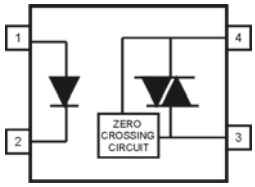
DATASHEET

# 4 PIN SOP ZERO-CROSS TRIAC PHOTOCOUPLER
# ELM304X, ELM306X, ELM308X Series


Schematic




Pin Configuration
1. Anode
2. Cathode
3. Terminal
4. Terminal

**Features:**

- Halogens free.
  (Br <900 ppm ,Cl <900 ppm , Br+Cl < 1500 ppm)
- Peak breakdown voltage
  - 400V: ELM304X
  - 600V: ELM306X
  - 800V: ELM308X
- High isolation voltage between input and output (Viso=3750 V rms )
- Zero voltage crossing
- Compliance with EU REACH
- Pb free and RoHS compliant.
- UL and cUL approved
- VDE approved
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CQC approved

## Description

The ELM304X, ELM306X and ELM308X devices consist of a GaAs infrared emitting diode optically coupled to a monolithic silicon detector performing the function of a zero voltage crossing bilateral triac driver.

They are designed for use with a discrete power triac in the interface of logic systems to equipment powered from 110 to 240 VAC lines, such as solid-state relays, industrial controls, motors, solenoids and consumer appliances, etc.

## Applications

- Solenoid/valve controls
- Light controls
- Static power switch
- AC motor drivers
- E.M. contactors
- Temperature controls
- AC Motor starters
- Solid state relays

## Absolute Maximum Ratings (Ta=25℃)

| Parameter | | | Symbol | Rating | Unit |
|---|---|---|---|---|---|
| Input | Forward current | | $I_F$ | 50 | mA |
| | Peak forward current (1us pulse, 300pps) | | $I_{F(PK)}$ | 1 | A |
| | Reverse voltage | | $V_R$ | 6 | V |
| | Power Dissipation | | $P_D$ | 100 | mW |
| Output | Off-state Output Terminal Voltage | ELM304X | $V_{DRM}$ | 400 | V |
| | | ELM306X | | 600 | |
| | | ELM308X | | 800 | |
| | On state RMS current | | $I_{T(RMS)}$ | 70 | mA(RMS) |
| | Power dissipation | | $P_C$ | 300 | mW |
| Isolation voltage *1 | | | $V_{ISO}$ | 3750 | Vrms |
| Operating temperature | | | $T_{OPR}$ | -40~+100 | °C |
| Storage temperature | | | $T_{STG}$ | -55~+150 | °C |
| Soldering Temperature*2 | | | $T_{SOL}$ | 260 | °C |

Notes:

*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2 are shorted together, and pins 3, 4 are shorted together.

*2 For 10 seconds

## Recommended Operating Conditions (Note)

Please use under recommended operating conditions to obtain expected characteristics

| Parameter | | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input forward current | EL30X2 | $I_F$ | 15 | 20 | 25 | mA |
| | EL30X3 | | 7 | 10 | 20 | mA |
| | EL30X4 | | 5 | 7 | 15 | mA |
| AC mains voltage | | $V_{AC}$ | - | - | 240 | V |
| Operating temperature | | $T_{OPR}$ | -25 | - | 85 | °C |

Notes:
The recommended operating conditions are given as a design guide necessary to obtain the intended performance of the device. Each parameter is an independent value. When creating a system design using this device, the electrical characteristics specified in this data sheet should also be considered.

## Electro-Optical Characteristics (Ta=25℃ unless specified otherwise)

### Input

| Parameter | Symbol | Min. | Typ.* | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | - | - | 1.5 | V | $I_F$ = 10mA |
| Reverse Leakage current | $I_R$ | - | - | 10 | μA | $V_R$ = 6V |

Note: Reverse Voltage(VR) Condition is applied to IR test only The device is not designed for reverse operation

### Output

| Parameter | Symbol | Min. | Typ.* | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| Peak Blocking Current | $I_{DRM1}$ | - | - | 500 | nA | $V_{DRM}$ = Rated $V_{DRM}$<br>$I_F$ = 0mA |
| Peak On-state Voltage | $V_{TM}$ | - | - | 2.5 | V | $I_{TM}$=100mA peak |
| Critical Rate of Rise off-state Voltage | dv/dt | 1000 | - | - | V/μs | $V_{PEAK}$ = 0.636×Rated $V_{DRM}$, $I_F$ = 0mA (Fig.12) |
| Inhibit Voltage (MT1-MT2 voltage above which device will not trigger) | $V_{INH}$ | - | - | 20 | V | |
| Leakage in Inhibited State | $I_{DRM2}$ | - | - | 1000 | μA | $I_F$= Rated $I_{FT}$, $V_{DRM}$=Rated $V_{DRM}$, off state |

### Transfer Characteristics

| Parameter | | Symbol | Min. | Typ.* | Max. | Unit | Condition |
|---|---|---|---|---|---|---|---|
| LED Trigger Current | 3042<br>3062<br>3082 | $I_{FT}$ | - | - | 10 | mA | Main terminal Voltage=3V*1 |
| | 3043<br>3063<br>3083 | | - | - | 5 | | |
| | 3044<br>3064<br>3084 | | - | - | 3 | | |
| Holding Current | | $I_H$ | - | 280 | - | μA | |

*1. All devices are guaranteed to trigger at an IF value over than max IFT

## Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs. Forward Voltage

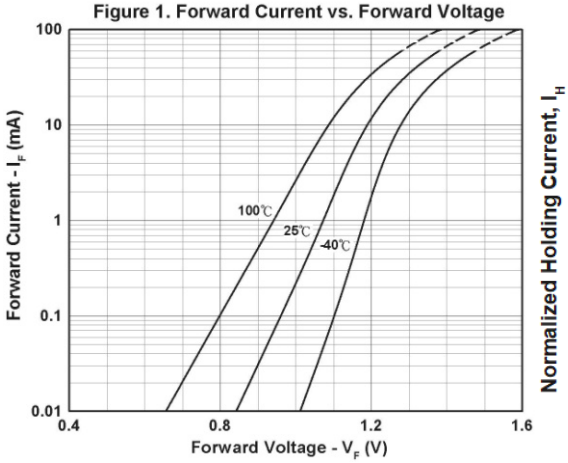



Figure 2. Holding Current vs Ambient Temperature

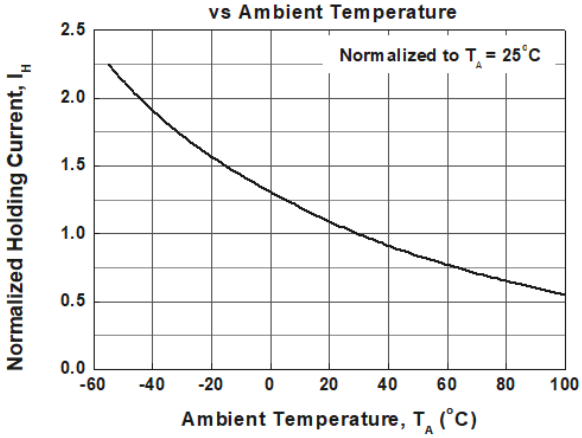
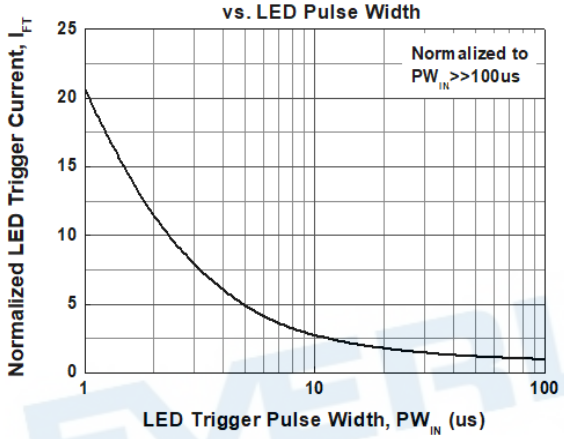



Figure 3. LED Current Required to Trigger vs. LED Pulse Width




Fugure 4. Inhibit Voltage vs Ambient Temperature

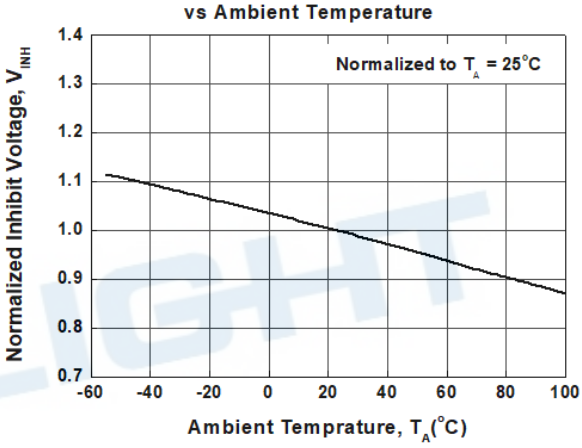



Figure 5. Leakage Current vs. Ambient Temperature

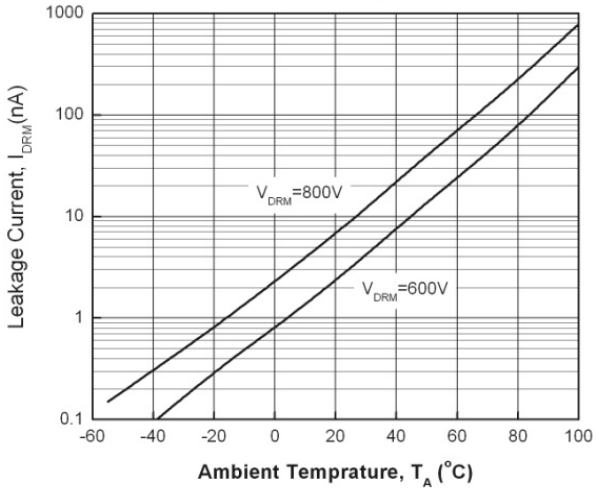



Figure 6. LED Trigger Current vs. Ambient Temperature

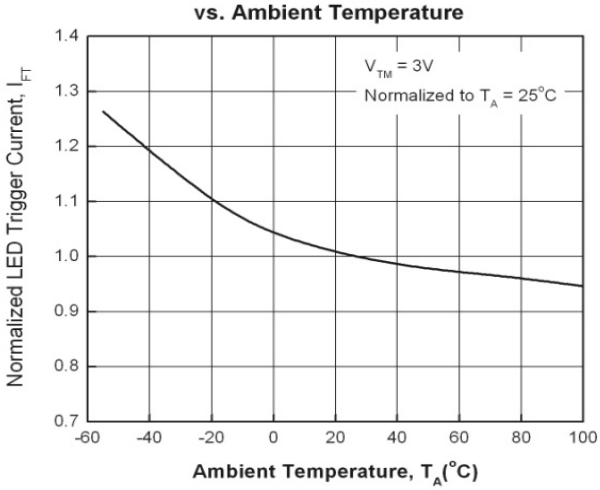


Figure 7. Off-State Output Terminal Voltage vs. Ambient Temperature

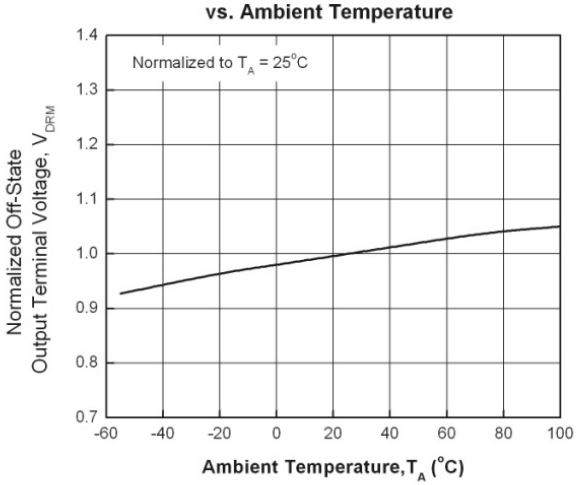



Figure 8. Leakage in Inhibit State vs. Ambient Temperature

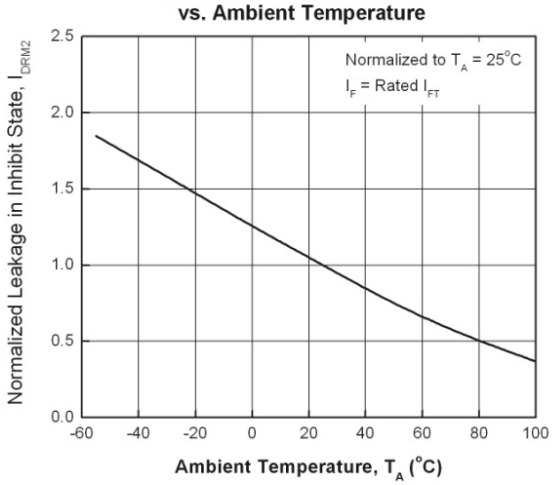



Figure 9. On-State Characteristics

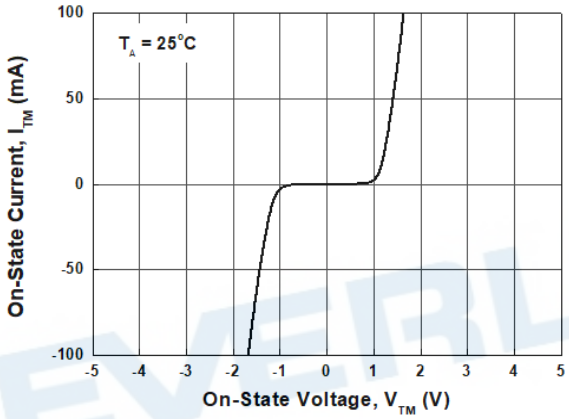



Fig 10. $I_F$ Maximum rating vs Temperature

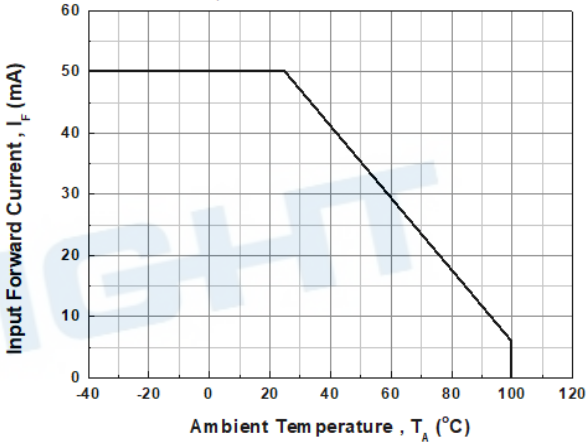
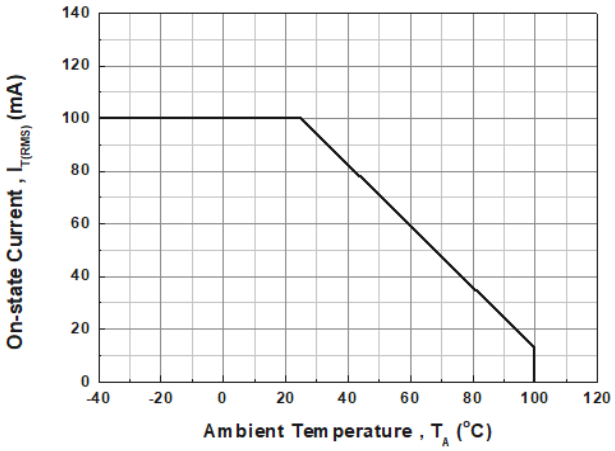
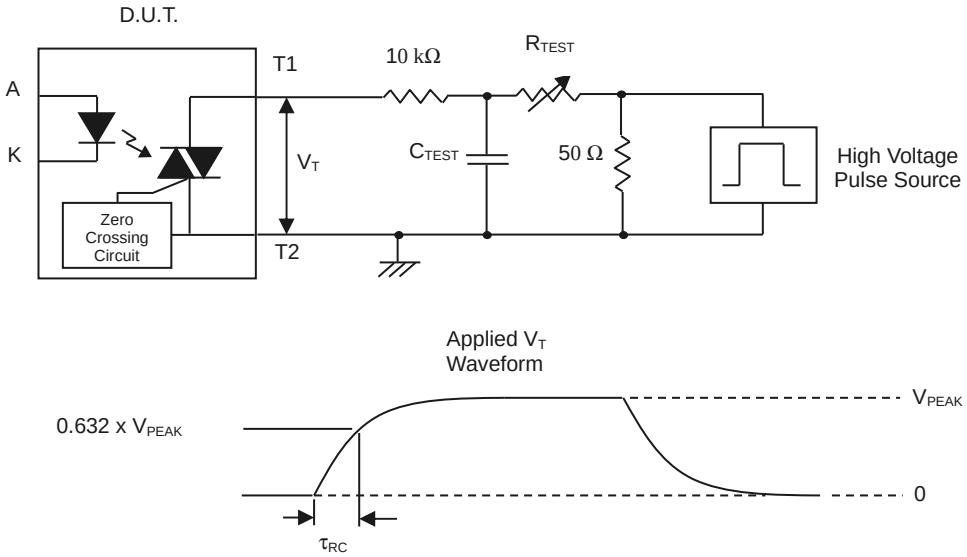



Fig 11. On-state Current vs Temperature




Note：The graphs shown in this datasheet are representing typical data only and do not show guaranteed values

**Figure 12. Static dv/dt Test Circuit & Waveform**




**Measurement Method**

The high voltage pulse is set to the required $V_{PEAK}$ value and applied to the D.U.T. output side through the RC circuit above. LED current is not applied. The waveform $V_T$ is monitored using a x100 scope probe. By varying $R_{TEST}$, the dv/dt (slope) is increased, until the D.U.T. is observed to trigger (waveform collapses). The dv/dt is then decreased until the D.U.T. stops triggering. At this point, $\tau_{RC}$ is recorded and the dv/dt calculated.

$$dv/dt = \frac{0.632 \times V_{PEAK}}{\tau_{RC}}$$

## Order Information

### Part Number

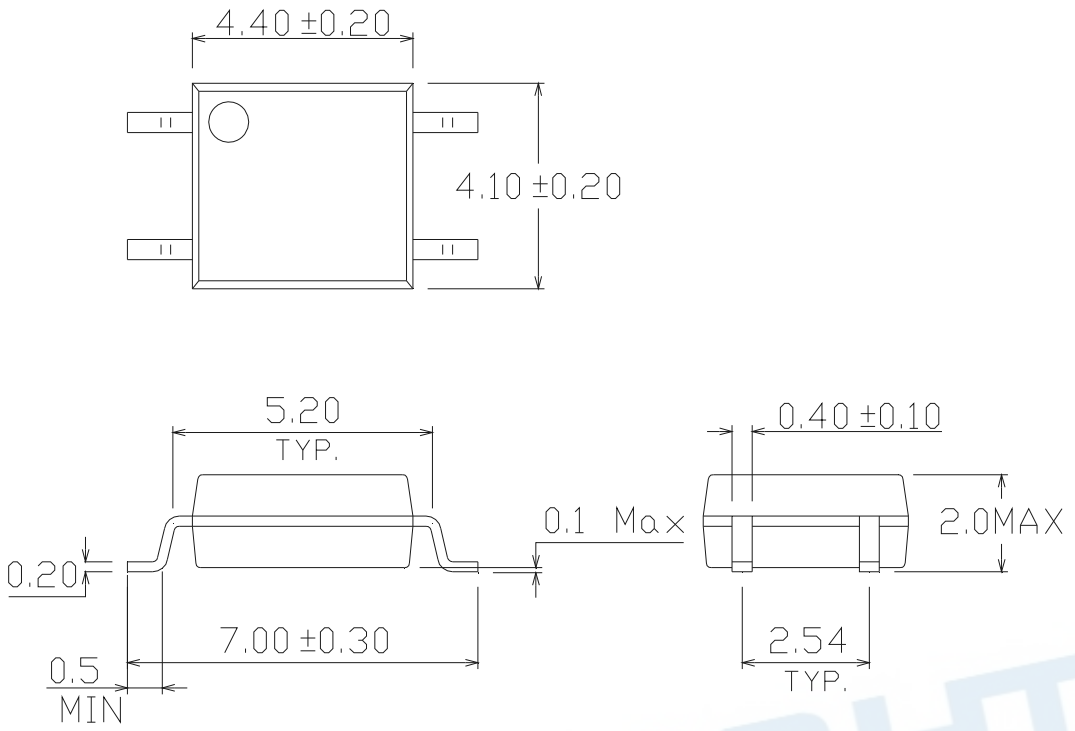
**ELM304X(Z)-V**
**or ELM306X(Z)-V**
**or ELM308X(Z)-V**

Note

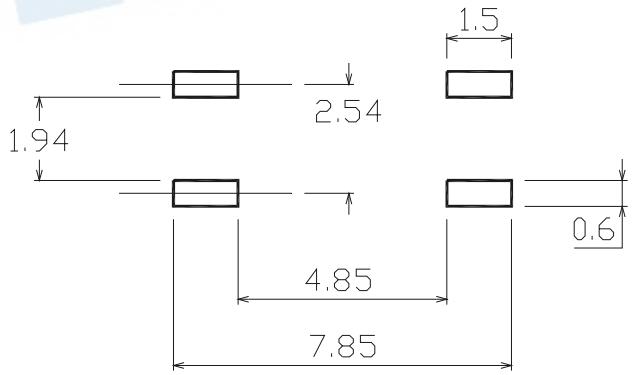
X = Part No. (2 for $I_{FT}$=10mA, 3 for $I_{FT}$=5mA, 4 for $I_{FT}$=3mA)
Z = Tape and reel option (TA, TB or none).
V = VDE safety approved optional

| Option | Description | Packing quantity |
|---|---|---|
| None | Standard | 100 units per tube |
| None | Standard + VDE safety optional | 100 units per tube |
| (TA) | TA tape & reel option | 3500 units per reel |
| (TB) | TB tape & reel option | 3500 units per reel |
| (TA)-V | TA tape & reel option + VDE safety optional | 3500 units per reel |
| (TB)-V | TB tape & reel option + VDE safety optional | 3500 units per reel |

## Package Dimension (Dimensions in mm)




## Recommended pad layout for surface mount leadform

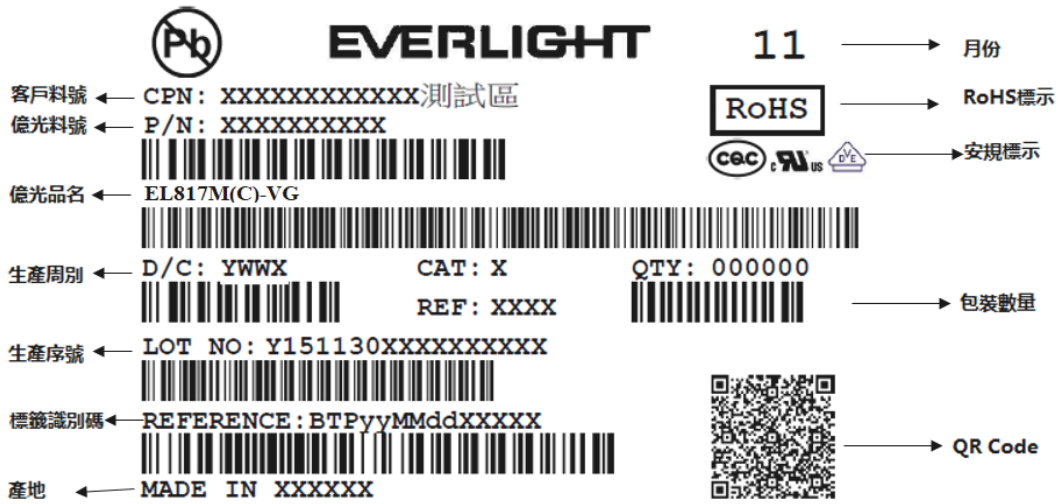


## Device Marking

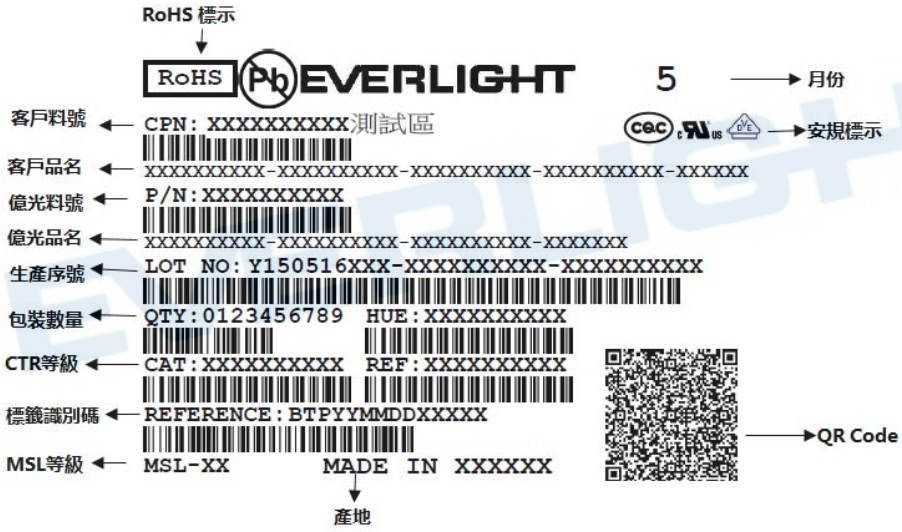

**Notes**

| | |
|---|---|
| EL | denotes Everlight |
| M3063 | denotes Device Number |
| Y | denotes 1 digit Year code |
| WW | denotes 2 digit Week code |
| V | denotes VDE safety option (optional) |

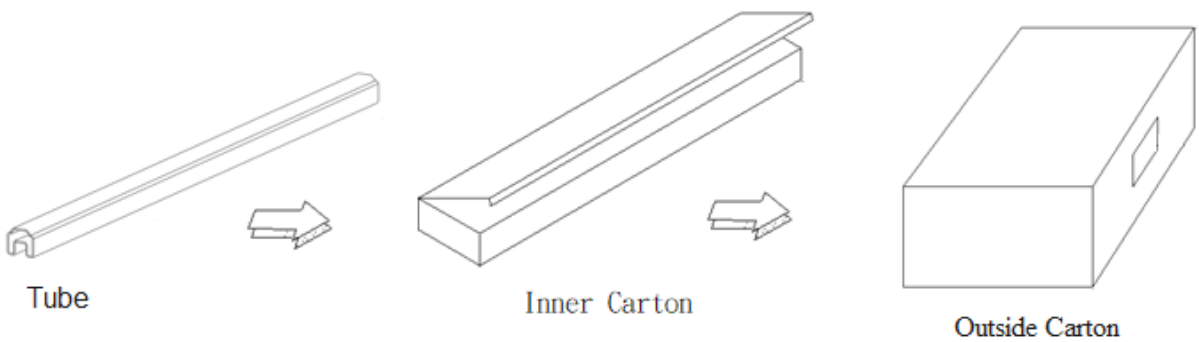
## Label form



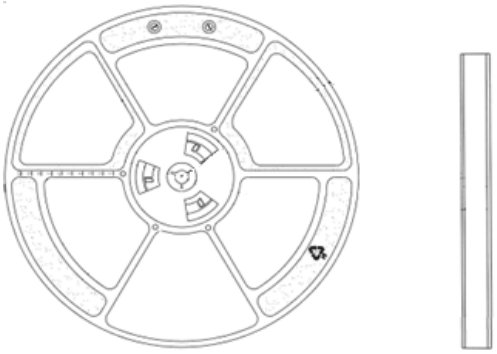

**or**



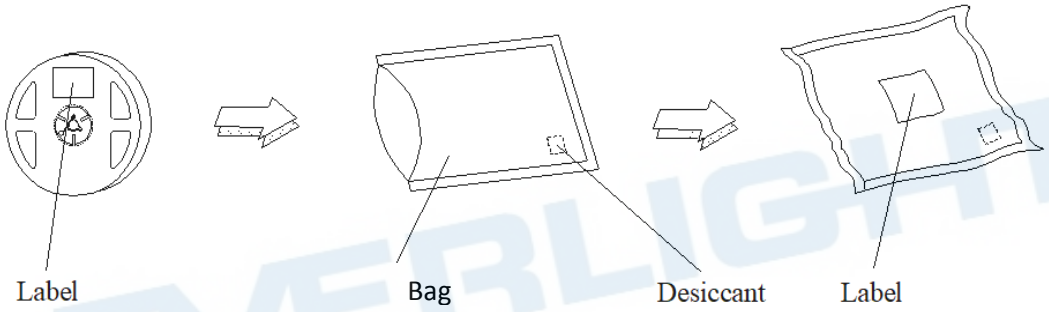

## TUBE Dimension

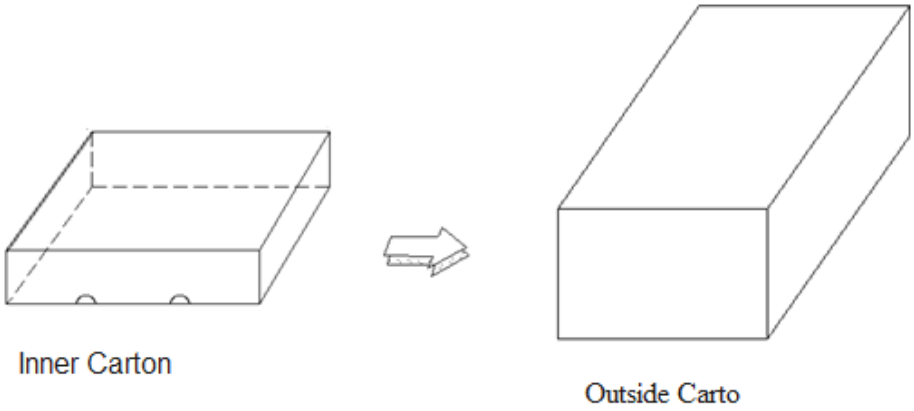


## Reel Dimension



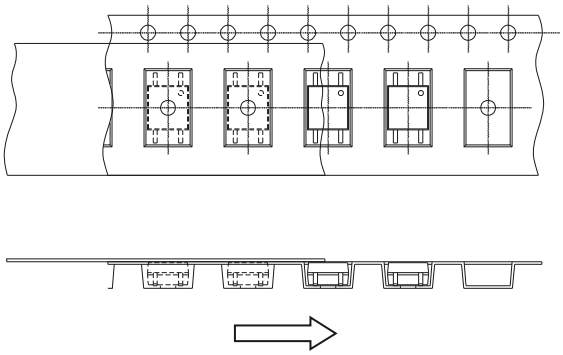
## Moisture Resistant Packaging



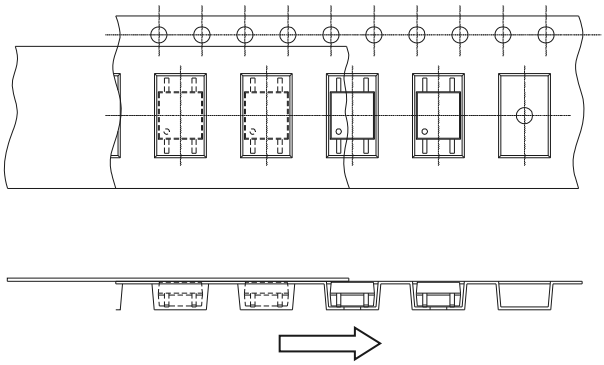
## Tape & Reel Packing Specifications

**Option TA**



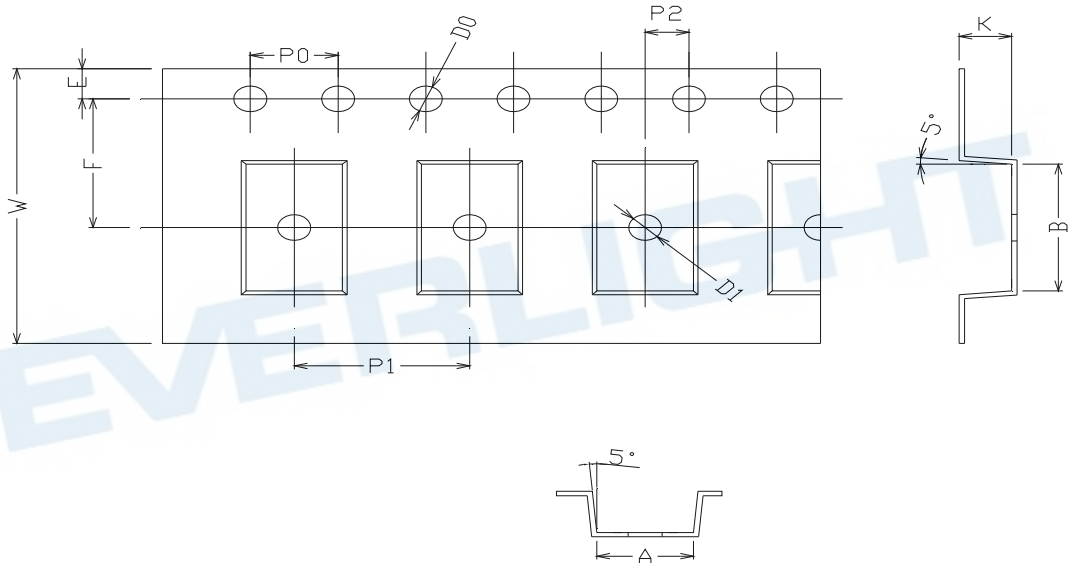
Direction of feed from reel

**Option TB**



Direction of feed from reel

## Tape dimensions



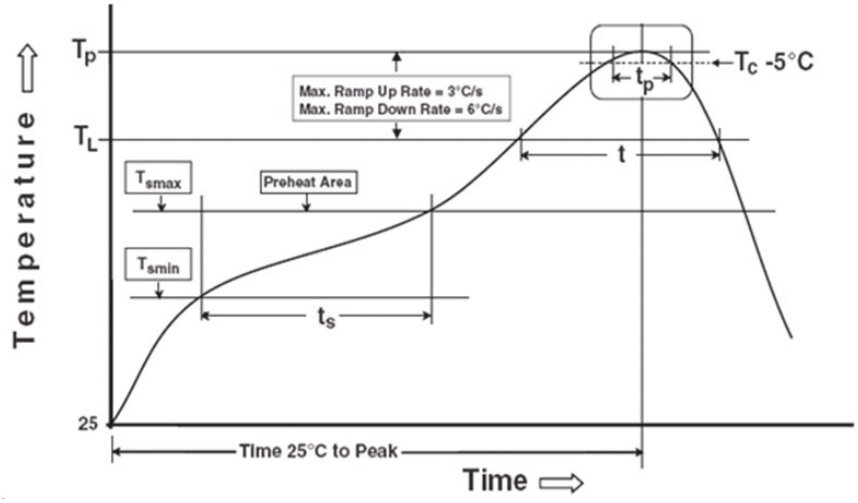

| Dimension No. | A | B | Do | D1 | E | F |
|---|---|---|---|---|---|---|
| Dimension (mm) | 4.4 ± 0.1 | 7.4 ± 0.1 | 1.5 + 0.1/-0 | 1.5 ± 0.1 | 1.7 5± 0.1 | 7.5 ± 0.1 |

| Dimension No. | Po | P1 | P2 | t | W | K |
|---|---|---|---|---|---|---|
| Dimension (mm) | 4.0 ± 0.15 | 8.0 ± 0.1 | 2.0 ± 0.1 | 0.25 ± 0.03 | 16.0 ± 0.2 | 2.4 ± 0.1 |

## Precautions for Use

1. Soldering Condition

1.1 (A) Maximum Body Case Temperature Profile for evaluation of Reflow Profile




Note: Reference: IPC/JEDEC J-STD-020D

| | |
|---|---|
| **Preheat** | |
| Temperature min ($T_{smin}$) | 150 °C |
| Temperature max ($T_{smax}$) | 200°C |
| Time ($T_{smin}$ to $T_{smax}$) ($t_s$) | 60-120 seconds |
| Average ramp-up rate ($T_{smax}$ to $T_p$) | 3 °C/second max |
| **Other** | |
| Liquidus Temperature ($T_L$) | 217 °C |
| Time above Liquidus Temperature ($t_L$) | 60-100 sec |
| Peak Temperature ($T_P$) | 260°C |
| Time within 5 °C of Actual Peak Temperature: $T_P$ - 5°C | 30 s |
| Ramp- Down Rate from Peak Temperature | 6°C /second max. |
| Time 25°C to peak temperature | 8 minutes max. |
| Reflow times | 3 times |

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## Precautions for General Storage

- Avoid storage locations where devices may be exposed to moisture or direct sunlight.
- Follow the precautions printed on the packing label of the device for transportation and storage.
- Keep the storage location temperature and humidity within a range of 5°C to 35°C and 20 % to 60 %,respectively.
- Do not store the products in locations with poisonous gases (especially corrosive gases) or in dusty conditions.
- Store the products in locations with minimal temperature fluctuations. Rapid temperature changes during storage can cause condensation, resulting in lead oxidation or corrosion, which will deteriorate the solderability of the leads.
- When restoring devices after removal from their packing, use anti-static containers.
- Do not allow loads to be applied directly to devices while they are in storage.
- If devices have been stored for more than two years under normal storage conditions, it is recommended that you check the leads for ease of soldering prior to use.

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