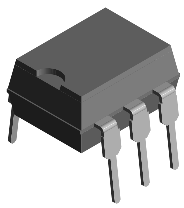
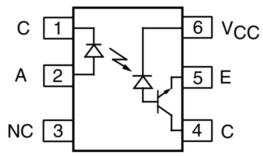
Optocoupler, High Speed Phototransistor Output, 1 Mbd, 10 kV/ms CMR, Split Collector Transistor Output





i179064

DESCRIPTION

The SFH636 is an optocoupler with a GaAIAs 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}
- GaAIAs 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

Pb Pb-free

e3 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

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 V, T_{amb} = 25 °C	R_{IO}	≥ 10^{12}	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	≥ 10^{11}	Ω
Storage temperature range		T_{stg}	- 55 to + 150	°C
Ambient temperature range		T_{amb}	- 55 to +100	°C
Junction temperature		T_j	100	°C
Soldering temperature [2]	max. 10 s, dip soldering: distance to seating plane ≥ 1.5 mm	T_{sld}	260	°C

Notes

(1) T_{amb} = 25 °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 mA	V_F		1.5	1.8	V
Reverse current	V_R = 3.0 V	I_R		0.5	10	µA
Capacitance	V_R = 0 V, f = 1.0 MHz	C_O		125		pF
Thermal resistance		R_{thja}		700		K/W
OUTPUT						
Logic high supply current	I_F = 0 V, V_O (open), V_{CC} = 15 V	I_{CCH}		0.01	1.0	µA
	I_F = 0 V, V_O (open), V_{CC} = 15 V	I_{CCH}		0.01	2.0	µA
Output current, output high	I_F = 0 V, V_O (open), V_{CC} = 5.5 V	I_{OH}		0.003	0.5	µA
	I_F = 0 V, V_O (open), V_{CC} =15 V	I_{OH}		0.01	1.0	µA
		I_{OH}			50	µA
Collector emitter capacitance	V_{CE} = 5.0 V, f = 1.0 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 mA, I_O = 2.4 mA, V_{CC} = 4.5 V	V_{OL}		0.1	0.4	V
Supply current, logic low	I_F = 16 mA, V_O open, V_{CC} = 15 V	I_{DD}		80		

Note

T_{amb} = 25 °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.

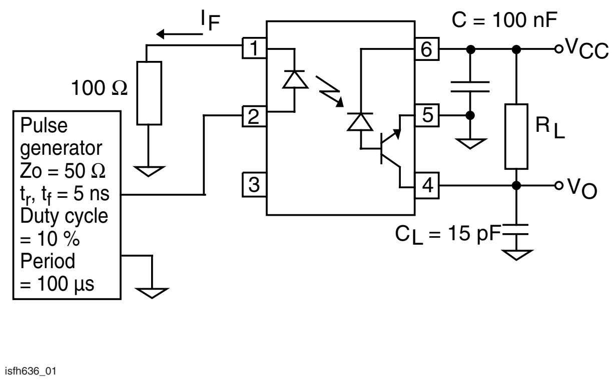


Fig. 1 - Test Setup

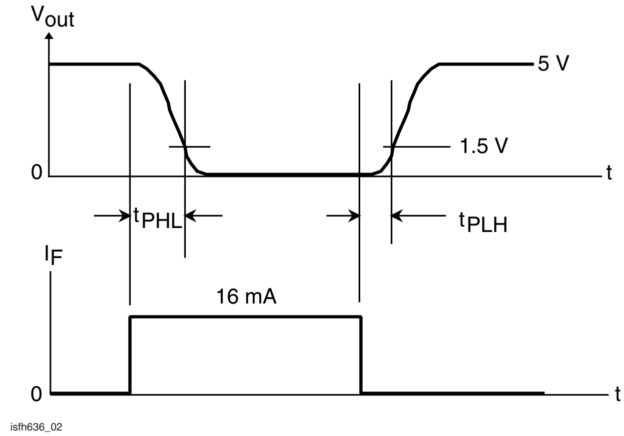


Fig. 2 - Switching Time Measurement

CURRENT TRANSFER RATIO						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Current Transfer Ratio	I_F = 16 mA, V_O = 0.4 V, V_{CC} = 4.5 V	I_C/I_F	19	30		%
	I_F = 16 mA, V_O = 0.5 V, V_{CC} = 4.5 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 mA, V_{CC} = 5.0 V, R_L = 1.9 kΩ	t_{PHL}		0.3	0.8	µs
Propagation delay time (low to low)	I_F = 16 mA, V_{CC} = 5.0 V, R_L = 1.9 kΩ	t_{PLH}		0.3	0.8	µs

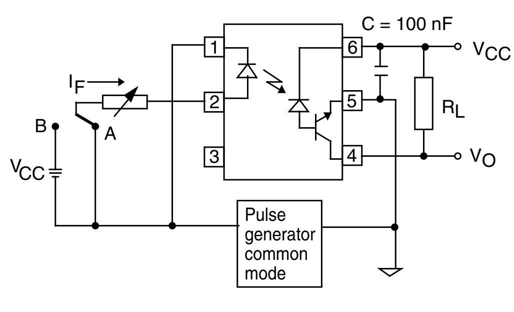


Fig. 3 - Common Mode Transient Test

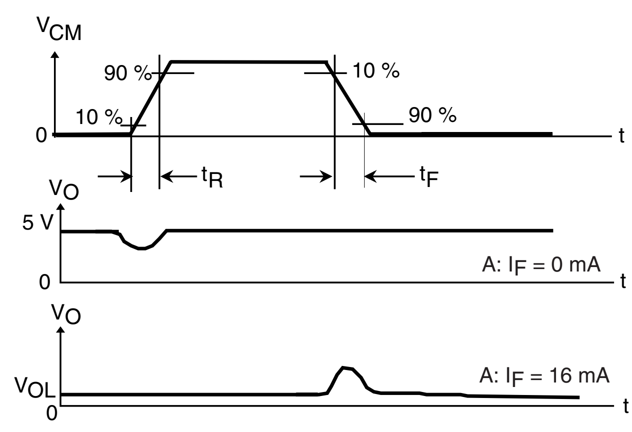


Fig. 4 - Measurement Waveform of CMR

COMMON MODE TRANSIENT IMMUNITY						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Common mode transient immunity (high)	I_O = 0 mA, V_{CM} = 1500 V_{P-P}, R_L = 1.9 kΩ, V_{CC} = 5.0 V	CM_H		10		kV/µs
Common mode transient immunity (low)	I_O = 16 mA, V_{CM} = 1500 V_{P-P}, R_L = 1.9 kΩ, V_{CC} = 5.0 V	CM_L		10		kV/µs

TYPICAL CHARACTERISTICS

T_{amb} = 25 °C, unless otherwise specified

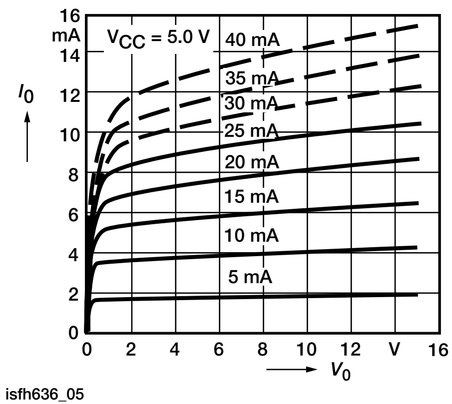


Fig. 5 - Output Characteristics-Output Current vs. Output Voltage

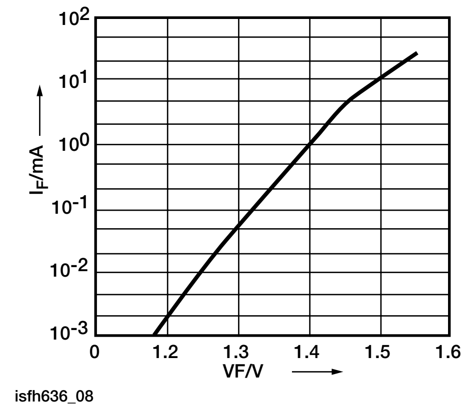


Fig. 8 - Forward Current of Emitting Diode vs. Forward Voltage

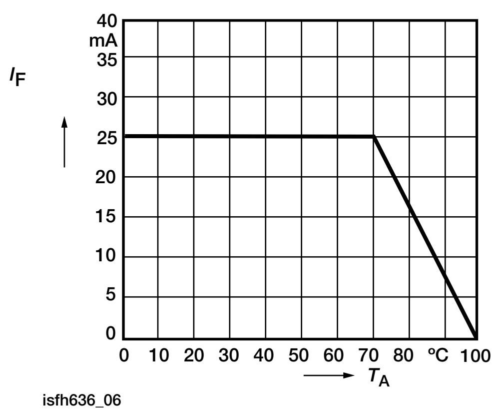


Fig. 6 - Permissible Forward Current of Emitting Diode vs. Ambient Temperature

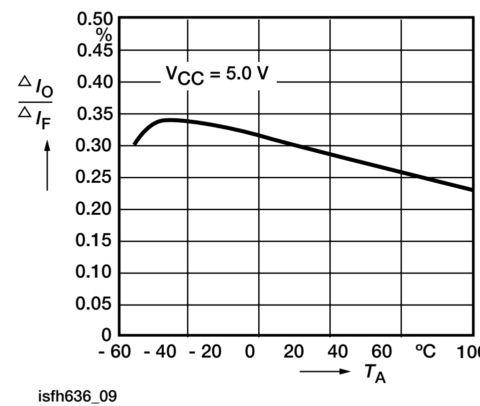


Fig. 9 - Small Signal Transfer Ratio vs. Forward Current

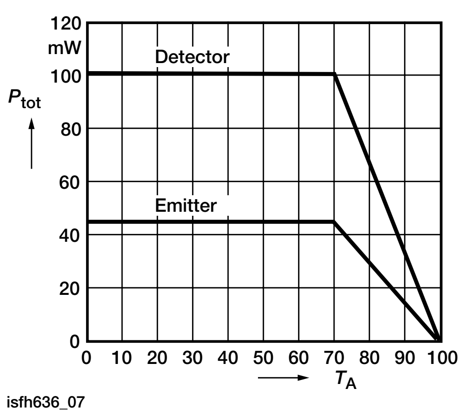


Fig. 7 - Permissible Total Power Dissipation vs. Ambient Temperature

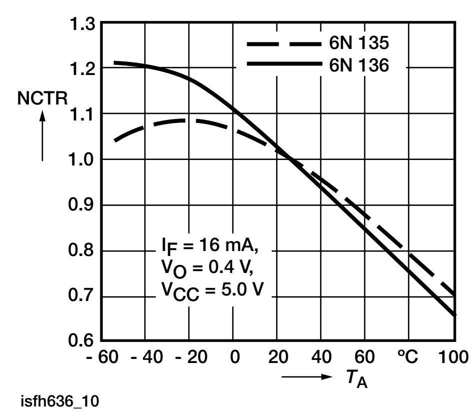


Fig. 10 - Current Transfer Ratio (Normalized) vs. Ambient Temperature

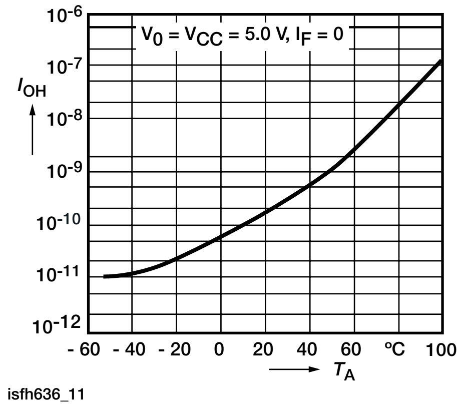


Fig. 11 - Output Current (High) vs. Ambient Temperature

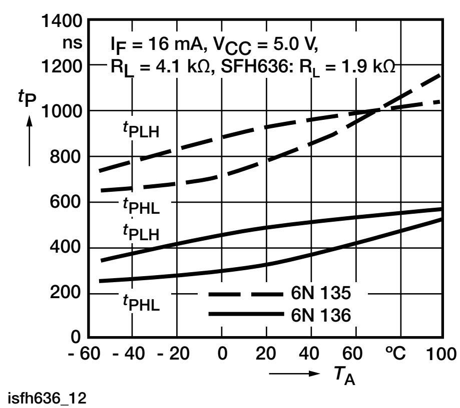


Fig. 12 - Delay Times vs. Ambient Temperature

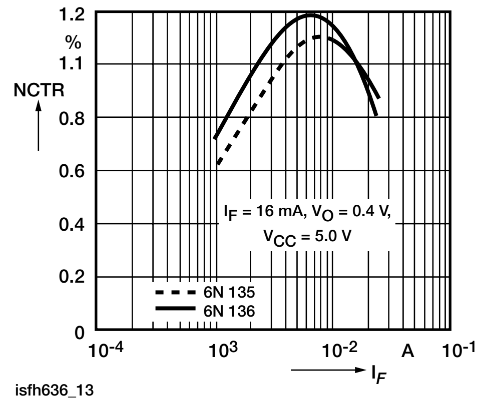
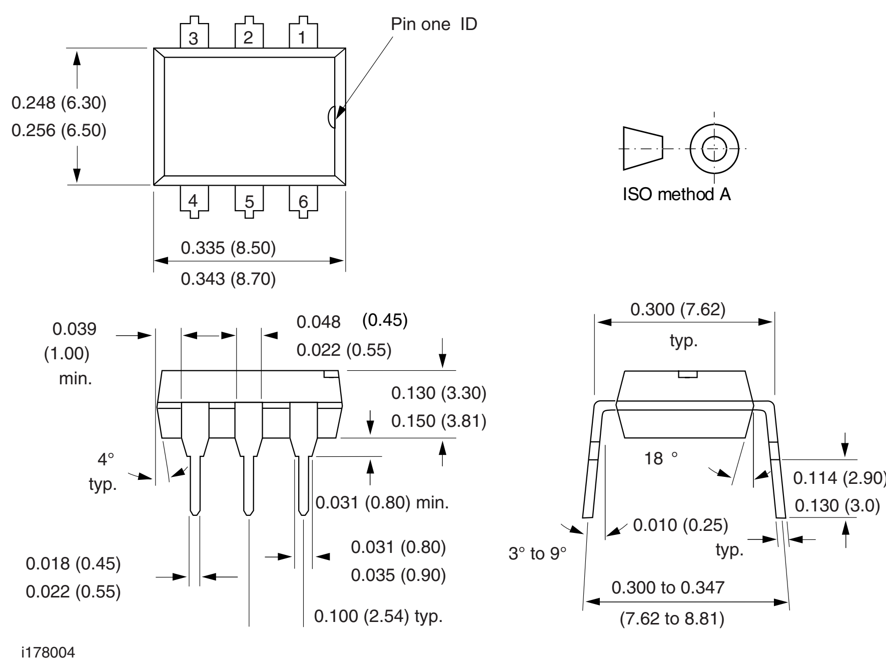
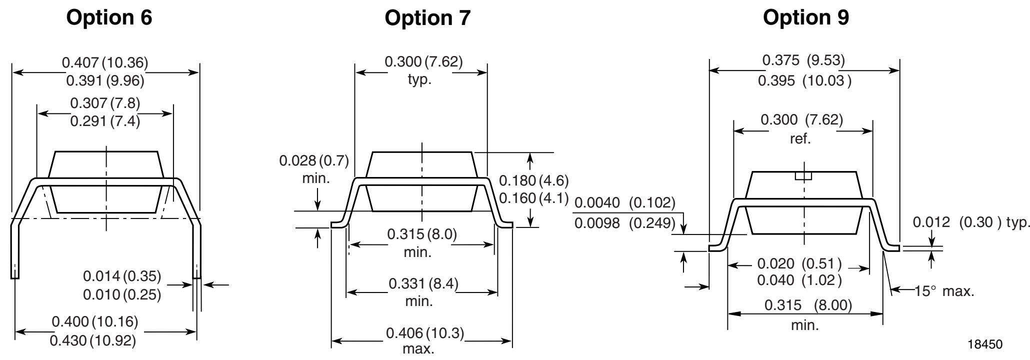


Fig. 13 - Current Transfer Ratio (Normalized) vs. Forward Current

PACKAGE DIMENSIONS in inches (millimeters)




Option 6
0.407 (10.36)
0.391 (9.96)
0.307 (7.8)
0.291 (7.4)
0.014 (0.35)
0.010 (0.25)
0.400 (10.16)
0.430 (10.92)
Option 7
0.300 (7.62)
typ.
0.028 (0.7)
min.
0.180 (4.6)
0.160 (4.1)
0.315 (8.0)
min.
0.331 (8.4)
min.
0.406 (10.3)
max.
Option 9
0.375 (9.53)
0.395 (10.03)
0.300 (7.62)
ref.
0.0040 (0.102)
0.0098 (0.249)
0.012 (0.30) typ.
0.020 (0.51)
0.040 (1.02)
15° max.
0.315 (8.00)
min.
18450

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It is the policy of Vishay Semiconductor GmbH to

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.

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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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