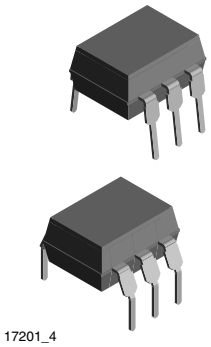
Optocoupler, Phototransistor Output



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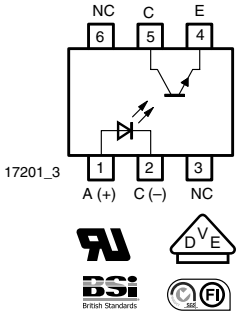


FEATURES

- Isolation test voltage 5000 V_{RMS}
- High common mode rejection
- No base terminal connection for improved noise immunity
- CTR offered in 4 groups
- Thickness though insulation ≥ 0.4 mm
- Creepage current resistance according to VDE0303/ IEC 60112 comparative tracking index: CTI ≥ 275
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

RoHS COMPLIANT

DESCRIPTION

The TCDT1100, TCDT1100G series consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 6 pin plastic dual inline package. The base of the phototransistor is not connected providing noise immunity.

VDE STANDARDS

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

- **DIN EN 60747-5-5 (VDE0884)**
  Optocoupler for electrical safety requirements
- **IEC 60950/EN 60950**
  Office machines (applied for reinforced isolation for mains voltage ≤ 400 V_{RMS})
- **VDE0804**
  Telecommunication apparatus and data processing
- **IEC 60065**
  Safety for mains-operated electronic and related household apparatus

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 IEC 60950; IEC 60065 pending
- DIN EN 60747-5-5 (VDE0884)
- FIMKO

ORDER INFORMATION

PART	REMARKS
TCDT1100	CTR > 40 %, DIP-6
TCDT1101	CTR 40 % to 80 %, DIP-6
TCDT1102	CTR 63 % to 125 %, DIP-6
TCDT1103	CTR 100 % to 200 %, DIP-6
TCDT1100G	CTR > 40 %, DIP-6, 400 mil
TCDT1101G	CTR 40 % to 80 %, DIP-6, 400 mil
TCDT1102G	CTR 63 % to 125 %, DIP-6, 400 mil
TCDT1103G	CTR 100 % to 200 %, DIP-6, 400 mil

Note

- G = leadform 10.16 mm; G is not marked on the body.

ABSOLUTE MAXIMUM RATINGS (1) (T_{amb} = 25 °C, unless otherwise specified)				
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 + 110	°C
Storage temperature range		T_{stg}	- 55 to + 125	°C
Soldering temperature (2)	2 mm from case, t ≤ 10 s	T_{sld}	260	°C

Notes

(1) 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 CHARACTERISTCS (1) (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 50 mA	V_F		1.25	1.6	V
Junction capacitance	V_R = 0, 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 ermitter cut-off current	V_{CE} = 20 V, I_F = 0, E = 0	I_{CEO}		200		nA
COUPLER						
Collector emitter saturation voltage	I_F = 10 mA, I_C = 1 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		0.6		pF

Note

(1) Minimum and maximum values are testing requierements. Typical values are characteristics of the device and are the result of engineering evaluations. 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} = 5 V, I_F = 10 mA	TCDT1100	CTR	40			%
		TCDT1100G	CTR				%
		TCDT1101	CTR	40		80	%
		TCDT1101G	CTR				%
		TCDT1102	CTR	63		125	%
		TCDT1102G	CTR				%
		TCDT1103	CTR	100		200	%
		TCDT1103G	CTR				%

MAXIMUM SAFETY RATINGS

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

- According to DIN EN 60747-5-5. 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}	1.6			kV
Partial discharge test voltage - lot test (sample test)	t_{Tr} = 60 s, t_{test} = 10 s, (see figure 1)	V_{IOTM}	6			kV
		V_{pd}	1.3			kV
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

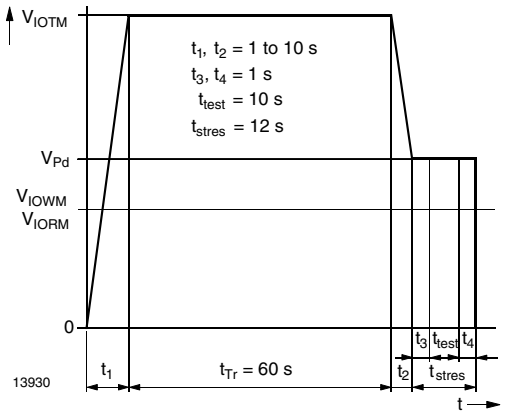


Fig. 1 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-5/DIN EN 60747-; IEC60747

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

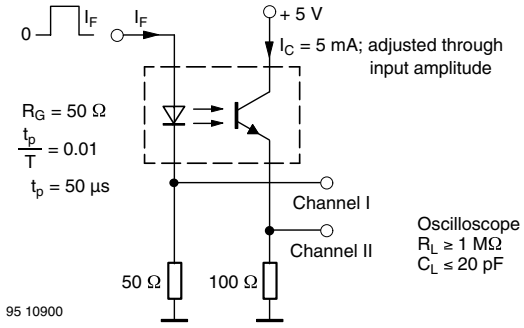


Fig. 2 - Test Circuit, Non-Saturated Operation

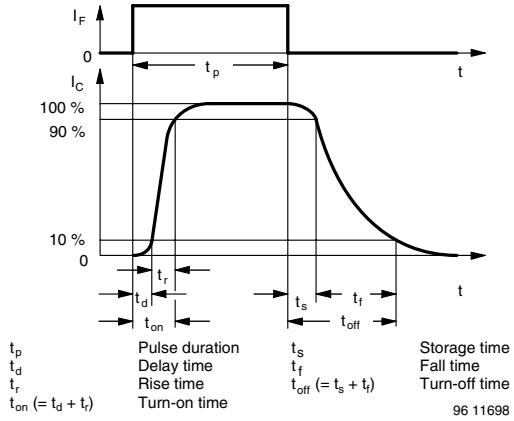


Fig. 4 - Switching Times

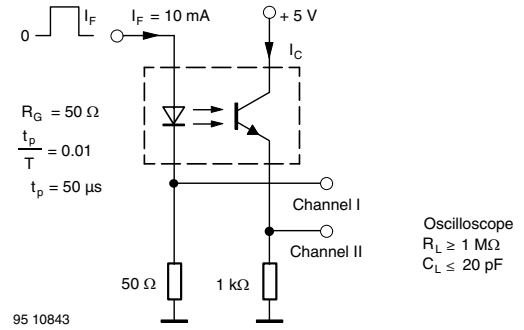
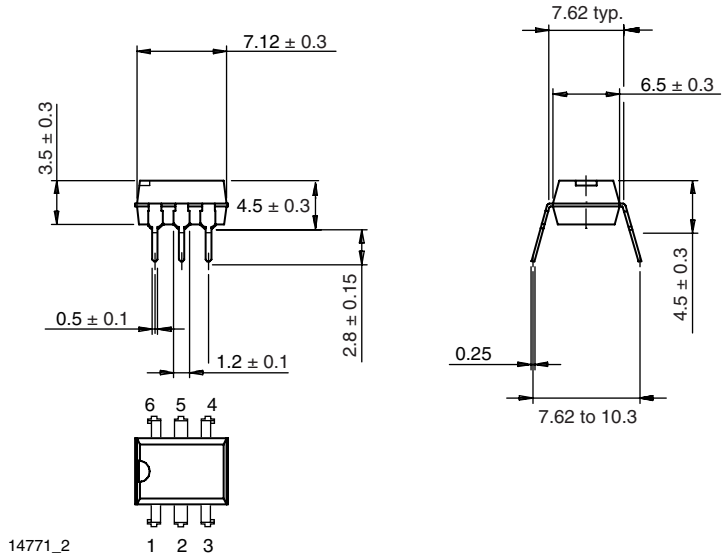


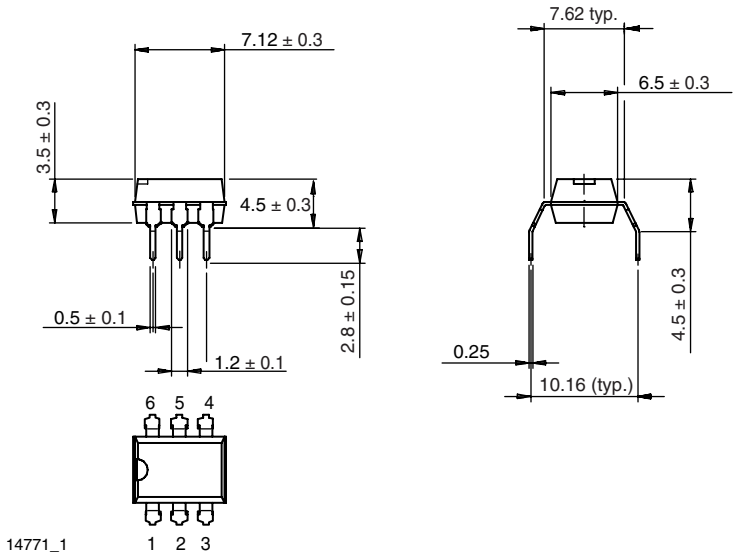
Fig. 3 - Test Circuit, Saturated Operation

PACKAGE DIMENSIONS in millimeters

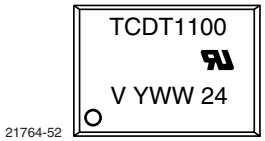
DIP-6



DIP-6, 400 mil



PACKAGE MARKING



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