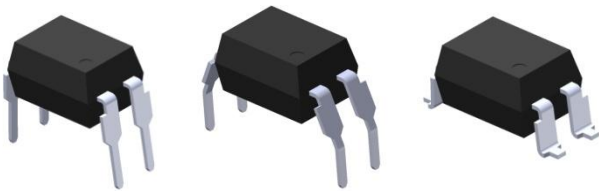




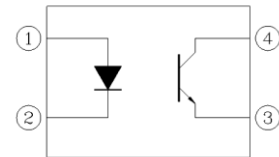
**THE DATASHEET OF  
EEH-ZE1E221P**



### 4 PIN DIP PHOTOTRANSISTOR PHOTOCOUPLER EL816 Series



Schematic



Pin Configuration

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

#### Features:

- Current transfer ratio  
(CTR: 50~600% at  $I_F = 5\text{mA}$ ,  $V_{CE} = 5\text{V}$ )  
(CTR: 63~320% at  $I_F = 10\text{mA}$ ,  $V_{CE} = 5\text{V}$ )
- High isolation voltage between input and output ( $V_{iso} = 5000\text{Vrms}$ )
- 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 No derating required up to $T_a = 100^\circ\text{C}$	$P_D$	100	mW
Output	Power dissipation Derating factor (above $T_a = 80^\circ\text{C}$ )	$P_C$	150 5.8	mW 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°C unless specified otherwise)**

**Input**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	$V_F$	-	1.2	1.4	V	$I_F = 20\text{mA}$
Reverse Current	$I_R$	-	-	10	$\mu\text{A}$	$V_R = 4\text{V}$
Input capacitance	$C_{in}$	-	30	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	EL816	50	-	600	%	$I_F = 5\text{mA}, V_{CE} = 5\text{V}$		
	EL816A	80	-	160				
	EL816B	130	-	260				
	EL816C	200	-	400				
	EL816D	300	-	600				
	EL816X	100	-	200				
	EL816Y	150	-	300				
	EL816I	63	-	125			$I_F = 10\text{mA}, V_{CE} = 5\text{V}$	
	EL816J	100	-	200				
	EL816K	160	-	320				
	EL816I	22	-	-				
	EL816J	34	-	-				$I_F = 1\text{mA}, V_{CE} = 5\text{V}$
	EL816K	56	-	-				

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

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

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

Typical Electro-Optical Characteristics Curves

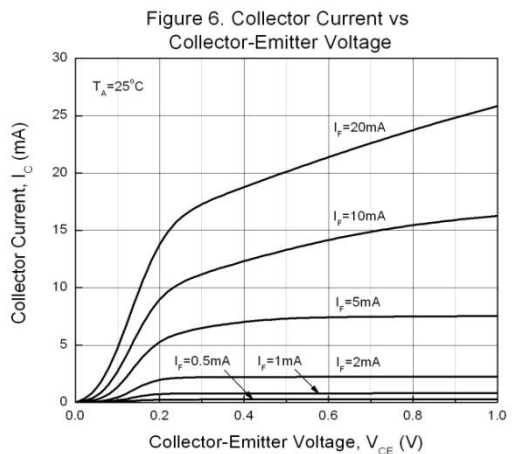
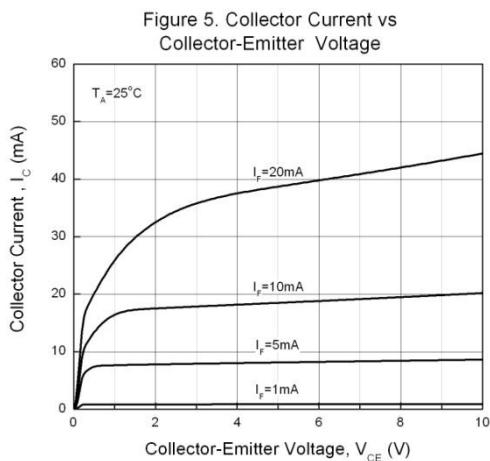
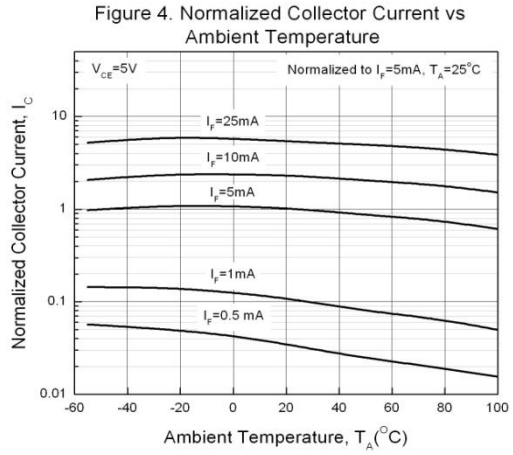
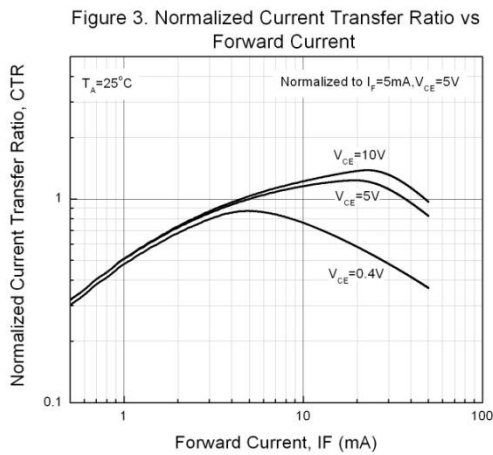
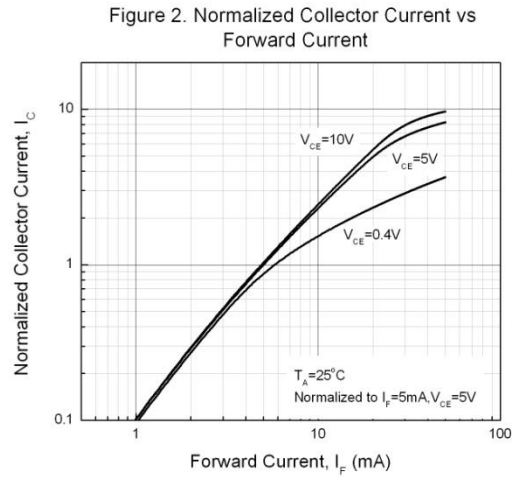
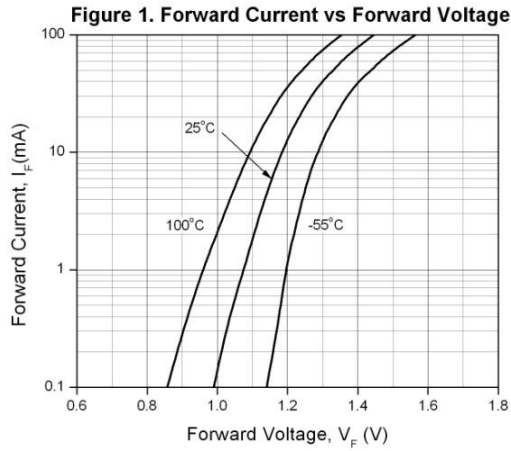


Figure 7. Collector Dark Current vs Ambient Temperature

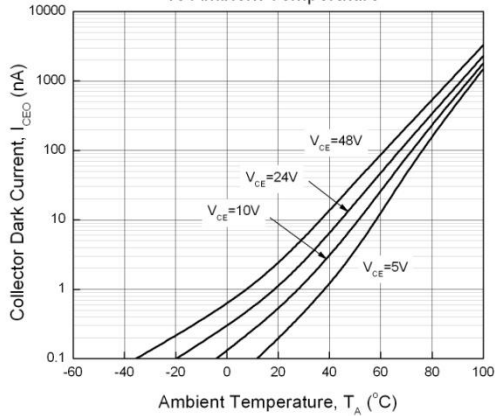


Figure 8. Switching Time vs Load Resistance

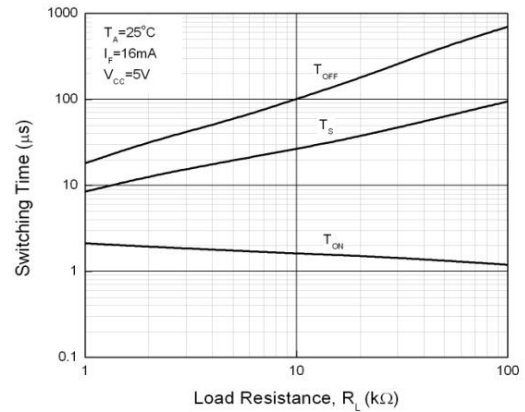


Figure 9. Collector-Emitter Saturation Voltage vs Ambient Temperature

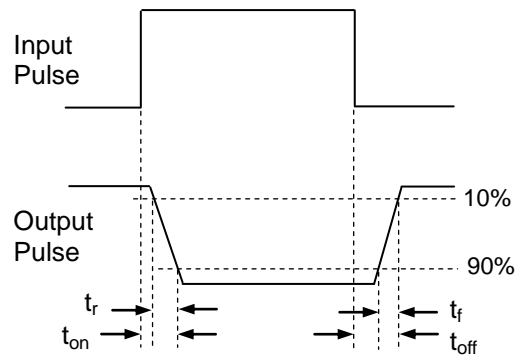
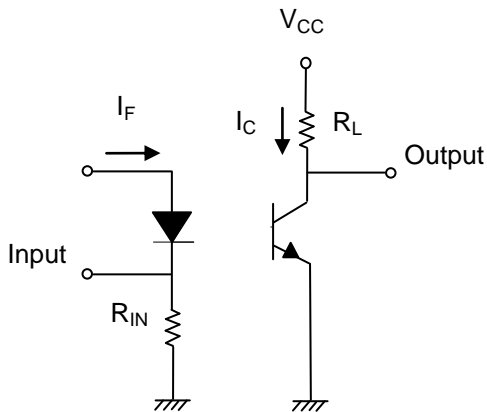
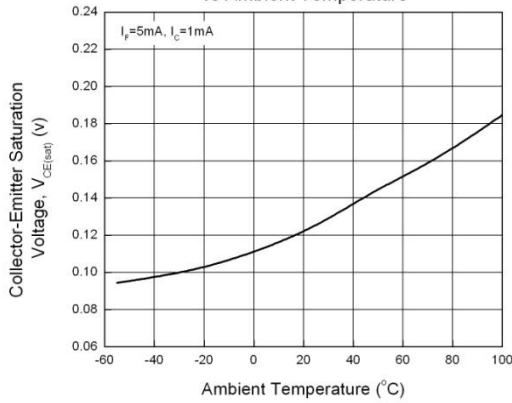


Figure 10. Switching Time Test Circuit & Waveforms

**Order Information**

**Part Number**

**EL816X(Y)(Z)-FV**

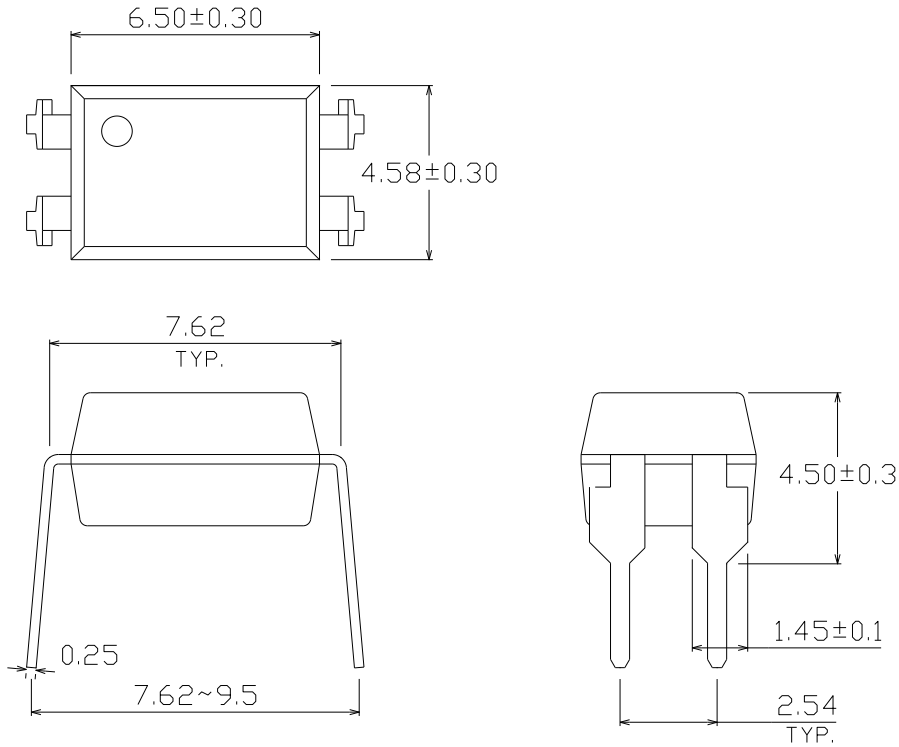
**Note**

- X = Lead form option (S, 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).

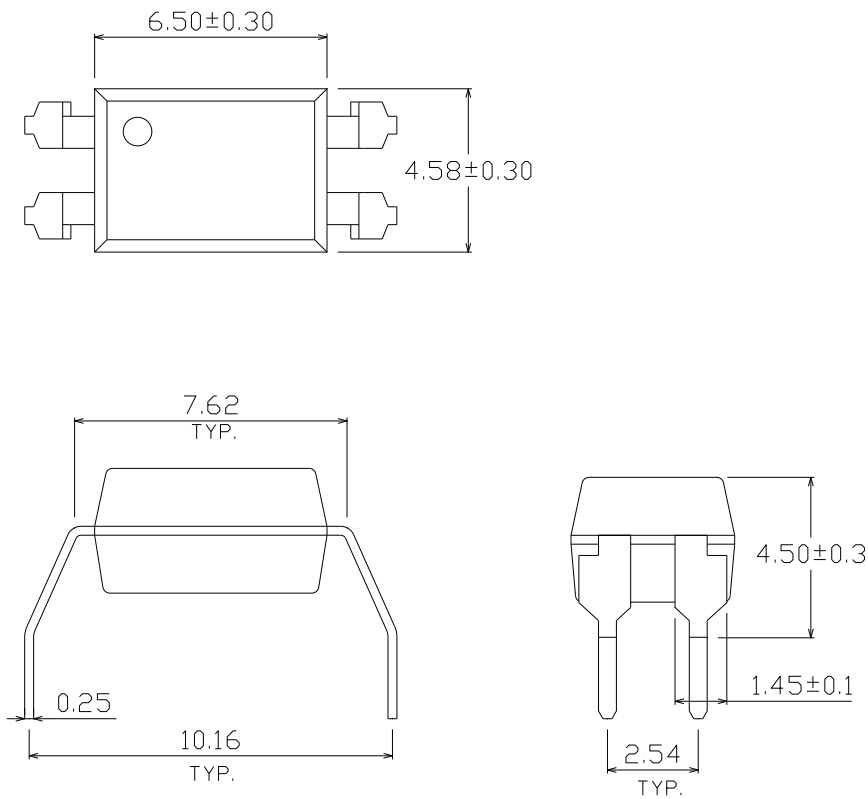
Option	Description	Packing quantity
None	Standard DIP-4	100 units per tube
M	Wide lead bend (0.4 inch spacing)	100 units per tube
S (TU)	Surface mount lead form + TU tape & reel option	1500 units per reel
S (TD)	Surface mount lead form + TD tape & reel option	1500 units per reel
S1 (TU)	Surface mount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

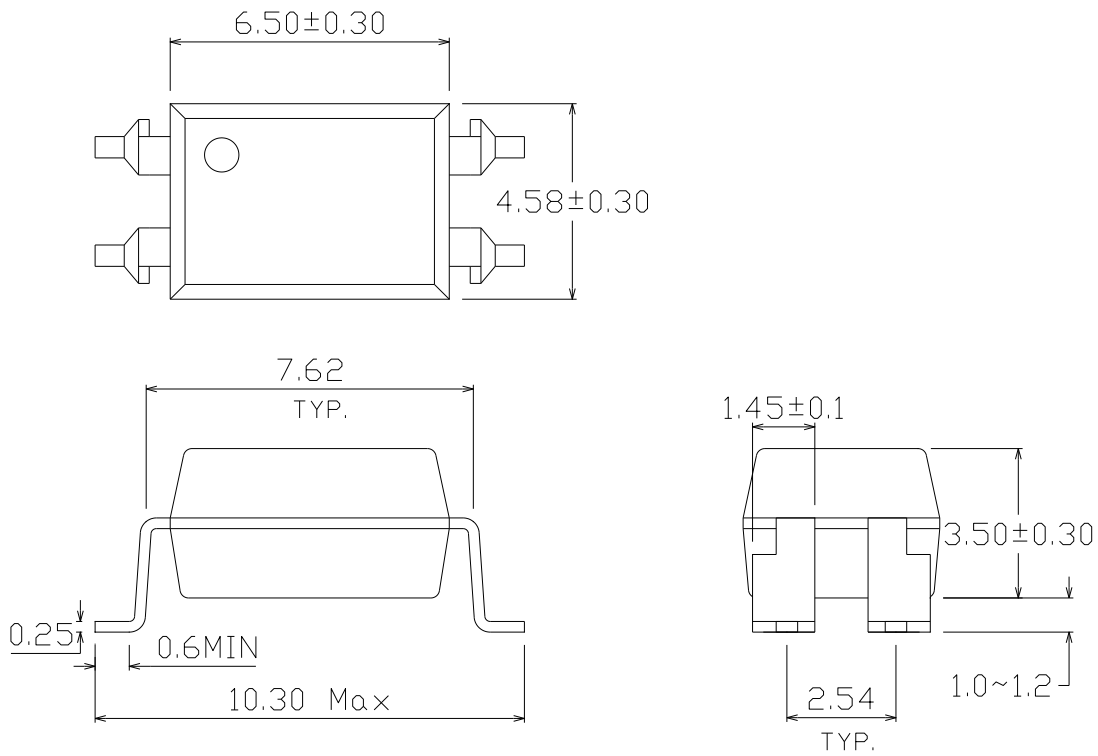
Standard DIP Type



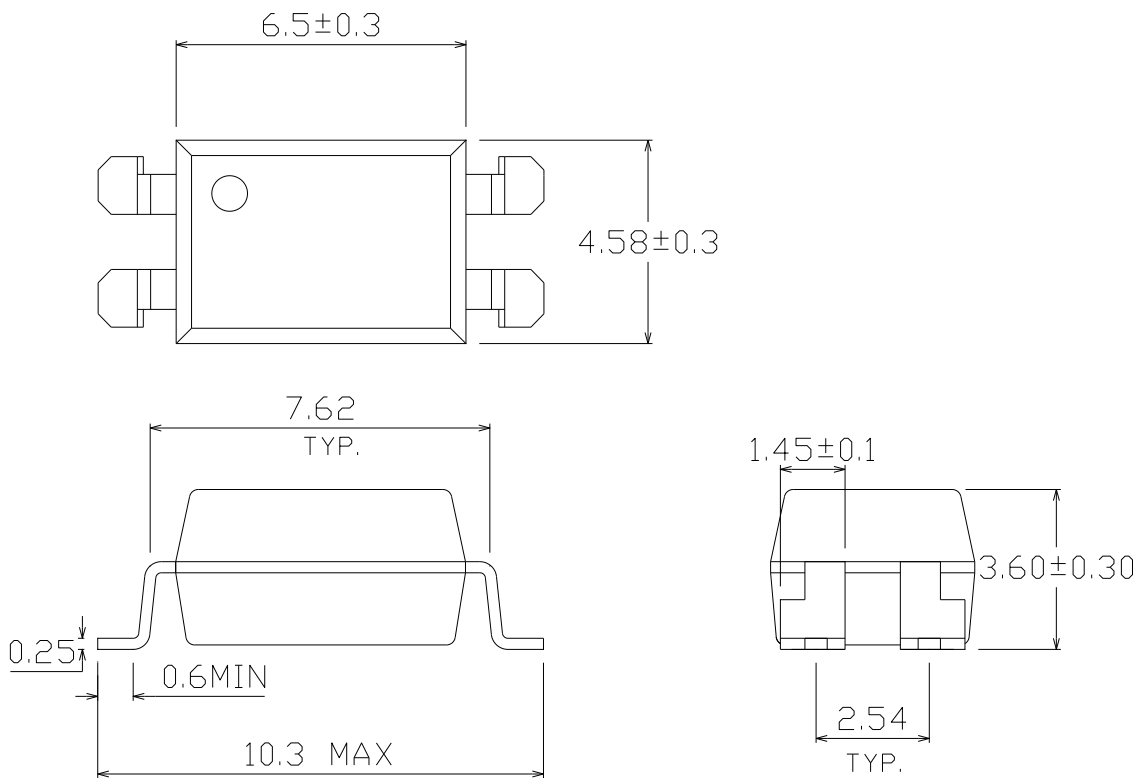
Option M Type



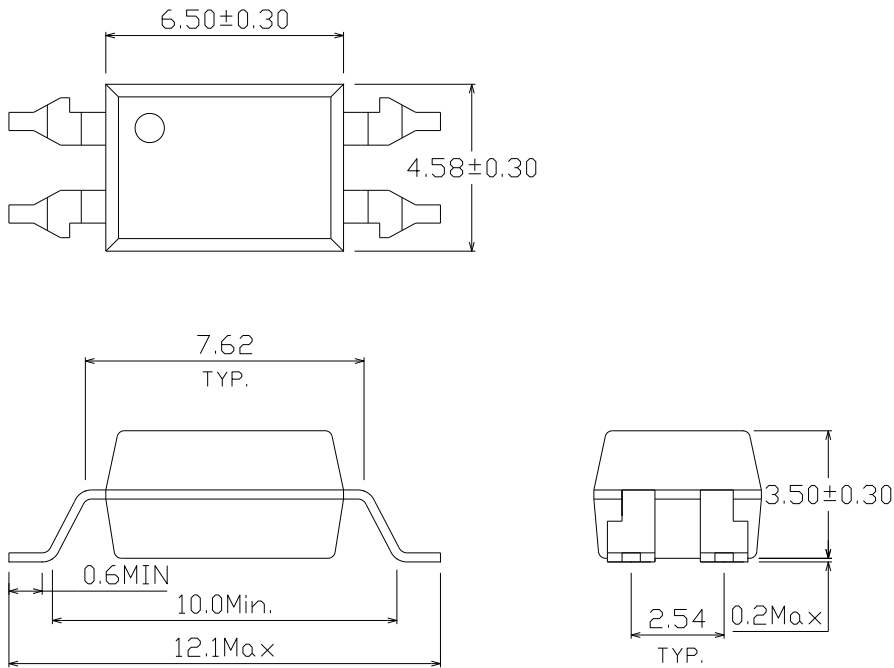
**Option S Type**



**Option S1 Type**

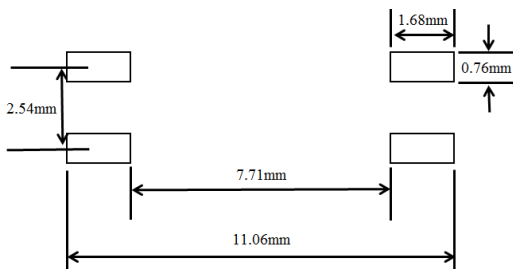


**Option S2 Type**

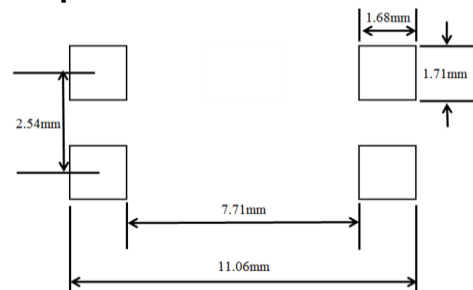


**Recommended pad layout for surface mount leadform**

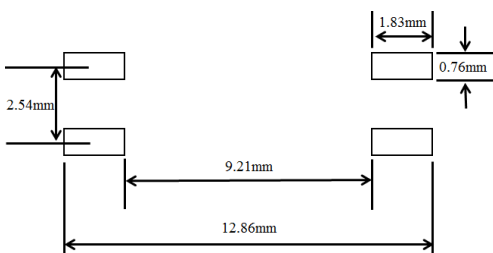
**For S option**



**For S1 option**



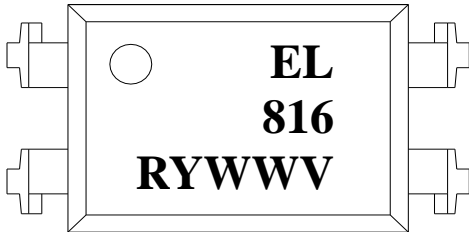
**For S2 option**



**Notes**

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

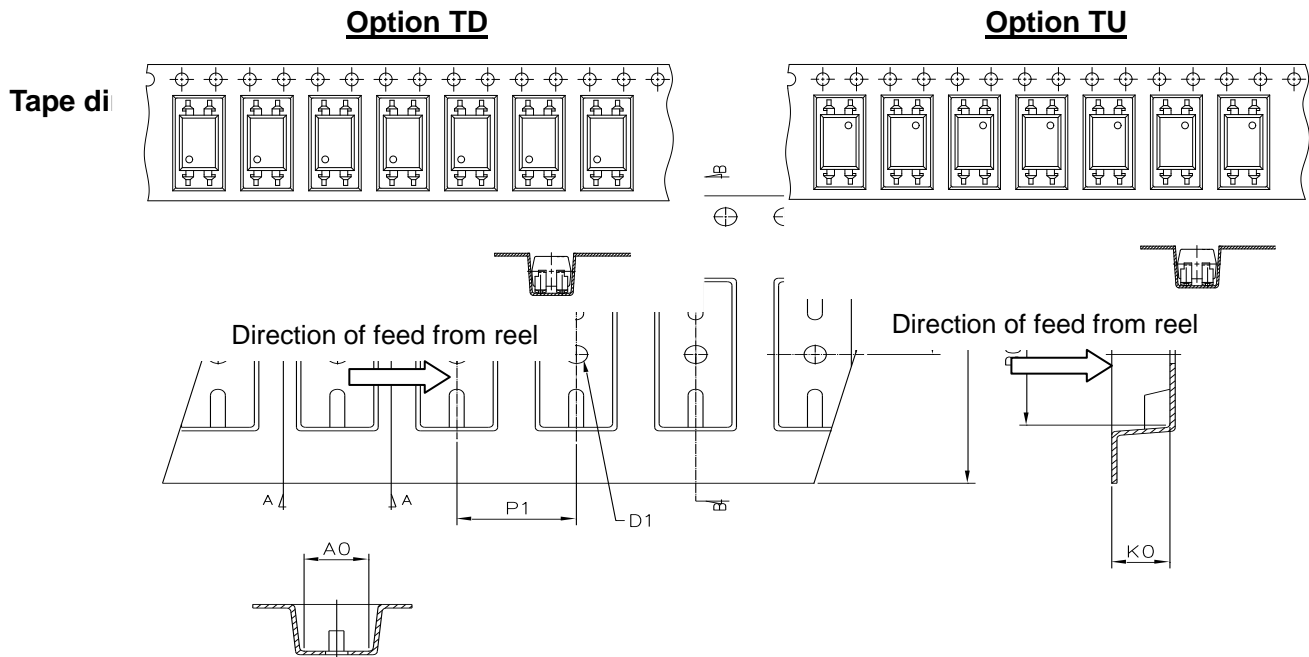
## Device Marking



## Notes

EL	denotes EVERLIGHT
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**

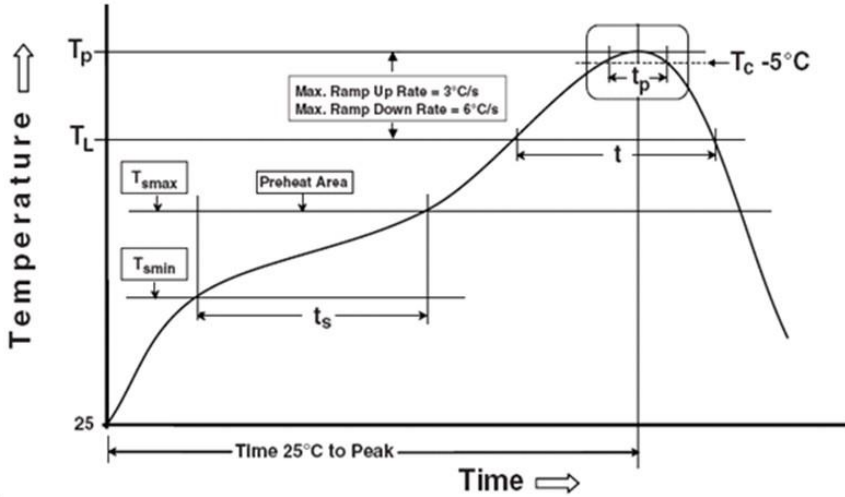


Dimension No.	<b>Ao</b>	<b>Bo</b>	<b>Do</b>	<b>D1</b>	<b>E</b>	<b>F</b>
Dimension (mm) S.S1	4.90±0.1	10.40±0.1	1.5±0.1	1.50±0.1	1.75±0.1	7.50±0.1
Dimension (mm) S2	4.88±0.1	12.55±0.1	1.5±0.1	1.50±0.1	1.75±0.1	11.5±0.1
Dimension No.	<b>Po</b>	<b>P1</b>	<b>P2</b>	<b>t</b>	<b>W</b>	<b>Ko</b>
Dimension (mm) S.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: $T_p - 5^\circ\text{C}$	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

## **DISCLAIMER**

1. EVERLIGHT reserves the right(s) on the adjustment of product material mix for the specification.
2. The product meets EVERLIGHT published specification for a period of twelve (12) months from date of shipment.
3. The graphs shown in this datasheet are representing typical data only and do not show guaranteed values.
4. When using this product, please observe the absolute maximum ratings and the instructions for using outlined in these specification sheets. EVERLIGHT assumes no responsibility for any damage resulting from the use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.
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