

## M220x Series

9x14 mm, 3.3/2.5/1.8 Volt, LVPECL/LVDS/CML,  
Clock Oscillator

### Product Features

- Featuring **QiK Chip™** Technology
- From order to ship in 2 weeks
- Superior Jitter Performance (less than 0.25 ps RMS, 12 kHz - 20 MHz)
- SAW replacement - better performance
- Frequencies from 150 MHz to 1.4 GHz



QiK Chip™



### Product Description

The 220x series of oscillators are 9x14 J-Lead oscillators designed with the QiK Chip™ technology. The QiK Chip™ technology was specifically designed for crystal based oscillators to provide low jitter performance (as low as 0.25 ps RMS) and a wide range of frequency support (150.00 MHz to 1.4 GHz) and provides a break-through in lean manufacturing enabling product to be provided in less than 2 weeks. The M220x provides design engineers with the stability needed in their advanced applications and supports the need for parts to be supplied quickly so that the rest of their circuit design can be solidified.

### Product 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
- Avionic Flight Controls
- Military Communications
- Clock and Data Recovery
- SD/HD Video
- FPGA/ASIC Clock Generation
- Test and Measurement Equipment

### Product Ordering Information

| Ordering Information           |                                                                                                                      | 00.0000 MHz |           |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------|-----------|
|                                | M220                                                                                                                 | 0           | 6 8 B P J |
| Product Series                 |                                                                                                                      |             |           |
| Supply Voltage                 | 0: 3.3 V 1: 2.5 V<br>2: 1.8 V                                                                                        |             |           |
| Temperature Range              | 2: -40°C to +85°C<br>6: -20°C to +70°C                                                                               |             |           |
| Stability                      | 4: ±50 ppm 3: ±100 ppm<br>8: ±20 ppm                                                                                 |             |           |
| Enable/Disable                 | B: Enable High (pin 1) G: Enable High (pin 2)<br>S: Enable Low (pin 1) M: Enable Low (pin 2)<br>U: No Enable/Disable |             |           |
| Logic Type                     | P: LVPECL L: LVDS<br>M: CML                                                                                          |             |           |
| Package/Lead Configuration     | J: 9x14 mm J-lead                                                                                                    |             |           |
| Frequency (customer specified) |                                                                                                                      |             |           |

M2200Sxxx, M2201Sxxx, M2202Sxxx - Contact factory for datasheets.

## Performance Characteristics

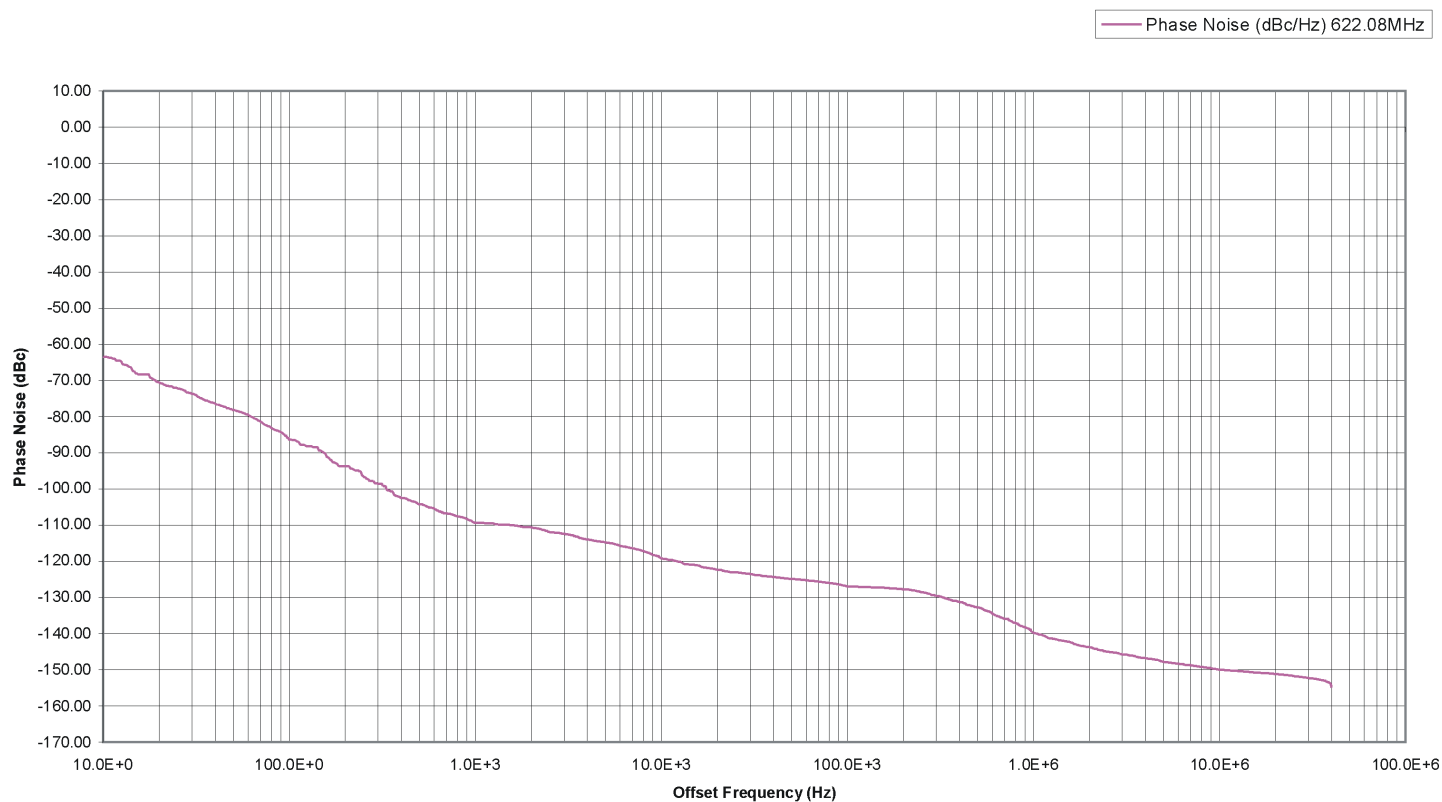
|               | Electrical Specifications    |                                                                                       |                                                                                      |                                                            |                        |                 |                                                                                              |
|---------------|------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------|-----------------|----------------------------------------------------------------------------------------------|
|               | PARAMETER                    | Symbol                                                                                | Min.                                                                                 | Typ.                                                       | Max.                   | Units           | Condition/Notes                                                                              |
|               | Frequency Range              | F                                                                                     | 150                                                                                  |                                                            | 1400                   | MHz             | See Note 1                                                                                   |
|               | Operating Temperature        | T <sub>A</sub>                                                                        | (See ordering information)                                                           |                                                            |                        |                 |                                                                                              |
|               | Storage Temperature          | T <sub>S</sub>                                                                        | -55                                                                                  |                                                            | +125                   | °C              |                                                                                              |
|               | Frequency Stability          | ΔF/F                                                                                  | (See ordering information)                                                           |                                                            |                        |                 |                                                                                              |
|               | Aging                        |                                                                                       |                                                                                      |                                                            |                        |                 |                                                                                              |
|               | 1st Year                     |                                                                                       | -3                                                                                   |                                                            | +3                     | ppm             |                                                                                              |
|               | Thereafter (per year)        |                                                                                       | -1                                                                                   |                                                            | +1                     | ppm             |                                                                                              |
|               | Supply Voltage               | V <sub>CC</sub>                                                                       | 1.71<br>2.375<br>3.135                                                               | 1.8<br>2.5<br>3.3                                          | 1.89<br>2.625<br>3.465 | V<br>V<br>V     | LVDS/CML                                                                                     |
|               | Input Current                | I <sub>CC</sub>                                                                       |                                                                                      |                                                            | 125                    | mA              | LVPECL/LVDS/CML                                                                              |
|               | Load                         |                                                                                       | 50 Ohms to (V <sub>CC</sub> -2) V <sub>DC</sub><br>100 Ohm differential load         |                                                            |                        |                 | See Note 3<br>LVPECL Waveform<br>LVDS/CML Waveform                                           |
|               | Symmetry (Duty Cycle)        |                                                                                       | 45                                                                                   |                                                            | 55                     | %               | LVPECL – V <sub>DD</sub> -1.3 V<br>LVDS – 1.25 V                                             |
|               | Output Skew                  |                                                                                       |                                                                                      | 20<br>15<br>20                                             |                        | ps<br>ps<br>ps  | LVPECL<br>CML<br>LVDS                                                                        |
|               | Differential Voltage         | V <sub>OD</sub>                                                                       | 250                                                                                  | 350                                                        | 450                    | mV              | LVDS                                                                                         |
|               |                              | V <sub>OD</sub>                                                                       | 0.7                                                                                  | .095                                                       | 1.20                   | V <sub>PP</sub> | CML                                                                                          |
|               | Common Mode Output Voltage   | V <sub>CM</sub>                                                                       |                                                                                      | 1.2                                                        |                        | V               | LVDS                                                                                         |
|               | Logic “1” Level              | V <sub>OH</sub>                                                                       | V <sub>CC</sub> -1.02                                                                |                                                            |                        | V               | LVPECL                                                                                       |
|               | Logic “0” Level              | V <sub>OL</sub>                                                                       |                                                                                      |                                                            | V <sub>CC</sub> -1.63  | V               | LVPECL                                                                                       |
|               | Rise/Fall Time               | T <sub>r</sub> /T <sub>f</sub>                                                        |                                                                                      | 0.23                                                       | 0.50                   | ns              | @ 20/80% LVPECL                                                                              |
|               | Enable Function              |                                                                                       | 80% V <sub>CC</sub> min or N/C: Output active<br>0.5V max: Output disables to high-Z |                                                            |                        |                 | Output Option B or G                                                                         |
|               |                              |                                                                                       | 0.5V max or N/C: Output active<br>80% V <sub>CC</sub> min: Output disables to high-Z |                                                            |                        |                 | Output Option S or M                                                                         |
|               | Start up Time                |                                                                                       |                                                                                      |                                                            | 10                     | ms              |                                                                                              |
|               | Phase Jitter<br>@ 622.08 MHz | φ <sub>J</sub>                                                                        |                                                                                      | 0.25                                                       |                        | ps RMS          | Integrated 12 kHz – 20 MHz                                                                   |
|               | Phase Noise                  |                                                                                       |                                                                                      | -60<br>-97<br>-107<br>-116<br>-121<br>-134<br>-146<br>-148 |                        |                 | @ 622.08 MHz<br>dBc/Hz<br>dBc/Hz<br>dBc/Hz<br>dBc/Hz<br>dBc/Hz<br>dBc/Hz<br>dBc/Hz<br>dBc/Hz |
| 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 <sup>-8</sup> 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 Conditions     | See solder profile, Figure 1                                                          |                                                                                      |                                                            |                        |                 |                                                                                              |

Note 1: Contact factory for standard frequency availability over 945 MHz

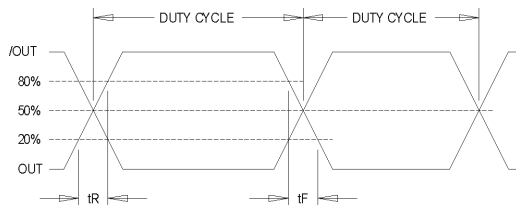
Note 2: Stability is inclusive of initial tolerance, deviation over temperature, shock, vibration, supply voltage, and aging for one year at 50°C mean ambient temperature.

Note 3: See Load Circuit Diagram in this Datasheet. Consult factory with nonstandard output load requirements.

## Phase Noise Plot



## Output Waveform

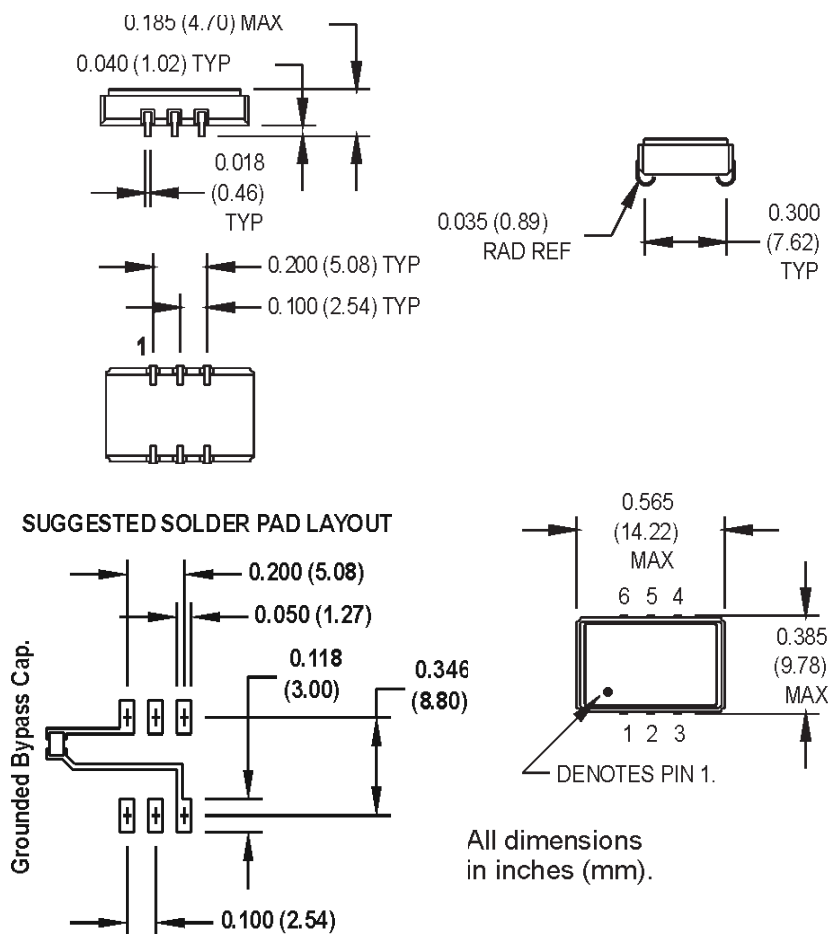


Output Waveform: LVDS/CML/PECL

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### Product Dimension & Pinout Information



#### PIN 1 ENABLE

Pin1: Enable/Disable  
Pin2: N/C  
Pin3: Ground  
Pin4: Output Q (LVPECL, LVDS, CML)  
Pin5: Output  $\bar{Q}$  (LVPECL, LVDS, CML)  
Pin6: Vcc

#### PIN 2 ENABLE

Pin1: N/C  
Pin2: Enable/Disable  
Pin3: Ground  
Pin4: Output Q (LVPECL, LVDS, CML)  
Pin5: Output  $\bar{Q}$  (LVPECL, LVDS, CML)  
Pin6: Vcc

### Handling Information

Although protection circuitry has been designed into the M220x 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  $\Omega$ , 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



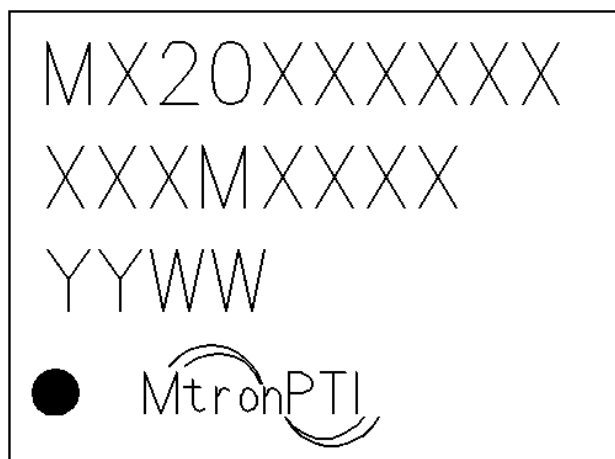
ATTENTION  
Static Sensitive  
Devices  
Handle only at  
Static Safe Work  
Stations

### Quality Parameters

| Environmental Specifications/Qualification Testing Performed on the M220 Clock Oscillator |                              |                                                       |
|-------------------------------------------------------------------------------------------|------------------------------|-------------------------------------------------------|
| 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 $1 \times 10^{-8}$                          |
| 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                            |

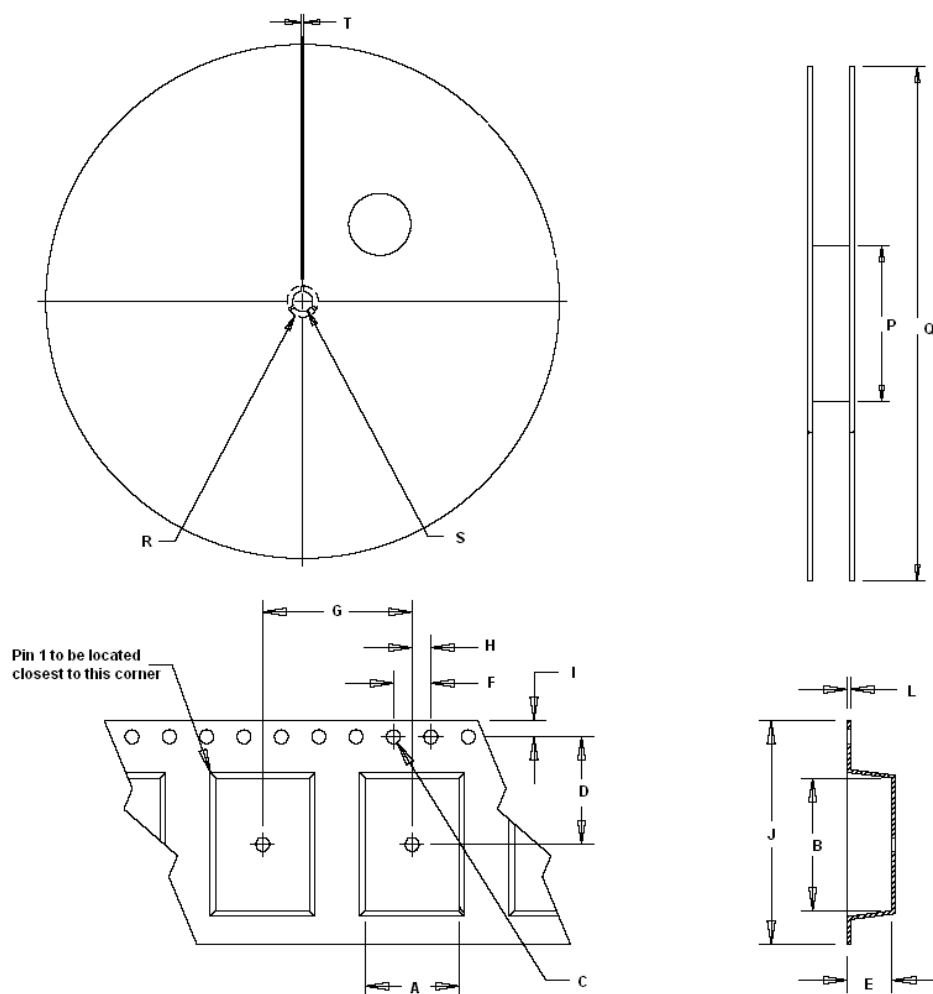
### Part Marking Guide

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     | L    | P      | Q      | R     | S     | T    |
|------------------------------|-------|-------|------|-------|------|------|-------|------|------|-------|------|--------|--------|-------|-------|------|
| M220x                        | 10.00 | 14.20 | 1.50 | 11.50 | 4.85 | 4.00 | 16.00 | 2.00 | 1.75 | 24.00 | 0.35 | 100.00 | 330.00 | 20.20 | 13.00 | 2.00 |

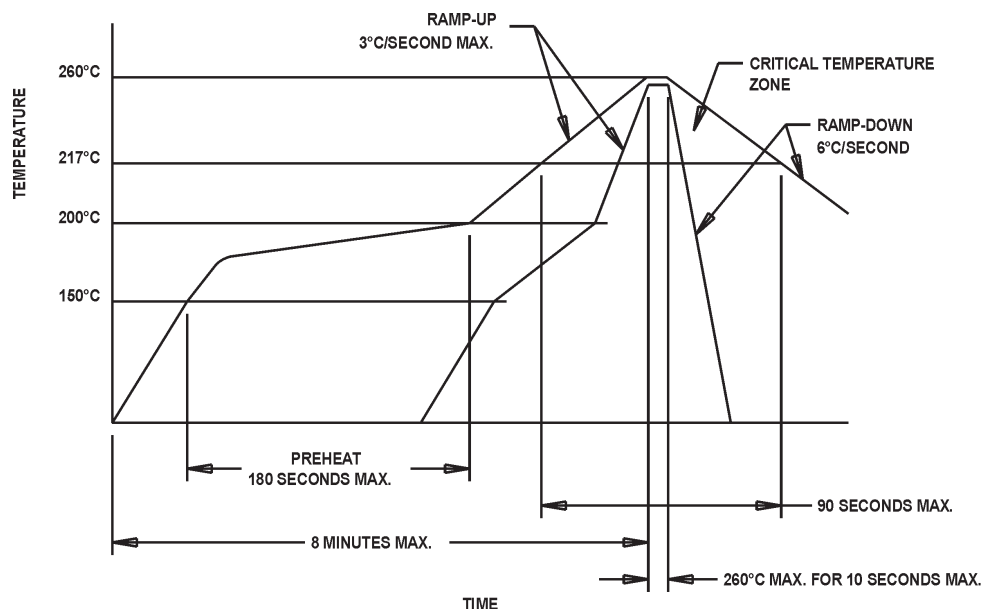


**Standard Tape and Reel:** 500 parts per reel

## Product Revision Table

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

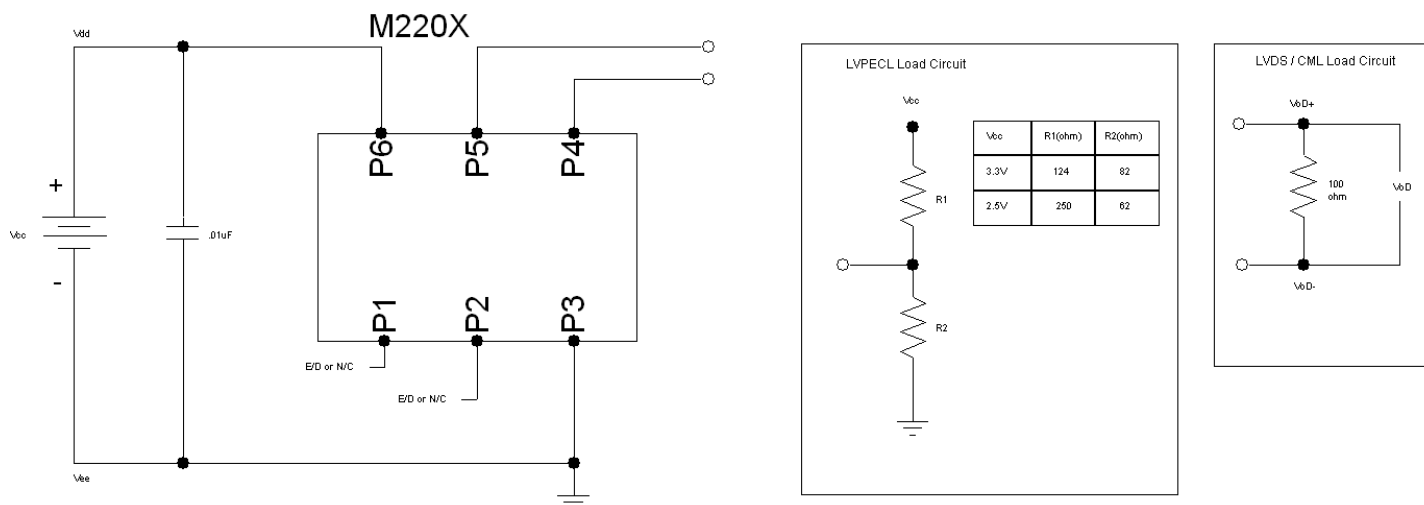
## Maximum Soldering Conditions



## Solder Conditions

Note: Exceeding these limits may damage the device.

## Typical Test Circuit & Load Circuit Diagrams



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)**