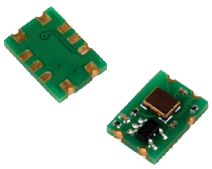
Available at Digi-Key**
www.digikey.com

High Precision TCXO /VCTXCO

CONNOR WINFIELD

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

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 Operation
- LVCMOS or Clipped Sinewave Output Logic
- Frequency Stabilities Available: ±0.5ppm, ±1.0ppm and ±2.5ppm
- Temperature Ranges Available: 0 to 70°C, -40 to 85°C, and -20 to 70°C
- Low Jitter <1pS RMS
- Tri-State Enable/Disable Function
- Miniature 5x7mm Surface Mount Package
- Tape and Reel Packaging
- RoHS Compliant / Lead Free
- Recommended for new designs

Applications:

- GPS Receivers
- Instrumentation
- Femtocells
- FTTH, FTTC

** Not all options available at Digi-Key

Ordering Information

T	J	5	F	020.0M
Type / Package TCXO / VCTCXO Series T = 5.0x7.0 mm 10 Pads TV = 5.0x7.0 mm 4 Pads	Features: J = TCXO, LVCMOS, 3.3Vdc K = TCXO, Clipped Sinewave, 3.3Vdc L = VCTCXO, LVCMOS, 3.3Vdc M = VCTCXO, Clipped Sinewave, 3.3Vdc	Temperature Range: 5 = 0 to 70°C 6 = -40 to 85°C 7 = -20 to 70°C	Frequency Stability: E = ±0.5 ppm F = ±1.0 ppm H = ±2.5 ppm	Output Frequency: Frequency Format -xxx.xM Min.* -xxx.xxxxxxM Max.* *Maximum of 6 digits after the decimal point. M=MHz

Example 1:
TJ5F-020.0M = 5x7mm, TCXO, LVCMOS, 3.3Vdc, 0 to 70°C, ±1.0ppm, Output Frequency 20.0MHz

Example 2:
TVJ6F-010.0M = 5x7mm, 4-pad TCXO, LVCMOS, 3.3Vdc, -40/85C, ±1.0pm, Output Frequency 10.0MHz

RoHS COMPLIANT

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Model Specifications

±0.50ppm Model Specifications

Model Number	TJ5E/TVJ5E	TK5E/TVK5E	TL5E/TVL5E	TM5E/TVM5E
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc
Frequency Range	10 to 50 MHz			
Frequency Stability vs Temperature [±(Fmax-Fmin)/2Fo]	±0.5ppm			
Temperature Range	0 to 70°C			

Model Number	TJ6E/TVJ6E	TK6E/TVK6E	TL6E/TVL6E	TM6E/TVM6E
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc
Frequency Range	10 to 50 MHz			
Frequency Stability vs Temperature [±(Fmax-Fmin)/2Fo]	±0.5ppm			
Temperature Range	-40 to 85°C			

±1.00ppm Model Specifications

Model Number	TJ5F/TVJ5F	TK5F/TVK5F	TL5F/TVL5F	TM5F/TVM5F
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc
Frequency Range	10 to 50 MHz			
Frequency Stability vs Temperature [±(Fmax-Fmin)/2Fo]	±1.0ppm			
Temperature Range	0 to 70°C			

Model Number	TJ6F/TVJ6F	TK6F/TVK6F	TL6F/TVL6F	TM6F/TVM6F
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc
Frequency Range	10 to 50 MHz			
Frequency Stability vs Temperature [±(Fmax-Fmin)/2Fo]	±1.0ppm			
Temperature Range	-40 to 85°C			

±2.50ppm Model Specifications

Model Number	TJ5H/TVJ5H	TK5H/TVK5H	TL5H/TVL5H	TM5H/TVM5H
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc
Frequency Range	10 to 50 MHz			
Frequency Stability vs Temperature [±(Fmax-Fmin)/2Fo]	±2.50ppm			
Temperature Range	0 to 70°C			

Model Number	TJ6H/TVJ6H	TK6H/TVK6H	TL6H/TVL6H	TM6H/TVM6H
Output Type	LVCMOS	Clipped Sinewave	LVCMOS	Clipped Sinewave
TCXO / VCTCXO	TCXO	TCXO	VCTCXO	VCTCXO
Supply Voltage	3.3Vdc	3.3Vdc	3.3Vdc	3.3Vdc
Frequency Range	10 to 50 MHz			
Frequency Stability vs Temperature [±(Fmax-Fmin)/2Fo]	±2.50ppm			
Temperature Range	-40 to 85°C			

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Absolute Maximum Ratings

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

Operating Specifications

Parameter	Minimum	Nominal	Maximum	Units	Notes
TCXO Frequency Calibration @ 25°C	-1.0	-	1.0	ppm	1
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	2
Aging	-1.0	-	1.0	ppm / year	
Frequency shift after reflow soldering	-1.0	-	1.0	ppm	3
Total Frequency Tolerance (20yrs):	-4.6	-	4.6	ppm	
Supply Voltage (Vcc)	3.135	3.3	3.465	Vdc	
Supply Current (Icc) LVCMOS:	-	6.5	8.0	mA	
Clipped Sine:	-	2	3.5	mA	
Jitter:					
Period Jitter	-	3.0	5.0	ps RMS	
Integrated Phase Jitter (12kHz to Fo/2 MHz)	-	0.3	1.0	ps RMS	4
Allan Deviation (Tau=1s, F=25.0Mhz)	-	1.5E-10	-		
Typical SSB Phase Noise (F=25.0MHz)					
@ 10 Hz offset		-90		dBc/Hz	
@ 100 Hz offset		-120		dBc/Hz	
@ 1 KHz offset		-140		dBc/Hz	
@ 10 KHz offset		-155		dBc/Hz	
@ 100 KHz offset		-156		dBc/Hz	
@ 1 MHz offset		-157		dBc/Hz	
Startup Time	-	-	10	ms	

Input Characteristics for Enable/Disable Pin 8 (T-series only)

Parameter	Minimum	Nominal	Maximum	Units	Note
Enable Voltage (High) or open circuit (Vih)	70% Vcc	-	-	Vdc	5
Disable Voltage (Low) Output Tri-stated (Vil)	-	-	30% Vcc	Vdc	

Input Characteristics for Voltage Control (Pin 10)

Parameter	Minimum	Nominal	Maximum	Units	Note
Control Voltage Range (Vcc = 3.3V) (Vc)	0.30	1.65	3.00	Vdc	
Frequency Tuning measured @ 25°C	±10	-	-	ppm	6
Linearity	±5	-	-	%	
Slope		Positive			
Input Impedance	100K	-	-	Ohms	

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LVCMOS Output Characteristics

Parameter	Minimum	Nominal	Maximum	Units	Note
LOAD	-	15	-	pF	7
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%	-	4	8	ns	

Clipped Sinewave Output Characteristics

Parameter	Minimum	Nominal	Maximum	Units	Note
Load					8
Output Load Resistance	-	10K	-	Ohms	
Output Load Capacitance	-	10	-	pF	
Output Voltage (≤ 40 MHz)	1.0	1.2	-	V pk-pk	
Output Voltage (>40 MHz)	0.8	1.0	-	V pk-pk	

Package Characteristics

Package	2.5x2.0mm Ceramic Surface Mount TCXO on FR4 adapter board

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 Process	RoHS compliant lead free. See soldering profile on Page 6
Solderability	Solderability per Mil Std 883E Method 2003

Notes:

1) *Initial calibration @ 25°C. ±2°C, for VCTCXO, control voltage must be set to nominal value. Specifications at time of shipment.*
2) *Frequency change after reciprocal temperature ramped over the operating range. Frequency measured before and after at 25°C.*
3) *Two consecutive solder reflows after 1 hour recovery @ 25°C.*
4) *BW = 12 KHz to 20 MHz.*
5) *Leave Pad 8 unconnected if enable / disable function is not required. When tristated, the output stage is disabled but the oscillator and compensation circuit are still active (current consumption < 1 mA).*
6) *Additional pull ranges are available; please contact the factory for additional information.*
7) *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.*
8) *Output is AC coupled.*

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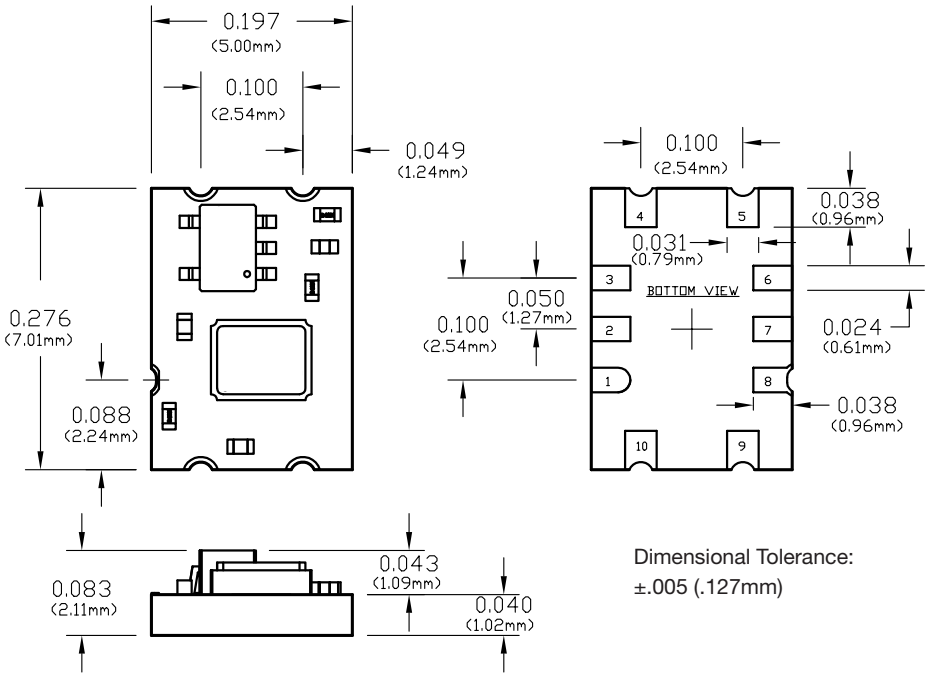
10-Pad Package (T-series) Configuration

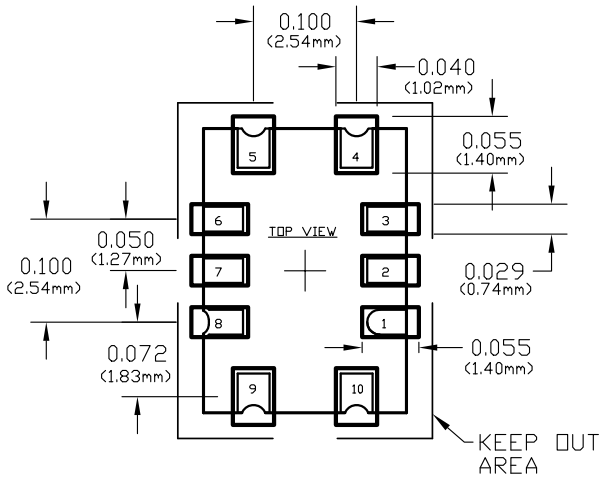


Dimensional Tolerance:
±.005 (.127mm)

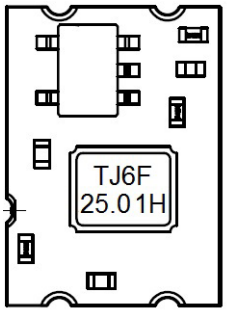
T-Series Pad Connections

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)

10-Pad Package (T-series) Suggested Pad Layout



Marking Configuraration



2 character Code

Y = Year	M = Month
1 = 2021	A = January
2 = 2022	B = February
3 = 2023	C = March
4 = 2024	D = April
	E = May
	F = June
	G = July
	H = August
	J = September
	K = October
	M = November
	N = December

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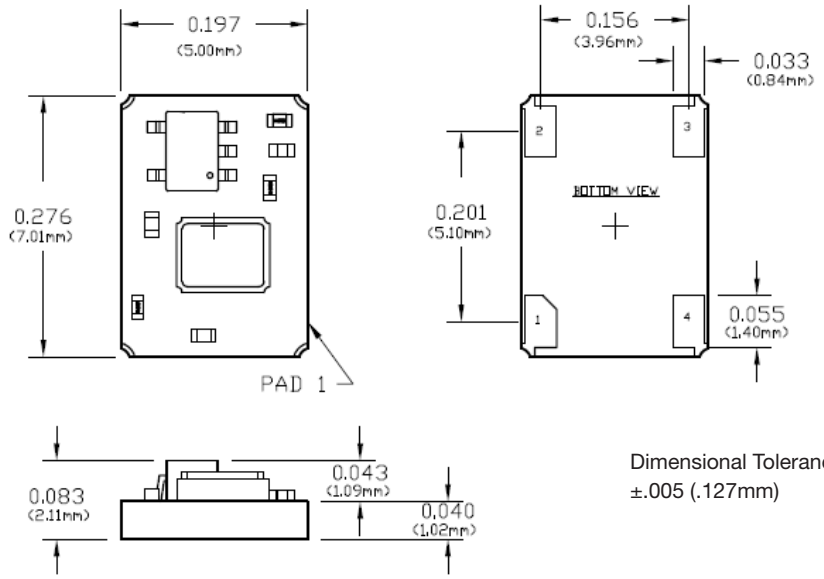
4-Pad Package (TV-series) Configuration

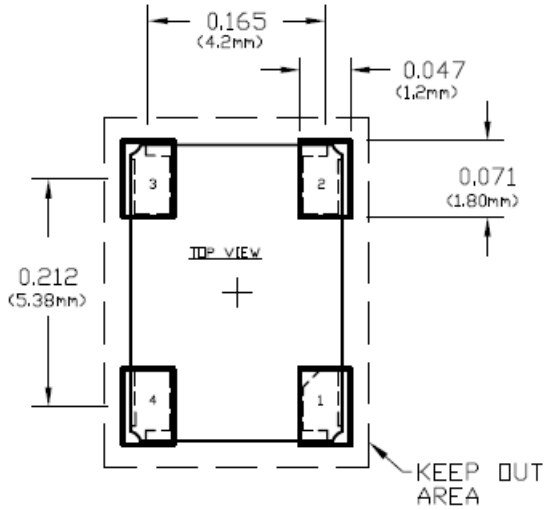


Dimensional Tolerance:
±.005 (.127mm)

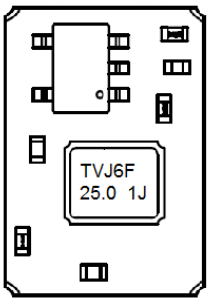
TV-Series Pad Connections

1:	VCTCXO: Voltage Control (Vc) TCXO: N/C
2:	Ground
3:	Output
4:	Supply (Vcc)

4-Pad Package (TV-series) Suggested Pad Layout



TV-Series Marking Configuraration



2 character Code	
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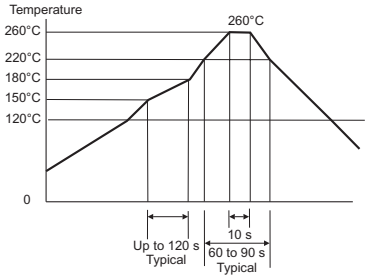
	M = November
	N = December

Solder Profile



Meets IPC/JEDEC J-STD-020C

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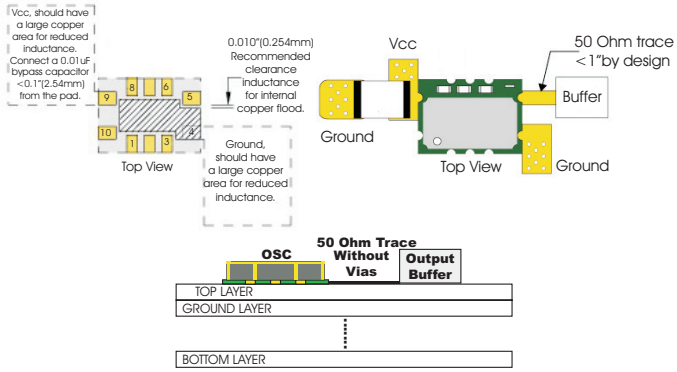
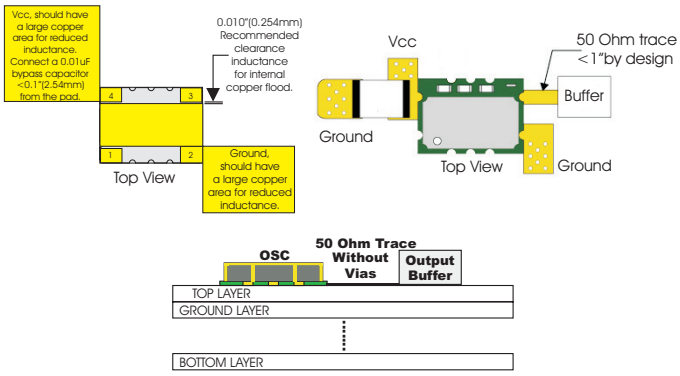
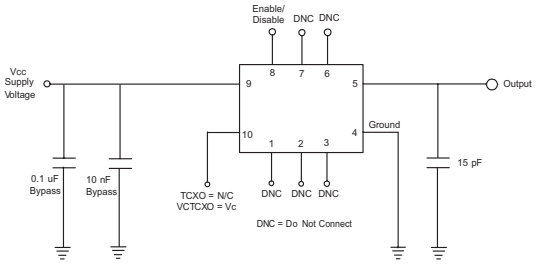
T Series Design Recommendations



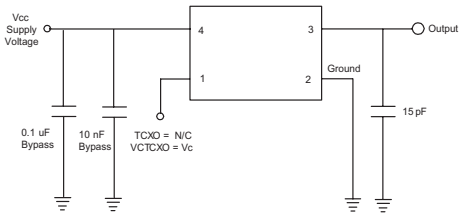
TV Series Design Recommendations



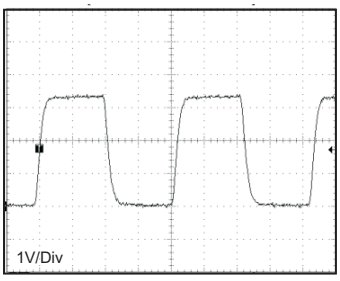
T Series LVCMOS Test Circuit



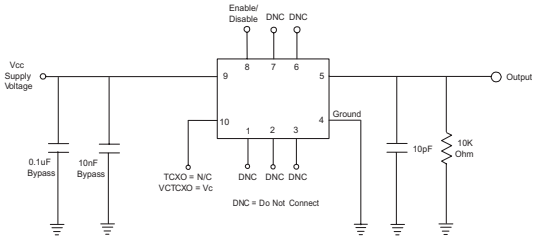
TV Series LVCMOS Test Circuit



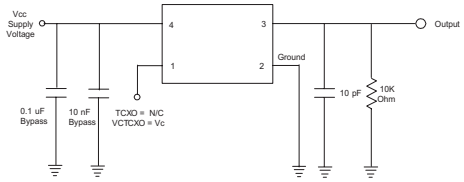
LVCMOS Output Waveform



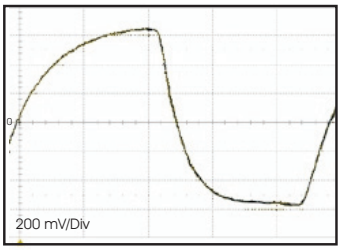
T Series Clipped Sinewave Test Circuit



TV Series Clipped Sinewave Test Circuit



Clipped Sinewave Output Waveform



Note: The clipped sinewave output is AC coupled

Bulletin	Tx452
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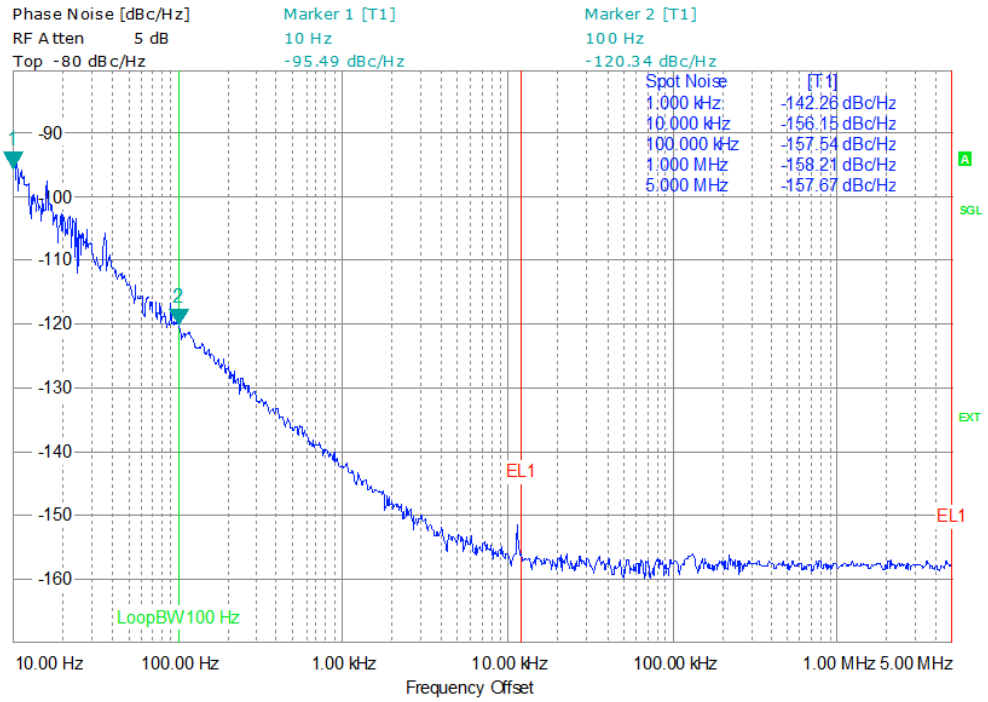
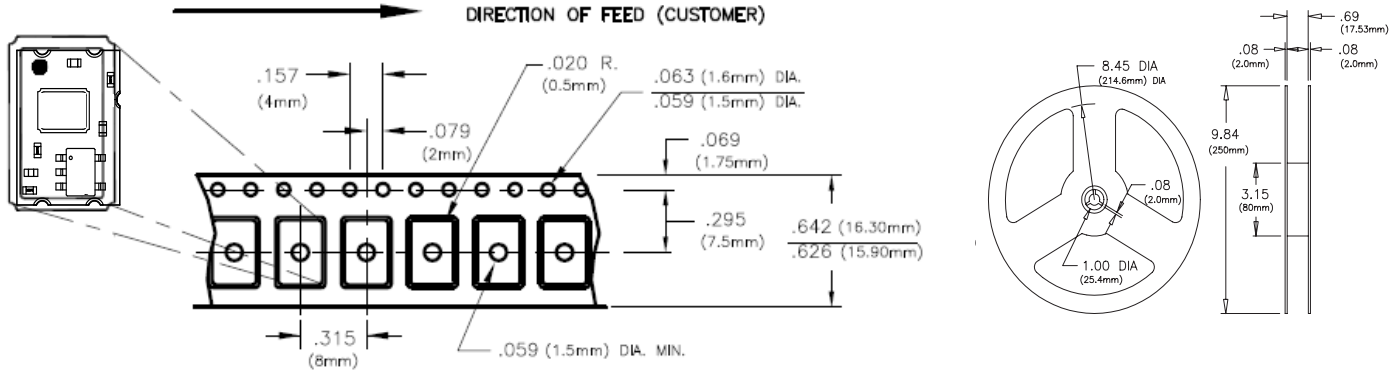
Typical Phase Noise at Fo=25MHz



5x7mm Tape and Reel Information

MEETS EIA-481A AND EIAJ-1009B
700 PCS/REEL MAXIMUM.



Revision History

Revision	Date	Note
00	09/02/21	New Release
01	09/16/21	Added 4-pad TV-series
02	01/20/22	Changed temperature range code 7 from -30/85°C to -20/70°C
03	07/13/22	Added ±2.5ppm stability option "H" to the part number table
04	09/22/22	Added total frequency tolerance specification page 3.
05	01/26/23	Updated dimensional tolerances on pages 5 and 6.
06	05/02/24	Added Digi-Key availability notes
07	05/07/24	Reduced Abs Max supply voltage