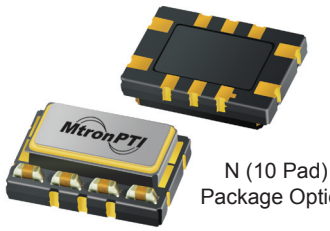
M610x Series Stratum 3

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

Product Features

- Stratum 3 performance with hold-over stability (0.32 ppm) over industrial temperature range (-40 °C to +85 °C)
- 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 M610x Series TCXO's and TCVCXO's provide network and wireless engineers with low voltage, surface mount products with tight stability over temperature and time. MtronPTI's unique approach to crystal compensation enables these devices to achieve full Stratum 3 temperature stability including holdover over -40 C to +85 C. Specially processed crystals enable the M610x 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 M610x ideal for those design engineers working on high data-rate, low BER data communication network products. 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 M610x Series is ideally suited for a wide range of applications such as SONET, SDH, SERDES, GSM, CDMA, 3G, 4G, Gig-Ethernet, 10G and 40G systems. Standard output for the M610x 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 a distinct advantage over similarly specified ovenized oscillators for power-sensitive remote applications. The M610x 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 52MHz.

Product Ordering Information

Ordering Information

M610x 1 S T C N 00.0000 MHz

Product Series
M6100: 5.0 V
M6101: 3.3 V
M6102: 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
S: ±4.6 ppm w/ Holdover

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)

M6100Sxxx, M6101Sxxx & M6102Sxxx - Contact factory for datasheets.

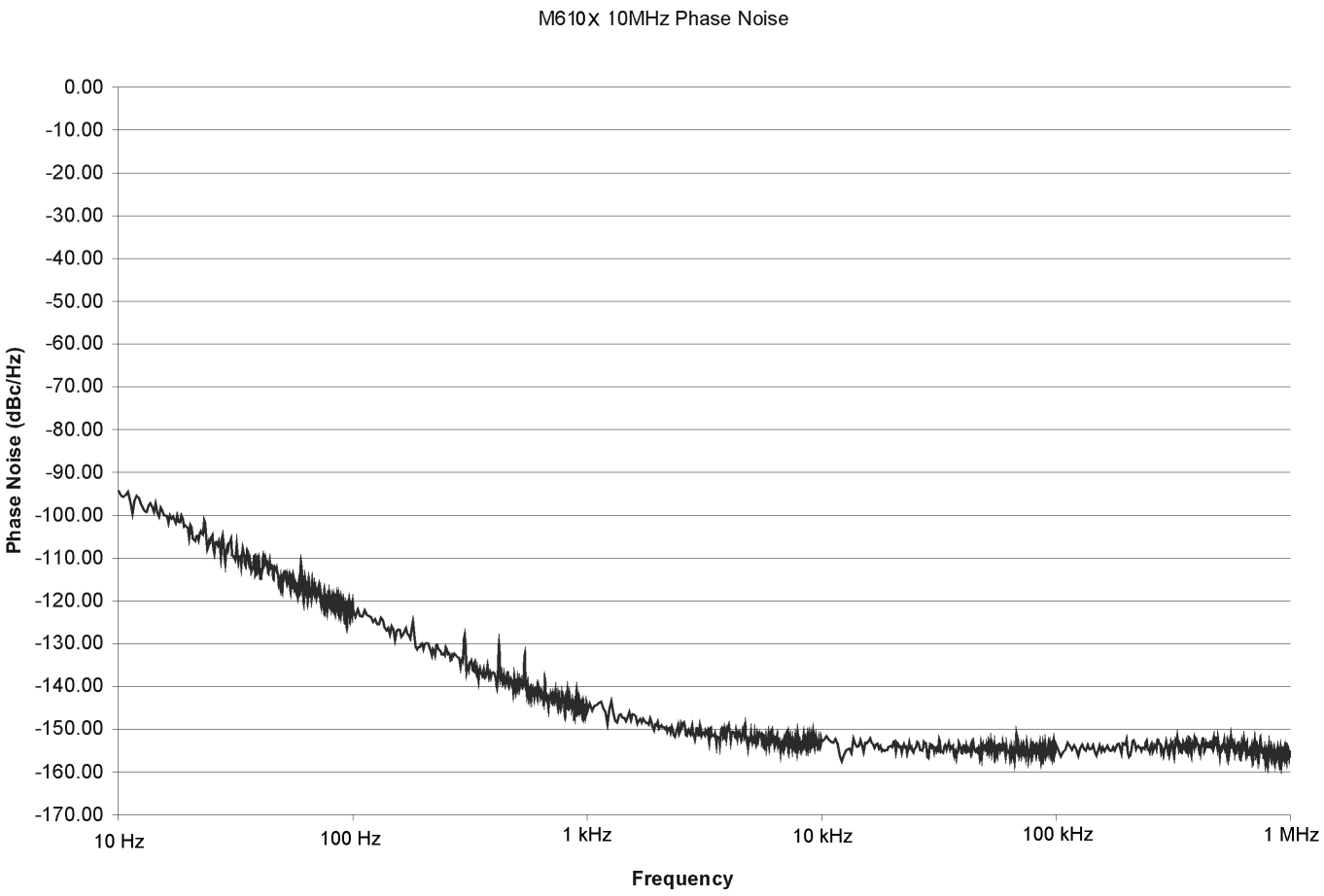
Revision: 1-5-11

Performance Characteristics

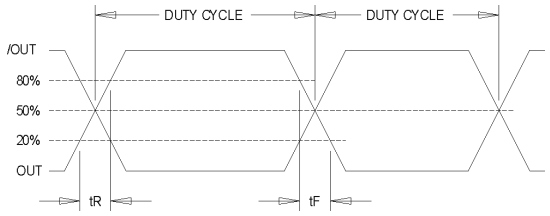
	Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Electrical Specifications	Frequency Range	F_O	8		52	MHz	Contact factory above 40 MHz
	Operating Temperature	T_A	-40		+85	℃	See Ordering Information
	Storage Temperature	T_{STG}	-55		+125	℃	
	Frequency Tolerance @ +25℃		-1.0		+1.0	ppm	For TCXO only
	Frequency Stability		-0.28		+0.28	ppm	Stability vs. Temperature
			-4.6		+4.6	ppm	Overall stability for 10 years
			-0.32		+0.32	ppm	Holdover stability for 24 hours over operating temperature
	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
	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



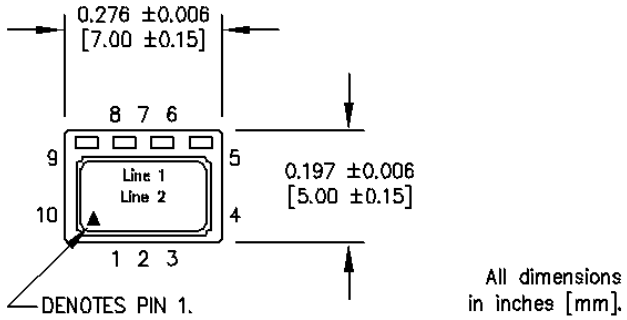
Output Waveform (HCMOS Output)

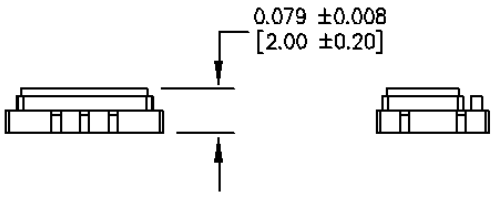


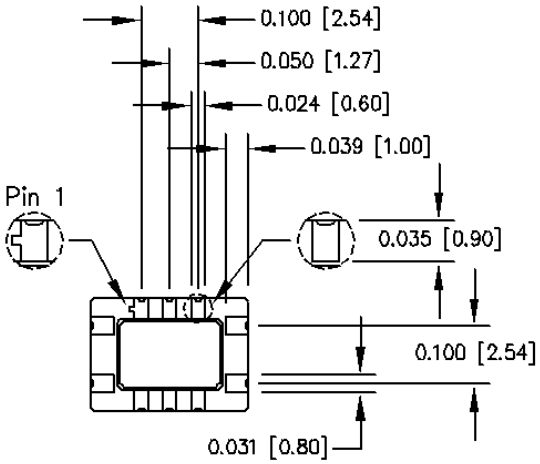
Product Dimension & Pinout Information - Package Code N (10 Pad)

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

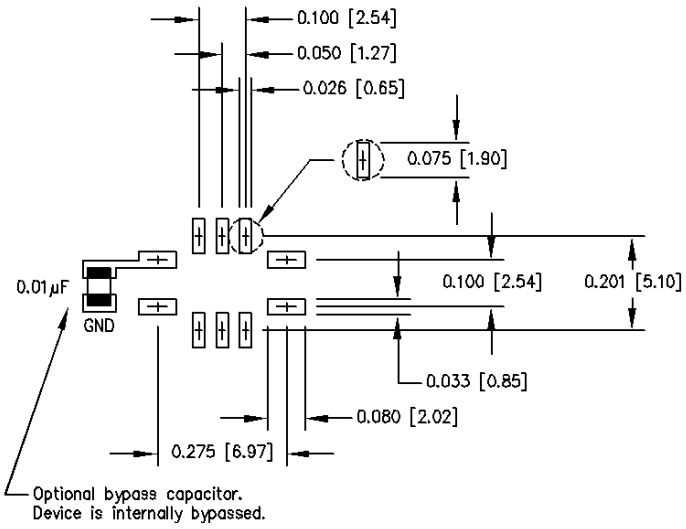
Part Marking Guide	
Line	**Description**
1	Part family, year, month of production
2	Frequency







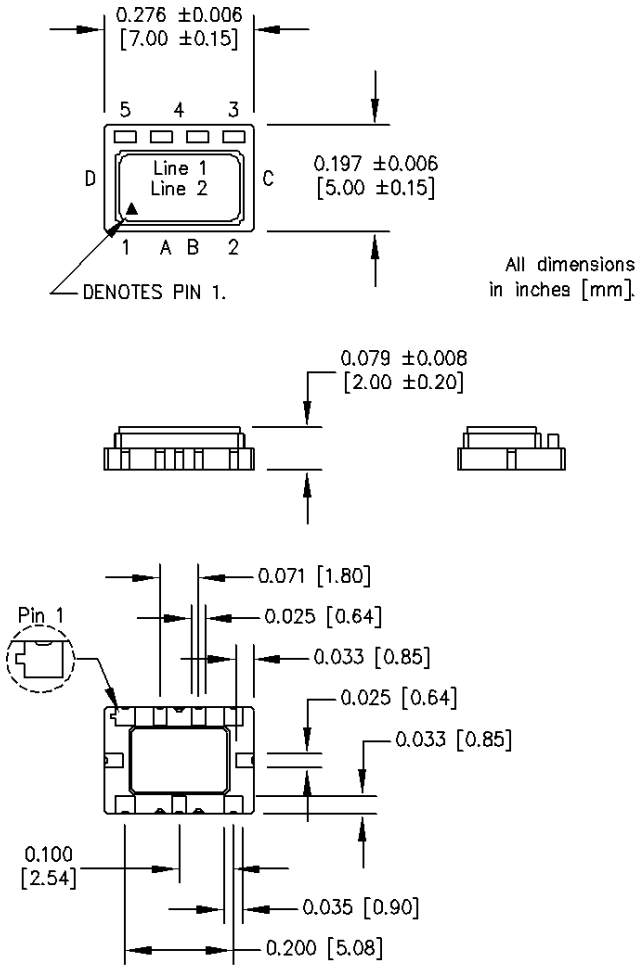
SUGGESTED SOLDER PAD LAYOUT



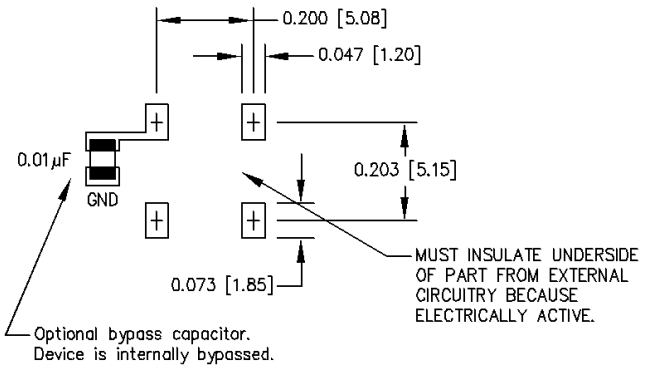
Product Dimension & Pinout Information - Package Code T (4/5 Pad)

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

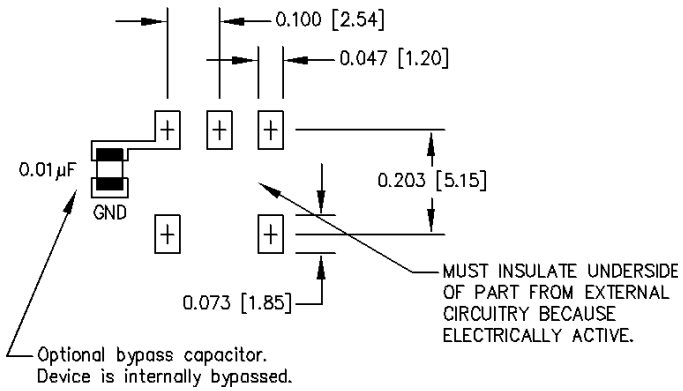
Part Marking Guide	
Line	**Description**
1	Part family, year, month of production
2	Frequency



SUGGESTED SOLDER PAD LAYOUT
WITHOUT TRISTATE (4 PAD)



SUGGESTED SOLDER PAD LAYOUT
WITH TRISTATE (5 PAD)



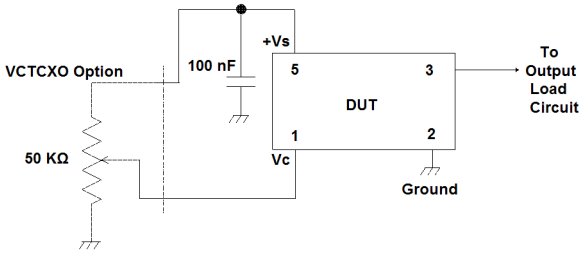
Handling Information

Although protection circuitry has been designed into the M610x 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.

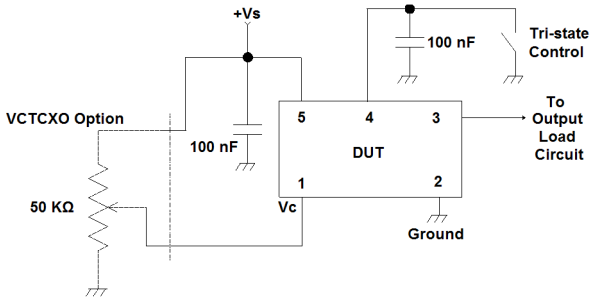
Model	ESD Threshold, Minimum	Unit
Human Body	1500*	V
Charged Device	1500*	V

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

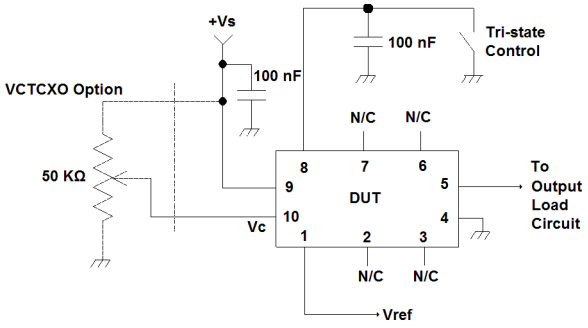
Typical Test Circuits



Test Circuit - T Package
Without Tri-State Option



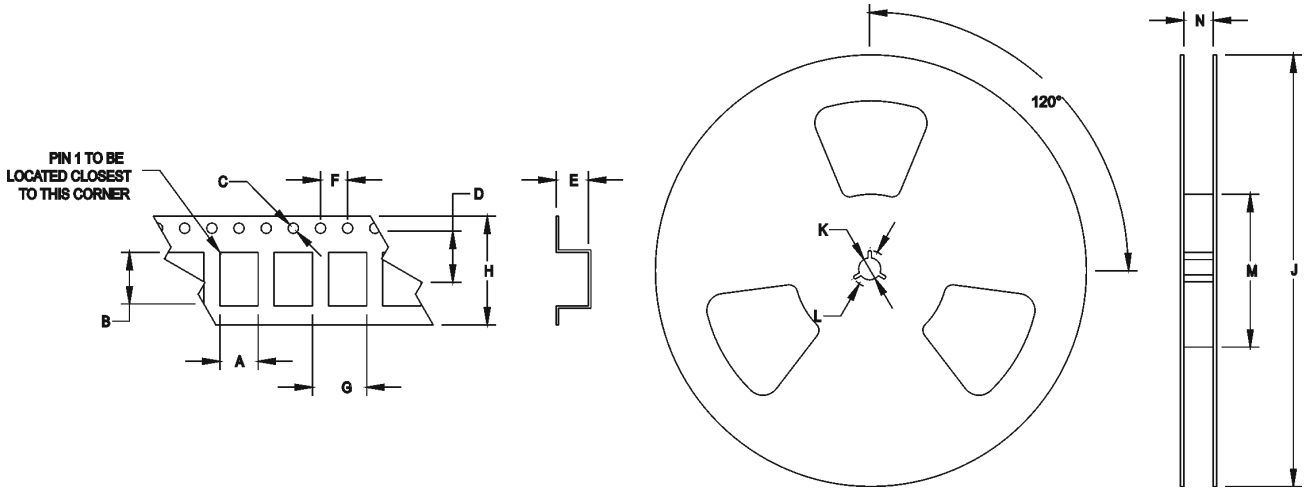
Test Circuit - T Package
With Tri-State Option



Test Circuit - N Package
With Tri-State

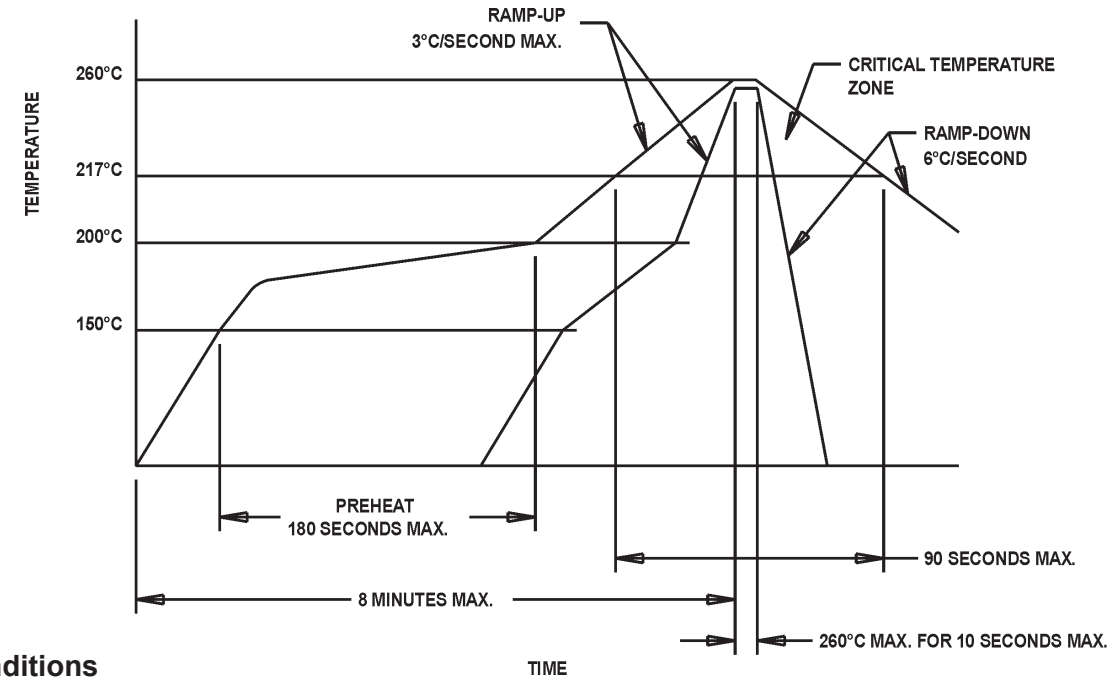
Tape & Reel Specifications

(all measurements are in mm)	A	B	C	D	E	F	G	H	J	K	L	M	N
M610x	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

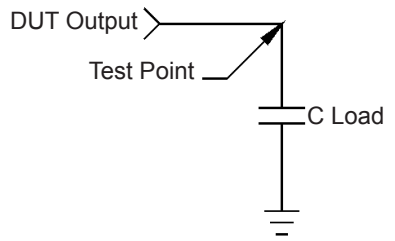
Note: Exceeding these limits may damage the device.

Quality Parameters

Environmental Specifications/Qualification Testing Performed on the M610x 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

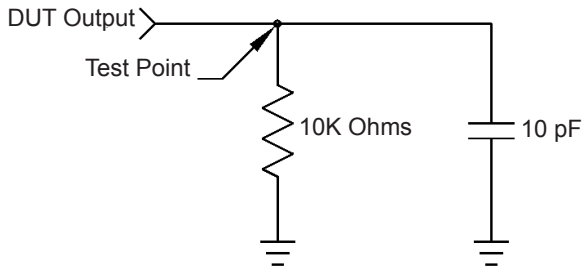
Load Circuit

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