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SiT8103

High Performance 1-110 MHz Oscillator



Features, Benefits and Applications

- MEMS oscillator with LVCMOS/LVTTL compatible output
- 1-110 MHz frequency range
- Frequency stability as low as ± 20 PPM
- Typical current consumption of 6.1 mA in active mode
- Standby or output enable modes
- 1.8V, 2.5V - 3.3V supply voltage
- SoftEdge™ configurable rise/fall time for driving higher loads or EMI reduction.
- 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
- Ultra short lead time
- Ideal for consumer electronics: video, set top boxes, HDTV, DVR, scanners, printers, IP camera, etc.
- Ideal for high-speed serial protocols: Ethernet, USB, SATA, SAS, Fibre Channel, Firewire, PCI Express

Specifications

Electrical Characteristics^[1]

| 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. ± 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 | Any voltage between 2.5V and 3.3V is supported with 1 decimal point resolution. |
| | | 2.25 | 2.5 | 2.75 | V | |
| | | 2.52 | 2.8 | 3.08 | V | |
| | | 2.97 | 3.3 | 3.63 | V | |
| Current Consumption | Idd | – | 6.7 | 7.5 | mA | No load condition, f = 20 MHz, Vdd = 2.5 V, 2.8 V or 3.3 V |
| | | – | 6.1 | 6.7 | mA | No load condition, f = 20 MHz, Vdd = 1.8 V |
| Standby Current | I_std | – | 2.4 | 4.3 | μ A | \overline{ST} = GND, Vdd = 3.3 V, Output is Weakly Pulled Down |
| | | – | 1.2 | 2.2 | μ A | \overline{ST} = GND, Vdd = 2.5 or 2.8 V, Output is Weakly Pulled Down |
| | | – | 0.4 | 0.8 | μ 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 | 15pF load, 20% - 80% Vdd=2.5V, 2.8V or 3.3V |
| | | – | 1.3 | 2.5 | ns | 15pF load, 20% - 80% Vdd=1.8V |
| | | – | 1.9 | 2.6 | ns | 30pF load, 20% - 80% Vdd=2.5V, 2.8V or 3.3V |
| | | – | 2.3 | 3.3 | ns | 30pF load, 20% - 80% Vdd=1.8V |
| | | – | 2.9 | 3.9 | ns | 45pF load, 20% - 80% Vdd=2.5V, 2.8V or 3.3V |
| | | – | 3.4 | 4.6 | ns | 45pF load, 20% - 80% Vdd=1.8V |
| Output Voltage High | VOH | 90% | – | – | Vdd | IOH = -4 mA (Vdd = 3.3 V) |
| Output Voltage Low | VOL | – | – | 10% | Vdd | IOH = -3 mA (Vdd = 2.8 V and Vdd = 2.5 V) IOH = -2 mA (Vdd = 1.8 V) |
| 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_start | – | – | 10 | ms | Measured from the time Vdd reaches its rated minimum value |
| Resume Time | T_resume | – | 3.0 | 4 | ms | Measured from the time \overline{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 @ BW: 900 kHz to 7.5 MHz, VDD = 2.5 V to 3.3 V |
| | | – | 0.8 | – | ps | f = 75 MHz @ BW: 900 kHz to 7.5 MHz, VDD = 1.8 V |

Note:

- All electrical specifications in the above table are measured with 15pF output load, unless stated otherwise in the Condition. For more information about SoftEdge™ rise/fall time for driving higher output load or reducing EMI, download <http://www.sitime.com/support2/documents/AN10022-rise-and-fall-time-rev1.1.pdf>.

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Pin Description Tables

| Pin #1 Functionality |
|------------------------------------------------------------|
| OE |
| H or Open ^[2] : specified frequency output |
| L: output is high impedance |
| ST |
| 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

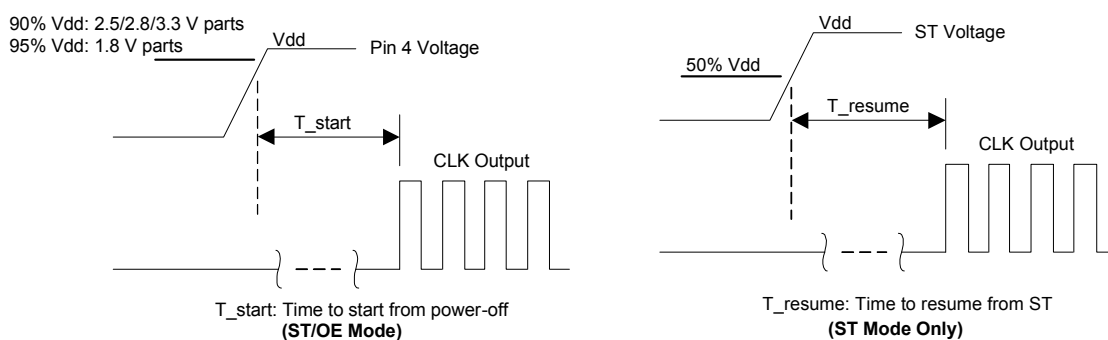
Attempted operation outside the absolute maximum ratings of the part may cause permanent damage to the part. Actual performance of the IC is only guaranteed within the operational specifications, not at absolute maximum ratings.

| Parameter | Min. | Max. | Unit |
|----------------------------------------------------------------------|--------|------|-------|
| Storage Temperature | -65 | 150 | °C |
| VDD | -0.5 | 4 | V |
| Electrostatic Discharge | - | 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 Sensitivity Level | MSL1 @ 260°C |

Startup and Resume Timing Diagram



Note:

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

■ Dimensions and Land Patterns

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| Package Size – Dimensions (Unit: mm) ¹ | Recommended Land Pattern (Unit: mm) ⁵ |
|---------------------------------------------------|--------------------------------------------------|
| <p>2.5 x 2.0 x 0.75 mm</p> | |
| <p>3.2 x 2.5 x 0.75 mm</p> | |
| <p>5.0 x 3.2 x 0.75 mm</p> | |
| <p>7.0 x 5.0 x 0.90 mm</p> | |

Notes:

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

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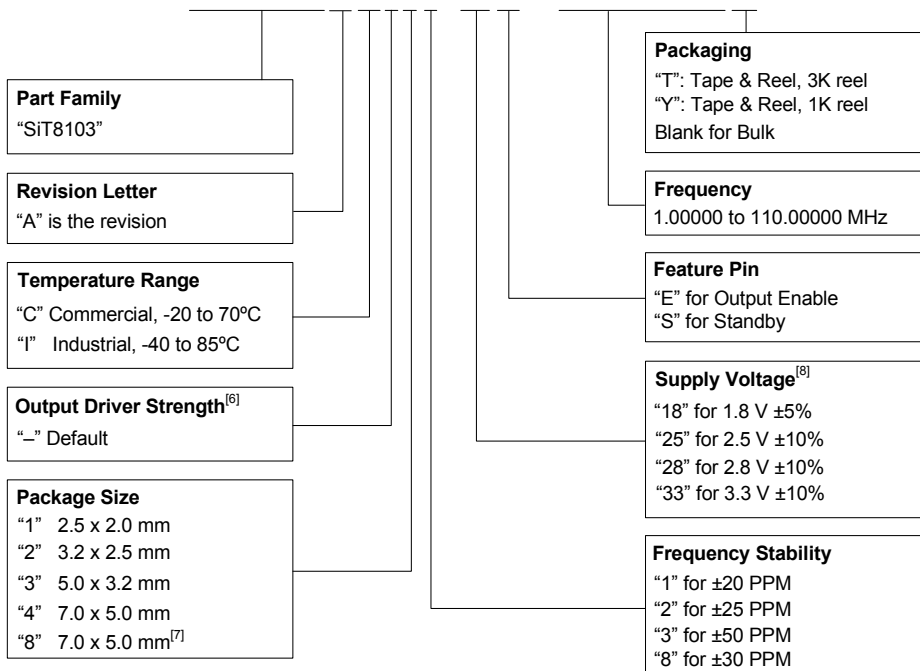
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Part No. Guide - How to Order

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

SiT8103AC-13-18E - 105.12345T



Notes:

- 6. Contact SiTime for different drive strength options for driving loads with faster rise/fall time spec than those shown in the electrical table, or reducing EMI.
- 7. Without Center Pad.
- 8. Supply voltage can be configured to any voltage up to 1 decimal place between 2.5V and 3.3V.

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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