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VT-700

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 (Pb) and fully compatible with lead free assembly

Applications

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

Block Diagram

V_{DD} Output

Crystal

Analog Temperature Comp.

Vcontrol or NC   Gnd
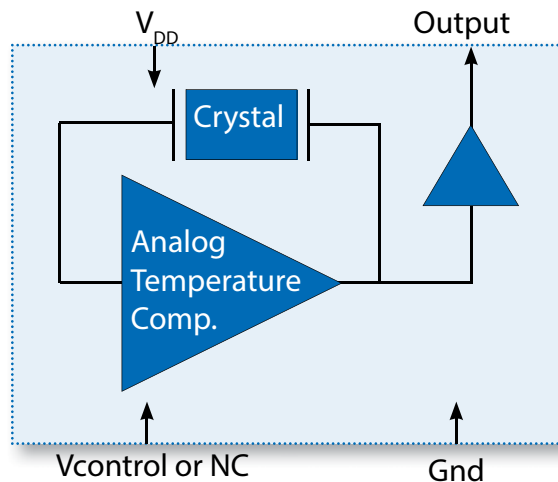
Specifications

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[1]	V_{DD}	+2.8, +3.0, +3.3 or +5.0			V
Supply Current, 8 to 14.999MHz 15.000 to 25.9999MHz 26.000 to 39.9999MHz 40.000MHz	I_{DD}			1.5 2.0 2.5 3.0	mA
Operating Temperature	T_{OP}	0/55, -10/60, -20/70, -30/80, -40/85			°C
Stability Over Operating Temperature		±0.5, ±1.0, ±.5, ±2.0, ±2.5, ±3.0, ±4.0, ±5.0			ppm
Initial Accuracy, "No Adjust" Option[2]				±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[3]	V_O p/p	0.8			V
Output Load				10K II 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
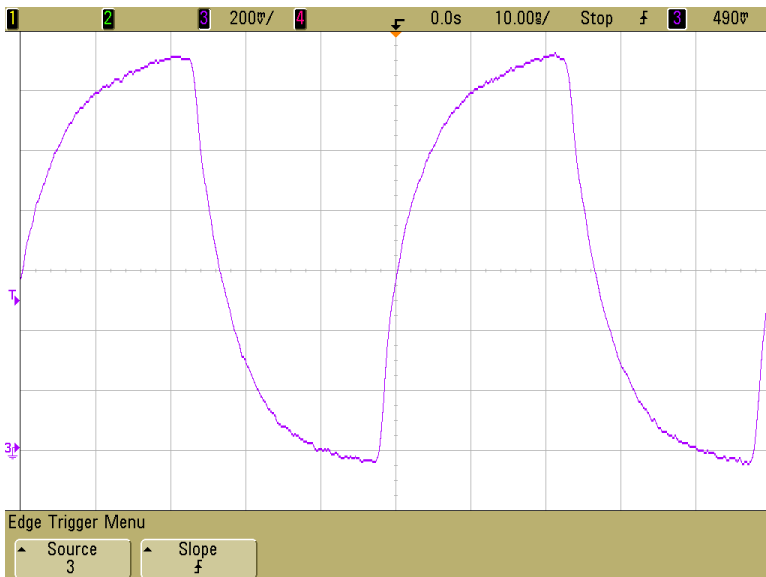
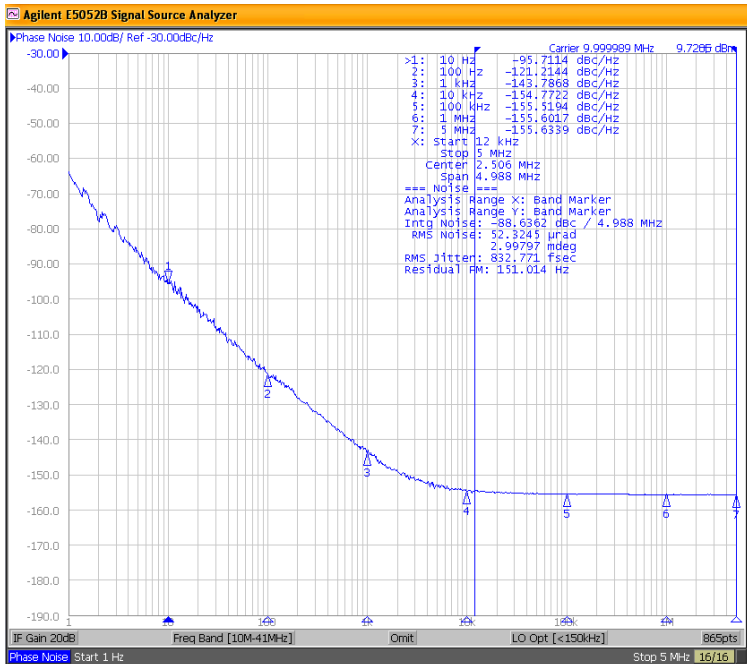## Phase Noise for a Clipped Sinewave Output
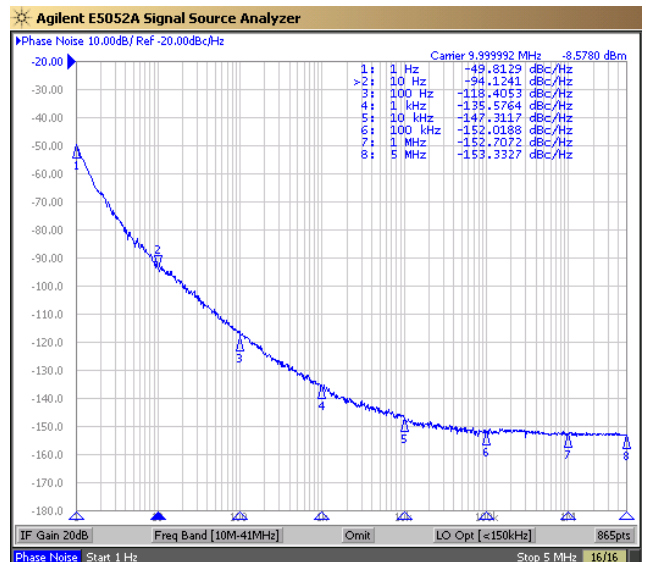
Specifications

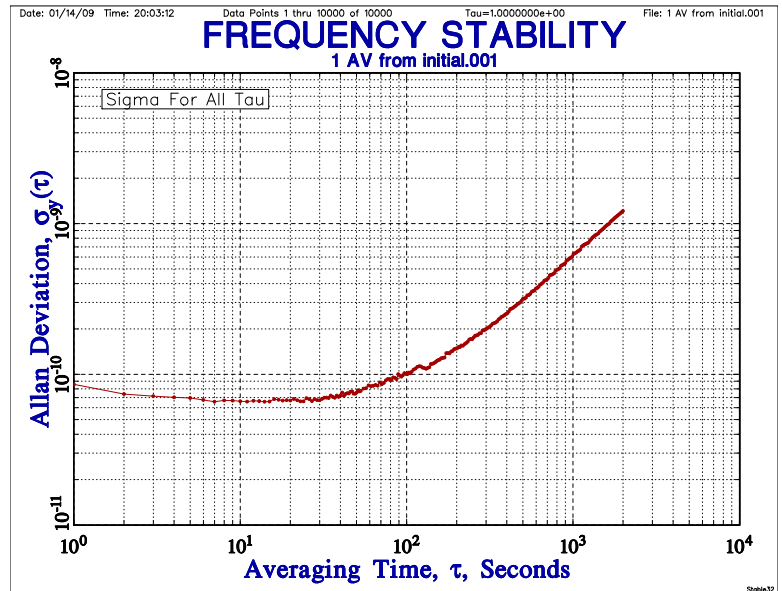## Table 2. Electrical Performance, CMOS Option

Parameter	Symbol	Min.	Typ	Max	Units
Output Frequency	f_O	10		40	MHz
Supply Voltage[1]	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, ±.5, ±2.0, ±2.5, ±3.0, ±4.0, ±5.0			ppm
Initial Accuracy, "No Adjust" Option[2]				±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[3]
  Output Logic High
  Output Logic Low
  Output Logic High Drive
  Output Logic Low Drive
	
	V_{OH}
	V_{OL}
	I_{OH}
	I_{OL}
		
		0.9*VDD
		
		4
				
				0.1*VDD
				-4
				
					V
					V
					mA
					mA

Rise and Fall Time[4]	t_R/t_F			3	ns
Output Load				15	pF

Phase Noise, 10.000MHz
  10Hz
  100Hz
  1kHz
  10kHz
  100kHz
			
			-95
			-121
			-143
			-154
			-155
					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 DC coupled.
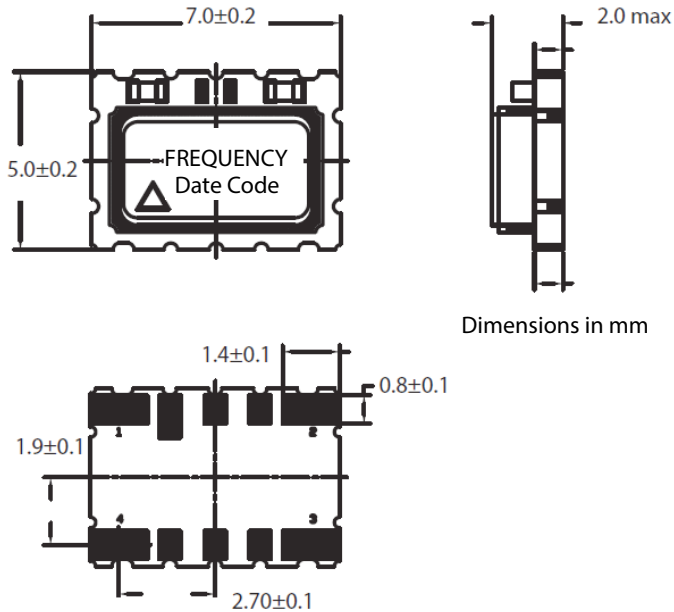4. Rise and Fall time are measured at 20/80% levels.

Phase Noise

Allan Deviation

Outline Drawing

7.0±0.2
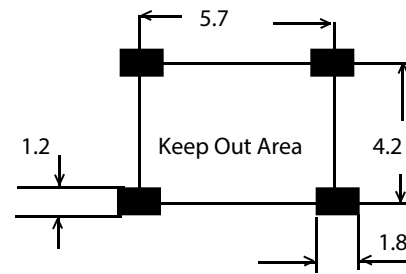
5.0±0.2

FREQUENCY
Date Code

2.0 max

Dimensions in mm

1.4±0.1

0.8±0.1

1.9±0.1

2.70±0.1

Recommended Pad Layout

5.7

1.2

Keep Out Area

4.2

1.8

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 were 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 were 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 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-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 therefor can be used for comparison purposes.

Table 4. Maximum Ratings			
Parameter	Symbol	Rating	Unit
Storage Temperature	T_{STORE}	-55/125	ºC
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:
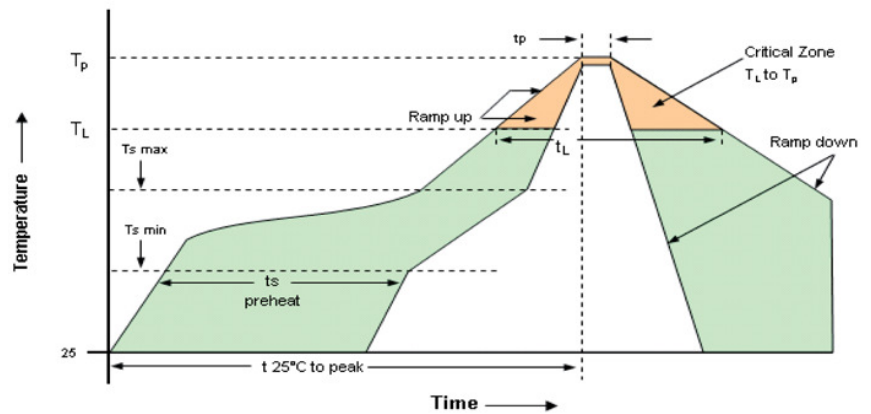
Tape & Reel

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
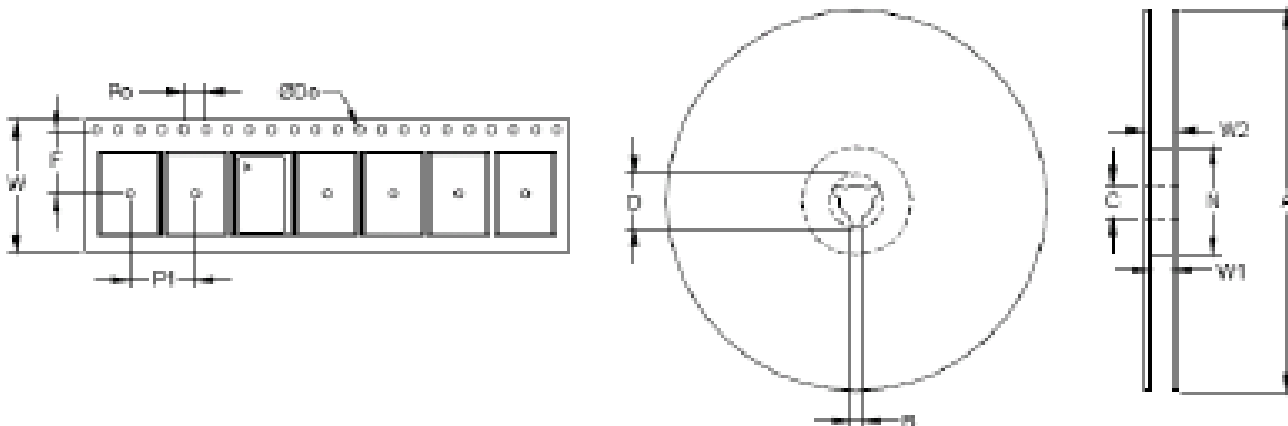
Table 8. Standard Frequencies (MHz)

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- xxMxxxxxxx

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
H: -30/85°C
E: -40/85°C

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

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

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

* Add _SNPBDIP for tin lead solder dip
Example: VT-700-EFG-206A-26M0000000_SNPBDIP

Revision History

Revision Date	Approved	Description
August 10, 2018	FB	Rev 0.4: Updated logo and contact information, added "SNPBDIP" ordering option