

# SPECIFICATIONS

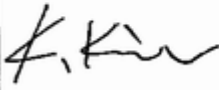
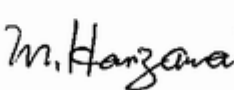

HIGH-FREQUENCY SMD CRYSTAL UNIT

Spec. No. X1E000391XXXX00

Type. FA3225AA

Frequency. 8 - 60 MHz

Date. 4<sup>th</sup> - June. 2013

Established : TD Production Engineering Department		
Approval	Checked	Responsible
		

# SPECIFICATIONS

Preliminary

## 1. Application

This document is applicable to the crystal unit that are delivered from Seiko Epson Corp.

This product complies with RoHS Directive.  
Designed for automotive safety application.

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.

## 2. Product No. / Model

X1E000391XXXX00 / FA3225AA.

## 3. Packing

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

## 4. Warranty

Defective parts which originate with us are replaced free of charge in the case of defects being found with 12 months after delivery.

## 5. Amendment and/or termination

Amendment and/or termination of this specification is subject to the agreement between the two parties.

## 6. Contents

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[ 1 ] Absolute maximum ratings

No.	Parameter	Rating value	Note
1	Storage temperature	-55 °C to +155 °C	Suppose to be within CI std. at +25 °C ± 3 °C

[ 2 ] Operating range

No.	Parameter	Symbol	Value		
			Min.	Typ.	Max.
1	Operating temperature	Topr	-40 °C	—	+150 °C
2	Drive level	DL	10 μW	—	200 μW

[ 3 ] Electrical characteristics

No.	Parameter	Symbol	Standard	Conditions
1	Nominal frequency	f <sub>0</sub>	8 - 60 MHz	Fundamental
2	Frequency tolerance	Δf/f <sub>0</sub>	± 30 × 10 <sup>-6</sup>	CL = 8pF to ∞ Ta = +25 °C±3 °C Drive level : 100 μW Not include aging
3	Series resistance (CI)	R <sub>1</sub>	Table. 1	π circuit IEC 60444-2 Drive level : 100 μW Ta= -40 °C to +125 °C
4	Shunt capacitance	C <sub>0</sub>	3.0 pF Max.	
5	Frequency Temperature Characteristics	T <sub>op</sub>	Table. 2	(Ref. at +25 °C±3 °C) Drive level : 100 μW
6	Isolation resistance	IR	500 MΩ Min.	DC 100V × 60 sec. between each terminals
7	Aging	Δfa/f	± 5 × 10 <sup>-6</sup> /year	Ta = +25 °C±3 °C Drive level : 100 μW

Table.1 Series resistance (CI)

Frequency	Series resistance
8MHz ≤ f < 9.8MHz	500 ΩMax
9.8MHz ≤ f < 12MHz	300 ΩMax
12MHz ≤ f < 13MHz	120 ΩMax
13MHz ≤ f < 20MHz	100 ΩMax
20MHz ≤ f ≤ 60MHz	80 ΩMax

Table.2 Frequency temperature characteristics

Temperature	Frequency tolerance
-40 °C ~ +125 °C	±50.0 ×10-6 ~
-50 °C ~ +150 °C	±150.0 ×10-6 ~

#### [ 4 ] Environmental and mechanical characteristics

Item No.3 to No.6 shall be tested after following pre conditioning.

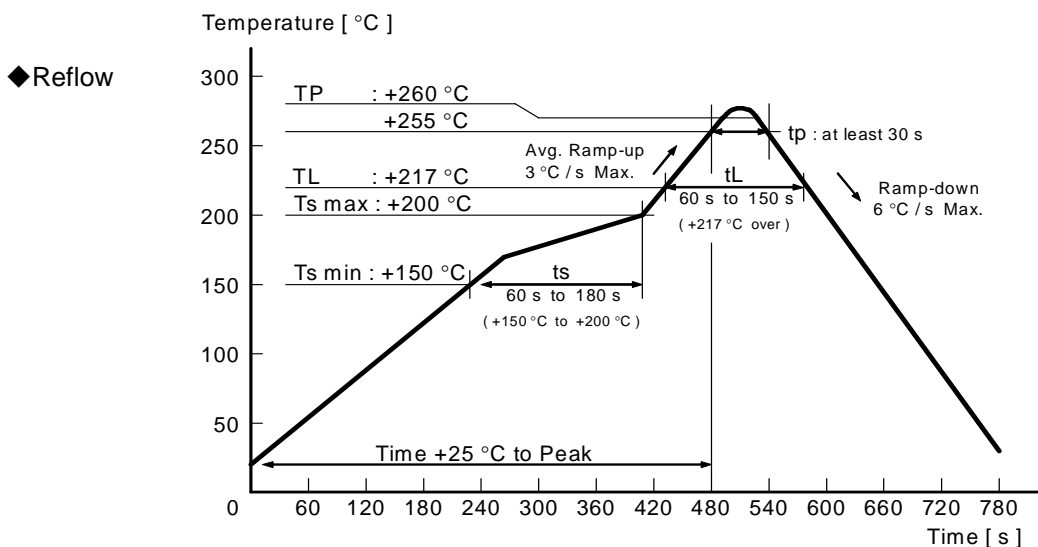
Pre conditioning : Test crystal must be leaving in room temperature for 24h after reflow x 3.

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

No.	Item	Value *1 *2		Test Conditions
		$\Delta f / f [1 \times 10^{-6}]$		
1	Drop	(2)	$\pm 10$	100g dummy Jig (SEIKO EPSON Standard) drop from 1500 mm height on the Concrete 3 directions 10 times
2	Vibration	(2)	$\pm 5$	10Hz to 55 Hz amplitude 0.75 mm 55Hz to 500Hz acceleration $98 \text{ m/s}^2$ 10Hz → 500Hz → 10Hz 15min./cycle 6 h (2 hours , 3 directions)
3	High temperature storage	(1)	$\pm 10$	+125°C × 1 000 h
4	Low temperature storage	(1)	$\pm 5$	-40°C × 1 000 h
5	Temperature cycle	(1)	$\pm 5 (8 \leq f_0 \leq 32\text{MHz})$ $\pm 10 (32 < f_0 \leq 60\text{MHz})$	-40°C ↔ +150°C 30 minutes at each temp. 100 cycle
6	Temperature humidity storage	(1)	$\pm 10$	+85°C × 85%RH × 1 000 h
7	Resistance to soldering heat		$\pm 5$	For convention reflow soldering furnace (3 times)
8	Substrate bending		No peeling-off at a soldered part	Bend width reaches 3 mm and hold for $5 \text{ s} \pm 1 \text{ s} \times 1 \text{ time}$ Ref. IEC 60068-2-21
9	Shear		No peeling-off at a soldered part	10 N press for $10 \text{ s} \pm 1 \text{ s}$ Ref. IEC 60068-2-21
10	Pull – off		No peeling-off at a soldered part	10 N press for $10 \text{ s} \pm 1 \text{ s}$ Ref. IEC 60068-2-21
11	Solderability		Terminals must be 95% covered with fresh solder.	Dip termination into solder bath at +235 °C ± 5 °C for 5 s (Using Rosin Flux)

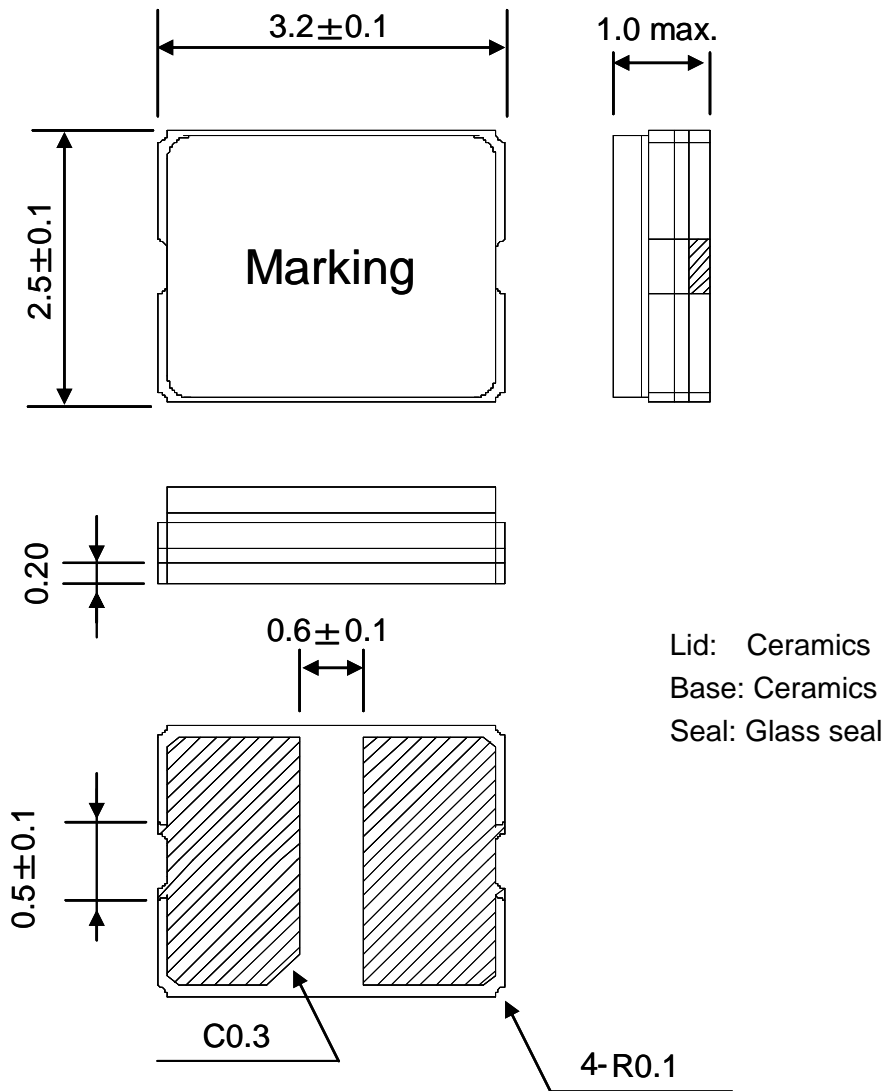
< Notes >

1. Item No.1 to No.10 resistance at before above tests should be less than  $\pm 20 \%$  or less than  $\pm 10 \Omega$ .
2. \*1 Each test done independently.
3. \*2 Measuring 2 h to 24 h later leaving in room temperature after each test.
  - (1) Measuring 24 h later leaving in room temperature after each test.
  - (2) Measuring 2 h later leaving in room temperature after each test.

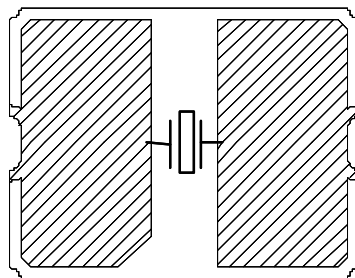


[5 ] Dimensions and Circuit

1) Dimension



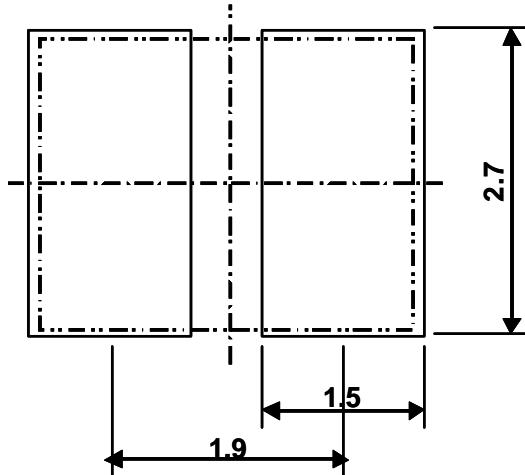
2) Terminal land connections ( Top view )



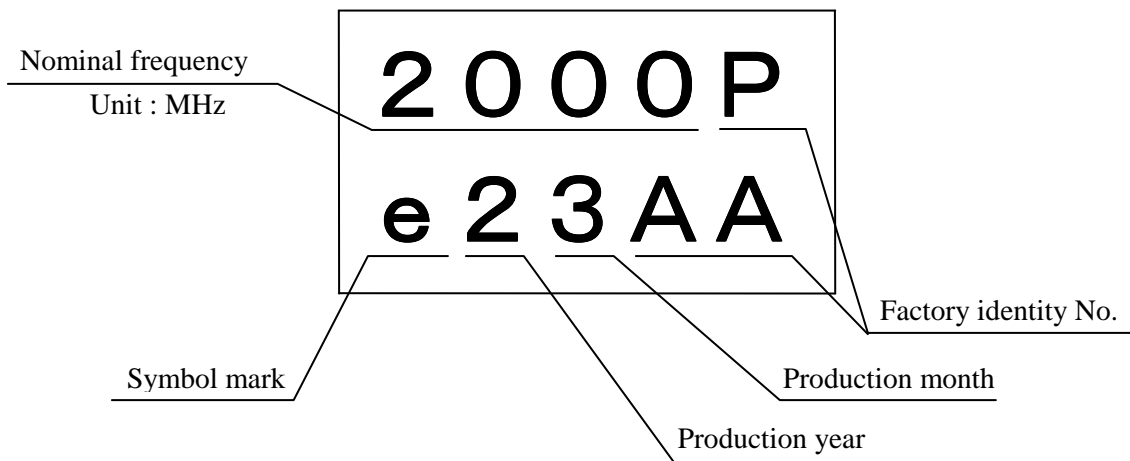
Type	FA3225A	Terminal treatment	Au plate	Unit	1 = 1mm
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[ 6 ] Recommended soldering pattern and Marking layout

1) Recommended soldering pattern



2) Marking layout



Production month

January	February	.....	October	Novembe r	Decembe r
1	2	.....	X	Y	Z

- Nominal frequency is only one example.
- Nominal frequency omits the figure below the second place of decimals.  
ex) 20 MHz ..... [2000]
- The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.

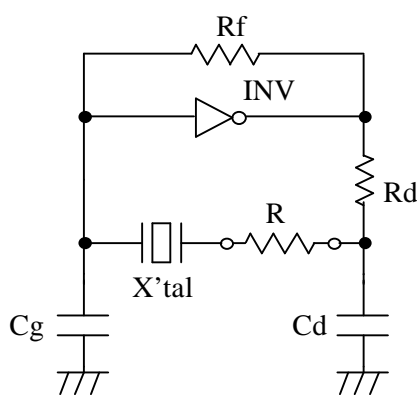
Type : FA3225A

Unit : 1 = 1mm

## [ 7 ] Notes

1. Max. three(3) timed reflow is allowed. Once miss soldering is happen, hand work soldering by soldering iron is recommended. (+350 °C × within 5 seconds)
2. Patterning should be followed by our recommended one.
3. Applying excessive excitation force to the crystal resonator may cause deterioration damage.
4. Unless adequate negative resistance is allocated in the oscillation circuit, start up time of oscillation may be increased, or no oscillation may occur. In order to avoid this, please provide enough negative resistance in the circuit design.

How to check the negative resistance



$$[-R] > C1 \times 10$$

- (1) Connect the resistor(R) to the circuit in series with the crystal resonator.
- (2) Adjust R so that oscillation can start (or stop).
- (3) Measure R when oscillation just start (or stop) in above(2).
- (4) Get the negative resistance  $-R=R+CI$  value.
- (5) Recommended  $-R$

5. The shortest line patterning on board is recommendable. Too long line on board may cause of abnormal oscillation.
6. To avoid malfunction, no pattern under or near the X'tal is allowed.
7. This device must be stored at the normal temperature and humidity conditions before mounting on a board.
8. Too much exciting shock or vibration may cause deterioration on damage. Depending on the condition such as a shock in assembly machinery, the products may be damaged. Please check your condition in advance to maintain shock level to be smallest.
9. This product can be subjected to ultrasonic cleaning. However, the oscillator may be affected depending on the conditions of the cleaning. Check conditions prior to use.
10. When used/stored under high humidity condition, there is potential problem with condensation. Please take precautions to prevent condensation.
11. Please refer to packing specification regarding how to storage the products in the pack.