

Beijing Yuantel Technology Co.,Ltd

RECIPIENT

SPECIFICATIONS

Product No. : X1G004611A02800

MODEL : SG-210SEBA

SPEC. No. : ECC2015-0480

DATE: Dec. 14. 2017

SEIKO EPSON CORPORATION

CHECKED Kiang Jiang /

PREPARED Charles Zhang /

SPECIFICATIONS

1. Application

This document is applicable to the crystal oscillator that are delivered to Beijing Yuantel Technology Co.,Ltd from Seiko Epson Corp.

This product is compliant with RoHS Directive.

This Product supplied (and any technical information furnished, if any) by Seiko Epson 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.

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 for the equipment, which requires an extra high reliability, such as satellite, rocket and other space systems, and medical equipment, the functional purpose of which is to keep life.

This SG-210SEBA is authorized for Use of X1G004611A02800 for automobile only.

2. Product No. / Model

The product No. of this crystal oscillator unit is X1G004611A02800.

The model is SG-210SEBA.

3. Packing

It is subject to the packing standard of Seiko Epson 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

Item No.	Item	Page
[1]	Absolute maximum ratings	2
[2]	Operating range	2
[3]	Frequency characteristics	2
[4]	Terminal assignment	3
[5]	Electrical characteristics	4
[6]	Test circuit	5
[7]	Timing chart	6-7
[8]	Environmental and mechanical characteristics	8
[9]	Dimensions and marking layout	9
[10]	Notes	10
[11]	Recommendable patterning	11

[1] Absolute maximum ratings

Parameter	Symbol	Value	Unit	Note
Supply voltage	V _{CC} -GND	-0.3 to +5.0	V	
Storage temperature *	T _{stg}	-40 to +125	°C	Stored as bare product after unpacking.
Input voltage	V _{IN}	-0.3 to V _{CC} +0.3	V	\overline{ST} Terminal

* Concerning the frequency change, please refer [8] Environmental and mechanical characteristics.

[2] Operating range

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Supply voltage	V _{CC}	1.6	1.8	2.2	V	
Supply voltage	GND	0.0	0.0	0.0	V	
Input voltage	V _{IN}	GND	-	V _{CC}	V	
Operating temperature	T _{use}	-40	+25	+105	°C	Y
Output load condition	L _{CMOS}	-	-	15	pF	

- Start up time(0 % V_{CC}→90 % V_{CC}) of power source should be more than 150 μs.
- By-pass capacitor (0.01 μF to 0.1 μF) is connected near V_{CC} between V_{CC} and GND.
(Refer to [11] Recommendable patterning)

[3] Frequency characteristics

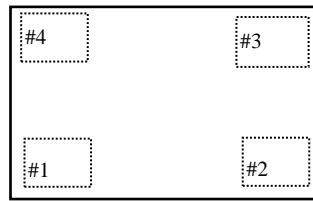
Output frequency (f₀) 25.0000 MHz

Parameter	Symbol	Value[1 × 10 ⁻⁶]	Note
Frequency tolerance *	f _{tol} (OSC)	Y : ±50	T _{use} =-40 °C to +105 °C
Aging	f _{aging}	± 3	T _{use} =+25 °C, V _{CC} =2.5 V First year

* This includes initial frequency tolerance, temperature characteristics, input voltage characteristics, and load characteristics, but excludes aging.

[4] Terminal assignment

Top View



Terminal name	Terminal No.	Terminal type.
$\overline{\text{ST}}$	1	INPUT
GND	2	—
OUT	3	OUTPUT
Vcc	4	—

$\overline{\text{ST}}$ pin : High or open. → Specified frequency output = enable.

$\overline{\text{ST}}$ pin : Low. → Output is high impedance = disabled.

* When the $\overline{\text{ST}}$ terminal is not controlled, it should be connected to the Vcc terminal.

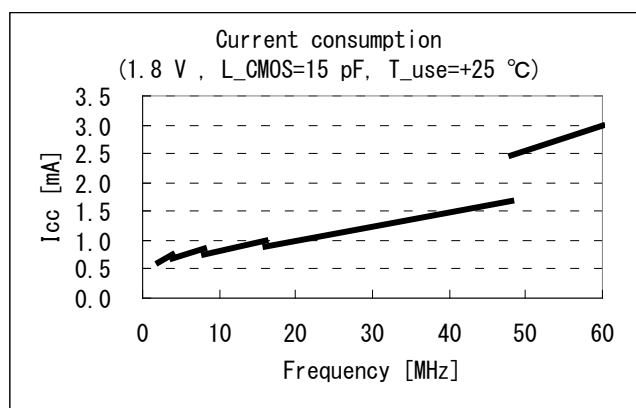
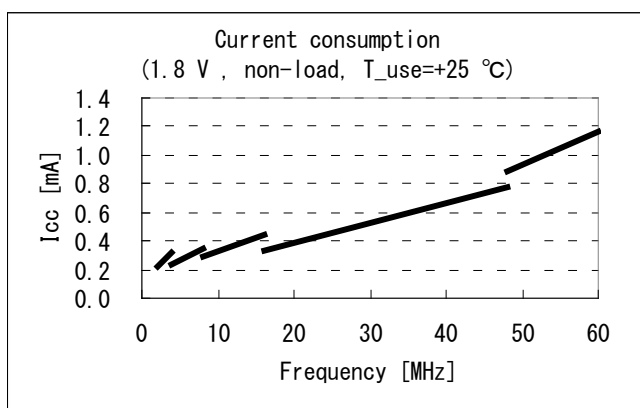
[5] Electrical characteristics

(Please see page 2 [2] Operating range)

Parameter	Symbol	Value		Unit	Note
		Min.	Max.		
Start up time	tosc	-	3	ms	t=0 at 90 % VCC
Current consumption	ICC	-	2.0	mA	No load
Standby current	I_std	-	1.6	μA	$\overline{ST} = \text{GND}$
Output rise time	tr	-	7.0	ns	20 % VCC → 80 % VCC
Output fall time	tf	-	7.0	ns	80 % VCC → 20 % VCC
Symmetry	SYM	40	60	%	50 % VCC Level
High level output voltage	VOH	0.9 VCC	-	V	IOH = -1 mA
Low level output voltage	VOL	-	0.1 VCC	V	IOL = 1 mA
High level input voltage	VIH	0.8 VCC	-	V	\overline{ST} terminal
Low level input voltage	VIL	-	0.2 VCC	V	\overline{ST} terminal
Input current	IiH	-	1	μA	VIN = VCC
	IiL	-1	-	μA	VIN = GND
Output disable time	tstp	-	100	Ns	\overline{ST} terminal High → Low
Output enable time	tsta	-	3	Ms	\overline{ST} terminal Low → High
Input pull-up resistance	RUP	3	-	MΩ	VCC=1.8 V, at +25 °C

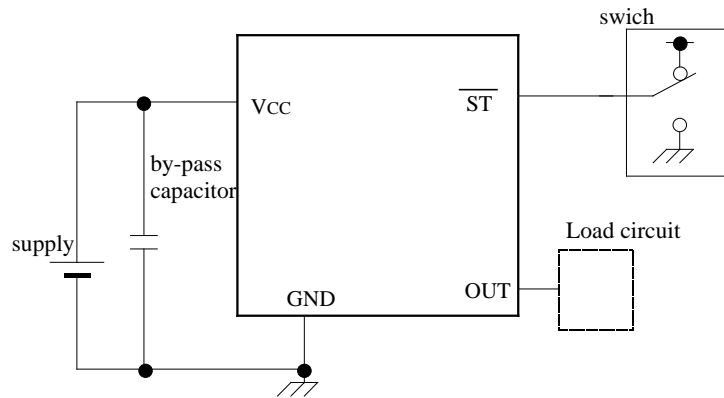
Refer to [6] Test circuit [7] Timing chart

◆Reference : Current consumption Typ. Value (VCC = 1.8 V , T_use = +25 °C)



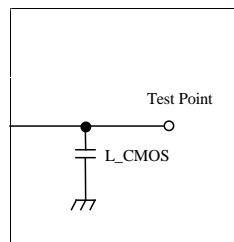
[6] Test circuit

1) Waveform observation

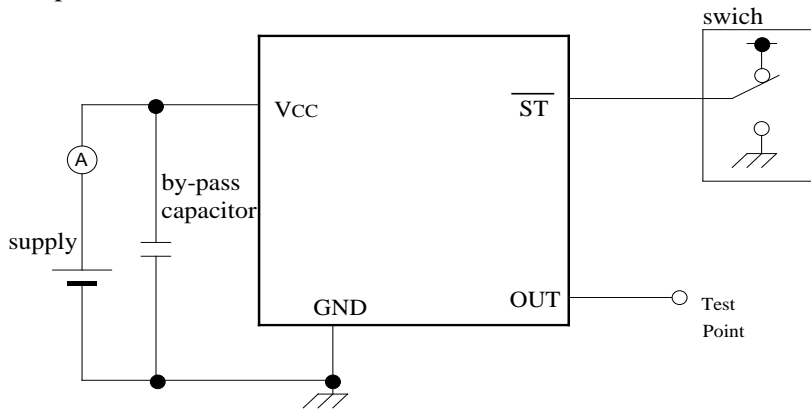


Load circuit

load capacitance



2) Current consumption



*Current consumption under the disable function should be $\overline{ST} = \text{GND}$.

3) Condition

(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) L_CMOS also includes probe capacitance.

(3) By-pass capacitor (0.01 μF to 0.1 μF) is placed closely between VCC and GND.

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

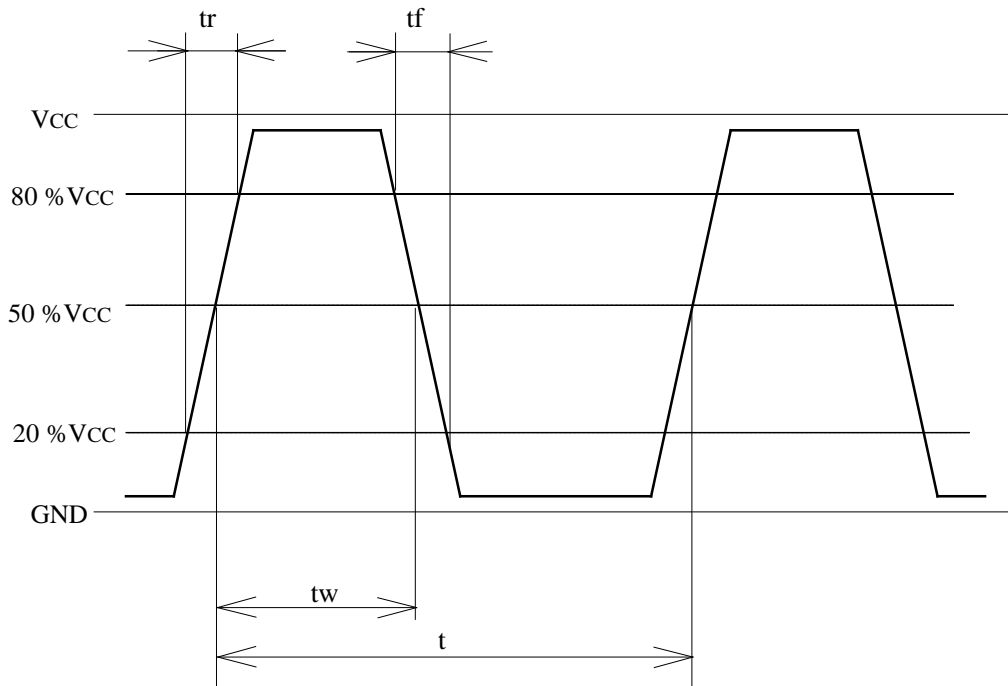
(5) Power supply

- Start up time (0 % VCC \rightarrow 90 % VCC) of power source should be more than 150 μs .
- Impedance of power supply should be as lowest as possible.

[7] Timing chart

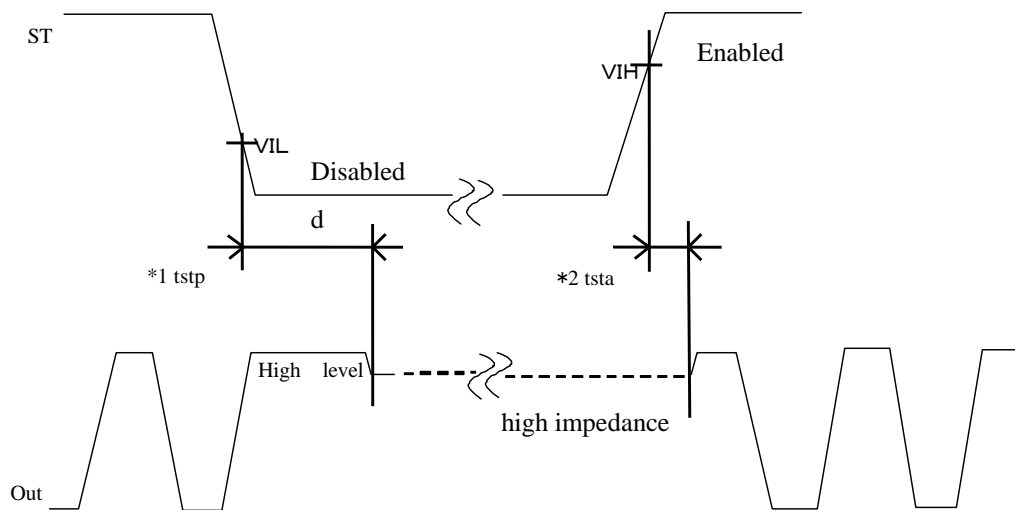
1) C-MOS load

$$\text{SYM} = tw/t \times 100 (\%)$$



2) \overline{ST} function and timing

\overline{ST} function	Osc. circuit	Output status
High or Open	Oscillation	Specified frequency is output : Enable
Low	Oscillation stop	Output becomes high impedance : Disable



*1 The time taken from $\overline{ST} = V_{IL}$ to output = Disable (high impedance)

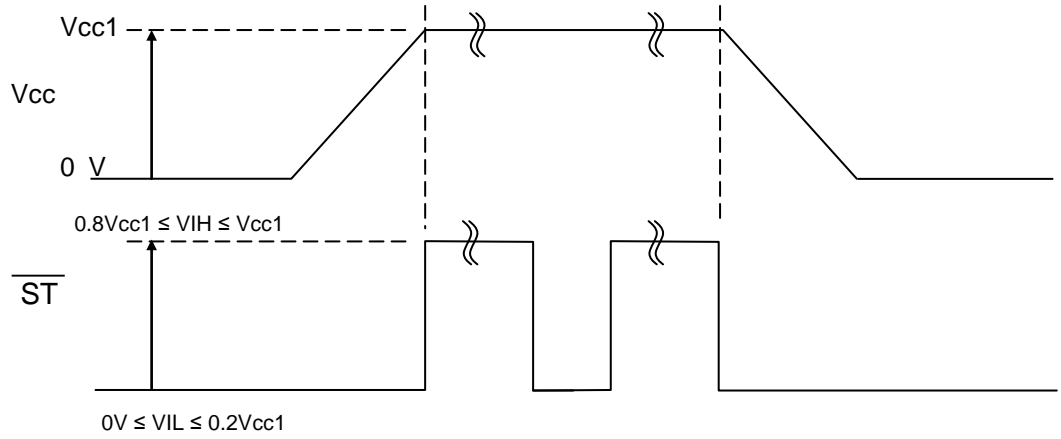
*2 The time taken from $\overline{ST} = V_{IH}$ to output = Start

Output start : $V_{OH} \geq 80\% V_{CC}$, $V_{OL} \leq 20\% V_{CC}$, $f_{out} = f_o \pm 1000 \times 10^{-6}$

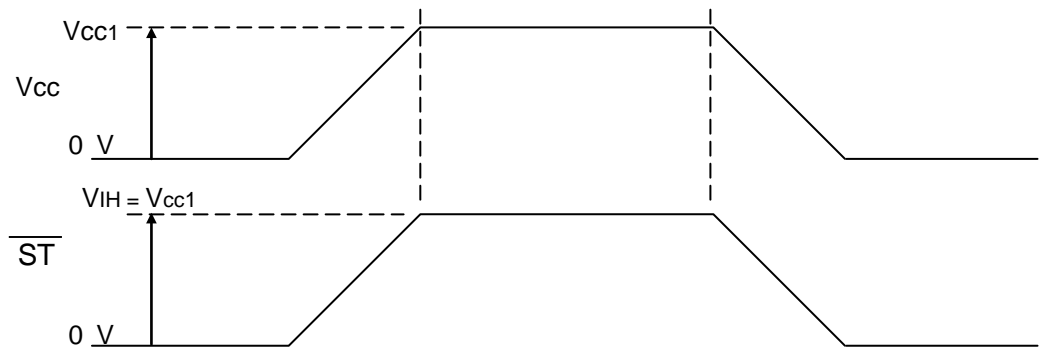
3) \overline{ST} Control timing

\overline{ST} function is used on the voltage below supply voltage.

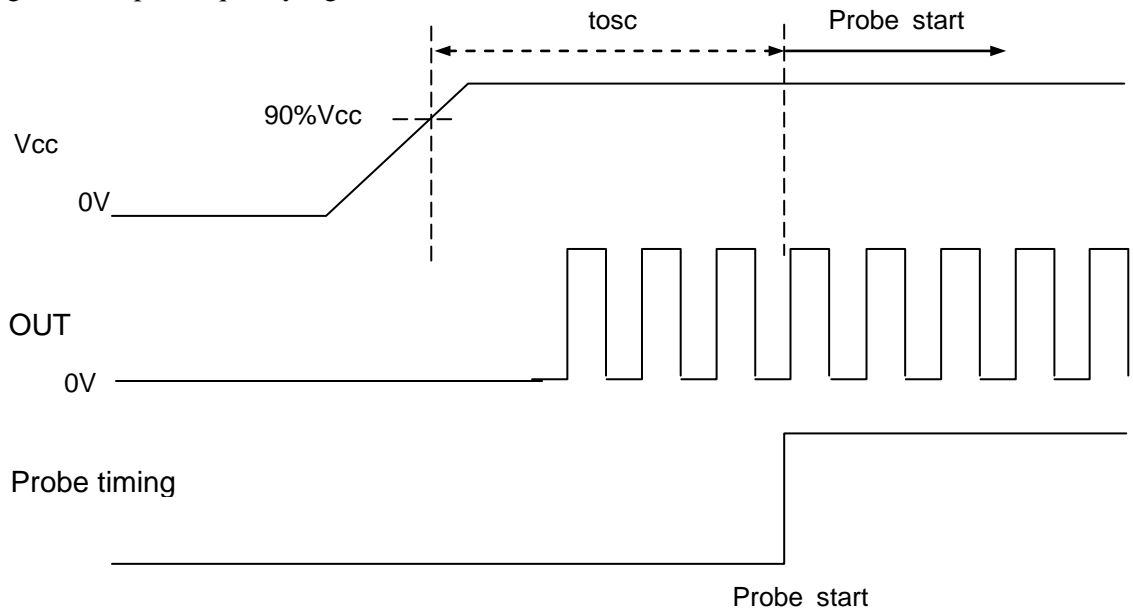
\overline{ST} control timing differs from V_{cc} control timing



\overline{ST} terminal is connected to V_{cc} terminal



4) Timing of an output frequency signal



[8] 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
		$\Delta f / f$ *2 [1×10^{-6}]	Electrical characteristics	
1	High temperature storage	*3 ± 20	Satisfy Item [5] after test.	+125 °C × 1 000 h
2	Low temperature storage	*3 ± 10		-40 °C × 1 000 h
3	High temperature bias	*3 ± 20		+125 °C × V _{CC} Max. × 1 000 h
4	Low temperature bias	*3 ± 10		-40 °C × V _{CC} Max. × 1 000 h
5	Temperature humidity bias	*3 ± 10		+85 °C × 85 %RH × V _{CC} Max. × 1 000 h
6	Temperature cycle	*3 ± 10		-40 °C ↔ +125 °C 30 min. at each temperature 1000 cycles
7	Resistance to soldering heat	± 5		Convection reflow soldering furnace (3 time) Ref. IPC/JEDEC J-STD-020D.1
8	Shock	± 3		150 g dummy Jig (Epson Toyocom Standard) drop from 1 500 mm height on the Concrete 3 directions 10 times.
9	Vibration	± 2		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 hours , 3 directions)
10	Seal	1×10^{-9} Pa·m ³ /s		He leakage detector
11	Solderability	Termination must be 95 % covered with fresh solder		Dip termination into solder bath at +235 °C \pm 5 °C for 5 s. (Using Rosin Flux)
12	Pull - off	No peeling-off at a solder part		10 N press for 10 s \pm 1 s Ref. EIAJ ED-4702

< Notes >

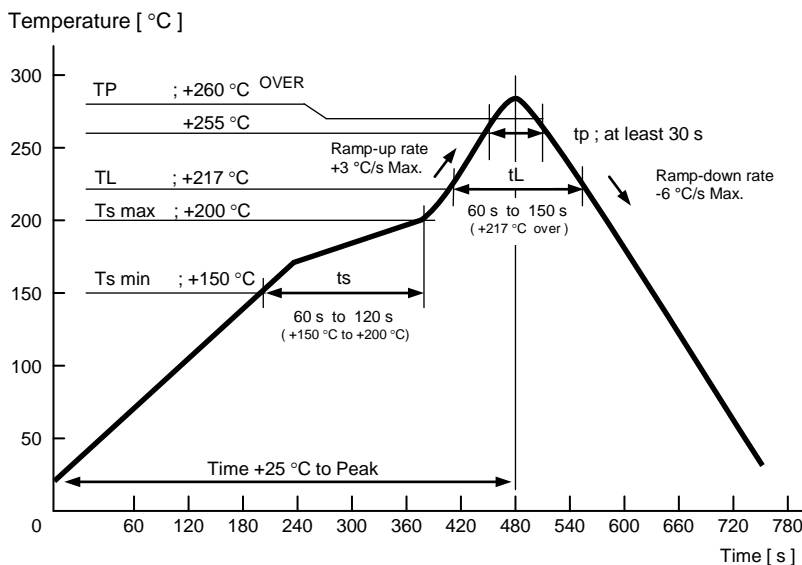
*1 Each test done independently.

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

*3 Initial value shall be measured after 24 h storage at room temperature after pre-conditioning.

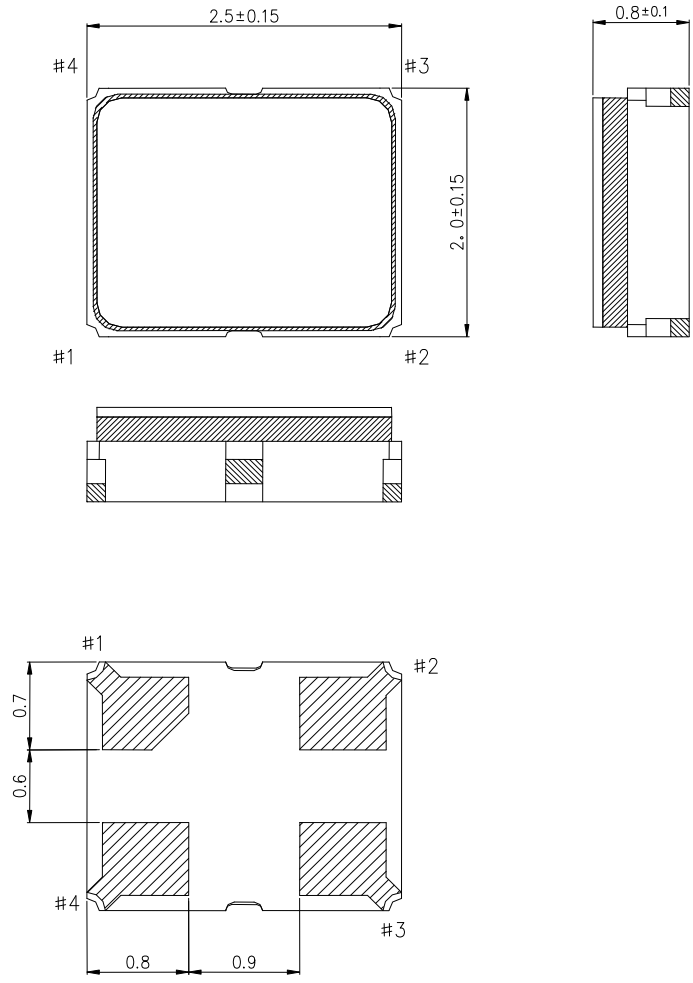
Pre-conditioning: Reflow (3 time)

Convection reflow condition (IPC/JEDEC J-STD-020D.1)



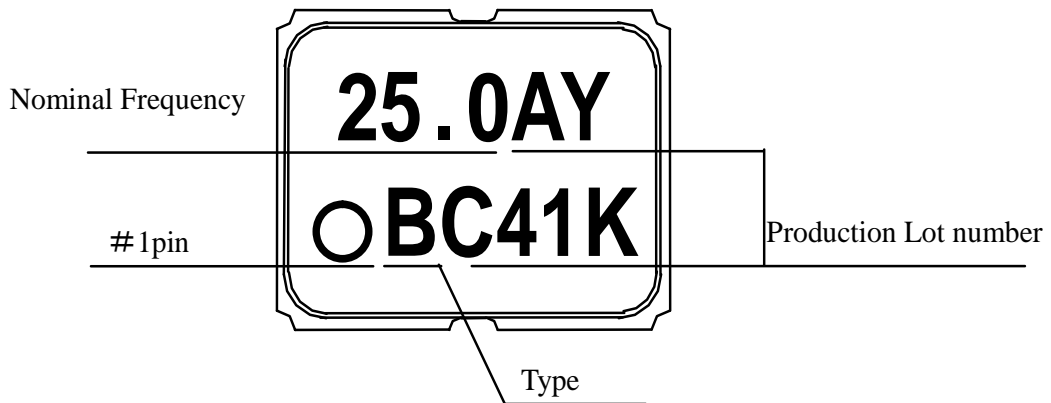
[9] Dimensions and marking layout

1) Dimensions



Terminal treatment : Au plating
Unit : mm

2) Marking layout



- ◆ The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.
- ◆ Output frequency shall indicate 4 digits (include decimal point), if the value of frequency over 4 digits, the least significant digits will be omitted.

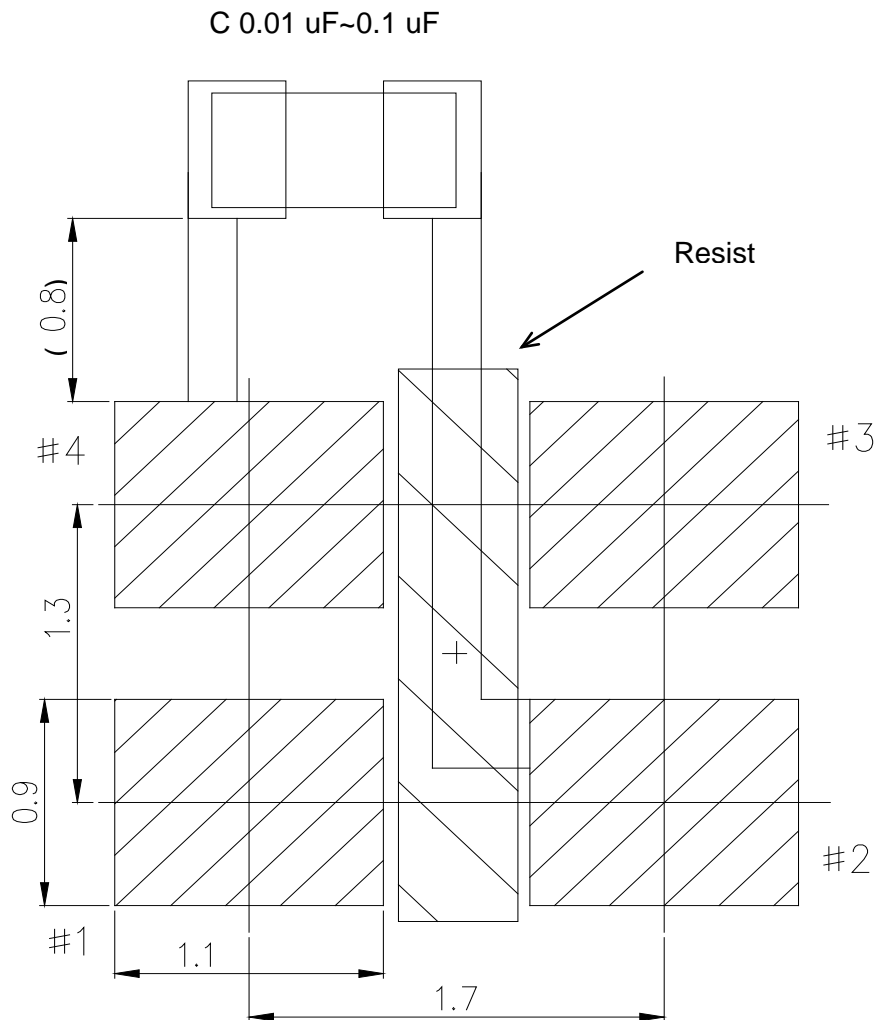
[10] Notes

- 1) This device is made with C-MOS IC.
Please take necessary precautions to prevent damage due to electrical static discharge.
- 2) Seiko Epson recommends a 0.01 μF to 0.1 μF capacitor must be connected near V_{CC} between V_{CC} and GND to obtain stable operation and protect against power line ripple.
- 3) V_{CC} and GND pattern shall be as large as possible so that high frequency impedance shall be small.
- 4) Seiko Epson cannot recommend to put filtering element into power line so as to reduce noise. Oscillator might be unstable oscillation because high frequency impedance of power line become higher. When use filtering element, please verify electrical construction and or element's spec.
- 5) Seiko Epson doesn't recommend to power on from intermediate electric voltage or extreme fast power on, Those powering conditions may cause no oscillation or abnormal oscillation.
- 6) Power ripple: 200 mV P-P max. Start up time (0 % V_{CC} \rightarrow 90 % V_{CC}) of power source should be more than 150 μs .
- 7) A long output line may cause irregular output, so try to make the output line as short as possible.
- 8) Other high-level signal lines may cause incorrect operation, so please do not place high level signal line close to this device.
- 9) This device contains a crystal resonator, so please don't expose excessive shock or vibration.
Seiko Epson recommends store device under normal temperature and humidity to keep the specification.
- 10) An automatic insertion is available, however, the internal crystal resonator might be damaged in case that too much shock or vibration is applied by machine condition.
Be sure to check your machine condition in advance.
- 11) Ultrasonic cleaning can be used on the SG-210SEBA, however, since the oscillator might be damaged under some conditions, please exercise in advance.
- 12) Seiko Epson recommends to use and store under room temperature and normal humidity to secure frequency accuracy and prevent moisture.
- 13) $\overline{\text{ST}}$ -pin has pull-up resistor internally. The resistor value is switched depending on input voltage.
Please refer to electrical characteristics.
- 14) Lid is electrically connected to GND.
Please don't apply electrical voltage.

[11] Recommendable patterning

The soldering pad sample indicated as like following:

Soldering position (Unit : mm)



Structure Diagram 構造図

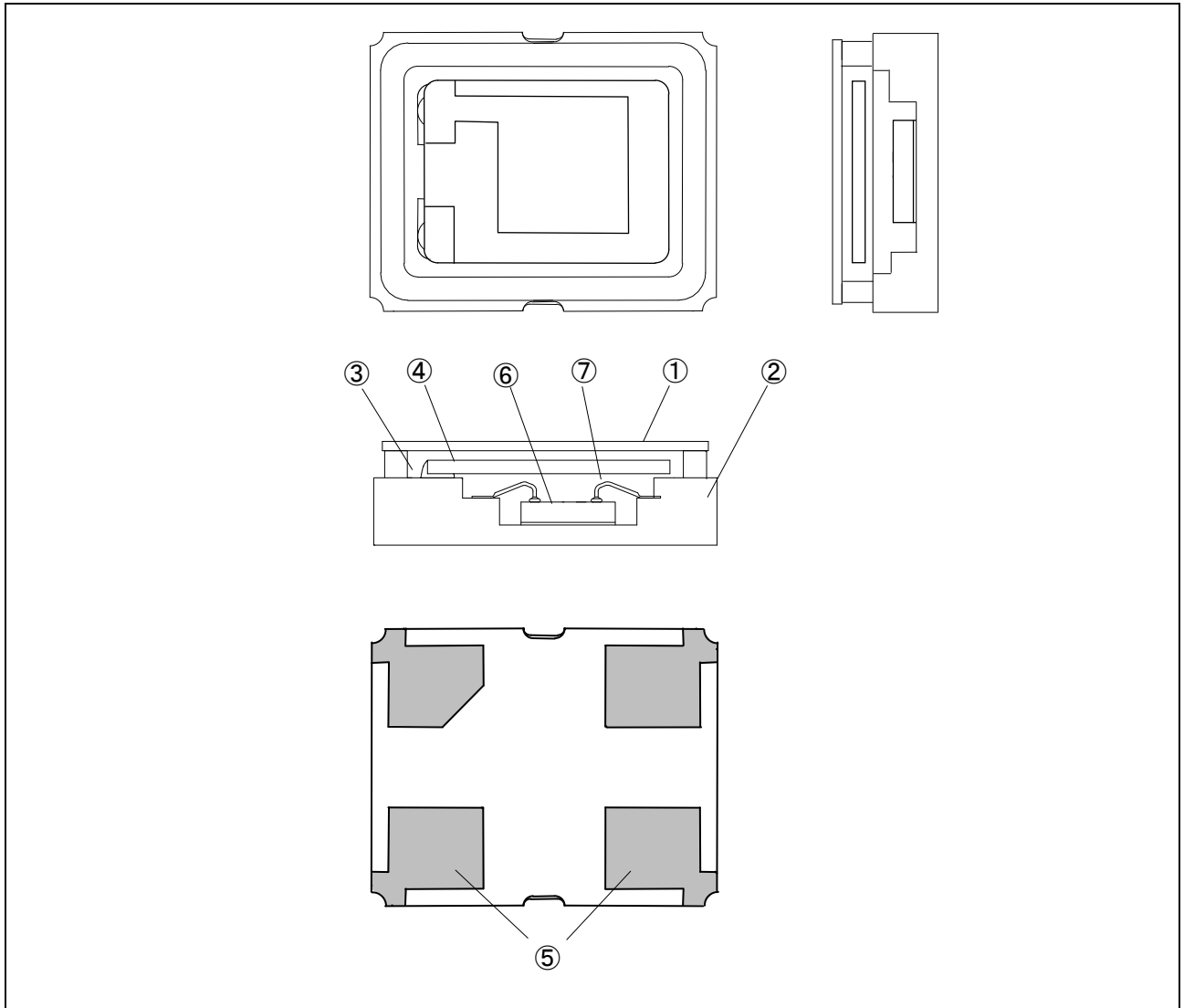
Rev.07

Model
型式

SG-210SxB / SG-210SxD / SG-210SxH
SG-210SxBA / SG-210PxP / SG-8003CG /
SG-211SxE / VG2520CAN / SG-8101CG /
SG-8018CG / SG-9101CG

Document No.
管理No.

SG210_D_0001



No.	Name of Part 部品名
①	Lid リッド
②	Package パッケージ
③	Crystal adhesive 接着剤
④	Crystal chip 水晶片
⑤	Terminal 端子
⑥	IC
⑦	Bonding wire ボンディングワイヤ

- PROCESS QUALITY CONTROL

No. SG210S*BA - 00 - ASE - 1

Crystal Oscillator SG-210S*BA

2015.02.27
SG210SxBA_Q_0001

Manufacturing process chart		No	Process	Setion	Standards	Inspection control item	Instruments	Inspection methods	Record
<p>The diagram shows a manufacturing process flow starting with four parallel inputs: Lid, Crystal, IC, and Base. Each input has a diamond-shaped inspection point labeled '1'. The process then proceeds through a series of steps: 1. In-coming inspection (diamond), 2. Creaning (circle), 3. Sputter (circle), 4. Parts Mounting (circle), 5. hardening (circle), 6. Wire bonding (circle), 7. Crystal mounting (circle), 8. hardening (circle), 9. Frequency Adjusting (circle), 10. Temporary Hermetic Sealing (circle), 11. Baking (circle), 12. Hermetic Sealin or Heating (circle), 13. Heating (circle), 14. Leakage (diamond), 15. Marking (circle), 16. LDL Inspection (diamond), 17. Electrical Characteristic (diamond), 18. Temp Characteristic (diamond), 19. High temp Ele Characteristic (diamond), 20. Visual inspection (diamond), 21. Outgoing inspection (diamond), 22. Taping (circle), and 23. Packing (circle). Inspection points are indicated by diamonds, and process steps are indicated by circles.</p>	1	In-coming inspection	Inspection Section	Purchasing Specification Incoming Inspection Standard	Appearance Dimension	MS	Sampling	Data sheet	
	2	Creaning	Production Section	Manufacturing Instruction Sheet	-	-	-	Data sheet	
	3	Sputter	Production Section	Manufacturing Instruction Sheet	Appearance Peeling Strength Frequency	Microscope Scratch CI Meter	100% Inspection Sampling Sampling	Data sheet Data sheet Data sheet	
	4	Parts Mounting	Production Section	Manufacturing Instruction Sheet	Appearance	MS	Sampling	Data sheet	
	5	hardening	Production Section	Manufacturing Instruction Sheet	-	-	-	-	
	6	Wire bonding	Production Section	Manufacturing Instruction Sheet	Bonding strength Appearance	Gauge MS	Sampling 100% Inspection	Data sheet Data sheet	
	7	Crystal mounting	Production Section	Manufacturing Instruction Sheet	Appearance	MS	100% Inspection	Data sheet	
	8	hardening	Production Section	Manufacturing Instruction Sheet	-	-	-	-	
	9	Frequency Adjusting	Production Section	Manufacturing Instruction Sheet	Frequency	Counter	100% Inspection	Data sheet	
	10	Temporary Hermetic Sealing	Production Section	Manufacturing Instruction Sheet	-	-	-	-	
	11	Baking	Production Section	Manufacturing Instruction Sheet	-	-	-	-	
	12	Hermetic Sealing	Production Section	Manufacturing Instruction Sheet	Appearance	MS	Sampling	Data sheet	
	13	Heating	Production Section	Manufacturing Instruction Sheet	-	-	-	-	
	14	Leakage	Production Section	Manufacturing Instruction Sheet	Leakage Inspection	M/C	100% Inspection	Data sheet	
	15	Marking	Production Section	Manufacturing Instruction Sheet	Appearance	MS	Sampling	Data sheet	
	16	LDL Inspection	Production Section	Manufacturing Instruction Sheet	Characteristic Inspection	M/C	100% Inspection	Data sheet	
	17	Electrical Characteristic	Production Section	Manufacturing Instruction Sheet	Electrical Characteristic	M/C	100% Inspection	Data sheet	
	18	Temp Characteristic	Production Section	Manufacturing Instruction Sheet	Temp Characteristic Inspection	M/C	Sampling	Data sheet	
	19	High temp Ele Characteristic	Production Section	Manufacturing Instruction Sheet	Electrical Characteristic	M/C	100% Inspection	Data sheet	
	20	Visual inspection	Production Section	Manufacturing Instruction Sheet	Appearance	MS	100% Inspection	Data sheet	
	21	Outgoing inspection	Inspection Section	Delivery Specifications Outgoing Inspection Standard	Electrical Characteristic Appearance	M/C MS	Sampling	Data sheet	
	22	Taping	Production Section	Manufacturing Instruction Sheet	Tape peeling Strength Frequency check Appearance	M/C M/C	Sampling 100% Inspection	Data sheet Data sheet	
	23	Packing	Production Control Section	Manufacturing Instruction Sheet Daily Shipping List	Customers Type Quantity	-	-	Delivery Slip	

TAPING SPECIFICATION

テープ梱包基準書

1. APPLICATION 適用範囲

This document is applicable to CG package.(2.5x2.0 size)

本基準書は、CGパッケージ(2.5×2.0サイズ)のテーピング梱包について規定する。

2. CONTENTS 目次

Item No.	Item	Page
[1]	Taping specification テーピング仕様	2 to 3
[2]	Shipping carton 外装箱への収納	4
[3]	Marking 表示	
[4]	Quantity 収納数量	
[5]	Storage environment 保管環境	5
[6]	Handling リール取扱い	

[1] Taping specification テーピング仕様

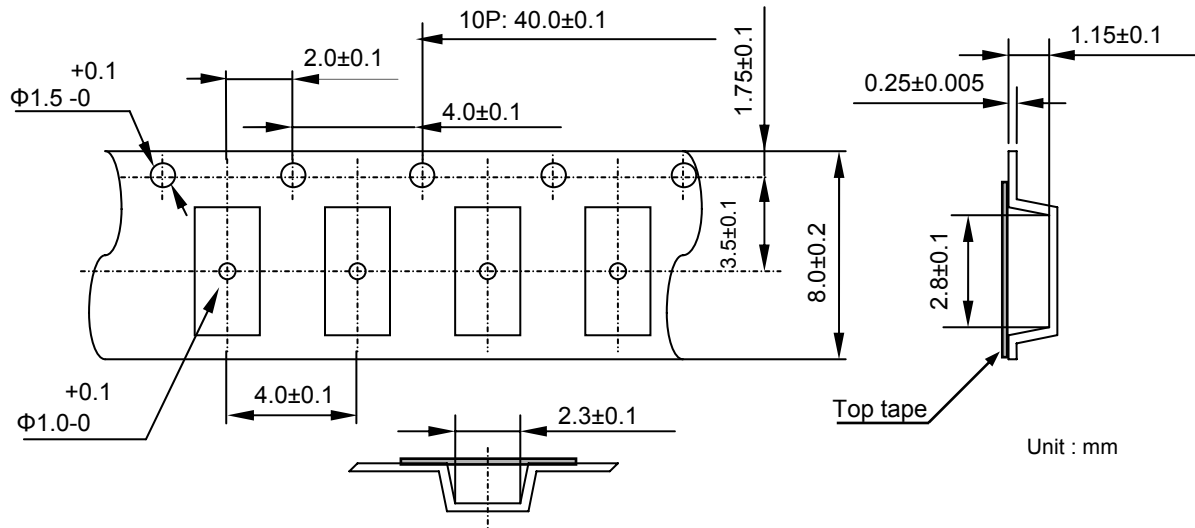
Subject to EIA-481, IEC 60286, JIS C0806.

「EIA-481」「IEC 60286」「JIS C0806」に準拠する。

(1) Tape dimensions TE0804L

Material of the Carrier Tape キャリアテープ材質: PS

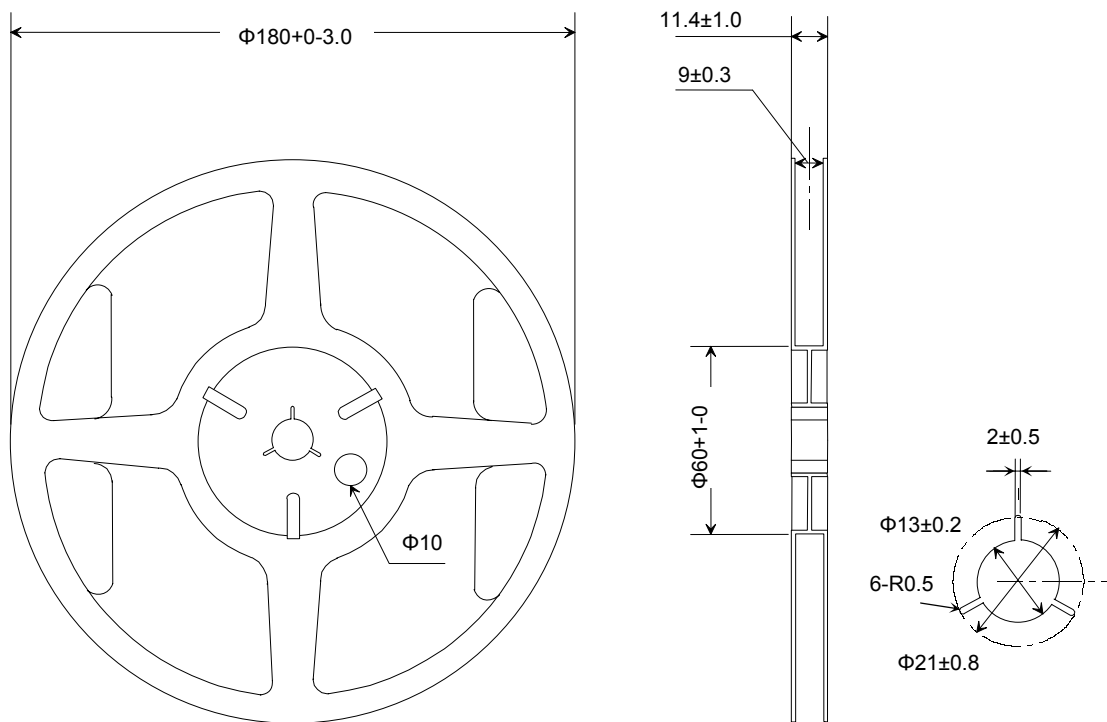
Material of the Top Tape トップテープ材質 : PET+PE



Unit : mm

(2) Reel dimensions

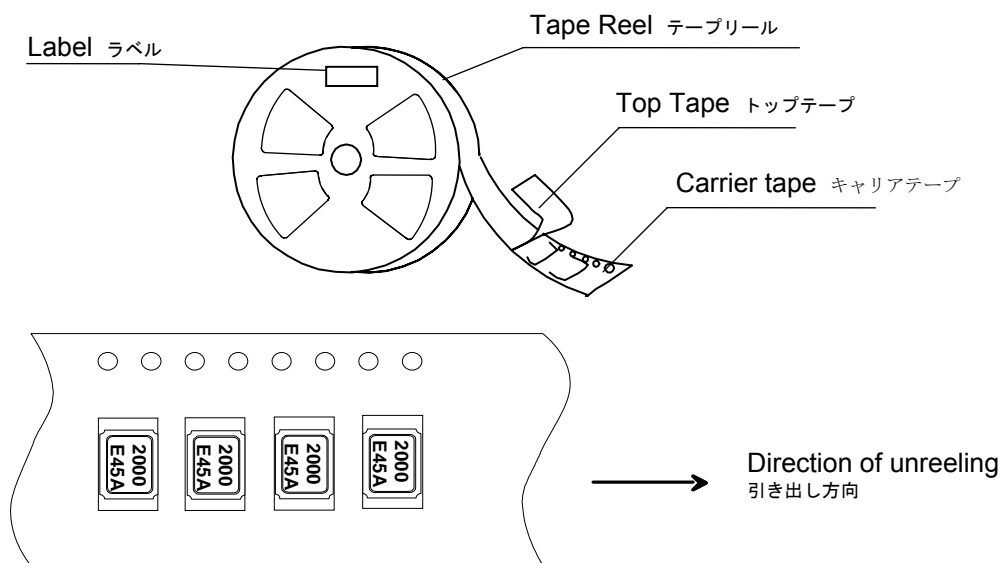
Material of the Reel リール材質: PS



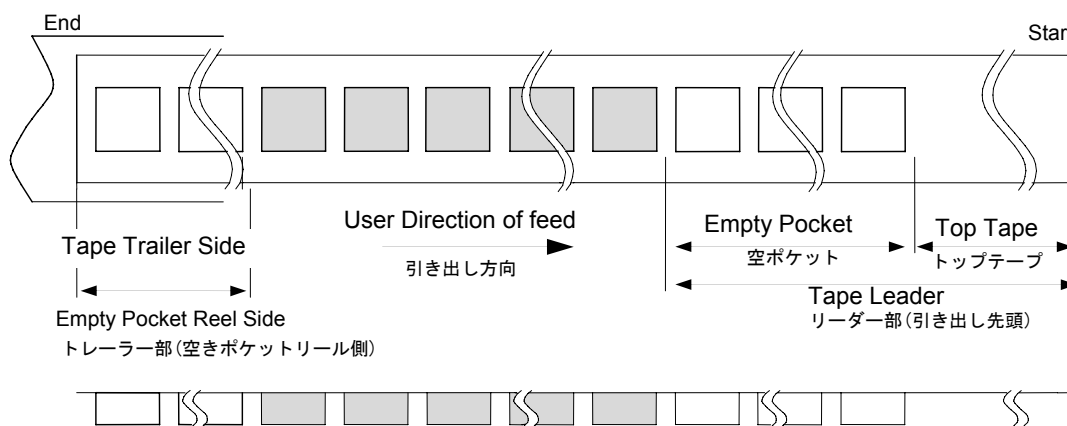
Form and Size of reel window shows are one of the example

リールの窓の形状は代表例を掲載。

(3) Packing 収納形態
 (a) Tape & Reel デバイス収納方法



(b) Start & End Point 引き出し先頭側及びリール側の処理



Item 項目		Empty Space 空きスペース	Note 備考
Tape Leader (引き出し先頭側)	Top Tape	Min. 1 000 mm	Feeding in the Top tape, the tip is fixed with tape. トップテープ単独で繰り出し、先端はテープにより固定。
	Carrier Tape	Min. 160 mm	Winding method is a diagram of the above リールへの巻き取り方法は、上図の通り。
Tape Trailer (リール側)	Top Tape	Min. 0 mm	Tip is fixed to the reel. 先端はリールに固定。
	Carrier Tape	Min. 160 mm	

(4) Peel force of the cover tape トップテープの剥離強度

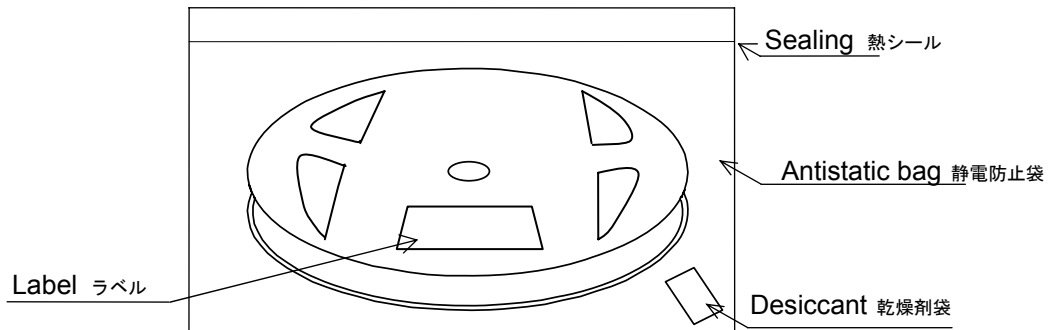
(a) angle : cover tape during peel off and the direction of unreeling shall be 165° to 180°.
 剥離角度 : テープの接着面に対し 165~180 度とする。

(b) peel speed : 300 mm/min
 剥離速度 : 300 mm/min とする。

(c) peel strength : 0.1~1.0 N
 剥離強度 : 0.1~1.0 N

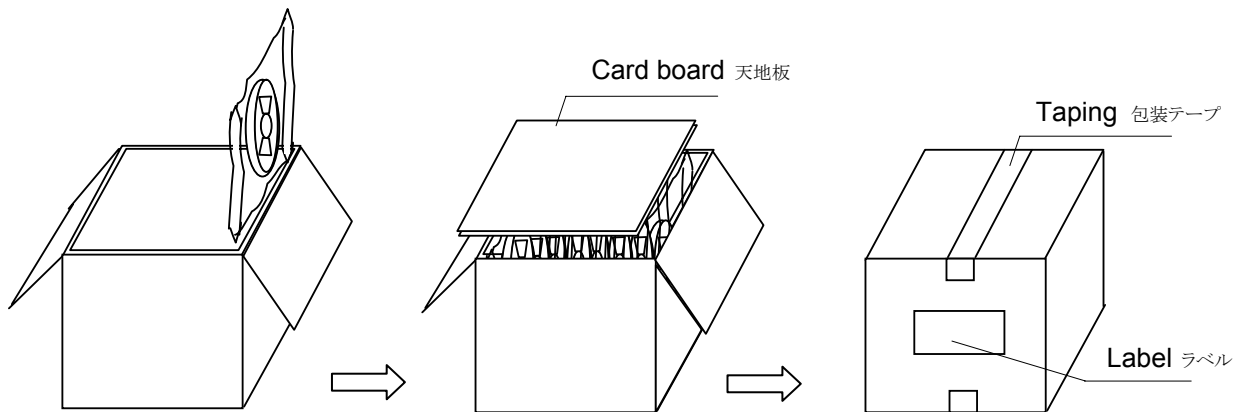
[2] Shipping carton 外装箱への収納

a) Packing to antistatic bag 袋への収納



b) Packing to shipping carton 外装箱への収納

If there is space in the outer box, material is put in a shock absorbing together.
空間ができた時は、クッション材を入れる。



[3] Marking 表示

(1) Reel marking リールへの表示

● Reel marking shall consist of

下記内容をリール表面に表示できるラベルを貼る。:

- 1) Parts name 製品名称
- 2) Quantity 製品数量
- 3) Manufacturing Date or symbol 製品の製造年月又はこれを示す記号
- 4) Manufacturer's Date or symbol 製品の製造業者又はその略号
- 5) Others (if necessary) その他必要事項

(2) Shipping carton marking 外装箱への表示

● Shipping carton marking shall consist of :

下記内容を外装箱表面に表示できるラベルを貼る。:

- 1) Parts name 製品名称
- 2) Quantity 製品数量

[4] Quantity 収納数量

- 3 000 pcs./reel (Standard)

However it is not the limit, in case that the order quantity does not fill with 3000 pieces.
Packing quantity is defined by 14th and 15th digit of product number.

但し、注文数量が3 000 pcsに満たない場合は、その限りではない。
収納数量は、製品型番の14桁、15桁による。

14th and 15th digit of product number. 製品型番の14桁、15桁	Quantity
00	3 000 pcs
01	Vinyl Bag(Bulk)
11	Any Quantity
12	250 pcs
14	1 000 pcs
15	2 000 pcs

[5] Storage environment 保管環境

- (1) Before open the packing, we recommend to keep less than +30 °C and 85 %RH of Humidity, and to use it less than 6 months after delivery.

開梱前の製品は、温度 +30 °C、湿度 85 %RH 以下での保管をして下さい。
貴社納入後、袋未開封で6ヶ月以内の実装を推奨します。

- (2) We recommend to open Package in immediately before use. After open Package, We recommend to keeps less than 6 month. No need dry air before soldering work if it is less than temperature +30 °C, 85 humidity %RH.

使用直前まで開梱せず、袋開封後は6ヶ月以内の実装を推奨します。
温度 +30 °C、湿度 85 %RH 以下では、はんだ付け作業前に乾燥不要です。

- (3) Not to storage with some erosive chemicals.

化学薬品類との同居を避ける。

- (4) Nothing is allowed to put on the reel or carton to prevent mechanical damage

外装箱がゆがまないようまた、外圧がかからないように保管して下さい。

[6] Handling リール取扱い

To handle with care to prevent the damage of tape, reel and products.

リールの取扱いについては、中のテープ・製品を変形させないようにして下さい。

RELIABILITY TEST DATA

Product Name : SG-210**BA Series (High temperature)

The Company evaluation condition

We evaluate environmental and mechanical characteristics by the following test condition .

No. A13-205-3B-001E

No.	ITEM	TEST CONDITIONS	VALUE *1		TEST	FAIL
			D f / f *2 [1 ± 10 ⁻⁶]	Electrical characteristics	Qty [n]	Qty [n]
1	High temperature storage	+125 °C × 1 000 h	*3 ± 20	Satisfy specification after test	22	0
2	Low temperature storage	-40 °C × 1 000 h	*3 ± 10		22	0
3	High temperature bias	+125 °C × Spec bias × 1 000 h	*3 ± 20		22	0
4	Low temperature bias	-40 °C × Spec bias × 1 000 h	*3 ± 10		22	0
5	Temperature humidity bias	+85 °C × 85 %RH × Spec bias × 1 000 h	*3 ± 10		22	0
6	Temperature cycle	-40 °C ⇔ +125 °C 30 min at each temp. 1000 cycles	*3 ± 10		22	0
7	Resistance to soldering heat	For convention reflow soldering furnace (3 times) Ref. IPC/JEDEC J-STD-020D.1	± 3		22	0
8	Shock	100 g dummy (EPSON Standard) drop from 1 500 mm height on to the concrete 3 directions 10 times	± 3		22	0
9	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)	± 2		22	0
10	Seal	He leakage detector	1 × 10 ⁻⁹ Pa·m ³ /s MAX	11	0	
11	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	
12	Pull-off	10N press for 10s ± 1s Ref.EIAJ ED-4702	No Peeling-off at a solder part	11	0	

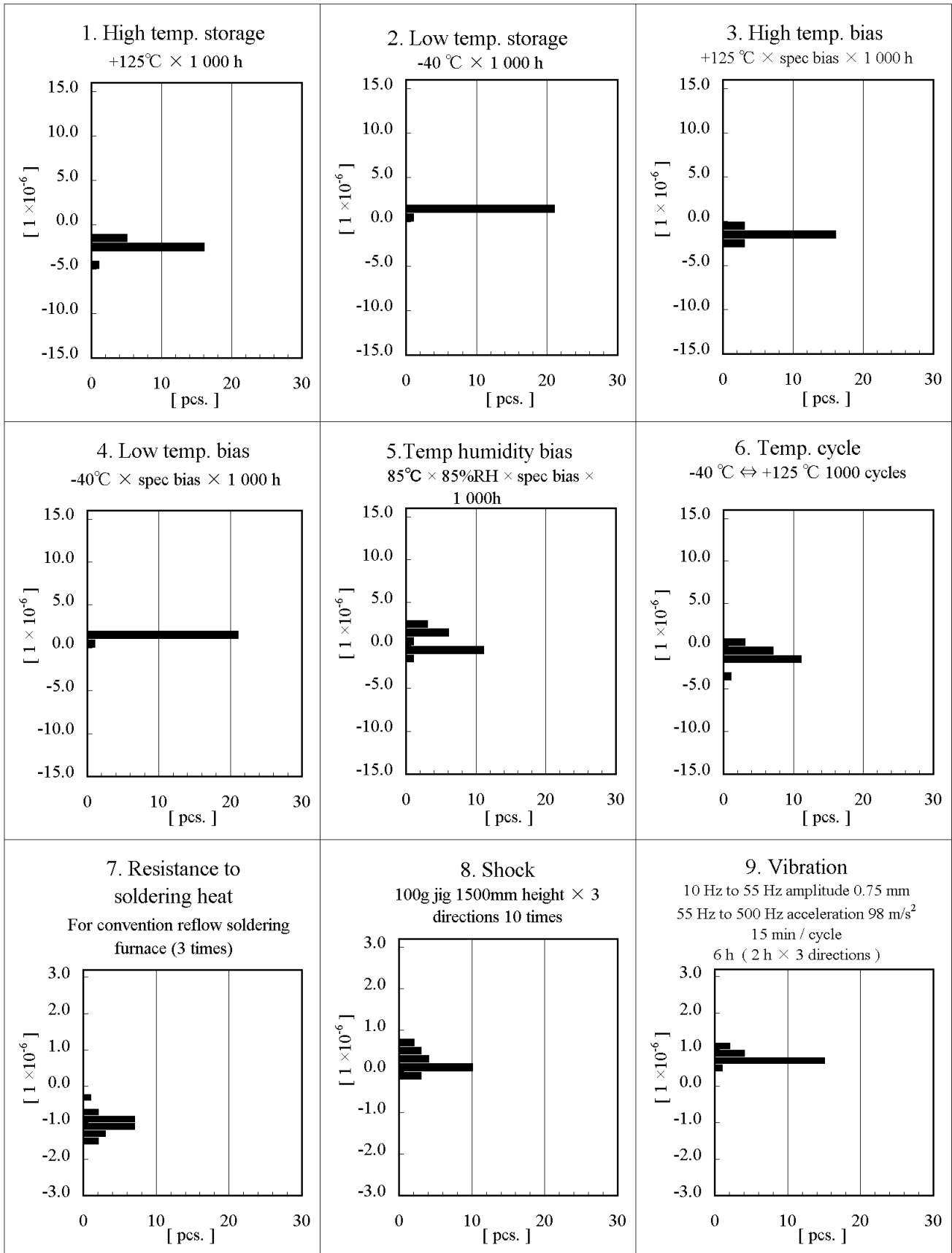
Notes

- *1 Each test done independently.
- *2 Measuring 2 h to 24 h later leaving in room temperature after each test.
- *3 Initial value shall be measured after 24 h storage at room temperature after pre-conditioning.
Pre-conditioning: Reflow (3 time)

Product Name : SG-210**BA Series (High temperature)

$\Delta f/f$

No. A13-205-3B-002E



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