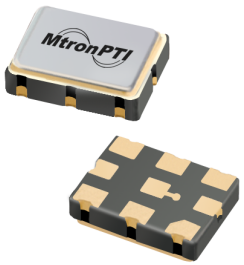
MtronPTI

...when timing matters

RoHS Compliant



Introduces

M31x Series Multiple Frequency LVPECL/LVDS/CML/HCMOS VCXO

Featuring ***QiK Chip™*** Technology

Features:

- Multiple Output Frequencies (2, 3, or 4) - Selectable
- Superior Jitter Performance (less than 0.25 ps RMS, 12 kHz - 20 MHz)
- Frequencies from 50 MHz to 1.4 GHz (LVDS/LVPECL/CML), and 10 MHz to 150 MHz (HCMOS)

Applications:

- Where more than one selectable frequency is required for different global regions, FEC (Forward Error Correction) or selectable funcionality are required.
- Telecommunications such as SONET / SDH / DWDM / FEC / SERDES / OC-3 thru OC-192
- Wireless base stations / WLAN / Gigabit Ethernet
- Avionic flight controls and military communications

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Applications Note:

The M31x series is ideally suited for a wide range of applications, specifically applications where extremely tight jitter performance is needed with a wide range of flexibility in the frequencies available. In video applications where line-rate timing-jitter is crucial, the QiK Chip M31x is a critical component of success for the circuit design. Jitter performance and Phase Noise performance well exceed the required SMPTE standards established for video applications.

In addition, the QiK Chip M31x product series provides multiple output frequencies from a single, highly stable crystal. Using a standard 5x7mm package provides access to up to 4 arbitrary output frequencies from the same oscillator, simplifying the performance-sensitive design testing and validation that requires frequency margining.

Industry leading jitter and phase noise performance, reduction in testing costs, increased flexibility in reducing PCB real estate for multiple output frequency demands, and an order to delivery time of less than 2 weeks, provides engineering and production advantages that have not been available in a small 5x7mm package in the past. The M31x produces outputs from 10MHz to 1.4GHz with unlimited margining increments. These independent frequencies can be a few parts per million or hundreds of MHz apart.

Frequency Select Truth Table		
	FS1	**FS0**
Frequency 1	High	High
Frequency 2	High	Low
Frequency 3	Low	High
Frequency 4	Low	Low

NOTE: Logic Low = 20% Vcc max.
Logic High = 80% Vcc min.

M31x Series Multiple Frequency LVPECL/LVDS/CML/HCMOS VCXO – 3.3/2.5/1.8 Volt – 5x7 mm

Product Features

- Multiple Output Frequencies (2, 3, or 4) - Selectable
- *QiK Chip™* Technology
- Superior jitter performance (less than 0.25 ps RMS, 12 kHz - 20 MHz)
- APR from ±50 to ±300 ppm over industrial temperature range
- SAW replacement - better performance
- Frequencies from 50 MHz - 1.4 GHz (LVDS/LVPECL/CML)
- Frequencies from 10 MHz to 150 MHz (HCMOS)

Product Description

The multiple frequency VCXO utilizes MtronPTI's Qik Chip™ technology to provide a very low jitter clock for all output frequencies. The M31x is available with up to 4 different frequency outputs from 10MHz through 1.4 GHz. Unlike traditional VCXO's where multiple crystals are required for each frequency, the M31x utilizes a rock solid fundamental 3rd overtone crystal and the Qik Chip™ IC to provide the wide range of output frequencies. Using this design approach, the M31x provides exceptional performance in frequency stability, jitter, phase noise and long term reliability.

Product Applications

- Global/Regional selection
- Forward Error Correction (FEC) / Selectable Functionality applications
- Telecommunications such as SONET / SDH / DWDM / FEC / SERDES / OC-3 thru OC-192
- 1-2-4-10 Gigabit Fibre Channel
- Wireless base stations / WLAN / Gigabit Ethernet
- xDSL, Network Communications
- Avionic flight controls
- Military Communications
- Clock and data recovery
- Low jitter clock generation
- Frequency margining

Product Ordering Information

Ordering Information

M31 x x x x x x x x -SXXX

Product Series

Number of Frequencies
- **2:** Two Selectable Frequencies
- **3:** Three Selectable Frequencies
- **4:** Four Selectable Frequencies

Supply Voltage
- **0:** 3.3 V
- **1:** 2.5 V
- **2:** 1.8 V

Operating Temperature
- **2:** -40°C to +85°C
- **6:** -20°C to +70°C

Absolute Pull Range (APR)
- **A:** ±50 ppm **B:** ±100 ppm **D:** ±200 ppm

Enable/Disable Function
- **G:** Enable High (Pad 2)
- **M:** Enable Low (Pad 2)

Logic Type
- **P:** LVPECL
- **L:** LVDS
- **M:** CML
- **C:** HCMOS

Two Frequency Select Function
- **2:** FS0=Pad 2
- ***A:** FS0=Pad A

Package/Lead Configuration
- **N:** 5 x 7 mm Leadless

Factory Assigned to Accommodate Customer Specified Frequencies - Contact Factory

*For three and four frequency selections, FS0=Pad A.

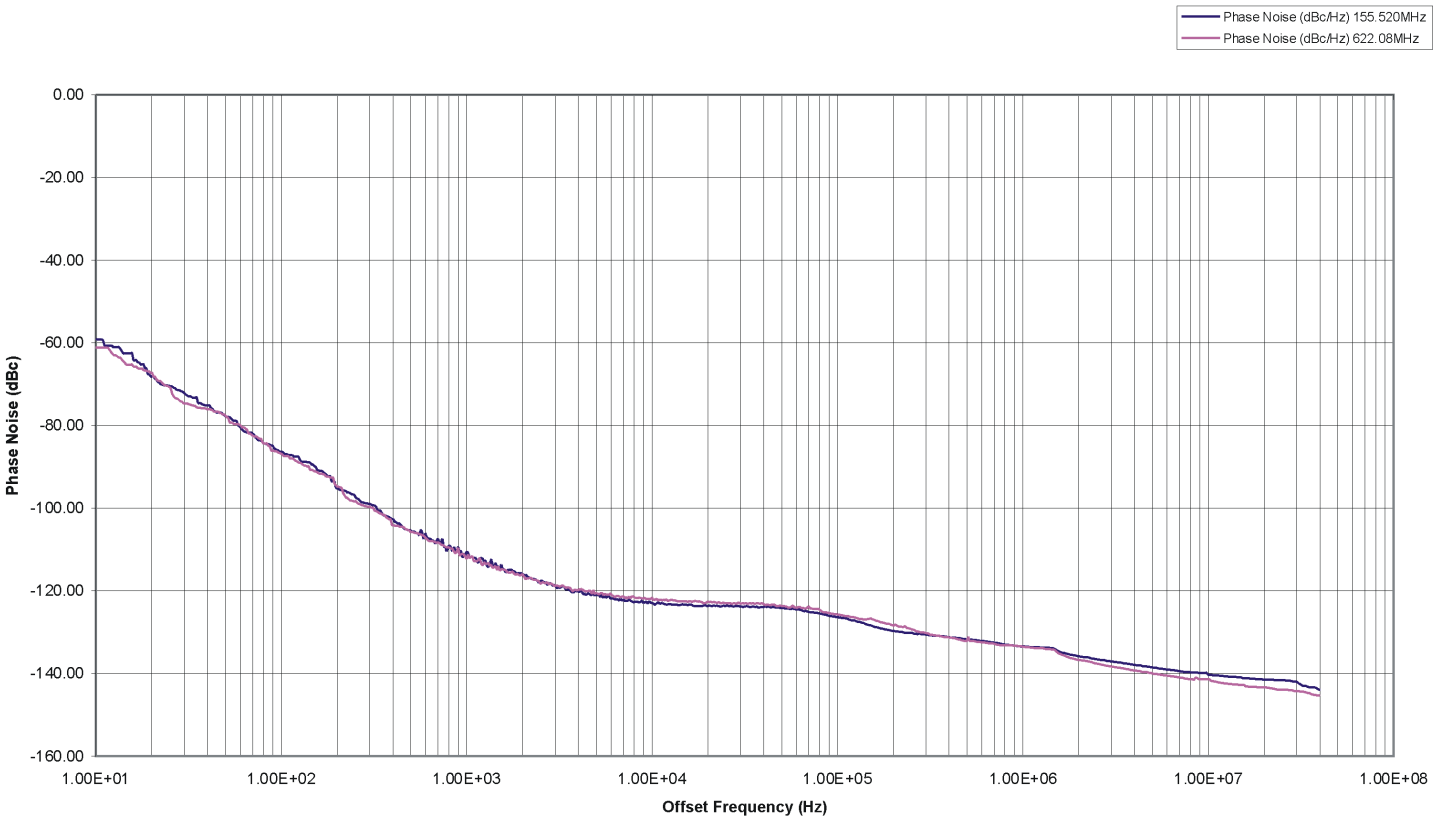
M3120Sxxx, M3121Sxxx, M3122Sxxx
M3130Sxxx, M3131Sxxx, M3132Sxxx
M3140Sxxx, M3141Sxxx, M3142Sxxx
Contact factory for datasheets.

Performance Characteristics

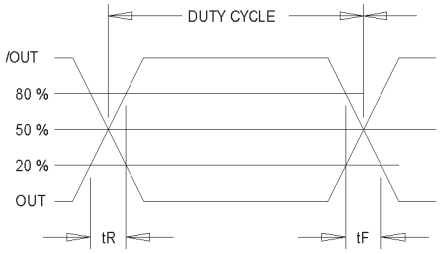
	PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
Electrical Specifications	Frequency Range	F	 50 10		 1400 150	 MHz MHz	See Note 1 LVPECL/LVDS/CML HCMOS
	Operating Temperature	TA	-20°C to +70°C or -40°C to +85°C				Customer Specified
	Storage Temperature	TS	-55		+125	°C	
	Frequency Stability	ΔF/F		±25		ppm	
	Aging 1st Year Thereafter (per year)		 -3 -1		 +3 +1	 ppm ppm	
	Pullability/APR		See Ordering Information				See Note 2
	Gain Transfer Function			90 135 180		ppm/V ppm/V Ppm/V	For ± 50 ppm APR For ± 100 ppm APR For ± 200 ppm APR
	Control Voltage	Vc	0.18 0.25 0.30	0.90 1.25 1.65	1.62 2.25 3.0	V V V	@ 1.8V Vcc @ 2.5V Vcc @ 3.3V Vcc
	Linearity			1	5	%	Positive Monotonic
	Modulation Bandwidth	fm	10			KHz	-3 dB bandwidth
	Input Impedance	Zin	500k	1M		Ohms	@ DC
	Supply Voltage	Vcc	1.71 2.375 3.135	1.8 2.5 3.3	1.89 2.625 3.465	V V V	
	Input Current	Icc			125 80	mA mA	LVPECL/LVDS/CML HCMOS
	Load						See Note 3
			50 Ohms to (Vcc –2) Vdc 100 Ohm differential load				LVPECL Waveform LVDS/CML Waveform
					15	pF	CMOS Waveform
	Symmetry (Duty Cycle)		45		55	%	LVPECL: Vdd – 1.3 V LVDS: 1.25 V
	Output Skew			20 15 20		ps ps ps	LVPECL CML LVDS
	Differential Voltage	Vod	250	350	450	mV	LVDS
		Vod	0.7	0.95	1.20	Vpp	CML
	Common Mode Output Voltage	Vcm		1.2		V	LVDS
	Logic "1" Level	Voh	Vcc -1.02 90% Vdd			V	LVPECL HCMOS
	Logic "0" Level	Vol			Vcc -1.63 10% Vdd	V	LVPECL HCMOS
	Rise/Fall Time	Tr/Tf		0.23	0.35 6.0	ns ns	@ 20/80% LVPECL Ref. 10%-90% Vdd HCMOS
	Enable Function Option G		80% Vcc min or N/C: Output active 0.5V max: Output disables to high-Z				Customer Specified (Pad 2)
	Enable Function Option M		0.5V max or N/C: Output active 80% Vcc min: Output disables to high-Z				Customer Specified (Pad 2)
	Frequency Selection		See Truth Table				
	Settling Time				10	ms	To within ± 1 ppm of frequency
	Start up Time				10	ms	
	Phase Jitter @ 622.08 MHz @ 125 MHz	 ϕJ ϕJ		 0.50	 1.0	 ps RMS ps RMS	 Integrated 12 kHz – 20 MHz HCMOS (12kHz – 20 MHz)
Environmental							
	Mechanical Shock	Per MIL-STD-202, Method 213, Condition C (100 g's, 6 mS duration, ½ sinewave)					
	Vibration	Per MIL-STD-202, Method 201 & 204 (10 g's from 10-2000 Hz)					
	Hermeticity	Per MIL-STD-202, Method 112, ($1x10^{-8}$ atm. cc/s of Helium)					
	Thermal Cycle	Per MIL-STD-883, Method 1010, Condition B (-55°C to +125°C, 15 min. dwell, 10 cycles)					
	Solderability	Per EIAJ-STD-002					
	Max. Soldering Cond.	See solder profile, Figure 1					

Note 1: Contact factory for standard frequency availability over 945 MHz.
Note 2: APR specification is inclusive of initial tolerance, deviation over temperature, shock, vibration, supply voltage, and aging for one year at 50°C mean ambient temperature.
Note 3: See Load Circuit Diagram in this Datasheet. Consult factory with nonstandard output load requirements.

Phase Noise Plot

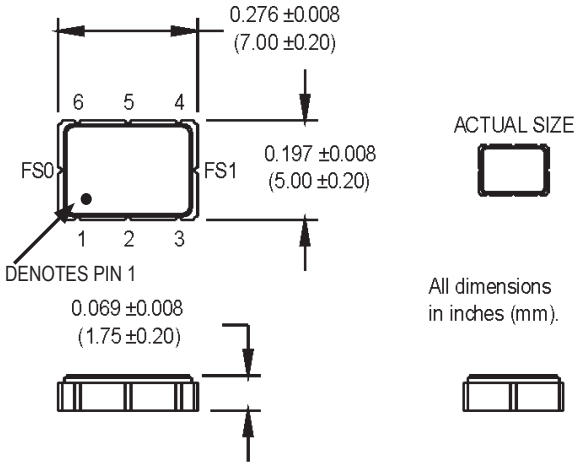


Output Waveform

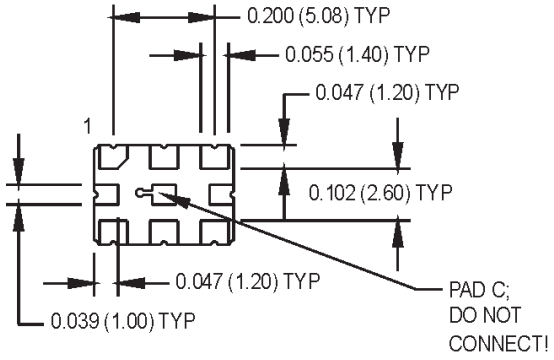


Output Waveform: LVDS / CML / LVPECL

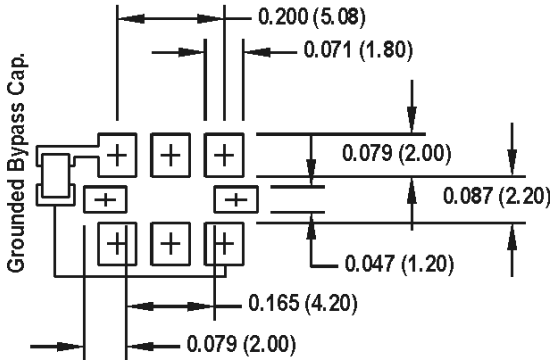
Product Dimension & Pinout Information



Pad1: Voltage Control
Pad2: Enable/Disable N/C or FS0
Pad3: Ground
Pad4: Output Q (LVPECL, LVDS, CML)
Pad5: Output $\overline{Q}$ (LVPECL, LVDS, CML)
Pad6: Vcc
PadA: FS0 or N/C
PadB: FS1
PadC: Do not connect!



SUGGESTED SOLDER PAD LAYOUT



Handling Information

Although protection circuitry has been designed into the M31x 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

Quality Parameters

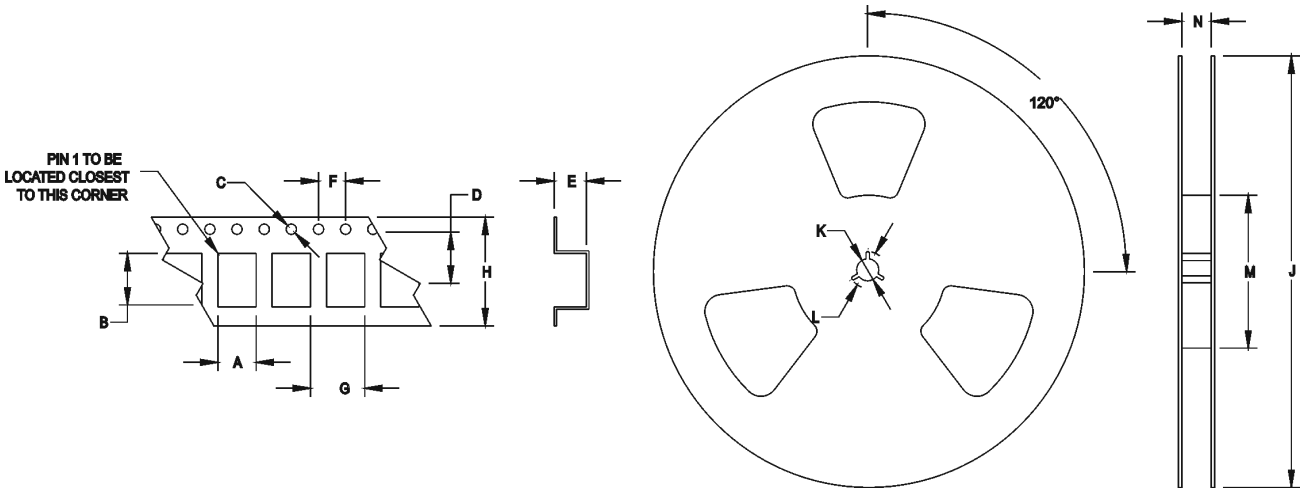
Environmental Specifications/Qualification Testing Performed on the M31x VCXO		
Test	**Test Method**	**Test Condition**
Electrical Characteristics	Internal Specification	Per Specification
Frequency vs. Temperature	Internal Specification	Per Specification
Mechanical Shock	MIL-STD-202, Method 213, C	100 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
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: Model Number
Line 2: Frequency
Line 3: Date Code
Line 4: Pin 1 Indicator / MtronPTI

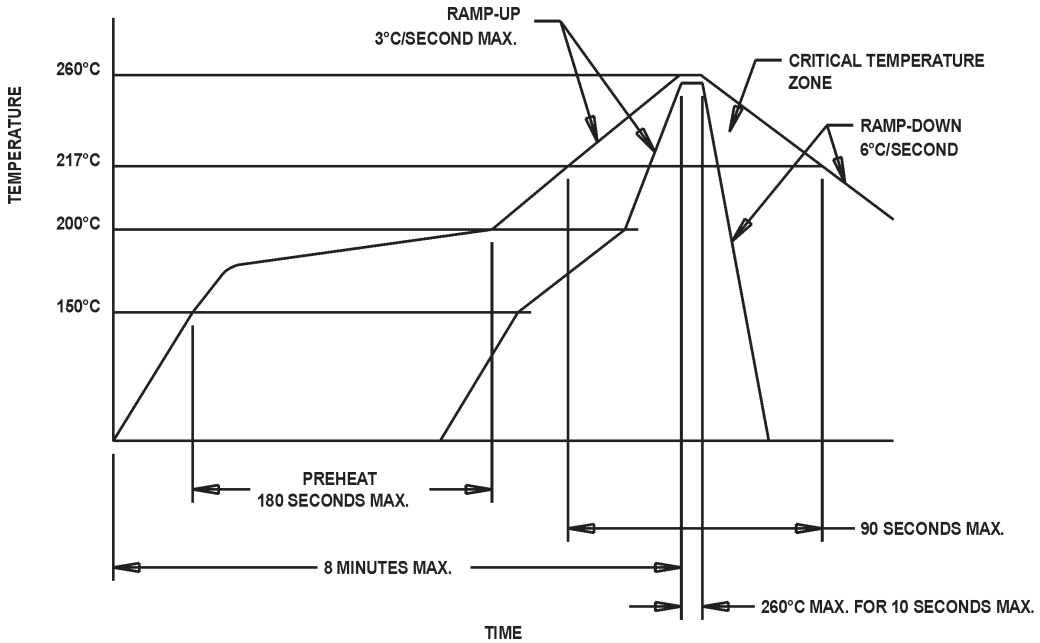
Tape & Reel Specifications

(all measurements are in mm)	A	B	C	D	E	F	G	H	I	J	K	L
M31x	6.51	9.29	1.5	7.5	2.8	4	8/12	16	180-330	13	21	60-100



Standard Tape and Reel: 1000 parts per reel

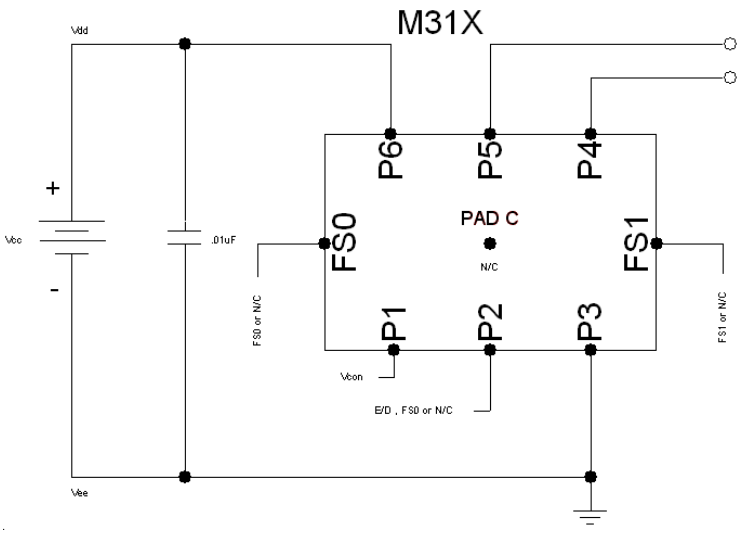
Maximum Soldering Conditions

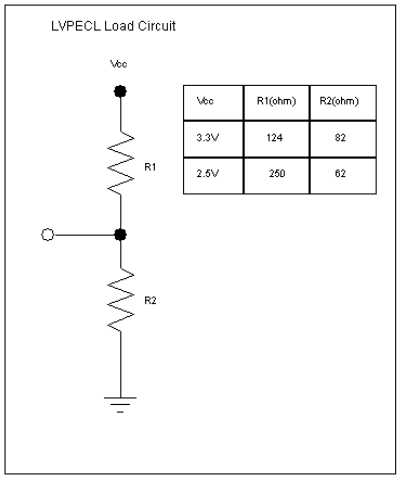


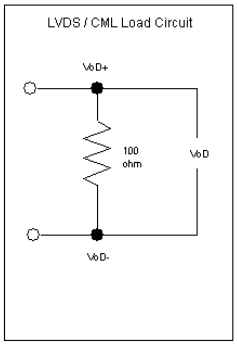
Solder Conditions

Note: Exceeding these limits may damage the device.

Typical Test Circuit & Load Circuit Diagrams







Product Revision Table

Date	Revision	PCN Number	Details of Revision
7/20/07	A	10118	IC Revision to improve phase noise and electrical performance

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

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