

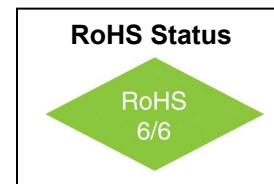
VFH5070

VCXO High Reliability

5x7mm SMD, CMOS

Features

- 1MHz to 80MHz frequency range
- -55°C to +125°C operating temperature range
- <0.2ps RMS jitter over 12kHz to 20MHz
- Wide APR ± 110 ppm typ.
- Leadless chip carrier package is hermetically sealed for superior aging and field performance
- Crystal angle controlled to ± 0.5 for excellent temperature stability
- 160 hour Class B burn-in and extensive environmental testing for best performance in rugged field environments
- Serialized test data available
- Calculated MTBF is 3.8×10^6 hours



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		± 50 ± 30		ppm	-55°C to +125°C -55°C to +85°C
Aging		First Year After First Year		3 1		ppm ppm/yr	
Pull Range	APR	$V_C 1.65 \pm 1.65V$	± 90	± 110		ppm	3.3V
		$V_C 2.5 \pm 2.5V$	± 100	± 110			5.0V
Operating Temperature	T		-55 -55		+125 +85	°C	See "How to Order"

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Electrical Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage	V_{CC}		3.0 4.5	3.3 5.0	3.6 5.5	V	
Supply Current	I_{CC}		3.0 4.0		5.0 7.0	mA	$CL=15\text{ pF}$ $V_{DD}=3.6\text{V}$ $CL=15\text{ pF}$ $V_{DD}=5.5\text{V}$
Current Consumption	I_{DDD}	$CL=15\text{pF}$, $V_{DD}=3.6\text{V}$, 5.5V $OE=0\text{V}$, $F_0=27\text{MHz}$		1	2	mA	@ output disable
Output Off Leak	I_O	$OE=0\text{V}$			10	μA	@ output disable
“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}	$I_{OH}=-5\text{mA}$	$V_{DD}-0.4$			V	$I_{OH}=-3\text{mA}$
“L” Output Voltage	V_{OL}	$I_{OL}=-5\text{mA}$			0.4	V	$I_{OH}=3\text{mA}$
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_{CC} Impedance	Pad 1, V_C	5* 100			MOhm KOhm	Order Code H * Order Code B
Start-up Time	T_s				5	ms	
Duty Cycle		CMOS @50% V_{DD}		48/52	45/55	%	
Control Voltage	V_{CC}		0 0		3.3 5.0	V	3.3V 5.0V
Modulation Bandwidth	F_C		15 15	20 20		kHz	3.3V 5.0V
Pulling Linearity	F_{LIN}			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 Pin	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

Table 1

Each unit undergoes the following:

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)

The following electrical test is performed at 25°C

Current	Frequency at 3.65V
Rise Time	Frequency at 3.0V
Fall Time	"Zero" logic level
Duty Cycle	"One" logic level
Tristate	
Frequency (also preferred at temp extremes)	

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

Thermal Characteristics

Thermal Resistance

From Junction to Case, R_{θjc} 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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How to Order:

VFH5070 - **E** **L** **H** - FREQUENCY, MHz

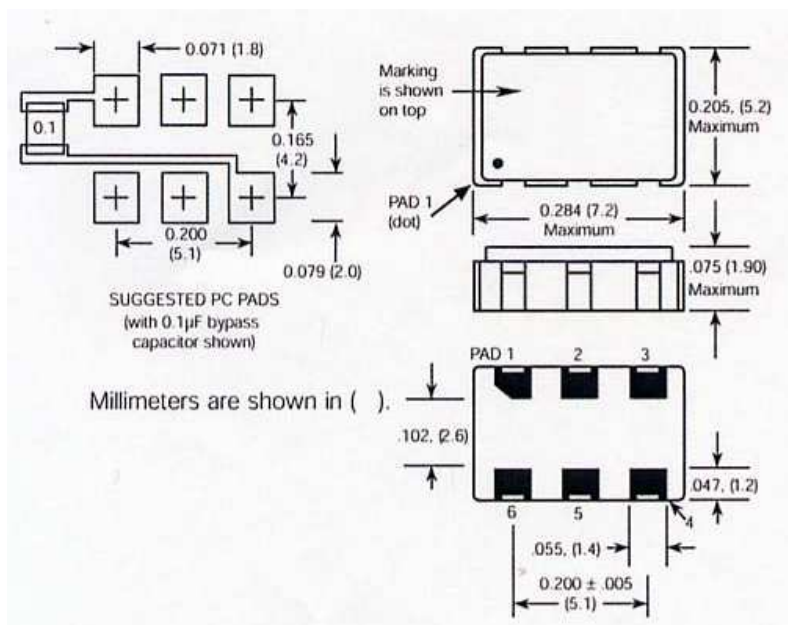
Voltage		Temperature Range		Input Impedance	
Code	Specification	Code	Specification	Code	Specification
D	5.0V	L	-55°C to +125°C	H	5MΩ*
E	3.3V	H	-55°C to +85°C	B	100KΩ

*3.3V only

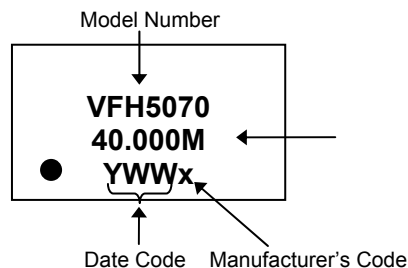
Pin Assignments

Pin #	Connections
1	V _C
2	Tristate
3	Ground, Case
4	Output
5	N/C
6	V _{CC}

Package

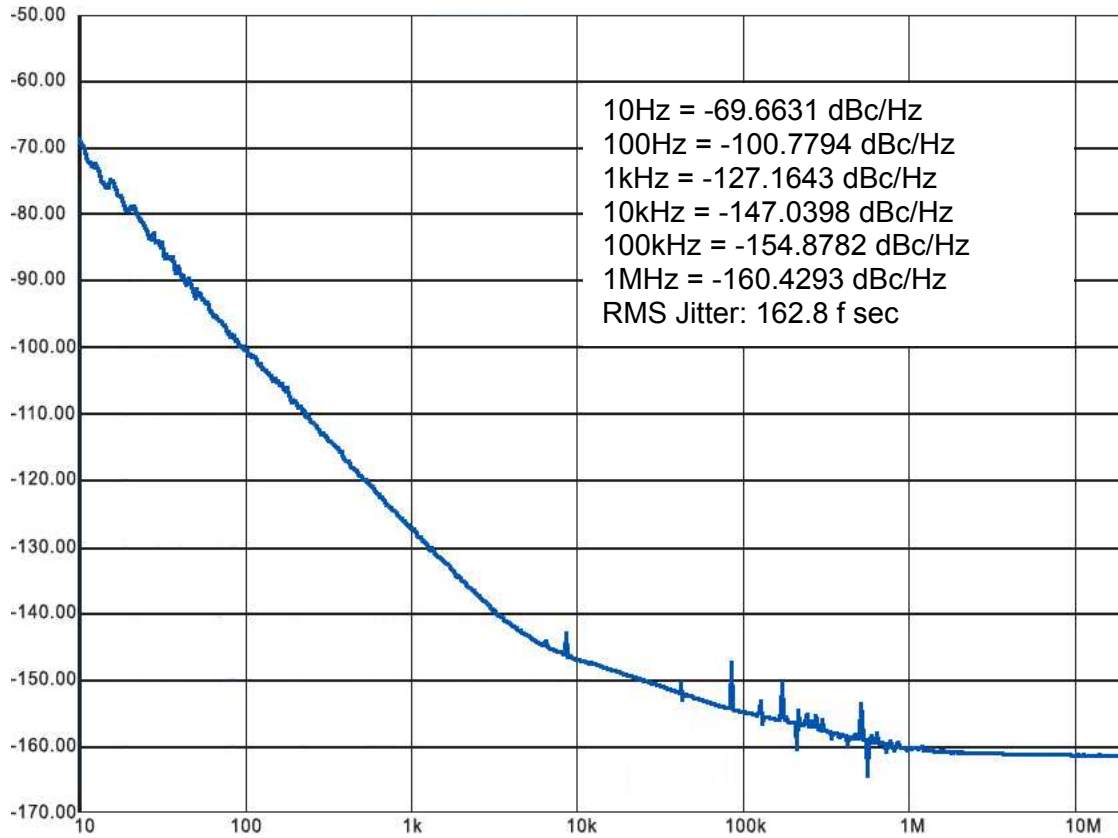


Marking Specification

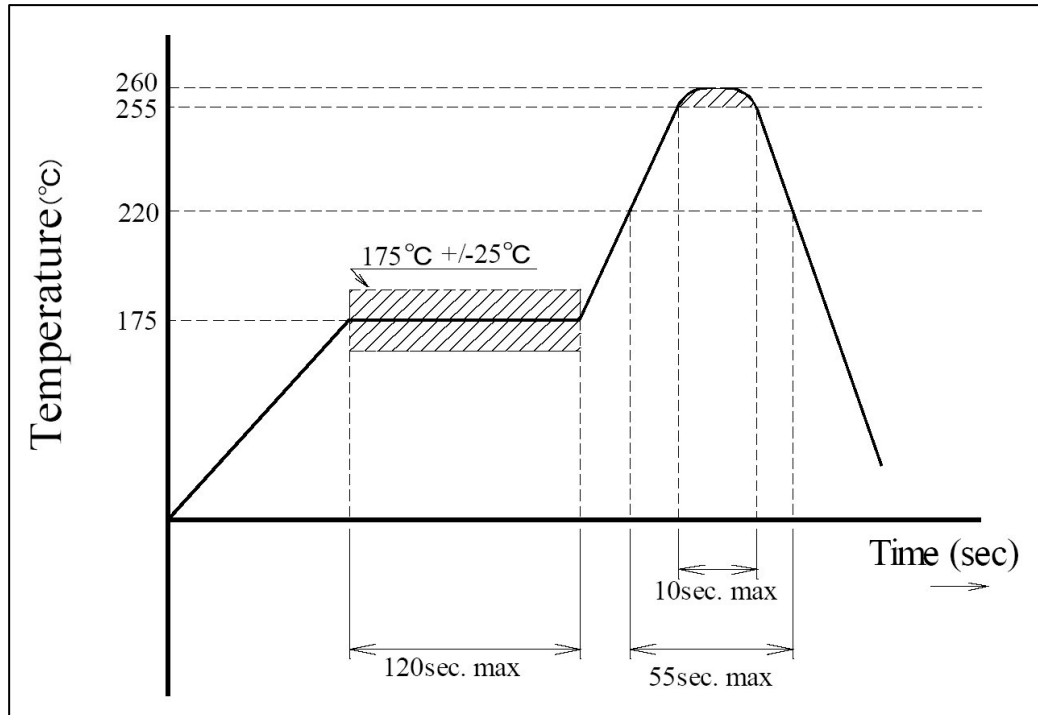


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Phase Noise Plot at 50MHz



Recommended Reflow Soldering Profile



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TABLE 2
Reliability Test Procedures and Conditions for Quartz Crystal Oscillators

1. Group A

Electrical Characteristics at temperature endpoints and 25°C

- Frequency @ 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, no catastrophic failures allowed)

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 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 Measurement</u>
MIL-STD-883	Method 1011 COND. B	Thermal Shock Liq. To liq. -55°C to 125°C, 15cycles	Frequency Output waveform
15			
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 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. A1	Fine Leak	Qs <5 X10 ⁻⁸
MIL-STD-883	Method 1014 COND. C1	Gross Leak	Visual in 125°C Detector fluid

Test data is available for additional cost