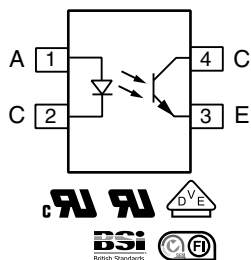




# Optocoupler, Phototransistor Output, High Reliability, 5300 V<sub>RMS</sub>



17448-5



## FEATURES

- Excellent CTR linearity depending on forward current
- Isolation test voltage, 5300 V<sub>RMS</sub>
- Fast switching times
- Low CTR degradation
- Low coupling capacitance
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS COMPLIANT

## DESCRIPTION

The SFH6156 features a variety of transfer ratios, low coupling capacitance and high isolation voltage. This coupler has a GaAs infrared diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic SMD package.

The coupling devices are designed for signal transmission between two electrically separated circuits.

## APPLICATIONS

- Switchmode power supply
- Telecom
- Battery powered equipment

## 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
- cUL tested to CSA 22.2 bulletin 5A
- BSI IEC 60950, IEC 60065
- FIMKO EN6005, EN60950-1

ORDERING INFORMATION				
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">S</div> <div style="border: 1px solid black; padding: 2px 5px;">F</div> <div style="border: 1px solid black; padding: 2px 5px;">H</div> <div style="border: 1px solid black; padding: 2px 5px;">6</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">5</div> <div style="border: 1px solid black; padding: 2px 5px;">6</div> <div style="border: 1px solid black; padding: 2px 5px;">-</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">X</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">T</div> </div> <p style="text-align: center; margin-top: 5px;"> <span style="margin-right: 100px;">PART NUMBER</span> <span style="margin-right: 50px;">CTR BIN</span> <span style="margin-right: 50px;">PACKAGE OPTION</span> <span>TAPE AND REEL</span> </p>				
AGENCY CERTIFIED/PACKAGE	CTR (%)			
	10 mA			
UL, cUL, BSI, FIMKO	40 to 80	63 to 125	100 to 200	160 to 320
SMD-4, 100 mil, pitch	SFH6156-1	SFH6156-2	SFH6156-3	SFH6156-4
	SFH6156-1T	SFH6156-2T	SFH6156-3T	SFH6156-4T
VDE, UL, cUL, BSI, FIMKO	40 to 80	63 to 125	100 to 200	160 to 320
SMD-4, 100 mil, pitch	SFH6156-1X001	SFH6156-2X001	SFH6156-3X001	SFH6156-4X001
	SFH6156-1X001T	SFH6156-2X001T	SFH6156-3X001T	SFH6156-4X001T



ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		$V_R$	6	V
DC forward current		$I_F$	60	mA
Surge forward current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	2.5	A
<b>OUTPUT</b>				
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	mA
<b>COUPLER</b>				
Isolation test voltage between emitter and detector	$t = 1\text{ s}$	$V_{ISO}$	5300	$V_{RMS}$
Creepage distance			$\geq 7$	mm
Clearance distance			$\geq 7$	mm
Insulation thickness between emitter and detector			$\geq 0.4$	mm
Comparative tracking index per DIN IEC112/VDE0303 part 1		CTI	$\geq 175$	
Isolation resistance	$V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Storage temperature range		$T_{stg}$	- 55 to + 150	$^{\circ}\text{C}$
Ambient temperature range		$T_{amb}$	- 55 to +100	$^{\circ}\text{C}$
Soldering temperature <sup>(1)</sup>	max. 10 s	$T_{sld}$	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.
- <sup>(1)</sup> Refer to reflow profile for soldering conditions for surface mounted devices (SMD).



Fig. 1 - Permissible Power Dissipation vs. Ambient Temperature





SWITCHING CHARACTERISTICS							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>NON-SATURATED</b>							
Rise time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 75 \text{ } \Omega$		$t_r$		2		$\mu\text{s}$
Fall time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 75 \text{ } \Omega$		$t_f$		2		$\mu\text{s}$
Turn-on time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 75 \text{ } \Omega$		$t_{on}$		3		$\mu\text{s}$
Turn-off time	$I_F = 10 \text{ mA}$ , $V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 75 \text{ } \Omega$		$t_{off}$		2.3		$\mu\text{s}$
Cut-off frequency	$I_F = 10 \text{ mA}$ , $V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 75 \text{ } \Omega$		$f_{ctr}$		250		kHz
<b>SATURATED</b>							
Rise time	$V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 1 \text{ k}\Omega$ , $I_F = 20 \text{ mA}$	SFH6156-1	$t_r$		2		$\mu\text{s}$
	$V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 1 \text{ k}\Omega$ , $I_F = 10 \text{ mA}$	SFH6156-2	$t_r$		3		$\mu\text{s}$
		SFH6156-3	$t_r$		3		$\mu\text{s}$
Fall time	$V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 1 \text{ k}\Omega$ , $I_F = 20 \text{ mA}$	SFH6156-1	$t_f$		11		$\mu\text{s}$
	$V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 1 \text{ k}\Omega$ , $I_F = 10 \text{ mA}$	SFH6156-2	$t_f$		14		$\mu\text{s}$
		SFH6156-3	$t_f$		14		$\mu\text{s}$
Turn-on time	$V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 1 \text{ k}\Omega$ , $I_F = 20 \text{ mA}$	SFH6156-1	$t_{on}$		3		$\mu\text{s}$
	$V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 1 \text{ k}\Omega$ , $I_F = 10 \text{ mA}$	SFH6156-2	$t_{on}$		4.2		$\mu\text{s}$
		SFH6156-3	$t_{on}$		4.2		$\mu\text{s}$
Turn-off time	$V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 1 \text{ k}\Omega$ , $I_F = 20 \text{ mA}$	SFH6156-1	$t_{off}$		18		$\mu\text{s}$
	$V_{CC} = 5 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$ , $R_L = 1 \text{ k}\Omega$ , $I_F = 10 \text{ mA}$	SFH6156-2	$t_{off}$		23		$\mu\text{s}$
		SFH6156-3	$t_{off}$		23		$\mu\text{s}$

SAFETY AND INSULATION RATINGS							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
Climatic classification (according to IEC 68 part 1)				55/100/21			
Comparative tracking index		CTI	175		399		
$V_{IOTM}$		$V_{IOTM}$	10 000			$V_{peak}$	
$V_{IORM}$		$V_{IORM}$	890			$V_{peak}$	
$P_{SO}$		$P_{SO}$			400	mW	
$I_{SI}$		$I_{SI}$			275	mA	
$T_{SI}$		$T_{SI}$			175	$^\circ\text{C}$	
Creepage distance			7			mm	
Clearance distance			7			mm	
Insulation thickness, reinforced rated	per IEC 60950 2.10.5.1		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** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)



isfh615a\_01

Fig. 2 - Linear Operation (without Saturation)



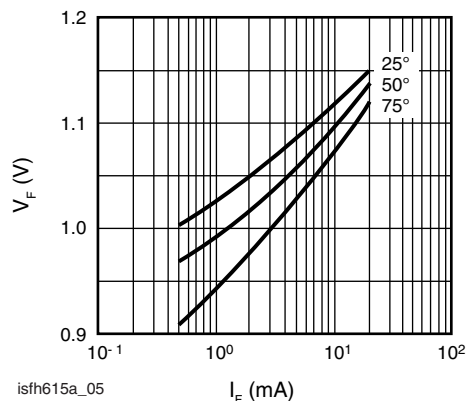
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Fig. 5 - Output Characteristics (Typ.) Collector Current vs. Collector Emitter Voltage



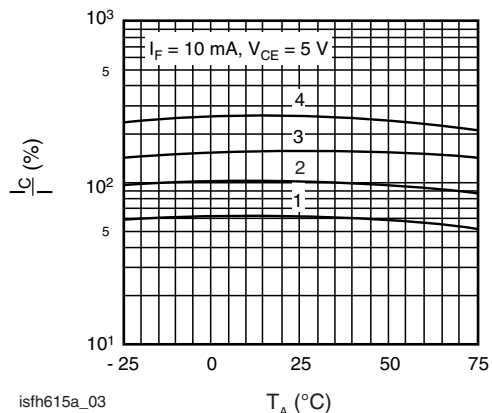
isfh615a\_02

Fig. 3 - Switching Operation (with Saturation)



isfh615a\_05

Fig. 6 - Diode Forward Voltage (Typ.) vs. Forward Current



isfh615a\_03

Fig. 4 - Current Transfer Ratio (Typ.) vs. Temperature



isfh615a\_06

Fig. 7 - Transistor Capacitance (Typ.) vs. Collector Emitter Voltage

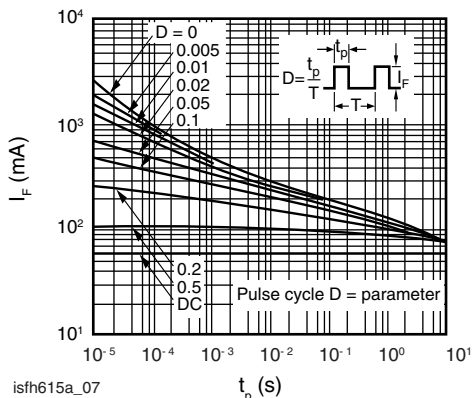


Fig. 8 - Permissible Pulse Handling Capability Forward Current vs. Pulse Width

**PACKAGE DIMENSIONS** millimeters



i178029\_11

**PACKAGE MARKING** (example of SFH6156-2X001T)



**Notes**

- VDE logo is only marked on option 1 parts.
- Tape and reel suffix (T) is not part of the package marking.



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