



## MHz RANGE CRYSTAL UNIT

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_nom          | 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_stg          | -40 °C to +125 °C                                                                                     |                          |                                           | Storage as single product.                                                      |
| Operating temperature                        | T_use          | -40 °C to +85 °C                                                                                      |                          |                                           |                                                                                 |
| Level of drive                               | DL             | 200 µW Max.                                                                                           |                          |                                           | Recommended: 1 to 100 µW                                                        |
| Frequency tolerance                          | f_tol          | ±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_tem          | ±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>i</sub> | As per table below                                                                                    |                          | As per table below                        | -40 °C to +85 °C, DL = 100 µW                                                   |
| Frequency aging                              | f_age          | ±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\_nom ≤ ±2 × 10<sup>-6</sup> / year Max.

## Motional resistance (ESR)

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

| (TSX-3225) | Frequency                   | Motional resistance |
|------------|-----------------------------|---------------------|
|            | 16.0 MHz ≤ f_nom < 21.0 MHz | 60 Ω Max.           |
|            | 21.0 MHz ≤ f_nom ≤ 48.0 MHz | 40 Ω Max.           |

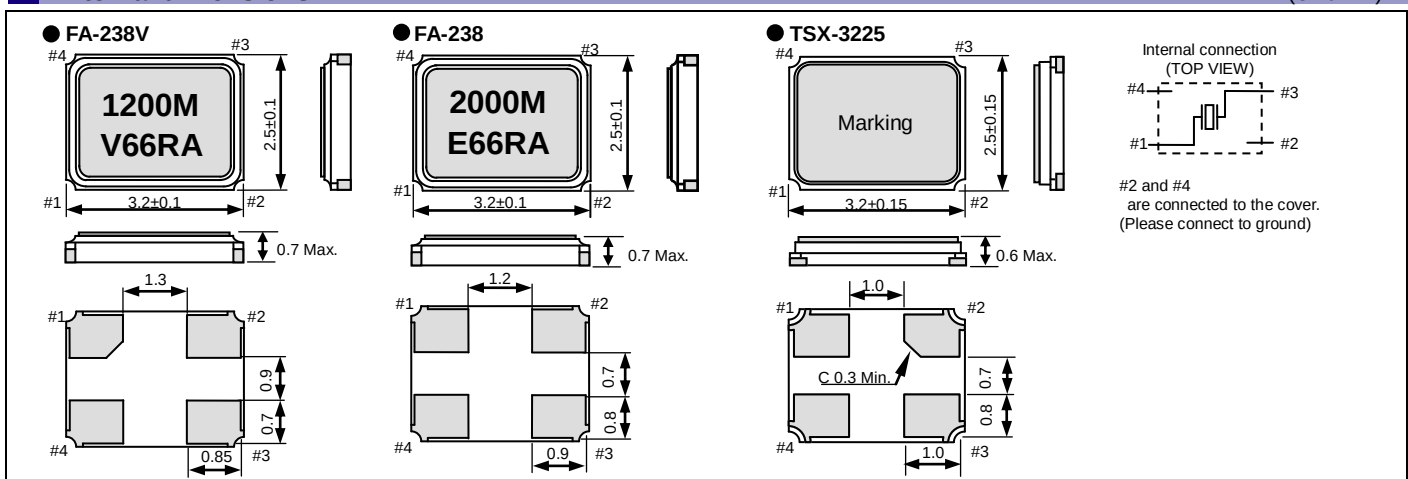
Product name FA-238V 12.000000MHz 12.0 +15.0-15.0  
(Standard form) ① ② ③ ④

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.

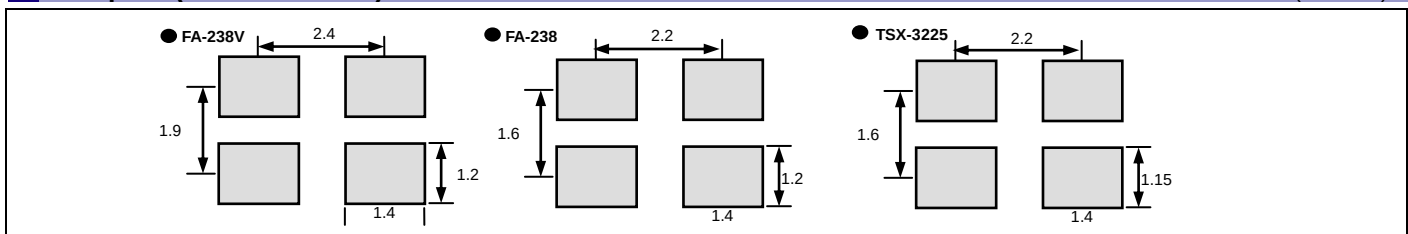
## External dimensions

(Unit:mm)



## Footprint (Recommended)

(Unit:mm)



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