SiT8004

Low Power Oscillator for High Frequency Applications

Features, Benefits and Applications

- Lowest power, high frequency oscillator with 6.3 mA typical active current
- 125MHz to 150MHz frequency range
- LVCMOS/LVTTL compatible output
- Excellent frequency stability over temperature, ±20 PPM
- Ultra low standby current, 1.2 µA
- Standby or output enable modes
- Four industry-standard packages: 2.5 x 2.0, 3.2 x 2.5, 5.0 x 3.2, 7.0 x 5.0 mm
- Drop-in replacement of quartz
- Ultra short lead time
- All-silicon device with outstanding reliability of 2 FIT (10x improvement over quartz-based devices), enhancing system mean-time-to-failure (MTBF)
- Ideal for high frequency applications in networking, storage, computer servers and communications
- Ideal for high speed protocals: GPON, EPON, Ethernet, SATA/SAS, DDR, PCI

Specifications

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Output Frequency Range	f	125	-	150	MHz	
Frequency Stability	F_stab	-20	–	+20	PPM	Inclusive of: Initial stability, operating temperature, rated power, supply voltage change, load change, shock and vibration
		-25	–	+25	PPM	
		-50	–	+50	PPM	± 20 PPM available in extended commercial temperature only
Aging	Ag	–1.0	–	1.0	PPM	1st year at 25°C
Operating Temperature Range	T_use	-20	–	+70	°C	Extended Commercial
		-40	–	+85	°C	Industrial
Supply Voltage	Vdd	2.25	2.5	2.75	V	
		2.52	2.8	3.08	V	
		2.97	3.3	3.63	V	
Current Consumption	Idd	–	6.7	8	mA	No load condition, f = 125 MHz, Vdd = 3.3 V
		–	6.2	7	mA	No load condition, f = 125 MHz, Vdd = 2.5 V or 2.8 V
Standby Current	I_std	–	2.4	4.3	µA	$\overline{ST}$ = GND, Vdd = 3.3 V, Output is Weakly Pulled Down
		–	1.2	2.2	µA	$\overline{ST}$ = GND, Vdd = 2.5 or 2.8 V, Output is Weakly Pulled Down
Duty Cycle	DC	40	50	60	%	All Vdds
Rise/Fall Time	Tr, Tf	–	1	2	ns	20% - 80% Vdd=2.5 V, 2.8 V or 3.3 V, 15 pf load
Output Voltage High	VOH	90%	–	–	Vdd	IOH = -4 mA (Vdd = 3.3 V) IOH = -3 mA (Vdd = 2.8 V and Vdd = 2.5 V)
Output Voltage Low	VOL	–	–	10%	Vdd	IOL = 4 mA (Vdd = 3.3 V) IOL = 3 mA (Vdd = 2.8 V and Vdd = 2.5 V)
Output Load	Ld	–	–	15	pF	At 125MHz and max supply voltage. Contact SiTime for higher output load option
Input Voltage High	VIH	70%	–	–	Vdd	Pin 1, OE or $\overline{ST}$
Input Voltage Low	VIL	–	–	30%	Vdd	Pin 1, OE or $\overline{ST}$
Startup Time	T_start	–	–	10	ms	Measured from the time Vdd reaches its rated minimum value
Resume Time	T_resume	–	3.0	3.8	ms	Measured from the time ST pin crosses 50% threshold
RMS Period Jitter	T_jitt	–	–	4.5	ps	f = 125 MHz, Vdd = 2.5 V, 2.8 V or 3.3 V
RMS Phase Jitter (random)	T_phj	–	0.5	–	ps	f = 125 MHz, Integration bandwidth = 900 kHz to 7.5 MHz, VDD = 2.5 V, 2.8 V, or 3.3 V

■ Specifications (Cont.)

Pin Description Tables

Pin #1 Functionality
OE
H or Open: specified frequency output
L: output is high impedance
$\overline{ST}$
H or Open: specified frequency output
L: output is low level (weak pull down). Oscillation stops

Pin Map	
Pin	**Connection**
1	OE/$\overline{ST}$
2	GND
3	CLK
4	VDD

Absolute Maximum Table

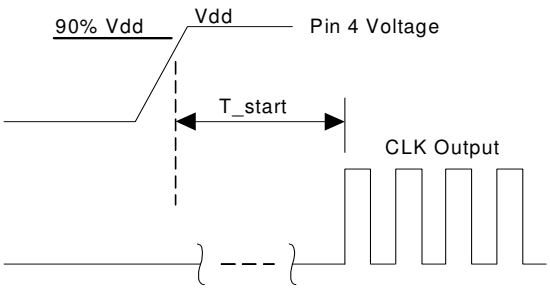
Attempted operation outside the absolute maximum ratings of the part may cause permanent damage to the part. Actual performance of the IC is only guaranteed within the operational specifications, not at absolute maximum ratings.

Parameter	Min.	Max.	Unit
Storage Temperature	-65	150	℃
VDD	-0.5	4	V
Electrostatic Discharge	–	2000	V
Theta JA (with copper plane on VDD and GND)	–	75	℃/W
Theta JC (with PCB traces of 0.010 inch to all pins)	–	24	℃/W
Soldering Temperature (follow standard Pb free soldering guidelines)	–	260	℃
Number of Program Writes	–	1	NA
Program Retention over -40 to 125℃, Process, VDD (0 to 3.65 V)	1,000+	–	years

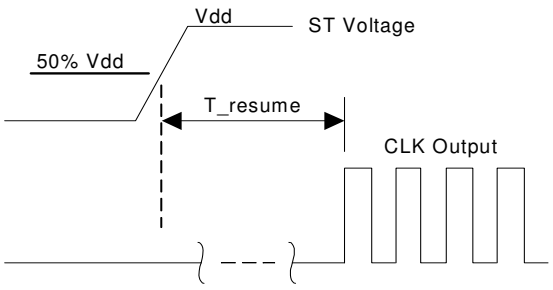
Environmental Compliance

Parameter	Condition/Test Method
Mechanical Shock	MIL-STD-883F, Method 2002
Mechanical Vibration	MIL-STD-883F, Method 2007
Temperature Cycle	JESD22, Method A104
Solderability	MIL-STD-883F, Method 2003
Moisture Sensitivity Level	MSL1 @ 260℃

Startup and Resume Timing Diagram

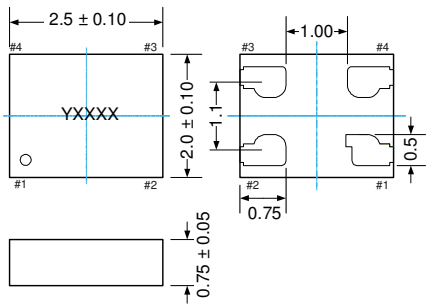
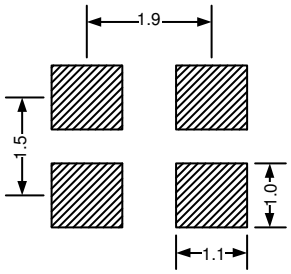
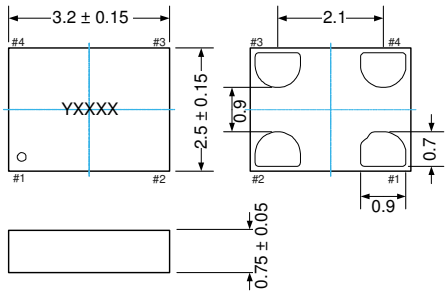
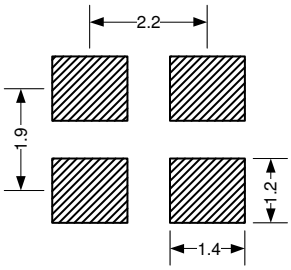
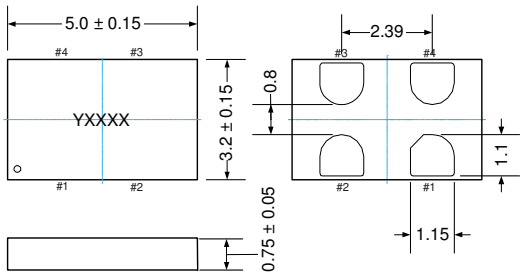
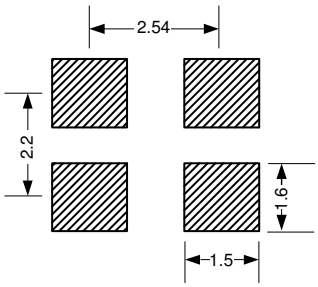
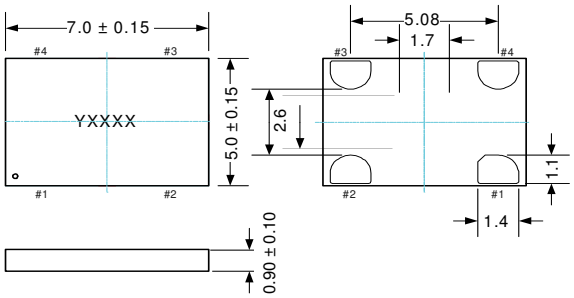
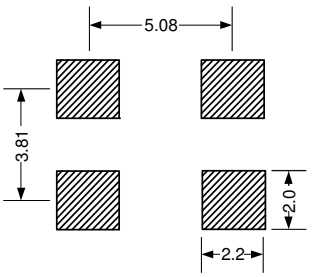


T_start: Time to start from power-off
(ST/OE Mode)



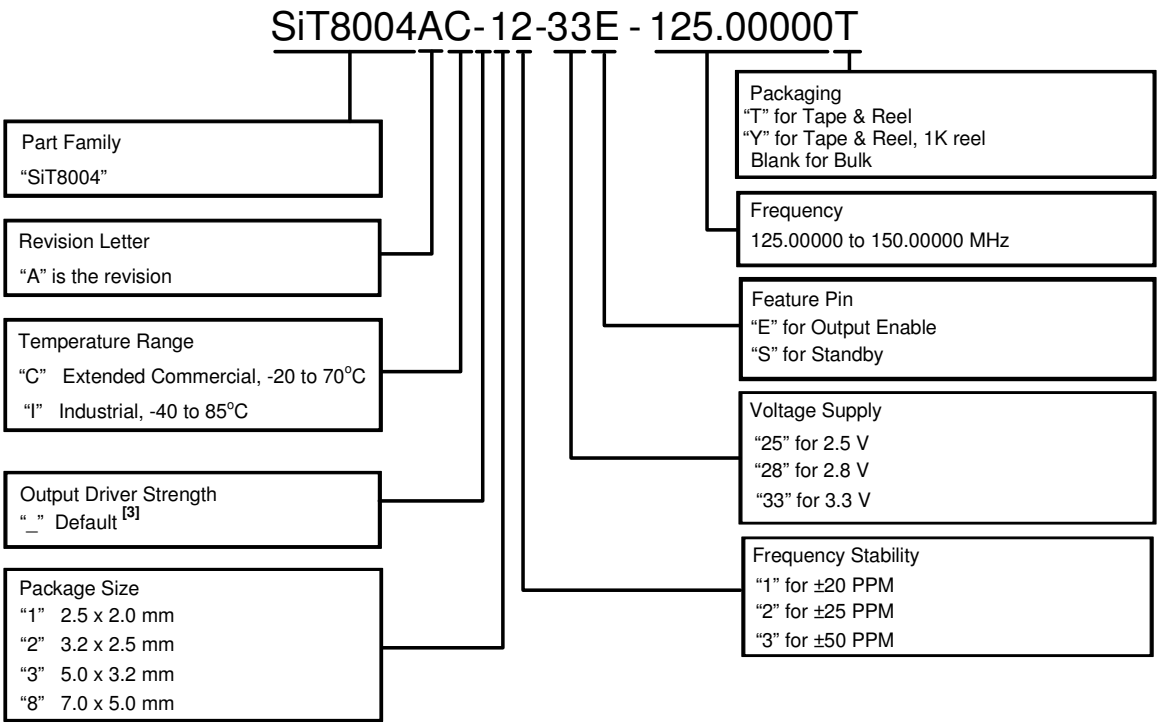
T_resume: Time to resume from ST
(ST Mode Only)

Dimensions and Land Patterns

Package Size – Dimensions (Unit: mm)[2]	Recommended Land Pattern (Unit: mm)[3]
2.5 x 2.0 x 0.75 mm	
	
3.2 x 2.5 x 0.75 mm	
	
5.0 x 3.2 x 0.75 mm	
	
7.0 x 5.0 x 0.90 mm	
	

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

■ Part No. Guide - How to Order



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

Frequency Stability vs. Temperature Range Options

Frequency Stability (PPM)	Temperature Range	Supply Voltage		
		2.5 V	2.8 V	3.3 V
±20	C (-20 to +70°C)	✓	✓	✓
	I (-40 to +85°C)	–	–	–
±25	C (-20 to +70°C) I (-40 to +85°C)	✓	✓	✓
±50	C (-20 to +70°C) I (-40 to +85°C)	✓	✓	✓