# SiT8102

## 1 to 200 MHz High Performance Oscillator

### Features

- High frequency stability
  - ±10 PPM, ±15 PPM, ±20 PPM
  - ±25 PPM, ±50 PPM, ±100 PPM
- Extremely low RMS phase jitter (random)
  - 0.5 ps (typical)
- Wide frequency range
  - 1 to 200 MHz
- Operating voltage
  - 1.8, 2.5, 2.8V or 3.3 V
  - 2.25 V to 3.63 V (contact SiTime)
- Operating temperature range
  - Industrial, -40 to 85 °C
  - Extended Commercial, -20 to 70 °C
  - Commercial, 0 to 70 °C
- Small footprint
  - 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
- High drive option: 30pF load (contact factory)

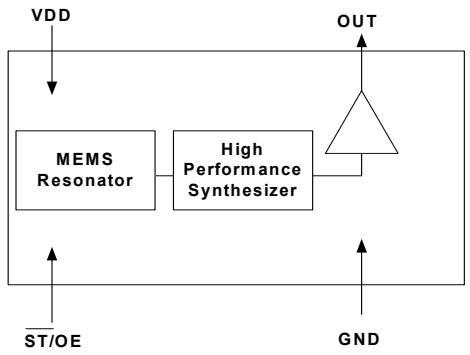
### Benefits

- No crystal or capacitors required
- Eliminates crystal qualification time
- Ultra-reliable start up and greater immunity from interference
- 50% + board saving space
- More cost effective than quartz oscillators, quartz crystals and clock ICs.
- Completely quartz-free

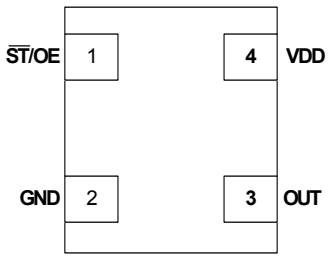
### Applications

- Communications and Networking Applications
- Consumer Electronics Applications
- Automotive Applications
- Industrial Applications
- Gigabit Ethernet
- 10 Gigabit Ethernet
- Fiber Channel
- Ethernet
- SATA/SAS
- USB 2.0
- PCI-Express

### Block Diagram




### Pinout




### Pin Description

| Pin No. | Name | Pin Description |
|---|---|---|
| 1 | $\overline{ST}$/OE | $\overline{Standby}$/ Output Enable |
| 2 | GND | Connect to Ground |
| 3 | OUT | 1 to 200 MHz Programmed Clock output |
| 4 | VDD | Connect to 1.8V / 2.5V / 2.8V / 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 |

## Description

The SiT8102 is the next generation of the SiT8002 programmable oscillator with lower phase noise, lower jitter, and a higher frequency range. SiTime oscillators are the smallest, high-performance programmable oscillator available and are suitable for use in high speed serial communications, consumer, portable, industrial, automotive and computation.

This oscillator is packaged in standard low-cost plastic and chip-scale IC packages.

System reliability is also increased with the SiT8102 by eliminating the quartz crystal and improved immunity to the environmental effects of vibration, 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 at 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 125 °C, 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 |
| | 2.52 | 2.8 | 3.08 | V |
| | 1.7 | 1.8 | 1.9 | V |
| Extended Commercial OperatingTemperature | -20 | – | 70 | °C |
| 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 strength 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 |
|---|---|---|---|---|---|
| Output Voltage High | IOH = -9 mA | 90 | – | – | %Vdd |
| Output Voltage Low | IOL = 9 mA | – | – | 10 | %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 | – | – | 34 | mA |
| Standby Current | Output is weakly pulled down, $\overline{ST}$ = GND | – | 30 | 50 | µA |
| Power Up Time | Time from minimum power supply voltage | – | – | 10 | ms |

@VDD = 2.5V ±10% or VDD = 2.8V ±10%, -40 to 85°C

| Parameter | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Output Voltage High | IOH = -7 mA | 90 | – | – | %Vdd |
| Output Voltage Low | IOL = 7mA | - | – | 10 | %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 | µA |
| 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 |
|---|---|---|---|---|---|
| Output Voltage High | IOH = -5 mA | 90 | – | – | %Vdd |
| Output Voltage Low | IOL = 5 mA | - | – | 10 | %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 | µA |
| 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 |
| Frequency Stability | Inclusive of initial tolerance, operating temp., rated power supply voltage change, load change | 0 to 70°C | -10 | – | +10 | PPM |
| | | -20 to 70°C<br>-40 to 85°C | -15 | – | +15 | PPM |
| | | | -20 | – | +20 | PPM |
| | | | -25 | | +25 | PPM |
| | | | -50 | | +50 | PPM |
| | | | -100 | | +100 | PPM |
| Aging | First year @ 25 °C | | – | – | 1 | PPM |
| Clock Output Duty Cycle | Output frequency= 1 to 125 MHz | | 45 | – | 55 | % |
| | Output frequency= 125 to 200 MHz | | 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 |
| RMS Period Jitter | Output frequency = 75 MHz | | – | 2.6 | 4 | ps |
| | Output frequency = 125 MHz | | – | 2.4 | 3.6 | ps |
| RMS Phase Jitter (Random) | Output frequency = 75 MHz (900 kHz to 7.5 MHz) | | – | 0.81 | – | ps |
| | Output frequency = 106.25 MHz (637kHz to 10 MHz) | | – | 1.64 | – | ps |
| | Output frequency = 125 MHz (1.875 to 20 MHz) | | – | 0.38 | – | ps |

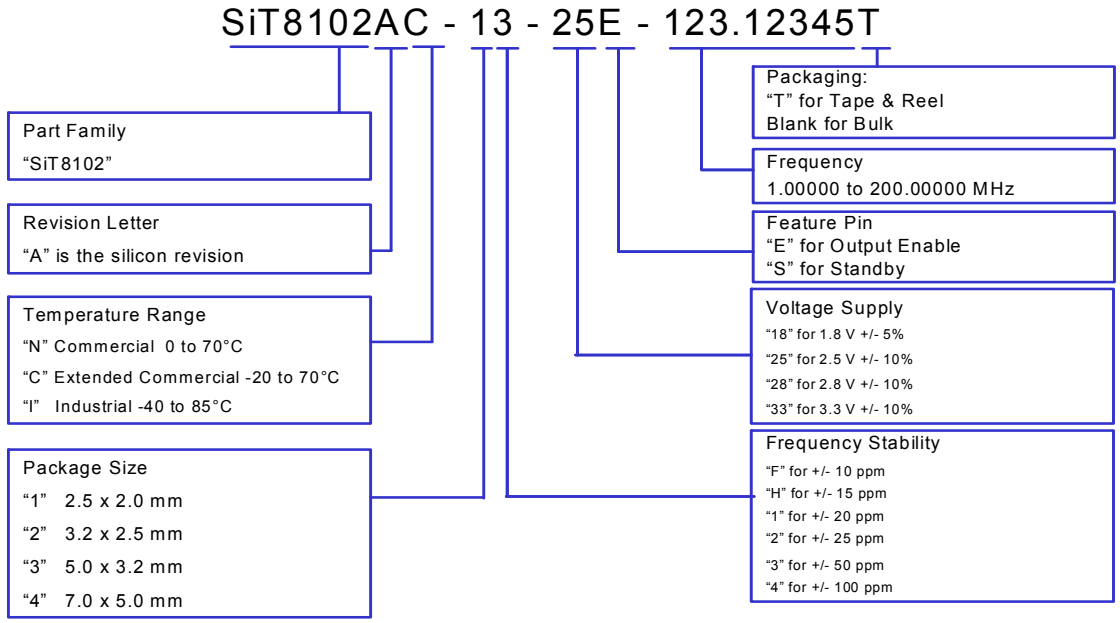
@VDD = 2.5V ±10% or VDD = 2.8V ±10%, -40 to 85°C

| Parameter | Condition | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Clock Output Frequency | | | 1 | – | 200 | MHz |
| Frequency Stability | Inclusive of initial tolerance, operating temp., rated power supply voltage change, load change | 0 to 70°C | -10 | – | +10 | PPM |
| | | -20 to 70°C<br>-40 to 85°C | -15 | – | +15 | PPM |
| | | | -20 | – | +20 | PPM |
| | | | -25 | | +25 | PPM |
| | | | -50 | | +50 | PPM |
| | | | -100 | | +100 | PPM |
| Aging | First year @ 25 °C | | – | – | 1 | PPM |
| Clock Output Duty Cycle | Output frequency= 1MHz to 125MHz | | 45 | – | 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 |
| RMS Period Jitter | Output frequency = 75 MHz | | – | 3 | 6 | ps |
| | Output frequency = 125 MHz | | – | 2.8 | 5 | ps |
| RMS Phase Jitter (Random) | Output frequency = 75 MHz (900 kHz to 7.5 MHz) | | – | 0.87 | – | ps |
| | Output frequency = 106.25 MHz (637kHz to 10 MHz) | | – | 1.7 | – | ps |
| | Output frequency = 125 MHz (1.875 to 20 MHz) | | – | 0.41 | – | ps |

@VDD = 1.8V ±5%, -40 to 85°C

| Parameter | Condition | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Clock Output Frequency | | | 1 | – | 200 | MHz |
| Frequency Stability | Inclusive of initial tolerance, operating temp., rated power supply voltage change, load change | 0 to 70°C | -15 | – | +15 | PPM |
| | | -20 to 70°C<br>-40 to 85°C | -20 | – | +20 | PPM |
| | | | -25 | | +25 | PPM |
| | | | -50 | | +50 | PPM |
| | | | -100 | | +100 | PPM |
| Aging | First year @ 25 °C | | – | – | 1 | PPM |
| Clock Output Duty Cycle | Output frequency= 1 MHz to 75 MHz | | 45 | – | 55 | % |
| | Output frequency= 75 MHz to 200 MHz | | 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 |
| RMS Period Jitter | Output frequency = 75 MHz | | – | 7.3 | 14 | ps |
| | Output frequency = 125 MHz | | – | 7.1 | 14 | ps |
| RMS Phase Jitter (Random) | Output frequency = 75 MHz (900 kHz to 7.5 MHz) | | – | 0.85 | – | ps |
| | Output frequency = 106.25 MHz (637kHz to 10 MHz) | | – | 1.72 | – | ps |
| | Output frequency = 125 MHz (1.875 to 20 MHz) | | – | 1.06 | – | ps |

## Ordering Information



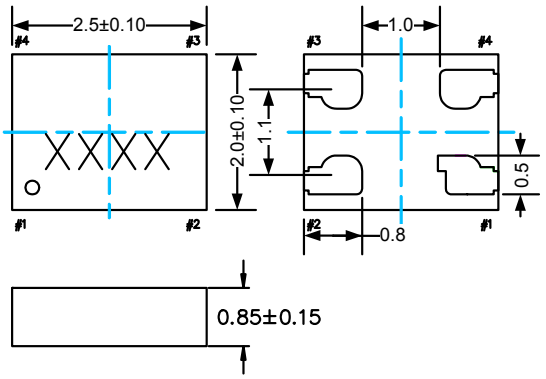

| FrequencyStability | Temperature Range | | |
|---|---|---|---|
| | N = 0 to 70C | C = -20 to 70C | I = -40 to 85C |
| ± 10 PPM | VDD = 2.5 or 2.8 or 3.3 V | NA | NA |
| ± 15 PPM | All VDDs | VDD = 2.5 or 2.8 or 3.3 V | VDD = 2.5 or 2.8 or 3.3 V |
| ± 20 PPM | All VDDs | | |
| ± 25PPM | | | |
| ± 50 PPM | | | |

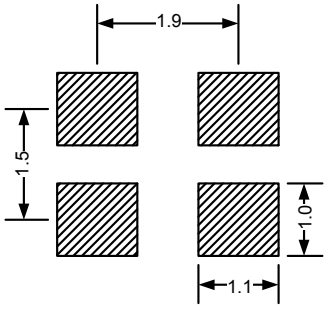
## Package Information [3]

**Dimension (mm)**

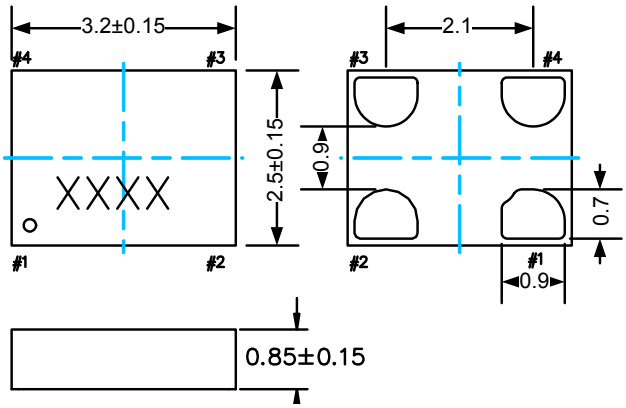
**Land Pattern** (recommended) **(mm)**[4]

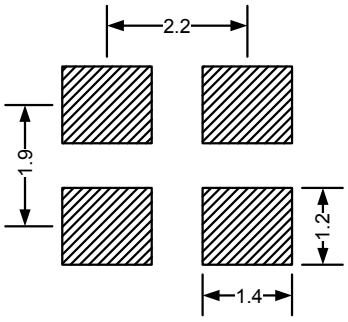
**2.5 x 2.0 x 0.85mm**



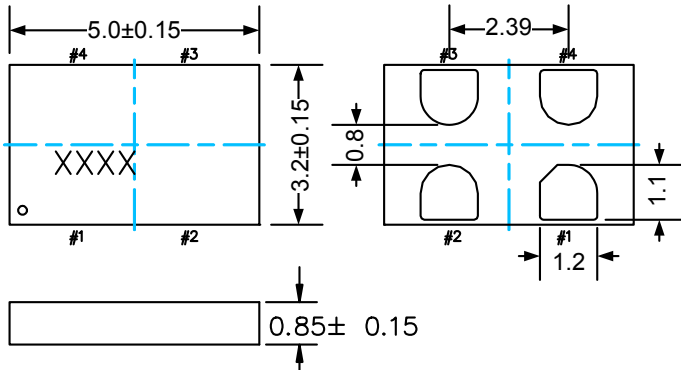



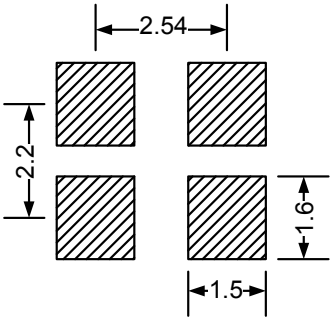

**3.2 x 2.5 x 0.85mm**




**5.0 x 3.2 x 0.85mm**



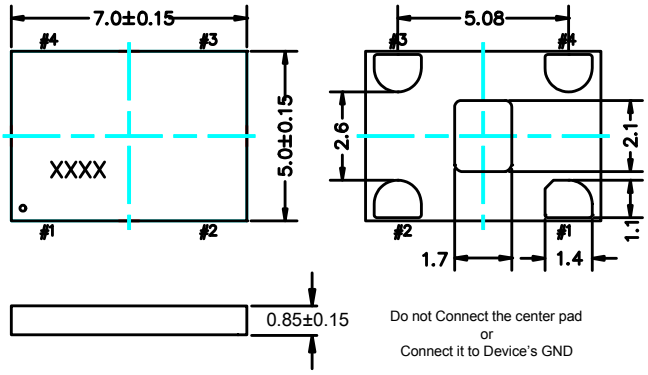



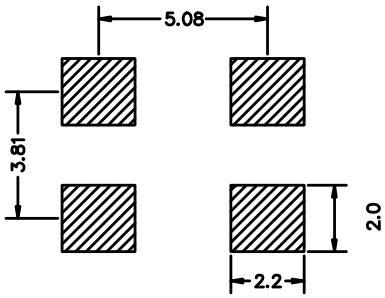
## Package Information (continued)[3]

**Dimension (mm)**

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

**7.0 x 5.0 x 0.85mm**




**Notes:**

3. xxxx top marking denotes manufacturing lot number.
4. A capacitor of value 0.1µF between VDD and GND is recommended.

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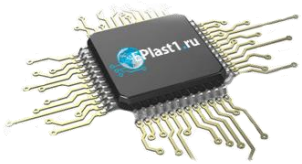


**Как с нами связаться**

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**Электронная почта:** org@eplast1.ru
**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.