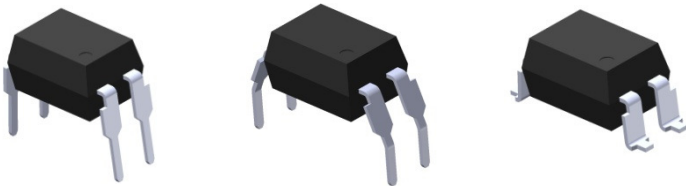




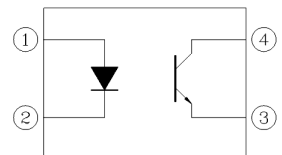
# THE DATASHEET OF EL851



## 4 PIN DIP HIGH VOLTAGE PHOTOTRANSISTOR PHOTOCOUPLER EL851 Series



Schematic



Pin Configuration

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

### Features:

- High collector- emitter voltage ( $V_{CEO}=350V$ )
- Current transfer ratio  
(CTR: 50~600% at  $I_F=5mA$ ,  $V_{CE}=5V$ )
- High isolation voltage between input and output ( $V_{iso}=5000 V rms$ )
- Compact dual-in-line package
- Pb free and RoHS compliant.
- UL approved (No. E214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved

### Description

The EL851 series devices consist an infrared emitting diodes, optically coupled to a phototransistor detector.

The devices are in a 4-pin DIP package and available in wide-lead spacing and SMD option.

### Applications

- Telephone line interface
- Interface to power supply circuit
- Controller for SSRs. DC motor
- Programmable Controllers

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

|        | Parameter                        | Symbol    | Rating     | Unit  |
|--------|----------------------------------|-----------|------------|-------|
| Input  | Forward current                  | $I_F$     | 60         | mA    |
|        | Peak forward current (1μs pulse) | $I_{FM}$  | 1          | A     |
|        | Reverse voltage                  | $V_R$     | 6          | V     |
|        | Power dissipation                | $P_D$     | 100        | mW    |
| Output | Collector power dissipation      | $P_C$     | 150        | mW    |
|        | Collector-Emitter voltage        | $V_{CEO}$ | 350        | V     |
|        | Collector Current                | $I_C$     | 50         | mA    |
|        | Emitter-Collector voltage        | $V_{ECO}$ | 7          | V     |
|        | Total Power Dissipation          | $P_{TOT}$ | 200        | mW    |
|        | Isolation Voltage*1              | $V_{ISO}$ | 5000       | V rms |
|        | Operating Temperature            | $T_{OPR}$ | -55 to 100 | °C    |
|        | Storage Temperature              | $T_{STG}$ | -55 to 125 | °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

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

**Input**

| Parameter         | Symbol   | Min. | Typ. | Max. | Unit          | Condition                |
|-------------------|----------|------|------|------|---------------|--------------------------|
| Forward Voltage   | $V_F$    | -    | 1.2  | 1.4  | V             | $I_F = 10\text{mA}$      |
| Reverse Current   | $I_R$    | -    | -    | 10   | $\mu\text{A}$ | $V_R = 5\text{V}$        |
| Input capacitance | $C_{in}$ | -    | 30   | 250  | pF            | $V = 0, f = 1\text{kHz}$ |

**Output**

| Parameter                           | Symbol     | Min | Typ. | Max. | Unit | Condition                             |
|-------------------------------------|------------|-----|------|------|------|---------------------------------------|
| Collector-Emitter dark current      | $I_{CEO}$  | -   | -    | 100  | nA   | $V_{CE} = 200\text{V}$                |
| Collector-Emitter breakdown voltage | $BV_{CEO}$ | 350 | -    | -    | V    | $I_C = 0.1\text{mA}$                  |
| Emitter-Collector breakdown voltage | $BV_{ECO}$ | 7   | -    | -    | V    | $I_E = 0.1\text{mA}$                  |
| Collector-Emitter capacitance       | $C_{CE}$   | -   | 10   | -    | pF   | $V_{CE} = 0\text{V}, f = 1\text{MHz}$ |

**Transfer Characteristics**

| Parameter                            | Symbol        | Min       | Typ. | Max. | Unit          | Condition   |
|--------------------------------------|---------------|-----------|------|------|---------------|---|
| Current Transfer Ratio               | CTR           | 50        | -    | 600  | %             | $I_F = 5\text{mA}, V_{CE} = 5\text{V}$                  |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | -         | -    | 0.4  | V             | $I_F = 20\text{mA}, I_C = 1\text{mA}$                   |
| Isolation resistance                 | $R_{IO}$      | $10^{11}$ | -    | -    | $\Omega$      | $V_{IO} = 500\text{Vdc}$                                |
| Input-output capacitance             | $C_{IO}$      | -         | 0.6  | -    | pF            | $V_{IO} = 0, f = 1\text{MHz}$                           |
| Rise time                            | $t_r$         | -         | 4    | 18   | $\mu\text{s}$ | $V_{CE} = 2\text{V}, I_C = 2\text{mA}, R_L = 100\Omega$ |
| Fall time                            | $t_f$         | -         | 5    | 18   | $\mu\text{s}$ |   |

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

Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

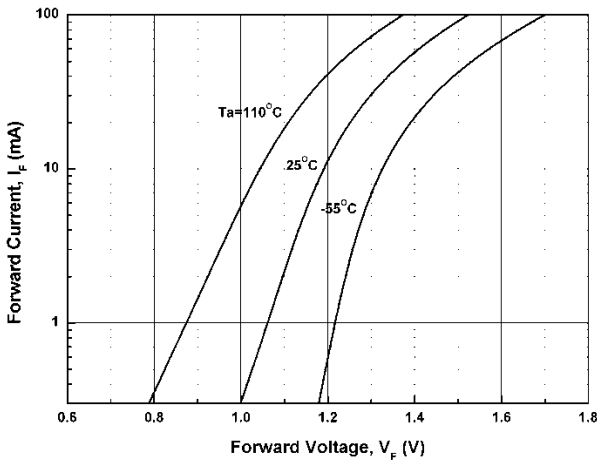


Figure 2. Current Transfer Ratio vs Forward Current

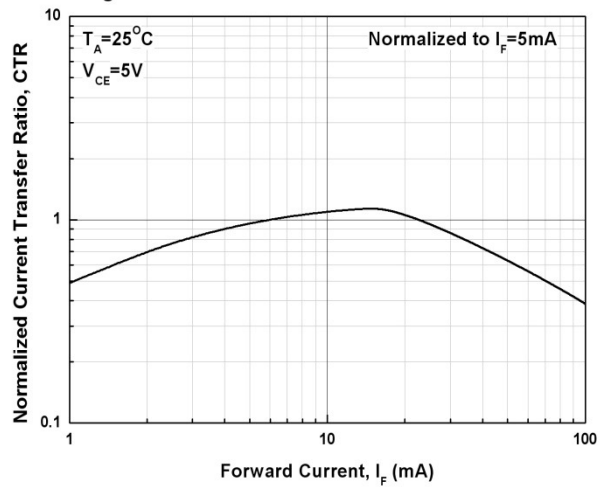


Figure 3. Collector Current vs Collector-emitter Voltage

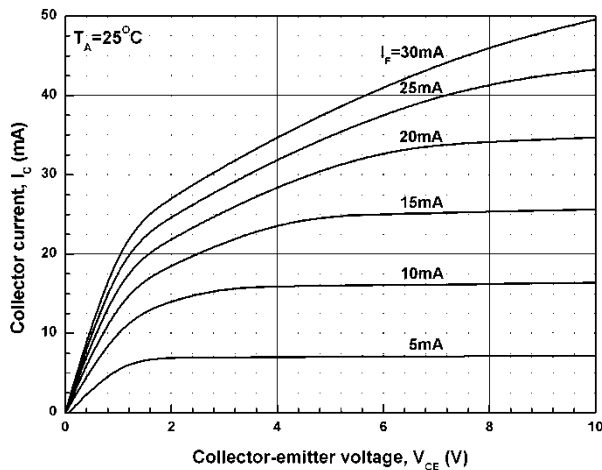


Figure 4. Relative Current Transfer Ratio vs Ambient Temperature

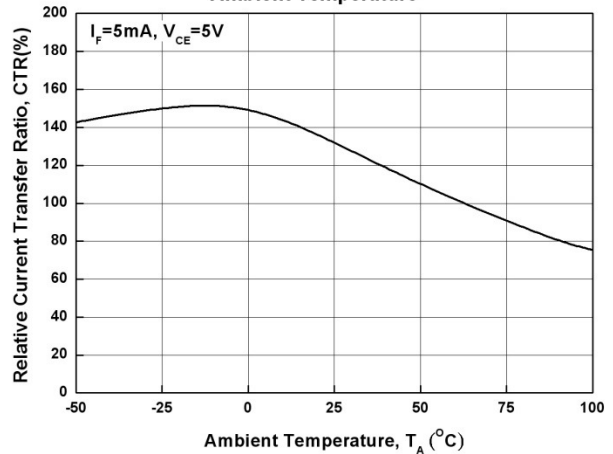


Figure 5. Collector-emitter Saturation Voltage vs Ambient Temperature

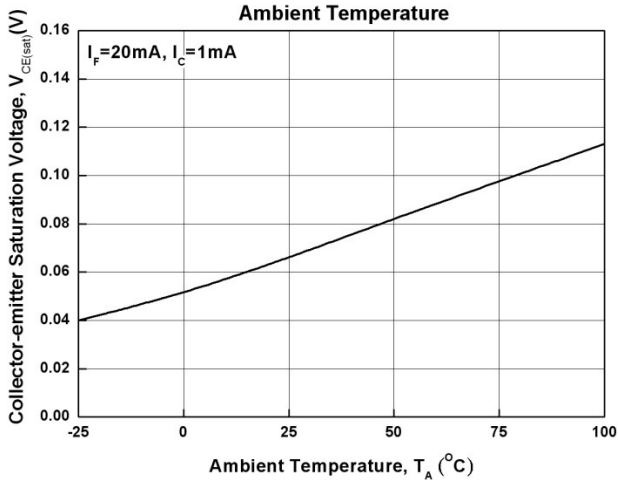


Figure 6. Dark Current vs Ambient Temperature

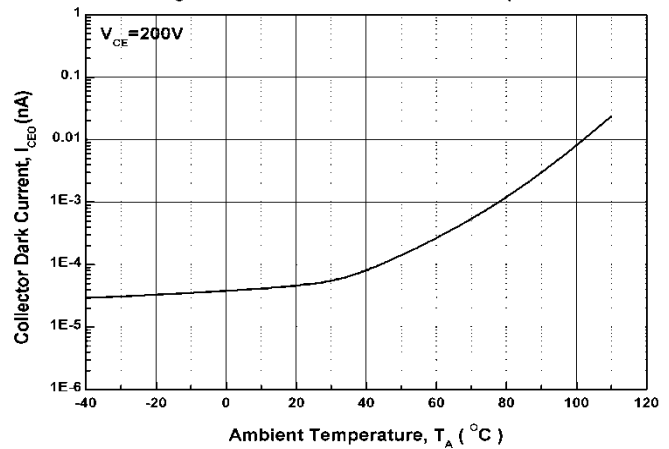


Figure 7. Switching Time vs. Load Resistance

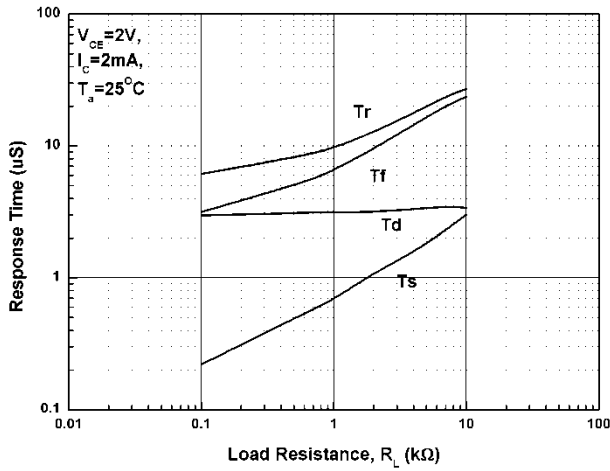


Figure 8. Collector-emitter Saturation Voltage vs Forward Current

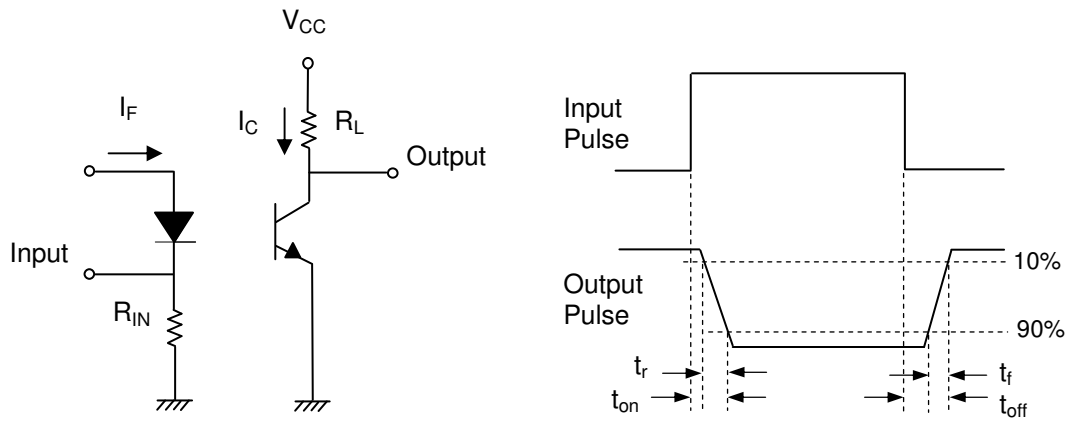
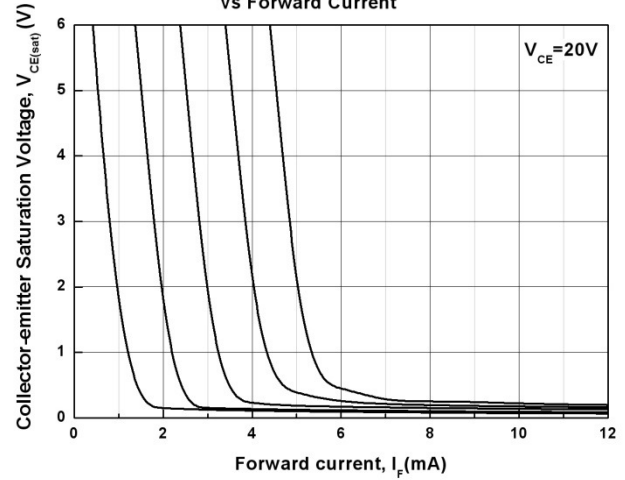


Figure 9. Switching Time Test Circuit & Waveforms

## Order Information

### Part Number

**EL851X(Z)-V**

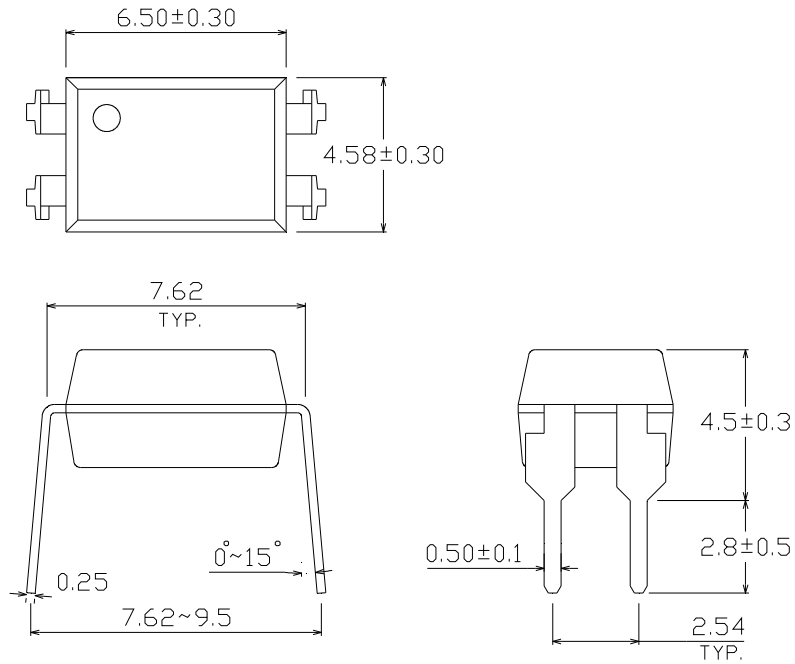
### Note

- X = Lead form option (S, S1, M or none)
- Z = Tape and reel option (TA, TB, TU, TD or none).
- V = VDE safety (optional).

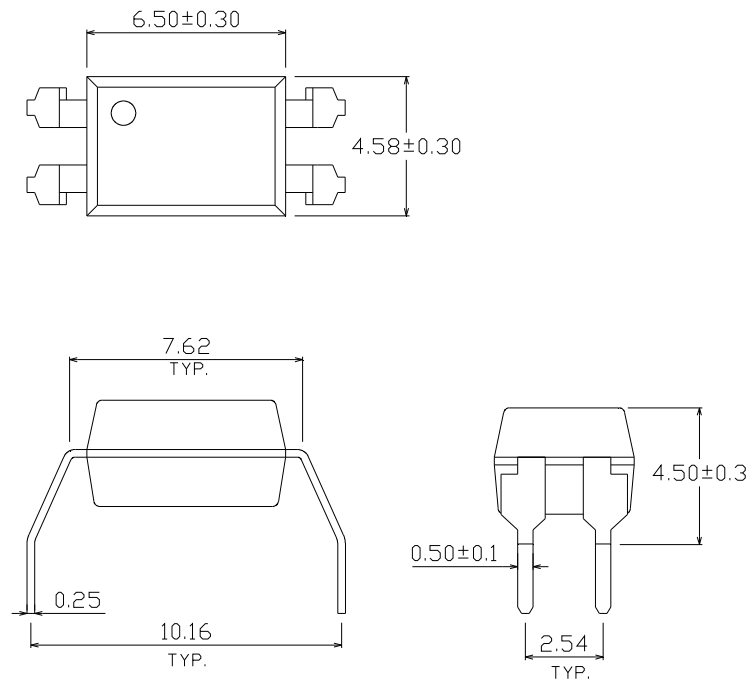
| Option  | Description   | Packing quantity    |
|---------|---|---------------------|
| None    | Standard DIP-4  | 100 units per tube  |
| M       | Wide lead bend (0.4 inch spacing)                             | 100 units per tube  |
| S (TA)  | Surface mount lead form + TA tape & reel option               | 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 |
| S (TU)  | Surface mount lead form + TU tape & reel option               | 1500 units per reel |
| S (TD)  | Surface mount lead form + TD tape & reel option               | 1500 units per reel |
| S1 (TU) | Surface mount lead form (low profile) + TU tape & reel option | 1500 units per reel |
| S1 (TD) | Surface mount lead form (low profile) + TD tape & reel option | 1500 units per reel |

Package Dimension (Dimensions in mm)

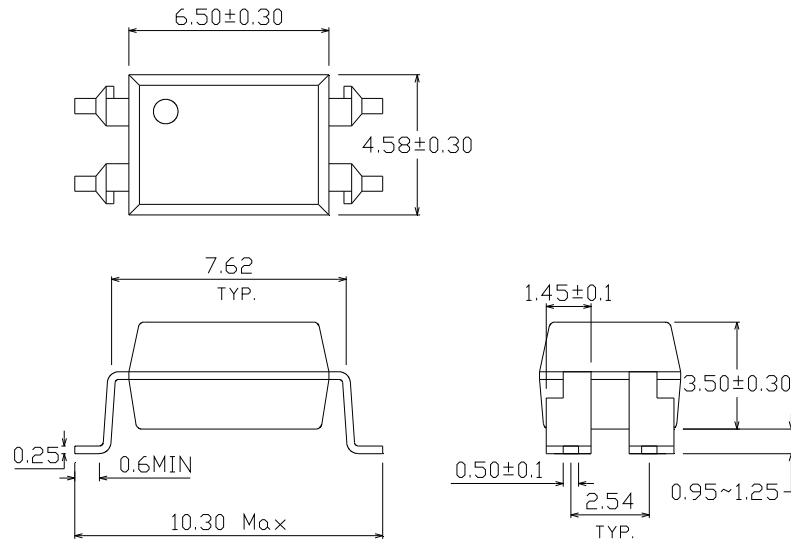
Standard DIP Type



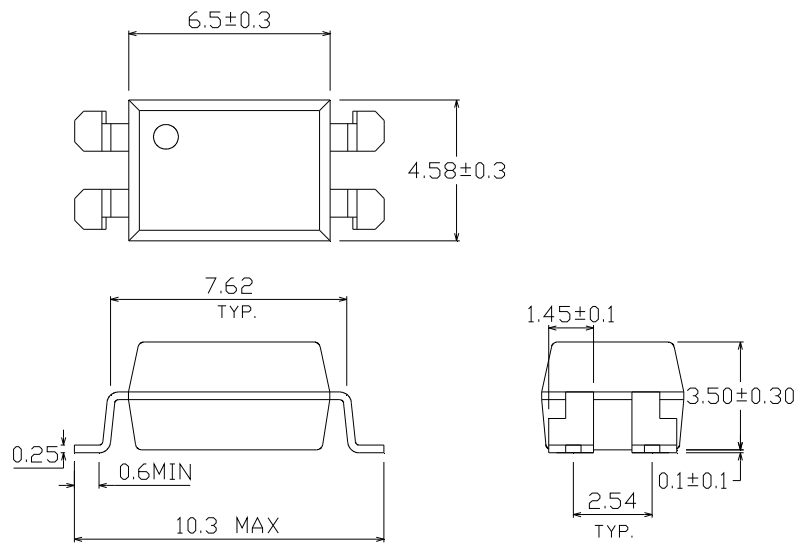
Option M Type



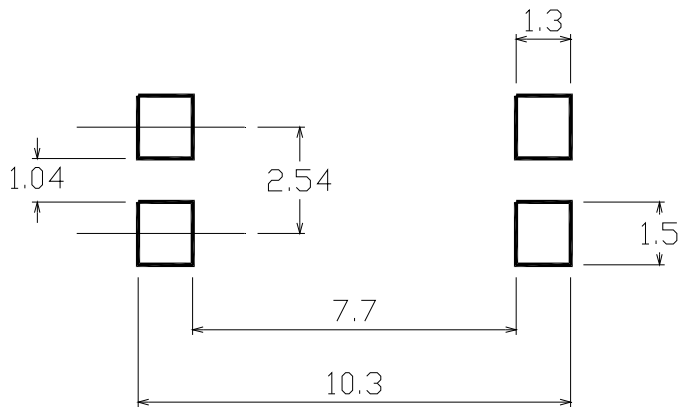
Option S Type



Option S1 Type



### Recommended pad layout for surface mount leadform



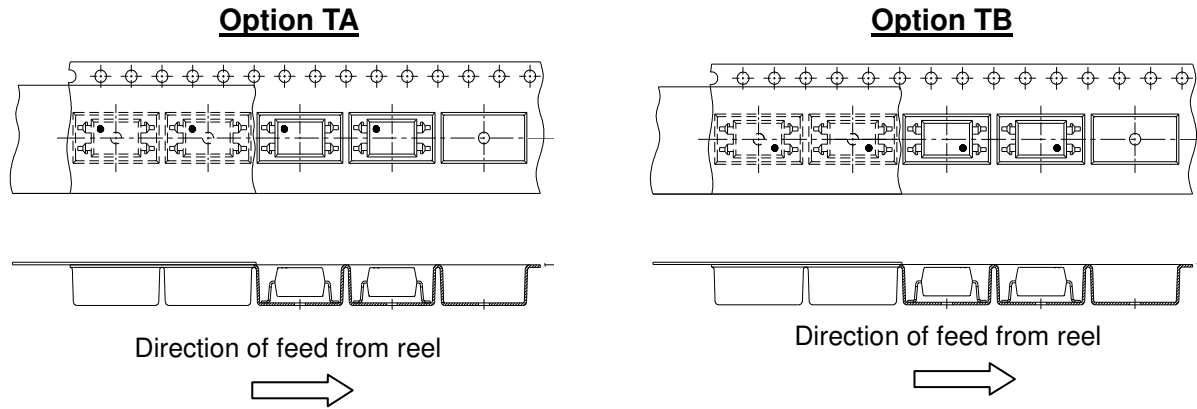
### Device Marking



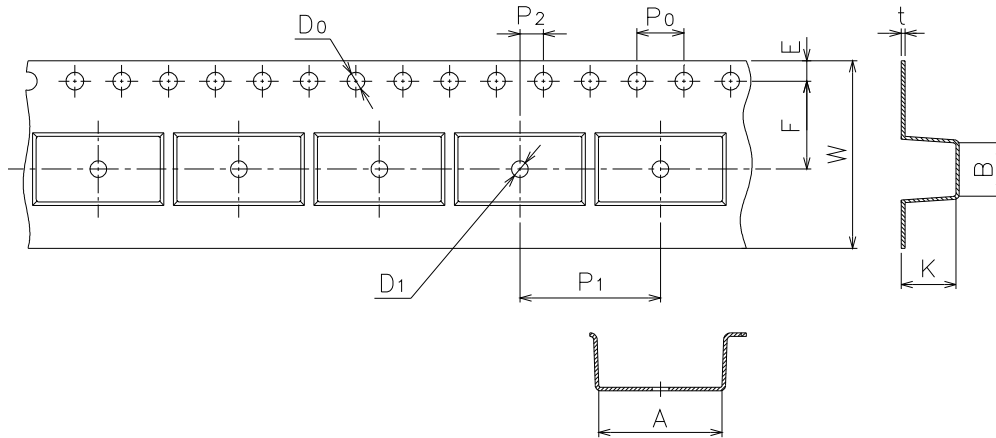
### Notes

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

**Tape & Reel Packing Specifications**

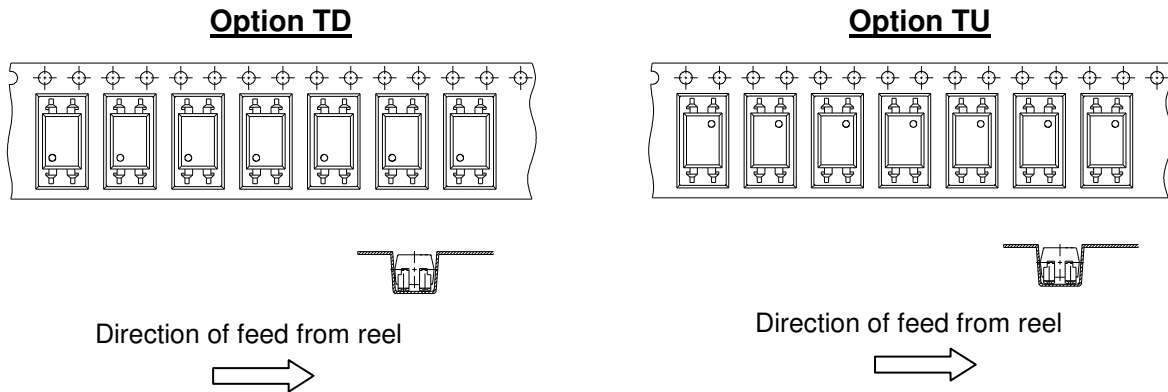


**Tape dimensions**

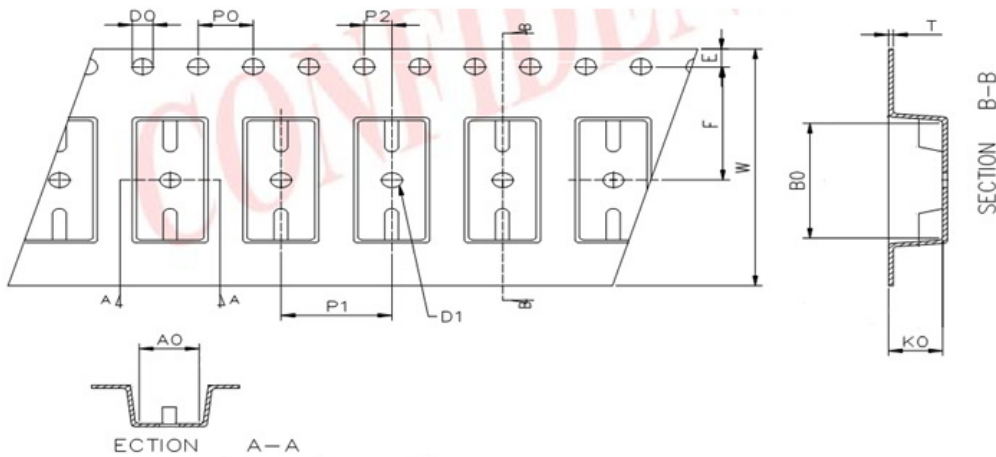


|                      |           |           |           |           |          |          |
|----------------------|-----------|-----------|-----------|-----------|----------|----------|
| Dimension No.        | <b>A</b>  | <b>B</b>  | <b>Do</b> | <b>D1</b> | <b>E</b> | <b>F</b> |
| Dimension (mm)<br>S  | 10.5±0.1  | 4.65±0.1  | 1.5±0.1   | 1.50±0.1  | 1.75±0.1 | 7.5±0.1  |
| Dimension (mm)<br>S1 | 10.5±0.1  | 4.65±0.1  | 1.5±0.1   | 1.50±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)<br>S  | 4.0±0.1   | 12.0±0.1  | 2.0±0.1   | 0.4±0.1   | 16.0±0.3 | 5.05±0.1 |
| Dimension (mm)<br>S1 | 4.0±0.1   | 12.0±0.1  | 2.0±0.1   | 0.4±0.1   | 16.0±0.3 | 4.75±0.1 |

**Tape & Reel Packing Specifications**



**Tape dimensions**

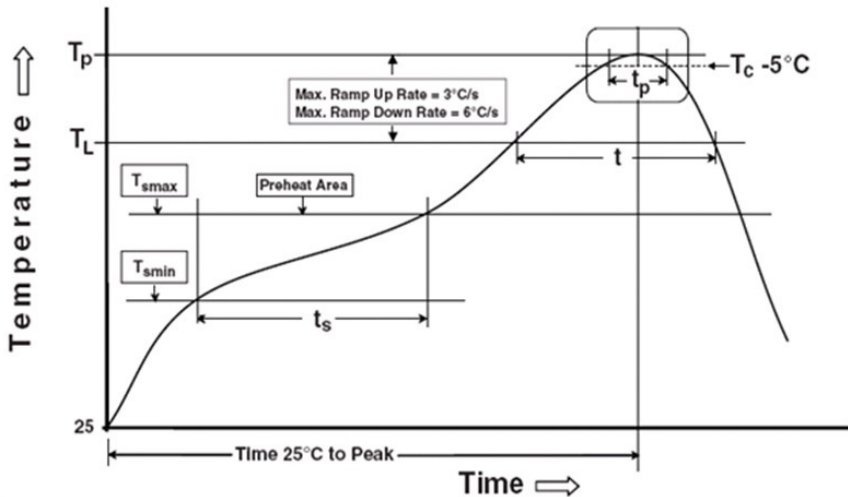


|                |           |           |           |           |           |           |
|----------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Dimension No.  | <b>Ao</b> | <b>Bo</b> | <b>Do</b> | <b>D1</b> | <b>E</b>  | <b>F</b>  |
| Dimension (mm) | 4.90±0.1  | 10.40±0.1 | 1.5±0.1   | 1.50±0.1  | 1.75±0.1  | 7.50±0.1  |
| Dimension No.  | <b>Po</b> | <b>P1</b> | <b>P2</b> | <b>t</b>  | <b>W</b>  | <b>Ko</b> |
| Dimension(mm)  | 4.00±0.1  | 8.00±0.   | 2.00±0.1  | 0.40±0.1  | 16.00±0.3 | 4.60±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           |

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