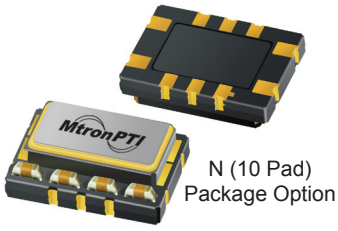
M611x Series

5 x 7 mm, 3.0, 3.3 & 5.0 Volt, HCMOS or Clipped Sinewave, Precision TCXO/TCVCXO

Product Features

- Tight stability performance
  (+/-0.3 ppm) over Industrial Temperatures (-40 °C to +85 °C)
  (+/-0.2ppm) over Commercial Temperatures (0 to 70C)
- Available in both 10 and 4/5 pads configurations
- 3.0 V, 3.3 V and 5.0 V versions
- Low phase noise and Excellent G-Sens performance: 1.5ppb/G
- Tri-state Function available



N (10 Pad)
Package Option

Product Description

MtronPTI's M611x Series TCXO's and TCVCXO's provide design engineers with low voltage, surface mount products with extremely tight stability (to ±0.2 ppm) over temperature and time. Specially processed crystals enable the M611x to achieve consistent long-term stability and minimal frequency shift after reflow. This processing also achieves 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. With two standard package configurations, MtronPTI can support the original industry standard 10 pad as well as the newer 4/5 pad topology (4 pad is without Tristate function and 5 pad is with Tristate function).

Product Applications

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. The product is ideally suited for battery and remote applications where it draws as little as 1.5 mA of current 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 40MHz and selectively to 52 MHz.

Product Ordering Information

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
2: -40°C to +85°C
6: -20°C to +70°C
8: 0°C to +50°C
F: -30°C to +75°C

Stability
P: ±0.3 ppm
G: ±0.5 ppm
J: ±1.0 ppm
K: ±2.0 ppm
H: ±2.5 ppm
L: ±4.6 ppm
M: ±0.2 ppm

Output Type
T: Voltage Controlled With Tristate
F: No Voltage Control With Tristate

Output Waveform
C: HCMOS
S: Clipped Sine Wave

Package/Lead Configurations
N: 10 Pad Leadless Ceramic
T: 4/5 Pad Leadless Ceramic

Frequency (customer specified)

M6110Sxxx, M6111Sxxx & M6112Sxxx - Contact factory for datasheets.

Revision: 1-5-11

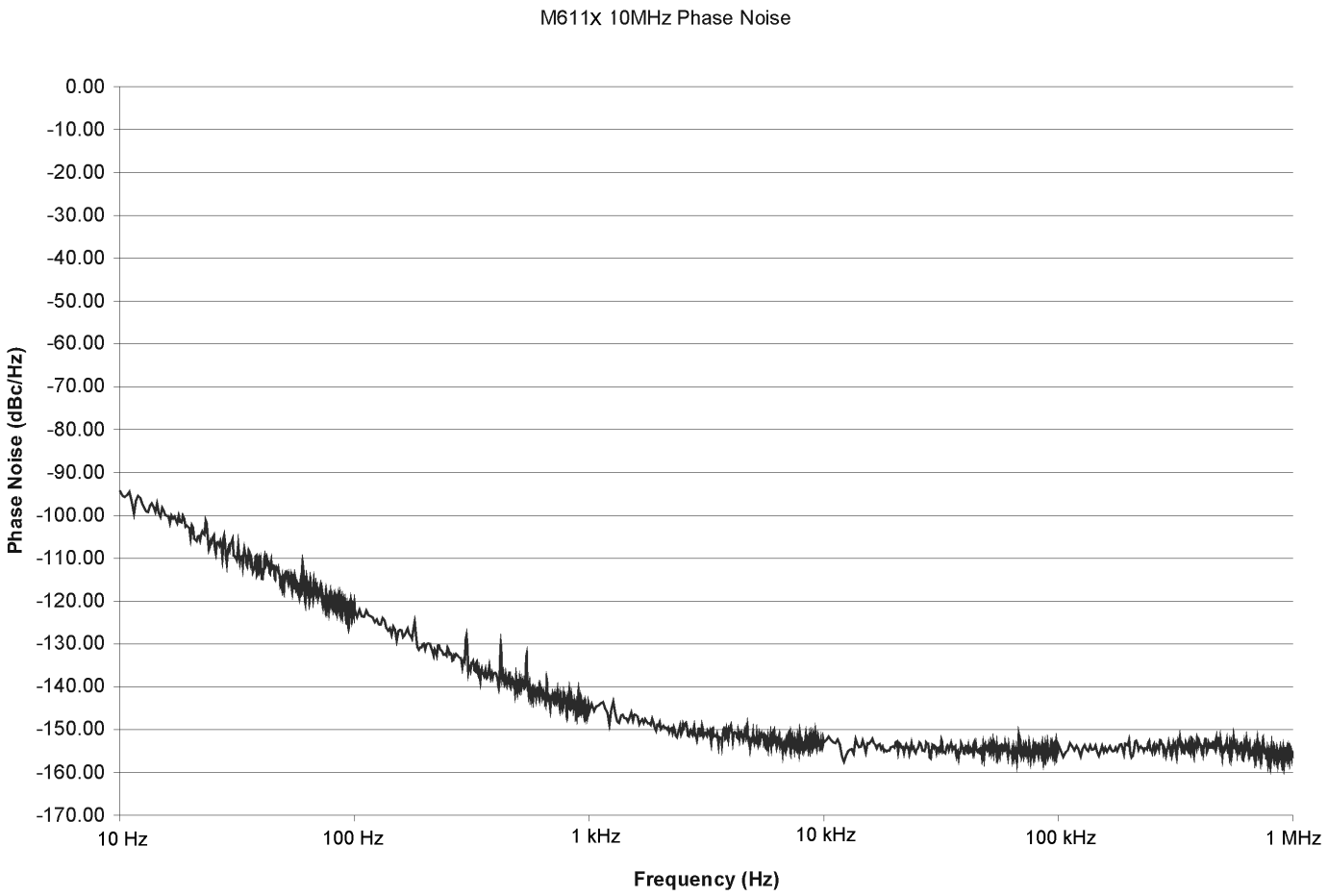
M611x Series

5 x 7 mm, 3.0, 3.3 & 5.0 Volt, HCMOS or Clipped Sinewave, Precision TCXO/TCVCXO

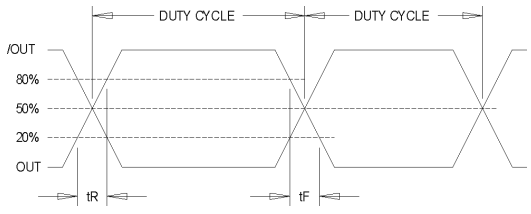
Performance Characteristics

	Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Electrical Specifications	Frequency Range	F_O	8		52	MHz	Contact factory above 40 MHz
	Operating Temperature	T_A	-40		+85	℃	See Ordering Information
	Storage Temperature	T_{STG}	-55		+125	℃	
	Frequency Tolerance @ +25℃		-1.0		+1.0	ppm	For TCXO only
	Frequency Stability		See Ordering Information				(Fmax – Fmin)/2
	Stability Vs. Reflow		-1.0		+1.0	ppm	
	Frequency Vs. Supply			±0.02	±0.1	ppm	For 5% supply voltage variation
	Frequency Vs. Load			±0.02	±0.1	ppm	For 5% load variation
	Aging (First Year)		-1.0		+1.0	ppm	$F_0 \leq 20$ MHz
	Aging (First Year)		-2.0		+2.0	ppm	$F_0 \geq 20$ MHz
	Aging (10 Year)		-3.0		+3.0	ppm	$F_0 \leq 20$ MHz (Includes first year)
	Aging (10 Year)		-5.0		+5.0	ppm	$F_0 \geq 20$ MHz (Includes first year)
	Supply Voltage Tolerance		-5.0		+5.0	%	See Ordering Information
	Supply Current (I_D)			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	V_{OL}			20	$\%V_S$	I_{OH}/I_{OL} = ± 4 mA, Vs = +3.0 V
	(HCMOS)	V_{OH}	80			$\%V_S$	I_{OH}/I_{OL} = ± 4 mA, Vs = +3.0 V
	Output Level		1.0			V_{pk-pk}	$F_o \leq 40$ MHz
	(Clipped Sinewave)		0.8			V_{pk-pk}	$F_o > 40$ 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		pF	HCMOS output
				10/10		Kohm/pF	Clipped sinewave output
	Frequency Adjustment		±9.2			ppm	Over Control Voltage Range
	Control Voltage Range		0.3		2.7	Volts	For V_S = 3.0
			0.3		3.0	Volts	For V_S = 3.3
			0.5		4.5	Volts	For V_S = 5.0
	Input Leakage Current		-50		+50	µA	
	Input Resistance		100			Kohm	
	Linearity				3	%	
	Modulation Bandwidth		2 kHz				
	Tristate Function		70			$\%V_S$	Output enabled. Logic “1” or “Open”
					30	$\%V_S$	Output disabled. Logic “0” or “GND”
	Tristate Leakage Current		-100		+100	µA	
	Phase Noise			-95		dBc/Hz	10 Hz Offset
	(Typical 10 MHz CMOS)			-125		dBc/Hz	100 Hz Offset
				-145		dBc/Hz	1 KHz Offset
				-152		dBc/Hz	10 KHz Offset
				-155		dBc/Hz	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, SMT					RoHS Compliant
	Max Soldering Conditions	See solder profile					

Phase Noise Plot



Output Waveform (HCMOS Output)

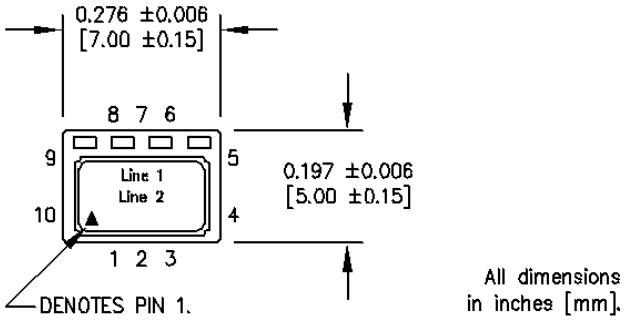


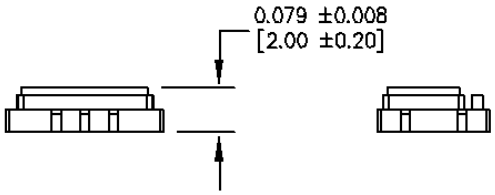
Product Dimension & Pinout Information - Package Code N (10 Pad)

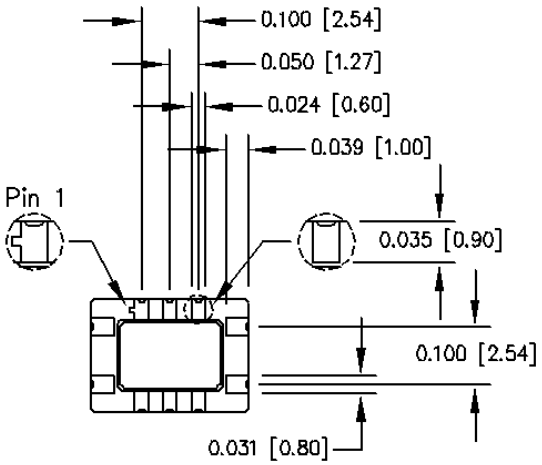
Pin Connections	
Function	**Pad**
Vref or N/C*	1
N/C - Do Not Connect	2
N/C - Do Not Connect	3
Ground	4
Output	5
N/C - Do Not Connect	6
N/C - Do Not Connect	7
Tristate	8
Supply Voltage (V_s)	9
Control Voltage	10

*Vref is not available for stabilities less than ±1.0 ppm

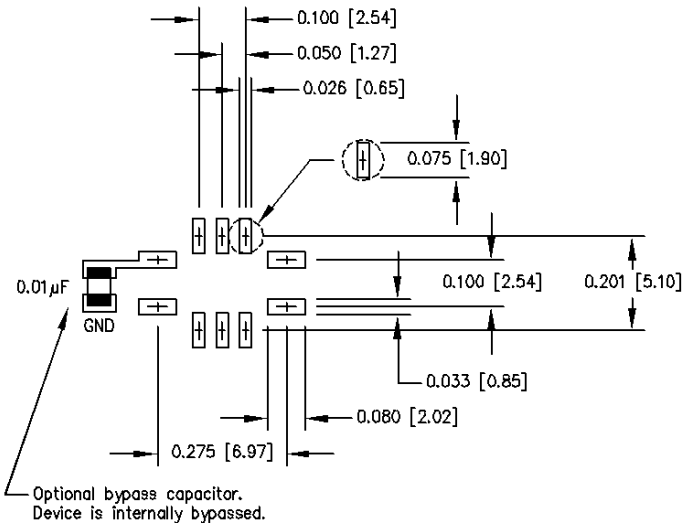
Part Marking Guide	
Line	**Description**
1	Part family, year, month of production
2	Frequency







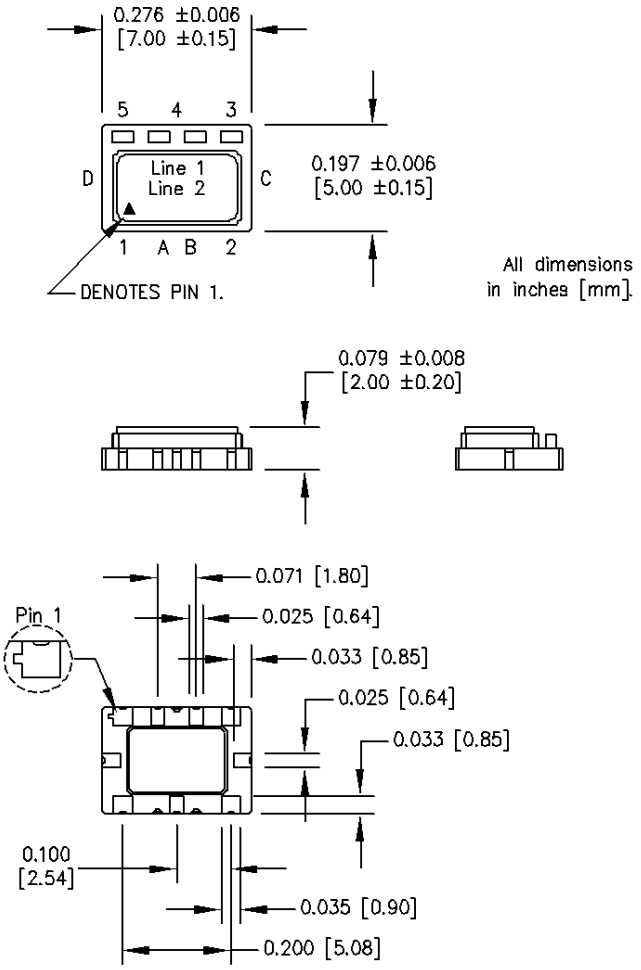
SUGGESTED SOLDER PAD LAYOUT



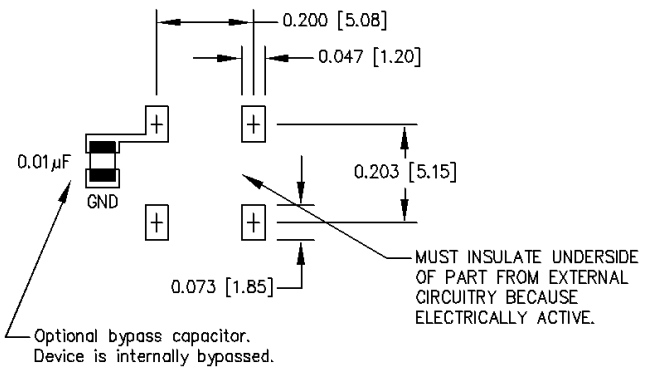
Product Dimension & Pinout Information - Package Code T (4/5 Pad)

Pin Connections	
Function	**Pad**
Vcontrol	1
N/C - Do Not Connect	A
N/C - Do Not Connect	B
Ground	2
N/C - Do Not Connect	C
Output	3
Tristate or N/C - Do Not Connect	4
Power	5
N/C - Do Not Connect	D

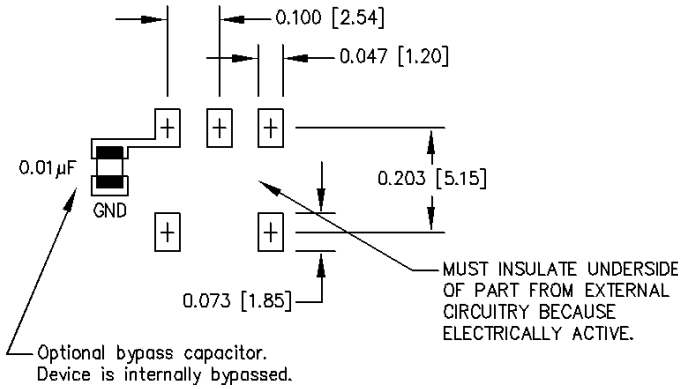
Part Marking Guide	
Line	**Description**
1	Part family, year, month of production
2	Frequency



SUGGESTED SOLDER PAD LAYOUT
WITHOUT TRISTATE (4 PAD)



SUGGESTED SOLDER PAD LAYOUT
WITH TRISTATE (5 PAD)



Handling Information

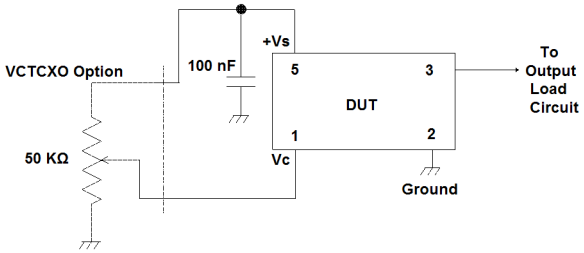
Although protection circuitry has been designed into the M611x oscillator, proper precautions should be taken to avoid exposure to electrostatic discharge (ESD) during handling and mounting. MtronPTI utilizes a human-body model (HBM) and a charged-device model (CDM) for ESD-susceptibility testing and 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 Ω, 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

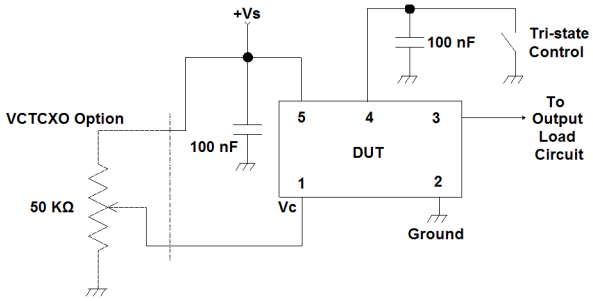
* MIL-STD-833D, Method 3015, Class 1

ATTENTION
Static Sensitive Devices
Handle only at Static Safe Work Stations

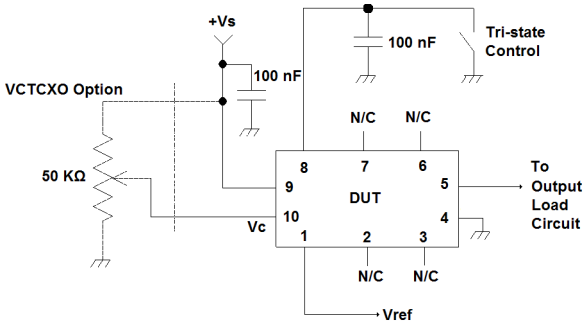
Typical Test Circuits



Test Circuit - T Package
Without Tri-State Option



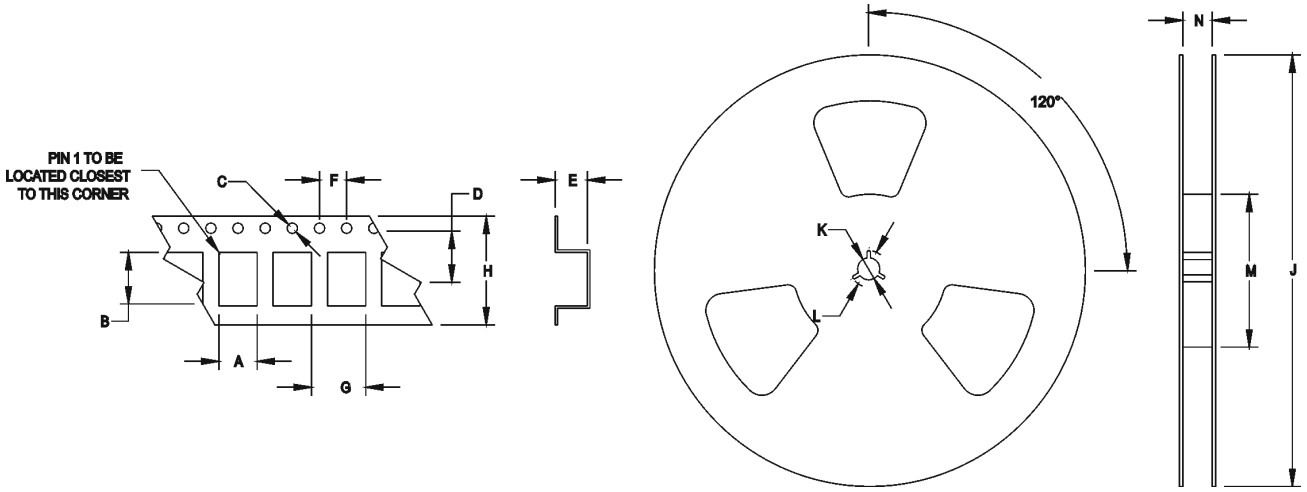
Test Circuit - T Package
With Tri-State Option



Test Circuit - N Package
With Tri-State

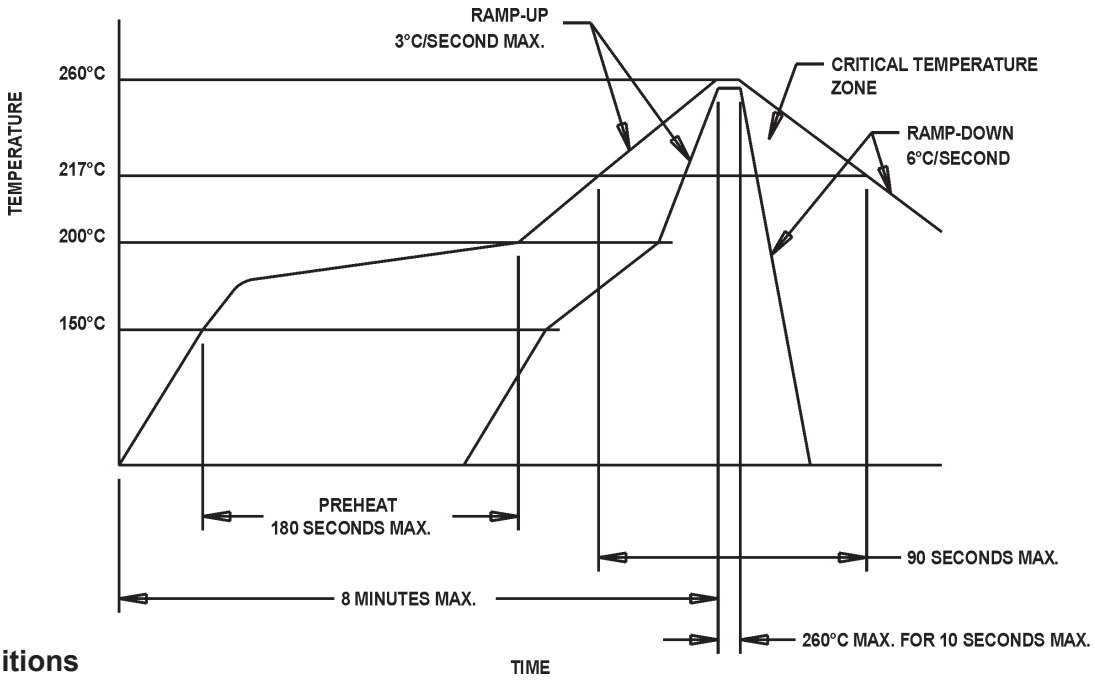
Tape & Reel Specifications

(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

Maximum Soldering Conditions



Solder Conditions

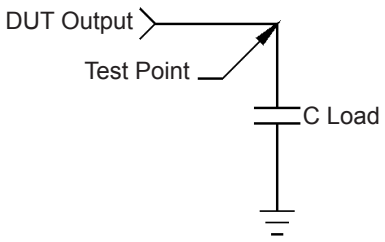
Note: Exceeding these limits may damage the device.

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 (Crystal Only)
Fine Leak	MIL-STD-202, Method 112	Must meet $1x10^{-8}$ (Crystal Only)
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
Physical Dimensions	MIL-STD-883, Method 2016	Per Specification
Internal Visual	Internal Specification	Per Internal Specification

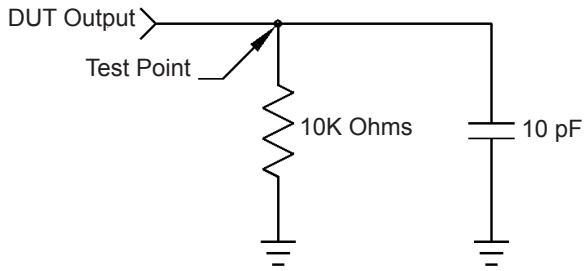
Load Circuit

Load Circuit #2 - HCMOS Output



Note: C Load includes probe and fixturing.

Load Circuit #7 - Clipped Sinewave Output



Product Revision Table

Date	Revision	PCN Number	Details of Revision

For custom products or additional specifications contact our sales team at
800.762.8800 (toll free) or 605.665.9321

For more information on this product visit the MtronPTI website at
www.mtronpti.com