

**VECTRON
INTERNATIONAL**

A **DOVER** COMPANY

EX-380/385 Series 4 Pin DIP Evacuated Miniature Crystal Oscillator EMXO™



Features

- Supply Voltage: 3.3 Vdc or 5 Vdc
- Aging: $<1 \times 10^{-9}$ /day, $<1 \times 10^{-7}$ /year (@ 10 MHz)
- Temperature Stability: to $\pm 7.5 \times 10^{-8}$ over -20°C to $+70^{\circ}\text{C}$
- Acceleration Sensitivity: 1×10^{-9} /g, Total Gamma
- Uses SC Family 3rd Overtone Crystal
- Low Power Consumption: <0.35 watts @ $+25^{\circ}\text{C}$
- Frequencies: 10 to 80 MHz
- Fast Warm-up: 1 to 2 minutes
- Patented Technique*

Applications

- SONET/SDH, DWDM, FDM, ATM, 3G
- Telecom Transmission and Switching Equipment
- Wireless Communication Equipment
- Military Airborne and Mobile systems

Description

Model EX-380 is a low profile 4 Pin DIP Evacuated Miniature, Oven Controlled Crystal Oscillator (EMXO) available in frequencies from 10 MHz to 80 MHz.

The EX-380 provides exceptionally low aging rates and tight temperature stabilities in an extremely small package over a wide range of environmental conditions. The through hole unit measures only 20.8mm x 13.2mm x 7.6mm (0.82" x 0.52" x 0.30"). At 10 MHz provides aging rates of $<1 \times 10^{-9}$ /day average, $<1 \times 10^{-7}$ for the first year and $<1 \times 10^{-6}$ for 10 years with temperature stabilities to $\pm 1 \times 10^{-7}$ over -40°C to $+85^{\circ}\text{C}$. Wider temperature ranges are available, i.e. -55°C to $+85^{\circ}\text{C}$. This is achieved by the application of new resonator design concepts and technological breakthroughs. This EMXO series bridges the gap between current large, high precision OCXO's and smaller TCXO'S. The EX-380 Series becomes the most economical choice where there is a need for spectral purity, short and long term stability, along with small size and dramatically reduced power consumption.

Standard supply voltages for the EX-380 series are 3.3 Vdc and 5 Vdc, all with an HCMOS output. A surface mount version of this oscillator is available (EX-385). Sinewave output is available in the surface mount version.

Notes: 1. We acknowledge the support of the U.S. Army for work on resonators associated with this product under contract #1 X66001 - 97-C-8635.

*U.S. Patent 5,917,272.

EX-380/385 Evacuated Miniature Oven Controlled Crystal Oscillator

Performance Characteristics for frequencies in the range 10 to 20.48 MHz

Parameter	Characteristics												
Available Frequencies	10 to 20.48 MHz (See Page 6 for specific Freq's)												
Size	See page 4 for outline Drawings and Dimensions												
Supply Voltage	5.0 Vdc \pm 5% 3.3 Vdc \pm 5% (12 Vdc is available, consult factory)												
Supply Current (Steady State)	< 70 mA @ +25°C and 5 Vdc <120 mA @ -40°C and 5 Vdc												
Turn-on current	300 mA, maximum @ 5.0 Vdc (250 mA typical)												
Output Type	HCMOS (Sinewave available with EX-385, consult factory)												
Level "0" and "1"	<0.4 Volts, >0.9 Vdd												
Symmetry (at 50% Vdd)	50/50 \pm 10%												
Rise/Fall Time (10-90%)	<7 ns												
Stability vs. Temperature	<p>D-758 = \pm0.075 ppm over -20°C to +70°C D-ST3 = Stratum 3 over -20°C to +70°C F-ST3 = Stratum 3 over -40°C to +85°C F-107 = \pm0.1 ppm over -40°C to +85°C x-ST3 = Stratum 3 Holdover stability per GR-1244-CORE Table 3-1 as described in Sections 5.2 and 9.1</p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>NOTE: Tighter stabilities and wider temperature ranges are available, please consult the factory.</p> </div>												
Aging (10 MHz Typical)	<1 x 10 ⁻⁹ /day average, <1 x 10 ⁻⁷ first year, <1 x 10 ⁻⁶ /10 years												
Short Term Stability (Allan Deviation)	<5 x 10 ⁻¹⁰ , 0.1 seconds to 10 seconds												
Phase noise (typical at 10 MHz, Static Condition)	<table border="0"> <thead> <tr> <th>Offset</th> <th>Phase Noise</th> </tr> </thead> <tbody> <tr> <td>10 Hz</td> <td>-100 dBc/Hz</td> </tr> <tr> <td>100 Hz</td> <td>-130 dBc/Hz</td> </tr> <tr> <td>1 kHz</td> <td>-140 dBc/Hz</td> </tr> <tr> <td>10 kHz</td> <td>-145 dBc/Hz</td> </tr> <tr> <td>100 kHz</td> <td>-150 dBc/Hz</td> </tr> </tbody> </table>	Offset	Phase Noise	10 Hz	-100 dBc/Hz	100 Hz	-130 dBc/Hz	1 kHz	-140 dBc/Hz	10 kHz	-145 dBc/Hz	100 kHz	-150 dBc/Hz
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Frequency vs. Supply	<2.5 x 10 ⁻⁹ per percent change												
Warm-up (Restabilization) (frequency relative to that 1 hour after turn-on, following 24 hours off time, at +25°C)	<table border="0"> <thead> <tr> <th></th> <th>Standard</th> <th>Optional (consult factory)</th> </tr> </thead> <tbody> <tr> <td>< \pm1 x 10⁻⁶</td> <td>60 seconds</td> <td>45 seconds</td> </tr> <tr> <td>< \pm1 x 10⁻⁷</td> <td>120 seconds</td> <td>90 seconds</td> </tr> </tbody> </table>		Standard	Optional (consult factory)	< \pm 1 x 10 ⁻⁶	60 seconds	45 seconds	< \pm 1 x 10 ⁻⁷	120 seconds	90 seconds			
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Electrical Frequency Adjust	A: \pm 1 ppm range with 0 to Vdd input voltage												
Initial Accuracy for Fixed Frequency	F: \pm 2 ppm @ +25°C												
Acceleration Sensitivity (10 MHz)	1 x 10 ⁻⁹ /g Total Gamma, standard (5 x 10 ⁻¹⁰ /g available at 10 MHz consult factory)												

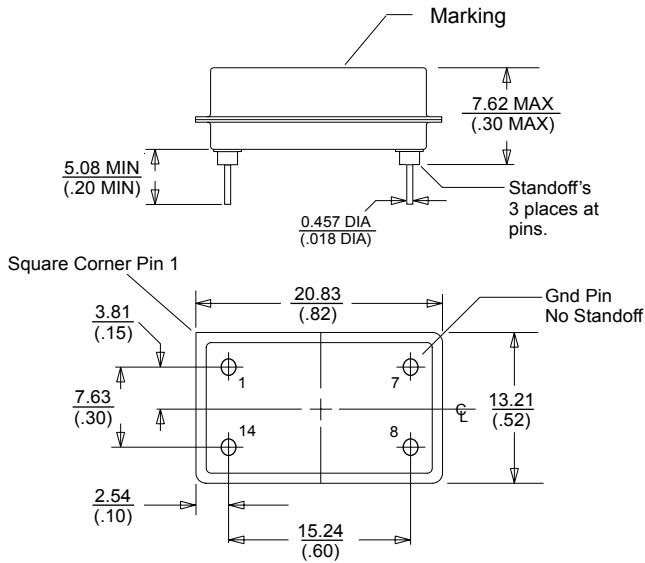
EX-380/385 Evacuated Miniature Oven Controlled Crystal Oscillator

Performance Characteristics for frequencies in the range 20.5 to 80 MHz

Parameter	Characteristics												
Available Frequencies	20.5 to 80 MHz (See Page 6 for specific Freq's)												
Size	See page 4 for outline Drawings and Dimensions												
Supply Voltage	5.0 Vdc \pm 5% 3.3 Vdc \pm 5%												
Supply Current (Steady State)	< 70 mA @ +25°C and 5 Vdc <120 mA @ -40°C and 5 Vdc												
Turn-on current	300 mA, maximum @ 5.0 Vdc (250 mA typical)												
Output Type	HCMOS (Sinewave available with EX-385, consult factory)												
Level "0" and "1"	<0.4 Volts, >0.9 Vdd												
Symmetry (at 50% Vdd)	50/50 \pm 10%												
Rise/Fall Time (10-90%)	<5 ns												
Stability vs. Temperature	D-ST3 = Stratum 3 over -20°C to +70°C F-ST3 = Stratum 3 over -40°C to +85°C x-ST3 = Stratum 3 Holdover stability per GR-1244-CORE Table 3-1 as described in Sections 5.2 and 9.1												
NOTE: Tighter stabilities and wider temperature ranges are available, please consult the factory.													
Aging (77.76 MHz Typical)	<3 x 10 ⁻⁹ /day average, <3 x 10 ⁻⁷ first year, <3 x 10 ⁻⁶ /10 years												
Short Term Stability (Allan Deviation)	<5 x 10 ⁻¹⁰ , 0.1 seconds to 10 seconds												
Phase noise (typical at 77.76 MHz, Static Condition)	<table border="1"> <thead> <tr> <th>Offset</th> <th>Phase Noise</th> </tr> </thead> <tbody> <tr> <td>10 Hz</td> <td>-80 dBc/Hz</td> </tr> <tr> <td>100 Hz</td> <td>-110 dBc/Hz</td> </tr> <tr> <td>1 kHz</td> <td>-130 dBc/Hz</td> </tr> <tr> <td>10 kHz</td> <td>-135 dBc/Hz</td> </tr> <tr> <td>100 kHz</td> <td>-140 dBc/Hz</td> </tr> </tbody> </table>	Offset	Phase Noise	10 Hz	-80 dBc/Hz	100 Hz	-110 dBc/Hz	1 kHz	-130 dBc/Hz	10 kHz	-135 dBc/Hz	100 kHz	-140 dBc/Hz
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Frequency vs. Supply	<2.5 x 10 ⁻⁹ per percent change												
Warm-up (Restabilization) (frequency relative to that 1 hour after turn-on, following 24 hours off time, at +25°C)	<table border="1"> <thead> <tr> <th></th> <th>Standard</th> <th>Optional (consult factory)</th> </tr> </thead> <tbody> <tr> <td>< \pm1 x 10⁻⁶</td> <td>60 seconds</td> <td>45 seconds</td> </tr> <tr> <td>< \pm1 x 10⁻⁷</td> <td>120 seconds</td> <td>90 seconds</td> </tr> </tbody> </table>		Standard	Optional (consult factory)	< \pm 1 x 10 ⁻⁶	60 seconds	45 seconds	< \pm 1 x 10 ⁻⁷	120 seconds	90 seconds			
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Electrical Frequency Adjust	A: Consult factory												
Initial Accuracy for Fixed Frequency	F: Consult factory												
Acceleration Sensitivity (77.76 MHz)	1 x 10 ⁻⁹ /g Total Gamma, typical												

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Outline Drawing

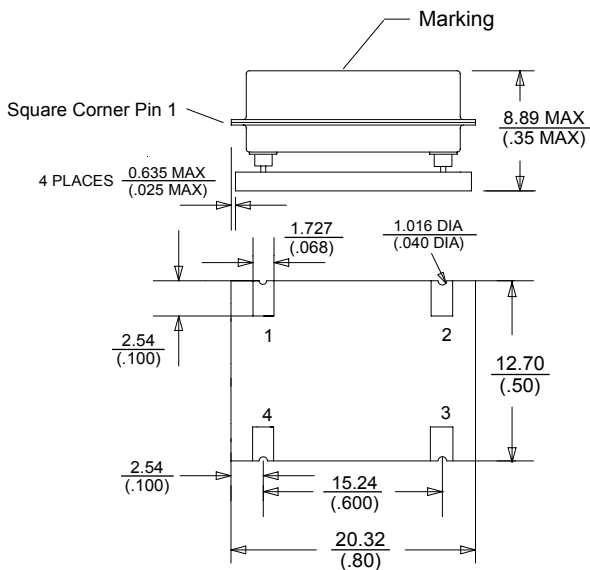


$\frac{\text{mm}}{\text{(in.)}}$

380 Package

Pin	Function
1	Frequency Adjust
7	GND, Case
8	Output
14	Supply

Pin Numbers are for reference only, they do not appear on unit



$\frac{\text{mm}}{\text{(in.)}}$

385 Package

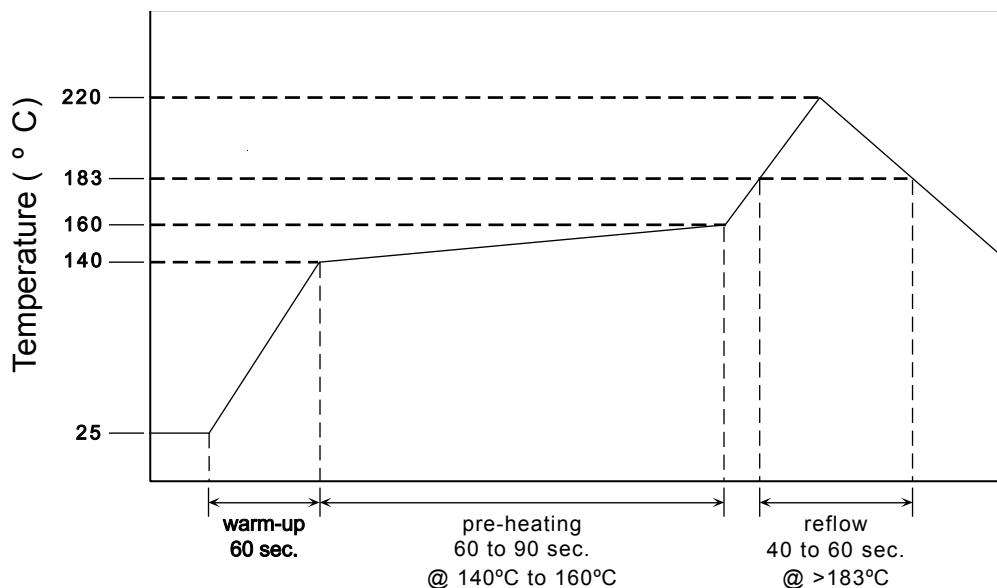
Pin	Function
1	Frequency Adjust
2	GND, Case
3	Output
4	Supply

Pin Numbers are for reference only, they do not appear on unit

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Recommended Reflow Profile

Convection Reflow Profile



Note: EMXO's are precision subsystems with tolerances measured to ± 0.001 ppm. The EX-385 series has been designed for pick and place reflow soldering. The suggested reflow profile is shown above. The EX-385 may be reflowed one time in the non-inverted state. VI recommends waiting at least two hours after reflow before measuring the unit.

Handling Precautions

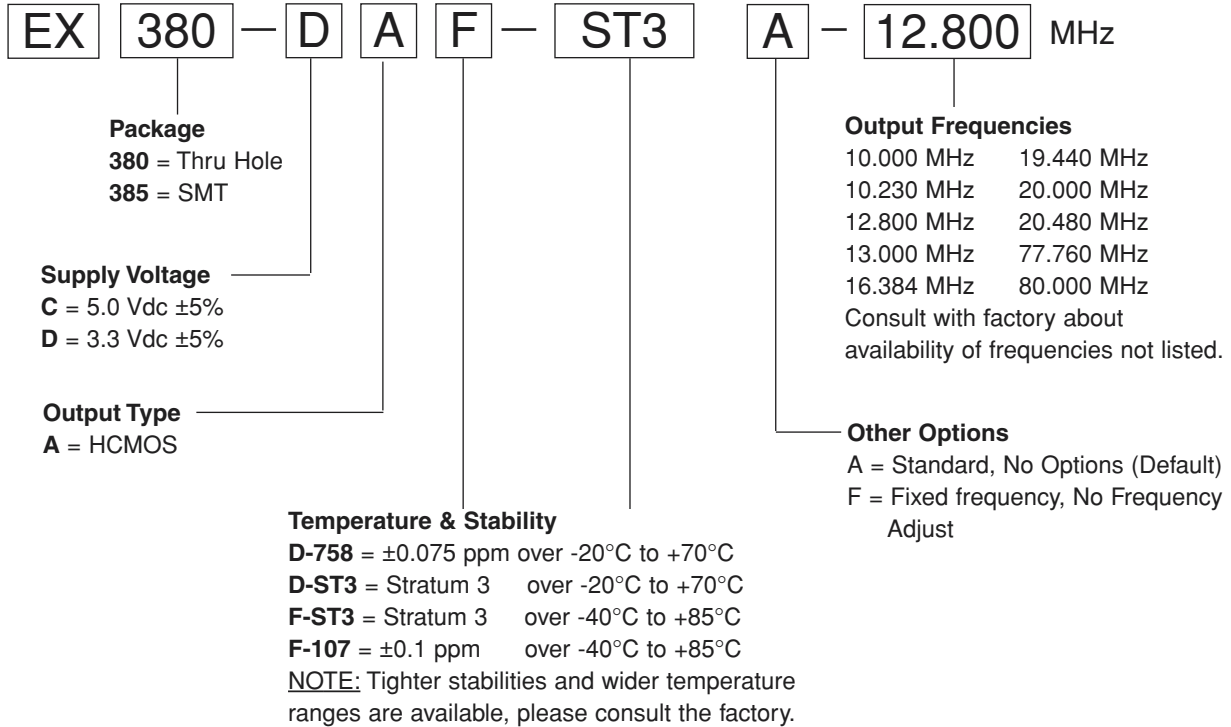
Although protection circuitry has been designed into this device, proper precautions should be taken to avoid exposure to electrostatic discharge (ESD) during handling and mounting. VI employs a human-body model (HBM) and a charged-device model (CDM) for ESD-susceptibility testing and protection design evaluation. ESD voltage thresholds are dependent on the

circuit parameters used to define the mode. Although no industry-wide standard has been adopted for the CDM, a standard HBM (resistance = 1500 ohms, capacitance = 100pf) is widely used and therefore can be used for comparison purposes. The HBM ESD threshold presented here was obtained by using these circuit parameters.

ESD Threshold Voltage		
Model	Threshold	Unit
Human-Body (HBM)	500	V min
Charged-Device	500	V min

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Ordering Information



Visit our website at www.vectron.com

For additional information please contact:



www.vectron.com

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