




Helping Customers Innovate, Improve & Grow



### Description

Vectron's VT-700 Temperature Compensated Crystal Oscillator (TCXO) is a quartz stabilized, clipped sine wave output or CMOS output, analog temperature compensated oscillator, operating off either a 2.8, 3.0, 3.3 or 5.0 volt supply, hermetically sealed 5x7 ceramic package.

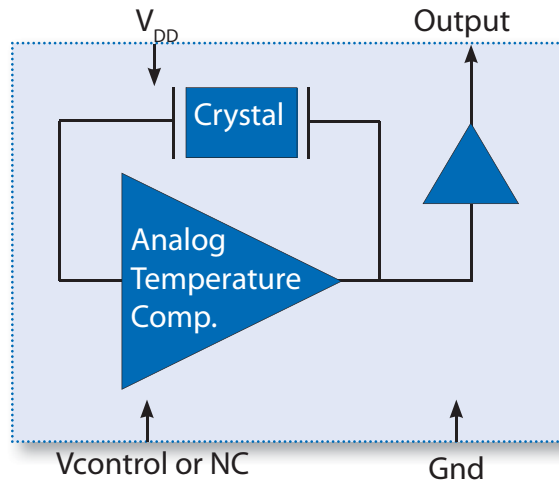
### Features

- Clipped Sine Wave or CMOS Output
- Output Frequencies to 40 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
- Handsets

### Block Diagram



# Specifications

**Table 1. Electrical Performance, Clipped Sine Wave Option**

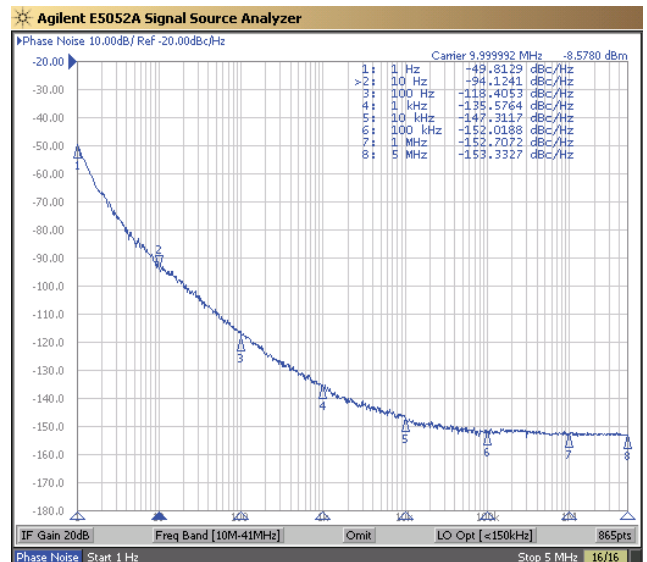
Parameter	Symbol	Min.	Typ	Max	Units
Output Frequency, +5V option +2.8, +3.0, +3.3V options	$f_o$	10 8		27 40	MHz
Supply Voltage <sup>1</sup>	$V_{DD}$	+2.8, +3.0, +3.3 or +5.0			V
Supply Current, 8 to 14.999MHz 15.000 to 25.999MHz 26.000 to 40.000MHz	$I_{DD}$			1.5 2.0 2.5	mA
Operating Temperature	$T_{OP}$	0/55, -10/60, -20/70, -30/80, -40/85			°C
Stability Over Operating Temperature		±0.5, ±1.0, ±1.5, ±2.0, ±2.5, ±3.0, ±4.0, ±5.0			ppm
Initial Accuracy, "No Adjust" Option <sup>2</sup>				±1.0	ppm
Power Supply Stability				±0.2	ppm
Load Stability				±0.2	ppm
Aging				±1.0	ppm/yr
Pull Range	TPR	±5, ±8, ±10, ±12			ppm
Control Voltage to reach Pull Range		0.5		2.5	V
Control Voltage Impedance		1			Mohm
Output Level <sup>3</sup>	$V_o$ p/p	0.8			V
Output Load				10K    10pF	
Phase Noise, 10.000MHz 10Hz 100Hz 1kHz 10kHz 100kHz			-94 -118 -135 -147 -152		dBc/Hz
Start Up Time				2	ms

1. The VT-700 power supply pin should be filtered, eg, a 0.1 and 0.01uf capacitor.
2. Initial Accuracy is ±2.0ppm after 2 IR Reflows.
3. The Output is AC coupled.

## Clipped Sine Wave Output



## Phase Noise for a Clipped Sinewave Output



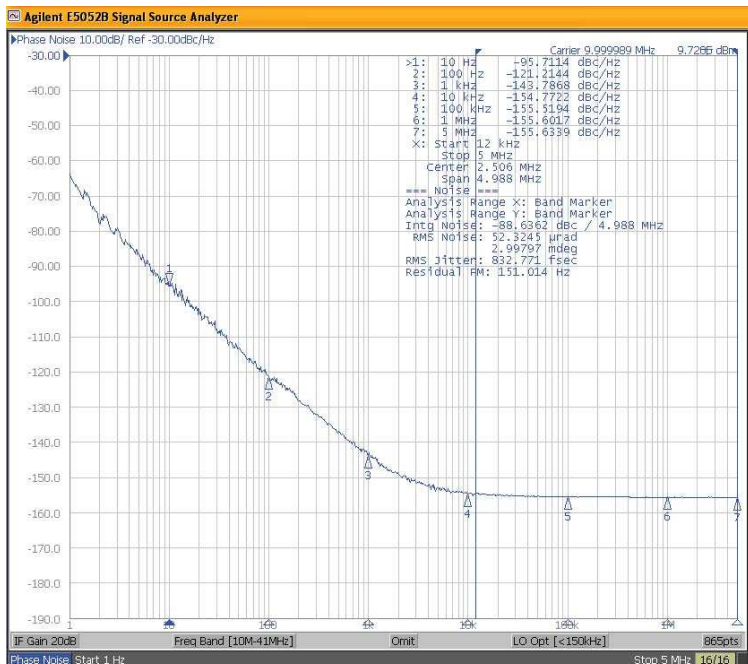
# Specifications

**Table 2. Electrical Performance, CMOS Option**

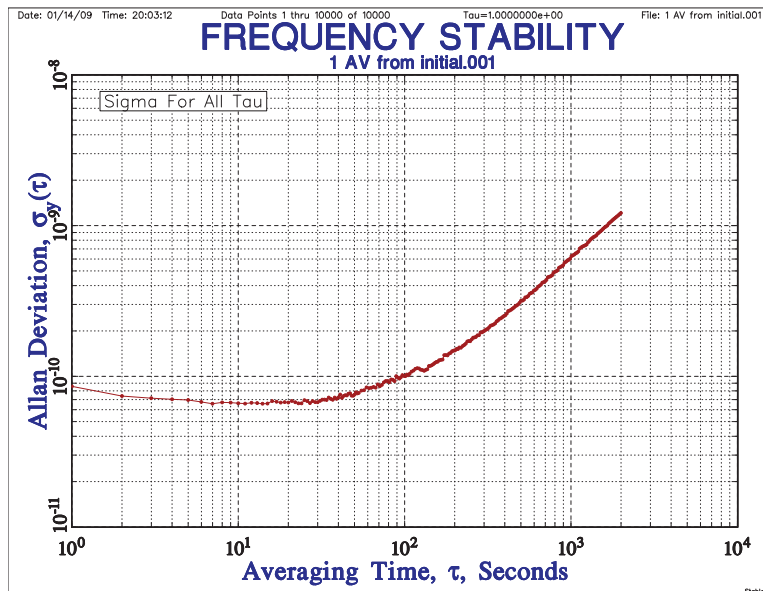
Parameter	Symbol	Min.	Typ	Max	Units
Output Frequency	$f_o$	10		40	MHz
Supply Voltage <sup>1</sup>	$V_{DD}$	3.135	3.3	3.465	V
Supply Current	$I_{DD}$			10	mA
Operating Temperature	$T_{OP}$	0/55, -10/60, -20/70, -30/80, -40/85			°C
Stability Over Operating Temperature		±0.5, ±1.0, ±1.5, ±2.0, ±2.5, ±3.0, ±4.0, ±5.0			ppm
Initial Accuracy, "No Adjust" Option <sup>2</sup>				±1.0	ppm
Power Supply Stability				±0.3	ppm
Load Stability				±0.2	ppm
Aging				±1.0	ppm/yr
Pull Range	TPR	±5, ±8, ±10, ±12			ppm
Control Voltage to reach Pull Range		0.5		2.5	V
Control Voltage Impedance		1			Mohm
Output Level <sup>3</sup>					
Output Logic High	$V_{OH}$	0.9*VDD			V
Output Logic Low	$V_{OL}$			0.1*VDD	V
Output Logic High Drive	$I_{OH}$			-4	mA
Output Logic Low Drive	$I_{OL}$	4			mA
Rise and Fall Time <sup>4</sup>	$t_R/t_F$			3	ns
Output Load				15	pF
Phase Noise, 10.000MHz					dBc/Hz
10Hz			-95		
100Hz			-121		
1kHz			-143		
10kHz			-154		
100kHz			-155		
Start Up Time				2	ms

1. The VT-700 power supply pin should be filtered, eg, a 0.1 and 0.01 uf capacitor.
2. Initial Accuracy is ±2.0ppm after 2 IR Reflows.
3. The Output is DC coupled.
4. Rise and Fall time are measured at 20/80% levels.

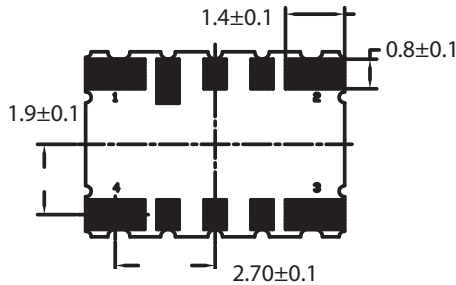
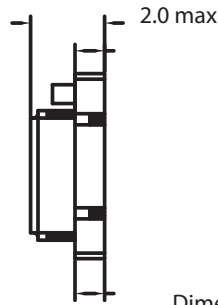
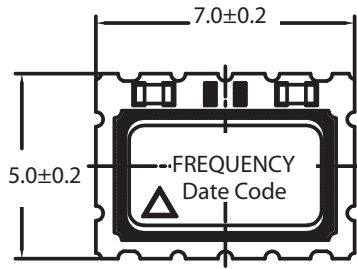
## Phase Noise



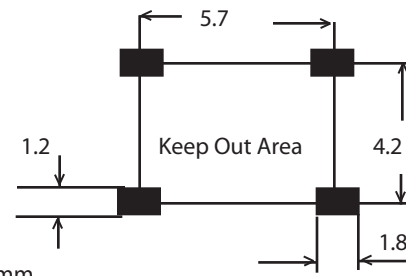
## Allan Deviation



## Outline Drawing



## Recommended Pad Layout



Dimensions in mm

**Table 3. 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

## VCXO Function

**VCXO Feature:** The VT-700 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-700 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-700-xxx-xxx0. By using the “no adjust” option, the circuit is simplified as  $V_C$  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-700, 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	$V_{DD}$	6	V
Control Voltage	$V_C$	0/ $V_{DD}$	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

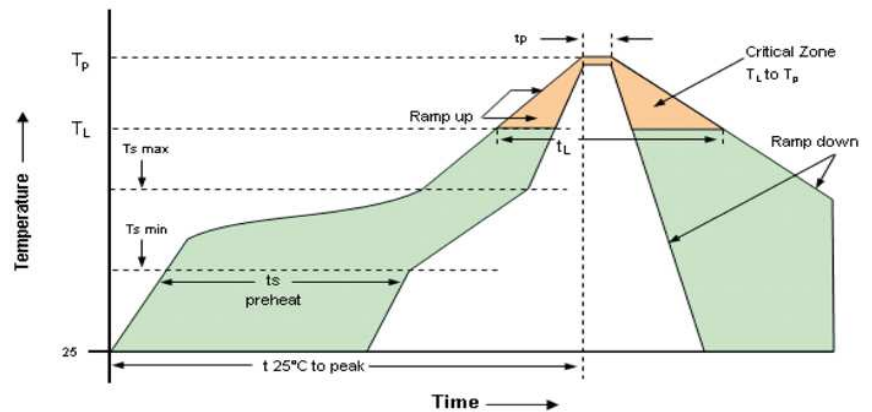
## IR Reflow

### 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	$t_L$	150 sec Max
Time to Peak Temperature	$t_{AMB-P}$	480 sec Max
Time at 260C	$t_p$	10 sec Max
Time at 240C	$t_{p2}$	60 sec Max
Ramp down	$R_{DN}$	6°C/sec Max

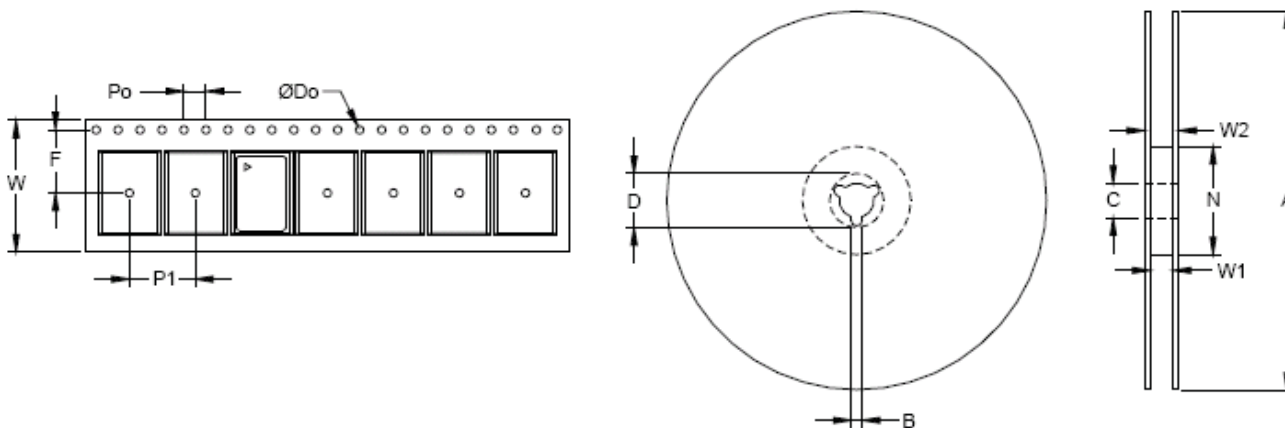
### Solderprofile:



## 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
16	7.5	1.5	4	8	180	1.5	13	20.2	60	16.4	20.4	1000



**Table 8. Standard Frequencies (MHz)**

8.1920	10.000	10.0001350	10.0013550	10.080	10.240	10.2450	11.05920	11.28960	12.000
12.2450	12.2880	12.3520	12.500	12.504	12.580	12.5829120	12.600	12.6883750	12.800
13.000	13.560	14.000	14.3180	14.400	14.500	14.58880	14.6171880	14.74560	14.850
15.000	15.3598650	15.360	16.000	16.034950	16.320	16.3252910	16.36760	16.3676670	16.36770
16.3840	16.3680	16.580	16.58880	16.777216	16.800	17.500	18.000	18.4140	18.4320
18.6010	19.000	19.200	19.440	19.680	19.6608	19.800	20.000	20.250	20.480
20.750	20.916460	21.250	21.94921875	22.000	22.3680	23.090	24.000	24.1920	24.53350
24.5760	24.80640	25.000	25.488280	26.000	27.000	28.000	30.720	32.000	33.000
35.3280	36.000	38.400	38.880	39.000	40.000				

## Ordering Information

### VT-700- E F G - 206A- xxMxxxxxxxx

**Product**

TCXO

**Package**

5x7 Package

**Voltage Options**

D: +5.0 Vdc ±5%,  
 E: +3.3 Vdc ±5%,  
 F: +3.0 Vdc ±5%  
 G: +2.8 Vdc ±5%

**Output**

A: CMOS  
 F: Clipped Sine Wave

**Temp Range**

R: 0 /55°C  
 K: -10/60°C  
 J: -20/70°C  
 G: -30/80°C  
 E: -40/85°C

Frequency in MHz

**Tuning**

0: Fixed, No tuning  
 A: ±5ppm  
 B: ±8ppm  
 C: ±10ppm  
 D: ±12ppm

**Stability**

507: ±0.5ppm  
 106: ±1ppm  
 156: ±1.5ppm  
 206: ±2.0ppm  
 256: ±2.5ppm  
 306: ±3.0ppm  
 356: ±3.5ppm  
 406: ±4.0ppm  
 506: ±5.0ppm

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

**Example: VT-700-EFG-206A-26M0000000**

## For Additional Information, Please Contact

**USA:**

Vectron International  
 267 Lowell Road  
 Hudson, NH 03051  
 Tel: 1.888.328.7661  
 Fax: 1.888.329.8328

**Europe:**

Vectron International  
 Landstrasse, D-74924  
 Neckarbischofsheim, Germany  
 Tel: +49 (0) 3328.4784.17  
 Fax: +49 (0) 3328.4784.30

**Asia:**

Vectron International  
 1F-2F, No 8 Workshop, No 308 Fenju Road  
 WaiGaoQiao Free Trade Zone  
 Pudong, Shanghai, China 200131  
 Tel: 86.21.5048.0777  
 Fax: 86.21.5048.1881

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