



Introduces

M611x Series HCMOS/Clipped Sinewave TCXO/TCVCXO

Features:

- Tight stability (0.3 ppm) over wide industrial temperature range (-40 °C to +85 °C)
- 3.0 V, 3.3 V and 5.0 V versions
- Wide frequency range 8-52 MHz
- Low phase noise
- Excellent G-sensitivity performance: 1.5 ppb/G
- Tri-state function

Applications:

- WiMax base stations
- Military and Avionics
- Point to point / multi-point radios
- Test and measurement and medical equipment
- WLAN
- GPS
- Frequency synthesis, frequency translation and land mobile radio



MtronPTI

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Applications Note

M611x Series

HCMOS/Clipped Sinewave TCXO/TCVCXO – 3.0/3.3/5.0 Volt – 5x7 mm

MtronPTI's M611x Series TCXO's and TCVCXO's provide design engineers with low voltage, surface mount products with extremely tight stability (to ± 0.3 ppm) over temperature and time. Specially processed crystals enable the M611x to achieve consistent long-term stability and minimal frequency shift after reflow. Our processing also enables us to achieve excellent g-sensitivity (1.5 ppb/g). The low phase noise (-155 dBc/Hz at 100 kHz) makes the M611x ideal for those design engineers working on all types of systems as the reference timing source.

The M611x Series is ideally suited for a wide range of applications such as GPS, military, avionics, test and measurement, WLAN, WiMax base stations (see Fig 2.), point to point/multi-point radios, medical equipment, frequency synthesis, frequency translation and land mobile radio.

Standard output for the M611x series is HCMOS compatible or clipped sinewave and draws as little as 1.5 mA with a 3.3 volt supply at 13 MHz. This low power consumption provides an advantage over similarly specified ovenized oscillators for power-sensitive applications.

The M611x series offers ± 9.2 ppm minimum pull range with excellent tuning linearity performance for critical PLL applications. This series is available in frequencies from 8 to 52 MHz, and is offered in a ceramic surface mount platform with industry standard 5 x 7 mm footprint.

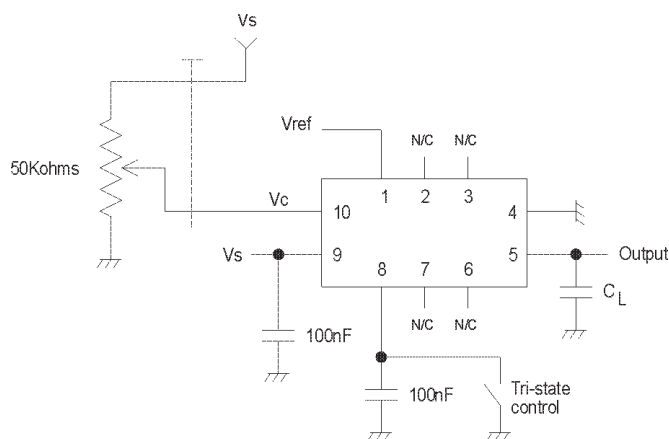


Figure 1. Typical Test Circuit

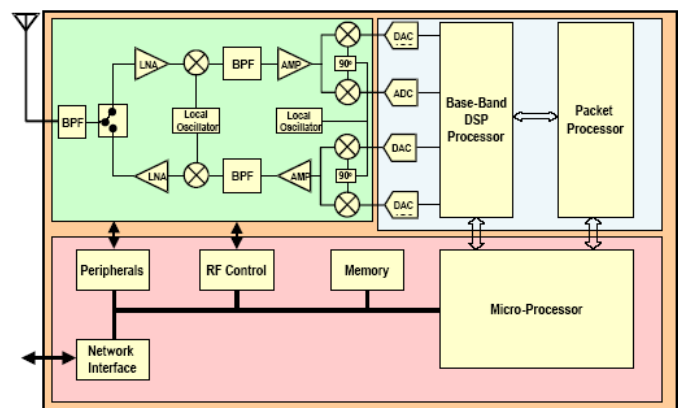


Figure 2. WiMax Subscriber Station

Product Specifications

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Description:

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Applications:

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- Test and measurement and medical equipment
- WLAN
- GPS
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Ordering Information:

Part Number Example: M611x 1 J I C N 40.00000MHz

Ordering Information	M611x	1	J	T	C	N	00.0000 MHz
Product Series M6110: 5.0 V M6111: 3.3 V M6112: 3.0 V	_____	_____	_____	_____	_____	_____	_____
Temperature Range 1: 0°C to +70°C 8: 0°C to +50°C 2: -40°C to +85°C F: -30°C to +75°C 6: -20°C to +70°C	_____	_____	_____	_____	_____	_____	_____
Stability P: ± 0.3 ppm K: ± 2.0 ppm G: ± 0.5 ppm H: ± 2.5 ppm J: ± 1.0 ppm	_____	_____	_____	_____	_____	_____	_____
Output Type T: Voltage Controlled With Tristate (VTCXO) F: No Voltage Control With Tristate (TCXO)	_____	_____	_____	_____	_____	_____	_____
Output Waveform C: HCMOS S: Clipped Sine Wave	_____	_____	_____	_____	_____	_____	_____
Package/Lead Configurations N: Leadless Ceramic	_____	_____	_____	_____	_____	_____	_____
Frequency (customer specified)	_____	_____	_____	_____	_____	_____	_____

Part Number Example: M6111JTCN – 40.00000 MHz

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M611x Series HCMOS/Clipped Sinewave TCXO/TCVCXO – 3.0/3.3/5.0 Volt – 5x7 mm

Performance Characteristics:

	Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Electrical Specifications	Frequency Range	F _O	8		52	MHz	
	Operating Temperature	T _A	-40		+85	°C	See Ordering Information
	Storage Temperature	T _{STG}	-55		+125	°C	
	Frequency Tolerance @ +25°C		-1.0		+1.0	ppm	For TCXO only
	Frequency Stability						See Ordering Information
	Stability Vs. Reflow		-1.0		+1.0	ppm	
	Frequency Vs. Supply			±0.2		ppm	For 10% supply voltage variation
	Frequency Vs. Load			±0.2		ppm	For 10% load variation
	Aging (First Year)		-1.0		+1.0	ppm	F ₀ ≤ 20 MHz
	Aging (First Year)		-2.0		+2.0	ppm	F ₀ ≥ 20 MHz
	Aging (10 Year)		-3.0		+3.0	ppm	F ₀ ≤ 20 MHz (Includes first year)
	Aging (10 Year)		-5.0		+5.0	ppm	F ₀ ≥ 20 MHz (Includes first year)
	Supply Voltage Tolerance		-5.0		+5.0	%	See Ordering Information
	Supply Current (I _b)			2.2	3.3	mA	HCMOS output at 13 MHz
				3.5	5.0	mA	HCMOS output at 26 MHz
				6.0	9.2	mA	HCMOS output at 52 MHz
				1.5	2.2	mA	Clipped sinewave output at 13 MHz
				1.8	2.7	mA	Clipped sinewave output at 26 MHz
				3.0	4.5	mA	Clipped sinewave output at 52 MHz
	Output Logic Levels (HCMOS)	V _{OL} V _{OH}	80		20	%V _S %V _S	I _{OH} /I _{OL} = ± 4 mA, V _S = +3.0 V I _{OH} /I _{OL} = ± 4 mA, V _S = +3.0 V
	Output Level (Clipped Sinewave)		1.0 0.8			V _{pk-pk} V _{pk-pk}	F ₀ ≤ 40 MHz F ₀ > 40 MHz
	Waveform Symmetry		40		60	%	Ref. to ½ V _S HCMOS only
	Rise/Fall Time				8	ns	Ref. 10% to 90%. HCMOS only
	Output Load			15 10/10		pF Kohm/pF	HCMOS output Clipped sinewave output
	Frequency Adjustment		±9.2			ppm	Over Control Voltage Range
	Control Voltage Range		0.3 0.3 0.5		2.7 3.0 4.5	Volts Volts Volts	For V _S = 3.0 For V _S = 3.3 For V _S = 5.0
	Input Leakage Current		-50		+50	µA	Pad 10
	Input Resistance		100			Kohm	Pad 10
Linearity				3	%		
Modulation Bandwidth		2 kHz				Pad 10	
Tristate Function (Pad 8)		70			%V _S	Output enabled. Logic "1" or "Open"	
				30	%V _S	Output disabled. Logic "0" or "GND"	
Tristate Leakage Current		-100		+100	µA	Pad 8	
Phase Noise (Typical 10 MHz CMOS)			-95 -125 -145 -152 -155		dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz	10 Hz Offset 100 Hz Offset 1 KHz Offset 10 KHz Offset 100 kHz Offset	
Environmental	Shock	MIL-STD-202, Method 213, Condition C				100 g	
	Vibration	MIL-STD-202, Methods 201 & 204				10 g from 10 to 2000 Hz	
	Solderability	EIAJ-STD-002					
	Package	5.0 x 7.0 x 2.0 mm, 10-pad SMT				RoHS Compliant	
	Max Soldering Conditions	See solder profile, Figure 1					

HCMOS Load – see load circuit diagram #2. Sinewave Load – see load circuit diagram #7.

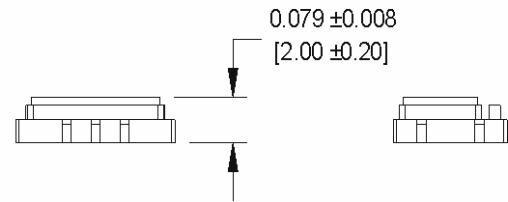
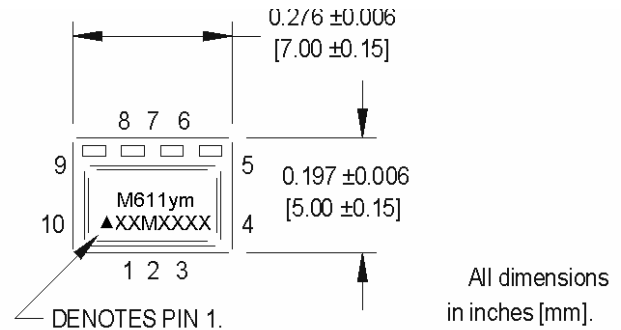
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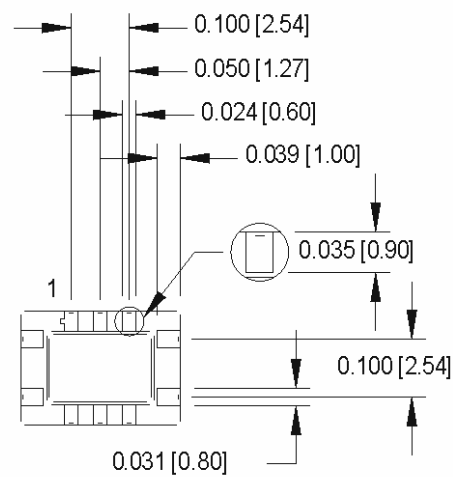
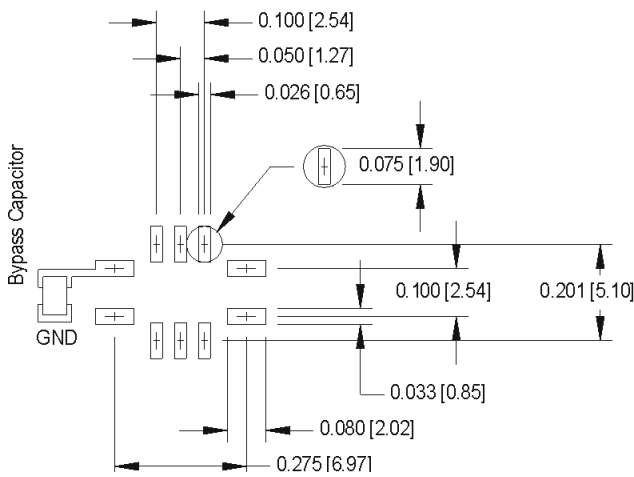
M611x Series HCMOS/Clipped Sinewave TCXO/TCVCXO – 3.0/3.3/5.0 Volt – 5x7 mm

Product Dimensions & Pinout Information:

Pin Connections	
Function	Pad
Vref or N/C	1
N/C	2
N/C	3
Ground	4
Output	5
N/C	6
N/C	7
Tristate	8
Supply Voltage (V _s)	9
Control Voltage	10



SUGGESTED SOLDER PAD LAYOUT



Handling Information:

Although protection circuitry has been designed into the M611x TCXO/TCVCXO, proper precautions should be taken to avoid exposure to electrostatic discharge (ESD) during handling and mounting. MtronPTI utilizes a human-body model (HBM) and a charged-device model (CDM) for ESD-susceptibility testing and protection design evaluation. ESD voltage thresholds are dependent on the circuit parameters used to define the mode. Although no industry-wide standard has been adopted for the CDM, a standard HBM (resistance = 1500, capacitance = 100 pF) is widely used and therefore can be used for comparison purposes. The HBM ESD threshold presented here was obtained using these circuit parameters.

Model	ESD Threshold, Minimum	Unit
Human Body	1500*	V
Charged Device	1500*	V

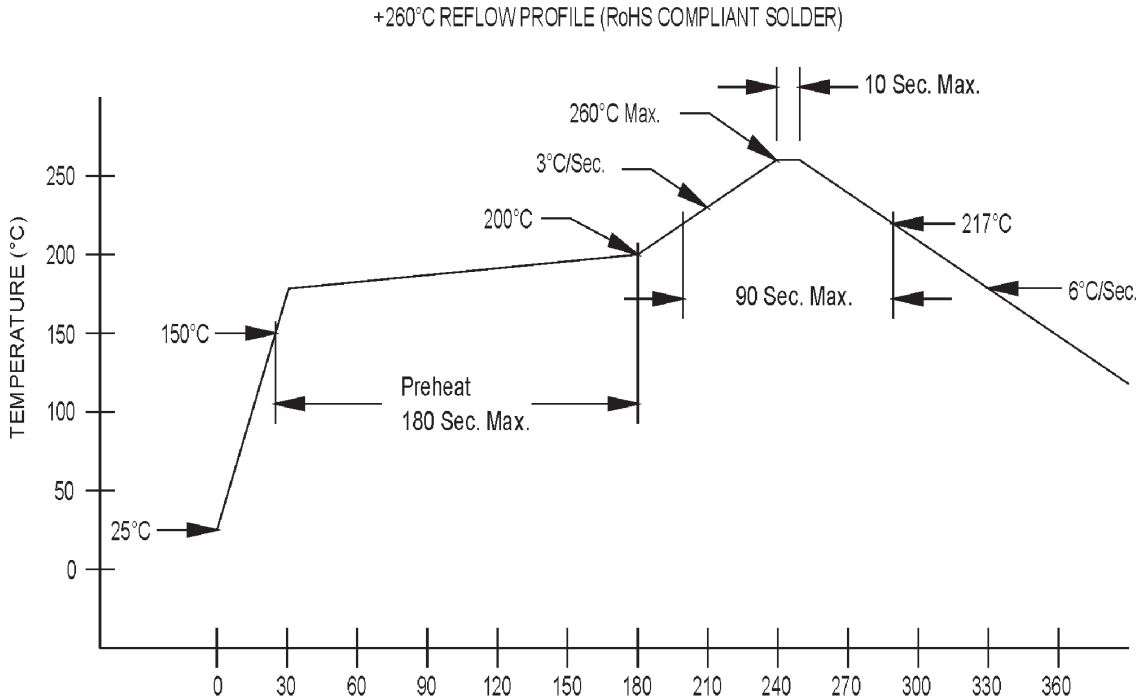
* MIL-STD-883D, Method 3015, Class 1

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M611x Series HCMOS/Clipped Sinewave TCXO/TCVCXO – 3.0/3.3/5.0 Volt – 5x7 mm

Solder Profile:



Quality Parameters:

Environmental Specifications/Qualification Testing Performed on the M611x TCXO/TCVCXO		
Test	Test Method	Test Condition
Electrical Characteristics	Internal Specification	Per Specification
Frequency vs. Temperature	Internal Specification	Per Specification
Mechanical Shock	MIL-STD-202, Method 213, C	100 g, 6 ms
Vibration	MIL-STD-202, Method 201-204	10 g from 10-2000 Hz
Thermal Cycle	MIL-STD-883, Method 1010, B	-55 Deg. C to +125 Deg. C, 15 minute Dwell, 10 cycles
Aging	Internal Specification	168 Hours at 105 Degrees C
Gross Leak	MIL-STD-202, Method 112	30 Second Immersion
Fine Leak	MIL-STD-202, Method 112	Must meet 1×10^{-8}
Solderability	MIL-STD-883, Method 2003	8 Hour Steam Age – Must Exhibit 95% coverage
Resistance to Solvents	MIL-STD-883, Method 2015	Three 1 minute soaks
Terminal Pull	MIL-STD-883, Method 2004, A	2 Pounds
Lead Bend	MIL-STD-883, Method 2004, B1	1 Bending Cycle
Physical Dimensions	MIL-STD-883, Method 2016	Per Specification
Internal Visual	Internal Specification	Per Internal Specification

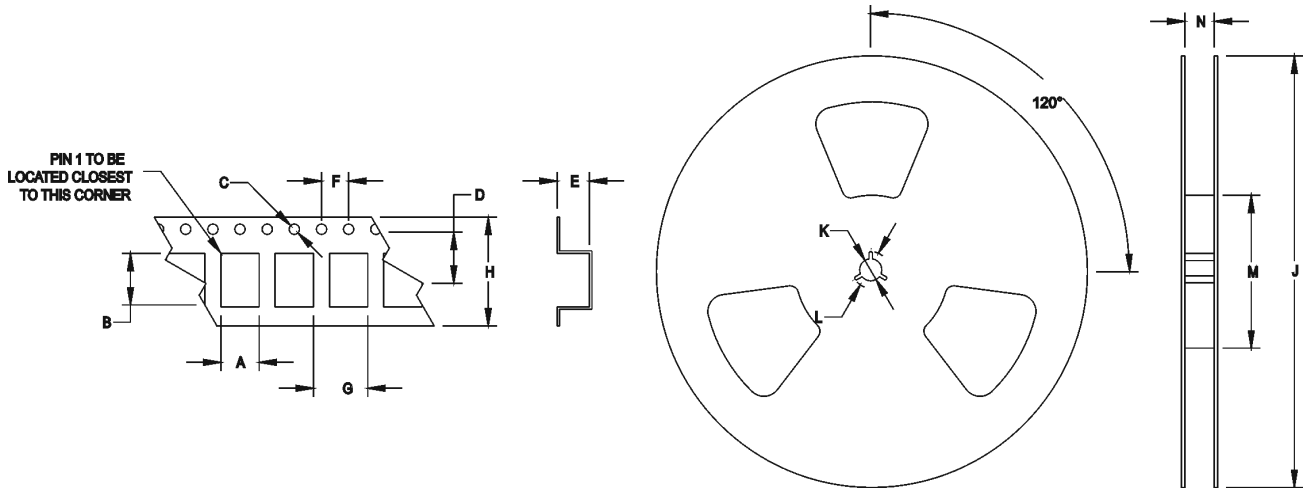
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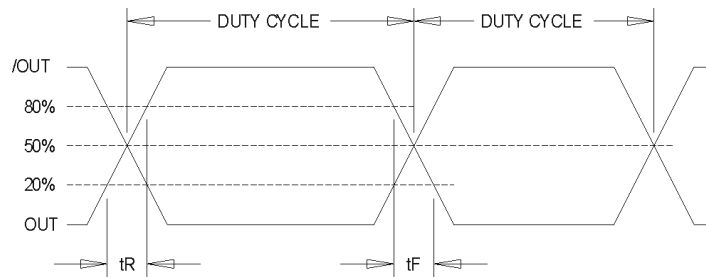
M611x Series HCMOS/Clipped Sinewave TCXO/TCVCXO – 3.0/3.3/5.0 Volt – 5x7 mm

Tape and Reel Specifications:

(all measurements are in mm)	A	B	C	D	E	F	G	H	J	K	L	M	N
M611x	5.40	7.40	1.55	7.50	2.60	2.00	4.00	16.00	330	13.00	20.20	100	16.40



Standard Tape and Reel: 1000 parts per reel



Output Waveform

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