CRYSTAL OSCILLATOR (Programmable) SPREAD SPECTRUM

OUTPUT: CMOS

SG-9101 series

• Frequency range : 0.67 MHz ~ 170 MHz (1 ppm Step)

• Supply voltage : 1.62 V ~ 3.63 V

• Function : Output enable (OE) or Standby (ST)

• Down or Center spread modulation

· Configurable spreading

3 modulation profile (Hershey-kiss, Sine-wave, Triangle),

4 modulation frequency, 6 spread percentage

• Package : 2.5 x 2.0, 3.2 x 2.5, 5.0 x 3.2, 7.0 x 5.0 (mm)

• PLL technology to enable short lead time

Available field oscillator programmer "SG-Writer II"



Specifications (characteristics)

Item Symbo		Symbol		Specif	ications	Conditions/Remarks				
Supply voltage		Vcc	1.80 V Typ. 2.50 V Typ. 3.30 V Typ.				_			
Supply voltage			1.62 V ~ 1.98 V 1.98 V ~ 2.20 V 2.20			2.70 V ~ 3.63 V				
Output frequency range fo					~ 170 MHz					
Storage temperature		T_stg			- +125 °C		Storage as single product.			
Operating temp	erature	T_use			~ +85 °C - +105 °C					
Frequency toler	ance*1	f tol			× 10 ⁻⁶		Average frequency of 1s gate time.			
requeries toler	aricc	1_101	3.4 mA Max.	3.5 mA Max.	3.6 mA Max.	3.7 mA Max.	T use = +105 °C	-		
			2.9 m/		3.0 mA Typ.	3.2 mA Typ.	T use = +25 °C	No load, f ₀ = 20 MHz		
Current consum	nption	Icc	5.7 mA Max.	6.0 mA Max.	6.9 mA Max.	8.3 mA Max.	T use = +105 °C			
			4.9 mA Typ. 5.9 mA Typ. 7.0 mA Typ.				T use = +25 °C	o load, f ₀ = 170 MHz		
Output disable	current	I dis	3.4 mA Max.	3.4 mA Max.	3.5 mA Max.	3.7 mA Max.	OE = GND, f _O = 170 MHz	7		
'			0.9 µA Max.	1.0 µA Max.	1.5 µA Max.	2.5 µA Max.	T use = +105 °C			
Standby curren	t	I_std	0.3 μA Typ.	0.4 μA Typ.	0.5 μA Typ.	1.1 μA Typ.	T use = +25 °C	T = GND		
Symmetry		SYM			~ 55 %	r 7r	50 % V _{CC} Level			
-,,							I _{OH} /I _{OL} Conditions	[mA]		
		Vон	90 % V _{CC} Min.				Rise/Fall time	Vcc *A *B *C *D		
							Default (fo > 40 MHz),	loн -2.5 -3.5 -4.0 -5.0		
						Fast	l _{OL} 2.5 3.5 4.0 5.0			
Output voltage (DC characteris	tion)						Default ($f_0 \le 40 \text{ MHz}$)			
(DC Characteris	ilics)		10 % V _{CC} Max.				Slow IoL 1.5 2.0 2.5 3.0 IoH -1.0 -1.5 -2.0 -2.5 IoH -1.0 1.5 2.0 2.5 2.0 -2.5 IoL 1.0 1.5 2.0 2.5 IoH -1.0 -1.5 -2.0 -2.5 IoH -1.0 -2.5 I			
		V_{OL}								
		- OL								
							*C : 2.20 V ~ 2.80 V, *D : 2.70 V ~ 3.63 V			
Output load cor	ndition	L_CMOS		15	pF Max.		-			
Innut valtage		V_{IH}		70 %	V _{CC} Min.		OE or ST			
Input voltage		VIL		30 % \	/cc Max.		OE 01 ST			
	Defeult			3.0	ns Max.		f _O > 40 MHz			
Rise and Fall	Default			6.0 ns Max.			f _O ≤40 MHz	20 % - 80 % Vcc		
time	Fast	tr/tf		3.0	ns Max.		f _O = 0.67 MHz ~ 170 MH:	L_CMOS = 15 pF		
	Slow		10.0 ns Max.				f _O = 0.67 MHz ~ 20 MHz	0 MHz		
Disable Time		t_stp	1 μs Max.				Measured from the time OE or ST pin crosses 30 % V _{CC}			
Enable Time		t_sta	1 µs Max.				Measured from the time OE pin crosses 70 % Vcc			
Resume Time		t_res	3 ms Max.				Measured from the time ST pin crosses 70 % V _{CC}			
Start-up time		t_str	3 ms Max.			Measured from the time V _{CC} reaches its rated minimum value, 1.62 V				

^{*1} Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, load drift and aging (+25 °C, 1 year).

Spread spectrum configuration

	C: Center spread	⑤Code	02	05	07	10	15	20
4	modulation	Spread percentage	±0.25 %	±0.5 %	±0.75 %	±1.0 %	±1.5 %	±2.0 %
	D: Down spread	⑤Code	05	10	15	20	30	40
	modulation	Spread percentage	-0.5 %	-1.0 %	-1.5 %	-2.0 %	-3.0 %	-4.0 %

Modulation frequency: 25.4 kHz (default), 6.3 kHz, 8.5 kHz, 12.7 kHz

Modulation profile: Hershey-kiss (default), Sine-wave, Triangle

Product Name

<u>SG-9101CG 170.000000MHz C 20 P H A A A</u>

1) (2)

(3)

4567890

② Package Type
CA: 7.0 mm x 5.0 mm
CB: 5.0 mm x 3.2 mm
CE: 3.2 mm x 2.5 mm

CG: 2.5 mm x 2.0 mm

©Function
P: Output enable
S: Standby

④Spread type

C: Center spread

D: Down spread

⑦ Operating temperature
 G: -40 °C ~ +85 °C
 H: -40 °C ~ +105 °C

A: Hershey-kiss (default)
B: Sine-wave
C: Triangle

@Rise/Fall time

Modulation profile

 (a) Modulation frequency

 A: 25.4 kHz (default)
 (a) Rise/Fa

 B: 12.7 kHz
 A: Default

 C: 8.5 kHz
 B: Fast

 D: 6.3 kHz
 C: Slow

①Model, ②Package type, ③Frequency,

Spread type, Spread percentage code,

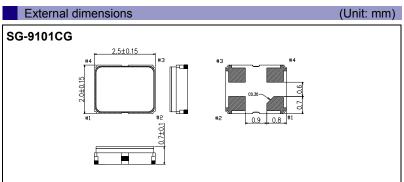
6 Function, 7 Operating temperature,

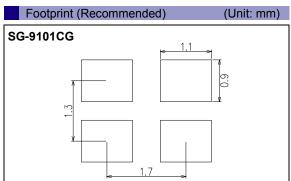
® Modulation frequency, 9 Modulation profile, 1 Rise/Fall time

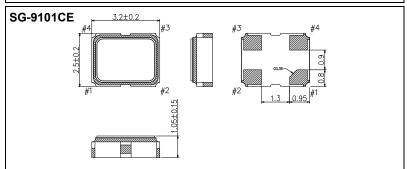


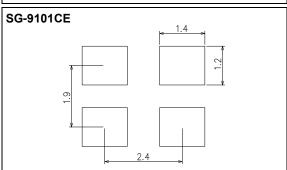
Pin description

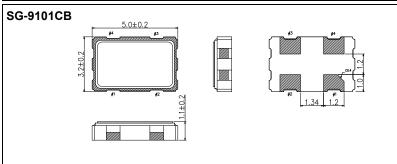
Pin	Name	I/O type		Function								
	OE	Input	Output enable	High: Specified frequency output from OUT pin								
	OL	IIIput	Output eriable	Low: Out pin is low (weak pull down), only output driver is disabled.								
1			Standby	High: Specified frequency output from OUT pin								
	ST	Input		Low: Out pin is low (weak pull down),								
				Device goes to standby mode. Supply current reduces to the least as I_std.								
2	GND	Power	Ground									
3	OUT	Output	Clock output									
4	V _{CC}	Power	Power supply									

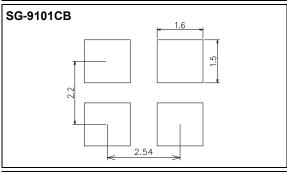


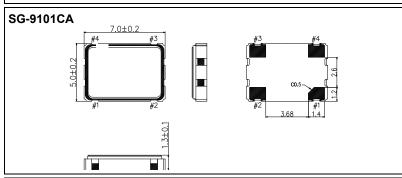


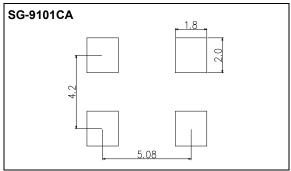








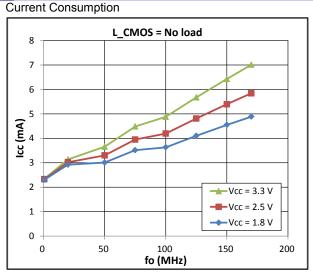


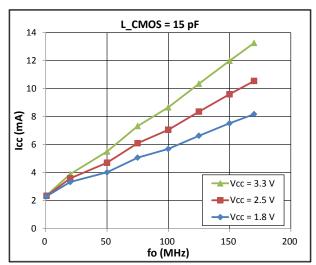


■Notes:

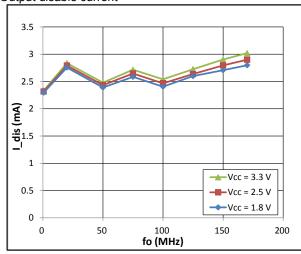
In order to achieve optimum jitter performance, the 0.1 μ F capacitor between V_{CC} and GND should be placed. It is also recommended that the capacitors are placed on the device side of the PCB, as close to the device as possible and connected together with short wiring pattern.

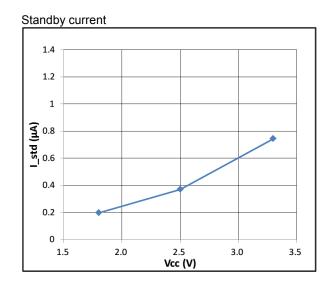
Specification Graph (Typical supplemental specification. Unless otherwise specified T_use = 25 °C, L_CMOS = 15pF)









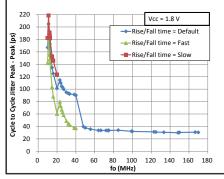


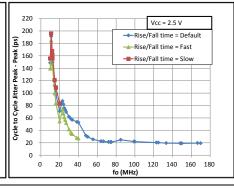
■Notes:

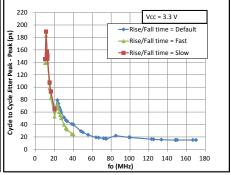
Spead percentage: ±2.0 %, Modulation frequency: 25.4 kHz, Modulation profile: Hershey-kiss

Specification Graph (Typical supplemental specification. Unless otherwise specified T_use = 25 °C, L_CMOS = 15pF)







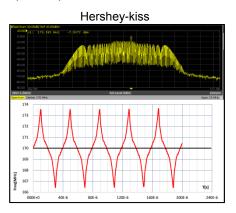


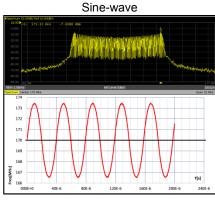
■ Notes:

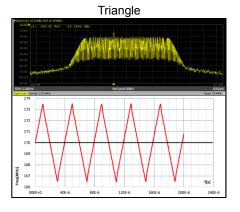
Spead percentage : $\pm 2.0~\%$, Modulation frequency : 25.4 kHz , Modulation profile : Hershey-kiss

Spread Spectrum Specification Graph

Spread Spectrum Profile fo: 170 MHz / Spread spectrum: ± 2.0 % / Modulation frequency: 25.4 kHz



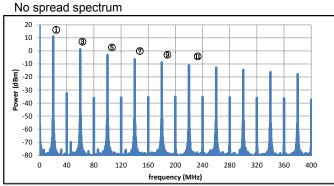


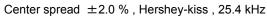


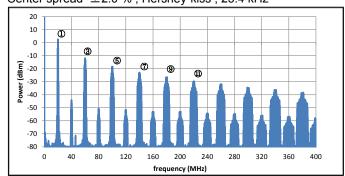
Harmonics Specification Graph

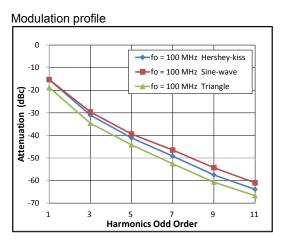
(Typical supplemental specification. Unless otherwise specified T use = 25 °C, L CMOS = 15pF, Vcc = 3.3 V)

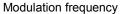
Harmonics spectrum (fo = 20 MHz)

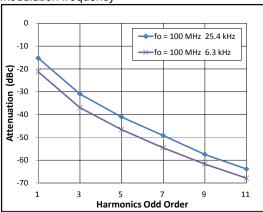


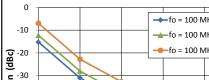








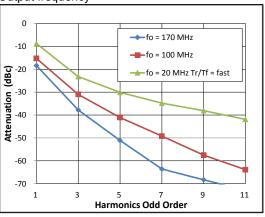




Spread percentage



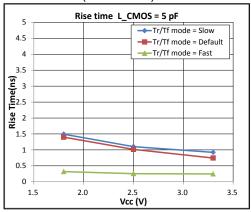
Output frequency

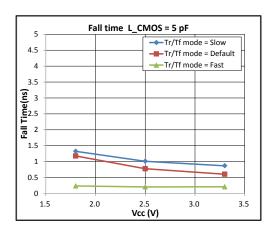


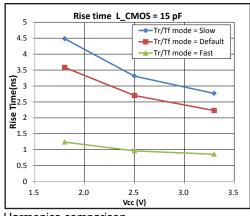
Hermonics order attenuation is normalizing to no-spread spectrum mode.

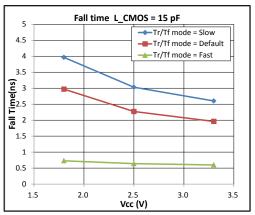
Specification Graph (Typical supplemental specification. Unless otherwise specified T use = 25 °C, L CMOS = 15pF)

Rise/Fall Time (fo = 20 MHz)



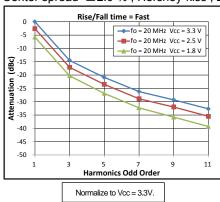


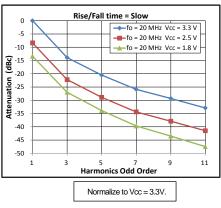


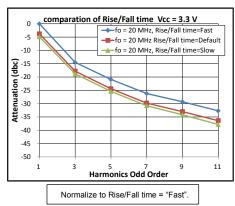


Harmonics comparison

Center spread ±2.0 %, Hershey-kiss, 25.4 kHz







■ Notes:

frequency	slow	default	fast		
0.67 M - 20 M	See Slow	See Default	See Fast		
20 M – 40 M	-	See Default	See Fast		
40 M – 170 M	-	See Fast	See Fast		



Simulation Model

IBIS Model is available upon request. Please contact us.
 Information Required: Oscillator operating condition (i.e. Power Supply, Rise/Fall Time, Temperature)

ESD Rating

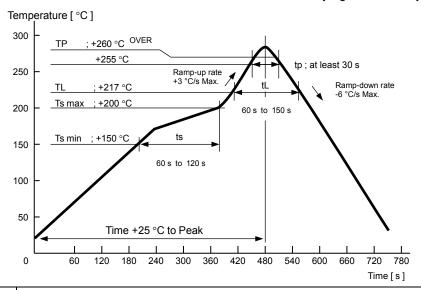
Test items	Breakdown voltage				
Human Body Model (HBM)	2000V				
Machine Model (MM)	250V				
Charged Device Model (CDM)	750V				

Device Material & Environmental Information

Model	Package	# of	Reference	Terminal	Terminal	Complies	Pb	MSL	Peak
	Dimensions	Pins	Weight	Material	Plating	With EU	Free	Rating	Temp.
			(Typ.)			RoHS			(Max)
SG-9101CG	2.5x2.0x0.7mm	4	13 mg	W	Au	Yes	Yes	1	260°C
SG-9101CE	3.2x2.5x1.0mm	4	25 mg	W	Au	Yes	Yes	1	260°C
SG-9101CB	5.0x3.2x1.1mm	4	51 mg	W	Au	Yes	Yes	1	260°C
SG-9101CA	7.0x5.0x1.3mm	4	143 mg	W	Au	Yes	Yes	1	260°C

SMD products Reflow profile(example)

The availability of the heat resistance for reflow conditions of JEDEC-STD-020D.01 is judged individually. Please inquire.





• Pb free.



- Complies with EU RoHS directive.
 - About the products without the Pb-free mark.
 Contains Pb in products exempted by EU RoHS directive.
 (Contains Pb in sealing glass, high melting temperature type solder or other.)

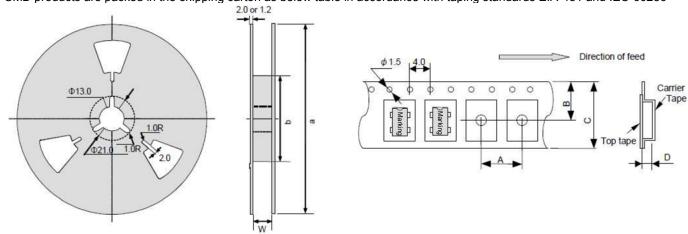


Device Marking

Model	Factory Programmed Part Marking	Field Programmable Part Marking
		(Blank Samples)
SG-9101CG	Product code 170. S1 OA23DK 1pin mark Lot No.	Product code S1 OA23DK 1pin mark Lot No.
SG-9101CE	Frequency Product code 170.0S1 o A23DK Lot No.	Product code S1 o A23DK Lot No.
SG-9101CB	Frequency 170.0S1 o A23DK Lot No.	S1 o A23DK Lot No.
SG-9101CA	Frequency 170.00S1 o A23DK Lot No.	S1 O A23DK Lot No.

Standard Packing Specification

SMD products are packed in the shipping carton as below table in accordance with taping standards EIA-481 and IEC-60286



Standard Packing Quantity & Dimension(Unit mm)

Standard Facking Quartity & Dimension(Ont him)										
		Quantity	Reel Dimension			Care	Direction of			
Model		(pcs/Reel)	а	b	W	Α	В	С	D	Feed (L= Left
	(pcs/keei)	A				Direction)				
9	G-9101CG	3000	Ф180	Ф60	9	4	5.25	8	1.15	L
9	SG-9101CE	2000	Ф180	Ф60	9	4	5.25	8	1.4	L
9	G-9101CB	1000	Ф180	Ф60	13	8	7.25	12	1.4	L
9	G-9101CA	1000	Ф254	Ф100	17.5	8	9.25	16	2.3	L

PROMOTION OF ENVIRONMENTAL MANAGEMENT SYSTEM CONFORMING TO INTERNATIONAL STANDARDS

At Seiko Epson, all environmental initiatives operate under the Plan-Do-Check-Action (PDCA) cycle designed to achieve continuous improvements. The environmental management system (EMS) operates under the ISO 14001 environmental management standard.

All of our major manufacturing and non-manufacturing sites, in Japan and overseas, completed the acquisition of ISO 14001 certification.

ISO 14000 is an international standard for environmental management that was established by the International Standards Organization in 1996 against the background of growing concern regarding global warming, destruction of the ozone layer, and global deforestation.

WORKING FOR HIGH QUALITY

In order provide high quality and reliable products and services than meet customer needs,

Seiko Epson made early efforts towards obtaining ISO9000 series certification and has acquired ISO9001 for all business establishments in Japan and abroad. We have also acquired ISO/TS 16949 certification that is requested strongly by major automotive manufacturers as standard.

ISO/TS16949 is the international standard that added the sector-specific supplemental requirements for automotive industry based on ISO9001.

Explanation of the mark that are using it for the catalog



►Pb free.



- ► Complies with EU RoHS directive.
 - *About the products without the Pb-free mark.

 Contains Pb in products exempted by EU RoHS directive.

 (Contains Pb in sealing glass, high melting temperature type solder or other.)



▶ Designed for automotive applications such as Car Multimedia, Body Electronics, Remote Keyless Entry etc.



 \blacktriangleright Designed for automotive applications related to driving safety (Engine Control Unit, Air Bag, ESC etc).

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