SiT3701

Smallest Voltage Controlled MEMS Oscillator (VCMO)

SiTime™ It's About Time

■ Features, Benefits and Applications

- The world's only VCMO with programmable pull range: ±60 PPM, ±120 PPM, ±240 PPM
- Typical pull range linearity of 0.06%
- 1-110 MHz frequency range
- LVCMOS/LVTTL compatible output
- Typical power consumption of 6.1 mA in active mode
- Typical VCMO tuning voltage: 0 V to 1.85 V for all Vdds
- Four industry-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
- All-silicon timing device with outstanding reliability of 2 FIT (10x improvement over quartz-based devices), enhancing system MTBF
- Ultra short lead time
- Ideal for Set-top Box, DTV, DVD-R, instrumentation, low bandwidth analog PLL, networking and communications

■ Specifications

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Output Frequency Range	f	1	–	110	MHz	
Frequency Stability	F_stab	-20	–	+20	PPM	Inclusive of: Initial stability, operating temperature, rated power, supply voltage change, load change.
		-25	–	+25	PPM	
		-30	–	+30	PPM	**±20 PPM is available for extended commercial temperature only.**
		-50	–	+50	PPM	
Pull Range[1,2]	PR	±60, ±120, ±240			PPM	
Upper Control Voltage	VC_U	1.55	–	1.85	V	All Vdds. Voltage at which maximum deviation (+60, +120, +240 PPM) is guaranteed.
Lower Control Voltage	VC_L	0	–	0.1	V	All Vdds. Voltage at which maximum deviation (-60, -120, -240 PPM) is guaranteed.
Linearity	Lin	–	0.06	0.25	%	
Frequency Change Polarity	–	Positive slope			–	
Operating Temperature Range	T_use	-20	–	+70	℃	Extended Commercial
		-40	–	+85	℃	Industrial
Supply Voltage	Vdd	1.71	1.8	1.89	V	
		2.25	2.5	2.75	V	
		2.52	2.8	3.08	V	
		2.97	3.3	3.63	V	
Current Consumption	Idd	–	6.7	7.5	mA	No load condition, f = 20 MHz, Vdd = 2.5 V, 2.8 V or 3.3 V
		–	6.1	6.7	mA	No load condition, f = 20 MHz, Vdd = 1.8 V
Duty Cycle	DC	45	–	55	%	All Vdds. f <= 75 MHz
		40	–	60	%	All Vdds. f > 75 MHz
Rise/Fall Time	Tr, Tf	–	1	2.0	ns	Vdd = 2.5, 2.8 or 3.3 V, 20% - 80% Vdd level
		–	1	2.5	ns	Vdd = 1.8 V, 20% - 80% Vdd level
Output Voltage High	VOH	90	–	–	%Vdd	IOH = -4 mA (Vdd = 3.3 V) IOH = -3 mA (Vdd = 2.8 V and Vdd = 2.5 V) IOH = -2 mA (Vdd = 1.8 V)
Output Voltage Low	VOL	–	–	10	%Vdd	IOL = 4 mA (Vdd = 3.3 V) IOL = 3 mA (Vdd = 2.8 V and Vdd = 2.5 V) IOL = 2 mA (Vdd = 1.8 V)
Output Load	Ld	–	–	15	pF	Maximum frequency and supply voltage Contact SiTime for higher output load
Start-up Time	T_osc	–	–	10	ms	Time @ minimum supply voltage to be zero
RMS Period Jitter	T_jitt	–	–	6	ps	f = 75 MHz, Vdd = 1.8 V
		–	–	4	ps	f = 75 MHz, Vdd = 2.5 V, 2.8 V or 3.3 V
RMS Phase Jitter (random)	T_phj	–	0.6	–	ps	f = 75 MHz, Integration bandwidth = 900 kHz to 7.5 MHz, VDD = 2.5 V, 2.8 V, or 3.3 V
		–	0.8	–	ps	f = 75 MHz, Integration bandwidth = 900 kHz to 7.5 MHz, VDD = 1.8 V

Notes:
1. Absolute Pull Range (APR) is defined as the guaranteed pull range over temperature and voltage.
2. APR = pull range (PR) - frequency stability (F_stab).

■ Specifications (Cont.)

Pin Description Tables

Pin #1 Functionality
VIN
0 - 1.85 V: produces voltage dependent frequency change

Pin Map	
Pin	Connection
1	VIN
2	GND
3	CLK
4	VDD

Absolute Maximum Ratings

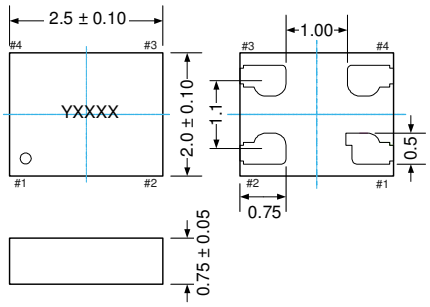
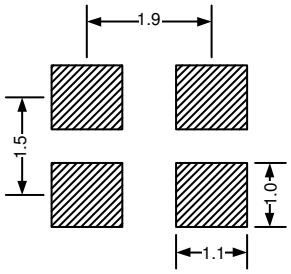
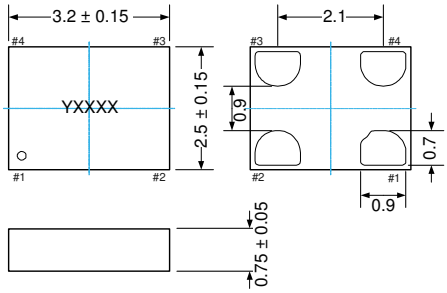
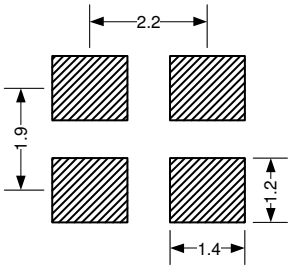
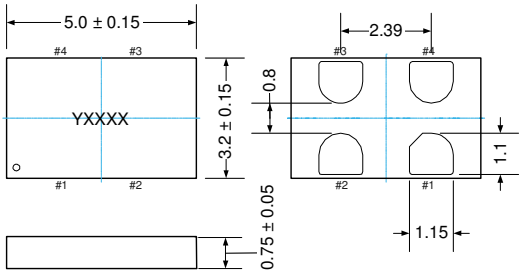
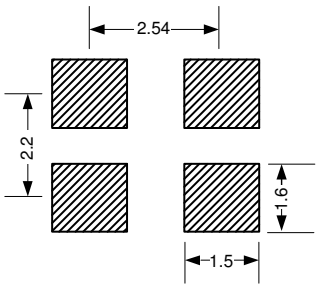
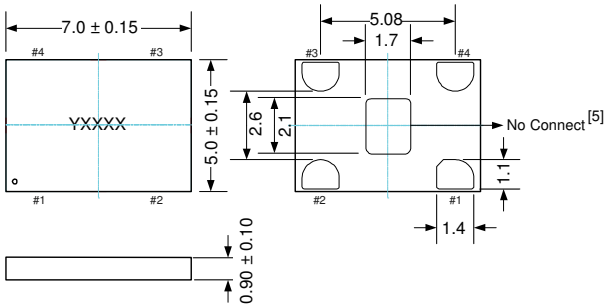
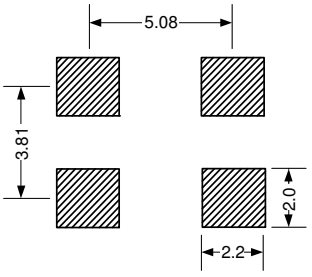
Attempted operation outside the absolute maximum ratings of the part may cause permanent damage to the part. Actual performance of the IC is only guaranteed within the operational specifications, not at absolute maximum ratings.

Parameter	Min.	Max.	Unit
Storage Temperature	-65	150	℃
VDD	-0.5	4	V
Electrostatic Discharge	–	6000	V
Theta JA (with copper plane on VDD and GND)	–	75	℃/W
Theta JC (with PCB traces of 0.010 inch to all pins)	–	24	℃/W
Soldering Temperature (follow standard Pb free soldering guidelines)	–	260	℃
Number of Program Writes	–	1	NA
Program Retention over -40 to 125℃, Process, VDD (0 to 3.65 V)	1,000+	–	years

Environmental Compliance

Parameter	Condition/Test Method
Mechanical Shock	MIL-STD-883F, Method 2002; 50kG
Mechanical Vibration	MIL-STD-883F, Method 2007; 70G
Temperature Cycle	JESD22, Method A104
Solderability	MIL-STD-883F, Method 2003
Moisture Sensibility Level	MSL1 @ 260℃

Dimensions and Land Patterns

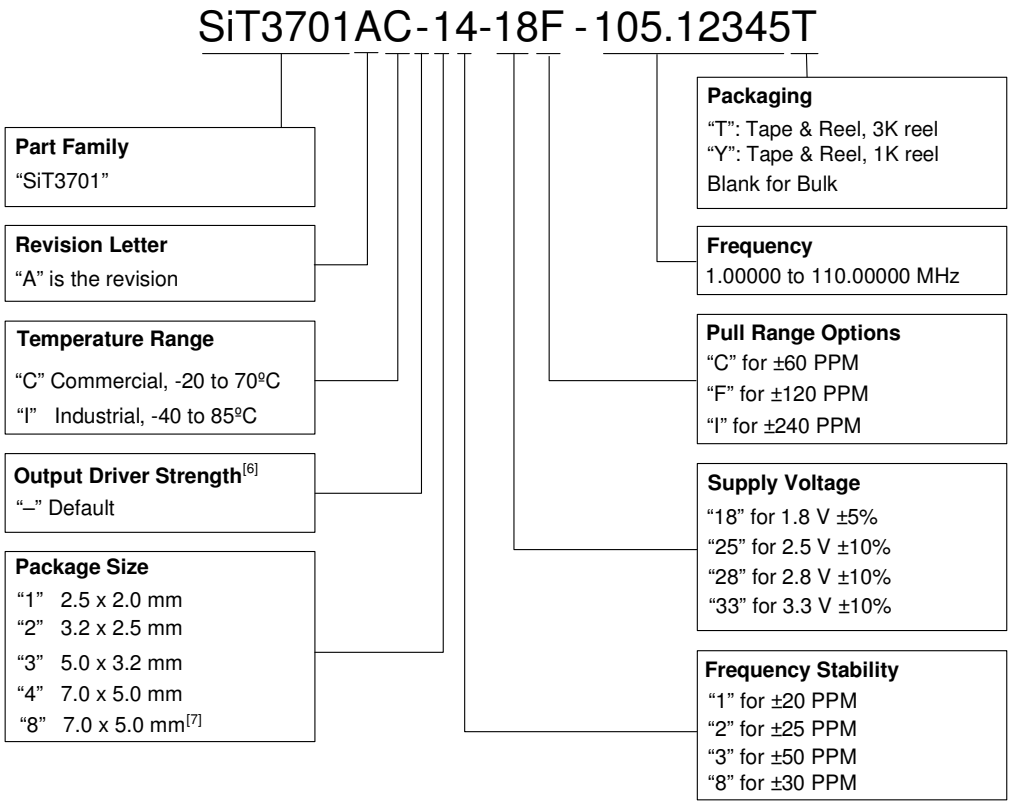
Package Size – Dimensions (Unit: mm)[3]	Recommended Land Pattern (Unit: mm)[4]
2.5 x 2.0 x 0.75 mm	
	
3.2 x 2.5 x 0.75 mm	
	
5.0 x 3.2 x 0.75 mm	
	
7.0 x 5.0 x 0.90 mm	
	

Notes:

3. 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.
5. The 7050 package with part number designation "-8" has NO center pad.

■ Part No. Guide - How to Order

The Part No. Guide is for reference only. For real-time customization and exact part number, use the SiTime Part Number Generator.



Notes:
6. Contact SiTime for different drive strength options for driving higher loads or reducing EMI.
7. Without Center Pad.

Frequency Stability vs. Temperature Range Options

Frequency Stability (PPM)	Temperature Range	Supply Voltage			
		1.8 V	2.5 V	2.8 V	3.3 V
±20	C (-20 to +70°C)	✓	✓	✓	✓
	I (-40 to +85°C)	–	–	–	–
±25	C (-20 to +70°C) I (-40 to +85°C)	✓	✓	✓	✓
±30	C (-20 to +70°C) I (-40 to +85°C)	✓	✓	✓	✓
±50	C (-20 to +70°C) I (-40 to +85°C)	✓	✓	✓	✓