



## 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 For the out of standard specifications, please contact us for inquiries.
Storage temperature	T <sub>stg</sub>	-40 °C to +125 °C			Store as bare 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), (±15 × 10 <sup>-6</sup> to ±50 × 10 <sup>-6</sup> is available)		±10 × 10 <sup>-6</sup>	+25 °C For the out of standard specifications, please contact us for inquiries. *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	For the out of standard specifications, please contact us for inquiries. *1
Load capacitance	CL	7 pF to ∞			For the out of standard specifications, please contact us for inquiries.
Motional resistance (ESR)	R <sub>i</sub>	As per below table		As per below table	-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)

<b>● FA-238V</b>  Top view: 3.2±0.1 (width), 2.5±0.1 (height). Pin 1 at bottom-left. Pin 2 at bottom-right. Pin 3 at top-right. Pin 4 at top-left. Side view: 0.7 Max. (thickness). Footprint: 1.3 (width), 0.9 (height), 0.85 (width), 0.7 (height).	<b>● FA-238</b>  Top view: 3.2±0.1 (width), 2.5±0.1 (height). Pin 1 at bottom-left. Pin 2 at bottom-right. Pin 3 at top-right. Pin 4 at top-left. Side view: 0.7 Max. (thickness). Footprint: 1.2 (width), 0.9 (height), 0.9 (width), 0.8 (height).	<b>● TSX-3225</b>  Top view: 3.2±0.15 (width), 2.5±0.15 (height). Pin 1 at bottom-left. Pin 2 at bottom-right. Pin 3 at top-right. Pin 4 at top-left. Side view: 0.6 Max. (thickness). Footprint: 1.0 (width), 0.8 (height), 1.0 (width), 0.7 (height). Internal connection (TOP VIEW): #2 and #4 are connected to the cover. (Please connect to ground).
---	---	--

## Footprint (Recommended)

(Unit:mm)

<b>● FA-238V</b>  Dimensions: 2.4 (width), 1.9 (height), 1.4 (width), 1.2 (height).	<b>● FA-238</b>  Dimensions: 2.2 (width), 1.6 (height), 1.4 (width), 1.2 (height).	<b>● TSX-3225</b>  Dimensions: 2.2 (width), 1.6 (height), 1.4 (width), 1.15 (height).
---	--	---

## 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. *About the products without the Pb-free mark. Contains Pb in products exempted by EU RoHS directive. (Contains Pb in sealing glass, high melting temperature type solder or other.)
	► The products have been designed for high reliability applications such as Automotive.

## Notice

- This material is subject to change without notice.
- Any part of this material may not be reproduced or duplicated in any form or any means without the written permission of Seiko Epson.
- The information about applied circuitry, software, usage, etc. written in this material is intended for reference only. Seiko Epson does not assume any liability for the occurrence of infringing on any patent or copyright of a third party. This material does not authorize the licensing for any patent or intellectual copyrights.
- When exporting the products or technology described in this material, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations.
- You are requested not to use the products (and any technical information furnished, if any) for the development and/or manufacture of weapon of mass destruction or for other military purposes. You are also requested that you would not make the products available to any third party who may use the products for such prohibited purposes.
- These products are intended for general use in electronic equipment. When using them in specific applications that require extremely high reliability, such as the applications stated below, you must obtain permission from Seiko Epson in advance.  
/ Space equipment (artificial satellites, rockets, etc.) / Transportation vehicles and related (automobiles, aircraft, trains, vessels, etc.) / Medical instruments to sustain life / Submarine transmitters / Power stations and related / Fire work equipment and security equipment / traffic control equipment / and others requiring equivalent reliability.
- All brands or product names mentioned herein are trademarks and/or registered trademarks of their respective.