VECTRON INTERNATIONAL
A DOVER COMPANY

Product Data Sheet

EX-380 Series

4 Pin DIP & SMD Evacuated Miniature Crystal Oscillator
EMXO™

Features

- **Supply Voltage: 3.3 Vdc or 5 Vdc**
- **Aging: <1x10^{-9} /day, <1x10^{-7} /year (@ 10 MHz)**
- **Temperature Stability: to ±7.5x10^{-8} over -20°C to +70°C**
- **Acceleration Sensitivity: 1 x10^{-9}/g, Total Gamma**
- **Uses SC Family 3rd Overtone Crystal**
- **Low Power Consumption: <0.35 watts @ +25°C**
- **Frequencies: 10 to 80 MHz for HCMOS or Sinewave outputs**
- **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

The model EX-380 Series is a low profile DIP or SMD, Evacuated Miniature Oven Controlled Crystal Oscillator (EMXO), available in frequencies from 10 MHz to 80 MHz.

The EX-380 Series provides exceptionally low aging rates and high 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"), @ 10 MHz provides aging rates of <1x10-9/day average, <1x10^{-7} for the first year and <1x10^{-6} for 10 years with temperature stabilities to ±1x10^{-7} over -40°C to +85°C. Wider temperature ranges are available from -55°C to +85°C. This is achieved by the application of new resonator design concepts and technological breakthroughs. This series of EMXO's 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 5Vdc, with HCMOS or Sinewave output options. A surface mount version of this oscillator is available (EX-381/5). Sinewave output is only available in the surface mount, EX-381, 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 Evacuated Miniature Oven Controlled Crystal Oscillator

Performance Characteristics for frequencies in the range 10 to 20.48 MHz

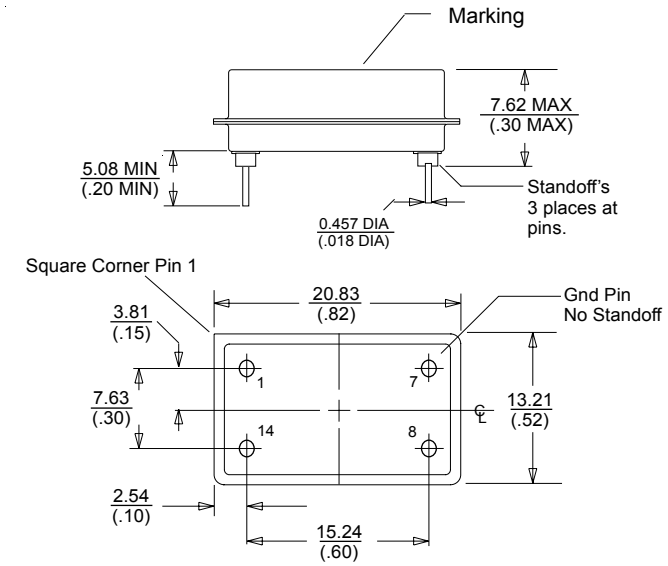
Parameter	Characteristics
Available Frequencies	10 to 20.48 MHz (See Page 6 for specific Freq's)
Size	See page 4 for outline Drawings and Dimensions
Supply Voltage	**(C)** 5.0 Vdc ±5% (**D**) 3.3 Vdc ±5%
Supply Current (Steady State)	< 70 mA @ +25°C and 5 Vdc , <90 mA @+25C and 3.3Vdc <120 mA @ -40°C and 5 Vdc, <150 mA @-40C and 3.3Vdc
Turn-on current	300 mA maximum @ 5.0 Vdc , 450 mA maximum @ 3.3V
Output Type	**(A)** HCM0S, **(G or H)** Sinewave into 50 ohms
Levels	**(A)** <0.4 Volts, >0.9 Vdd, **(G)** 0 dBm, **(H)** +3 dBm
Symmetry (at 50% Vdd)	**(A)** 50/50 ±10%
Rise/Fall Time (10%-90%)	**(A)** <7 ns
Stability vs. Temperature **NOTE:** Tighter stabilities and wider temperature ranges are available, please consult the factory.	**D-107** = ±0.1 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** = ±0.1 ppm over -40°C to +85°C **x-ST3** = Stratum 3 Holdover stability per GR-1244-CORE 280 ppm pk-pk over temperature, < 40 ppb drift.
Aging (10 MHz Typical)	<1 x 10^{-9}/day average, <1 x 10^{-7} / year, <1 x 10^{-6} /10 years
Short -Term Stability (Allan Deviation)	<5 x 10^{-10}, 0.1 seconds to 10 seconds
Phase Noise (Static Conditions)	Offset — PhaseNoise 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
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)	Standard / Optional (consult factory) < ±1 x 10^{-6} — 60 seconds / 45 seconds < ±1 x 10^{-7} — 120 seconds / 90 seconds
Electrical Frequency Adjust	**A:** >±1 ppm range with 0 to Vdd input voltage
Initial Accuracy for Fixed Frequency	**F:** ±1 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)

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	**(C)** 5.0 Vdc ±5% **(D)** 3.3 Vdc ±5%
Supply Current (Steady State)	< 70 mA @ +25°C and 5 Vdc, <90 mA @+25C and 3.3Vdc <120 mA @ -40°C and 5 Vdc, <150 mA @-40C and 3.3Vdc
Turn-on current	300 mA maximum @ 5.0 Vdc, 450 mA maximum @ 3.3V
Output Type	**(A)** HCM0S, **(G or H)** Sinewave into 50 ohms
Levels	**(A)**<0.4 Volts, >0.9 Vdd **(G)** 0 dBm, **(H)** +3 dBm
Symmetry (at 50% Vdd)	**(A)** 50/50 ±10%
Rise/Fall Time (10-90%)	**(A)** <5 ns
Stability vs. Temperature **NOTE:** Tighter stabilities and wider temperature ranges are available, please consult the factory.	**D-ST3** = Stratum 3 over -20°C to +70°C **D-107** = ±0.1 ppm over -20°C to +70°C (< 50 MHz) **F-507** = ±0.5 ppm over -40°C to +85°C **F-147** = ±0.14 ppm over -40°C to +85°C (<50 MHz) x-ST3 = Stratum 3 Holdover stability per GR-1244-CORE. 280 ppm pk-pk over temperature, <40 ppb drift.
Aging (38.88 MHz Typical)	<3 x 10^{-9}/day average, <3 x 10^{-7}/ year, <3 x 10^{-6} /10 years
Short Term Stability (Allan Deviation)	<5 x 10^{-10}, 0.1 seconds to 10 seconds
Phase Noise (Static Conditions)	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
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)	Standard / Optional (consult factory) < ±1 x 10^{-6} — 60 seconds / 45 seconds < ±1 x 10^{-7} — 120 seconds / 90 seconds
Electrical Frequency Adjust	**A:** >±3 ppm range with 0 to Vdd input voltage
Initial Accuracy for Fixed Frequency	**F:** ±1.5 ppm @ +25°C
Acceleration Sensitivity	1 x 10^{-9}/g Total Gamma, standard

EX-380 Evacuated Miniature Oven Controlled Crystal Oscillator

Outline Drawing

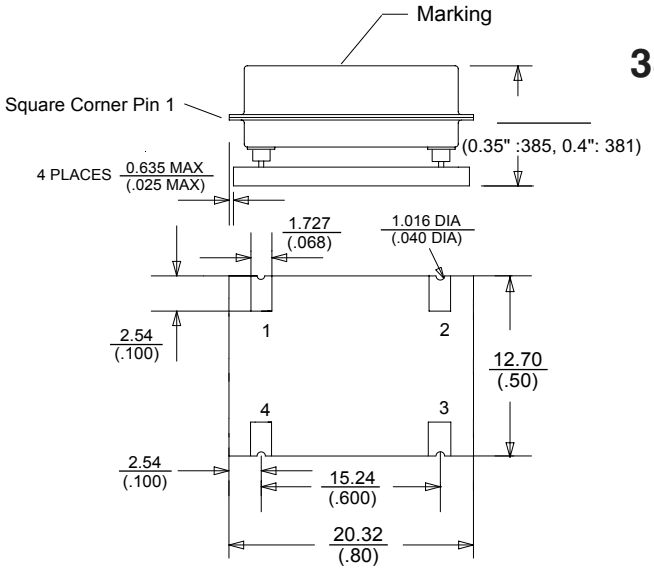


mm
(in.)

380 Package

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

Pin Numbers do not appear on the unit.
* Pin 1 is the Oven Alarm with option G.



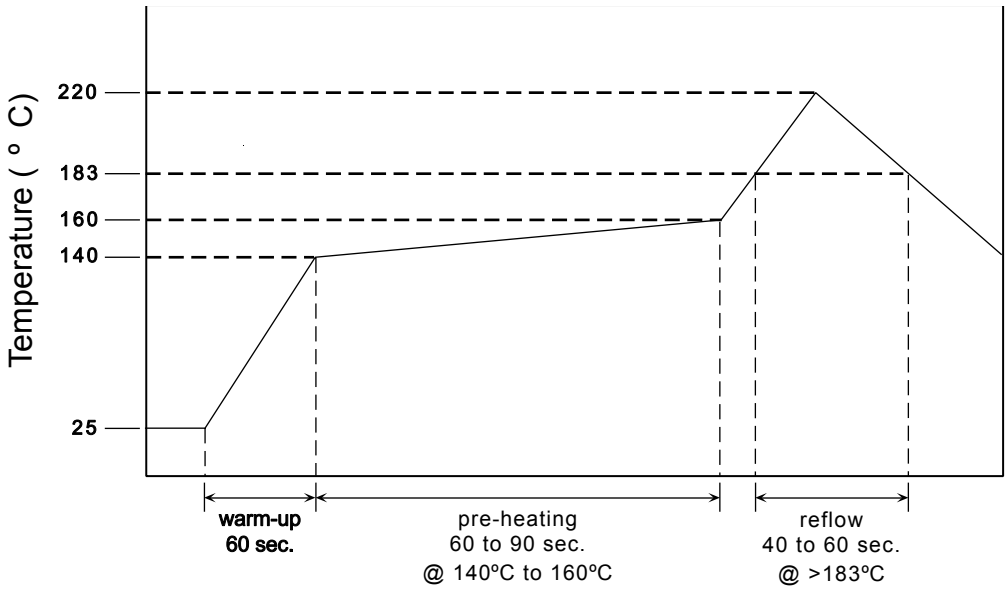
mm
(in.)

381(ht= 0.4") ,385 (ht=0.35") Package

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

Pin Numbers do not appear on the unit.
* Pin 1 is the Oven Alarm with option G.

Recommended Reflow Profile



Note: EMXO's are precision subsystems with tolerances measured to ±0.001 ppm. The EX-381/5 series has been designed for pick and place reflow soldering. The suggested reflow profile is shown above. The EX-381/5 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

EX-380 Evacuated Miniature Oven Controlled Crystal Oscillator

Ordering Information

EX 380 — D A F — ST3 — A — 12.800 MHz

Package
380 = Thru Hole
381,385 = SMD

Supply Voltage
C: +5 Vdc ± 5%
D: +3.3Vdc ± 5%

Output Type
A = HCMOS,**G***=0 dBm, **H***=+3 dBm/ 50 ohms (*=381 only)

Temperature & Stability
D-107 = ±0.1 ppm over -20°C to +70°C (<50 MHz)
D-ST3 = Stratum 3 over -20°C to +70°C
F-507 = ±0.5 ppm over -40°C to +85°C
F-147 = ±0.14 ppm over -40°C to +85°C (<50 MHz)
NOTE: Tighter stabilities and wider temperature ranges are available, please consult the factory.

Other Options
A = Standard, No Options (Default)
F = Fixed Frequency, No Frequency Adjust
G= Fixed Frequency Option & Oven Alarm Option.

Note: Oven Alarm (into 10k ohm load):
Normal: > 0.8Vdd , Error: <0.1Vdd
Oven alarm is not available when EFC is specified.

Output Frequencies

10.000 MHz	19.440 MHz	77.760 MHz
10.230 MHz	20.000 MHz	80.000 MHz
12.800 MHz	20.480 MHz	
13.000 MHz	38.880 MHz	
16.384 MHz	40.000 MHz	

Consult with Factory about availability of frequencies not listed.

Visit our website at www.vectron.com

For additional information please contact:

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