

VFHV570

Extended Temperature/COTS VCXO, 5x7mm SMD, CMOS

Features

- 1MHz to 80MHz frequency range
- -55°C to +175°C operating temperature range
- <0.2ps RMS Jitter over 12kHz to 20MHz
- APR typ. ± 100 ppm
- Start-up time is less than 5ms

Applications

- Industrial
- Military
- High Temperature



Part Dimensions: 7.2 x 5.2 x 1.9 mm

Description

These high reliability oscillators provide CMOS waveforms for applications subjected to the most stringent environmental conditions. They are mechanically robust and weigh less than 0.2 grams. This 5x7 mm SMD package has a hermetic seal, thus ensuring the integrity of the part. Each oscillator is burned-in at 125°C for 160 hours, temperature cycled and centrifuged then fully tested in accordance with Table 1. Reliability tests are performed per Table 2.

Electrical Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Frequency Range	F		1	-	80	Mhz	-
Frequency Stability	$\Delta F/F$	Includes operating temperature, change of input voltage, change of load, shock and vibration	-	± 50 ± 30	-	ppm	-55°C to +125°C (L) -55°C to +85°C (H)
Aging		First Year	-	3	-	ppm	-
		After First Year	-	1	-	ppm/yr	-
Pull Range	APR	$V_{dd} = 3.3V; V_c 1.65 \pm 1.65V$	± 90 ± 50	± 105	-	ppm	(L,H) (K,R)
		$V_{dd} = 5V; V_c 2.5 \pm 2.5V$	± 100 ± 65	± 110	-		(L,H) (K,R)
Operating Temperature	T		-55	-	+175	°C	See ordering information
Supply Voltage	V_{cc}		3.0	3.3	3.6	V	-
			4.5	5.0	5.5		
Supply Current	I_{cc}		3.0	-	5.0	mA	$CL=15 pF$ $V_{DD}= 3.6V$
			4.0	-	7.0		-
Current Consumption	I_{DDD}	$CL=15pF, V_{DD} = 3.6V, 5.5V, OE=0V, F0=27MHz$	-	1	2	mA	@ output disable
Output Off Leak	I_o	$OE=0V$	-	-	10	μA	@ output disable



Electrical Specifications (continued)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
"H" Input Current	I_{IH}	$V_{IN} = V_{DD}$	-	-	1	μA	-
"L" Input Current	I_{IL}	$V_{IN} = V_{SS}$	-	1.3	10	μA	-
"H" Output Voltage	V_{OH}	$I_{OH} = -5mA$	$V_{DD}-0.4$	-	-	V	$I_{OH} = -3mA$
"L" Output Voltage	V_{OL}	$I_{OL} = -5mA$	-	-	0.4	V	$I_{OL} = 3mA$
Rise & Fall Times		CMOS, 15pF	3.0	-	6.0	ns	+125°C
RMS Jitter 12kHz to 20MHz	1σ		-	<0.2	-	ps	-
Phase Noise		10Hz		-65		dBc/Hz	@ 50MHz
		100Hz		-94			
		1kHz	-	-120	-		
		10kHz		-142			
		100kHz		-155			
		1MHz		-159			
Input Impedance	V_C Impedance	Pad 1, V_C	5* 100	-	-	M Ω k Ω	Order Code H* Order Code B
Start-up Time	T_S		-	-	5	ms	-
Duty Cycle		CMOS @50% VDD	-	48/52	45/55	%	-
Control Voltage	V_C		0	-	3.3	V	3.3V
			0	-	5.0		5.0V
Modulation Bandwidth	F_C		15	20	-	kHz	3.3V
			15	20	-		5.0V
Pulling Linearity	F_{LIN}		-	10	15	%	-
Tristate		Input HIGH (>2.5V) or floating: ACTIVE Input LOW (<0.5V): HIGH IMPEDANCE					

*Available for 3.3V only



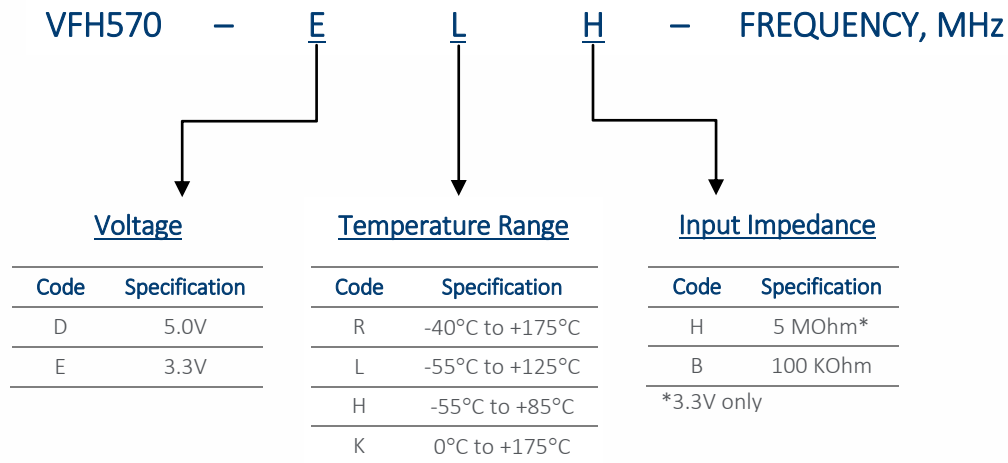
Absolute Maximum Ratings

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage	V_{DD}		$V_{SS} - 0.5$	-	7	V	-
Input Voltage	V_{IN}	All Input Pins	$V_{SS} - 0.5$	-	$V_{DD} + 0.5$	V	-
Output Voltage	V_{OUT}		$V_{SS} - 0.5$	-	$V_{DD} + 0.5$	V	-
Power Dissipation	I_{OUT}		-	-	30	mA	-
ESD		MM	-	± 200	-	-	-
		HBM	-	± 2000	-	-	-

Environmental and Mechanical

Parameter	Conditions
Shock	1000 Gs, 0.35 ms, ½ sine wave, 3 shocks in each plane
Vibration	10-2000 Hz of 0.06" d.a. or 20Gs, whichever is less
Humidity	Resistant to 85° R.H. at 85°C
Leak	Per MIL-STD-883, Method 1014, Condition A and Condition C
Case	Hermetically sealed ceramic LCC
Pads	39 microinch of gold over nickel
Resistance to Solvents	Per MIL-STD-202, Method 215
Marking	Epoxy ink or laser engraved

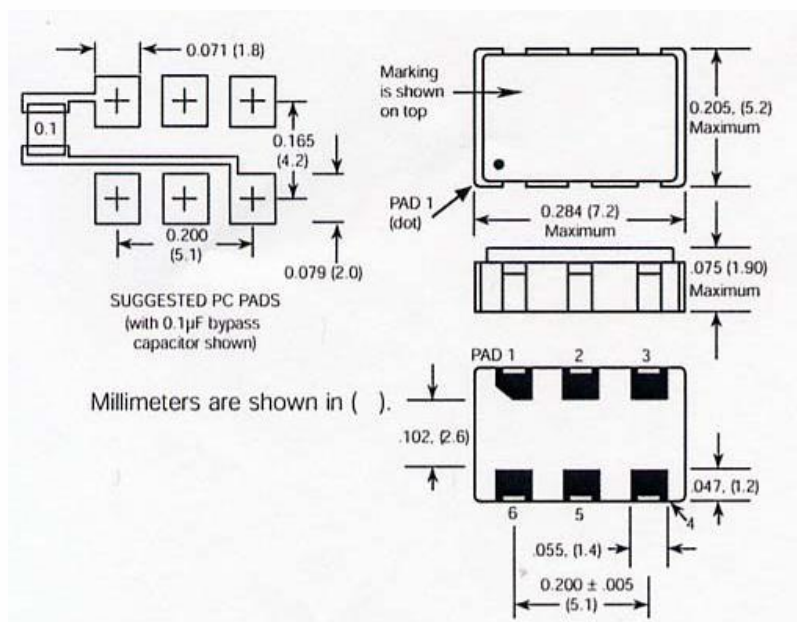
How to Order



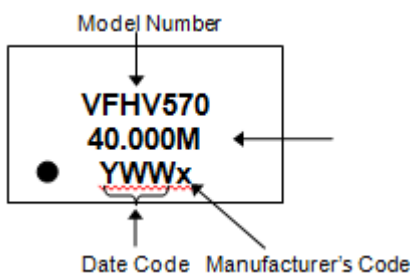
Pin Assignments

Pin #	Connection
1	Vc
2	Tristate
3	Ground, Case
4	Output
5	N/C
6	Vcc

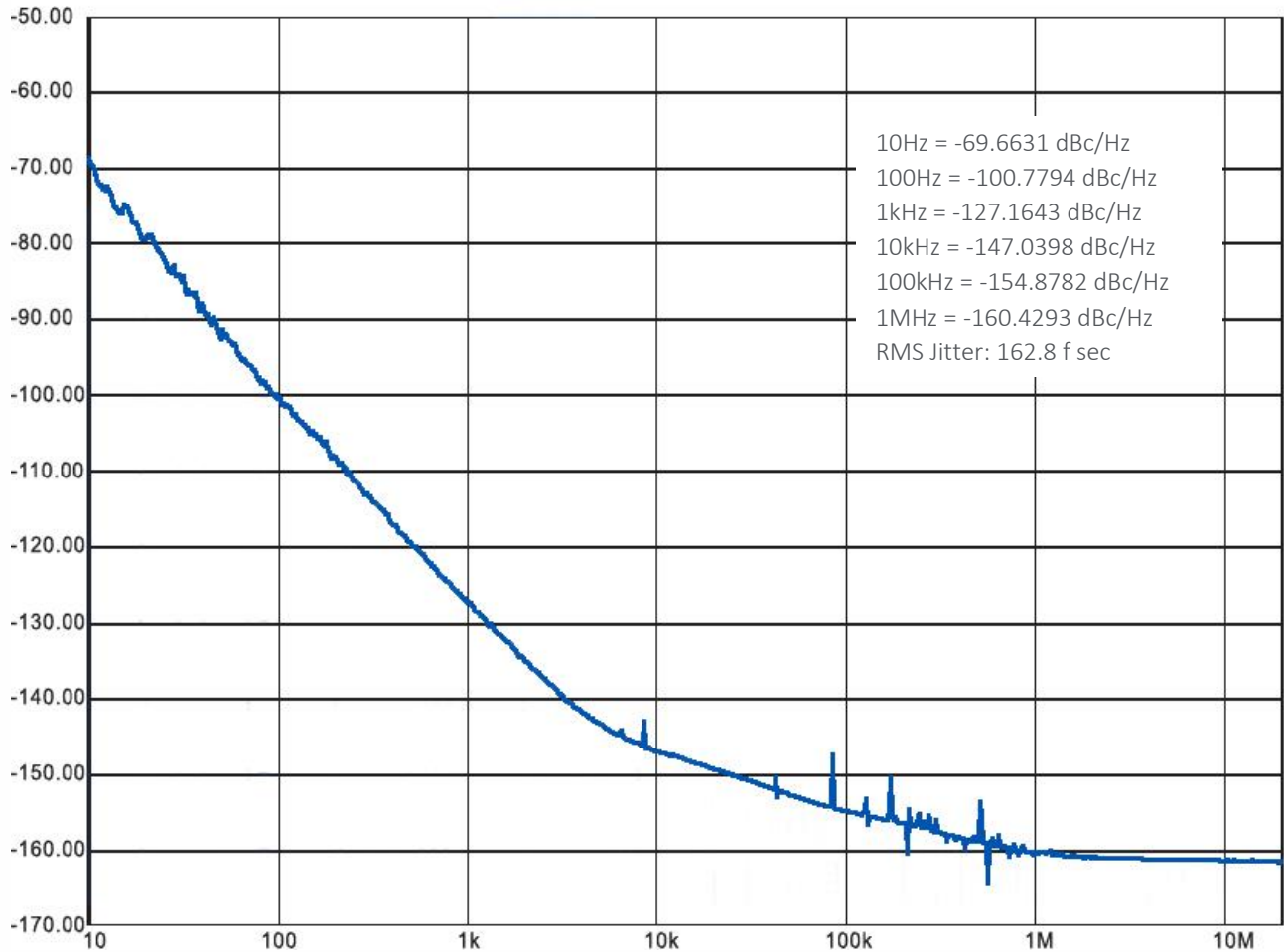
Package



Marking Specification



Phase Noise Plot at 50MHz



Recommended Reflow Soldering Profile

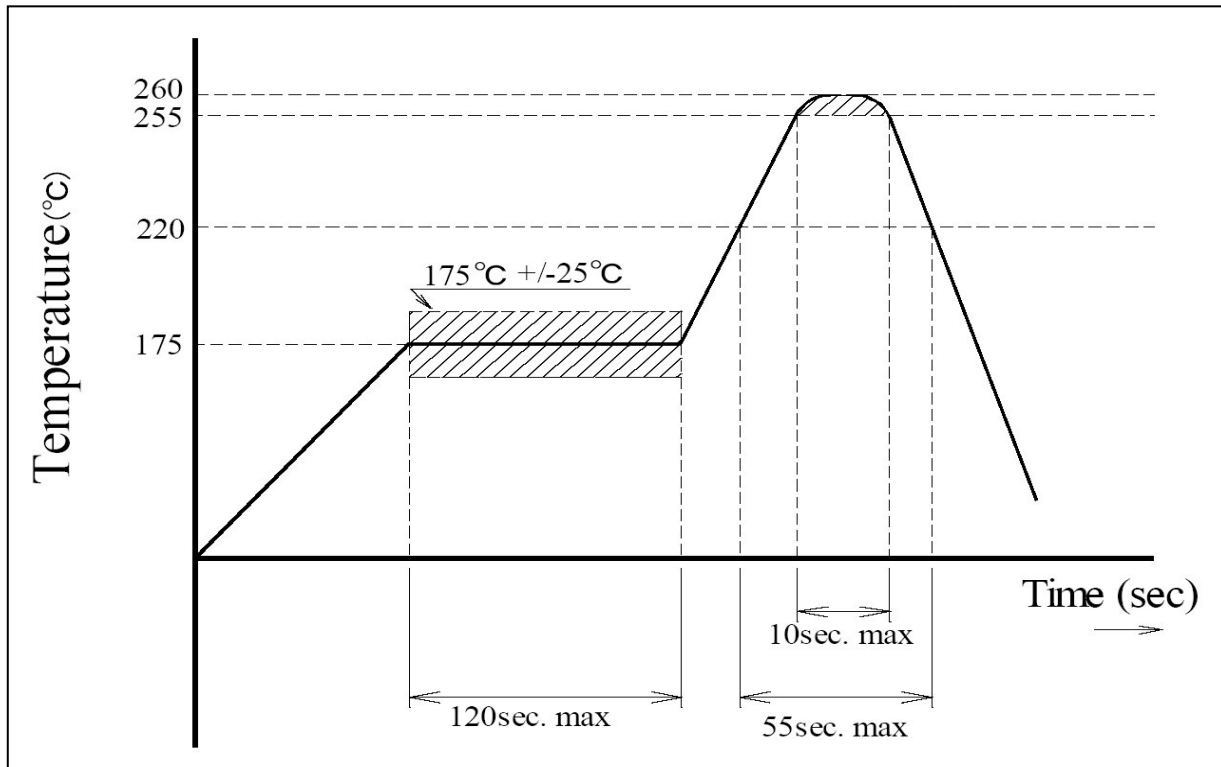


Table 1

Each unit undergoes screening for product level B class 2 oscillators by MIL-PRF-55310

Internal Visual	
Stabilization Bake	MIL-STD-883 Method 1008, Cond. B
Temperature Cycling	MIL-STD-883 Method 1010, Cond. B
Constant Acceleration	MIL-STD-883 Method 2001, Cond. A
Fine Leak	MIL-STD-883 Method 1014, Cond. A
Gross Leak	MIL-STD-883 Method 1014, Cond. C
Burn-in	MIL-STD-883 Method 1015, Cond. B (125°C for 160 hours with bias)
Electrical test at 25°C	
Current	Frequency at max Vdd
Rise Time	Frequency at min Vdd
Fall Time	"Zero" logic level
Duty Cycle	"One" logic level
Tristate	
Frequency at 25°C and frequency verification at temperature extremes	

Serialized test data on each unit available upon request for additional cost.

Thermal Characteristics

Thermal Resistance

From Junction to Case, $R_{\theta jc}$ 16 °C/Watt

Surface Mount Application

These packages are designed for reflow soldering in accordance with recommended profiles. For hand-soldering, the temperature of the iron should not exceed 400°C for three seconds.



TABLE 2

Reliability Test Procedures and Conditions for Quartz Crystal Oscillators

1. Group A

Electrical Characteristics at 25°C

Frequency at nominal supply voltage and endpoints
 Input current
 Symmetry (Duty Cycle)
 Zero/One levels
 Rise/Fall times
 Frequency (verify frequency at the temperature extremes)

Physical Dimensions
 Length/width
 Height
 Package finish (Corrosion, discoloration, etc.)
 Marking placement/legibility

2. Group B
 1000 hrs at or above 125°C, nominal voltage, proper load
 (sample size by MIL -PRF-55310 table 6, max. aging within 15 years
 requirement without catastrophic failures)

3. Group C- All units have passed Group A testing

A. Subgroup 1: 8 pcs.

<u>Standard</u>	<u>Condition</u>	<u>Description</u>	<u>End Point</u> <u>Measurement</u>
MIL-STD-883	Method 2002 COND.B	Mechanical Shock 1500 g's, 0.5ms 5 drops, 6 axis	Frequency Output waveform
MIL-STD-883	Method 2007 COND. A	Vibration, var. freq. 20 g's, 0.06" disp., 20- 20, 000-20 Hz	Frequency Output waveform
MIL-STD-883	Method 2003	Solderability	Visual 95% Coverage

Test data is available for additional cost.

B. Subgroup 2: 4 pcs (One-half of Subgroup 1)

<u>Standard</u>	<u>Condition</u>	<u>Description</u>	<u>End point</u> <u>Measurement</u>
MIL-STD-883	Method 1011 COND. B	Thermal Shock Liq. To liq. 15 cycles	Frequency Output waveform
MIL-STD-202	Method 105 COND. B	Altitude, 3.44 inch Hg. 12 hrs	Frequency Output waveform
MIL-STD-883	Method 1004	Moisture resist. with supply voltage applied 25°C to 65°C, 90 to 100% RH, 10 cycles	Frequency Output waveform
MIL-STD-202	Method 210 COND. A	Resistance to Solder Heat Immersion @350°C 3.5 sec	Frequency Output waveform

C. Subgroups 3: 4 pcs. (One half of Subgroup 1)

<u>Standard</u>	<u>Condition</u>	<u>Description</u>	<u>End point</u> <u>Measurement</u>
MIL-STD-883	Method 1009 COND. A	Salt Atmosphere 24 hrs. @ 35°C 0.5-3.0% Solution	Frequency Output waveform Visual
MIL-STD-883	Method 1014 COND. A	Fine Leak	Qs <5 X10 ⁻⁸
MIL-STD-883	Method 1014 COND. C	Gross Leak	Visual in 125°C Detector fluid