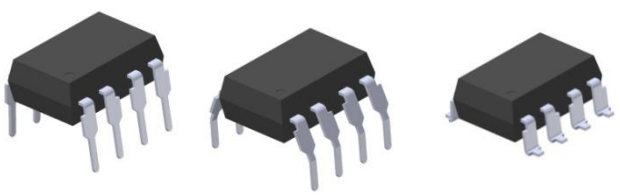
EVERLIGHT

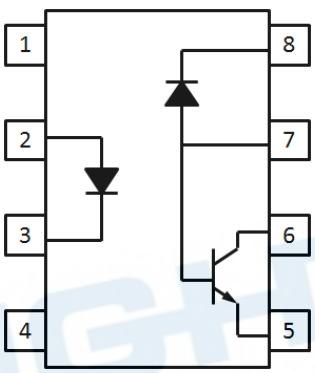
DATASHEET

8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER
6N135 6N136 EL450X Series

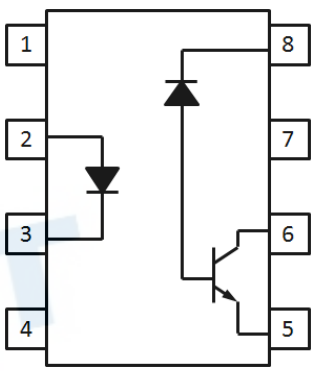


Schematic

6N135 / 6N136



EL4502 / EL4503



Features

- High speed 1Mbit/s
- High isolation voltage between input and output (Viso=5000 Vrms)
- Guaranteed performance from 0°C to 70°C
- Wide operating temperature range of -55°C to 100°C
- Pb free and RoHS compliant
- UL and cUL approved(No. E214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved

Pin Configuration
1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. V_{out}
7. V_B
8. V_{CC}

Pin Configuration
1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. V_{out}
7. No Connection
8. V_{CC}

Description

The 6N135, 6N136, EL4502 and EL4503 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance of the input transistor. The devices are packaged in an 8-pin DIP package and available in wide-lead spacing and SMD option

Applications

- Line receivers
- Telecommunication equipments
- Power transistor isolation in motor drives
- Replacement for low speed phototransistor photo couplers
- Feedback loop in switch-mode power supplies
- Home appliances
- High speed logic ground isolation

Absolute Maximum Ratings (Ta=25℃)

Parameter			Symbol	Rating	Unit
Input	Forward current		I_F	25	mA
	Peak forward current (50% duty, 1ms P.W)		I_{FP}	50	mA
	Peak transient current (≤1μs P.W,300pps)		I_{Ftrans}	1	A
	Reverse voltage		V_R	5	V
	Power dissipation		P_{IN}	45	mW
Output	Power dissipation		P_O	100	mW
	Emitter-Base reverse voltage	6N135 6N136	V_{EBR}	5	V
	Base current	6N135 6N136	I_B	5	mA
	Average Output current		$I_{O(AVG)}$	8	mA
	Peak Output current		$I_{O(PK)}$	16	mA
	Output voltage		V_O	-0.5 to 20	V
	Supply voltage		V_{CC}	-0.5 to 30	V
Total Power Dissipation			P_{TOT}	200	mW
Isolation Voltage*1			V_{ISO}	5000	Vrms
Operating Temperature			T_{OPR}	-55 to 100	℃
Storage Temperature			T_{STG}	-55 to 125	℃
Soldering Temperature*2			T_{SOL}	260	℃

Notes:

*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2, 3, 4 are shorted together, and pins 5, 6, 7, 8 are shorted together.

*2 For 10 seconds

Electrical Characteristics (T_A=0 to 70°C unless specified otherwise)

Input

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	V_F	-	1.45	1.8	V	I_F =16mA
Reverse Voltage	V_R	5.0	-	-	V	I_R = 10μA
Temperature coefficient of forward voltage	$\Delta V_F/\Delta T_A$	-	-1.9	-	mV/°C	I_F =16mA

Output

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Logic High Output Current	I_{OH}	-	0.001	0.5	μA	I_F=0mA, V_O=V_{CC}=5.5V, T_A=25°C
		-	0.01	1		I_F=0mA, V_O=V_{CC}=15V, T_A=25°C
		-	-	50		I_F=0mA, V_O=V_{CC}=15V
Logic Low Supply Current	I_{CCL}	-	140	200	μA	I_F=16mA, V_O=Open, V_{CC}=15V
Logic High Supply Current	I_{CCH}	-	0.01	1	μA	I_F=0mA, V_O=Open, V_{CC}=15V, T_A=25°C
		-	-	2		I_F=0mA, V_O=Open, V_{CC}=15V

Transfer Characteristics (T_A=0 to 70°C unless specified otherwise)

Parameter		Symbol	Min	Typ.	Max.	Unit	Condition
Current Transfer Ratio	6N135	CTR	7	-	50	%	I_F = 16mA ,V_O = 0.4V, V_{CC}=4.5V, T_A=25°C
	6N136 EL4502 EL4503		19	-	50		
	6N135		5	-	-		I_F = 16mA ,V_O = 0.5V, V_{CC}=4.5V
	6N136 EL4502 EL4503		15	-	-		
Logic Low Output Voltage	6N135	V_{OL}	-	0.18	0.4	V	I_F = 16mA ,I_O = 1.1mA, V_{CC}=4.5V, T_A=25°C
	6N136 EL4502 EL4503		-	0.25	0.4		I_F = 16mA ,I_O = 3mA, V_{CC}=4.5V, T_A=25°C
	6N135		-	-	0.5		I_F = 16mA ,I_O =0.8mA, V_{CC}=4.5V
	6N136 EL4502 EL4503		-	-	0.5		I_F= 16mA ,I_O=2.4mA, V_{CC}=4.5V

Switching Characteristics (T_A=0 to 70°C unless specified otherwise, I_F=16mA, Vcc=5V)

Parameter		Symbol	Min	Typ.	Max.	Unit	Condition
Propagation Delay Time to Logic Low (Fig.8)	6N135	TPHL	-	0.35	1.5	µs	R_L =4.1KΩ, TA=25°C
			-	-	2.0		R_L=4.1KΩ
	6N136 EL4502 EL4503		-	0.35	0.8		R_L=1.9KΩ, T_A=25°C
			-	-	1.0		R_L =1.9KΩ
Propagation Delay Time to Logic High (Fig.8)	6N135	TPLH	-	0.5	1.5	µs	R_L =4.1KΩ, TA=25°C
			-	-	2.0		R_L =4.1KΩ
	6N136 EL4502 EL4503		-	0.3	0.8		R_L =1.9KΩ, TA=25°C
			-	-	1.0		R_L =1.9KΩ
Common Mode Transient Immunity at Logic High (Fig.9)*3	6N135	CM_H	1,000	-	-	V/µs	I_F = 0mA , V_{CM}=10Vp-p, R_L=4.1KΩ, T_A =25°C
	6N136 EL4502		1,000	-	-		I_F = 0mA , V_{CM}=10Vp-p, R_L=1.9KΩ, T_A =25°C
	EL4503		15000	20000	-		I_F = 0mA , V_{CM}=1500Vp-p, R_L=1.9KΩ, T_A =25°C
Common Mode Transient Immunity at Logic Low (Fig.9)*3	6N135	CM_L	1,000	-	-	V/µs	I_F = 16mA , V_{CM}=10Vp-p, R_L=4.1KΩ, T_A =25°C
	6N136 EL4502		1,000	-	-		I_F = 16mA , V_{CM}=10Vp-p, R_L=1.9KΩ, T_A=25°C
	EL4503		15000	20000	-		I_F = 16mA , V_{CM} =1500Vp-p, R_L =1.9KΩ, T_A =25°C

* Typical values at T_a = 25°C

Typical Electro-Optical Characteristics Curves

Fig.1 Forward Current vs. Forward Voltage

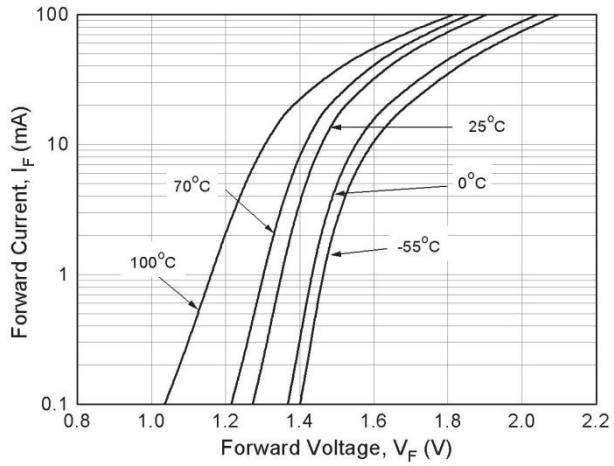


Fig.2 Normalized Current Transfer Ratio vs. Forward Current

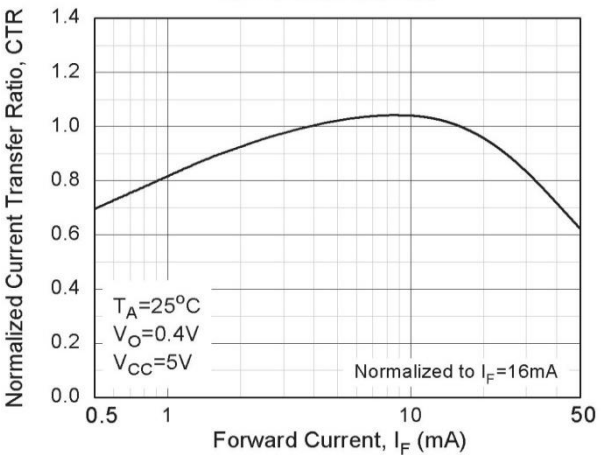


Fig.3 Normalized Current Transfer Ratio vs. Ambient Temperature

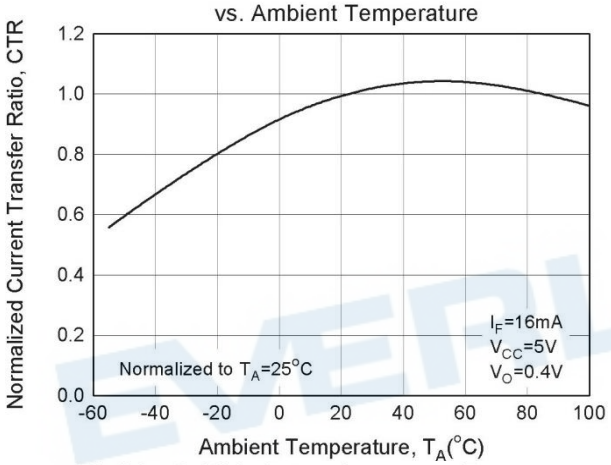


Fig.4 Output Current vs Output Voltage

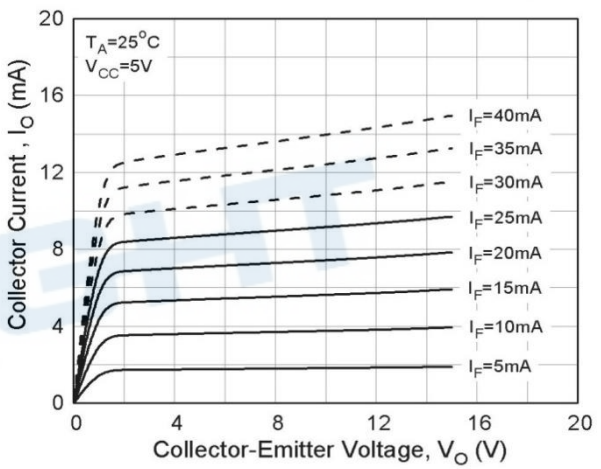


Fig.5 Logic High Output Current vs. Temperature

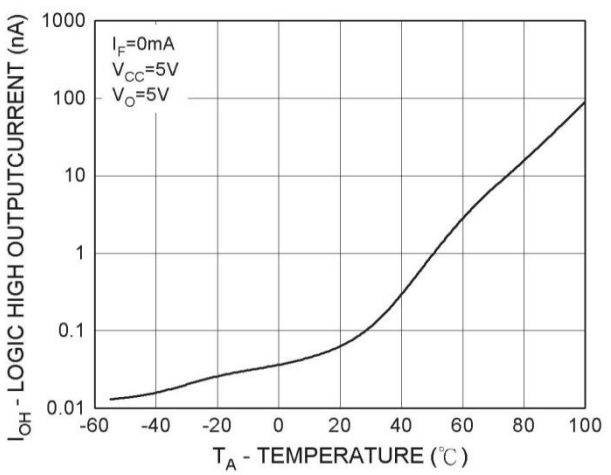


Fig.6 Propagation Delay vs. Load Resistance

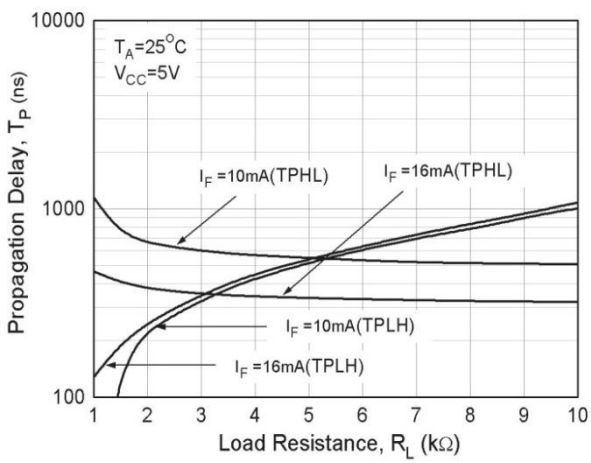


Fig.7 Propagation Delay vs. Temperature

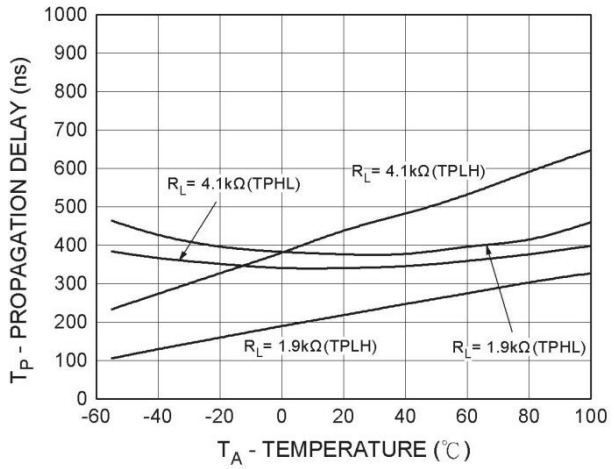


Figure 8 Switching Time Test Circuit & Waveform

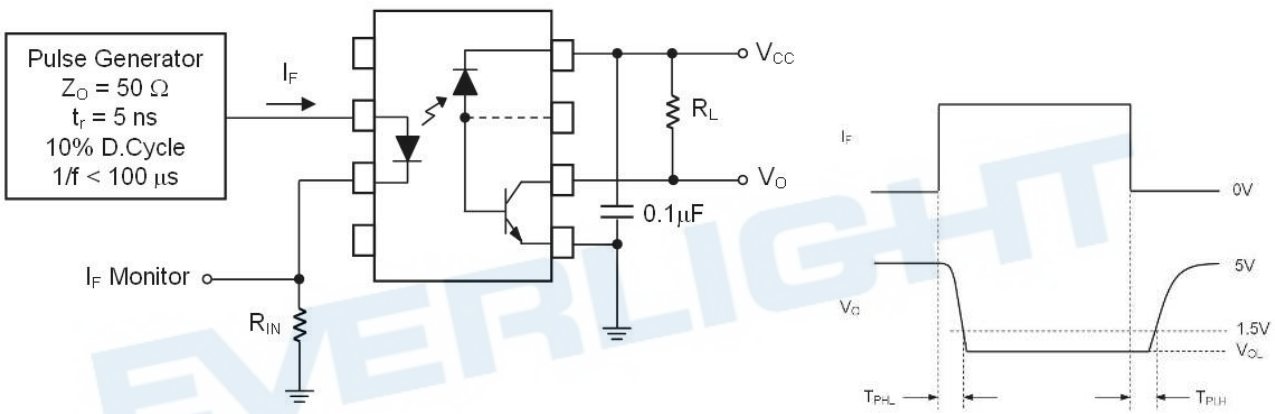
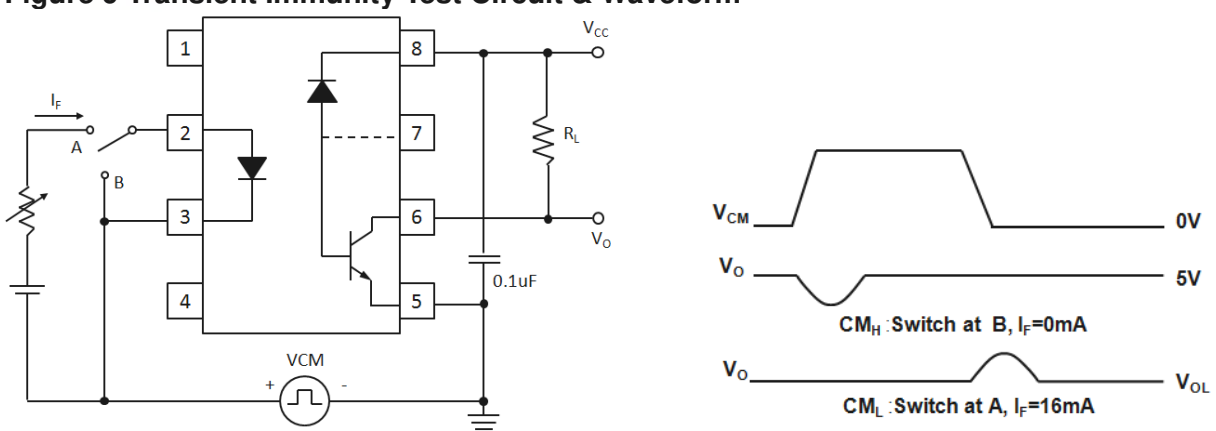


Figure 9 Transient Immunity Test Circuit & Waveform



Note:

*3 Common mode transient immunity in logic high level is the maximum tolerable (positive) dVcm/dt on the leading edge of the common mode pulse signal VCM, to assure that the output will remain in a logic high state (i.e., VO > 2.0V).

Common mode transient immunity in logic low level is the maximum tolerable (negative) dVcm/dt on the trailing edge of the common mode pulse signal, VCM, to assure that the output will remain in a logic low state (i.e., VO < 0.8V).

Order Information

Part Number

6N13XY(Z)-V

or

EL450XY(Z)-V

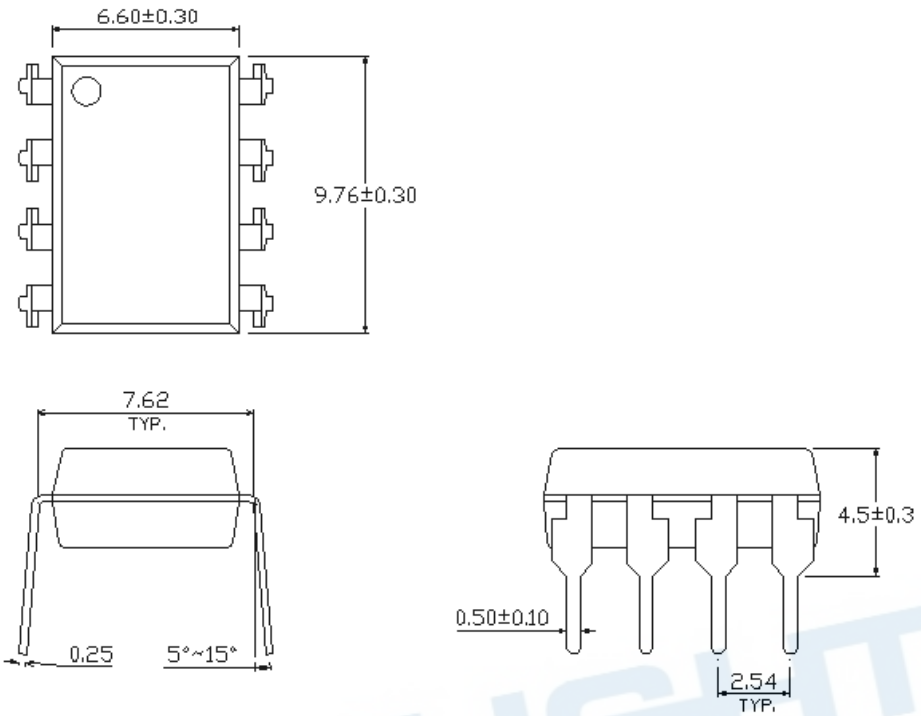
Note

X = Part No. (X = 5 or 6) for 6N series; (X=2 or 3) for EL45 series
Y = Lead form option (S, S1, M or none)
Z = Tape and reel option (TA, TB or none)
V = VDE (optional)

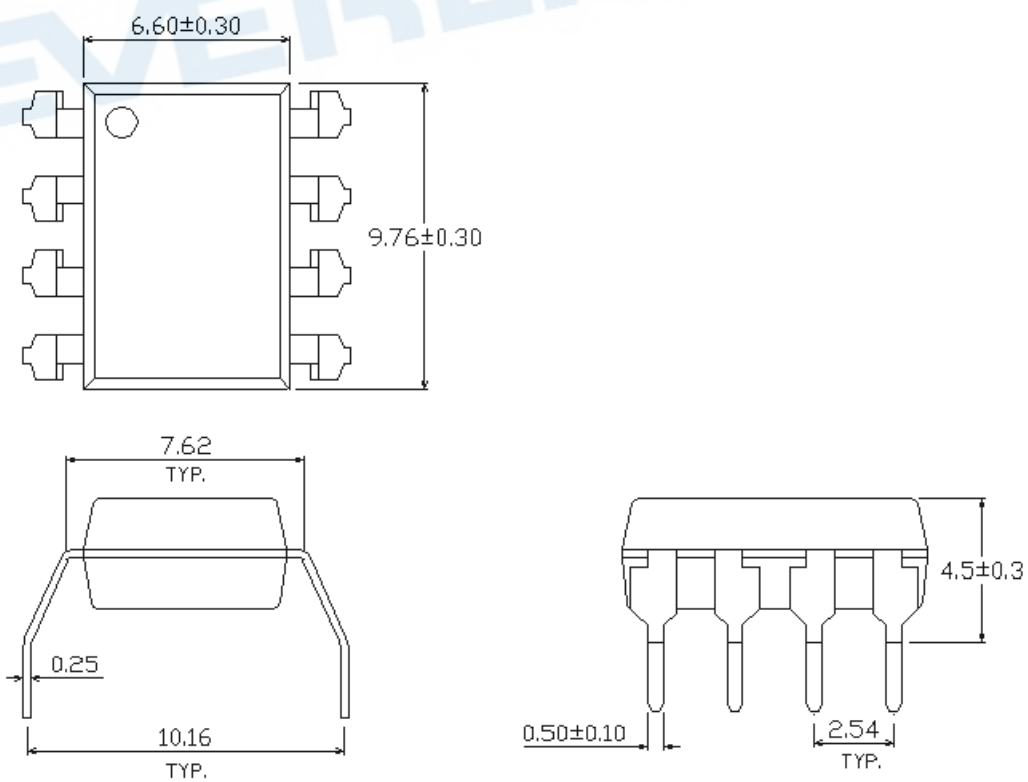
Option	Description	Packing quantity
None	Standard DIP-8	45 units per tube
M	Wide lead bend (0.4 inch spacing)	45 units per tube
S (TA)	Surface mount lead form + TA tape & reel option	1000 units per reel
S (TB)	Surface mount lead form + TB tape & reel option	1000 units per reel
S1 (TA)	Surface mount lead 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)

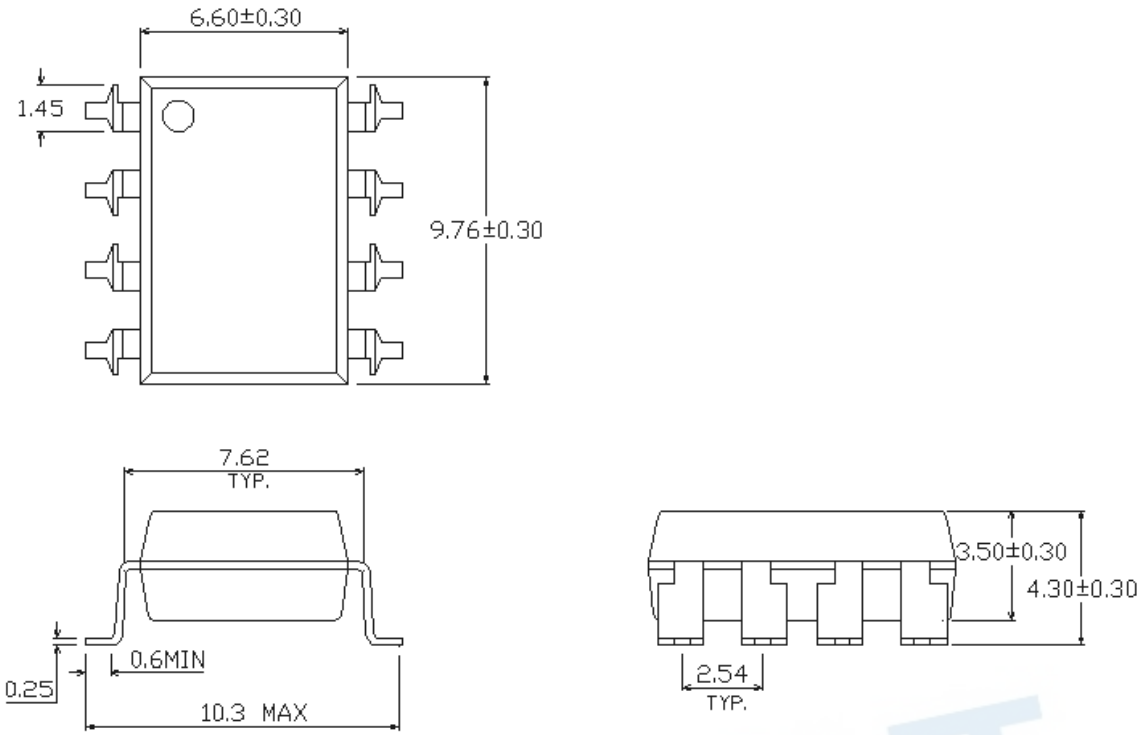
Standard DIP Type



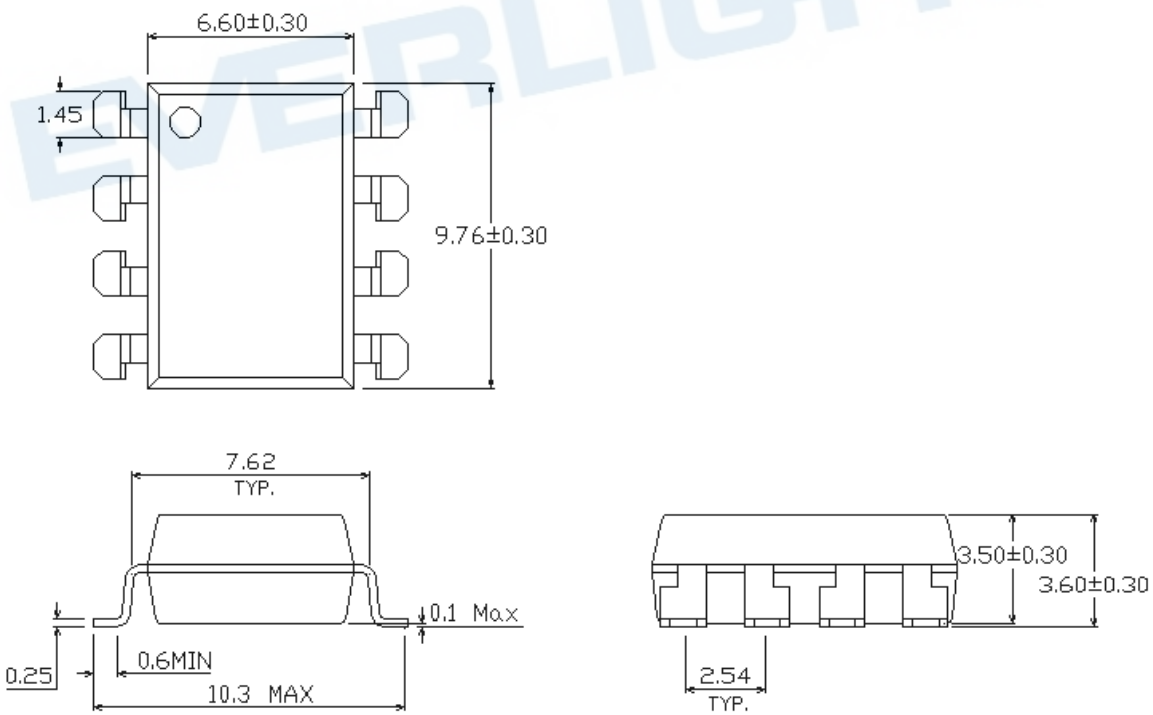
Option M Type



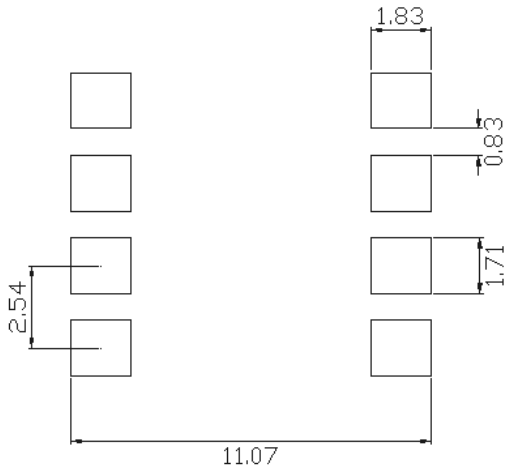
Option S Type



Option S1 Type

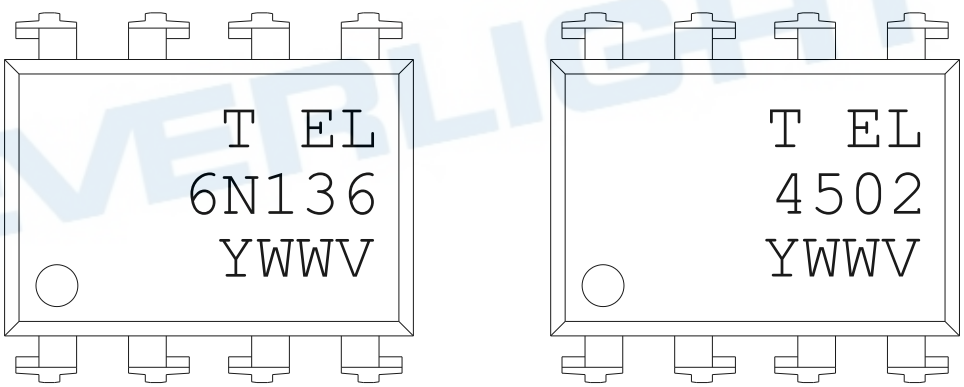


Recommended pad layout for surface mount leadform



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

Device Marking

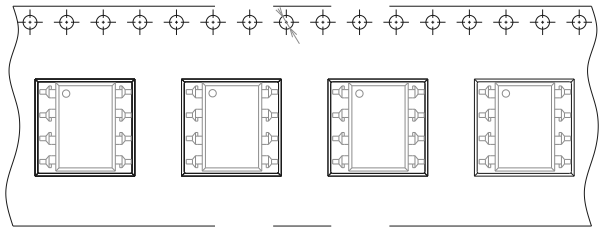


Notes

T	denotes Factory No code : made in China T : made in Taiwan
EL	denotes EVERLIGHT
4502	denotes Device Number
6N136	denotes Device Number
Y	denotes 1 digit Year code
WW	denotes 2 digit Week code
V	denotes VDE (optional)

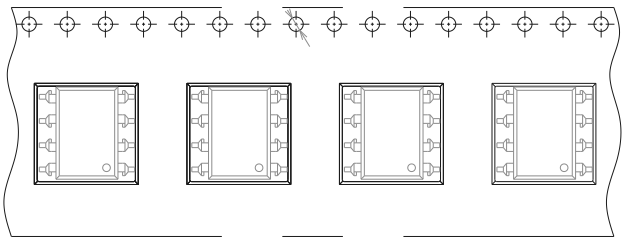
Tape & Reel Packing Specifications

Option TA



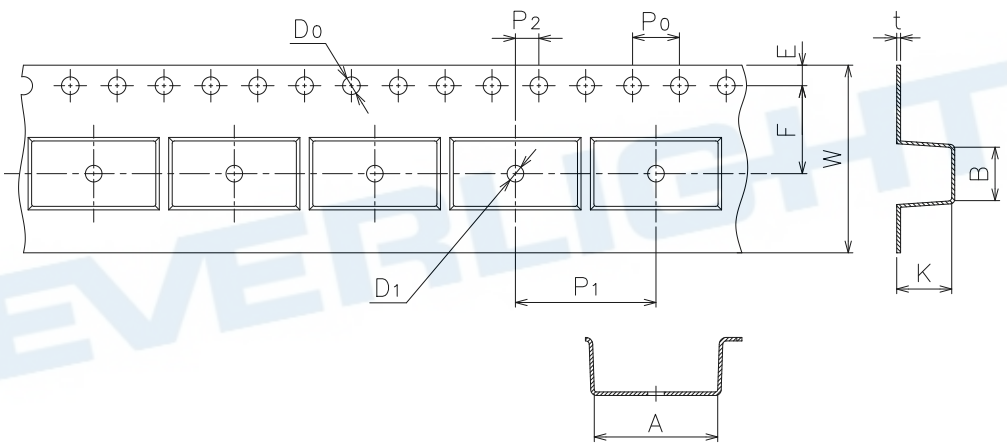
Direction of feed from reel

Option TB



Direction of feed from reel

Tape dimensions

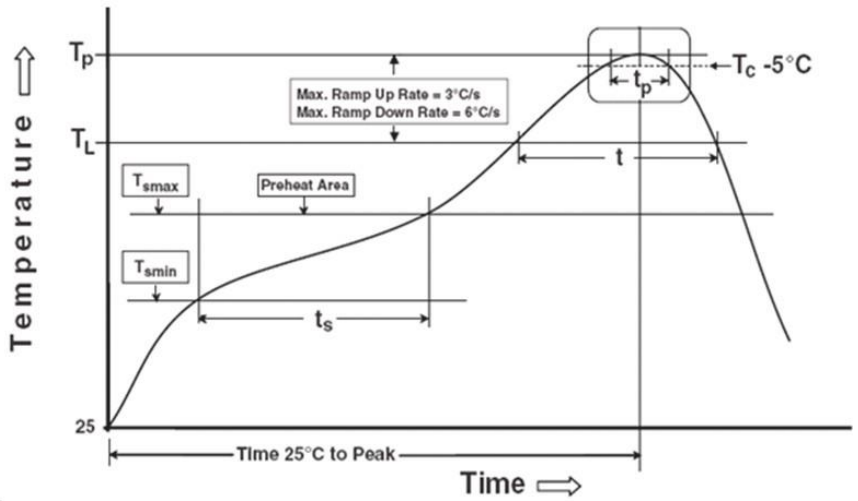


Dimension No.	**A**	**B**	**Do**	**D1**	**E**	**F**
Dimension(mm)	10.4±0.1	10.0±0.1	1.5+0.1/-0	1.5±0.25	1.75±0.1	7.5±0.1
Dimension No.	**Po**	**P1**	**P2**	**t**	**W**	**K**
Dimension(mm)	4.0±0.1	12.0±0.1	2.0±0.05	0.4±0.05	16.0±0.3	4.5±0.1

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°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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DISCLAIMER

1. Above specification may be changed without notice. EVERLIGHT will reserve authority on material change for above specification.
2. The graphs shown in this datasheet are representing typical data only and do not show guaranteed values.
3. When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets. EVERLIGHT assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.
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