

### ■ Features, Benefits and Applications

- The world's lowest power programmable oscillator with 3.2 mA typical active current
- 1-110 MHz frequency range
- LVCMOS/LVTTL compatible output
- Frequency stability as low as  $\pm 20$  PPM
- Standby current as low as 0.5  $\mu$ A
- Fast resume time of 3.0 ms typical
- 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
- Outstanding mechanical robustness for portable applications
- All-silicon device with outstanding reliability of 2 FIT (10x improvement over quartz-based devices), enhancing system mean-time-to-failure (MTBF)
- Ultra short lead time
- Ideal for portable applications: portable media players, digital cameras, digital camcorders, portable navigation devices, handheld gaming, cell phones and other battery-powered handheld applications
- Ideal for high-speed serial protocols such as: USB 1.1, USB 2.0, USB 3.0, SATA, SAS, Firewire, Ethernet, etc.

### ■ Specifications

#### Electrical Characteristics

| Parameter                   | Symbol   | Min. | Typ. | Max. | Unit    | Condition  |
|-----------------------------|----------|------|------|------|---------|--|
| Output Frequency Range      | f        | 1    | –    | 110  | MHz     |  |
| Frequency Stability         | F_stab   | -20  | –    | +20  | PPM     | Inclusive of: Initial stability, operating temperature, rated power, supply voltage change, load change, shock and vibration<br><br>$\pm 20$ PPM available in extended commercial temperature only |
|                             |          | -25  | –    | +25  | PPM     |  |
|                             |          | -30  | –    | +30  | PPM     |  |
|                             |          | -50  | –    | +50  | PPM     |  |
| 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      | 1.71 | 1.8  | 1.89 | V       |  |
|                             |          | 2.25 | 2.5  | 2.75 | V       |  |
|                             |          | 2.52 | 2.8  | 3.08 | V       |  |
|                             |          | 2.97 | 3.3  | 3.63 | V       |  |
| Current Consumption         | Idd      | –    | 3.7  | 4.1  | mA      | No load condition, f = 20 MHz, Vdd = 2.5 V, 2.8 V or 3.3 V   |
|                             |          | –    | 3.2  | 3.5  | mA      | No load condition, f = 20 MHz, Vdd = 1.8 V   |
| Standby Current             | I_std    | –    | 2.4  | 4.3  | $\mu$ A | $\overline{ST}$ = GND, Vdd = 3.3 V, Output is Weakly Pulled Down   |
|                             |          | –    | 1.2  | 2.2  | $\mu$ A | $\overline{ST}$ = GND, Vdd = 2.5 or 2.8 V, Output is Weakly Pulled Down  |
|                             |          | –    | 0.4  | 0.8  | $\mu$ A | $\overline{ST}$ = GND, Vdd = 1.8 V, Output is Weakly Pulled Down   |
| Duty Cycle                  | DC       | 45   | 50   | 55   | %       | All Vdds. f $\leq$ 75 MHz  |
|                             |          | 40   | 50   | 60   | %       | All Vdds. f > 75 MHz   |
| Rise/Fall Time              | Tr, Tf   | –    | 1    | 2    | ns      | 20% - 80% Vdd=2.5 V, 2.8 V or 3.3 V, 15 pf load  |
|                             |          | –    | 1.3  | 2.5  | ns      | 20% - 80% Vdd=1.8 V, 15 pf load  |
| Output Voltage High         | VOH      | 90%  | –    | –    | Vdd     | IOH = -4 mA (Vdd = 3.3 V)<br>IOH = -3 mA (Vdd = 2.8 V and Vdd = 2.5 V)<br>IOH = -2 mA (Vdd = 1.8 V)  |
| Output Voltage Low          | VOL      | –    | –    | 10%  | Vdd     | IOL = 4 mA (Vdd = 3.3 V)<br>IOL = 3 mA (Vdd = 2.8 V and Vdd = 2.5 V)<br>IOL = 2 mA (Vdd = 1.8 V)   |
| Output Load                 | Ld       | –    | –    | 15   | pF      | At maximum frequency and 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_osc    | –    | –    | 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   | –    | –    | 4.0  | ps      | f = 75 MHz, Vdd = 2.5 V, 2.8 V or 3.3 V  |
|                             |          | –    | –    | 5.5  | ps      | f = 75 MHz, Vdd = 1.8 V  |
| RMS Phase Jitter (random)   | T_phj    | –    | 0.6  | –    | ps      | f = 75 MHz, Integration bandwidth = 900 kHz to 7.5 MHz, VDD = 2.5 V, 2.8 V, or 3.3 V   |
|                             |          | –    | 0.8  | –    | ps      | f = 75 MHz, Integration bandwidth = 900 kHz to 7.5 MHz, VDD = 1.8 V  |

### Specifications (Cont.)

#### Pin Description Tables

| Pin #1 Functionality                                       |
|--|
| <b>OE</b>  |
| H or Open <sup>1)</sup> : specified frequency output       |
| L: output is high impedance                                |
| <b><math>\overline{\text{ST}}</math></b>                   |
| H or Open: specified frequency output                      |
| L: output is low level (weak pull down). Oscillation stops |

| Pin Map |                            |
|---------|----------------------------|
| Pin     | Connection                 |
| 1       | OE/ $\overline{\text{ST}}$ |
| 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  | °C    |
| VDD  | -0.5   | 4    | V     |
| Electrostatic Discharge  | –      | 2000 | 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 3.65 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°C              |

#### Startup and Resume Timing Diagram



#### Note:

- In 1.8 V mode, a resistor of <100 kΩ between OE pin and VDD is recommended.

### ■ Dimensions and Land Patterns

| Package Size – Dimensions (Unit: mm) <sup>[2]</sup> | Recommended Land Pattern (Unit: mm) <sup>[3]</sup> |
|---|--|
| <p><b>2.5 x 2.0 x 0.75 mm</b></p>                   |  |
| <p><b>3.2 x 2.5 x 0.75 mm</b></p>                   |  |
| <p><b>5.0 x 3.2 x 0.75 mm</b></p>                   |  |
| <p><b>7.0 x 5.0 x 0.90 mm</b></p>                   |  |

**Notes:**

2. Y denotes manufacturing origin and XXXX denotes manufacturing lot number. The value of "Y" will depend on the assembly location of the device.
3. A capacitor of value 0.1  $\mu$ F between Vdd and GND is recommended.
4. The 7050 package with part number designation "-8" has NO center pad.

■ Part No. Guide - How to Order

The Part No. Guide is for reference only. For real-time customization and exact part number, use the SiTime [Part Number Generator](#).

### SiT8003AC-12-18E-105.12345T



**Note:**

- 5. Contact SiTime for different drive strength options for driving higher loads or reducing EMI.
- 6. Without Center Pad.

### Frequency Stability vs. Temperature Range Options

| Frequency Stability (PPM) | Temperature Range | Supply Voltage |       |       |       |
|---------------------------|-------------------|----------------|-------|-------|-------|
|                           |                   | 1.8 V          | 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)  | -              | -     | -     | -     |
| ±30                       | C (-20 to +70°C)  | ✓              | ✓     | ✓     | ✓     |
|                           | I (-40 to +85°C)  | -              | -     | -     | -     |
| ±50                       | C (-20 to +70°C)  | ✓              | ✓     | ✓     | ✓     |
|                           | I (-40 to +85°C)  | -              | -     | -     | -     |

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#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.