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

Valpey Fisher Corporation
High Frequency, Low Phase Noise Timing Solutions

Features

- Leadless chip carrier package is hermetically sealed for superior aging and field performance
- Crystal angle controlled to ±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 3.8×10^6 hours at 125°C

RoHS Status

RoHS 6/6

Description

These high reliability oscillators provide HCMOS clock 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 each oscillator. 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. The calculated MTBF is 3.8×10^6 at 125°C.

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	ΔF/F	Vs. Operating Temperature	±25		±75	ppm	See Chart
		Aging 1st Year After 1st Year			±3 ±1		
Operating Temperature Range	T		-55°		+125°	°C	See Chart
Input Voltage	Vcc		3.0 4.5	3.30 5.0	3.6 5.5	V	
Input Current	Icc				45	mA	5.0V
		3 to 10 MHz 10.1 to 20 MHz 20.1 to 30 MHz 30.1 to 50 MHz 50.1 to 67 MHz 67.1 to 125 MHz			4.5 6.0 15.5 20.0 30.0 40.0		3.3V
Jitter RMS					5 6	ps	5.0V 3.3V

Electrical Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Waveform Symmetry		Measured at 50% V_{DD}		48/52	45/55 45/55	%	5.0V 3.3V
Rise / Fall Time	Tr/Tf	CMOS, 15pF, from 0.4 to (V_{DD}-0.4) V			4	ns	5.0V
		CMOS, 15pF, 20% to 80% (<60MHz) 20% to 80% (≥60MHz) CMOS, 30pF, 20% to 80% (<60MHz) 20% to 80% (≥60MHz) CMOS, 50pF, 20% to 80% (<60MHz)		 3.0 2.0 4.0 3.0 6.0	 4.0 2.5 5.0 4.5 8.0		3.3V
Output Level	"Zero" Level "One" Level	Sinking 16mA Sourcing 8mA	 V_{DD}-0.4		0.4	V	
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	Condition
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, Cond. A1 and Cond. 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

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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

Table 1

Each unit undergoes the following:

1. Stabilization Bake	MIL-STD-883 Method 1008, Cond,.B
2. Temperature Cycling	MIL-STD-883 Method 1010, Cond, B
3. Constant Acceleration	MIL-STD-883 Method 2001, Cond, A
4. Burn-in	MIL-STD-883 Method 1015, Cond B (125°C for 168 hours with bias)
5. Fine Leak	MIL-STD-883 Method 1014, Cond. A1
6. Gross Leak	MIL-STD-883 Method 1014, Cond C
7. Electrical Test at 25°C and temperature extremes, as follows:	
A. Frequency	F. Duty Cycle
B. Current	G. Frequency at max V_{DD}
C. Rise Time	H. Frequency at min V_{DD}
D. Fall Time	I. "Zero" logic level
E. Duty Cycle	J. Tristate

Test Data on each unit is available for additional cost

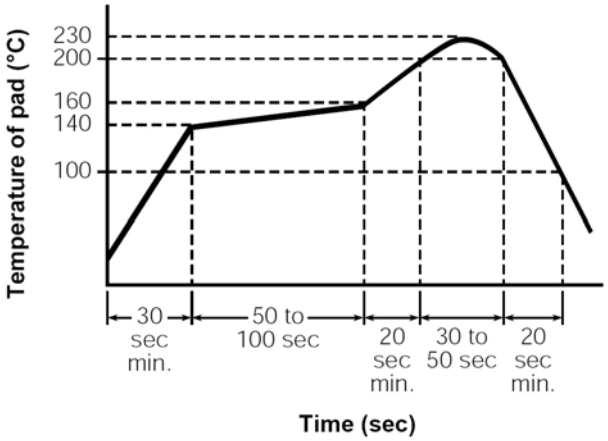
Thermal Characteristics

Thermal Resistance

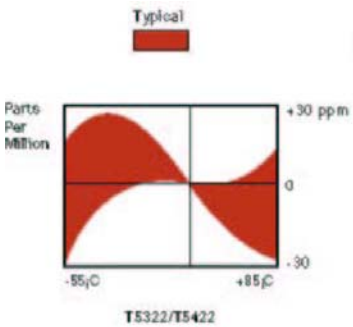
From Junction to Case, RØjc 16 °C/Watt

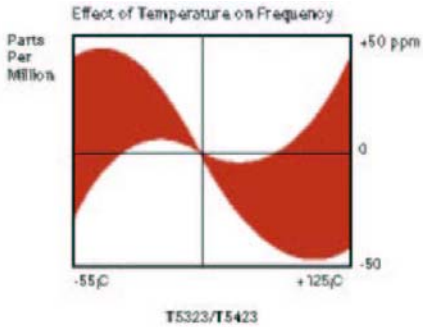
Surface Mount Application

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.



Recommended Reflow Soldering Profile





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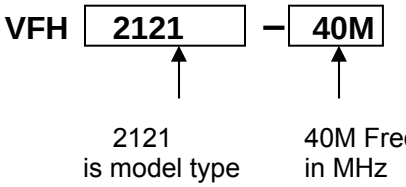
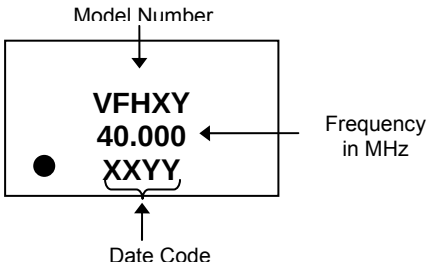
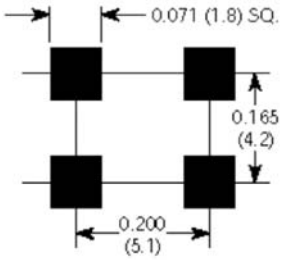
How to Order



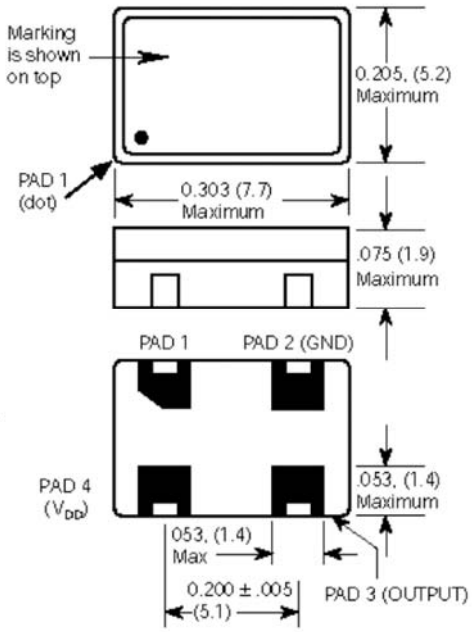
Marking Specification



Package



Millimeters are shown in ( ).



Pad	VFH2121-VFH2124 VFH2521-VFH2524	VFH2221-VFH2224 VFH2621-VFH2624
1	N/C	Tristate
2	Ground	
3	Output	
4	V_{DD}	

PROCESSING FLOW CHART

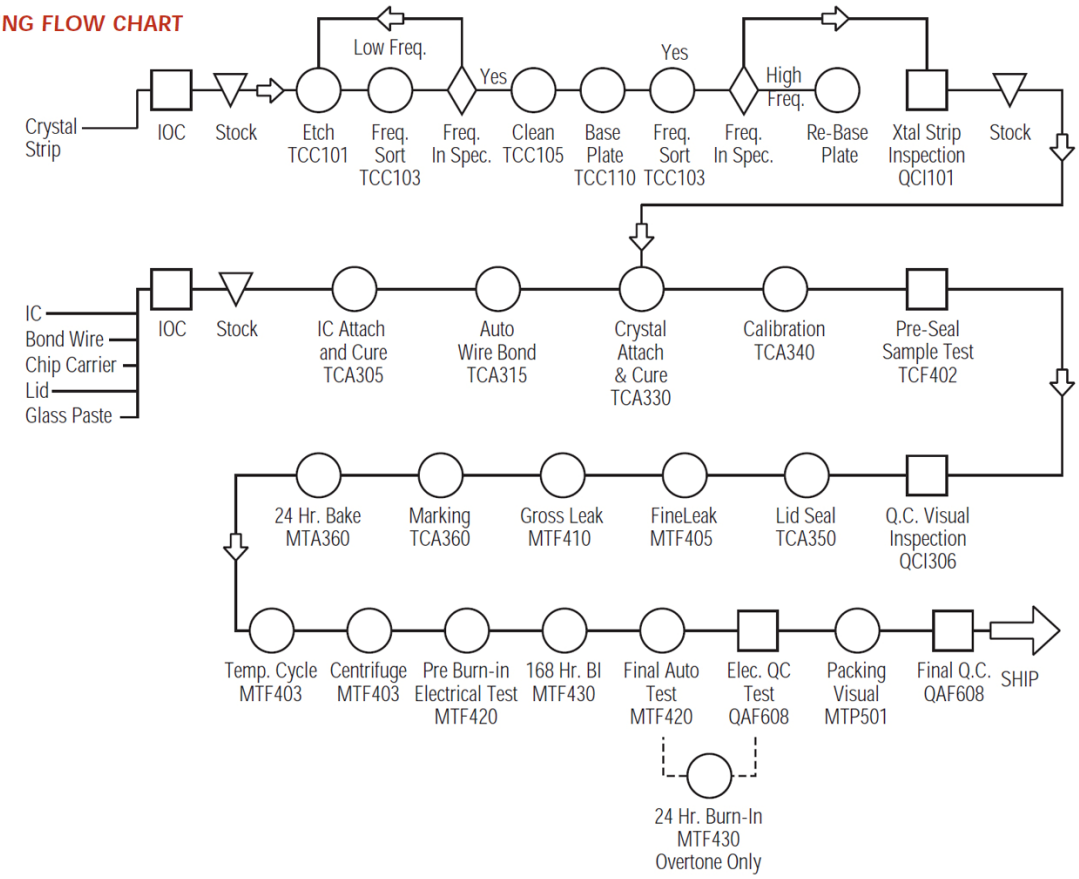


TABLE 2
Reliability Test Procedures and Conditions for Quartz Crystal Oscillators

1. Group A

Electrical Characteristics at -55°C, 25°C, and 125°C
(85°C for VFH2121, VFH2521,VFH2221,VFH2621)
Frequency @ 3.0, 3.3 and 3.6 volts, and 4.5, 5.0, 5.5 volts
Symmetry (Duty Cycle)
Input current
Zero/One levels
Rise/Fall times
Physical Dimensions
Length/width
Height
Seal (Visual)
Package finish (Corrosion, discoloration, etc.)
Marking placement/legibility

2. Group B- Life Test
1000 hrs at or above 125°C, 5.0V or 3.3V VDC, with proper load

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

A. Subgroup 1-8 pcs.

Standard	Condition	Description	End Point Measurement
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)

Standard	Condition	Description	End point Measurement
MIL-STD-883	Method 1011 COND. B	Thermal Shock Liq. To liq. -55°C to 125°C, 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 5.0V or 3.3V 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 @350ºC 3.5 sec	Frequency Output waveform

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

Standard	Condition	Description	End point Measurement
	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. A1	Fine Leak	Qs <5 $X10^{-8}$
MIL-STD-883	Method 1014 COND. C1	Gross Leak	Visual in 125°C Detector fluid