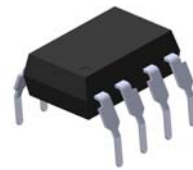
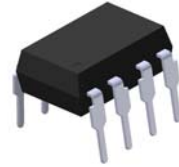


## 8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER

**6N135 6N136  
ICPL4502**

### 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



### Description

The 6N135, 6N136 and ICPL4502 devices each consist of an infrared emitting diodes, optically coupled to a high speed photo detector. 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.

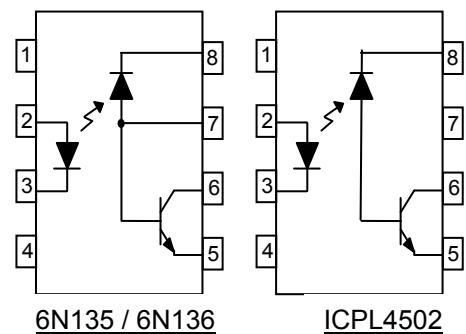
They are packaged in an 8-pin DIP package and available in wide-lead spacing and SMD option.



### Applications

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

### Schematic



#### Pin Configuration

1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7. V<sub>B</sub>
8. V<sub>CC</sub>

#### Pin Configuration

1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7. No Connection
8. V<sub>CC</sub>

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

**6N135 6N136  
ICPL4502**

**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 (≤1 μs 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  
ICPL4502**

**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	$I_{CCL}$	-	150	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  $T_A = 25^\circ\text{C}$

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

## 6N135 6N136 ICPL4502

### Transfer Characteristics ( $T_A=0$ to $70^\circ\text{C}$ 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 ICPL4502		19	-	50		
	6N135		5	-	-		$I_F = 16\text{mA}, V_O = 0.5\text{V}, V_{CC}=4.5\text{V}$
	6N136 ICPL4502		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 ICPL4502		-	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 ICPL4502		-	-	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 $70^\circ\text{C}$ 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	6N135	TPHL	-	0.15	1.5	$\mu\text{s}$	$R_L=4.1\text{K}\Omega, T_A=25^\circ\text{C}$
			-	-	2.0		$R_L=4.1\text{K}\Omega$
	6N136 ICPL4502		-	0.15	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	6N135	TPLH	-	0.7	1.5	$\mu\text{s}$	$R_L=4.1\text{K}\Omega, T_A=25^\circ\text{C}$
			-	-	2.0		$R_L=4.1\text{K}\Omega$
	6N136 ICPL4502		-	0.4	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	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 ICPL4502		1,000	-	-		$I_F = 0\text{mA}, V_{CM}=10\text{Vp-p}, R_L=1.9\text{K}\Omega, T_A = 25^\circ\text{C}$
Common Mode Transient Immunity at Logic Low	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 ICPL4502		1,000	-	-		$I_F = 16\text{mA}, V_{CM}=10\text{Vp-p}, R_L=1.9\text{K}\Omega, T_A = 25^\circ\text{C}$

**Typical Performance Curves**

Figure 1. Forward Current vs Forward Voltage

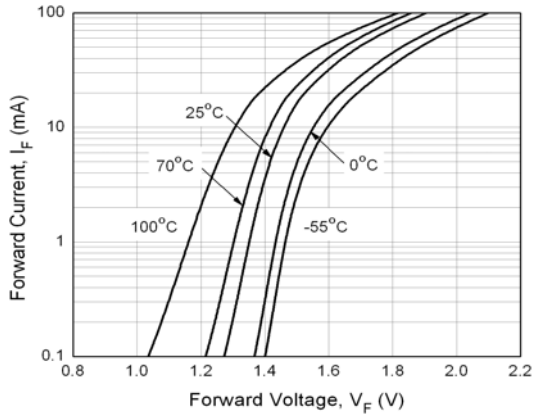


Figure 2. Normalized Current Transfer Ratio vs Forward Current

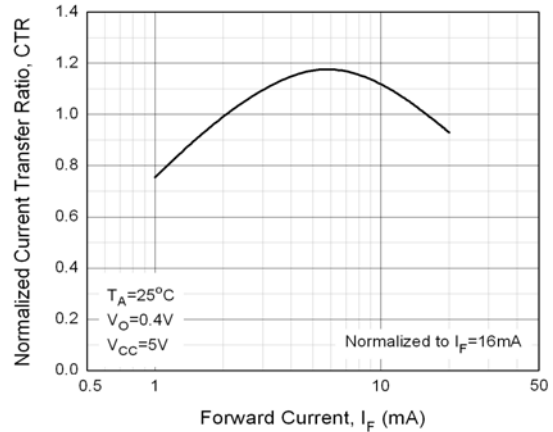


Figure 3. Normalized Current Transfer Ratio vs Ambient Temperature

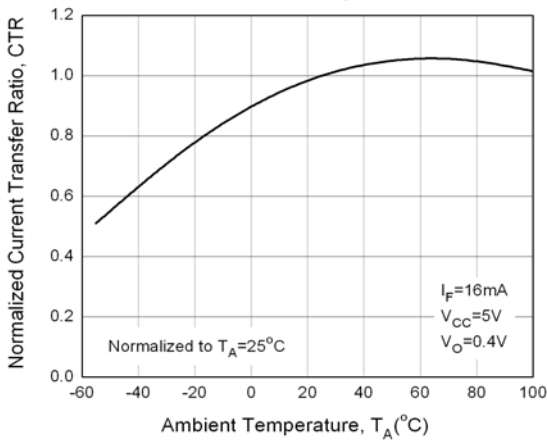


Figure 4. Output Current vs Output Voltage

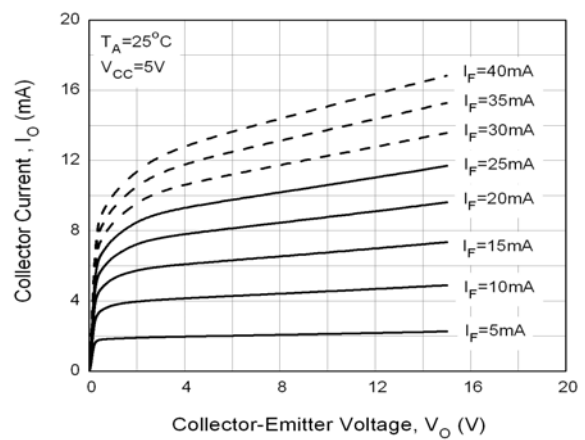


Figure 5. Logic High Output Current vs Ambient Temperature

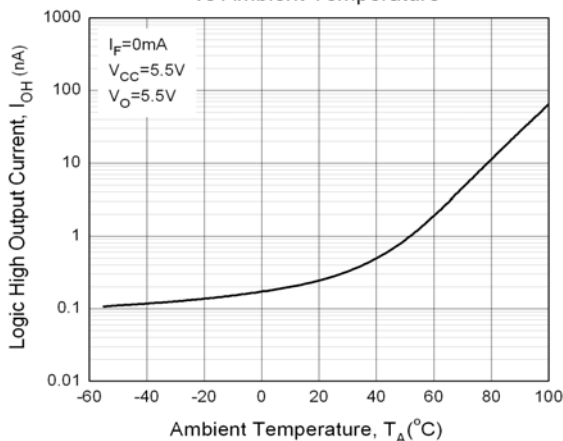
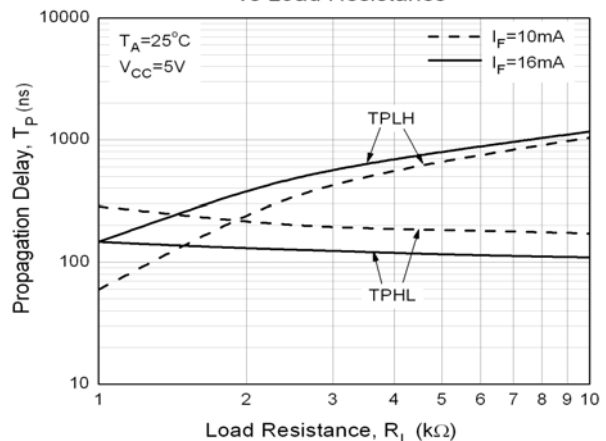


Figure 6. Propagation Delay vs Load Resistance



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

6N135 6N136  
ICPL4502

Figure 7. Propagation Delay vs Ambient Temperature

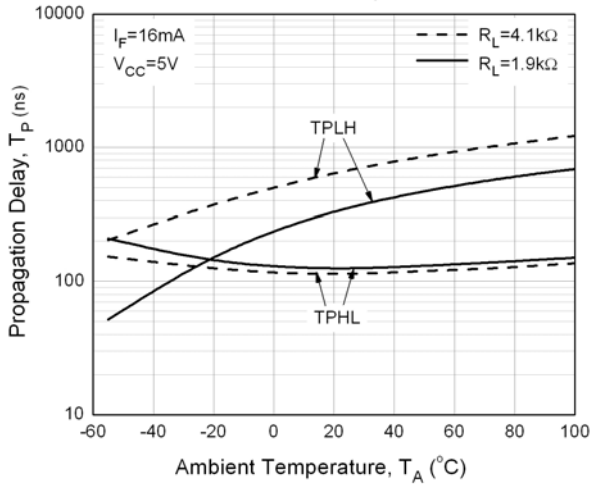


Figure 8 Switching Time Test Circuit & Waveform

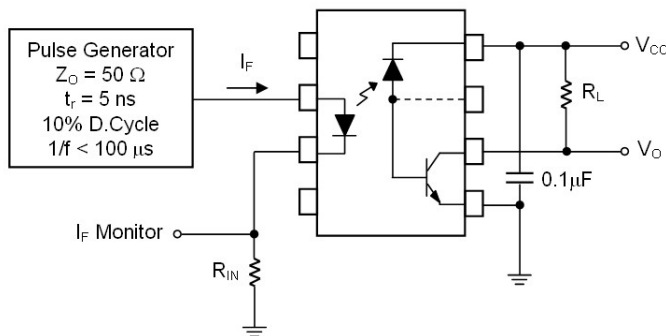
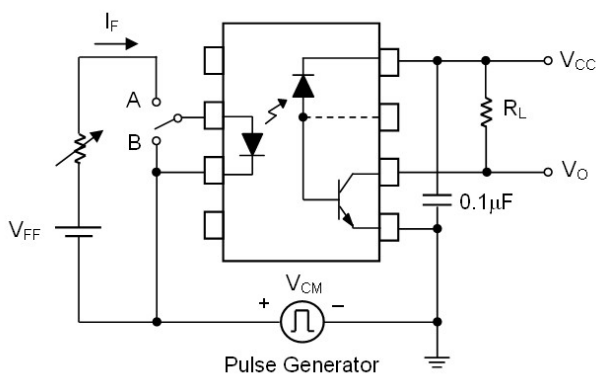
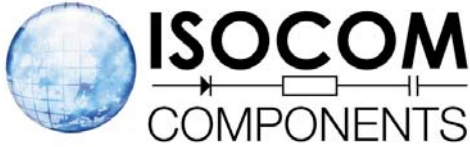


Figure 9 Transient Immunity Test Circuit &



## Order Information



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

**6N135 6N136  
ICPL4502**

**Part Number**

**6N13XY**

or

**ICPL4502Y**

**Note**

X = Part No. (X = 5 or 6 for 6N13X)  
Y = Lead form option (G SM or none)

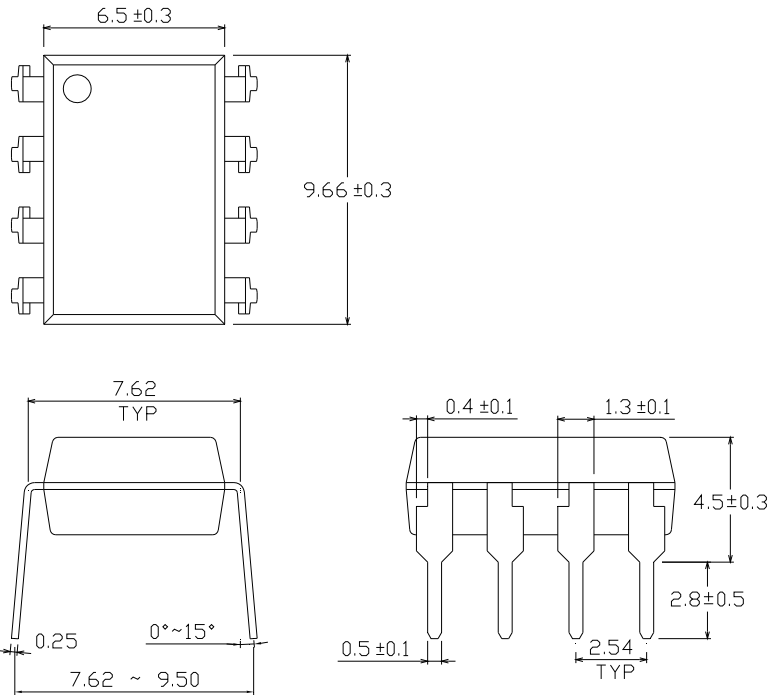
Option	Description	Packing quantity
None	Standard DIP-8	45 units per tube
G	Wide lead bend (0.4 inch spacing)	45 units per tube
SM	Surface mount lead in tubes	45 units per tube
SM T+R	Surface mount lead form (low profile) + TA tape & reel option	1000 units per reel

**8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR  
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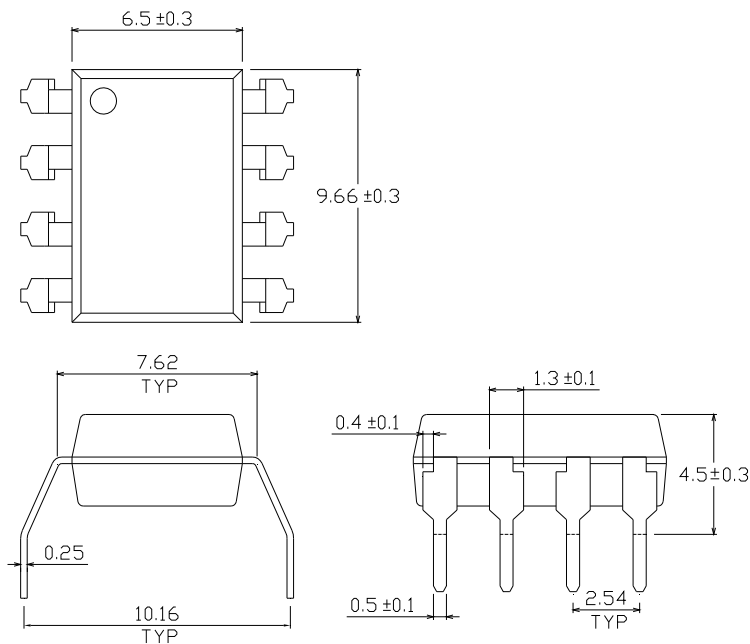
**6N135 6N136  
ICPL4502**

**Package Drawing  
(Dimensions in mm)**

**Standard DIP Type**



**Option G Type**

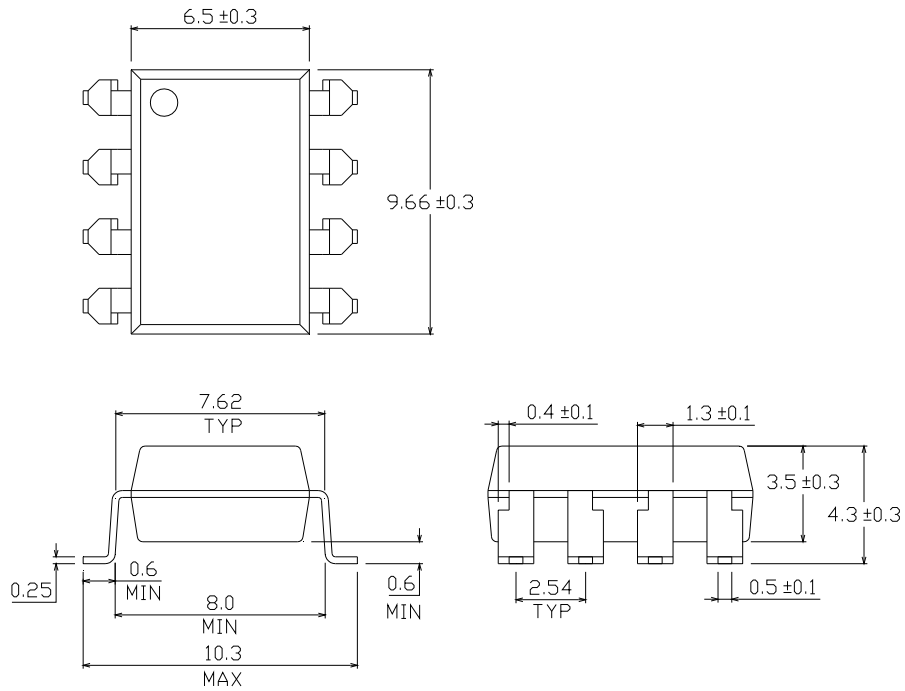




**8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR  
PHOTOCOUPLER**

**6N135 6N136  
ICPL4502**

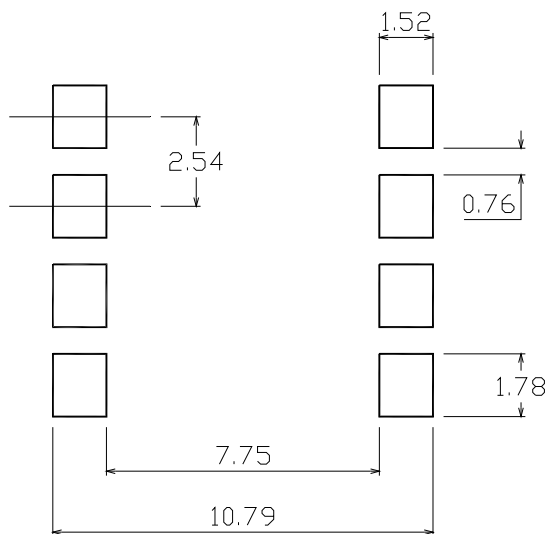
**Option SM Type**



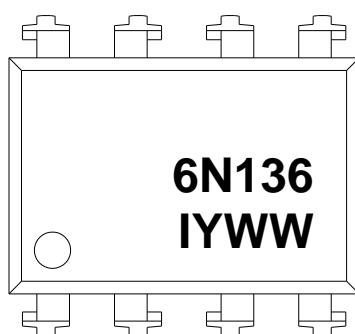
**8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR  
PHOTOCOUPLER**

**6N135 6N136  
ICPL4502**

**Recommended pad layout for surface mount leadform**



**Device Marking**



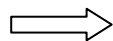
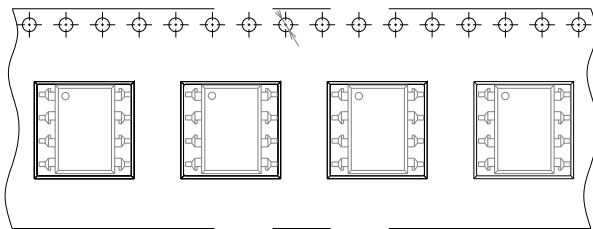
**Notes**

- 6N136 denotes Device Number
- Y denotes 1 digit Year code
- WW denotes 2 digit Week code
- I denotes Isocom

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

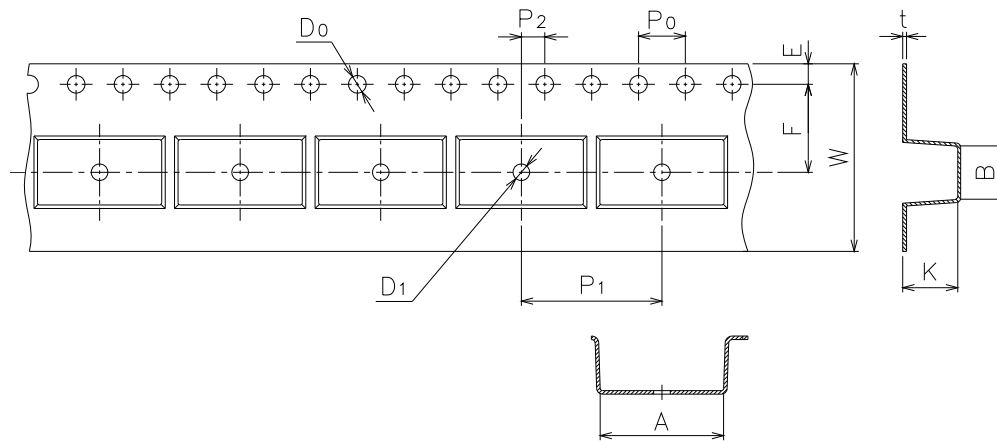
**6N135 6N136  
ICPL4502**

**Tape & Reel Packing Specifications**



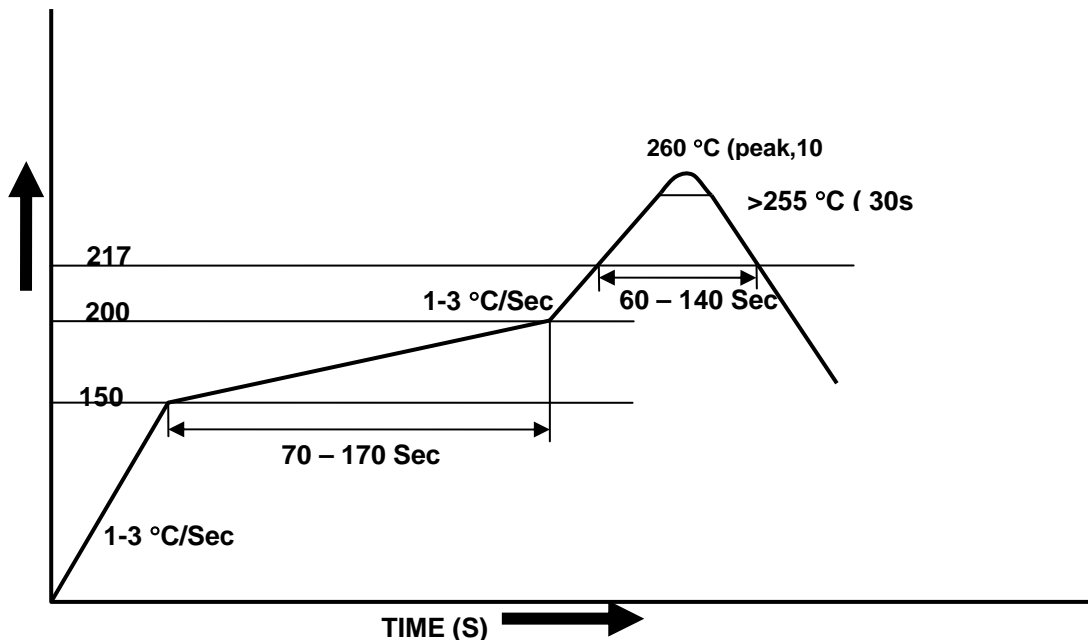
Direction of feed from reel

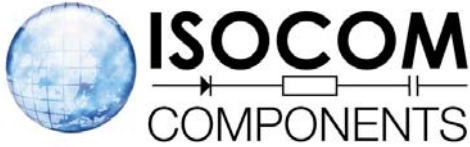
**Tape dimensions**



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

**Solder Reflow Temperature Profile**





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

**6N135 6N136  
ICPL4502**

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