Precision Sub-Miniature 5.0x3.2mm TCXO / VCTCXO **Designed for Telecom Applications**

CONNO

2111 Comprehensive Drive Aurora, Illinois 60505 Phone: 630-851-4722 Fax: 630-851-5040 www.conwin.com

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Description:

The Connor-Winfield 5.0x3.2mm Temperature **Compensated Crystal** Oscillators and Voltage **Controlled Temperature Compensated Crystal** Oscillators are designed for use in applications

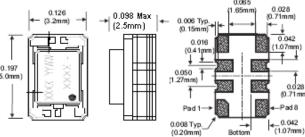
requiring tight frequency stability in a small

package. Through the use of Analog Temperature Compensation, this device is capable of holding sub 1-ppm stabilities over wide temperature ranges.

Package Layout

0.065 0.028 (0.71mm) 0.126 0.083 Max 0.006 Typ (2.1mm) (3.2mm) (0.15m 0.042 0.016 8MHZ 9 (1.07mm) (0.41)08 08 0 f 0.197 0.050 (1.27mm) (5.0mm ● 12.8 0.028 1 (0.71m Pad 1 -Pad 8 .0.042 (1.07mm) 0.008 Tvp Top View Dimensional Tolerance +/-0.005 (+/-0.127mm) (0.20m Bottom

Alternate Package Layout for Select Frequencies 0.065



Features:

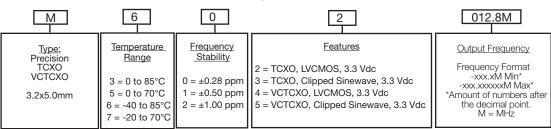
- 3.3V Operation
- LVCMOS or clipped Sinewave Output Logic
- Sub-Miniature 5.0x3.2mm SMT Package
- Frequency Stabilities Available: ±0.28 ppm with Stratum 3 Holdover ±0.50 ppm or ±1.00 ppm
- Temperature Ranges Available:
 - 0 to 70°C; 0 to 85°C; -20 to 70°C; -40 to 85°C
- Low Power <10mA
- Low Jitter <1pS RMS
- Low Phase Noise
- Tape and Reel Packaging
- RoHS Compliant / Lead Free ✓ RoHS
- Recommended for new designs

Applications:

- STRATUM 3 Applications
- GPS Receivers
- Instrumentation
- Femtocells
- FTTH, FTTC

Pad Connections Pad Connection 1: Volltage Control or N/C 2: Do Not Connect 3: Do Not Connect 4: Ground 5: Output Do Not Connect 6: 7: Do Not Connect 8: Supply, Vcc

Ordering Information



* Models M602, M604, M612 and M614 are available with the frequency range limited to 6.4 MHz to 26 MHz

Example: M602-012.8M = 3.2x5mm, TCXO, LVCMOS, 3.3Vdc, -40° to 85°C, ±0.28ppm, Output Frequency 12.8MHz To order an M602 with an output frequency of: 6.4MHz = M602-006.4M Consult the factory for available frequencies



Bulletin	Tx214
Page	1 of 4
Revision	05
Date	15 Dec 2014





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Absolute Maximum Ratings					
Parameter	Minimum	Nominal	Maximum	Units	Notes
Storage Temperature	-55	-	85	°C	
Supply Voltage (Vcc)	-0.5	-	6.0	Vdc	
Input Voltage (Vc)	-0.5	-	Vcc + 0.5	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 First Year	-1.00	-	1.00	ppm	
Total Frequency Tolerance (20 Years)	-4.60	-	4.60	ppm	3
Supply Voltage (Vcc)	3.135	3.3	3.465	Vdc	4
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	-70	dBc/Hz	
SSB Phase Noise at 100Hz offset	-	-115	-100	dBc/Hz	
SSB Phase Noise at 1KHz offset	-	-135	-130	dBc/Hz	
SSB Phase Noise at >10KHz offset	-	-152	-145	dBc/Hz	
SSB Phase Noise at >100KHz offset	-	-154	-150	dBc/Hz	
Start Up Time	-	-	10	ms	

Input Characteristics for Voltage Control (Pad 1)

Parameter	Minimum	Nominal	Maximum	Units	Notes
Control Voltage Range ($Vcc = 3.3V$) (Vc)	0.3	1.65	3.0	Vdc	
Frequency Tuning measured @ 25°C	±10	-	-	ppm	5
Linearity	±5	-	-	%	
Slope	Positive				
Input Impedance	100K	-	-	Ohms	
Modulation Bandwidth (3dB)	10	-	-	KHz	

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) (loh)	-	-	-4	mA	
(Low) (IoI)	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	6
Output Load Capacitance	-	10	-	pF	6
Output Voltage	1.00	-	-	V pk-pk	
Output Impedance	-	200	-	Ohms	

Notes:

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) 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.

4) For best in application performance, careful selection of an external power source is critical. Select an external regulator that meets or exceeds to the 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 10KHz) 15uV p-p, Voltage Noise Density = 50nV/ (Square root Hz), Temperature Coefficient <5ppm °C.</p>

5) Additional pull ranges are available; please contact the factory for additional information.

6) Attention: To achieve optimal frequency stability, and in some cases to meet the specification stated on this datasheet, 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 20ppb per pF load difference.

7) Output is DC coupled.

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Bulletin	Tx214
Page	
Fage	2 of 4
Revision	05
	05
Date	15 Dec 2014



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M705

Clipped Sinewave

VCTCXO

M605

Clipped Sinewave

Notes

1

2

Notes

Model Specifications

Ma dal Nicurala au	N4500	N/500	MEOA	MEOE	Nistaa
Model Number Output Type	M502 LVCMOS	M503 Clipped Sinewave	M504 LVCMOS	M505 Clipped Sinewa	Notes
TCXO/VCTCXO	TCXO	TCX0	VCTCXO	VCTCX0	100
Frequency Range	TUNU	6.4 to 40		VOTOXO	
Frequency Stability		±0.28p			1
Supply Voltage		3.3V	-		
Temperature Range		0 to 70			
Holdover Stability		±0.32			2
Model Number	M302	M303	M304	M305	Notes
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewa	ave
TCXO/VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range		6.4 to 40			
Frequency Stability		±0.28p	-		1
Supply Voltage		3.3Vc			
Temperature Range		0 to 85			
Holdover Stability		±0.32p	pm		2
Model Number	M512	M513	M514	M515	Notes
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewa	ave
TCXO/VCTCXO	TCX0	TCXO	VCTCXO	VCTCXO	
Frequency Range		6.4 to 40) MHz		
Frequency Stability		±0.50p	opm		1
Supply Voltage		3.3Vo	dc		
Temperature Range		0 to 70)°C		
Model Number	M312	M313	M314	M315	Notes
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewa	ave
TCXO/VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range		6.4 to 40	MHz		
Frequency Stability		±0.50p	pm		1
Supply Voltage		3.3Vd	lc		
Temperature Range		0 to 85	5°C		
Model Number	M522	M523	M524	M525	Notes
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewa	
TCXO/VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range		6.4 to 52	MHz		
Frequency Stability		±1.00p	opm		1
Supply Voltage		3.3Vo	dc		
Temperature Range		0 to 70)°C		
Model Number	M322	M323	M324	M325	Notes
Output Type	LVCMOS	Clipped Sinewave		Clipped Sinewa	
TCX0/VCTCX0	TCXO	TCXO	VCTCXO	VCTCXO	
Frequency Range		6.4 to 52			
Frequency Stability		±1.00p			1
Supply Voltage		3.3Vc			
Temperature Range		0 to 85	5°C		

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	TCX0/VCTCX0	TCXO	TCXO	VCTCXO	VCTCXO	
I	Frequency Range	6.4 to 26 MHz	6.4 to 40 MHz	6.4 to 26 MHz	6.4 to 40 MHz	
I	Frequency Stability		±0.2	28ppm		1
I	Supply Voltage		3.3	3Vdc		
I	Temperature Range		-40 te	o 85°C		
l	Holdover Stability		±0.3	32ppm		2
ľ						
I	Model Number	M712	M713	M714	M715	Notes
l	Output Type	LVCMOS	Clipped Sinewave	LVCMOS (Clipped Sineway	e
l	TCXO/VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
I	Frequency Range		6.4 to 4	0 MHz		
l	Frequency Stability		±0.50	ppm		1
I	Supply Voltage		3.3V	dc		
l	Temperature Range		-20 to	70°C		
I	Model Number	M612	M613	M614	M615	Notes
l	Output Type	LVCMOS	Clipped Sinewave	LVCMOS (Clipped Sineway	e
I	TCXO/VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
I	Frequency Range	6.4 to 26 MHz	6.4 to 40 MHz	6.4 to 26 MHz	6.4 to 40 MHz	
I	Frequency Stability		±0.5	i0ppm		1
I	Supply Voltage		3.3	3Vdc		
l	Temperature Range		-40 te	o 85°C		
l	Model Number	M722	M723	M724	M725	Notes
l	Output Type	LVCMOS	Clipped Sinewave		Clipped Sineway	е
l	TCX0/VCTCX0	TCXO	TCXO	VCTCXO	VCTCXO	
l	Frequency Range		6.4 to 5			
l	Frequency Stability		±1.00			1
l	Supply Voltage		3.3V			
l	Temperature Range		-20 to	70°C		
I	Model Number	M622	M623	M624	M625	Notes
l	Output Type	LVCMOS	Clipped Sinewave	LVCMOS (Clipped Sineway	е
	TCX0/VCTCX0	TCXO	ТСХО	VCTCXO	VCTCXO	
I	Frequency Range		6.4 to 5	2 MHz		
	Frequency Stability		±1.0)Oppm		1
	Supply Voltage	3.3Vdc				
н	Temperature Range		-40 t	o 85°C		
I	Temperature nange		-10 1	0000		

Model Specifications

M704

LVCMOS

VCTCX0

M604

LVCMOS

M703

Clipped Sinewave

TCX0

M603

Clipped Sinewave

6.4 to 40 MHz

±0.28ppm

3.3Vdc

-20 to 70°C

±0.32ppm

M702

LVCMOS

TCX0

M602

LVCMOS

Model Number

Output Type

TCX0/VCTCX0

Supply Voltage

Frequency Range

Frequency Stability

Temperature Range

Holdover Stability

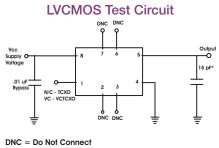
Model Number

Output Type

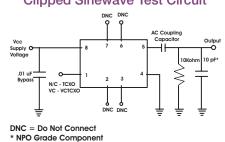
Notes:

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

2) Inclusive of frequency stability, supply voltage change (±1%), aging, for 24 hours.



* NPO Grade Component



Bulletin	Tx214
Page	3 of 4
Revision	05
Date	15 Dec 2014

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Clipped Sinewave Test Circuit

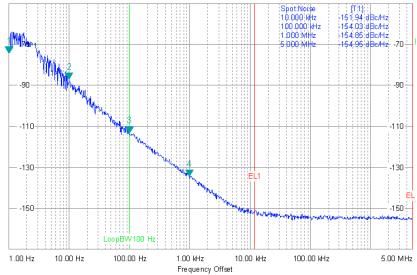


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Environmental Characteristics

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.
Solderability	Solderability per Mil Std 883E Method 2003

Typical Phase Noise M602-020.0M Typical Phase Noise (dBc/Hz)



To CMOS То Output Output 0.028 (0.71mm) External AC →□ Coupling Capacitor 0.053 (1.35mm) Used for Clipped 4 5 Sinewave Output Тфр 0.098 Keep Out Area* (2.49mm) View External 8 Bypass Capacitor 0.050 0.01 uF 🔲 . (1.27mm) 0.050 То (1.27mm) Ground

Suggested Pad Layout

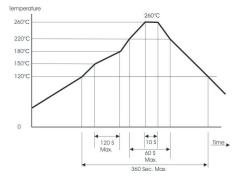
Dimensional Tolerance: +/-0.005 (+/-0.127mm)

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

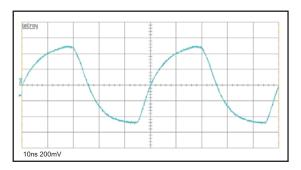
DIRECTION OF FEED (CUSTOMER) 020 R. .063 (1.6mm) DIA. .059 (1.5mm) DIA. 157 (4m -.079 (2mm)/ .069 (1,75mm) .295 (7.5mm) .630 (16.0mm) 646 0 ł .08 -.795 (20.2mm) .315 (8mm) .08 .059 (1.5mm) DIA. MIN Ţ .059 † 1.5mm) 7.09 /180mm) <u>†</u> 2.36 (60mm) T .512

Tape and Reel Specifications

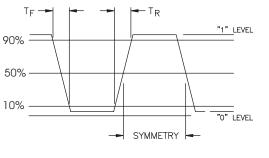
Solder Profile



Clipped Sinewave Output Waveform



LVCMOS Output Waveform



-	
Bulletin	Tx214
Page	4 of 4
Revision	05
Date	15 Dec 2014

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