



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

CUSTOMER : \_\_\_\_\_  
PRODUCT TYPE : SMD TSX 2.5\*2.0  
NOMINAL FREQ. : 26.000000 MHz  
FL P/N : 2Z26000002  
REVISION : A4  
CUSTOMER P/N : \_\_\_\_\_

CUSTOMER'S APPROVAL&DATE

|  |
|--|
|  |
|--|

FL CORPORATION

| APPROVED     | CHECKED | DESIGNED        |
|--------------|---------|-----------------|
| Liu GuoQiang | Jin Qi  | Katsushi Yasuda |

RoHS Compliant



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## ATTACHMENT (optional)

- |                                    |   |                              |  |
|------------------------------------|---|------------------------------|--|
| · ELECTRICAL CHARACTERISTICS TEST  | A | <input type="checkbox"/> YES | <input checked="" type="checkbox"/> NO |
| · TEMPERATURE CHARACTERISTICS TEST | B | <input type="checkbox"/> YES | <input checked="" type="checkbox"/> NO |



**PRODUCT DESCRIPTION**

**Standard atmospheric conditions**

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

Ambient temperature : 25±10℃  
 Relative humidity : 40%~70%

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

Ambient temperature : 25±3℃  
 Relative humidity : 40%~70%

**Measure equipment**

Electrical characteristics measured by S&A250B or equivalent.

**Crystal cutting type**

The crystal is using AT CUT (thickness shear mode)

**ELECTRICAL SPECIFICATIONS**

|    | Parameters                      | Symbol | Electrical Spec.   |    |        | Units      | Notes       |
|----|---------------------------------|--------|--------------------|----|--------|------------|-------------|
| 1  | Nominal Frequency               | FL     | 26.000000          |    |        | MHz        | -           |
| 2  | Oscillation Mode                | -      | AT-cut Fundamental |    |        | -          | -           |
| 3  | Load Capacitance                | CL     | 9.0                |    |        | pF         | -           |
| 4  | Frequency Tolerance             | -      |                    |    | +/-10  | ppm        | at 25±3℃    |
| 5  | Tolerance Over Temperature      | -      |                    |    | +/-10  | ppm        | at -25~+85℃ |
| 6  | Aging (/1 year)                 | -      |                    |    | +/-1.0 | ppm/year   | -           |
| 7  | Aging (/2 year)                 | -      |                    |    | +/-1.5 | ppm/2year  | -           |
| 8  | Aging (/5 year)                 | -      |                    |    | +/-2.5 | ppm/5year  | -           |
| 9  | Aging (/10 year)                | -      |                    |    | +/-5.0 | ppm/10year | -           |
| 10 | Operating Temperature           | -      | -30                |    | +85    | ℃          |             |
| 11 | Storage Temperature             | -      | -40                |    | +85    | ℃          | -           |
| 12 | Equivalent series resistance    | ESR    |                    |    | 30     | ohms       | -           |
| 13 | Tuning Sensitivity              | TS     | 16.2               | 18 | 19.8   | ppm/pF     | -           |
| 14 | Spurious mode series resistance | -      | 500                |    |        | ohms       | ±1MHz       |
| 15 | Insulation Resistance           | IR     | 500                |    |        | M-ohms     | at DC 100V  |
| 16 | Drive Level                     | DL     |                    |    | 100.0  | u W        | -           |



**ELECTRICAL SPECIFICATIONS**

| No. | Parameters                           | Symbol | Electrical Spec. |        |         | UNITS                                    | Notes                     |
|-----|--------------------------------------|--------|------------------|--------|---------|--|---------------------------|
|     |                                      |        |                  |        |         |  |                           |
| 17  | First-order curve fitting parameter  | -      | -0.35            | -0.225 | -0.10   | ppm/°C                                   | (Note 1)                  |
| 18  | Second-order curve fitting parameter | -      | -12.0            | -8.5   | -5.0    | x10 <sup>-4</sup><br>ppm/°C <sup>2</sup> | (Note 1)                  |
| 19  | Third-order curve fitting parameter  | -      | 8.7              | 9.9    | 11.0    | x10 <sup>-5</sup><br>ppm/°C <sup>3</sup> | (Note 1)                  |
| 20  | Frequency stability slope 1          | -      |                  |        | +/-0.05 | ppm/°C                                   | 'at -10~+60°C<br>(Note 2) |
| 21  | Frequency stability slope 2          | -      |                  |        | +/-0.05 | ppm/°C                                   | 'at -30~+85°C<br>(Note 2) |
| 22  | G Sensitivity                        | -      |                  |        | +/-2    | ppb/G                                    | -                         |
| 23  | Full Cycle Temperature Hysteresis    | -      |                  |        | +/-0.5  | ppm/°C                                   | 'at -40~+85°C<br>(Note 3) |
| 24  | Small Cycle Temperature Hysteresis   | -      |                  |        | +/-0.05 | ppm/°C                                   | (Note 4)                  |
| 25  | Perturbation                         | -      |                  |        | +/-0.5  | ppm/°C                                   | (Note 5)                  |
| 26  | DLD Freq (Max-Min)                   | -      |                  |        | 2.0     | ppm                                      | (Note 6)                  |
| 27  | DLD Freq (Repeatability)             | -      |                  |        | 0.7     | ppm                                      | (Note 6)                  |
| 28  | DLD ESR (Max-Min)                    | -      |                  |        | 2.5     | ohms                                     | (Note 6)                  |
| 29  | DLD ESR (Repeatability)              | -      |                  |        | 1.5     | ohms                                     | (Note 6)                  |

Note 1 S curve (FL) 3rd order curve fitting coefficient requirement over operation temperature under 2°C test.  
 $[F(T) = C3(T-T_0)^3 + C2(T-T_0)^2 + C1(T-T_0) + C0; T_0 = 25°C]$

Note 2 Frequency slope error between measured S curve (FL) data and 3rd order curve fitting data over temperature under per 2°C test. (Continuous temperature rate change of 1.0°C/min)

Note 3 Difference in frequency measurement at any temperature when undergoing a thermal cycle over the entire operation temperature range from -40°C to 85°C per 2°C test.

Note 4 Difference in frequency measurement at any temperature when undergoing a thermal cycle of a temperature range of 5°C per 1°C test.

Note 5 Residual error from the frequency vs. temperature curve fit 5th order. Minimum of frequency reading every 3°C over operation temperature.

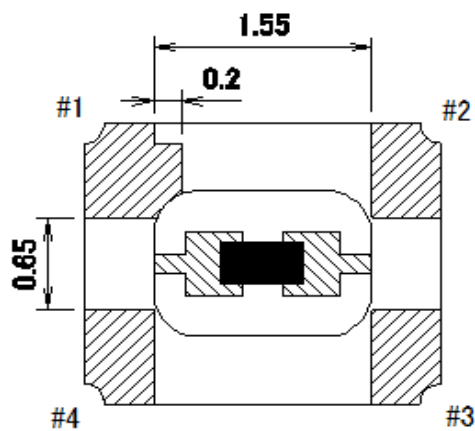
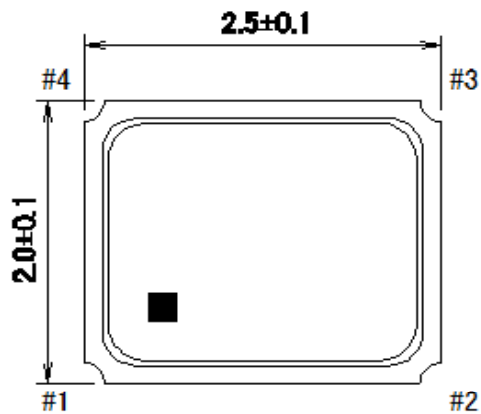
Note 6 DLD Sweep: 10nW to 100uW to 10nW.



**NTC THERMISTOR SPECIFICATIONS TABLE**

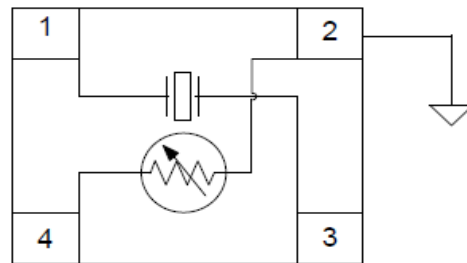
|   | Parameters            | Symbol | Electrical Spec. |      |     | UNITS  | Notes          |
|---|-----------------------|--------|------------------|------|-----|--------|----------------|
| 1 | Operating Temperature | -      | -30              |      | +85 | °C     |                |
| 2 | Storage Temperature   | -      | -40              |      | +85 | °C     |                |
| 3 | Resistance            | -      |                  | 100  |     | k-ohms | at 25°C        |
| 4 | B-constant            | -      |                  | 4250 |     | K      | at 25°C - 50°C |
| 5 | Tolerance             | -      |                  |      | 1   | %      |                |

**DIMENSIONS**



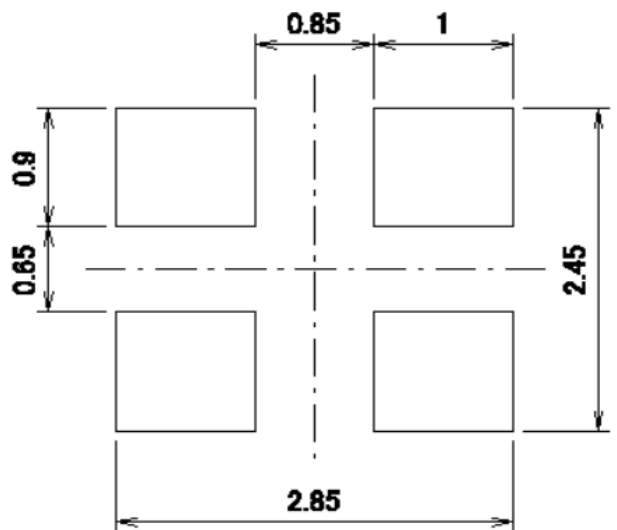
Unit : mm

**CONNECTION DIAGRAM**



| Pin | Function                  |
|-----|---------------------------|
| #1  | Xtal terminal (Input)     |
| #2  | Thermistor + GND terminal |
| #3  | Xtal terminal (Output)    |
| #4  | Thermistor terminal       |

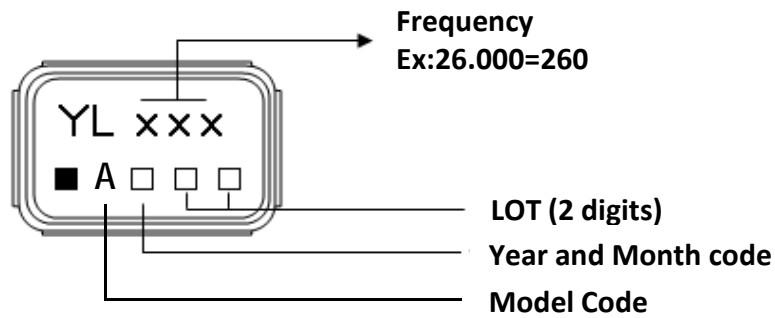
**SUGGESTED LAYOUT**



Unit : mm



**MARKING**

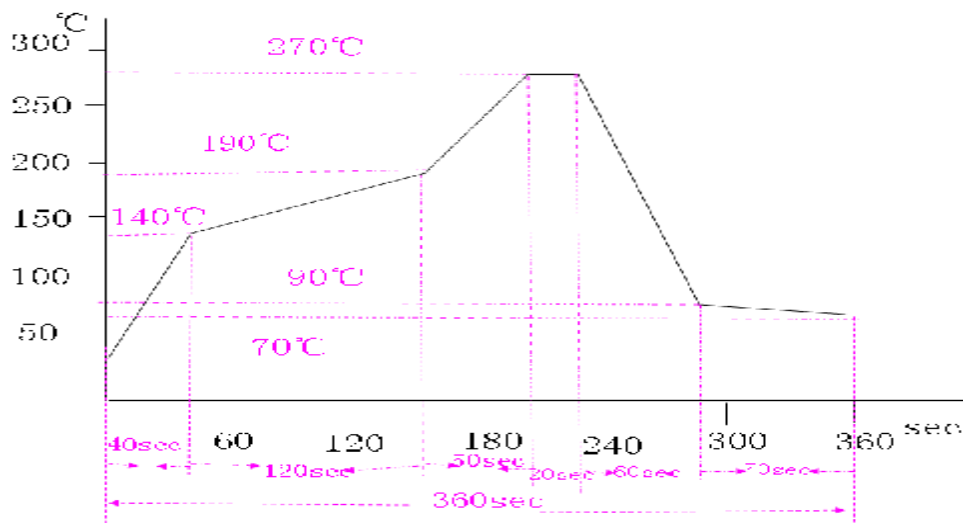


| month<br>year |      | JAN  | FEB  | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---------------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|               |      | 2017 | 2021 | A   | B   | C   | D   | E   | F   | G   | H   | J   | K   |
| 2018          | 2022 | N    | P    | Q   | R   | S   | T   | U   | V   | W   | X   | Y   | Z   |
| 2019          | 2023 | a    | b    | c   | d   | e   | f   | g   | h   | j   | k   | l   | m   |
| 2020          | 2024 | n    | p    | q   | r   | s   | t   | u   | v   | w   | x   | y   | z   |

**SUGGESTED REFLOW PROFILE**

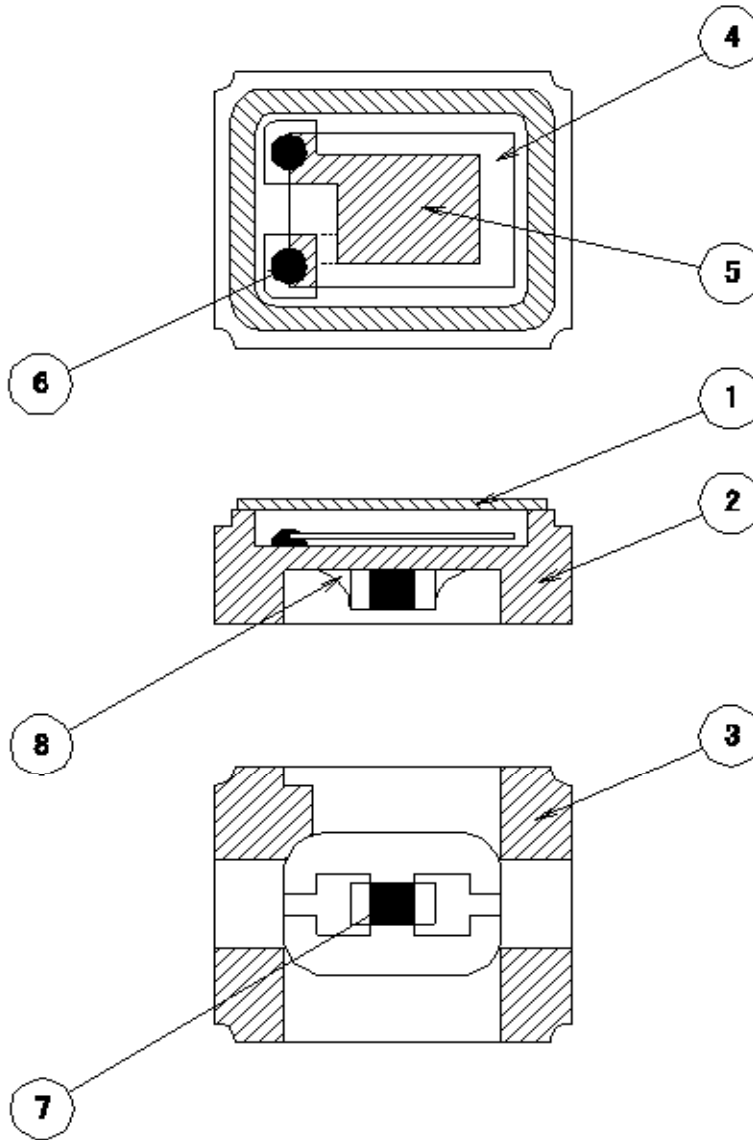
Total time : 360 sec. Max.

Solder melting point :185 °C





### STRUCTURE ILLUSTRATION



| NO | COMPONENTS          | MATERIALS  | QTY | FINISH/SPECIFICATIONS |
|----|---------------------|--|-----|-----------------------|
| 1  | Cap(Lid)            | Kovar(Fe+Co+Ni)                                      | 1   | Ni plating            |
| 2  | Base(Package)       | Alumina Ceramics ( $Al_2O_3$ )<br>+ Kovar (Fe+Co+Ni) | 1   | -                     |
| 3  | Pad(Package)        | Ni + Au  | 4   | -                     |
| 4  | Crystal Blank       | $SiO_2$  | 1   | -                     |
| 5  | Conductive Adhesive | Ag   | 2   | Silicone resin        |
| 6  | Electrode           | Cr + Ag  | 2   | -                     |
| 7  | Thermistor          | Alumina Ceramics ( $Al_2O_3$ ),<br>Ni + Ag+ Sn       | 1   | -                     |
| 8  | Solder              | Sn + Ag + Cu   | 2   | -                     |

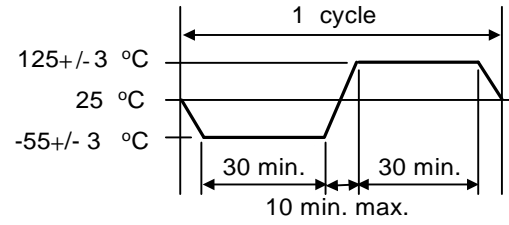


**RELIABILITY SPECIFICATIONS**

**1.MECHANICAL ENDURANCE**

| No. | Test Item                    | Test Methods  |              |
|-----|------------------------------|---|--------------|
| 1   | Drop Test                    | 150 cm height, fall freely onto stainless plate 3 times.  | JIS C6701    |
| 2   | Shock Test                   | 150g/150cm Height,3times in the direction of $\pm x$ , $\pm y$ , $\pm z$ on concrete floor  | IEC-68-02-27 |
| 3   | Mechanical Shock             | Device are shocked to half sine wave ( 1000 G ) three mutually pendicular axes each 3 times. 1.0m sec. duration time                                    | MIL-STD-202F |
| 4   | Vibration                    | Frequency range 10 ~ 55 Hz<br>Amplitude 1.52 mm<br>Pendicular axes each test time 2 hours ( x,y,z Axis )<br>Total test time 6 hours                     | MIL-STD-883E |
| 5   | Gross Leak                   | Standard Sample For Automatic Gross Leak Detector Test<br>Pressure 2kg/cm2  | MIL-STD-883E |
| 6   | Fine Leak                    | Helium Bombing 4.5kgf/cm2 for 2 hr  | MIL-STD-883E |
| 7   | Solderability                | Temperature 215 °C +/- 5 °C<br>Immersing depth 0.5 mm minimum<br>Immersion time 10 +/- 0.5 seconds<br>Flux Rosin resin methyl alcohol solvent ( 1 : 4 ) | MIL-STD-883E |
| 8   | Resistance To Soldering Heat | Pre-heat temperature 125 °C<br>Pre-heat time 60 ~ 120 sec.<br>Test temperature 260 +/- 5 °C<br>Test time 5 +/- 1 sec.                                   | MIL-STD-202F |

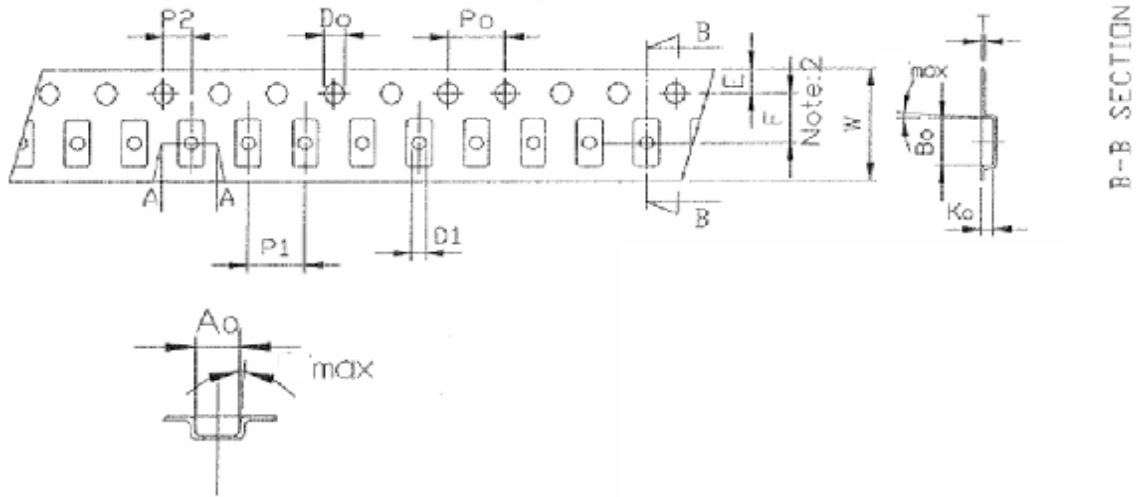
**2.ENVIRONMENTAL ENDURANCE**

| No. | Test Item               | Test Methods  |              |
|-----|-------------------------|---|--------------|
| 9   | High Temp. Storage      | + 125 °C +/- 3 °C for 500 +/- 12 hours  | MIL-STD-883E |
| 10  | Low Temp. Storage       | - 40 °C +/- 3 °C for 500 +/- 12 hours   |              |
| 11  | Thermal Shock           | Total 100 cycles of the following temperature cycle<br><br> | MIL-STD-883E |
| 12  | High Temp&Homidity      | 85°C±3°C, RH 85%,500Hrs   | JIS C5023    |
| 13  | Pressure Cooker Storage | 121 +/- 3°C, RH100%, 2 bar, for 240 hours   | JIS C6701    |





PACKING : (EIA-481-2)



| Dimension<br>PKG Type | Unit : mm |          |          |           |       |          |          |
|-----------------------|-----------|----------|----------|-----------|-------|----------|----------|
|                       | A0        | B0       | K0       | T         | W     | E        | F        |
| 2520 TSX(8mm)         | 2.25±0.1  | 2.70±0.1 | 1.45±0.1 | 0.25±0.05 | 8±0.3 | 1.75±0.1 | 3.50±0.1 |
|                       | P1        | P2       | D1       | D0        | P0    |          |          |
|                       | 4±0.1     | 2±0.1    | 1±0.1    | 1.55±0.05 | 4±0.1 |          |          |

Standard Reel Quantity is 3,000 pcs per reel.

THE INSPECTION FOR TAPE TENSION


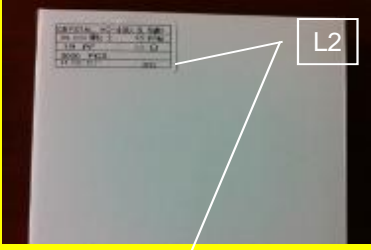


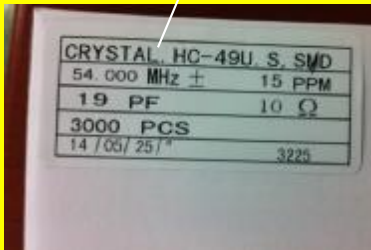

| ITEM         |  | Defect  | Method            |
|--------------|--|---|-------------------|
| Appearance   | ALL  | 1.The tape is not coincidence<br>2.The bubble | Visual inspection |
| Tape Tension | 8045、7050<br>6035-12mm<br>5032-12mm<br>3225-12mm | overstep 61±6g(55~67g)                        | Pull test         |
|              | 3225-8mm   | overstep 40±5g(35~45g)                        |                   |
|              | 2520-8mm   | overstep 55±6g(49~61g)                        |                   |
|              | 2016-8mm   | overstep 34±6g(28~40g)                        |                   |
|              | 1612-8mm   | overstep 34±6g(28~40g)                        |                   |
|              | 6035-16mm<br>5032-16mm                           | overstep 60±6g(54~66g)                        |                   |

REMARK : NA


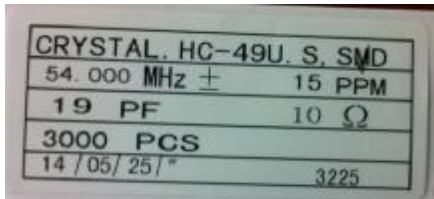
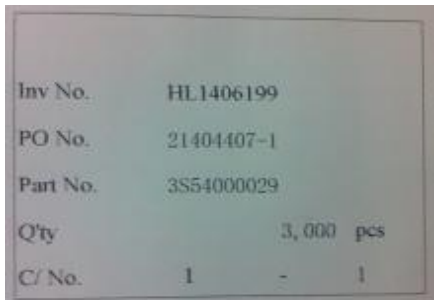


**SMD PRODUCT PACKING STANDARD**

**Out-going packing instruction**

| Reel Packing   | Inner Packing  | Carton   |
|--|--|--|
| name: reel<br>standard: diameter 18cm<br>material: plastics                        | name: inner box<br>standard: L19.0xW19.0xH2.5cm<br>material: B corrugated paper    | name: carton<br>standard: L34.0xW22.0xH22.0cm<br>material: AB corrugated paper(10 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.Date Code<br>2.Lot No.<br>3.Part No.<br>4.Freq<br>5.Q'ty                  | 75x35mm   | White    |
|  | L2   | 机打标签<br>Printing Label<br>(Printing Paper)    | 1.Freq<br>2.Electrical Parameters<br>3.Q'ty<br>4.Part No.<br>5.Packing Date | 75x35mm   | White    |
|  | L3   | 运输标签(唛头)<br>Shipping Mark<br>(Printing Paper) | 1.inv No.<br>2.PO No.<br>3.Part No.<br>4.Q'ty<br>5.C/No.                    | 100x100mm | 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                 | Test Method  |
|--|----------------------------------|----------------------------------|--|
| Banned Substances  | Maximum concentration ppm(mg/kg) | Maximum concentration ppm(mg/kg) |  |
| 1. 镉及镉化合物<br>Cadmium and cadmium compounds   | 5                                | 5                                | ICP-AES as per EN1122, method B2001 or other acid digestion.   |
| 2. 铅及铅化合物<br>Lead and lead compounds   | 40                               | 100                              | ICP-AES after as per EPA 3050B or other acid digestion.  |
| 3. 汞及汞化合物<br>Mercury and mercury compounds   | 5                                | 5                                | ICP-AES after as per EPA 3052 or other acid digestion.   |
| 4. 六价铬化合物<br>Hexavalent-Chromium VI (Cr+6)   | 10                               | 10                               | As per US EPA 7196A and US EPA 3060A.  |
| 5. 聚溴联苯 PBB<br>Polybrominated biphenyls  | 5                                | 5                                | With reference to USEPA 3540 or USEPA3550.<br>Analysis was performed by LPLC/DAD, LC/MS or GC/MS.<br>(prohibited by 2002/95/EC (RoHS),83/261/EEC, and76/769/EEC) |
| 6. 聚溴二苯醚 PBDE<br>Polybrominated diphenyl ethers  | 5                                | 5                                | With reference to USEPA3540or USEPA3550.<br>Analysis was performed by HPLC/DAD LC/MS or GC/MS.(prohibited by 2002/95/EC(RoHS), 83/264/EEC, and 76/769/EEC)       |
| 7. 多氯联苯 (PCB)<br>Polychlorinated biphenyl  | 5                                | 5                                |  |
| 8. 多氯化萘 (PCN)<br>Polychlorinated naphthalene   | 5                                | 5                                |  |
| 9. 氯代烷烃 (CP)<br>Chlorinated paraffin   | 5                                | 5                                |  |
| 10. 其他有机氯化物<br>Other chlorinated organic compounds   | 5                                | 5                                |  |
| 11. 其他有机溴化合物<br>Other brominated organic compounds   | 5                                | 5                                |  |
| 12. 有机锡化合物 (三丁基锡化合物,三苯基锡化合物)<br>Organic tin compounds (Tributyl tin category & Triphenyl tin category )              | 5                                | 5                                |  |
| 13. 石棉<br>Asbestos   | 5                                | 5                                |  |
| 14. 偶氮化合物<br>Azo compounds   | 5                                | 5                                |  |
| 15. 甲醛<br>Formaldehyde   | 5                                | 5                                |  |
| 16. 聚氯乙烯(PVC)以及聚氯乙烯混合物<br>Polyvinyl chloride (PVC) and PVC blends  | No detect                        | No detect                        |  |
| 17. 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                             |  |

Lead Free Products are “Directive 2002/95/EC of The European Parliament of 27 January 2003 on the restriction of certain hazardous substances (RoHS) in electrical and electronic equipment” and Sony SS-00259 Compliant.

