# SiT9045 PRELIMINARY

1 to 150 MHz, Endura™ Series EMI Reduction Oscillator

## Features

- Best acceleration sensitivity of 0.1 ppb/*g*
- Spread spectrum for EMI reduction
  - Wide spread % option
    - Center spread: from ±0.125% to ±2%, ±0.125% step size
    - Down spread: -0.25% to -4% with -0.25% step size
  - Spread profile option: Triangular, Hershey-kiss, Random
- Programmable rise/fall time for EMI reduction: 8 options, 0.25 to 40 ns
- Extended temperature range (-55°C to 125°C)
- Any frequency between 1 MHz and 150 MHz accurate to 6 decimal places
- Pin1 modes: Standby, output enable, or spread disable
- LVCMOS output
- AEC-Q100 qualified
- Industry-standard packages
  - QFN: 2.0 x 1.6 $mm^2$, 2.5 x 2.0 $mm^2$, 3.2 x 2.5 $mm^2$
- RoHS and REACH compliant, Pb-free, Halogen-free and Antimony-free
- Contact SiTime for up-screening and LAT programs

## Applications

- Avionics systems
- Field communication systems
- Telemetry applications

## Electrical Specifications

### Table 1. Electrical Characteristics

All Min and Max limits are specified over temperature and rated operating voltage with 15 pF output load unless otherwise stated. Typical values are at 25°C and 3.3V supply voltage.

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| **Frequency Range** | | | | | | |
| **Output Frequency Range** | f | 1 | – | 150 | MHz | |
| **Frequency Stability and Aging** | | | | | | |
| **Frequency Stability**[1] | F_stab | -50 | – | +50 | ppm | Inclusive of initial tolerance at 25°C, 1st year aging at 25°C, and variations over operating temperature, rated power supply voltage. Spread = Off. |
| **Operating Temperature Range** | | | | | | |
| **Operating Temperature Range** | T_use | -40 | – | +85 | °C | AEC-Q100 Grade 3 |
| | | -40 | – | +105 | °C | AEC-Q100 Grade 2 |
| | | -40 | – | +125 | °C | AEC-Q100 Grade 1 |
| | | -55 | – | +125 | °C | Extended cold AEC-Q100 Grade 1 |
| **Rugged Characteristics** | | | | | | |
| **Acceleration (g) sensitivity, Gamma Vector** | F_g | – | – | 0.1 | ppb/*g* | Low sensitivity grade; total gamma over 3 axes; 15 Hz to 2 kHz; MIL-PRF-55310, computed per section 4.8.18.3.1 |

**Table 1. Electrical Characteristics (continued)**

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| **Supply Voltage and Current Consumption** | | | | | | |
| **Supply Voltage** | Vdd | 1.62 | 1.8 | 1.98 | V | |
| | | 2.25 | 2.5 | 2.75 | V | |
| | | 2.52 | 2.8 | 3.08 | V | |
| | | 2.7 | 3.0 | 3.3 | V | |
| | | 2.97 | 3.3 | 3.63 | V | |
| | | 2.25 | – | 3.63 | V | |
| **Current Consumption** | Idd | – | 7.9 | 9.5 | mA | No load condition, f = 148.5 MHz, Vdd = 2.5V to 3.3V |
| | | – | 6.6 | 8.0 | mA | No load condition, f = 148.5 MHz, Vdd = 1.8V |
| **OE Disable Current** | I_OD | – | 5.3 | 6.5 | mA | f = 148.5 MHz, Vdd = 2.5V to 3.3V, OE = GND, Output in high-Z state |
| | | – | 5.0 | 6.0 | mA | f = 148.5 MHz, Vdd = 1.8V, OE = GND, Output in high-Z state |
| **Standby Current** | I_std | – | 2.6 | 9.0 | µA | $\overline{ST}$ = GND, Vdd = 2.5V to 3.3V, Output is weakly pulled down |
| **LVCMOS Output Characteristics** | | | | | | |
| **Duty Cycle** | DC | 45 | – | 55 | % | f = 1 to 137 MHz |
| | | 43 | – | 57 | % | f = 137.000001 to 150 MHz |
| **Rise/Fall Time** | Tr, Tf | – | 1.2 | 2.0 | ns | 20% - 80%, default derive strength |
| **Output High Voltage** | VOH | 90% | – | – | Vdd | IOH = -4 mA (Vdd = 3.0V or 3.3V)<br>IOH = -3 mA (Vdd = 2.8V and Vdd = 2.5V)<br>IOH = -2 mA (Vdd = 1.8V) |
| **Output Low Voltage** | VOL | – | – | 10% | Vdd | IOL = 4 mA (Vdd = 3.0V or 3.3V)<br>IOL = 3 mA (Vdd = 2.8V and Vdd = 2.5V)<br>IOL = 2 mA (Vdd = 1.8V) |
| **Input Characteristics** | | | | | | |
| **Input High Voltage** | VIH | 70% | – | – | Vdd | Pin 1, OE or $\overline{ST}$ |
| **Input Low Voltage** | VIL | – | – | 30% | Vdd | Pin 1, OE or $\overline{ST}$ |
| **Input Leakage Current** | IL | – | -2.3 | – | µA | Pin1, $\overline{ST}$ logic low |
| | | – | 2.8 | – | µA | Pin1, $\overline{ST}$ logic high |
| | | – | -24.6 | – | µA | Pin1, OE / SD logic low |
| | | – | 3.2 | – | µA | Pin1, OE / SD logic high |
| **Startup and Resume Timing** | | | | | | |
| **Startup Time** | T_start | – | – | 10 | ms | Measured from the time Vdd reaches its rated minimum value |
| **Enable/Disable Time** | T_oe | – | – | 215 | ns | f = 148.5 MHz. For other frequencies, T_oe = 100 ns + 3 * cycles |
| **Resume Time** | T_resume | – | – | 10 | ms | Measured from the time ST pin crosses 50% threshold |
| **Spread Enable Time** | T_sde | – | – | 4 | µs | Measured from the time SD pin crosses 50% threshold |
| **Spread Disable Time** | T_sdde | – | – | 55 | µs | Measured from the time SD pin crosses 50% threshold |
| **Jitter** | | | | | | |
| **Cycle-to-cycle jitter** | T_ccj | – | 10.5 | – | ps | f = 148.5 MHz, Vdd = 2.5 to 3.3V, Spread = ON (or OFF) |
| | | – | 10.8 | – | ps | f = 148.5 MHz, Vdd = 1.8V, Spread = ON (or OFF) |

**Note:**
1. Contact SiTime for ±20/25 ppm options.

### Table 2. Spread Spectrum %

| Ordering Code | Center Spread (%) | Down Spread (%) |
|---|---|---|
| A | ±0.125 | -0.25 |
| B | ±0.250 | -0.50 |
| C | ±0.390 | -0.78 |
| D | ±0.515 | -1.04 |
| E | ±0.640 | -1.29 |
| F | ±0.765 | -1.55 |
| G | ±0.905 | -1.84 |
| H | ±1.030 | -2.10 |
| I | ±1.155 | -2.36 |
| J | ±1.280 | -2.62 |
| K | ±1.420 | -2.91 |
| L | ±1.545 | -3.18 |
| M | ±1.670 | -3.45 |
| N | ±1.795 | -3.71 |
| O | ±1.935 | -4.01 |
| P | ±2.060 | -4.28 |

### Table 3. Spread Profile[2]

| Spread Profile |
|---|
| Triangular |
| Hershey-kiss |
| Random |

**Note:**

2. In both Triangular and Hershey-kiss profiles, modulation rate is employed with a frequency of ~31.25 kHz. In random profile, modulation rate is ~ 8.6 kHz.

### Table 4. Pin Description

| Pin | Symbol | Functionality | |
|---|---|---|---|
| 1 | OE / $\overline{ST}$ / NC / SD | Output Enable | H[3]: specified frequency output<br>L: output is high impedance. Only output driver is disabled. |
| | | Standby | H[3]: specified frequency output<br>L: output is low (week pull down). Device goes to sleep mode. Supply current reduced to I_std. |
| | | No Connect | Pin1 has no function (Any voltage between 0 and Vdd or Open) |
| | | Spread Disable | H: Spread = ON<br>L: Spread = OFF |
| 2 | GND | Power | Electrical ground |
| 3 | OUT | Output | Oscillator output |
| 4 | VDD | Power | Power supply voltage[4] |

**Top View**

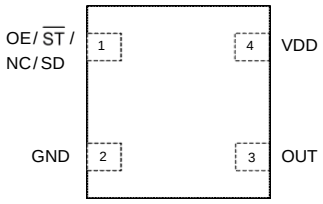



**Figure 1. Pin Assignments**

**Notes:**

3. In OE or $\overline{ST}$ mode, a pull-up resistor of 10 kΩ or less is recommended if pin 1 is not externally driven. If pin 1 needs to be left floating, use the NC option.
4. A capacitor of value 0.1 µF or higher between Vdd and GND is required.

### Table 5. Absolute Maximum Limits

Attempted operation outside the absolute maximum ratings 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 |
| **Soldering Temperature (follow standard Pb free soldering guidelines)** | – | 260 | °C |
| **Junction Temperature[5]** | – | 150 | °C |

**Note:**

5. Exceeding this temperature for extended period of time may damage the device.

### Table 6. Maximum Operating Junction Temperature[6]

| Max Operating Temperature (ambient) | Maximum Operating Junction Temperature |
|---|---|
| 85°C | 95°C |
| 105°C | 115°C |
| 125°C | 135°C |

**Note:**
6. Datasheet specifications are not guaranteed if junction temperature exceeds the maximum operating junction temperature.

### Table 7. 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** |

## Timing Diagrams

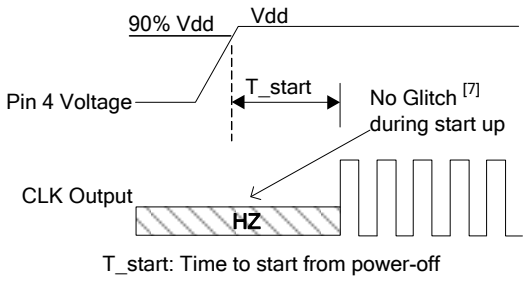



**Figure 2. Startup Timing**

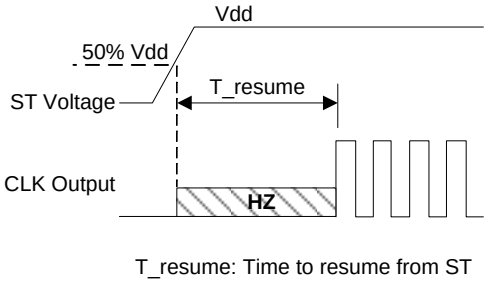



**Figure 3. Standby Resume Timing (ST Mode Only)**

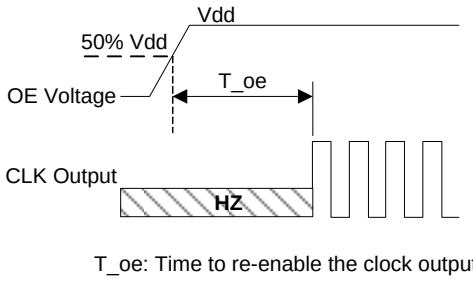



**Figure 4. OE Enable Timing (OE Mode Only)**

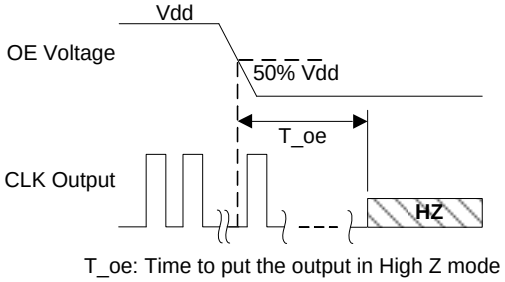



**Figure 5. OE Disable Timing (OE Mode Only)**

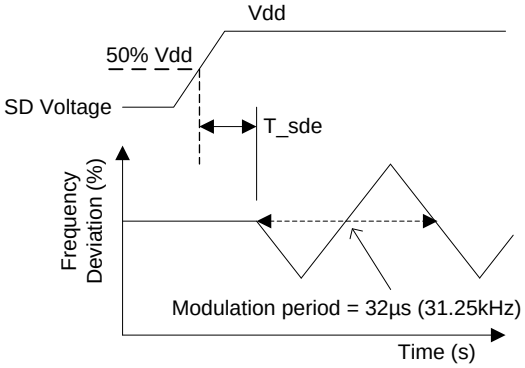



**Figure 6. SD Enable Timing (SD Mode Only)**

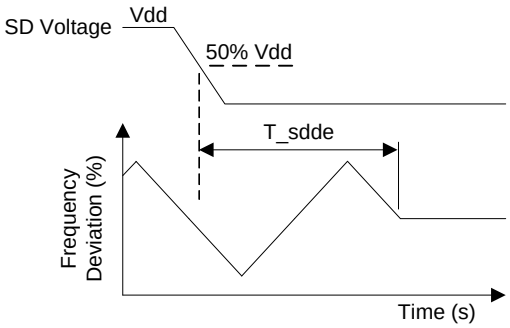



**Figure 7. SD Diable Timing (SD Mode Only)**

**Note:**

7. SiT9045 has “no runt” pulses and “no glitch” output during startup or resume.

## Performance Plots

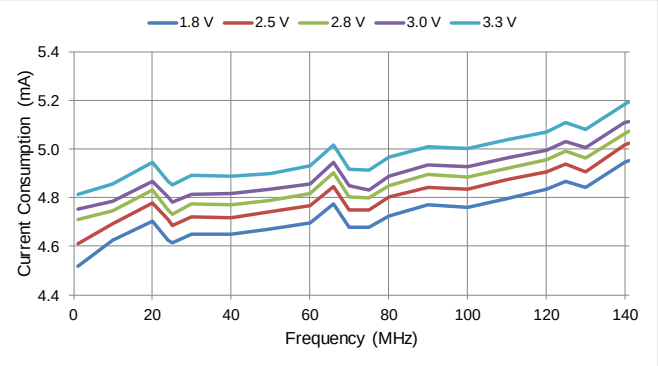



**Figure 8. Current Consumption vs Frequency**

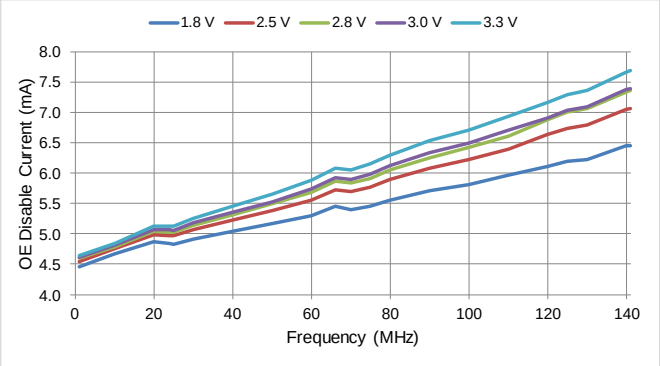



**Figure 9. OE Disable Current vs Frequency**

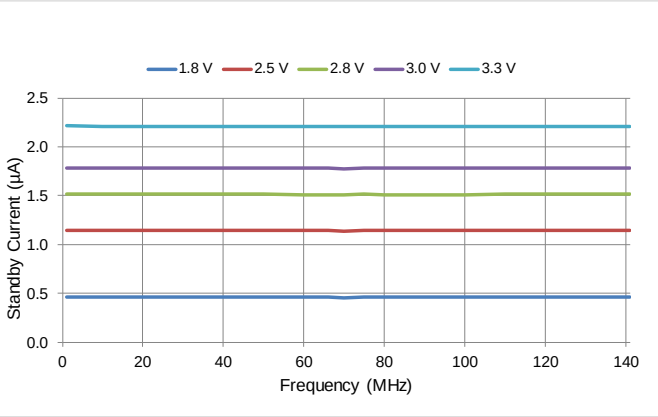



**Figure 10. Standby Current vs Frequency**

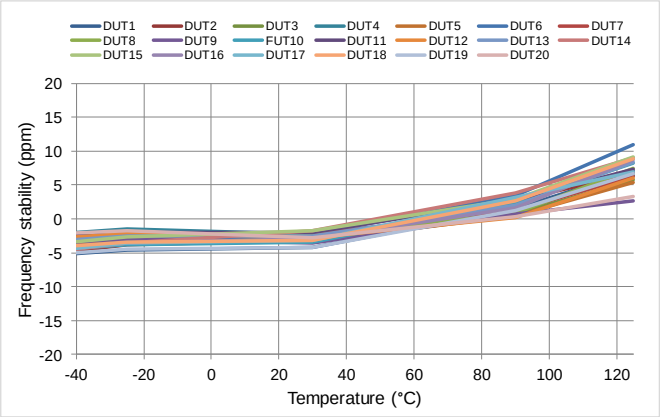



**Figure 11. Frequency vs Temperature**

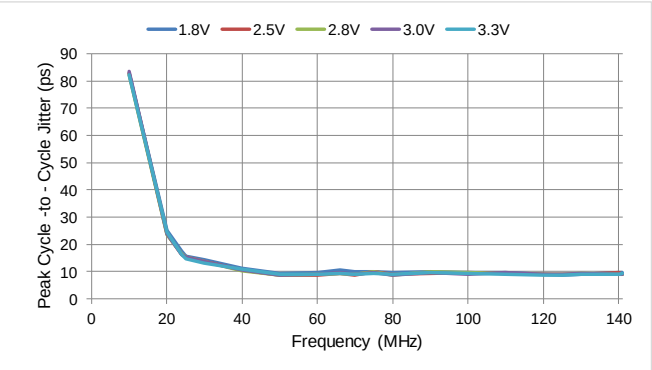



**Figure 12. Cycle-to-cycle Jitter vs Frequency**
(Spread profile: Triangular, Spread type: center, Spread percentage: ±2.060%)

## Rise/Fall Time (20% to 80%) vs $C_{LOAD}$ Tables

**Table 8. Vdd = 1.8V Rise/Fall Times for Specific $C_{LOAD}$**

| Rise/Fall Time Typ (ns) | | | | | |
|---|---|---|---|---|---|
| **Drive Strength \ $C_{LOAD}$** | **5 pF** | **15 pF** | **30 pF** | **45 pF** | **60 pF** |
| **L** | 6.16 | 11.61 | 22.00 | 31.27 | 39.91 |
| **A** | 3.19 | 6.35 | 11.00 | 16.01 | 21.52 |
| **R** | 2.11 | 4.31 | 7.65 | 10.77 | 14.47 |
| **B** | 1.65 | 3.23 | 5.79 | 8.18 | 11.08 |
| **T** | 0.93 | 1.91 | 3.32 | 4.66 | 6.48 |
| **E** | 0.78 | 1.66 | 2.94 | 4.09 | 5.74 |
| **U** | 0.70 | 1.48 | 2.64 | 3.68 | 5.09 |
| **F or "-": default** | 0.65 | 1.30 | 2.40 | 3.35 | 4.56 |

**Table 9. Vdd = 2.5V Rise/Fall Times for Specific $C_{LOAD}$**

| Rise/Fall Time Typ (ns) | | | | | |
|---|---|---|---|---|---|
| **Drive Strength \ $C_{LOAD}$** | **5 pF** | **15 pF** | **30 pF** | **45 pF** | **60 pF** |
| **L** | 4.13 | 8.25 | 12.82 | 21.45 | 27.79 |
| **A** | 2.11 | 4.27 | 7.64 | 11.20 | 14.49 |
| **R** | 1.45 | 2.81 | 5.16 | 7.65 | 9.88 |
| **B** | 1.09 | 2.20 | 3.88 | 5.86 | 7.57 |
| **T** | 0.62 | 1.28 | 2.27 | 3.51 | 4.45 |
| **E or "-": default** | 0.54 | 1.00 | 2.01 | 3.10 | 4.01 |
| **U** | 0.43 | 0.96 | 1.81 | 2.79 | 3.65 |
| **F** | 0.34 | 0.88 | 1.64 | 2.54 | 3.32 |

**Table 10. Vdd = 2.8V Rise/Fall Times for Specific $C_{LOAD}$**

| Rise/Fall Time Typ | | | | | |
|---|---|---|---|---|---|
| **Drive Strength \ $C_{LOAD}$** | **5 pF** | **15 pF** | **30 pF** | **45 pF** | **60 pF** |
| **L** | 3.77 | 7.54 | 12.28 | 19.57 | 25.27 |
| **A** | 1.94 | 3.90 | 7.03 | 10.24 | 13.34 |
| **R** | 1.29 | 2.57 | 4.72 | 7.01 | 9.06 |
| **B** | 0.97 | 2.00 | 3.54 | 5.43 | 6.93 |
| **T** | 0.55 | 1.12 | 2.08 | 3.22 | 4.08 |
| **E or "-": default** | 0.44 | 1.00 | 1.83 | 2.82 | 3.67 |
| **U** | 0.34 | 0.88 | 1.64 | 2.52 | 3.30 |
| **F** | 0.29 | 0.81 | 1.48 | 2.29 | 2.99 |

**Table 11. Vdd = 3.0V Rise/Fall Times for Specific $C_{LOAD}$**

| Rise/Fall Time Typ (ns) | | | | | |
|---|---|---|---|---|---|
| **Drive Strength \ $C_{LOAD}$** | **5 pF** | **15 pF** | **30 pF** | **45 pF** | **60 pF** |
| **L** | 3.60 | 7.21 | 11.97 | 18.74 | 24.30 |
| **A** | 1.84 | 3.71 | 6.72 | 9.86 | 12.68 |
| **R** | 1.22 | 2.46 | 4.54 | 6.76 | 8.62 |
| **B** | 0.89 | 1.92 | 3.39 | 5.20 | 6.64 |
| **T or "-": default** | 0.51 | 1.00 | 1.97 | 3.07 | 3.90 |
| **E** | 0.38 | 0.92 | 1.72 | 2.71 | 3.51 |
| **U** | 0.30 | 0.83 | 1.55 | 2.40 | 3.13 |
| **F** | 0.27 | 0.76 | 1.39 | 2.16 | 2.85 |

**Table 12. Vdd = 3.3V Rise/Fall Times for Specific $C_{LOAD}$**

| Rise/Fall Time Typ (ns) | | | | | |
|---|---|---|---|---|---|
| **Drive Strength \ $C_{LOAD}$** | **5 pF** | **15 pF** | **30 pF** | **45 pF** | **60 pF** |
| **L** | 3.39 | 6.88 | 11.63 | 17.56 | 23.59 |
| **A** | 1.74 | 3.50 | 6.38 | 8.98 | 12.19 |
| **R** | 1.16 | 2.33 | 4.29 | 6.04 | 8.34 |
| **B** | 0.81 | 1.82 | 3.22 | 4.52 | 6.33 |
| **T or "-": default** | 0.46 | 1.00 | 1.86 | 2.60 | 3.84 |
| **E** | 0.33 | 0.87 | 1.64 | 2.30 | 3.35 |
| **U** | 0.28 | 0.79 | 1.46 | 2.05 | 2.93 |
| **F** | 0.25 | 0.72 | 1.31 | 1.83 | 2.61 |

## Programmable Drive Strength

The SiT9045 includes a programmable drive strength feature to provide a simple, flexible tool to optimize the clock rise/fall time for specific applications. Benefits from the programmable drive strength feature are:

- Improves system radiated electromagnetic interference (EMI) by slowing down the clock rise/fall time.
- Improves the downstream clock receiver's (RX) jitter by decreasing (speeding up) the clock rise/fall time.
- Ability to drive large capacitive loads while maintaining full swing with sharp edge rates.

For more detailed information about rise/fall time control and drive strength selection, see the SiTime Application Notes section.

### EMI Reduction by Slowing Rise/Fall Time

Figure 13 shows the harmonic power reduction as the rise/fall times are increased (slowed down). The rise/fall times are expressed as a ratio of the clock period. For the ratio of 0.05, the signal is very close to a square wave. For the ratio of 0.45, the rise/fall times are very close to near-triangular waveform. These results, for example, show that the 11$^{th}$ clock harmonic can be reduced by 35 dB if the rise/fall edge is increased from 5% of the period to 45% of the period.

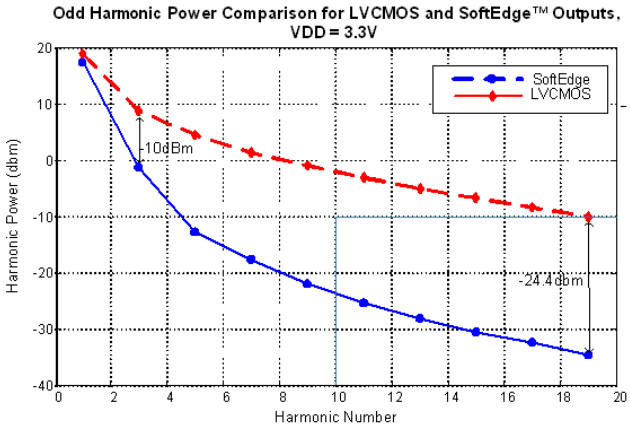



**Figure 13. Harmonic EMI reduction as a function of slower rise/fall time**

### Jitter Reduction with Faster Rise/Fall Time

Power supply noise can be a source of jitter for the downstream chipset. One way to reduce this jitter is to increase rise/fall time (edge rate) of the input clock. Some chipsets would require faster rise/fall time in order to reduce their sensitivity to this type of jitter. The SiT9045 provides up to 3 additional high drive strength settings for very fast rise/fall time. Refer to the Rise/Fall Time Tables to determine the proper drive strength.

### High Output Load Capability

The rise/fall time of the input clock varies as a function of the actual capacitive load the clock drives. At any given drive strength, the rise/fall time becomes slower as the output load increases. As an example, for a 3.3V SiT9045 device with default drive strength setting, the typical rise/fall time is 1.1 ns for 15 pF output load. The typical rise/fall time slows down to 2.9 ns when the output load increases to 45 pF. One can choose to speed up the rise/fall time to 1.9 ns by then increasing the drive strength setting on the SiT9045.

The SiT9045 can support up to 60 pF or higher in maximum capacitive loads with up to 3 additional drive strength settings. Refer to the Rise/Tall Time Tables to determine the proper drive strength for the desired combination of output load vs. rise/fall time.

### SiT9045 Drive Strength Selection

Tables 8 through 12 define the rise/fall time for a given capacitive load and supply voltage.

1. Select the table that matches the SiT9045 nominal supply voltage (1.8V, 2.5V, 2.8V, 3.3V).
2. Select the capacitive load column that matches the application requirement (15 pF to 60 pF)
3. Under the capacitive load column, select the desired rise/fall times.
4. The left-most column represents the part number code for the corresponding drive strength.
5. Add the drive strength code to the part number for ordering purposes.

### Calculating Maximum Frequency

Based on the rise and fall time data given in Tables 8 through 12, the maximum frequency the oscillator can operate with guaranteed full swing of the output voltage over temperature as follows:

$$\text{Max Frequency} = \frac{1}{5 \times \text{Trf\_20/80}}$$

where Trf_20/80 is the typical value for 20%-80% rise/fall time.

### Example 1

Calculate $f_{MAX}$ for the following condition:

- Vdd = 1.8V (Table 8)
- Capacitive Load: 30 pF
- Desired Tr/f time = 3 ns (rise/fall time part number code = E)

Part number for the above example:

SiT9045AA**E**12-18EAA66.666660

Drive strength code is inserted here. Default setting is "-"

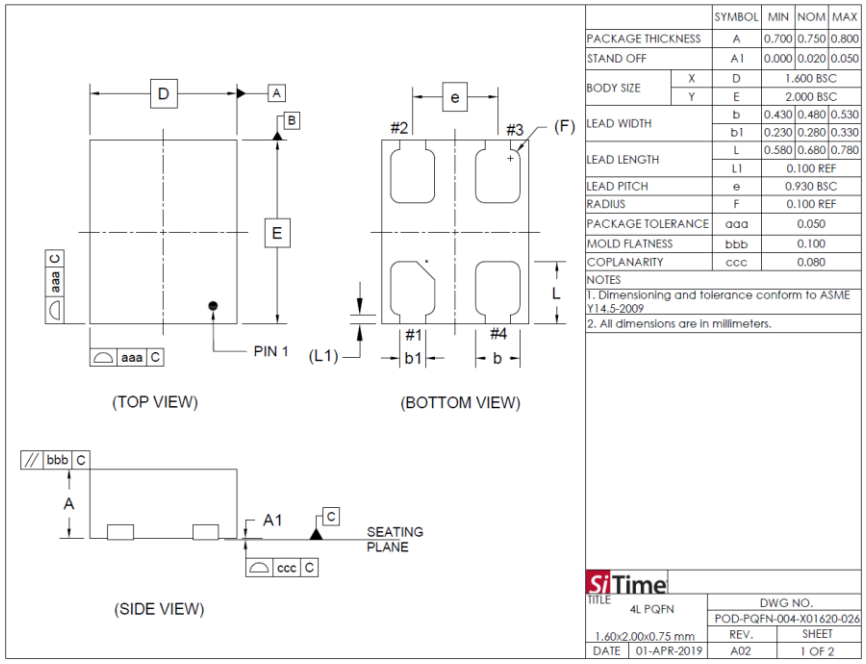
### Supplied Voltage

The supplied voltage must always stay within the range from minimum to maximum limits of rated operating voltage. When supplied voltage drops below the range and return back within the limits from intermediate voltage level, the device may have no output clock and/or malfunction.

## Dimensions and Patterns

| Package Size – Dimensions (Unit: mm)[8] | Recommended Land Pattern (Unit: mm)[9] |
|---|---|

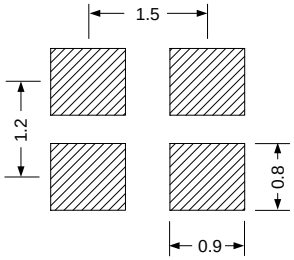
**2.0 x 1.6 x 0.75 mm**



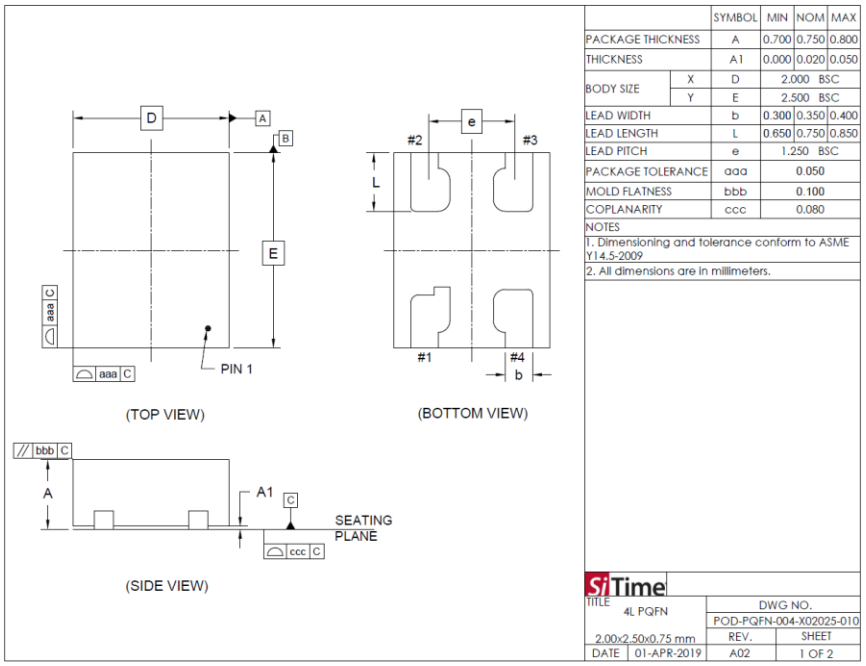

| | | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|---|
| PACKAGE THICKNESS | | A | 0.700 | 0.750 | 0.800 |
| STAND OFF | | A1 | 0.000 | 0.020 | 0.050 |
| BODY SIZE | X | D | | 1.600 BSC | |
| | Y | E | | 2.000 BSC | |
| LEAD WIDTH | | b | 0.430 | 0.480 | 0.530 |
| | | b1 | 0.230 | 0.280 | 0.330 |
| LEAD LENGTH | | L | 0.580 | 0.680 | 0.780 |
| | | L1 | | 0.100 REF | |
| LEAD PITCH | | e | | 0.930 BSC | |
| RADIUS | | F | | 0.100 REF | |
| PACKAGE TOLERANCE | | aaa | | 0.050 | |
| MOLD FLATNESS | | bbb | | 0.100 | |
| COPLANARITY | | ccc | | 0.080 | |

NOTES
1. Dimensioning and tolerance conform to ASME Y14.5-2009
2. All dimensions are in millimeters.

| | | |
|---|---|---|
| TITLE | 4L PQFN 1.60x2.00x0.75 mm | DWG NO. POD-PQFN-004-X01620-026 |
| | | REV. A02 |
| DATE | 01-APR-2019 | SHEET 1 OF 2 |



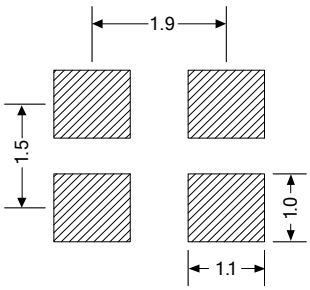

**2.5 x 2.0 x 0.75 mm**




| | | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|---|
| PACKAGE THICKNESS | | A | 0.700 | 0.750 | 0.800 |
| THICKNESS | | A1 | 0.000 | 0.020 | 0.050 |
| BODY SIZE | X | D | | 2.000 BSC | |
| | Y | E | | 2.500 BSC | |
| LEAD WIDTH | | b | 0.300 | 0.350 | 0.400 |
| LEAD LENGTH | | L | 0.650 | 0.750 | 0.850 |
| LEAD PITCH | | e | | 1.250 BSC | |
| PACKAGE TOLERANCE | | aaa | | 0.050 | |
| MOLD FLATNESS | | bbb | | 0.100 | |
| COPLANARITY | | ccc | | 0.080 | |

NOTES
1. Dimensioning and tolerance conform to ASME Y14.5-2009
2. All dimensions are in millimeters.

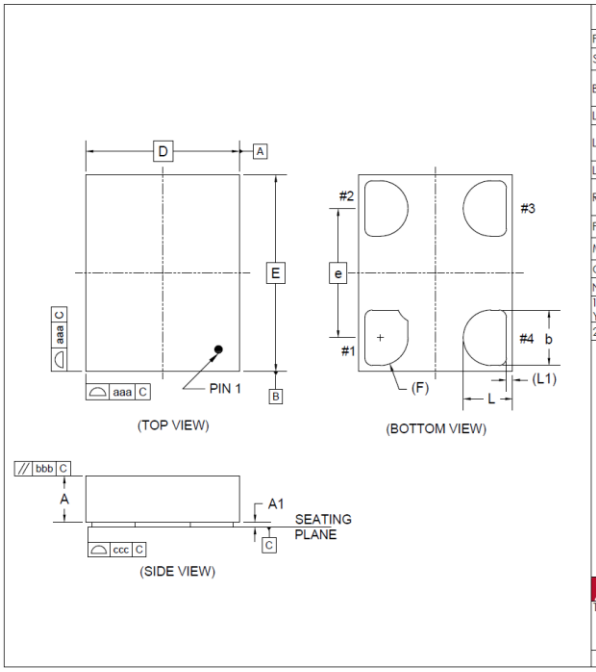
| | | |
|---|---|---|
| TITLE | 4L PQFN 2.00x2.50x0.75 mm | DWG NO. POD-PQFN-004-X02025-010 |
| | | REV. A02 |
| DATE | 01-APR-2019 | SHEET 1 OF 2 |



## Dimensions and Patterns

| Package Size – Dimensions (Unit: mm)[8] | Recommended Land Pattern (Unit: mm)[9] |
|---|---|

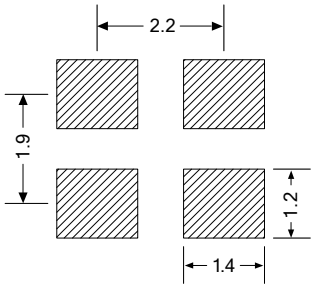
**3.2 x 2.5 x 0.75 mm**




| | | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|---|
| PACKAGE THICKNESS | | A | 0.700 | 0.750 | 0.800 |
| STAND OFF | | A1 | 0.000 | 0.020 | 0.050 |
| BODY SIZE | X | D | | 2.500 BSC | |
| | Y | E | | 3.200 BSC | |
| LEAD WIDTH | | b | 0.800 | 0.900 | 1.000 |
| LEAD LENGTH | | L | 0.700 | 0.800 | 0.900 |
| | | L1 | | 0.100 REF | |
| LEAD PITCH | | e | | 2.100 BSC | |
| RADIUS | | F | | 0.450 REF | |
| | | F1 | | 0.120 REF | |
| PACKAGE TOLERANCE | | aaa | | 0.050 | |
| MOLD FLATNESS | | bbb | | 0.100 | |
| COPLANARITY | | ccc | | 0.080 | |

NOTES
1. Dimensioning and tolerance conform to ASME Y14.5-2009
2. All dimensions are in millimeters.

| | | |
|---|---|---|
| TITLE: 4L PQFN | DWG NO. | POD-PQFN-004-X03225-002 |
| 3.20x2.50x0.75 mm | REV. | SHEET |
| DATE: 01-APR-2019 | A04 | 1 OF 2 |




**Notes:**

8. 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.
9. A capacitor of value 0.1 µF or higher between Vdd and GND is required.

## Ordering Information

The following part number guide is for reference only. To customize and build an exact part number, use the SiTime Part Number Generator.

SiT9045AA-71-18EAA25.000625D

**Part Family**
"SiT9045"

**Revision Letter**
"A" is the revision

**Temperature Range**
"I" -40ºC to 85ºC, AEC-Q100 Grade3
"E" -40ºC to 105ºC, AEC-Q100 Grade2
"A" -40ºC to 125ºC, AEC-Q100 Grade1
"M" -55ºC to 125ºC, Ext cold AEC-Q100 Grade1

**Output Drive Strength**
"–" Default (datasheet limits)
See Tables 8 to 12 for rise/fall times

| | |
|---|---|
| "L" | "T" |
| "A" | "E" |
| "R" | "U" |
| "B" | "F" |

**Package Size**
"7" 2.0 x 1.6 mm
"1" 2.5 x 2.0 mm
"2" 3.2 x 2.5 mm

**Frequency Stability**[10]
"3" for ±50 ppm

**Spread Type and Profile**
"-" Center spread & Triangular (Default)
"H" Center spread & Hershey Kiss
"R" Center spread & Random
"D" Down spread & Triangular
"G" Down spread & Hershey Kiss
"Q" Down spread & Random

**Packing Method**
"D": 8 mm Tape & Reel, 3ku reel
"E": 8 mm Tape & Reel, 1ku reel
Blank for Bulk

**Frequency**[11]
1.000000 to 150.000000 MHz

**Special Features**
"A" for Low *g*-Sensitivity, 0.1 ppb/*g*

**Spread Percentage**[11]
"-" no spread

| | | Center: | Down: |
|---|---|---|---|
| "A" | for | ±0.125, | -0.25 |
| "B" | for | ±0.250, | -0.50 |
| "C" | for | ±0.390, | -0.78 |
| "D" | for | ±0.515, | -1.04 |
| "E" | for | ±0.640, | -1.29 |
| "F" | for | ±0.765, | -1.55 |
| "G" | for | ±0.905, | -1.84 |
| "H" | for | ±1.030, | -2.10 |
| "I" | for | ±1.155, | -2.36 |
| "J" | for | ±1.280, | -2.62 |
| "K" | for | ±1.420, | -2.91 |
| "L" | for | ±1.545, | -3.18 |
| "M" | for | ±1.670, | -3.45 |
| "N" | for | ±1.795, | -3.71 |
| "O" | for | ±1.935, | -4.01 |
| "P" | for | ±2.060, | -4.28 |

**Feature Pin**
"E" for Output Enable
"S" for Standby
"N" for No Connect
"D" for Spread Disablel

**Supply Voltage**
"18" for 1.8V ±10%
"25" for 2.5V ±10%
"28" for 2.8V ±10%
"30" for 3.0V ±10%
"33" for 3.3V ±10%
"XX" for 2.5V -10% to 3.3V +10%

**Note:**
10. Contact SiTime for ±20/25 ppm options.
11. Refer to the Supported Frequencies tables below.

## Supported Frequencies Tables

**Table 13. Supported Frequencies (-40 to +85°C, Center spread)**

| Spread Percentage (%) | Supported Frequencies (MHz) | |
|---|---|---|
| Center spread | Min. | Max. |
| "A": ±0.125<br>"B": ±0.250<br>"C": ±0.390<br>"D": ±0.515<br>"E": ±0.640<br>"F": ±0.765<br>"G": ±0.905<br>"H": ±1.030<br>"I": ±1.155<br>"J": ±1.280<br>"K": ±1.420<br>"L": ±1.545<br>"M": ±1.670<br>"N": ±1.795<br>"O": ±1.935<br>"P": ±2.060 | 1.000000 | 150.00000 |

**Table 14. Supported Frequencies (-40 to +85°C, Down spread)**

| Spread Percentage (%) | Supported Frequencies (MHz) | |
|---|---|---|
| Down spread | Min. | Max. |
| "A": -0.25<br>"B": -0.50<br>"C": -0.78<br>"D": -1.04<br>"E": -1.29<br>"F": -1.55<br>"G": -1.84<br>"H": -2.10<br>"I": -2.36<br>"J": -2.62<br>"K": -2.91<br>"L": -3.18<br>"M": -3.45<br>"N": -3.71<br>"O": -4.01<br>"P": -4.28 | 1.000000 | 150.00000 |

**Table 15. Supported Frequencies (-40 to +105°C or -40 to +125°C, Center spread)**

| Spread Percentage (%) | Supported Frequencies (MHz) | |
|---|---|---|
| Center spread | Min. | Max. |
| "A": ±0.125<br>"B": ±0.250<br>"C": ±0.390<br>"D": ±0.515<br>"E": ±0.640<br>"F": ±0.765<br>"G": ±0.905<br>"H": ±1.030<br>"I": ±1.155<br>"J": ±1.280 | 1.000000 | 150.000000 |
| "K": ±1.420 | 1.000000 | 149.900000 |
| "L": ±1.545 | 1.000000 | 120.100000 |
| | 120.700000 | 149.800000 |
| "M": ±1.670 | 1.000000 | 119.900000 |
| | 124.500000 | 149.600000 |
| "N": ±1.795 | 1.000000 | 100.100000 |
| | 102.700000 | 119.600000 |
| | 128.400000 | 149.300000 |
| "O": ±1.935 | 1.000000 | 85.800000 |
| | 86.100000 | 100.100000 |
| | 103.400000 | 119.400000 |
| | 129.200000 | 149.100000 |
| "P": ±2.060 | 1.000000 | 74.500000 |
| | 75.800000 | 85.400000 |
| | 88.500000 | 99.300000 |
| | 106.200000 | 119.200000 |
| | 132.700000 | 148.900000 |

**Table 16. Supported Frequencies (-40 to +105°C or -40 to +125°C, Down spread)**

| Spread Percentage (%) | Supported Frequencies (MHz) | |
|---|---|---|
| Down spread | Min. | Max. |
| "A": -0.25<br>"B": -0.50<br>"C": -0.78<br>"D": -1.04<br>"E": -1.29<br>"F": -1.55<br>"G": -1.84<br>"H": -2.10<br>"I": -2.36<br>"J": -2.62<br>"K": -2.91<br>"L": -3.18<br>"M": -3.45 | 1.000000 | 150.000000 |
| "N": -3.71 | 1.000000 | 120.100000 |
| | 123.200000 | 150.000000 |
| "O": -4.01 | 1.000000 | 100.100000 |
| | 101.600000 | 120.100000 |
| | 127.000000 | 150.000000 |
| "P": -4.28 | 1.000000 | 85.800000 |
| | 87.400000 | 100.100000 |
| | 102.400000 | 102.900000 |
| | 104.800000 | 120.100000 |
| | 128.100000 | 128.600000 |
| | 131.100000 | 150.000000 |

### Table 17. Supported Frequencies (-55 to +125°C, Center spread)

| Spread Percentage (%) | Supported Frequencies (MHz) | |
|---|---|---|
| Center spread | Min. | Max. |
| “A”: ±0.125<br>“B”: ±0.250<br>“C”: ±0.390<br>“D”: ±0.515<br>“E”: ±0.640<br>“F”: ±0.765<br>“G”: ±0.905<br>“H”: ±1.030<br>“I”: ±1.155<br>“J”: ±1.280 | 1.000000 | 150.000000 |
| “K”: ±1.420 | 1.000000 | 120.100000 |
| | 120.900000 | 149.900000 |
| “L”: ±1.545 | 1.000000 | 120.100000 |
| | 124.700000 | 149.800000 |
| “M”: ±1.670 | 1.000000 | 100.100000 |
| | 102.900000 | 119.800000 |
| | 128.600000 | 149.600000 |
| “N”: ±1.795 | 1.000000 | 85.800000 |
| | 86.300000 | 100.100000 |
| | 103.500000 | 119.600000 |
| | 129.400000 | 149.300000 |
| “O”: ±1.935 | 1.000000 | 74.600000 |
| | 75.900000 | 85.600000 |
| | 88.6000000 | 99.500000 |
| | 106.300000 | 119.400000 |
| | 132.900000 | 149.100000 |
| “P”: ±2.060 | 1.000000 | 60.100000 |
| | 60.200000 | 66.500000 |
| | 67.700000 | 74.500000 |
| | 77.400000 | 85.400000 |
| | 90.300000 | 99.300000 |
| | 108.400000 | 119.100000 |
| | 135.500000 | 148.900000 |

### Table 18. Supported Frequencies (-55 to +125°C, Down spread)

| Spread Percentage (%) | Supported Frequencies (MHz) | |
|---|---|---|
| Down spread | Min. | Max. |
| “A”: -0.25<br>“B”: -0.50<br>“C”: -0.78<br>“D”: -1.04<br>“E”: -1.29<br>“F”: -1.55<br>“G”: -1.84<br>“H”: -2.10<br>“I”: -2.36<br>“J”: -2.62<br>“K”: -2.91<br>“L”: -3.18 | 1.000000 | 150.000000 |
| “M”: -3.45 | 1.000000 | 120.100000 |
| | 123.400000 | 150.000000 |
| “N”: -3.71 | 1.000000 | 100.100000 |
| | 101.800000 | 120.100000 |
| | 127.300000 | 150.000000 |
| “O”: -4.01 | 1.000000 | 85.800000 |
| | 87.500000 | 100.100000 |
| | 102.600000 | 102.800000 |
| | 105.000000 | 120.100000 |
| | 128.200000 | 128.500000 |
| | 131.300000 | 150.000000 |
| “P”: -4.28 | 1.000000 | 75.100000 |
| | 75.600000 | 85.800000 |
| | 88.200000 | 100.100000 |
| | 105.800000 | 120.100000 |
| | 132.300000 | 150.000000 |

### Table 19. Revision history

| Version | Release Date | Change Summary |
|---|---|---|
| 0.5 | 07/22/2019 | First release |

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