CS00067AN Preliminary

±0.2 PPM, 25 MHz MEMS VCTCXO

The Smart Timing Choice™

Features

- ±0.2 PPM frequency stability over temperature
- 25 MHz frequency
- Low phase jitter: 0.5 ps RMS (12 kHz to 20 MHz)
- Voltage control option with pull range of ±12.5 PPM (contact SiTime for the Digital Control option)
- LVCMOS/HCMOS compatible output
- SoftEdge™ configurable rise/fall time control
- Standard 4-pin package: 3.2 x 2.5 mm, 5.0 x 3.2 mm
- Outstanding silicon reliability of 2 FIT, 10 times better than quartz
- Pb-free, RoHs and REACH compliant

Applications

- Servers and other high precision applications

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Electrical Characteristics[1]

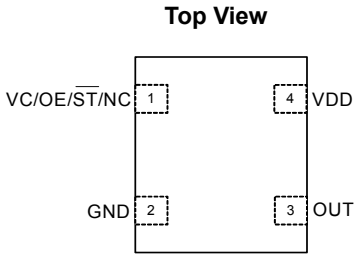
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Frequency Range						
Output Frequency Range	f	–	25	–	MHz	
Frequency Stability and Aging						
Initial Tolerance	F_init	-1.5	–	1.5	PPM	At 25°C
Stability Over Temperature	F_stab	-0.20	–	+0.20	PPM	
Supply Voltage	F_vdd	–	0.025	–	PPM	±5% Vdd
Temperature Hysteresis	F_h	-100		+100	PPB	0 to 70°C measured with 1°C/2 minute temperature slope.
		-80		+80	PPB	Any 10°C temperature range between 0 to 70°C measured with 1°C/2 minute temperature slope.
Output Load	F_load	–	0.1	–	PPM	15 pF ±10% of load
First year Aging	F_1year	-1.5	–	+1.5	PPM	25°C
10-year Aging	F_10year	-3.5	–	+3.5	PPM	25°C
Operating Temperature Range	T_use	0	–	+70	°C	Commercial temperature range
Voltage Control Options						
Pull Range	PR		±12.5		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	Z_vc	100	–	–	kΩ	
Frequency Change Polarity	–		Positive slope		–	
Control Voltage -3dB Bandwidth	V_BW	–	–	8	kHz	
Supply Voltage and Power Consumption						
Supply Voltage	Vdd	2.97	3.3	3.63	V	Contact SiTime for any other supply voltage options.
Current Consumption	Idd	–	31	33	mA	No load condition, f = 25 MHz, Vdd = 3.3V.
LVCMOS Output Characteristics						
Duty Cycle	DC	45	–	55	%	All Vdds
LVCMOS Rise/Fall Time	Tr, Tf	–	1.5	2	ns	LVCMOS option. Default rise/fall time, All Vdds, 10% - 90% Vdd.
SoftEdge™ Rise/Fall Time		SoftEdge™ Rise/Fall Time Table			ns	SoftEdge™ option. Frequency and supply voltage dependent.
Output Voltage High	VOH	90%	–	–	Vdd	IOH = -7 mA, IOL = 7 mA, (Vdd = 3.3V) IOH = -4 mA, IOL = 4 mA
Output Voltage Low	VOL	–	–	10%	Vdd	
Input Characteristics						
Input Voltage High	VIH	70%	–	–	Vdd	For OE or $\overline{ST}$ input pin.
Input Voltage Low	VIL	–	–	30%	Vdd	
Startup Time						
Startup Time	T_start	–	–	10	ms	Measured from the time Vdd reaches its rated minimum value.
Jitter						
RMS Period Jitter	T_jitt	–	1.7	2	ps	f = 25 MHz, Vdd = 3.3V
RMS Phase Jitter (random)	T_phj	–	0.6	1	ps	f = 25 MHz, Integration bandwidth = 12 kHz to 20 MHz, All Vdds.

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[2]: specified frequency output. L: output is high impedance. Only output driver is disabled.
		Standby	H or Open[2]: 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.

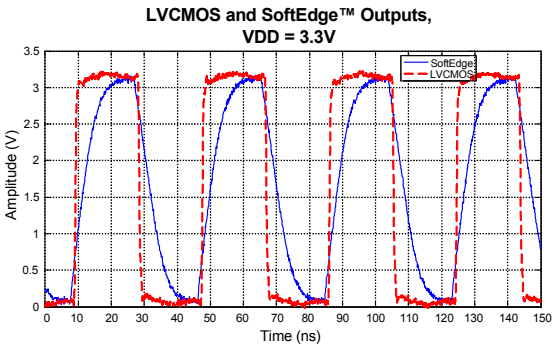
Parameter	Min.	Max.	Unit
Storage Temperature	-65	150	°C
VDD	-0.5	4	V
Electrostatic Discharge	–	2000	V
Soldering Temperature (follow standard Pb free soldering guidelines)	–	260	°C

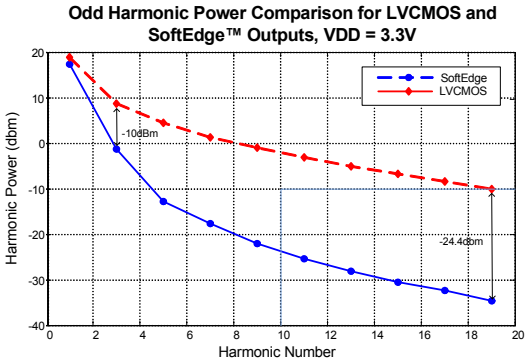
Environmental Compliance

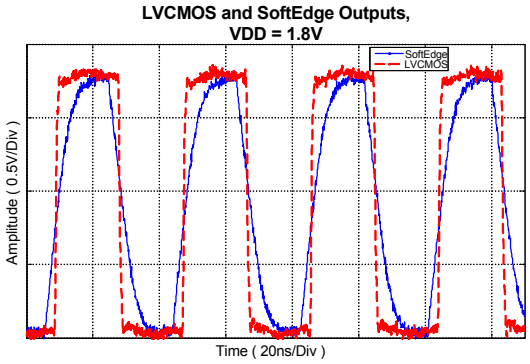
Parameter	Condition/Test Method
Mechanical Shock	**MIL-STD-883F, Method 2002**
Mechanical Vibration	**MIL-STD-883F, Method 2007**
Temperature Cycle	**JESD22, Method A104**
Solderability	**MIL-STD-883F, Method 2003**
Moisture Sensitivity Level	**MSL1 @ 260°C**

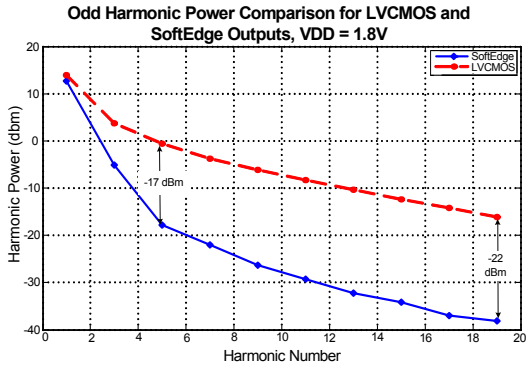
SoftEdge™ Waveform Examples and Corresponding Harmonics Reduction

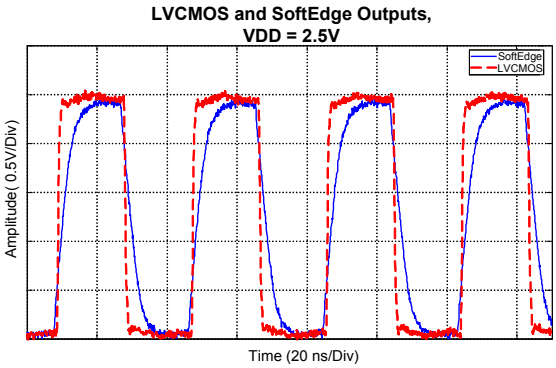
Figures below illustrate the harmonic power reduction as the rise/fall times are slowed from the standard squarewave output to that of the SoftEdge™ output. In general, the 1.8V device shows the lowest harmonics and provides best EMI performance comparing to devices with higher operating voltages.

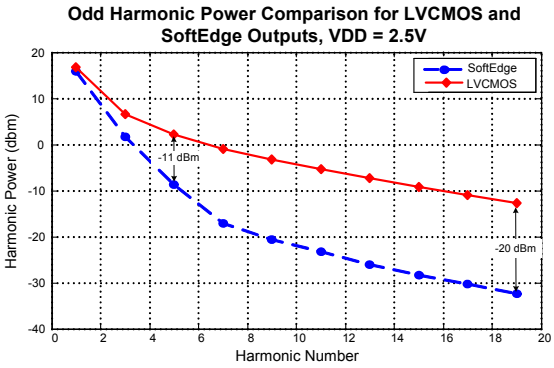




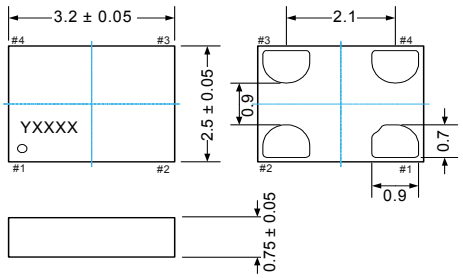
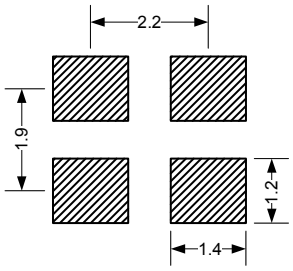
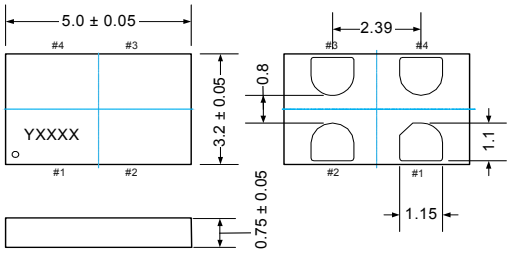
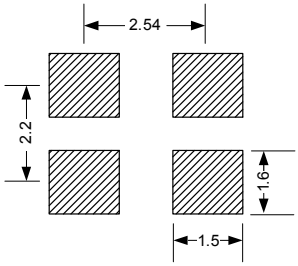








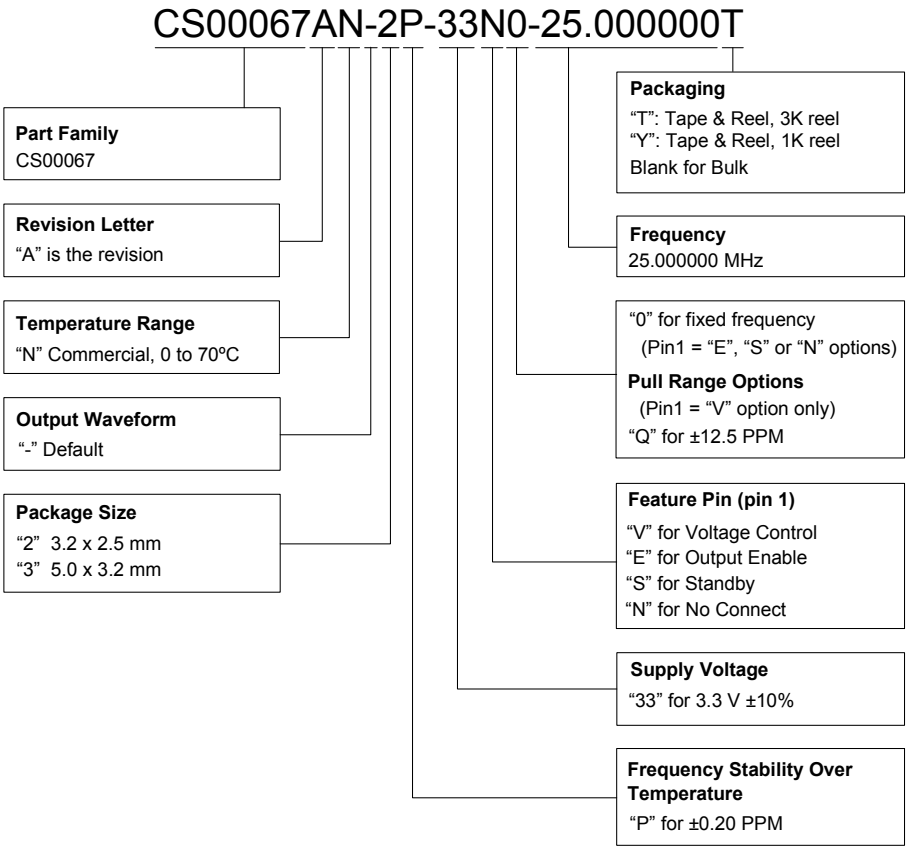
Dimensions and Patterns

Package Size – Dimensions (Unit: mm) [3]	Recommended Land Pattern (Unit: mm) [4]
3.2 x 2.5 x 0.75 mm 	
5.0 x 3.2 x 0.75 mm 	

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



Additional Information

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