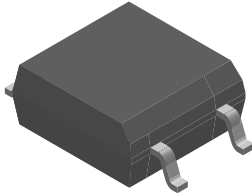
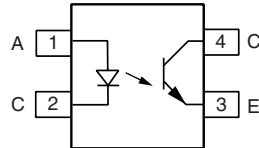




## Optocoupler Phototransistor Output, SOP-4, Mini-Flat Package



i179065



### 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.

### FEATURES

- SOP (small outline package)
- Isolation test voltage, 3750 V<sub>RMS</sub> (1.0 s)
- High collector emitter breakdown voltage, V<sub>CEO</sub> = 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



**RoHS**  
COMPLIANT

### 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 <sup>(1)</sup>				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		V <sub>R</sub>	6.0	V
DC forward current		I <sub>F</sub>	50	mA
Surge forward current	t <sub>p</sub> ≤ 10 μs	I <sub>FSM</sub>	2.5	A
Power dissipation		P <sub>diss</sub>	80	mW

ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>OUTPUT</b>				
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
<b>COUPLER</b>				
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	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500$ V, $T_{amb} = 100$ °C	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Storage temperature range		$T_{stg}$	- 55 to + 150	°C
Ambient temperature range		$T_{amb}$	- 55 to + 100	°C
Soldering temperature <sup>(2)</sup>	max. 10 s dip soldering distance to seating plane $\geq 1.5$ mm	$T_{sld}$	260	°C

**Notes**

<sup>(1)</sup>  $T_{amb} = 25$  °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.

<sup>(2)</sup> Refer to reflow profile for soldering conditions for surface mounted devices.

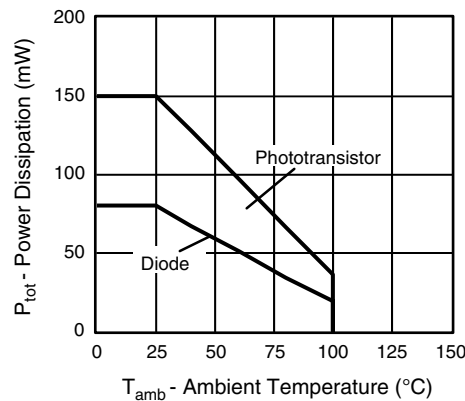


Fig. 1 - Permissible Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
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	$\mu$ A
Capacitance	$V_R = 0$ V, $f = 1.0$ MHz	$C_O$		14		pF
Thermal resistance		$R_{thJA}$		750		K/W
<b>OUTPUT</b>						
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



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ELECTRICAL CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>COUPLER</b>						
Collector emitter saturation voltage	$I_F = 10 \text{ mA}$ , $I_C = 2.0 \text{ mA}$	$V_{CEsat}$		1.0	0.3	V
Coupling capacitance	$f = 1.0 \text{ MHz}$	$C_C$		0.3		pF

**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.

CURRENT TRANSFER RATIO							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
$I_C/I_F$	$I_F = 5.0 \text{ mA}$ , $V_{CE} = 5.0 \text{ V}$	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	$I_C = 2.0 \text{ mA}$ , $V_{CC} = 5 \text{ V}$ , $R_L = 100 \text{ } \Omega$	$t_r$		3.0		$\mu\text{s}$
Fall time	$I_C = 2.0 \text{ mA}$ , $V_{CC} = 5 \text{ V}$ , $R_L = 100 \text{ } \Omega$	$t_f$		4.0		$\mu\text{s}$
Turn-on time	$I_C = 2.0 \text{ mA}$ , $V_{CC} = 5 \text{ V}$ , $R_L = 100 \text{ } \Omega$	$t_{on}$		5.0		$\mu\text{s}$
Turn-off time	$I_C = 2.0 \text{ mA}$ , $V_{CC} = 5 \text{ V}$ , $R_L = 100 \text{ } \Omega$	$t_{off}$		3.0		$\mu\text{s}$

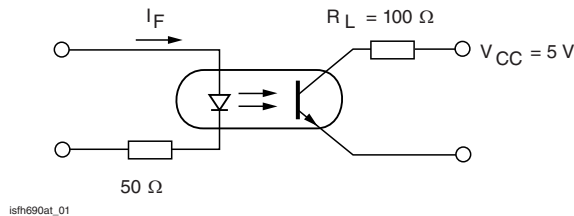


Fig. 2 - Switching Operation (without Saturation)

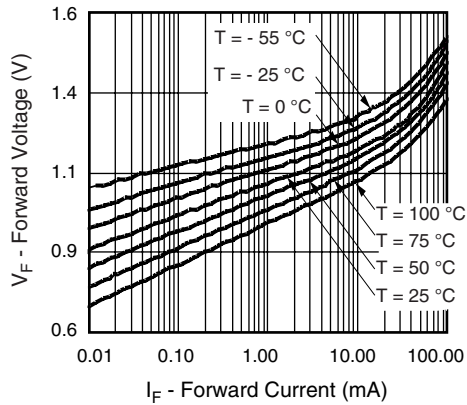
SAFETY AND INSULATION RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Climatic classification (according to IEC 68 part 1)				55/100/21		
Comparative tracking index		CTI	175		399	
$V_{IOTM}$			6000			V
$V_{IORM}$			707			V
$P_{SO}$					350	mW
$I_{SI}$					150	mA
$T_{SI}$					175	$^\circ\text{C}$
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.

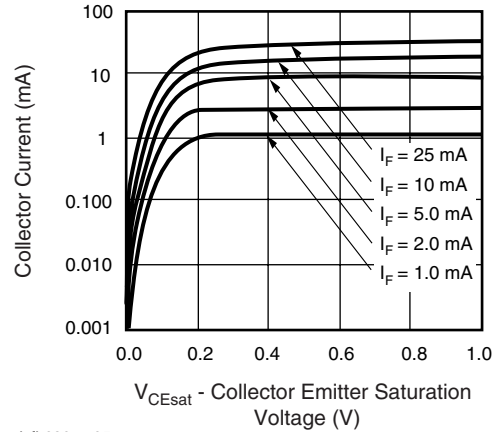
**TYPICAL CHARACTERISTICS**

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



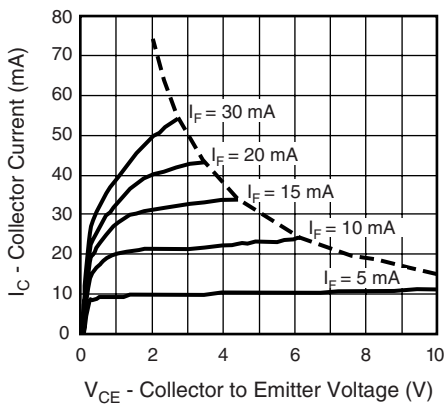
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Fig. 3 - Diode Forward Voltage vs. Forward Current



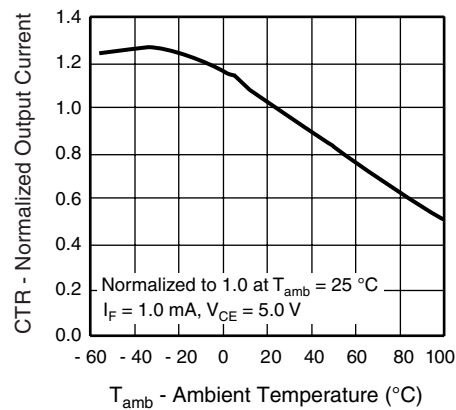
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Fig. 6 - Collector Current vs. Collector Emitter Saturation Voltage



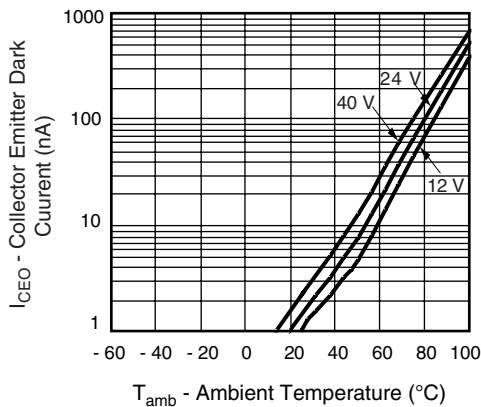
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Fig. 4 - Collector Current vs. Collector Emitter Voltage



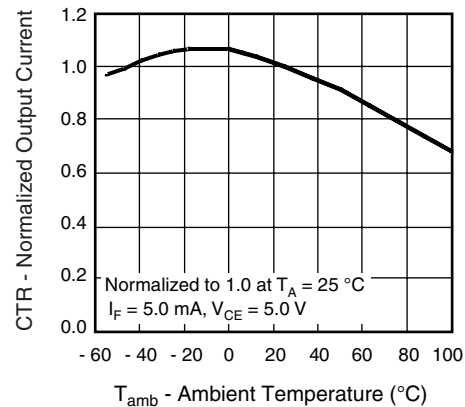
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Fig. 7 - Normalized Output Current vs. Ambient Temperature



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



isfh690at\_07

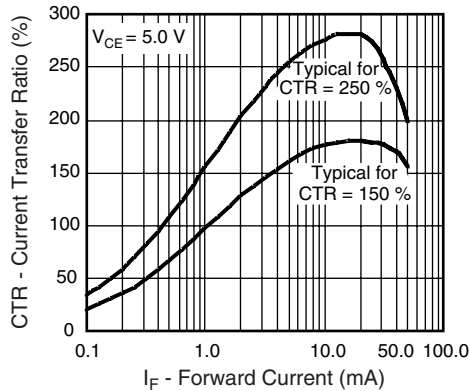
Fig. 8 - Normalized Output Current vs. Ambient Temperature



# SFH690ABT/SFH690AT/SFH690BT/SFH690CT/SFH690DT

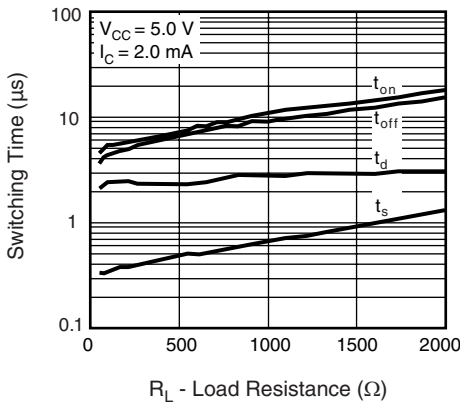
Optocoupler Phototransistor Output,  
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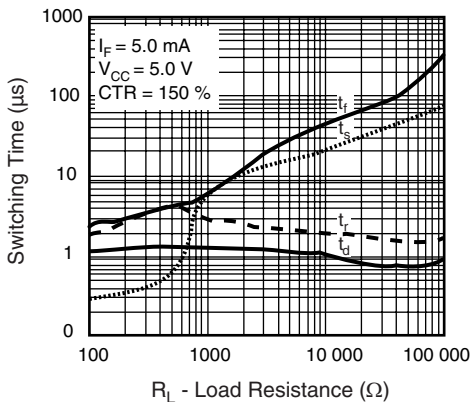
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Fig. 9 - Current Transfer Ratio vs. Forward Current



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Fig. 10 - Switching Time vs. Load Resistance



isfh690at\_10

Fig. 11 - Switching Time vs. Load Resistance

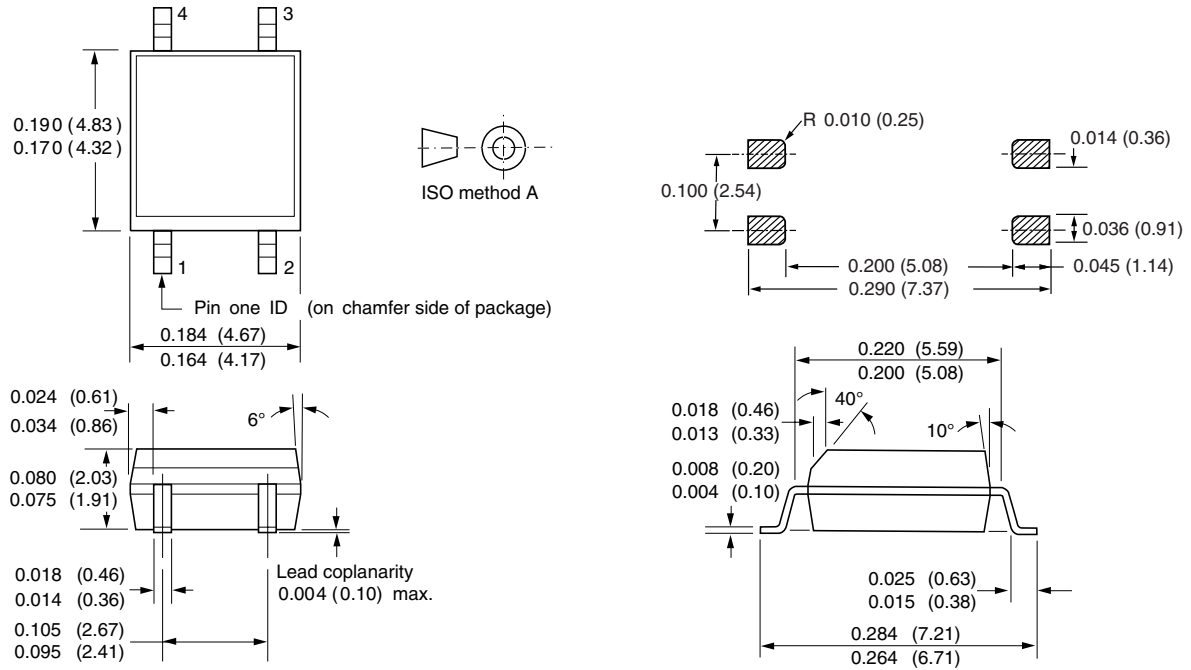
# SFH690ABT/SFH690AT/SFH690BT/SFH690CT/SFH690DT



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## PACKAGE DIMENSIONS in inches (millimeters)



i178037



## OZONE DEPLETING SUBSTANCES POLICY STATEMENT

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.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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



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