

M611x Series

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

Product 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



Product Description

MtronPTI's M611x Series TCXO's and TCVTCXO'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.

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 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.

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 | | | | | | | |
| 3: | 0°C to +50°C | | | | | | | |
| 4: | -30°C to +75°C | | | | | | | |
| 5: | -20°C to +70°C | | | | | | | |
| Stability | | | | | | | | |
| P: | ± 0.3 ppm | | | | | | | |
| G: | ± 0.5 ppm | | | | | | | |
| J: | ± 1.0 ppm | | | | | | | |
| K: | ± 2.0 ppm | | | | | | | |
| H: | ± 2.5 ppm | | | | | | | |
| Output Type | | | | | | | | |
| T: | Voltage Controlled With Tristate (VCTCXO) | | | | | | | |
| F: | No Voltage Control With Tristate (TCXO) | | | | | | | |
| Output Waveform | | | | | | | | |
| C: | HCMOS | | | | | | | |
| S: | Clipped Sine Wave | | | | | | | |
| Package/Lead Configurations | | | | | | | | |
| N: | Leadless Ceramic | | | | | | | |
| Frequency (customer specified) | | | | | | | | |

M6110Sxxx, M6111Sxxx & M6112Sxxx - Contact factory for datasheets.

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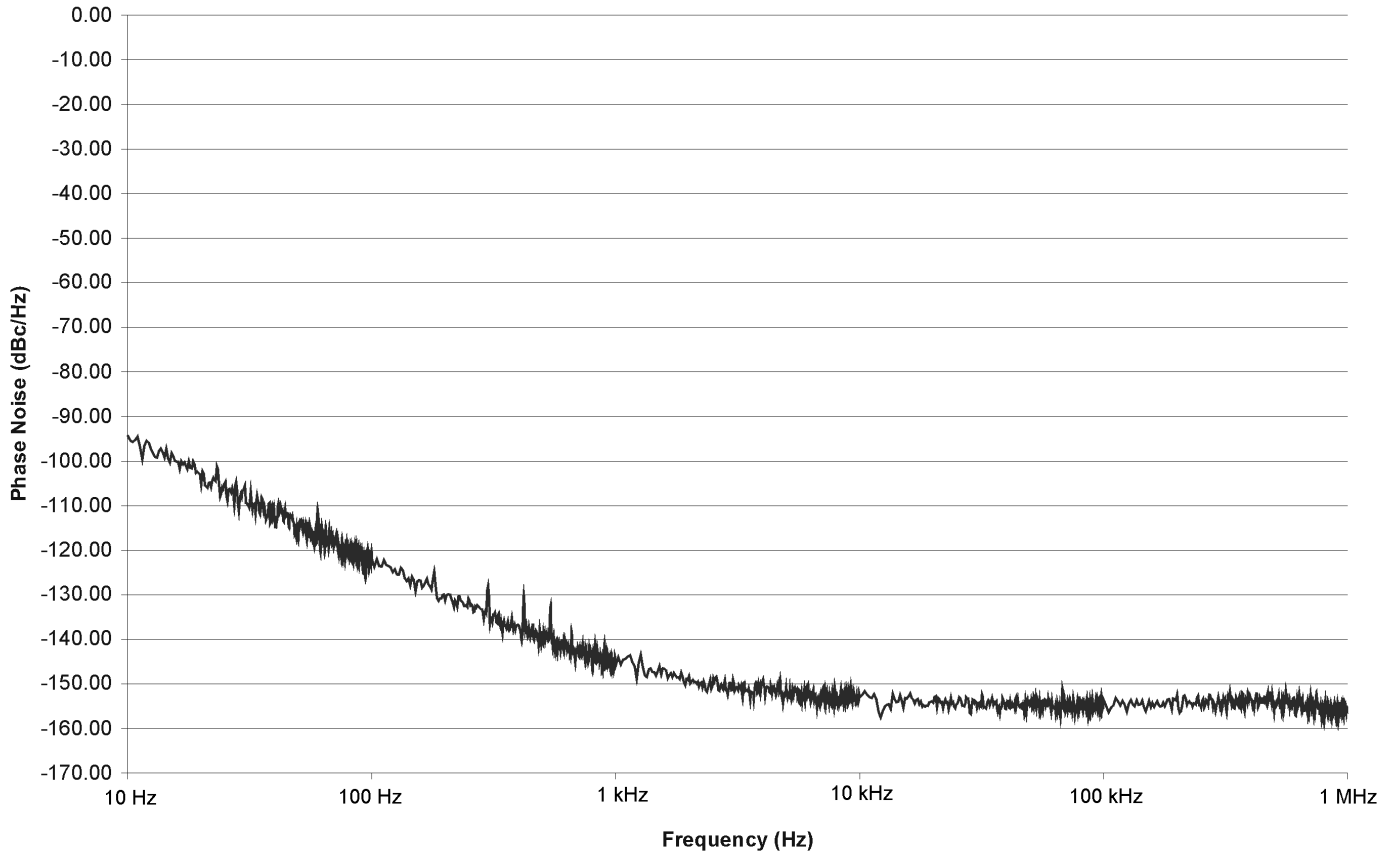
Performance Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Units | Conditions/Notes |
|-----------------------------------|--------------------------|--------------------------------------|-------|------|--------------------|--|
| 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 | $F_0 \leq 20$ 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 (HCMOS) | V_{OL} V_{OH} | 80 | | 20 | % V_S % V_S | $I_{OH}/I_{OL} = \pm 4$ mA, $V_S = +3.0$ V $I_{OH}/I_{OL} = \pm 4$ mA, $V_S = +3.0$ V |
| Output Level (Clipped Sinewave) | | 1.0 | | | V_{pk-pk} | $F_0 \leq 40$ MHz |
| | | 0.8 | | | V_{pk-pk} | $F_0 > 40$ MHz |
| Waveform Symmetry | | 40 | | 60 | % | Ref. to $\frac{1}{2} V_S$. 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 | 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 | | 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 | | | | |

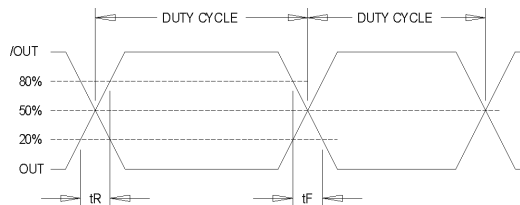
HCMOS Load – see load circuit diagram #2. Sinewave Load – see load circuit diagram #7.

Phase Noise Plot

M611x 10MHz Phase Noise

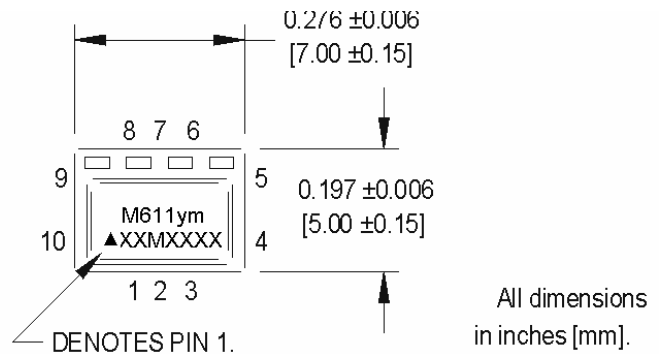


Output Waveform

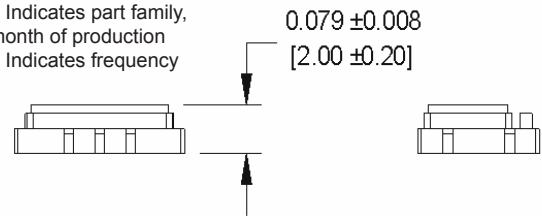


Product Dimension & Pinout Information

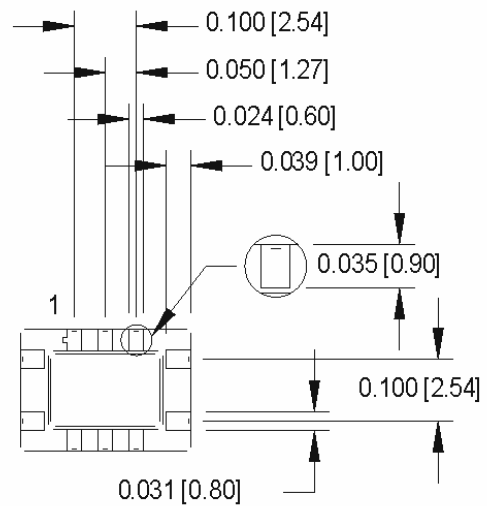
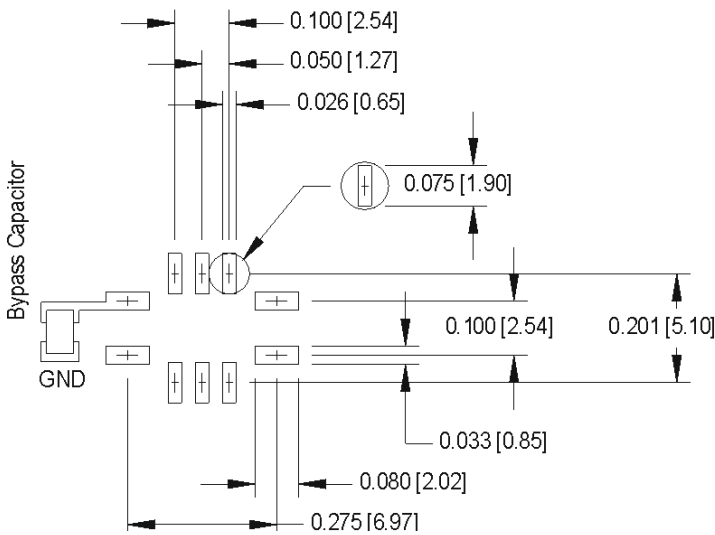
| Pin Connections | |
|----------------------------------|-----|
| Function | Pad |
| Vref or N/C | 1 |
| N/C | 2 |
| N/C | 3 |
| Ground | 4 |
| Output | 5 |
| N/C | 6 |
| N/C | 7 |
| Tristate | 8 |
| Supply Voltage (V _s) | 9 |
| Control Voltage | 10 |



Part Markings:
Line 1: Indicates part family,
year, month of production
Line 2: Indicates frequency



SUGGESTED SOLDER PAD LAYOUT



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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-883D, Method 3015, Class 1



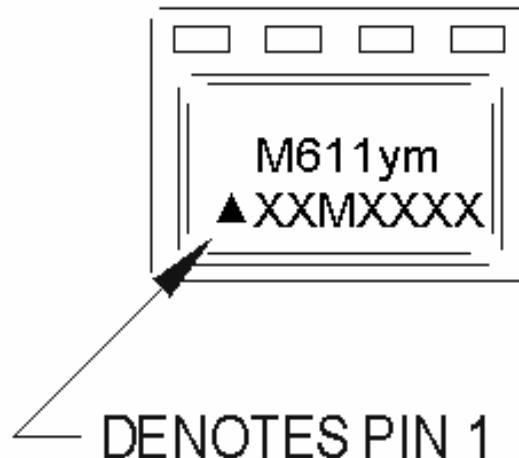
Quality Parameters

| Environmental Specifications/Qualification Testing Performed on the M611x TCXO/TCVTCXO | | |
|--|------------------------------|---|
| 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^{-10} |
| 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

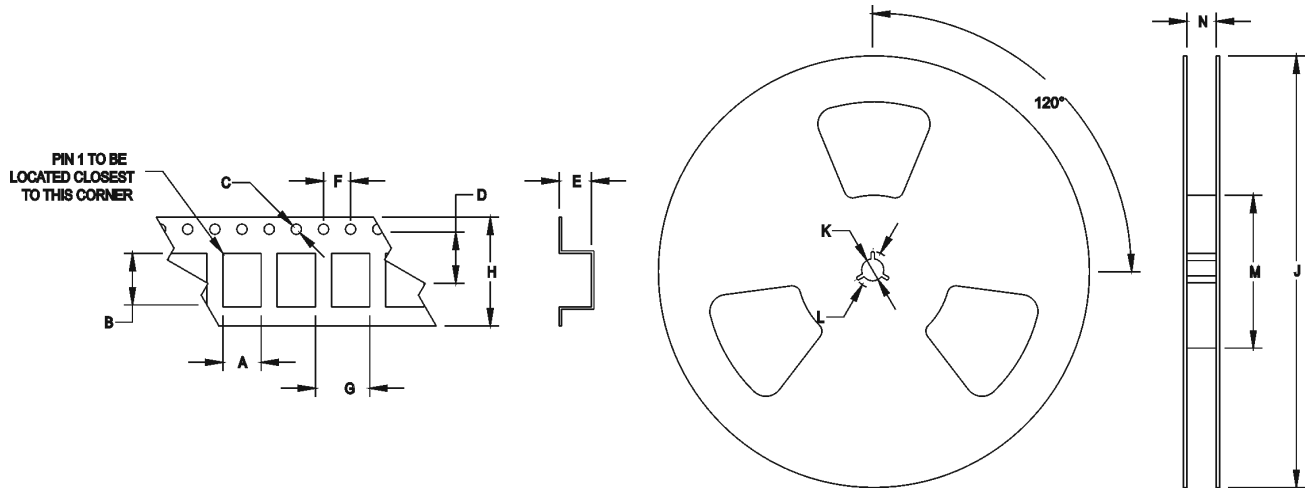


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Tape & Reel Specifications

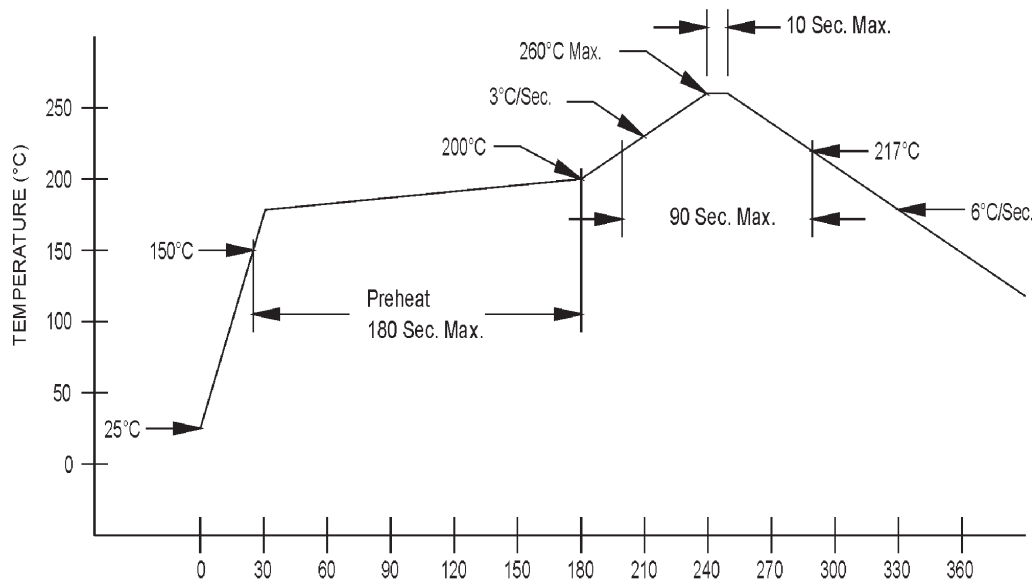
| (all measurements are in mm) | A | B | C | D | E | F | G | H | J | K | L | M | N |
|------------------------------|------|------|------|------|------|------|------|-------|-----|-------|-------|-----|-------|
| M611x | 5.40 | 7.40 | 1.55 | 7.50 | 2.60 | 2.00 | 4.00 | 16.00 | 330 | 13.00 | 20.20 | 100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



Standard Tape and Reel: 1000 parts per reel

Maximum Soldering Conditions

+260°C REFLOW PROFILE (RoHS COMPLIANT SOLDER)



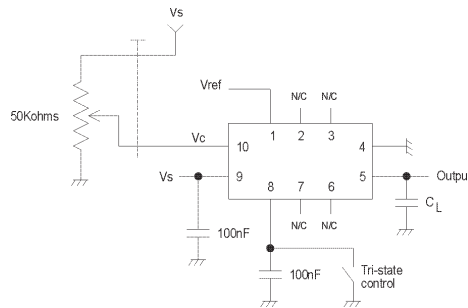
Solder Conditions

Note: Exceeding these limits may damage the device.

M611x Series

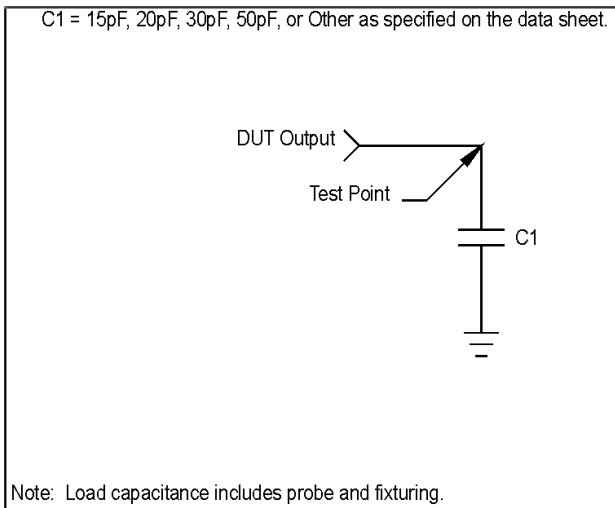
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Typical Test Circuit

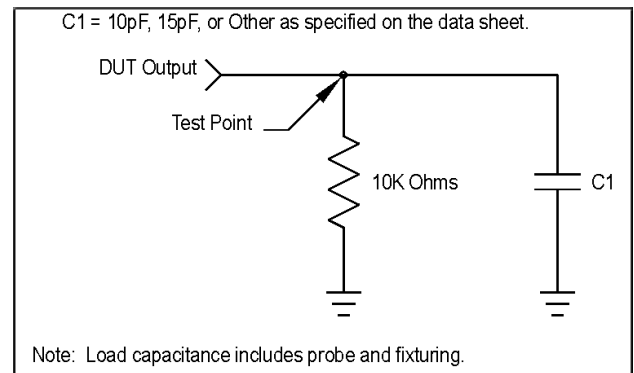


Load Circuit

Load Circuit #2 - HCMOS



Load Circuit #7 - Clipped Sinewave TCXO/TCVTCXO



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