

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)

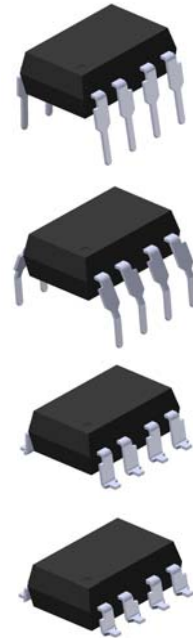
Description

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.

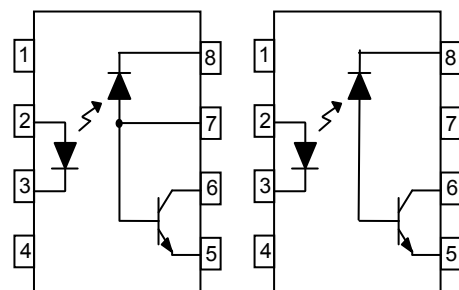
The devices are packaged in an 8-pin DIP package and available in wide-lead spacing and SMD option.

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}

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Absolute Maximum Ratings ($T_a=25^{\circ}\text{C}$)

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 ($\leq 1\mu\text{s}$ 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
Isolation voltage ^{*1}		V_{ISO}	5000	V rms
Operating temperature		T_{OPR}	-55 ~ +100	$^{\circ}\text{C}$
Storage temperature		T_{STG}	-55 ~ +125	$^{\circ}\text{C}$
Soldering temperature ^{*2}		T_{SOL}	260	$^{\circ}\text{C}$

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.



LIGHTING FOREVER

8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER

**6N135 6N136
EL4502****Electrical Characteristics ($T_A=0$ to 70°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	μA	$I_F=0\text{mA}$, $V_O=V_{CC}=5.5\text{V}$, $T_A=25^{\circ}\text{C}$
		-	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	μA	$I_F=16\text{mA}$, $V_O=\text{Open}$, $V_{CC}=15\text{V}$
Logic High Supply Current	I_{CCH}	-	0.01	1	μA	$I_F=0\text{mA}$, $V_O=\text{Open}$, $V_{CC}=15\text{V}$, $T_A=25^{\circ}\text{C}$
		-	-	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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**6N135 6N136
EL4502**

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

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

Switching Characteristics ($T_A=0$ to 70°C unless specified otherwise, $I_F=16\text{mA}$, $V_{CC}=5\text{V}$)

Parameter		Symbol	Min.	Typ.*	Max.	Unit	Conditions
Propagation Delay Time to Logic Low (Fig.8)	6N135	TPHL	-	0.35	1.5	μ s	$R_L=4.1K\Omega$, $T_A=25^{\circ}C$
			-	-	2.0		$R_L=4.1K\Omega$
	6N136 EL4502		-	0.35	0.8		$R_L=1.9K\Omega$, $T_A=25^{\circ}C$
			-	-	1.0		$R_L=1.9K\Omega$
Propagation Delay Time to Logic High (Fig.8)	6N135	TPLH	-	0.5	1.5	μ s	$R_L=4.1K\Omega$, $T_A=25^{\circ}C$
			-	-	2.0		$R_L=4.1K\Omega$
	6N136 EL4502		-	0.3	0.8		$R_L=1.9K\Omega$, $T_A=25^{\circ}C$
			-	-	1.0		$R_L=1.9K\Omega$
Common Mode Transient Immunity at Logic High (Fig.9)* ³	6N135	CM_H	1,000	-	-	V/ μ s	$I_F = 0mA$, $V_{CM}=10Vp-p$, $R_L=4.1K\Omega$, $T_A = 25^{\circ}C$
	6N136 EL4502		1,000	-	-		$I_F = 0mA$, $V_{CM}=10Vp-p$, $R_L=1.9K\Omega$, $T_A = 25^{\circ}C$
Common Mode Transient Immunity at Logic Low (Fig.9)* ³	6N135	CM_L	1,000	-	-	V/ μ s	$I_F = 16mA$, $V_{CM}=10Vp-p$, $R_L=4.1K\Omega$, $T_A = 25^{\circ}C$
	6N136 EL4502		1,000	-	-		$I_F = 16mA$, $V_{CM}=10Vp-p$, $R_L=1.9K\Omega$, $T_A=25^{\circ}C$

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

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Typical Performance Curves

Fig.1 Forward Current vs. Forward Voltage

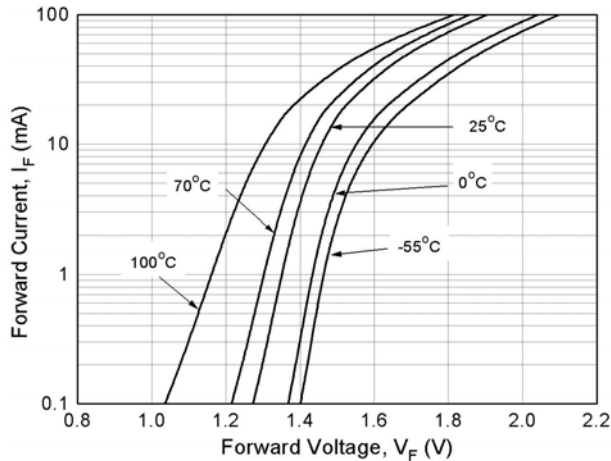


Fig.2 Normalized Current Transfer Ratio vs. Forward Current

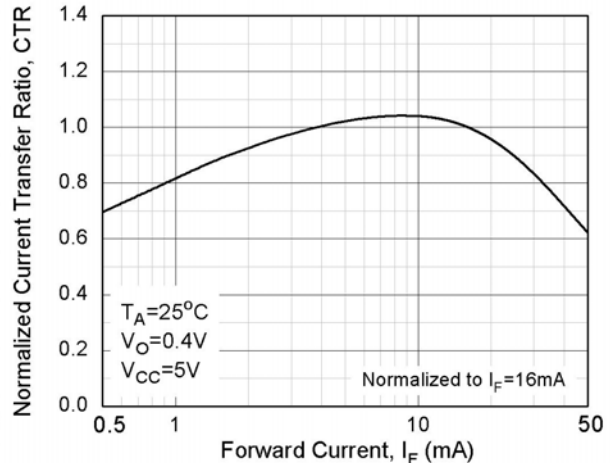


Fig.3 Normalized Current Transfer Ratio vs. Ambient Temperature

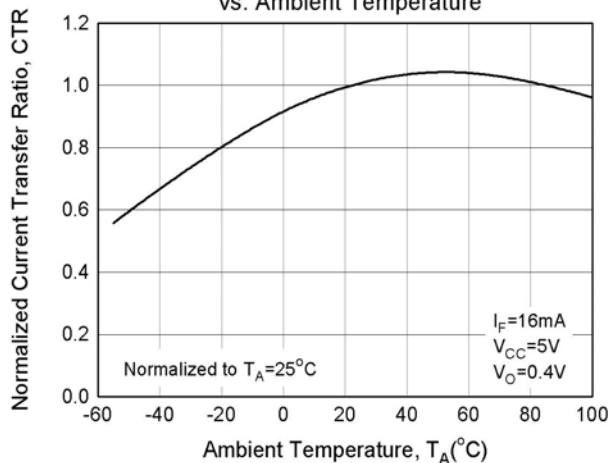


Fig.4 Output Current vs. Output Voltage

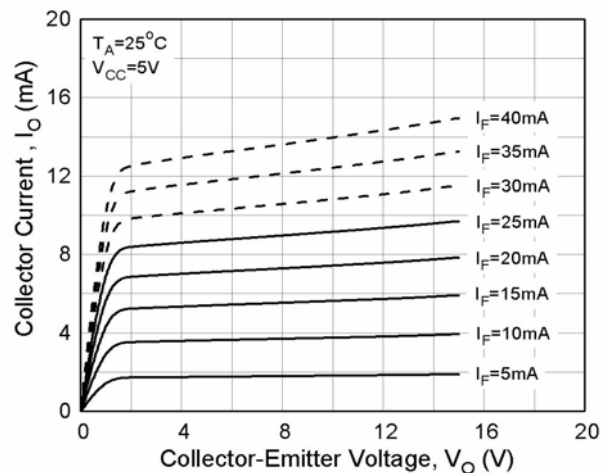


Fig.5 Logic High Output Current vs. Temperature

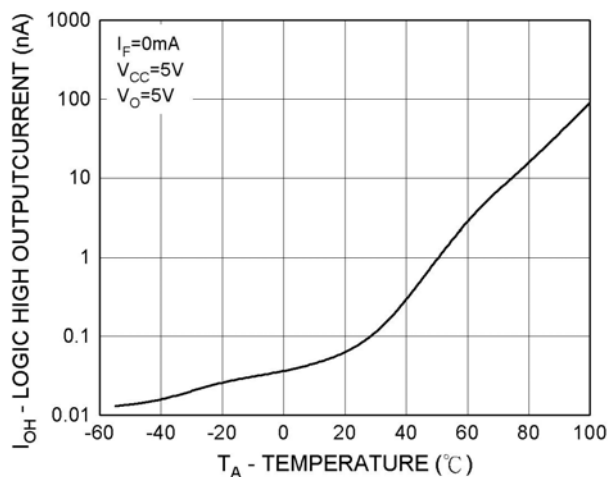
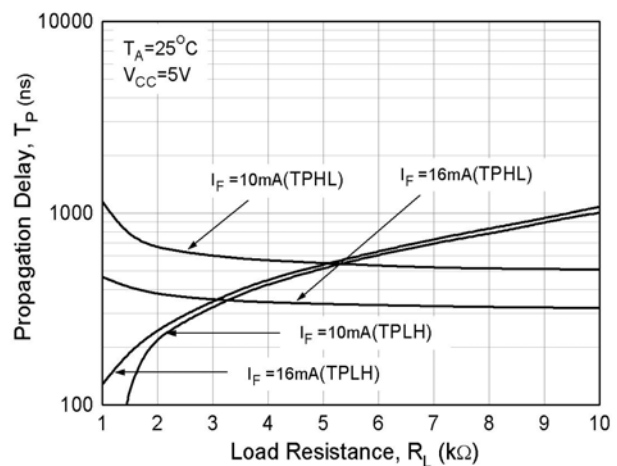


Fig.6 Propagation Delay vs. Load Resistance



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Fig.7 Propagation Delay vs. Temperature

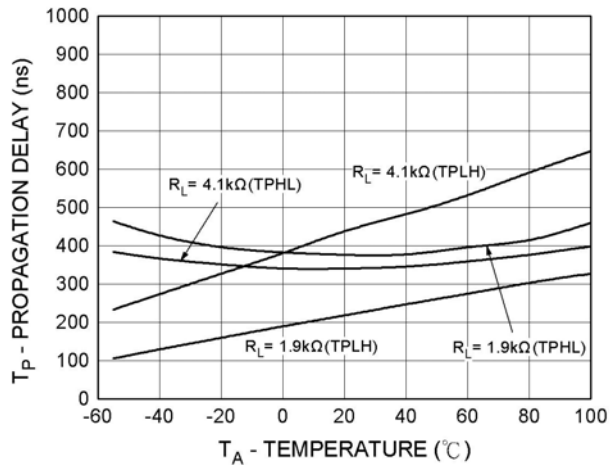


Figure 8 Switching Time Test Circuit & Waveform

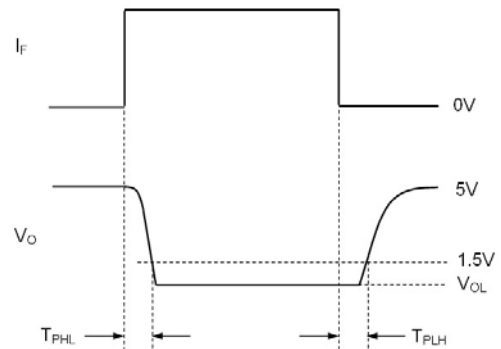
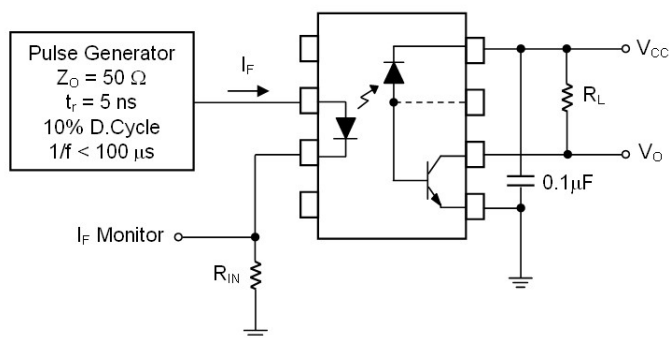
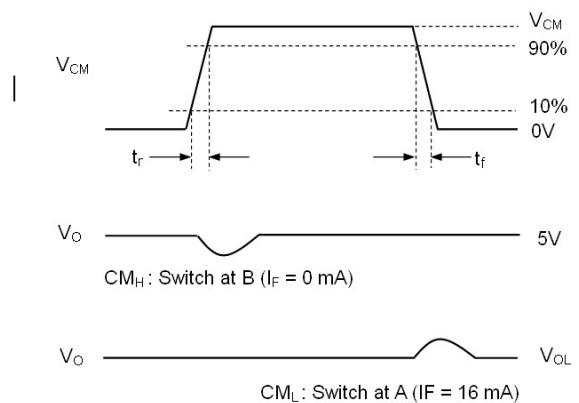
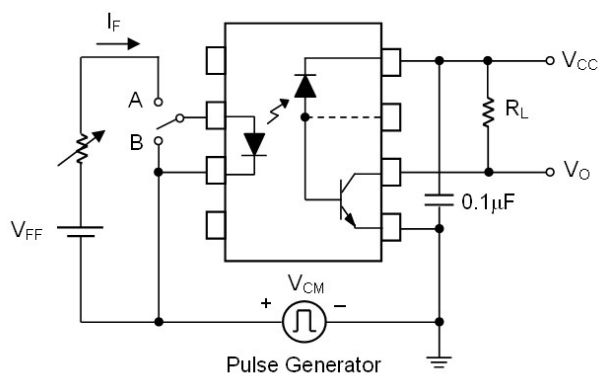


Figure 9 Transient Immunity Test Circuit &



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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)

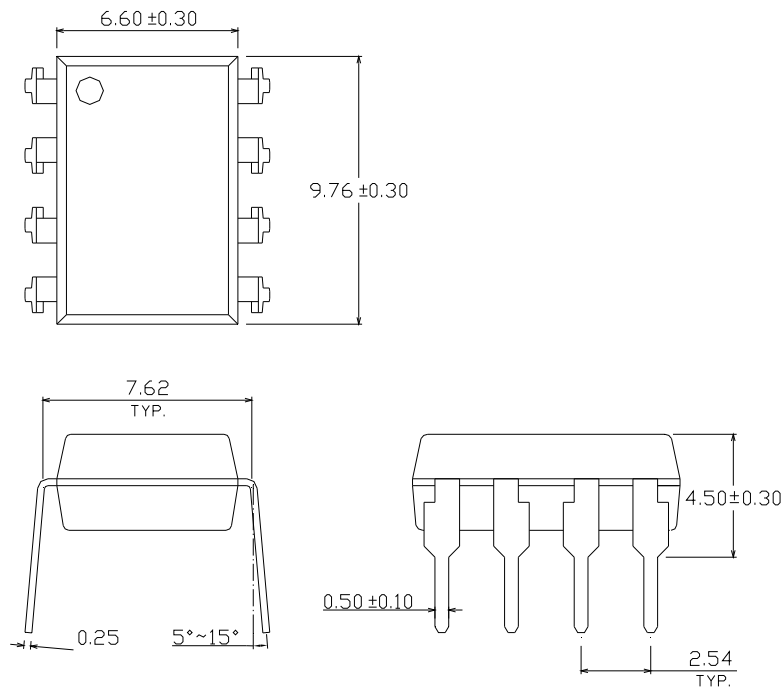
Option	Description	Packing quantity
None	Standard DIP-8	45 units per tube
M	Wide lead bend (0.4 inch spacing)	45 units per tube
S (TA)	Surface mount lead form + TA tape & reel option	1000 units per reel
S (TB)	Surface mount lead form + TB tape & reel option	1000 units per reel
S1 (TA)	Surface mount lead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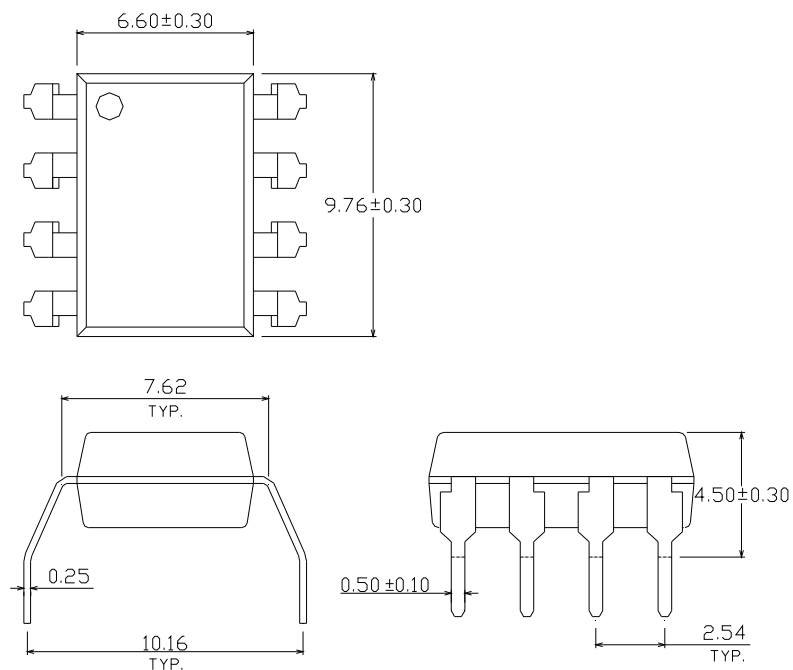
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Package Drawing (Dimensions in mm)

Standard DIP Type



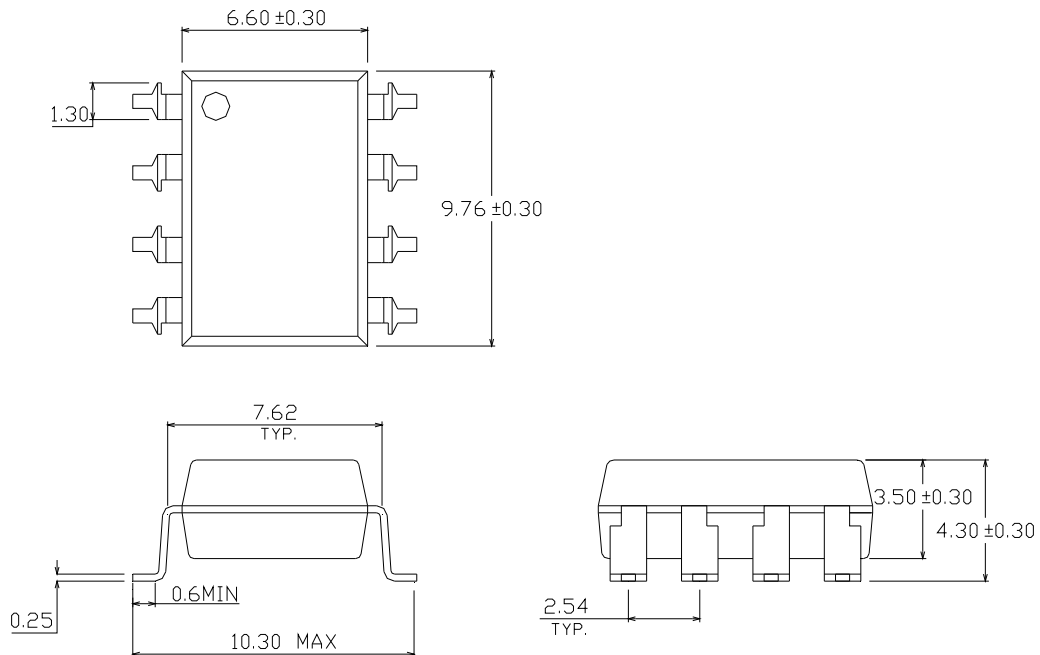
Option M Type



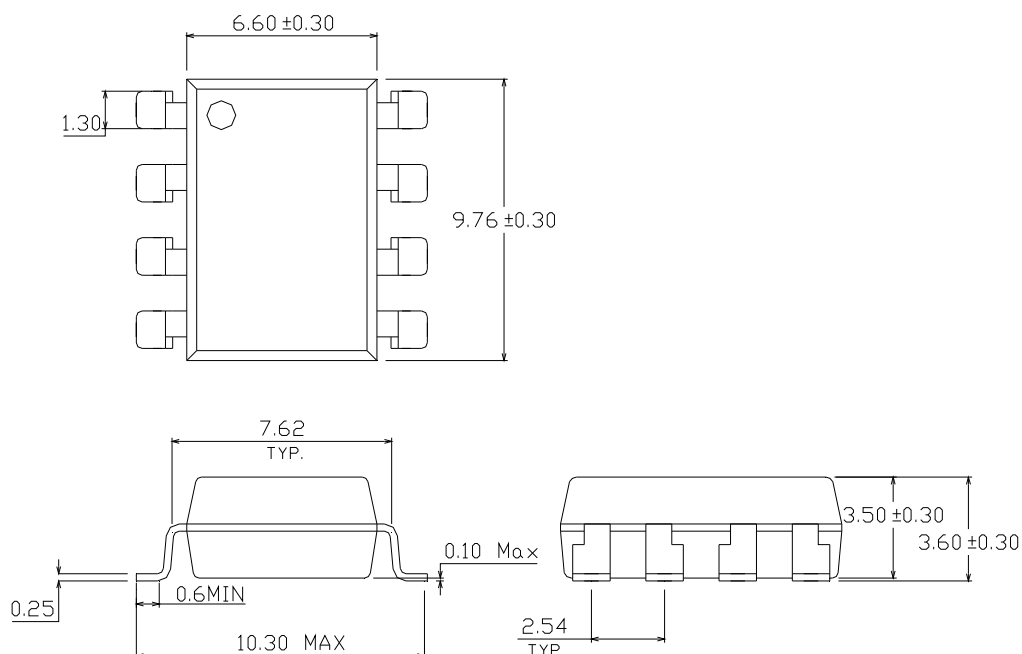
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Option S Type



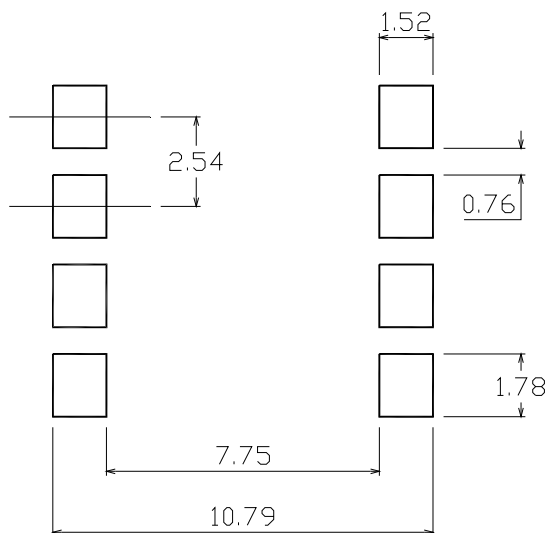
Option S1 Type



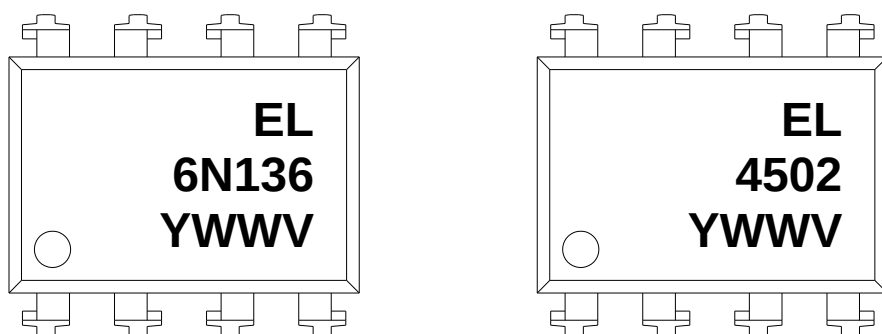
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Recommended pad layout for surface mount leadform



Device Marking



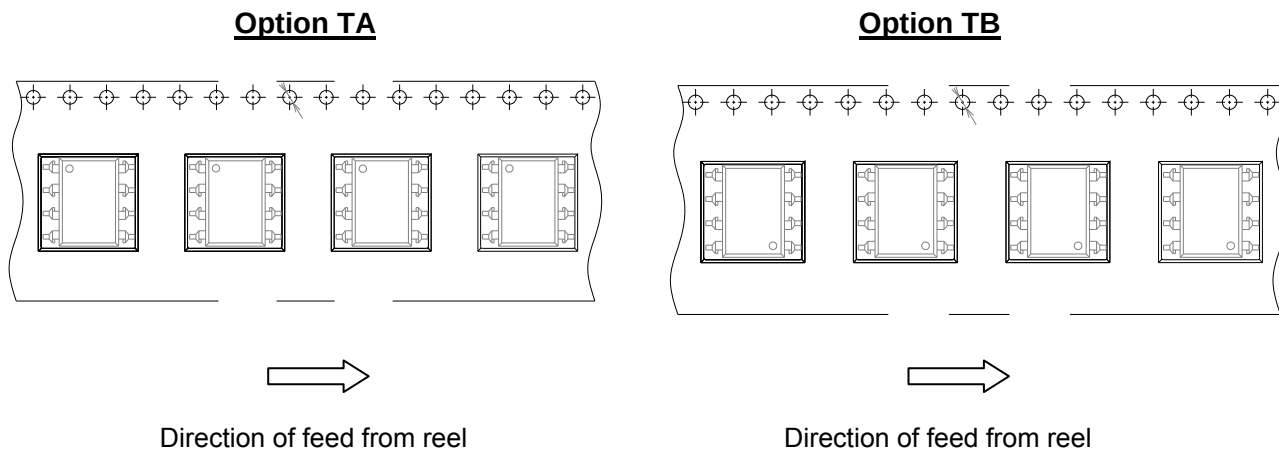
Notes

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

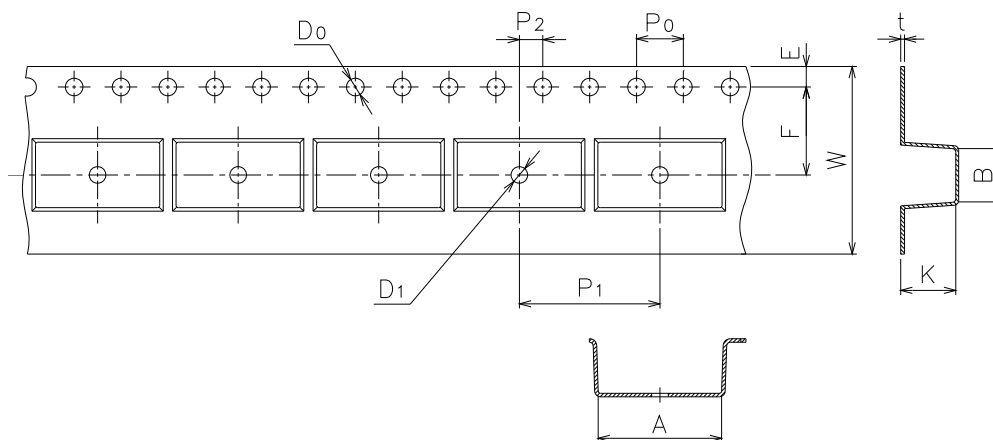
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Tape & Reel Packing Specifications



Tape dimensions

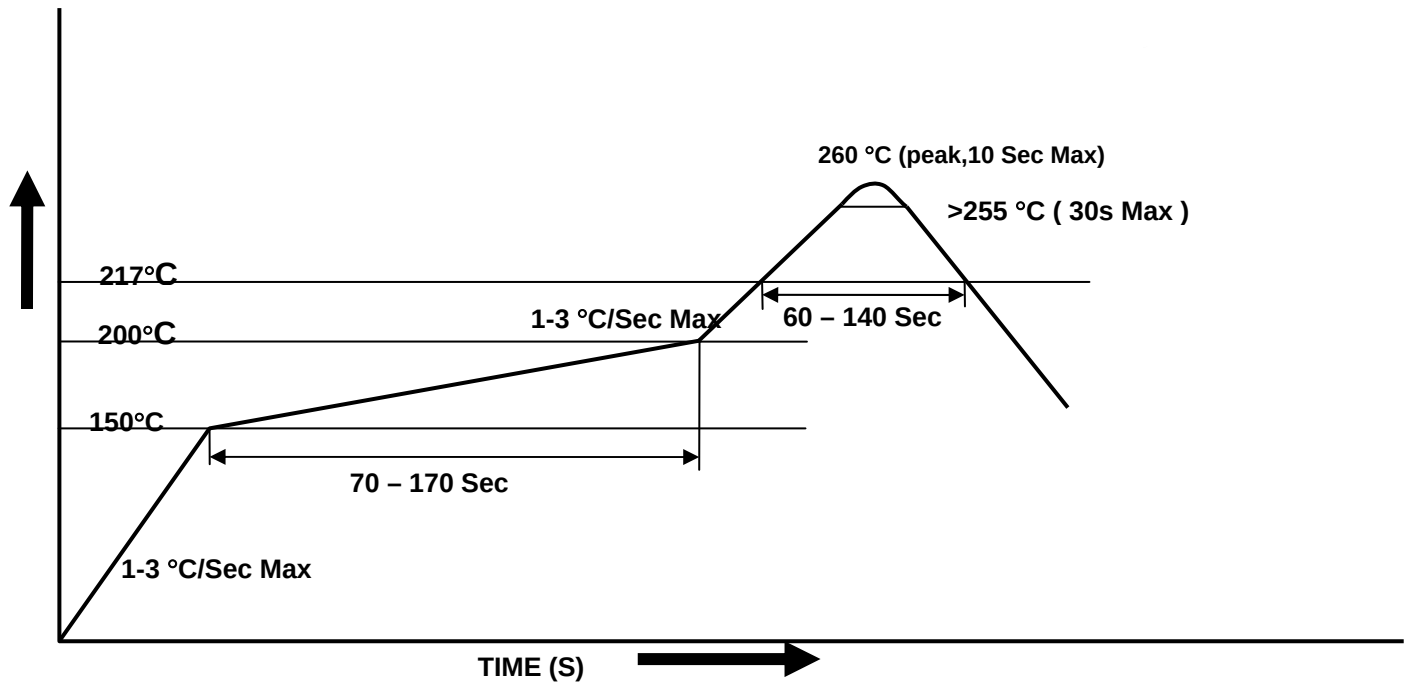


Dimension No.	A	B	Do	D1	E	F
Dimension(mm)	10.4±0.1	10.0±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1
Dimension No.	Po	P1	P2	t	W	K
Dimension(mm)	4.0±0.1	12.0±0.1	2.0±0.1	0.4±0.1	16.0+0.3/ -0.1	4.5±0.1

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Solder Reflow Temperature Profile



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