



VOLTAGE CONTROLLED CRYSTAL OSCILLATORS HCMOS/TTL 5V



Thru-Hole

Hi Reliability: -55° to +125°C
TRISTATE, 1 MHz to 35 MHz

*MF Electronics oscillators are not
compliant with MIL-PRF-55310*

GUARANTEED CAPTURE RANGE/ABSOLUTE PULL RANGE

Guaranteed Capture Range (GCR) and Absolute Pull Range (APR) are terms often used interchangeably. MF's Guaranteed Capture Range (GCR) is defined as the minimum guaranteed frequency deviation or "pull" (in ppm) around the nominal frequency, with all effects of temperature, variations in V_{DD} and load taken into account. This amount of absolute frequency deviation is available under all operating conditions for modulation or capturing other signals. No additional frequency capture allowances are necessary.

FEATURES

- 168 hour Class B burn-in and extensive environmental testing for best performance in rugged field environments
- Crystal angle controlled to ± 1 minute for excellent temperature stability from -55 to +125°C
- Each unit is ATE-tested to guarantee full compliance with all electrical specifications
- Guaranteed Capture Range of ± 50 ppm
- Excellent incremental and best-straight-line linearity
- Start-up time is less than 10ms
- Over-control voltage up to 7V allows for 20% control voltage overshoot

TYPICAL APPLICATIONS

- Aircraft and aerospace
- Transportation equipment
- Phase locked loops and data acquisition projects that may be exposed to the most severe environmental conditions, including:
 - xDSL customer premise equipment
 - Cable modems
 - ATM/SONET/SDH

| MODEL | Control Voltage (Volts) | Frequency Deviation (ppm) | Guaranteed Capture Range (ppm) | Control Voltage at Center Frequency | Center Frequency Stability (ppm) |
|-------|-------------------------|---------------------------|--------------------------------|-------------------------------------|----------------------------------|
| 6306 | 0 to 5.0 | ± 50 min | ± 50 | 2.5V | ± 50 typ, ± 75 max |

DESCRIPTION

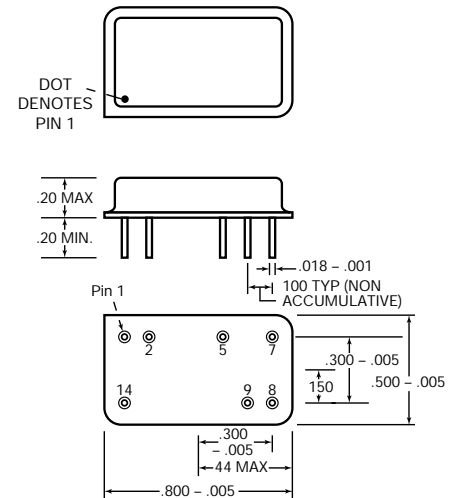
| | |
|-------|---|
| M6306 | ± 50 ppm, min. deviation when using 0 to 5.0V control-voltage and 2.5v center with ± 75 ppm stability |
|-------|---|

CONNECTIONS

| | Full Size |
|--------|------------------------|
| Pin 1. | Not used |
| Pin 2. | Control Voltage, V_C |
| Pin 5. | Tristate |
| Pin 7. | Ground & Case |
| Pin 8. | Output |
| Pin 9. | Not used |
| Pin14. | +5V, V_{DD} |

Description

MF Electronics now offers VCXOs manufactured to Hi-Rel standards, for applications that are subjected to the most stringent environmental conditions. These VCXOs guarantee ± 50 ppm capture over -55° to +125°C. These thru-hole VCXOs generate a 5 volt HCMOS/TTL frequency output which is controlled ("pulled") by an input voltage. These VCXOs offer tristate operation, facilitating diagnostic ATE testing, or user's choice of clock speed under software control.



"M-1" Package





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ELECTRICAL SPECIFICATIONS

Frequency Range 1 MHz to 35 MHz

Frequency Stability Includes calibration at 25°C, operating temperature, change of input voltage, change of load, shock and vibration.

| | MIN | TYP | MAX | UNITS |
|--------------------------------------|-----|-----|-----|-------|
| Input Voltage, V_{DD} | 4.5 | 5.0 | 5.5 | volts |
| Input Current | | | | |
| 1 KHz to 10 MHz | | 8 | 14 | mA |
| 10.1 to 25 MHz | | 15 | 20 | mA |
| 25.1 to 50 MHz | | 20 | 30 | mA |
| 50.1 to 75 MHz | | 25 | 35 | mA |
| 75.1 to 125 MHz | | 30 | 40 | mA |

Output Levels

"0" Level, sinking 16 mA
"1" Level, sourcing 8 mA

| | | |
|----------------------|-----|-------|
| V _{DD} -0.4 | 0.4 | volts |
|----------------------|-----|-------|

Rise and Fall Times

| | | | |
|-------------------------------------|-----|-----|----|
| CMOS, 15 pf, 20 to 80% (<60 MHz) | 3.0 | 4 | ns |
| CMOS, 30 pf, 20 to 80% (<60 MHz) | 4.0 | 5 | ns |
| CMOS, 50 pf, 20 to 80% (<60 MHz) | 6.0 | 8 | ns |
| CMOS, 15 pf, 20 to 80% (>60 MHz) | 2.0 | 2.5 | ns |
| CMOS, 30 pf, 20 to 80% (>60 MHz) | 3.0 | 4.5 | ns |

Symmetry

CMOS, @ 50% V_{DD} 48/52 45/55 percent

Aging

First year 3 ppm
After first year 1 ppm/yr

Control Voltage 0 7.0 volts

Modulation Bandwidth 15 KHz

Jitter

From positive edge to positive edge 40 80 ps pk-pk
10 15 ps RMS

ENVIRONMENTAL SPECIFICATIONS

Temperature

Operating -55° to +125°C
Storage -55° to +125°C

Shock – 1000 Gs, 0.35 ms, 1/2 sine wave, 3 shocks in each plane

Vibration – 10-2000 Hz of .06" d.a. or 20 Gs, whichever is less

Humidity – Resistant to 85% R.H. at 85°C

MECHANICAL SPECIFICATIONS

Gross Leak – Each unit checked in 125°C fluorocarbon

Case – Stainless Steel

Marking – MF part number, date code, serial number and description
Marking will withstand MIL-STD 202, Method 215

Optional Marking – Customer part number if required

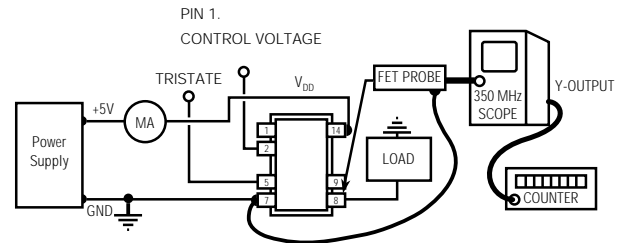
Leads – Kovar, nickel plated, gold flash

Shock – MIL-STD 883, Method 2002, Test Condition B

Vibration – MIL-STD 883, Method 2007, Test Condition A

TRISTATE FUNCTION

| Pin 5 | Pin 8 |
|-----------------------|---------------------|
| Floating or 4.0V min. | Clock Output |
| 0.4V max. | Output is tristated |



To adapt Fet probe to receptacle use Tektronix Part #103-0164-00

To connect output to scope use Tektronix Part #131-0258-00 (receptacle)

TEST CIRCUIT





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TABLE 1

Each unit undergoes the following:

1. Stabilization Bake MIL-STD-883 Method 1008, Cond. B
2. Temperature Cycling MIL-STD-883 Method 1010, Cond. B
3. Centrifuge MIL-STD-883 Method 2001, Cond. A
4. Burn-in MIL-STD-883 Method 1015, Cond. B
(125°C for 168 hours with bias)
5. Fine Leak MIL-STD-883 Method 1014, Cond. A1
6. Gross Leak MIL-STD-883 Method 1014, Cond. C
7. Electrical Test at 25°C and temperature extremes, as follows:

- | | |
|--|-----------------------|
| A. Frequency at specified control voltages | H. Duty Cycle (FL) |
| B. Current | I. Frequency at 5.5V |
| C. Rise Time (NL) | J. Frequency at 4.5V |
| D. Fall Time (NL) | K. "Zero" logic level |
| E. Rise Time (FL) | L. "One" logic level |
| F. Fall Time (FL) | M. Pullability |
| G. Duty Cycle (NL) | N. Pull Linearity |

Test data on each unit is available for additional cost

TABLE 2 — RELIABILITY TEST PROCEDURE AND CONDITIONS FOR QUARTZ CRYSTAL OSCILLATORS

I. Group A

- Electrical Characteristics at -55°, 25° and 125°C
- Frequency @ 4.5, 5.0 and 5.5 volts (for 5 volts units)
- Symmetry (Duty Cycle)
- Input current
- Zero/One levels
- Rise/Fall times
- Physical Dimensions
- Length/width
- Height
- Package finish (Corrosion, discoloration, etc.)
- Marking placement/legibility

II. Group B – Life Test

1000 hrs at 125°C with bias and load

III. Group C – All units have passed Group A testing

A. Subgroup 1 – 8 pcs.

| Standard | Condition | Description | End point measurement |
|-------------|------------------------|---|------------------------------|
| MIL-STD-883 | METHOD 2002 COND. B | Mechanical shock 1500 g's, 5ms 5 drops, 6 axis | Frequency Output waveform |
| MIL-STD-883 | METHOD 2007 COND. A | Vibration, var. freq. 20 g's, .06" disp., 20- 20,000-20 Hz | Frequency Output waveform |
| MIL-STD-883 | METHOD 2003 | Solderability | Visual 95% coverage |
| MIL-STD-883 | METHOD 1011 COND. B | Thermal Shock Liq. to liq. -55 to 125°C, 15 cycles | Frequency Output waveform |
| MIL-STD-202 | METHOD 105 COND. B. | Altitude, 3.44 inch Hg, 12 hrs | Frequency Output waveform |
| MIL-STD-883 | METHOD 1004 | Moisture resist. with 5V applied 25-65°C, 90 to 100% RH, 10 cycles | Frequency Output waveform |
| MIL-STD-202 | METHOD 210 COND. A. | Resistance to Solder Heat Immersion @350°C 3.5 sec | Frequency Output waveform |

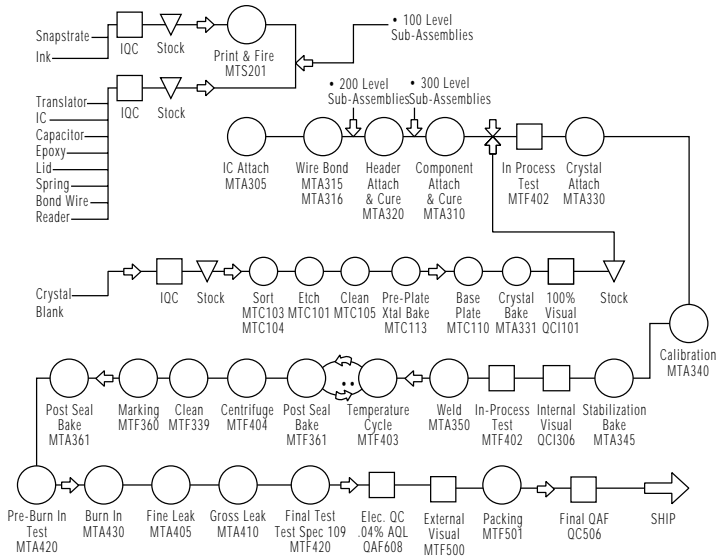
B. Subgroup 2 – 4 pcs (One-half of Subgroup 1)

| Standard | Condition | Description | End point measurement |
|-------------|------------------------|---|------------------------------|
| MIL-STD-883 | METHOD 1011 COND. B | Thermal Shock Liq. to liq. -55 to 125°C, 15 cycles | Frequency Output waveform |
| MIL-STD-202 | METHOD 105 COND. B. | Altitude, 3.44 inch Hg, 12 hrs | Frequency Output waveform |
| MIL-STD-883 | METHOD 1004 COND. A | Moisture resist. with 5V applied 25-65°C, 90 to 100% RH, 10 cycles | Frequency Output waveform |
| MIL-STD-202 | METHOD 210 COND. A. | Resistance to Solder Heat Immersion @350°C 3.5 sec | Frequency Output waveform |

C. Subgroup 3 – 4 pcs. (One half of Subgroup 1)

| Standard | Condition | Description | End point measurement |
|-------------|------------------------|---|--|
| MIL-STD-883 | METHOD 1009 COND. A | Salt Atmosphere 24 hrs. @ 35°C .5-3.0% Solution | Frequency Output waveform Visual |
| MIL-STD-883 | METHOD 1014 COND. B | Fine Leak | Qs <5 x 10 ⁻⁸ |
| MIL-STD-883 | METHOD 1014 COND. C | Gross Leak | Visual in 125°C Detector fluid |

PROCESSING FLOW CHART



NOTE: • Indicates where Sub-Contracted Assemblies and Sub-Assemblies enter the Manufacturing line.
All Sub-Contracted Assemblies and Sub-Assemblies are inspected to QC1307 and stored in stock until needed.
•• Indicates Post Seal Bake and Temperature Cycle Processes may be performed in reverse order.



