High Precision TCXO / VCTCXO

CONNOR WINFIELD

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Description

The Connor-Winfield 5.0x7.0mm Temperature Compensated Crystal Controlled Oscillators and Voltage Controlled Temperature Compensated Crystal Controlled Oscillators are designed for use in applications requiring tight frequency stability in a small package. 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.

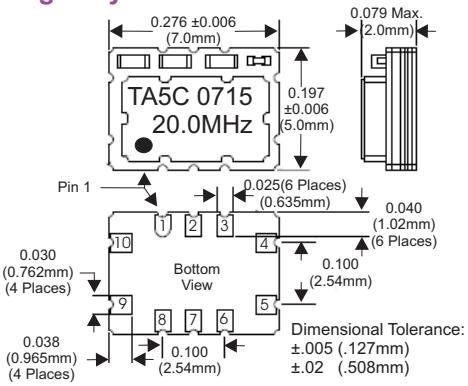
Features:

- 3.3V or 5.0V Operation
- CMOS or Clipped Sinewave Output Logic
- Miniature 5x7mm Surface Mount Package
- Frequency Stabilities Available:
  - Tx5C / Tx6C Series: ±0.25ppm
  - Tx5E / Tx6E Series: ±0.50ppm
  - Tx5F / Tx6F Series: ±1.00ppm
- Temperature Ranges Available:
  - Tx5x Series: 0 to 70°C
  - Tx6x Series: -40 to 85°C
- Low Jitter <1pS RMS
- Tri-State Enable/Disable Function
- Tape and Reel Packaging
- RoHS Compliant / Lead Free
- Recommended for new designs

Applications

GPS Receivers
Instrumentation
Femtocells
FTTH, FTTC

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)

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 MHz 27 MHz 38.88 MHz

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

Ordering Information

T	A	5	C	-	020.0M
Type: Precision TCXO VCTCXO 5x7mm	Features: A = TCXO, LVCMOS, 3.3Vdc. B = TCXO, Clipped Sinewave, 3.3Vdc. C = TCXO, HCMOS, 5.0Vdc. D = TCXO, Clipped Sinewave, 5.0Vdc. E = VCTCXO, LVCMOS, 3.3Vdc. F = VCTCXO, Clipped Sinewave, 3.3Vdc. G = VCTCXO, HCMOS, 5.0Vdc. H = VCTCXO, Clipped Sinewave, 5.0Vdc.	Temperature Range: 5 = 0 to 70° C 6 = -40 to 85° C	Frequency Stability: C = +/-0.25 ppm E = +/- 0.50 ppm F = +/- 1.00 ppm		Output Frequency: Frequency Format -xxx.xM Min.* -xxx.xxxxxxM Max.* *Amount of numbers after the decimal point. M = MHz

Example:
TA5C-020.0M = 5x7mm, TCXO, LVCMOS,
3.3Vdc, 0 to 70C, +/-0.25ppm, Output Frequency 20.0MHz

To order an TA5C with an output frequency of:
6.4 MHz = TA5C-006.4M
10 MHz = TA5C-010.0M
38.88 MHz = TA5C-038.88M

RoHS COMPLIANT

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Model Specifications

±0.25ppm Model Specifications

Table 1.0

Model Number	TA5C	TB5C	TE5C	TF5C	TC5C	TD5C	TG5C	TH5C
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc	5.0Vdc	5.0Vdc	5.0Vdc	5.0Vdc
Frequency Range	6.4 to 40 MHz							
Frequency Stability	±0.25ppm (Note 1)							
Temperature Range	0 to 70°C							

Table 2.0

Model Number	TA6C	TB6C	TE6C	TF6C	TC6C	TD6C	TG6C	TH6C
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc	5.0Vdc	5.0Vdc	5.0Vdc	5.0Vdc
Frequency Range	6.4 to40 MHz							
Frequency Stability	±0.25ppm (Note 1)							
Temperature Range	-40 to 85°C							

±0.50ppm Model Specifications

Table 3.0

Model Number	TA5E	TB5E	TE5E	TF5E	TC5E	TD5E	TG5E	TH5E
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc	5.0Vdc	5.0Vdc	5.0Vdc	5.0Vdc
Frequency Range	6.4 to 40 MHz							
Frequency Stability	±0.50ppm (Note 1)							
Temperature Range	0 to 70°C							

Table 4.0

Model Number	TA6E	TB6E	TE6E	TF6E	TC6E	TD6E	TG6E	TH6E
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc	5.0Vdc	5.0Vdc	5.0Vdc	5.0Vdc
Frequency Range	6.4 to 40 MHz							
Frequency Stability	±0.50ppm (Note 1)							
Temperature Range	-40 to 85°C							

±1.00ppm Model Specifications

Table 5.0

Model Number	TA5F	TB5F	TE5F	TF5F	TC5F	TD5F	TG5F	TH5F
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc	5.0Vdc	5.0Vdc	5.0Vdc	5.0Vdc
Frequency Range	6.4 to 52 MHz							
Frequency Stability	±1.00ppm (Note 1)							
Temperature Range	0 to 70°C							

Table 6.0

Model Number	TA6F	TB6F	TE6F	TF6F	TC6F	TD6F	TG6F	TH6F
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave	HCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc	5.0Vdc	5.0Vdc	5.0Vdc	5.0Vdc
Frequency Range	6.4 to 52 MHz							
Frequency Stability	±1.00ppm (Note 1)							
Temperature Range	-40 to 85°C							

Note: 1) Frequency stability vs. change in temperature. [±(Fmax – Fmin)/2.Fo].

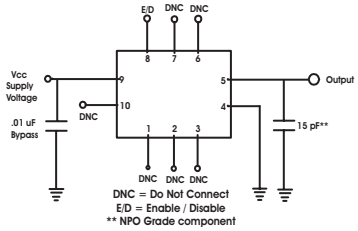
Features

TCXO or VCTCXO
3.3V or 5.0V Operation
CMOS Output or
Clipped Sinewave Output
Frequency Stability:
- Tx5C/Tx6C - Series±0.25ppm
- Tx5E/Tx6E - Series±0.50ppm
- Tx5F/Tx6F - Series±1.00ppm

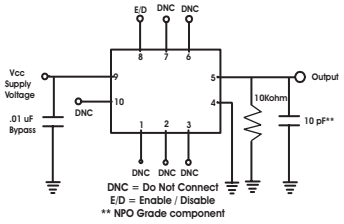
Temperature Range:
- Tx5x-Series 0 to 70°C
- Tx6xx-Series -40 to 85°C

Low Jitter <1pS RMS
Tri-State Enable/Disable
Surface Mount Package
Tape and Reel Packing
RoHS Compliant / Lead Free

CMOS Test Circuit



Clipped Sinewave Test Circuit



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Electrical Specifications for all Models

ABSOLUTE MAXIMUM RATINGS

TABLE 7.0

PARAMETER	UNITS	MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
Storage Temperature		-55	-	125	°C	
Supply Voltage	(Vcc)	-0.5	-	6.0	Vdc	
Input Voltage		-0.5	-	Vcc+0.6	Vdc	

Operating Specifications

Parameter		Minimum	Nominal	Maximum	UNITS	Notes
TCXO Frequency Calibration @ 25°C		-1.00	-	1.00	ppm	1
Supply Voltage Variation. (Vcc±5%)		-0.2	-	0.2	ppm	
Load Coefficient, ±5%		-0.2	-	0.2	ppm	
Static Temperature Hysteresis		-0.4	-	0.4	ppm	2
Aging		-1.00	-	1.00	ppm / year	
Frequency shift after reflow soldering		-1.00	-	1.00	ppm	
Supply Voltage	(Vcc)	3.135	3.3	3.465	Vdc	3
	(Vcc)	4.75	5.0	5.25	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	
Startup Time		-	-	10	ms	

Input Characteristics for Enable / Disable Function (Pin 8)

Parameter		Minimum	Nominal	Maximum	Units	Notes
Enable Voltage (High) or open circuit	(Vih)	70% Vcc	-	-	Vdc	4
Disable Voltage (Low) Output Tri-stated	(Vil)	-	-	30% Vcc	Vdc	

Input Characteristics for Voltage Control (Pin10)

Parameter			Minimum	Nominal	Maximum	Units	Notes
Control Voltage Range	(Vcc = 3.3V)	(Vc)	0.30	1.65	3.00	Vdc	
	(Vcc = 5.0V)	(Vc)	0.50	2.50	4.50	Vdc	
Frequency Tuning measured @25°C			±10	-	-	ppm	5
Linearity			±5	-	-	%	
Slope			Positive				
Input Impedance			100K	-	-	Ohms	

CMOS 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	

Clipped Sinewave Output Characteristics

Parameter	Minimum	Nominal	Maximum	Units	Notes
Load					7
Output Load Resistance	-	10K	-	Ohms	
Output Load Capacitance	-	10	-	pF	
Output Voltage (≤ 30 MHz)	1.00	-	-	V pk-pk	
Output Voltage (> 30 MHz)	0.80	-	-	V pk-pk	

1) TCXO: Initial calibration @ 25°C. Specifications at time of shipment after 48 hours of operation.
2) Frequency change after reciprocal temperature ramped over the operating range. Frequency measured before and after at 25°C.
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) Attention: To achieve the frequency stability specified 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.
7) Output is AC coupled.

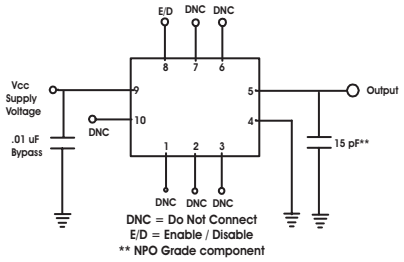
Features

TCXO or VCTCXO
3.3V or 5.0V Operation
CMOS Output or
Clipped Sinewave Output
Frequency Stability:
- Tx5C/Tx6C - Series±0.25ppm
- Tx5E/Tx6E - Series±0.50ppm
- Tx5F/Tx6F - Series±1.00ppm

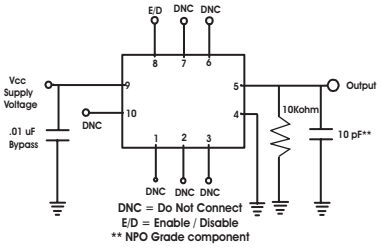
Temperature Range:
- Tx5x-Series 0 to 70°C
- Tx6xx-Series -40 to 85°C

Low Jitter <1pS RMS
Tri-State Enable/Disable
Surface Mount Package
Tape and Reel Packing
RoHS Compliant / Lead Free

CMOS Test Circuit



Clipped Sinewave Test Circuit



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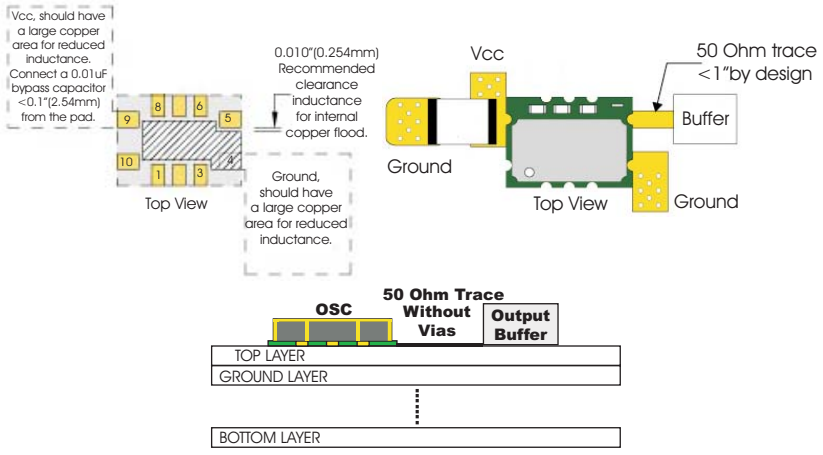
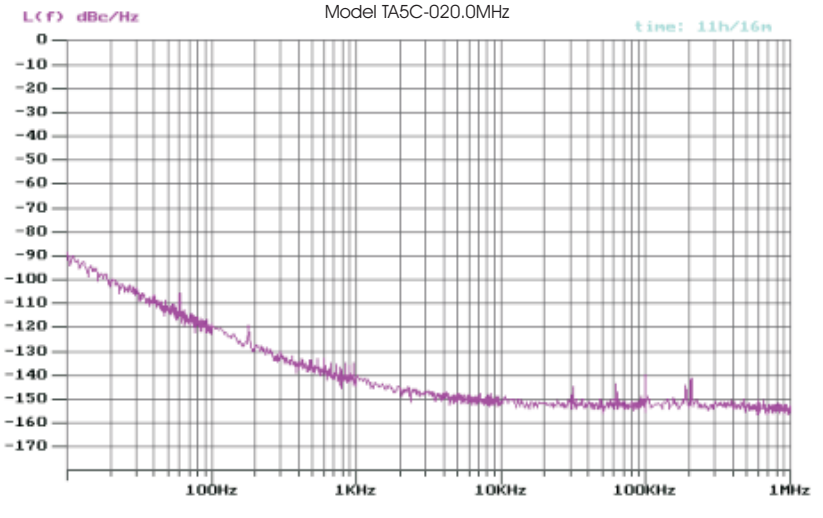
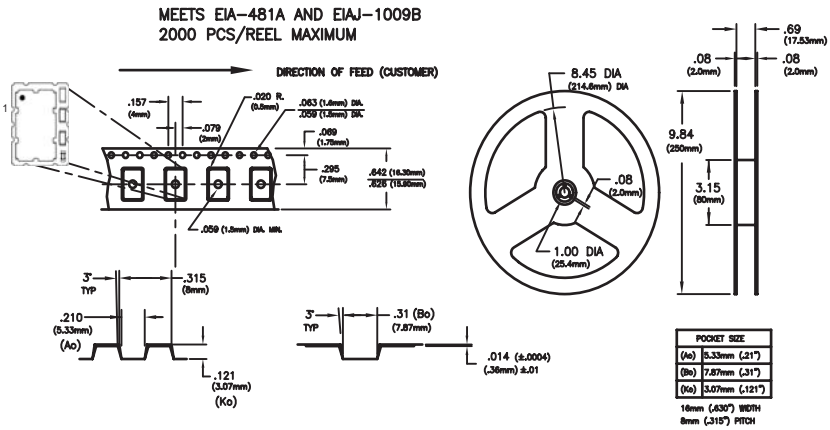
Design Recommendations



Typical Phase Noise



Tape and Reel Specifications



Package Characteristics

Table 13.0

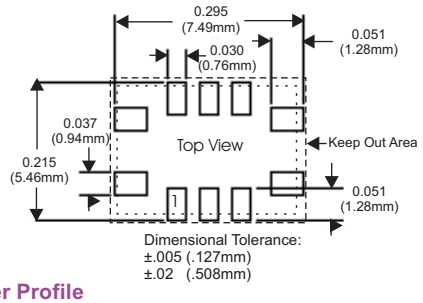
Package	Ceramic Surface Mount Package.

Environmental Characteristics

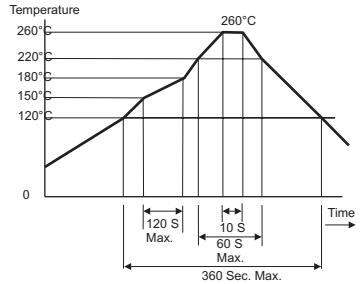
Table 14.0

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

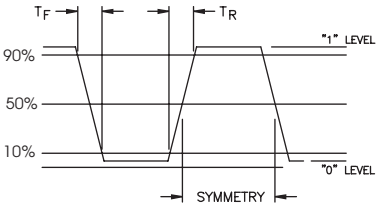
Suggested Pad Layout



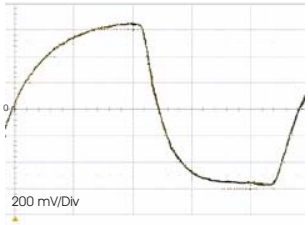
Solder Profile



LVCMOS Output Waveform



Clipped Sinewave Output Waveform



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