

## 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

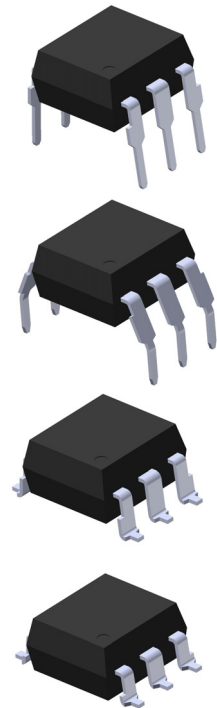
### Description

The 4N2X, 4N3X, H11AX series of devices each consist of an infrared emitting diode optically coupled to a phototransistor.

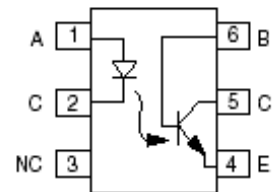
They are packaged in a 6-pin DIP package and available in wide-lead spacing and SMD option.

### Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs



Schematic



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

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## Absolute Maximum Ratings ( $T_a=25^{\circ}\text{C}$ )

| Parameter                           |                                                  | Symbol    | Rating   | Unit                   |
|-------------------------------------|--------------------------------------------------|-----------|----------|------------------------|
| Input                               | Forward current                                  | $I_F$     | 60       | mA                     |
|                                     | Peak forward current ( $t = 10\mu\text{s}$ )     | $I_{FM}$  | 1        | A                      |
|                                     | Reverse voltage                                  | $V_R$     | 6        | V                      |
|                                     | Power dissipation ( $T_A = 25^{\circ}\text{C}$ ) | $P_D$     | 100      | mW                     |
|                                     | Derating factor (above $100^{\circ}\text{C}$ )   |           | 3.8      | mW/ $^{\circ}\text{C}$ |
| 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 ( $T_A = 25^{\circ}\text{C}$ ) | $P_C$     | 150      | mW                     |
|                                     | Derating factor (above $100^{\circ}\text{C}$ )   |           | 9.0      | mW/ $^{\circ}\text{C}$ |
| Total power dissipation             |                                                  | $P_{tot}$ | 200      | mW                     |
| Isolation voltage <sup>*1</sup>     |                                                  | $V_{iso}$ | 5000     | V <sub>rms</sub>       |
| Operating temperature               |                                                  | $T_{opr}$ | -55~+110 | $^{\circ}\text{C}$     |
| Storage temperature                 |                                                  | $T_{stg}$ | -55~+125 | $^{\circ}\text{C}$     |
| Soldering temperature <sup>*2</sup> |                                                  | $T_{sol}$ | 260      | $^{\circ}\text{C}$     |

### 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.



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## Electrical Characteristics (T<sub>a</sub>=25°C unless specified otherwise)

### Input

| Parameter         | Symbol          | Min. | Typ.* | Max. | Unit | Condition             |
|-------------------|-----------------|------|-------|------|------|-----------------------|
| Forward voltage   | V <sub>F</sub>  | -    | 1.2   | 1.5  | V    | I <sub>F</sub> = 10mA |
| Reverse current   | I <sub>R</sub>  | -    | -     | 10   | μA   | V <sub>R</sub> = 6V   |
| Input capacitance | C <sub>in</sub> | -    | 30    | -    | pF   | V = 0, f = 1MHz       |

### Output

| Parameter                           | Symbol            | Min.             | Typ.* | Max. | Unit | Condition                                  |
|-------------------------------------|-------------------|------------------|-------|------|------|--------------------------------------------|
| Collector-Base dark current         | I <sub>CBO</sub>  | -                | -     | 20   | nA   | V <sub>CB</sub> = 10V                      |
| Collector-Emitter dark current      | 4N2X<br>H11AX     | I <sub>CEO</sub> | -     | -    | nA   | V <sub>CE</sub> = 10V, I <sub>F</sub> =0mA |
|                                     | 4N3X              |                  | -     | -    |      | V <sub>CE</sub> = 60V, I <sub>F</sub> =0mA |
| Collector-Emitter breakdown voltage | BV <sub>CEO</sub> | 80               | -     | -    | V    | I <sub>C</sub> =1mA                        |
| Collector-Base breakdown voltage    | BV <sub>CBO</sub> | 80               | -     | -    | V    | I <sub>C</sub> =0.1mA                      |
| Emitter-Collector breakdown voltage | BV <sub>ECO</sub> | 7                | -     | -    | V    | I <sub>E</sub> =0.1mA                      |
| Emitter-Base breakdown voltage      | BV <sub>EBO</sub> | 7                | -     | -    | V    | I <sub>E</sub> =0.1mA                      |
| Collector-Emitter capacitance       | C <sub>CE</sub>   | -                | 8     | -    | pF   | V <sub>CE</sub> =0V, f=1MHz                |

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

# 6 PIN DIP PHOTOTRANSISTOR PHOTOCOUPLER

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Transfer Characteristics ( $T_a=25^\circ\text{C}$  unless specified otherwise)

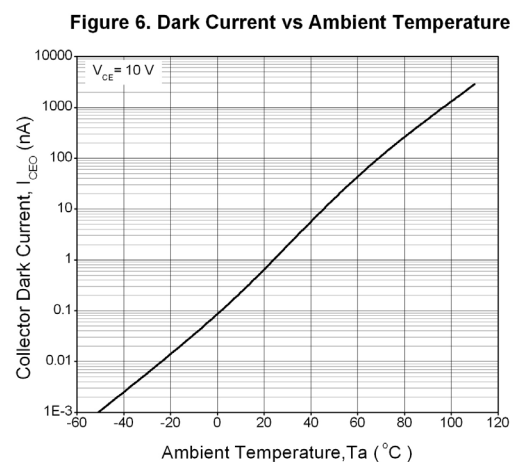
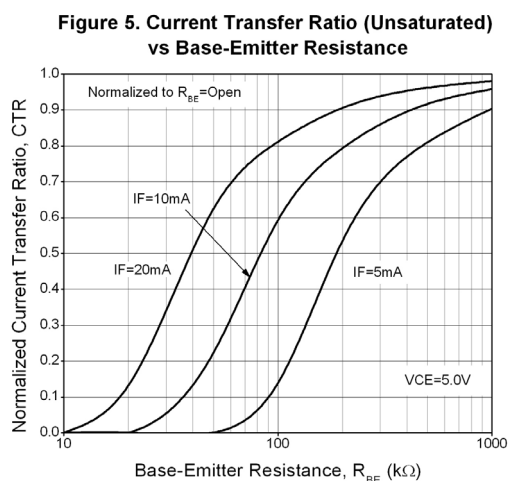
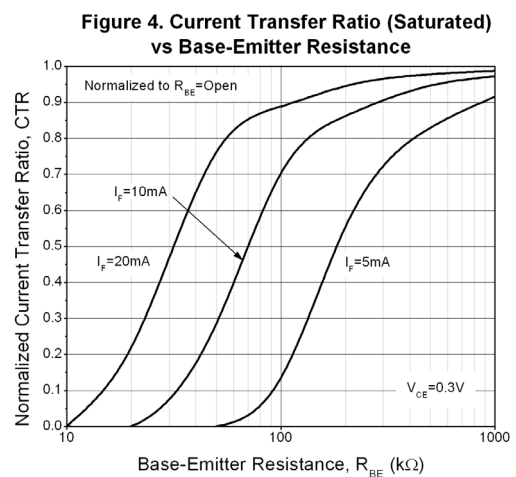
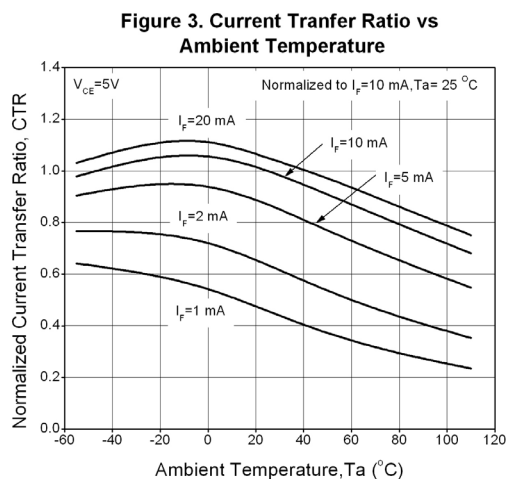
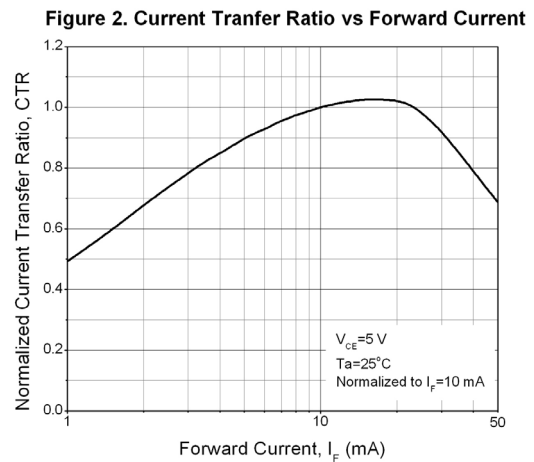
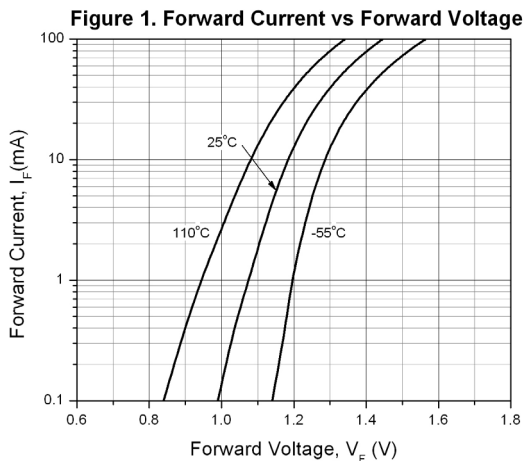
| Parameter                            |                                                           | Symbol        | Min.      | Typ.* | Max. | Unit          | Condition                                                                      |
|--------------------------------------|-----------------------------------------------------------|---------------|-----------|-------|------|---------------|--------------------------------------------------------------------------------|
| Current transfer ratio               | 4N35, 4N36, 4N37                                          | CTR           | 100       | -     | -    | %             | $I_F = 10\text{mA}$ , $V_{CE} = 10\text{V}$                                    |
|                                      | H11A1                                                     |               | 50        | -     | -    |               |                                                                                |
|                                      | H11A5                                                     |               | 30        | -     | -    |               |                                                                                |
|                                      | 4N25, 4N26, 4N38, H11A2, H11A3                            |               | 20        | -     | -    |               |                                                                                |
|                                      | 4N27, 4N28, H11A4                                         |               | 10        | -     | -    |               |                                                                                |
| Collector-Emitter saturation voltage | 4N25, 4N26, 4N27, 4N28                                    | $V_{CE(sat)}$ | -         | -     | 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 | $T_{on}$      | -         | 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        | $T_{off}$     | -         | 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  $T_a = 25^\circ\text{C}$

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H11AX Series**

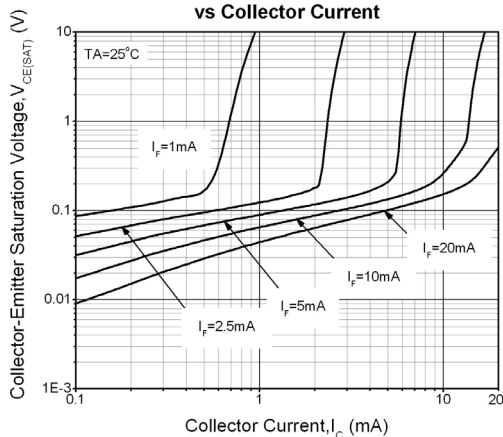
## Typical Performance Curves



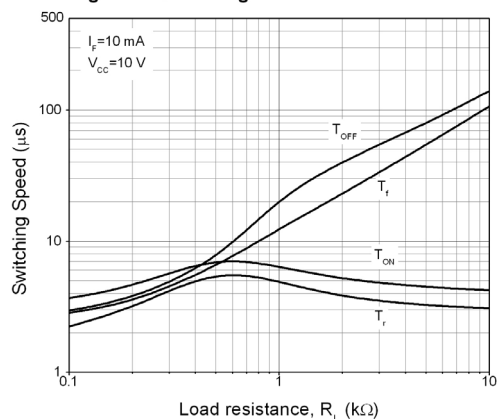
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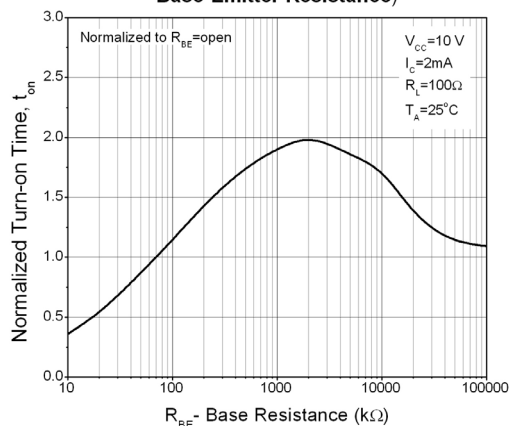
**Figure 7. Collector-Emitter Saturation Voltage vs Collector Current**



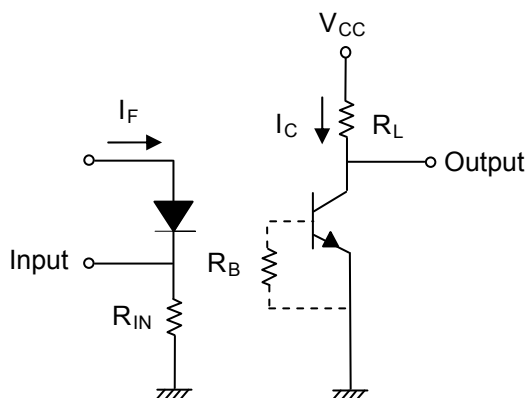
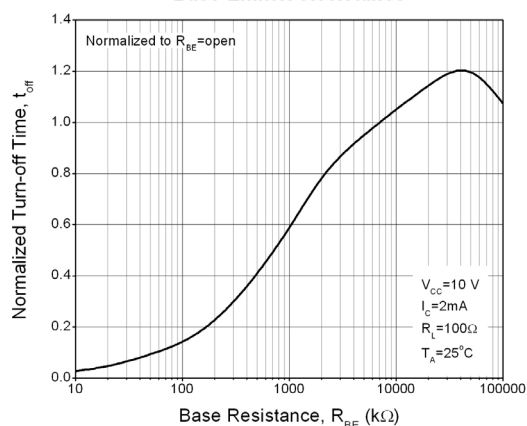
**Figure 8. Switching Time vs Load Resistance**



**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**



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## 6 PIN DIP PHOTOTRANSISTOR PHOTOCOUPLER

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### 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 |

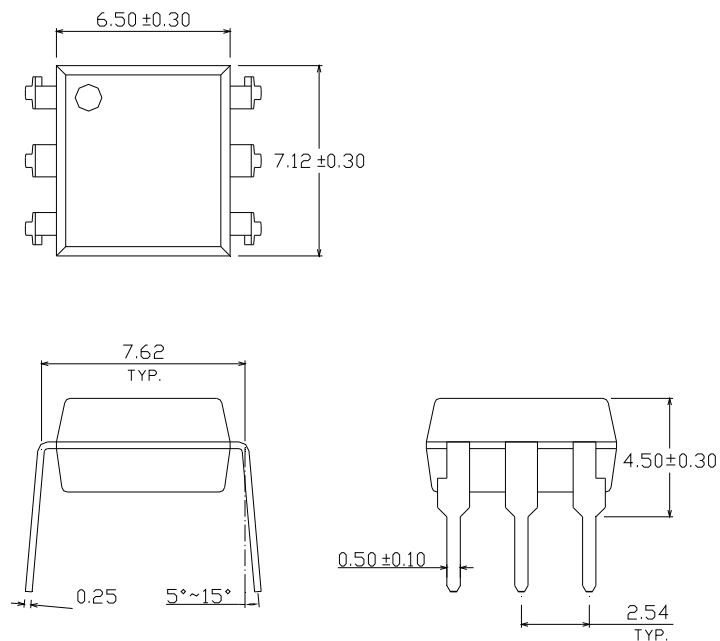
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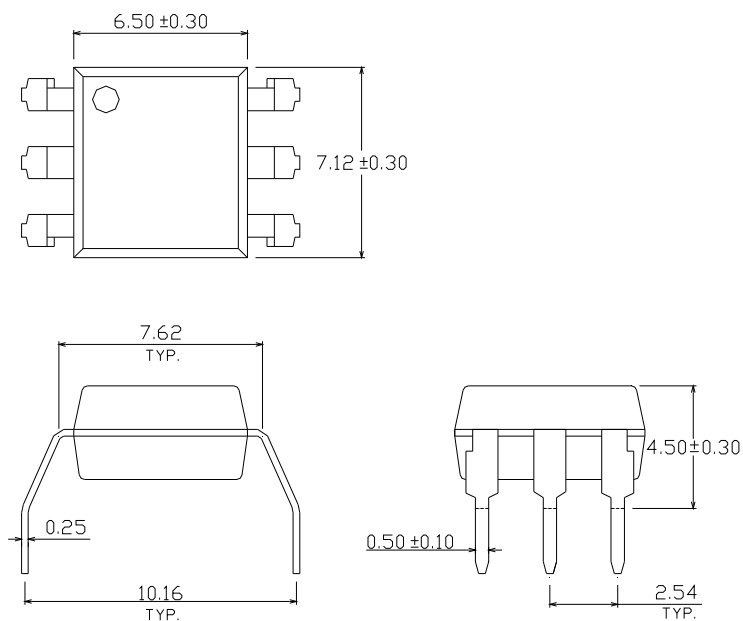
## Package Drawings

(Dimensions in mm)

### Standard DIP Type



### Option M Type

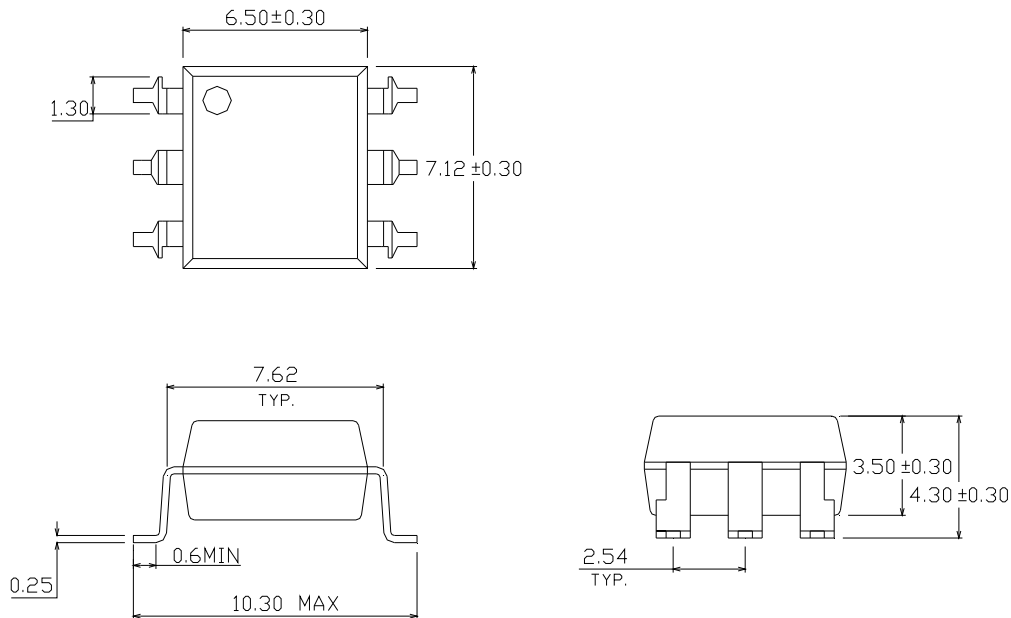




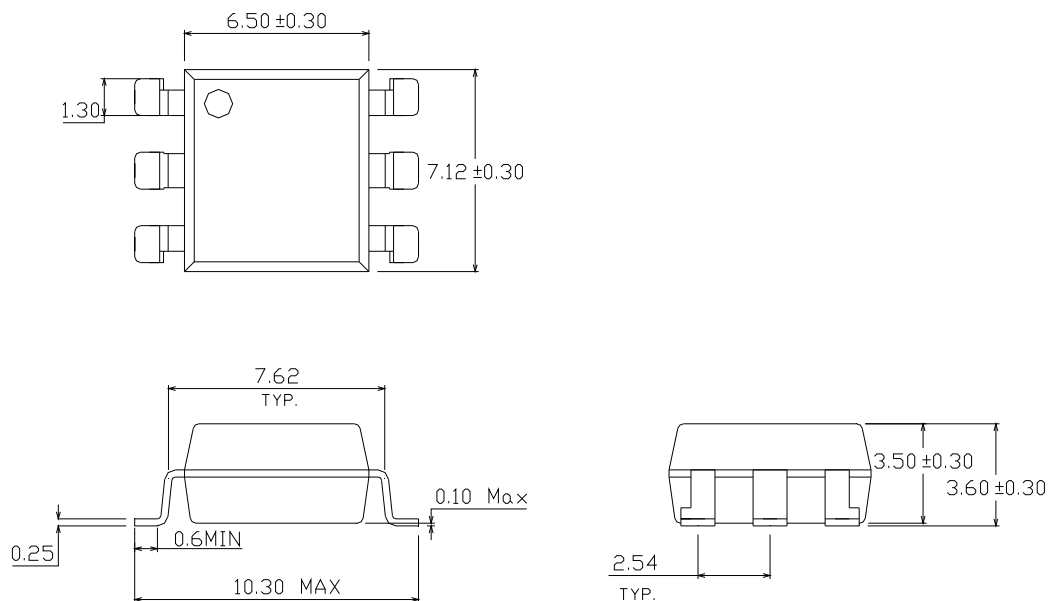
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## Option S Type



## Option S1 Type



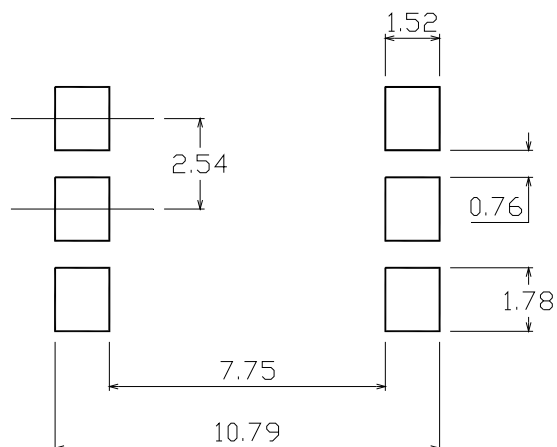


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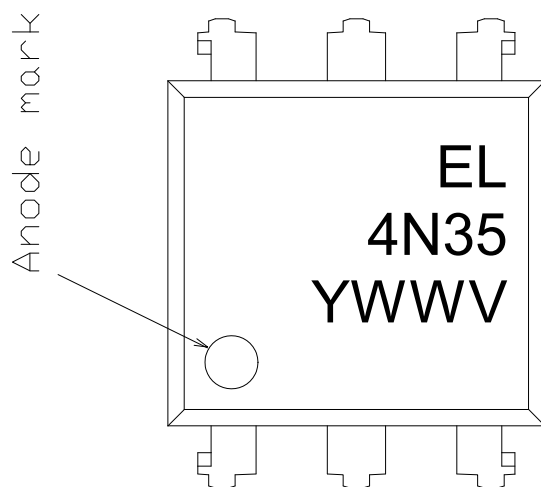
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Recommended pad layout for surface mount leadform



### Device Marking



### Notes

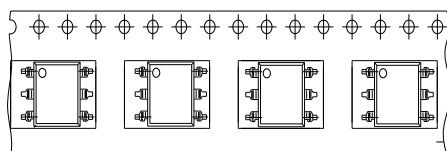
|      |                           |
|------|---------------------------|
| EL   | denotes Everlight         |
| 4N35 | denotes Device Number     |
| Y    | denotes 1 digit Year code |
| WW   | denotes 2 digit Week code |
| V    | denotes VDE (optional)    |

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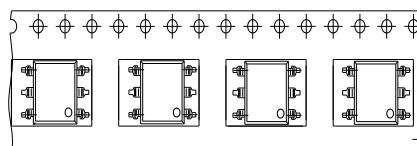
## Tape & Reel Packing Specifications

**Option TA**



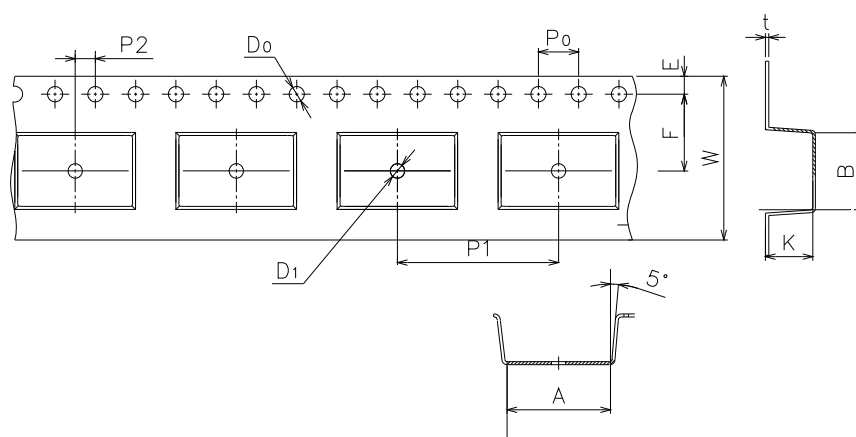
Direction of feed from reel

**Option TB**



Direction of feed from reel

## Tape dimensions



| Dimension No.  | A        | B        | D0      | D1         | E        | F       |
|----------------|----------|----------|---------|------------|----------|---------|
| Dimension (mm) | 10.4±0.1 | 7.52±0.1 | 1.5±0.1 | 1.5+0.1/-0 | 1.75±0.1 | 7.5±0.1 |

| Dimension No.  | P0       | P1       | P2      | t         | W        | K       |
|----------------|----------|----------|---------|-----------|----------|---------|
| Dimension (mm) | 4.0±0.15 | 16.0±0.1 | 2.0±0.1 | 0.35±0.03 | 16.0±0.2 | 4.5±0.1 |

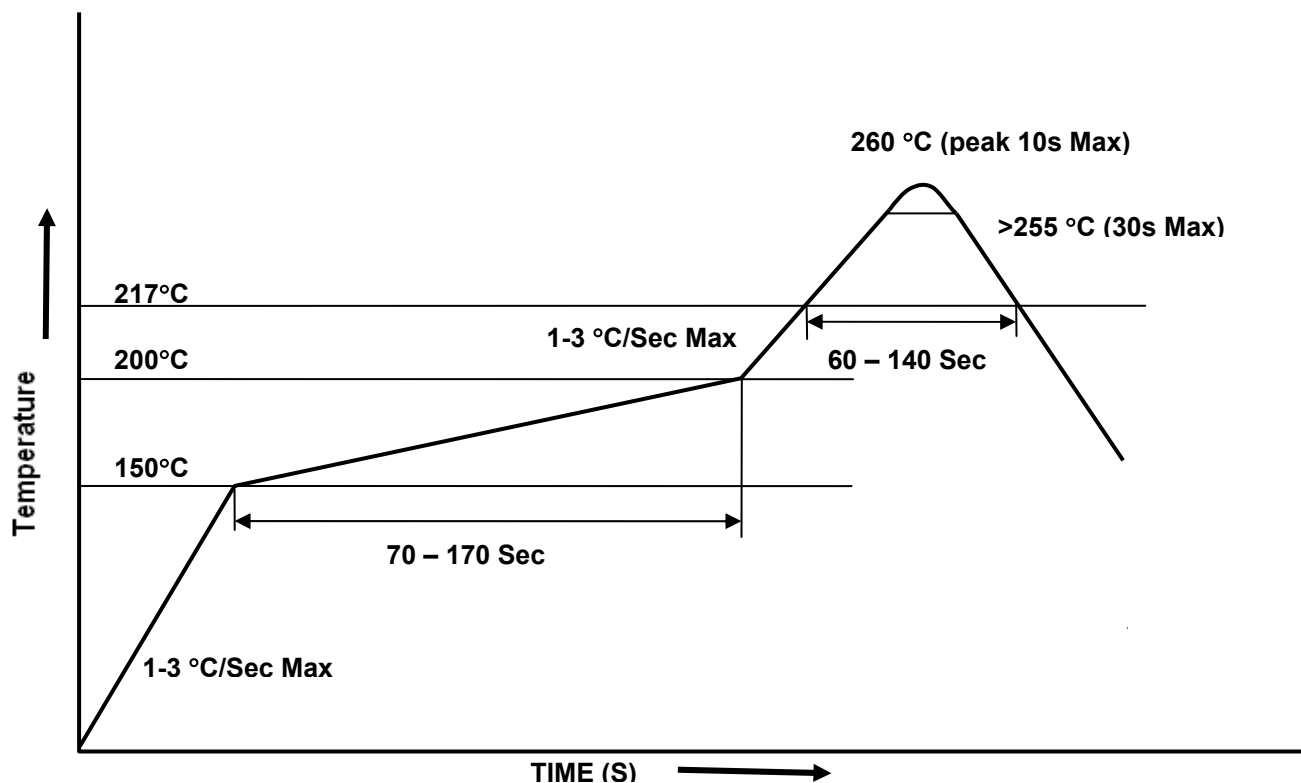


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### Solder Reflow Temperature Profile



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