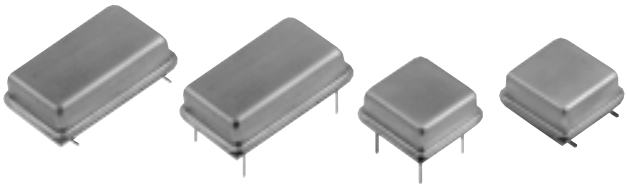
VOLTAGE CONTROLLED CRYSTAL OSCILLATORS
HCMOS/TTL 5V



FULL SIZE D.I.L.
M package
M6001 thru M6007
M6021 thru M6023

HALF SIZE D.I.L.
H package
H6001 thru H6007
H6021 thru H6023

Thru-Hole/Gull Wing
Industrial: -40º to +85ºC
1 KHz 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

- Industrial temperature range of -40 to +85ºC allows for use in harsh environmental conditions
- 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

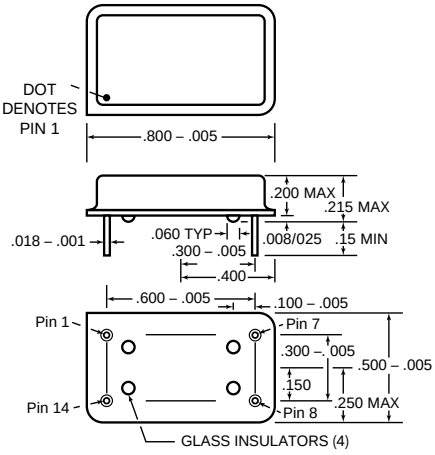
- Phase locked loops and data acquisition projects, including:
  - xDSL customer premise equipment
  - Cable modems
  - ATM/SONET/SDH

Description

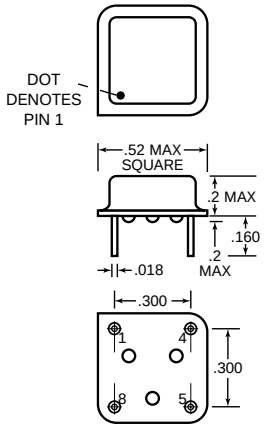
These thru-hole VCXOs generate a 5 volt HCMOS/TTL frequency output which is controlled ("pulled") by an input voltage. MF Electronics' VCXO specification defines not only the end-point frequency/ voltage parameters, but also the center voltage at which the nominal frequency is acheived.

CONNECTIONS

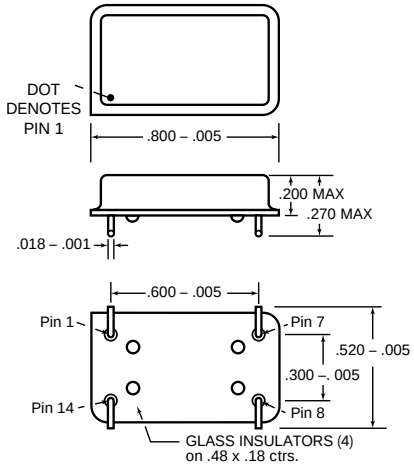
	Full Size	Half Size
Pin 1.	Control Voltage, V_C	Control Voltage, V_C
Pin 4.		Ground & Case
Pin 5.		Output
Pin 7.	Ground & Case	
Pin 8.	Output	+5V, V_{DD}
Pin14.	+5V, V_{DD}	



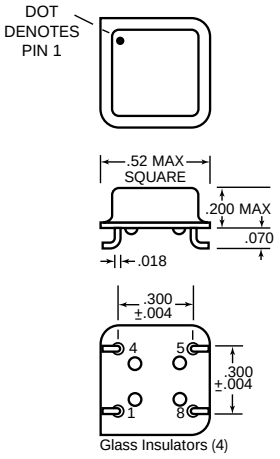
"M" Package



"H" Package



"M" Package with Gull Wing



"H" Package with Gull Wing

MF ELECTRONICS

International Sales: +1.914-712-2200 • USA Sales: +1.800.331.1236 • Fax: 914.712.2290 • www.mfelectronics.com • email:sales@mfelectronics.com

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Center Frequency is Between Two Voltages with ±50 ppm stability

MODEL	Control Voltage (Volts)	Frequency Deviation (ppm)	Guaranteed Capture Range (ppm)	Control Voltage at Center Frequency	Center Frequency Stability (ppm)
6001	0.3 to 10.0	± 175 min	± 175	2.5 to 5.0	± 40, typ ± 50, max
6002	0.3 to 4.0	± 75 min	± 75	1.3 to 2.3	
6003	0.3 to 10.0	± 175 to 300	± 175	2.5 to 5.0	
6004	0.3 to 4.0	± 125 min	± 125	1.3 to 2.3	
6005	1.0 to 4.0	± 75 to 300	± 75	1.8 to 3.0	
6006	0 to 5.0	± 150 min	± 150	—	
6007	0.5 to 4.5	± 125 to 250	± 125	1.8 to 3.0	

Center Frequency is at 2.5V with ±50 ppm stability

MODEL	Control Voltage (Volts)	Frequency Deviation (ppm)	Guaranteed Capture Range (ppm)	Control Voltage at Center Frequency	Center Frequency Stability (ppm)
6021	0.5 to 4.5	± 75 to 150	± 75	2.5	± 30, typ ± 50, max
6022	0.5 to 4.5	± 100 to 200	± 100	2.5	
6023	0.5 to 4.5	± 150 to 300	± 150	2.5	

DESCRIPTIONS

M6001, H6001	±175 ppm, min. deviation when using 0.3 to 10V control-voltage
M6002, H6002	±75 ppm, min. deviation when using 0.3 to 4.0V control-voltage
M6003, H6003	±175 ppm to ±300 ppm deviation when using 0.3 to 10V control-voltage
M6004, H6004	±125 ppm deviation when using 0.3 to 4.0V control-voltage
M6005, H6005	±75 ppm to ±300 ppm deviation when using 1.0 to 4.0 control-voltage, for use where the control voltage is 1 volt off both rails
M6006, H6006	±150 ppm, min. deviation when using 0 to 5.0 control-voltage
M6007, H6007	±125 ppm to ±250 ppm deviation when using 0.5 to 4.5 control-voltage
M6021, H6021	±75 ppm capture when using 0.5 to 4.5V control-voltage and 2.5V center with 50 ppm stability
M6022, H6022	±100 ppm capture when using 0.5 to 4.5V control-voltage and 2.5V center with 50 ppm stability
M6023, H6023	±150 ppm capture when using 0.5 to 4.5V control-voltage and 2.5V center with 50 ppm stability

FREQUENCY STABILITY

Frequency stability vs. Temperature is typically better than ±40 ppm for -40 to +85°C. 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.

ELECTRICAL SPECIFICATIONS

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

Center Frequency Range
V_C = 2.5V 1 KHz to 150 MHz

	MIN	TYP	MAX	UNITS
Input Voltage	4.5	5.0	5.5	volts
Input Current		30	45	mA
Output Levels (HCMOS)				
"0" Level, sinking 16 mA.			0.4	volts
"1" Level, sourcing 10 mA.	V_{DD} -.4			volts
Rise and Fall Times, HCMOS				
From 0.4 to (V_{DD}-.4) V		2.5	4	ns
(Above 35 MHz)			2	ns
Symmetry				
At V_{DD}/2			45/55	percent
Aging				
First year		3		ppm
After first year		1		ppm/yr
Input Impedance,				
Pin 5., Control Voltage	15	1000		Kohms
Control Voltage Bandwidth	15	150		KHz

ENVIRONMENTAL SPECIFICATIONS

Temperature
Operating -40º to +85°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 plated

Case – Stainless steel, type 304

Marking – Permanent black epoxy ink or laser marked

Resistance to Solvents – MIL STD 202, Method 215

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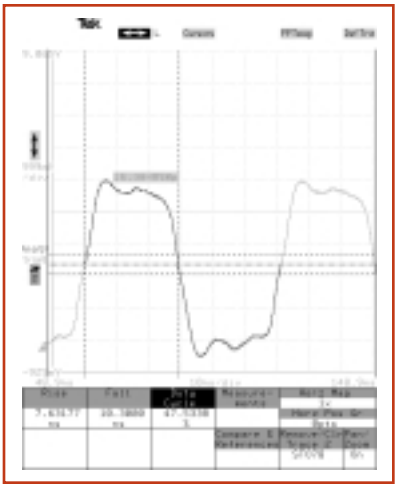
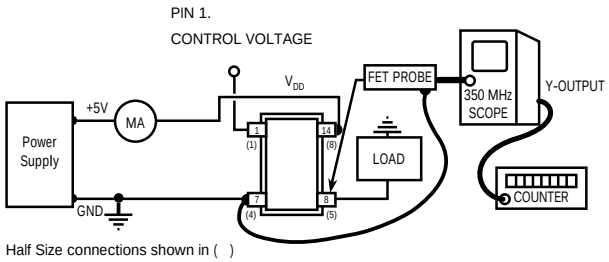


Fig. 1 M6022-16.384M, with 50 pf load



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

M6022-16.384M, TYPICAL

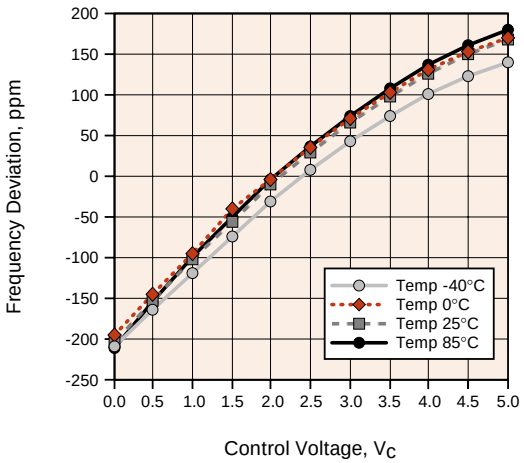


Fig. 2 Frequency vs. Control Voltage

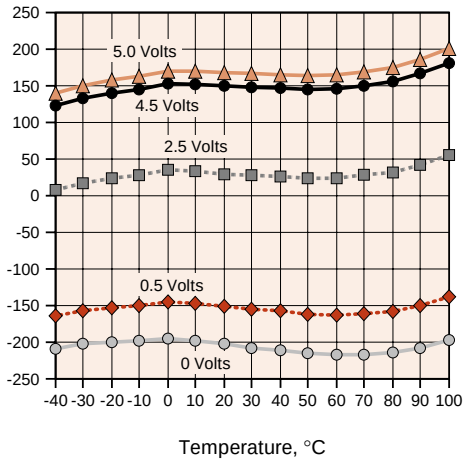


Fig. 3 Frequency vs. Temperature

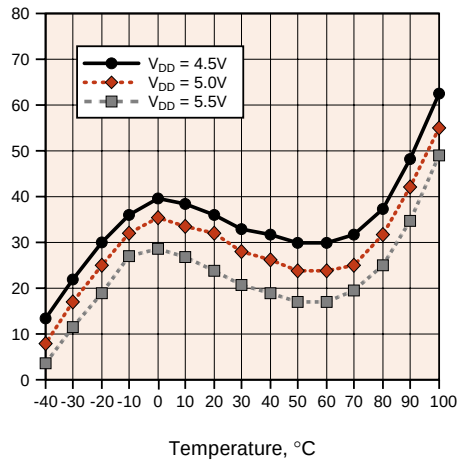


Fig. 4 Frequency vs. Temperature @ 2.5V Control Voltage

HOW TO ORDER

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

M 6001-12.352M

- "M" is full size DIL "H" is half size DIL
- "6001" is model type
- "12.352 M" frequency in MHz
- Leave blank for straight leads Add "G" for gullwing

SS#	Rev.
M6001	A

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