

а <u> Міскосні</u>р company



Vectron's VT-702 Temperature Compensated Crystal Oscillator (TCXO) is a quartz stabilized, clipped sine wave or CMOS output, amalog temperature compensated oscillator, operating off either 5.0 or 3.3 volt supply, hermetically sealed 10 pad 7.0 x 5.0 mm ceramic package.

Features

- 5.000 52.000MHz Output Frequency
- ±0.280 ppm Temperature Stability
- Optional Frequency Tuning
- Fundamental Crystal Design
- Stratum 3 version available as a custom part number
- Hermetically Sealed Ceramic SMD package
- Product is compliant to RoHS directive and fully compatible with lead free assembly

Applications

- Femto Cells
- Base Stations
- IP Networking
- Global Posiitoning Systems
- Point to Point Radio
- Test and Measurement

Block Diagram



Specifications

| Table 1. Electrical Performance, Clipped Sine Wave Option | | | | | | | |
|-------------------------------------------------------------|--------------------|---------------------|--------------------|---------------------|--------|--|--|
| Parameter | Symbol | Min | Тур | Max | Units | | |
| Output Frequency ¹ , Ordering Option | f _o | 5 | | 52 | MHz | | |
| Supply Voltage ² , Ordering Option | V _{DD} | +2 | 2.8, +3.0, +3.3, + | -5.0 | V | | |
| Supply Current | I _{DD} | | | 3.5 | mA | | |
| Operating Temperature, Ordering Option | T _{op} | 0/55, -10 |)/70, -20/70, -30 | /85, -40/85 | °C | | |
| F | requency St | ability | | | | | |
| Stability Over T _{op} ⁴ Ordering Option | F _{STAB} | ±0.05, ± | ±0.10, ±0.20, ±0. | .28, ±0.50 | ppm | | |
| Frequency Tolerance ⁵ | F _{TOL} | | | ±2.0 | ppm | | |
| Power Supply Stability, ±5% change | F _{SUP} | | | ±0.2 | ppm | | |
| Load Stability, ±10% change | F _{LOAD} | | | ±0.2 | ppm | | |
| Aging / 1st year | F _{AGE} | | | ±1.0 | ppm | | |
| Frequency | 「uning (EFC) | , Ordering Opt | ion | | | | |
| Tuning Range ⁶ | PR | ±5. | ppm | | | | |
| Tuning Slope | | | | | | | |
| Control Voltage to reach Pull Range | Vc | 0.5 | 1.5 | 2.5 | V | | |
| Control Voltage Impedance | | 100 | | | Kohm | | |
| RF Output (Clip | ped Sine W | ave) Ordering (| Option | | | | |
| Output Level | V _o p-p | 0.8 | | | V | | |
| Output Load | C _L | | 10K II 10pF | | | | |
| Start Up Time | t _{su} | | | 2 | ms | | |
| Output Enable ⁷ | V _{IH} | 0.7*V _{DD} | | | V | | |
| Output Disable | V _{IL} | | | 0.3*V _{DD} | V | | |
| | Phase Noi | ise ⁸ | r | I | 1 | | |
| Phase Noise ⁸ , 10MHz 10Hz | | | -99 | | dBc/Hz | | |
| 10Hz | | | -123 | | | | |
| 1kHz | | | -143 | | | | |
| 10kHz | | | -152 | | | | |
| 100kHz | | | -155 | | | | |

1. Refer to Table 8 for Standard Frequencies. Other Frequencies may be avilable upon request. Check with factory

2. Output DC-cut capacitor is optional.

3. The VT-702 power supply pin should be filtered, eg, a 0.1 and 0.01uf capacitor

4. Referenced to the midpoint between minimum and maximum frequency value over the operating temperature range.

5. Frequency measured at 25 °C, 1 hour after 2 IR reflows.

6. Referenced to Mid Control Voltage

7. Output is Enabled if Enable / Disable pad is left Open or No Connect.

8. Measured using Agilent E5052 Signal Source Analyzer at 25 °C

| Table 2. Electrical Performance, CMOS Optio | n | | | | |
|-------------------------------------------------------------|---------------------------------|---------------------|--------------------|---------------------|--------|
| Parameter | Symbol | Min | Тур | Max | Units |
| Output Frequency ¹ , Ordering Option | f _o | 5 | 1 | 52 | MHz |
| Supply Voltage ² , Ordering Option | V _{DD} | + | V | | |
| Supply Current | I _{DD} | | | 6.0 | mA |
| Operating Temperature, Ordering Option | T _{OP} | 0/55, -10 |)/70, -20/70, -30 | /85, -40/85 | °C |
| | Frequency St | ability | | | |
| Stability Over T _{OP} ⁴ Ordering Option | F _{STAB} | ±0.05, = | ±0.10, ±0.20, ±0 | .28, ±0.50 | ppm |
| Frequency Tolerance ⁵ | F _{TOL} | | | ±2.0 | ppm |
| Power Supply Stability, ±5% change | F _{SUP} | | | ±0.2 | ppm |
| Load Stability, ±10% change | F _{LOAD} | | | ±0.2 | ppm |
| Aging / 1st year | F _{AGE} | | | ±1.0 | ppm |
| Frequ | iency Tuning (EFC) | , Ordering Opt | ion | | |
| Tuning Range ⁶ | PR | ±5. | .0, ±8.0, ±10.0, ± | ±12.0 | ppm |
| Tuning Slope | | | | | |
| Control Voltage to reach Pull Range | Vc | 0.5 | 1.5 | 2.5 | V |
| Control Voltage Impedance | | 100 | | | Kohm |
| RF | Output (CMOS), O | rdering Option | | | |
| Output Level High | V _{OH} | 0.9*V _{DD} | | | V |
| Output Level Low | V _{OL} | | | 0.1*V _{DD} | V |
| Output Load | C _L | | | 15 | pF |
| Duty Cycle | | 45 | | 55 | % |
| Start Up Time | T _{SUP} | | | 2 | ms |
| Rise / Fall Times | t _R / t _F | | | 4 | ns |
| Output Enable ⁷ | V _{IH} | 0.7*V _{DD} | | | V |
| Output Disable | V | | | 0.3*V _{DD} | V |
| | Phase Noi | se ⁸ | 1 | 1 | 1 |
| Phase Noise ⁸ , 10MHz | | | 101 | | dBc/Hz |
| 10Hz 100Hz | | | -101 -124 | | |
| 100Hz 1kHz | | | -124 -144 | | |
| 10kHz | | | -154 | | |
| 100kHz | | | -156 | | |

1. Refer to Table 8 for Standard Frequencies. Other Frequencies may be avilable upon request. Check with factory

2. Output DC-cut capacitor is optional.

3. The VT-702 power supply pin should be filtered, eg, a 0.1 and 0.01uf capacitor

4. Referenced to the midpoint between minimum and maximum frequency value over the operating temperature range.

5. Frequency measured at 25 °C, 1 hour after 2 IR reflows.

6. Referenced to Mid Control Voltage

7. Output is Enabled if Enable / Disable pad is left Open or No Connect.

8. Measured using Agilent E5052 Signal Source Analyzer at 25 °C

Phase Noise, CMOS



Package Drawing





Dimensions in mm



Marking Information XXMXXX - Frequency (10M000) YY - Year of Manufacture

WW - Week of the Year

- T Manufacturing Location
- Pin 1 Indicator

Recommended Land Pattern



| Table 3. | Table 3. Pinout | | | | | | | | |
|----------|--------------------------------|------------|--|--|--|--|--|--|--|
| Pin # | Symbol | Function | | | | | | | |
| 1 | NC No Connect | | | | | | | | |
| 2 | NC | No Connect | | | | | | | |
| 3 | NC | No Connect | | | | | | | |
| 4 | GND | Ground | | | | | | | |
| 5 | OUT | RF Output | | | | | | | |
| 6 | NC No Connects | | | | | | | | |
| 7 | NC | No Connect | | | | | | | |
| 8 | E/D Enable / Disable | | | | | | | | |
| 9 | V _{DD} Supply Voltage | | | | | | | | |
| 10 | NC | No Connect | | | | | | | |

Enable/Disable Function

Enable/Disable Feature: The VT-702 has an enable/disable feature to which shuts down the oscillator and puts the output in to a high impdeance mode. If the Enable/Disable is left open or floating, the output is active**l.**

Clipped Sine Wave Output



Maximum Ratings

Absolute Maximum Ratings and Handling Precautions

Stresses in excess of the absolute maximum ratings can permanently damage the device. Functional operation is not implied or any other excess of conditions represented in the operational sections of this data sheet. Exposure to absolute maximum ratings for extended periods may adversely affect device reliability.

Although ESD protection circuitry has been designed into the VT-702, proper precautions should be taken when handling and mounting, Vectron employs a Human Body Model and Charged Device Model for ESD susceptibility testing and design evaluation. ESD thresholds are dependent on the circuit parameters used to define the model. Although no industry standard has been adopted for the CDM a standard resistance of 1.5kOhms and capacitance of 100pF is widely used and therefor can be used for comparison purposes.

| Table 4. Maximum Ratings | | | |
|---------------------------|--------------------|---------------------------|------|
| Parameter | Symbol | Rating | Unit |
| Storage Temperature | T _{store} | -55/125 | °C |
| Supply Voltage | V _{DD} | -0.6/6.0 | V |
| Control Voltage | Vc | -0.6/V _{DD} +0.6 | V |
| Enable/Disable Voltage | E/D | -0.6/V _{DD} +0.6 | V |
| ESD, Human Body Model | | 1500 | V |
| ESD, Charged Device Model | | 1000 | V |

| Table 5. Environmental Compliance | | | | | |
|-----------------------------------|-------------------------|--|--|--|--|
| Parameter | Condition | | | | |
| Mechanical Shock | MIL-STD-883 Method 2002 | | | | |
| Mechanical Vibration | MIL-STD-883 Method 2007 | | | | |
| Temperature Cycle | MIL-STD-883 Method 1010 | | | | |
| Solderability | MIL-STD-883 Method 2003 | | | | |
| Fine and Gross Leak | MIL-STD-883 Method 1014 | | | | |
| Resistance to Solvents | MIL-STD-883 Method 2015 | | | | |
| Moisture Sensitivity Level | MSL1 | | | | |
| Contact Pads | Gold over Nickel | | | | |

IR Reflow

Suggested IR Profile

Devices are built using lead free epoxy and can be subjected to standard lead free IR reflow conditions shown in Table 5. Contact pads are gold over nickel and lower maximum temperatures can also be used, such as 220C.

| Table 6. Reflow Profile | | |
|----------------------------------|--------------------------|-------------------------------|
| Parameter | Symbol | Value |
| PreHeat Time Ts-min Ts-max | t _s | 200 sec Max 150°C 200°C |
| Ramp Up | R _{up} | 3°C/sec Max |
| Time above 217C | t | 150 sec Max |
| Time to Peak Temperature | t _{25C to peak} | 480 sec Max |
| Time at 260C | t _P | 30 sec Max |
| Time at 240C | t _{P2} | 60 sec Max |
| Ramp down | R _{DN} | 6°C/sec Max |

Solderprofile:



Tape & Reel

| Table 7. Tape and Reel Information | | | | | | | | | | | | |
|------------------------------------|-----|-----|----|----------------------|-----|-----|----|------|----|------|------|--------|
| Tape Dimensions (mm) | | | | Reel Dimensions (mm) | | | | | | | | |
| w | F | Do | Ро | P1 | A | В | С | D | N | W1 | W2 | #/Reel |
| 16 | 7.5 | 1.5 | 4 | 8 | 180 | 1.5 | 13 | 20.2 | 60 | 16.4 | 20.4 | 1000 |





Ordering Information

| Table 8. Sta | Table 8. Standard Frequencies (MHz) | | | | | | | | |
|--------------|-------------------------------------|--------|--------|--------|--------|--------|--------|--|--|
| 10.000 | 12.800 | 16.384 | 19.200 | 20.000 | 25.000 | 26.000 | 40.000 | | |
| | | | | | | | | | |
| | | | | | | | | | |



* Add **_SNPBDIP** for tin lead solder dip Example: VT-702-EFW-207A-26M000000_SNPBDIP

| Revision History | | | | | | |
|------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------|--|--|--|--|
| Revision Date | Approved | Description | | | | |
| August 10, 2018 | FB | Rev 0.4: Updated logo and contact information, added "SNPBDIP" ordering option | | | | |
| October 29, 2018 | FB Correct package drawing and specifications from rev Nov30 2015 version | | | | | |
| | | | | | | |
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