

# CRYSTAL OSCILLATOR SPXO

## SG-645 / SG-636 series

- Frequency range : 2.21675 MHz to 135 MHz
- Supply voltage : 2.5 V / 3.3 V / 5.0 V
- Function : Output enable(OE) Standby( $\overline{ST}$ )
- Thickness : SG-645:1.5 mm Max.  
SG-636:2.7 mm Max.



Actual size

SG-645 series



SG-636 series



### Specifications (characteristics)

Item	Symbol	Specifications				Remarks
		SG-636 PTF	SG-636 PH	SG-636 PCE SG-636 SCE	SG-636 PDE	
Output frequency range	$f_0$	2.21675 MHz to 41.000 MHz	41.001 MHz to 70.000 MHz	2.21675 MHz to 40.000 MHz	2.21675 MHz to 40.000 MHz	
Supply voltage	$V_{CC}$	5.0 V $\pm$ 0.5 V		3.3 V $\pm$ 0.3 V	2.5 V $\pm$ 0.25 V	
Temperature range	Storage temperature	-55 °C to +100 °C				Store as bare product after unpacking
	Operating temperature	-20 °C to +70 °C				
Frequency tolerance	$f_{tol}(osc)$	C: $\pm 100 \times 10^{-6}$				-20 °C to +70 °C
Current consumption	$I_{CC}$	17 mA Max.	35 mA Max.	9 mA Max.	5 mA Max.	No load condition
Output disable current	$I_{dis}$	10 mA Max.	20 mA Max.	5 mA Max.	3 mA Max.	OE=GND
Stand-by current	$I_{std}$	—		2 $\mu$ A Max.	—	$\overline{ST}$ =GND(SCE)
Symmetry	SYM	40 % to 60 %		45 % to 55 %		CMOS load:50 % $V_{CC}$ level
		45 % to 55 %		—		TTL load: 1.4 V level
High output voltage	$V_{OH}$	$V_{CC}$ -0.4 V Min.				$I_{OH}$ =-8 mA(PTF)/-4 mA(PH,SCE,PCE), -3.2 mA(PDE)
Low output voltage	$V_{OL}$	0.4 V Max.				$I_{OL}$ =16 mA(PTF)/4mA(PH,SCE,PCE) /3.2 mA(PDE)
Output load condition (TTL)	$L_{TTL}$	10 TTL Max.	—			$L_{CMOS} \leq 15$ pF
Output load condition (CMOS)	$L_{CMOS}$	50 pF Max.	20 pF Max.( $\leq 55$ MHz) 15 pF Max.( $> 55$ MHz)	30 pF Max.	15 pF Max.	
Output enable / disable input voltage	$V_{IH}$	2.0 V Min.		80 % $V_{CC}$ Min.		OE Terminal, $\overline{ST}$ Terminal (SCE)
	$V_{IL}$	0.8 V Max.		20 % $V_{CC}$ Max.		
Output rise and fall time	$t_r / t_f$	7 ns Max.	5 ns Max.			CMOS load:20 % $V_{CC}$ to 80 % $V_{CC}$ level
		5 ns Max.	—			TTL load:0.4 V to 2.4 V level
Oscillation start up time	$t_{osc}$	4 ms Max.	10 ms Max.	4 ms Max.		Time at minimum supply voltage to be 0 s
Frequency aging	$f_{aging}$	$\pm 5 \times 10^{-6}$ / year Max.				+25 °C, $V_{CC}$ =5.0 V/3.3 V/2.5 V, First year

### Specifications (characteristics)

Item	Symbol	Specifications			Remarks
		SG-636 PTG	SG-636 PHG	SG-636 PCG SG-636 SCG	
Output frequency range	$f_0$	2.21675 MHz to 33.000 MHz *1			
Supply voltage	$V_{CC}$	4.5 V to 5.5 V		2.7 V to 3.6 V	
Temperature range	Storage temperature	-55 °C to +100 °C			Store as bare product after unpacking
	Operating temperature	-20 °C to +70 °C			
Frequency tolerance	$f_{tol}(osc)$	B: $\pm 50 \times 10^{-6}$ C: $\pm 100 \times 10^{-6}$			-20 °C to +70 °C
Current consumption	$I_{CC}$	25 mA Max.		12 mA Max.	No load condition
Output disable current	$I_{dis}$	20 mA Max.		10 mA Max.	OE=GND (PTG,PHG,PCG)
Stand-by current	$I_{std}$	—		50 $\mu$ A Max.	$\overline{ST}$ =GND (SCG)
Symmetry	SYM	—		45 % to 55 %	50 % $V_{CC}$ level, $L_{CMOS}$ =25 pF
		40 % to 60 %	—		1.4 V level, $L_{CMOS}$ =25 pF
High output voltage	$V_{OH}$	2.4 V Min.	—		$I_{OH}$ =-8 mA
		—	$V_{CC}$ -0.4 V Min.		$I_{OH}$ =-16 mA
Low output voltage	$V_{OL}$	—		0.4 V Max.	$I_{OL}$ =8 mA
		0.4 V Max.		—	
Output load condition	$L_{CMOS}$	25 pF Max.			
Output enable / disable input voltage	$V_{IH}$	2.0 V Min.		70 % $V_{CC}$ Min.	OE Terminal, $\overline{ST}$ Terminal
	$V_{IL}$	0.8 V Max.		20 % $V_{CC}$ Max.	
Output rise and fall time	$t_r / t_f$	—	3.4 ns Max.	4 ns Max.	20 % $V_{CC}$ to 80 % $V_{CC}$ level, $L_{CMOS} \leq 25$ pF
		2.4 ns Max.	—		TTL load:0.4 V to 2.4 V level, $L_{CMOS} \leq 25$ pF
Oscillation start up time	$t_{osc}$	12 ms Max.			$t=0$ at 90 % $V_{CC}$
Frequency aging	$f_{aging}$	$\pm 5 \times 10^{-6}$ / year Max.			+25 °C, $V_{CC}$ =5.0 V/ 3.3 V, First year

\*1 4.1250 MHz <  $f_0$  < 4.4336 MHz, 8.2500 MHz <  $f_0$  < 8.8672 MHz, 16.500 MHz <  $f_0$  < 17.7344 MHz : Unavailable

## Specifications (characteristics)

Item	Symbol	Specifications			Remarks
		SG-636 PTW / STW SG-645 PTW / STW	SG-636 PHW / SHW SG-645 PHW / SHW	SG-636 PCW / SCW SG-645 PCW / SCW	
Output frequency range	$f_0$	32.001 MHz to 135.000 MHz			
Supply voltage	V <sub>cc</sub>	5.0 V ±0.5 V		3.3 V ±0.3 V	
Temperature range	Storage temperature	SG-636P**:-55 °C to +100 °C / SG-645P**:-55 °C to +125 °C			Store as bare product after unpacking
	Operating temperature	-20 °C to +70 °C			
Frequency tolerance	$f_{tol(osc)}$	—		-40 °C to +85 °C	SG-645PCW / SCW Only
		B: ±50 × 10 <sup>-6</sup> C: ±100 × 10 <sup>-6</sup>		M: ±50 × 10 <sup>-6</sup>	-20 °C to +70 °C *1
Current consumption	I <sub>cc</sub>	45 mA Max.		28 mA Max.	No load condition( Max. frequency range )
Output disable current	I <sub>dis</sub>	30 mA Max.		16 mA Max.	OE=GND (PTW,PHW,PCW)
Stand-by current	I <sub>std</sub>	50 µA Max.			$\overline{ST}$ =GND (STW,SHW,SCW)
Symmetry	SYM	—		40 % to 60 %	50 % V <sub>cc</sub> level, L <sub>CMOS</sub> =Max.
		40 % to 60 %		—	1.4 V level, L <sub>CMOS</sub> =Max.
High output voltage	V <sub>OH</sub>	V <sub>cc</sub> -0.4 V Min.			I <sub>OH</sub> =-16 mA(PTW , STW , PHW , SHW) /-8 mA(PCW , SCW)
Low output voltage	V <sub>OL</sub>	0.4 V Max.			I <sub>OL</sub> = 16 mA(PTW , STW , PHW , SHW) / 8 mA(PCW , SCW)
Output load condition (TTL)	L <sub>TTL</sub>	5 TTL Max.	—	—	f <sub>osc</sub> ≤ 90 MHz, Max.Supply voltage.
Output load condition (CMOS)	L <sub>CMOS</sub>	15 pF Max.			Max.frequency, Max.Supply voltage.
Output enable / disable input voltage	V <sub>IH</sub>	2.0 V Min.		70 % V <sub>cc</sub> Min.	OE Terminal , $\overline{ST}$ Terminal
	V <sub>IL</sub>	0.8 V Max.		20 % V <sub>cc</sub> Max.	
Output rise and fall time	t <sub>r</sub> / t <sub>f</sub>	—		4 ns Max.	20 % V <sub>cc</sub> to 80 % V <sub>cc</sub> level, L <sub>CMOS</sub> ≤ Max.
		4 ns Max.		—	
Oscillation start up time	t <sub>osc</sub>	10 ms Max.			Time at minimum supply voltage to be 0 s
Frequency aging	f <sub>aging</sub>	±5 × 10 <sup>-6</sup> / year Max.			+25 °C, V <sub>cc</sub> =5.0 V / 3.3 V, First year

\*1 SG-636 series "C" tolerance : 40 MHz<f<sub>osc</sub>≤135 MHz

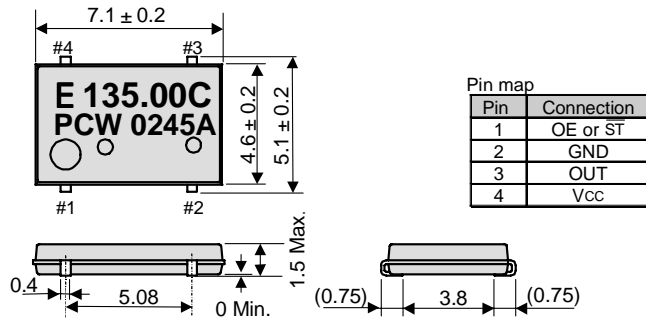
## External dimensions

(Unit:mm)

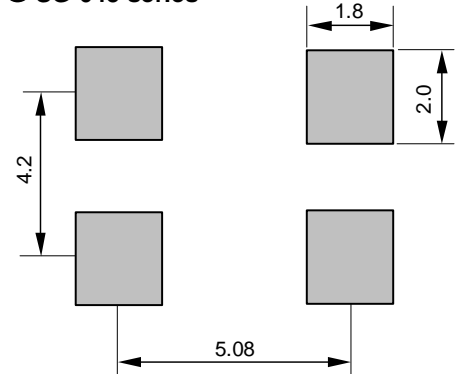
## Footprint (Recommended)

(Unit:mm)

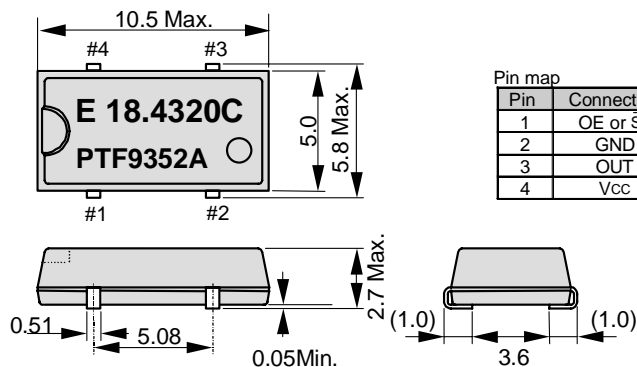
## ● SG-645 series



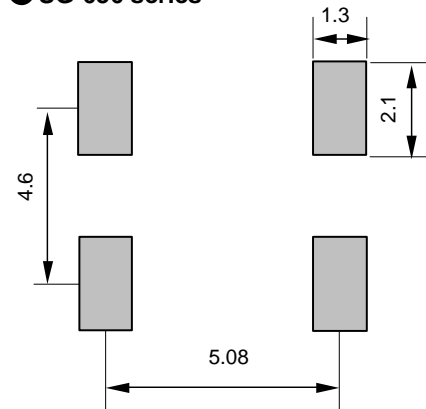
## ● SG-645 series



## ● SG-636 series



## ● SG-636 series



Metal may be exposed on the top or bottom of this product.  
This will not affect any quality, reliability or electrical spec.

## Note.

OE pin (PTF,PH,PCE,PDE,PTW,PHW,PCW,PTG,PHG,PCG)

OE pin = "H" or "open" : Specified frequency output.

OE pin = "L" : Output is high impedance.

$\overline{ST}$  pin (STW, SHW, SCW,SCG)

$\overline{ST}$  pin = "H" or "open" : Specified frequency output.

$\overline{ST}$  pin = "L" : Output is low level (weak pull - down),oscillation stops.

$\overline{ST}$  pin (SCE)

$\overline{ST}$  pin = "H" or "open" : Specified frequency output.

$\overline{ST}$  pin = "L" : Output is low level ,oscillation stops.

# “Quartz + MEMS” EPSON TOYOCOM

In order to meet customer needs in a rapidly advancing digital, broadband and ubiquitous society, we are committed to offering products that are one step ahead of the market and a rank above the rest in quality. To achieve our goals, we follow a “3D (three device) strategy” designed to drive both horizontal and vertical growth. We will to grow our three device categories of “Timing Devices”, “Sensing Devices” and “Optical Devices”, and expand vertical growth through a combination of products from these categories.

A Quartz MEMS is any high added value quartz device that exploits the characteristics of quartz crystal material but that is produced using MEMS (micro-electro-mechanical system) processing technology.

Market needs are advancing faster than previously imagined toward smaller, more stable crystal products, but we will stay ahead of the curve by rolling out products that exceed market speed and quality requirements. We want to further accelerate the 3D strategy by QMEMS.

Quartz devices have become crucial in the network environment where products are increasingly intended for broadband, ubiquitous applications and where various types of terminals can transfer information almost immediately via LAN and WAN on a global scale. Epson Toyocom Corporation addresses every single aspect within a network environment. The new corporation offers “Digital Convergence” solutions to problems arising with products for consumer use, such as, core network systems and automotive systems.

## PROMOTION OF ENVIRONMENTAL MANAGEMENT SYSTEM CONFORMING TO INTERNATIONAL STANDARDS

At Epson Toyocom, 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. In the future, new group companies will be expected to acquire the certification around the third year of operations.

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 to provide high quality and reliable products and services that meet customer needs, Epson Toyocom 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.

QS-9000 is an enhanced standard for quality assurance systems formulated by leading U.S. automobile manufacturers based on the international ISO 9000 series.

ISO/TS 16949 is a global standard based on QS-9000, a severe standard corresponding to the requirements from the automobile industry.

## Notice

- This material is subject to change without notice.
- Any part of this material may not be reproduced or duplicated in any form or any means without the written permission of Epson Toyocom.
- The information, applied circuitry, programming, usage, etc., written in this material is intended for reference only. Epson Toyocom does not assume any liability for the occurrence of infringing on any patent or copyright of a third party. This material does not authorize the licensing on for any patent or intellectual copyrights.
- Any product described in this material may contain technology or the subject relating to strategic products under the control of the Foreign Exchange and Foreign Trade Law of Japan and may require an export license from the Ministry of International Trade and Industry or other approval from another government agency.
- You are requested not to use the products (and any technical information furnished, if any) for the development and/or manufacture of weapon of mass destruction or for other military purposes. You are also requested that you would not make the products available to any third party who may use the products for such prohibited purposes.
- These products are intended for general use in electronic equipment. When using them in specific applications that require extremely high reliability, such as the applications stated below, you must obtain permission from Epson Toyocom in advance.  
/ Space equipment (artificial satellites, rockets, etc.) / Transportation vehicles and related (automobiles, aircraft, trains, vessels, etc.)  
/ Medical instruments to sustain life / Submarine transmitters / Power stations and related / Fire work equipment and security equipment  
/ traffic control equipment / and others requiring equivalent reliability.
- In this new crystal master for Epson Toyocom, product codes and markings will remain as previously identified prior to the merger.  
Due to the on-going strategy of gradual unification of part numbers, please review product codes and markings, as they will change during the course of the coming months.  
We apologize for the inconvenience, but we will eventually have a unified part numbering system for Epson Toyocom that will be user friendly.