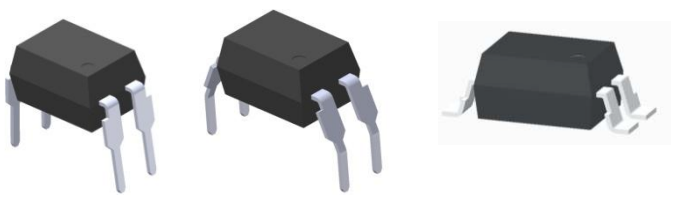
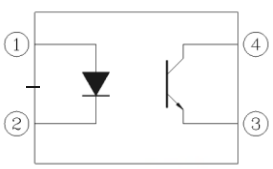
DATASHEET

# 4 PIN DIP PHOTOTRANSISTOR PHOTOCOUPLER
# EL816 Series



Schematic




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

**Features:**

- Compliance Halogens Free (Only copper leadframe)
  (Br < 900 ppm, Cl < 900 ppm, Br+Cl < 1500 ppm)
- Current transfer ratio
  (CTR: 50~600% at $I_F$ = 5mA, $V_{CE}$ = 5V)
  (CTR: 63~320% at $I_F$ = 10mA, $V_{CE}$ = 5V)
- High isolation voltage between input and output (Viso=5000Vrms)
- Creepage distance > 7.62mm
- 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
- CQC approved

## Description

The EL816 series of devices each consist of an infrared emitting diodes, optically coupled to a phototransistor detector.
They are packaged in a 4-pin DIP package and available in wide-lead spacing and SMD option.

## Applications

- Programmable controllers
- System appliances, measuring instruments
- Telecommunication equipments
- Home appliances, such as fan heaters, etc.
- Signal transmission between circuits 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 $T_a$ = 100°C | $P_D$ | 100 | mW |
| Output | Power dissipation | $P_C$ | 150 | mW |
| | Derating factor (above $T_a$ = 80°C) | | 5.8 | mW/°C |
| | Collector current | $I_C$ | 50 | mA |
| | 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 | Vrms |
| 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 |
| Reverse Current | $I_R$ | - | - | 10 | μA | $V_R$ = 4V |
| Input capacitance | $C_{in}$ | - | 30 | 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 | EL816 | CTR | 50 | - | 600 | % | $I_F$ = 5mA ,$V_{CE}$ = 5V |
| | EL816A | | 80 | - | 160 | | |
| | EL816B | | 130 | - | 260 | | |
| | EL816C | | 200 | - | 400 | | |
| | EL816D | | 300 | - | 600 | | |
| | EL816X | | 100 | - | 200 | | |
| | EL816Y | | 150 | - | 300 | | |
| | EL816I | CTR | 63 | - | 125 | % | $I_F$ = 10mA ,$V_{CE}$ = 5V |
| | EL816J | | 100 | - | 200 | | |
| | EL816K | | 160 | - | 320 | | |
| | EL816I | | 22 | - | - | | $I_F$ = 1mA ,$V_{CE}$ = 5V |
| | EL816J | | 34 | - | - | | |
| | EL816K | | 56 | - | - | | |

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

| Parameter | Symbol | Min | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| Collector-Emitter saturation voltage | $V_{CE(sat)}$ | - | 0.1 | 0.2 | V | $I_F$ = 20mA ,$I_C$ = 1mA |
| Isolation resistance | $R_{IO}$ | $5\times10^{10}$ | - | - | Ω | $V_{IO}$ = 500Vdc, 40~60% R.H. |
| Floating capacitance | $C_{IO}$ | - | 0.6 | 1.0 | pF | $V_{IO}$ = 0, f = 1MHz |
| Cut-off frequency | fc | - | 80 | - | kHz | $V_{CE}$ = 5V, $I_C$ = 2mA $R_L$ = 100Ω, -3dB |
| Rise time | $t_r$ | - | 4 | 18 | µs | $V_{CE}$ = 2V, $I_C$ = 2mA, $R_L$ = 100Ω |
| Fall time | $t_f$ | - | 3 | 18 | µs | |

* Typical values at $T_a$ = 25°C

## Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

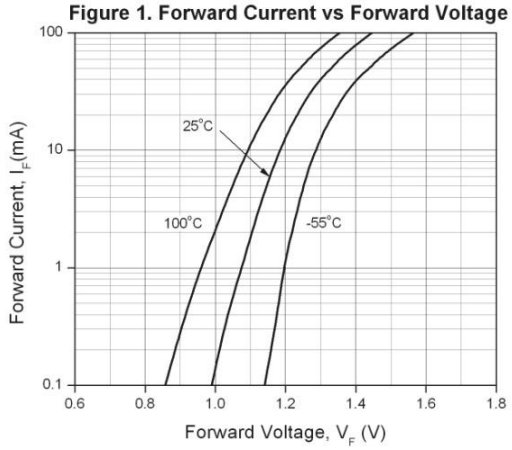



Figure 2. Normalized Collector Current vs Forward Current

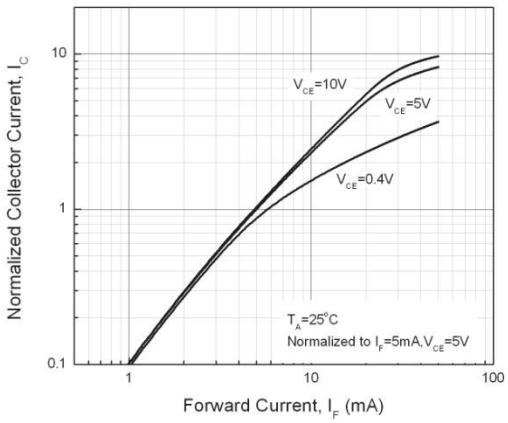



Figure 3. Normalized Current Transfer Ratio vs Forward Current

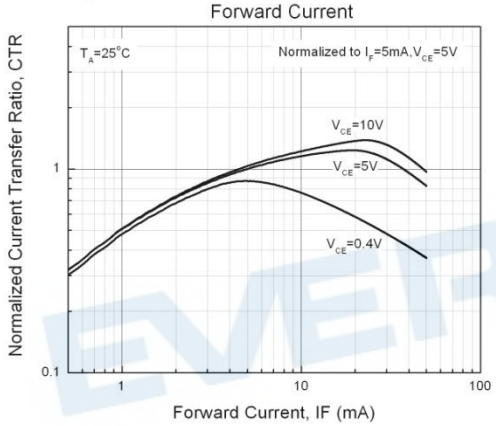



Figure 4. Normalized Collector Current vs Ambient Temperature

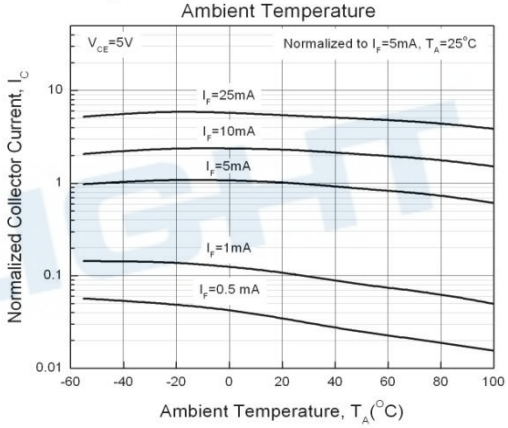



Figure 5. Collector Current vs Collector-Emitter Voltage

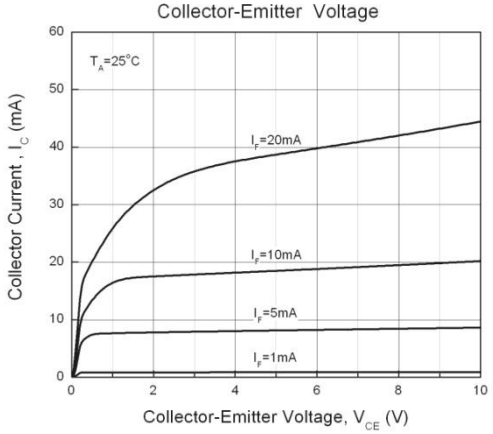



Figure 6. Collector Current vs Collector-Emitter Voltage

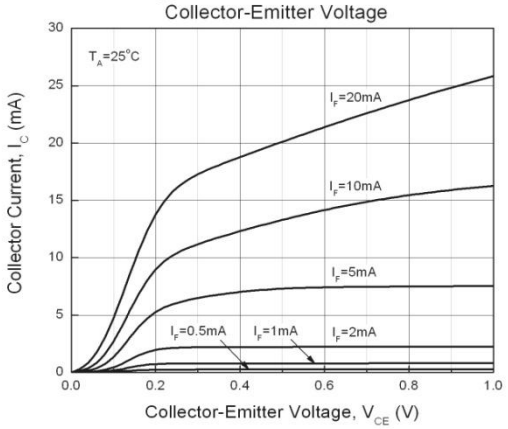


Figure 7. Collector Dark Current vs Ambient Temperature

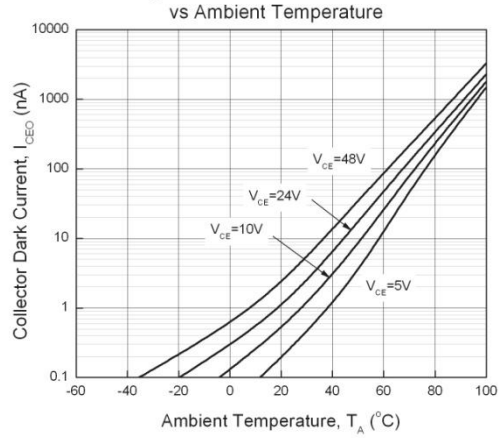



Figure 8. Switching Time vs Load Resistance

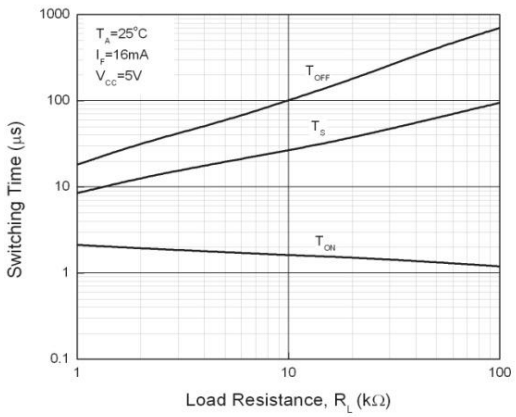
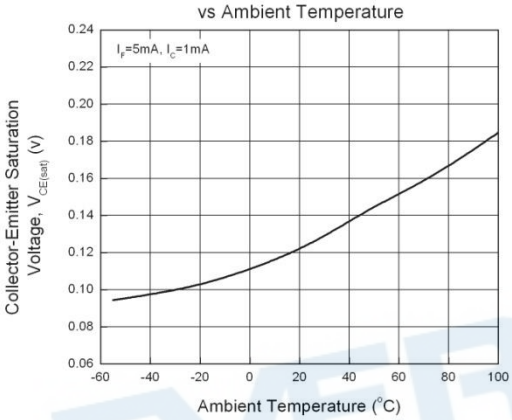



Figure 9. Collector-Emitter Saturation Voltage vs Ambient Temperature





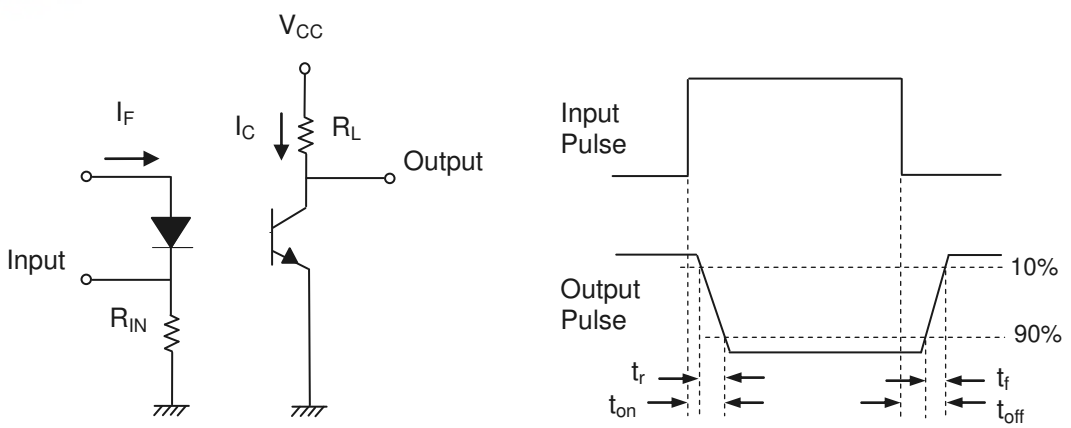




**Figure 10. Switching Time Test Circuit & Waveforms**

## Order Information

### Part Number

# EL816X(Y)(Z)-FV

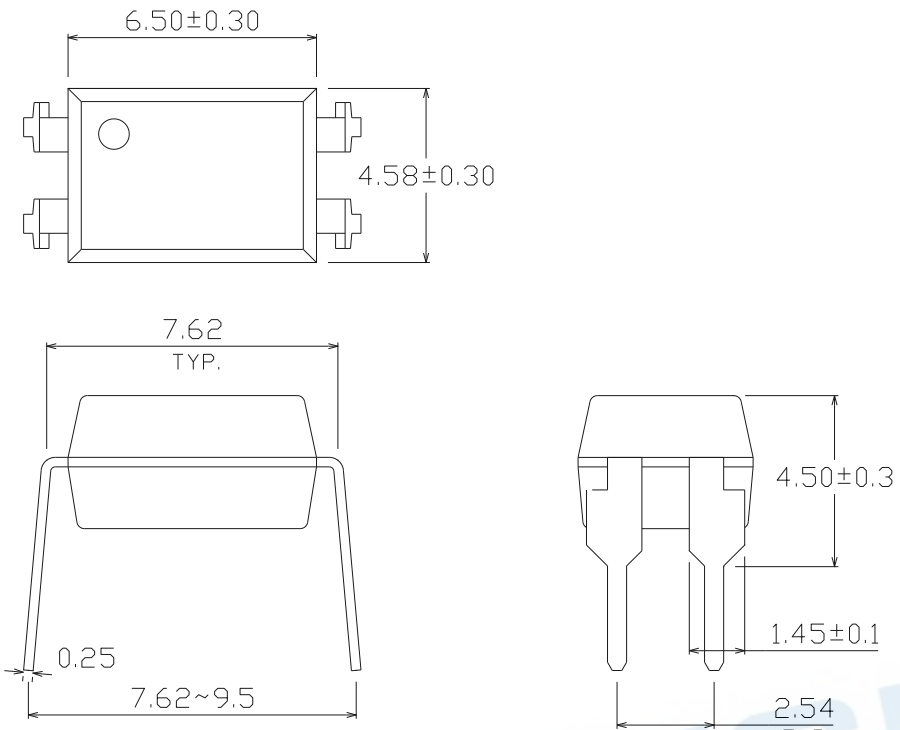
**Note**

X = Lead form option (S1, S2, M or none)
Y = CTR Rank (A, B, C, D, X, Y, I, J, K or none)
Z = Tape and reel option (TU, TD or none).
F = Lead frame option (F: Iron, None: copper)
V = VDE safety (optional).

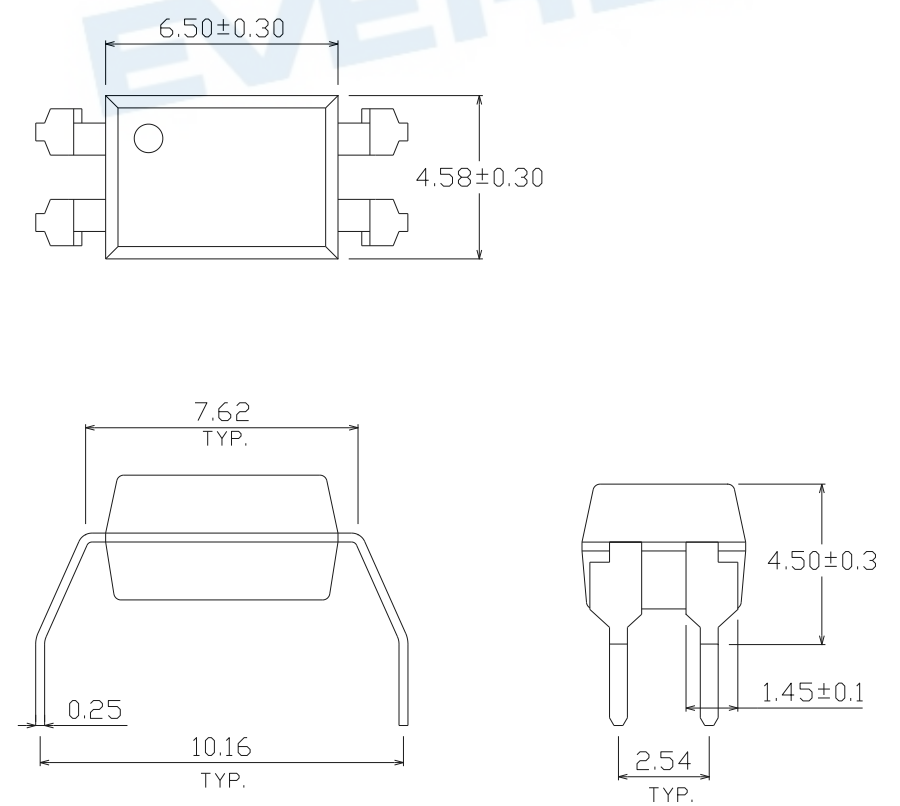
| Option | Description | Packing quantity |
|---|---|---|
| None | Standard DIP-4 | 100 units per tube |
| M | Wide lead bend (0.4 inch spacing) | 100 units per tube |
| S1 (TU) | Surface mount lead form (low profile) + TU tape & reel option | 1500 units per reel |
| S1 (TD) | Surface mount lead form (low profile) + TD tape & reel option | 1500 units per reel |
| S2 (TU) | Surface mount lead form (low profile) + TU tape & reel option | 2000 units per reel |
| S2 (TD) | Surface mount lead form (low profile) + TD tape & reel option | 2000 units per reel |

## Package Dimension (Dimensions in mm)

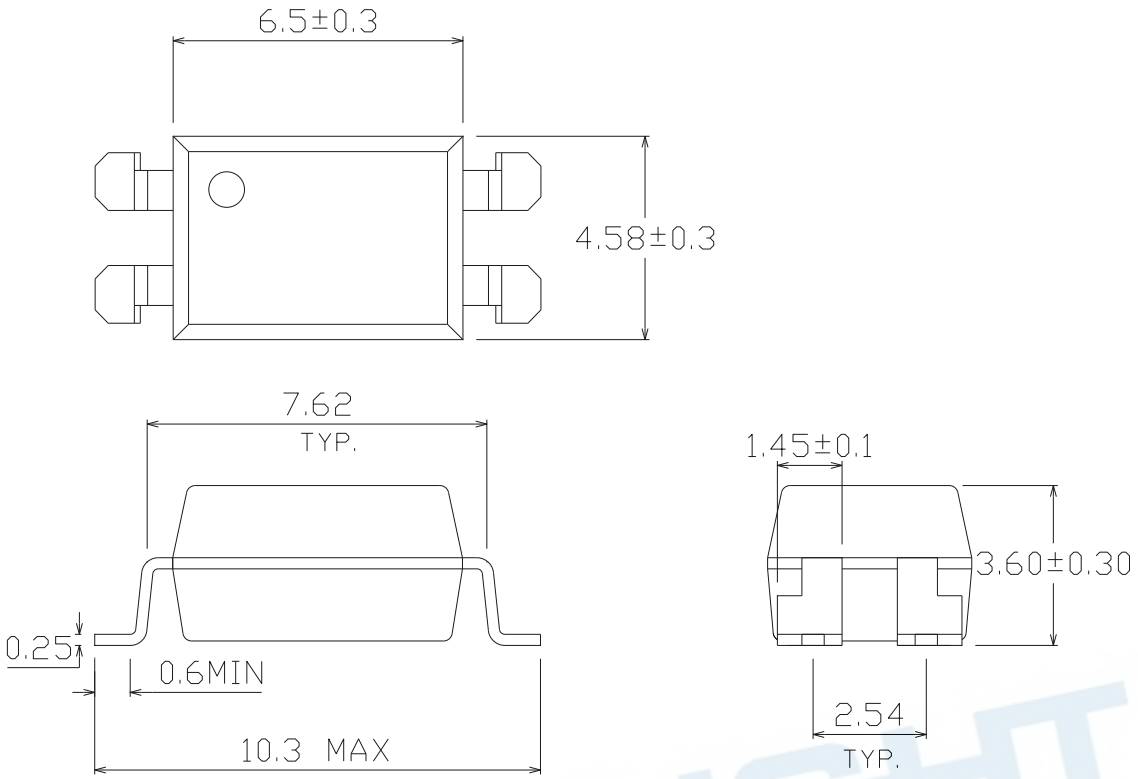
### Standard DIP Type



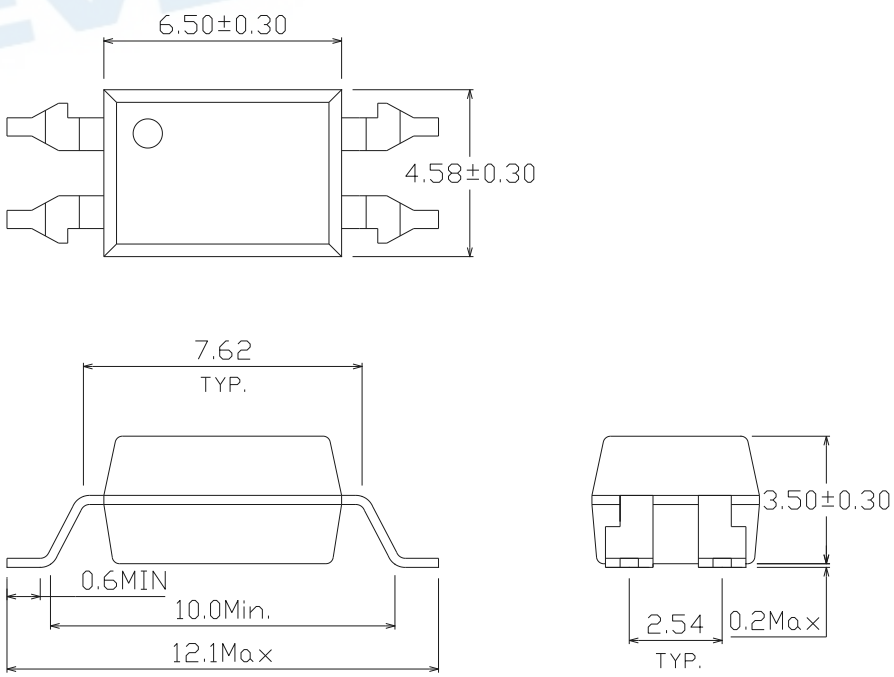

### Option M Type



## Option S1 Type

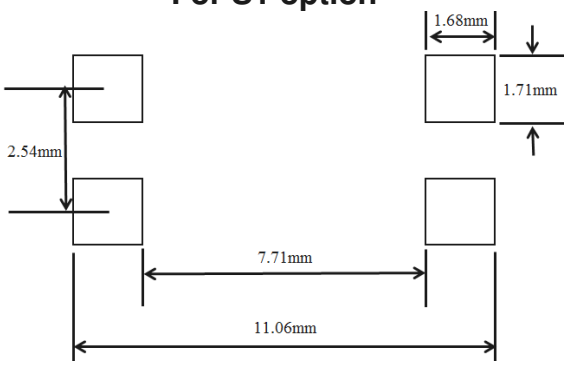



## Option S2 Type

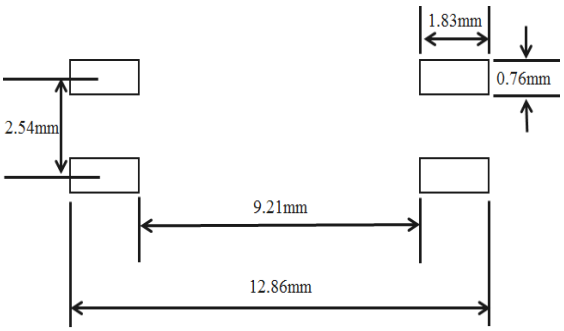


## Recommended pad layout for surface mount leadform

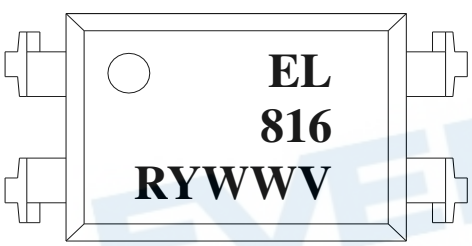
### For S1 option




### For S2 option




## Device Marking



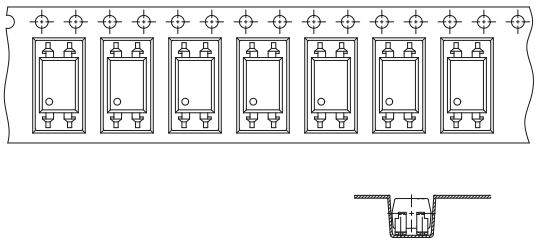



**Notes**

| | |
|---|---|
| EL | denotes EVERLIGHT |
| 816 | denotes Device Number |
| R | denotes CTR Rank(A, B, C, D, X, Y, I, J, K or none) |
| Y | denotes 1 digit Year code |
| WW | denotes 2 digit Week code |
| V | denotes VDE (optional) |

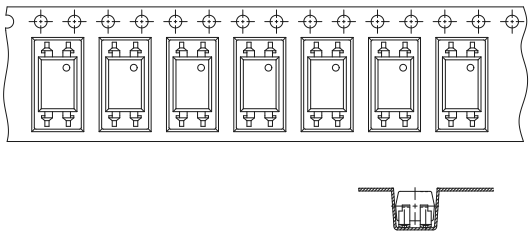
## Tape & Reel Packing Specifications

**Option TD**



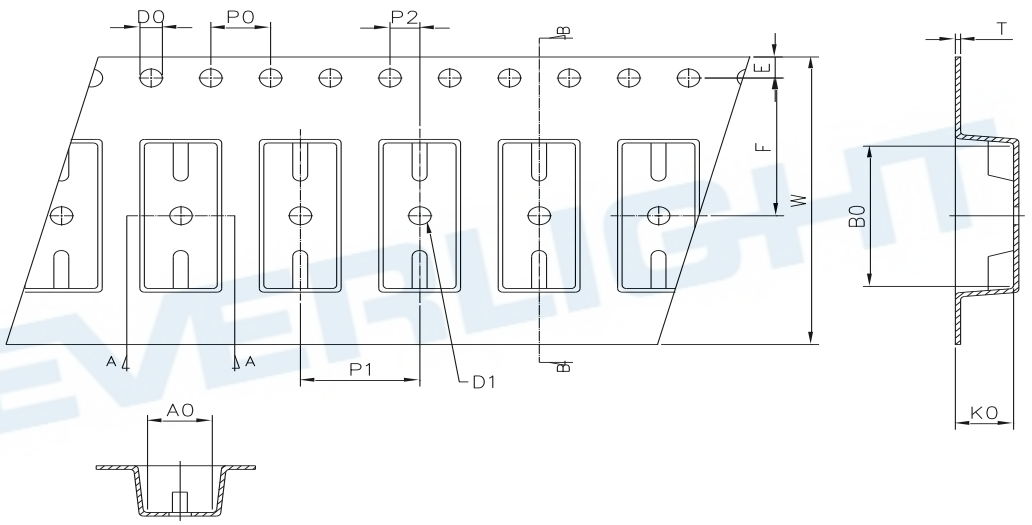
Direction of feed from reel

**Option TU**



Direction of feed from reel

## Tape dimensions

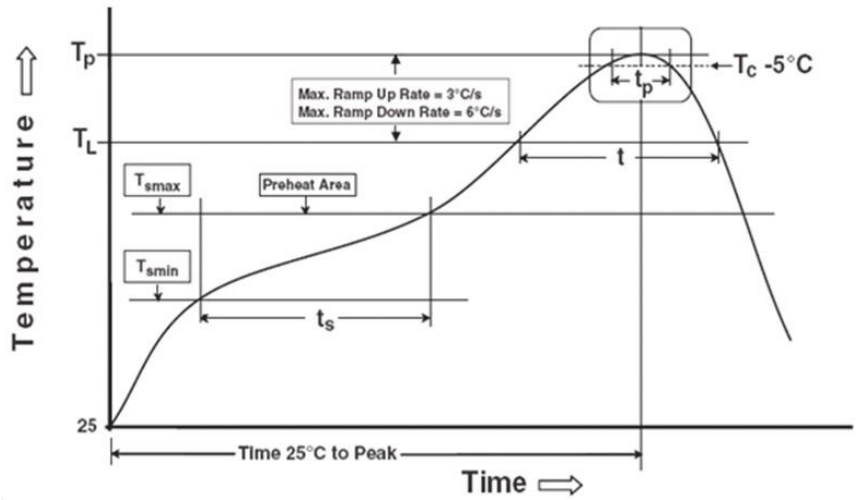



| Dimension No. | **Ao** | **Bo** | **Do** | **D1** | **E** | **F** |
|---|---|---|---|---|---|---|
| Dimension (mm) S1 | 4.90±0.1 | 10.40±0.1 | 1.5±0.1 | 1.50±0.1 | 1.75±0.1 | 7.50±0.1 |
| Dimension (mm) S2 | 4.88±0.1 | 12.55±0.1 | 1.5±0.1 | 1.50±0.1 | 1.75±0.1 | 11.5±0.1 |
| Dimension No. | **Po** | **P1** | **P2** | **t** | **W** | **Ko** |
| Dimension (mm) S1 | 4.00±0.1 | 8.00±0. | 2.00±0.1 | 0.40±0.1 | 16.00±0.3 | 4.60±0.1 |
| Dimension (mm) S2 | 4.00±0.1 | 8.00±0.1 | 2.00±0.1 | 0.40±0.1 | 24.00±0.3 | 4.00±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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