

### Product Features

- Tight stability (0.5 ppm)
- 3.3 V and 5.0 V versions
- Wide frequency range 8-52 MHz
- Low phase noise



### Product Description

MtronPTI's M6049/M6050 series of TCXO and TCVCXO's provide design engineers with a high stability in a reliable standard 14-DIP through-hole device. Tight stability of  $\pm 0.5$  ppm is achievable utilizing MtronPTI's unique crystal compensation technology. Excellent phase noise ( $-152$  dBc/Hz at 10kHz) is also exhibited by the M6049/M6050 series. HCMOS and clipped sinewave output types are available in frequencies from 8 MHz to 52 MHz.

### Product Applications

The M6049/M6050 series is ideally suited for a wide range of applications such as SERDES, SONET, WiMAX, GSM, GPS, 3G & 4G, CDMA, Gig-E, and other wireless communications systems. The low power ( $< 10$  mA) make the M6049/M6050 a good choice for use in battery back-up operated systems and other "green" related, power sensitive applications. The low phase noise allows the M6049/M6050 to be used as a reference oscillator for PLL circuits in RF synthesizers and digital transmission systems.

### Product Ordering Information

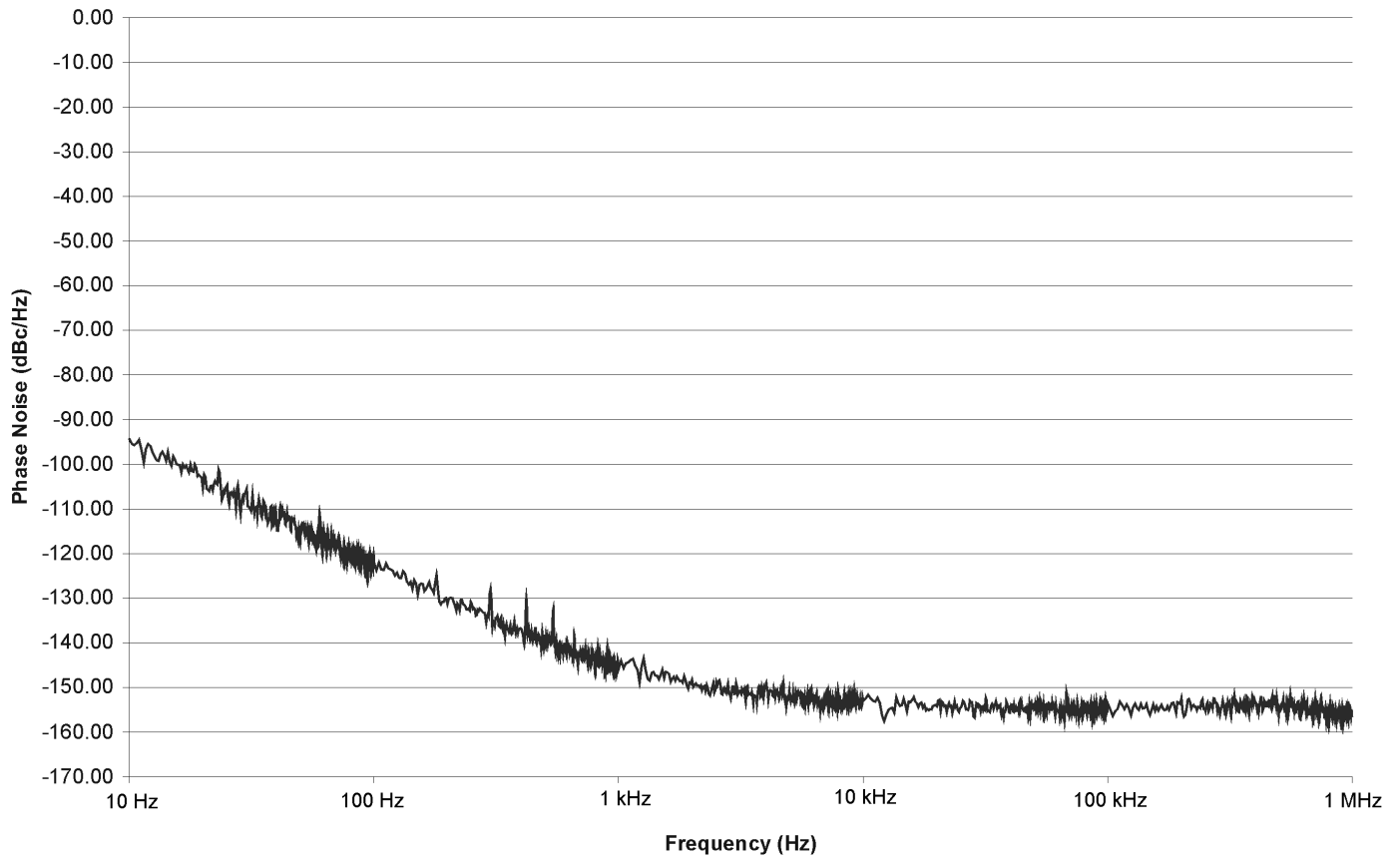
Ordering Information		M6049 1 G A C D					00.0000 MHz
Product Series	M6049 = 3.3 V M6050 = 5.0 V						
Temperature Range	1: 0°C to +70°C 2: -40°C to +85°C 6: -20°C to +70°C	8: 0°C to +50°C F: -30°C to +75°C					
Stability	G: $\pm 0.5$ ppm J: $\pm 1.0$ ppm K: $\pm 2.0$ ppm	H: $\pm 2.5$ ppm L: $\pm 4.6$ ppm E: $\pm 10$ ppm					
Tuning Range (min)	A: $\pm 5$ ppm B: $\pm 10$ ppm	C: $\pm 20$ ppm X: No Voltage Control					
Output Waveform	C: 45/55% HCMOS S: Clipped Sinewave						
Package/Lead Configurations	D: 14 Pin Dip						
Frequency (customer specified)							

**Performance Characteristics**

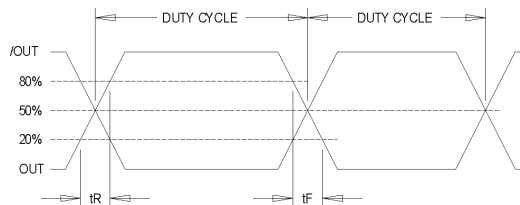
	Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Electrical Specifications	Frequency Range	F <sub>O</sub>	8		52	MHz	
	Operating Temperature	T <sub>A</sub>	-40		+85	°C	See Ordering Information
	Storage Temperature	T <sub>STG</sub>	-55		+125	°C	
	Frequency Tolerance @ +25°C		-1.0		+1.0	ppm	For TCXO only
	Frequency Stability						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 <sub>0</sub> ≤ 20 MHz
	Aging (First Year)		-2.0		+2.0	ppm	F <sub>0</sub> ≥ 20 MHz
	Aging (10 Year)		-3.0		+3.0	ppm	F <sub>0</sub> ≤ 20 MHz (Includes first year)
	Aging (10 Year)		-5.0		+5.0	ppm	F <sub>0</sub> ≥ 20 MHz (Includes first year)
	Supply Voltage (V <sub>S</sub> )		-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
	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 Logic Levels (Clipped Sinewave)	V <sub>OL</sub> V <sub>OH</sub>	1.0 0.8			V <sub>pk-pk</sub> V <sub>pk-pk</sub>	F <sub>0</sub> ≤ 40 MHz F <sub>0</sub> > 40 MHz
	Waveform Symmetry		45		55	%	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
	Frequency Adjustment		See Ordering Information				Over Control Voltage Range
	Control Voltage Range		0.3		3.0	Volts	For V <sub>S</sub> = 3.3 V
			0.5		4.5	Volts	For V <sub>S</sub> = 5.0 V
	Input Leakage Current		-50		+50	µA	Pin 1
Input Resistance		100			Kohm	Pin 1	
Linearity				10	%		
Modulation Bandwidth		10			KHz	Pin 1, 20 MHz, min pull of ±10 ppm	
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	14 Pin Dip				RoHS Compliant	

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

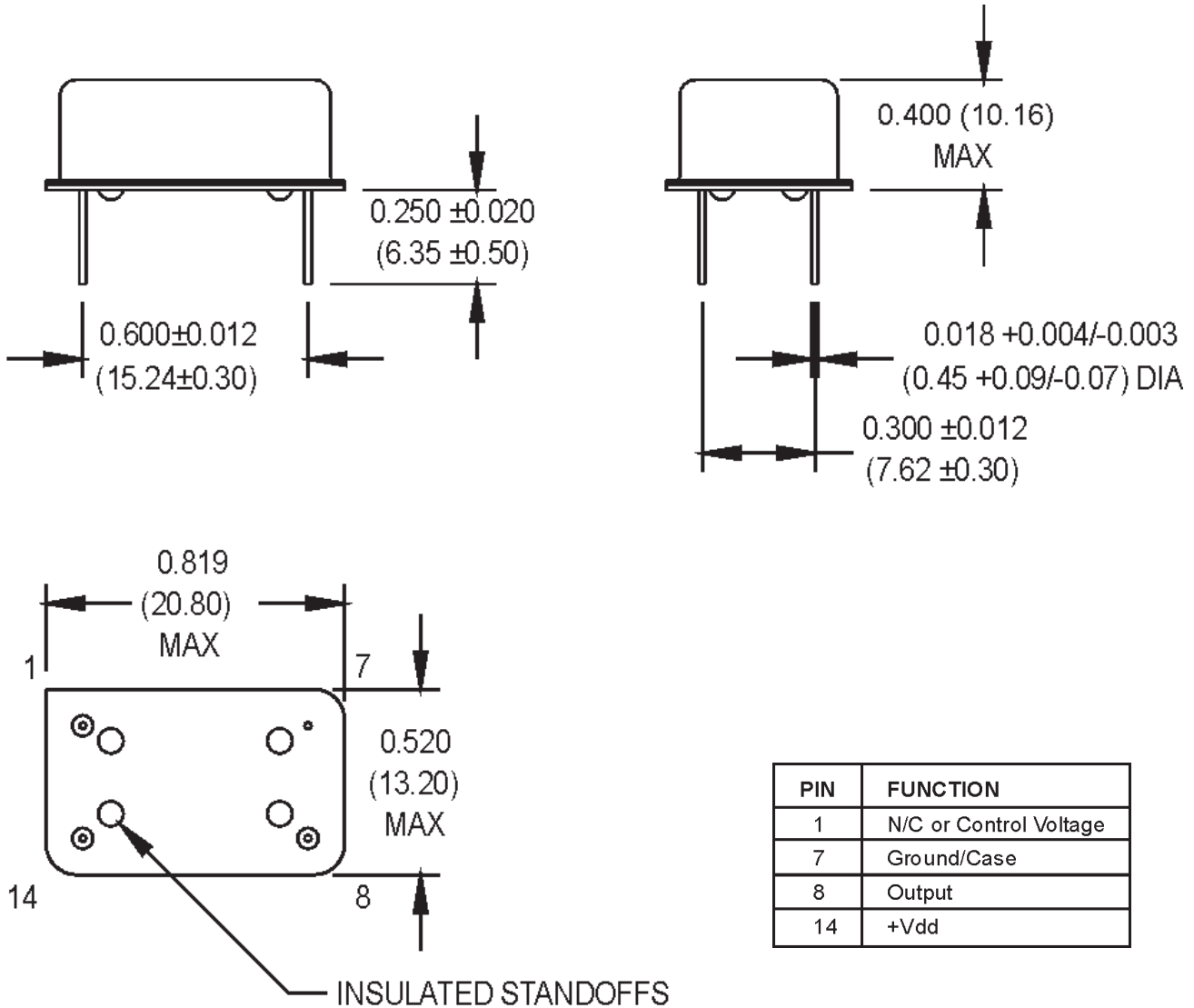
**Phase Noise Plot**



**Output Waveform**



**Product Dimension & Pinout Information**



PIN	FUNCTION
1	N/C or Control Voltage
7	Ground/Case
8	Output
14	+Vdd

All dimensions  
in inches (mm).

### Handling Information

Although protection circuitry has been designed into the M6049/M6050 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

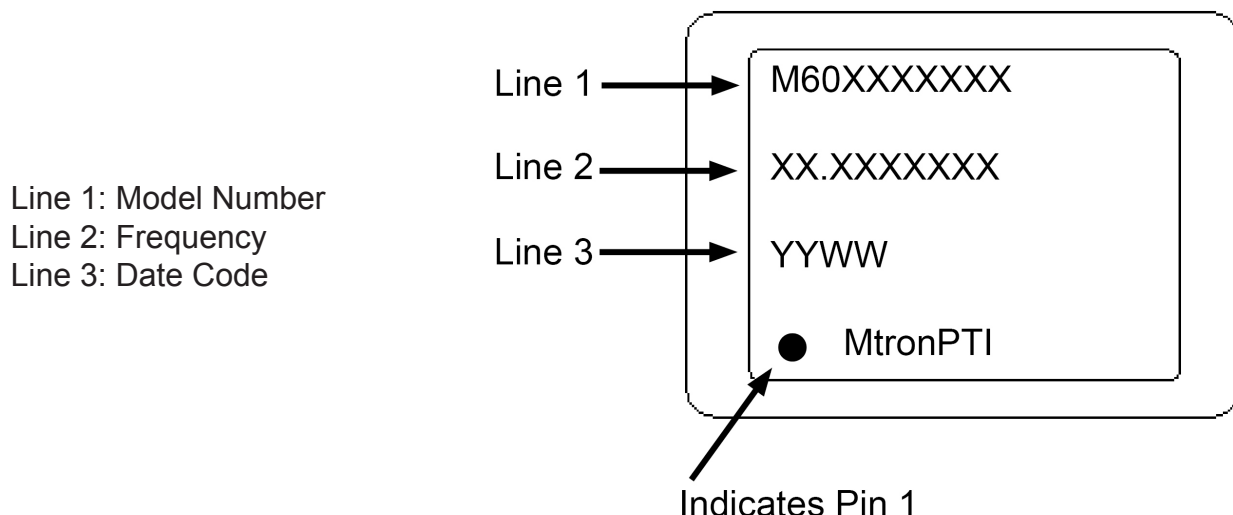
\* MIL-STD-883D, Method 3015, Class 1



### Quality Parameters

Environmental Specifications/Qualification Testing Performed on the M6049/M6050 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 1x10 <sup>-8</sup>
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



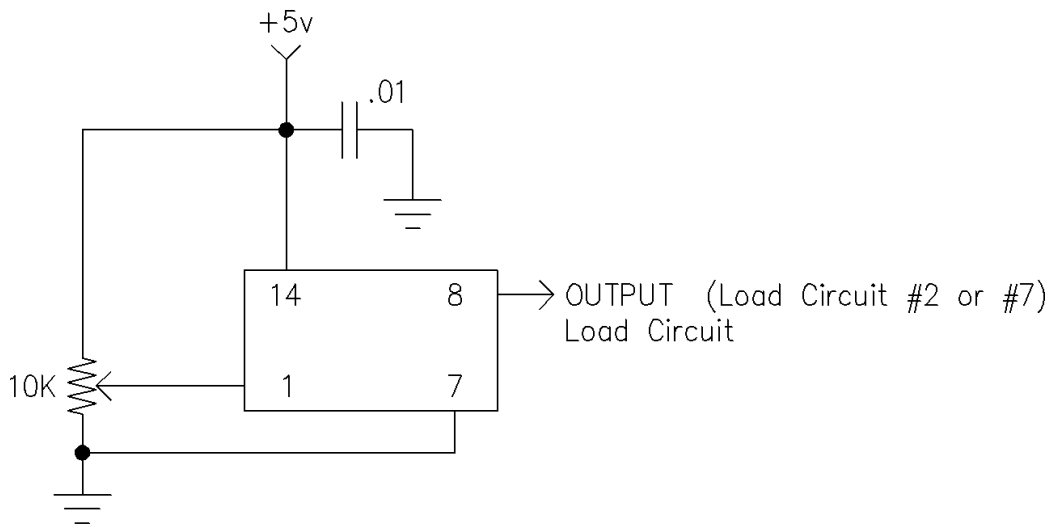
**Maximum Wave Soldering Conditions:**

Typical solder conditions for through hole crystals and oscillators:  
Per MIL-STD-202, Method 210 "Resistance to Soldering Heat", Condition C

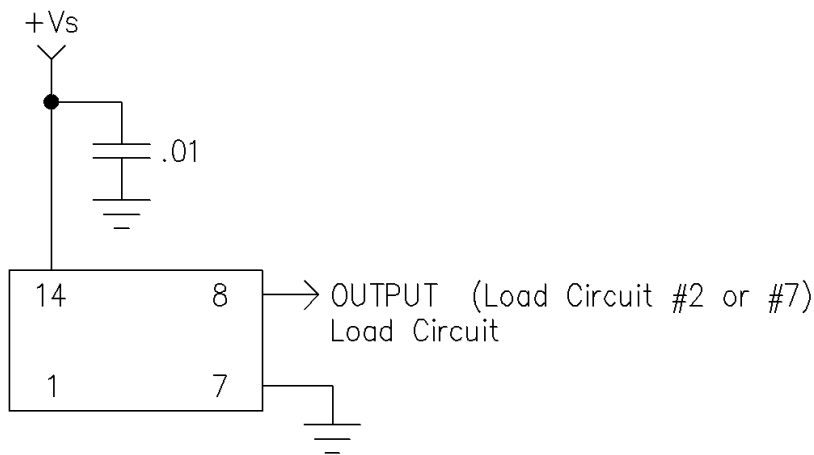
Wave solder with a solder bath temperature of  $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and an exposure time of  $10 \pm 1$  second. Preheat  $1-4^{\circ}\text{C/s}$  to within  $100^{\circ}\text{C}$  of solder temperature ( $25 \pm 6$  mm/s).

Note: Exceeding these limits may damage the device.

**Typical Test Circuit**



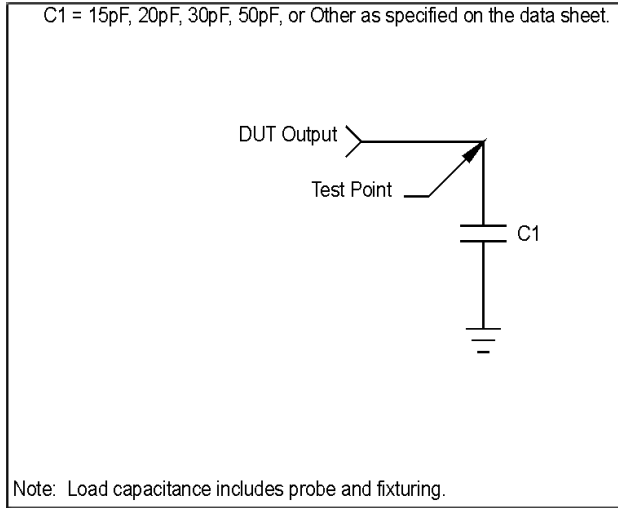
Voltage Tune Option (TCVCXO)



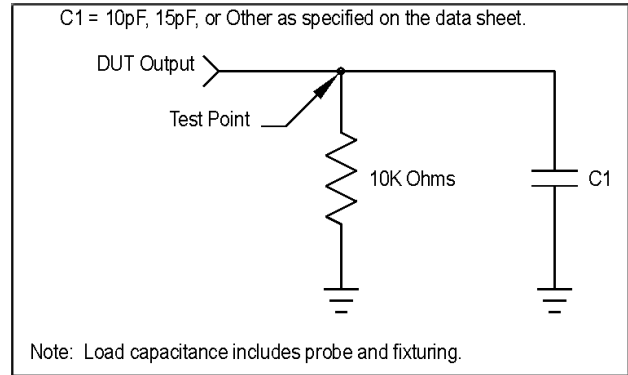
Non-Voltage Tune Option (TCXO)

**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](http://www.mtronpti.com)**