SIEMENS

SFH6135
SFH6136
HIGH-SPEED 5.3 kV TRIOS®
OPTOCOUPLER

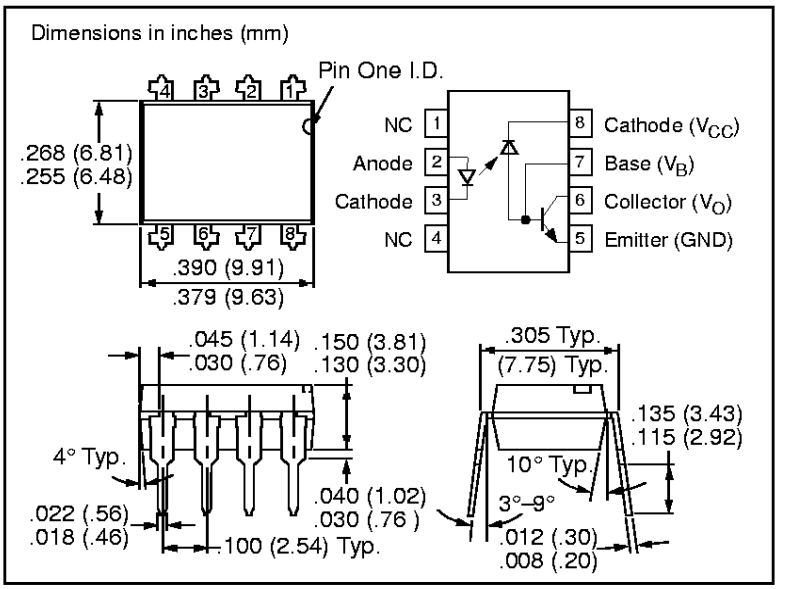
FEATURES

- **Isolation Test Voltage: 5300 VAC_{RMS}**
- **TTL Compatible**
- **High Bit Rates: 1 Mbit/s**
- **High Common-Mode Interference Immunity**
- **Bandwidth 2 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 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 V
Forward Current ..... 25 mA
Peak Forward Current (t =1 ms, duty cycle 50%) ..... 50 mA
Maximum Surge Forward Current (t ≤1 µs, 300 pulses/s) ..... 1 A
Thermal Resistance ..... 700 K/W
Total Power Dissipation (T_A≤70°C) ..... 45 mW

Detector

Supply Voltage ..... -0.5 to 15 V
Output Voltage ..... -0.5 to 15 V
Emitter-Base Voltage ..... 5 V
Output Current ..... 8 mA
Maximum Output Current ..... 16 mA
Base Current ..... 5 mA
Thermal Resistance ..... 300 K/W
Total Power Dissipation (T_A≤70°C) ..... 100 mW

Package

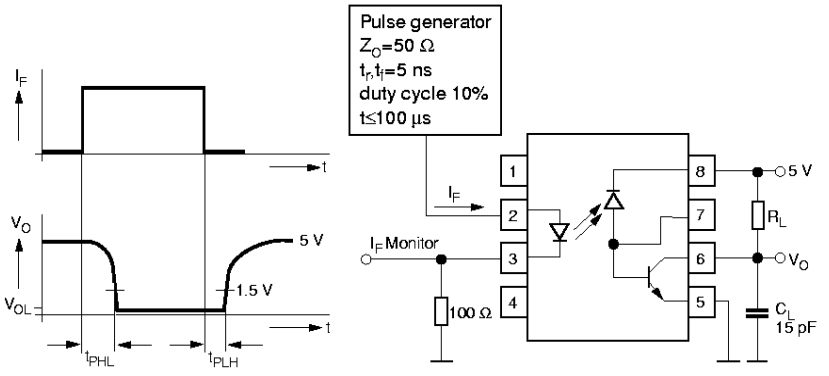
Isolation Test Voltage ..... 5300 VAC_{RMS}
Pollution Degree (DIN VDE 0110) 2
Creepage ..... ≥7 mm
Clearance ..... ≥7 mm
Comparative Tracking Index per DIN IEC112/VDE 0303 part 1 175
Isolation Resistance
V_{IO}=500 V, T_A = 25°C ..... ≥10^{12} Ω
V_{IO}=500 V, T_A = 100°C ..... ≥10^{11} Ω
Storage Temperature Range ..... –55°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

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	V	I_R=10 µA
Reverse Current	I_R	0.5 (≤10)	µA	V_R=3 V
Capacitance	C_O	125	pF	V_R=0 V, f=1 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)	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_{CH}	3 (≤500)	nA	I_F=0 mA, V_O=V_{CC}=5.5 V
Output Current, Output High	I_{CH}	0.01 (≤1)	µA	I_F=0 mA V_O=V_{CC}=15 V
Current Gain	H_{FE}	150		V_O=5 V, I_O=3 mA
Package				
Coupling Capacitance-Input-Output	C_{IO}	0.6	pF	f=1 MHz
Current Transfer Ratio SFH6135 SFH6136	 CTR CTR	 16 (≥7) 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 ≥15	 % %	I_F=16 mA, V_O=0.5 V, V_{CC}=4.5 V

SWITCHIMG TIMES

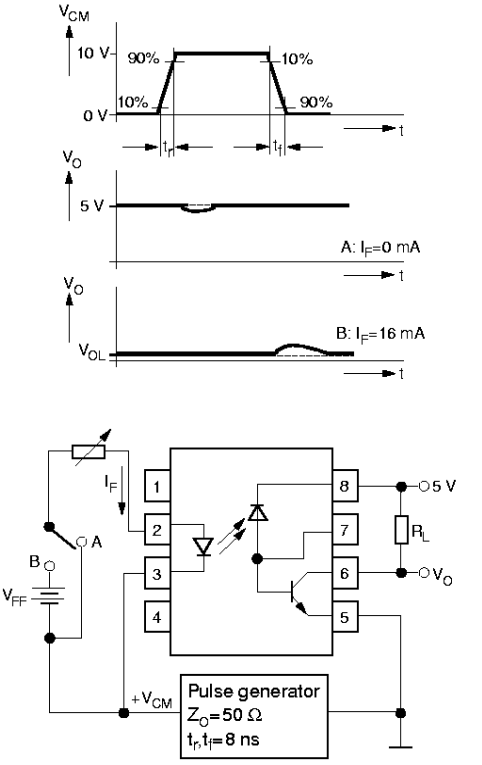
Figure 1. Schematic



Delay Time (I_F=16 mA, V_{CC}=5 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



Common Mode Interference Immunity
V_{CM}=10 VP-P, V_{CC}=5 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. Output characteristics–SFH6135
Output current versus output voltage
T_A=25°C, V_{CC}=5 V

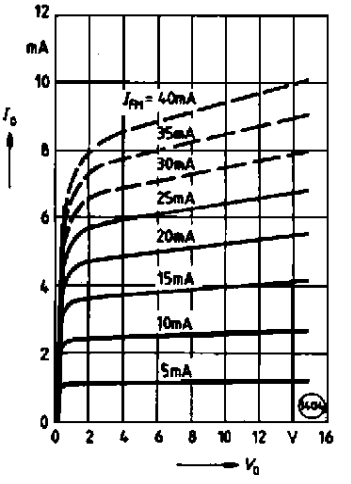


Figure 4. Output characteristics– SFH6136 Output current versus output voltage T_A=25°C, V_{CC}=5 V

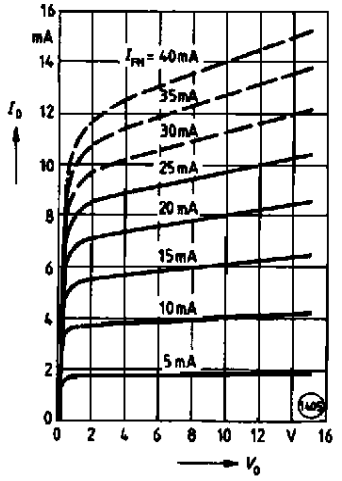


Figure 5. Permissible forward current of emitting diode versus ambient temperature

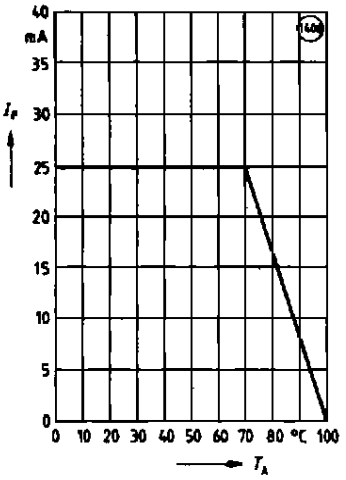


Figure 6. Permissible total power dissipation versus ambient temperature

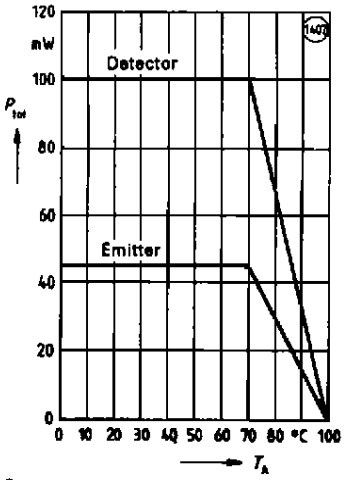


Figure 7. Forward current of emitting diode versus forward voltage T_A=25°C

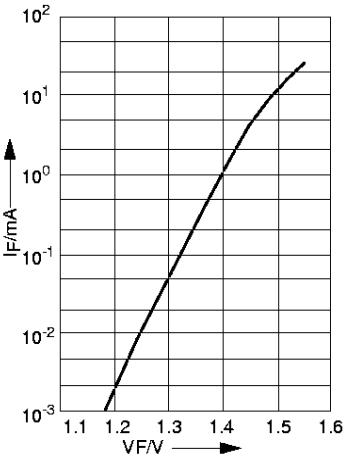


Figure 8. Small signal transfer ratio versus forward current V_{CC}=5 V, T_A=25°C

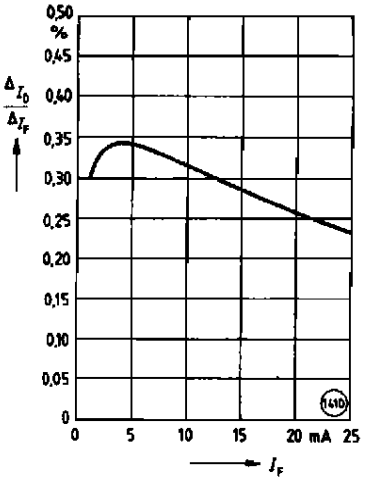


Figure 9. Current transfer ratio (normalized) versus ambient temp. I_F=16 mA, V_O=0.4 V, V_{CC}=5 V, T_A=25°C

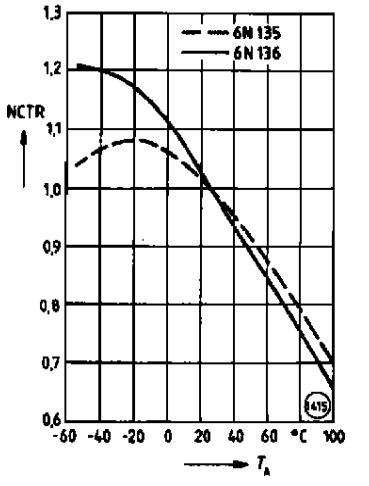


Figure 10. Output current (high) versus ambient temperature V_O=V_{CC}=5 V, I_F=0

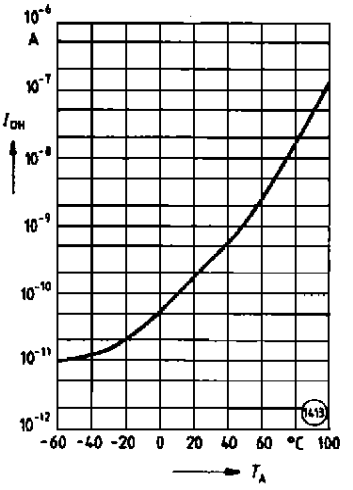


Figure 11. Delay times versus ambient temperature I_F=16 mA, V_{CC}=5 V, SFH6135: R_L=4.1 kΩ, SFH6136: R_L=1.9kΩ

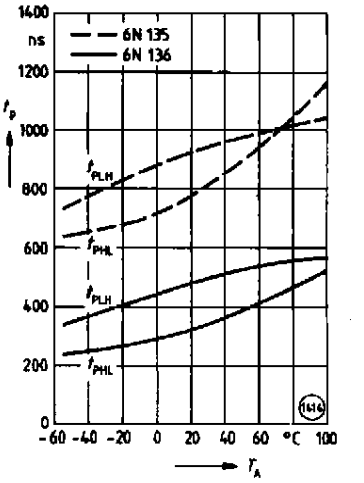


Figure 12. Current transfer ratio (normalized) versus forward current I_F=16 mA, V_O=0.4 V, V_{CC}=5 V, T_A=25°C)