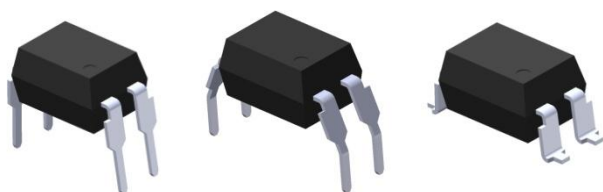
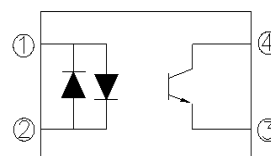


### 4 PIN DIP PHOTOTRANSISTOR PHOTOCOUPLER AC INPUT PHOTOCOUPLER EL814 Series



Schematic



#### Features:

- AC input response
- Current transfer ratio (CTR: Min. 20% at  $I_F = \pm 1\text{mA}$ ,  $V_{CE} = 5\text{V}$ )
- High isolation voltage between input and output (Viso=5000 V rms )
- Wide Operating temperature range -55~110°C
- High collector-emitter voltage  $V_{CEO}=80\text{V}$
- Compact dual-in-line package
- Pb free and RoHS compliant.
- UL approved (No. E214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CSA approved
- CQC approved

#### Pin Configuration

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

#### 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°C)

|                                     | 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 °C)  |           | 2.9        | mW/°C |
| Output                              | Power dissipation               | $P_C$     | 150        | mW    |
|                                     | Derating factor (above 100 °C)  |           | 5.8        | mW/°C |
|                                     | Collector-Emitter voltage       | $V_{CEO}$ | 80         | V     |
|                                     | Emitter-Collector voltage       | $V_{ECO}$ | 6          | V     |
| 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 are shorted together, and pins 3, 4 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  | 1.4  | V    | $I_F = \pm 20\text{mA}$  |
| Input capacitance | $C_{in}$ | -    | 50   | 250  | pF   | $V = 0, f = 1\text{KHz}$ |

**Output**

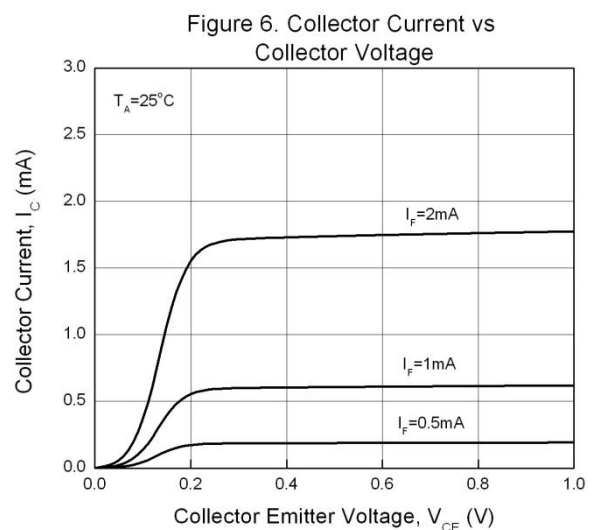
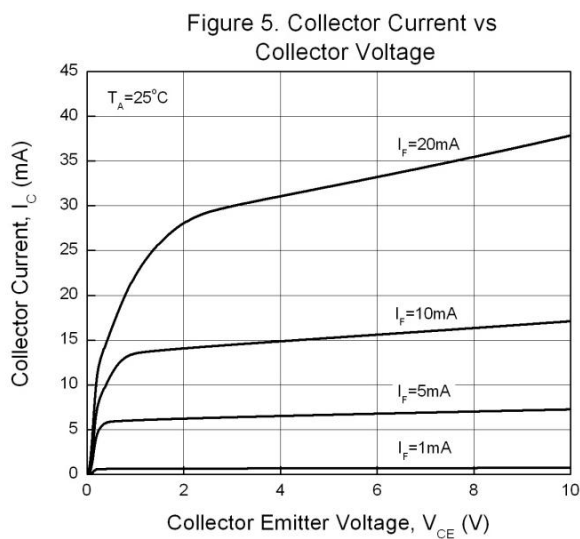
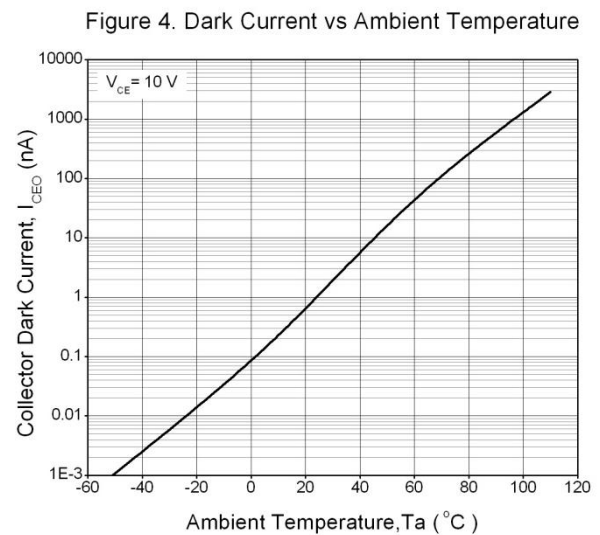
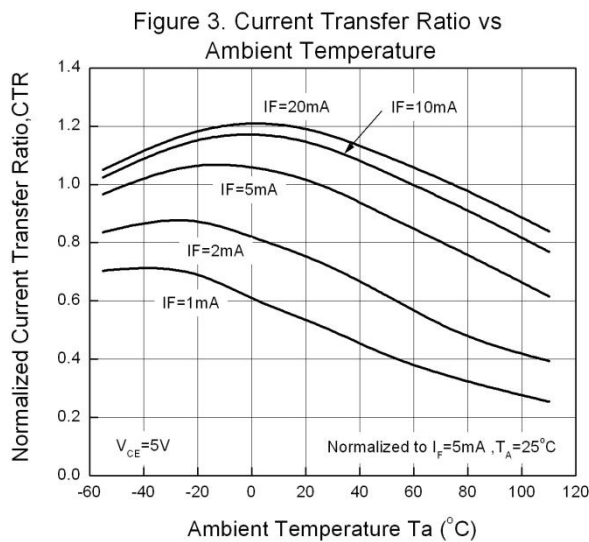
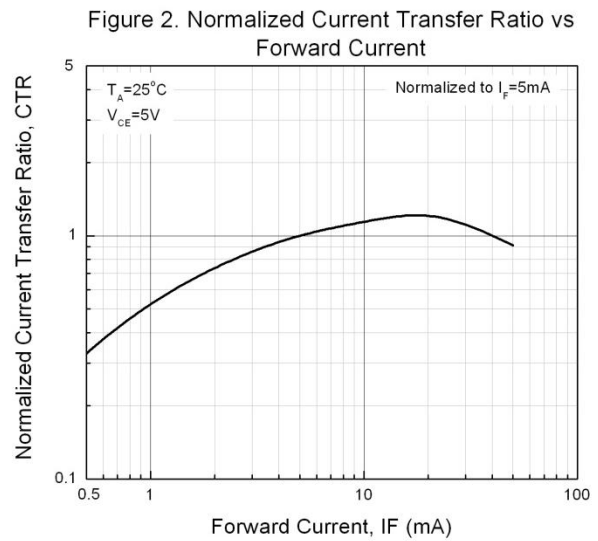
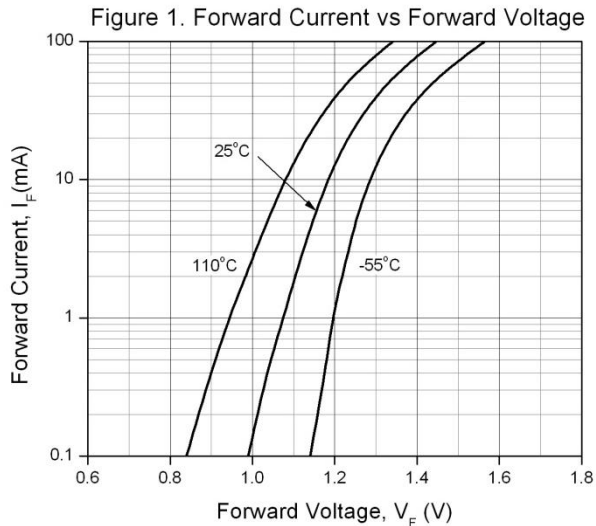
| Parameter                           | Symbol     | Min | Typ. | Max. | Unit | Condition                               |
|-------------------------------------|------------|-----|------|------|------|-----------------------------------------|
| Collector-Emitter dark current      | $I_{CEO}$  | -  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

**Transfer Characteristics**

| Parameter                            | Symbol        | Min                | Typ.      | Max. | Unit          | Condition                                                      |
|--------------------------------------|---------------|--------------------|-----------|------|---------------|----------------------------------------------------------------|
| Current Transfer ratio               | EL814         | 20                 | -         | 300  | %             | $I_F = \pm 1\text{mA}, V_{CE} = 5\text{V}$                     |
|                                      | EL814A        | 50                 | -         | 150  |               |                                                                |
| CTR Symmetry                         |               | 0.7                |           | 1.3  |               | $I_F = \pm 1\text{mA}, V_{CE} = 5\text{V}$                     |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | -                  | 0.05      | 0.2  | V             | $I_F = \pm 20\text{mA}, I_C = 1\text{mA}$                      |
| Isolation resistance                 | $R_{IO}$      | $5 \times 10^{10}$ | $10^{11}$ | -    | $\Omega$      | $V_{IO} = 500\text{Vdc}, 40\sim 60\% \text{R.H}$               |
| Cut-off frequency                    | $f_c$         | -                  | 80        | -    | kHz           | $V_{CE}=5\text{V}, I_C=2\text{mA}, R_L=100\Omega, -3\text{dB}$ |
| Floating capacitance                 | $C_{IO}$      | -                  | 0.6       | 1.0  | pF            | $V_{IO} = 0, f = 1\text{MHz}$                                  |
| Rise time                            | $T_r$         | -                  | 7         | 18   | $\mu\text{s}$ | $V_{CE}=2\text{V}, I_C=2\text{mA}, R_L=100\Omega$              |
| Fall time                            | $T_f$         | -                  | 11        | 18   | $\mu\text{s}$ |                                                                |

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

## Typical Electro-Optical Characteristics Curves



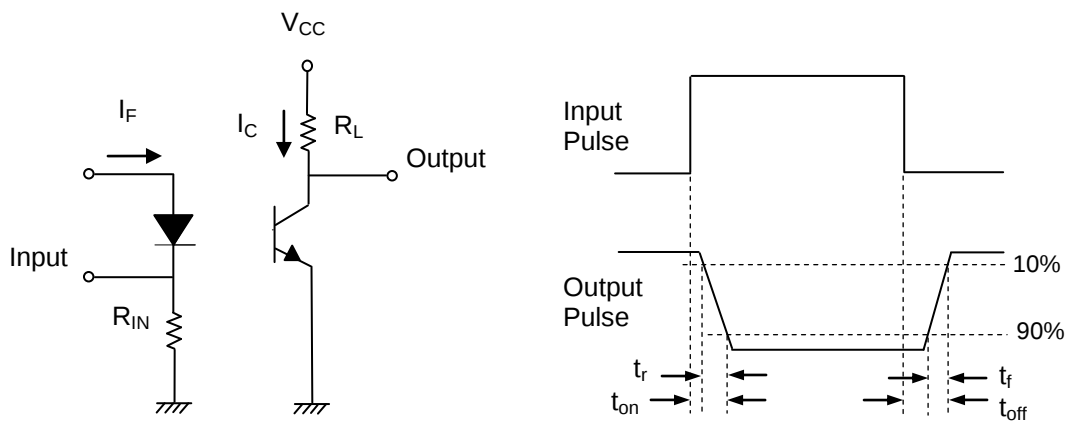
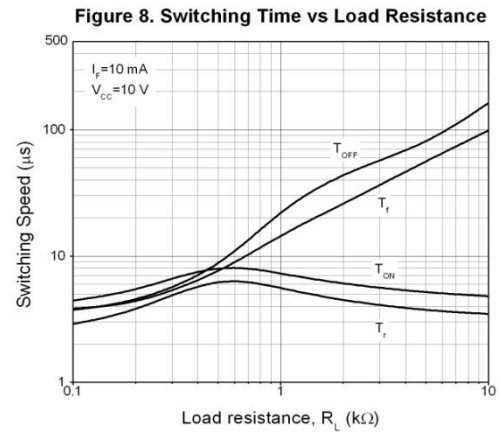
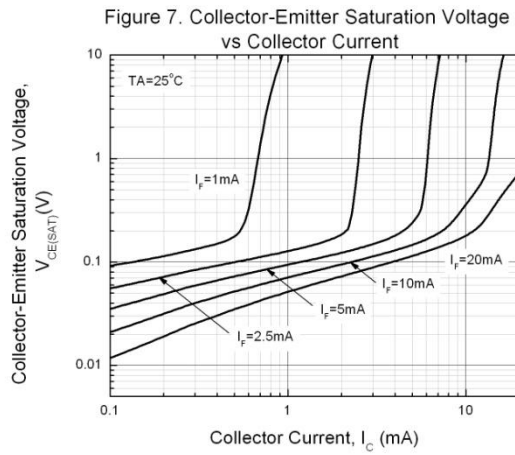


Figure 9. Switching Time Test Circuit & Waveforms

## Order Information

### Part Number

**EL814X(Y)(Z)-V**

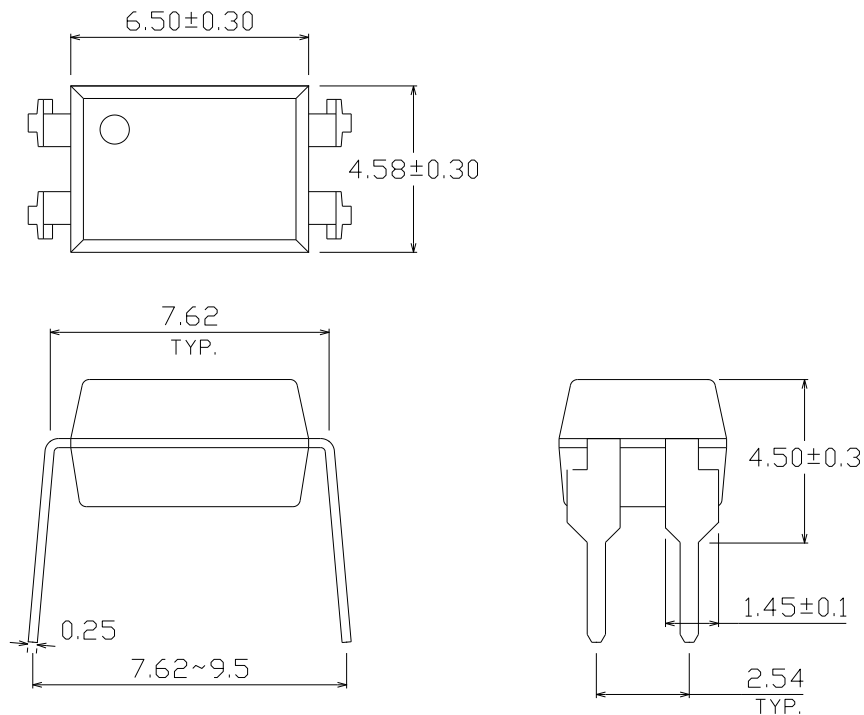
### Note

- 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).

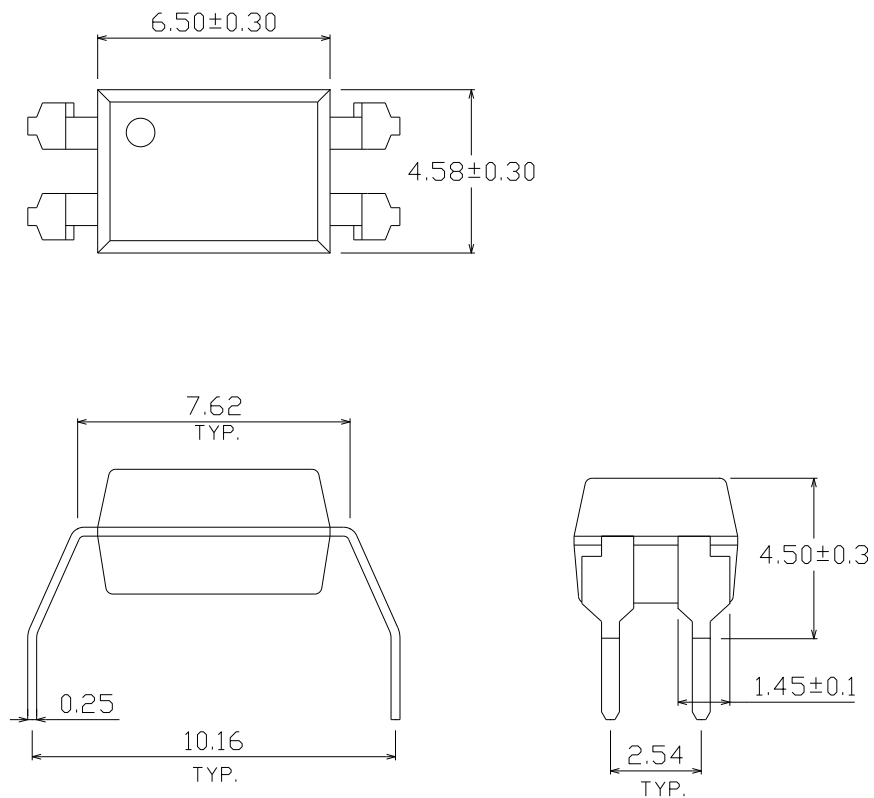
| Option  | Description                                                   | Packing quantity    |
|---------|---------------------------------------------------------------|---------------------|
| None    | Standard DIP-4                                                | 100 units per tube  |
| M       | 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)**

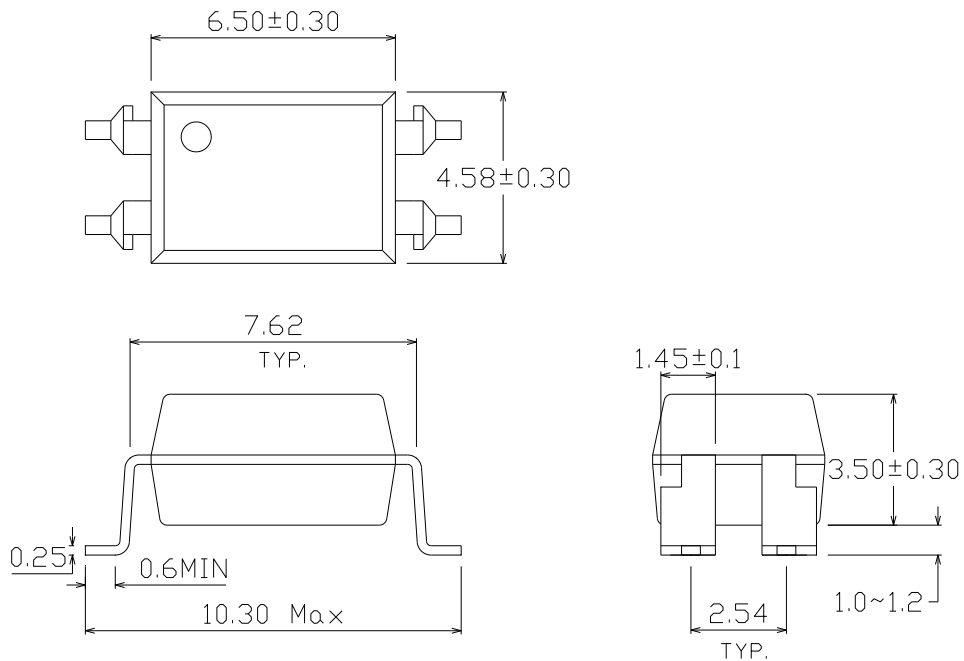
**Standard DIP Type**



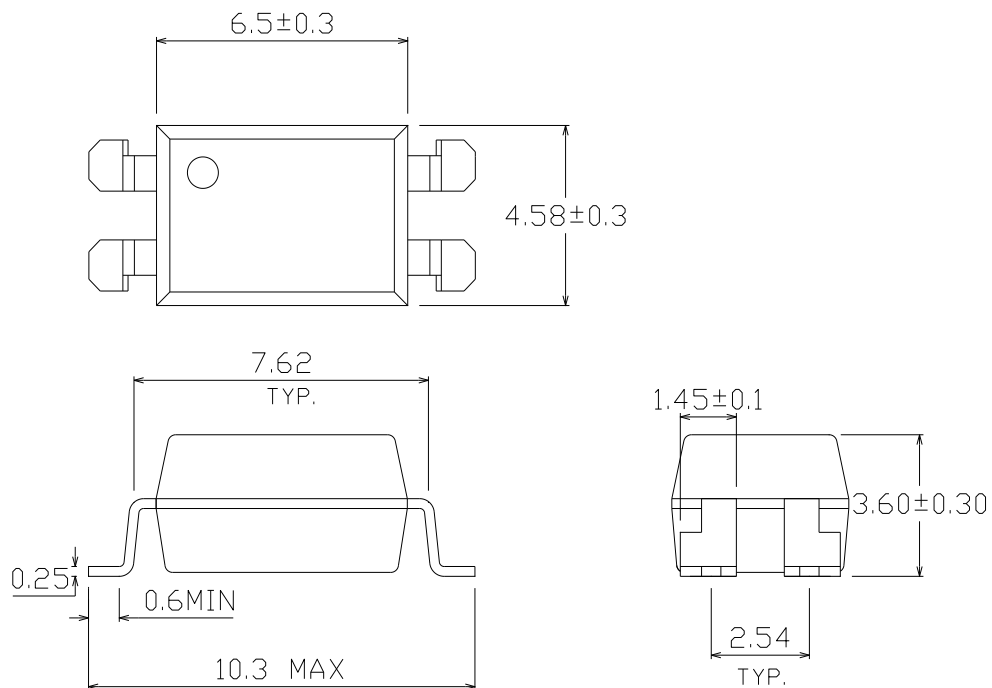
**Option M Type**



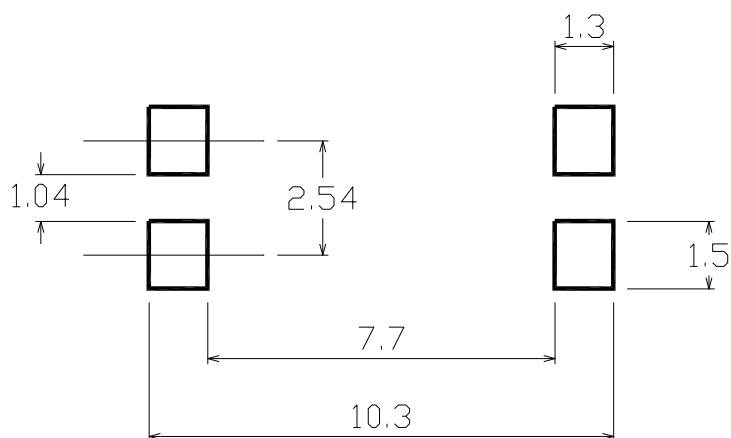
**Option S Type**



**Option S1 Type**



### Recommended pad layout for surface mount leadform



### Device Marking

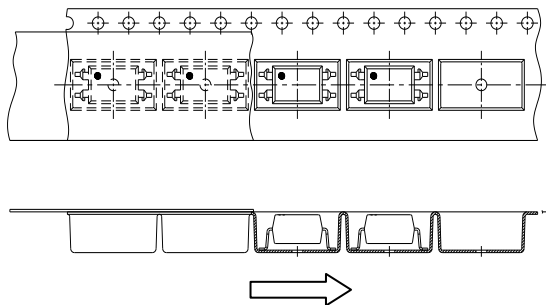


### Notes

|     |                              |
|-----|------------------------------|
| 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)       |

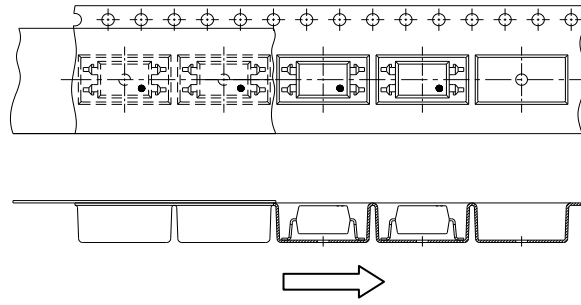
## Tape & Reel Packing Specifications

**Option TA**



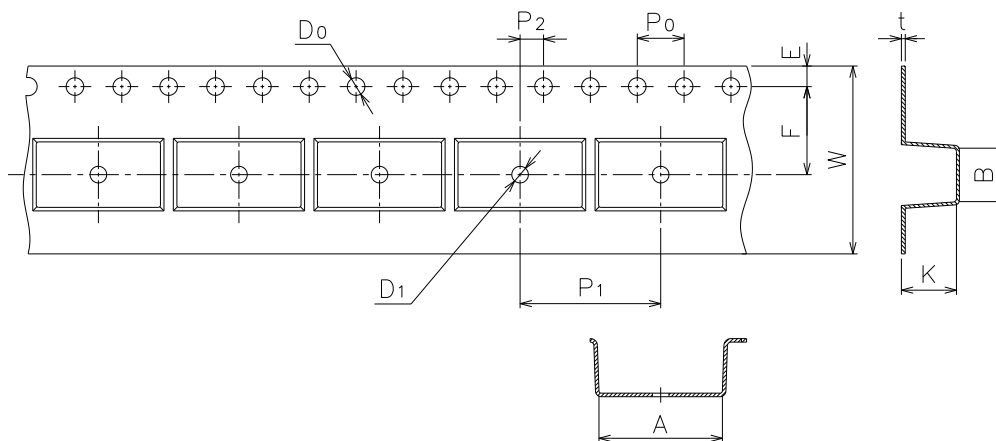
Direction of feed from reel

**Option TB**



Direction of feed from reel

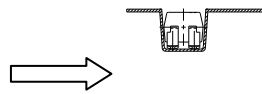
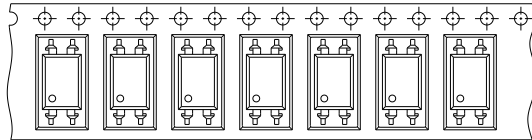
## Tape dimensions



| Dimension No.        | A        | B        | D0       | D1       | E        | F        |
|----------------------|----------|----------|----------|----------|----------|----------|
| Dimension (mm)<br>S  | 10.5±0.1 | 4.65±0.1 | 1.55±0.1 | 1.50±0.1 | 1.75±0.1 | 7.5±0.1  |
| Dimension (mm)<br>S1 | 10.5±0.1 | 4.65±0.1 | 1.55±0.1 | 1.50±0.1 | 1.75±0.1 | 7.5±0.1  |
| Dimension No.        | P0       | P1       | P2       | t        | W        | K        |
| Dimension (mm)<br>S  | 4.0±0.1  | 12.0±0.1 | 2.0±0.1  | 0.4±0.1  | 16.0±0.3 | 5.05±0.1 |
| Dimension (mm)<br>S1 | 4.0±0.1  | 12.0±0.1 | 2.0±0.1  | 0.4±0.1  | 16.0±0.3 | 4.75±0.1 |

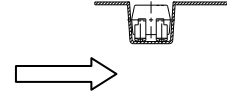
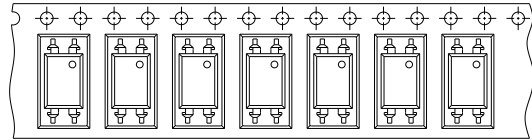
## Tape & Reel Packing Specifications

**Option TD**



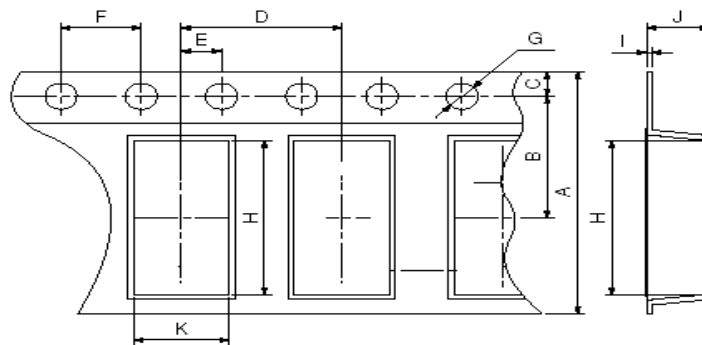
Direction of feed from reel

**Option TU**



Direction of feed from reel

## Tape dimensions

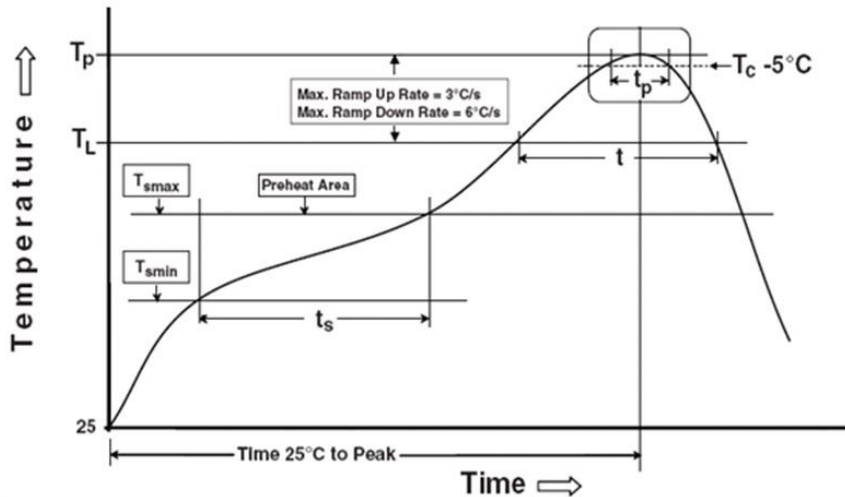


| Dimension No. | A         | B        | C        | D        | E       | F       |
|---------------|-----------|----------|----------|----------|---------|---------|
| Dimension(mm) | 16.00±0.3 | 7.5±0.1  | 1.75±0.1 | 8.0±0.1  | 2.0±0.1 | 4.0±0.1 |
| Dimension No. | G         | H        | I        | J        | K       |         |
| Dimension(mm) | 1.5±0.1   | 10.4±0.1 | 0.4±0.1  | 4.60±0.1 | 5.1±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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