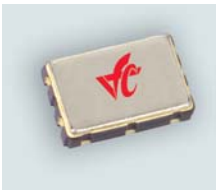
VFH5070
VCXO High Reliability
5x7mm SMD, CMOS

Valpey Fisher Corporation
Uncompromised Precision

Features



- 1MHz to 80MHz frequency range
- -55°C to +125°C operating temperature range
- <0.2ps RMS Jitter over 12kHz to 20MHz
- APR min ± 100ppm
- Leadless chip carrier package is hermetically sealed for superior aging and field performance
- Crystal angle controlled to +/-0.5 for excellent temperature stability
- 168 hour Class B burn-in and extensive environmental testing for best performance in rugged field environments
- Serialized test data available
- Calculated MTBF is $3.8X10^6$ hours

RoHS Status

RoHS 6/6

Applications

- Industrial
- Military
- High Temperature Commercial

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 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.

Electrical Specifications

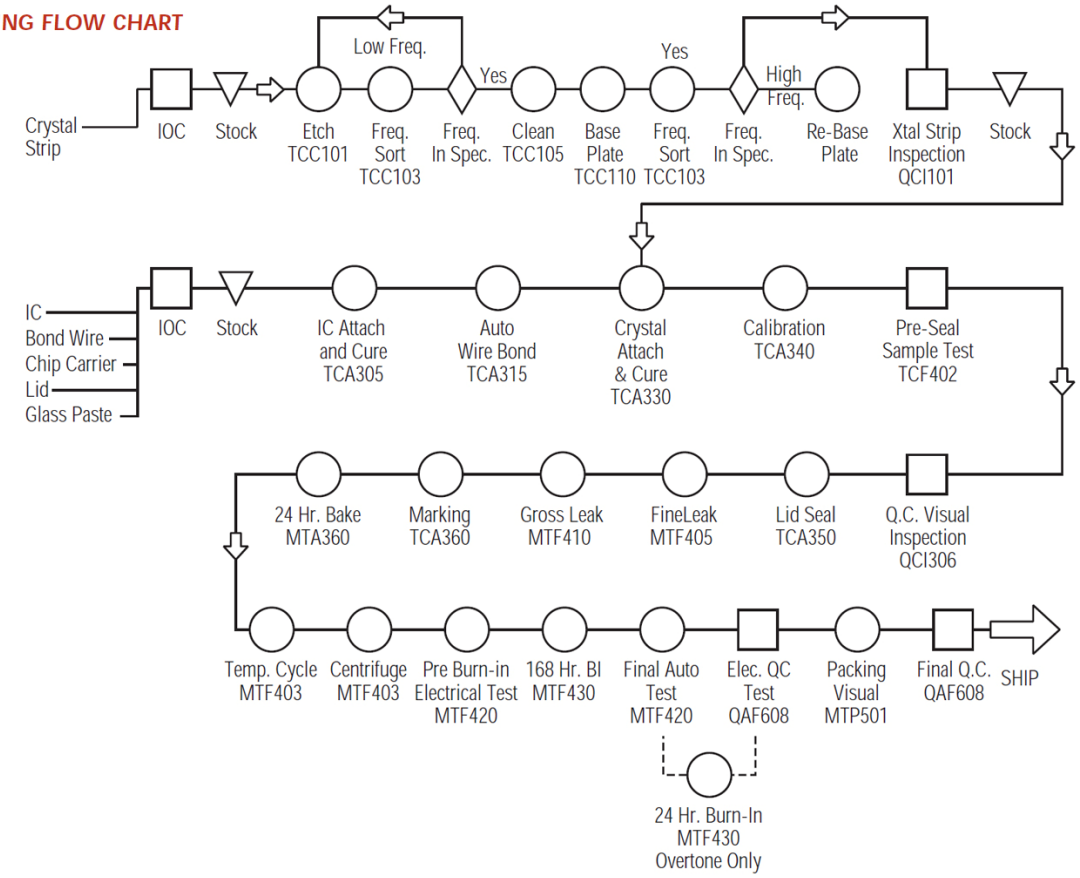
Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Frequency Range	F		1		80	MHz	
Frequency Stability	ΔF/F	Includes operating temperature, change of input voltage, change of load, shock and vibration		± 50		ppm	-55°C to +125°C
Aging		First Year After First Year		3 1		ppm ppm	
Pull Range	APR	Vc 1.65 ± 1.65V	±100	±110		ppm	3.3V
		Vc 2.5 ± 2.5V	±100	±110			5.0V
Operating Temperature	T		-55 -55		+125 +85	°C	See "How to Order"

Electrical Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage	Vcc		3.0 4.5	3.3 5.0	3.6 5.5	V	
Supply Current	Icc		3.0		5.0	mA	*CL=15 pF* *V_{DD}= 3.6V*
			4.0		7.0		*CL=15 pF* *V_{DD}= 5.5V*
Current Consumption	I_{DDD}	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}=V_{DD}			1	µA	
"L" Input Current	I_{IL}	V_{IN}=V_{SS}		1.3	10	µA	
"H" Output Voltage	V_{OH}	I_{OH}=-5mA	V_{DD}-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		10Hz 100Hz 1kHz 10kHz 100kHz 1MHz		-65 -94 -120 -142 -155 -159		dBc/Hz	@ 50MHz
Input Impedance	V_C Impedance	Pad 1, Vc	5* 100			MOhm KOhm	Order Code H * Order Code B
Start-up Time	Ts				5	ms	
Duty Cycle		CMOS @50% V_{DD}		48/52	45/55	%	
Control Voltage	Vc		0		3.3	V	3.3V
			0		5.0		5.0V
Modulation Bandwidth	Fc		15	20		kHz	3.3V
			15	20			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.

PROCESSING FLOW CHART



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	Specification
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	39 microinch of gold over nickel
Resistance to Solvents	Per MIL-STD-202, Method 215
Marking	Epoxy ink or laser engraved

VFH5070
VCXO High Reliability
5x7mm SMD, CMOS

Valpey Fisher Corporation
Uncompromised Precision

How to Order:

VFH5070 – [E] [L] [ ] – FREQUENCY

Voltage

Code	Specification
D	5.0V
E	3.3V

Temperature Range

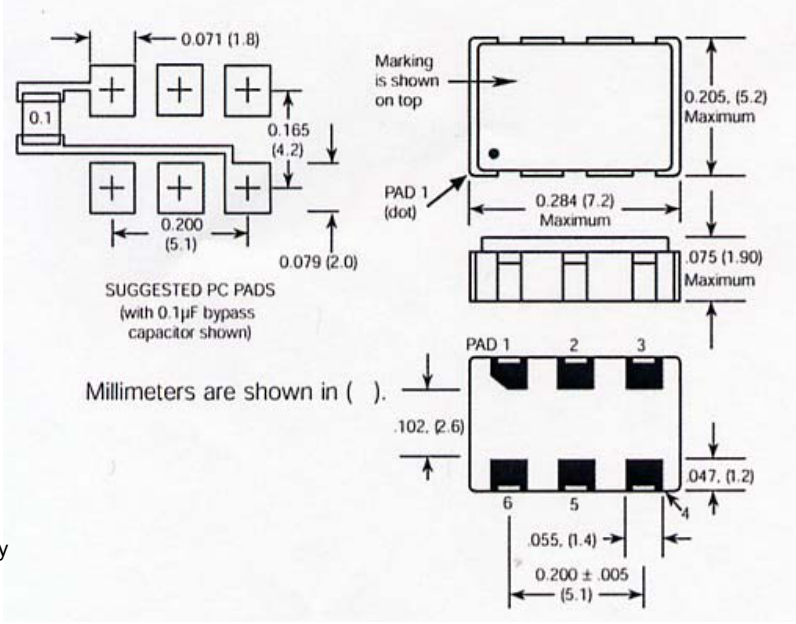
Code	Specification
L	-55°C to +125°C
H	-55°C to +85°C

Input Impedance

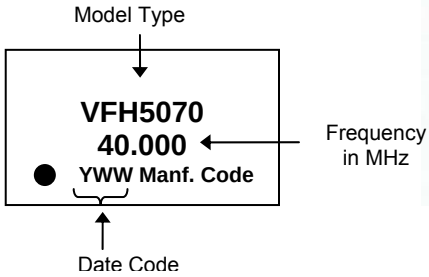
Code	Specification
H	5MOhm*
B	100KOhm

*3.3V only

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



Marking Specification



Valpey Fisher Corporation
Uncompromised Precision

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

Phase Noise Plot at 50MHz

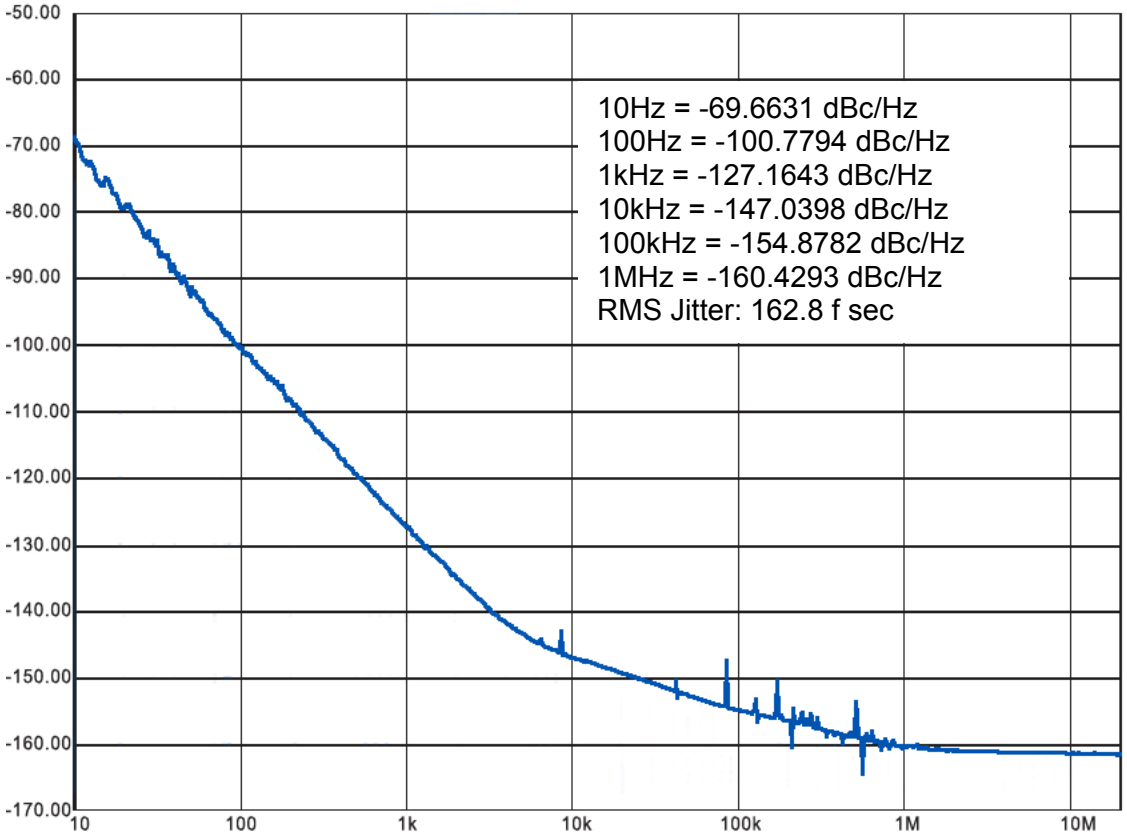


TABLE 2
Valpey Fisher Qualification Test Procedures and Conditions for Quartz Crystal Oscillators

1. Group A

Electrical Characteristics at -55°, +25° and +125 ° C
- Frequency @ + 3.3 and +5.0 volts
  - Symmetry (Duty Cycle)
  - Input current
  - Zero/One levels
  - Rise/Fall times
- Physical Dimensions
  - Length/width
  - Height
  - Package finish (Corrosion, discoloration, etc.)
  - Marking placement/legibility

2. Group B- Life Test

1000 hrs at 125°C with bias and load

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

A. Subgroup 1-12pcs.

Standard	Condition	Description	End Point Measurement
MIL-STD-883	Method 2002 COND.B	Mechanical Shock 1500 g's, 5ms 5 drops, 6 axis	Frequency Output waveform
MIL-STD-883	Method 2007 COND. A.	Vibration, var. freq. 20 g's, .06" disp., 20-20, 000-20 Hz	Frequency Output waveform
MIL-STD-883	Method 2003	Solderability	Visual 95% Coverage

B. Subgroup 2: 6 pcs (One-half of Subgroup 1

Standard	Condition	Description	End point Measurement
MIL-STD-883	Method 1011 COND. B	Thermal Shock Liq. To liq.	Frequency Output waveform 15 cycles
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 3.3V applied 25-65°C, 90 to 100% RH, 10 cycles	Frequency Output waveform
MIL-STD-202	Method 210 COND.A	Resistance to Solder Heat	Frequency Output waveform Immersion @350ºC 3.5 sec

C. Subgroups 3: 6 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 .5-3.0% Solution	Frequency Output waveform Visual
MIL-STD-883	Method 1014 COND. B	Fine Leak	Qs <5 X10^{-8}
MIL-STD-883	Method 1014 COND. C	Gross Leak	Visual in 125°C Detector fluid