SFH640

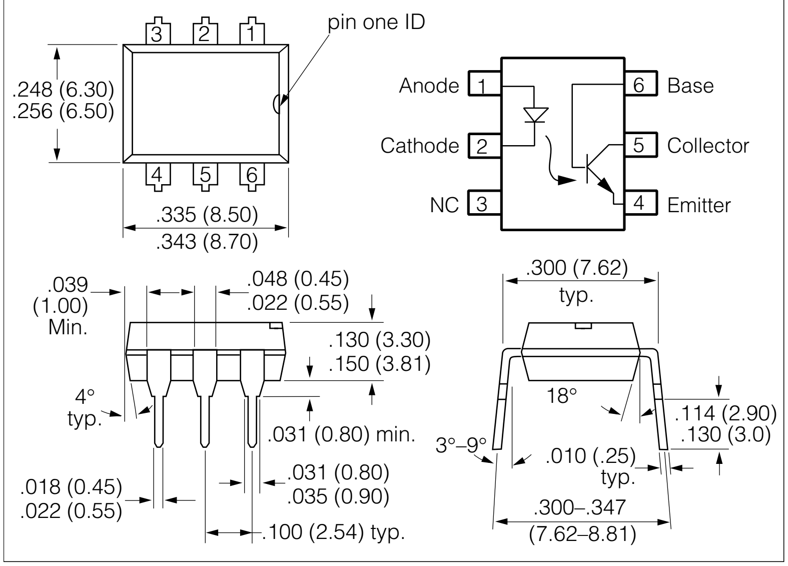
5.3 kV TRIOS® High BV_{CER} Voltage Phototransistor Optocoupler

FEATURES
- **CTR at I_F=10 mA, V_{CE}=10 V**
  SFH640-1, 40-80%
  SFH640-2, 63-125%
  SFH640-3*, 100-200%
- **Good CTR Linearity with Forward Current**
- **Low CTR Degradation**
- **Very High Collector-emitter Breakdown Voltage, BV_{CER}=300 V**
- **Isolation Test Voltage: 5300 V_{RMS}**
- **Low Coupling Capacitance**
- **High Common Mode Transient Immunity**
- **Phototransistor Optocoupler**
  6 Pin DIP Package with Base Connection
- **Field Effect Stable by TRIOS**
  (TRansparent IOn Shield)
- **VDE 0884 Available with Option 1**
- **Underwriters Lab File #E52744**

DESCRIPTION
The SFH 640 is an optocoupler with very high BVCER, a minimum of 300 volts. It is intended for telecommunications applications or any DC application requiring a high blocking voltage. The SFH640 is a “better than” replacement for H11D1.

*Supplies from this group can't always be guaranteed due to unforeseeable yield spread.

Dimensions in inches (mm)



Maximum Ratings (T_A=25°C)

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	300 V
Collector-base Voltage	300 V
Emitter-base Voltage	7.0 V
Collector Current	50 mA
Surge Collector Current (t_P≤1.0 ms)	100 mA
Total Power Dissipation	300 mW

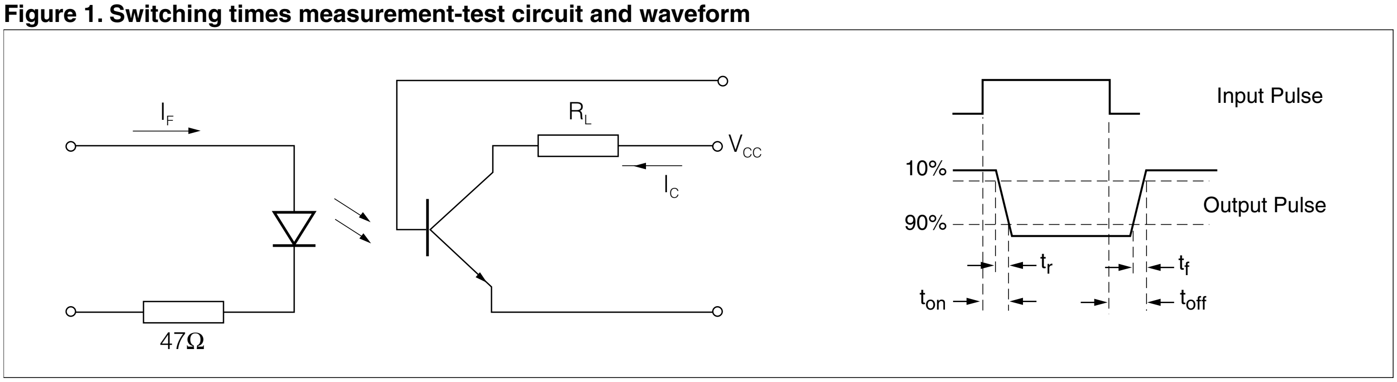
Package

Isolation Test Voltage (between emitter and detector, refer to climate DIN 40046 part 2 Nov. 74)	5300 V_{RMS}/7500 V_{PK}
Isolation Resistance	
V_{IO}=500 V, T_A=25°C	≥10^{12} Ω
V_{IO}=500 V, T_A=100°C	≥10^{11} Ω
Insulation Thickness between Emitter and Detector	≥0.4 mm
Creepage	≥7.0 mm
Clearance	≥7.0 mm
Comparative Tracking Index per DIN IEC 112/VDE 0303, part1	175
Storage Temperature Range	–55°C to +150°C
Operating Temperature Range	–55°C to +100°C
Junction Temperature	100°C
Soldering Temperature (max. 10 s, dip soldering: distance to seating plane≥1.5 mm)	260°C

Table 1. Characteristics (T_A=25°C, unless otherwise specified)

	Symbol	Min	Typ	Max	Unit	Condition
Emitter						
Forward Voltage	V_F	—	1.1	1.5	V	I_F=10 mA
Reverse Voltage	V_R	6.0	—	—	V	I_R=10 µA
Reverse Current	I_R	—	0.01	10	µA	V_R=6.0 V
Capacitance	C_O	—	25	—	pF	V_R=0 V, f=1.0 MHz
Thermal Resistance	R_{thJA}	—	750	—	K/W	—
Detector						
Voltage Collector-emitter Emitter-base	 BV_{CER} BV_{BEO}	 300 7.0	—	—	 V V	 I_{CE}=1.0 mA, R_{BE}=1.0 MΩ I_{EB}=10 µA
Capacitance	C_{CE} C_{CB} C_{EB}	—	7.0 8.0 38	—	pF pF pF	V_{CE}=10 V, f=1.0 MHz V_{CB}=10 V, f=1.0 MHz V_{EB}=5.0 V, f=1.0 MHz
Thermal Resistance	R_{thJA}	—	250	—	K/W	—
Package						
Coupling Capacitance	C_C	—	0.6	—	pF	—
Coupling Transfer Ratio SFH640-1 SFH640-2 SFH640-3 	 I_C/I_F I_C/I_F I_C/I_F 	 40 13 63 22 100 34	 30 45 70	 80 125 200 	 % % % 	 I_F=10 mA, V_{CE}=10 V I_F=1.0 mA, V_{CE}=10 V I_F=10 mA, V_{CE}=10 V I_F=1.0 mA, V_{CE}=10 V I_F=10 mA, V_{CE}=10 V I_F=1.0 mA, V_{CE}=10 V
Saturation Voltage, Collector-emitter SFH640-1 SFH640-2 SFH640-3	 V_{CEsat} V_{CEsat} V_{CEsat}	—	 0.25 0.25 0.25	 0.4 0.4 0.4	 V V V	 I_F=10 mA, I_C=2.0 mA I_F=10 mA, I_C=3.2 mA I_F=10 mA, I_C=5.0 mA
Leakage Current, Collector-emitter	I_{CER}	—	1.0	100	nA	V_{CE}=200 V, R_{BE}=1.0 MΩ

Figure 1. Switching times measurement-test circuit and waveform



Switching Times (Typical)

Table 2. I_C=2.0 mA (to adjust by I_F), R_L=100 Ω, T_A=25°C, V_{CC}=10 V

Description	Symbol	Values	Unit
Turn-On Time	t_{on}	5.0	µs
Rise Time	t_r	2.5	µs
Turn-Off Time	t_{off}	6.0	µs
Fall Time	t_f	5.5	µs

Figure 2. Current transfer ratio (typ.) V_{CE}=10 V, T_A=25°C, normalized to I_F=10 mA, NCTR=f(I_F)

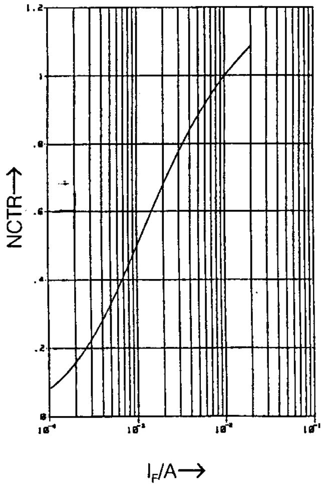


Figure 3. Diode forward voltage (typ.) V_F=f(I_F,T_A)

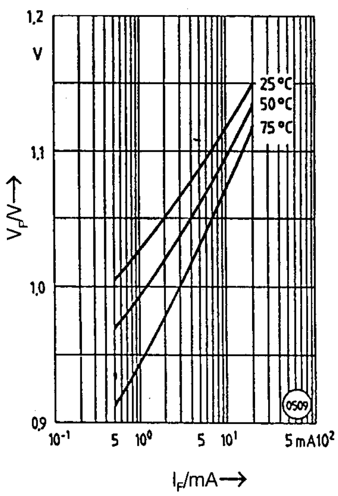


Figure 4. Output characteristics (typ.) T_A=25°C, I_{CE}=f(V_{CE}, I_B)

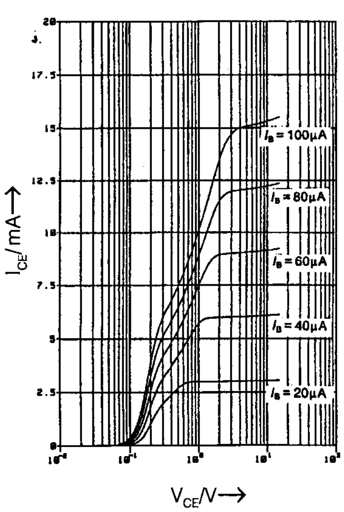


Figure 5. Output characteristics (typ.) T_A=25°C, I_{CE}=f(V_{CE}, I_F)

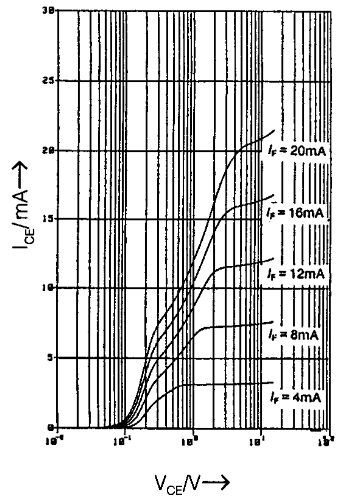


Figure 6. Transistor capacitances (typ.) T_A=25°C, f=1.0 MHz, C_{CE}=f(V_{CE}) C_{CB}=f (V_{CB}), C_{EB}=f(V_{EB})

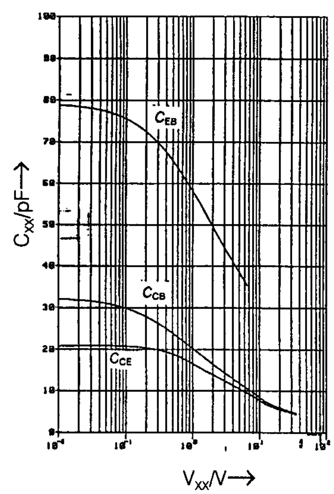


Figure 7. Collector-emitter leakage current (typ.) I_F=0, R_{BE}=1.0 MW, I_{CER}=f(V_{CE})

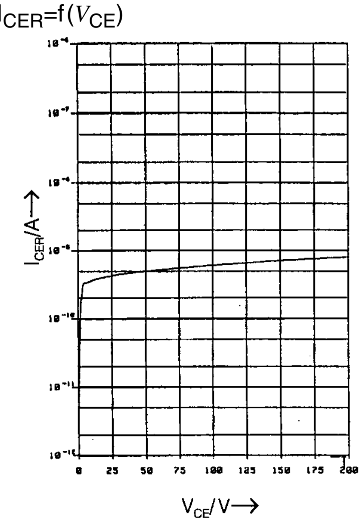


Figure 8. Permissible loss diode I_F=f(T_A)

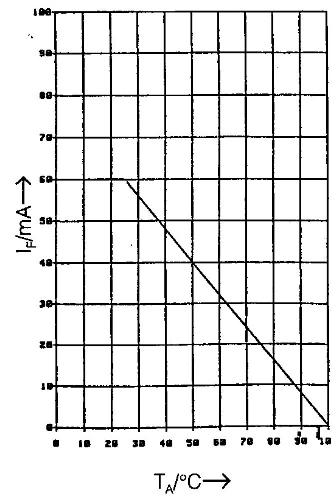


Figure 9. Permissible power dissipation P_{IOT}=f(T_A)