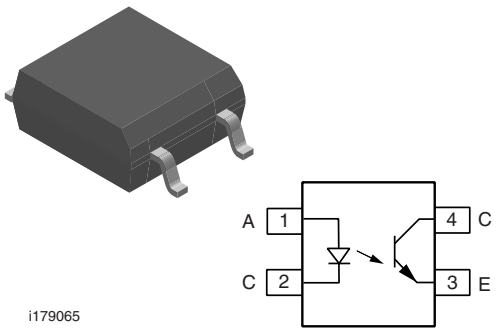
Optocoupler Phototransistor Output, SOP-4, Mini-Flat Package



FEATURES

- SOP (small outline package)
- Isolation test voltage, 3750 V_{RMS} (1.0 s)
- High collector emitter breakdown voltage, V_{CEO} = 70 V
- Low saturation voltage
- Fast switching times
- Temperature stable
- Low coupling capacitance
- End-stackable, 0.100" (2.54 mm) spacing
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Pb-free

e3

RoHS COMPLIANT

DESCRIPTION

The SFH690ABT/AT/BT/CT/DT family has a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a 4-pin 100 mil lead pitch miniflat package. It features a high current transfer ratio, low coupling capacitance, and high isolation voltage.

The coupling devices are designed for signal transmission between two electrically separated circuits. The SFH690 series is available only on tape and reel. There are 2000 parts per reel. Marking for SFH690AT is 690A; SFH690BT is 690B; SFH690CT is 690C; SFH690DT is 690D; SFH690ABT will be marked as 690A or 690B.

APPLICATIONS

- High density mounting or space sensitive PCBs
- PLCs
- Telecommunication

AGENCY APPROVALS

- UL1577, file no. E52744 system code U
- CSA 93751
- BSI IEC 60950; IEC 60065
- DIN EN 60747-5-5 available with option 1

ORDER INFORMATION	
PART	**REMARKS**
SFH690ABT	CTR 50 to 300 %, SOP-4
SFH690AT	CTR 50 to 150 %, SOP-4
SFH690BT	CTR 100 to 300 %, SOP-4
SFH690CT	CTR 100 to 200 %, SOP-4
SFH690DT	CTR 200 to 400 %, SOP-4
SFH690CT-X001	CTR 100 to 200 %, SOP-4 (option 1) (VDE)

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
DC forward current		I_F	50	mA
Surge forward current	$t_p \leq 10$ µs	I_{FSM}	2.5	A
Power dissipation		P_{diss}	80	mW

ABSOLUTE MAXIMUM RATINGS (1)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
OUTPUT				
Collector emitter voltage		V_{CE}	70	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 (1.0 s)		V_{ISO}	3750	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
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.

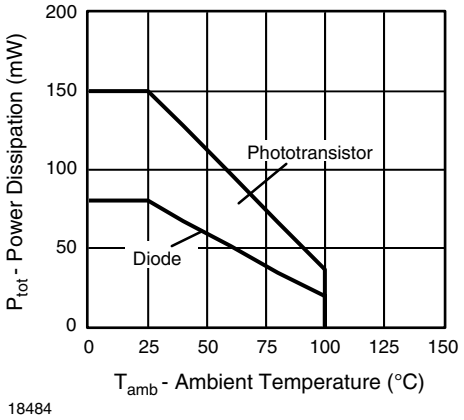


Fig. 1 - Permissible Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 5 mA	V_F		1.15	1.4	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		14		pF
Thermal resistance		R_{thJA}		750		K/W
OUTPUT						
Collector emitter leakage current	V_{CE} = 20 V	I_{CEO}			100	nA
Collector emitter capacitance	V_{CE} = 5.0 V, f = 1.0 MHz	C_{CE}		2.8		pF
Thermal resistance		R_{thJA}		500		K/W

ELECTRICAL CHARACTERISTICS

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
COUPLER						
Collector emitter saturation voltage	I_F = 10 mA, I_C = 2.0 mA	V_{CEsat}		1.0	0.3	V
Coupling capacitance	f = 1.0 MHz	C_C		0.3		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 = 5.0 mA, V_{CE} = 5.0 V	SFH690ABT	CTR	50		300	%
		SFH690AT	CTR	50		150	%
		SFH690BT	CTR	100		300	%
		SFH690CT	CTR	100		200	%
		SFH690DT	CTR	200		400	%

SWITCHING CHARACTERISTICS

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Rise time	I_C = 2.0 mA, V_{CC} = 5 V, R_L = 100 Ω	t_r		3.0		µs
Fall time	I_C = 2.0 mA, V_{CC} = 5 V, R_L = 100 Ω	t_f		4.0		µs
Turn-on time	I_C = 2.0 mA, V_{CC} = 5 V, R_L = 100 Ω	t_{on}		5.0		µs
Turn-off time	I_C = 2.0 mA, V_{CC} = 5 V, R_L = 100 Ω	t_{off}		3.0		µs

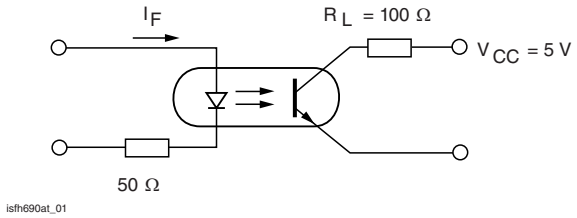


Fig. 2 - Switching Operation (without Saturation)

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}			6000			V
V_{IORM}			707			V
P_{SO}					350	mW
I_{SI}					150	mA
T_{SI}					175	°C
Creepage distance			5			mm
Clearance distance			5			mm
Insulation thickness			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

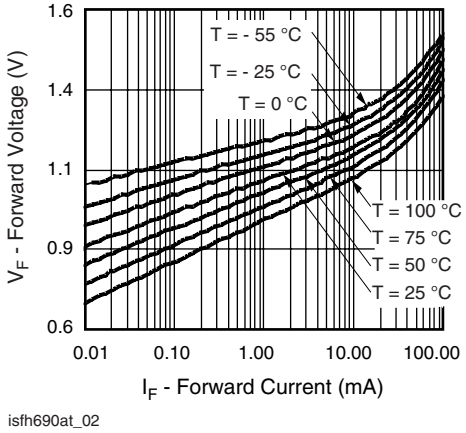


Fig. 3 - Diode Forward Voltage vs. Forward Current

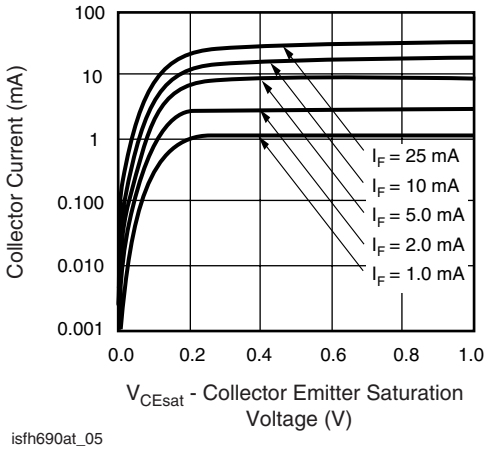


Fig. 6 - Collector Current vs. Collector Emitter Saturation Voltage

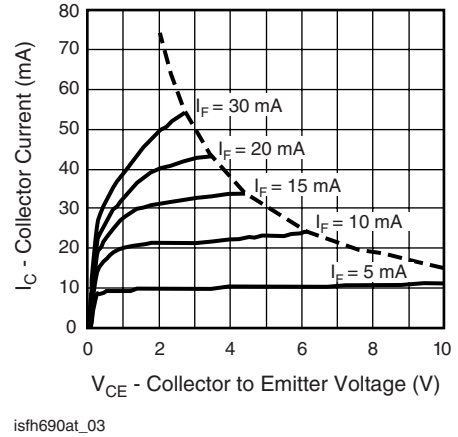


Fig. 4 - Collector Current vs. Collector Emitter Voltage

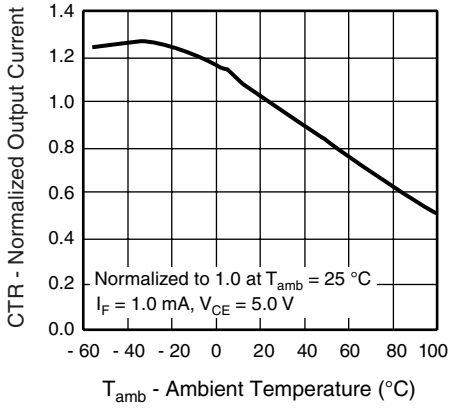


Fig. 7 - Normalized Output Current vs. Ambient Temperature

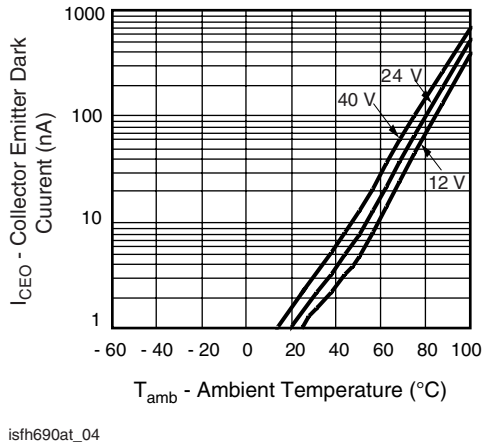


Fig. 5 - Collector to Emitter Dark Current vs. Ambient Temperature

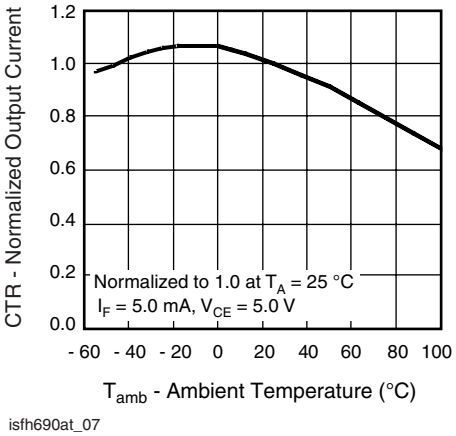


Fig. 8 - Normalized Output Current vs. Ambient Temperature

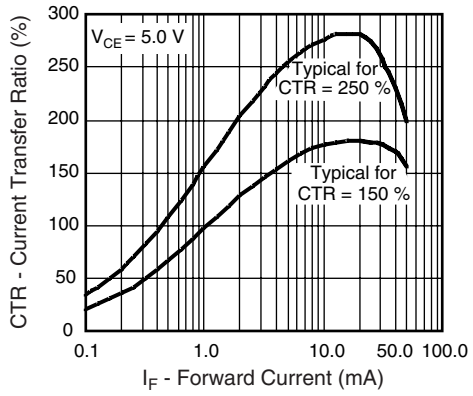


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Fig. 9 - Current Transfer Ratio vs. Forward Current

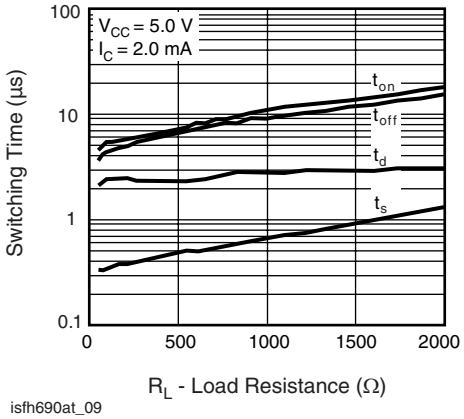

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Fig. 10 - Switching Time vs. Load Resistance

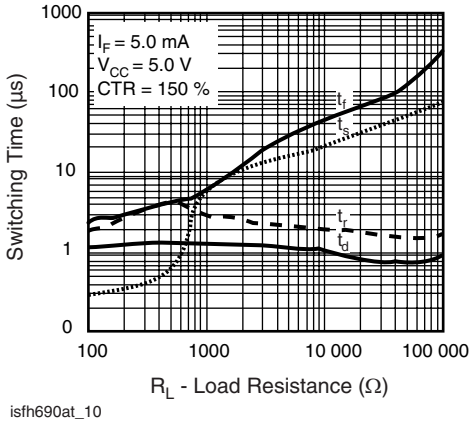

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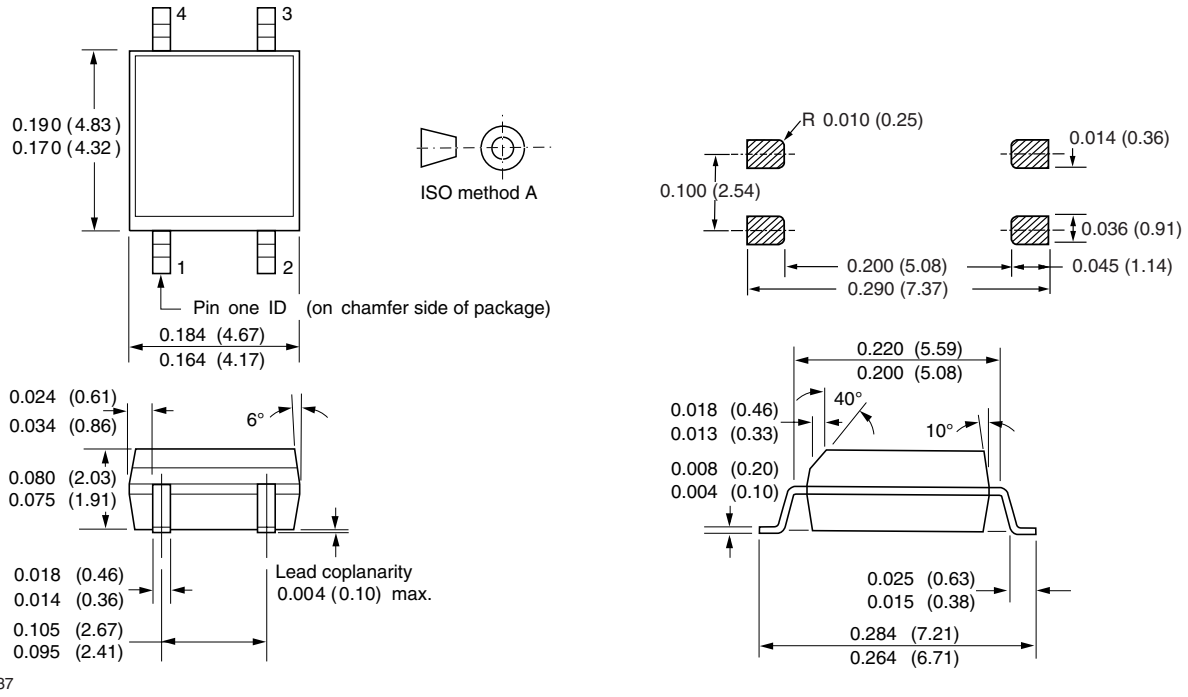
Fig. 11 - Switching Time vs. Load Resistance

PACKAGE DIMENSIONS in inches (millimeters)



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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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