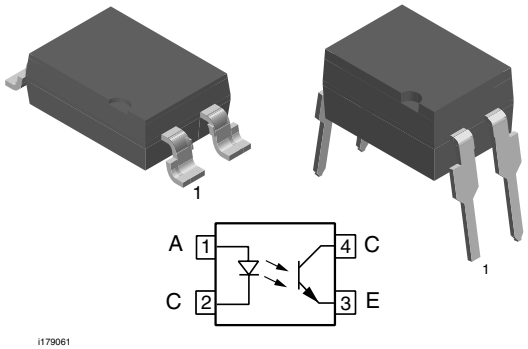
Optocoupler, Phototransistor Output, Low Input Current



FEATURES

- Good CTR linearity depending on forward current
- Low CTR degradation
- High collector emitter voltage, V_{CEO} = 55 V
- Isolation test voltage, 5300 V_{RMS}
- Low coupling capacitance
- End stackable, 0.100" (2.54 mm) spacing
- High common mode transient immunity
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Pb-free

e3

RoHS COMPLIANT

DESCRIPTION

The SFH618A (DIP) and SFH6186 (SMD) feature a high current transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared diode emitter, which is optically coupled to silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 or SMD package.

The coupling devices are designed for signal transmission between two electrically separated circuits.The couplers are end-stackable with 2.54 mm lead spacing. Creepage and clearance distances of > 8.0 mm achieved with option 6. This version complies with IEC 60950 (DIN VDE 0805) for reinforced insulation to an operation voltage of 400 V_{RMS} or DC.

APPLICATIONS

- Telecom
- Industrial controls
- Battery powered equipment
- Office machines

AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- CSA 93751
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 pending available with option 1
- BSI IEC 60950; IEC 60065
- FIMKO

ORDER INFORMATION

PART	REMARKS
SFH618A-2	CTR 63 to 125 %, DIP-4
SFH618A-3	CTR 100 to 200 %, DIP-4
SFH618A-4	CTR 160 to 320 %, DIP-4
SFH618A-5	CTR 250 to 500 %, DIP-4
SFH6186-2	CTR 63 to 125 %, SMD-4
SFH6186-3	CTR 100 to 200 %, SMD-4
SFH6186-4	CTR 160 to 320 %, SMD-4
SFH6186-5	CTR 250 to 500 %, SMD-4
SFH618A-3X006	CTR 100 to 200 %, DIP-4 400 mil (option 6)
SFH618A-3X007	CTR 100 to 200 %, SMD-4 (option 7)
SFH618A-4X006	CTR 160 to 320 %, DIP-4 400 mil (option 6)
SFH618A-5X006	CTR 250 to 500 %, DIP-4 400 mil (option 6)
SFH618A-5X007	CTR 250 to 500 %, SMD-4 (option 7)

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	6.0	V
Power dissipation		P_{diss}		mW
Forward current		I_F	60	mA
OUTPUT				
Collector emitter voltage		V_{CE}	55	V
Emitter collector voltage		V_{EC}	7.0	V
Collector current		I_C	50	mA
	$t_p \leq 1.0$ ms	I_C	100	mA
Power dissipation		P_{diss}	150	mW
COUPLER				
Isolation test voltage between emitter and detector, refer to Climate DIN 40046, part 2, Nov. 74		V_{ISO}	5300	V_{RMS}
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	$\geq 10^{11}$	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).

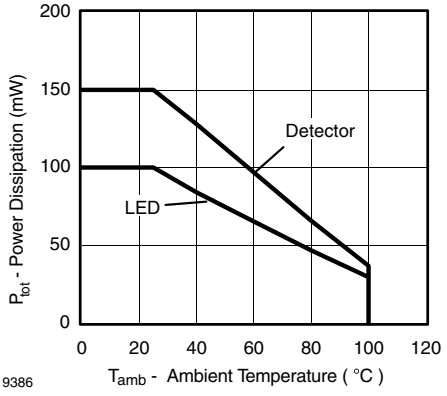


Fig. 1 - Permissible Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT							
Forward voltage	I_F = 5.0 mA		V_F		1.1	1.5	V
Reverse current	V_R = 6.0 V		I_R		0.01	10	µA
Capacitance	V_R = 0 V, f = 1.0 MHz		C_O		25		pF
Thermal resistance			R_{thja}		1070		K/W

ELECTRICAL CHARACTERISTICS

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
OUTPUT							
Collector emitter leakage current	V_{CE} = 10 V		I_{CEO}		10	200	nA
Collector emitter capacitance	V_{CE} = 5.0 V, f = 1.0 MHz		C_{CE}		7.0		pF
Thermal resistance			R_{thja}		500		K/W
COUPLER							
Collector emitter saturation voltage	I_C = 0.32 mA, I_F = 1.0 mA	SFH618A-2	V_{CEsat}		0.25	0.4	V
		SFH6186-2	V_{CEsat}		0.25	0.4	V
	I_C = 0.5 mA, I_F = 1.0 mA	SFH618A-3	V_{CEsat}		0.25	0.4	V
		SFH6186-3	V_{CEsat}		0.25	0.4	V
	I_C = 0.8 mA, I_F = 1.0 mA	SFH618A-4	V_{CEsat}		0.25	0.4	V
		SFH6186-4	V_{CEsat}		0.25	0.4	V
	I_C = 1.25 mA, I_F = 1.0 mA	SFH618A-5	V_{CEsat}		0.25	0.4	V
		SFH6186-5	V_{CEsat}		0.25	0.4	V
Coupling capacitance			C_C		0.25		pF

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.

CURRENT TRANSFER RATIO

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
I_C/I_F	I_F = 1.0 mA, V_{CE} = 0.5 V	SFH618A-2	CTR	63		125	%
		SFH6186-2	CTR	63		125	%
	I_F = 0.5 mA, V_{CE} = 1.5 V	SFH618A-2	CTR	32	75		%
		SFH6186-2	CTR	32	75		%
	I_F = 1.0 mA, V_{CE} = 0.5 V	SFH618A-3	CTR	100		200	%
		SFH6186-3	CTR	100		200	%
	I_F = 0.5 mA, V_{CE} = 1.5 V	SFH618A-3	CTR	50	120		%
		SFH6186-3	CTR	50	120		%
	I_F = 1.0 mA, V_{CE} = 0.5 V	SFH618A-4	CTR	160		320	%
		SFH6186-4	CTR	160		320	%
	I_F = 0.5 mA, V_{CE} = 1.5 V	SFH618A-4	CTR	80	200		%
		SFH6186-4	CTR	80	200		%
	I_F = 1.0 mA, V_{CE} = 0.5 V	SFH618A-5	CTR	250		500	%
		SFH6186-5	CTR	250		500	%
	I_F = 0.5 mA, V_{CE} = 1.5 V	SFH618A-5	CTR	125	300		%
		SFH6186-5	CTR	125	300		%

SWITCHING CHARACTERISTICS

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn on time	V_{CC} = 5.0 V, I_C = 2.0 mA, R_L = 100 Ω	t_{on}		6.0		µs
Rise time	V_{CC} = 5.0 V, I_C = 2.0 mA, R_L = 100 Ω	t_r		3.5		µs
Turn off time	V_{CC} = 5.0 V, I_C = 2.0 mA, R_L = 100 Ω	t_{off}		5.5		µs
Fall time	V_{CC} = 5.0 V, I_C = 2.0 mA, R_L = 100 Ω	t_f		5.0		µs

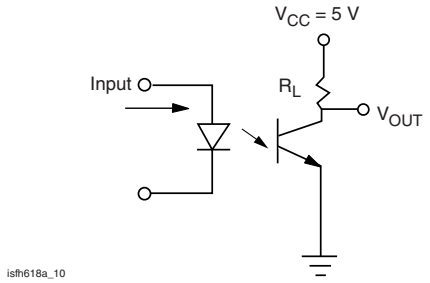


Fig. 2 - Test Circuit

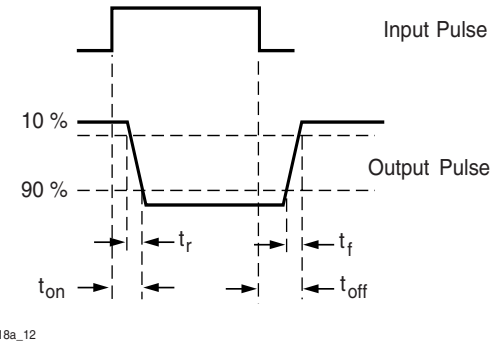


Fig. 3 - Test Circuit and Waveforms

SAFETY AND INSULATION RATINGS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Climatic classification (according to IEC 68 part 1)				55/100/21		
Comparative tracking index		CTI	175		399	
V_{IOTM}			10000			V
V_{IORM}			890			V
P_{SO}					400	mW
I_{SI}					275	mA
T_{SI}					175	°C
Creepage distance	standard DIP-4		7			mm
Clearance distance	standard DIP-4		7			mm
Creepage distance	400 mil DIP-4		8			mm
Clearance distance	400 mil DIP-4		8			mm
Insulation thickness, reinforced rated	per IEC 60950 2.10.5.1		0.4			mm

Note

As per IEC 60747-5-2, § 7.4.3.8.1, this optocoupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

TYPICAL CHARACTERISTICS

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

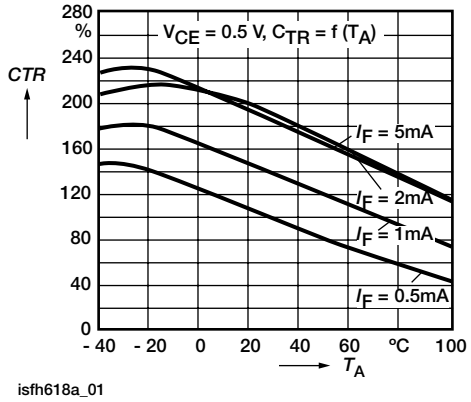


Fig. 4 - Current Transfer Ratio (Typ.)

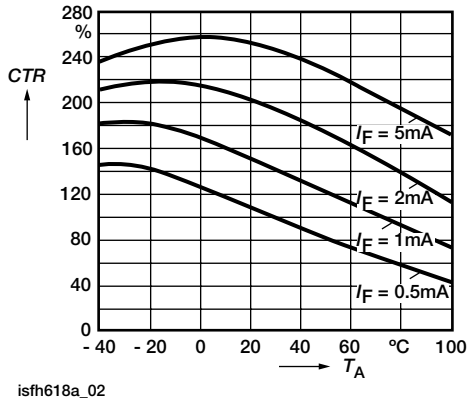


Fig. 5 - Current Transfer Ratio (Typ.)

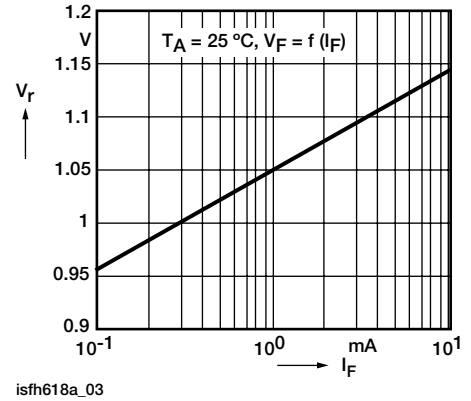


Fig. 6 - Diode Forward Voltage (Typ.)

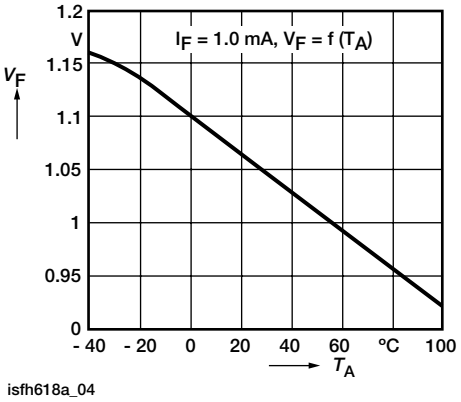


Fig. 7 - Diode Forward Voltage (Typ.)

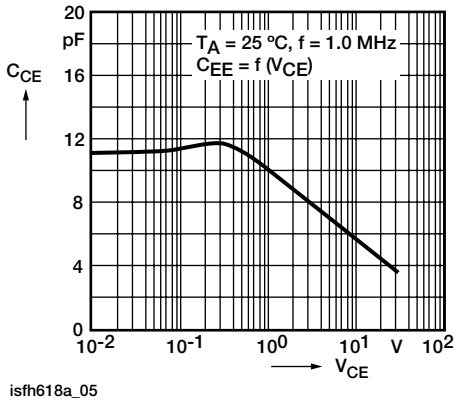


Fig. 8 - Transistor Capacitance

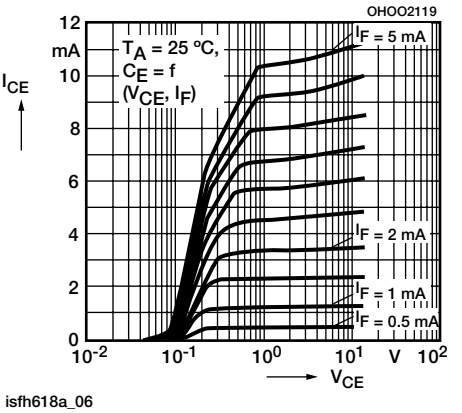


Fig. 9 - Output Characteristics

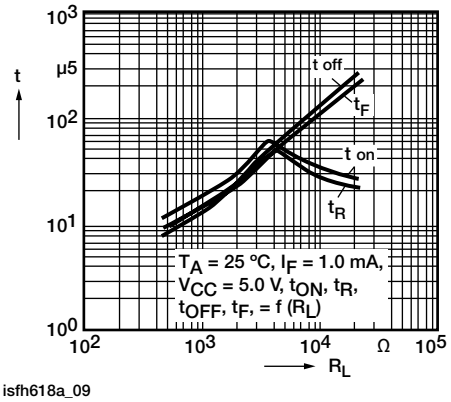
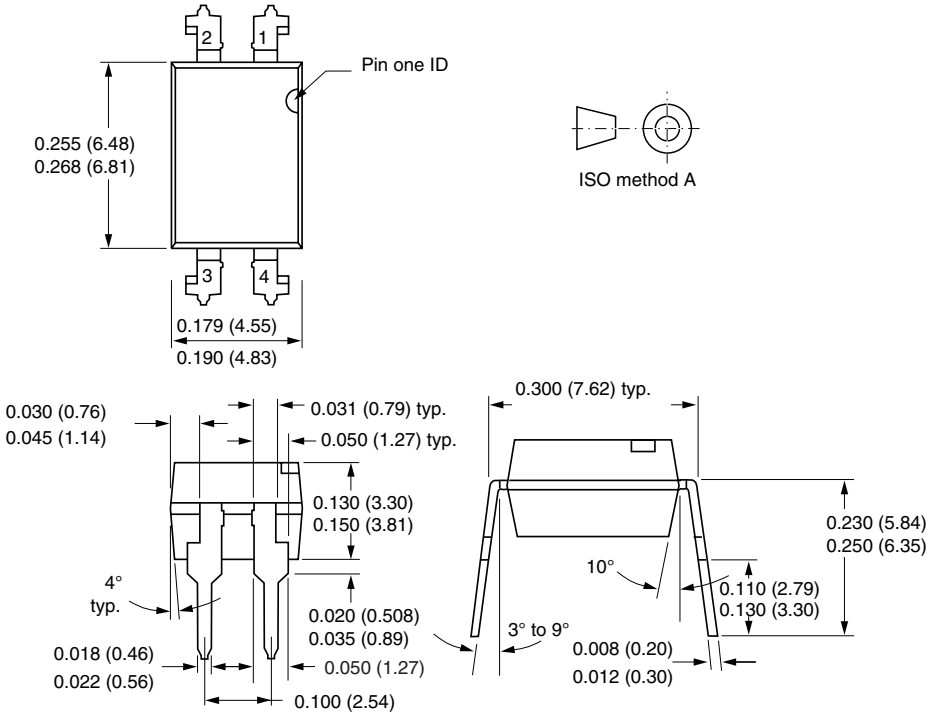
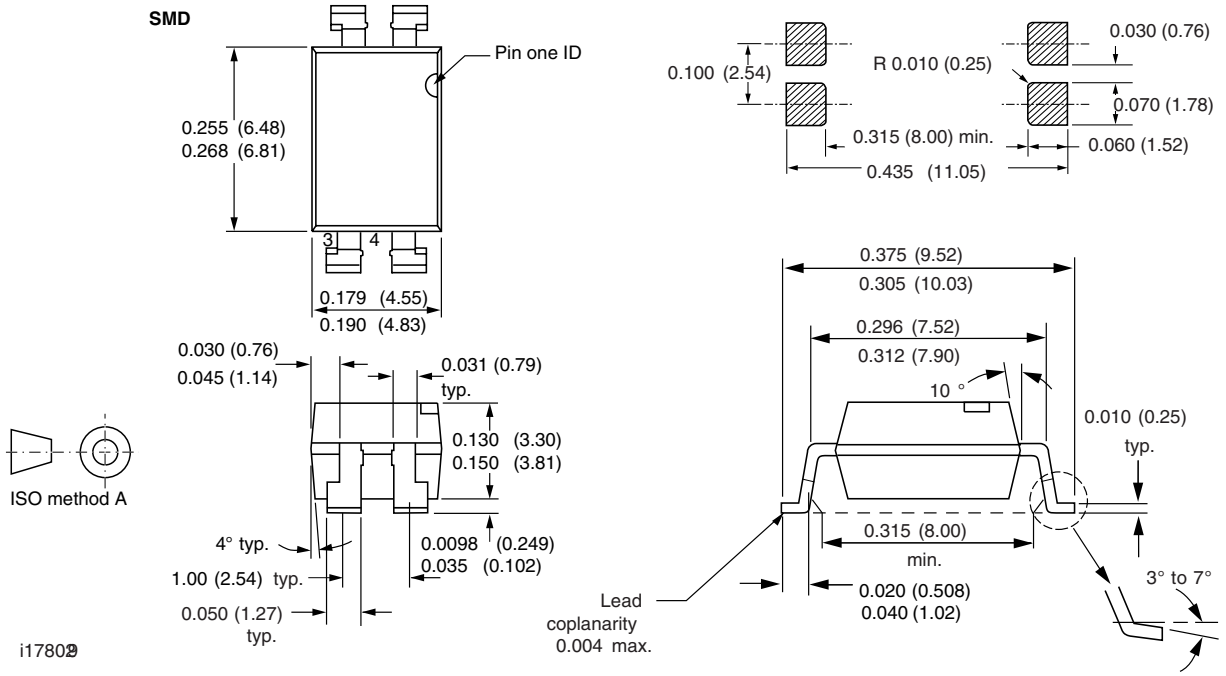


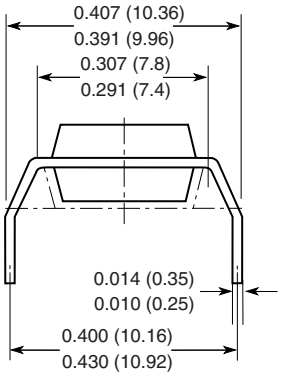
Fig. 10 - Switching Times (Typ.)

PACKAGE DIMENSIONS in inches (millimeters)

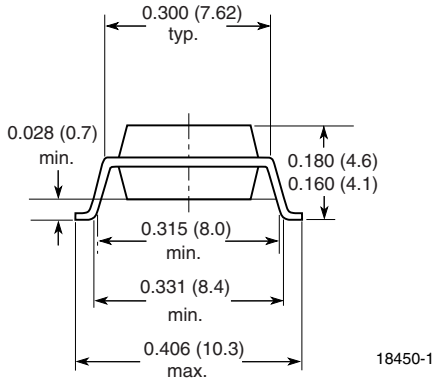




Option 6



Option 7



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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.

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.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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