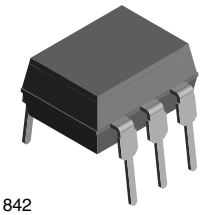
Optocoupler, Phototransistor Output, with Base Connection



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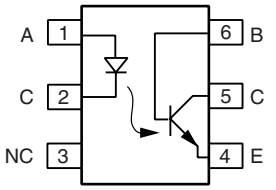


i179004-5

FEATURES

- Isolation test voltage 5000 V_{RMS}
- Interfaces with common logic families
- Input-output coupling capacitance < 0.5 pF
- Industry standard dual-in-line 6 pin package
- Compliant to RoHS directive 2002/95/EC and in accordance to 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

DESCRIPTION

Each optocoupler consists of gallium arsenide infrared LED and a silicon NPN phototransistor.

AGENCY APPROVALS

- Underwriters laboratory file no. E52744
- BSI: EN 60065:2002, EN 60950:2000
- FIMKO; EN 60065, EN 60335, EN 60950 certificate no. 25156

ORDER INFORMATION	
PART	**REMARKS**
4N35	CTR > 100 %, DIP-6
4N36	CTR > 100 %, DIP-6
4N37	CTR > 100 %, DIP-6

ABSOLUTE MAXIMUM RATINGS (1)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	50	mA
Surge current	t ≤ 10 µs	I_{FSM}	1	A
Power dissipation		P_{diss}	70	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 ms	I_C	100	mA
Power dissipation		P_{diss}	70	mW
COUPLER				
Isolation test voltage		V_{ISO}	5000	V_{RMS}
Creepage			≥ 7	mm
Clearance			≥ 7	mm
Isolation thickness between emitter and detector			≥ 0.4	mm

ABSOLUTE MAXIMUM RATINGS (1)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
COUPLER				
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 + 150	°C
Operating temperature		T_{amb}	- 55 to + 100	°C
Junction temperature		T_j	100	°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 wave profile for soldering condditions for through hole devices (DIP).

ELECTRICAL CHARACTERISTICS (1)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT							
Junction capacitance	V_R = 0 V, f = 1 MHz		C_j		50		pF
Forward voltage (2)	I_F = 10 mA		V_F		1.3	1.5	V
	I_F = 10 mA, T_{amb} = - 55 °C		V_F	0.9	1.3	1.7	V
Reverse current (2)	V_R = 6 V		I_R		0.1	10	µA
Capacitance	V_R = 0 V, f = 1 MHz		C_O		25		pF
OUTPUT							
Collector emitter breakdown voltage(2)	I_C = 1 mA	4N35	BV_{CEO}	30			V
		4N36	BV_{CEO}	30			V
		4N37	BV_{CEO}	30			V
Emitter collector breakdown voltage(2)	I_E = 100 µA		BV_{ECO}	7			V
OUTPUT							
Collector base breakdown voltage (2)	I_C = 100 µA, I_B = 1 µA	4N35	BV_{CBO}	70			V
		4N36	BV_{CBO}	70			V
		4N37	BV_{CBO}	70			V
Collector emitter leakage current (2)	V_{CE} = 10 V, I_F = 0	4N35	I_{CEO}		5	50	nA
		4N36	I_{CEO}		5	50	nA
	V_{CE} = 10 V, I_F = 0	4N37	I_{CEO}		5	50	nA
	V_{CE} = 30 V, I_F = 0, T_{amb} = 100 °C	4N35	I_{CEO}			500	µA
		4N36	I_{CEO}			500	µA
		4N37	I_{CEO}			500	µA
Collector emitter capacitance	V_{CE} = 0		C_{CE}		6		pF
COUPLER							
Resistance, input output (2)	V_{IO} = 500 V		R_{IO}	10^{11}			Ω
Capacitance, input output	f = 1 MHz		C_{IO}		0.6		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) Indicates JEDEC registered value.

CURRENT TRANSFER RATIO							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN**	**TYP.**	**MAX**	**UNIT**
DC current transfer ratio (1)	V_{CE} = 10 V, I_F = 10 mA	4N35	CTR_{DC}	100			%
		4N36	CTR_{DC}	100			%
		4N37	CTR_{DC}	100			%
	V_{CE} = 10 V, I_F = 10 mA, T_A = - 55 °C to + 100 °C	4N35	CTR_{DC}	40	50		%
		4N36	CTR_{DC}	40	50		%
		4N37	CTR_{DC}	40	50		%

Note
(1) Indicates JEDEC registered values.

SWITCHING CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Switching time (1)	V_{CC} = 10 V, I_C = 2 mA, R_L = 100 Ω	t_{on}, t_{off}		10		µs

Note
(1) Indicates JEDEC registered values.

TYPICAL CHARACTERISTICS

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

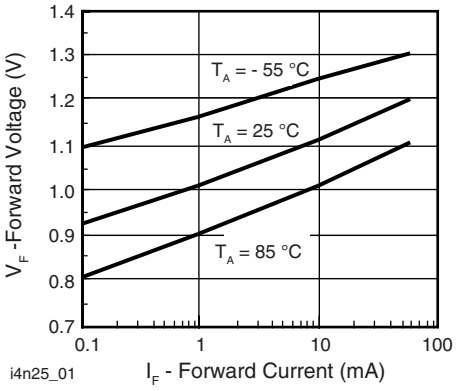


Fig. 1 - Forward Voltage vs. Forward Current

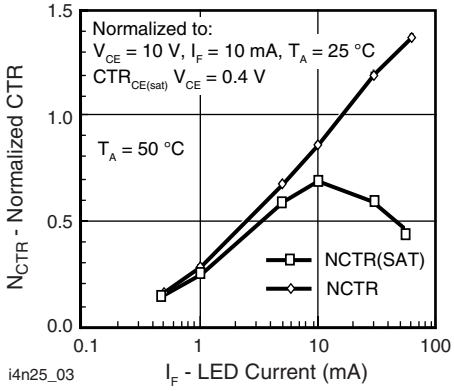


Fig. 3 - Normalized Non-Saturated and Saturated CTR vs. LED Current

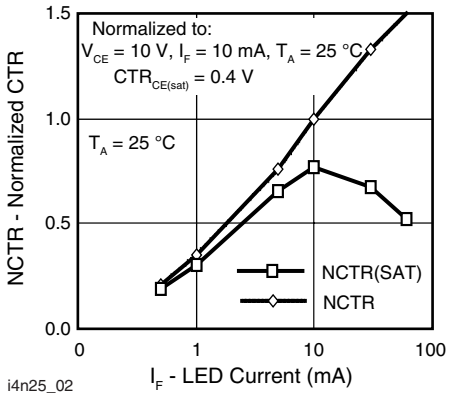


Fig. 2 - Normalized Non-Saturated and Saturated CTR vs. LED Current

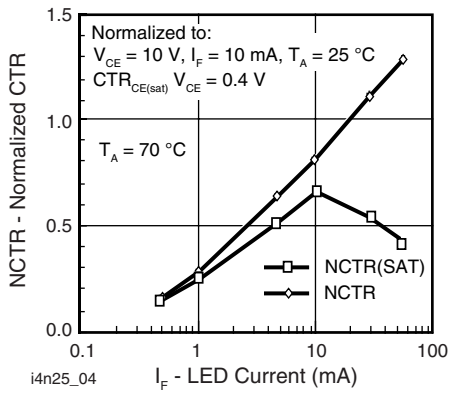


Fig. 4 - Normalized Non-Saturated and Saturated CTR vs. LED Current

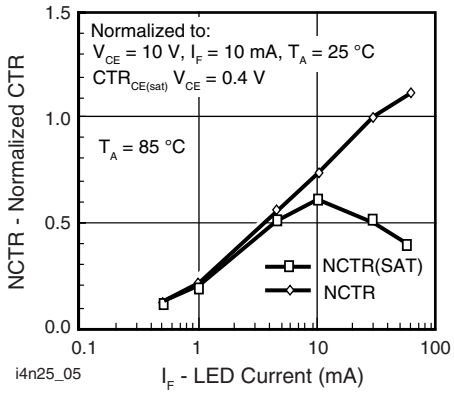


Fig. 5 - Normalized Non-Saturated and Saturated CTR vs. LED Current

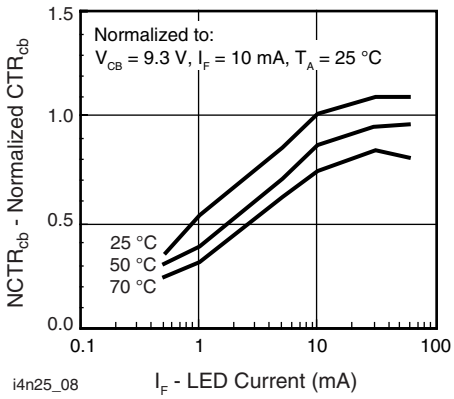


Fig. 8 - Normalized CTR_{cb} vs. LED Current and Temperature

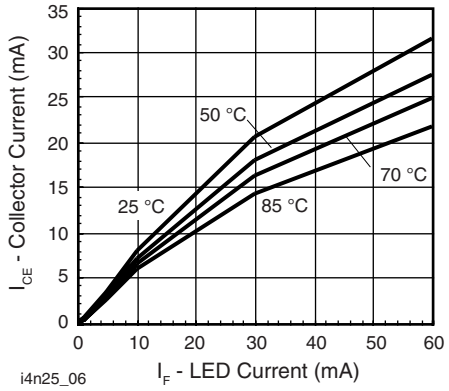


Fig. 6 - Collector Emitter Current vs. Temperature and LED Current

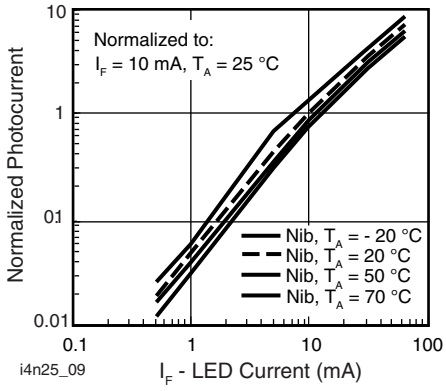


Fig. 9 - Normalized Photocurrent vs. I_F and Temperature

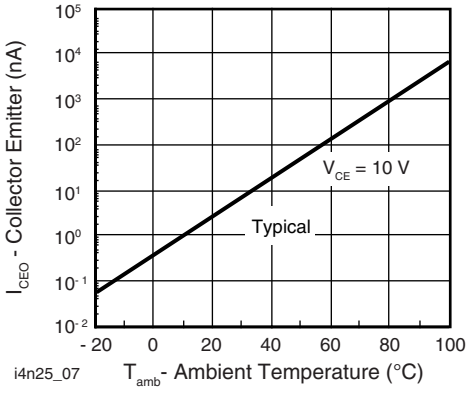


Fig. 7 - Collector Emitter Leakage Current vs. Temperature

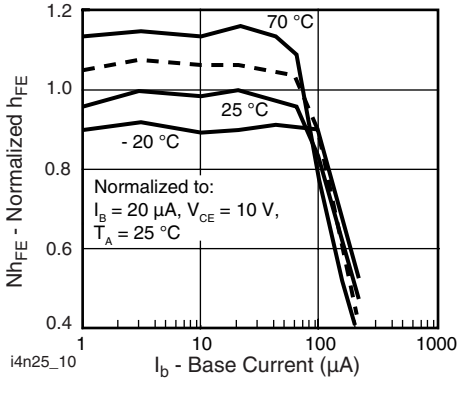


Fig. 10 - Normalized Non-Saturated h_{FE} vs. Base Current and Temperature

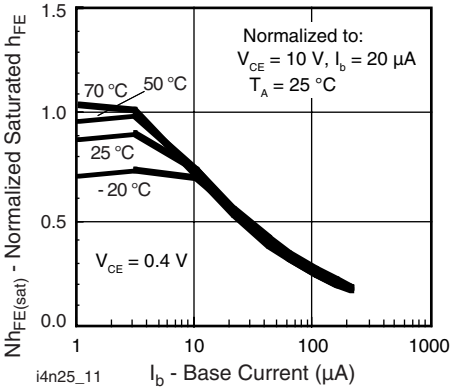


Fig. 11 - Normalized h_{FE} vs. Base Current and Temperature

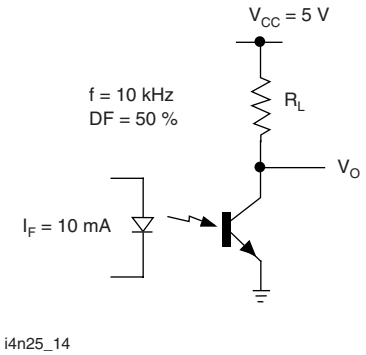


Fig. 14 - Switching Schematic

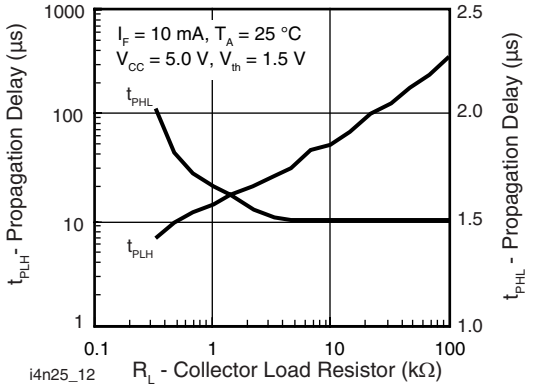


Fig. 12 - Propagation Delay vs. Collector Load Resistor

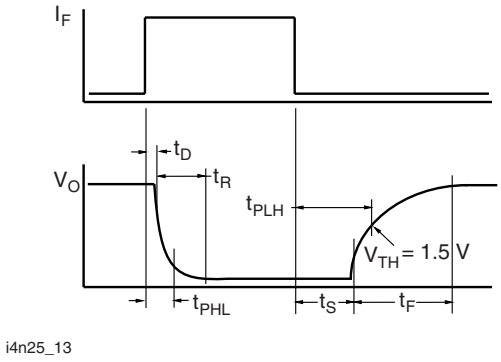
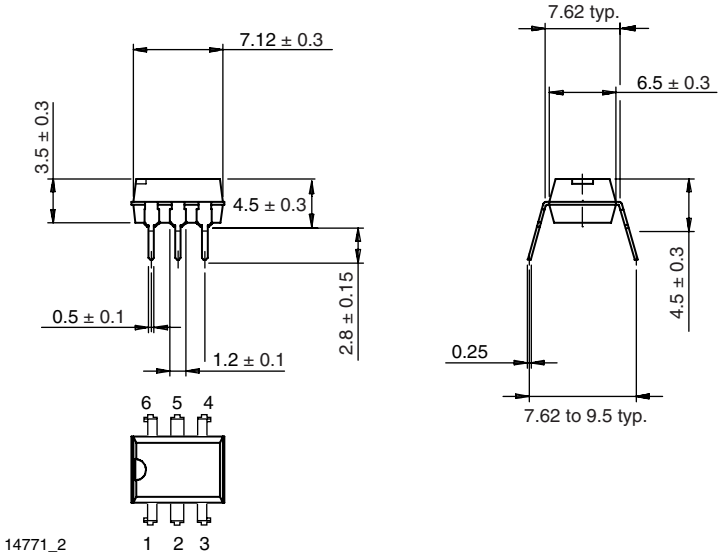
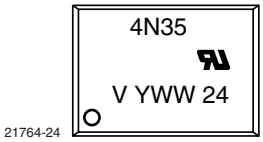


Fig. 13 - Switching Timing

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING



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