



Introduces

M6049/M6050 Series HCMOS/Clipped Sinewave Precision TCXO/TCVCXO

Features:

- Tight Stability (0.5 ppm)
- Low Phase Noise
- 3.3 V and 5.0 V Versions
- Frequencies from 8 to 52 MHz

Applications:

- Telecommunications such as SERDES / SONET / WiMAX / GSM / GPS / CDMA / Gig-E
- Military communication equipment
- PLL frequency reference
- Test and measurement equipment

MtronPTI

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Applications Note:

MtronPTI's M6049/M6050 series of 14-pin DIP compatible TCXO and TCVCXO products provide design engineers with a high performance and economically priced frequency control device. Stability as tight as ± 0.5 ppm is available with excellent aging characteristics. Frequencies from 8 MHz to 52 MHz are available.

The M6049/M6050 series is well suited for a wide range of precise frequency control applications such as test and measurement equipment, wireless base stations, HF, VHF and UHF communications equipment, PLL frequency reference, avionics, and military communications equipment.

The M6049/M6050 series is available with either an HCMOS or clipped sinewave output and an operating voltage of 5 volts or 3.3 volts. The devices can be ordered as a fixed (F) output or with an adjustable frequency (V) output. Precise adjustment utilizing voltage tuning on pin 1 allows the user to easily adjust the device to nominal frequency without the use of a mechanical trimmer internal to the TCXO. This voltage tuning option means that the hermeticity of the package is maintained because there is no need for a trimmer adjustment hole to be placed on the cover of the part. This assures better long term stability, and aging by preventing the ingress of outside atmosphere or moisture into device due to a trimmer access hole being present in the cover. The M6049/M6050 is an excellent replacement for older 14-pin DIP type TCXO/TCVCXO's that utilize a trimmer access hole in the package.

Voltage tuning also allows the designer to configure different digital methods to adjust the frequency of the device electronically without actually requiring human interface with the device.

The low power of the M6049/M6050 devices also makes it a good choice for low power, or "green" applications requiring a high degree of power management.

M6049/M6050 Series HCMOS/Clipped Sinewave Precision TCXO/TCVCXO 14 Pin DIP, 3.3 & 5.0 Volt

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 ± 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 sine wave 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: ± 0.5 ppm H: ± 2.5 ppm J: ± 1.0 ppm L: ± 4.6 ppm K: ± 2.0 ppm E: ± 10 ppm
Tuning Range (min)	A: ± 5 ppm B: ± 10 ppm C: ± 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)	

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Performance Characteristics

	Electrical Specifications					
	Parameter	Symbol	Min.	Typ.	Max.	Units
	Frequency Range	F _O	8		52	MHz
	Operating Temperature	T _A	-40		+85	°C
	Storage Temperature	T _{STG}	-55		+125	°C
	Frequency Tolerance @ +25°C		-1.0		+1.0	ppm
	Frequency Stability					
	Stability Vs. Reflow		-1.0		+1.0	ppm
	Frequency Vs. Supply			±0.2		ppm
	Frequency Vs. Load			±0.2		ppm
	Aging (First Year)		-1.0		+1.0	ppm
	Aging (First Year)		-2.0		+2.0	ppm
	Aging (10 Year)		-3.0		+3.0	ppm
	Aging (10 Year)		-5.0		+5.0	ppm
	Supply Voltage (V _S)		-5.0		+5.0	%
	Supply Current (I _O)			2.2	3.3	mA
				3.5	5.0	mA
				6.0	9.2	mA
	Output Logic Levels (HCMOS)	V _{OL} V _{OH}	80		20	%V _S %V _S
	Output Logic Levels (Clipped Sinewave)	V _{OL} V _{OH}	1.0 0.8			V _{pk-pk} V _{pk-pk}
	Waveform Symmetry		45		55	%
	Rise/Fall Time				8	ns
	Output Load			15		pF
	Frequency Adjustment		See Ordering Information			Over Control Voltage Range
	Control Voltage Range		0.3		3.0	Volts
			0.5		4.5	Volts
	Input Leakage Current		-50		+50	µA
	Input Resistance		100			Kohm
	Linearity				10	%
	Modulation Bandwidth		10			KHz
	Phase Noise (Typical 10 MHz CMOS)			-95 -125 -145 -152 -155		dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz
						10 Hz Offset 100 Hz Offset 1 KHz Offset 10 KHz Offset 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

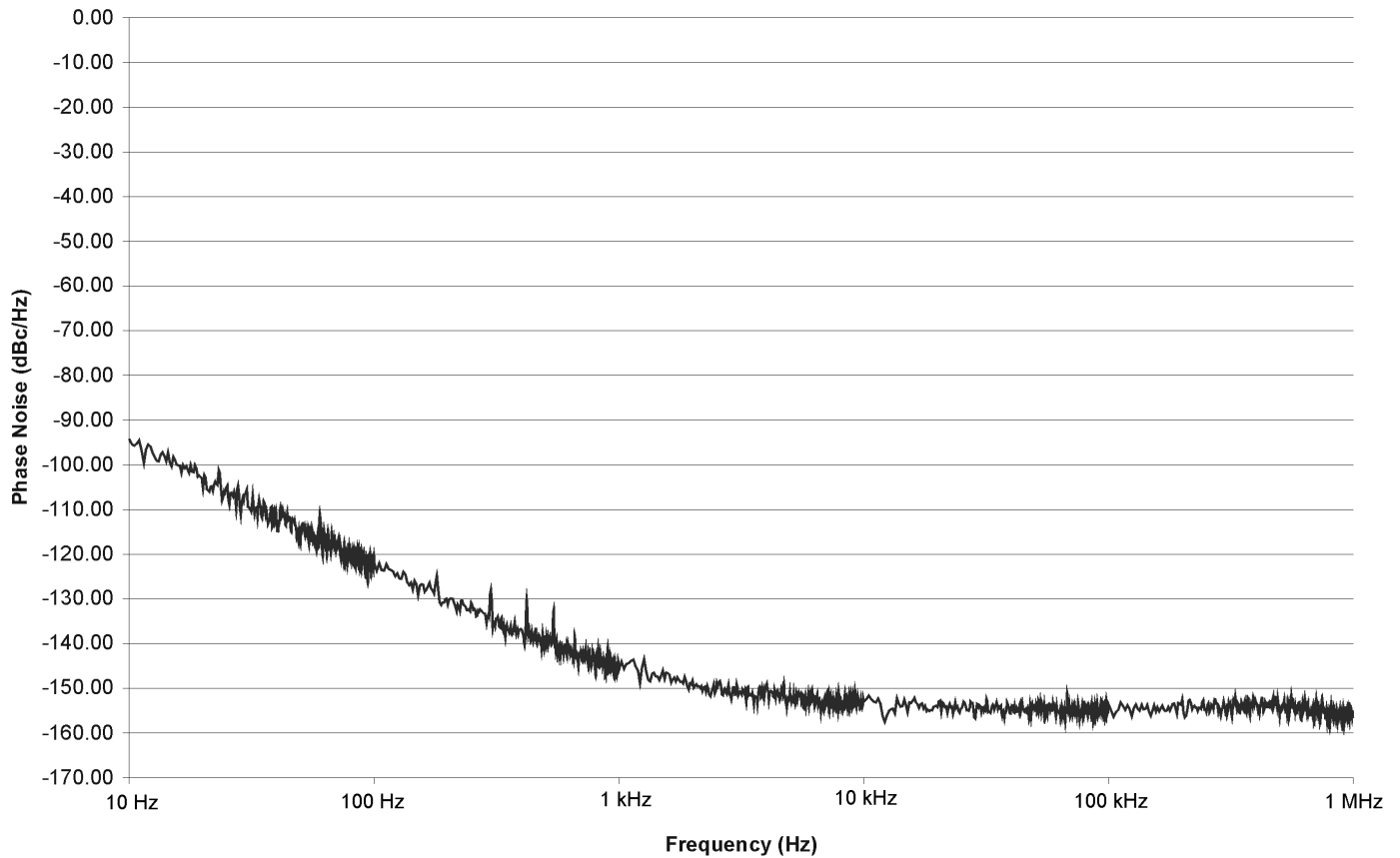
HCMOS Load – see load circuit diagram #2. Clipped Sinewave Load – see load circuit diagram #7.

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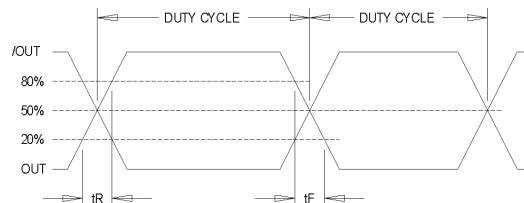
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Phase Noise Plot



Output Waveform

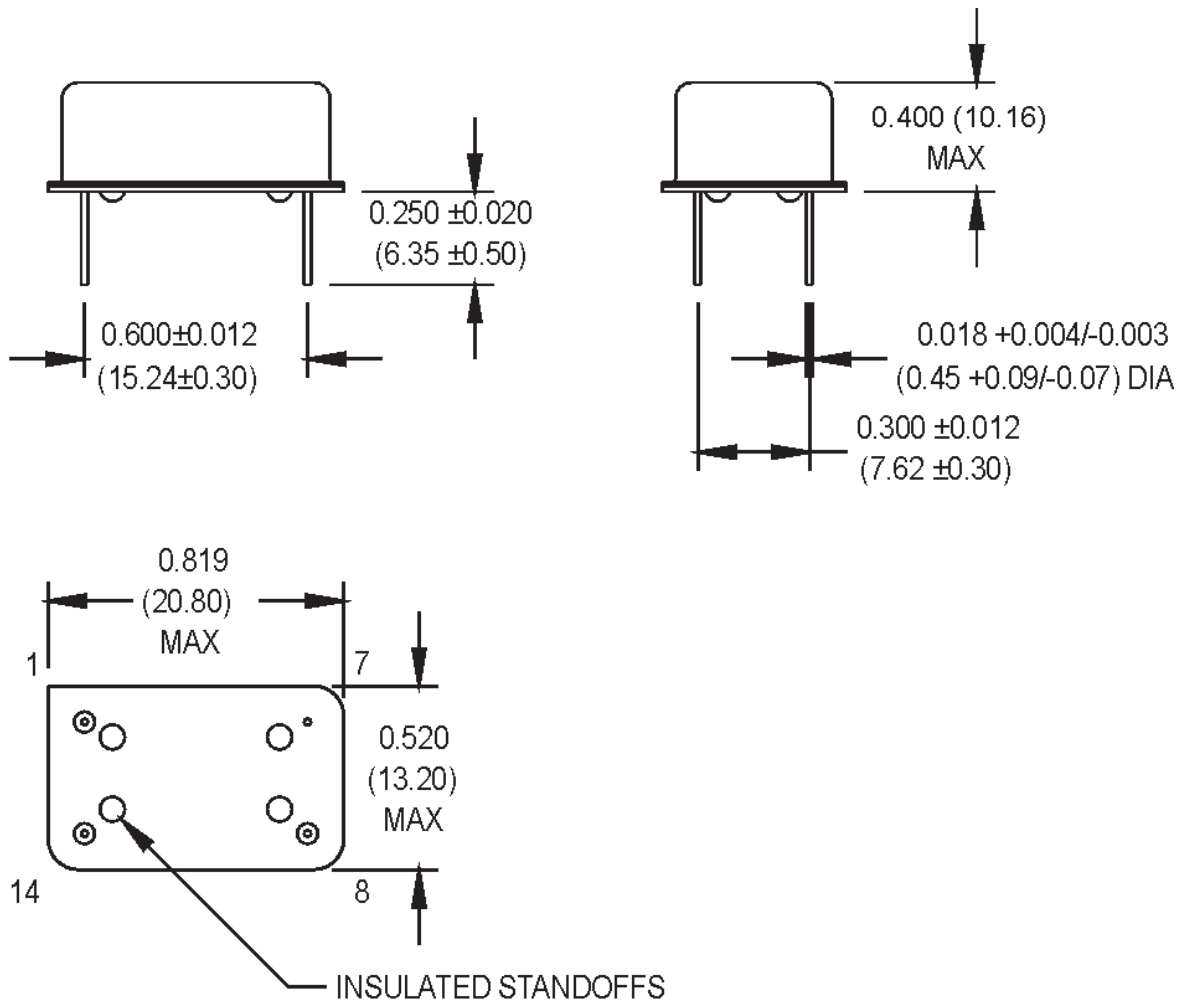


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Product Dimension & Pinout Information



All dimensions
in inches (mm).

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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

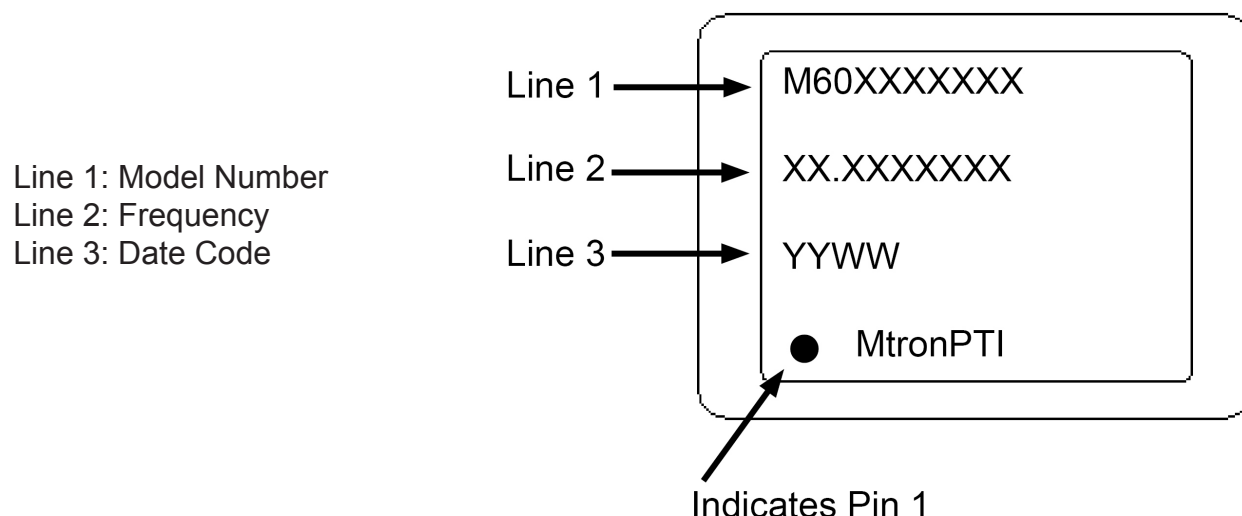
* MIL-STD-883D, Method 3015, Class 1



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 1×10^{-8}
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



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Maximum Soldering Conditions

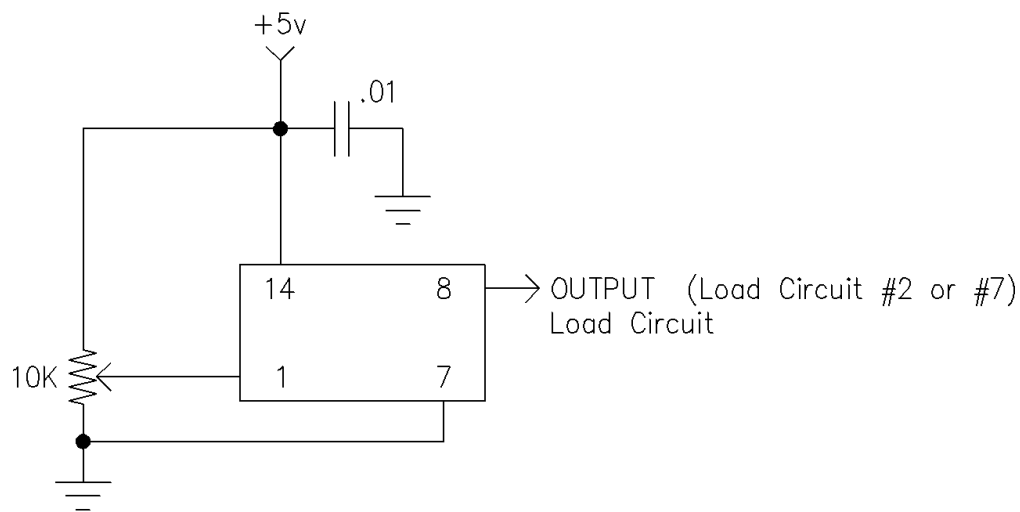
Typical solder conditions for through hole crystals and oscillators:

Per MIL-STD-202, Method 210 "Resistance to Soldering Heat", Condition C

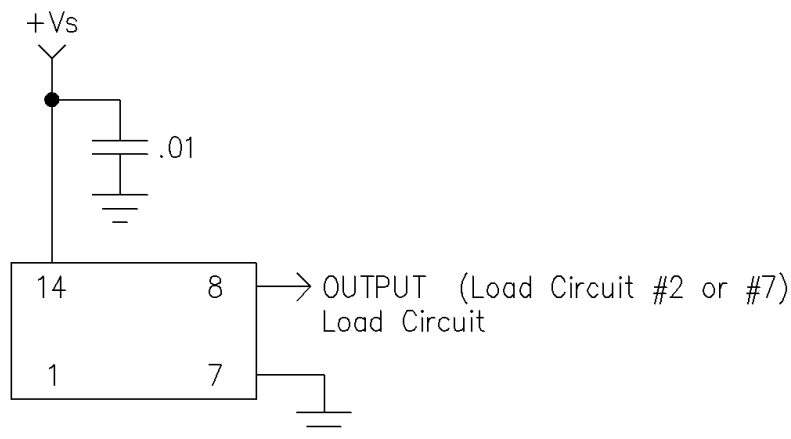
Wave solder with a solder bath temperature of $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and an exposure time of 10 ± 1 second. Preheat $1\text{--}4^{\circ}\text{C/s}$ to within 100°C of solder temperature (25 ± 6 mm/s).

Note: Exceeding these limits may damage the device.

Typical Test Circuits



Voltage Tune Option (TCVCXO)



Non-Voltage Tune Option (TCXO)

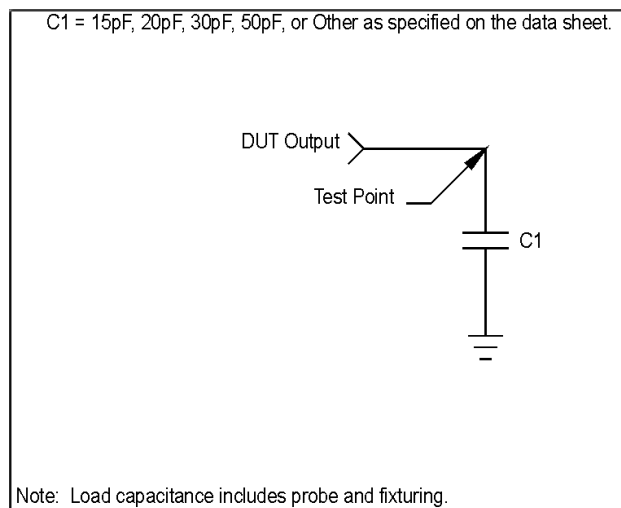
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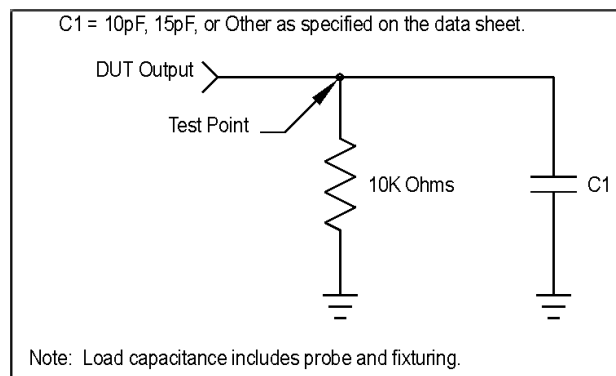
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Load Circuit Diagrams

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
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