# PRODUCT SPECIFICATION SHEET




PRELIMINARY DATASHEET

| | | | |
|---|---|---|---|
| **Customer** | - | | |
| **Customer P/N** | - | | |
| **Product Type** | Quartz Crystal Resonator | | |
| **Part Number** | 9Y16000003 | **Version** | S0 |
| **Part Description** | SMD X'tal 2.0 x 1.6 | | |
| **Nominal Frequency** | 16.000000MHz | | |

| | |
|---|---|
| **Prepared** | Li Xiang |
| **Reviewed** | Liao Xiaohua |
| **Approved** | Liu Feng |
| **Date** | 2024/8/9 |

**Customer's Approval & Date：**

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MSL1 Moisture Sensitivity Level

Pb Lead-Free

RoHS Compliant

AEC-Q200 Qualified

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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 | 2024/8/9 | Li Xiang | |
| | | | | |
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## 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 | -40 | - | +125 | °C | - |
| 3 | Load capacitance ($C_L$) | - | 6 | - | pF | - |
| 4 | Drive level | - | 10 | 100 | 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 | -30 | - | +30 | 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) | - | - | 120 | ohms | - |
| 5 | Shunt capacitance (C0) | - | - | 3 | pF | - |
| 6 | Insulation resistance | 500 | - | - | M-ohms | At DC 100V |

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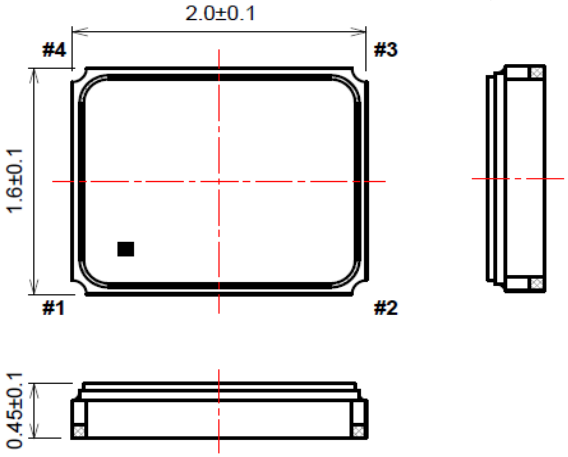
**Measure equipment:** Electrical characteristics is measured by S&A 250B or equivalent.

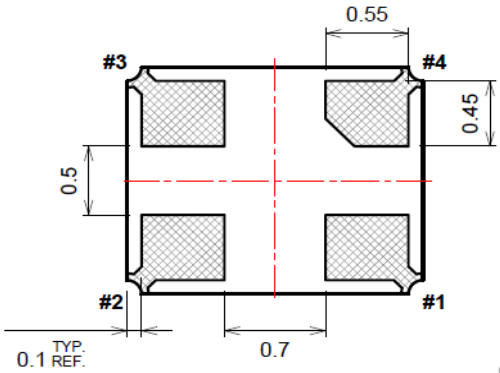
**Standard atmospheric conditions:**

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

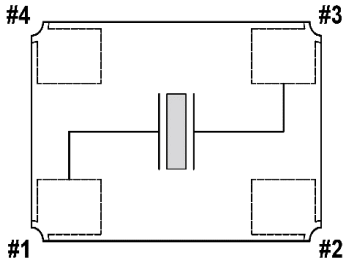
### 3.1 Package dimensions and pad functions (Unit : mm)



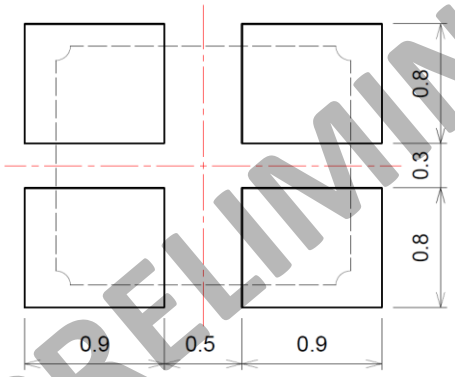

Unit : mm

Tolerance unless otherwise specified: ±0.1mm.



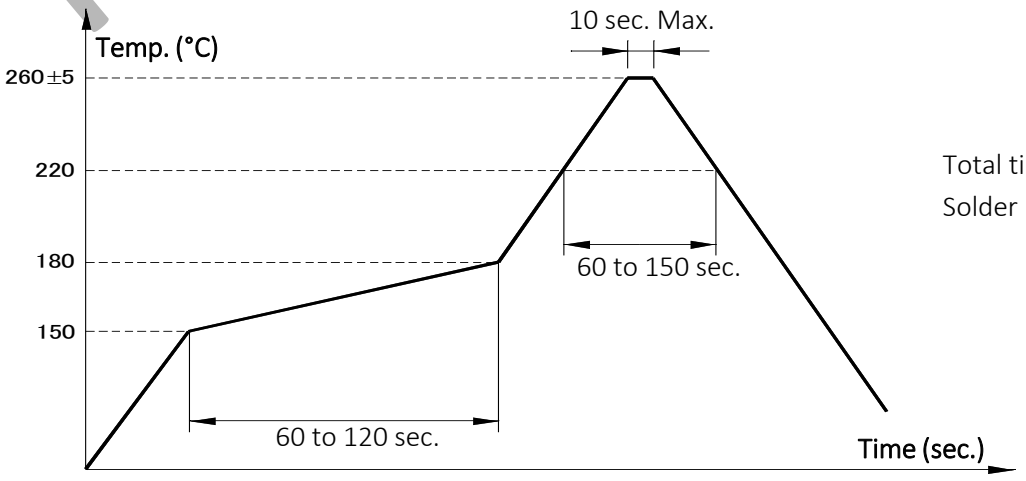

| Pad | Function |
|---|---|
| #1 | X'tal terminal (Input/output) |
| #2 | GND terminal |
| #3 | X'tal terminal (Input/output) |
| #4 | GND terminal |

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




Unit : mm

### 3.3 Recommended reflow profile



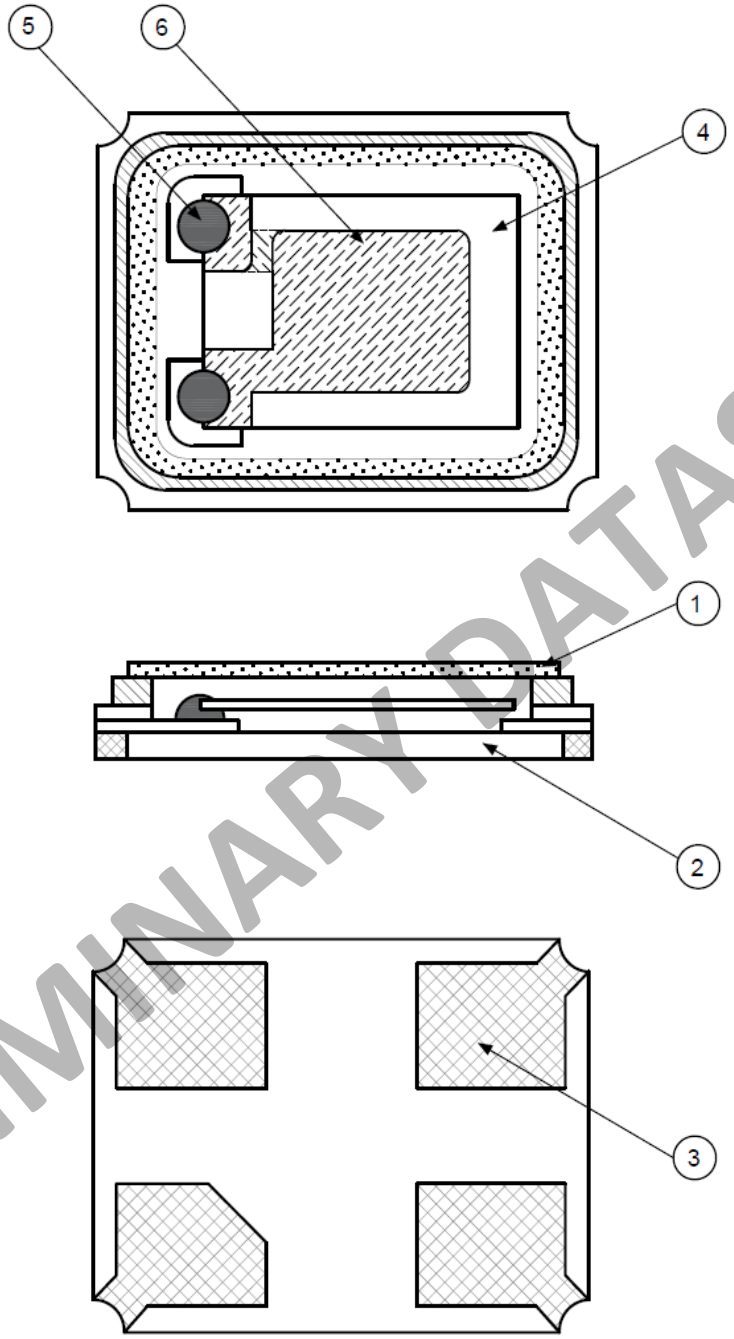

Total time : 360 sec. Max.

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

Test items and conditions

| # | Item | Test Condition | Reference |
|---|---|---|---|
| 1 | High temperature exposure (storage) | 1000 hours, unpowered.<br>Tested at maximum specified operating temperature or maximum specified storage temperature (whichever is higher). | AEC-Q200 Test 3<br>MIL-STD-202<br>Method 108 |
| 2 | Temperature cycling | 1000 cycles, unpowered.<br>Lower temperature of the chamber: -55°C.<br>Upper temperature of the chamber: maximum specified operating temperature and shall not exceed 85°C.<br>Dwell time (soak time): 30 minutes.<br>Transition time: 1 minute maximum. | AEC-Q200 Test 4<br>JESD22-A104 |
| 3 | Humidity bias | 1000 hours. 85°C/85%RH with $V_{DD}$ applied. | AEC-Q200 Test 7<br>MIL-STD-202<br>Method 103 |
| 4 | High temperature operating life | 1000 hours, with $V_{DD}$ applied.<br>Temperature of the chamber: maximum specified operating temperature up to 150°C. | AEC-Q200 Test 8<br>MIL-STD-202<br>Method 108 |
| 5 | External visual | Inspect device construction, marking and workmanship.<br>Pre and post electrical test not required. | AEC-Q200 Test 9<br>MIL-STD-883<br>Method 2009 |
| 6 | Physical dimensions | Verify physical dimensions to the applicable component specification.<br>Pre and post electrical test not required. | AEC-Q200 Test 10<br>JESD22-B100 |
| 7 | Mechanical shock | Condition C, 100g's, 6 msec., half-sine, three shocks in each direction along the three mutually perpendicular axes. | AEC-Q200 Test 13<br>MIL-STD-202<br>Method 213 |
| 8 | Vibration | Test from 10 Hz to 2000 Hz.<br>5g's for 20 minutes.<br>12 cycles each of 3 orientations. | AEC-Q200 Test 14<br>MIL-STD-202<br>Method 204 |
| 9 | Resistance to soldering heat | Condition K, time above 217 °C , 60 sec. to 150 sec., reflow 3 cycles. | AEC-Q200 Test 15<br>MIL-STD-202<br>Method 210 |

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## 4. Reliability (Cont.)

Test items and conditions (Cont.)

| # | Item | Test Condition | Reference |
|---|---|---|---|
| 10 | Solderability | Method B1, Coating Durability Category 2.<br>Method D, Coating Durability Category 2.<br>Pre and post electrical test not required. | AEC-Q200 Test 18<br>J-STD-002 |
| 11 | Electrical characterization | Summary to show minimum, maximum, mean and standard deviation at room, minimum and maximum operating temperatures.<br>Pre and post electrical test not required. | AEC-Q200 Test 19<br>Product specification sheet |
| 12 | Board flex (SMD) | Board bending displacement: 2.5 mm, holding time: 60 sec. | AEC-Q200 Test 21<br>AEC-Q200-005 |
| 13 | Terminal strength (SMD) | Force: 1.8 kg, holding time: 60 sec. | AEC-Q200 Test 22<br>AEC-Q200-006 |

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## 5. Marking and Packing

### 5.1 Marking definition

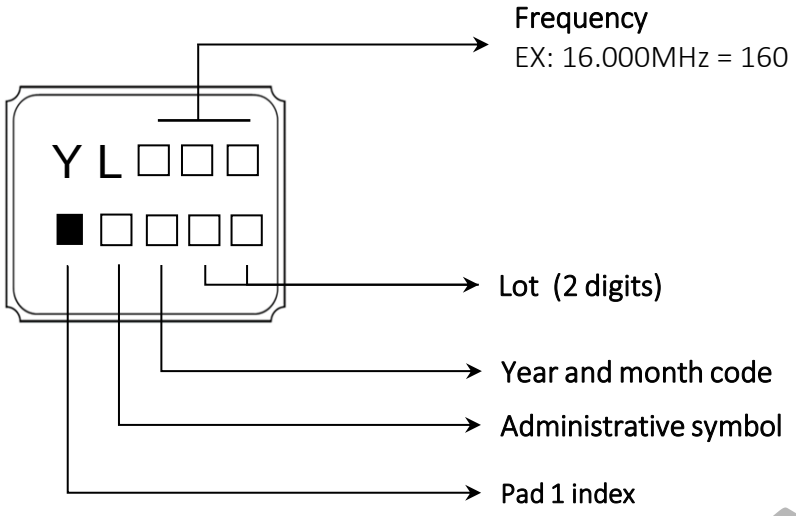
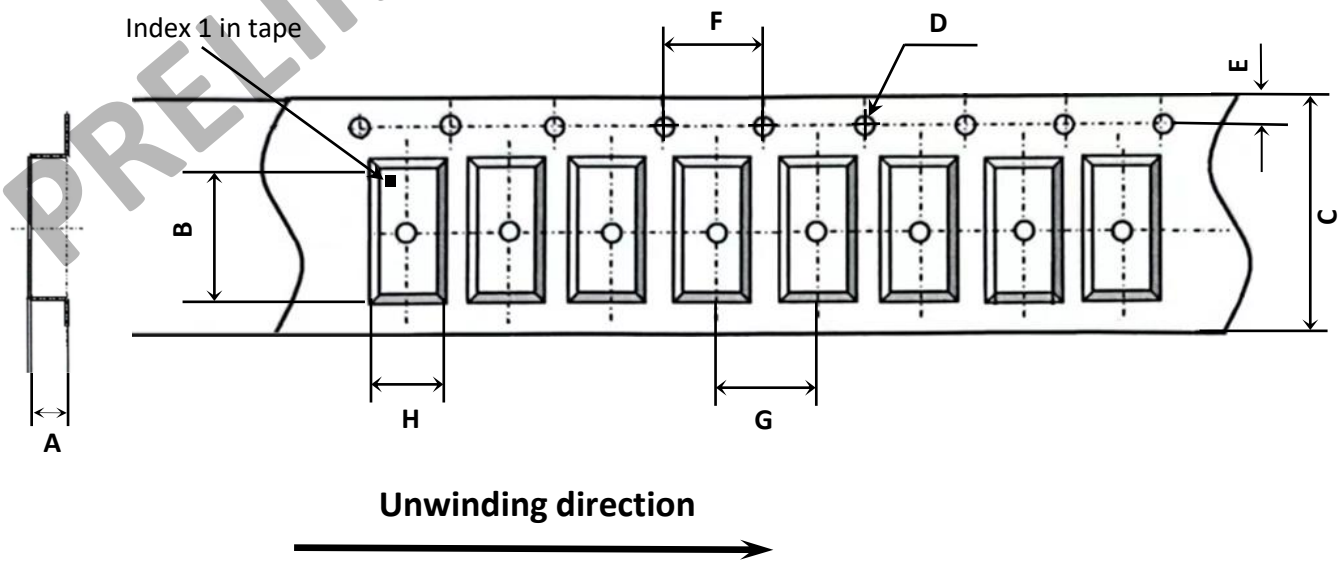



Table of Year and Month code

| 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；

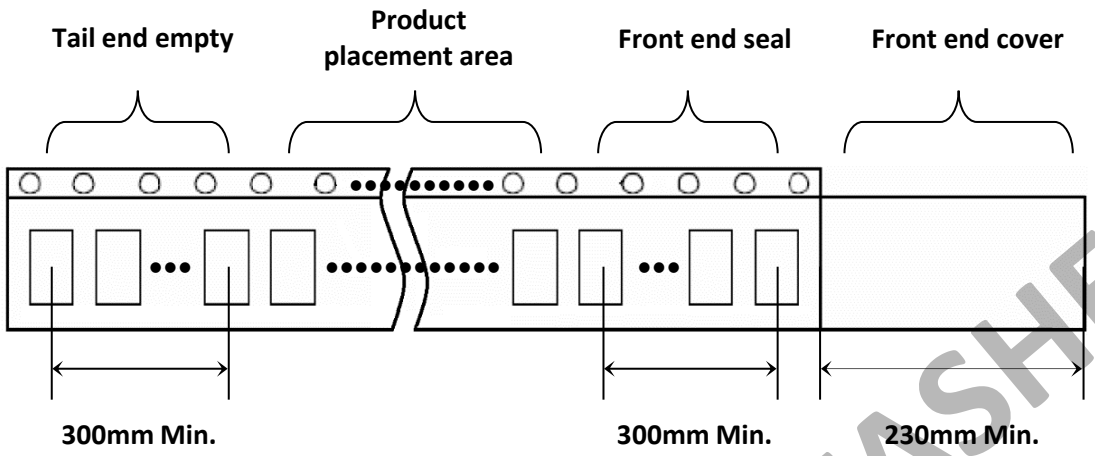


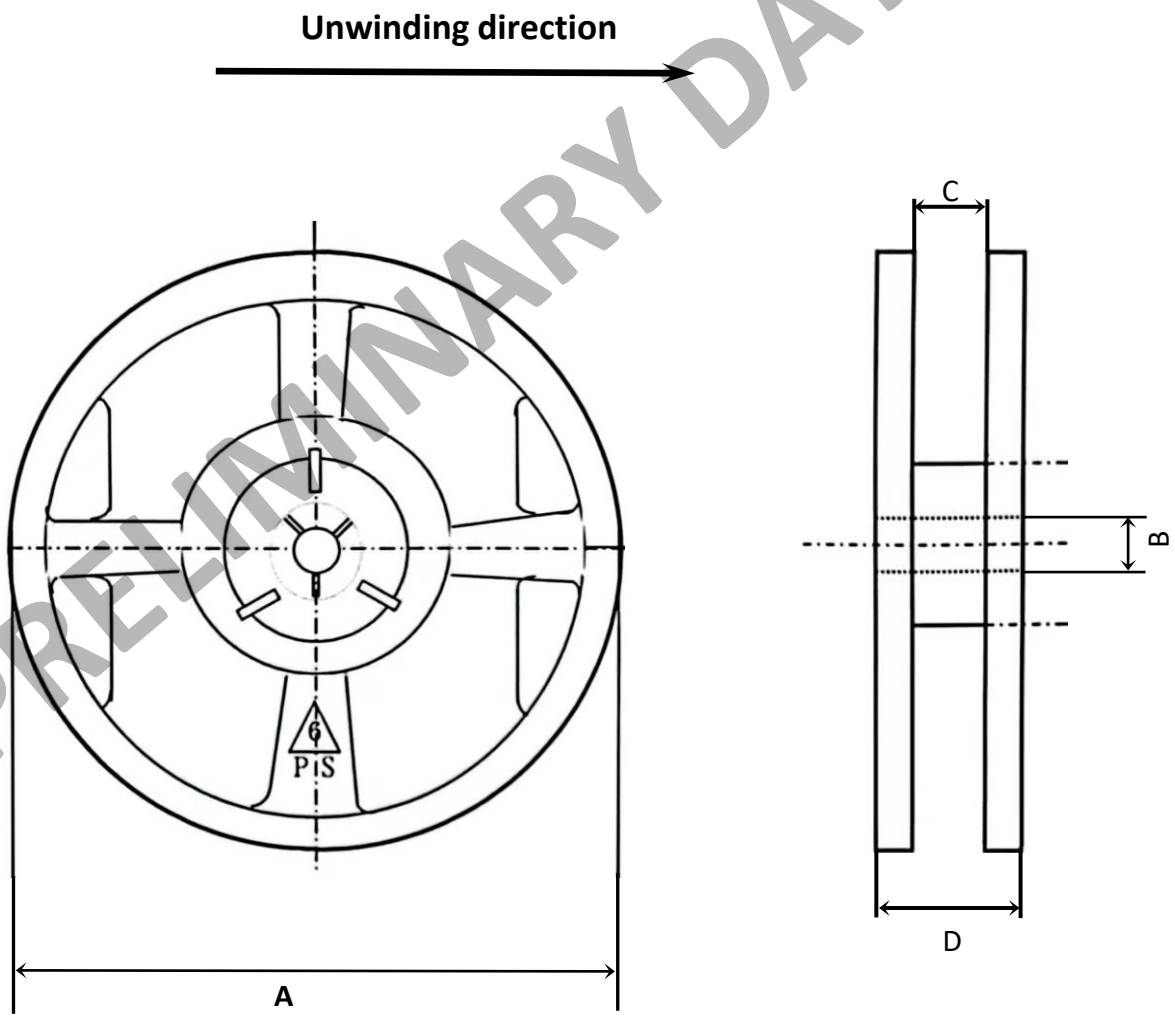

| Tape dimension (Unit : mm) | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H |
| 0.65±0.1 | 2.3±0.1 | 8.0±0.3 | 1.55±0.05 | 1.75±0.1 | 4.00±0.2 | 4.00±0.1 | 1.90±0.1 |

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5. Marking and Packing (Cont.)

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




3,000 pcs/reel

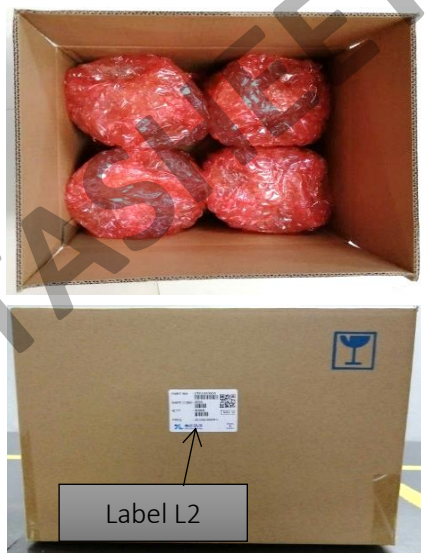
| Reel dimension (Unit : mm) | | | |
|---|---|---|---|
| A | B | C | D |
| 178±2.0 | 13.2±0.5 | 9.0±0.5 | 11.5±1.4 |

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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 |
|  |  |  |

The label instruction

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