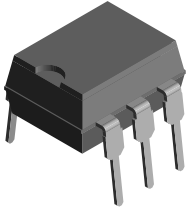
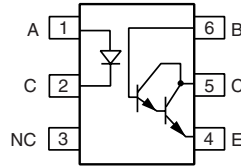


## Optocoupler, Photodarlington Output, High Gain, with Base Connection



I179005



### FEATURES

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


**RoHS**  
COMPLIANT

### 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.

### AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 pending available with option 1
- BSI IEC60950; IEC60065

### ORDER INFORMATION

PART	REMARKS
4N32-X000	CTR > 500 %, DIP-6
4N33-X000	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)

#### Note

For additional information on the available options refer to option information.

### ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		$V_R$	3	V
Forward current		$I_F$	60	mA
Power dissipation		$P_{diss}$	100	mW
Derate linearly	from 55 °C		1.33	mW/°C
<b>OUTPUT</b>				
Collector emitter breakdown voltage		$BV_{CEO}$	30	V
Emitter base breakdown voltage		$BV_{EBO}$	8	V
Collector base breakdown voltage		$BV_{CBO}$	50	V
Emitter collector breakdown voltage		$BV_{ECO}$	5	V
Collector (load) current		$I_C$	125	mA
Power dissipation		$P_{diss}$	150	mW
Derate linearly			2	mW/°C

# 4N32-X000/4N33-X000



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ABSOLUTE MAXIMUM RATINGS (1)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>COUPLER</b>				
Total dissipation		$P_{tot}$	250	mW
Derate linearly			3.3	mW/°C
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		$T_{stg}$	- 55 to + 150	°C
Operating temperature		$T_{amb}$	- 55 to + 100	°C
Lead soldering time (2)	at 260 °C		10	s

## Notes

(1)  $T_{amb} = 25\text{ °C}$ , 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 ratings for extended periods of the time can adversely affect reliability.

(2) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

ELECTRICAL CHARACTERISTICS (1)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
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	$\mu\text{A}$
Capacitance	$V_R = 0\text{ V}$	$C_O$		25		pF
<b>OUTPUT</b>						
Collector emitter breakdown voltage (2)	$I_C = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{CEO}$	30			V
Collector base breakdown voltage (2)	$I_C = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{CB0}$	50			V
Emitter base breakdown voltage (2)	$I_C = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{EBO}$	8			V
Emitter collector breakdown voltage (2)	$I_C = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{ECO}$	5	10		V
Collector emitter leakage current	$V_{CE} = 10\text{ V}, I_F = 0$	$I_{CEO}$		1.0	100	nA
	$I_C = 0.5\text{ mA}, V_{CE} = 5.0\text{ V}$	$h_{FE}$	13			
<b>COUPLER</b>						
Collector emitter saturation voltage		$V_{CEsat}$		1.0		V
Coupling capacitance				1.5		pF

## Notes

(1)  $T_{amb} = 25\text{ °C}$ , 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.

(2) Indicates JEDEC registered values.

CURRENT TRANSFER RATIO						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Current transfer ratio	$V_{CE} = 10\text{ V}, I_F = 10\text{ mA}$	CTR	500			%

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$V_{CC} = 10\text{ V}, I_C = 50\text{ mA}$	$t_{on}$			5.0	$\mu\text{s}$
Turn-off time	$I_F = 200\text{ mA}, R_L = 180\text{ }\Omega$	$t_{off}$			100	$\mu\text{s}$



SAFETY AND INSULATION RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Climatic classification (according to IEC 68 part 1)				55/100/21		
Comparative tracking index		CTI	175		399	
$V_{IOTM}$			8000			V
$V_{IORM}$			890			V
$P_{SO}$					700	mW
$I_{SI}$					400	mA
$T_{SI}$					175	°C
Creepage distance	standard DIP-6		7			mm
Clearance distance	standard DIP-6		7			mm
Creepage distance	400 mil DIP-6		8			mm
Clearance distance	400 mil DIP-6		8			mm
Insulation thickness, reinforced rated	per IEC 60950 2.10.5.1		0.4			mm

**Note**

As per IEC 60747-5-2, § 7.4.3.8.1, this optocoupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

**TYPICAL CHARACTERISTICS**

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

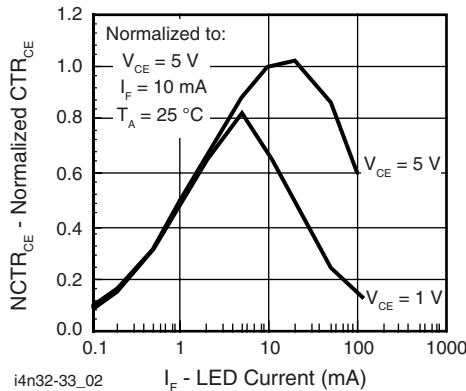


Fig. 1 - Normalized Non-Saturated and Saturated  $CTR_{CE}$  vs. LED Current

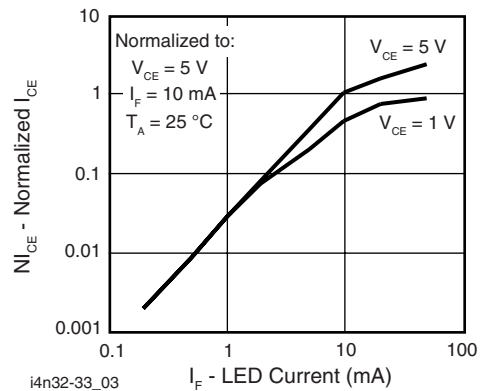


Fig. 2 - Normalized Non-Saturated and Saturated Collector Emitter Current vs. LED Current

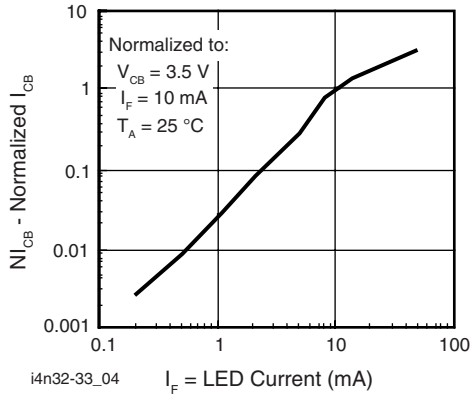


Fig. 3 - Normalized Collector Base Photocurrent vs. LED Current

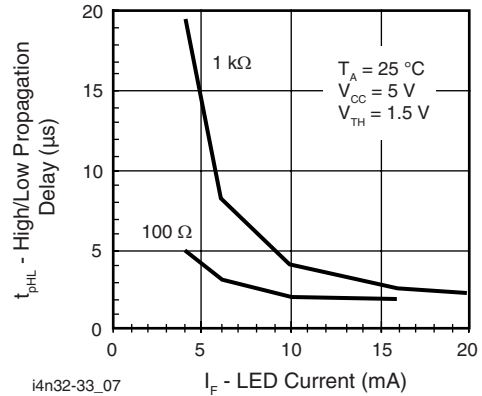


Fig. 6 - High to Low Propagation Delay vs. Collector Load Resistance and LED Current

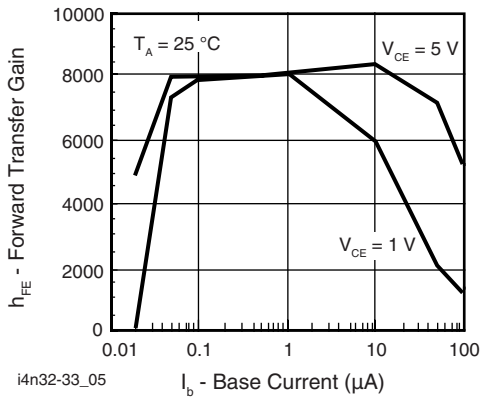


Fig. 4 - Non-Saturated and Saturated  $h_{FE}$  vs. Base Current

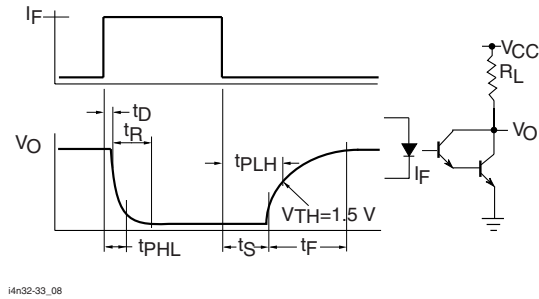


Fig. 7 - Switching Waveform and Switching Schematic

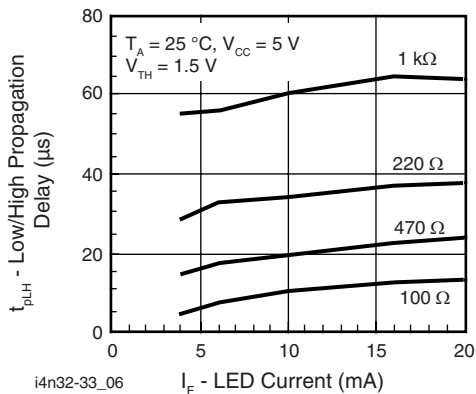


Fig. 5 - Low to High Propagation Delay vs. Collector Load Resistance and LED Current



# 4N32-X000/4N33-X000

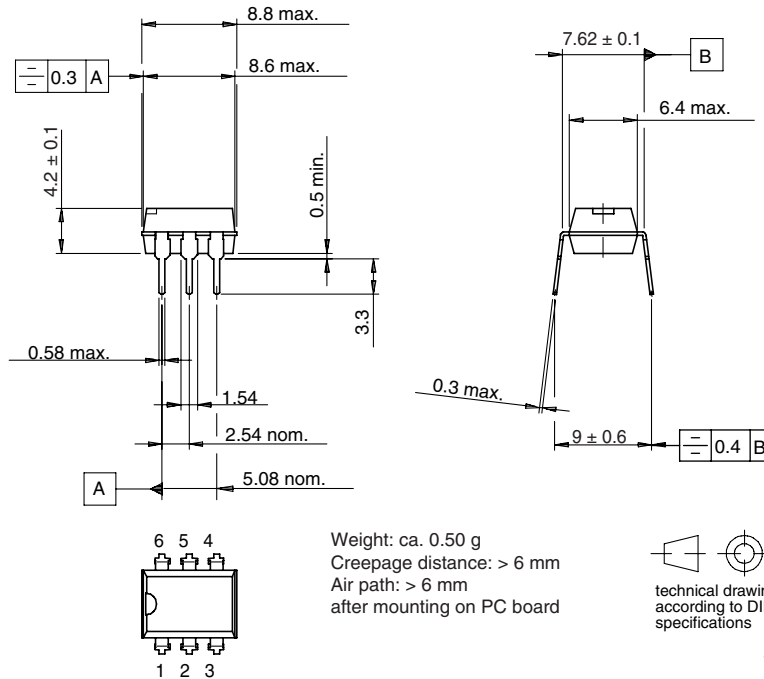
## Optocoupler, Photodarlington Output, Vishay Semiconductors High Gain, with Base Connection

### PACKAGE DIMENSIONS in millimeters

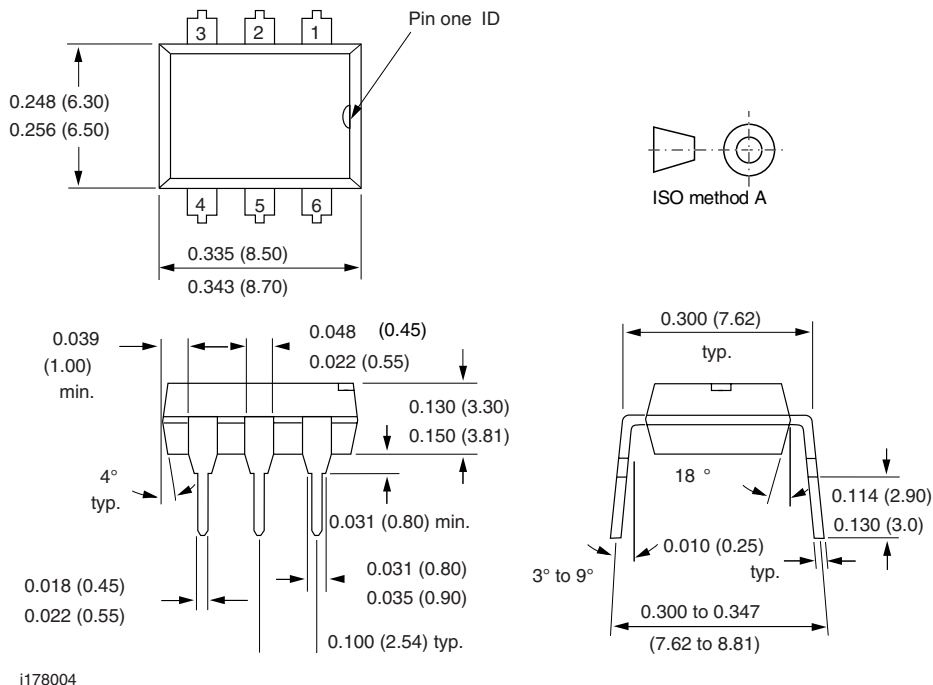
For 4N32/33.... see DIL300-6 Package dimension in the package section.

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



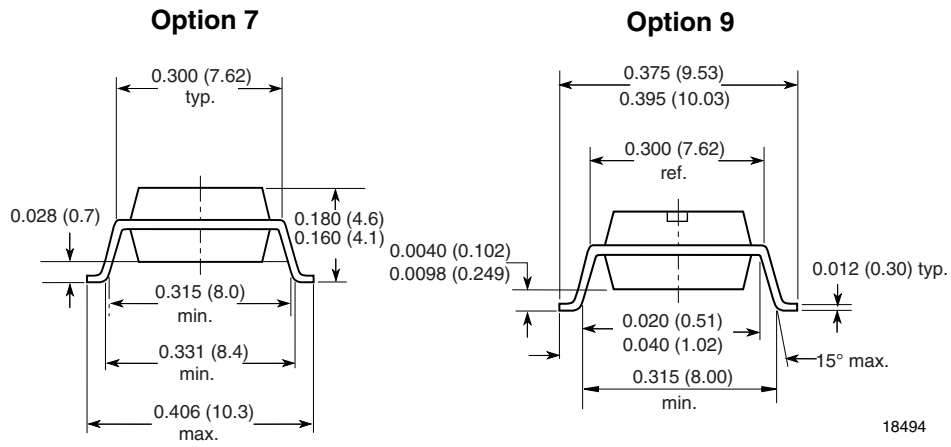
### DIP-6 Package Dimensions



# 4N32-X000/4N33-X000



Vishay Semiconductors Optocoupler, Photodarlington Output,  
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**OZONE DEPLETING SUBSTANCES POLICY STATEMENT**

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively.
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA.
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany



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