# PRODUCT SPECIFICATION SHEET




| | | | |
|---|---|---|---|
| **Customer** | - | | |
| **Customer P/N** | - | | |
| **Product Type** | Quartz Crystal Resonator | | |
| **Part Number** | 2S16000142 | Version | S0 |
| **Part Description** | SMD X'tal 2.5 x 2.0 | | |
| **Nominal Frequency** | 16.000000MHz | | |

| | |
|---|---|
| **Prepared** | Li Xiang |
| **Reviewed** | Liao Xiaohua |
| **Approved** | Liu Feng |
| **Date** | 2024-10-24 |

**Customer's Approval & Date：**

广东惠伦晶体科技股份有限公司
中国广东省东莞市黄江镇东环路鸡啼岗段68号
68 Donghuan Road, Jitigang Village, Huangjiang, Dongguan, Guangdong Province, P. R. China
WEB : http://www.dgylec.com/
TEL : +86 ( 0 ) 769 - 38879888
FAX : +86 ( 0 ) 769 - 38879889
EMAIL : yl@dgylec.com

RoHS COMPLIANT

Pb Lead-Free

**Moisture Sensitivity Level 1**

FAITH LONG CRYSTAL

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ATTENTION

[1] If you intend to use products on the controlling equipment that relate to medical, aeronautical, aerospace, military science, space and etc., please make sure to let us know your intentions in advance.

[2] Ultrasonic related process may cause damage to crystal blank by resonance itself. If ultrasonic related process is used, we strongly recommend to assess the damage risk under related ultrasonic conditions before use in production.

## 1. History of Specification Revision

| Ver. | Contents | Date | Reviser | Remark |
|---|---|---|---|---|
| S0 | Initial released | 2024-10-24 | Li Xiang | |
| | | | | |
| | | | | |
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FAITH LONG CRYSTAL

## 2. Electrical Specifications

### 2.1 General specification

| # | Parameter | Value/Description | Unit | Remark |
|---|---|---|---|---|
| 1 | Nominal frequency | 16.000000 | MHz | - |
| 2 | Cutting type | AT-cut | - | - |
| 3 | Oscillation mode | Fundamental | - | - |
| 4 | Moisture sensitivity level (MSL) | Level 1 | - | J-STD-020 |
| 5 | ESD | HBM ≥ 2000V | - | ANSI/ESDA/JEDEC JS-001 |

### 2.2 Operation conditions

| # | Parameter | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| 1 | Operating temperature | -40 | - | +85 | °C | - |
| 2 | Storage temperature | -55 | - | +125 | °C | - |
| 3 | Load capacitance ($C_L$) | - | 12 | - | pF | - |
| 4 | Drive level | - | 50 | - | μW | - |

### 2.3 Frequency stability & electrical parameters

| # | Parameter | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| 1 | Initial frequency tolerance | -10 | - | +10 | ppm | At 25±3°C and specific load, refer to nominal frequency |
| 2 | Frequency stability | -20 | - | +20 | ppm | Within operating temperature range, refer to frequency at 25°C |
| 3 | Frequency aging (First year) | -3 | - | +3 | ppm | At 25±3°C |
| 4 | Equivalent series resistance (ESR) | - | - | 90 | ohms | - |
| 5 | Shunt capacitance (C0) | - | - | 5 | pF | - |
| 6 | Insulation resistance | 500 | - | - | M-ohms | At DC 100V |

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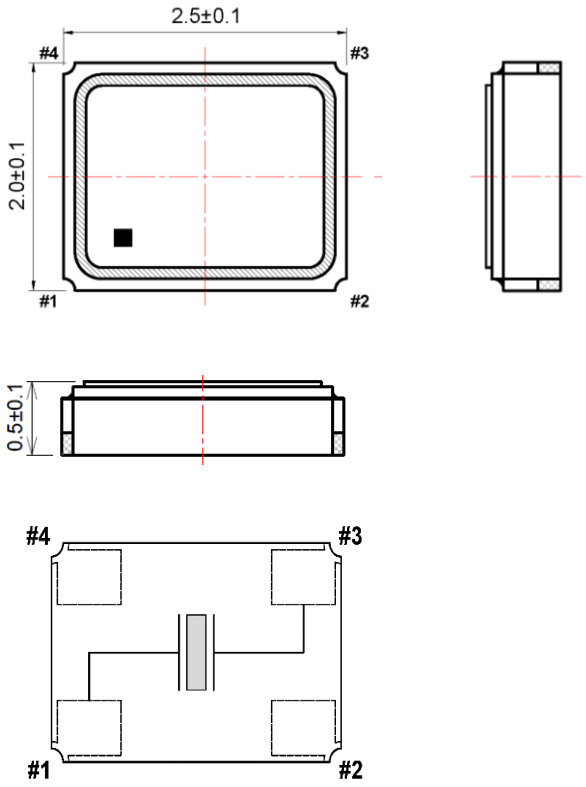
**Measure equipment:** Electrical characteristics is measured by S&A 250B or equivalent.

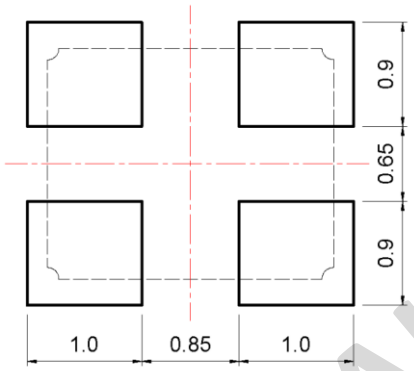
**Standard atmospheric conditions:**

Unless otherwise specified, the standard environmental conditions for performance measurement and tests are under ambient temperature at (25±3)°C and relative humidity: 40% to 70%.

## 3. Product Design

### 3.1 Package dimensions and pad functions (Unit : mm)



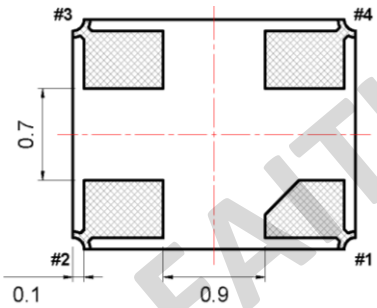




Unit : mm

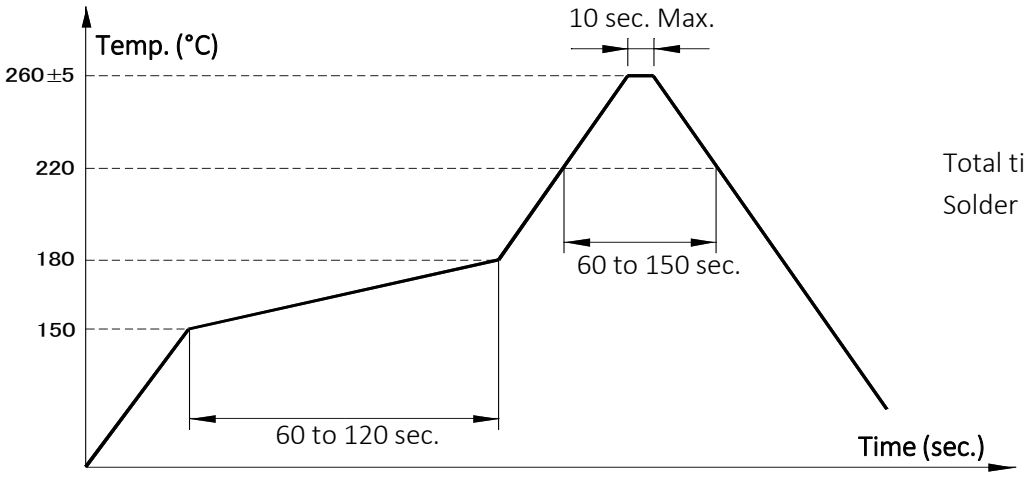
Tolerance unless otherwise specified: ±0.1mm.

| Pad | Function |
|---|---|
| #1 | X'tal terminal (Input/output) |
| #2 | GND terminal |
| #3 | X'tal terminal (Input/output) |
| #4 | GND terminal |

### 3.2 Recommended land pattern (Unit : mm)




### 3.3 Recommended reflow profile



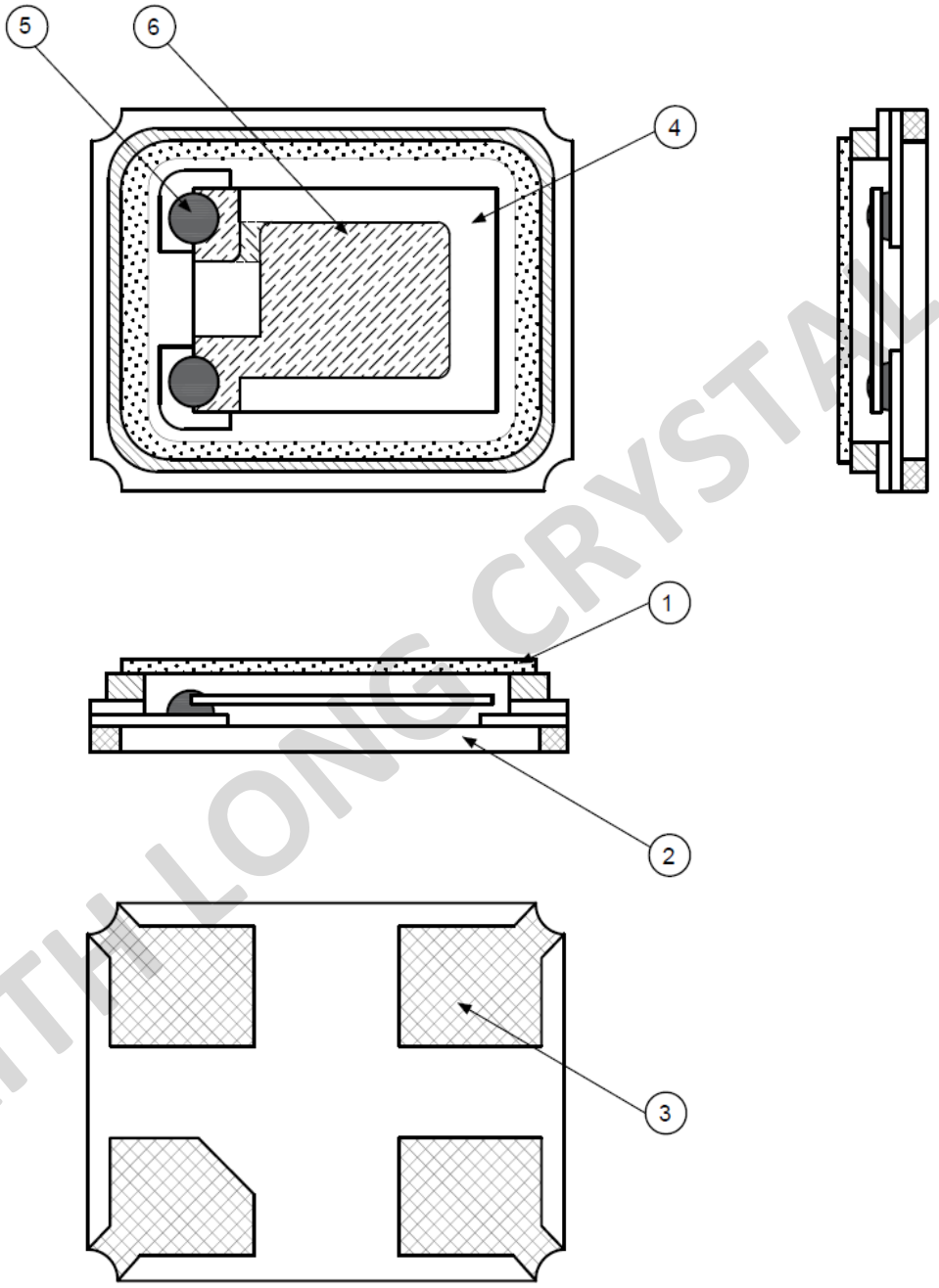

Total time : 360 sec. Max.

Solder melting point : 225°C

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## 3. Product Design (Cont.)

### 3.4 Illustration to product structure




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| # | Components | Materials | Finish |
|---|---|---|---|
| 1 | Cap (Lid) | Kovar (Fe-Co-Ni) | Ni plating |
| 2 | Base (Package) | Almina ceramics ($Al_2O_3$) | - |
| 3 | Pad (Package) | Ni + Au | Ni + Au plating |
| 4 | Crystal blank | $SiO_2$ | - |
| 5 | Conductive adhesive | Ag | Silicone resin |
| 6 | Electrode | Noble metal | - |

## 4. Reliability

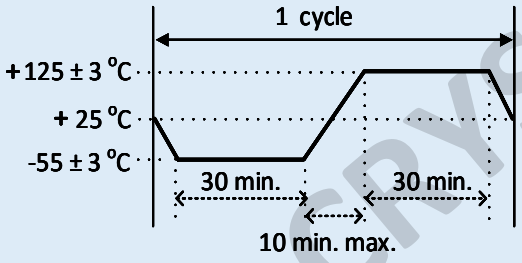
### 4.1 Mechanical endurance

| # | Item | Test Condition | Reference |
|---|---|---|---|
| 1 | Drop test | 150cm height, fall freely onto hard board 3 times | JIS C6701 |
| 2 | Mechanical shock | Specimen is shocked to half sine wave, 1000 g, 0.5msec duration along three mutually perpendicular axes (±X, ±Y, and ±Z). Each direction for 3 shocks (total 18 shocks). | MIL-STD-202 Method 213 |
| 3 | Vibration | Frequency range (10 to 55) Hz<br>Amplitude 1.52 mm<br>Test time of each perpendicular axis 2 hours (±X, ±Y, and ±Z)<br>Total test time 6 hours | MIL-STD-202 Method 201 |
| 4 | Gross leak | Standard sample for automatic gross leak detector test pressure 2kg/cm$^2$ | MIL-STD-883 Method 1014 |
| 5 | Fine leak | Helium bombing 5.0kg/cm$^2$ for 2 hours | MIL-STD-883 Method 1014 |
| 6 | Solderability | Temperature (245 ± 5 )°C<br>Immersing depth 0.5 mm minimum<br>Immersion time (5 ± 1) sec.<br>Flux Rosin resin methyl alcohol solvent (1 : 4) | J-STD-002 |
| 7 | Resistance to soldering heat | Test temperature (260 ± 5 )°C<br>Test time (10 ± 1) sec. | MIL-STD-202 Method 210 |

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## 4. Reliability (Cont.)

### 4.2 Environmental endurance

| # | Item | Test Condition | Reference |
|---|---|---|---|
| 1 | High temperature storage (Aging) | +125 °C ± 3 °C for 500 hours | MIL-STD-202 Method 108 |
| 2 | Low temperature storage | -40 °C ± 3 °C for 500 hours | IEC 60068-2-1 |
| 3 | Thermal shock | Total 100 cycles of the following temperature cycle   | MIL-STD-883 Method 1011.9 |
| 4 | High temperature & humidity | +85°C ±3°C, RH 85%, 500 hours | JIS C5023 |
| 5 | High temperature operating life | 1000 hours at +85°C with $V_{DD}$ applied | MIL-STD-202 Method 108 |

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## 5. Marking and Packing

### 5.1 Marking definition

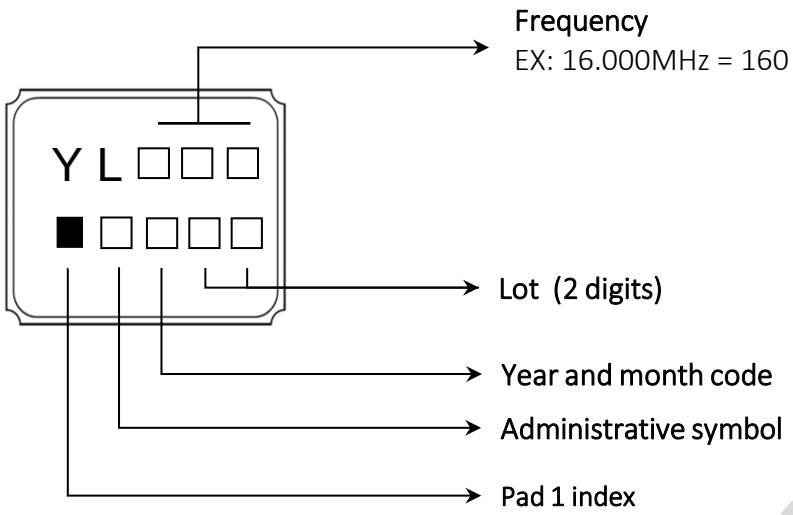
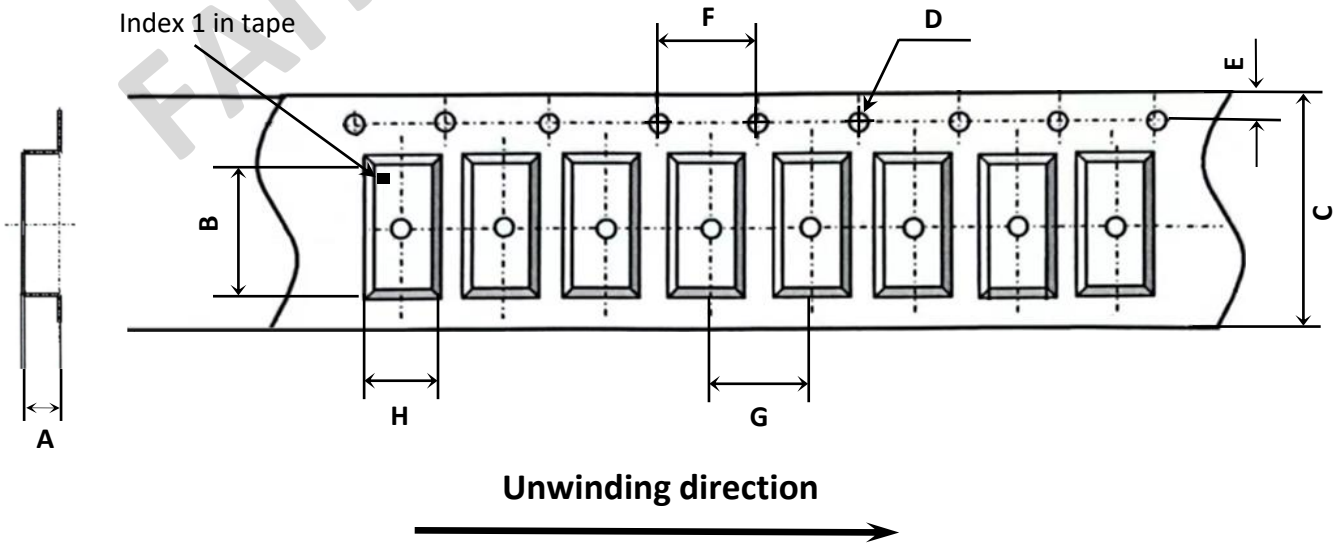



Table of Year and Month code

| Year \ Month | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2021 | 2025 | A | B | C | D | E | F | G | H | J | K | L | M |
| 2022 | 2026 | N | P | Q | R | S | T | U | V | W | X | Y | Z |
| 2023 | 2027 | a | b | c | d | e | f | g | h | j | k | l | m |
| 2024 | 2028 | n | p | q | r | s | t | u | v | w | x | y | z |

### 5.2 Packing (EIA-481-2)

8mm-4mm，3000pcs / reel，ϕ178；

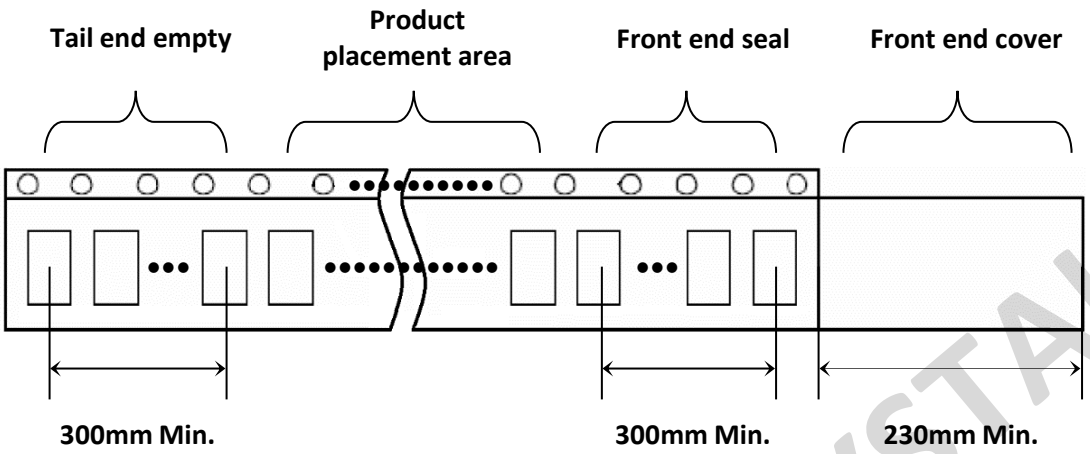



| Tape dimension (Unit : mm) | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H |
| 0.80±0.1 | 2.70±0.1 | 8.0±0.3 | 1.55±0.05 | 1.75±0.1 | 4.00±0.02 | 4.00±0.1 | 2.25±0.1 |

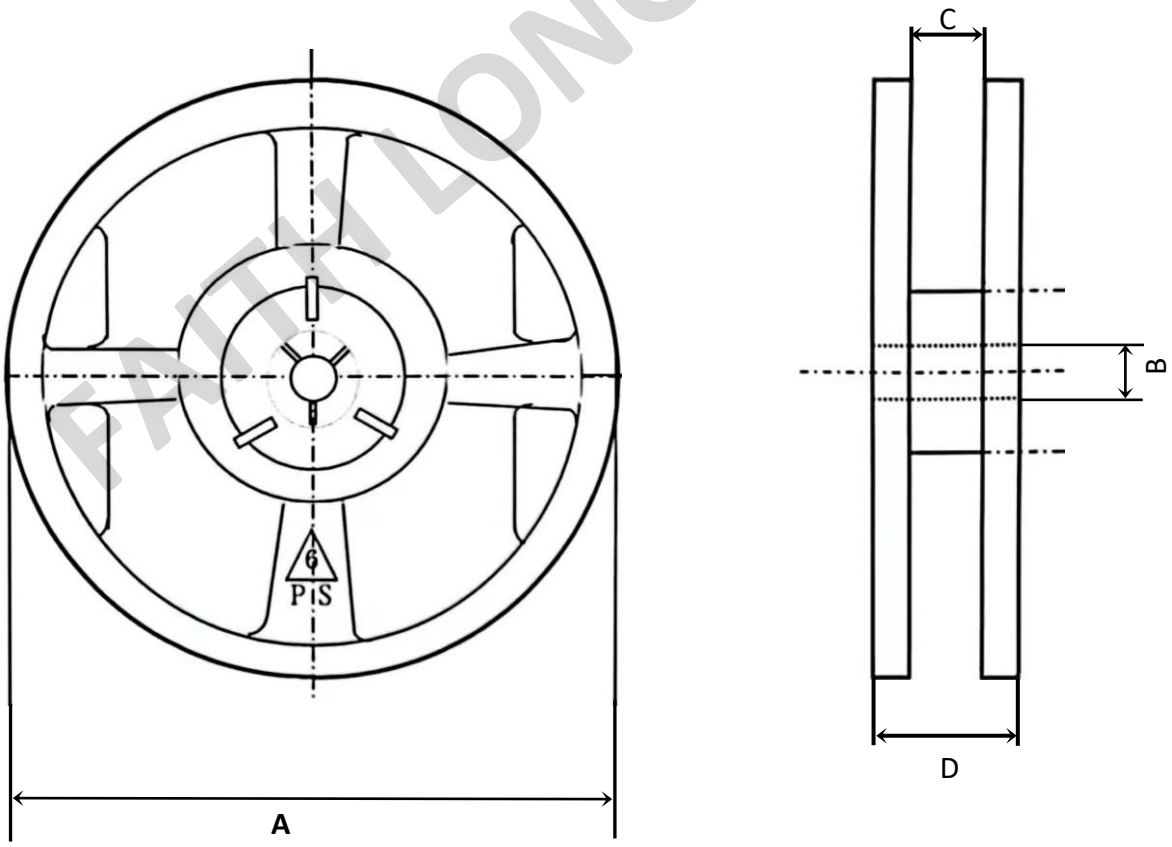
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5. Marking and Packing (Cont.)

5.2 Packing (EIA-481-2) (Cont.)




Unwinding direction




3,000 pcs/reel

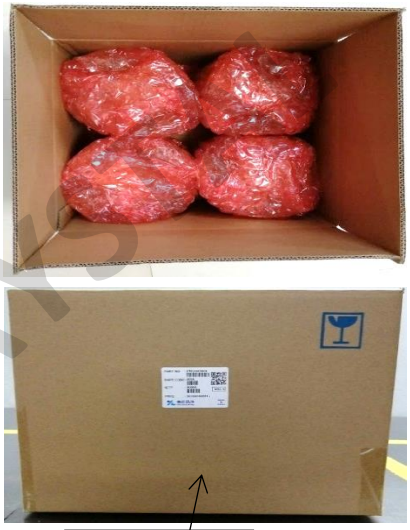
| Reel dimension (Unit : mm) | | | |
|---|---|---|---|
| A | B | C | D |
| 178±2.0 | 13.2±0.5 | 9.0±0.5 | 11.5±1.4 |

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## 5. Marking and Packing (Cont.)

### 5.3 SMD product packing standard

Out-going packing instruction

| Reel packing | Inner packing | Carton |
|---|---|---|
| Name: reel<br>Standard: diameter 18cm<br>Material: plastics | Name: bubble wrap<br>Standard: 430×330×20mm<br>Material: HDPE<br>Quantity: 15 reels | Name: carton<br>Standard: 400×400×280mm<br>Material: AB corrugated paper<br>Quantity: 4 bags |
| <br>Label L1 |  | <br>Label L2 |

The label instruction

| Label drawing | Mark | Name of article | Items | Size | Printing |
|---|---|---|---|---|---|
|  | L1 | Bar code label<br>(Chintz paper) | 1. Part No.<br>2. Lot No.<br>3. Q'ty<br>4. Freq | 70x50mm | White |
|  | L2 | Bar code label<br>(Chintz paper) | 1. Part No.<br>2. Date Code<br>3. Q'ty<br>4. Freq | 70x50mm | White |

Remark: The above instruction of label drawing is used for template and may vary with different product specifications . If customer has specified requirements for labels packaging, please provide the operation procedure.

Product storage conditions:

[1] Temperature: 15 to 35°C.

[2] Humidity: 30 to 70% RH.

[3] Time: within 6 months after delivery.

[4] Please store the products in a dry, clean, well-ventilated area and avoid direct sunlight exposure, heat, and vibration.

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## 6. Environmental substance

| # | Banned substances | Max. concentration (ppm; mg/kg) | |
|---|---|---|---|
| | | Products | Packing |
| 1 | Cadmium (Cd) and cadmium compounds<br>镉及镉化合物 | 100 | 100 |
| 2 | Lead (Pb) and lead compounds<br>铅及铅化合物 | 1,000 | 100 |
| 3 | Mercury (Hg) and mercury compounds<br>汞及汞化合物 | 1,000 | 100 |
| 4 | Hexavalent-chromium VI (Cr+6)<br>六价铬化合物 | 1,000 | 100 |
| 5 | Polybrominated biphenyls (PBBs)<br>聚溴联苯 PBB | 1,000 | N/A |
| 6 | Polybrominated diphenyl ethers (PBDEs)<br>聚溴二苯醚 PBDE | 1,000 | N/A |
| 7 | Di (2-ethylhexyl) phthalate (DEHP)<br>邻苯二甲酸二(2-乙基己基)酯 DEHP | 1,000 | N/A |
| 8 | Butyl benzyl phthalate (BBP)<br>邻苯二甲酸丁苄酯 BBP | 1,000 | N/A |
| 9 | Dibutyl phthalate (DBP)<br>邻苯二甲酸二丁酯 DBP | 1,000 | N/A |
| 10 | Diisobutyl Phthalate (DIBP)<br>邻苯二甲酸二异丁酯 DIBP | 1,000 | N/A |
| 11 | Fluorine (F), Chlorine (Cl), Bromine (Br), Iodine (I)<br>氟(F)、氯(Cl)、溴(Br)、碘(I) | 900, 900, 900, 900<br>Note : Br + Cl < 1,000 | N/A |
| 12 | Heavy metals (Hg, Cd, PB, Cr+6, PBBs and PBDEs) in packing materials<br>包装材料中重金属(汞、镉、六价铬、铅、PBB、PBDE)之总量 | N/A | 100<br>铅(Pb) + 镉(Cd) + 汞(Hg) + 六价铬(Cr+6) <100ppm |
| 13 | (SVHC) Substances of very high concern<br>高度关注物质 | 1,000 | N/A |

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