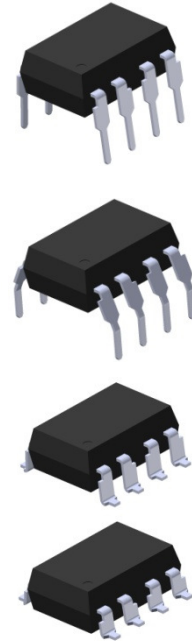


Features

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

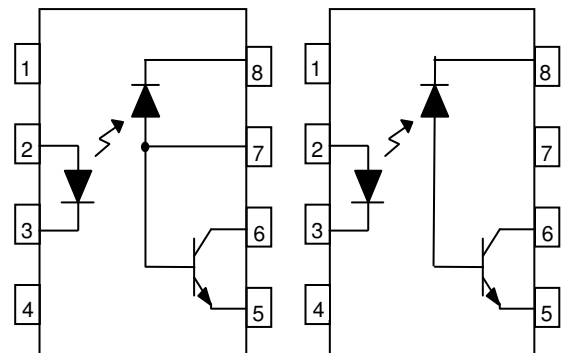
The 6N135, 6N136, EL4502 and EL4503 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor 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	-	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 EL4502 EL4503	-	0.35	0.8		$R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$
		-	-	1.0		$R_L=1.9\text{K}\Omega$
Propagation Delay Time to Logic High (Fig.8)	6N135	-	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 EL4502 EL4503	-	0.3	0.8		$R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$
		-	-	1.0		$R_L=1.9\text{K}\Omega$
Common Mode Transient Immunity at Logic High (Fig.9) ^{*3}	6N135	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	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

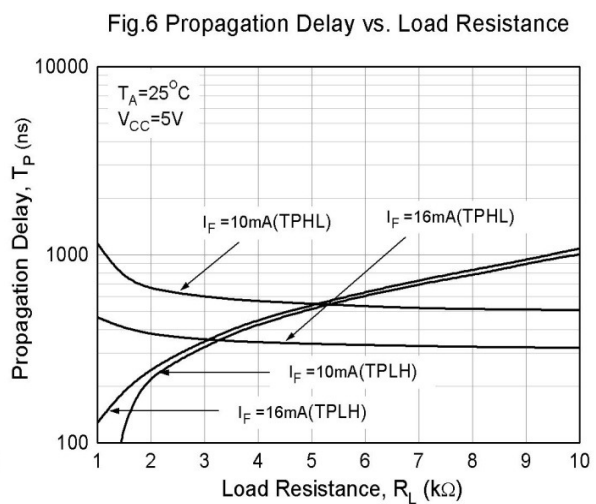
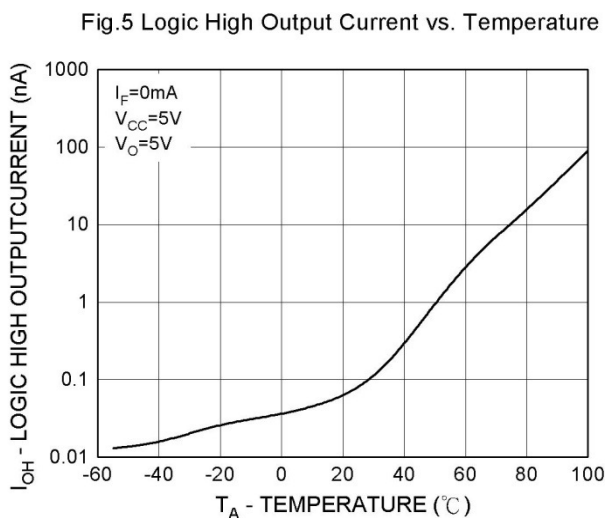
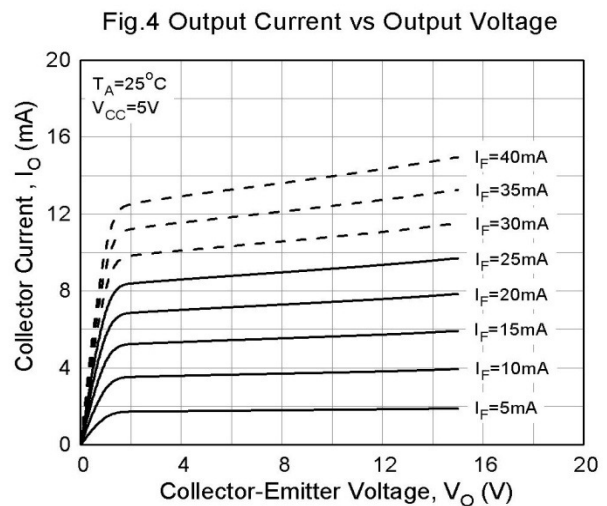
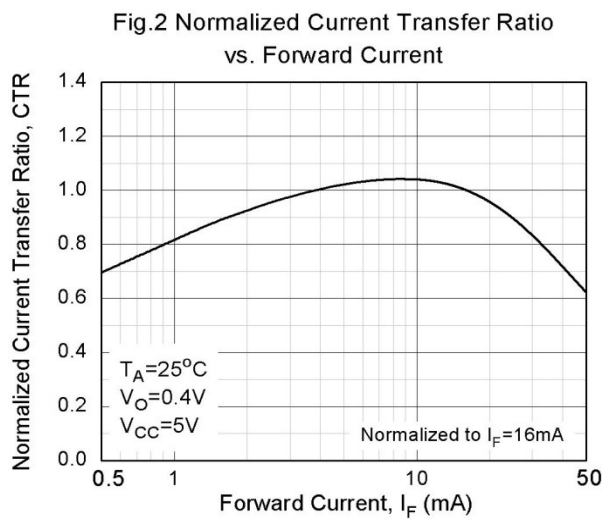
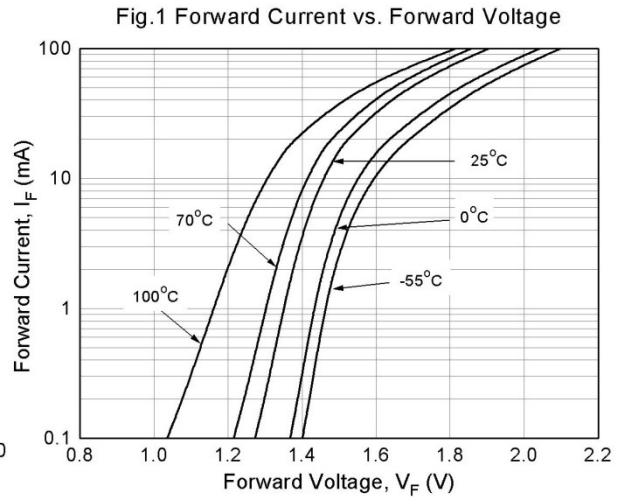
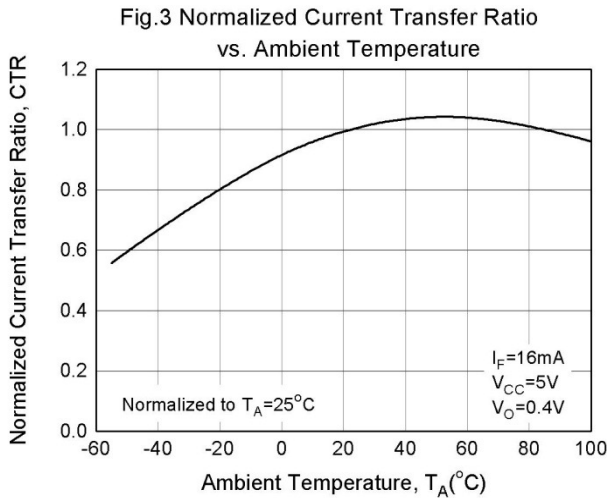


Fig.7 Propagation Delay vs. Temperature

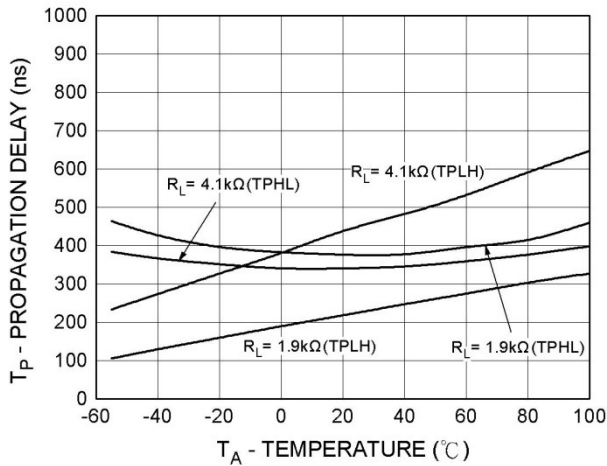


Figure 8 Switching Time Test Circuit & Waveform

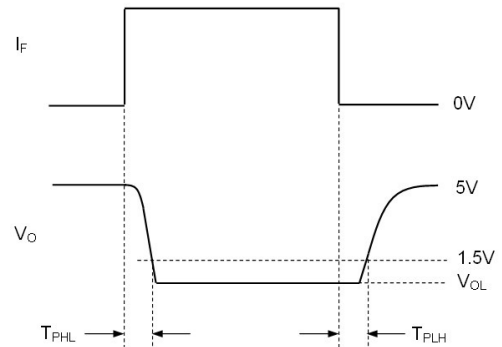
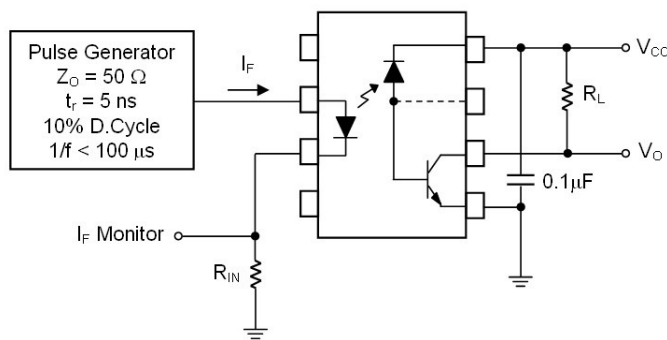
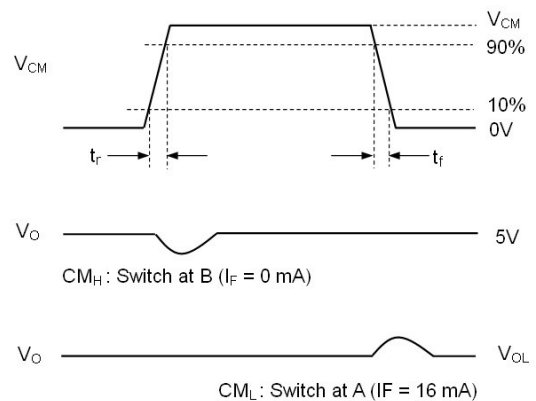
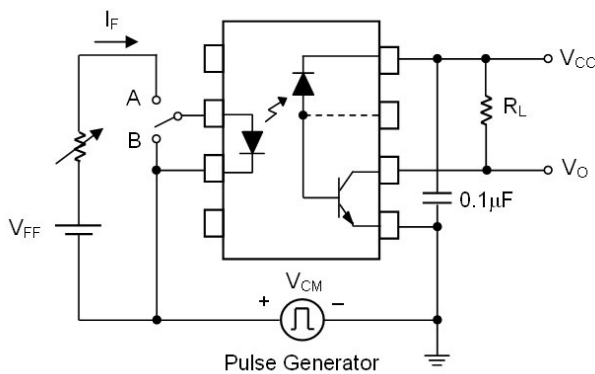


Figure 9 Transient Immunity Test Circuit &



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)

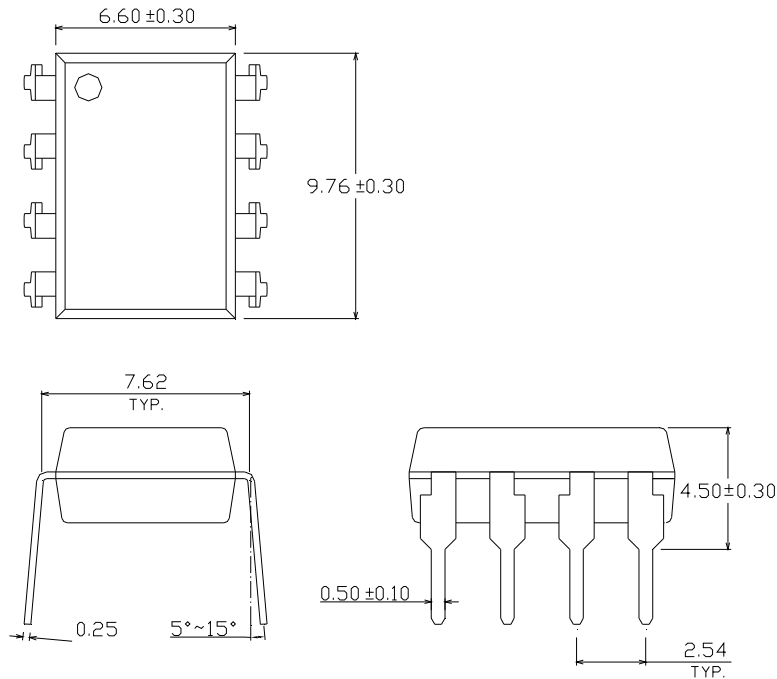
V = VDE (optional)

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

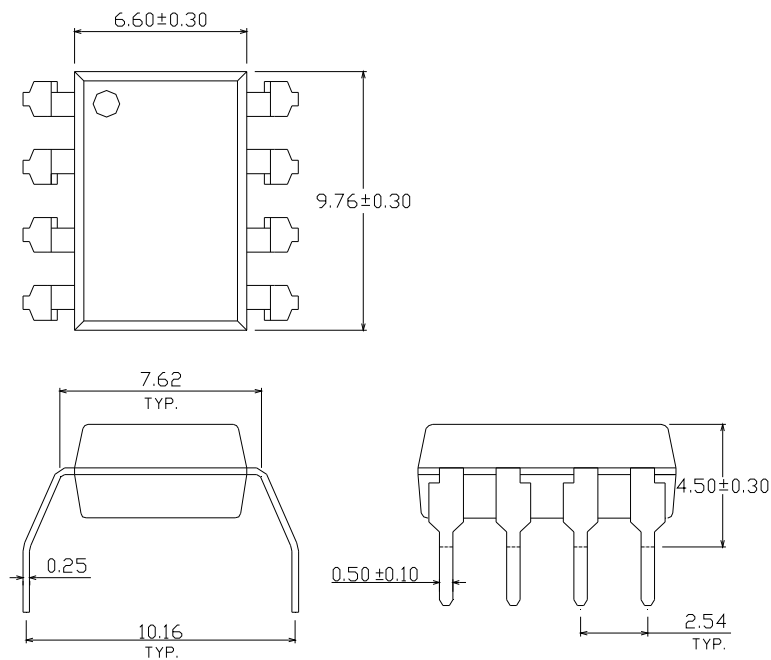
Package Drawing

(Dimensions in mm)

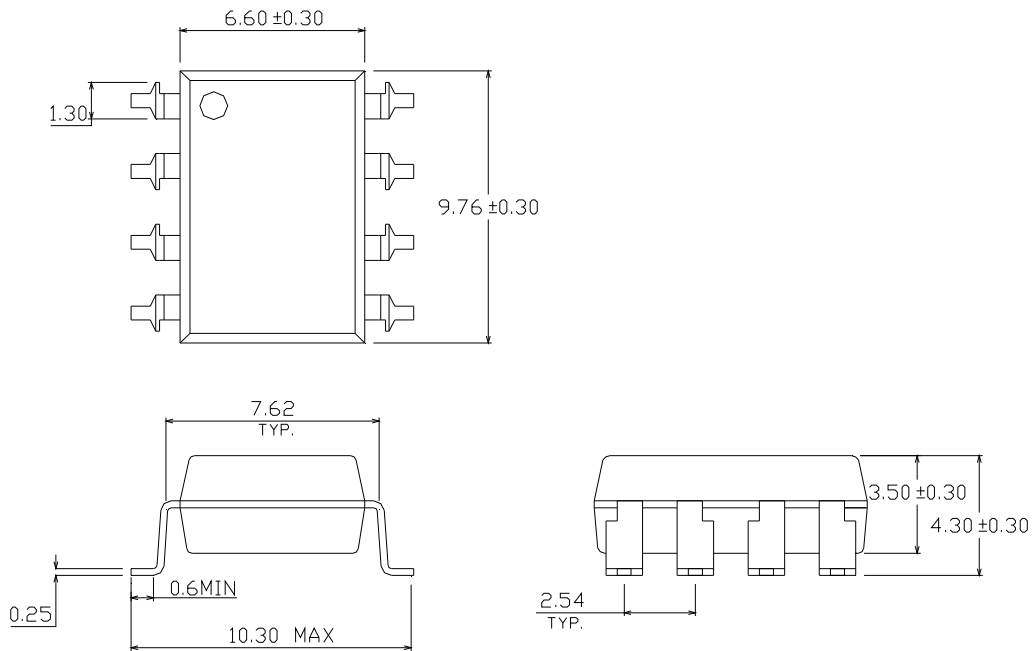
Standard DIP Type



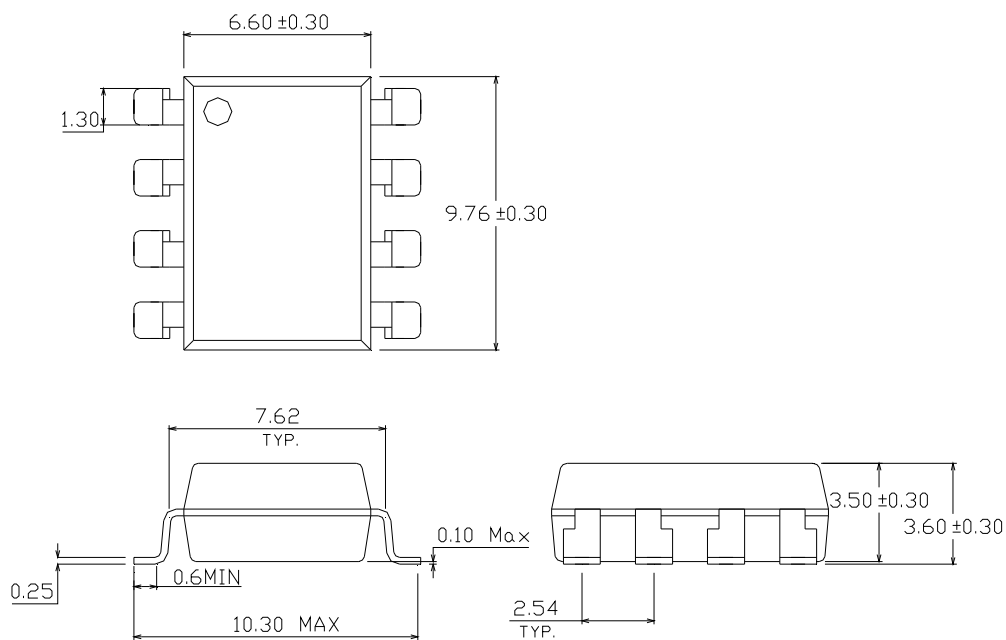
Option M Type



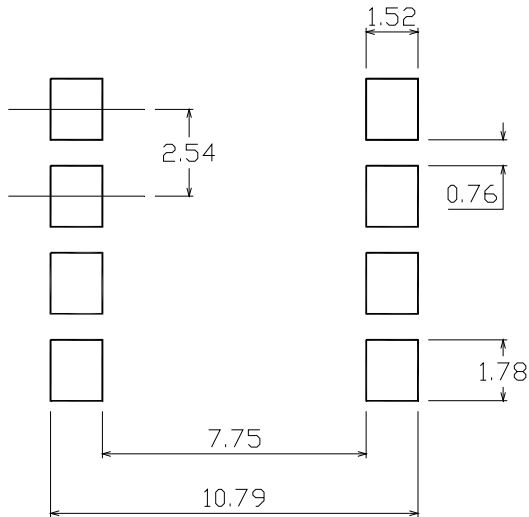
Option S Type



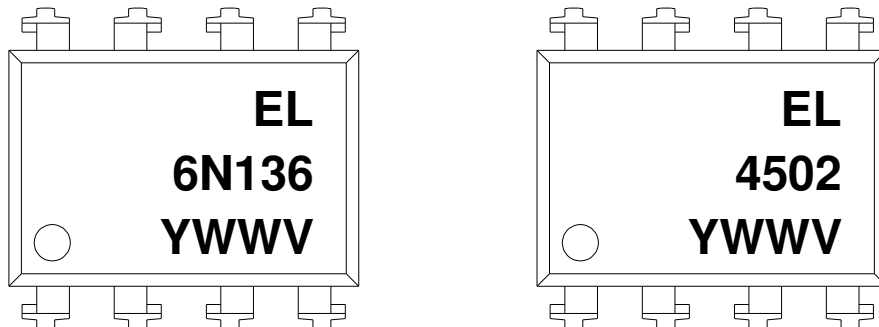
Option S1 Type



Recommended pad layout for surface mount leadform



Device Marking



Notes

4502

6N136 denotes Device Number

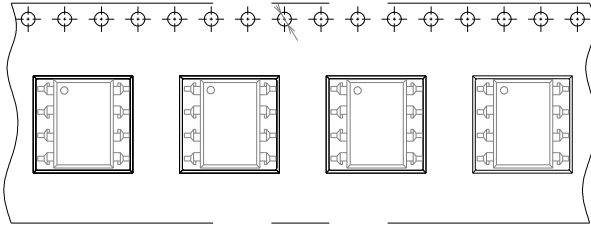
Y denotes 1 digit Year code

WW denotes 2 digit Week code

V denotes VDE (optional)

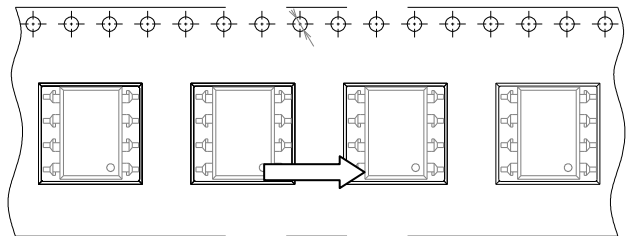
Tape & Reel Packing Specifications

Option TA



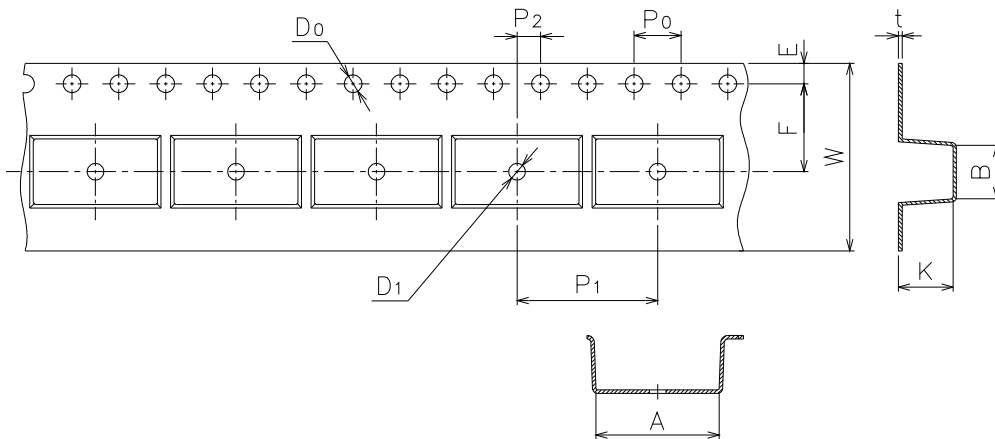
Direction of feed from reel

Option TB



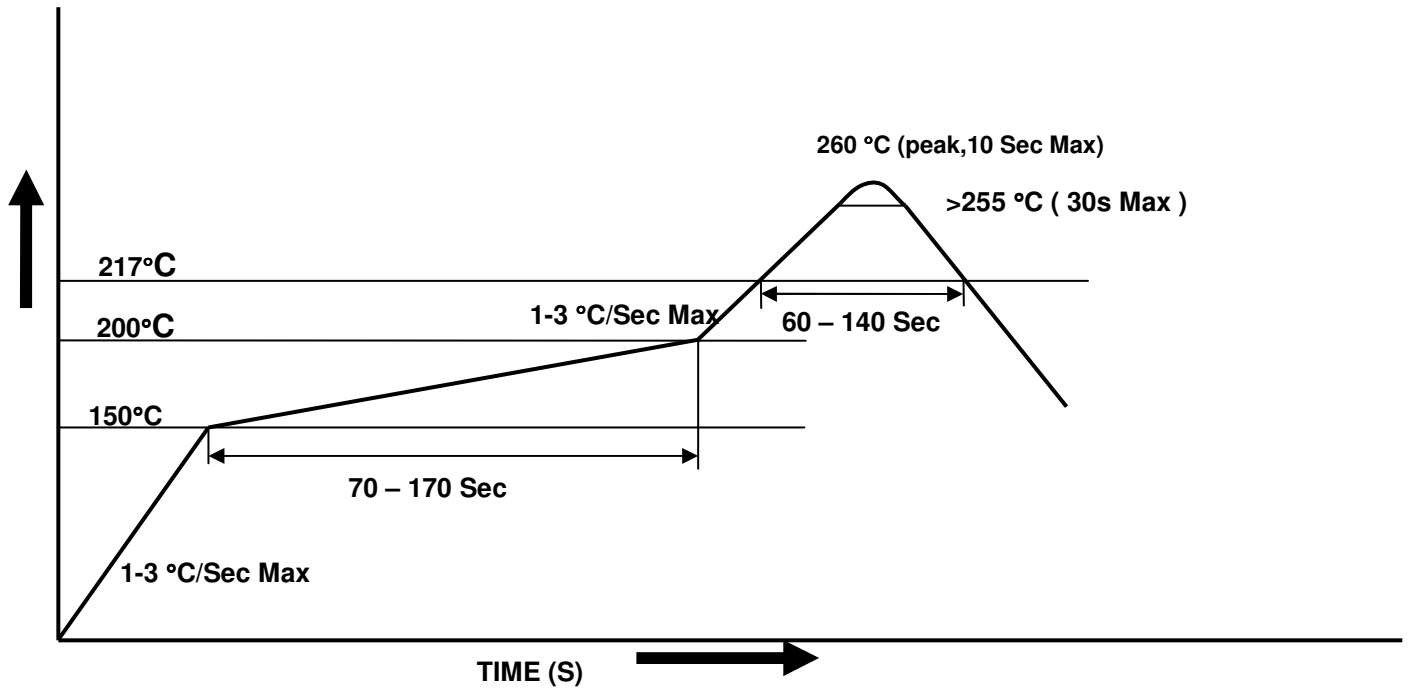
Direction of feed from reel

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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[6N136S1\(TA\)-V](#) [6N136S1\(TB\)](#) [6N136S1\(TB\)-V](#) [6N136-V](#)