

SPECIFICATIONS

HIGH-FREQUENCY SMD CRYSTAL UNIT

Spec _____ No : X1E000341025100

Type _____ : FA-238A

Frequency _____ : 55.46667MHz

Date : 21th-June-2013

Seiko Epson Corp	
TD Prod.Eng.G	
Manager In	charge

SPECIFICATIONS

1. Application

- 1) This document is applicable to the crystal unit FA-238A that are delivered from Seiko Epson Corp.
- 2) This product complies with RoHS Directive.
- 3) 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.
- 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 for the 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

X1E000341247322 / FA-238A

3. Packing

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

4. Warranty

- 1)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

- 1)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.	Item	Symbol	Rating value			Unit	Note
			Min.	Typ.	Max.		
1	Storage temperature range	T_stg	- 40	-	+ 125	°C	Depends on the Environmental characteristics specifications.

[2] Operating range

No.	Item	Symbol	Rating value			Unit	Note
			Min.	Typ.	Max.		
1	Operating temperature range	T_use	-40	-	125	°C	Depends on the Motional resistance and Frequency temperature characteristics specifications.
2	Level of drive	DL	1	100	200	μW	

[3] Electrical characteristics

No.	Item	Symbol	Value	Unit	Conditions
1	Nominal Frequency	f_nom	77068889	MHz	Fundamental
2	Frequency tolerance	f_tol	± 8%	× 10 ⁻⁶	CL = : pF ~ Ta = + 25 ± 3 °C DL : 100 μW Not include aging
3	Motional resistance	R1	Table 1.	Ω	π circuit IEC 60444-2 DL : 100 μW T_Uuse: Depend on Temperature. Specifications.
4	Shunt capacitance	C0	5 and less	pF	π circuit and N.A.
5	Frequency Versus temperature characteristics	f_tem	Table 2.	× 10 ⁻⁶	Ref. at + 25 °C ± 3 °C DL : 100 μW
6	Isolation resistance	IR	500 Min.	MΩ	DC 100 V, 60 seconds between each terminals (#1, #3)
7	Aging	f_age	± 5	× 10 ⁻⁶ /year	Ta = + 25 °C ± 3 °C

Table 1. Motional resistance

Frequency.	Resistance
12MHz f < 13.0MHz	120 Max.
13MHz f < 20.0MHz	80 Max.
20.0MHz f < 25.0MHz	60 Max.
25.0MHz f 60.0MHz	50 Max.
-	-

Table 2. Temperature Characteristics

Temperature	Tolerance
-40 ~+85	± 30× 10 ⁻⁶ ~
-40 ~+105	± 40× 10 ⁻⁶ ~
-40 ~+125	± 50× 10 ⁻⁶ ~
-	-
-	-

[4] Environmental and mechanical characteristics

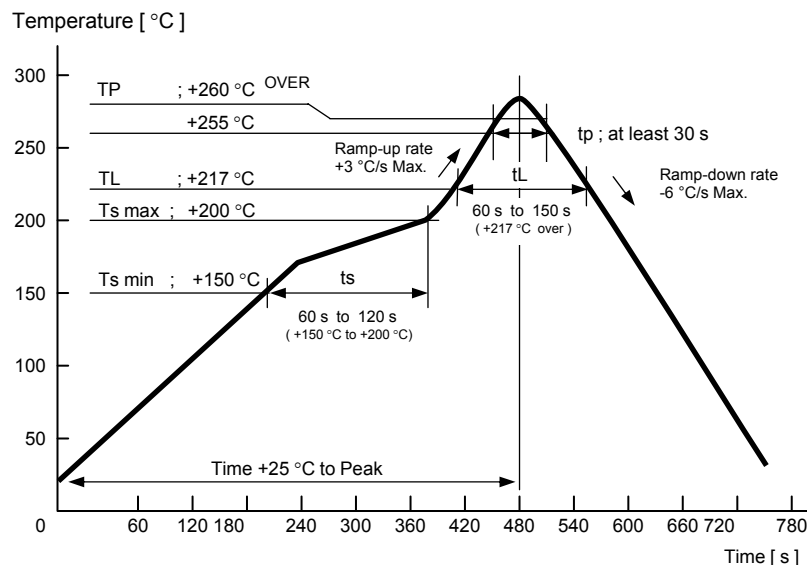
(The company evaluation condition : We evaluate it by the following examination item and examination condition.)

No.	Item	Value * 1 * 2		Test Conditions
		$\Delta f / f [1 \times 10^{-6}]$		
1	Shock	* 3	± 5	100 g dummy Jig (Epson Standard) drop from 1 500 mm height on the Concrete 3 directions 10 times
2	Vibration	* 3	± 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 15 min./cycle 6 h (2 hours , 3 directions)
3	High temperature storage	* 3	± 10	+ 125 °C × 1 000 h
4	Low temperature storage	* 3	± 5	- 40 °C × 1 000 h
5	Temperature cycle	* 3	± 10	- 40 °C ↔ + 125 °C 30 minutes at each temp. 1 000 cycle
6	Temperature humidity storage	* 3	± 5	+ 85 °C × 85 %RH × 1 000 h
7	Resistance to soldering heat		± 5	For convention reflow soldering furnace (5 times)
8	Substrate bending	No peeling-off at a soldered part		Bend width reaches 3.0 mm and hold for 20 s ± 1 s × 1 time Ref. IEC 60068-2-21
9	Shear	No peeling-off at a soldered part		10 N press for 10 s ± 1 s Ref. IEC 60068-2-21
10	Pull – off	No peeling-off at a soldered part		10 N press for 10 s ± 1 s Ref. IEC 60068-2-21
11	Solderability	Terminals must be 95 % covered with fresh solder.		Dip termination into solder bath at + 230 °C ± 10 °C for 5 s (Using Rosin Flux)

< Notes >

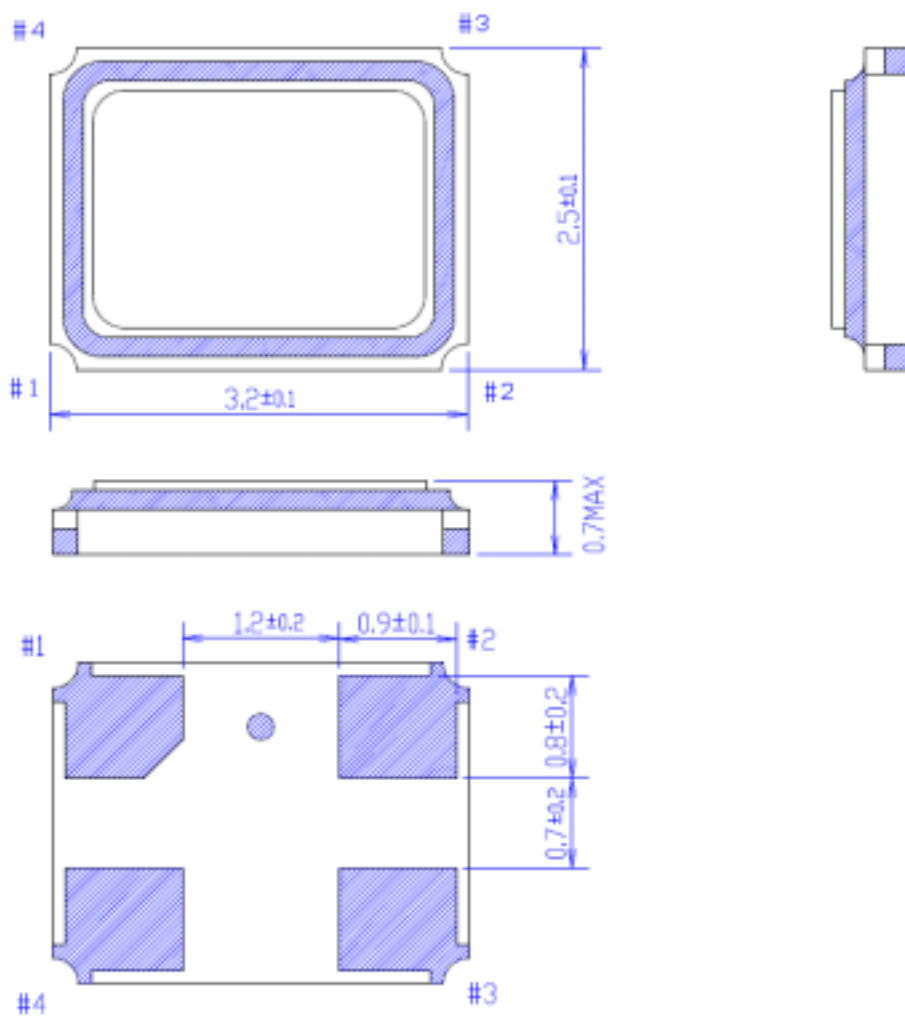
- * 1 Each test done independently.
- * 2 Measuring 24 h later leaving in room temperature after each test.
- * 3 Item No.1 to No.6 shall be tested after following pre conditioning.
Measuring 24 h later leaving in room temperature after Pre conditioning.
Pre conditioning : Reflow 5 times.
- Item No.1 to No.7, Shift motional resistance at after above tests should be less than 20 % or less than 10 Ω.

Reflow condition (follow to IPC/JEDEC J-STD-020D.1)



[5] Dimensions and Circuit

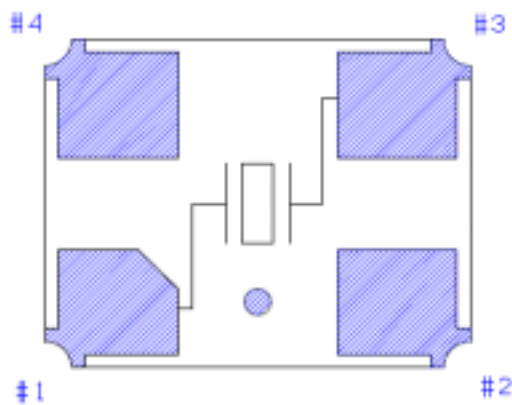
1) Dimension



Terminal Au plate : 1.5 µm Max.

2) Circuit

(TOP VIEW)



1 , # 3 : XTAL
 # 2 , # 4 : GND (are connected to the cover)

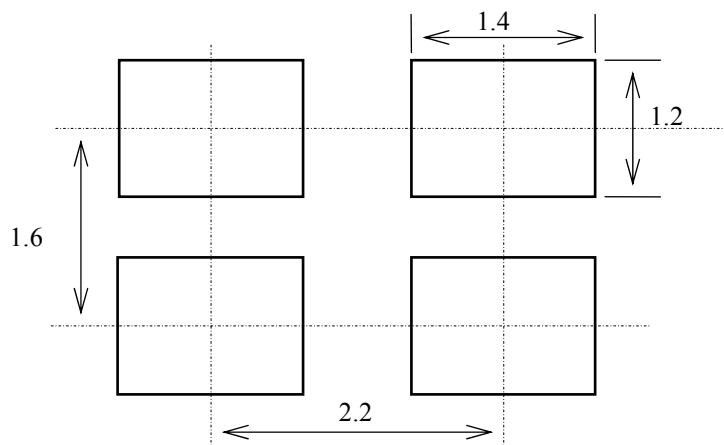
Type : FA-238A

Terminal treatment : Au plate

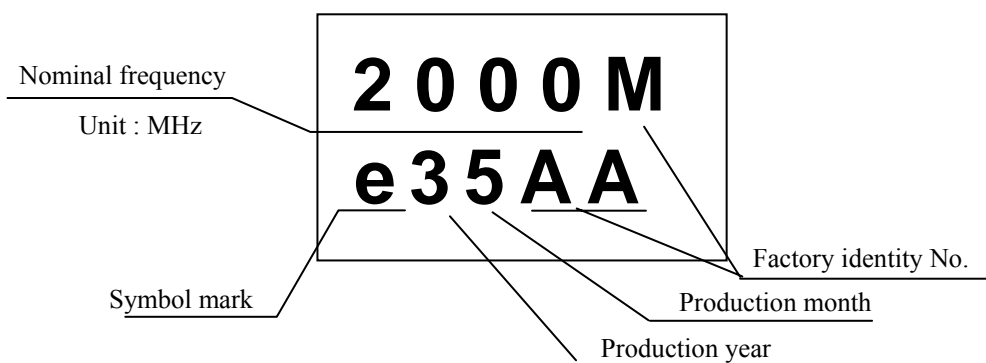
Unit : 1 = 1 mm

[6] Recommended soldering pattern and Marking layout

1) Recommended soldering pattern



2) Marking layout



Production month

January	February	October	November	December
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.

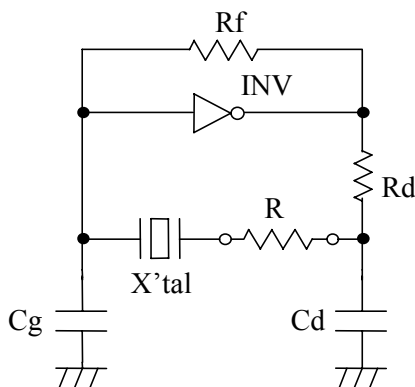
Type : FA-238A

Unit : 1 = 1 mm

[7] Notes

1. Max five (5) times re-flow is allowed. Its recommended to manually solder when not enough/no solder detected.
(Using soldering iron at +350 °C Max × within 5 seconds)
2. Too much exciting shock or vibration may cause deterioration on damage.
The product may damage depends on the condition such as a shock in assembly machinery.
Please check your process condition in advance to minimize and maintain the shock level.
3. It is recommended to do patterning to the oscillator as short as possible. Abnormal oscillation may happened if the line is too long.
4. Please normal temperature (+15 °C to +35 °C) and normal humidity (25 to 85 %RH) as much as possible for the frequency accuracy securing.
Storing the crystal products under higher or lower temperature or high humidity for long period may affect frequency stability or solderability. Check conditions prior to use.
5. This product may be affected to ultrasonic cleaning.. Check conditions prior to use.
6. When do the be dewy of the oscillation circuit board, the frequency change or the oscillation stop is generated.
Please use it under the condition without the be dewy.
7. Applying excessive excitation force to the crystal unit may cause deterioration damage.
8. Few data or readings taken at user side may be different from our company's data.
Confirmation of the different value is necessary before application.
9. To avoid malfunction, no pattern across or near the crystal is allowed.
10. Start up time of oscillation may be increased or no oscillation may occur unless adequate negative resistance is allocated in the oscillation circuit In order to avoid this, please provide enough negative resistance to the circuit design.

How to check the negative resistance



- (1) Connect the resistor(R) to the circuit in series with the crystal unit.
- (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 $-R$
 $[-R]>CI \times 10$