


Helping Customers Innovate, Improve & Grow



Description

Vectron's VT-804 Temperature Compensated Crystal Oscillator (TCXO) is a quartz stabilized, Clipped sine wave or CMOS output, 5th order analog temperature compensated oscillator, operating off a 2.8V to 5.0 volt supply in a hermetically sealed 3.2x5mm ceramic package.

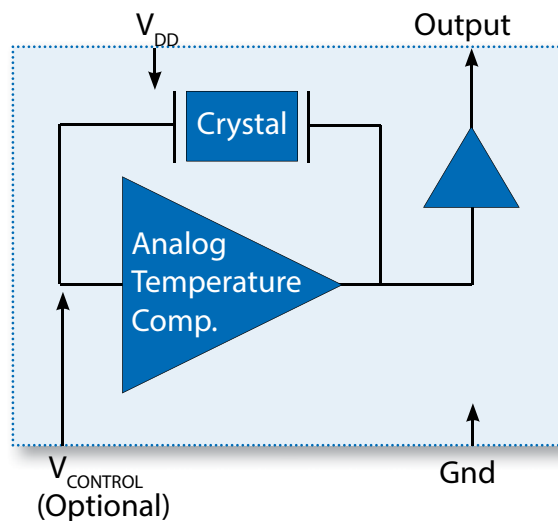
Features

- Clipped Sine Wave or CMOS Output
- 10.000 - 52.000MHz Output Frequency
- ± 50 ppb Temperature Stability
- Optional Frequency Tuning
- Fundamental Crystal Design
- Gold over nickel contact pads
- 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 Positioning Systems
- Point to Point Radio
- Manpack Radio
- Test and Measurement

Block Diagram



Specifications

Table 1. Electrical Performance, Clipped Sine Wave Option

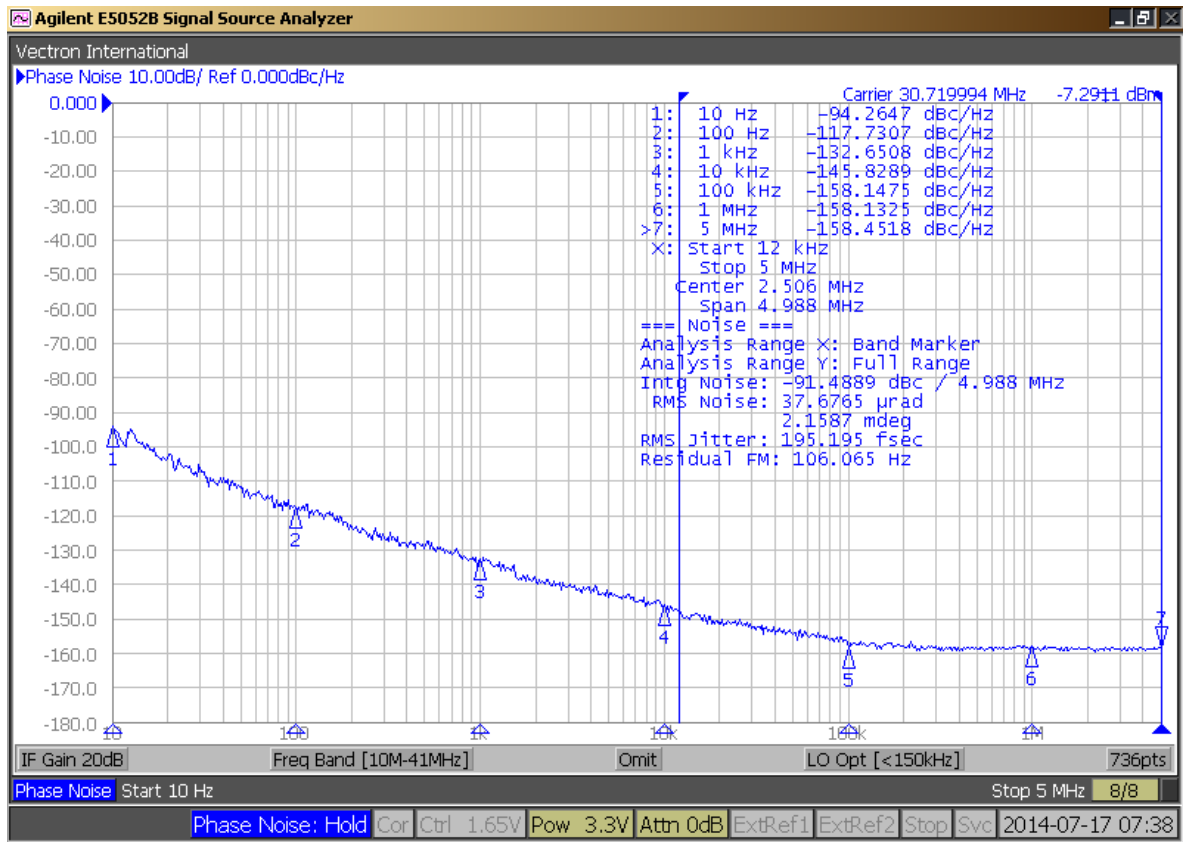
| Parameter | Symbol | Min. | Typ | Max | Units |
|---|------------|---|-------------------------------------|-------------|--------|
| Output Frequency ¹ , <i>Ordering Option</i> | f_o | 10 | | 52 | MHz |
| Supply Voltage ³ , <i>Ordering Option</i> | V_{DD} | +2.8, +3.0, +3.3, +5.0 | | | V |
| Supply Current 10.000MHz - 26.000MHz 26.001MHz - 52.000MHz | I_{DD} | | | 2.0 3.0 | mA |
| Operating Temperature, <i>Ordering Option</i> | T_{OP} | 0/55, -10/70, -20/70, -30/85, -40/85 | | | °C |
| Frequency Stability | | | | | |
| Stability Over T_{OP} ⁴ , <i>Ordering Option</i> | F_{STAB} | ±0.05, ±0.10, ±0.20, ±0.28, ±0.50, ±1.00, ±2.00 | | | ppm |
| Frequency Tolerance ⁵ | F_{TOL} | | | ±1.5 | ppm |
| Power Supply Stability, ±5% | F_{PWR} | | | ±0.1 | ppm |
| Load Stability, ±5% | F_{LOAD} | | | ±0.1 | ppm |
| Aging / 1st year | F_{AGE} | | | ±1.0 | ppm |
| Frequency Tuning (EFC), <i>Ordering Option</i> | | | | | |
| Tuning Range ⁶ | PR | ±5.0, ±8.0, ±10.0, ±12.0 | | | ppm |
| Tuning Slope | | Positive | | | |
| Control Voltage to reach Pull Range | V_C | 0.5 | 1.5 | 2.5 | V |
| Control Voltage Impedance | | 100 | | | Kohm |
| RF Output (Clipped Sine Wave), <i>Ordering Option</i> | | | | | |
| Output Level High | V_o p-p | 0.8 | | | V |
| Output Load | C_L | | | 10k 10pF | |
| Start Up Time | t_{SU} | | | 2 | ms |
| Phase Noise⁷ | | | | | |
| Phase Noise, 30.720MHz ⁷ 10Hz 100Hz 1kHz 10kHz 100kHz | ϕ_N | | -92 -115 -133 -146 -158 | | dBc/Hz |
| Integrated Jitter, 30.720MHz ⁷ 12kHz-5MHz | | | 0.20 | | ps-rms |

1. Refer to Table 8 for Standard Frequencies. Other Frequencies are available on request. Check with factory.
2. Output DC-cut capacitor is optional.
3. The VT-804 power supply pin (Pin4) should be filtered using a by-pass capacitor of 0.1uF for optimal performance.
4. Referenced to the midpoint between minimum and maximum frequency value over Operating Temperature Range.
5. Frequency measured at 25 °C, 1 hour after 2 IR reflows.
6. Referenced to Mid Control Voltage
7. Measured at ambient temperature using Agilent E5052B Signal Source Analyzer.

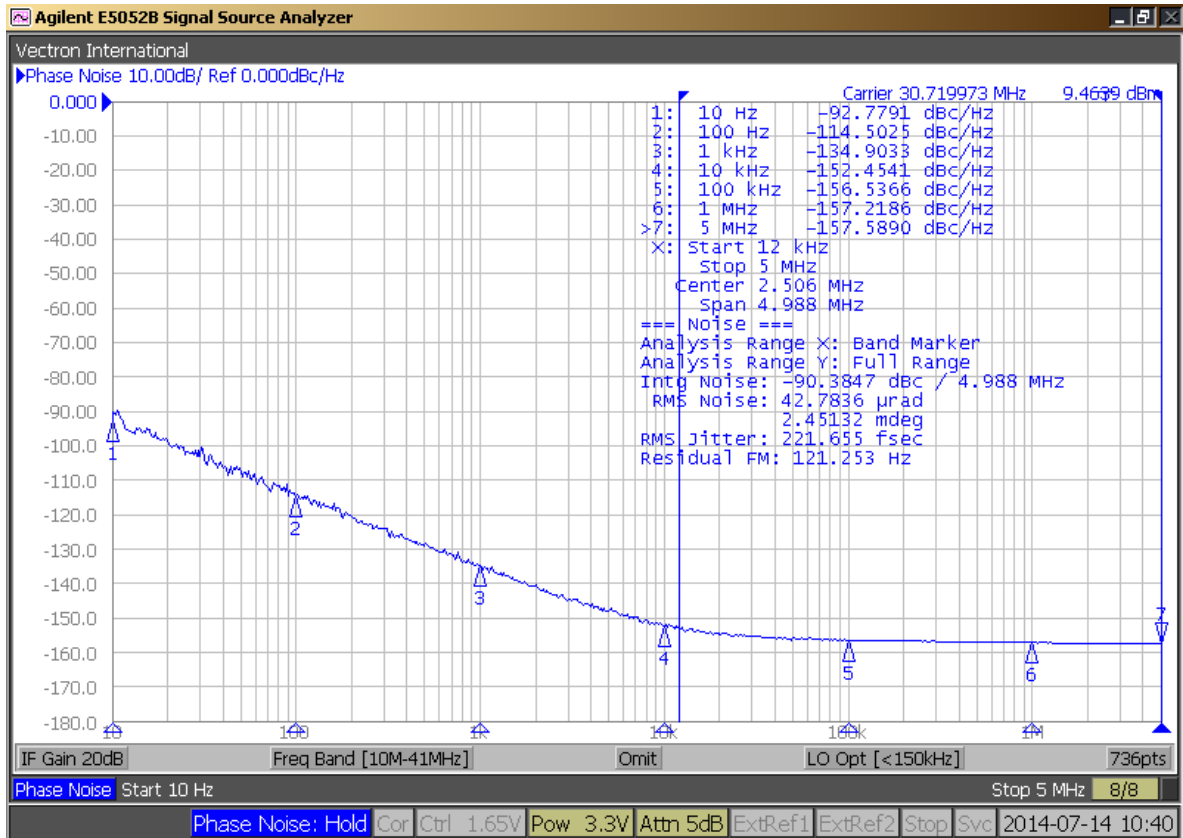
| Table 2. Electrical Performance, CMOS Option | | | | | |
|---|----------------------|---|-------------------------------------|---------------|--------|
| Parameter | Symbol | Min. | Typ | Max | Units |
| Output Frequency ¹ , <i>Ordering Option</i> | f_o | 10 | | 40 | MHz |
| Supply Voltage ³ , <i>Ordering Option</i> | V_{DD} | +2.8, +3.0, +3.3, +5.0 | | | V |
| Supply Current 10.000MHz - 26.000MHz 26.001MHz - 52.000MHz | I_{DD} | | | 3.5 8.0 | mA |
| Operating Temperature, <i>Ordering Option</i> | T_{OP} | 0/55, -10/70, -20/70, -30/85, -40/85 | | | °C |
| Frequency Stability | | | | | |
| Stability Over T_{OP} ⁴ , <i>Ordering Option</i> | F_{STAB} | ±0.05, ±0.10, ±0.20, ±0.28, ±0.50, ±1.00, ±2.00 | | | ppm |
| Frequency Tolerance ⁵ | F_{TOL} | | | ±1.5 | ppm |
| Power Supply Stability, ±5% | F_{PWR} | | | ±0.3 | ppm |
| Load Stability, ±5% | F_{LOAD} | | | ±0.1 | ppm |
| Aging / 1st year | F_{AGE} | | | ±1.0 | ppm |
| Frequency Tuning (EFC), <i>Ordering Option</i> | | | | | |
| Tuning Range ⁶ | PR | ±5.0, ±8.0, ±10.0, ±12.0 | | | ppm |
| Tuning Slope | | Positive | | | |
| Control Voltage to reach Pull Range | V_C | 0.5 | 1.5 | 2.5 | V |
| Control Voltage Impedance | | 100 | | | Kohm |
| RF Output (CMOS), <i>Ordering Option</i> | | | | | |
| Output Level High Output Level Low | V_{OH} V_{OL} | 0.9* V_{DD} | | 0.1* V_{DD} | V |
| Output Load | C_L | | | 15 | pF |
| Duty Cycle | | 45 | | 55 | % |
| Start Up Time | t_{SU} | | | 2 | ms |
| Rise & Fall Times | | | | 5 | ns |
| Phase Noise ⁷ | | | | | |
| Phase Noise, 30.720MHz ⁷ 10Hz 100Hz 1kHz 10kHz 100kHz | θ_N | | -90 -112 -134 -150 -156 | | dBc/Hz |
| Integrated Jitter, 30.720MHz ⁷ 12kHz - 5MHz | | | 0.22 | | ps-rms |

1. Refer to Table 8 for Standard Frequencies. Other Frequencies are available on request. Check with factory.
2. Output DC-cut capacitor is optional.
3. The VT-804 power supply pin (Pin4) should be filtered using a by-pass capacitor of 0.1uF for optimal performance.
4. Referenced to the midpoint between minimum and maximum frequency value over Operating Temperature Range.
5. Frequency measured at 25 °C, 1 hour after 2 IR reflows.
6. Referenced to Mid Control Voltage.
7. Measured at ambient temperature using Agilent E5052B Signal Source Analyzer

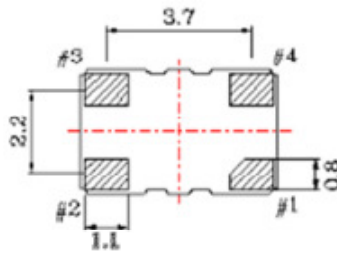
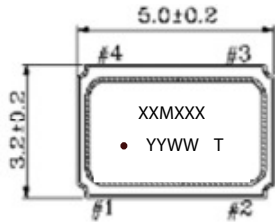
Phase Noise Performance for 30.72MHz Clipped Sine Wave



Phase Noise Performance for 30.72MHz CMOS



Package Outline Drawing



Dimensions in mm

Marking Information

XXMXX - Frequency (Example: 30M720)

YY - Year of Manufacture

WW - Week of the Year

T - Manufacturing Location

• - Pin 1 Indicator

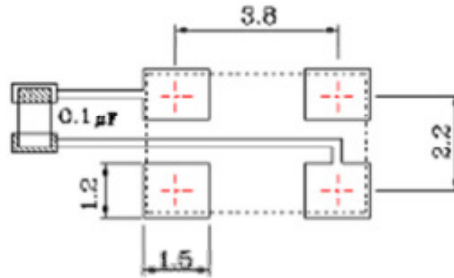
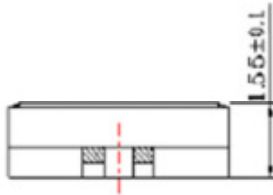


Table 3. Pinout

| Pin # | Symbol | Function |
|-------|----------------------|------------------------------------|
| 1 | V _c or NC | TCXO Control Voltage or No Connect |
| 2 | GND | Ground |
| 3 | OUT | RF Output |
| 4 | V _{DD} | Supply Voltage |

Note:

0.1µF capacitor is a by-pass power supply filter capacitor placed between Pin4 (V_{DD}) and Ground for optimal performance.

VCXO Function

VCXO Feature: The VT-804 is supplied with a VCXO function for applications where it will be used in a PLL, or the output frequency needs fine tune or calibration adjustments. This is a high impedance input, 100kOhm, and can be driven with an op-amp or terminated with adjustable resistors etc. **Pin1 should not be left floating on the VCXO optional device.**

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-804, proper precautions should be taken when handling and mounting, VI 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 therefore 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 | V |
| Control Voltage | V _c | -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 |

Reliability

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

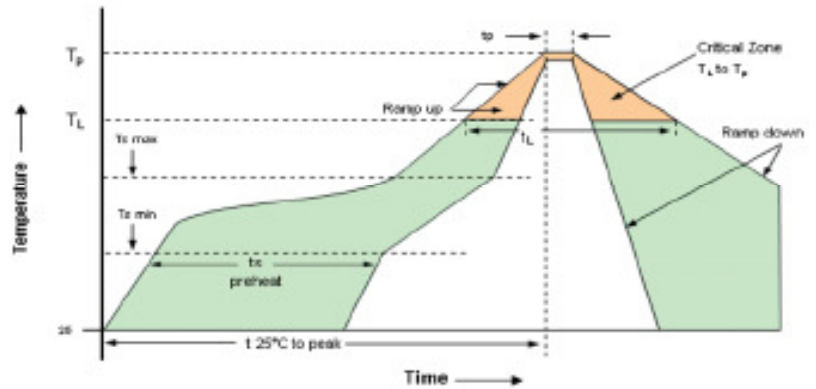
Suggested IR Profile

Devices are built using lead free epoxy and can be subjected to standard lead free IR reflow conditions shown in Table 6. Contact pads are gold over nickel and lower maximum temperatures can also be used, such as 220°C.

Table 6. Reflow Profile

| Parameter | Symbol | Value |
|--------------------------|---------------------------|-------------|
| PreHeat Time | t_s | 200 sec Max |
| Ts-min | | 150°C |
| Ts-max | | 200°C |
| Ramp Up | R_{UP} | 3°C/sec Max |
| Time above 217C | t_L | 150 sec Max |
| Time to Peak Temperature | $t_{25C \text{ to peak}}$ | 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 |

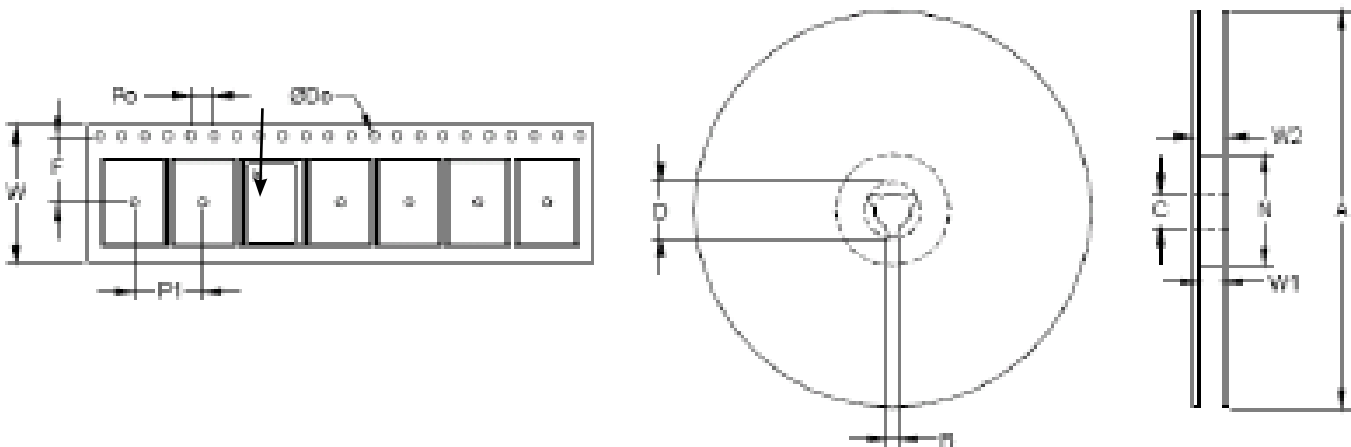
Solderprofile:



Tape & Reel

Table 7. Tape and Reel Information

| Tape Dimensions (mm) | | | | | Reel Dimensions (mm) | | | | | | | |
|----------------------|-----|-----|----|----|----------------------|-----|----|----|----|------|------|--------|
| W | F | Do | Po | P1 | A | B | C | D | N | W1 | W2 | #/Reel |
| 12 | 5.5 | 1.5 | 4 | 8 | 180 | 2.5 | 13 | 21 | 60 | 12.5 | 15.5 | 2000 |

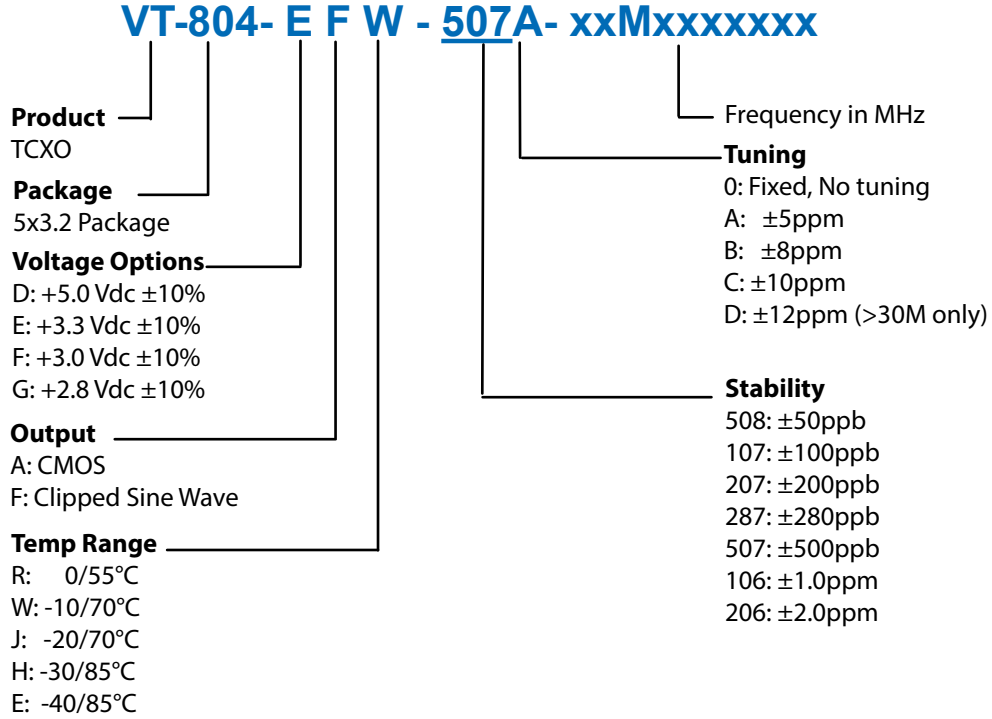


Ordering Information

Table 8. Standard Frequencies (MHz)

| 10.000 | 12.800 | 19.200 | 20.000 | 24.000 | 26.000 | 28.800 | 30.720 | 40.000 | 50.000 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | | | | | | | |
| | | | | | | | | | |

Note: Other Frequencies are available on request.



Example: VT-804-EAE-2870-10M0000000

* Add **_SNPBDIP** for tin lead solder dip

Example: VT-804-EAE-2870-10M0000000_**_SNPBDIP**

Table 9. Capability Chart [Clipped Sine & CMOS Output]

| | 50ppb | 100ppb | 200ppb | 280ppb | 500ppb | 1ppm |
|----------|-------|--------|--------|--------|--------|------|
| 0/55°C | ● | ● | ● | ● | ● | ● |
| -10/70°C | ● | ● | ● | ● | ● | ● |
| -20/70°C | ● | ● | ● | ● | ● | ● |
| -30/85°C | ● | ● | ● | ● | ● | ● |
| -40/85°C | ● | ● | ● | ● | ● | ● |

- = Can be provided.
- = Under development. Please consult with factory.
- = Cannot be provided.

Revision History

| Revision Date | Approved | Description |
|-------------------|----------|--|
| July 17, 2014 | VN | Rev 0.1: VT-804 Product Preliminary Datasheet - Internal Verification |
| August 28, 2014 | VN | Rev 0.2: VT-804 Product Release - Wesbite |
| November 14, 2016 | VN | Rev 0.3: Updated Clipped Sine Wave and CMOS current draw for high frequency range. |
| August 10, 2018 | FB | Rev 0.4: Updated logo and contact information, added "SNPBDIP" ordering option |



Microsemi Headquarters
One Enterprise, Aliso Viejo, CA 92656 USA
Within the USA: +1 (800) 713-4113
Outside the USA: +1 (949) 380-6100
Sales: +1 (949) 380-6136
Fax: +1 (949) 215-4996
email: sales.support@microsemi.com
www.microsemi.com

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