

Optocoupler, High Speed Phototransistor Output, 1 Mbd, 10 kV/ms CMR, Split Collector Transistor Output



I179064



DESCRIPTION

The SFH636 is an optocoupler with a GaAlAs infrared emitting diode, optically coupled to an integrated photo detector consisting of a photo diode and a high speed transistor in a DIP-6 plastic package. The device is functionally similar to 6N136 except there is no base connection, and the electrical foot print is different. Noise and dv/dt performance is enhanced by not bringing out the base connection.

Signals can be transmitted between two electrically separated circuits up to frequencies of 2.0 MHz. The potential difference between the circuits to be coupled should not exceed the maximum permissible reference.

FEATURES

- High speed optocoupler without base connection
- Isolation test voltage: 5300 V_{RMS}
- GaAlAs emitter
- Integrated detector with photo diode and transistor
- High data transmission rate: 1.0 MBit/s
- TTL compatible
- Open collector output
- CTR at I_F = 16 mA, V_O = 0.4 V, V_{CC} = 4.5 V, T_{amb} = 25 °C: ≥ 19 %
- Good CTR linearity relative to forward current
- Low coupling capacitance
- dV/dt: typ. 10 kV/μs
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC


RoHS
COMPLIANT

APPLICATIONS

- IGBT drivers
- Data communications
- Programmable controllers

AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 pending available with option 1

ORDER INFORMATION

| PART | REMARKS |
|-------------|--------------------------------------|
| SFH636 | CTR ≥ 19 %, DIP-6 |
| SFH636-X006 | CTR ≥ 19 %, DIP-6 400 mil (option 6) |
| SFH636-X007 | CTR ≥ 19 %, SMD-6 (option 7) |
| SFH636-X009 | CTR ≥ 19 %, SMD-6 (option 9) |

Note

For additional information on the available options refer to option information.

ABSOLUTE MAXIMUM RATINGS (1)

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|-----------------------|---------------------------------------|-------------------|-------|------|
| INPUT | | | | |
| Reverse voltage | | V _R | 3.0 | V |
| DC forward current | | I _F | 25 | mA |
| Surge forward current | t _p ≤ 1.0 μs, 300 pulses/s | I _{FSM} | 1.0 | A |
| Power dissipation | | P _{diss} | 45 | mW |

Vishay Semiconductors Optocoupler, High Speed Phototransistor Output,
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| ABSOLUTE MAXIMUM RATINGS ⁽¹⁾ | | | | |
|--|--|------------|----------------|------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| OUTPUT | | | | |
| Supply voltage | | V_S | - 0.5 to 30 | V |
| Output voltage | | V_O | - 0.5 to 20 | V |
| Output current | | I_O | 8.0 | mA |
| Power dissipation | | P_{diss} | 100 | mW |
| COUPLER | | | | |
| Isolation test voltage between emitter and detector, refer to climate DIN 40046, part 2, Nov. 74 | | V_{ISO} | 5300 | V_{RMS} |
| Creepage distance | | | ≥ 7 | mm |
| Clearance distance | | | ≥ 7 | mm |
| Isolation resistance | $V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^\circ\text{C}$ | R_{IO} | $\geq 10^{12}$ | Ω |
| | $V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^\circ\text{C}$ | R_{IO} | $\geq 10^{11}$ | Ω |
| Storage temperature range | | T_{stg} | - 55 to + 150 | $^\circ\text{C}$ |
| Ambient temperature range | | T_{amb} | - 55 to +100 | $^\circ\text{C}$ |
| Junction temperature | | T_j | 100 | $^\circ\text{C}$ |
| Soldering temperature ⁽²⁾ | max. 10 s, dip soldering: distance to seating plane ≥ 1.5 mm | T_{sld} | 260 | $^\circ\text{C}$ |

Notes

⁽¹⁾ $T_{amb} = 25\text{ }^\circ\text{C}$, unless otherwise specified.

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

⁽²⁾ Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

| ELECTRICAL CHARACTERISTICS | | | | | | |
|--------------------------------------|--|------------|------|-------|------|---------------|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| INPUT | | | | | | |
| Forward voltage | $I_F = 16\text{ mA}$ | V_F | | 1.5 | 1.8 | V |
| Reverse current | $V_R = 3.0\text{ V}$ | I_R | | 0.5 | 10 | μA |
| Capacitance | $V_R = 0\text{ V}, f = 1.0\text{ MHz}$ | C_O | | 125 | | pF |
| Thermal resistance | | R_{thja} | | 700 | | K/W |
| OUTPUT | | | | | | |
| Logic high supply current | $I_F = 0\text{ V}, V_O$ (open), $V_{CC} = 15\text{ V}$ | I_{CCH} | | 0.01 | 1.0 | μA |
| | $I_F = 0\text{ V}, V_O$ (open), $V_{CC} = 15\text{ V}$ | I_{CCH} | | 0.01 | 2.0 | μA |
| Output current, output high | $I_F = 0\text{ V}, V_O$ (open), $V_{CC} = 5.5\text{ V}$ | I_{OH} | | 0.003 | 0.5 | μA |
| | $I_F = 0\text{ V}, V_O$ (open), $V_{CC} = 15\text{ V}$ | I_{OH} | | 0.01 | 1.0 | μA |
| | | I_{OH} | | | | 50 |
| Collector emitter capacitance | $V_{CE} = 5.0\text{ V}, f = 1.0\text{ MHz}$ | C_{CE} | | 3.0 | | pF |
| Thermal resistance | | R_{thja} | | 300 | | K/W |
| COUPLER | | | | | | |
| Coupling capacitance | | C_C | | 0.6 | | pF |
| Collector emitter saturation voltage | $I_F = 16\text{ mA}, I_O = 2.4\text{ mA}, V_{CC} = 4.5\text{ V}$ | V_{OL} | | 0.1 | 0.4 | V |
| Supply current, logic low | $I_F = 16\text{ mA}, V_O$ open, $V_{CC} = 15\text{ V}$ | I_{DD} | | 80 | | |

Note

$T_{amb} = 25\text{ }^\circ\text{C}$, unless otherwise specified.

Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

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isfh636_01

Fig. 1 - Test Setup



isfh636_02

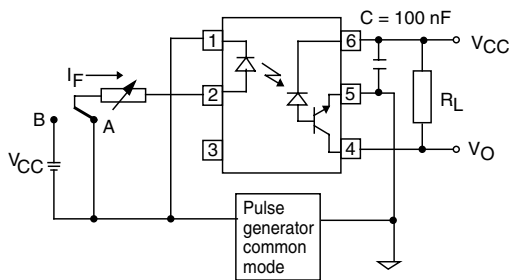
Fig. 2 - Switching Time Measurement

CURRENT TRANSFER RATIO

| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|------------------------|--|-----------|------|------|------|------|
| Current Transfer Ratio | $I_F = 16 \text{ mA}, V_O = 0.4 \text{ V}, V_{CC} = 4.5 \text{ V}$ | I_C/I_F | 19 | 30 | | % |
| | $I_F = 16 \text{ mA}, V_O = 0.5 \text{ V}, V_{CC} = 4.5 \text{ V}$ | I_C/I_F | 15 | | | % |

SWITCHING CHARACTERISTICS

| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|--|-----------|------|------|------|---------------|
| Propagation delay time (high to low) | $I_F = 16 \text{ mA}, V_{CC} = 5.0 \text{ V}, R_L = 1.9 \text{ k}\Omega$ | t_{PHL} | | 0.3 | 0.8 | μs |
| Propagation delay time (low to low) | $I_F = 16 \text{ mA}, V_{CC} = 5.0 \text{ V}, R_L = 1.9 \text{ k}\Omega$ | t_{PLH} | | 0.3 | 0.8 | μs |



isfh636_03

Fig. 3 - Common Mode Transient Test



isfh636_04

Fig. 4 - Measurement Waveform of CMR

COMMON MODE TRANSIENT IMMUNITY

| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---------------------------------------|---|--------|------|------|------|-------------------------|
| Common mode transient immunity (high) | $I_O = 0 \text{ mA}, V_{CM} = 1500 \text{ V}_{P-P}, R_L = 1.9 \text{ k}\Omega, V_{CC} = 5.0 \text{ V}$ | CM_H | | 10 | | $\text{kV}/\mu\text{s}$ |
| Common mode transient immunity (low) | $I_O = 16 \text{ mA}, V_{CM} = 1500 \text{ V}_{P-P}, R_L = 1.9 \text{ k}\Omega, V_{CC} = 5.0 \text{ V}$ | CM_L | | 10 | | $\text{kV}/\mu\text{s}$ |

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TYPICAL CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

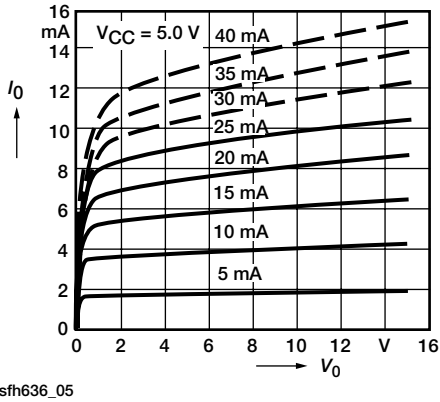


Fig. 5 - Output Characteristics-Output Current vs. Output Voltage

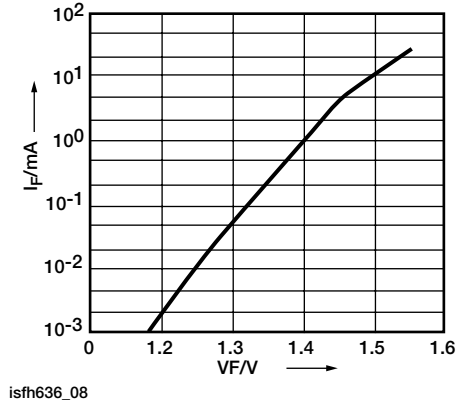


Fig. 8 - Forward Current of Emitting Diode vs. Forward Voltage

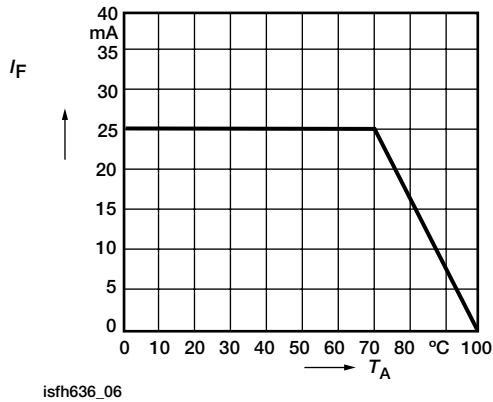


Fig. 6 - Permissible Forward Current of Emitting Diode vs. Ambient Temperature

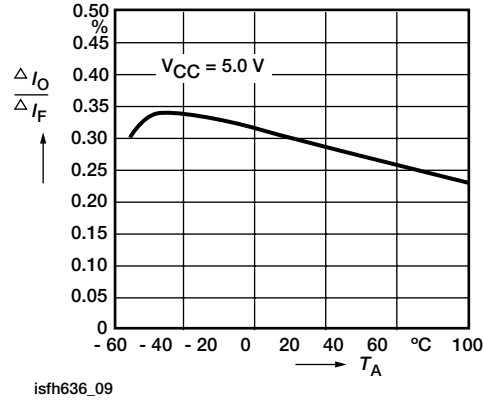


Fig. 9 - Small Signal Transfer Ratio vs. Forward Current



Fig. 7 - Permissible Total Power Dissipation vs. Ambient Temperature

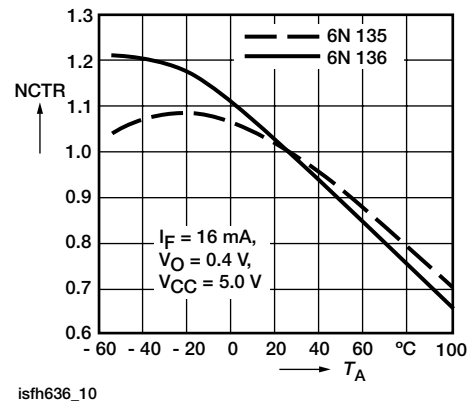


Fig. 10 - Current Transfer Ratio (Normalized) vs. Ambient Temperature

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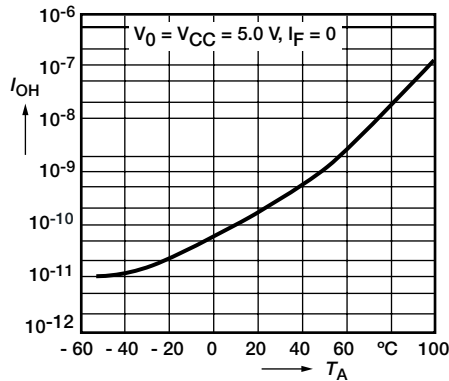


Fig. 11 - Output Current (High) vs. Ambient Temperature

Fig. 12 - Delay Times vs. Ambient Temperature

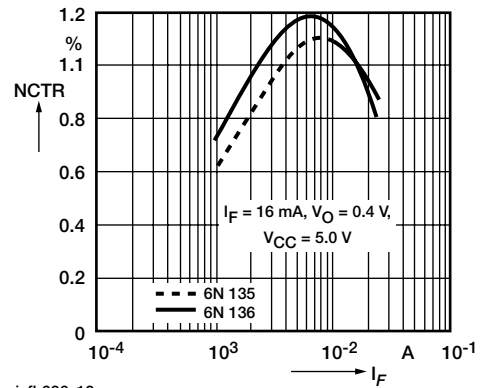
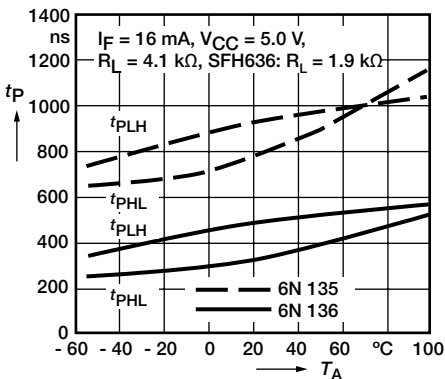
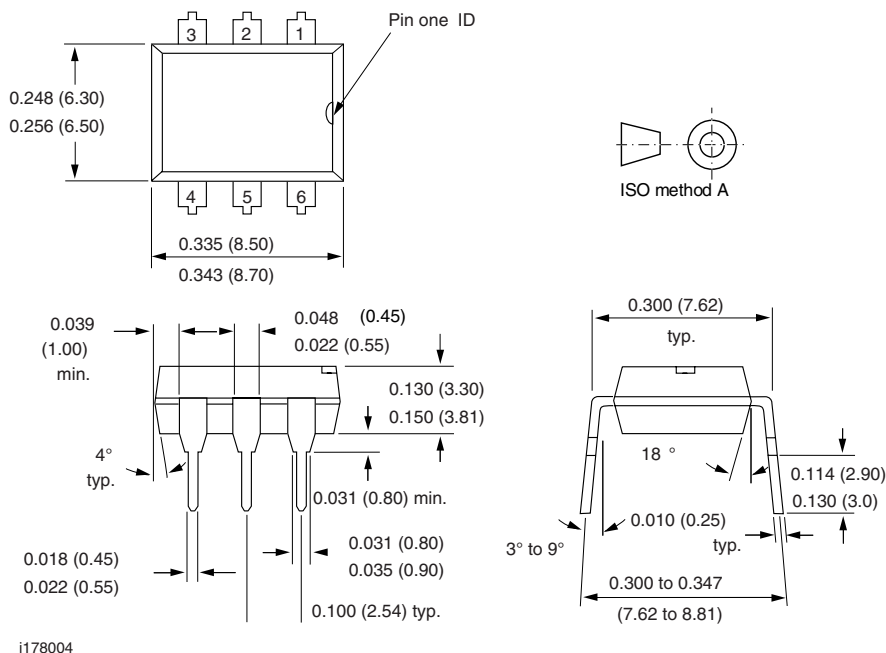
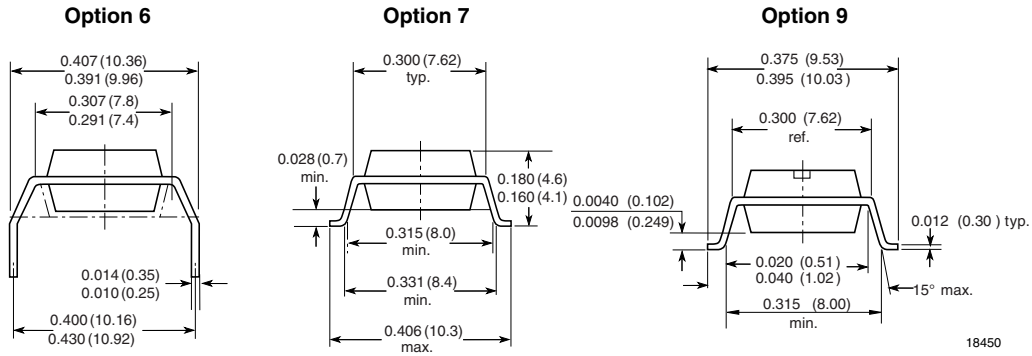


Fig. 13 - Current Transfer Ratio (Normalized) vs. Forward Current


PACKAGE DIMENSIONS in inches (millimeters)


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3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

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