

FEATURES

- Isolation Test Voltage: 2500 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*
- Underwriters Lab File #E52744

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 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 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

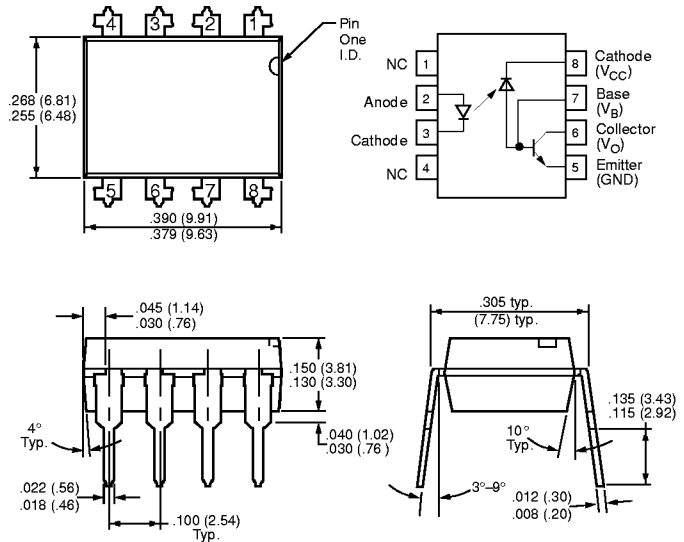
Supply Voltage -0.5 to 15 V
 Output Voltage -0.5 to 15 V
 Emitter-Base Voltage 5 V
 Output Current 8 mA
 Maximum Output Current 16 mA
 Base Current 5 mA
 Thermal Resistance 300 K/W
 Total Power Dissipation (T_A ≤ 70°C) 100 mW

Package

Isolation Test Voltage (between emitter and detector climate per DIN 40046, part 2, Nov. 74 (t=1min.) 2500 VAC_{RMS}
 Pollution Degree (DIN VDE 0109) 2
 Creepage ≥7 mm
 Clearance ≥7 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 ≥10¹² Ω
 V_{IO}=500 V, T_A = 100°C ≥10¹¹ Ω
 Storage Temperature Range -55°C to +125°C
 Ambient Temperature Range -55°C to +100°C
 Soldering Temperature (max. ≤10 sec., dip soldering ≥0.5 mm from case bottom) 260°C

*TRIOS—Transparent IO Shield

Dimensions in inches (mm)



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

Emitter	Symbol		Unit	Condition
Forward Voltage	V _F	1.6 (≤1.9)	V	I _F =16 mA
Breakdown Voltage	V _{BR}	≥5	V	I _R =10 μA
Reverse Current	I _R	0.5 (≤10)	μA	V _R =5 V
Capacitance	C _O	125	pF	V _R =0 V, f=1 MHz
Temperature Coefficient, Forward Voltage	ΔV _F /ΔT _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	V _{OL}	0.1 (≤0.4)	V	I _F =16 mA, V _{CC} =4.5 V, I _O =1.1 mA
6N135	V _{OL}	0.1 (≤0.4)	V	I _O =2.4 mA
6N136				
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				
6N135	CTR	16 (≥7)	%	I _F =16 mA, V _O =0.4 V, V _{CC} =4.5 V, T _A =25°C
6N136	CTR	35 (≥19)	%	
6N135	CTR	≥5	%	I _F =16 mA, V _O =0.5 V, V _{CC} =4.5 V
6N136	CTR	≥15	%	

Figure 1. Switching times

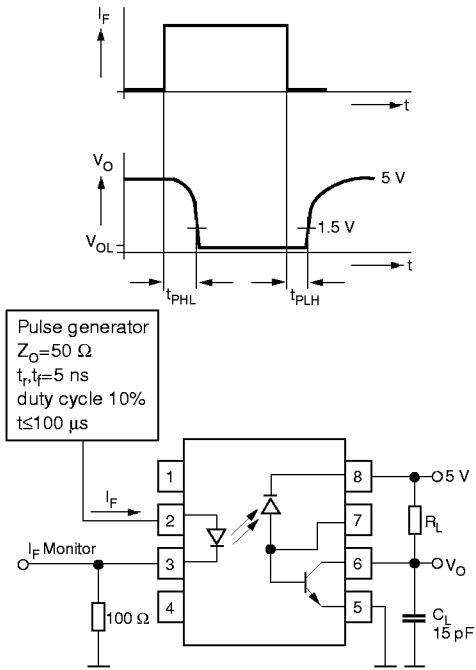
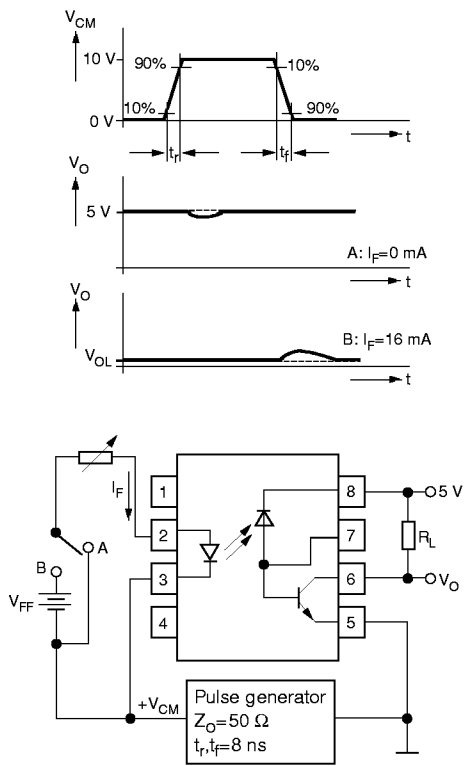


Figure 2. Common-mode interference immunity



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

High - Low 6N135 ($R_L=4.1 \text{ k}\Omega$) 6N136 ($R_L=1.9 \text{ k}\Omega$)	t_{PHL} t_{PHL}	0.3 (≤ 1.5) 0.2 (≤ 0.8)	μs μs
Low - High 6N135 ($R_L=4.1 \text{ k}\Omega$) 6N136 ($R_L=1.9 \text{ k}\Omega$)	t_{PLH} t_{PLH}	0.3 (≤ 1.5) 0.2 (≤ 0.8)	μs μs

Common Mode Interference Immunity

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

High ($I_F=0 \text{ mA}$) 6N135 ($R_L=4.1 \text{ k}\Omega$) 6N136 ($R_L=1.9 \text{ k}\Omega$)	CM_H CM_H	1000 1000	$\text{V}/\mu\text{s}$ $\text{V}/\mu\text{s}$
Low ($I_F=16 \text{ mA}$) 6N135 ($R_L=4.1 \text{ k}\Omega$) 6N136 ($R_L=1.9 \text{ k}\Omega$)	CM_L CM_L	1000 1000	$\text{V}/\mu\text{s}$ $\text{V}/\mu\text{s}$

Figure 3. Output characteristics-6N135
Output current versus output voltage

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

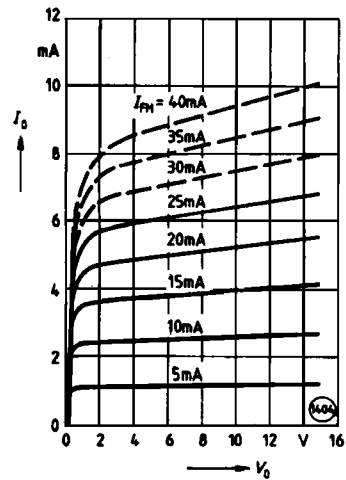


Figure 4. Output characteristics-6N136
Output current versus output voltage

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

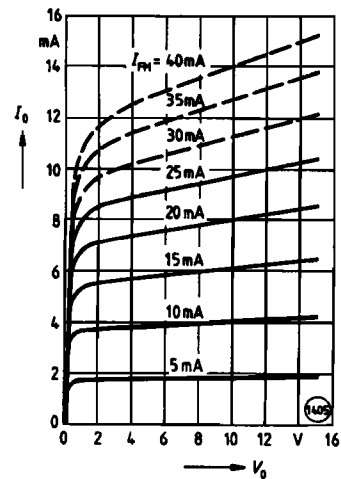


Figure 5. Permissible forward current of emitting diode versus ambient temperature

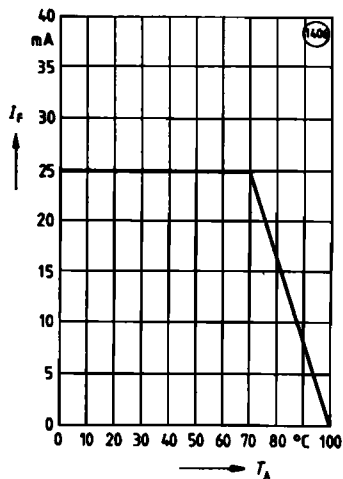


Figure 6. Permissible total power dissipation versus ambient temperature

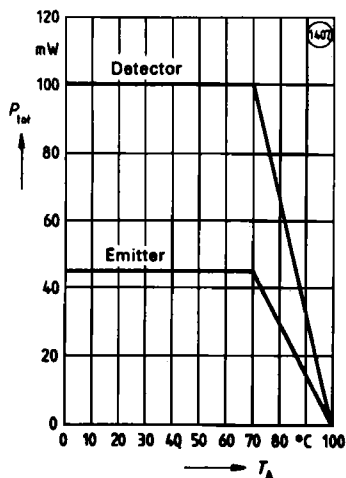


Figure 7. Forward current of emitting diode versus forward voltage ($T_A=25^\circ\text{C}$)

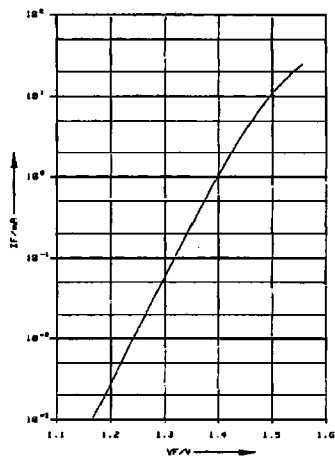


Figure 8. Small signal transfer ratio versus forward current ($V_{CC}=5\text{ V}$, $T_A=25^\circ\text{C}$)

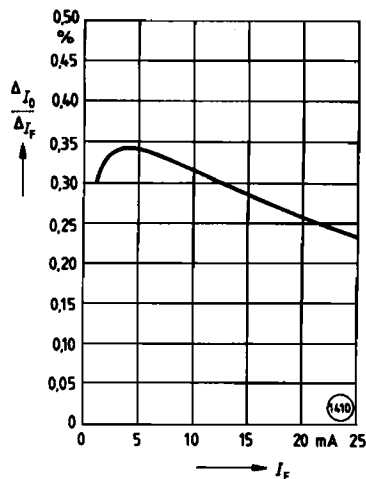


Figure 9. Current transfer ratio (normalized) versus ambient temperature (normalized to $I_F=16\text{ mA}$, $V_O=0.4\text{ V}$, $V_{CC}=5\text{ V}$, $T_A=25^\circ\text{C}$)

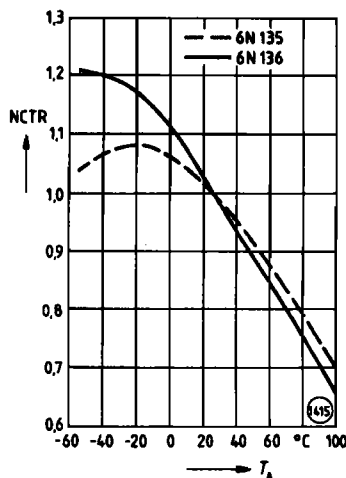


Figure 10. Output current (high) versus ambient temperature ($V_O=V_{CC}=5\text{ V}$, $I_F=0$)

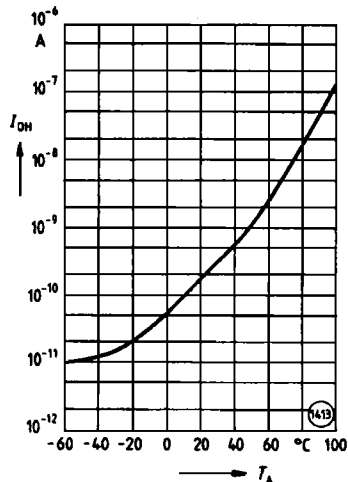


Figure 11. Delay times versus ambient temperature ($I_F=16\text{ mA}$, $V_{CC}=5\text{ V}$, 6N135: $R_L=4.1\text{ k}\Omega$, 6N136: $R_L=1.9\text{ k}\Omega$)

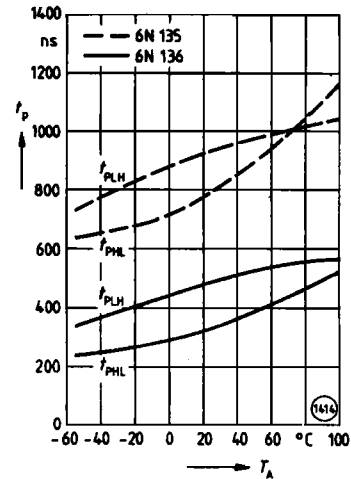


Figure 12. Current transfer ratio (normalized) versus forward current ($I_F=16\text{ mA}$, $V_O=0.4\text{ V}$, $V_{CC}=5\text{ V}$, $T_A=25^\circ\text{C}$)

