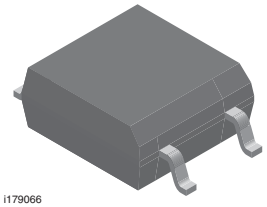
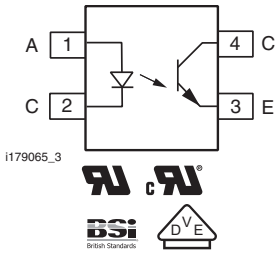
Optocoupler Phototransistor Output, SOP-4, 100 mil Pitch, Mini-Flat Package





FEATURES

- SOP (small outline package)
- Isolation test voltage, 3750 V_{RMS} (1 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
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS COMPLIANT
GREEN (5-2008)**

Note
** Please see document “Vishay Material Category Policy”: www.vishay.com/doc?99902

DESCRIPTION

The SFH690ABT, SFH690AT, SFH690BT, SFH690CT, SFH690DT 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

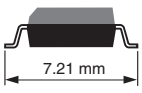
- High density mounting or space sensitive PCBs
- PLCs
- Telecommunication

AGENCY APPROVALS

- UL1577, file no. E52744 system code U
- cUL tested to CSA 22.2 bulletin 5A
- BSI IEC 60950; IEC 60065
- DIN EN 60747-5-2 (VDE 0884) available with option 1

ORDERING INFORMATION

S	F	H	6	9	0	x	x	-	X	0	0	1	T
PART NUMBER						CTR BIN			PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED/PACKAGE	CTR (%)				
UL, cUL, BSI	**50 to 300**	**50 to 150**	**100 to 300**	**100 to 200**	**200 to 400**
SOP-4, 100 mil pitch	SFH690ABT	SFH690AT3 (1)	SFH690BT3 (1)	SFH690CT	SFH690DT
VDE, UL, cUL, BSI	**50 to 300**	**50 to 150**	**100 to 300**	**100 to 200**	**200 to 400**
SOP-4, 100 mil pitch	-	-	-	SFH690C-X001T	SFH690D-X001T

Note
(1) Product is rotated 180° in tape and reel cavity

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	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
OUTPUT				
Collector emitter voltage		V_{CEO}	70	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
	$t_p \leq 1$ ms	I_C	100	mA
Power dissipation		P_{diss}	150	mW
COUPLER				
Isolation test voltage between emitter and detector (1 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 (1)	max. 10 s dip soldering distance to seating plane ≥ 1.5 mm	T_{sld}	260	°C

Notes

- 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.

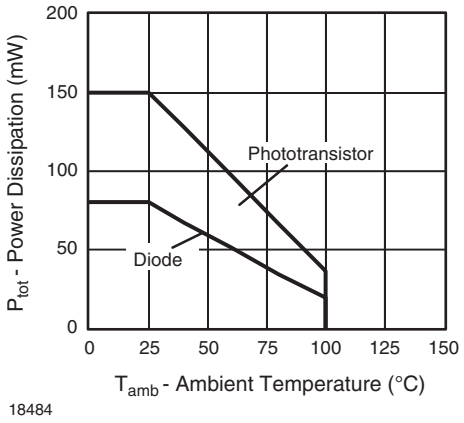


Fig. 1 - Permissible Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
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 V	I_R		0.01	10	µA
Capacitance	V_R = 0 V, f = 1 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 V, f = 1 MHz	C_{CE}		2.8		pF
Thermal resistance		R_{thJA}		500		K/W
COUPLER						
Collector emitter saturation voltage	I_F = 10 mA, I_C = 2 mA	V_{CEsat}		0.1	0.3	V
Coupling capacitance	f = 1 MHz	C_C		0.3		pF

Note

- 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 (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
I_C/I_F	I_F = 5 mA, V_{CE} = 5 V	SFH690ABT	CTR	50		300	%
		SFH690AT	CTR	50		150	%
		SFH690BT	CTR	100		300	%
		SFH690CT	CTR	100		200	%
		SFH690DT	CTR	200		400	%

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Rise time	I_C = 2 mA, V_{CC} = 5 V, R_L = 100 Ω	t_r		3		µs
Fall time	I_C = 2 mA, V_{CC} = 5 V, R_L = 100 Ω	t_f		4		µs
Turn-on time	I_C = 2 mA, V_{CC} = 5 V, R_L = 100 Ω	t_{on}		5		µs
Turn-off time	I_C = 2 mA, V_{CC} = 5 V, R_L = 100 Ω	t_{off}		3		µs

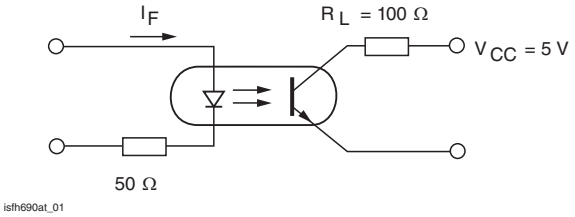


Fig. 2 - Switching Operation (without Saturation)

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)

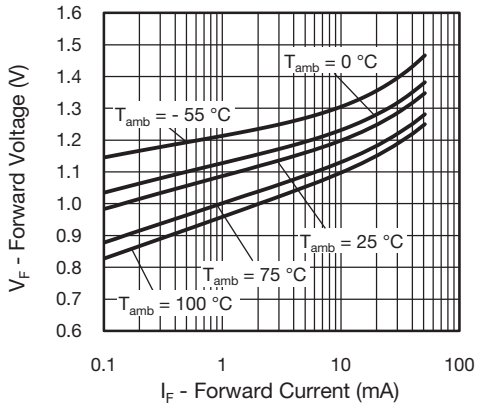


Fig. 3 - Forward Voltage vs. Forward Current

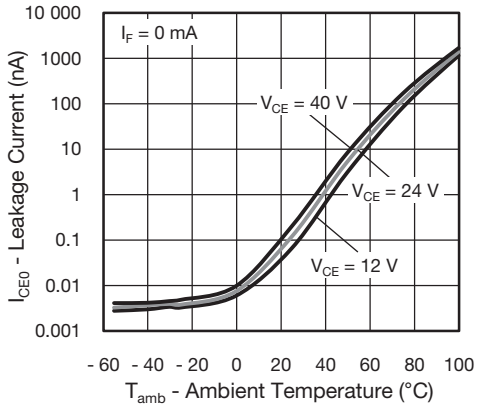


Fig. 5 - Leakage Current vs. Ambient Temperature

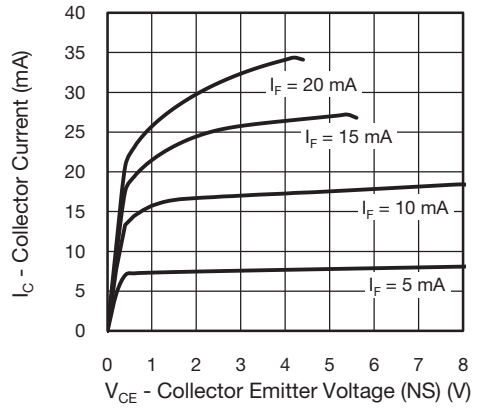


Fig. 4 - Collector Current vs. Collector Emitter Voltage (NS)

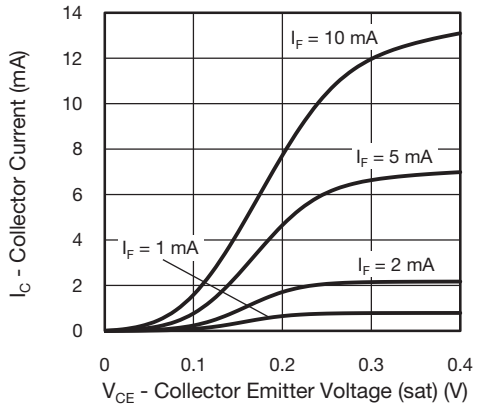


Fig. 6 - Collector Current vs. Collector Emitter Voltage (sat)

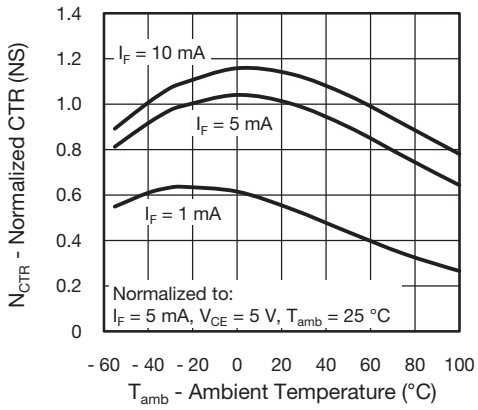


Fig. 7 - Normalized Current Transfer Ratio (sat) vs. Ambient Temperature

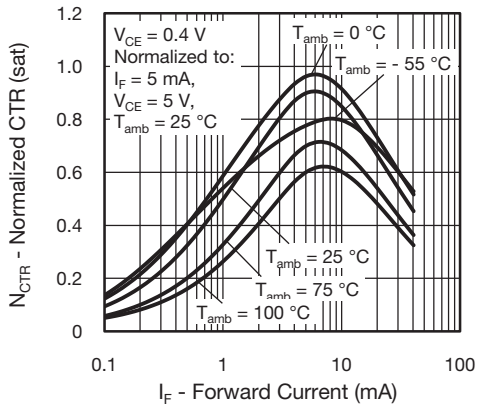


Fig. 10 - Normalized CTR (sat) vs. Forward Current

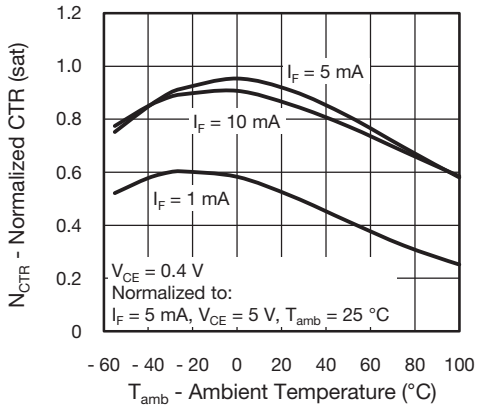


Fig. 8 - Normalized Current Transfer Ratio (NS) vs. Ambient Temperature

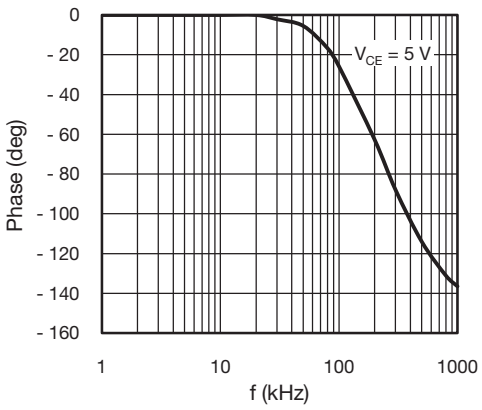


Fig. 11 - F_{CTR} vs. Phase Angle

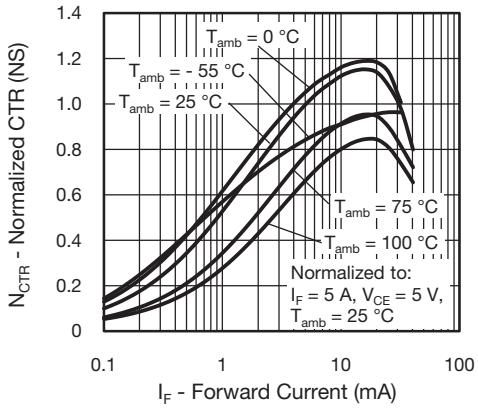


Fig. 9 - Normalized CTR (NS) vs. Forward Current

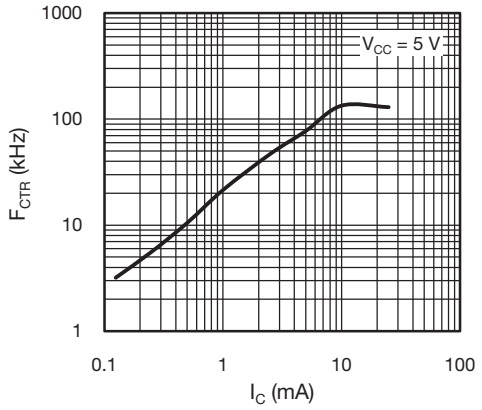


Fig. 12 - F_{CTR} vs. Collector Current

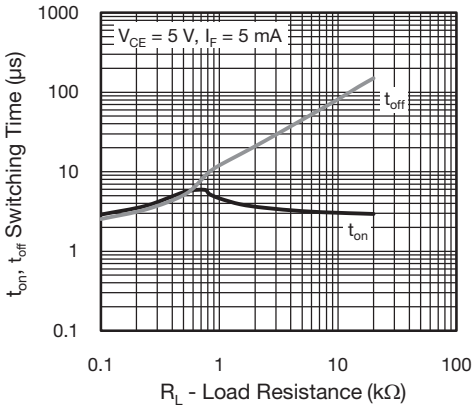
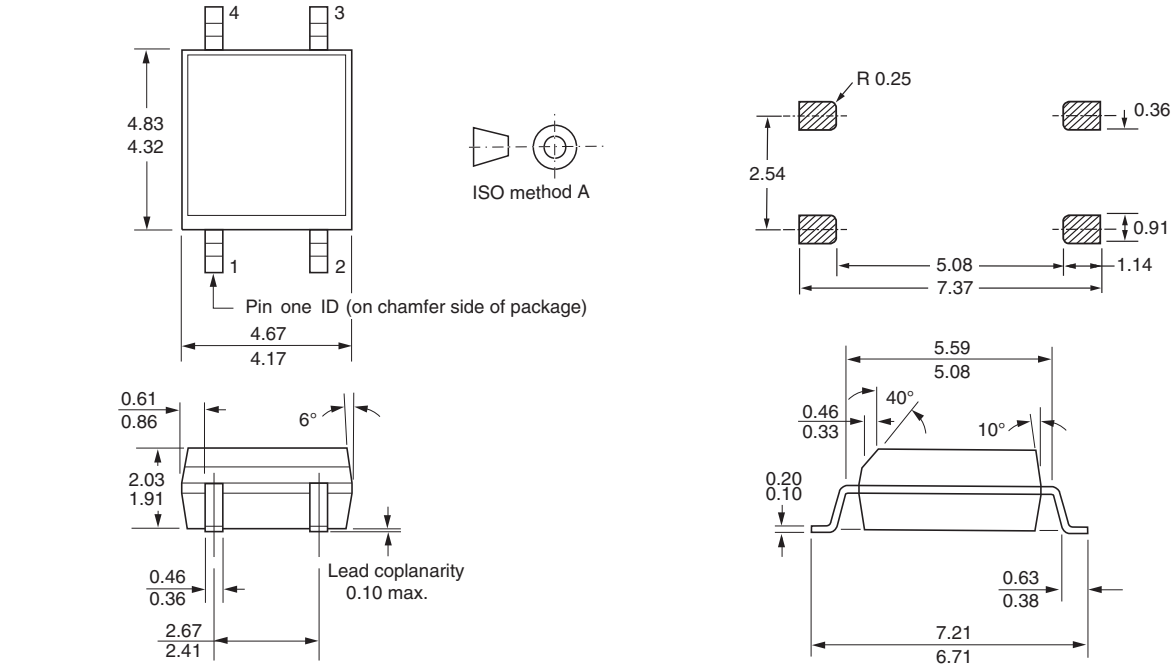
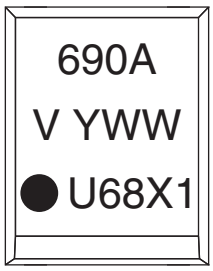


Fig. 13 - Switching Time vs. Load Resistance

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING (example of SFH690AT)



Notes

- Only option 1 is reflected in the package marking with the characters “X1”
- Tape and reel suffix (T) is not part of the package marking

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