

SPECIFICATIONS

1. Application

- 1) This document is applicable to the crystal unit
- 2) RoHS compliant
MC-306 contains lead in high melting type solder which is exempted in 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

The product No. of this crystal unit is Q13MC3061000300.
The model is MC-306.

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

Item No.	Item	Page
[1]	Absolute maximum ratings	2
[2]	Operating range	2
[3]	Static characteristics	2
[4]	Environmental and Mechanical characteristics	3
[5]	Dimensions and Marking layout	4 to 5
[6]	Notes	6

[1] Absolute maximum ratings

No.	Item	Symbol	Rating value			Unit	Note
			Min.	Typ.	Max.		
1	Storage temperature range	T_stg	- 55		+ 125	°C	
2	Maximum level of drive	GL		1.0		μW	

[2] Operating range

No.	Item	Symbol	Rating value			Unit	Note
			Min.	Typ.	Max.		
1	Operating temperature range	T_use	- 40		+ 85	°C	
2	Level of drive	DL		0.1		μW	
3	Vibration mode		Fundamental				

[3] Static characteristics

No.	Item	Symbol	Value	Unit	Conditions	
1	Nominal Frequency	f_nom	32.768	kHz		
2	Frequency tolerance	f_tol	± 20	× 10 ⁻⁶	CL = 12.5 pF Ta = + 25 ± 3 °C Not include aging	
3	Quality factor	Q	5.0Min.	× 10 ⁴	Decay method	
4	Motional resistance	R1	50 Max.	kΩ	CI meter : Saunders 140B Level of drive : 1.0 μW	
5	Motional capacitance	C1	1.8 Typ.	fF		
6	Shunt capacitance	C0	0.9 Typ.	pF		
7	Frequency temperature characteristics	Turnover temperature	Ti	+ 25 ± 5	°C	Values are calculated by The frequencies at + 10, + 25, + 40 °C with C-MOS circuit.
		Parabolic coefficient	B	- 0.04 Max.	× 10 ⁻⁶ /°C ²	
8	Isolation resistance	IR	500 Min.	MΩ	DC 100 V ± 15, 60 seconds Between terminal # 1 and terminal # 4	
9	Frequency Aging	f_age	± 3	× 10 ⁻⁶ /year	Ta = + 25 °C ± 3 °C	

[4] Environmental and mechanical characteristic

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

No.	Items	Value*1*2	Conditions
		$\Delta f/f [1 \times 10^{-6}]$	
1	Drop	± 5	Free drop from 750 mm height on a hard wooden board for 3 times (Board is thickness more than 30 mm)
2	Vibration resistance	± 3	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 a) ± 20 *3 b) ± 10	a) + 125 °C × 1 000 h b) + 85 °C × 1 000 h
4	Low temperature storage	*3 ± 20	- 55 °C × 1 000 h
5	Temperature cycle	*3 ± 20	- 55 °C ↔ + 125 °C 30 min. at each temp. 100 cycles
6	High temperature and humidity	*3 ± 20	+ 85 °C × 8 5%RH × 1 000 h
7	Soldering heat resistance	± 5	For convention reflow soldering furnace (2 times)
8	Shear	No peeling-off at a soldered part	20 N press the side for 10 ± 1 s Ref. IEC 60068-2-21
9	Pull - off	No peeling-off at a soldered part	10 N press the side for 10 ± 1 s. Ref. IEC 60068-2-21
10	Solvent resistance	The marking shall be legible	Ref. JIS C 0052 or IEC 60068-2-45
11	Solderability	Termination must be 95 % covered with fresh solder	Dip termination into solder bath at + 235 °C ± 5 °C for 3 s (Using Rosin Flux)

< 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 %RH × 48 h ± 1 h → reflow 2 times
 2. Initial value shall be after 24 h at room temperature.
4. Shift series resistance at after above tests should be less than 60 kΩ

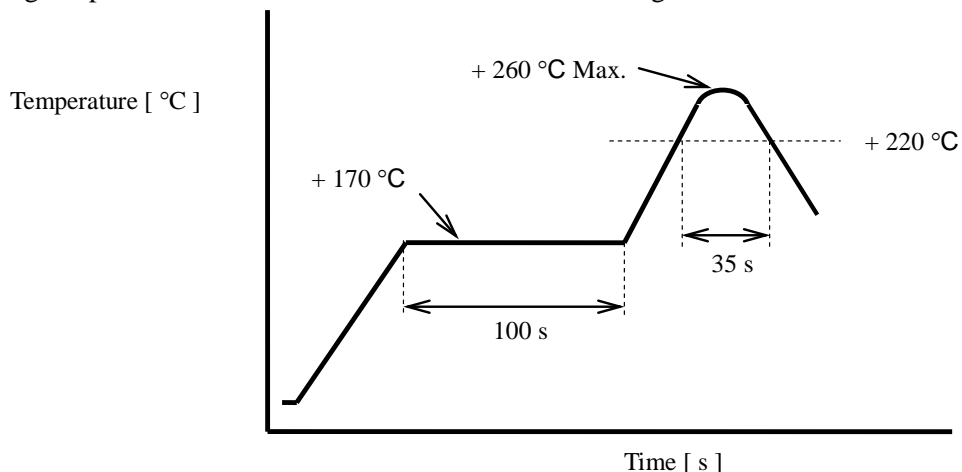
◆ Air-reflow

Pre heating temperature : + 170 °C

Pre heating time : 100 s

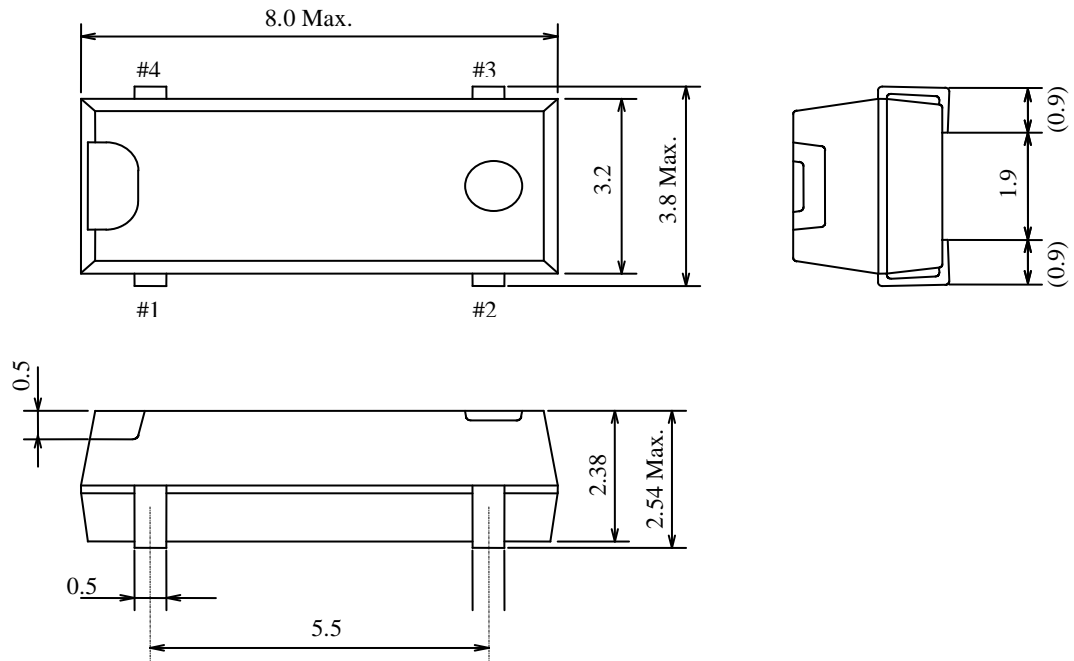
Heating temperature : + 220 °C

Heating time : 35 s



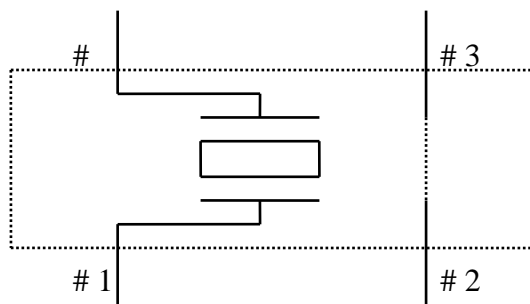
[5] Dimensions and marking layout

1. Dimensions



Metal may be exposed on the top or bottom of this product.
This will not affect any quality, reliability or electrical spec.

2. Circuit location

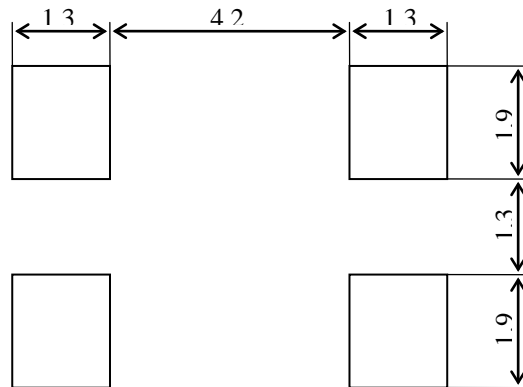


Do not connect # 2 and # 3 terminals to any external terminals.

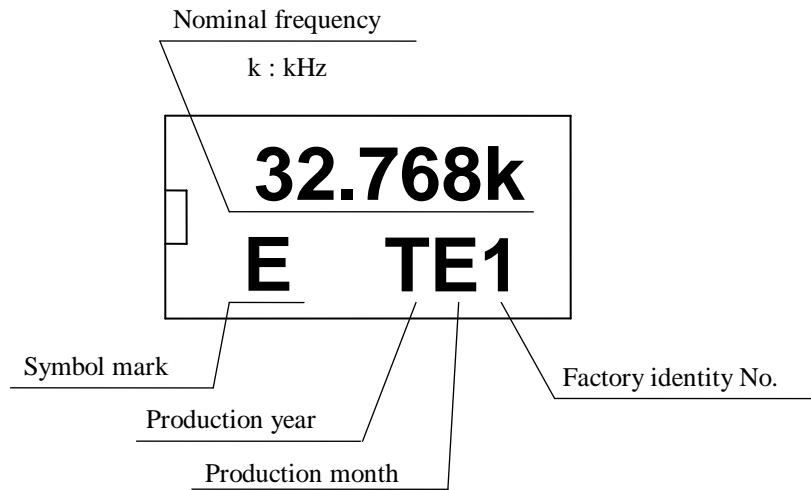
Type	MC-306	Terminal treatment	Pb Free Solder plate	Unit	1 = 1 mm
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3. Recommendable patterning

Unit : 1 = 1 mm



4. Marking layout



Symbol of Manufacturing year

Year digit		1	2	3	4	5	6	7	8	9	0
Marking	Terminal Plating: Sn-Bi or Sn-Ag	A	B	C	D	E	F	G	H	J	K
Marking	Terminal Plating: Sn	M	N	R	S	T	U	V	W	X	Z

Year digit(1st) of the Production

Symbol of Manufacturing month

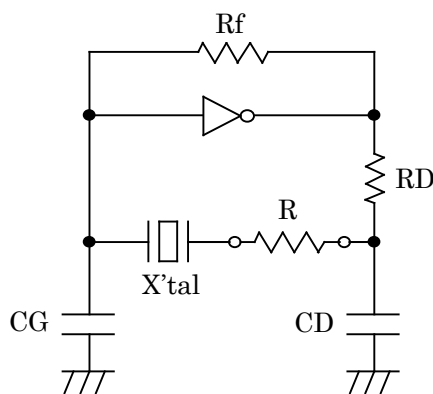
Month digit	1	2	3	4	5	6	7	8	9	10	11	12
Marking (Halide free)	A	B	C	D	E	F	G	H	J	K	L	M

- ◆ Nominal frequency is only example.
- ◆ The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.

[6] Notes

1. Max two (2) times reflow is allowed. Once miss soldering is happen, hand work soldering by soldering iron is recommended. (+ 350 °C × within 5 sec.)
2. Patterning should be followed by our recommended one.
3. Applying excessive excitation force to the crystal unit 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.

How to check the negative resistance.



(1) Connect the resistance (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
 $|-R| > CI \times (5 \sim 10)$

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.
Solder paste should be more than 150 μm thickness.
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. Depending on the conditions, ultrasonic cleaning cloud cause resonance damage of the internal crystal unit. Since we are unable to determine the usage conditions (type of cleaning unit, power, time, conditions inside the bath, etc.) at our company, we cannot guarantee the safety of this unit when it is cleaned in an ultrasonic cleaner.
10. Ink marking is some kind of solvent may damage marking ink; please take precautions when choosing solvent.
11. Please refer to packing specification regarding how to storage the products in the pack.

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