

FULL-SIZE DIP HIGH-FREQUENCY CRYSTAL OSCILLATOR

# SG-51 series

HALF-SIZE DIP HIGH-FREQUENCY CRYSTAL OSCILLATOR

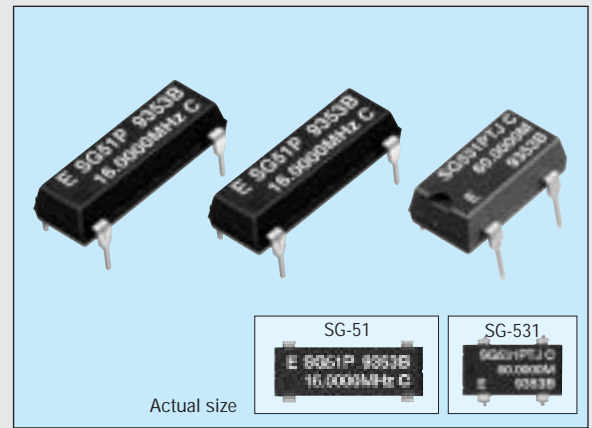
# SG-531 series

Product number (please refer to page 1)

**Q32510xxxxxx00**

**Q32531xxxxxx00**

- Pin compatible with full-size metal can. (SG-51 series)
- Pin compatible with half-size metal can. (SG-531 series)
- Cylindrical AT-cut crystal unit builtin, thus assuring high reliability.
- Use of CMOS IC enables reduction of current consumption.



Actual size

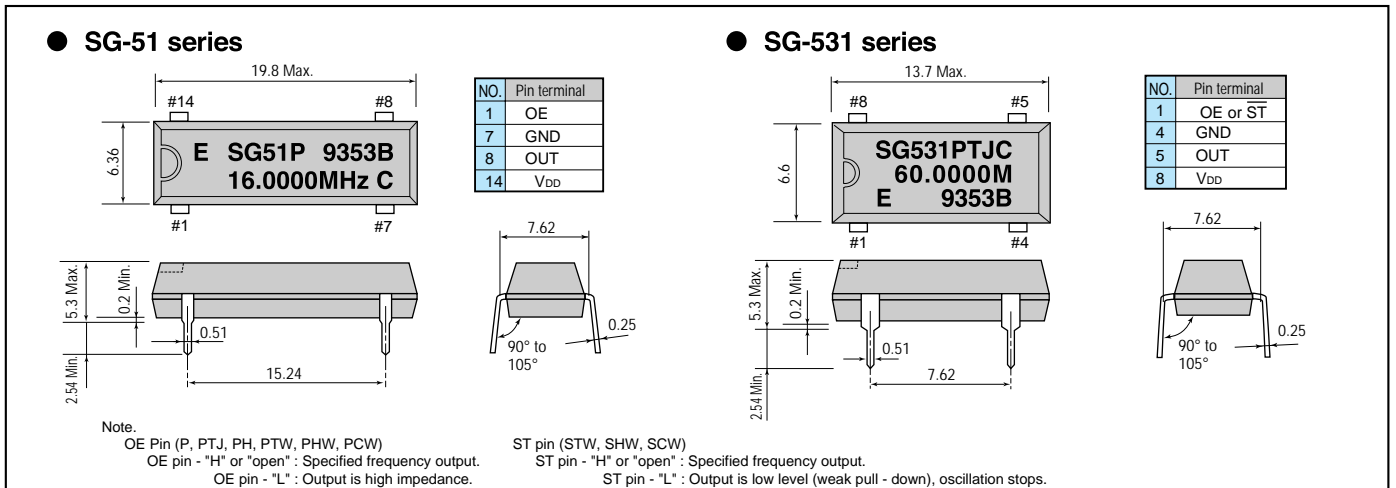
## Specifications (characteristics)

Item	Symbol	Specifications			Remarks
		SG-51P/531P	SG-51PTJ/531PTJ	SG-51PH/531PH	
Output frequency range	$f_0$	1.0250 MHz to 26.0000 MHz	26.0001 MHz to 66.6667 MHz		Refer to page 31. "Frequency range"
Power source voltage	Max. supply voltage	$V_{DD-GND}$	-0.3 V to +7.0 V	-0.5 V to +7.0 V	
	Operating voltage	$V_{DD}$	5.0 V $\pm$ 0.5 V		
Temperature range	Storage temperature	$T_{STG}$	-55 °C to +125 °C		Stored as bare product after unpacking
	Operating temperature	$T_{OPR}$	-20 °C to +70 °C (-40 °C to +85 °C)		Refer to page 31. "Frequency range"
Frequency stability	$\Delta f/f_0$		B: $\pm 50 \times 10^{-6}$ C: $\pm 100 \times 10^{-6}$		B type is possible up to 55.0 MHz
Current consumption	$I_{OP}$	23 mA Max.	35 mA Max.		No load condition
Output disable current	$I_{OE}$	12 mA Max.	28 mA Max.	20 mA Max.	OE=GND
Duty	CMOS level	$t_w/t$	40 % to 60 %	40 % to 60 %	1/2 $V_{DD}$ level
	TTL level		45 % to 55 %		1.4 V level
Output voltage	$V_{OH}$	$V_{DD}-0.4$ V Min.	2.4 V Min.	$V_{DD}-0.4$ V Min.	$I_{OH} = -400 \mu A$ (P,PTJ) / -4 mA (PH)
	$V_{OL}$		0.4 V Max.		$I_{OL} = 16$ mA (P) / 8 mA (PTJ) / 4mA (PH)
Output load condition (fan out)	CMOS	$C_L$	50 pF Max.	50 pF Max.	
	TTL	N	10 TTL Max.	5 TTL Max.	$C_L \leq 15$ pF
Output enable/disable input voltage	$V_{IH}$	2.0 V Min.	3.5 V Min.	2.0 V Min.	$I_{IH} = 1 \mu A$ Max. (OE= $V_{DD}$ )
	$V_{IL}$	0.8 V Max.	1.5 V Max.	0.8 V Max.	$I_{IL} = -100 \mu A$ Min. (OE=GND), PTJ: $I_{IL} = -500 \mu A$ Min. (OE=GND)
Output rise time	CMOS level	$t_{TLH}$	8 ns Max.	7 ns Max.	CMOS load: 20 % $\rightarrow$ 80 % $V_{DD}$
	TTL level		5 ns Max.	—	TTL load: 0.4 V $\rightarrow$ 2.4 V
Output fall time	CMOS level	$t_{THL}$	8 ns Max.	7 ns Max.	CMOS load: 80 % $\rightarrow$ 20 % $V_{DD}$
	TTL level		5 ns Max.	—	TTL load: 2.4 V $\rightarrow$ 0.4 V
Oscillation start up time	$t_{OSC}$	4 ms Max.	10 ms Max.		More than for 1 ms until $V_{DD} = 0$ V $\rightarrow$ 4.5 V Time at 4.5 V to be 0 s
Aging	$f_a$		$\pm 5 \times 10^{-6}$ /year Max.		$T_a = +25$ °C, $V_{DD} = 5$ V, first year
Shock resistance	S.R.		$\pm 20 \times 10^{-6}$ Max.		Three drops on a hard board from 750 mm or excitation test with 29400 m/s <sup>2</sup> x 0.3 ms x 1/2 sine wave in 3 directions

Note: • Unless otherwise stated, characteristics (specifications) shown in the above table are based on the rated operating temperature and voltage condition.  
• External by-pass capacitor is recommended.

## External dimensions

(Unit: mm)



## ■ Specifications (characteristics)

Item	Symbol	Specifications		Remarks
		SG-531PCG	SG-531SCG	
Output frequency range	f <sub>o</sub>	1.5000 MHz to 26.0000 MHz		Refer to page 31. "Frequency range"
Power source voltage	Max. supply voltage	V <sub>DD-GND</sub>	-0.5 V to +7.0 V	
	Operating voltage	V <sub>DD</sub>	2.7 V to 3.6 V	
Temperature range	Storage temperature	T <sub>STG</sub>	-55 °C to +125 °C	Stored as bare product after unpacking
	Operating temperature	T <sub>OPR</sub>	-40 °C to +85 °C	Refer to page 31. "Frequency range"
Frequency stability	Δf/f <sub>o</sub>	B : ±50 x 10 <sup>-6</sup> C : ±100 x 10 <sup>-6</sup>		-20 °C to +70 °C
		M : ±100 x 10 <sup>-6</sup>		-40 °C to +85 °C
Current consumption	I <sub>OP</sub>	12 mA Max.		No load condition
Output disable current	I <sub>OE</sub>	10 mA Max.	—	OE=GND (PCG)
Standby current	I <sub>ST</sub>	—	50 μA Max.	ST=GND (SCG)
Duty	tw/t	45 % to 55 %		50 % V <sub>DD</sub> , CL = 25 pF
Output voltage	V <sub>OH</sub>	V <sub>DD</sub> -0.4 V Min.		I <sub>OH</sub> = -8 mA
	V <sub>OL</sub>	0.4 V Max.		I <sub>OL</sub> = 8 mA
Output load condition (fan out)	CL	25 pF		
Output enable disable input voltage	V <sub>IH</sub>	70 % V <sub>DD</sub> Min.		OE, ST
	V <sub>IL</sub>	20 % V <sub>DD</sub> Max.		OE, ST
Output rise time	t <sub>TLH</sub>	4.0 ns Max.		20 % to 80 % V <sub>DD</sub> , CL ≤ 25 pF
Output fall time	t <sub>THL</sub>	4.0 ns Max.		80 % to 20 % V <sub>DD</sub> CL ≤ 25 pF
Oscillation start up time	t <sub>OSC</sub>	12 ms Max.		Time at minimum operating voltage to be 0 s
Aging	f <sub>a</sub>	±5 x 10 <sup>-6</sup> / year Max.		T <sub>a</sub> =+25 °C, V <sub>DD</sub> =3.3 V, First year
Shock resistance	S.R.	±20 x 10 <sup>-6</sup> Max.		Three drops on a hard board from 750 mm or excitation test with 29400 m/s <sup>2</sup> x 0.3 ms x 1/2 sine wave in 3 directions

## ■ Specifications (characteristics)

Item	Symbol	Specifications			Remarks
		SG-531PTW/STW	SG-531PHW/SHW	SG-531PCW/SCW	
Output frequency range	f <sub>o</sub>	55.0001 MHz to 135.0000 MHz		26.0001 MHz to 135.0000 MHz	Refer to page 31. "Frequency range"
Power source voltage	Max. supply voltage	V <sub>DD-GND</sub>	-0.5 V to +7.0 V		
	Operating voltage	V <sub>DD</sub>	5.0 V ± 0.5 V	3.3 V ± 0.3 V	
Temperature range	Storage temperature	T <sub>STG</sub>	-55 °C to +100 °C		Stored as bare product after unpacking
	Operating temperature	T <sub>OPR</sub>	-20 °C to +70 °C	-40 °C to +85 °C	Refer to page 31. "Frequency range"
Frequency stability	Δf/f <sub>o</sub>	B : ±50 x 10 <sup>-6</sup> C : ±100 x 10 <sup>-6</sup>			-20 °C to +70 °C
		—			M : ±100 x 10 <sup>-6</sup>
Current consumption	I <sub>OP</sub>	45 mA Max.		28 mA Max.	No load condition
Output disable current	I <sub>OE</sub>	30 mA Max.		16 mA Max.	OE=GND(P*W)
Standby current	I <sub>ST</sub>	50 μA Max.		—	ST=GND(S*W)
Duty	tw/t	40 % to 60 %	—	—	TTL load : 1.4 V, CL = Max.
		45 % to 55 %	—	—	TTL load : 1.4 V, 5TTL + 15 pF, f <sub>o</sub> ≤ 66.6667 MHz
		—	40 % to 60 %	40 % to 60 %	CMOS load : 50% V <sub>DD</sub> , CL = Max.
		—	45 % to 55 %	—	CMOS load : 50% V <sub>DD</sub> , CL = 25 pF, f <sub>o</sub> ≤ 66.6667 MHz
Output voltage	V <sub>OH</sub> V <sub>OL</sub>	V <sub>DD</sub> -0.4 V Min.		—	I <sub>OH</sub> = -16 mA (*TW/*HW)/-8 mA(*CW)
		0.4 V Max.		—	I <sub>OL</sub> = 16 mA (*TW/*HW)/8 mA(*CW)
		15 pF	—	—	f <sub>o</sub> ≤ 135 MHz
		5 TTL + 15 pF	—	—	f <sub>o</sub> ≤ 90 MHz
Output load condition (fan out)	CL	25 pF	—	—	f <sub>o</sub> ≤ 66.6667 MHz
		—	15 pF	15 pF	f <sub>o</sub> ≤ 135 MHz
		—	25 pF	—	f <sub>o</sub> ≤ 125 MHz
		—	50 pF	—	f <sub>o</sub> ≤ 66.6667MHz
Output enable disable input voltage	V <sub>IH</sub> V <sub>IL</sub>	2.0 V Min.		0.7 V <sub>DD</sub> Min.	OE, ST
		0.8 V Max.		0.2 V <sub>DD</sub> Max.	OE, ST
		2.0 ns Max.	—	—	TTL load : 0.8 V→2.0 V, CL = Max.
		4.0 ns Max.	—	—	TTL load : 0.4 V→2.4 V, CL = Max.
Output rise time	t <sub>TLH</sub>	—	3.0 ns Max.	—	CMOS load : 20 %→80 % V <sub>DD</sub> , CL = 25 pF
		—	—	3.0 ns Max.	CMOS load : 20 %→80 % V <sub>DD</sub> , CL = 15 pF
		—	4.0 ns Max.	4.0 ns Max.	CMOS load : 20 %→80 % V <sub>DD</sub> , CL = Max.
		—	—	—	—
Output fall time	t <sub>THL</sub>	2.0 ns Max.	—	—	TTL load : 2.0 V→0.8 V, CL = Max.
		4.0 ns Max.	—	—	TTL load : 2.4 V→0.4 V, CL = Max.
		—	3.0 ns Max.	—	CMOS load : 80 %→20 % V <sub>DD</sub> , CL = 25 pF
		—	—	3.0 ns Max.	CMOS load : 80 %→20 % V <sub>DD</sub> , CL = 15 pF
Oscillation start up time	t <sub>OSC</sub>	10 ms Max.		—	Time at minimum operating voltage to be 0 s
		—		4.0 ns Max.	—
Aging	f <sub>a</sub>	±5 x 10 <sup>-6</sup> / year Max.		—	T <sub>a</sub> =+25 °C, V <sub>DD</sub> =5.0 V / 3.3 V, First year
Shock resistance	S.R.	±20 x 10 <sup>-6</sup> Max.		—	Three drops on a hard board from 750 mm or excitation test with 29400 m/s <sup>2</sup> x 0.3 ms x 1/2 sine wave in 3 directions