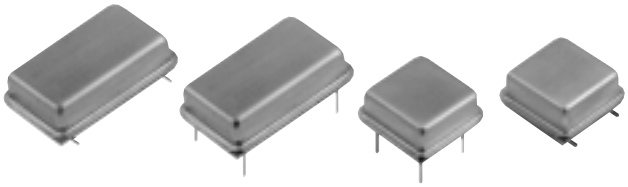
VOLTAGE CONTROLLED CRYSTAL OSCILLATORS
HCMOS 5V



FULL SIZE D.I.L.
M package
M2001 thru M2007
M2021 thru M2023
M2031 thru M2033

HALF SIZE D.I.L.
H package
H2001 thru H2007
H2021 thru H2023
H2031 thru H2033

Thru-Hole / Gull Wing
0º to 70ºC
1 MHz to 175 MHz

These 5V VCXOs generate an HCMOS frequency output which is controlled by an input voltage. The end-point frequency/voltage parameters are defined, as is the center frequency.

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}, variations in load, and aging 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

- Frequency from 1 MHz to 175 MHz
- Capture-range is fully defined, under all conditions
- Start-up time less than 5 ms
- Low profile package available above 60 MHz
- Choice of thru-hole or gull wing

TYPICAL APPLICATIONS

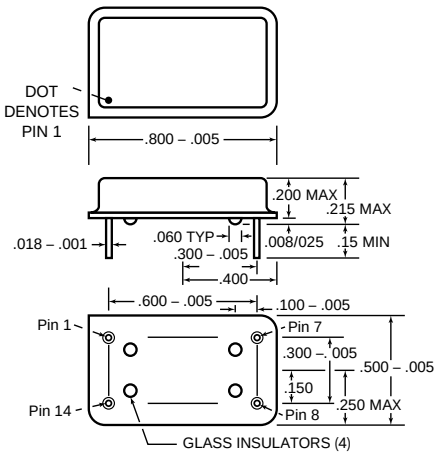
- Phase locked loops and data acquisition projects, including:
  - xDSL customer premise equipment
  - Cable modems
  - ATM/SONET/SDH

Description

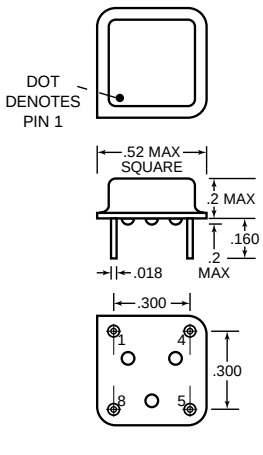
Thru-hole VCXOs are available for 5V operation from 1 MHz to175 MHz. Users have a choice of many off-the-shelf models. Diverse combinations of pull, control voltage and center frequency deviation are available, accommodating a wide variety of filtering and driving circuitry. Standard VCXOs are hermetically sealed in full size (M) or half size (H), DIL packages. All VCXOs are tested and guaranteed over 0 to 70°C. For operation from -40 to +85°C see our extended temperature models.

CONNECTIONS

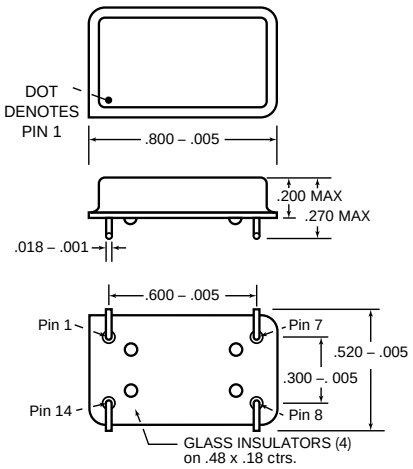
Full Size	Half Size	
Pin 1.	Pin 1.	Control Voltage, V_C
Pin 7.	Pin 4.	Ground & Case
Pin 8.	Pin 5.	Output
Pin 14.	Pin 8.	+5V, V_{DD}



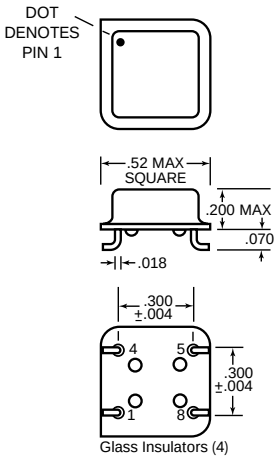
"M" Package



"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

VOLTAGE CONTROLLED CRYSTAL OSCILLATORS HCMOS 5V

Thru-Hole /Gull Wing,

0º to 70ºC

1 MHz to 175 MHz

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Center Frequency is Between Two Voltages

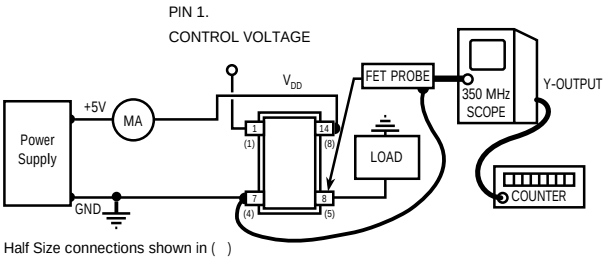
MODEL	Control Voltage (Volts)	Frequency Deviation (ppm)	Guaranteed Capture Range (ppm)	Control Voltage at Center Frequency	Center Frequency Stability (ppm)
2001	0.3 to 10.0	± 175 min	± 175	2.5 to 5.0	± 30, typ ± 50, max
2002	0.3 to 4.0	± 75 min	± 75	1.3 to 2.3	
2003	0.3 to 10.0	± 175 to 300	± 175	2.5 to 5.0	
2004	0.3 to 4.0	± 125 min	± 125	1.3 to 2.3	
2005	1.0 to 4.0	± 75 to 300	± 75	1.8 to 3.0	
2006	0 to 5.0	± 150 min	± 150	—	
2007	0.5 to 4.5	± 125 to 250	± 125	1.8 to 3	

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)
2021	0.5 to 4.5	± 75 to 150	± 75	2.5	± 30, typ ± 50, max
2022	0.5 to 4.5	± 100 to 200	± 100	2.5	
2023	0.5 to 4.5	± 150 to 300	± 150	2.5	

Center Frequency is at 2.5V with ±25 ppm stability

MODEL	Control Voltage (Volts)	Frequency Deviation (ppm)	Guaranteed Capture Range (ppm)	Control Voltage at Center Frequency	Center Frequency Stability (ppm)
2031	0.5 to 4.5	± 75 to 150	± 75	2.5	± 20, typ ± 25, max
2032	0.5 to 4.5	± 100 to 200	± 100	2.5	
2033	0.5 to 4.5	± 150 to 300	± 150	2.5	



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

M2001, H2001	±175 ppm, min. deviation when using 0.3 to 10V control-voltage
M2002, H2002	±75 ppm, min. deviation when using 0.3 to 4.0V control-voltage
M2003, H2003	±175 ppm to ±300 ppm deviation when using 0.3 to 10V control-voltage
M2004, H2004	±125 ppm min. deviation when using 0.3 to 4.0V control-voltage
M2005, H2005	±75 ppm to ±300 ppm deviation when using 1.0 to 4.0V control-voltage, for use where the control voltage is 1 volt off both rails
M2006, H2006	±150 ppm, min. deviation when using 0 to 5.0V rail-to-rail control-voltage
M2007, H2007	±125 ppm to ±250 ppm deviation when using 0.5 to 4.5V control-voltage
M2021, H2021	±75 ppm capture when using using 0.5 to 4.5V control-voltage and 2.5V center with ±50 ppm stability
M2022, H2022	±100 ppm capture when using using 0.5 to 4.5V control-voltage and 2.5V center with ±50 ppm stability
M2023, H2023	±150 ppm capture when using using 0.5 to 4.5V control-voltage and 2.5V center with ±50 ppm stability
M2031, H2031	±75 ppm capture when using using 0.5 to 4.5V control-voltage and 2.5V center with ±25 ppm stability
M2032, H2032	±100 ppm capture when using using 0.5 to 4.5V control-voltage and 2.5V center with ±25 ppm stability
M2033, H2033	±150 ppm capture when using using 0.5 to 4.5V control-voltage and 2.5V center with ±25 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 allowance. 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.

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ELECTRICAL SPECIFICATIONS

Frequency Range 1 MHz to 175 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 = 2.5V 1 MHz to 175 MHz

Frequency Stability
V_C = 2.5V ±20, ±25 or ±50 ppm, max. as shown in model specification

	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 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

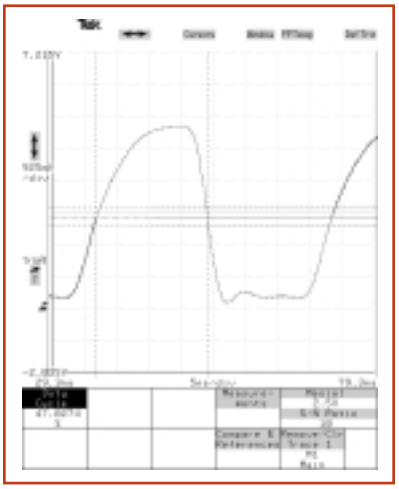

Fig. 1 M2001-27M with 33 pf load

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FREQUENCY VS. CONTROL VOLTAGE FOR TYPICAL DEVICES

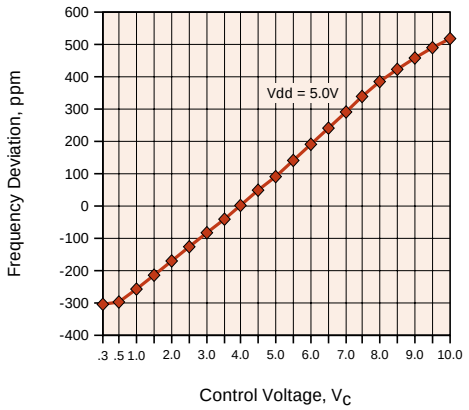

Fig. 2 M2001-40M

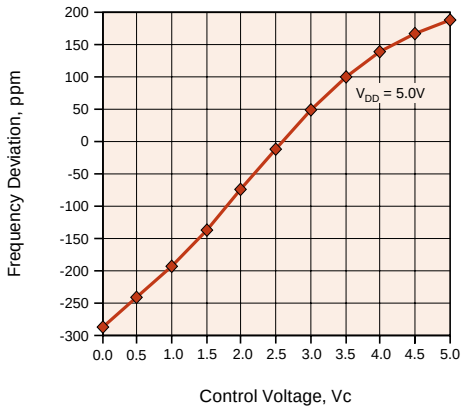

Fig. 6 M2023-19.44

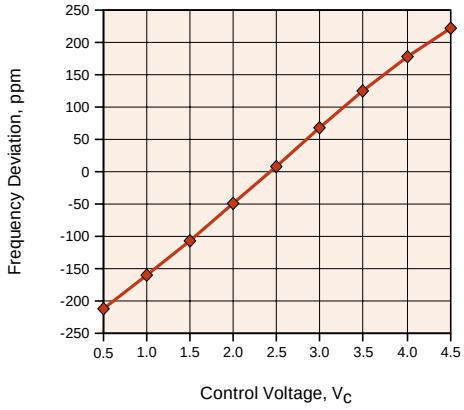

Fig. 4 M2007-16.777216M

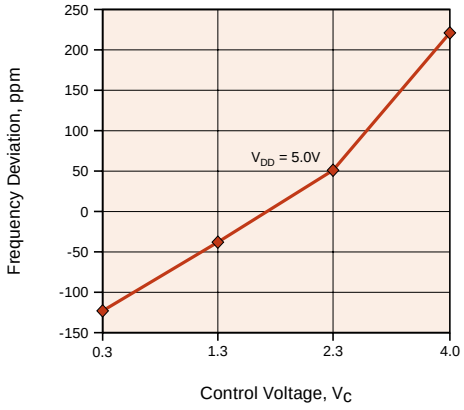

Fig. 3 M2002-12.352

HOW TO ORDER

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

M 2033-14.372M

- "M" is full size DIL "H" is half size DIL
- "2033" is model type
- "14.372 M" frequency in MHz
- Leave blank for straight leads Add "G" for gullwing

SS#	Rev.
M2001	A