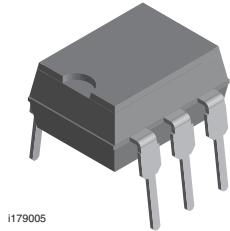
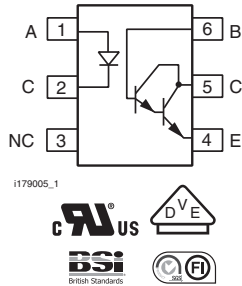


## Optocoupler, Photodarlington Output, High Gain, With Base Connection



i179005



### FEATURES

- Very high current transfer ratio, 500 % min.
- High isolation resistance,  $10^{11} \Omega$  typical
- Standard plastic DIP package
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

### AGENCY APPROVALS

- UL1577, file no. E52744 system code H
- DIN EN 60747-5-2 (VDE 0884) / DIN EN 60747-5-5 (pending), available with option 1
- BSI IEC 60950; IEC 60065
- FIMKO

### 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.

ORDERING INFORMATION		
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">4</div> <div style="border: 1px solid black; padding: 2px;">N</div> <div style="border: 1px solid black; padding: 2px;">3</div> <div style="border: 1px solid black; padding: 2px;">#</div> <div style="border: 1px solid black; padding: 2px;">-</div> <div style="border: 1px solid black; padding: 2px;">X</div> <div style="border: 1px solid black; padding: 2px;">0</div> <div style="border: 1px solid black; padding: 2px;">#</div> <div style="border: 1px solid black; padding: 2px;">#</div> <div style="border: 1px solid black; padding: 2px;">T</div> </div> <p style="text-align: center;">PART NUMBER                      PACKAGE OPTION                      TAPE AND REEL</p>		
AGENCY CERTIFIED/PACKAGE	CTR (%)	
UL, BSI, FIMKO	≥ 500	≥ 500
DIP-6	4N32	4N33

**Note**

- Additional options may be possible, please contact sales office



<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
input				
Reverse voltage		$V_R$	3	V
Forward current		$I_F$	60	mA
Power dissipation		$P_{diss}$	100	mW
Derate linearly	From 55 $^{\circ}\text{C}$		1.33	mW/ $^{\circ}\text{C}$
output				
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/ $^{\circ}\text{C}$
coupler				
Total dissipation		$P_{tot}$	250	mW
Derate linearly			3.3	mW/ $^{\circ}\text{C}$
Isolation test voltage (between emitter	1 s	$V_{ISO}$	5300	$V_{RMS}$
Leakage path			7	mm min.
Air path			7	mm min.
Isolation resistance	$V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Storage temperature		$T_{stg}$	-55 to +150	$^{\circ}\text{C}$
Operating temperature		$T_{amb}$	-55 to +100	$^{\circ}\text{C}$
Lead soldering time <sup>(1)</sup>	At 260 $^{\circ}\text{C}$		10	s

**Notes**

- 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>(1)</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)

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
input						
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
output						
Collector emitter breakdown voltage <sup>(1)</sup>	$I_C = 100\text{ }\mu\text{A}$ , $I_F = 0$	$BV_{CEO}$	30	-	-	V
Collector base breakdown voltage <sup>(1)</sup>	$I_C = 100\text{ }\mu\text{A}$ , $I_F = 0$	$BV_{CBO}$	50	-	-	V
Emitter base breakdown voltage <sup>(1)</sup>	$I_C = 100\text{ }\mu\text{A}$ , $I_F = 0$	$BV_{EBO}$	8	-	-	V
Emitter collector breakdown voltage <sup>(1)</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	-	-	
coupler						
Collector emitter saturation voltage		$V_{CEsat}$	-	1	-	V
Coupling capacitance			-	1.5	-	pF

**Notes**

- 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>(1)</sup> Indicates JEDEC<sup>®</sup> 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	$I_F = 200\text{ mA}$ , $R_L = 180\ \Omega$	$t_{off}$	-	-	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	$^{\circ}\text{C}$
Creepage distance	Standard DIP-6		7	-	-	mm
Clearance distance	Standard DIP-6		7	-	-	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

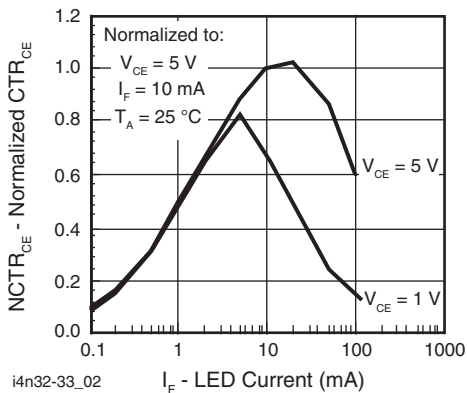
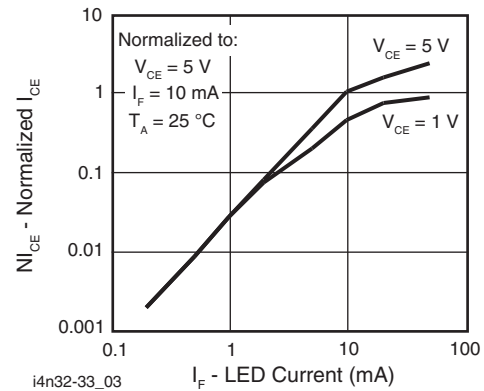
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\ ^{\circ}\text{C}$ , unless otherwise specified)

 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

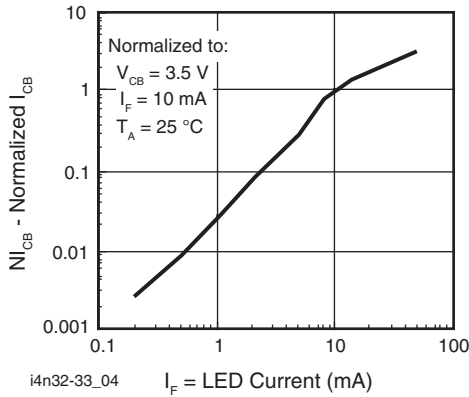


Fig. 3 - Normalized Collector Base Photocurrent vs. LED Current

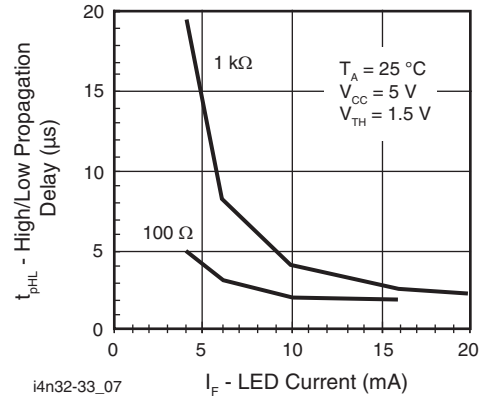


Fig. 6 - High to Low Propagation Delay vs. Collector Load Resistance and LED Current

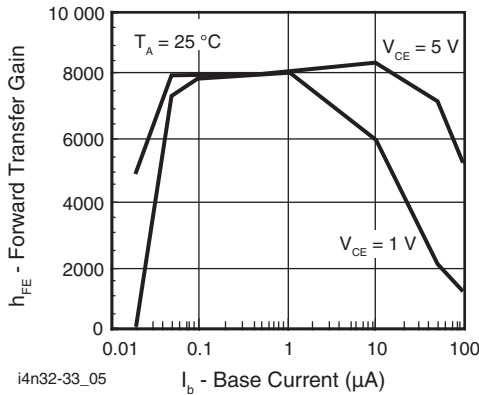


Fig. 4 - Non-Saturated and Saturated  $h_{FE}$  vs. Base Current

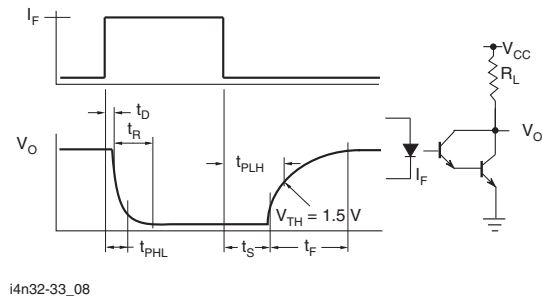


Fig. 7 - Switching Waveform and Switching Schematic

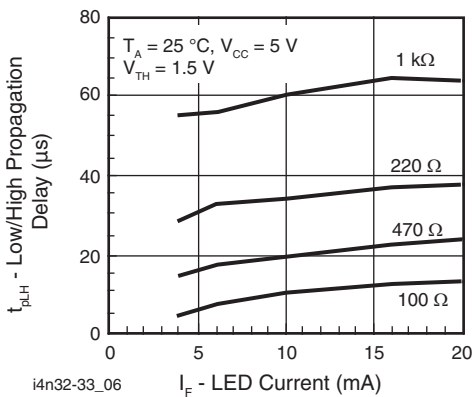


Fig. 5 - Low to High Propagation Delay vs. Collector Load Resistance and LED Current





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