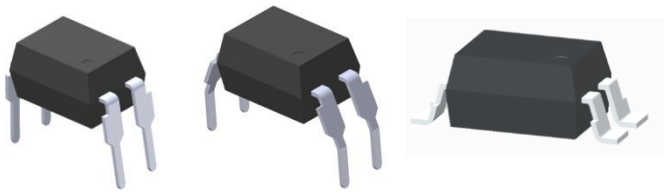
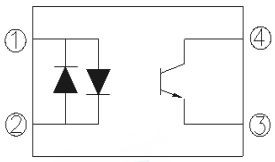
DATASHEET

# 4 PIN DIP PHOTOTRANSISTOR PHOTOCOUPLER
# AC INPUT PHOTOCOUPLER
# EL814 Series



Schematic




Pin Configuration
1. Anode / Cathode
2. Cathode / Anode
3. Emitter
4. Collector

## Features

- Compliance Halogens Free
  (Br < 900 ppm, Cl < 900 ppm, Br+Cl < 1500 ppm)
- AC input response
- Current transfer ratio (CTR: Min. 20% at $I_F$ = ±1mA,$V_{CE}$ = 5V)
- High isolation voltage between input and output (Viso = 5000 V rms )
- Wide Operating temperature range -55~110ºC
- High collector-emitter voltage $V_{CEO}$ = 80V
- Compact dual-in-line 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
- CQC approved

## Description

The EL814 series of devices each consist of two infrared emitting diodes, connected in inverse parallel, optically coupled to a phototransistor detector.
They are packaged in a 4-pin DIP package and available in side-lead spacing and SMD option.

## Applications

- AC line monitor
- Programmable controllers
- Telephone line interface
- Unknown polarity DC sensor

## Absolute Maximum Ratings (Ta=25℃)

| Parameter | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Input | Forward current | $I_F$ | ±60 | mA |
| | Peak forward current (t = 10μs) | $I_{FM}$ | 1 | A |
| | Power dissipation | $P_D$ | 100 | mW |
| | Derating factor (above 100 ºC) | | 2.9 | mW/ºC |
| Output | Power dissipation | $P_C$ | 150 | mW |
| | Derating factor (above 100 ºC) | | 5.8 | mW/ºC |
| | Collector-Emitter voltage | $V_{CEO}$ | 80 | V |
| | Emitter-Collector voltage | $V_{ECO}$ | 6 | V |
| Total Power Dissipation | | $P_{TOT}$ | 200 | mW |
| Isolation Voltage*1 | | $V_{ISO}$ | 5000 | V rms |
| Operating Temperature | | $T_{OPR}$ | -55 to 110 | °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℃ unless specified otherwise)

### Input

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | - | 1.2 | 1.4 | V | $I_F$ = ± 20mA |
| Input capacitance | $C_{in}$ | - | 50 | 250 | pF | V = 0, f = 1KHz |

### Output

| Parameter | Symbol | Min | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| Collector-Emitter dark current | $I_{CEO}$ | - | - | 100 | nA | $V_{CE}$ = 20V, $I_F$ = 0mA |
| Collector-Emitter breakdown voltage | $BV_{CEO}$ | 80 | - | - | V | $I_C$ = 0.1mA |
| Emitter-Collector breakdown voltage | $BV_{ECO}$ | 6 | - | - | V | $I_E$ = 0.1mA |

### Transfer Characteristics

| Parameter | | Symbol | Min | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|---|
| Current Transfer ratio | EL814 | CTR | 20 | - | 300 | % | $I_F$ = ±1mA ,$V_{CE}$ = 5V |
| | EL814A | | 50 | - | 150 | | |
| CTR Symmetry | | | 0.5 | | 2.0 | | $I_F$ = ±1mA ,$V_{CE}$ = 5V |
| Collector-emitter saturation voltage | | $V_{CE(sat)}$ | - | 0.05 | 0.2 | V | $I_F$ = ±20mA ,$I_c$ = 1mA |
| Isolation resistance | | $R_{IO}$ | $5\times10^{10}$ | $10^{11}$ | - | Ω | $V_{IO}$ = 500Vdc, 40~60%R.H |
| Cut-off frequency | | $f_c$ | - | 80 | - | kHz | $V_{CE}$=5V, $I_C$=2 mA, $R_L$=100Ω, -3dB |
| Floating capacitance | | $C_{IO}$ | - | 0.6 | 1.0 | pF | $V_{IO}$ = 0, f = 1MHz |
| Rise time | | $T_r$ | - | - | 18 | μs | $V_{CE}$=2V, $I_C$=2mA, $R_L$=100Ω |
| Fall time | | $T_f$ | - | - | 18 | μs | |

* Typical values at $T_a$ = 25°C

## Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

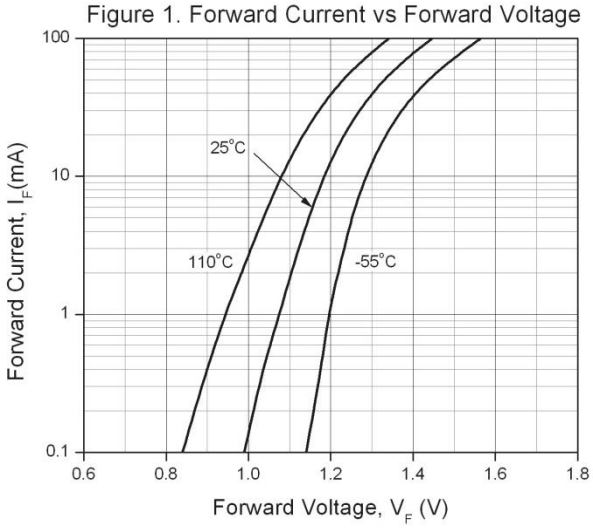



Figure 2. Normalized Current Transfer Ratio vs Forward Current

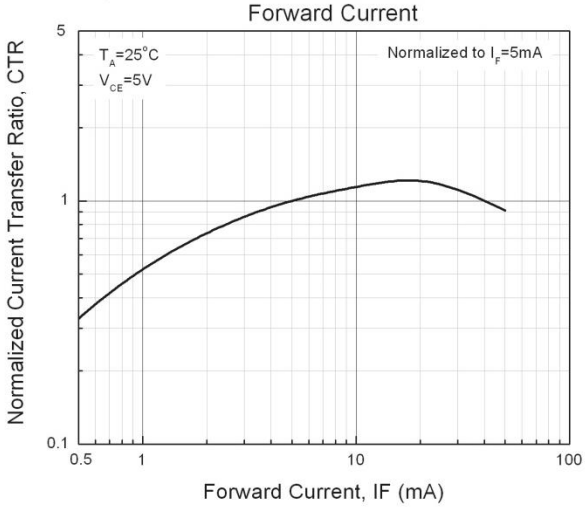



Figure 3. Current Transfer Ratio vs Ambient Temperature

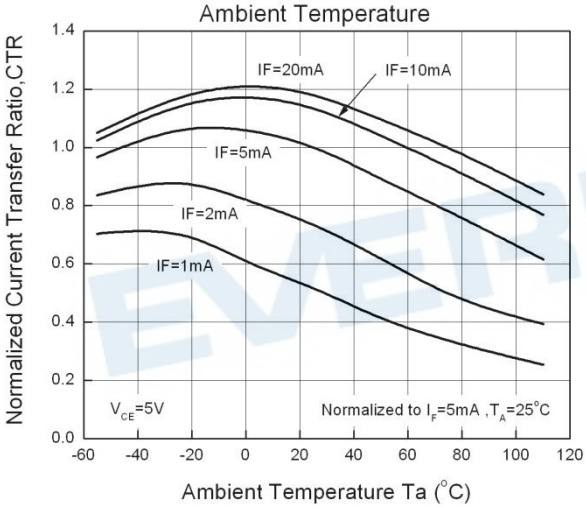



Figure 4. Dark Current vs Ambient Temperature

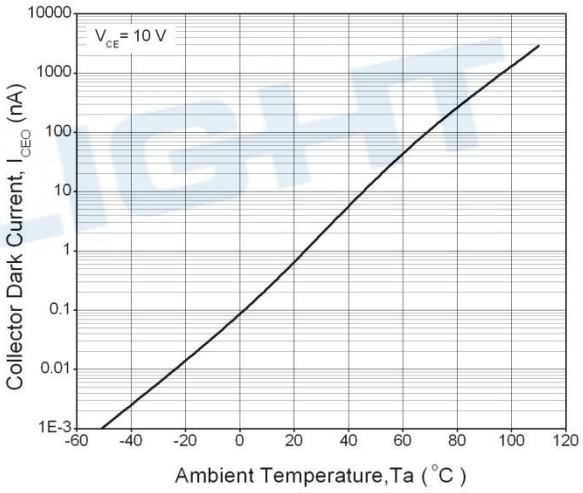



Figure 5. Collector Current vs Collector Voltage

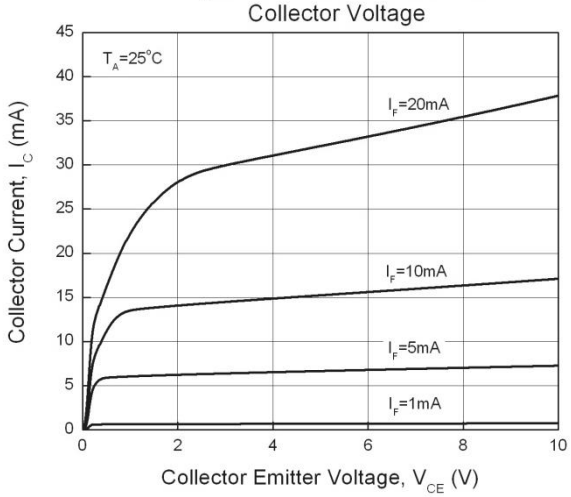



Figure 6. Collector Current vs Collector Voltage

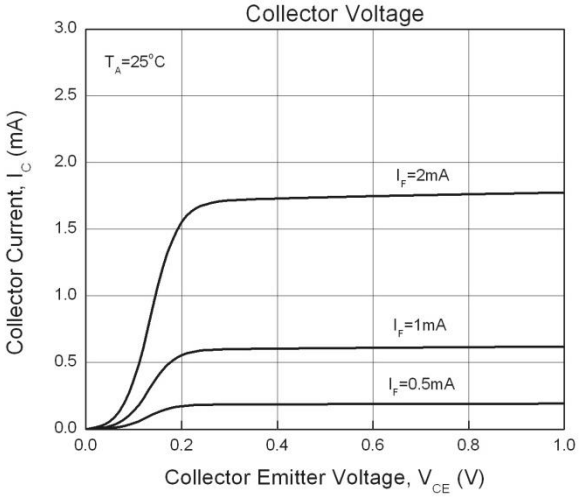


Figure 7. Collector-Emitter Saturation Voltage vs Collector Current

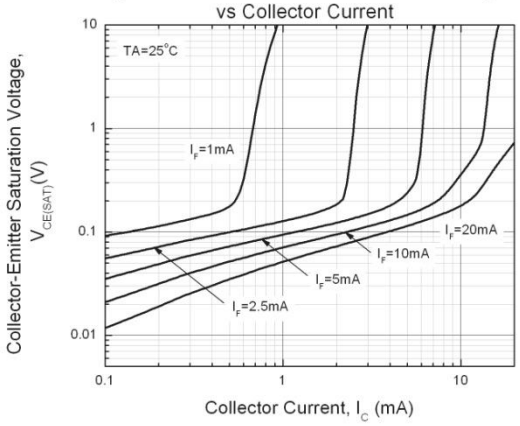
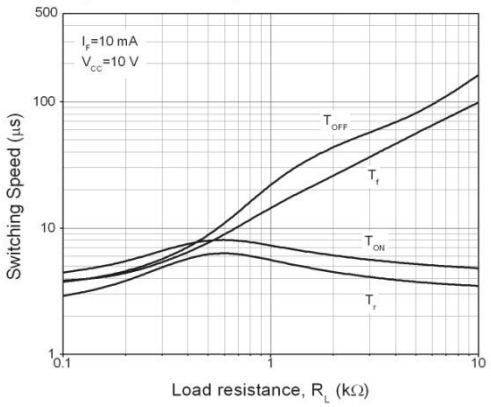



Figure 8. Switching Time vs Load Resistance



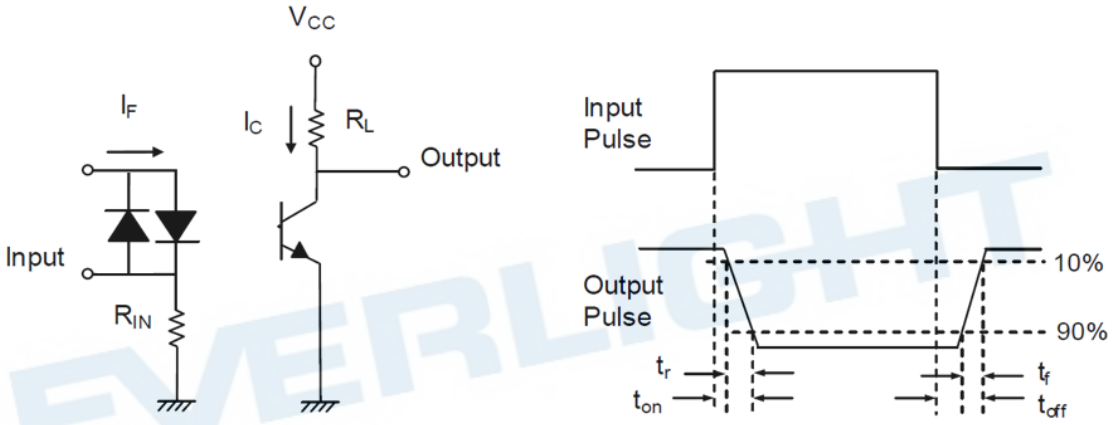




**Figure 9. Switching Time Test Circuit & Waveforms**

## Order Information

### Part Number

# EL814X(Y)(Z)-V

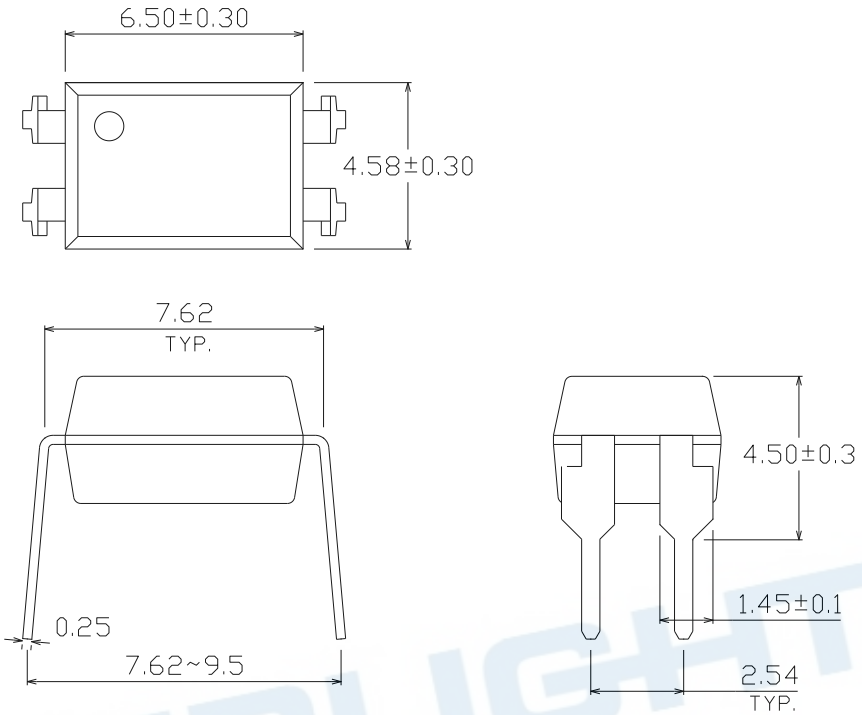
**Notes**

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

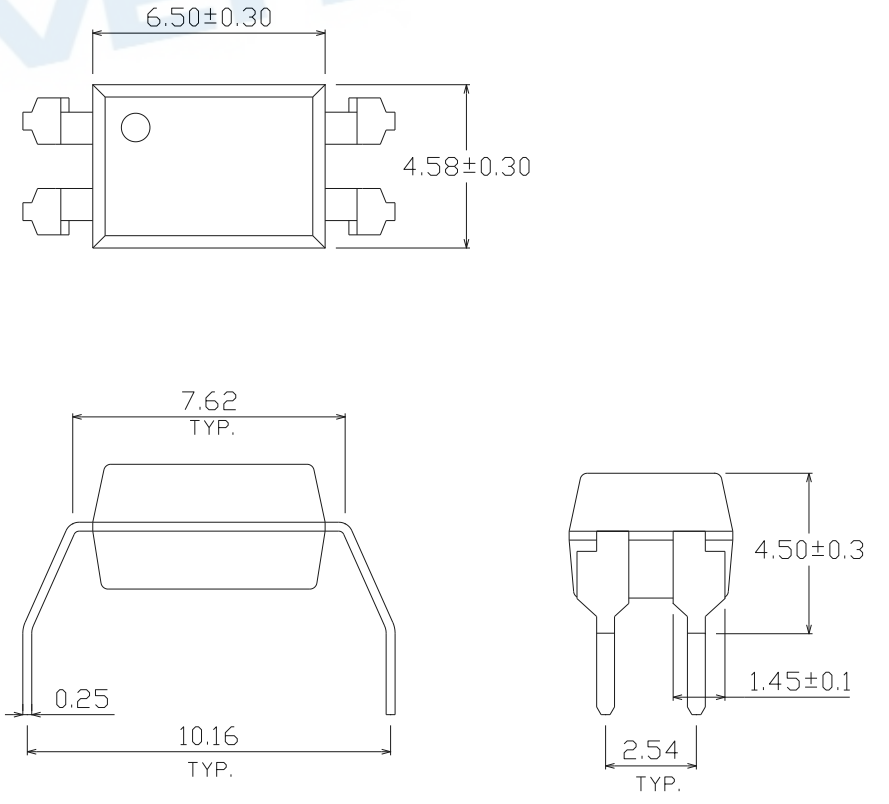
| Option | Description | Packing quantity |
|---|---|---|
| None | Standard DIP-4 | 100 units per tube |
| M | Wide lead bend (0.4 inch spacing) | 100 units per tube |
| S (TA) | Surface mount lead form + TA tape & reel option | 1000 units per reel |
| S (TB) | Surface mount lead form + TB tape & reel 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)

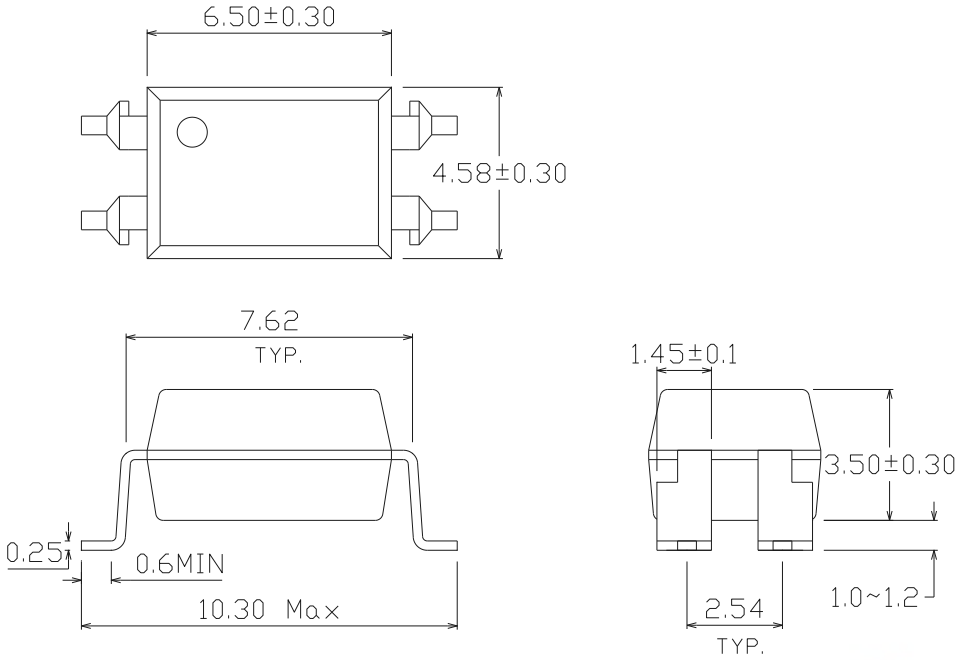
### Standard DIP Type



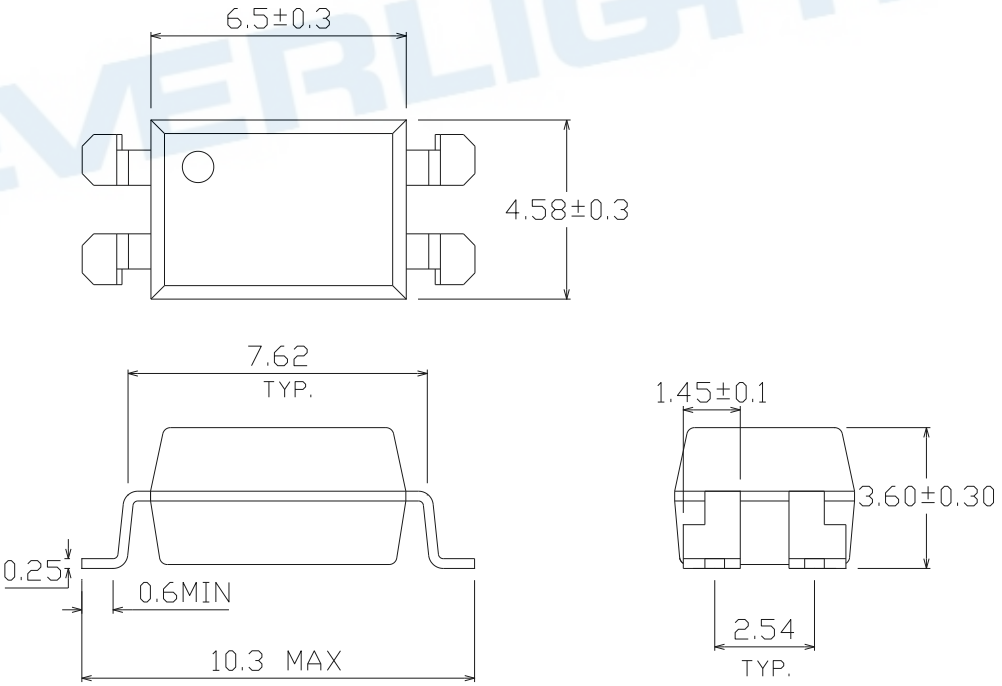

### Option M Type



### Option S Type

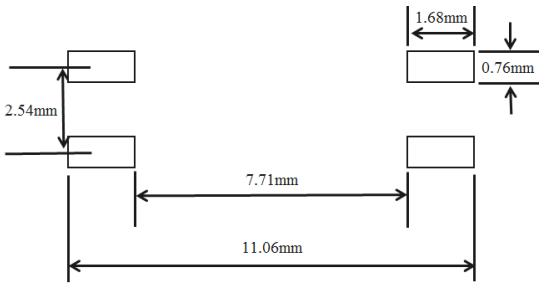



### Option S1 Type

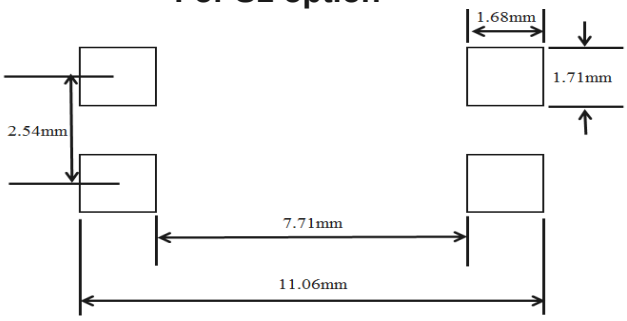


## Recommended pad layout for surface mount leadform

### For S option



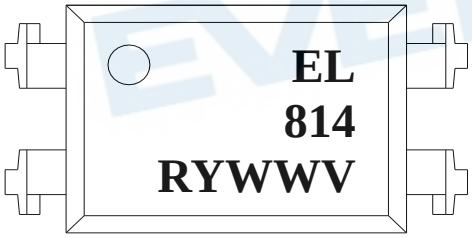

### For S1 option




**Notes**

Suggested pad dimension is just for reference only.
Please modify the pad dimension based on individual need.

## Device Marking

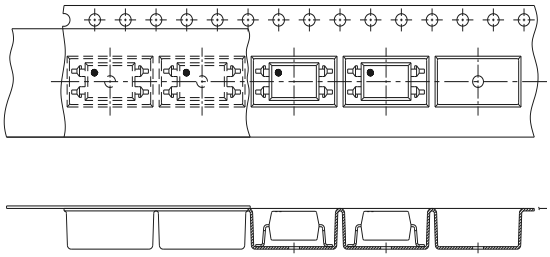



**Notes**

| | |
|---|---|
| EL | denotes EVERLIGHT |
| 814 | denotes Device Number |
| R | denotes CTR Rank (A or none) |
| Y | denotes 1 digit Year code |
| WW | denotes 2 digit Week code |
| V | denotes VDE (optional) |

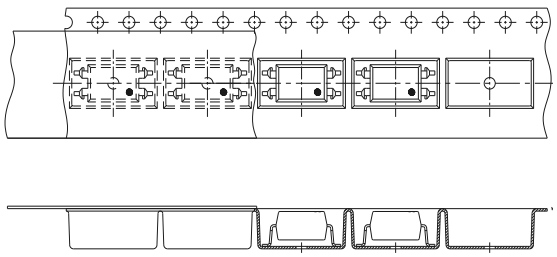
## Tape & Reel Packing Specifications

**Option TA**

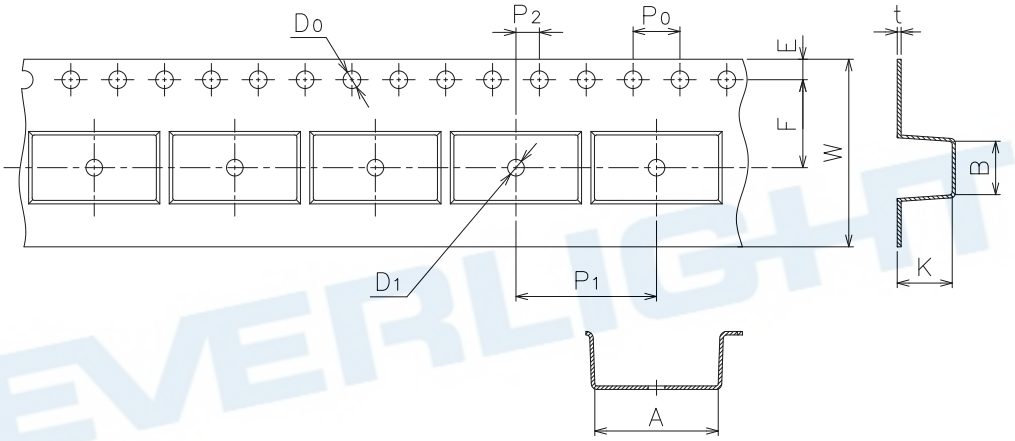


Direction of feed from reel

**Option TB**

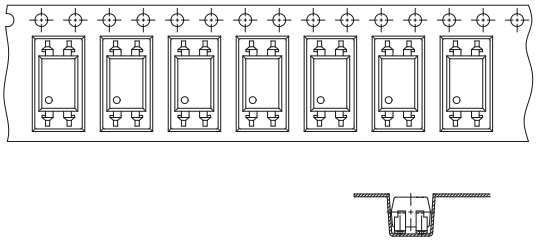


Direction of feed from reel



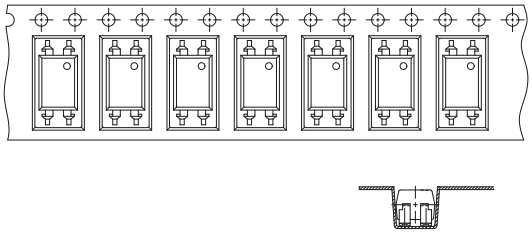

| Dimension No. | A | B | Do | D1 | E | F |
|---|---|---|---|---|---|---|
| Dimension (mm) S | 10.7±0.1 | 4.65±0.1 | 1.5±0.1 | 1.50±0.1 | 1.75±0.1 | 7.5±0.1 |
| Dimension (mm) S1 | 10.7±0.1 | 4.65±0.1 | 1.5±0.1 | 1.50±0.1 | 1.75±0.1 | 7.5±0.1 |
| **Dimension No.** | **Po** | **P1** | **P2** | **t** | **W** | **K** |
| Dimension (mm) S | 4.0±0.1 | 12.0±0.1 | 2.0±0.1 | 0.4±0.1 | 16.0±0.3 | 4.75±0.1 |
| Dimension (mm) S1 | 4.0±0.1 | 12.0±0.1 | 2.0±0.1 | 0.4±0.1 | 16.0±0.3 | 3.90±0.1 |

**Option TD**



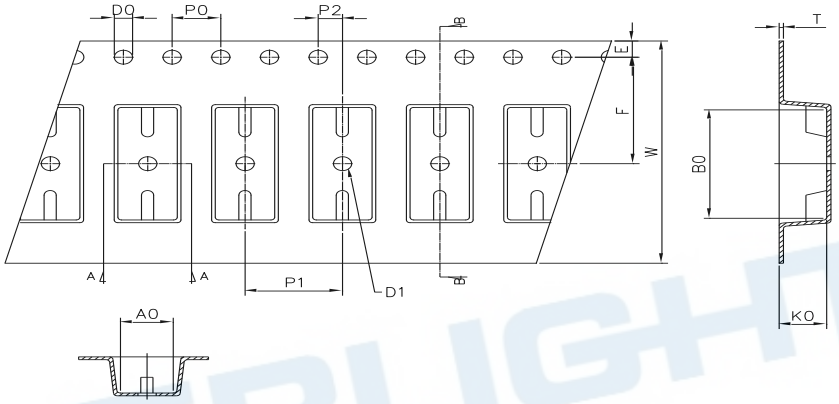
Direction of feed from reel

**Option TU**



Direction of feed from reel

## Tape dimensions

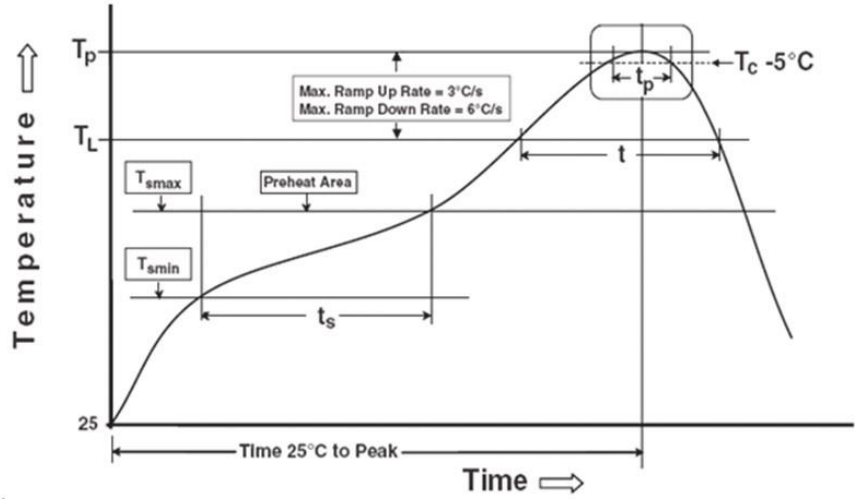



| Dimension No. | Ao | Bo | Do | D1 | E | F |
|---|---|---|---|---|---|---|
| Dimension (mm) S.S1 | 4.90±0.1 | 10.40±0.1 | 1.5±0.1 | 1.50±0.1 | 1.75±0.1 | 7.50±0.1 |
| Dimension No. | **Po** | **P1** | **P2** | **t** | **W** | **Ko** |
| Dimension (mm) S.S1 | 4.00±0.1 | 8.00±0.1 | 2.00±0.1 | 0.40±0.1 | 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




Notes — 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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