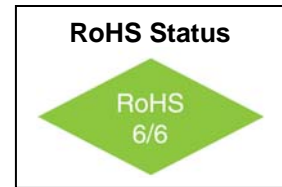


**VFH2121-VFH2124, VFH2221-VFH2224**  
**VFH2521-VFH2524, VFH2621-VFH2624**  
**XO Hi-Rel, 5.0V, 3.3V**  
**5x7mm SMD, HCMOS/TTL**



**Features**

- Leadless chip carrier package is hermetically sealed for superior aging and field performance
- Crystal angle controlled to  $\pm 0.5$  minute for excellent temperature stability
- 168 hour Class B burn-in and extensive environmental testing for best performance in rugged field environments
- Guarantee start-up with a ramping DC supply
- Start-up time <5ms, typical
- Tristate option available
- Calculated MTBF is  $3.8 \times 10^6$  hours at 125°C



**Description**

These high reliability oscillators provide HCMOS clock outputs 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 each part. Each oscillator is burned-in at 125°C for 168 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 0.5		105 125	MHz	5.0V 3.3V
Frequency Stability	$\Delta F/F$	Vs. Operating Temperature	$\pm 25$		$\pm 75$	ppm	See "How to Order" Chart
		Aging 1 <sup>st</sup> Year After 1 <sup>st</sup> Year			$\pm 3$ $\pm 1$		
Operating Temperature Range	T		-55°		+125°	°C	See "How to Order" Chart
Input Voltage	V <sub>CC</sub>		3.0 4.5	3.30 5.0	3.6 5.5	V	
Input Current	I <sub>CC</sub>				45	mA	5.0V
		3 to 10MHz 10.1 to 20MHz 20.1 to 30MHz 30.1 to 50MHz 50.1 to 67MHz 67.1 to 125MHz			4.5 6.0 15.5 20.0 30.0 40.0		3.3V
RMS Jitter					5 6	ps	5.0V 3.3V



**VFH2121-VFH2124, VFH2221-VFH2224**  
**VFH2521-VFH2524, VFH2621-VFH2624**  
**XO Hi-Rel, 5.0V, 3.3V**  
**5x7mm SMD, HCMOS/TTL**



**Electrical Specifications**

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Waveform Symmetry		Measured at 50% V <sub>DD</sub>		48/52	45/55 45/55	%	5.0V 3.3V
Rise / Fall Time	T <sub>R</sub> /T <sub>F</sub>	CMOS, 15pF, from 0.4 to (V <sub>DD</sub> -0.4) V			4	ns	5.0V
		CMOS, 15pF, 20% to 80% (<60MHz)		3.0	4.0		3.3V
		20% to 80% (≥60MHz)		2.0	2.5		
		CMOS, 30pF, 20% to 80% (<60MHz)		4.0	5.0		
		20% to 80% (≥60MHz)		3.0	4.5		
		CMOS, 50pF, 20% to 80% (<60MHz)		6.0	8.0		
Output Level	“Zero” Level	Sinking 16mA			0.4	V	
	“One” Level	Sourcing 8mA	V <sub>DD</sub> -0.4				
Input Requirement for Pin 1		“1”: On-Pin 1 may float or 2.4V min., sourcing 400 microAmp “0”: Disable or Tristate-Pin 1 requires 0.4V, sinking 400 microAmp					

**Environmental and Mechanical Conditions**

Parameter	Conditions
Storage Temperature	-55°C to +150°C
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	15 microinch of gold over nickel
Resistance to Solvents	Per MIL-STD-202, Method 215
Marking	Epoxy ink or laser engraved



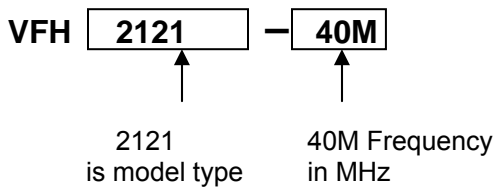
**VFH2121-VFH2124, VFH2221-VFH2224  
VFH2521-VFH2524, VFH2621-VFH2624  
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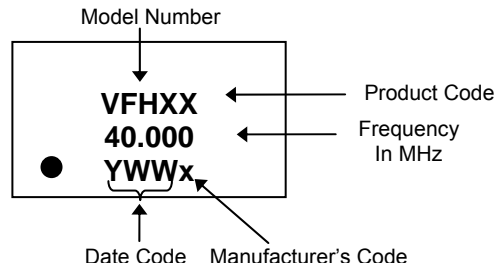
**Models**

FIXED OUTPUT		TRISTATE		Operating Temperature	Frequency Stability
3.3V	5.0V	3.3V	5.0V		
VFH2121	VFH2521	VFH2221	VFH2621	-55°C to +85°C	±25 ppm
VFH2122	VFH2522	VFH2222	VFH2622	-55°C to +85°C	±50 ppm
VFH2123	VFH2523	VFH2223	VFH2623	-55°C to +125°C	±75 ppm
VFH2124	VFH2524	VFH2224	VFH2624	-55°C to +125°C	±50 ppm

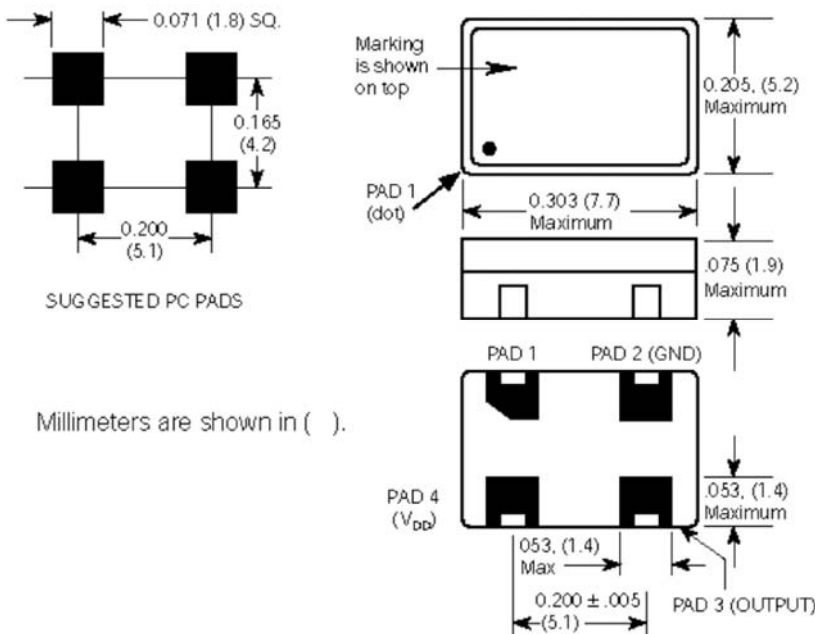
**How to Order**



**Marking Specification**



**Package**



Millimeters are shown in ( ).

**Pin Assignment**

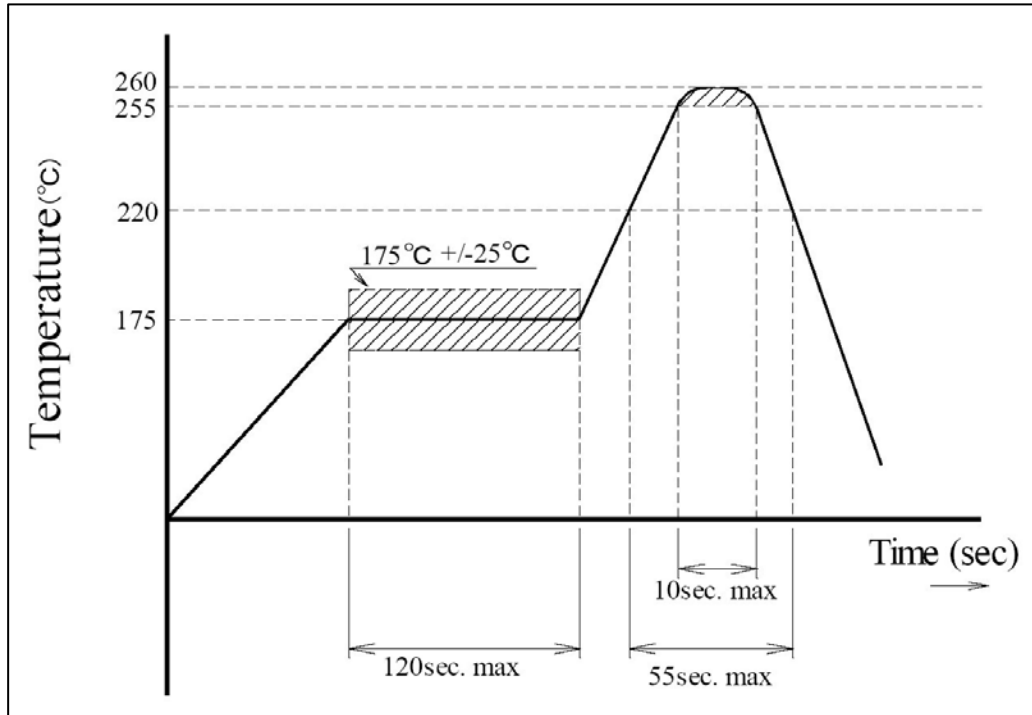
Pin	VFH2121-VFH2124 VFH2521-VFH2524	VFH2221-VFH2224 VFH2621-VFH2624
1	N/C	Tristate
2	Ground	
3	Output	
4	V <sub>DD</sub>	



**VFH2121-VFH2124, VFH2221-VFH2224**  
**VFH2521-VFH2524, VFH2621-VFH2624**  
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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 <sub>DD</sub>
Rise Time	Frequency at min V <sub>DD</sub>
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<sub>θjc</sub> 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.



**VFH2121-VFH2124, VFH2221-VFH2224**  
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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.

