Telecom Performance TCXO / VCTCXO

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Description:

The Connor-Winfield 5x7mm Temperature Compensated Crystal Controlled Oscillators and Voltage Controlled Temperature Compensated Crystal Controlled Oscillators are designed for use in S3 Telecom Applications. Through the use of Analog Temperature Compensation, this device is capable of holding sub 1-ppm stabilities over the commercial or the industrial temperature ranges. All models will meet ±4.6 ppm accuracies for twenty years. Three STRATUM 3 compliant model series are available.

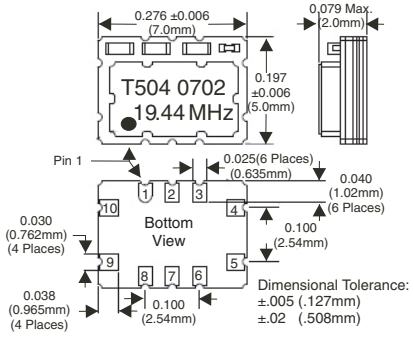
Features

- Miniature 5 x 7mm Surface Mount Package
- 3.3V Operation
- LVCMOS or Clipped Sinewave Output Logic
- Frequency Stabilities Available:
  - T30x / T50x / T60x / T70x: ±0.28ppm
  - T31x / T51x / T61x / T71x: ±0.50ppm
  - T32x / T52x / T62x / T72x: ±1.00ppm
  - T33x / T53x / T63x / T73x: ±2.00ppm
- Temperature Ranges Available:
  - T3xx Series: 0 to 85°C
  - T5xx Series: 0 to 70°C
  - T6xx Series: -40 to 85°C
  - T7xx Series: -20 to 70°C
- Frequency Tolerance: ±4.60 ppm for 20 years.
- Aging: <4.63E-13 / second
- Low Jitter <1ps RMS
- Tri-State Enable/Disable Function
- Tape and Reel Packaging
- RoHS Compliant / Lead Free
- Recommended for New Designs

STRATUM 3 Applications

- Timing Reference Clocks
- Instrumentation

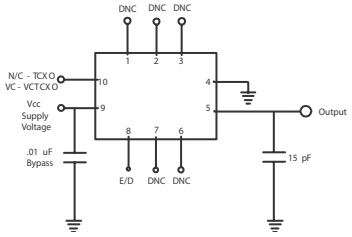
Package Layout



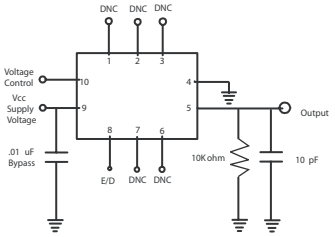
Pad Connections

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:	Tri-state Enable /Disable
9:	Supply, Vcc
10:	Voltage Control (VCTCXO) N/C (TCXO)

LVCMOS Test Circuit



Clipped Sinewave Test Circuit



Standard Frequencies Available *

6.4 MHz, 9.72 MHz, 10.0 MHz, 10.24 MHz, 12.5 MHz, 12.8 MHz, 13.5 MHz, 19.2 MHz, 19.44 MHz, 20.0 MHz, 20.48 MHz, 25.0 MHz, 27.0 MHz, 38.88 MHz

* Available frequencies from the factory for small quantity orders or quick delivery. Additional frequencies are available.

Ordering Information

T	5	0	4	019.44M
Type: Precision TCXO VCTCXO 5x7mm	Temperature Range 3 = 0 to 85°C 5 = 0 to 70°C 6 = -40 to 85°C 7 = -20 to 70°C	Frequency Stability 0 = ±0.28 ppm 1 = ±0.50 ppm 2 = ±1.00 ppm 3 = ±2.00 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.xxxxxxM Max.* * Amount of numbers after the decimal point. M = MHz

Example:

T504-019.44M = 5x7mm, VCTCXO, LVCMOS, 3.3Vdc, 0 to 70°C, ±28ppm, Output Frequency 19.44MHz

To order an T504 with an output frequency of: 6.4 MHz = T504-006.4M
20 MHz = T504-020.0M
38.88 MHz = T504-038.88M

RoHS COMPLIANT

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Model Specifications

Model Number	T302	T303	T304	T305	✓STRATUM 1
Temperature Range		0 to 85°C			
Model Number	T502	T503	T504	T505	✓STRATUM 1
Temperature Range		0 to 70°C			
Model Number	T602	T603	T604	T605	✓STRATUM 1
Temperature Range		-40 to 85°C			
Model Number	T702	T703	T704	T705	✓STRATUM 1
Temperature Range		-20 to 70°C			
Output Type	LVCMOS Clipped Sinewave	LVCMOS	Clipped Sinewave		
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range		6.4 to 40 MHz			
Frequency Stability		±0.28ppm			1
Supply Voltage	3.3Vdc				
Holdover Stability		±0.32ppm			2
Aging / Life		±3.0ppm			3
Aging / Day		±40ppb			
Aging / Second		4.63E-13			

Model Specifications

Model Number	T312	T313	T314	T315	
Temperature Range		0 to 85°C			
Model Number	T512	T513	T514	T515	
Temperature Range		0 to 70°C			
Model Number	T612	T613	T614	T615	
Temperature Range		-40 to 85°C			
Model Number	T712	T713	T714	T715	
Temperature Range		-20 to 70°C			
Output Type	LVCMOS Clipped Sinewave	LVCMOS	Clipped Sinewave		
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range		6.4 to 40 MHz			
Frequency Stability		±0.50ppm			1
Supply Voltage	3.3Vdc				
Frequency Aging		±3.0ppm			3

Model Specifications

Model Number	T322	T323	T324	T325	
Temperature Range		0 to 85°C			
Model Number	T522	T523	T524	T525	
Temperature Range		0 to 70°C			
Model Number	T622	T623	T624	T625	
Temperature Range		-40 to 85°C			
Model Number	T722	T723	T724	T725	
Temperature Range		-20 to 70°C			
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave	
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range		6.4 to 52 MHz			
Frequency Stability		±1.00ppm			1
Supply Voltage	3.3Vdc				
Frequency Aging		±3.0ppm			3

Model Specifications

Model Number	T332	T333	T334	T335	
Temperature Range		0 to 85°C			
Model Number	T532	T533	T534	T535	
Temperature Range		0 to 70°C			
Model Number	T632	T633	T634	T635	
Temperature Range		-40 to 85°C			
Model Number	T732	T733	T734	T735	
Temperature Range		-20 to 70°C			
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave	
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range		6.4 to 52 MHz			
Frequency Stability		±2.00ppm			1
Supply Voltage	3.3Vdc				
Frequency Aging		±3.0ppm			3

Operating Specifications

Parameter			Minimum	Nominal	Maximum	Units	Notes
TCXO Frequency Calibration @ 25°C			-1.00	-	1.00	ppm	4
Supply Voltage Variation. (Vcc±5%)			-0.05	-	0.05	ppm	
Load Coefficient, ±5%			-0.05	-	0.05	ppm	
Static Temperature Hysteresis			-0.4	-	0.4	ppm	5
Total Frequency Tolerance			-4.60	-	4.60	ppm	6
Supply Voltage (±5%)	(Vcc)		3.135	3.3	3.465	Vdc	7
Supply Current	(Icc)		-	6	10	mA	
Period Jitter			-	3	5	ps rms	
Integrated Phase Jitter (BW=12kHz to 20MHz)			-	0.3	1.0	ps rms	
SSB Phase Noise at 10Hz offset			-	-90	-85	dBc/Hz	8
SSB Phase Noise at 100Hz offset			-	-120	-115	dBc/Hz	8
SSB Phase Noise at 1KHz offset			-	-140	-135	dBc/Hz	8
SSB Phase Noise at >10KHz offset			-	-150	-145	dBc/Hz	8
SSB Phase Noise at >100KHz offset			-	-152	-150	dBc/Hz	8
Start Up Time			-	-	1	ms	9

Input Characteristics For Enable / Disable Function (Pad 8)

Parameter		Minimum	Nominal	Maximum	Units	Notes
Enable Voltage (High) or open circuit	(Vih)	70% Vcc	-	-	Vdc	10
Disable Voltage (Low) Output Tri-stated	(Vil)	-	-	30% Vcc	Vdc	

Input Characteristics For Voltage Control (Pad10)

Parameter		Minimum	Nominal	Maximum	Units	Notes
Control Voltage Range (Vcc = 3.3V)	(Vc)	0.3	1.65	3.0	Vdc	
Frequency Tuning		±10	-	-	ppm	11
Linearity		±5	-	-	%	
Input Impedance		100K	-	-	Ohm	
Modulation Bandwidth (3dB)		10	-	-	KHz	
Slope			Positive			

LVCMOS Output Characteristics

Parameter			Minimum	Nominal	Maximum	Units	Notes
LOAD			-	15	-	pF	12
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	

Clipped Sinewave Output Characteristics

Parameter	Minimum	Nominal	Maximum	Units	Notes
Load					13
Output Load Resistance	-	10K	-	Ohms	
Output Load Capacitance	-	10	-	pF	12
Output Voltage (< 40 MHz)	1.00	-	-	V pk-pk	
Output Voltage (> 40 MHz)	0.80	-	-	V pk-pk	

Notes:

1. *Frequency stability vs. change in temperature. [±(Fmax – Fmin)/2.Fo].*
2. *Inclusive of frequency stability, supply voltage change (±1%), aging, for 24 hours.*
3. *Over twenty years*
4. *TCXO: Initial calibration @ 25°C. Specifications at time of shipment after 48 hours of operation.*
5. *Frequency change after reciprocal temperature ramped over the operating range. Frequency measured before and after at 25°C.*
6. *Inclusive of calibration @ 25°C, frequency vs. change in temperature, change in supply voltage (±5%), load change (±5%), reflow soldering process and 20 years aging.*
7. *For best in application performance, careful selection of an external power source is critical. Select an external regulator that meets or exceeds to following specifications regarding voltage regulation tolerance, initial accuracy, temperature coefficient, voltage noise, and low voltage noise density* ***Factory Test Conditions****: Initial Accuracy ±2mv, Noise (0.1Hz to 10 KHz) 15uV p-p, Voltage Noise Density = 50nV/srt Hz, Temperature Coefficient < 5ppm/°C.*
8. *Phase noise measurements Fo = 20 MHz, other frequencies may vary by 20log F/20MHz.*
9. *Typical start up time for the frequency range of 12.8 MHz to 25 MHz ≤330 us.*
10. *Leave Pad 8 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 ≤ 1mA).*
11. *Additional pull ranges are available; please contact the factory for additional information.*
12. *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..*
13. *Output is AC coupled.*

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Absolute Maximum Ratings

Parameter	Minimum	Nominal	Maximum	
Storage Temperature	-55	-	85	°C
Supply Voltage (Vcc)	-0.5	-	6.0	Vdc
Input Voltage	-0.5	-	Vcc+0.5	Vdc

CONNOR WINFIELD

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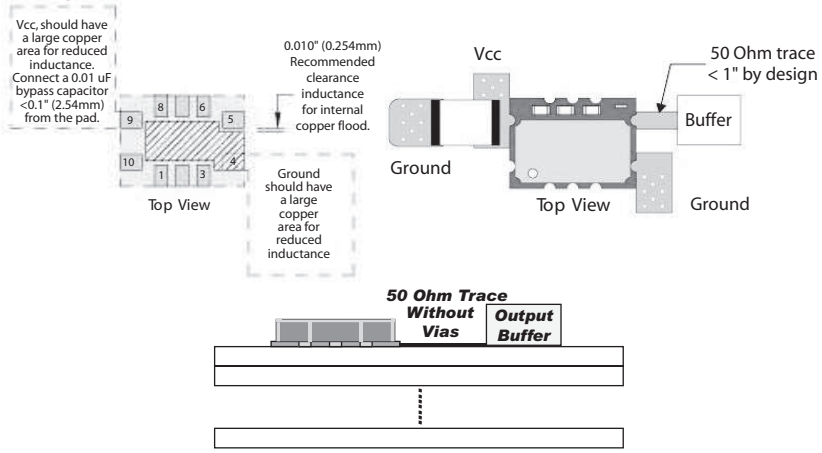
Package Characteristics

Package Hermetically sealed surface mount package with metal cover.

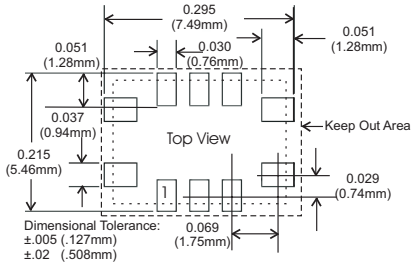
Environmental Characteristics

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:	SMD product suitable for Convection Reflow soldering. Peak temperature 260°C. Maximum time above 220°C, 60 seconds.

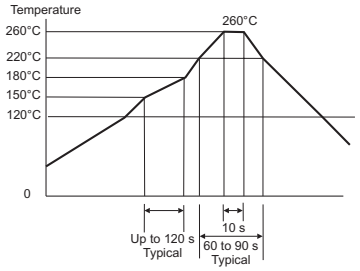
Design Recommendations



Suggested Pad Layout

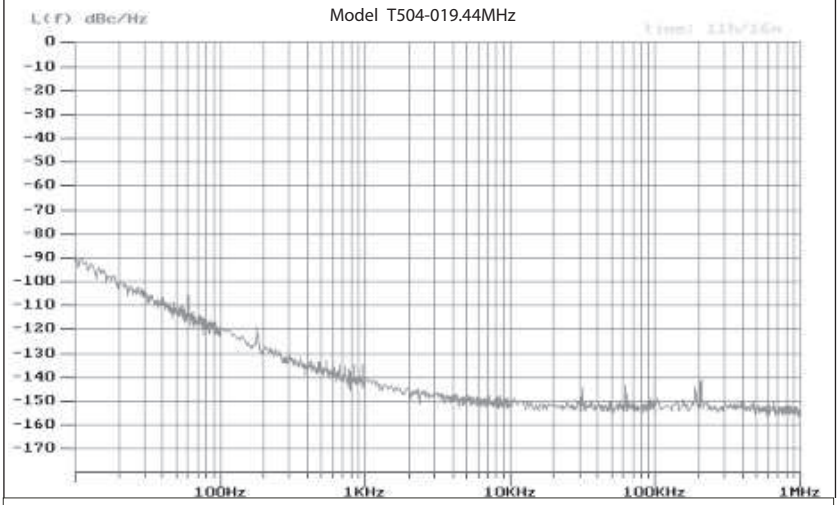


Solder Profile

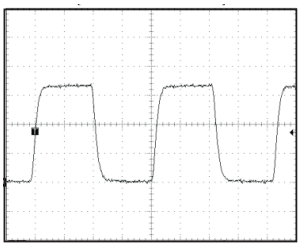


Meets IPC/JEDEC J-STD-020C

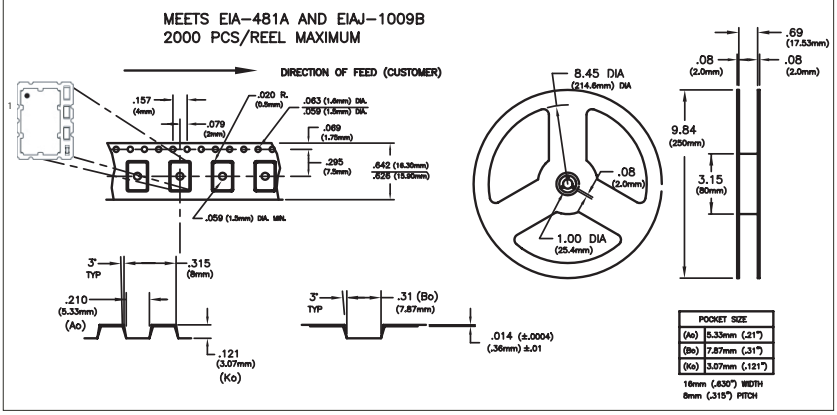
Typical Phase Noise



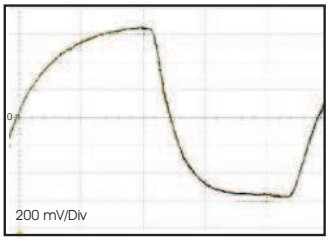
LVCMOS Output Waveform



Tape and Reel Specifications



Clipped Sinewave Output Waveform



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