CRYSTAL OSCILLATOR
PROGRAMMABLE

SG-8002CE series

- Frequency range : 1 MHz to 125 MHz
- Supply voltage : 3.3 V or 5.0 V
- Function : Output enable(OE) or Standby($\overline{ST}$)
- Thickness : 1.05 mm Typ.
- Lead(Pb)-free : Lead free completely
- Short mass production lead time by PLL technology.
- SG-Writer available to purchase.
  Please contact EPSON TOYOCOM or local sales representative.

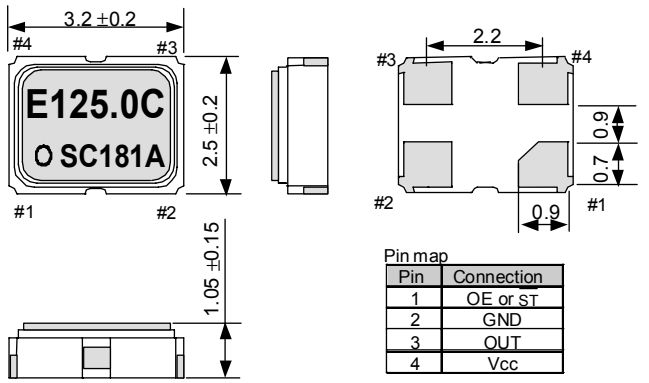
Actual size

Specifications (characteristics)

Item		Symbol	Specifications *2			Remarks
			PT / ST	PH / SH	PC / SC	
Output frequency range		f_0	1 MHz to 125 MHz		—	V_{CC}=4.5 V to 5.5 V
			—		1 MHz to 125 MHz	V_{CC}=3.0 V to 3.6 V
			—		1 MHz to 66.7 MHz	V_{CC}=2.7 V to 3.6 V
Supply voltage		V_{CC}	4.5 V to 5.5 V		2.7 V to 3.6 V	
Temperature range	Storage temperature	T_stg	-40 °C to +125 °C			Stored 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 "Frequency range"
Frequency tolerance		F_tol(osc)	B: ±50 × 10^{-6} ,C: ±100 × 10^{-6}			-20 °C to +70 °C
			M: ±100 × 10^{-6}			-40 °C to +85 °C *3
Current consumption		I_{CC}	40 mA Max.		28 mA Max.	No load condition, Max. frequency
Output disable current		I_dis	30 mA Max.		16 mA Max.	OE=GND
Standby current		I_std	50 µA Max.			$\overline{ST}$ =GND(ST,SH,SC)
Symmetry *1		SYM	—	40 % to 60 %		CMOS load:50 % V_{CC} level, Max. load condition
			40 % to 60 %	—		TTL load: 1.4 V, Max. load condition
High output voltage		V_{OH}	V_{CC}-0.4 V Min.			I_{OH}=-16 mA(PT,ST,PH,SH),-8 mA(PC,SC)
Low output voltage		V_{OL}	0.4 V Max.			I_{OL}=16 mA(PT,ST,PH,SH), 8 mA(PC,SC)
Output load condition (TTL) *1		L_TTL	5 TTL Max.	—		Max. frequency and Max. Supply voltage
Output load condition (CMOS) *1		L_CMOS	15 pF Max.			
Output enable / disable input voltage		V_{IH}	2.0 V Min.		70 % V_{CC} Min.	$\overline{ST}$, OE terminal
		V_{IL}	0.8 V Max.		20 % V_{CC} Max.	$\overline{ST}$, OE terminal
Output rise and fall time *1		tr/ tf	—	3 ns Max.		CMOS load: 20 % V_{CC} to 80 % V_{CC} level
			4 ns Max.	—		TTL load: 0.4 V to 2.4 V level
Oscillation start up time		t_{OSC}	10 ms Max.			Time at minimum supply voltage to be 0 s
Frequency aging		F_aging	±5 × 10^{-6} / year Max.			+25 °C,V_{CC}=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 Page 48.
*2 PLL-PLL connection & Jitter specification, please refer to Page 49.
*3 PT / ST and PH / SH for "M" tolerance will be available up to 27 MHz. Checking possible by the Frequency checking program.

External dimensions (Unit:mm)



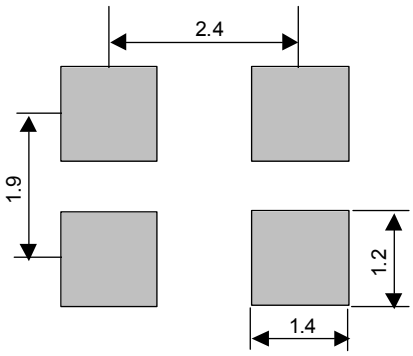
Pin map

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.
ST pin - "L" : Output is low level (weak pull - down), oscillation stops.

Footprint (Recommended) (Unit:mm)



SG-8002 Series Specifications

Page	Item / Model		Current Consumption	Supply Voltage	Output load condition	Output rise time / Output fall time	Symmetry	Function
44	SG-8002LA (SON 4-pin)	PH	35 mA Max.	4.5 V to 5.5 V	15 pF	3.0 ns Max. (20 %Vcc to 80 %Vcc, L_CMOS=Max.)	40 % to 60 %(50 %Vcc,L_CMOS=15 pF,f0≤80 MHz/-40°C to+85°C)	OE
		SH						ST
	SG-8002LB (SOJ 4-pin)	PC	28 mA Max.	3.0 V to 3.6 V (2.7 V to 3.6 V)	15 pF	3.0 ns Max. (20 %Vcc to 80 %Vcc, L_CMOS=Max.)	45 % to 55 %(50 %Vcc,L_CMOS=15 pF,Vcc=3.0 V to 3.6 V,f0≤40 MHz) 40 % to 60 %(50 %Vcc,L_CMOS=15 pF,Vcc=3.0 V to 3.6 V,f0≤125 MHz) ↑ (50 %Vcc,L_CMOS=15 pF,Vcc=2.7 V to 3.6 V,f0≤66.7 MHz)	OE
		SC						ST
45 46 47	SG-8002CA (SON) SG-8002JA (SOJ 4-pin) SG-8002DB (DIP 14-pin) SG-8002DC (DIP 8-pin)	PT	45 mA Max.	4.5 V to 5.5 V	5 TTL+15 pF (f0≤125MHz/-20°C to+70°C) 25 pF (f0≤66.7 MHz/-20°C to+70°C) 5 TTL+15 pF (f0≤40 MHz/-40°C to +85°C) 15 pF(f0≤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,f0≤66.7 MHz/-20°C to +70°C) ↑ (1.4 V,L_TTL=5 TTL+15 pF,f0≤40.0 MHz/-40°C to +85°C) 40 % to 60 %(1.4 V,L_TTL=5 TTL+15 pF,f0≤125 MHz/-20°C to +70°C) ↑ (1.4 V,L_CMOS=25 pF,f0≤66.7 MHz/-20°C to +70°C) ↑ (1.4 V,L_CMOS=15 pF,f0≤55.0 MHz/-40°C to +85°C)	OE
		ST						ST
		PH			25 pF (f0≤125 MHz/-20°C to+70°C) 50 pF (f0≤66.7 MHz/-20°C to+70°C) 15 pF (f0≤55 MHz/-40°C to+85vC) 25 pF (f0≤40 MHz/-40°C to+85°C)	3.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS≤25) 4.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS=Max.)	45 % to 55 %(50 % Vcc,L_CMOS=25 pF,f0≤66.7 MHz/-20°C to +70°C) ↑ (50 % Vcc,L_CMOS=25 pF,f0≤40.0 MHz/-40°C to +85°C) 40 % to 60 %(50 % Vcc,L_CMOS=25 pF,f0≤125 MHz/-20°C to +70°C) ↑ (50 % Vcc,L_CMOS=50 pF,f0≤66.7 MHz/-20°C to+70°C) ↑ (50 % Vcc,L_CMOS=15 pF,f0≤55.0 MHz/-40°C to +85°C)	OE
		SH						ST
		PC	28 mA Max.	3.0 V to 3.6 V (2.7 V to 3.6 V)	15 pF (f0≤66.7 MHz/2.7 to 3.6 V) 15 pF (f0≤125 MHz/3.0 to 3.6 V) 30 pF (f0≤40 MHz/3.0 to 3.6 V)	3.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS≤15) 4.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS=Max.)	45 % to 55 %(50 % Vcc,L_CMOS=30 pF,Vcc=3.0 V to 3.6 V,f0≤40 MHz) 40 % to 60 %(50 % Vcc,L_CMOS=15 pF,Vcc=3.0 V to 3.6 V,f0≤125 MHz) ↑ (50 % Vcc,L_CMOS=15 pF,Vcc=2.7 V to 3.6 V,f0≤66.7 MHz)	OE
		SC						ST
46	SG-8002JC (SOJ 4-pin)	PT	45 mA Max.	4.5 V to 5.5 V	5TTL + 15 pF (f0≤90 MHz/-20 to+70°C) 15 pF (f0≤125 MHz/-20°C to +70°C) 25 pF (f0≤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,f0≤66.7 MHz/-20°C to+70°C) 40 % to 60 %(1.4 V,L_TTL=5 TTL+15 pF,f0≤90.0 MHz/-20°C to+70°C) ↑ (1.4 V,L_CMOS=25 pF,f0≤66.7 MHz/-20°C to +70°C) ↑ (1.4 V,L_CMOS=15 pF,f0≤125 MHz/-20°C to +70°C)	OE
		ST						ST
		PH			15 pF (f0≤125 MHz/-20°C to+70°C) 25 pF (f0≤90 MHz/-20°C to+70°C) 50 pF (f0≤66.7 MHz/-20°C to+70°C)	3.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS≤25) 4.0 ns Max. (20 % Vv to 80 % Vcc, L_CMOS=Max.)	45 % to 55 %(50 % Vcc,L_CMOS=25 pF,f0≤66.7 MHz/-20°C to +70°C) 40 % to 60 %(50 % Vcc,L_CMOS=15 pF,f0≤125 MHz/-20°C to +70°C) ↑ (50 % Vcc,L_CMOS=25 pF,f0≤90 MHz/-20°C to +70°C) ↑ (50 % Vcc,L_CMOS=50 pF,f0≤50 MHz/-20°C to +70°C)	OE
		SH						ST
		PC	28 mA Max.	3.0 V to 3.6 V (2.7 V to 3.6 V)	15 pF (f0≤66.7 MHz/2.7 to 3.6 V) 15 pF (f0≤125 MHz/3.0 to 3.6 V) 30 pF (f0≤40 MHz/3.0 to3.6 V)	3.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS≤15) 4.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS=Max.)	45 % to 55 %(50 % Vcc,L_CMOS=30 pF,Vcc=3.0 V to 3.6 V,f0≤40 MHz) 40 % to 60 %(50 % Vcc,L_CMOS=15 pF,Vcc=3.0 V to 3.6 V,f0≤125 MHz) ↑ (50 % Vcc,L_CMOS=15 pF,Vcc=2.7 V to 3.6 V,f0≤66.7 MHz)	OE
		SC						ST
45	SG-8002JF (SOJ 4-pin)	PT	45 mA Max.	4.5 V to 5.5 V	15 pF (f0≤125 MHz/-20°C to +70°C) 25 pF (f0≤66.7 MHz/-20°C to+70°C) 5TTL + 15 pF (f0≤ 90 MHz/-20°C to +70°C) 15 pF (f0≤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,f0≤66.7 MHz/-20°C to+70°C) 40 % to 60 %(1.4 V,L_TTL=5 TTL+15 pF,f0≤90 MHz/-20°C to +70°C) ↑ (1.4 V, L_CMOS=25 pF,f0≤66.7 MHz/-20°C to +70°C) ↑ (1.4 V, L_CMOS=15 pF,f0≤125 MHz/-20°C to +70°C) ↑ (1.4 V, L_CMOS=15 pF,f0≤40 MHz/-40°C to +85°C)	OE
		ST						ST
		PH			15 pF (f0≤125 MHz/-20°C to+70°C) 25 pF (f0≤90 MHz/-20°C to+70°C) 50 pF (f0≤50 MHz/-20°C to+70°C) 15 pF (f0≤40 MHz/-40°C to+85°C)	3.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS≤25) 4.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS=Max.)	45 % to 55 %(50 % Vcc,L_CMOS=25 pF,f0≤66.7 MHz/-20°C to +70°C) 40 % to 60 %(50 % Vcc,L_CMOS=25 pF,f0≤90.0 MHz/-20°C to +70°C) ↑ (50 % Vcc,L_CMOS=50 pF,f0≤50.0 MHz/-20°C to+70°C) ↑ (50 % Vcc,L_CMOS=15 pF,f0≤125 MHz/-20°C to+70°C) ↑ (50 % Vcc,L_CMOS=15 pF,f0≤40 MHz/-40°C to+85°C)	OE
		SH						ST
		PC	28 mA Max.	3.0 V to 3.6 V (2.7 V to 3.6 V)	15 pF(f0≤66.7 MHz/2.7 to 3.6 V) 15 pF(f0≤125 MHz/3.0 to 3.6 V) 30 pF(f0≤40 MHz/3.0 to 3.6 V)	3.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS≤15) 4.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS=Max.)	45 % to 55 %(50 % Vcc,L_CMOS=30 pF,Vcc=3.0 V to 3.6 V,f0≤40 MHz) 40 % to 60 %(50 % Vcc,L_CMOS=15 pF,Vcc=3.0 V to 3.6 V,f0≤125 MHz) ↑ (50 % Vcc,L_CMOS=15 pF,Vcc=2.7 V to 3.6 V,f0≤66.7 MHz)	OE
		SC						ST
43	SG-8002CE (SON)	PT	40 mA Max.	4.5 V to 5.5 V	5 TTL+15 pF (f0≤125 MHz/-20°C to + 70°C) 5 TTL+15 pF (f0≤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,f0≤66.7 MHz/-20°C to +70°C) ↑ (1.4 V,L_TTL=5 TTL+15 pF,f0≤27.0 MHz/-40°C to + 85°C) 40 % to 60 %(1.4 V,L_TTL=5 TTL+15 pF,f0≤125 MHz/-20°C to +70°C)	OE
		ST						ST
		PH			15 pF (f0≤125 MHz/-20°C to +70°C) 25 pF (f0≤100 MHz/-20°C to+70°C) 25 pF (f0≤27 MHz/-40°C to +85°C)	3.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS=Max.)	45 % to 55 %(50 % Vcc,L_CMOS=25 pF,f0≤66.7 MHz/-20°C to +70°C) ↑ (50 % Vcc,L_CMOS=25 pF,f0≤27.0 MHz/-40°C to + 85°C) 40 % to 60 %(50 % Vcc,L_CMOS=15 pF,f0≤125 MHz/-20°C to +70°C)	OE
		SH						ST
		PC	28 mA Max.	3.0 V to 3.6 V (2.7 V to 3.6 V)	15 pF (f0≤66.7 MHz/2.7 to 3.6 V) 15 pF (f0≤125 MHz/3.0 to 3.6 V)	3.0 ns Max. (20 % Vcc to 80 % Vcc, L_CMOS=Max.)	45 % to 55 %(50 % Vcc,L_CMOS=15 pF,Vcc=3.0 V to 3.6 V,f0≤40 MHz) 40 % to 60 %(50 % Vcc,L_CMOS=15 pF,Vcc=3.0 V to 3.6 V,f0≤125 MHz) ↑ (50 % Vcc,L_CMOS=15 pF,Vcc=2.7 V to 3.6 V,f0≤66.7 MHz)	OE
		SC						ST

SG-8002 series and HG-8002 series

■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)

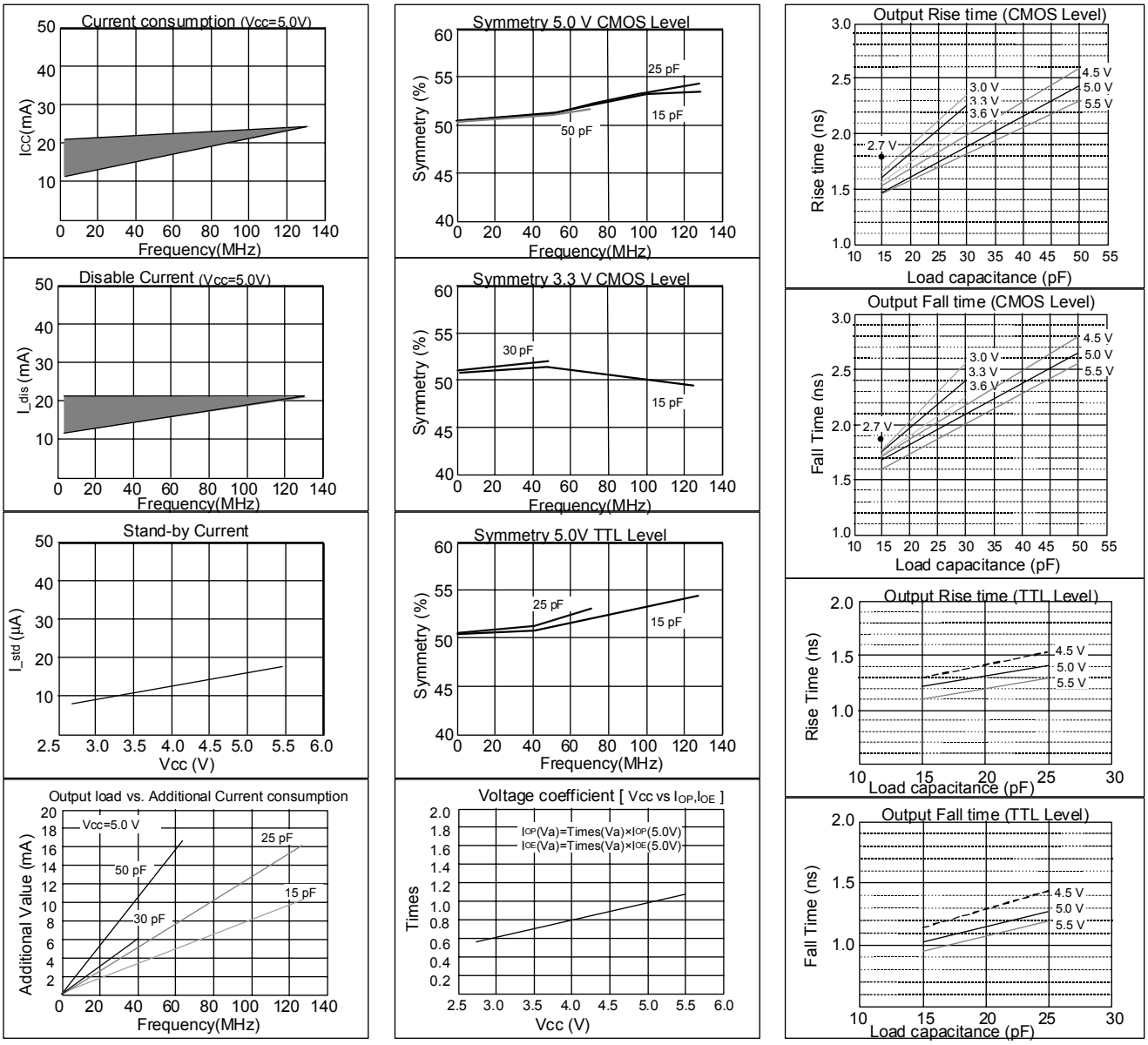
■Remarks on noise management for power supply line

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.

■Jitter Specifications

Model	Supply Voltage	Jitter Item	Specifications	Remarks
PT / PH ST / SH	5 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

■SG-8002 series Characteristics chart



End to End EPSON TOYOCOM

The development of our ubiquitous network society has caused a diversification of applications and has increased the demand for high-level quartz devices in terms of quality, quantity, and function.
The Quartz Device Operations Division of SEIKO EPSON CORPORATION (EPSON)and TOYO COMMUNICATION EQUIPMENT CO.,LTD.(TOYOCOM) were integrated on October 1,2005 to establish a new company, EPSON TOYOCOM CORPORATION, to meet these market and customer demands.
Each company contributes its own strength; EPSON holds a strong presence in consumer products and TOYOCOM is strong in industrial products. The consolidation of these two companies in a new company that provides advanced expertise with a wide range of products for terminals and infrastructure to our customers.
Quartz device 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 “end-to-end” solutions to problems arising with products for consumer use, such as core network systems and automotive systems.

PROMOTION OF ENVIRONMENTAL MANAGEMENT SYSTEM CONFORMING INTERNATIONAL STANDARD

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.
In May 2001, 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

EPSON TOYOCOM quickly began working to aquire company-wide ISO 9000 series certification, and has acquired ISO 9001 or ISO 9002 certification with all targeted products manufactured in Japanese and overseas plants.
The Quartz Device Operations Division (Ina Japan,EPM and SZE) have acquired QS-9000 certification, which are of higher Level.
Also QS-9000 and TS 16949 certification, which is of higher level, has been acquired.

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 automobile industry.

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  / 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 code and marking will still remain as previously identified prior to the merger.
  Due to the on going strategy of gradual unification of part numbers, please review product code and marking 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 which will be user friendly.