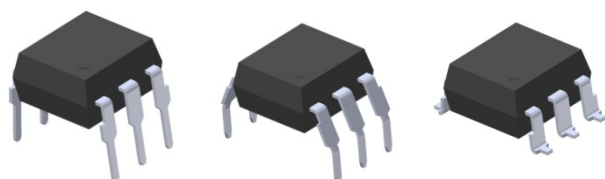


### 6 PIN DIP ZERO-CROSS TRIAC DRIVER PHOTOCOUPLER EL303X, EL304X, EL306X, EL308X Series



#### Features:

- Compliance Halogens Free  
(Br < 900 ppm, Cl < 900 ppm, Br+Cl < 1500 ppm)
- Peak breakdown voltage
  - 250V: EL303X - 400V: EL304X
  - 600V: EL306X - 800V: EL308X
- High isolation voltage between input and output (Viso=5000 V rms )
- Zero voltage crossing
- Compliance with EU REACH
- Pb free
- The product itself will remain within RoHS compliant version
- UL and cUL approved
- VDE approved
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CQC approved

#### Description

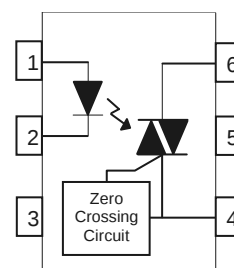
The EL303X, EL304X, EL306X and EL308X series of devices each consist of a infrared emitting diode optically coupled to a monolithic silicon zero voltage crossing photo triac.

They are designed for use with a discrete power triac in the interface of logic systems to equipment powered from 110 to 380 VAC lines, such as solid-state relays, industrial controls, motors, solenoids and consumer appliances.

#### Applications

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

#### Schematic



#### Pin Configuration

1. Anode
2. Cathode
3. No Connection
4. Terminal
5. Substrate  
(do not connect)
6. Terminal

### Absolute Maximum Ratings (Ta=25°C) \*3

| Parameter                                             |                   | Symbol              | Rating     | Unit |
|-------------------------------------------------------|-------------------|---------------------|------------|------|
| Input                                                 | Forward current   | I <sub>F</sub>      | 50         | mA   |
|                                                       | Reverse voltage   | V <sub>R</sub>      | 6          | V    |
|                                                       | Power dissipation | P <sub>D</sub>      | 100        | mW   |
| Output                                                | EL303X            | V <sub>DRM</sub>    | 250        | V    |
|                                                       | EL304X            |                     | 400        |      |
|                                                       | EL306X            |                     | 600        |      |
|                                                       | EL308X            |                     | 800        |      |
| Off-state Output Terminal Voltage                     |                   |                     |            |      |
| R.M.S. On-state current                               |                   | I <sub>T(RMS)</sub> | 100        | mA   |
| Peak Repetitive Surge Current (pw≤100μs,120pps)       |                   | I <sub>TP</sub>     | 2          | A    |
| Peak Non-repetitive Surge Current (f=60Hz, one cycle) |                   | I <sub>TSM</sub>    | 1          | A    |
| Power dissipation                                     |                   | P <sub>C</sub>      | 300        | mW   |
| Total power dissipation                               |                   | P <sub>TOT</sub>    | 400        | mW   |
| Isolation voltage *1                                  |                   | V <sub>ISO</sub>    | 5000       | Vrms |
| Operating temperature                                 |                   | T <sub>OPR</sub>    | -40 to 100 | °C   |
| Storage temperature                                   |                   | T <sub>STG</sub>    | -55 to 125 | °C   |
| Soldering Temperature*2                               |                   | T <sub>SOL</sub>    | 260        | °C   |

#### Notes:

\*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2 & 3 are shorted together, and pins 4, 5 & 6 are shorted together.

\*2 For 10 seconds

\*3 Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions are within the absolute maximum ratings.

### Recommended Operating Conditions (Note)

Please use under recommended operating conditions to obtain expected characteristics

| Parameter             | Symbol           | Min. | Typ. | Max. | Unit |
|-----------------------|------------------|------|------|------|------|
| Input forward current | EL30X1           | 20   | 25   | 30   | mA   |
|                       | EL30X2           | 15   | 20   | 25   | mA   |
|                       | EL30X3           | 7    | 10   | 20   | mA   |
| AC mains voltage      | V <sub>AC</sub>  | -    | -    | 240  | V    |
| Operating temperature | T <sub>OPR</sub> | -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°C unless specified otherwise)

### Input

| Parameter               | Symbol         | Min. | Typ.* <sup>1</sup> | Max. | Unit | Condition             |
|-------------------------|----------------|------|--------------------|------|------|-----------------------|
| Forward Voltage         | V <sub>F</sub> | -    | -                  | 1.5  | V    | I <sub>F</sub> = 30mA |
| Reverse Leakage current | I <sub>R</sub> | -    | -                  | 10   | μA   | V <sub>R</sub> = 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 <sub>DRM1</sub> | -    | -     | 500  | nA   | V <sub>DRM</sub> = Rated V <sub>DRM</sub><br>I <sub>F</sub> = 0 mA* <sup>2</sup>                    |
| Peak On-state Voltage                                                 | V <sub>TM</sub>   | -    | -     | 3    | V    | I <sub>TM</sub> =100 mA peak, I <sub>F</sub> =Rated I <sub>FT</sub>                                 |
| Critical Rate of Rise off-state Voltage                               | dv/dt             | 600  | -     | -    | V/μs | V <sub>PEAK</sub> = 0.636×Rated V <sub>DRM</sub> ,<br>I <sub>F</sub> = 0mA (Fig. 12)                |
| Inhibit Voltage (MT1-MT2 voltage above which device will not trigger) | V <sub>INH</sub>  | -    | -     | 20   | V    | I <sub>F</sub> = Rated I <sub>FT</sub>                                                              |
| Leakage in Inhibited State                                            | I <sub>DRM2</sub> | -    | -     | 500  | μA   | I <sub>F</sub> = Rated I <sub>FT</sub> ,<br>V <sub>DRM</sub> =Rated V <sub>DRM</sub> ,<br>off state |

#### Notes:

\*1. Typical values at T<sub>a</sub> = 25°C.

\*2. Test voltage must be applied within dv/dt rating.

Transfer Characteristics (Ta=25°C unless specified otherwise)

| Parameter           | Symbol         | Min.            | Typ.* | Max. | Unit | Condition                  |    |  |  |
|---------------------|----------------|-----------------|-------|------|------|----------------------------|----|--|--|
| LED Trigger Current | EL3031         | -               | -     | 15   | mA   | Main terminal Voltage=3V*3 |    |  |  |
|                     | EL3041         |                 |       |      |      |                            |    |  |  |
|                     | EL3061         |                 |       |      |      |                            |    |  |  |
|                     | EL3081         |                 |       |      |      |                            |    |  |  |
|                     | EL3032         | I <sub>FT</sub> | -     | -    |      |                            | 10 |  |  |
|                     | EL3042         |                 |       |      |      |                            |    |  |  |
|                     | EL3062         |                 |       |      |      |                            |    |  |  |
|                     | EL3082         |                 |       |      |      |                            |    |  |  |
|                     | EL3033         | -               | -     | 5    |      |                            |    |  |  |
|                     | EL3043         |                 |       |      |      |                            |    |  |  |
|                     | EL3063         |                 |       |      |      |                            |    |  |  |
|                     | EL3083         |                 |       |      |      |                            |    |  |  |
| Holding Current     | I <sub>H</sub> | -               | 250   | -    | μA   |                            |    |  |  |

Notes:  
\*3. All devices are guaranteed to trigger at an I<sub>F</sub> value over than max I<sub>FT</sub>.



## Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

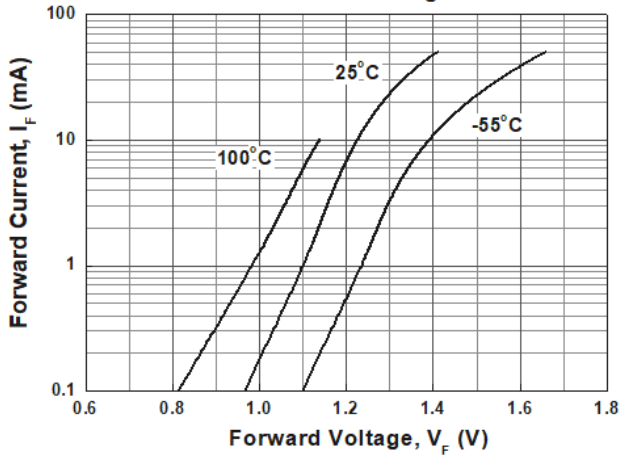


Figure 2. Holding Current vs Ambient Temperature

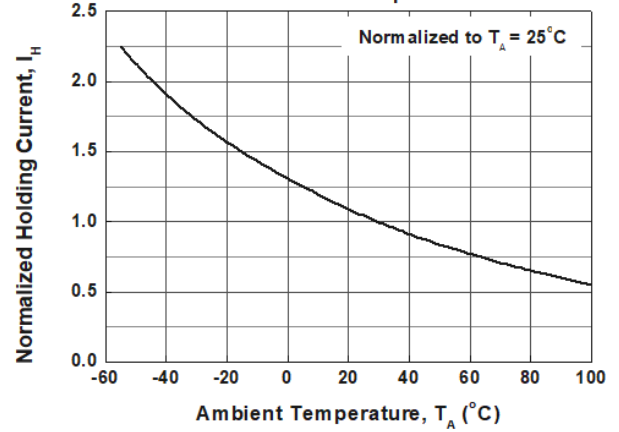


Figure 3. LED Current Required to Trigger vs. LED Pulse Width

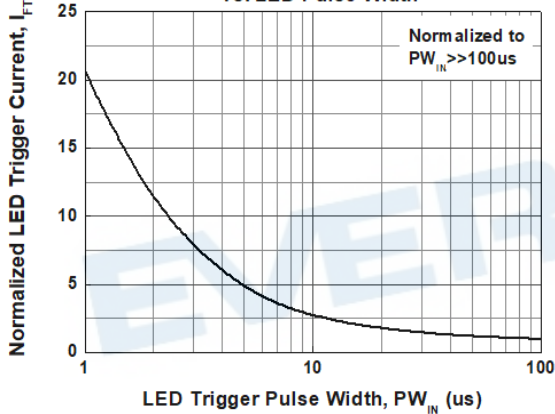


Figure 4. Inhibit Voltage vs Ambient Temperature

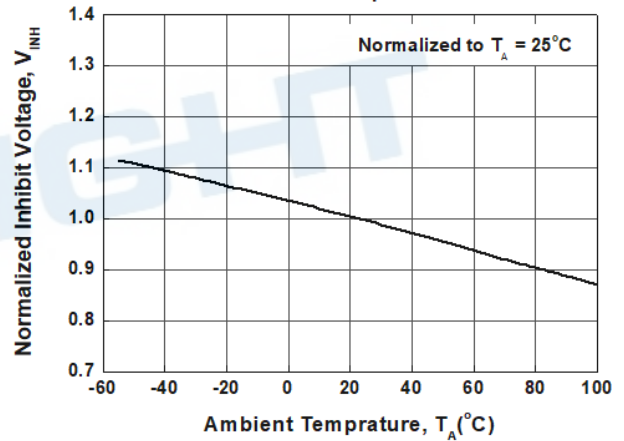


Figure 5. Leakage Current vs. Ambient Temperature

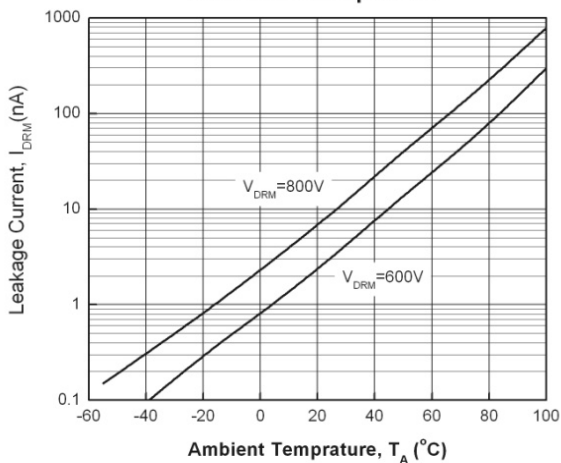


Figure 6. LED Trigger Current vs. Ambient Temperature

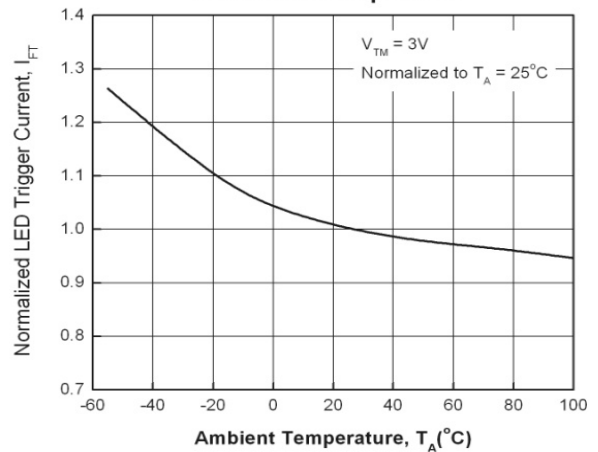


Figure 7. Off-State Output Terminal Voltage vs. Ambient Temperature

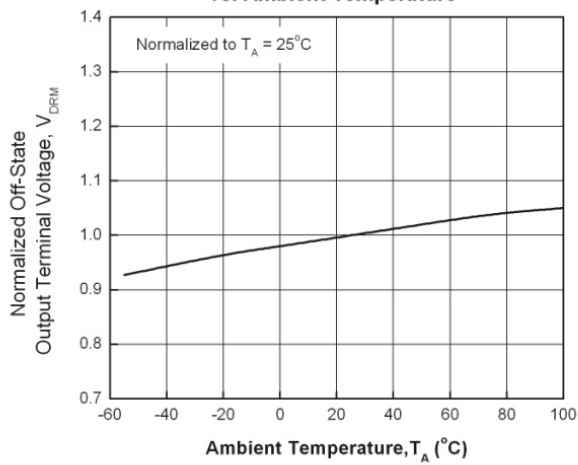


Figure 8. Leakage in Inhibit State vs. Ambient Temperature

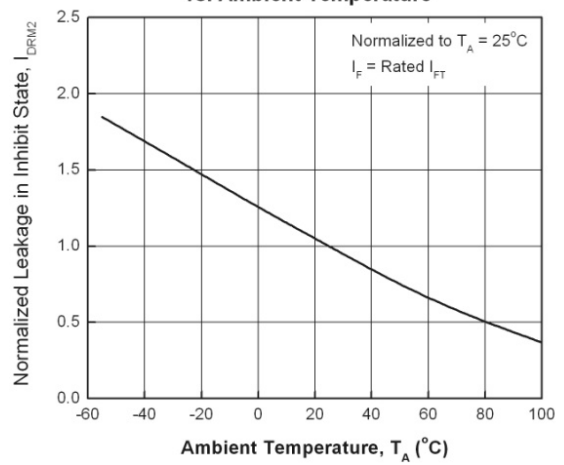


Figure 9. On-State Characteristics

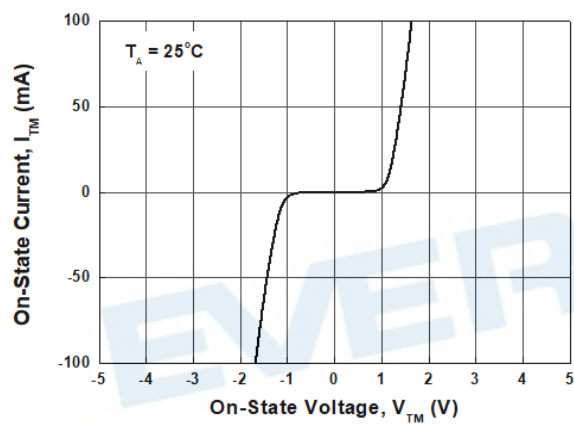


Fig 10.  $I_F$  Maximum rating vs Temperature

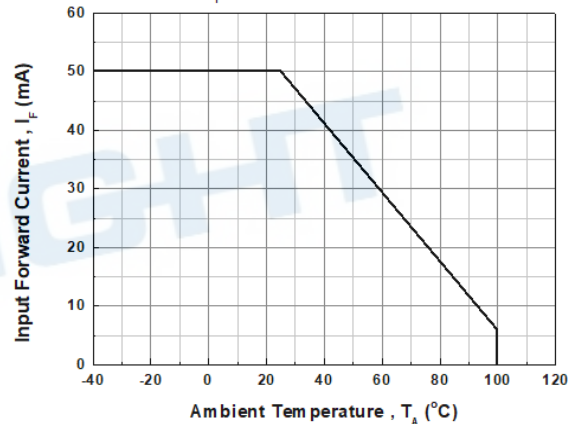


Fig 11. On-state Current vs Temperature

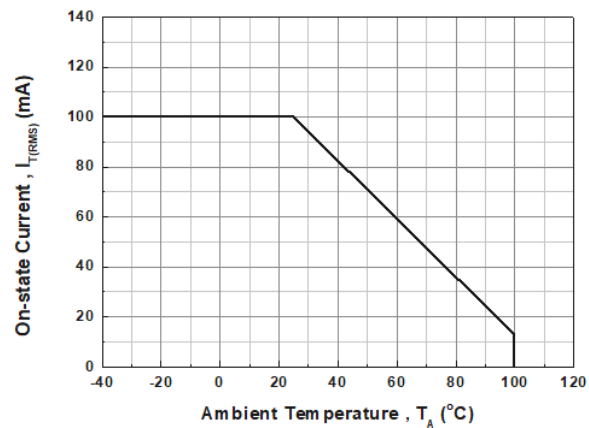
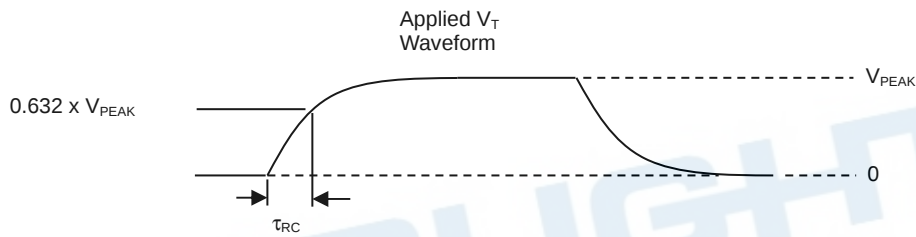
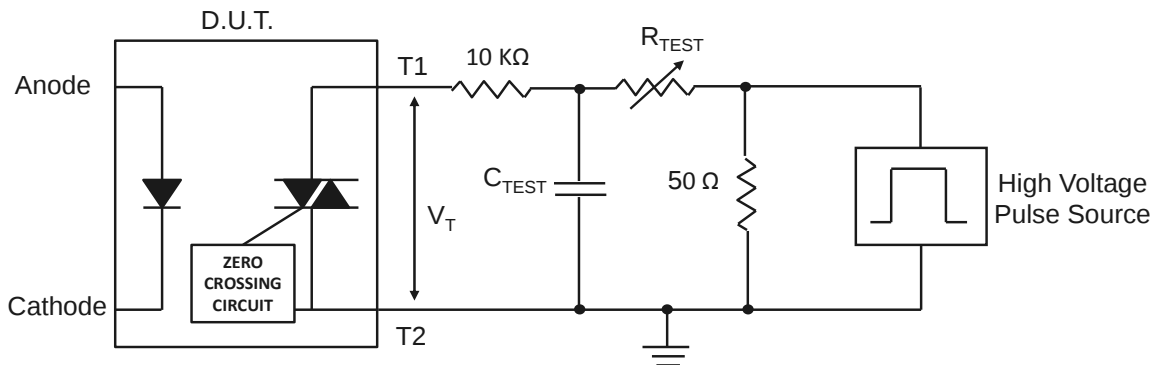


Figure 12. Static dv/dt Test Circuit & Waveform



### Measurement Method

The high voltage pulse is set to the required V<sub>PEAK</sub> value and applied to the D.U.T. output side through the RC circuit above. LED current is not applied. The waveform V<sub>T</sub> is monitored using a x100 scope probe. By varying R<sub>TEST</sub>, 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, τ<sub>RC</sub> is recorded and the dv/dt calculated.

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

## Order Information

### Part Number

**EL303XY(Z)-V**  
or **EL304XY(Z)-V**  
or **EL306XY(Z)-V**  
or **EL308XY(Z)-V**

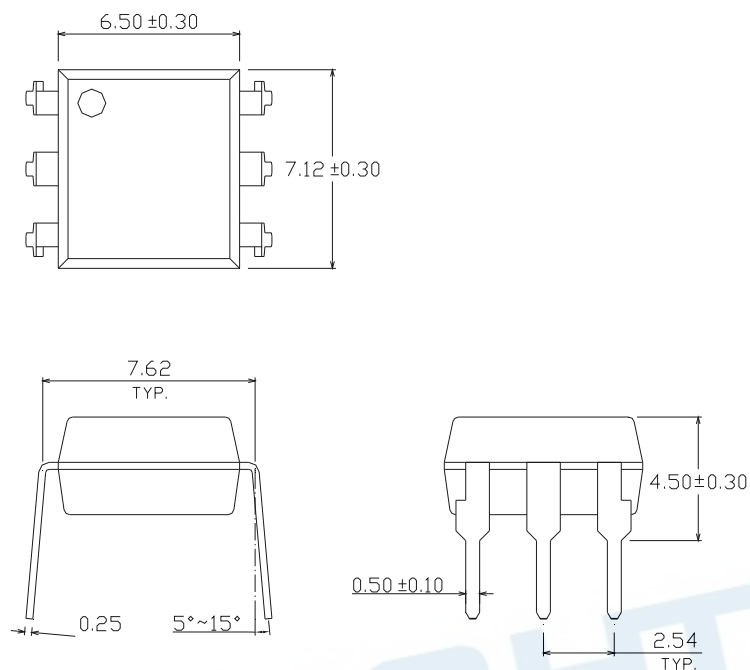
### Note

X = Part No. (1, 2 or 3)  
Y = Lead form option (S, S1, M or none)  
Z = Tape and reel option (TA, TB or none)  
V = VDE safety approved option

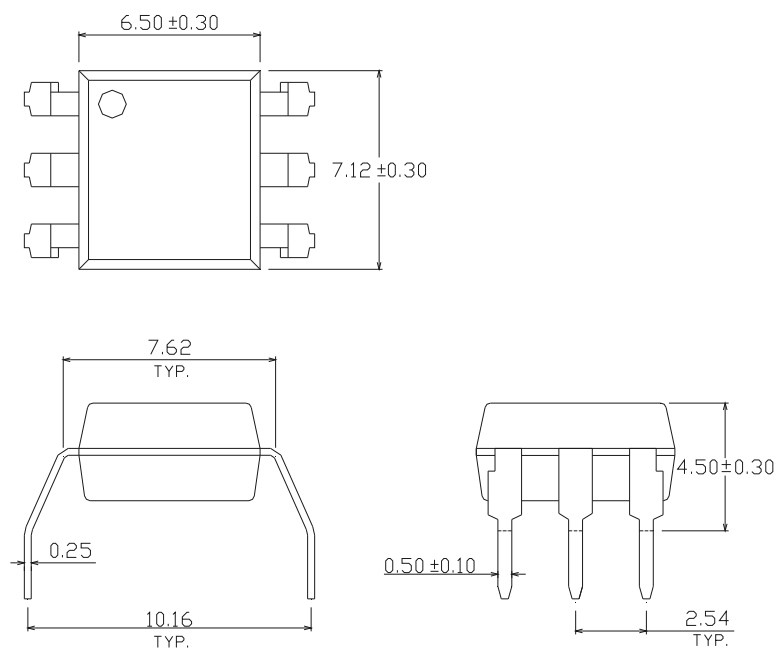
| Option  | Description                                                   | Packing quantity    |
|---------|---------------------------------------------------------------|---------------------|
| None    | Standard DIP-6                                                | 65 units per tube   |
| M       | Wide lead bend (0.4 inch spacing)                             | 65 units per tube   |
| S (TA)  | Surface mount lead form + TA tape & reel option               | 1000 units per reel |
| S (TB)  | Surface mount lead form + TB tape & reel option               | 1000 units per reel |
| S1 (TA) | Surface mount lead form (low profile) + TA tape & reel option | 1000 units per reel |
| S1 (TB) | Surface mount lead form (low profile) + TB tape & reel option | 1000 units per reel |

## Package Dimension (Dimensions in mm)

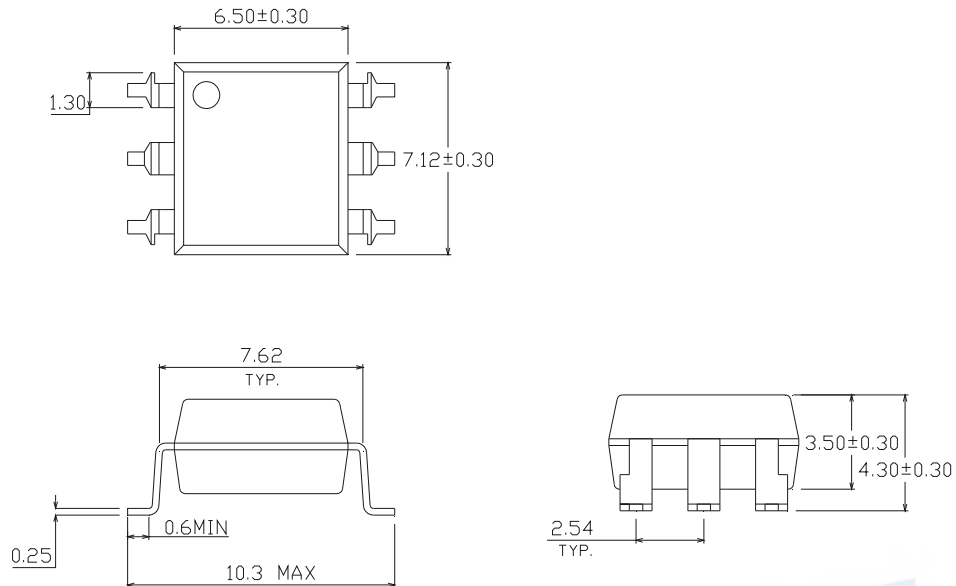
### Standard DIP Type



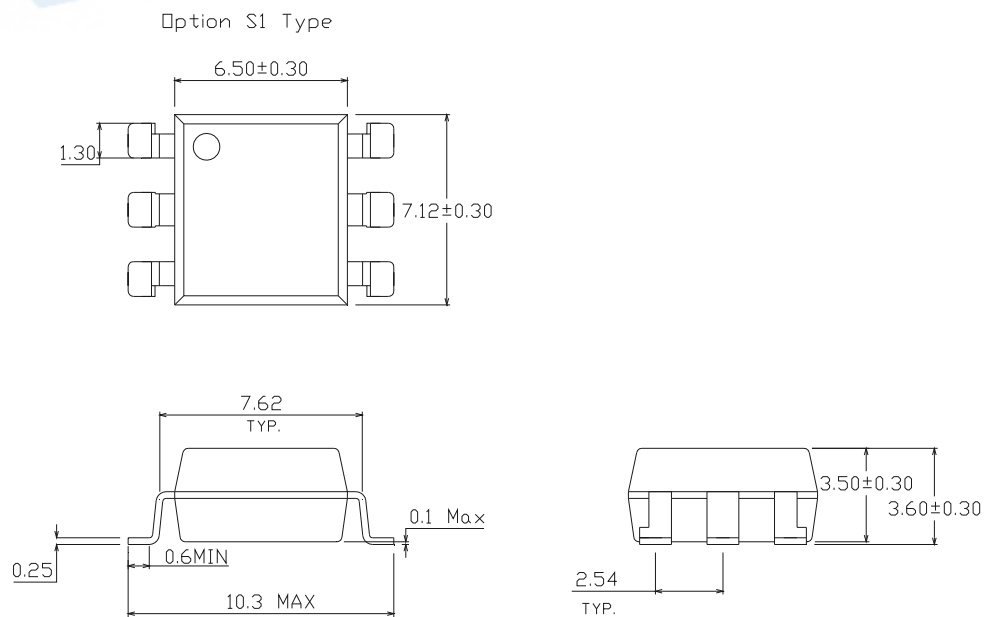
### Option M Type



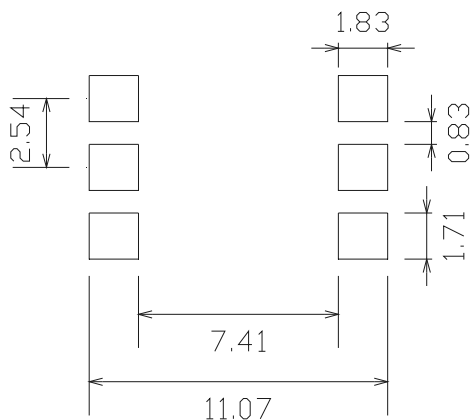
### Option S Type



### Option S1 Type



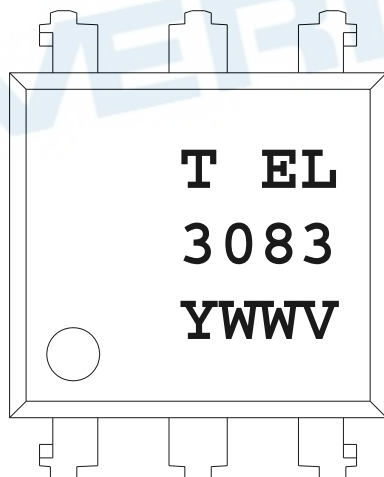
### Recommended pad layout for surface mount leadform



### Notes

Suggested pad dimension is just for reference only.  
Please modify the pad dimension based on individual need.

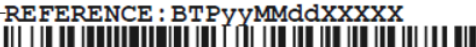
### Device Marking



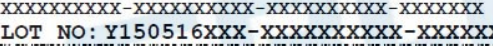
### Notes

|      |                           |
|------|---------------------------|
| T    | denotes Factory           |
|      | No code : made in China   |
|      | T : made in Taiwan        |
| EL   | denotes EVERLIGHT         |
| 3083 | denotes Device Number     |
| Y    | denotes 1 digit Year code |
| WW   | denotes 2 digit Week code |
| V    | denotes VDE option        |

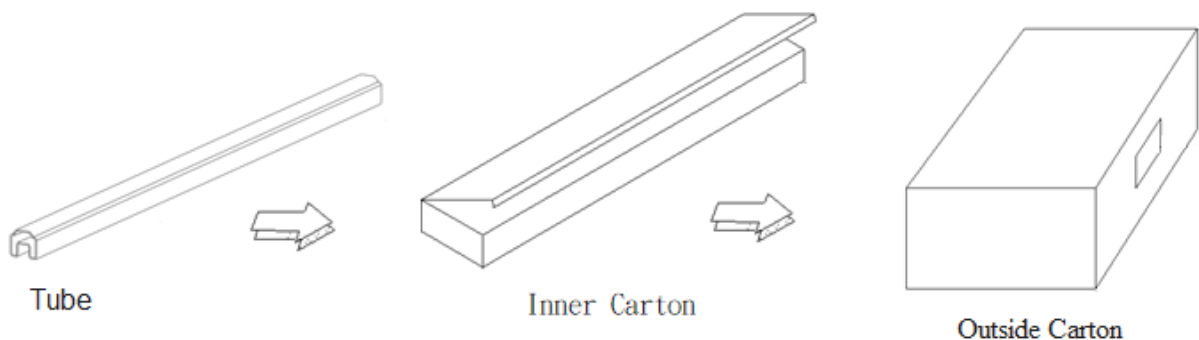
## Label form

 **EVERLIGHT** 11 → 月份  
 客戶料號 ← CPN: XXXXXXXXXXXX 測試區  
 億光料號 ← P/N: XXXXXXXXXXXX  
  
 億光品名 ← EL817M(C)-VG  
  
 生產周別 ← D/C: YWWX CAT: X QTY: 000000  
 REF: XXXX  → 包裝數量  
 生產序號 ← LOT NO: Y151130XXXXXXXXXX  
  
 標籤識別碼 ← REFERENCE: BTPyyMMddXXXXX  
  
 產地 ← MADE IN XXXXXX  → QR Code

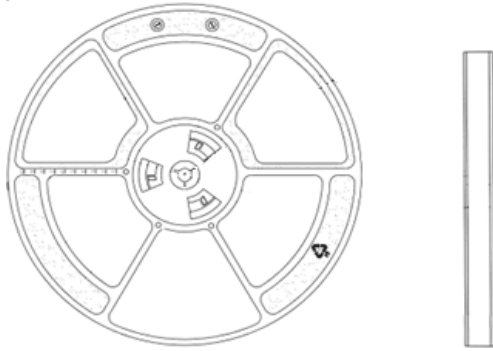
or

RoHS 標示  
  **EVERLIGHT** 5 → 月份  
 客戶料號 ← CPN: XXXXXXXXXXXX 測試區  
  
 客戶品名 ← XXXXXXXXXXX-XXXXXXXXXX-XXXXXXXXXX-XXXXXXXXXX-XXXXXX  
 億光料號 ← P/N: XXXXXXXXXXXX  
  
 億光品名 ← XXXXXXXXXXX-XXXXXXXXXX-XXXXXXXXXX-XXXXXX  
  
 生產序號 ← LOT NO: Y150516XXX-XXXXXXXXXX-XXXXXXXXXX  
  
 包裝數量 ← QTY: 0123456789 HUE: XXXXXXXXXXXX  
   
 CTR等級 ← CAT: XXXXXXXXXXXX REF: XXXXXXXXXXXX  
   
 標籤識別碼 ← REFERENCE: BTPYYMMDDXXXXX  
  
 MSL等級 ← MSL-XX MADE IN XXXXXX  
  
 產地  
 → QR Code

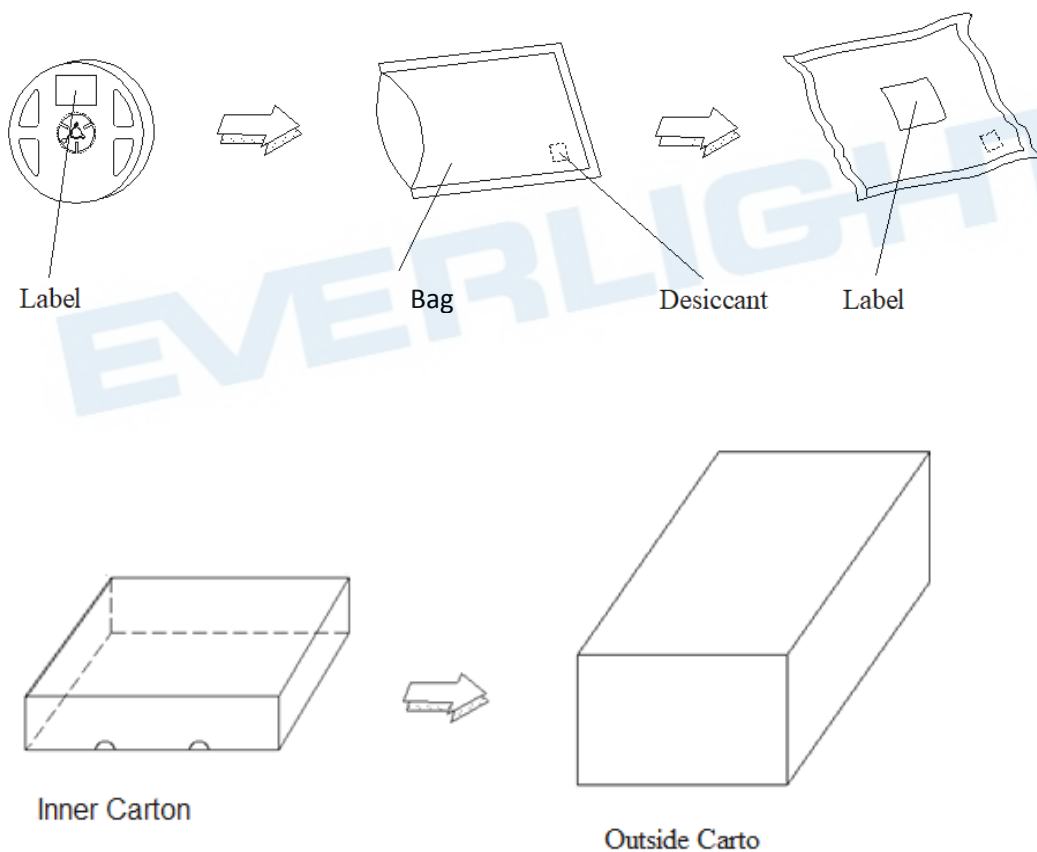
## TUBE Dimension



## Reel Dimension

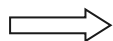
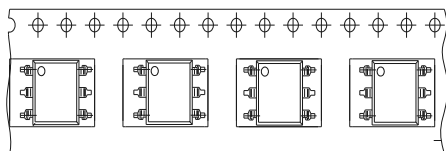


## Moisture Resistant Packaging



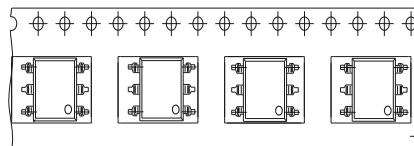
## Tape & Reel Packing Specifications

### Option TA



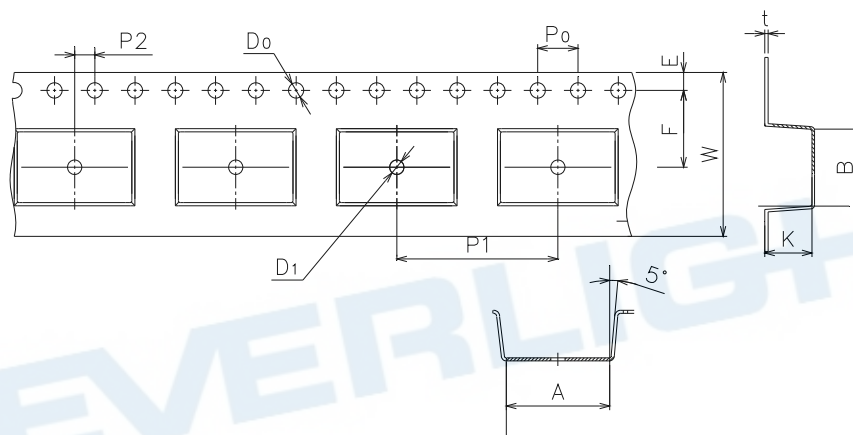
Direction of feed from reel

### Option TB



Direction of feed from reel

## Tape dimensions



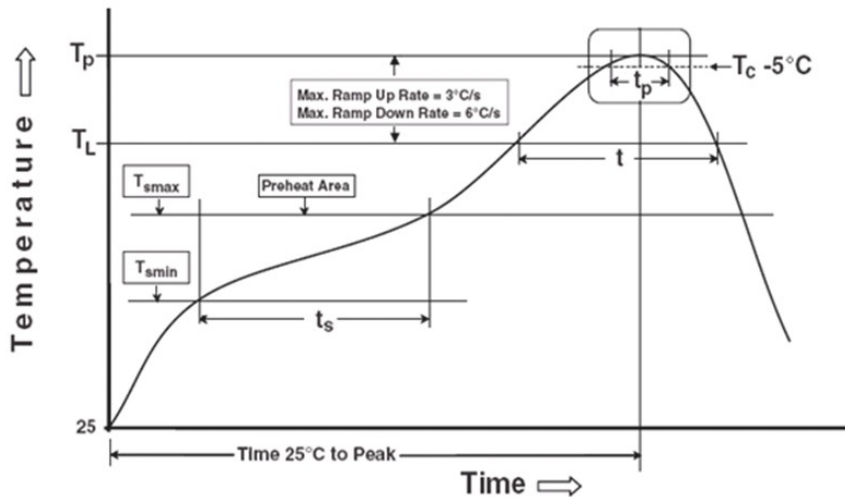
| Dimension No.  | A        | B        | Do      | D1      | E        | F       |
|----------------|----------|----------|---------|---------|----------|---------|
| Dimension (mm) | 10.8±0.1 | 7.55±0.1 | 1.5±0.1 | 1.5±0.1 | 1.75±0.1 | 7.5±0.1 |

| Dimension No.  | P0       | P1     | P2      | t         | W        | K       |
|----------------|----------|--------|---------|-----------|----------|---------|
| Dimension (mm) | 4.0±0.15 | 12±0.1 | 2.0±0.1 | 0.35±0.03 | 16.0±0.2 | 4.5±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: $T_P - 5^\circ\text{C}$ | 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          |

## 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.

EVERLIGHT

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1. Above specification may be changed without notice. EVERLIGHT will reserve authority on material change for above specification.
2. The graphs shown in this datasheet are representing typical data only and do not show guaranteed values.
3. When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets. EVERLIGHT assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.
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