BRIGHTEK

BRIGHTEK (EUROPE) LIMITED

Brighten Up The World With LED!

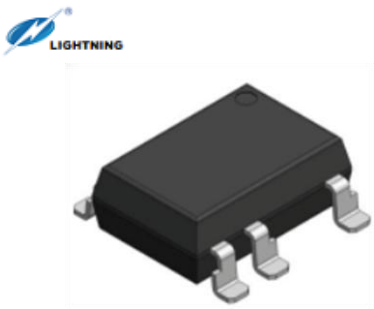
ISO/TS 16949:2009 BS EN ISO 14001:2004 QC 080000 IECQ HSPM

# PRODUCT DATASHEET


- ▶ DC-In Solid State Relay
- ▶ SMD7 Low Profile
- ▶ Zero-Cross TRIAC Output

Release Date: 24 June 2025 Version: A00

# TDRX213(SL)(T1)-GV



TDRX213(SL) Series

## TDRX213(SL) Series

RoHS Compliant

### DESCRIPTION:

The TDRX213(SL) series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a monolithic silicon zero-cross photo TRIAC to drive a power TRIAC in a plastic DIP7 package with SMD7 Low Profile lead forming option.

### FEATURES:

- High isolation 5000Vrms
- DC input with TRIAC output
- Operating temperature range -40°C to +85°C
- REACH & RoHS compliance
- MSL class 1
- Regulatory Approvals:
  - UL - UL1577
  - VDE - EN60747-5-5 (VDE0884-5)
  - CQC - GB4943.1, GB8898
  - cUL - CSA Component Acceptance Service Notice 5A
- Packing: 1000pcs/reel

### APPLICATIONS:

- Solenoid/valve controls
- Lighting controls
- Motor controls
- Temperature controls
- Static AC power switches
- Solid state relays
- Interfacing microprocessors to 115 to 240VAC peripherals

Partner with: LIGHTNING

## NAMING & ORDERING INFORMATION:

Naming Information:

| TDR X 213 (SL) (T1)- G V | |
|---|---|
| TDRX213 | Part Number |
| X | Selection: On-State RMS Current (X=0~3) |
| SL | Lead Form Option: SMD7 Low Profile |
| T1 | Selection: Tape and Reel Option (T1(default)/T2) |
| G | Green Option |
| V | VDE Option |

Ordering Information:

**TDRX213(SL)(T1)-GV**

X = Selection: On-State RMS Current (X=0~3)

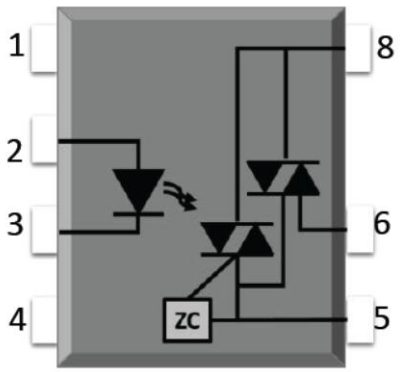
| Part Number | Symbol | Values | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| TDR0213(SL)(T1)-GV | $IT_{(RMS)}$ * | --- | --- | 0.3 | A | $I_{TSM}$=3A ** $P_W$=100µs, 120pps |
| TDR1213(SL)(T1)-GV | | --- | --- | 0.6 | | $I_{TSM}$=6A $P_W$=100µs, 120pps |
| TDR2213(SL)(T1)-GV | | --- | --- | 0.9 | | $I_{TSM}$=9A $P_W$=100µs, 120pps |
| TDR3213(SL)(T1)-GV | | --- | --- | 1.2 | | $I_{TSM}$=12A $P_W$=100µs, 120pps |

* $IT_{(RMS)}$ = On-State RMS Current
** $I_{TSM}$ = Non-repetitive Surge Current

| Version No. | Original Release Date |
|---|---|
| Rev: A00 | 29/08/2024 |

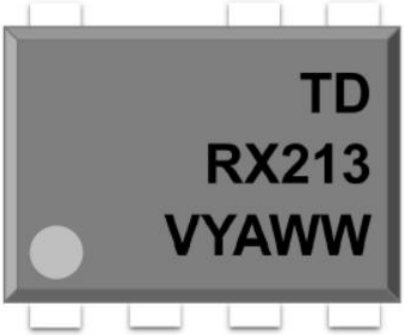
## SCHEMATIC DIAGRAM & MARKING:

Schematic Diagram:




| PIN Definition | |
|---|---|
| 1 | NC |
| 2 | Anode |
| 3 | Cathode |
| 4 | NC |
| 5 | Gate |
| 6 | Terminal |
| 7 | (Absent) |
| 8 | Terminal |

Marking Information:




| Marking Definition | |
|---|---|
| TD | Manufacturer Code |
| RX213 | Part Number |
| V | VDE Applicable |
| Y | Fiscal Year |
| A | Manufacturing Code |
| WW | Work Week |

Labelling Information:


This product is manufactured, tested, and packed by

LIGHTNING

for more details, please visit www.tdled.com

## ABSOLUTE CHARACTERISTICS:

Absolute Maximum Ratings:

| Parameter | | Symbol | Ratings | Unit |
|---|---|---|---|---|
| INPUT | | | | |
| Forward Current | | $I_F$ | 60 | mA |
| Reverse Voltage | | $V_R$ | 6 | V |
| Junction Temperature | | $T_j$ | 125 | °C |
| Input Power Dissipation | | $P_I$ | 100 | mW |
| OUTPUT | | | | |
| Off-State Output Terminal Voltage | | $V_{DRM}$ | 600 | V |
| On-State RMS Current | TDR0213 | $I_{T(RMS)}$ | 0.3 | A |
| | TDR1213 | | 0.6 | |
| | TDR2213 | | 0.9 | |
| | TDR3213 | | 1.2 | |
| Non-repetitive Surge Current $P_W$=100μs, 120pps | TDR0213 | $I_{TSM}$ | 3 | A |
| | TDR1213 | | 6 | |
| | TDR2213 | | 9 | |
| | TDR3213 | | 12 | |
| Junction Temperature | | $T_j$ | 125 | °C |
| COMMON | | | | |
| Total Power Dissipation | | $P_{tot}$ | 400 | mW |
| Isolation Voltage | | $V_{iso}$ | 5000 *1 | Vrms |
| Operating Temperature | | $T_{opr}$ | -40~+85 | °C |
| Storage Temperature | | $T_{stg}$ | -40~+125 | °C |
| Soldering Temperature | | $T_{sol}$ | 260 *2 | °C |

*1. AC for 1 minute, R.H.=40~60%.
*2. For 10 seconds max.

## ELECTRICAL CHARACTERISTICS:

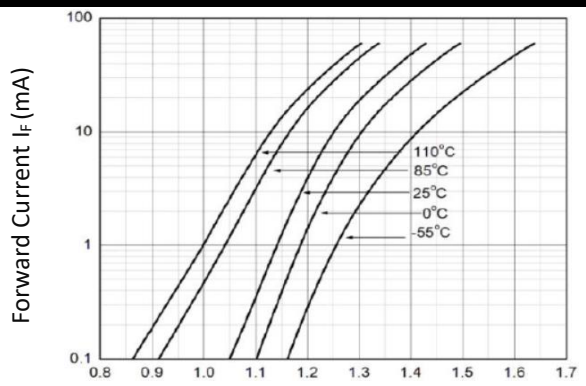
Electrical Optical Characteristics at $T_a$=25°C:

| Parameter | Symbol | Values | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| INPUT | | | | | | |
| Forward Voltage | $V_F$ | --- | 1.24 | 1.4 | V | $I_F$=10mA |
| Reverse Current | $I_R$ | --- | --- | 10 | μA | $V_R$=6V |
| Input Capacitance | $C_{IN}$ | --- | 30 | --- | pF | V=0, f=1kHz |
| OUTPUT | | | | | | |
| Peak Off-State Current Either Direction | $I_{DRM}$ | --- | --- | 100 | μA | $V_{DRM}$=600V $I_F$=0 |
| On-State Terminal Voltage | $V_{TM}$ | --- | 1.7 | 2.5 | V | $I_{TM}$=Rated $I_{TM}$ |
| Critical Rate of Rise of Off-State Voltage - Breakdown Voltage | dV/dt | 1000 | --- | --- | V | $V_{PEAK}$=600V *1 |
| TRANSFER CHARACTERISTICS | | | | | | |
| LED Trigger Current | $I_{FT}$ | --- | --- | 10 | mA | $R_L$=100Ω Terminal Voltage=6V |
| Holding Current | $I_H$ | --- | --- | 25 | mA | --- |
| Isolation Resistance | $R_{ISO}$ | 10^12 | 10^14 | --- | Ω | DC=500V, 40~60% R.H. |
| Floating Capacitance | $C_{IO}$ | --- | 0.25 | 1 | pF | V=0, f=1MHz |
| ZERO-CROSSING CHARACTERISTICS | | | | | | |
| Inhibit Voltage | $V_{INH}$ | --- | --- | 20 | V | $I_F$=10mA |
| Leakage in Inhibited State | $I_{DRM2}$ | --- | --- | 500 | μA | $I_F$=10mA $V_{DRM}$=600V |
| Response Time (Rise) | $T_{ON}$ | --- | 30 | --- | μs | $V_D$=6V, $R_L$=100Ω $I_F$=10mA |

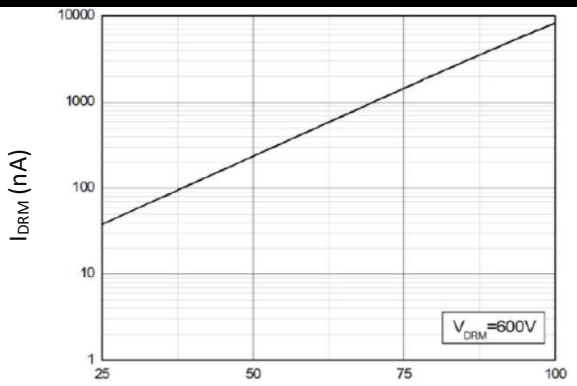
*1. Test voltage must be applied within dV/dt rating.

## CHARACTERISTIC CURVES:

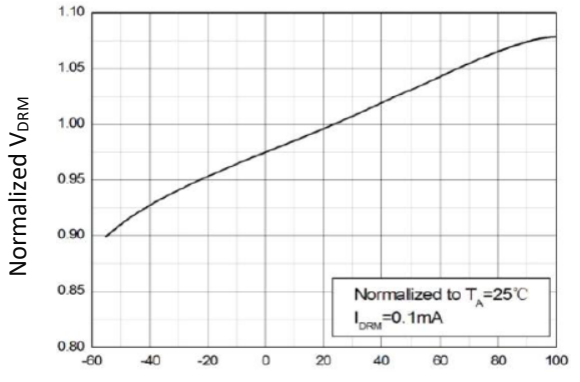
### Forward Current v.s. Forward Voltage



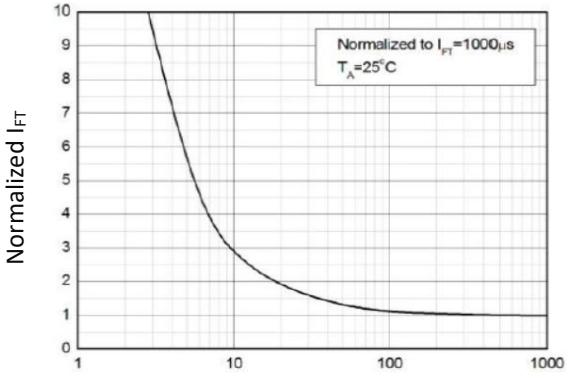

### Off-State Terminal Current v.s. Ambient Temperature



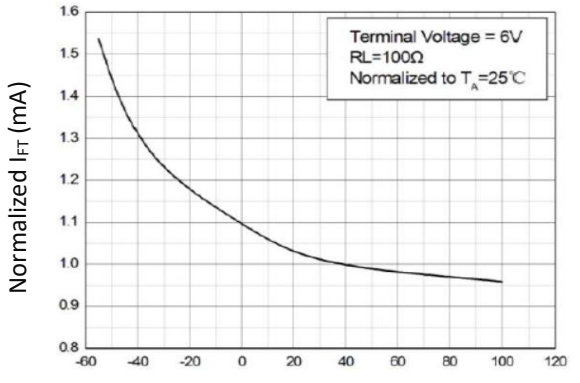

### Normalized Off-State Terminal Voltage v.s. Ambient Temperature



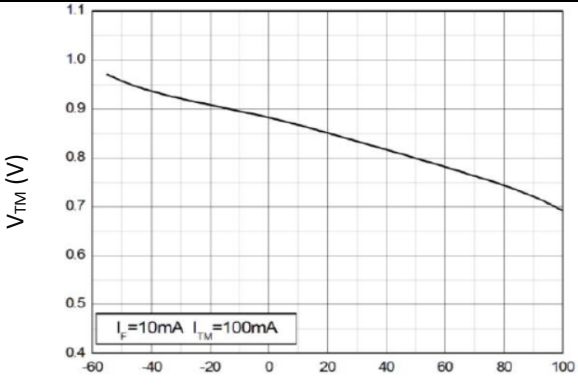

### Normalized Trigger Current v.s. LED Trigger Pulse Width




### Normalized Trigger Current v.s. Ambient Temperature

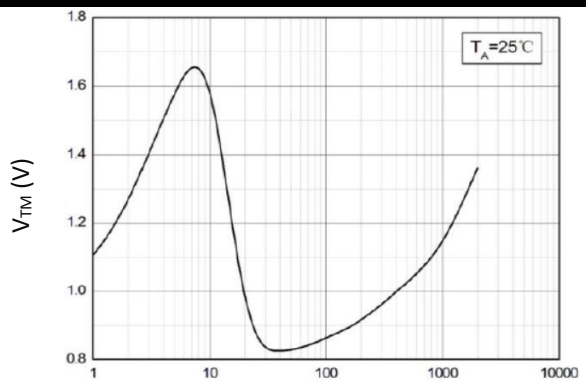



### On-State Terminal Voltage v.s. Ambient Temperature



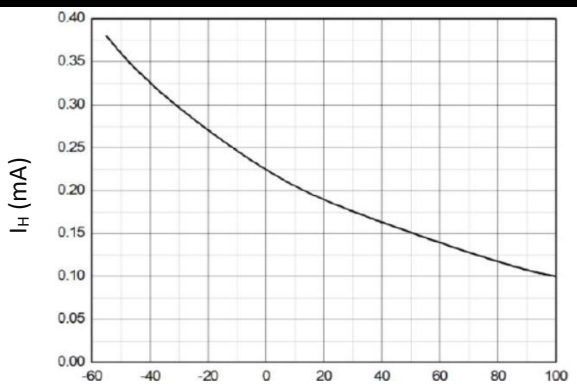
## CHARACTERISTIC CURVES:

### On-State Terminal Voltage v.s. On-State Terminal Current



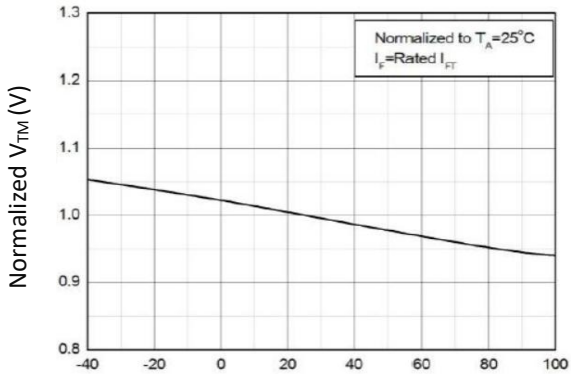

$I_{TM}$ (mA)

### Holding Current v.s. Ambient Temperature



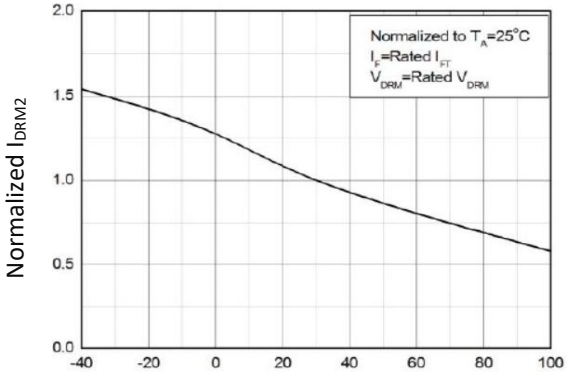

Ambient Temperature $T_a$ (°C)

### Normalized Inhibit Voltage v.s Ambient Temperature



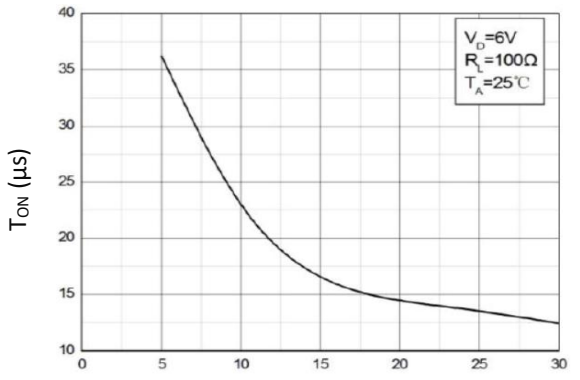

Ambient Temperature $T_a$ (°C)

### Normalized Leakage in Inhibit State v.s. Ambient Temperature



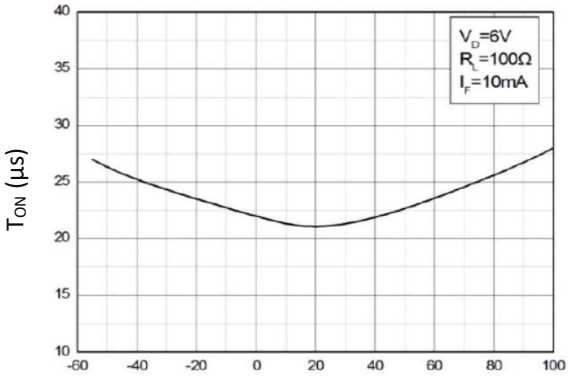

Ambient Temperature $T_a$ (°C)

### Turn On Time v.s. Forward Current




$I_F$ (mA)

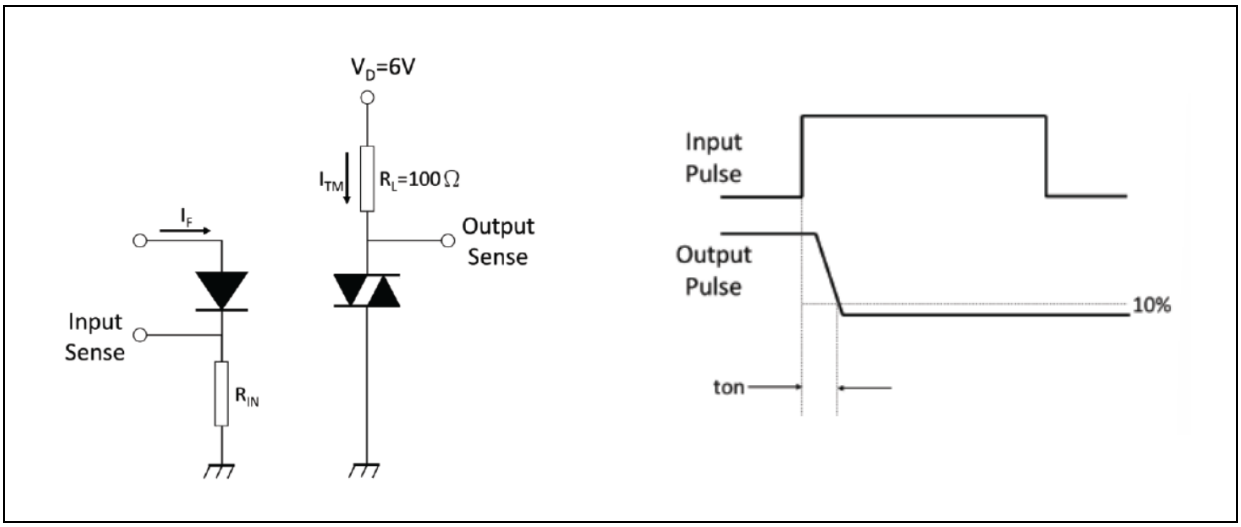
### Turn On Time v.s. Ambient Temperature



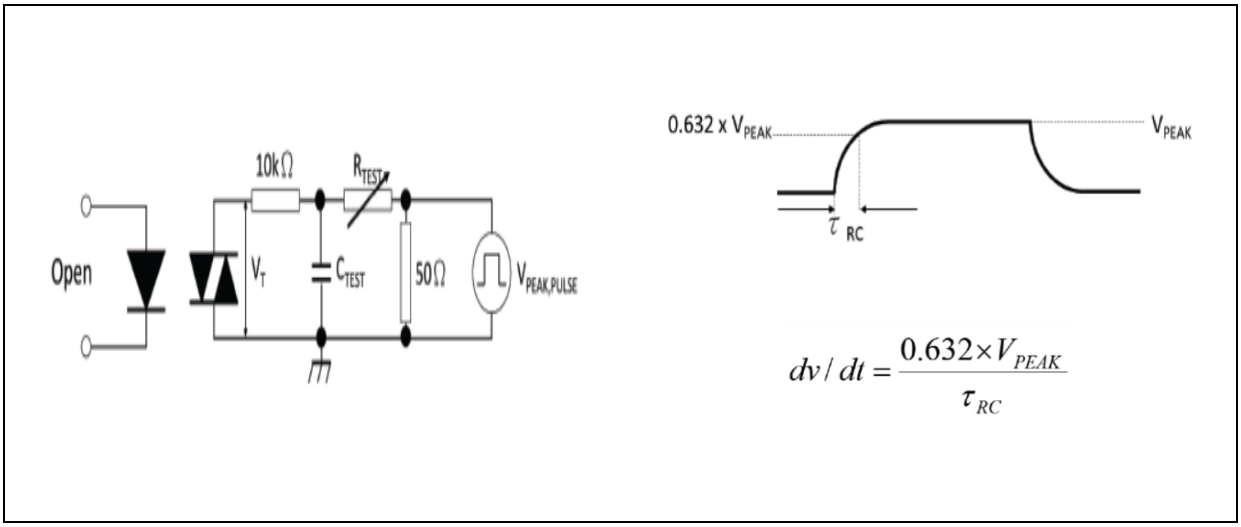

Ambient Temperature $T_a$ (°C)

## TEST CIRCUIT:

Test Circuit and Waveforms of Turn On Time:



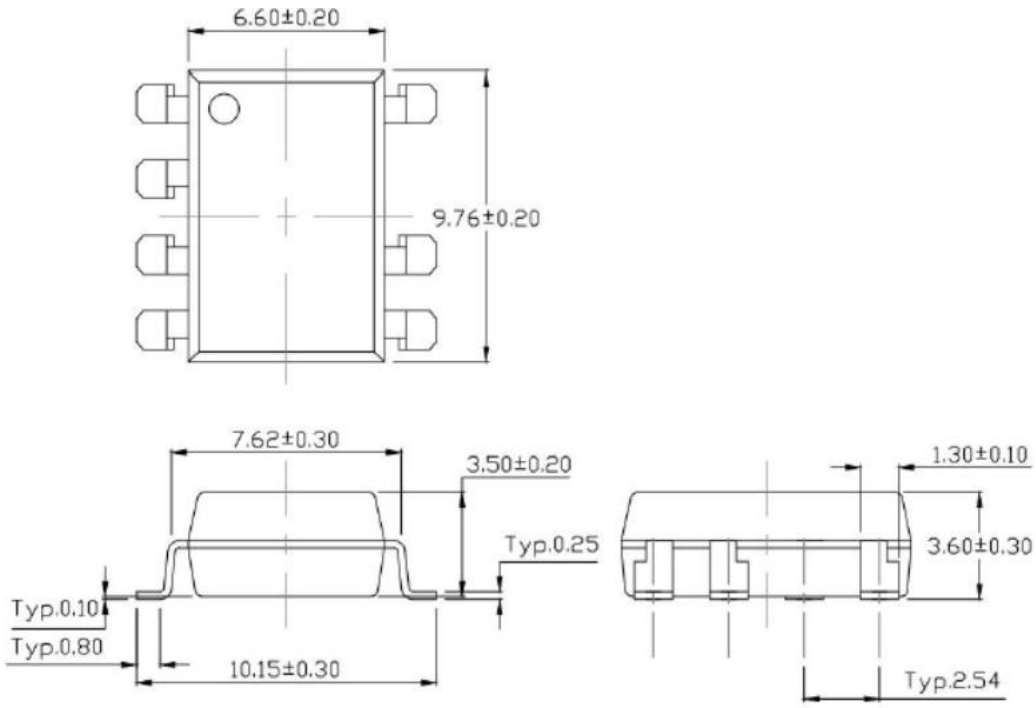

Test Circuit and Waveforms of dV/dt:



## OUTLINE DIMENSION:

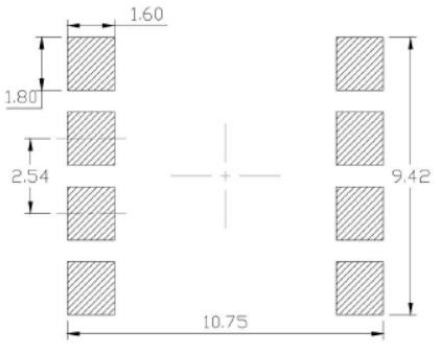
Package Dimension:

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




1. All dimensions are in millimetre (mm).

Recommended Soldering Mask:



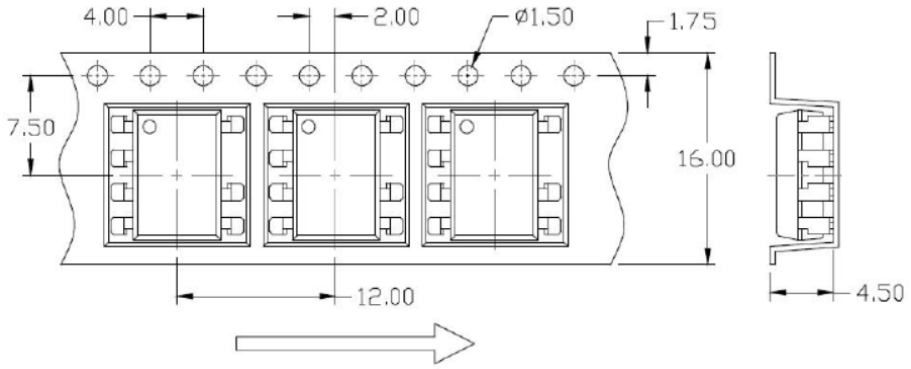

1. Dimensions are in millimetre (mm).

## PACKING SPECIFICATION:

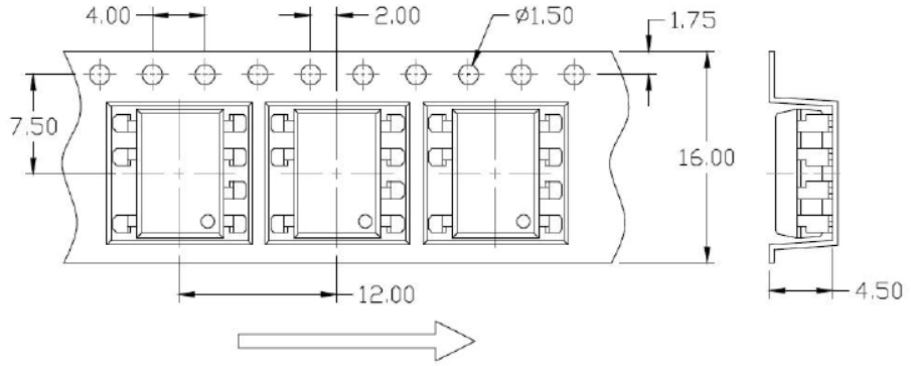
Reel Dimension:

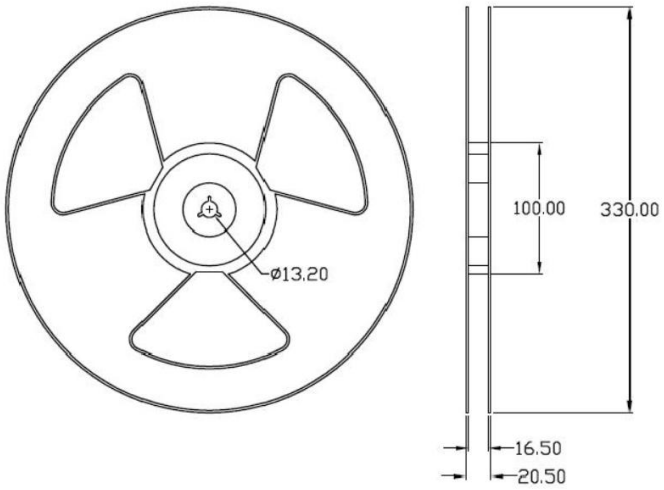
T1/T2: 1000pcs/reel

Reel Option: T1 (default)




Reel Option: T2

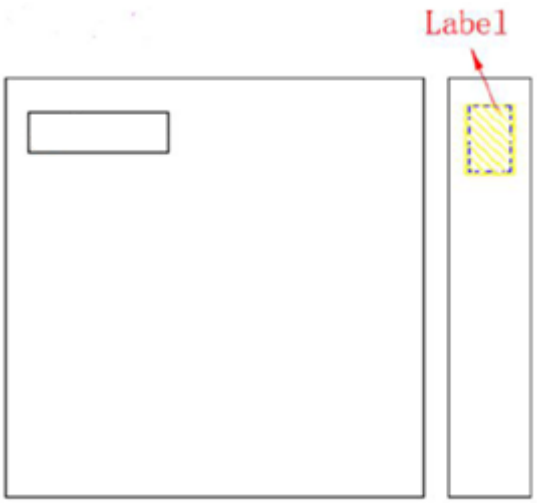


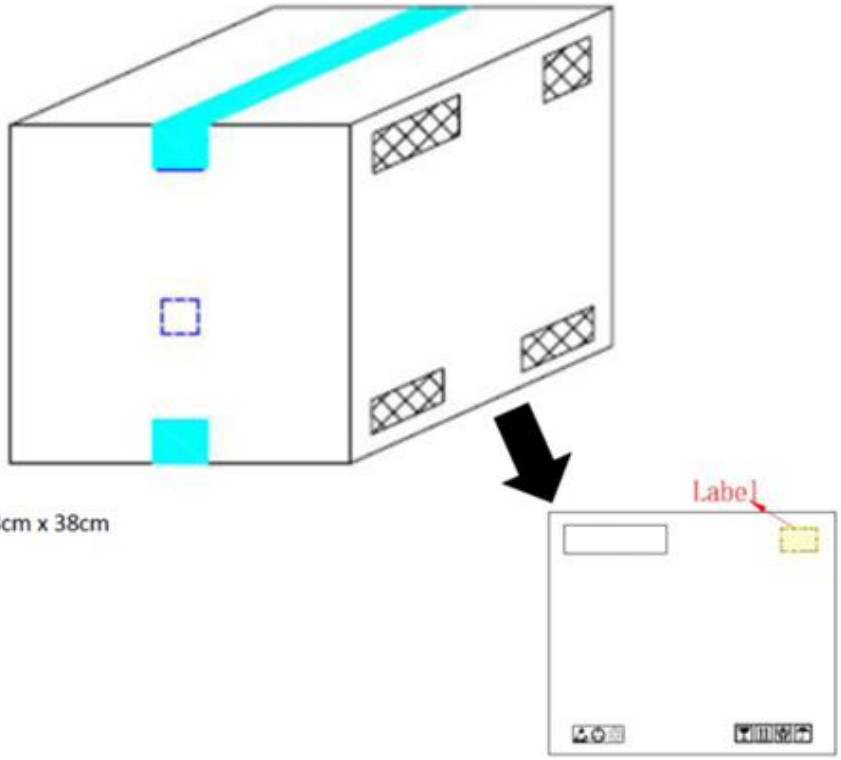
## PACKING SPECIFICATION:

Box Dimension:

T1/T2: 3 reels (3Kpcs)/inner box, 5 inner boxes (15Kpcs)/carton



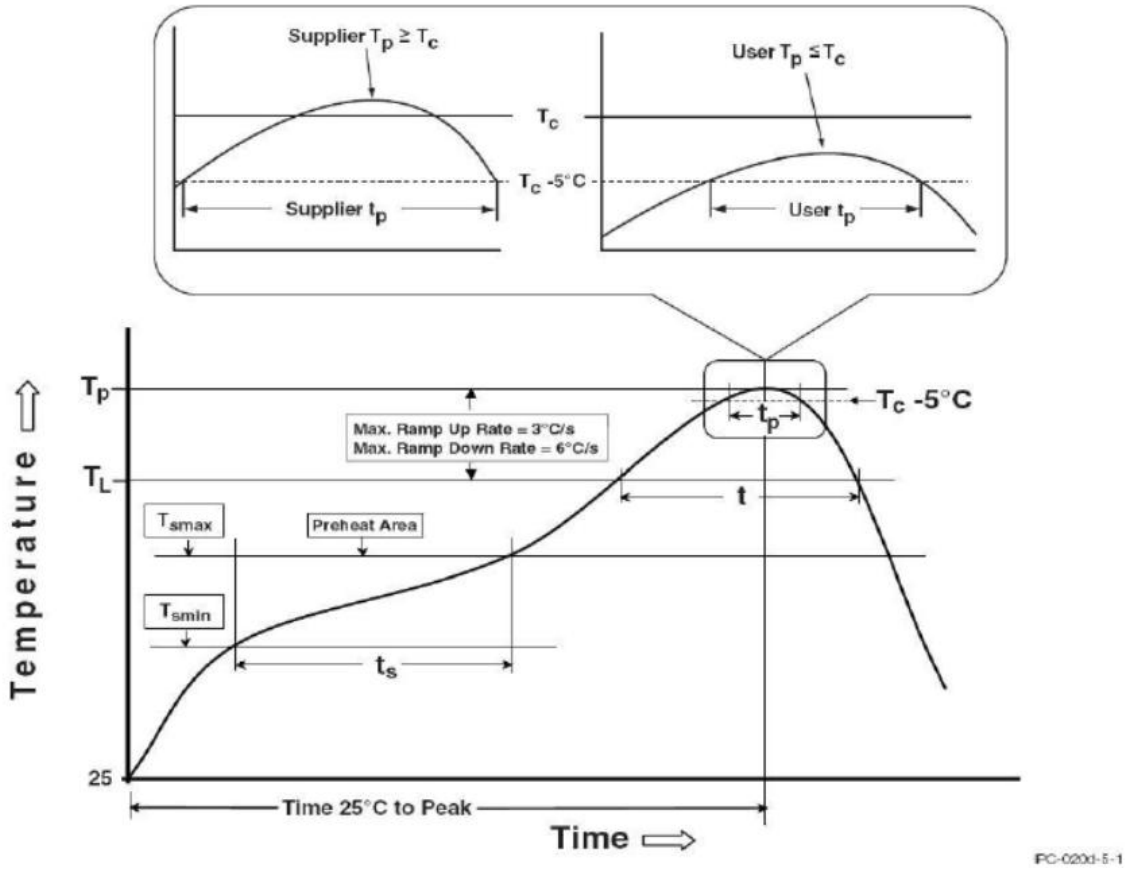

- L x W x H = 36cm x 36cm x 6.9cm




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

## RECOMMENDED SOLDERING PROFILE:

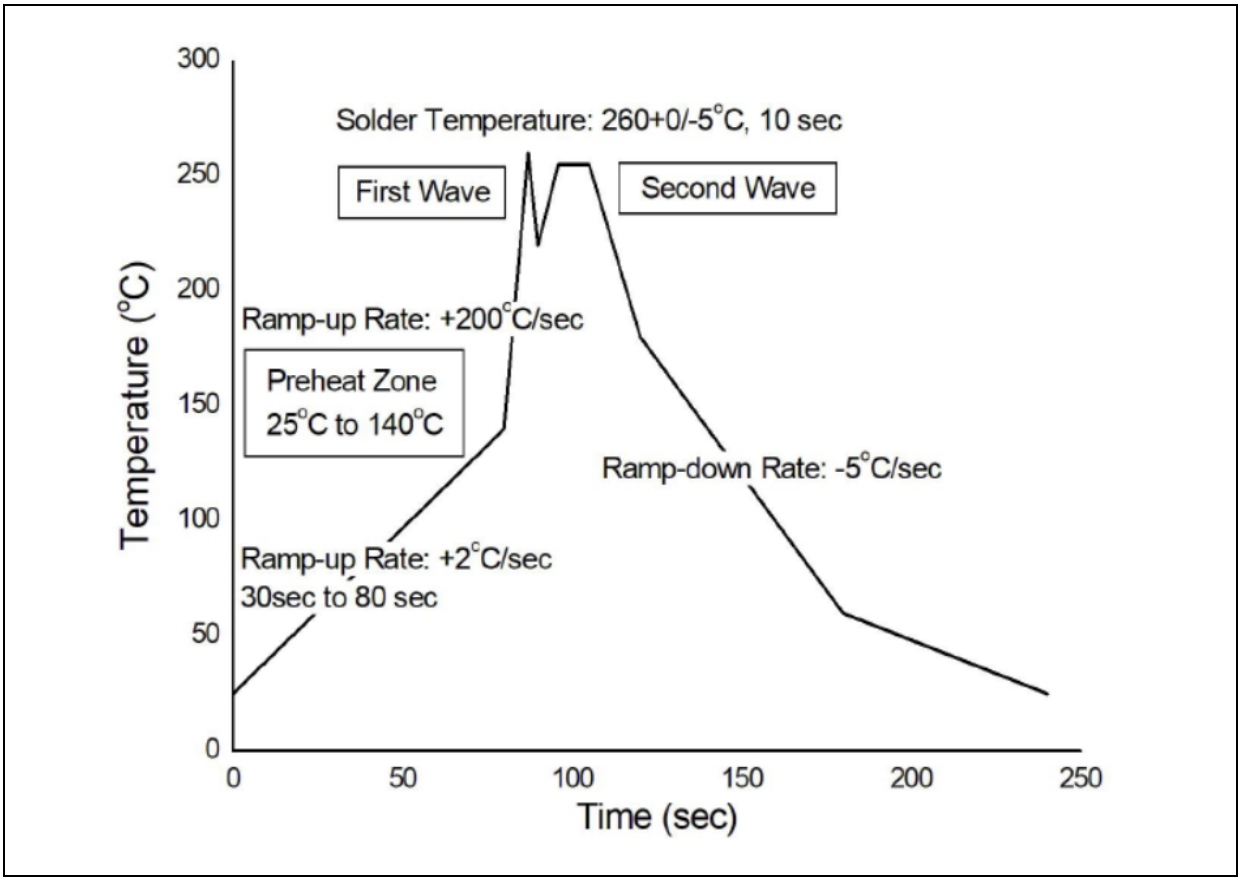
Reflow Information:




| Profile Feature | Sn-Pb Assembly Profile | Pb-Free Assembly Profile |
|---|---|---|
| Temperature Min. ($T_{smin}$) | 100°C | 150°C |
| Temperature Max. ($T_{smax}$) | 150°C | 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. |

## RECOMMENDED SOLDERING PROFILE:

Wave Soldering (JESD22-A111 Compliant):




Hand Soldering:

| | |
|---|---|
| Soldering Temperature | 380±5°C |
| Soldering Time | 3 sec max. |

Note:

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