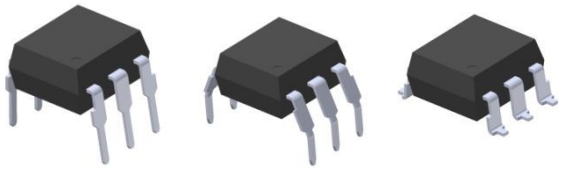
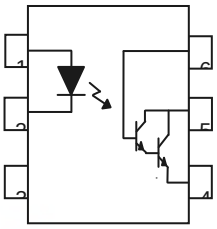
DATASHEET

# 6 PIN DIP PHOTODARLINGTON PHOTOCOUPLER
# TIL113, 4NXX, H11BX Series



Schematic



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

## Features:

- 4NXX series: 4N29, 4N30, 4N31, 4N32, 4N33
- H11BX series: H11B1, H11B2, H11B3, H11B255
- High isolation voltage between input and output (Viso=5000 V rms )
- Creepage distance >7.62 mm
- Operating temperature up to +110°C
- Compact small outline package
- The product itself will remain within RoHS compliant version
- Compliance with EU REACH
- UL and cUL approved(No. E214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved

## Description

The TIL113, 4NXX and H11BX series of devices each consist of an infrared emitting diode optically coupled to a photo darlington detector.

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

## Applications

- Low power logic circuits
- Telecommunications equipment
- Portable electronics
- Interfacing coupling systems 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 | A |
| | Reverse voltage | $V_R$ | 6 | V |
| | Power dissipation<br>No derating required up to Ta = 100°C | $P_D$ | 120 | mW |
| | | | 3.8 | mW/°C |
| Output | Power dissipation<br>Derating factor (above Ta = 80°C) | $P_C$ | 150 | mW |
| | | | 6.5 | mW/°C |
| | Collector-Emitter voltage | $V_{CEO}$ | 55 | V |
| | Collector-Base voltage | $V_{CBO}$ | 55 | V |
| | Emitter-Collector voltage | $V_{ECO}$ | 7 | V |
| | Emitter-Base voltage | $V_{EBO}$ | 7 | V |
| Total power dissipation | | $P_{TOT}$ | 200 | mW |
| Isolation voltage | | $V_{ISO}$ | 5000 | Vrms |
| Operating temperature | | $T_{OPR}$ | -55~+100 | °C |
| Storage temperature | | $T_{STG}$ | -55~+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 & 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 | $I_F$ = 10mA<br>$I_F$ = 50mA for H11B3 |
| Reverse Current | $I_R$ | - | - | 10 | μA | $V_R$ = 6V |
| Input capacitance | $C_{in}$ | - | 50 | - | pF | V = 0, f = 1MHz |

### Output

| Parameter | Symbol | Min. | Typ.* | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| Collector-Emitter dark current | $I_{CEO}$ | - | - | 100 | nA | $V_{CE}$ = 10V |
| Collector-Emitter breakdown voltage | $BV_{CEO}$ | 55 | - | - | V | $I_c$=1mA |
| Emitter-Collector breakdown voltage | $BV_{CBO}$ | 55 | - | - | V | $I_C$=0.1mA |
| Emitter-Collector breakdown voltage | $BV_{ECO}$ | 7 | - | - | V | $I_E$=0.1mA |

## Transfer Characteristics ($T_a$=25°C unless specified otherwise)

| Parameter | | Symbol | Min | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|---|
| Current transfer ratio | 4N32<br>4N33 | CTR | 500 | - | - | % | $I_F$ = 10mA ,$V_{CE}$ = 10V |
| | 4N29<br>4N30 | | 100 | - | - | | |
| | 4N31 | | 50 | - | - | | |
| | H11B1 | | 500 | - | - | | $I_F$ = 1mA ,$V_{CE}$ = 5V |
| | H11B2 | | 200 | - | - | | |
| | H11B3 | | 100 | - | - | | |
| | H11B255 | | 100 | - | - | | $I_F$ = 10mA ,$V_{CE}$ = 5V |
| | TIL113 | | 300 | - | - | | $I_F$ = 10mA ,$V_{CE}$ = 1V |

## Transfer Characteristics ($T_a$=25°C unless specified otherwise)

| Parameter | | Symbol | Min | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|---|
| Collector-emitter saturation voltage | 4N29<br>4N30<br>4N32<br>4N33 | $V_{CE(sat)}$ | - | - | 1.0 | V | $I_F$ = 8mA ,$I_c$ = 2mA |
| | 4N31<br>TIL113 | | - | - | 1.2 | | $I_F$ = 8mA ,$I_c$ = 2mA |
| | H11B1<br>H11B2<br>H11B3 | | - | - | 1.0 | | $I_F$ = 1mA ,$I_c$ = 1mA |
| | H11B255 | | - | - | 1.0 | | $I_F$ = 50mA ,$I_c$ = 50mA |
| Isolation resistance | | $R_{IO}$ | $10^{11}$ | - | - | Ω | $V_{IO}$ = 500Vdc |
| Input-output Capacitance | | $C_{IO}$ | - | 0.8 | - | pF | $V_{IO}$ = 0, f = 1MHz |
| Turn-on time | H11B1<br>H11B2<br>H11B3<br>H11B255 | Ton | - | 25 | - | µs | $V_{CC}$ = 10V, $I_F$ = 10mA, $R_L$ = 100Ω |
| | 4N29<br>4N30<br>4N31<br>4N32<br>4N33<br>TIL113 | | - | - | 5 | | $V_{CC}$ = 10V, $I_C$ = 50mA, $I_F$=200mA |
| Turn-off time | H11B1<br>H11B2<br>H11B3<br>H11B255 | Toff | - | 18 | - | µs | $V_{CC}$ = 10V, $I_F$ = 10mA, $R_L$ = 100Ω |
| | 4N32<br>4N33<br>TIL113 | | - | - | 100 | | $V_{CC}$ = 10V, $I_C$ = 50mA, $I_F$=200mA |
| | 4N29<br>4N30<br>4N31 | | - | - | 40 | | |

* Typical values at $T_a$ = 25°C

## Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

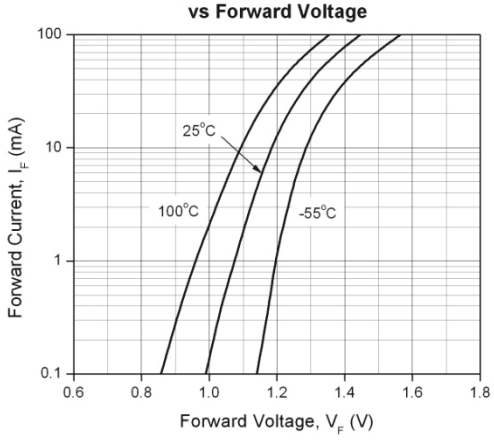



Figure 2. Current Transfer Ratio vs. Ambient Temperature

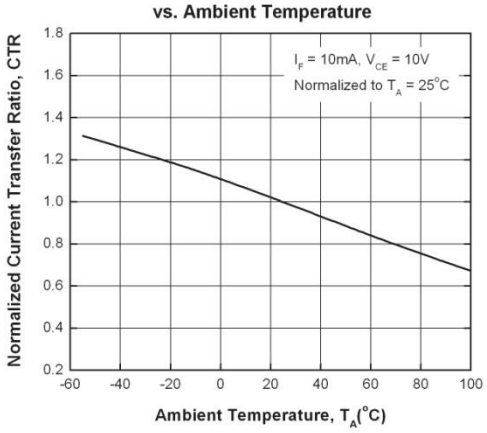



Figure 3. Normalized Current Transfer Ratio vs Forward Current

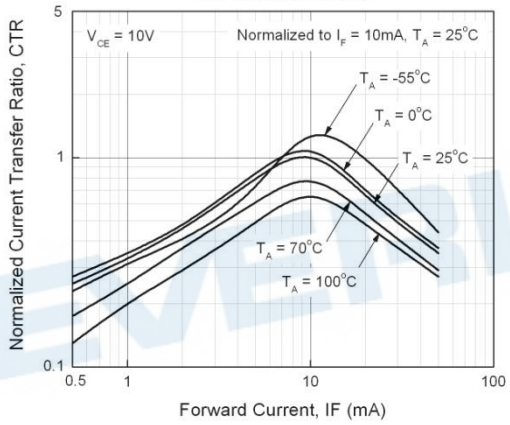



Figure 4. Collector Dark Current vs Ambient Temperature

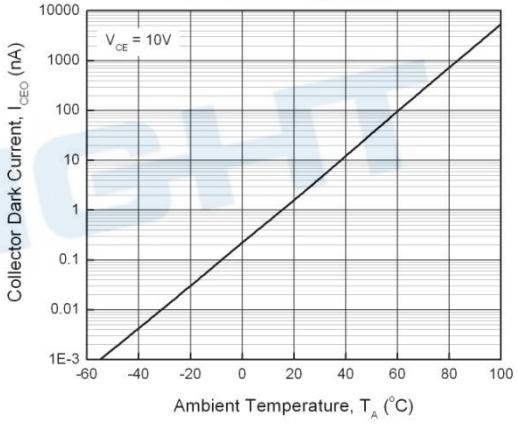



Figure 5. Turn-on Time vs Forward Current

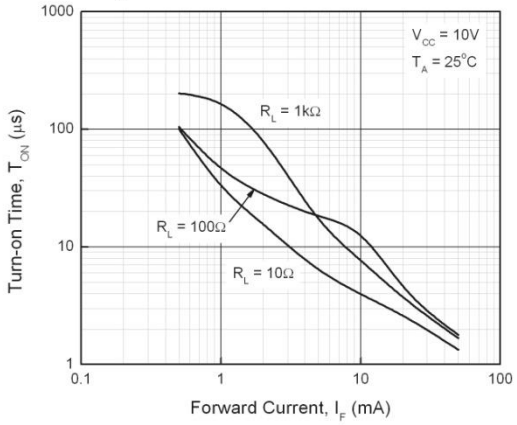
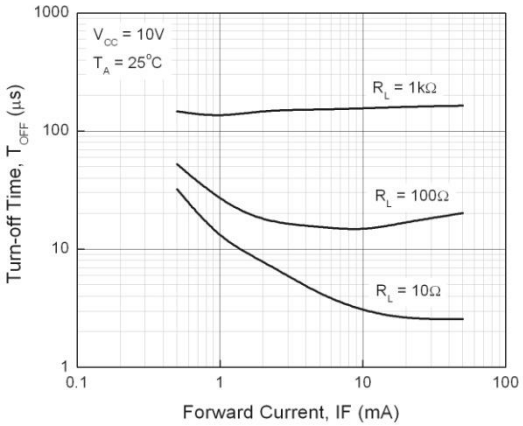



Figure 6. Turn-off Time vs Forward Current



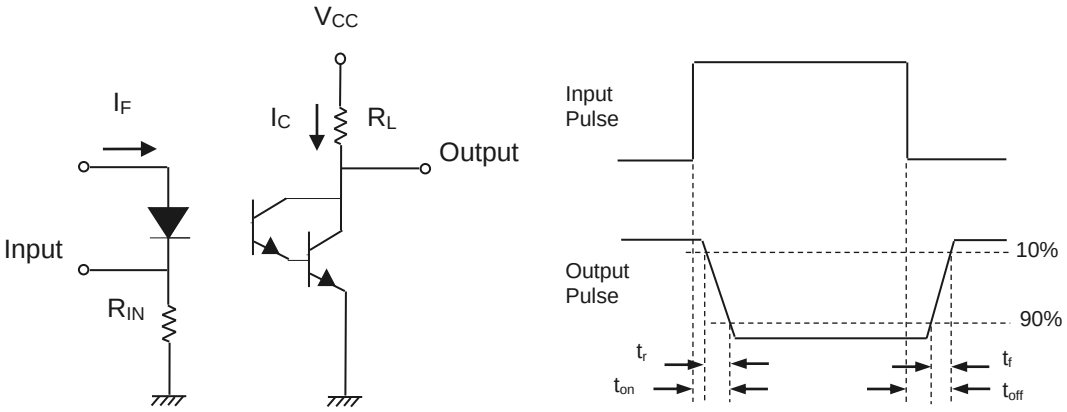



**Figure 7. Switching Time Test Circuit & Waveforms**

## Order Information

### Part Number

**4NXXY(Z)-V**
**or H11BXY(Z)-V**
**or TIL113Y(Z)-V**

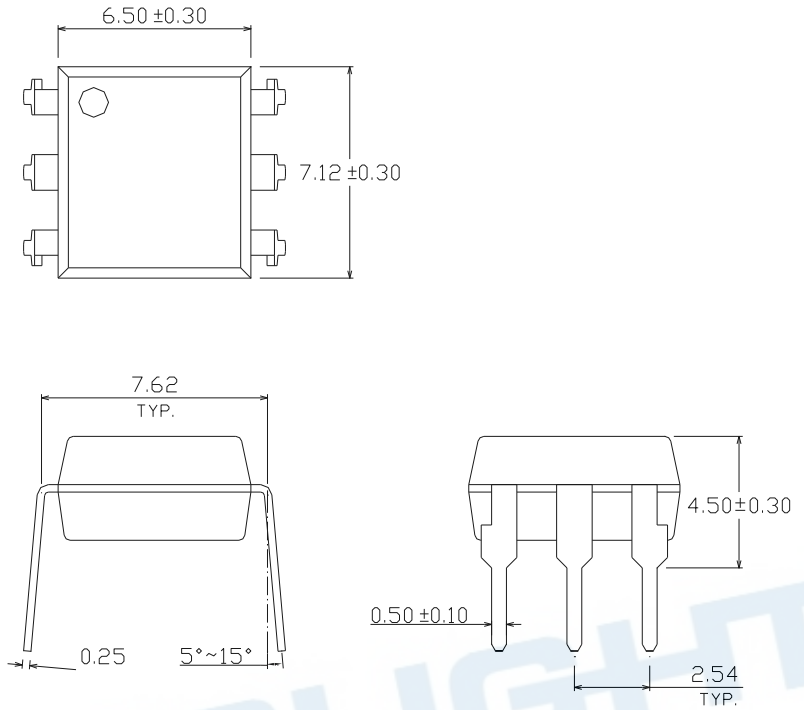
### Note

XX = Part No. for 4NXX series (29, 30, 31, 32 or 33)
X = Part No. for H11BX series (1, 2, 3 or 255)
Y = Lead form option (S, S1, M or none)
Z = Tape and reel option (TA, TB or none).
V = VDE safety (optional)

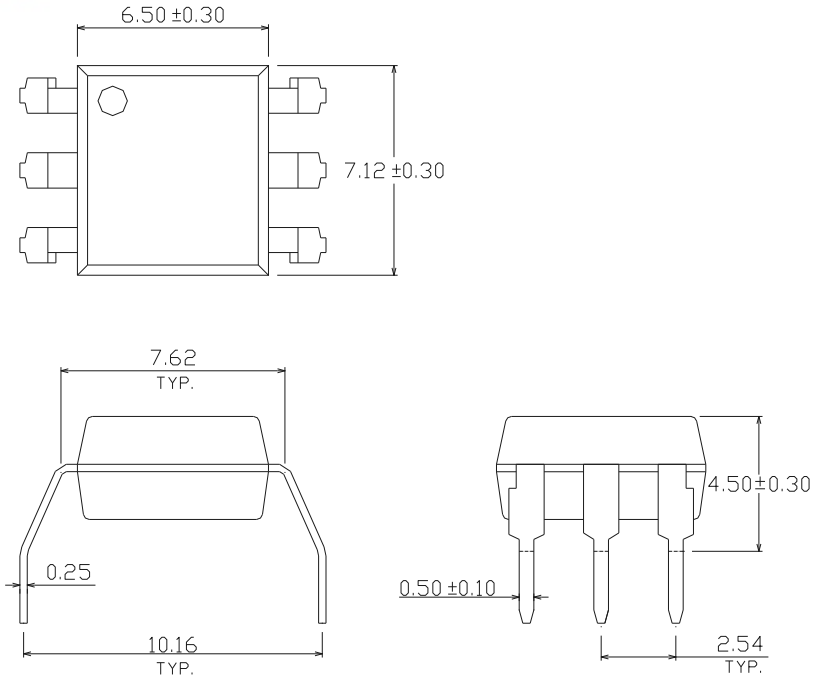
| Option | Description | Packing quantity |
|---|---|---|
| None | Standard DIP-6 | 65 units per tube |
| M | Wide lead bend (0.4 inch spacing) | 65 units per tube |
| S (TA) | Surface mount lead form + TA tape & reel option | 1000 units per reel |
| S (TB) | Surface mount lead form + TB tape & reel 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)

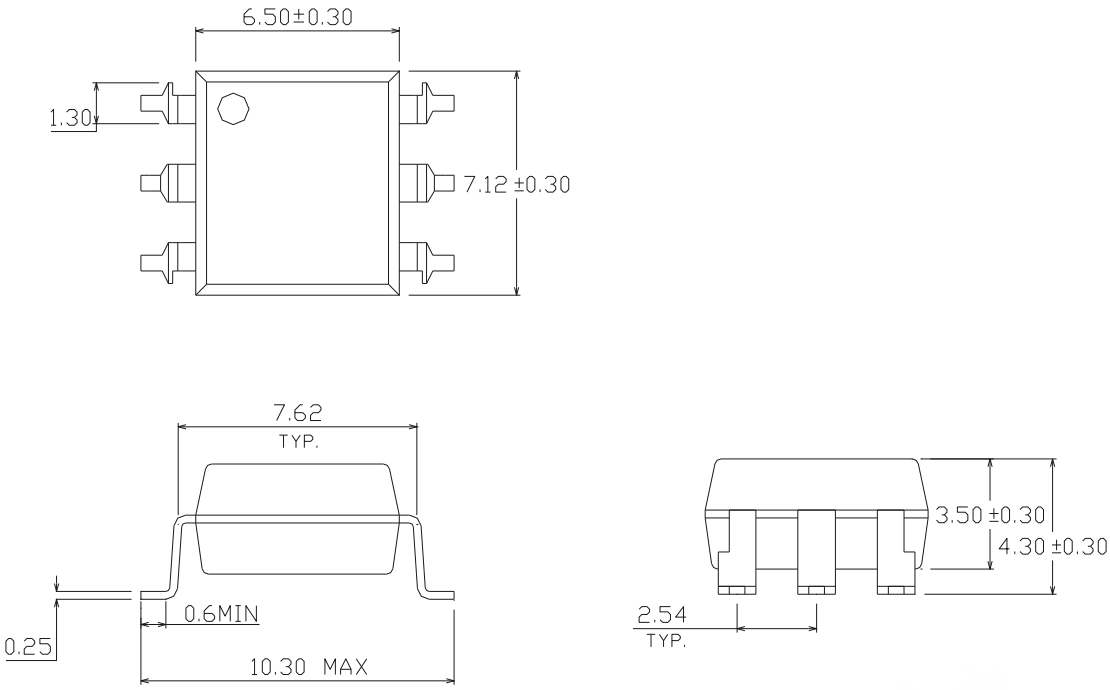
### Standard DIP Type



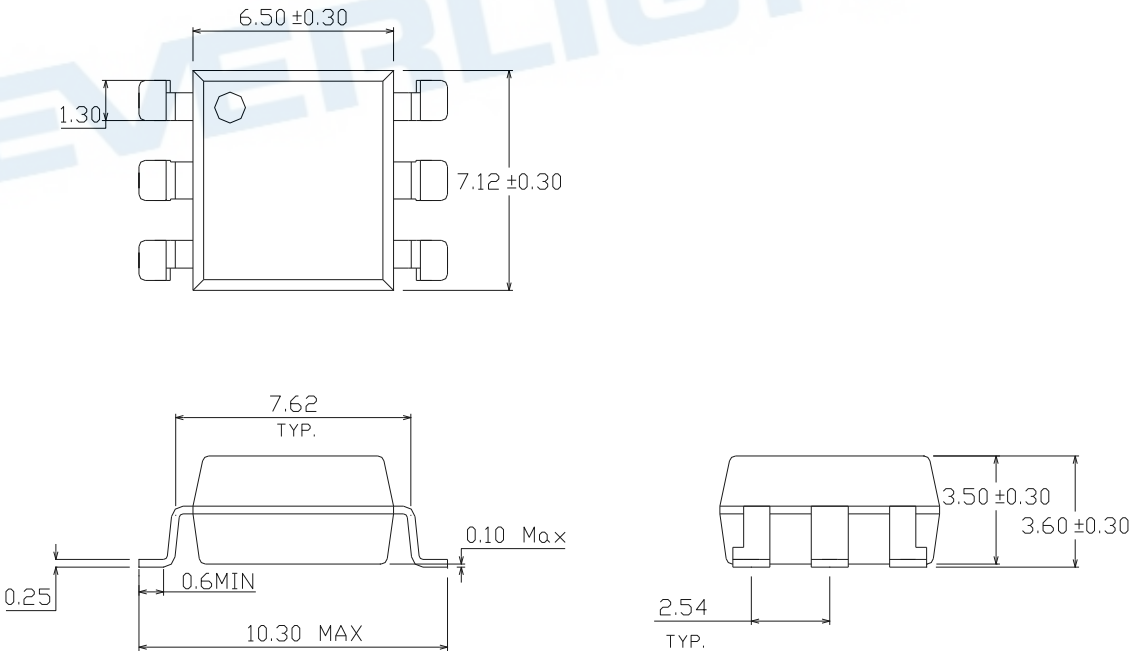

### Option M Type



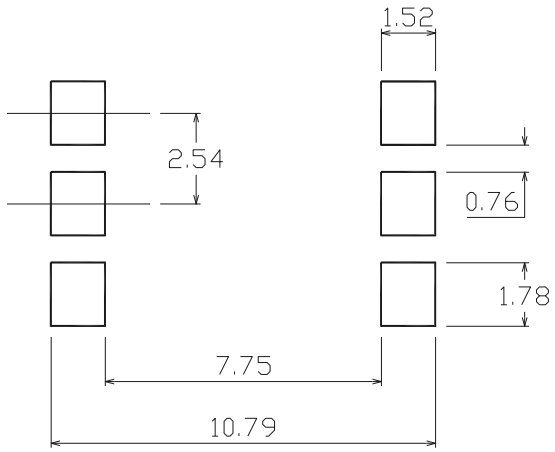
**Option S Type**



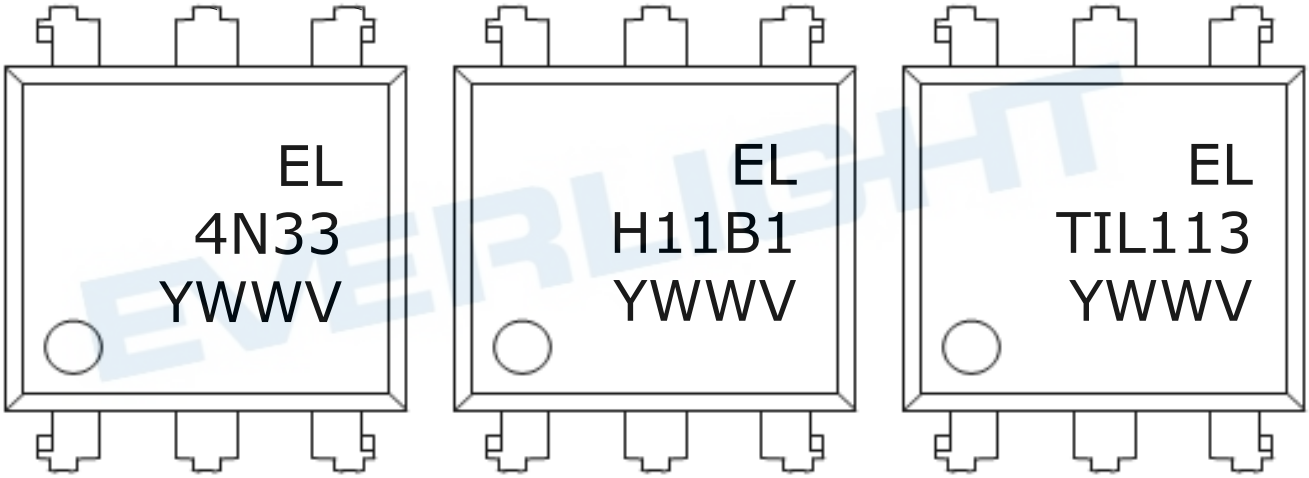

**Option S1 Type**



## Recommended pad layout for surface mount leadform




## Device Marking

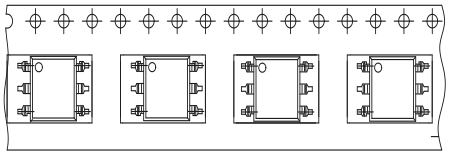



**Notes**

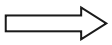
| | |
|---|---|
| EL | denotes Everlight |
| 4N33<br>TIL113 | |
| H11B1 | denotes Part Number |
| Y | denotes 1 digit Year code |
| WW | denotes 2 digit Week code |
| V | denotes VDE safety (optional) |

## Tape & Reel Packing Specifications

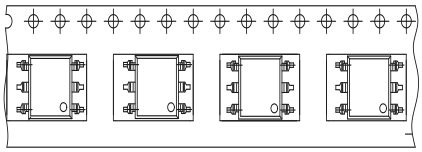
**Option TA**



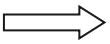
Direction of feed from reel



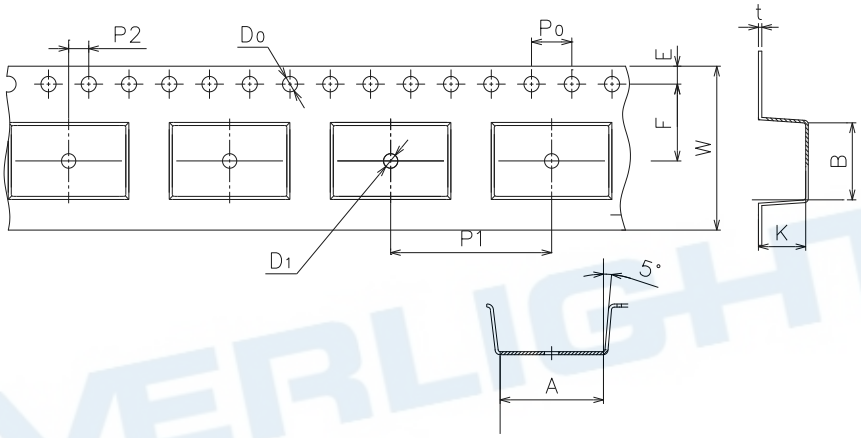
**Option TB**



Direction of feed from reel



## Tape dimensions

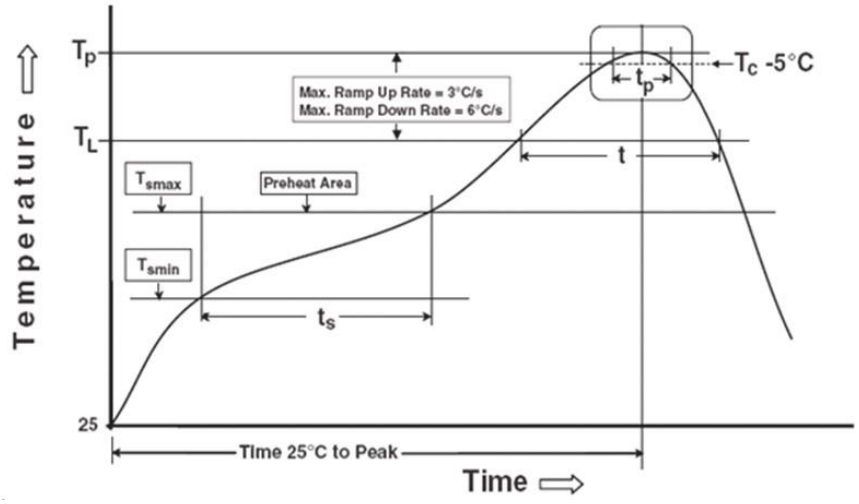



| Dimension No. | A | B | Do | D1 | E | F |
|---|---|---|---|---|---|---|
| Dimension(mm) | 10.8±0.1 | 7.5±0.1 | 1.5±0.1 | 1.5+0.1/-0 | 1.75±0.1 | 7.5±0.1 |
| Dimension No. | Po | P1 | P2 | t | W | K |
| Dimension(mm) | 4.0±0.15 | 12±0.1 | 2.0±0.1 | 0.35±0.03 | 16.0±0.2 | 4.5±0.1 |

## 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°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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