VT-860

Temperature Compensated Crystal Oscillator

Description

Vectron's VT-860 Temperature Compensated Crystal Oscillator (TCXO) is a quartz stabilized, Clipped sine wave output, analog temperature compensated oscillator, operating off a 3.3, 2.8, 2.5 or 1.8 volt supply in a hermetically sealed 2.0 x 1.6 mm ceramic package.

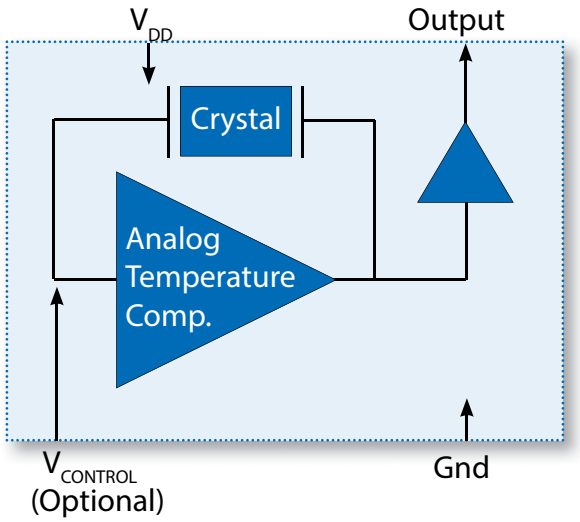
Features

- 13.000 - 52.000 MHz Output Frequency
- ±0.5 ppm Temperature Stability over -40 °C to 85 °C
- Optional Frequency Tuning
- Fundamental Crystal Design
- Gold over nickel contact pads
- Hermetically Sealed 2.0 x 1.6 mm Ceramic SMD package
- Product is compliant to RoHS directive and fully compatible with lead free assembly

Applications

- GNSS Modules
- LoRa Base Station
- Wireless Connectivity
- Point to Point Radio
- Manpack Radio
- Test and Measurement

Block Diagram

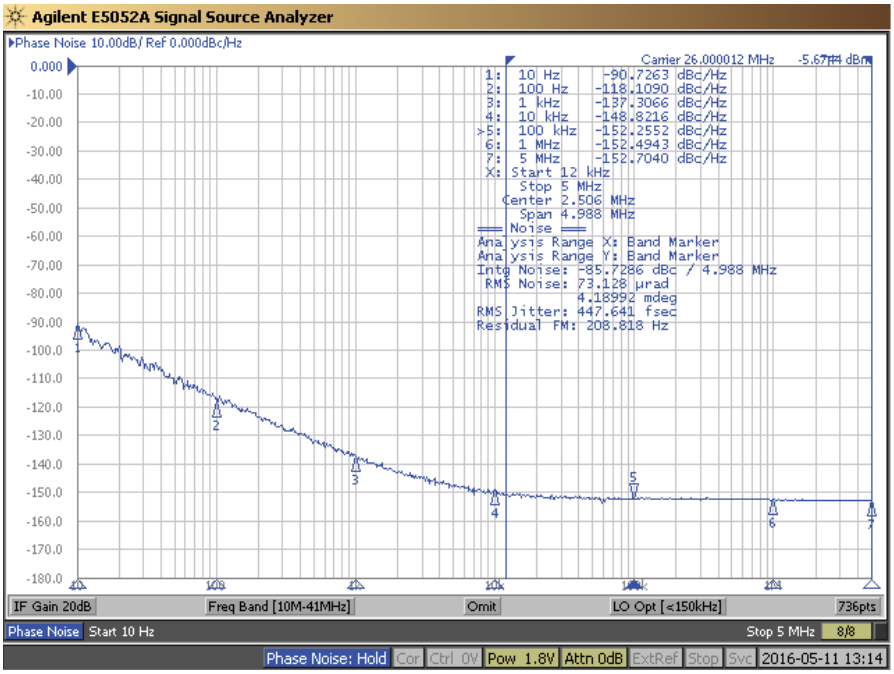


Specifications

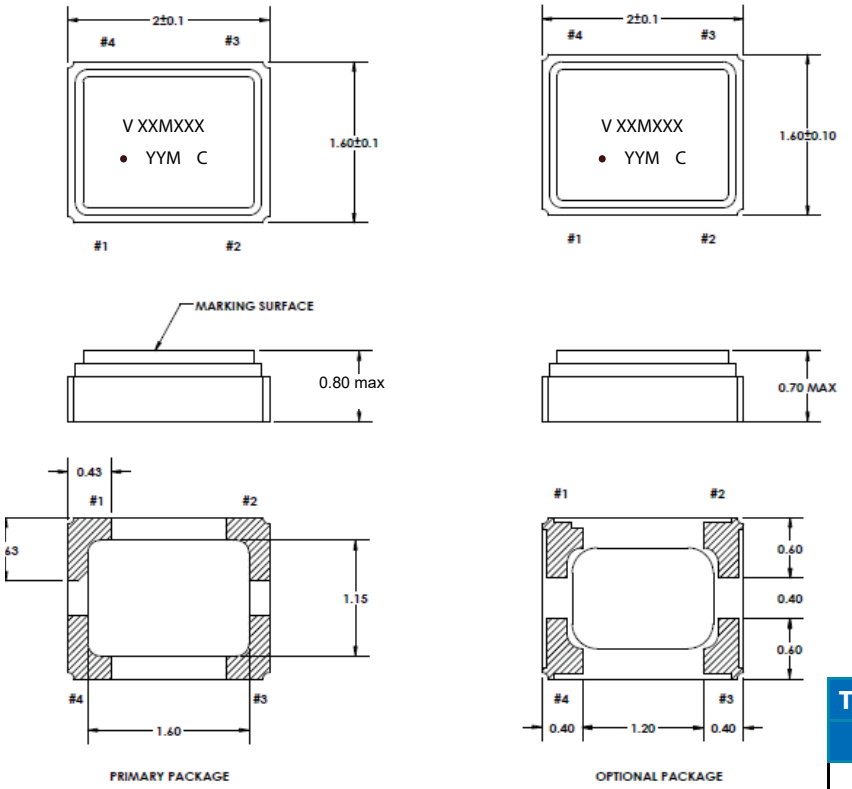
Table 1. Electrical Performance, Clipped Sine Wave					
Parameter	Symbol	Min.	Typ	Max	Units
Output Frequency[1], *Ordering Option*	f_O	13		52	MHz
Supply Voltage[2], *Ordering Option*	V_{DD}	+1.8, +2.5, +2.8, +3.0, +3.3			V
Supply Current	I_{DD}			2.3	mA
Operating Temperature, *Ordering Option*	T_{OP}	-20/70, -40/85			°C
Frequency Stability					
Stability Over T_{OP}[3], *Ordering Option*	F_{STAB}	±0.50, ±1.00			ppm
Frequency Tolerance[4]	F_{TOL}			±2.0	ppm
Power Supply Stability, ±5%	F_{PWR}			±0.1	ppm
Load Stability, ±10%	F_{LOAD}			±0.2	ppm
Static Hysteresis	HYS			±0.6	ppm
Aging / 1st year	F_{AGE}			±1.0	ppm
Frequency Tuning (EFC), *Ordering Option*					
Tuning Range[5]	PR	±5.0, ±10.0, ±12.0			ppm
Tuning Slope		Positive			
Control Voltage to reach Pull Range 1.8V Supply Voltage Option 2.5V, 2.8V, 3.0V and 3.3V Supply Voltage Option	V_C	 0.3 0.5	 0.9 1.5	 1.5 2.5	 V V
Linearity	Lin			10	%
Control Voltage Impedance		500			Kohm
RF Output , Clipped Sine Wave					
Output Level High	V_O p-p	0.8			V
Output Load	C_L		10k || 10pF		
Start Up Time	t_{SU}			2	ms
Phase Noise					
Phase Noise, 26.00MHz[6] 10Hz 100Hz 1kHz 10kHz 100kHz	$\emptyset_N$		 -90 -112 -132 -145 -147		dBc/Hz
Integrated Phase Jitter, 26.00MHz (12k-5MHz)[7]	$\emptyset_J$		0.4	1.0	ps

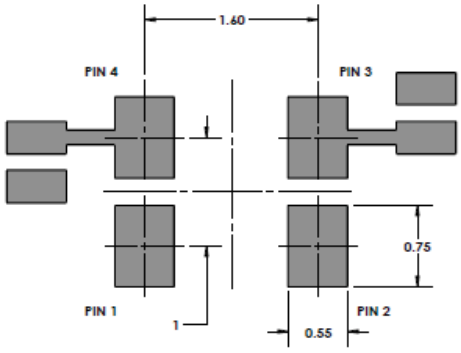
1. Refer to Table 7 for Standard Frequencies. Other Frequencies are available on request. Check with factory.
2. The VT-860 power supply pin (Pin4) should be filtered using a by-pass capacitor of 0.1uF for optimal performance.
3. Referenced to the midpoint between minimum and maximum frequency value over Operating Temperature Range.
4. Frequency measured at 25 °C, 1 hour after 2 IR reflows.
5. Referenced to Mid Control Voltage.
6. Measured at room ambient temperature using Agilent E5052B Signal Source Analyzer.

Typical Phase Noise Performance (26MHz)



Package Outline Drawing & Pad Layout





Dimensions in mm

Table 2. Pinout

Pin #	Symbol	Function
1	Vc or NC	TCXO Control Voltage or No Connect
2	GND	Ground
3	OUT	RF Output
4	V_{DD}	Supply Voltage

Marking Information

V = Vectron
XXMXX = Frequency (Example: 26M000)
YY = Year of Manufacture
M = Month of the Year (M = A-Jan, B-Feb.....K-Nov, L-Dec)
C = Manufacturing Location
• = Pin 1 Indicator

Note:
0.1uF capacitor is a by-pass power supply filter capacitor placed between Pin4 (Vdd) and Ground for optimal performance. Optional 1000pF DC cut capacitor can be used in the 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-860, 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 3. 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

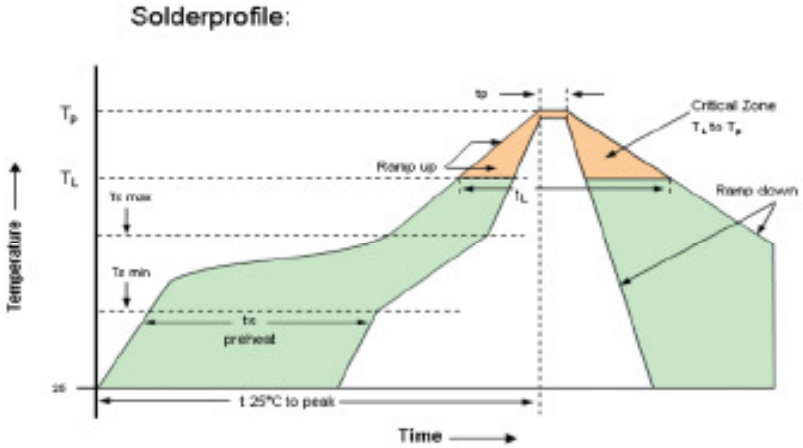
Table 4. Environmental Compliance	
Parameter	Condition
Mechanical Shock	MIL-STD-883 Method 2002
Mechanical Vibration	MIL-STD-883 Method 2007
Temperature Cycle	MIL-STD-883 Method 1010
Solderability	MIL-STD-883 Method 2003
Fine and Gross Leak	MIL-STD-883 Method 1014
Resistance to Solvents	MIL-STD-883 Method 2015
Moisture Sensitivity Level	MSL1
Contact Pads	Gold (0.3 um min -1.0 um max)over Nickel
Weight	8 mg

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 220°C.

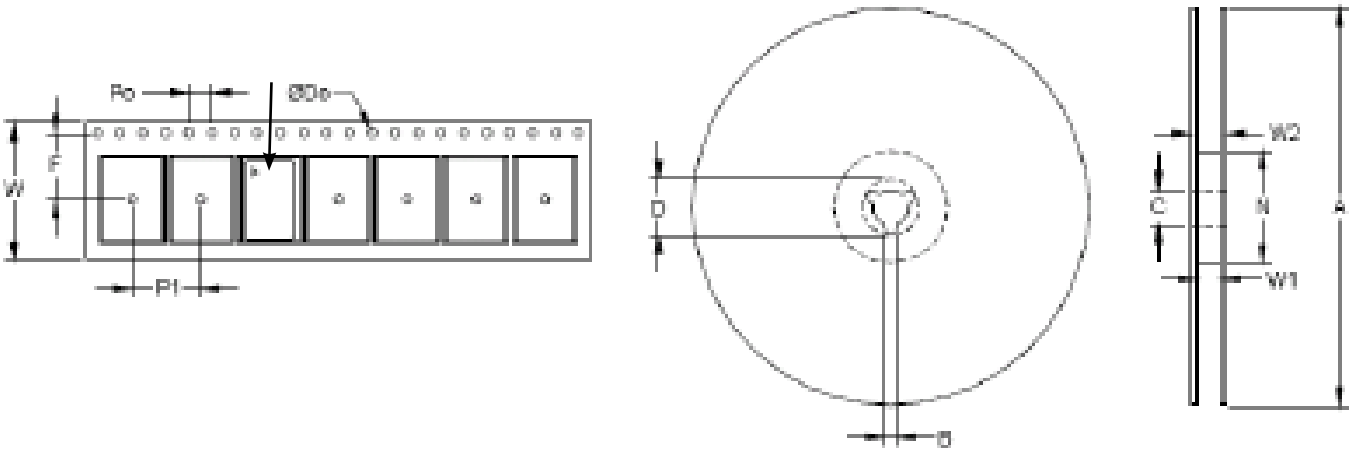
Table 5. Reflow Profile		
Parameter	Symbol	Value
PreHeat Time Ts-min Ts-max	t_s	200 sec Max 150°C 200°C
Ramp Up	R_{UP}	3°C/sec Max
Time above 217C	t_L	150 sec Max
Time to Peak Temperature	$t_{25C\ to\ peak}$	480 sec Max
Time at 260C	t_P	30 sec Max
Time at 240C	t_{P2}	60 sec Max
Ramp down	R_{DN}	6°C/sec Max



Tape & Reel

Table 6. Tape and Reel Information

Tape Dimensions (mm)					Reel Dimensions (mm)							
W	F	Do	Po	P1	A	B	C	D	N	W1	W2	#/Reel
8	3.5	1.5	4	4	180	2.0	13	20.2	60	9.0	11.4	1000



Ordering Information

VT-860- E F E - 507A- xxMxxxxxxXX

Product
TCXO

Package
2.0x1.6 mm Ceramic

Voltage Options
E: +3.3 Vdc ± 5%
F: +3.0Vdc ± 5%
G: +2.8Vdc ± 5%
H: +2.5Vdc ± 5%
J: +1.8Vdc ± 5%

Output
F: Clipped Sine Wave

Temp Range
J: -20/70°C
E: -40/85°C

Stability
507: ±0.5ppm
106: ±1.0ppm

Tuning
0: Fixed, No tuning
A: ±5ppm
C: ±10ppm
D: ±12ppm

Frequency in MHz

Packaging
TR: Tape and Reel
blank: Cut Tape / non Tape and Reel quantities
_SNPB: Tin lead solder dipped

**Note: not all combination of options are available.*
Other specifications may be available upon request.

Example:

VT-860-EFE-507A-26M0000000TR	**Tape and Reel**
VT-860-EFE-507A-26M0000000	**Cut Tape**
VT-860-EFE-507A-26M0000000_SNPB	**Tin lead solder dipped**

Standard Frequencies & Capability Chart

Table 7. Standard Frequencies (MHz)									
12.000	12.288	16.000	16.368	16.369	19.200	20.000	24.000	26.000	32.000
32.736	38.400	40.000	48.000						

Note: Other Frequencies may be available on request.

Revision History

Revision Date	Approved	Description
May 10, 2016	VN	Rev 0.1 - VT-860 Preliminary Datasheet - Internal Verification, Factory Approval, Product Launch
May 19, 2016	VN	Rev 0.2 - Updated Features and Application section
June 27, 2016	VN	Rev 0.3: Corrected marking information and updated standard frequency table (Table 7)
August 10, 2018	FB	Rev 0.4: Update logo and contact information, update PCB layout, add "SNPBDIP" ordering option
May 24, 2019	FB	Rev 0.5: Update logo, contact information and ordering information, update "SNPBDIP" to "SNPB" ordering option
April 30, 2020	FB	Add tape an reel ordering option

Contact Information

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