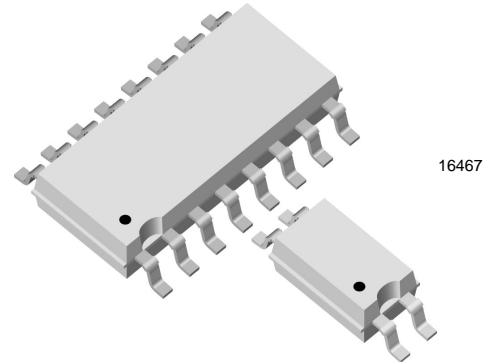


# Optocoupler with Photodarlington Output

## Description

The TCMD10.. Series consist of a photodarlington optically coupled to a gallium arsenide infrared-emitting diodes in an 4- lead up to 16- lead plastic Miniflat package. The elements are mounted on one leadframe using a **coplanar technique**, providing a fixed distance between input and output for highest safety requirements.

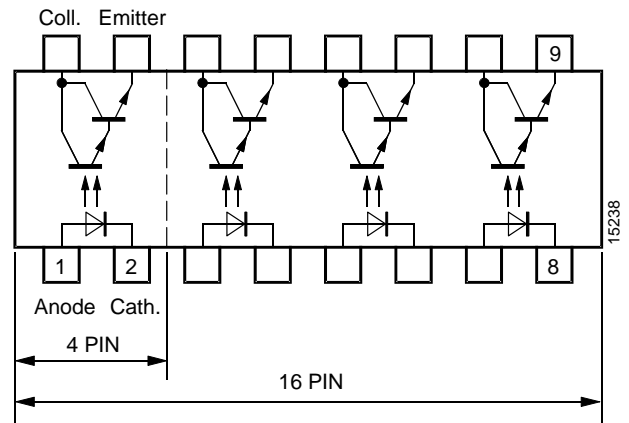


## Applications

Programmable logic controllers, modems, answering machines, general applications

## Features

- Low profile package (half pitch)
- AC Isolation test voltage  $V_{io} = 3.75 \text{ kV}_{RMS}$
- Low coupling capacitance of typical 0.3 pF
- Low temperature coefficient of CTR
- Wide ambient temperature range
- Underwriters Laboratory (UL) 1577 recognized, file number E-76222
- CSA (C-UL) 1577 recognized file number E- 76222 - Double Protection
- Coupling System M



## Order Instruction

Ordering Code	CTR Ranking	Remarks
TCMD1000	>600%	4 Pin = Single channel
TCMD4000	>600%	16 Pin = Quad channel

### Absolute Maximum Ratings

#### Input (Emitter)

Parameter	Test Conditions	Symbol	Value	Unit
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	$T_{amb} \leq 25^\circ C$	$P_V$	100	mW
Junction temperature		$T_j$	125	$^\circ C$

#### Output (Detector)

Parameter	Test Conditions	Symbol	Value	Unit
Collector emitter voltage		$V_{CEO}$	35	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	80	mA
Peak collector current	$t_p/T = 0.5, t_p \leq 10 ms$	$I_{CM}$	100	mA
Power dissipation	$T_{amb} \leq 25^\circ C$	$P_V$	150	mW
Junction temperature		$T_j$	125	$^\circ C$

#### Coupler

Parameter	Test Conditions	Symbol	Value	Unit
AC isolation test voltage (RMS)		$V_{IO}^{1)}$	3.75	kV
Total power dissipation	$T_{amb} \leq 25^\circ C$	$P_{tot}$	250	mW
Operating ambient temperature range		$T_{amb}$	-40 to +100	$^\circ C$
Storage temperature range		$T_{stg}$	-40 to +100	$^\circ C$
Soldering temperature		$T_{sd}$	235	$^\circ C$

<sup>1)</sup> Related to standard climate 23/50 DIN 50014



**Electrical Characteristics** ( $T_{amb} = 25^{\circ}\text{C}$ )

Input (Emitter)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
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

Output (Detector)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
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

Coupler

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector emitter saturation voltage	$I_F = 10\text{ mA}, I_C = 1\text{ mA}$	$V_{CEsat}$			0.3	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

Current Transfer Ratio (CTR)

Parameter	Test Conditions	Type	Symbol	Min.	Typ.	Max.	Unit
$I_C/I_F$	$V_{CE} = 2\text{ V}, I_F = 1\text{ mA}$	TCMD1000	CTR	6.0	8.0		
	$V_{CE} = 2\text{ V}, I_F = 1\text{ mA}$	TCMD4000	CTR	6.0	8.0		

### Switching Characteristics

Parameter	Test Conditions	Symbol	Typ.	Unit
Rise time	$V_{CE} = 2\text{ V}$ , $I_C = 10\text{ mA}$ , $R_L = 100\ \Omega$ (see figure 1)	$t_r$	300	$\mu\text{s}$
Turn-off time		$t_{off}$	250	$\mu\text{s}$

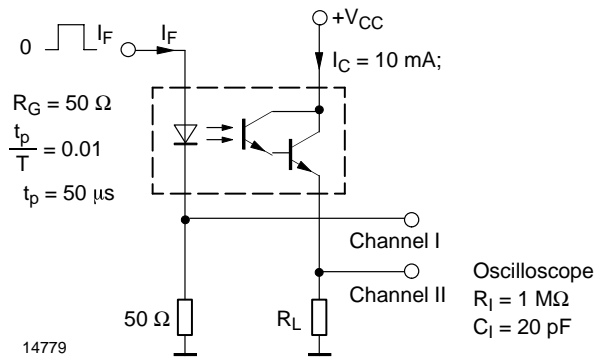


Figure 1. Test circuit, non-saturated operation

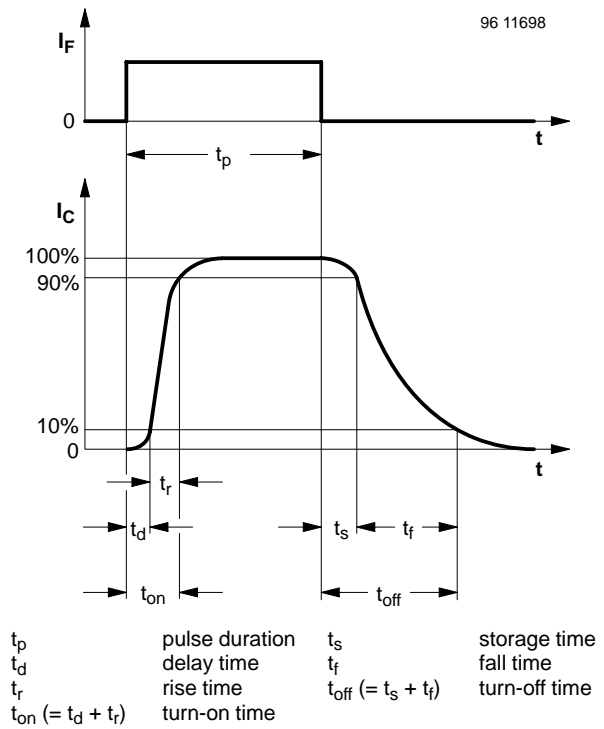


Figure 2. Switching times

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

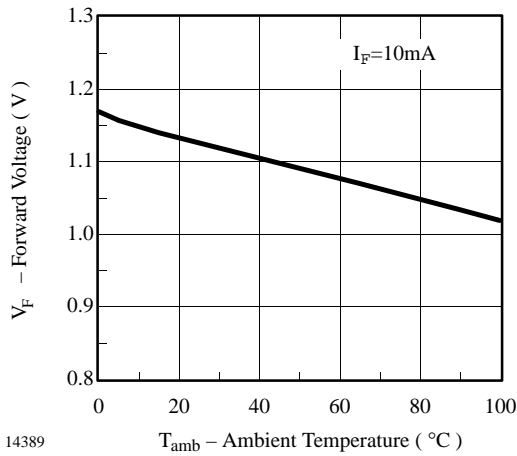


Figure 3. Forward Voltage vs. Ambient Temperature

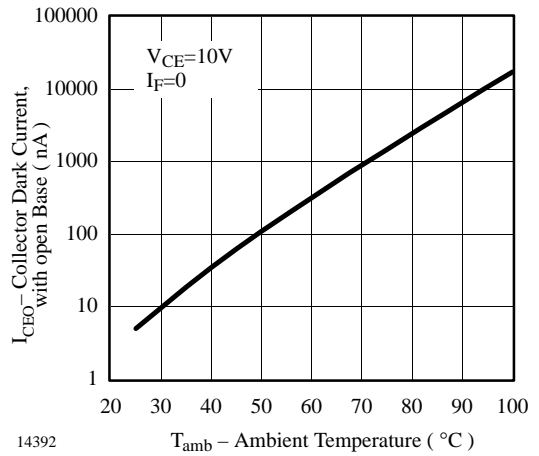


Figure 6. Collector Dark Current vs. Ambient Temperature

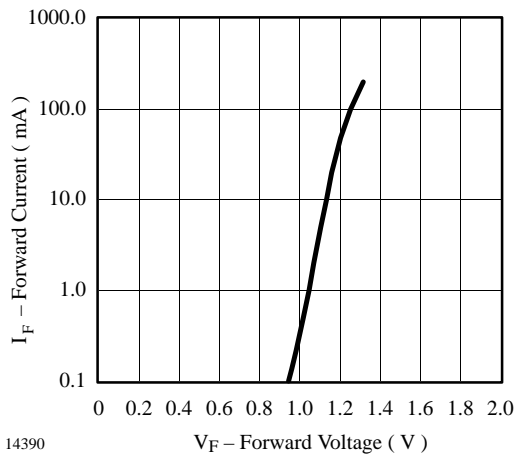


Figure 4. Forward Current vs. Forward Voltage

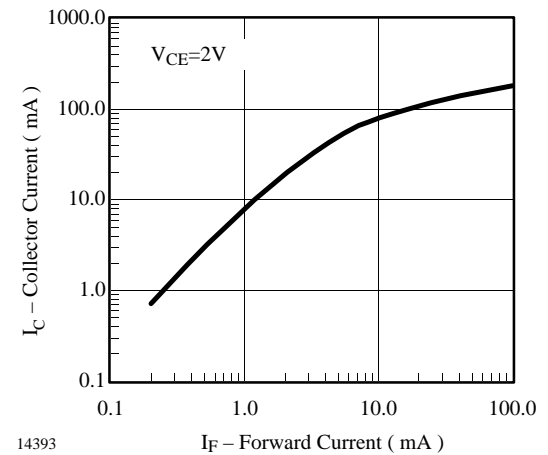


Figure 7. Collector Current vs. Forward Current

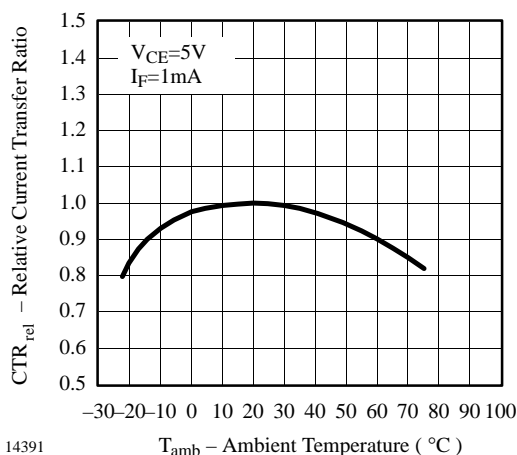


Figure 5. Relative Current Transfer Ratio vs. Ambient Temperature

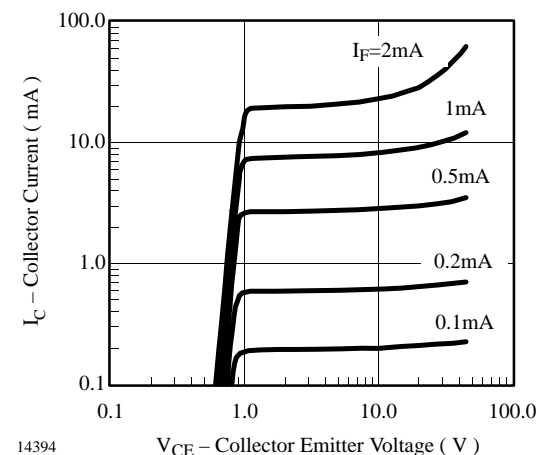


Figure 8. Collector Current vs. Collector Emitter Voltage

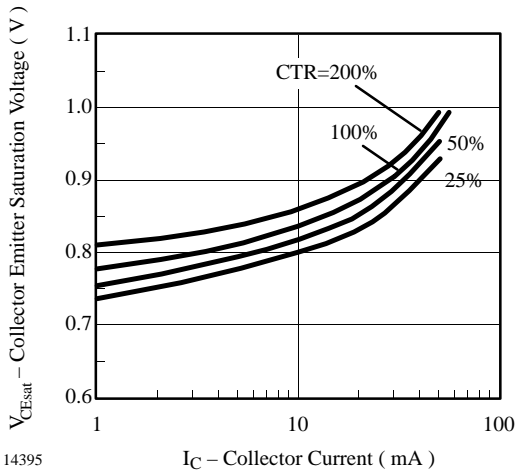


Figure 9. Collector Emitter Saturation Voltage vs. Collector Current

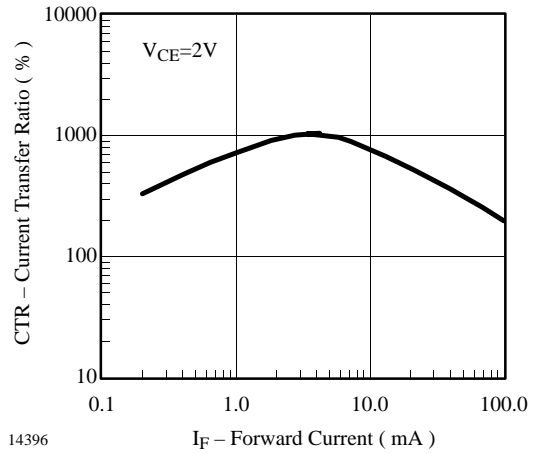


Figure 10. Current Transfer Ratio vs. Forward Current

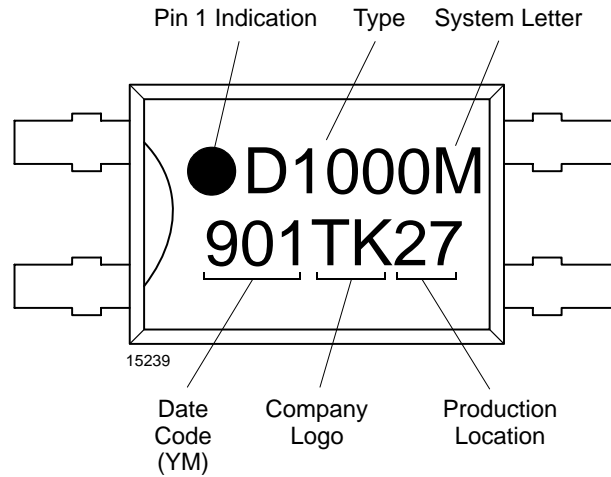
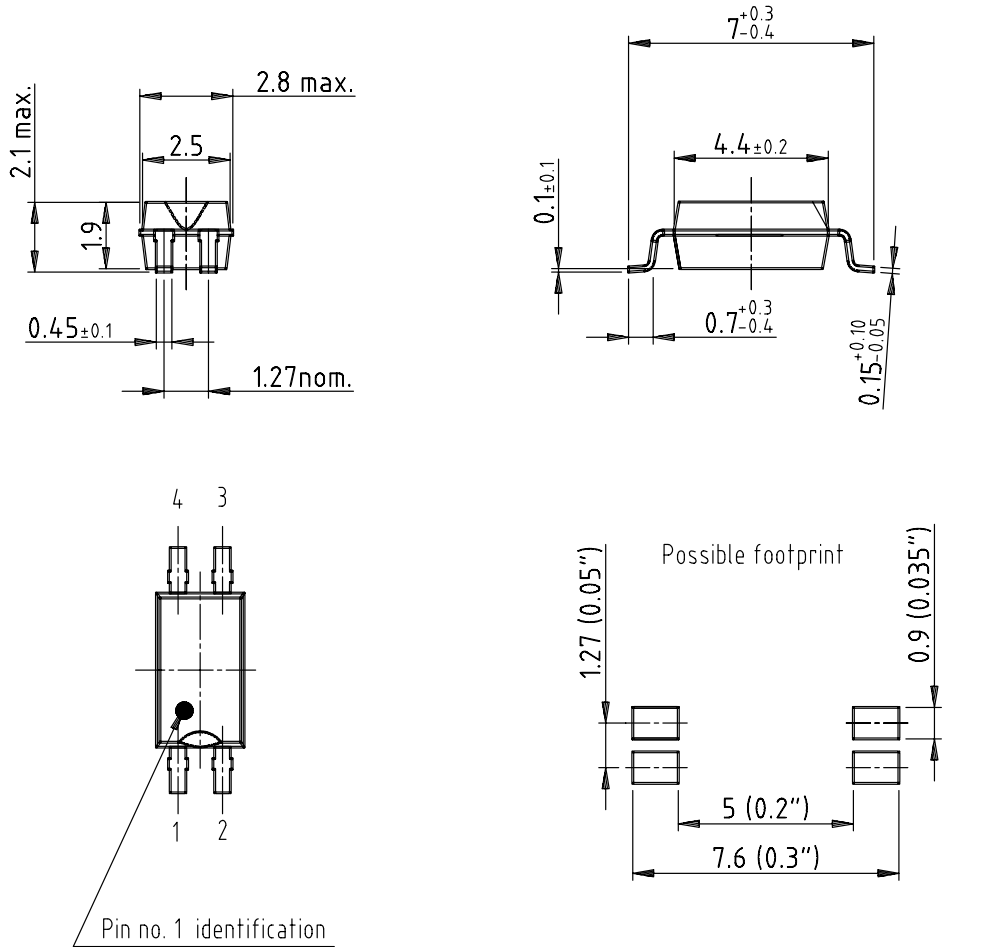


Figure 11. Marking example

## Dimensions of TCMD1... in mm



16283

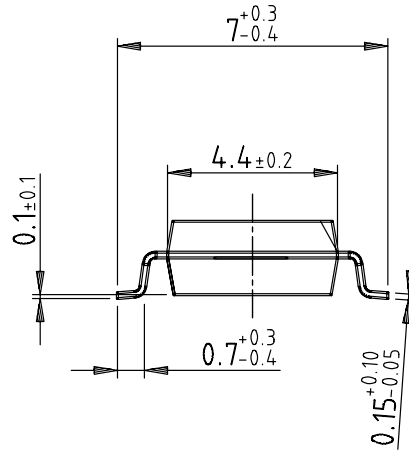
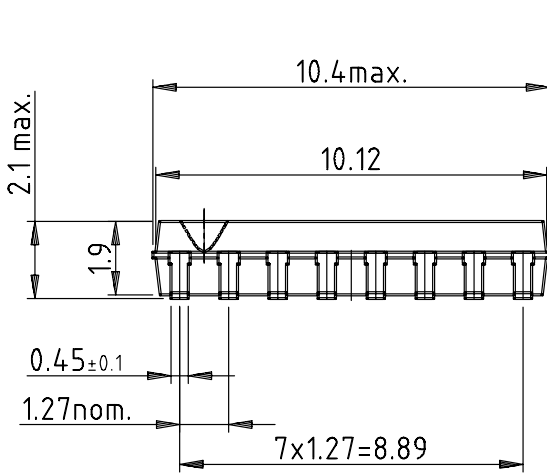
technical drawings  
according to DIN  
specifications

# TCMD10.. Series

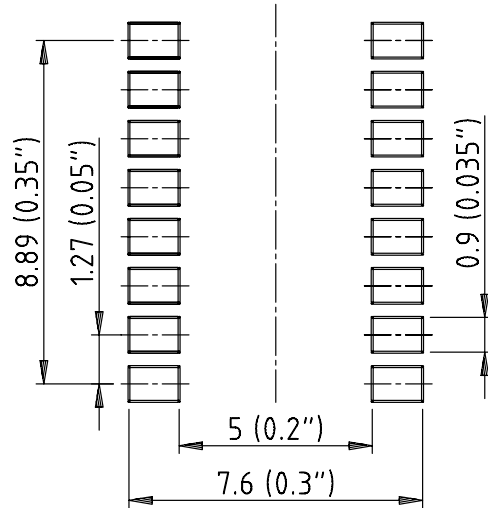
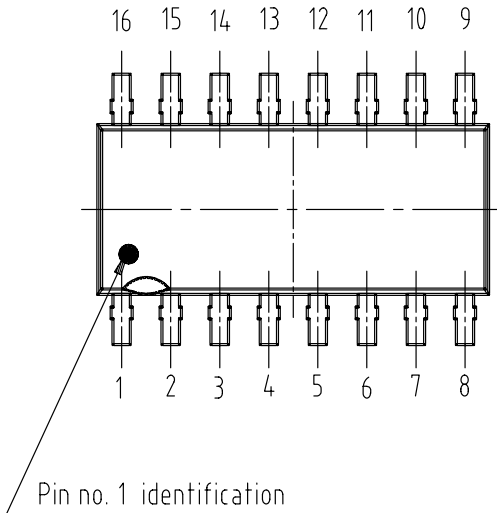
Vishay Semiconductors



## Dimensions of TCMD4... in mm

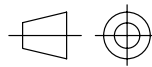


Possible footprint



Drawing-No.: 6.544-5330.03-4

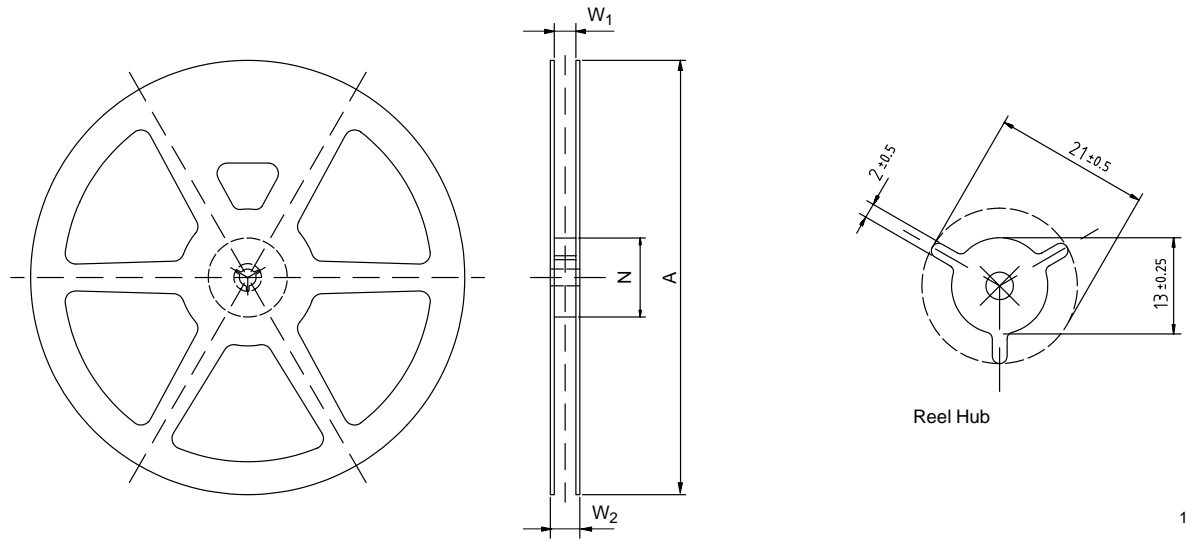
Issue: 1; 04.04.00



technical drawings  
according to DIN  
specifications

15226

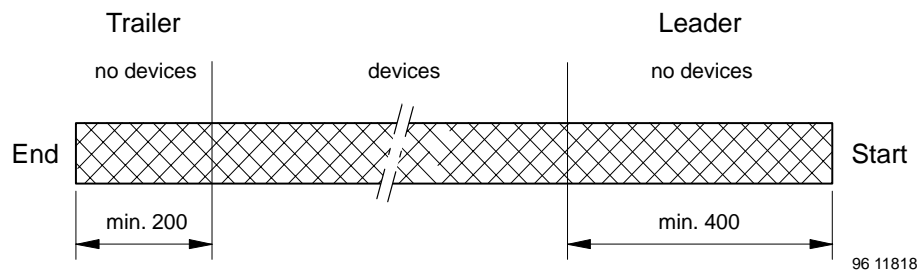
**Dimensions of Reel in mm**



16515

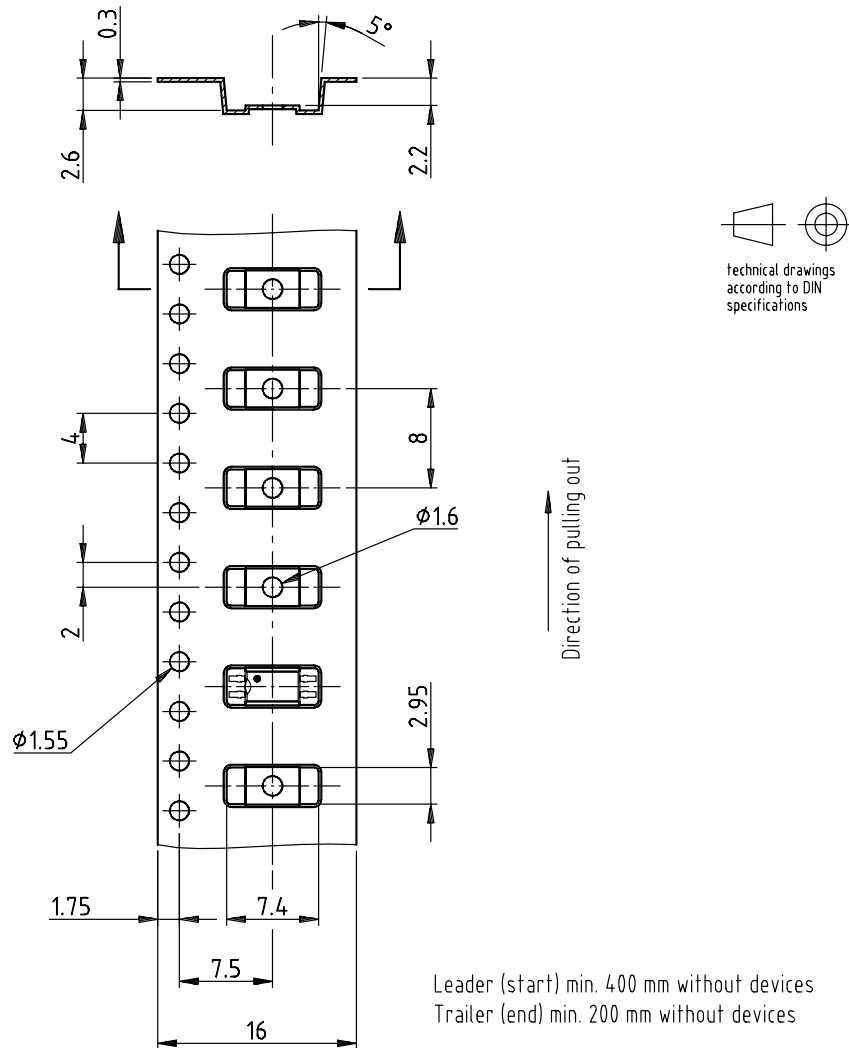
Version	Tape Width	A	N	$W_1$	$W_{2 \text{ max}}$
G	16	$330 \pm 1$	$100 \pm 1.5$	$16.4 + 2$	22.4

**Dimensions of Leader and Trailer in mm**



96 11818

### Dimensions of Tape in mm



Drawing-No.: 9.700-5253.01-4

Issue: 1; 22.11.00

16511





### Ozone Depleting Substances Policy Statement

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.**

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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