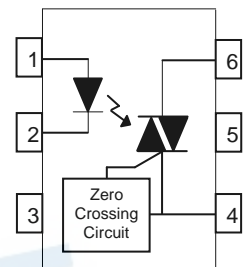


### 6 PIN DIP ZERO-CROSS TRIAC DRIVER PHOTOCOUPLER EL303X, EL304X, EL306X, EL308X Series



Schematic



#### Features:

- Peak breakdown voltage
  - 250V: EL303X
  - 400V: EL304X
  - 600V: EL306X
  - 800V: EL308X
- High isolation voltage between input and output (Viso=5000 V rms )
- Zero voltage crossing
- Compliance with EU REACH
- The product itself will remain within RoHS compliant version
- UL and cUL approved (No. E214129)
- VDE approved (No.132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CQC approved

#### Pin Configuration

1. Anode
2. Cathode
3. No Connection
4. Terminal
5. Substrate  
(do not connect)
6. Terminal

#### Description

The EL303X, EL304X, EL306X and EL308X series of devices each consist of a GaAs infrared emitting diode optically coupled to a monolithic silicon zero voltage crossing photo triac. They are designed for use with a discrete power triac in the interface of logic systems to equipment powered from 110 to 380 VAC lines, such as solid-state relays, industrial controls, motors, solenoids and consumer appliances.

#### Applications

- Solenoid/valve controls
- Light controls
- Static power switch
- AC motor drivers
- E.M. contactors
- Temperature controls
- AC Motor starters

**Absolute Maximum Ratings (Ta=25°C)**

Parameter		Symbol	Rating	Unit	
Input	Forward current	I <sub>F</sub>	60	mA	
	Reverse voltage	V <sub>R</sub>	6	V	
	Power dissipation	P <sub>D</sub>	100	mW	
	Derating factor (above T <sub>a</sub> = 85°C)		3.8	mW /°C	
Output	EL303X	V <sub>DRM</sub>	250	V	
	Off-state Output Terminal Voltage		EL304X		400
	EL306X		600		
	EL308X		800		
	Peak Repetitive Surge Current (pw=1ms,120pps)	I <sub>TSM</sub>	1	A	
	On-State RMS Current	I <sub>T(RMS)</sub>	100	mA	
	Power dissipation	P <sub>C</sub>	300	mW	
	Derating factor (above T <sub>a</sub> = 85°C)		7.6	mW/°C	
Total power dissipation	P <sub>TOT</sub>	330	mW		
Isolation voltage *1	V <sub>ISO</sub>	5000	V <sub>rms</sub>		
Operating temperature	T <sub>OPR</sub>	-55 to 100	°C		
Storage temperature	T <sub>STG</sub>	-55 to 125	°C		
Soldering Temperature*2	T <sub>SOL</sub>	260	°C		

Notes:

\*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2& 3 are shorted together, and pins 4, 5 & 6 are shorted together.

\*2 For 10 seconds

**Electro-Optical Characteristics (Ta=25°C unless specified otherwise)**

**Input**

Parameter	Symbol	Min.	Typ.*1	Max.	Unit	Condition
Forward Voltage	V <sub>F</sub>	-	-	1.5	V	I <sub>F</sub> = 30mA
Reverse Leakage current	I <sub>R</sub>	-	-	10	μA	V <sub>R</sub> = 6V

**Output**

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Condition
Peak Blocking Current	I <sub>DRM1</sub>	-	-	100 500	nA	V <sub>DRM</sub> = Rated V <sub>DRM</sub> I <sub>F</sub> = 0 mA*2
Peak On-state Voltage	V <sub>TM</sub>	-	-	3	V	I <sub>TM</sub> =100 mA peak, I <sub>F</sub> =Rated I <sub>FT</sub>
Critical Rate of Rise off-state Voltage	dv/dt	1000 600	-	-	V/μs	V <sub>PEAK</sub> =Rated V <sub>DRM</sub> , I <sub>F</sub> =0 (Fig. 10)*3
Inhibit Voltage (MT1-MT2 voltage above which device will not trigger)	V <sub>INH</sub>	-	-	20	V	I <sub>F</sub> = Rated I <sub>FT</sub>
Leakage in Inhibited State	I <sub>DRM2</sub>	-	-	500	μA	I <sub>F</sub> = Rated I <sub>FT</sub> , V <sub>DRM</sub> =Rated V <sub>DRM</sub> , off state

- Notes:
- \*1. Typical values at T<sub>a</sub> = 25°C
  - \*2. Test voltage must be applied within dv/dt rating.
  - \*3. This is static dv/dt. See Figure 10 for test circuit. Commutating dv/dt is a function of the load-driving thyristor(s) only.

**Transfer Characteristics**

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Condition
LED Trigger Current	EL3031	-	-	15	mA	Main terminal Voltage=3V <sup>*4</sup>
	EL3041					
	EL3061					
	EL3081					
	EL3032	-	-	10		
	EL3042					
	EL3062					
	EL3082					
	EL3033	-	-	5		
	EL3043					
EL3063						
EL3083						
Holding Current	I <sub>H</sub>	-	280	-	μA	

Notes:

\*4. All devices are guaranteed to trigger at an I<sub>F</sub> value less than or equal to max I<sub>FT</sub>. Therefore, recommended operating I<sub>F</sub> lies between max I<sub>FT</sub> (15 mA for EL3031/EL3041/EL3061/EL3081, 10 mA for EL3032/EL3042/EL3062/EL3082, 5 mA for EL3033/EL3043/EL3063/EL3083) and absolute maximum I<sub>F</sub> (60 mA).



Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

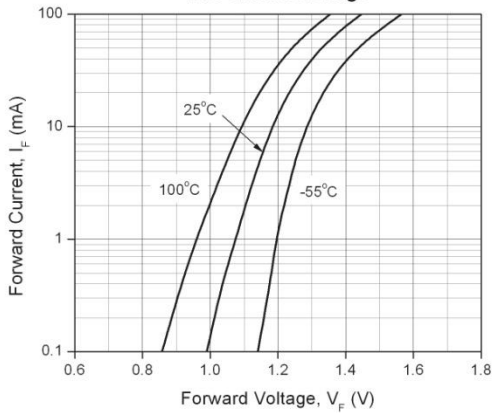


Figure 2. On-State Characteristics

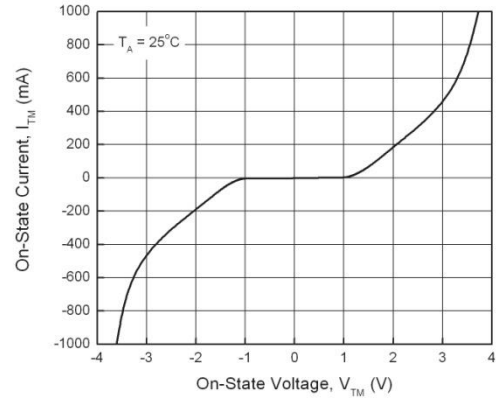


Figure 3. Holding Current vs. Ambient Temperature

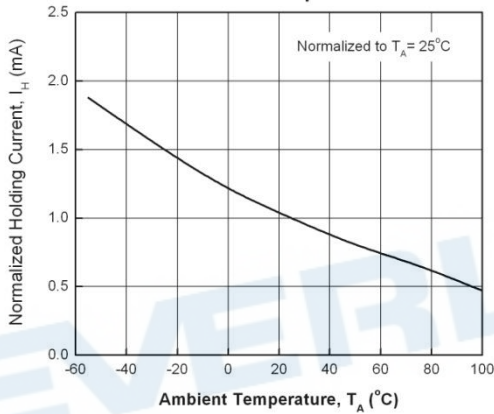


Figure 4. LED Current Required to Trigger vs. LED Pulse Width

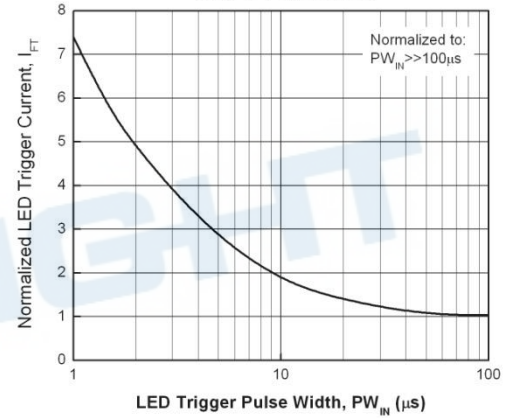


Figure 5. Leakage Current vs. Ambient Temperature

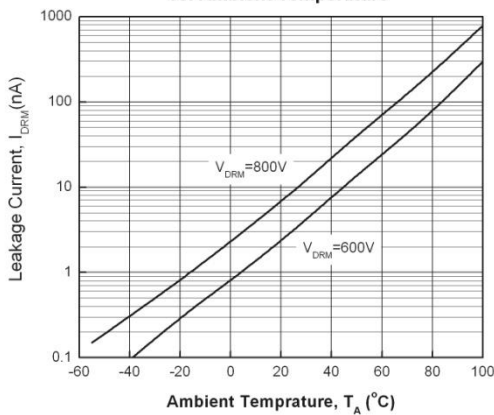


Figure 6. LED Trigger Current vs. Ambient Temperature

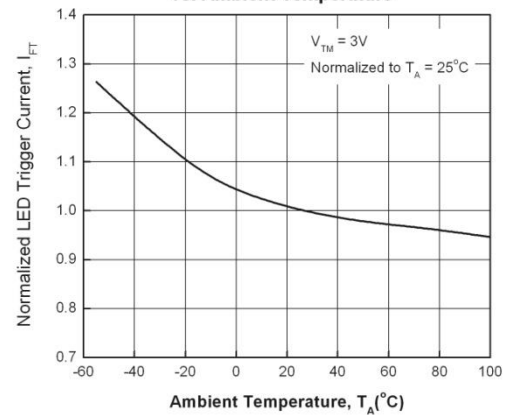


Figure 7. Off-State Output Terminal Voltage vs. Ambient Temperature

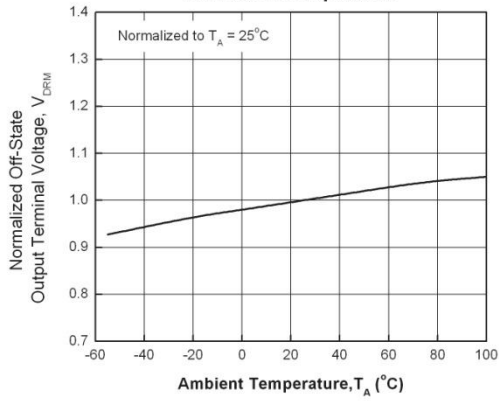


Figure 8. Leakage in Inhibit State vs. Ambient Temperature

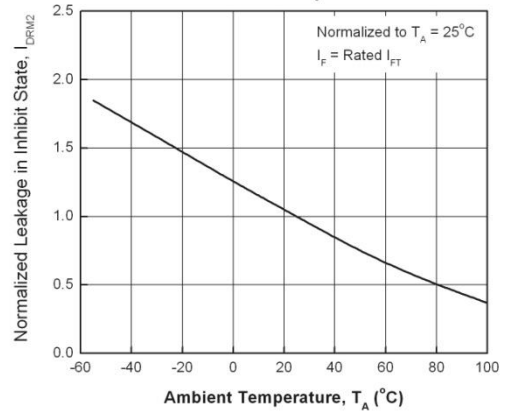


Figure 9. Inhibit Voltage vs. Ambient Temperature

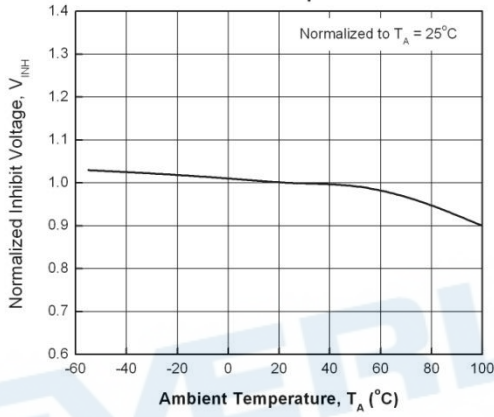
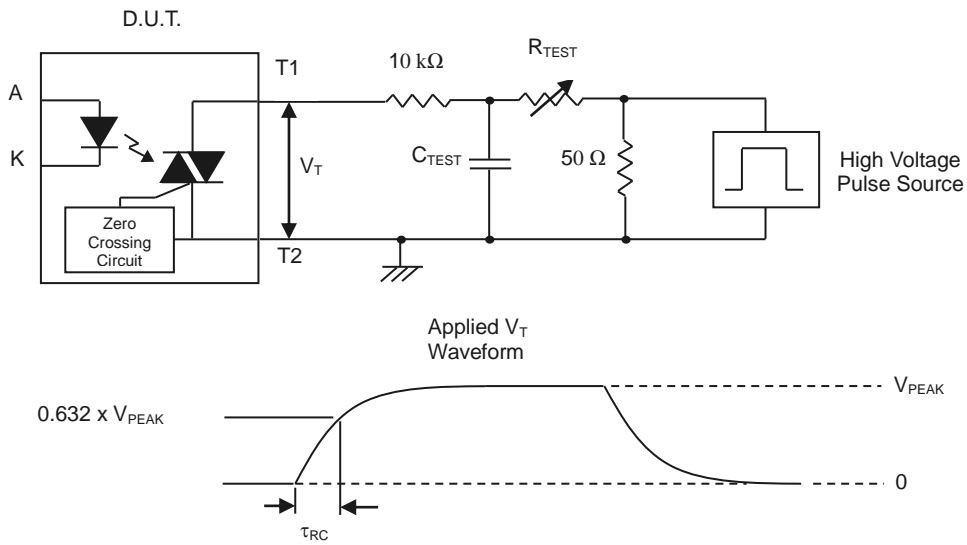


Figure 10. Static dv/dt Test Circuit & Waveform



### Measurement Method

The high voltage pulse is set to the required V<sub>PEAK</sub> value and applied to the D.U.T. output side through the RC circuit above. LED current is not applied. The waveform V<sub>T</sub> is monitored using a x100 scope probe. By varying R<sub>TEST</sub>, the dv/dt (slope) is increased, until the D.U.T. is observed to trigger (waveform collapses). The dv/dt is then decreased until the D.U.T. stops triggering. At this point, τ<sub>RC</sub> is recorded and the dv/dt calculated.

$$dv/dt = \frac{0.632 \times V_{PEAK}}{\tau_{RC}}$$

For example, V<sub>PEAK</sub> = 600V for EL306X series. The dv/dt value is calculated as follows:

$$dv/dt = \frac{0.632 \times 600}{\tau_{RC}} = \frac{379.2}{\tau_{RC}}$$

## Order Information

### Part Number

**EL303XY(Z)-V**  
or **EL304XY(Z)-V**  
or **EL306XY(Z)-V**  
or **EL308XY(Z)-V**

### Note

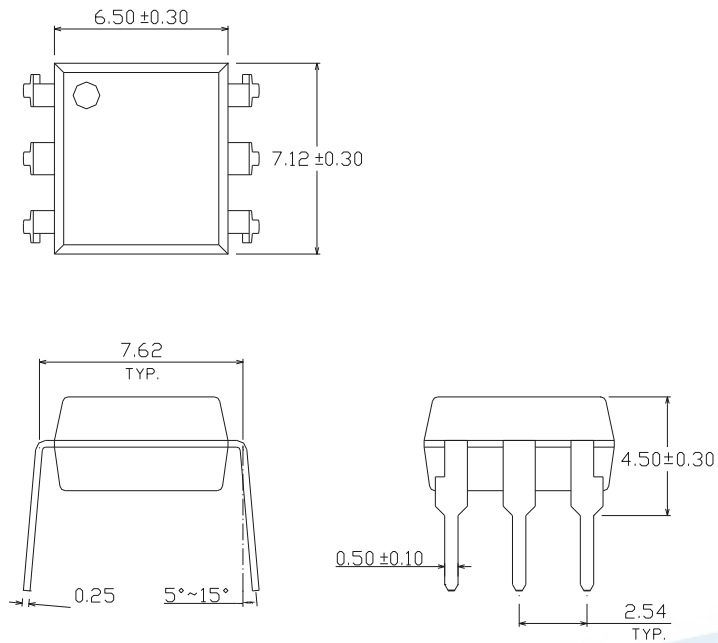
X = Part No. (1, 2 or 3)  
Y = Lead form option (S, S1, M or none)  
Z = Tape and reel option (TA, TB or none)  
V = VDE safety approved option

Option	Description	Packing quantity
None	Standard DIP-6	65 units per tube
M	Wide lead bend (0.4 inch spacing)	65 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

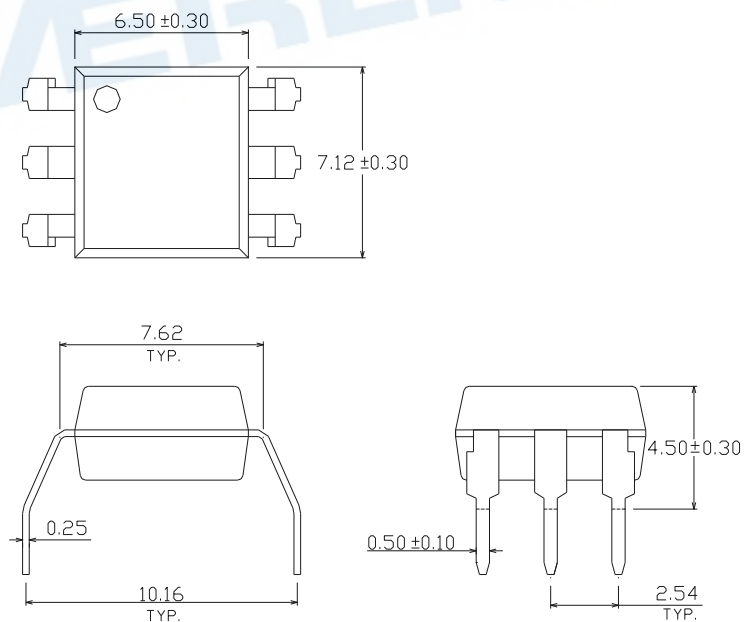


### Package Dimension (Dimensions in mm)

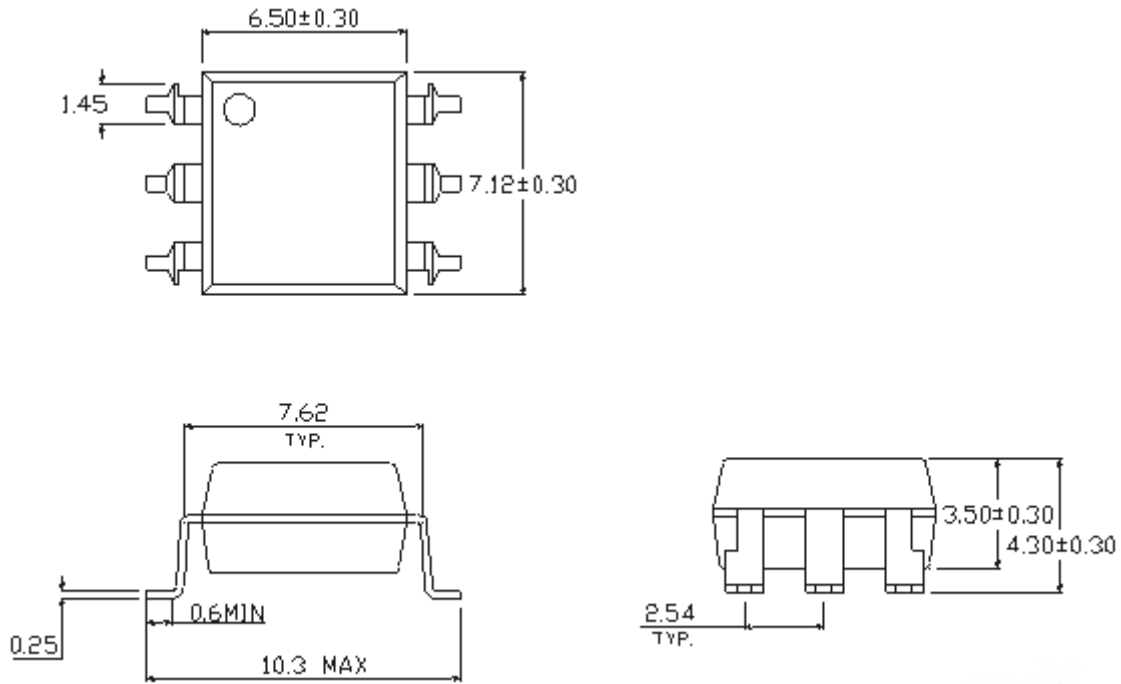
#### Standard DIP Type



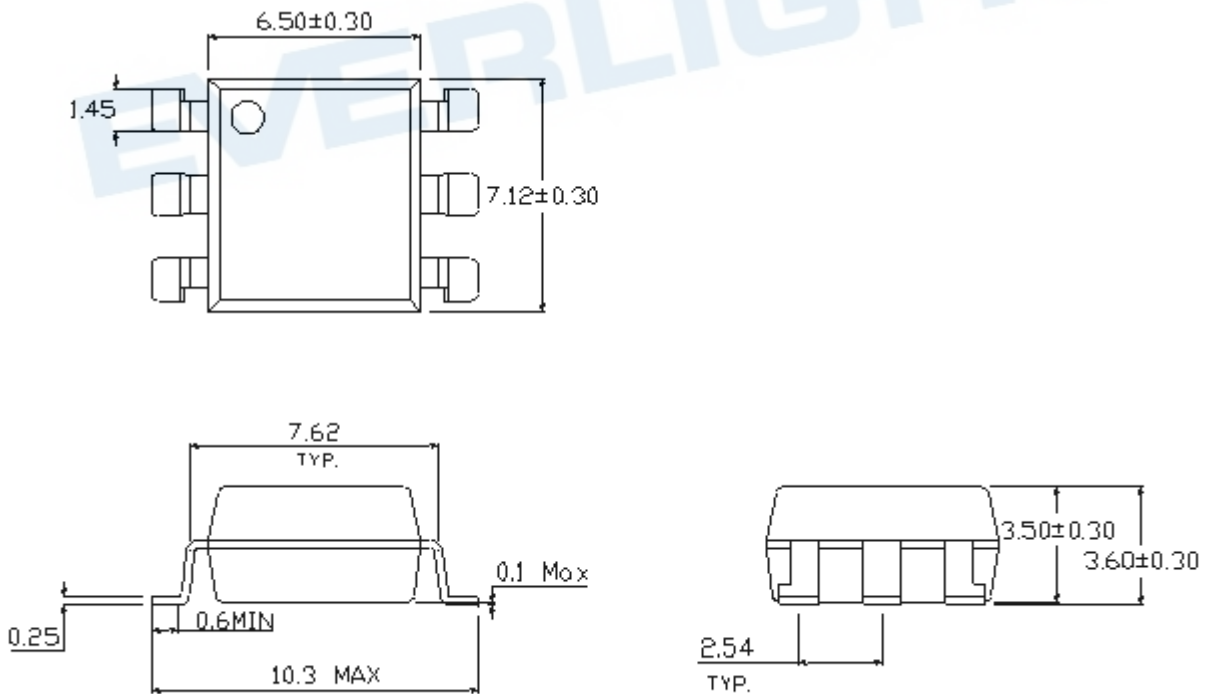
#### Option M Type



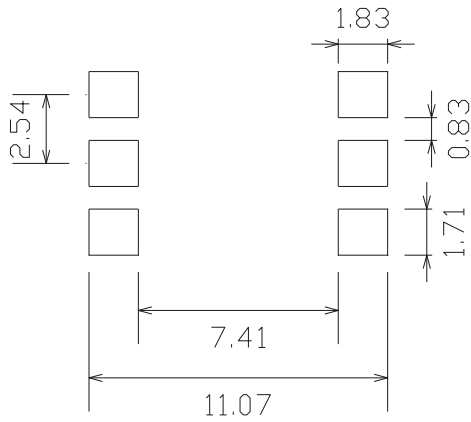
Option S Type



Option S1 Type



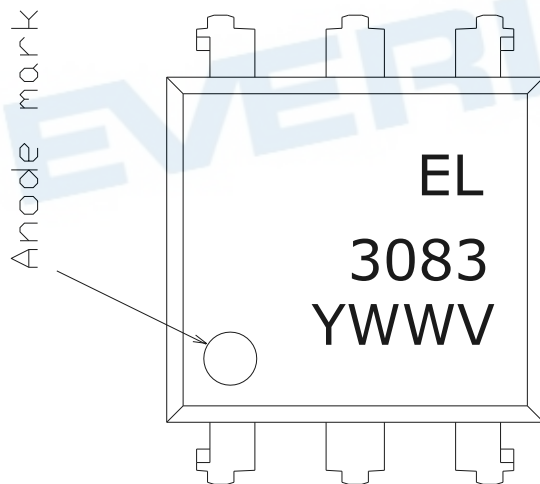
### Recommended pad layout for surface mount leadform



### Notes

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

### Device Marking

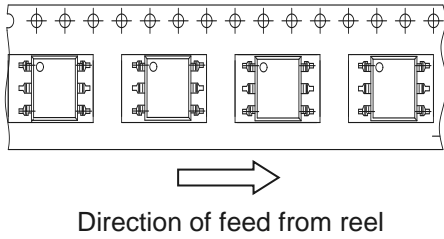


### Notes

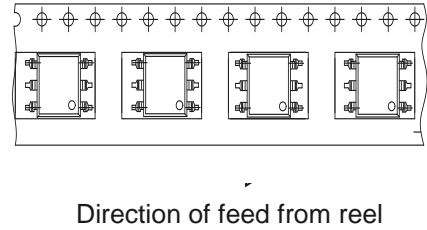
EL denotes Everlight  
3083 denotes Device Number  
Y denotes 1 digit Year code  
WW denotes 2 digit Week code  
V denotes VDE option

**Tape & Reel Packing Specifications**

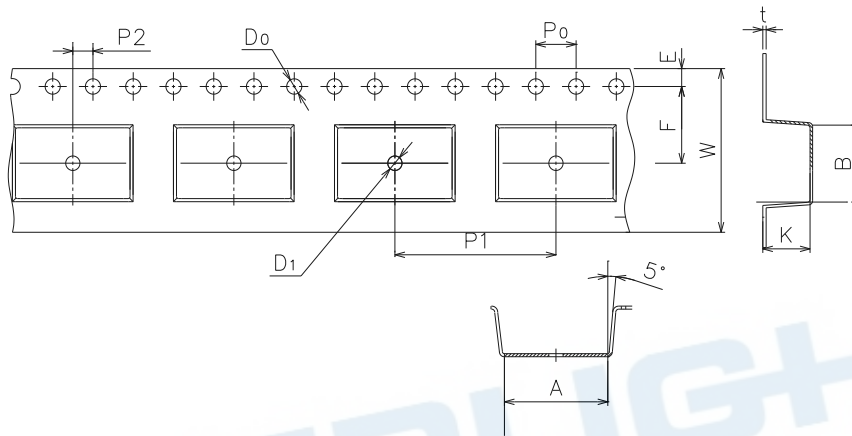
**Option TA**



**Option TB**



**Tape dimensions**



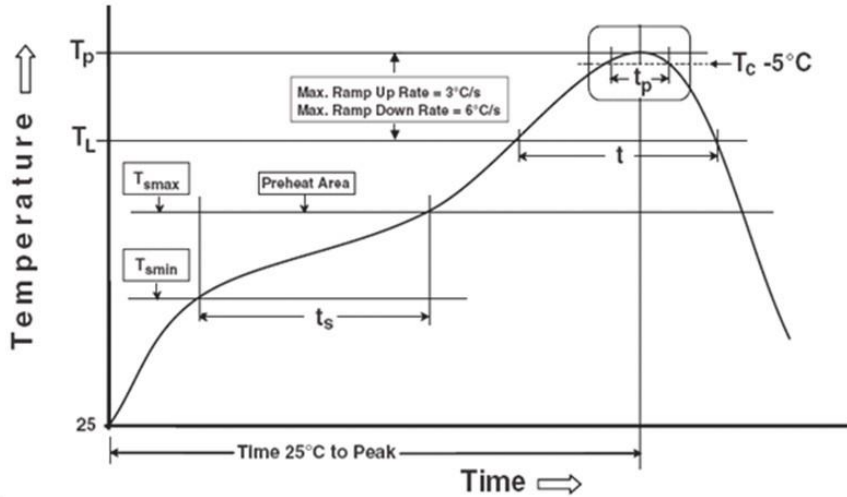
Dimension No.	A	B	Do	D1	E	F
Dimension (mm)	10.8±0.1	7.55±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1

Dimension No.	Po	P1	P2	t	W	K
Dimension (mm)	4.0±0.15	12±0.1	2.0±0.1	0.35±0.03	16.0±0.2	4.5±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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