6N135 / 6N136

High-Speed TRIOS®

Optocoupler

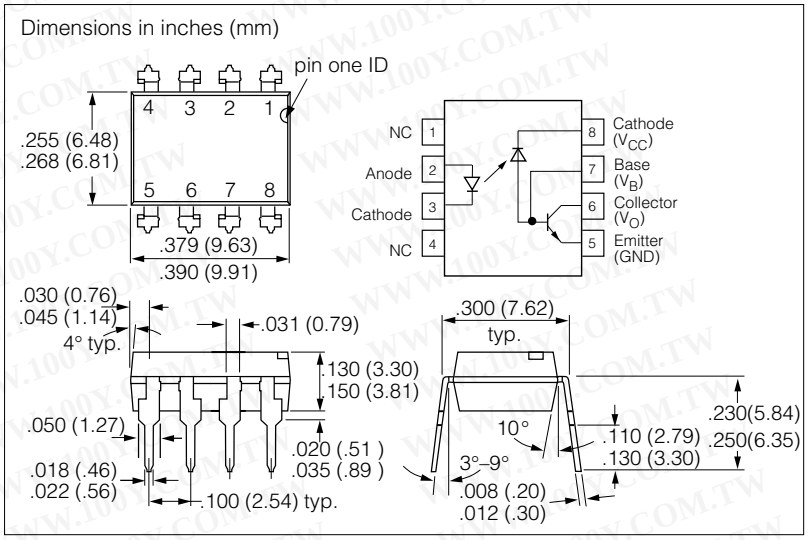
FEATURES

- **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***
- **Underwriters Lab File #E52744**
- **VDE #0884 Approval Available with Option 1**

Description

The 6N135 and 6N136 are optocouplers with 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 ..... 5.0 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 15 V
Output Voltage ..... –0.5 to 15 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 (between emitter and detector climate per DIN 50014, part 2, Nov. 74 (t=1.0 s) ..... 5300 V_{RMS}
Pollution Degree (DIN VDE 0109) 2.0
Creepage ..... ≥7.0 mm
Clearance ..... ≥7.0 mm
Comparative Tracking Index per DIN IEC112/VDE 0303 part 1, Group IIIa per DIN VDE 6110 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 from case bottom) ..... 260°C

Characteristics T_A=0 to 70°C unless otherwise specified, T_A=25°C typ.

Emitter	Symbol	Value	Unit	Condition
Forward Voltage	V_F	1.6 (≤1.9)	V	I_F=16 mA
Breakdown Voltage	V_{BR}	≥5.0		I_R=10 µA
Reverse Current	I_R	0.5 (≤10)	µA	V_R=5.0 V
Capacitance	C_O	125	pF	V_R=0 V, f=1.0 MHz
Temperature Coefficient, 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)		I_F=0 mA, V_O open, V_{CC}=15 V
Output Voltage, Output Low 6N135 6N136	V_{OL}	0.1 (≤0.4)	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		0.01 (≤1)	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				
6N135 6N136	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
6N135 6N136	CTR CTR	≥5.0 ≥15		I_F=16 mA, V_O=0.5 V, V_{CC}=4.5 V

***TRIOS**—**TR**ansparent **IO**n **S**hield

Figure 1. Switching Times

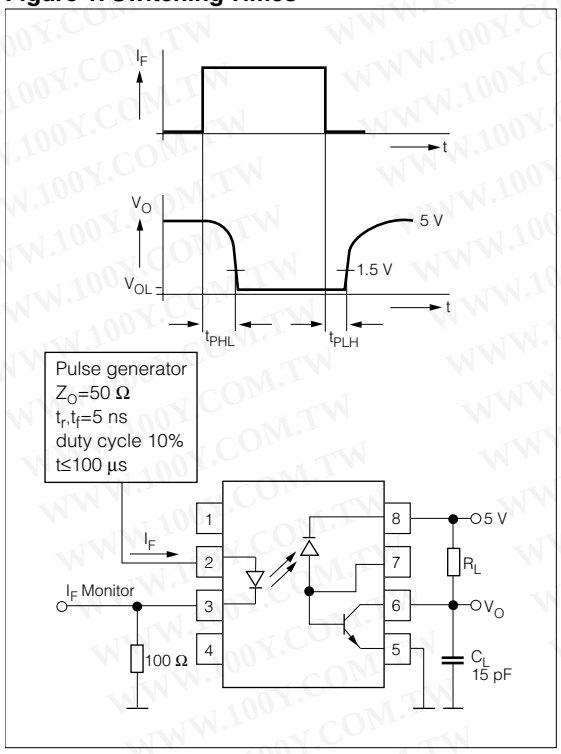
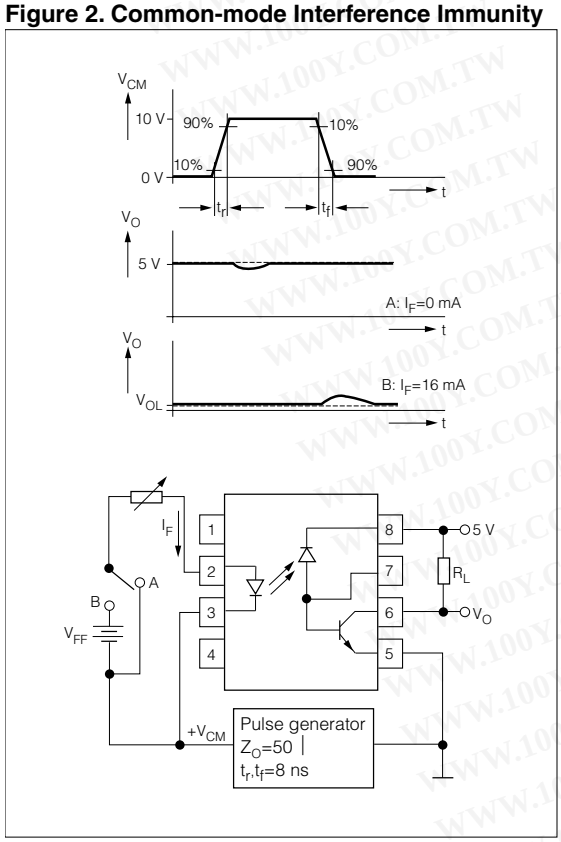


Figure 2. Common-mode Interference Immunity



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

Parameter		Symbol	Value	Unit	Condition
High–Low	6N135	t_{PHL}	0.3 (≤1.5)	µs	R_L=4.1 kΩ
	6N136		0.2 (≤0.8)		R_L=1.9 kΩ
Low–High	6N135	t_{PLH}	0.3 (≤1.5)	µs	R_L=4.1 kΩ
	6N136		0.2 (≤0.8)		R_L=1.9 kΩ

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

Parameter		Symbol	Value	Unit	Condition
High, I_F=0 mA	6N135	CMH	1000	V/µs	R_L=4.1 kΩ
	6N136				R_L=1.9 kΩ
Low, I_F=16 mA	6N135	CML			R_L=4.1 kΩ
	6N136				R_L=1.9 kΩ

Figure 3. LED forward current vs. forward voltage

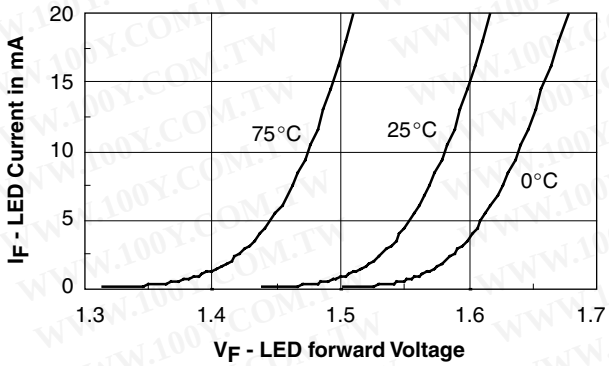


Figure 4. Permissible forward LED current vs. temperature

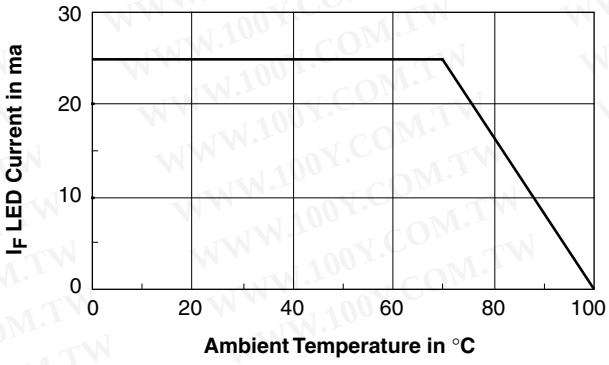


Figure 5. Permissible power dissipation vs. temperature

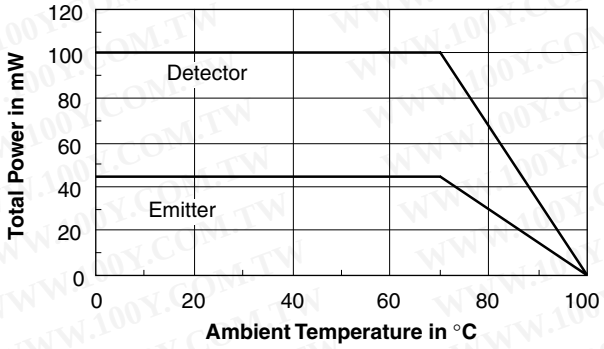


Figure 6. Output Current vs. Output Voltage
(T_A=25°C, V_{CC}=5.0 V)

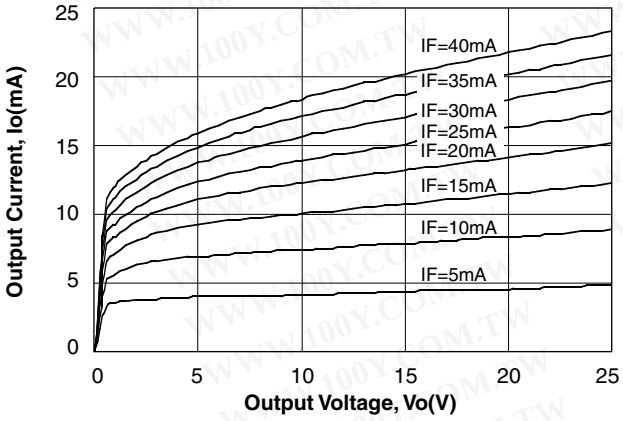


Figure 7. Output Current vs. Temperature
@ V_O=0.4 V, V_{CC}=5.0

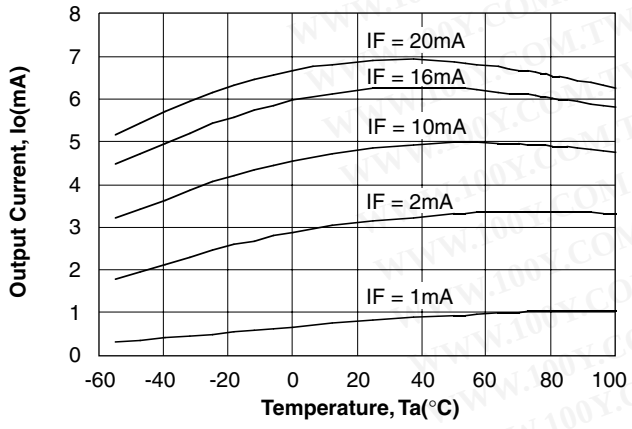


Figure 8. Propagation Delay vs. Temperature-6N136
@ V_{CC}=5.0 V, I_F=16 mA, R_L=1.9 kΩ

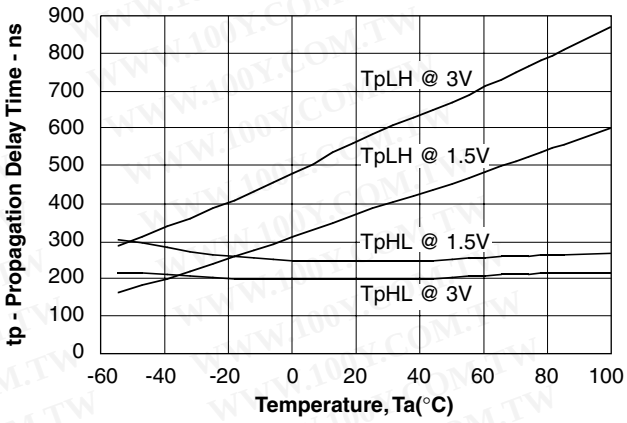


Figure 9. Propagation Delay vs. Temperature-6N135
@ V_{CC}=5.0 V, I_F=16 mA, R_L=4.1 kΩ

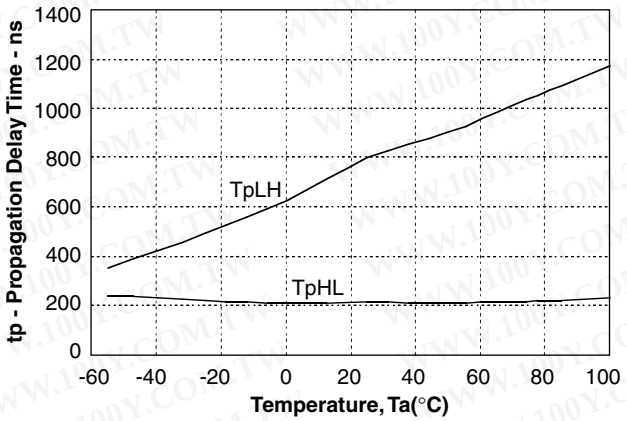


Figure 10. Logic High Output Current vs. Temperature

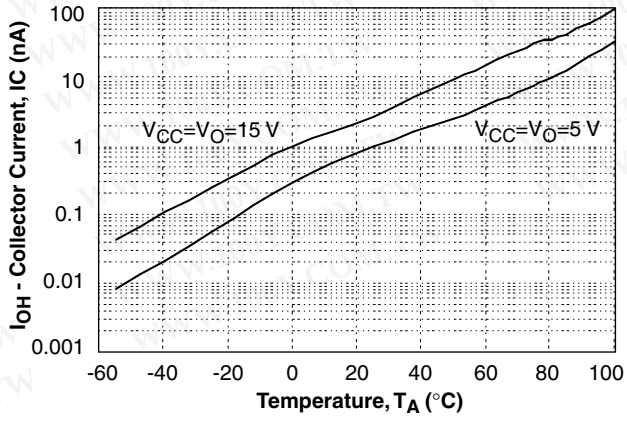


Figure 11. Small Signal Current Transfer Ratio vs. Quiescent Input Current (V_{CC}=5.0 V, R_L=100 Ω)