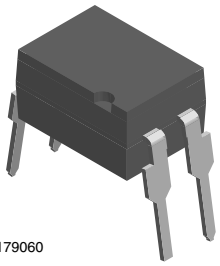
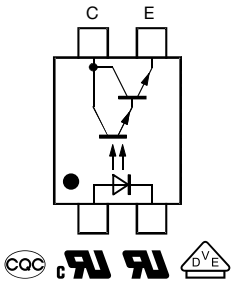
Optocoupler, Photodarlington Output, High Gain





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 ≥ 0.4 mm
- Creepage current resistance according to VDE 0303/ IEC60112 comparative tracking index: CTI ≥ 175
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

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 ≤ 400 V_{RMS})
- **VDE 0804**
  Telecommunication apparatus and data processing
- **IEC60065**
  Safety for mains-operated electronic and related household apparatus

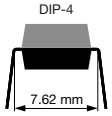
AGENCY APPROVALS

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

ORDERING INFORMATION

T	C	E	D	1	1	0	0	#

PART NUMBER



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

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
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
Power dissipation		P_{diss}	70	mW
Junction temperature		T_j	125	°C
OUTPUT				
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}	70	mW
Junction temperature		T_j	125	°C
COUPLER				
Isolation test voltage (RMS)	t = 1 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	°C
Storage temperature range		T_{stg}	-55 to +150	°C
Soldering temperature (1)	2 mm from case, t ≤ 10 s	T_{sld}	260	°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.

(1) Refer to wave profile for soldering conditions for through hole devices

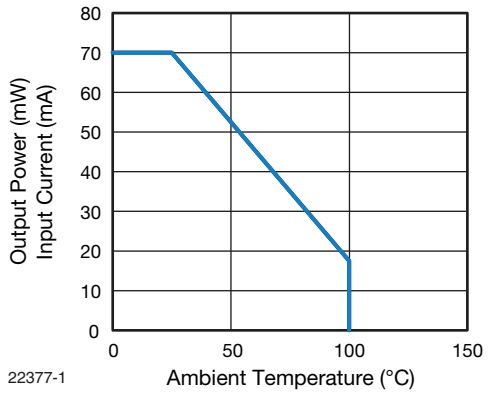


Fig. 1 - Abs. max. Power Dissipation (mW)
Abs. max. Input Current (mA)

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
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
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} = 10 V, I_F = 0, E = 0	I_{CEO}	-	15	100	nA
COUPLER						
Collector emitter saturation voltage	I_F = 10 mA, I_C =5 mA	V_{CEsat}	-	-	1	V
Cut-off frequency	V_{CE} = 5 V, I_F = 10 mA, R_L = 100 Ω	f_c	-	10	-	kHz
Coupling capacitance	f = 1 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.

CURRENT TRANSFER RATIO						
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**
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	°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.

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

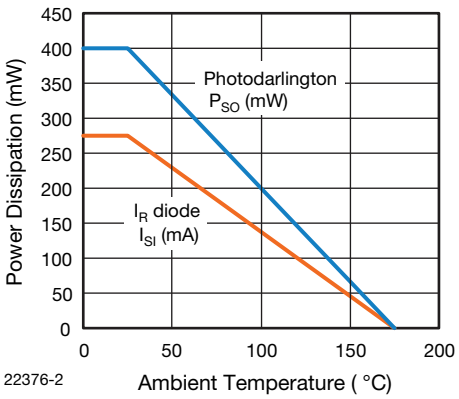


Fig. 2 - Safety Power Rating
I_{si} in mA and P_{so} in mW

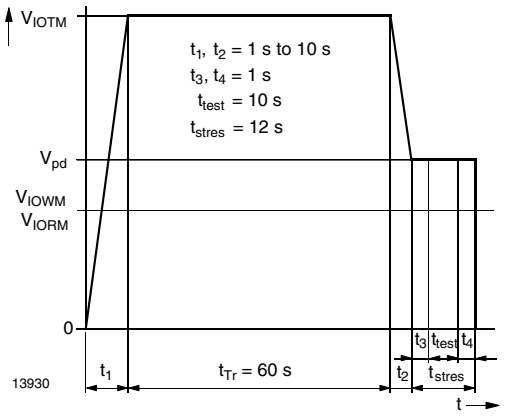


Fig. 3 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2; IEC60747-5-5

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

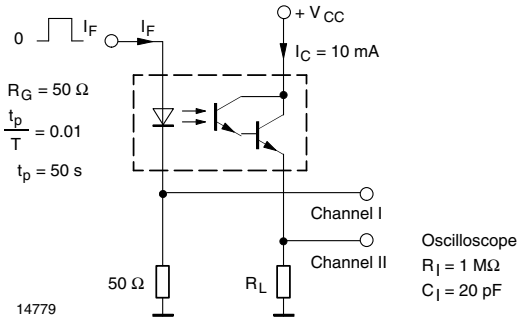


Fig. 4 - Test Circuit, Non-Saturated Operation

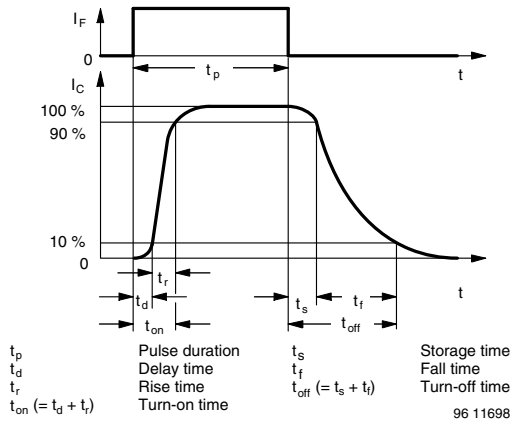


Fig. 5 - Switching Times

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

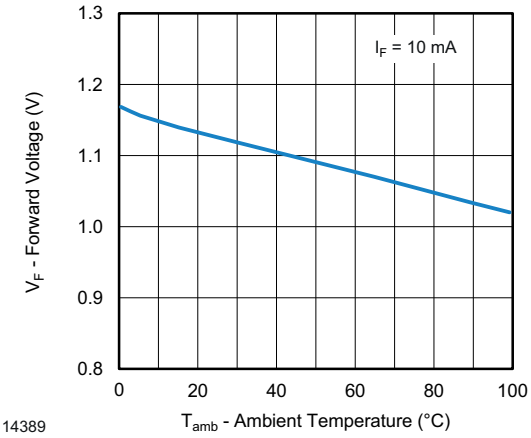


Fig. 6 - Forward Voltage vs. Ambient Temperature

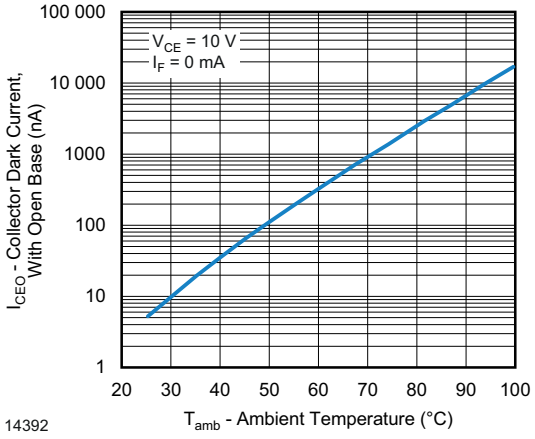


Fig. 9 - Collector Dark Current vs. Ambient Temperature

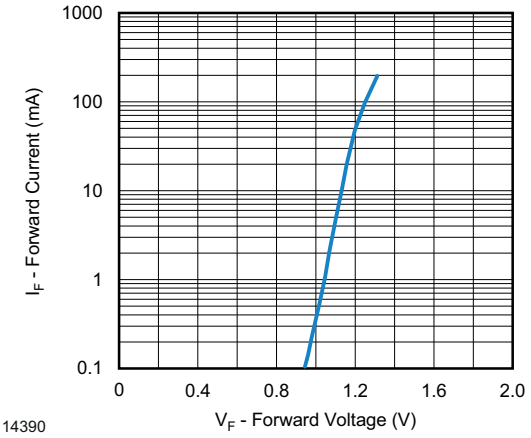


Fig. 7 - Forward Current vs. Forward Voltage

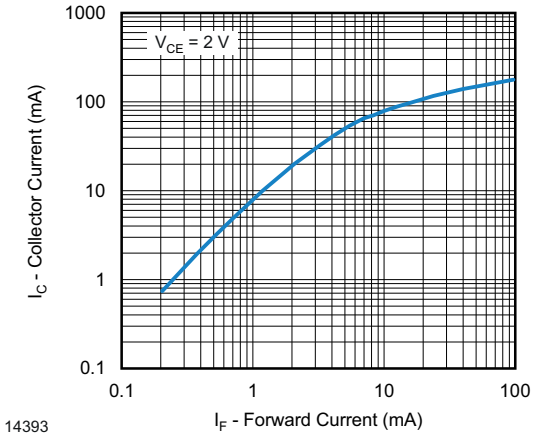


Fig. 10 - Collector Current vs. Forward Current

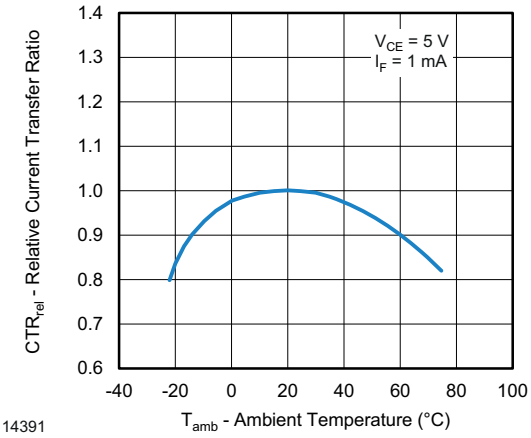


Fig. 8 - Relative Current Transfer Ratio vs. Ambient Temperature

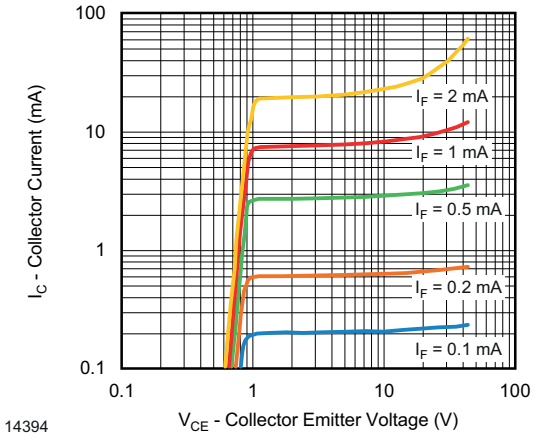


Fig. 11 - Collector Current vs. Collector Emitter Voltage

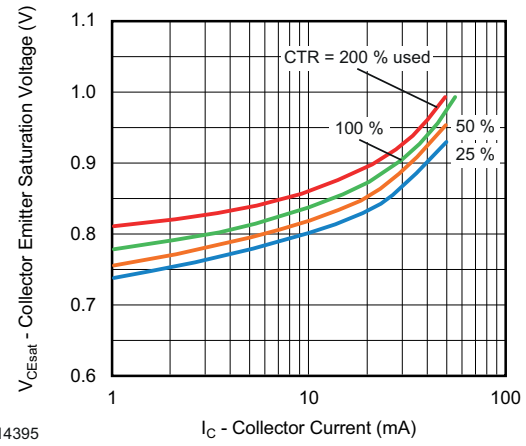


Fig. 12 - Collector Emitter Saturation Voltage vs. Collector Current

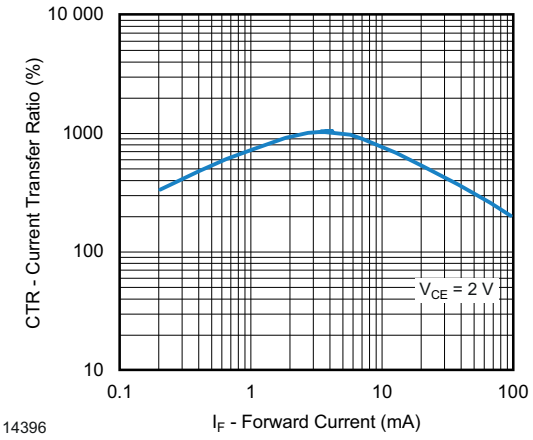
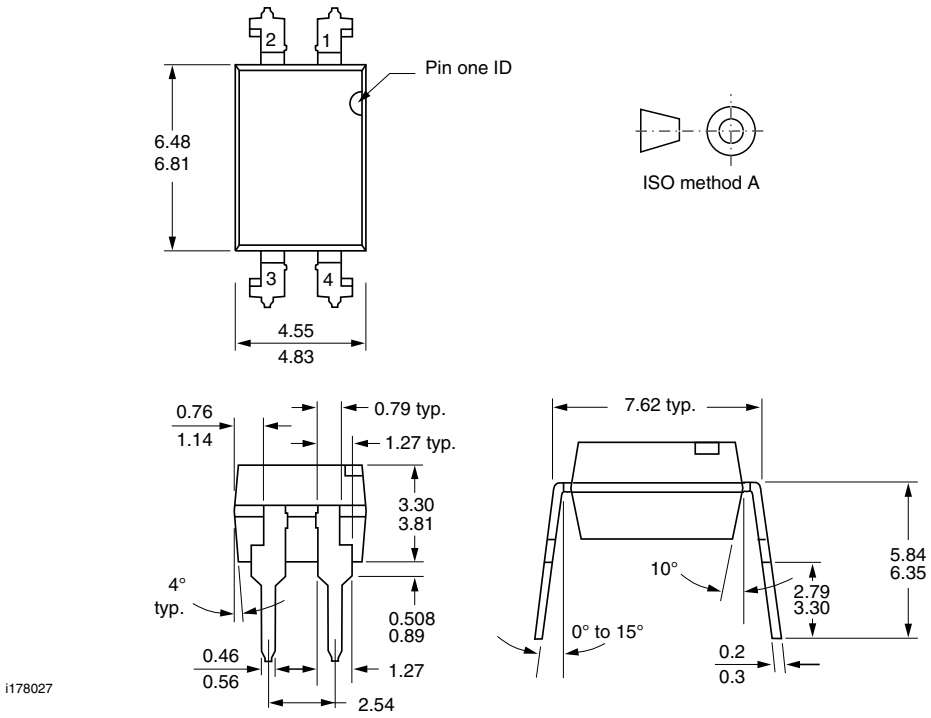
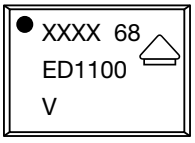


Fig. 13 - Current Transfer Ratio vs. Forward Current

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING (example)



Note

- XXXX = LMC (lot marking code)

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