

O-CS41-FS59XX-P-X-05-R 10.000 MHz
Precision Ultra Low Phase Noise OCXO in 41x30 mm
SMD Package with OSC Disable and Oven Alarm
features for Instrumentation

Rev. B

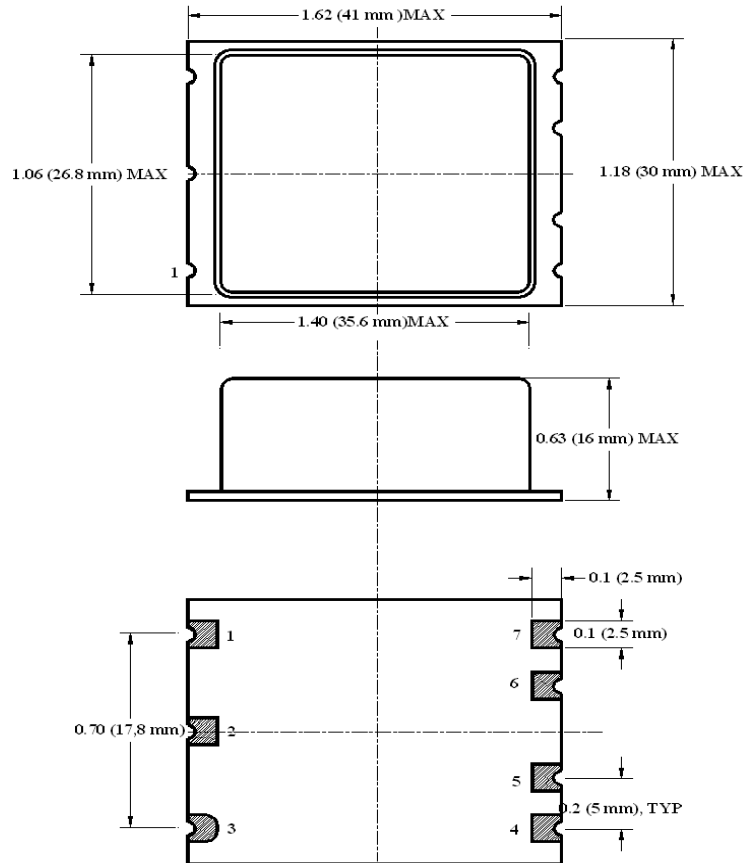
Product Data Sheet

Features

- SC-cut crystal
- High Stability
- Low Aging
- Ultra Low Phase Noise
 - Ultimate (U) -146 dBc/Hz at 10Hz
 - 172 dBc/Hz on the floor
 - Extraordinary (E) -88 dBc/Hz at 0.1 Hz
 - 119 dBc/Hz at 1 Hz
 - 148 dBc/Hz at 10 Hz
 - 168 dBc/Hz on the floor

Applications

- Instrumentation
- Radar
- Satellite Communications
- Reference
- COTS/Dual use



Parameter	Symb	Condition	Min	Typ	Max	Unit	Note
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Absolute Maximum Ratings

Input Break Down Voltage	Vcc		-0.5		13.6	V	
Storage temper.	Ts		-40		85	°C	
Control Voltage	Vc		-1		5.5	V	

Electrical

Frequency	F			10.000		MHz															
Frequency stability	$\Delta F/F$	vs. temp. grades L, P, and U			± 5 ± 200	ppb	-10°C to 75°C 75°C to 80°C														
		vs. temp, grade E			± 1		0°C to 75°C														
		vs. Supply		0.2	0.5		ppb/5% Vcc														
		Vs. Load			0.5		ppb/5% Rload														
Aging		per day		5E-10			After 30 days														
		per 30 days		5E-9																	
		per year, first year		3E-8																	
		second year		2E-8																	
		15 years		3E-7																	
Allan Deviation		0.1s		3E-13																	
		1.0 s		2E-12																	
		10 s		5E-12																	
SSB Phase Noise (Achieved after 10 minutes warm-up) 2*	$\mathcal{L}(\phi)$	1Hz 10 Hz 100 Hz 1 KHz		-110	-105 -140 -155 -160	dBc/Hz	Grade L														
								10 KHz 100 KHz			-168 -170										
														1Hz 10 Hz 100 Hz 1 KHz			-112 -145 -156 -162	dBc/Hz	Grade P		
																				10 KHz 100 KHz	
		1Hz 10 Hz 100 Hz 1 KHz			-115 -146 -156 -163	dBc/Hz	Grade U														
								10 KHz 100 KHz			-170 -172										
														0.1Hz 1Hz 10 Hz 100 Hz			-88 -119 -148 -160	dBc/Hz	Grade E 6*		
																				1 KHz 10 KHz 100 KHz	
		Retrace			After 30 minutes		± 10														
		G-sensitivity			worst direction			± 1.0	ppb/G												
		Input Voltage	Vcc		10.5	12.0	12.6	V													
		Power consumption	P	steady state, 25°C		1.2	1.5		W	Still air											
				steady state, -10°C		1.8															
				start-up @ -10°C		2.5	3.2														
		Spectral Purity		Spurious Harmonics/Sine Harmonics		-35	-80 -30 -45	dBc	Non-harmonic E grade												
				Load		Internally AC-coupled 50 Ohm															
Warm-up time	τ_{ω}	to 0.1ppm accuracy to 10ppb accuracy		3	5 10	minutes	Off time <24 hrs Aging rate was reached														

All parameters for 10 MHz

Start-up time	τ_s	From cold start at room temperature		5		seconds	RF output to appear
		From OSC EN activation			0.1		
Output Waveform		Sinewave					
Output Power			+10	+13	+17	dBm	L, P, and U grades
			+7		+12		E grade
Control voltage	V_c		0		5.0	V	
Reference Voltage	V_{ref}	No load	4.8	5.0	5.2	V	100 Ohm series to V_{ref} E grade, straight to V_{ref}
			4.0	4.096	4.2		
Output Impedance		At V_{ref} pin			100	Ohm	L, P, and U grades
Output Short Circuit Current V_{ref}	I_o			20		mA	E grade
Pull range		from nominal F	± 0.3	± 0.5	± 0.8	ppm	
Absolute Pull Range	APR	Over all conditions	± 0.05			ppm	Sufficient for lifetime, 15 years
Deviation slope		Monotonic, positive	0.15		0.25	ppm/V	
Tuning Linearity					10%		
Initial Calibration	$\Delta F/F$	As shipped at 25°C, $V_c = 2.50$ V			± 0.1	ppm	L, P, and U grades
					± 0.03		E grade
Setability	V_{c0}	@25°C, F_{nom}	2.5 ± 0.3			V	3*
Oven Ready (N/A for E grade)		V pad #2	3.3		0.5	V	Ready Not Ready
Oscillator Enable		CMOS Logic "1" (5.0V > V > 2.4) or floating Logic "0" (V < 0.5V)	Enabled			V	Oscillation stops 5*
			Disabled				
Modulation Bandwidth	F_m	-3 dB at 1 KHz	DC		1	KHz	

Notes:

- 2*. It's assumed that phase noise test is performed under static conditions (no vibration), in still air, and care is taken for minimizing EMI. Cross correlation method is recommended with equipment having adequate performance
- 3*. Longer storage time, especially at low temperatures, may affect both retrace and setability parameters. It may require few days on power for re-stabilization.
- 4. All parameters, unless otherwise specified, are at nominal conditions, i.e.: T=25°C, Nominal V_{cc} & Nominal Load.
- 5*. Additional retrace from OSC DIS to OSC EN is within normal aging and temperature stability range of frequency deviation. Cannot be specified separately.
- 6*. E grade phase noise test is performed with internal bias to $V_c = 2.5$ V, provided by resistive divider from V_{ref} . Resistors are low noise metal film. After the test, the bias is removed.

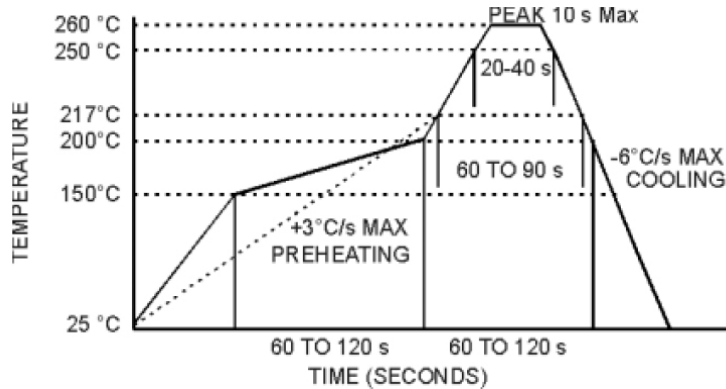
Environmental and Mechanical

Operating temp. range	-10°C to 75°C. Operable range -10°C to 80°C, meaning that stability from 75°C to 80°C of ± 5 ppb may not be met, otherwise OXCO will function. 0°C to 75°C for E grade
Mechanical Shock	Per MIL-STD-202, 30G, 11ms
Vibration	Per MIL-STD-202, 5G to 2000 Hz
Soldering Conditions	See profile below. The device may be reflowed once. Reflowing upside down is not allowed. Hand soldering is highly encouraged. NO CLEAN assembly is recommended

Electrical Connections

Pin Out	Pad #1- GND; Pad#2 – Oven Ready indicator (N/A for E grade); Pad #3 – RF Output; Pad #4 – V_{cc} ; Pad #5 – Output Enable; Pad #6 – V_c ; Pad #7 – V_{ref}
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MAX Reflow Profile



Creating a Part Number

Q - **C** **S41** **F** **S** **XX** **XX** - **P** - **X** - **05** - **R** - FREQ
OCXO
 Conventional Power

Package Code
 SMD 41x30x16, 6 pads

Supply Voltage

Code	Specification
F	12V, NOM

Output

Code	Specification
S	Sinewave

Temperature Stability

Code	Specification
59	5×10^{-9}
19	E grade 1×10^{-9}

Operating Temperature Range

Code	Specification
GX	-10°C to 75°C *
IX	0°C to 75°C, E grade

Operable to 80°C

Environmental

Code	Specification
R	RoHS compliant, not designed for reflow

Aging

05	$5E-10 = 0.5$ ppb/day
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Phase Noise (See Table)

Code	Specification
X	Per table

Deviation slope

Code	Specification
P	Positive, 0 to Vref



**Temperature Code Table

Letter	Temp °C	Letter	Temp °C	Letter	Temp °C	Letter	Temp °C	Letter	Temp °C	Letter	Temp °C
A	-40	F	-15	K	10	P	35	U	60	Z	85
B	-35	G	-10	L	15	Q	40	V	65		
C	-30	H	-5	M	20	R	45	W	70		
D	-25	I	0	N	25	S	50	X	75		
E	-20	J	5	O	30	T	55	Y	80		

E Grade performance example

