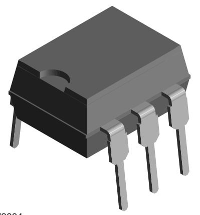
Optocoupler, Phototransistor Output, with Base Connection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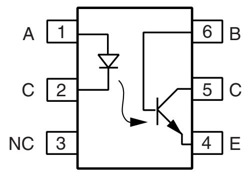


DESCRIPTION

The 4N25 family is an industry standard single channel phototransistor coupler. This family includes the 4N25/4N26/4N27/4N28. Each optocoupler consists of gallium arsenide infrared LED and a silicon NPN phototransistor.

These couplers are underwriters laboratories (UL) listed to comply with a 5300 V_{RMS} isolation test voltage. This isolation performance is accomplished through special Vishay manufacturing process.

Compliance to DIN EN 60747-5-5 partial discharge isolation specification is available by ordering option 1.

These isolation processes and the Vishay ISO9001 quality program results in the highest isolation performance available for a commercial plastic phototransistor optocoupler.

The devices are also available in lead formed configuration suitable for surface mounting and are available either on tape and reel, or in standard tube shipping containers.

Note

For additional design information see application note 45 normalized curves

FEATURES

- Isolation test voltage 5300 V_{RMS}
- Interfaces with common logic families
- Input-output coupling capacitance < 0.5 pF
- Industry standard dual-in-line 6 pin package
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Pb-free

e3

RoHS
COMPLIANT

APPLICATIONS

- AC mains detection
- Reed relay driving
- Switch mode power supply feedback
- Telephone ring detection
- Logic ground isolation
- Logic coupling with high frequency noise rejection

AGENCY APPROVALS

- UL1577, file no. E76222 system code A
- DIN EN 60747-5-5 available with option 1

ORDER INFORMATION	
PART	**REMARKS**
4N25	CTR > 20 %, DIP-6
4N26	CTR > 20 %, DIP-6
4N27	CTR > 10 %, DIP-6
4N28	CTR > 10 %, DIP-6

ABSOLUTE MAXIMUM RATINGS (1)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V_R	5	V
Forward current		I_F	60	mA
Surge current	t ≤ 10 µs	I_{FSM}	3	A
Power dissipation		P_{diss}	100	mW
OUTPUT				
Collector emitter breakdown voltage		V_{CEO}	70	V
Emitter base breakdown voltage		V_{EBO}	7	V
Collector current		I_C	50	mA
	t ≤ 1.0 ms	I_C	100	mA
Power dissipation		P_{diss}	150	mW

For technical questions, contact: optocoupler.answers@vishay.com
Document Number: 83725
Rev. 1.6, 07-May-08

ABSOLUTE MAXIMUM RATINGS [1]				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
COUPLER				
Isolation test voltage		V_{ISO}	5300	V_{RMS}
Creepage distance			≥ 7.0	mm
Clearance distance			≥ 7.0	mm
Isolation thickness between emitter and detector			≥ 0.4	mm
Comparative tracking index	DIN IEC 112/VDE 0303, part 1		175	
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	10^{12}	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	10^{11}	Ω
Storage temperature		T_{stg}	- 55 to + 125	°C
Operating temperature		T_{amb}	- 55 to + 100	°C
Junction temperature		T_j	125	°C
Soldering temperature [2]	max.10 s dip soldering: distance to seating plane ≥ 1.5 mm	T_{sld}	260	°C

Notes

[1] 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 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 condditions for through hole devices (DIP).

ELECTRICAL CHARACTERISTICS [1]							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Forward voltage [2]	I_F = 50 mA		V_F		1.3	1.5	V
Reverse current [2]	V_R = 3.0 V		I_R		0.1	100	µA
Capacitance	V_R = 0 V		C_O		25		pF
OUTPUT							
Collector base breakdown voltage [2]	I_C = 100 µA		BV_{CBO}	70			V
Collector emitter breakdown voltage[2]	I_C = 1.0 mA		BV_{CEO}	30			V
Emitter collector breakdown voltage [2]	I_E = 100 µA		BV_{ECO}	7			V
I_{CEO}(dark) [2]	V_{CE} = 10 V, (base open)	4N25			5	50	nA
		4N26			5	50	nA
		4N27			5	50	nA
		4N28			10	100	nA
I_{CBO}(dark) [2]	V_{CB} = 10 V, (emitter open)				2.0	20	nA
Collector emitter capacitance	V_{CE} = 0		C_{CE}		6.0		pF
COUPLER							
Isolation test voltage [2]	Peak, 60 Hz		V_{IO}	5300			V
Saturation voltage, collector emitter	I_{CE} = 2.0 mA, I_F = 50 mA		$V_{CE(sat)}$			0.5	V
Resistance, input output [2]	V_{IO} = 500 V		R_{IO}	100			GΩ
Capacitance, input output	f = 1 MHz		C_{IO}		0.5		pF

Notes

[1] 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.

[2] JEDEC registered values are 2500 V, 1500 V, 1500 V, and 500 V for the 4N25, 4N26, 4N27, and 4N28 respectively.

CURRENT TRANSFER RATIO							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
DC current transfer ratio	V_{CE} = 10 V, I_F = 10 mA	4N25	CTR_{DC}	20	50		%
		4N26	CTR_{DC}	20	50		%
		4N27	CTR_{DC}	10	30		%
		4N28	CTR_{DC}	10	30		%

Note
Indicates JEDEC registered values.

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Rise and fall times	V_{CE} = 10 V, I_F = 10 mA, R_L = 100 Ω	t_r, t_f		2.0		µs

TYPICAL CHARACTERISTICS

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

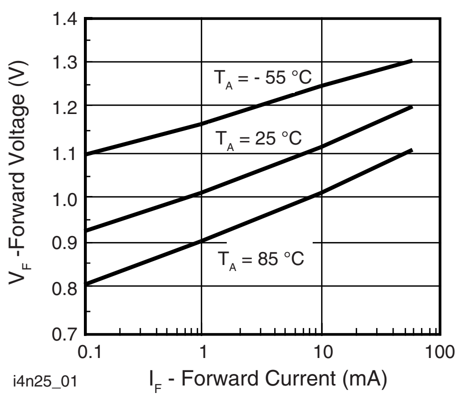


Fig. 1 - Forward Voltage vs. Forward Current

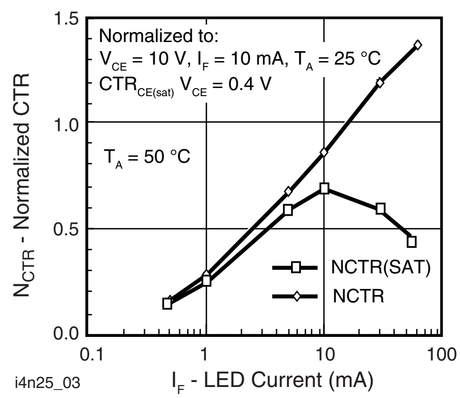


Fig. 3 - Normalized Non-Saturated and Saturated CTR vs. LED Current

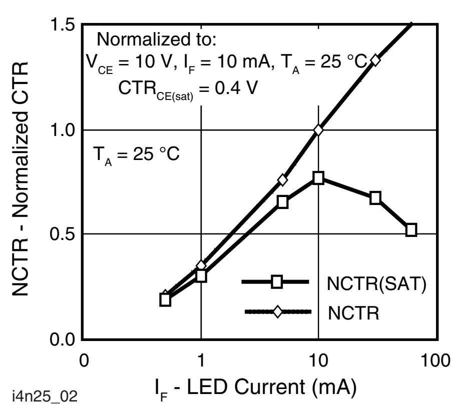


Fig. 2 - Normalized Non-Saturated and Saturated CTR vs. LED Current

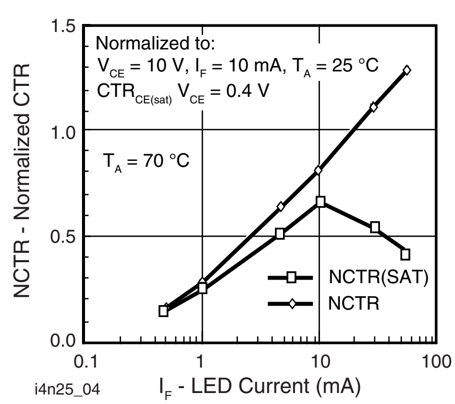


Fig. 4 - Normalized Non-Saturated and Saturated CTR vs. LED Current

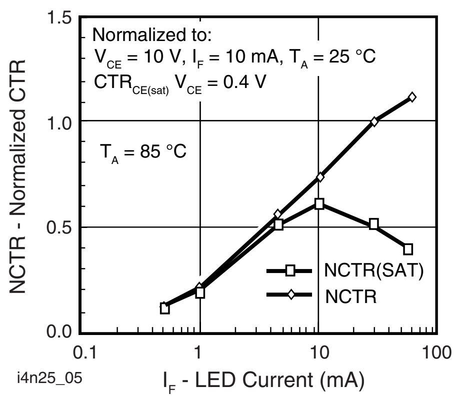


Fig. 5 - Normalized Non-Saturated and Saturated CTR vs. LED Current

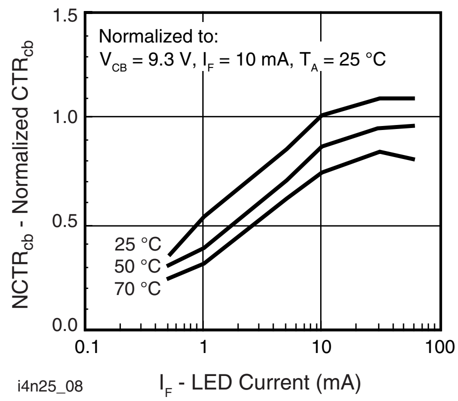


Fig. 8 - Normalized CTRcb vs. LED Current and Temperature

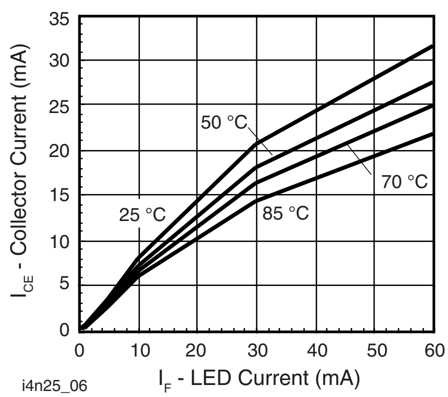


Fig. 6 - Collector Emitter Current vs. Temperature and LED Current

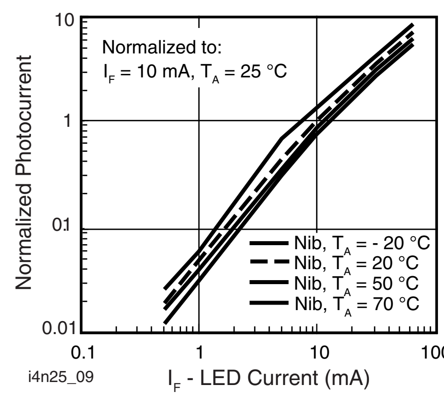


Fig. 9 - Normalized Photocurrent vs. I_F and Temperature

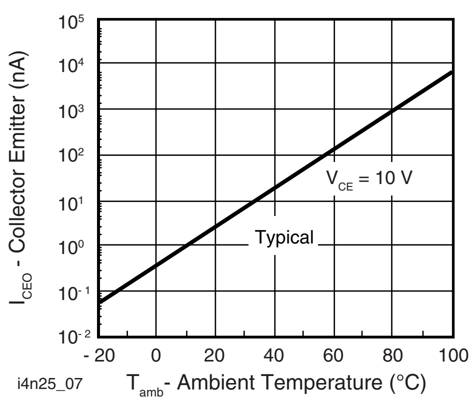


Fig. 7 - Collector Emitter Leakage Current vs. Temperature

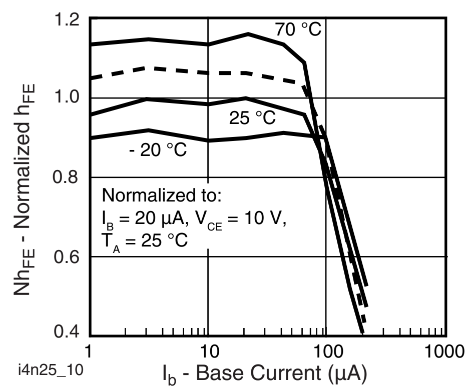


Fig. 10 - Normalized Non-Saturated h_{FE} vs. Base Current and Temperature

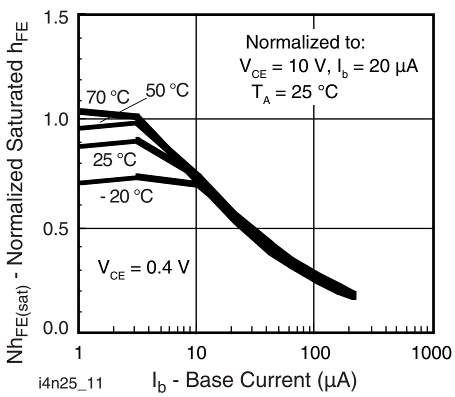


Fig. 11 - Normalized h_{FE} vs. Base Current and Temperature

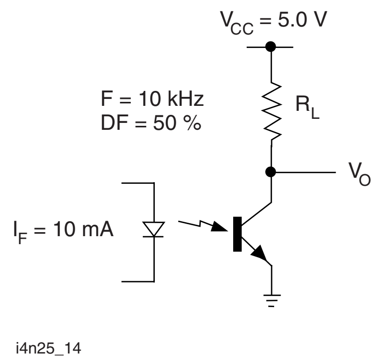


Fig. 14 - Switching Schematic

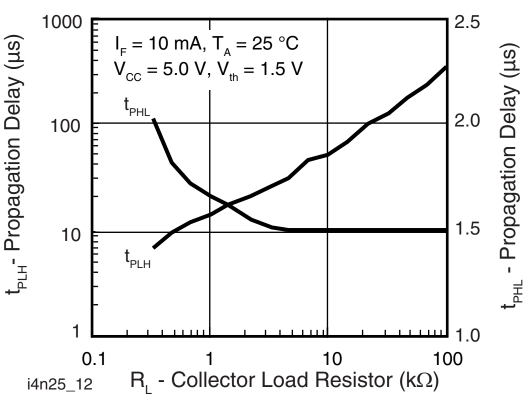


Fig. 12 - Propagation Delay vs. Collector Load Resistor

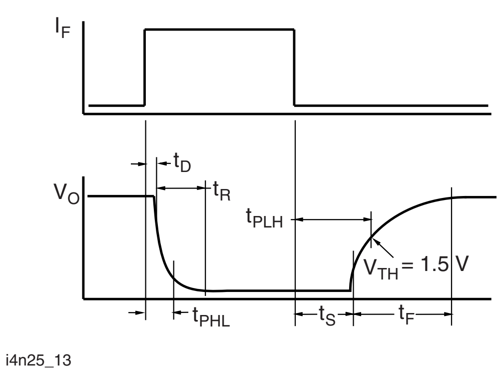


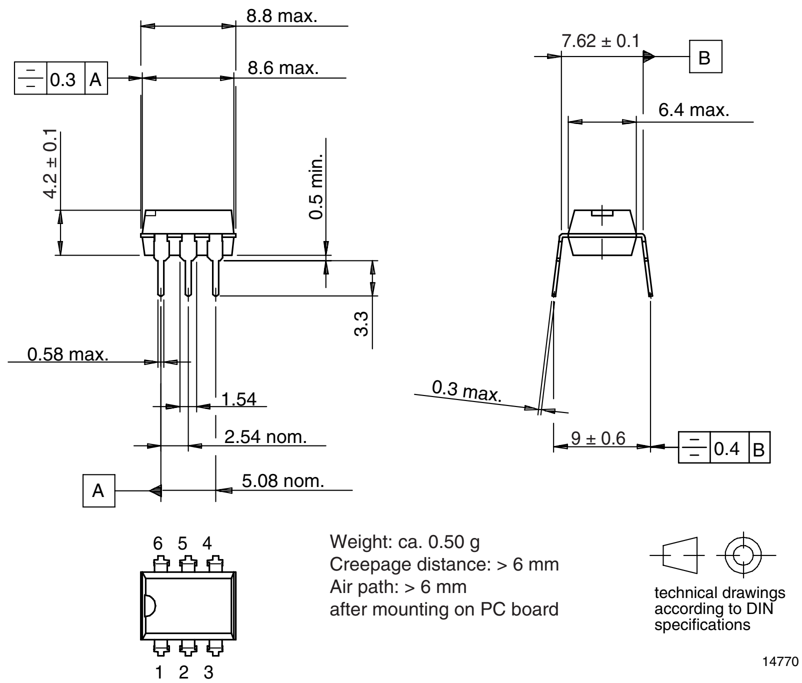
Fig. 13 - Switching Timing

PACKAGE DIMENSIONS in millimeters

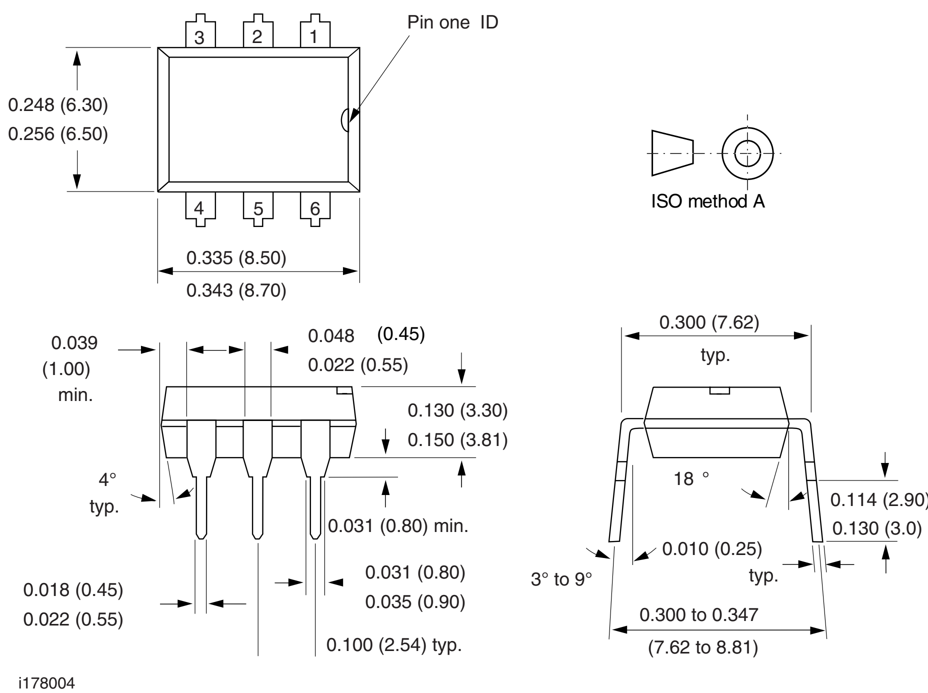
For 4N25/26/27..... see DIL300-6 Package dimension in the Package Section.

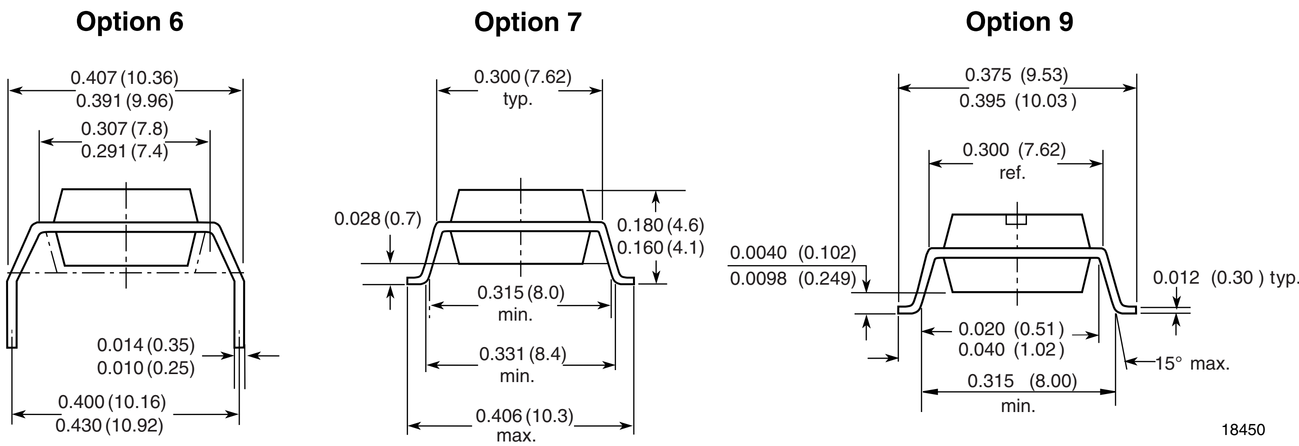
For 4N28 and for products with an option designator (e.g. 4N25-X001 or 4N26-X007)..... see DIP-6 Package dimensions in the Package Section.

DIL300-6 Package Dimensions



DIP-6 Package Dimensions




Option 6
0.407 (10.36)
0.391 (9.96)
0.307 (7.8)
0.291 (7.4)
0.014 (0.35)
0.010 (0.25)
0.400 (10.16)
0.430 (10.92)
Option 7
0.300 (7.62)
typ.
0.028 (0.7)
0.180 (4.6)
0.160 (4.1)
0.315 (8.0)
min.
0.331 (8.4)
min.
0.406 (10.3)
max.
Option 9
0.375 (9.53)
0.395 (10.03)
0.300 (7.62)
ref.
0.0040 (0.102)
0.0098 (0.249)
0.012 (0.30) typ.
0.020 (0.51)
0.040 (1.02)
15° max.
0.315 (8.00)
min.
18450

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.

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

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