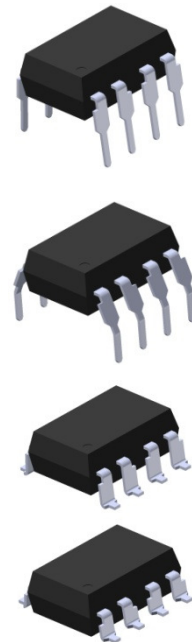


Features

- High speed 1Mbit/s
- High isolation voltage between input and output ($V_{iso}=5000\text{ Vrms}$)
- 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

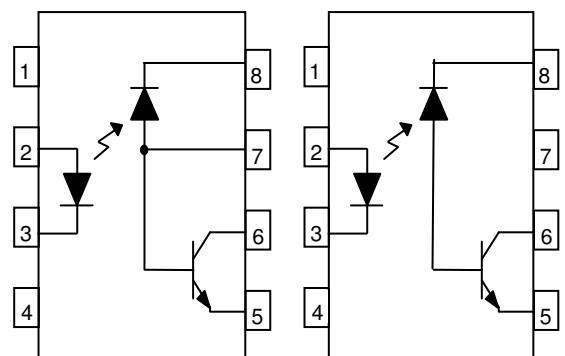
The 6N135, 6N136, EL4502 and EL4503 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor 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

Schematic



6N135 / 6N136

EL4502 / EL4503

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}

Absolute Maximum Ratings (T_a=25°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 (≤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
	Isolation voltage ^{*1}	V _{ISO}	5000	V rms
Operating temperature		T _{OPR}	-55 ~ +100	°C
Storage temperature		T _{STG}	-55 ~ +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, 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	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 $T_A = 25^\circ\text{C}$

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 EL4503		19	-	50		
	6N135		5	-	-		$I_F = 16\text{mA}$, $V_O = 0.4\text{V}$, $V_{CC}=4.5\text{V}$
	6N136 EL4502 EL4503		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 EL4503		-	0.25	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 EL4503		-	-	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	μs	$R_L=4.1\text{K}\Omega$, $T_A=25^\circ\text{C}$
	-		-	2.0	$R_L=4.1\text{K}\Omega$		
	6N136		-	0.35	0.8		$R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$
	EL4502 EL4503		-	-	1.0		$R_L=1.9\text{K}\Omega$
Propagation Delay Time to Logic High (Fig.8)	6N135	TPLH	-	0.5	1.5	μs	$R_L=4.1\text{K}\Omega$, $T_A=25^\circ\text{C}$
	-		-	2.0	$R_L=4.1\text{K}\Omega$		
	6N136		-	0.3	0.8		$R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$
	EL4502 EL4503		-	-	1.0		$R_L=1.9\text{K}\Omega$
Common Mode Transient Immunity at Logic High (Fig.9) ^{*3}	6N135	CM_H	1,000	-	-	$\text{V}/\mu\text{s}$	$I_F = 0\text{mA}$, $V_{CM}=10\text{Vp-p}$, $R_L=4.1\text{K}\Omega$, $T_A = 25^\circ\text{C}$
	6N136 EL4502		1,000	-	-		$I_F = 0\text{mA}$, $V_{CM}=10\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A = 25^\circ\text{C}$
	EL4503		15000	20000	-		$I_F = 0\text{mA}$, $V_{CM}=1500\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A = 25^\circ\text{C}$
Common Mode Transient Immunity at Logic Low (Fig.9) ^{*3}	6N135	CM_L	1,000	-	-	$\text{V}/\mu\text{s}$	$I_F = 16\text{mA}$, $V_{CM}=10\text{Vp-p}$, $R_L=4.1\text{K}\Omega$, $T_A = 25^\circ\text{C}$
	6N136 EL4502		1,000	-	-		$I_F = 16\text{mA}$, $V_{CM}=10\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A = 25^\circ\text{C}$
	EL4503		15000	20000	-		$I_F = 0\text{mA}$, $V_{CM}=1500\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A = 25^\circ\text{C}$

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

Typical Performance Curves

Fig.3 Normalized Current Transfer Ratio
vs. Ambient Temperature

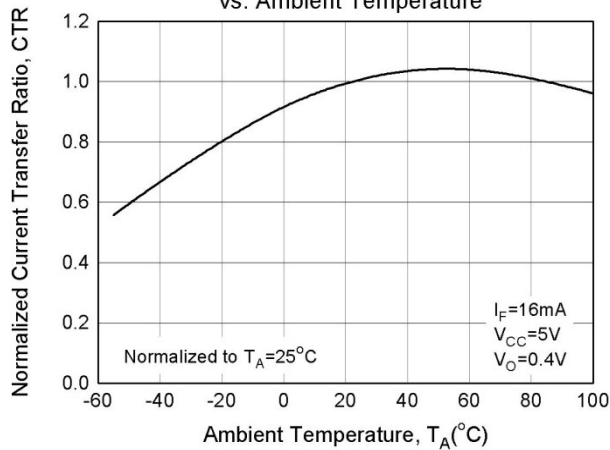


Fig.1 Forward Current vs. Forward Voltage

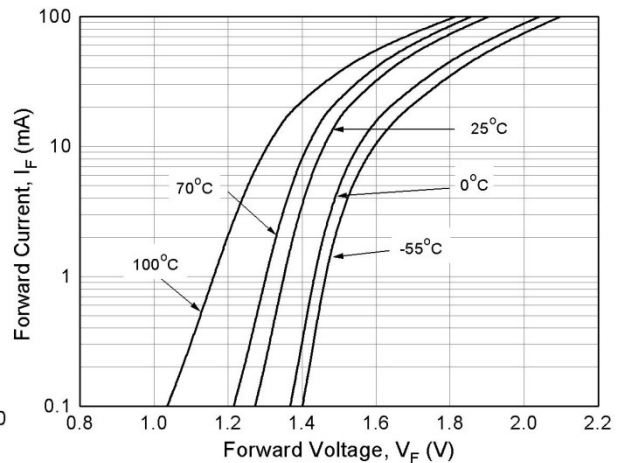


Fig.2 Normalized Current Transfer Ratio
vs. Forward Current

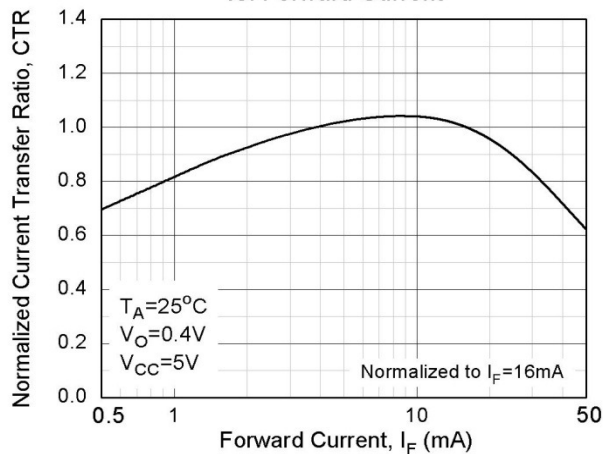


Fig.4 Output Current vs. Output Voltage

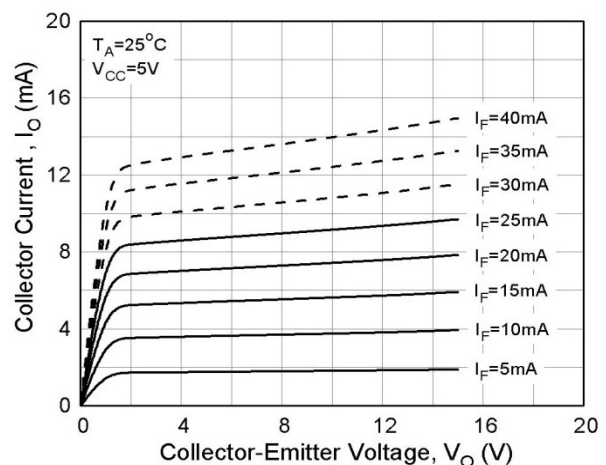


Fig.5 Logic High Output Current vs. Temperature

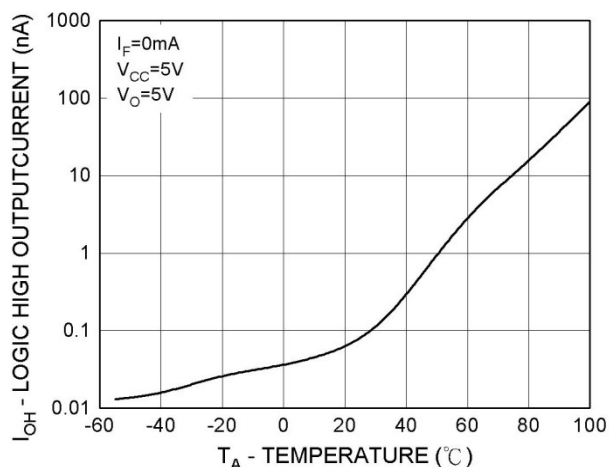


Fig.6 Propagation Delay vs. Load Resistance

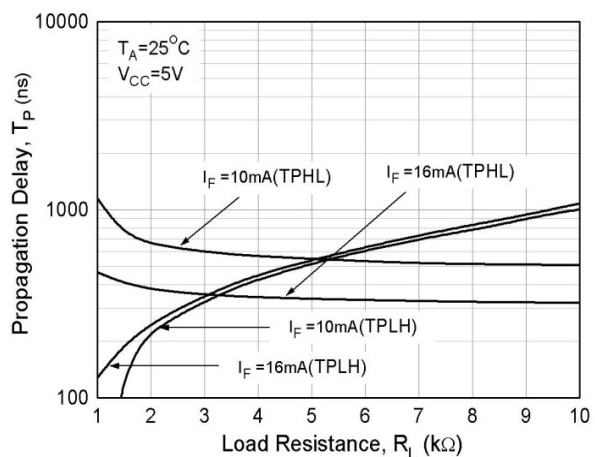


Fig.7 Propagation Delay vs. Temperature

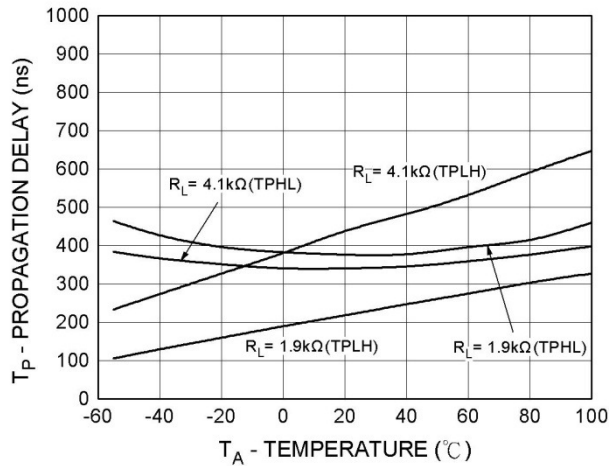


Figure 8 Switching Time Test Circuit & Waveform

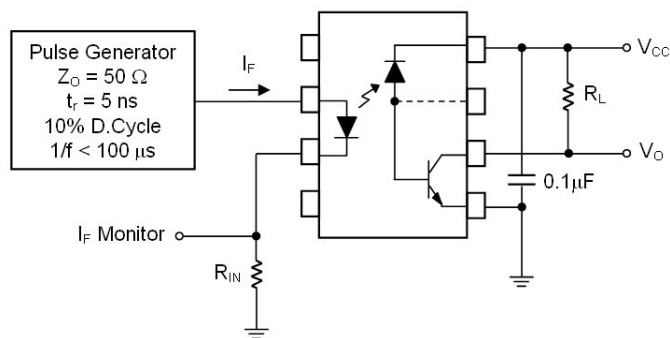
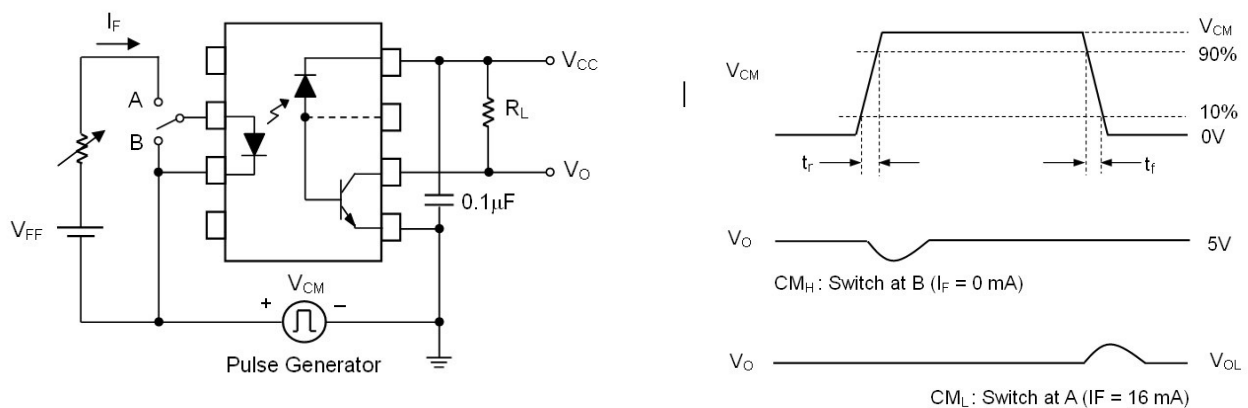


Figure 9 Transient Immunity Test Circuit &



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 V_{CM} , 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, V_{CM} , 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

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)

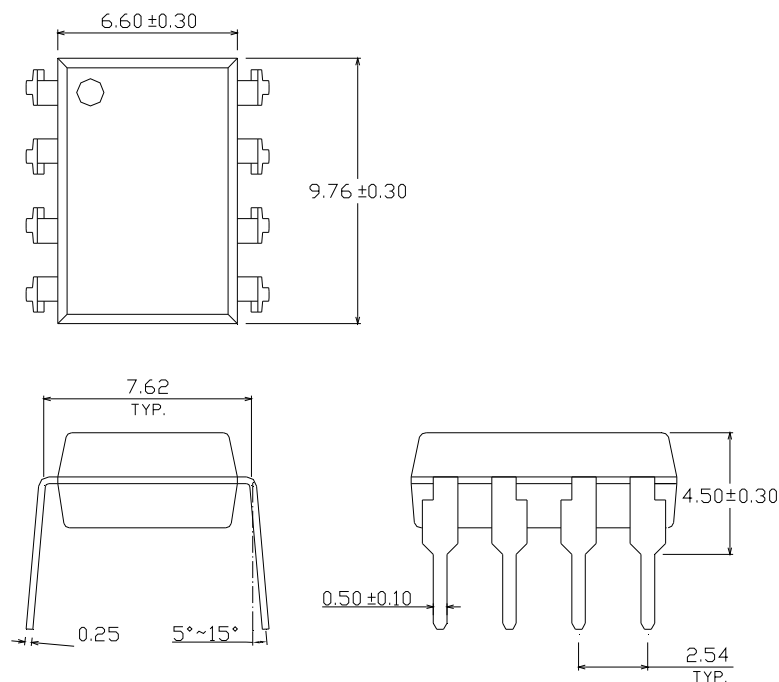
Z = Tape and reel option (TA, TB or none)

V = VDE (optional)

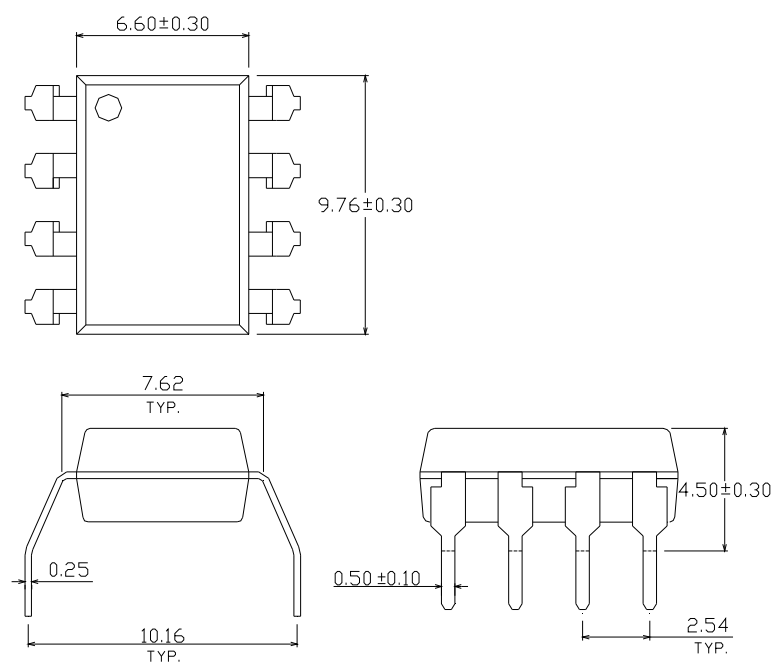
Option	Description	Packing quantity
None	Standard DIP-8	45 units per tube
M	Wide lead bend (0.4 inch spacing)	45 units per tube
S (TA)	Surface mount lead form + TA tape & reel option	1000 units per reel
S (TB)	Surface mount lead form + TB tape & reel option	1000 units per reel
S1 (TA)	Surface mount lead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

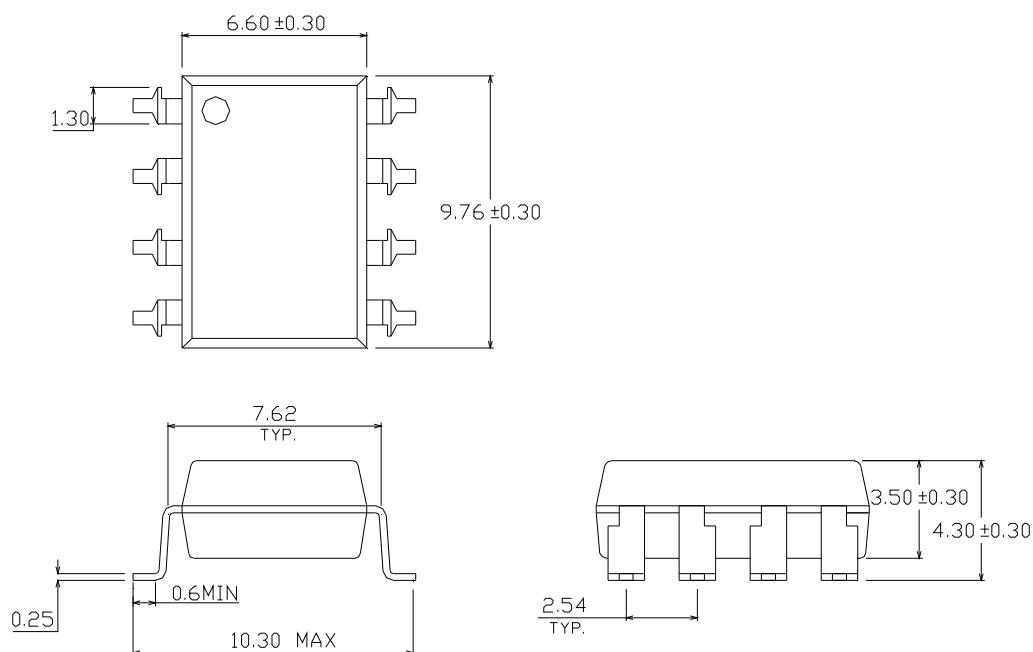
Standard DIP Type



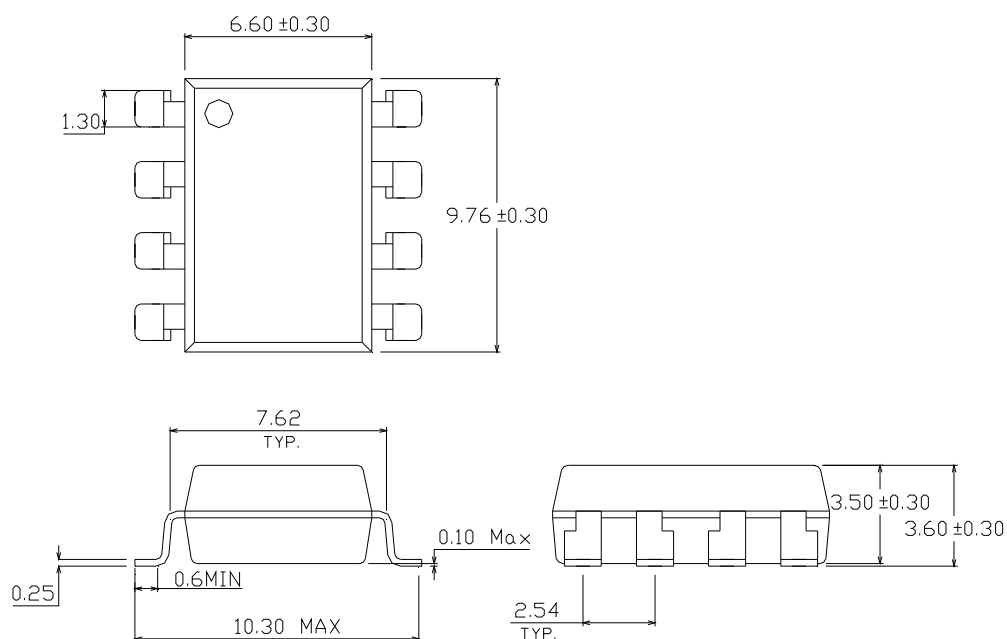
Option M Type



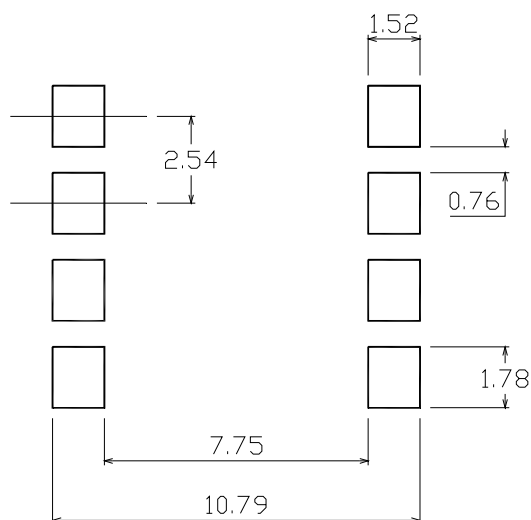
Option S Type



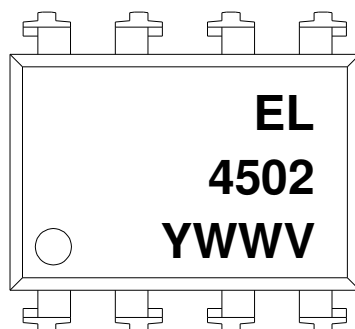
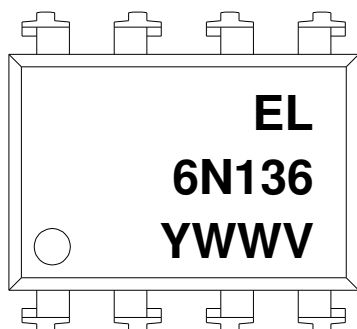
Option S1 Type



Recommended pad layout for surface mount leadform



Device Marking



Notes

4502

6N136 denotes Device Number

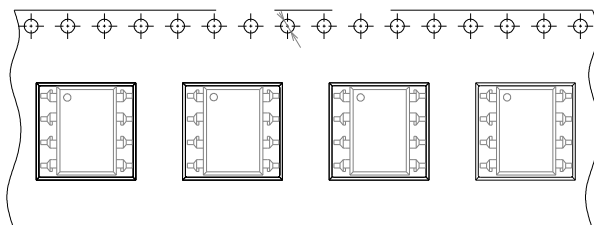
Y denotes 1 digit Year code

WW denotes 2 digit Week code

V denotes VDE (optional)

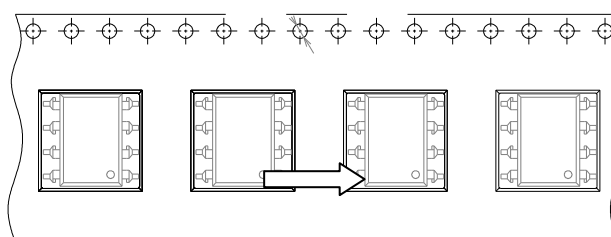
Tape & Reel Packing Specifications

Option TA



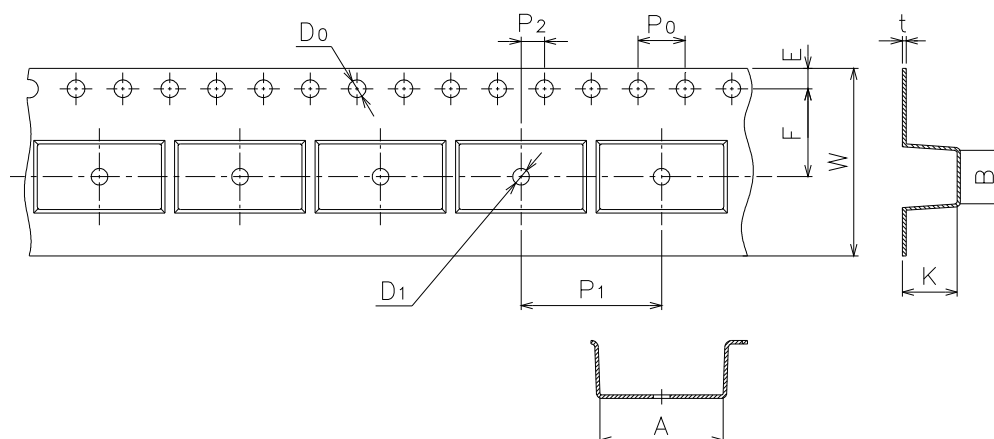
Direction of feed from reel

Option TB



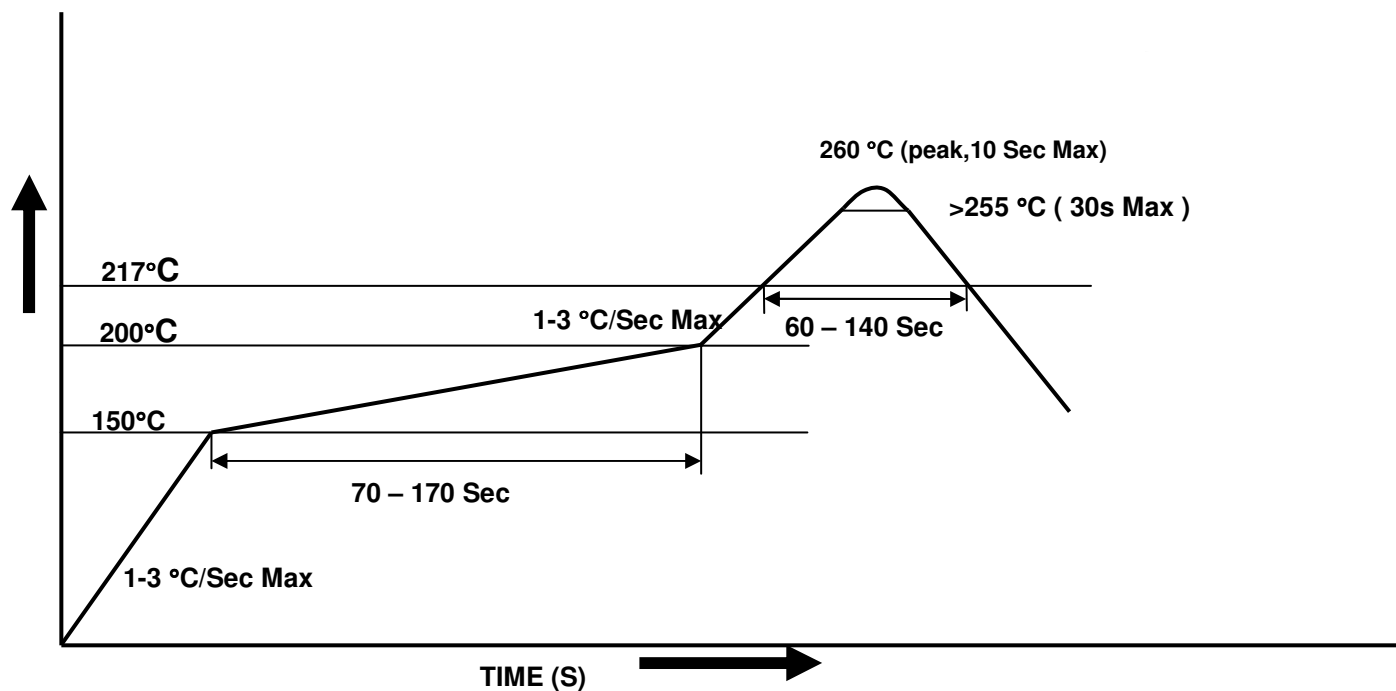
Direction of feed from reel

Tape dimensions



Dimension No.	A	B	Do	D1	E	F
Dimension(mm)	10.4±0.1	10.0±0.1	1.5±0.1	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

Solder Reflow Temperature Profile



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Contact Us :

➤ Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd
Minhang District, Shanghai , China

➤ Sales :

Direct +86 (21) 6401-6692

Email amall@ameya360.com

QQ 800077892

Skype ameyasales1 ameyasales2

➤ Customer Service :

Email service@ameya360.com

➤ Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com