VECTRON INTERNATIONAL
A DOVER COMPANY

EX-400

Evacuated Miniature Crystal Oscillator

Description

The EX-400 provides exceptionally low aging rates and tight temperature stabilities in an extremely small package over a wide range of environmental conditions. This EMXO series bridges the gap between current large, high precision OCXO's and smaller TCXO's. The EX-400 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.

Features

- 4-Pin Dip
- Uses Doubly Rotated Crystal
- Low Power Consumption: <0.35 watts @ +25°C
- Previous Model Number: EX-380, EX-381, EX-385 series
- Frequency Range: 10 MHz - 80 MHz

Applications

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

Performance Specifications

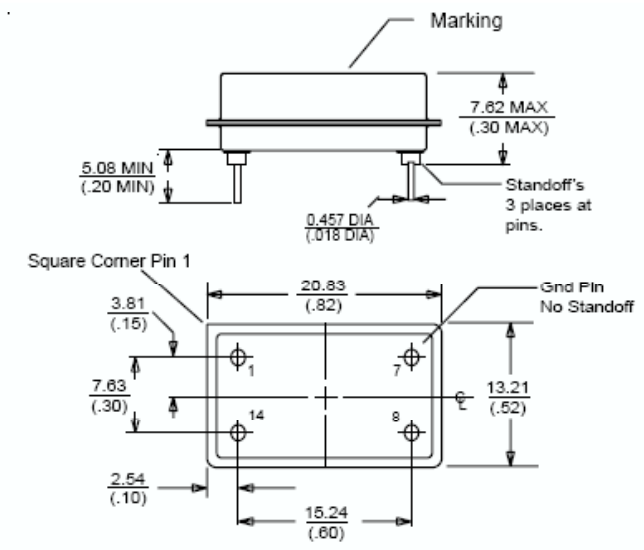
Frequency Stabilities[1]					
Parameter	Min	Typ	Max	Units	Condition
vs. operating temperature range (referenced to +25°C)	-75		+75	ppb	-20… +70°C (10 to 20.49 MHz)
	-100		+100	ppb	-20… +70°C (10 to 50 MHz)
	-100		+100	ppb	-40… +85°C (10 to 20.49 MHz)
	-150		+150	ppb	-20… +70°C
	-150		+150	ppb	-40… +85°C
	-150		+150	ppb	-55… +85°C (10 to 50 MHz)
	-250		+250	ppb	-20… +70°C
	-250		+250	ppb	-40… +85°C
	-250		+250	ppb	-55… +85°C
	-500		+500	ppb	-20… +70°C
	-500		+500	ppb	-40… +85°C
	-500		+500	ppb	-55… +85°C

Performance Specifications

Frequency Stabilities[1]						
Parameter		Min	Typ	Max	Units	Condition
vs. Stratum 3 per GR-1244-CORE	Operating Temp	-140		+140	ppb	-20… +70°C
		-140		+140	ppb	-40… +85°C (10 to 50 MHz)
	Holdover	-140		+140	ppb	-55… +85°C (10 to 20.49 MHz)
	Drift	-370		+370	ppb	24 hours
	MTIE	-4.63		+4.63	10-13/sec	Over 7100 seconds
				+1	ppm	0.16sec < Observe Times < 64 sec
Warm-up Time				1	minutes	to ± 1ppm of final frequency (1 hour)
				2	minutes	to ± 100ppb of final frequency (1 hour)
Initial Tolerance (10 to 19.9 MHz)		-1.0		+1.0	ppb	for fixed frequency
Initial Tolerance (20 to 80 MHz)		-1.5		+1.5	ppb	for fixed frequency
vs. supply voltage change (10 to 50 MHz)		-2.5		+2.5	ppb	VS ± 5%
vs. supply voltage change (50 to 80 MHz)		-5.0		+5.0	ppb	VS ± 5%
vs. load change (10 to 80 MHz)		-15		+15	ppb	Load ± 5%
vs. aging / day (10 to 14.9 MHz)		-1.0		+1.0	ppb	after 30 days of operation
vs. aging / day (15 to 19.9 MHz)		-2.0		+2.0	ppb	after 30 days of operation
vs. aging / day (20 to 49.9 MHz)		-3.0		+3.0	ppb	after 30 days of operation
vs. aging / day (50 to 80.0 MHz)		-4.0		+4.0	ppb	after 30 days of operation
vs. aging / 1 year (10 to 14.9 MHz)		-200		+200	ppb	after 30 days of operation
vs. aging / 1 year (15 to 19.9 MHz)		-300		+300	ppb	after 30 days of operation
vs. aging / 1 year (20 to 80 MHz)		-500		+500	ppb	after 30 days of operation
vs. aging / 10 year (10 to 14.9 MHz)		-1000		+1000	ppb	after 30 days of operation
vs. aging / 10 year (15 to 19.9 MHz)		-2000		+2000	ppb	after 30 days of operation
vs. aging / 10 year (20 to 80 MHz)		-3000		+3000	ppb	after 30 days of operation
Supply Voltage (Vs)						
Supply voltage (Standard)		4.75	5.0	5.25	VDC	
Supply voltage (Option)		3.135	3.3	3.465	VDC	
Power Consumption				1.5	Watts	during warm-up
				0.35	Watts	steady state @ +25°C (10 to 29.99 MHz)
				0.45	Watts	steady state @ +25°C (30 to 80 MHz)
				0.7	Watts	steady state @ -40°C (10 to 29.99 MHz)
				0.8	Watts	steady state @ -40°C (30 to 80 MHz)
RF Output						
Signal [Standard]		HCMOS				
Load			15		pF	
Signal Level (Vol)				0.4	VDC	
Signal Level (Voh)		0.8			VDC	
Rise/Fall Time				+5	ns	(10-80%)
Duty cycle		40		60	%	(Voh-Vol)/2
Signal [Option]		Sinewave				
Load			50		ohm	
Output Power [Standard]		0		+4	dBm	50 Ohm load
Output Power [Option]		+3		+7	dBm	50 Ohm load

Frequency Stabilities[1]					
Parameter	Min	Typ	Max	Units	Condition
Frequency Tuning (EFC)					
Tuning Range	Fixed OCXO; No adjust				
Tuning Range	±1.0 ±2.0 ±3.0 ±4.0		±5.0 ±8.0 ±10.0 ±12.0	ppm ppm ppm ppm	with 10 to 14.99 MHz with 15 to 20.48 MHz with 20.5 to 49.99 MHz with 50 to 80 MHz
Control Voltage Range	0		Vdd	VDC	
Tuning Slope	Positive				
Additional Parameters					
Phase Noise @ 20 MHz (Typical)			-100	dBc/Hz	10 Hz
			-130	dBc/Hz	100 Hz
			-140	dBc/Hz	1 KHz
			-145	dBc/Hz	10 KHz
			-150	dBc/Hz	10 KHz
Phase Noise @ 50 MHz (Typical)			-80	dBc/Hz	10 Hz
			-110	dBc/Hz	100 Hz
			-130	dBc/Hz	1 KHz
			-135	dBc/Hz	10 KHz
			-140	dBc/Hz	10 KHz
Allan Deviation			0.2	ppb	Tau = 1 sec to 10 sec (10 to 20.49 MHz)
			0.5	ppb	Tau = 1 sec to 10 sec (20.5 to 80 MHz)
Weight			5	g	
Absolute Maximum Ratings					
Supply Voltage			5.5	VDC	with Vs=5 V
			5.5	VDC	with Vs=3.3 V
Output Load			30	pF	
Operable temperature range	-55		+85	°C	
Storage temperature range	-55		+85	°C	

Outline Drawing / Enclosure

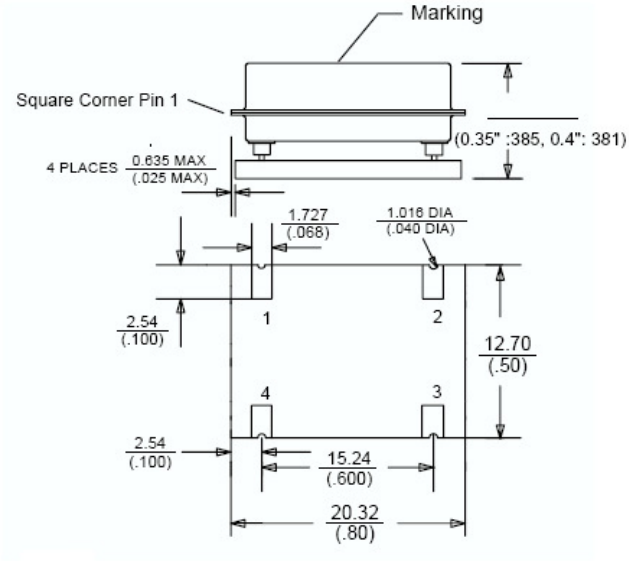


Dimensions in mm (inches)

Type A		
Code	Height "H"	Pin Length "L"
0	7.62	5.08

Pin Connections	
1	EFC \ No Connect \ Oven Monitor
7	Ground (Case)
8	RF Output
14	Supply Voltage Input

Outline Drawing / Enclosure

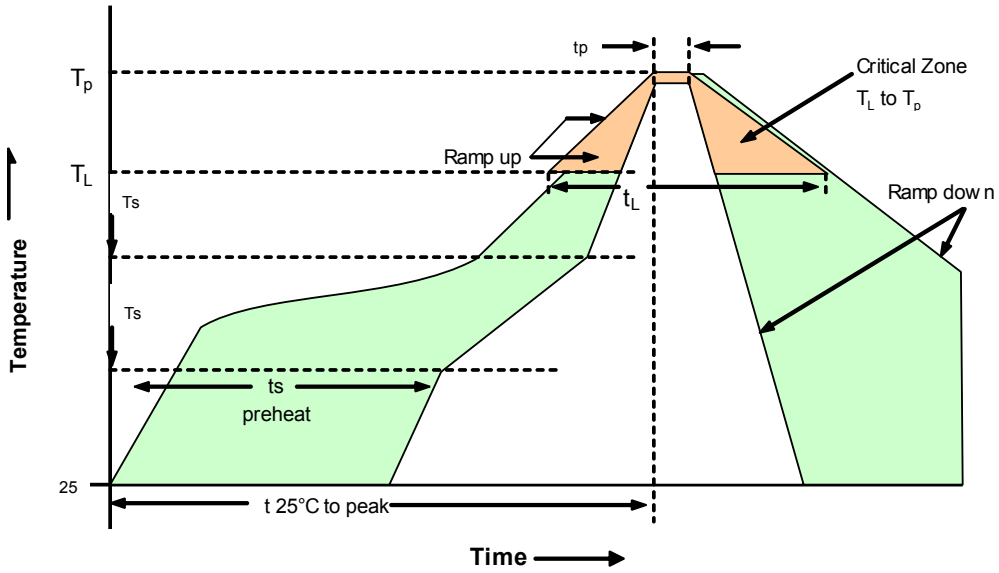


Dimensions in mm (inches)

Type B		
Code	Height "H"	Pin Length "L"
1	8.9 (0.35")	NA
2	10.2 (0.4")	NA

Pin Connections	
1	EFC \ No Connect \ Oven Monitor
7	Ground (Case)
8	RF Output
14	Supply Voltage Input

Recommended Reflow Profile



Profile Feature	Sn-Pb Assembly	Profile Feature	Sn-Pb Assembly
PRECAUTION: Series shall not expose to temperature higher than 230°C. If exposing to temperature higher than 230°C, stability and power consumption may permanently degrade.			
Average ramp-up rate (TL to Tp)	3°C/second max.	Time 25°C to Peak Temperature	4 minutes max.
Preheat -Temperature Min Tsmin) -Temperature Min Tsmax) -Time (min to max) (ts)	135°c 155°c 60-90 seconds	Time maintained above - Temperature (TL) - Time (tL)	 183°C 45-60 seconds
Tsmax to TL - Ramp-up Rate	3°C/second max.		
Time maintained above - Temperature (TL) - Time (tL)	 183°C 45-60 seconds	 Time within 5°C of actual Peak Temperature (tp)	 10-20 seconds max.
Peak Temperature (Tp)	max 220°C	Ramp-down Rate	6°C/second max.
Note: All temperatures refer to topside of the package, measured on the package body surface.			

Ordering Information

EX - 400 0 - D A J - 107 0 - 10M0000000

Product Family
EX: EMXO

Package
13x20mm

Height
0: A 7.62mm (HCMOS only)
1: B 8.9mm (HCMOS only)
2: B 10.2mm (Sinewave only)

Supply Voltage
D: +5V
E: +3.3V

RF Output Code
A: HCMOS
E: Sinewave

Temperature Range
A: -55°C to +85°C
E: -40°C to +85°C
J: -20°C to +70°C

Stability Code
758: ±75ppb
107: ±100ppb
157: ±150ppb
257: ±250ppb
507: ±500ppb
147: ±140ppb(ST3)

Frequency Control
0: Fixed Frequency (HCMOS)
1: Fixed Frequency (0 dBm)
2: Fixed Frequency (+3 dBm)
3: Electrical Tuning (HCMOS)
4: Electrical Tuning (0 dBm)
5: Electrical Tuning (+3 dBm)
6: Oven Alarm Option (HCMOS)
7: Oven Alarm Option (0 dBm)
8: Oven Alarm Option (+3 dBm)

Frequency

Notes:

1. Contact factory for improved stabilities or additional product options. Not all options and codes are available at all frequencies.
2. Unless other stated all values are valid after warm-up time and refer to typical conditions for supply voltage, frequency control voltage, load, temperature (25°C).
3. Phase noise degrades with increasing output frequency.
4. Subject to technical modification.
5. Contact factory for availability.

For Additional Information, Please Contact

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