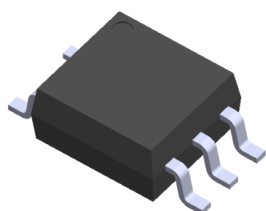
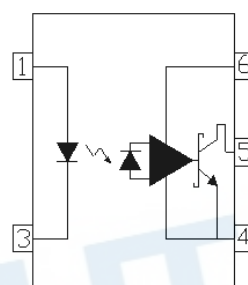


### 5 PIN SOP HIGH SPEED 10MBit/s LOGIC GATE PHOTOCOUPLER ELM6XX series



Schematic



Pin Configuration

- 1, Anode
- 3, Cathode
- 4, Gnd
- 5, Vout
- 6, VCC

#### Features

- Compliance Halogen Free .  
(Br <900 ppm , Cl <900 ppm , Br+Cl < 1500 ppm)
- High speed 10Mbit/s
- Guaranteed performance from -40 to 85°C
- Logic gate output
- High isolation voltage between input and output (Viso=3750 V rms )
- Compliance with EU REACH
- Pb free and RoHS compliant.
- UL and cUL approved(No. E214129)
- VDE approved (No. 40028116)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved

#### Description

The ELM600, ELM601 and ELM611 are consists of an infrared emitting diode optically coupled to a high speed integrated photo detector logic gate with a strobable output.

The devices are packaged in a 5-pin small outline package which conforms to the standard footprint.

#### Applications

- Ground loop elimination
- LSTTL to TTL, LSTTL or 5 volt CMOS
- Line receiver, data transmission
- Data multiplexing
- Switching power supplies
- Pulse transformer replacement
- Computer peripheral interface

#### Truth Table

| Input | Output |
|-------|--------|
| H     | L      |
| L     | H      |

**Absolute Maximum Ratings (T<sub>A</sub>=25 °C)**

|        | Parameter                           | Symbol           | Rating     | Unit  |
|--------|-------------------------------------|------------------|------------|-------|
| Input  | Forward current                     | I <sub>F</sub>   | 50         | mA    |
|        | Reverse voltage                     | V <sub>R</sub>   | 5          | V     |
|        | Power dissipation                   | P <sub>D</sub>   | 100        | mW    |
| Output | Power dissipation                   | P <sub>C</sub>   | 85         | mW    |
|        | Output current                      | I <sub>O</sub>   | 50         | mA    |
|        | Output voltage                      | V <sub>O</sub>   | 7.0        | V     |
|        | Supply voltage                      | V <sub>CC</sub>  | 7.0        | V     |
|        | Output Power Dissipation            | P <sub>O</sub>   | 85         | mW    |
|        | Isolation Voltage* <sup>1</sup>     | V <sub>ISO</sub> | 3750       | V rms |
|        | Operating Temperature               | T <sub>OPR</sub> | -40 ~ +85  | °C    |
|        | Storage Temperature                 | T <sub>STG</sub> | -55 ~ +125 | °C    |
|        | Soldering Temperature* <sup>2</sup> | T <sub>SOL</sub> | 260        | °C    |

Notes:

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

\*2 For 10 seconds

**Electrical Characteristics (T<sub>A</sub>=-40 to 85°C unless specified otherwise)**

**Input**

| Parameter                                  | Symbol                         | Min. | Typ. | Max. | Unit  | Condition                                   |
|--|--------------------------------|------|------|------|-------|---|
| Forward voltage                            | V <sub>F</sub>                 | -    | 1.45 | 1.8  | V     | I <sub>F</sub> = 10mA                       |
| Reverse voltage                            | V <sub>R</sub>                 | 5.0  | -    | -    | V     | I <sub>R</sub> = 10μA, T <sub>A</sub> =25°C |
| Temperature coefficient of forward voltage | V <sub>F</sub> /T <sub>A</sub> | -    | -1.9 | -    | mV/°C | I <sub>F</sub> =10mA                        |
| Input capacitance                          | C <sub>IN</sub>                | -    | 70   | -    | pF    | V <sub>F</sub> =0, f=1MHz                   |

**Output**

| Parameter                 | Symbol           | Min | Typ. | Max. | Unit | Condition                                   |
|---------------------------|------------------|-----|------|------|------|---|
| High level supply current | I <sub>CCH</sub> | -   | 6.0  | 9    | mA   | I <sub>F</sub> =0mA, V <sub>CC</sub> =5.5V  |
| Low level supply current  | I <sub>CCL</sub> | -   | 7.5  | 10   | mA   | I <sub>F</sub> =10mA, V <sub>CC</sub> =5.5V |

**Transfer Characteristics**

| Parameter                 | Symbol          | Min | Typ. | Max. | Unit | Condition  |
|---------------------------|-----------------|-----|------|------|------|--|
| High Level Output Current | I <sub>OH</sub> | -   | 2.1  | 30   | uA   | V <sub>CC</sub> =5.5V, V <sub>O</sub> =5.5V, I <sub>F</sub> =250uA           |
| Low Level Output Current  | V <sub>OL</sub> | -   | 0.4  | 0.6  | V    | V <sub>CC</sub> = 5.5V, I <sub>F</sub> =5mA, I <sub>OL</sub> (Sinking)=13mA  |
| Input Threshold Current   | I <sub>FT</sub> | -   | 2.4  | 5    | mA   | V <sub>CC</sub> = 5.5V, V <sub>O</sub> =0.6V, I <sub>OL</sub> (Sinking)=13mA |

**Switching Characteristics** ( $T_A=-40$  to  $85^\circ\text{C}$ ,  $V_{CC}=5\text{V}$ ,  $I_F=7.5\text{mA}$  unless specified otherwise)

| Parameter  | Symbol                           | Min                              | Typ.                    | Max.         | Unit            | Condition   |
|--|----------------------------------|----------------------------------|-------------------------|--------------|-----------------|---|
| Propagation delay time to output High level* <sup>3</sup><br>(Fig.10)  | $T_{PHL}$                        | -                                | 41                      | 100          | ns              | $C_L = 15\text{pF}$ , $R_L=350\Omega$ , $T_A=25^\circ\text{C}$  |
| Propagation delay time to output Low level* <sup>3</sup><br>(Fig.10)   | $T_{PLH}$                        | -                                | 50                      | 100          | ns              | $C_L = 15\text{pF}$ , $R_L=350\Omega$ , $T_A=25^\circ\text{C}$  |
| Pulse width distortion   | $ T_{PHL} - T_{PLH} $            | -                                | 9                       | 35           | ns              | $C_L = 15\text{pF}$ , $R_L=350\Omega$   |
| Propagation Delay Skew* <sup>4</sup>                                   | $t_{PSK}$                        | -                                | -                       | 40           | ns              | $C_L = 15\text{pF}$ , $R_L=350\Omega$   |
| Output rise time<br>(Fig.10)   | $t_r$                            | -                                | 40                      | -            | ns              | $C_L = 15\text{pF}$ , $R_L=350\Omega$   |
| Output fall time<br>(Fig.10)   | $t_f$                            | -                                | 10                      | -            | ns              | $C_L = 15\text{pF}$ , $R_L=350\Omega$   |
| Common Mode Transient Immunity at Logic High* <sup>6</sup><br>(Fig.11) | M600<br><hr/> M601<br><hr/> M611 | -<br><hr/> 5,000<br><hr/> 20,000 | -<br><hr/> -<br><hr/> - | -<br><hr/> - | $V/\mu\text{S}$ | $I_F = 7.5\text{mA}$ , $V_{OH}=2.0\text{V}$ ,<br>$R_L=350\Omega$ , $T_A=25^\circ\text{C}$<br>$V_{CM}=10\text{Vp-p}$<br><hr/> $I_F = 7.5\text{mA}$ , $V_{OH}=2.0\text{V}$ ,<br>$R_L=350\Omega$ , $T_A=25^\circ\text{C}$<br>$V_{CM}=50\text{Vp-p}$<br><hr/> $I_F = 7.5\text{mA}$ , $V_{OH}=2.0\text{V}$ ,<br>$R_L=350\Omega$ , $T_A=25^\circ\text{C}$<br>$V_{CM}=1000\text{Vp-p}$ |
| Common Mode Transient Immunity at Logic Low* <sup>7</sup><br>(Fig.11)  | M600<br><hr/> M601<br><hr/> M611 | -<br><hr/> 5,000<br><hr/> 20,000 | -<br><hr/> -            | -<br><hr/> - | $V/\mu\text{S}$ | $I_F = 0\text{mA}$ , $V_{OL}=0.8\text{V}$ ,<br>$R_L=350\Omega$ , $T_A=25^\circ\text{C}$<br>$V_{CM}=10\text{Vp-p}$<br><hr/> $I_F = 0\text{mA}$ , $V_{OL}=0.8\text{V}$ ,<br>$R_L=350\Omega$ , $T_A=25^\circ\text{C}$<br>$V_{CM}=50\text{Vp-p}$<br><hr/> $I_F = 0\text{mA}$ , $V_{OL}=0.8\text{V}$ ,<br>$R_L=350\Omega$ , $T_A=25^\circ\text{C}$<br>$V_{CM}=1000\text{Vp-p}$       |

\*All typicals at  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$

Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

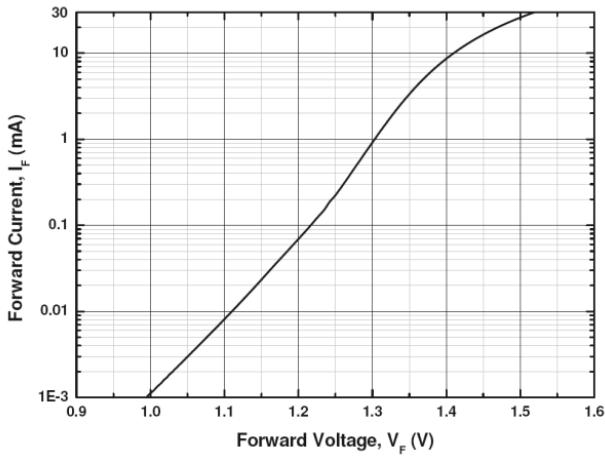


Figure 2. Low Level Output Voltage vs Ambient Temperature

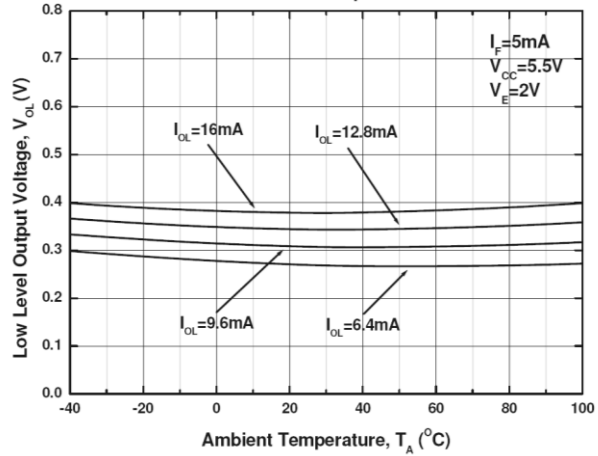


Figure 3. Low Level Output Current vs Ambient Temperature

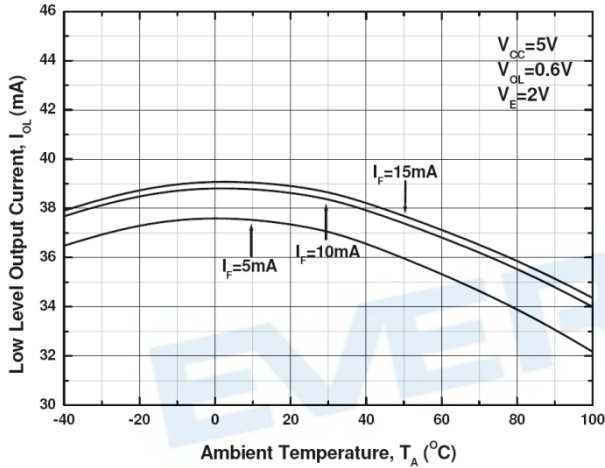


Figure 4. Input Threshold Current vs Ambient Temperature

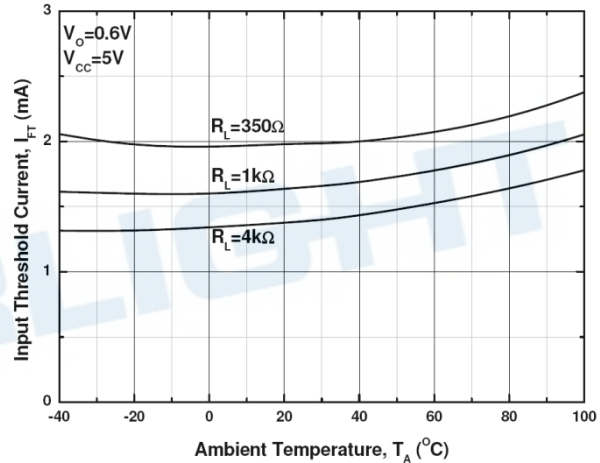


Figure 5. Input Current vs Output Voltage

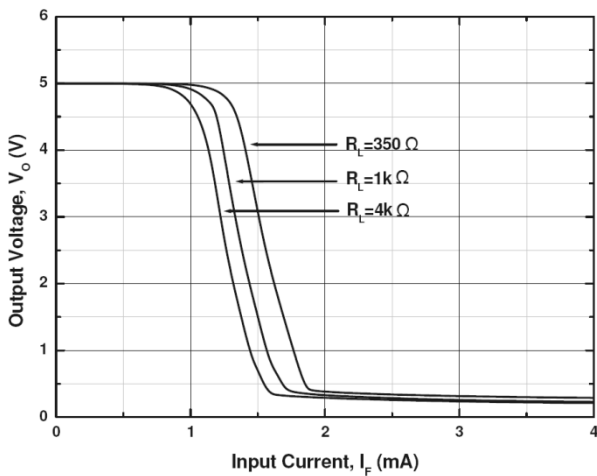


Figure 6. High Level Output Current vs Ambient Temperature

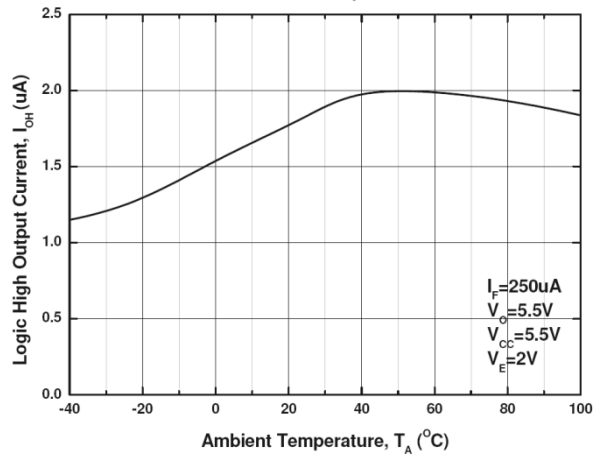


Figure 7. Propagation Delay vs. Temperature

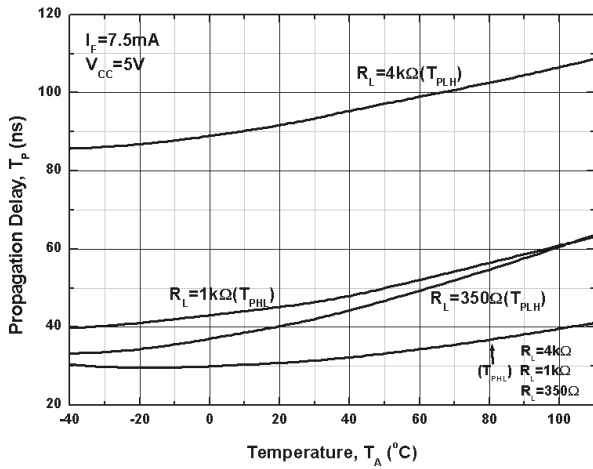


Figure 8. Pulse Width Distortion vs. Temperature

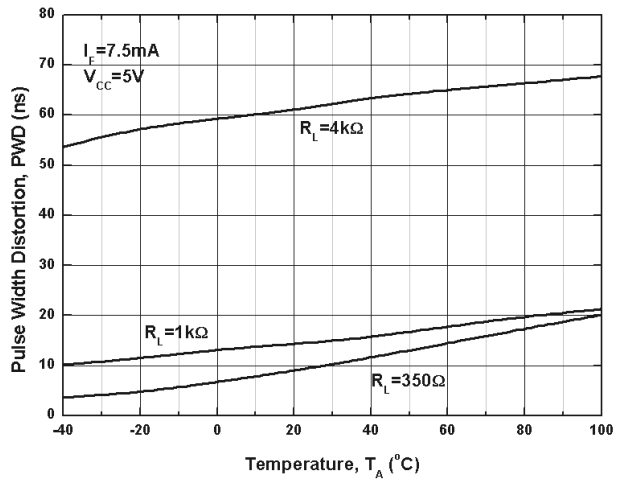


Figure 9. Rise and Fall Time vs. Temperature

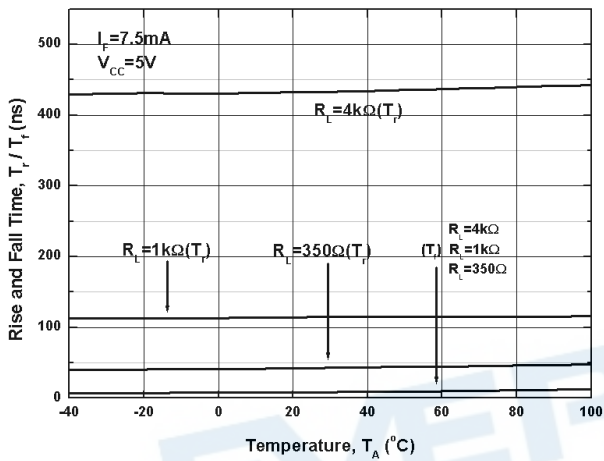


Fig. 10 Test circuit and waveforms for  $t_{PHL}$ ,  $t_{PLH}$ ,  $t_r$ , and  $t_f$

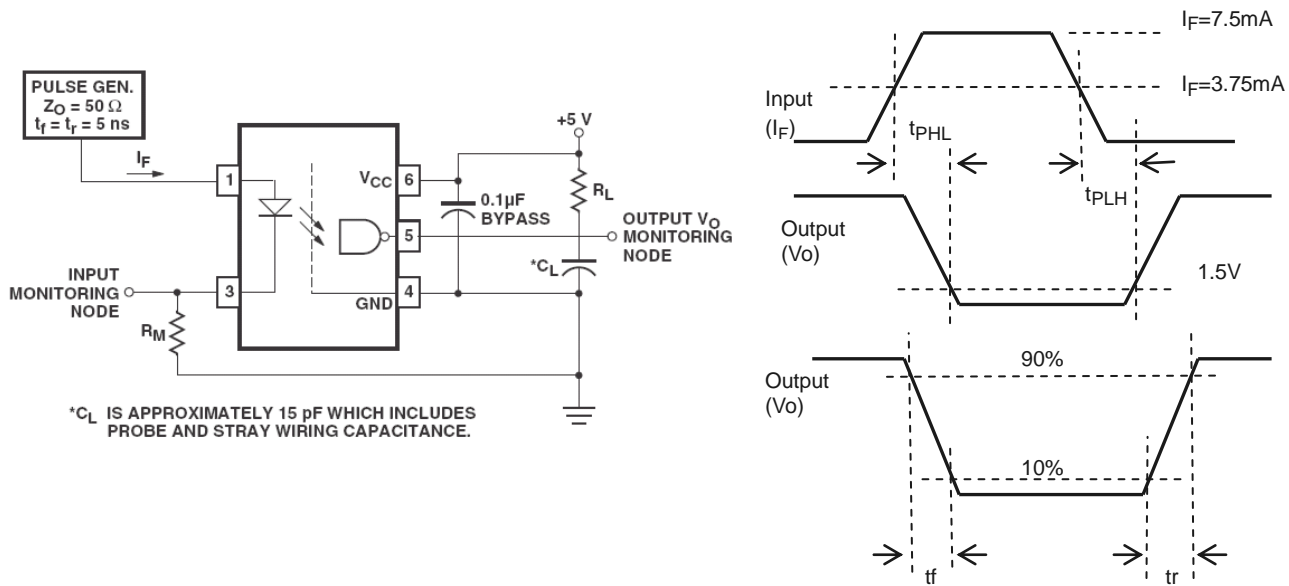
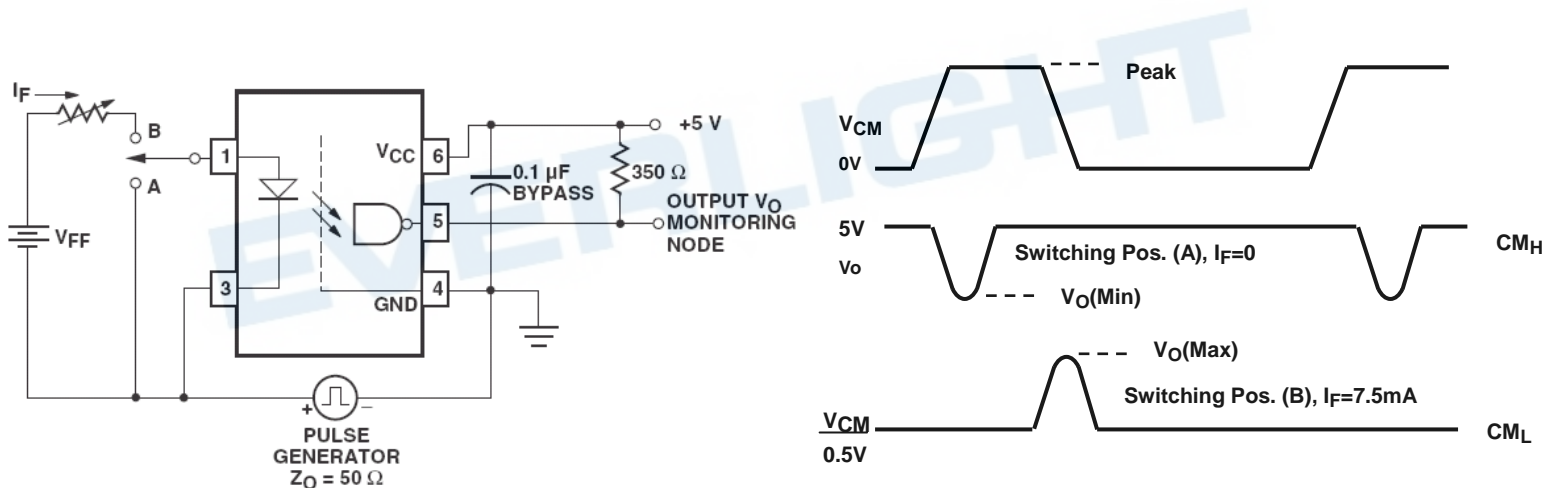


Fig. 11 Test circuit Common mode Transient Immunity



**Notes:**

- \*3 The  $t_{PLH}$  propagation delay is measured from 3.75 mA point on the falling edge of the input pulse to the 1.5V point on the rising edge of the output pulse.
- \*4 The  $t_{PHL}$  propagation delay is measured from 3.75 mA point on the rising edge of the input pulse to the 1.5 V point on the falling edge of the output pulse
- \*5  $t_{PSK}$  is equal to the magnitude of the worst case difference in  $t_{PHL}$  and/or  $t_{PLH}$  that will be seen between units at any given temperature within the worst case operating condition range.
- \*6  $CM_H$ – The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the HIGH state (i.e.,  $V_{OUT} > 2.0V$ ).
- \*7  $CM_L$ – The maximum tolerable rate of fall of the common mode voltage to ensure the output will remain in the LOW output state (i.e.,  $V_{OUT} < 0.8V$ ).

## Order Information

### Part Number

**ELM6XX(Z)-V**

### Note

XX = Part no.(00, 01 or 11)

Z = Tape and reel option (TA, TB or none).

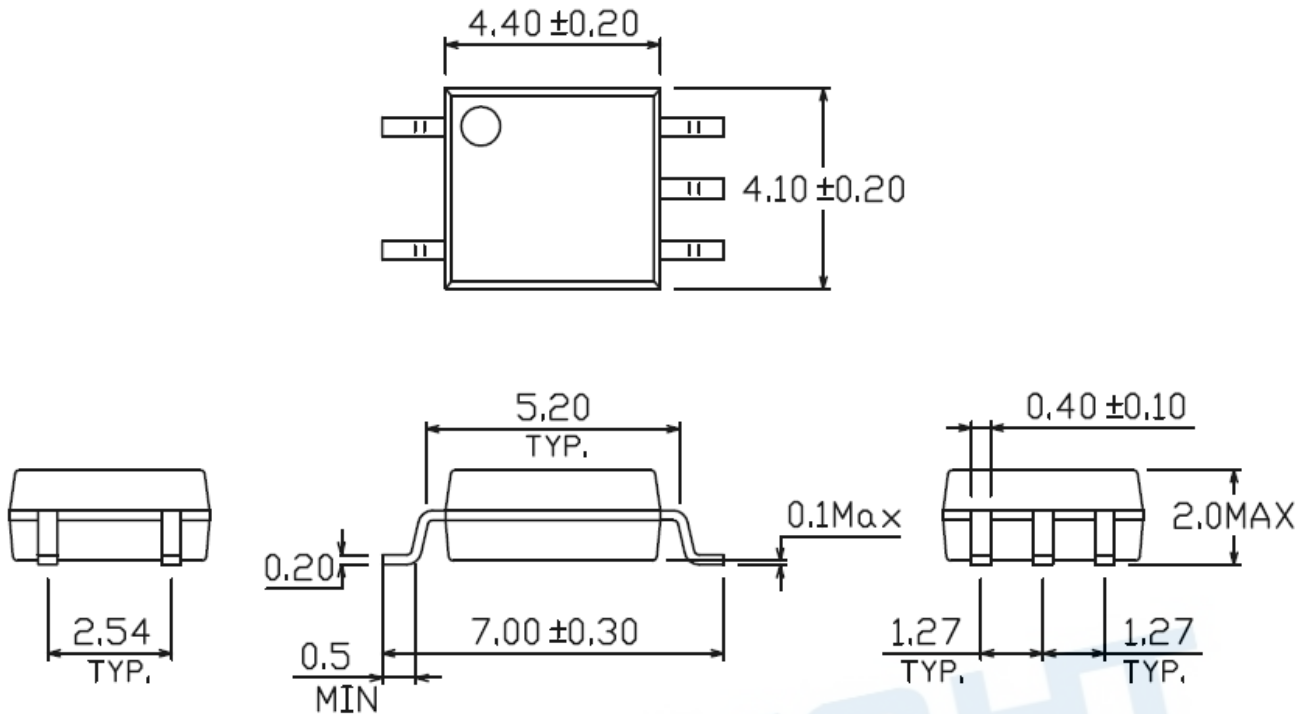
V = VDE (optional)

| Option | Description                                     | Packing quantity    |
|--------|---|---------------------|
| None   | Standard SMD option                             | 100 units per tube  |
| (TA)   | Surface mount lead form + TA tape & reel option | 3000 units per reel |
| (TB)   | Surface mount lead form + TB tape & reel option | 3000 units per reel |

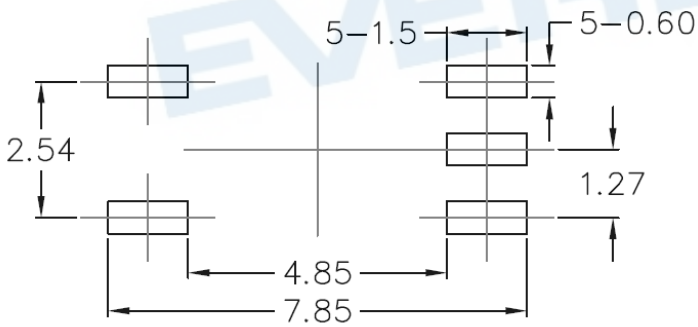
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**Package Dimension**  
 (Dimensions in mm)



**Recommended pad layout for surface mount leadform**



## Device Marking

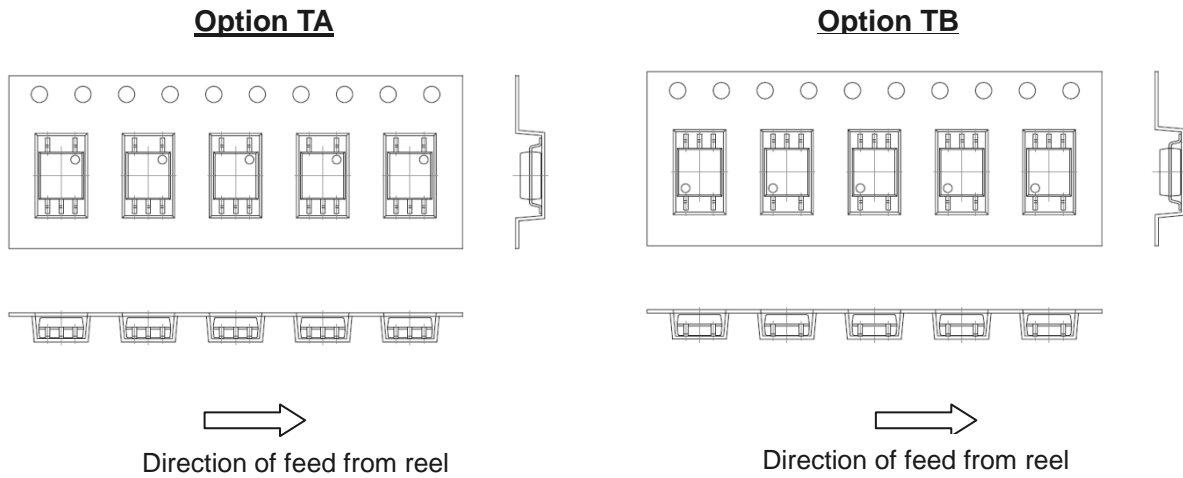


## Notes

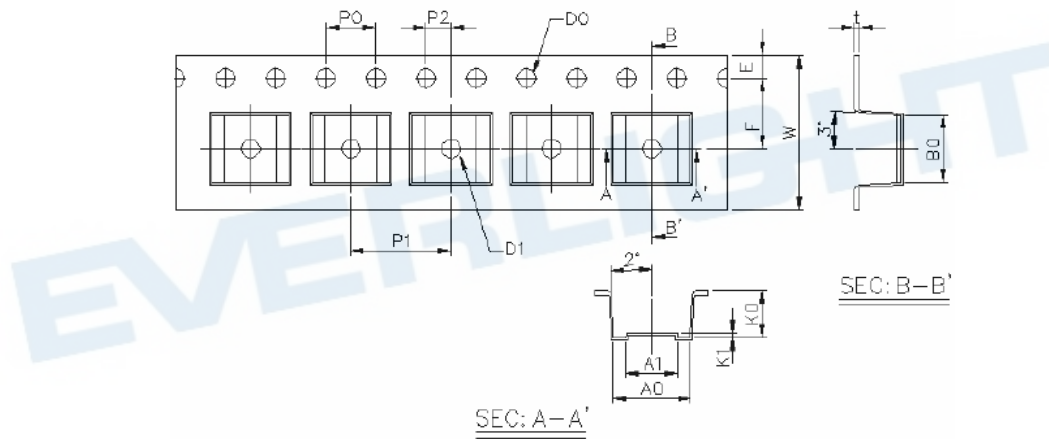
|      |                           |
|------|---------------------------|
| EL   | denotes EVERLIGHT         |
| M611 | denotes Device Number     |
| Y    | denotes 1 digit Year code |
| WW   | denotes 2 digit Week code |
| V    | denotes VDE (optional)    |

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**Tape & Reel Packing Specifications**



**Tape dimensions**

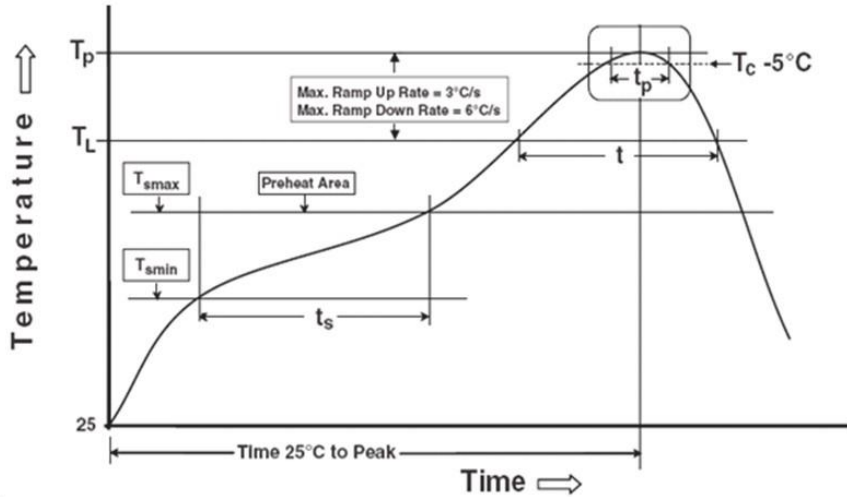


|               |           |           |           |           |                   |          |
|---------------|-----------|-----------|-----------|-----------|-------------------|----------|
| Dimension No. | <b>A</b>  | <b>B</b>  | <b>Do</b> | <b>D1</b> | <b>E</b>          | <b>F</b> |
| Dimension(mm) | 10.4±0.1  | 10.0±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±0.1   | 12.0±0.1  | 2.0±0.1   | 0.4±0.1   | 16.0+0.3/<br>-0.1 | 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          |

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