

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

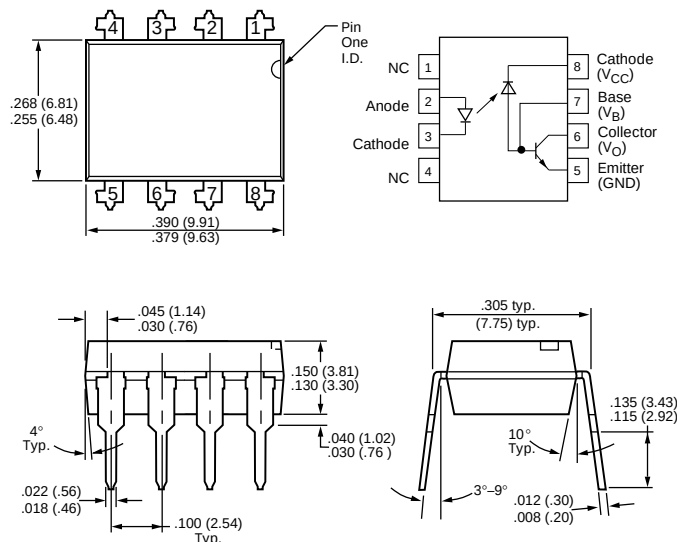
Supply Voltage	-0.5 to 15 V
Output Voltage	-0.5 to 15 V
Emitter-Base Voltage	5 V
Output Current	8 mA
Maximum Output Current	16 mA
Base Current	5 mA
Thermal Resistance	300 K/W
Total Power Dissipation (T _A ≤ 70°C)	100 mW

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	≥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 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 6N135 6N136	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				
6N135 6N136	CTR CTR	16 (≥7) 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 ≥15	% %	I _F =16 mA, V _O =0.5 V, V _{CC} =4.5 V

Figure 1. Switching times

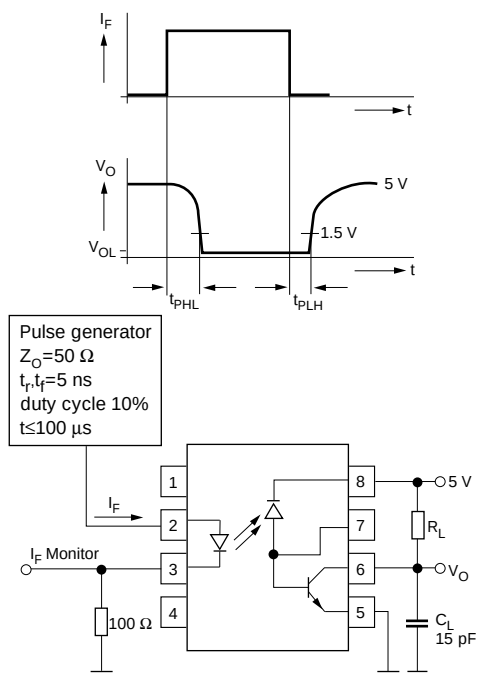
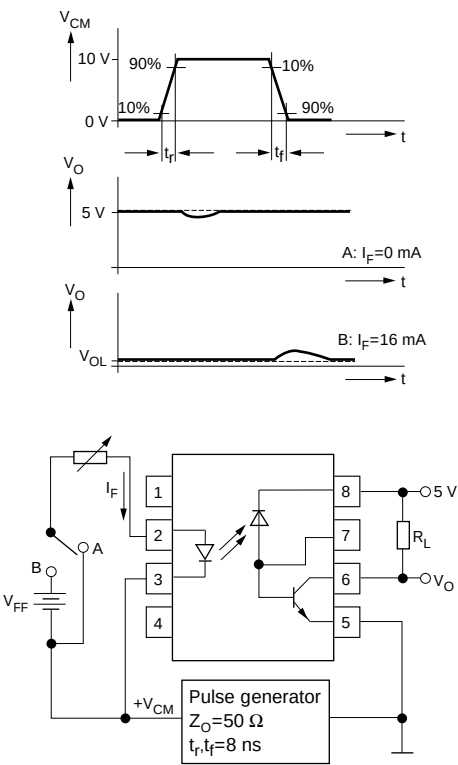


Figure 2. Common-mode interference immunity



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

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

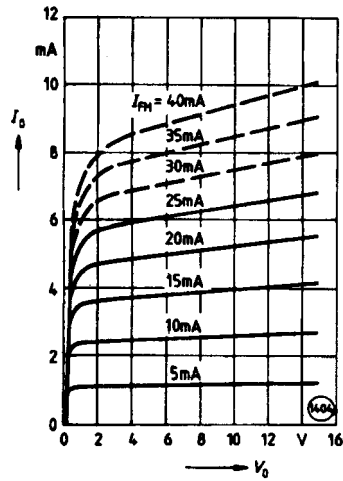


Figure 4. Output characteristics-6N136

Output current versus output voltage

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

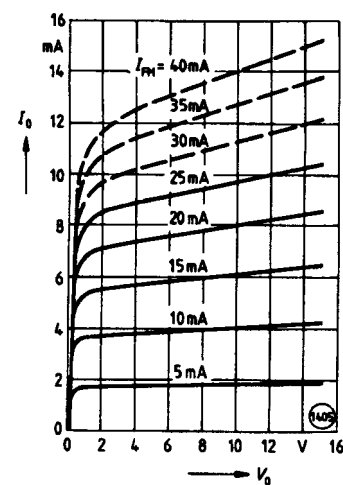


Figure 5. Permissible forward current of emitting diode versus ambient temperature

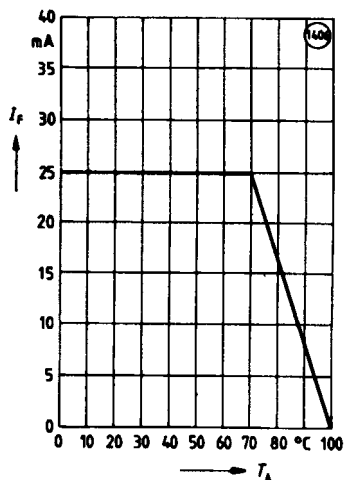


Figure 6. Permissible total power dissipation versus ambient temperature

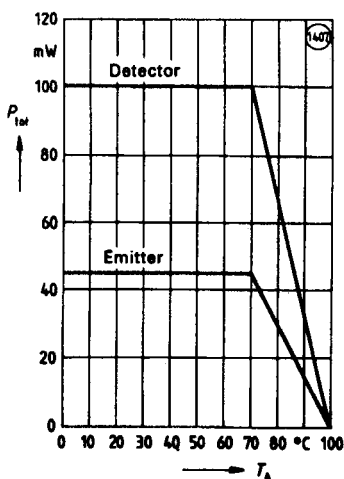


Figure 7. Forward current of emitting diode versus forward voltage (\$T_A=25^\circ\text{C}\$)

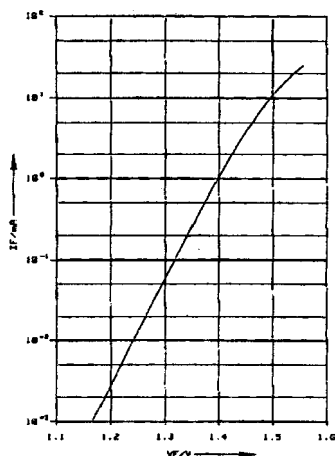


Figure 8. Small signal transfer ratio versus forward current (\$V_{CC}=5\text{ V}\$, \$T_A=25^\circ\text{C}\$)

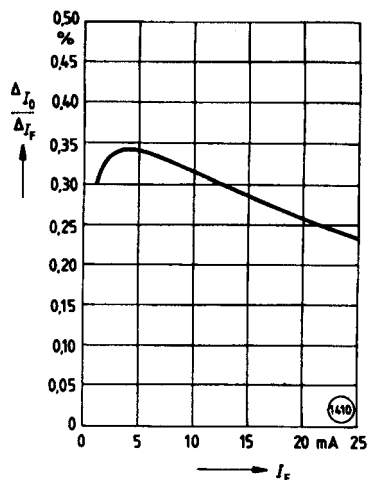


Figure 9. Current transfer ratio (normalized) versus ambient temperature (normalized to \$I_F=16\text{ mA}\$, \$V_O=0.4\text{ V}\$, \$V_{CC}=5\text{ V}\$, \$T_A=25^\circ\text{C}\$)

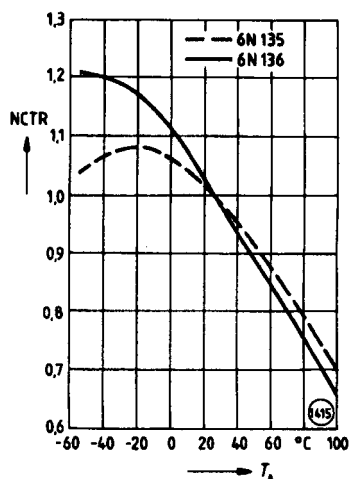


Figure 10. Output current (high) versus ambient temperature (\$V_O=V_{CC}=5\text{ V}\$, \$I_F=0\$)

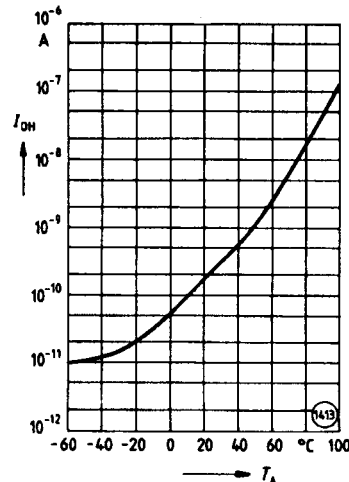


Figure 11. Delay times versus ambient temperature (\$I_F=16\text{ mA}\$, \$V_{CC}=5\text{ V}\$, 6N135: \$R_L=4.1\text{ k}\Omega\$, 6N136: \$R_L=1.9\text{ k}\Omega\$)

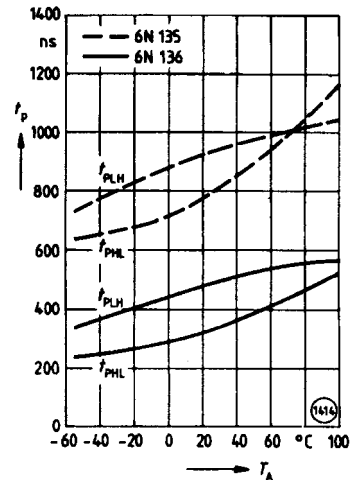


Figure 12. Current transfer ratio (normalized) versus forward current (\$I_F=16\text{ mA}\$, \$V_O=0.4\text{ V}\$, \$V_{CC}=5\text{ V}\$, \$T_A=25^\circ\text{C}\$)

