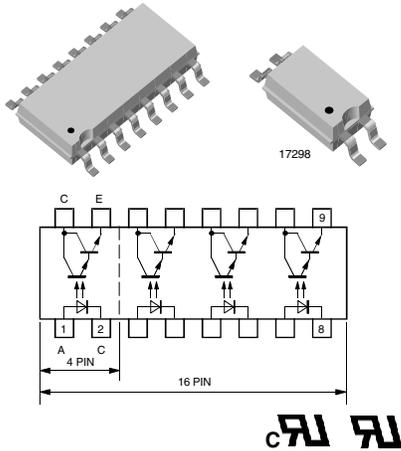


## Optocoupler, Photodarlington Output, High Gain, Single/Quad Channel, Half Pitch Mini-Flat Package



### DESCRIPTION

The TCMD1000/TCMD4000 consist of a photodarlington optically coupled to a gallium arsenide infrared-emitting diodes in either a 4 pin or 16 pin miniflat package. The elements provide a fixed distance between input and output for highest safety requirements.

### FEATURES

- Low profile package (half pitch)
- AC isolation test voltage 3750 V<sub>RMS</sub>
- Low coupling capacitance of typical 0.3 pF
- Low temperature coefficient of CTR
- Wide ambient temperature range
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



**RoHS**  
COMPLIANT

### APPLICATIONS

- Programmable logic
- Modems
- Answering machines
- General applications

### AGENCY APPROVALS

- UL1577, file no. E76222 system code M, double protection
- CSA 22.2 bulletin 5A, double protection
- VDE DIN EN 60747-5-2 (VDE 0884)

### ORDER INFORMATION

PART	REMARKS
TCMD1000	CTR > 600 %, SOP-4
TCMD4000	CTR > 600 %, SOP-16

### ABSOLUTE MAXIMUM RATINGS (1)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		V <sub>R</sub>	6	V
Forward current		I <sub>F</sub>	60	mA
Forward surge current	t <sub>p</sub> ≤ 10 μs	I <sub>FSM</sub>	1.5	A
Power dissipation		P <sub>diss</sub>	100	mW
Junction temperature		T <sub>j</sub>	125	°C
<b>OUTPUT</b>				
Collector emitter voltage		V <sub>CEO</sub>	35	V
Emitter collector voltage		V <sub>ECO</sub>	7	V
Collector current		I <sub>C</sub>	80	mA
Collector peak current	t <sub>p</sub> /T = 0.5, t <sub>p</sub> ≤ 10 ms	I <sub>CM</sub>	100	mA
Power dissipation		P <sub>diss</sub>	150	mW
Junction temperature		T <sub>j</sub>	125	°C

ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>COUPLER</b>				
AC isolation test voltage (RMS)		$V_{ISO}^{(2)}$	3750	$V_{RMS}$
Total power dissipation		$P_{tot}$	250	mW
Operating ambient temperature range		$T_{amb}$	- 40 to + 100	°C
Storage temperature range		$T_{stg}$	- 40 to + 100	°C
Soldering temperature <sup>(3)</sup>		$T_{slid}$	260	°C

### Notes

<sup>(1)</sup>  $T_{amb} = 25\text{ °C}$ , 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.

<sup>(2)</sup> Related to standard climate 23/50 DIN 50014.

<sup>(3)</sup> Refer to reflow profile for soldering conditions for surface mounted devices.

ELECTRICAL CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	$I_F = 50\text{ mA}$	$V_F$		1.25	1.6	V
Junction capacitance	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$	$C_j$		50		pF
<b>OUTPUT</b>						
Collector emitter voltage	$I_C = 100\text{ }\mu\text{A}$	$V_{CEO}$	35			V
Emitter collector voltage	$I_E = 100\text{ }\mu\text{A}$	$V_{ECO}$	7			V
Collector dark current	$V_{CE} = 10\text{ V}$ , $I_F = 0$ , $E = 0$	$I_{CEO}$			100	nA
<b>COUPLER</b>						
Collector emitter saturation voltage	$I_F = 20\text{ mA}$ , $I_C = 5\text{ mA}$	$V_{CEsat}$			1.0	V
Cut-off frequency	$I_F = 10\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $R_L = 100\text{ }\Omega$	$f_c$		10		kHz
Coupling capacitance	$f = 1\text{ MHz}$	$C_k$		0.3		pF

### Note

$T_{amb} = 25\text{ °C}$ , 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
$I_C/I_F$	$V_{CE} = 2\text{ V}$ , $I_F = 1\text{ mA}$	TCMD1000	CTR	600	800		%
		TCMD4000	CTR	600	800		%

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Rise time	$V_{CE} = 2\text{ V}$ , $I_C = 10\text{ mA}$ , $R_L = 100\text{ }\Omega$ (see figure 1)	$t_r$		300		$\mu\text{s}$
Turn-off time	$V_{CE} = 2\text{ V}$ , $I_C = 10\text{ mA}$ , $R_L = 100\text{ }\Omega$ (see figure 1)	$t_{off}$		250		$\mu\text{s}$

## Optocoupler, Photodarlington Output, Vishay Semiconductors High Gain, Single/Quad Channel, Half Pitch Mini-Flat Package

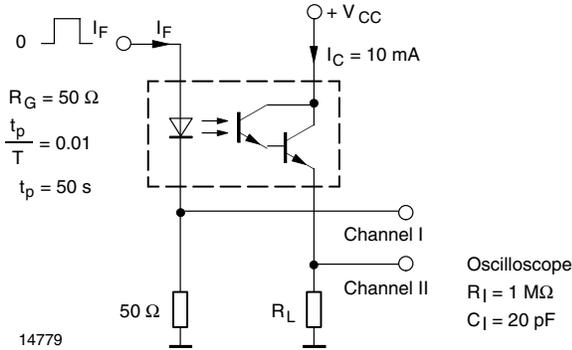


Fig. 1 - Test Circuit, Non-Saturated Operation

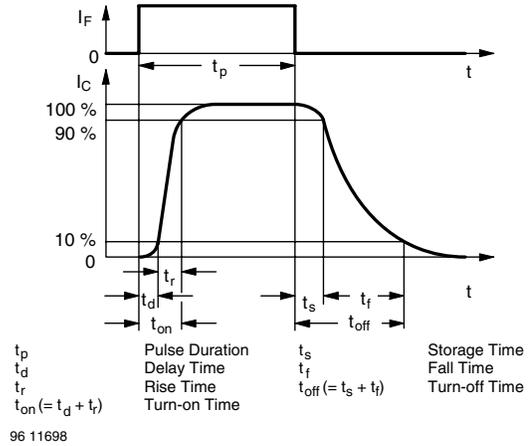


Fig. 2 - Switching Times

### TYPICAL CHARACTERISTICS

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

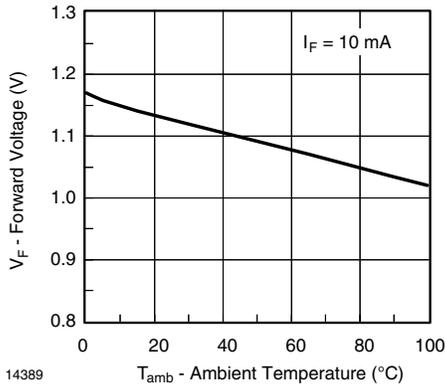


Fig. 3 - Forward Voltage vs. Ambient Temperature

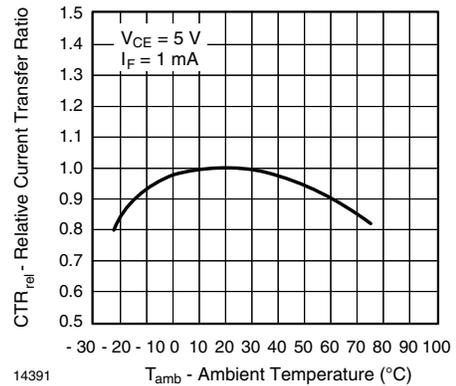


Fig. 5 - Relative Current Transfer Ratio vs. Ambient Temperature

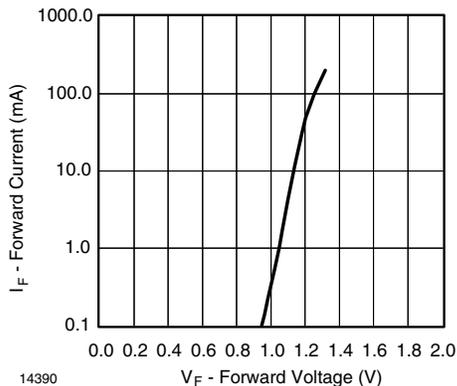


Fig. 4 - Forward Current vs. Forward Voltage

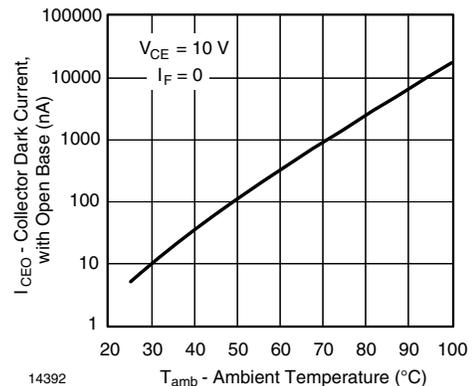


Fig. 6 - Collector Dark Current vs. Ambient Temperature

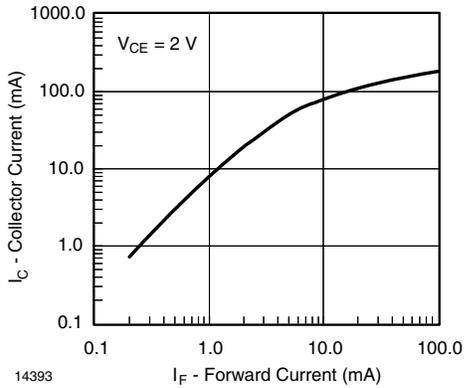


Fig. 7 - Collector Current vs. Forward Current

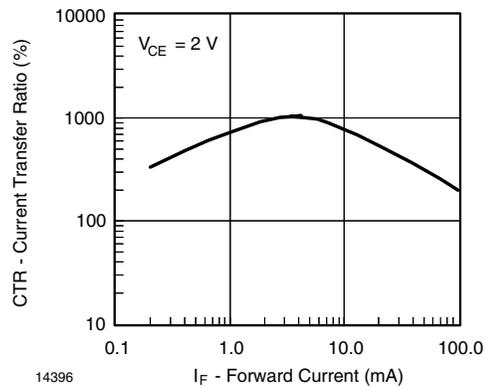


Fig. 10 - Current Transfer Ratio vs. Forward Current

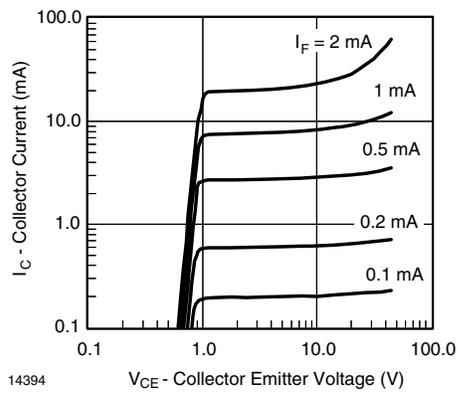


Fig. 8 - Collector Current vs. Collector Emitter Voltage

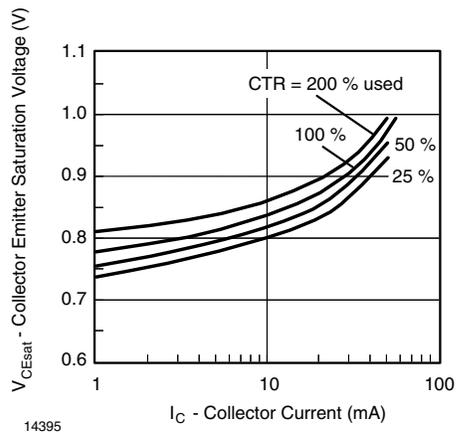


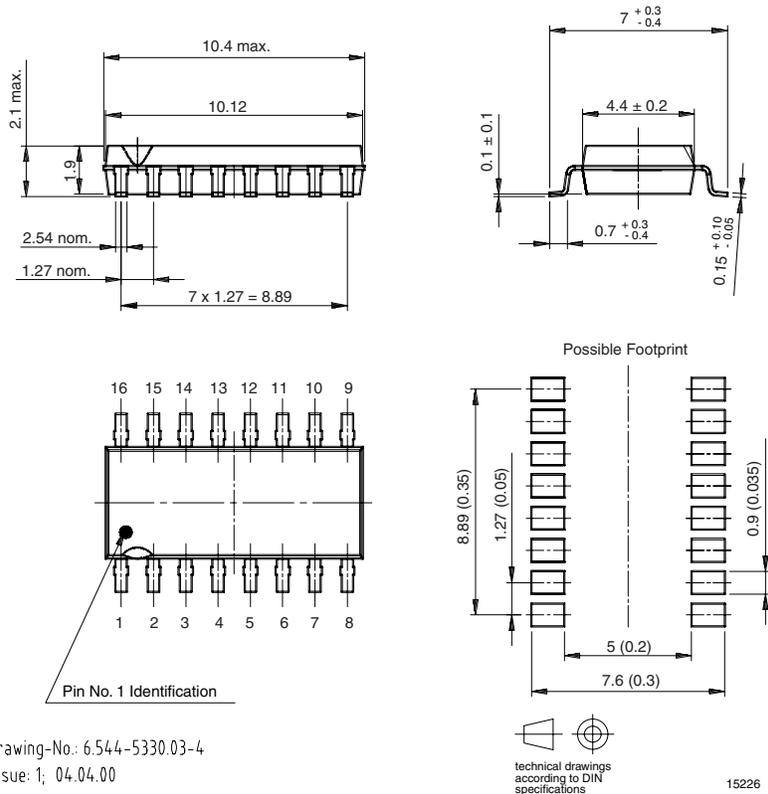
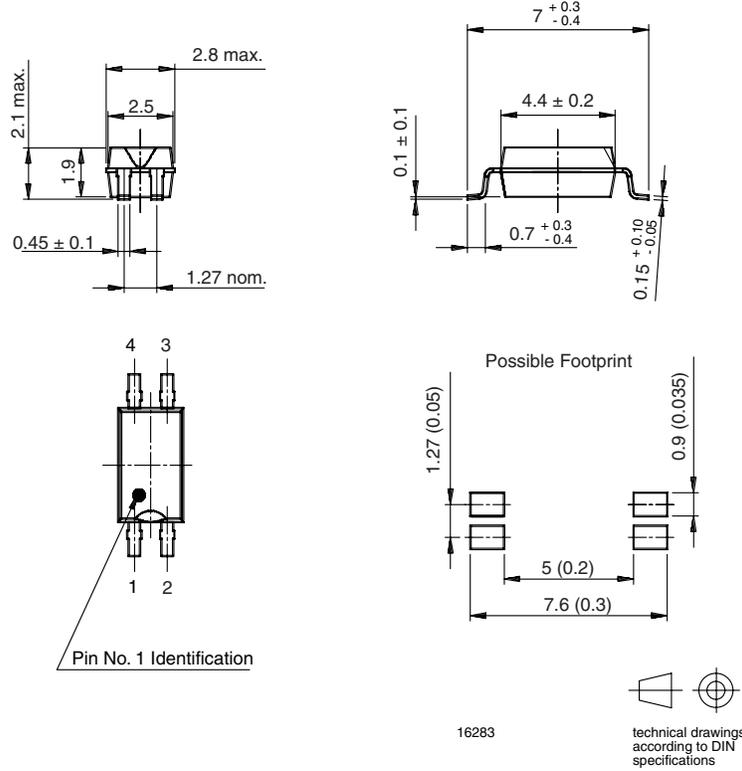
Fig. 9 - Collector Emitter Saturation Voltage vs. Collector Current



# TCMD1000/TCMD4000

Optocoupler, Photodarlington Output, Vishay Semiconductors  
High Gain, Single/Quad Channel, Half  
Pitch Mini-Flat Package

## PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5330.03-4  
Issue: 1; 04.04.00



Vishay Semiconductors Optocoupler, Photodarlington Output,  
High Gain, Single/Quad Channel, Half  
Pitch Mini-Flat Package

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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.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

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