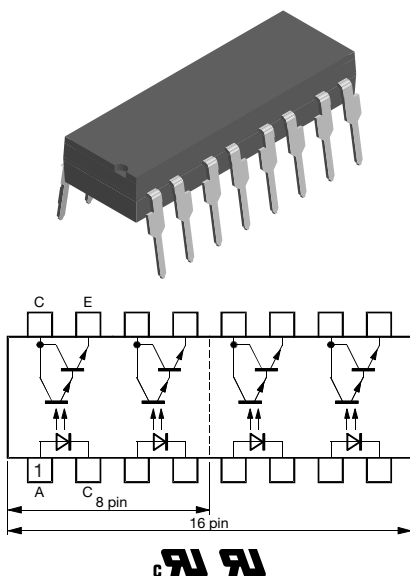




## Optocoupler, Photodarlington Output, Dual Channel, High Gain



### DESCRIPTION

The 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.

### FEATURES

- Isolation materials according to UL 94 V-0
- 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)  $V_{IOWM} = 600 \text{ V}_{RMS}$
- Rated recurring peak voltage (repetitive)  $V_{IORM} = 848 \text{ V peak}$
- Thickness though insulation  $\geq 0.75 \text{ mm}$
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

### LINKS TO ADDITIONAL RESOURCES



Product Page



Design Tools



SPICE  
Models



Footprints



Schematics

### 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 / EN 60950**  
Office machines (applied for reinforced isolation for mains voltage  $\leq 400 \text{ V}_{RMS}$ )
- **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  $\leq 300 \text{ V}$
  - for appl. class I - III at mains voltage  $\leq 600 \text{ V}$  according to DIN EN 60747-5-5 (VDE 0884)

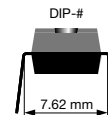
### AGENCY APPROVALS

- [UL](#)
- [cUL](#)



## ORDERING INFORMATION

T	C	E	D	4	1	0	0
PART NUMBER							



AGENCY CERTIFIED / PACKAGE	CTR (%)
UL, cUL	≥ 600
DIP-16	TCED4100

ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Peak reverse voltage		$V_R$	6.0	V
Forward continuous current		$I_F$	60	mA
Forward surge current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	1.5	A
Power dissipation		$P_{diss}$	100	mW
Junction temperature		$T_j$	125	$^{\circ}\text{C}$
<b>OUTPUT</b>				
Collector emitter breakdown voltage		$BV_{CEO}$	35	V
Emitter collector breakdown voltage		$BV_{ECO}$	7.0	V
$I_{CMAX\text{ DC}}$		$I_{CMAX\text{ DC}}$	80	mA
$I_{CMAX}$	$t < 1.0\text{ ms}$	$I_{CMAX}$	100	mW
Power dissipation		$P_{diss}$	150	mW
Junction temperature		$T_j$	125	$^{\circ}\text{C}$
<b>COUPLER</b>				
Isolation test voltage	$t = 1\text{ min}$	$V_{ISO}$	5000	$V_{RMS}$
Total package dissipation		$P_{tot}$	250	mW
Storage temperature		$T_{stg}$	-40 to +100	$^{\circ}\text{C}$
Operating temperature		$T_{amb}$	-55 to +125	$^{\circ}\text{C}$
Soldering temperature <sup>(1)</sup>	2 mm from case, $t \leq 10\text{ s}$	$T_{sld}$	260	$^{\circ}\text{C}$

## Notes

- 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.

<sup>(1)</sup> Refer to wave profile for soldering conditions for through-hole devices.

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

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	$I_F = 20\text{ mA}$	$V_F$	-	1.15	1.4	V
Junction capacitance	$V_R = 0\text{ V}$ , $f = 1.0\text{ MHz}$	$C_j$	-	50	-	pF
<b>OUTPUT</b>						
Collector emitter breakdown voltage	$I_C = 1\text{ mA}$	$BV_{CEO}$	32	-	-	V
Emitter collector breakdown voltage	$I_E = 100\text{ }\mu\text{A}$	$BV_{ECO}$	7.0	-	-	V
Collector emitter cut-off current	$V_{CE} = 10\text{ V}$ , $I_F = 0\text{ A}$ , $E = 0$	$I_{CEO}$		15	100	nA
<b>COUPLER</b>						
Saturation voltage, collector emitter	$I_{CE} = 0.5\text{ mA}$	$V_{CEsat}$	-	-	1.0	V
Cut-off frequency	$V_{CE} = 5\text{ V}$ , $I_F = 10\text{ mA}$ , $R_L = 100\text{ }\Omega$	$f_c$	-	10	-	kHz
Coupling capacitance	$f = 1\text{ MHz}$	$C_k$	-	0.3	-	pF

## Note

- 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.

**CURRENT TRANSFER RATIO** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
$I_C/I_F$	$V_{CE} = 2\text{ V}$ , $I_F = 1\text{ mA}$	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	$^{\circ}\text{C}$

**Note**

- According to DIN EN 60747-5-5 (see Fig. 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 %, $t_{test} = 1\text{ s}$	$V_{pd}$	1.6	-	-	kV
Partial discharge test voltage - lot test (sample test)	$t_{Tr} = 60\text{ s}$ , $t_{test} = 10\text{ s}$ , (see Fig. 2)	$V_{IOTM}$	8	-	-	kV
		$V_{pd}$	1.3	-	-	kV
Insulation resistance	$V_{IO} = 500\text{ V}$	$R_{IO}$	$10^{12}$	-	-	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$	$R_{IO}$	$10^{11}$	-	-	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 150\text{ }^{\circ}\text{C}$ (construction test only)	$R_{IO}$	$10^9$	-	-	$\Omega$

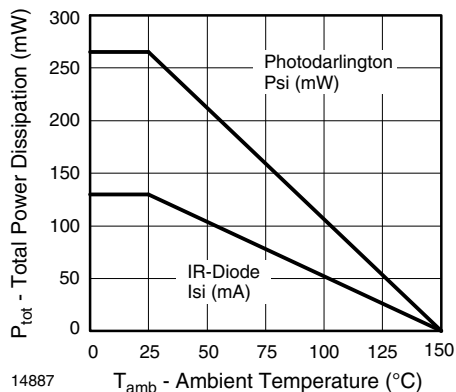


Fig. 1 - Derating Diagram

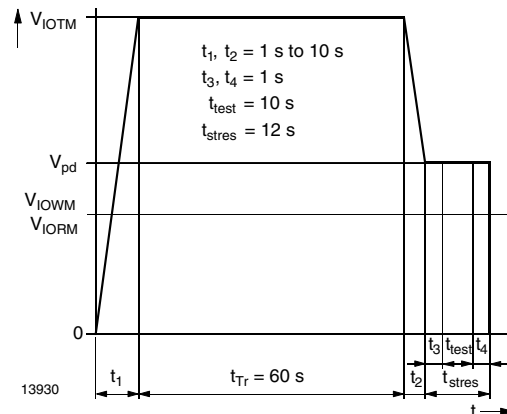


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-5/DIN EN 60747-5; IEC60747

**SWITCHING CHARACTERISTICS**

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

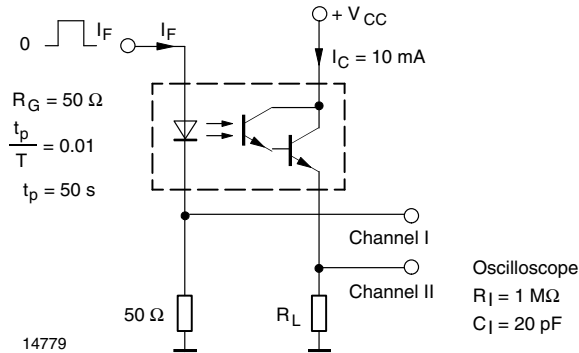


Fig. 3 - Test Circuit, Non-Saturated Operation

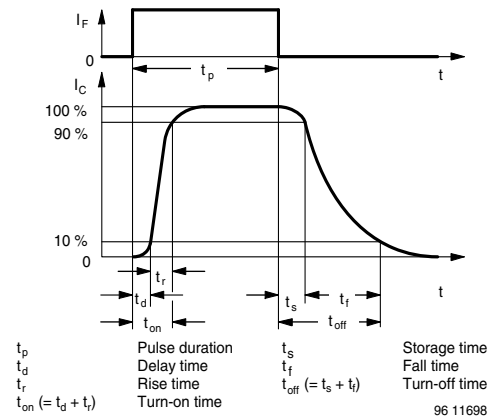


Fig. 4 - Switching Times

### TYPICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

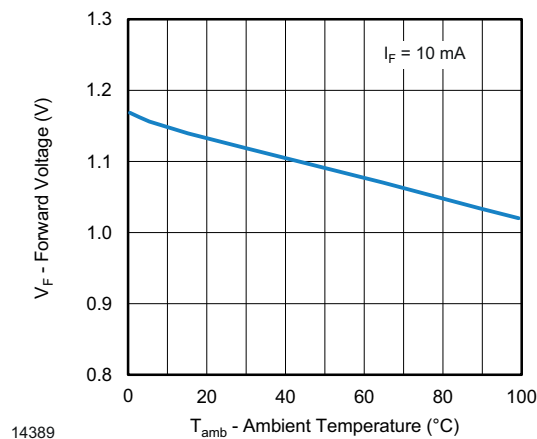


Fig. 5 - Forward Voltage vs. Ambient Temperature

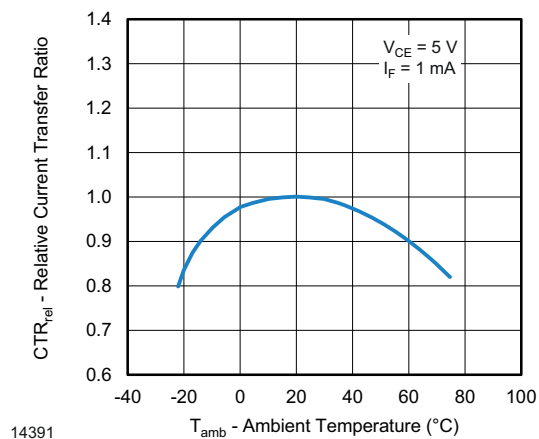


Fig. 7 - Relative Current Transfer Ratio vs. Ambient Temperature

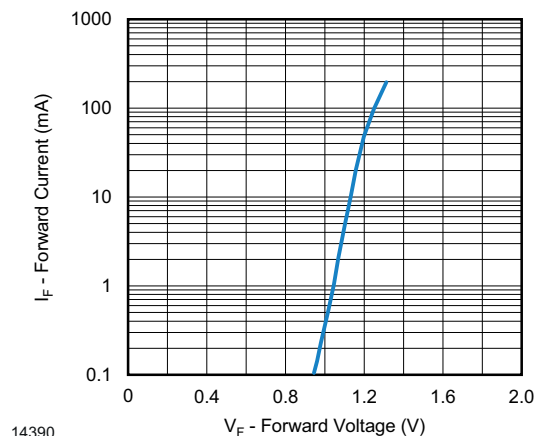


Fig. 6 - Forward Current vs. Forward Voltage

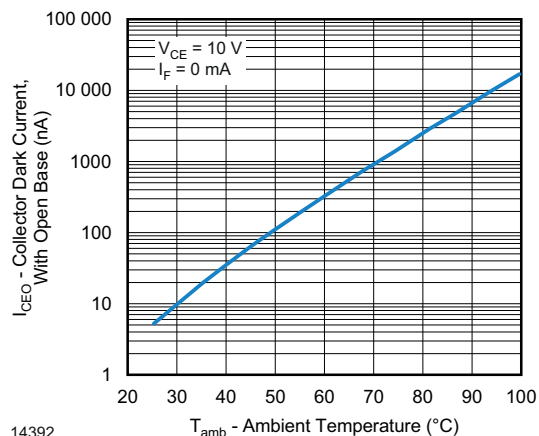


Fig. 8 - Collector Dark Current vs. Ambient Temperature

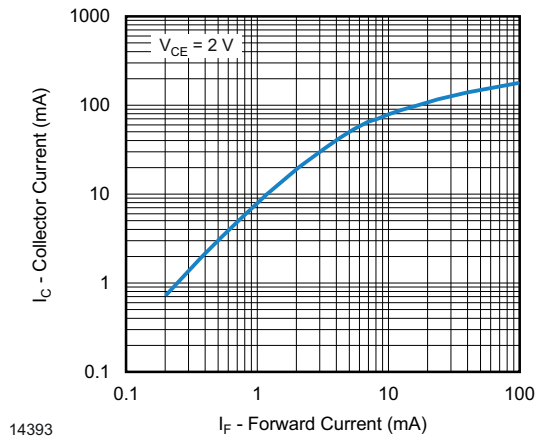


Fig. 9 - Collector Current vs. Forward Current

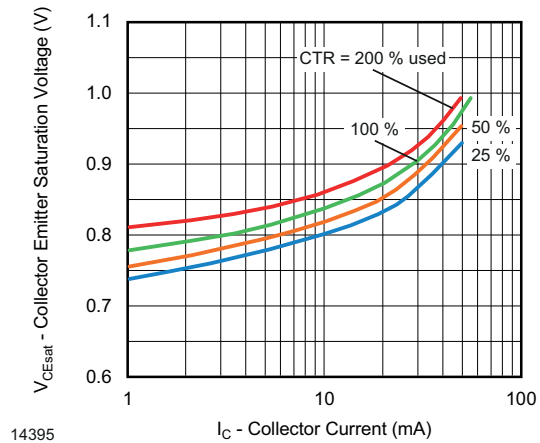


Fig. 11 - Collector Emitter Saturation Voltage vs. Collector Current

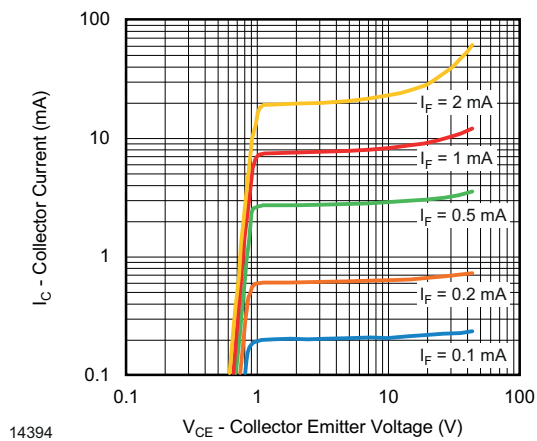


Fig. 10 - Collector Current vs. Collector Emitter Voltage

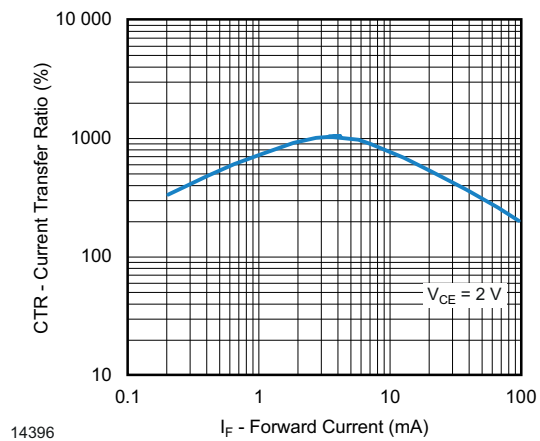
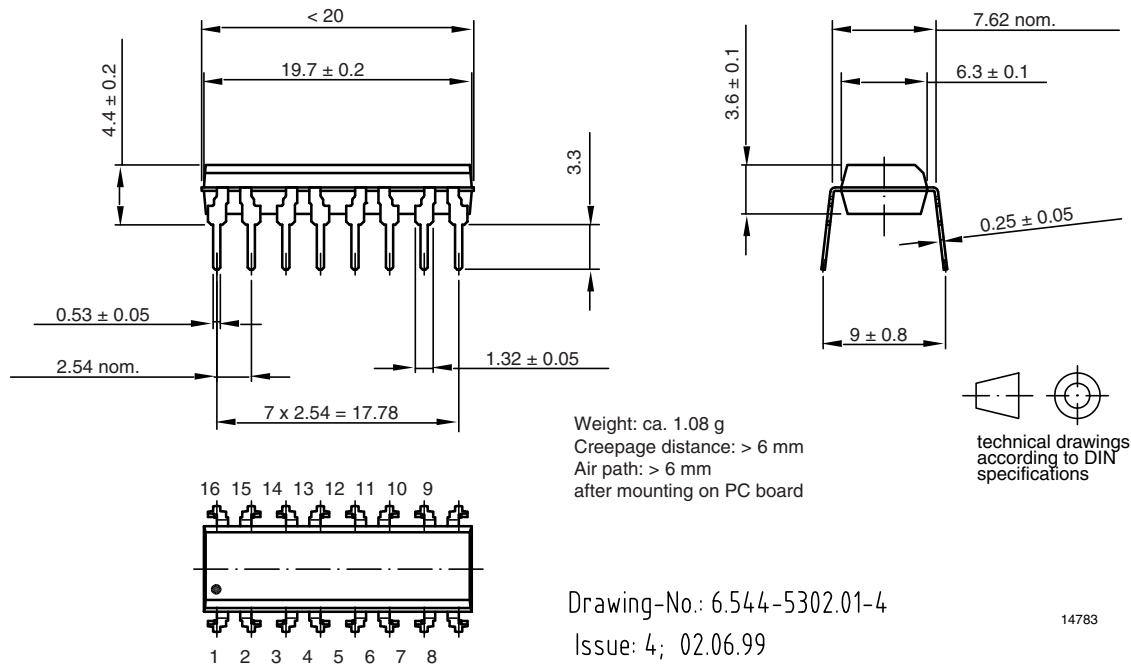
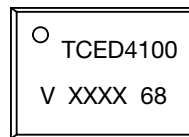


Fig. 12 - Current Transfer Ratio vs. Forward Current

**PACKAGE DIMENSIONS** in millimeters**PACKAGE MARKING** (example)**Note**

- XXXX = LMC (lot marking code)



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