High Speed Optocoupler, 1 MBd, Photodiode with Transistor Output

Features

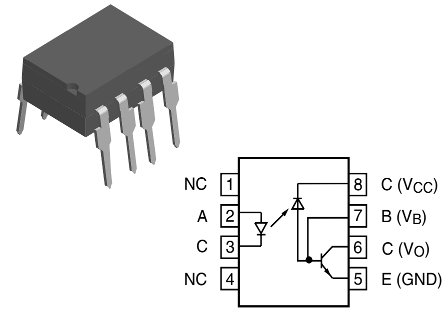
- Isolation Test Voltage: 5300 V_{RMS}
- TTL Compatible
- High Bit Rates: 1.0 Mbit/s
- High Common-Mode Interference Immunity
- Bandwidth 2.0 MHz
- Open-Collector Output
- External Base Wiring Possible
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Agency Approvals

- UL1577, File No. E52744 System Code H or J, Double Protection
- DIN EN 60747-5-2 (VDE0884)
  DIN EN 60747-5-5 pending
  Available with Option 1
- CSA 93751

Description

The 6N135 and 6N136 are optocouplers with a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector which consists of a photo diode and a high-speed transistor in a DIP-8 plastic package.



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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 should not exceed the maximum permissible reference voltages

Order Information

Part	Remarks
6N135	CTR ≥ 7 %, DIP-8
6N136	CTR ≥ 19 %, DIP-8
6N135-X007	CTR ≥ 7 %, SMD-8 (option 7)
6N136-X006	CTR ≥ 19 %, DIP-8 400 mil (option 6)
6N136-X007	CTR ≥ 19 %, SMD-8 (option 7)
6N136-X009	CTR ≥ 19 %, SMD-8 (option 9)

For additional information on the available options refer to Option Information.

Absolute Maximum Ratings

T_{amb} = 25 °C, unless otherwise specified

Stresses in excess of the absolute Maximum Ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute Maximum Rating for extended periods of the time can adversely affect reliability.

Input

Parameter	Test condition	Symbol	Value	Unit
Reverse voltages		V_R	5.0	V
Forward current		I_F	25	mA
Peak forward current	t = 1.0 ms, duty cycle 50 %	I_{FSM}	50	mA
Maximum surge forward current	t ≤ 1.0 µs, 300 pulses/s		1.0	A
Thermal resistance		R_{th}	700	K/W
Power dissipation	T_{amb} = 70 °C	P_{diss}	45	mW

Output

Parameter	Test condition	Symbol	Value	Unit
Supply voltage		V_S	- 0.5 to 15	V
Output voltage		V_O	- 0.5 to 15	V
Emitter-base voltage		V_{EBO}	5.0	V
Output current		I_O	8.0	mA
Maximum output current			16	mA
Base current		I_B	5.0	mA
Thermal resistance			300	K/W
Power dissipation	T_{amb} = 70 °C	P_{diss}	100	mW

Coupler

Parameter	Test condition	Symbol	Value	Unit
Isolation test voltage (between emitter and detector climate per DIN 50014 part 2, NOV 74	t = 1.0 s	V_{ISO}	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_{amb} = 25 °C	R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	$\geq 10^{11}$	Ω
Storage temperature range		T_{stg}	- 55 to + 125	°C
Ambient temperature range		T_{amb}	- 55 to + 100	°C
Soldering temperature	max. ≤ 10 s, dip soldering ≥ 0.5 mm from case bottom	T_{sld}	260	°C

Electrical Characteristics

T_{amb} = 25 °C, unless otherwise specified
Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

Input

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I_F = 16 mA	V_F		1.6	1.9	V
Breakdown voltage	I_R = 10 µA	V_{BR}	5.0			V
Reverse current	V_R = 5.0 V	I_R		0.5	10	µA
Capacitance	V_R = 0 V, f = 1.0 MHz	C_O		125		pF
Temperature coefficient, forward voltage	I_F = 16 mA	$\Delta V_F/\Delta T_A$		-1.7		mV/°C

Output

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Logic low supply current	I_F = 16 mA, V_O open, V_{CC} = 15 V		I_{CCL}		150		µA
Supply current, logic high	I_F = 0 mA, V_O open, V_{CC} = 15 V		I_{CCH}		0.01	1	µA
Output voltage, output low	I_F = 16 mA, V_{CC} = 4.5 V, I_O = 1.1 mA	6N135	V_{OL}		0.1	0.4	V
	I_F = 16 mA, V_{CC} = 4.5 V, I_O = 2.4 mA	6N136	V_{OL}		0.1	0.4	V
Output current, output high	I_F = 0 mA, V_O = V_{CC} = 5.5 V		I_{OH}		3.0	500	nA
	I_F = 0 mA, V_O = V_{CC} = 15 V		I_{OH}		0.01	1	µA

Coupler

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Capacitance (input-output)	f = 1.0 MHz	C_{IO}		0.6		pF

Current Transfer Ratio

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Current Transfer Ratio	I_F = 16 mA, V_O = 0.4 V, V_{CC} = 4.5 V	6N135	CTR	7	16		%
		6N136	CTR	19	35		%
	I_F = 16 mA, V_O = 0.5 V, V_{CC} = 4.5 V	6N135	CTR	5			%
		6N136	CTR	15			%

Switching Characteristics

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
High-low	I_F = 16 mA, V_{CC} = 5.0 V, R_L = 4.1 kΩ	6N135	t_{PHL}		0.3	1.5	µs
	I_F = 16 mA, V_{CC} = 5.0 V, R_L = 1.9 kΩ	6N136	t_{PHL}		0.2	0.8	µs
Low-high	I_F = 16 mA, V_{CC} = 5.0 V, R_L = 4.1 kΩ	6N135	t_{PLH}		0.3	1.5	µs
	I_F = 16 mA, V_{CC} = 5.0 V, R_L = 1.9 kΩ	6N136	t_{PLH}		0.2	0.8	µs

Common Mode Transient Immunity

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
High	I_F = 0 mA, V_{CM} = 10 V_{P-P}, V_{CC} = 5.0 V, R_L = 4.1 kΩ	6N135	$\|CM_H\|$		1000		V/µs
	I_F = 0 mA, V_{CM} = 10 V_{P-P}, V_{CC} = 5.0 V, R_L = 1.9 kΩ	6N136	$\|CM_H\|$		1000		V/µs
Low	I_F = 16 mA, V_{CM} = 10 V_{P-P}, V_{CC} = 5.0 V, R_L = 4.1 kΩ	6N135	$\|CM_L\|$		1000		V/µs
	I_F = 16 mA, V_{CM} = 10 V_{P-P}, V_{CC} = 5.0 V, R_L = 1.9 kΩ	6N136	$\|CM_L\|$		1000		V/µs

Typical Characteristics (Tamb = 25 °C unless otherwise specified)

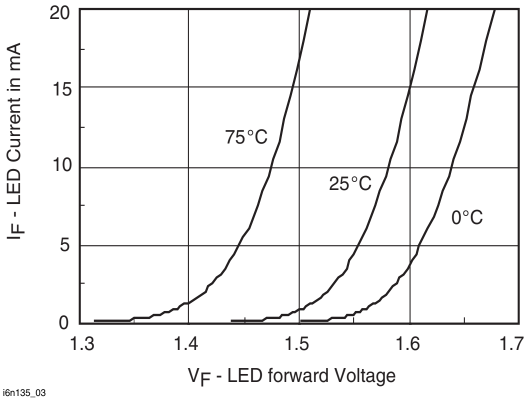


Figure 1. LED Forward Current vs.Forward Voltage

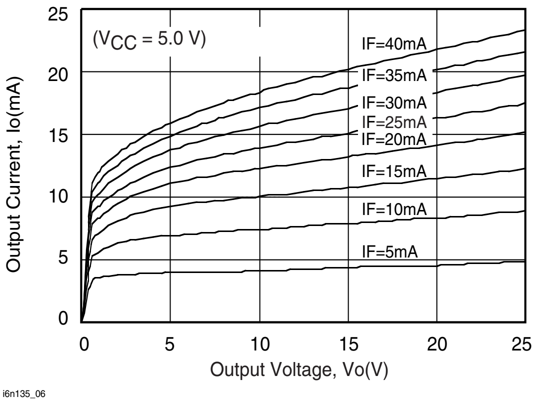


Figure 4. Output Current vs. Output Voltage

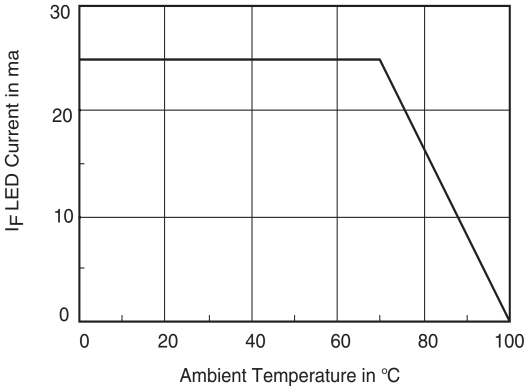


Figure 2. Permissible Forward LED Current vs. Temperature

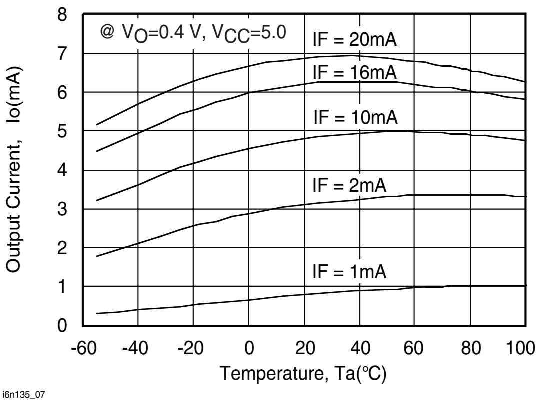


Figure 5. Output Current vs. Temperature

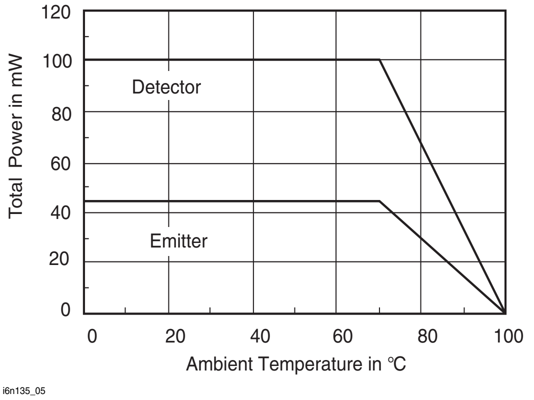


Figure 3. Permissible Power Dissipation vs. Temperature

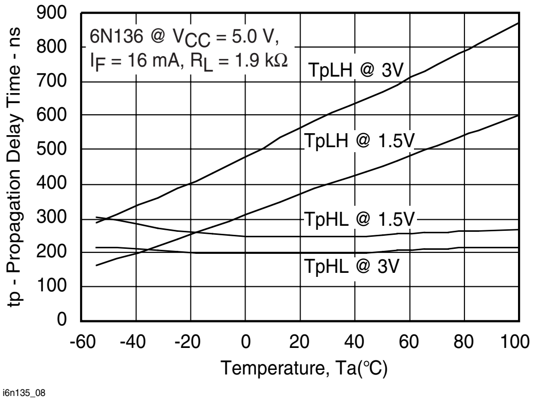


Figure 6. Propagation Delay vs. Ambient Temperature

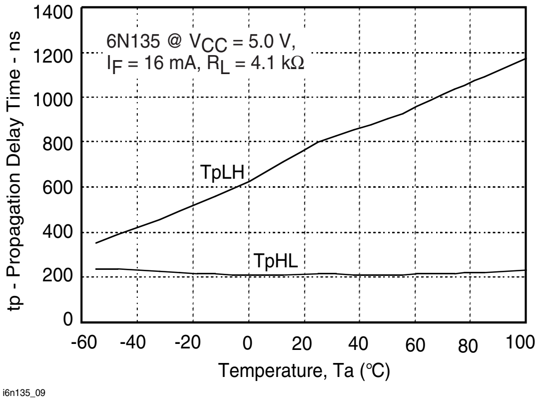


Figure 7. Propagation Delay vs. Ambient Temperature

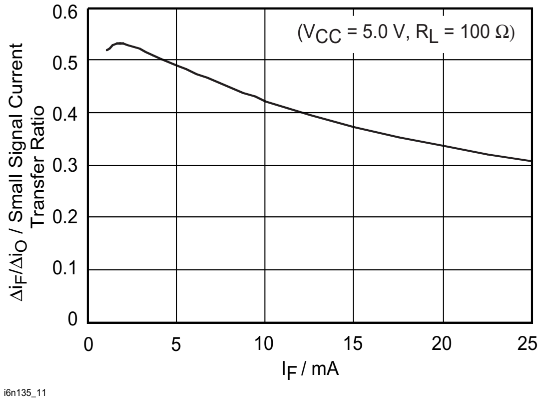


Figure 9. Small Signal Current Transfer Ratio vs. Quiescent Input Current

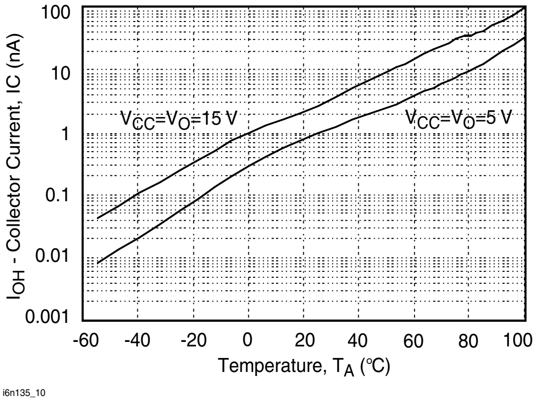


Figure 8. Logic High Output Current vs.Temperature

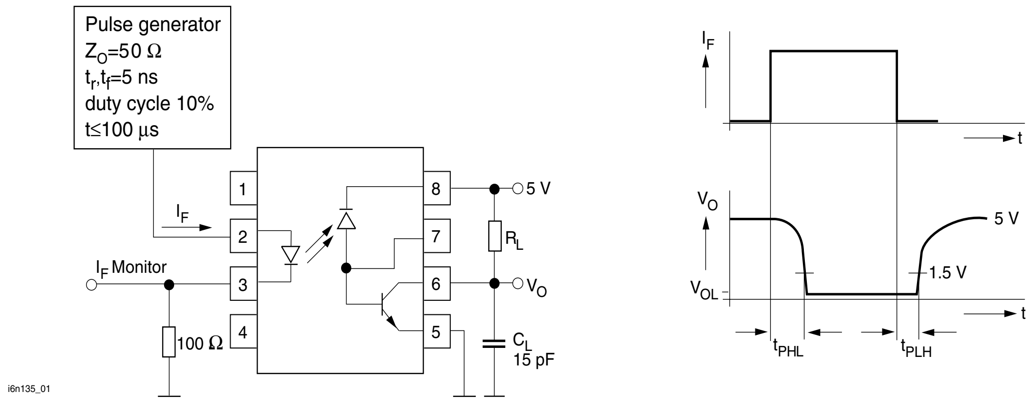


Figure 10. Switching Times

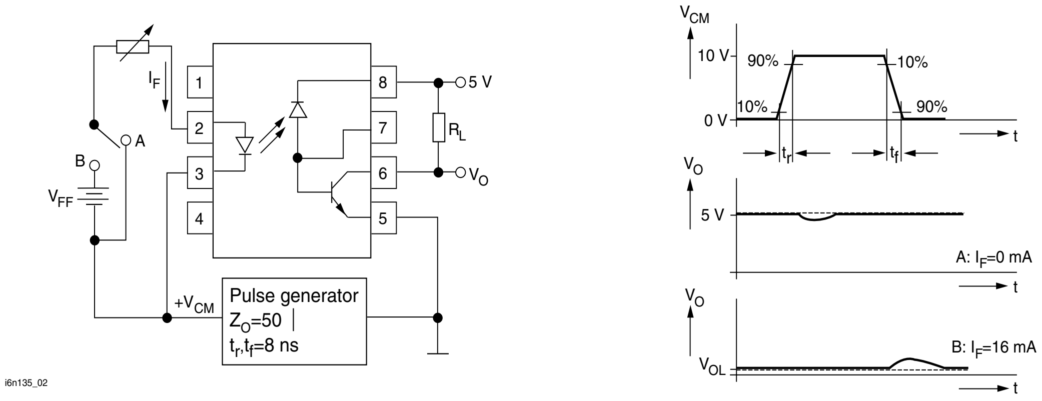
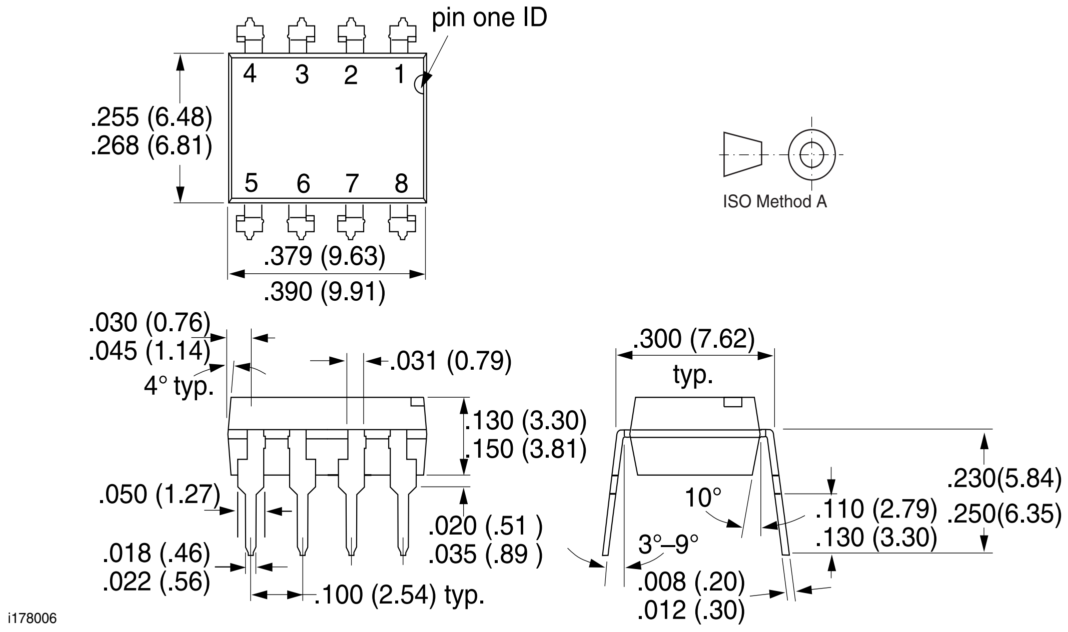
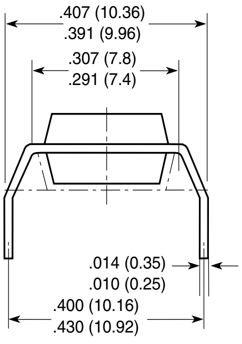


Figure 11. Common-Mode Interference Immunity

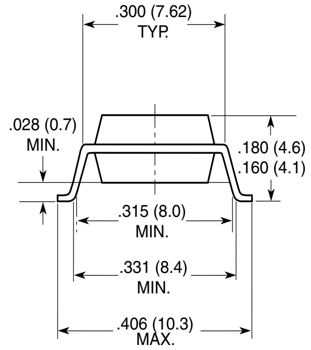
Package Dimensions in Inches (mm)



Option 6



Option 7



Option 9