SiT3809

High Frequency MEMS VCXO

Preliminary

Features, Benefits and Applications

- Any frequency between 80.000001 and 220 MHz with 6 decimal places of accuracy
- 100% pin-to-pin drop-in replacement to quartz based VCXO
- Frequency stability as low as ±10 PPM
- Widest pull range options from ±25 PPM to ±1600 PPM
- Superior pull range linearity of <= 1%, 10 times better than quartz
- LVCMOS/LVTTL compatible output
- Three industry-standard packages: 3.2 mm x2.5 mm (4-pin), 5.0 mm x 3.2 mm (6-pin), 7.0 mm x 5.0 mm (6-pin)
- Ideal for telecom clock synchronization, instrumentation, low bandwidth analog PLL, jitter cleaner, clock recovery, audio, video, FPGA, broadband and networking

Specifications

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Output Frequency Range	f	80.000001	–	220	MHz	
Frequency Stability	F_stab	-10	–	+10	PPM	Inclusive of Initial tolerance[1] at 25 °C, operating temperature, rated supply voltage variation and load variation (15% pF ±10%)
		-25	–	+25	PPM	
		-50	–	+50	PPM	
Operating Temperature Range	T_use	-20	–	+70	°C	Extended Commercial
		-40	–	+85	°C	Industrial
Supply Voltage	Vdd	2.97	3.3	3.63	V	Conact SiTime for any other voltage support between 2.5V and 3.3V
		2.52	2.8	3.08	V	
		2.25	2.5	2.75	V	
		1.71	1.8	1.89		
Pull Range[2,3]	PR	±25, ±50, ±100,±150, ±200, ±400, ±800, ±1600			PPM	
Upper Control Voltage	VC_U	1.7	–	–	V	Vdd = 1.8 V, Voltage at which maximum deviation is guaranteed.
		2.4	–	–	V	Vdd = 2.5 V, Voltage at which maximum deviation is guaranteed.
		2.7	–	–	V	Vdd = 2.8 V, Voltage at which maximum deviation is guaranteed.
		3.2	–	–	V	Vdd = 3.3 V, Voltage at which maximum deviation is guaranteed.
Lower Control Voltage	VC_L	–	–	0.1	V	Voltage at which miminum deviation is guaranteed.
Control Voltage Input Impedence	Z_vin	100	–	–	kΩ	For the voltage control pin
Linearity	Lin	–	0.1	1	%	
Frequency Change Polarity	–	Positive slope			–	
Control Voltage Bandwidth(-3dB)	V_BW	–	8	–	kHz	Contact SiTime for 16 kHz and other high bandwidth options
Current Consumption	Idd	–	34	36	mA	No load condition, f = 100 MHz, Vdd = 2.5 V, 2.8 V or 3.3 V
		–	30	33	mA	No load condition, f = 100 MHz, Vdd = 1.8 V
Standby Current	I_std	–	–	70	µA	All Vdds, $\overline{ST}$ = GND, output is Weakly Pulled Down
Duty Cycle	DC	45	–	55	%	f <= 165 MHz, all Vdds.
		40	–	60	%	f > 165 MHz, all Vdds.
Rise/Fall Time	Tr, Tf	–	1.5	2	ns	Vdd = 1.8, 2.5, 2.8 or 3.3 V, 10% - 90% Vdd level
Output Voltage High	VOH	90%	–	–	Vdd	OH = -7 mA, IOL = 7 mA, (Vdd = 3.3 V) IOH = -4 mA, IOL = 4 mA, (Vdd = 2.8 V and Vdd = 2.5 V) IOH = -2 mA, IOL = 2 mA, (Vdd = 1.8 V)
Output Voltage Low	VOL	–	–	10%	Vdd	
Input Pull-up Impedance	Z_in	–	100	250	kΩ	For the OE/$\overline{ST}$ pin if available
Start-up Time	T_start	–	6	10	ms	
OE Enable/Disable Time	T_oe	–	–	150	ns	f= 100 MHz, all Vdds. For other freq, T_oe = 100 ns + 3 cycles
Resume Time	T_resume	–	–	10	ms	Measured from the time ST pin crosses 50% threshold
RMS Period Jitter	T_jitt	–	1.5	2	ps	f = 156.25 MHz, Vdd = 2.5 V, 2.8 V or 3.3 V
		–	2	3	ps	f = 156.25 MHz, Vdd = 1.8 V
RMS Phase Jitter (random)	T_phj	–	0.5	1	ps	f = 156.25 MHz, Integration bandwidth=12kHz to 20MHz, All Vdds
Aging	F_aging	–	–	±5	PPM	10 years

Notes:
1. Initial tolerance is measure at Vin = Vdd/2
2. Absolute Pull Range (APR) is defined as the guaranteed pull range over temperature and voltage.
3. APR = pull range (PR) - frequency stability (F_stab) - Aging (F_aging)
4. All electrical specifications in the above table are measured with 15pF output load. Contact SiTime for higher drive options.

■ Specifications (Cont.)

Pin Description Tables (4-pin device)

Pin #1 Functionality
VIN
0 - Vdd: produces voltage dependent frequency change

Pin Map	
Pin	**Connection**
1	VIN
2	GND
3	CLK
4	Vdd

Pin Description Tables (6-pin device)

Pin #1 Functionality
VIN
0 - Vdd: produces voltage dependent frequency change
Pin #2 Functionality
NC
H or L or Open: No effect on output frequency or other device functions
OE
H or Open[5]: specified frequency output
L: output is high impedance
$\overline{ST}$
H or Open[3]: specified frequency output
L: output is low level (weak pull down). Oscillation stops

Pin Map	
Pin	**Connection**
1	VIN
2	NC/OE/$\overline{ST}$
3	GND
4	CLK
5	NC
6	Vdd

Absolute Maximum Ratings

Attempted operation outside the absolute maximum ratings of the part may cause permanent damage to the part. Actual performance of the IC is only guaranteed within the operational specifications, not at absolute maximum ratings.

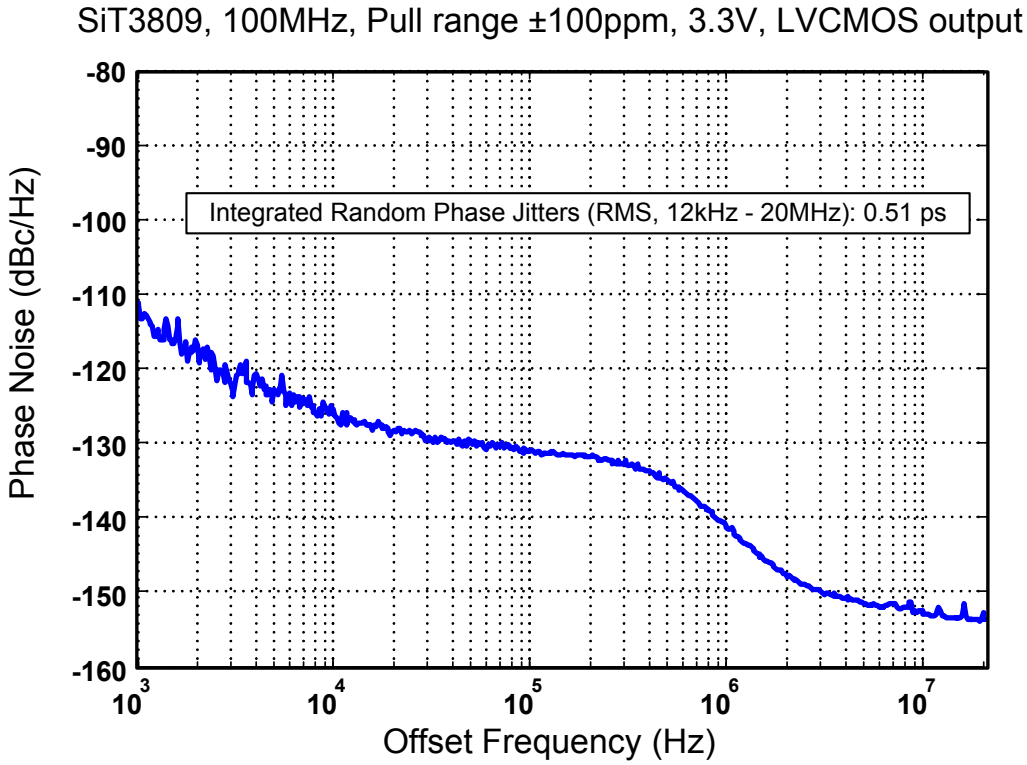
Parameter	Min.	Max.	Unit
Storage Temperature	-65	150	°C
Vdd	-0.5	4	V
Electrostatic Discharge	–	6000	V
Soldering Temperature (follow standard Pb free soldering guidelines)	–	260	°C
Number of Program Writes	–	1	NA
Program Retention over -40 to 125°C, Process, Vdd (0 to 3.65 V)	1,000+	–	years

Environmental Compliance

Parameter	Condition/Test Method
Mechanical Shock	MIL-STD-883F, Method 2002; 50kG
Mechanical Vibration	MIL-STD-883F, Method 2007; 70G
Temperature Cycle	JESD22, Method A104
Solderability	MIL-STD-883F, Method 2003
Moisture Sensibility Level	MSL1 @ 260°C

Notes:
5. A resistor of <100 kΩ between OE/$\overline{ST}$ pin and VDD is recommended for all voltages.

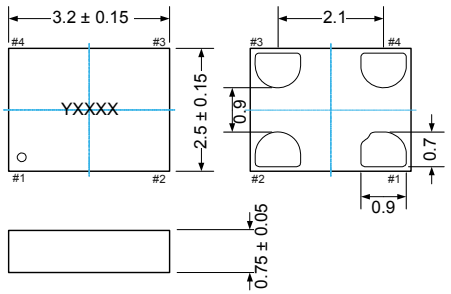
Phase Noise Plot

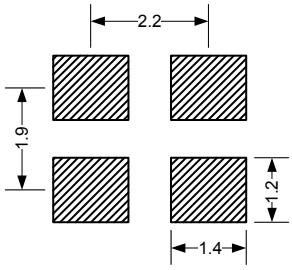


■ Dimensions and Land Patterns

Packages (4-pin device)

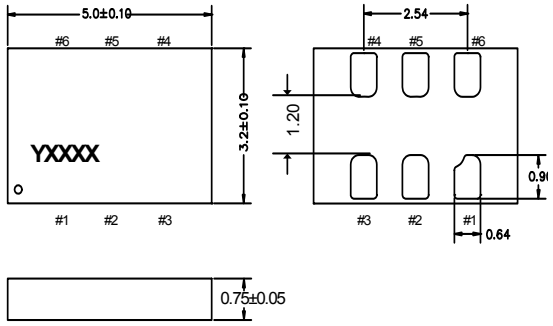
3.2 x 2.5 x 0.75 mm

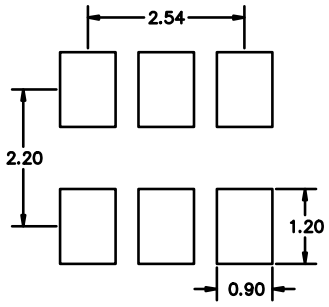


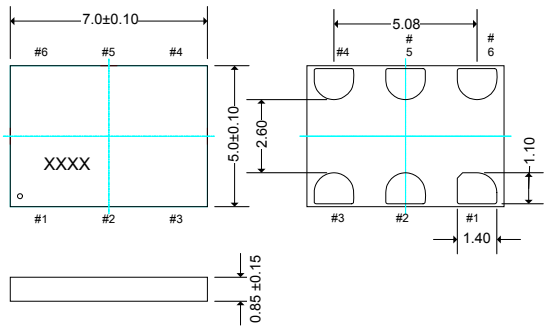


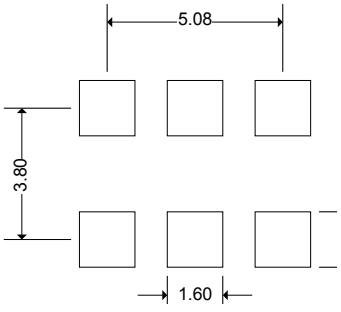
Packages (6-pin device)

Package Size – Dimensions (Unit: mm)[6]	Recommended Land Pattern (Unit: mm)[7]
5.0 x 3.2 x 0.75 mm	
7.0 x 5.0 x 0.90 mm	









Notes:
6. Top marking: Y denotes manufacturing origin and XXXX denotes manufacturing lot number. The value of "Y" will depend on the assembly location of the device.
7. A capacitor of value 0.1 µF between Vdd and GND is recommended.

Part No. Guide - How to Order

SiT3809AC-2F-33EH-108.123456T

Part Family
"SiT3809"

Revision Letter
"A" is the revision

Temperature Range
"C" Commercial, -20 to 70ºC
"I" Industrial, -40 to 85ºC

Output Driver Strength [8]
"–" Default

Package
"2" 4-pin, 3.2 x 2.5 mm
"C" 6-pin, 5.0 x 3.2 mm
"D" 6-pin, 7.0 x 5.0 mm

Frequency Stability
"F" for ±10 PPM
"2" for ±25 PPM
"3" for ±50 PPM

Packaging
"T": Tape & Reel, 3K reel
"Y": Tape & Reel, 1K reel
Blank for Bulk

Frequency
80.000001 to 220.000000 MHz

Pull Range Options
"M" for ±25 PPM
"B" for ±50 PPM
"E" for ±100 PPM
"G" for ±150 PPM
"H" for ±200 PPM
"X" for ±400 PPM
"Y" for ±800 PPM
"Z" for ±1600 PPM

Feature Pin
"N" for No Connect in 6-pin devices, Default value in 4-pin device
"E" for Output Enable (6-pin only)
"S" for Standby (6-pin only)

Supply Voltage
"18" for 1.8 V ±5%
"25" for 2.5 V ±10%
"28" for 2.8 V ±10%
"33" for 3.3 V ±10%

APR Definition

Absolute pull range (APR) = Norminal pull range (PR) - frequency stability (F_stab) - Aging (F_aging)

APR Table

Nominal Pull Range	Frequency Stability		
	± 10	± 25	±50
	APR (PPM)		
± 25	± 10	—	—
± 50	± 35	± 20	—
± 100	± 85	± 70	± 45
± 150	± 135	± 120	± 95
± 200	± 185	± 170	± 145
± 400	± 385	± 370	± 345
± 800	± 785	± 770	± 745
± 1600	± 1585	± 1570	± 1545

Note:
8. Contact SiTime for different drive strength options for driving higher loads or reducing EMI.