



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_{RMS} electrical isolation between input and output. Separate 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.

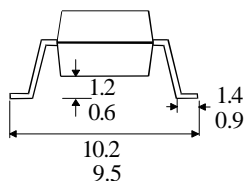
FEATURES

- High speed - 1 Mbits/s
- High Common Mode Transient Immunity 1000V/μs
- TTL Compatible
- 2 MHz Bandwidth
- Open Collector Output
- 2500V_{RMS} 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

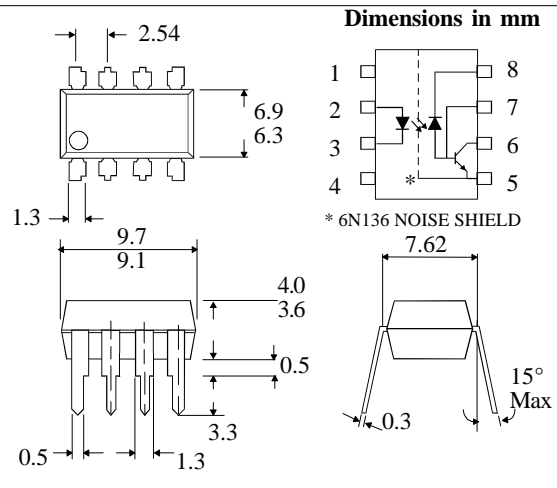
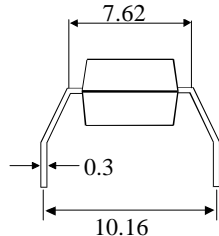
APPLICATIONS

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

OPTION SM SURFACEMOUNT



OPTION G



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°C to 70°C Unless otherwise noted)

| PARAMETER | SYM | DEVICE | MIN | TYP* | MAX | UNITS | TEST CONDITION |
|---|---------------------------------|--------|------|------------------|-----|------------------|---|
| Current Transfer Ratio (note 5) | CTR | 6N135 | 7 | 18 | | % | I _F = 16mA, V _O = 0.4V V _{CC} = 4.5V, T _A = 25°C |
| | | 6N136 | 19 | 24 | | % | |
| Logic Low Output Voltage | V _{OL} | 6N135 | | 0.1 | 0.4 | V | I _F = 16mA, I _O = 1.1mA V _{CC} = 4.5V, T _A = 25°C |
| | | 6N136 | | 0.1 | 0.4 | V | |
| Logic High Output Current | I _{OH} | | | 3 | 500 | nA | I _F = 0mA, T _A = 25°C V _O = V _{CC} = 5.5V I _F = 0mA, T _A = 25°C V _O = V _{CC} = 15V I _F = 0mA V _O = V _{CC} = 15V |
| | | | | 0.01 | 1 | μA | |
| Logic Low Supply Current | I _{CCL} | | | | 40 | μA | I _F = 16mA, V _O = open V _{CC} = 15V |
| Logic High Supply Current | I _{CCH} | | | 0.02 | 1 | μA | I _F = 0mA, V _O = open V _{CC} = 15V, T _A = 25°C I _F = 0mA, V _O = open V _{CC} = 15V |
| | | | | | 2 | μA | |
| Input Forward Voltage | V _F | | | 1.5 | 1.7 | V | I _F = 16mA, T _A = 25°C |
| Temperature Coefficient of Forward Voltage | $\frac{\Delta V_F}{\Delta T_A}$ | | | -1.6 | | mV/°C | I _F = 16mA |
| Input Reverse Voltage | V _R | | 5 | | | V | I _R = 10μA, T _A = 25°C |
| Input Capacitance | C _{IN} | | | 60 | | pF | f = 1MHz, V _F = 0 |
| Input-output Isolation Voltage | V _{ISO} | | 2500 | 5000 | | V _{RMS} | R.H. equal to or less than 50%, t = 1min. T _A = 25°C |
| Resistance (Input to Output) | R _{IO} | | | 10 ¹² | | Ω | V _{IO} = 500V dc (note 6) |
| Capacitance (Input to Output) | C _{IO} | | | 0.6 | | pF | f = 1MHz (note 6) |
| Transistor DC Current Gain | H _{FE} | | | 150 | | | V _O = 5V, I _O = 3mA |

* All typicals at T_A = 25°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 | μs | $R_L = 4.1\text{k}\Omega$, (note 9) |
| | | 6N136 | | 0.2 | 0.8 | μs | $R_L = 1.9\text{k}\Omega$, (note 8) |
| Propagation Delay Time To Logic High at Output (fig 1) | t_{PLH} | 6N135 | | 0.5 | 1.5 | μs | $R_L = 4.1\text{k}\Omega$, (note 9) |
| | | 6N136 | | 0.2 | 0.8 | μs | $R_L = 1.9\text{k}\Omega$, (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°C free air temperature at a rate of $0.8 \text{ mA}/^\circ\text{C}$.
2. Derate linearly above 70°C free air temperature at a rate of $1.6 \text{ mA}/^\circ\text{C}$.
3. Derate linearly above 70°C free air temperature at a rate of $0.9 \text{ mW}/^\circ\text{C}$.
4. Derate linearly above 70°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 1.6mA and the $5.6\text{k}\Omega$ pull-up resistor.
9. The $4.1\text{k}\Omega$ load represents 1 LSTTL unit load of 0.36mA 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

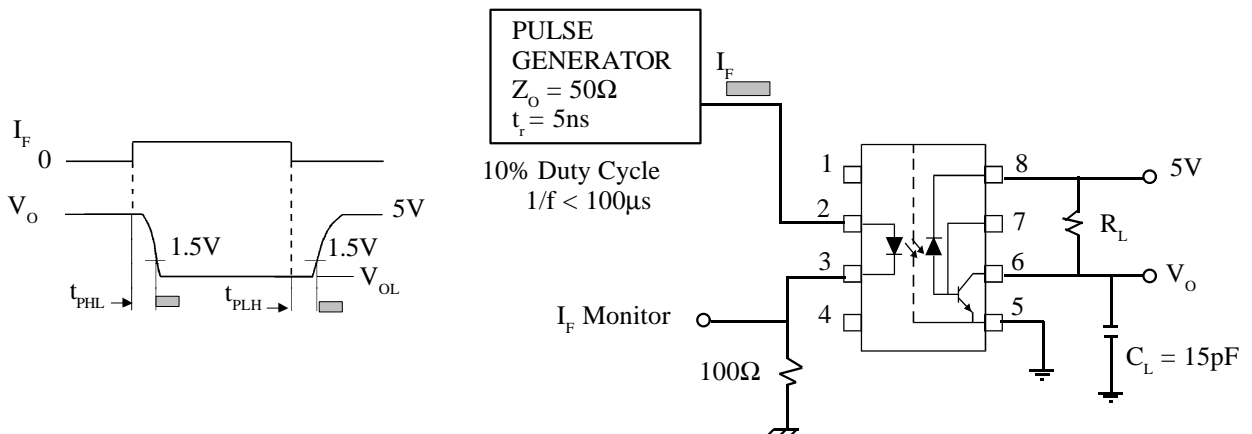


FIG. 2 TEST CIRCUIT FOR TRANSIENT IMMUNITY AND TYPICAL WAVEFORMS

