# Tiny Size and Low Height MHz range crystal unit: Product Name: FA1210AN

## Features

- Package size: 1.2 x 1.0 mm, t = 0.3 mm Max.
- Frequency range : 32 MHz to 100 MHz
  (Currently avail: 32 MHz, 48 MHz)
- Frequency tolerance : ±10 x $10^{-6}$ (@+25 °C)
- Frequency vs. temperature characteristics:
  : ±10 x $10^{-6}$ ( -20 °C to +75 °C)
  : ±15 x $10^{-6}$ ( -30 °C to +85 °C)
  : ±20 x $10^{-6}$ ( -40 °C to +85 °C)
- ESR: 100 Ω Max. (32 MHz)
  60 Ω Max. (48 MHz)



FA1210AN

(1.2 x 1.0 mm, t = 0.3 mm Max.)

## Applications

- Wearables, Smart speakers, Digital health
- Smartphone, Tablets, PCs
- General Consumer Electronics/Appliances
- Industrial IoT, Meter, Light/Building monitoring
- Enables wireless communication:
  - •BLE, BT, NFC, Zigbee, Wi-Fi, etc.
  - •LoRa, NB-IoT, SigFox, etc.

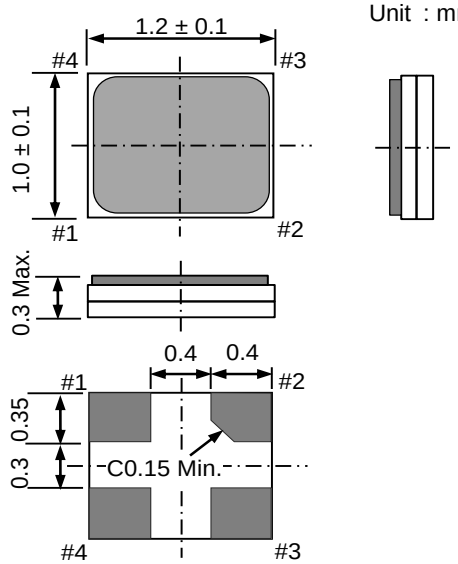
## Description

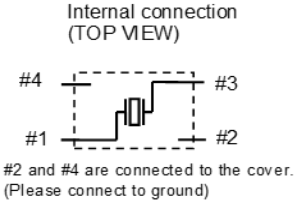
FA1210AN is tiny size and low height, enabling designers to save board space without compromising performance. This is essential for devices and modules pushing the limit on features and size.

The wide MHz range frequency serves the popular wireless communication protocols, ideal for consumer and industrial IoT applications.

## Outline Drawing

Unit : mm

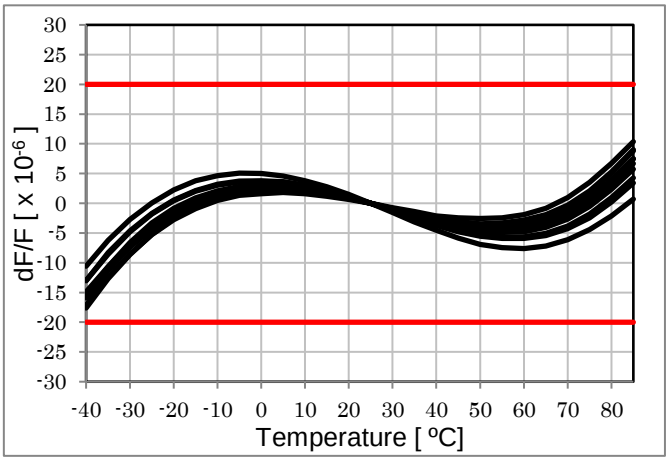



| Pin | Connection |
|---|---|
| #1 | X'tal |
| #2 | GND |
| #3 | X'tal |
| #4 | GND |

## Typical Performance

Frequency vs. Temperature characteristics
(Frequency = 32 MHz, n=10)



## [ 1 ]Product Number / Product Name

(1-1) Product Number

X1E000411xxxx26 (Please contact Epson for details)

(1-2)Product Name (Standard Form)

FA1210AN 32.000000MHz 12.0 +10.0-10.0

a b c d

a: Model b: Frequency c: Load capacitance(pF) d: Frequency tolerance(x$10^{-6}$, +25 °C)

In addition to the mentioned above specification items("a" to "d"),
and pleases specify the frequency vs. temperature characteristics (one of "e" to "g" specification below).

e: ±10 x $10^{-6}$ / -20 °C to +75 °C, f: ±15 x $10^{-6}$ / -30 °C to +85 °C , g: ±20 x $10^{-6}$ / -40 °C to +85 °C

## [ 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 (+105) | °C | Please contact Epson about T_use > +85 °C |
| Level of drive | DL | 0.01 | 10 | 100 | µW | Recommended:10 µW |

## [ 4 ] Static Characteristics

| Item | Symbol | Specifications | | | Unit | Conditions / Remarks |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Nominal frequency range | f_nom | 32 | - | 100 | MHz | Please contact Epson about available frequncies |
| | | 32, 48 | | | | Currently avail frequency |
| Frequency tolerance | f_tol | -10.0 | - | +10.0 | x$10^{-6}$ | +25 °C ± 3 °C<br>DL = 10 µW<br>Does not include frequency aging |
| Motional resistance (ESR) | $R_1$ | 100 (32 MHz)<br>60 (48 MHz) | | | Ω Max. | π circuit IEC 60444-2<br>T_use = Operating temperature range<br>DL = 10 µW |
| Shunt capacitance | $C_0$ | - | - | 1.0 | pF | π circuit and Network Analyzer |
| Frequency vs. temperature characteristics | f_tem | Table 1. | | | x$10^{-6}$ | Reference at +25 °C ± 3 °C |
| Load capacitance | CL | 6 | - | ∞ | pF | Please specify |
| Isolation resistance | IR | 500 | - | - | MΩ | |
| Frequency aging | f_age | ±1 (32 MHz, 48 MHz) | | | x$10^{-6}$ | +25°C , First year |

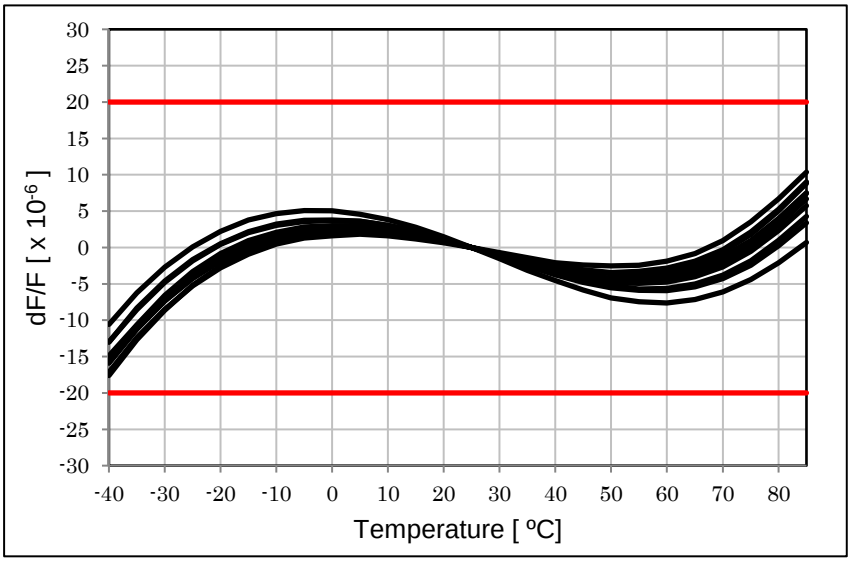
Table 1. Frequency vs. temperature characteristics

| Operating temperature range | Frequency temperature characteristics |
|---|---|
| -20 °C to +75 °C | ±10 x $10^{-6}$ |
| -30 °C to +85 °C | ±15 x $10^{-6}$ |
| -40 °C to +85 °C | ±20 x $10^{-6}$ |

Please contact Epson for other than the above

## [ 5 ] Example of frequency vs. temperature characteristics

(5-1) 32.000 MHz n = 10




## [ 6 ] Marking Description

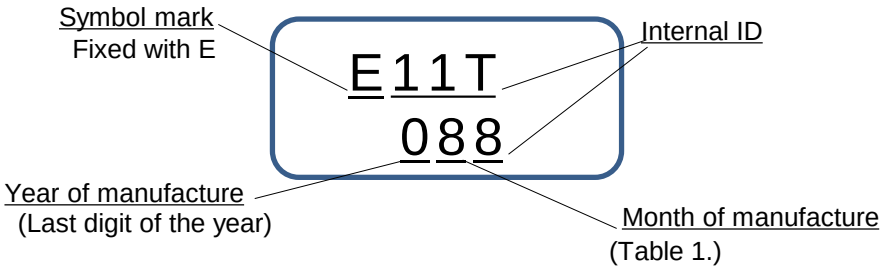
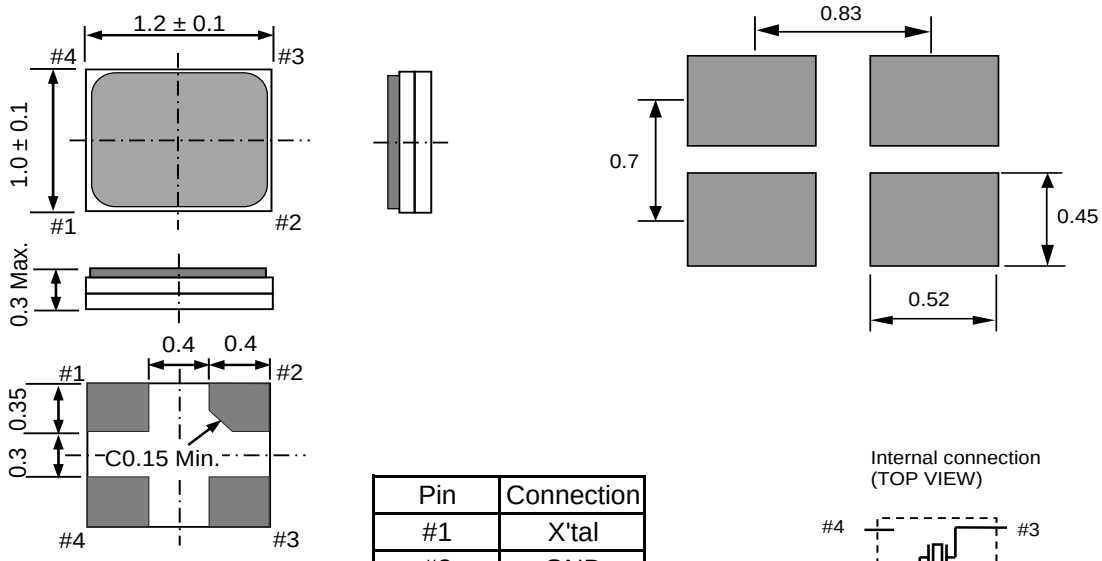



Table 1. Month of manufacture

| 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

Unit: mm




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

Internal connection
(TOP VIEW)




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

Reference weight Typ. : 1.0 mg

Terminal coating : Au plating

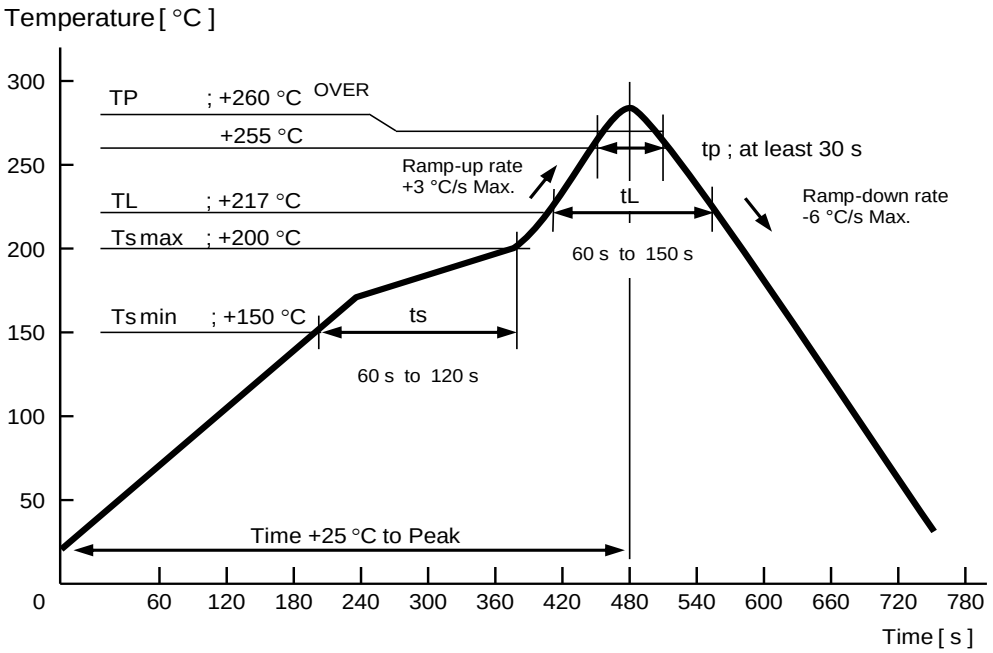
## [ 8 ] Moisture Sensitivity Level and Electro-Static Discharge Ratings

(8-1)Moisture Sensitivity Level (MSL)

| Parameter | Specification | Conditions |
|---|---|---|
| MSL | LEVEL 1 | JEDEC J-STD-020E |

## [ 9 ] Reflow Profile

JEDEC J-STD-020E



## [ 10 ] Packing Information

### (10-1) Packing Quantity

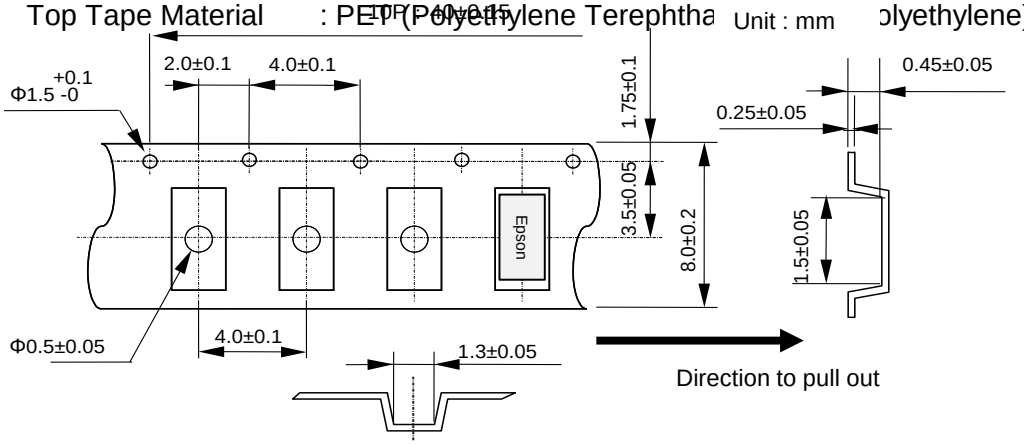
The last two digits of the Product Number (X1E000411xxxx**xx**) defines the packing quantity.
The standard is "26" for a 6 000 pcs/Reel.

### (10-2) Taping Specification

Subject to EIA-481, IEC-60286 and JIS C0806

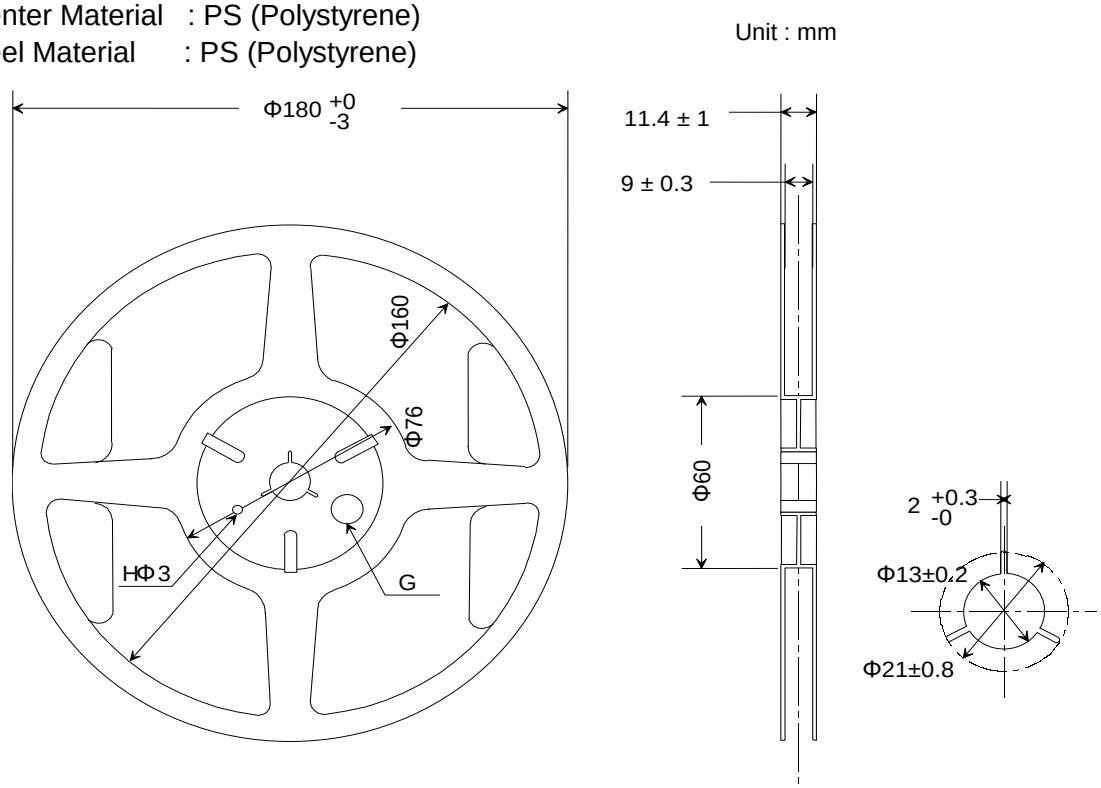
#### (1) Tape Dimensions

Carrier Tape Material : PS (Polystyrene)
Top Tape Material : PET (Polyethylene Terephtha olyethylene)




#### (2) Reel Dimensions

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

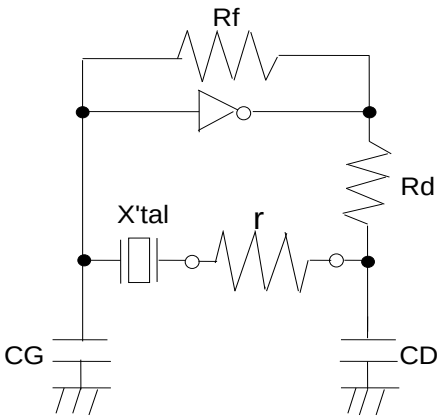


## [ 11 ] Handling Precautions

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 Epson 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 degrading the performance of the product, we strongly advise that you adhere to the below recommendations:

1. Limit reflow to 3 times.
   This product has gone through AuSn melt sealing.
   Reflow mounting is recommended instead of using a soldering iron or air heater.
   When the product is removed from a PCB board or module with a soldering iron, please do so carefully as excess heat to the AuSn sealing material (melt point +278 °C) may deteriorate the seal and hermeticity.
2. Avoid using the products if it received any excessive shocks and vibrations
   Crystal products may be damaged under some conditions during mounting if exposed to excess shock.
   Please set the mounting conditions to a slow mounting speed on the PCB to minimize shock as much as possible.
   Please review the conditions after the changed are made.
3. Keep the electrode wiring as short as possible to ensure normal oscillation.
4. Store the crystal products at normal temperature (+15 °C to +35 °C) and humidity (25 %RH to 85 %RH）
   Storing the crystal products under higher temperature or high humidity over one year may affect frequency stability or solderability.
   Contact Epson before use if the product has been stored outside the conditions mentioned above.
5. Ultrasonic equipment used for cleaning or bonding may deteriorate the characteristics of the product.
   Be sure to check in advance.
6. In high humidity environment, dew condensation on the PCB board may cause malfunction such frequency shift or no oscillation.
7. Applying excessive drive level to the crystal units may cause deterioration of characteristics or damage.
   Design and test the circuit so that the proper drive level is maintained.
8. The characteristic such as frequency, etc. may differ from your measurement depending on the measurement method or conditions.
   Contact Epson for any questions.
9. In order to avoid malfunction by other signal lines, design pattern other signal lines away from the product.
   and in case of multi-layered PCB board, do not lay out other signal lines under.
   If shielding with GND is required, shield the surface farthest from the oscillation circuits.
10. Use soldering paste <80 µm Max, the products are low profile specification.
11. Ensure adequate negative resistance is allocated in the oscillation circuit,
    otherwise oscillation startup time may increase or no oscillation may occur.
    In order to avoid this, provide enough negative resistance that is 5 to 10 time the motional resistance(R1)
12. Aging specifications are estimated from environmental reliability tests and expected frequency variation over time.
    They do not provide a guarantee of aging over the product lifecycle.
13. Should any customer use the product in any manner contrary to the precautions and/or advice herein,
    such use shall be done at the customer’s own risk.

< Check of 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 to 10

## 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.

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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.**<br>*About the products without the Pb-free mark.<br>Contains Pb in products exempted by EU RoHS directive<br>(Contains Pb in sealing glass, high melting temperature type solder or other) |

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