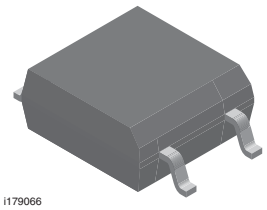
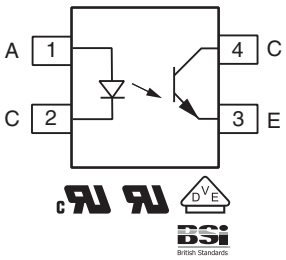
Optocoupler Phototransistor Output, SOP-4, Mini-Flat Package, 110 °C Rated





FEATURES

- Operating temperature from - 55 °C to + 110 °C
- SOP (small outline package)
- Isolation test voltage, 3750 V_{RMS} (1 s)
- Low saturation voltage
- Fast switching times
- 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 110 °C rated SFH1690AT, SFH1690BT, SFH1690CT, and SFH1690ABT 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 SFH1690 series is available only on tape and reel. There are 2000 parts per reel.

APPLICATIONS

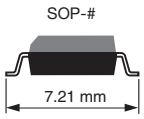
- PLCs
- Telecommunication

AGENCY APPROVALS

- UL1577, file no. E52744 system code U
- cUL - file no. E52744, cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 (pending) available with option 1
- BSI tested to IEC 60065 and IEC 60950-2001

ORDERING INFORMATION

S	F	H	1	6	9	0	#	#	T	-	X	0	0	1
PART NUMBER									TAPE AND REEL		VDE OPTION			



AGENCY CERTIFIED/PACKAGE	CTR (%)			
UL, cUL, BSI	**50 to 300**	**50 to 150**	**100 to 300**	**100 to 200**
SOP-4, Mini flat	SFH1690ABT	SFH1690AT	SFH1690BT	SFH1690CT
VDE, UL, cUL, BSI	**50 to 300**	**50 to 150**	**100 to 300**	**100 to 200**
SOP-4, Mini flat	-	-	SFH1690BT-X001	-

Note

- For additional information on the available options refer to option information.

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
DC forward current		I_F	50	mA
Reverse voltage		V_R	6	V
Surge forward current	$t_p \leq 10$ µs	I_{FSM}	2.5	A
Power dissipation		P_{diss}	80	mW
Derate linearly from 25 °C			0.7	mW/°C
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	mW
Power dissipation		P_{diss}	150	mW
Derate linearly from 25 °C			1.5	mW/°C
COUPLER				
Isolation test voltage between emitter and detector	t = 1 s	V_{ISO}	3750	V_{RMS}
Operating temperature range		T_{amb}	- 55 to + 110	°C
Storage temperature range		T_{stg}	- 55 to + 150	°C
Soldering temperature	max. 10 s dip soldering distance to seating plane ≥ 1.5 mm	T_{sld}	260	°C

Note

- 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.

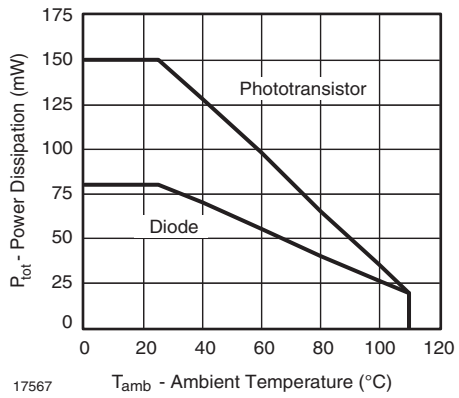


Fig. 1 - Permissible Power Dissipation vs. Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**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
OUTPUT							
Collector emitter leakage current	V_{CE} = 20 V		I_{CEO}			100	nA
Collector emitter breakdown voltage	I_C = 100 µA		BV_{CEO}	70			V
Emitter collector breakdown voltage	I_E = - 10 µA		BV_{ECO}	7			V
Collector emitter saturation voltage	I_F = 10 mA, I_C = 2.5 mA		V_{CEsat}		0.25	0.4	V
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz		C_{CE}		2.8		pF
COUPLER							
Coupling capacitance	f = 1 MHz		C_C		0.3		pF
Capacitance (input to output)			C_{IO}		0.5		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	SFH1690ABT	CTR	50		300	%
		SFH1690AT	CTR	50		150	%
		SFH1690BT	CTR	100		300	%
		SFH1690CT	CTR	100		200	%

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.

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

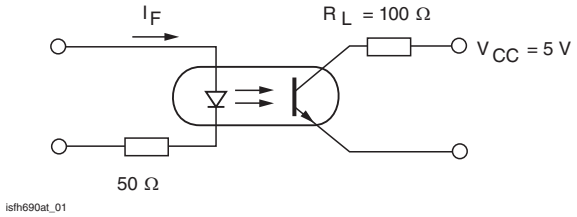


Fig. 2 - Switching Operation (without Saturation)

SAFETY AND INSULATION RATINGS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Climatic classification (according to IEC 68 part 1)				55/110/21		
Pollution degree (DIN VDE 0109)				2		mm
Comparative tracking index per DIN IEC112/ VDE 0303 part 1, group IIIa per DIN VDE 6110 175 399			175		399	
V_{IOTM}		V_{IOTM}	6000			V
V_{IORM}		V_{IORM}	707			V
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
P_{SO}					350	mW
I_{SI}					150	mA
T_{SI}					165	°C
Creepage distance			5			mm
Clearance distance			5			mm
Insulation thickness between emitter and detector			≥ 0.4			mm

Note

- As per IEC 60747-5-5, §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)

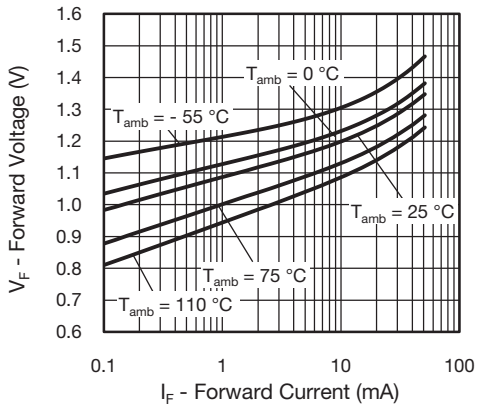


Fig. 3 - Forward Voltage vs. Forward Current

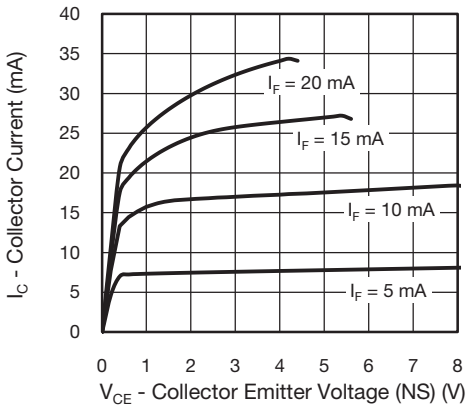


Fig. 4 - Collector Current vs. Collector Emitter Voltage (NS)

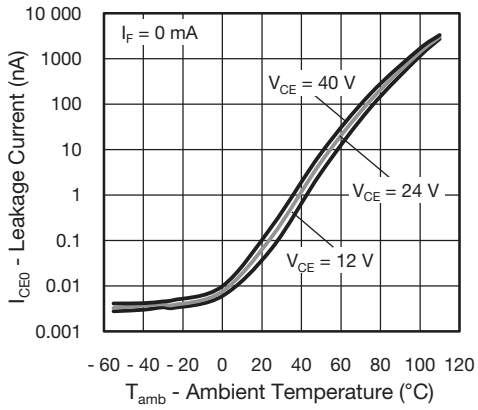


Fig. 5 - Leakage Current vs. Ambient Temperature

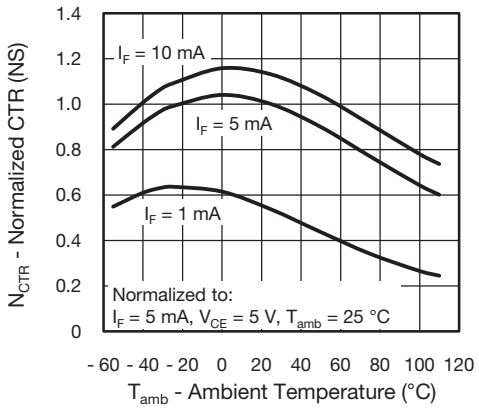


Fig. 8 - Normalized Current Transfer Ratio (NS) vs. Ambient Temperature

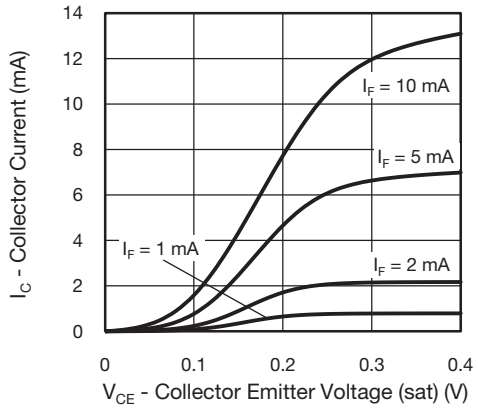


Fig. 6 - Collector Current vs. Collector Emitter Voltage (sat)

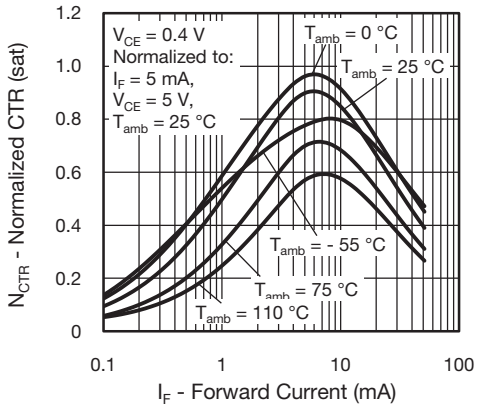


Fig. 9 - Normalized CTR (sat) vs. Forward Current

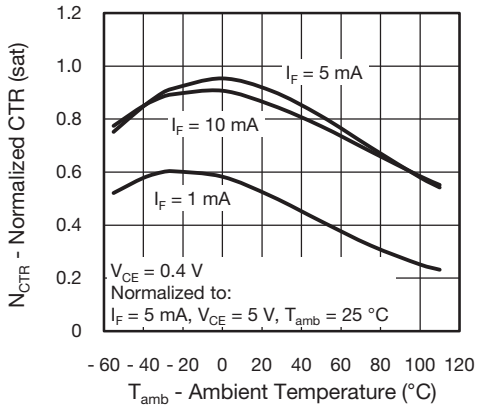


Fig. 7 - Normalized Current Transfer Ratio (sat) vs. Ambient Temperature

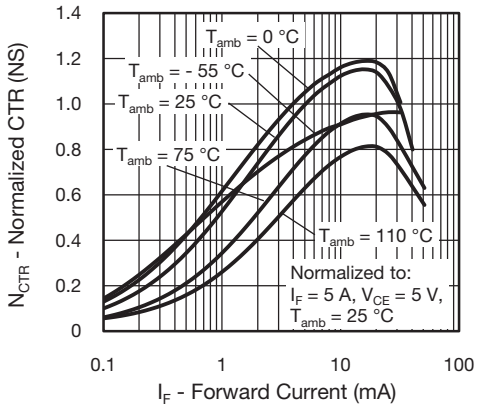


Fig. 10 - Normalized CTR (NS) vs. Forward Current

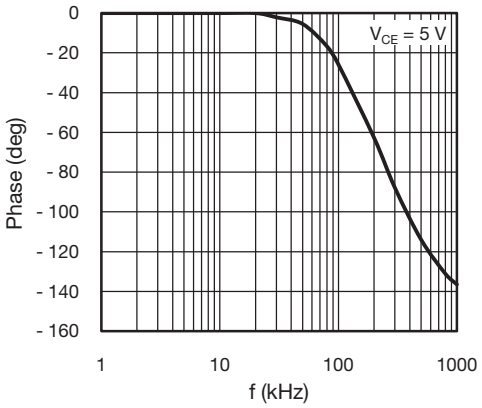


Fig. 11 - F_{CTR} vs. Phase Angle

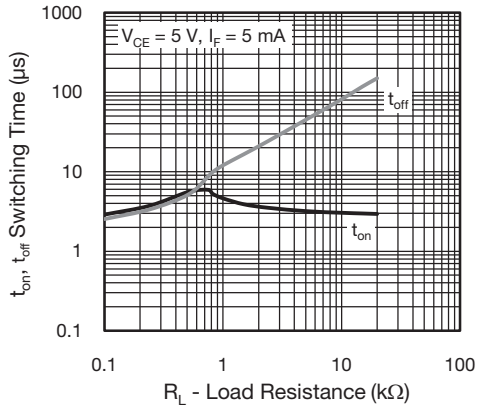


Fig. 13 - Switching Time vs. Load Resistance

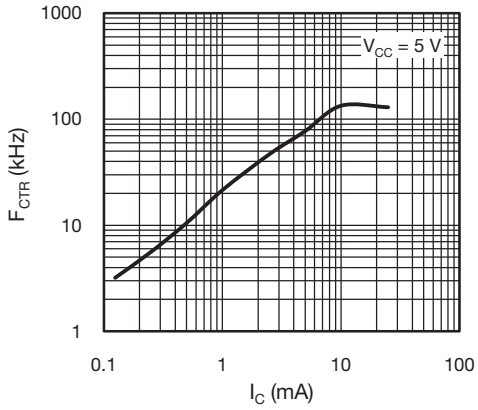
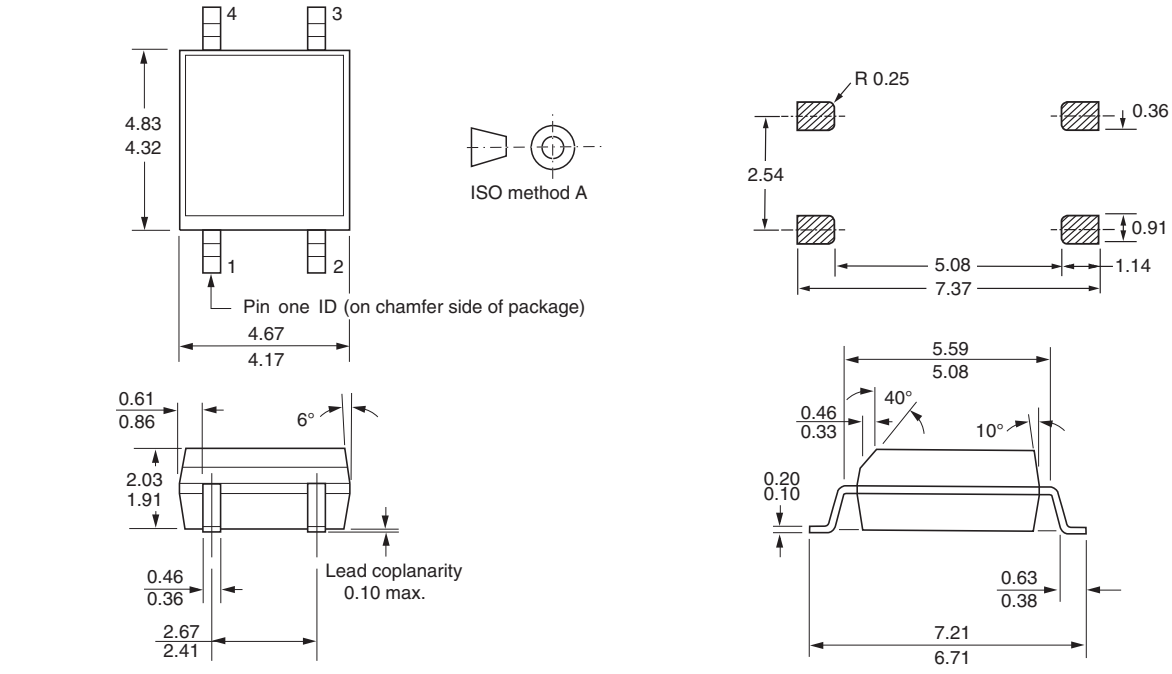
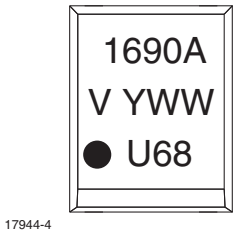


Fig. 12 - F_{CTR} vs. Collector Current

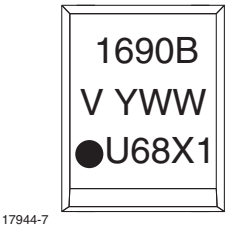
PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING



(example for SFH1690AT)



(example for SFH1690BT-X001)

Notes

- The marking of the SFH1690ABT will either show 1690A or 1690B on the first line.
- Tape and reel suffix (T) is not part of the package marking.

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