

DESCRIPTION

The 6N135, 6N136, ICPL4502 and ICPL4503 devices each consists 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 increases the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance of the input transistor.

FEATURES

- High speed 1Mbit/s
- High AC Isolation Voltage 5000V_{rms}
- Guaranteed performance from 0°C to 70°C
- Wide Operating temperature range
- -55°C to 100°C
- Pb Free and RoHS Compliant
- UL File E91231
- VDE Approval Certificate No. 40044376 for 6N135 and 6N136, with suffix "V"

APPLICATIONS

- Line Receivers
- Telecommunication Equipments
- Power Transistor Isolation in Motor Drives
- Replacement of Low Speed Phototransistor Optocouplers
- Feedback Loop in Switch Mode Power Supplies
- High Speed Logic Ground Isolation
- Home Appliances

ORDER INFORMATION

- Add G after PN for 10mm lead spacing
- Add SM after PN for Surface Mount
- Add SMT&R after PN for Surface Mount Tape & Reel



A 0.1µF bypass Capacitor shall be connected between V_{CC} and GND.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Stresses exceeding the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

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Input				
Forward Current	25mA			
Forward Peak Current (50% duty cycle, 1ms pulse width)	50mA			
Peak Transient Current (≤1µs pulse width, 300pps)	1A			
Reverse Voltage	5V			
Power dissipation	45mW			
Output				
Output Current	8mA			
Peak Output Current	16mA			
Emitter-Base Reverse Voltage (6N135 and 6N136)	5V			
Base Current (6N135 and 6N136)	5mA			
Supply Voltage	-0.5V to 30V			
Output Voltage	-0.5V to 20V			
Power Dissipation	100mW			
Total Package				
Isolation Voltage	$5000V_{RMS}$			
Operating Temperature	-55 to 100 °C			
Storage Temperature	-55 to 125 °C			
Lead Soldering Temperature (10s)	260°C			
ISOCOM COMPONENTS ASIA LTD				

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ELECTRICAL CHARACTERISTICS ($T_A = 0^{\circ}C$ to 70°C unless otherwise specified)

INPUT

Parameter	Symbol	Test Condition	Min	Тур.*	Max	Unit
Forward Voltage	\mathbf{V}_{F}	$I_F = 16mA$		1.45	1.8	V
Reverse Voltage	V _R	$I_R = 10 \mu A$	5.0			V
Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T_A$	$I_F = 16mA$		-1.9		mV/°C

OUTPUT

Parameter	Symbol	Test Condition	Min	Тур.*	Мах	Unit
Logic High Output Current	I _{OH}	$I_F = 0mA, V_O = V_{CC} = 5.5V,$ $T_A = 25^{\circ}C$		0.001	0.5	μΑ
		$I_F = 0mA, V_O = V_{CC} = 15V,$ $T_A = 25^{\circ}C$		0.01	1	
		$I_F = 0mA, V_O = V_{CC} = 15V$			50	
Logic Low Output Voltage	V _{OL}	6N135 $I_F = 16mA, I_O = 1.1mA,$ $V_{CC} = 4.5V, T_A = 25^{\circ}C$		0.18	0.4	V
		$I_F = 16mA, I_O = 0.8mA,$ $V_{CC} = 4.5V,$			0.5	
		$\label{eq:ICPL4502} \begin{split} & 6N136 \ / \ ICPL4502 \ / \ ICPL4503 \\ & I_F = 16mA, \ I_O = 3mA, \\ & V_{CC} = 4.5V, \ T_A = 25^\circ C \end{split}$		0.25	0.4	
		$I_{\rm F} = 16 {\rm mA}, I_{\rm O} = 2.4 {\rm mA}, V_{\rm CC} = 4.5 {\rm V}$			0.5	
Logic Low Supply Current	I _{CCL}	$I_F = 16mA, V_O = Open,$ 140 200 $V_{CC} = 15V$		200	μΑ	
Logic High Supply Current	I _{CCH}	$I_F = 0mA$, $V_O = Open$, $V_{CC} = 15V$, $T_A = 25^{\circ}C$		0.01	1	μΑ
		$I_F = 0mA, V_O = Open,$ $V_{CC} = 15V$			2]

* Typical values at T_A = 25°C



ELECTRICAL CHARACTERISTICS ($T_A = 0^{\circ}C$ to 70°C unless otherwise specified)

COUPLED

COMPONENTS

Parameter	Symbol	Test Condition	Min	Тур.*	Max	Unit
Current Transfer Ratio	CTR	6N135	7		50	%
		6N136 / ICPL4502 / ICPL4503	19		50	
		$I_F = 16mA, V_O = 0.4V$ $V_{CC} = 4.5V, T_A = 25^{\circ}C$				
		6N135	5			
		6N136 / ICPL4502 / ICPL4503	15			
		$I_F = 16mA, V_O = 0.5V$ $V_{CC} = 4.5V$				

ISOLATION

Parameter	Symbol	Test Condition	Min	Тур.*	Мах	Unit
Insulation Voltage	V _{ISO}	$T_A = 25^{\circ}C, RH = 40 \%$ to 60%, t = 1 min,	5000			V _{RMS}

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



ELECTRICAL CHARACTERISTICS (T_A = 0°C to 70°C unless otherwise specified)

ISOCOM

COMPONENTS

Symbol Unit **Parameter Test Condition** Min Typ.* Max Propagation Delay Time T_{PHL} 6N135 μs to Logic Low $R_L = 4.1 k\Omega$, $T_A = 25^{\circ}C$ 0.35 1.5 $R_L = 4.1 k\Omega$ 2.0 6N136 / ICPL4502 / ICPL4503 $R_L = 1.9 k\Omega$, $T_A = 25^{\circ}C$ 0.35 0.8 $R_L = 1.9k\Omega$ 1.0 Propagation Delay Time 6N135 T_{PLH} μs to Logic High $R_L = 4.1 k\Omega, T_A = 25^{\circ}C$ 0.5 1.5 $R_L = 4.1 k\Omega$ 2.0 6N136 / ICPL4502 / ICPL4503 $R_L = 1.9 k\Omega$, $T_A = 25^{\circ}C$ 0.3 0.8 $R_L = 1.9k\Omega$ 1.0 Common Mode Tran- CM_{H} 6N135 1000 V/µs sient Immunity at Logic $I_F = 0mA$, $V_{CM} = 10Vp-p$, High $R_{L} = 4.1 k\Omega, T_{A} = 25^{\circ}C$ 6N136 / ICPL4502 1000 $I_F = 0mA$, $V_{CM} = 10Vp-p$, $R_L = 1.9 k\Omega$, $T_A = 25^{\circ}C$ **ICPL4503** 15000 20000 $I_F = 0mA$, $V_{CM} = 1500Vp-p$, $R_{L} = 1.9 k\Omega, T_{A} = 25^{\circ}C$ Common Mode Tran- CM_L 6N135 1000 V/µs sient Immunity at Logic $I_F = 16mA$, $V_{CM} = 10Vp-p$, Low $R_L = 4.1 k\Omega$, $T_A = 25^{\circ}C$ 6N136 / ICPL4502 1000 $I_F = 16mA$, $V_{CM} = 10Vp-p$, $R_{L} = 1.9 k\Omega, T_{A} = 25^{\circ}C$ **ICPL4503** 15000 20000 $I_F = 16mA$, $V_{CM} = 1500Vp-p$, $R_L = 1.9 k\Omega$, $T_A = 25^{\circ}C$

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

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





Fig 1 Forward Current vs Forward Voltage



Fig 3 Normalized CTR vs Forward Current



Fig 5 Propagation Delay vs Load Resistance



Fig 2 Output Current vs Output Voltage



Fig 4 Normalized CTR vs T_A



Fig 6 Propagation Delay vs T_A









Switching Time Test Circuit





Common Mode Transient Immunity Test Circuit

Note:

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

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	6N135, 6N136, ICPL4502, ICPL4503 (UL Approval)						
After PN	PN	Description	Packing quantity				
None	6N135, 6N136, ICPL4502, ICPL4503	Standard Dip8	45 pcs per tube				
G	6N135G, 6N136G, ICPL4502G, ICPL4503G	10mm Lead Spacing	45 pcs per tube				
SM	6N135SM, 6N136SM, ICPL4502SM, ICPL4503SM	Surface Mount	45 pcs per reel				
SMT&R	6N135SMT&R, 6N136SMT&R, ICPL4502SMT&R, ICPL4503SMT&R	Surface Mount Tape & Reel	1000 pcs per reel				

	6N135V, 6N136V (UL and VDE Approvals)					
After PN	PN	Description	Packing quantity			
None	6N135V, 6N136V	Standard Dip8	45 pcs per tube			
G	6N135VG, 6N136VG	10mm Lead Spacing	45 pcs per tube			
SM	6N135VSM, 6N136VSM	Surface Mount	45 pcs per reel			
SMT&R	6N135VSMT&R, 6N136VSMT&R	Surface Mount Tape & Reel	1000 pcs per reel			

DEVICE MARKING (Example : 6N136)





PACKAGE DIMENSIONS (mm)

DIP







PACKAGE DIMENSIONS (mm)

SMD



10.30 MAX



RECOMMENDED PAD LAYOUT FOR SMD (mm)

0.25





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	P ₁	P ₂	t	w	к
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



REFLOW SOLDERING TEMPERATURE PROFILE (One Time Reflow Soldering is Recommended)



Profile Details	Conditions
Preheat - Min Temperature (T _{SMIN}) - Max Temperature (T _{SMAX}) - Time T _{SMIN} to T _{SMAX} (t _s)	150°C 200°C 60s - 120s
$\label{eq:solution} \begin{array}{l} \textbf{Soldering Zone} \\ & - \text{Peak Temperature } (T_{\text{P}}) \\ & - \text{Liquidous Temperature } (T_{\text{L}}) \\ & - \text{Time within 5°C of Actual Peak Temperature } (T_{\text{P}} - 5^{\circ}\text{C}) \\ & - \text{Time maintained above } T_{\text{L}} \left(t_{\text{L}} \right) \\ & - \text{Ramp Up Rate } (T_{\text{L}} \text{ to } T_{\text{P}}) \\ & - \text{Ramp Down Rate } (T_{\text{P}} \text{ to } T_{\text{L}}) \end{array}$	260°C 217°C 30s 60s - 100s 3°C/s max 6°C/s max
Average Ramp Up Rate (T_{smax} to T_P)	3°C/s max
Time 25°C to Peak Temperature	8 minutes max



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