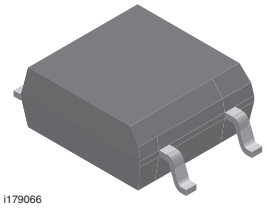
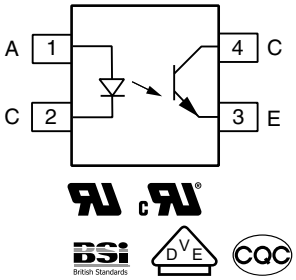
Optocoupler Phototransistor Output, SOP-4, 100 mil Pitch, Mini-Flat Package





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
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
e3
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

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

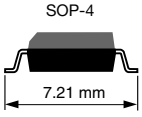
- High density mounting or space sensitive PCBs
- PLCs
- Telecommunication

AGENCY APPROVALS

- UL1577, file no. E52744 system code U
- cUL tested to CSA 22.2 bulletin 5A
- BSI EN 60950; EN 60065
- DIN EN 60747-5-5 (VDE 0885-5) available with option 1
- CQC GB4943.1-2011 and GB8898-2011 (suitable for installation altitude below 2000 m)

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), SFH690AT (2)	SFH690BT3 (1), SFH690BT (2)	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	-	-	SFH690B-X001T	SFH690C-X001T	SFH690D-X001T

Notes

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

(2) Also available in tubes, do not put "T" to the end

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 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.

(3) Refer to reflow profile for soldering conditions for surface mounted devices.

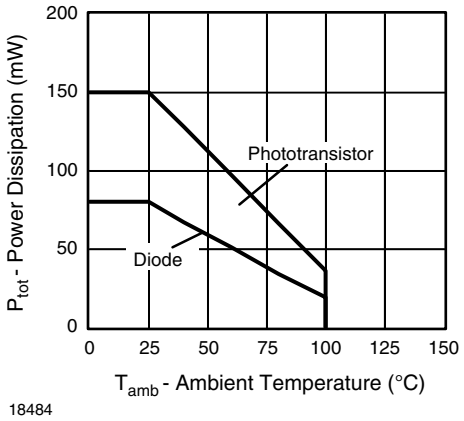


Fig. 1 - Permissible Power Dissipation vs. Ambient Temperature

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 timet	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

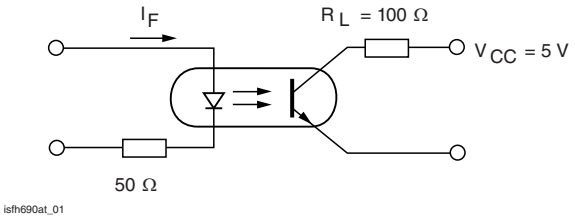


Fig. 2 - Switching Operation (without saturation)

SAFETY AND INSULATION RATINGS				
PARAMETER	**CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		55 / 100 / 21	
Partial discharge test voltage - lot test (sample test)	t_{Tr} = 60 s, t_{test} = 10 s, (see Fig. 2)	V_{IOTM}	6000	V_{peak}
Isolation test voltage (RMS)		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
Forward current		I_{si}	150	mA
Power dissipation		P_{so}	350	mW
Safety temperature		T_{si}	175	°C
Comparative tracking index		CTI	175	
Clearance distance			5.0	mm
Creepage distance			5.0	mm
Insulation distance (internal)			0.4	mm

Note

- According to DIN EN 60747-5-2 (VDE 0884) (see fig. 2). This optocoupler is suitable for safe electrical isolation only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.

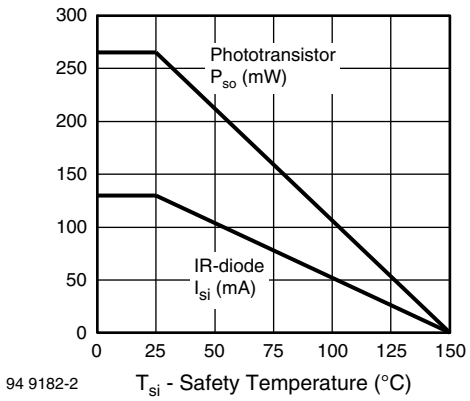


Fig. 3 - Derating Diagram

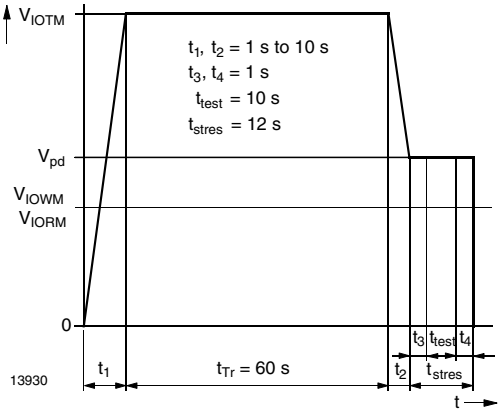


Fig. 4 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2 (VDE 0884); IEC60747-5-5

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

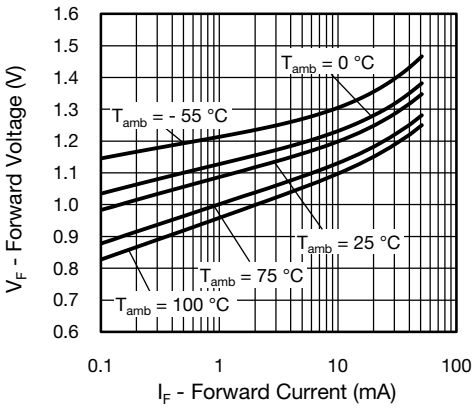


Fig. 5 - Forward Voltage vs. Forward Current

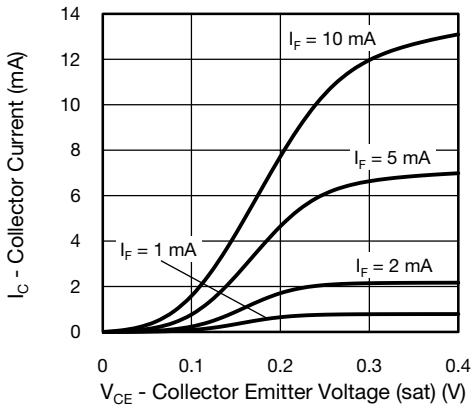


Fig. 8 - Collector Current vs. Collector Emitter Voltage (saturated)

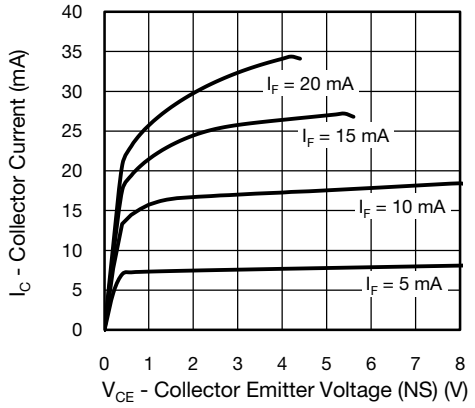


Fig. 6 - Collector Current vs. Collector Emitter Voltage (non-saturated)

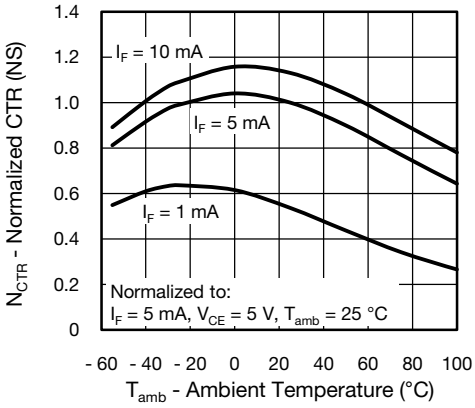


Fig. 9 - Normalized Current Transfer Ratio vs. Ambient Temperature

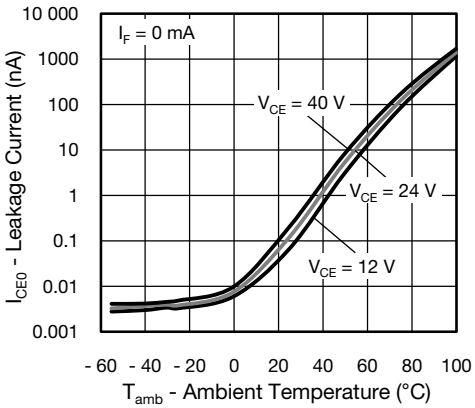


Fig. 7 - Leakage Current vs. Ambient Temperature

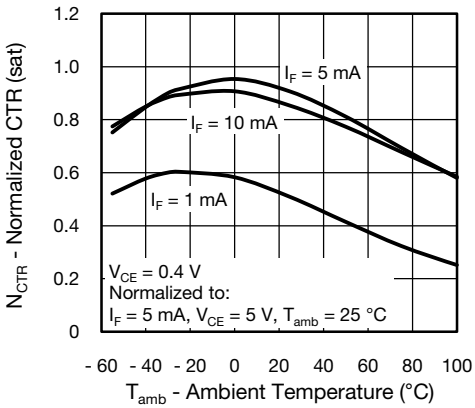


Fig. 10 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

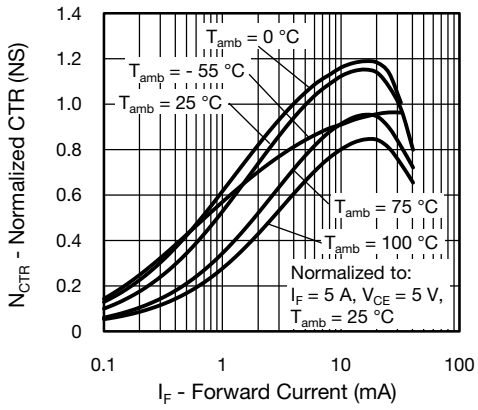


Fig. 11 - Normalized CTR (non-saturated) vs. Forward Current

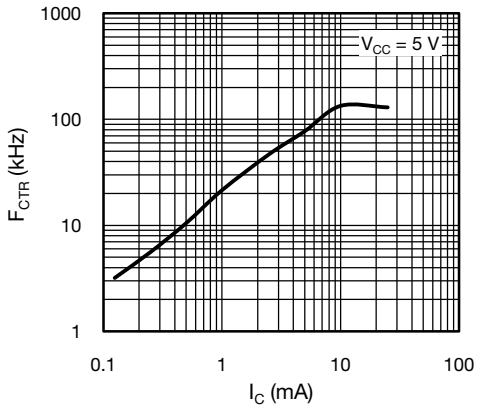


Fig. 14 - F_{CTR} vs. Collector Current

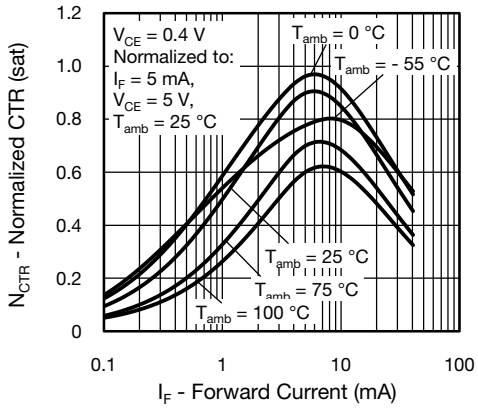


Fig. 12 - Normalized CTR (saturated) vs. Forward Current

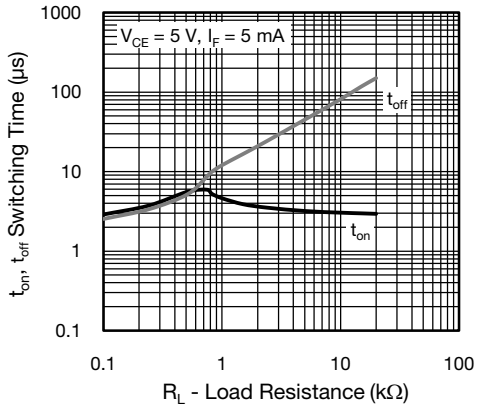


Fig. 15 - Switching Time vs. Load Resistance

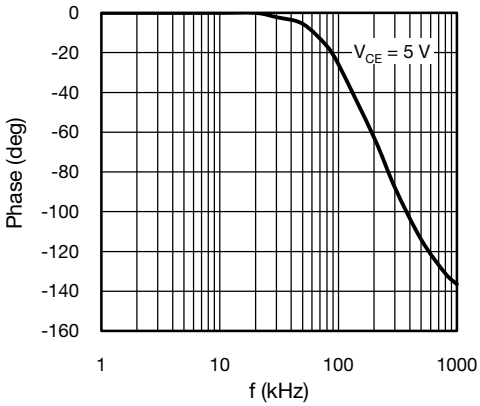
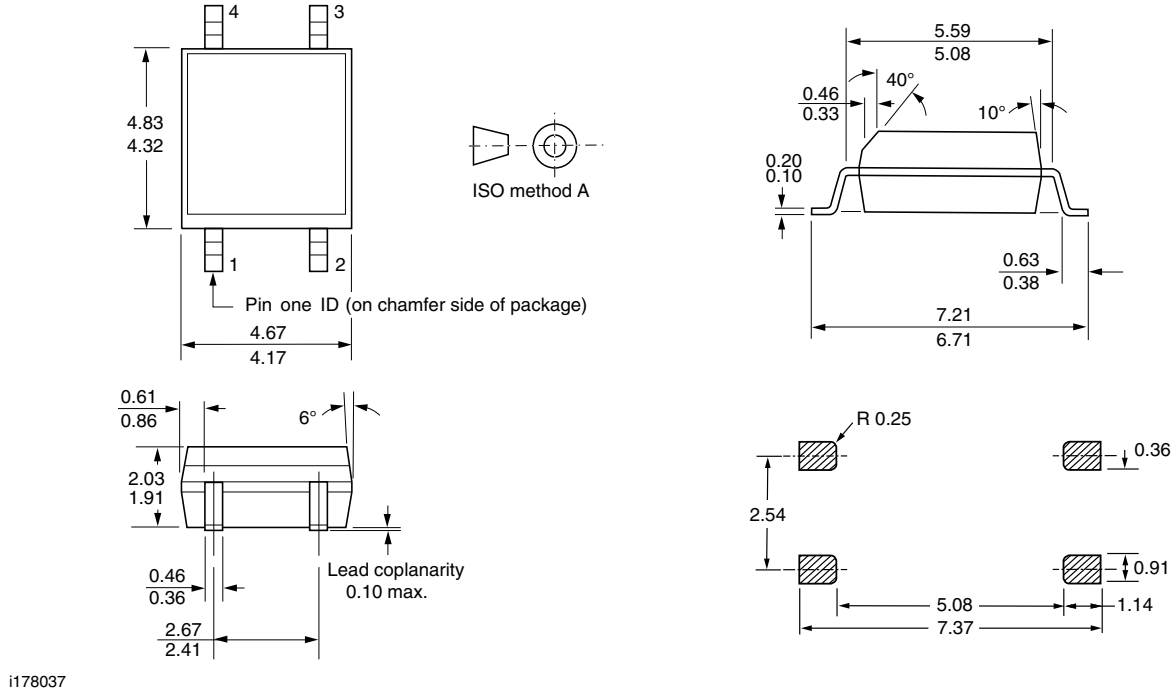


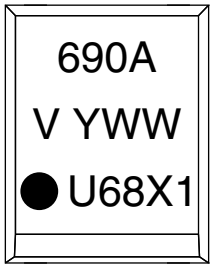
Fig. 13 - F_{CTR} vs. Phase Angle

PACKAGE DIMENSIONS (in millimeters)



i178037

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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