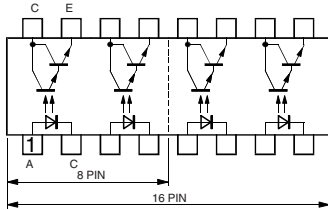
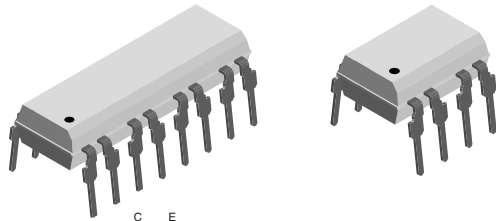




# THE DATASHEET OF TCED4100



## Optocoupler, Photodarlington Output, Dual Channel, High Gain



17200



### DESCRIPTION

The TCED2100/TCED4100 consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 8-pin (dual) or 16-pin (quad) 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 60747-5-5**  
Optocoupler for electrical safety requirements
- **IEC 60950/EN 60950**  
Office machines (applied for reinforced isolation for mains voltage  $\leq 400 V_{RMS}$ )
- **VDE 0804**  
Telecommunication apparatus and data processing
- **IEC 60065**  
Safety for mains-operated electronic and related household apparatus

### FEATURES

- 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 common mode rejection
- Low temperature coefficient of CTR
- Creepage current resistance according to VDE 0303/ IEC 60112 comparative tracking index: CTI  $\geq 175$
- Rated impulse voltage (transient overvoltage)  $V_{IOTM} = 8 \text{ kV peak}$
- Isolation test voltage (partial discharge test voltage)  $V_{pd} = 1.6 \text{ kV peak}$
- Rated isolation voltage (RMS includes DC)  $V_{IOWM} = 600 V_{RMS}$
- Rated recurring peak voltage (repetitive)  $V_{IORM} = 848 \text{ V peak}$
- Thickness though insulation  $\geq 0.75 \text{ mm}$
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



RoHS COMPLIANT

### 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  $\leq 300 \text{ V}$   
- for appl. class I - III at mains voltage  $\leq 600 \text{ V}$  according to DIN EN 60747-5-5.

### AGENCY APPROVALS

- UL1577, file no. E76222 system code U, double protection
- CSA 22.2 bulletin 5A, double protection
- DIN EN 60747-5-5
- BSI IEC 60950; IEC 60065
- FIMKO

ORDER INFORMATION	
PART	REMARKS
TCED2100	CTR $\geq 600 \%$ , DIP-8
TCED4100	CTR $\geq 600 \%$ , DIP-16



<b>ABSOLUTE MAXIMUM RATINGS (1)</b>				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		$V_R$	6	V
Forward current		$I_F$	60	mA
Forward surge current	$t_p \leq 10 \mu s$	$I_{FSM}$	1.5	A
Power dissipation		$P_{diss}$	100	mW
Junction temperature		$T_j$	125	°C
<b>OUTPUT</b>				
Collector emitter voltage		$V_{CEO}$	35	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	80	mA
Collector peak current	$t_p/T = 0.5, t_p \leq 10 ms$	$I_{CM}$	100	mA
Power dissipation		$P_{diss}$	150	mW
Junction temperature		$T_j$	125	°C
<b>COUPLER</b>				
Isolation test voltage (RMS)	$t = 1 min$	$V_{ISO}$	5000	$V_{RMS}$
Total power dissipation		$P_{tot}$	250	mW
Operating ambient temperature range		$T_{amb}$	- 40 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)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , 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.

<b>ELECTRICAL CHARACTERISTICS</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	$I_F = 20 mA$	$V_F$		1.15	1.4	V
Junction capacitance	$V_R = 0 V, f = 1 MHz$	$C_j$		50		pF
<b>OUTPUT</b>						
Collector emitter voltage	$I_C = 1 mA$	$V_{CEO}$	32			V
Emitter collector voltage	$I_E = 100 \mu A$	$V_{ECO}$	7			V
Collector emitter cut-off current	$V_{CE} = 10 V, I_F = 0 A, E = 0$	$I_{CEO}$		15	100	nA
<b>COUPLER</b>						
Collector emitter saturation voltage	$I_F = 20 mA, I_C = 5 mA$	$V_{CEsat}$			1	V
Cut-off frequency	$V_{CE} = 5 V, I_F = 10 mA, R_L = 100 \Omega$	$f_c$		10		kHz
Coupling capacitance	$f = 1 MHz$	$C_k$		0.3		pF

**Note** $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified.

Minimum and maximum values are tested requirements. 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.

<b>CURRENT TRANSFER RATIO</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
$I_C/I_F$	$V_{CE} = 2 V, I_F = 1 mA$	CTR	600	800		%

MAXIMUM SAFETY RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward current		$I_F$			130	mA
<b>OUTPUT</b>						
Power dissipation		$P_{diss}$			265	mW
<b>COUPLER</b>						
Rated impulse voltage		$V_{IOTM}$			8	kV
Safety temperature		$T_{si}$			150	°C

**Note**

According to DIN EN 60747-5-5 (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	$R_{IO}$	$10^{12}$			$\Omega$
	$V_{IO} = 500$ V, $T_{amb} = 100$ °C	$R_{IO}$	$10^{11}$			$\Omega$
	$V_{IO} = 500$ V, $T_{amb} = 150$ °C (construction test only)	$R_{IO}$	$10^9$			$\Omega$

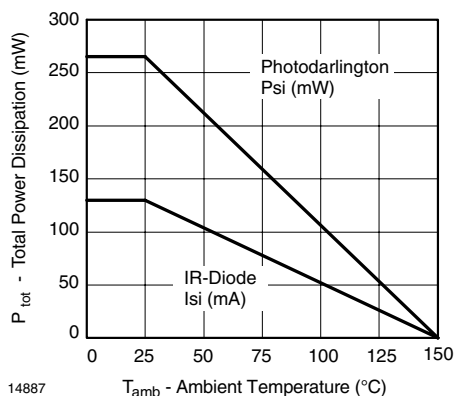


Fig. 1 - Derating Diagram

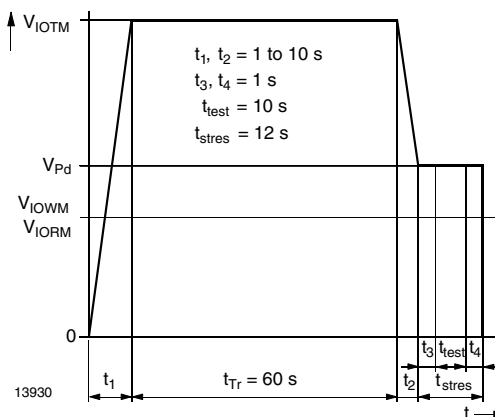


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-5/DIN EN 60747-; IEC60747

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Rise time	$V_{CC} = 2$ V, $I_C = 10$ mA, $R_L = 100$ $\Omega$ , (see figure 3)	$t_r$		300		$\mu$ s
Fall time	$V_{CC} = 2$ V, $I_C = 10$ mA, $R_L = 100$ $\Omega$ , (see figure 3)	$t_f$		250		$\mu$ s

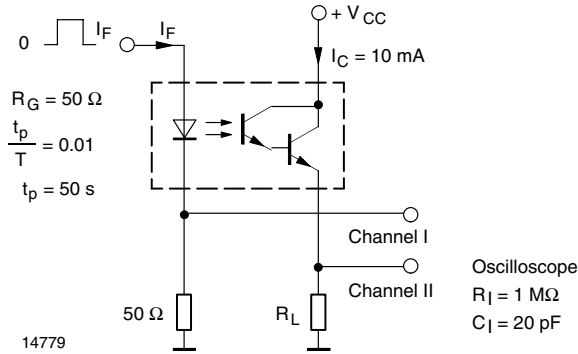


Fig. 3 - Test Circuit, Non-Saturated Operation

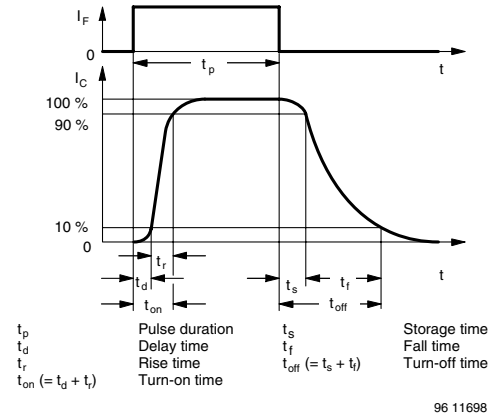


Fig. 4 - Switching Times

### TYPICAL CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

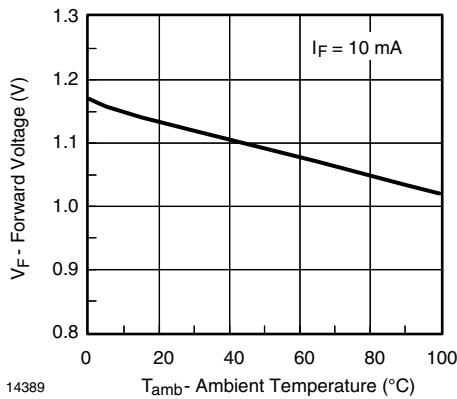


Fig. 5 - Forward Voltage vs. Ambient Temperature

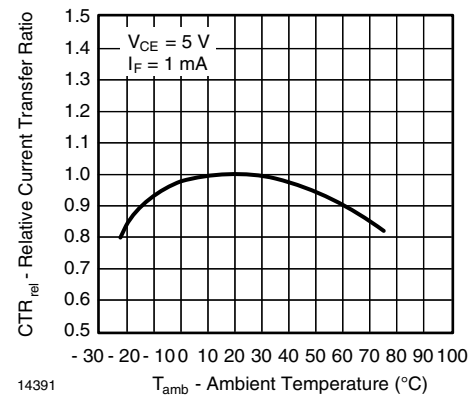


Fig. 7 - Relative Current Transfer Ratio vs. Ambient Temperature

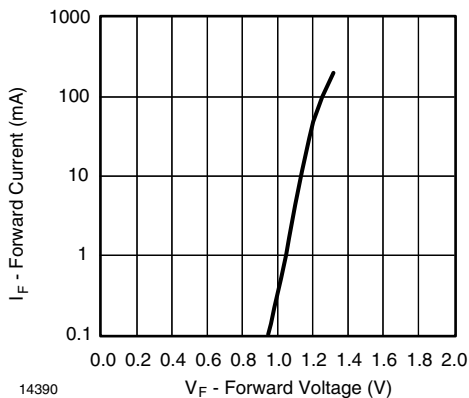


Fig. 6 - Forward Current vs. Forward Voltage

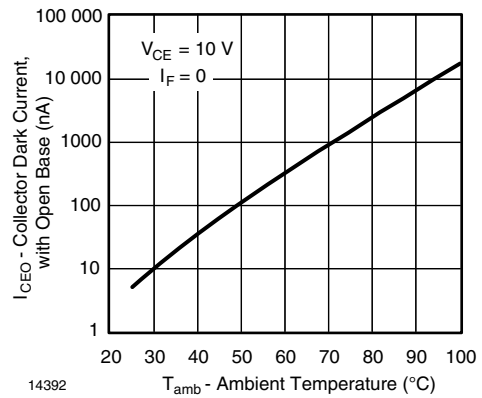


Fig. 8 - Collector Dark Current vs. Ambient Temperature

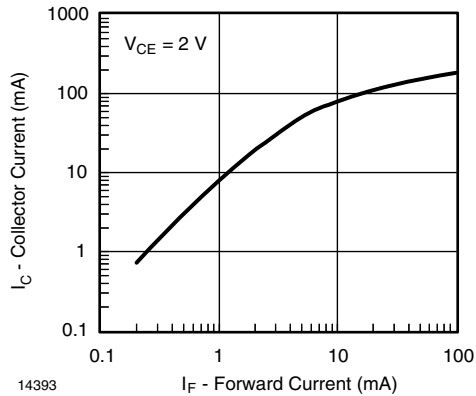


Fig. 9 - Collector Current vs. Forward Current

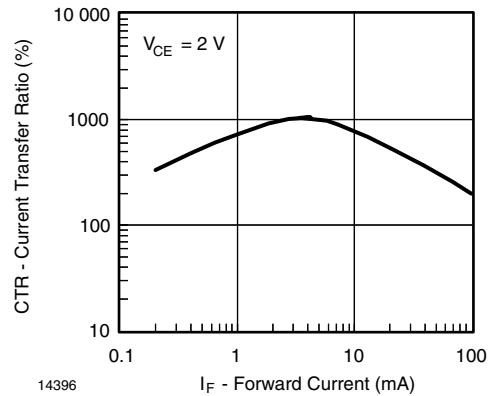


Fig. 12 - Current Transfer Ratio vs. Forward Current

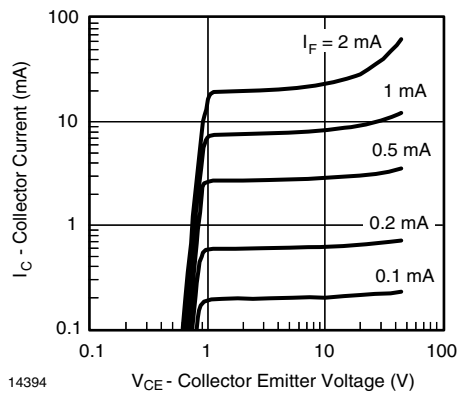


Fig. 10 - Collector Current vs. Collector Emitter Voltage

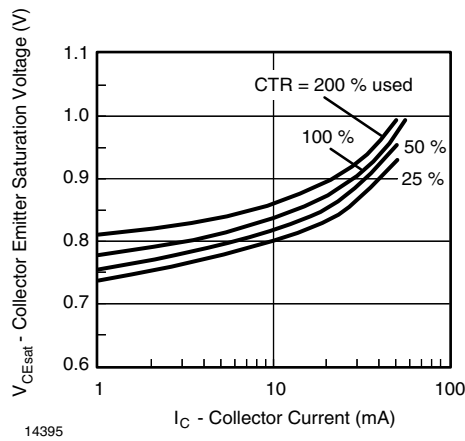


Fig. 11 - Collector Emitter Saturation Voltage vs. Collector Current

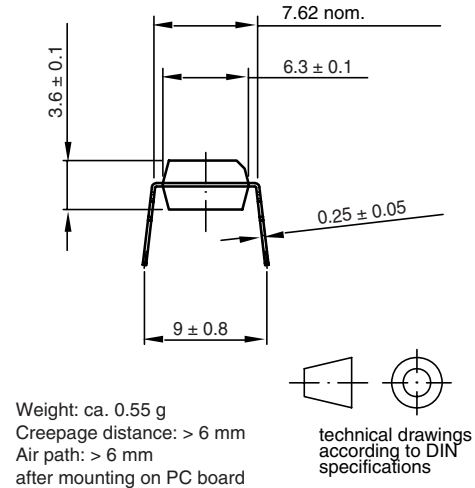
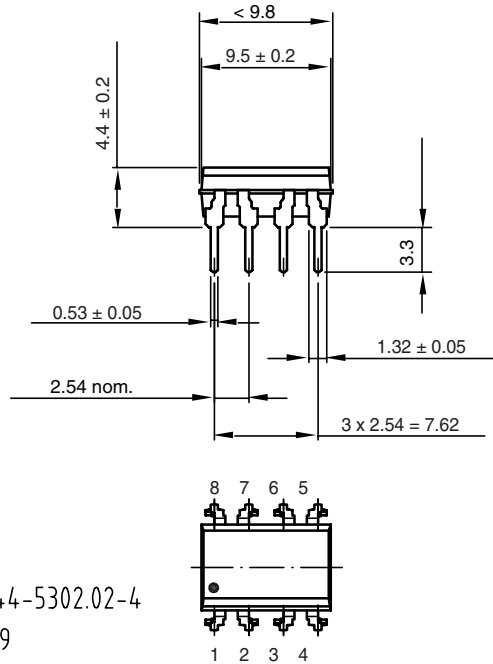


# TCED2100/TCED4100

Optocoupler, Photodarlington Output,  
Dual Channel, High Gain

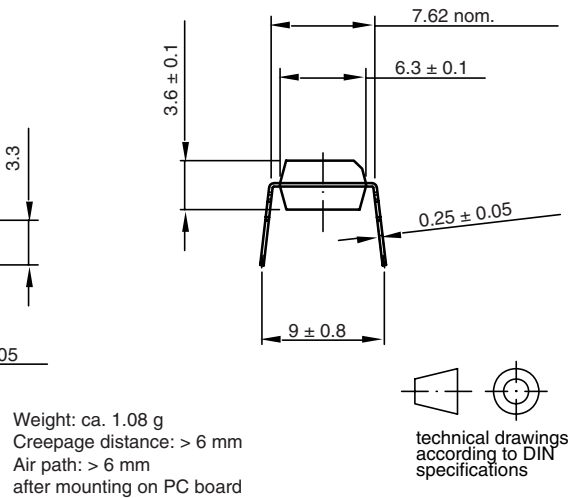
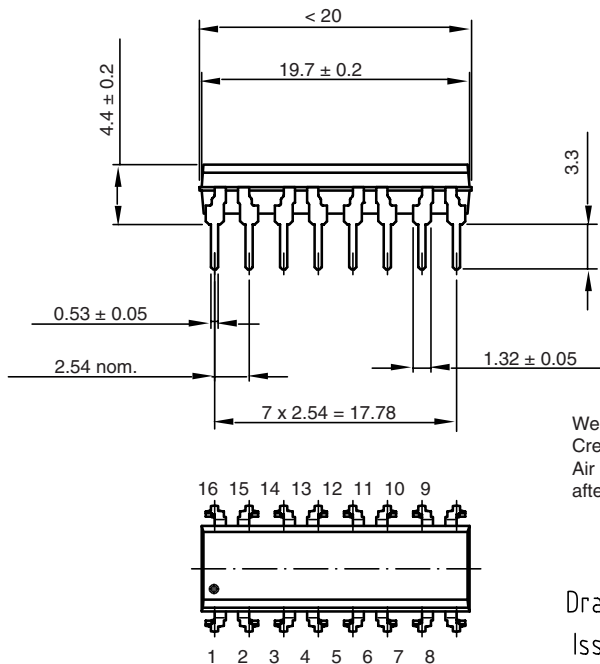
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## PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5302.02-4  
Issue: 4; 02.06.99

14784



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Issue: 4; 02.06.99

14783

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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.

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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.
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