



## MHz RANGE CRYSTAL UNIT

MA-406  
MA-505, MA-506

- Frequency range : 4 MHz to 64 MHz
- Thickness : 11.7 × 4.8 × 3.7 mm ... MA-406  
13.46 × 5.08 × 4.6 mm ... MA-505 / 506
- Overtone order : Fundamental  
3rd overtone (30 MHz to 64 MHz)
- Applications : For Clock of integrated circuit



Product Number (please contact us)

MA-406 : Q22MA4062xxxx00

MA-505 : Q22MA5052xxxx00

MA-506 : Q22MA5062xxxx00



Actual size

MA-406



MA-505 / 506



## Specifications (characteristics)

| Item                                                    | Symbol           | Specifications                                                                  | Conditions / Remarks                                                  |
|---------------------------------------------------------|------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| Nominal frequency range                                 | f <sub>nom</sub> | 4.000 MHz to 29.999 MHz                                                         | Fundamental *1                                                        |
|                                                         |                  | 30.000 MHz to 64.000 MHz                                                        | 3rd overtone *2                                                       |
| Storage temperature                                     | T <sub>stg</sub> | -55 °C to +125 °C                                                               | Storage as single product.                                            |
| Operating temperature                                   | T <sub>use</sub> | -20 °C to +70 °C                                                                | Please contact us on availability of -40 °C to +85 °C                 |
| Level of drive                                          | DL               | 10 µW to 100 µW                                                                 |                                                                       |
| Frequency tolerance (standard)                          | f <sub>tol</sub> | ±50 × 10 <sup>-6</sup>                                                          | +25 °C                                                                |
| Frequency versus temperature characteristics (standard) | f <sub>tem</sub> | Under 5.5 MHz : ±50 × 10 <sup>-6</sup><br>Over 5.5 MHz : ±30 × 10 <sup>-6</sup> | -20 °C to +70 °C                                                      |
|                                                         |                  | Fundamental: 10 pF to ∞                                                         | Please contact us for requirements not listed in this specifications. |
| Load capacitance                                        | CL               | Overtone: 5 pF to ∞                                                             | Please specify                                                        |
| Motional resistance (ESR)                               | R <sub>1</sub>   | As per table below                                                              | -20 °C to +70 °C, DL=100 µW                                           |
| Shunt capacitance                                       | C <sub>0</sub>   | 5 pF Max.                                                                       |                                                                       |
| Frequency aging                                         | f <sub>age</sub> | ±5 × 10 <sup>-6</sup> / year Max.                                               | +25 °C, First year                                                    |

\*1 4.0 MHz ≤ f<sub>nom</sub> < 5.5 MHz : See "Available frequencies from 4.0 MHz to less than 5.5 MHz". 8.0 MHz < f<sub>nom</sub> < 8.2 MHz: Unavailable.\*2 26.000 MHz ≤ f<sub>nom</sub> < 30.000 MHz : please contact us for inquiries for 3rd overtone mode.

## Available frequencies from 4.0 MHz to less than 5.5 MHz (MHz)

|       |       |       |       |          |          |       |       |        |
|-------|-------|-------|-------|----------|----------|-------|-------|--------|
| 4.000 | 4.032 | 4.096 | 4.190 | 4.194304 | 4.433619 | 4.500 | 4.800 | 4.9152 |
|-------|-------|-------|-------|----------|----------|-------|-------|--------|

## Motional resistance (ESR)

| Frequency (MHz)     | 4 ≤ f <sub>nom</sub> < 5.5 | 5.5 ≤ f <sub>nom</sub> < 6 | 6 ≤ f <sub>nom</sub> < 10 | 10 ≤ f <sub>nom</sub> < 12 | 12 ≤ f <sub>nom</sub> < 16 | 16 ≤ f <sub>nom</sub> < 30 | 30 ≤ f <sub>nom</sub> ≤ 36 | 36 < f <sub>nom</sub> ≤ 64 |
|---------------------|----------------------------|----------------------------|---------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Motional resistance | 150 Ω Max.                 | 100 Ω Max.                 | 80 Ω Max.                 | 60 Ω Max.                  | 50 Ω Max.                  | 40 Ω Max.                  | 100 Ω Max.                 | 80 Ω Max.                  |
| Overtone order      | Fundamental                |                            |                           |                            |                            |                            | 3rd overtone               |                            |

Product name MA-406 24.000000MHz 12.0 +10.0-10.0

(Standard form)

① ② ③ ④

①Model ②Frequency ③Load capacitance(pF) ④Frequency tolerance(× 10<sup>-6</sup>, +25 °C)

In addition to the above mentioned specification item, please specify frequency temperature characteristics and operating temperature range in case of inquiry.

## External dimensions

(Unit:mm)

|                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>● MA-406</p> <p>11.7 Max.<br/>4.0<br/>4.8 Max.<br/>3.7 Max.<br/>9.6<br/>0.7<br/>2.1 (1.2)</p> <p>Internal connection (TOP VIEW)</p> <p>Do not connect #2 and #3 to external device.<br/>The metal case inside of the molding compound may be exposed on the top or bottom of this product.<br/>This purely cosmetic and does not have any effect on quality, reliability or electrical specs.</p> | <p>● MA-505 / 506</p> <p>12.70<br/>13.46 Max.<br/>5.08 Max.<br/>4.19<br/>4.6 Max.<br/>0.2 Min.<br/>2.54<br/>1.09<br/>3.3</p> <p>Internal connection in MA-505 (TOP VIEW)</p> <p>Internal connection in MA-506 (TOP VIEW)</p> <p>Do not connect #2 and #3 of MA-506 to external device.<br/>The first digit of lot No. means : 5xxxx MA-505<br/>6xxxx MA-506</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Footprint (Recommended)

(Unit:mm)

|                                                    |                                            |                                                      |
|----------------------------------------------------|--------------------------------------------|------------------------------------------------------|
| <p>● MA-406</p> <p>1.8 7.8 1.8<br/>1.9 1.7 1.9</p> | <p>● MA-505</p> <p>4.1 7.0 4.1<br/>5.6</p> | <p>● MA-506</p> <p>4.1 7.0 4.1<br/>2.05 2.05 1.5</p> |
|----------------------------------------------------|--------------------------------------------|------------------------------------------------------|

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At Seiko Epson, all environmental initiatives operate under the Plan-Do-Check-Action (PDCA) cycle designed to achieve continuous improvements. The environmental management system (EMS) operates under the ISO 14001 environmental management standard.

All of our major manufacturing and non-manufacturing sites, in Japan and overseas, completed the acquisition of ISO 14001 certification.

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### ► Explanation of the mark that are using it for the catalog

|                                                                                     |                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | ► Pb free.                                                                                                                                                                                                                      |
|  | ► Complies with EU RoHS directive.<br>*About the products without the Pb-free mark.<br>Contains Pb in products exempted by EU RoHS directive.<br>(Contains Pb in sealing glass, high melting temperature type solder or other.) |
|  | ► Designed for automotive applications such as Car Multimedia, Body Electronics, Remote Keyless Entry etc.                                                                                                                      |
|  | ► Designed for automotive applications related to driving safety (Engine Control Unit, Air Bag, ESC etc ).                                                                                                                      |

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