

HIGH-SPEED 2.5 kV TRIOS® OPTOCOUPLER

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

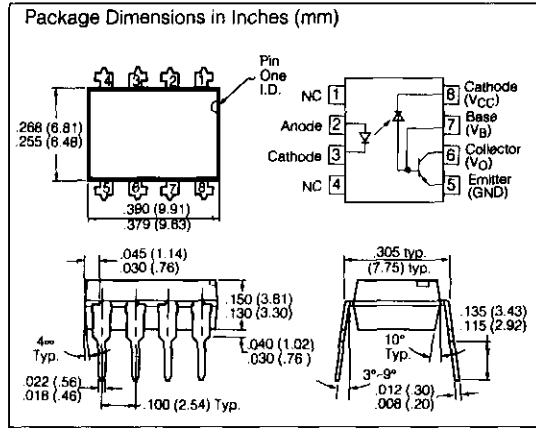
Reverse Voltage	5 V
Forward Current	25 mA
Peak Forward Current (t = 1 ms, duty cycle 50%)	50 mA
Maximum Surge Forward Current (t ≤ 1 μs, 300 pulses/s)	1 A
Thermal Resistance	700 K/W
Total Power Dissipation (T _A ≤ 70°C)	45 mW

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 = 1 min.)	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



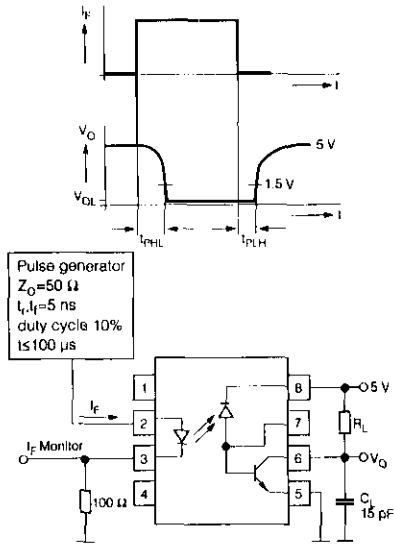
Characteristics

(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 ₀	125 pF	V _R = 0 V, f = 1 MHz
Temperature Coefficient of Forward Voltage	ΔV _F / ΔT _A	-1.7 mV/°C	I _F = 16 mA
Detector			
Supply Current			I _F = 16 mA, V _O open, V _{CC} = 15 V
Logic Low	I _{CCL}	150 μA	
Supply Current			I _F = 0 mA, V _O open, V _{CC} = 15 V
Logic High	I _{CCH}	0.01 (≤ 1) μA	
Output Voltage			I _F = 16 mA, V _{CC} = 4.5 V
Output Low			I _O = 1.1 mA
6N135	V _{OL}	0.1 (≤ 0.4) V	
6N136	V _{OL}	0.1 (≤ 0.4) V	I _O = 2.4 mA
Output Current			I _F = 0 mA, V _O = V _{CC} = 5.5 V
Output High	I _{OH}	3 (≤ 500) nA	
Output Current			I _F = 0 mA, V _O = V _{CC} = 15 V
Output High	I _{OH}	0.01 (≤ 1) μA	
Current Gain	H _{FE}	150	V _O = 5 V, I _O = 3 mA
Package			
Coupling Capacitance			f = 1 MHz
Input-Output	C _{IP}	0.6 pF	
Current Transfer Ratio			I _F = 16 mA, V _O = 0.4 V, V _{CC} = 4.5 V, T _A = 25°C
6N135	CTR	16 (≥ 7) %	
6N136	CTR	35 (≥ 19) %	
Current Transfer Ratio			I _F = 16 mA, V _O = 0.5 V, V _{CC} = 4.5 V
6N135	CTR	≥ 5 %	
6N136	CTR	≥ 15 %	

*TRIOS - Transparent IO Shield

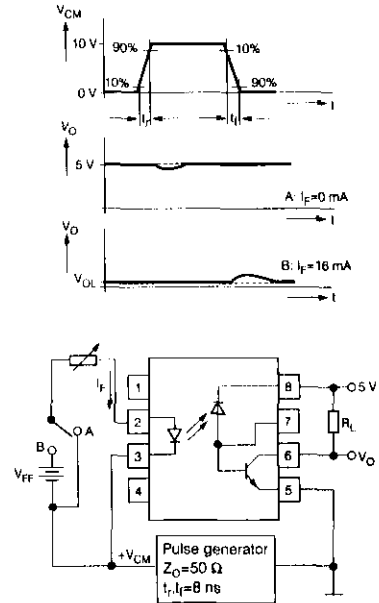
SWITCHING TIMES



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

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

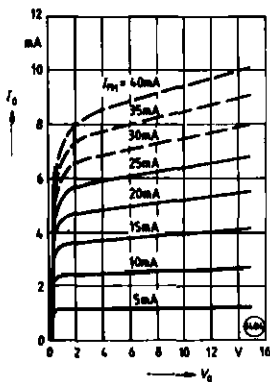
COMMON-MODE INTERFERENCE IMMUNITY



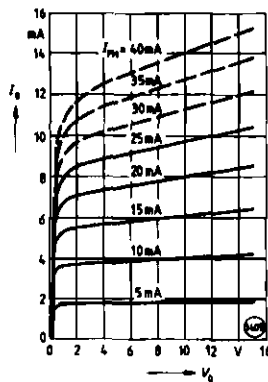
Common Mode Interference Immunity
 ($V_{CM}=10 \text{ V}_{P-P}$, $V_{CC}=5 \text{ V}$, $T_A=25^\circ\text{C}$)

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

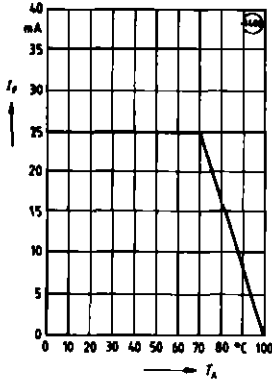
Output characteristics-6N135
 Output current versus output voltage ($T_A=25^\circ\text{C}$, $V_{CC}=5 \text{ V}$)



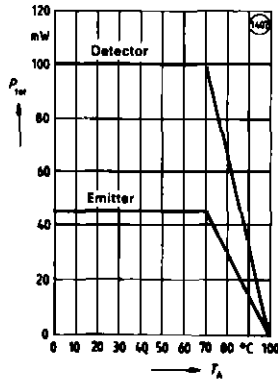
Output characteristics-6N136
 Output current versus output voltage ($T_A=25^\circ\text{C}$, $V_{CC}=5 \text{ V}$)



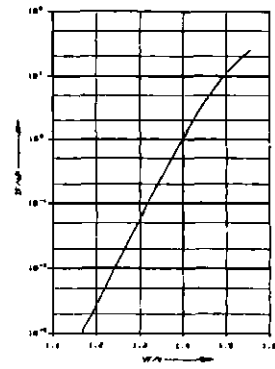
Permissible forward current of emitting diode versus ambient temperature



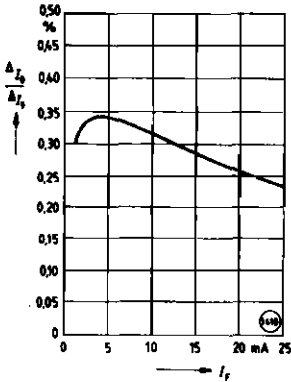
Permissible total power dissipation versus ambient temperature



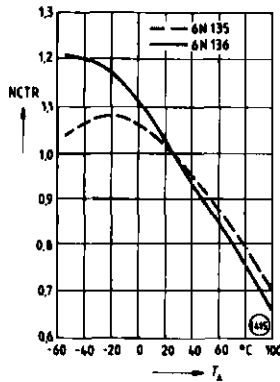
Forward current of emitting diode versus forward voltage (TA=25°C)



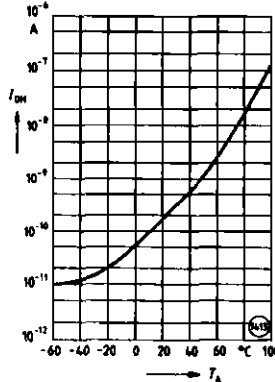
Small signal transfer ratio versus forward current (VCC=5 V, TA=25°C)



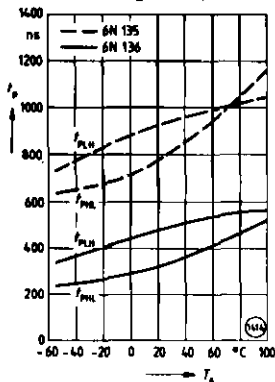
Current transfer ratio (normalized) versus ambient temperature (normalized to If=16 mA, VO=0.4 V, VCC=5 V, TA=25°C)



Output current (high) versus ambient temperature (VO=VCC=5 V, If=0)



Delay times versus ambient temperature (If=16 mA, VCC=5 V, 6N135: RL=4.1 kΩ, 6N136: RL=1.9 kΩ)



Current transfer ratio (normalized) versus forward current (If=16 mA, VO=0.4 V, VCC=5 V, TA=25°C)

