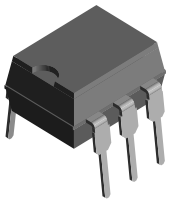
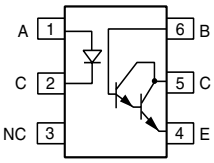
4N32/ 4N33

Optocoupler, Photodarlington Output, High Gain, With Base Connection

Features

- Very high current transfer ratio, 500 % Min.
- High isolation resistance, 10^{11} Ω Typical
- Standard plastic DIP package
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC





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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
- BSI IEC60950 IEC60065

Description

The 4N32 and 4N33 are optically coupled isolators with a gallium arsenide infrared LED and a solicon photodarlington sensor.

Switching can be achieved while maintaining a high degree of isolation between driving and load circuits.

These optocouplers can be used to replace reed and mercury relays with advantages of long life, high speed switching and elimination of magnetic fields.

Order Information

Part	Remarks
4N32	CTR > 500 %, DIP-6
4N33	CTR > 500 %, DIP-6
4N32-X007	CTR > 500 %, SMD-6 (option 7)
4N32-X009	CTR > 500 %, SMD-6 (option 9)
4N33-X007	CTR > 500 %, SMD-6 (option 7)
4N33-X009	CTR > 500 %, SMD-6 (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
Peak reverse voltage		V_R	3.0	V
Forward continuous current		I_F	60	mA
Power dissipation		P_{diss}	100	mW
Derate linearly	from 55 °C		1.33	mW/°C

Parameter	Test condition	Symbol	Value	Unit
Collector-emitter breakdown voltage		BV_{CEO}	30	V
Emitter-base breakdown voltage		BV_{EBO}	8.0	V
Collector-base breakdown voltage		BV_{CBO}	50	V
Emitter-collector breakdown voltage		BV_{ECO}	5.0	V
Collector (load) current		I_C	125	mA
Power dissipation		P_{diss}	150	mW
Derate linearly			2.0	mW/°C

Coupler

Parameter	Test condition	Symbol	Value	Unit
Total dissipation		P_{tot}	250	mW
Derate linearly			3.3	mW/°
Isolation test voltage (between emitter and detector, Standard Climate: 23 °C/ 50 %RH, \\nDIN 500 14)		V_{ISO}	5300	V_{RMS}
Leakage Path			7.0	mm min.
Air Path			7.0	mm min.
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
Storange temperature		T_{amb}	- 55 to + 150	°C
Operating temperature		T_{stg}	- 55 to + 100	°C
Lead soldering time	at 260 °C		10	s

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 = 50 mA	V_F		1.25	1.5	V
Reverse current	V_R = 3.0 V	I_R		0.1	100	µ
Capacitance	V_R = 0 V	C_O		25		pF

Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector-emitter breakdown voltage[1)]	I_C = 100 µA, I_F = 0	BV_{CEO}	30			V
Collector-base breakdown voltage[1)]	I_C = 100 µA, I_F = 0	BV_{CBO}	50			V
Emitter-base breakdown voltage[1)]	I_C = 100 µA, I_F = 0	BV_{EBO}	8.0			V
Emitter-collector breakdown voltage[1)]	I_C = 100 µA, I_F = 0	BV_{ECO}	5.0	10		V
Collector-emitter leakage current	V_{CE} = 10 V, I_F = 0	I_{CEO}		1.0	100	nA
	I_C = 0.5 mA, V_{CE} = 5.0 V	h_{FE}	13			

1) Indicates JEDEC registered values

Coupler

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Colector emitter saturation voltage		V_{CEsat}		1.0		V
Coupling capacitance				1.5		pF

Current Transfer Ratio

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Current Transfer Ratio	V_{CE} = 10 V, I_F = 10 mA,	CTR	500			%

Switching Characteristics

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Turn on time	V_{CC} = 10 V, I_C = 50 mA	t_{on}			5.0	µs
Turn off time	I_F = 200 mA, R_L = 180 Ω	t_{off}			100	µs

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

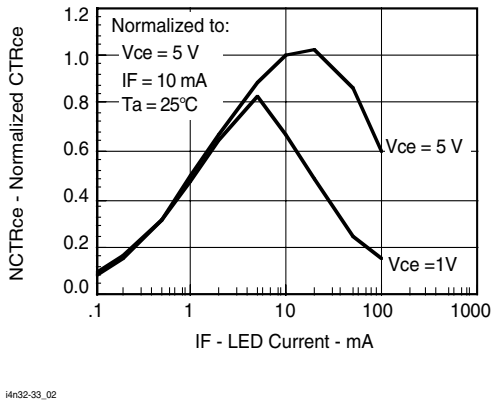

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Figure 1. Normalized Non-saturated and Saturated CTR_{CE} vs. LED Current

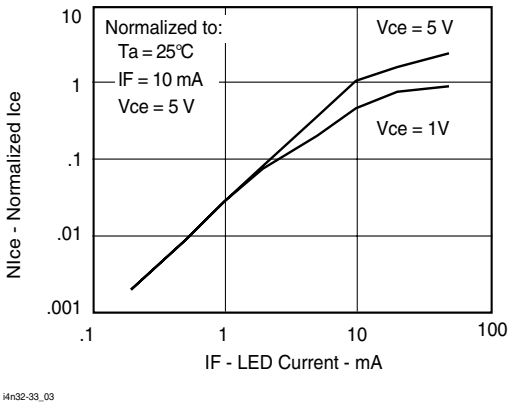

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Figure 2. Normalized Non-Saturated and Saturated Collector-Emitter Current vs. LED Current

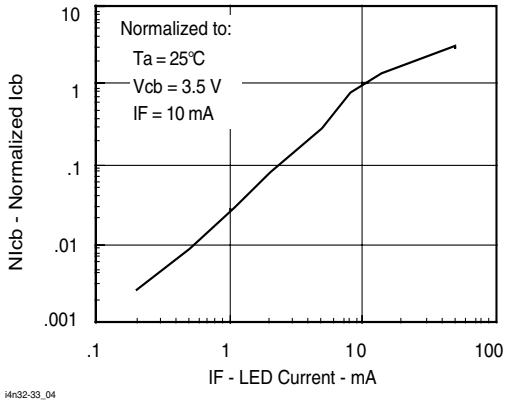


Figure 3. Normalized Collector-Base Photocurrent vs. LED Current

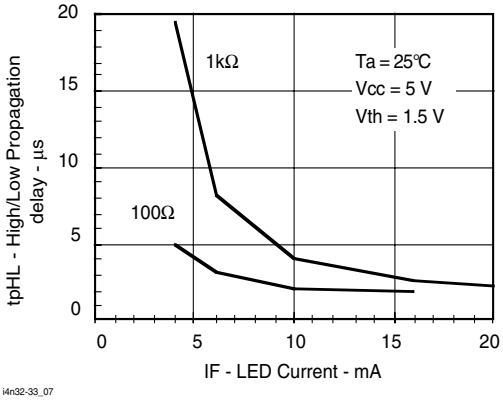


Figure 6. High to low Propagation Delay vs. Collector Load Resistance and LED Current

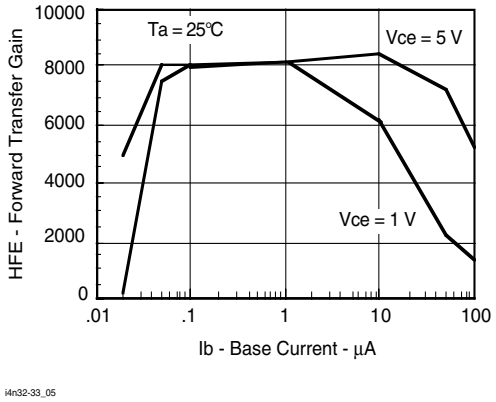


Figure 4. Non-Saturated and Saturated HFE vs. Base Current

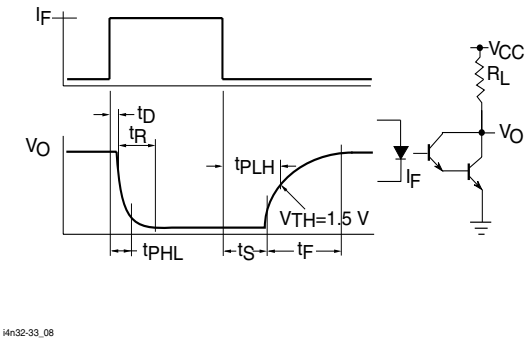


Figure 7. Switching Waveform and Switching Schematic

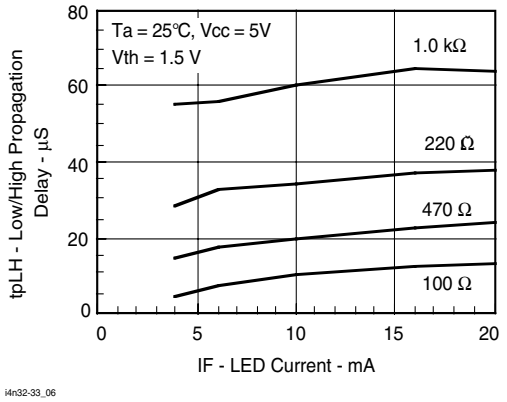
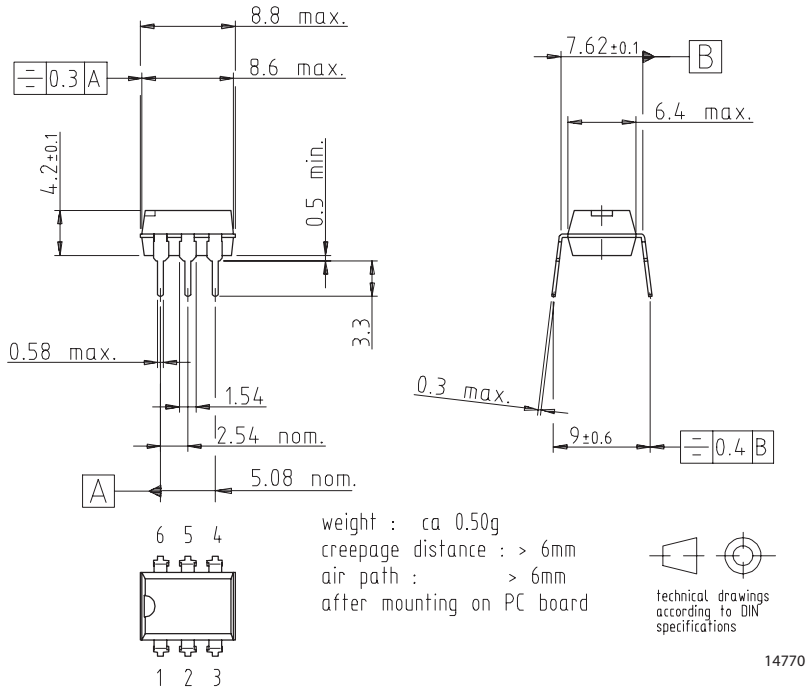


Figure 5. Low to High Propagation Delay vs. Collector Load Resistance and LED Current

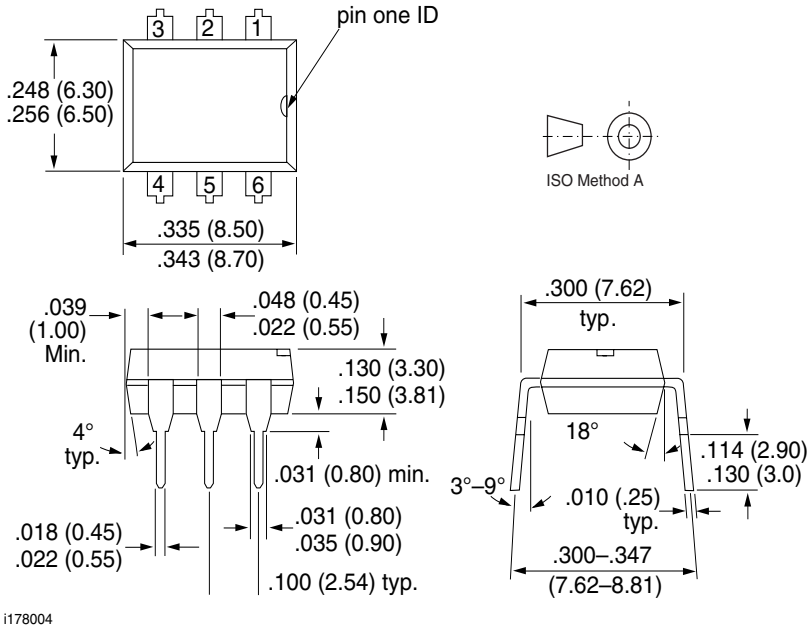
Package Dimensions in Inches (mm)

For 4N32/33..... see DIL300-6 Package dimension in the Package Section.
For products with an option designator (e.g. 4N32-X007 or 4N33-X009)..... see DIP-6 Package dimensions in the Package Section.

DIL300-6 Package Dimensions



DIP-6 Package Dimensions



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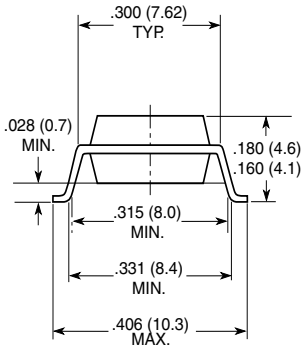
Option 7



Option 9