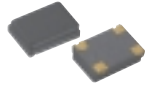




VOLTAGE CONTROLLED CRYSTAL OSCILLATORS HCMOS/TTL 5V

SURFACE MOUNT

T2002, T2006
T2021, T2022,
T2024
T2031, T2032
T2034



5 x 7 mm Surface Mount

Commercial: 0° to 70°C

3 MHz to 45 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

- Guaranteed Capture Range of ± 75 ppm or ± 100 ppm, depending on model
- Excellent incremental 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

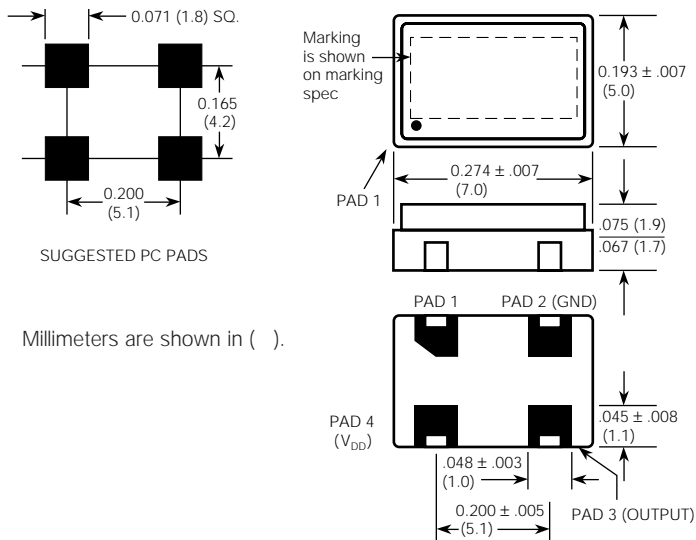
- Phase locked loops and data acquisition projects, including:
 - xDSL customer premise equipment
 - Cable modems
 - ATM/SONET/SDH

Description

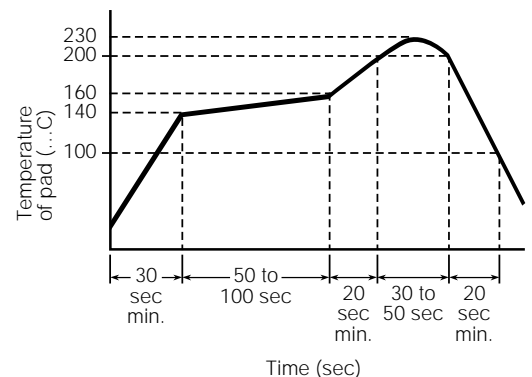
These SMD VCXOs generate a 5 volt HCMOS/TTL frequency output which is controlled ("pulled") by an input voltage. MF Electronics' VCXO specification defines not only the end-point frequency/voltage parameters, but also the center voltage at which the nominal frequency is achieved.

CONNECTIONS

T Package	
Pad 1.	Control Voltage
Pad 2.	Ground
Pad 3.	Output
Pad 4.	+5V, V_{DD}



"T" Package



Recommended Reflow Soldering Profile





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Center Frequency is Between Two Voltages with ±50 ppm stability

MODEL	Letter ID	Control Voltage (Volts)	Guaranteed Frequency Deviation (ppm)	Control Capture Range (ppm)	Center Voltage at Center Frequency	Frequency Stability (ppm)
T2002	VA	0.3 to 4.0	± 75 min	± 75	1.3 to 2.3	50, max
T2006	VB	0 to 5.0	± 100 min	± 100	-	

Center Frequency is at 2.5V with ±50 ppm stability

MODEL	Letter ID	Control Voltage (Volts)	Guaranteed Frequency Deviation (ppm)	Control Capture Range (ppm)	Center Frequency Voltage (Volts)	Frequency Stability (ppm)
T2021	VC	0.5 to 4.5	± 75 to 150	± 75	2.5	± 30 typ ± 50, max
T2022	VD	0.5 to 4.5	± 100 to 200	± 100	2.5	
T2024	VE	0 to 5.0	± 100 to 250	± 100	2.5	

Center Frequency is at 2.5V with ±25 ppm stability

MODEL	Letter ID	Guaranteed Control Voltage (Volts)	Control Frequency Deviation (ppm)	Center Capture Range (ppm)	Frequency Voltage (Volts)	Frequency Stability (ppm)
T2031	VF	0.5 to 4.5	± 75 to 150	± 75	2.5	± 20 typ ± 25, max
T2032	VG	0.5 to 4.5	± 100 to 200	± 100	2.5	
T2034	VH	0 to 5.0	± 100 to 250	± 100	2.5	

DESCRIPTIONS

T2002	±75 ppm, min. deviation when using 0 to 4.0V control-voltage
T2006	±100 ppm, min. deviation when using 0 to 5.0V rail-to-rail control-voltage
T2021	±75 ppm capture when using using 0.5 to 4.5V control-voltage and 2.5V center with ±50 ppm stability
T2022	±100 ppm capture when using using 0.5 to 4.5V control-voltage and 2.5V center with ±50 ppm stability
T2024	±100 ppm capture when using using 0 to 5.0V control-voltage and 2.5V center with ±50 ppm stability
T2031	±75 ppm capture when using using 0.5 to 4.5V control-voltage and 2.5V center with ±25 ppm stability
T2032	±100 ppm capture when using using 0.5 to 4.5V control-voltage and 2.5V center with ±25 ppm stability
T2034	±100 ppm capture when using using 0 to 5.0V 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 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.

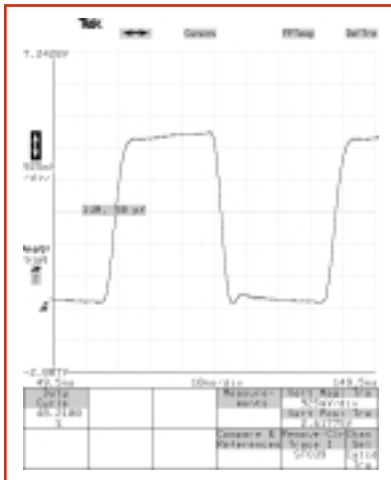


Fig. 1 T2002-14M, with 50 pf load

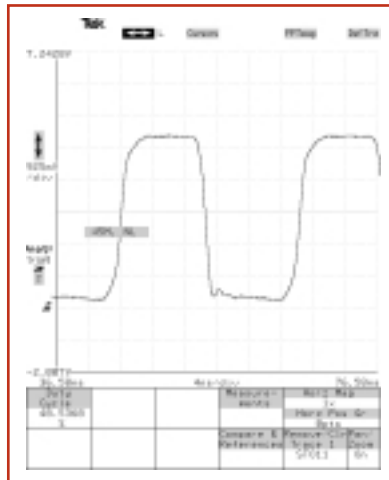


Fig. 2 T2042-45 M, without load

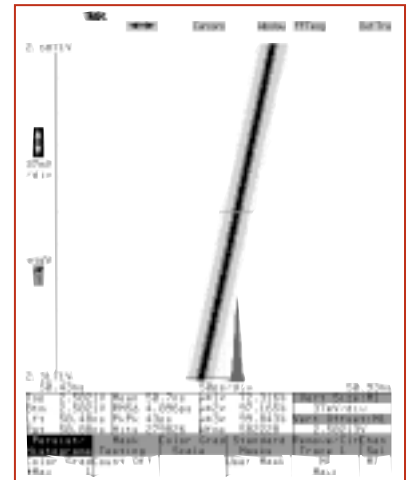


Fig. 3 T2032-20.48M





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ELECTRICAL SPECIFICATIONS

Frequency Range 3 MHz to 45 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	4.5	5.0	5.5	volts
Input Current,				
3M to 8M				
5.5 V _{DD} @ 15 pf			12	mA
5.5 V _{DD} @ 50 pf			14	mA
8M to 20M				
5.5 V _{DD} @ 15 pf			18	mA
5.5 V _{DD} @ 50 pf			22	mA
20M to 45M				
5.5 V _{DD} @ 15 pf			26	mA
5.5 V _{DD} @ 50 pf			30	mA

Output Levels

"0" Level, sinking 16 mA. 0.4 volts
"1" Level, sourcing 10 mA. V_{DD} - .4 volts

Rise and Fall Times, HCMOS

HCMOS, from 20 to 80%, 15 pf 2.5 ns
HCMOS, from 20 to 80%, 50 pf 5.0 ns

Symmetry

10 TTL, @ 1.4 V, (TTL) 45/55 percent
NL to 30 pf (HCMOS) 45/55 percent
NL to 50 pf (HCMOS) > 30 MHz 40/60 percent

Aging

First year 3 ppm
After first year 1 ppm/yr

Input Impedance,

Pad 1., Control Voltage 100 1000 Kohms

Control Voltage Bandwidth

15 75 KHz

ENVIRONMENTAL SPECIFICATIONS

Temperature

Operating 0° to 70°C
Storage -55° 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 5 X 10⁻⁸ atoms, cc/sec of helium

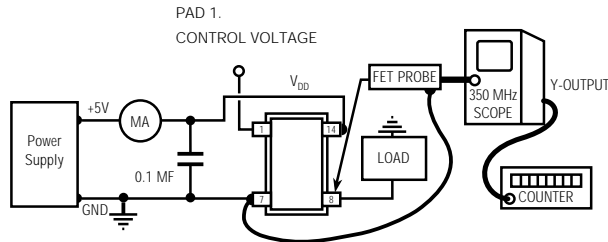
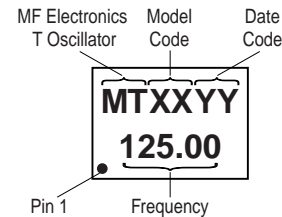
Pads – 60 microinch of gold over nickel

Marking – Print is permanent

Resistance to Solvents – MIL STD 202, Method 215

MARKING SPECIFICATION

The format for the marking is:



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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DEVIATION vs CONTROL VOLTAGE
FOR T2034-20M, TYPICAL

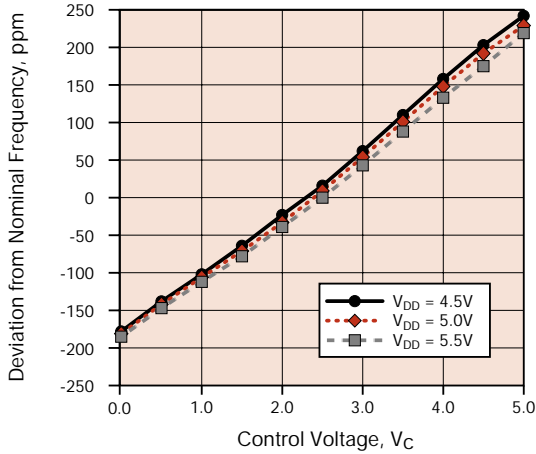


Fig. 4 Deviation vs. Control Voltage at 0°C

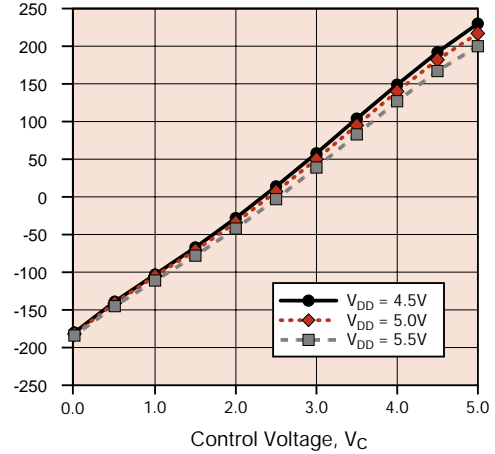


Fig. 5 Deviation vs. Control Voltage at 25°C

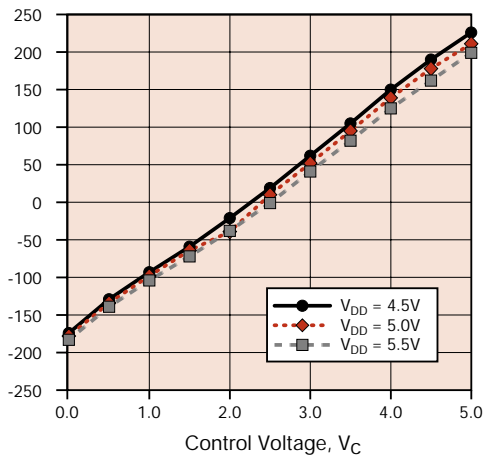


Fig. 6 Deviation vs. Control Voltage at 70°C

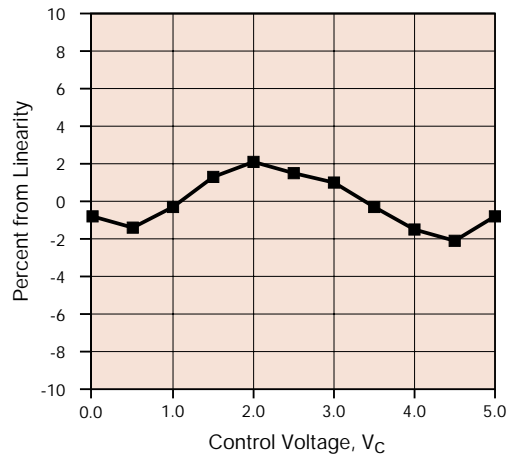


Fig. 7 Departure from Linearity





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TYPICAL PERFORMANCE

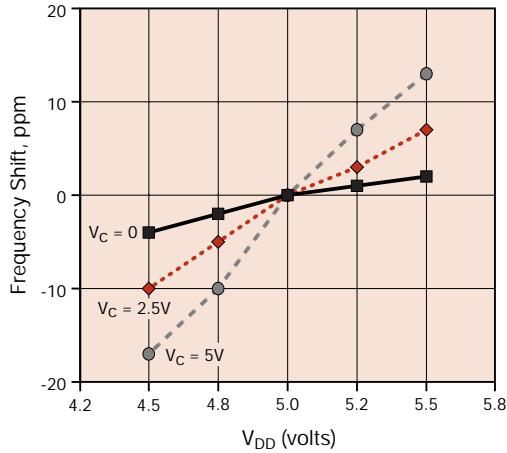


Fig. 8 Frequency Shift due to V_{DD} at 25°C

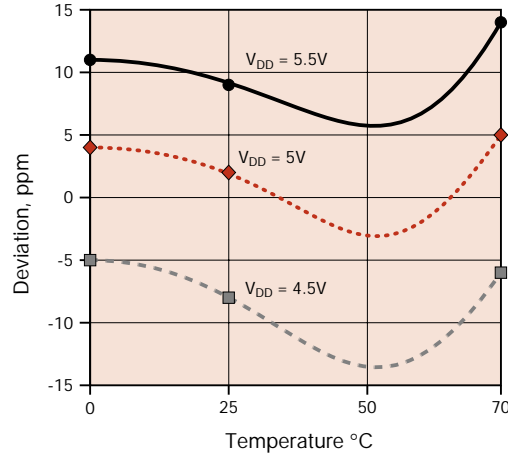


Fig. 9 Frequency Shift vs. Temperature

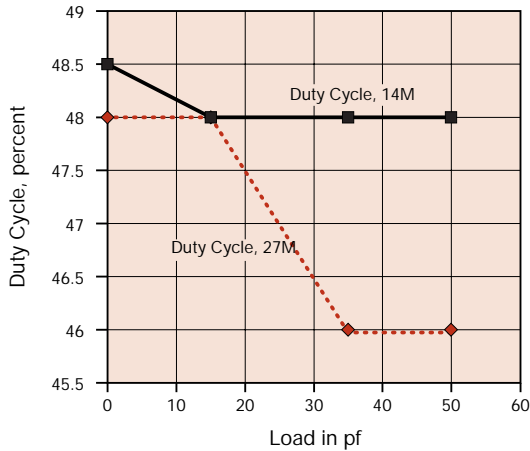


Fig. 10 Duty Cycle vs. Load
14 MHz & 27 MHz

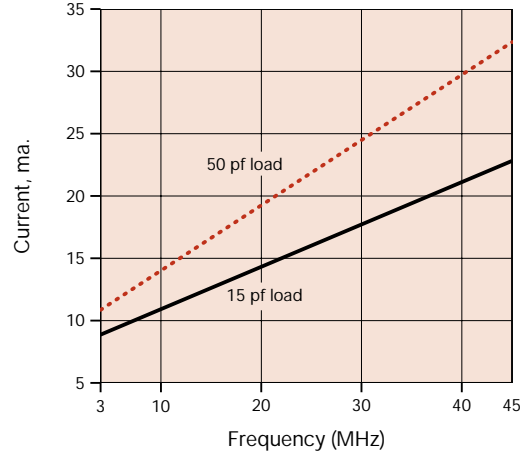


Fig. 11 Current vs. Center Frequency

HOW TO ORDER

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

T 2031-12.352M

"T" is SMD
"T" package

"2031"
is model
type

"12.352 M"
frequency
in MHz

SS#	Rev.
T2002	A



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