SFH615A

5.3 kV TRIOS® Optocoupler
High Reliability

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_{RMS}**
- **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

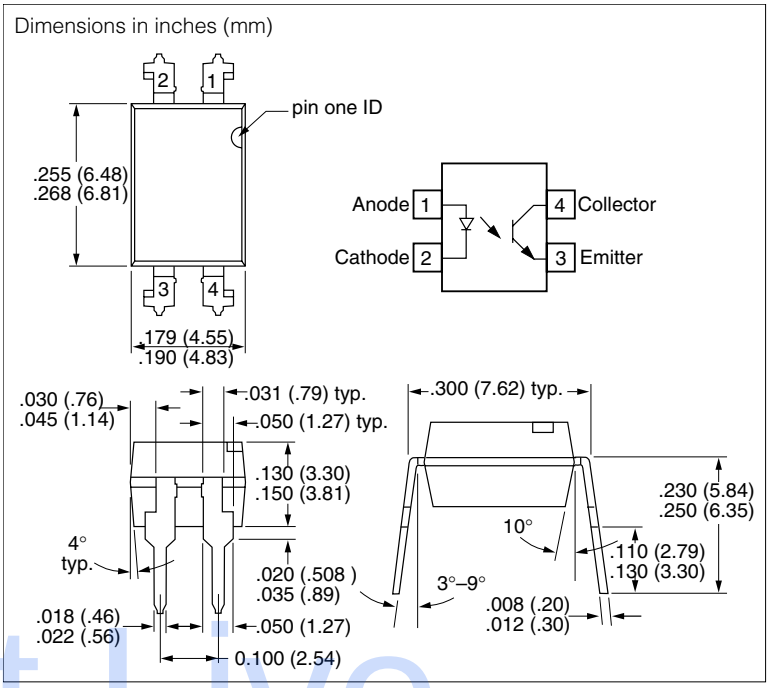
The SFH615A features a large variety of transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 package.

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_{RMS} or DC.

Specifications subject to change.



Maximum Ratings

Emitter

Reverse Voltage ..... 6.0 V
DC Forward Current ..... 60 mA
Surge Forward Current (t_P≤10 µs) ..... 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≤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_{RMS}
Creepage ..... ≥7.0 mm
Clearance ..... ≥7.0 mm
Insulation Thickness between Emitter and Detector ..... ≥0.4 mm
Comparative Tracking Index per DIN IEC 112/VDE0 303, part 1 ..... ≥175
Isolation Resistance
V_{IO}=500 V, T_A=25°C ..... ≥10^{12} Ω
V_{IO}=500 V, T_A=100°C ..... ≥10^{11} Ω
Storage Temperature Range ..... –55 to +150°C
Ambient Temperature Range ..... –55 to +100°C
Junction Temperature ..... 100°C
Soldering Temperature (max. 10 s. Dip Soldering Distance to Seating Plane ≥1.5 mm) ..... 260°C

Characteristics (T_A=25°C)

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

Current Transfer Ratio (I_C/I_F at V_{CE}=5.0 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 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 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 V	2.0(≤50)	2.0(≤50)	5.0(≤100)	5.0(≤100)	2.0(≤50)	5.0(≤100)	5.0(≤100)	5.0(≤100)	5.0(≤100)	5.0(≤100)	nA

Table 1. I_F=10 mA, V_{CC}=5.0 V, T_A=25°C, without Saturation

Parameter	Sym.	Value	Unit
Load Resistance	R_L	75	Ω
Turn-on Time	t_{on}	3.0	µs
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	kHz

Table 2. V_{CC}=5.0 V, T_A=25°C, with Saturation

Parameter	Sym.	Switching Time by Dash Numbers			Unit
		-1, -12, -13 I_F=20 mA	-2, -3, -23 I_F=10 mA	-4, -34, -24 I_F=5.0 mA	
Load Resistance	R_L	1000	1000	1000	Ω
Turn-on Time	t_{on}	3.0	4.2	6.0	µs
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)

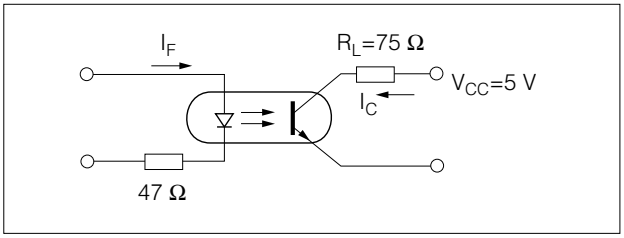


Figure 2. Switching Operation (with saturation)

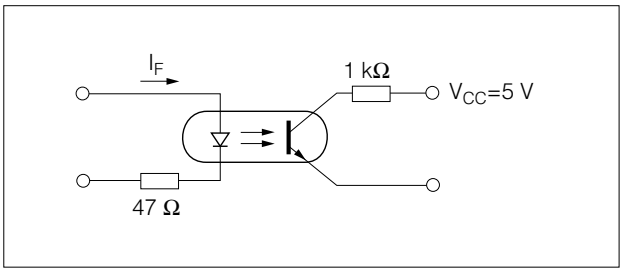


Figure 3. Current Transfer Ratio (typical) vs. Temperature
I_F=10 mA, V_{CE}=5.0 V

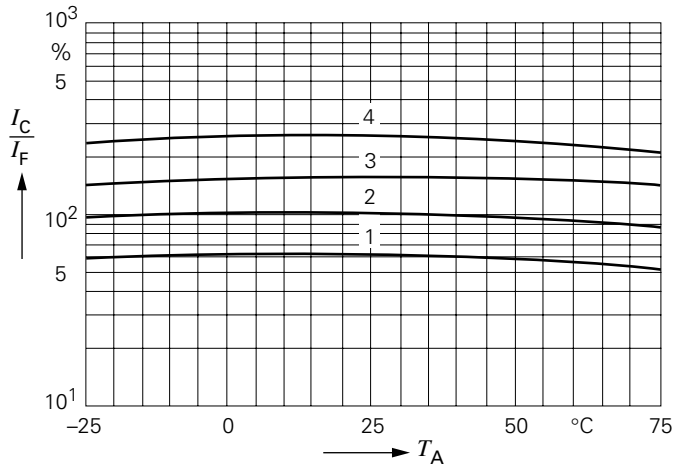


Figure 4. Output Characteristics (typical) Collector Current vs. Collector-emitter Voltage T_A=25°C

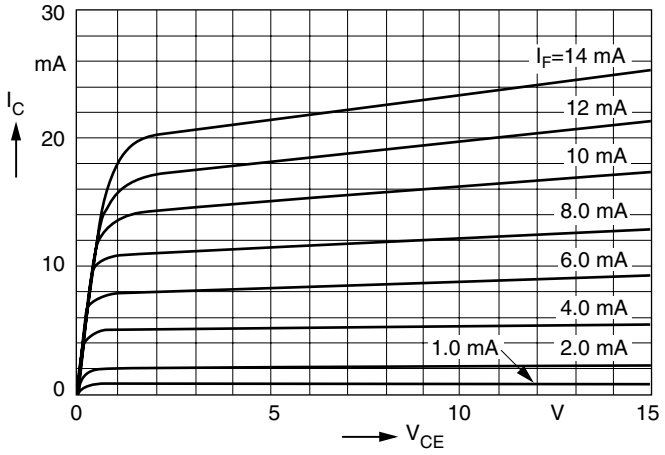


Figure 5. Diode Forward Voltage (typical) vs. Forward Current

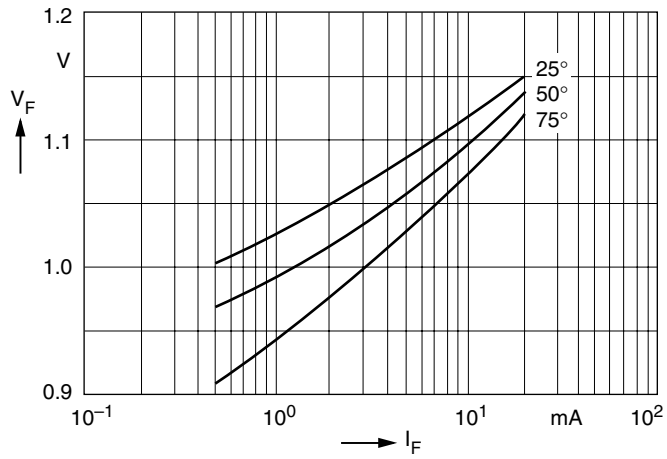


Figure 6. Transistor Capacitance (typical) vs. Collector-emitter Voltage T_A=25°C, f=1.0 MHz

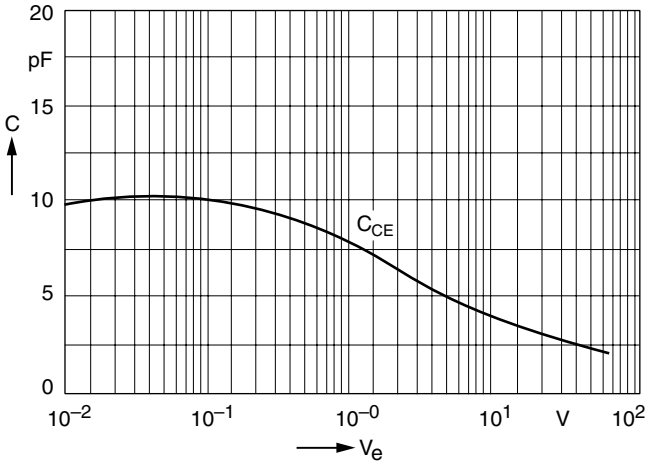


Figure 7. Permissible Pulse Handling Capability. Forward Current vs. Pulse Width Pulse cycle D=parameter, T_A=25°C

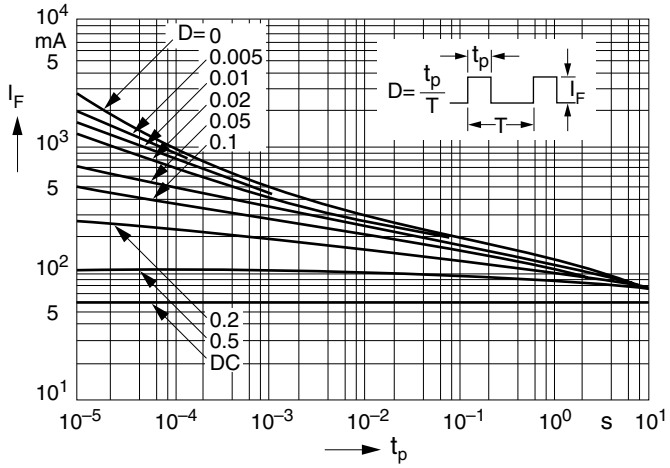


Figure 8. Permissible Power Dissipation vs. Ambient Temperature

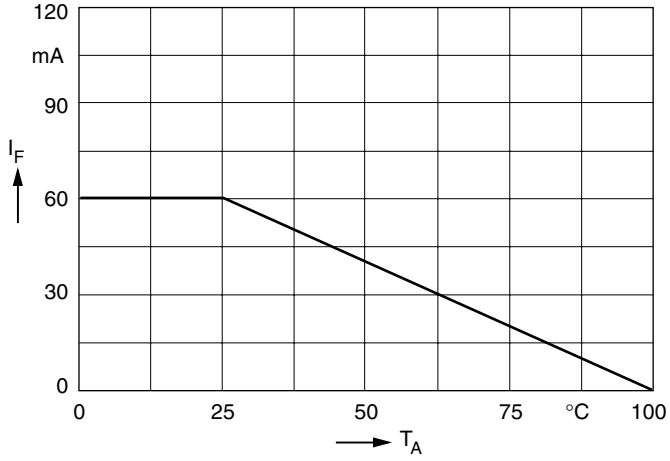


Figure 9. Permissible Diode Forward Current vs. Ambient Temperature