

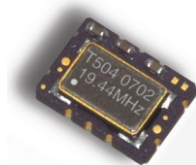
5.0 x 7.0mm Surface Mount Package LVCMOS, Clipped Sinewave T5xx Series and T6xx Series



TCXO / VCVCXO

Description

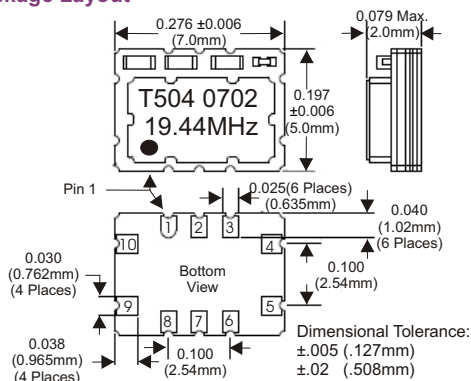
The Connor-Winfield 5.0x7.0mm Temperature Compensated Crystal Controlled Oscillators (TCXO series) and Voltage Controlled Temperature Compensated Crystal Controlled Oscillators (VCTCXO series) are designed for use in S3 Telecom applications. Through the use of Analog Temperature Compensation, this device is capable of holding sub 1-ppm stabilities over the commercial or the industrial temperature ranges. All models meet +/-4.6ppm accuracies for twenty years.



Features:

- TCXO or VCTCXO
- 3.3V Operation
- LVCMOS or Clipped Sinewave Output Logic
- Frequency Stabilities Available:
 - T50x / T60x: ±0.28ppm
 - T51x / T61x: ±0.50ppm
 - T52x / T62x: ±1.00ppm
- Temperature Ranges Available:
 - T5xx Series: 0 to 70°C
 - T6xx Series: -40 to 85°C
- Low Jitter < 1pS RMS
- Tri-State Enable/Disable
- Surface Mount Package
- Tape and Reel Packing
- Lead Free
- RoHS Compliant

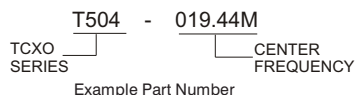
Package Layout



Pin 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)

Ordering Information



Standard Frequencies Available *

- 6.4 MHz 9.72 MHz 10.0 MHz
- 12.8 MHz 19.44 MHz 20.0 MHz

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

Standard Models Numbers Available

Table 1.0

LVCMOS Model Number	Clipped Sinewave Model Number	Frequency Range	Frequency Stability	Temperature Range	TCXO / VCTCXO
T502	T503	6.4 to 27 MHz	±0.28 ppm	0 to 70°C	TCXO
T602	T603	6.4 to 27 MHz	±0.28 ppm	-40 to 85°C	TCXO
T504	T505	6.4 to 27 MHz	±0.28 ppm	0 to 70°C	VCTCXO
T604	T605	6.4 to 27 MHz	±0.28 ppm	-40 to 85°C	VCTCXO
T512	T513	6.4 to 40 MHz	±0.50 ppm	0 to 70°C	TCXO
T612	T613	6.4 to 40 MHz	±0.50 ppm	-40 to 85°C	TCXO
T514	T515	6.4 to 40 MHz	±0.50 ppm	0 to 70°C	VCTCXO
T614	T615	6.4 to 40 MHz	±0.50 ppm	-40 to 85°C	VCTCXO
T522	T523	6.4 to 52 MHz	±1.00 ppm	0 to 70°C	TCXO
T622	T623	6.4 to 52 MHz	±1.00 ppm	-40 to 85°C	TCXO
T524	T525	6.4 to 52 MHz	±1.00 ppm	0 to 70°C	VCTCXO
T624	T625	6.4 to 52 MHz	±1.00 ppm	-40 to 85°C	VCTCXO



Bulletin	Tx176
Page	1 of 4
Revision	03
Date	08 Mar 2007

Absolute Maximum Ratings

Table 2.0

Parameter	Minimum	Nominal	Maximum	Units	Notes
Storage Temperature	-55	-	125	°C	
Supply Voltage (Vcc)	-0.5	-	6.0	Vdc	
Input Voltage (Vcc)	-0.5	-	Vcc+0.6	Vdc	

Model Specifications

Table 3.0
Notes

Model Number	T502	T503	T504	T505	Notes
Output Type	LVC MOS	Clipped Sinewave	LVC MOS	Clipped Sinewave	
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range	6.4 to 27 MHz				
Frequency Stability	±0.28ppm				1
Supply Voltage	3.3Vdc				
Temperature Range	0 to 70°C				
Holdover Stability	±0.32ppm				2

Table 4.0
Notes

Model Number	T602	T603	T604	T605	Notes
Output Type	LVC MOS	Clipped Sinewave	LVC MOS	Clipped Sinewave	
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range	6.4 to 27 MHz				
Frequency Stability	±0.28ppm				1
Supply Voltage	3.3Vdc				
Temperature Range	-40 to 85°C				
Holdover Stability	±0.32ppm				2

Table 5.0
Notes

Model Number	T512	T513	T514	T515	Notes
Output Type	LVC MOS	Clipped Sinewave	LVC MOS	Clipped Sinewave	
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range	6.4 to 40 MHz				
Frequency Stability	±0.50ppm				1
Supply Voltage	3.3Vdc				
Temperature Range	0 to 70°C				

Table 6.0
Notes

Model Number	T612	T613	T614	T615	Notes
Output Type	LVC MOS	Clipped Sinewave	LVC MOS	Clipped Sinewave	
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range	6.4 to 40 MHz				
Frequency Stability	±0.50ppm				1
Supply Voltage	3.3Vdc				
Temperature Range	-40 to 85°C				

Table 7.0
Notes

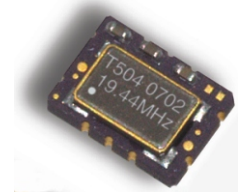
Model Number	T522	T523	T524	T525	Notes
Output Type	LVC MOS	Clipped Sinewave	LVC MOS	Clipped Sinewave	
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range	6.4 to 52 MHz				
Frequency Stability	±1.00ppm				1
Supply Voltage	3.3Vdc				
Temperature Range	0 to 70°C				

Table 8.0
Notes

Model Number	T622	T623	T624	T625	Notes
Output Type	LVC MOS	Clipped Sinewave	LVC MOS	Clipped Sinewave	
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range	6.4 to 52 MHz				
Frequency Stability	±1.00ppm				1
Supply Voltage	3.3Vdc				
Temperature Range	-40 to 85°C				

Notes:

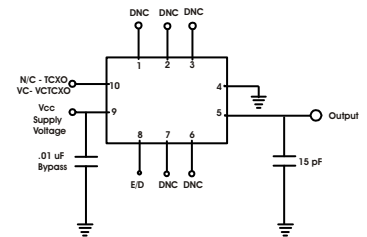
- 1) Frequency stability vs. change in temperature. $[\pm (F_{max} - F_{min})/2 \cdot F_0]$.
- 2) Inclusive of frequency stability, supply voltage change ($\pm 1\%$), aging, for 24 hours.



Features

TCXO
VCTCXO
3.3V Operation
LVC MOS Output
Clipped Sinewave Output
Frequency Stability:
T50x/T60x-Series ±0.28ppm
T51x/T61x-Series ±0.50ppm
T52x/T62x-Series ±1.00ppm
Temperature Range:
T5xx-Series 0 to 70°C
T6xx-Series -40 to 85°C
Low Jitter <1pS RMS
Tri-State Enable/Disable
Surface Mount Package
Tape and Reel Packing
RoHS Compliant / Lead Free

LVC MOS Test Circuit



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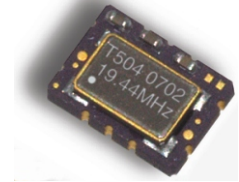
Bulletin	Tx176
Page	2 of 4
Revision	03
Date	08 Mar 2007

Electrical Specifications for all Models

OPERATING SPECIFICATIONS

Table 9.0

PARAMETER		MINIMUM	NOMINAL	MAXIMUM	UNITS	Notes
TCXO Frequency Calibration @ 25°C		-1.00	-	1.00	ppm	1
Total Frequency Tolerance		-4.60	-	4.60	ppm	2
Supply Voltage	(Vcc)	3.135	3.3	3.465	Vdc	3
Supply Current	(Icc)	-	6	10	mA	
Jitter (BW=10Hz to 20MHz)		-	-	5	ps rms	
Jitter (BW=12kHz to 20MHz)		-	-	1	ps rms	
SSB Phase Noise at 10Hz offset		-	-80	-70	dBc/Hz	
SSB Phase Noise at 100Hz offset		-	-110	-100	dBc/Hz	
SSB Phase Noise at 1KHz offset		-	-135	-130	dBc/Hz	
SSB Phase Noise at >10KHz offset		-	-150	-145	dBc/Hz	
SSB Phase Noise at >100KHz offset		-	-150	-150	dBc/Hz	



INPUT CHARACTERISTICS for ENABLE / DISABLE FUNCTION (Pin 8)

Table 10.0

PARAMETER		MINIMUM	NOMINAL	MAXIMUM	UNITS	Notes
Enable Voltage (High) or open circuit	(Vih)	70% Vdd	-	-	Vdc	4
Disable Voltage (Low) Output Tri-stated	(Vil)	-	-	30% Vdd	Vdc	

INPUT CHARACTERISTICS for VOLTAGE CONTROL (Pin10)

Table 11.0

PARAMETER		MINIMUM	NOMINAL	MAXIMUM	UNITS	Notes
Control Voltage Range (Vcc = 3.3V)	(Vc)	0.3	1.65	3.0	Vdc	
Frequency Tuning		±10	-	-	ppm	5
Linearity		±5	-	-	%	
Slope		Positive				

LVC MOS OUTPUT CHARACTERISTICS

Table 12.0

PARAMETER		MINIMUM	NOMINAL	MAXIMUM	UNITS	Notes
LOAD		-	-	15	pF	
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

Table 13.0

PARAMETER		MINIMUM	NOMINAL	MAXIMUM	UNITS	Notes
Load		-	10KOhm//10pF	-		6
Output Voltage (<= 40 MHz)		1.00	-	-	V pk-pk	
Output Voltage (> 40 MHz)		0.80	-	-	V pk-pk	

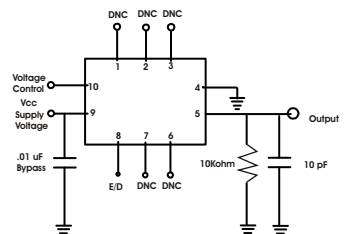
Notes:

- 1) TCXO: Initial calibration @ 25°C. Specifications at time of shipment after 48 hours of operation.
- 2) 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.
- 3) 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/sqrt Hz, Temperature Coefficient < 5ppm°C.
- 4) 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 ≤ 1 mA).
- 5) Additional pull ranges are available; please contact the factory for additional information.
- 6) Output is AC coupled.

Features

TCXO
VCTCXO
3.3V Operation
LVC MOS Output
Clipped Sinewave Output
Frequency Stability:
T50x/T60xSeries ±0.28ppm
T51x/T61x-Series ±0.50ppm
T52x/T62x-Series ±1.00ppm
Temperature Range:
T5xx-Series 0 to 70°C
T6xx-Series -40 to 85°C
Low Jitter < 1pS RMS
Tri-State Enable/Disable
Surface Mount Package
Tape and Reel Packing
RoHS Compliant / Lead Free

Clipped Sinewave Test Circuit



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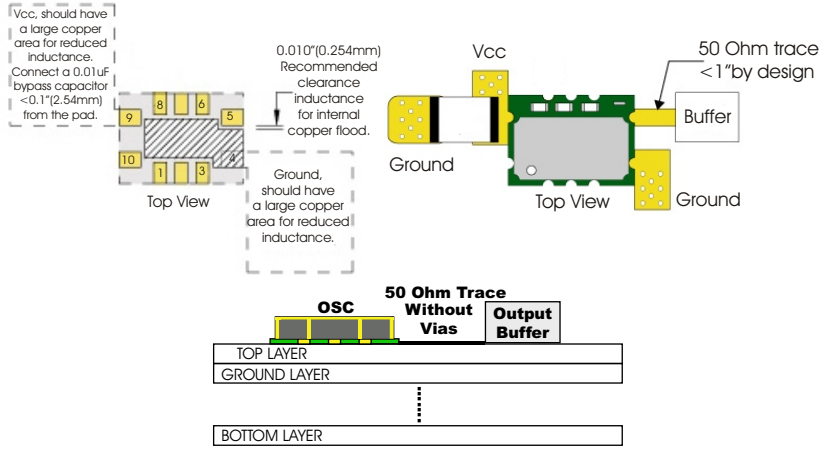
Bulletin Tx176

Page 3 of 4

Revision 03

Date 08 Mar 2007

Design Recommendations



Package Characteristics

Table 14.0

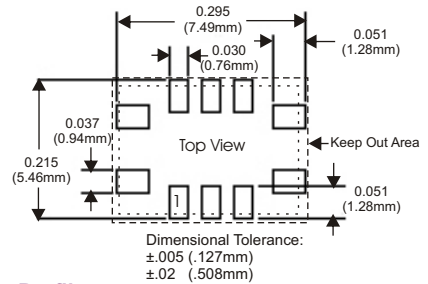
Package	Ceramic Surface Mount Package.
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Environmental Characteristics

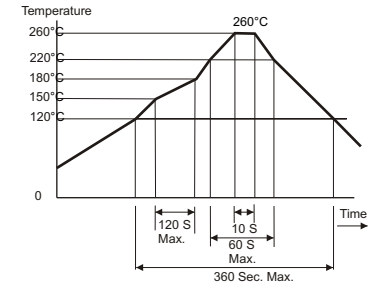
Table 15.0

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.
Solderability:	Solderability per Mil Std 883E Method 2003

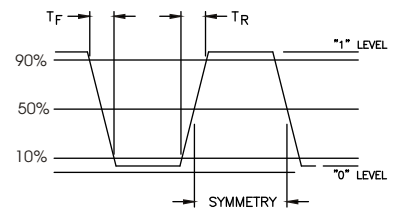
Suggested Pad Layout



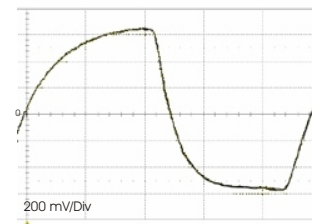
Solder Profile



LVC MOS Output Waveform



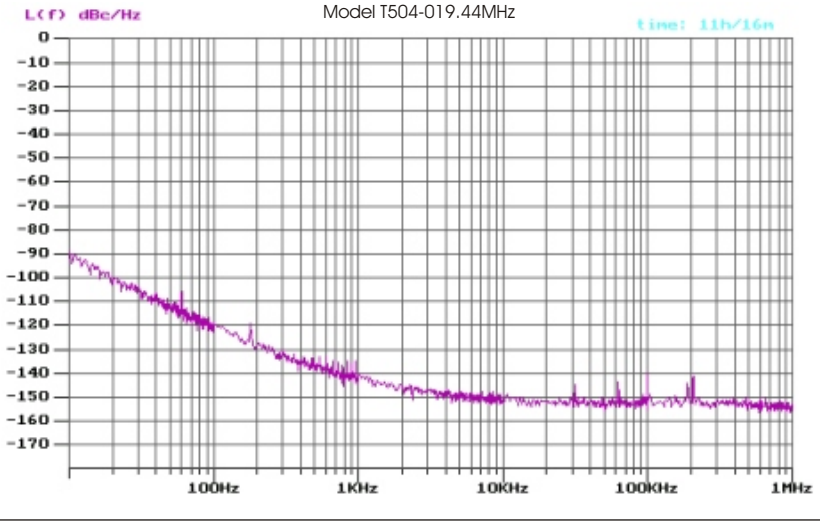
Clipped Sinewave Output Waveform



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Bulletin	Tx176
Page	4 of 4
Revision	03
Date	08 Mar 2007

Typical Phase Noise



Tape and Reel Specifications

