

#### FEATURES

- **Variety of Current Transfer Ratios at  $I_F=10$  mA**
  - SFH615A-1, 40–80%
  - SFH615A-2, 63–125%
  - SFH615A-3, 100–200%
  - SFH615A-4, 160–320%
  - SFH615A-12, 40–125%
  - SFH615A-23, 63–200%
  - SFH615A-34, 100–320%
  - SFH615A-13, 40–200%
  - SFH615A-24, 63–320%
  - SFH615A-14, 40–320%
- **Low CTR Degradation**
- **Good CTR Linearity Depending on Forward Current**
- **Withstand Test Voltage, 5300 V<sub>RMS</sub>**
- **High Collector-Emitter Voltage,  $V_{CEO}=70$  V**
- **Low Saturation Voltage**
- **Fast Switching Times**
- **Field-Effect Stable by TRIOS (Transparent IOn Shield)**
- **Temperature Stable**
- **Low Coupling Capacitance**
- **End-Stackable, .100" (2.54 mm) Spacing**
- **High Common-Mode Interference Immunity (Unconnected Base)**
- **Underwriters Lab File #52744**
- **VDE 0884 Available with Option 1**

#### DESCRIPTION

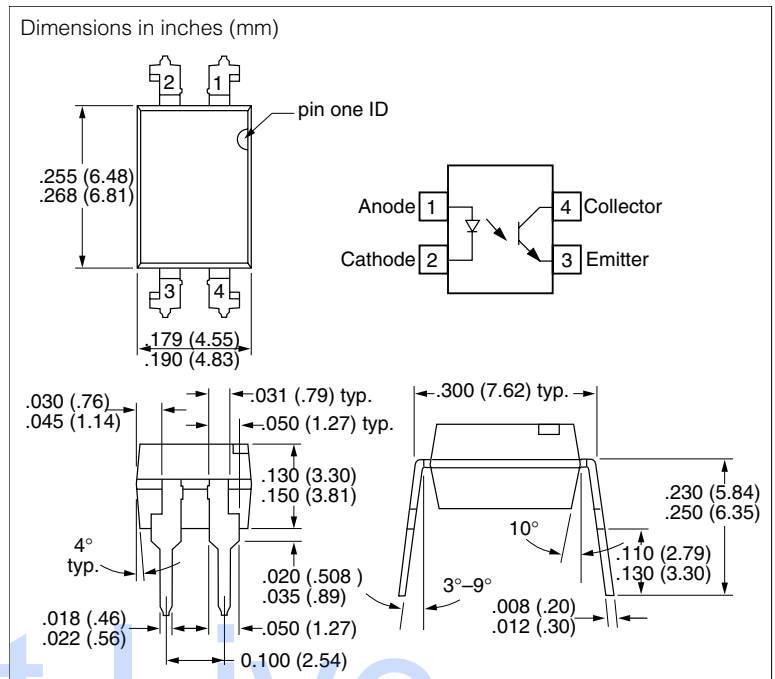
The SFH615A features a large variety of transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 package.

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

The couplers are end-stackable with 2.54 mm lead spacing.

Creepage and clearance distances of >8.0 mm are achieved with option 6. This version complies with IEC 950 (DIN VDE 0805) for reinforced insulation up to an operation voltage of 400 V<sub>RMS</sub> or DC.

Specifications subject to change.



#### Maximum Ratings

##### Emitter

Reverse Voltage .....	6.0 V
DC Forward Current .....	60 mA
Surge Forward Current ( $t_p \leq 10 \mu s$ ) .....	2.5 A
Total Power Dissipation .....	100 mW

##### Detector

Collector-Emitter Voltage .....	70 V
Emitter-Collector Voltage .....	7.0 V
Collector Current .....	50 mA
Collector Current ( $t_p \leq 1.0$ ms) .....	100 mA
Total Power Dissipation .....	150 mW

##### Package

Isolation Test Voltage between Emitter and Detector, refer to Climate DIN 40046, part 2, Nov. 74, $t=1.0$ s .....	5300 V <sub>RMS</sub>
Creepage .....	$\geq 7.0$ mm
Clearance .....	$\geq 7.0$ mm
Insulation Thickness between Emitter and Detector .....	$\geq 0.4$ mm
Comparative Tracking Index per DIN IEC 112/VDE0 303, part 1 .....	$\geq 175$
Isolation Resistance	
$V_{IO}=500$ V, $T_A=25^\circ C$ .....	$\geq 10^{12} \Omega$
$V_{IO}=500$ V, $T_A=100^\circ C$ .....	$\geq 10^{11} \Omega$
Storage Temperature Range .....	$-55$ to $+150^\circ C$
Ambient Temperature Range .....	$-55$ to $+100^\circ C$
Junction Temperature .....	$100^\circ C$
Soldering Temperature (max. 10 s. Dip Soldering Distance to Seating Plane $\geq 1.5$ mm) .....	$260^\circ C$

### Characteristics ( $T_A=25^\circ\text{C}$ )

Parameter	Sym.	Value	Unit	Condition
<b>Emitter (IR GaAs)</b>				
Forward Voltage	$V_F$	1.25( $\leq 1.65$ )	V	$I_F=60\text{ mA}$
Reverse Current	$I_R$	0.01( $\leq 10$ )	$\mu\text{A}$	$V_R=6.0\text{ V}$
Capacitance	$C_0$	13	pF	$V_R=0\text{ V}$ , $f=1.0\text{ MHz}$
Thermal Resistance	$R_{thJA}$	750	K/W	—
<b>Detector (Si Phototransistor)</b>				
Capacitance	$C_{CE}$	5.2	pF	$V_{CE}=5.0\text{ V}$ , $f=1.0\text{ MHz}$
Thermal Resistance	$R_{thJA}$	500	K/W	—
<b>Package</b>				
Collector-Emitter Saturation Voltage	$V_{CEsat}$	0.25( $\leq 0.4$ )	V	$I_F=10\text{ mA}$ , $I_C=2.5\text{ mA}$
Coupling Capacitance	$C_C$	0.4	pF	—

### Current Transfer Ratio ( $I_C/I_F$ at $V_{CE}=5.0\text{ V}$ ) and Collector-emitter Leakage Current

Parameter	-1	-2	-3	-4	-12	-23	-34	-13	-24	-14	Unit
$I_C/I_F$ ( $I_F=10\text{ mA}$ )	40–80	63–125	100–200	160–320	40–125	63–200	100–320	40–200	63–320	40–320	%
$I_C/I_F$ ( $I_F=1.0\text{ mA}$ )	30(>13)	45(>22)	70(>34)	90(>56)	30(>13)	45(>22)	70(>34)	30(>13)	45(>22)	30(>13)	
Collector-Emitter Leakage Current, $I_{CEO}$ , $V_{CE}=10\text{ V}$	2.0( $\leq 50$ )	2.0( $\leq 50$ )	5.0( $\leq 100$ )	5.0( $\leq 100$ )	2.0( $\leq 50$ )	5.0( $\leq 100$ )	5.0( $\leq 100$ )	5.0( $\leq 100$ )	5.0( $\leq 100$ )	5.0( $\leq 100$ )	nA

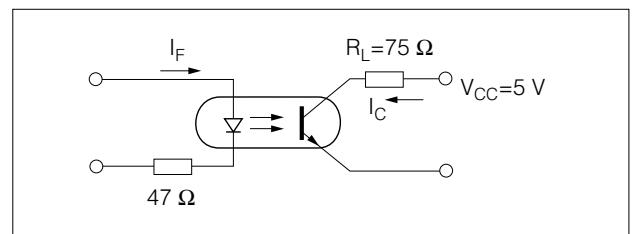
**Table 1.**  $I_F=10\text{ mA}$ ,  $V_{CC}=5.0\text{ V}$ ,  $T_A=25^\circ\text{C}$ , without Saturation

Parameter	Sym.	Value	Unit
Load Resistance	$R_L$	75	$\Omega$
Turn-on Time	$t_{on}$	3.0	$\mu\text{s}$
Rise Time	$t_r$	2.0	
Turn-off Time	$t_{off}$	2.3	
Fall Time	$t_f$	2.0	
Cut-off Frequency	$F_{CO}$	250	

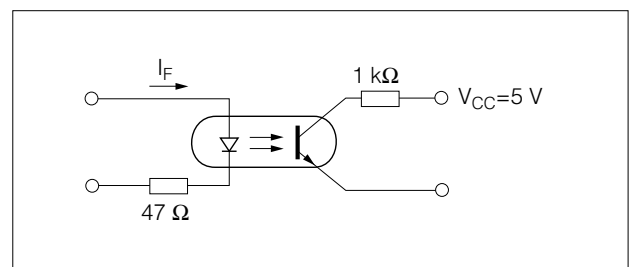
**Table 2.**  $V_{CC}=5.0\text{ V}$ ,  $T_A=25^\circ\text{C}$ , with Saturation

Parameter	Sym.	Switching Time by Dash Numbers			Unit
		-1, -12, -13 $I_F=20\text{ mA}$	-2, -3, -23 $I_F=10\text{ mA}$	-4, -34, -24 $I_F=5.0\text{ mA}$	
Load Resistance	$R_L$	1000	1000	1000	$\Omega$
Turn-on Time	$t_{on}$	3.0	4.2	6.0	$\mu\text{s}$
Rise Time	$t_r$	2.0	3.0	4.6	
Turn-off Time	$t_{off}$	18	23	25	
Fall Time	$t_f$	11	14	15	

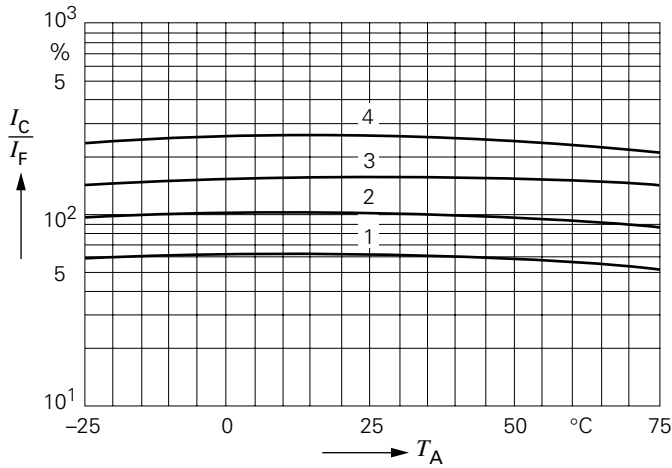
**Figure 1.** Switching Times (Typical) Linear Operation (without saturation)



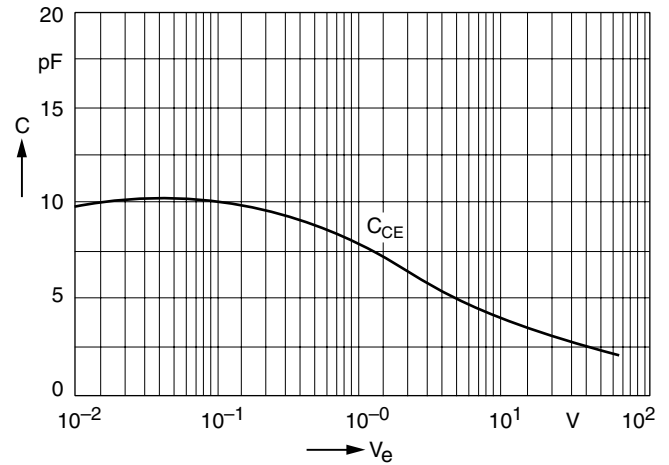
**Figure 2.** Switching Operation (with saturation)



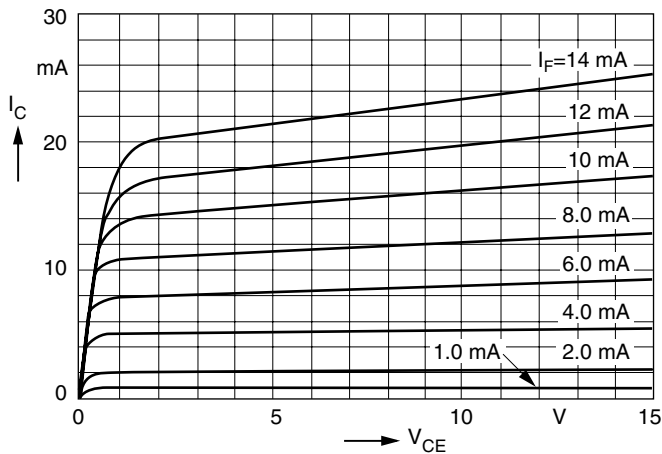
**Figure 3. Current Transfer Ratio (typical) vs. Temperature**  
 $I_F=10\text{ mA}$ ,  $V_{CE}=5.0\text{ V}$



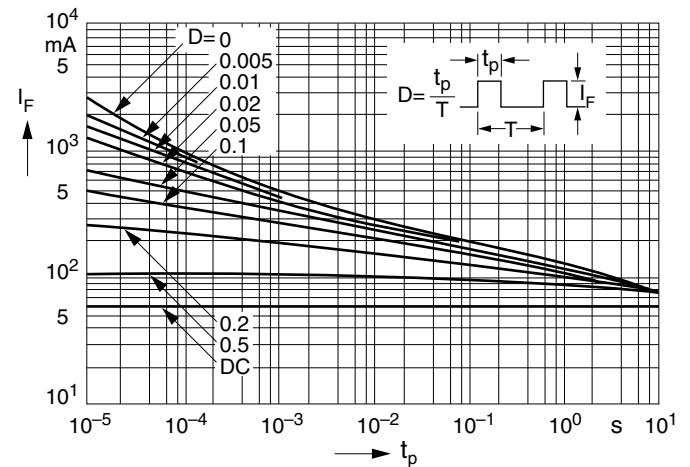
**Figure 6. Transistor Capacitance (typical) vs. Collector-emitter Voltage**  
 $T_A=25^\circ\text{C}$ ,  $f=1.0\text{ MHz}$



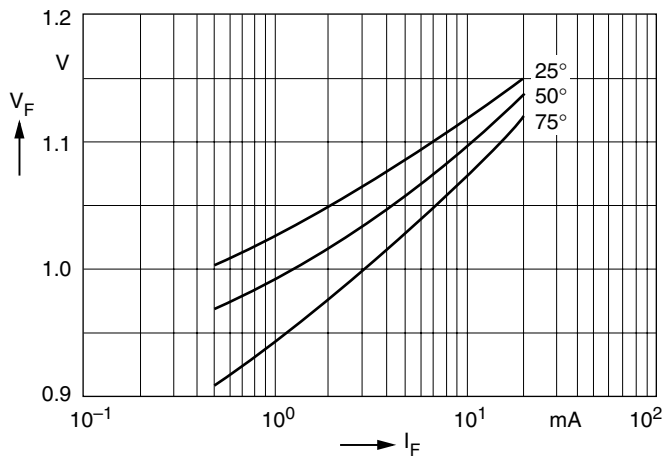
**Figure 4. Output Characteristics (typical) Collector Current vs. Collector-emitter Voltage**  
 $T_A=25^\circ\text{C}$



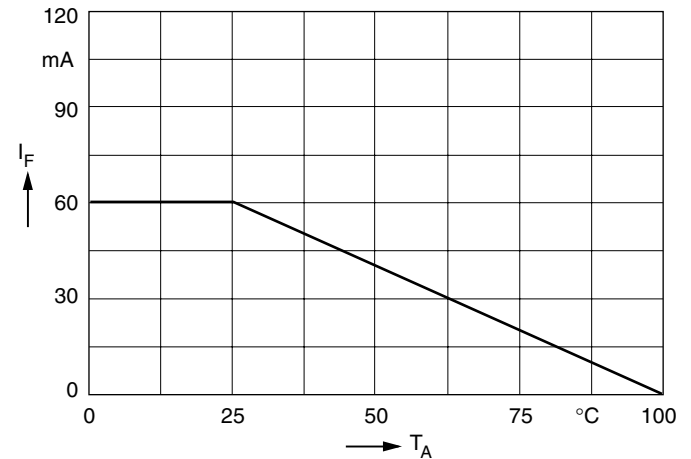
**Figure 7. Permissible Pulse Handling Capability. Forward Current vs. Pulse Width**  
 Pulse cycle  $D$ =parameter,  $T_A=25^\circ\text{C}$



**Figure 5. Diode Forward Voltage (typical) vs. Forward Current**



**Figure 8. Permissible Power Dissipation vs. Ambient Temperature**



**Figure 9. Permissible Diode Forward Current vs. Ambient Temperature**

