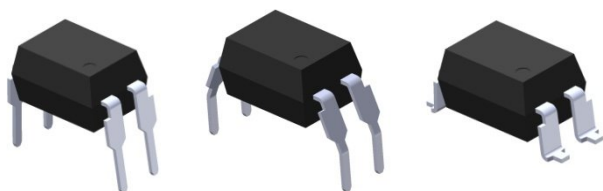
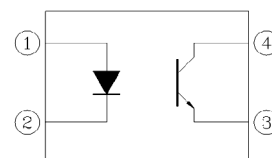


4 PIN DIP PHOTOTRANSISTOR PHOTOCOUPLER EL816 Series



Schematic



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 (Viso=5000 V rms)
- Creepage distance >7.62 mm
- Operating temperature up to +110°C
- Compact small outline package
- Pb free and RoHS compliant.
- UL approved (No. E214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CSA approved

Pin Configuration

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

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	μA	$V_R = 4\text{V}$
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}	5×10^{10}	-	-	Ω	$V_{IO} = 500\text{Vdc}$, 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	$V_{CE} = 5\text{V}$, $I_C = 2\text{mA}$ $R_L = 100\Omega$, -3dB
Rise time	t_r	-	4	18	μs	$V_{CE} = 2\text{V}$, $I_C = 2\text{mA}$, $R_L = 100\Omega$
Fall time	t_f	-	3	18	μs	

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

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Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

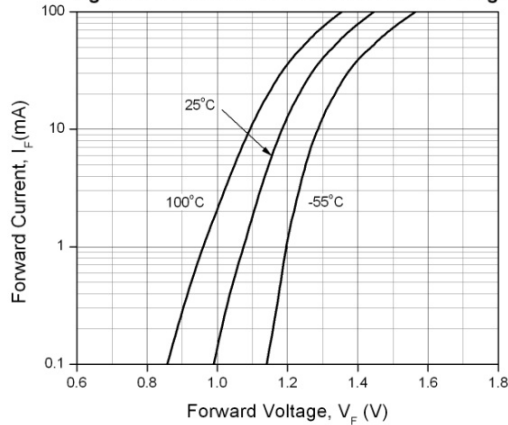


Figure 2. Normalized Collector Current vs Forward Current

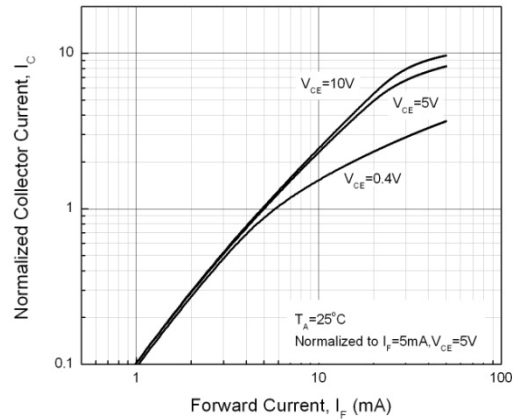


Figure 3. Normalized Current Transfer Ratio vs Forward Current

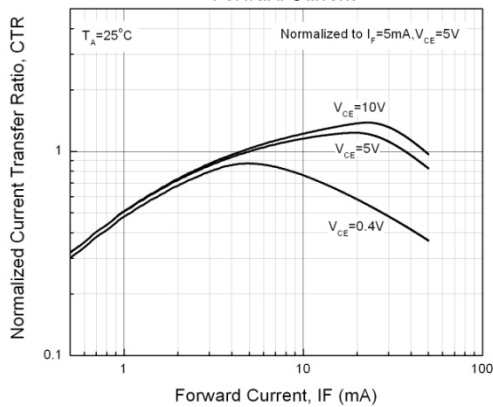


Figure 4. Normalized Collector Current vs Ambient Temperature

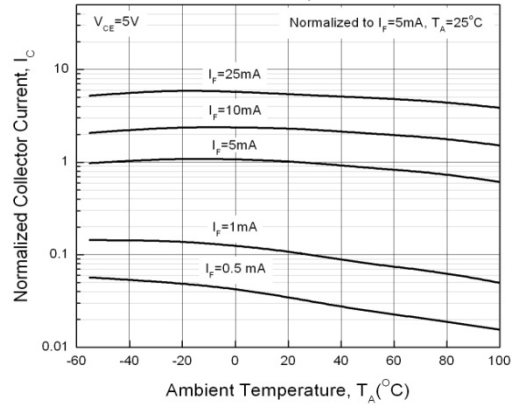


Figure 5. Collector Current vs Collector-Emitter Voltage

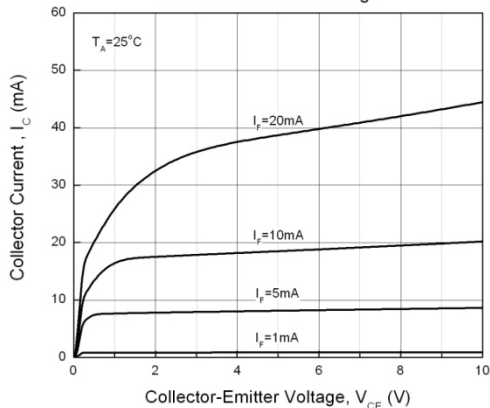


Figure 6. Collector Current vs Collector-Emitter Voltage

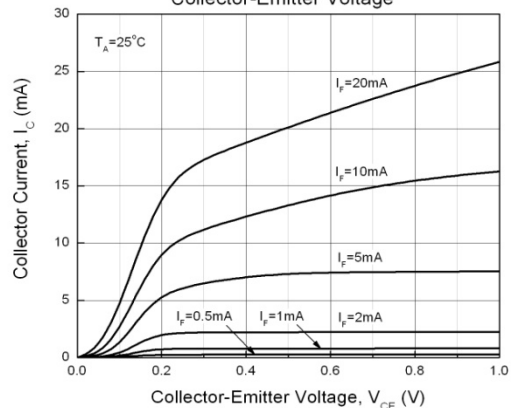


Figure 7. Collector Dark Current vs Ambient Temperature

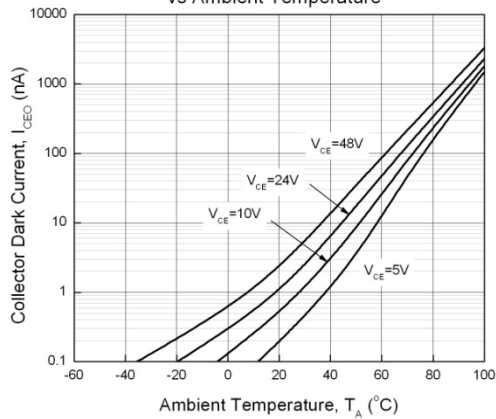


Figure 8. Switching Time vs Load Resistance

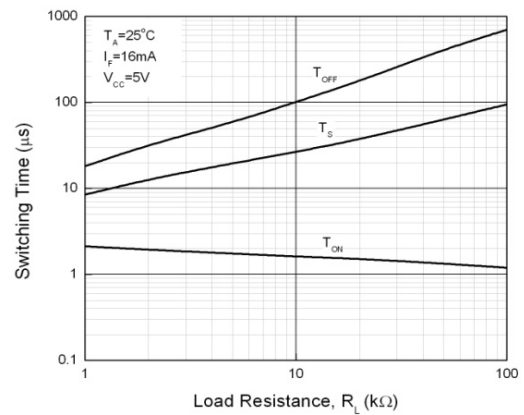


Figure 9. Collector-Emitter Saturation Voltage vs Ambient Temperature

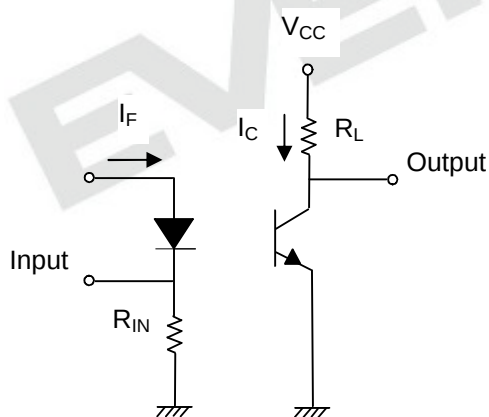
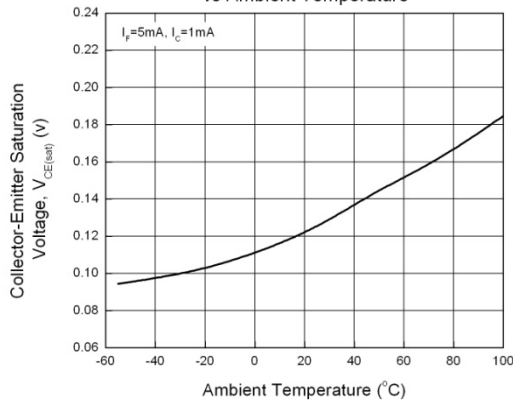


Figure 10. Switching Time Test Circuit & Waveforms

Order Information

Part Number

EL816X(Y)(Z)-FV

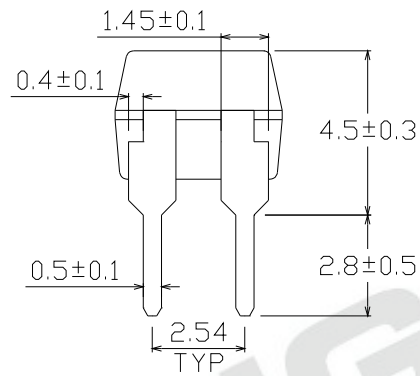
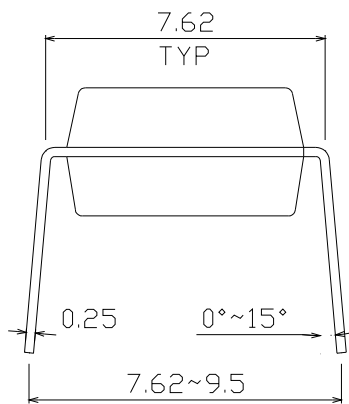
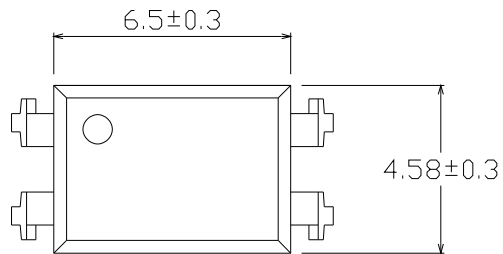
Note

- X = Lead form option (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).

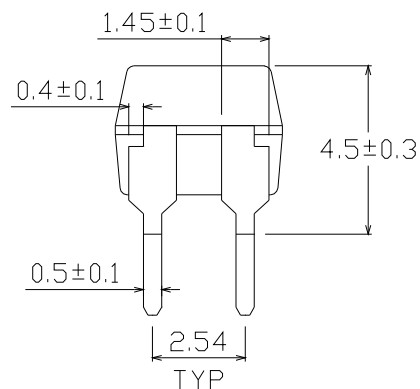
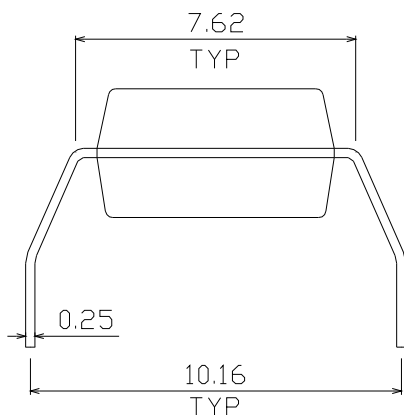
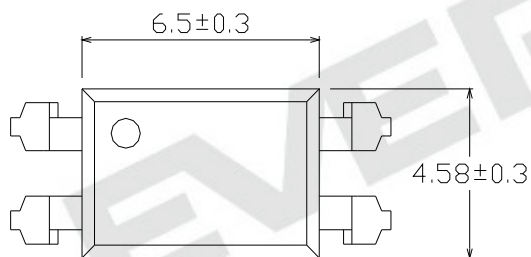
Option	Description	Packing quantity
None	Standard DIP-4	100 units per tube
M	Wide lead bend (0.4 inch spacing)	100 units per tube
S (TA)	Surface mount lead form + TA tape & reel option	1000 units per reel
S (TB)	Surface mount lead form + TB tape & reel option	1000 units per reel
S1 (TA)	Surface mount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

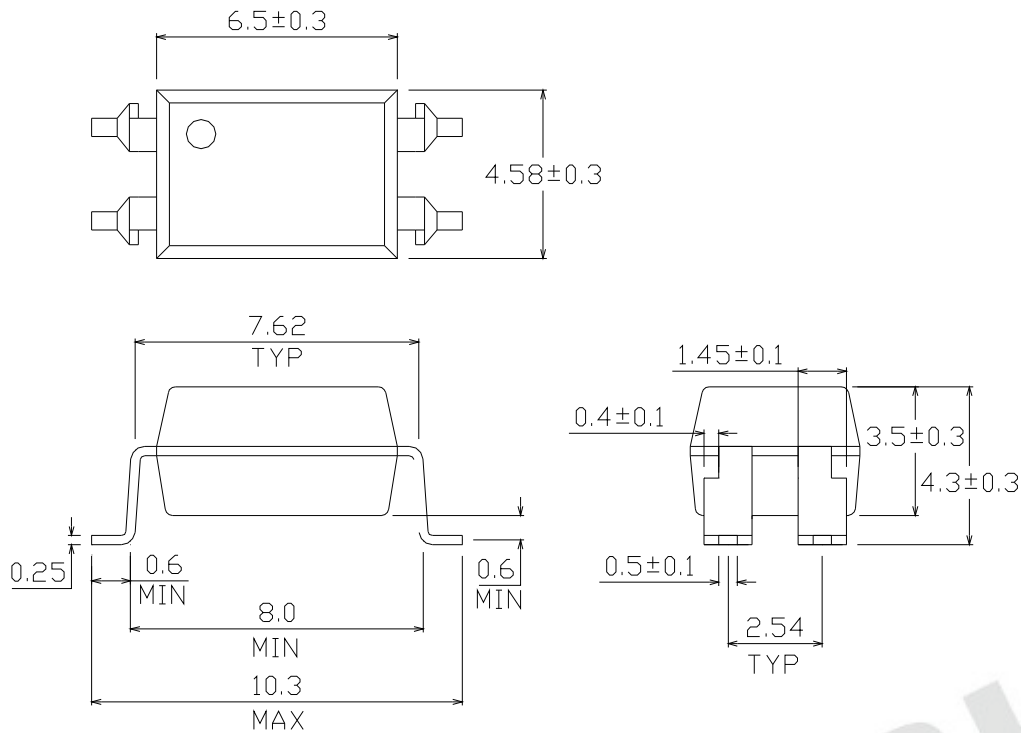
Standard DIP Type



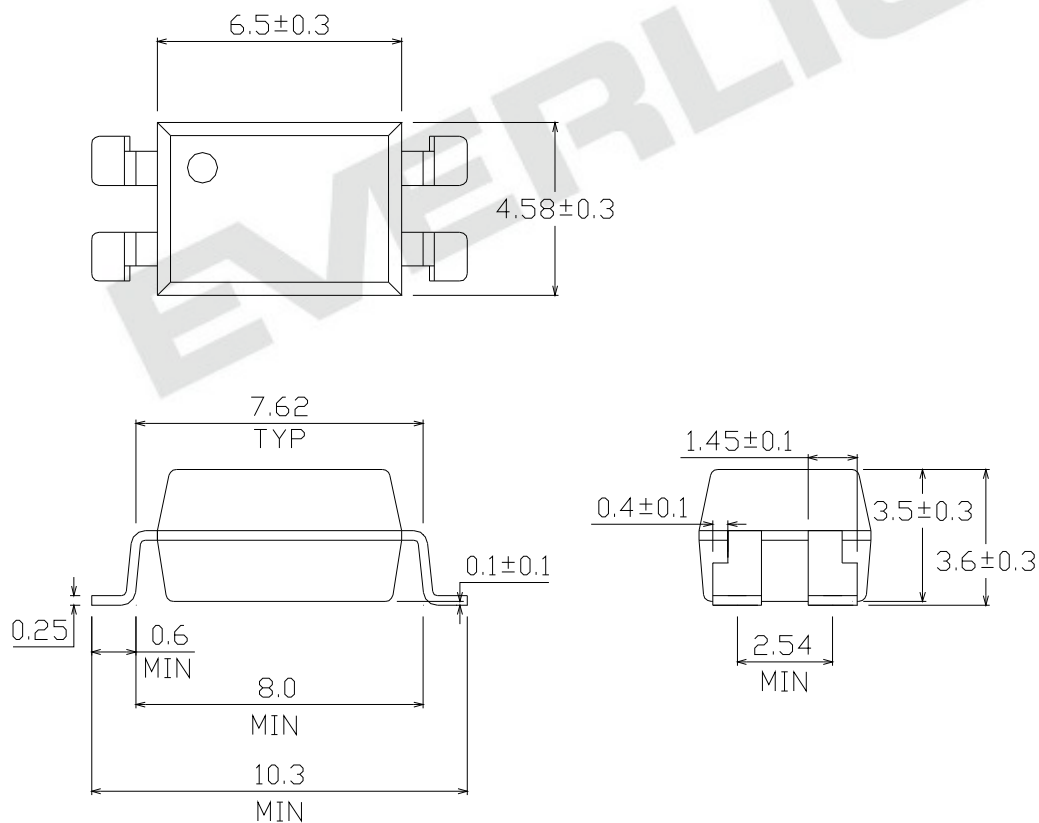
Option M Type



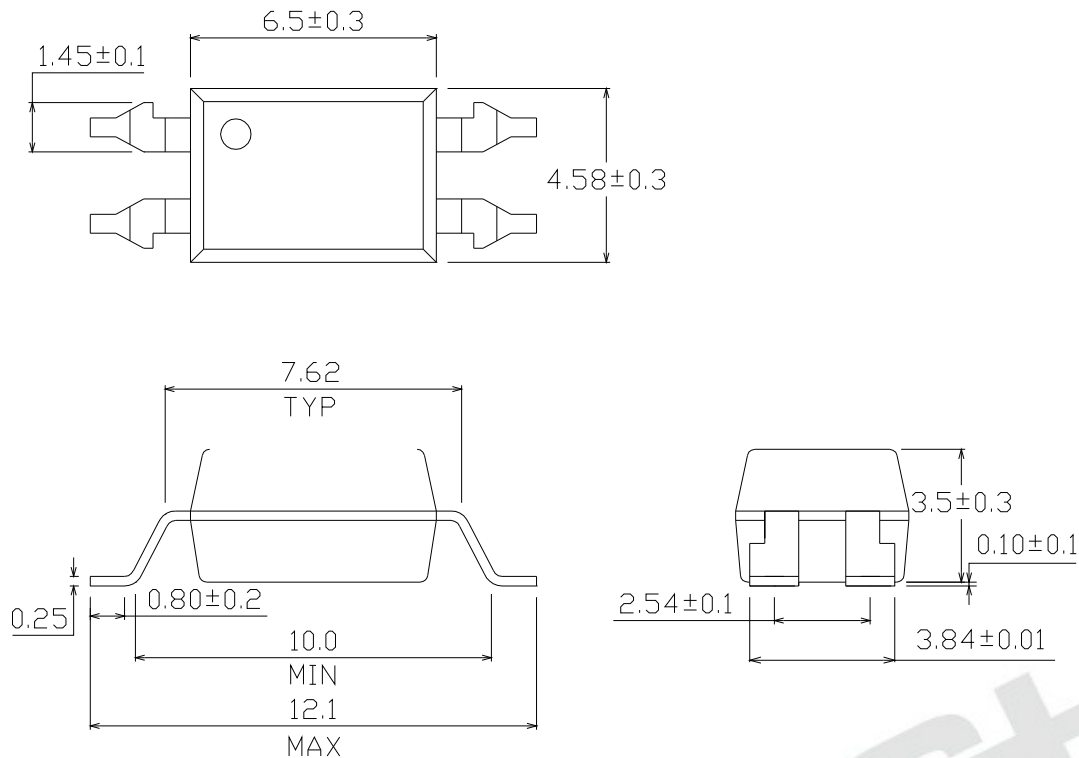
Option S Type



Option S1 Type

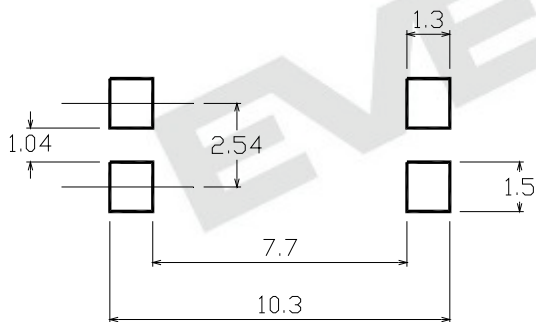


Option S2 Type

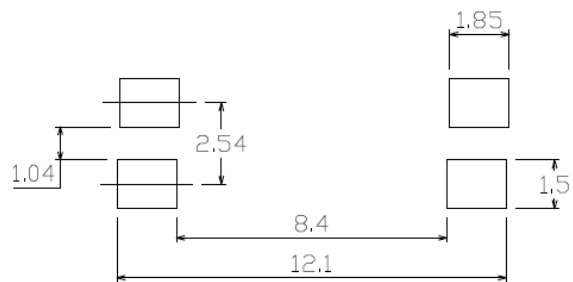


Recommended pad layout for surface mount leadform

For S and S1 option



For S2 option



Device Marking

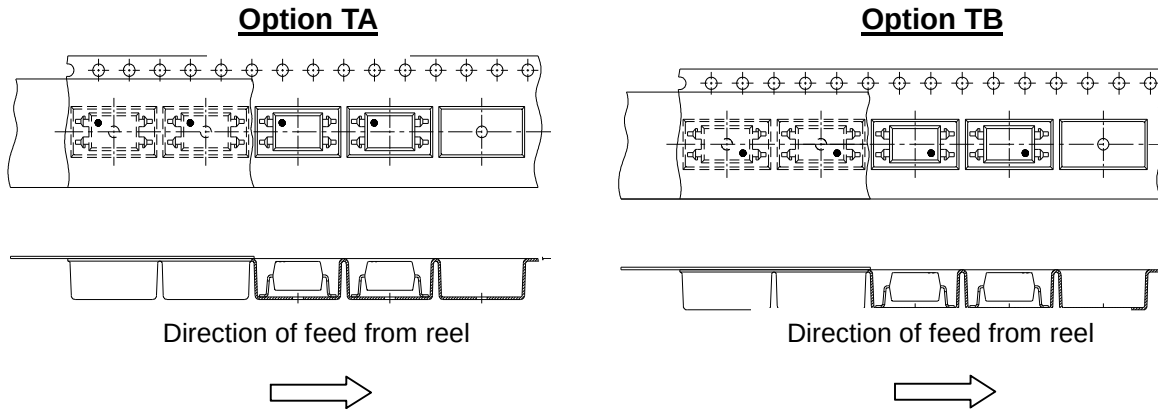


Notes

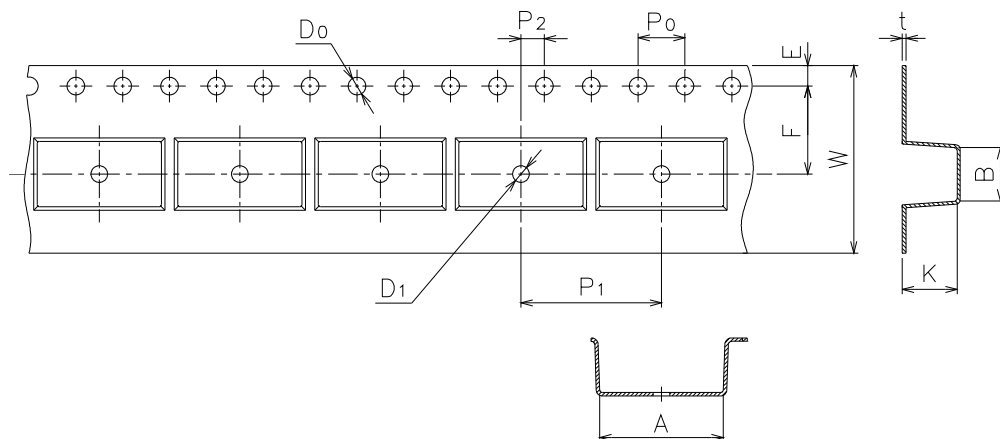
EL	denotes EVERLIGHT
816	denotes Device Number
R	denotes CTR Rank
Y	denotes 1 digit Year code
WW	denotes 2 digit Week code
V	denotes VDE (optional)

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Tape & Reel Packing Specifications



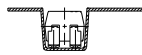
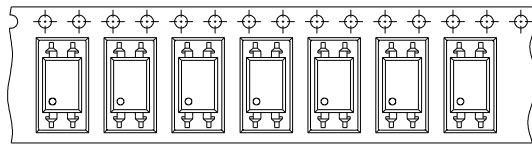
Tape dimensions



Tape dimensions

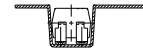
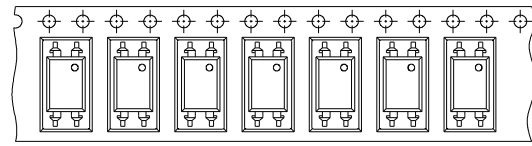
Dimension No.	A	B	D0	D1	E	F
Dimension (mm)	10.5±0.1	4.65±0.1	1.55±0.1	1.50±0.1	1.75±0.1	7.5±0.1
Dimension (mm) S2	12.15±0.1	4.65±0.1	1.55±0.1	1.50±0.1	1.75±0.1	7.5±0.1
Dimension No.	P0	P1	P2	t	W	K
Dimension (mm)	4.0±0.1	12.0±0.1	2.0±0.1	0.35±0.1	16.0±0.3	4.75±0.1
Dimension (mm) S2	4.0±0.1	16.0±0.1	2.0±0.1	0.35±0.1	16.0±0.3	3.90±0.1

Option TD



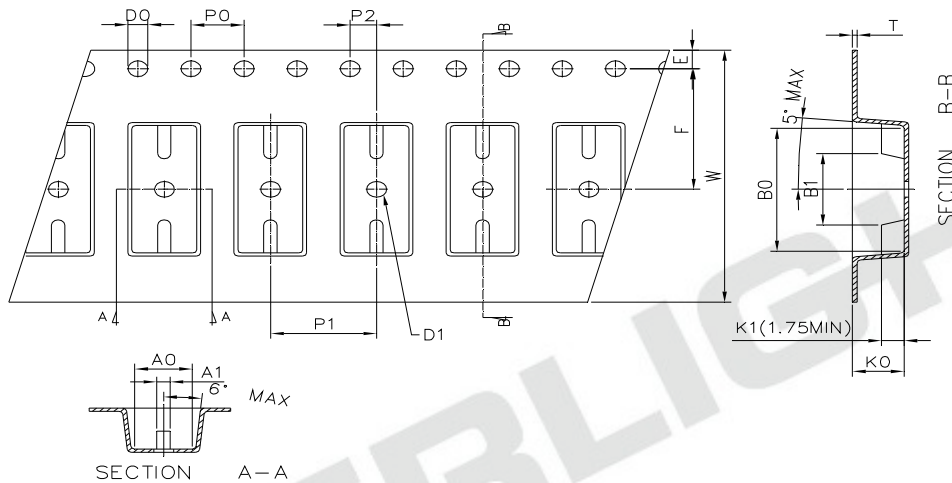
Direction of feed from reel

Option TU



Direction of feed from reel

Tape dimensions



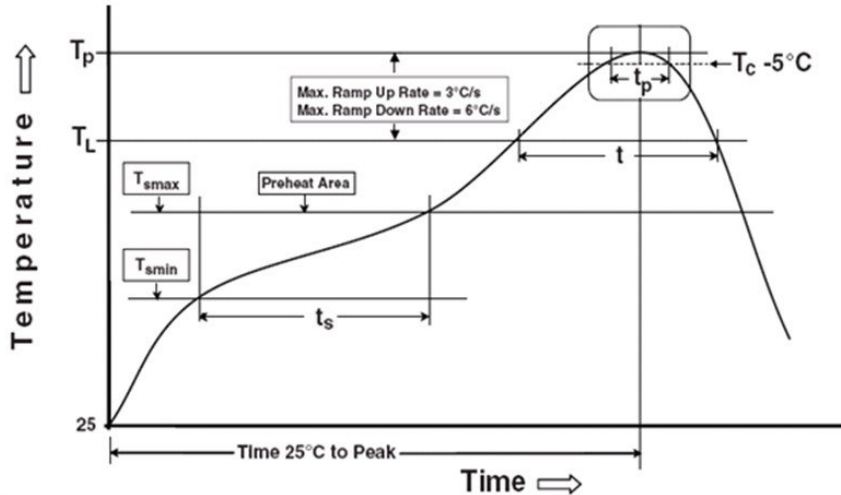
Tape dimensions

Dimension No.	W	F	E	P1	P2	P0
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 (mm) S2	24.0±0.3	11.5±0.1	1.75±0.1	8.0±0.1	2.0±0.1	4.0±0.1
Dimension No.	D0	B0	T	K0	A0	D1
Dimension(mm)	1.5±0.1	10.4±0.1	0.4±0.05	4.60±0.1	5.1±0.1	1.5±0.1
Dimension (mm) S2	1.5±0.1	12.55±0.1	0.35±0.05	4.0±0.1	4.88±0.1	1.5±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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