# SiT8944B

1 – 110 MHz, -55 to 125°C, Endura™ Series Oscillator

## Features

- Best acceleration sensitivity of 0.1 ppb/*g*
- Any frequencies between 1 MHz and 110 MHz accurate to 6 decimal places
- Extended temperature range (-55°C to 125°C)
- Excellent total frequency stability as low as ±20 ppm
- Supply voltage of 1.8 V or 2.25 V to 3.63 V
- Low power consumption of 3.8 mA typical at 1.8 V
- Standby mode for longer battery life
- LVCMOS/LVTTL compatible output
- AEC-Q100 qualified
- Industry-standard packages: 2.0 x 1.6, 2.5 x 2.0, 3.2 x 2.5, 5.0 x 3.2, 7.0 x 5.0 mm x mm
- 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
- Smart munitions

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## Electrical Characteristics

### Table 1. Electrical Characteristics[1,2]

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 nominal supply voltage.

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| **Frequency Range** | | | | | | |
| **Output Frequency Range** | f | 1 | – | 110 | MHz | Refer to Tables 13 to 15 for the exact list of Supported Frequencies |
| **Frequency Stability and Aging** | | | | | | |
| **Frequency Stability** | F_stab | -20 | – | +20 | ppm | Inclusive of Initial tolerance at 25°C, 1st year aging at 25°C, and variations over operating temperature, rated power supply voltage and load (15 pF ±10%) |
| | | -25 | – | +25 | ppm | |
| | | -30 | – | +30 | ppm | |
| | | -50 | – | +50 | ppm | |
| **Hysteresis** | F_hys | -2 | – | 2 | ppm | Per MIL-STD-55310, 3.6.9.2, -55°C to 125°C. 0.5°C/min, 50 cfm air flow |
| **20-year Aging** | F_aging | – | – | ± 28 | ppm | At 85°C, after 2-days of continuous operation |
| **Operating Temperature Range** | | | | | | |
| **Operating Temperature Range (ambient)** | 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 Grade1 |
| **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 |
| **Supply Voltage and Current Consumption** | | | | | | |
| **Supply Voltage** | Vdd | 1.62 | 1.8 | 1.98 | V | All voltages between 2.25 V and 3.63 V including 2.5 V, 2.8 V, 3.0 V and 3.3 V are supported |
| | | 2.25 | – | 3.63 | V | |
| **Current Consumption** | Idd | – | 4.0 | 4.8 | mA | No load condition, f = 20 MHz, Vdd = 2.25 V to 3.63 V |
| | | – | 3.8 | 4.5 | mA | No load condition, f = 20 MHz, Vdd = 1.8 V |
| **OE Disable Current** | I_od | – | – | 4.5 | mA | Vdd = 2.5 V to 3.3 V, OE = Low, Output in high Z state |
| | | – | – | 4.3 | mA | Vdd = 1.8 V, OE = Low, Output in high Z state |
| **Standby Current** | I_std | – | 2.6 | – | µA | Vdd = 2.8 V to 3.3V, $\overline{ST}$ = Low, Output is weakly pulled down |
| | | – | 1.4 | – | µA | Vdd = 2.5 V, $\overline{ST}$ = Low, Output is weakly pulled down |
| | | – | 0.6 | – | µA | Vdd = 1.8 V, $\overline{ST}$ = Low, Output is weakly pulled down |

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## Table 1. Electrical Characteristics[1,2] (continued)

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| **LVCMOS Output Characteristics** | | | | | | |
| **Duty Cycle** | DC | 45 | – | 55 | % | All Vdd levels |
| **Rise/Fall Time** | Tr, Tf | – | 1.5 | 3 | ns | Vdd = 2.25 V - 3.63 V, 20% - 80% |
| | | – | 1.3 | 2.5 | ns | Vdd = 1.8 V, 20% - 80% |
| **Output High Voltage** | VOH | 90% | – | – | Vdd | IOH = -4 mA (Vdd = 3.0 V or 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 Low Voltage** | VOL | – | – | 10% | Vdd | IOL = 4 mA (Vdd = 3.0 V or 3.3 V)<br>IOL = 3 mA (Vdd = 2.8 V and Vdd = 2.5 V)<br>IOL = 2 mA (Vdd = 1.8 V) |
| **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 Pull-up Impedance** | Z_in | – | 100 | – | kΩ | Pin 1, OE logic high or logic low, or $\overline{ST}$ logic high |
| | | 2 | – | – | MΩ | Pin 1, $\overline{ST}$ logic low |
| **Startup and Resume Timing** | | | | | | |
| **Startup Time** | T_start | – | – | 5.5 | ms | Measured from the time Vdd reaches its rated minimum value |
| **Enable/Disable Time** | T_oe | – | – | 130 | ns | f = 110 MHz. For other frequencies, T_oe = 100 ns + 3 * cycles |
| **Resume Time** | T_resume | – | – | 5 | ms | Measured from the time $\overline{ST}$ pin crosses 50% threshold |
| **Jitter** | | | | | | |
| **RMS Period Jitter** | T_jitt | – | 1.6 | 2.5 | ps | f = 75 MHz, 2.25 V to 3.63 V |
| | | – | 1.9 | 3.0 | ps | f = 75 MHz, 1.8 V |
| **RMS Phase Jitter (random)** | T_phj | – | 0.5 | – | ps | f = 75 MHz, Integration bandwidth = 900 kHz to 7.5 MHz |
| | | – | 1.3 | – | ps | f = 75 MHz, Integration bandwidth = 12 kHz to 20 MHz |

**Notes:**

1. All electrical specifications in the above table are specified with 15 pF output load and for all Vdd(s) unless otherwise stated.
2. The typical value of any parameter in the Electrical Characteristic table is specified for the nominal value of the highest voltage option for that parameter and at 25°C temperature.

## Table 2. Pin Description

| Pin | Symbol | Functionality | |
|---|---|---|---|
| 1 | OE/ $\overline{ST}$ /NC | 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 (weak pull down). Device goes to sleep mode. Supply current reduces to I_std. |
| | | No Connect | Any voltage between 0 and Vdd or Open[3]: Specified frequency output. Pin 1 has no function. |
| 2 | GND | Power | Electrical ground[4] |
| 3 | OUT | Output | Oscillator output |
| 4 | VDD | Power | Power supply voltage[4] |

**Top View**

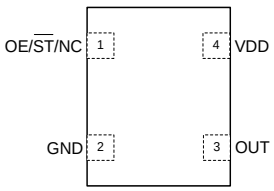



**Figure 1. Pin Assignments**

**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.



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## Table 3. 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 4. Thermal Consideration[6]

| Package | θJA, 4 Layer Board (°C/W) | θJA, 2 Layer Board (°C/W) | θJC, Bottom (°C/W) |
|---|---|---|---|
| 7050 | 142 | 273 | 30 |
| 5032 | 97 | 199 | 24 |
| 3225 | 109 | 212 | 27 |
| 2520 | 117 | 222 | 26 |
| 2016 | 152 | 252 | 36 |

**Note:**

6. Refer to JESD51 for θJA and θJC definitions, and reference layout used to determine the θJA and θJC values in the above table.

## Table 5. Maximum Operating Junction Temperature[7]

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

**Note:**

7. Datasheet specifications are not guaranteed if junction temperature exceeds the maximum operating junction temperature.

## Table 6. Environmental Compliance

| Parameter | Condition/Test Method | Value | Unit |
|---|---|---|---|
| **Mechanical Shock** | **MIL-STD-883F, Method 2002, Condition G** | 30,000 | *g* |
| **Mechanical Vibration** | **MIL-STD-883F, Method 2007** | 70 | *g* |
| **Vibration Fatigue** | **MIL-STD-883, Method 2005** | 20 | *g* |
| **Constant Acceleration** | **MIL-STD-883, Method 2001** | 30,000 | *g* |
| **Ambient Pressure Operating** | **MIL-STD-202, Method 105, Condition C** | 70,000 | ft |
| **Temperature Cycle** | **JESD22, Method A104** | | |
| **Solderability** | **MIL-STD-883F, Method 2003** | | |
| **Moisture Sensitivity Level** | **MSL1 @ 260°C** | | |

SiT8944 is 100% screened in accordance with SiTime Endura flow.


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## Test Circuit and Waveform

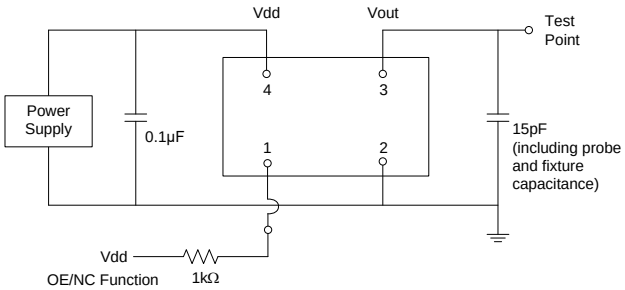



**Figure 2. Test Circuit[8]**

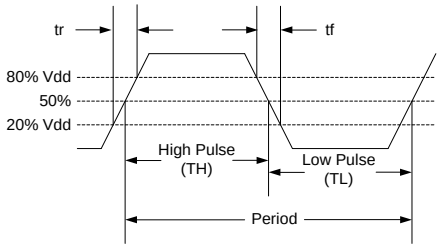



**Figure 3. Waveform[8]**

**Note :**

8. Duty Cycle is computed as Duty Cycle = TH/Period.

## Timing Diagrams

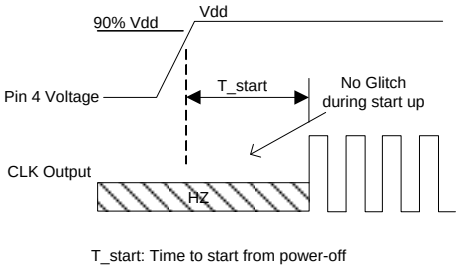



**Figure 4. Startup Timing (OE/ $\overline{ST}$ Mode)[9]**

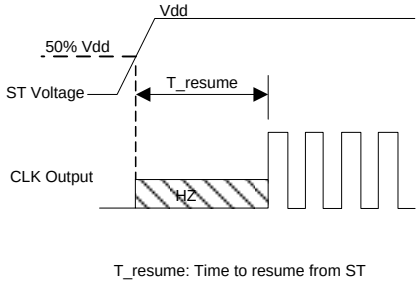



**Figure 5. Standby Resume Timing ( $\overline{ST}$ Mode Only)**

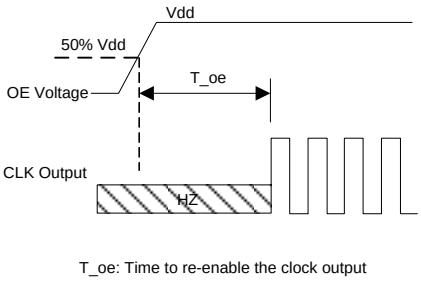



**Figure 6. OE Enable Timing (OE Mode Only)**

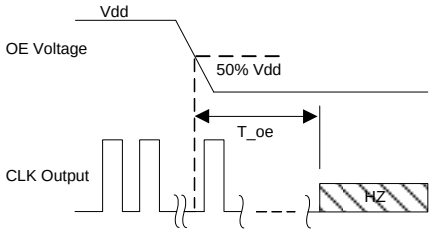



**Figure 7. OE Disable Timing (OE Mode Only)**

**Note:**

9. SiT8944 has “no runt” pulses and “no glitch” output during startup or resume.



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## Performance Plots[10]

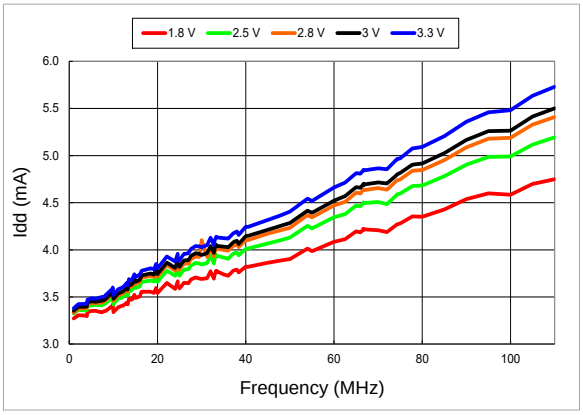



**Figure 8. Idd vs Frequency**

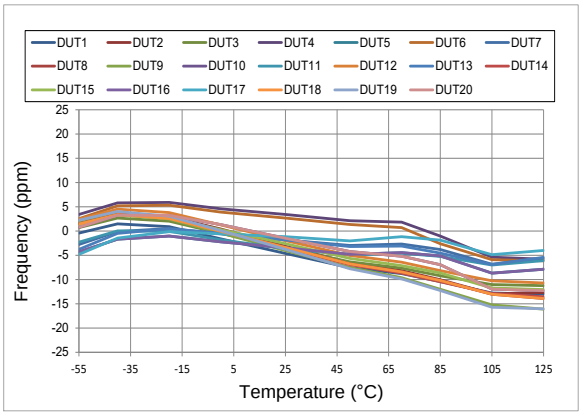



**Figure 9. Frequency vs Temperature**

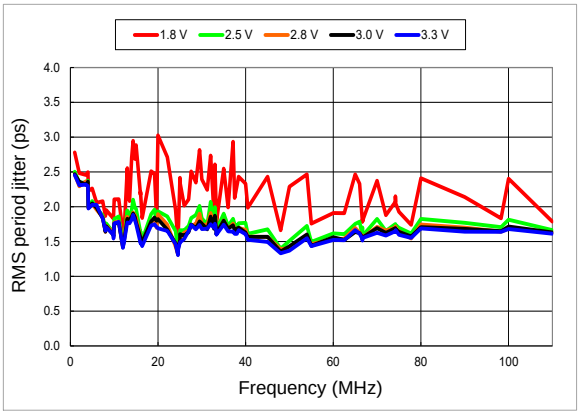



**Figure 10. RMS Period Jitter vs Frequency**

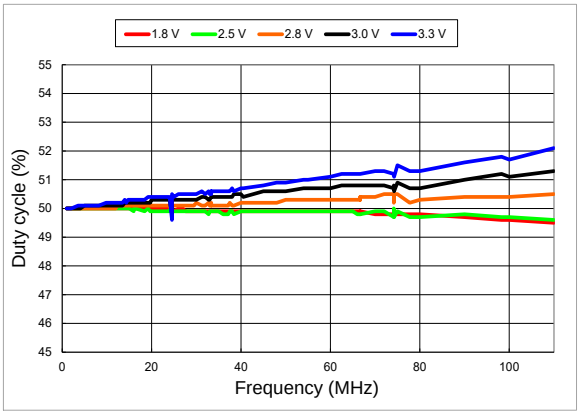



**Figure 11. Duty Cycle vs Frequency**

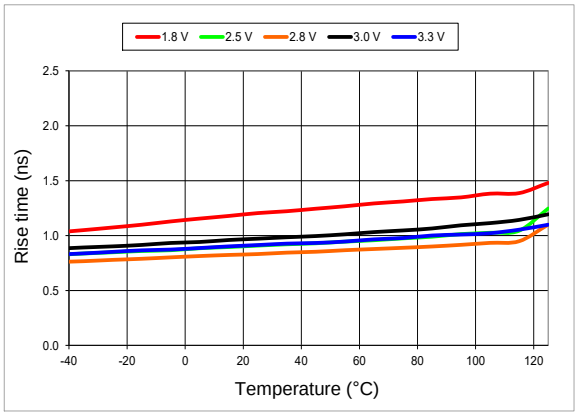



**Figure 12. 20%-80% Rise Time vs Temperature**

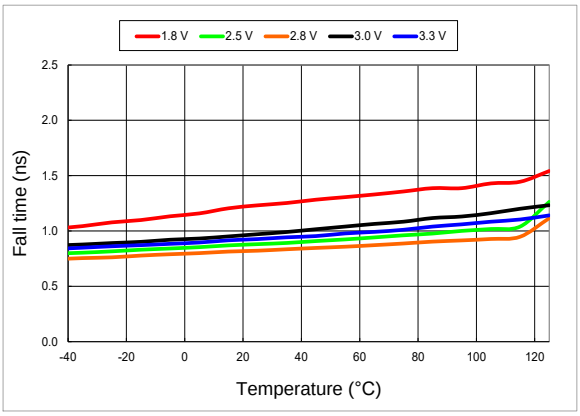



**Figure 13. 20%-80% Fall Time vs Temperature**



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## Performance Plots[10]

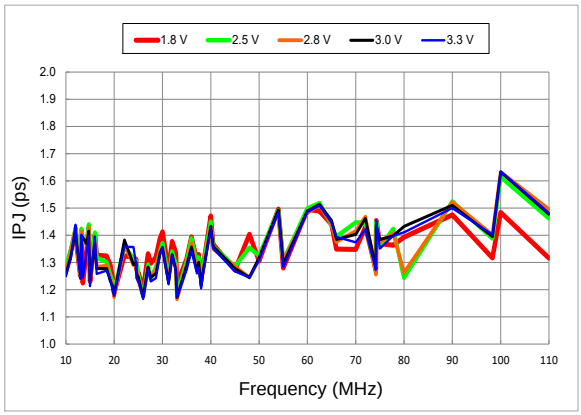



**Figure 14. RMS Integrated Phase Jitter Random (12 kHz to 20 MHz) vs Frequency[11]**

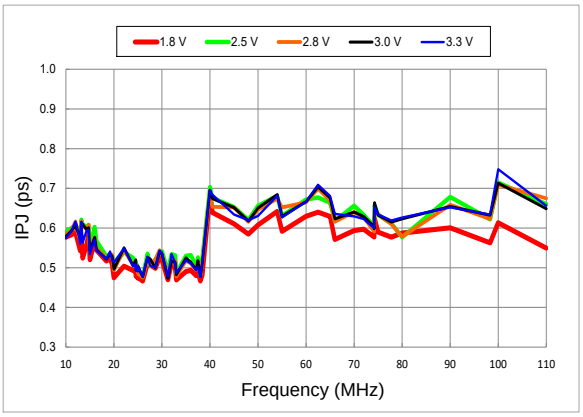



**Figure 15. RMS Integrated Phase Jitter Random (900 kHz to 20 MHz) vs Frequency[11]**

**Notes:**

10. All plots are measured with 15 pF load at room temperature, unless otherwise stated.
11. Phase noise plots are measured with Agilent E5052B signal source analyzer. Integration range is up to 5 MHz for carrier frequencies up to 40 MHz.



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## Programmable Drive Strength

The SiT8944 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 16 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 11th 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.

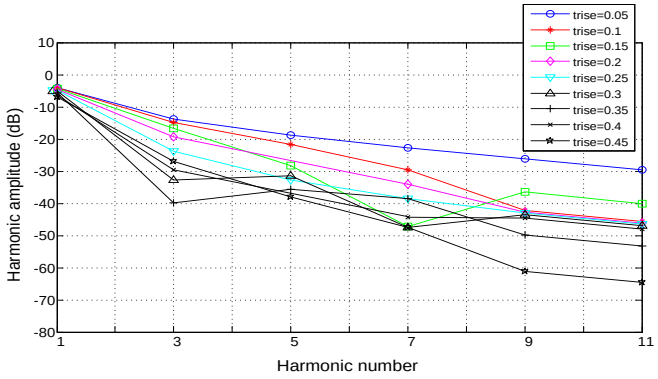



**Figure 16. Harmonic EMI reduction as a Function of Slower Rise/Fall Time**

### 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 speed up the rise/fall time of the input clock. Some chipsets may also require faster rise/fall time in order to reduce their sensitivity to this type of jitter. Refer to the Rise/Fall Time Tables (Table 7 to Table 11) 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 3.3 V SiT8944 device with default drive strength setting, the typical rise/fall time is 1 ns for 15 pF output load. The typical rise/fall time slows down to 2.6 ns when the output load increases to 45 pF. One can choose to speed up the rise/fall time to 1.83 ns by then increasing the drive strength setting on the SiT8944.

The SiT8944 can support up to 60 pF in maximum capacitive loads with drive strength settings. Refer to the Rise/Tall Time Tables (Table 7 to Table 11) to determine the proper drive strength for the desired combination of output load vs. rise/fall time.

### SiT8944 Drive Strength Selection

Tables 7 through 11 define the rise/fall time for a given capacitive load and supply voltage.

1. Select the table that matches the SiT8944 nominal supply voltage (1.8 V, 2.5 V, 2.8 V, 3.0 V, 3.3 V).
2. Select the capacitive load column that matches the application requirement (5 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 7 through 11, the maximum frequency the oscillator can operate with guaranteed full swing of the output voltage over temperature can be calculated 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 = 1.8 V (Table 7)
- Capacitive Load: 30 pF
- Desired Tr/f time = 3 ns
  (rise/fall time part number code = E)

Part number for the above example:

SiT8944BM**E**12-18EA66.666660

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



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

### Table 7. Vdd = 1.8 V 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 8. Vdd = 2.5 V 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 9. Vdd = 2.8 V 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** | 3.77 | 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 10. Vdd = 3.0 V 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 11. Vdd = 3.3 V 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 |


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## Pin 1 Configuration Options (OE, $\overline{ST}$ , or NC)

Pin 1 of the SiT8944 can be factory-programmed to support three modes: Output enable (OE), standby $\overline{ST}$ or No Connect (NC). These modes can also be programmed with the Time Machine II using Field Programmable Oscillators.

### Output Enable (OE) Mode

In the OE mode, applying logic Low to the OE pin only disables the output driver and puts it in Hi-Z mode. The core of the device continues to operate normally. Power consumption is reduced due to the inactivity of the output. When the OE pin is pulled High, the output is typically enabled in <1 µs.

### Standby ($\overline{ST}$) Mode

In the $\overline{ST}$ mode, a device enters into the standby mode when Pin 1 pulled Low. All internal circuits of the device are turned off. The current is reduced to a standby current, typically in the range of a few µA. When $\overline{ST}$ is pulled High, the device goes through the "resume" process, which can take up to 5 ms.

### No Connect (NC) Mode

In the NC mode, the device always operates in its normal mode and output the specified frequency regardless of the logic level on pin 1.

Table 12 below summarizes the key relevant parameters in the operation of the device in OE, $\overline{ST}$, or NC mode.

**Table 12. OE vs. $\overline{ST}$ vs. NC**

| | OE | $\overline{ST}$ | NC |
|---|---|---|---|
| Active current 20 MHz (max, 1.8 V) | 4.5 mA | 4.5 mA | 4.5 mA |
| OE disable current (max. 1.8 V) | 4.3 mA | N/A | N/A |
| Standby current (typical 1.8 V) | N/A | 0.6 uA | N/A |
| OE enable time at 110 MHz (max) | 130 ns | N/A | N/A |
| Resume time from standby (max, all frequency) | N/A | 5 ms | N/A |
| Output driver in OE disable/standby mode | High Z | Weak pull-down | N/A |

### Output on Startup and OE Enable

The SiT8944 comes with gated output. Its clock output is accurate to the rated frequency stability within the first pulse from initial device startup or when the output driver is enabled.

In addition, the SiT8944 supports "no runt" pulses and "no glitch" output during startup or when the device output driver is enabled as shown in the waveform captures in Figure 17 and Figure 18.

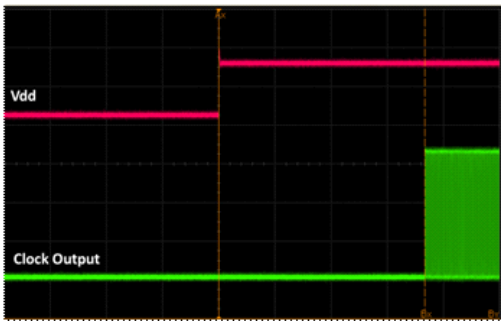



**Figure 17. Startup Waveform vs. Vdd**

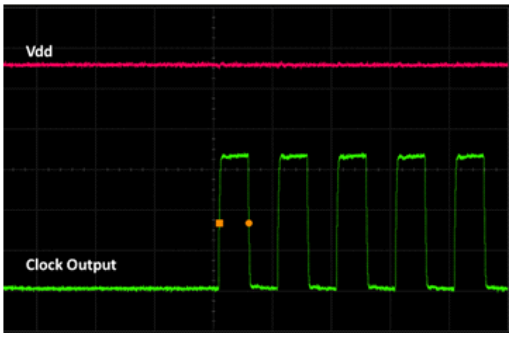


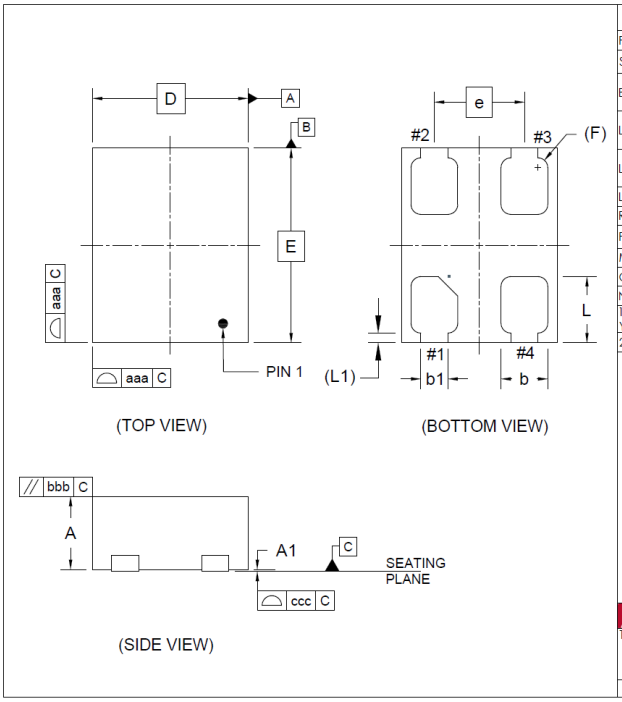

**Figure 18. Startup Waveform vs. Vdd**
(Zoomed-in View of Figure 17)


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## Dimensions and Patterns

| Package Size – Dimensions (Unit: mm)[12] | Recommended Land Pattern (Unit: mm)[13] |
|---|---|

**2.0 x 1.6 x 0.75 mm**

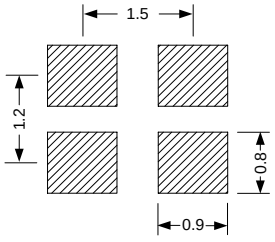



| | | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|---|
| PACKAGE THICKNESS | | A | 0.700 | 0.750 | 0.800 |
| STAND OFF | | A1 | 0.000 | 0.020 | 0.050 |
| BODY SIZE | X | D | | 1.600 BSC | |
| | Y | E | | 2.000 BSC | |
| LEAD WIDTH | | b | 0.430 | 0.480 | 0.530 |
| | | b1 | 0.230 | 0.280 | 0.330 |
| 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 | |

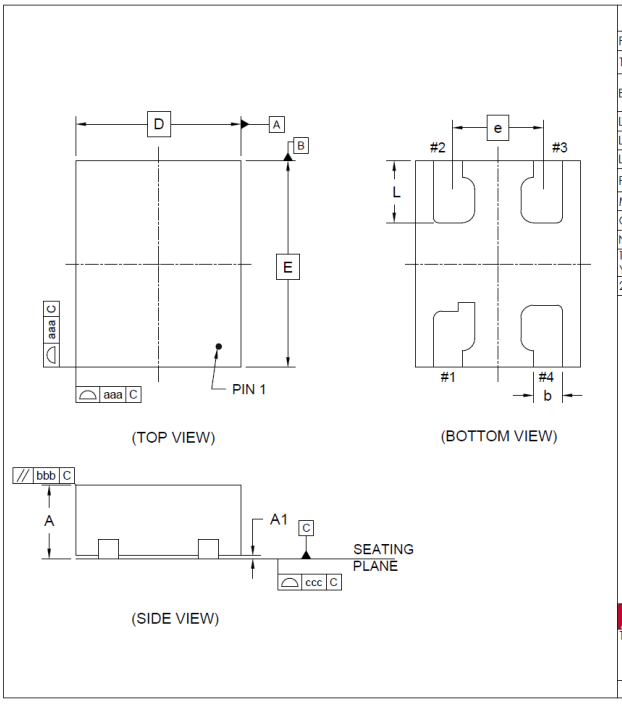
NOTES
1. Dimensioning and tolerance conform to ASME Y14.5-2009
2. All dimensions are in millimeters.

SiTime

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




**2.5 x 2.0 x 0.75 mm**

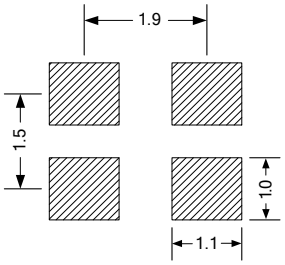



| | | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|---|
| PACKAGE THICKNESS | | A | 0.700 | 0.750 | 0.800 |
| THICKNESS | | A1 | 0.000 | 0.020 | 0.050 |
| BODY SIZE | X | D | | 2.000 BSC | |
| | Y | E | | 2.500 BSC | |
| LEAD WIDTH | | b | 0.300 | 0.350 | 0.400 |
| LEAD LENGTH | | L | 0.650 | 0.750 | 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.

SiTime

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



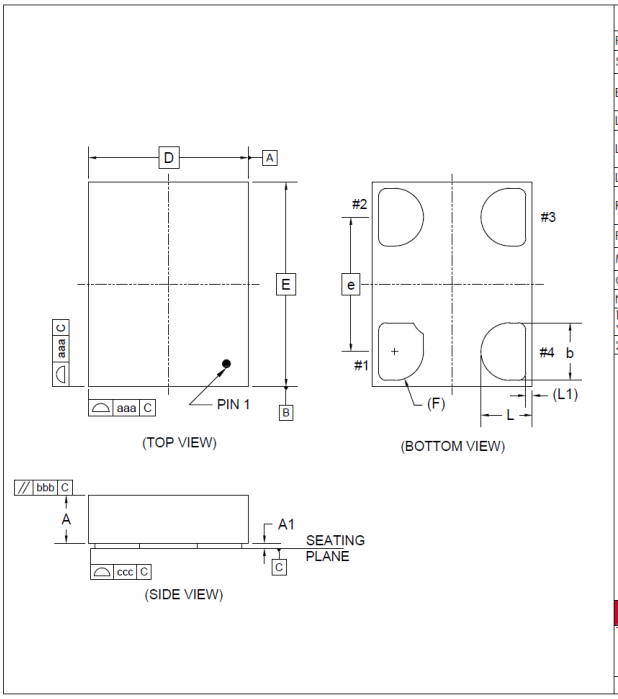


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## Dimensions and Patterns (continued)

| Package Size – Dimensions (Unit: mm)[12] | Recommended Land Pattern (Unit: mm)[13] |
|---|---|

**3.2 x 2.5 x 0.75 mm**

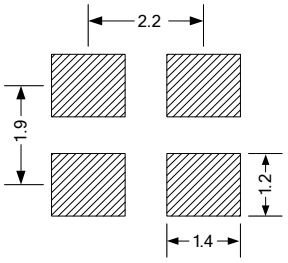



| | | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|---|
| PACKAGE THICKNESS | | A | 0.700 | 0.750 | 0.800 |
| STAND OFF | | A1 | 0.000 | 0.020 | 0.050 |
| BODY SIZE | X | D | | 2.500 BSC | |
| | Y | E | | 3.200 BSC | |
| LEAD WIDTH | | b | 0.800 | 0.900 | 1.000 |
| LEAD LENGTH | | L | 0.700 | 0.800 | 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 | |

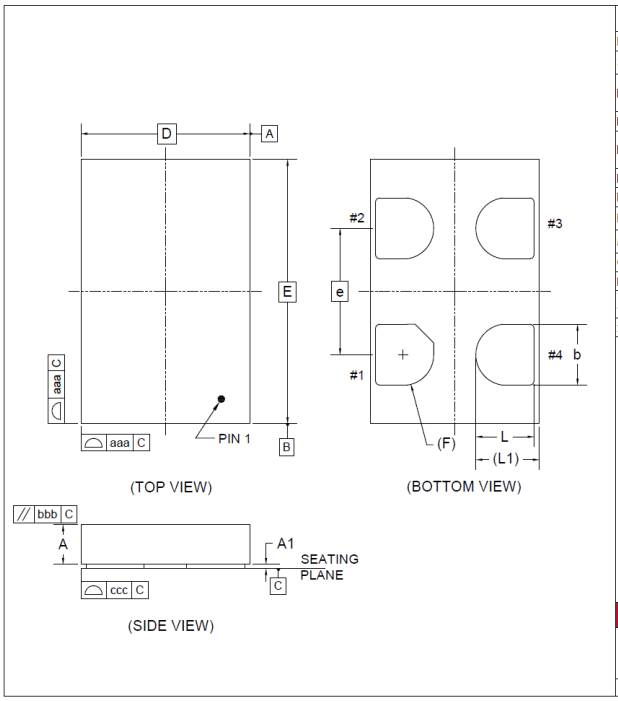
NOTES
1. Dimensioning and tolerance conform to ASME Y14.5-2009
2. All dimensions are in millimeters.

SiTime

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




**5.0 x 3.2 x 0.75 mm**

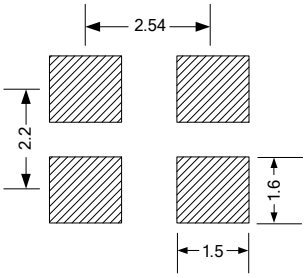



| | | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|---|
| PACKAGE THICKNESS | | A | 0.700 | 0.750 | 0.800 |
| STAND OFF | | A1 | 0.000 | 0.020 | 0.050 |
| BODY SIZE | X | D | | 3.200 BSC | |
| | Y | E | | 5.000 BSC | |
| LEAD WIDTH | | b | 1.000 | 1.100 | 1.200 |
| LEAD LENGTH | | L | 1.050 | 1.100 | 1.150 |
| | | L1 | | 1.200 REF | |
| LEAD PITCH | | e | | 2.390 BSC | |
| RADIUS | | F | | 0.575 | |
| 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.

SiTime

| TITLE | DWG NO. |
|---|---|
| 4L PQFN | POD-PQFN-004-X05032-003 |
| 5.00x3.20x0.75 mm | REV. A04 / SHEET 1 OF 2 |
| DATE 01-APR-2019 | |



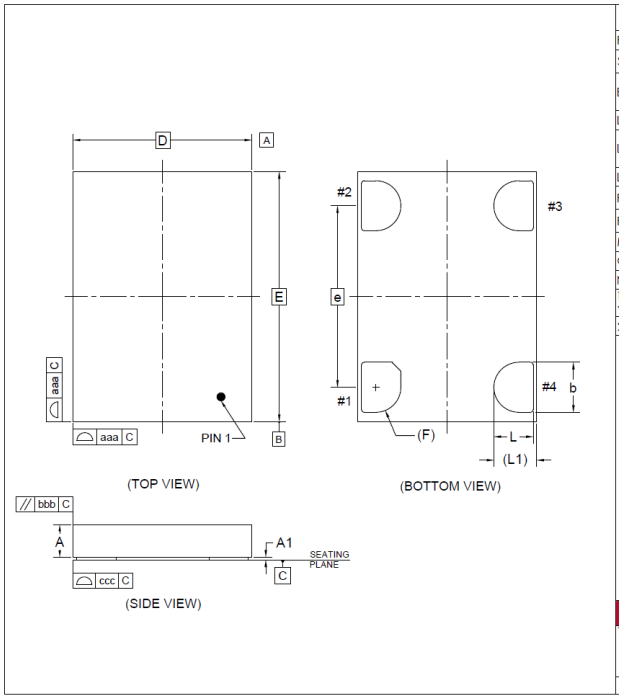



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## Dimensions and Patterns (continued)

| Package Size – Dimensions (Unit: mm)[12] | Recommended Land Pattern (Unit: mm)[13] |
|---|---|

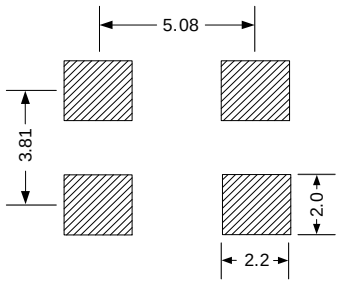
**7.0 x 5.0 x 0.90 mm**




| | | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|---|
| PACKAGE THICKNESS | | A | 0.800 | 0.900 | 1.000 |
| STAND OFF | | A1 | 0.000 | 0.020 | 0.050 |
| BODY SIZE | X | D | | 5.000 BSC | |
| | Y | E | | 7.000 BSC | |
| LEAD WIDTH | | b | 1.350 | 1.400 | 1.450 |
| LEAD LENGTH | | L | 1.050 | 1.100 | 1.150 |
| | | L1 | | 1.200 REF | |
| LEAD PITCH | | e | | 5.080 BSC | |
| RADIUS | | F | | 0.080 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 7.00x5.00x0.90 mm | DWG NO. | POD-PQFN-004-X07050-011 |
| | REV. | SHEET |
| DATE: 01-APR-2019 | A02 | 1 OF 2 |



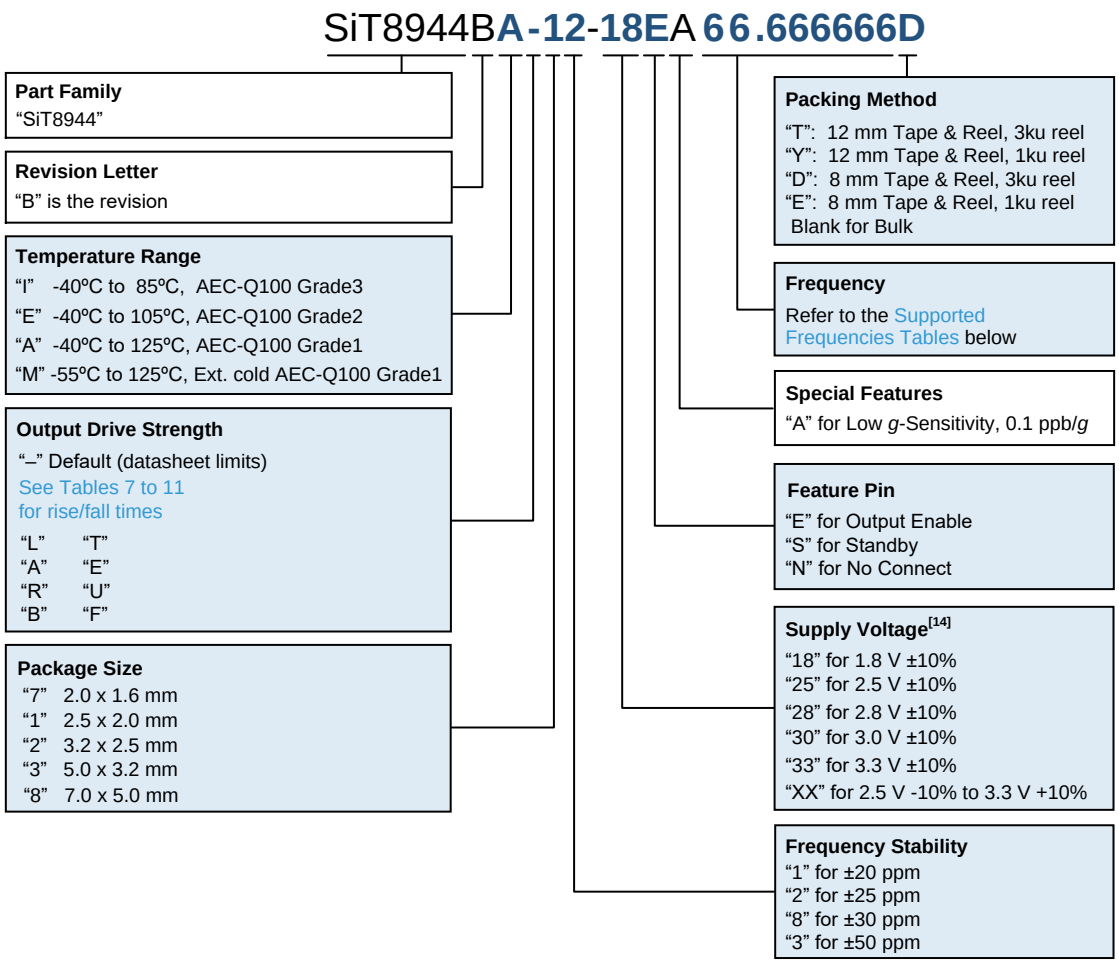

**Notes:**

12. 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.
13. A capacitor of value 0.1 µF or higher between Vdd and GND is required.


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## 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.




**Note:**

14. The voltage portion of the SiT8944 part number consists of two characters that denote the specific supply voltage of the device. The SiT8944 supports either 1.8 V ±10% or any voltage between 2.25 V and 3.62 V. In the 1.8 V mode, one can simply insert 18 in the part number. In the 2.5 V to 3.3 V mode, two digits such as 18, 25 or 33 can be used in the part number to reflect the desired voltage. Alternatively, "XX" can be used to indicate the entire operating voltage range from 2.25 V to 3.63 V.


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### Table 13. Supported Frequencies (-40°C to 85°C)[15]

| Frequency Range | |
|---|---|
| Min. | Max. |
| 1.000000 MHz | 110.000000 MHz |

### Table 14. Supported Frequencies (-40°C to +105°C or -40°C to 125°C)[15, 16]

| Frequency Range | |
|---|---|
| Min. | Max. |
| 1.000000 MHz | 61.222999 MHz |
| 61.974001 MHz | 69.795999 MHz |
| 70.485001 MHz | 79.062999 MHz |
| 79.162001 MHz | 81.427999 MHz |
| 82.232001 MHz | 91.833999 MHz |
| 92.155001 MHz | 94.248999 MHz |
| 94.430001 MHz | 94.874999 MHz |
| 94.994001 MHz | 97.713999 MHz |
| 98.679001 MHz | 110.000000 MHz |

### Table 15. Supported Frequencies (-55°C to 125°C)[15, 16]

| Frequency Range | |
|---|---|
| Min. | Max. |
| 1.000000 MHz | 61.222999 MHz |
| 61.974001 MHz | 69.239999 MHz |
| 70.827001 MHz | 78.714999 MHz |
| 79.561001 MHz | 80.159999 MHz |
| 80.174001 MHz | 80.779999 MHz |
| 82.632001 MHz | 91.833999 MHz |
| 95.474001 MHz | 96.191999 MHz |
| 96.209001 MHz | 96.935999 MHz |
| 99.158001 MHz | 110.000000 MHz |

**Notes:**

15. Any frequency within the min and max values in the above tables are supported with 6 decimal places of accuracy.
16. Please contact SiTime for frequencies that are not listed in the tables above.

### Table 16. Ordering Codes for Supported Tape & Reel Packing Method

| Device Size (mm x mm) | 16 mm T&R (3ku) | 16 mm T&R (1ku) | 12 mm T&R (3ku) | 12 mm T&R (1ku) | 8 mm T&R (3ku) | 8 mm T&R (1ku) |
|---|---|---|---|---|---|---|
| 2.0 x 1.6 | – | – | – | – | D | E |
| 2.5 x 2.0 | – | – | – | – | D | E |
| 3.2 x 2.5 | – | – | – | – | D | E |
| 5.0 x 3.2 | – | – | T | Y | – | – |
| 7.0 x 5.0 | T | Y | – | – | – | – |


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## Table 17. Revision History

| Revision | Release Date | Change Summary |
|---|---|---|
| 0.5 | 22-Jul-2019 | First release |
| 1.0 | 24-Jul-2020 | Final release<br>Formatting and date format changes |
| 1.1 | 30-Jun-2023 | Added Frequency Hysterisis and 20-yr aging, Added Endura Screening,<br>Clarified test conditions of Table 6. Environmental Compliance |

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