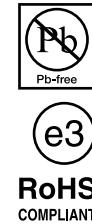
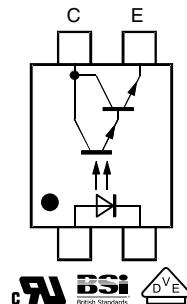
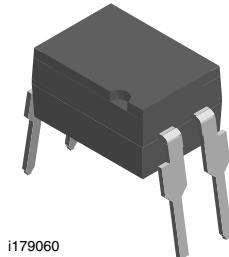


Optocoupler, Photodarlington Output



FEATURES

- High isolation test voltage 5300 VRMS
- Standard plastic DIP-4 package
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912

DESCRIPTION

The SFH655A is optically coupled isolators with a gallium arsenide infrared LED and a silicon photodarlington detector. Switching can be achieved while maintaining a high degree of isolation between driving and load circuits.

This optocouplers can be used to replace reed and mercury relays with advantages of long life, high speed switching and elimination of magnetic fields.

AGENCY APPROVALS

- UL - file no. E52744 system code H, double protection
- DIN EN 60747-5-2 (VDE 0884), IEC 60747-5-5
- DIN EN 60747-5-5 (VDE 0884) pending
- BSI IEC 60950; IEC 60065

ORDERING INFORMATION

S	F	H	6	#	#	A	-	#	#	#	#	DIP	Option 9
PART NUMBER							PACKAGE OPTION						
AGENCY CERTIFIED/PACKAGE							CTR (%)						
cUL, VDE							> 600						
DIP-4							SFH655A						
SMD-4, option 9							SFH655A-X009						

Note

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

ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25^{\circ}C$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Peak reverse voltage		V_{RM}	6	V
Forward continuous current		I_F	60	mA
Surge forward current	$t_p \leq 10\mu s$	I_{FSM}	2.5	A
Derate linearly from $25^{\circ}C$			1.33	$mW/^{\circ}C$
Power dissipation		P_{diss}	100	mW
OUTPUT				
Collector emitter breakdown voltage		BV_{CEO}	55	V
Emitter collector breakdown voltage		BV_{ECO}	6	V
Collector (load) current		I_C	125	mA
Derate linearly from $25^{\circ}C$			2	$mW/^{\circ}C$
Power dissipation		P_{diss}	150	mW

ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25^\circ\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
COUPLER				
Derate linearly from 25°C			3.33	$\text{mW}/^\circ\text{C}$
Total power dissipation		P_{tot}	250	mW
Storage temperature range		T_{stg}	-55 to +150	$^\circ\text{C}$
Operating temperature range		T_{amb}	-55 to +100	$^\circ\text{C}$
Soldering temperature ⁽¹⁾	max. 10 s, dip soldering distance to seating plane $\geq 1.5\text{ mm}$	T_{sld}	260	$^\circ\text{C}$

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)

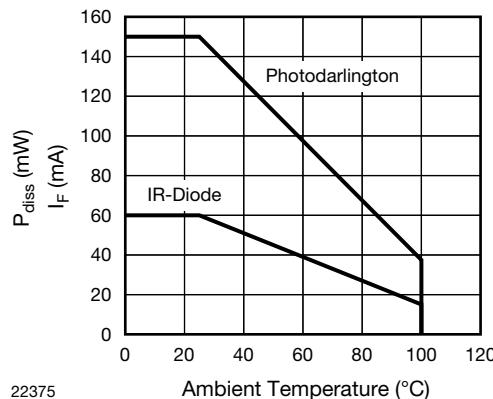


Fig. 1 - Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^\circ\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Forward voltage	$I_F = 10\text{ mA}$		V_F	-	1.15	1.5	V
Reverse current	$V_R = 6\text{ V}$		I_R	-	0.02	10	μA
Capacitance	$V_R = 0\text{ V}, f = 1\text{ MHz}$		C_O	-	50	-	pF
OUTPUT							
Collector emitter breakdown voltage	$I_{CE} = 100\text{ }\mu\text{A}$		BV_{CEO}	55	-	-	V
Emitter collector breakdown voltage	$I_{EC} = 10\text{ }\mu\text{A}$		BV_{ECO}	6	-	-	V
Collector emitter dark current	$V_{CE} = 40\text{ V}$		I_{CEO}	-	12	400	nA
Collector emitter capacitance	$V_{CE} = 0\text{ V}, f = 1\text{ MHz}$		C_{CE}	-	13.5	-	pF
COUPLER							
Collector emitter saturation voltage	$I_F = 20\text{ mA}, I_C = 5\text{ mA}$	SFH655A	V_{CESat}	-	-	1	V
Coupling capacitance	$V_{I-O} = 0\text{ V}, f = 1\text{ MHz}$		C_C	-	0.45	-	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 ($T_{amb} = 25^\circ C$, unless otherwise specified)

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Current transfer ratio	$I_F = 1 \text{ mA}$, $V_{CE} = 2 \text{ V}$	SFH655A	CTR	600	-	-	%

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	$t = 1 \text{ min}$	V_{ISO}	4420	V_{RMS}
Maximum transient isolation voltage		V_{IOTM}	10 000	V
Maximum repetitive peak isolation voltage		V_{IORM}	890	V
Isolation resistance	$V_{IO} = 500 \text{ V}$, $T_{amb} = 25^\circ C$	R_{IO}	$\geq 10^{12}$	Ω
	$V_{IO} = 500 \text{ V}$, $T_{amb} = 100^\circ C$	R_{IO}	$\geq 10^{11}$	Ω
	$V_{IO} = 500 \text{ V}$, $T_{amb} = 150^\circ C$ (construction test only)	R_{IO}	$\geq 10^9$	Ω
Output safety power		P_{SO}	400	mW
Input safety current		I_{SI}	275	mA
Input safety temperature		T_{SI}	175	$^\circ C$
Creepage distance	Standard DIP-4		≥ 7	mm
Clearance distance	Standard DIP-4		≥ 7	mm
Insulation thickness		DTI	≥ 0.4	mm
Partial discharge test voltage - routine test	100 %, $t_{test} = 1 \text{ s}$	V_{pd}	1.669	kV
Partial discharge test voltage - lot test (sample test)	$t_{Tr} = 60 \text{ s}$, $t_{test} = 10 \text{ s}$, (see fig. 2)	V_{pd}	1.424	kV

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

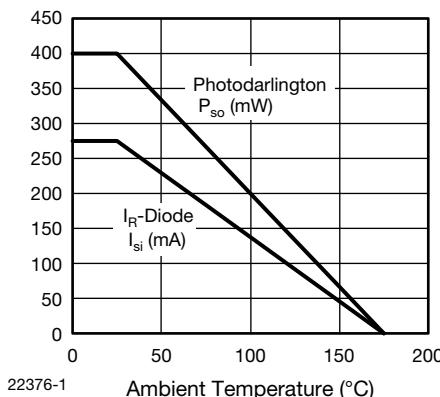


Fig. 2 - Derating Diagram

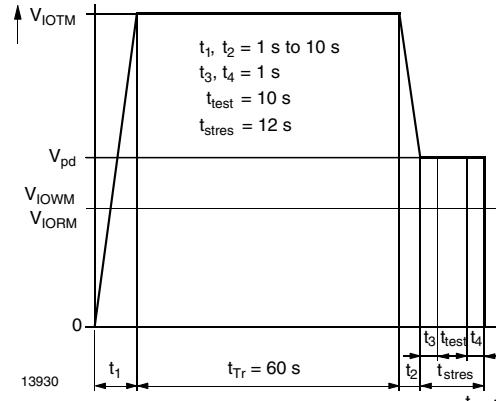


Fig. 3 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2 (VDE 0884); IEC 60747-5-5

SWITCHING CHARACTERISTICS ($T_{amb} = 25$ °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time (fig. 10, test circuit 1)	$V_{CC} = 10$ V, $I_C = 2$ mA, $R_L = 100$ Ω	SFH612A	t_{on}		16		μs
Turn-off time (fig. 10, test circuit 1)	$V_{CC} = 10$ V, $I_C = 2$ mA, $R_L = 100$ Ω	SFH612A	t_{off}		15		μs
Rise time (fig. 10, test circuit 1)	$V_{CC} = 10$ V, $I_C = 2$ mA, $R_L = 100$ Ω	SFH612A	t_r		14		μs
Fall time (fig. 10, test circuit 1)	$V_{CC} = 10$ V, $I_C = 2$ mA, $R_L = 100$ Ω	SFH612A	t_f		14		μs
Turn-on time (fig. 11, test circuit 2)	$V_{CC} = 2$ V, $I_C = 10$ mA, $R_L = 100$ Ω	SFH655A	t_{on}		31		μs
Turn-off time (fig. 11, test circuit 2)	$V_{CC} = 2$ V, $I_C = 10$ mA, $R_L = 100$ Ω	SFH655A	t_{off}		55		μs
Rise time (fig. 11, test circuit 2)	$V_{CC} = 2$ V, $I_C = 10$ mA, $R_L = 100$ Ω	SFH655A	t_r		27	250	μs
Fall time (fig. 11, test circuit 2)	$V_{CC} = 2$ V, $I_C = 10$ mA, $R_L = 100$ Ω	SFH655A	t_f		56	200	μs

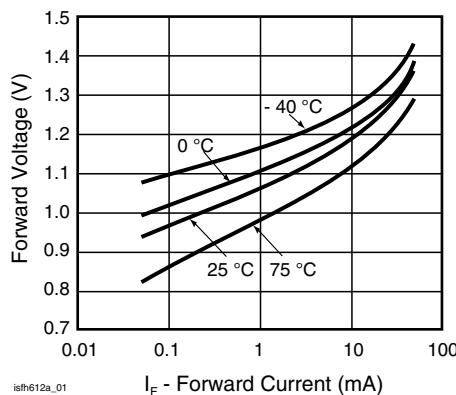
TYPICAL CHARACTERISTICS ($T_{amb} = 25$ °C, unless otherwise specified)

Fig. 4 - Forward Voltage vs. Forward Current

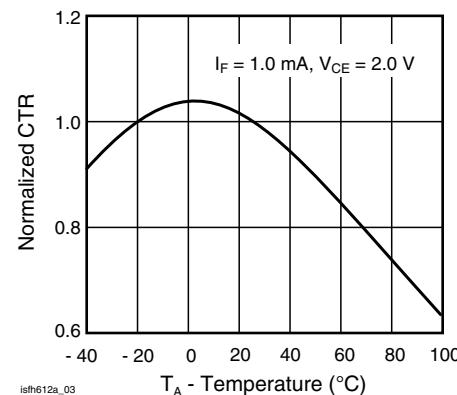


Fig. 6 - Normalized CTR vs. Temperature

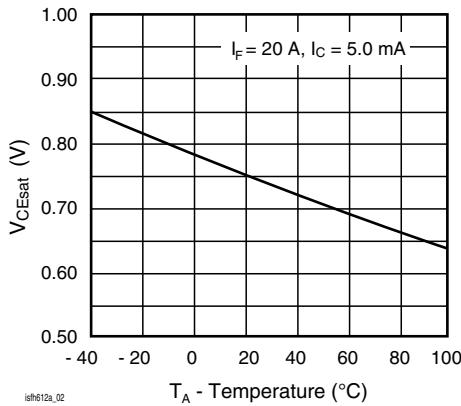


Fig. 5 - Collector Emitter Saturation Voltage vs. Temperature

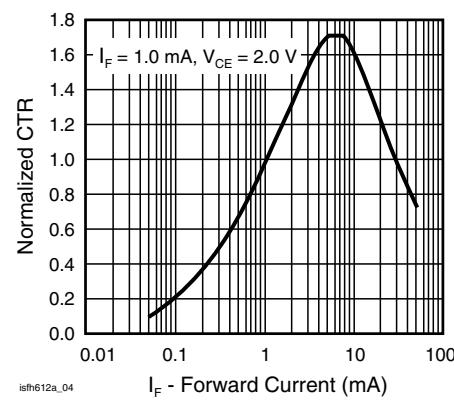


Fig. 7 - Normalized CTR vs. Forward Current

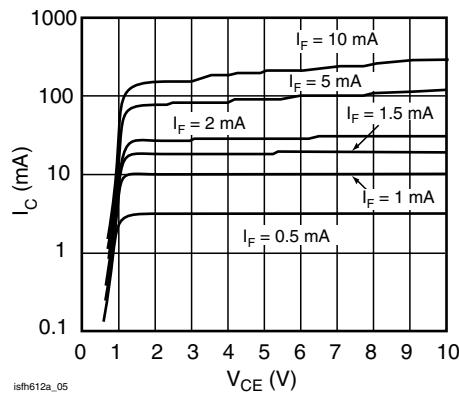


Fig. 8 - Collector Current vs. Collector Emitter Voltage

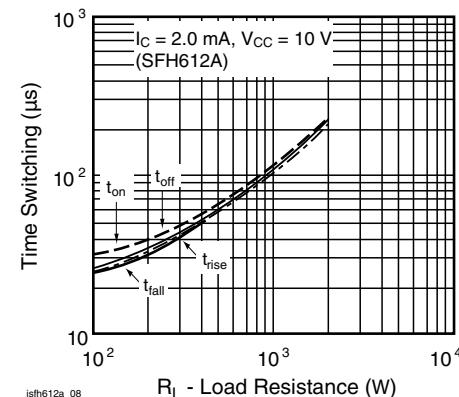


Fig. 11 - Switching Time vs. Load Resistor

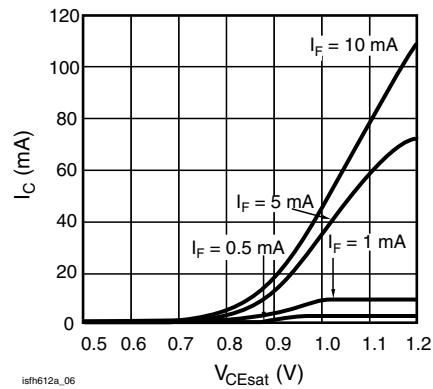


Fig. 9 - Collector Current vs. Collector Emitter Saturation Voltage

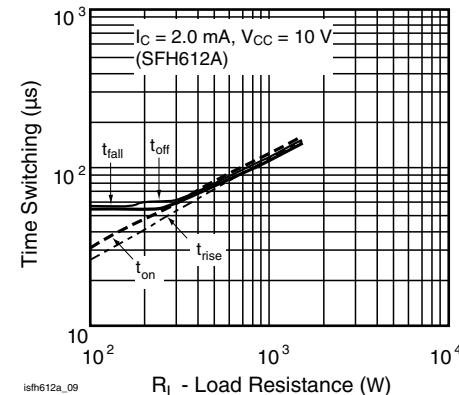


Fig. 12 - Switching Time vs. Load Resistor

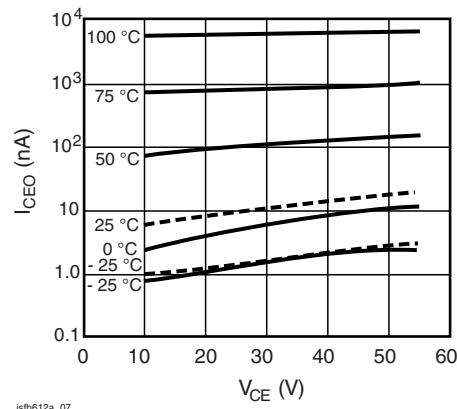
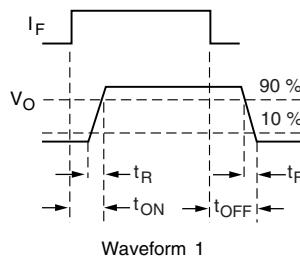
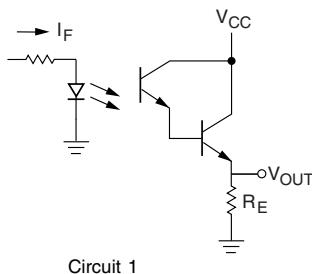
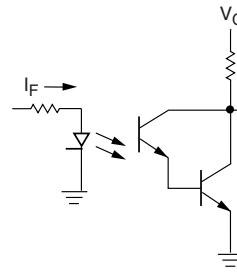
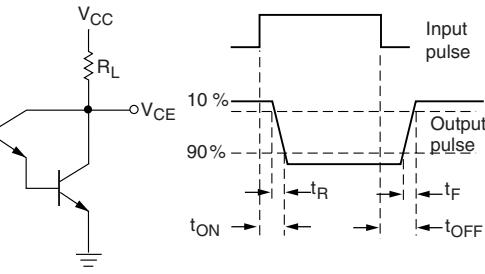
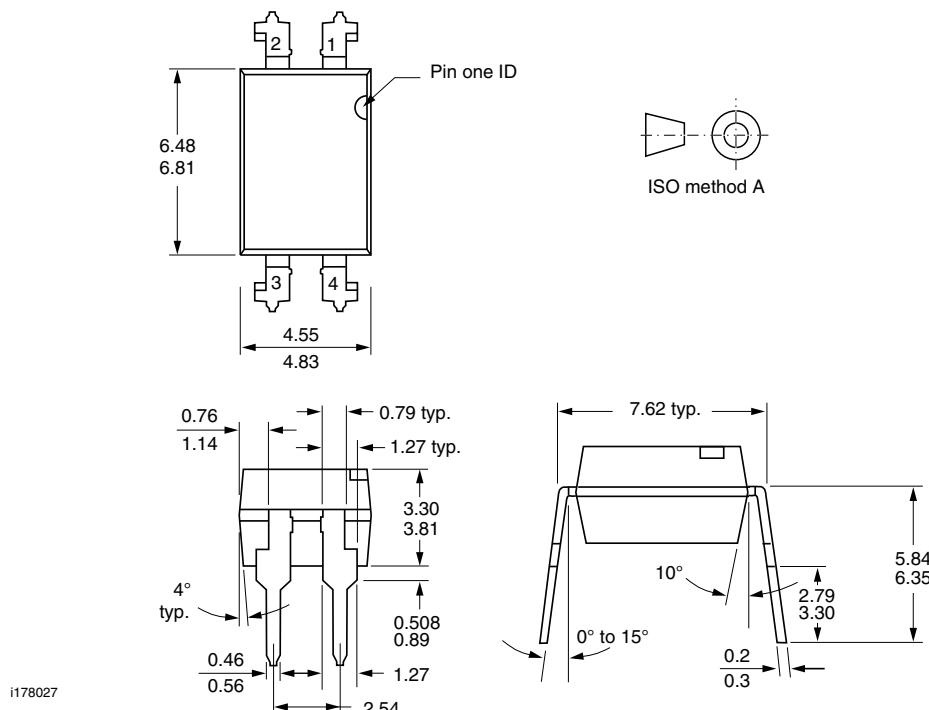


Fig. 10 - Collector Emitter Dark Current vs. Collector Emitter Voltage over Temperature

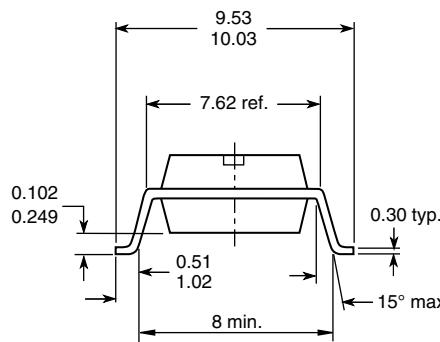

Circuit 1

Circuit 2

Waveform 2

isfh612a_10

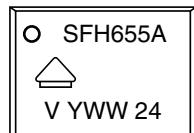
isfh612a_11

Fig. 13 - Switching Time Test Circuit and Waveforms
Fig. 14 - Switching Time Test Circuit and Waveforms
PACKAGE DIMENSIONS in millimeters


i178027

Option 9


18449

PACKAGE MARKING**Note**

- VDE logo is only printed on option 1 parts. Option information is not marked on the part

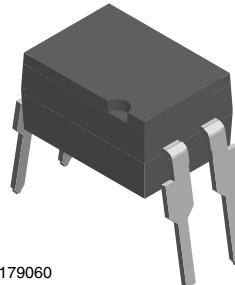
Footprint and Schematic Information for SFH655A

The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

Note that the 3D models for these parts can be found on the Vishay product page.

PART NUMBER	FOOTPRINT / SCHEMATIC
SFH655A	www.snapeda.com/part/SFH655A/Vishay/view-part
SFH655A-X009	www.snapeda.com/part/SFH655A-X009/Vishay/view-part

For technical issues and product support, please contact optocoupleranswers@vishay.com.



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