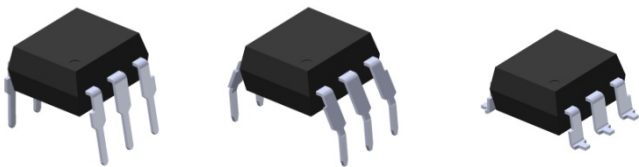


### 6 PIN DIP PHOTOTRANSISTOR PHOTOCOUPLER

4N2X Series

4N3X Series

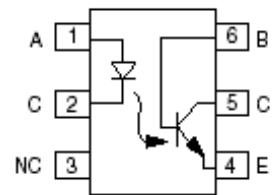
H11AX Series



#### Features:

- 4N2X series: 4N25, 4N26, 4N27, 4N28
- 4N3X series: 4N35, 4N36, 4N37, 4N38
- H11AX series: H11A1, H11A2, H11A3, H11A4, H11A5
- High isolation voltage between input and output (Viso=5000 V rms)
- Creepage distance >7.62 mm
- Operating temperature up to +110°C
- Compact dual-in-line package
- Pb free and RoHS compliant.
- UL approved (No. E214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approval
- DEMKO approval
- FIMKO approval
- CSA approved
- CQC approved

#### Schematic



#### Pin Configuration

1. Anode
2. Cathode
3. No Connection
4. Emitter
5. Collector
6. Base

#### Description

The 4N2X, 4N3X, H11AX series of devices each consist of an infrared emitting diode optically coupled to a phototransistor. They are packaged in a 6-pin DIP package and available in wide-lead spacing and SMD option.

#### Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

## Absolute Maximum Ratings (Ta=25°C)

|        | Parameter                                 | Symbol    | Rating     | Unit  |
|--------|-------------------------------------------|-----------|------------|-------|
| Input  | Forward current                           | $I_F$     | 60         | mA    |
|        | Peak forward current (t = 10μs)           | $I_{FM}$  | 1          | A     |
|        | Reverse voltage                           | $V_R$     | 6          | V     |
|        | Power dissipation (T <sub>A</sub> = 25°C) | $P_D$     | 100        | mW    |
|        | Derating factor (above 100°C)             |           | 3.8        | mW/°C |
| Output | Collector-Emitter voltage                 | $V_{CEO}$ | 80         | V     |
|        | Collector-Base voltage                    | $V_{CBO}$ | 80         | V     |
|        | Emitter-Collector voltage                 | $V_{ECO}$ | 7          | V     |
|        | Emitter-Base voltage                      | $V_{EBO}$ | 7          | V     |
|        | Power dissipation (T <sub>A</sub> = 25°C) | $P_C$     | 150        | mW    |
|        | Derating factor (above 100°C)             |           | 9.0        | mW/°C |
|        | Total Power Dissipation                   | $P_{TOT}$ | 200        | 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 & 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. | Max. | Unit          | Condition                |
|-------------------|----------|------|------|------|---------------|--------------------------|
| Forward voltage   | $V_F$    | -    | 1.2  | 1.5  | V             | $I_F = 10\text{mA}$      |
| Reverse current   | $I_R$    | -    | -    | 10   | $\mu\text{A}$ | $V_R = 6\text{V}$        |
| Input capacitance | $C_{in}$ | -    | 30   | -    | pF            | $V = 0, f = 1\text{MHz}$ |

**Output**

| Parameter                           | Symbol     | Min | Typ. | Max. | Unit | Condition                               |
|-------------------------------------|------------|-----|------|------|------|-----------------------------------------|
| Collector-Base dark current         | $I_{CBO}$  | -   | -    | 20   | nA   | $V_{CB} = 10\text{V}$                   |
| Collector-Emitter dark current      | 4N2X       | -   | -    | 50   | nA   | $V_{CE} = 10\text{V}, I_F = 0\text{mA}$ |
|                                     | H11AX      | -   | -    | 50   |      |                                         |
|                                     | 4N3X       | -   | -    | 50   |      |                                         |
| Collector-Emitter breakdown voltage | $BV_{CEO}$ | 80  | -    | -    | V    | $I_C = 1\text{mA}$                      |
| Collector-Base breakdown voltage    | $BV_{CBO}$ | 80  | -    | -    | V    | $I_C = 0.1\text{mA}$                    |
| Emitter-Collector breakdown voltage | $BV_{ECO}$ | 7   | -    | -    | V    | $I_E = 0.1\text{mA}$                    |
| Emitter-Base breakdown voltage      | $BV_{EBO}$ | 7   | -    | -    | V    | $I_E = 0.1\text{mA}$                    |
| Collector-Emitter capacitance       | $C_{CE}$   | -   | 8    | -    | pF   | $V_{CE} = 0\text{V}, f = 1\text{MHz}$   |

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

### Transfer Characteristics

| Parameter                            | Symbol                                                    | Min       | Typ. | Max. | Unit          | Condition                                                                      |
|--------------------------------------|-----------------------------------------------------------|-----------|------|------|---------------|--------------------------------------------------------------------------------|
| Current Transfer ratio               | 4N35, 4N36, 4N37                                          | 100       | -    | -    | %             | $I_F = \pm 10\text{mA}$ , $V_{CE} = 10\text{V}$                                |
|                                      | H11A1                                                     | 50        | -    | -    |               |                                                                                |
|                                      | H11A5                                                     | 30        | -    | -    |               |                                                                                |
|                                      | 4N25, 4N26, 4N38, H11A2, H11A3                            | 20        | -    | -    |               |                                                                                |
|                                      | 4N27, 4N28, H11A4                                         | 10        | -    | -    |               |                                                                                |
| Collector-Emitter saturation voltage | 4N25, 4N26, 4N27, 4N28                                    | -         | -    | 0.5  | V             | $I_F = 50\text{mA}$ , $I_C = 2\text{mA}$                                       |
|                                      | 4N35, 4N36, 4N37                                          | -         | -    | 0.3  |               | $I_F = 10\text{mA}$ , $I_C = 0.5\text{mA}$                                     |
|                                      | H11A1, H11A2, H11A3, H11A4, H11A5                         | -         | -    | 0.4  |               |                                                                                |
|                                      | 4N38                                                      | -         | -    | 1.0  |               | $I_F = 20\text{mA}$ , $I_C = 4\text{mA}$                                       |
| Isolation resistance                 | $R_{IO}$                                                  | $10^{11}$ | -    | -    | $\Omega$      | $V_{IO} = 500\text{Vdc}$                                                       |
| Input-output capacitance             | $C_{IO}$                                                  | -         | 0.2  | -    | pF            | $V_{IO} = 0$ , $f = 1\text{MHz}$                                               |
| Turn-on time                         | 4N25, 4N26, 4N27, 4N28, H11A1, H11A2, H11A3, H11A4, H11A5 | -         | 3    | 10   | $\mu\text{s}$ | $V_{CC} = 10\text{V}$ , $I_F = 10\text{mA}$ , $R_L = 100\Omega$<br>See Fig. 11 |
|                                      | 4N35, 4N36, 4N37, 4N38                                    | -         | 10   | 12   |               | $V_{CC} = 10\text{V}$ , $I_C = 2\text{mA}$ , $R_L = 100\Omega$ , See Fig. 11   |
| Turn-off time                        | 4N25, 4N26, 4N27, 4N28, H11A1, H11A2, H11A3, H11A4, H11A5 | -         | 3    | 10   | $\mu\text{s}$ | $V_{CC} = 10\text{V}$ , $I_F = 10\text{mA}$ , $R_L = 100\Omega$<br>See Fig. 11 |
|                                      | 4N35, 4N36, 4N37, 4N38                                    | -         | 9    | 12   |               | $V_{CC} = 10\text{V}$ , $I_C = 2\text{mA}$ , $R_L = 100\Omega$ , See Fig. 11   |

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

## Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

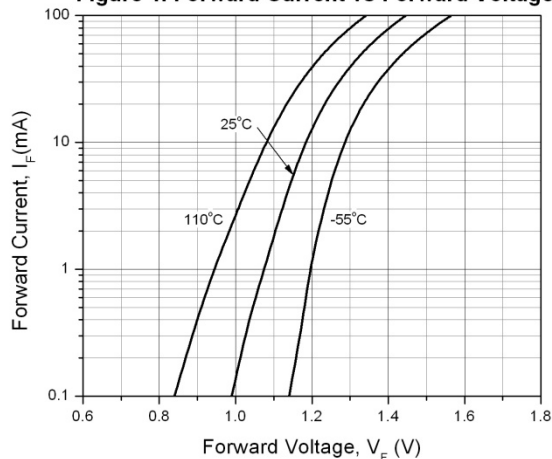


Figure 2. Current Transfer Ratio vs Forward Current

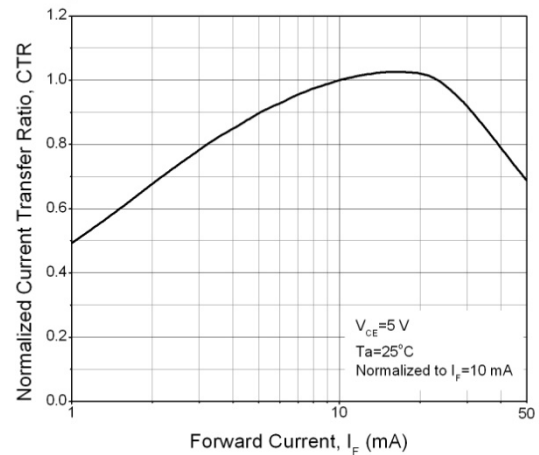


Figure 3. Current Transfer Ratio vs Ambient Temperature

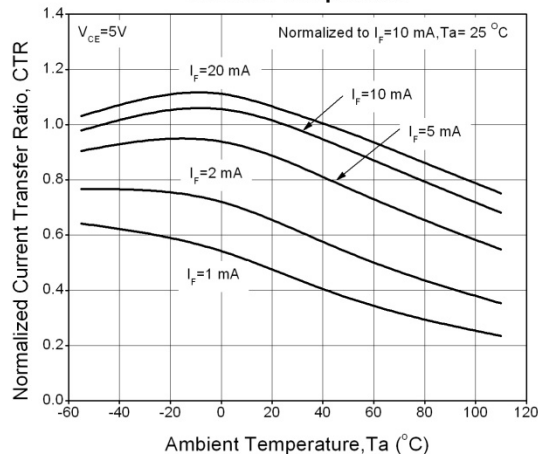


Figure 4. Current Transfer Ratio (Saturated) vs Base-Emitter Resistance

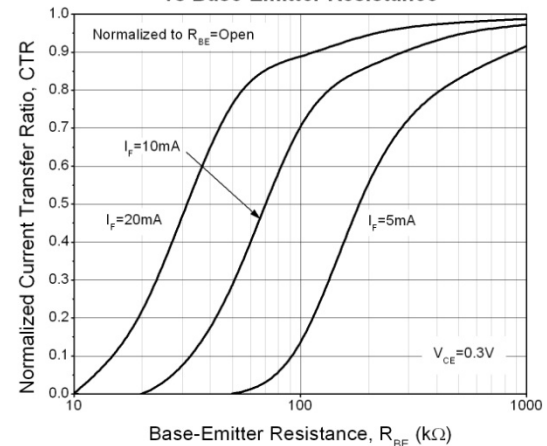


Figure 5. Current Transfer Ratio (Unsaturated) vs Base-Emitter Resistance

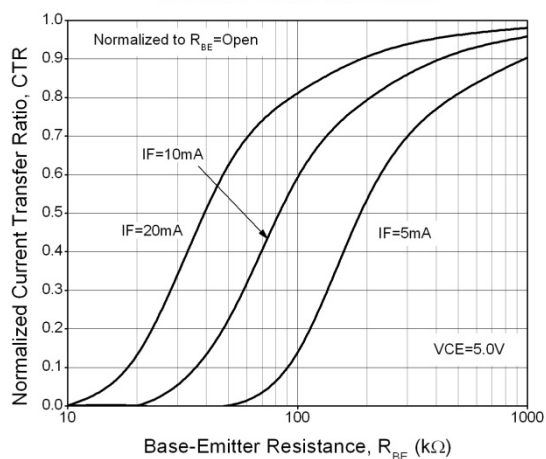


Figure 6. Dark Current vs Ambient Temperature

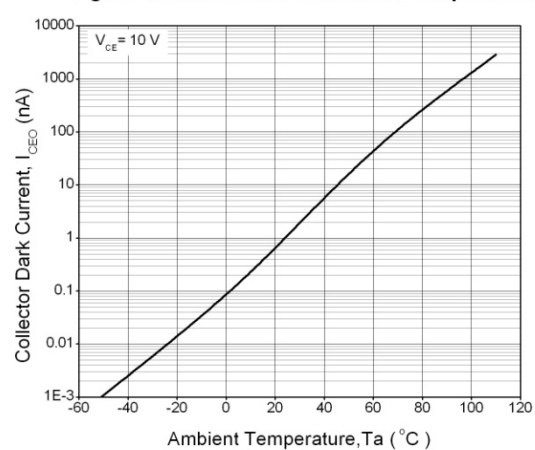


Figure 7. Collector-Emitter Saturation Voltage vs Collector Current

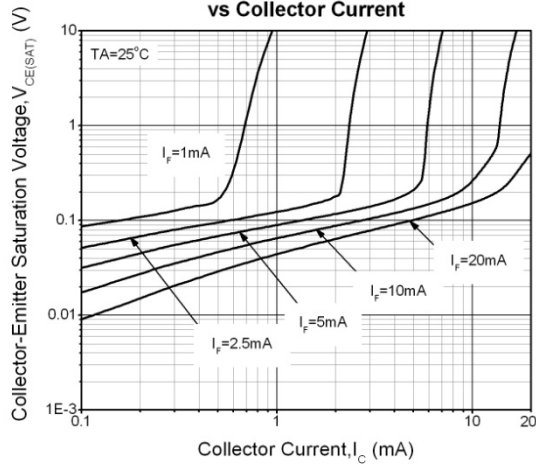


Figure 8. Switching Time vs Load Resistance

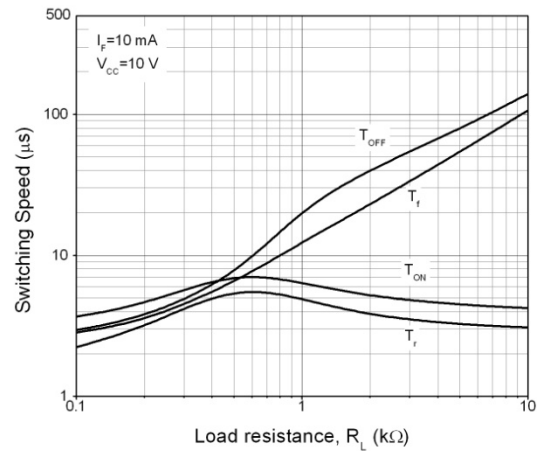


Figure 9. Turn-on Time vs Base-Emitter Resistance

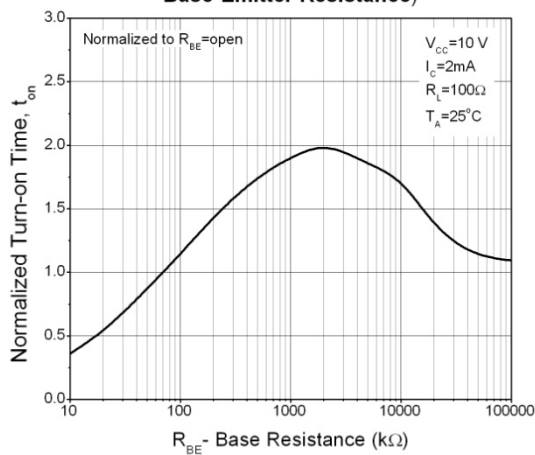


Figure 10. Turn-off Time vs Base-Emitter Resistance

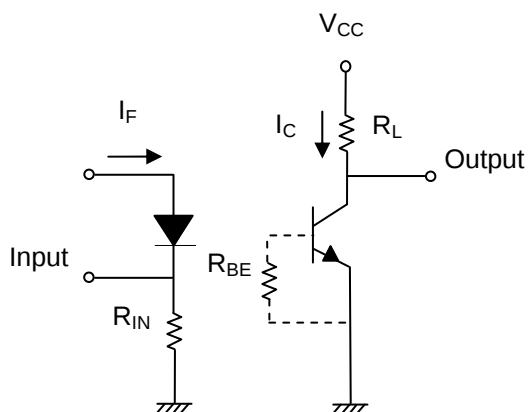
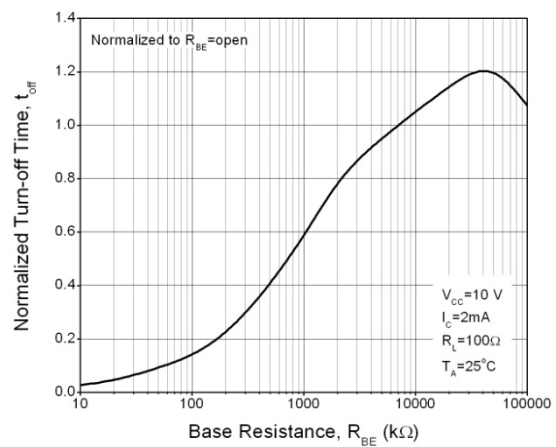


Figure 11. Switching Time Test Circuit & Waveforms

## Order Information

### Part Number

**4NXXY(Z)-V**

or

**H11AXY(Z)-V**

### Note

XX = Part no. for 4NXX series (25, 26, 27, 28, 35, 36, 37 or 38)

X = Part no. for H11AX series (1, 2, 3, 4, or 5)

Y = Lead form option (S, S1, M or none)

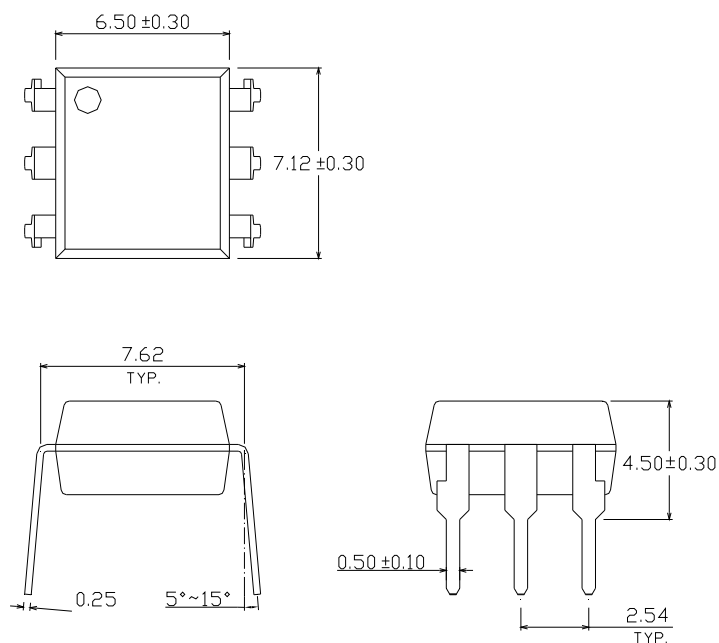
Z = Tape and reel option (TA, TB or none).

V = VDE safety (optional)

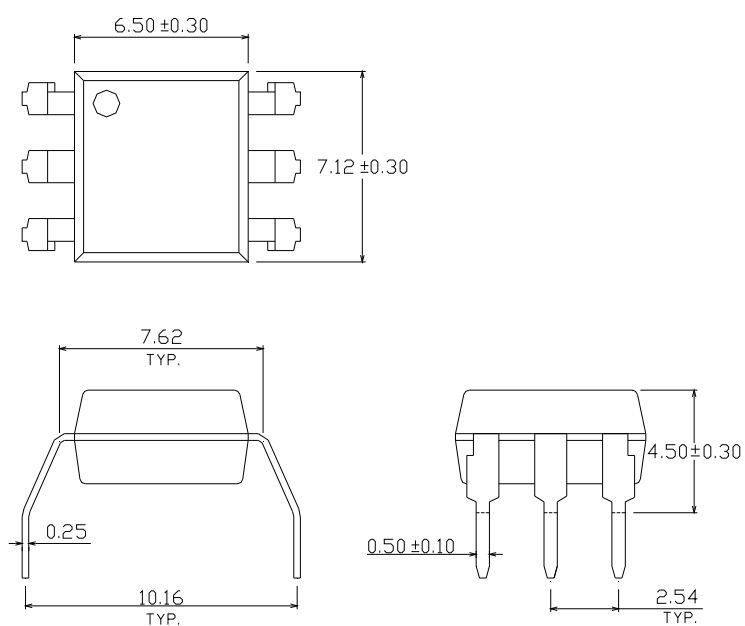
| Option  | Description                                                   | Packing quantity    |
|---------|---------------------------------------------------------------|---------------------|
| None    | Standard DIP-6                                                | 65 units per tube   |
| M   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

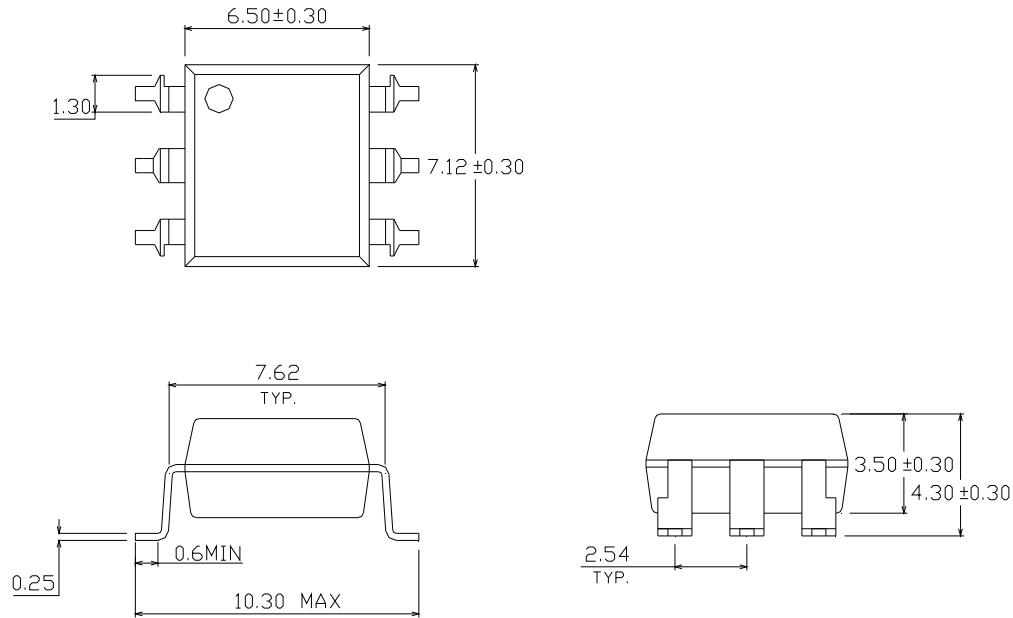
### Standard DIP Type



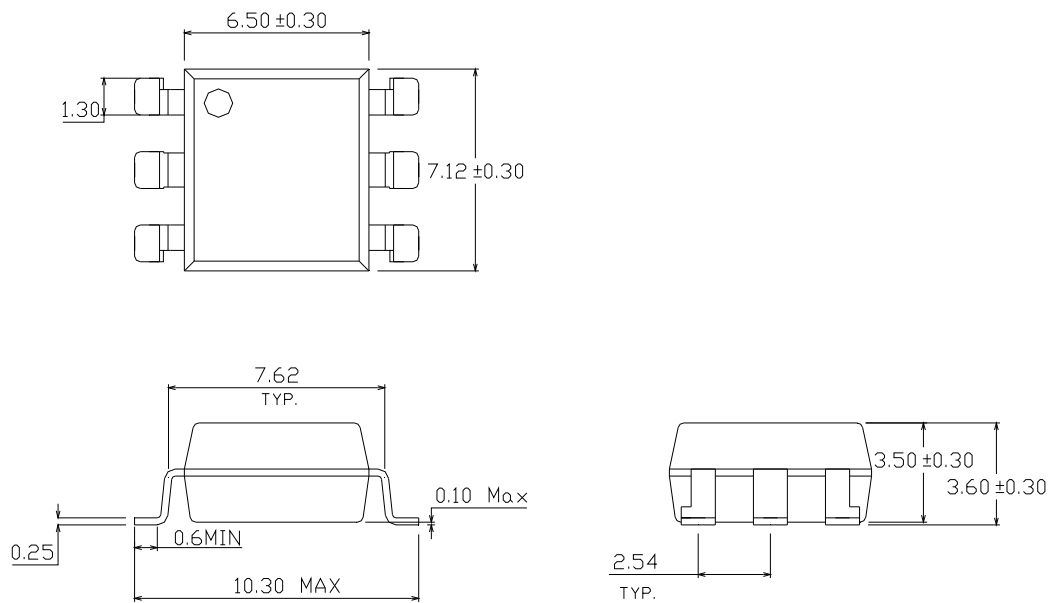
### Option M Type



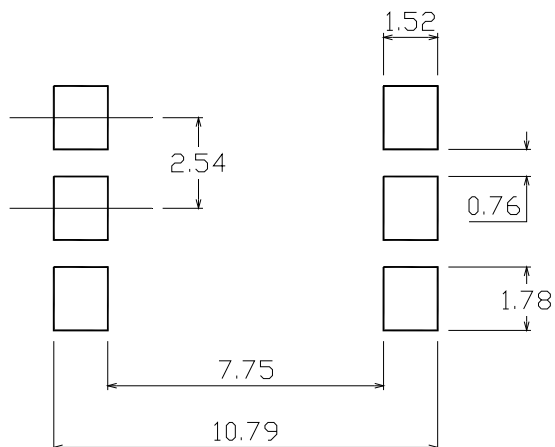
### Option S Type



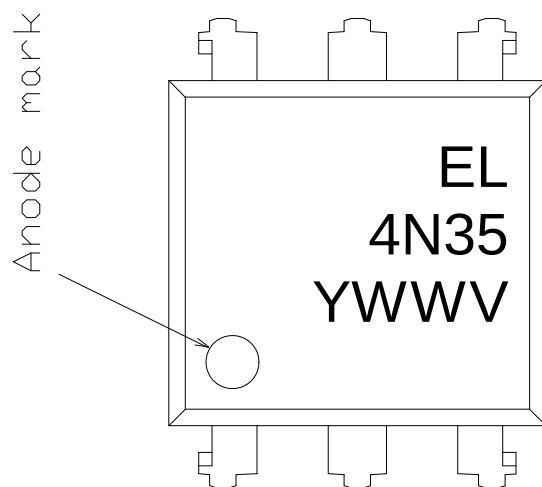
### Option S1 Type



## Recommended pad layout for surface mount leadform



## Device Marking

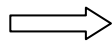
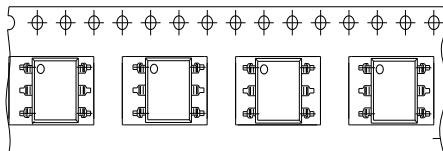


## Notes

EL denotes Everlight  
4N35 denotes Device Number  
Y denotes 1 digit Year code  
WW denotes 2 digit Week code  
V denotes VDE (optional)

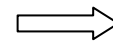
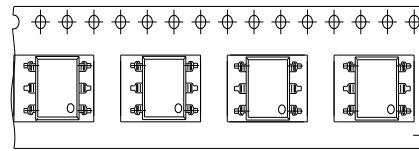
## Tape & Reel Packing Specifications

**Option TA**



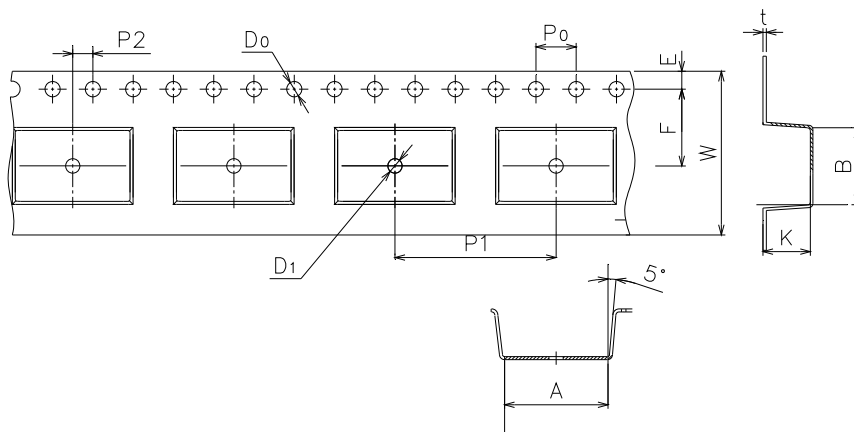
Direction of feed from reel

**Option TB**



Direction of feed from reel

## Tape dimensions

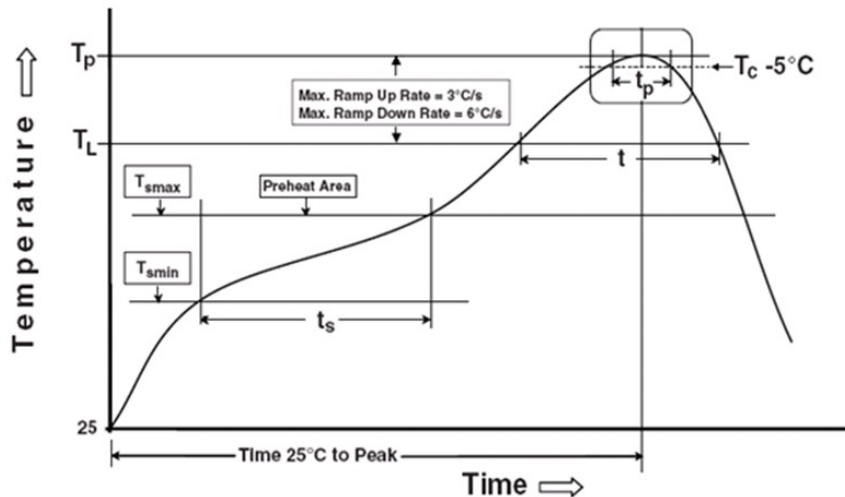


| Dimension No.  | A        | B       | Do      | D1         | E        | F       |
|----------------|----------|---------|---------|------------|----------|---------|
| Dimension (mm) | 10.4±0.1 | 7.5±0.1 | 1.5±0.1 | 1.5+0.1/-0 | 1.75±0.1 | 7.5±0.1 |
| Dimension No.  | Po       | P1      | P2      | 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          |

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