

## 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<sub>RMS</sub>
- 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<sub>F</sub> = 16 mA, V<sub>O</sub> = 0.4 V, V<sub>CC</sub> = 4.5 V, T<sub>amb</sub> = 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 <sup>(1)</sup>

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		V <sub>R</sub>	3.0	V
DC forward current		I <sub>F</sub>	25	mA
Surge forward current	t <sub>p</sub> ≤ 1.0 μs, 300 pulses/s	I <sub>FSM</sub>	1.0	A
Power dissipation		P <sub>diss</sub>	45	mW

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ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>OUTPUT</b>				
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
<b>COUPLER</b>				
Isolation test voltage between emitter and detector, refer to climate DIN 40046, part 2, Nov. 74		$V_{ISO}$	5300	$V_{RMS}$
Creepage distance			$\geq 7$	mm
Clearance distance			$\geq 7$	mm
Isolation resistance	$V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^\circ\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^\circ\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
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 <sup>(2)</sup>	max. 10 s, dip soldering: distance to seating plane $\geq 1.5$ mm	$T_{sld}$	260	$^\circ\text{C}$

**Notes**

<sup>(1)</sup>  $T_{amb} = 25\text{ }^\circ\text{C}$ , 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.

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

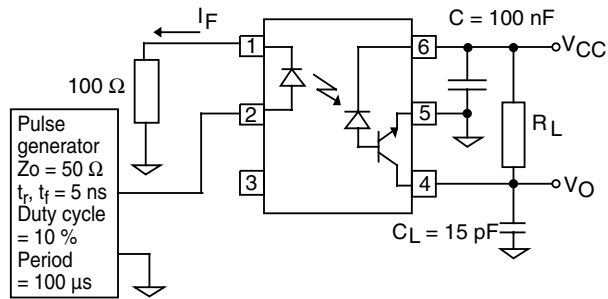
ELECTRICAL CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	$I_F = 16\text{ mA}$	$V_F$		1.5	1.8	V
Reverse current	$V_R = 3.0\text{ V}$	$I_R$		0.5	10	$\mu\text{A}$
Capacitance	$V_R = 0\text{ V}, f = 1.0\text{ MHz}$	$C_O$		125		pF
Thermal resistance		$R_{thja}$		700		K/W
<b>OUTPUT</b>						
Logic high supply current	$I_F = 0\text{ V}, V_O$ (open), $V_{CC} = 15\text{ V}$	$I_{CCH}$		0.01	1.0	$\mu\text{A}$
	$I_F = 0\text{ V}, V_O$ (open), $V_{CC} = 15\text{ V}$	$I_{CCH}$		0.01	2.0	$\mu\text{A}$
Output current, output high	$I_F = 0\text{ V}, V_O$ (open), $V_{CC} = 5.5\text{ V}$	$I_{OH}$		0.003	0.5	$\mu\text{A}$
	$I_F = 0\text{ V}, V_O$ (open), $V_{CC} = 15\text{ V}$	$I_{OH}$		0.01	1.0	$\mu\text{A}$
		$I_{OH}$				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
<b>COUPLER</b>						
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

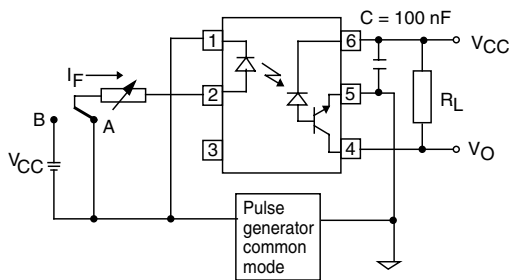
Fig. 2 - Switching Time Measurement

**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	$\mu\text{s}$
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	$\mu\text{s}$



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

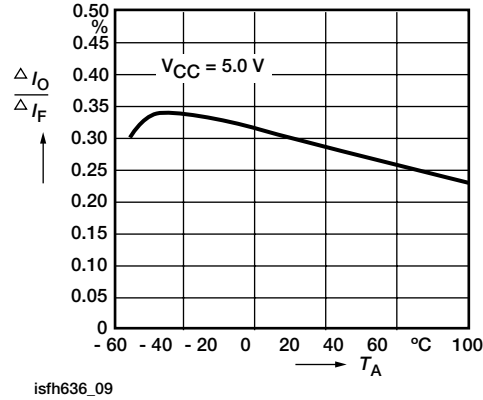


Fig. 9 - Small Signal Transfer Ratio vs. Forward Current



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

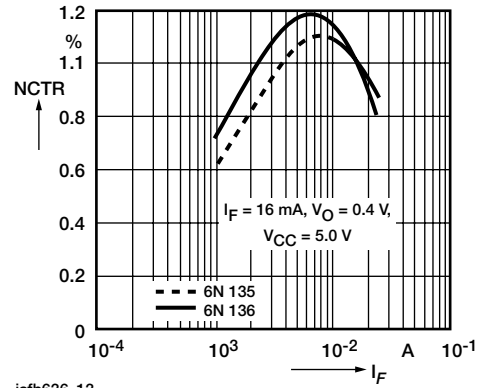
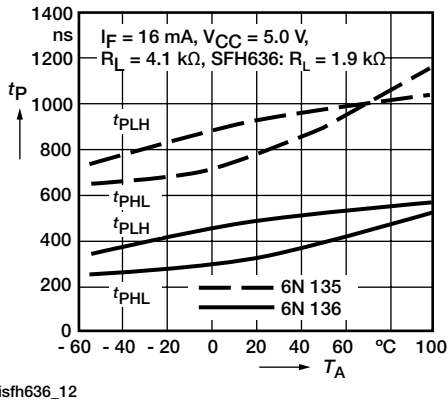
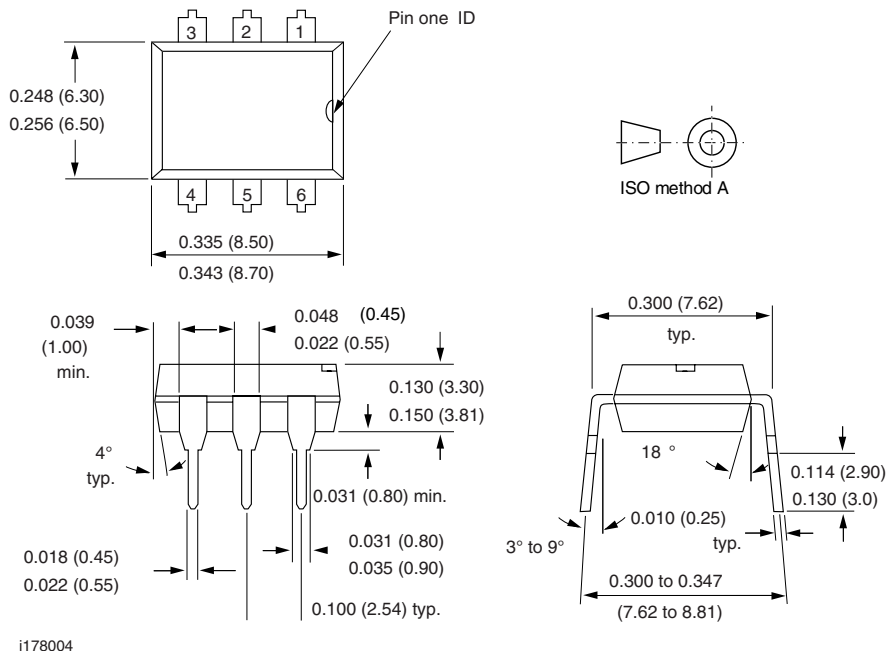
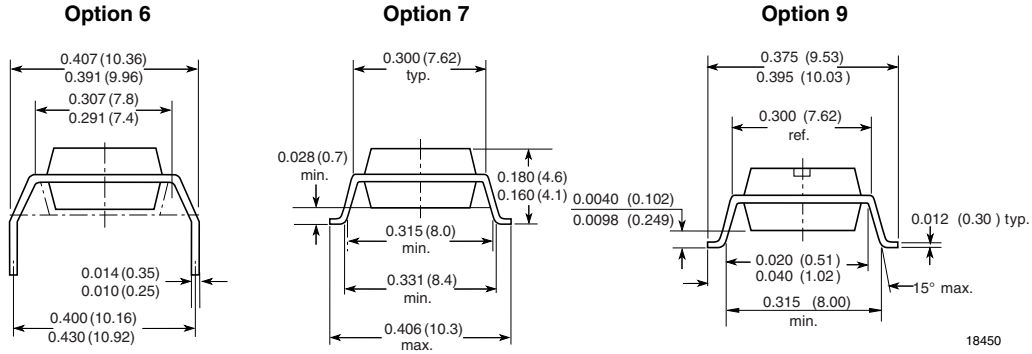


Fig. 13 - Current Transfer Ratio (Normalized) vs. Forward Current


**PACKAGE DIMENSIONS** in inches (millimeters)


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1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively.
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA.
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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