

## Product Features

- Stratum 3 performance with hold-over stability (0.32 ppm) over 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



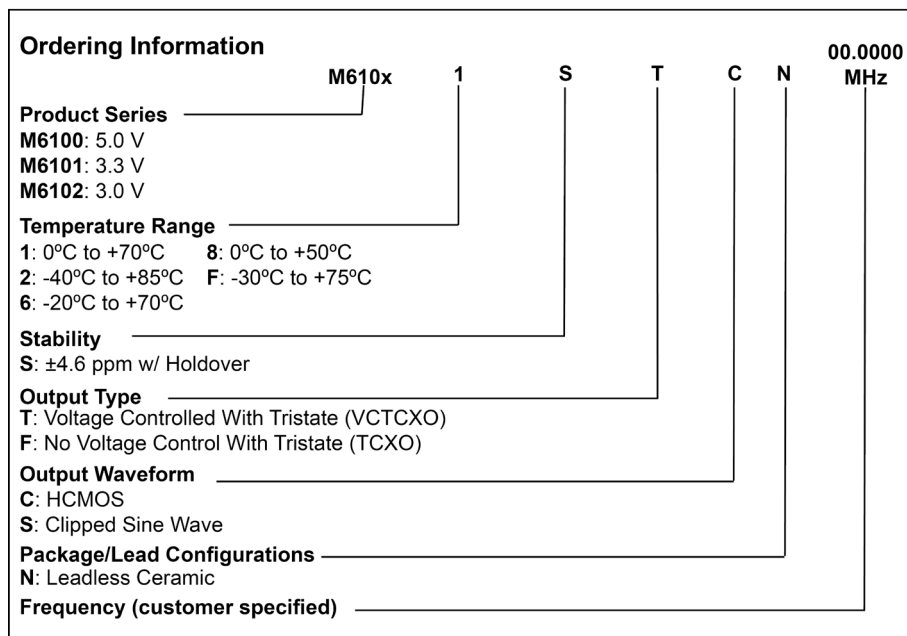
## Product Description

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. 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 M610x ideal for those design engineers working on high data-rate, low BER data communication network products.

## 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 an advantage over similarly specified ovenized oscillators for power-sensitive 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 52 MHz, and is offered in a ceramic surface mount platform with industry standard 5 x 7 mm footprint.

## Product Ordering Information



M6100Sxxx, M6101Sxxx & M6102Sxxx - Contact factory for datasheets.

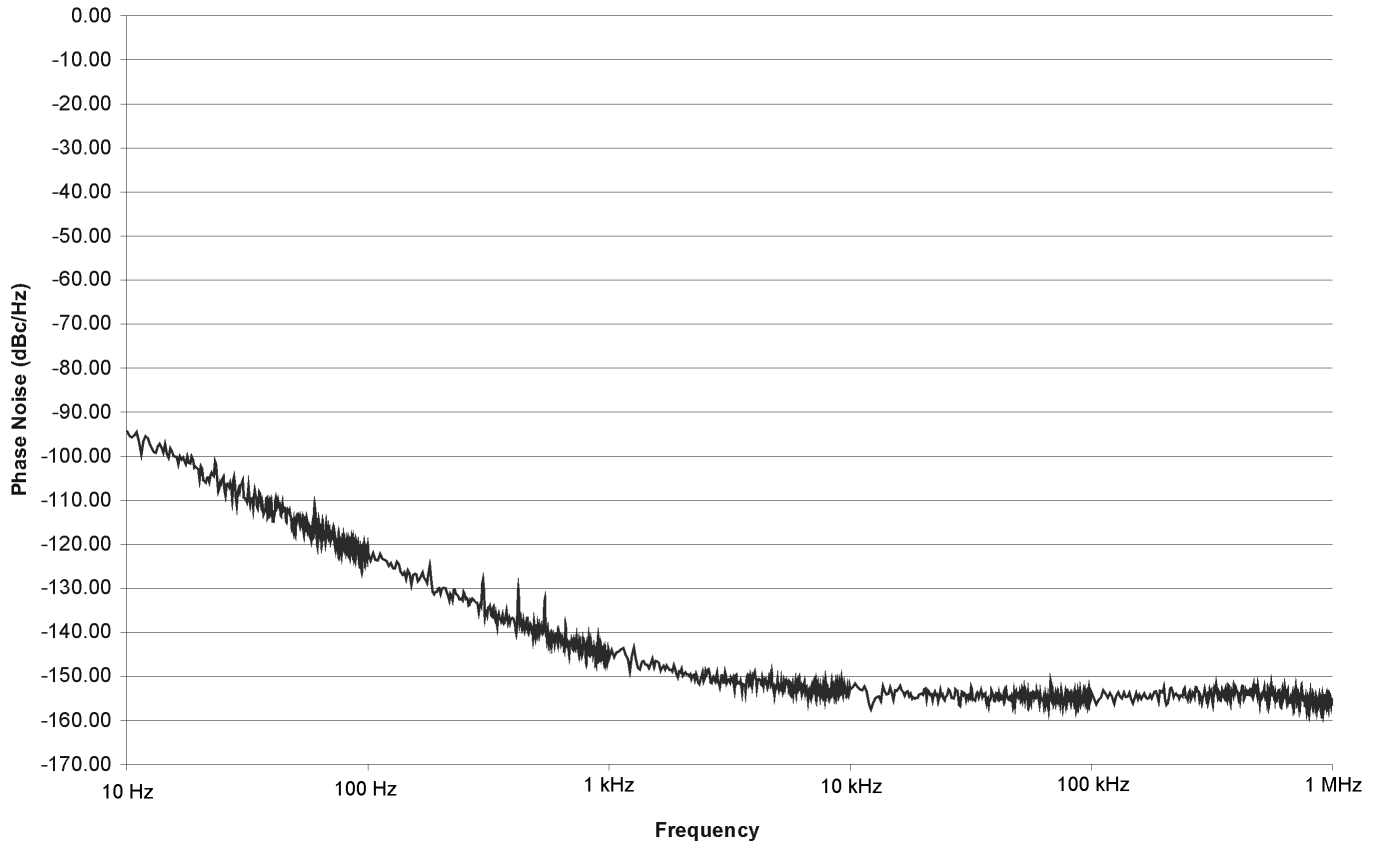
**Performance Characteristics**

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Frequency Range	F <sub>O</sub>	8		52	MHz	
Operating Temperature	T <sub>A</sub>	-40		+85	°C	See Ordering Information
Storage Temperature	T <sub>STG</sub>	-55		+125	°C	
Frequency Tolerance @ +25°C		-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			±0.2		ppm	For 10% supply voltage variation
Frequency Vs. Load			±0.2		ppm	For 10% load variation
Supply Voltage Tolerance		-5.0		+5.0	%	See Ordering Information
Supply Current (I <sub>D</sub> )			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 <sub>OL</sub> V <sub>OH</sub>	80		20	%V <sub>S</sub> %V <sub>S</sub>	I <sub>OH</sub> /I <sub>OL</sub> = ±4 mA, V <sub>S</sub> = +3.0 V I <sub>OH</sub> /I <sub>OL</sub> = ±4 mA, V <sub>S</sub> = +3.0 V
Output Level (Clipped Sinewave)		1.0			V <sub>pk-pk</sub>	F <sub>O</sub> ≤ 40 MHz
		0.8			V <sub>pk-pk</sub>	F <sub>O</sub> > 40 MHz
Waveform Symmetry		40		60	%	Ref. to ½ V <sub>S</sub> 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 <sub>S</sub> = 3.0
		0.3		3.0	Volts	For V <sub>S</sub> = 3.3
		0.5		4.5	Volts	For V <sub>S</sub> = 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 <sub>S</sub>	Output enabled. Logic "1" or "Open"
				30	%V <sub>S</sub>	Output disabled. Logic "0" or "GND"
Tristate Leakage Current		-100		+100	µA	Pad 8
Phase Noise (Typical 10 MHz CMOS)			-95		dBc/Hz	10 Hz Offset
			-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, 10-pad SMT				RoHS Compliant
	Max Soldering Conditions	See solder profile, Figure 1				

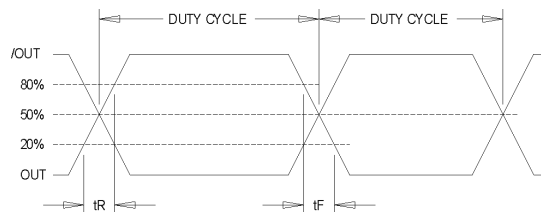
HCMOS Load – see load circuit diagram #2. Sinewave Load – see load circuit diagram #7.

**Phase Noise Plot**

M610x 10MHz Phase Noise

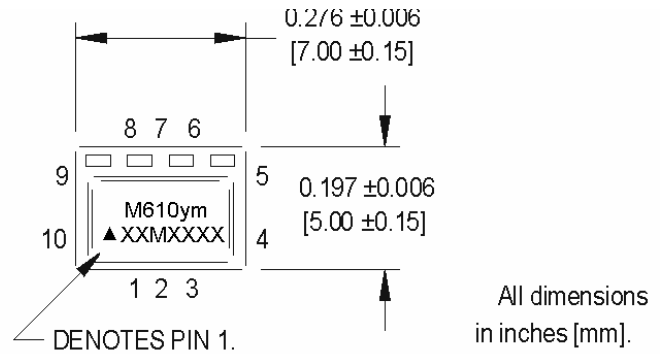


**Output Waveform**

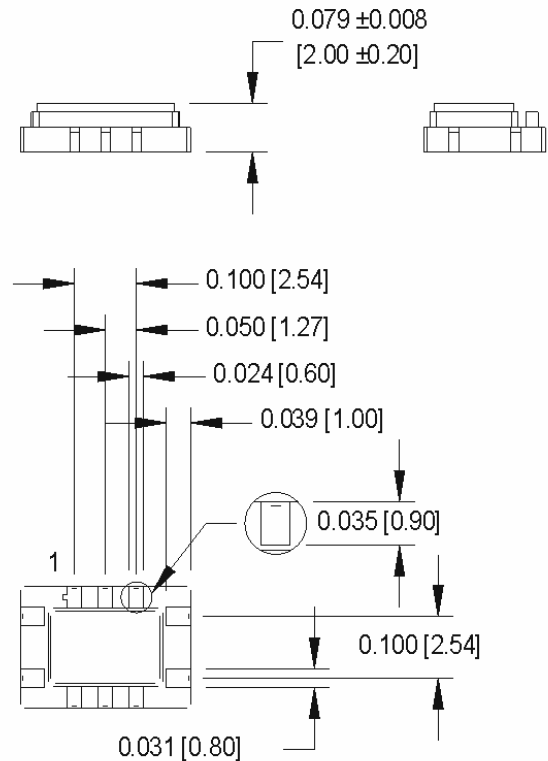
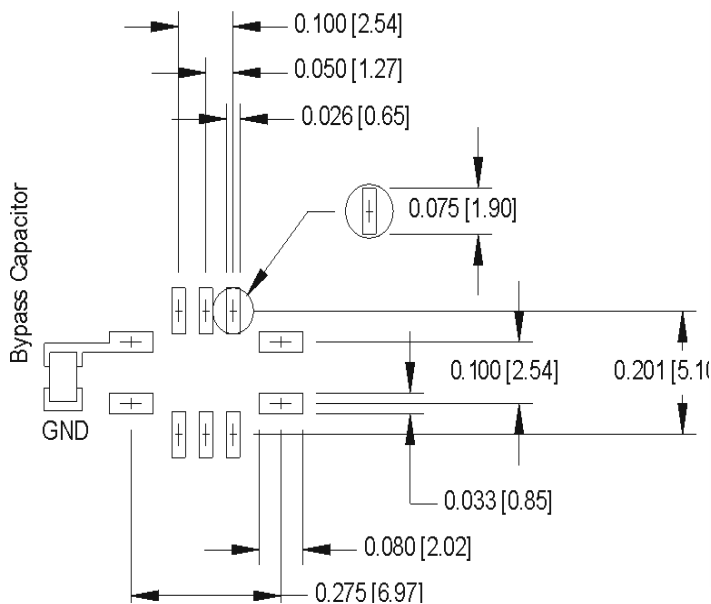


## Product Dimension & Pinout Information

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 <sub>s</sub> )	9
Control Voltage	10



### SUGGESTED SOLDER PAD LAYOUT



## M610x Series Stratum 3

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

### 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  $\Omega$ , 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



ATTENTION  
Static Sensitive  
Devices  
Handle only at  
Static Safe Work  
Stations

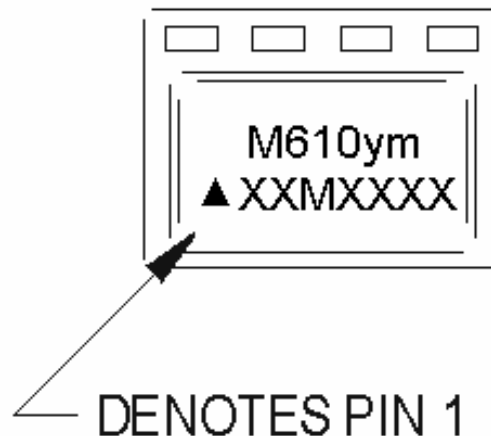
### Quality Parameters

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
Fine Leak	MIL-STD-202, Method 112	Must meet $1 \times 10^{-3}$
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

### Part Marking Guide

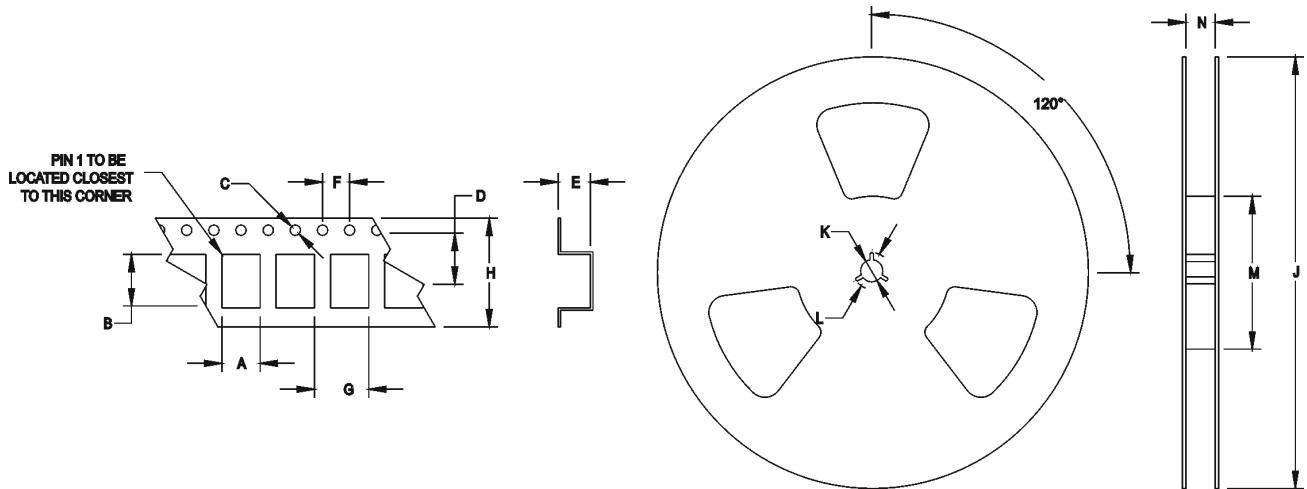
Line 1: Indicates part family, year, month of production

Line 2: Indicates frequency



**Tape & Reel Specifications**

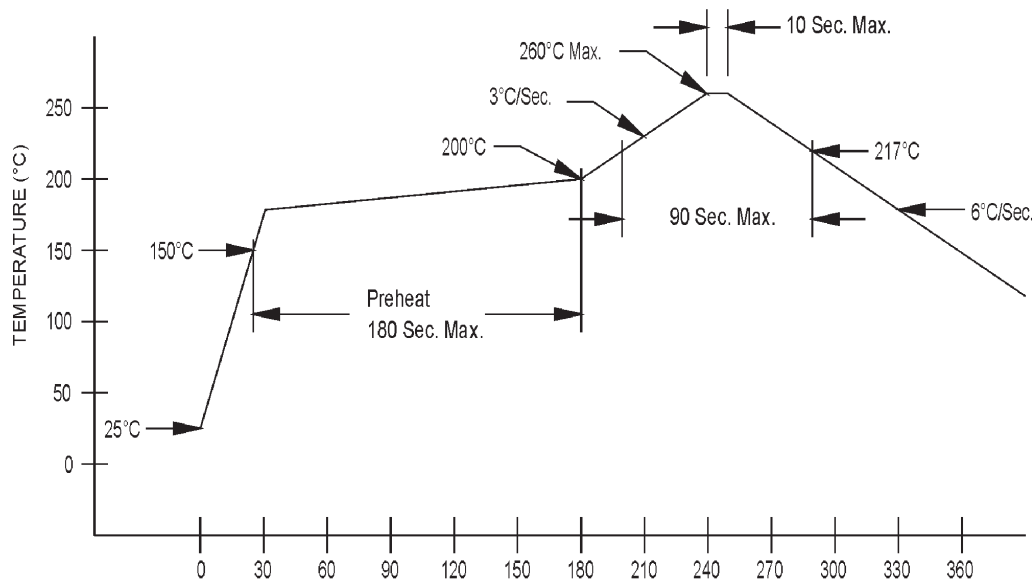
(all measurements are in mm)	A	B	C	D	E	F	G	H	J	K	L	M	N
M610x	5.40	7.40	1.55	7.50	2.60	2.00	4.00	16.00	330	13.00	20.20	100	16.40



**Standard Tape and Reel: 1000 parts per reel**

**Maximum Soldering Conditions**

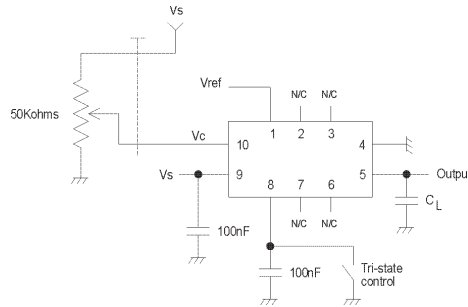
+260°C REFLOW PROFILE (RoHS COMPLIANT SOLDER)



**Solder Conditions**

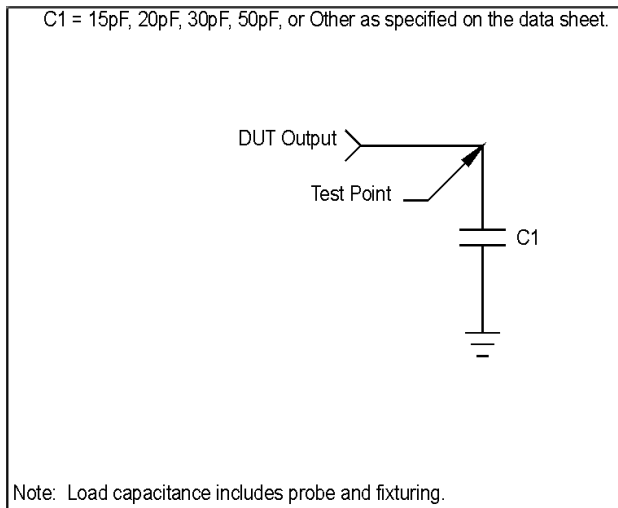
Note: Exceeding these limits may damage the device.

**Typical Test Circuit**

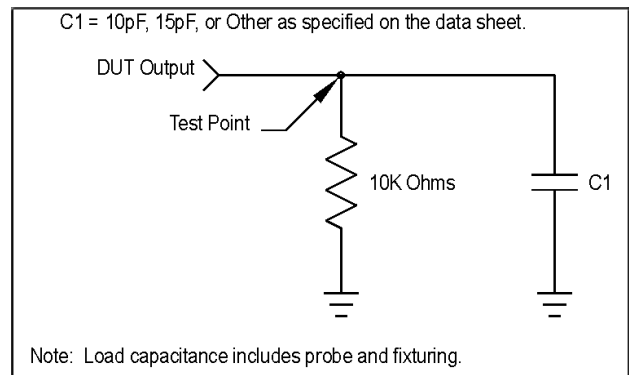


**Load Circuit**

Load Circuit #2 - HCMOS



Load Circuit #7 - Clipped Sinewave TCXO/TCVCXO



**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**