

Description

The TD816 series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon planar phototransistor detector in a plastic DIP4 package with different lead forming options.

With the robust coplanar double mold structure, TD816 series provide the most stable isolation feature.

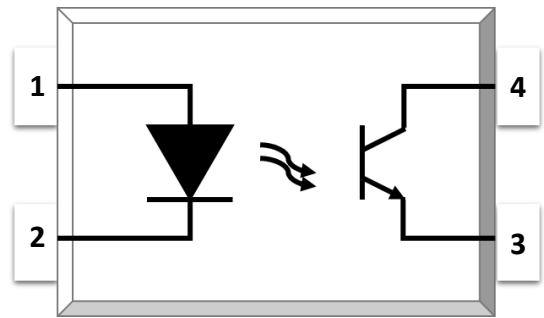
Features

- High isolation 5000 VRMS
- CTR flexibility available see order information
- DC input with transistor output
- Operating temperature range - 55 °C to 110 °C
- REACH compliance
- Halogen free
- MSL class 1
- Regulatory Approvals
 - UL - UL1577
 - VDE - EN60747-5-5(VDE0884-5)
 - CQC – GB4943.1, GB8898

Applications

- Switch mode power supplies
- Programmable controllers
- Household appliances
- Office equipment

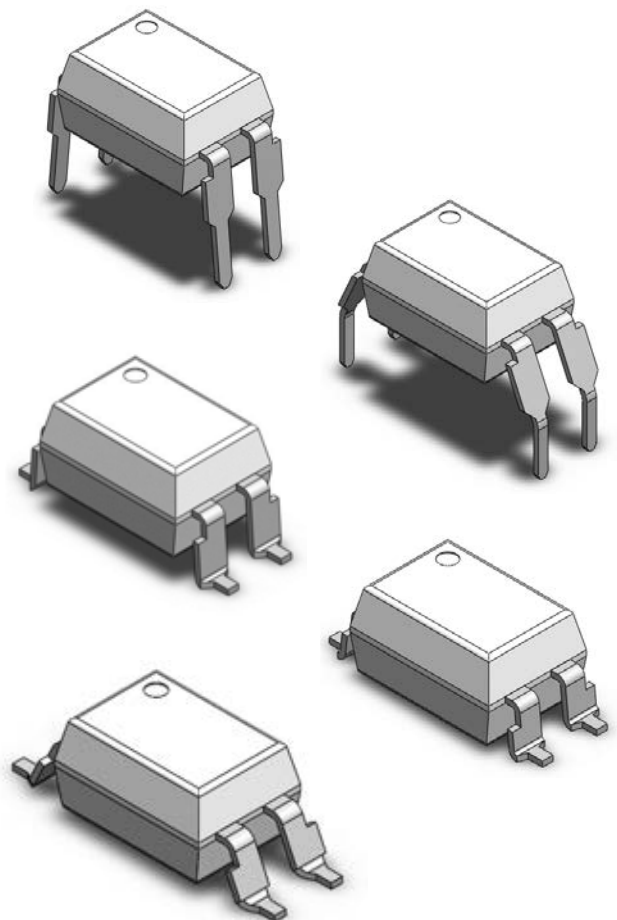
SCHEMATIC



PIN DEFINITION

1. Anode
2. Cathode
3. Emitter
4. Collector

PACKAGE OUTLINE





ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | VALUE | UNIT | NOTE |
|-----------------------------|-----------|---------|------|------|
| INPUT | | | | |
| Forward Current | I_F | 60 | mA | |
| Peak Forward Current | I_{FP} | 1 | A | 1 |
| Reverse Voltage | V_R | 6 | V | |
| Input Power Dissipation | P_I | 100 | mW | |
| OUTPUT | | | | |
| Collector - Emitter Voltage | V_{CEO} | 80 | V | |
| Emitter - Collector Voltage | V_{ECO} | 7 | V | |
| Collector Current | I_C | 50 | mA | |
| Output Power Dissipation | P_O | 150 | mW | |
| COMMON | | | | |
| Total Power Dissipation | P_{tot} | 200 | mW | |
| Isolation Voltage | V_{iso} | 5000 | Vrms | 2 |
| Operating Temperature | T_{opr} | -55~110 | °C | |
| Storage Temperature | T_{stg} | -55~125 | °C | |
| Soldering Temperature | T_{sol} | 260 | °C | |

Note 1. 100µs pulse, 100Hz frequency

Note 2. AC For 1 Minute, R.H. = 40 ~ 60%



| ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C | | | | | | | | |
|-----------------------------------------------|----------------------|------------------|------------------|------|------|--------------------------------|----------------|--|
| PARAMETER | SYMBOL | MIN | TYP. | MAX. | UNIT | TEST CONDITION | NOTE | |
| INPUT | | | | | | | | |
| Forward Voltage | V _F | - | 1.24 | 1.4 | V | IF=10mA | | |
| Reverse Current | I _R | - | - | 10 | μA | VR=6V | | |
| Input Capacitance | C _{in} | - | 10 | - | pF | V=0, f=1kHz | | |
| OUTPUT | | | | | | | | |
| Collector Dark Current | I _{CEO} | - | - | 100 | nA | VCE=20V, IF=0 | | |
| Collector-Emitter Breakdown Voltage | BV _{CEO} | 80 | - | - | V | IC=0.1mA, IF=0 | | |
| Emitter-Collector Breakdown Voltage | BV _{ECO} | 7 | - | - | V | IE=0.1mA, IF=0 | | |
| TRANSFER CHARACTERISTICS | | | | | | | | |
| Current Transfer Ratio | TD816 | CTR | 50 | - | 600 | % | IF=5mA, VCE=5V | |
| | TD816A | | 80 | - | 160 | | | |
| | TD816B | | 130 | - | 260 | | | |
| | TD816C | | 200 | - | 400 | | | |
| | TD816D | | 300 | - | 600 | | | |
| | TD816E | | 100 | - | 200 | | | |
| Collector-Emitter Saturation Voltage | V _{CE(sat)} | - | 0.06 | 0.2 | V | IF=20mA, IC=1mA | | |
| Isolation Resistance | R _{ISO} | 10 ¹² | 10 ¹⁴ | - | Ω | DC500V, 40 ~ 60% R.H. | | |
| Floating Capacitance | C _{IO} | - | 0.4 | 1 | pF | V=0, f=1MHz | | |
| Cut-off Frequency | f _c | - | 80 | - | kHz | VCE=2V, IC=2mA RL=100Ω,-3dB | 3 | |
| Response Time (Rise) | t _r | - | 3 | 18 | μs | VCE=2V, IC=2mA | 4 | |
| Response Time (Fall) | t _f | - | 4 | 18 | μs | RL=100Ω | 4 | |

Note 3. Fig.12&13

Note 4. Fig.14



CHARACTERISTIC CURVES

Fig.1 Forward Current vs. Ambient Temperature

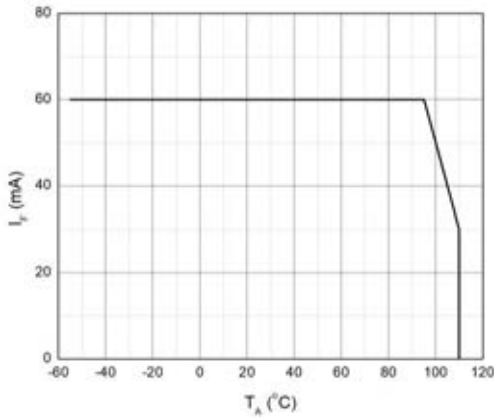


Fig.2 Collector Power Dissipation vs. Ambient Temperature

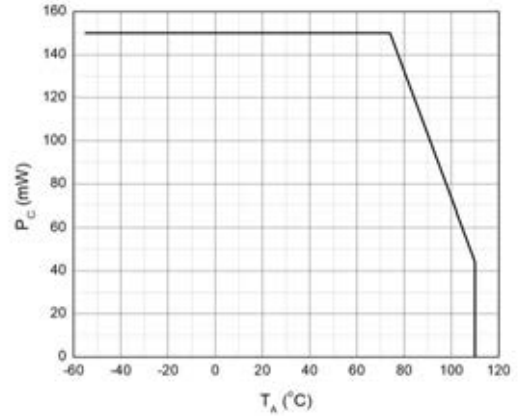


Fig.3 Forward Current vs. Forward Voltage

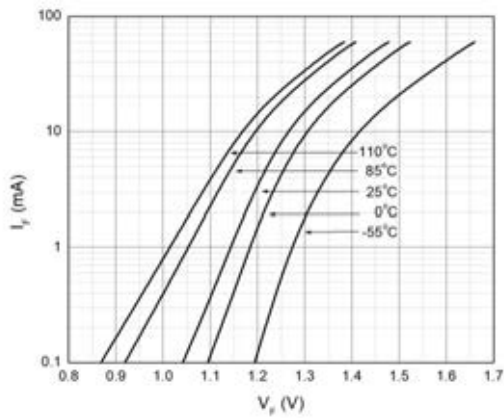


Fig.4 Collector Dark Current vs. Ambient Temperature

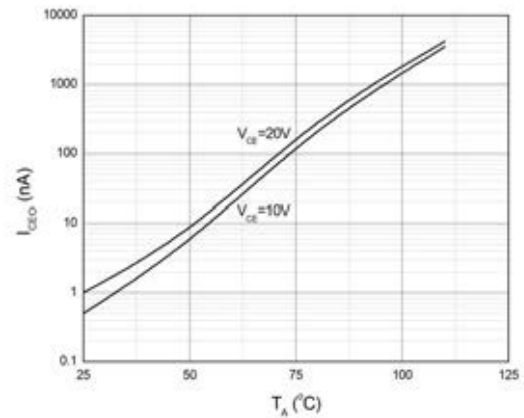


Fig.5 Collector Current vs. Collector-emitter Voltage

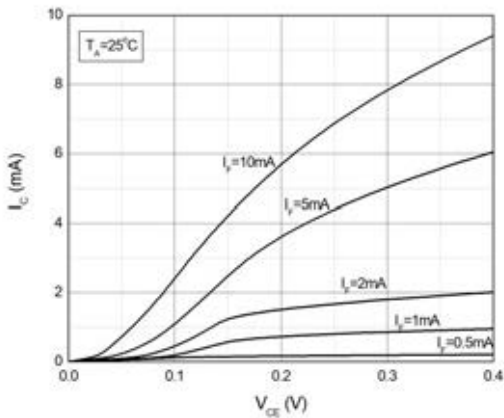
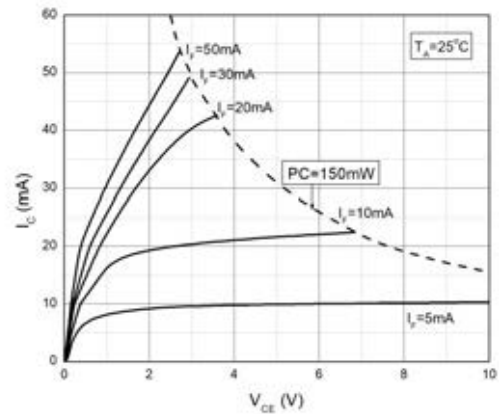


Fig.6 Collector Current vs. Collector-emitter Voltage



CHARACTERISTIC CURVES

Fig.7 Normalized Current Transfer Ratio vs. Forward Current

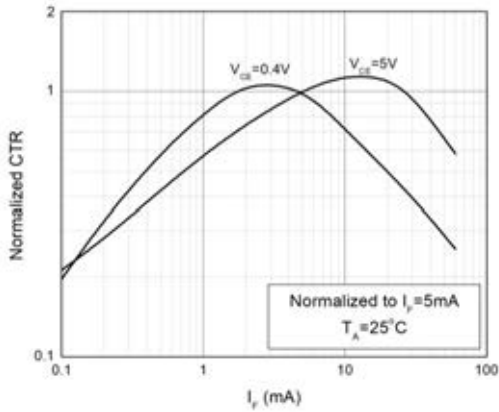


Fig.8 Normalized Current Transfer Ratio vs. Ambient Temperature

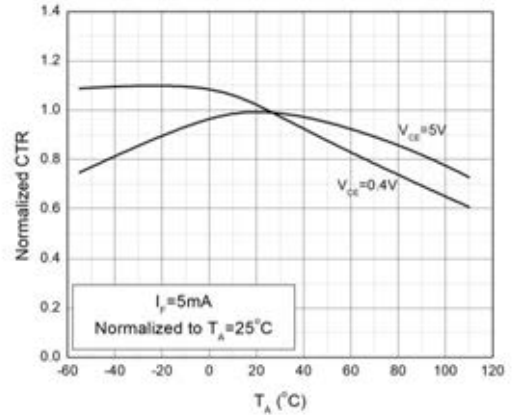


Fig.9 Collector-emitter Saturation Voltage vs. Ambient Temperature

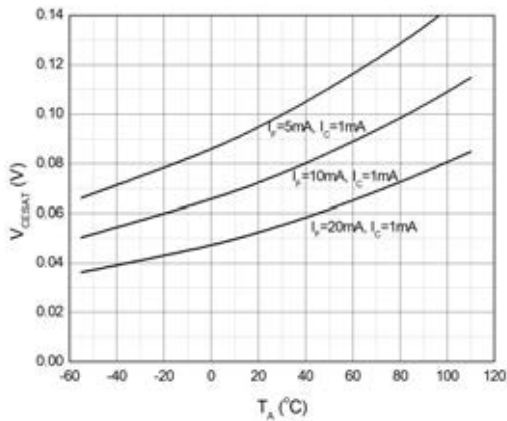


Fig.10 Switching Time vs. Load Resistance

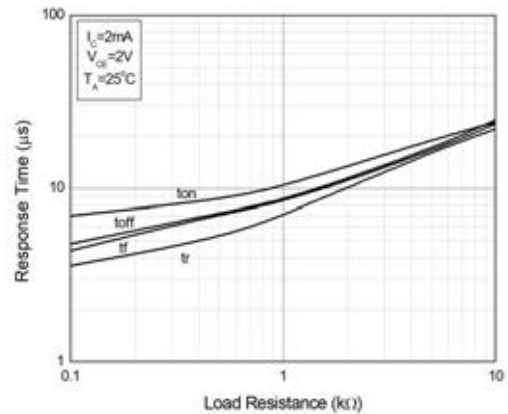
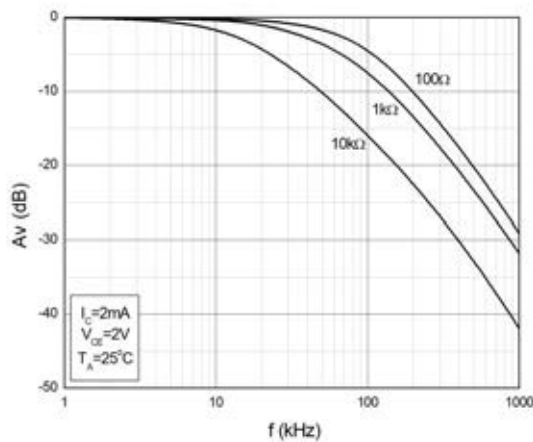


Fig.11 Frequency Response



TEST CIRCUITS

Fig.12 Test Circuits of Response Time

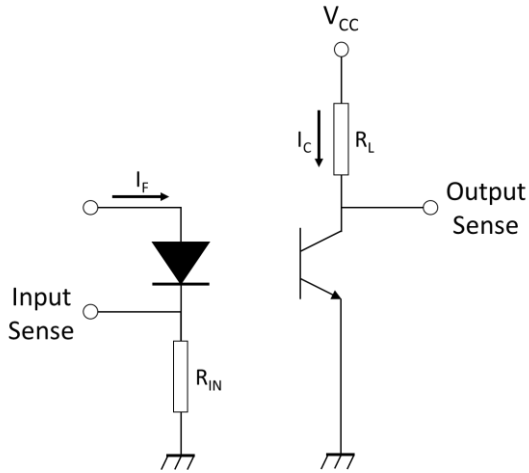


Fig.13 Curves of Response Time

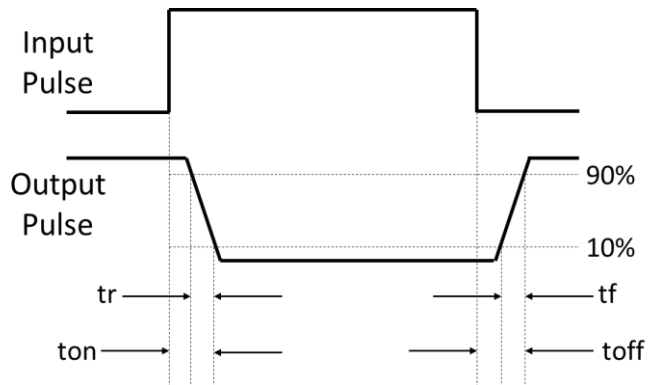
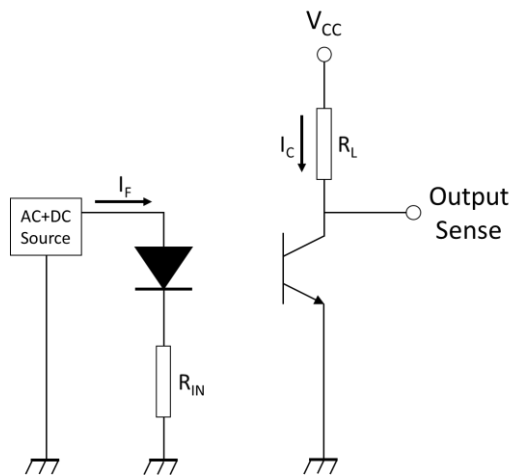
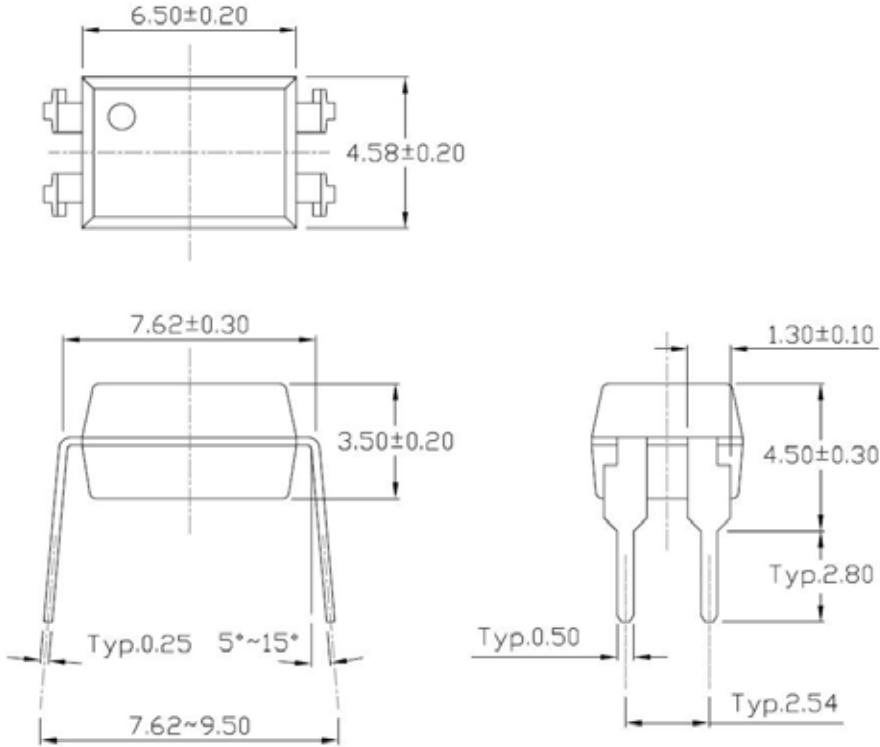


Fig.14 Test Circuits of Frequency Response

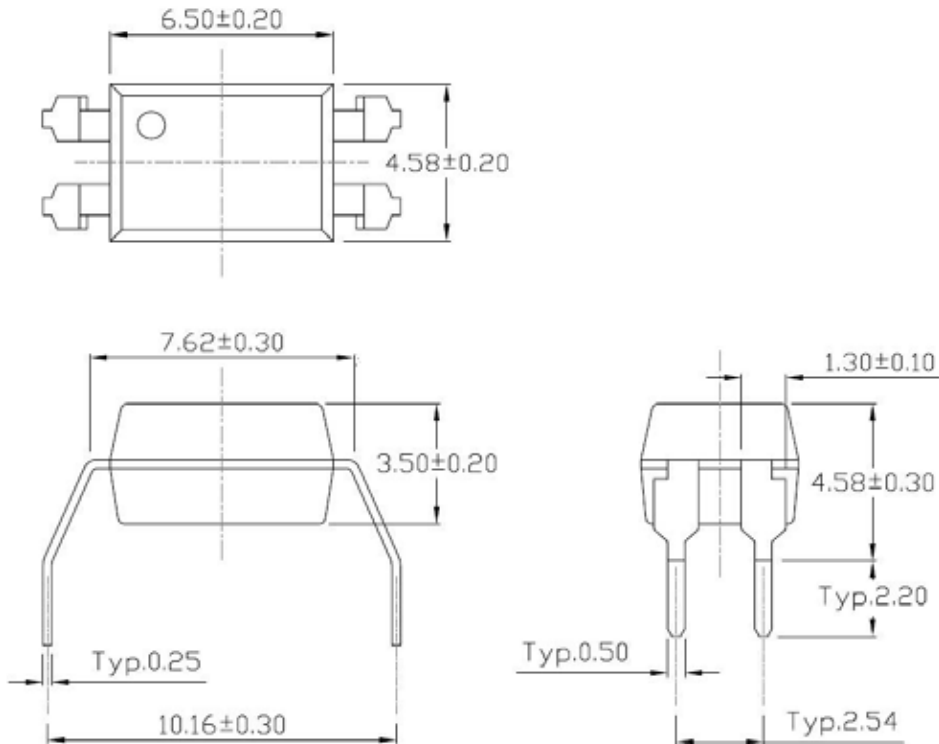


PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Standard DIP – Through Hole (DIP Type)

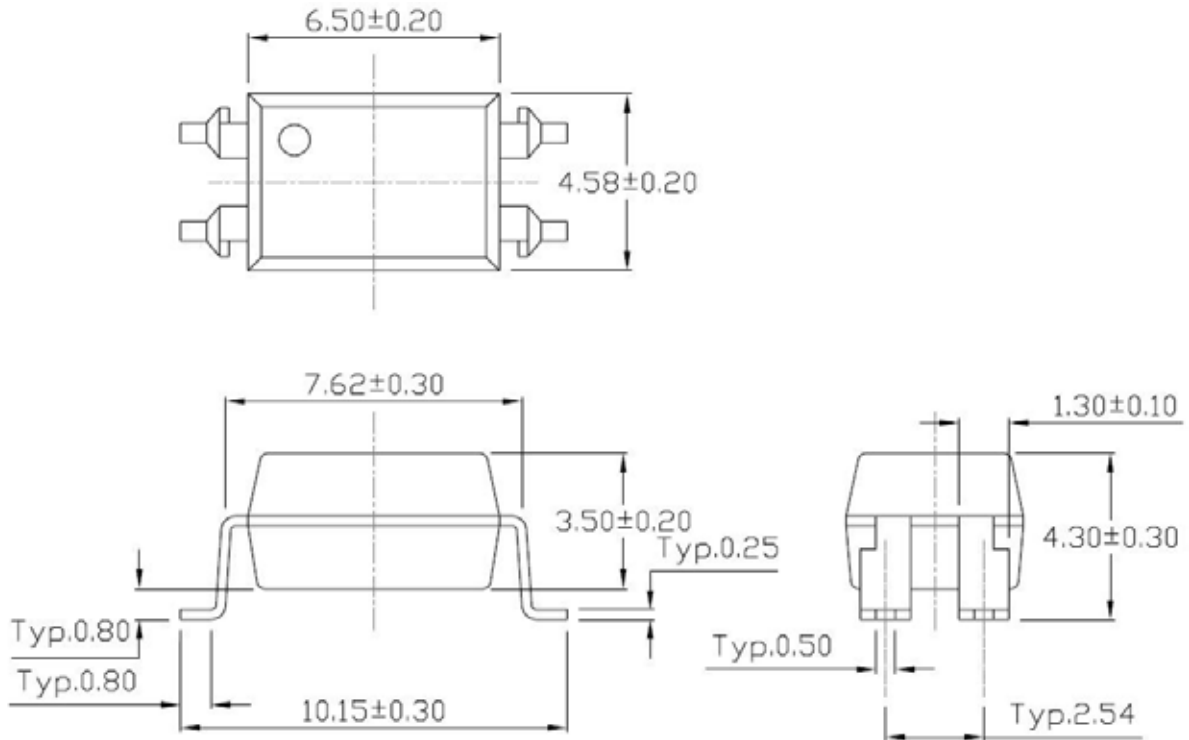


Gullwing (400mil) Lead Forming – Through Hole (M Type)

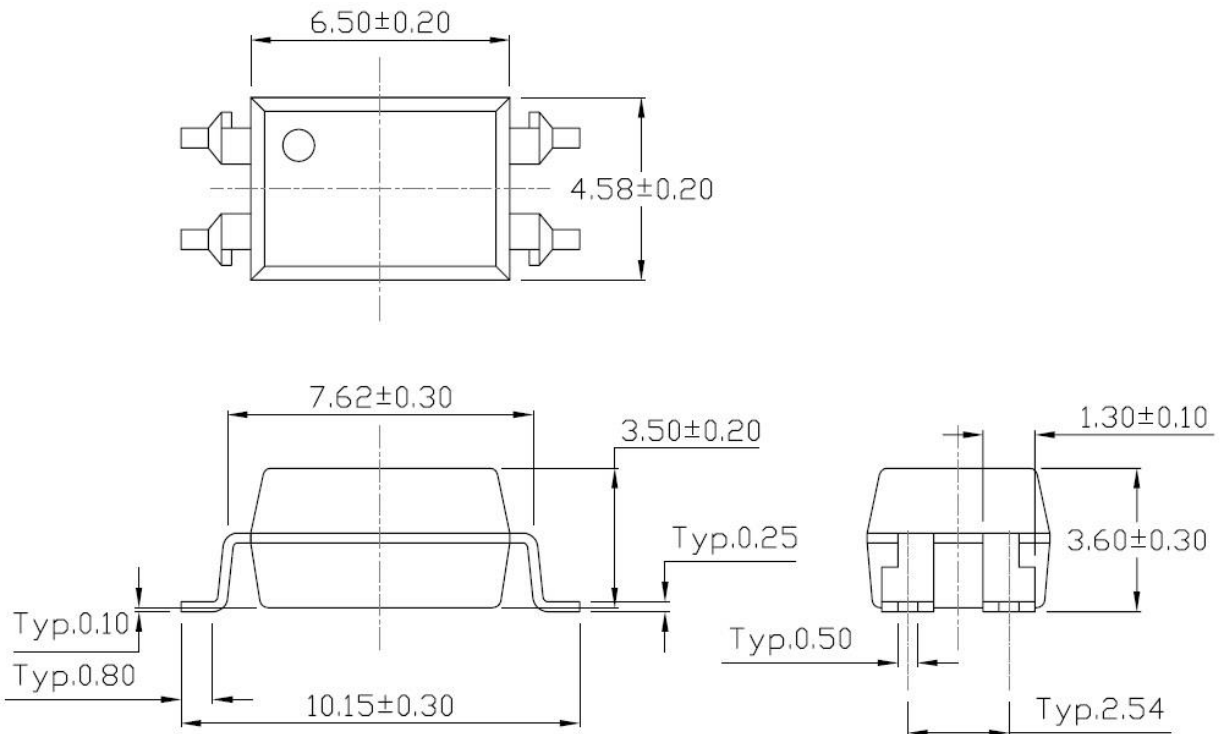


PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (S Type)

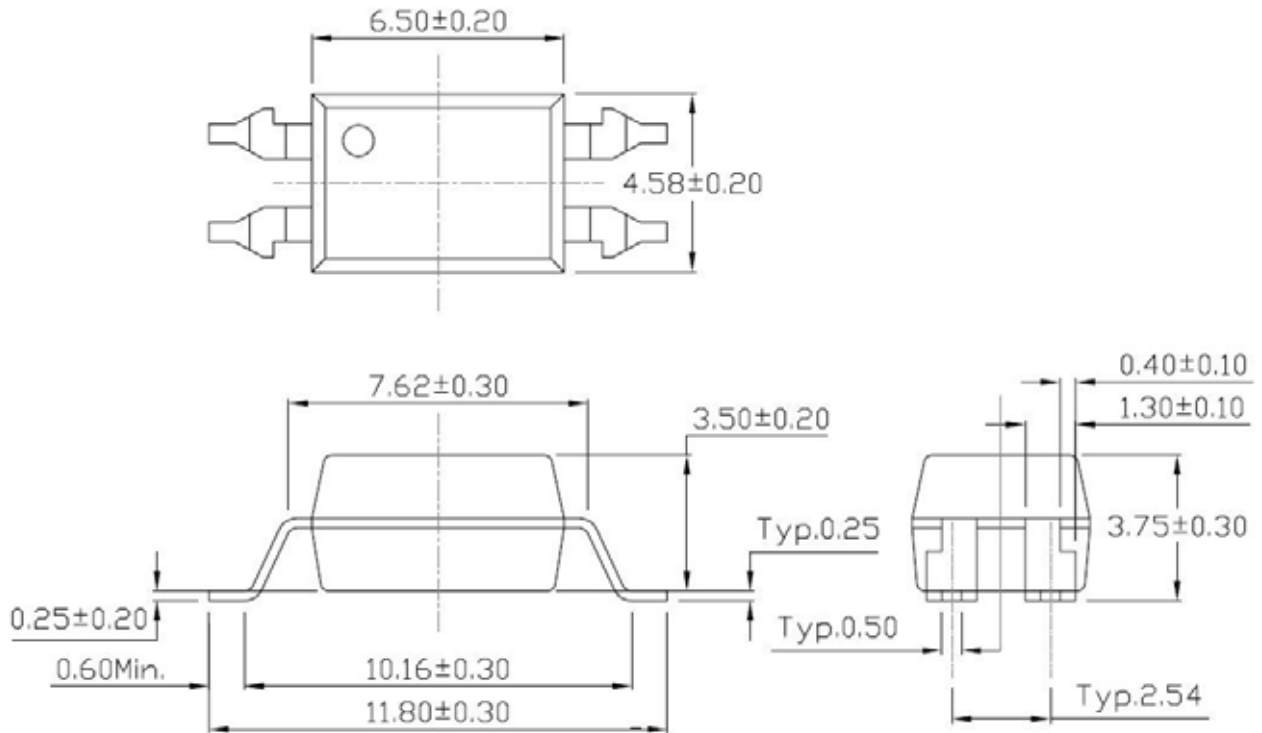


Surface Mount (Low Profile) Lead Forming (SL Type)



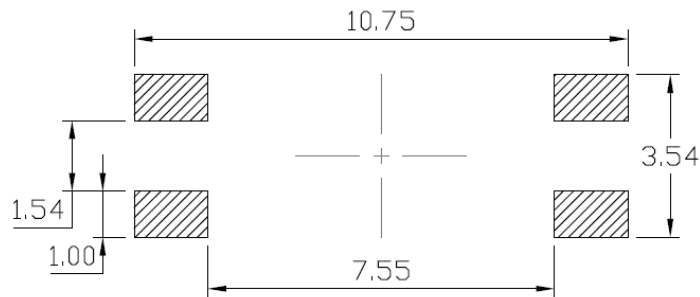
PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount (Gullwing) Lead Forming (SLM Type)

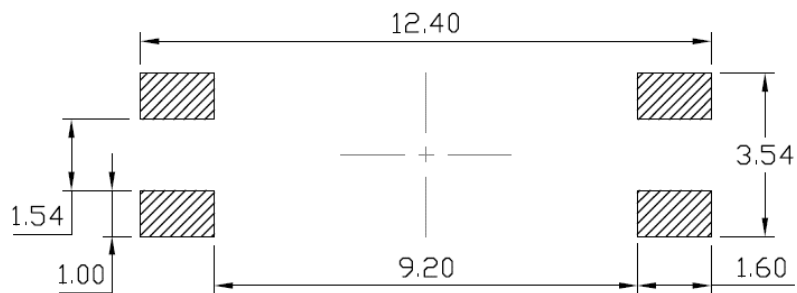


RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming & Surface Mount (Low Profile) Lead Forming

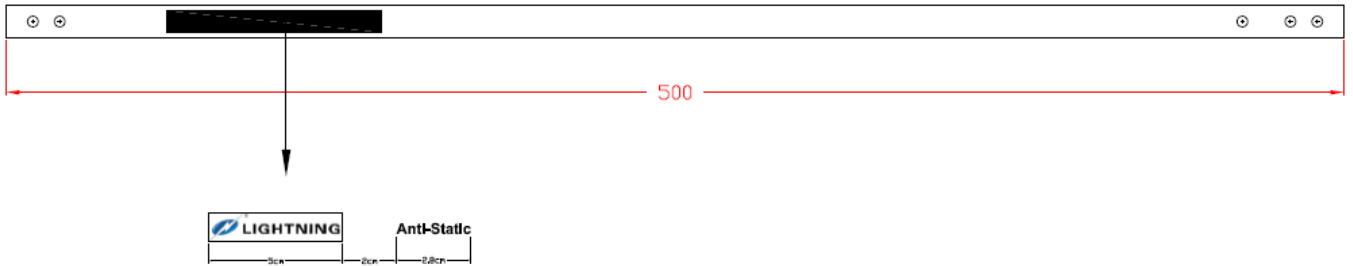
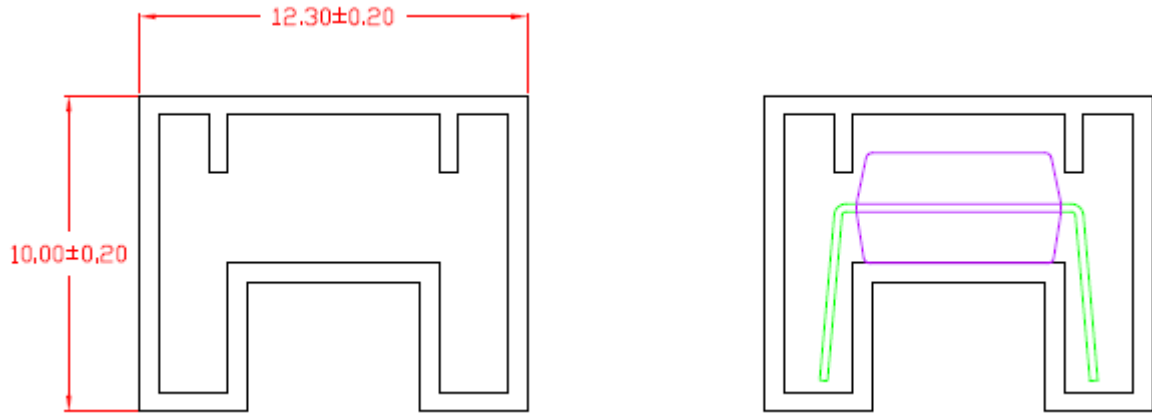


Surface Mount (Gullwing) Lead Forming

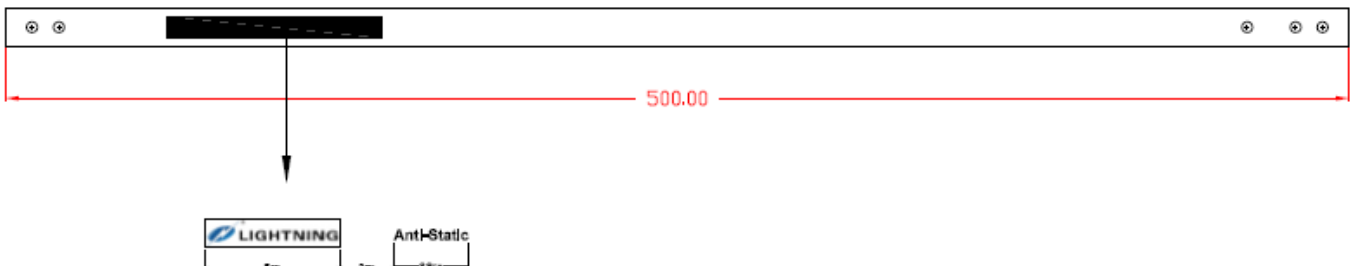
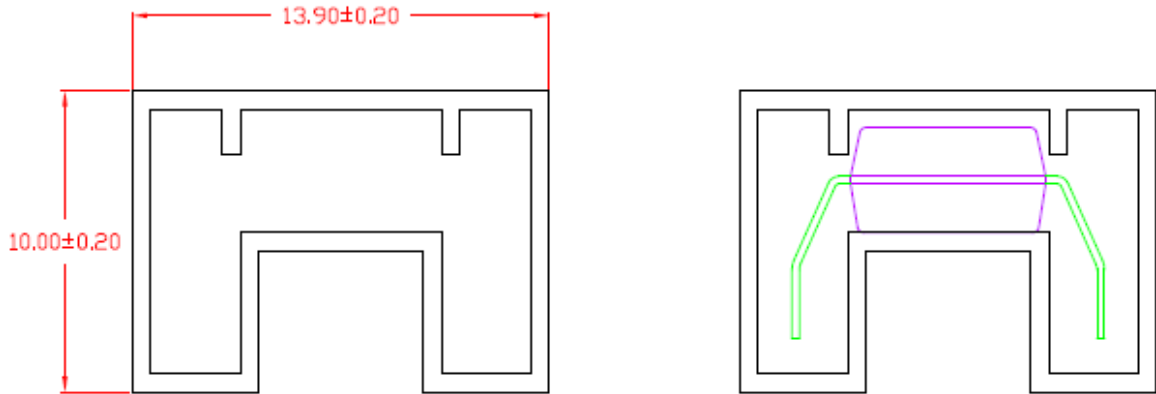


TUBE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Standard DIP



Option M



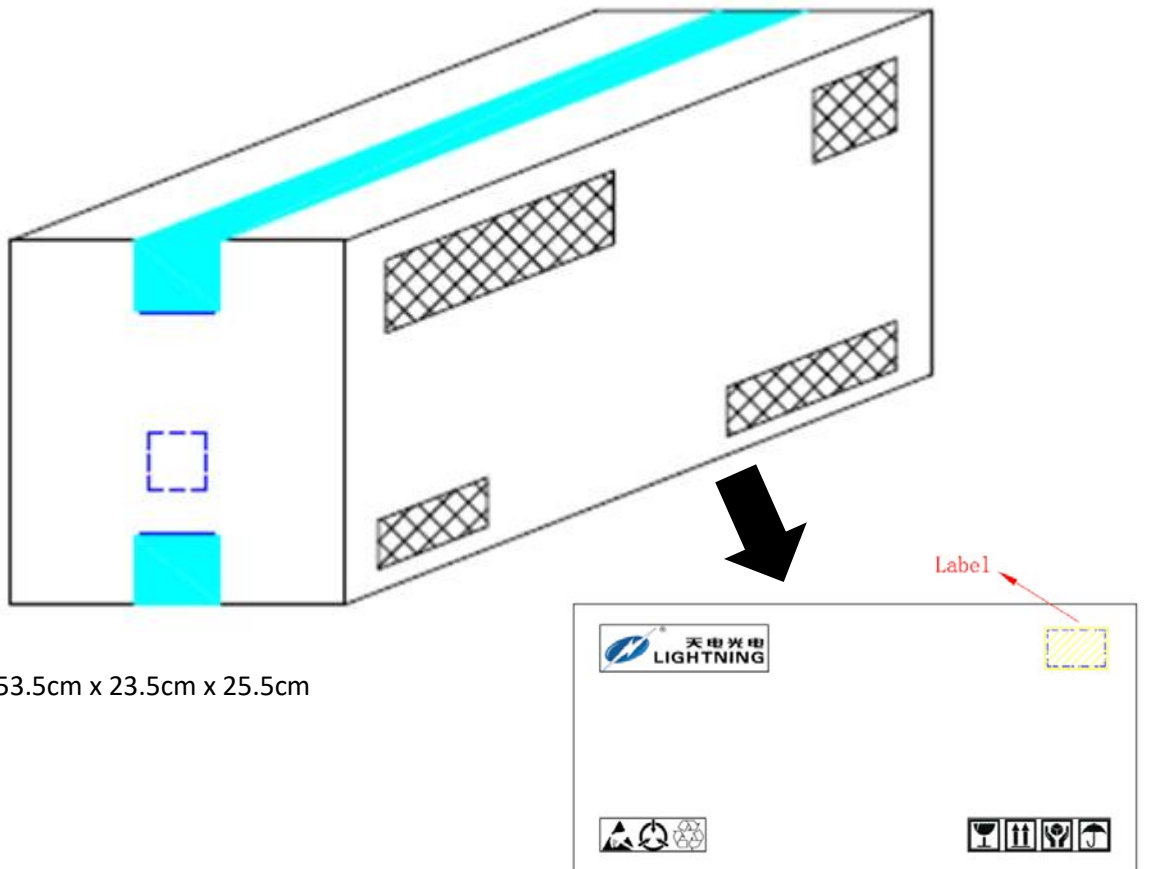
BOX SPECIFICATIONS (Tube Type)

Inner Box



- L x W x H = 52.5cm x 10.7cm x 4.7cm

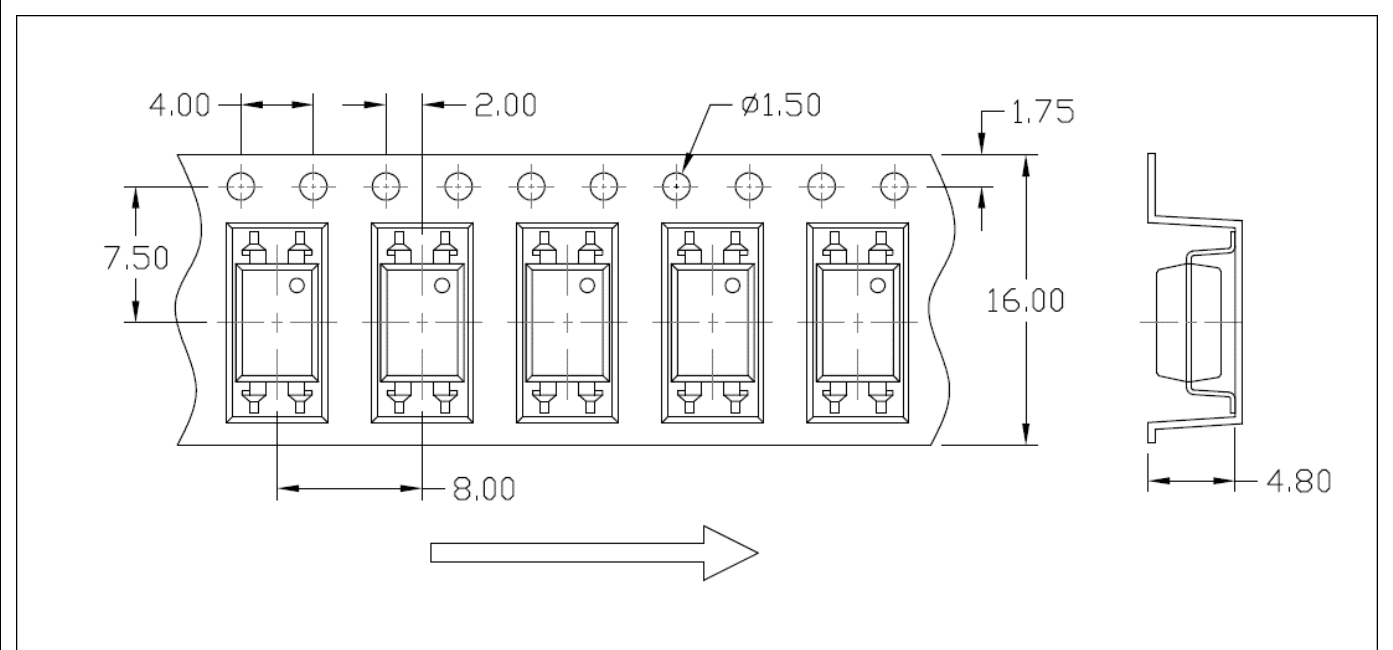
Outer Box



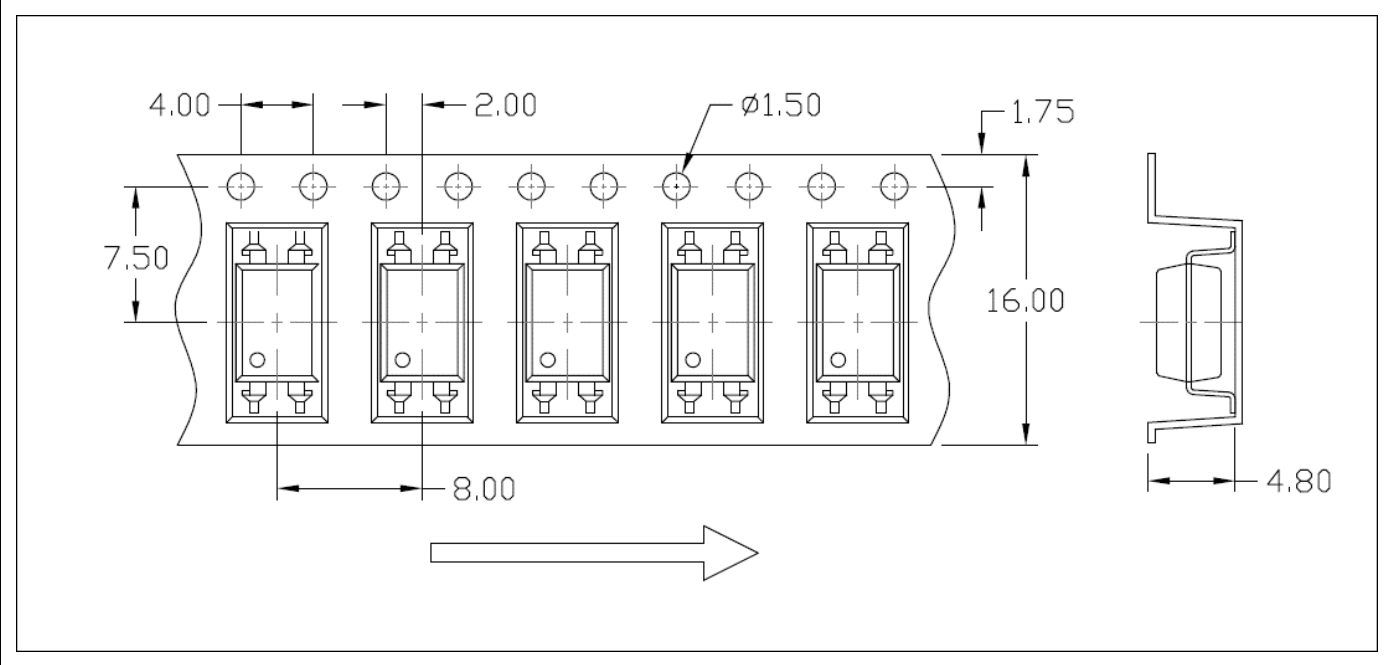
- L x W x H = 53.5cm x 23.5cm x 25.5cm

CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Option S(T1) & SL(T1)

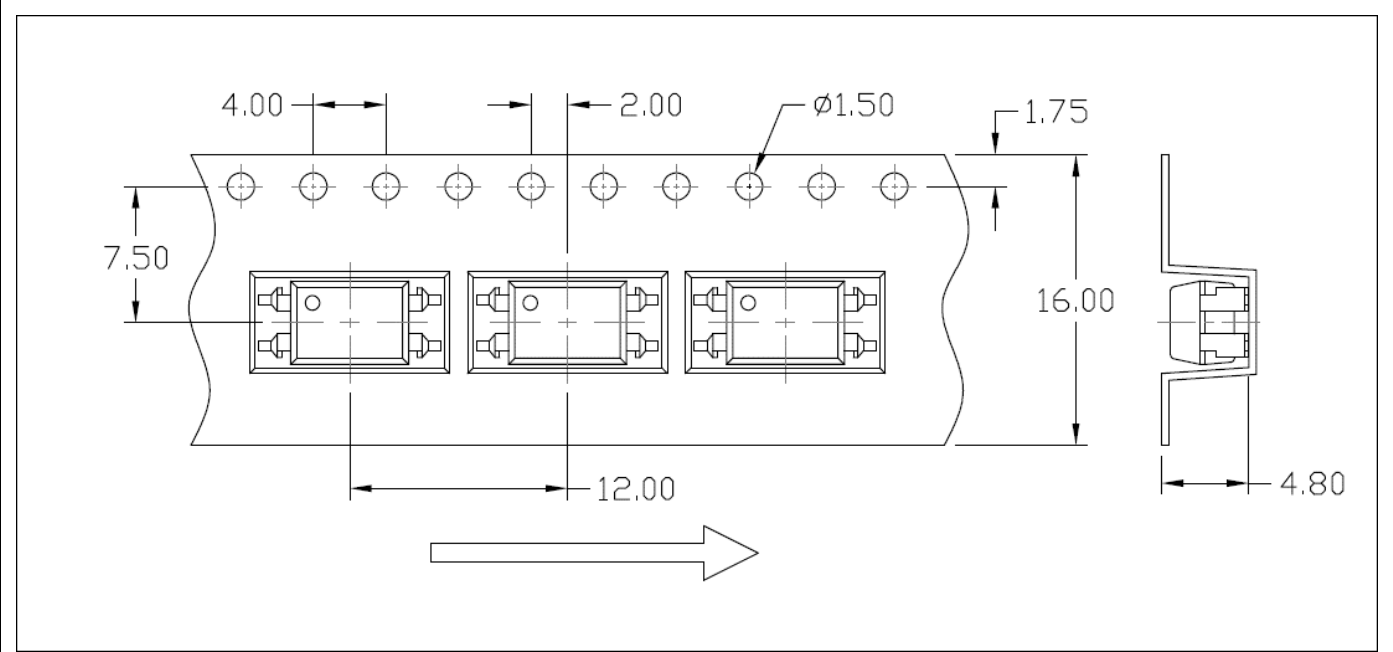


Option S(T2) & SL(T2)

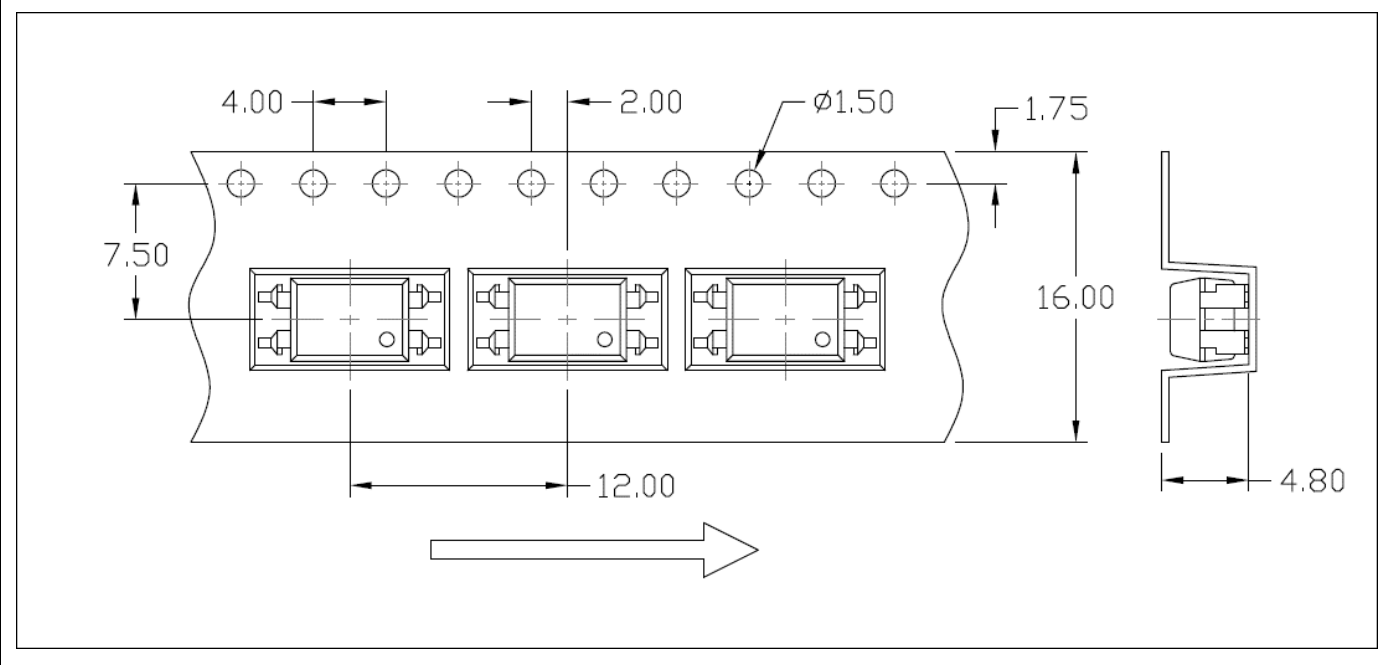


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Option S(T3) & SL(T3)

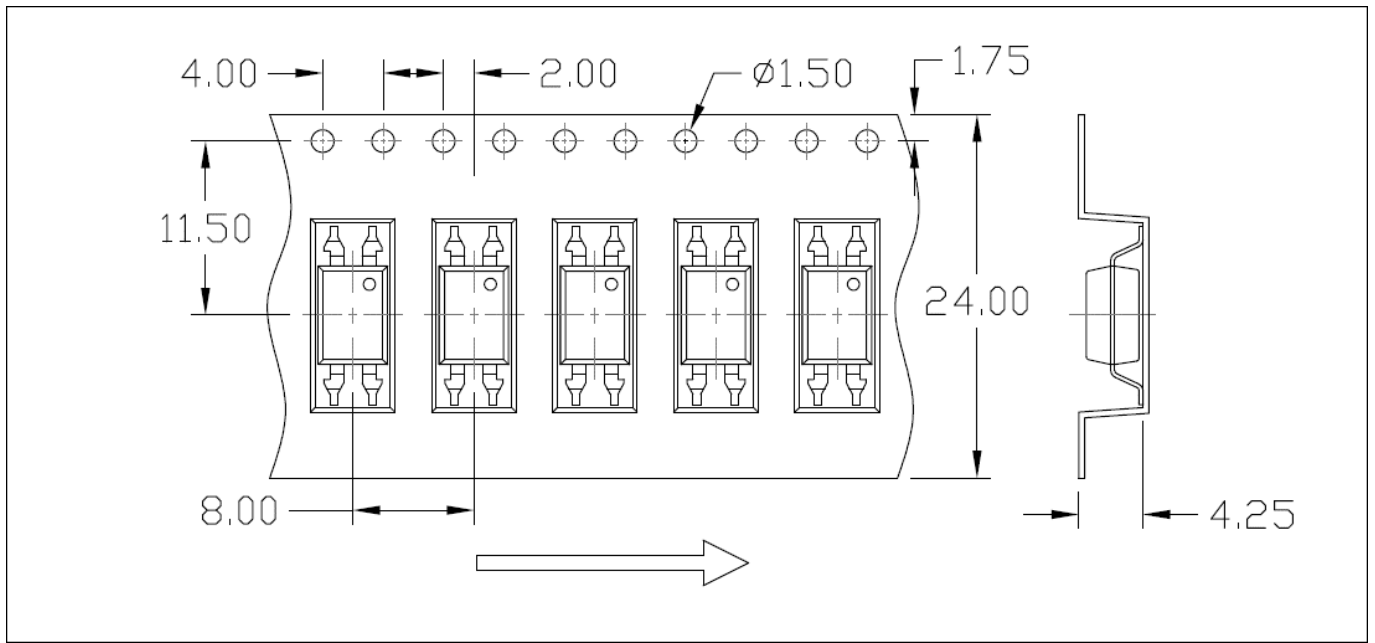


Option S(T4) & SL(T4)

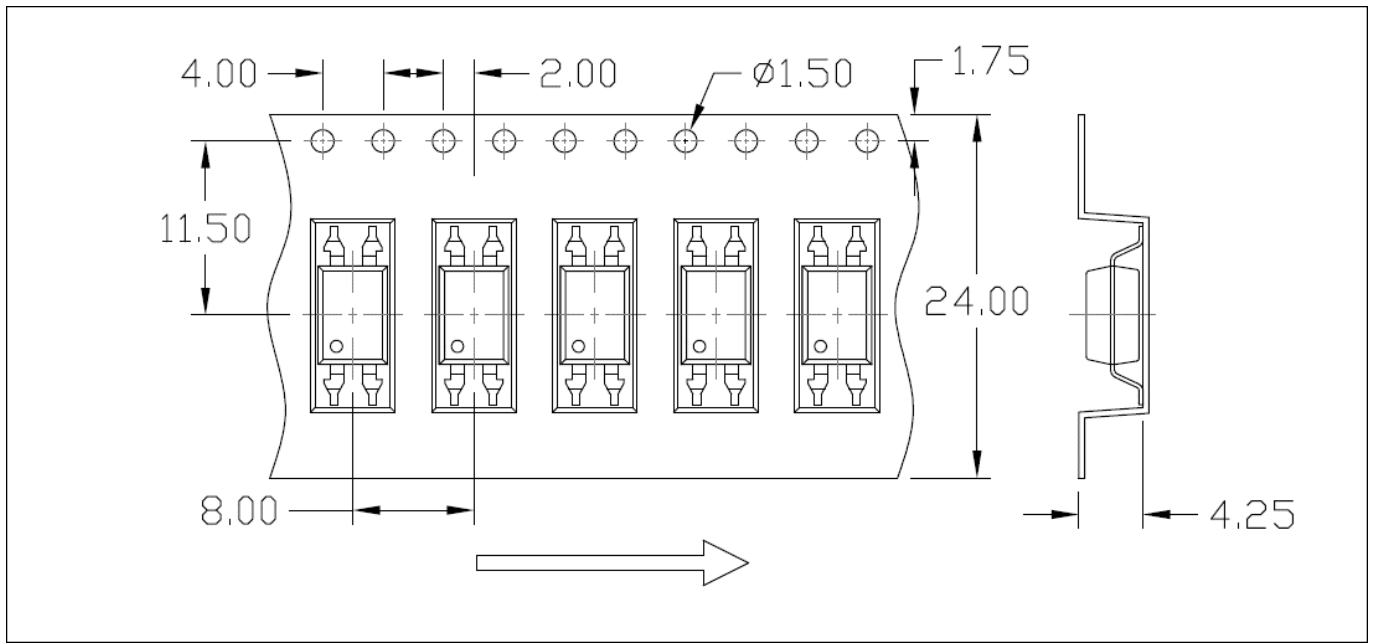


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Option SLM(T1)

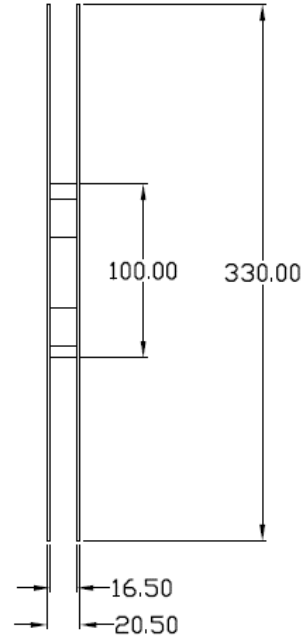
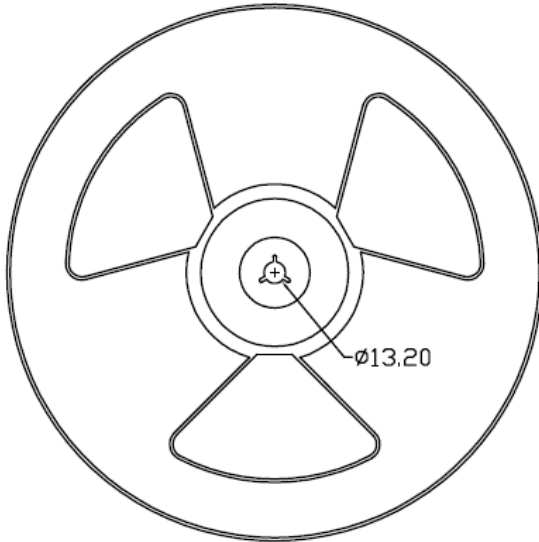


Option SLM(T2)

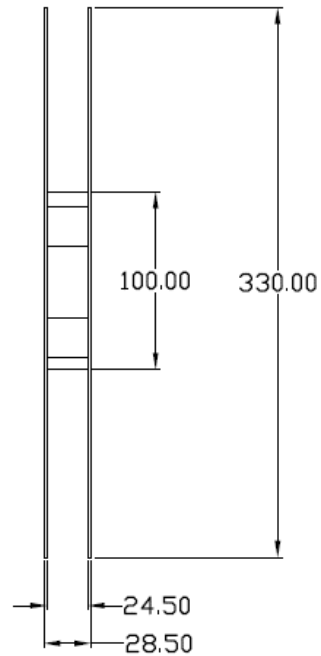
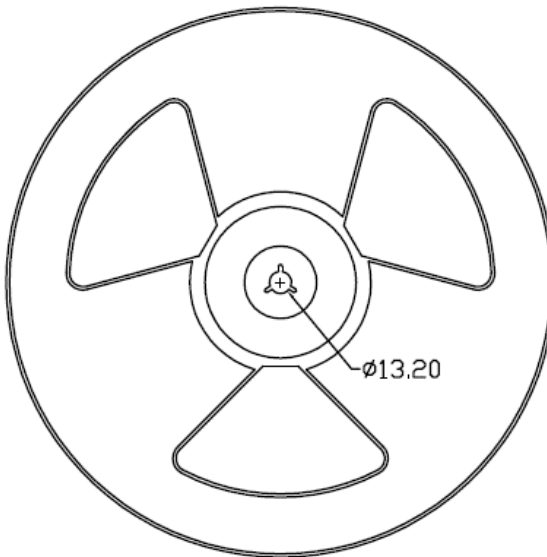


REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Option S & Option SL

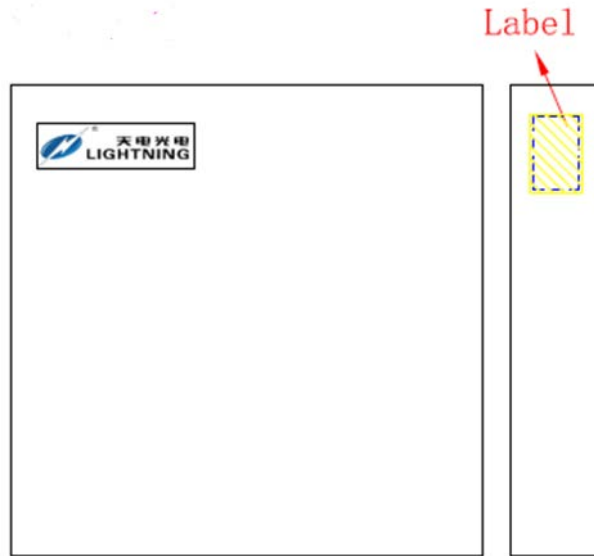


Option SLM



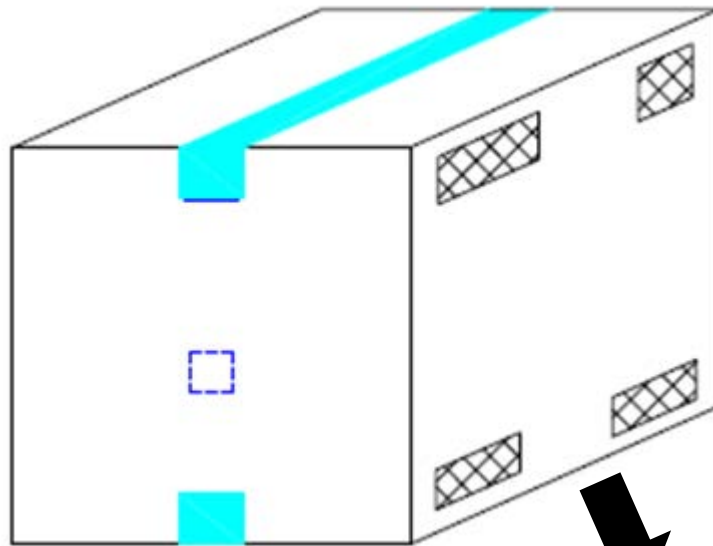
BOX SPECIFICATIONS (Reel Type)

Inner Box

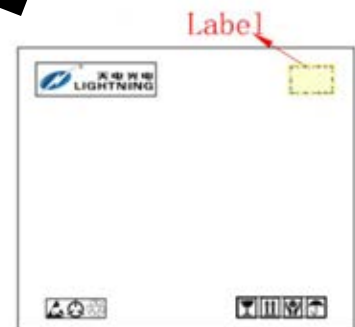


- L x W x H = 36cm x 36cm x 6.9cm

Outer Box



- L x W x H = 45cm x 38cm x 38cm





ORDERING AND MARKING INFORMATION

MARKING INFORMATION



TD : Company Abbr.
F : Leadframe Option
816 : Part Number
X : CTR Rank
V : VDE Option
Y : Fiscal Year
A : Manufacturing Code
WW : Work Week

ORDERING INFORMATION

ORDERING INFORMATION

TD816X(Y)(Z)-FGV

LABEL INFORMATION

TD – Company Abbr.
 816 – Part Number
 X – Rank (A/B/C/D/E or None)
 Y – Lead Form Option (M/S/SL/SLM/None)
 Z – Tape and Reel Option (T1/T2/T3/T4)
 F – Leadframe Option (F:Iron, None:Copper)
 G – Green
 V – VDE Option (V or None)

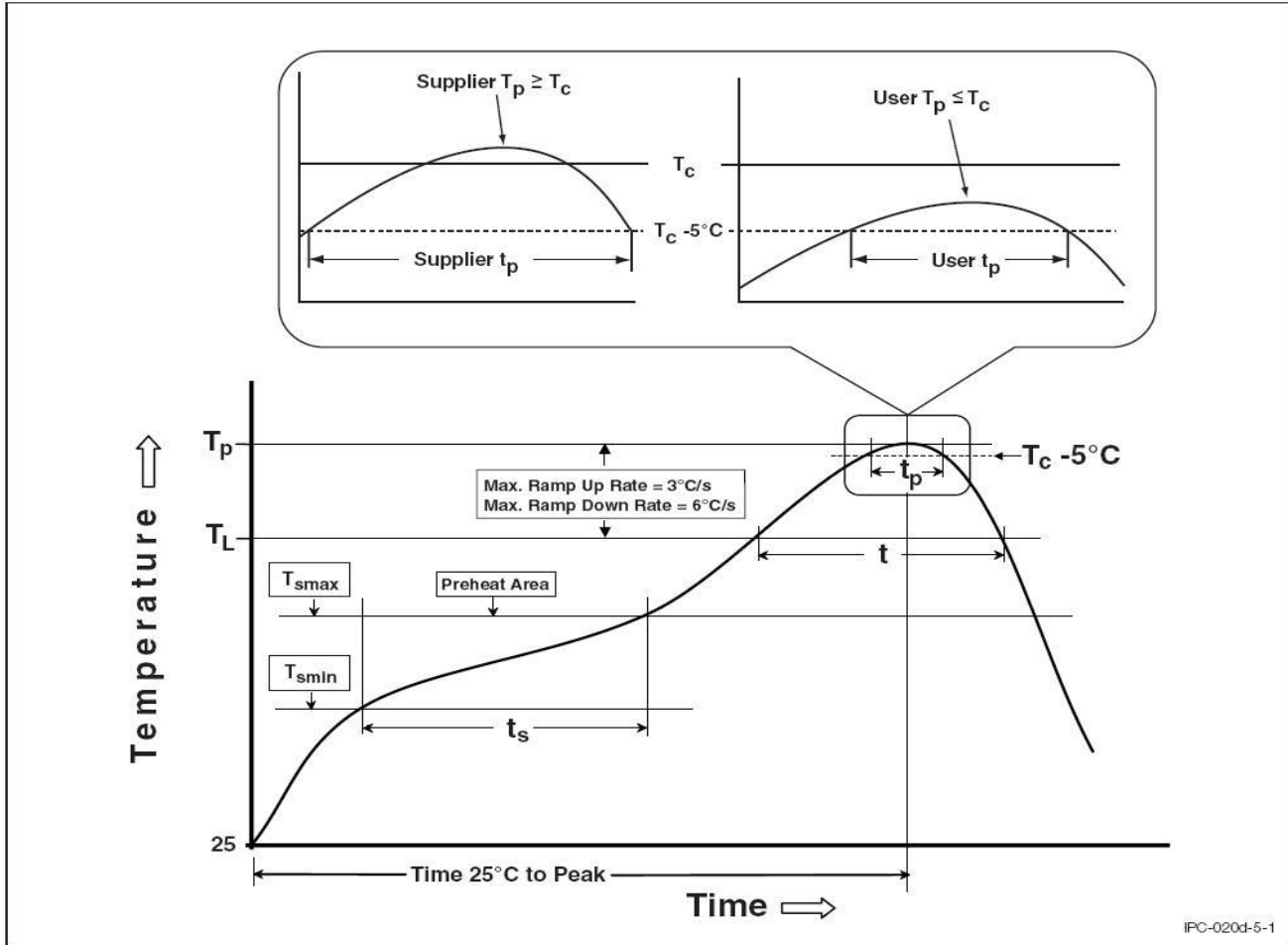


Packing Quantity

| Option | Quantity | Quantity – Inner box | Quantity – Outer box |
|---------|-----------------|----------------------|-------------------------------------|
| None | 100 Units/Tube | 32 Tubes/Inner box | 10 Inner box/Outer box = 32k Units |
| M | 100 Units/Tube | 32 Tubes/Inner box | 10 Inner box/Outer box = 32k Units |
| S(T1) | 1500 Units/Reel | 3 Reels/Inner box | 5 Inner box/Outer box = 22.5k Units |
| S(T2) | 1500 Units/Reel | 3 Reels/Inner box | 5 Inner box/Outer box = 22.5k Units |
| S(T3) | 1000 Units/Reel | 3 Reels/Inner box | 5 Inner box/Outer box = 15k Units |
| S(T4) | 1000 Units/Reel | 3 Reels/Inner box | 5 Inner box/Outer box = 15k Units |
| SL(T1) | 1500 Units/Reel | 3 Reels/Inner box | 5 Inner box/Outer box = 22.5k Units |
| SL(T2) | 1500 Units/Reel | 3 Reels/Inner box | 5 Inner box/Outer box = 22.5k Units |
| SL(T3) | 1000 Units/Reel | 3 Reels/Inner box | 5 Inner box/Outer box = 15k Units |
| SL(T4) | 1000 Units/Reel | 3 Reels/Inner box | 5 Inner box/Outer box = 15k Units |
| SLM(T1) | 1500 Units/Reel | 3 Reels/Inner box | 5 Inner box/Outer box = 22.5k Units |
| SLM(T2) | 1500 Units/Reel | 3 Reels/Inner box | 5 Inner box/Outer box = 22.5k Units |

REFLOW INFORMATION

REFLOW PROFILE



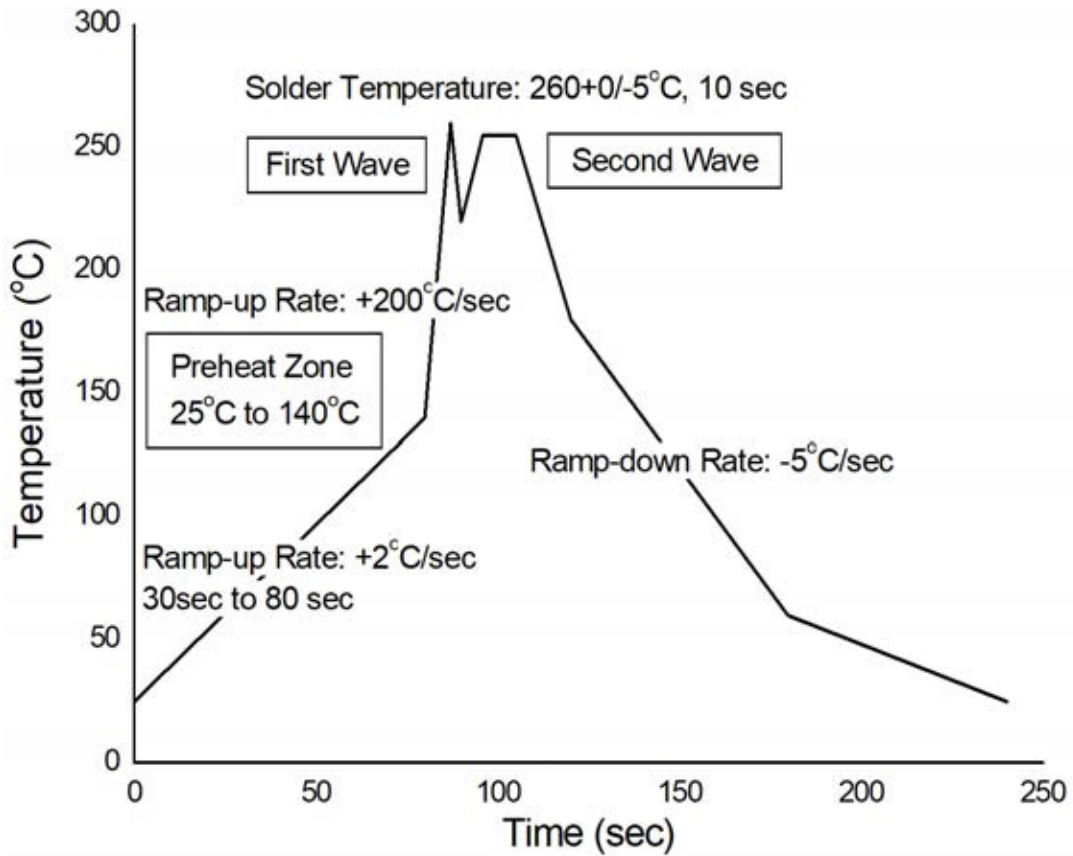
IPC-020d-5-1

| Profile Feature | Sn-Pb Assembly Profile | Pb-Free Assembly Profile |
|-----------------------------------------------------------------------|------------------------|--------------------------|
| Temperature Min. (T _{smin}) | 100 | 150°C |
| Temperature Max. (T _{smax}) | 150 | 200°C |
| Time (t _s) from (T _{smin} to T _{smax}) | 60-120 seconds | 60-120 seconds |
| Ramp-up Rate (t _L to t _P) | 3°C/second max. | 3°C/second max. |
| Liquidous Temperature (T _L) | 183°C | 217°C |
| Time (t _L) Maintained Above (T _L) | 60 – 150 seconds | 60 – 150 seconds |
| Peak Body Package Temperature | 235°C +0°C / -5°C | 260°C +0°C / -5°C |
| Time (t _P) within 5°C of 260°C | 20 seconds | 30 seconds |
| Ramp-down Rate (T _P to T _L) | 6°C/second max | 6°C/second max |
| Time 25°C to Peak Temperature | 6 minutes max. | 8 minutes max. |



TEMPERATURE PROFILE OF SOLDERING

WAVE SOLDERING (JESD22-A111 COMPLIANT)



HAND SOLDERING BY SOLDERING IRON

| | |
|-----------------------|--------------------------------|
| Soldering Temperature | $380 \pm 0/-5^{\circ}\text{C}$ |
| Soldering Time | 3 sec max. |

- One time soldering is recommended for all soldering method.
- Do not solder more than three times for IR reflow soldering.



DISCLAIMER

- LIGHTNING is continually improving the quality, reliability, function and design. LIGHTNING reserves the right to make changes without further notices.
- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
- LIGHTNING makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, LIGHTNING disclaims (a) any and all liability arising out of the application or use of any product, (b) any and all liability, including without limitation special, consequential or incidental damages, and (c) any and all implied warranties, including warranties of fitness for particular
- The products shown in this publication are designed for the general use in electronic applications such as office automation, equipment, communications devices, audio/visual equipment, electrical application and instrumentation purpose, non-infringement and merchantability.
- This product is not intended to be used for military, aircraft, automotive, medical, life sustaining or lifesaving applications or any other application which can result in human injury or death.
- Please contact LIGHTNING sales agent for special application request.
- Immerge unit's body in solder paste is not recommended.
- Parameters provided in datasheets may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated in each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify LIGHTNING's terms and conditions of purchase, including but not limited to the warranty expressed therein.
- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability.