CRYSTAL OSCILLATOR
PROGRAMMABLE

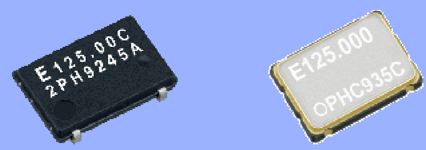
SG - 8002JF / CA series

- Frequency range : 1 MHz to 125 MHz
- Supply voltage : 3.3 V / 5.0 V
- Function : Output enable(OE) or Standby($\overline{ST}$)
- External dimensions : 7.0 × 5.0 × 1.4 t (mm) ···SG-8002CA
- Pin compatible with ceramic package crystal oscillator (7 × 5) : SG-8002JF
- Short mass production lead time by PLL technology.
- SG-Writer available to purchase.
  Please contact Epson Toyocom or local sales representative.

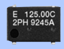
Pb Free — CA Type

RoHS Compliant — JF,CA Type

Product Number (please contact us)
SG-8002JF : Q3308JFx1xxxx00
SG-8002CA : Q3309CAx0xxxx00



Actual size

SG-8002JF	SG-8002CA
	

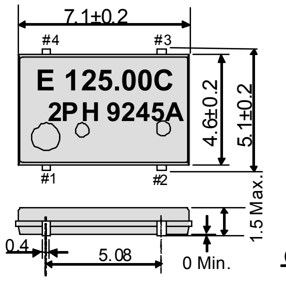
Specifications (characteristics)

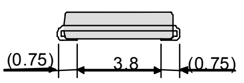
Item		Symbol	Specifications *2 PT / ST	PH / SH	PC / SC	Remarks
Output frequency range		f_0	1 MHz to 125 MHz		—	Vcc=4.5 V to 5.5 V
			—		1 MHz to 125 MHz	Vcc=3.0 V to 3.6 V
			—		1 MHz to 66.7 MHz	Vcc=2.7 V to 3.6 V
Supply voltage		Vcc	4.5 V to 5.5 V		2.7 V to 3.6 V	
Temperature range	Storage temperature	T_stg	-55 °C to +125 °C			Store as bare product after unpacking
	Operating temperature	T_use	-20 °C to +70 °C (-40 °C to +85 °C)		-40 °C to +85 °C	Refer to "Outline specifications" (Frequency range)
Frequency tolerance		f_tol	B: $\pm 50 \times 10^{-6}$,C: $\pm 100 \times 10^{-6}$			-20 °C to +70 °C
			M: $\pm 100 \times 10^{-6}$			-40 °C to +85 °C *3
Current consumption		Icc	45 mA Max.		28 mA Max.	No load condition, Max. frequency range
Disable current		I_dis	30 mA Max.		16 mA Max.	OE=GND(PT,PH,PC)
Stand-by current		I_std	50 µA Max.			$\overline{ST}$ =GND(ST,SH,SC)
Symmetry*1		SYM	—	40 % to 60 %		CMOS load:50 % Vcc level, Max. load condition
			40 % to 60 %	—		TTL load: 1.4 V level, Max. load condition
High output voltage		VOH	Vcc-0.4 V Min.			IOH=-16 mA(PT / ST,PH / SH),-8 mA(PC / SC)
Low output voltage		VOL	0.4 V Max.			IOL=16 mA(PT / ST,PH / SH), 8 mA(PC / SC)
Output load condition (TTL) *1		L_TTL	5TTL Max.	—		$f_0 \leq 90$ MHz, Max. supply voltage
Output load condition (CMOS) *1		L_CMOS	15 pF Max.	15 pF Max. (CA:25 pF Max.)	15 pF Max.	Max. frequency and Max. supply voltage
Output enable / disable input voltage		VIH	2.0 V Min.		70 % Vcc Min.	$\overline{ST}$ terminal or OE terminal
		VIL	0.8 V Max.		20 % Vcc Max.	
Rise time / Fall time *1		t_r / t_f	—	3 ns Max.		CMOS load: 20 % Vcc to 80 % Vcc level
			4 ns Max.	—		TTL load: 0.4 V to 2.4 V level
Start-up time		t_str	10 ms Max.			Time at minimum supply voltage to be 0 s
Frequency aging		f_aging	$\pm 5 \times 10^{-6}$ / year Max.			+25 °C, Vcc=5.0 V/ 3.3 V (PC / SC) First year

*1 Operating temperature (-40 °C to +85 °C), the available frequency, symmetry and output load conditions, please refer to "Outline specifications" page.
*2 PLL-PLL connection & Jitter specification, please refer to "Jitter specifications and characteristics chart" page.
*3 PT / ST and PH / SH for "M" tolerance will be available up to 55 MHz. (JF:40 MHz)
Checking possible by the Frequency Checking Program.

External dimensions (Unit:mm)

● SG-8002JF





Pin map

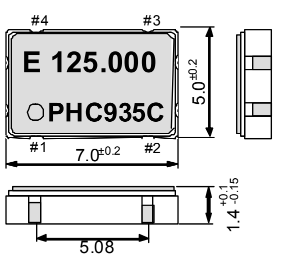
Pin	Connection
1	OE or ST
2	GND
3	OUT
4	Vcc

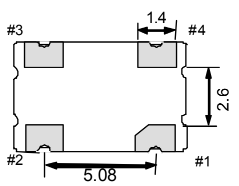
Note.
OE Pin (PT, PH, PC)
OE pin = "H" or "open" : Specified frequency output.
OE pin = "L" : Output is high impedance.

$\overline{ST}$ pin (ST, SH, SC)
$\overline{ST}$ pin = "H" or "open": Specified frequency output.
$\overline{ST}$ pin = "L" : Output is low level (weak pull - down), oscillation stops.

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

● SG-8002CA

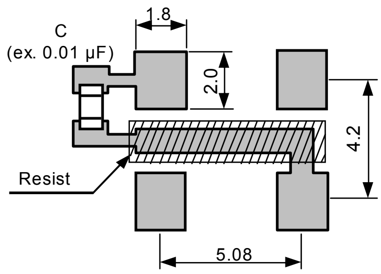




Pin map

Pin	Connection
1	OE or ST
2	GND
3	OUT
4	Vcc

Footprint (Recommended) (Unit:mm)



To maintain stable operation, provide by-pass capacitor with more than 0.1 µF at a location as near as possible to the power source terminal of the crystal products (between Vcc - GND).

SG-8002 Series_ Outline of specifications

Model (Item)		Current Consumption	Supply Voltage	Output load condition	Output rise time Output fall time	Symmetry	Function
SG-8002LB (SOJ 4-pin)	PH SH	30 mA Max.	4.5 V to 5.5 V	15 pF	3.0 ns Max. (20 % V_{CC} to 80 % V_{CC},L_CMOS=Max.)	40 % to 60 %(50 % V_{CC}, L_CMOS=15 pF, f_0≤80 MHz/-40 °C to+85 °C)	OE $\overline{ST}$
	PC SC	28 mA Max.	3.0 V to 3.6 V (2.7 V to 3.6 V)	15 pF	3.0 ns Max. (20 % V_{CC} to 80 % V_{CC}, L_CMOS=Max.)	45 % to 55 %(50 % V_{CC}, L_CMOS=15 pF, V_{CC}=3.0 V to 3.6 V, f_0≤40 MHz) 40 % to 60 %(50 % V_{CC}, L_CMOS=15 pF, V_{CC}=3.0 V to 3.6 V, f_0≤125 MHz) ↑ (50 % V_{CC}, L_CMOS=15 pF, V_{CC}=2.7 V to 3.6 V, f_0≤66.7 MHz)	OE $\overline{ST}$
SG-8002CA (SON) SG-8002JA (SOJ 4-pin) SG-8002DB (DIP 14-pin) SG-8002DC (DIP 8-pin)	PT ST	45 mA Max.	4.5 V to 5.5 V	5 TTL+15 pF (f_0≤125 MHz/-20 °C to+70 °C) 25 pF (f_0≤66.7 MHz/-20 °C to+70 °C) 5 TTL+15 pF (f_0≤40 MHz/-40 °C to +85 °C) 15 pF(f_0≤55 MHz/-40 °C to +85 °C)	2.0 ns Max. (0.8 V to 2.0 V,L_CMOS or L_TTL=Max.) 4.0 ns Max. (0.4 V to 2.4 V,L_CMOS or L_TTL=Max.)	45 % to 55 %(1.4 V, L_TTL=5 TTL+15 pF, f_0≤66.7 MHz/-20 °C to +70 °C) ↑ (1.4 V, L_TTL=5 TTL+15 pF, f_0≤40.0 MHz/-40 °C to +85 °C) 40 % to 60 %(1.4 V, L_TTL=5 TTL+15 pF, f_0≤125 MHz/-20 °C to +70 °C) ↑ (1.4 V, L_CMOS=25 pF, f_0≤66.7 MHz/-20 °C to +70 °C) ↑ (1.4 V, L_CMOS=15 pF, f_0≤55.0 MHz/-40 °C to +85 °C)	OE $\overline{ST}$
	PH SH			25 pF (f_0≤125 MHz/-20 °C to+70 °C) 50 pF (f_0≤66.7 MHz/-20 °C to+70 °C) 15 pF (f_0≤55 MHz/-40 °C to+85 °C) 25 pF (f_0≤40 MHz/-40 °C to+85 °C)	3.0 ns Max. (20 % V_{CC} to 80 % V_{CC},L_CMOS≤25) 4.0 ns Max. (20 % V_{CC} to 80 % V_{CC},L_CMOS=Max.)	45 % to 55 %(50 % V_{CC}, L_CMOS=25 pF, f_0≤66.7 MHz/-20 °C to +70 °C) ↑ (50 % V_{CC}, L_MOS=25 pF, f_0≤40.0 MHz/-40 °C to +85 °C) 40 % to 60 %(50 % V_{CC}, L_CMOS=25 pF, f_0≤125 MHz/-20 °C to +70 °C) ↑ (50 % V_{CC}, L_CMOS=50 pF, f_0≤66.7 MHz/-20 °C to+70 °C) ↑ (50 % V_{CC}, L_CMOS=15 pF, f_0≤55.0 MHz/-40 °C to +85 °C)	OE $\overline{ST}$
	PC SC	28 mA Max.	3.0 V to 3.6 V (2.7 V to 3.6 V)	15 pF (f_0≤66.7 MHz/2.7 to 3.6 V) 15 pF (f_0≤125 MHz/3.0 to 3.6 V) 30 pF (f_0≤40 MHz/3.0 to 3.6 V)	3.0 ns Max. (20 % V_{CC} to 80 % V_{CC},L_CMOS≤15) 4.0 ns Max. (20 % V_{CC} to 80 % V_{CC},L_CMOS=Max.)	45 % to 55 %(50 % V_{CC}, L_CMOS=30 pF, V_{CC}=3.0 V to 3.6 V, f_0≤40 MHz) 40 % to 60 %(50 % V_{CC}, L_CMOS=15 pF, V_{CC}=3.0 V to 3.6 V, f_0≤125 MHz) ↑ (50 % V_{CC}, L_CMOS=15 pF, V_{CC}=2.7 V to 3.6 V, f_0≤66.7 MHz)	OE $\overline{ST}$
SG-8002JC (SOJ 4-pin)	PT ST	45 mA Max.	4.5 V to 5.5 V	5TTL + 15 pF (f_0≤90 MHz/-20 to+70 °C) 15 pF (f_0≤125 MHz/-20 °C to +70 °C) 25 pF (f_0≤66.7 MHz/-20 °C to+70 °C)	2.0 ns Max. (0.8 V to 2.0 V,L_CMOS or L_TTL=Max.) 4.0 ns Max. (0.4 V to 2.4 V,L_CMOS or L_TTL=Max.)	45 % to 55 %(1.4 V,L_TTL=5 TTL+15 pF, f_0≤66.7 MHz/-20 °C to+70 °C) 40 % to 60 %(1.4 V,L_TTL=5 TTL+15 pF, f_0≤90.0 MHz/-20 °C to+70 °C) ↑ (1.4 V,L_CMOS=25 pF, f_0≤66.7 MHz/-20 °C to +70 °C) ↑ (1.4 V,L_CMOS=15 pF, f_0≤125 MHz/-20 °C to +70 °C)	OE $\overline{ST}$
	PH SH			15 pF (f_0≤125 MHz/-20 °C to+70 °C) 25 pF (f_0≤90 MHz/-20 °C to+70 °C) 50 pF (f_0≤66.7 MHz/-20 °C to+70 °C)	3.0 ns Max. (20 % V_{CC} to 80 % V_{CC},L_CMOS≤25) 4.0 ns Max. (20 % V_{CC} to 80 % V_{CC},L_CMOS=Max.)	45 % to 55 %(50 % V_{CC}, L_CMOS=25 pF, f_0≤66.7 MHz/-20 °C to +70 °C) 40 % to 60 %(50 % V_{CC}, L_CMOS=15 pF, f_0≤125 MHz/-20 °C to +70 °C) ↑ (50 % V_{CC}, L_CMOS=25 pF, f_0≤90 MHz/-20 °C to +70 °C) ↑ (50 % V_{CC}, L_CMOS=50 pF, f_0≤50 MHz/-20 °C to +70 °C)	OE $\overline{ST}$
	PC SC	28 mA Max.	3.0 V to 3.6 V (2.7 V to 3.6 V)	15 pF (f_0≤66.7 MHz/2.7 to 3.6 V) 15 pF (f_0≤125 MHz/3.0 to 3.6 V) 30 pF (f_0≤40 MHz/3.0 to3.6 V)	3.0 ns Max. (20 % V_{CC} to 80 % V_{CC} ,L_CMOS≤15) 4.0 ns Max. (20 % V_{CC} to 80 % V_{CC} ,L_CMOS=Max.)	45 % to 55 %(50 % V_{CC}, L_CMOS=30 pF, V_{CC}=3.0 V to 3.6 V, f_0≤40 MHz) 40 % to 60 %(50 % V_{CC}, L_CMOS=15 pF, V_{CC}=3.0 V to 3.6 V, f_0≤125 MHz) ↑ (50 % V_{CC}, L_CMOS=15 pF, V_{CC}=2.7 V to 3.6 V, f_0≤66.7 MHz)	OE $\overline{ST}$
SG-8002JF (SOJ 4-pin)	PT ST	45 mA Max.	4.5 V to 5.5 V	15 pF (f_0≤125 MHz/-20 °C to +70 °C) 25 pF (f_0≤66.7 MHz/-20 °C to+70 °C) 5TTL + 15 pF (f_0≤ 90 MHz/-20 °C to +70 °C) 15 pF (f_0≤40 MHz/-40 °C to +85 °C)	2.0 ns Max. (0.8 V to 2.0 V,L_CMOS≤25) 4.0 ns Max. (0.4 V to 2.4 V,L_CMOS or L_TTL=Max.)	45 % to 55 %(1.4 V, L_TTL=5 TTL+15 pF, f_0≤66.7 MHz/-20 °C to+70 °C) 40 % to 60 %(1.4 V, L_TTL=5 TTL+15 pF, f_0≤90 MHz/-20 °C to +70 °C) ↑ (1.4 V, L_CMOS=25 pF, f_0≤66.7 MHz/-20 °C to +70 °C) ↑ (1.4 V, L_CMOS=15 pF, f_0≤125 MHz/-20 °C to +70 °C) ↑ (1.4 V, L_CMOS=15 pF, f_0≤40 MHz/-40 °C to +85 °C)	OE $\overline{ST}$
	PH SH			15 pF (f_0≤125 MHz/-20 °C to+70 °C) 25 pF (f_0≤90 MHz/-20 °C to+70 °C) 50 pF (f_0≤50 MHz/-20 °C to+70 °C) 15 pF (f_0≤40 MHz/-40 °C to+85 °C)	3.0 ns Max. (20 % V_{CC} to 80 % V_{CC},L_CMOS≤25) 4.0 ns Max. (20 % V_{CC} to 80 % V_{CC},L_CMOS=Max.)	45 % to 55 %(50 % V_{CC}, L_CMOS=25 pF, f_0≤66.7 MHz/-20 °C to +70 °C) 40 % to 60 %(50 % V_{CC}, L_CMOS=25 pF, f_0≤90.0 MHz/-20 °C to +70 °C) ↑ (50 % V_{CC}, L_CMOS=50 pF, f_0≤50.0 MHz/-20 °C to+70 °C) ↑ (50 % V_{CC}, L_CMOS=15 pF, f_0≤125 MHz/-20 °C to+70 °C) ↑ (50 % V_{CC}, L_CMOS=15 pF, f_0≤40 MHz/-40 °C to+85 °C)	OE $\overline{ST}$
	PC SC	28 mA Max.	3.0 V to 3.6 V (2.7 V to 3.6 V)	15 pF(f_0≤66.7 MHz/2.7 to 3.6 V) 15 pF(f_0≤125 MHz/3.0 to 3.6 V) 30 pF(f_0≤40 MHz/3.0 to 3.6 V)	3.0 ns Max. (20 % V_{CC} to 80 % V_{CC},L_CMOS≤15) 4.0 ns Max. (20 % V_{CC} to 80 % V_{CC},L_CMOS=Max.)	45 % to 55 %(50 % V_{CC}, CL=30 pF, V_{CC}=3.0 V to 3.6 V, f_0≤40 MHz) 40 % to 60 %(50 % V_{CC}, CL=15 pF, V_{CC}=3.0 V to 3.6 V, f_0≤125 MHz) ↑ (50 % V_{CC}, CL=15 pF, V_{CC}=2.7 V to 3.6 V, f_0≤66.7 MHz)	OE $\overline{ST}$
SG-8002CE (SON)	PT ST	40 mA Max.	4.5 V to 5.5 V	5 TTL+15 pF (f_0≤125 MHz/-20 °C to + 70 °C) 5 TTL+15 pF (f_0≤27 MHz/-40 °C to +85 °C)	2.0 ns Max. (0.8 V to 2.0 V,L_TTL=Max.) 4.0 ns Max. (0.4 V to 2.4 V,L_TTL=Max.)	45 % to 55 %(1.4 V, L_TTL=5 TTL+15 pF, f_0≤66.7 MHz/-20 °C to +70 °C) ↑ (1.4 V, L_TTL=5 TTL+15 pF, f_0≤27.0 MHz/-40 °C to + 85 °C) 40 % to 60 %(1.4 V, L_TTL=5 TTL+15 pF, f_0≤125 MHz/-20 °C to +70 °C)	OE $\overline{ST}$
	PH SH			15 pF (f_0≤125 MHz/-20 °C to +70 °C) 25 pF (f_0≤100 MHz/-20 °C to+70 °C) 25 pF (f_0≤27 MHz/-40 °C to +85 °C)	3.0 ns Max. (20 % V_{CC} to 80 % V_{CC} ,L_CMOS=Max.)	45 % to 55 %(50 % V_{CC}, L_CMOS=25 pF, f_0≤66.7 MHz/-20 °C to +70 °C) ↑ (50 % V_{CC}, L_CMOS=25 pF, f_0≤27.0 MHz/-40 °C to + 85 °C) 40 % to 60 %(50 % V_{CC}, L_CMOS=15 pF, f_0≤125 MHz/-20 °C to +70 °C)	OE $\overline{ST}$
	PC SC	28 mA Max.	3.0 V to 3.6 V (2.7 V to 3.6 V)	15 pF (f_0≤66.7 MHz/2.7 to 3.6 V) 15 pF (f_0≤125 MHz/3.0 to 3.6 V)	3.0 ns Max. (20 % V_{CC} to 80 % V_{CC}, L_CMOS=Max.)	45 % to 55 %(50 % V_{CC}, L_CMOS=15 pF, V_{CC}=3.0 V to 3.6 V, f_0≤40 MHz) 40 % to 60 %(50 % V_{CC}, L_CMOS=15 pF, V_{CC}=3.0 V to 3.6 V, f_0≤125 MHz) ↑ (50 % V_{CC}, L_CMOS=15 pF, V_{CC}=2.7 V to 3.6 V, f_0≤66.7 MHz)	OE $\overline{ST}$

►TABLE OF FREQUENCY RANGE

Model		Supply voltage	Frequency tolerance Operating Temperature	Frequency (1 MHz / 50 MHz / 100 MHz / 125 MHz)
SG-8002CE	PT/ ST PH/ SH	4.5 V to 5.5 V	B,C	1.0 MHz – 125 MHz
			M	1.0 MHz – 27 MHz
	PC/SC	3.0 V to 3.6 V (2.7 V to 3.6 V)	B,C,M	1.0 MHz – 125 MHz *2.7 V to 3.6 V : 1.0 MHz to 66.7 MHz
SG-8002LB	PH/ SH	5.0 V±0.5 V	B,C	1.0 MHz – 80 MHz
			M,L	1.0 MHz – 27 MHz
	PC/ SC	3.3 V±0.3 V	B,C,M,L	1.0 MHz – 125 MHz *2.7 V to 3.6 V : 1.0 MHz to 66.7 MHz
SG-8002JF	PT/ ST PH/ SH	4.5 V to 5.5 V	B,C	1.0 MHz – 125 MHz
			M	1.0 MHz – 40 MHz
	PC SC	3.0 V to 3.6 V (2.7 V to 3.6 V)	B,C,M	1.0 MHz – 125 MHz *2.7 V to 3.6 V : 1.0 MHz to 66.7 MHz
SG-8002CA SG-8002JA SG-8002DB SG-8002DC	PT/ ST PH/ SH	4.5 V to 5.5 V	B,C	1.0 MHz – 125 MHz
			M	1.0 MHz – 55 MHz
	PC/ SC	3.0 V to 3.6 V (2.7 V to 3.6 V)	B,C,M	1.0 MHz – 125 MHz *2.7 V to 3.6 V : 1.0 MHz to 66.7 MHz
SG-8002JC	PT/ ST PH/ SH	4.5 V to 5.5 V	B C	1.0 MHz – 125 MHz
	PC/ SC	3.0 V to 3.6 V (2.7 V to 3.6 V)	B C	1.0 MHz – 125 MHz *2.7 V to 3.6 V : 1.0 MHz to 66.7 MHz

Frequency tolerance : B:±50×10^{-6}(-20 °C to +70 °C), C:±100×10^{-6} (-20 °C to +70 °C), M:±100×10^{-6} (-40 °C to +85 °C), L:±50×10^{-6} (-40 °C to +85 °C)

SG / HG-8002 series_ Jitter specifications and characteristics chart

■PLL-PLL connection

Because we use a PLL technology, there are a few cases that the jitter value will increase when SG-8002 is connected to another PLL-oscillator.
In our experience, we are unable to recommend these products for the applications such as telecom carrier use or analog video clock use. Please be careful checking in advance for these application (Jitter specification is Max.250 ps/CL=15 pF)

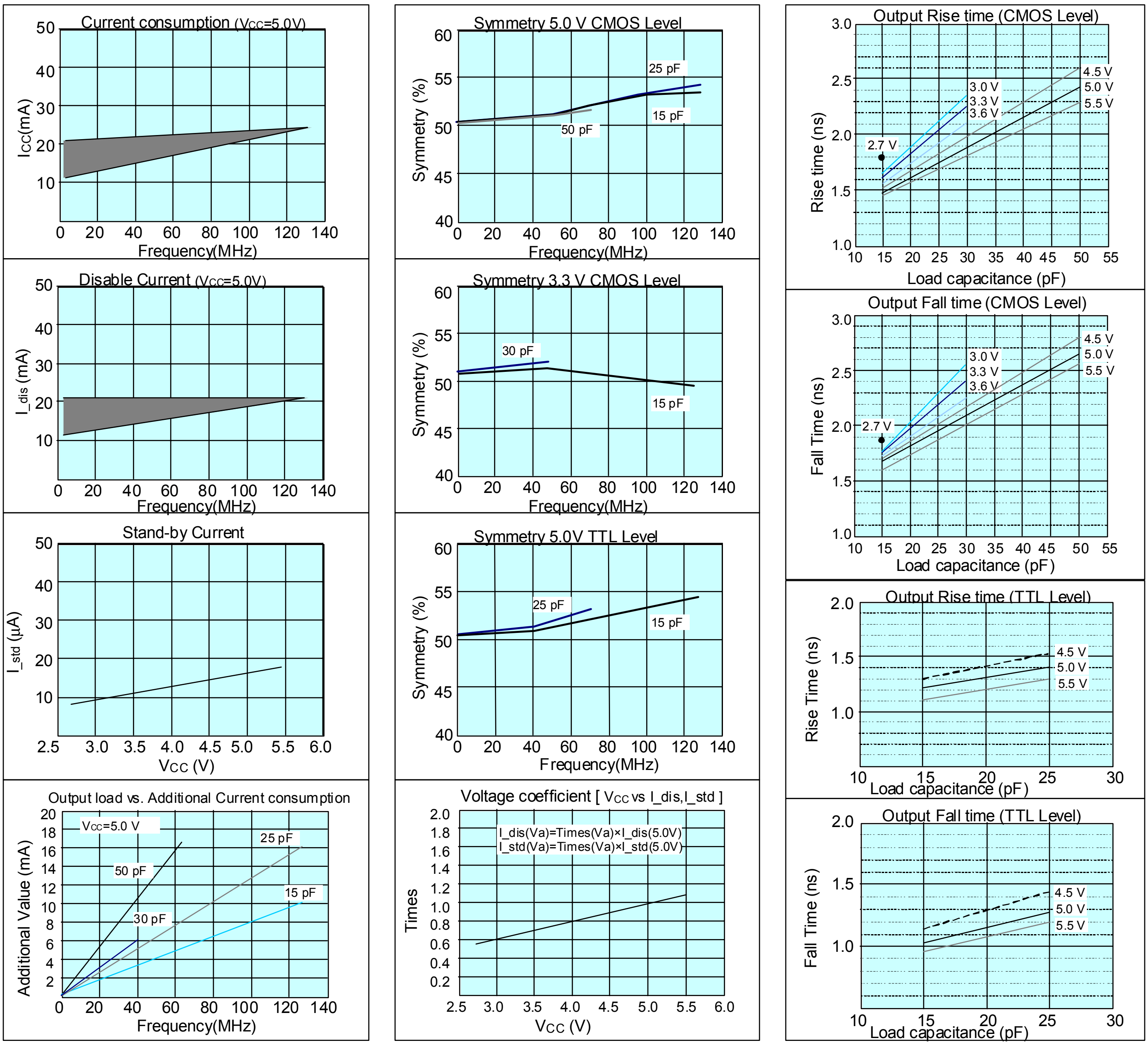
Jitter Specifications

Model	Supply Voltage	Jitter Item	Specifications	Remarks
PT / PH ST / SH	5.0 V ±0.5 V	Cycle to cycle	150 ps Max.	33 MHz ≤ f0 ≤ 125 MHz, L_CMOS=15 pF
			200 ps Max.	1.0 MHz ≤ f0 < 33 MHz, L_CMOS=15 pF
		Peak to peak	200 ps Max.	33 MHz ≤ f0 ≤ 125 MHz, L_CMOS=15 pF
			250 ps Max.	1.0 MHz ≤ f0 < 33 MHz, L_CMOS=15 pF
SC / PC	3.3 V ±0.3 V	Cycle to cycle	200 ps Max.	1.0 MHz ≤ f0 ≤ 125 MHz, L_CMOS=15 pF
		Peak to peak	250 ps Max.	1.0 MHz ≤ f0 ≤ 125 MHz, L_CMOS=15 pF

■Remarks on noise management for power supply line

We do not recommend inserting filters or other devices in the power supply line as the counter measure of EMI noise reduction.
This device insertion might cause high-frequency impedance high in the power supply line and it affects oscillator stable drive.
When this measure is required, please evaluate circuitry and device behavior in the circuit and verify that it will not affect oscillation.
Start up time (0 % VCC to 90 % VCC) of power source should be more than 150 µs.

■SG-8002 series Characteristics chart



“QMEMS” 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.

QMEMS

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.

> 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.

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

WORKING FOR HIGH QUALITY

In order provide high quality and reliable products and services than 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.

►Explanation of the mark that are using it for the catalog

Pb Free	**►Pb free.**
RoHS Compliant	**►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.)**
For Automotive	**►The products have been designed for high reliability applications such as Automotive.**

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- 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.