

## Precision Ultra Low Phase Noise OCXO in Low Profile 22x25x10 mm SMD package



ESD Sensitive

25.4 x 22 x 10 mm  
Datasheet #1348B

### Features

- SC-cut crystal
- High Stability
- Low Profile (10mm) SMD package
- Low Aging
- Ultra Low Phase Noise Option:
  - Premium(P)-145dBc/Hz at 10Hz;
    - 172dBc/Hz on the floor
  - Ultimate(U)-115dBc/Hz at 1Hz
    - 146dBc/Hz at 10Hz;
      - 172dBc/Hz on the floor
  - Extraordinary(E)-120dBc/Hz at 1Hz
    - 148dBc/Hz at 10Hz
      - 172dBc/Hz on the floor
- Sine Wave or HCMOS/TTL output

### Applications

- Instrumentation
- Tele/Data Communications
- GPS

### Absolute Maximum Ratings

Parameters	Symbol	Condition	Min	Typ	Max	Unit	Notes
Input Break Down Voltage	V <sub>cc</sub>	5 V supply	-0.5		5.5	V	
Storage temper.	T <sub>s</sub>		-50		90	°C	
Control Voltage	V <sub>c</sub>		-1 -1		5.5 11	V	Slope option "P" Slope option "L"

### Electrical

Parameters	Symbol	Condition	Min	Typ	Max	Unit	Notes
Frequency	F		8	10.000	13	MHz	
Frequency stability	ΔF/F	vs. Temp.		20		ppb	See chart below
		vs. Supply		0.2	0.3	ppb/10%V <sub>cc</sub>	
Aging		per day per year, first year second year		5E-10 5E-8 3E-8			after 30 days of continuous operation
Allan Deviation		0.1s 1s 10s		5E-13 2E-12 5E-12			Premium version, option "P"
SSB Phase Noise (achieved after 10 minutes warm-up)	S <sub>φ</sub>	1Hz 10Hz 100Hz 1KHz 10KHz 100KHz			-112 -145 -155 -162 -169 -172	dBc/Hz	Premium version, option "P"
		1Hz 10Hz 100Hz 1KHz 10KHz 100KHz		-115	-114 -146 -156 -163 -169 -172	dBc/Hz	Ultimate version, option "U" 2*

All parameters for 10 MHz

## Precision Ultra Low Phase Noise OCXO in Low Profile 22x25x10 mm SMD package



ESD Sensitive

25.4 x 22 x 10 mm  
Datasheet #1348B

### Electrical (cont.)

Parameters	Symbol	Condition	Min	Typ	Max	Unit	Notes	
SSB Phase Noise (achieved after 10 minutes warm-up)	S $\phi$	1Hz			-120	dBc/Hz	Extraordinary version, option E, available with slope option L	
		10Hz			-148			
		100Hz			-160			
		1KHz			-168			
		10KHz			-170			
		100KHz			-172			
Retrace		After 30 minutes			±10	ppb	24 Hours off 3*	
G-sensitivity		worst direction			±1.0	ppb/G		
Input Voltage	V <sub>cc</sub>		4.75	5.0	5.25	V		
Power consumption, Still air 4*	P	steady state, 25°C, start-up @ -30°C		0.6 2.0	0.8 2.5	W	Operating temp range to 70°C	
Spectral Purity		Subharmonics		none		dBc		
		Spurious Harmonics		-35	-80 -30			
Load		10Kohm//15pF (HCMOS/TTL), AC-coupled 50 Ohm (Sine-wave)					Output Code T Output Code S	
Warm-up time	$\tau$	to 0.1ppm accuracy		3	5	minutes		
Output Waveform		HCMOS/TTL compatible or Sinewave						
Output Power			+10	+13		dBm	Output Code S	
Logic 1 (CMOS)	V <sub>oh</sub>		3.3			V	Output Code T	
Logic 0 (CMOS)	V <sub>ol</sub>				0.1	V	Output Code T	
Control Voltage	V <sub>c</sub>		0 0		4.5 10.0	V	Slope option "P" Slope option "L"	
Output Enable		CMOS Logic "1" (4.5V>V>2.5) or floating Logic "0" (V<0.5V)	Enabled Disabled	V		Pout<-30 dBm	Optional	
Input impedance	Z <sub>in</sub>	At V <sub>c</sub> pin	10			KOhm		
Modulation bandwidth	F <sub>m</sub>				1000	Hz		
Reference Voltage	V <sub>ref</sub>			4.5		V		
Output Impedance		At V <sub>ref</sub> pin		100		Ohm		
Pull range		from nominal F	±0.4	±0.6		ppm		
Deviation slope		Monotonic, positive Monotonic, positive		1.0/V <sub>ref</sub> 0.12		ppm/V	Slope option "P" Slope option "L"	
Setability	V <sub>c0</sub>	@25°C, F <sub>nom</sub> . Internal bias is optional, specify on PO 2.25 V for "P", 4.5 V for "L"		2.25±0.5 5±0.5		V	Slope option "P" 3* Slope option "L"	

**Precision Ultra Low Phase Noise OCXO in Low Profile 22x25x10 mm SMD package**



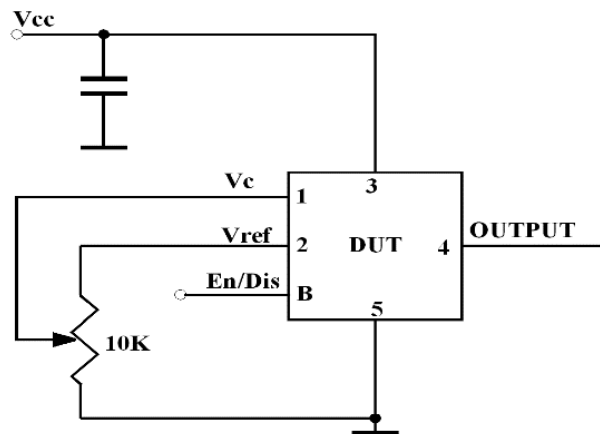
ESD Sensitive

25.4 x 22 x 10 mm  
 Datasheet #1348B

## Environmental and Mechanical

Parameter	Description
Operating temp. range	0°C to 70°C Standard, Other options - see chart below
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

## Test Circuit



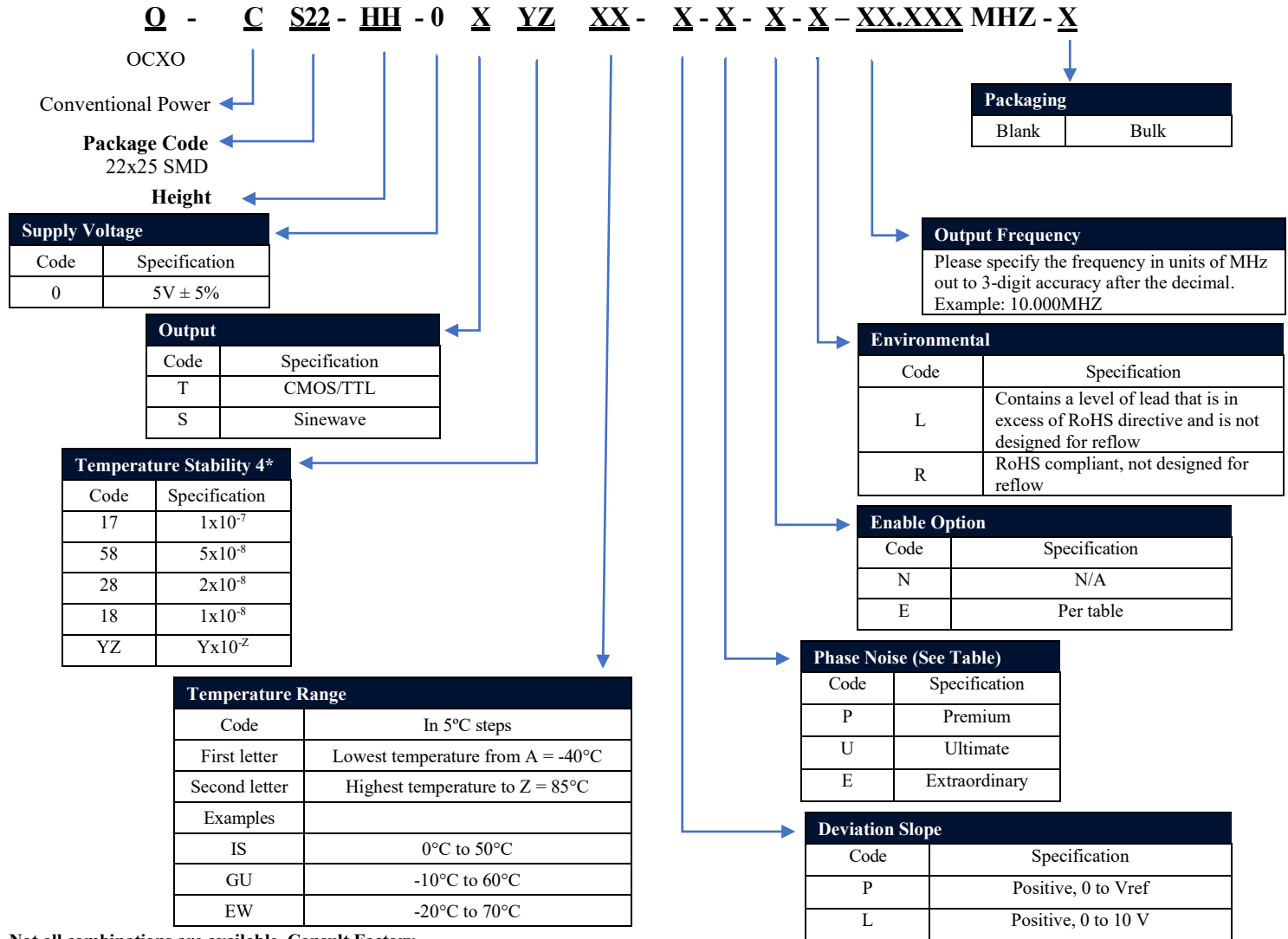
**Precision Ultra Low Phase Noise OCXO in Low Profile 22x25x10 mm SMD package**



**ESD Sensitive**

**25.4 x 22 x 10 mm**  
**Datasheet #1348B**

## Creating a Part Number



Not all combinations are available. Consult Factory.

### 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		

## Precision Ultra Low Phase Noise OCXO in Low Profile 22x25x10 mm SMD package



ESD Sensitive

25.4 x 22 x 10 mm  
Datasheet #1348B

### Notes:

1) For highest operating temperature higher than 70°C the power consumption will be higher (about 20% for 85°C). Values listed are for test in still air environment, the values will go up while testing in the temperature chamber.

2\* This specification is preliminary. It is recommended to specify Slope option "L" for Ultimate Phase noise performance. Recommended test equipment – Symmetricom 5120A-01 Phase Noise and Allan Deviation Test Set (be aware of limitations on the floor, especially if the DUT frequency is not 10.000 MHz), Noise XT DCNTS, or Holtzworth HA 7000B series. "Clean" analog power supply i.e., HP E3610A or equivalent. It's assumed that phase noise test is performed under static conditions (no vibration), in still air, and care is taken for minimizing EMI.

3\* Longer storage time, especially at low temperatures, may affect both retrace and setability parameters. It may require a few days on power for re-stabilization.

4\* The power consumption is affected by the operating temperature range (the higher the temperature- the higher the power consumption. The values in the table are for high operating temperature at 70°C.)

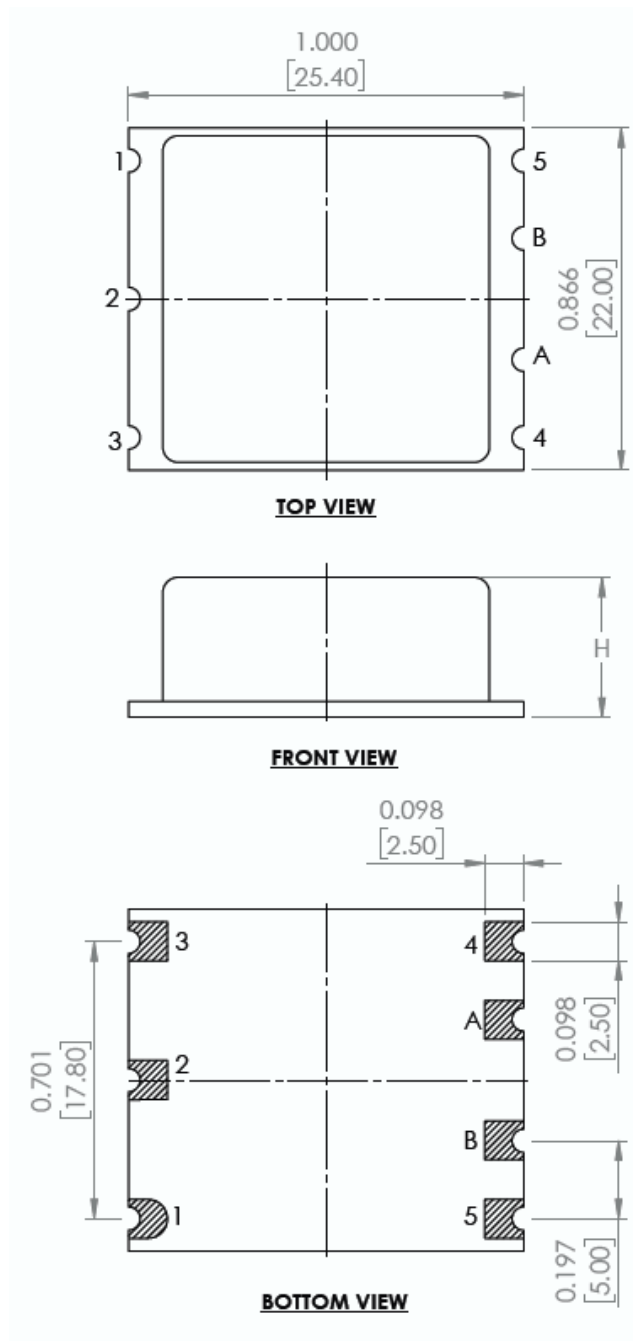
Precision Ultra Low Phase Noise OCXO in Low Profile 22x25x10 mm SMD package



ESD Sensitive

25.4 x 22 x 10 mm  
Datasheet #1348B

## Mechanical Dimensions



H Code	Height, inches (mm) TYP
09	0.350" [9.0 mm]
10	0.394" [10.0 mm]

Pin #	Function
1	Vc
2	Vref
3	Vcc
4	Output
5	GND
A	N/C
B	Output Enable

Dimensions: inches [mm]

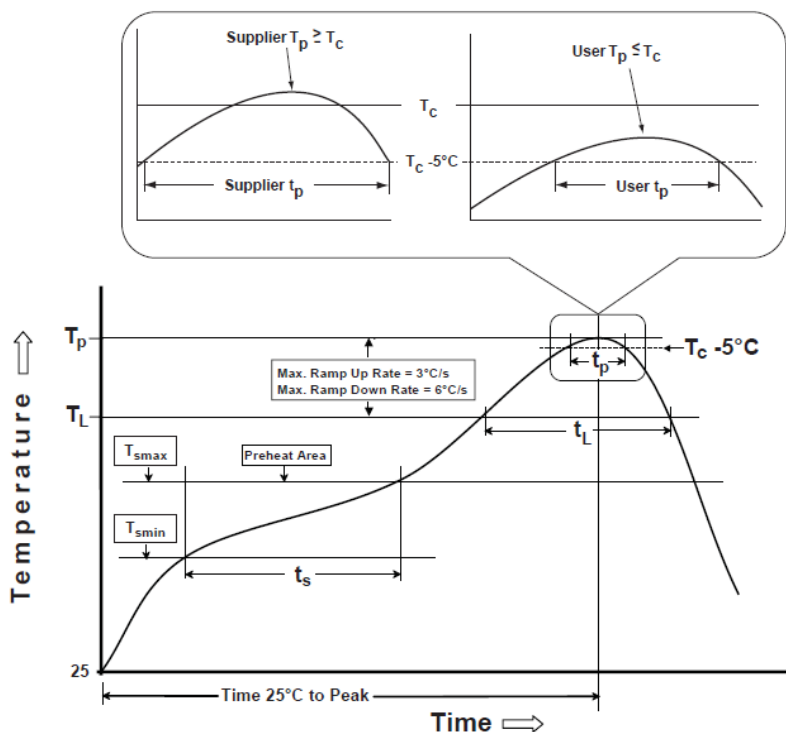
## Precision Ultra Low Phase Noise OCXO in Low Profile 22x25x10 mm SMD package



ESD Sensitive

25.4 x 22 x 10 mm  
Datasheet #1348B

### Reflow Profile [JEDEC J-STD-020]



**Table 1**

SnPb Eutectic Process Classification Temperatures ( $T_c$ )		
Package Thickness	Volume $\text{mm}^3$ <350	Volume $\text{mm}^3$ $\geq$ 350
<2.5 mm	235°C	220°C
$\geq$ 2.5 mm	220°C	220°C

**Table 2**

Pb-Free Process Classification Temperatures ( $T_c$ )			
Package Thickness	Volume $\text{mm}^3$ <350	Volume $\text{mm}^3$ 350-2000	Volume $\text{mm}^3$ >2000
<1.6 mm	260°C	260°C	260°C
1.6 mm - 2.5 mm	260°C	250°C	245°C
>2.5 mm	250°C	245°C	245°C

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat / soak		
Temperature minimum ( $T_{smin}$ )	100°C	150°C
Temperature maximum ( $T_{smax}$ )	150°C	200°C
Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60 - 120 sec.	60 - 120 sec.
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3°C/sec. max	3°C/sec. max
Liquidous temperature ( $T_L$ )	183°C	217°C
Time at liquidous ( $t_L$ )	60 - 150 sec.	60 - 150 sec.
Peak package body temperature ( $T_p$ )*	<b>see Table 1</b>	<b>see Table 2</b>
Time ( $t_p$ )** within 5°C of the specified classification temperature ( $T_c$ )	20 sec.	30 sec.
Ramp-down rate ( $T_p$ to $T_{smax}$ )	6°C/sec. max	6°C/sec. max
Time 25°C to peak temperature	6 min. max	8 min. max
Reflow cycles	1 max	1 max

\*Tolerance for peak profile temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.

\*\*Tolerance for time at peak profile temperature ( $t_p$ ) is defined as supplier minimum and a user maximum.