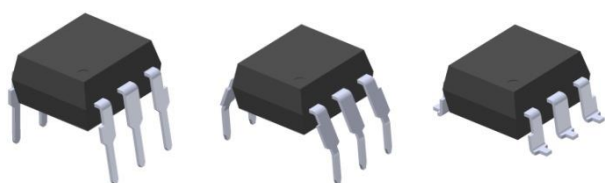
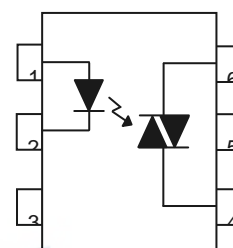


### 6 PIN DIP RANDOM-PHASE TRIAC DRIVER PHOTOCOUPLER EL301X, EL302X, EL305X Series



Schematic



Pin Configuration

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

#### Features:

- Peak breakdown voltage
  - 250V: EL301X
  - 400V: EL302X
  - 600V: EL305X
- High isolation voltage between input and output (Viso=5000 V rms )
- Compact dual-in-line package
- Compliance with EU REACH
- The product itself will remain within RoHS compliant version
- UL and cUL approved (No. E214129)
- VDE approved (No.132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CQC approved

#### Description

The EL301X, EL302X and EL305X series of devices each consist of a GaAs infrared emitting diode optically coupled to a monolithic silicon random phase photo Triac.

They are designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 115 to 240 VAC operations.

#### Applications

- Solenoid/valve controls
- Lamp ballasts
- Static AC power switch
- Interfacing microprocessors to 115 to 240Vac peripherals
- Incandescent lamp dimmers
- Temperature controls
- Motor controls

**Absolute Maximum Ratings (Ta=25°C )**

| Parameter                           |   | Symbol       | Rating  | Unit      |   |
|-------------------------------------|---|--------------|---|-----------|---|
| Input                               | Forward current                                   | $I_F$        | 60  | mA        |   |
|                                     | Reverse voltage                                   | $V_R$        | 6   | V         |   |
|                                     | Power dissipation                                 | $P_D$        | 100   | mW        |   |
|                                     | Derating factor (above $T_a = 85^\circ\text{C}$ ) |              | 3.8   | mW / °C   |   |
| Output                              |   |              | EL301X  | 250       |   |
|                                     | Off-state Output Terminal Voltage                 | $V_{DRM}$    | EL302X  | 400       | V |
|                                     |   |              | EL305X  | 600       |   |
|                                     |   |              | Peak Repetitive Surge Current (pw=100µs,120pps) | $I_{TSM}$ | 1 |
|                                     | On-State RMS Current                              | $I_{T(RMS)}$ | 100   | mA        |   |
|                                     | Power dissipation                                 | $P_C$        | 300   | mW        |   |
|                                     | Derating factor (above $T_a = 85^\circ\text{C}$ ) |              | 7.4   | mW/°C     |   |
|                                     | Total power dissipation                           | $P_{TOT}$    | 330   | mW        |   |
| Isolation voltage <sup>*1</sup>     | $V_{ISO}$   | 5000         | Vrms  |           |   |
| Operating temperature               | $T_{OPR}$   | -55 to 100   | °C  |           |   |
| Storage temperature                 | $T_{STG}$   | -55 to 125   | °C  |           |   |
| Soldering Temperature <sup>*2</sup> | $T_{SOL}$   | 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

**Electro-Optical Characteristics (Ta=25°C unless specified otherwise)**

**Input**

| Parameter               | Symbol         | Min. | Typ.*1 | Max. | Unit | Condition             |
|-------------------------|----------------|------|--------|------|------|-----------------------|
| Forward Voltage         | V <sub>F</sub> | -    | 1.18   | 1.5  | V    | I <sub>F</sub> = 10mA |
| Reverse Leakage current | I <sub>R</sub> | -    | -      | 10   | μA   | V <sub>R</sub> = 6V   |

**Output**

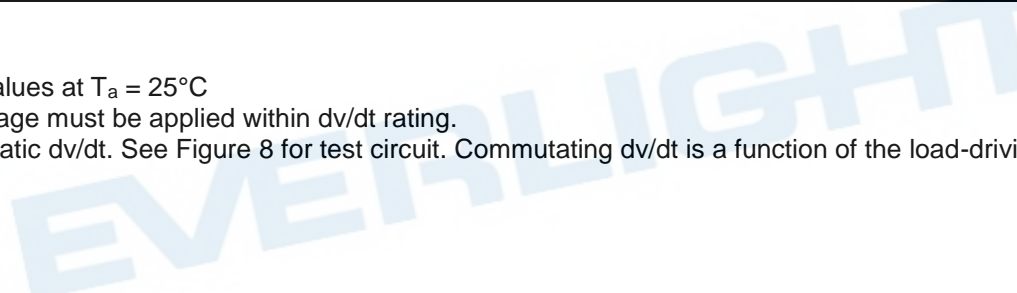
| Parameter                               | Symbol                     | Min.      | Typ.*1   | Max.   | Unit | Condition   |
|---|----------------------------|-----------|----------|--------|------|---|
| Peak Blocking Current                   | I <sub>DRM</sub>           | -         | -        | 100    | nA   | V <sub>DRM</sub> = Rated V <sub>DRM</sub><br>I <sub>F</sub> = 0mA*2   |
| Peak On-state Voltage                   | V <sub>TM</sub>            | -         | -        | 2.5    | V    | I <sub>TM</sub> =100mA peak,<br>I <sub>F</sub> =Rated I <sub>FT</sub>   |
| Critical Rate of Rise off-state Voltage | EL301X<br>EL302X<br>EL305X | -<br>1000 | 100<br>- | -<br>- | V/μs | V <sub>PEAK</sub> =Rated V <sub>DRM</sub> ,<br>I <sub>F</sub> =0 (Fig. 8)*3<br>V <sub>PEAK</sub> =400V,<br>I <sub>F</sub> =0 (Fig. 8) |

Notes:

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

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

\*3. This is static dv/dt. See Figure 8 for test circuit. Commutating dv/dt is a function of the load-driving thyristor(s) only.



**Transfer Characteristics**

| Parameter           | Symbol                     | Min. | Typ.*1 | Max. | Unit    | Condition                  |
|---------------------|----------------------------|------|--------|------|---------|----------------------------|
| LED Trigger Current | EL3020                     |      |        | 30   | mA      | Main terminal Voltage=3V*4 |
|                     | EL3010<br>EL3021<br>EL3051 | -    | -      | 15   |         |                            |
|                     | EL3011<br>EL3022<br>EL3052 | -    | -      | 10   |         |                            |
|                     | EL3012<br>EL3023<br>EL3053 | -    | -      | 5    |         |                            |
|                     |                            |      |        |      |         |                            |
| Holding Current     | $I_H$                      | -    | 250    | -    | $\mu A$ |                            |

Notes:

\*4. All devices are guaranteed to trigger at an  $I_F$  value less than or equal to max  $I_{FT}$ . Therefore, recommended operating  $I_F$  lies between max  $I_{FT}$  (30 mA for EL3020, 15 mA for EL3010/EL3021/EL3051, 10 mA for EL3011/EL3022/EL3052, 5 mA for EL3012/EL3023/EL3053) and absolute maximum  $I_F$  (60 mA).

EVERLIGHT

Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

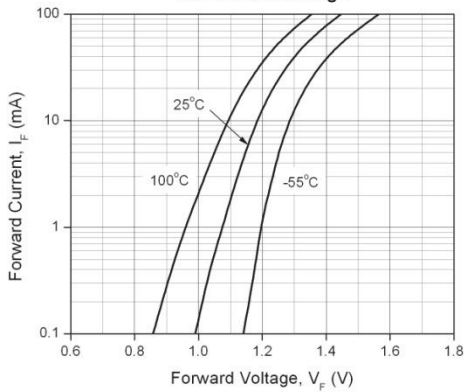


Figure 2. On-State Characteristics

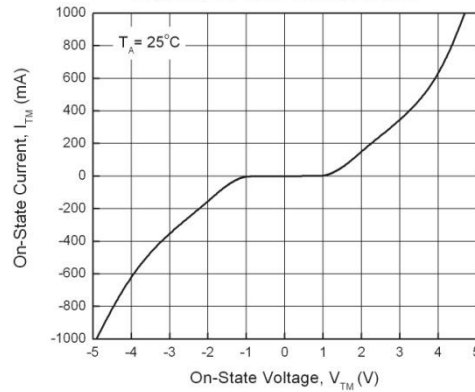


Figure 3. Holding Current vs. Ambient Temperature

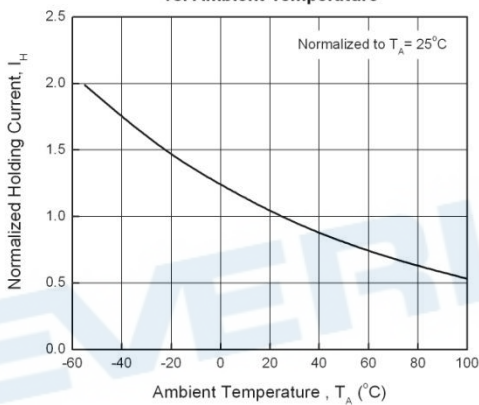


Figure 4. LED Current Required to Trigger vs. LED Pulse Width

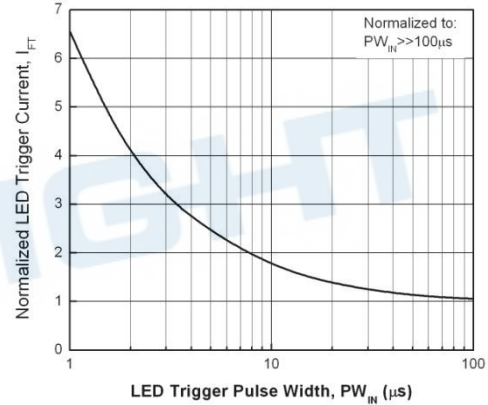


Figure 5. Leakage Current vs. Ambient Temperature

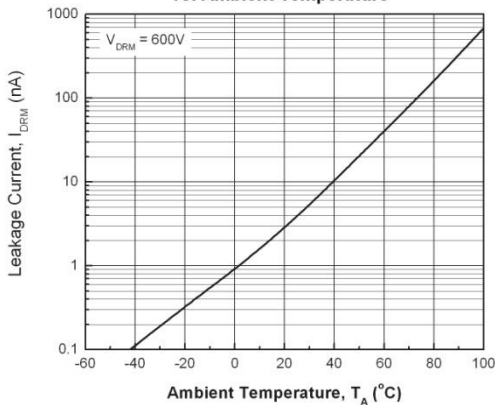


Figure 6. LED Trigger Current vs. Ambient Temperature

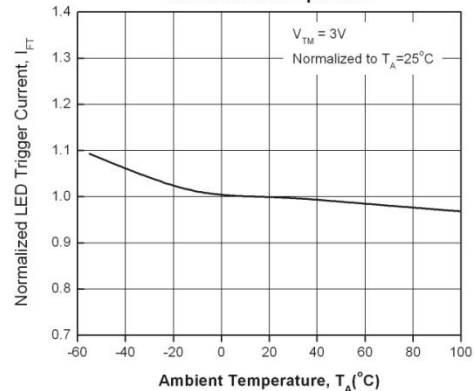


Figure 7. Off-State Output Terminal Voltage vs. Ambient Temperature

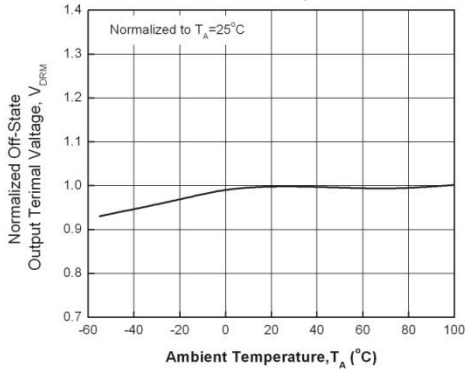
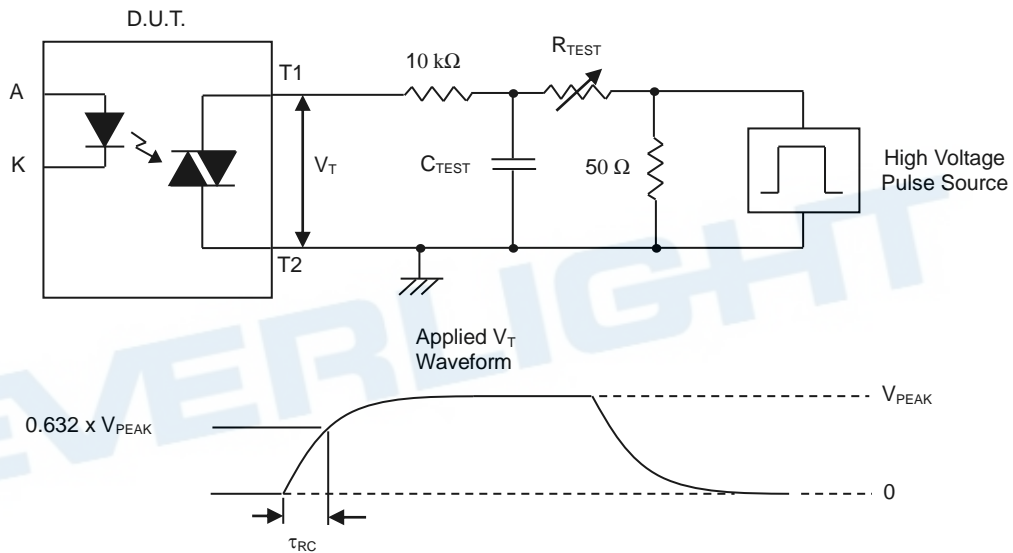


Figure 8. Static dv/dt Test Circuit & Waveform



### 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.

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

For example,  $V_{PEAK} = 400V$  for EL302X series. The  $dv/dt$  value is calculated as follows:

$$dv/dt = \frac{0.632 \times 400}{\tau_{RC}} = \frac{252.8}{\tau_{RC}}$$

**Order Information**

**Part Number**

**EL301XY(Z)-V**  
 or **EL302XY(Z)-V**  
 or **EL305XY(Z)-V**

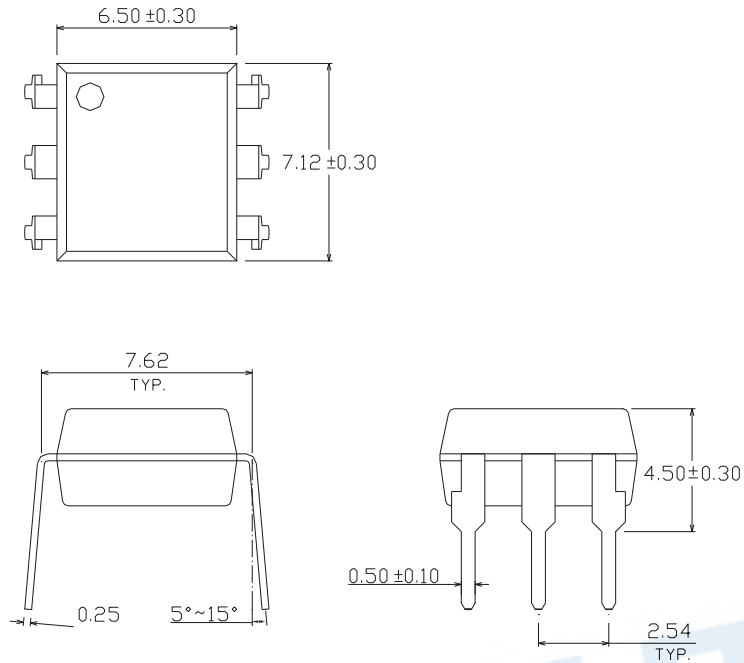
**Notes**

- X = Part No. for EL301x (0, 1 or 2).
- X = Part No. for EL302x (0,1, 2 or 3)
- X = Part No. for EL305x (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 (optional)

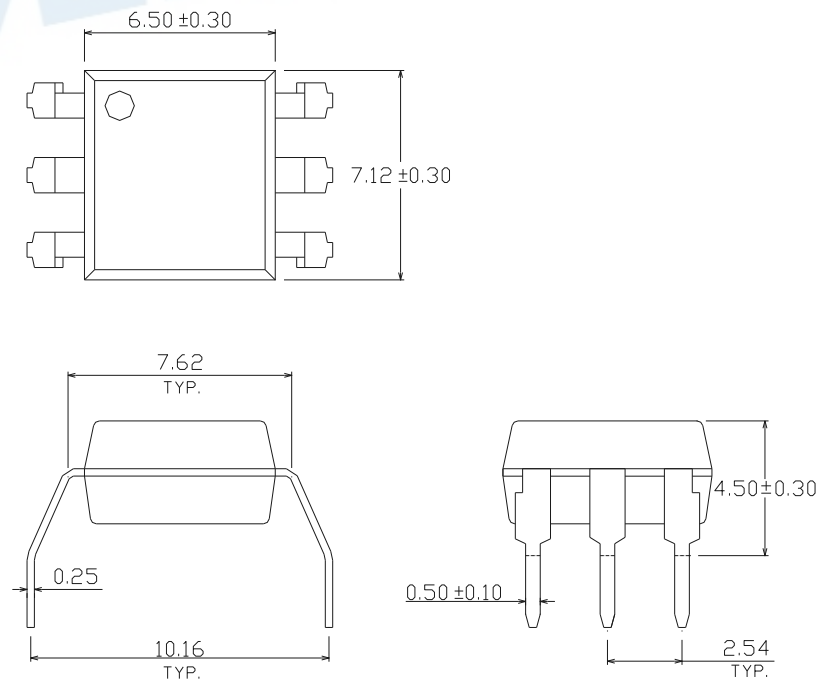
| Option  | Description   | Packing quantity    |
|---------|---|---------------------|
| None    | Standard DIP-6  | 65 units per tube   |
| M       | Wide lead bend (0.4 inch spacing)                             | 65 units per tube   |
| S       | Surface mount lead form                                       | 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

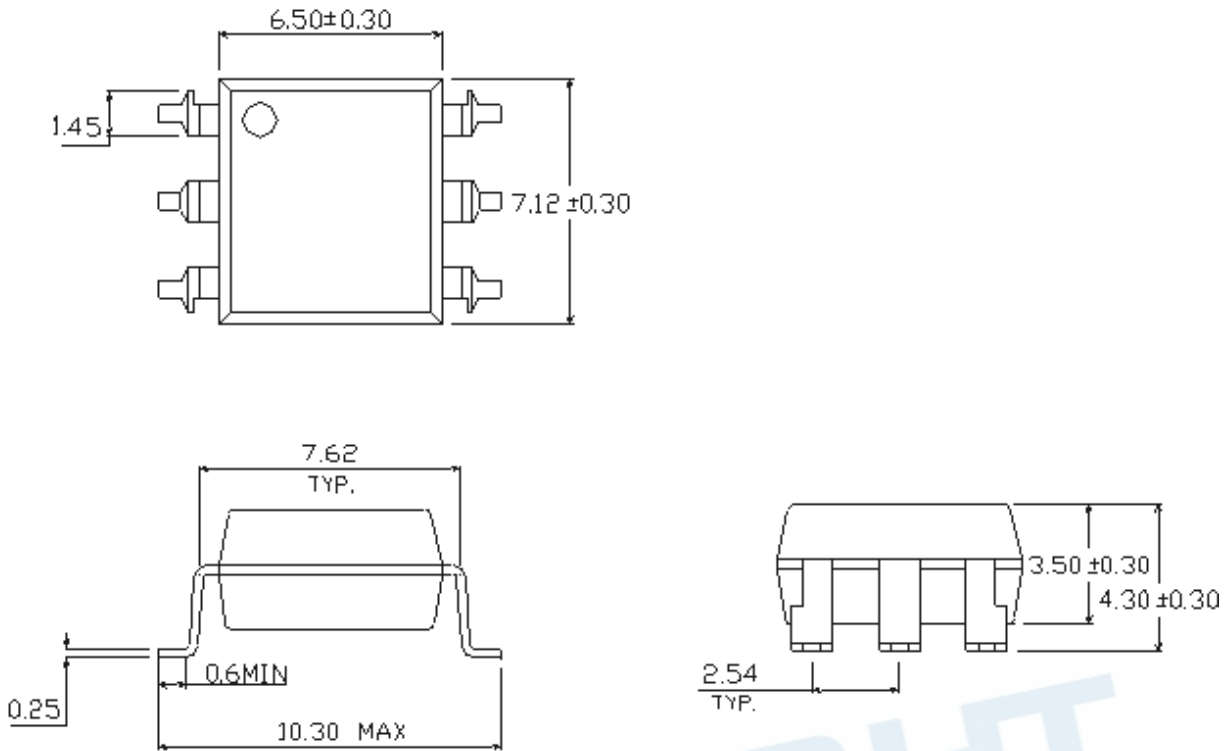


Option M Type

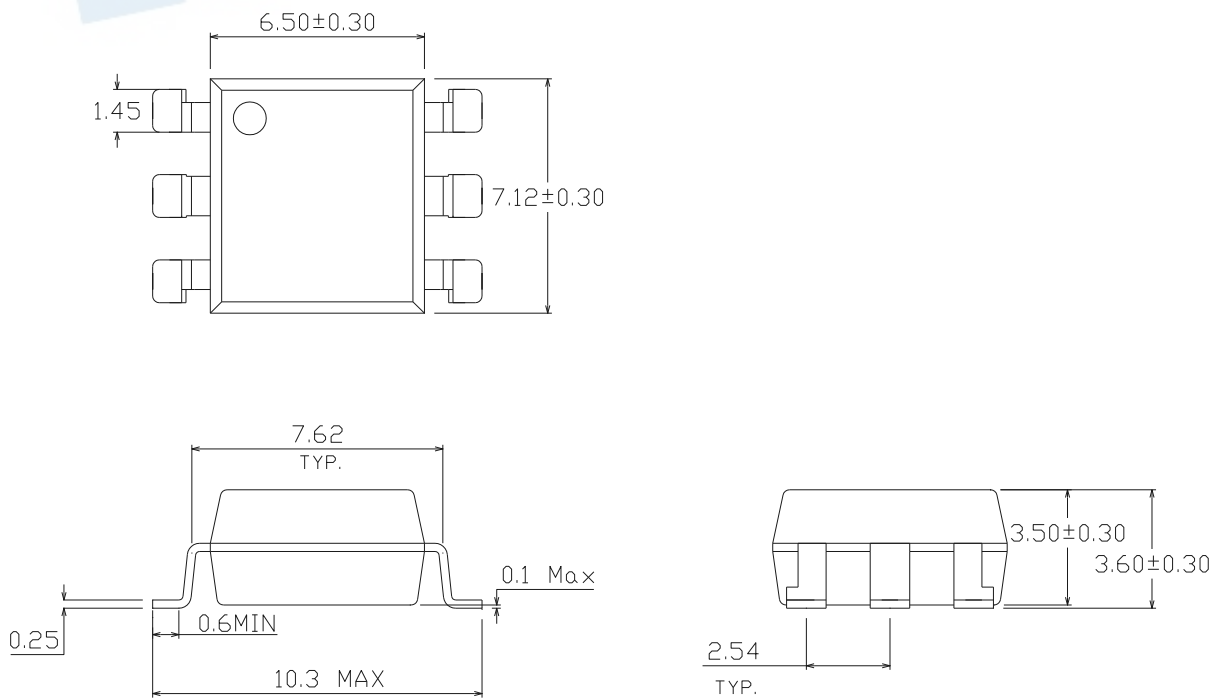




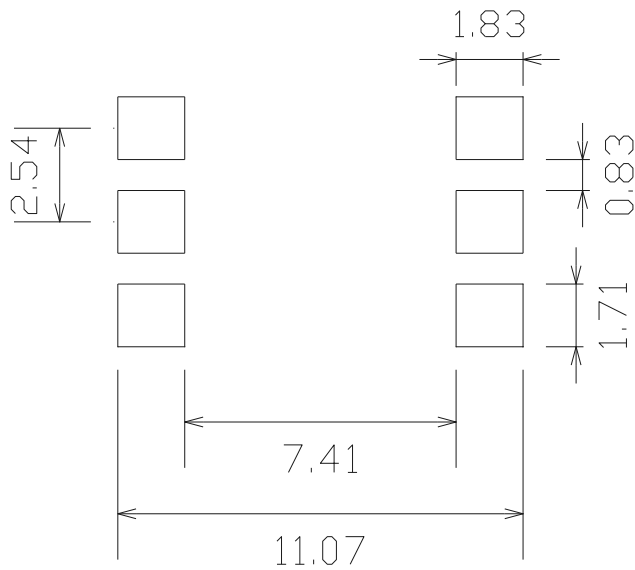
**Option S Type**



**Option S1 Type**



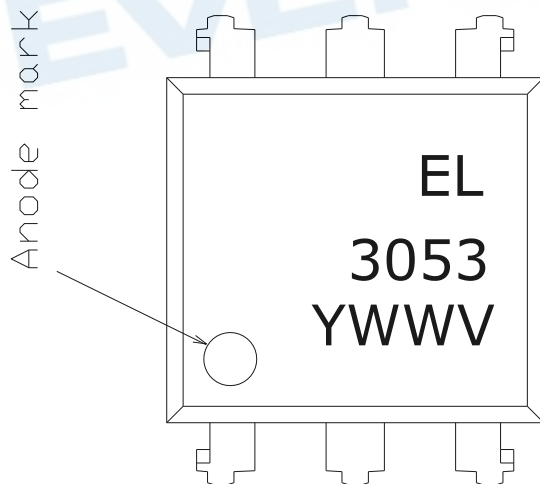
Recommended pad layout for surface mount leadform



Notes

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

Device Marking

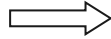
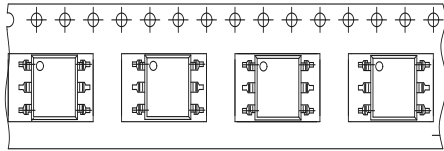


Notes

EL denotes EVERLIGHT  
3053 denotes Device Number  
Y denotes 1 digit Year code  
WW denotes 2 digit Week code  
V denotes VDE (optional)

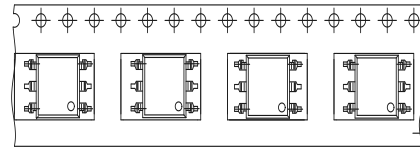
**Tape & Reel Packing Specifications**

**Option TA**



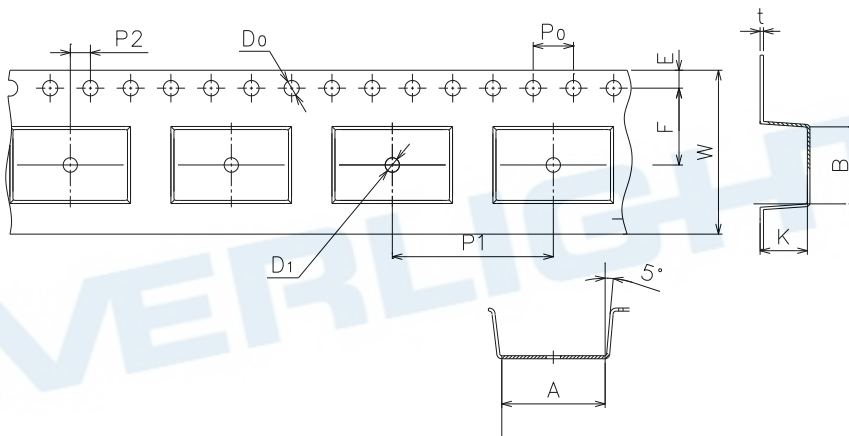
Direction of feed from reel

**Option TB**



Direction of feed from reel

**Tape dimensions**

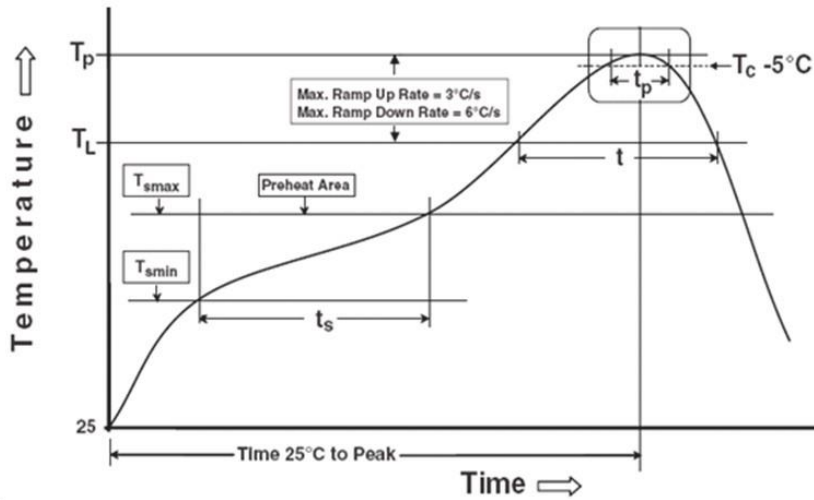


|                |           |           |           |           |          |          |
|----------------|-----------|-----------|-----------|-----------|----------|----------|
| Dimension No.  | <b>A</b>  | <b>B</b>  | <b>Do</b> | <b>D1</b> | <b>E</b> | <b>F</b> |
| Dimension (mm) | 10.8±0.1  | 7.5±0.1   | 1.5±0.1   | 1.5±0.1   | 1.75±0.1 | 7.5±0.1  |
| Dimension No.  | <b>Po</b> | <b>P1</b> | <b>P2</b> | <b>t</b>  | <b>W</b> | <b>K</b> |
| 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



Notes

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          |

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