广东惠伦晶体科技股份有限公司
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# PRODUCT SPECIFICATION SHEET

| | | |
|---|---|---|
| CUSTOMER | : | |
| PRODUCT TYPE | : | OSC 2.0X1.6 (4PAD) |
| NOMINAL FREQ. | : | 24.000000 MHz |
| FL P/N | : | 9L24000008 |
| REVISION | : | S0 |
| CUSTOMER P/N | : | |

CUSTOMER'S APPROVAL&DATE

FL CORPORATION

| APPROVED | CHECKED | DESIGNED |
|---|---|---|
| Xing Yue | Huang Ji Ning | Li Xiang |

MSL1

RoHS Compliant

AEC-Q100 Certified

**CONTENTS** **PAGE**


- SPECIFICATION REVISION RECORD SHEET 2
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**ATTACHMENT（optional）**

- ELECTRICAL CHARACTERISTICS TEST A ☐ YES ☑ NO
- TEMPERATURE CHARACTERISTICS TEST B ☐ YES ☑ NO

**Attention**

- 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.
- 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.

## SPECIFICATION REVISION RECORD SHEET

| Rev. | Revise page | Revise Contents | Date | Ref. No. | Reviser |
|---|---|---|---|---|---|
| S0 | N/A | Initial released | 20-Jul-23 | N/A | Li Xiang |
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## ELECTRICAL SPECIFICATIONS

**Standard atmospheric conditions**

Unless otherwise specified. The standard range of atmospheric conditions for making measurement and tests are as follow:

Ambient temperature 25±2℃
Relative humidity 40%~70%

If there is no doubt the results, measurement shall be made within the following limits:

Ambient temperature 25±2℃
Relative humidity 40%~70%

**Measure equipment**

Electrical characteristics measured by S&A 280B or equivalent.

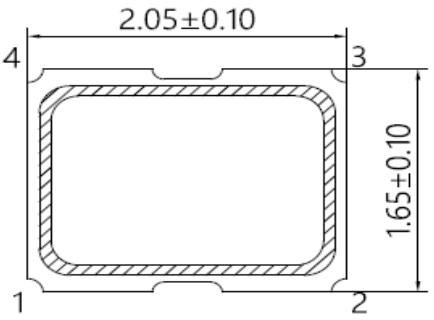
**Crystal cutting type**

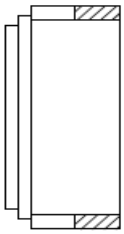
The crystal is using AT CUT (thickness shear mode)

**ELECTRICAL SPECIFICATIONS**

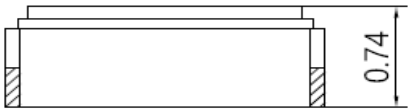
| Parameters | Symbol | Electrical Spec. | UNITS | Notes |
|---|---|---|---|---|
| Nominal Frequency | FL | 24.000000 | MHz | - |
| Operating Temperature | TOPR | -40 ~ +125 | ℃ | - |
| The Total Frequency Offset | - | +/-50 | ppm | - |
| Output Load | CL | 15.0 | p F | Max. |
| Supply Voltage | VDD | 1.71~3.63 | V | 3.3V typ |
| “0”Level | VOL | VDD×0.1 | V | Max. |
| “1”Level | VOH | VDD×0.9 | V | Min. |
| Enable High Voltage | ELH | VDD×0.7 | V | Min. |
| Enable Low Voltage | ELL | VDD×0.3 | V | Max. |
| Symmetry of Wave Form | Symmetry | 45~55% | | - |
| Current Consumption | IDD | 4.0 | mA | Max. |
| Rise and Fall Time | Tr,Tf | 2.7 | nSec | Max. |
| Start time | tosc | 5.0 | mSec | Max. |
| Aging | - | +/-5 | ppm | 1st Year |
| Storage Temperature Range | - | -55 ~ +125 | ℃ | - |
| Output waveform | | CMOS | | |
| ESD | - | HBM＞2000V | - | JESD22-A114-B |
| MSL | - | Level 1 | - | IPC/JEDEC J-STD-033C |

## DIMENSIONS



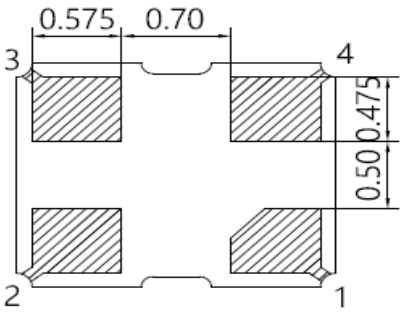



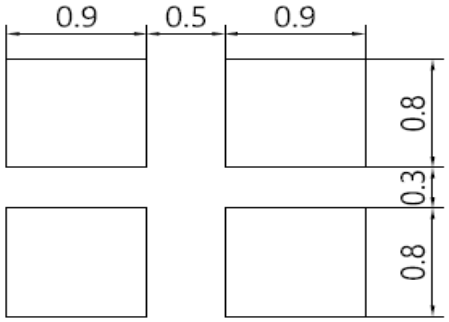
PAD FUNCTION
1: ENABLE CONTROL
2: GND
3: OUT
4: VDD



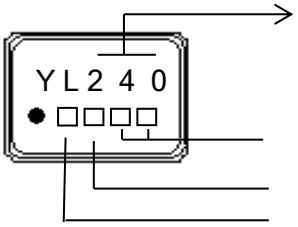

Enable Control

| Pad 1 Input | Pad 3 Output |
|---|---|
| Level High or Open | Normal Operation |
| Level Low | Stopped |




## MARKING



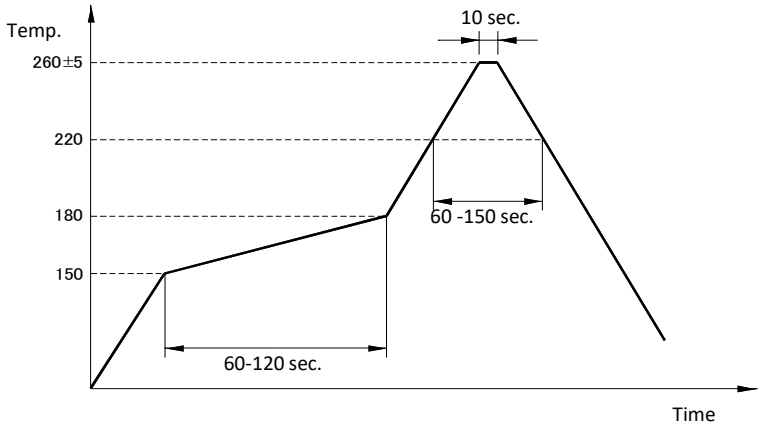

**Frequency**
**Ex：240=24.000MHz**

**Lot （2 digits）**
**Year Month Code**
**Administrative Symbol**

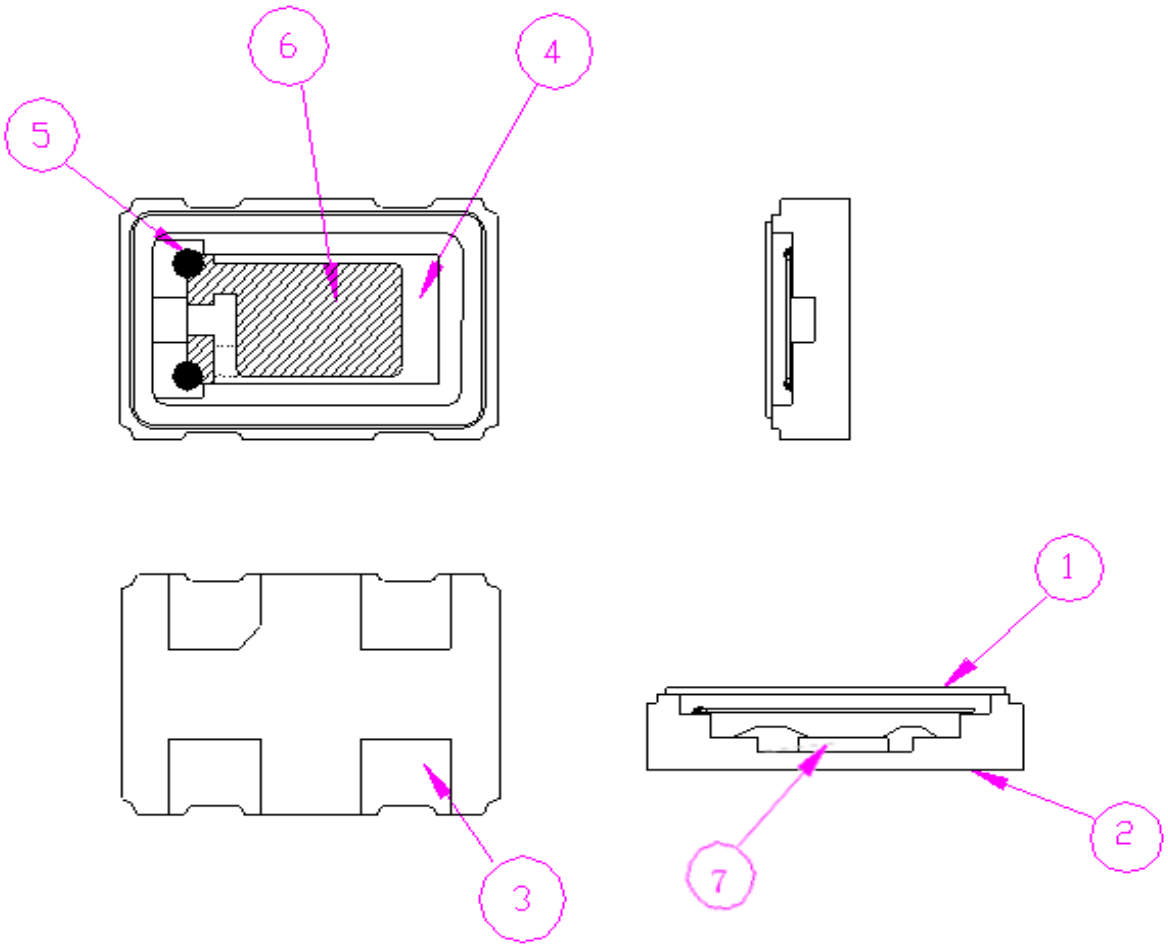
| year \ month | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2021 | 2025 | A | B | C | D | E | F | G | H | J | K | L | M |
| 2022 | 2026 | N | P | Q | R | S | T | U | V | W | X | Y | Z |
| 2023 | 2027 | a | b |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

## SUGGESTED REFLOW PROFILE

Total time : 360 sec. Max.
Solder melting point : 225 °C



## STRUCTURE ILLUSTRATION




| NO | COMPONENTS | MATERIALS | QTY | FINISH/SPECIFICATIONS |
|---|---|---|---|---|
| 1 | Cap (Lid) | Metal (Fe) | 1 | - |
| 2 | Base (Package) | Ceramic ($Al_2O_3$) | 1 | Alumina ceramics |
| 3 | Pad (Package) | Au | 4 | Tungsten metalize<br>+Ni plating<br>+Au plating |
| 4 | Crystal blank | $SiO_2$ | 1 | - |
| 5 | Conductive adhesive | Ag | 4 | Silicone resin |
| 6 | Electrode | Noble metal | 2 | - |
| 7 | IC | Silicon (Si) | 1 | - |

## RELIABILITY SPECIFICATIONS

Based on AEC-Q100 Rev. H

| No. | Item | Stress and Test Condition | Reference |
|---|---|---|---|
| 1 | Preconditioning | MSL1, bake 125°C 24 hours, 85°C/85% RH 168 hours, reflow x3 times. | JEDEC J-STD-020, JESD22-A113 |
| 2 | Temperature-Humidity-Bias or Biased HAST | Preconditioning before stress. THB (85°C/85%RH for 1000 hours) or HAST (130°C/85%RH for 96 hours, or 110°C/85%RH for 264 hours). | JEDEC JESD22-A101 or A110 |
| 3 | Autoclave or Unbiased HAST or Temperature-Humidity (without Bias) | Preconditioning before stress. AC (121°C/15psig for 96 hours) or unbiased HAST (130°C/85%RH for 96 hours, or 110°C/85%RH for 264 hours). | JEDEC JESD22-A102, A118, or A101 |
| 4 | Temperature Cycling | Preconditioning before stress.<br>Grade 0: -55ºC to +150ºC for 2000 cycles or equivalent.<br>Grade 1: -55ºC to +150ºC for 1000 cycles or equivalent.<br>Grade 2: -55ºC to +125ºC for 1000 cycles or equivalent.<br>Grade 3: -55ºC to +125ºC for 500 cycles or equivalent. | JEDEC JESD22-A104 and Appendix 3 |
| 5 | High Temperature Storage Life | +200ºC Ta for 72 hours. | JEDEC JESD22-A103 |
| 6 | High Temperature Operating Life | Grade 0: +150ºC Ta for 1000 hours.<br>Grade 1: +125°C Ta for 1000 hours.<br>Grade 2: +105ºC Ta for 1000 hours.<br>Grade 3: +85ºC Ta for 1000 hours.<br>Vcc max. | JEDEC JESD22-A108 |
| 7 | Solderability | Perform 8 hour steam aging prior to testing (1 hour for Au-plated leads). 260°C±5°C,5sec±1sec., immersing depth≥0.5mm. | JEDEC JESD22-B102 or JEDEC J-STD-002D |
| 8 | Physical Dimensions | Applicable JEDEC standard outline and individual device spec for significant dimensions and tolerance. | JEDE JESD22-B100 and B108, AEC Q003 |
| 9 | Electrostatic Discharge Human Body Model | 2kV HBM. | AEC Q100-002 |

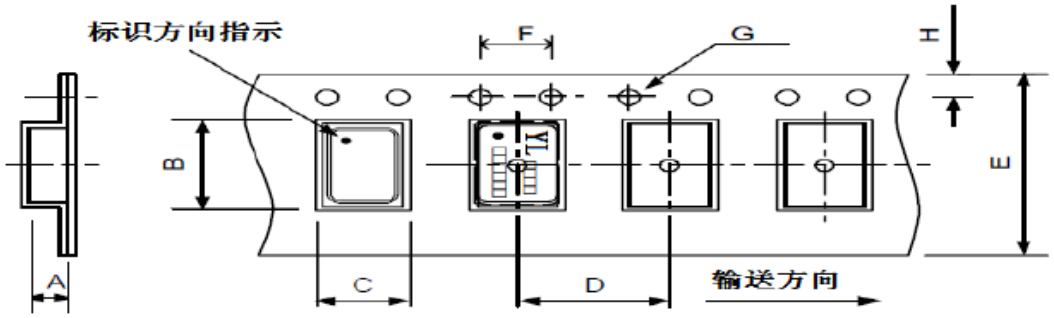
**RELIABILITY SPECIFICATIONS**

Based on AEC-Q100 Rev. H

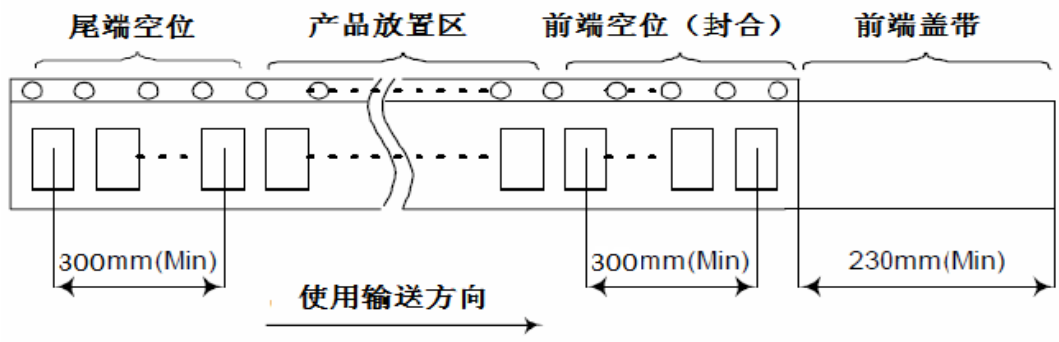
| No. | Item | Stress and Test Condition | Reference |
|---|---|---|---|
| 10 | Electrostatic Discharge Charged Device Model | 750V corner pins, 500V all other pins. | AEC Q100-011 |
| 11 | Latch-Up | Maximum ambient operating temperature, maximum operating voltage, 100mA. | AEC Q100-004 |
| 12 | Mechanical Sock | Y1 plane only, 5 pulses, 0.5 msec duration, 1500 g peak acceleration. | JEDEC JESD22-B104 |
| 13 | Variable Frequency Vibration | 20 Hz to 2 KHz to 20 Hz (logarithmic variation) in >4 minutes, 4X in each orientation, 50 g peak acceleration. | JEDEC JESD22-B103 |
| 14 | Constant Acceleration | Y1 plane only, 30 K g force. | MIL-STD-883 2001 |
| 15 | Gross/Fine Leak | Any single-specified fine test followed by any single-specified gross test. | MIL-STD-883 Method 1014 |
| 16 | Package Drop | Drop part on each of 6 axes once from a height of 1.2m onto a concrete surface. | AEC-Q100 #G6 |
| 17 | Internal Water Vapor | 100˚C, moisture <5000ppm. | MIL-STD-883 Method 1018 |

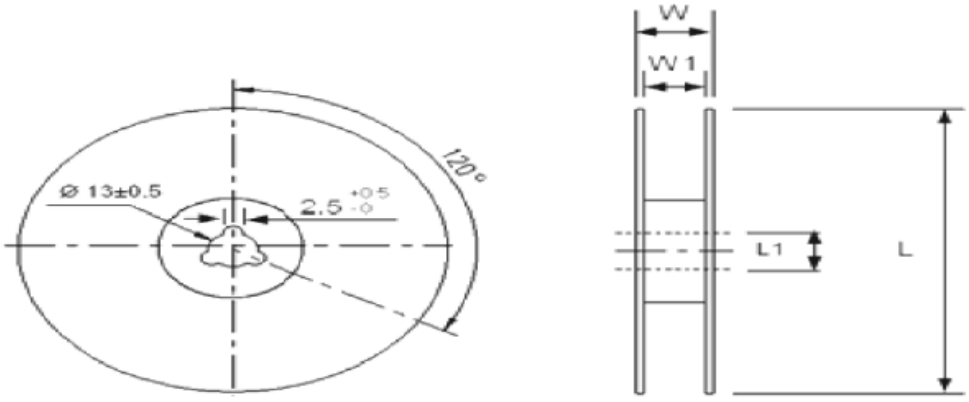
**PACKING :**

8mm-4mm，3000pcs / reel， ϕ178；




| | A | B | C | D | E | F | G | H | |
|---|---|---|---|---|---|---|---|---|---|
| 尺寸 | 0.65 ±0.1 | 2.20 ±0.1 | 1.90 ±0.1 | 4.00 | 8.00 | 4.00 | 1.50 | 1.75 | 单位: mm |



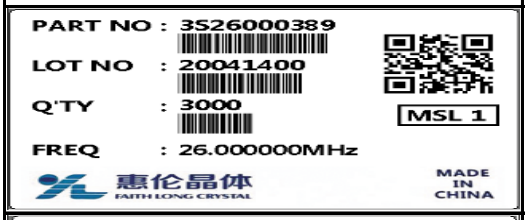

| 尺寸 | L | L1 | W | W1 | 单位:mm |
|---|---|---|---|---|---|
| | 178 | 13 | 11.5 | 8 | 每卷数量:3000 支 |

## SMD PRODUCT PACKING STANDARD

### Out-going packing instruction

| Reel Packing | Inner Packing | Carton |
|---|---|---|
| name：reel<br>standard：diameter 18cm<br>material：plastics<br>name：Anti-Static Shielding Bag<br>standard：205×250mm | name：Anti-Static Bubble Bags<br>standard：430x330+20mm<br>material：HDPE(15 reels enter) | name：carton<br>standard：400x400x280mm<br>material：AB corrugated paper (60 boxes enter) |
|  |  |  |
|  |  |  |

### The label instruction

| Label Drawing | Mark | Name of Article | Spec. | Size | Printing |
|---|---|---|---|---|---|
|  | L1 | 条码标签<br>Bar Code Label<br>(Chintz Paper) | 1.Part No.<br>2.Lot No.<br>3.Q'ty<br>4.Freq | 70x50mm | White |
|  | L2 | 条码标签<br>Bar Code Label<br>(Chintz Paper) | 1.Part No.<br>2.Date Code<br>3.Q'ty<br>4.Freq | 70x50mm | White |

**Remark**

Specifications on the label is for the use of templates with different product specifications may vary.
If customer specified requirements for labels packaging. please provide the operation procedure.

| Range | Products | Packing Material |
|---|---|---|
| **Banned Substances** | **Maximum concentration ppm(mg/kg)** | **Maximum concentration ppm(mg/kg)** |
| 1.镉及镉化合物<br>Cadmium and cadmium compounds | 100 | 100 |
| 2.铅及铅化合物<br>Lead and lead compounds | 1000 | 100 |
| 3.汞及汞化合物<br>Mercury and mercury compounds | 1000 | 100 |
| 4.六价铬化合物<br>Hexavalent-Chromium VI (Cr+6) | 1000 | 100 |
| 5.聚溴联苯 PBB<br>Polybrominated biphenyls | 1000 | N/A |
| 6.聚溴二苯醚 PBDE<br>Polybrominated diphenyl ethers | 1000 | N/A |
| 7.邻苯二甲酸二(2-乙基己基)酯 DEHP<br>Di (2-ethylhexyl) phthalate | 1000 | N/A |
| 8.邻苯二甲酸丁苄酯 BBP<br>Butyl Benzyl Phthalate | 1000 | N/A |
| 9.邻苯二甲酸二丁酯 DBP<br>Dibutyl Phthalate | 1000 | N/A |
| 10 邻苯二甲酸二异丁酯 DIBP<br>Diisobutyl Phthalate | 1000 | N/A |
| 11. 氟（F）、氯（Cl）、溴（Br）、碘（I）<br>Fluorine、Chlorine、 Bromine、Iodine | 900、900、900、900<br>注：Br+Cl＜1000 | N/A |
| 12.包装材料中重金属(汞、镉、六价铬、铅、PBB、PBDE)之总量<br>Heavy metals (mercury, cadmium, lead, Cr+6,PBB and PBDE) in packing materials | N/A | 100<br>铅(Pb) + 镉(Cd) + 汞(Hg) + 六价铬(Cr+6) <100ppm |
| 13.高度关注物质<br>SVHC-Substances of Very High Concern | 1000 | N/A |


惠伦晶体
FAITH LONG CRYSTAL