SiT9045

AEC-Q100, 1 to 150 MHz 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
- 100% pin-to-pin drop-in replacement to quartz-based XO’s
- Excellent total frequency stability as low as ±25 ppm
- Low power consumption of 6.6 mA typical at 1.8V
- Pin1 modes: Standby, output enable, or spread disable
- LVCMOS output
- 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

Applications

- Avionics systems
- Field communication systems
- Telemetry applications

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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	-25	–	+25	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.
		-50	–	+50	ppm	
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
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
		–	0.6	5.0	µA	$\overline{ST}$ = GND, Vdd = 1.8V, Output is weakly pulled down

Table 1. Electrical Characteristics (continued)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Condition
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
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) IOH = -3 mA (Vdd = 2.8V and Vdd = 2.5V) IOH = -2 mA (Vdd = 1.8V)
Output Low Voltage	VOL	–	–	10%	Vdd	IOL = 4 mA (Vdd = 3.0V or 3.3V) IOL = 3 mA (Vdd = 2.8V and Vdd = 2.5V) 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 ppm options.

Table 2. Spread Spectrum %[3]

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[2,3]

Spread Profile
Triangular
Hershey-kiss
Random

Notes:

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.
3. The random profile supports up to ±1.030% center spread or -2.10% down spread (ordering codes A through H).

Table 4. Pin Description

Pin	Symbol	Functionality	
1	OE/$\overline{ST}$/NC/SD	Output Enable	H[4]: specified frequency output L: output is high impedance. Only output driver is disabled.
		Standby	H[4]: specified frequency output 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 L: Spread = OFF
2	GND	Power	Electrical ground
3	OUT	Output	Oscillator output
4	VDD	Power	Power supply voltage[5]

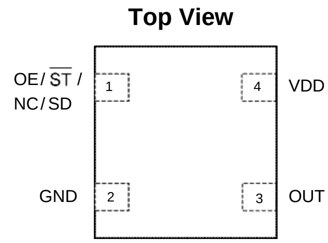


Figure 1. Pin Assignments

Notes:

4. 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.
5. 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[6]	–	150	°C

Note:

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

Table 6. 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

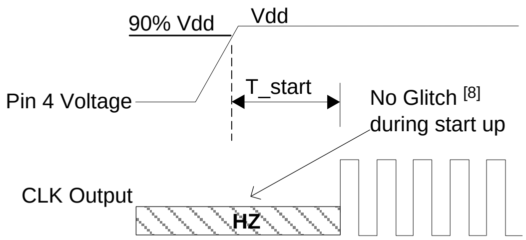
Note:

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

Table 7. Environmental Compliance

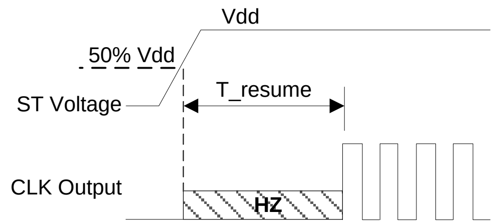
Parameter	Condition/Test Method
Mechanical Shock	**MIL-STD-883F, Method 2002**
Mechanical Vibration	**MIL-STD-883F, Method 2007**
Temperature Cycle	**JESD22, Method A104**
Solderability	**MIL-STD-883F, Method 2003**
Moisture Sensitivity Level	**MSL1 @ 260°C**

Timing Diagrams



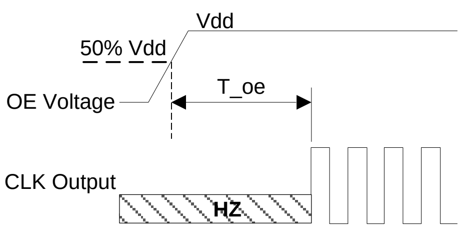
T_start: Time to start from power-off

Figure 2. Startup Timing



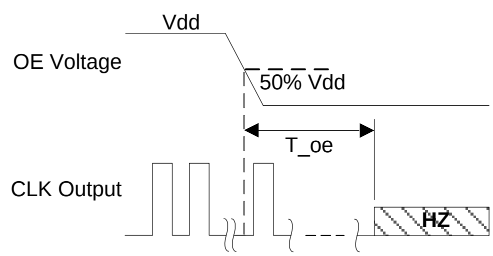
T_resume: Time to resume from ST

Figure 3. Standby Resume Timing (ST Mode Only)



T_oe: Time to re-enable the clock output

Figure 4. OE Enable Timing (OE Mode Only)



T_oe: Time to put the output in High Z mode

Figure 5. OE Disable Timing (OE Mode Only)

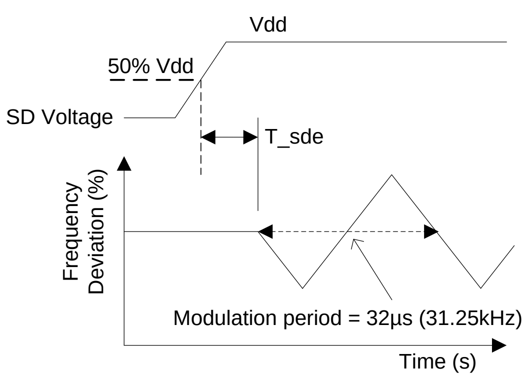


Figure 6. SD Enable Timing (SD Mode Only)

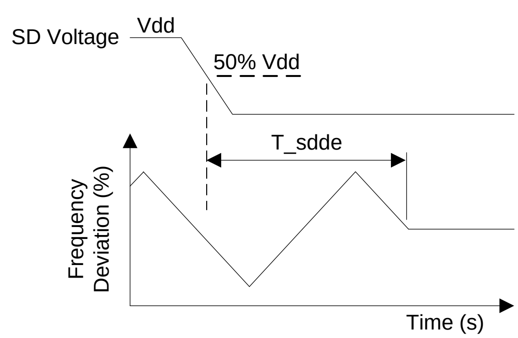


Figure 7. SD Diable Timing (SD Mode Only)

Note:

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

Performance Plots

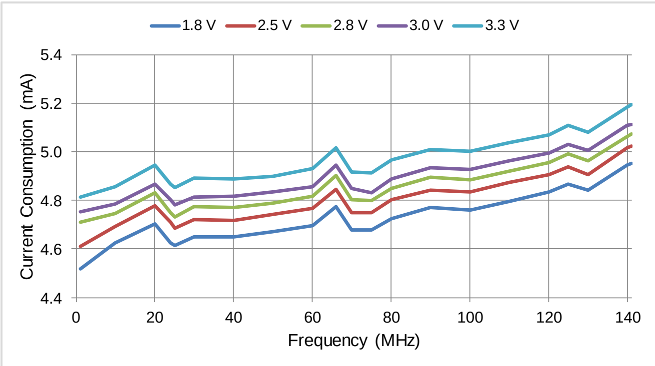


Figure 8. Current Consumption vs Frequency

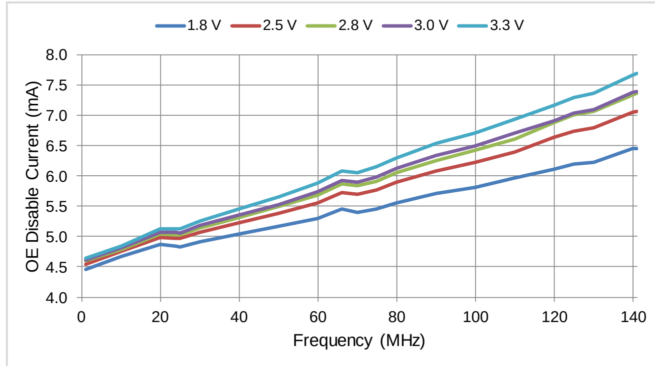


Figure 9. OE Disable Current vs Frequency

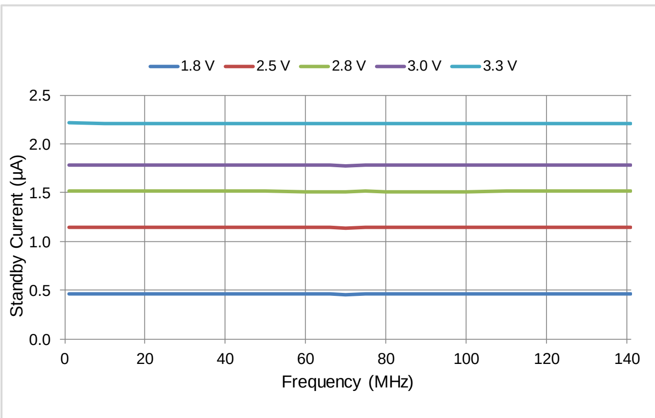


Figure 10. Standby Current vs Frequency

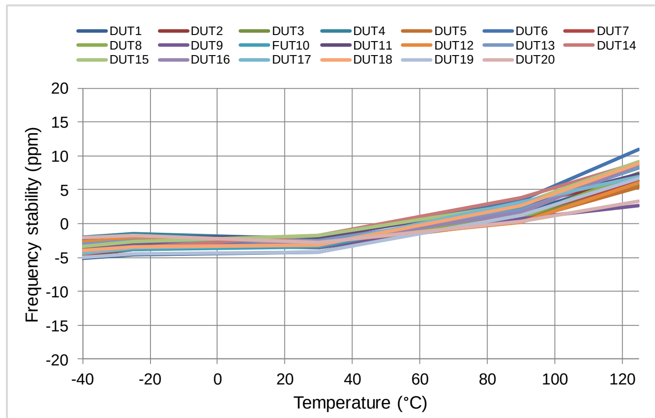


Figure 11. Frequency vs Temperature

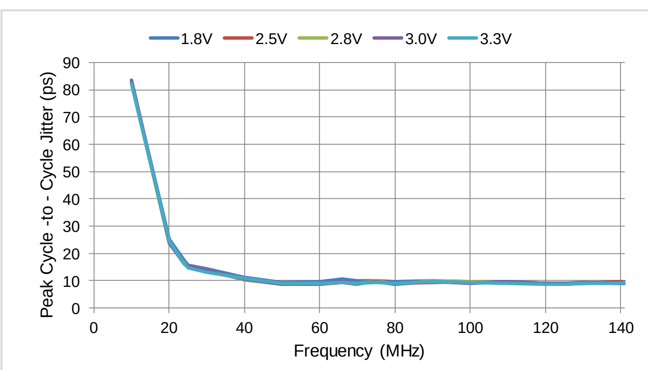


Figure 12. Cycle-to-cycle Jitter vs Frequency
(Spread profile: Triangular, Spread type: center, Spread percentage: ±2.060%)

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 (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 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 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.

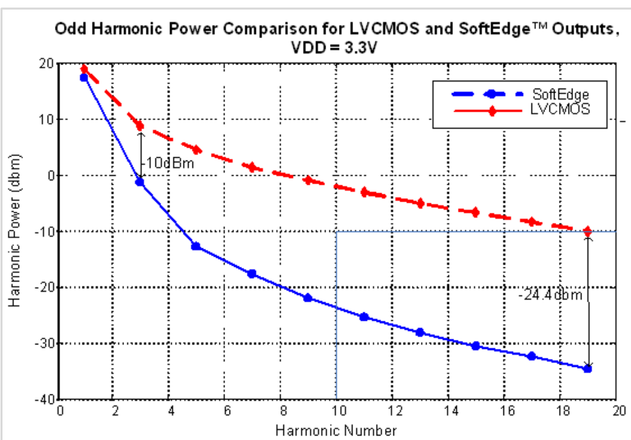


Figure 13. Harmonic EMI reduction as a function of slower rise/fall time

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:

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

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**12-18E-66.666660

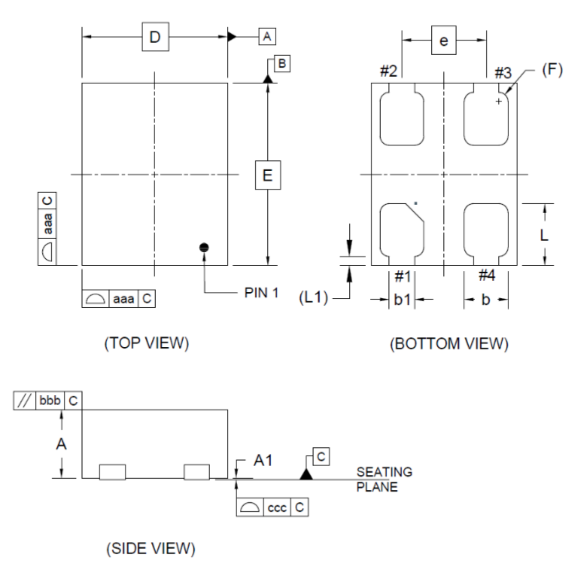
Drive strength code is inserted here. Default setting is "-"

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)[9]	Recommended Land Pattern (Unit: mm)[10]
2.0 x 1.6 x 0.75 mm	

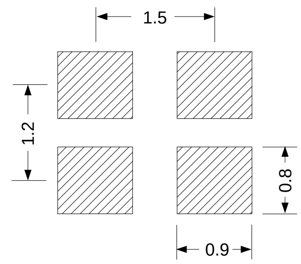


		SYMBOL	MIN	NOM	MAX
PACKAGE THICKNESS		A	0.700	0.750	0.800
STAND OFF		A1	0.000	0.020	0.050
BODY SIZE	X	D	1.600 BSC		
	Y	E	2.000 BSC		
LEAD WIDTH		b	0.430	0.480	0.530
		b1	0.230	0.280	0.330
LEAD LENGTH		L	0.580	0.680	0.780
		L1	0.100 REF		
LEAD PITCH		e	0.930 BSC		
RADIUS		F	0.100 REF		
PACKAGE TOLERANCE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

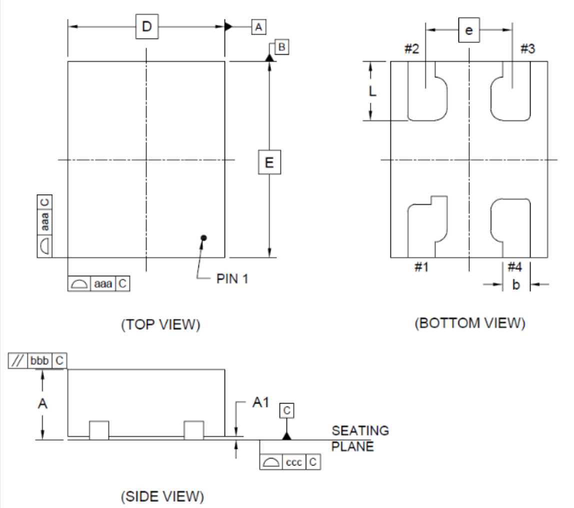
NOTES
1. Dimensioning and tolerance conform to ASME Y14.5-2009
2. All dimensions are in millimeters.

SiTime

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



2.5 x 2.0 x 0.75 mm

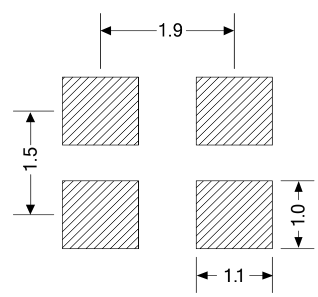


		SYMBOL	MIN	NOM	MAX
PACKAGE THICKNESS		A	0.700	0.750	0.800
THICKNESS		A1	0.000	0.020	0.050
BODY SIZE	X	D	2.000 BSC		
	Y	E	2.500 BSC		
LEAD WIDTH		b	0.300	0.350	0.400
LEAD LENGTH		L	0.650	0.750	0.850
LEAD PITCH		e	1.250 BSC		
PACKAGE TOLERANCE		aaa	0.050		
MOLD FLATNESS		bbb	0.100		
COPLANARITY		ccc	0.080		

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

SiTime

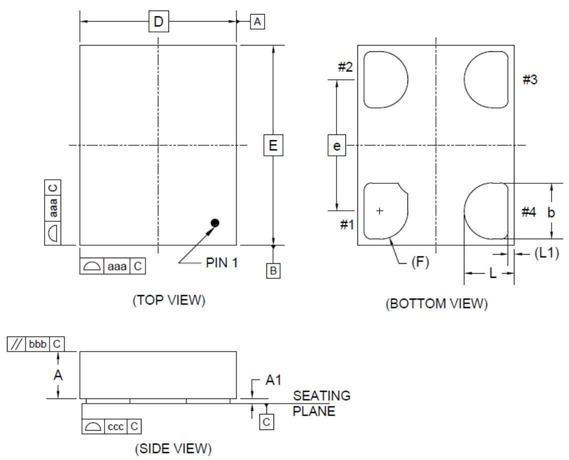
TITLE 4L PQFN 2.00x2.50x0.75 mm		DWG NO. POD-PQFN-004-X02025-010	
		REV.	SHEET
DATE	01-APR-2019	A02	1 OF 2



Dimensions and Patterns

Package Size – Dimensions (Unit: mm)[9]	Recommended Land Pattern (Unit: mm)[10]

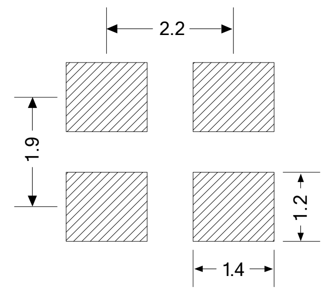
3.2 x 2.5 x 0.75 mm



		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 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:

9. 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.
10. 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[11]
"2" for ±25 ppm
"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[12]
1.000000 to 150.000000 MHz

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

Spread Percentage[13]
"-" 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:

11. Contact SiTime for ±20 ppm options.
12. Refer to the Supported Frequencies tables below.
13. The random profile supports up to ±1.030% center spread or -2.10% down spread (ordering codes A through H).

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 "B": ±0.250 "C": ±0.390 "D": ±0.515 "E": ±0.640 "F": ±0.765 "G": ±0.905 "H": ±1.030 "I": ±1.155 "J": ±1.280 "K": ±1.420 "L": ±1.545 "M": ±1.670 "N": ±1.795 "O": ±1.935 "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 "B": -0.50 "C": -0.78 "D": -1.04 "E": -1.29 "F": -1.55 "G": -1.84 "H": -2.10 "I": -2.36 "J": -2.62 "K": -2.91 "L": -3.18 "M": -3.45 "N": -3.71 "O": -4.01 "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 "B": ±0.250 "C": ±0.390 "D": ±0.515 "E": ±0.640 "F": ±0.765 "G": ±0.905 "H": ±1.030 "I": ±1.155 "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 "B": -0.50 "C": -0.78 "D": -1.04 "E": -1.29 "F": -1.55 "G": -1.84 "H": -2.10 "I": -2.36 "J": -2.62 "K": -2.91 "L": -3.18 "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 "B": ±0.250 "C": ±0.390 "D": ±0.515 "E": ±0.640 "F": ±0.765 "G": ±0.905 "H": ±1.030 "I": ±1.155 "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 "B": -0.50 "C": -0.78 "D": -1.04 "E": -1.29 "F": -1.55 "G": -1.84 "H": -2.10 "I": -2.36 "J": -2.62 "K": -2.91 "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. Additional information

Document	Description	Download Link
Manufacturing Notes	Tape & Reel dimension, reflow profile and other manufacturing related info	http://www.sitime.com/manufacturing-notes
Qualification Reports	RoHS report, reliability reports, composition reports	http://www.sitime.com/support/quality-and-reliability
Termination Techniques	Termination design recommendations	http://www.sitime.com/support/application-notes
Layout Techniques	Layout recommendations	http://www.sitime.com/support/application-notes

Table 20. Revision history

Version	Release Date	Change Summary
0.5	07/22/2019	First release
1.00	07/24/2020	Final release
1.01	08/13/2020	Added support for ±25ppm frequency stability

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