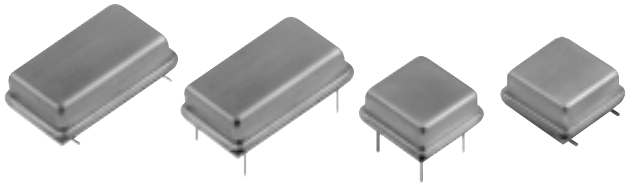
VOLTAGE CONTROLLED CRYSTAL OSCILLATORS
HCMOS/TTL 3.3V

FULL SIZE D.I.L. M package	HALF SIZE D.I.L. H package
M2306	H2306
M2321, M2322	H2321,H2322
M2331, M2332	H2331, H2332
M2341, M2342	H2341, H2342



Thru-Hole / Gull Wing
Commercial: 0º to 70ºC
1 MHz to 150 MHz

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

- Excellent incrememtal and best-straight-line linearity
- Start-up time is less than 5ms
- Each unit is ATE-tested to guarantee full compliance with all electrical specifications

TYPICAL APPLICATIONS

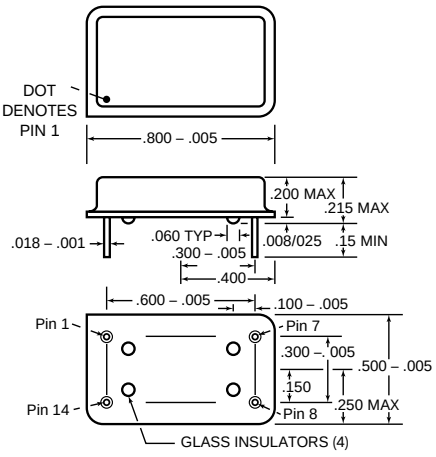
- Phase locked loops and data acquisition projects, including:
  - xDSL customer premise equipment
  - Cable modems
  - ATM/SONET/SDH

Description

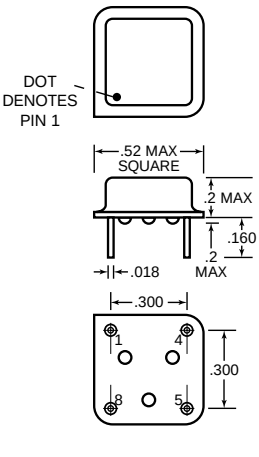
These thru-hole VCXOs generate a 3.3 volt HCMOS/TTL frequency output which is controlled ("pulled") by an input voltage. MF Electronics' VCXO specification defines not only the end-point frequency/voltage parameters, but also the center voltage at which the nominal frequency is acheived.

CONNECTIONS

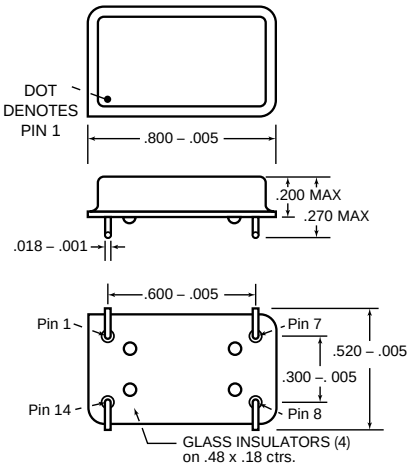
	Full Size	Half Size
Pin 1.	Control Voltage, V_C	Control Voltage, V_C
Pin 4.		Ground & Case
Pin 5.		Output
Pin 7.	Ground & Case	
Pin 8.	Output	+3.3V, V_{DD}
Pin14.	+3.3V, V_{DD}	



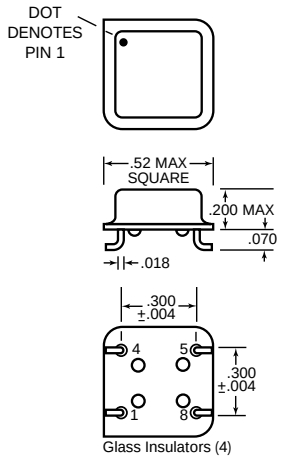
"M" Package



"H" Package



"M" Package with Gull Wing



"H" Package with Gull Wing

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Center Frequency is Between Two Voltages

MODEL	Control Voltage (Volts)	Frequency Deviation (ppm)	Guaranteed Capture Range (ppm)	Control Voltage at Center Frequency	Center Frequency Stability (ppm)
2306	0 to 3.0	± 150 min	± 150	—	± 30, typ ± 50, max

Center Frequency is at 1.5V with ±50 ppm stability

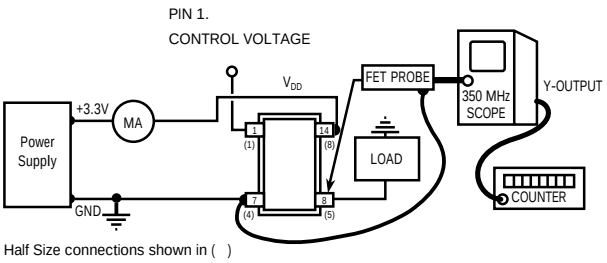
MODEL	Control Voltage (Volts)	Frequency Deviation (ppm)	Guaranteed Capture Range (ppm)	Control Voltage at Center Frequency	Center Frequency Stability (ppm)
2321	0.5 to 2.5	± 75 to 150	± 75	1.5	± 30, typ
2322	0.5 to 2.5	± 100 to 200	± 100	1.5	± 50, max

Center Frequency is at 1.5V with ±25 ppm stability

MODEL	Control Voltage (Volts)	Frequency Deviation (ppm)	Guaranteed Capture Range (ppm)	Control Voltage at Center Frequency	Center Frequency Stability (ppm)
2331	0.5 to 2.5	± 75 to 150	± 75	1.5	± 20, typ
2332	0.5 to 2.5	± 100 to 200	± 100	1.5	± 25, max

Center Frequency is at 1.5V with ±20 ppm stability

MODEL	Control Voltage (Volts)	Frequency Deviation (ppm)	Guaranteed Capture Range (ppm)	Control Voltage at Center Frequency	Center Frequency Stability (ppm)
2341	0.5 to 2.5	± 75 to 150	± 75	1.5	± 15, typ
2342	0.5 to 2.5	± 100 to 200	± 100	1.5	± 20, max



Half Size connections shown in ( )

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

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

ALL OSCILLATORS HAVE INTERNAL BYPASS CAPACITORS

TEST CIRCUIT

DESCRIPTIONS

M2306, H2306	±150 ppm, min. deviation when using 0 to 3 control-voltage
M2321, H2321	±75 ppm capture when using using 0.5 to 2.5V control-voltage and 1.5V center with ±50 ppm stability
M2322, H2322	±100 ppm capture when using using 0.5 to 2.5V control-voltage and 1.5V center with ±50 ppm stability
M2331, H2331	±75 ppm capture when using using 0.5 to 2.5V control-voltage and 1.5V center with ±25 ppm stability
M2332, H2332	±100 ppm capture when using using 0.5 to 2.5V control-voltage and 1.5V center with ±25 ppm stability
M2341, H2341	±75 ppm capture when using using 0.5 to 2.5V control-voltage and 1.5V center with ±20 ppm stability
M2342, H2342	±100 ppm capture when using using 0.5 to 2.5V control-voltage and 1.5V center with ±20 ppm stability

FREQUENCY STABILITY

Frequency stability vs. Temperature (0 to 70°C) is typically better than ±20 ppm. Since the deviation of each oscillator is tested and guaranteed over the whole operating temperature range, it is not necessary to make additional capture allowances. All oscillators will capture frequencies with the full minimum values of the deviation under all conditions.

QUALITY

Each VCXO is computer-tested at three temperatures to guarantee full compliance to the specification.

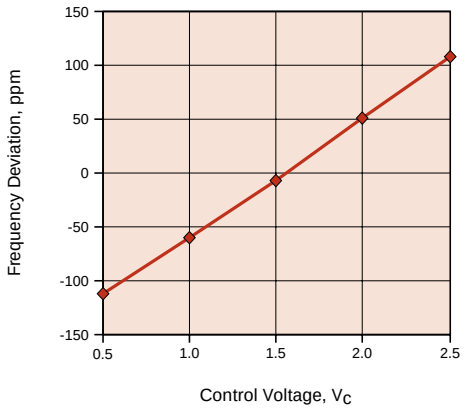


Fig. 1 Frequency vs. Control Voltage for M2331-16M

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ELECTRICAL SPECIFICATIONS

Frequency Range 1 MHz to 150 MHz

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

Center Frequency Range

V_C = 1.5V 1 MHz to 150 MHz

Frequency Stability

V_C = 1.5V ±25 or ±50 ppm, max. as shown in model specification

	MIN	TYP	MAX	UNITS
Input Voltage, V_{DD}	3.0	3.3	3.6	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			0.4	volts
"1" Level, sourcing 8 mA	V_{DD}-.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
Input Impedance				
Control Voltage		15	1000	Kohms
Control Voltage Bandwidth	15	150		KHz

HOW TO ORDER

For Part Number, put package type before model number, and add frequency in MHz, for example:

M 2331-16.364M

- "M" is full size DIL, "H" is half size DIL
- "2331" is model type
- "16.364 M" frequency in MHz
- Leave blank for straight leads Add "G" for gullwing

ENVIRONMENTAL SPECIFICATIONS

Temperature

Operating 0º to 70°C

Storage -55º to +125°C

Temperature Cycle – Not to exceed ±5 ppm change when exposed to 2 hours maximum at each temperature from 0 to 120°C, with 25°C reference

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

Fine Leak – Mass spectrometer leak rate less than 2 X 10^{-8} atmos, cc/sec of helium

Pins – Kovar, nickel plated with 60/40 solder coat

Bend Test – Will withstand two bends of 90° from reference

Header – Steel, with nickel plate

Case – Stainless steel, type 304

Marking – Permanent black epoxy ink or laser marked

Resistance to Solvents – MIL STD 202, Method 215

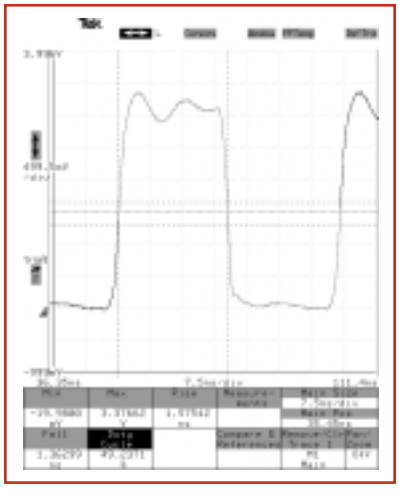

Fig. 2. H2321-19.44M with 33 pf load

SS#	Rev.
M2306	A

MF ELECTRONICS

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