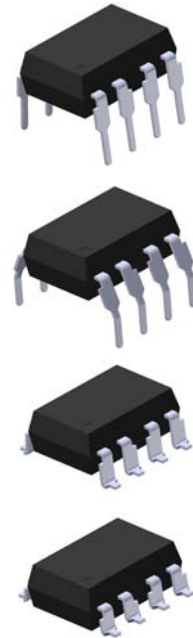


# 8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER

6N135 6N136  
EL4502

## 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 approved (No. 214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CSA approved (No. 2037145)



## Description

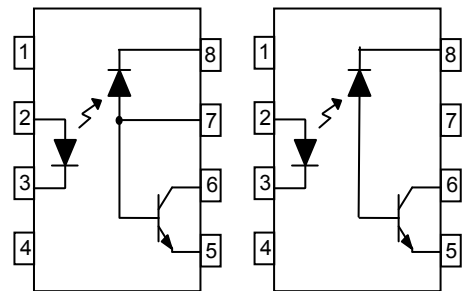
The 6N135, 6N136 and EL4502 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor 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

### Schematic



6N135 / 6N136

EL4502

#### Pin Configuration

1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7.  $V_B$
8.  $V_{CC}$

#### Pin Configuration

1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7. No Connection
8.  $V_{CC}$



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# 8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER

**6N135 6N136  
EL4502**

## Absolute Maximum Ratings (T<sub>a</sub>=25°C)

Parameter		Symbol	Rating	Unit	
Input	Forward current	I <sub>F</sub>	25	mA	
	Peak forward current (50% duty, 1ms P.W)	I <sub>FP</sub>	50	mA	
	Peak transient current (≤1μs P.W,300pps)	I <sub>Ftrans</sub>	1	A	
	Reverse voltage	V <sub>R</sub>	5	V	
	Power dissipation	P <sub>IN</sub>	45	mW	
Output	Power dissipation	P <sub>O</sub>	100	mW	
	Emitter-Base reverse voltage	6N135 6N136	V <sub>EBR</sub>	5	V
	Base current	6N135 6N136	I <sub>B</sub>	5	mA
	Average Output current	I <sub>O(AVG)</sub>	8	mA	
	Peak Output current	I <sub>O(PK)</sub>	16	mA	
	Output voltage	V <sub>O</sub>	-0.5 to 20	V	
	Supply voltage	V <sub>CC</sub>	-0.5 to 30	V	
Isolation voltage *1		V <sub>ISO</sub>	5000	V rms	
Operating temperature		T <sub>OPR</sub>	-55 ~ +100	°C	
Storage temperature		T <sub>STG</sub>	-55 ~ +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, 4 are shorted together, and pins 5, 6, 7, 8 are shorted together.

\*2 For 10 seconds.

# 8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER

6N135 6N136  
EL4502

## Electrical Characteristics ( $T_A=0$ to $70^\circ\text{C}$ unless specified otherwise)

### Input

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Conditions
Forward voltage	$V_F$	-	1.45	1.8	V	$I_F = 16\text{mA}$
Reverse Voltage	$V_R$	5.0	-	-	V	$I_R = 10\mu\text{A}$
Temperature coefficient of forward voltage	$\Delta V_F/\Delta T_A$	-	-1.9	-	mV/ $^\circ\text{C}$	$I_F = 16\text{mA}$

### Output

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Conditions
Logic High Output Current	$I_{OH}$	-	0.001	0.5	$\mu\text{A}$	$I_F=0\text{mA}$ , $V_O=V_{CC}=5.5\text{V}$ , $T_A=25^\circ\text{C}$
		-	0.01	1		$I_F=0\text{mA}$ , $V_O=V_{CC}=15\text{V}$ , $T_A=25^\circ\text{C}$
		-	-	50		$I_F=0\text{mA}$ , $V_O=V_{CC}=15\text{V}$
Logic Low Supply Current	$I_{CCL}$	-	140	200	$\mu\text{A}$	$I_F=16\text{mA}$ , $V_O=\text{Open}$ , $V_{CC}=15\text{V}$
Logic High Supply Current	$I_{CCH}$	-	0.01	1	$\mu\text{A}$	$I_F=0\text{mA}$ , $V_O=\text{Open}$ , $V_{CC}=15\text{V}$ , $T_A=25^\circ\text{C}$
		-	-	2		$I_F=0\text{mA}$ , $V_O=\text{Open}$ , $V_{CC}=15\text{V}$

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



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# 8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER

**6N135 6N136  
EL4502**

## Transfer Characteristics (T<sub>A</sub>=0 to 70°C unless specified otherwise)

Parameter		Symbol	Min.	Typ.*	Max.	Unit	Conditions
Current Transfer Ratio	6N135	CTR	7	-	50	%	I <sub>F</sub> = 16mA, V <sub>O</sub> = 0.4V, V <sub>CC</sub> =4.5V, T <sub>A</sub> =25°C
	6N136 EL4502		19	-	50		
	6N135		5	-	-		
	6N136 EL4502		15	-	-		
Logic Low Output Voltage	6N135	V <sub>OL</sub>	-	0.18	0.4	V	I <sub>F</sub> = 16mA, I <sub>O</sub> = 1.1mA, V <sub>CC</sub> =4.5V, T <sub>A</sub> =25°C
	6N136 EL4502		-	0.18	0.4		
	6N135		-	-	0.5		
	6N136 EL4502		-	-	0.5		

## Switching Characteristics (T<sub>A</sub>=0 to 70°C unless specified otherwise, I<sub>F</sub>=16mA, V<sub>CC</sub>=5V)

Parameter		Symbol	Min.	Typ.*	Max.	Unit	Conditions
Propagation Delay Time to Logic Low (Fig.8)	6N135	TPHL	-	0.35	1.5	μs	R <sub>L</sub> =4.1KΩ, T <sub>A</sub> =25°C
			-	-	2.0		R <sub>L</sub> =4.1KΩ
	6N136 EL4502		-	0.35	0.8		R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C
			-	-	1.0		R <sub>L</sub> =1.9KΩ
Propagation Delay Time to Logic High (Fig.8)	6N135	TPLH	-	0.5	1.5	μs	R <sub>L</sub> =4.1KΩ, T <sub>A</sub> =25°C
			-	-	2.0		R <sub>L</sub> =4.1KΩ
	6N136 EL4502		-	0.3	0.8		R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C
			-	-	1.0		R <sub>L</sub> =1.9KΩ
Common Mode Transient Immunity at Logic High (Fig.9) <sup>*3</sup>	6N135	CM <sub>H</sub>	1,000	-	-	V/μs	I <sub>F</sub> = 0mA, V <sub>CM</sub> =10Vp-p, R <sub>L</sub> =4.1KΩ, T <sub>A</sub> =25°C
	6N136 EL4502		1,000	-	-		I <sub>F</sub> = 0mA, V <sub>CM</sub> =10Vp-p, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C
Common Mode Transient Immunity at Logic Low (Fig.9) <sup>*3</sup>	6N135	CM <sub>L</sub>	1,000	-	-	V/μs	I <sub>F</sub> = 16mA, V <sub>CM</sub> =10Vp-p, R <sub>L</sub> =4.1KΩ, T <sub>A</sub> =25°C
	6N136 EL4502		1,000	-	-		I <sub>F</sub> = 16mA, V <sub>CM</sub> =10Vp-p, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C

\* Typical values at T<sub>A</sub> = 25°C

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**Typical Performance Curves**

Fig.1 Forward Current vs. Forward Voltage

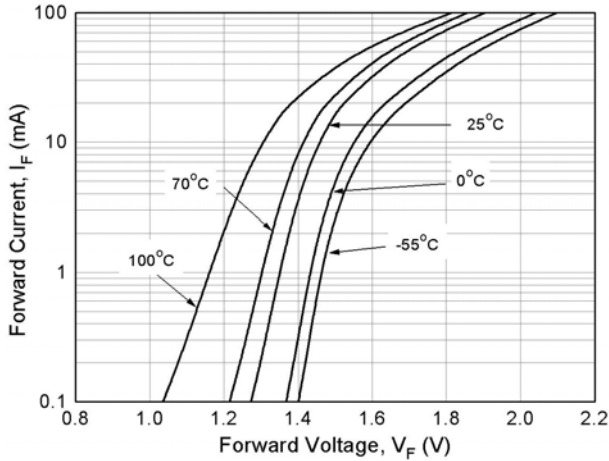


Fig.2 Normalized Current Transfer Ratio vs. Forward Current

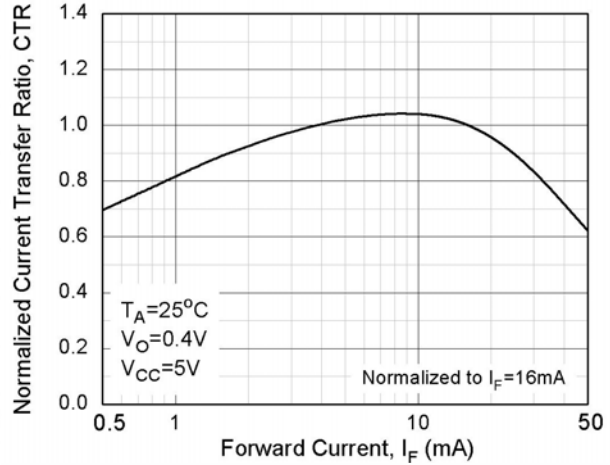


Fig.3 Normalized Current Transfer Ratio vs. Ambient Temperature

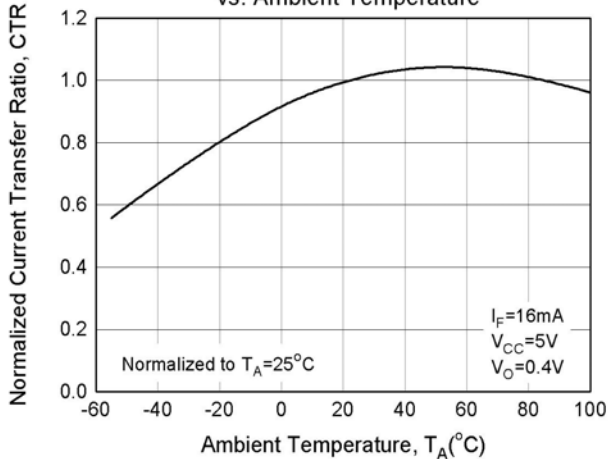


Fig.4 Output Current vs. Output Voltage

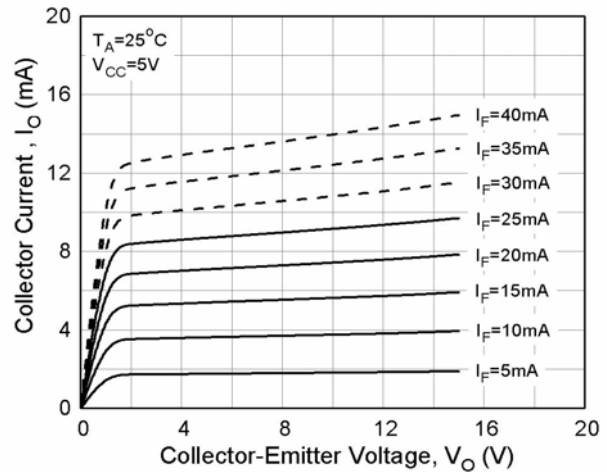


Fig.5 Logic High Output Current vs. Temperature

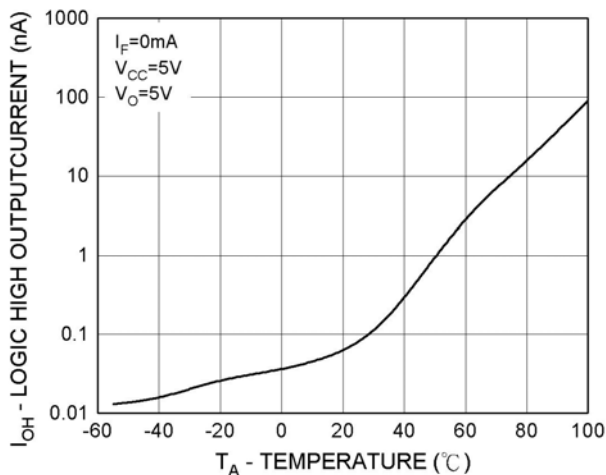
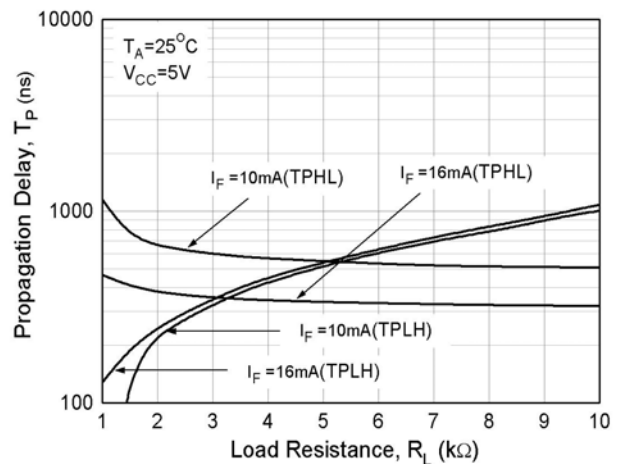


Fig.6 Propagation Delay vs. Load Resistance



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Fig.7 Propagation Delay vs. Temperature

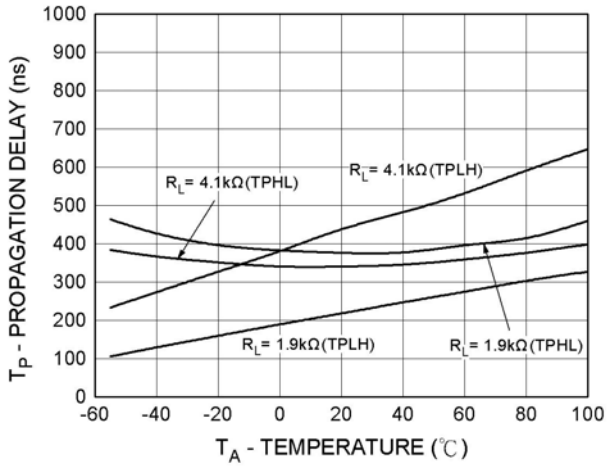


Figure 8 Switching Time Test Circuit & Waveform

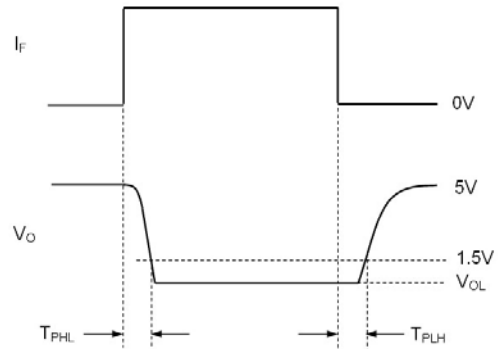
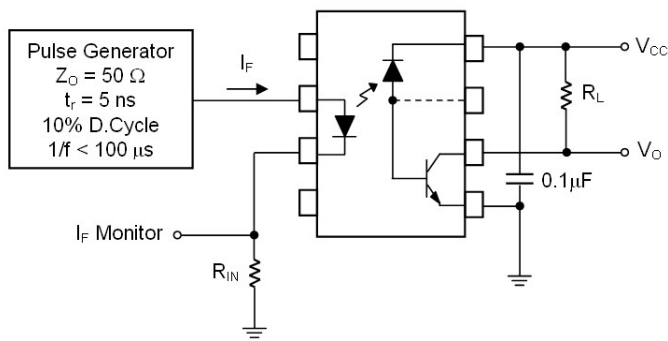
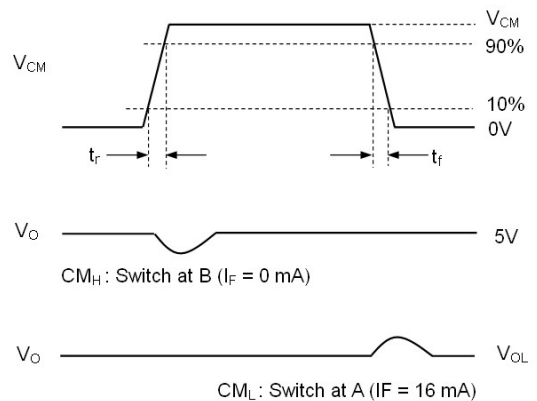
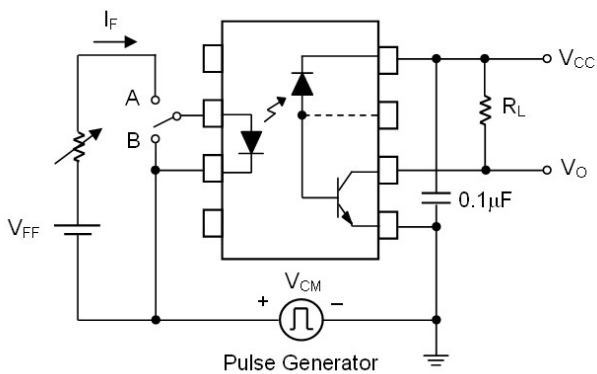


Figure 9 Transient Immunity Test Circuit &





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### Note:

\*3 Common mode transient immunity in logic high level is the maximum tolerable (positive)  $dV_{cm}/dt$  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.,  $V_O > 2.0V$ ).

Common mode transient immunity in logic low level is the maximum tolerable (negative)  $dV_{cm}/dt$  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.,  $V_O < 0.8V$ ).

### Order Information

#### Part Number

**6N13XY(Z)-V**

or

**EL4502Y(Z)-V**

### Note

- X = Part No. (X = 5 or 6)
- Y = Lead form option (S, S1, M or none)
- Z = Tape and reel option (TA, TB or none)
- V = VDE (optional)

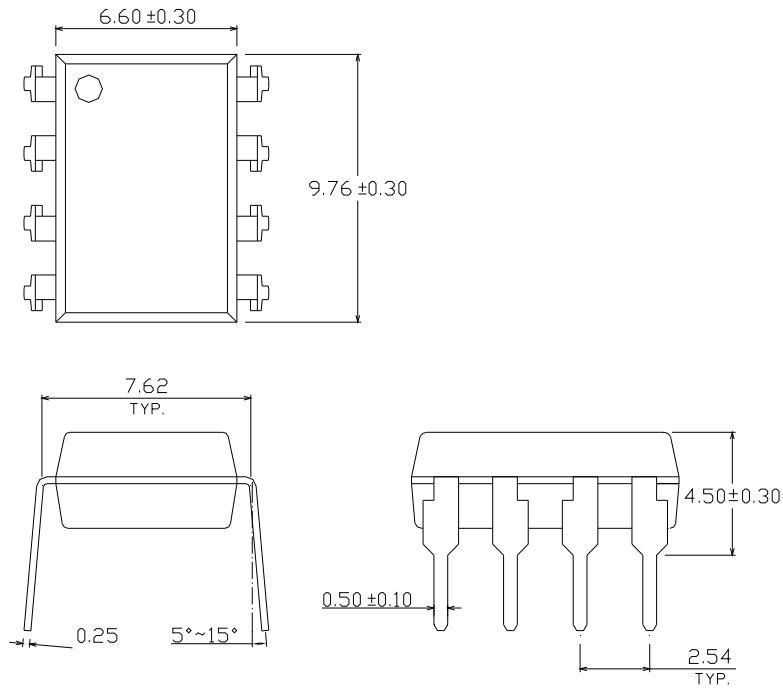
Option	Description	Packing quantity
None	Standard DIP-8	45 units per tube
M	Wide lead bend (0.4 inch spacing)	45 units per tube
S (TA)	Surface mount lead form + TA tape & reel option	1000 units per reel
S (TB)	Surface mount lead form + TB tape & reel option	1000 units per reel
S1 (TA)	Surface mount lead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

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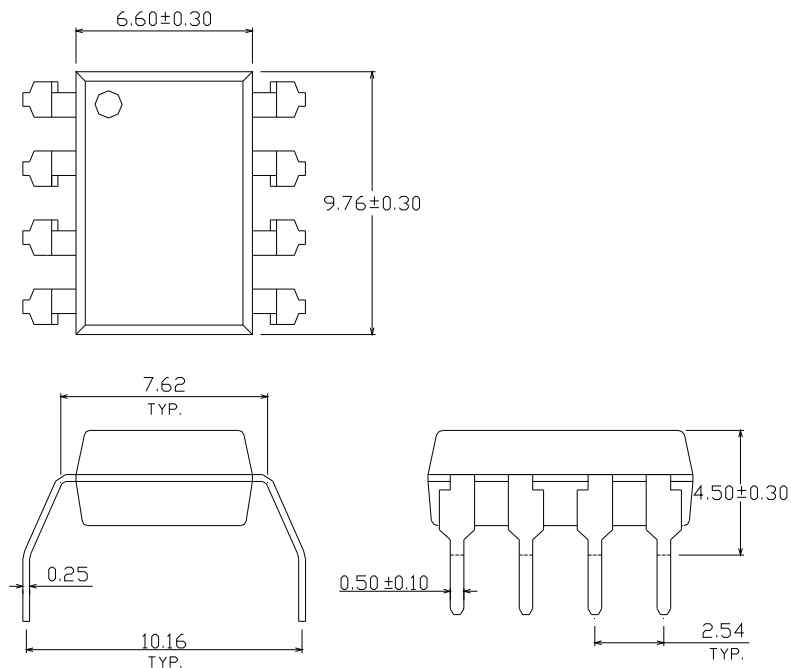
**6N135 6N136  
EL4502**

**Package Drawing  
(Dimensions in mm)**

**Standard DIP Type**



**Option M Type**

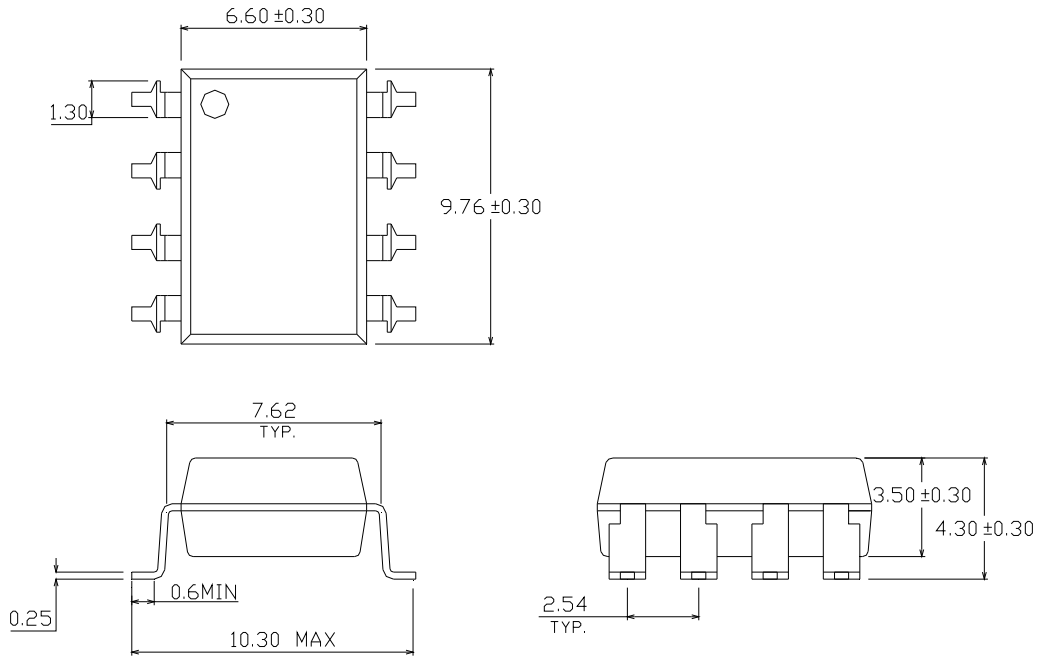




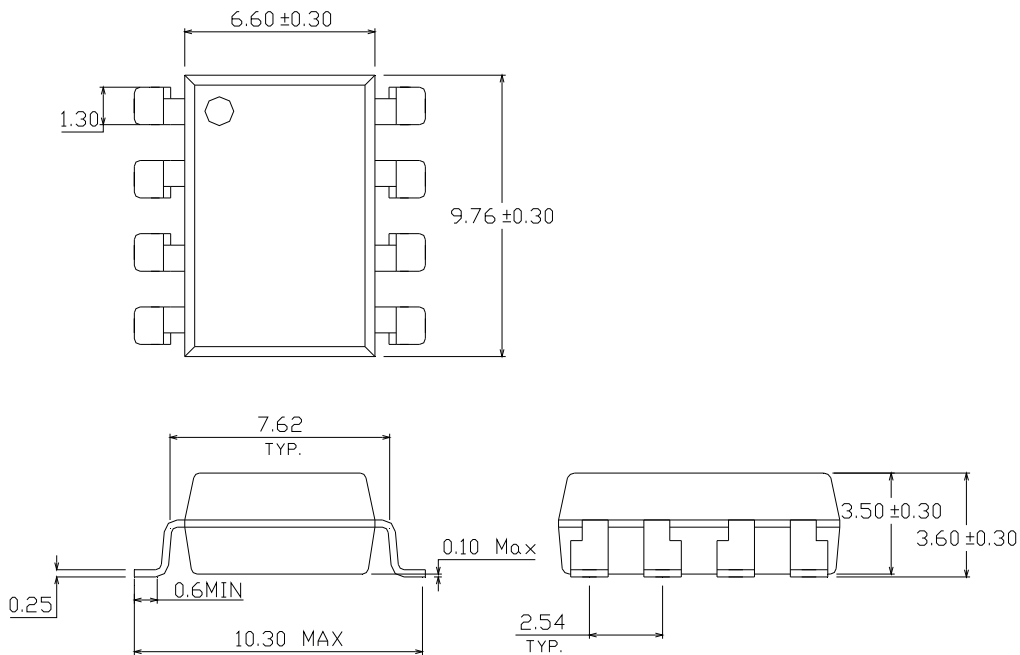
**8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR  
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**Option S Type**



**Option S1 Type**



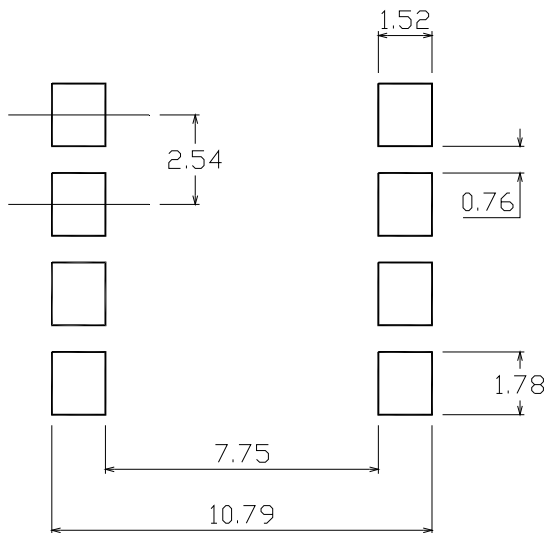


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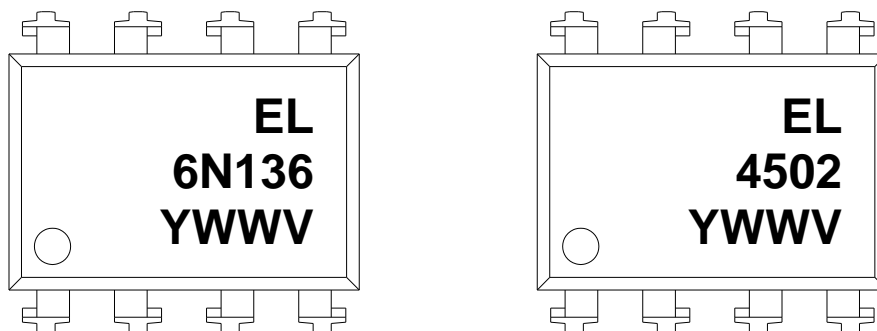
# 8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER

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EL4502

## Recommended pad layout for surface mount leadform



## Device Marking



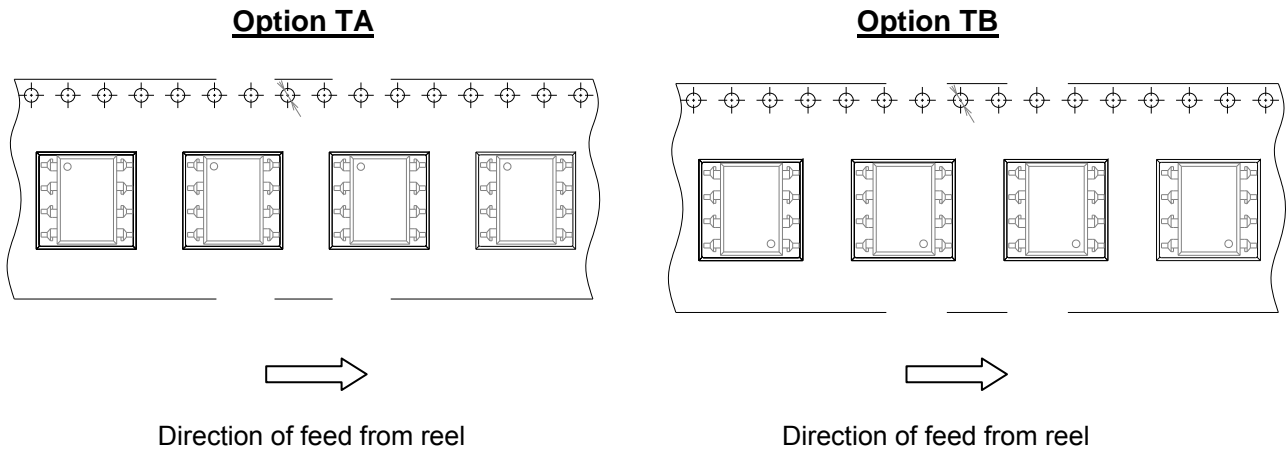
## Notes

- 4502
- 6N136 denotes Device Number
- Y denotes 1 digit Year code
- WW denotes 2 digit Week code
- V denotes VDE (optional)

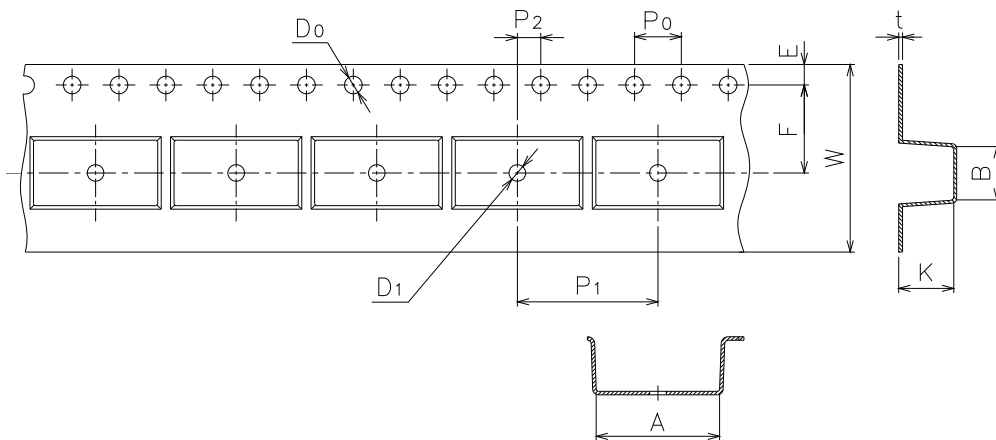
**8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR  
PHOTOCOUPLER**

**6N135 6N136  
EL4502**

**Tape & Reel Packing Specifications**



**Tape dimensions**

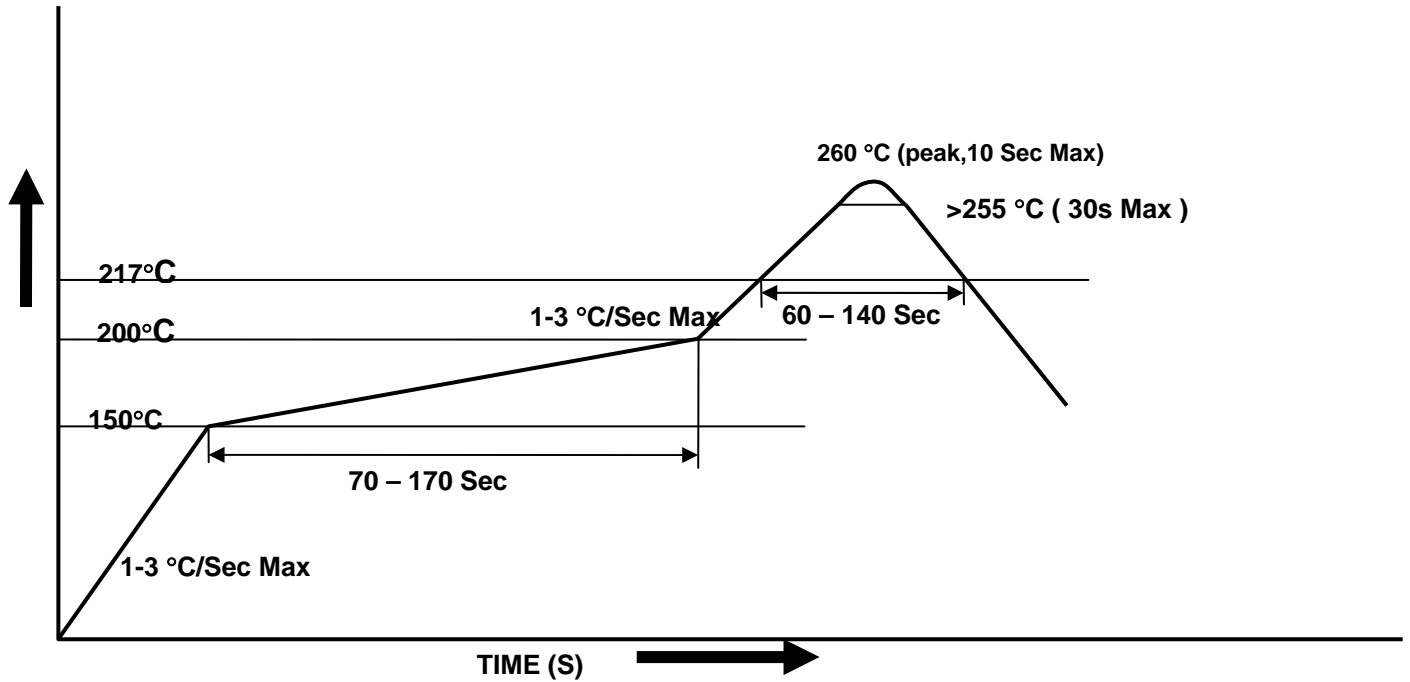


Dimension No.	<b>A</b>	<b>B</b>	<b>Do</b>	<b>D1</b>	<b>E</b>	<b>F</b>
Dimension(mm)	10.4±0.1	10.0±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1
Dimension No.	<b>Po</b>	<b>P1</b>	<b>P2</b>	<b>t</b>	<b>W</b>	<b>K</b>
Dimension(mm)	4.0±0.1	12.0±0.1	2.0±0.1	0.4±0.1	16.0+0.3/ -0.1	4.5±0.1

**8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR  
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**6N135 6N136  
EL4502**

**Solder Reflow Temperature Profile**





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## 8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER

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