



### TTL HA-160 Series

### Description

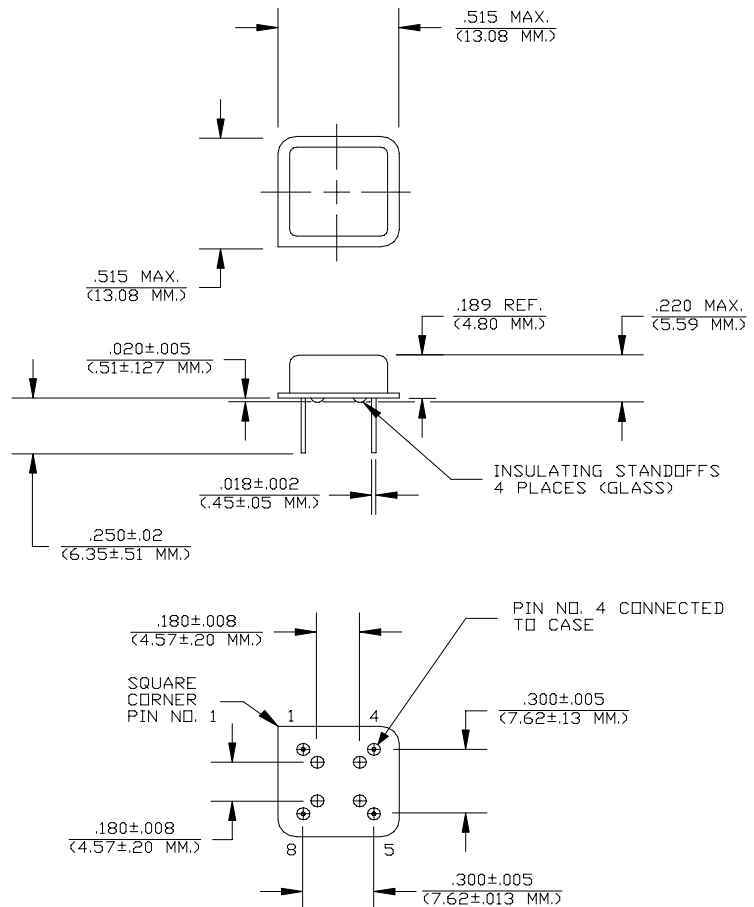
The **HA-160 Series** of quartz crystal oscillators are general purpose TTL oscillators. All units are resistance welded in an all metal package, offering RFI shielding, and are designed to survive standard wave soldering operations without damage. Insulated standoffs to enhance board cleaning are standard.

### Features

- Wide frequency range—0.5MHz to 85.0MHz
- User specified tolerance available
- Will withstand vapor phase temperatures of 253°C for 4 minutes maximum
- Space-saving alternative to discrete component oscillators
- High shock resistance, to 3000g
- All metal, resistance weld, hermetically sealed package
- Low Jitter
- High Q Crystal actively tuned oscillator circuit
- Power supply decoupling internal
- No internal PLL avoids cascading PLL problems
- High frequencies due to proprietary design
- Gold plated leads - Solder dipped leads available upon request
- Low power consumption
- RoHS Compliant, Lead Free Construction (unless solder dipped leads are supplied)
- COTS/Dual use

### Electrical Connection

| Pin | Connection      |
|-----|-----------------|
| 1   | N.C.            |
| 4   | Grd & Case      |
| 5   | Output          |
| 8   | V <sub>CC</sub> |



HS-160 Series Continued  
TTL

Rev. H

### Operating Conditions and Output Characteristics

#### Electrical Characteristics

| Parameter                          | Symbol   | Conditions   | Min     | Typical | Max     |
|------------------------------------|----------|--|---------|---------|---------|
| Frequency                          | -----    | -----  | 0.5MHz  | -----   | 85.0MHz |
| Duty Cycle                         | -----    | @ $V_{CC}/2$   | 40/60%  | -----   | 60/40%  |
| Logic 0                            | $V_{OL}$ | @ 16mA   | -----   | -----   | 0.4V    |
| Logic 1                            | $V_{OH}$ | @ 0.4mA  | 2.4V    | -----   | -----   |
| Rise & Fall Time                   | tr,tf    | @ 0.4 to 2.4V<br><40MHz  | -----   | -----   | 8.0 ns  |
|                                    |          | 40MHz or greater   | -----   | -----   | 5.0 ns  |
| Jitter, RMS <sup>(2)</sup>         | -----    | <40MHz OT & >40MHz   | -----   | -----   | 5 psec  |
|                                    |          | <40MHz Fund  | -----   | -----   | 8 psec  |
| Frequency Stability <sup>(1)</sup> | dF/F     | Overall conditions including:<br>voltage, calibration, temp.,<br>10 yr aging, shock, vibration | -100ppm | -----   | +100ppm |

#### General Characteristics

| Parameter             | Symbol   | Conditions         | Min    | Typical | Max         |
|-----------------------|----------|--------------------|--------|---------|-------------|
| Supply Voltage        | $V_{CC}$ | -----              | 4.75V  | 5.0V    | 5.25V       |
| Supply Current        | $I_{CC}$ | No Load            | 0.0 mA | -----   | 50 mA       |
| Output current        | $I_O$    | -----              | 0.0 mA | -----   | ±16.0 mA    |
| Operating temperature | $T_A$    | -----              | 0°C    | -----   | 70°C        |
| Storage temperature   | $T_S$    | -----              | -55°C  | -----   | 125°C       |
| Power Dissipation     | $P_D$    | -----              | -----  | -----   | 263 mW      |
| Lead temperature      | $T_L$    | Soldering, 10 sec. | -----  | -----   | 300°C       |
| Load                  | -----    | -----              | -----  | -----   | 10 TTL gate |
| Start-up Time         | $t_s$    | <20MHz             | -----  | -----   | 2 ms        |
|                       |          | 20MHz or greater   | -----  | -----   | 10 ms       |

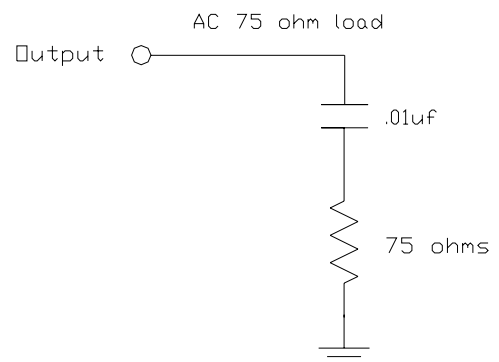
#### Environmental and Mechanical Characteristics

|                     |   |
|---------------------|---|
| Mechanical Shock    | Per MIL-STD-202, Method 213, Condition E                      |
| Thermal Shock       | Per MIL-STD-883, Method 1011, Condition A                     |
| Vibration           | 0.060" double amplitude 10 Hz to 55 Hz, 35g's 55Hz to 2000 Hz |
| Soldering Condition | 300°C for 10 seconds  |
| Hermetic Seal       | Leak rate less than $1 \times 10^{-8}$ atm.cc/sec of helium   |

#### Footnotes:

- Standard frequency stability ( $\pm 20, \pm 25, \pm 50$ ppm & others available)
- Jitter performance is frequency dependent. Please contact factory for full characterization. RMS jitter bandwidth of 12kHz to 20MHz.

#### Test Load:



#### Creating a Part Number

HA - X16X - FREQ

#### Package Code

HA Ledged 4 pin (8 pin)  
SA Ledged 4 pin (8 pin) SMD  
Gull Wing

#### Input Voltage

| Code | Specification |
|------|---------------|
| A    | 3.3V          |
|      | 5V            |

#### Tolerance/Performance

|   |                      |
|---|----------------------|
| 0 | ±100ppm 0-70°C       |
| 1 | ±50ppm 0-70°C        |
| 7 | ±25ppm 0-70°C        |
| 9 | Customer Specific    |
| A | ±20ppm 0-70°C        |
| B | ±50ppm -40 to +85°C  |
| C | ±100ppm -40 to +85°C |