

### ■ Features, Benefits and Applications

- The world's lowest power programmable oscillator with 3.2 mA typical active current
- Selectable Output Frequency:  $F_0$  or  $F_1$  where  $F_1 = F_0/2, F_0/3, F_0/4, \text{ or } F_0/8$
- 1-110 MHz frequency range
- LVCMOS/LVTTL compatible output
- Frequency stability as low as  $\pm 20$  PPM
- 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
- All-silicon device with outstanding reliability of 2 FIT (10x improvement over quartz-based devices), enhancing system mean-time-to-failure (MTBF)
- Outstanding mechanical robustness for portable applications
- Ultra short lead time
- Ideal for applications with common and related frequencies: 48/24/12 MHz for USB, 50/25 MHz for Ethernet, 24.576/12.288 MHz for audio, 54/27 MHz for video, 66/33 MHz for CPU

### ■ Specifications

#### Electrical Characteristics

| Parameter                   | Symbol       | Min. | Typ. | Max. | Unit | Condition                                                                                                                                                                                                            |
|-----------------------------|--------------|------|------|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency Range             | f            | 1    | –    | 110  | MHz  |                                                                                                                                                                                                                      |
| Output Frequency            | $F_0$        | 2    | –    | 110  | MHz  | The actual output frequency of the CLK pin is selected by the FS (frequency select pin) to be either $F_0$ or $F_1$ .                                                                                                |
|                             | $F_1$        | 1    | –    | 55   | 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><b><math>\pm 20</math> PPM available in extended commercial temperature only</b> |
|                             |              | -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                                                                                                                                                                           |
| Duty Cycle                  | DC           | 45   | 50   | 55   | %    | All Vdds. f <= 75 MHz                                                                                                                                                                                                |
|                             |              | 40   | 50   | 60   | %    | All Vdds. f > 75 MHz                                                                                                                                                                                                 |
| Rise/Fall Time              | $T_r, T_f$   | –    | 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  | 4    | 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                                                                                                                                                                              |
|                             |              | –    | –    | 6.5  | 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                              |
|---------------------------------------------------|
| FS                                                |
| H or Open <sup>[1]</sup> : output frequency $F_0$ |
| L: output frequency $F_1$                         |

| Pin Map |            |
|---------|------------|
| Pin     | Connection |
| 1       | FS         |
| 2       | GND        |
| 3       | CLK        |
| 4       | VDD        |

### Absolute Maximum Ratings

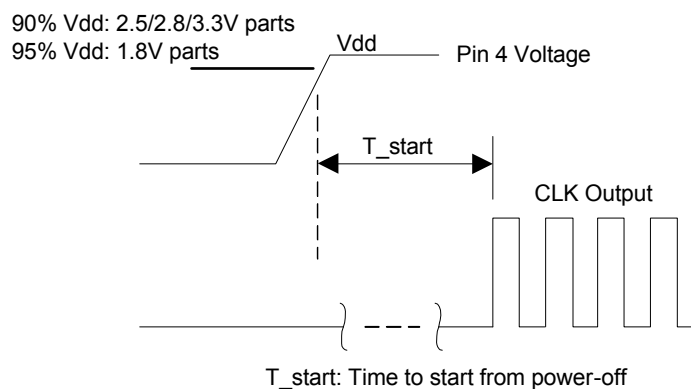
Attempted operation outside the absolute maximum ratings of the part may cause permanent damage to the part. Actual performance of the IC is only guaranteed within the operational specifications, not at absolute maximum ratings.

| Parameter                                                            | Min.   | Max. | Unit  |
|----------------------------------------------------------------------|--------|------|-------|
| Storage Temperature                                                  | -65    | 150  | °C    |
| VDD                                                                  | -0.5   | 4    | 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 3.65 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 Sensibility Level | MSL1 @ 260°C              |

### Startup Timing Diagram



#### Note:

1. 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>                   |                                                    |

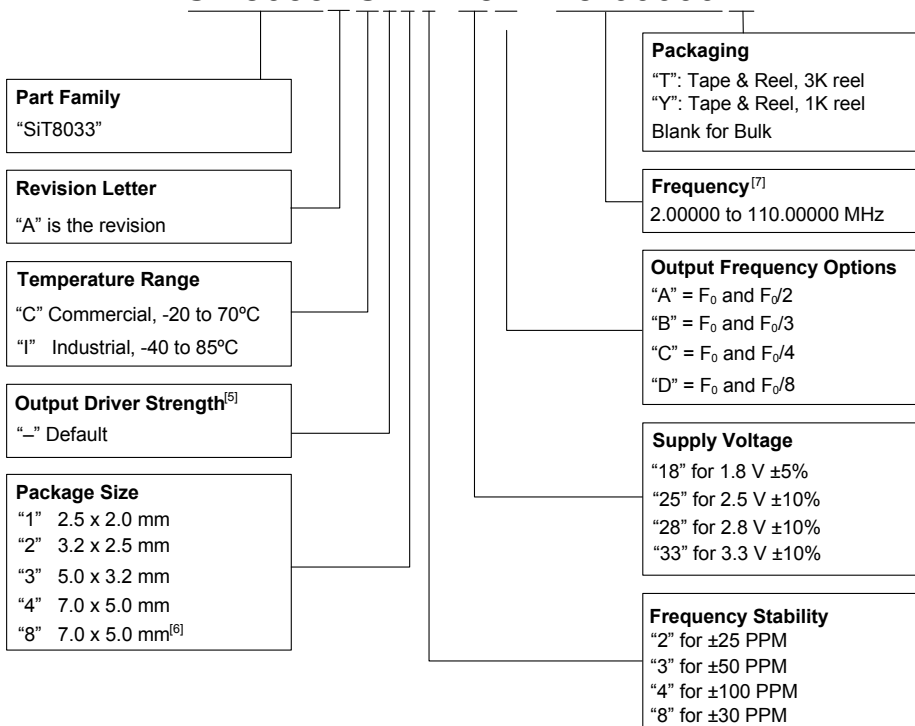
#### Notes:

- Y denotes manufacturing origin and XXXX denotes manufacturing lot number. The value of "Y" will depend on the assembly location of the device.
- A capacitor of value 0.1  $\mu$ F between Vdd and GND is recommended.
- 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](#).

## SiT8033AC-14-18A-48.00000T



#### Notes:

5. Contact SiTime for different drive strength options for driving higher loads or reducing EMI.
6. Without Center Pad.
7. Frequency is for  $F_0$  (see table below for minimum output frequencies).

### 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 |
| $\pm 20$                  | C (-20 to +70°C)  | ✓              | ✓     | ✓     | ✓     |
|                           | I (-40 to +85°C)  | —              | —     | —     | —     |
| $\pm 25$                  | C (-20 to +70°C)  | ✓              | ✓     | ✓     | ✓     |
|                           | I (-40 to +85°C)  | ✓              | ✓     | ✓     | ✓     |
| $\pm 30$                  | C (-20 to +70°C)  | ✓              | ✓     | ✓     | ✓     |
|                           | I (-40 to +85°C)  | ✓              | ✓     | ✓     | ✓     |
| $\pm 50$                  | C (-20 to +70°C)  | ✓              | ✓     | ✓     | ✓     |
|                           | I (-40 to +85°C)  | ✓              | ✓     | ✓     | ✓     |

### Frequency Select Options vs. Minimum Output Frequency

| Output Frequency Option | Minimum Frequency ( $F_0$ ) |
|-------------------------|-----------------------------|
| A = $F_0$ and $F_0/2$   | 2 MHz                       |
| B = $F_0$ and $F_0/3$   | 3 MHz                       |
| C = $F_0$ and $F_0/4$   | 4 MHz                       |
| D = $F_0$ and $F_0/8$   | 8 MHz                       |

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