

## Features

- Any frequency between 80.000001 and 220 MHz accurate to 6 decimal places
- 100% pin-to-pin drop-in replacement to quartz-based (VC)TCXO
- Frequency stability as low as  $\pm 1.5$  PPM. Contact SiTime for  $\pm 1$  PPM option
- Ultra low phase jitter: 0.5 ps (12 kHz to 20 MHz)
- Voltage control option with pull range from  $\pm 12.5$  PPM to  $\pm 50$  PPM
- LVC MOS/HCMOS compatible output
- Voltage control, standby, output enable or no connect modes
- Standard 4-pin packages: 2.5 x 2.0, 3.2 x 2.5, 5.0 x 3.2, 7.0 x 5.0 mm
- Outstanding silicon reliability of 2 FIT, 10 times better than quartz
- Pb-free, RoHs and REACH compliant

## Applications

- Ideal for telecom, networking, smart meter, GPS and wireless applications



EXPRESS  
SAMPLES



GREEN  
SOLUTIONS



QUARTZ  
FREE

## Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Output Frequency Range	f	80.000001	–	220	MHz	
Initial Tolerance	F_init	-1	–	1	PPM	At 25°C
Stability Over Temperature	F_stab	-1	–	+1	PPM	Over operating temperature range at rated nominal power supply voltage and load. (see ordering codes on page 5)  $\pm 1.5$ PPM is available in -20 to 70 °C temp. range only. <b>Contact SiTime for <math>\pm 1</math> PPM options.</b>
		-1.5	–	+1.5	PPM	
		-2.5	–	+2.5	PPM	
		-5	–	+5	PPM	
Supply Voltage	F_vdd	–	0.05	–	PPM	$\pm 10\%$ Vdd ( $\pm 5\%$ for Vdd = 1.8V)
Output Load	F_load	–	0.1	–	PPM	$\pm 10\%$ of 15 pF load
First year Aging	F_aging	-1.0	–	+1.0	PPM	
10-year Aging		-3.5	–	+3.5	PPM	25°C
Stability vs. Temperature Slope	F_slope	–	0.1	–	PPM/°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	Contact SiTime for any other supply voltage options.
		2.25	2.5	2.75	V	
		2.52	2.8	3.08	V	
		2.70	3.0	3.3	V	
		2.97	3.3	3.63	V	
Pull Range	PR	$\pm 12.5, \pm 25, \pm 50$			PPM	
Upper Control Voltage	VC_U	Vdd-0.1	–	–	V	All Vdds. Voltage at which maximum deviation is guaranteed.
Control Voltage Range	VC_L	–	–	0.1	V	
Control Voltage Input Impedance	Z_vc	100	–	–	k $\Omega$	
Frequency Change Polarity	–	Positive slope			–	
Control Voltage -3dB Bandwidth	V_BW	–	–	8	kHz	
Current Consumption	Idd	–	34	36	mA	No load condition, f = 100 MHz, Vdd = 2.5V, 2.8V or 3.3V
		–	30	33	mA	No load condition, f = 100 MHz, Vdd = 1.8V
OE Disable Current	I_OD	–	–	31	mA	Vdd = 2.5V, 2.8V or 3.3V, OE = GND, output is Weakly Pulled Down
		–	–	30	mA	Vdd = 1.8 V. OE = GND, output is Weakly Pulled Down
Standby Current	I_std	–	–	70	$\mu$ A	Vdd = 2.5V, 2.8V or 3.3V, ST = GND, output is Weakly Pulled Down.
		–	–	10	$\mu$ A	Vdd = 1.8V. ST = GND, output is Weakly Pulled Down.
Duty Cycle	DC	45	–	55	%	All Vdds
LVC MOS Rise/Fall Time	Tr, Tf	–	1.5	2	ns	LVC MOS option. Default rise/fall time, All Vdds, 10% - 90% Vdd.
Output Voltage High	VOH	90%	–	–	Vdd	OH = -7 mA, IOL = 7 mA, (Vdd = 3.3V, 3.0V)
Output Voltage Low	VOL	–	–	10%	Vdd	IOH = -4 mA, IOL = 4 mA, (Vdd = 2.8V, 2.5V)
		–	–	–	Vdd	IOH = -2 mA, IOL = 2 mA, (Vdd = 1.8V)
Input Voltage High	VIH	70%	–	–	Vdd	Pin 1, OE or ST
Input Voltage Low	VIL	–	–	30%	Vdd	Pin 1, OE or ST
Input Pull-up Impedance	Z_in	–	100	250	k $\Omega$	

### Electrical Characteristics (continued)

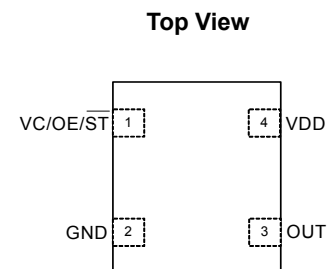
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Startup Time	T_start	–	–	10	ms	Measured from the time Vdd reaches its rated minimum value
OE Enable/Disable Time	T_oe	–	–	150	ns	f = 80.000001 MHz. For other frequencies, T_oe = 100 ns + 3
Resume Time	T_resume	–	6	10	ms	Measured from the time ST pin crosses 50% threshold
RMS Period Jitter	T_jitt	–	1.5	2	ps	f = 156.25 MHz, Vdd = 2.5V, 2.8V or 3.3V
		–	2	3	ps	f = 156.25 MHz, Vdd = 1.8V
RMS Phase Jitter (random)	T_phj	–	0.5	1	ps	f = 156.25 MHz, Integration bandwidth = 12 kHz to 20 MHz

**Note:**

1. All electrical specifications in the above table are measured with 15pF output load, Contact SiTime for higher drive options.

### Pin Configuration

Pin	Symbol	Functionality	
1	VC/OE/ $\overline{ST}$ /NC	V control	Voltage control
		Output Enable	H or Open <sup>[2]</sup> : specified frequency output L: output is high impedance. Only output driver is disabled.
		Standby	H or Open <sup>[2]</sup> : specified frequency output L: output is low (weak pull down). Device goes to sleep mode. Supply current reduces to I_std.
		NC	No connect (input receiver off)
2	GND	Power	Electrical and case ground
3	CLK	Output	Oscillator output
4	VDD	Power	Power supply voltage



**Note:**

2. A pull-up resistor of <10 kΩ between OE/ $\overline{ST}$  pin and Vdd is recommended in high noise environment when the device operates in OE/ $\overline{ST}$  mode.

### Absolute Maximum

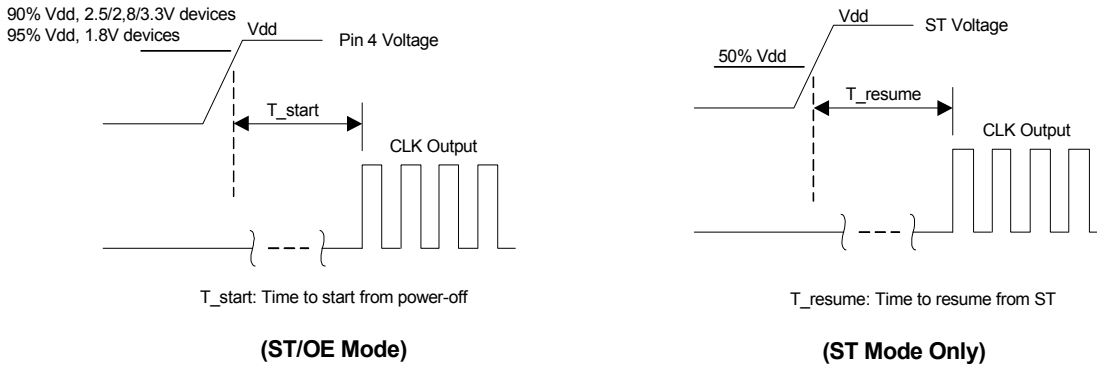
Attempted operation outside the absolute maximum ratings of the part may cause permanent damage to the part. Actual performance of the IC is only guaranteed within the operational specifications, not at absolute maximum ratings.

Parameter	Min.	Max.	Unit
Storage Temperature	-65	150	°C
VDD	-0.5	4	V
Electrostatic Discharge	–	2000	V
Soldering Temperature (follow standard Pb free soldering guidelines)	–	260	°C

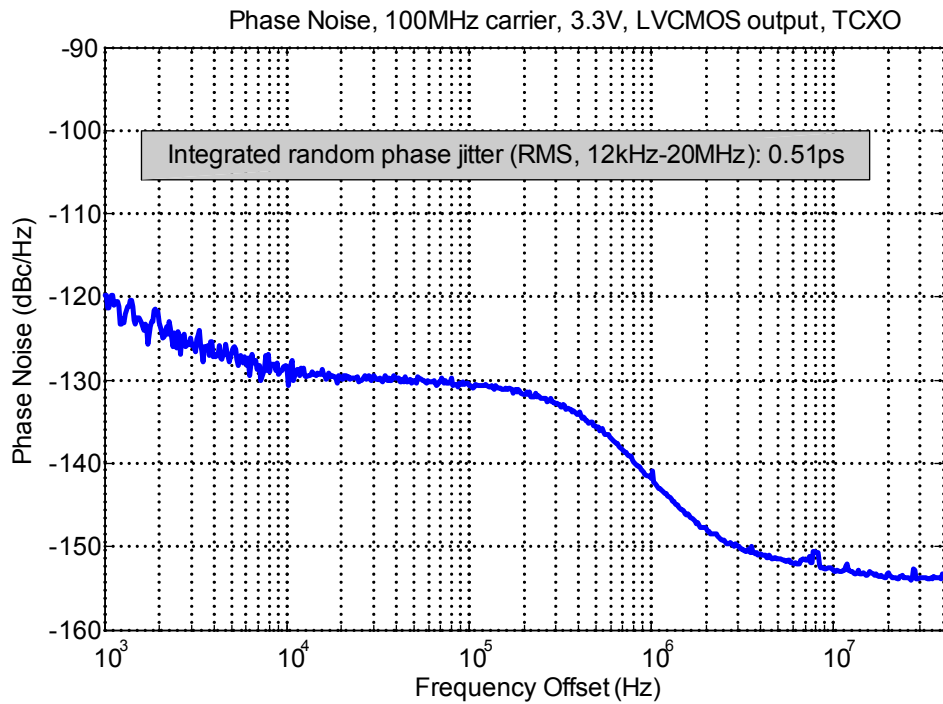
### Environmental Compliance

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

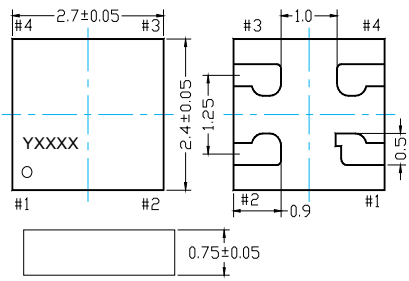
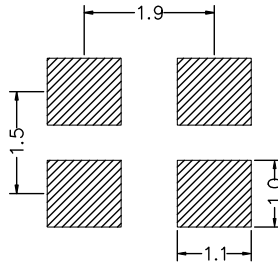
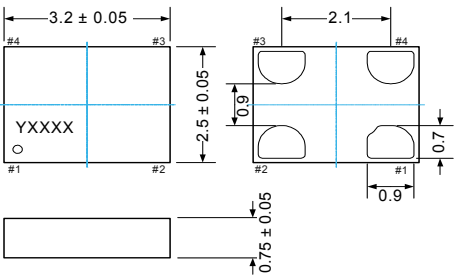
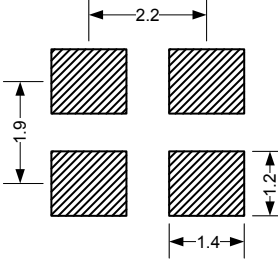
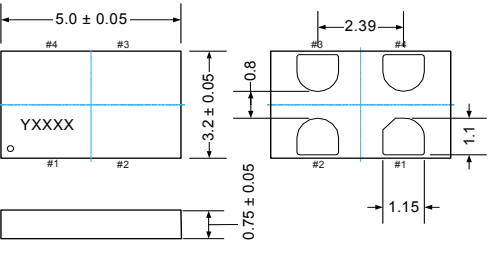
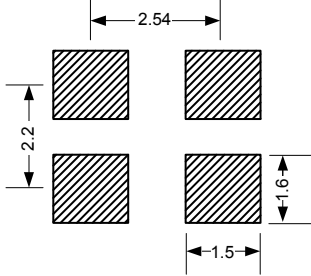
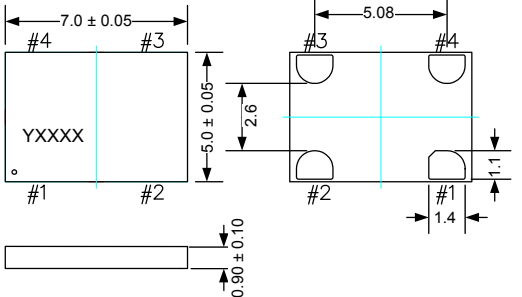
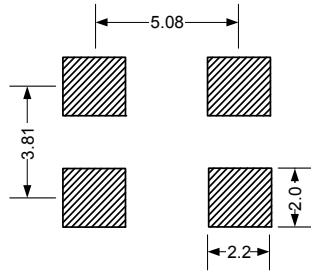
**Timing Diagram**



**Phase Noise Plot**



**Dimensions and Patterns**

Package Size – Dimensions (Unit: mm) <sup>[3]</sup>	Recommended Land Pattern (Unit: mm) <sup>[4]</sup>
<p><b>2.7 x 2.4 x 0.75 mm (100% compatible with 2.5 x 2.0 mm footprint)</b></p> 	
<p><b>3.2 x 2.5 x 0.75 mm</b></p> 	
<p><b>5.0 x 3.2 x 0.75 mm</b></p> 	
<p><b>7.0 x 5.0 x 0.90 mm</b></p> 	

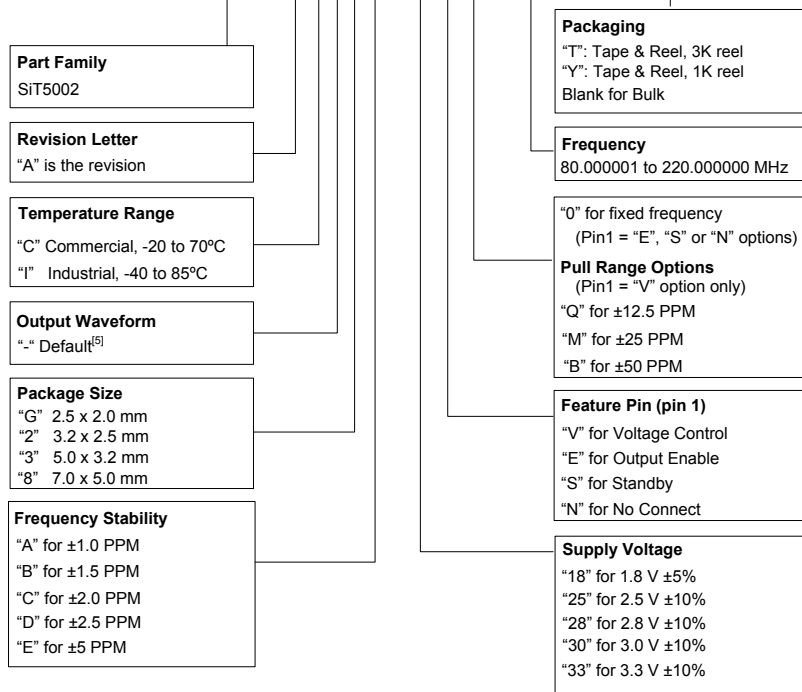
**Notes:**

- 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 μF between Vdd and GND is recommended.

### Ordering Information

The Part No. Guide is for reference only. To customize and build an exact part number, use the SiTime [Part Number Generator](#).

SiT5002AC-2D-18VQ-155.520000T



**Note:**

5. SiTime's SoftEdge™ output waveform with 6 ns rise/fall time reduces EMI and is similar to clipped sine wave in functionality.

### Frequency Stability vs. Temperature Range Options

Frequency Stability (PPM)	Temperature Range	
	C (-20 to +70°C)	I (-40 to +85°C)
±5	✓	✓
±2.5	✓	✓
±2	✓	✓
±1.5	✓	Contact SiTime
±1	Contact SiTime	Contact SiTime

**Additional Information**

Document	Description	Download Link
<b>Manufacturing Notes</b>	Tape & Reel dimension, reflow profile and other manufacturing related info	<a href="http://www.sitime.com/component/docman/doc_download/85-manufacturing-notes-for-sitime-oscillators">http://www.sitime.com/component/docman/doc_download/85-manufacturing-notes-for-sitime-oscillators</a>
<b>Qualification Reports</b>	RoHS report, reliability reports, composition reports	<a href="http://www.sitime.com/support/quality-and-reliability">http://www.sitime.com/support/quality-and-reliability</a>
<b>Performance Reports</b>	Additional performance data such as phase noise, current consumption and jitter for selected frequencies	<a href="http://www.sitime.com/support/performance-measurement-report">http://www.sitime.com/support/performance-measurement-report</a>
<b>Termination Techniques</b>	Termination design recommendations	<a href="http://www.sitime.com/support/application-notes">http://www.sitime.com/support/application-notes</a>
<b>Layout Techniques</b>	Layout recommendations	<a href="http://www.sitime.com/support/application-notes">http://www.sitime.com/support/application-notes</a>

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