RECIPIENT

SPECIFICATIONS

Product No. : **Q22MA4061027700**

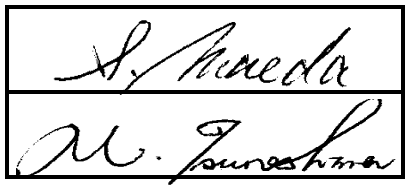
Model : **MA-406**

SPEC. No. : **A06-146-1A**

DATE : **May. 25. 2006**

EPSON TOYOCOM CORPORATION

8548 Naka-minowa
Minowa-machi Kamiina-gun
Nagano-ken
399-4696 Japan



SPECIFICATIONS

1. Application

This document is applicable to the crystal resonator that are delivered to
XAC AUTOMATION(SUZHOU)CO.,LTD from EPSON TOYOCOM Corp.
This product is not authorized for use as critical components in life support device or systems.

2. Product No. / Model

The product No. of this crystal resonator is Q22MA4061027700.

The model is MA-406.

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 of both parties.

6. Contents

Item No.	Item	Page
[1]	Absolute maximum ratings	2
[2]	Operating range	2
[3]	Electrical characteristics	2
[4]	Environmental and mechanical characteristics	3
[5]	Dimensions and marking layout	4
[6]	Recommendable patterning	5
[7]	Notes	6

[1] Absolute maximum ratings

Item	Symbol	Rating value
Storage temperature	TSTG	-55 °C to +125 °C
Maximum drive level	GL	2 mW

[2] Operating range

Item	Symbol	Value		
		Min.	Typ.	Max.
Operating temperature	TOPR	-20 °C		+70 °C
Drive level	DL		100 μW	

[3] Electrical characteristics

Item	Symbol	Value	Note
Frequency	f1	12 MHz	
Frequency tolerance	ΔF/F	$\pm 50 \times 10^{-6}$	CL = 16 pF Ta= +25 °C ± 3 °C Drive level : 100 μW not include aging
Series resistance	R1	50Ω Max.	π circuit Drive level : 100 μW Ta = -20°C to +70 °C
Shunt capacitance	C0	5 pF Max.	
Frequency temperature characteristics		$\pm 30 \times 10^{-6}$	-20 °C to +70 °C (0×10^{-6}at +25 °C ± 3 °C) Drive level : 100 μW
Isolation resistance	IR	500 MΩ Min.	DC 100V, 60 sec. between terminals or terminal and case
Aging	fa	$\pm 5 \times 10^{-6}$/year	Ta = +25 °C ± 3 °C Drive level : 100 μW

[4] Environmental and mechanical characteristics

Item No.3 to No.6 shall be tested after following pre conditioning
+85±2 °C×85±5%RH×24±1 h after 24 h at room temperature

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

No.	Items	Value*1*2 $\Delta f/f\ [1 \times 10^{-6}]$	Conditions
1	Drop	(2) ± 10	Free drop from 750 mm height on a hard wooden board for 3 times (Board is thickness more than 30 mm)
2	Vibration	(2) ± 10	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	(1) a) ± 50 b) ± 10	a) +125 °C × 1 000 h b) +85 °C × 1 000 h
4	Low temperature storage	(1) ± 10	-55℃×1 000 h
5	Temperature cycle	(1) ± 10	-55 °C ⇔ +125 °C 30 min. at each temp. 100 cycles
6	Temperature humidity storage	(1) ± 20	+85°C × 85%RH × 1 000 h
7	Resistance to soldering heat	± 8	For convention reflow soldering furnace (2 times)
8	Shear	No peeling-off at a soldered part	20 N press the side for 10 s ± 1 s Ref. IEC 60068-2-21
9	Pull - off	No peeling-off at a soldered part	10 N press the side for 10 s ± 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 90 % covered with fresh solder	Dip termination into solder bath at +230 °C ± 10 °C for 3 s (Using Rosin Flux)

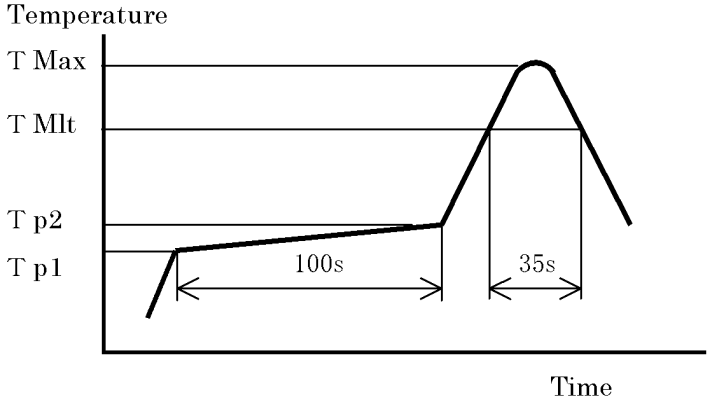
1. Item No.1 to No.7 resistance at before above tests should be less than ±20 % or less than under mentioned values.
2. *1 Each test done independently.
3. *2 Measuring 2 h to 24 h later leaving in room temperature after each test.
   (1) Measuring 24 h later leaving in room temperature after each test.
   (2) Measuring 2 h later leaving in room temperature after each test.

Frequency	Vib. mode	ΔCI
4.0 MHz ≤ f < 5.0 MHz	Fundamental	50Ω
5.5 MHz ≤ f < 12.0 MHz		10Ω
12.0 MHz ≤ f ≤ 30.0 MHz		5Ω
26.0 MHz ≤ f ≤ 64.0 MHz	3rd overtone	10Ω

◆Reflow

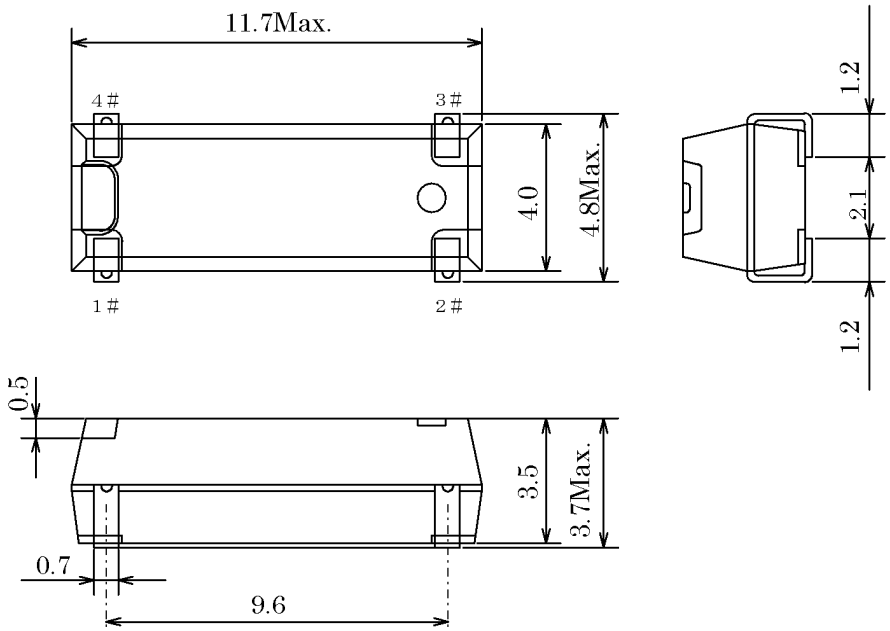
Pre Heating Temperature
T p1～T p2 = +170℃
Heating Temperature
T Mlt = +220℃
Peek Temperature
T Max = +260℃

Point of measuring
In case of Solderability
Terminal.
In case of Resistance to soldering heat
Surface.

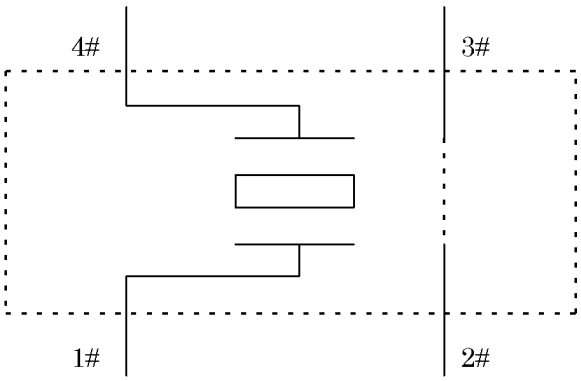


[5] Dimensions and marking layout

Dimensions



Circuit location



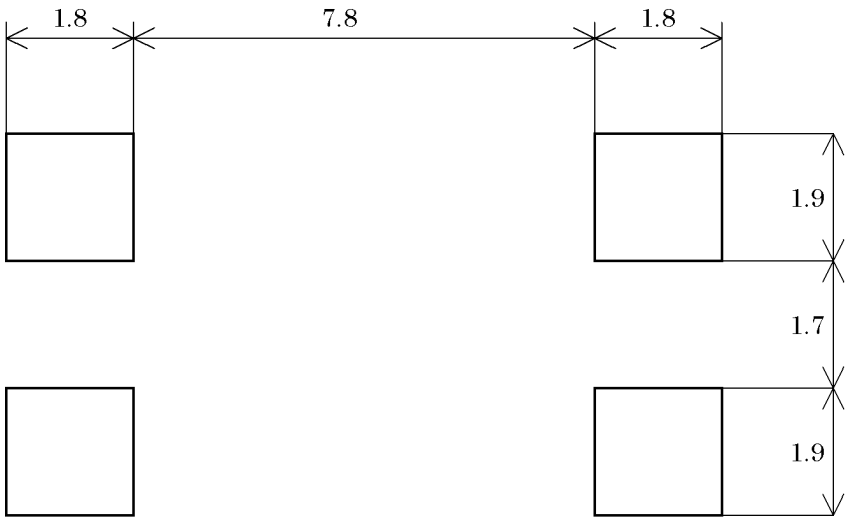
* Do not connect 2# and 3# terminals to any external terminals.

Type	MA-406	Terminal treatment	Pb Free solder plate	Unit	1 = 1 mm

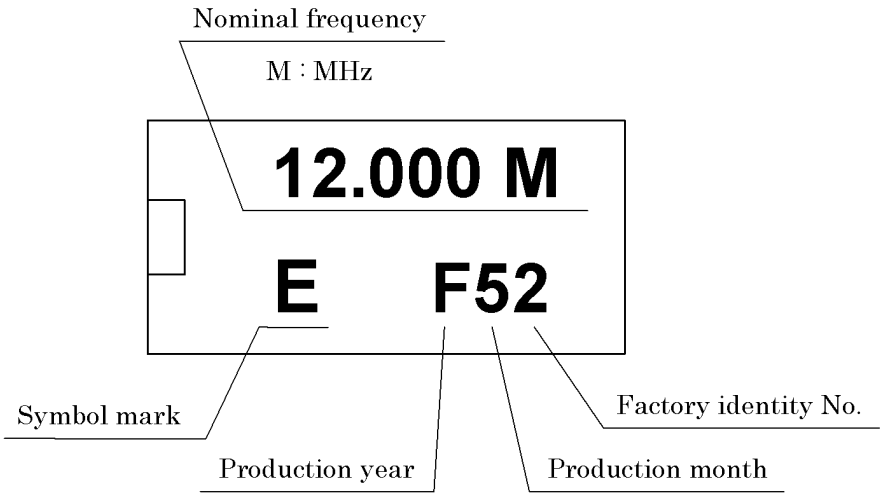
[6] Recommendable patterning and marking layout

Recommendable patterning

Unit : mm



Marking layout



Marking table for Production year with the last one digit of Anno Domini

The last one digit of A.D	1	2	3	4	5	6	7	8	9	0
Production year of marking	A	B	C	D	E	F	G	H	J	K

Marking table for Production month with the marking number

Jan.	Feb.	····	Oct.	Nov.	Dec.
1	2	····	X	Y	Z

- ♦ Nominal frequency is only example.
- ♦ Nominal frequency omits the figure below the forth place of decimals.
- ♦ The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.

[7] Notes

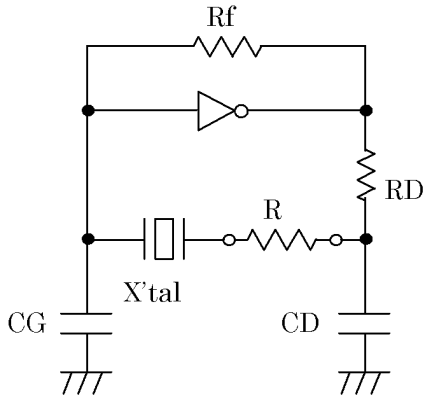
1. Max. two (2) times reflow is allowed. Once miss soldering is happen, hand work soldering by soldering iron is recommended. (+350 °C Max. × within 5 sec.)

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 oscillation may occur.

   How to check the negative resistance



1) Connect the resistance (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
   | -R | > CI × (5 ~ 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.

9. Don't storage or use in the environment that temperature may change rapidly to avoid the condition.

10. Please refer to packing specification regarding how to storage the products in the pack.