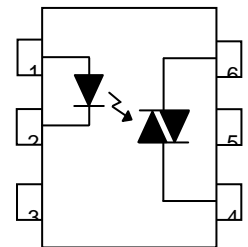


### 6 PIN DIP RANDOM-PHASE TRIAC DRIVER PHOTOCOUPLER EL301X, EL302X, EL305X Series



Schematic



#### Features:

- Peak breakdown voltage
  - 250V: EL301X
  - 400V: EL302X
  - 600V: EL305X
- High isolation voltage between input and output (Viso=5000 V rms )
- Compact dual-in-line package
- 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

#### Pin Configuration

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

#### Description

The EL301X, EL302X and EL305X series of devices each consist of a GaAs infrared emitting diode optically coupled to a monolithic silicon random phase photo Triac.

They are designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 115 to 240 VAC operations.

#### Applications

- Solenoid/valve controls
- Lamp ballasts
- Static AC power switch
- Interfacing microprocessors to 115 to 240Vac peripherals
- Incandescent lamp dimmers
- Temperature controls
- Motor controls

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

Parameter		Symbol	Rating	Unit	
Input	Forward current	$I_F$	60	mA	
	Reverse voltage	$V_R$	6	V	
	Power dissipation	$P_D$	100	mW	
	Derating factor (above $T_a = 85^\circ\text{C}$ )		3.8	mW / °C	
Output			EL301X	250	
	Off-state Output Terminal Voltage	$V_{DRM}$	EL302X	400	V
			EL305X	600	
			Peak Repetitive Surge Current (pw=100µs,120pps)	$I_{TSM}$	1
	On-State RMS Current	$I_{T(RMS)}$	100	mA	
	Power dissipation	$P_C$	300	mW	
	Derating factor (above $T_a = 85^\circ\text{C}$ )		7.4	mW/°C	
Total power dissipation	$P_{TOT}$	330	mW		
Isolation voltage <sup>*1</sup>	$V_{ISO}$	5000	Vrms		
Operating temperature	$T_{OPR}$	-55 to 100	°C		
Storage temperature	$T_{STG}$	-55 to 125	°C		
Soldering Temperature <sup>*2</sup>	$T_{SOL}$	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	$V_F$	-	1.18	1.5	V	$I_F = 10\text{mA}$
Reverse Leakage current	$I_R$	-	-	10	$\mu\text{A}$	$V_R = 6\text{V}$

**Output**

Parameter	Symbol	Min.	Typ.**1	Max.	Unit	Condition									
Peak Blocking Current	$I_{\text{DRM}}$	-	-	100	nA	$V_{\text{DRM}} = \text{Rated } V_{\text{DRM}}$ $I_F = 0\text{mA}$ **2									
Peak On-state Voltage	$V_{\text{TM}}$	-	-	2.5	V	$I_{\text{TM}} = 100\text{mA peak}$ , $I_F = \text{Rated } I_{\text{FT}}$									
Critical Rate of Rise off-state Voltage	<table border="0"> <tr> <td>EL301X</td> <td rowspan="3"><math>dv/dt</math></td> <td rowspan="3">-</td> <td rowspan="3">100</td> <td rowspan="3">-</td> <td rowspan="3">V/<math>\mu\text{s}</math></td> <td rowspan="3"> <math>V_{\text{PEAK}} = \text{Rated } V_{\text{DRM}}</math>,  <math>I_F = 0</math> (Fig. 8)**3                             </td> </tr> <tr> <td>EL302X</td> </tr> <tr> <td>EL305X</td> </tr> </table>	EL301X	$dv/dt$	-	100	-	V/ $\mu\text{s}$	$V_{\text{PEAK}} = \text{Rated } V_{\text{DRM}}$ , $I_F = 0$ (Fig. 8)**3	EL302X	EL305X					
EL301X	$dv/dt$	-							100	-	V/ $\mu\text{s}$	$V_{\text{PEAK}} = \text{Rated } V_{\text{DRM}}$ , $I_F = 0$ (Fig. 8)**3			
EL302X															
EL305X															
		1000	-	-		$V_{\text{PEAK}} = 400\text{V}$ , $I_F = 0$ (Fig. 8)									

Notes:

\*1. Typical values at  $T_a = 25^\circ\text{C}$

\*2. Test voltage must be applied within  $dv/dt$  rating.

\*3. This is static  $dv/dt$ . See Figure 8 for test circuit. Commutating  $dv/dt$  is a function of the load-driving thyristor(s) only.

**Transfer Characteristics**

Parameter	Symbol	Min.	Typ <sup>*1</sup>	Max.	Unit	Condition
LED Trigger Current	EL3020			30	mA	Main terminal Voltage=3V <sup>*4</sup>
	EL3010 EL3021 EL3051	-	-	15		
	EL3011 EL3022 EL3052	-	-	10		
	EL3012 EL3023 EL3053	-	-	5		
Holding Current	I <sub>H</sub>	-	250	-	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> (30 mA for EL3020, 15 mA for EL3010/EL3021/EL3051, 10 mA for EL3011/EL3022/EL3052, 5 mA for EL3012/EL3023/EL3053) and absolute maximum I<sub>F</sub> (60 mA).

Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

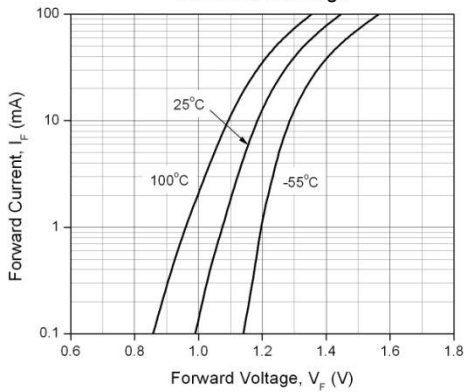


Figure 2. On-State Characteristics

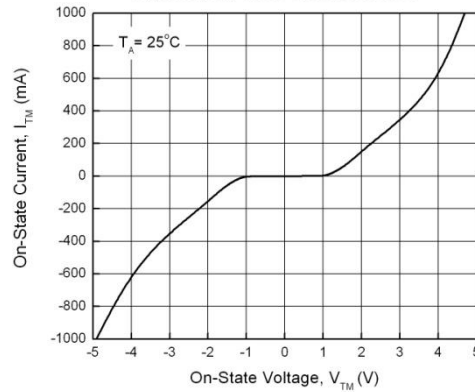


Figure 3. Holding Current vs. Ambient Temperature

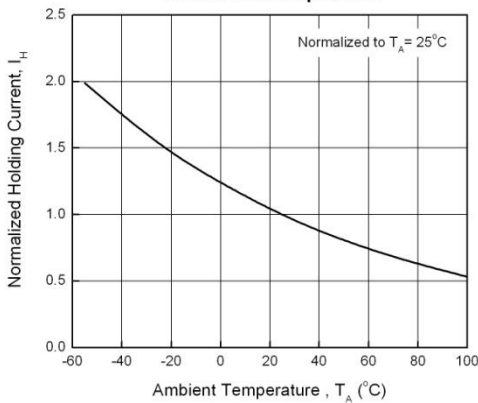


Figure 4. LED Current Required to Trigger vs. LED Pulse Width

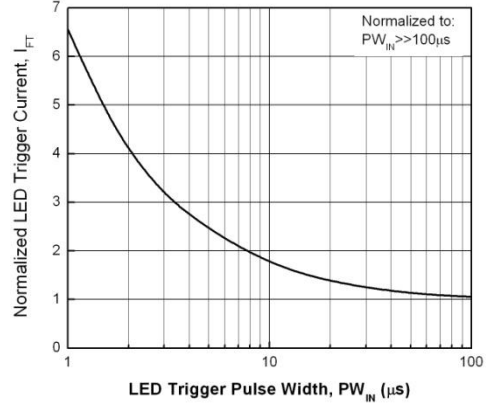


Figure 5. Leakage Current vs. Ambient Temperature

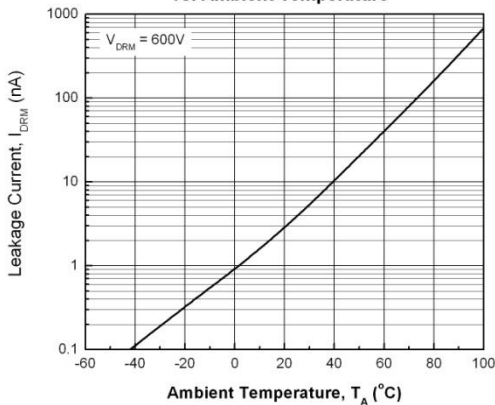


Figure 6. LED Trigger Current vs. Ambient Temperature

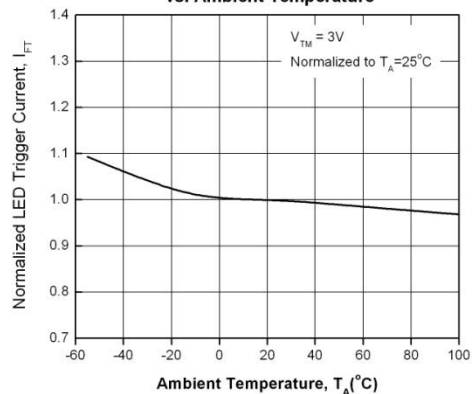


Figure 7. Off-State Output Terminal Voltage vs. Ambient Temperature

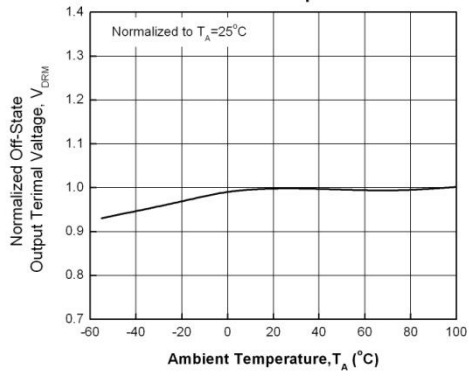
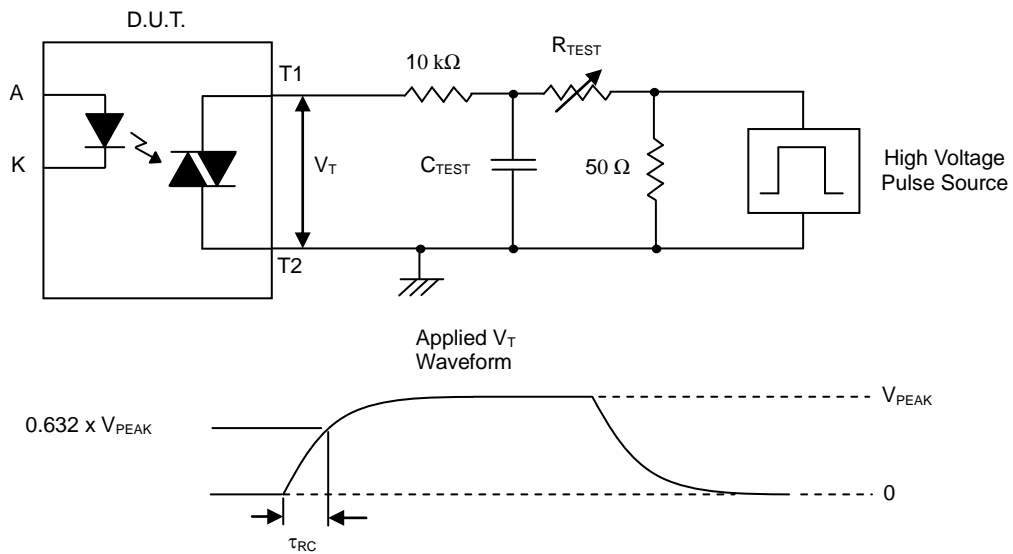


Figure 8. Static dv/dt Test Circuit & Waveform



### Measurement Method

The high voltage pulse is set to the required  $V_{PEAK}$  value and applied to the D.U.T. output side through the RC circuit above. LED current is not applied. The waveform  $V_T$  is monitored using a x100 scope probe. By varying  $R_{TEST}$ , 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,  $\tau_{RC}$  is recorded and the dv/dt calculated.

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

For example,  $V_{PEAK} = 400V$  for EL302X series. The dv/dt value is calculated as follows:

$$dv/dt = \frac{0.632 \times 400}{\tau_{RC}} = \frac{252.8}{\tau_{RC}}$$

## Order Information

### Part Number

**EL301XY(Z)-V**  
or **EL302XY(Z)-V**  
or **EL305XY(Z)-V**

### Notes

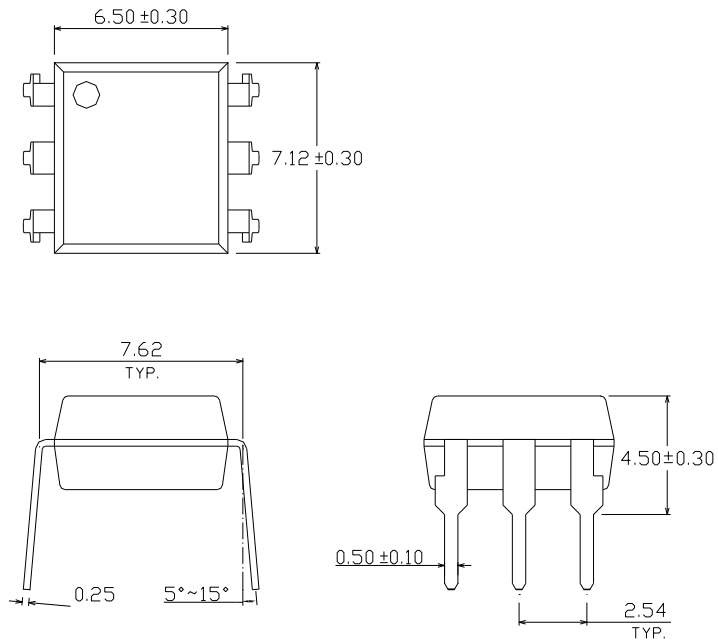
- X = Part No. for EL301x (0, 1 or 2).
- X = Part No. for EL302x (0,1, 2 or 3)
- X = Part No. for EL305x (1, 2 or 3)
- Y = Lead form option (S, S1, M or none)
- Z = Tape and reel option (TA, TB or none).
- V = VDE safety approved (optional)

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	Surface mount lead form	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

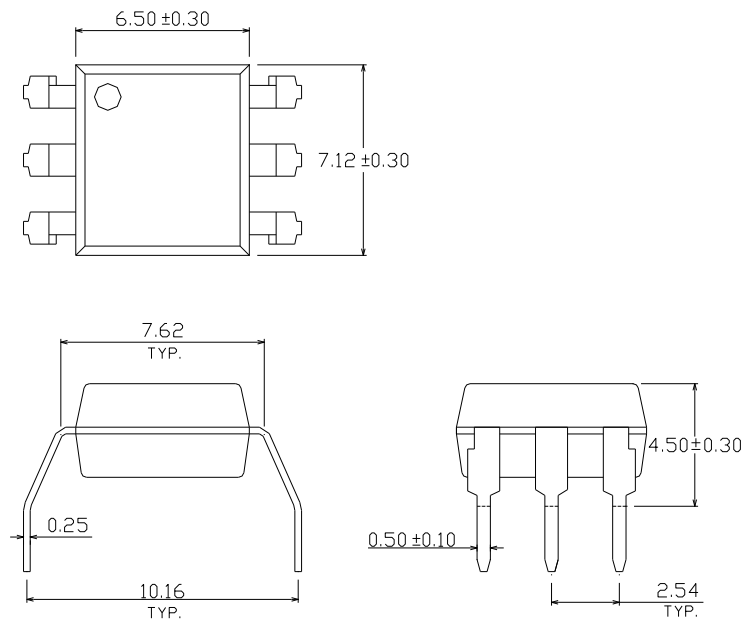


## Package Dimension (Dimensions in mm)

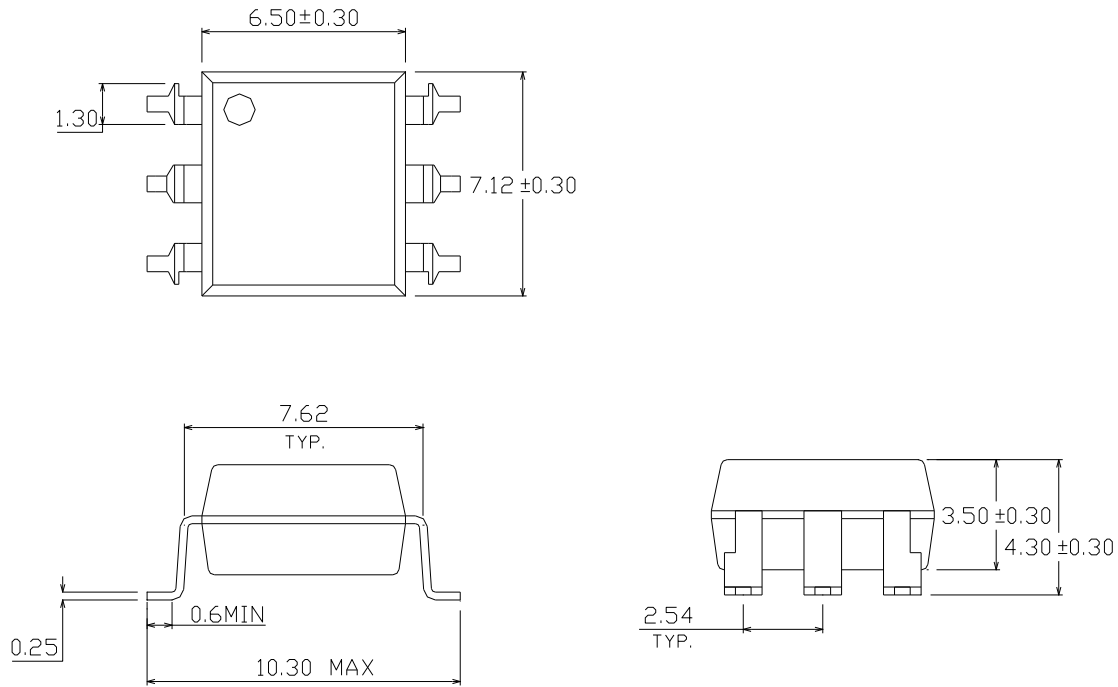
### Standard DIP Type



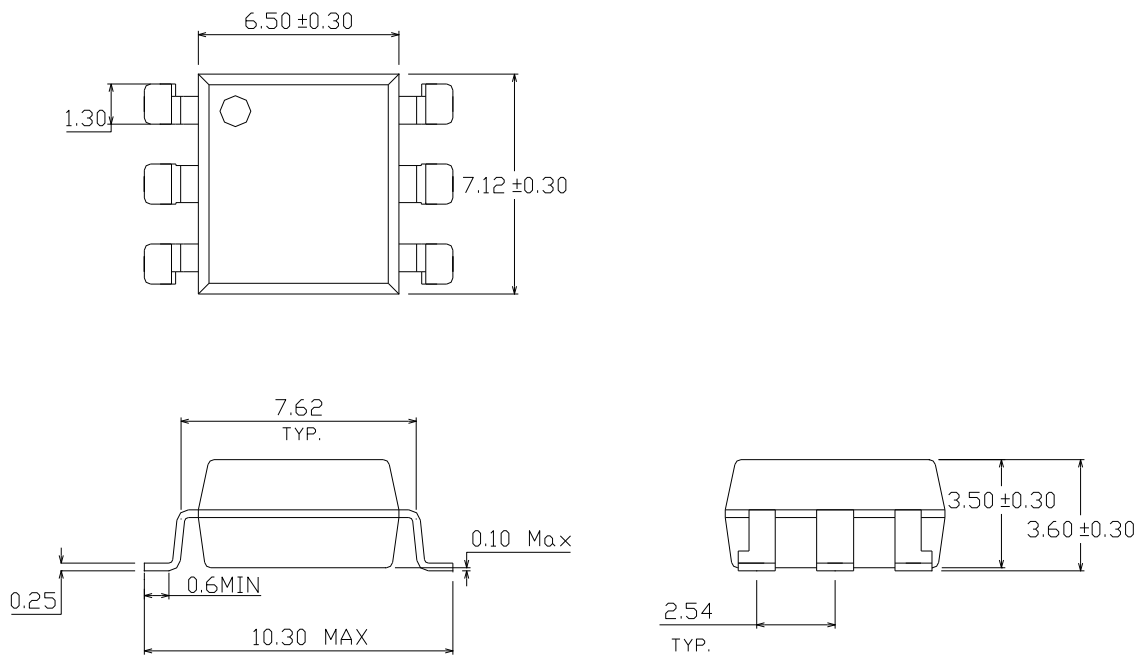
### Option M Type



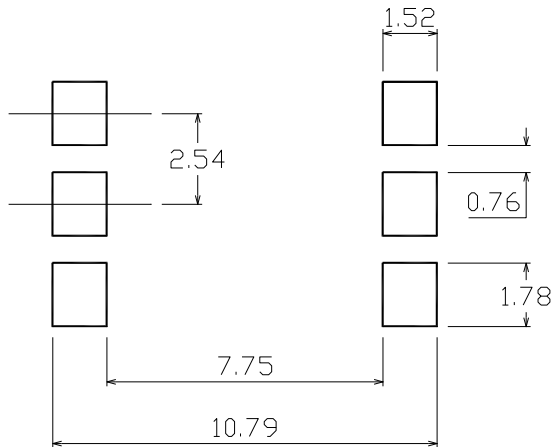
**Option S Type**



**Option S1 Type**



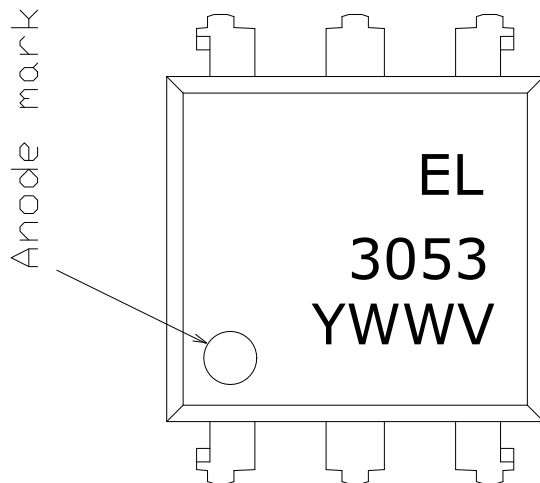
### Recommended pad layout for surface mount leadform



#### Notes

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

### Device Marking

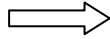
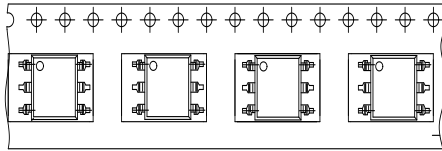


#### Notes

EL denotes EVERLIGHT  
3053 denotes Device Number  
Y denotes 1 digit Year code  
WW denotes 2 digit Week code  
V denotes VDE (optional)

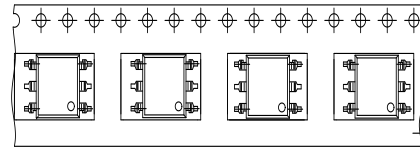
**Tape & Reel Packing Specifications**

**Option TA**



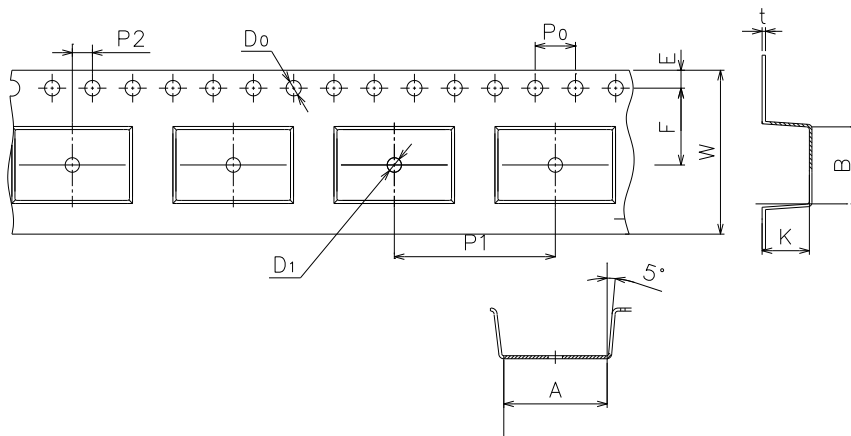
Direction of feed from reel

**Option TB**



Direction of feed from reel

**Tape dimensions**

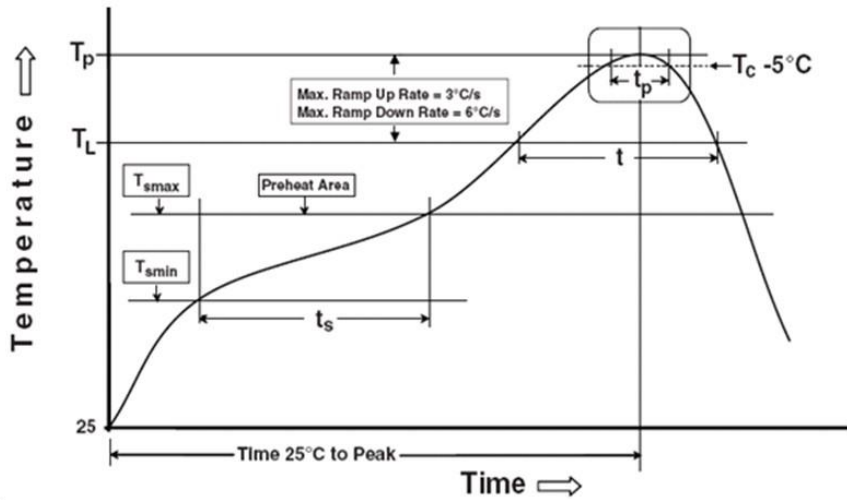


Dimension No.	<b>A</b>	<b>B</b>	<b>Do</b>	<b>D1</b>	<b>E</b>	<b>F</b>
Dimension (mm)	10.4±0.1	7.5±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1
Dimension No.	<b>Po</b>	<b>P1</b>	<b>P2</b>	<b>t</b>	<b>W</b>	<b>K</b>
Dimension (mm)	4.0±0.15	12±0.1	2.0±0.1	0.35±0.03	16.0±0.2	4.5±0.1

## Precautions for Use

### 1. Soldering Condition

#### 1.1 (A) Maximum Body Case Temperature Profile for evaluation of Reflow Profile



Notes

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