



EX-209

Hi-Reliability Evacuated Miniature Crystal Oscillator

Helping Customers Innovate, Improve & Grow



Features

16 pin Double Dip Package
 Ruggedized hybrid thick film construction
 Low Power Consumption
 Legacy Model: EX-245

Typical Applications

Satellite and Deep Space
 Radiation Tolerance Required
 Severe Environmental Conditions

Frequency Range
Standard Frequencies

10 MHz – 40 MHz
 10, 20 MHz

Frequency stabilities¹ [10 to 20 MHz]

Parameter	Min	Typ	Max	Units	Operating temp range	Options ⁵
vs. operating temperature range (Referenced to +25°C)	-50		+50	ppb	0 ... +60°C	
	-75		+75	ppb	-20 ... +70°C	
	-100		+100	ppb	-40 ... +85°C	
Parameter	Min	Typ	Max	Units	Condition	
Initial tolerance For Fixed Freq.	-1		+1	ppm	Fixed, no adjust option	
Settability	-0.2		+0.2	ppm		
vs. supply voltage change	-15		+15	ppb	V _s ± 5%	
vs. load	-15		+15	ppb	Load ± 5%	
vs. aging / day	-2		+2	ppb	after 7 days of operation	
vs aging / 1 year	-200		+200	ppb	10 to <12MHz	
vs. aging /10 year	-1000		+1000	ppb	12 to <16MHz	
vs. aging /10 year	-1500		+1500	ppb	16 to 20MHz	
Warm-up Time			120	seconds	to ± 1ppm of final freq. @+25°C	
			180	seconds	to ± 100ppb of final freq. @+25°C	

<http://www.vectron.com> Rev. 12-4-09 sem

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Frequency stabilities¹ [>20 to 40 MHz]

Parameter	Min	Typ	Max	Units	Operating temp range	
vs. operating temperature range (Referenced to +25°C)	-75		+75	ppb	0 ... +60°C	
	-100		+100	ppb	-20 ... +70°C	
	-150		+150	ppb	-40 ... +85°C	
Parameter	Min	Typ	Max	Units	Condition	
Initial tolerance For Fixed Freq. Stability vs. supply voltage change vs. load vs. aging / day vs aging / 1 year vs. aging /10 year	-1.5		+1.5	ppm	Fixed, no adjust option V _s ± 5% Load ± 5% after 7 days of operation	
	-0.3		+0.3	ppm		
	-25		+25	ppb		
	-25		+25	ppb		
	-3		+3	ppb		
	-300		+300	ppb		
Warm-up Time			120	seconds	to ± 1ppm of final freq. @+25°C	
			180	seconds	to ± 100ppb of final freq. @+25°C	

Supply Voltage (Vs)

Parameter	Min	Typ	Max	Units	Condition
Supply voltage [Standard]	4.75	5	5.25	VDC	
Power consumption			2.2	Watts	during warm-up
			0.7	Watts	steady state @ +25°C
			1.2	Watts	steady state @ -40°C

RF Output

Parameter	Min	Typ	Max	Units	Condition
Signal [Standard]	HCMOS				
Load		15		pF	
Signal Level (Vol)			0.1	VDD	
Signal Level (Voh)	0.9			VDD	
Rise/Fall Time			+7	ns	(10-90%)
Duty cycle	40		60	%	@ (Voh-Vol)/2
Signal [Option]	Sinewave				
Load		50		Ω	
Output Power [Standard]	0.0	+2.0	4.0	dBm	50 Ohm load
Output Power [Option]	3.0	+5.0	7.0	dBm	50 Ohm load
Harmonics			-25	dBc	
Spurious			-60	dBc	

Frequency Tuning (EFC)

Parameter	Min	Typ	Max	Units	Condition
Tuning Range	Fixed, No Adjust				Options ⁵
Tuning Range	Sufficient to compensate for 10 years aging				
Vref	4.0	4.1	4.2	Vdc	Source Current 1mA maximum

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Additional Parameters¹ [10 to 20 MHz]

Parameter	Max.	Units	Condition		
Phase Noise	-100	dBc/Hz	10	Hz	10 to 20 MHz
	-125	dBc/Hz	100	Hz	
	-140	dBc/Hz	1	kHz	
	-145	dBc/Hz	10	kHz	
	-145	dBc/Hz	100	kHz	
G-Sensitivity	1 x 10 ⁻⁹	/g	Test at 10g sine vibration at 100Hz		

Additional Parameters¹ [>20 to 40 MHz]

Parameter	Max.	Units	Condition		
Phase Noise	-90	dBc/Hz	10	Hz	> 20 to 40 MHz
	-115	dBc/Hz	100	Hz	
	-130	dBc/Hz	1	kHz	
	-140	dBc/Hz	10	kHz	
	-140	dBc/Hz	100	kHz	
G-Sensitivity	1 x 10 ⁻⁹	/g	Test at 10g sine vibration at 100Hz		

Environmental Conditions (Designed to meet)

- Radiation Tolerant (operating): Active devices are selected from a family of product that is inherently radiation tolerant to meet 100krad (SI) total dose
- Mechanical Shock (survive)^{***}: MIL-STD-202, Test Method 213, Condition E (1000G, 0.5msec)
- Vibration Random (survive)^{***}: MIL-STD-202, Test Method 214, Condition I-F (20Grms, 3 minutes/axis)
- Vibration Sine (survive)^{***}: MIL-STD-202, Test Method 204, Condition D (20Grms, 20 minutes/axis)

Note: ^{***} Met by design, not tested

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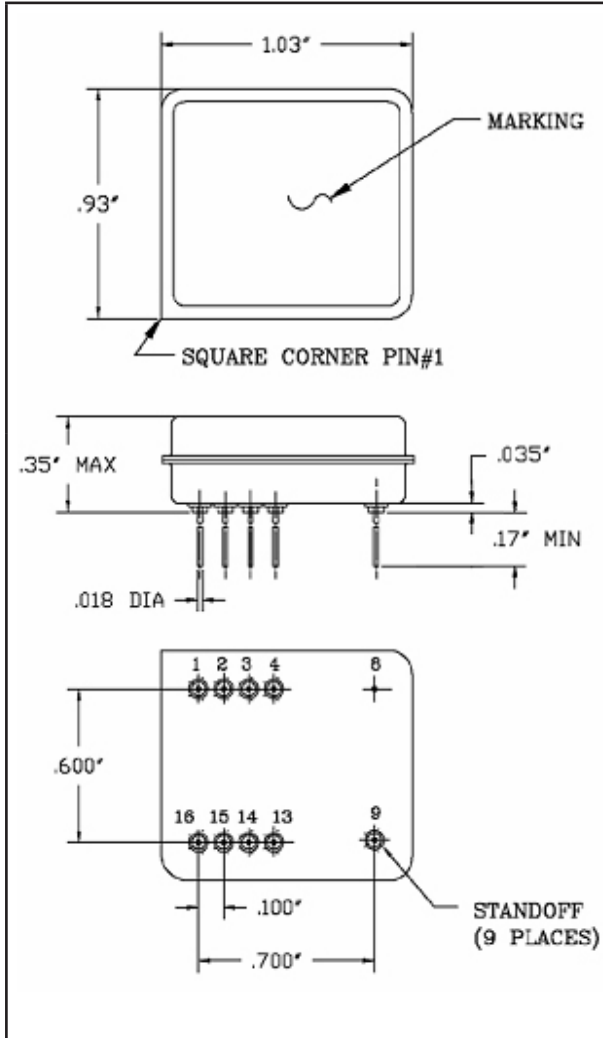
Screening Options

Ordering Code	S		B	
Test Inspection	S-Level Screening		B-Level Screening	
Nondestructive Bond Pull	MIL-STD-883 Method 2023		N/A	
Internal Visual Per Mil-PRF-55310 Requirement	Internal Visual Per Mil-PRF-55310 Requirement		Internal Visual Per Mil-PRF-55310 Requirement	
Stabilization Bake	MIL-STD-883 Method 1008, Condition C	150°C for 48hrs	MIL-STD-883 Method 1008, Condition C	150°C for 48hrs
Thermal Shock	MIL-STD-883 Method 1011, Condition A	0°C to 100°C for 15cycles	N/A	
Temperature Cycling (1)	MIL-STD-883 Method 1010, Condition A	-55°C to 85°C (2) for 10cycles	MIL-STD-883 Method 1010, Condition A	-55°C to 85°C (2) for 10cycles
Constant Acceleration (1)	MIL-STD-883 Method 2001	1000g's (3) Y1 Only	MIL-STD-883 Method 2001	1000g's (3) Y1 Only
Seal (Fine & Gross Leak) (1)	N/A (Vacuum Seal)		N/A (Vacuum Seal)	
PIND	MIL-STD-883 Method 2020, Condition B	10g peak at 60Hz minimum	N/A	
Electrical Test	Per Mil-PRF-55310 Requirement		Per Mil-PRF-55310 Requirement	
Burn-in (1)	85°C (2) for 240hrs		85°C (2) for 240hrs	
Electrical Test	Per Mil-PRF-55310 Requirement		Per Mil-PRF-55310 Requirement	
Radiographic	MIL-STD-883 Method 2012		N/A	
Note: (1) These test inspections deviate from screening requirements for class 2 oscillator in MIL-PRF-55310. (2) The maximum operating and storage temperature of the EX-209 is +85°C. The EX-209 shall not be exposed to temperature higher than +85°C at length of time. (3) The design and construction of the EX-209 can withstand up to 1000g's constant acceleration				

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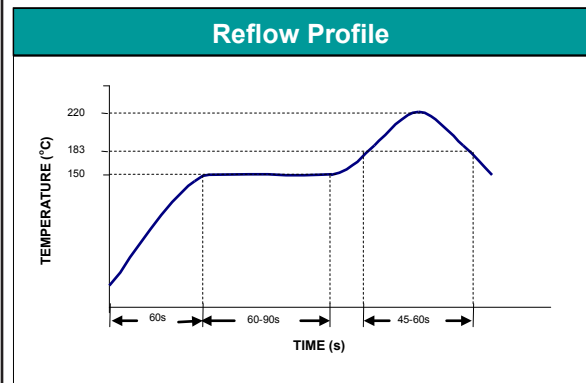
Package Outline



Pin Function

Pin #	With EFC	Fixed Frequency
1	EFC	No Connection
2-4	No Connection	No Connection
8	Case/GND	Case/GND
9	Output	Output
13-14	No Connection	No Connection
15	Vref	No Connection
16	Supply	Supply

**Pin numbers are for reference



How to order this product:

Use this worksheet to forward the following information to your factory representative :											
Model	-	Supply Voltage Code	RF Output Code	Temperature Range	-	Stability	Options			-	Frequency
EX-209	-	C	A	D	-	508	A	S	S	-	10M0000000

Model Code:
209: Type A

Supply Voltage Code:
C: 5 V

RF Output Code:
A: CMOS
G: Sinewave (0 dBm)
H: Sinewave (+3 dBm)

Temperature Range:
K: 0 ... +60°C
D: -20...+70°C
F: -40...+85°C

Stability:
508: ±50ppb
758: ±75ppb
107: ±100ppb
157: ±150ppb

Other Options:
A: Electrical Tuning
F: Fixed Frequency

Screening Option:
S: "S" Level Screening
B: "B" Level Screening
E: "EM" Engineering Model

Crystal Options:
S: Swept Quartz
N: Non-Swept Quartz

Notes:

- 1 Contact factory for improved stabilities or additional product options. Not all options and codes are available at all frequencies.
- 2 Unless otherwise 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.

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