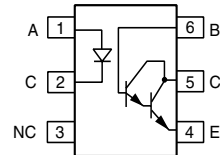
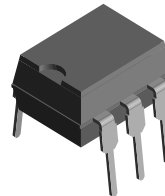


## Optocoupler, Photodarlington Output, High Gain, With Base Connection

### Features

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



1179005



### 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 silicon 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

$T_{amb} = 25 \text{ }^\circ\text{C}$ , 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 $^\circ\text{C}$		1.33	mW/ $^\circ\text{C}$

# 4N32/ 4N33

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	$V_{IO} = 500 \text{ V}, T_{amb} = 25 \text{ °C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500 \text{ V}, T_{amb} = 100 \text{ °C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Storage 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

$T_{amb} = 25 \text{ °C}$ , 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	$I_F = 50 \text{ mA}$	$V_F$		1.25	1.5	V
Reverse current	$V_R = 3.0 \text{ V}$	$I_R$		0.1	100	$\mu$
Capacitance	$V_R = 0 \text{ V}$	$C_O$		25		pF

## Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector-emitter breakdown voltage <sup>1)</sup>	$I_C = 100 \mu A, I_F = 0$	$BV_{CEO}$	30			V
Collector-base breakdown voltage <sup>1)</sup>	$I_C = 100 \mu A, I_F = 0$	$BV_{CBO}$	50			V
Emitter-base breakdown voltage <sup>1)</sup>	$I_C = 100 \mu A, I_F = 0$	$BV_{EBO}$	8.0			V
Emitter-collector breakdown voltage <sup>1)</sup>	$I_C = 100 \mu A, I_F = 0$	$BV_{ECO}$	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			

<sup>1)</sup> Indicates JEDEC registered values

## Coupler

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

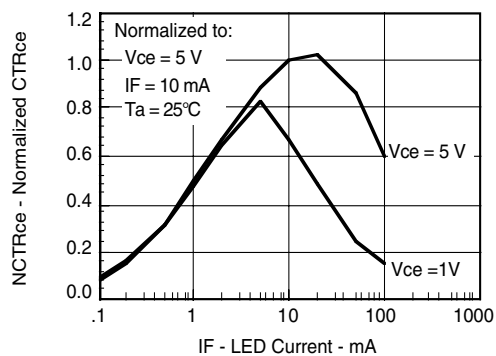
## Current Transfer Ratio

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

## Switching Characteristics

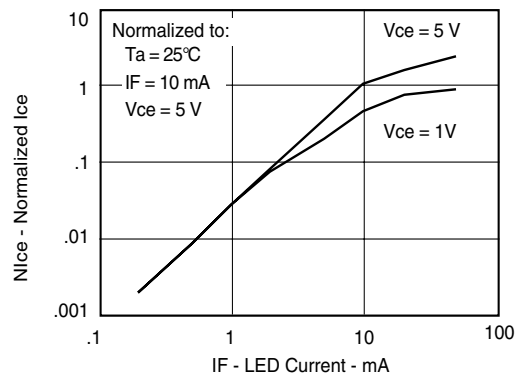
Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Turn on time	$V_{CC} = 10 V, I_C = 50 mA$	$t_{on}$			5.0	$\mu s$
Turn off time	$I_F = 200 mA, R_L = 180 \Omega$	$t_{off}$			100	$\mu s$

## Typical Characteristics ( $T_{amb} = 25^\circ C$ unless otherwise specified)



4n32-33\_02

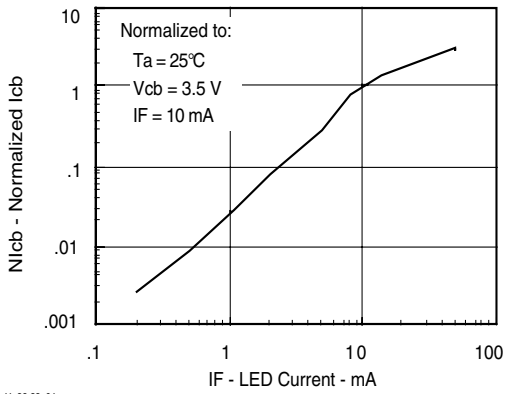
Figure 1. Normalized Non-saturated and Saturated  $CTR_{CE}$  vs. LED Current



4n32-33\_03

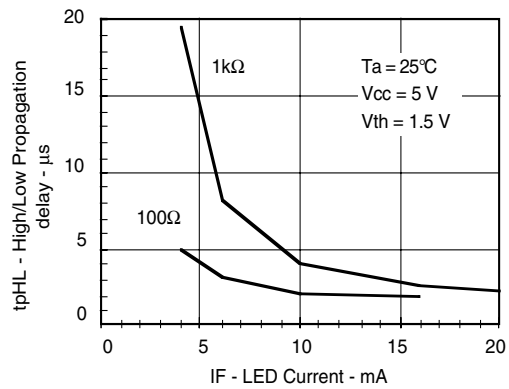
Figure 2. Normalized Non-Saturated and Saturated Collector-Emitter Current vs. LED Current

# 4N32/ 4N33



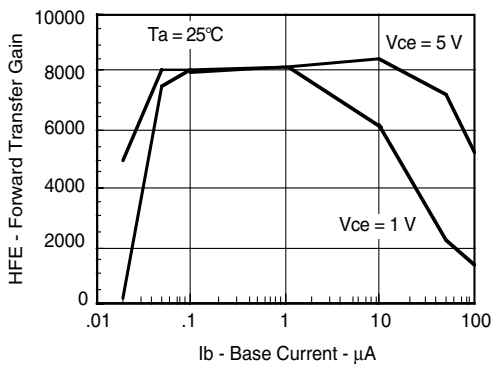
4N32-33\_04

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



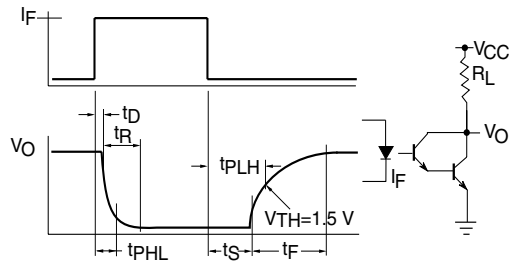
4N32-33\_07

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



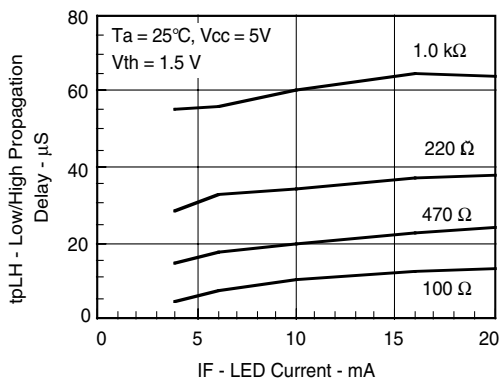
4N32-33\_05

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



4N32-33\_08

Figure 7. Switching Waveform and Switching Schematic



4N32-33\_06

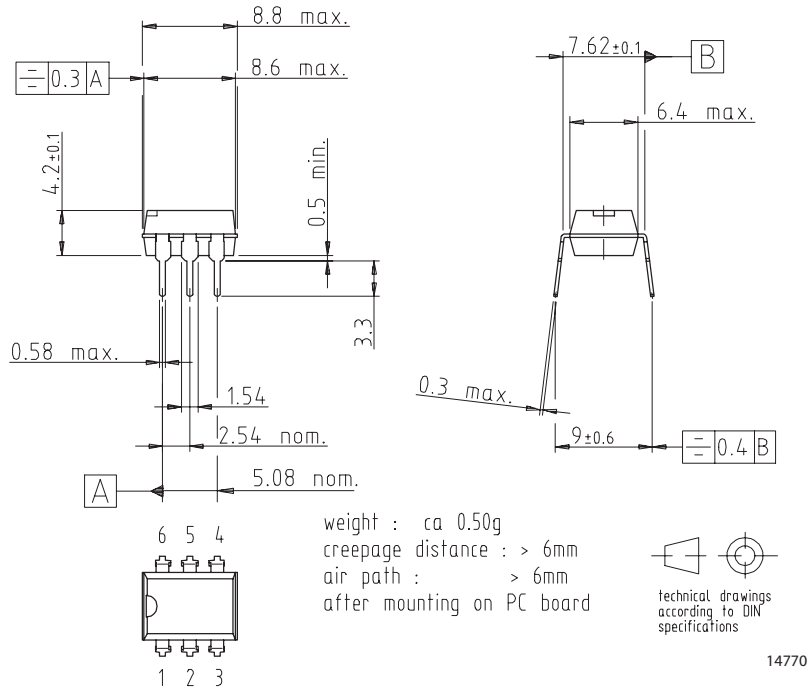
Figure 5. Low to High Propagation Delay vs. Collector Load Resistance and LED Current

## Package Dimensions in Inches (mm)

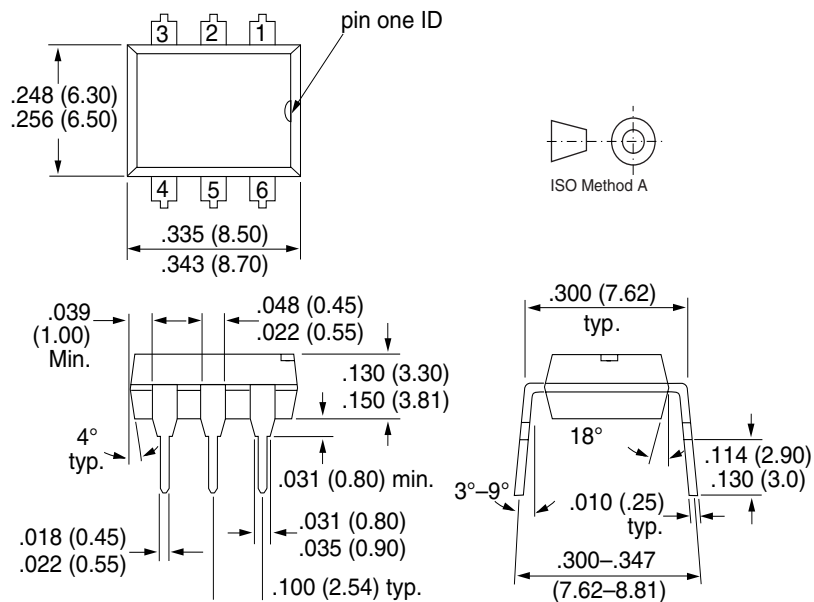
For 4N32/33..... see DIL300-6 Package dimension in the Package Section.

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



# 4N32/ 4N33

Vishay Semiconductors

