VFHV570

Extended Temperature/COTS VCXO, 5x7mm SMD, CMOS

Features

- 1MHz to 80MHz frequency range
- -55°C to +175°C operating temperature range
- <0.2ps RMS Jitter over 12kHz to 20MHz
- APR typ. ± 100ppm
- Start-up time is less than 5ms

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	ΔF/F	Includes operating temperature, change of input voltage, change of load, shock and vibration	-	± 50 ±30	-	ppm	-55°C to +125°C (L) -55°C to +85°C (H)
Aging		First Year After First Year	-	3 1	-	ppm ppm/yr	-
Pull Range	APR	V_{dd} = 3.3V; V_c 1.65 ± 1.65V	±90 ±50	±105	-	ppm	(L,H) (K,R)
		V_{dd} = 5V; V_c 2.5 ± 2.5V	±100 ±65	±110	-		(L,H) (K,R)
Operating Temperature	T		-55	-	+175	°C	See ordering information
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	Io	OE=0V	-	-	10	µA	@ output disable

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Electrical Specifications (continued)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
"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	-	-	MΩ kΩ	Order Code H* Order Code B
Start-up Time	Ts		-	-	5	ms	-
Duty Cycle		CMOS @50% VDD	-	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: ACTIVE Input LOW (<0.5V): HIGH IMPEDANCE					

*Available for 3.3V only

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

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How to Order

VFHV570 – E L H – FREQUENCY, MHz

Voltage

Code	Specification
D	5.0V
E	3.3V

Temperature Range

Code	Specification
R	-40°C to +175°C
L	-55°C to +125°C
H	-55°C to +85°C
K	0°C to +175°C

Input Impedance

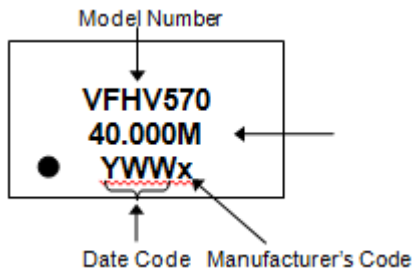
Code	Specification
H	5 MOhm*
B	100 KOhm

*3.3V only

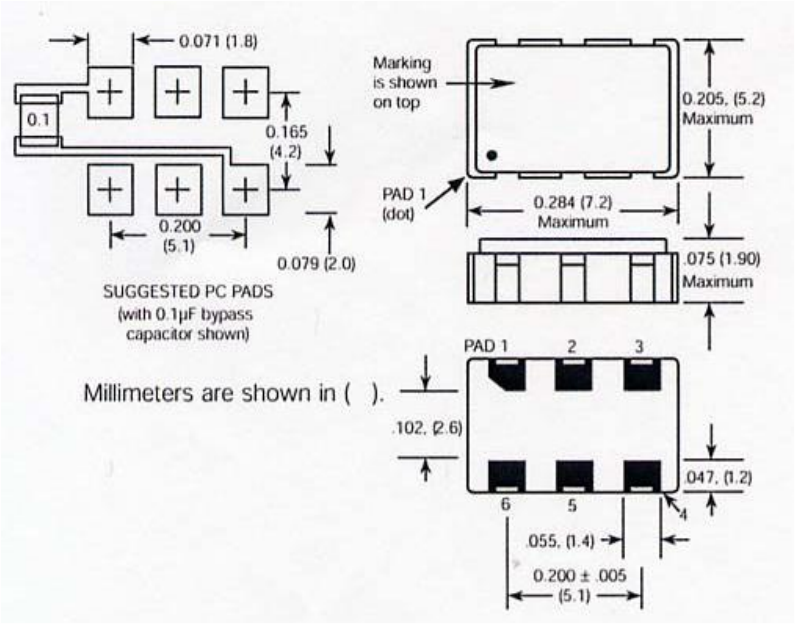
Pin Assignments

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

Marking Specification



Package



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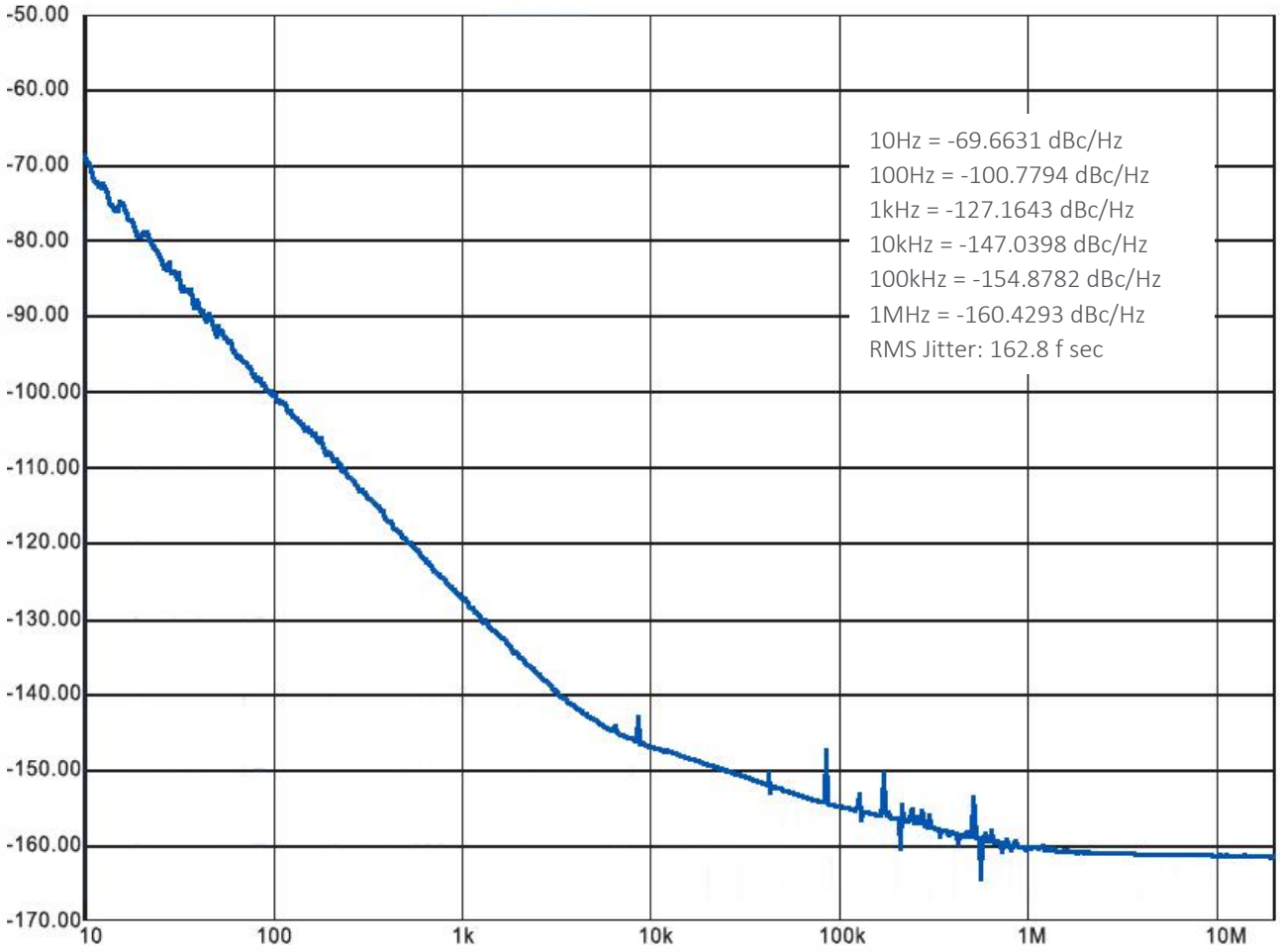
Phase Noise Plot at 50MHz



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Recommended Reflow Soldering Profile

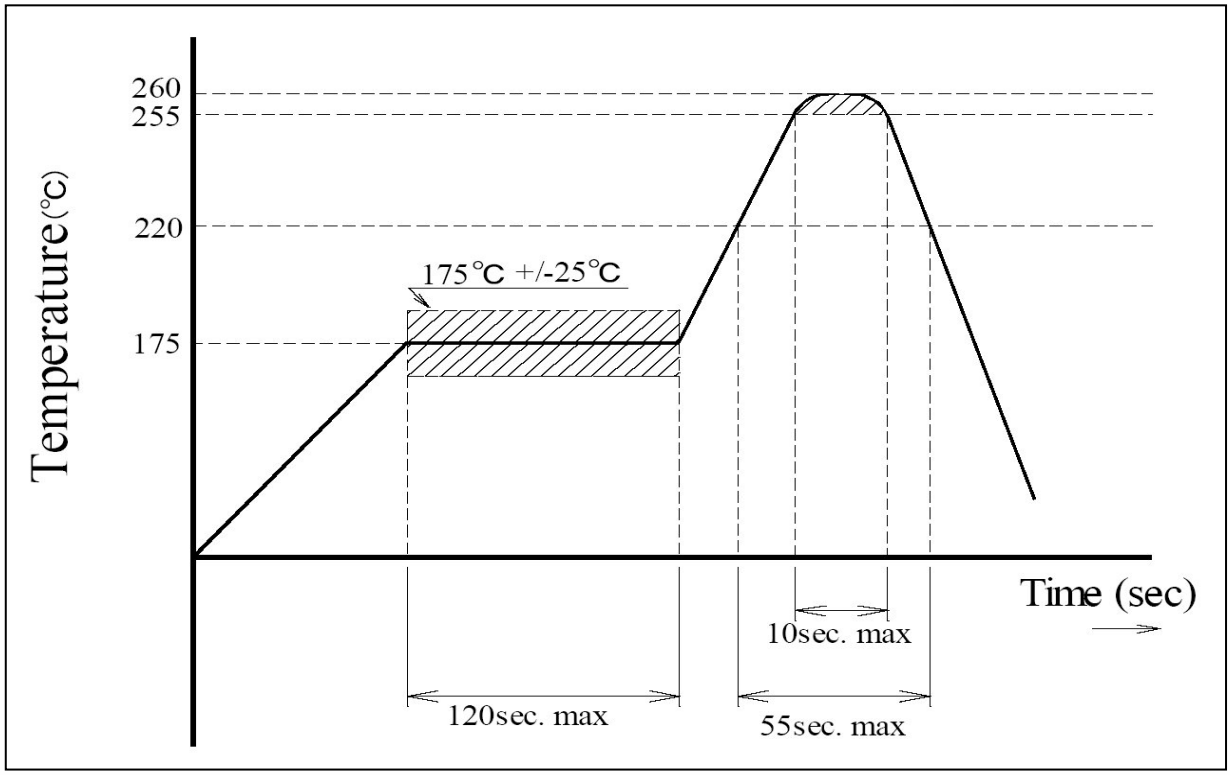

Table 1

Each unit undergoes screening for product level B class 2 oscillators by MIL-PRF-55310

Internal Visual	
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)

Electrical test at 25°C

Current	Frequency at max Vdd
Rise Time	Frequency at min Vdd
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, 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.

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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.

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

Test data is available for additional cost.

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. 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 @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. A	Fine Leak	Qs <5 $X10^{-8}$
MIL-STD-883	Method 1014 COND. C	Gross Leak	Visual in 125°C Detector fluid

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