SiT9001

High Performance Spread Spectrum Oscillator

Features

- 50 ps Ultra-low cycle-to-cycle jitter
- Frequency range
  - 1 MHz to 200 MHz
- Center Spread Modulation: ±0.25%, ±0.5%, ±1%
- Down Spread Modulation: -0.5%, -1%, -2%
  - Spread Disable Option available
- Power Down Options available
- Frequency tolerance
  - ±50 ppm or ±100 ppm (Spread = OFF)
- Operating voltage
  - 1.8V or 2.5 or 3.3 V
- Operating Temperature Range
  - Industrial, -40°C to +85°C
  - Extended Commercial, -20°C to +70°C
- World's Smallest footprints:
  - 2.5 x 2.0 x 0.85 mm
  - 3.2 x 2.5 x 0.85 mm
  - 5.0 x 3.2 x 0.85 mm
  - 7.0 x 5.0 x 0.85 mm
- All packages are Pb-free and ROHs compliant
- Dramatically reduces EMI
- High drive option: 30pF load (contact factory)

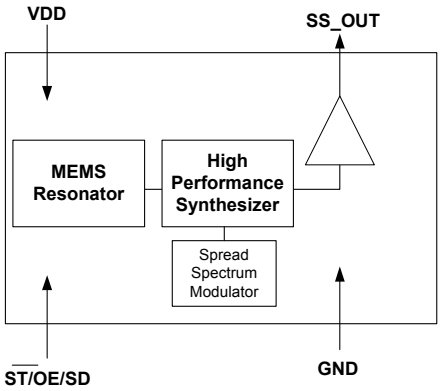
Benefits

- Services most PC peripherals, networking, and consumer applications
- Provides wide range of spread percentage for maximum electromagnetic interference (EMI) reduction
- Ultra-reliable start up and greater Immunity from Interference
- Factory programmable for ultra-fast lead time
- No crystal or capacitors required
- Eliminates crystal qualification time
- 50%+ board saving space
- completely quartz-free

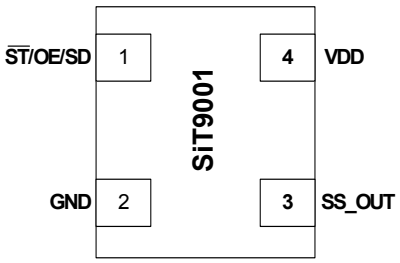
Applications

- Set-top boxes and LCD displays
- Scanners, Printers and Copiers
- Interface Controllers and Graphics Cards
- PCI, CPU and Memory Buses
- Routers and Modems

Block Diagram



Pinout



Pin Description

Pin No.	Name	Pin Description
1	ST/OE/SD	Standby/ Output Enable/ Spread Disable
2	GND	Connect to Ground
3	SS_OUT	1 to 200 MHz Spread Spectrum Clock Output
4	VDD	Connect to 1.8V or 2.5V or 3.3V

Pin1

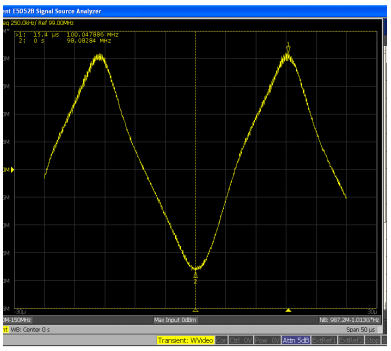
Pin #1 Functionality
OE
H or Open; specified frequency output
L: output is high impedance
$\overline{ST}$
H or Open; specified frequency output
L: output is low level (weak pull down) Oscillation stops
SD (Down Spread Only)
H or Open: Spread = ON
L : Spread =OFF

Spread Spectrum Modes

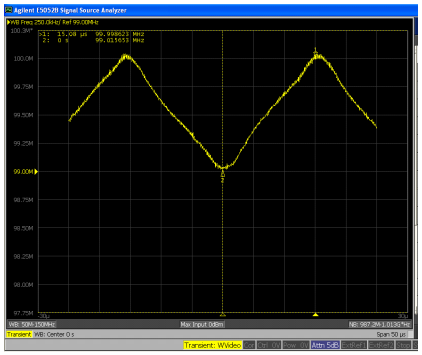
Center Spread	**Code**	**1**	**2**	**3**
	Percentage	±1.0%	±0.50%	±0.25%
Down Spread	**Code**	**4**	**5**	**6**
	Percentage	-2.0%	-1.0%	0.50%

In both modes, triangle modulation is employed with a frequency of ~32 kHz.

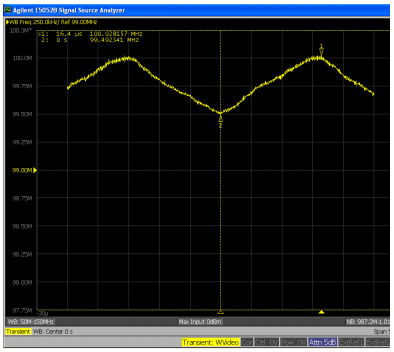
Down Spread: -2%



Down Spread: -1%



Down Spread:-0.5%



The SiT9001 can be factory programmed to provide down spread modulation or center spread modulation. In the down spread modulation mode, pin 1 can be factory programmed as a spread disable pin. In both the down spread and center spread modulation modes, pin can be factory programmed to be either output enable or standby.

Description

The SiT9001 is a spread-spectrum capable, programmable MEMS oscillator. The SiT9001 offers unparalleled flexibility in terms of frequency range, frequency accuracy tolerance, supply voltage, and operating temperature range while simultaneously offering outstanding performance in terms of low jitter and a higher frequency range. This flexibility and high performance is made available in packages down to 2.5 x 2.0 mm, making the SiT9001 the smallest programmable spread-spectrum oscillator available.

The SiT9001 is factory programmable and offers two types of spread modulation: down spread modulation, and center spread modulation. In down spread modulation mode, a spread disable pin is available (Pin 1).

Power down (either output enable or standby) mode options are available for both down spread and center spread versions of the SiT9001.

The SiT9001, by eliminating the quartz crystal, has improved immunity, shock, strain and humidity.

To order samples, go to www.sitime.com and click on Request Sample" link.

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 absolute maximum ratings.

Absolute Maximum Table

Parameter	Min.	Max.	Unit
Storage Temperature	-65	150	°C
VDD	-0.5	+3.65	V
Electrostatic Discharge	–	6000	V
Theta JA (with copper plane on VDD and GND)	–	75	°C/W
Theta JC (with PCB traces of 0.010 inch to all pins)	–	24	°C/W
Soldering Temperature (follow standard Pb free soldering guidelines)	–	260	°C
Number of Program Writes	–	1	NA
Program Retention over -40 to 125C, Process, VDD (0 to 3.65V)	–	1,000+	years

Operating Conditions

Parameter	Min.	Typ.	Max.	Unit
Supply Voltages, VDD[1]	2.97	3.3	3.63	V
	2.25	2.5	2.75	V
	1.7	1.8	1.9	V
Frequency Tolerance, Spread = OFF (down spread only) (Inclusive of Initial tolerance, operating temperature, rated power supply voltage change, load change,aging, shock and vibration)	-50	–	+50	ppm
	-100	–	+100	ppm
Industrial Operating Temperature	-40	–	85	°C
Maximum Load Capacitance[2]	–	–	15	pF

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 Sensibility Level	MSL1 @ 260°C

Notes:
1. The 2.5V device can operate from 2.25V to 3.63V with higher output drive, however, the data sheet specifications cannot be guaranteed. Please contact factory for this option.
2. The output driver strenght can be programmed to drive up to 30pF load. Please contact factory for this option.

DC Electrical Specifications

@VDD=3.3V ±10%, -40 to 85°C

Parameter	Condition	Min.	Typ.	Max.	Unit
Voltage Output High	IOH = -20 mA	70	–	–	%Vdd
Voltage Output Low	IOL = 20 mA	–	–	30	%Vdd
Input Voltage High	Pin 1	70	–	–	%Vdd
Input Voltage Low	Pin 1	–	–	30	%Vdd
Operating Current	Output frequency = 30 MHz, 15 pF load	–	–	27	mA
	Output frequency = 125 MHz, 15 pF load	–	–	34	mA
Standby Current	Output is weakly pulled down, $\overline{ST}$ = GND	–	30	50	uA
Power Up Time	Time from minimum power supply voltage	–	–	10	ms

@VDD=2.5V ±10%, -40 to 85°C

Parameter	Condition	Min.	Typ.	Max.	Unit
Voltage Output High	IOH = -15 mA	70	–	–	%Vdd
Voltage Output Low	IOL = 15 mA	–	–	30	%Vdd
Input Voltage High	Pin 1	70	–	–	%Vdd
Input Voltage Low	Pin 1	–	–	30	%Vdd
Operating Current	Output frequency = 30 MHz, 15 pF load	–	–	26	mA
	Output frequency = 125 MHz, 15 pF load	–	–	31	mA
Standby Current	Output is weakly pulled down, $\overline{ST}$ = GND	–	30	50	uA
Power Up Time	Time from minimum power supply voltage	–	–	10	ms

@VDD=1.8V ±5%, -40 to 85°C

Parameter	Condition	Min.	Typ.	Max.	Unit
Voltage Output High	IOH = -10 mA	70	–	–	%Vdd
Voltage Output Low	IOL = 10 mA	–	–	30	%Vdd
Input Voltage High	Pin 1	70	–	–	%Vdd
Input Voltage Low	Pin 1	–	–	30	%Vdd
Operating Current	Output frequency = 30 MHz, 15 pF load	–	–	26	mA
	Output frequency = 125 MHz, 15 pF load	–	–	31	mA
Standby Current	Output is weakly pulled down, $\overline{ST}$ = GND	–	30	50	uA
Power Up Time	Time from minimum power supply voltage	–	–	10	ms

AC Electrical Specifications

@VDD=3.3V ±10%, -40 to 85°C

Parameter	Condition	Min.	Typ.	Max.	Unit
Clock Output Frequency		1	–	200	MHz
Clock Output Duty Cycle	Output frequency= 1MHz to 75MHz	45	50	55	%
	Output frequency= 75MHz to 200MHz	40	–	60	%
Clock Output Rise Time	15 pF Load, 20% to 80% VDD	–	1.0	1.5	ns
Clock Output Fall Time	15 pF Load, 80% to 20% VDD	–	1.0	1.5	ns
Cycle-to-cycle Jitter	Spread = OFF, Output frequency = 133.33 MHz	–	29	–	ps
	Spread = ON, Output frequency = 133.33 MHz 2% down spread	–	29	–	ps

@VDD=2.5V ±10%, -40 to 85°C

Parameter	Condition	Min.	Typ.	Max.	Unit
Clock Output Frequency		1	–	200	MHz
Clock Output Duty Cycle	Output frequency= 1MHz to 125MHz	45	50	55	%
	Output frequency= 125MHz to 200MHz	40	–	60	%
Clock Output Rise Time	15 pF Load, 20% to 80% VDD	–	1.0	1.5	ns
Clock Output Fall Time	15 pF Load, 80% to 20% VDD	–	1.0	1.5	ns
Cycle-to-cycle Jitter	Spread = OFF, Output frequency = 133.33 MHz	–	37	–	ps
	Spread = ON, Output frequency = 133.33 MHz 2% down spread	–	37	–	ps

@VDD=1.8V ±5%, -40 to 85°C

Parameter	Condition	Min.	Typ.	Max.	Unit
Clock Output Frequency		1	–	200	MHz
Clock Output Duty Cycle	Output frequency= 1MHz to 75MHz	45	50	55	%
	Output frequency= 75MHz to 200MHz	40	–	60	%
Clock Output Rise Time	15 pF Load, 20% to 80% VDD	–	1.0	1.5	ns
Clock Output Fall Time	15 pF Load, 80% to 20% VDD	–	1.0	1.5	ns
Cycle-to-cycle Jitter	Spread = OFF, Output frequency = 133.33 MHz	–	27	–	ps
	Spread = ON, Output frequency = 133.33 MHz 2% down spread	–	27	–	ps

Ordering Information

SiT9001AC - 14 - 33E6- 123.12345T

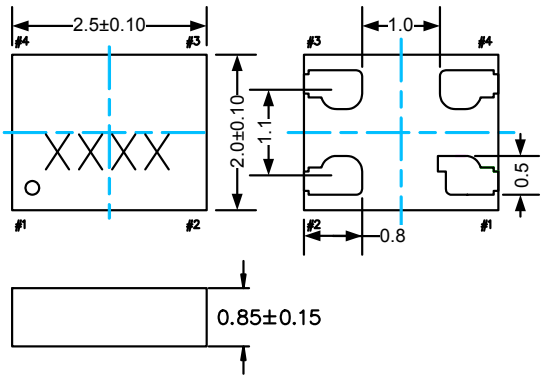
- **Part Family**
  "SiT9001"
- **Revision Letter**
  "A" is the revision
- **Temperature Range**
  "C" Commercial -20 to 70°C
  "I" Industrial -40 to 85°C
- **Package Size**
  "1" 2.5 x 2.0 mm
  "2" 3.2 x 2.5 mm
  "3" 5.0 x 3.2 mm
  "4" 7.0 x 5.0 mm
- **Frequency Tolerance (Spread = OFF)**
  "3" for +/- 50 ppm
  "4" for +/- 100 ppm
- **Voltage Supply**
  "18" for 1.8 V +/- 5%
  "25" for 2.5 V +/- 10%
  "33" for 3.3 V +/- 10%
- **Feature Pin**
  "E" for Output Enable
  "S" for Standby
  "D" for Spread Disable (Down spread only)
- **Spread Option:**
  Center: 1 = +/-1% 2 = +/-0.5% 3 = +/-0.25%
  Down: 4 = -2% 5 = -1% 6 = -0.5%
- **Frequency**
  1.00000 to 200.00000 MHz
- **Packaging:**
  "T" for Tape & Reel
  Blank for Bulk

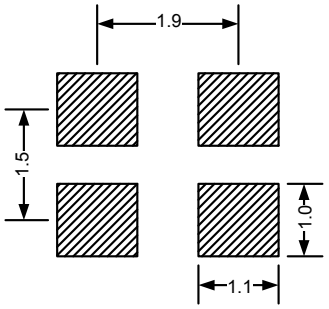
Package Information [3]

Dimension (mm)

Land Pattern (recommended) **(mm)**[4]

2.5 x 2.0 x 0.85mm

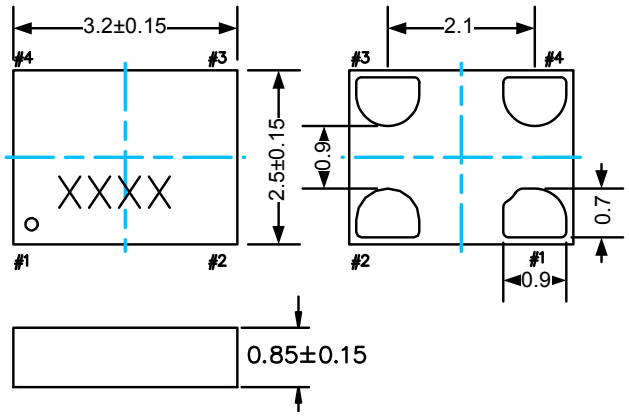


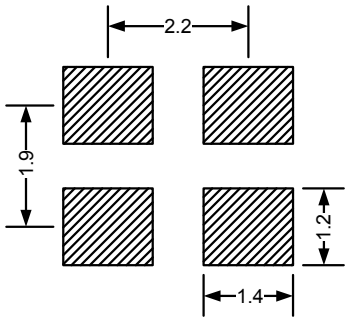


Package Information (continued)[3]

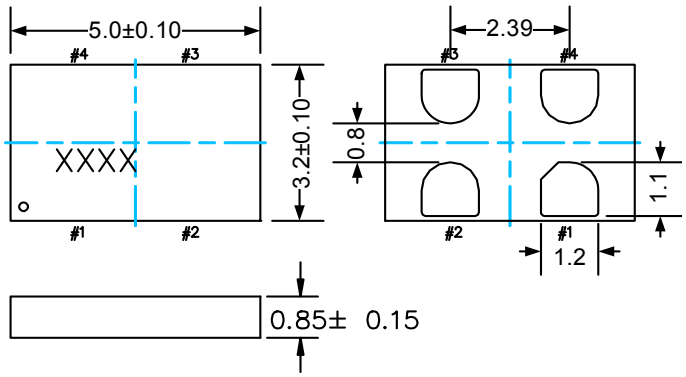
Dimension (mm) **Land Pattern** (recommended) **(mm)**[4]

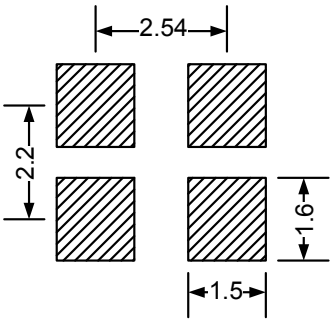
3.2 x 2.5 x 0.85mm



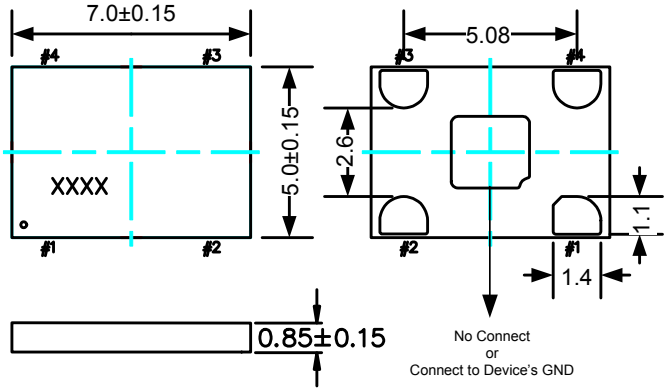


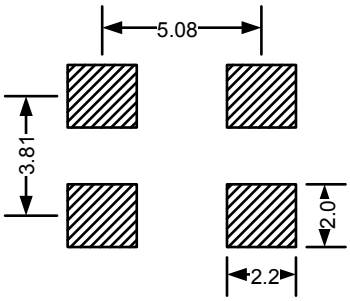
5.0 x 3.2 x 0.85mm





7.0 x 5.0 x 0.85mm





Notes:
3. xxxx top marking denotes manufacturing lot number.
4. A capacitor of value 0.01µF between VDD and GND is recommended.