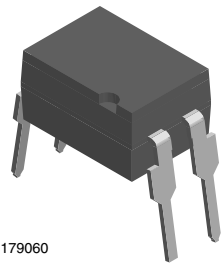
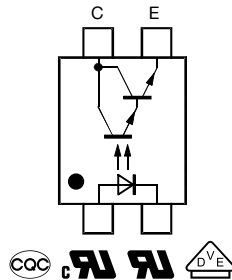




## Optocoupler, Photodarlington Output, High Gain



i179060

**RoHS**  
COMPLIANT

### LINKS TO ADDITIONAL RESOURCES

[Product Page](#)

### DESCRIPTION

The TCED1100 consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-lead plastic dual inline package.

### VDE STANDARDS

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

- **DIN EN 60747-5-5**  
Optocoupler for electrical safety requirements
- **IEC EN 60950**  
Office machines (applied for reinforced isolation for mains voltage  $\leq 400 V_{RMS}$ )
- **VDE 0804**  
Telecommunication apparatus and data processing
- **IEC60065**  
Safety for mains-operated electronic and related household apparatus

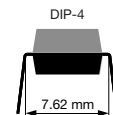
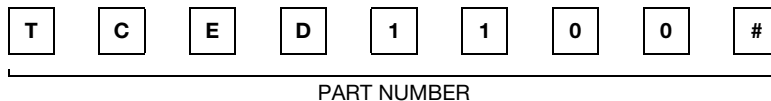
### FEATURES

- Extra low coupling capacity - typical 0.2 pF
- High common mode rejection
- Available in single or four channels
- Rated impulse voltage (transient overvoltage)  $V_{IOTM} = 10 kV_{peak}$
- Isolation test voltage (partial discharge test voltage)  $V_{pd} = 1.67 kV_{peak}$
- Rated isolation voltage (RMS includes DC)  $V_{IORM} = 800 V_{peak}$
- Rated recurring peak voltage (repetitive)  $V_{IORM} = 890 V_P$
- Thickness though insulation  $\geq 0.4$  mm
- Creepage current resistance according to VDE 0303/IEC60112 comparative tracking index:  $CTI \geq 175$
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### AGENCY APPROVALS

- [UL](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0804\)](#)
- [CQC GB4943.1](#)
- [CQC GB8898](#)

### ORDERING INFORMATION



AGENCY CERTIFIED / PACKAGE	CTR (%)
UL, cUL, VDE, CQC	600
DIP-4	TCED1100



ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		$V_R$	6	V
Forward current		$I_F$	60	mA
Forward surge current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	1.5	A
Power dissipation		$P_{diss}$	70	mW
Junction temperature		$T_j$	125	$^{\circ}\text{C}$
<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	$t_p/T = 0.5, t_p \leq 10\text{ ms}$	$I_{CM}$	100	mA
Power dissipation		$P_{diss}$	70	mW
Junction temperature		$T_j$	125	$^{\circ}\text{C}$
<b>COUPLER</b>				
Isolation test voltage (RMS)	$t = 1\text{ min}$	$V_{ISO}$	4420	$V_{RMS}$
Isolation voltage		$V_{IORM}$	890	$V_P$
Total power dissipation		$P_{tot}$	200	mW
Operating ambient temperature range		$T_{amb}$	-55 to +100	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	-55 to +150	$^{\circ}\text{C}$
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

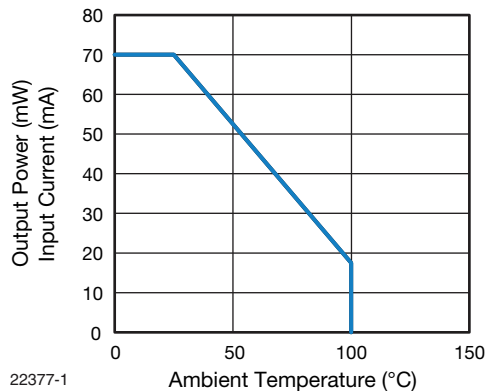


Fig. 1 - Abs. max. Power Dissipation (mW)  
Abs. max. Input Current (mA)



<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$	$C_j$	-	50	-	pF
<b>OUTPUT</b>						
Collector emitter voltage	$I_C = 1\text{ mA}$	$V_{CEO}$	32	-	-	V
Emitter collector voltage	$I_E = 100\text{ }\mu\text{A}$	$V_{ECO}$	7	-	-	V
Collector emitter cut-off current	$V_{CE} = 10\text{ V}$ , $I_F = 0$ , $E = 0$	$I_{CEO}$	-	15	100	nA
<b>COUPLER</b>						
Collector emitter saturation voltage	$I_F = 10\text{ mA}$ , $I_C = 5\text{ mA}$	$V_{CEsat}$	-	-	1	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	$f = 1\text{ MHz}$	$C_k$	-	0.6	-	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.

<b>CURRENT TRANSFER RATIO</b>						
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	-	%

<b>MAXIMUM SAFETY RATINGS</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
input						
Forward current		$I_F$	-	-	275	mA
output						
Power dissipation		$P_{diss}$	-	-	400	mW
Coupler						
Rated impulse voltage		$V_{IOTM}$	-	-	10	kV
Safety temperature		$T_{SI}$	-	-	175	$^{\circ}\text{C}$
Safety output power		$P_{SO}$	-	-	400	mW
Safety input current		$I_{SI}$	-	-	275	mA

**Note**

- According to DIN EN 60747-5-2 (see fig. 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.

<b>INSULATION RATED PARAMETERS</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Partial discharge test voltage - routine test	100 %, $t_{test} = 1\text{ s}$	$V_{pd}$	1.67	-	-	$\text{kV}_{peak}$
Partial discharge test voltage - lot test (sample test)	$t_{Tr} = 60\text{ s}$ , $t_{test} = 10\text{ s}$ , (see fig. 2)	$V_{IOTM}$	10	-	-	$\text{kV}_{peak}$
		$V_{pd}$	1.42	-	-	$\text{kV}_{peak}$
Insulation resistance	$V_{IO} = 500\text{ V}$	$R_{IO}$	$10^{12}$	-	-	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 110\text{ }^{\circ}\text{C}$	$R_{IO}$	$10^{11}$	-	-	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 175\text{ }^{\circ}\text{C}$ (construction test only)	$R_{IO}$	$10^9$	-	-	$\Omega$

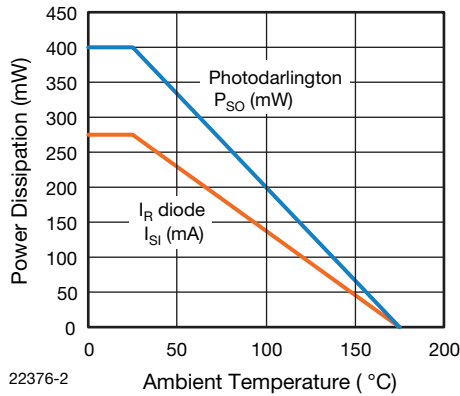


Fig. 2 - Safety Power Rating  
 $I_{si}$  in mA and  $P_{so}$  in mW

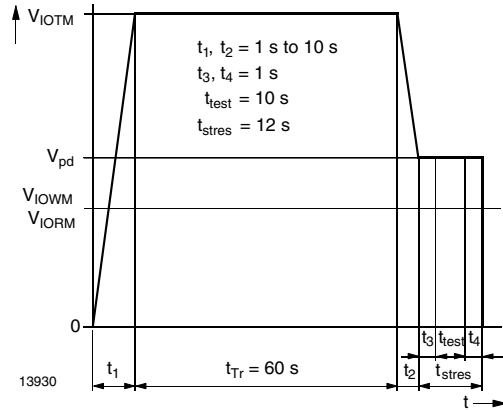


Fig. 3 - Test Pulse Diagram for Sample Test according to  
DIN EN 60747-5-2; IEC60747-5-5

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

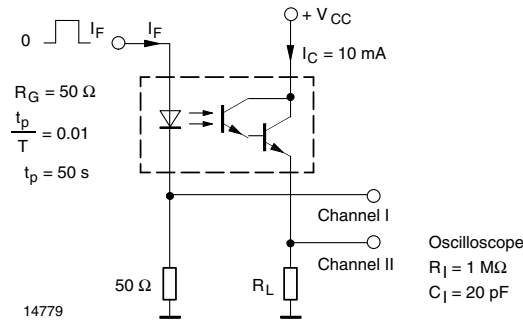


Fig. 4 - Test Circuit, Non-Saturated Operation

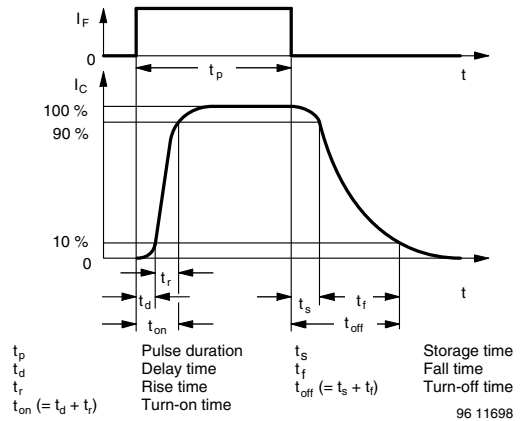


Fig. 5 - Switching Times



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

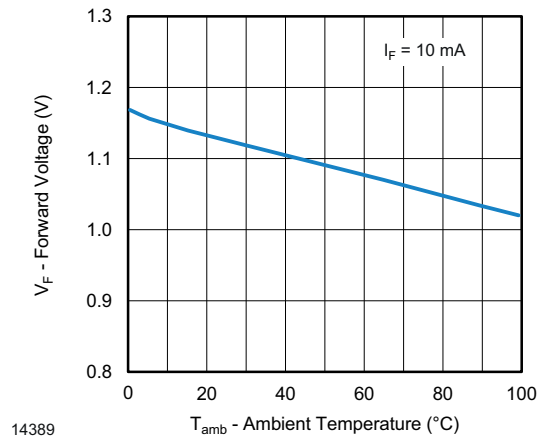


Fig. 6 - Forward Voltage vs. Ambient Temperature

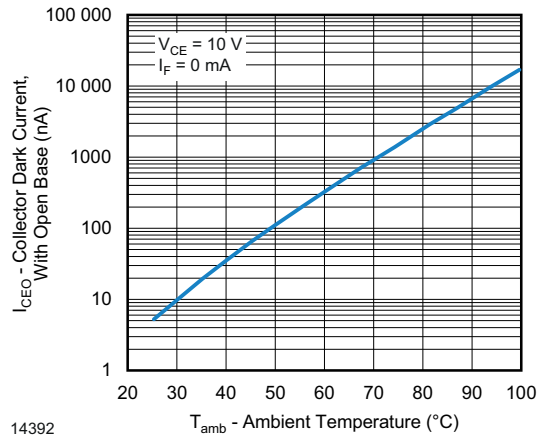


Fig. 9 - Collector Dark Current vs. Ambient Temperature

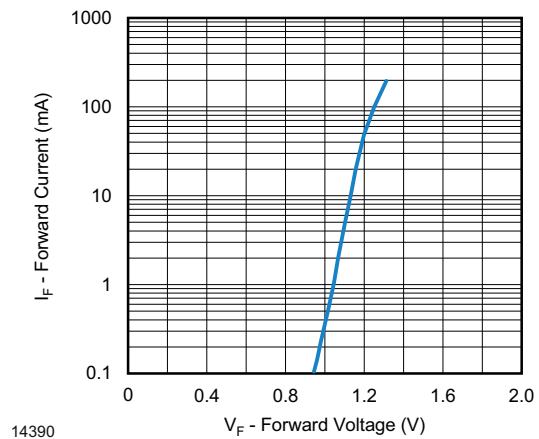


Fig. 7 - Forward Current vs. Forward Voltage

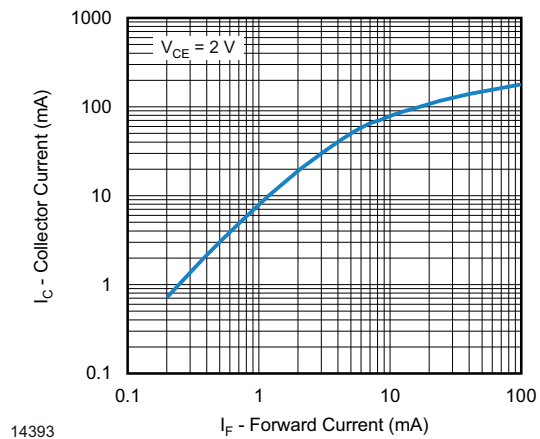


Fig. 10 - Collector Current vs. Forward Current

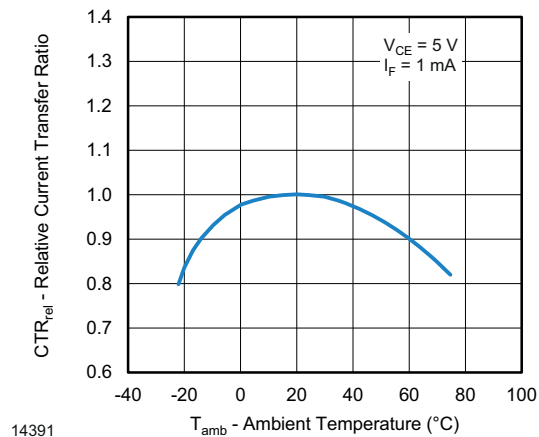


Fig. 8 - Relative Current Transfer Ratio vs. Ambient Temperature

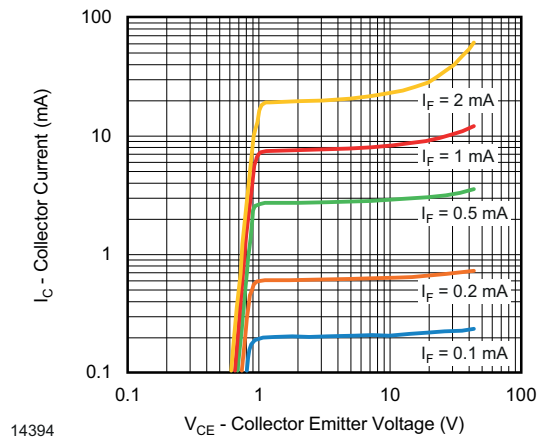
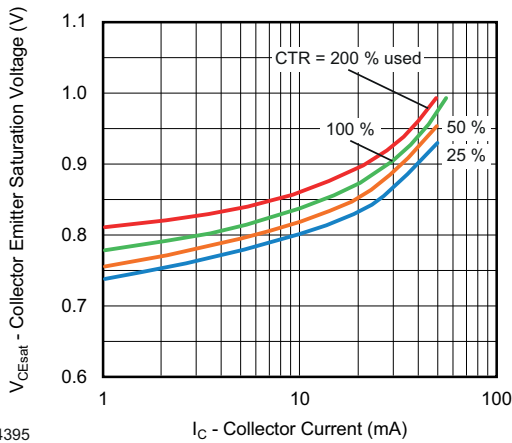
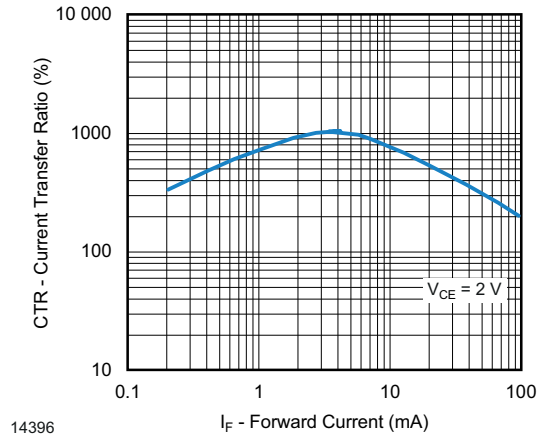


Fig. 11 - Collector Current vs. Collector Emitter Voltage



14395

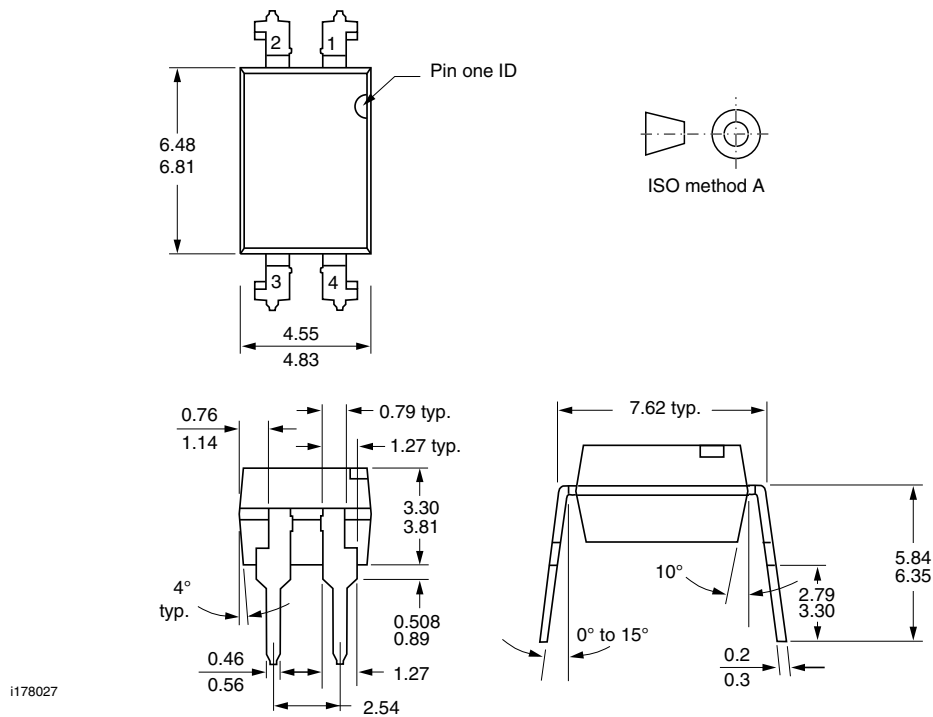
Fig. 12 - Collector Emitter Saturation Voltage vs. Collector Current



14396

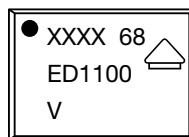
Fig. 13 - Current Transfer Ratio vs. Forward Current

**PACKAGE DIMENSIONS** in millimeters



i178027

**PACKAGE MARKING** (example)



**Note**

- XXXX = LMC (lot marking code)



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.