

SIEMENS

SFH6135 SFH6136

HIGH-SPEED 5.3 kV TRIOS® OPTOCOUPLER

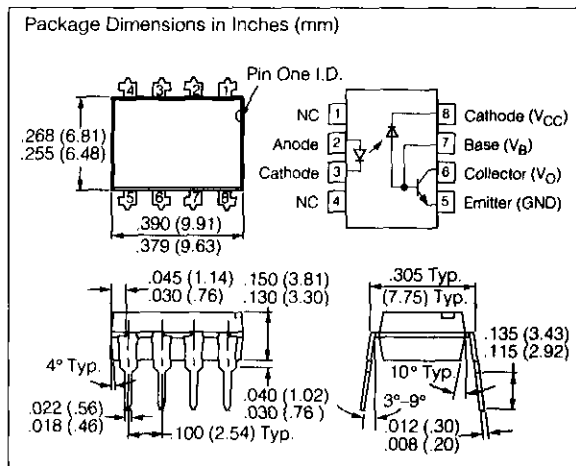
FEATURES

- 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

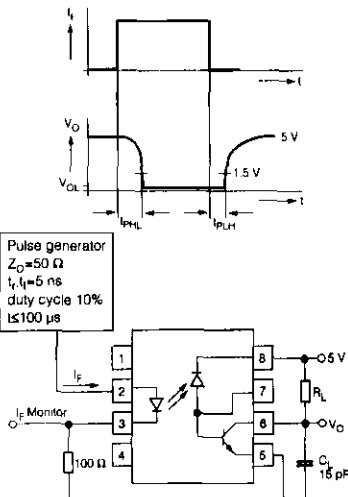
Isolation Test Voltage	5300 VAC _{RMS}
Pollution Degree (DIN VDE 0110)	2
Creepage	≥ 7 mm
Clearance	≥ 7 mm
Comparative Tracking Index per DIN IEC 112/VDE 0303 part 1	175
Isolation Resistance	
V _{IO} = 500 V, T _A = 25°C	≥ 10 ¹² Ω
V _{IO} = 500 V, T _A = 100°C	≥ 10 ¹¹ Ω
Storage Temperature Range	-55°C 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

($T_A=0$ to 70°C unless otherwise specified)

Emitter		Symbol	Unit	Condition
Forward Voltage	V_F	1.6 (≤ 1.9)	V	$I_F=16$ mA
Breakdown Voltage	V_{BR}	≥ 3	V	$I_R=10$ μ A
Reverse Current	I_R	0.5 (≤ 10)	μ A	$V_R=3$ V
Capacitance	C_0	125	pF	$V_R=0$ V, $f=1$ MHz
Temperature Coefficient of Forward Voltage		$\Delta V_F/\Delta T_A$	-1.7 mV/ $^\circ\text{C}$	$I_F=16$ mA
Detector				
Supply Current				$I_F=16$ mA, V_O open, $V_{CC}=15$ V
Logic Low	I_{CCL}	150	μ A	
Supply Current				$I_F=0$ mA, V_O open, $V_{CC}=15$ V
Logic High	I_{CCH}	0.01 (≤ 1)	μ A	
Output Voltage				$I_F=16$ mA, $V_{CC}=4.5$ V
Output Low	V_{OL}	0.1 (≤ 0.4)	V	$I_O=1.1$ mA
SFH6135	V_{OL}	0.1 (≤ 0.4)	V	$I_O=2.4$ mA
Output Current				
Output High	I_{OH}	3 (≤ 500)	nA	$I_F=0$ mA, $V_O=V_{CC}=5.5$ V
Output Current				$I_F=0$ mA, $V_O=V_{CC}=15$ V
Output High	I_{OH}	0.01 (≤ 1)	μ A	$V_O=5$ V, $I_O=3$ mA
Current Gain	H_{FE}	150		
Package				
Coupling Capacitance				$f=1$ MHz
Input-Output	C_{IO}	0.6	pF	
Current Transfer Ratio				$I_F=16$ mA, $V_O=0.4$ V, $V_{CC}=4.5$ V, $T_A=25^\circ\text{C}$
SFH6135	CTR	16 (≥ 7)	%	
SFH6136	CTR	35 (≥ 19)	%	
Current Transfer Ratio				$I_F=16$ mA, $V_O=0.5$ V, $V_{CC}=4.5$ V
SFH6135	CTR	≥ 5	%	
SFH6136	CTR	≥ 15	%	

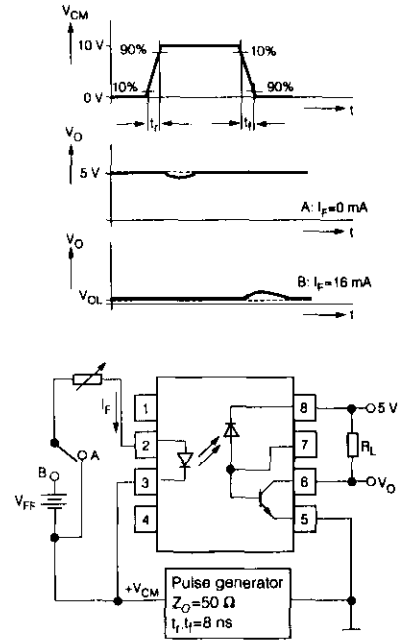
SWITCHING TIMES



Delay Time ($I_F=16$ mA, $V_{CC}=5$ V, $T_A=25^\circ\text{C}$)

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

Common-mode Interference Immunity



Common Mode Interference Immunity

($V_{CM}=10$ V p.p., $V_{CC}=5$ V, $T_A=25^\circ\text{C}$)

High ($I_F=0$ mA)			
SFH6135 ($R_L=4.1$ k Ω)	CM _H	1000	V/ μs
SFH6136 ($R_L=1.9$ k Ω)	CM _H	1000	V/ μs
Low ($I_F=16$ mA)			
SFH6135 ($R_L=4.1$ k Ω)	CM _L	1000	V/ μs
SFH6136 ($R_L=1.9$ k Ω)	CM _L	1000	V/ μs

Figure 1. Output characteristics—SFH6135
 Output current versus output voltage
 ($T_A=25^\circ\text{C}$, $V_{CC}=5$ V)

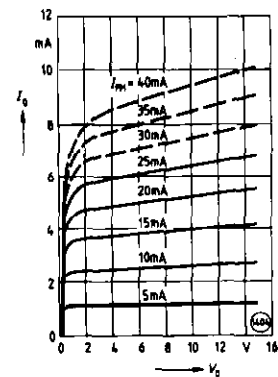


Figure 2. Output characteristics—SFH6136
Output current versus output voltage
($T_A=25^\circ\text{C}$, $V_{CC}=5\text{ V}$)

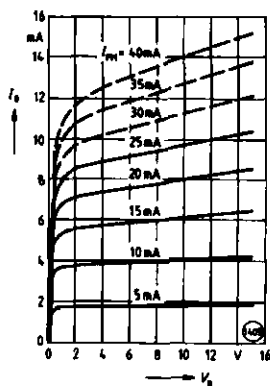


Figure 3. Permissible forward current of emitting diode versus ambient temperature

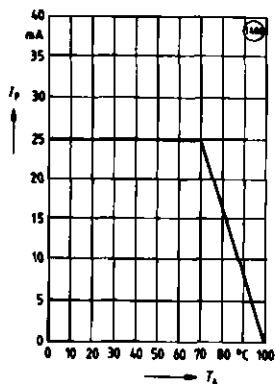


Figure 4. Permissible total power dissipation versus ambient temperature

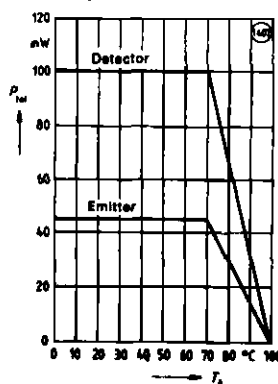


Figure 5. Forward current of emitting diode versus forward voltage ($T_A=25^\circ\text{C}$)

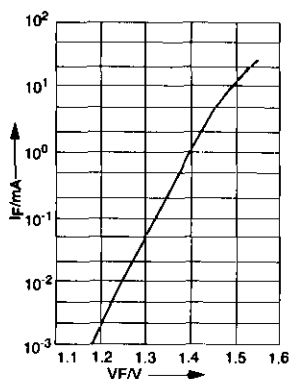


Figure 6. Small signal transfer ratio versus forward current
($V_{CC}=5\text{ V}$, $T_A=25^\circ\text{C}$)

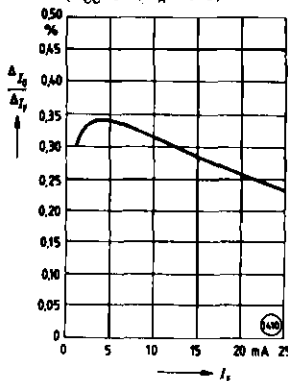


Figure 7. Current transfer ratio (normalized) versus ambient temperature ($I_F=16\text{ mA}$, $V_O=0.4\text{ V}$, $V_{CC}=5\text{ V}$, $T_A=25^\circ\text{C}$)

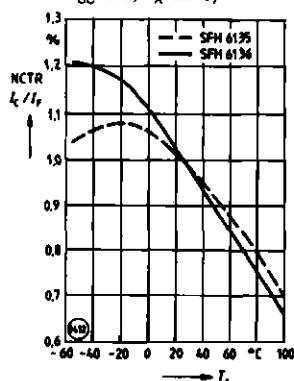


Figure 8. Output current (high) versus ambient temperature ($V_O=V_{CC}=5\text{ V}$, $I_F=0$)

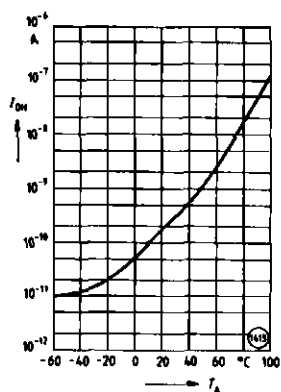


Figure 9. Delay times versus ambient temperature ($I_F=16\text{ mA}$, $V_{CC}=5\text{ V}$, SFH6135: $R_L=4.1\text{ k}\Omega$, SFH6136: $R_L=1.9\text{ k}\Omega$)

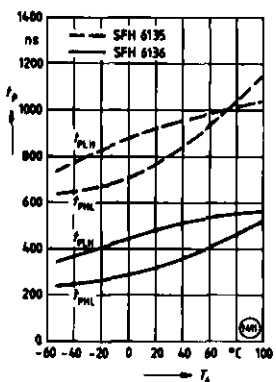


Figure 10. Current transfer ratio (normalized) versus forward current ($I_F=16\text{ mA}$, $V_O=0.4\text{ V}$, $V_{CC}=5\text{ V}$, $T_A=25^\circ\text{C}$)

