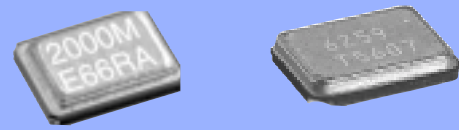


**MHz RANGE CRYSTAL UNIT
MINIATURE SIZE LOW PROFILE SMD**

**FA - 238V / FA - 238
TSX-3225**

- Frequency range : 12 MHz to 54 MHz
- Thickness : 0.6 mm
- Overtone order : Fundamental
- Applications : Mobile phone, Bluetooth, W-LAN
ISM band radio, Clock for MPU



Actual size

FA-238V/ FA-238

TSX-3225



Specifications (characteristics)

Item	Symbol	For Clock		For RF Reference	Remarks
		FA-238V	FA-238	TSX-3225	
Nominal frequency range	f	12.000 MHz to 15.999 MHz	16.000 MHz to 50.000 MHz	12.000 MHz to 54.000 MHz	Fundamental *1 For the out of standard specifications, please contact us for inquiries.
Temperature Range	Storage temperature T_stg	-40 °C to +125 °C		-40 °C to +85 °C	Store as bare product after unpacking
	Operating temperature T_use	-40 °C to +85 °C		-20 °C to +75 °C	Specified equivalent series must be satisfied
Level of drive	DL	10 μW to 100 μW		100 μW Max.	
Frequency tolerance	f_tol	±50 × 10 ⁻⁶ (standard), (±15 × 10 ⁻⁶ to ±50 × 10 ⁻⁶ is available)		±10 × 10 ⁻⁶	+25 °C For the out of standard specifications, please contact us for inquiries. *1
Frequency versus temperature characteristics	f_tem	±30 × 10 ⁻⁶ / -20 °C to +70 °C		±10 × 10 ⁻⁶ / -20 °C to +75 °C	For the out of standard specifications, please contact us for inquiries. *1
Load capacitance	CL	7 pF to ∞ (Standard: 10 pF)		9 pF to ∞ (Standard: 9 pF, 12 pF, 16 pF, ∞)	For the out of standard specifications, please contact us for inquiries.
Motional resistance (ESR)	R ₁	As per below table		As per below table	-40 °C to +85 °C, DL = 100 μW
Frequency aging	f_age	±5 × 10 ⁻⁶ / year Max.		±1 × 10 ⁻⁶ / year Max.	+25 °C, First year

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

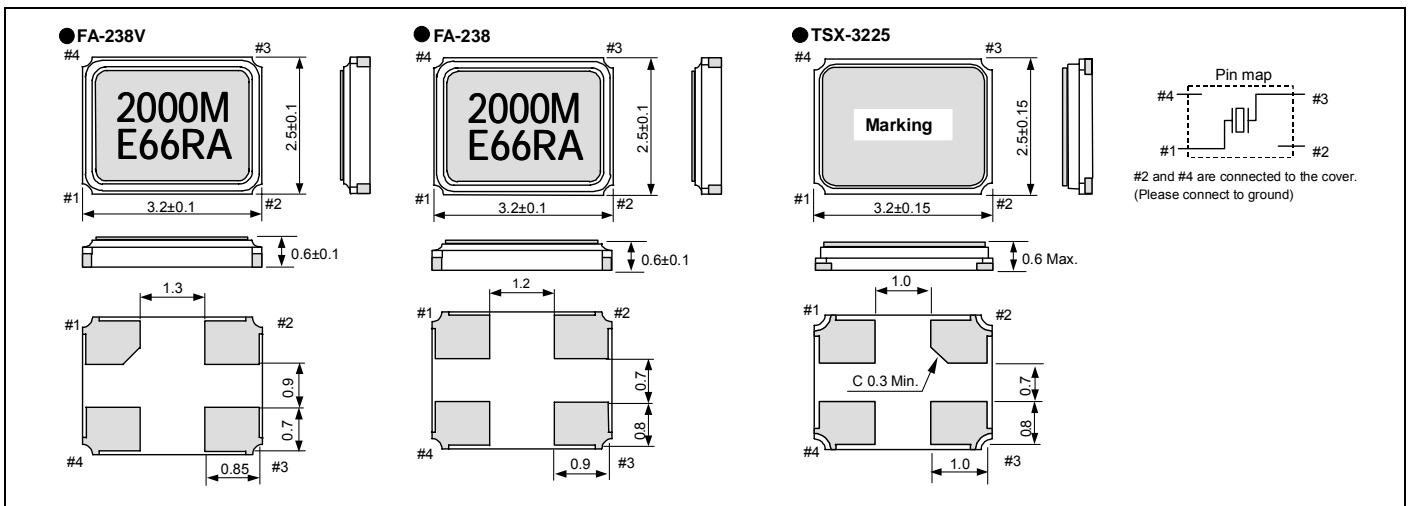
Motional resistance (ESR)

(FA-238V / FA-238) Frequency	Motional resistance
12.0 MHz ≤ f ≤ 13.0 MHz	100 Ω Max.
13.0 MHz < f < 20.0 MHz	80 Ω Max.
20.0 MHz ≤ f < 25.0 MHz	60 Ω Max.
25.0 MHz ≤ f < 30.0 MHz	50 Ω Max.
30.0 MHz ≤ f ≤ 50.0 MHz	40 Ω Max.

(TSX-3225) Frequency	Motional resistance
12.0 MHz ≤ f < 16.0 MHz	100 Ω Max.
16.0 MHz ≤ f < 21.0 MHz	60 Ω Max.
21.0 MHz ≤ f ≤ 54.0 MHz	40 Ω Max.

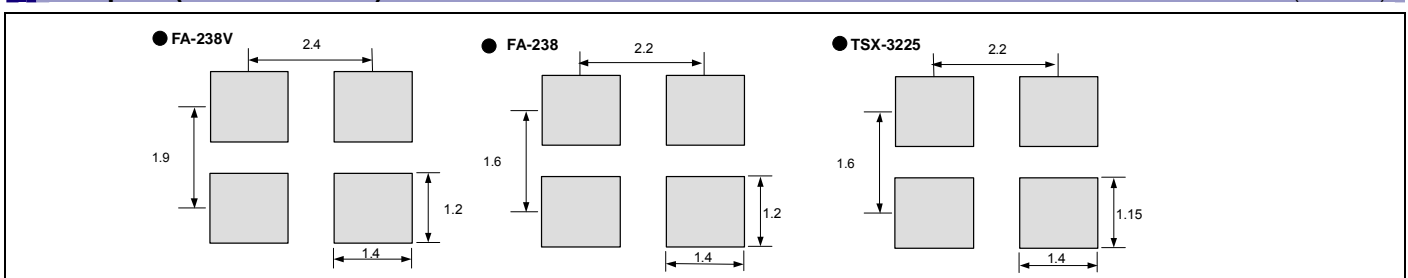
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)



“3D STRATEGY” EPSON TOYOCOM

In order to meet customer needs in a rapidly advancing digital, broadband and ubiquitous society, we are committed to offering products that are one step ahead of the market and a rank above the rest in quality. To achieve our goals, we follow a “3D (three device) strategy” designed to drive both horizontal and vertical growth. We will to grow our three device categories of “Timing Devices”, “Sensing Devices” and “Optical Devices”, and expand vertical growth through a combination of products from these categories.

Quartz devices have become crucial in the network environment where products are increasingly intended for broadband, ubiquitous applications and where various types of terminals can transfer information almost immediately via LAN and WAN on a global scale. Epson Toyocom Corporation addresses every single aspect within a network environment. The new corporation offers “Digital Convergence” solutions to problems arising with products for consumer use, such as, core network systems and automotive systems.

PROMOTION OF ENVIRONMENTAL MANAGEMENT SYSTEM CONFORMING TO INTERNATIONAL STANDARDS

At Epson Toyocom, 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. In the future, new group companies will be expected to acquire the certification around the third year of operations.

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

Epson Toyocom quickly began working to acquire company-wide ISO 9000 series certification, and has acquired ISO 9001 or ISO 9002 certification for all targeted products manufactured in Japanese and overseas plants.

Epson Toyocom has acquired QS-9000 certification, which is of a higher level. Also, TS 16949 certification, which is also of a higher level, has been acquired.

QS-9000 is an enhanced standard for quality assurance systems formulated by leading U.S. automobile manufacturers based on the international ISO 9000 series.

ISO/TS 16949 is a global standard based on QS-9000, a severe standard corresponding to the requirements from the automobile industry.

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 - / 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.
- In this new crystal master for Epson Toyocom, product codes and markings will remain as previously identified prior to the merger. Due to the on-going strategy of gradual unification of part numbers, please review product codes and markings, as they will change during the course of the coming months. We apologize for the inconvenience, but we will eventually have a unified part numbering system for Epson Toyocom that will be user friendly.