M615x Series

5.0 x 7.0 mm, 3.0, 3.3 & 5.0 V, HCMOS or Clipped Sine Wave, Precision TCXO/TCVCXO

Product Features

Features

- Stratum 3 Performance with 0.34 ppm (pk-pk) Holdover Stability Over Industrial Temperature Range (-40 °C to +85 °C)
- 3.0 V, 3.3 V and 5.0 V Options
- Low Phase Noise and Excellent G-Sens Performance (1.5 ppb/g)
- Tristate Function Available
- Available in Clipped Sine Wave or HCMOS

Applications

- Synchronous Ethernet Slave Clocks ITU-T G.8262 EEC Options 1 & 2
- Compliant to Stratum 3 GR-1244-Core & GR-253-Core
- SONET/SDH Network Timing
- Wireless Communications

Product Description

MtronPTI's M615x Series TCXO and TCVCXO provide network and wireless engineers with low voltage, surface mount products with extremely tight stability over temperature and time. MtronPTI's unique approach to crystal compensation enables these devices to achieve full Stratum 3 compliance, including holdover stability over the industrial temperature range (-40 °C to +85 °C). Specially processed crystals enable the M615x 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 offset) makes the M615x ideal for the design engineer working on all types of systems as the reference timing source.

Product Ordering Information

Ordering Information

M6151	2	S	T	S	N	00.0000 MHz

Product Series
M6150 = 5.0 V
M6151 = 3.3 V
M6152 = 3.0 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
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: Leadless Ceramic (10 pads)

Frequency (customer specified)

M615xSxxx - Custom datasheets.

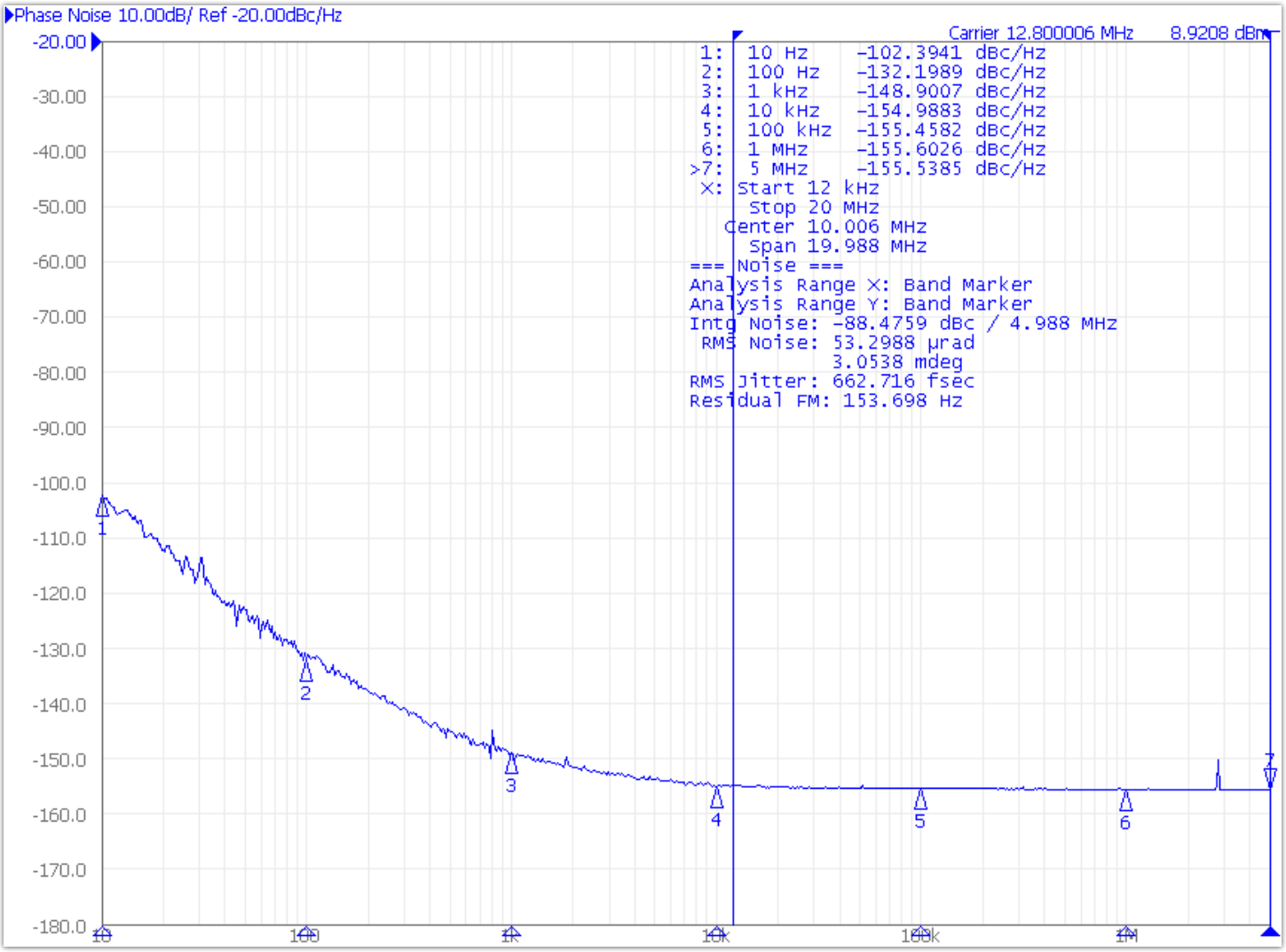
Rev: 07/17/2013

Performance Characteristics

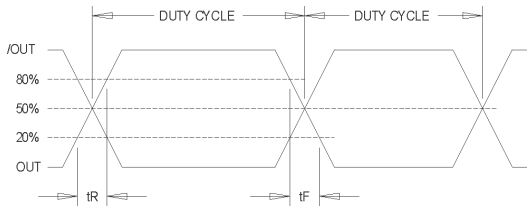
	Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Electrical Specifications	Frequency Range	F_O	8		38.88	MHz	Contact factory above 38.88 MHz.
	Initial Accuracy	F_I	-1.0		+1.0	ppm	@ +25 °C at time of shipment.
	Operating Temperature	T_A	(See Ordering Information)			°C	
	Storage Temperature	T_{STG}	-55		+125	°C	
	Frequency Stabilities						
	Stability vs Temperature	$\Delta F_T/F$			0.3	ppm	T_A = -40 °C to +85 °C (includes Hysteresis) Ref GR1244CORE
	Stability vs Drift				40	ppb	After 24 hours at constant temperature.
	Free-Run Accuracy		-4.6		+4.6	ppm	Includes initial calibration @ +25 °C, deviation over temperature, supply voltage and load variations, reflow, hysteresis, and 20 year aging.
	Stability vs Supply Voltage	$\Delta F_{VDD}/F$		±0.02	±0.1	ppm	±5 % change in voltage.
	Stability vs Load	$\Delta F_{LOAD}/F$		±0.02	±0.1	ppm	±5 % change in load.
	Supply Voltage & Current						
	Supply Voltage (V_{DD}) Tolerance		-5.0		+5.0	%	(See Ordering Information)
	Supply Current (I_D)			2.0	3.0	mA	HCMOS output at 13 MHz
	(Reference to V_{DD} = 3.3 V)			3.0	4.0	mA	HCMOS output at 26 MHz
				4.2	5.2	mA	HCMOS output at 38.88 MHz
				1.3	2.0	mA	Clipped Sine Wave output at 13 MHz
				1.7	2.7	mA	Clipped Sine Wave output at 26 MHz
				2.3	3.5	mA	Clipped Sine Wave output at 38.88 MHz
	RF Output						
	Output Logic Levels	V_{OL}			20	% V_{DD}	I_{OH}/I_{OL} = ±4 mA, V_{DD} = +3.0 V
	(HCMOS)	V_{OH}	80			% V_{DD}	I_{OH}/I_{OL} = ±4 mA, V_{DD} = +3.0 V
	Output Level		1.0			V_{pk-pk}	F_O < 40 MHz
	(Clipped Sine Wave)		0.8			V_{pk-pk}	F_O > 40 MHz
	Symmetry (Duty Cycle)	t_{DC}	40	50	60	%	Ref. to ½ V_S. HCMOS Only
	Rise/Fall Time	t_R/t_F			6.5	ns	Ref. 10 % to 90 %. HCMOS only
	Output Load		15 pF				HCMOS Output
			10 kΩ || 10 pF				Clipped Sine Wave Output
	Frequency Adjustment		±9.2			ppm	Over Control Voltage Range
	Control Voltage Range		0.3		2.7	V	For V_{DD} = 3.0 V
			0.3		3.0	V	For V_{DD} = 3.3 V
			0.5		4.5	V	For V_{DD} = 5.0 V
	Input Leakage Current		-50		+50	µA	
	Input Resistance		100			kΩ	
	Linearity				5	%	
	Modulation Bandwidth		2 kHz				
	Other Parameters						
	Tristate Function		70			% V_{DD}	Output enabled. Logic "1" or "Open"
					30	% V_{DD}	Output disabled. Logic "0" or "GND"
	Tristate Leakage Current		-100		+100	µA	
	Phase Noise			-102		dBc/Hz	@ 10 Hz Offset
	(Typical 12.8 MHz HCMOS @ 3.3 V)			-132		dBc/Hz	@ 100 Hz Offset
				-148		dBc/Hz	@ 1 kHz Offset
				-154		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 Hz to 2000 Hz)					
	Solderability	EIAJ-STD-002					
	Package	5.0 mm x 7.0 mm, SMT and DIP (RoHS Compliant)					
	Max Soldering Conditions	See solder profile					

Phase Noise Plot

M615x 12.8 MHz Phase Noise

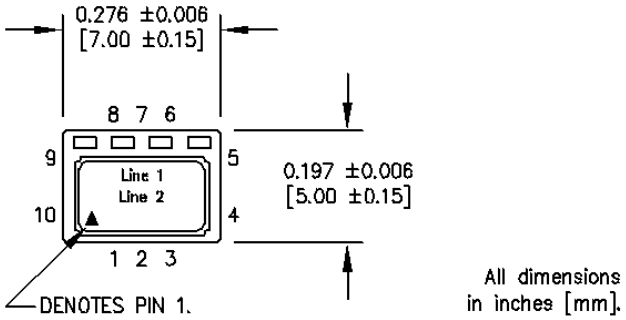


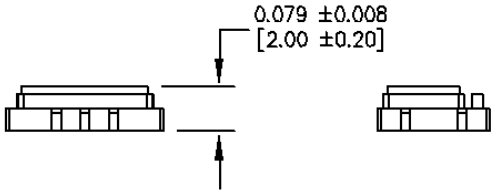
Output Waveform (HCMOS Output)



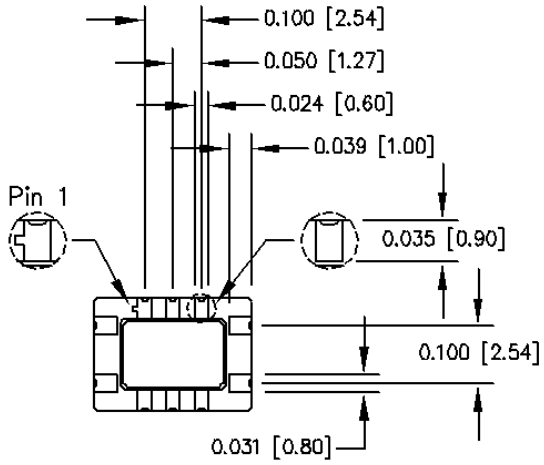
Product Dimension & Pinout Information

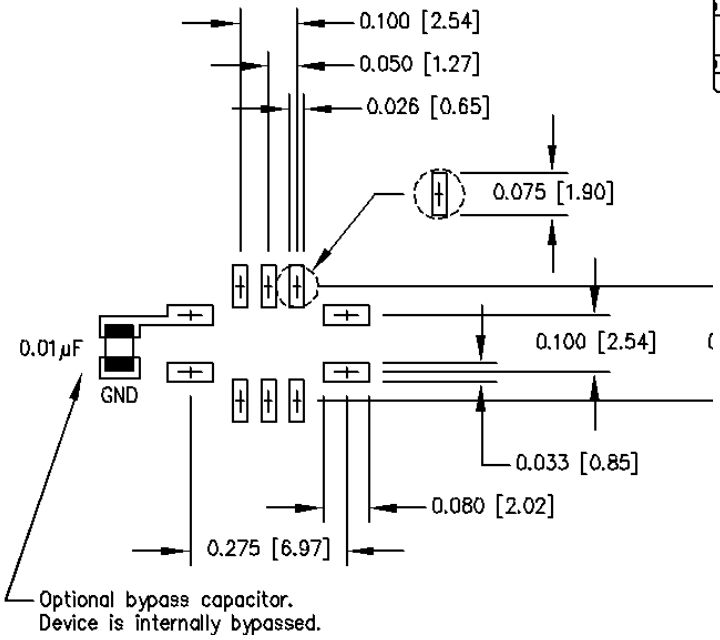
Pin Connections	
Function	**Pad**
N/C - Do Not Connect	1
N/C - Do Not Connect	2
N/C - Do Not Connect	3
Ground	4
Output	5
N/C - Do Not Connect	6
N/C - Do Not Connect	7
Tristate	8
Supply Voltage (V_{DD})	9
Control Voltage	10





SUGGESTED SOLDER PAD LAYOUT





Handling Information

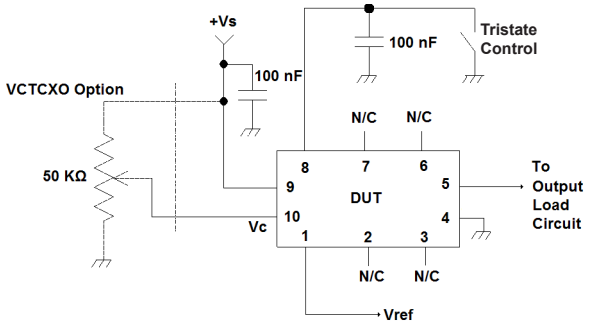
Although protection circuitry has been designed into the M615x oscillator, proper precautions should be taken to avoid exposure to electrostatic discharge (ESD) during handling and mounting. MtronPTI utilizes a human-body model (HBM) and a charged-device model (CDM) for ESD-susceptibility testing and 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

ATTENTION
Static Sensitive Devices
Handle only at Static
Safe Work Stations

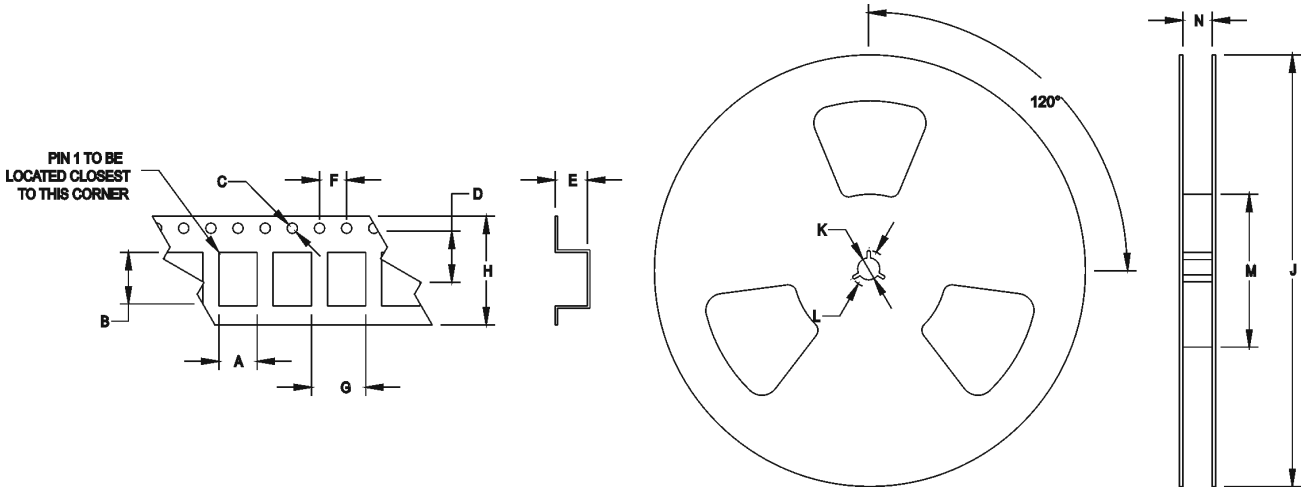
Typical Test Circuits



Test Circuit - N Package
With Tristate

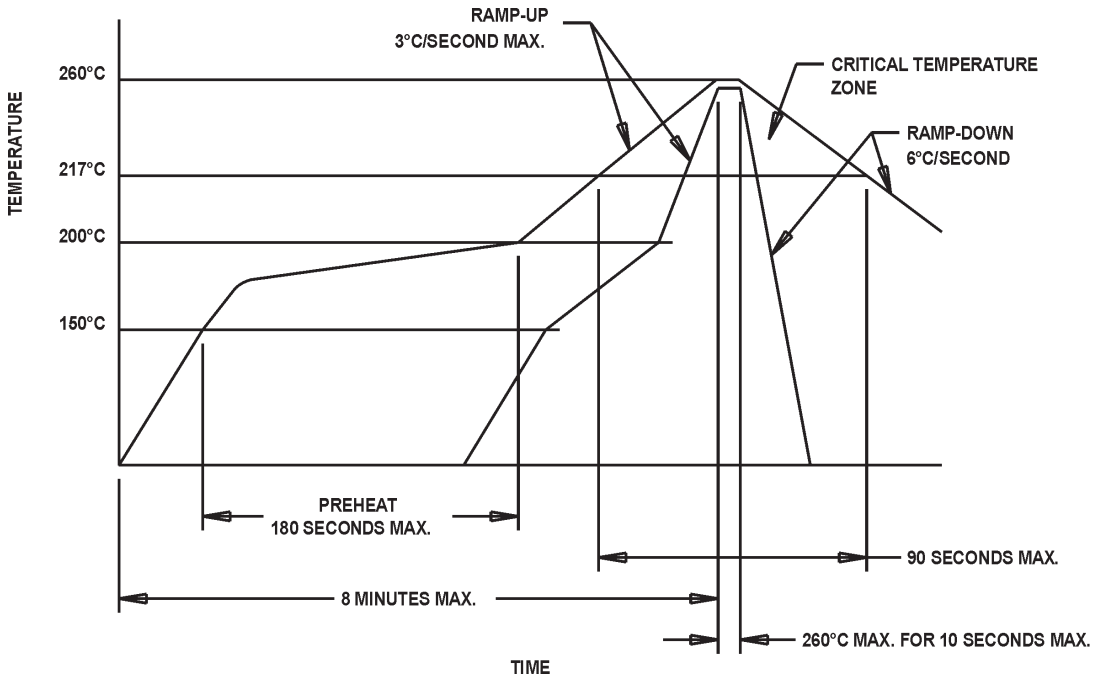
Tape & Reel Specifications

(all measurements are in mm)	A	B	C	D	E	F	G	H	J	K	L	M	N
M615x	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



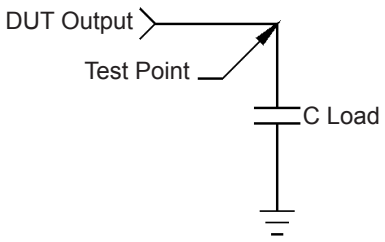
Note: Exceeding these limits may damage the device.

Quality Parameters

Environmental Specifications/Qualification Testing Performed		
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's
Vibration	MIL-STD-202, Method 201-204	10 g's 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 1x10-8
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
Physical Dimensions	MIL-STD-883, Method 2016	Per Specification
Internal Visual	Internal Specification	Per Internal Specification

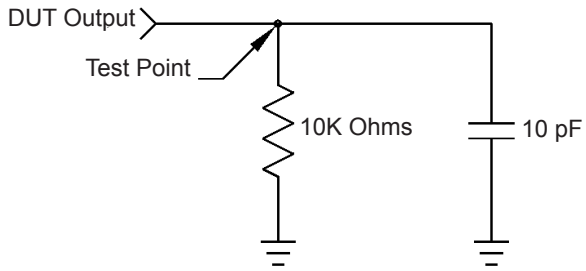
Load Circuit

Load Circuit #2 - HCMOS Output



Note: C Load includes probe and fixturing.

Load Circuit #7 - Clipped Sine Wave Output



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