

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



Part Dimensions: 7.2 x 5.2 x 1.9 mm

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 ppm	-55°C to +125°C -55°C to +85°C
		First Year	-	3	-	ppm	-
Aging		After First Year		1		ppm/yr	
Pull Range	APR	Vc 1.65 \pm 1.65V	± 90	± 110	-	ppm	3.3V
		Vc 2.5 \pm 2.5V	± 100	± 110	-		5.0V
Operating Temperature	T		-55 -55	-	+125 +85	°C	See "How to Order"
Supply Voltage	Vcc		3.0	3.3	3.6	V	-
			4.5	5.0	5.5		



Electrical Specifications (continued)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Current	I _{CC}		3.0	-	5.0	μA	CL = 15 pF V _{DD} = 3.6V
			4.0	-	7.0		CL = 15 pF V _{DD} = 5.5V
Current Consumption	I _{DD}	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
“H” Input Current	I _{IH}	V _{IN} = VDD	-	-	1	μA	-
“L” Input Current	I _{IL}	V _{IN} = VSS	-	1.3	10	μA	-
“H” Output Voltage	V _{OH}	I _{OH} = -5mA	VDD-0.4	-	-	V	I _{OH} = -3mA
“L” Output Voltage	V _{OL}	I _{OL} = -5mA	-	-	0.4	V	I _{OH} = 3mA
Rise & Fall Times	-	CMOS, 15pF	3.0	-	6.0	ns	+125°C
RMS Jitter 12kHz to 20MHz	1σ		-	<0.2	-	ps	-
Phase Noise	-		-	-65	-	dBc/Hz	@ 50MHz
				-94			
				-120			
				-142			
				-155			
-159							
Input Impedance	V _C Impedance	Pad 1, V _C	5*	-	-	MOhm	Order Code H*
			100			kOhm	Order Code B
Start-up Time	T _S		-	-	5	ms	-
Duty Cycle		CMOS @50% VDD	-	48/52	45/55	%	-
Control Voltage	V _{CC}		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	FLIN		-	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 µinch 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

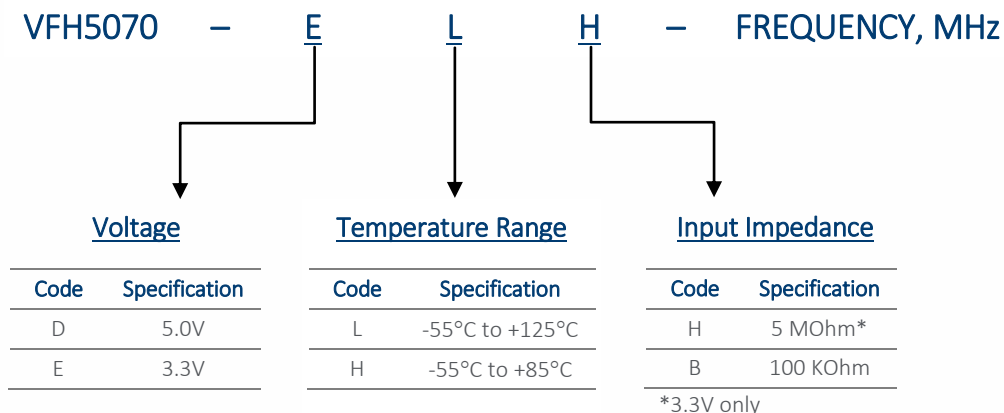
Thermal Resistance

From Junction to Case, $R_{\theta jc}$ 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.

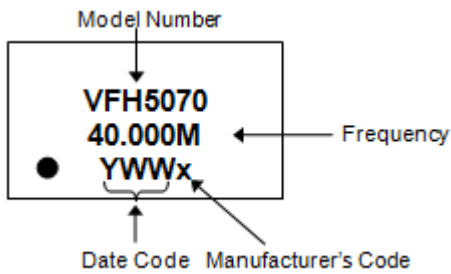
How to Order



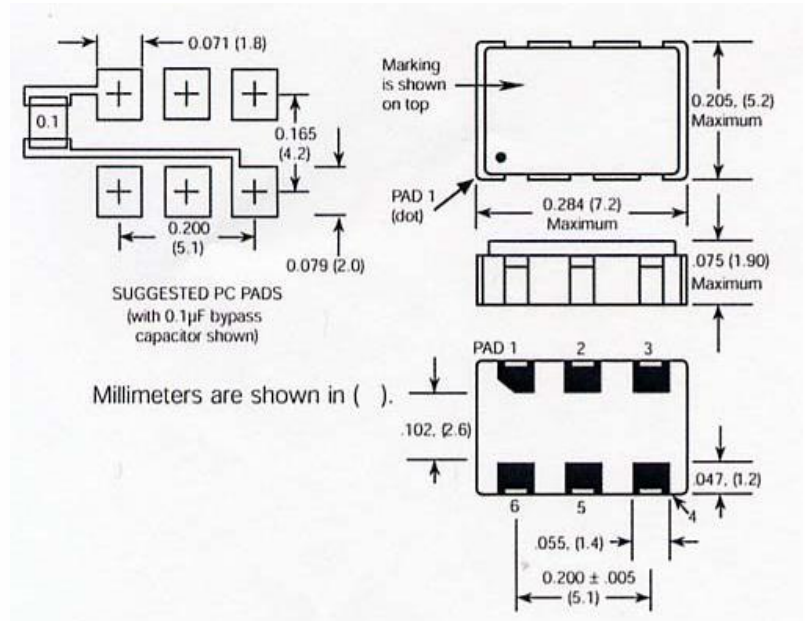
Pin Assignments

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

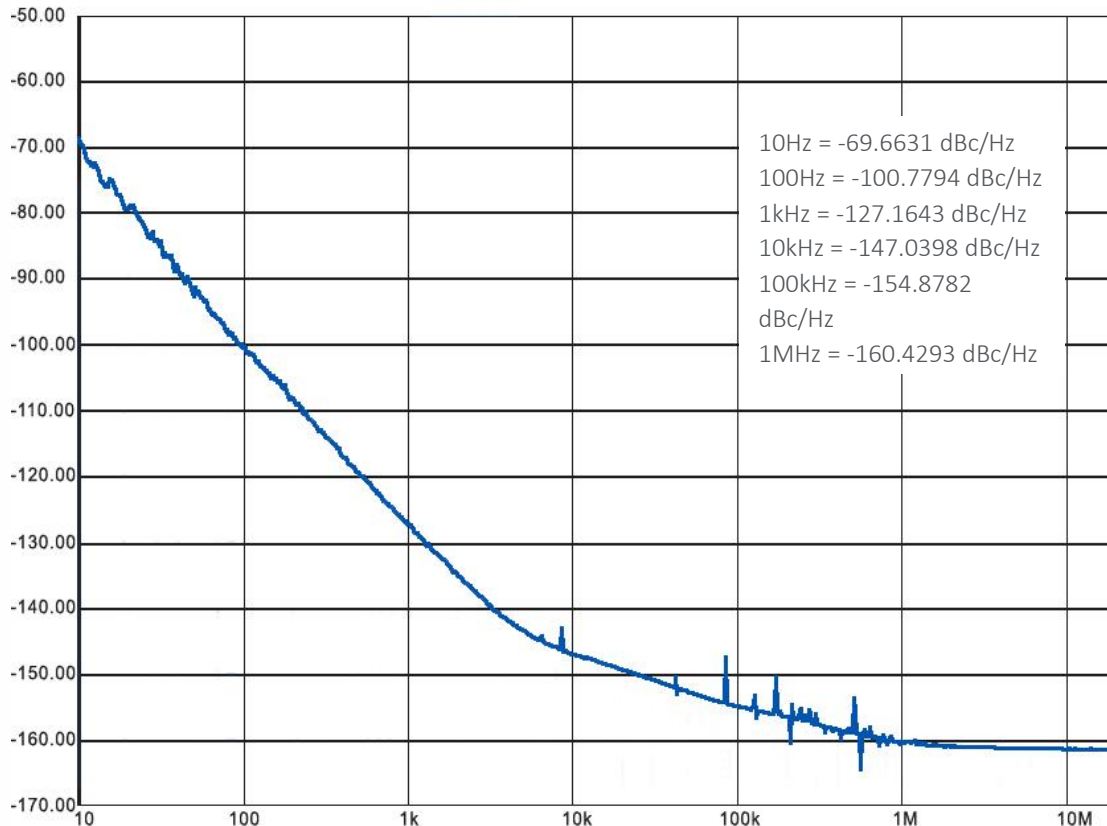
Marking Specification



Package



Phase Noise Plot at 50MHz



Recommended Reflow Soldering Profile

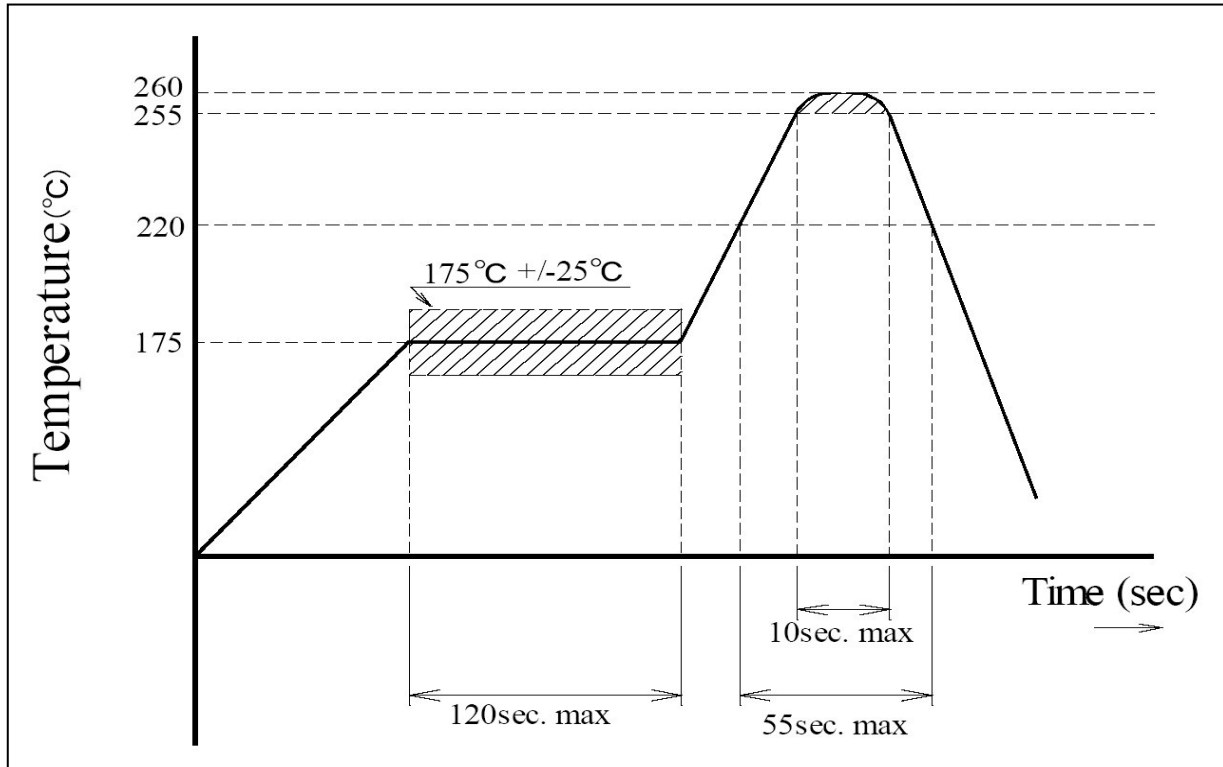


TABLE 2

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>Measurement</u>	<u>End point</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>Measurement</u>	<u>End point</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 ⁻⁶	
MIL-STD-883	Method 1014 COND. C1	Gross Leak	Visual in 125°C Detector fluid	

Test data is available for additional cost