

## Features

- $\pm 60$  ps Peak-Peak Period Jitter
- Wide frequency range
  - 1 MHz to 15 MHz
- Low frequency stability
  - $\pm 30$  ppm
  - $\pm 50$  ppm or  $\pm 100$  ppm
- Operating voltage
  - 1.8V or 2.5 or 2.8 or 3.3 V
  - 2.25V to 3.6V (contact factory)
- Operating temperature range:
  - Industrial,  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$
  - Extended Commercial,  $-20^{\circ}\text{C}$  to  $70^{\circ}\text{C}$
- Small footprint
  - $2.5 \times 2.0 \times 0.75$  mm
  - $3.2 \times 2.5 \times 0.75$  mm
  - $5.0 \times 3.2 \times 0.75$  mm
  - $7.0 \times 5.0 \times 0.90$  mm
- All packages are Pb-free and RoHS compliant (QFN SMD)
- Ultra-reliable start up and greater immunity from interference
- High drive option: 30pF load (contact factory)

## Benefits

- No crystal or capacitors required
- Eliminates crystal qualification time
- 50% + board saving space
- More cost effective than Quartz oscillators, Quartz crystals and Clock ICs.
- Completely quartz-free

## Applications

- Consumer Electronics
- Set Top Box, HDTV, DVR
- Office Automation: Scanners, Printers, Copiers
- Automotive Applications
- Industrial Applications: Interface Controllers, Graphics Cards.

## Block Diagram



## Pinout



## Pin Description

| Pin No. | Name  | Pin Description                      |
|---------|-------|--------------------------------------|
| 1       | ST/OE | Standby/ Output Enable               |
| 2       | GND   | Connect to Ground                    |
| 3       | OUT   | 1 to 125 MHz Programmed Clock output |
| 4       | VDD   | Connect to 1.8V or 2.5V or 3.3V      |

## Pin1

| Pin #1 Functionality                                      |
|-----------------------------------------------------------|
| <b>OE</b>                                                 |
| H or Open; specified frequency output                     |
| L: output is high impedance                               |
| <b>ST</b>                                                 |
| H or Open; specified frequency output                     |
| L: output is low level (weak pull down) oscillation stops |

## Description

The SiT8002 oscillator family is composed of the world's smallest, high-performance programmable oscillators. The SiT8002 is suitable for use in clock generation for consumer, portable, industrial, automotive, and computation applications.

This oscillator family is packaged in standard low-cost plastic QFN-type IC packages with footprints that match common quartz surface mount products.

MEMS resonators are 1000x smaller by volume than quartz resonators and are built in high volume CMOS fabs instead of small custom manufacturing facilities. Due to their small size, massive lot sizes, and simpler manufacturing processes

MEMS oscillators are inherently more reliable, have more consistent performance and are always in stock.

The SiT8002, by eliminating the quartz crystals, has improved immunity to the environmental effects of vibration, shock, strain, and humidity.

To order samples, go to [www.sitime.com](http://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 3.6V)         |      | 1,000+ | years |

## Operating Conditions

| Parameter                                 | Min. | Typ. | Max. | Unit |
|-------------------------------------------|------|------|------|------|
| Supply Voltages, VDD <sup>[1]</sup>       | 2.97 | 3.3  | 3.63 | V    |
|                                           | 2.25 | 2.5  | 2.75 | V    |
|                                           | 1.7  | 1.8  | 1.9  | V    |
| Extended Commercial Operating Temperature | -20  | -    | 70   | °C   |
| Industrial Operating Temperature          | -40  | -    | 85   | °C   |
| Maximum Load Capacitance <sup>[2]</sup>   | -    | -    | 15   | pF   |
| VDD Ramp Time                             | 0    | -    | 200  | ms   |

## 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 parameters 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  $\pm 10\%$ , -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 = 65 MHz, 15 pF load               | -    | -    | 22   | mA      |
| Standby Current     | Output is weakly pulled down, $\overline{ST}$ = GND | -    | 30   | 50   | $\mu$ A |
| Power Up Time       | Time from minimum power supply voltage              | -    | 12   | 50   | ms      |

@VDD = 2.5V  $\pm 10\%$ , -40 to 85°C

| Parameter           | Condition                                           | Min. | Typ. | Max. | Unit    |
|---------------------|-----------------------------------------------------|------|------|------|---------|
| Output Voltage High | IOH = -7 mA                                         | 90   | -    | -    | %Vdd    |
| Output Voltage Low  | IOL = 7 mA                                          | -    | -    | 10   | %Vdd    |
| Input Voltage High  | Pin 1                                               | 70   | -    | -    | %Vdd    |
| Input Voltage Low   | Pin 1                                               | -    | -    | 30   | %Vdd    |
| Operating Current   | Output frequency = 65 MHz, 15 pF load               | -    | -    | 22   | mA      |
| Standby Current     | Output is weakly pulled down, $\overline{ST}$ = GND | -    | 30   | 50   | $\mu$ A |
| Power Up Time       | Time from minimum power supply voltage              | -    | 12   | 50   | ms      |

@VDD = 1.8V  $\pm 5\%$ , -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 = 65 MHz, 15 pF load               | -    | -    | 19   | mA      |
| Standby Current     | Output is weakly pulled down, $\overline{ST}$ = GND | -    | 30   | 50   | $\mu$ A |
| Power Up Time       | Time from minimum power supply voltage              | -    | 12   | 50   | ms      |

## AC Electrical Specifications

@VDD = 3.3V  $\pm 10\%$ , -40 to 85 °C

| Parameter                          | Condition                                                                                                                         | Min. | Typ. | Max.     | Unit |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------|------|----------|------|
| Clock Output Frequency             |                                                                                                                                   | 1    | -    | 125      | MHz  |
| Frequency Stability <sup>[3]</sup> | Inclusive of initial stability, operating temperature, rated power supply voltage change, load change, aging, shock and vibration | -30  | -    | +30      | ppm  |
|                                    |                                                                                                                                   | -50  | -    | +50      | ppm  |
|                                    |                                                                                                                                   | -100 | -    | +100     | ppm  |
| Aging                              | First year                                                                                                                        | -    | -    | 1        | ppm  |
| Clock Output Duty Cycle            | Output frequency= 1 MHz to 125 MHz                                                                                                | 45   | -    | 55       | %    |
| Clock Output Rise Time             | 15 pF Load, 20% to 80% VDD                                                                                                        | -    | 1.0  | 2.0      | ns   |
| Clock Output Fall Time             | 15 pF Load, 80% to 20% VDD                                                                                                        | -    | 1.0  | 2.0      | ns   |
| Pk-pk Period Jitter                | Output frequency = 24 MHz                                                                                                         | -    | -    | $\pm 98$ | ps   |
|                                    | Output frequency = 100 MHz                                                                                                        | -    | -    | $\pm 60$ | ps   |

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

| Parameter                          | Condition                                                                                                                         | Min. | Typ. | Max.      | Unit |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------|------|-----------|------|
| Clock Output Frequency             |                                                                                                                                   | 1    | -    | 125       | MHz  |
| Frequency Stability <sup>[3]</sup> | Inclusive of initial stability, operating temperature, rated power supply voltage change, load change, aging, shock and vibration | -30  | -    | +30       | ppm  |
|                                    |                                                                                                                                   | -50  | -    | +50       | ppm  |
|                                    |                                                                                                                                   | -100 | -    | +100      | ppm  |
| Aging                              | First year                                                                                                                        | -    | -    | 1         | ppm  |
| Clock Output Duty Cycle            | Output frequency = 1MHz to 125MHz                                                                                                 | 45   | -    | 55        | %    |
| Clock Output Rise Time             | 15 pF Load, 20% to 80% VDD                                                                                                        | -    | 1.0  | 2.0       | ns   |
| Clock Output Fall Time             | 15 pF Load, 80% to 20% VDD                                                                                                        | -    | 1.0  | 2.0       | ns   |
| Pk-pk Period Jitter                | Output frequency = 24 MHz                                                                                                         | -    | -    | $\pm 130$ | ps   |
|                                    | Output frequency = 100 MHz                                                                                                        | -    | -    | $\pm 60$  | ps   |

@VDD = 1.8V  $\pm 5\%$ , -40 to 85 °C

| Parameter                          | Condition                                                                                                                         | Min. | Typ. | Max.      | Unit |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------|------|-----------|------|
| Clock Output Frequency             |                                                                                                                                   | 1    | -    | 125       | MHz  |
| Frequency Stability <sup>[3]</sup> | Inclusive of initial stability, operating temperature, rated power supply voltage change, load change, aging, shock and vibration | -50  | -    | +50       | ppm  |
|                                    |                                                                                                                                   | -100 | -    | +100      | ppm  |
| Aging                              | First year                                                                                                                        | -    | -    | 1         | ppm  |
| Clock Output Duty Cycle            | Output frequency = 1 MHz to 65MHz                                                                                                 | 45   | -    | 55        | %    |
|                                    | Output frequency = 65 MHz to 125MHz                                                                                               | 40   | -    | 60        | %    |
| Clock Output Rise Time             | 15 pF Load, 20% to 80% VDD                                                                                                        | -    | 1.0  | 2.0       | ns   |
| Clock Output Fall Time             | 15 pF Load, 80% to 20% VDD                                                                                                        | -    | 1.0  | 2.0       | ns   |
| Pk-pk Period Jitter                | Output frequency = 24 MHz                                                                                                         | -    | -    | $\pm 185$ | ps   |
|                                    | Output frequency = 100 MHz                                                                                                        | -    | -    | $\pm 100$ | ps   |

### Notes:

3.  $\pm 30$  ppm is available only for VDD=2.5V or 3.3V.

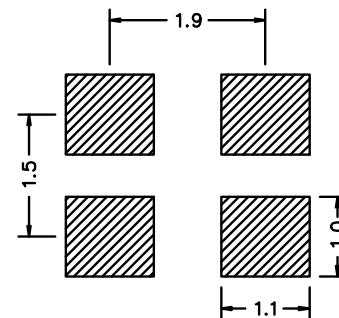
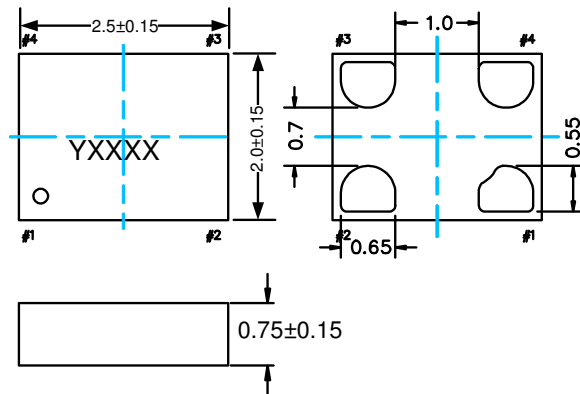
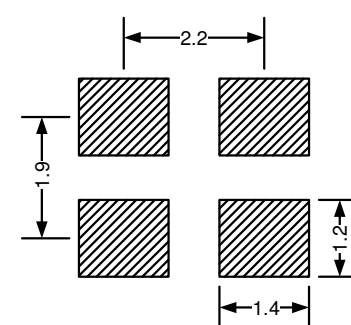
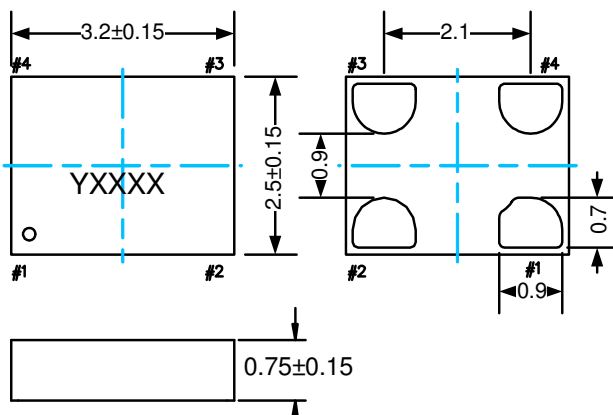
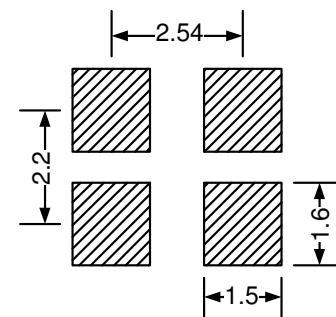
## Ordering Information

**Note:**

4. Contact SiTime for different output drive strength options.

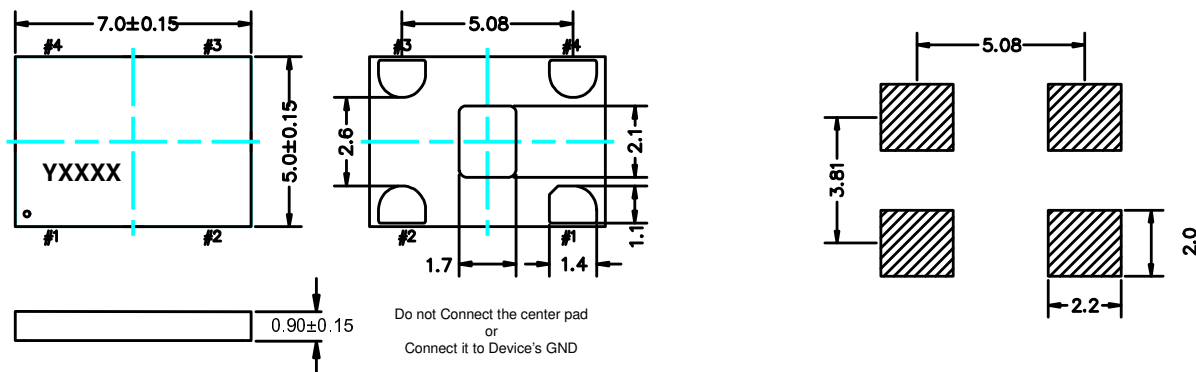
Package Information <sup>[5,6]</sup>

Dimension (mm)

Land Pattern (recommended) (mm)<sup>[7]</sup>2.5 x 2.0 x 0.75mm3.2 x 2.5 x 0.75mm5.0 x 3.2 x 0.75mm

Package Information (continued)<sup>[5,6]</sup>

Dimension (mm)

Land Pattern (recommended) (mm)<sup>[7]</sup>**7.0 x 5.0 x 0.90mm**

5. Y top marking denotes manufacturing origin. The value of "Y" will depend on the assembly location of the device.

6. XXXX denotes manufacturing lot number.

7. A capacitor of value  $0.1 \mu\text{F}$  between VDD and GND is recommended.

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