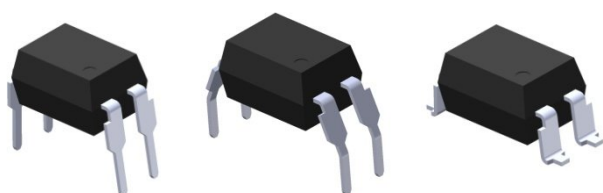
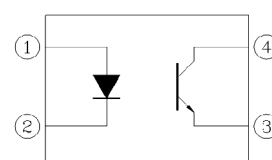


### 4 PIN DIP PHOTOTRANSISTOR PHOTOCOUPLER EL816 Series



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 inputs and output ( $V_{iso} = 5000\text{ V rms}$ )
- Creepage distance  $> 7.62\text{ mm}$
- Operating temperature up to  $+110^\circ\text{C}$
- Compact small outline package
- Pb free and RoHS compliant.
- UL and cUL approved (No. E214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO 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	-	-			
	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	$t_r$	-	4	18	$\mu\text{s}$	$V_{CE} = 2\text{V}, I_C = 2\text{mA}$ , $R_L = 100\Omega$
Fall time	$t_f$	-	3	18	$\mu\text{s}$	

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

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Typical Electro-Optical Characteristics Curves

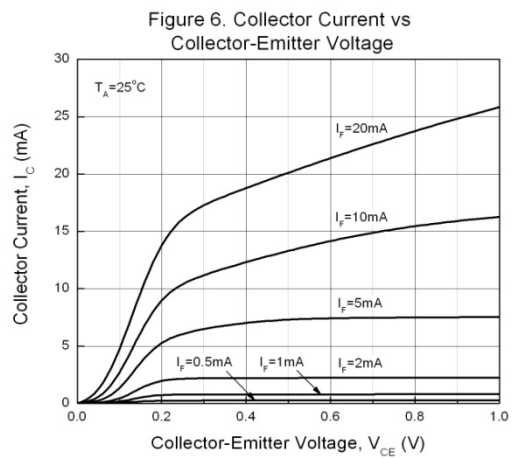
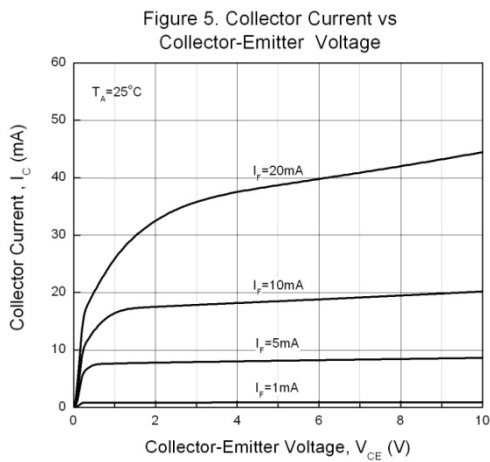
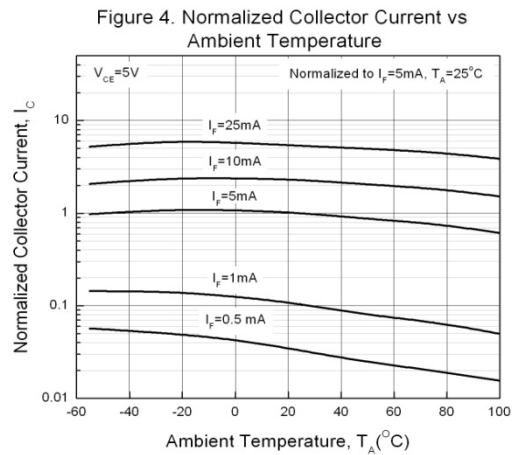
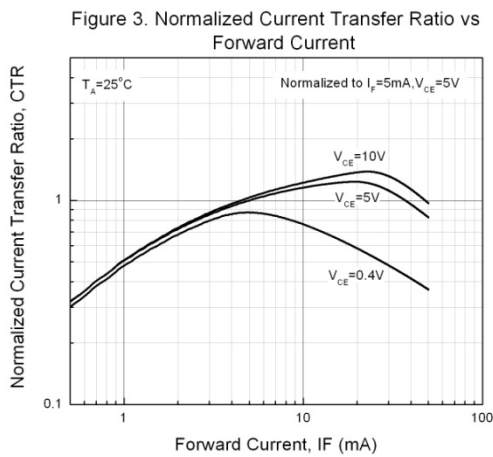
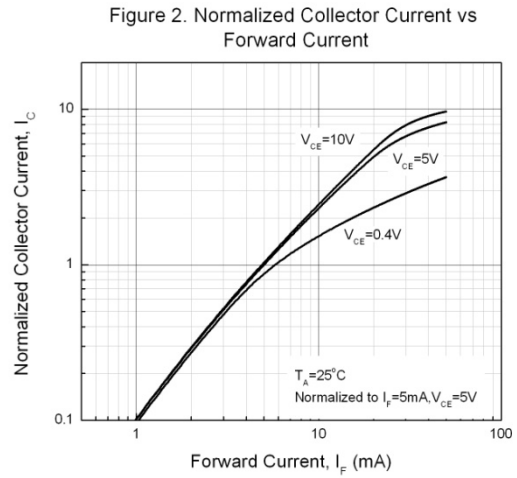
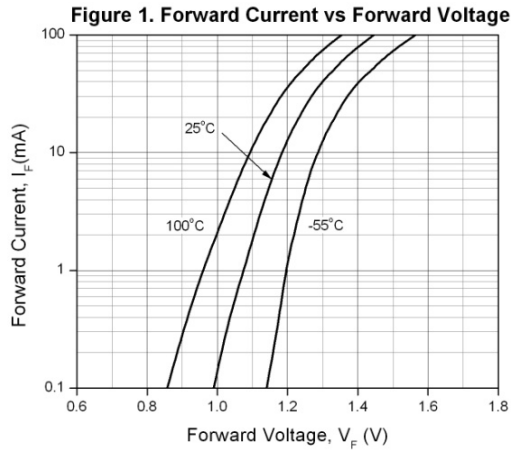


Figure 7. Collector Dark Current vs Ambient Temperature

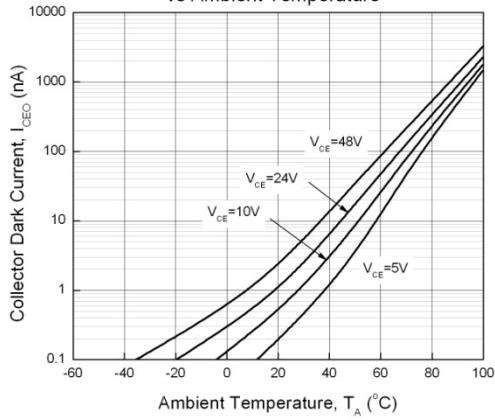


Figure 8. Switching Time vs Load Resistance

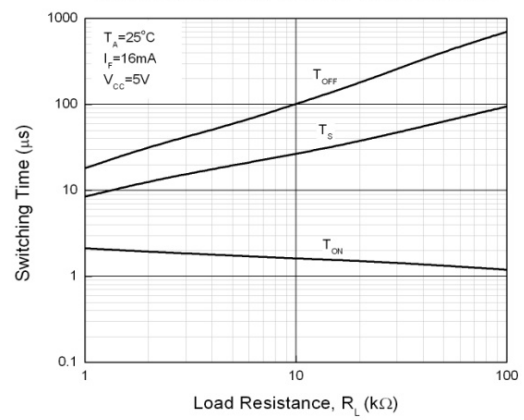


Figure 9. Collector-Emitter Saturation Voltage vs Ambient Temperature

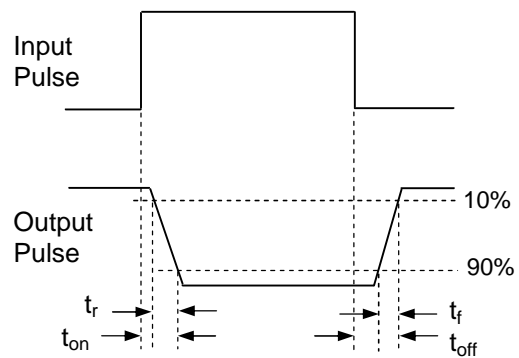
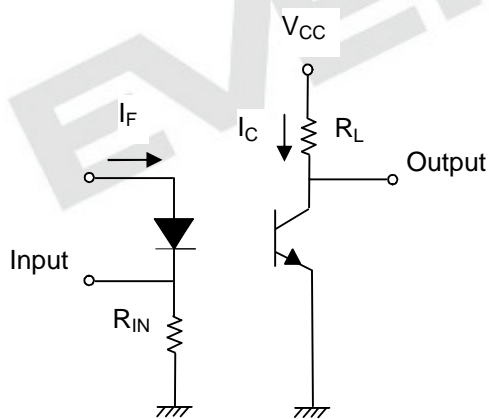
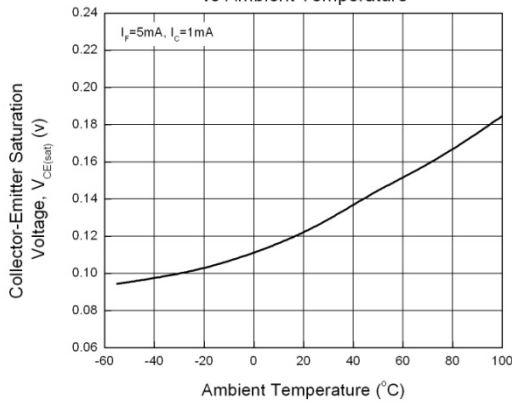


Figure 10. Switching Time Test Circuit & Waveforms

**Order Information**

**Part Number**

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

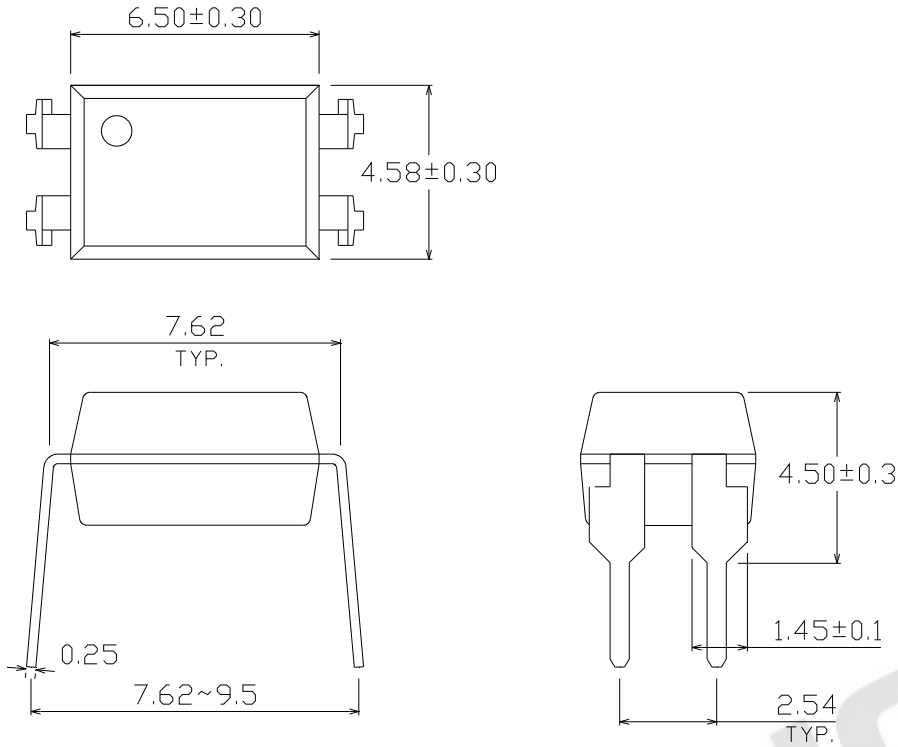
**Note**

- 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 (TA, TB, TU, TD or none).
- F = Lead frame option (F: Iron, None: copper)
- V = VDE safety (optional).

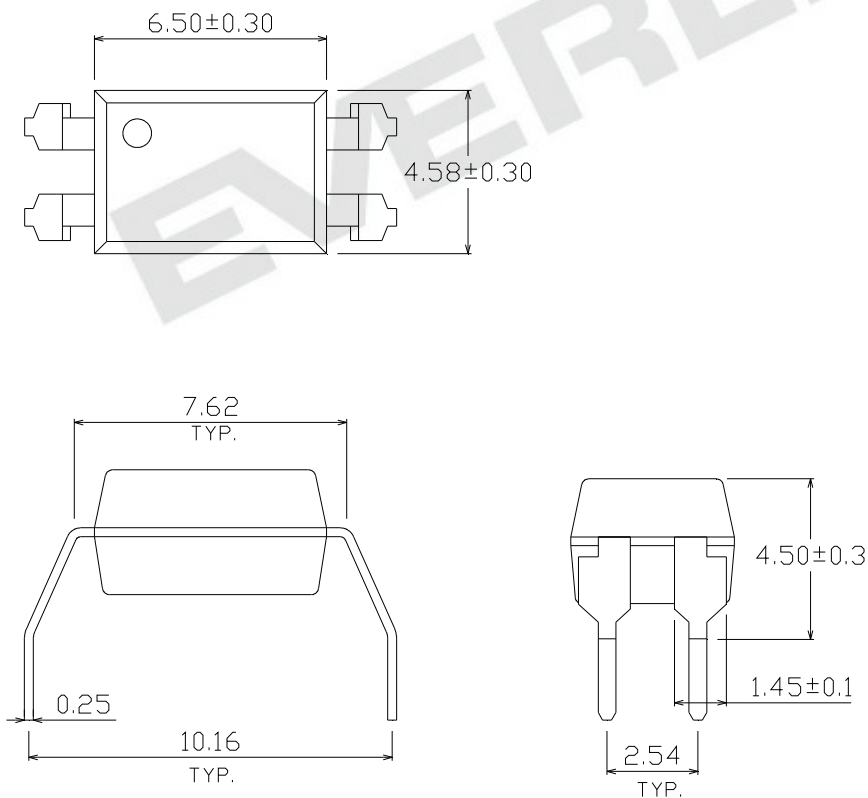
Option	Description	Packing quantity
None	Standard DIP-4	100 units per tube
M	Wide lead bend (0.4 inch spacing)	100 units per tube
S (TA)	Surface mount lead form + TA tape & reel option	1000 units per reel
S (TB)	Surface mount lead form + TB tape & reel option	1000 units per reel
S1 (TA)	Surface mount 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
S2 (TA)	Surface mount lead form (Gull-wing) + TA tape & reel option	1000 units per reel
S2 (TB)	Surface mount lead form (Gull-wing) + 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
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

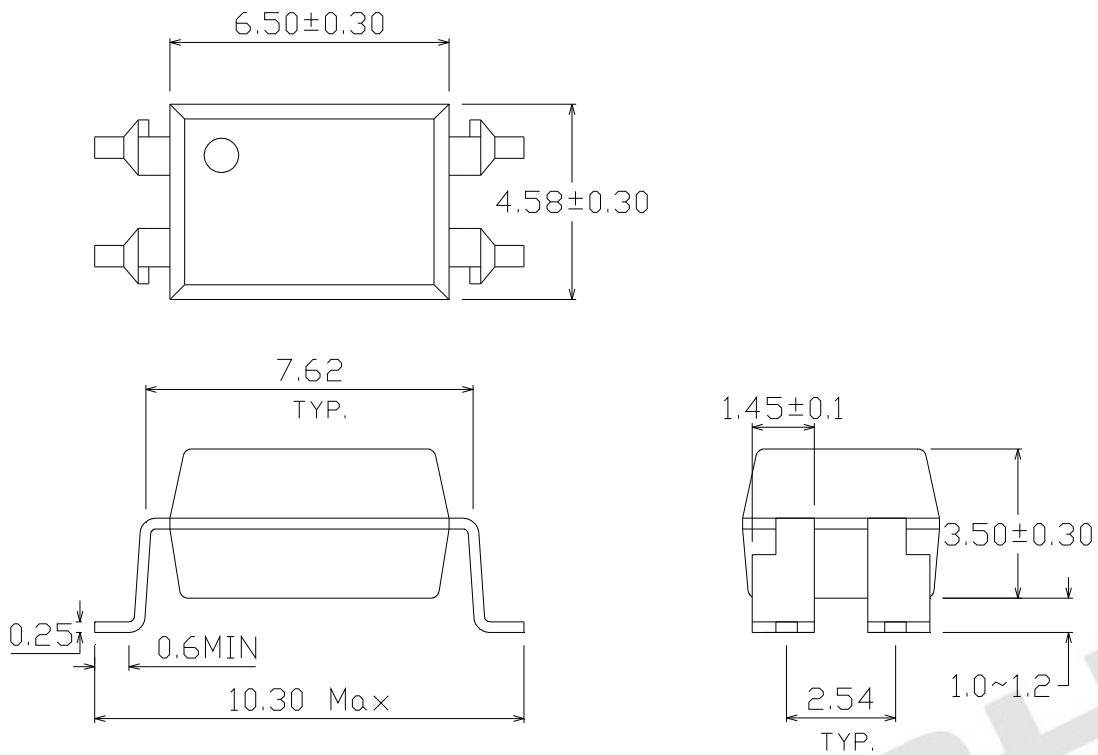


Option M Type

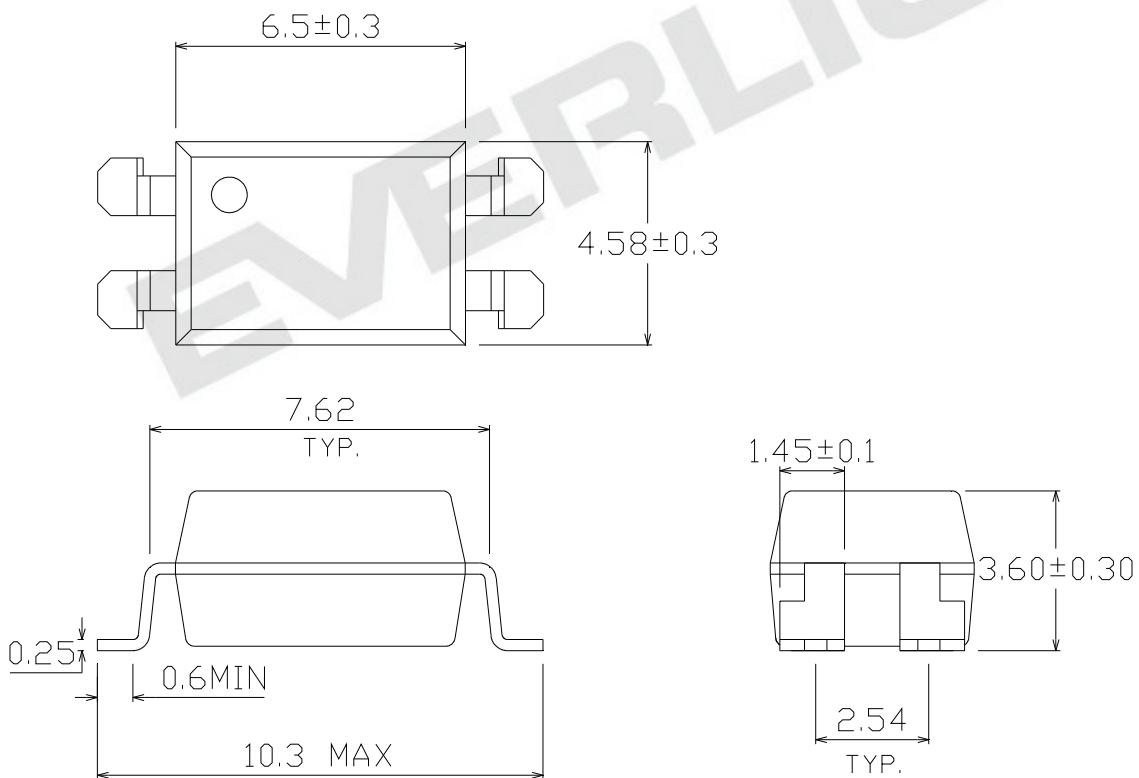




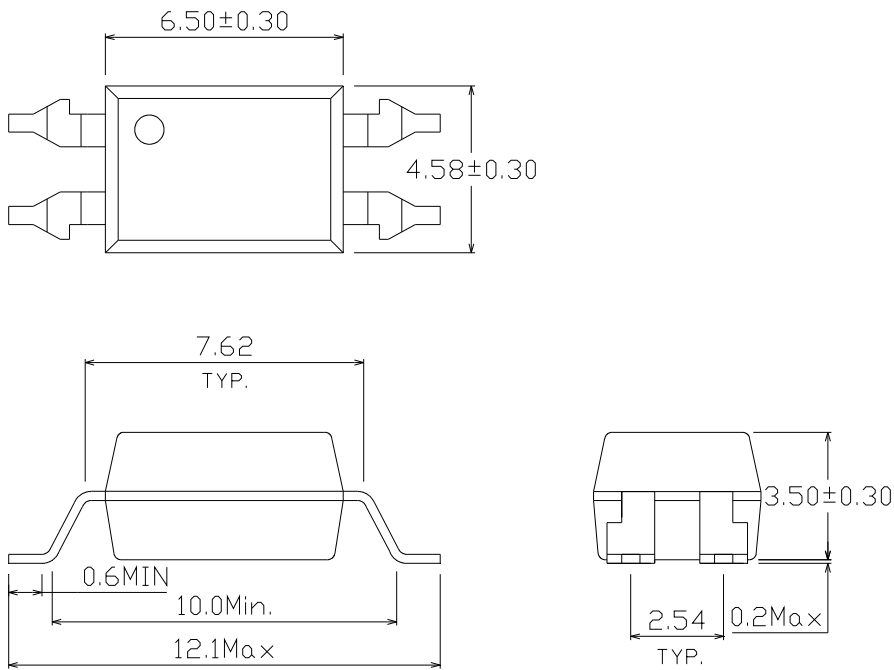
Option S Type



Option S1 Type

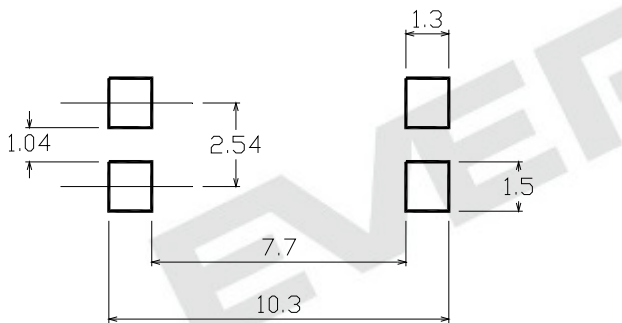


**Option S2 Type**

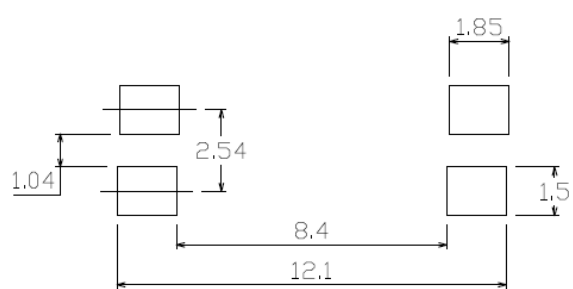


**Recommended pad layout for surface mount leadform**

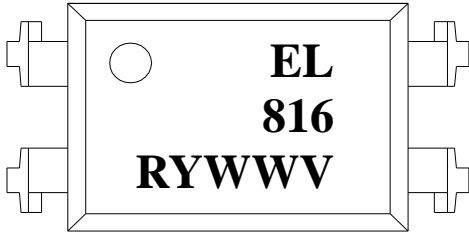
**For S and S1 option**



**For S2 option**



## Device Marking

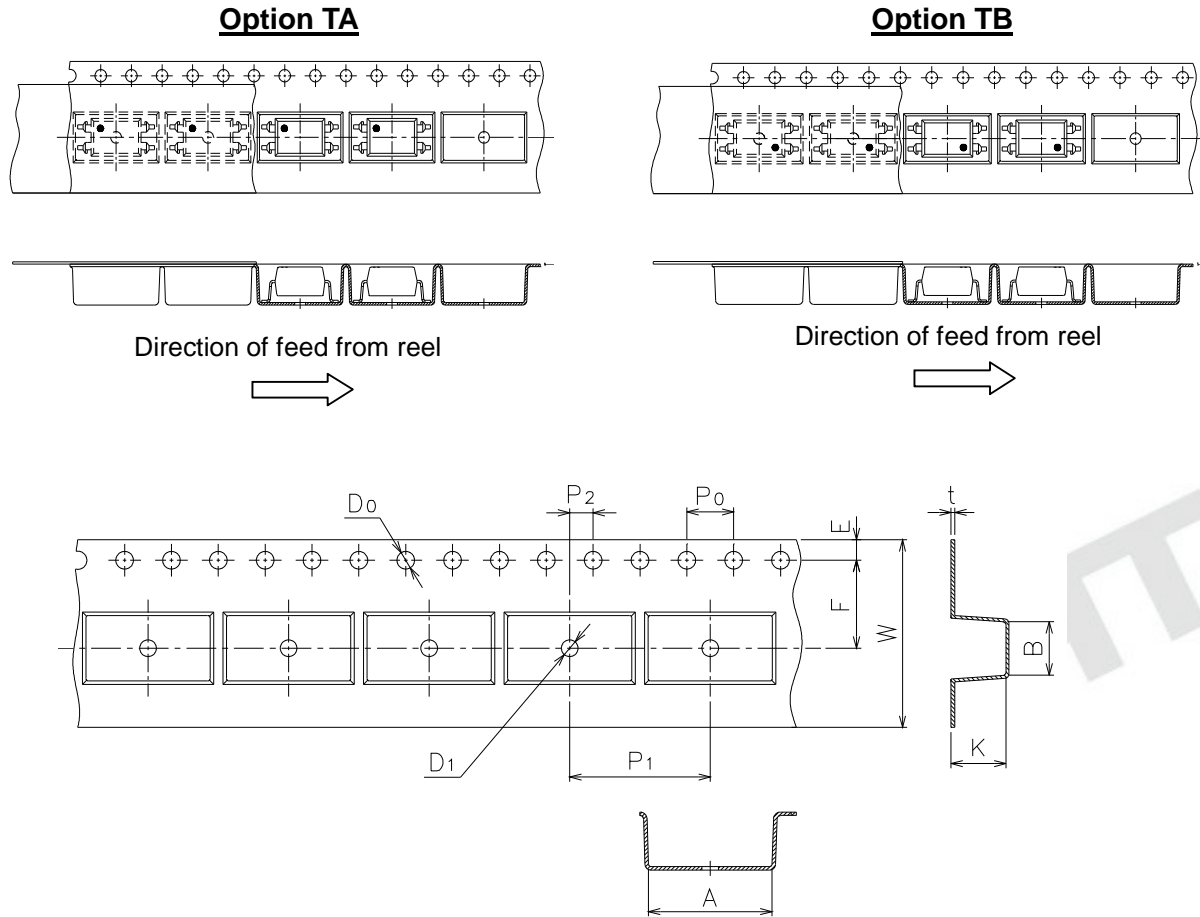


## Notes

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)

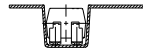
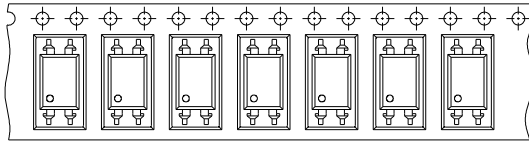
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Tape & Reel Packing Specifications

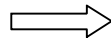


Dimension No.	A	B	$D_0$	$D_1$	E	F
Dimension (mm) S	10.5±0.1	4.65±0.1	1.5±0.1	1.50±0.1	1.75±0.1	7.5±0.1
Dimension (mm) S1	10.5±0.1	4.65±0.1	1.5±0.1	1.50±0.1	1.75±0.1	7.5±0.1
Dimension (mm) S2	12.15±0.1	4.65±0.1	1.5±0.1	1.50±0.1	1.75±0.1	7.5±0.1
Dimension No.	$P_0$	$P_1$	$P_2$	t	W	K
Dimension (mm) S	4.0±0.1	12.0±0.1	2.0±0.1	0.4±0.1	16.0±0.3	5.05±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	4.75±0.1
Dimension (mm) S2	4.0±0.1	16.0±0.1	2.0±0.1	0.4±0.1	16.0±0.3	3.90±0.1

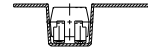
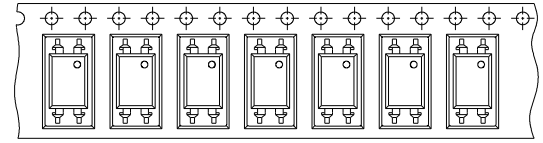
**Option TD**



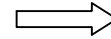
Direction of feed from reel



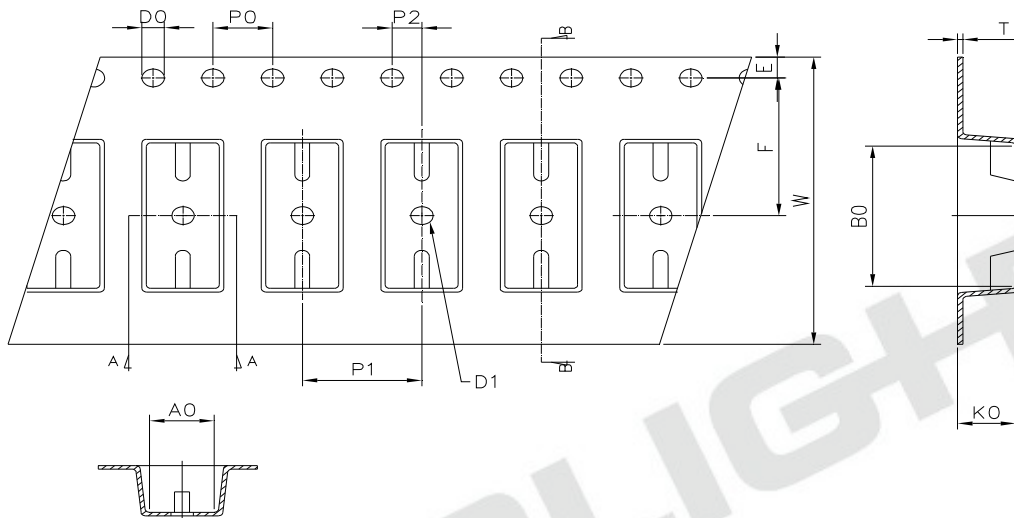
**Option TU**



Direction of feed from reel



**Tape dimensions**

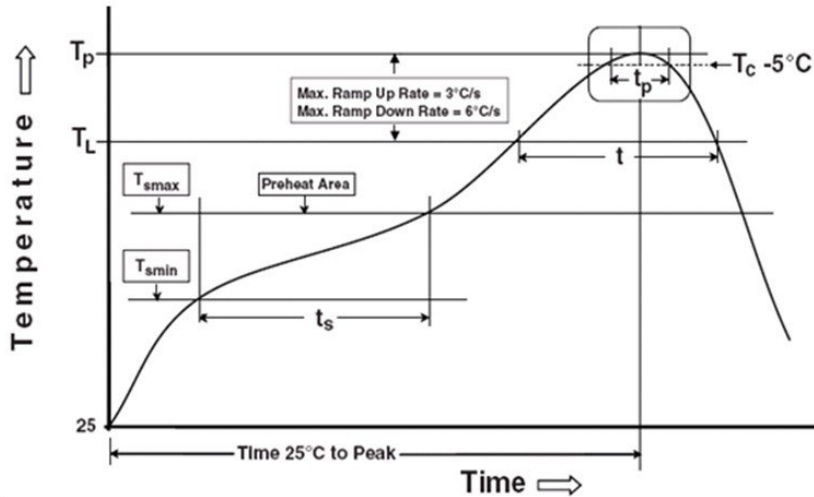


Dimension No.	<b>Ao</b>	<b>Bo</b>	<b>Do</b>	<b>D1</b>	<b>E</b>	<b>F</b>
Dimension (mm) S.S1	4.90±0.1	10.40±0.1	1.5±0.1	1.50±0.1	1.75±0.1	7.50±0.1
Dimension (mm) S2	4.88±0.1	12.55±0.1	1.5±0.1	1.50±0.1	1.75±0.1	11.5±0.1
Dimension No.	<b>Po</b>	<b>P1</b>	<b>P2</b>	<b>t</b>	<b>W</b>	<b>Ko</b>
Dimension (mm) 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

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