



High Precision TCXO / VCTCXO Oscillators

CONNOR WINFIELD



2111 Comprehensive Drive

Aurora, Illinois 60505

Phone: 630-851-4722

Fax: 630-851-5040

www.conwin.com

US Headquarters:

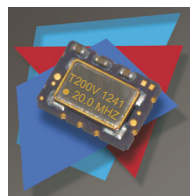
630-851-4722

European Headquarters:

+353-61-472221

Description:

The Connor-Winfield's T100/T200 and the TV100/TV200 series have very high frequency stability with excellent phase noise performance. Available in a 5x7mm surface mount package. These TCXO's and VCTCXO's through the use of Analog Temperature Compensation are capable of holding sub 100-ppb or 200-ppb stabilities over the commercial or industrial temperature ranges. The surface mount package is designed for high-density mounting and is optimum for mass production.



Features:

Models:

T100 / T200-Series
TV100 / TV200-Series

- Package
T100-T200 Series 5 x 7mm 10 Pad
TV100-TV200 Series 5 x 7mm 4 Pad
- Frequencies Available:
10, 12.8, 19.2 or 20 MHz
- 3.3 Vdc Operation
- Output Logic: LVCMOS
- Frequency Stability:
T100 / TV100: +/-100 ppb, 0 to 70°C
T200 / TV200: +/-200 ppb, -40 to 85°C
- Fixed Frequency - TCXO
- Optional Control Voltage - VCTCXO
- Low Jitter <0.50 ps RMS
- Low Phase Noise
- Tri-State Enable/Disable:
Available on T100 / T200 Models.
- Tape and Reel Packaging
- RoHS Compliant / Lead Free ✓RoHS

Applications:

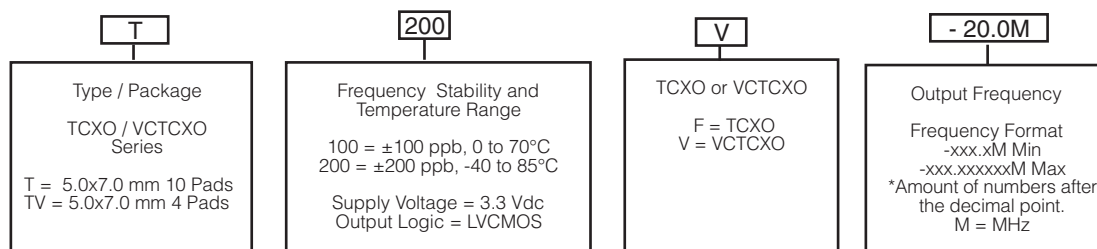
Basestation, Communications, DSL / ADSL, Femtocell, IP Timing, LTE, Precision GPS, SONET / SDH, WiMAX / WiBro, WLAN.

Absolute Maximum Ratings

| Parameter | Minimum | Nominal | Maximum | Units | Notes |
|----------------------|---------|---------|-----------|-------|-------|
| Storage Temperature | -40 | - | 85 | °C | |
| Supply Voltage (Vcc) | -0.5 | - | 4.6 | Vdc | |
| Input Voltage | (Vc) | -0.5- | Vcc + 0.5 | Vdc | |

** T200 &
TV200 not
available at
Digi-Key

Ordering Information



Example: Part Number

T100F-019.2M = 5x7mm 10 pad package, ±100 ppb, 0 to 70°C, 3.3 Vdc, LVCMOS Output, TCXO, 19.2 MHz
T200V-020.0M = 5x7mm 10 pad package, ±200 ppb, -40 to 85°C, 3.3 Vdc, LVCMOS Output, VCTCXO, 20.0 MHz
TV100F-010.0M = 5x7mm 4 pad package, ±100 ppb, 0 to 70°C, 3.3 Vdc, LVCMOS Output, TCXO, 10.0 MHz
TV200V-012.8M = 5x7mm 4 pad package, ±200 ppb, -40 to 85°C, 3.3 Vdc, LVCMOS Output, VCTCXO, 12.8 MHz





Operating Specifications

| Parameter | Minimum | Nominal | Maximum | Units | Notes |
|--------------------------------------|---|----------------------|---------|--------|-------|
| Output Frequency (Fo) | - | 10, 12.8, 19.2 or 20 | - | MHz | |
| Frequency Calibration @ 25 °C | -1.0 | - | 1.0 | ppm | 1 |
| Frequency Stability | (See Ordering Information for full part number) | | | | |
| Model T100x, TV100x | -100 | - | 100 | ppb | 2 |
| Model T200x, TV200x | -200 | - | 200 | ppb | 2 |
| Frequency vs. Load Stability | -0.20 | - | 0.20 | ppm | ±5% |
| Frequency vs. Voltage Stability | -0.20 | - | 0.20 | ppm | ±5% |
| Static Temperature Hysteresis | - | - | 0.40 | ppm | 3 |
| Freq. shift after reflow soldering | -1.0 | - | 1.0 | ppm | 4 |
| Long Term Stability | -1.0 | - | 1.0 | ppm | 5 |
| Aging | | | | | |
| per Life (20 Years) | -3.0 | - | 3.0 | ppm | |
| per Day | -40 | - | 40 | ppb | |
| per Second | - | 4.63E-13 | - | | |
| Operating Temperature Range | (See Ordering Information for full part number) | | | | |
| Model T100x, TV100x | 0 | - | 70 | °C | |
| Model T200x, TV200x | -40 | - | 85 | °C | |
| Supply Voltage (Vcc) | 3.135 | 3.30 | 3.465 | Vdc | |
| Supply Current (Icc) | - | - | 2.1 | mA | |
| Jitter: | | | | | |
| Period Jitter | - | 3.0 | 5.0 | ps RMS | |
| Integrated Phase Jitter (12K to 20M) | - | 0.3 | 1.0 | ps RMS | 6 |
| SSB Phase Noise for Fo=10.0 MHz | | | | | |
| @ 1 Hz offset | - | -60 | - | dBc/Hz | |
| @ 10 Hz offset | - | -98 | - | dBc/Hz | |
| @ 100 Hz offset | - | -126 | - | dBc/Hz | |
| @ 1 KHz offset | - | -143 | - | dBc/Hz | |
| @ 10 KHz offset | - | -151 | - | dBc/Hz | |
| @ 100 KHz offset | - | -152 | - | dBc/Hz | |
| @ 1 MHz offset | - | -155 | - | dBc/Hz | |
| Start-Up Time | - | - | 10 | ms | |

Control Voltage Input Characteristics

| Parameter | Minimum | Nominal | Maximum | Units | Notes |
|----------------------------|----------------|---------|---------|-------|-------|
| Control Voltage | 0.3 | 1.65 | 3.0 | V | |
| Frequency Pullability | ±10 | - | - | ppm | |
| Control Voltage Slope | Positive Slope | | | | |
| Monotonic Linearity | - | - | 10 | % | |
| Input Impedance | 100K | - | - | Ohm | |
| Modulation Bandwidth (3dB) | 10 | - | - | KHz | |

**Enable /Disable Input Characteristics (Pad 8)
(Models T100F, T200F, T100V and T200V Only)**

| Parameter | Minimum | Nominal | Maximum | Units | Notes |
|-------------------------------|---------|---------|---------|-------|-------|
| Enable Input Voltage -(Vih) | 70%Vcc | - | - | Vdc | 7 |
| Disable Input Voltage - (Vil) | - | - | 30%Vcc | Vdc | 7 |

| Function | Output |
|---------------|---------------------------|
| Low: | Disabled (High Impedance) |
| High or Open: | Enabled |

LVC MOS Output Characteristics

| Parameter | Minimum | Nominal | Maximum | Units | Notes |
|-----------------------------|---------|---------|---------|-------|-------|
| Load (CL) | - | 15 | - | pF | 8 |
| Voltage (High) (Voh) | 90%Vcc | - | - | Vdc | |
| (Low) (Vol) | - | - | 10%Vcc | Vdc | |
| Duty Cycle at 50% of Vcc | 45 | 50 | 55 | % | |
| Rise / Fall Time 10% to 90% | - | 4 | 8 | ns | |

Package Characteristics

| | |
|---------|---|
| Package | Hermetically sealed ceramic package with grounded metal cover |
|---------|---|

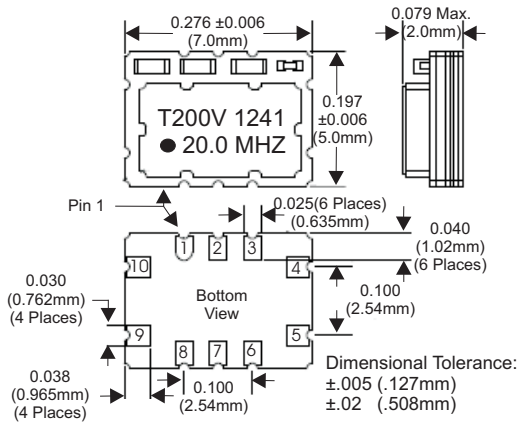
Environmental Characteristics

| | |
|--------------------|---|
| 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 2. |

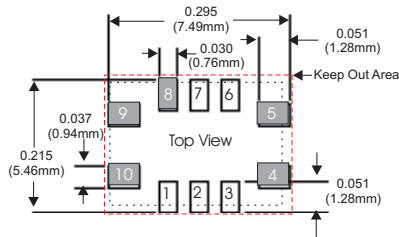
Notes:

1. Initial calibration @ 25°C. ±2°C, for VCTCXO's Vc = 1.65V. Specifications at time of shipment after 48 hours of operation.
2. Frequency stability vs. change in temperature. $[\pm(F_{max}-F_{min})/2.F_0]$. For VCTCXO's - Vc = 1.65V
3. Frequency change after reciprocal temperature ramped over the operating range. Frequency measured before and after at 25°C
4. Two consecutive reflows after 1 hour recovery @ 25°C.
5. Frequency drift over 1 year @ 25°C.
6. BW = 12 KHz to 20 MHz
7. Leave Pad 8 on models, T100F, T200F, T100V, T200V 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).
8. Attention: To achieve optimal frequency stability, and in some cases to meet the specification stated on this data sheet, 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 20 ppb per pF load difference..

T100/T200 Package Outline



T100/T200 Suggested Pad Layout

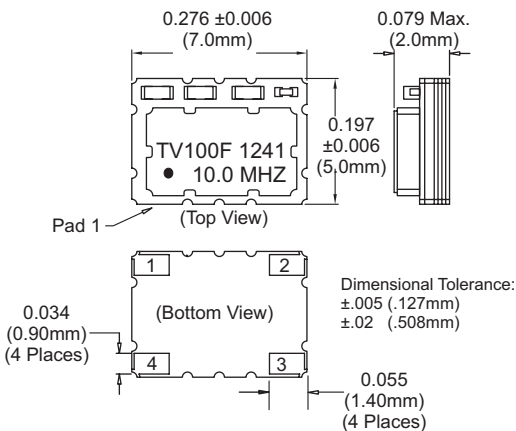


* Do not route any traces in the keep out area. It is recommended the next layer under the keep out area is to be ground plane.

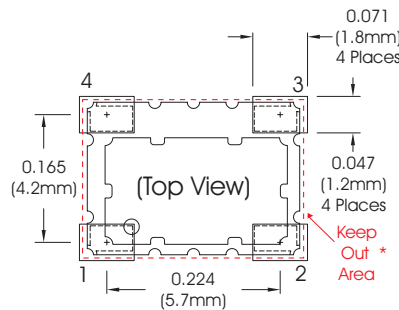
T100/T200 Pad Connections

- 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: Enable / Disable
- 9: Supply Voltage (Vcc)
- 10: VCTCXO: Control Voltage (Vc)
TCXO: N/C

TV100/TV200 Package Outline



TV100/TV200 Suggested Pad Layout



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

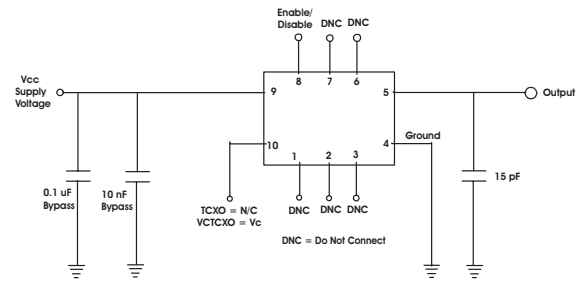
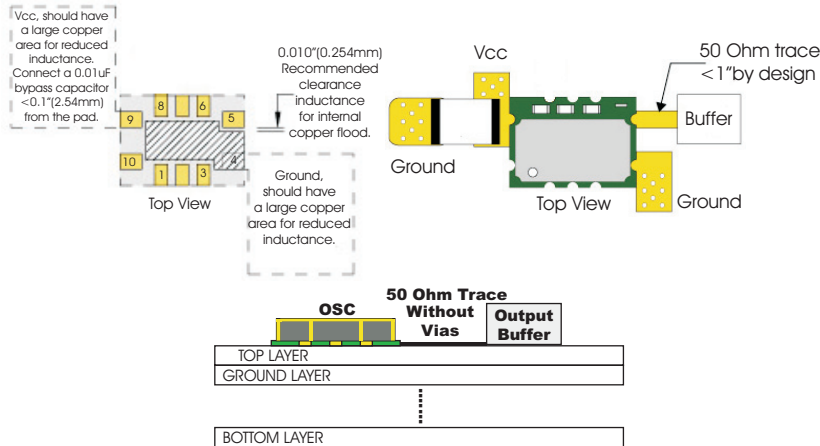
TV100/TV200 Pad Connections

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



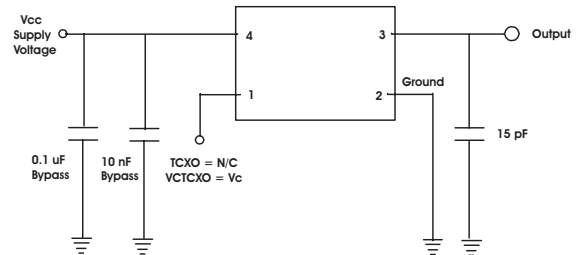
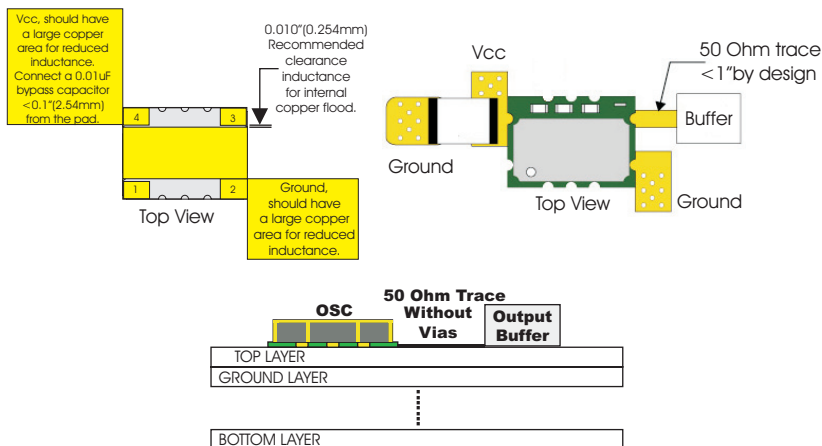
T100 / T200 Design Recommendations

T100 / T200 Test Circuit



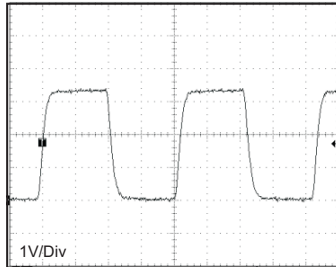
TV100 / TV200 Design Recommendations

TV100 / TV200 Test Circuit

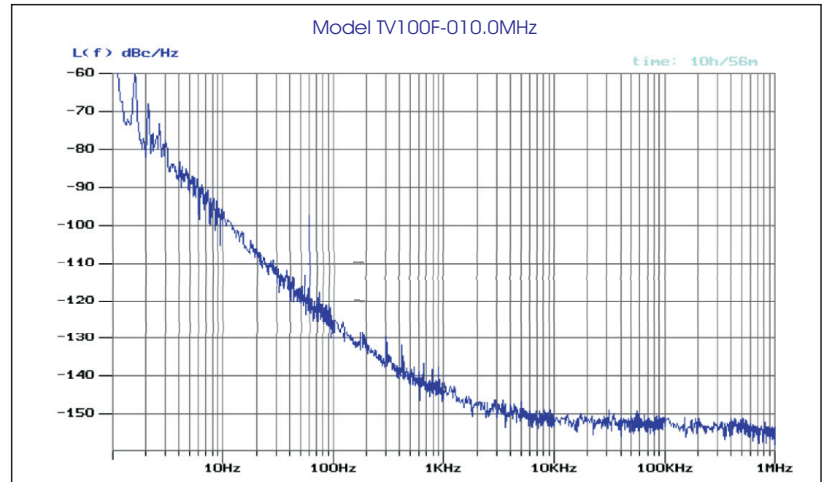


Attention: To achieve optimal frequency stability, and in some cases to meet the specification stated on this data sheet, it is required that the circuit connected to this TCXO output must have the equivalent input capacitance that is specified by the nominal load capacitance. Deviations from the nominal load capacitance will have a graduated effect on the stability of approximately 20 ppb per pF load difference.

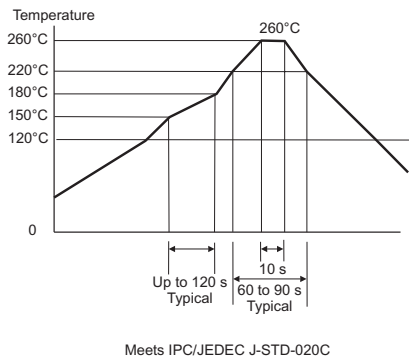
LVC MOS Output Waveform



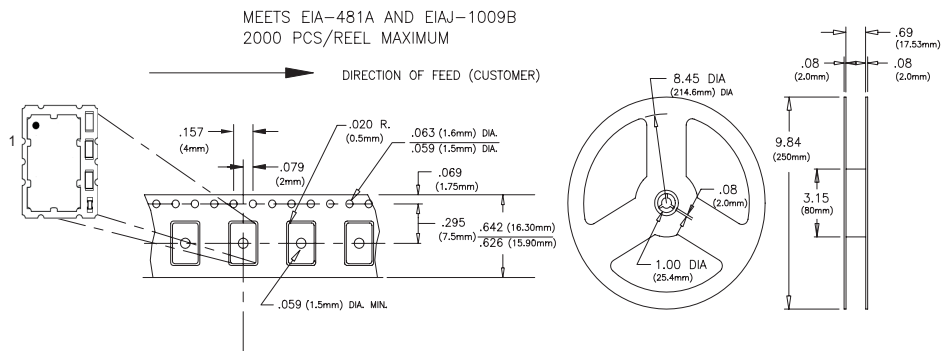
Phase Noise Information



Solder Profile



5x7 mm Tape and Reel Information



Revision History

| Revision | Date | Changes |
|-------------|----------|--|
| A00 | 12/05/11 | Advanced information data sheet released |
| A01 | 04/24/12 | Added 12.8 MHz and +/-50ppb 0 to 70 °C Models |
| 02 | 04/26/12 | Updated integrated phase jitter to 0.3 ps RMS nominal. |
| 03 | 10/12/12 | Removed M series |
| Revision 04 | 01/09/13 | Updated phase noise information |

| | |
|----------|--------------------|
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| Revision | 04 |
| Date | 09 Jan 2013 |