequency Adjustment	Voltage control (+1.5V ±1V)	n.a. / ±8 ppm min.
Frequency slope	n.a.	Positive
Harmonic distortion	-5 dBc max.	
Start-up time	2 ms max.	
SSB phase noise (26.000 MHz)	-135 dBc / Hz, Typical at 1 kHz offset	
Short-term frequency stability	±1 ppb max. (Allan variance Tau = 0.1 sec.)	
IR reflow resistance	±1 ppm max. (referred to frequency before reflow)	
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Standard frequencies (MHz)	8.000, 10.000, 12.000, 12.800, 13.000, 14.400, 16.368, 19.200, 19.800, 20.000, 25.5535, 26.000, 40.000	
Optional Operating Temperature ^{*4}	Low limit / Symbol	-10°C / g -15°C / h -20°C / i -25°C / j -30°C / k -35°C / l -40°C / m +55°C / ff +60°C / gg +65°C / hh +70°C / ii +75°C / jj +80°C / kk +85°C / ll
	High limit / Symbol	

(^{*1}) Final part number to be assigned with package type, TCXO or VC-TCXO, input voltage, operating temperature and frequency. e.g. SXO-5200V-N-W-26MHz

(^{*2}) Referred to nominal frequency before reflow soldering.

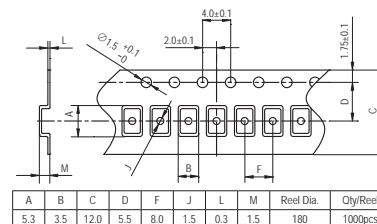
(^{*3}) At V_{CON} = +1.5V DC for SXO-5200V

(^{*4}) Select "low limit" and "high limit" for new operating temperature combination from the lists.

PACKAGE DATA

Item	Package	SXO-5200
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLK OSC

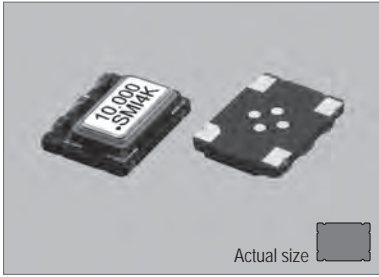
VCXO

TCXO

OCXO

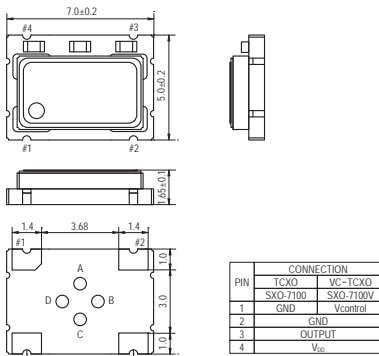
MCF

SXO-7100



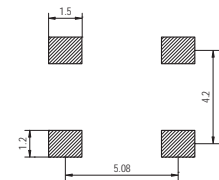
Actual size
0.165 gm (wt.)

SXO-7100



* The terminals (A,B,C & D) Not to be connected.
* No pattern path underneath the package.

SOLDERING PATTERN

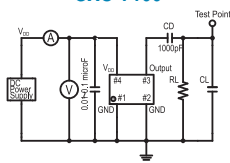


OUTPUT WAVEFORM



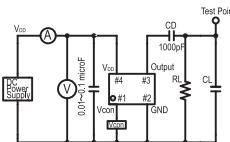
TEST CIRCUIT

SXO-7100



CD: DC-Cut capacitance
RL: 10kΩ±10%
CL: 10pF ± 10% including fixture and probe capacitance

SXO-7100V



CD: DC-Cut capacitance
RL: 10kΩ±10%
CL: 10pF ± 10% including fixture and probe capacitance

STANDARD SPECIFICATIONS

● CLIPPED SINE WAVEFORM
● PACKAGE SIZE 7.0x5.0 mm

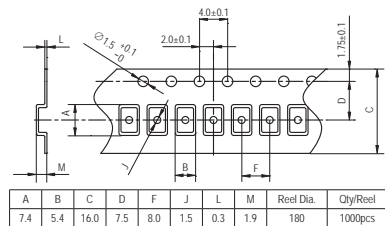
Item		Specifications						
General part number		SXO-7100* ²	SXO-7100V* ²					
Frequency range		10.000 MHz to 26.000 MHz						
Initial frequency tolerance at +25°C ±2°C		±0.5 ppm max.* ³	±0.5 ppm max. (V _{CON} = +1.5V) ³					
TCXO or VC-TCXO		TCXO	VC-TCXO					
Frequency Stability	Temperature range	±2.5 ppm max. over -30°C to +75°C (referred to +25°C) ⁴						
	Input voltage change	±0.2 ppm max. at V _{DD} ±5% DC						
	Output load change	±0.2 ppm max. at 10 kΩ ±10% with 10 pF ±10%						
	Aging	±1 ppm max. per year at +25°C ±3°C						
Operating Conditions	Operating temperature	-30°C to +75°C (Standard) -40°C to +85°C (W = Option, frequency dependent)						
	Supply voltage (V _{DD})	H = +2.8V, J = +3.0V, K = +3.3V, N = +5.0V DC ±5%						
	Control voltage (V _{CON})	n.a.	+1.5V ±1V DC					
Absolute Max. Ratings	Supply voltage	-0.6V to +6.0V DC						
	V _{control} voltage (V _{CON})	n.a.	-0.6V to V _{DD} +0.6V DC					
	Storage temperature	-40°C to +85°C						
Input current		2 mA max.						
Output (-40°C to +85°C)	Level	0.8 V _{p-p} min.						
	Load	10 kΩ // 10 pF						
	Waveform	Clipped sine wave (DC-cut)						
Frequency adjustment		n.a.						
Voltage control (+1.5V ±1V)		n.a.	±8 ppm min.					
Frequency slope		n.a.	Positive					
Harmonic distortion		-5 dBc max.						
Start-up time		2 ms max.						
SSB phase noise (26.000 MHz)		-130 dBc / Hz, Typical at 1 kHz offset						
Short-term frequency stability		±1 ppb max. (Allan variance Tau = 0.1 sec.)						
IR reflow resistance		±1 ppm max. (referred to frequency before reflow)						
Reflow condition		+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)						
Standard frequencies (MHz)		10.000, 12.800, 13.000, 14.400, 15.360, 19.200, 19.680, 26.000						
Optional Operating Temperature* ⁵	Low limit / Symbol	-10°C / g	-15°C / h	-20°C / i	-25°C / j	-30°C / k	-35°C / l	-40°C / m
	High limit / Symbol	+55°C / ff	+60°C / gg	+65°C / hh	+70°C / ii	+75°C / jj	+80°C / kk	+85°C / ll

(¹) Formerly SXO-7100AV(B)
 (²) Final part number to be assigned with package type, TCXO or VC-TCXO, input voltage, operating temperature and frequency.
 e.g. SXO-7100-K-15.36MHz
 (³) Referred to nominal frequency before reflow soldering.
 (⁴) At V_{CON} = +1.5 V DC for SXO-7100V.
 (⁵) Select "low limit" and "high limit" for new operating temperature combination from the lists.

PACKAGE DATA

Item	Package	SXO-7100
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



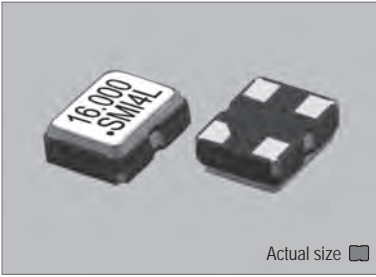
Temperature Compensated Crystal Oscillators

TCXO TRI-STATE ±2.5 ppm 4 to 54 MHz 2.5x2.0 mm +1.8 to +3.3 V CMOS

SXO-2520 (+1.8V to +3.3V FIXED MODELS) 2.5x2.0 mm

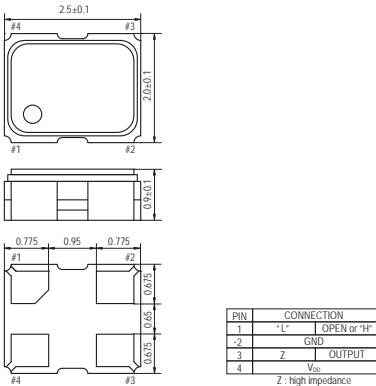
STANDARD SMD TCXO

SXO-2520

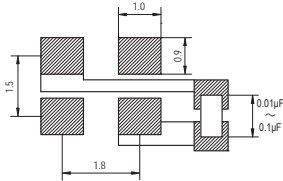


Actual size 0.014 gm (wt.)

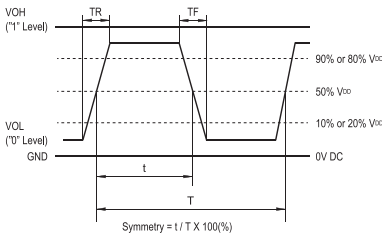
SXO-2520



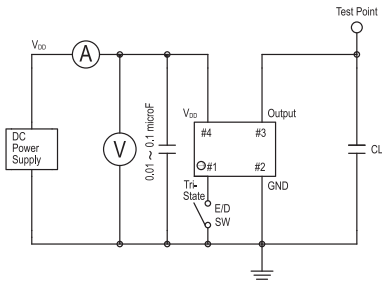
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

- ENABLE / DISABLE OUTPUT CONTROL
- CMOS OUTPUT
- PACKAGE SIZE 2.5x2.0 mm

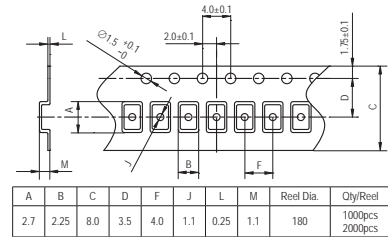
Item	Specifications					
General part number	SXO-2520*1					
Frequency range	4.000 MHz to 54.000 MHz					
Initial frequency tolerance at +25°C ±2°C	±1 ppm max.					
Frequency Stability	Temperature range	±2.5 ppm max. over -30°C to +75°C (referred to +25°C)*2				
	Input voltage change	±0.2 ppm max. at V _{DD} ±5% DC				
	Output load change	±0.2 ppm max. at 15 pF ±10%				
	Aging	±1 ppm max. per year at +25°C ±3°C				
Operating Conditions	Operating temperature	-30°C to +75°C (Standard) -40°C to +85°C (W = Option, frequency dependent)				
	Supply voltage (V _{DD})	D = +1.8V*2, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC ±5%				
Absolute Max. Ratings	Stand-by control voltage (Pin#1)	V _H : 80% V _{DD} min. V _L : 20% V _{DD} max.*2				
	Supply voltage	-0.5V to +4.0V DC				
Input current (max. mA)	Storage temperature	-55°C to +100°C				
Stand-by current*3		4 to 10 MHz	10 to 20 MHz	20 to 30 MHz	30 to 40 MHz	40 to 54 MHz
	+1.8V*2	3.1	3.7	4.2	4.6	5.5
	+2.5V	3.1	3.7	4.2	4.6	5.5
	+2.8V	3.4	4.1	4.7	5.2	6.0
	+3.3V	4.0	4.8	5.5	6.0	7.0
		10 µA max. (Pin#1 = V _L)... -40°C to +85°C				
Output (-40°C to +85°C)	Symmetry	45% to 55% at 1/2 V _{DD} level				
	Rise and fall times	5 ns max. (10% V _{DD} to 90% V _{DD} level)				
	"0" level	V _{OL} : 10% V _{DD} max.				
	"1" level	V _{OH} : 90% V _{DD} min.				
Load	15 pF max. (CMOS)					
Disable delay time	200 ns max.					
Enable delay time	10 ms max.					
Start-up time	10 ms max.					
SSB phase noise (24.000 MHz)	-145 dBc / Hz, Typical at 10 kHz offset					
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)					
Standard frequencies (MHz)	12.288, 16.000, 20.000, 24.000, 25.000, 32.000, 40.000, 44.000, 49.152					

(*1) Final part number to be assigned with package type, input voltage, operating temperature and frequency. e.g. SXO-2520-F-24MHz
 (*2) V_{DD} = +1.8 V is available for only allover ±5ppm max. of frequency stability.
 (*3) Internal crystal oscillation to be halted (Pin#1 = V_L)

PACKAGE DATA

Item	Package	SXO-2520
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLK OSC

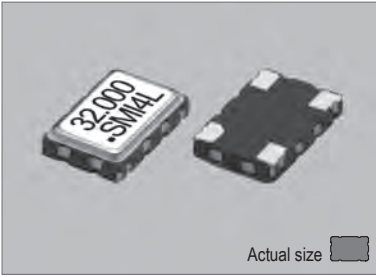
VCO

TCXO

OCXO

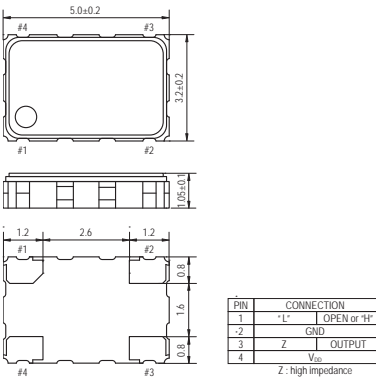
MCF

SXO-5032

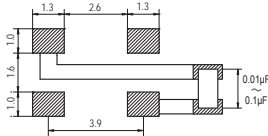


Actual size
0.052 gm (wt.)

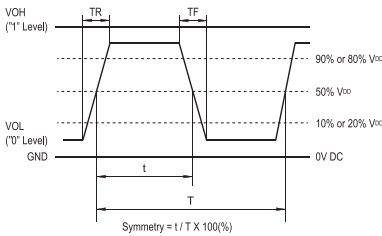
SXO-5032



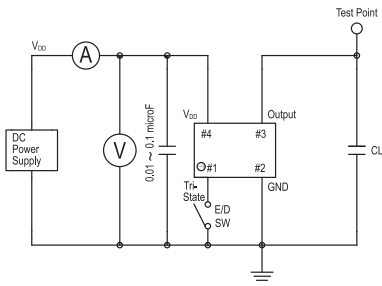
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



STANDARD SPECIFICATIONS

- CMOS OUTPUT
- HIGH STABILITY TCXO
- PACKAGE SIZE 5.0x3.2 mm

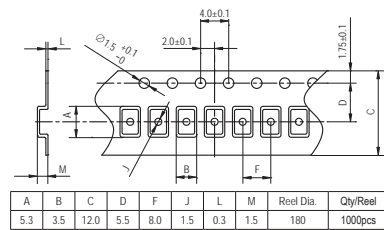
Item	Specifications						
General part number	SXO-5032*1						
Frequency range	4.000 MHz to 54.000 MHz						
Frequency Stability	Frequency tolerance at +25°C ±2°C	±1 ppm max. (1 hour after reflow soldering)					
	Temperature range	±2.5 ppm max. over -30°C to +75°C (referred to +25°C)*2					
	Input voltage change	±0.2 ppm max. at V _{DD} ±5% DC					
	Output load change	±0.2 ppm max. at 15 pF ±10%					
	Aging	±1 ppm max. per year at +25°C ±3°C					
Operating Conditions	Operating temperature	-30°C to +75°C (Standard) -40°C to +85°C (W = Option, frequency dependent)					
	Supply voltage (V _{DD})	D = +1.8V*2, F = +2.5V, H = +2.8V, K = +3.3V DC ±5%					
Absolute Max. Ratings	Stand-by control voltage(Pin#1)	V _{IH} : 80% V _{DD} min. V _{IL} : 20% V _{DD} max.*2					
	Supply voltage	-0.5V to +4V DC					
Input current (max. mA)	Storage temperature	-55°C to +100°C					
	4 to 10 MHz	10 to 20 MHz	20 to 30 MHz	30 to 40 MHz	40 to 54 MHz		
		+1.8V*2	3.1	3.7	4.2	4.6	5.5
		+2.5V	3.1	3.7	4.2	4.6	5.5
		+2.8V	3.4	4.1	4.7	5.2	6.0
		+3.3 V	4.0	4.8	5.5	6.0	7.0
		Stand-by current*3	10 µA max. (Pin#1 = V _{IL})				
Output (-40°C to +85°C)	Symmetry	40% to 60% at 50% V _{DD} level					
	Rise and fall times	5 ns max. (10% V _{DD} to 90% V _{DD} level)					
	"0" level	V _{OL} : 10% V _{DD} max.					
	"1" level	V _{OH} : 90% V _{DD} min.					
Load	15 pF max. (CMOS)						
Disable delay time	200 ns max.						
Enable delay time	10 ms max.						
Start-up time	10 ms max.						
SSB phase noise	-145 dBc / Hz, Typical at 10 kHz offset						
Reflow condition	+250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)						
Standard frequencies (MHz)	24.000, 25.000, 26.000, 27.000, 32.000, 40.000, 44.000, 50.000, 52.000						

(*1) Final part number to be assigned with package type, input voltage, operating temperature and frequency.
e.g. SXO-5032-H-S-32MHz
(*2) V_{DD} = +1.8V is available for only all over ±5 ppm max. of frequency stability.
(*3) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

PACKAGE DATA

Item	Package	SXO-5032
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metallized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



XTAL

CLK OSC

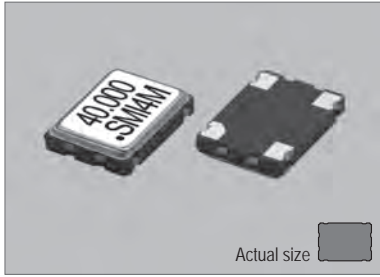
VCXO

TCXO

OCXO

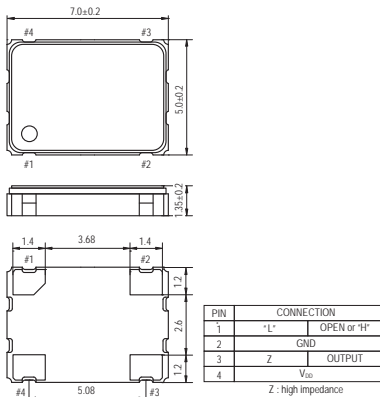
MCF

SXO-7050

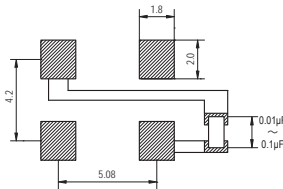


0.157 gm (wt.)

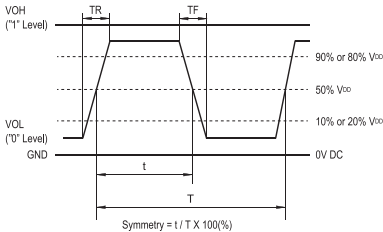
SXO-7050



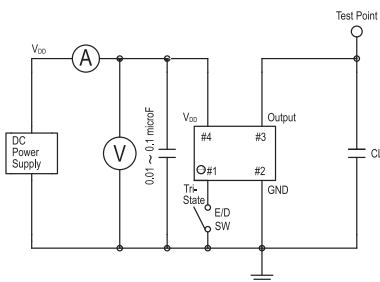
SOLDERING PATTERN



OUTPUT WAVEFORM



TEST CIRCUIT



CL: including fixture and probe capacitance.

STANDARD SPECIFICATIONS

- CMOS OUTPUT
- HIGH STABILITY TCXO
- PACKAGE SIZE 7.0x5.0 mm

Item	Specifications	
General part number	SXO-7050 ^{*1}	
Frequency range	4.000 MHz to 54.000 MHz	
Frequency Stability	Frequency tolerance at +25°C ±2°C	±1.5 ppm max. (1 hour after reflow soldering)
	Temperature range	±2.5 ppm max. over -30°C to +75°C (referred to +25°C) ^{*2}
	Input voltage change	±0.2 ppm max. at V _{DD} ±5% DC
	Output load change	±0.2 ppm max. at 15 pF ±10%
	Aging	±1 ppm max. per year at +25°C ±3°C
Operating Conditions	Operating temperature	-30°C to +75°C (Standard) -40°C to +85°C (W = Option, frequency dependent)
	Supply voltage (V _{DD})	D = +1.8V ^{*2} , F = +2.5V, H = +2.8V, K = +3.3V DC ±5%
Absolute Max. Ratings	Stand-by control voltage(Pin#1)	V _{IH} : 80% V _{DD} min. V _{IL} : 20% V _{DD} max. ^{*2}
	Supply voltage	-0.5V to +4V DC
Input current (max. mA)	Storage temperature	-55°C to +100°C
Stand-by current ^{*3}		10 µA max. (Pin#1 = V _{IL})
	Symmetry	45% to 55% at 50% V _{DD} level
	Rise and fall times	5 ns max. (10% V _{DD} to 90% V _{DD} level)
	"0" level	V _{OL} : 10% V _{DD} max.
	"1" level	V _{OH} : 90% V _{DD} min.
	Load	15 pF max. (CMOS)
Disable delay time	200 ns max.	
Enable delay time	10 ms max.	
Start-up time	10 ms max.	
SSB phase noise	-145 dBc / Hz, Typical at 10 kHz offset	
Reflow condition	+250°C ±10°C for 10 seconds +175°C ±10°C for 1 to 2 minutes (preheating)	
Standard frequencies (MHz)	16.000, 19.200, 20.000, 22.000, 24.000, 25.000, 32.000, 40.000, 44.000	

(*1) Final part number to be assigned with package type, input voltage, operating temperature and frequency. e.g. SXO-7050-K-S-44MHz

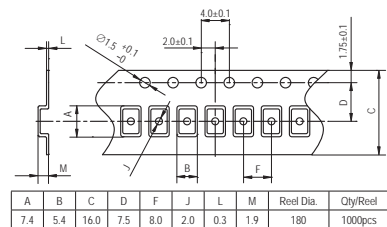
(*2) V_{DD} = +1.8V available for only allover ±5 ppm max. of frequency stability.

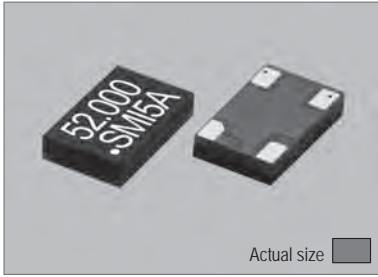
(*3) Internal crystal oscillation to be halted (Pin#1 = V_{IL})

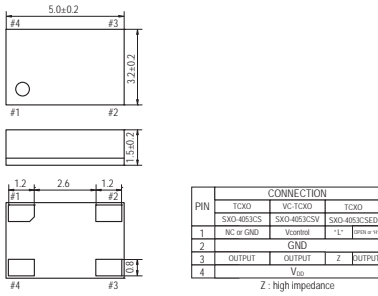
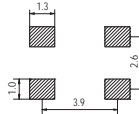
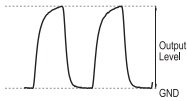
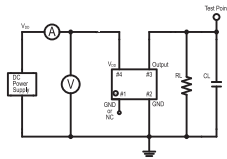
PACKAGE DATA

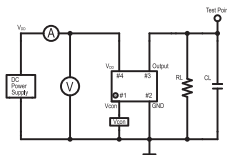
Item	Package	SXO-7050
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

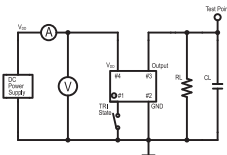
TAPE SPECIFICATIONS



SXO-4053CS

 Actual size
0.043 gm (wt.)

SXO-4053CS

SOLDERING PATTERN

OUTPUT WAVEFORM

TEST CIRCUIT
SXO-4053CS

 Both DC-Cut capacitor and by-pass capacitor are built in the oscillator.
RL: 10Kohm $\pm 10\%$
CL: 10pF $\pm 10\%$ including fixture and probe capacitance

SXO-4053CSV

 Both DC-Cut capacitor and by-pass capacitor are built in the oscillator.
RL: 10Kohm $\pm 10\%$
CL: 10pF $\pm 10\%$ including fixture and probe capacitance

SXO-4053CSEV

 Both DC-Cut capacitor and by-pass capacitor are built in the oscillator.
RL: 10Kohm $\pm 10\%$
CL: 10pF $\pm 10\%$ including fixture and probe capacitance

STANDARD SPECIFICATIONS

 ● CLIPPED SINE WAVEFORM
● PACKAGE SIZE 5.0x3.2 mm

Item	Specifications							
General part number	SXO-4053CS ^{*1}	SXO-4053CSV ^{*1}	SXO-4053CSED ^{*1}					
Frequency range	13.000 MHz to 52.000 MHz							
Initial frequency tolerance at +25°C $\pm 2^\circ\text{C}$	± 1.5 ppm max. ^{*2*3}							
TCXO or VC-TCXO	TCXO	VC-TCXO	TCXO					
Frequency Stability	Temperature range	DD/kj: ± 2 ppm max. : over -30°C to $+75^\circ\text{C}$ (referred to $+25^\circ\text{C}$) ³ CC/kl: ± 1.5 ppm max. : over -30°C to $+85^\circ\text{C}$ (referred to $+25^\circ\text{C}$) ³ BB/kl: ± 1 ppm max. : over -30°C to $+85^\circ\text{C}$ (referred to $+25^\circ\text{C}$) ³ AA/kl: ± 0.5 ppm max. : over -30°C to $+85^\circ\text{C}$ (referred to $+25^\circ\text{C}$) ³						
	Input voltage change	± 0.2 ppm max. at $V_{DD} \pm 5\%$ DC						
	Output load change	± 0.2 ppm max. at 10 k Ω $\pm 10\%$ with 10 pF $\pm 10\%$						
	Aging	± 1 ppm max. per year at $+25^\circ\text{C} \pm 3^\circ\text{C}$						
Operating Conditions	Operating temperature	-30°C to $+75^\circ\text{C}$ (S1 = Standard 1) -30°C to $+85^\circ\text{C}$ (S2 = Standard 2) -40°C to $+85^\circ\text{C}$ (W = Option, frequency dependent)						
	Supply voltage (V_{DD})	D = +1.8V, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC $\pm 5\%$						
	Control voltage (Pin#1)	n.a.	$1/2 V_{DD} \pm 0.8V$ ($V_{DD} = +1.8V$) $1/2 V_{DD} \pm 1V$ ($V_{DD} = +2.5V$ to $+3.3V$)	n.a.				
Absolute Max. Ratings	Stand-by control voltage (Pin#1)	n.a.						
	Supply voltage	-0.5V to +4V DC						
Input current	Vcontrol voltage (Pin#1)	n.a.	-0.6V to $V_{DD} + 0.6V$ DC					
	Storage temperature	-40°C to $+85^\circ\text{C}$						
Stand-by current (Pin#1 = V_{IL})	Supply voltage	1.5 mA max. (13.000 MHz to 30.000 MHz) 1.7 mA max. (30.000 MHz to 40.000 MHz) 2 mA max. (40.000 MHz to 52.000 MHz)						
	Level	0.8 Vp-p min.						
	Load	10 k Ω // 10 pF						
Output (-40°C to +85°C)	Waveform	Clipped sine wave (DC-cut)						
	Frequency Adjustment	Voltage control	n.a.	± 8 ppm to ± 13 ppm ($V_{DD} = +1.8V$) ± 9 ppm to ± 15 ppm ($V_{DD} = +2.5V$ to $+3.3V$)				
Frequency slope	n.a.		positive					
Disable delay time	n.a.		200 ns max.					
Enable delay time	n.a.		10 ms max.					
Start-up time	10 ms max.							
SSB phase noise (26.000 MHz)	-133 dBc / Hz, Typical at 1 kHz offset							
Short-term frequency stability	± 1 ppb max. (Allan variance Tau = 0.1 sec.)							
Reflow condition	$+250^\circ\text{C} \pm 10^\circ\text{C}$ for 10 seconds $+170^\circ\text{C} \pm 10^\circ\text{C}$ for 1 to 2 minutes (preheating)							
Standard frequencies (MHz)	16.368, 16.369, 19.200, 26.000, 27.456, 33.600, 38.400, 52.000							
Optional Operating Temperature ^{*4}	Low limit / Symbol	-10°C / g	-15°C / h	-20°C / i	-25°C / j	-30°C / k	-35°C / l	-40°C / m
	High limit / Symbol	+55°C / ff	+60°C / gg	+65°C / hh	+70°C / ii	+75°C / jj	+80°C / kk	+85°C / ll

^(*) Final part number to be assigned with package type, TCXO or VC-TCXO, frequency stability, input voltage, operating temperature and frequency.
e.g. SXO-4053CSED-BB/kl-K-S2-26MHz

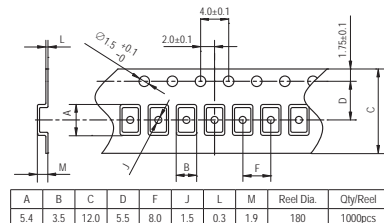
^(**) Referred to nominal frequency before reflow soldering.

^(***) At $V_{con} = 1/2 V_{DD}$ DC for SXO-4053CSV.

^(***) Select "low limit" and "high limit" for new operating temperature combination from the lists.

PACKAGE DATA

Item	Package	SXO-4053CS
Cover		Epoxy Resin
Base		Glass Epoxy
Sealing		Seam (Built-in crystal)
Terminal		Copper (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS


XTAL

CLK OSC

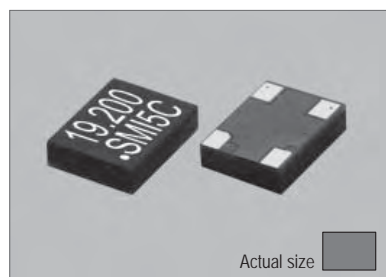
VCXO

TCXO

OCXO

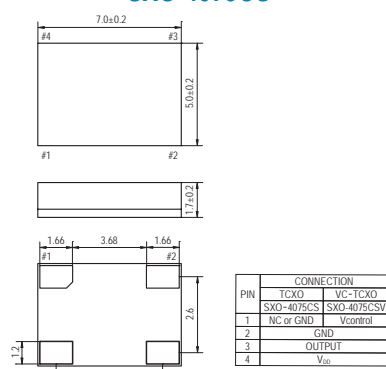
MCF

SXO-4075CS

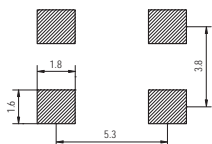


Actual size
0.13 gm (wt.)

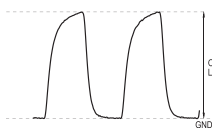
SXO-4075CS



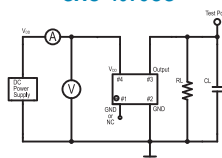
SOLDERING PATTERN



OUTPUT WAVEFORM

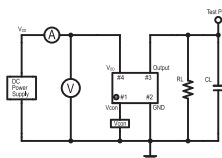


TEST CIRCUIT SXO-4075CS



Both DC-Cut capacitor and by-pass capacitor are built in the oscillator.
RL: 10Kohm ± 10%
CL: 10pF ± 10% including fixture and probe capacitance

SXO-4075CSV



Both DC-Cut capacitor and by-pass capacitor are built in the oscillator.
RL: 10Kohm ± 10%
CL: 10pF ± 10% including fixture and probe capacitance

STANDARD SPECIFICATIONS

● CLIPPED SINE WAVEFORM
● PACKAGE SIZE 7.0x5.0 mm

Item		Specifications	
General part number		SXO-4075CS*1	SXO-4075CSV*1
Frequency range		10.000 MHz to 40.000 MHz	
Initial frequency tolerance at +25°C ± 2°C		±1.5 ppm max.*2	±1.5 ppm max.*2*3
TCXO or VC-TCXO		TCXO	VC-TCXO
Frequency Stability	Temperature range	DD/kjj : ±2 ppm max. over -30°C to +75°C (referred to +25°C)*3 CC/kll : ±1.5 ppm max. over -30°C to +85°C (referred to +25°C)*3 BB/klj : ±1 ppm max. over -30°C to +85°C (referred to +25°C)*3 AA/klj : ±0.5 ppm max. over -30°C to +85°C (referred to +25°C)*3	
	Input voltage change	±0.2 ppm max. at VDD ±5% DC	
	Output load change	±0.2 ppm max. at 10 kΩ ±10% with 10 pF ±10%	
	Aging	±1 ppm max. per year at +25°C ±3°C	
Operating Conditions	Operating temperature	-30°C to +75°C (S1 = Standard 1) -30°C to +85°C (S2 = Standard 2) -40°C to +85°C (W = Option, frequency dependent)	
	Supply voltage (VDD)	D = +1.8V, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC ±5%	
	Control voltage (Pin#1)	n.a.	0.9V ± 0.8V (VDD = +1.8V) 1/2 VDD ±1V (VDD = +2.5V to +3.3V)
Absolute Max. Ratings	Supply voltage	-0.6V to +4.6V DC	
	Vcontrol voltage (Vcon)	n.a.	-0.6V to VDD +0.6V DC
	Storage temperature	-40°C to +85°C	
Input current		1.5 mA max. (10.000 MHz to 30.000 MHz) 1.7 mA max. (30.000 MHz to 40.000 MHz)	
Output (-40°C to +85°C)	Level	0.8 Vp-p min.	
	Load	10 kΩ // 10 pF	
	Waveform	Clipped sine wave (DC-cut)	
Frequency Adjustment	Voltage control	n.a.	±8 ppm to ±13 ppm (VDD = +1.8V) ±9 ppm to ±15 ppm (VDD = +2.5V to +3.3V)
		Positive	
Frequency slope		n.a.	Positive
Harmonic distortion		-5 dBc max.	
Start-up time		10 ms max.	
SSB phase noise (26.000 MHz)		-133 dBc / Hz, Typical at 1 kHz offset	
Short-term frequency stability		±1 ppb max. (Allan variance Tau = 0.1 sec.)	
IR reflow resistance		±1 ppm max. (referred to frequency before reflow)	
Reflow condition		+240°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Standard frequencies (MHz)		10.000, 13.000, 16.367667, 16.369, 16.800, 19.200, 20.000, 23.104 24.5536, 25.000, 26.000, 38.400	
Optional Operating Temperature*4	Low limit / Symbol	-10°C / g	-15°C / h
	High limit / Symbol	+55°C / ff	+60°C / gg

(*1) Final part number to be assigned with package type, TCXO or VC-TCXO, frequency stability, input voltage, operating temperature and frequency.
e.g. SXO-4075CSV-CC/klj-K-S2-19.2MHz

(*2) Referred to nominal frequency before reflow soldering.

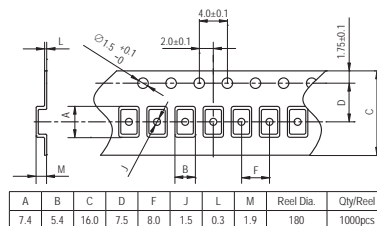
(*3) At Vcon = 1/2 VDD DC for SXO-4075CSV.

(*4) Select "low limit" and "high limit" for new operating temperature combination from the lists.

PACKAGE DATA

Item	Package	SXO-4075CS
Cover		Epoxy Resin
Base		Glass Epoxy
Sealing		Seam (Built-in crystal)
Terminal		Copper (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



SXO-4075CM SERIES (+1.8 V to +3.3 V FIXED MODELS) 7.0x5.0 mm

STANDARD SMD TCXO

XTAL

CLK OSC

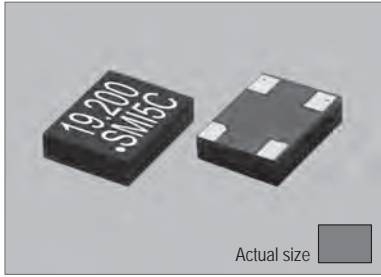
VCXO

TCXO

OCXO

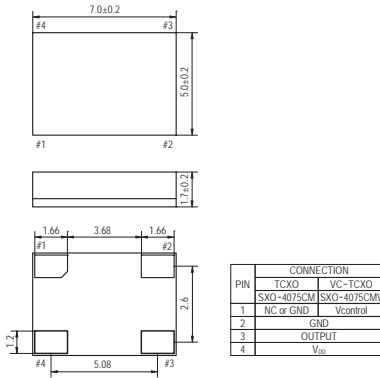
MCF

SXO-4075CM

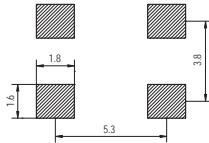


Actual size
0.13 gm (wt.)

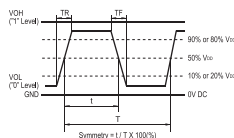
SXO-4075CM



SOLDERING PATTERN

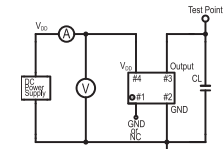


OUTPUT WAVEFORM



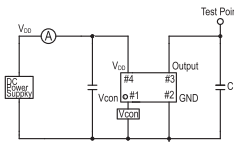
TEST CIRCUIT

SXO-4075CM



By-pass capacitor is built in the oscillator.
CL: including fixture and probe capacitance.

SXO-4075CMV



By-pass capacitor is built in the oscillator.
CL: including fixture and probe capacitance.

STANDARD SPECIFICATIONS

● CMOS OUTPUT
● PACKAGE SIZE 7.0x5.0 mm

Item	Specifications	
General part number	SXO-4075CM*1	SXO-4075CMV*1
Frequency range	10.000 MHz to 40.000 MHz	
Initial frequency tolerance at +25°C ±2°C	±1.5 ppm max.*2	±1.5 ppm max. (V _{CON} = 1/2 V _{DD})*2,3
TCXO or VC-TCXO	TCXO	VC-TCXO
Frequency Stability	Temperature range	DD/kjj: ±2 ppm max. over -30°C to +75°C (referred to +25°C)*3 CC/kll: ±1.5 ppm max. over -30°C to +85°C (referred to +25°C)*3 BB/kll: ±1 ppm max. over -30°C to +85°C (referred to +25°C)*3 AA/kll: ±0.5 ppm max. over -30°C to +85°C (referred to +25°C)*3
	Input voltage change	±0.2 ppm max. at V _{DD} ±5% DC
	Output load change	±0.2 ppm max. at 10 kΩ ±10% with 10 pF ±10%
	Aging	±1 ppm max. per year at +25°C ±3°C
	Operating Conditions	-30°C to +75°C (S1 = Standard 1) -30°C to +85°C (S2 = Standard 2) -40°C to +85°C (W = Option, frequency dependent)
Supply voltage (V _{DD})	D = +1.8V, F = +2.5V, H = +2.8V, J = +3.0V, K = +3.3V DC ±5%	
	Control voltage (Pin#1)	n.a. / 0.9V ±0.8V (V _{DD} = +1.8V) 1/2 V _{DD} ±1V (V _{DD} = +2.5V to +3.3V)
Absolute Max. Ratings	Supply voltage	-0.6V to +4.6V DC
	V _{control} voltage (V _{con})	n.a. / -0.6V to V _{DD} +0.6V DC
	Storage temperature	-40°C to +85°C
Input current	4 mA max. (10.000 MHz to 30.000 MHz) 6 mA max. (30.000 MHz to 40.000 MHz)	
Output (-40°C to +85°C)	Symmetry	40% to 50% at 1/2 V _{DD} level
	Rise and fall times	10 ns max. (10% V _{DD} to 90% V _{DD} level)
	"0" level	V _{OL} : 10% V _{DD} max.
	"1" level	V _{OH} : 90% V _{DD} min.
	Load	15 pF max. (CMOS)
Frequency Adjustment	Voltage control	±8 ppm to ±13 ppm (V _{DD} = +1.8V)
		±9 ppm to ±15 ppm (V _{DD} = +2.5V to +3.3V)
Frequency Slope	n.a.	Positive
Disable delay time	n.a.	200 ns max.
Enable delay time	n.a.	10 ms max.
Start-up time	10 ms max.	
SSB phase noise (26.000 MHz)	-133 dBc / Hz, Typical at 1 kHz offset	
Short-term frequency stability	±1 ppb max. (Allan variance Tau = 0.1 sec.)	
Reflow condition	+240°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)	
Standard frequencies (MHz)	10.000, 13.000, 16.367667, 16.368, 16.369, 16.800, 19.200, 20.000, 23.104, 24.5536, 25.000, 26.000, 38.400	
Optional Operating Temperature*4	Low limit / Symbol	-10°C / g -15°C / h -20°C / i -25°C / j -30°C / k -35°C / l -40°C / m
	High limit / Symbol	+55°C / ff +60°C / gg +65°C / hh +70°C / ii +75°C / jj +80°C / kk +85°C / ll

(*1) Final part number to be assigned with package type, TCXO or VC-TCXO, frequency stability, input voltage, operating temperature and frequency.
e.g. SXO-4075CMV-CC/kll-K-S2-19.2MHz

(*2) Referred to nominal frequency before reflow soldering.

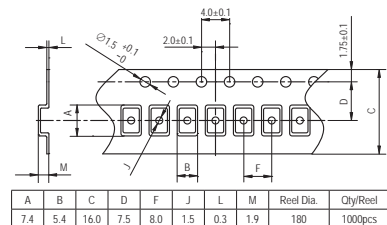
(*3) At V_{con} = 1/2 V_{DD} DC for SXO-4075CMV.

(*4) Select "low limit" and "high limit" for new operating temperature combination from the lists.

PACKAGE DATA

Item	Package	SXO-4075CM
Cover		Epoxy Resin
Base		Glass Epoxy
Sealing		Seam (Built-in crystal)
Terminal		Copper (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



Temperature Compensated Crystal Oscillators

TCXO or VC-TCXO

±0.1 or ±0.28 ppm

10 to 40 MHz

5.0x3.2 mm
7.0x5.0 mm

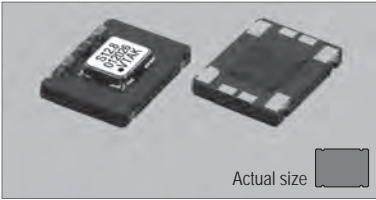
+2.7 to +5.5 V

CMOS or CLIPPED SINE

SXO-9000 SERIES (+2.7V to +5.0V FIXED MODELS) 5.0x3.2 mm 7.0x5.0 mm

STANDARD SMD TCXO

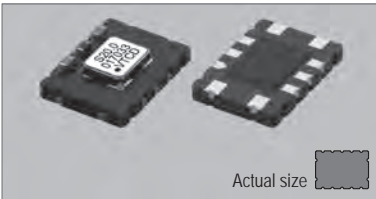
SXO-9000C



Actual size

0.125 gm (wt.)

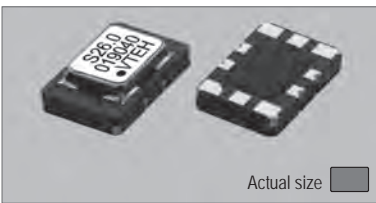
SXO-9000D



Actual size

0.125 gm (wt.)

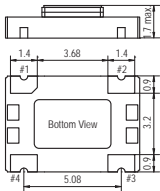
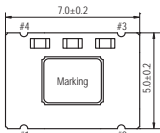
SXO-9000E



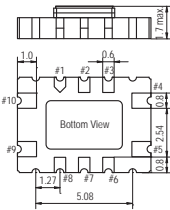
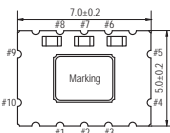
Actual size

0.07 gm (wt.)

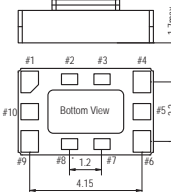
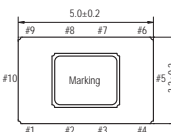
SXO-9000C (4-pads)



SXO-9000D (10-pads)



SXO-9000E (10-pads)



PIN CONNECTION

PIN	CONNECTION	
	TCXO	VC-TCXO
1	NC or GND	Vcon
2	GND	GND
3	OUTPUT	OUTPUT
4	+V DC	-V DC

PIN	CONNECTION	
	TCXO	VC-TCXO
1	NC or GND	NC or GND
2	NC or GND	NC or GND
3	NC or GND	NC or GND
4	GND	GND
5	OUTPUT	OUTPUT
6	NC or GND	NC or GND
7	NC or GND	NC or GND
8	E/D	E/D
9	-V DC	-V DC
10	NC or GND	Vcon

PIN	CONNECTION	
	TCXO	VC-TCXO
1	NC or GND	Vcon
2	NC or GND	NC or GND
3	E/D	E/D
4	GND	GND
5	NC or GND	NC or GND
6	OUTPUT	OUTPUT
7	NC or GND	NC or GND
8	NC or GND	NC or GND
9	-V DC	-V DC
10	NC or GND	NC or GND

STANDARD SPECIFICATIONS

- FEMTOCELL APPLICATION
- CMOS or CLIPPED SINE WAVEFORM
- PACKAGE SIZE 5.0x3.2 mm or 7.0x5.0 mm

Item	Specifications							
General part number	SXO-9000C-CS ¹ SXO-9000D-CS SXO-9000E-CS	SXO-9000C-CSV ¹ SXO-9000D-CSV SXO-9000E-CSV	SXO-9000C-CM ¹ SXO-9000D-CM SXO-9000E-CM	SXO-9000C-CMV ¹ SXO-9000D-CMV SXO-9000E-CMV				
Frequency range	10.000 MHz to 40.000 MHz							
Initial frequency tolerance at +25°C ±2°C	±1.5 ppm max. (after 2 times of reflow soldering)							
Output waveform	Clipped Sine OUTPUT		CMOS OUTPUT					
TCXO or VC-TCXO	TCXO	VC-TCXO	TCXO	VC-TCXO				
Frequency Stability	Temperature range	KK2 : ±0.1 ppm max. over -10°C to +70°C (referred to +25°C) ² QQ2 : ±0.28 ppm max. over -40°C to +85°C (referred to +25°C) ²						
	Input voltage change	±0.2 ppm max. at V _{DD} ±5% DC						
	Output load change	±0.1 ppm max. at load ±10%						
	Aging (Stratum 3)	±4.6 ppm max. at +40°C for 20 years including overall freq. stability						
Operating Conditions	Operating temperature	-10°C to +70°C (S1 = Standard 1) -40°C to +85°C (S2 = Standard 2)						
	Supply voltage (V _{DD})	+2.7V to +5.5V DC ±5%						
	Control voltage (Vcon)	n.a.	+1.65V ± 1.65V	n.a.	+1.65V ± 1.65V			
	Supply voltage	-0.6V to +6.0V DC						
Absolute Max. Ratings	Vcontrol voltage (Vcon)	n.a.	-0.6V to V _{DD} +0.6V DC	n.a.	-0.6V to V _{DD} +0.6V DC			
	Storage temperature	-40°C to +85°C						
Input current	3 mA max.		5 mA max.					
Output (-40°C to +85°C)	Symmetry	n.a.		45% to 55% at 1/2 V _{DD} level				
	Rise and fall times	n.a.		5 ns max. (10% to 90% V _{DD} level)				
	Level	0.8 Vp-p min.		V _{OL} = 10% V _{DD} max. V _{OH} = 90% V _{DD} min.				
	Load	10 kΩ // 10 pF		15 pF max.				
	Waveform	Clipped sine wave ³		CMOS				
Frequency adjustment voltage control (1/2 V _{DD} ±1/2 V _{DD})	n.a.	±5 ppm to ±20 ppm	n.a.	±5 ppm to ±15 ppm				
Holdover	±5 ppb / day, ±20 ppb / 168 hours (7 days)							
Frequency slope	n.a.	Positive	n.a.	Positive				
Harmonic distortion	-5 dBc max.							
Start-up time	3.5 ms max.							
SSB phase noise (20.000 MHz)	-140 dBc / Hz, Typical at 1 kHz offset							
Vcon input impedance	n.a.	100 kΩ min.	n.a.	100 kΩ min.				
Short-term frequency stability	±1 ppb max. (Allan variance Tau = 0.1 sec.)							
IR reflow resistance	±1 ppm max. (referred to frequency before reflow)							
Reflow condition	+250°C ±10°C for 10 seconds							
	+170°C ±10°C for 1 to 2 minutes (preheating)							
Standard frequencies (MHz)	10.000, 12.800, 19.200, 19.440, 20.000, 20.480, 24.576, 26.000, 30.720							
Optional Operating Temperature ⁴	Low limit / Symbol	-10°C / g	-15°C / h	-20°C / i	-25°C / j	-30°C / k	-35°C / l	-40°C / m
	High limit / Symbol	+55°C / ff	+60°C / gg	+65°C / hh	+70°C / ii	+75°C / jj	+80°C / kk	+85°C / ll

(¹) Final part number to be assigned with package type, TCXO or VC-TCXO, frequency stability, input voltage and frequency.

e.g. SXO-9000CMV-QQ2-3.3V-26MHz

(²) V_{con} = 1/2 V_{DD} DC for SXO-9000C/D/E-CSV & CMV.

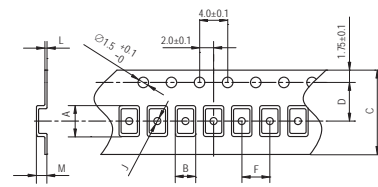
(³) DC-cut for SXO-9000C & SXO-9000D. DC coupling for SXO-9000E.

(⁴) Select "low limit" and "high limit" for new operating temperature combination from the lists.

PACKAGE DATA

Item	Package	SXO-9000
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



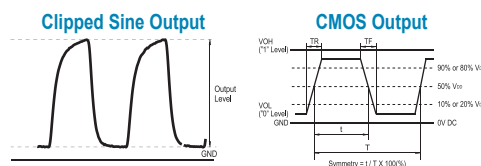
SXO-9000C & SXO-9000D

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
8.2	5.8	16.0	7.5	8.0	1.6	0.3	2.16	254	1000pcs (100pcs)

SXO-9000E

A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
5.9	3.7	12.0	5.5	8.0	1.6	0.3	2.00	254	1000pcs (100pcs)

OUTPUT WAVEFORM



XTAL

CLK OSC

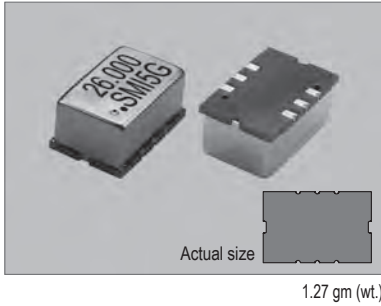
VCXO

TCXO

OCXO

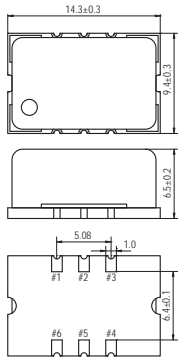
MCF

SXO-8000K



1.27 gm (wt.)

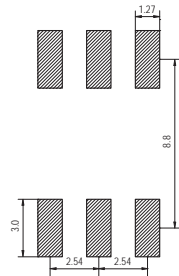
SXO-8000K



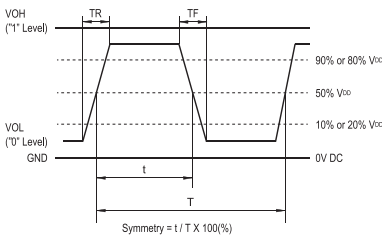
Pin	Connection	Pin	Connection
1	Vcon	4	Output
2	NC*	5	NC*
3	GND	6	Vcc

(* #2 & #5 - Pulled up internally and connected to #6 / +V DC. Connect #2, #5 & #6 to outer NC's.

SOLDERING PATTERN



OUTPUT WAVEFORM



STANDARD SPECIFICATIONS

● CMOS OUTPUT
● PACKAGE SIZE 14.3x9.4 mm

Item		Specifications
General part number		SXO-8000K ^(*)
Frequency range		5.000 MHz to 40.000 MHz
Initial frequency tolerance at +25°C ±2°C		±0.5 ppm max. (V _{DD} = +3.3V, V _{con} = +1.65V, CL = 15 pF & 1 hour after warm-up time)
Frequency Stability	Temperature range	AA2 / iii : ±10 ppb max. over -20°C to +70°C (referred to +25°C) BB2 / iii : ±20 ppb max. over -20°C to +70°C (referred to +25°C) CC2 / iii : ±30 ppb max. over -20°C to +70°C (referred to +25°C) EE2 / iii : ±50 ppb max. over -20°C to +70°C (referred to +25°C) BB2 / mll : ±20 ppb max. over -40°C to +85°C (referred to +25°C) CC2 / mll : ±30 ppb max. over -40°C to +85°C (referred to +25°C) EE2 / mll : ±50 ppb max. over -40°C to +85°C (referred to +25°C)
	Operating Conditions	Operating temperature: -20°C to +70°C (Standard), -40°C to +85°C (W = Option) Supply voltage (V _{DD}): +3.3V DC ±5% Control voltage (V _{con}): +1.65V DC ±1.65V
Absolute Max. Ratings	Supply voltage	-0.6V to +4.0V DC
	Control voltage	-0.6V to V _{DD} +0.6V DC
Input current (max.)	Storage temperature	-55°C to +85°C
	Symmetry	600 mA (during warm-up) 200 mA (steady state at +25°C)
Output (-40°C to +85°C)	Rise and fall times	45% to 55% at 1/2 V _{DD} level
	"0" Level	4 ns max. (10% V _{DD} to 90% V _{DD} level)
	"1" Level	V _{OL} : 10% V _{DD} max. V _{OH} : 90% V _{DD} min.
	Load	15 pF max. (CMOS)
Frequency Adjustment	Voltage control (+0.2V to +2.8V)	±5 ppm min.
Frequency slope		Positive
Linearity		5% max.
SSB phase noise (at 19.200 MHz & +25°C)	10 Hz	-94 dBc / Hz, Typical
	100 Hz	-124 dBc / Hz, Typical
Warm-up time	1 kHz	-145 dBc / Hz, Typical
	10 kHz	-155 dBc / Hz, Typical
Vcon input impedance		5 minutes to ±20 ppb of final frequency at +25°C
Short-term frequency stability		1 MΩ max.
Reflow condition		±1 ppb max. (Allan variance Tau = 0.1 sec.) +250°C ±10°C for 10 seconds +170°C ±10°C for 1 to 2 minutes (preheating)
Standard frequencies (MHz)		10.000, 12.800, 13.000, 16.384, 19.200, 20.000, 25.000, 26.000, 30.720, 38.400, 38.880, 40.000

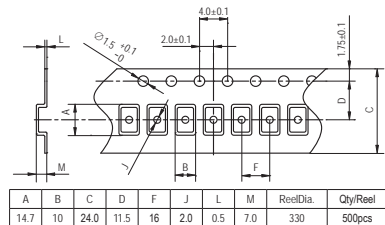
(*¹) Final part number to be assigned with package type, frequency stability and frequency.
e.g. SXO-8000K-CC2/iii-13.000MHz

PACKAGE DATA

Item	Package	SXO-8000K
Lid		Metal
Base		PCB
Sealing		Reflow soldering (4 corners)
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

(*²) Cleaning is not recommended.

TAPE SPECIFICATIONS



A	B	C	D	F	J	L	M	ReelDia.	Qty/Reel
14.7	10	24.0	11.5	16	2.0	0.5	7.0	330	500pcs

Monolithic Crystal Filters

SINGLE PACKAGE 7.0x5.0 mm 2-POLE

96SMF SERIES (2-POLE MCF IN SINGLE 7.0x5.0 mm PACKAGE)

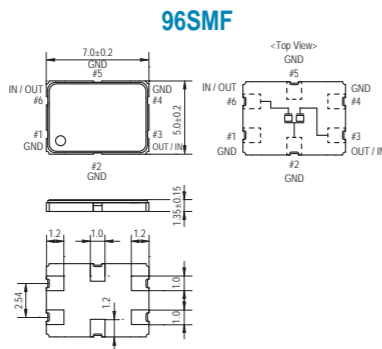
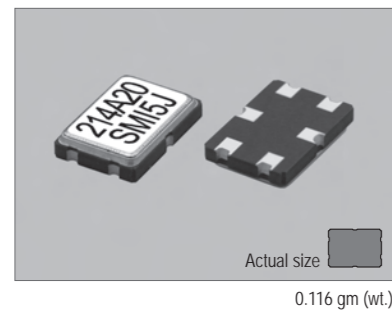
STANDARD SMD MCF

STANDARD SPECIFICATIONS

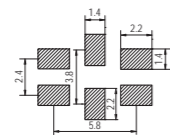
- 2-POLE FILTERS
- 21.4 MHz, 21.7 MHz & 45 MHz
- PACKAGE SIZE 7.0x5.0 mm

Part Number	Nominal Frequency f ₀ (MHz)	Oscillation Mode	Passband min.		Stopband max.		Attenuation Guaranteed min.		Ripple max.	Loss max.	Terminating Impedance	Operating Temperature	No. of Pole
			(dB)	(kHz)	(dB)	(kHz)	(dB)	(kHz)	(dB)	(dB)	(Ω // pF)	(°C)	
96SMF214A7.5A	21.4	FUND	3	±3.75	18	±25.0	70	-910	1.0	2.0	850 // 6.0	-30 to +80	2
96SMF214A7.5B	21.4	FUND	3	±3.75	18	±14.0	70	-910	1.0	2.0	870 // 6.0	-30 to +80	2
96SMF214A7.5C	21.4	FUND	3	±3.75	15	±12.5	60	-900	1.0	2.0	870 // 6.0	-30 to +80	2
96SMF214A12	21.4	FUND	3	±6.0	15	±20.0	70	-910	0.5	1.5	1200 // 2.0	-30 to +80	2
96SMF214A15A	21.4	FUND	3	±7.5	18	±25.0	70	-910	1.0	2.0	1500 // 1.5	-30 to +80	2
96SMF214A15B	21.4	FUND	3	±7.5	18	±25.0	70	-910	1.0	2.0	1500 // 2.0	-30 to +80	2
96SMF214A15C	21.4	FUND	3	±7.5	18	±25.0	70	-910	0.5	1.5	1500 // 2.5	-30 to +80	2
96SMF214A20	21.4	FUND	3	±10.0	15	±30.0	70	-910	1.0	2.0	1800 // 1.0	-30 to +80	2
96SMF214A30A	21.4	FUND	3	±15.0	15	±45.0	70	-910	1.0	2.0	2000 // 0.5	-30 to +80	2
96SMF214A30B	21.4	FUND	3	±15.0	15	±45.0	60	-910	1.0	2.0	2000 // 0.5	-30 to +80	2
96SMF217A7.5A	21.7	FUND	3	±3.75	20	±18.0	70	-910	1.0	2.0	850 // 6.0	-30 to +80	2
96SMF217A7.5B	21.7	FUND	3	±3.75	18	±14.0	70	-910	1.0	2.0	870 // 6.0	-30 to +80	2
96SMF217A7.5C	21.7	FUND	3	±3.75	15	±12.5	70	-910	1.0	2.0	850 // 3.5	-30 to +80	2
96SMF217A7.5D	21.7	FUND	3	±3.75	18	±12.5	50	-910	1.0	2.0	1500 // 6.0	-30 to +80	2
96SMF217A7.9	21.7	FUND	3	±3.95	18	±12.5	70	-910	1.0	2.0	850 // 8.0	-30 to +80	2
96SMF217A15A	21.7	FUND	3	±7.5	18	±25.0	70	-910	1.0	2.0	1500 // 2.5	-30 to +80	2
96SMF217A15B	21.7	FUND	3	±7.5	18	±25.0	70	-910	0.5	2.0	1500 // 1.5	-30 to +80	2
96SMF217A15C	21.7	FUND	3	±7.5	15	±25.0	70	-910	1.0	2.0	1500 // 2.0	-30 to +80	2
96SMF450A7.5A	45.0	FUND	3	±3.75	10	±12.5	70	-910	1.0	2.0	200 // 4.0	-30 to +80	2
96SMF450A7.5B	45.0	FUND	3	±3.75	20	±25.0	70	-910	1.5	2.0	650 // 3.5	-30 to +80	2
96SMF450A12	45.0	FUND	3	±6.0	15	±20.0	70	-910	1.0	2.0	650 // 5.0	-30 to +80	2
96SMF450A15A	45.0	FUND	3	±7.5	15	±25.0	70	-910	1.0	2.0	560 // 6.0	-30 to +80	2
96SMF450A15B	45.0	FUND	3	±7.5	15	±25.0	70	-910	1.0	2.0	650 // 3.0	-30 to +80	2
96SMF450A15C	45.0	FUND	3	±7.5	15	±25.0	70	-910	1.0	2.0	650 // 4.0	-30 to +80	2
96SMF450A15D	45.0	FUND	3	±7.5	15	±25.0	70	-910	1.0	2.0	650 // 3.5	-30 to +80	2
96SMF450A15E	45.0	3rd	3	±7.5	15	±25.0	60	-910	0.5	1.5	2700 // 1.7	-30 to +80	2
96SMF450A20	45.0	FUND	3	±10.0	15	±35.0	70	-910	1.0	2.0	800 // 3.0	-30 to +80	2
96SMF450A25	45.0	FUND	3	±12.5	15	±50.0	70	-910	1.0	3.0	1000 // 2.0	-30 to +80	2
96SMF450A30A	45.0	FUND	3	±15.0	16	±60.0	70	-910	1.0	2.0	1100 // 0.0	-30 to +80	2
96SMF450A30B	45.0	FUND	3	±15.0	15	±60.0	65	-910	1.0	2.0	1200 // 1.8	-30 to +80	2
96SMF450A40	45.0	FUND	3	±20.0	15	±70.0	70	-910	1.0	3.0	1000 // 1.0	-30 to +80	2
96SMF450A48	45.0	FUND	3	±24.0	-	-	40	-910	1.0	2.0	1000 // 0.7	-30 to +80	2

96SMF



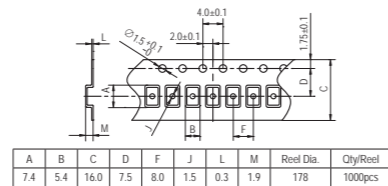
SOLDERING PATTERN



PACKAGE DATA

Item	Package	96SMF
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



Monolithic Crystal Filters

SINGLE PACKAGE 7.0x5.0 mm 2-POLE

96SMF SERIES (2-POLE MCF IN SINGLE 7.0x5.0 mm PACKAGE)

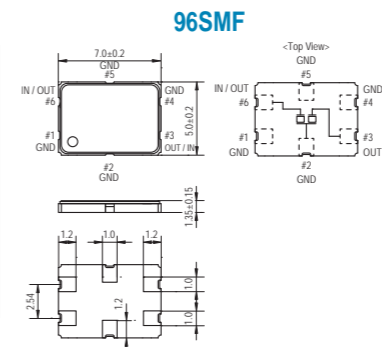
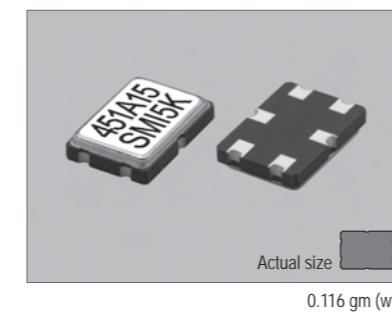
STANDARD SMD MCF

STANDARD SPECIFICATIONS

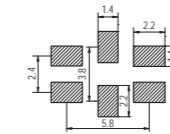
- 2-POLE FILTERS
- OTHER FREQUENCIES
- PACKAGE SIZE 7.0x5.0 mm

Part Number	Nominal Frequency f ₀ (MHz)	Oscillation Mode	Passband min.		Stopband max.		Attenuation Guaranteed min.		Ripple max.	Loss max.	Terminating Impedance	Operating Temperature	No. of Pole
			(dB)	(kHz)	(dB)	(kHz)	(dB)	(kHz)	(dB)	(dB)	(Ω // pF)	(°C)	
96SMF145A15	14.575	FUND	3.0	±7.50	13	±20.0	50	-910	0.5	2.0	2500 // 1.0	-30 to +80	2
96SMF204A5	20.480	FUND	3.0	±2.50	15	±10.0	70	-910	1.0	2.0	850 // 8.0	-30 to +80	2
96SMF212A15	21.250	FUND	3.0	±7.5	19	±25.0	70	-910	1.0	2.0	1500 // 2.5	-30 to +80	2
96SMF213A15	21.300	FUND	3.0	±7.50	18	±25.0	45	-150	1.0	2.0	1500 // 2.5	-30 to +80	2
96SMF2132A15	21.325	FUND	3.0	±7.50	18	±25.0	45	-150	1.0	2.0	1500 // 2.5	-30 to +80	2
96SMF218A7.5	21.800	FUND	3.0	±3.75	15	±12.5	70	-910	1.0	2.0	850 // 6.0	-30 to +80	2
96SMF241A20	24.100	FUND	3.0	±10.00	10	±25.0	70	-910	1.0	2.0	1350 // 1.5	-30 to +80	2
96SMF245A20	24.555	FUND	3.0	±10.00	10	±25.0	70	-910	1.0	2.0	1350 // 1.5	-30 to +80	2
96SMF246A47	24.600	FUND	3.0	±23.50	-	-	40	-910	1.0	1.5	5000 // 0.0	-30 to +80	2
96SMF256A20	25.655	FUND	3.0	±10.00	10	±25.0	70	-910	1.0	2.0	1350 // 1.5	-30 to +80	2
96SMF260A20	26.000	FUND	1.5	±10.00	10	±25.0	75	-910	1.0	2.0	1300 // 1.5	-30 to +80	2
96SMF264A15	26.450	FUND	3.0	±7.50	15	±25.0	70	-910	1.0	2.0	1500 // 3.0	-30 to +80	2
96SMF270A24	27.000	FUND	3.0	±12.00	10	±25.0	70	-910	1.0	3.0	1000 // 1.6	-30 to +80	2
96SMF292A20	29.250	FUND	3.0	±10.00	10	±25.0	70	-910	1.0	1.5	1800 // 1.5	-30 to +80	2
96SMF300A40	30.000	FUND	1.0	±20.00	15	±125.0	30	-910	1.0	3.0	3800 // -0.4	-30 to +80	2
96SMF451A15	45.100	FUND	3.0	±7.50	15	±25.0	65	-910	1.0	2.0	560 // 6.0	-30 to +80	2
96SMF4515A15	45.150	FUND	3.0	±7.50	13	±25.0	70	-910	1.0	3.0	1000 // 4.0	-30 to +80	2
96SMF499A20	49.950	FUND	3.0	±10.00	13	±45.0	70	-910	1.0	3.0	800 // 2.0	-30 to +80	2
96SMF499A25	49.950	FUND	3.0	±12.50	13	±50.0	70	-910	1.0	3.0	800 // 1.5	-30 to +80	2
96SMF500A5	50.000	FUND	3.0	±2.50	15	±10.0	40	-1000	1.0	5.0	200 // 0.9	-30 to +80	2
96SMF768A8	76.800	3rd	3.0	±4.00	15	±13.0	50	-910	1.0	2.0	2000 // 0.4	-30 to +80	2
96SMF800A24	80.000	3rd	3.0	±12.00	15	±35.0	50	-910	1.0	2.0	2500 // -0.8	-30 to +80	2
96SMF900A30A	90.000	3rd	3.0	±15.00	16	±50.0	30	-910	0.5	3.0	3000 // -0.5	-30 to +80	2
96SMF921A6A	92.160	3rd	3.0	±3.00	30	±30.0	50	-910	1.0	3.0	2000 // 0.4	-30 to +80	2
96SMF921A6B	92.160	3rd	3.0	±3.00	30	±30.0	50	-910	1.0	3.0	1000 // -0.2	-30 to +80	2
96SMF100A20	100.000	3rd	3.0	±10.00	10	±28.0	50	-910	1.0	3.0	1500 // -0.8	-30 to +80	2
96SMF1001A14	100.100	3rd	3.0	±7.00	13	±28.0	50	-910	1.0	3.0	1500 // -0.3	-30 to +80	2
96SMF101A14	101.000	3rd	3.0	±7.00	13	±28.0	50	-910	1.0	3.0	1500 // -0.3	-30 to +80	2
96SMF105A14	105.000	3rd	3.0	±7.00	13	±28.0	50	-910	1.0	3.0	1500 // -1.0	-30 to +80	2
96SMF109A15	109.650	3rd	3.0	±7.50	18	±25.0	50	-910	1.0	3.0	1500 // -0.6	-30 to +80	2
96SMF109A24	109.650	3rd	3.0	±12.00	18	±60.0	65	-910	1.0	2.0	2000 // -1.1	-30 to +80	2
96SMF110A15	110.000	3rd	3.0	±7.50	18	±25.0	50	-910	1.0	3.0	1500 // -1.0	-30 to +80	2
96SMF122A7	122.880	3rd	6.0	±3.75	30	±40.0	50	-910	2.0	3.0	1000 // 1.6	-30 to +80	2
96SMF150A7	150.000	3rd	3.0	±3.50	15	±15.0	50	-910	1.0	7.0	1000 // 1.8	-30 to +80	2

96SMF



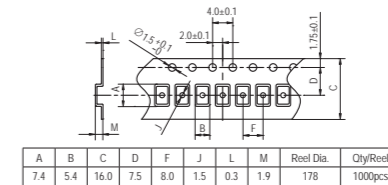
SOLDERING PATTERN



PACKAGE DATA

Item	Package	96SMF
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

TAPE SPECIFICATIONS



96SMF SERIES (4-POLE MCF IN SINGLE 7.0x5.0 mm PACKAGE)

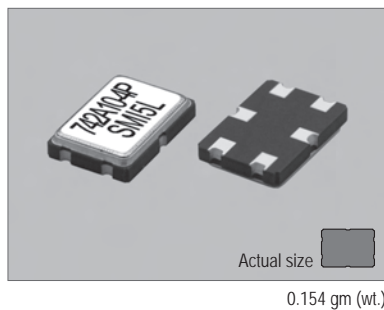
STANDARD SMD MCF

STANDARD SPECIFICATIONS

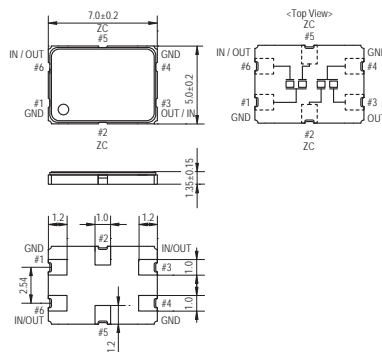
- 4-POLE FILTERS
- OTHER FREQUENCIES
- PACKAGE SIZE 7.0x5.0 mm

Part Number	Nominal Frequency fo	Oscillation Mode	Passband min.		Stopband max.		Attenuation Guaranteed min.		Ripple max.	Loss max.	Terminating Impedance	Coupling Capacitor	Operating Temperature	No. of Pole
	(MHz)		(dB)	(kHz)	(dB)	(kHz)	(dB)	(kHz)	(dB)	(dB)	(Ω // pF)	Zc (pF)	(°C)	
96SMF214A7.5-4P	21.400	FUND	3	±3.75	30	±12.5	80	-910	1.0	4.0	1800 // 2.0	6.0	-30 to +80	4
96SMF214A12-4P	21.400	FUND	3	±6.00	30	±22.0	80	-910	1.0	4.0	1800 // 2.0	5.5	-30 to +80	4
96SMF217A7.5-4P	21.700	FUND	3	±3.75	31	±12.5	75	-910	1.0	4.0	1800 // 2.0	6.0	-30 to +80	4
96SMF217A15-4P	21.700	FUND	3	±7.50	30	±25.0	70	-910	1.0	4.0	1750 // 0.35	5.0	-30 to +80	4
96SMF388A7.5-4P	38.850	FUND	3	±3.75	40	±18.0	80	-910	1.0	4.0	480 // 5.5	15.0	-30 to +80	4
96SMF388A10-4P	38.850	FUND	3	±5.00	40	±20.0	80	-910	1.0	4.0	610 // 3.0	14.0	-30 to +80	4
96SMF388A12-4P	38.850	FUND	3	±6.00	35	±25.0	70	-910	1.0	4.0	610 // 3.0	13.0	-30 to +80	4
96SMF448A15-4P	44.850	FUND	3	±7.50	35	±25.0	70	-910	1.0	4.0	650 // 3.0	8.0	-30 to +80	4
96SMF449A16-4P	44.9725	FUND	3	±8.00	20	±30.0	80	-910	1.0	4.0	800 // 1.7	8.0	-30 to +80	4
96SMF450A7.5-4P	45.000	FUND	3	±3.75	30	±12.5	80	-910	1.0	4.0	350 // 6.5	18.0	-30 to +80	4
96SMF450A10-4P	45.000	FUND	3	±5.00	40	±20.0	80	-910	1.0	4.0	610 // 3.0	14.0	-30 to +80	4
96SMF450A15A-4P	45.000	FUND	3	±7.50	30	±25.0	80	-910	1.0	4.0	650 // 3.0	9.0	-30 to +80	4
96SMF450A15B-4P	45.000	FUND	3	±7.50	35	±26.0	80	-910	1.0	3.0	800 // 1.7	8.0	-30 to +80	4
96SMF450A15C-4P	45.000	FUND	3	±7.50	30	±25.0	80	-910	1.0	3.0	650 // 2.5	8.0	-30 to +80	4
96SMF450A15D-4P	45.000	FUND	3	±7.50	30	±25.0	70	-910	1.0	4.0	600 // 3.0	9.5	-30 to +80	4
96SMF450A15E-4P	45.000	FUND	3	±7.50	25	±22.0	80	-910	1.0	4.0	800 // 2.0	8.0	-30 to +80	4
96SMF450A15F-4P	45.000	FUND	3	±7.50	30	±25.0	80	-910	1.0	3.0	650 // 3.0	9.0	-30 to +80	4
96SMF450A30A-4P	45.000	FUND	3	±15.00	30	±45.0	70	-910	1.0	3.0	1000 // 1.0	5.0	-30 to +80	4
96SMF450A30B-4P	45.000	FUND	3	±15.00	30	±50.0	80	-910	1.0	3.0	800 // 1.7	6.0	-30 to +80	4
96SMF450A30C-4P	45.000	FUND	3	±15.00	30	±45.0	70	-910	1.0	3.0	1000 // 1.0	15	-30 to +80	4
96SMF451A12-4P	45.100	FUND	3	±6.00	25	±22.0	80	-910	1.0	4.0	500 // 4.5	11.5	-30 to +80	4
96SMF451A15-4P	45.100	FUND	3	±7.50	30	±25.0	80	-910	1.0	4.0	800 // 2.0	8.0	-30 to +80	4
96SMF453A7.5-4P	45.300	FUND	3	±3.75	30	±12.5	80	-910	1.0	5.0	350 // 6.5	18.0	-30 to +80	4
96SMF453A12-4P	45.300	FUND	3	±6.00	30	±20.0	80	-910	1.0	4.0	650 // 3.0	9.0	-30 to +80	4
96SMF453A15-4P	45.300	FUND	3	±7.50	30	±25.0	80	-910	1.0	4.0	650 // 2.5	8.5	-30 to +80	4
96SMF463A12-4P	46.350	FUND	3	±6.00	30	±20.0	75	-900	1.0	3.0	490 // 4.0	13.0	-30 to +80	4
96SMF472A10-4P	47.250	FUND	3	±5.00	40	±18.0	80	-910	1.0	3.5	430 // 6.5	14.5	-30 to +80	4
96SMF474A7.5-4P	47.400	FUND	3	±3.75	20	±12.5	80	-910	1.5	6.0	350 // 6.5	17.0	-30 to +80	4
96SMF484A15-4P	48.425	FUND	3	±7.50	20	±25.0	80	-910	1.0	5.0	470 // 4.5	12.0	-30 to +80	4
96SMF494A7.5-4P	49.455	FUND	3	±3.75	30	±15.0	80	-910	1.0	4.0	300 // 7.5	20.0	-30 to +80	4
96SMF499A10-4P	49.950	FUND	3	±5.00	40	±20.0	80	-910	1.0	4.0	350 // 6.0	15.5	-30 to +80	4
96SMF700A20-4P	70.000	3rd	3	±10.00	35	±40.0	70	-910	1.0	4.0	3000 // -0.6	-0.8	-30 to +80	4
96SMF742A10-4P	74.250	FUND	3	±5.00	40	±18.0	80	-910	1.0	3.5	430 // 6.5	14.5	-30 to +80	4
96SMF900A7.5-4P	90.000	3rd	3	±3.75	30	±12.5	80	-910	1.0	4.0	1200 // 0.0	0.7	-30 to +80	4

96SMF



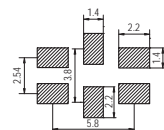
96SMF



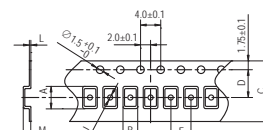
PACKAGE DATA

Item	Package	96SMF
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

SOLDERING PATTERN



TAPE SPECIFICATIONS



A	B	C	D	F	J	L	M	Reel Dia.	Qty/Reel
7.4	5.4	16.0	7.5	8.0	1.5	0.3	1.9	178	1000pcs

XTAL

CLK OSC

VCXO

TCXO

OCXO

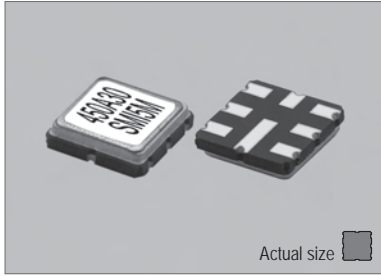
MCF

STANDARD SPECIFICATIONS

- 2-POLE FILTERS
- OTHER FREQUENCIES
- PACKAGE SIZE 3.8x3.8 mm

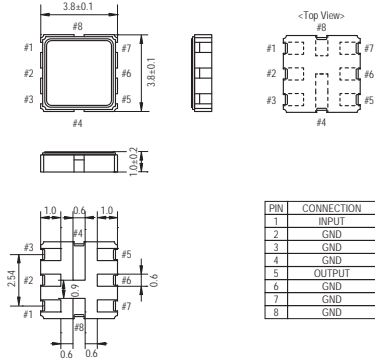
Part Number	Nominal Frequency fo (MHz)	Oscillation Mode	Passband min.		Stopband max.		Attenuation Guaranteed min.		Ripple max. (dB)	Loss max. (dB)	Terminating Impedance (Ω // pF)	Operating Temperature (°C)	No. of Pole
			(dB)	(kHz)	(dB)	(kHz)	(dB)	(kHz)					
38SMF450A15	45.000	FUND	3	±7.5	13	±25.0	60	-910	1.0	3.0	560 // 4.5	-30 to +80	2
38SMF450A30	45.000	FUND	3	±15	15	±60.0	60	-900	1.0	2.5	1100 // 1.0	-30 to +80	2
38SMF463A15	46.350	FUND	3	±7.5	15	±25.0	70	-910	1.0	2.0	470 // 6.0	-30 to +80	2

38SMF



Actual size
0.042 gm (wt.)

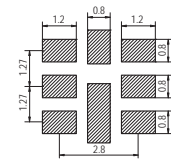
38SMF



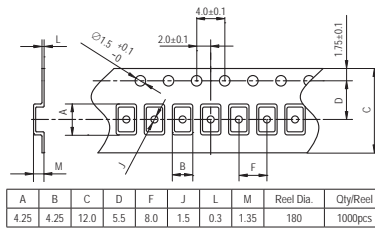
PACKAGE DATA

Item	Package	38SMF
Lid		Metal
Base		Ceramic
Sealing		Seam
Terminal		Tungsten (metalized)
Terminal plating		Gold / Nickel (surface) / (under)
RoHS		Compliant (Pb-free)

SOLDERING PATTERN



TAPE SPECIFICATIONS



XTAL

CLKOSC

VCXO

TCXO

OCXO

MCF