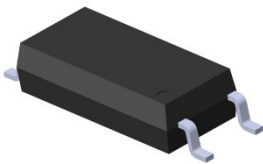
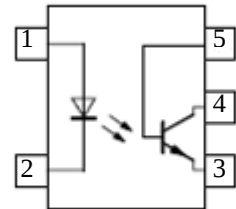


### 5 PIN LONG CREEPAGE SOP PHOTOTRANSISTOR PHOTOCOUPLER EL111X-G Series



Schematic



Pin Configuration

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

#### Features:

- Free halogens compliant
- Current transfer ratio  
(CTR: 50~600% at  $I_F = 5\text{mA}$ ,  $V_{CE} = 5\text{V}$ )  
(CTR: 63~320% at  $I_F = 10\text{mA}$ ,  $V_{CE} = 5\text{V}$ )
- High isolation voltage between input and output (Viso=5000 V rms )
- Compact 5 Pin SOP with a 2.0 mm profile
- 8mm long creepage distance
- Pb free and RoHS compliant.
- UL approved (No. E214129)
- VDE approved (No. 40028391)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved

#### Description

The EL111X-G series devices consist of an infrared emitting diode, optically coupled to a phototransistor detector. Compound use free halogens and  $\text{Sb}_2\text{O}_3$ . They are packaged in a 5-pin SOP package

#### Applications

- Programmable controllers
- System appliances, measuring instruments
- Telecommunication equipments
- Home appliances, such as fan heaters, etc.
- Signal transmission between circuits of different potentials and impedances

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

|        | Parameter                           | Symbol    | Rating     | Unit  |
|--------|-------------------------------------|-----------|------------|-------|
| Input  | Forward current                     | $I_F$     | 60         | mA    |
|        | Peak forward current (1us, pulse)   | $I_{FP}$  | 1.5        | A     |
|        | Reverse voltage                     | $V_R$     | 6          | V     |
|        | Power dissipation                   | $P_D$     | 100        | mW    |
| Output | Power dissipation                   | $P_C$     | 150        | mW    |
|        | Collector current                   | $I_C$     | 50         | mA    |
|        | Collector-Emitter voltage           | $V_{CEO}$ | 80         | V     |
|        | Emitter-Collector voltage           | $V_{ECO}$ | 7          | V     |
|        | Total Power Dissipation             | $P_{TOT}$ | 250        | mW    |
|        | Isolation Voltage* <sup>1</sup>     | $V_{ISO}$ | 5000       | V rms |
|        | Operating Temperature               | $T_{OPR}$ | -55 to 110 | °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 are shorted together, and pins 3, 4 & 5 are shorted together.

\*2 For 10 seconds

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

**Input**

| Parameter         | Symbol   | Min. | Typ. | Max. | Unit          | Condition                |
|-------------------|----------|------|------|------|---------------|--------------------------|
| Forward Voltage   | $V_F$    | -    | -    | 1.5  | V             | $I_F = 50\text{mA}$      |
| Reverse current   | $I_R$    | -    | -    | 10   | $\mu\text{A}$ | $V_R = 6\text{V}$        |
| Input capacitance | $C_{in}$ | -    | 50   | -    | pF            | $V = 0, f = 1\text{kHz}$ |

**Output**

| Parameter                           | Symbol     | Min | Typ. | Max. | Unit | Condition                               |
|-------------------------------------|------------|-----|------|------|------|-----------------------------------------|
| Collector-Emitter dark current      | $I_{CEO}$  | -   | -    | 100  | nA   | $V_{CE} = 20\text{V}, I_F = 0\text{mA}$ |
| Collector-Emitter breakdown voltage | $BV_{CEO}$ | 80  | -    | -    | V    | $I_C = 0.1\text{mA}$                    |
| Emitter-Collector breakdown voltage | $BV_{ECO}$ | 7   | -    | -    | V    | $I_E = 0.1\text{mA}$                    |

**Transfer Characteristics**

| Parameter                            | Symbol        | Min                | Typ. | Max. | Unit     | Condition                                           |
|--------------------------------------|---------------|--------------------|------|------|----------|-----------------------------------------------------|
| Current Transfer ratio               | EL1110        | 50                 | -    | 600  | %        | $I_F = 5\text{mA}, V_{CE} = 5\text{V}$              |
|                                      | EL1116        | 100                | -    | 300  |          |                                                     |
|                                      | EL1117        | 80                 | -    | 160  |          |                                                     |
|                                      | EL1118        | 130                | -    | 260  |          |                                                     |
|                                      | EL1119        | 200                | -    | 400  |          |                                                     |
|                                      | EL1112        | 63                 | -    | 125  | %        | $I_F = 10\text{mA}, V_{CE} = 5\text{V}$             |
|                                      | EL1113        | 100                | -    | 200  |          |                                                     |
|                                      | EL1114        | 160                | -    | 320  |          |                                                     |
|                                      | EL1112        | 22                 | -    | -    |          |                                                     |
|                                      | EL1113        | 34                 | -    | -    |          | $I_F = 1\text{mA}, V_{CE} = 5\text{V}$              |
|                                      | EL1114        | 56                 | -    | -    |          |                                                     |
| Collector-Emitter saturation voltage | $V_{CE(sat)}$ | -                  | -    | 0.4  | V        | $I_F = 10\text{mA}, I_C = 1\text{mA}$               |
| Isolation resistance                 | $R_{IO}$      | $5 \times 10^{10}$ | -    | -    | $\Omega$ | $V_{IO} = 500\text{Vdc}, 40 \sim 60\% \text{ R.H.}$ |
| Floating capacitance                 | $C_{IO}$      | -                  | -    | 1.0  | pF       | $V_{IO} = 0, f = 1\text{MHz}$                       |

### Transfer Characteristics

| Parameter     | Symbol | Min | Typ. | Max. | Unit          | Condition                                      |
|---------------|--------|-----|------|------|---------------|------------------------------------------------|
| Turn on time  | Ton    | -   | 4    | -    | $\mu\text{s}$ | $V_{CE} = 5V, I_C = 5mA,$<br>$R_L = 100\Omega$ |
| Turn off time | Toff   | -   | 3    | -    |               |                                                |
| Rise time     | $t_r$  | -   | 2    | 18   | $\mu\text{s}$ | $V_{CE} = 5V, I_C = 5mA,$<br>$R_L = 100\Omega$ |
| Fall time     | $t_f$  | -   | 3    | 18   |               |                                                |

\* Typical values at  $T_a = 25^\circ\text{C}$

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## Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs. Forward Voltage

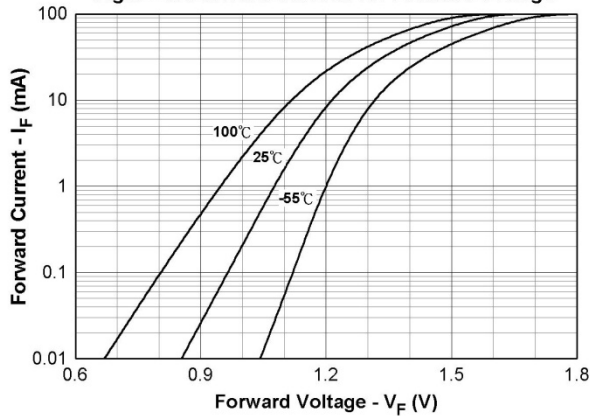


Figure 2. Collector Dark Current vs. Ambient Temperature

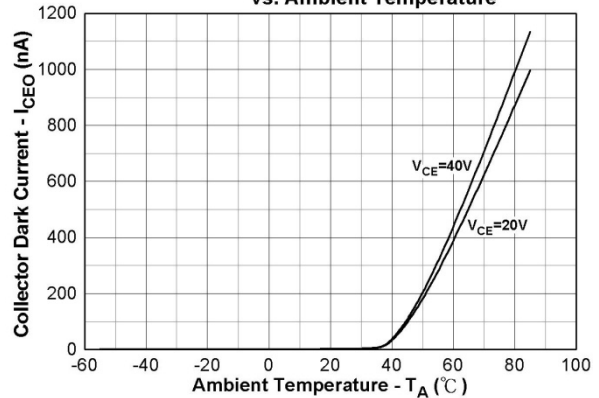


Figure 3. Collector Current vs. Collector Emitter Voltage

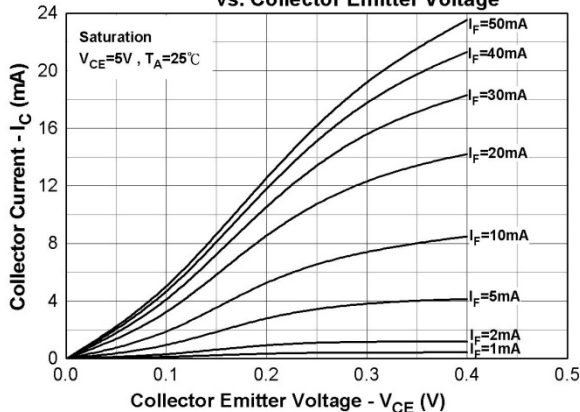


Figure 4. Collector Current vs. Collector Emitter Voltage

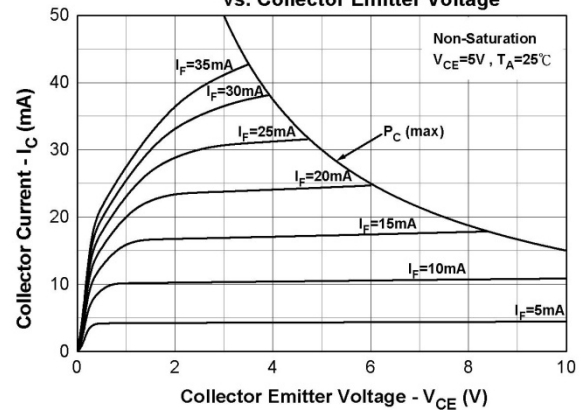


Figure 5. Normalized Collector Current vs. Forward Current

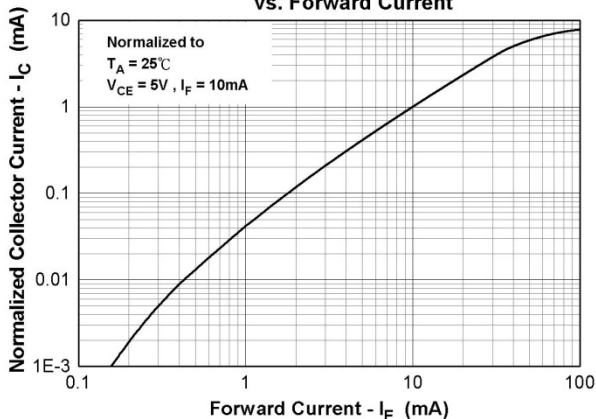


Figure 6. Normalized Current Transfer Ratio vs. Forward Current

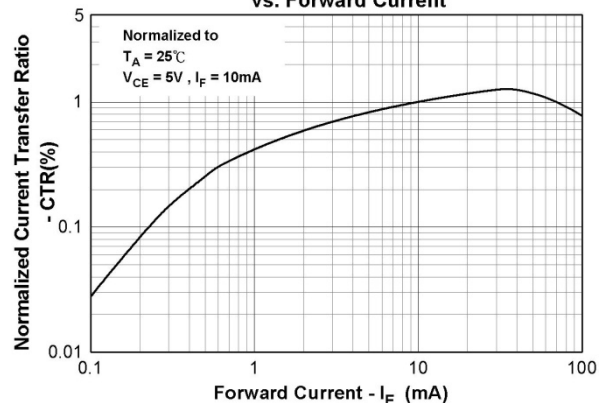


Figure 7. Normalized Current Transfer Ratio vs. Ambient Temperature

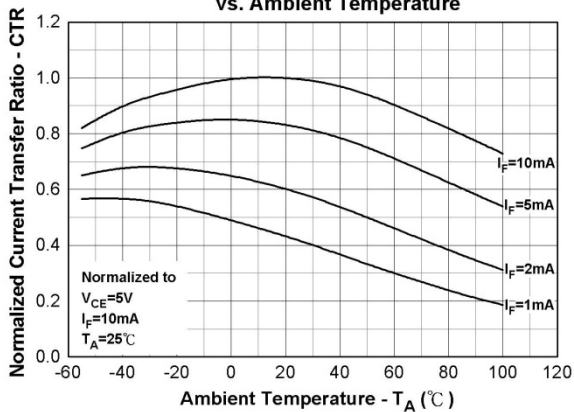


Figure 8. Normalized Current Transfer Ratio vs. Ambient Temperature

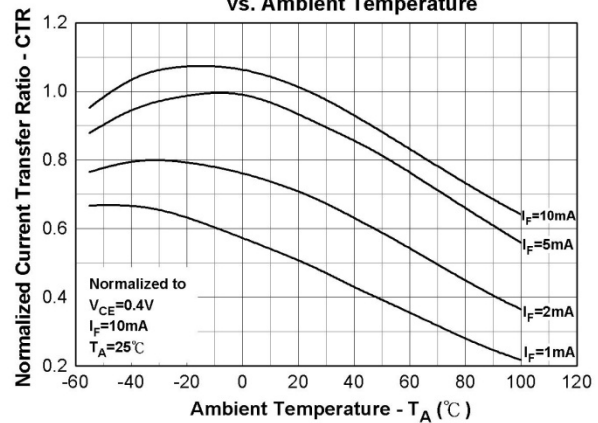


Figure 9. Turn on/off Time vs. Collector Current

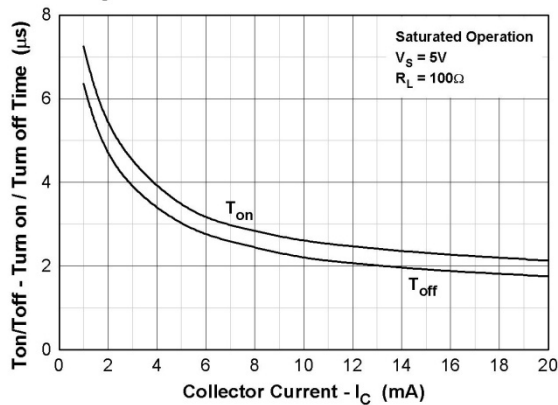


Figure 10. Turn on/off Time vs. Forward Current

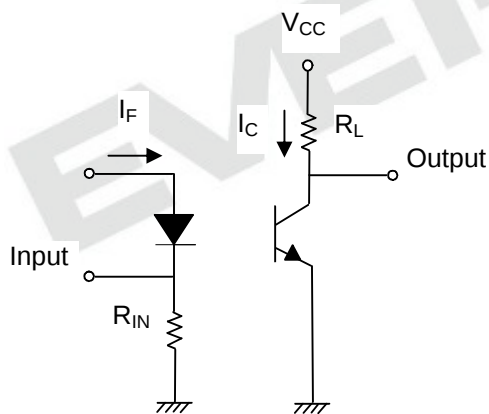
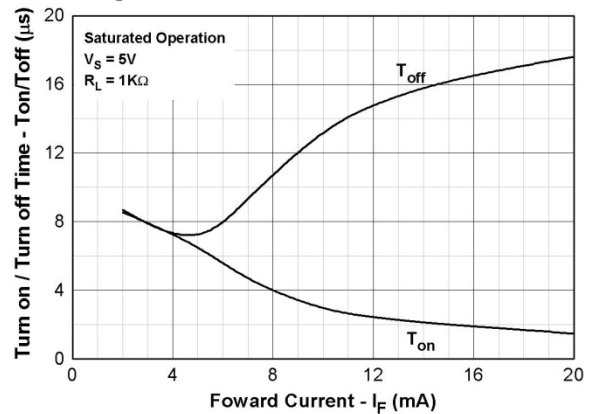


Figure 11. Switching Time Test Circuit & Waveforms

## Order Information

### Part Number

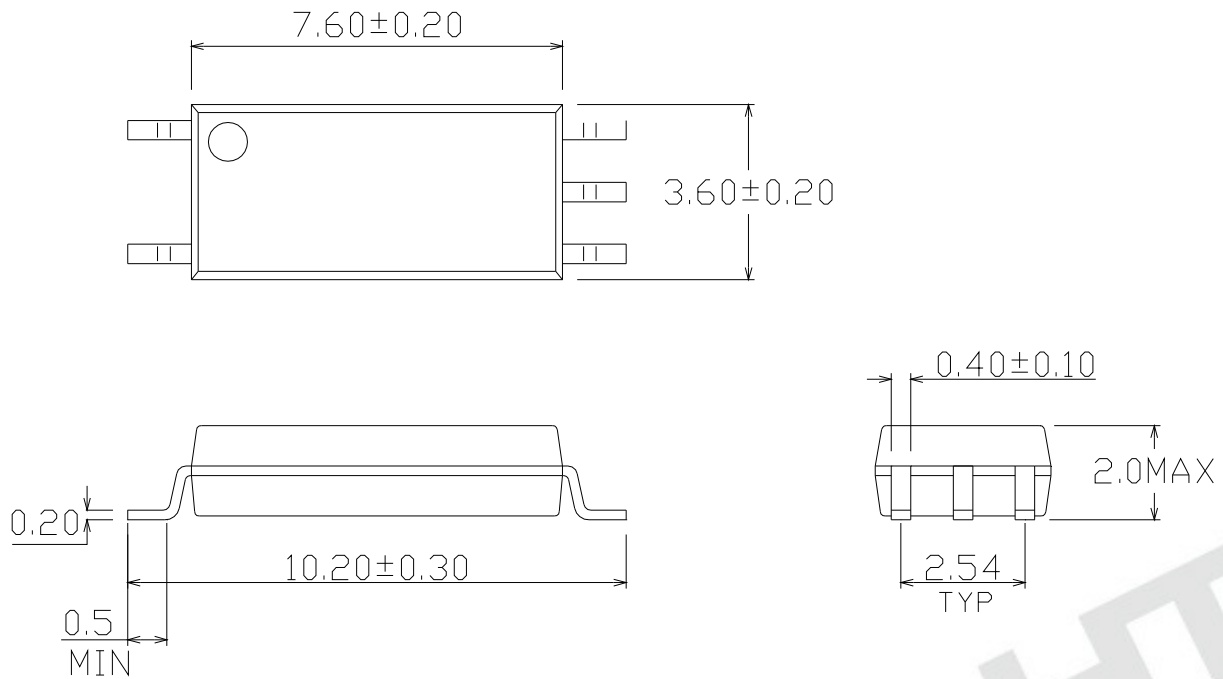
**EL111X(Y)-VG**

### Note

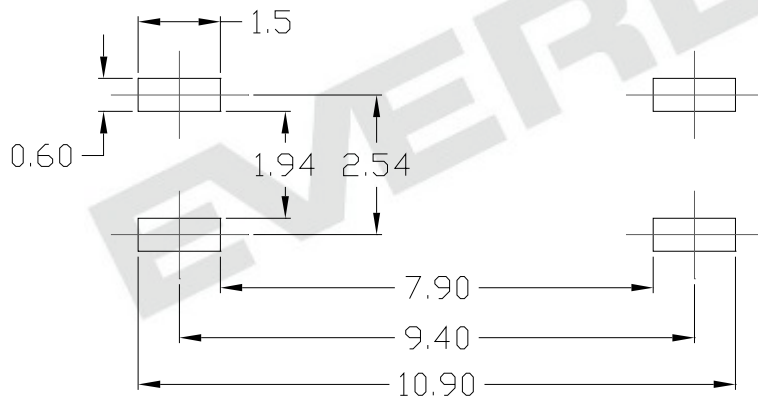
EL111 = Part No.  
X = CTR Rank (0, 2, 3, 4, 6, 7, 8 or 9)  
Y = Tape and reel option (TA, TB or none).  
V = VDE safety (optional)  
G = Halogens free

| Option | Description                 | Packing quantity    |
|--------|-----------------------------|---------------------|
| None   | Standard SMD option         | 100 units per tube  |
| -V     | Standard SMD option + VDE   | 100 units per tube  |
| (TA)   | TA Tape & reel option       | 3000 units per reel |
| (TB)   | TB Tape & reel option       | 3000 units per reel |
| (TA)-V | TA Tape & reel option + VDE | 3000 units per reel |
| (TB)-V | TB Tape & reel option + VDE | 3000 units per reel |

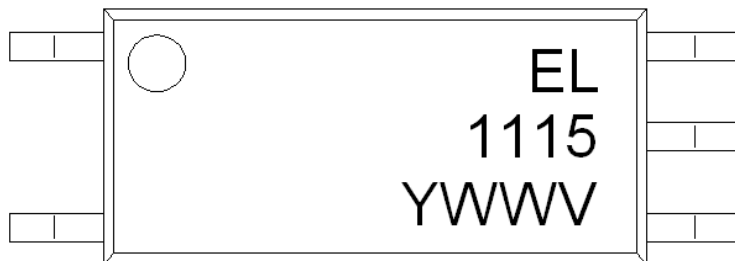
Package Dimension (Dimensions in mm)



Recommended pad layout for surface mount leadform



## Device Marking

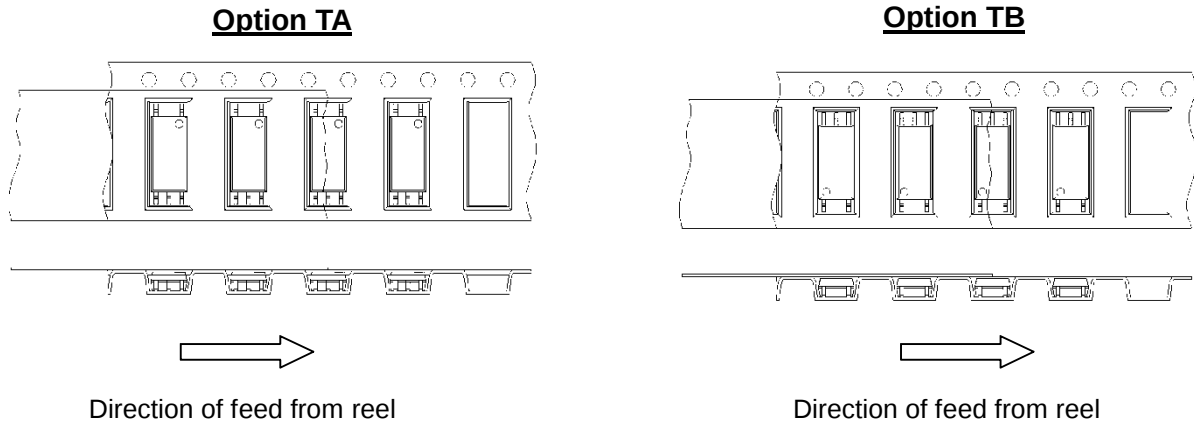


## Notes

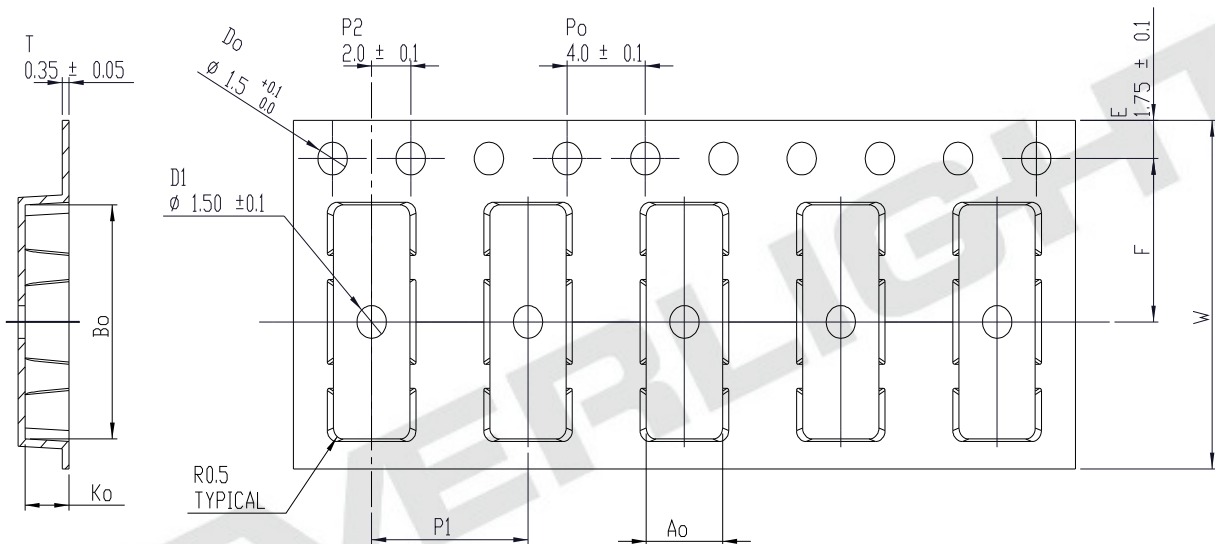
|      |                           |
|------|---------------------------|
| EL   | denotes Everlight         |
| 1115 | denotes Device Number     |
| Y    | denotes 1 digit Year code |
| WW   | denotes 2 digit Week code |
| V    | denotes VDE (optional)    |

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## Tape & Reel Packing Specifications



## Tape dimensions

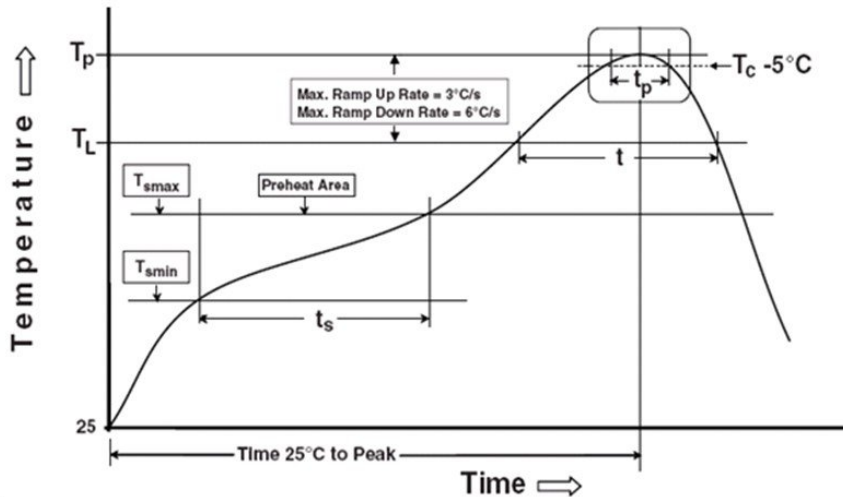


| Dimension No.  | Ao         | Bo           | Do           | D1          | E           | F           |
|----------------|------------|--------------|--------------|-------------|-------------|-------------|
| Dimension (mm) | 3.9 ± 0.10 | 10.75 ± 0.10 | 1.5 + 0.1/-0 | 1.5 ± 0.10  | 1.75 ± 0.10 | 7.5 ± 0.10  |
| Dimension No.  | Po         | P1           | P2           | T           | W           | Ko          |
| Dimension (mm) | 4.0 ± 0.10 | 8.0 ± 0.10   | 2.0 ± 0.10   | 0.35 ± 0.05 | 16.0 ± 0.30 | 2.25 ± 0.10 |

## 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          |

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