VT-704

Temperature Compensated Crystal Oscillator

a Microchip company

Description

Vectron's VT-704 Temperature Compensated Crystal Oscillator (TCXO) is a quartz stabilized, Clipped sine wave or CMOS output, analog temperature compensated oscillator, operating off a 2.5V to 3.3 volt supply in a hermetically sealed 7.0 x 5.0 mm ceramic package.

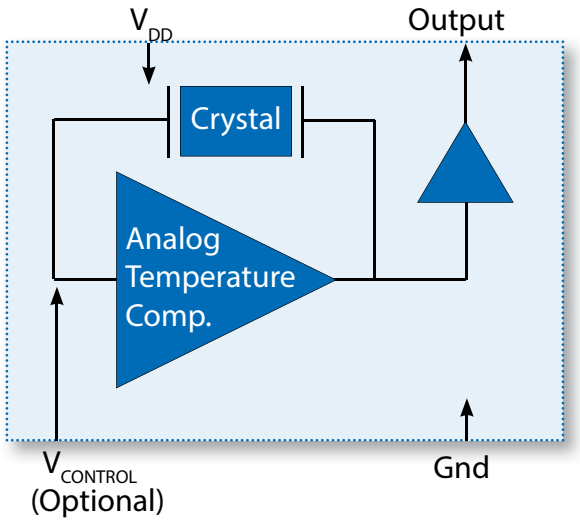
Features

- Clipped Sine Wave or CMOS Output
- 5.000 - 52.000MHz Output Frequency
- ±0.5ppm 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

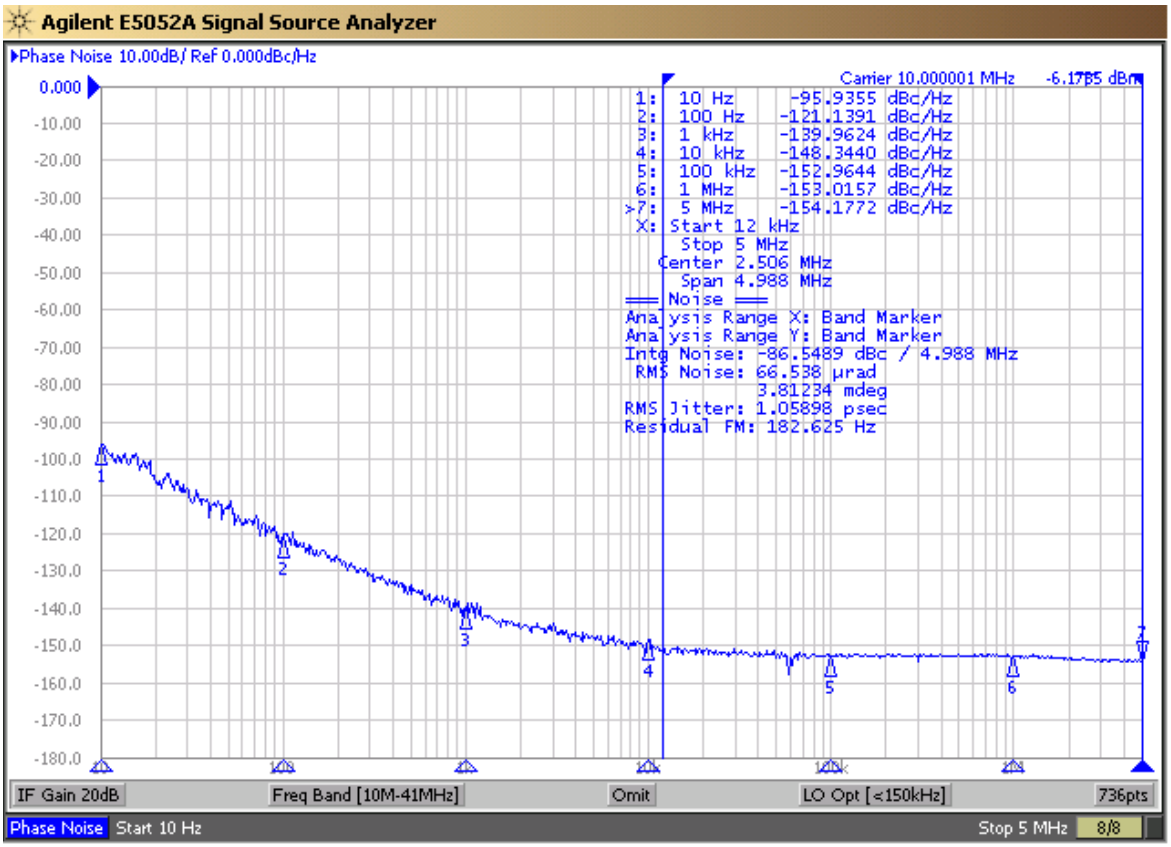
Table 1. Electrical Performance, Clipped Sine Wave Option					
Parameter	Symbol	Min.	Typ	Max	Units
Output Frequency[1], *Ordering Option*	f_O	5		52	MHz
Supply Voltage[3], *Ordering Option*	V_{DD}	+2.5, +2.8, +3.0, +3.3			V
Supply Current	I_{DD}			3.5	mA
Operating Temperature, *Ordering Option*	T_{OP}	0/55, -10/70, -20/70, -30/80, -30/85, -40/85			°C
Frequency Stability					
Stability Over T_{OP}[4], *Ordering Option*	F_{STAB}	±0.5, ±1.0, ±1.5 , ±2.0, ±2.5, ±3.0, ±4.0, ±5.0			ppm
Frequency Tolerance[5]	F_{TOL}			±2.0	ppm
Power Supply Stability, ±5%	F_{PWR}			±0.1	ppm
Load Stability, ±10%	F_{LOAD}			±0.2	ppm
Aging / 1st year	F_{AGE}			±1.0	ppm
Frequency Tuning (EFC), *Ordering Option*					
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), *Ordering Option*					
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[7]					
Phase Noise, 10.00MHz[7]	$Ø_N$				dBc/Hz
10Hz			-96		
100Hz			-122		
1kHz			-140		
10kHz			-148		
100kHz			-153		

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-704 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.

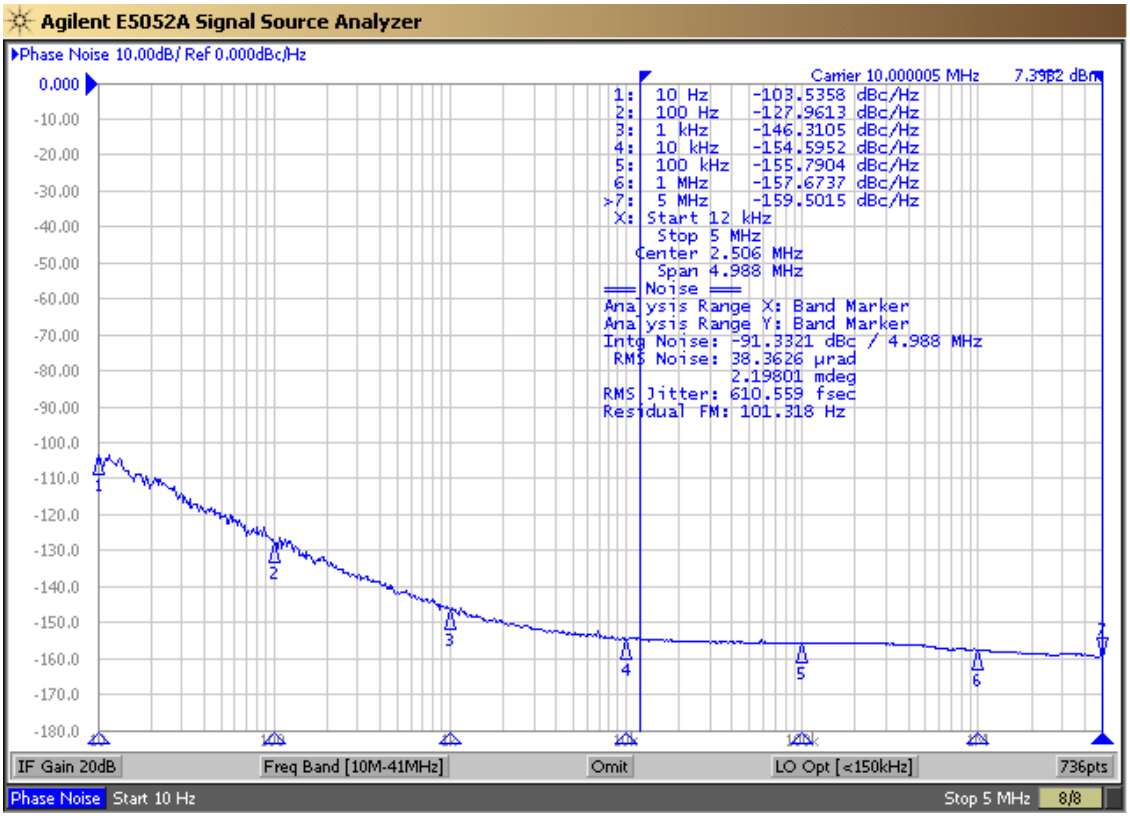
Table 2. Electrical Performance, CMOS Option					
Parameter	Symbol	Min.	Typ	Max	Units
Output Frequency[1], *Ordering Option*	f_O	5		52	MHz
Supply Voltage[3], *Ordering Option*	V_{DD}	+2.5, +2.8, +3.0, +3.3			V
Supply Current	I_{DD}			6.0	mA
Operating Temperature, *Ordering Option*	T_{OP}	0/55, -10/70, -20/70, -30/80, -30/85, -40/85			°C
Frequency Stability					
Stability Over T_{OP}[4], *Ordering Option*	F_{STAB}	±0.5, ±1.0, ±1.5 , ±2.0, ±2.5, ±3.0, ±4.0, ±5.0			ppm
Frequency Tolerance[5]	F_{TOL}			±2.0	ppm
Power Supply Stability, ±5%	F_{PWR}			±0.1	ppm
Load Stability, ±10%	F_{LOAD}			±0.2	ppm
Aging / 1st year	F_{AGE}			±1.0	ppm
Frequency Tuning (EFC), *Ordering Option*					
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), *Ordering Option*					
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				4	ns
Phase Noise[7]					
Phase Noise, 10.00MHz[7] 10Hz 100Hz 1kHz 10kHz 100kHz	$\emptyset_N$		 -98 -129 -145 -153 -156		dBc/Hz

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-704 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

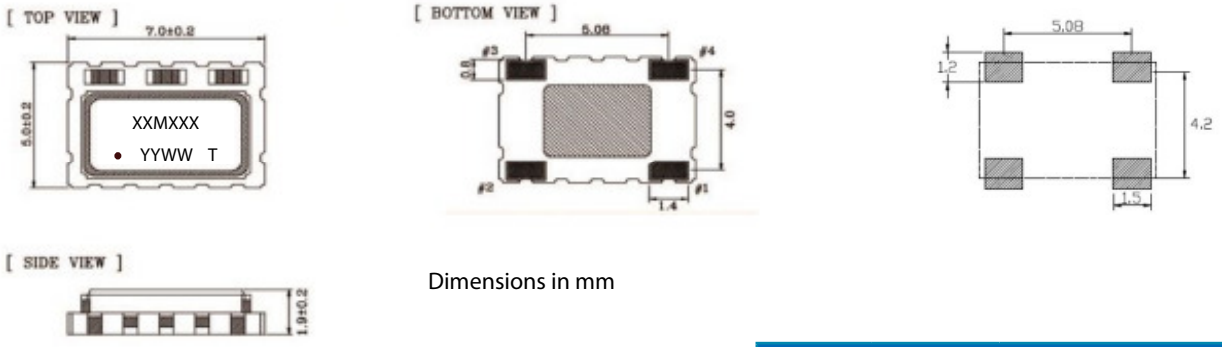
Phase Noise Performance for 10MHz Clipped Sine Wave



Phase Noise Performance for 10MHz CMOS



Package Outline Drawing & Pad Layout



Dimensions in mm

Marking Information
XXMXX - Frequency (Example: 10M000)
YY - Year of Manufacture
WW - Week of the Year
T - Manufacturing Location
• - Pin 1 Indicator

Table 3. 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

Note:
0.1uF capacitor is a by-pass power supply filter capacitor placed between Pin4 (Vdd) and Ground for optimal performance.

VCXO Function

VCXO Feature: The VT-704 is supplied 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, 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-704, 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}	-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

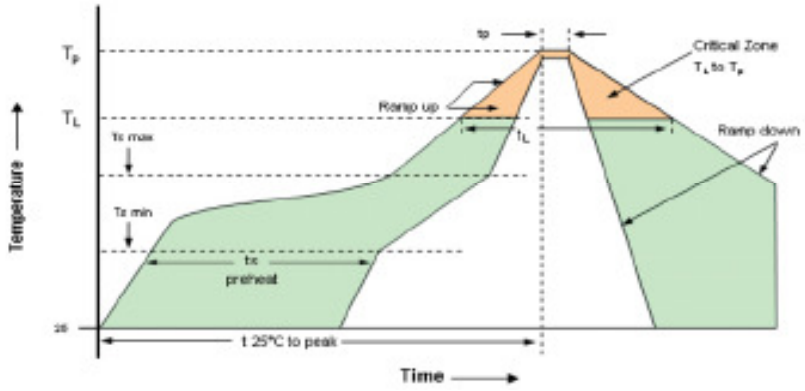
IR Reflow

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.

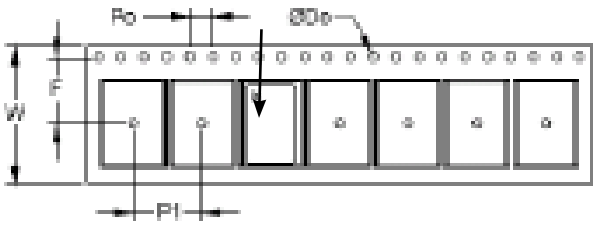
Table 6. Reflow Profile		
Parameter	Symbol	Value
PreHeat Time Ts-min Ts-max	t_s	200 sec Max 150°C 200°C
Ramp Up	R_{UP}	3ºC/sec Max
Time above 217C	t_L	150 sec Max
Time to Peak Temperature	$t_{25C\ to\ peak}$	480 sec Max
Time at 260C	t_P	30 sec Max
Time at 240C	t_{P2}	60 sec Max
Ramp down	R_{DN}	6ºC/sec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

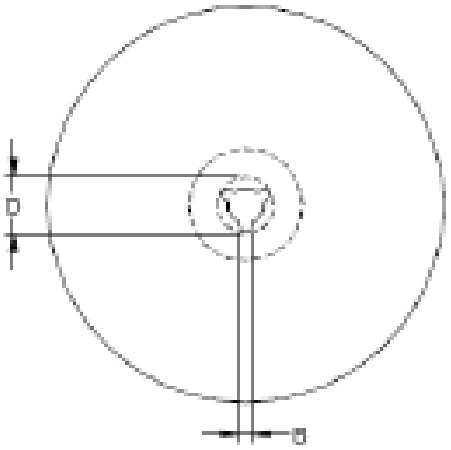
Solderprofile:

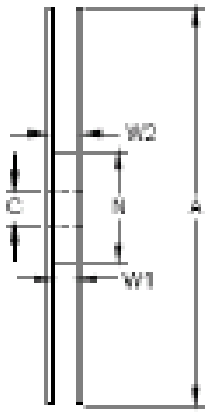


Tape & Reel

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







Ordering Information

Table 8. Standard Frequencies (MHz)

8.000	8.192	10.000	12.800	16.000	16.384	19.200	19.440	25.000	26.000
40.000									

Note: Other Frequencies are available on request.

VT-704- E F W - 507A- xxMxxxxxx

Product
TCXO

Package
7.0 x 5.0 Package

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

Output
A: CMOS
F: Clipped Sine Wave

Temp Range
R: 0/55°C
W: -10/70°C
J: -20/70°C
G: -30/80°C
H: -30/85°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: ±1.0ppm
156: ±1.5ppm
206: ±2.0ppm
256: ±2.5ppm
306: ±3.0ppm
406: ±4.0ppm
506: ±5.0ppm

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

Example: VT-704-EFW-507A-12M8000000

* Add **_SNPBDIP** for tin lead solder dip
Example: VT-704-EFW-507A-12M8000000_SNPBDIP

Revision History

Revision Date	Approved	Description
May 4, 2015	VN	Rev 0.1: VT-704 Product Preliminary Datasheet - Internal Verification
May11, 2015	VN	Rev 0.2: Preliminary Datasheet Website (Product Launch)
June 16, 2015	VN	Rev 0.3: Added temperature code "G" for -30/80 °C operating temperature range
June 14, 2016	VN	Rev 0.4: Removed "Preliminary".
August 10, 2018	FB	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