



**HIGH SPEED OPTICALLY  
COUPLED ISOLATOR  
PHOTOTRANSISTOR OUTPUT**

**APPROVALS**

- UL recognised, File No. E91231

**DESCRIPTION**

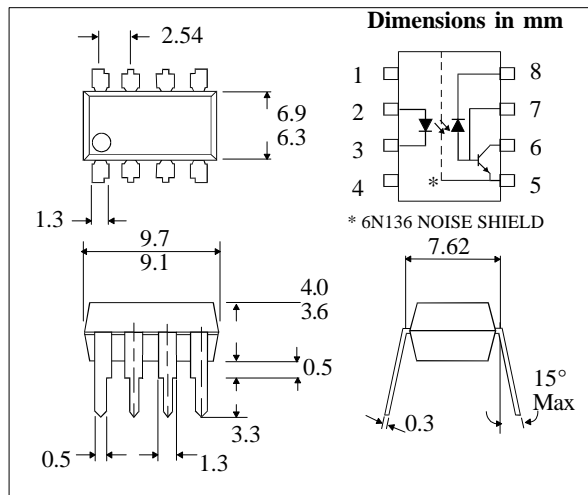
These diode-transistor optocouplers use a light emitting diode and an integrated photon detector to provide 2500Volts<sub>RMS</sub> electrical isolation between input and output. Seperate connection for the photodiode bias and output transistor collector improve the speed up to a hundred times that of a conventional photo-transistor coupler by reducing the base-collector capacitance.

**FEATURES**

- High speed - 1 Mbits/s
- High Common Mode Transient Immunity 1000V/μs
- TTL Compatible
- 2 MHz Bandwidth
- Open Collector Output
- 2500V<sub>RMS</sub> Withstand Test Voltage, 1 Min
- 6N136 has improved noise shield which gives superior common mode rejection
- Options :-  
10mm lead spread - add G after part no.  
Surface mount - add SM after part no.  
Tape&reel - add SMT&R after part no.
- All electrical parameters 100% tested
- Custom electrical selections available

**APPLICATIONS**

- Line receivers
- Pulse transformer replacement
- Wide bandwidth analog coupling
- Output interface to CMOS-LSTTL-TTL



**ABSOLUTE MAXIMUM RATINGS  
(25°C unless otherwise specified)**

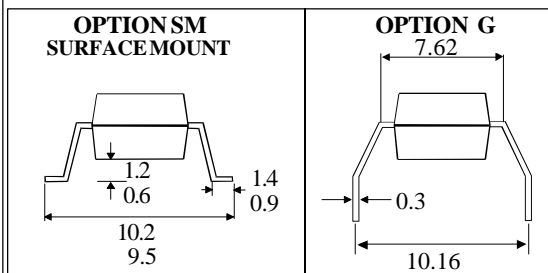
Storage Temperature \_\_\_\_\_ -55°C to + 125°C  
 Operating Temperature \_\_\_\_\_ -55°C to + 100°C  
 Lead Soldering Temperature  
 (1/16 inch (1.6mm) from case for 10 secs) 260°C

**INPUT DIODE**

Average Forward Current \_\_\_\_\_ 25mA ( 1 )  
 Peak Forward Current \_\_\_\_\_ 50mA ( 2 )  
 ( 50% duty cycle, 1ms pulse width )  
 Peak Transient Current \_\_\_\_\_ 1.0A  
 (equal to or less than 1μs P.W., 300 pps)  
 Reverse Voltage \_\_\_\_\_ 5V  
 Power Dissipation \_\_\_\_\_ 45mW( 3 )

**DETECTOR**

Average Output Current \_\_\_\_\_ 8mA  
 Peak Output Current \_\_\_\_\_ 16mA  
 Supply and Output Voltage \_\_\_\_\_ -0.5 to +15V  
 Base Current \_\_\_\_\_ 5mA  
 Power Dissipation \_\_\_\_\_ 100mW(4 )



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**ELECTRICAL CHARACTERISTICS (  $T_A = 0^\circ\text{C}$  to  $70^\circ\text{C}$  Unless otherwise noted )**

PARAMETER	SYM	DEVICE	MIN	TYP*	MAX	UNITS	TEST CONDITION
Current Transfer Ratio (note 5)	CTR	6N135	7	18		%	$I_F = 16\text{mA}, V_O = 0.4\text{V}$ $V_{CC} = 4.5\text{V}, T_A = 25^\circ\text{C}$
		6N136	19	24		%	
Logic Low Output Voltage	$V_{OL}$	6N135		0.1	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		0.1	0.4	V	
Logic High Output Current	$I_{OH}$			3	500	nA	$I_F = 0\text{mA}, T_A = 25^\circ\text{C}$ $V_O = V_{CC} = 5.5\text{V}$ $I_F = 0\text{mA}, T_A = 25^\circ\text{C}$ $V_O = V_{CC} = 15\text{V}$ $I_F = 0\text{mA}$ $V_O = V_{CC} = 15\text{V}$
				0.01	1	$\mu\text{A}$	
Logic Low Supply Current	$I_{CCL}$				40	$\mu\text{A}$	$I_F = 16\text{mA}, V_O = \text{open}$ $V_{CC} = 15\text{V}$
Logic High Supply Current	$I_{CCH}$			0.02	1	$\mu\text{A}$	$I_F = 0\text{mA}, V_O = \text{open}$ $V_{CC} = 15\text{V}, T_A = 25^\circ\text{C}$ $I_F = 0\text{mA}, V_O = \text{open}$ $V_{CC} = 15\text{V}$
					2	$\mu\text{A}$	
Input Forward Voltage	$V_F$			1.5	1.7	V	$I_F = 16\text{mA}, T_A = 25^\circ\text{C}$
Temperature Coefficient of Forward Voltage	$\frac{\Delta V_F}{\Delta T_A}$			-1.6		mV/ $^\circ\text{C}$	$I_F = 16\text{mA}$
Input Reverse Voltage	$V_R$		5			V	$I_R = 10\mu\text{A}, T_A = 25^\circ\text{C}$
Input Capacitance	$C_{IN}$			60		pF	$f = 1\text{MHz}, V_F = 0$
Input-output Isolation Voltage	$V_{ISO}$		2500	5000		$V_{RMS}$	R.H.equal to or less than 50%, $t = 1\text{min}, T_A = 25^\circ\text{C}$
Resistance (Input to Output)	$R_{IO}$			$10^{12}$		$\Omega$	$V_{IO} = 500\text{V dc}$ (note 6)
Capacitance (Input to Output)	$C_{IO}$			0.6		pF	$f = 1\text{MHz}$ (note 6)
Transistor DC Current Gain	$H_{FE}$			150			$V_O = 5\text{V}, I_O = 3\text{mA}$

\* All typicals at  $T_A = 25^\circ\text{C}$

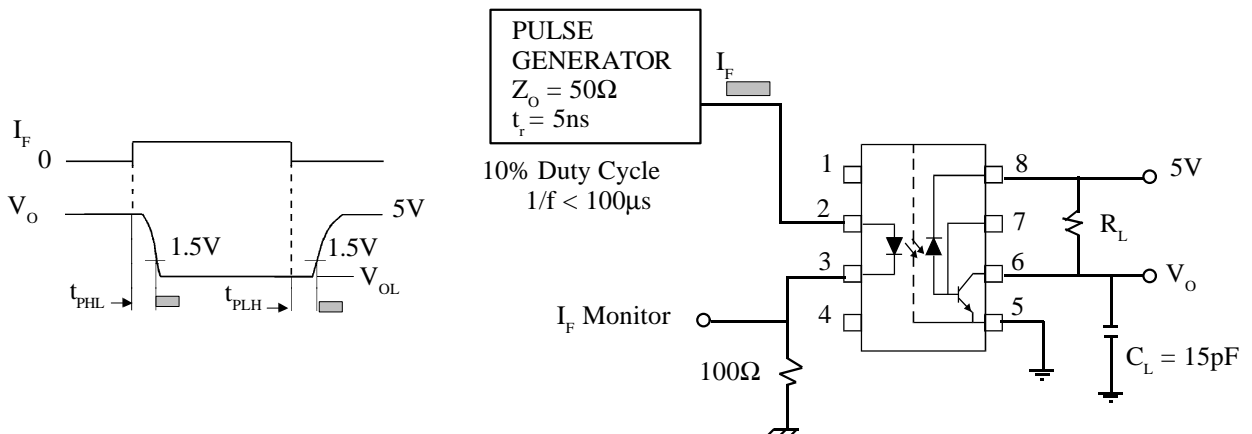
**SWITCHING SPECIFICATIONS AT  $T_A = 25^\circ\text{C}$  ( $V_{CC} = 5\text{V}$ ,  $I_F = 16\text{mA}$  Unless otherwise noted )**

PARAMETER	SYM	DEVICE	MIN	TYP	MAX	UNITS	TEST CONDITION
Propagation Delay Time To Logic Low at Output ( fig 1 )	$t_{PHL}$	6N135		0.5	1.5	$\mu\text{s}$	$R_L = 4.1\text{k}\Omega$ , ( note 9 )
		6N136		0.2	0.8	$\mu\text{s}$	$R_L = 1.9\text{k}\Omega$ , ( note 8 )
Propagation Delay Time To Logic High at Output ( fig 1 )	$t_{PLH}$	6N135		0.5	1.5	$\mu\text{s}$	$R_L = 4.1\text{k}\Omega$ , ( note 9 )
		6N136		0.2	0.8	$\mu\text{s}$	$R_L = 1.9\text{k}\Omega$ , ( note 8 )
Common Mode Transient Immunity at Logic High Level Output ( fig 2 )	$CM_H$	6N135		1000		$\text{V}/\mu\text{s}$	$I_F = 0\text{mA}$ , $V_{CM} = 10\text{V}_{PP}$ $R_L = 4.1\text{k}\Omega$ , (note 7,8,9)
		6N136		1000		$\text{V}/\mu\text{s}$	$I_F = 0\text{mA}$ , $V_{CM} = 10\text{V}_{PP}$ $R_L = 1.9\text{k}\Omega$ , (note 7,8,9)
Common Mode Transient Immunity at Logic Low Level Output ( fig 2 )	$CM_L$	6N135		-1000		$\text{V}/\mu\text{s}$	$V_{CM} = 10\text{V}_{PP}$ $R_L = 4.1\text{k}\Omega$ , (note 7,8,9)
		6N136		-1000		$\text{V}/\mu\text{s}$	$V_{CM} = 10\text{V}_{PP}$ $R_L = 1.9\text{k}\Omega$ , (note 7,8,9)
Bandwidth	BW			2		MHz	$R_L = 100\Omega$ , ( note 10 )

**NOTES:-**

1. Derate linearly above  $70^\circ\text{C}$  free air temperature at a rate of  $0.8 \text{ mA}/^\circ\text{C}$ .
2. Derate linearly above  $70^\circ\text{C}$  free air temperature at a rate of  $1.6 \text{ mA}/^\circ\text{C}$ .
3. Derate linearly above  $70^\circ\text{C}$  free air temperature at a rate of  $0.9 \text{ mW}/^\circ\text{C}$ .
4. Derate linearly above  $70^\circ\text{C}$  free air temperature at a rate of  $1.0 \text{ mW}/^\circ\text{C}$ .
5. CURRENT TRANSFER RATIO is defined as the ratio of output collector current,  $I_O$ , to the forward LED input current,  $I_F$  times 100%.
6. Device considered a two-terminal device: pins 1,2,3, and 4 shorted together and pins 5,6,7 and 8 shorted together.
7. 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  $V_{CM}$  to assure that the output will remain in a Logic High state (i.e.  $V_O > 2.0\text{V}$ ). 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 Logic Low state (i.e.  $V_O < 0.8\text{V}$ ).
8. The  $1.9\text{k}\Omega$  load represents 1 TTL unit load of  $1.6\text{mA}$  and the  $5.6\text{k}\Omega$  pull-up resistor.
9. The  $4.1\text{k}\Omega$  load represents 1 LSTTL unit load of  $0.36\text{mA}$  and the  $6.1\text{k}\Omega$  pull-up resistor.
10. The frequency at which the a.c. output voltage is 3dB below the low frequency asymptote.

**FIG.1 SWITCHING TEST CIRCUIT**



**FIG. 2 TEST CIRCUIT FOR TRANSIENT IMMUNITY AND TYPICAL WAVEFORMS**

