

### FEATURES

- Isolation Test Voltage: 2500 VAC<sub>RMS</sub>
- 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<sub>A</sub> ≤ 70°C) ..... 45 mW

#### Detector

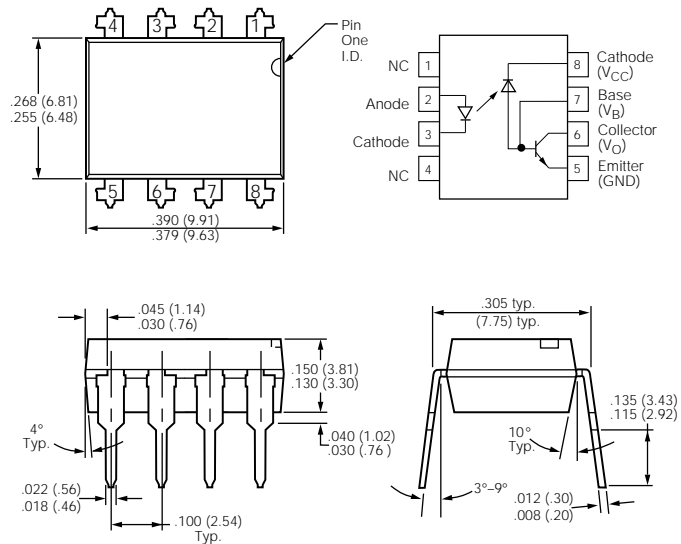
Supply Voltage ..... -0.5 to 15 V  
 Output Voltage ..... -0.5 to 15 V  
 Emitter-Base Voltage ..... 5 V  
 Output Current ..... 8 mA  
 Maximum Output Current ..... 16 mA  
 Base Current ..... 5 mA  
 Thermal Resistance ..... 300 K/W  
 Total Power Dissipation (T<sub>A</sub> ≤ 70°C) ..... 100 mW

#### Package

Isolation Test Voltage (between emitter and detector climate per DIN 40046, part 2, Nov. 74 (t=1min.) ..... 2500 VAC<sub>RMS</sub>  
 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<sub>IO</sub> = 500 V, T<sub>A</sub> = 25°C ..... ≥ 10<sup>12</sup> Ω  
 V<sub>IO</sub> = 500 V, T<sub>A</sub> = 100°C ..... ≥ 10<sup>11</sup> 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

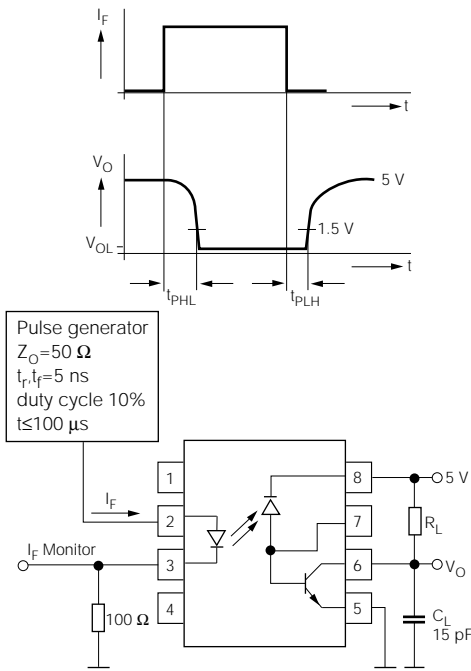
Dimensions in inches (mm)



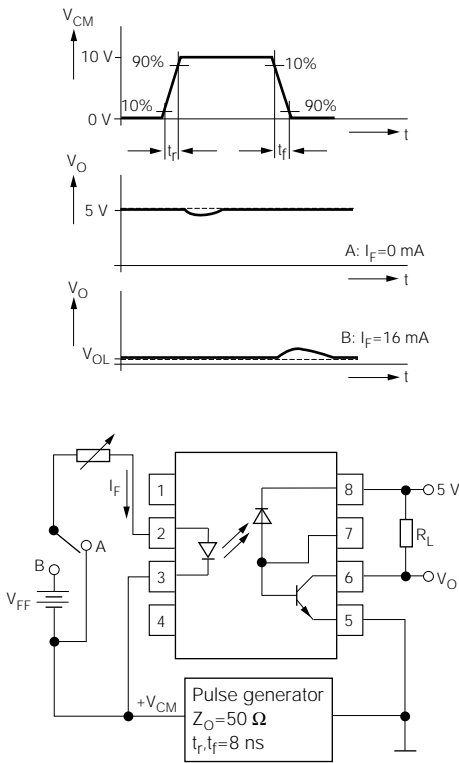
### Characteristics (T<sub>A</sub> = 0 to 70°C unless otherwise specified, T<sub>A</sub> = 25°C typ.)

Emitter	Symbol		Unit	Condition
Forward Voltage	V <sub>F</sub>	1.6 (≤1.9)	V	I <sub>F</sub> = 16 mA
Breakdown Voltage	V <sub>BR</sub>	≥ 5	V	I <sub>R</sub> = 10 μA
Reverse Current	I <sub>R</sub>	0.5 (≤10)	μA	V <sub>R</sub> = 5 V
Capacitance	C <sub>O</sub>	125	pF	V <sub>R</sub> = 0 V, f = 1 MHz
Temperature Coefficient, Forward Voltage	ΔV <sub>F</sub> / ΔT <sub>A</sub>	-1.7	mV/°C	I <sub>F</sub> = 16 mA
<b>Detector</b>				
Supply Current Logic Low	I <sub>CCL</sub>	150	μA	I <sub>F</sub> = 16 mA, V <sub>O</sub> open, V <sub>CC</sub> = 15 V
Supply Current Logic High	I <sub>CCH</sub>	0.01 (≤1)	μA	I <sub>F</sub> = 0 mA, V <sub>O</sub> open, V <sub>CC</sub> = 15 V
Output Voltage, Output Low	V <sub>OL</sub>	0.1 (≤0.4)	V	I <sub>F</sub> = 16 mA, V <sub>CC</sub> = 4.5 V, I <sub>O</sub> = 1.1 mA
Output Voltage, Output High	V <sub>OL</sub>	0.1 (≤0.4)	V	I <sub>F</sub> = 16 mA, V <sub>CC</sub> = 4.5 V, I <sub>O</sub> = 2.4 mA
Output Current, Output High	I <sub>CH</sub>	3 (≤500)	nA	I <sub>F</sub> = 0 mA, V <sub>O</sub> = V <sub>CC</sub> = 5.5 V
Output Current, Output High	I <sub>CH</sub>	0.01 (≤1)	μA	I <sub>F</sub> = 0 mA, V <sub>O</sub> = V <sub>CC</sub> = 15 V
Current Gain	H <sub>FE</sub>	150		V <sub>O</sub> = 5 V, I <sub>O</sub> = 3 mA
<b>Package</b>				
Coupling Capacitance Input-Output	C <sub>IO</sub>	0.6	pF	f = 1 MHz
Current Transfer Ratio				
6N135	CTR	16 (≥7)	%	I <sub>F</sub> = 16 mA, V <sub>O</sub> = 0.4 V, V <sub>CC</sub> = 4.5 V, T <sub>A</sub> = 25°C
6N136	CTR	35 (≥19)	%	I <sub>F</sub> = 16 mA, V <sub>O</sub> = 0.4 V, V <sub>CC</sub> = 4.5 V, T <sub>A</sub> = 25°C
6N135	CTR	≥ 5	%	I <sub>F</sub> = 16 mA, V <sub>O</sub> = 0.5 V, V <sub>CC</sub> = 4.5 V
6N136	CTR	≥ 15	%	I <sub>F</sub> = 16 mA, V <sub>O</sub> = 0.5 V, V <sub>CC</sub> = 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 ( $\leq 0.8$ )	$\mu\text{s}$ $\mu\text{s}$
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 ( $\leq 0.8$ )	$\mu\text{s}$ $\mu\text{s}$

**Common Mode Interference Immunity**

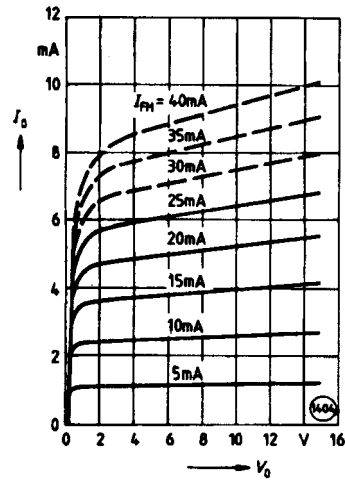
( $V_{CM}=10\ \text{V}_{P-P}$ ,  $V_{CC}=5\ \text{V}$ ,  $T_A=25^\circ\text{C}$ )

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**

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

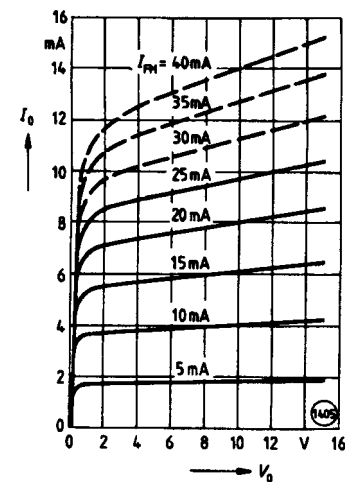


Figure 5. Permissible forward current of emitting diode versus ambient temperature

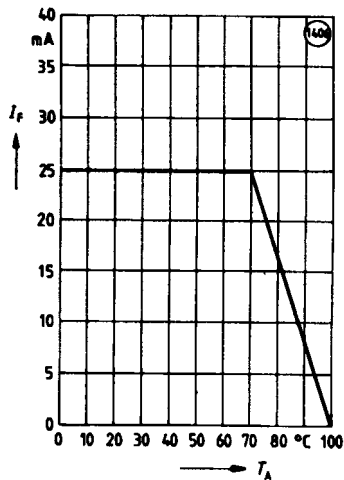


Figure 6. Permissible total power dissipation versus ambient temperature

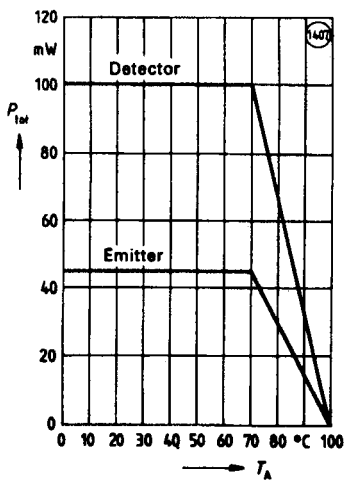


Figure 7. Forward current of emitting diode versus forward voltage ( $T_A=25^\circ\text{C}$ )

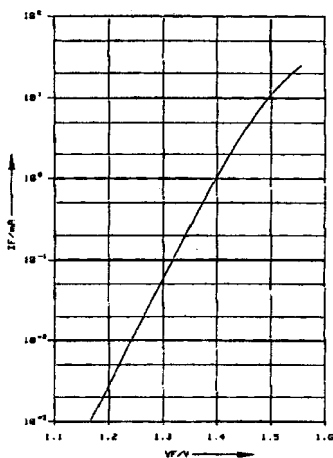


Figure 8. Small signal transfer ratio versus forward current ( $V_{CC}=5\text{ V}$ ,  $T_A=25^\circ\text{C}$ )

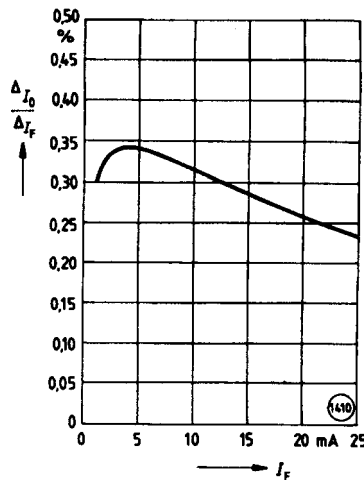


Figure 9. Current transfer ratio (normalized) versus ambient temperature (normalized to  $I_F=16\text{ mA}$ ,  $V_O=0.4\text{ V}$ ,  $V_{CC}=5\text{ V}$ ,  $T_A=25^\circ\text{C}$ )

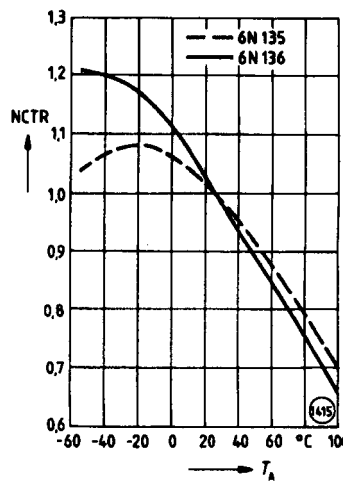


Figure 10. Output current (high) versus ambient temperature ( $V_O=V_{CC}=5\text{ V}$ ,  $I_F=0$ )

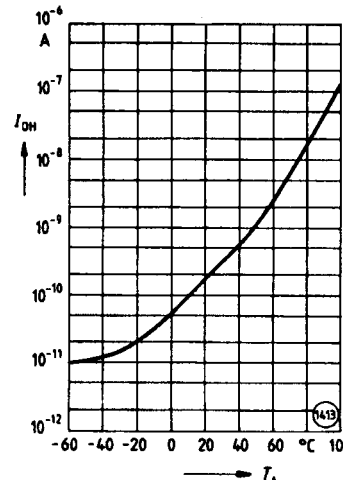


Figure 11. Delay times versus ambient temperature ( $I_F=16\text{ mA}$ ,  $V_{CC}=5\text{ V}$ , 6N135:  $R_L=4.1\text{ k}\Omega$ , 6N136:  $R_L=1.9\text{ k}\Omega$ )

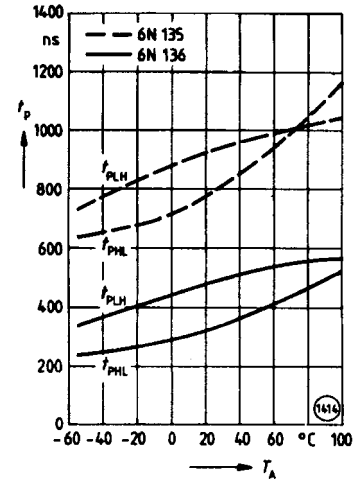
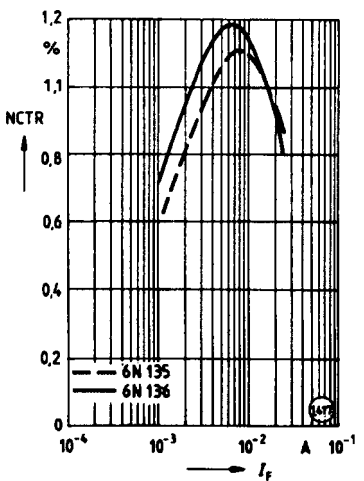


Figure 12. Current transfer ratio (normalized) versus forward current ( $I_F=16\text{ mA}$ ,  $V_O=0.4\text{ V}$ ,  $V_{CC}=5\text{ V}$ ,  $T_A=25^\circ\text{C}$ )



This datasheet has been download from:

[www.datasheetcatalog.com](http://www.datasheetcatalog.com)

Datasheets for electronics components.