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[SFH6136.](#)

EN

This Datasheet is presented by
the manufacturer

DE

Dieses Datenblatt wird vom
Hersteller bereitgestellt

FR

Cette fiche technique est
présentée par le fabricant

High-Speed 5.3 kV TRIOS® Optocoupler

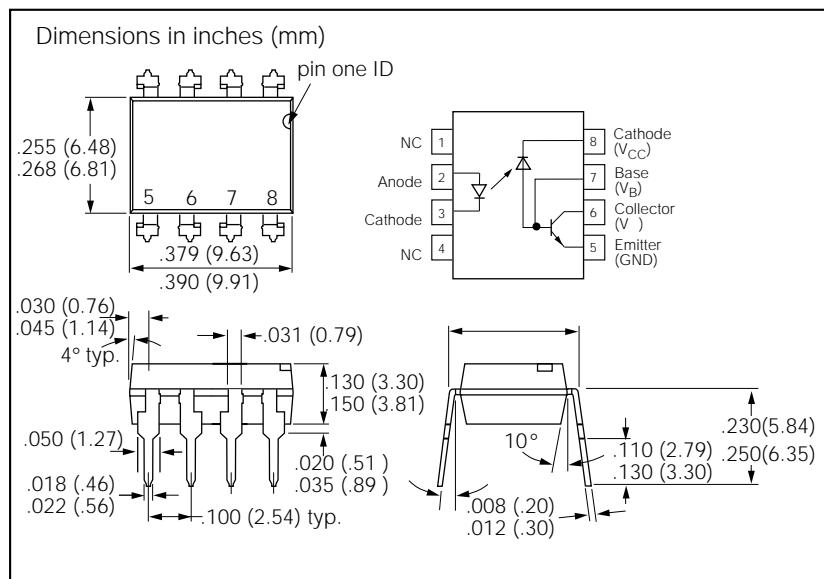
FEATURES

- **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 ($t \leq 1$ μ s, 300 pulses/s).....	1 A
Thermal Resistance.....	700 K/W
Total Power Dissipation ($T_A \leq 70^\circ\text{C}$).....	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 ($T_A \leq 70^\circ\text{C}$).....	100 mW

Package

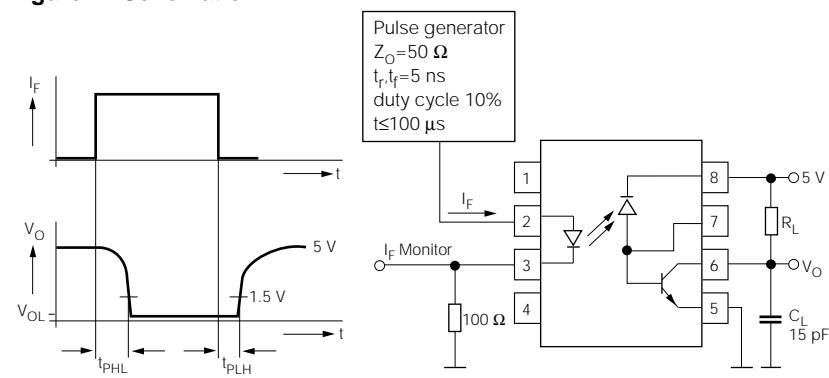
Isolation Test Voltage	5300 VAC	RMS
Pollution Degree (DIN VDE 0110).....	2	
Creepage.....	\geq	7 mm
Clearance	\geq	7 mm
Comparative Tracking Index per DIN IEC112/VDE 0303 part 1 ...	175	
Isolation Resistance		
$V_{IO}=500$ V, $T_A = 25^\circ\text{C}$	\geq	$10^{12} \Omega$
$V_{IO}=500$ V, $T_A = 100^\circ\text{C}$	\geq	$10^{11} \Omega$
Storage Temperature Range.....	-55	$^\circ\text{C}$ to +125 $^\circ\text{C}$
Ambient Temperature Range.....	-55	$^\circ\text{C}$ to +100 $^\circ\text{C}$
Soldering Temperature (max. ≤ 10 s. dip soldering ≥ 0.5 mm distance from case bottom)	260	$^\circ\text{C}$

Characteristics ($T_A=25^\circ\text{C}$, unless otherwise specified)

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

SWITCHING TIMES

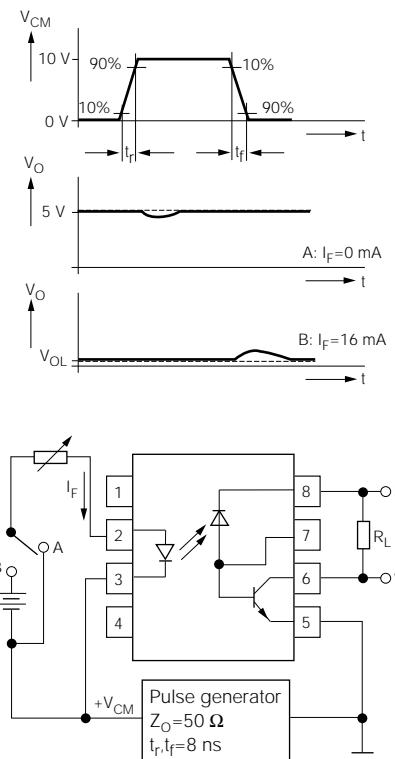
Figure 1. Schematic



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

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

Figure 2. Common-mode interference immunity



Common Mode Interference Immunity

$$V_{CM}=10 \text{ VP-P}, V_{CC}=5 \text{ V}, T_A=25^\circ\text{C}$$

High ($I_F=0 \text{ mA}$) SFH6135 ($R_L=4.1 \text{ k}\Omega$) SFH6136 ($R_L=1.9 \text{ k}\Omega$)	CM_H CM_H	1000 1000	$V/\mu\text{s}$ $V/\mu\text{s}$
Low ($I_F=16 \text{ mA}$) SFH6135 ($R_L=4.1 \text{ k}\Omega$) SFH6136 ($R_L=1.9 \text{ k}\Omega$)	CM_L CM_L	1000 1000	$V/\mu\text{s}$ $V/\mu\text{s}$

Figure 3. Output characteristics—SFH6135
Output current versus output voltage

$$T_A=25^\circ\text{C}, V_{CC}=5 \text{ V}$$

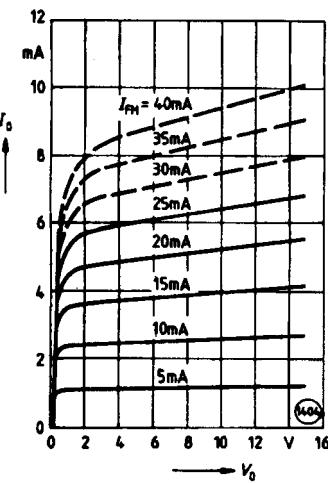


Figure 4. Output characteristics–SFH6136 Output current versus output voltage $T_A=25^\circ\text{C}$, $V_{CC}=5\text{ V}$

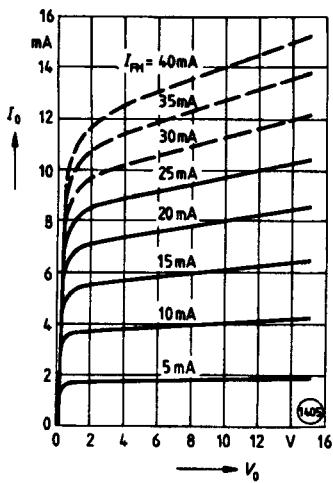


Figure 5. Permissible forward current of emitting diode versus ambient temperature

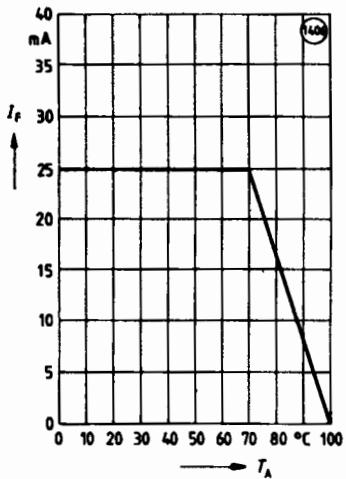


Figure 6. Permissible total power dissipation versus ambient temperature

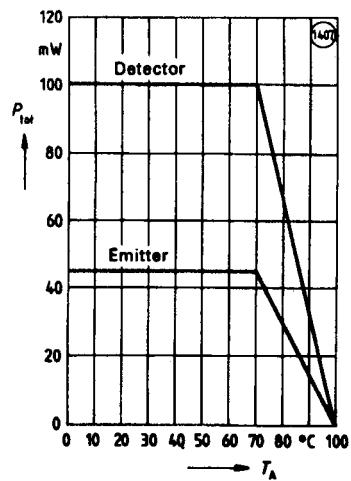


Figure 7. Forward current of emitting diode versus forward voltage $T_A=25^\circ\text{C}$

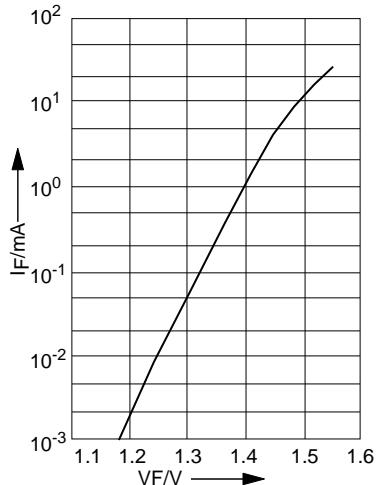


Figure 10. Output current (high) versus ambient temperature $V_O=V_{CC}=5\text{ V}$, $I_F=0$

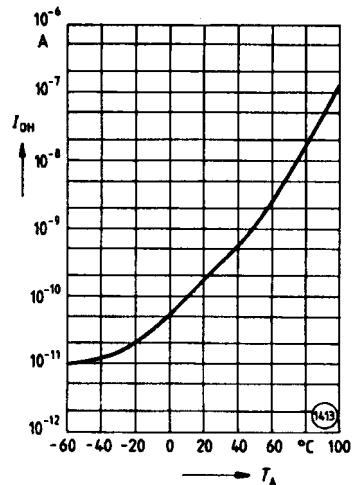


Figure 8. Small signal transfer ratio versus forward current $V_{CC}=5\text{ V}$, $T_A=25^\circ\text{C}$

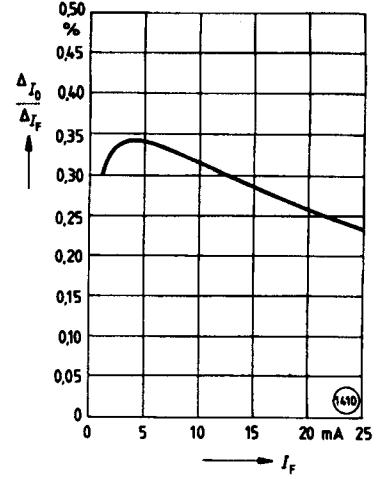


Figure 9. Current transfer ratio (normalized) versus ambient temp. $I_F=16\text{ mA}$, $V_O=0.4\text{ V}$, $V_{CC}=5\text{ V}$, $T_A=25^\circ\text{C}$

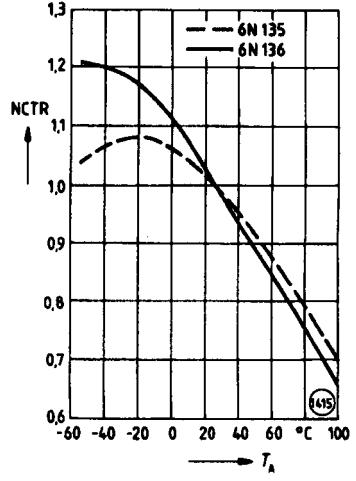


Figure 11. Delay times versus ambient temperature $I_F=16\text{ mA}$, $V_{CC}=5\text{ V}$, SFH6135: $R_L=4.1\text{ k}\Omega$, SFH6136: $R_L=1.9\text{k}\Omega$

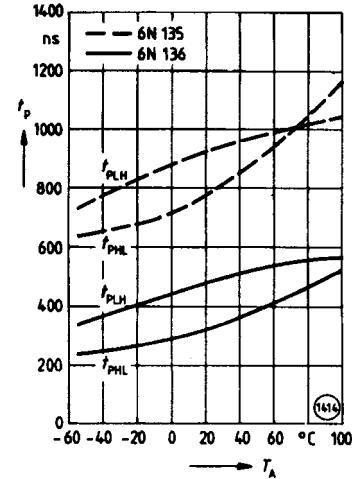
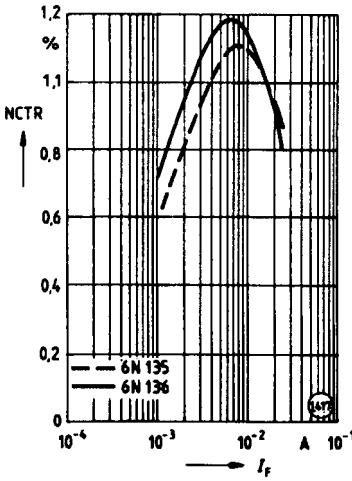


Figure 12. Current transfer ratio (normalized) versus forward current $I_F=16\text{ mA}$, $V_O=0.4\text{ V}$, $V_{CC}=5\text{ V}$, $T_A=25^\circ\text{C}$





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