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## 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, LVCMOS 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
- LVCMOS or Clipped Sinewave Output
- Ceramic Surface Mount Package
- Tape and Reel Packaging
- RoHS Compliant / Pb Free

### Absolute Maximum Ratings

| Parameter            | Minimum | Nominal | Maximum | Units | Notes |
|----------------------|---------|---------|---------|-------|-------|
| Storage Temperature  | -40     | -       | 85      | °C    |       |
| Supply Voltage (Vcc) | -0.5    | -       | 6.0     | 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                 |                                                               |         |         |         |       |
| ±5% change in Voltage                 | -                                                             | ±20     | ±40     | ppb     |       |
| ±10% change in Voltage                | -                                                             | ±60     | ±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               | -                                                             | -       | ±0.7    | ppb/min | 1     |
| During and 15 min after variable temp | -                                                             | -       | ±1.7    | ppb/min | 1, 5  |
| Residual dF from slope                | -                                                             | -       | ±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      |       |
| Supply Voltage (Vcc)                  | 2.97                                                          | 3.30    | 3.63    | Vdc     | ±10%  |
| Supply Current (Icc)                  |                                                               |         |         |         |       |
| Model CSBx1 (LVCMOS Output)           | -                                                             | 2.1     | -       | mA      |       |
| Model CSBx2 (Clipped Sine Output)     | -                                                             | 1.3     | -       | mA      |       |
| SSB Phase Noise Fo = 10.0 MHz         |                                                               |         |         |         |       |
| @ 1Hz offset                          | -                                                             | -68     | -       | dBc/Hz  |       |
| @ 10Hz offset                         | -                                                             | -100    | -       | dBc/Hz  |       |
| @ 100Hz offset                        | -                                                             | -129    | -       | dBc/Hz  |       |
| @ 1KHz offset                         | -                                                             | -148    | -       | dBc/Hz  |       |
| @ 10KHz offset                        | -                                                             | -154    | -       | dBc/Hz  |       |
| @ 100KHz offset                       | -                                                             | -154    | -       | dBc/Hz  |       |
| @ 1MHz offset                         | -                                                             | -154    | -       | dBc/Hz  |       |
| Start-up Time                         | -                                                             | -       | 10      | ms      |       |

### Models CSB11 and CSB21 LVCMOS 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

|                                                            |                                                                                          |                                                               |                                                                                                                                                    |
|------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CSB</b><br>Package Type<br>5x7 mm Package<br>C/S Beacon | <b>1</b><br>Temperature Range<br>1 = -40 to 55°C (Class I)<br>2 = -20 to 55°C (Class II) | <b>1</b><br>Output Type<br>1 = LVCMOS<br>2 = Clipped Sinewave | <b>- 010.0M</b><br>Output Frequency<br>Frequency Format *<br>-xxx.xM Min., -xxx.xxxxxM Max.*<br>Amount of numbers after the decimal point. M = MHz |
|------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|

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 2.        |

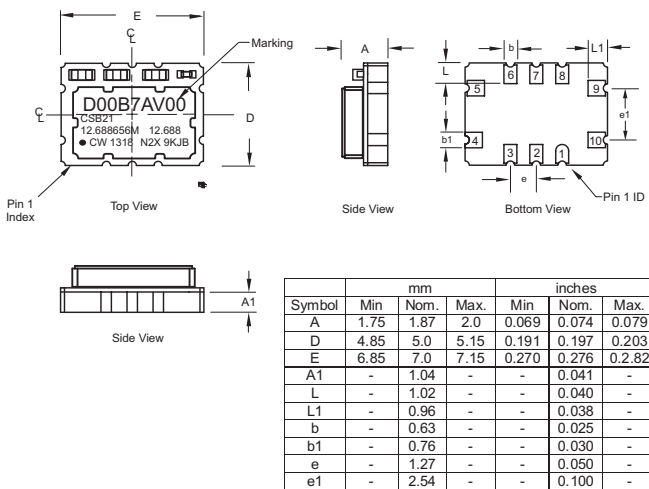
## Package Characteristics

|         |                                                                                          |
|---------|------------------------------------------------------------------------------------------|
| Package | Hermetically sealed ceramic package and grounded metal cover. RoHS compliant, lead free. |
|---------|------------------------------------------------------------------------------------------|

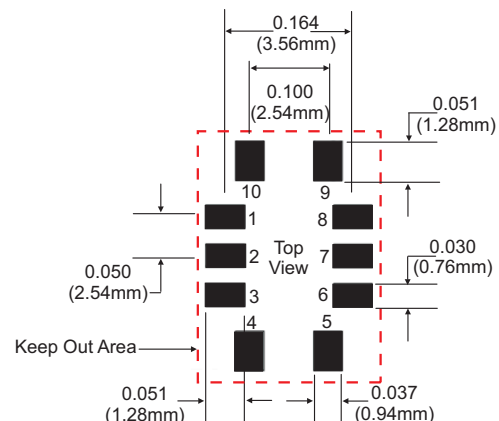
### Notes:

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.  $[\pm(F_{max} - F_{min})/(2 \cdot F_o)]$ .
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  $\sim 1\text{mA}$  when output is disabled.

## Package Layout

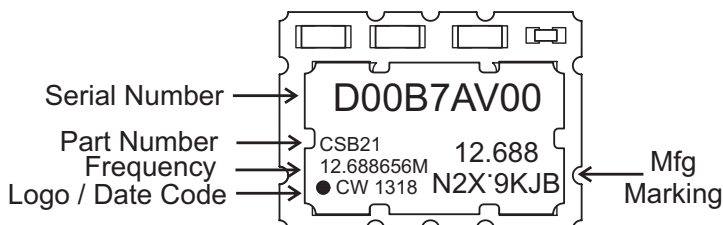


## Suggested Pad Layout



Keep Out Area: Do not route any traces in the keep out area. It is recommended the next layer under the keep out area is to be ground plane.

## Marking Information.



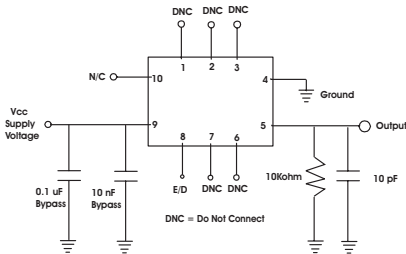
## Pad Connections

- 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

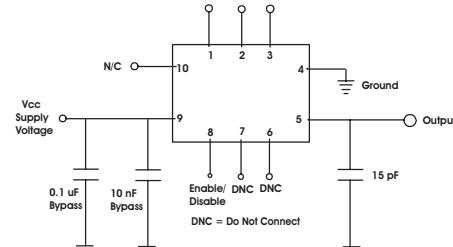
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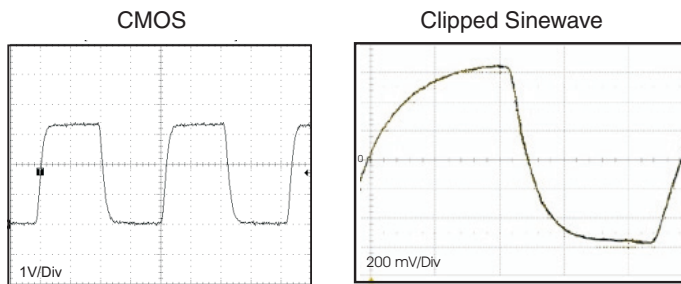
## Clipped Sinewave Test Circuit



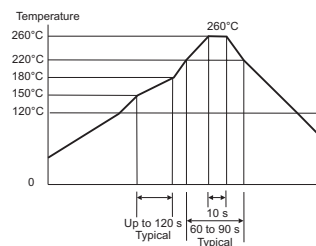
## CMOS Test Circuit



## Output Waveform

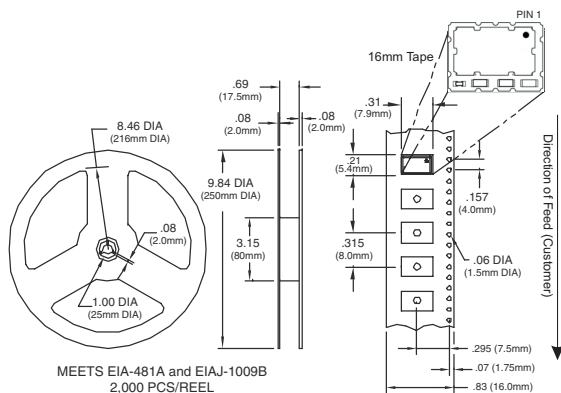


## Solder Profile

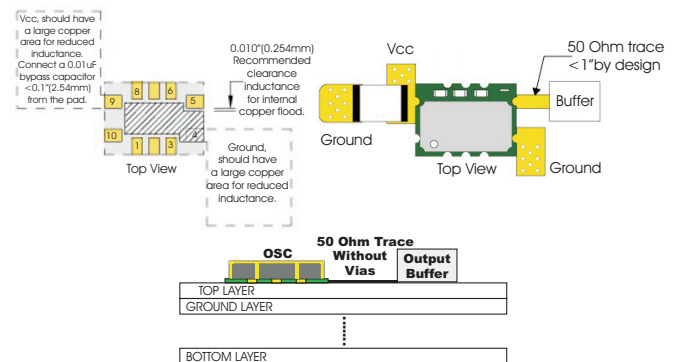


Meets IPC/JEDEC J-STD-020C

## Tape and Reel Dimensions



## 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 00 | Data sheet release. 01/03/10                                               |
| Revision 01 | Added 12.68875 MHz to the data sheet. 01/28/11                             |
| Revision 02 | Added conformance data 07/31/12                                            |
| Revision 03 | Updated marking, added serial number. 04/30/13                             |
| Revision 04 | Added IPC package drawing, footprint and test data availability. 10/22/13. |
| Revision 05 | Updated Voltage coefficient. 10/29/13                                      |

|          |                    |
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