



## MHz RANGE CRYSTAL UNIT

### MINIATURE SIZE LOW PROFILE SMD

# FA - 238V / FA - 238

# TSX - 3225

- Frequency range : 12 MHz to 60 MHz (FA-238, FA-238V)
- External dimensions : 3.2 × 2.5 × 0.6 mm ... TSX-3225
- : 3.2 × 2.5 × 0.7 mm ... FA-238V / FA-238
- Overtone order : Fundamental
- Applications : Mobile phone, Bluetooth, W-LAN
- ISM band radio, Clock for MPU



Product Number (please contact us)

FA-238V : Q22FA23V0xxxx00

FA-238 : Q22FA2380xxxx00

TSX-3225 : X1E000021xxxx00



Actual size

FA-238V/ FA-238

TSX-3225

## Specifications (characteristics)

| Item                                         | Symbol           | For Clock                                                                                             |                          | For RF Reference                          | Conditions / Remarks                                                            |
|----------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------------------|---------------------------------------------------------------------------------|
|                                              |                  | FA-238V                                                                                               | FA-238                   | TSX-3225                                  |                                                                                 |
| Nominal frequency range                      | f <sub>nom</sub> | 12.000 MHz to 15.999 MHz                                                                              | 16.000 MHz to 60.000 MHz | 16.000 MHz to 48.000 MHz                  | Fundamental *1<br>Please contact us about available frequencies.                |
| Storage temperature                          | T <sub>stg</sub> | -40 °C to +125 °C                                                                                     |                          |                                           | Storage as single product.                                                      |
| Operating temperature                        | T <sub>use</sub> | -40 °C to +85 °C                                                                                      |                          |                                           |                                                                                 |
| Level of drive                               | DL               | 200 µW Max.                                                                                           |                          |                                           | Recommended: 1 to 100 µW                                                        |
| Frequency tolerance                          | f <sub>tol</sub> | ±50 × 10 <sup>-6</sup> (standard),<br>(±15 × 10 <sup>-6</sup> to ±50 × 10 <sup>-6</sup> is available) |                          | ±10 × 10 <sup>-6</sup>                    | +25 °C Please contact us for requirements not listed in this specifications. *1 |
| Frequency versus temperature characteristics | f <sub>tem</sub> | ±30 × 10 <sup>-6</sup> / -20 °C to +70 °C                                                             |                          | ±10 × 10 <sup>-6</sup> / -20 °C to +75 °C | Please contact us for requirements not listed in this specifications. *1        |
| Load capacitance                             | CL               | 7 pF to ∞                                                                                             |                          |                                           | Please specify.                                                                 |
| Motional resistance (ESR)                    | R <sub>1</sub>   | As per table below                                                                                    |                          | As per table below                        | -40 °C to +85 °C, DL = 100 µW                                                   |
| Frequency aging                              | f <sub>age</sub> | ±5 × 10 <sup>-6</sup> / year Max.                                                                     |                          | ±1 × 10 <sup>-6</sup> / year Max.*2       | +25 °C, First year                                                              |

\*1 FA-238: For over 40 MHz, only the standard specification applies.

\*2 40 MHz ≤ f<sub>nom</sub> : ±2 × 10<sup>-6</sup> / year Max.

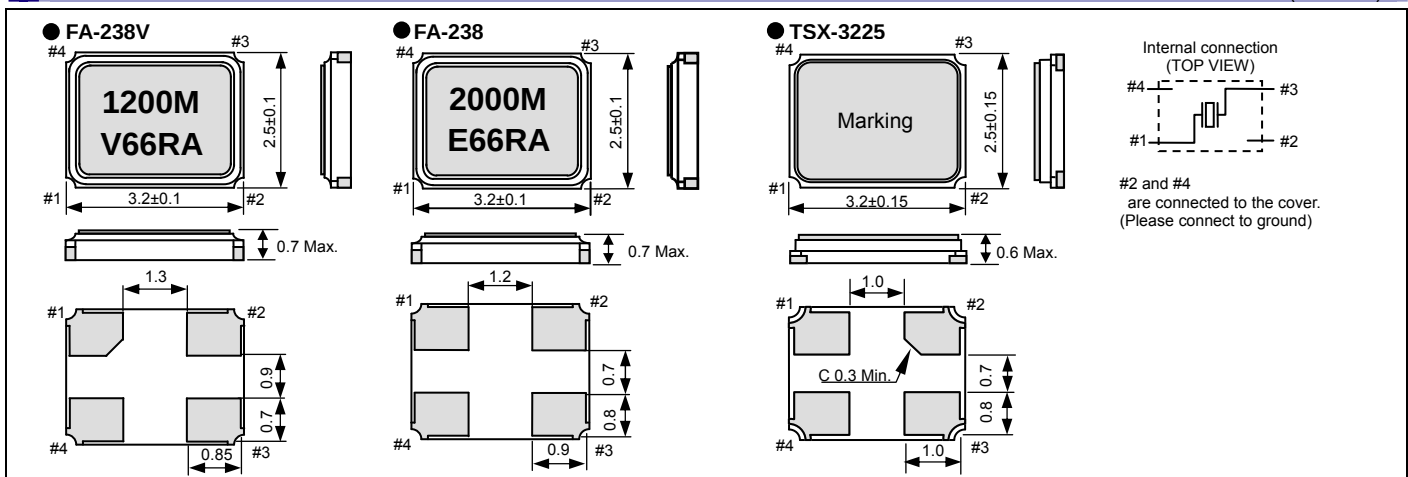
## Motional resistance (ESR)

| (FA-238V / FA-238) | Frequency                              | Motional resistance |
|--------------------|----------------------------------------|---------------------|
|                    | 12.0 MHz ≤ f <sub>nom</sub> ≤ 13.0 MHz | 100 Ω Max.          |
|                    | 13.0 MHz < f <sub>nom</sub> < 20.0 MHz | 80 Ω Max.           |
|                    | 20.0 MHz ≤ f <sub>nom</sub> < 25.0 MHz | 60 Ω Max.           |
|                    | 25.0 MHz ≤ f <sub>nom</sub> < 30.0 MHz | 50 Ω Max.           |
|                    | 30.0 MHz ≤ f <sub>nom</sub> ≤ 60.0 MHz | 40 Ω Max.           |

| (TSX-3225) | Frequency                              | Motional resistance |
|------------|----------------------------------------|---------------------|
|            | 16.0 MHz ≤ f <sub>nom</sub> < 21.0 MHz | 60 Ω Max.           |
|            | 21.0 MHz ≤ f <sub>nom</sub> ≤ 48.0 MHz | 40 Ω Max.           |

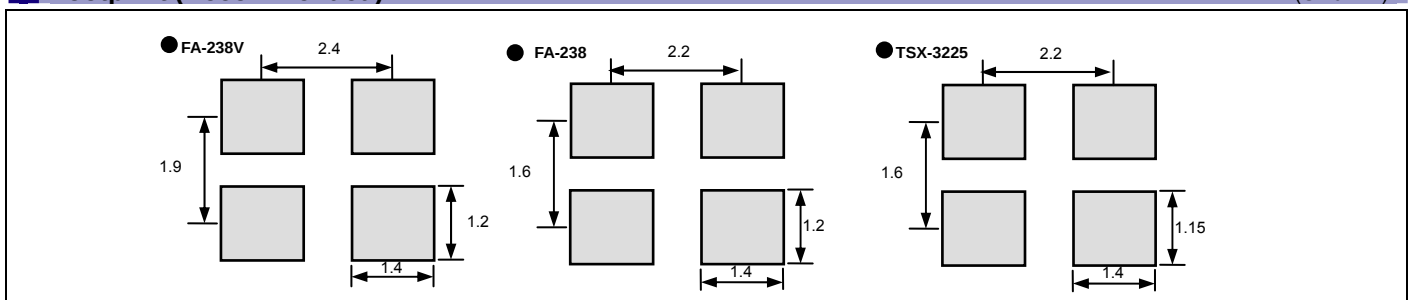
## External dimensions

(Unit:mm)



## Footprint (Recommended)

(Unit:mm)



## PROMOTION OF ENVIRONMENTAL MANAGEMENT SYSTEM CONFORMING TO INTERNATIONAL STANDARDS

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.

ISO 14000 is an international standard for environmental management that was established by the International Standards Organization in 1996 against the background of growing concern regarding global warming, destruction of the ozone layer, and global deforestation.

## WORKING FOR HIGH QUALITY

In order provide high quality and reliable products and services than meet customer needs,

Seiko Epson made early efforts towards obtaining ISO9000 series certification and has acquired ISO9001 for all business establishments in Japan and abroad. We have also acquired ISO/TS 16949 certification that is requested strongly by major automotive manufacturers as standard.

ISO/TS16949 is the international standard that added the sector-specific supplemental requirements for automotive industry based on ISO9001.

### ► 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.) |
|  | ► The products have been designed for high reliability applications such as Automotive.                                                                                                                                         |

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