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### Improved Performance 5x7mm TCXO / VCTCXO



### In Stock at Digi-Key

2111 Comprehensive Drive

Aurora, Illinois 60505

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### **Description:**

Connor-Winfield's TBxxx and TVBxxx series are 5x7mm TCXO and VCTCXO products with exceptional frequency stability and low phase noise. Through the use of analog temperature compensation, these products are capable of holding Stratum 3 level temperature stabilities of ±0.28 ppm over the commercial and industrial temperature ranges. Available in 4-pad or 10-pad surface mount footprints.

These products are designed for such applications as IEEE 1588 PTP or Synchronous Ethernet.

Using the latest analog TCXO technology, the TBxxx and TVBxxx series have improved phase noise and frequency stability performance.

### **Applications:**

- IEEE 1588 Applications
- Synchronous Ethernet slave clocks, ITU-T G.8262 EEC options 1 & 2
- Compliant to Stratum 3, GR-1244-CORE & GR-253-CORE
- Wireless Communications
- Small Cells
- · Test and Measurement



#### Features:

Frequency Stabilities Available:

+/-0.28 ppm (10 to 54 MHz) ✓ STRATUM 3

+/-0.50 ppm, +/-1.00 ppm or +/-2.00 ppm

(10 to 100 MHz)

Temperature Ranges Available:

0 to 85°C, 0 to 70°C, -40 to 85°C or -20 to 70°C

Packages Available:

TB - Series: 5 x 7mm - 10 Pad

TVB - Series: 5 x 7mm - 4 Pad

3.3 Vdc Operation

Output Logic: LVCMOS or Clipped Sinewave

Fixed Frequency - TCXO

Voltage Controlled - VCTCXO

Low Jitter < 0.50 ps RMS

Low Phase Noise

Tri-State Enable/Disable: (TB - Model Series Only)

Tape and Reel Packaging

RoHS Compliant / Lead Free ✓ RoHS

### Standard Frequencies Available \*

\* 10.0 MHz, 12.8 MHz, 19.2 MHz, 19.44 MHz, 20.0 MHz, 25.0 MHz, 38.88 MHz, 40 MHz and 50 MHz Available frequencies from the factory for small quantity orders or quick delivery. Additional frequencies are available.

### **Ordering Information**

TVB	5	0	4	- 010.0M
Type / Package TCXO / VCTCXO Series TB = 5.0x7.0 mm 10 Pads TVB = 5.0x7.0 mm 4 Pads	Temperature Range 3 = 0 to 85 °C 5 = 0 to 70 °C 6 = -40 to 85 °C 7 = -20 to 70 °C	$0 = \pm 0.28 \text{ ppm}$ $1 = \pm 0.50 \text{ ppm}$	Features 2 = TCXO, LVCMOS, 3.3 Vdc 3 = TCXO, Clipped Sinewave, 3.3 Vdc 4 = VCTCXO, LVCMOS, 3.3 Vdc 5 = VCTCXO, Clipped Sinewave, 3.3 Vdc	Output Frequency  Frequency Format -xxx.xM Min -xxx.xxxxxM Max *Amount of numbers after the decimal point. M = MHz



Bulletin	Tx380
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Example: Part Number

TVB504-010.0M = 5x7mm 4 pad package,  $\pm 0.28$  ppm, 0 to 70 °C, 3.3 Vdc, LVCMOS Output, VCTCXO TB715-012.8M = 5x7mm 10 pad package,  $\pm 0.50$  ppm, -20 to 70 °C, 3.3 Vdc, Clipped Sinewave Output, VCTCXO TB622-050.0M = 5x7mm 10 pad package,  $\pm 1.0$  ppm, -40 to 85 °C, 3.3 Vdc, LVCMOS Output, TCXO TVB602-010.0M = 5x7mm 4 pad package,  $\pm 0.28$  ppm, -40 to 85 °C, 3.3 Vdc, LVCMOS Output, TCXO



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Absolute Maximum Ratings					
Parameter	Minimum	Nominal	Maximum	Units	Notes
Storage Temperature	-55	-	125	°C	
Supply Voltage (Vcc)	-0.5	-	6.0	Vdc	
Input Voltage (Vc)	-0.5	-	Vcc + 0.5	Vdc	

Parameter         Minimum         Nominal         Maximum         Units         Notes           Output Frequency (Fo)         Models TBXDx, TVBxDx         10         -         50         MHz           Models TBXDx, TVBxDx         10         -         100         MHz           Models TBXDx, TVBxDx         10         -         100         MHz           Models TBXDx, TVBXDx         10         -         100         MHz           Models TBXX, TVBXXx         0         -         85         °C           Models TBSXX, TVBSXx         0         -         85         °C           Models TBXX, TVBXXx         0         -         85         °C           Models TBXX, TVBXXx         0         -         85         °C           Frequency Salbility (See Ordering Information or Full part number)         -         -         70         °C           Frequency Stability (See Ordering Information for full part number)         -		Operating	Specificat	ions		
Models TBx0x, TVBx0x         10         -         50         MHz           Models TBx2x, TVBx1x         10         -         100         MHz           Models TBx2x, TVBx2x         10         -         100         MHz           Models TBx3x, TVBx3xx         10         -         100         MHz           Operating Temperature Range         (See Ordering Information for full part number)         85         °C           Models TB5xx, TVB5xx         0         -         85         °C           Models TB6xx, TVB6xx         -40         -         85         °C           Models TB7xx, TVB7xx         -20         -         70         °C           Frequency Calibration @ 25 °C         -1.0         -         1.0         ppm         2           Frequency Stability (See Ordering Information for full part number)         Per Second         38         °C         Nodels TBx0x, TVBx0x         -0.28         -0.28         ppm         2         -0.28         -0.28         ppm         2         -0.28         -0.28         ppm         3         -0.28         -0.28         ppm         3         -0.28         -0.28         -0.28         -0.28         ppm         3         -0.28         -0.28         -0.28	Parameter				Units	Notes
Models TBx0x, TVBx0x         10         -         50         MHz           Models TBx2x, TVBx1x         10         -         100         MHz           Models TBx2x, TVBx2x         10         -         100         MHz           Models TBx3x, TVBx3xx         10         -         100         MHz           Operating Temperature Range         (See Ordering Information for full part number)         85         °C           Models TB5xx, TVB5xx         0         -         85         °C           Models TB6xx, TVB6xx         -40         -         85         °C           Models TB7xx, TVB7xx         -20         -         70         °C           Frequency Calibration @ 25 °C         -1.0         -         1.0         ppm         2           Frequency Stability (See Ordering Information for full part number)         Per Second         38         °C         Nodels TBx0x, TVBx0x         -0.28         -0.28         ppm         2         -0.28         -0.28         ppm         2         -0.28         -0.28         ppm         3         -0.28         -0.28         ppm         3         -0.28         -0.28         -0.28         -0.28         ppm         3         -0.28         -0.28         -0.28	Output Frequency (Fo)					
Models TBx2x, TVBx2x         10         -         100         MHz           Models TBx3x, TVBx3x         10         -         100         MHz           Operating Temperature Range         (See □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □		10	_	50	MHz	
Models TBx2x, TVBx2x         10         -         100         MHz         MHz         Models TBx3x, TVBx3x         10         -         100         MHz         MHz         Models TBx3x, TVBx3x         0         -         85         °C         C         Models TB5xx, TVB5xx         0         -         85         °C         C         Models TB5xx, TVB5xx         0         -         70         °C         C         Models TB6xx, TVB5xx         -40         -         70         °C         C         Models TB6xx, TVB5xx         -40         -         85         °C         -         -         C         Models TB6xx, TVB6xx         -40         -         1.0         ppm         1         -         -         -         1.0         ppm         1         -	•	10	_	100	MHz	
Models TBx3x, TVBx3x         10         -         100         MHz           Operating Temperature Range         (See Ordering Information for full part number)         Recompany         0         -         85         °C           Models TB5xx, TVB5xx         0         -         70         °C         -           Models TB6xx, TVB5xx         -40         -         85         °C           Models TB7xx, TVB7xx         -20         -         70         °C           Frequency Calibration @ 25 °C         -1.0         -         1.0         ppm         1           Frequency Stability (See Ordering Information for full part number) Per STRATUM 3 GR-1244-CORE         Models TBx0x, TVBx0x         -0.28         -         0.28         ppm         2           Models TBx1x, TVBx1x         -0.50         -         0.20         ppm         2           Models TBx2x, TVBx2x         -1.00         -         0.50         ppm         2           Models TBx3x, TVBx3x         -2.00         -         0.50         ppm         2           Models TBxx1x, TVBx1x         -0.50         -         0.50         ppm         2           Models TBx2x, TVBx2x         -1.00         -         0.20         ppm         2 </td <td></td> <td>10</td> <td>_</td> <td>100</td> <td>MHz</td> <td></td>		10	_	100	MHz	
Operating Temperature Range Models TB3xx, TVB3xx         (See Ordering Information for full part number)         85         °C           Models TB5xx, TVB6xx         0         -         85         °C           Models TB6xx, TVB6xx         -40         -         85         °C           Models TB7xx, TVB7xx         -20         -         70         °C           Frequency Calibration @ 25 °C         -1.0         -         1.0         ppm         1           Frequency Stability (See Ordering Information for full part number) Per STRATUM 3 GR-1244-CORE         Models TBx0x, TVBx0x         -0.28         -         0.28         ppm         2           Holdover Stability (See Ordering Information for full part number)         Per STRATUM 3 GR-1244-CORE         Models TBx1x, TVBx0x         -0.28         -         0.28         ppm         2           Frequency Stability (See Ordering Information for full part number)         Post of the ppm         2         ppm         2           Models TBx1x, TVBx1x         -0.50         -         0.50         ppm         2           Models TBx2x, TVBx2x         -1.00         -         1.00         ppm         2           Frequency vs. Load Stability         -0.20         -         0.20         ppm         ±5%           Stat		10	_	100	MHz	
Models TB3xx, TVB3xx         0         -         85         °C           Models TB6xx, TVB6xx         0         -         70         °C           Models TB6xx, TVB6xx         -40         -         85         °C           Models TB6xx, TVB7xx         -20         -         70         °C           Frequency Calibration @ 25 °C         -1.0         -         1.0         ppm         1           Frequency Stability         -0.28         -         0.28         ppm         2           Holdover Stability         -0.32         -         0.32         ppm         3           Frequency Stability         -0.50         -         0.50         ppm         2           Models TBx1x, TVBx1x         -0.50         -         0.50         ppm         2           Models TBx3x, TVBx3x         -2.00         -         0.50         ppm         2           Frequency Vs. Load Stability         -0.20         -         0.20         ppm         ±5%           Frequency Vs. Load Stability         -0.20         -         0.20         ppm         ±5%           Static Temperature Hysteresis         -         -         0.40         ppm         ±5% <td< td=""><td></td><td></td><td>derina Inform</td><td></td><td></td><td></td></td<>			derina Inform			
Models TB5xx, TVB5xx         0         -         70         °C           Models TB6xx, TVB6xx         -40         -         85         °C           Frequency Calibration № 25 °C         -1.0         -         1.0         ppm         1           Frequency Stability (See Ordering Information for full part number) Per STRATUM 3 GR-1244-CORE Models TBx0x, TVBx0x         -0.28         -         0.28         ppm         2           Holdover Stability         -0.32         -         0.28         ppm         2           Frequency Stability         -0.32         -         0.50         ppm         2           Models TBx1x, TVBx1x         -0.50         -         0.50         ppm         2           Models TBx3x, TVBx2x         -1.00         -         1.00         ppm         2           Models TBx3x, TVBx3x         -2.00         -         0.50         ppm         2           Models TBx3x, TVBx3x         -2.00         -         0.20         ppm         2           Frequency vs. Voltage Stability         -0.20         -         0.20         ppm         ±5%           Static Temperature Hysteresis         -         -         0.20         ppm         ±5%           Static Temperature Hy		•	-		,	
Models TB6xx, TVB6xx Models TB7xx, TVB7xx         -40         -         85         °C           Frequency Calibration @ 25 °C         -1.0         -         70         °C           Frequency Stability (See Ordering Information For full part number) Per STRATUM 3 GR-1244-CORE         -         0.28         ppm         2           Models TBx0x, TVBx0x         -0.28         -         0.28         ppm         2           Holdover Stability         -0.32         -         0.32         ppm         3           Frequency Stability         (See Ordering Information for full part number)         Very Calibration for full part number         Very Calibration for full part num		-	_		_	
Models TB7xx, TVB7xx         -20         -70         °C           Frequency Calibration @ 25 °C         -1.0         -         1.0         ppm         1           Frequency Stability (See Ordering Information for full part number) Per STRATUM 3 GR-1244-CORE         Models TBx0x, TVBx0x         -0.28         -         0.28         ppm         2           Holdover Stability         -0.32         -         0.32         ppm         3           Frequency Stability         -0.50         -         0.50         ppm         2           Models TBx2x, TVBx2x         -1.00         -         0.50         ppm         2           Models TBx3x, TVBx3x         -2.00         -         0.20         ppm         2           Models TBx3x, TVBx3x         -2.00         -         0.20         ppm         2           Models TBx3x, TVBx3x         -2.00         -         0.20         ppm         2           Frequency vs. Load Stability         -0.20         -         0.20         ppm         ±5%           Static Temperature Hysteresis         -         0.20         ppm         ±5%           Static Temperature Hysteresis         -         0.10         ppm         5           Long Term Stability	•		_		_	
Frequency Calibration @ 25 °C   -1.0   -   1.0   ppm   1	•		_			
Frequency Stability (See Ordering Information for full part number) Per STRATUM 3 GR-1244-CORE Models TBx0x, TVBx0x         -0.28         -0.28         ppm         2 ppm         2 ppm         3 ppm         2 ppm         4 ppm			_			1
Models TBx0x, TVBx0x         -0.28         -0.32         ppm         2           Holdover Stability         -0.32         -         0.32         ppm         3           Frequency Stability         (See Ordering Information for full part number)         Wodels TBx1x, TVBx1x         -0.50         -         0.50         ppm         2           Models TBx2x, TVBx2x         -1.00         -         1.00         ppm         2           Models TBx3x, TVBx3x         -2.00         -         2.00         ppm         2           Models TBx3x, TVBx3x         -2.00         -         0.20         ppm         2           Frequency vs. Load Stability         -0.20         -         0.20         ppm         ±5%           Frequency vs. Voltage Stability         -0.20         -         0.20         ppm         ±5%           Frequency vs. Voltage Stability         -0.20         -         0.20         ppm         ±5%           Frequency vs. Voltage Stability         -0.20         -         0.20         ppm         ±5%           Frequency vs. Voltage Stability         -0.20         -         0.40         ppm         ±5%           Static Temperature Hysteresis         -1.0         -         0.40         <			for full part nu			
Holdover Stability		-				
Frequency Stability   (See Ordering Information for full part number)   Models TBx1x, TVBx1x   -0.50   -     0.50   ppm   2   Models TBx2x, TVBx2x   -1.00   -     1.00   ppm   2   Models TBx2x, TVBx2x   -1.00   -     2.00   ppm   2   Models TBx3x, TVBx3x   -2.00   -     2.00   ppm   2   Erequency vs. Load Stability   -0.20   -     0.20   ppm   ±5%   Erequency vs. Voltage Stability   -0.20   -     0.20   ppm   ±5%   Erequency vs. Voltage Stability   -0.20   -     0.20   ppm   ±5%   Erequency vs. Voltage Stability   -0.20   -     0.20   ppm   ±5%   Erequency vs. Voltage Stability   -1.0   -     1.0   ppm   4   Ereq. shift after reflow soldering   -1.0   -     1.0   ppm   5   Engrey Stability   -1.0   -     1.0   ppm   6   Engrey Stability   -1.0   -     1.0   ppm   6   Engrey Stability   -1.0   -     1.0   ppm   6   Engrey Stability   -1.0   -     3.0   ppm   per Day   -40   -     40   ppb   per Second   -     4.63E-13   Engrey Stability   -40   -     40   ppb   P	,		_			
Models TBx1x, TVBx1x         -0.50         -         0.50         ppm         2           Models TBx2x, TVBx2x         -1.00         -         1.00         ppm         2           Models TBx3x, TVBx3x         -2.00         -         2.00         ppm         2           Frequency vs. Load Stability         -0.20         -         0.20         ppm         ±5%           Frequency vs. Voltage Stability         -0.20         -         0.20         ppm         ±5%           Static Temperature Hysteresis         -         -         0.40         ppm         4           Freq. shift after reflow soldering         -1.0         -         1.0         ppm         5           Long Term Stability         -1.0         -         1.0         ppm         5           Long Term Stability         -1.0         -         1.0         ppm         6           Aging per Life (20 Years)         -3.0         -         3.0         ppm         6           Aging per Life (20 Years)         -3.0         -         3.0         ppm         -           Supply Voltage (Vcc)         3.135         3.30         3.465         Vdc           Supply Current (Icc)         LVCMOS         - </td <td></td> <td></td> <td>ormation for fu</td> <td></td> <td>ρμιι</td> <td></td>			ormation for fu		ρμιι	
Models TBx2x, TVBx2x         -1.00         -         1.00         ppm         2           Models TBx3x, TVBx3x         -2.00         -         2.00         ppm         2           Frequency vs. Load Stability         -0.20         -         0.20         ppm         ±5%           Frequency vs. Voltage Stability         -0.20         -         0.20         ppm         ±5%           Static Temperature Hysteresis         -         -         0.40         ppm         4           Freq. shift after reflow soldering         -1.0         -         0.40         ppm         4           Freq. shift after reflow soldering         -1.0         -         1.0         ppm         5           Long Term Stability         -1.0         -         1.0         ppm         5           Long Term Stability         -1.0         -         1.0         ppm         6           Aging per Life (20 Years)         -3.0         -         3.0         ppm         ppm         6           Aging per Life (20 Years)         -3.0         -         3.0         ppm         ppb         ppb         ppb         ppb         ppc         ppm         4         63E-13         3.0         ppm         4.63E					nnm	2
Models TBx3x, TVBx3x         -2.00         -         2.00         ppm         2           Frequency vs. Load Stability         -0.20         -         0.20         ppm         ±5%           Frequency vs. Voltage Stability         -0.20         -         0.20         ppm         ±5%           Static Temperature Hysteresis         -         -         0.40         ppm         4           Freq. shift after reflow soldering         -1.0         -         1.0         ppm         5           Long Term Stability         -1.0         -         1.0         ppm         5           Long Term Stability         -1.0         -         1.0         ppm         6           Aging per Life (20 Years)         -3.0         -         3.0         ppm         ppm         6           Aging per Life (20 Years)         -3.0         -         3.0         ppm         ppm         6           Aging per Life (20 Years)         -3.0         -         3.0         ppm         ppm         6           Aging per Life (20 Years)         -3.0         -         3.0         ppm         ppm         ppm         4         6         2         1.0         ppm         ppm         4	,		-			
Frequency vs. Load Stability         -0.20         -         0.20         ppm         ±5%           Frequency vs. Voltage Stability         -0.20         -         0.20         ppm         ±5%           Static Temperature Hysteresis         -         -         0.40         ppm         4           Freq. shift after reflow soldering         -1.0         -         1.0         ppm         5           Long Term Stability         -1.0         -         1.0         ppm         5           Long Term Stability         -1.0         -         1.0         ppm         5           Aging per Life (20 Years)         -3.0         -         3.0         ppm         6           Aging per Life (20 Years)         -3.0         -         3.0         ppm         ppm         6           Aging per Life (20 Years)         -3.0         -         3.0         ppm         ppm         6         4         6         Ppm         ppm         6         4         6         2         4         6         2         4         6         8         7         0         5         1         0         ppm         ppm         ppm         ppm         ppm         9         1	· ·		-			
Frequency vs. Voltage Stability         -0.20         -         0.20         ppm         ±5%           Static Temperature Hysteresis         -         -         0.40         ppm         4           Freq. shift after reflow soldering         -1.0         -         1.0         ppm         5           Long Term Stability         -1.0         -         1.0         ppm         6           Aging         -         -         1.0         ppm         6           Aging         -         -         3.0         ppm         6           Aging         -         -         3.0         ppm         6           Aging         -         -         3.0         ppm         6           Aging         -         -         4.0         pp         7           Supply Voltage (Vcc)         3.135         3.30			-			
Static Temperature Hysteresis         -         -         0.40         ppm         4           Freq. shift after reflow soldering         -1.0         -         1.0         ppm         5           Long Term Stability         -1.0         -         1.0         ppm         6           Aging         per Life (20 Years)         -3.0         -         3.0         ppm         6           Aging         per Life (20 Years)         -3.0         -         3.0         ppm         6           Supply Current (lete (20 Years)         -40         -         4.63E-13         40         ppb         -           Supply Voltage (Vcc)         3.135         3.30         3.465         Vdc         -           Supply Current (lcc)         LVCMOS         -         2.1         6.0         mA         -           LVCMOS         -         2.1         6.0         mA         - <t< td=""><td></td><td></td><td>-</td><td></td><td></td><td></td></t<>			-			
Freq. shift after reflow soldering         -1.0         -         1.0         ppm         5           Long Term Stability         -1.0         -         1.0         ppm         6           Aging         per Life (20 Years)         -3.0         -         3.0         ppm         ppm           per Day         -40         -         40         ppb         ppb           per Second         -         4.63E-13         Vdc         Supply Voltage (Vcc)         3.135         3.30         3.465         Vdc           Supply Current (Icc)         LVCMOS         -         2.1         6.0         mA           Clipped Sinewave         -         1.3         2.9         mA           Jitter:         Period Jitter         -         3.0         5.0         ps RMS           Integrated Phase Jitter (12K to Fo/2)-         0.5         1.0         ps RMS         7           Typical SSB Phase Noise         For Fo         10.0 MHz         50.0 MHz         100.0 MHz         60         dBc/Hz           @ 10 Hz offset         -98         -70         -60         dBc/Hz           @ 10 KHz offset         -143         -122         -119			-			
Long Term Stability         -1.0         -         1.0         ppm         6           Aging per Life (20 Years) per Day         -3.0         -         3.0         ppm           per Day per Second         -40         -         40         ppb           per Second         -         4.63E-13         -         -           Supply Voltage (Vcc)         3.135         3.30         3.465         Vdc           Supply Current (Icc) LVCMOS         -         2.1         6.0         mA           Clipped Sinewave         -         1.3         2.9         mA           Jitter:         Period Jitter         -         3.0         5.0         ps RMS           Integrated Phase Jitter (12K to Fo/2) -         0.5         1.0         ps RMS         7           Typical SSB Phase Noise         For Fo         10.0 MHz         50.0 MHz         100.0 MHz         50.0 MHz           @ 10 Hz offset         -98         -70         -60         dBc/Hz         4Bc/Hz           @ 10 KHz offset         -143         -122         -119         dBc/Hz           @ 10 KHz offset         -151         -145         -142         dBc/Hz           @ 100 KHz offset         -152         -150 <td></td> <td></td> <td>-</td> <td></td> <td></td> <td>-</td>			-			-
Aging       per Life (20 Years)       -3.0       -       3.0       ppm         per Day       -40       -       40       ppb         per Second       -       4.63E-13         Supply Voltage (Vcc)       3.135       3.30       3.465       Vdc         Supply Current (Icc)       VCMOS       -       2.1       6.0       mA         Clipped Sinewave       -       1.3       2.9       mA         Jitter:         Period Jitter       -       3.0       5.0       ps RMS         Integrated Phase Jitter (12K to Fo/2) -       0.5       1.0       ps RMS       7         Typical SSB Phase Noise         For Fo       10.0 MHz       50.0 MHz       100.0 MHz       50.0 MHz       100.0 MHz       60.0 dBc/Hz       <			-			
per Life (20 Years)         -3.0         -         3.0         ppm           per Day         -40         -         40         ppb           per Second         -         4.63E-13         -           Supply Voltage (Vcc)         3.135         3.30         3.465         Vdc           Supply Current (Icc)         -         2.1         6.0         mA           LVCMOS         -         2.1         6.0         mA           Clipped Sinewave         -         1.3         2.9         mA           Jitter:         -         3.0         5.0         ps RMS           Integrated Phase Jitter (12K to Fo/2) -         0.5         1.0         ps RMS         7           Typical SSB Phase Noise         -         0.5         1.0         ps RMS         7           Typical SSB Phase Noise         -         0.0         dBc/Hz         0.0         0		-1.0	-	1.0	ppm	6
per Day         -40         -         40         ppb           per Second         -         4.63E-13         -           Supply Voltage (Vcc)         3.135         3.30         3.465         Vdc           Supply Current (Icc)         -         2.1         6.0         mA           LVCMOS         -         2.1         6.0         mA           Clipped Sinewave         -         1.3         2.9         mA           Jitter:           Period Jitter         -         3.0         5.0         ps RMS           Integrated Phase Jitter (12K to Fo/2)-         0.5         1.0         ps RMS         7           Typical SSB Phase Noise           For Fo         10.0 MHz         50.0 MHz         100.0 MHz         400.0 MHz         100.0 MHz         400.0		2.0		2.0	nnm	
per Second         -         4.63E-13           Supply Voltage (Vcc)         3.135         3.30         3.465         Vdc           Supply Current (Icc)         LVCMOS         -         2.1         6.0         mA           Clipped Sinewave         -         1.3         2.9         mA           Jitter:         Period Jitter         -         1.3         2.9         mA           Jitter:         Period Jitter (12K to Fo/2) -         3.0         5.0         ps RMS           Integrated Phase Jitter (12K to Fo/2) -         0.5         1.0         ps RMS         7           Typical SSB Phase Noise         For Fo         10.0 MHz         50.0 MHz         100.0 MHz         7           © 10 Hz offset         -98         -70         -60         dBc/Hz           © 100 Hz offset         -125         -100         -91         dBc/Hz           © 10 KHz offset         -143         -122         -119         dBc/Hz           © 100 KHz offset         -151         -145         -142         dBc/Hz           © 100 KHz offset         -152         -150         -153         dBc/Hz           © 1 MHz offset         -155			-			
Supply Voltage (Vcc)         3.135         3.30         3.465         Vdc           Supply Current (Icc)         LVCMOS         -         2.1         6.0         mA           LVCMOS         -         1.3         2.9         mA           Clipped Sinewave         -         1.3         2.9         mA           Jitter:           Period Jitter         -         3.0         5.0         ps RMS           Integrated Phase Jitter (12K to Fo/2) -         0.5         1.0         ps RMS         7           Typical SSB Phase Noise           For Fo         10.0 MHz         50.0 MHz         100.0 MHz         50.0 MHz         100.0 MHz         1			- 4.00E 40	40	ppp	
Supply Current (Icc)         LVCMOS       -       2.1       6.0       mA         Clipped Sinewave       -       1.3       2.9       mA         Jitter:         Period Jitter       -       3.0       5.0       ps RMS         Integrated Phase Jitter (12K to Fo/2) -       0.5       1.0       ps RMS       7         Typical SSB Phase Noise         For Fo       10.0 MHz       50.0 MHz       100.0 MHz       100.0 MHz         @ 10 Hz offset       -98       -70       -60       dBc/Hz         @ 100 Hz offset       -125       -100       -91       dBc/Hz         @ 1 KHz offset       -143       -122       -119       dBc/Hz         @ 10 KHz offset       -151       -145       -142       dBc/Hz         @ 100 KHz offset       -152       -150       -153       dBc/Hz         @ 1 MHz offset       -155       -152       -153       dBc/Hz				0.405	\/a a	
LVCMOS       -       2.1       6.0       mA         Clipped Sinewave       -       1.3       2.9       mA         Jitter:         Period Jitter       -       3.0       5.0       ps RMS         Integrated Phase Jitter (12K to Fo/2) -       0.5       1.0       ps RMS       7         Typical SSB Phase Noise         For Fo       10.0 MHz       50.0 MHz       100.0 MHz         @ 10 Hz offset       -98       -70       -60       dBc/Hz         @ 100 Hz offset       -125       -100       -91       dBc/Hz         @ 1 KHz offset       -143       -122       -119       dBc/Hz         @ 10 KHz offset       -151       -145       -142       dBc/Hz         @ 100 KHz offset       -152       -150       -153       dBc/Hz         @ 1 MHz offset       -155       -152       -153       dBc/Hz		3.135	3.30	3.405	vac	
Clipped Sinewave         -         1.3         2.9         mA           Jitter:           Period Jitter         -         3.0         5.0         ps RMS           Integrated Phase Jitter (12K to Fo/2) -         0.5         1.0         ps RMS         7           Typical SSB Phase Noise           For Fo         10.0 MHz         50.0 MHz         100.0 MHz         50.0 MHz         100.0 MHz <td></td> <td></td> <td>0.4</td> <td>0.0</td> <td>^</td> <td></td>			0.4	0.0	^	
Jitter:         Period Jitter       -       3.0       5.0       ps RMS       7         Integrated Phase Jitter (12K to Fo/2) -       0.5       1.0       ps RMS       7         Typical SSB Phase Noise       For Fo       10.0 MHz       50.0 MHz       100.0 MHz       50.0 MHz       100.0 MHz       50.0 MHz       100.0 MHz       60.0 MHz       40.0 MHz       60.0 MBc/Hz       40.0 MBc/Hz       60.0 MBc/Hz <th< td=""><td></td><td>-</td><td></td><td></td><td></td><td></td></th<>		-				
Period Jitter         -         3.0         5.0         ps RMS           Integrated Phase Jitter (12K to Fo/2) -         0.5         1.0         ps RMS         7           Typical SSB Phase Noise         For Fo         10.0 MHz         50.0 MHz         100.0 MHz         50.0 MHz         100.0			1.3	2.9	mA	
Integrated Phase Jitter (12K to Fo/2) -         0.5         1.0         ps RMS         7           Typical SSB Phase Noise         For Fo         10.0 MHz         50.0 MHz         100.0 MHz         50.0 MHz         100.0 MHz         50.0 MHz         100.0 MHz			0.0	F 0	DMC	
Typical SSB Phase Noise           For Fo         10.0 MHz         50.0 MHz         100.0 MHz           @ 10 Hz offset         -98         -70         -60         dBc/Hz           @ 100 Hz offset         -125         -100         -91         dBc/Hz           @ 1 KHz offset         -143         -122         -119         dBc/Hz           @ 10 KHz offset         -151         -145         -142         dBc/Hz           @ 100 KHz offset         -152         -150         -153         dBc/Hz           @ 1 MHz offset         -155         -152         -153         dBc/Hz		- -				7
For Fo         10.0 MHz         50.0 MHz         100.0 MHz           @ 10 Hz offset         -98         -70         -60         dBc/Hz           @ 100 Hz offset         -125         -100         -91         dBc/Hz           @ 1 KHz offset         -143         -122         -119         dBc/Hz           @ 10 KHz offset         -151         -145         -142         dBc/Hz           @ 100 KHz offset         -152         -150         -153         dBc/Hz           @ 1 MHz offset         -155         -152         -153         dBc/Hz		F0/2)-	0.5	1.0	ps RIVIS	
@ 10 Hz offset       -98       -70       -60       dBc/Hz         @ 100 Hz offset       -125       -100       -91       dBc/Hz         @ 1 KHz offset       -143       -122       -119       dBc/Hz         @ 10 KHz offset       -151       -145       -142       dBc/Hz         @ 100 KHz offset       -152       -150       -153       dBc/Hz         @ 1 MHz offset       -155       -152       -153       dBc/Hz	• •	40.0 141.1	50.0 1411	400 0 1411		
@ 100 Hz offset       -125       -100       -91       dBc/Hz         @ 1 KHz offset       -143       -122       -119       dBc/Hz         @ 10 KHz offset       -151       -145       -142       dBc/Hz         @ 100 KHz offset       -152       -150       -153       dBc/Hz         @ 1 MHz offset       -155       -152       -153       dBc/Hz					ID // I	
@ 1 KHz offset       -143       -122       -119       dBc/Hz         @ 10 KHz offset       -151       -145       -142       dBc/Hz         @ 100 KHz offset       -152       -150       -153       dBc/Hz         @ 1 MHz offset       -155       -152       -153       dBc/Hz					•	
@ 10 KHz offset       -151       -145       -142       dBc/Hz         @ 100 KHz offset       -152       -150       -153       dBc/Hz         @ 1 MHz offset       -155       -152       -153       dBc/Hz						
@ 100 KHz offset -152 -150 -153 dBc/Hz @ 1 MHz offset -155 -152 -153 dBc/Hz					,	
@ 1 MHz offset -155 -152 -153 dBc/Hz					•	
Start-Up I ime 10 ms		-155	-152			
	Start-Up Time		-	-	10	ms

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Control Voltage Input Characteristics
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Parameter	Minimum	Nominal	Maximum	Units	Notes
Control Voltage	0.3	1.65	3.0	V	
Frequency Pullability	±10	-	-	ppm	
Control Voltage Slope		Positive Slope			
Monotonic Linearity	_	- '	10	%	
Input Impedance	100K	-	-	Ohm	
Modulation Bandwidth (3dB)	10	-	-	KHz	

### Enable / Disable Input Characteristics (Pad 8)

### **TB Series only**

Parameter	Minimum	Nominal	Maximum	Units	Notes	
Enable Input Voltage -(Vih) Disable Input Voltage - (Vil)	70%Vcc -	<del>-</del> -	- 30%Vcc	Vdc Vdc	8 8	
Function	Output					

Function Output

Low: Disabled (High Impedance) High or Open: Enabled

LVCMOS Output Characteristics

	VCMOS Out	put Griarac	teristics		
Parameter	Minimum	Nominal	Maximum	Units	Notes
Load (CL)	-	15	-	pF	9
Voltage (High) (Voh)	90%Vcc	-	-	Vdc	
(Low) (Vol)	-	-	10%Vcc	Vdc	
Duty Cycle at 50% of Vcc	45	50	55	%	
Rise / Fall Time 10% to 90%	-	4	8	ns	

### **Clipped Sinewave Output Characteristics**

Parameter	Minimum	Nominal	Maximum	Units	Notes
Load (CL)					
Output Load Resistance	-	10K	-	Ohm	
Output Load Capacitance	-	10	-	рF	
Output Voltage(≤ 40 MHz)	1.0	1.2	-	·V	pk-pk
Output Voltage(>40 MHz)	0.8	1.0	-	V	pk-pk

### **Package Characteristics**

Package Hermetically sealed ceramic package with grounded metal cover

### **Environmental Characteristics**

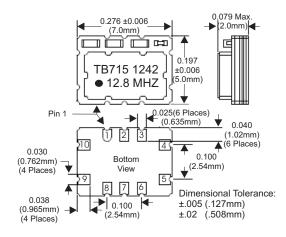
Vibration:	Vibration per Mil Std 883E Method 2007.3 Test Condition A.
Shock:	Mechanical Shock per Mil Std 883E Method 2002.4 Test Condition B.
Soldering Process:	RoHS compliant lead free. See soldering profile on page 2.

#### Notes:

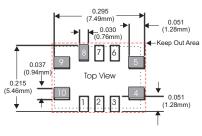
- 1. Initial calibration @  $25^{\circ}$ C.  $\pm 2^{\circ}$ C, for VCTCXO's Vc = 1.65V. Specifications at time of shipment after 48 hours of operation.
- 2. Frequency stability vs. change in temperature. [±(Fmax-Fmin)/(2\*Fo]). For VCTCXO's Vc -= 1.65V
- 3. Inclusive of frequency stability, supply voltage change ( $\pm 1\%$ ), aging, for 24 hours. Per STRATUM 3 GR-1244-CORE.
- 4. Frequency change after reciprocal temperature ramped over the operating range. Frequency measured before and after at 25°C
- 5. Two consecutive solder reflows after 1 hour recovery @ 25°C.
- 6. Frequency drift over 1 year @ 25°C.
- 7. BW = 12 KHz to 20 MHz
- 8. Leave Pad 8 on the TB Series unconnected if enable / disable function is not required. When tri-stated, the output stage is disabled but the oscillator and compensation circuit are still active (current consumption < 1 mA).
- 9. 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.

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### TB Series Suggested Pad Layout

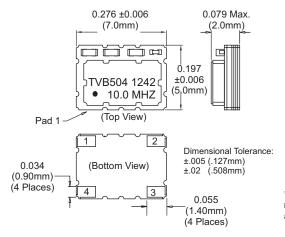


\* Do not route any traces in the keep out area. It is recommended the next layer under the keep out area is to be ground plane.

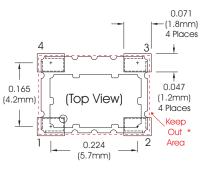
### TB Series Pad Connections

_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
9:	Supply Voltage (Vcc
10:	VCTCXO: Control Voltage (Vc)
	TCXO: N/C

# TVB Series Package Outline



### TVB Series Suggested Pad Layout



\* 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.

## TVB Series Pad Connections

1:	VCTCXO: Voltage Control (Vc) TCXO: N/C
2:	Ground
3:	Output
4:	Supply (Vcc)

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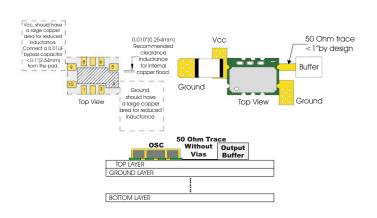


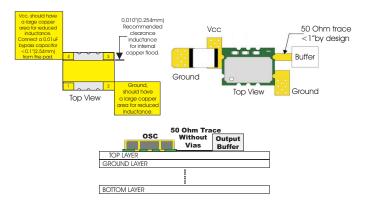
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### **TB Series Design Recommendations**

### **TVB Series Design Recommendations**

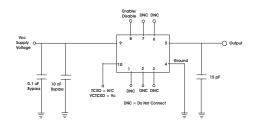


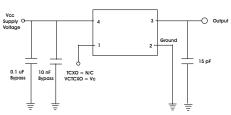


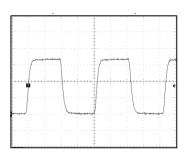
# TB Series LVCMOS Test Circuit

TVB Series LVCMOS Test Circuit

**LVCMOS Output Waveform** 



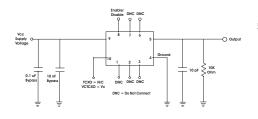


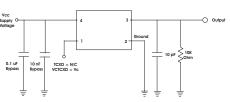


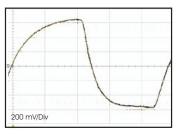
# TB Series Clipped Sinewave Test Circuit

TVB Series Clipped Sinewave Test Circuit

Clipped Sinewave Output Waveform







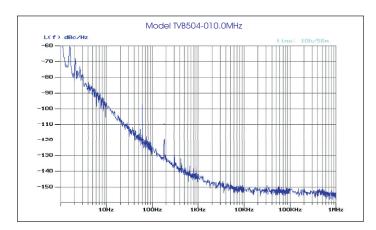
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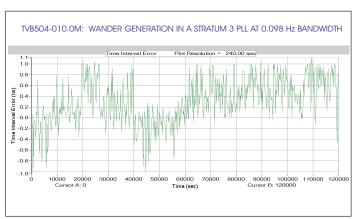
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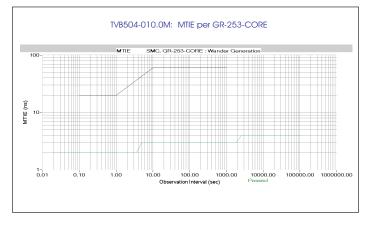
### **Phase Noise Information**



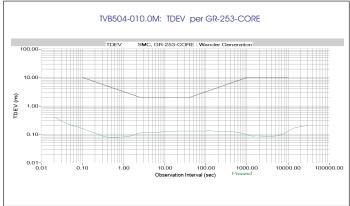
### TIE



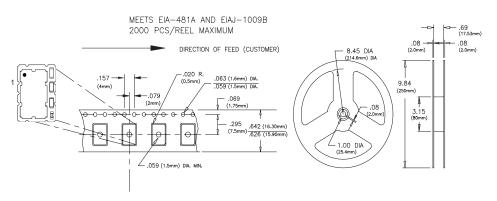
### **MTIE**



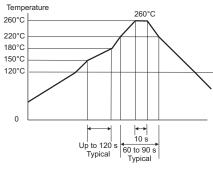
### **TDEV**



### 5x7mm Tape and Reel Information



### Solder Profile



#### Meets IPC/JEDEC J-STD-020C

Revision	History
ILCVISION	I HOLOI Y

Revision 00	Data sheet released 10/23/12
Revision 01	Added Digi-Key 11/29/12.
Revision 02	Increased frequency range to 100 MHz 02/25/13

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