



## CMOS (TTL Compatible) HA-460 Series

### Description

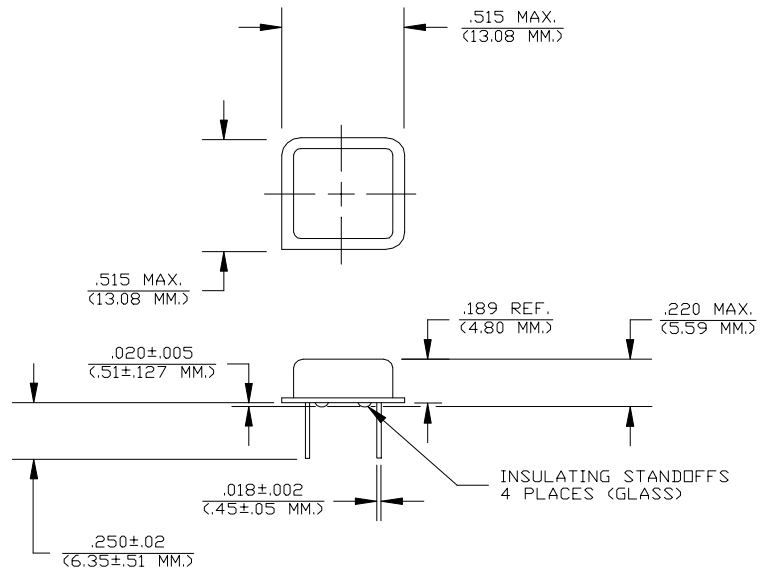
The **HA-460 Series** of quartz crystal oscillators are resistance welded in an all metal package, offering RFI shielding, and are designed to survive standard wave soldering operations without damage. Insulated standoffs to enhance board cleaning are standard.

### Features

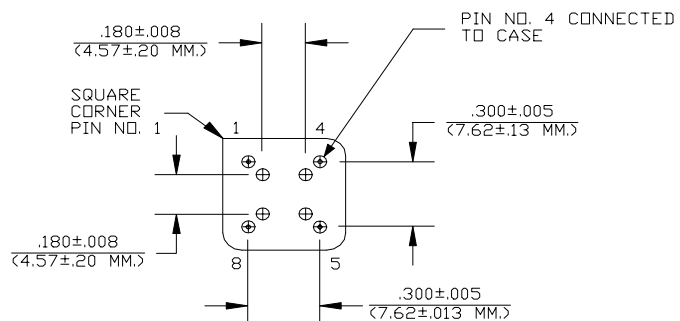
- Wide frequency range—0.5MHz to 30.0MHz
- User specified tolerance available
- Will withstand vapor phase temperatures of 253°C for 4 minutes maximum
- Space-saving alternative to discrete component oscillators
- High shock resistance, to 3000g
- All metal, resistance weld, hermetically sealed package
- Low Jitter
- High Q Crystal actively tuned oscillator circuit
- Low power consumption
- 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
- CMOS and TTL output levels

### Electrical Connection

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



Dimensions are in inches and MM.



HA-460 Series Continued  
CMOS (TTL Compatible)

Rev. C

### Operating Conditions and Output Characteristics

#### Electrical Characteristics

| Parameter                          | Symbol   | Conditions   | Min                            | Typical | Max          |
|------------------------------------|----------|--|--------------------------------|---------|--------------|
| Frequency                          | -----    | -----  | 0.5MHz                         | -----   | 30.0MHz      |
| Duty Cycle                         | -----    | @ $V_{DD}/2$   | 45/55%                         | -----   | 55/45%       |
| Logic 0                            | $V_{OL}$ | @ 600 $\mu$ A<br>@ 16mA  | -----                          | -----   | 0.2V<br>0.4V |
| Logic 1                            | $V_{OH}$ | @ 600 $\mu$ A<br>@ 16mA  | $V_{DD}-0.2V$<br>$V_{DD}-0.4V$ | -----   | -----        |
| Rise & Fall Time                   | tr,tf    | 10-90% $V_O$   | -----                          | -----   | 3 ns         |
| Jitter, RMS <sup>(2)</sup>         | -----    | -----  | -----                          | -----   | 8.0 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        | $V_{DD}$ | -----                      | 4.5V   | 5.0V    | 5.5V          |
| Supply Current        | $I_{DD}$ | No Load                    | 0.0 mA | -----   | 30 mA         |
| Output current        | $I_O$    | -----                      | 0.0 mA | -----   | $\pm 16.0$ mA |
| Operating temperature | $T_A$    | -----                      | 0°C    | -----   | 70°C          |
| Storage temperature   | $T_S$    | -----                      | -55°C  | -----   | 125°C         |
| Power Dissipation     | $P_D$    | -----                      | -----  | -----   | 210 mW        |
| Lead temperature      | $T_L$    | Soldering, 10 sec.         | -----  | -----   | 300°C         |
| Load                  | -----    | -----                      | -----  | -----   | 15pf          |
| Start-up Time         | $t_s$    | <20MHz<br>20MHz or greater | -----  | -----   | 2 ms<br>10 ms |

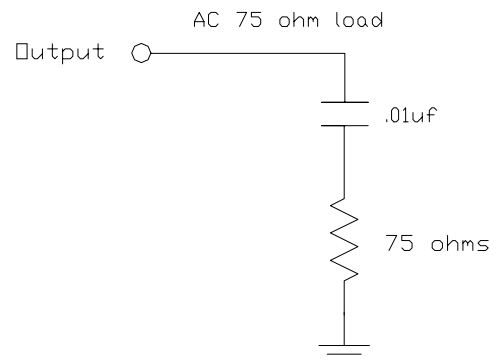
#### Environmental and Mechanical Characteristics

|                     |   |
|---------------------|---|
| Mechanical Shock    | Per MIL-STD-202, Method 213, Condition E                      |
| Thermal Shock       | Per MIL-STD-833, 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.

#### Test Load:



#### Creating a Part Number

HA - A46X - 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  $\pm 100$ ppm 0-70°C  
1  $\pm 50$ ppm 0-70°C  
7  $\pm 25$ ppm 0-70°C  
9 Customer Specific  
A  $\pm 20$ ppm 0-70°C  
B  $\pm 50$ ppm -40 to +85°C  
C  $\pm 100$ ppm -40 to +85°C