RECIPIENT

SPECIFICATIONS

Halide free

Product No. : Q3102LC02000500

MODEL : SG-3030LC

SPEC. No. : Q08-048-4A

DATE: Apr. 21. 2008

EPSON TOYOCOM CORPORATION

QZ Business Unit

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SPECIFICATIONS

1. Application

1) This document is applicable to the low/medium-frequency crystal oscillator that are delivered to Shenzhen Huawei Communications Co., Ltd. from Epson Toyocom Corp.
2) RoHS compliant
SG-3030LC contains lead in Low melting type solder which is exempted in RoHS directive.
3) This Product supplied (and any technical information furnished, if any) by Epson Toyocom Corporation shall not be used for the development and manufacture of weapon of mass destruction or for other military purposes.
Making available such products and technology to any third party who may use such products or technologies for the said purposes are also prohibited.
4) This product listed here is designed as components or parts for electronics equipment in general consumer use.
We do not expect that any of these products would be incorporated or otherwise used as a component or part forthe equipment, which requires an systems, and medical equipment, the functional purpose of which is to keep extra high reliability, such as satellite, rocket and other space life.

2. Product No. / Model

The product No. of this crystal oscillator unit is Q3102LC02000500.
The model is SG-3030LC

3. Packing

It is subject to the packing standard of Epson Toyocom Corp.

4. Warranty

Defective parts which are originated by us are replaced free of charge in case defects are found within 12 months after delivery.

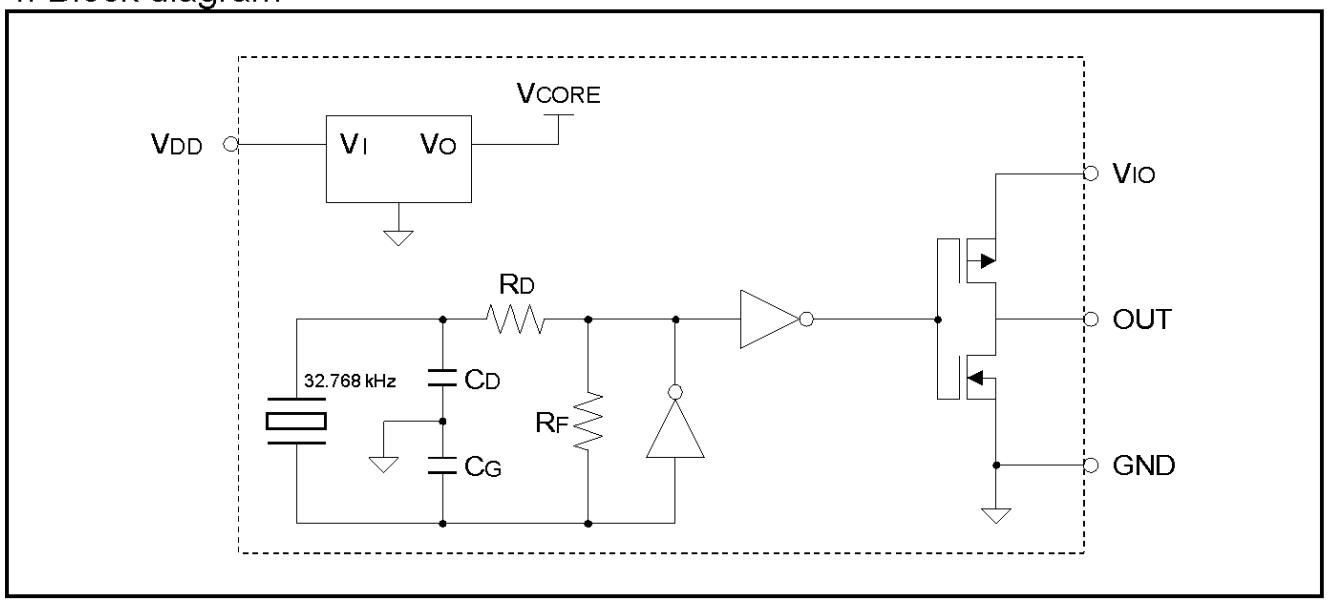
5. Amendment and abolishment

Amendment and/or abolishment of this specification are subject to the agreement between both parties.

6. Contents

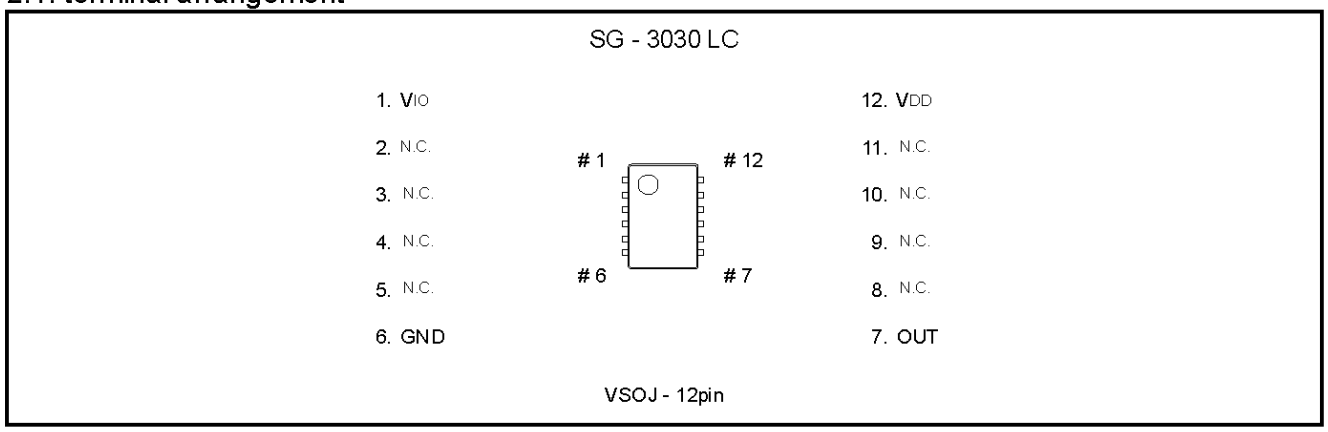
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1. Block diagram



2. Terminal description

2.1. terminal arrangement



2.2. Terminal assignment

Pin Name	Pin No.	Pin Type	Function	Comments
VDD	12	–	VDDpower supply	VDD pin is a power supply pin for the internal 32.768-kHz oscillator.
VIO	1	–	OUT power supply	OUT Power supply terminal for an output function operation. OUT The high level output from an output terminal becomes electrical current potential input into this terminal. ∗ Please refer to a V_{OH} Comments.
OUT	7	OUTPUT	Clock output terminal	This is a C-MOS output pin with 32.768-kHz output. Electrical current potential in the high level output Variable with an input level of a VIO input terminal.
GND	6	–	GNDpower supply	Connect this pin to the negative (ground) side of the power supply.
N.C.	2 – 5, 8 – 11	–	–	These pins are not connected on chip. These pins should be left open, connected to GND, or connected to VDD.

∗1) Be sure to connect a filter capacity of at least 0.1μF close to V_{DD} - GND.and V_{IO}-GND.
∗2) When do not use a V_{IO} function, please connect a V_{IO} terminal to V_{DD}.

3 Absolute maximum ratings

GND = 0 V

arameter	Symbol	Min.	Typ.	Max.	Unit	Comments
Power voltage	V_{DD}	GND - 0.3		GND + 7.0	V	Between V_{DD} and GND
Storage temperature*	T_{STG}	-55		+125	°C	Stored bare product after unpacking

4. Operating condition

GND = 0 V

Item	Symbol	Min.	Typ.	Max.	Unit	Comments
Power supply voltage	V_{DD}	1.5	3.3	5.5	V	V_{DD} pin
Interface power supply voltage	V_{IO}	1.5	3.3	5.5	V	V_{IO} pin
Operating temperature	T_{OPR}	–40		+85	°C	No condensation

3 Frequency characteristics

*If not specifically indicated, GND=0 V, Ta= –40 °C to +85 °C
V_{DD} = 1.5 V ~ 5.5 V , V_{IO} = 1.5 V ~ 5.5 V

Item	Symbol	Min.	Typ.	Max.	Unit	Comments
Output frequency	fo		32.768 (Typ.)		kHz	
Frequency tolerance	$\Delta f / f$		5 ± 23 (*1) (*2)		$\times 10^{-6}$	Ta = +25 °C V_{DD} = 3.3 V
Frequency temperature characteristics	Top	– 120		+ 10	$\times 10^{-6}$	Ta = –20 °C ~ +70 °C, V_{DD} = 3.3 V ; Ta=+25 °C is standard
Frequency voltage characteristics	f / V	– 2		+ 2	$\times 10^{-6}$ / V	Ta = +25 °C V_{DD} = 1.5 V ~ 5.5 V
Oscillating starting time	tosc		0.5	1.0	s	Ta = –40 °C ~ +85 °C V_{DD} = 2.7 V ~ 5.5 V
			0.5	1.0	s	Ta = +25 °C V_{DD} = 2.0 V ~ 5.5 V
			1.0	3.0	s	Ta = +25 °C V_{DD} = 1.5 V ~ 5.5 V
Aging	fa	– 5		+ 5	$\times 10^{-6}$ / year	Ta = +25 °C V_{DD} = 3.3 V ; First year

*1) Equivalent to 1 minute of monthly deviation (excluding offset).

*2) This numerical value contains frequency change share after having enforced reflow soldering handling.

6. Electrical characteristics

*If not specifically indicated, GND=0 V, Ta= –40 °C to +85 °C
V_{DD} = 1.5 V ~ 5.5 V , V_{IO} = 1.5 V ~ 5.5 V

6.1. DC electrical characteristics

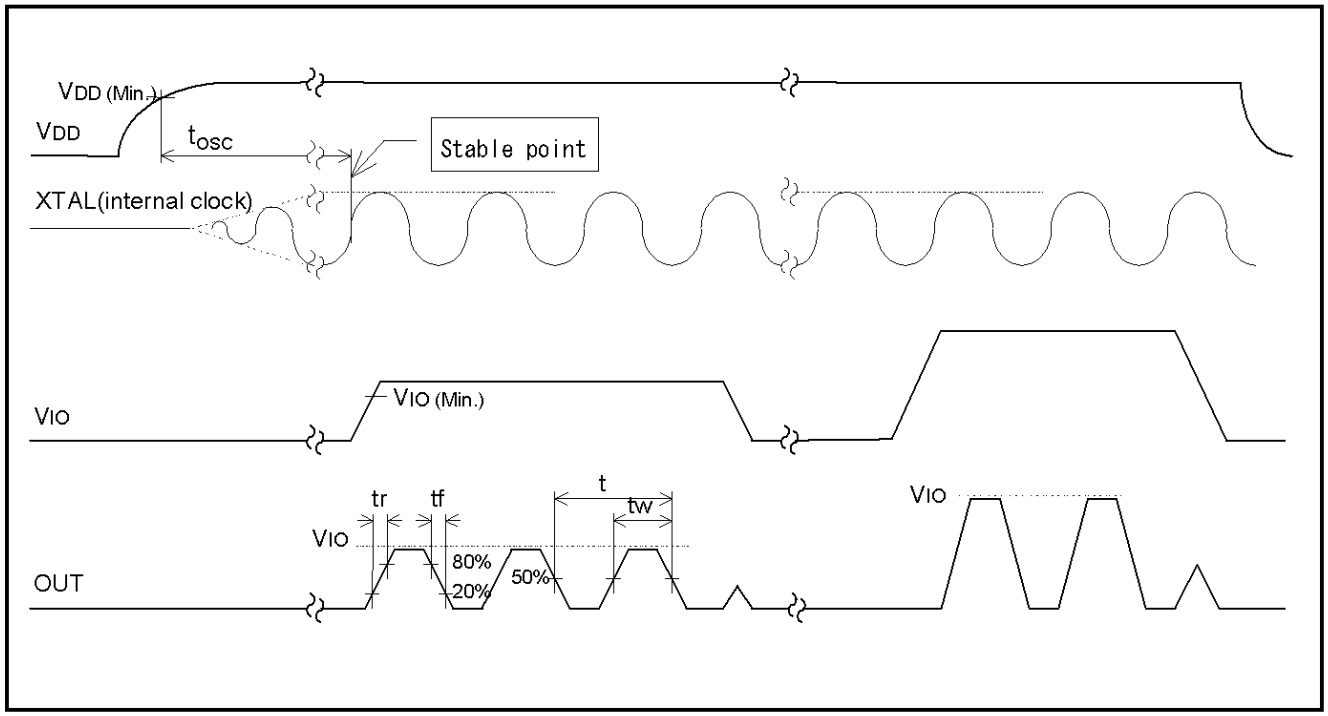
Item	Symbol	Min.	Typ.	Max.	Unit	Comments
Current consumption (V_{DD})	I_{DD}		0.4	0.7	μA	V_{DD} = 1.5 V ~ 5.5 V
Current consumption (V_{IO})	I_{IO}		0.6	1.3	μA	No load, V_{IO} = 3.3 V ± 0.3 V
			1.3	2.5	μA	No load, V_{IO} = 5.0 V ± 0.5 V
			2.5	4.5	μA	C_L = 15 pF, V_{IO} = 3.3 V ± 0.3 V
			4.0	6.5	μA	C_L = 15 pF, V_{IO} = 5.0 V ± 0.5 V
Output voltage	V_{OH}	V_{IO}–0.4			V	I_{OH} = –400 μA
	V_{OL}			GND + 0.4	V	I_{OL} = 400 μA

6.2. AC electrical characteristics

*If not specifically indicated, GND=0 V, Ta= –40 °C to +85 °C
V_{DD} = 1.5 V ~ 5.5 V , V_{IO} = 1.5 V ~ 5.5 V

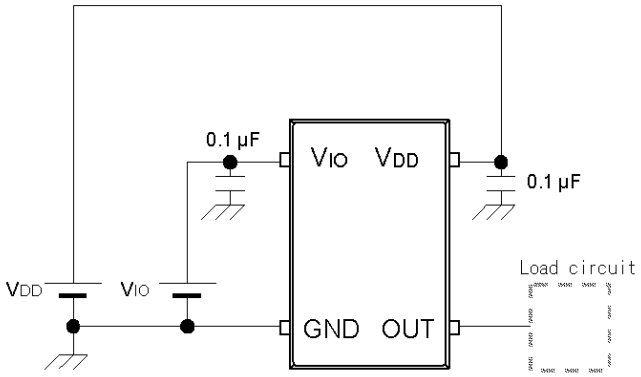
Item	Symbol	Min.	Typ.	Max.	Unit	Comments
Output load	C_L			15	pF	
Output duty	tw / t	45	50	55	%	V_{TH} = V_{IO} / 2, C_L = 15 pF
Output rise time Output fall time	tr , tf			200	ns	20 % V_{IO} ↔ 80 % V_{IO}, C_L = 15 pF V_{IO} = 1.5 V ~ 5.5 V
				100	ns	20 % V_{IO} ↔ 80 % V_{IO}, C_L = 15 pF V_{IO} = 1.8 V ~ 5.5 V

7. Timing chart

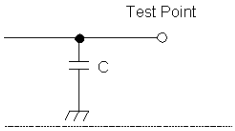


8. Test circuit

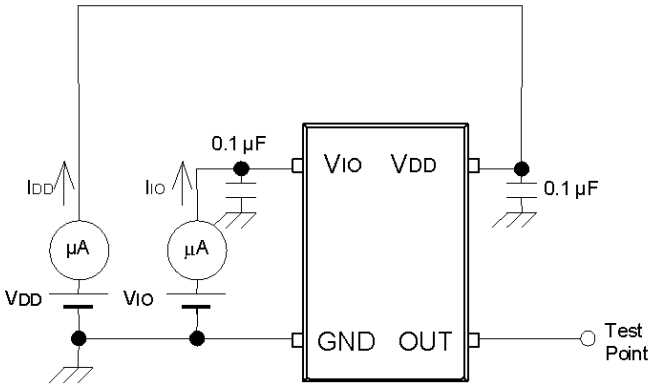
8.1. Waveform observe



Load circuit load capacitance



8.2. Current consumption



8.3. Test conditions

(1) Oscilloscope
- Band width should be minimum 5 times higher (wider) than measurement frequency.
- Probe earth should be placed closely from test point and lead length should be as short as possible.

* Recommendable to use miniature socket. (Don't use earth lead.)

(2) 'CL' includes probe capacitance.

(3) Connect a by-pass capacitor greater that 0.1 µF as close as possible to the power supply terminal. (V_{DD} and V_{IO}).

(4) Use the current meter whose internal impedance value is small.

(5) Power supply
- Start up time (0 %V_{DD} → 90 %V_{DD}) of power source should be more than 150 µs.
- Impedance of power supply should be as lowest as possible.

9 Environmental and mechanical characteristics

(The company evaluation condition We evaluate it by the following examination item and examination condition.)

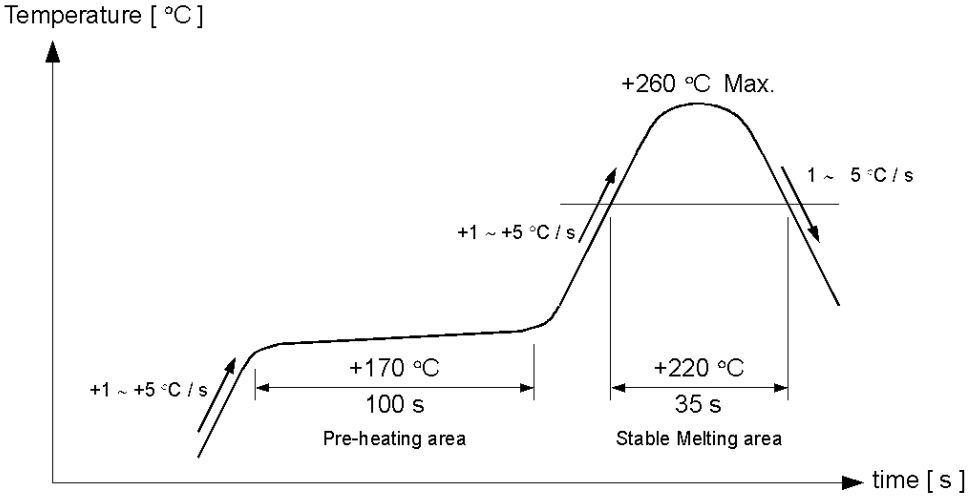
No.	Item	Value *1		Test Conditions
		Δ f / f [1×10^{-6}] *2	Electrical characteristics	
1	High temperature storage	*3 ± 50	*4 Satisfy item [5,6] after test	+125 °C × 1 000 h
2	Low temperature storage	*3 ± 10		-55 °C × 1 000 h
3	High temperature bias	*3 ± 20		+85 °C × 5.5 V × 1 000 h
4	Low temperature bias	*3 ± 10		-40 °C × 5.5 V × 1 000 h
5	Temperature humidity bias	*3 ± 20		+85 °C × 85 %RH × 5.5 V × 1 000 h
6	Temperature cycle	*3 ± 10		-55 °C ⇔ +125 °C 30 min at each temp. 100 cycles
7	Shock	± 8		100g dummy(SEIKO EPSON Standard) drop from 1 500 mm height on to the concrete. 3 directions × 3 times.
8	Vibration	± 5		10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz acceleration 98 m/s^2 10 Hz → 500 Hz → 10 Hz 15min./cycle 6 h (2 hours , 3 directions)
9	Pull - off	No peeling-off at a solder part		10 N press for 10 s ± 1 s Ref. EIAJ ED-4702
10	Solderability	Termination must be 95 % covered with fresh solder		Dip termination into solder bath at +235 °C ± 5 °C for 5 s (Using Rosin Flux)
11	Solvent resistance	The marking shall be legible		Ref. JIS C 0052 or IEC 60068-2-45

< Notes >

1. *1 Each test done independently.
2. *2 Measuring 2 h to 24 h later leaving in room temperature after each test.
3. *3 Pre conditionings
   1. +125 °C × 24 h to +85 °C × 85 % × 48 h → reflow 2 times
   2. Initial value shall be after 24 h at room temperature.
4. *4 [5] Frequency Characteristics (but excludes frequency tolerance and aging.)

♦ Air-reflow

Pre heating temperature: +170 °C Pre heating time: 100 s
Heating temperature : +220 °C Heating time : 35 s
Peak temperature must not exceed +260 °C

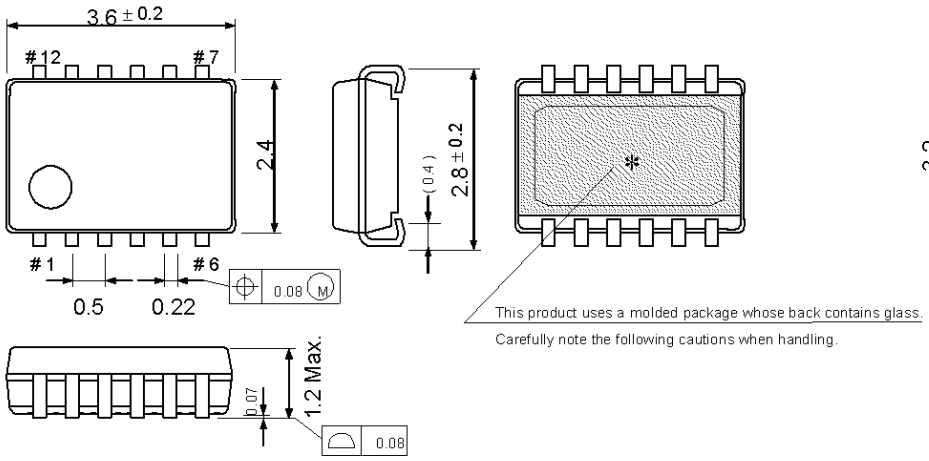


10. External dimensions / Marking layout

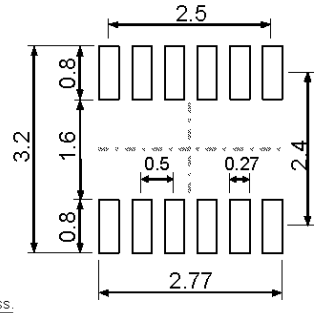
10.1. External dimensions

SG – 3030 LC (VSOJ – 12pin)

• External dimensions



• Recommended soldering pattern



Unit : mm

∗ Notes on packaging

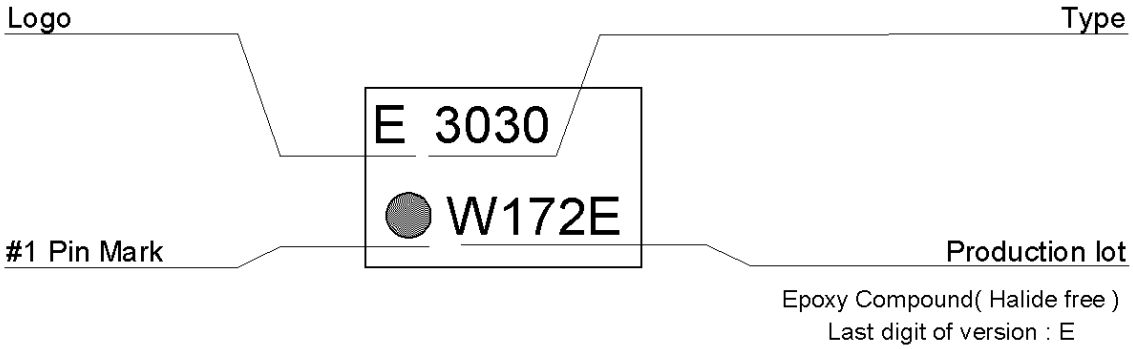
This product uses a molded package whose back contains glass.
Carefully note the following cautions when handling.

(1) Packaging equipment
This product uses a molded package whose back contains glass.
Therefore, it is possible for shocks during packaging to cause product breakage, depending on the packaging machinery and conditions.
Please be sure to check that the load placed on products during packaging is as low as possible (low speeds during loading onto the substrate, low chuck forces, etc.) before using packaging equipment.
Carry out the same checks when changing packaging conditions.
The presence of foreign objects between this product and the packaging substrate may result in product breakage.
Guard against introduction of foreign objects during packaging.
Also, carry out measures to eliminate static electricity during packaging of and operations with this product.

(2) Stop using the glue
Any glue must never use it after soldering crystal oscillator to a circuit board.
This product has glass on the back side of a package.
When glue invasions between circuit board side and glass side, then glass cracks by thermal expansion of glue.
In this case a crystal oscillation stops.
Consider glue abolition or glue do not touch to crystal oscillator.

10.2. Marking layout

SG – 3030 LC (VSOJ – 12pin)



Epoxy Compound(Halide free)
Last digit of version : E

∗ Contents displayed indicate the general markings and display, but are not the standards for the fonts, sizes and positioning.。

11. Application notes

1) Notes on handling

This module uses a C-MOS IC to realize low power consumption. Carefully note the following cautions when handling.

(1) Static electricity
While this module has built-in circuitry designed to protect it against electrostatic discharge, the chip could still be damaged by a large discharge of static electricity. Containers used for packing and transport should be constructed of conductive materials. In addition, only soldering irons, measurement circuits, and other such devices which do not leak high voltage should be used with this module, which should also be grounded when such devices are being used.

(2) Noise
If a signal with excessive external noise is applied to the power supply or input pins, the device may malfunction or "latch up." In order to ensure stable operation, connect a filter capacitor (preferably ceramic) of greater that 0.1 μF as close as possible to the power supply pins (between VDD and GNDs). Also, avoid placing any device that generates high level of electronic noise near this module.
* Do not connect signal lines to the shaded area in the figure shown in Fig. 1 and, if possible, embed this area in a GND land.

(3) Voltage levels of input pins
When the input pins are at the mid-level, this will cause increased current consumption and a reduced noise margin, and can impair the functioning of the device. Therefore, try as much as possible to apply the voltage level close to VDD or GND.

(4) Handling of unused pins
Since the input impedance of the input pins is extremely high, operating the device with these pins in the open circuit state can lead to unstable voltage level and malfunctions due to noise. Therefore, pull-up or pull-down resistors should be provided for all unused input pins.

2) Notes on packaging

(1) Soldering heat resistance.
If the temperature within the package exceeds +260 °C, the characteristics of the crystal oscillator will be degraded and it may be damaged. The reflow conditions within our reflow profile is recommended. Therefore, always check the mounting temperature and time before mounting this device. Also, check again if the mounting conditions are later changed.
* See Fig. 2 profile for our evaluation of Soldering heat resistance for reference.

(2) Packaging equipment
This product uses a molded package whose back contains glass.
Therefore, it is possible for shocks during packaging to cause product breakage, depending on the packaging machinery and conditions.
Please be sure to check that the load placed on products during packaging is as low as possible (low speeds during loading onto the substrate, low chuck forces, etc.) before using packaging equipment.
Carry out the same checks when changing packaging conditions.
The presence of foreign objects between this product and the packaging substrate may result in product breakage.
Guard against introduction of foreign objects during packaging.
Also, carry out measures to eliminate static electricity during packaging of and operations with this product.

(3) Ultrasonic cleaning
Depending on the usage conditions, there is a possibility that the crystal oscillator will be damaged by resonance during ultrasonic cleaning. Since the conditions under which ultrasonic cleaning is carried out (the type of cleaner, power level, time, state of the inside of the cleaning vessel, etc.) vary widely, this device is not warranted against damage during ultrasonic cleaning.

(4) Mounting orientation
This device can be damaged if it is mounted in the wrong orientation. Always confirm the orientation of the device before mounting.

(5) Leakage between pins
Leakage between pins may occur if the power is turned on while the device has condensation or dirt on it. Make sure the device is dry and clean before supplying power to it.

(6) Use of adhesive after packaging product
This product uses a molded package whose back contains glass.
Please check that use of the adhesive does not cause problems before adopting any adhesive as a measure to reinforce the packaging for your product.

Fig. 1 : Example GND Pattern

SG – 3030 LC

(VSOJ 12 pin)

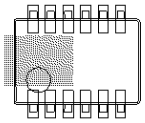
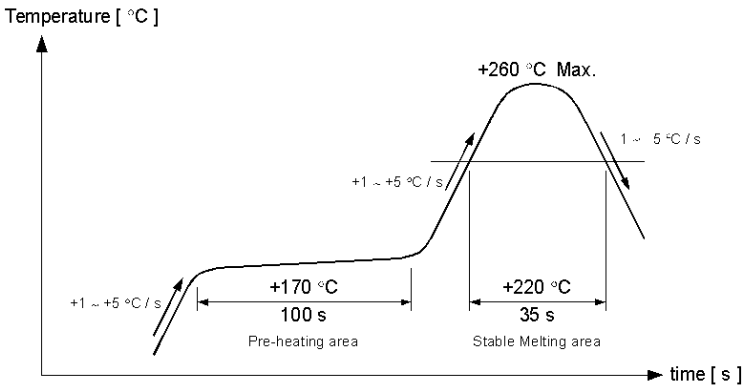


Fig. 2 : Reference profile for our evaluation of Soldering heat resistance.



EPSON TOYOCOM

RELIABILITY TEST DATA

Product Name SG-3030 LC

Halide free mold , 100%Sn plating

The Company evaluation condition

We evaluate environmental and mechanical characteristics by the following test condition . **No. F-G-0316-01-003Ehf**

No.	ITEM	TEST CONDITIONS	VALUE *1		TEST Qty [n]	FAIL Qty [n]
			Δ f / f *2 [1 × 10^{-6}]	Electrical characteristics		
1	High temperature storage	+125 °C × 1 000 h	*3 ± 50	Satisfy specification after test	22	0
2	Low temperature storage	-55 °C × 1 000 h	*3 ± 10		22	0
3	High temperature bias	+85 °C × 3.6 V × 1 000 h	*3 ± 20		22	0
4	Low temperature bias	-40 °C × 3.6 V × 1 000 h	*3 ± 10		22	0
5	Temperature humidity bias	+85 °C × 85 %RH × 3.6 V × 1 000 h	*3 ± 20		22	0
6	Temperature cycle	-55 °C ⇔ +125 °C 30 min at each temp. 100 cycles	*3 ± 10		22	0
7	Shock	100 g dummy (SEIKO EPSON Standard) drop from 1 500 mm height on to the concrete 3 directions 3 times	± 8		22	0
8	Vibration	10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz acceleration 98 m/s^2 10 Hz → 500 Hz → 10 Hz 15 min/cycle 6 h (2 h × 3 directions)	± 5		22	0
9	Pull-off	10 N press for 10 s ± 1 s Ref. EIAJ ED-4702	No peeling-off at a solder part		11	0
10	Solderability	Dip termination into solder bath at +235 °C ± 5 °C for 5 s (Using Rosin Flux)	Termination must be 95 % covered with fresh solder		11	0
11	Solvent resistance	Ref. JIS C 0052 or IEC 60068-2-45	The marking shall be legible		11	0

Notes

*1 Each test done independently.

*2 Measuring 2 h to 24 h later leaving in room temperature after each test.

*3 Pre-conditions (Dry +125℃x24h→ high temp & humidity +85℃x85%RHx48h→Reflow 2times) should be performed before each tests. Pre conditionings Initial value shall be after 24 h at room temperature.

QZ Business Unit.

Qualification Data

EPSON TOYOCOM

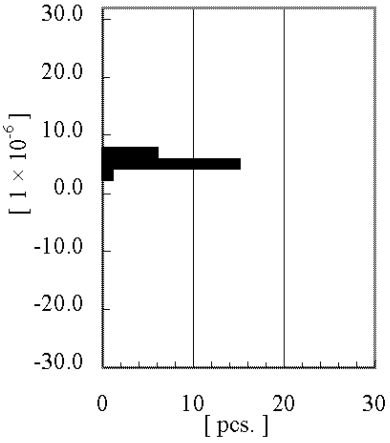
Product Name SG-3030 LC Halide free mold , 100%Sn plating

Frequency Shift Rate Δ f / f

No. F-G-0316-01-004Ehf

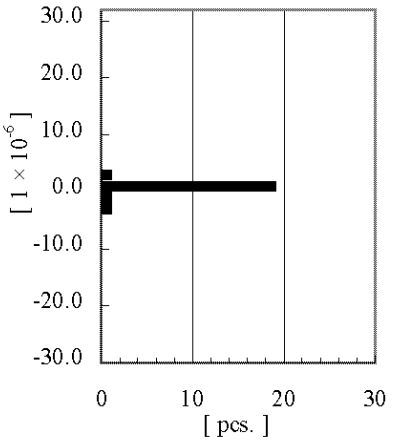
1. High temp. storage

+125 °C × 1 000 h



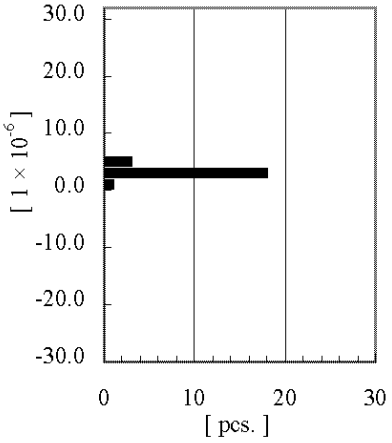
2. Low temp. storage

-55 °C × 1 000 h



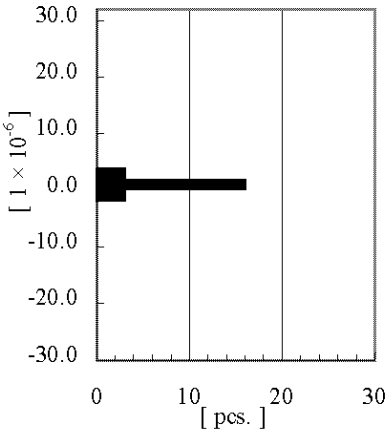
3. High temp. bias

+85 °C × 3.6 V × 1 000 h



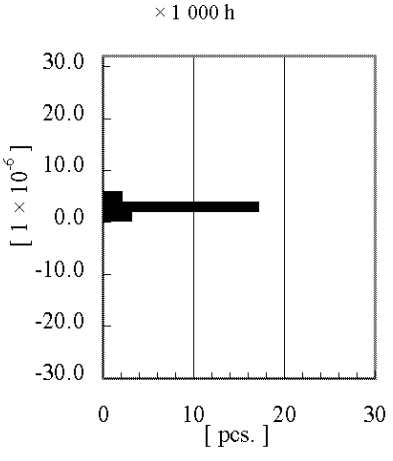
4. Low temp. bias

-40 °C × 3.6 V × 1 000 h



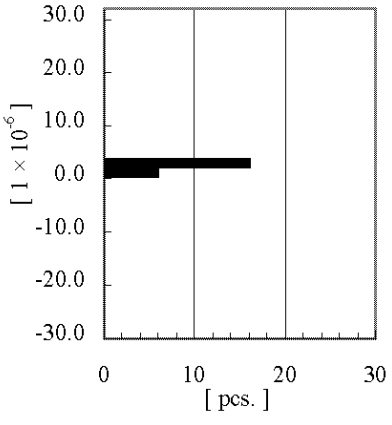
5. Temp. humidity bias

+85 °C × 85 %RH × 3.6 V
× 1 000 h



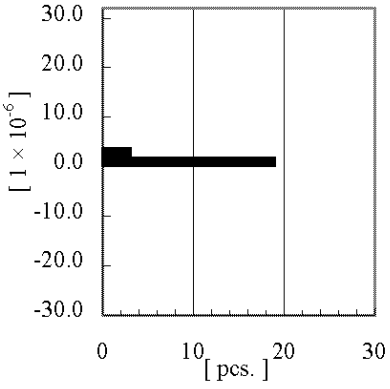
6. Temp. cycle

-55 °C ⇔ +125 °C
100 cycles 30min each step



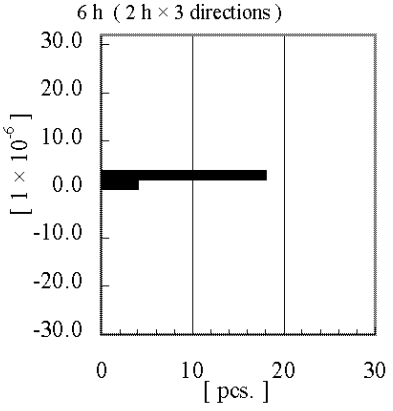
7. Shoch

100 g dummy (SEIKO EPSON Standard)
dropfrom1 500 mm height on to the
concrete 3 directins 3 times



8. Vibration

10 Hz to 55 Hz amplitude 0.75 mm
55 Hz to 500 Hz 98 m/s^2
15 min / cycle
6 h (2 h × 3 directions)



Qualification Data