VOLTAGE CONTROLLED OSCILLATORS
HCMOS, 0° TO 70°C

FULL SIZE D.I.L.
M2306
L2306
M2321, M2322
L2321, L2322
M2331, M2332
L2331, L2332
M2341, M2342
L2341, L2342

M2308

HALF SIZE D.I.L.
H2306
H2321,H2322
H2331, H2332
H2341, H2342

Thru-Hole VCXOs, 3.3V

Thru-hole 3.3V VCXOs are available for the first time, and in a variety of off-the-shelf models. Versions in full size (M) and half size (H) cans are offered as standard designs for 0 to 70°C. These models are recommended for new equipment designs that operate at 3.3V to minimize current, power, and heat dissipation. Many combinations of pull, control voltage and center frequency deviation are available, to accommodate a wide variety of filtering and driving circuitry. For additional input voltage/ deviations and operation through 175 MHz see our 5V models. For operation from -40 to +85°C see our temperature extended models.

Thru-Hole/Gull Wing, 3.3V
1 MHz to 125 MHz

These 3.3V 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.

CAPTURE RANGE

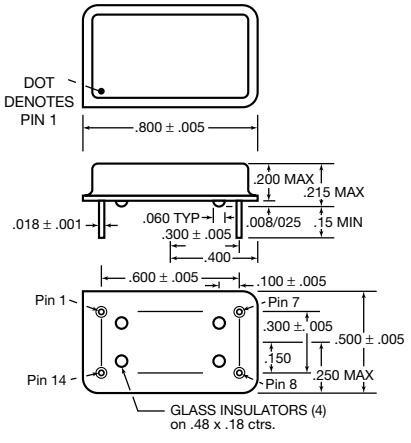
The Frequency-Capture range is equal to the (Center-Frequency ± the Frequency Deviation), because every MF VCXO is ATE-tested to meet the Frequency-Deviation over the temperature range. ***Frequency Capture specification includes all effects of temperature and supply voltage. It is not necessary to make additional capture allowances.***

CONNECTIONS

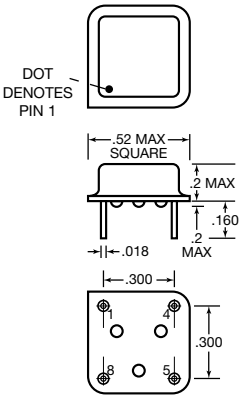
Full Size	Half Size	
Pin 1.	Pin 1.	Control Voltage, V_C
Pin 7.	Pin 4.	Ground & Case
Pin 8.	Pin 5.	Output
Pin 14.	Pin 8.	+3.3V, V_{DD}

FEATURES

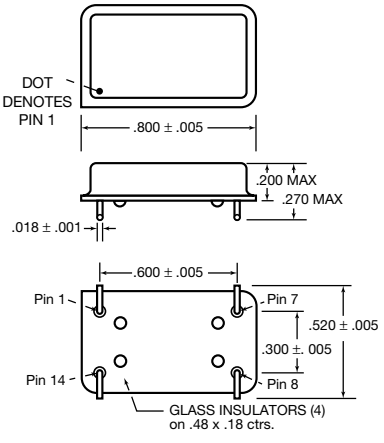
- Frequency from 1 MHz to 125 MHz
- Capture-range is fully defined, under all conditions
- Start-up time less than 5 ms.
- Low profile package available above 60 MHz
- Typical jitter is less than 15 ps RMS
- Choice of thru-hole or gull wing



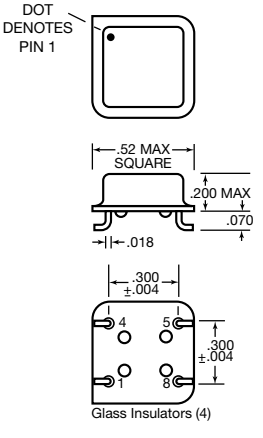
"M" Package – "L" Package is same as "M" but seated height is 0.190



"H" Package



"M" Package with Gull Wing



"H" Package with Gull Wing

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HCMOS, 0° TO 70°C
Thru-Hole/Gull Wing, 3.3V
1 MHz to 125 MHz

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HALF SIZE D.I.L.
H2306
H2321,H2322
H2331, H2332
H2341, H2342

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

DESCRIPTIONS

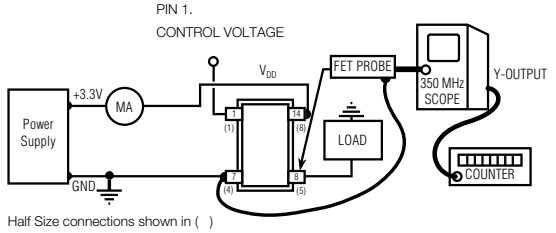
M2306, H2306, L2306	±150 ppm, min. deviation when using 0 to 3 control-voltage
M2321, H2321, L2321	±75 ppm capture when using using 0.5 to 2.5V control-voltage and 1.5V center with ±50 ppm stability
M2322, H2322, L2322	±100 ppm capture when using using 0.5 to 2.5V control-voltage and 1.5V center with ±50 ppm stability
M2331, H2331, L2331	±75 ppm capture when using using 0.5 to 2.5V control-voltage and 1.5V center with ±25 ppm stability
M2332, H2332, L2332	±100 ppm capture when using using 0.5 to 2.5V control-voltage and 1.5V center with ±25 ppm stability
M2341, H2341, L2341	±75 ppm capture when using using 0.5 to 2.5V control-voltage and 1.5V center with ±20 ppm stability
M2342, H2342, L2342	±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.

M2308 SPECIFICATIONS

Temperature of Operation	0 to 70°C (25 ppm) –40 to +85°C (50 ppm)		
Supply Voltage	5V ± 5%		
Supply Current	(CL = 15 pf)		
≤10 MHz	13 ma.		
≤20 MHz	17 ma.		
≤25 MHz	19 ma.		
Phase Jitter	<100 ps.		
Output Symmetry	45/55 @ CMOS/TTL levels (<16 MHz) 40/60 @ CMOS/TTL levels (16-25 MHz)		
TR & TF (max.)	**TR**	**TF**	(CL = 15 pf)
Cmos (20 to 80%)	5ns	4ns	
TTL (.5 to 2.5V)	4ns	4ns	
Load	10 TTL gates, CMOS compatible		
Start-up time	<10 ms.		
Frequency Control			
Control Voltage	0.5 – 1.5 – 2.5 Vdc		
Deviation	±75 ppm min., ±150 ppm max.		
Sensitivity	+75 to +150 ppm/V		
Linearity	<±5%		
Input Impedance	≥50 K ohms at ≤10 KHz		
Modulation BW	≥20 KHz (-3db, Vc=2.5V)		



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

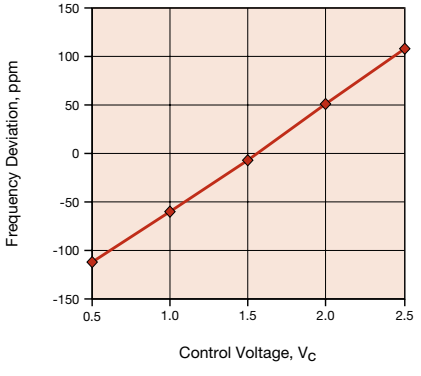


Fig. 1 Frequency vs. Control Voltage for M2331-16M

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M2308

HALF SIZE D.I.L.
H2306
H2321,H2322
H2331, H2332
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SPECIFICATIONS

Temperature

Operating	0 to 70°C
Storage	–55 to +125°C

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		0.5	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
Input Impedance				
Control Voltage		15	1000	Kohms
Control Voltage Bandwidth	15	150		KHz

ENVIRONMENTAL SPECIFICATIONS

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 G's, 0.35 ms, 1/2 sine wave, 3 shocks in each plane

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

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

MECHANICAL SPECIFICATIONS

Gross Leak – Each unit checked in 125°C flurocarbon

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 – Printing is black epoxy ink

Resistance to Solvents – MIL STD 202, Method 215

AGING

3 to 5 ppm, first year, typ.
1 ppm per year thereafter, typ.

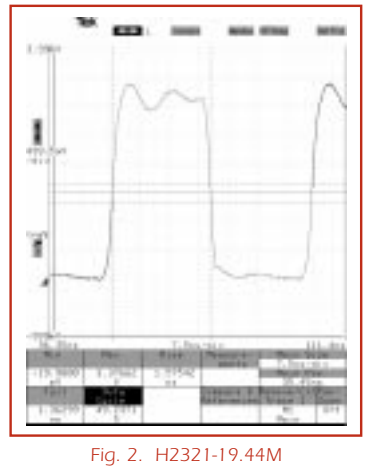

Fig. 2. H2321-19.44M with 33 pf load

HOW TO ORDER

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

M 2331-16.364M G

- "M" is full size DIL, "H" is half size DIL, "L" is low height, full size DIL
- "2331" is model type
- "16.364 M" frequency in MHz
- Add "G" for gullwing

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