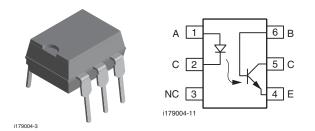
SFH601

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Optocoupler, Phototransistor Output, with Base Connection



DESCRIPTION

The SFH601 is an optocoupler with a gallium arsenide LED emitter which is optically coupled with a silicon planar phototransistor detector. The component is packaged in a plastic plug-in case 20 AB DIN 41866.

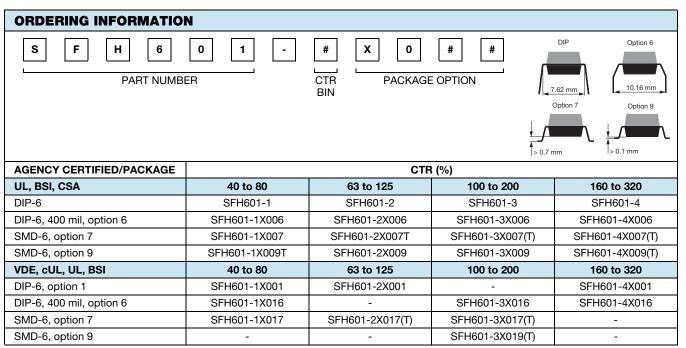
The coupler transmits signals between two electrically isolated circuits.

FEATURES

- Isolation test voltage (1.0 s), 5300 V_{RMS}
- $V_{CEsat} 0.25 (\le 0.4) V$, $I_F = 10 mA$, $I_C = 2.5 mA$
- Built to conform to VDE requirements
- Highest quality premium device
- Long term stability
- Storage temperature, -55 ° to +150 °C
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>

AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- DIN EN 60747-5-5 (VDE 0884-5) available with option 1
- CSA 93751
- BSI IEC 60950; IEC 60065



Note

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



(e3)

ROHS COMPLIANT



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ABSOLUTE MAXIMUM R	ATINGS (T _{amb} = 25 °C, unless otherwise	e specified)		
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V _R	6	V
DC forward current		١ _F	60	mA
Surge forward current	t = 10 µs	I _{FSM}	2.5	А
Total power dissipation		P _{diss}	100	mW
OUTPUT				
Collector emitter voltage		V _{CEO}	100	V
Emitter base voltage		V _{EBO}	7	V
Collector current		Ι _C	50	mA
	t = 1.0 ms	Ι _C	100	mA
Power dissipation		P _{diss}	150	mW
COUPLER				
Storage temperature range		T _{stg}	-55 to +150	°C
Ambient temperature range		T _{amb}	-55 to +100	°C
Junction temperature		Tj	100	°C
Soldering temperature ⁽¹⁾	Max. 10 s, dip soldering: distance to seating plane \ge 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.

⁽¹⁾ Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

ELECTRICAL CHARACTERISTICS (T _{amb} = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Forward voltage	I _F = 60 mA		V _F	-	1.25	1.65	V
Breakdown voltage	I _R = 10 μΑ		V _{BR}	6	-	-	V
Reverse current	V _R = 6 V		I _R	-	0.01	10	μA
Capacitance	V _F = 0 V, f = 1 MHz		Co	-	25	-	pF
Thermal resistance			R _{thja}	-	750	-	K/W
OUTPUT							
Collector emitter capacitance	$f = 1 MHz, V_{CE} = 5 V$		C _{CE}	-	6.8	-	pF
Collector base capacitance	$f = 1 MHz, V_{CB} = 5 V$		C _{CB}	-	8.5	-	pF
Emitter base capacitance	f = 1 MHz, V _{EB} = 5 V		C _{EB}	-	11	-	pF
Thermal resistance			R _{thja}	-	500	-	K/W
		SFH601-1	I _{CEO}	-	2	50	nA
Collector omitter lookage ourrept	V _{CE} =10 V	SFH601-2	I _{CEO}	-	2	50	nA
Collector emitter leakage current		SFH601-3	I _{CEO}	-	5	100	nA
		SFH601-4	I _{CEO}	-	5	100	nA
COUPLER							
Saturation voltage collector emitter	I _F = 10 mA, I _C = 2.5 mA		V _{CEsat}	-	0.25	0.4	V
Capacitance (input to output)	V _{I-O} = 0, f = 1 MHz		C _{IO}	-	0.6	-	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							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
$I_{\rm C}/I_{\rm F}$ at $V_{\rm CE}$ = 5.0 V	I _F = 10 mA	SFH601-1	CTR	40	-	80	%
		SFH601-2	CTR	63	-	125	%
		SFH601-3	CTR	100	-	200	%
		SFH601-4	CTR	160	-	320	%
	1 1 - 1 1	SFH601-1	CTR	13	30	-	%
		SFH601-2	CTR	22	45	-	%
	I _F = 1 mA	SFH601-3	CTR	34	70	-	%
		SFH601-4	CTR	56	90	-	%

Note

• Current transfer ratio and collector emitter leakage current by dash number.

SWITCHING CHARACTERISTICS							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
NON-SATURATED		•		•	•		•
Current	$V_{CC} = 5 \text{ V}, \text{ R}_{L} = 75 \Omega$		l _F	-	10	-	mA
Rise time	$V_{CC} = 5 \text{ V}, \text{ R}_{L} = 75 \Omega$		tr	-	2	-	μs
Fall time	$V_{CC} = 5 \text{ V}, \text{ R}_{L} = 75 \Omega$		t _f	-	2	-	μs
Turn-on time	$V_{CC} = 5 \text{ V}, \text{ R}_{L} = 75 \Omega$		t _{on}	-	3	-	μs
Turn-off time	$V_{CC} = 5 \text{ V}, \text{ R}_{L} = 75 \Omega$		t _{off}	-	2.3	-	μs
SATURATED		-					
		SFH601-1	IF	-	20	-	mA
Current		SFH601-2	IF	-	10	-	mA
Current		SFH601-3	IF	-	10	-	mA
		SFH601-4	IF	-	0.5	-	mA
		SFH601-1	tr	-	2	-	μs
Rise time		SFH601-2	tr	-	3	-	μs
Rise lime		SFH601-3	tr	-	3	-	μs
		SFH601-4	t _r	-	4.6	-	μs
		SFH601-1	t _f	-	11	-	μs
Fall time		SFH601-2	t _f	-	14	-	μs
Failume		SFH601-3	t _f	-	14	-	μs
		SFH601-4	t _f	-	15	-	μs
		SFH601-1	t _{on}	-	3	-	μs
-		SFH601-2	t _{on}	-	4.2	-	μs
Turn-on time		SFH601-3	t _{on}	-	4.2	-	μs
		SFH601-4	t _{on}	-	6	-	μs
		SFH601-1	t _{off}	-	18	-	μs
Turn-off time		SFH601-2	t _{off}	-	23	-	μs
rum-on ume		SFH601-3	t _{off}	-	23	-	μs
		SFH601-4	t _{off}	-	25	-	μs

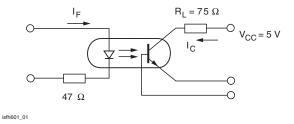
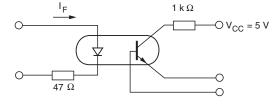


Fig. 1 - Linear Operation (without Saturation)



isfh601_02

Fig. 2 - Switching Operation (with Saturation)

Rev. 1.6, 23-Jul-15

3

Document Number: 83663

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SFH601



SAFETY AND INSULATION RATINGS							
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT			
Climatic classification	According to IEC 68 part 1		55 / 100 / 21				
Comparative tracking index		CTI	175				
Maximum rated withstanding isolation voltage	t = 1 min	V _{ISO}	4420	V _{RMS}			
Maximum transient isolation voltage		VIOTM	8000	V			
Maximum repetitive peak isolation voltage		V _{IORM}	890	V			
Isolation resistance	$V_{IO} = 500 \text{ V}, \text{ T}_{amb} = 25 ^{\circ}\text{C}$	R _{IO}	≥ 10 ¹²	Ω			
Isolation resistance	$V_{IO} = 500 \text{ V}, \text{ T}_{amb} = 100 ^{\circ}\text{C}$	R _{IO}	≥ 10 ¹¹	Ω			
Output safety power		P _{SO}	700	mW			
Input safety current		I _{SI}	400	mA			
Input safety temperature		T _{SI}	175	°C			
Creepage distance	Standard DIP-4		≥ 7	mm			
Clearance distance	Standard DIP-4		≥ 7	mm			
Creepage distance	400 mil DIP-4		≥ 8	mm			
Clearance distance	400 mil DIP-4		≥ 8	mm			
Insulation thickness		DTI	≥ 0.4	mm			

Note

• As per IEC 60747-5-5, § 7.4.3.8.2, 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)

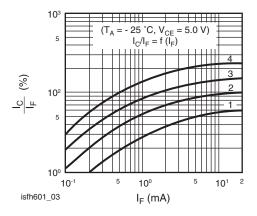


Fig. 3 - Current Transfer Ratio vs. Diode Current

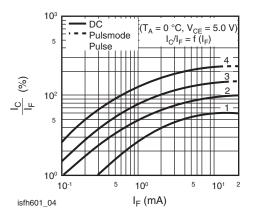


Fig. 4 - Current Transfer Ratio vs. Diode Current



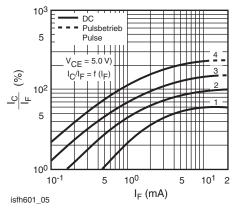


Fig. 5 - Current Transfer Ratio vs. Diode Current

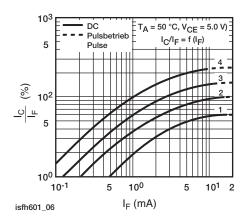


Fig. 6 - Current Transfer Ratio vs. Diode Current

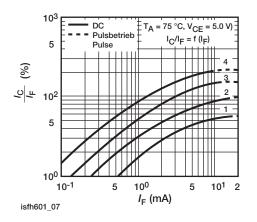


Fig. 7 - Current Transfer Ratio vs. Diode Current

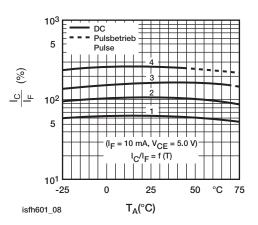


Fig. 8 - Current Transfer Ratio vs. Diode Current

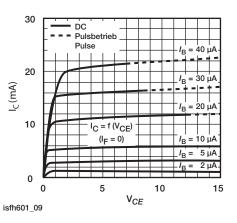


Fig. 9 - Transistor Characteristics

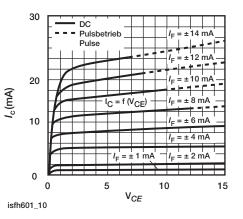
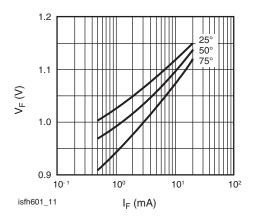


Fig. 10 - Output Characteristics

5

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Fig. 11 - Forward Voltage

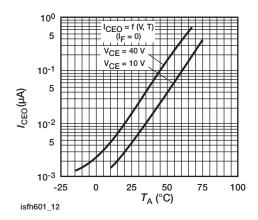


Fig. 12 - Collector Emitter Off-state Current

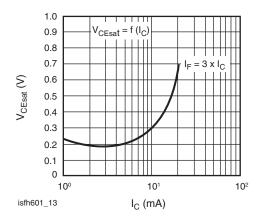


Fig. 13 - Saturation Voltage vs. Collector Current and Modulation Depth SFH601-1

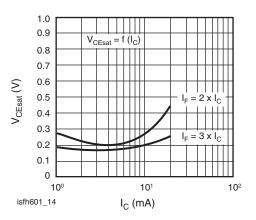


Fig. 14 - Saturation Voltage vs. Collector Current and Modulation Depth SFH601-2

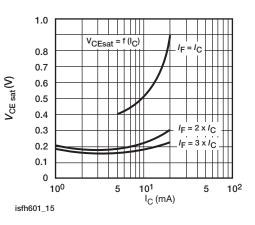


Fig. 15 - Saturation Voltage vs. Collector Current and Modulation Depth SFH601-3

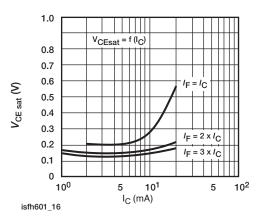


Fig. 16 - Saturation Voltage vs. Collector Current and Modulation Depth SFH601-4

Rev. 1.6, 23-Jul-15

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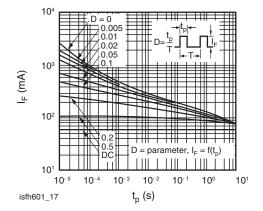


Fig. 17 - Permissible Pulse Load

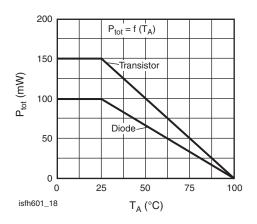


Fig. 18 - Permissible Power Dissipation for Transistor and Diode

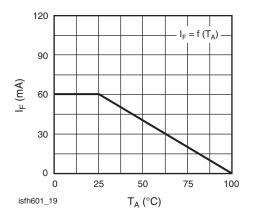
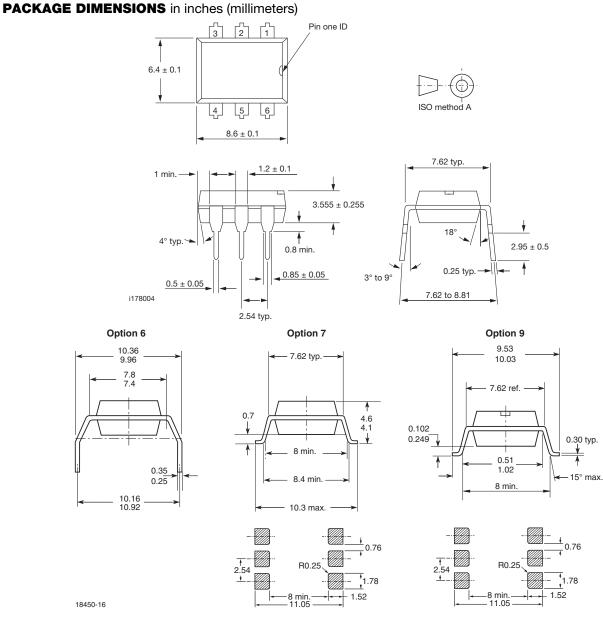


Fig. 19 - Permissible Forward Current Diode

Rev. 1.6, 23-Jul-15

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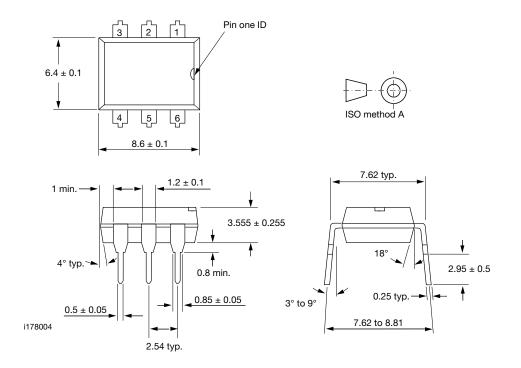
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DIP-6A

PACKAGE DIMENSIONS in inches (millimeters)



Note

The information in this document provides generic information but for specific information on a product the appropriate product datasheet should be used.

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