CRYSTAL OSCILLATOR (SPXO)
FOR AUTOMOTIVE
32.768 kHz

Product Number
SG-3031CMA : X1B000401A00116

SG-3031CMA

- Built-in 32.768 kHz crystal unit allows adjustment-free efficient operation.
- Operation temperature -40 °C to +105 °C
- Use of CMOS IC enables reduction of current consumption.
- V_{IO} controls swing amplitude.
- AEC-Q100 compliant

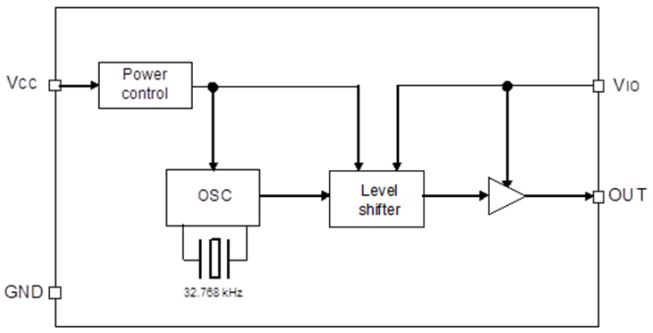
- Applications
  Infotainment and communication devices, Body (ECU*)
  Clock for Time counting and Sleep function. *ECU: Electronic control unit

Specifications (characteristics)

Item	Symbol	Specifications	Remarks
Output frequency range	fo	32.768 kHz	
Supply voltage	V_{CC}	1.2 V to 5.5 V	V_{CC} <1.5 V, V_{IO} = V_{CC}
Interface power supply voltage	V_{IO}	1.2 V to 5.5 V	
Storage temperature range	T_stg	-55 °C to +125 °C	Store as bare product after unpacking
Operating temperature range	T_use	-40 °C to +105 °C	
Frequency tolerance	f_tol	+5 ± 23 × 10^{-6}	+25 °C, V_{CC} = 3.3 V
Frequency temperature coefficient	fo-Tc	-120 × 10^{-6} to +10 × 10^{-6}	-20 °C to +70 °C (V_{CC} = 3.3 V +25 °C is reference)
		-240 × 10^{-6} to +10 × 10^{-6}	-40 °C to +85 °C (V_{CC} = 3.3 V +25 °C is reference)
		-420 × 10^{-6} to +10 × 10^{-6}	-40 °C to +105 °C (V_{CC} = 3.3 V +25 °C is reference)
Frequency voltage coefficient	fo-V_{CC}	±1 × 10^{-6} / V Max.	V_{CC} = 1.5 V to 5.5 V
		±5 × 10^{-6} / V Max.	V_{CC} = 1.2 V to 1.5 V
Current consumption (V_{CC} Pin)	I_{CC}	0.30 µA Typ. / 0.65 µA Max.	V_{CC} = 1.2 V to 5.5 V
Current consumption (V_{CC}+V_{IO} Pin)	I_{CC}+I_{IO}	0.38 µA Typ.	V_{CC} = V_{IO} = 1.2 V, No load condition
		0.65 µA Typ. / 1.3 µA Max. (+105 °C)	V_{CC} = V_{IO} = 3.3 V, No load condition
Symmetry	SYM	45 % to 55 %	1/2V_{CC}(V_{IO}) level, 1.5 V to 5.5 V
		40 % to 60 %	1/2V_{CC} (V_{IO}) level, V_{CC} < 1.5 V
Output voltage	V_{OH} / V_{OL}	V_{IO} - 0.4V Min. / 0.4V Max.	I_{OH} = -0.4mA / I_{OL} = 0.4mA, V_{IO} = 1.5 V to 5.5 V
		V_{IO} - 0.2V Min. / 0.2V Max.	I_{OH} = -0.1mA / I_{OL} = 0.1mA, V_{IO} = 1.2 V to 1.5 V
Output load condition (CMOS)	L_CMOS	15 pF Max.	CMOS load
Rise time / Fall time	tr/tf	200 ns Max.	20 % V_{IO} to 80 % V_{IO} level, V_{IO} = 1.2 V to 5.5 V
		100 ns Max.	20 % V_{IO} to 80 % V_{IO} level, V_{IO} = 1.8 V to 5.5 V
Start-up time	t_str	0.15 s Typ. / 0.45 s Max.	V_{CC} = 1.5 V to 5.5 V
		1.0 s Max.	V_{CC} = 1.2 V to 1.5 V
Frequency aging	f_age	±5 × 10^{-6} / year Max.	+25 °C, V_{CC} = 3.3 V, First year

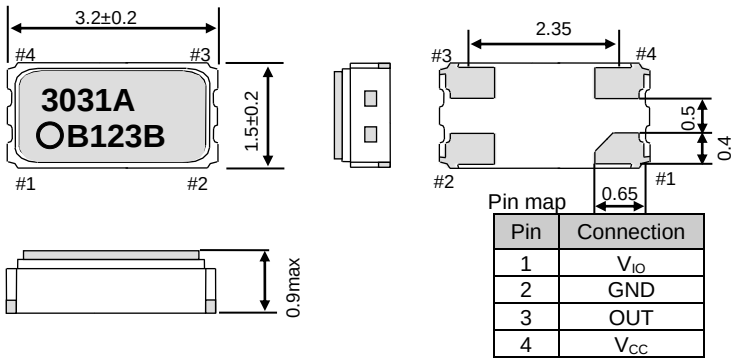
Unless otherwise stated, characteristics (specifications) shown in the above table are based on the rated operating temperature and voltage condition.

Block diagram



V_{IO} is a power supply pin for OUT output and can also be used as an OE pin. Set V_{IO} to 0 V when setting Disable.
Vcc is a power supply pin for operating the 32.768 kHz oscillation. Power consumption can be minimized by minimizing the applied voltage of both power supplies. However, when V_{CC} < 1.5 V, V_{IO} = V_{CC}.

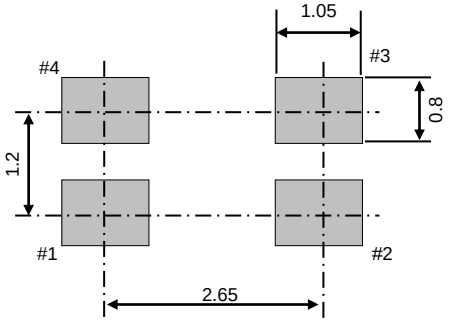
External dimension (Unit:mm)



Pin map

Pin	Connection
1	V_{IO}
2	GND
3	OUT
4	V_{CC}

Footprint(rference) (Unit:mm)



To maintain stable operation, provide a 0.01 uF to 0.1 uF by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC} – GND, V_{IO}-GND).

►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 general equipment.
	►Designed for automotive applications related to driving and safety.

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