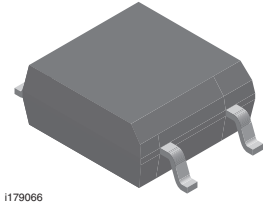
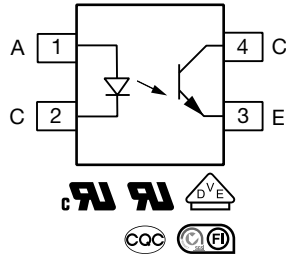




Optocoupler Phototransistor Output, SOP-4, Mini-Flat Package, 110 °C Rated



1179066



parts per reel.

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



LINKS TO ADDITIONAL RESOURCES



[Product Page](#)

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

APPLICATIONS

- PLCs
- Telecommunication

AGENCY APPROVALS

- [UL](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#), available with option 1
- [BSI](#)
- [CQC GB4943.1](#)
- [CQC GB8898](#)
- [FIMKO](#)

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, FIMKO, CQC					50 to 300		50 to 150		100 to 300		100 to 200				
SOP-4, Mini flat					SFH1690ABT		SFH1690AT		SFH1690BT		SFH1690CT				
UL, cUL, BSI, FIMKO, CQC, VDE (option 1)					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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, 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	$t_p \leq 10\text{ }\mu\text{s}$	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
	$t_p \leq 1\text{ ms}$	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	$t = 1\text{ s}$	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 $\geq 1.5\text{ mm}$	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.

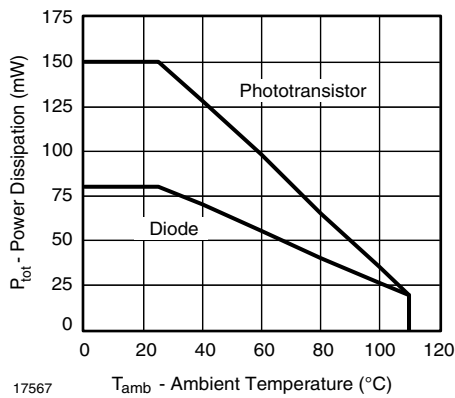


Fig. 1 - Permissible Power Dissipation vs. Temperature

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Forward voltage	$I_F = 5\text{ mA}$		V_F	-	1.15	1.4	V
Reverse current	$V_R = 6\text{ V}$		I_R	-	0.01	10	μA
Capacitance	$V_R = 0\text{ V}, f = 1\text{ MHz}$		C_O	-	14		pF
OUTPUT							
Collector emitter leakage current	$V_{CE} = 20\text{ V}$		I_{CEO}	-	-	100	nA
Collector emitter breakdown voltage	$I_C = 100\text{ }\mu\text{A}$		BV_{CEO}	70	-	-	V
Emitter collector breakdown voltage	$I_E = -10\text{ }\mu\text{A}$		BV_{ECO}	7	-	-	V
Collector emitter saturation voltage	$I_F = 10\text{ mA}, I_C = 2.5\text{ mA}$		V_{CEsat}	-	0.25	0.4	V
Collector emitter capacitance	$V_{CE} = 5\text{ V}, f = 1\text{ MHz}$		C_{CE}	-	2.8	-	pF
COUPLER							
Coupling capacitance	$f = 1\text{ MHz}$		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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
I_C/I_F	$I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$	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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
Rise time	$V_{CC} = 5\text{ V}, I_C = 2\text{ mA}, R_L = 100\text{ }\Omega$	t_r	-	3	-	μs	
Fall time	$V_{CC} = 5\text{ V}, I_C = 2\text{ mA}, R_L = 100\text{ }\Omega$	t_f	-	4	-	μs	
Turn-on time	$V_{CC} = 5\text{ V}, I_C = 2\text{ mA}, R_L = 100\text{ }\Omega$	t_{on}	-	5	-	μs	
Turn-off time	$V_{CC} = 5\text{ V}, I_C = 2\text{ mA}, R_L = 100\text{ }\Omega$	t_{off}	-	3	-	μs	

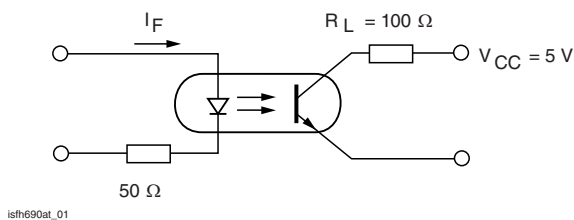


Fig. 2 - Switching Operation (without Saturation)



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	$V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^{\circ}\text{C}$	R_{IO}	-	-	$\geq 10^{12}$	Ω
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^{\circ}\text{C}$	R_{IO}	-	-	$\geq 10^{11}$	Ω
P_{SO}			-	-	350	mW
I_{SI}			-	-	150	mA
T_{SI}			-	-	165	$^{\circ}\text{C}$
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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

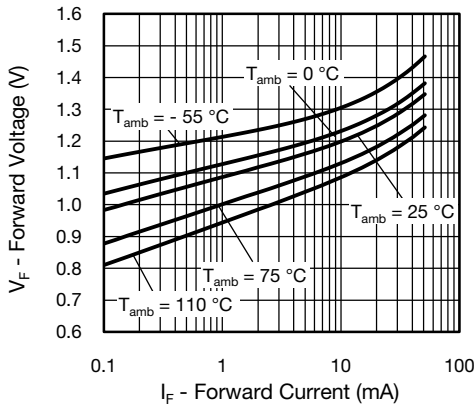


Fig. 3 - Forward Voltage vs. Forward Current

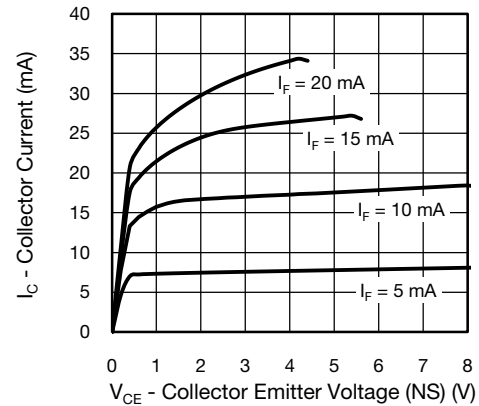


Fig. 4 - Collector Current vs. Collector Emitter Voltage (NS)

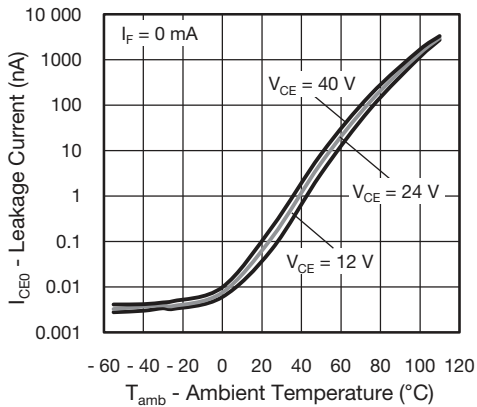


Fig. 5 - Leakage Current vs. Ambient Temperature

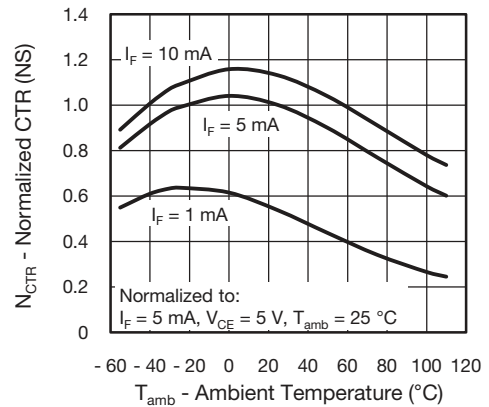


Fig. 8 - Normalized Current Transfer Ratio (NS) vs. Ambient Temperature

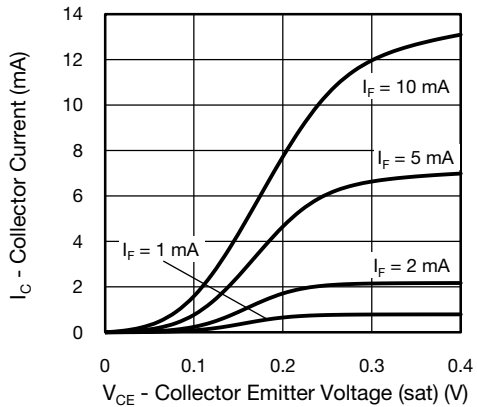


Fig. 6 - Collector Current vs. Collector Emitter Voltage (sat)

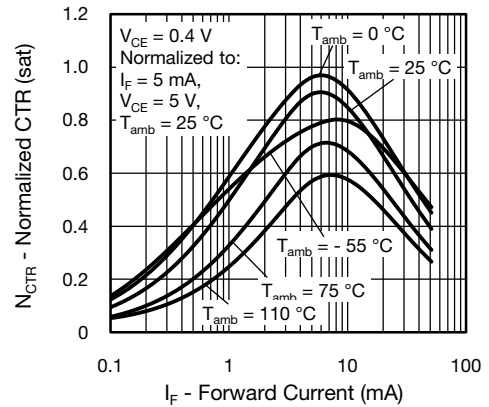


Fig. 9 - Normalized CTR (sat) vs. Forward Current

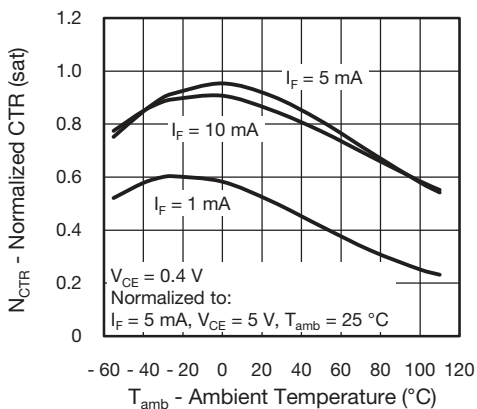


Fig. 7 - Normalized Current Transfer Ratio (sat) vs. Ambient Temperature

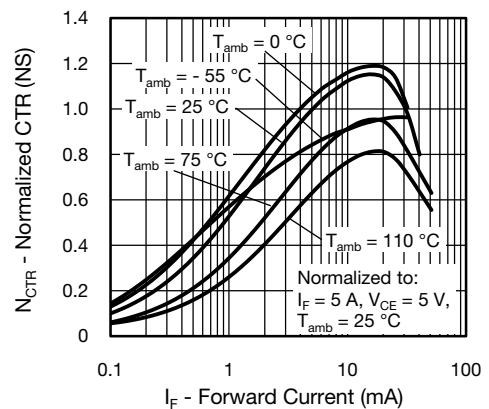


Fig. 10 - Normalized CTR (NS) vs. Forward Current

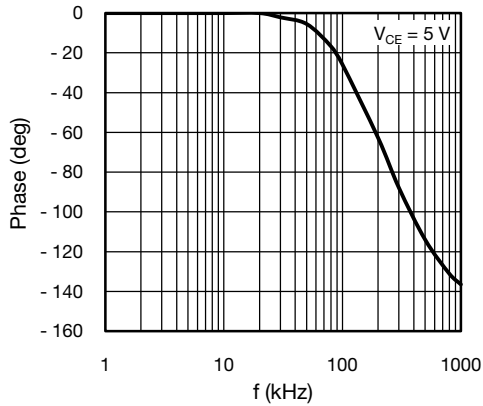


Fig. 11 - F_{CTR} vs. Phase Angle

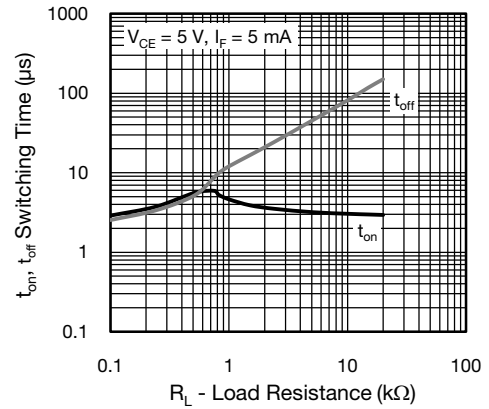


Fig. 13 - Switching Time vs. Load Resistance

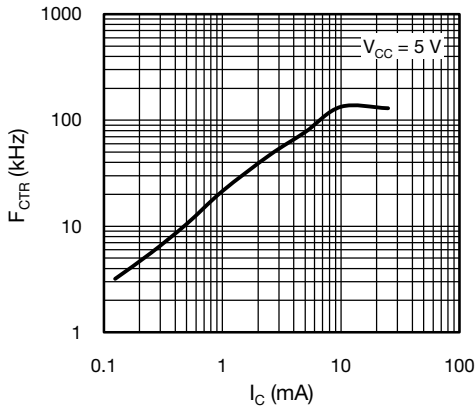
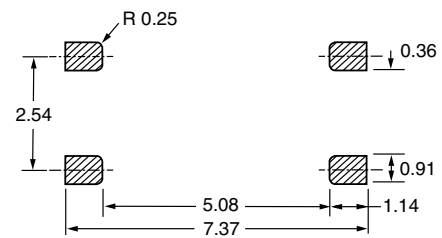
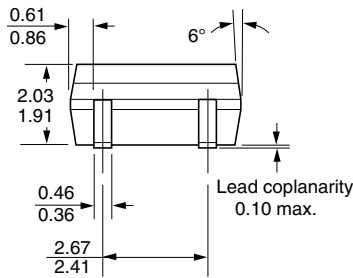
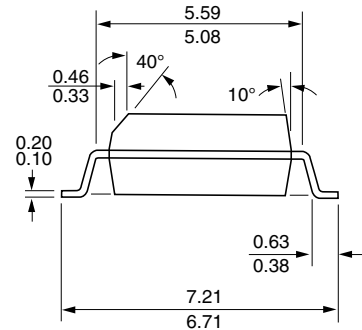
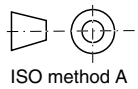
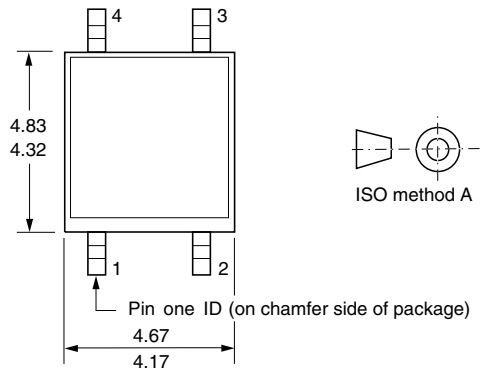


Fig. 12 - F_{CTR} vs. Collector Current

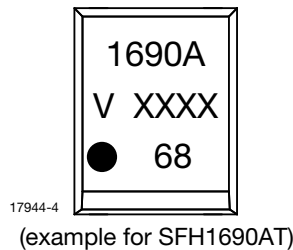


PACKAGE DIMENSIONS in millimeters

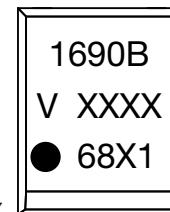


i178037

PACKAGE MARKING



(example for SFH1690AT)



(example for SFH1690BT-X001)

Notes

- XXXX = LMC (lot marking code)
- 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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