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

Q22FA12800085xx

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

(1-2) Product Name / Model Name

FA-128 27.120000 MHz 10.0 +30.0-30.0

[2] Absolute maximum ratings

Parameter	Symbol	Specifications			Unit	Conditions
		Min.	Typ.	Max.		
Storage temperature	T_stg	-40	-	+125	ºC	Storage as single product
Operating temperature range	T_use	-40	-	+105	ºC	-

[3] Specifications(characteristics)

Parameter	Symbol	Specifications			Unit	Conditions
		Min.	Typ.	Max.		
Nominal frequency	f_nom	-	27.120000	-	MHz	Fundamental
Frequency tolerance	f_tol	-30	-	+30	x 10^{-6}	@+25ºC
Frequency Stability over temperature	f_tem	-30	-	+30	x 10^{-6}	-20ºC to +75ºC
Operating temperature	T_use	-20	-	+75	ºC	
Level of drive	DL	-	10	100	µW	Recommended: 10 µW
Load capacitance	CL	-	10	-	pF	
Motional resistance (ESR)	R1	-	-	60	Ω	
Motional capacitance	C1	-	2.07	-	fF	
Motional inductance	L1	-	16.64	-	mH	
Shunt capacitance	C0	-	0.63	-	pF	
Frequency aging	f_age	-5	−	+5	x10^{-6} /yea	@+25ºC, 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): ±10 x 10^{-6} / ±30 x 10^{-6} (@+25 °C)
- Frequency vs. temperature characteristics (standard):
  ±10 x 10^{-6} (-20 °C to +75 °C)
  ±30 x 10^{-6} (-20 °C to +75 °C)
- ESR: 150 Ω Max. (19.2 MHz ≤ f_nom < 20 MHz)
  100 Ω Max. (20 MHz ≤ f_nom < 24 MHz)
  80 Ω Max. (24 MHz ≤ f_nom < 26 MHz)
  60 Ω Max. (26 MHz ≤ f_nom ≤ 54 MHz)

FA-128
(2.0 x 1.6 mm, t = 0.5 mm Max.)

Applications

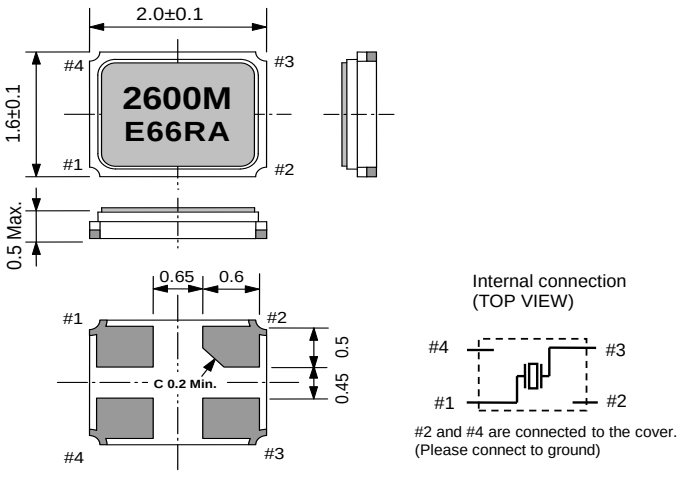
- Small communication module for consumer and industrial applications
- Wearable devices
- Clock for MCU

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



Internal connection
(TOP VIEW)

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

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

[1] Product Number / Product Name

(1-1) Product Number

Q22FA1280xxxx18 (Please contact Epson for details)

(1-2) Product Name (Standard Form)

FA-128 24.000000MHz 12.0 +10.0-10.0

① ② ③ ④

①Model ②Frequency ③Load capacitance (pF) ④Frequency tolerance (x10^{-6}, +25 °C)

In addition to the mentioned above specification items (① to ④),
pleases specify the frequency vs. temperature characteristics.

[2] Absolute Maximum Ratings

Item	Symbol	Rating value			Unit	Note
		Min.	Typ.	Max.		
Storage temperature range	T_stg	-40	-	+125	°C	Satisfy environmental characteristics specifications

[3] Operating Conditions

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

[4] Static Characteristics

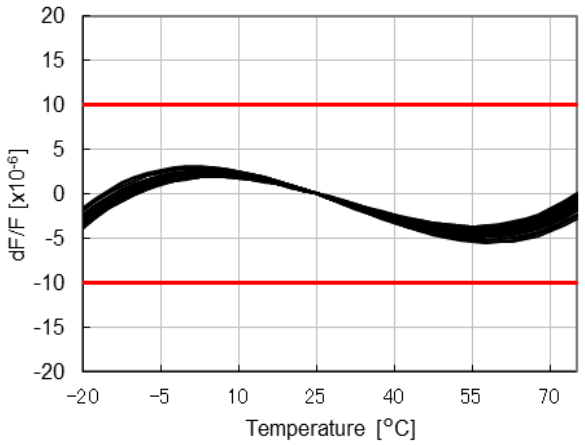
Item	Symbol	Specifications	Unit	Condition / Remarks
Nominal frequency range	f_nom	19.2000 to 54.000	MHz	
Frequency tolerance (Standard)	f_tol	±10 ±30	x10^{-6}	T_use = +25 °C ± 3 °C DL = 100 µW Does not include frequency aging Please contact Epson for requirements not listed in the specifications
Frequency vs. temperature characteristics (Standard)	f_tem	±10 ±30	x10^{-6}	Reference at T_use = +25 °C ± 3 °C -20 °C to +75 °C Please contact Epson for requirements not listed in the specifications
Load capacitance	CL	6 to ∞	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^{-6}	T_use = +25 °C ± 3 °C First year

Table 1.

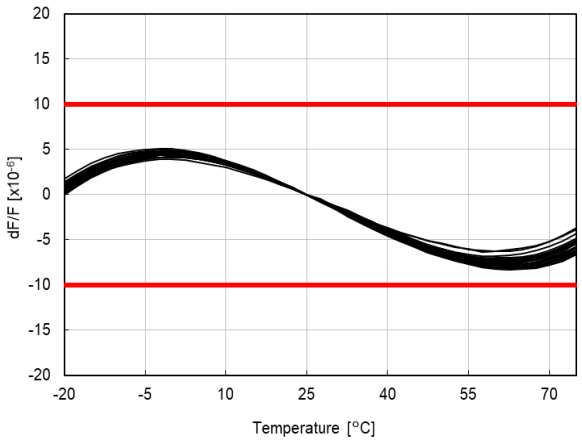
Frequency	R1
19.2 MHz ≤ f_nom < 20 MHz	150 Ω Max.
20 MHz ≤ f_nom < 26 MHz	100 Ω Max.
24 MHz ≤ f_nom < 26 MHz	80 Ω Max.
26 MHz ≤ f_nom ≤ 54 MHz	60 Ω Max.

[5] Example of Frequency Temperature Characteristics

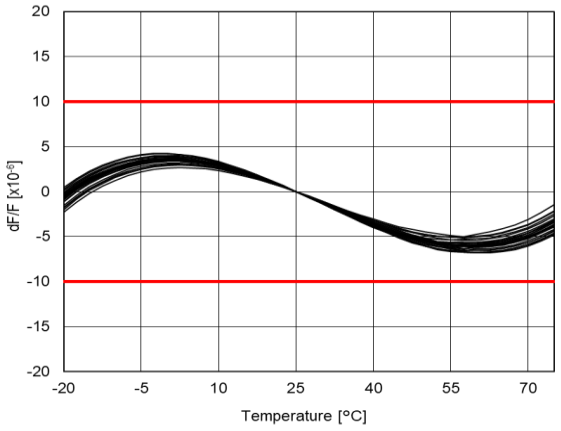
19.2 MHz n = 30



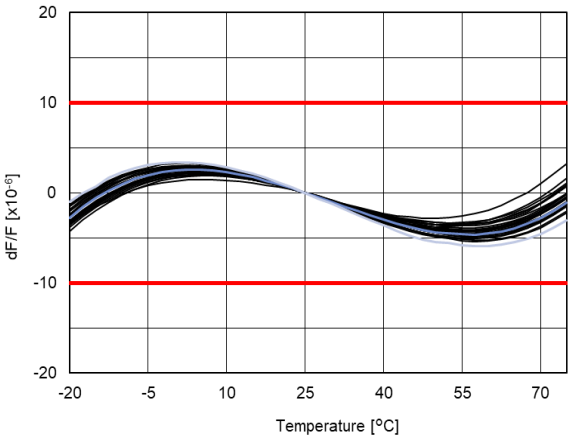
20 MHz n = 30



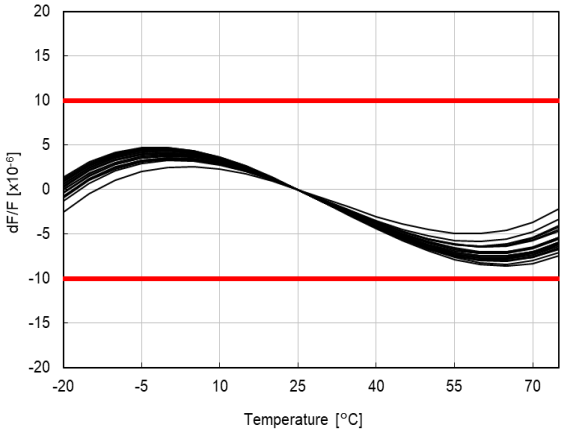
24 MHz n = 30



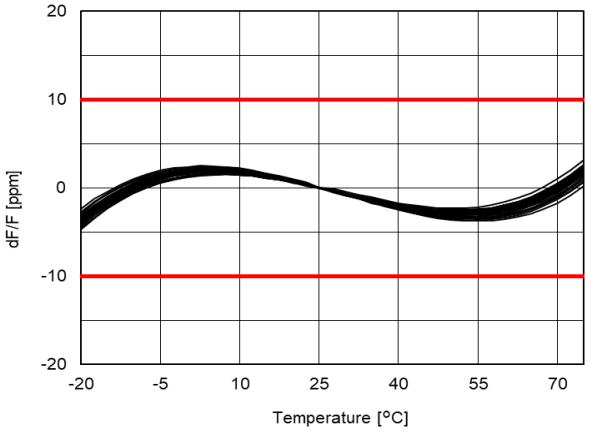
24.576 MHz n = 30



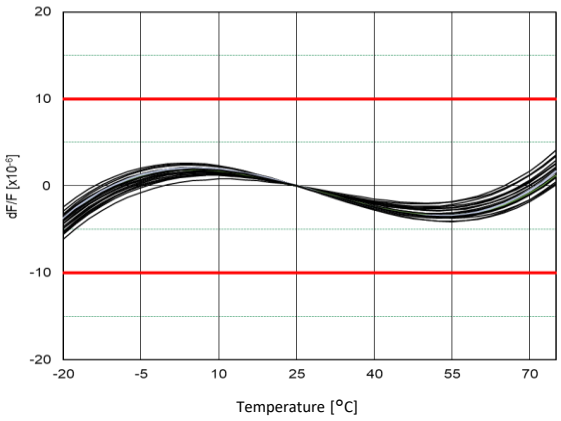
25 MHz n = 30



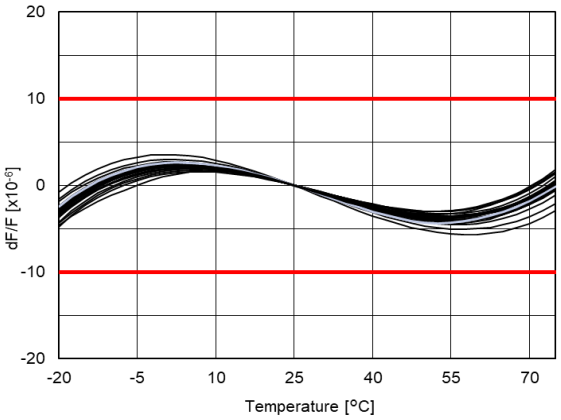
26 MHz n = 30



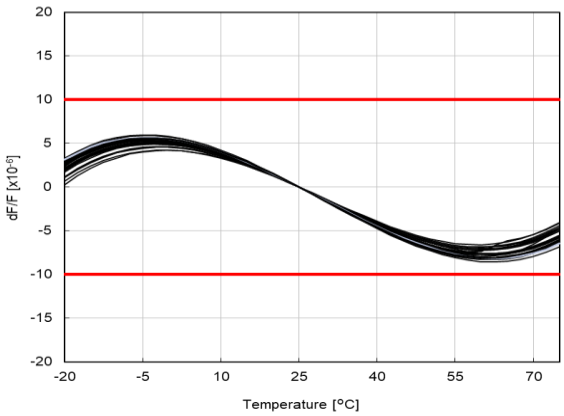
27.12 MHz n = 30



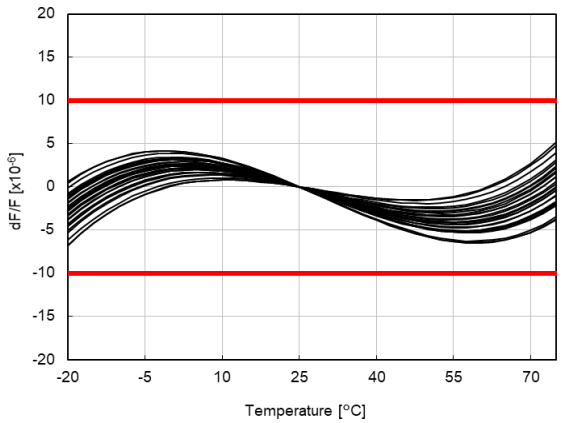
32 MHz n = 30



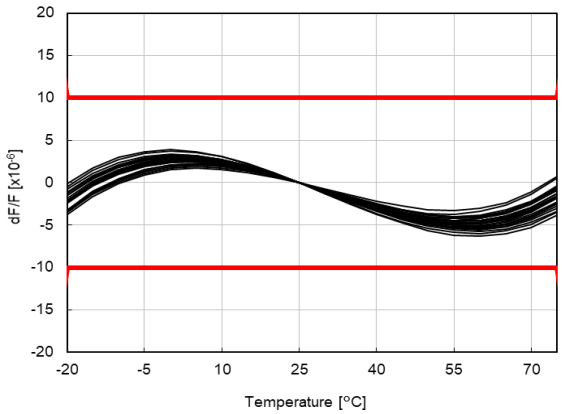
37.4 MHz n = 30



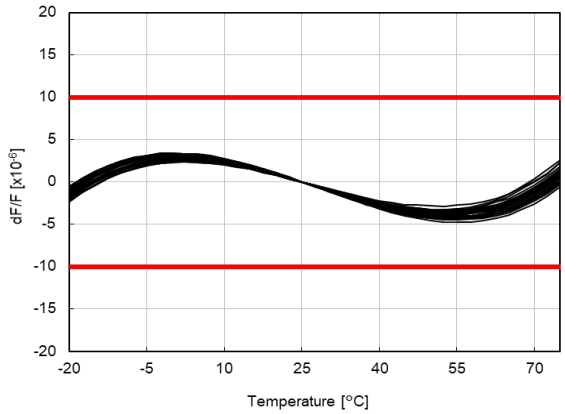
38.4 MHz n = 30



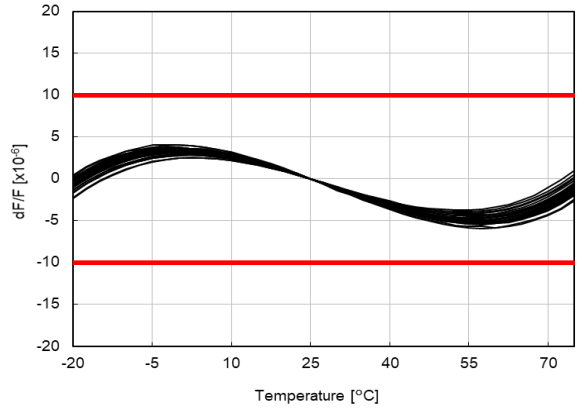
40 MHz n = 30



48 MHz n = 30



52 MHz n = 30



[6] Marking Description

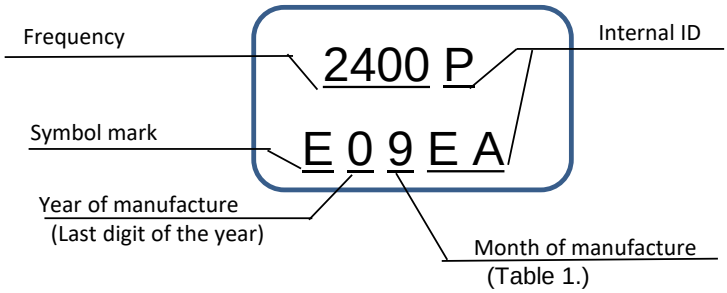
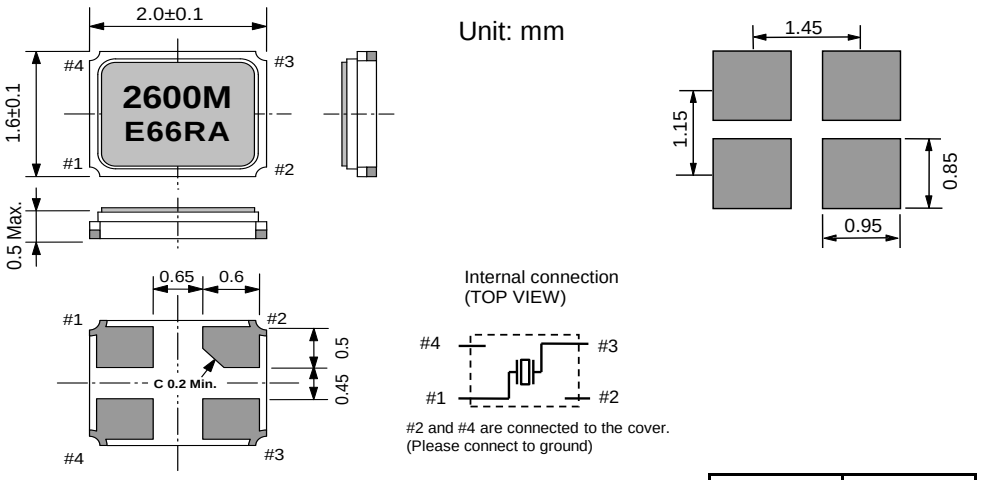


Table 1. Month of manufacture

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	X	Y	Z

[7] Outline Drawing and Recommended Footprint



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

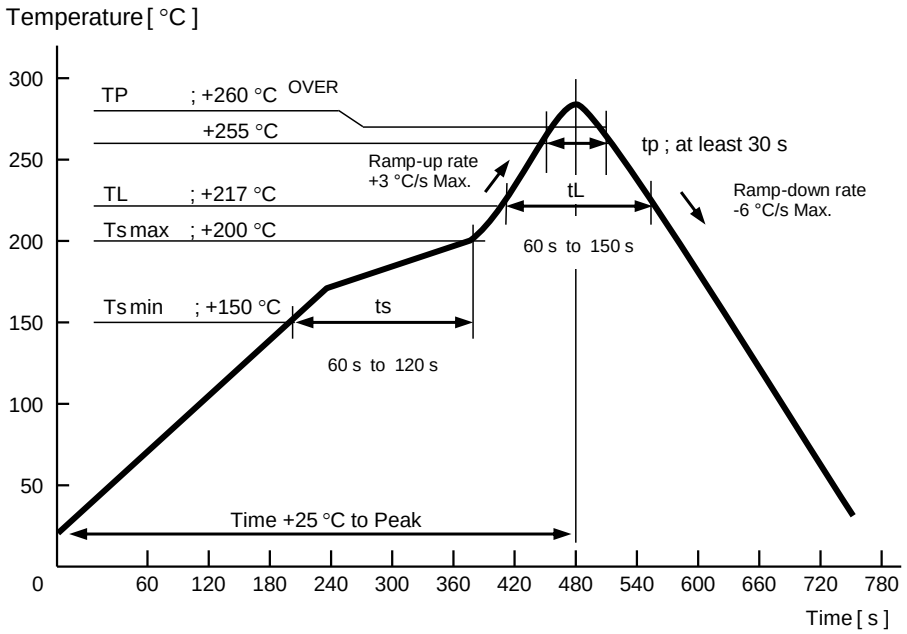
Reference weight Typ.: 7 mg

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)



[10] Packing Information

(1) Packing Quantity

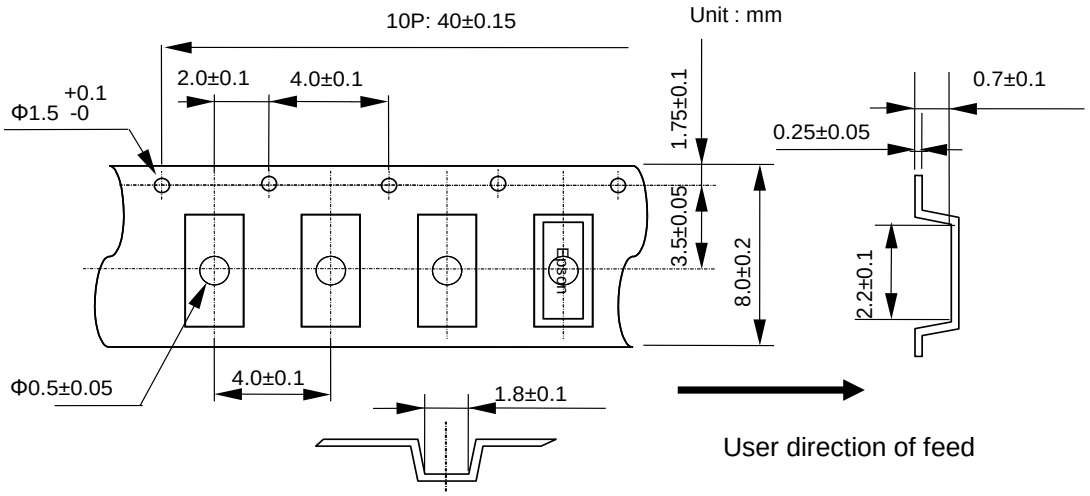
The last two digits of the Product Number (Q22FA1280xxxx**xx**) are a code that defines the packing quantity.
The standard is "18" for a 5 000 pcs / Reel.

(2) Taping Specification

Subject to EAI-481, IEC 60286 and JIS C0806

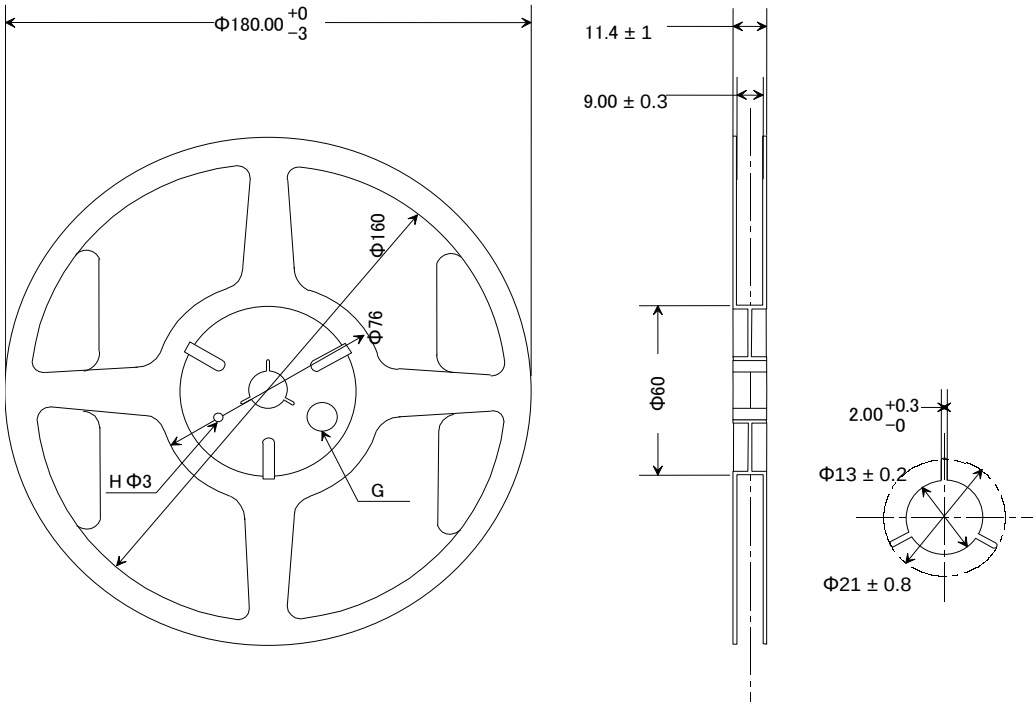
(2-1) Tape Dimensions

Carrier Tape Material : PS (Polystyrene)
Top Tape Material : PET (Polyethylene Terephthalate) + PE (Polyethylene)



(2-2) Reel Dimensions

Center Material : PS (Polystyrene)
Reel Material : PS (Polystyrene)

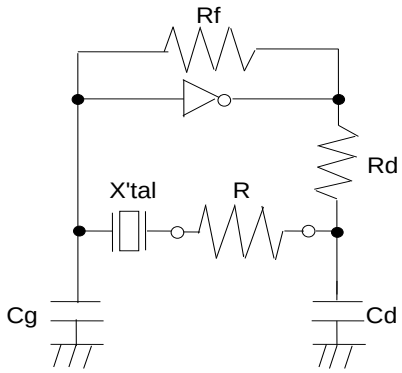


[11] Handling Precautions

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.

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

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

■ Explanation of marks used in this datasheet

Pb Free	**●Pb free.**
RoHS Compliant	**●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)