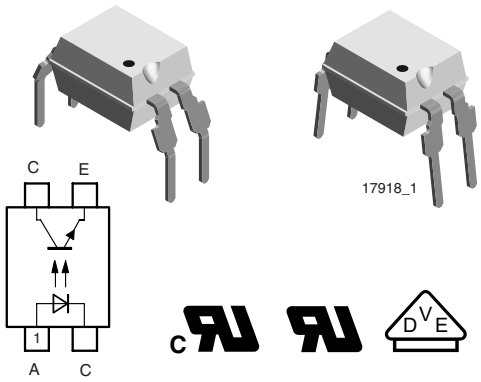
Optocoupler, Phototransistor Output, High Temperature, 110 °C Rated



DESCRIPTION

The TCET1110/ TCET1110G consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-pin plastic dual inline package.
The elements are mounted on one leadframe, providing a fixed distance between input and output for highest safety requirements.

VDE STANDARDS

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

- **DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 pending**
  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

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 60747-5-2 (VDE 0884)/ DIN EN 60747-5-5 pending.

FEATURES

- CTR offered in 9 groups
- Isolation materials according to UL94-VO
- Pollution degree 2
  (DIN/VDE 0110/resp. IEC 60664)
- Climatic classification 55/100/21
  (IEC 60068 part 1)
- Special construction: therefore, extra low coupling capacity of typical 0.2 pF, high **C**ommon **M**ode **R**ejection
- Low temperature coefficient of CTR
- Temperature range - 40 to + 110 °C
- Rated impulse voltage (transient overvoltage) V_{IOTM} = 8 kV_{peak}
- Isolation test voltage (partial discharge test voltage) V_{pd} = 1.6 kV
- Rated isolation voltage (RMS includes DC) V_{IOWM} = 600 V_{RMS}
- Rated recurring peak voltage (repetitive) V_{IORM} = 848 peak
- Creepage current resistance according to VDE 0303/ IEC 60112 **C**omparative **T**racking **I**ndex: **CTI** ≥ 175
- Thickness through insulation ≥ 0.75 mm
- External creepage distance > 8 mm
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

AGENCY APPROVALS

- UL1577, file no. E76222 system code U, double protection
- BSI: EN 60065:2002, EN 60950:2000
  certificate no. 7081 and 7402
- DIN EN 60747-5-2 (VDE 0884)
  DIN EN 60747-5-5 pending
- FIMKO

ORDER INFORMATION	
PART	**REMARKS**
TCET1110	CTR 50 to 600 %, DIP-4
TCET1111	CTR 40 to 80 %, DIP-4
TCET1112	CTR 63 to 125 %, DIP-4
TCET1113	CTR 100 to 200 %, DIP-4
TCET1114	CTR 160 to 320 %, DIP-4
TCET1115	CTR 50 to 150 %, DIP-4
TCET1116	CTR 100 to 300 %, DIP-4
TCET1117	CTR 80 to 160 %, DIP-4
TCET1118	CTR 130 to 260 %, DIP-4
TCET1119	CTR 200 to 400 %, DIP-4
TCET1110G	CTR 50 to 600 %, DIP-4
TCET1111G	CTR 40 to 80 %, DIP-4
TCET1112G	CTR 63 to 125 %, DIP-4
TCET1113G	CTR 100 to 200 %, DIP-4
TCET1114G	CTR 160 to 320 %, DIP-4
TCET1115G	CTR 50 to 150 %, DIP-4
TCET1116G	CTR 100 to 300 %, DIP-4
TCET1117G	CTR 80 to 160 %, DIP-4
TCET1118G	CTR 130 to 260 %, DIP-4
TCET1119G	CTR 200 to 400 %, DIP-4

Note

4 Pin = single channel

G = lead form 10.16 mm; G is not marked on the body

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Forward surge current	$t_P \leq 10$ µs	I_{FSM}	1.5	A
OUTPUT				
Collector emitter voltage		V_{CEO}	70	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
COUPLER				
Isolation test voltage (RMS)	t = 1 min	V_{ISO}	5000	V_{RMS}
Operating ambient temperature range		T_{amb}	- 40 to + 110	°C
Storage temperature range		T_{stg}	- 55 to + 125	°C
Soldering temperature	2 mm from case, ≤ 10 s	T_{sld}	260	°C

Note

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

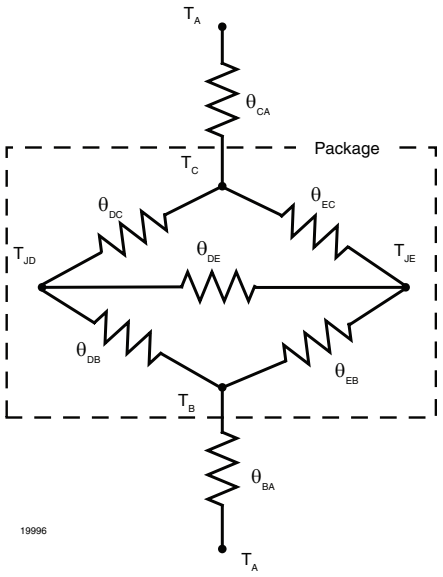
Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

THERMAL CHARACTERISTICS (1)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
LED power dissipation	at 25 °C	P_{diss}	100	mW
Output power dissipation	at 25 °C	P_{diss}	150	mW
Maximum LED junction temperature		T_{jmax}	125	°C
Maximum output die junction temperature		T_{jmax}	125	°C
Thermal resistance, junction emitter to board		θ_{EB}	173	°C/W
Thermal resistance, junction emitter to case		θ_{EC}	149	°C/W
Thermal resistance, junction detector to board		θ_{DB}	111	°C/W
Thermal resistance, junction detector to case		θ_{DC}	127	°C/W
Thermal resistance, junction emitter to junction detector		θ_{ED}	173	°C/W
Thermal resistance, board to ambient(2)		θ_{BA}	197	°C/W
Thermal resistance, case to ambient(2)		θ_{CA}	4041	°C/W

Notes

(1) The thermal model is represented in the thermal network below. Each resistance value given in this model can be used to calculate the temperatures at each node for a given operating condition. The thermal resistance from board to ambient will be dependent on the type of PCB, layout and thickness of copper traces. For a detailed explanation of the thermal model, please reference Vishay's Thermal Characteristics of optocouplers application note.

(2) For 2 layer FR4 board (4" x 3" x 0.062)



ELECTRICAL CHARACTERISTICS

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}	70			V
Emitter collector voltage	I_E = 100 µA	V_{ECO}	7			V
Collector emitter cut-off current	V_{CE} = 20 V, I_f = 0, E = 0	I_{CEO}		10	100	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		0.3		pF

Note

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} = 5 V, I_F = 1 mA	TCET1111 TCET1111G	CTR	13	30		%
		TCET1112 TCET1112G	CTR	22	45		%
		TCET1113 TCET1113G	CTR	34	70		%
		TCET1114 TCET1114G	CTR	56	90		%
	V_{CE} = 5 V, I_F = 5 mA	TCET1110 TCET1110G	CTR	50		600	%
		TCET1115 TCET1115G	CTR	50		150	%
		TCET1116 TCET1116G	CTR	100		300	%
		TCET1117 TCET1117G	CTR	80		160	%
		TCET1118 TCET1118G	CTR	130		260	%
		TCET1119 TCET1119G	CTR	200		400	%
	V_{CE} = 5 V, I_F = 10 mA	TCET1111 TCET1111G	CTR	40		80	%
		TCET1112 TCET1112G	CTR	63		125	%
		TCET1113 TCET1113G	CTR	100		200	%
		TCET1114 TCET1114G	CTR	160		320	%

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}			8	kV
Safety temperature		T_{si}			150	°C

Note

According to DIN EN 60747-5-2 (VDE0884)/ DIN EN 60747-5-5 pending (see figure 1). 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 2)	V_{IOTM}	8			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

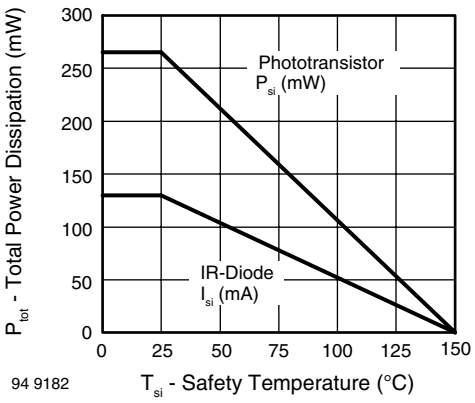


Fig. 1 - Derating Diagram

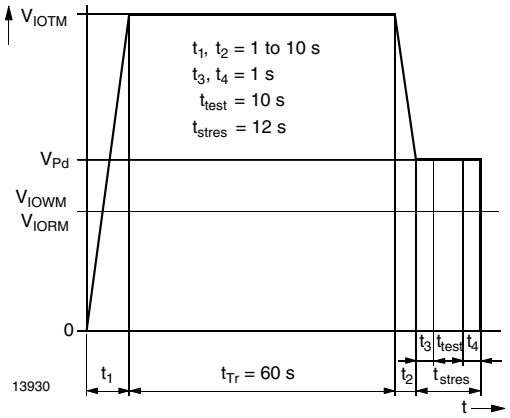


Fig. 2 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-; IEC60747

SWITCHING CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN**	**TYP.**	**MAX**	**UNIT**
Delay time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_d		3		µs
Rise time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_r		3		µs
Fall time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_f		4.7		µs
Storage time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_s		0.3		µs
Turn-on time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_{on}		6		µs
Turn-off time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_{off}		5		µs
Turn-on time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ, (see figure 4)	t_{on}		9		µs
Turn-off time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ, (see figure 4)	t_{off}		10		µs

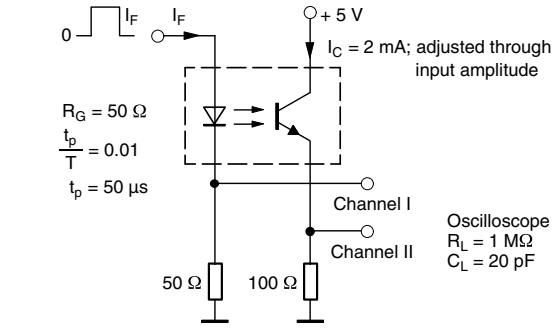


Fig. 3 - Test Circuit, Non-Saturated Operation

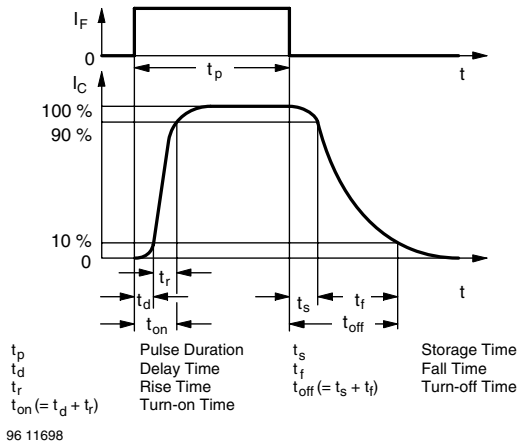


Fig. 5 - Switching Times

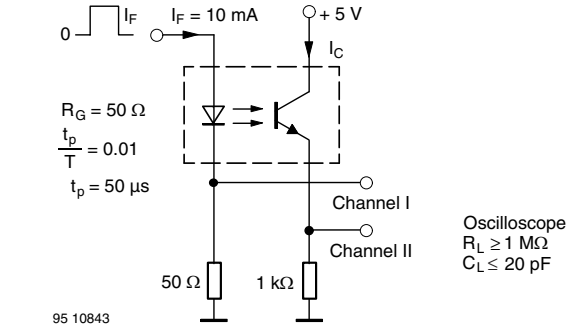


Fig. 4 - Test Circuit, Saturated Operation

TYPICAL CHARACTERISTICS

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

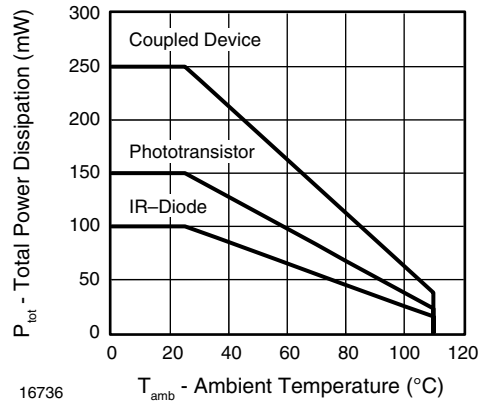


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

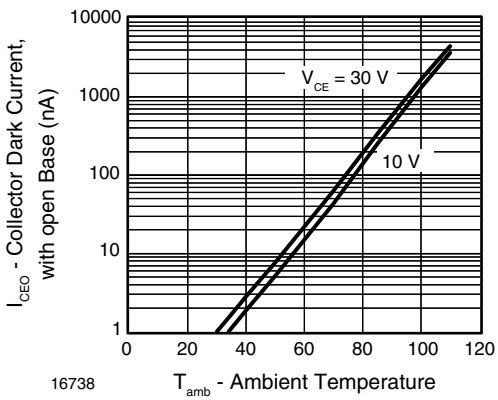


Fig. 9 - Collector Dark Current vs. Ambient Temperature

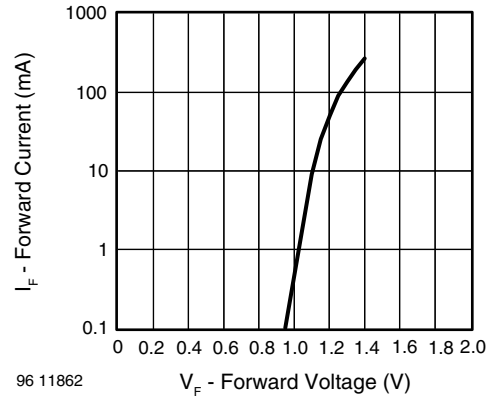


Fig. 7 - Forward Current vs. Forward Voltage

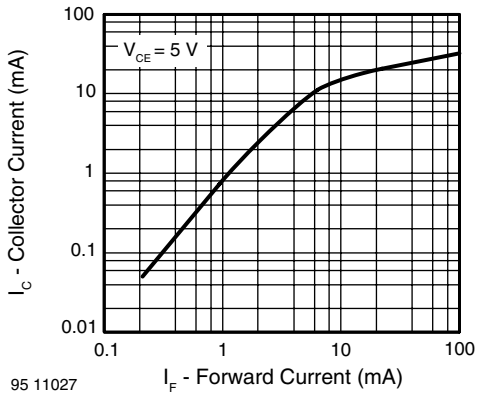


Fig. 10 - Collector Current vs. Forward Current

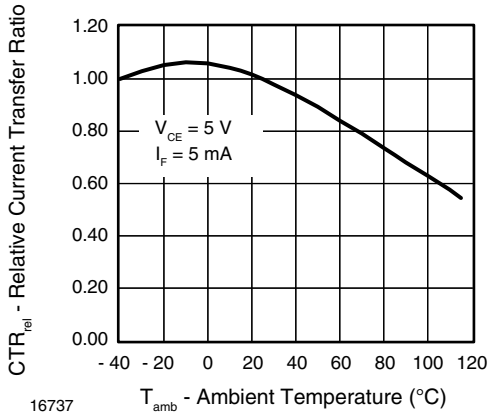


Fig. 8 - Relative Current Transfer Ratio vs. Ambient Temperature

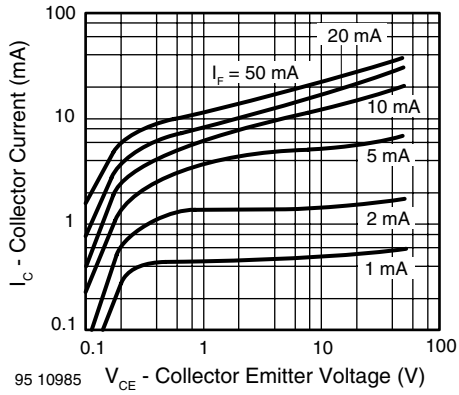


Fig. 11 - Collector Current vs. Collector Emitter Voltage

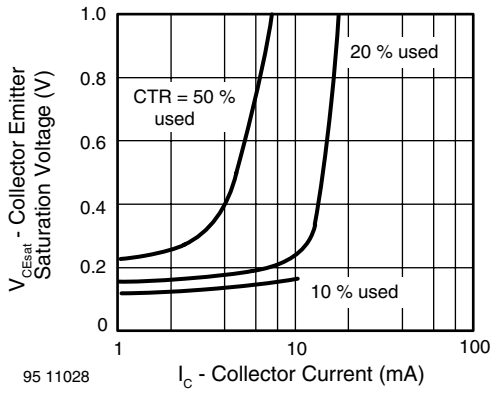


Fig. 12 - Collector Emitter Saturation Voltage vs. Collector Current

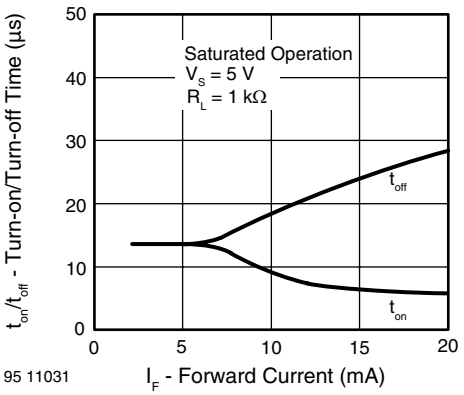


Fig. 15 - Turn-on/off Time vs. Forward Current

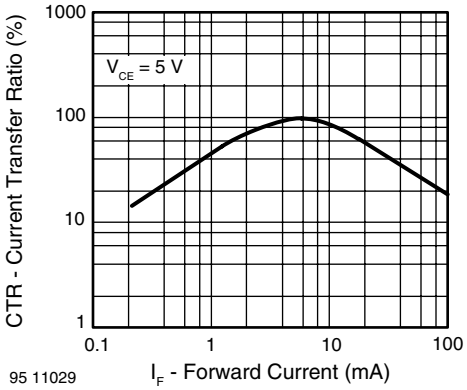


Fig. 13 - Current Transfer Ratio vs. Forward Current

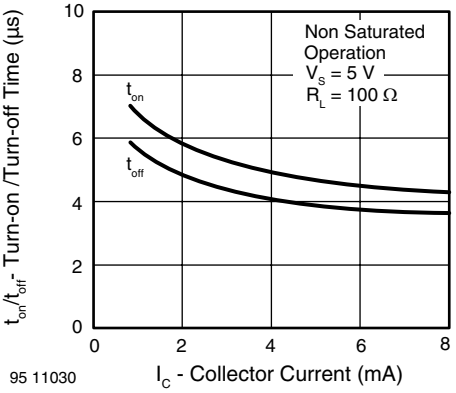
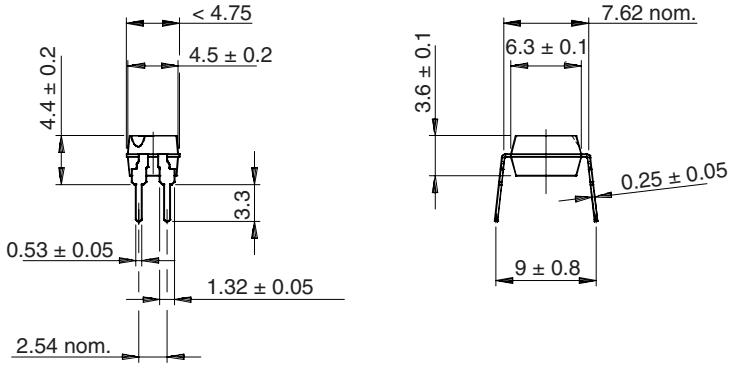


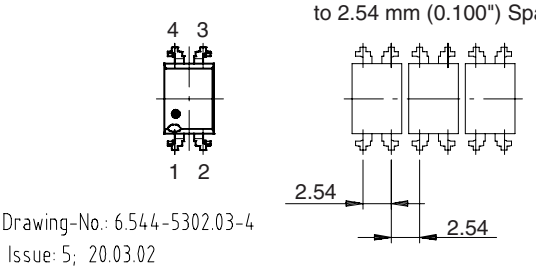
Fig. 14 - Turn-on/off Time vs. Collector Current

PACKAGE DIMENSIONS in millimeters

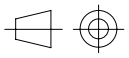


E. g.:
Special Features: Endstackable to 2.54 mm (0.100") Spacing

Weight: ca. 0.25 g
Creepage Distance: > 6 mm
Air Path: > 6 mm
after Mounting on PC Board

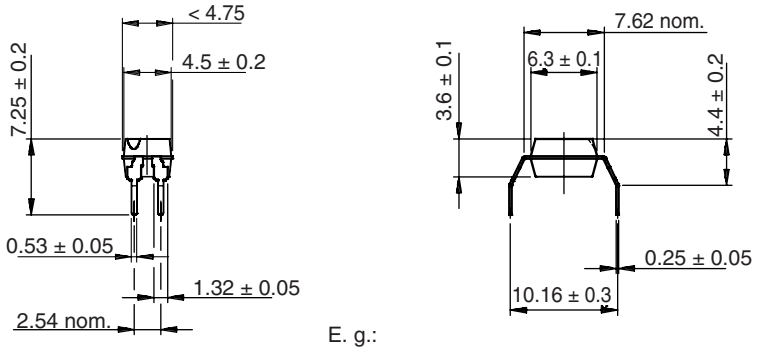


Drawing-No.: 6.544-5302.03-4
Issue: 5; 20.03.02

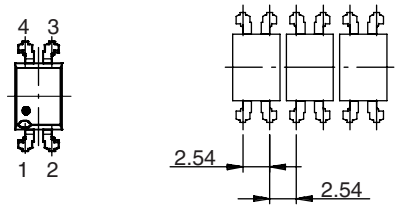


technical drawings according to DIN specifications

14789

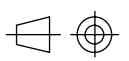


E. g.:
Special Features: Endstackable to 2.54 mm (0.100") Spacing



Weight: ca. 0.25 g
Creepage Distance: > 8 mm
Air Path: > 8 mm
after Mounting on PC Board

Drawing-No.: 6.544-5303.03-4
Issue: 4; 20.03.02



technical drawings according to DIN specifications

14792

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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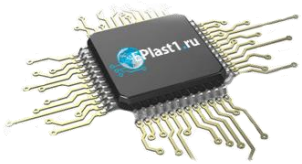
Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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