



**THE DATASHEET OF  
CSB21-012.688656M**





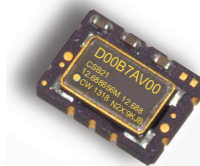
## 5x7mm Surface Mount TCXO's for Cospas-Sarsat Beacons Model CSBxx Series

# CONNOR WINFIELD



### Description:

The Connor-Winfield's CSBxx Series precision TCXO's are ideally suited for the next generation of emergency beacon applications. The CSBxx Series are Surface Mount, 5x7mm, 3.3V, LVC MOS or Clipped Sinewave Temperature Compensated Crystal Oscillators (TCXO) designed for emergency beacon applications requiring tight frequency stability and low power. The data is serialized and available on-line to the customer for future reference during certification. See page 4 for instructions.



### Features:

- 3.3 Vdc Operation
- Frequency Stability:  $\pm 0.20$  ppm
- Mean Slope =  $\pm 0.7$  ppb/min
- Temperature Ranges Available:
  - Class I -40 to 55°C, Class II -20 to 55°C
  - Option: -10 to 65°C
- LVC MOS or Clipped Sinewave Output
- Ceramic Surface Mount Package
- Tape and Reel Packaging
- RoHS Compliant / Pb Free

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### Absolute Maximum Ratings

Parameter	Minimum	Nominal	Maximum	Units	Notes
Storage Temperature	-40	-	85	°C	
Supply Voltage (Vcc)	-0.6	-	4.6	Vdc	
Input Voltage	-0.5	-	Vcc+0.5	Vdc	

### Operating Specifications

Parameter	Minimum	Nominal	Maximum	Units	Notes
Frequency Range: (Fo)	10	-	20	MHz	
Standard Frequencies:	10.0, 12.688375, 12.688575, 12.688656, 12.68875, 16.367, 20.0			MHz	
Frequency Stability					1
Calibration @ 25 °C	-0.50	-	0.50	ppm	2
Frequency vs. Temperature	-0.20	-	0.20	ppm	3
Frequency vs. Voltage					
$\pm 5\%$ change in Voltage	-	$\pm 20$	$\pm 40$	ppb	
$\pm 10\%$ change in Voltage	-	$\pm 60$	$\pm 100$	ppb	
Frequency vs. Load	-0.10	-	0.10	ppm	4
Allan Variance (tau = 100ms)	-1.00	-	1.00	ppb	
Mean Slope dF/dt					
Steady state conditions	-	-	$\pm 0.7$	ppb/min	1
During and 15 min after variable temp	-	-	$\pm 1.7$	ppb/min	1, 5
Residual dF from slope	-	-	$\pm 2.0$	ppb	1, 5
Reflow Soldering	-1.0	-	1.0	ppm	
Aging for 1st Year	-1.0	-	1.0	ppm	
Aging for 10 Years	-3.0	-	3.0	ppm	
Operating Temperature Range:					
Model CSB1x (Class I)	-40	-	55	°C	
Model CSB2x (Class II)	-20	-	55	°C	
Option: Model CSB3x	-10	-	65	°C	
Supply Voltage (Vcc)	2.97	3.30	3.63	Vdc	$\pm 10\%$
Supply Current (Icc)					
Model CSBx1 (LVC MOS Output)	-	2.1	-	mA	
Model CSBx2 (Clipped Sine Output)	-	1.3	-	mA	
SSB Phase Noise Fo = 10.0 MHz					
@ 1Hz offset	-	-70	-	dBc/Hz	
@ 10Hz offset	-	-105	-	dBc/Hz	
@ 100Hz offset	-	-130	-	dBc/Hz	
@ 1KHz offset	-	-150	-	dBc/Hz	
@ 10KHz offset	-	-158	-	dBc/Hz	
@ 100KHz offset	-	-159	-	dBc/Hz	
@ 1MHz offset	-	-159	-	dBc/Hz	
Start-up Time	-	-	10	ms	

### Models CSB11 and CSB21 LVC MOS Output Characteristics

Parameter	Minimum	Nominal	Maximum	Units	Notes
Load	-	15	-	pF	6
Voltage (High) (Voh)	90%Vcc	-	-	Vdc	
(Low) (Vol)	-	-	10%Vcc	Vdc	
Current (High) (Ioh)	-4	-	-	mA	
(Low) (Iol)	-	-	4	mA	
Duty Cycle at 50% of Vcc	45	50	55	%	
Rise / Fall Time 10% to 90%	-	-	8	ns	

### Models CSB12 and CSB22 Clipped Sinewave Output Characteristics

Parameter	Minimum	Nominal	Maximum	Units	Notes
Output Load Resistance	-	10K	-	Ohm	6
Output Load Capacitance	-	10	-	pF	6
Output Voltage	1.0	-	-	V pk-pk	AC Coupled

### Ordering Information

CSB	1	1	- 010.0M
Package Type 5x7 mm Package C/S Beacon	Temperature Range 1 = -40 to 55°C (Class I) 2 = -20 to 55°C (Class II) 3 = -10 to 65°C	Output Type 1 = LVC MOS 2 = Clipped Sinewave	Output Frequency Frequency Format * -xxx.xM Min., -xxx.xxxxxM Max.* Six digits maximum after the decimal point. M = MHz

\*\*Not all options available at Digi-Key

Example Part Number: CSB11-010.0M



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## Tri-State Enable / Disable Input Characteristics

Parameter	Minimum	Nominal	Maximum	Units	Notes
Enable Voltage (High)	70%Vcc	-	-	Vdc	7
Disable Voltage (Low)	-	-	30%Vcc	Vdc	

## Environmental Characteristics

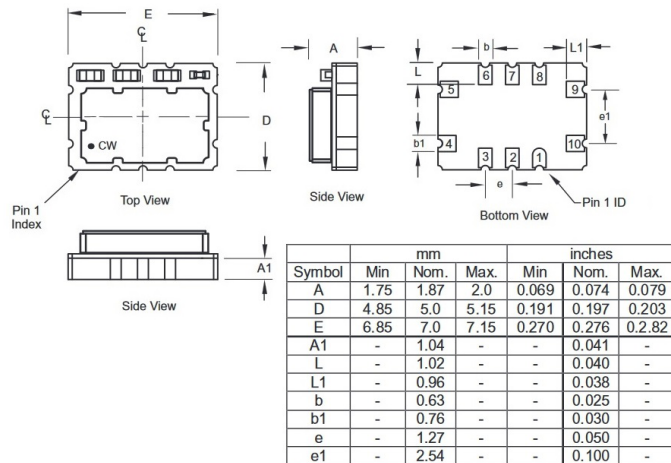
Vibration:	Vibration per Mil Std 883E Method 2007.3 Test Condition A
Shock:	Mechanical Shock per Mil Std 883E Method 2002.4 Test Condition B.
Soldering Process:	RoHS compliant lead free. See soldering profile on page 4.

## Package Characteristics

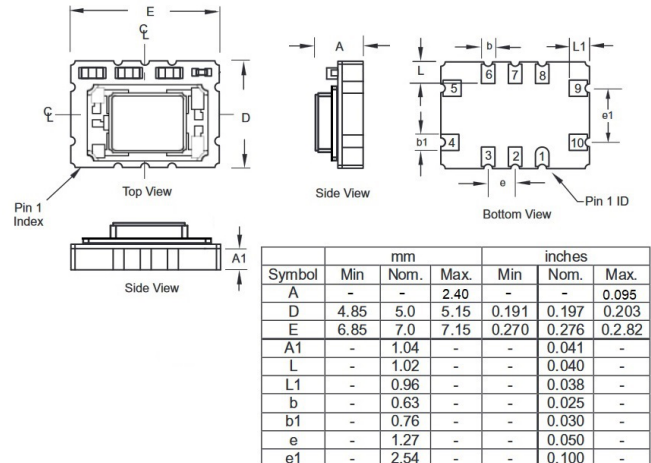
Package	Hermetically sealed ceramic package and grounded metal cover. RoHS compliant, lead free.
Moisture Sensitivity Level	MSL-1

- Notes:**
1. Medium term stability (Specified and measured according to the latest release of "Specification for Cospas-Sarat-406 MHz distress Beacon" C/S T.001. Averaged over 18 measurements in 15 minute period and following 15 minute warm up.)
  2. Frequency referenced to Fo.
  3. Frequency stability vs. change in temperature.  $[\pm(F_{max} - F_{min}) / (2 \cdot F_0)]$ .
  4. Referenced to 15 pF,  $\pm 5\%$ .
  5.  $dT/dt \leq \pm 5^\circ\text{C}/\text{hour}$
  6. Attention: To achieve optimal frequency stability, and in some cases to meet the specification stated on this data sheet, it is required that the circuit connected to this TCXO output must have the equivalent input capacitance that is specified by the nominal load capacitance. Deviations from the nominal load capacitance will have a graduated effect on the stability of approximately 20 ppb per pF load difference.
  7. Oscillator and compensation circuit are still active when output is disabled during tri-state mode. Output is enabled with no connection on pad 8. Supply current is ~ 1mA when output is disabled.

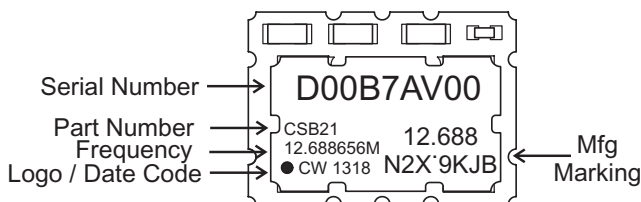
### Package Layout 1



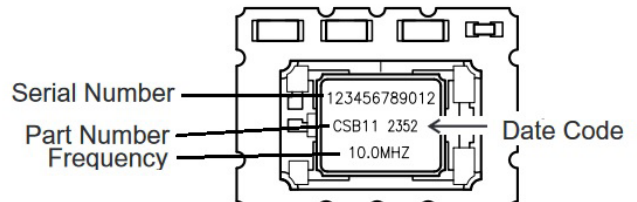
### Package Layout 2 for 10MHz and 20MHz



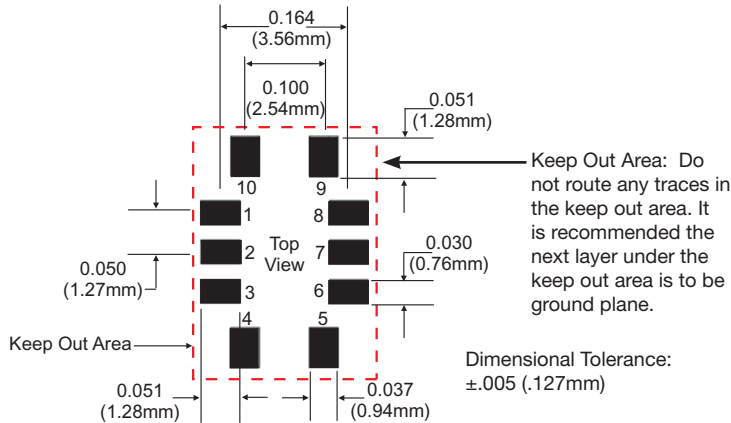
### Marking Information for frequencies other than 10MHz and 20MHz (5x3.2mm crystal)



### Marking Information for 10MHz and 20MHz models (3.2x2.5mm crystal)



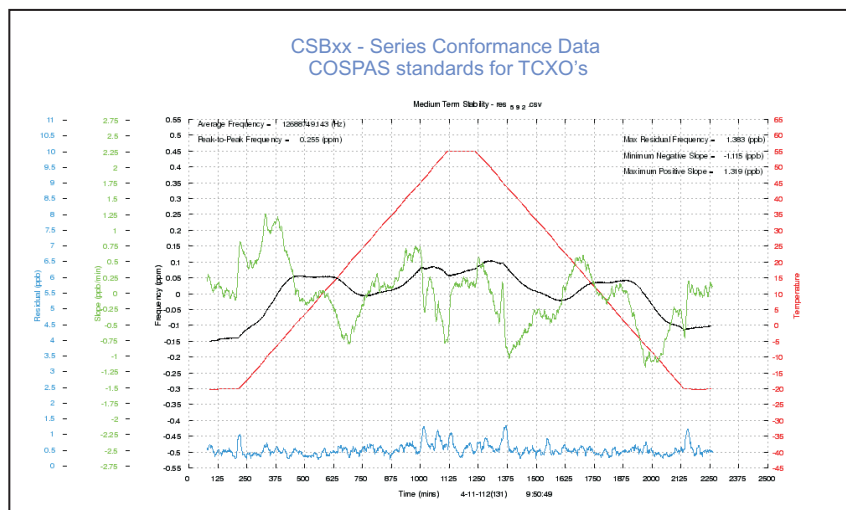
## Suggested Pad Layout



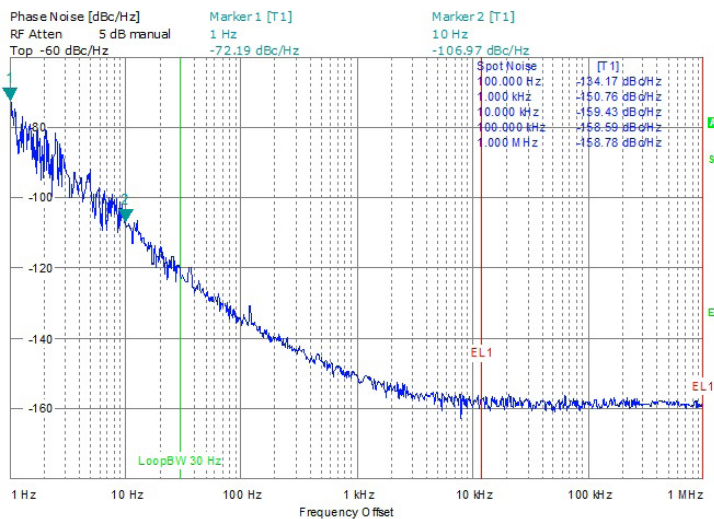
## Pad Connections

- 1: Do Not Connect
- 2: Do Not Connect
- 3: Do Not Connect
- 4: Ground
- 5: Output
- 6: Do Not Connect
- 7: Do Not Connect
- 8: Enable/Disable (OE)
- 9: Supply Voltage (Vcc)
- 10: N/C

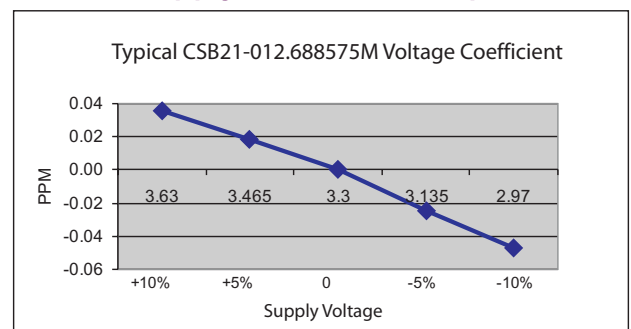
## Conformance Data



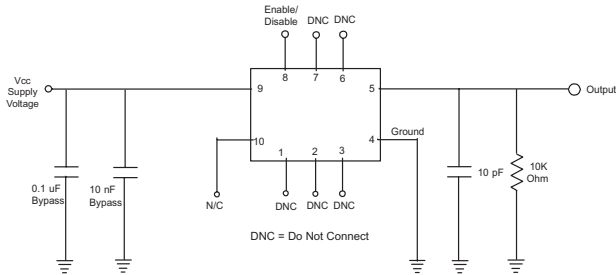
## Phase Noise Plot



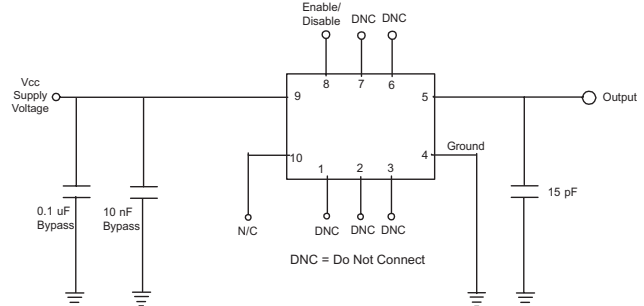
## Supply Coefficient Graph



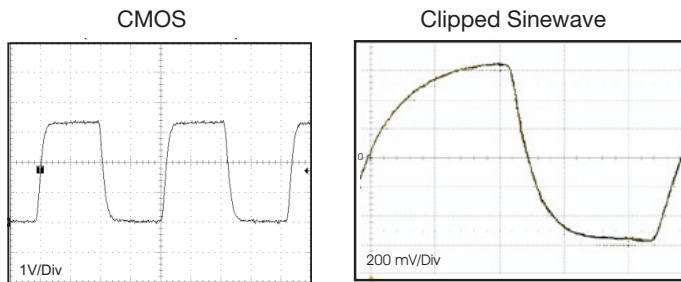
## Clipped Sinewave Test Circuit



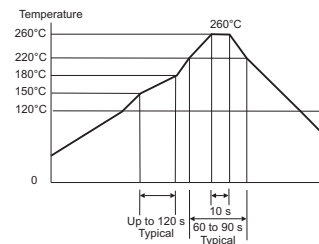
## CMOS Test Circuit



## Output Waveform



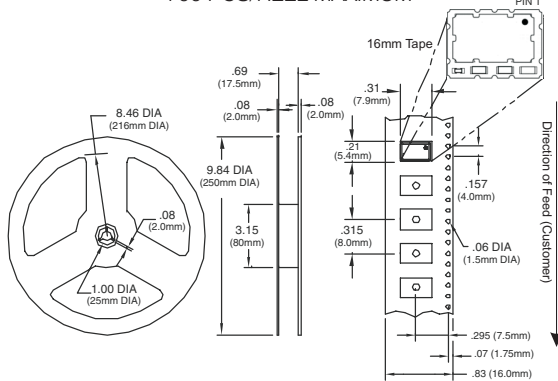
## Solder Profile



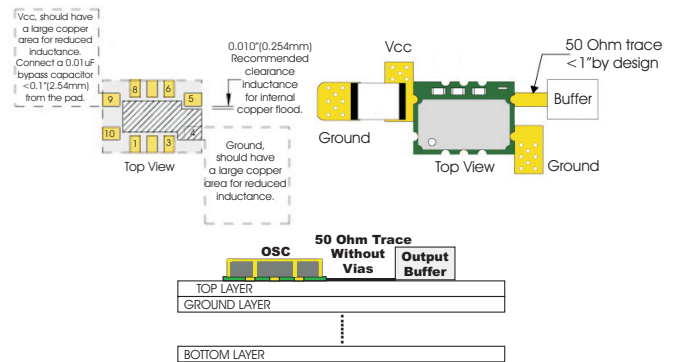
Meets IPC/JEDEC J-STD-020C

## Tape and Reel Dimensions

MEETS EIA-481A AND EIAJ-1009B  
700 PCS/REEL MAXIMUM



## Design Recommendations



## Test Data Availability

Serialized test data files are available on-line for all CSB-Series parts.

Please contact Connor-Winfield's Sales Department for more information. Call: 630-851-4722 or Email: [sales@conwin.com](mailto:sales@conwin.com)

## Revision History

Revision	Date	Note
00	01/03/10	Data sheet release.
01	01/28/11	Added 12.68875 MHz to the data sheet.
02	07/31/12	Added conformance data
03	04/30/13	Updated marking, added serial number.
04	10/22/13	Added IPC package drawing, footprint and test data availability.
05	10/29/13	Updated Voltage coefficient.
06	10/20/15	Added -10 to +65C temperature range option.
07	02/21/17	Corrected dimension error in Suggested Pad Layout.
08	11/21/23	Updated Supply Voltage (Vcc)
09	04/24/24	Update package outline and marking information for 10M and 20M parts.

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