Serial No. : 2014-0416
DATE : 2014/04/04

ITEM : CRYSTAL RESONATOR

DSX321G 12.000MHz
(INDONESIA) 1C212000BC0AK
(THAILAND) 1N212000BC0AK

Please acknowledge receipt of this specification by signing and returning a copy to us.

| RECEIPT | |
|---|---|
| DATE | |
| RECEIVED | (signature)<br>(name) |

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1. ELECTRICAL CHARACTERISTICS

(This test shall be performed under the conditions of temp.at +25 ± 3°C, Relative Humidity 60% max.)

| | |
|---|---|
| (1) NOMINAL FREQUENCY | 12.000000 MHz |
| (2) OVERTONE ORDER | Fundamental |
| (3) LOAD CAPACITANCE(CL) | 12.0 pF |
| (4) FREQUENCY TOLERANCE | ±20 ppm max. (at +25 ± 3 °C) |
| (5) DRIVE LEVEL | 175 ± 10 μW |
| (6) SERIES RESISTANCE | 80 Ω max. (at Series) |
| (7) OPERATING TEMPERATURE RANGE | -10 ~ +70 °C |
| (8) FREQUENCY CHARACTERISTICS OVER TEMPERATURE | ±30 ppm max. / -10 ~ +70 °C (ref. to +25°C) |
| (9) SHUNT CAPACITANCE | 2.0pF max. |
| (10) INSULATION RESISTANCE | 500MΩ min. / DC 100 ± 15V |
| (11) STORAGE TEMPERATURE RANGE | -40 ~ +85 °C |

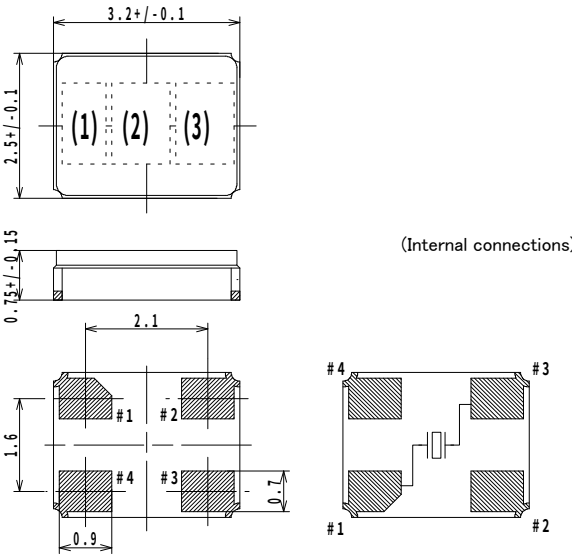
2. CONSTRUCTION

| | |
|---|---|
| (1) DIMENSIONS AND MARKING | Refer to 4. |

3. OTHER SPECIFICATIONS

| | |
|---|---|
| (1) EMBOSS CARRIER TAPE & REEL | Refer to 5. |
| (2) PACKING | Refer to 6. |
| (3) REFLOW CONDITIONS (REFERENCE) | Refer to 7. |
| (4) LAND PATTERN (REFERENCE) | Refer to 8. |
| (5) RELIABILITY SPECIFICATION | Refer to 9. ~ 11. |
| (6) OTHER HANDLING INSTRUCTIONS | Refer to 12. |

4. DIMENSIONS AND MARKING




#1 ,#3 Connected to quartz element
#2 ,#4 Open (unconnected)

Unit : mm
Tolerance : ±0.1

Figure-1

Logo(1) and Nominal Frequency (2) should be printed as follows by producing district

Made in INDONESIA --> Spec. No.: 1C212000BC0AK , Logo : D , Frequency: 12

Made in THAILAND --> Spec. No.: 1N212000BC0AK , Logo : $\overline{D}$ , Frequency: 12

* Made in INDONESIA : Under Bar with D
* Made in THAILAND : Top Bar with D

Nominal Frequency ( 2 ) = Mark two digits from upper decimal point
(ex. 12.000000 MHz ----> 12 )

Manufacturing lot No.( 3 )
(year) ex. 2014 shall be marked as ' 4 ' (The last digit of the year)
(Month) ex. Apr. shall be marked as ' D ' (As shown in Table-1.)

(Table-1.)

| Month | Jan. | Feb. | Mar. | Apr. | May. | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mark | A | B | C | D | E | F | G | H | J | K | L | M |

Plating material of a terminal. : Ni Plating + Au Plating.
A clearance between the soldering terminal portion and a print circuit board side should be less than 0.1mm.

5. EMBOSS CARRIER TAPE & REEL

(1) Dimensions of embossed carrier tape

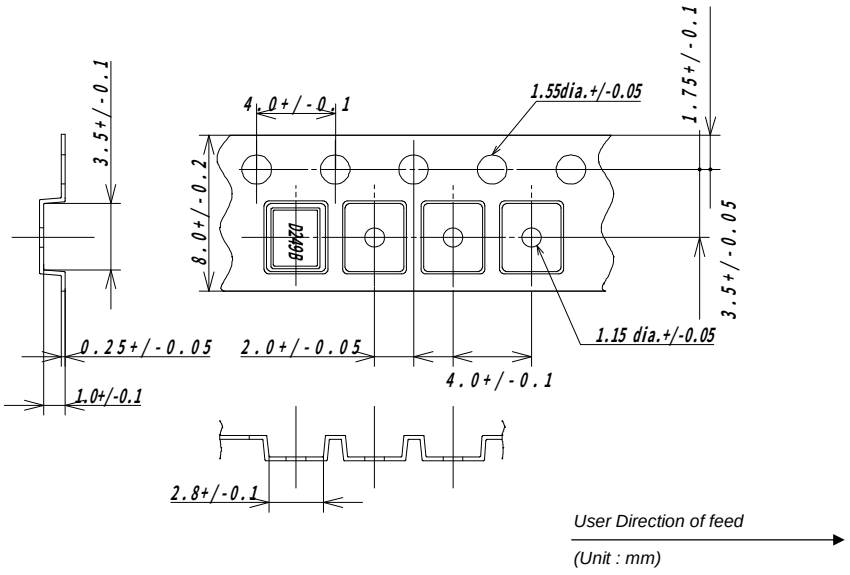



Figure-2

(2) Dimensions of tape reel

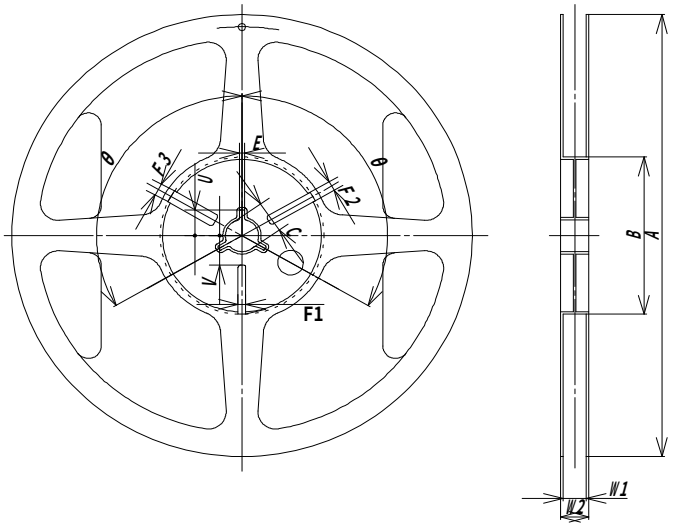



Figure-3

| TITLE<br>DSX321G TYPE QUARTZ CRYSTAL SPECIFICATION | REMARK | | |
|---|---|---|---|
| DATE | SPEC. No. | REV. | PAGE |
| 2014/04/04 | 1C212000BC0AK<br>1N212000BC0AK | | 3 / 12 |

(Unit:mm)

| Item | | | Mark | Dimensions Angle |
|---|---|---|---|---|
| Flange | Diameter | | A | Φ180 +0.0 / -3.0 |
| | Inside of Frange | | W1 | 9.0 ± 0.3 |
| | Outside of Frange | | W2 | 11.4 ± 1.0 |
| | Inside Diameter | | B | Φ60 +1.0-0 |
| Center Core | Center Core Slit | Width | F1 | 3.0 ± 0.2 |
| | | | F2 | 4.0 ± 0.2 |
| | | | F3 | 5.0 ± 0.2 |
| | | Length | V | 11.9 +0.5 / -0.0 |
| | | Angle | θ | 120° |
| | Spindle Diameter | | C | Φ13 ± 0.2 |
| | Key Seats | Width | E | 2.0 ± 0.5 |
| | | Length | U | 10.5 ± 0.4 |
| | | Angle | θ | 120° |

(3) Material of the reel

| | |
|---|---|
| Reel | Polystyrene+Carbon(Black) |
| | Polystyrene(White) |

(4) Storage condition
Temperature : +40 °C max.
Relative Humidity : 80% max.
( It is a guaranteed term because it obtains an excellent soldering: 6 months)

(5) Standard packing quantity

3,000 pcs/reel

(6) Material of the tape

| Tape | Material |
|---|---|
| Carrier tape | Polystyrene+Carbon |
| Cover tape | Polyester |

(7) Label contents

Type
Our specification No.
Your Part No.
Lot No.
Nominal Frequency
Quantity
Our Company Name
Producting Country

Stick a label on the each reel.

(8) Taping dimension

| | | |
|---|---|---|
| Leader | Cover-tape | The length of cover-tape in the leader is more than 400mm including empty embossed area. |
| | Carrier-tape | After all products were packaged, must remain more than twenty pieces or 400mm empty area, which should be sealed by cover-tape. |
| Terminal | Cover-tape | The tip of cover-tape shall be fixed temporary by paper tape and roll around the core of reel one round. |
| | Carrier-tape | The empty embossed area which are sealed by cover-tape must remain more than 40mm. |

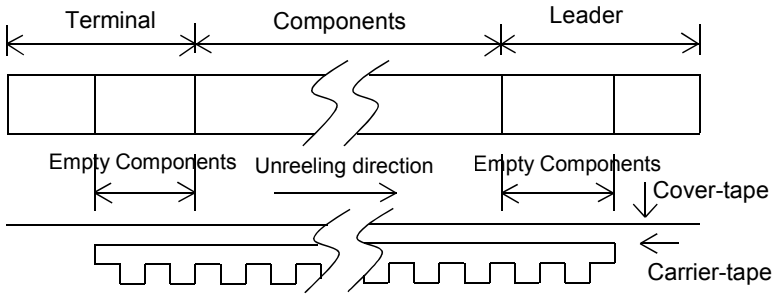



Figure-4

(9) Joint of tape
The carrier-tape and cover-tape should not be jointed.

(10) Release strength of cover tape
It has to between 0.1 ~ 0.7N under following condition.
Pulling direction 165 ~ 180 °
Speed 300mm/min
Otherwise unless specified.

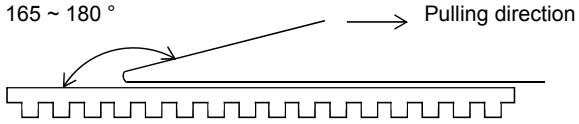
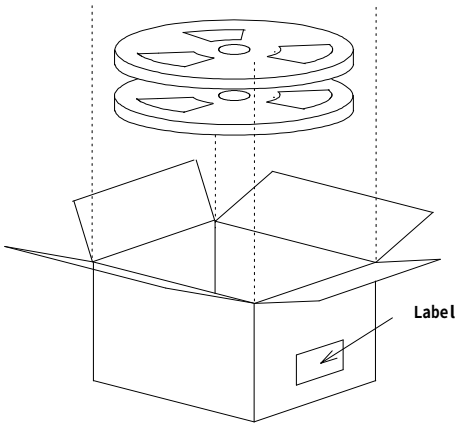



Figure-5

Other standards shall be based on JIS C 0806 $_{-1990}$.

6. PACKING

(1) STORAGE METHOD




Label contents

The type of product
Lot No.
Specification
Quantity
Shipment Day
Remark

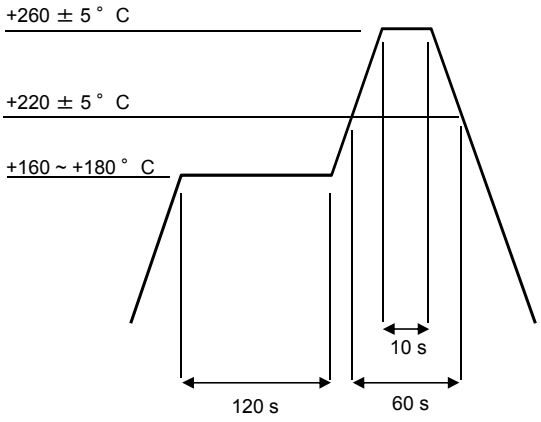
Figure-6

(2) BOX SIZE

From lot size packingsize shall be changed.
In the upper and lower part and the opening in box it shall be protected products using aircushion sheets.

7. REFLOW CONDITIONS (REFERENCE)

During the solder reflow process, please complete within following temperature, period.
Reflow soldering shall be allowed only 2 times.

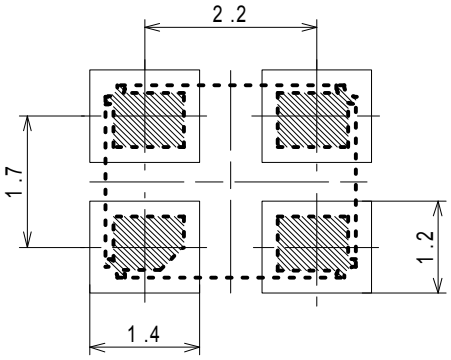



Total time : 240 s max.

Figure-7

HANDSOLDERING METHOD : +350 ± 10 °C , 3+1/-0s Each terminal once
(Please take care so that a soldering iron should not touch a product directly.)

8. LAND PATTERN (REFERENCE)




Unit : mm

Figure-8

| TITLE<br>DSX321G TYPE QUARTZ CRYSTAL SPECIFICATION | REMARK | | |
|---|---|---|---|
| DATE | SPEC. No. | REV. | PAGE |
| 2014/04/04 | 1C212000BC0AK<br>1N212000BC0AK | | 7 / 12 |

9. MECHANICAL ENDURANCE

(1) SHOCK (ACCELERATION)
After the following test,parts shall conform specification 11.C
1000m/s$^2$ by 6ms X,Y,Z each axis (6 directions) , 3cycles

(2) SHOCK (MOUNTING DROP)
After the following test,parts shall conform specification 11.C
3cycles(18times) drop from 150 cm heights to concrete.
Further,parts shall be solderd on substrate, fixed Aluminum materials(about 100g).

| | | |
|---|---|---|
| Substrate materials | : | Glass Epoxy |
| 1 cycle | : | each 1 times of 6 directions |

(3) VIBRATION
After the following test,parts shall conform specification 11.C
and no abnormal appearance shall be observed.

| | | |
|---|---|---|
| Frequency of Vibration | : | 10 ~ 500 ~ 10 Hz |
| Amplitude(p-p) | : | Sine waves of 1.5mm or 100m/s$^2$ |
| Cycle | : | 11min |
| Vibration axis | : | X.Y.Z |
| Vibration period | : | 2 h for each axis |

(4) SEAL
Less than 2.0×10$^{-9}$ Pa m$^3$/s by Helium leak detector.
Also, no serial bubble is observed by Fluorocarbon tests.

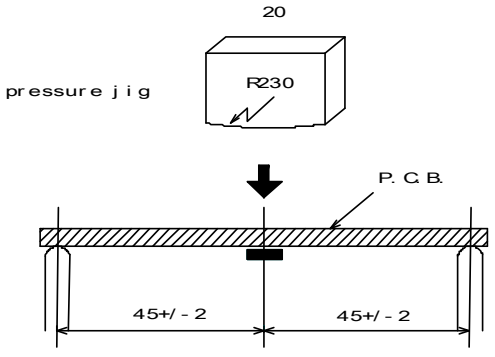
(5) SOLDERABILITY
After the following test, more than 95% of terminal shall be covered by new solder.
3 ± 0.5 s dip in +245 ± 5 °C solder.
(Solder composition : Sn-3Ag-0.5Cu) (Use rosin type flux for solder.)

(6) RESISTANCE TO SOLDERING HEAT (REFLOW)
48 h past at room temperature from following test,parts shall conform specification 11.C
perform the attached Reflow conditions to reference.

(7) RESISTANCE TO SOLDERING HEAT (HAND SOLDERING METHOD)
48 h past at room temperature from following test,parts shall conform specification 11.C
+350 ± 10°C , 3+1/-0s Each terminal once.

(8) SUBSTRATE BENDING
After the following test,parts shall conform specification 11.C
and no abnormality shall be observed in external appearance and sealing
tightnen and others shall be based on ET-7403 of EIAJ.
Mount the specimen on substrate.
Apply the following pressure

| | | |
|---|---|---|
| Direction | : | see right figure |
| Speed | : | about 1.0 mm/s |
| Hours | : | 5 ± 1 s |
| Amount of substrate | : | 3 mm max. |

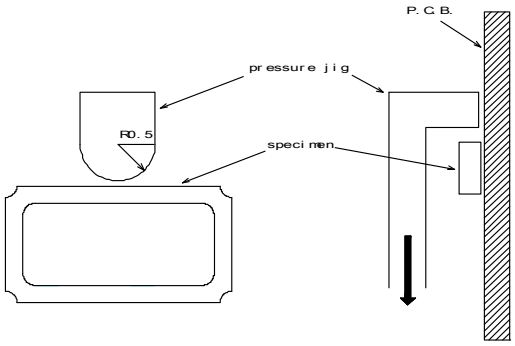


(9) SHEAR

After the following test,parts shall conform specification 11.C
and no abnormality shall be observed in external appearance and sealing
tightness and others shall be based on ET-7403 of EIAJ.

Mount the specimen on substrate.
Apply the following pressure

| | | |
|---|---|---|
| Weight | : | 10 N |
| Hours | : | 10 ± 1 s |
| Direction | : | see right figure |

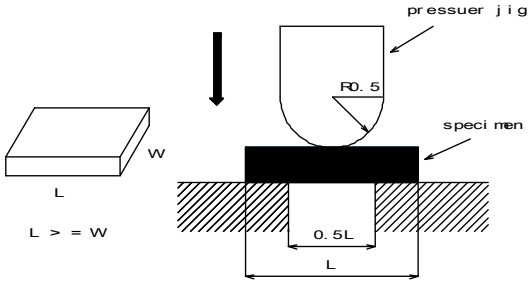



(10) BODY STRENGTH

After the following test,parts shall conform specification 11.C
and no abnormality shall be observed in external appearance and sealing
tightness and others shall be based on ET-7403 of EIAJ.

Mount the specimen on substrate.
Apply the following pressure

| | | |
|---|---|---|
| Presure jig | : | R0.5 |
| Weight | : | 10N |
| Hours | : | 10 ± 1 s |
| Direction | : | see right figure |



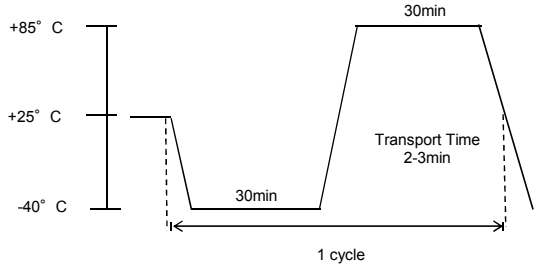
10. ENVIRONMENTAL ENDURANCE

(1) LOW TEMPERATURE
2 h past at room temperature after following test, parts shall conform specification 11.C
240 h , -40 ± 3 °C.

(2) HUMIDITY
2 h past at room temperature after following test, parts shall conform specification 11.D
240 h , +85 ± 2 °C , relative humidity 85 ± 5%.

(3) HIGH TEMPERATURE
2 h past at room temperature after following test, parts shall conform specification 11.D
240 h , +85 ± 2 °C.

(4) TEMPERATURE CYCLE
2 h past at room temperature after 25 cycles of following test, parts shall conform specification 11.D




11. SPECIFICATION

Frequency Variation and Equivalent Resistance shall be within Table below after the reliability test.

| Spec. | Frequency Variation | Equivalent Resistance |
|---|---|---|
| A | ±2ppm | ±15 % or 2.0 Ω max. (Use larger specification) |
| B | ±5ppm | ±15 % or 2.0 Ω max. (Use larger specification) |
| C | ±5ppm | ±20 % or 3.0 Ω max. (Use larger specification) |
| D | ±10ppm | ±20 % or 3.0 Ω max. (Use larger specification) |
| E | ±20ppm | ±25 % or 10.0 Ω max. (Use larger specification) |

12. DSX321G TYPE QUARTZ CRYSTAL HANDLING INSTRUCTIONS

(1) SOLDERING
Please perform the attached Reflow conditions to reference within 2 times.

(2) MOUNT
Crystal products are designed to be compatible with automatic mounting.
Be sure to have a mounting test in advance by using the actual mounting machine and check that the characteristics of the products are not damaged by the automatic mounting.
In the process where the boad is warped, such as board separation process, be careful that the warping does not influence the characteristics and soldering of crystal products.
Since mounting by Ultrasonic welding and processing have a possibility of an excessive vibration spreading inside a crystal resonator and becoming the cause of characteristic deterioration and not oscillating, it does not recommend.
Underfilling Material for DSX321G Types,KDS considers underfilling material such as heat-cured resin would not affect the characteristics of the DSX321G crystal mounted, however, we recommend the crystal be tested and checked in such a case prior to use so that there are the possibility that the crystal may have a cap off or a crack in the ceramic base.

(3) WASHING
About use of the washing liquid of a basin system, an alcoholic system, and a chlorofluorocarbon-replacing material system, it is checking that it is satisfactory.
However please consult in advance about other washing liquid.
Although the check about ultrasonic washing is performed, since it is an examination with a simple substance, the check for the second time by the use state is recommended.

(4) THE CAUTIONS ON USE
The piece of crystal it is processed very smaller than the conventional thing inside DSX321G series crystal unit may be damaged, if excessive excitation electric power is applied.
Please use it below with the value specified on a catalog and specifications.
Please refrain from forming patterns between crystal land pattern's since there is a possibility to cause crack in base.
If the temperature is higher than +280 °C, there is a possibility for the sealing glass to remelt.
Avoid using the product at temperature higher than specified.

(5) HANDLING OF A PRODUCT
DSX321G series has sufficient intensity to fall and vibration.
However when too much shock is added according to a certain cause, the use after a characteristic check is recommended.

(6) STORAGE
Since the soldering nature of a terminal may be degraded, please avoid storage in high temperature and a humid place.
Please keep it in the place which direct rays do not hit and dew condensation does not generate.

# 2014-0416 REVISION RECORD

| Rev.No | Date | Reason | Contents | Approved | Checked | Drawn |
|---|---|---|---|---|---|---|
| - | 2014/04/04 | - | The first edition. | T.Okishio | Y.Maeda | S.Miura |
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