SFH6135
SFH6136

High-Speed 5.3 kV TRIOS® Optocoupler

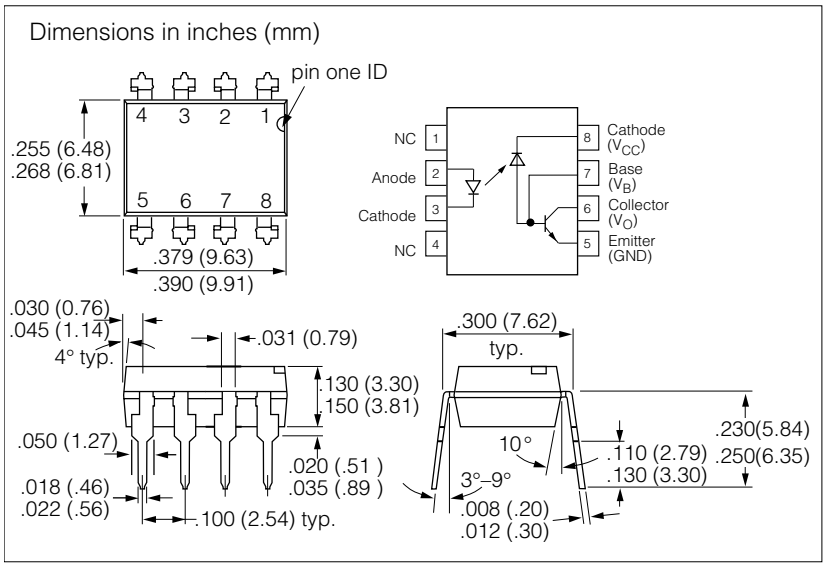
FEATURES

- **Isolation Test Voltage: 5300 V_{RMS}**
- **TTL Compatible**
- **High Bit Rates: 1.0 Mbit/s**
- **High CoMmon-mode Interference Immunity**
- **Bandwidth 2.0 MHz**
- **Open-collector Output**
- **External Base Wiring Possible**
- **Field-effect Stable by TRIOS (TRansparent IOn Shield)**
- **Underwriters Lab File #52744**
- **VDE 0884 Available with Option 1**

Description

The SFH6135 and SFH6136 optocouplers feature a high signal transmission rate and a high isolation resistance. They have a GaAlAs infrared emitting diode, optically coupled with an integrated photodetector which consists of a photodiode and a high-speed transistor in a DIP-8 plastic package.

Signals can be transmitted between two electrically separated circuits up to frequencies of 2.0 MHz. The potential difference between the circuits to be coupled is not allowed to exceed the maximum permissible reference voltages.



Maximum Ratings

Emitter

Reverse Voltage ..... 3.0 V
Forward Current ..... 25 mA
Peak Forward Current (t =1.0 ms, duty cycle 50%) ..... 50 mA
Maximum Surge Forward Current (t ≤1.0 µs, 300 pulses/s) ..... 1.0 A
Thermal Resistance ..... 700 K/W
Total Power Dissipation (T_A≤70°C) ..... 45 mW

Detector

Supply Voltage ..... –0.5 to 30 V
Output Voltage ..... –0.5 to 25 V
Emitter-base Voltage ..... 5.0 V
Output Current ..... 8.0 mA
Maximum Output Current ..... 16 mA
Base Current ..... 5.0 mA
Thermal Resistance ..... 300 K/W
Total Power Dissipation (T_A≤70°C) ..... 100 mW

Package

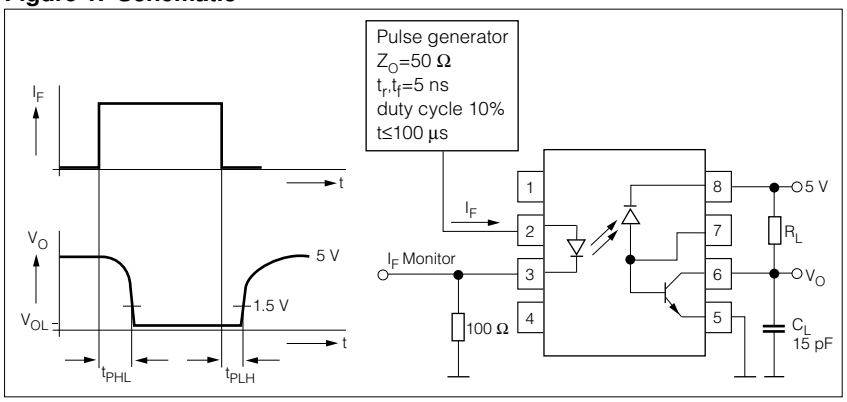
Isolation Test Voltage ..... 5300 V_{RMS}
Pollution Degree (DIN VDE 0110) 2
Creepage ..... ≥7.0 mm
Clearance ..... ≥7.0 mm
Comparative Tracking Index per DIN IEC112/VDE 0303 part 1 175
Isolation Resistance
V_{IO}=500 V, T_A=25°C ..... $\geq 10^{12}\ \Omega$
V_{IO}=500 V, T_A=100°C ..... $\geq 10^{11}\ \Omega$
Storage Temperature Range ..... –55°C to +125°C
Ambient Temperature Range ..... –55°C to +100°C
Soldering Temperature (max. ≤10 s. dip soldering ≥0.5 mm distance from case bottom) ..... 260°C

Table 4. Characteristics (T_A=25°C, unless otherwise specified)

	Symbol		Unit	Condition
Emitter				
Forward Voltage	V_F	1.6 (≤1.9)	V	I_F=16 mA
Breakdown Voltage	V_{BR}	≥3.0	V	I_R=10 µA
Reverse Current	I_R	0.5 (≤10)	µA	V_R=3.0 V
Capacitance	C_O	125	pF	V_R=0 V, f=1.0 MHz
Temperature Coefficient of Forward Voltage	$\Delta V_F / \Delta T_A$	1.7	mV/°C	I_F=16 mA
Detector				
Supply Current, Logic Low	I_{CCL}	150	µA	I_F=16 mA, V_O open, V_{CC}=15 V
Supply Current, Logic High	I_{CCH}	0.01 (≤1.0)	µA	I_F=0 mA, V_O open, V_{CC}=15 V
Output Voltage, Output Low SFH6135 SFH6136	 V_{OL} V_{OL}	 0.1 (≤0.4) 0.1 (≤0.4)	 V V	I_F=16 mA, V_{CC}=4.5 V I_O=1.1 mA I_O=2.4 mA
Output Current, Output High	I_{OH}	3.0 (≤500)	nA	I_F=0 mA, V_O=V_{CC}=5.5 V
Output Current, Output High	I_{OH}	0.01 (≤1.0)	µA	I_F=0 mA V_O=V_{CC}=15 V
Package				
Coupling Capacitance-Input-output	C_{IO}	0.6	pF	f=1.0 MHz
Current Transfer Ratio SFH6135 SFH6136	 CTR CTR	 16 (≥7.0) 35 (≥19)	 % %	I_F=16 mA, V_O=0.4 V, V_{CC}=4.5 V, T_A=25°C
Current Transfer Ratio SFH6135 SFH6136	 CTR CTR	 ≥5.0 ≥15	 % %	I_F=16 mA, V_O=0.5 V, V_{CC}=4.5 V

SWITCHING TIMES

Figure 1. Schematic



Delay Time (I_F=16 mA, V_{CC}=5.0 V, T_A=25°C)

High - Low SFH6135 (R_L=4.1 kΩ) SFH6136 (R_L=1.9 kΩ)	 t_{PHL} t_{PHL}	 0.3 (≤1.5) 0.2 (≤0.8)	 µs µs
Low - High SFH6135 (R_L=4.1 kΩ) SFH6136 (R_L=1.9 kΩ)	 t_{PLH} t_{PLH}	 0.3 (≤1.5) 0.2 (≤0.8)	 µs µs

Figure 2. Common-mode interference immunity

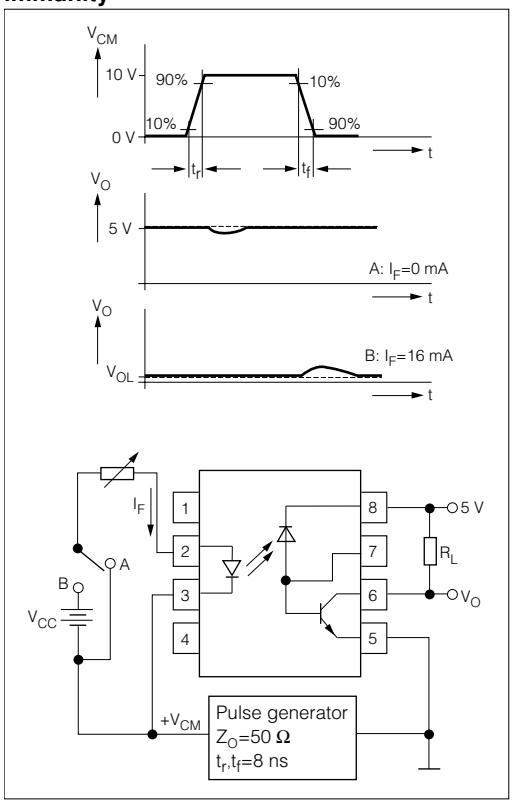


Table 1. Common Mode Interference Immunity

V_{CM}=10 V_{P-P}, V_{CC}=5.0 V, T_A=25°C

High (I_F=0 mA) SFH6135 (R_L=4.1 kΩ) SFH6136 (R_L=1.9 kΩ)	 CM_H CM_H	 1000 1000	 V/µs V/µs
Low (I_F=16 mA) SFH6135 (R_L=4.1 kΩ) SFH6136 (R_L=1.9 kΩ)	 CM_L CM_L	 1000 1000	 V/µs V/µs

Figure 3. LED forward current vs. forward voltage

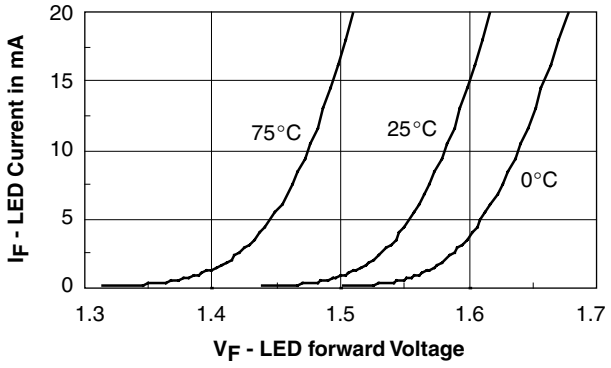


Figure 4. Permissible forward LED current vs. temperature

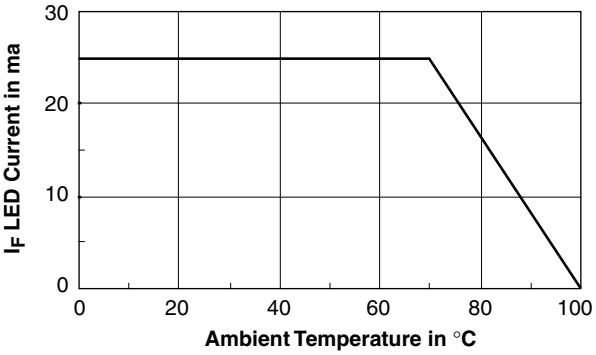


Figure 5. Permissible power dissipation vs. temperature

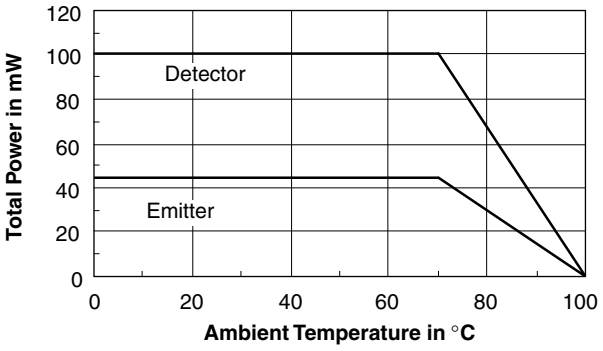


Figure 6. Output Current vs. Output Voltage
(T_A=25°C, V_{CC}=5.0 V)

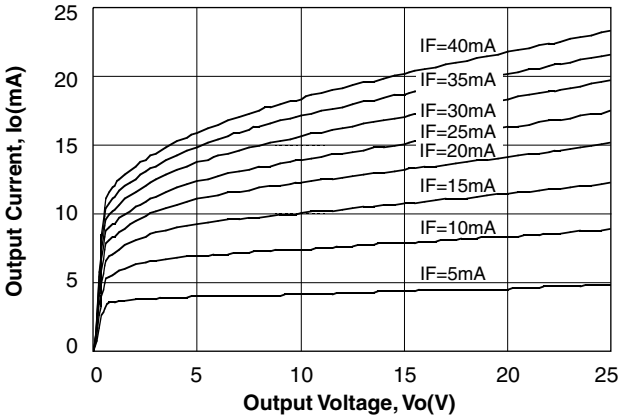


Figure 7. Output Current vs. Temperature
@ V_O=0.4 V, V_{CC}=5.0

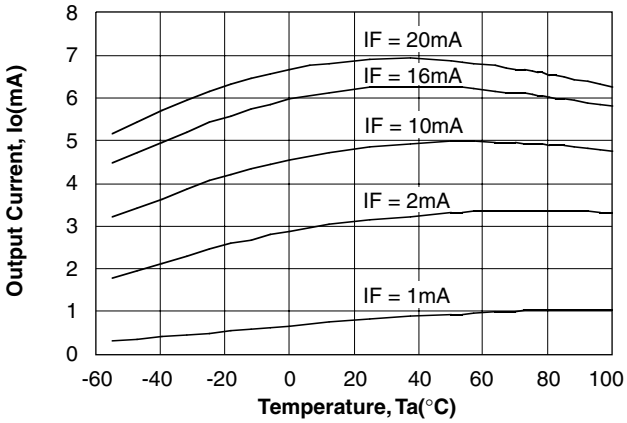


Figure 8. Propagation Delay vs. Temperature-SFH6136
@ V_{CC}=5.0 V, I_F=16 mA, R_L=1.9 kΩ

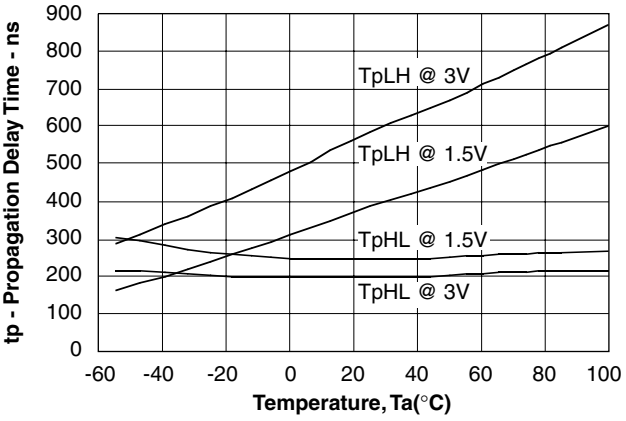


Figure 9. Propagation Delay vs. Temperature-SFH6135
@ V_{CC}=5.0 V, I_F=16 mA, R_L=4.1 kΩ

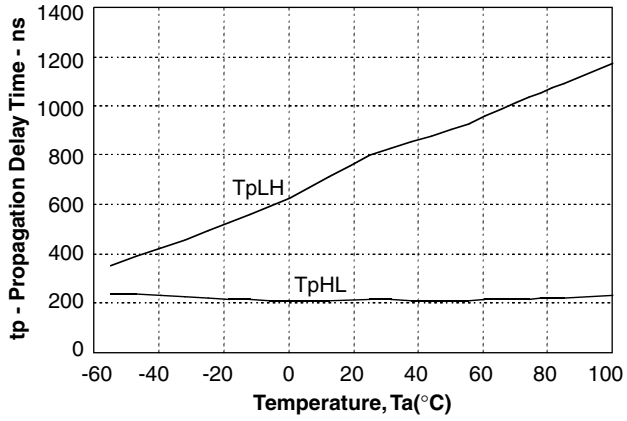


Figure 10. Logic High Output Current vs. Temperature

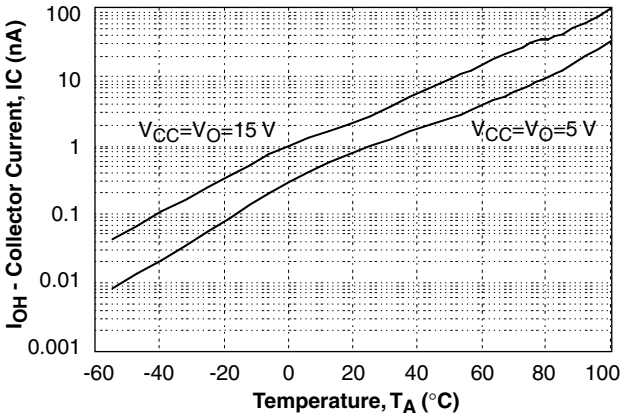


Figure 11. Small Signal Current Transfer Ratio vs. Quiescent Input Current (V_{CC}=5.0 V, R_L=100 Ω)