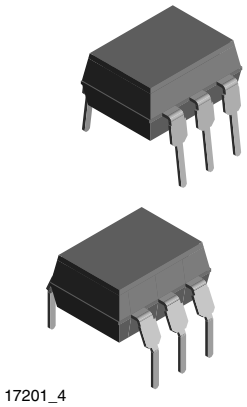
Optocoupler, Phototransistor Output



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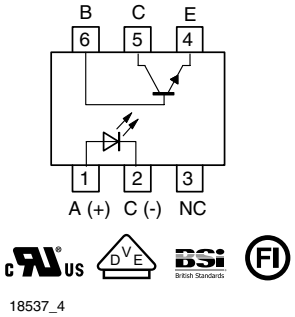

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DESCRIPTION

The 4N25V, 4N25GV, 4N35V, 4N35GV series consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 6-lead plastic dual inline package.

VDE STANDARDS

These couplers perform safety functions according to the following equipment standards:

DIN EN 60747-5-5 (VDE 0884)
Optocoupler for electrical safety requirements

IEC 60950
Office machines (applied for reinforced isolation for mains voltage ≤ 400 V_{RMS})

VDE 0804
Telecommunication apparatus and data processing

IEC 60065
Safety for mains-operated electronic and related household apparatus

FEATURES

- Special construction: therefore, extra low coupling capacity of typical 0.2 pF, high common mode rejection
- Low temperature coefficient of CTR
- Rated isolation voltage (RMS includes DC) V_{IOWM} = 600 V_{RMS} (848 V peak)
- Rated recurring peak voltage (repetitive) V_{IORM} = 600 V_{RMS}
- Thickness through insulation ≥ 0.4 mm
- Creepage current resistance according to VDE 0303/ IEC 60112 comparative tracking index: **CTI** ≥ 275
- Rated impulse voltage (transient overvoltage) V_{IOTM} = 6 kV peak
- Isolation test voltage (partial discharge test voltage) V_{pd} = 1.6 kV
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

APPLICATIONS

- Switch-mode power supplies
- Line receiver
- Computer peripheral interface
- Microprocessor system interface
- Circuits for safe protective separation against electrical shock according to safety class II (reinforced isolation):
  - for appl. class I - IV at mains voltage ≤ 300 V
  - for appl. class I - III at mains voltage ≤ 600 V
  according to DIN EN 60747-5-5

AGENCY APPROVALS

- UL1577, file no. E52744, double protection
- BSI: BS EN 41003, BS EN 60065 (BS 415), pending
- DIN EN 60747-5-5 (VDE 0884)
- FIMKO (SETI): EN 60950, certificate no. FI25155

ORDER INFORMATION (1)	
PART	**REMARKS**
4N25GV	CTR > 20 % wide lead spacing, DIP-6
4N35GV	CTR > 100 % wide lead spacing, DIP-6
4N25V	CTR > 20 %, DIP-6
4N35V	CTR > 100 %, DIP-6

Note
(1) G = leadform 10.16 mm; G is not marked on the body.

ABSOLUTE MAXIMUM RATINGS (1)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V_R	5	V
Forward current		I_F	60	mA
Forward surge current	$t_p \leq 10$ µs	I_{FSM}	3	A
Power dissipation		P_{diss}	70	mW
Junction temperature		T_j	125	°C
OUTPUT				
Collector emitter voltage		V_{CEO}	32	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
Collector peak current	$t_p/T = 0.5$, $t_p \leq 10$ ms	I_{CM}	100	mA
Power dissipation		P_{diss}	70	mW
Junction temperature		T_j	125	°C
COUPLER				
Isolation test voltage (RMS)		V_{ISO}	5000	V_{RMS}
Total power dissipation		P_{tot}	200	mW
Ambient temperature range		T_{amb}	- 55 to + 100	°C
Storage temperature range		T_{stg}	- 55 to + 125	°C
Soldering temperature (2)	2 mm from case, $t \leq 10$ s	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 conditions for through hole devices.

ELECTRICAL CHARACTERISTICS (1)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
Forward voltage	I_F = 50 mA	V_F		1.2	1.4	V
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j		50		pF
OUTPUT						
Collector emitter voltage	I_C = 1 mA	V_{CEO}	32			V
Emitter collector voltage	I_E = 100 µA	V_{ECO}	7			V
Collector emitter leakage current	V_{CE} = 10 V, I_F = 0, T_{amb} = 100 °C	I_{CEO}			50	nA
	V_{CE} = 30 V, I_F = 0, T_{amb} = 100 °C	I_{CEO}			500	nA
COUPLER						
Collector emitter saturation voltage	I_F = 50 mA, I_C = 2 mA	V_{CEsat}			0.3	V
Cut-off frequency	V_{CE} = 5 V, I_F = 10 mA, R_L = 100 Ω	f_c		110		kHz
Coupling capacitance	f = 1 MHz	C_k		1		pF

Note

(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.

CURRENT TRANSFER RATIO							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
I_C/I_F	V_{CE} = 10 V, I_F = 10 mA	4N25V	CTR	20	100		%
		4N25GV	CTR				
		4N35V	CTR	100	150		%
		4N35GV	CTR				
	V_{CE} = 10 V, I_F = 10 mA, T_{amb} = 100 °C	4N35V	CTR	40			%
		4N35GV	CTR				

MAXIMUM SAFETY RATINGS (1)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
Forward current		I_F			130	mA
OUTPUT						
Power dissipation		P_{diss}			265	mW
COUPLER						
Rated impulse voltage		V_{IOTM}			6	kV
Safety temperature		T_{si}			150	°C

Note

(1) According to DIN EN 60747-5-5 (see figure 2). This optocoupler is suitable for safe electrical isolation only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.

INSULATION RATED PARAMETERS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Partial discharge test voltage - routine test	100 %, t_{test} = 1 s	V_{pd}	1600			V
Partial discharge test voltage - lot test (sample test)	t_{Tr} = 60 s, t_{test} = 10 s, (see figure 2)	V_{IOTM}	6000			V
		V_{pd}	1400			V
Insulation resistance	V_{IO} = 500 V	R_{IO}	10^{12}			Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	10^{11}			Ω
	V_{IO} = 500 V, T_{amb} = 150 °C (construction test only)	R_{IO}	10^{9}			Ω

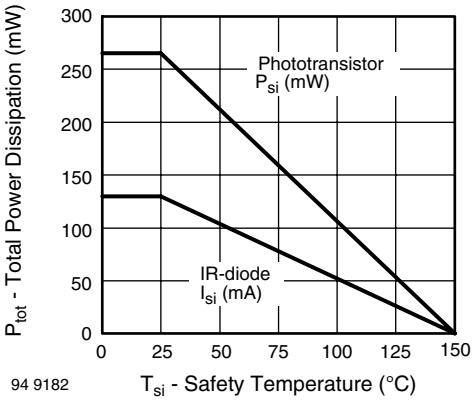


Fig. 1 - Derating Diagram

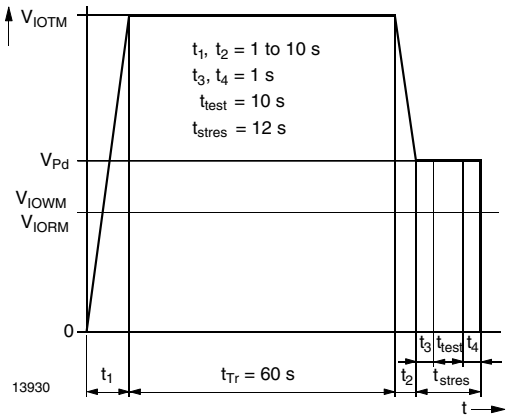


Fig. 2 - Test Pulse Diagram for Sample Test according to DIN EN 60747-; IEC 60747

SWITCHING CHARACTERISTICS							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Delay time (see figure 3)	V_S = 5 V, I_C = 5 mA, R_L = 100 Ω,	4N25V 4N25GV	t_d		4		µs
	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω,	4N35V 4N35GV	t_d		2.5		µs
Rise time (see figure 3)	V_S = 5 V, I_C = 5 mA, R_L = 100 Ω,	4N25V 4N25GV	t_r		7		µs
	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω,	4N35V 4N35GV	t_r		3		µs
Fall time (see figure 3)	V_S = 5 V, I_C = 5 mA, R_L = 100 Ω,	4N25V 4N25GV	t_f		6.7		µs
	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω,	4N35V 4N35GV	t_f		4.2		µs
Storage time (see figure 3)	V_S = 5 V, I_C = 5mA, R_L = 100 Ω,	4N25V 4N25GV	t_s		0.3		µs
	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω,	4N35V 4N35GV	t_s		0.3		µs
Turn-on time (see figure 3)	V_S = 5 V, I_C = 5 mA, R_L = 100 Ω,	4N25V 4N25GV	t_{on}		11		µs
	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω,	4N35V 4N35GV	t_{on}			10	µs
Turn-off time (see figure 3)	V_S = 5 V, I_C = 5 mA, R_L = 100 Ω,	4N25V 4N25GV	t_{off}		7		µs
	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω,	4N35V 4N35GV	t_{off}			10	µs
Turn-on time (see figure 4)	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ,	4N25V 4N25GV	t_{on}		25		µs
		4N35V 4N35GV	t_{on}		9		µs
Turn-off time (see figure 4)	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ,	4N25V 4N25GV	t_{off}		42.5		µs
		4N35V 4N35GV	t_{off}		25		µs

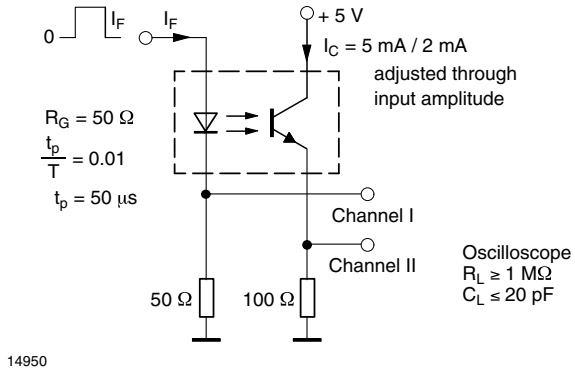


Fig. 3 - Test circuit, Non-Saturated Operation

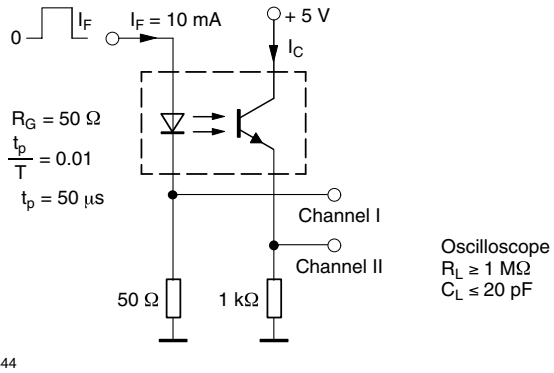


Fig. 4 - Test Circuit, Saturated Operation

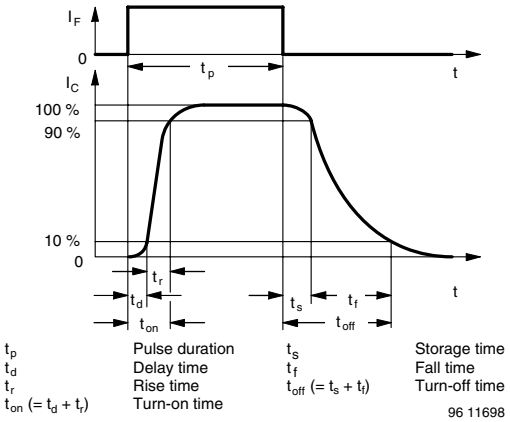


Fig. 5 - Switching Times

TYPICAL CHARACTERISTICS

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

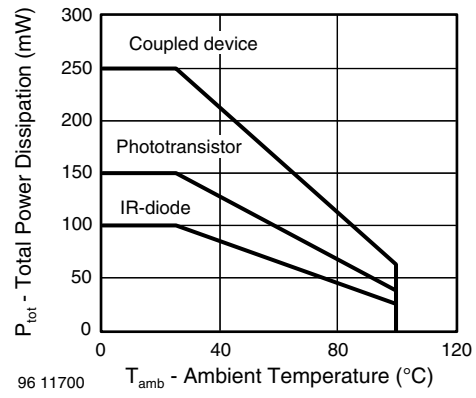


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

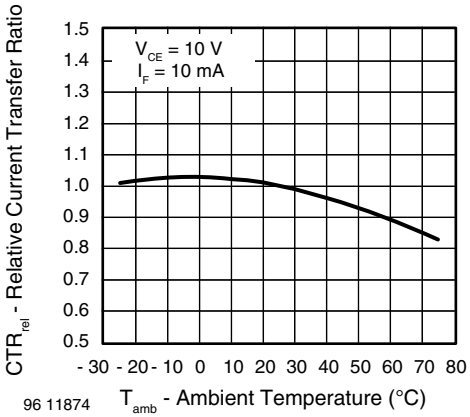


Fig. 8 - Relative Current Transfer Ratio vs. Ambient Temperature

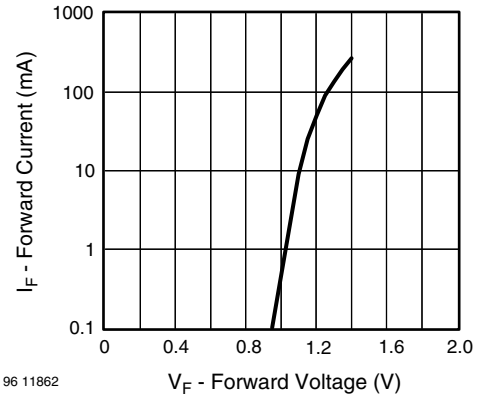


Fig. 7 - Forward Current vs. Forward Voltage

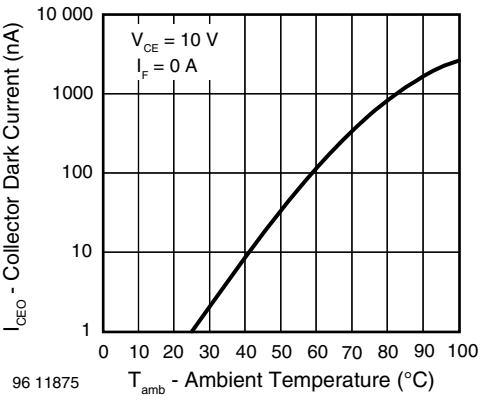


Fig. 9 - Collector Dark Current vs. Ambient Temperature

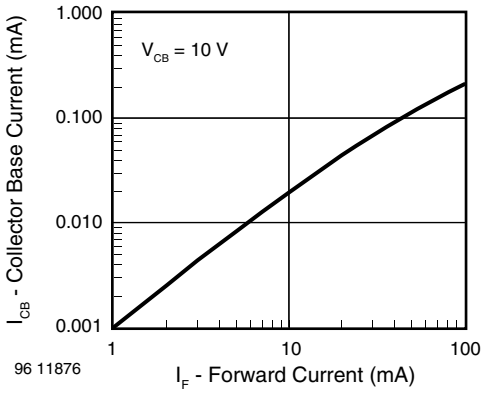


Fig. 10 - Collector Base Current vs. Forward Current

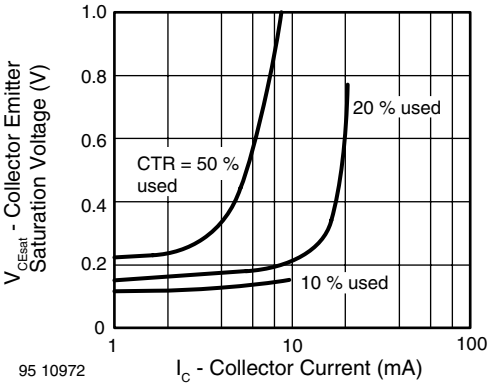


Fig. 13 - Collector Emitter Saturation Voltage vs. Collector Current

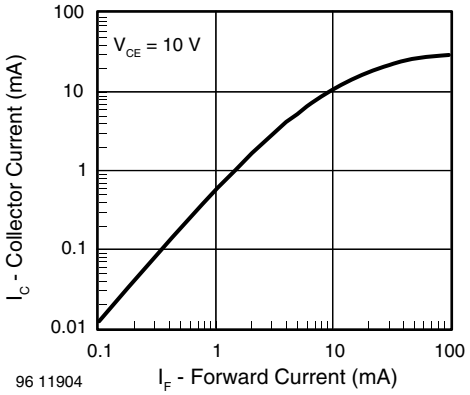


Fig. 11 - Collector Current vs. Forward Current

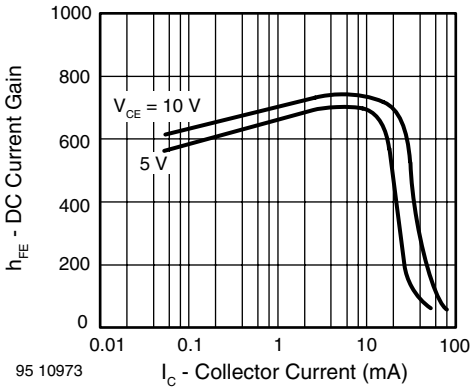


Fig. 14 - DC Current Gain vs. Collector Current

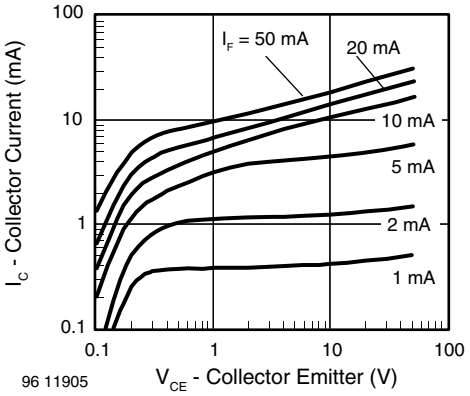


Fig. 12 - Collector Current vs. Collector Emitter Voltage

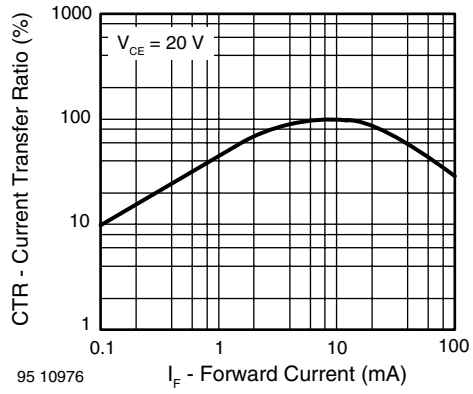


Fig. 15 - Current Transfer Ratio vs. Forward Current

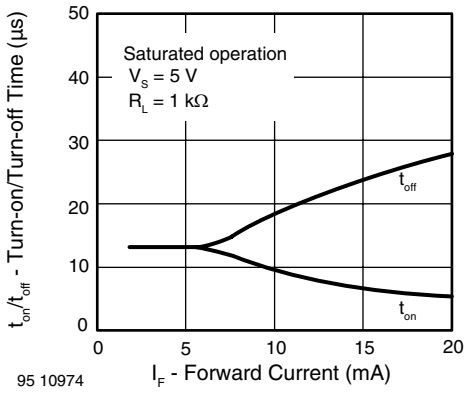


Fig. 16 - Turn-on/off Time vs. Forward Current

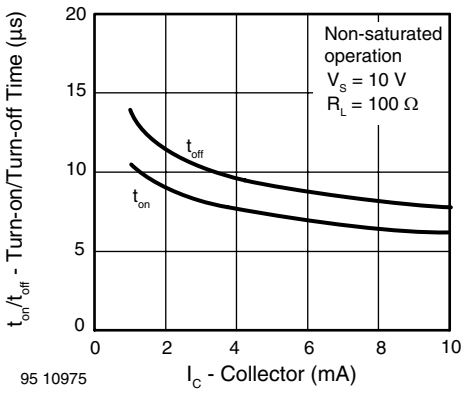
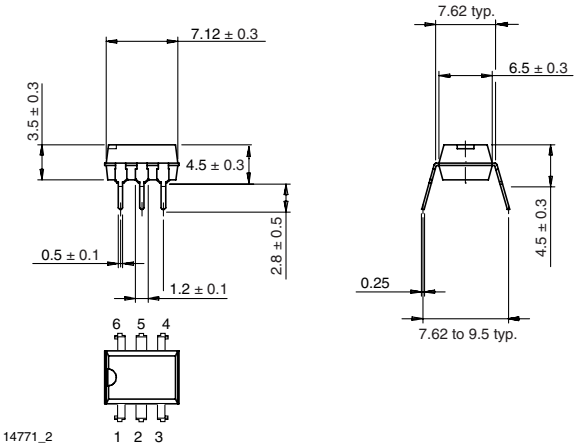


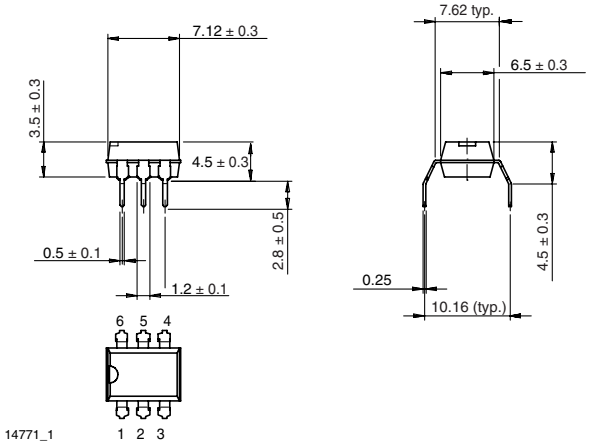
Fig. 17 - Turn-on/off Time vs. Collector Current

PACKAGE DIMENSIONS in millimeters

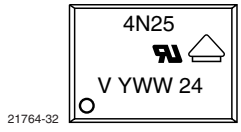
DIP-6



DIP-6, 400 mil



PACKAGE MARKING



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