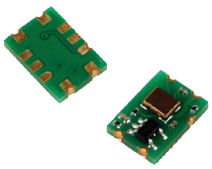
# High Precision TCXO /VCTXCO

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 and ±1.0ppm
- 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 ✓RoHS
- Recommended for new designs

## Applications:

- GPS Receivers
- Instrumentation
- Femtocells
- FTTH, FTTC

## Ordering Information

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

CONNOR WINFIELD

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

# 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 | | | |



Specifications subject to change without notification. See Connor-Winfield's website for latest revision.
© Copyright 2022 The Connor-Winfield Corporation Not intended for life support applications.

CONNOR WINFIELD

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

## Absolute Maximum Ratings

| Parameter | Minimum | Nominal | Maximum | Units | Notes |
|---|---|---|---|---|---|
| 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 | -1.0 | - | 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 |
| 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 | | | | | |
| For Fo | | 25.0 MHz | | | |
| @ 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 | |



Specifications subject to change without notification. See Connor-Winfield's website for latest revision.
© Copyright 2022 The Connor-Winfield Corporation Not intended for life support applications.

CONNOR WINFIELD

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

## 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.*

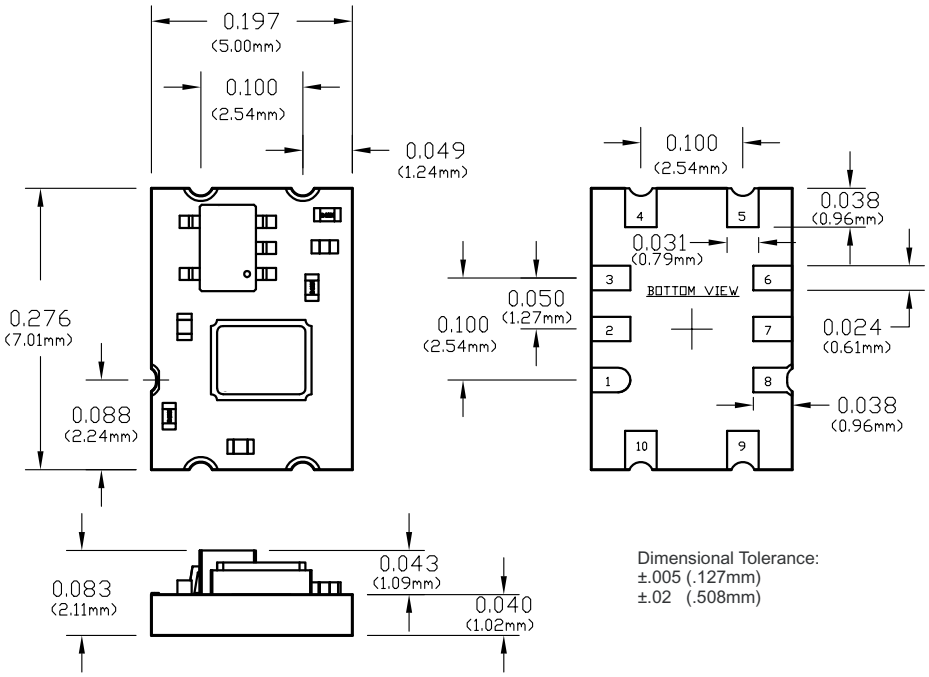


Specifications subject to change without notification. See Connor-Winfield's website for latest revision.
© Copyright 2022 The Connor-Winfield Corporation Not intended for life support applications.

CONNOR WINFIELD

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

## 10-Pad Package (T-series) Configuration

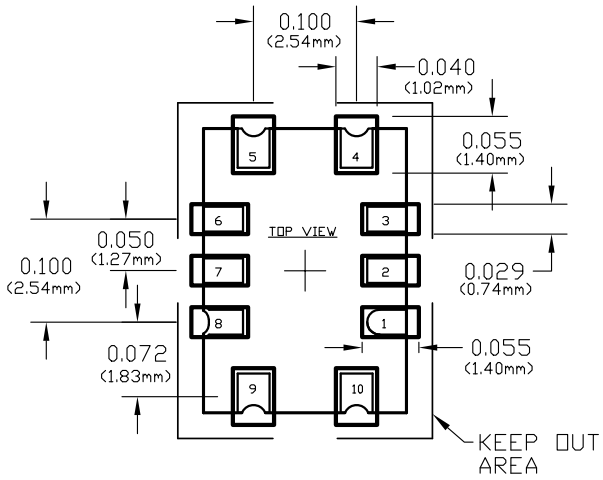



Dimensional Tolerance:
±.005 (.127mm)
±.02 (.508mm)

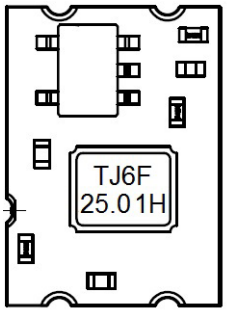
## T-Series Pad Connections

| | |
|---|---|
| 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)<br>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 |

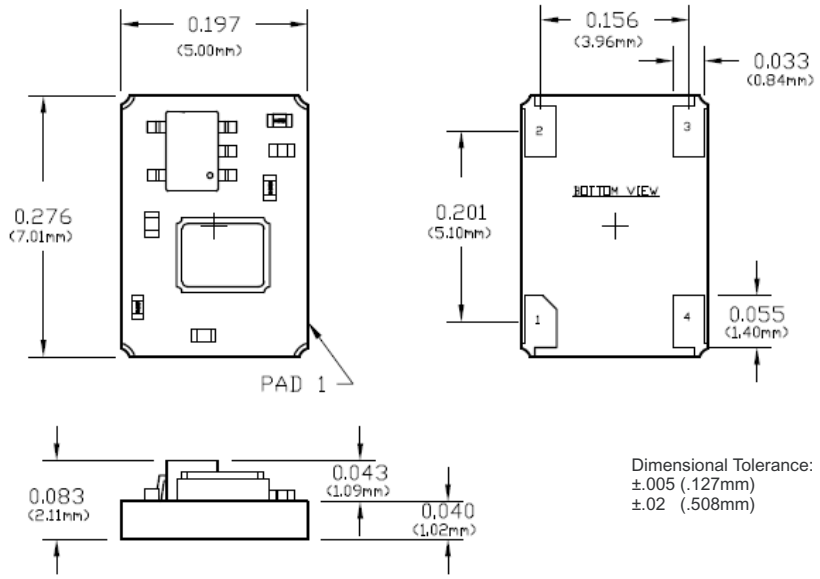


Specifications subject to change without notification. See Connor-Winfield's website for latest revision.
© Copyright 2022 The Connor-Winfield Corporation Not intended for life support applications.

CONNOR WINFIELD

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

## 4-Pad Package (TV-series) Configuration

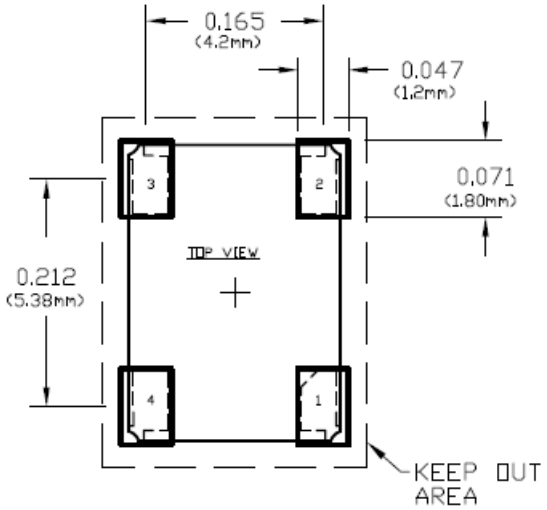



Dimensional Tolerance:
±.005 (.127mm)
±.02 (.508mm)

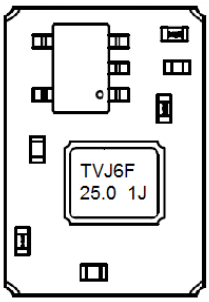
## TV-Series Pad Connections

| | |
|---|---|
| 1: | VCTCXO: Voltage Control (Vc)<br>TCXO: N/C |
| 2: | Ground |
| 3: | Output |
| 4: | Supply (Vcc) |

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

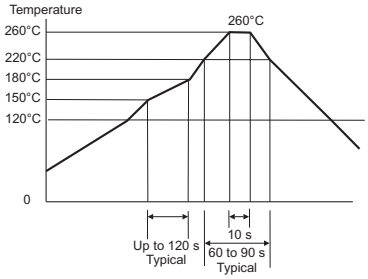



## TV-Series Marking Configuraration




| 2 character Code | |
|---|---|
| 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 |

## Solder Profile




Meets IPC/JEDEC J-STD-020C

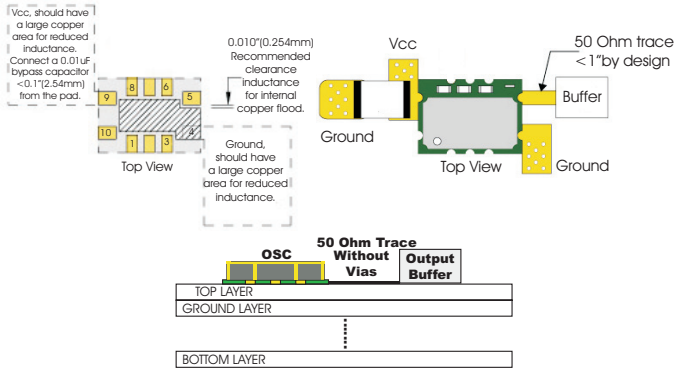


Specifications subject to change without notification. See Connor-Winfield's website for latest revision.
© Copyright 2022 The Connor-Winfield Corporation Not intended for life support applications.

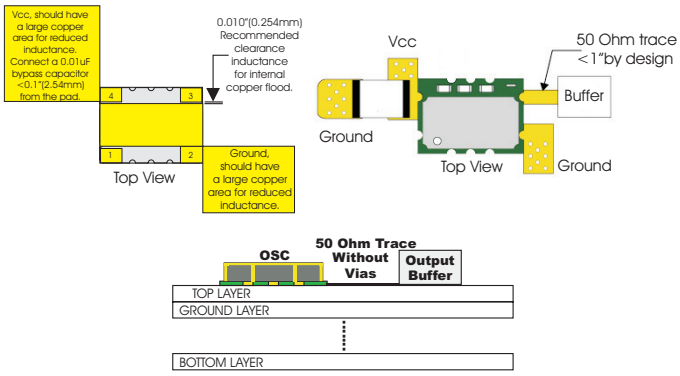
CONNOR WINFIELD

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

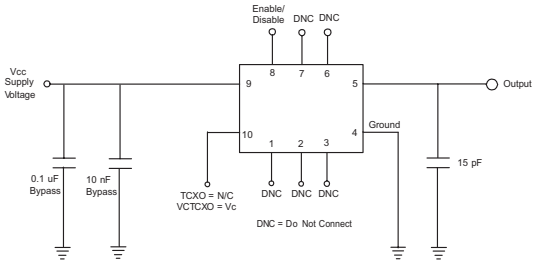
## T Series Design Recommendations



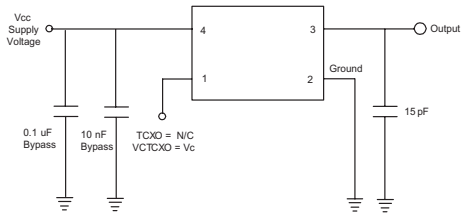

## TV Series Design Recommendations



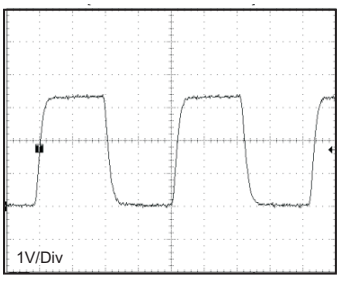

## T Series LVCMOS Test Circuit



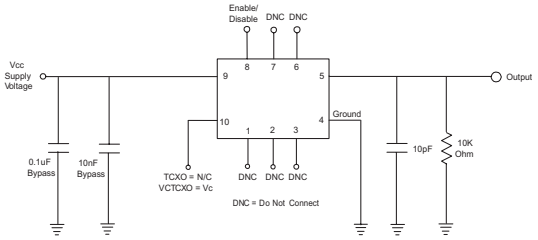

## TV Series LVCMOS Test Circuit



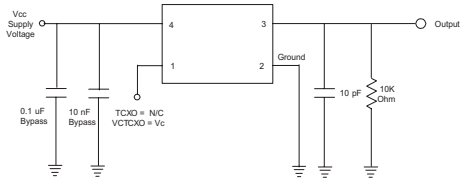

## LVCMOS Output Waveform



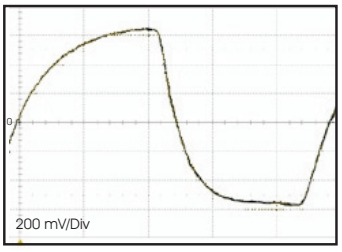

## T Series Clipped Sinewave Test Circuit




## TV Series Clipped Sinewave Test Circuit




## Clipped Sinewave Output Waveform




Note: The clipped sinewave output is AC coupled

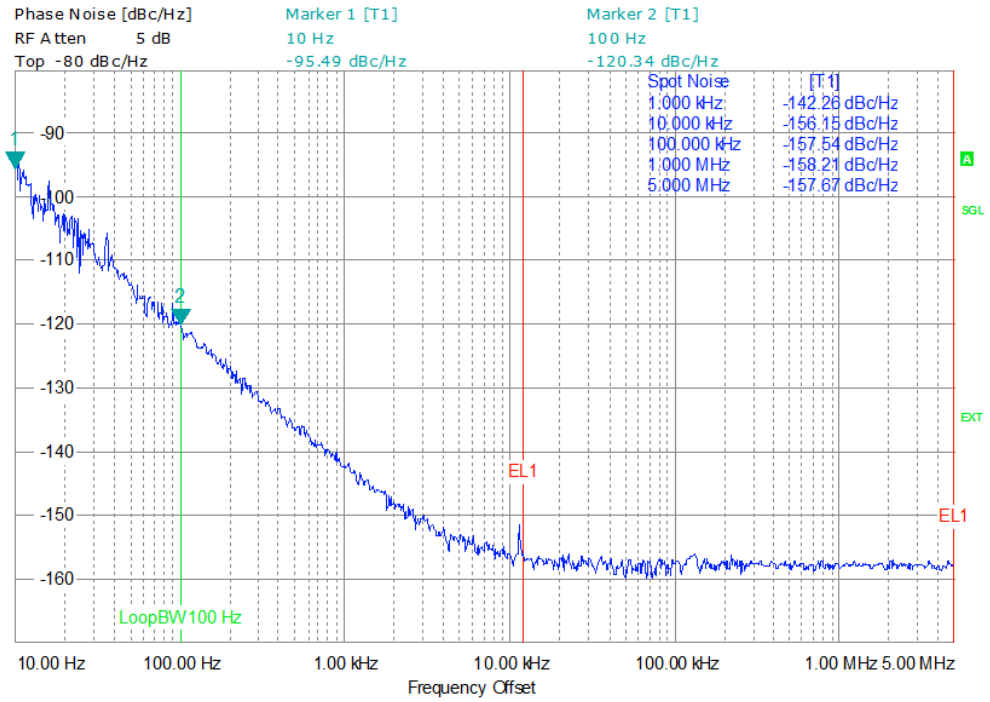
| | |
|---|---|
| Bulletin | Tx452 |
| Page | 7 of 8 |
| Revision | 02 |
| Date | 20 Jan 2022 |

Specifications subject to change without notification. See Connor-Winfield's website for latest revision.
© Copyright 2022 The Connor-Winfield Corporation Not intended for life support applications.

CONNOR WINFIELD

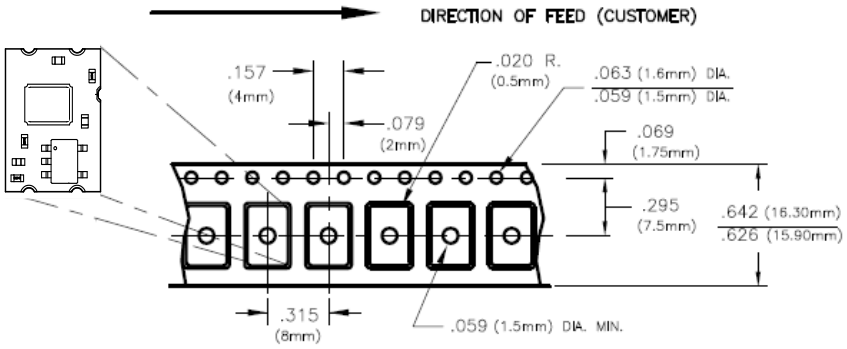
2111 Comprehensive Drive
Aurora, Illinois 60505
Phone: 630-851-4722
Fax: 630-851-5040
**www.conwin.com**

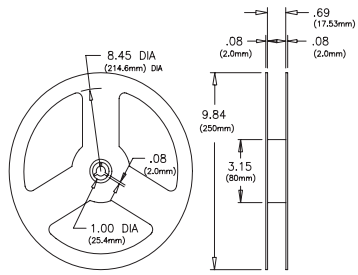
## Typical Phase Noise at Fo=25MHz




## 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 |



Specifications subject to change without notification. See Connor-Winfield's website for latest revision.
© Copyright 2022 The Connor-Winfield Corporation Not intended for life support applications.