## MHz RANGE CRYSTAL UNIT

# FA-238V
# FA-238
# TSX-3225

Pb Free
RoHS Compliant

**Product Number**
**FA-238V : Q22FA23V0xxxx17**
**FA-238 : Q22FA2380xxxx17**
**TSX-3225 : X1E000021xxxx17**

FA-238V/ FA-238

TSX-3225

- Frequency range : 12 MHz to 50 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

## Specifications (characteristics)

| Item | Symbol | For Clock | | For RF Reference | Conditions / Remarks |
|---|---|---|---|---|---|
| | | FA-238V | FA-238 | TSX-3225 | |
| Nominal frequency range | f_nom | 12 MHz to 15.999 MHz | 16 MHz to 50 MHz | 16 MHz to 48 MHz | Fundamental *1<br>Please contact us about available frequencies. |
| Storage temperature | T_stg | -40 °C to +125 °C | | | Storage as single product. |
| Operating temperature | T_use | -40 °C to +85 °C (+105 °C) | | | Please contact us about +85 °C < T_use |
| Level of drive | DL | 200 μW Max. | | | Recommended: 10 μW |
| Frequency tolerance | f_tol | ±50 × $10^{-6}$ (standard),<br>(±15 × $10^{-6}$ to ±50 × $10^{-6}$ is available) | | ±10 × $10^{-6}$ | +25 °C Please contact us for requirements not listed in this specifications. *1 |
| Frequency versus temperature characteristics | f_tem | ±30 × $10^{-6}$/-20 °C to +70 °C | | ±10 × $10^{-6}$/-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) | R1 | As per below table1. | | As per below table2. | -40 °C to +85 °C, DL = 100 μW |
| Frequency aging | f_age | ±5 × $10^{-6}$ / year Max. | | ±1 × $10^{-6}$ / year Max.*2 | +25 °C, First year |

*1 FA-238: For over 40 MHz, only the standard specification applies. *2 40 MHz ≤ f_nom : ±2 × $10^{-6}$ / year Max.

Table 1. FA-238V / FA-238 Motional resistance (ESR) R1

| **(FA-238V / FA-238)** Frequency | Motional resistance |
|---|---|
| 12 MHz ≤ f_nom ≤ 13 MHz | 100 Ω Max. |
| 13 MHz < f_nom < 20 MHz | 80 Ω Max. |
| 20 MHz ≤ f_nom < 25 MHz | 60 Ω Max. |
| 25 MHz ≤ f_nom < 30 MHz | 50 Ω Max. |
| 30 MHz ≤ f_nom ≤ 50 MHz | 40 Ω Max. |

Table 2. TSX-3225 Motional resistance (ESR) R1

| **(TSX-3225)** Frequency | Motional resistance |
|---|---|
| 16 MHz ≤ f_nom < 21 MHz | 60 Ω Max. |
| 21 MHz ≤ f_nom ≤ 48 MHz | 40 Ω Max. |

## Product name

Product name (Standard form)

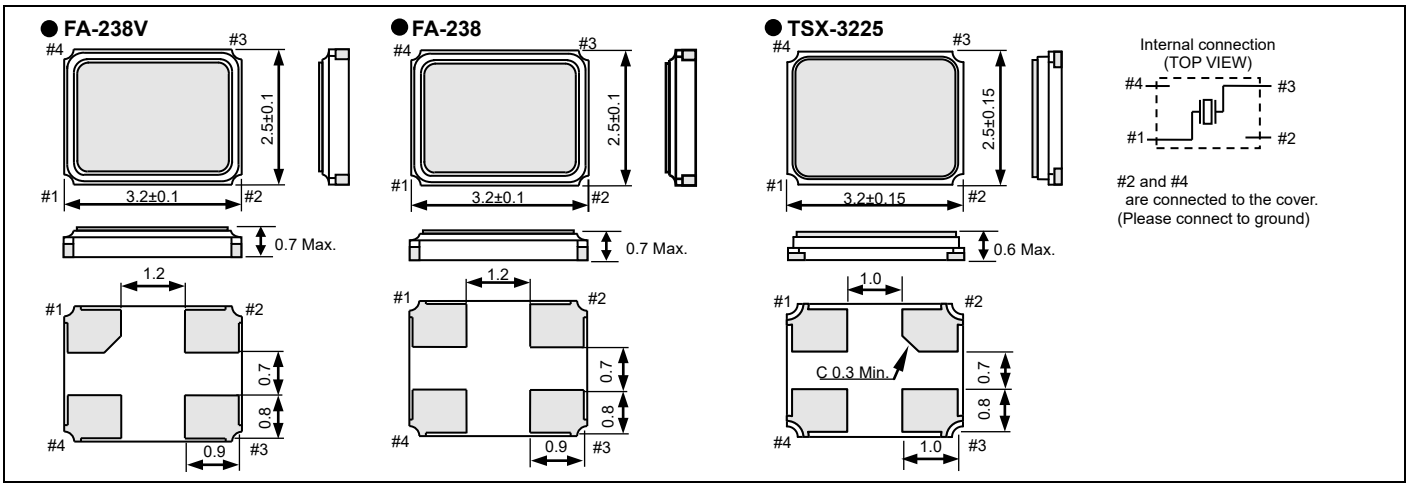
FA-238V ① 12.000000MHz ② 12.0 ③ +15.0-15.0 ④

①Model ②Frequency ③Load capacitance(pF) ④Frequency tolerance(× $10^{-6}$, +25 °C)

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

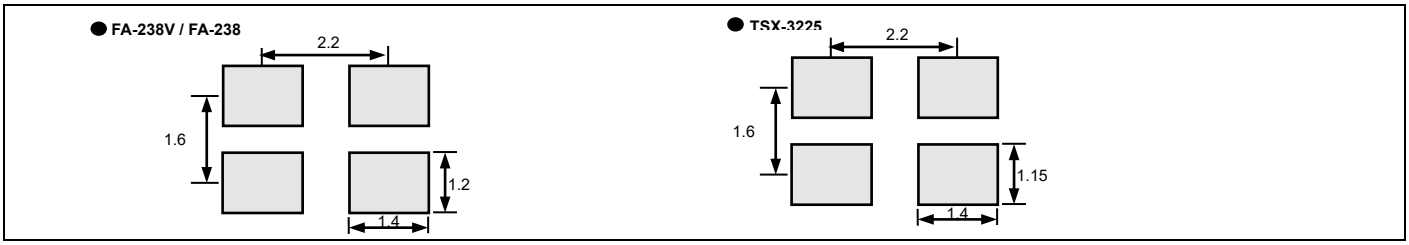
## External dimensions

(Unit:mm)




## 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.

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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 IATF 16949 certification that is requested strongly by major automotive manufacturers as standard.

IATF 16949 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 | ►Pb free. |
| RoHS Compliant | ►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.) |
| For Automotive | ►Designed for automotive applications such as Car Multimedia, Body Electronics, Remote Keyless Entry etc. |
| Automotive Safety | ►Designed for automotive applications related to driving safety (Engine Control Unit, Air Bag, ESC etc ). |

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