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## Description

Vectron's VT-501 Temperature Compensated Crystal Oscillator (TCXO) is a quartz stabilized, CMOS output, analog temperature compensated oscillator, operating off either a 3.3 or 5.0 volt supply in a 9.9 x 11.8mm FR4 board with nickel cover.

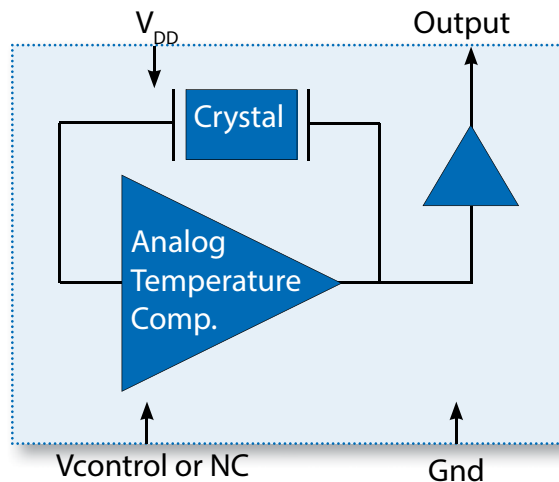
## Features

- CMOS Output
- Output Frequencies to 61.440 MHz
- Fundamental Crystal Design
- Optional VCXO Function available
- Gold over nickel contact pads
- Hermetically Sealed Ceramic SMD package
- Product is compliant to RoHS directive  and fully compatible with lead free assembly

## Applications

- Wireless Communications
- Base Stations
- Point to point radios
- Broadband Access
- Test Equipment

## Block Diagram



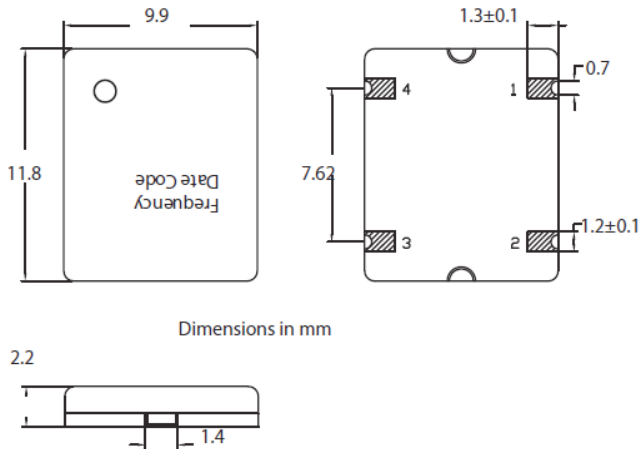
# Specifications

**Table 1. Electrical Performance**

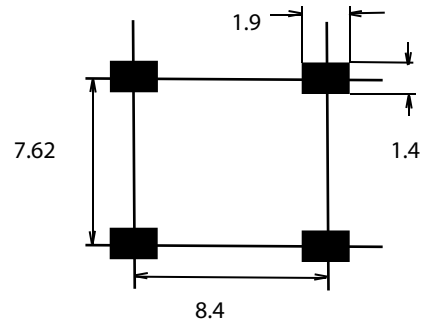
Parameter	Symbol	Min.	Typ	Max	Units
Output Frequency	$f_o$	8		61.440	MHz
Supply Voltage <sup>1</sup>	$V_{DD}$	+3.3 or +5.0			V
Supply Current, 8-22MHz >22MHz	$I_{DD}$			15 24	mA
Operating Temperature, <i>ordering option</i>	$T_{OP}$	0/55, -10/60, -20/70, -30/80, -40/85			°C
Stability Over $T_{OP}$ , <i>ordering option</i>		$\pm 1.0, \pm 1.5, \pm 2.0, \pm 2.5, \pm 3.0, \pm 4.0, \pm 5.0$			ppm
Initial Accuracy, "No Adjust" Option				$\pm 2.0$	ppm
Power Supply Stability				$\pm 1.0$	ppm
Load Stability				$\pm 0.3$	ppm
Aging				$\pm 1.0$	ppm/yr
Pull Range	TPR	$\pm 5, \pm 8, \pm 10, \pm 12, \pm 15$			ppm
Control Voltage to reach Pull Range, 5V 3.3V option		0.5 0.3		4.5 3.0	V
Control Voltage Impedance		100			kohm
Output Level <sup>2</sup> Output High Output Low Output High Drive Output Low Drive	$V_{OH}$ $V_{OL}$ $I_{OH}$ $I_{OL}$	$0.9 * V_{DD}$  4		$0.1 * V_{DD}$ -4	V V mA mA
Output Load			15		pF
Duty Cycle				40/60	%
Phase Noise, 10.000MHz 10Hz 100Hz 1kHz 10kHz 100kHz			-107 -138 -148 -152 -154		dBc/Hz
Start Up Time				10	ms

1. The VT-501 power supply pin should be filtered, eg, a 0.1 and 0.01 uf capacitor
2. The Output is DC coupled
3. Duty Cycle is On Time/Period, see Figure 2. Test Circuit is shown in Figure 1.

## Outline Drawing



## Recommended Pad Layout



**Table 2. Pinout**

Pin #	Symbol	Function
1	$V_c$	TCXO Control Voltage or Ground
2	GND	Electrical and Lid Ground
3	$f_o$	Output Frequency
4	$V_{DD}$	Supply Voltage

## Test Circuit

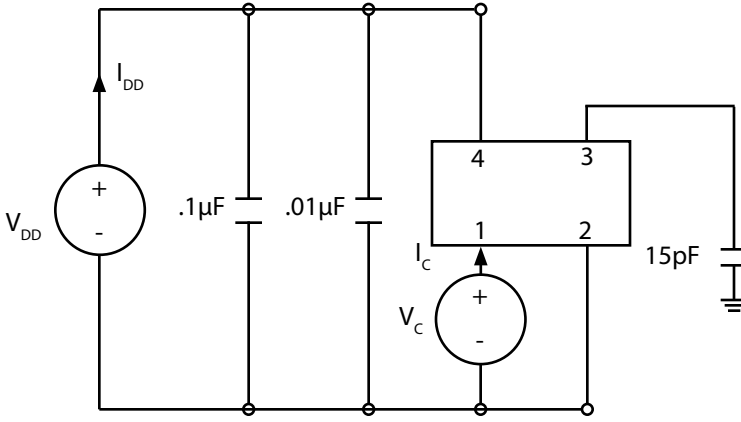


Figure 1 Test Circuit

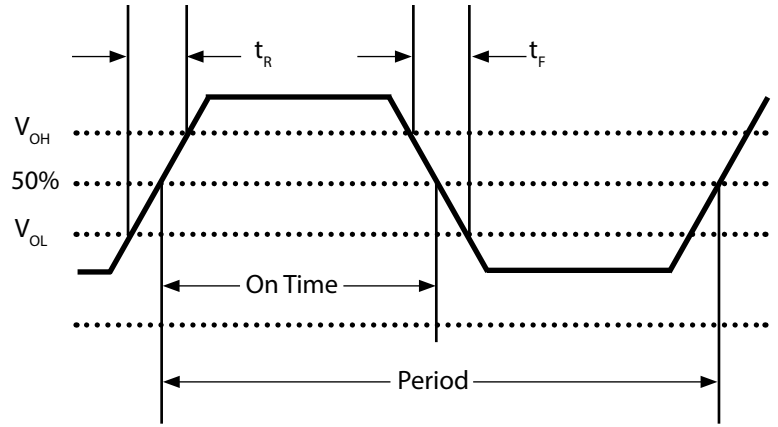


Figure 2 Duty Cycle, On Time/Period

## Phase Noise and Allan Deviation Plot

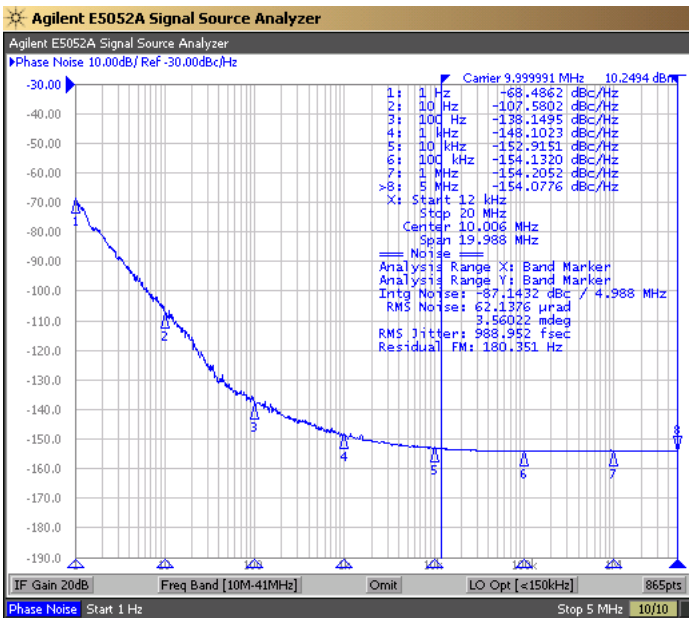


Figure 3 Phase Noise Plot for a 10.000MHz output

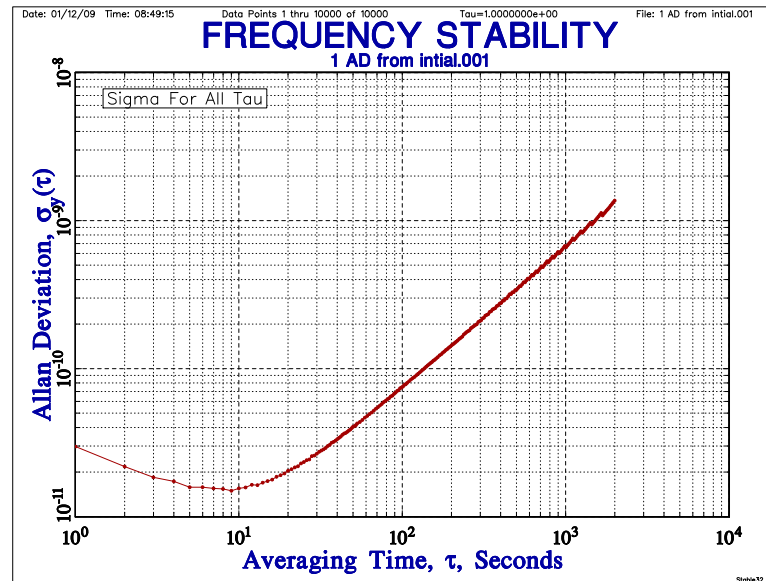


Figure 4 Allan Deviation Plot for a 10.000MHz output

## VCXO Function

**VCXO Feature:** The VT-501 can be ordered 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, 1Mohm, and can be driven with an op-amp or terminated with adjustable resistors etc. **Pin 1 should not be left floating on the VCXO optional device.**

**“No Adjust” Option:** In applications where the VT-501 will not be used in a PLL, or the output frequency does not need fine tune adjustments, the best device to use would be a VT-501-xxx-xxx0. By using the “no adjust” option, the circuit is simplified as Vc does not need to be adjusted or set to a predetermined voltage and pin 1 should be grounded (pin 1 can be left open but should not be set to a voltage such as an RF signal or power supply voltage).

## 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-501, 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	$T_{STORE}$	-40/85	°C
Supply Voltage	$V_{DD}$	7	V
Control Voltage	$V_C$	0/ $V_{DD}$	V
ESD, Human Body Model		1000	V
ESD, Charged Device Model		500	V

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 ( 0.03 um) over Nickel (3um - 5um)
Weight	460 mg

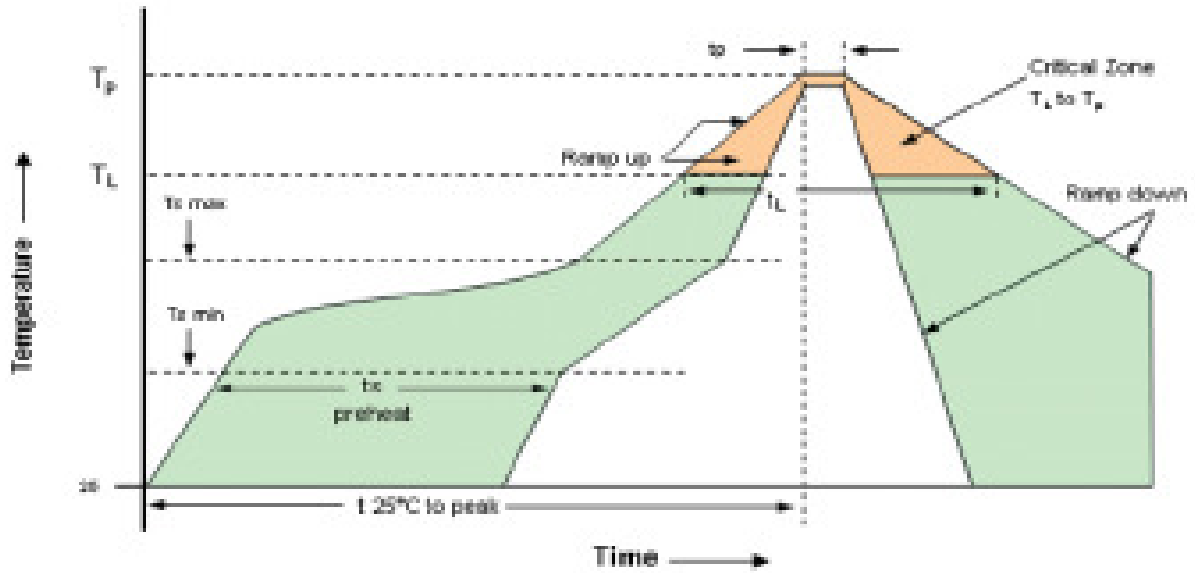
### Suggested IR Profile

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 5. Reflow Profile		
Parameter	Symbol	Value
PreHeat Time	$t_s$ $T_{s-min}$ $T_{s-max}$	60 sec Min, 260 sec Max 150°C 200°C
Ramp Up	$R_{UP}$	3°C/sec Max
Time above 217C	$t_L$	60 sec Min, 150 sec Max
Time to Peak Temperature	$t_{25-PEAK}$	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

## IR Reflow

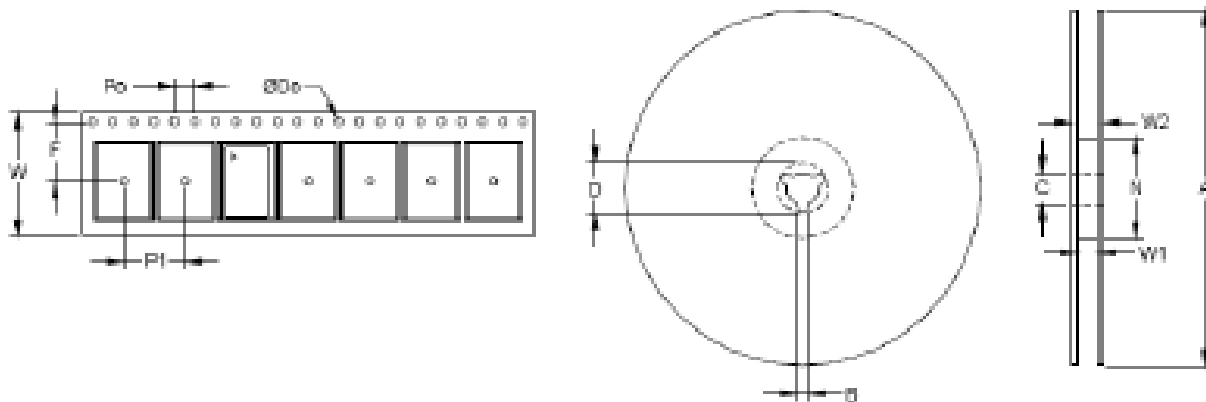
### Solderprofile:



## 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
24	11.5	1.5	4	16	330	2	13	21	80	24.4	28.4	500

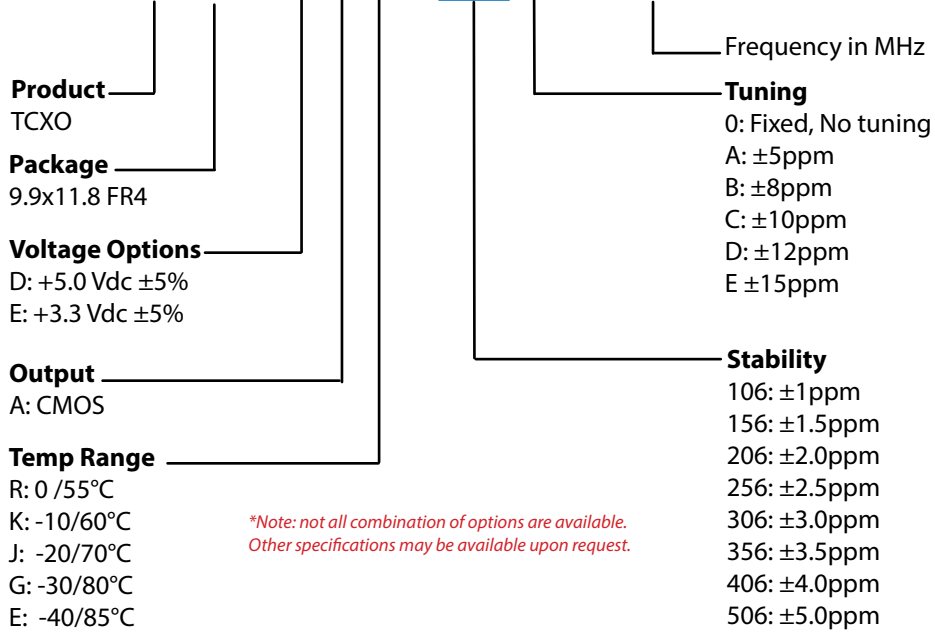


# Ordering Information

**Table 7. Standard Frequencies (MHz)**

8.750	9.83040	10.000	10.230	11.000	12.28880	12.3520	12.500	12.800	13.000
14.318180	14.400	15.360	16.3840	16.800	18.4140	19.200	19.440	19.6608	19.680
20.000	21.400	24.9770	25.1658240	25.600	26.880	27.000	30.080	30.720	32.000
32.7680	37.800	38.400	44.000	44.7360	46.000	46.080	48.000	50.000	56.000
61.440									

## VT-501- E A G - 206 A - xxMxxxxxxx



**Example: VT-501-EAG-206A-19M2000000**

## Revision History

Revision	Date	Description
0.1	1/10/2009	Initial
0.2	1/17/2017	Update logo
0.3	3/18/2019	Update Logo and contact information, add weight and gold plating details, tape and reel set to 500 pieces.

## Contact Information

### **USA:**

100 Watts Street  
Mt Holly Springs, PA 17065  
Tel: 1.717.486.3411  
Fax: 1.717.486.5920

### **Europe:**

Landstrasse  
74924 Neckarbischofsheim  
Germany  
Tel: +49 (0) 7268.801.0  
Fax: +49 (0) 7268.801.281



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