VT-827

Voltage Controlled, Temperature Compensated Crystal Oscillator

Features

- Clipped Sine Wave or CMOS Output
- 8.000 MHz to 40.000 MHz Output
- ±2.5 ppm Temperature Stabilty
- Optional Frequency Tuning
- Fundamental Crystal Design
- Gold over Nickel Contact Pads
- Hermetically Sealed Ceramic 3.2 mm x 2.5 mm SMD Package
- Product is Compliant to RoHS Directive and Fully Compatible with Lead-Free Assembly

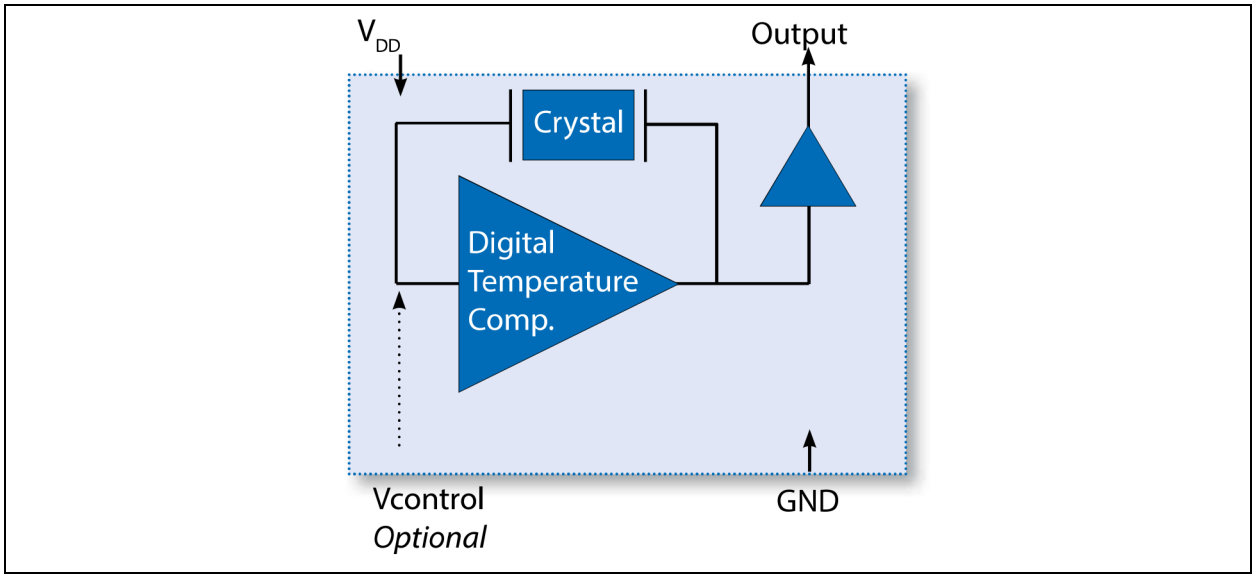
Applications

- Femto Cells
- Base Stations
- IP Networking
- Point-to-Point Radio
- Manpack Radio
- Test and Measurement

General Description

Microchip's VT-827 temperature compensated crystal oscillator (TCXO) is a quartz stabilized, clipped sine wave or CMOS output, digital temperature compensated oscillator that operates off a 2.5V, 3.0V, or 3.3V supply in a hermetically sealed 3.2 mm x 2.5 mm package

Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Supply Voltage (V_{DD}) ..... –0.3V to +4.0V
Control Voltage (V_C) ..... –0.3V to V_{DD} + 0.3V
ESD Rating, Human Body Model (Note 1) 600V
ESD Rating, Charged Device Model (Note 1) ..... 3 kV
Storage Temperature (T_S) ..... –55°C to +120°C

† Notice: Stresses in excess of the Absolute Maximum Ratings can permanently damage the device. Functional operation is not implied at these or any other conditions in 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.

Note 1: Although ESD protection circuitry has been designed into the VT-827, proper precautions should be taken when handling and mounting. Microchip employs a Human Body Model (HBM) and a Charged Device Model (CDM) for ESD susceptibility testing and design protection 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 1.5 kΩ and capacitance of 100 pF is widely used and therefore can be used for comparison purposes.

ELECTRICAL CHARACTERISTICS, CMOS OUTPUT

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions
Output Frequency (Note 1)	f_O	8	—	40	MHz	Ordering Option
Supply Voltage (Note 2)	V_{DD}	—	2.5	—	V	Ordering Option
		—	3.0	—		
		—	3.3	—		
Supply Current	I_{DD}	—	—	6.0	mA	—
Operating Temperature	T_{OP}	–30	—	+85	°C	Ordering Option
		–40	—	+85		
Stability over Operating Temperature	—	—	—	±1.0	ppm	Ordering Option
		—	—	±1.5		
		—	—	±2.0		
		—	—	±2.5		
Initial Accuracy (Note 3)	—	—	—	±1.5	ppm	“No Adjust” option
Power Supply Stability, ±5% change	—	—	—	±0.3	ppm	—
Load Stability, ±5% change	—	—	—	±0.3	ppm	—
Aging	—	—	—	±1.0	ppm	1st year
Pull Range	PR	±5	—	—	ppm	Ordering Option
		±10	—	—		
		±12	—	—		
Control Voltage to Reach Pull Range	—	0.5	—	2.5	V	—
Control Voltage Impedance	—	100	—	—	kΩ	—

Note 1: The output is DC-coupled.
2: The VT-827 power supply pin should be filtered. For example, a 10 µF, 0.1 µF, and 0.01 µF.
3: After two IR reflows and 24 hours.
4: Measured at 10% and 90% of waveform.

ELECTRICAL CHARACTERISTICS, CMOS OUTPUT (CONTINUED)

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions
Gain Slope	—	Positive			—	—
Output Level	V_{OH}	0.8 x V_{DD}	—	—	V	—
	V_{OL}	—	—	0.5	V	
Rise and Fall Time (Note 4)	t_r/t_f	—	—	10	ns	—
Duty Cycle	—	40	—	60	%	—
Output Load	—	—	15	—	pF	—
Phase Noise, 10 Hz	$Ø_N$	—	–80	—	dBc/Hz	30.000 MHz
Phase Noise, 100 Hz		—	–110	—		
Phase Noise, 1 kHz		—	–130	—		
Phase Noise, 10 kHz		—	–140	—		
Phase Noise, 100 kHz		—	–140	—		
Phase Noise, 1 MHz		—	–145	—		
Start Up Time	t_{SU}	—	—	2	ms	—

Note 1: The output is DC-coupled.

2: The VT-827 power supply pin should be filtered. For example, a 10 µF, 0.1 µF, and 0.01 µF.

3: After two IR reflows and 24 hours.

4: Measured at 10% and 90% of waveform.

ELECTRICAL CHARACTERISTICS, CLIPPED SINE WAVE OUTPUT

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions
Output Frequency (Note 1)	f_O	8	—	40	MHz	Ordering Option
Supply Voltage (Note 2)	V_{DD}	—	2.5	—	V	Ordering Option
		—	3.0	—		
		—	3.3	—		
Supply Current	I_{DD}	—	—	2.0	mA	—
Operating Temperature	T_{OP}	–30	—	+85	°C	Ordering Option
		–40	—	+85		
Stability over Operating Temperature	—	—	—	±1.0	ppm	Ordering Option
		—	—	±1.5		
		—	—	±2.0		
		—	—	±2.5		
Initial Accuracy (Note 3)	—	—	—	±1.5	ppm	“No Adjust” option
Power Supply Stability, ±5% change	—	—	—	±0.3	ppm	—
Load Stability, ±5% change	—	—	—	±0.3	ppm	—
Aging	—	—	—	±1.0	ppm	1st year
Pull Range	PR	±5	—	—	ppm	Ordering Option
		±10	—	—		
		±12	—	—		
Control Voltage to Reach Pull Range	—	0.5	—	2.5	V	—
Control Voltage Impedance	—	100	—	—	kΩ	—
Gain Slope	—	Positive			—	—
Output Level	V_{OP-P}	0.8	—	—	V	—
Output Load	—	—	10K || 10	—	pF	—
Phase Noise, 10 Hz	$Ø_N$	—	–93	—	dBc/Hz	24.000 MHz
Phase Noise, 100 Hz		—	–120	—		
Phase Noise, 1 kHz		—	–138	—		
Phase Noise, 10 kHz		—	–145	—		
Phase Noise, 100 kHz		—	–148	—		
Phase Noise, 1 MHz		—	–153	—		
Start Up Time	t_{SU}	—	—	2	ms	—

Note 1: The output is DC-coupled.

2: The VT-827 power supply should be filtered. For example, a 10 µF, 0.1 µF, and 0.01 µF capacitor.

3: After two IR reflows and 24 hours.

2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1	NC or V_C	No connection or TCXO control voltage. See Note 1.
2	GND	Ground.
3	OUT	Output.
4	V_{DD}	Supply voltage.

Note 1: Pin 1 should not be left floating on the optional VCXO device. Pin 1 can be left open or set to GND on the non-VCXO option.

VCXO FUNCTION

The VT-827 is supplied with a VCXO function for applications where it will be used in a PLL or if the output frequency needs fine tuning or calibration adjustments. This is a high impedance input, 100 kΩ, and can be driven with an Op Amp or terminated with adjustable resistors. Pin 1 should not be left floating on the VCXO optional device. Pin 1 can be left open or set to GND on the non-VCXO option.

3.0 RELIABILITY

Microchip qualification will include aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The VT-827 family is capable of meeting the following qualification tests.

TABLE 3-1: ENVIRONMENTAL COMPLIANCE

Parameter	Conditions
Mechanical Shock	MIL-STD-883, Method 2002 (1500G, 0.5 ms)
Mechanical Vibration	MIL-STD-883, Method 2007 (20G peak acceleration)
Temperature Cycle	MIL-STD-883, Method 1010 (–55°C to +85°C)
Solderability	MIL-STD-883, Method 2003 (Lead-free solder)
Gross and Fine Leak	MIL-STD-883, Method 1014
Resistance to Solvents	MIL-STD-883, Method 2015 (IPA solvent)
Moisture Sensitivity Level	MSL 1
Contact Pads	Gold (0.3 µm min., 1.0 µm max.) over Nickel

4.0 IR REFLOW

Devices are built using lead-free epoxy and can be subjected to standard lead-free IR reflow conditions shown in Table 4-1. Contact pads are gold over nickel and lower maximum temperatures can also be used, such as 220°C.

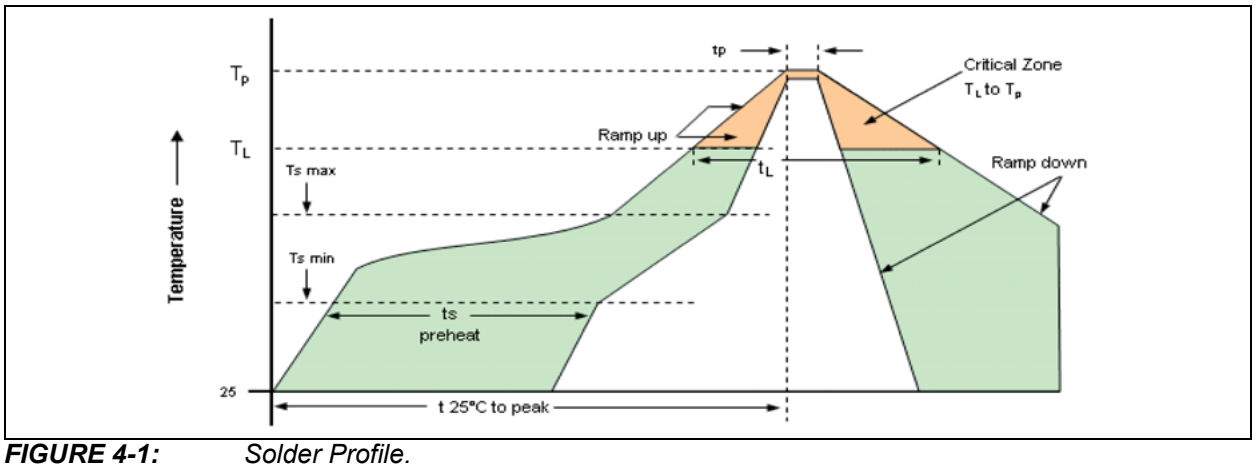


FIGURE 4-1: *Solder Profile.*

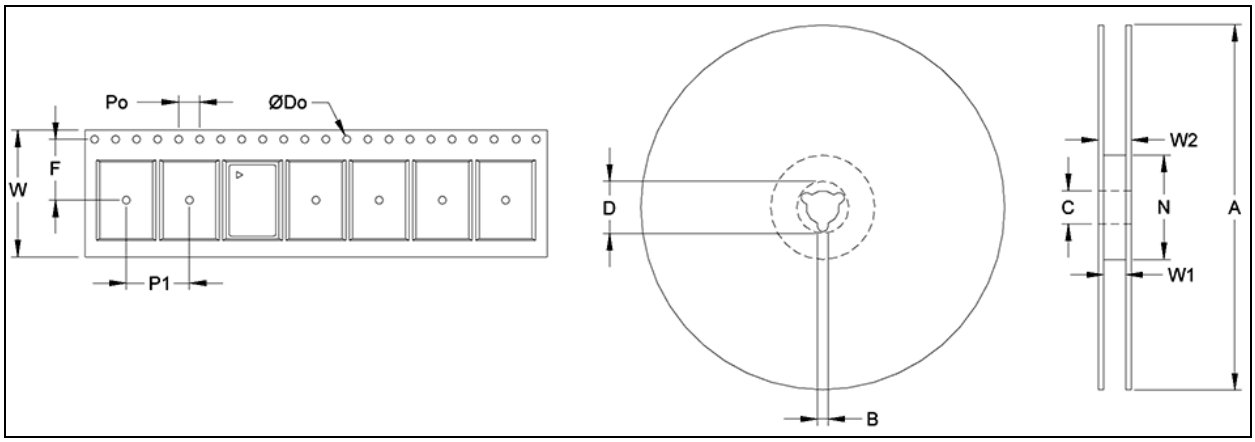
TABLE 4-1: REFLOW PROFILE

Parameter	Symbol	Value
Pre-Heat Time	t_S	200 seconds maximum
—	$T_{S(MIN)}$	150°C
—	$T_{S(MAX)}$	200°C
Ramp Up	R_{UP}	3°C/sec. maximum
Time above 217°C	t_L	150 seconds maximum
Time to Peak Temperature	T_{AMB-P}	480 seconds maximum
Time at 260°C	t_P	30 seconds maximum
Time at 240°C	t_{P2}	60 seconds maximum
Ramp Down	R_{DN}	6°C/sec. maximum

5.0 TAPE AND REEL

TABLE 5-1: TAPE AND REEL DIMENSIONS

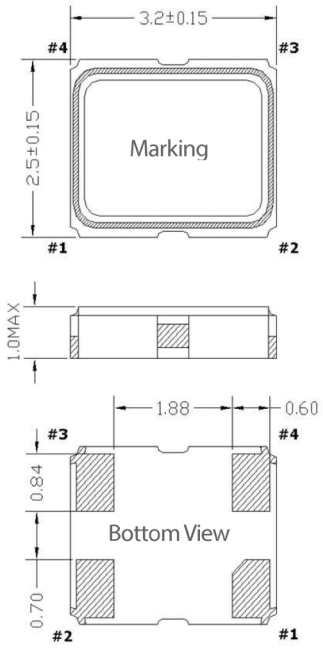
Tape Dimensions (mm)						Reel Dimensions (mm)							
Dimension	W	F	Do	Po	P1	A	B	C	D	N	W1	W2	# per Reel
Tolerance	Typ	Typ	Typ	Typ	Typ	Typ	Typ	Typ	Typ	Typ	Typ	Max	
VT-827	8	3.5	1.5	4	4	178	2	13	21	60	10	14	1000



6.0 PACKAGING INFORMATION

4-Lead 3.2 mm x 2.5 mm VDFN Package Outline and Recommended Land Pattern

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Marking
VFFMFFF
.YYWW KH
where
V = Vectron
FFMFFF = Frequency, eg 25M000 = 25.000MHz
YY= Year, MM= Month, KH = Manufacturing location

Dimensions in mm

APPENDIX A: REVISION HISTORY

Revision A (April 2021)

- Converted Vectron document VT-827 to Microchip data sheet template DS20006523A.
- Minor grammatical text changes throughout.

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

Device	-X	X	X	-XXX	X	-XXXXXXXXXX	XX
Part No.	Power Supply	Output	Temp. Range	Stability	Tuning	Frequency	Packaging

Device:	VT-827:	Voltage Controlled, Temperature Compensated Crystal Oscillator in 4-Lead 3.2 mm x 2.5 mm VDFN
Power Supply:	E = 3.3VDC ±5% F = 3.0VDC ±5% H = 2.5VDC ±5%	
Output:	A = CMOS F = Clipped Sine Wave	
Temperature Range:	E = –40°C to +85°C H = –30°C to +85°C	
Stability:	106 = ±1.0 ppm 156 = ±1.5 ppm 206 = ±2.0 ppm 256 = ±2.5 ppm	
Tuning:	0 = Fixed, No Tuning A = ±5 ppm C = ±10 ppm D = ±12 ppm	
Frequency:	xxMxxxxxxx=Frequency in MHz	
Packaging:	TR = 1,000/Reel <blank>= Cut Tape/ non-TR quantities	

Examples:

a) VT-827-EAH-106C-14M7456000TR:
VT-827, 3.3VDC, CMOS Output, –30°C to +85°C Temp Range, ±1.0 ppm Stability, ±10 ppm Tuning, 14.7456 MHz, 1000/Reel

b) VT-827-HFH-256A-38M4000000TR:
VT-827, 2.5VDC, Clipped Sine Wave Output, –30°C to +85°C Temp Range, ±2.5 ppm Stability, ±5 ppm Tuning, 38.400 MHz, 1000/Reel

Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

Note: Not all combinations of options are available. ±2.5 ppm stability over the –30°C to +85°C range is the standard best option. Check with the factory on combination and frequency.

TABLE 1: STANDARD FREQUENCIES

8.000 MHz	10.000 MHz	12.000 MHz	12.800 MHz	13.000 MHz	14.400 MHz
14.7456 MHz	16.000 MHz	16.384 MHz	18.432 MHz	19.200 MHz	19.53125 MHz
20.000 MHz	22.5792 MHz	24.000 MHz	25.000 MHz	26.000 MHz	27.000 MHz
30.000 MHz	30.720 MHz	31.250 MHz	32.000 MHz	33.1776 MHz	36.000 MHz
38.400 MHz	40.000 MHz	—	—	—	—

NOTES:

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods being used in attempts to breach the code protection features of the Microchip devices. We believe that these methods require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Attempts to breach these code protection features, most likely, cannot be accomplished without violating Microchip's intellectual property rights.
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