

# Precision Sub-Miniature 5.0x3.2mm TCXO / VCTCXO

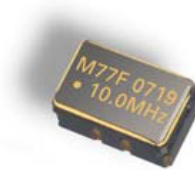
# CONNOR WINFIELD



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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.



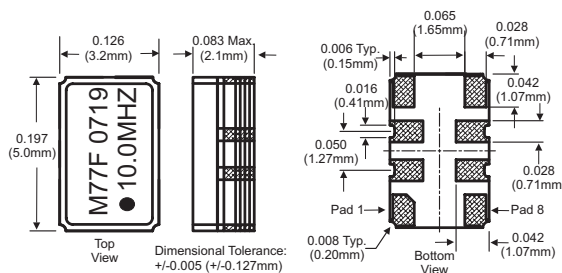
## Applications:

- GPS Receivers
- Instrumentation
- Femtocells
- FTTH, FTTC

## Features:

- 2.5V or 3.3V Operation
- Clipped Sinewave Output
- Sub-Miniature 5.0x3.2mm SMT Package
- Frequency Stabilities Available:
  - $\pm 1.00$ ppm or  $\pm 2.0$ ppm
- Temperature Ranges Available:
  - 0 to 70 C
  - -20 to 70 C
  - -30 to 8 C
- Low Power <2mA
- Low Jitter <1pS RMS
- Tape and Reel Packaging
- RoHS Compliant / Lead Free
- Recommended for new designs

## Package Layout



## Pin Connections

Pad	Connection
1	Voltage Control or N/C
2	N/C
3	N/C
4	Ground
5	Output
6	Do not connect
7	Do not connect
8	Supply, Vcc

## Ordering Information

M77F - 010.0M

TCXO SERIES      Example Part Number      CENTER FREQUENCY

## Ordering Information

<b>M</b>	<b>7</b>	<b>7</b>	<b>F</b> -	<b>010.0M</b>
<b>Type:</b> Precision TCXO VCTCXO 5x3.2mm	<b>Features:</b> 4 = TCXO, Clipped Sinewave, 2.5Vdc. 7 = TCXO, Clipped Sinewave, 3.3Vdc. 8 = VCTCXO, Clipped Sinewave, 2.5Vdc. 9 = VCTCXO, Clipped Sinewave, 3.3Vdc.	<b>Temperature Range:</b> 5 = 0 to 70° C 7 = -20 to 70° C 8 = -30 to 85° C	<b>Frequency Stability:</b> E = $\pm 0.50$ ppm F = $\pm 1.00$ ppm G = $\pm 2.00$ ppm	<b>Output Frequency:</b> Frequency Format -xxx.xM Min.* -xxx.xxxxxM Max.* *Amount of numbers after the decimal point. M = MHz

Example:  
M77F-010.0M = 5x3.2mm, TCXO, Clipped Sinewave, 3.3Vdc, -20 to 70C, +/-1.00ppm, Output Frequency 10.0MHz

To order an M77F with an output frequency of:  
 6.4 MHz = M77F-006.4M  
 20 MHz = M77F-020.0M  
 38.88 MHz = M77F-038.88M

## Standard Frequencies Available \*

6.4 MHz 9.72 MHz 10.0 MHz 10.24 MHz 12.5 MHz 12.8 MHz  
 13.5 MHz 19.44 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.





## Model Specifications

<b>Model Number</b>	<b>M45E</b>	<b>M75E</b>	<b>M85E</b>	<b>M95E</b>	<b>Note</b>
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Supply Voltage	2.5Vdc	3.3Vdc	2.5Vdc	3.3Vdc	
Frequency Stability	±0.50ppm				1
Temperature Range	0 to 70°C				
<b>Model Number</b>	<b>M47E</b>	<b>M77E</b>	<b>M87E</b>	<b>M97E</b>	<b>Note</b>
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Supply Voltage	2.5Vdc	3.3Vdc	2.5Vdc	3.3Vdc	
Frequency Stability	±0.50ppm				1
Temperature Range	-20 to 70°C				
<b>Model Number</b>	<b>M48E</b>	<b>M78E</b>	<b>M88E</b>	<b>M98E</b>	<b>Note</b>
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Supply Voltage	2.5Vdc	3.3Vdc	2.5Vdc	3.3Vdc	
Frequency Stability	±0.50ppm				1
Temperature Range	-30 to 85°C				
<b>Model Number</b>	<b>M45F</b>	<b>M75F</b>	<b>M85F</b>	<b>M95F</b>	<b>Note</b>
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Supply Voltage	2.5Vdc	3.3Vdc	2.5Vdc	3.3Vdc	
Frequency Stability	±1.00ppm				1
Temperature Range	0 to 70°C				
<b>Model Number</b>	<b>M47F</b>	<b>M77F</b>	<b>M87F</b>	<b>M97F</b>	<b>Note</b>
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Supply Voltage	2.5Vdc	3.3Vdc	2.5Vdc	3.3Vdc	
Frequency Stability	±1.00ppm				1
Temperature Range	-20 to 70°C				
<b>Model Number</b>	<b>M48F</b>	<b>M78F</b>	<b>M88F</b>	<b>M98F</b>	<b>Note</b>
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Supply Voltage	2.5Vdc	3.3Vdc	2.5Vdc	3.3Vdc	
Frequency Stability	±1.00ppm				1
Temperature Range	-30 to 85°C				
<b>Model Number</b>	<b>M45G</b>	<b>M75G</b>	<b>M85G</b>	<b>M95G</b>	<b>Note</b>
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Supply Voltage	2.5Vdc	3.3Vdc	2.5Vdc	3.3Vdc	
Frequency Stability	±2.0ppm				1
Temperature Range	0 to 70°C				
<b>Model Number</b>	<b>M47G</b>	<b>M77G</b>	<b>M87G</b>	<b>M97G</b>	<b>Note</b>
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Supply Voltage	2.5Vdc	3.3Vdc	2.5Vdc	3.3Vdc	
Frequency Stability	±2.0ppm				1
Temperature Range	-20 to 70°C				
<b>Model Number</b>	<b>M48G</b>	<b>M78G</b>	<b>M88G</b>	<b>M98G</b>	<b>Note</b>
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO	
Supply Voltage	2.5Vdc	3.3Vdc	2.5Vdc	3.3Vdc	
Frequency Stability	±2.0ppm				1
Temperature Range	-30 to 85°C				

**Note:**

1) Frequency stability vs. change in temperature.  $[\pm(F_{max} - F_{min})/2.F_0]$ .



## Absolute Maximum Ratings for All Models

Parameter	Minimum	Nominal	Maximum	Units	Notes
Storage Temperature	-55	-	125	°C	
Supply Voltage (Vcc)	-0.6	-	4.6	Vdc	
Input Voltage (Vc)	-0.5	-	Vcc+0.5	Vdc	

## Operating Specifications for All Models

Parameter	Minimum	Nominal	Maximum	Units	Notes
Frequency Range	6.4	-	40	MHz	
Frequency Calibration (TCXO Models)	-1.00	-	1.00	ppm	1
Aging First Year	-1.0	-	1.0	ppm	
Total Aging for 10 years	-4.6	-	4.6	ppm	
Supply Voltage Variation. (Vcc±5%)	-0.025	-	0.025	ppm	
Load Coefficient, ±5%	-0.025	-	0.025	ppm	
Static Temperature Hysteresis	-0.4	-	0.4	ppm	2
Frequency shift after reflow soldering	-1.00	-	1.00	ppm	3
Supply Voltage					
2.5v Models (Vcc)	2.375	2.500	2.625	Vdc	4
3.3V Models (Vcc)	3.135	3.300	3.465	Vdc	4
Supply Current (Icc)	-	-	2	mA	
Jitter (BW=10Hz to 20MHz)	-	-	5	ps rms	
Jitter (BW=12kHz to 20MHz)	-	-	1	ps rms	
SSB Phase Noise at 10Hz offset	-	-80	-	dBc/Hz	
SSB Phase Noise at 100Hz offset	-	-110	-	dBc/Hz	
SSB Phase Noise at 1KHz offset	-	-130	-	dBc/Hz	
SSB Phase Noise at >10KHz offset	-	-145	-	dBc/Hz	

## Input Characteristics for Voltage Control (Pad 1)

Parameter	Minimum	Nominal	Maximum	Units	Notes
Control Voltage Range					
2.5v Models (Vc)	0.2	1.2	2.2	Vdc	
3.3v Models (Vc)	0.5	1.5	2.5	Vdc	
Frequency Tuning	±10	-	-	ppm	
Linearity	±5	-	-	%	
Slope	Positive				

## Clipped Sinewave Output Characteristics (Pad 5)

Parameter	Minimum	Nominal	Maximum	Units	Notes
Output Voltage	1.00	-	-	V pk-pk	
Load					5
Output Load Resistance	-	10K	-	Ohms	
Output Load Capacitance	-	10	-	pF	

## Package Characteristics

Package	Ceramic Surface Mount Package
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## Environmentals

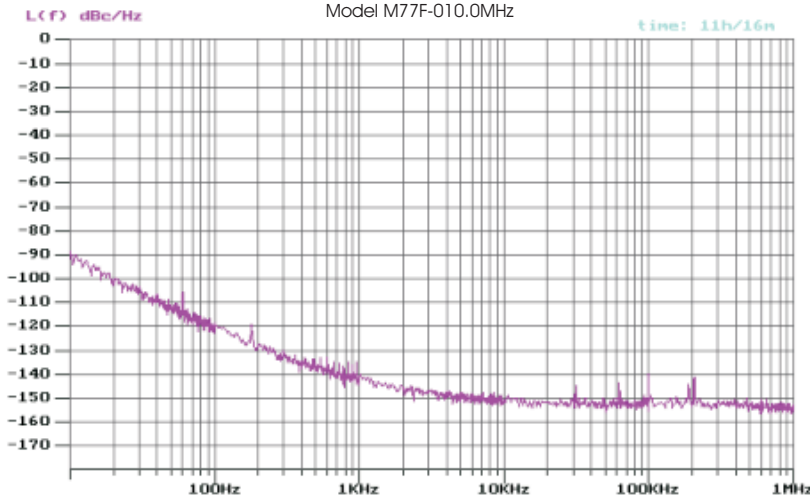
Vibration:	Vibration per Mil Std 883E Method 2007.3 Test Condition A
Shock:	Mechanical Shock per Mil Std 883E Method 2002.4 Test Condition B.
Soldering:	RoHS compliant, lead free. See solder profile page 4.
Solderability:	Solderability per Mil Std 883E Method 2003

### Notes:

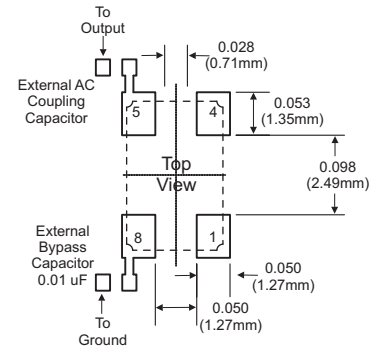
- 1) TCXO: Initial calibration @ 25°C. Specifications at time of shipment after 48 hours of operation.
- 2) Frequency change after reciprocal temperature ramped over the operating range. Frequency measured before and after at 25°C.
- 3) Within two hours after reflow.
- 4) For best in application performance, 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.
- 5) Output is DC coupled

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Revision	<b>08</b>
Date	<b>28 Nov 2023</b>

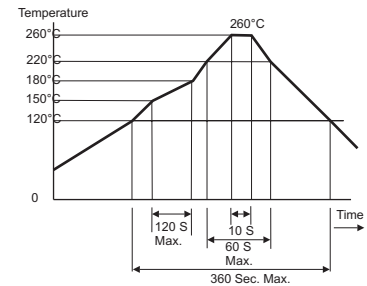
## Typical Phase Noise



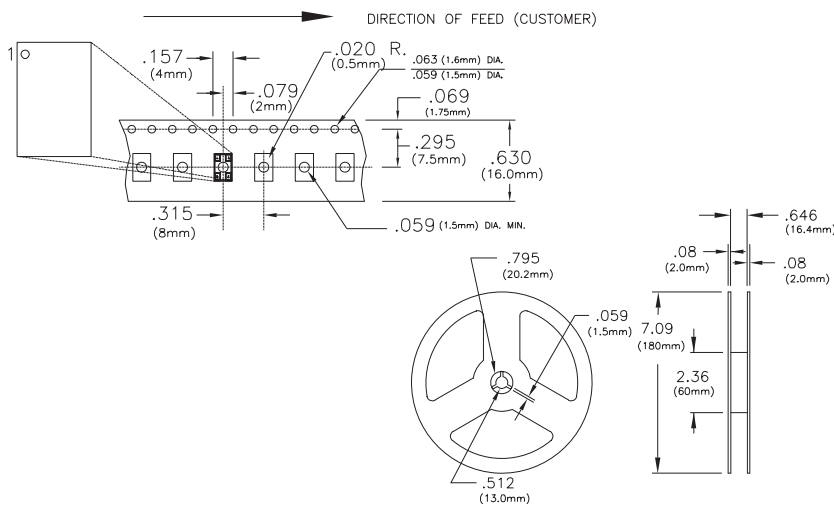
## Suggested Pad Layout



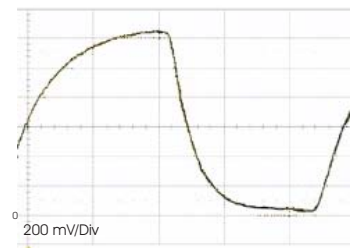
## Solder Profile



## Tape and Reel Specifications



## Output Waveform



## Test Circuit

