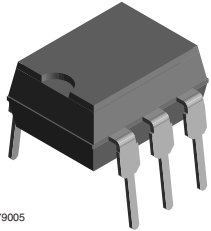
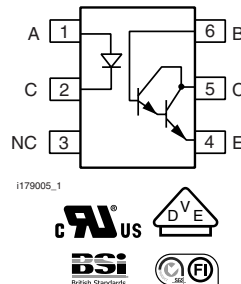


## Optocoupler, Photodarlington Output, High Gain, with Base Connection



I179005



### 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.

### FEATURES

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


**RoHS**  
COMPLIANT

### AGENCY APPROVALS

- UL1577, file no. E52744 system code H
- DIN EN 60747-5-5 available with option 1
- BSI IEC60950; IEC60065
- FIMKO

### ORDER INFORMATION <sup>(1)</sup>

PART	REMARKS
4N32	CTR > 500 %, DIP-6
4N33	CTR > 500 %, DIP-6
4N32-X000	CTR > 500 %, DIP-6
4N33-X000	CTR > 500 %, DIP-6
4N32-X007	CTR > 500 %, SMD-6 (option 7)
4N32-X007	CTR > 500 %, SMD-6 (option 9)
4N33-X009	CTR > 500 %, SMD-6 (option 7)
4N33-X009	CTR > 500 %, SMD-6 (option 9)

#### Note

<sup>(1)</sup> 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		$I_C$	100	mA
Power dissipation		$P_{diss}$	150	mW
Derate linearly			2	mW/°C

ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>				
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 base)	1 s	$V_{ISO}$	5300	$V_{RMS}$
Leakage path			7	mm min.
Air path			7	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 <sup>(2)</sup>	at 260 °C		10	s

**Notes**

<sup>(1)</sup>  $T_{amb} = 25\text{ °C}$ , 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.

<sup>(2)</sup> 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 <sup>(1)</sup>						
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	$V_R = 3\text{ V}$	$I_R$		0.1	100	$\mu\text{A}$
Capacitance	$V_R = 0\text{ V}$	$C_O$		25		pF
<b>OUTPUT</b>						
Collector emitter breakdown voltage <sup>(2)</sup>	$I_C = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{CEO}$	30			V
Collector base breakdown voltage <sup>(2)</sup>	$I_C = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{CBO}$	50			V
Emitter base breakdown voltage <sup>(2)</sup>	$I_C = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{EBO}$	8			V
Emitter collector breakdown voltage <sup>(2)</sup>	$I_C = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{ECO}$	5	10		V
Collector emitter leakage current	$V_{CE} = 10\text{ V}, I_F = 0$	$I_{CEO}$		1	100	nA
	$I_C = 0.5\text{ mA}, V_{CE} = 5\text{ V}$	$h_{FE}$	13			
<b>COUPLER</b>						
Collector emitter saturation voltage		$V_{CEsat}$		1		V
Coupling capacitance				1.5		pF

**Notes**

<sup>(1)</sup>  $T_{amb} = 25\text{ °C}$ , 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.

<sup>(2)</sup> 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	$\mu\text{s}$
Turn-off time	$I_F = 200\text{ mA}, R_L = 180\text{ }\Omega$	$t_{off}$			100	$\mu\text{s}$



SAFETY AND INSULATION RATINGS (1)						
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**

(1) As per IEC 60747-5-5, § 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**

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

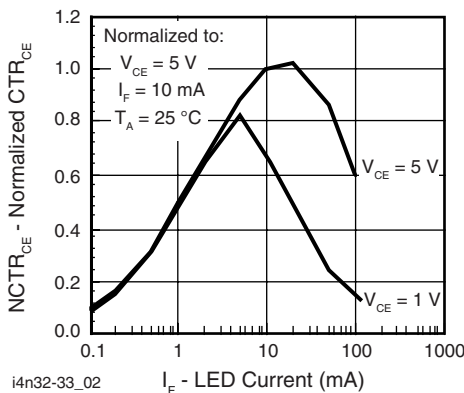


Fig. 1 - Normalized Non-Saturated and Saturated  $CTR_{CE}$  vs. LED Current

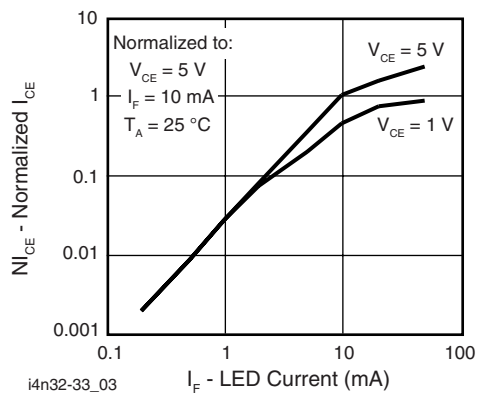


Fig. 2 - Normalized Non-Saturated and Saturated Collector Emitter Current vs. LED Current

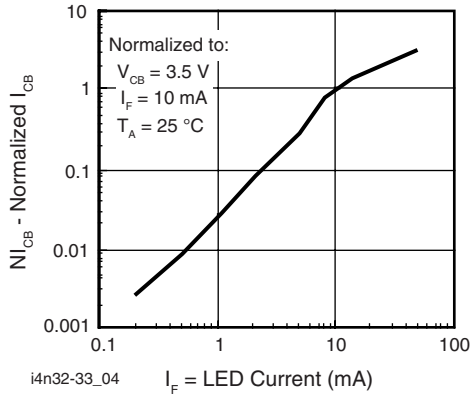


Fig. 3 - Normalized Collector Base Photocurrent vs. LED Current

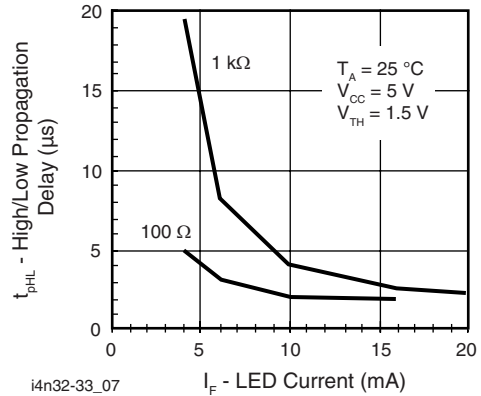


Fig. 6 - High to Low Propagation Delay vs. Collector Load Resistance and LED Current

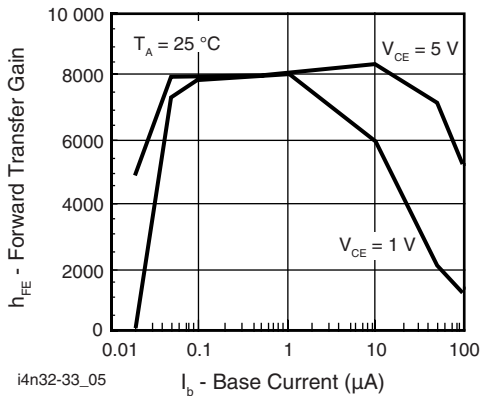


Fig. 4 - Non-Saturated and Saturated  $h_{FE}$  vs. Base Current

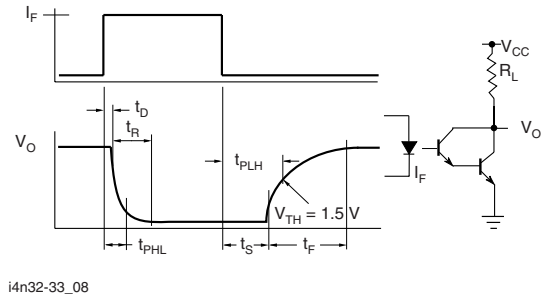


Fig. 7 - Switching Waveform and Switching Schematic

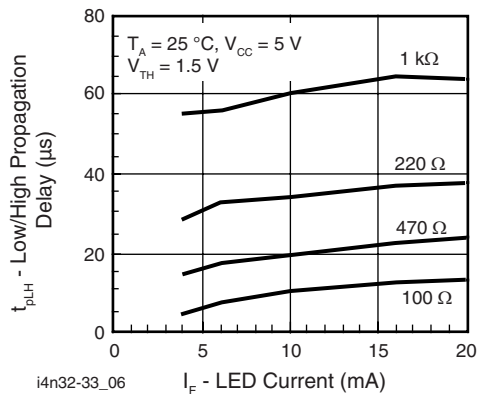


Fig. 5 - Low to High Propagation Delay vs. Collector Load Resistance and LED Current

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

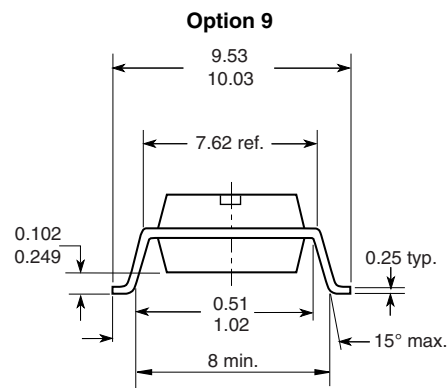
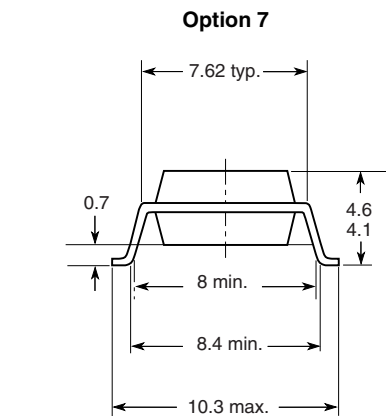
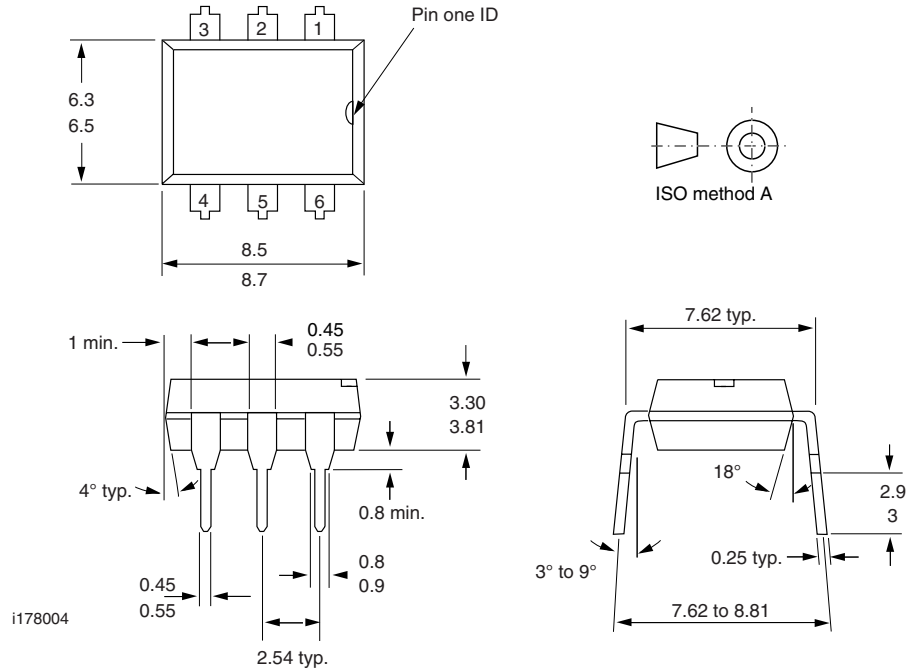
Vishay Semiconductors

### PACKAGE DIMENSIONS in millimeters

For 4N32, 4N33.... see DIL300-6 package dimension in the package section.

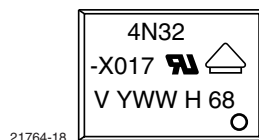
For products with an option designator (e.g. 4N32-X007 or 4N33-X009).... see DIP-6 package dimensions in the package section.

### DIP-6 Package Dimensions



18494

### PACKAGE MARKING



21764-18

### Note

Example marking for 4N32-X017T.

Option 6, 9 or T are not indicated in the marking.



## Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.