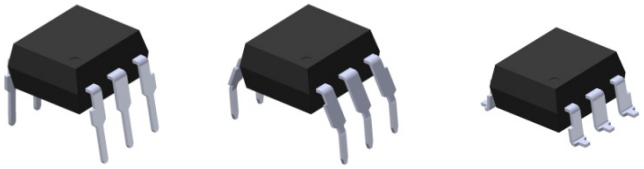
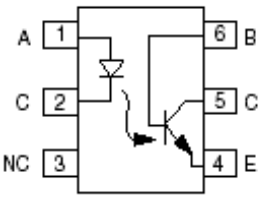
DATASHEET

6 PIN DIP PHOTOTRANSISTOR PHOTOCOUPLER
TIL11X Series
MCT2X Series



Schematic



Pin Configuration

1. Anode
2. Cathode
3. No Connection
4. Emitter
5. Collector
6. Base

Features:

- TIL11X series: TIL111, TIL117
- MCT2X series: MCT2, MCT2E
- High isolation voltage between input and output
  Viso = 5000 Vrms
- Creepage distance >7.6mm
- Compact dual-in-line package
- Operating temperature up to +110°C
- Pb free and RoHS compliant.
- UL approved (No. E214129)
- VDE approved (No. 132249)
- SEMKO approval
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CSA approved
- CQC approved

Description

The TIL11X series and MCT2X series of devices each consist of an infrared emitting diode optically coupled to a phototransistor detector.
They are packaged in a 6-pin DIP package and available in wide-lead spacing and SMD option.

Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance system
- Industrial controls

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Absolute Maximum Ratings (Ta=25℃)

	Parameter	Symbol	Rating	Unit
Input	Forward current	I_F	60	mA
	Peak forward current (t = 10μs)	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	Power dissipation	P_D	100	mW
	Derating factor (above 100°C)		3.8	mW/°C
Output	Collector-Emitter voltage	V_{CEO}	80	V
	Collector-Base voltage	V_{CBO}	80	V
	Emitter-Collector voltage	V_{ECO}	7	V
	Power dissipation	P_C	150	mW
	Derating factor (above 100°C)		9.0	mW/°C
Total Power Dissipation		P_{TOT}	200	mW
Isolation Voltage*1		V_{ISO}	5000	V rms
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 & 3 are shorted together, and pins 4, 5 & 6 are shorted together.
*2 For 10 seconds

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Electro-Optical Characteristics (Ta=25℃ unless specified otherwise)

Input

Parameter		Symbol	Min.	Typ.	Max.	Unit	Condition
Forward voltage	TIL111	V_F	-	1.22	1.4	V	I_F = 16mA
	TIL117		-	-	1.4		T_A=0-70℃, I_F = 16mA
			-	1.32	-		T_A= -55℃, I_F = 16mA
			-	1.1	-		T_A=110℃, I_F = 16mA
	MCT2 MCT2E		-	1.23	1.5		I_F = 20mA
Reverse current		I_R	-	-	10	μA	V_R = 6V

Output

Parameter		Symbol	Min	Typ.	Max.	Unit	Condition
Collector-Base dark current		I_{CBO}	-	-	20	nA	V_{CB} = 10V
Collector-Emitter dark current	All	I_{CEO}	-	1	50	nA	V_{CE} = 10V, IF=0mA
	TIL117		-	0.2	50		V_{CE} = 30V, I_F = 0mA, T_A=70℃
Collector-Emitter breakdown voltage		BV_{CEO}	80	-	-	V	I_c=1mA
Collector-Base breakdown voltage		BV_{CBO}	80	-	-	V	I_C=0.01mA
Emitter-Collector breakdown voltage		BV_{ECO}	7	-	-	V	I_E=0.1mA
Emitter-Base breakdown voltage		BV_{EBO}	7	-	-	V	I_E=0.1mA

* Typical values at T_a = 25°C

Transfer Characteristics

Parameter		Symbol	Min	Typ.	Max.	Unit	Condition
Collector current (Phototransistor operation)	TIL111	$I_{C(ON)}$	2	-	-	mA	I_F = 16mA ,V_{CE} = 0.4V
Collector current (Photodiode operation)			7	-	-	μA	I_F = 16mA ,V_{CB} = 0.4V
Current Transfer Ratio	TIL117	CTR	50	-	-	%	I_F = 10mA ,V_{CE} = 10V
	MCT2 MCT2E		20	-	-		I_F = 10mA ,V_{CE} = 10V

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Transfer Characteristics

Parameter		Symbol	Min	Typ.	Max.	Unit	Condition
Collector-Emitter saturation voltage	All	$V_{CE(sat)}$	-	-	0.4	V	I_F = 16mA , I_C = 2mA
	TIL117		-	-	0.4		I_F = 10mA , I_C = 0.5mA
Isolation resistance		R_{IO}	10^{11}	-	-	Ω	V_{IO} = 500Vdc
Input-output capacitance		C_{IO}	-	-	2	pF	V_{IO} = 0, f = 1MHz
Turn-on time	TIL117	T_{on}	-	10	12	μs	V_{CC} = 10V, I_C = 2mA, R_L = 100Ω
Turn-off time	TIL117	T_{off}	-	9	12		
Rise time	TIL117 TIL111	t_r	-	6	10		
Fall time	TIL117 TIL111	t_f	-	8	10		
Turn-on time	MCT2 MCT2E	T_{on}	-	3	10	μs	V_{CC} = 10V, I_F = 10mA, R_L = 100Ω
Turn-off time	MCT2 MCT2E	T_{off}	-	3	10		
Rise time	MCT2 MCT2E	t_r	-	3	10		
Fall time	MCT2 MCT2E	t_f	-	3	10		

* Typical values at T_a = 25°C

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Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

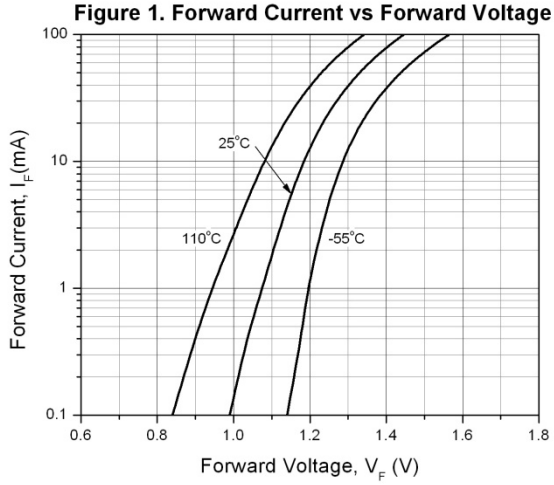

Figure 2. Current Tranfer Ratio vs Forward Current

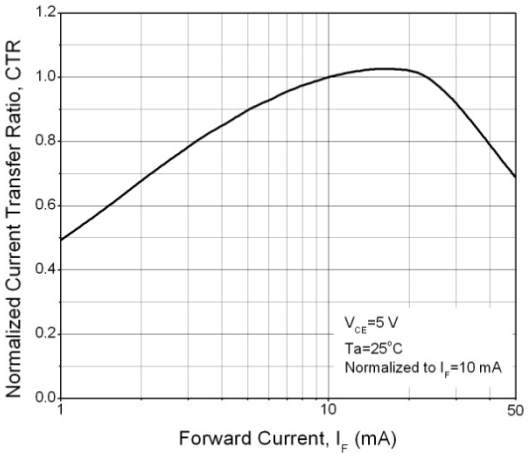

Figure 3. Current Tranfer Ratio vs Ambient Temperature

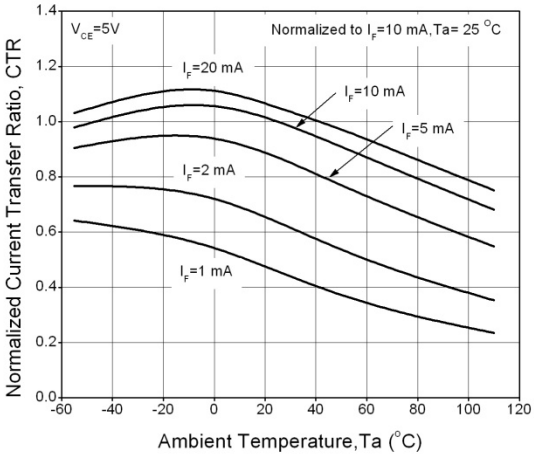

Figure 4. Current Transfer Ratio (Saturated) vs Base-Emitter Resistance

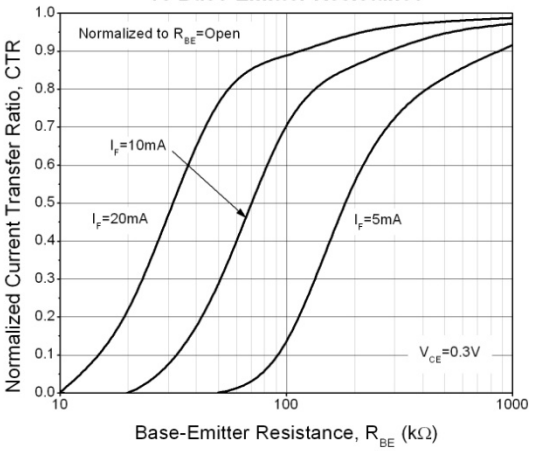

Figure 5. Current Transfer Ratio (Unsaturated) vs Base-Emitter Resistance

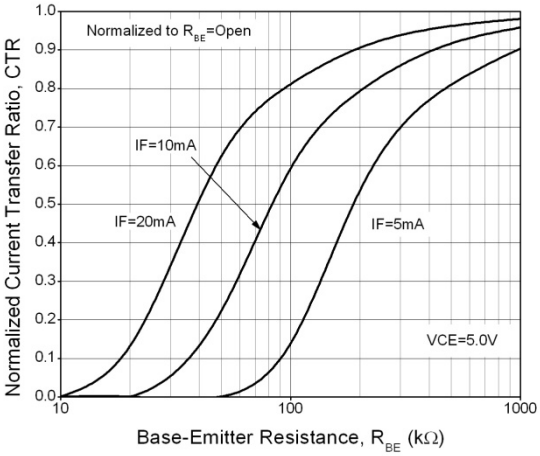

Figure 6. Dark Current vs Ambient Temperature

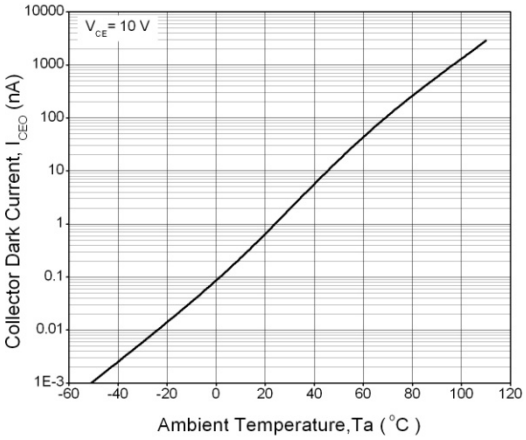

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Figure 7. Collector-Emitter Saturation Voltage vs Collector Current

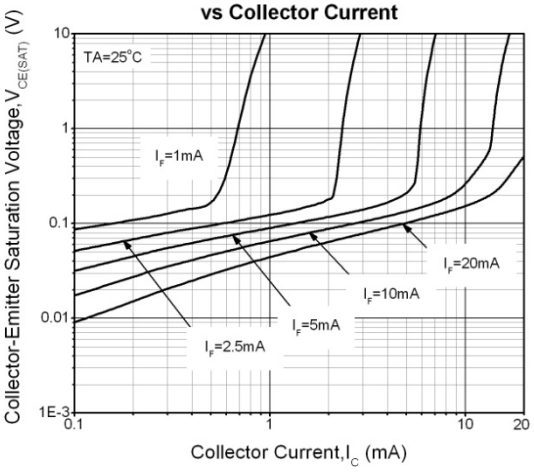


Figure 8. Switching Time vs Load Resistance

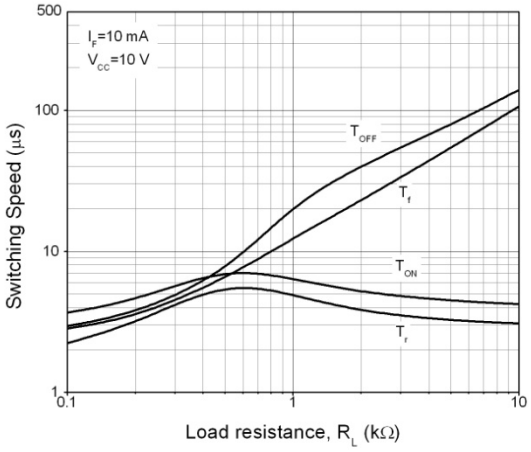


Figure 9. Turn-on Time vs Base-Emitter Resistance)

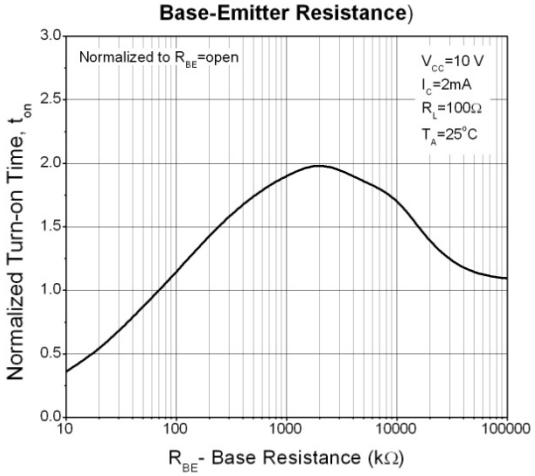
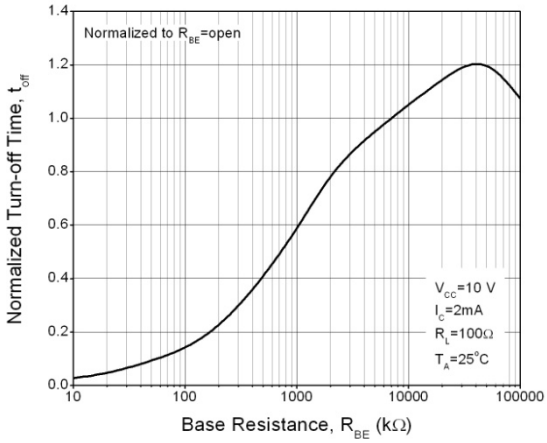


Figure 10. Turn-off Time vs Base-Emitter Resistance



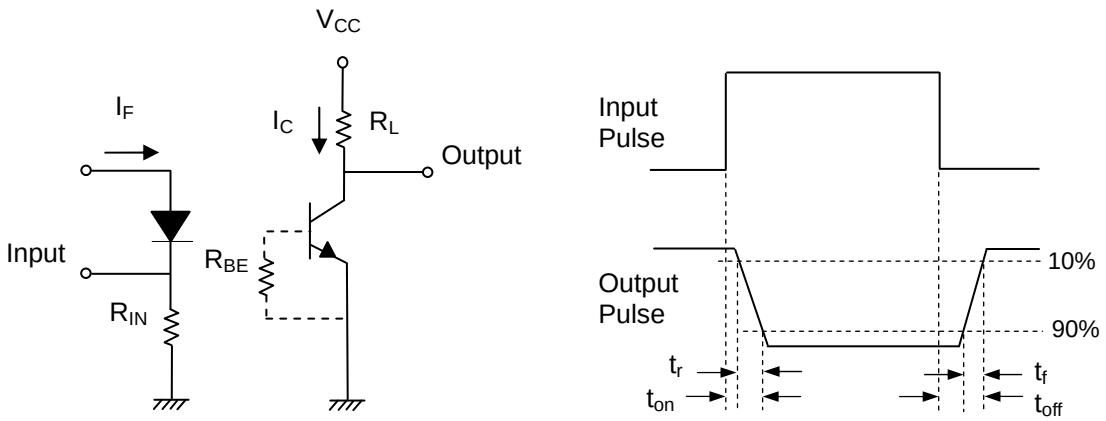


Figure 11. Switching Time Test Circuit & Waveforms

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Order Information

Part Number

TIL11XY(Z)-V

or

MCT2XY(Z)-V

Note
X = Part no. for MCT2X series (E or none)
= Part no. for TIL11X series (1 or 7)
Y = Lead form option (S, S1, M or none)
Z = Tape and reel option (TA, TB or none).
V = VDE safety (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 (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

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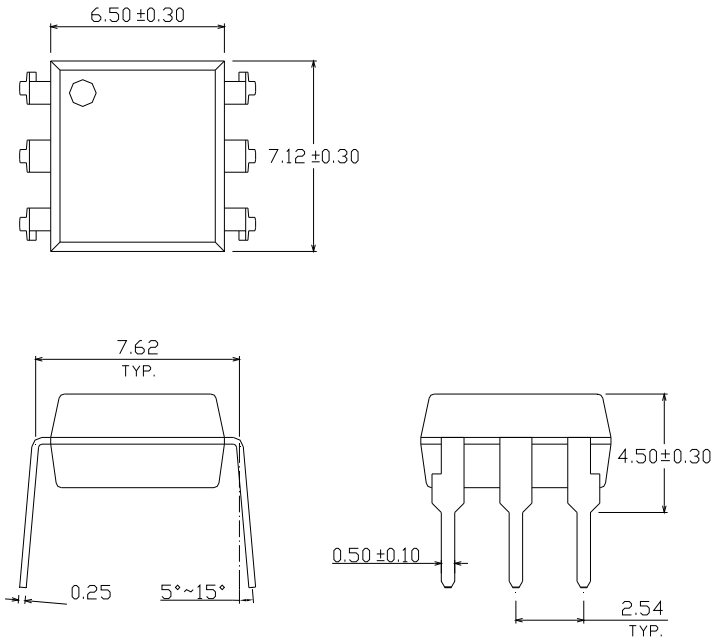
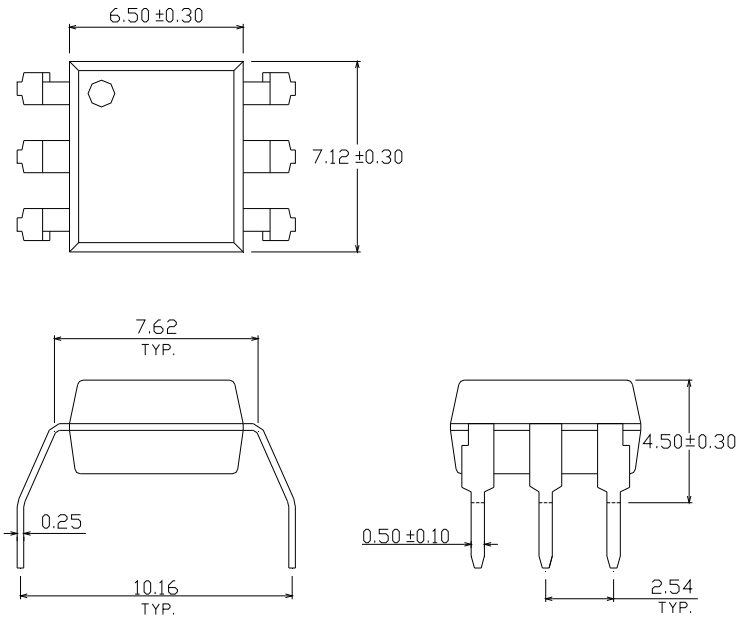
Package Dimension (Dimensions in mm)

Standard DIP Type



Option M Type



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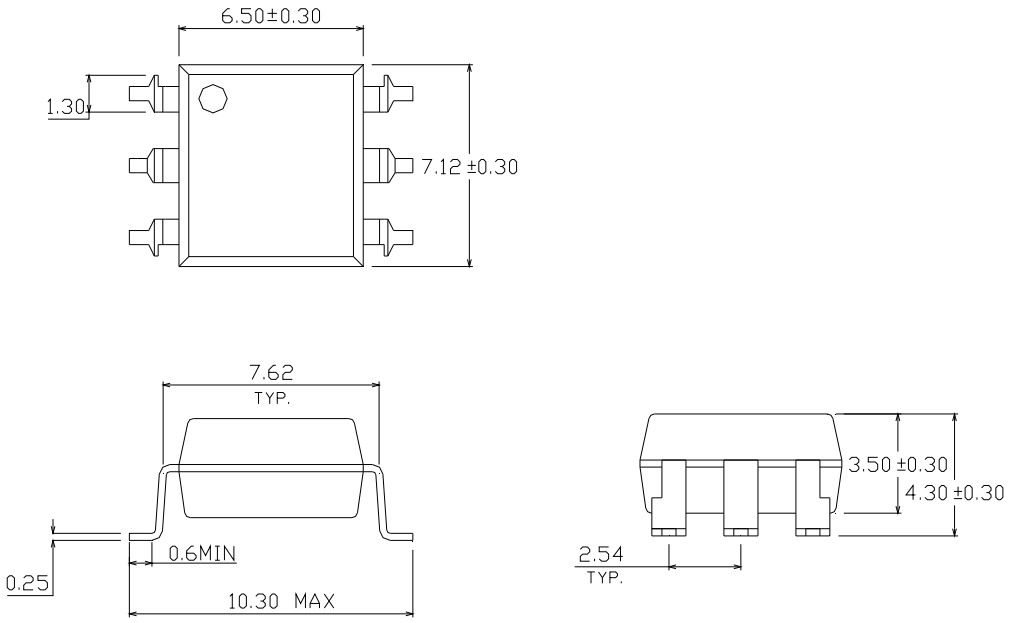
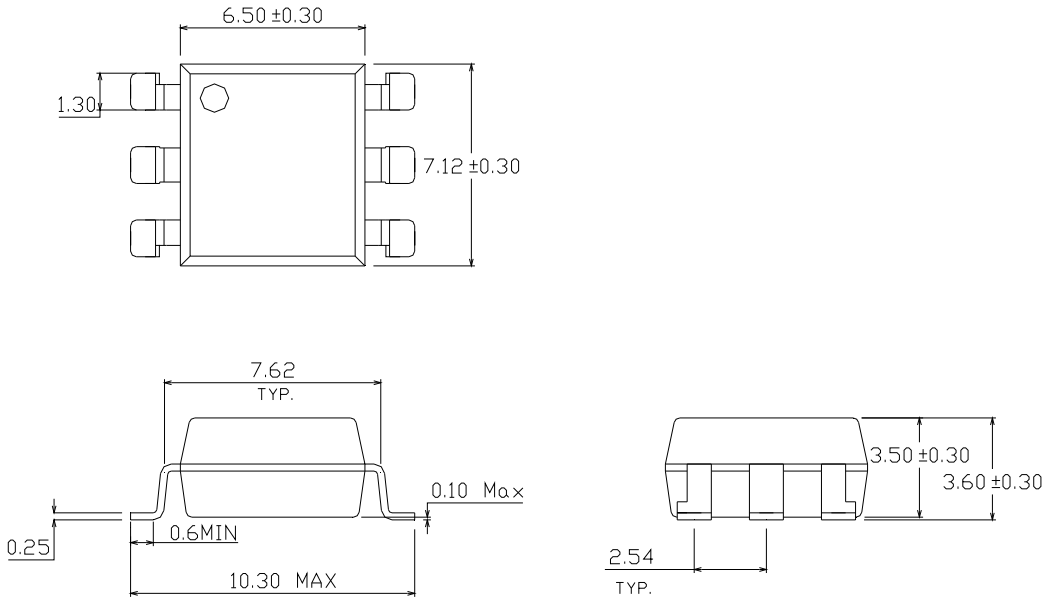
Option S Type



Option S1 Type



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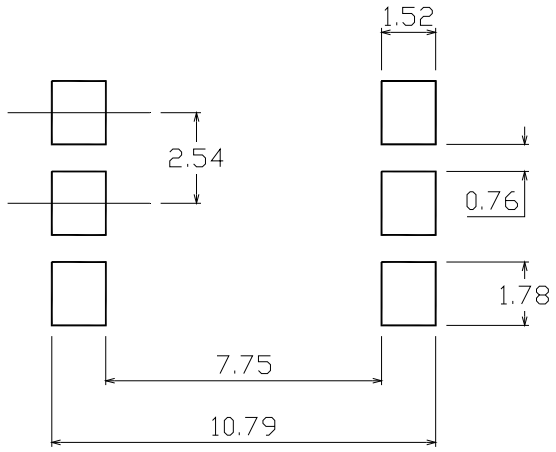
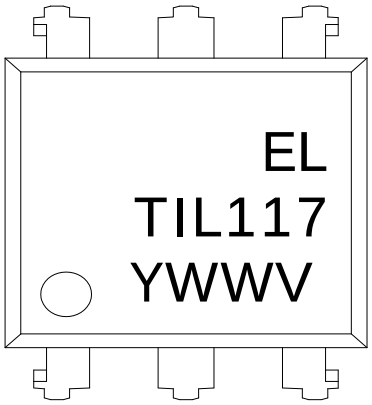
Recommended pad layout for surface mount leadform



Device Marking



Notes

EL	denotes Everlight
TIL117	denotes Device Number
Y	denotes 1 digit Year code
WW	denotes 2 digit Week code
V	denotes VDE optional

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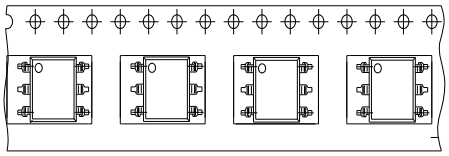
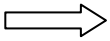
Tape & Reel Packing Specifications

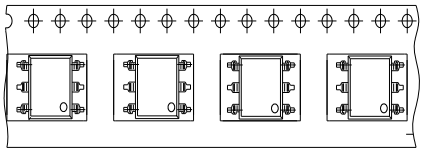
Option TA

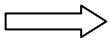




Direction of feed from reel

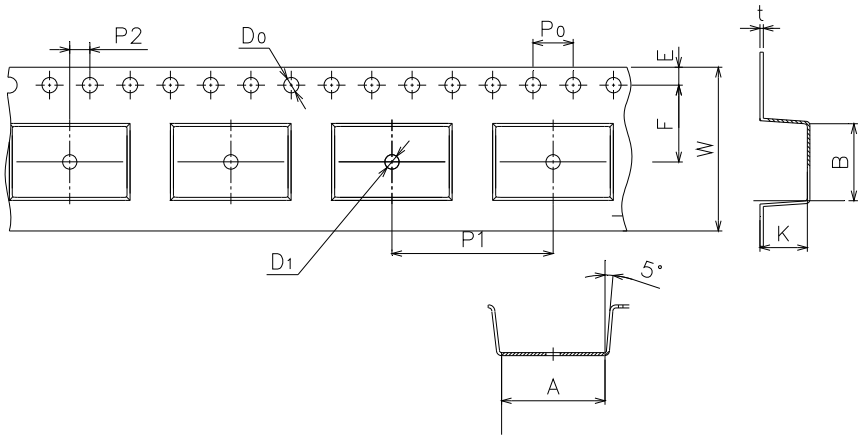
Option TB





Direction of feed from reel

Tape dimensions



Dimension No.	A	B	Do	D1	E	F
Dimension (mm)	10.4±0.1	7.5±0.1	1.5±0.1	1.5+0.1/-0	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

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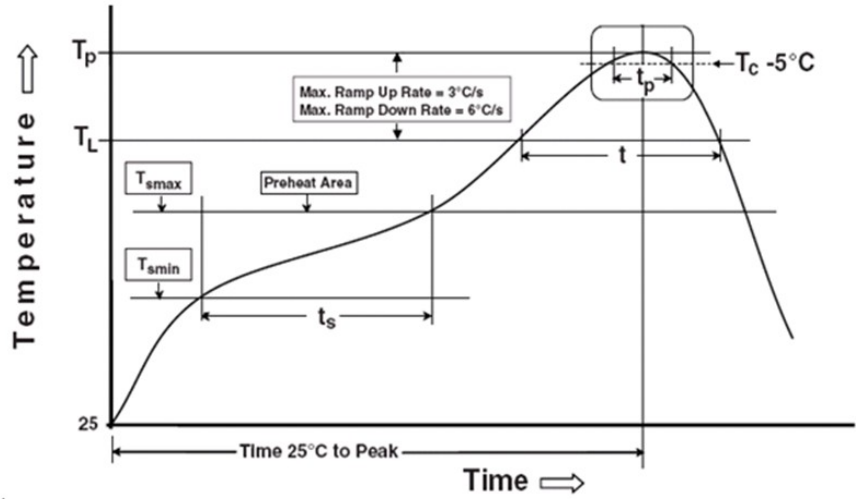
Precautions for Use

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°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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