# MHz Range Crystal unit

- Package size (2.0 mm × 1.6 mm × 0.5 mm)
- · Fundamental mode
- · Reference weight Typ.7.0 mg

### [1] Product Number / Product Name / Marking

(1-1) Product Number / Ordering Code

## Q22FA12800141xx

Last 2 digits code(**xx**) defines Quantity. The standard is "18", 5 000 pcs/Reel.

#### (1-2) Product Name / Model Name

#### FA-128 20.000000 MHz 10.0 +10.0-10.0

#### [2] Absolute maximum ratings

Parameter	Symbol		Specification	S	Unit	Conditions	
Farameter	Symbol	Min.	Тур.	Max.	Unit		
Storage temperature	T_stg	-40	-	+125	٥C	Storage as single product	
Operating temperature range	T_use	-40	-	+105	°C	-	

#### [3] Specifications(characteristics)

Parameter	Symbol		Specifications	S	Unit	Conditions	
Faranieter	Symbol	Min.	Тур.	Max.	Unit		
Nominal frequency	f_nom	-	20.000000	-	MHz	Fundamental	
Frequency tolerance	f_tol	-10	-	+10	x 10 <sup>-6</sup>	@+25°C	
Frequency Stability over temperature	f_tem	-10	-	+10	x 10 <sup>-6</sup>	-20°C to +70°C	
Operating temperature	T_use	-20	-	+70	°C		
Level of drive	DL	-	10	100	μW	Recommended: 10 µW	
Load capacitance	CL	-	10	-	pF		
Motional resistance (ESR)	R1	-	-	100	Ω		
Motional capacitance	C1	-	1.46	-	fF		
Motional inductance	L1	-	43.31	-	mH		
Shunt capacitance	C0	-	0.56	-	pF		
Frequency aging	f_age	-1	-	+1	x10 <sup>-6</sup> /yea	@+25°C, First year	

### [For other general specifications, please refer to the attached Full Data Sheet below]

# 2.0 x 1.6 mm size MHz range crystal unit: FA-128

## Features

- Package size: 2.0 x 1.6 mm, t = 0.5 mm Max.
- Frequency range: 19.2 MHz to 54 MHz
- Frequency tolerance (standard):  $\pm 10 \times 10^{-6} / \pm 30 \times 10^{-6} (@+25 °C)$
- Frequency vs. temperature characteristics (standard):
- ESR:
- $\pm 10 \times 10^{-6}$  (-20 °C to +75 °C)  $\pm 30 \times 10^{-6}$  (-20 °C to +75 °C) 150 Ω Max. (19.2 MHz  $\leq$  f\_nom < 20 MHz) 100 Ω Max. (20 MHz  $\leq$  f\_nom < 24 MHz) 80 Ω Max. (24 MHz  $\leq$  f\_nom < 26 MHz) 60 Ω Max. (26 MHz  $\leq$  f\_nom  $\leq$  54 MHz)



## Applications

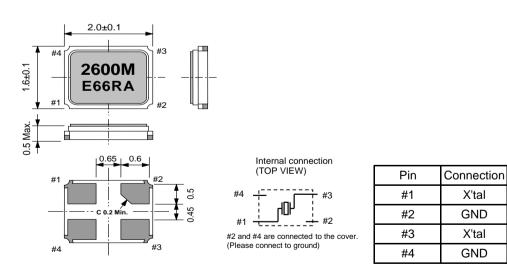
- · Small communication module for consumer and industrial applications
- Wearable devices
- Clock for MCU

## Description

The FA-128 has been commercialized as a reference clock for communication modules, which requires high accuracy, and as a clock for wireless communication and microcomputers for applications that require miniaturization (TWS (True Wireless Stereo), Smart Watch, etc.).

The products created using the element processing technology cultivated over many years contribute to improving the performance of the customer's system.

## **Outline Drawing and Terminal Assignment**



#### [1] Product Number / Product Name

#### (1-1) Product Number

1

Q22FA1280xxxx18 (Please contact Epson for details)

(1-2) Product Name (Standard Form)

<u>FA-128</u> <u>24.000000MHz</u> <u>12.0</u> <u>+10.0-10.0</u>

2 3

(1)Model (2)Frequency (3)Load capacitance (pF) (4)Frequency tolerance (x10<sup>-6</sup>, +25 °C) In addition to the mentioned above specification items ((1) to (4), pleases specify the frequency vs. temperature characteristics.

4

#### [2] Absolute Maximum Ratings

ltem	Symbol		Rating value	)	Unit	Note
liem	Symbol	Min.	Тур.	Max.	Offic	
Storage temperature range	T_stg	-40	-	+125	°( :	Satisfy environmental characteristics specifications

#### [3] Operating Conditions

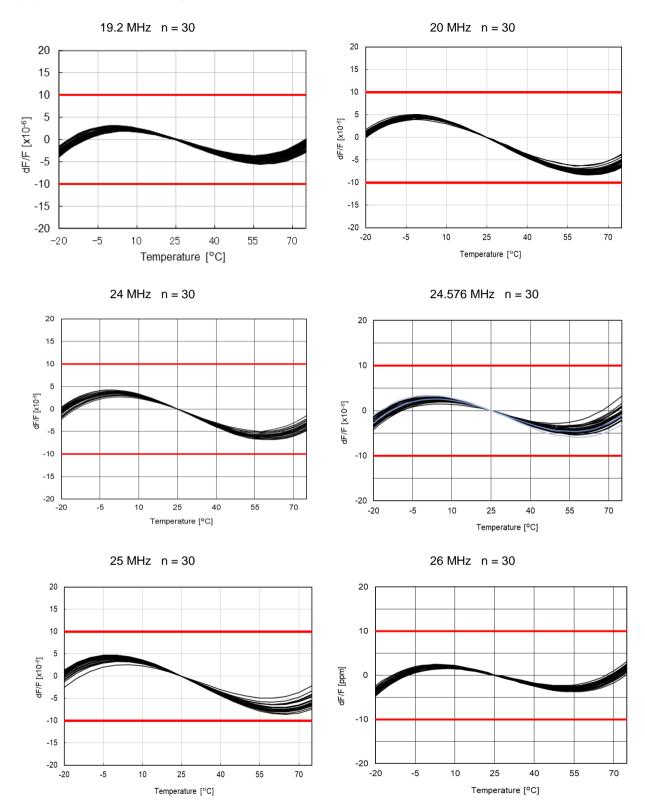
ltem	Symbol	Rating value				Note	
	Symbol	Min.	Тур.	Max.	Unit	note	
Operating temperature range	T_use	-40	-	+85	°C		
Operating temperature range	I_use	-40	-	+105	-	Please contact Epson	
Level of drive	DL	1		200	μW	Recommended: 10 µW	

#### [4] Static Characteristics

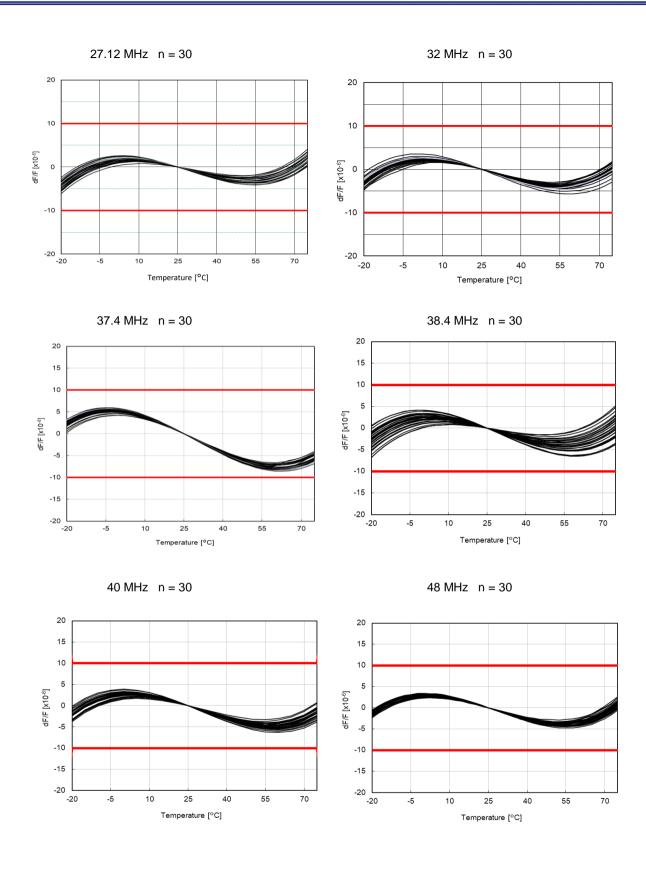
ltem	Symbol	Specifications	Unit	Condition / Remarks
Nominal frequency range	f_nom	19.2000 to 54.000	MHz	
Frequency tolerance (Standard)	f_tol	±10 ±30	x10 <sup>-6</sup>	T_use = +25 °C $\pm$ 3 °C DL = 100 $\mu$ W Does not include frequency aging Please contact Epson for requirements not listed in the specifications
Frequency vs. temperature characteristics (Standard)	f_tem	±10 ±30	x10 <sup>-6</sup>	Reference at $T_use = +25 \text{ °C} \pm 3 \text{ °C}$ -20  °C to $+75  °CPlease contact Epson forrequirements not listed in thespecifications$
Load capacitance	CL	6 to co	pF	Please specify
Motional resistance (ESR)	R1	Table 1.	Ω	π circuit IEC 60444-2 T_use = Operating temperature range DL = 100 μW
Shunt capacitance	C0	3.0 Max.	pF	
Frequency aging	f_age	±1 Max. (19.2 MHz ≤ f_nom < 40 MHz) ±2 Max. (40 MHz ≤ f_nom ≤ 54 MHz)	x10 <sup>-6</sup>	T_use = +25 °C ± 3 °C First year

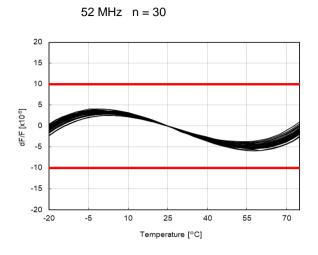
Table 1.

Frequency	R1
19.2 MHz <u>&lt;</u> f_nom < 20 MHz	150 Ω Max.
20 MHz <u>&lt;</u> f_nom < 26 MHz	100 Ω Max.
24 MHz <u>&lt;</u> f_nom < 26 MHz	80 Ω Max.
26 MHz <u>&lt;</u> f_nom <u>&lt;</u> 54 MHz	60 Ω Max.



[5] Example of Frequency Temperature Characteristics





#### [6] Marking Description

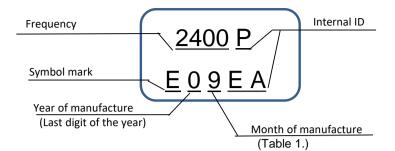
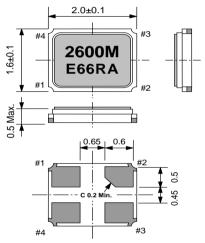


Table 1. Month of manufacture

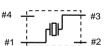
Mont	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	Х	Y	Ζ

#### [7] Outline Drawing and Recommended Footprint





Unit: mm



#2 and #4 are connected to the cover. (Please connect to ground)

Pin	Connection
#1	X'tal
#2	GND
#3	X'tal
#4	GND

0.95

1.45

0.85

1.15

Reference weight Typ.: 7 mg

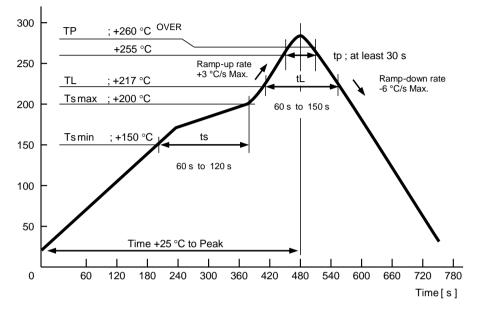
Terminal coating: Au plating

## [8] Moisture Sensitivity Level

Parameter	Specification	Conditions
MSL	LEVEL1	JEDEC J-STD-020D.01

#### [9] Reflow Profile (JEDEC J-STD-020D.01)

Temperature [ °C ]



#### [10] Packing Information

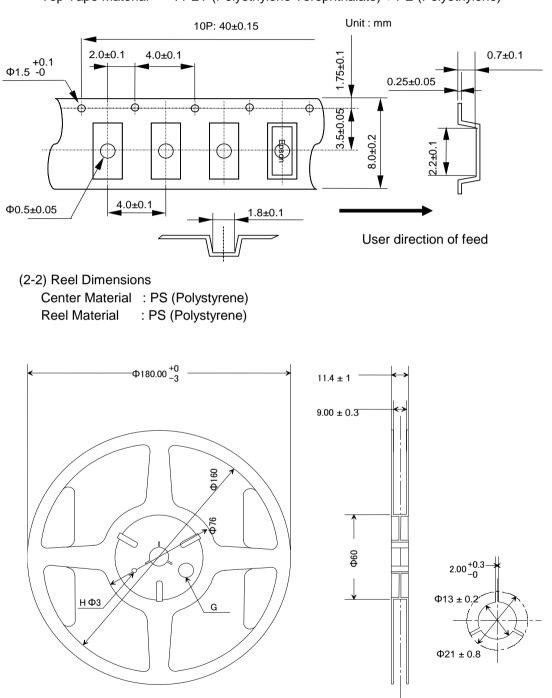
(1) Packing Quantity

The last two digits of the Product Number (Q22FA1280xxxx $\underline{xx}$ ) are a code that defines the packing quantity. The standard is "18" for a 5 000 pcs / Reel.

(2) Taping Specification

Subject to EAI-481, IEC 60286 and JIS C0806

(2-1) Tape Dimensions
 Carrier Tape Material : PS (Polystyrene)
 Top Tape Material : PET (Polyethylene Terephthalate) + PE (Polyethylene)



#### [11] Handling Precautions

Prior to using this product, please carefully read the section entitled "Precautions" on our Web site (https://www5.epsondevice.com/en/information/#precaution) for instructions on how to handle and use the product properly to ensure optimal performance of the product in your equipment. Before using the product under any conditions other than those specified therein,

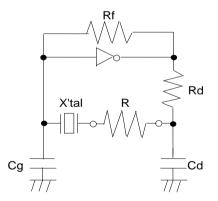
please consult with us to verify and confirm that the performance of the product will not be negatively affected by use under such conditions.

In addition to the foregoing precautions, in order to avoid the deteriorating performance of the product, we strongly recommend that you DO NOT use the product under ANY of the following conditions:

1. Max three (3) times re-flow is allowed. Its recommended to manually solder when not enough/no solder detected. (Using soldering iron at +350 °C Max × within 5 seconds)

- 2. Patterning on a board should follow our company recommended pattern.
- 3. Too much exciting shock or vibration may cause deterioration on damage. The product may damage depends on the condition such as a shock in assembly machinery. Please check your process condition in advance to minimize and maintain the shock level.
- 4. It is recommended to do patterning to the oscillator as short as possible. Abnormal oscillation may happened if the line is too long.
- 5. Condensation may occur when products are used/stored under remarkable temperature change.
- 6. This product may be affected to ultrasonic cleaning. It is depends on the cleaning conditions (Cleaning machine type/power/time/content/position etc.). The warranty will not cover any damage due to this type of usage. Check conditions prior to use.
- 7. When the substrate of oscillation become dewy, the crystal frequency is changed or stopped. Please use under without the dewfall.
- 8. Applying excessive excitation Drive Level to the crystal Unit may cause deterioration damage.
- 9. Few data or readings taken at user side may be different from our company's data. Confirmation of the different value is necessary before application.
- 10. To avoid malfunction, no pattern across or near the crystal is allowed.
- 11. Start up time of oscillation may be increased or no oscillation may occur unless adequate negative resistance is allocated in the oscillation circuit In order to avoid this, please provide enough negative resistance to the circuit design.

How to check the negative resistance.



- 1) Insert a pure resistance R in series with the X'tal.
- 2) Adjust R and find the maximum R value that starts oscillation.
- 3) Check the value of R in the oscillation state of 2).
  Negative resistance of the circuit |-R| =
  R + Series resistance value R1 of the X'tal
- 4) Negative resistance |-R| guideline: |-R| > R1 Max. x 5

12. Please refer to packing specification for the storage method and packing standard.

## 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.

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

Explanation of marks used in this datasheet

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.

IATF 16949 is the international standard that added the sector-specific supplemental requirements for automotive industry based on ISO9001.

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