

# 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.  $\pm 100$ ppm
- Start-up time is less than 5ms



#### RoHS Status



#### Applications

- Industrial
- Military
- High Temperature

#### 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		$\pm 50$ $\pm 30$		ppm	-55°C to +125°C (L) -55°C to +85°C (H)
Aging		First Year After First Year		3 1		ppm ppm/yr	
Pull Range	APR	$V_{DD}= 3.3V$ ; $V_C 1.65 \pm 1.65V$	$\pm 90$ $\pm 50$	$\pm 105$		ppm	(L,H) (K,R)
		$V_{DD}=5V$ ; $V_C 2.5 \pm 2.5V$	$\pm 100$ $\pm 65$	$\pm 110$			(L,H) (K,R)
Operating Temperature	T		-55		+175	°C	See ordering information
Supply Voltage	$V_{CC}$		3.0 4.5	3.3 5.0	3.6 5.5	V	
Supply Current	$I_{CC}$		3.0		5.0	mA	$CL=15 pF$ $V_{DD}= 3.6V$
			4.0		7.0		$CL=15 pF$ $V_{DD}= 5.5V$

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**Electrical Specifications**

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Current Consumption	$I_{DD}$	CL=15pF, V <sub>DD</sub> =3.6V, 5.5V OE=0V, F0=27MHz		1	2	mA	@ output disable
Output Off Leak	$I_O$	OE=0V			10	μA	@ output disable
“H” Input Current	$I_{IH}$	V <sub>IN</sub> =V <sub>DD</sub>			1	μA	
“L” Input Current	$I_{IL}$	V <sub>IN</sub> =V <sub>SS</sub>		1.3	10	μA	
“H” Output Voltage	V <sub>OH</sub>	I <sub>OH</sub> =-5mA	V <sub>DD</sub> -0.4			V	I <sub>OH</sub> =-3mA
“L” Output Voltage	V <sub>OL</sub>	I <sub>OL</sub> =-5mA			0.4	V	I <sub>OH</sub> =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 100Hz 1kHz 10kHz 100kHz 1MHz		-65 -94 -120 -142 -155 -159		dBc/Hz	@ 50MHz
Input Impedance	V <sub>C</sub> Impedance	Pad 1, V <sub>C</sub>	5* 100			MOhm kOhm	Order Code H* Order Code B
Start-up Time	T <sub>s</sub>				5	ms	
Duty Cycle		CMOS @50% V <sub>DD</sub>		48/52	45/55	%	
Control Voltage	V <sub>C</sub>		0		3.3	V	3.3V
			0		5.0		5.0V
Modulation Bandwidth	F <sub>C</sub>		15	20		kHz	3.3V
			15	20			5.0V
Pulling Linearity	F <sub>LIN</sub>			10	15	%	
Tristate	Input HIGH (>2.5V) or floating: Input LOW (<0.5V):		ACTIVE HIGH IMPEDANCE				

\*Available for 3.3V only.

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**Absolute Maximum Rating**

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 Conditions**

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

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#### How to Order:

VFHV570 - **E L H** - FREQUENCY, MHz

Voltage	
Code	Specification
D	5.0V
E	3.3V

Temperature Range	
Code	Specification
R	-40°C to +175°C
L	-55°C to +125°C
H	-55°C to +85°C
K	0°C to +175°C

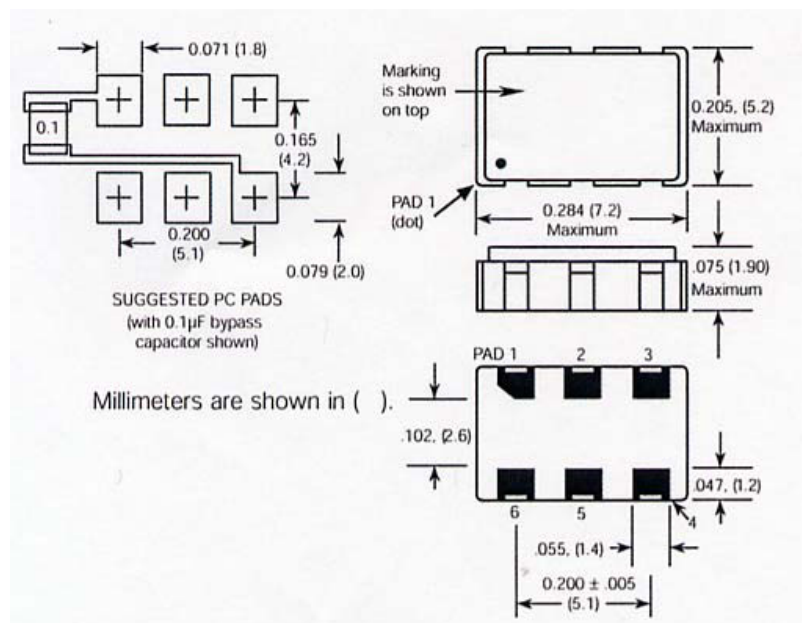
Input Impedance	
Code	Specification
H	5MOhm*
B	100KOhm

\*3.3V only

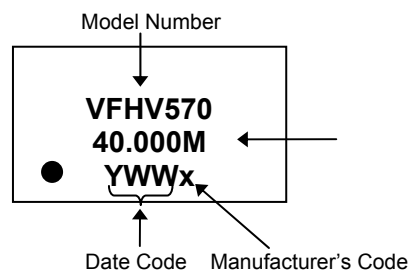
#### Pin Assignments

Pin #	Connections
1	V <sub>C</sub>
2	Tristate
3	Ground, Case
4	Output
5	N/C
6	V <sub>CC</sub>

#### Package



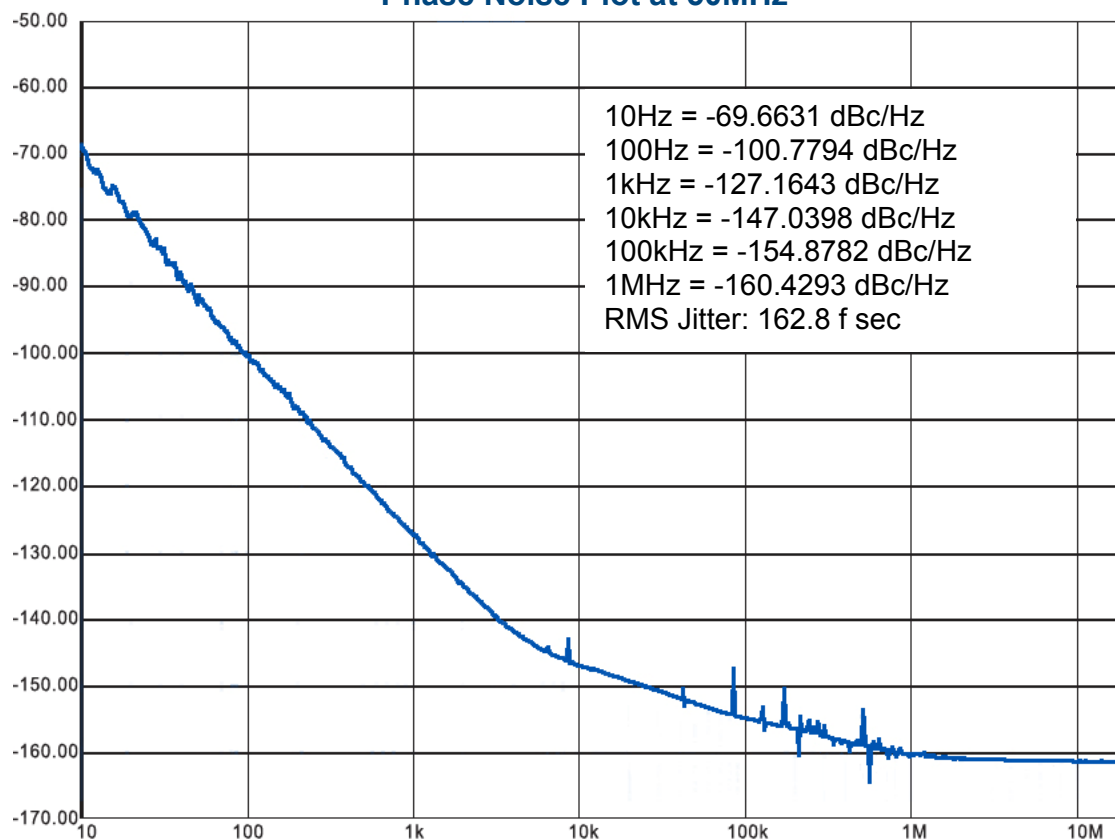
#### Marking Specification



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**Phase Noise Plot at 50MHz**



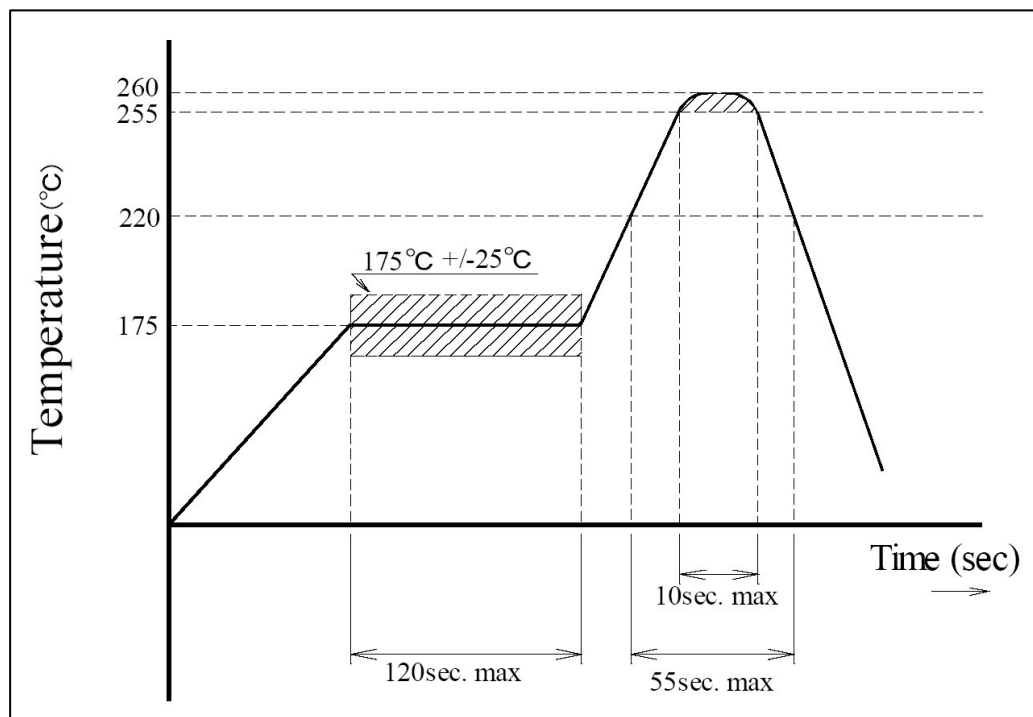
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### Recommended Reflow Soldering Profile



**Table 1**

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

Internal Visual	MIL-STD-883 Method 1008, COND. B
Stabilization Bake	MIL-STD-883 Method 1010, COND. B
Temperature Cycling	MIL-STD-883 Method 2001, COND. A
Constant Acceleration	MIL-STD-883 Method 1014, COND. A
Fine Leak	MIL-STD-883 Method 1014, COND. C
Gross Leak	MIL-STD-883 Method 1015, COND. B
Burn-in	(125°C for 160 hours with bias)
Electrical test at 25°C	
Current	Frequency at max $V_{DD}$
Rise Time	Frequency at min $V_{DD}$
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.



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**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

##### 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>
	Storage Temp. No. Oper	24 hrs. @ -55°C 24 hrs. @ 125°C	Frequency Output waveform
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 <sup>-8</sup>
MIL-STD-883	Method 1014 COND. C	Gross Leak	Visual in 125°C Detector fluid

Test data is available for additional cost.