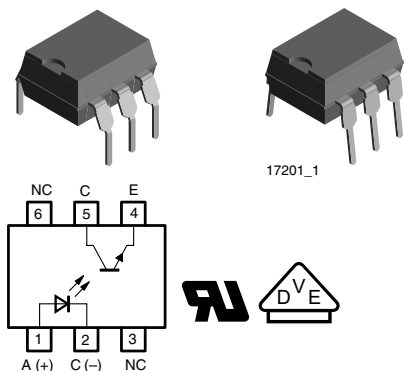


## Optocoupler, Phototransistor Output



### DESCRIPTION

The TCDT1100/TCDT1100G series consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 6-pin plastic dual in line package. The base of the phototransistor is not connected providing noise immunity.

The elements are mounted on one leadframe which providing a fixed distance between input and output for highest safety requirements.

### VDE STANDARDS

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

- **DIN EN 60747-5-5 pending**  
Optocoupler for electrical safety requirements
- **IEC 60950/EN 60950**  
Office machines (applied for reinforced isolation for mains voltage  $\leq 400 V_{RMS}$ )
- **VDE 0804**  
Telecommunication apparatus and data processing
- **IEC 60065**  
Safety for mains-operated electronic and related household apparatus

### FEATURES

- Isolation test voltage 5300  $V_{RMS}$
- Extra low coupling capacity - typical 0.2 pF
- High common mode rejection
- No base terminal connection for improved noise immunity
- CTR offered in 4 groups
- Thickness through insulation  $\geq 0.75$  mm
- Creepage current resistance according to VDE 0303/ IEC 60112 comparative tracking index: CTI  $\geq 275$
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



**RoHS**  
COMPLIANT

### 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  $\leq 300$  V  
- for appl. class I - III at mains voltage  $\leq 600$  V according to DIN EN 60747-5-5.

### AGENCY APPROVALS

- UL1577, file no. E76222 system code A, double protection
- BSI IEC 60950; IEC 60065
- DIN EN 60747-5-5
- FIMKO

ORDER INFORMATION	
PART	REMARKS
TCDT1100	CTR > 40 %, DIP-6
TCDT1101	CTR 40 to 80 %, DIP-6
TCDT1102	CTR 63 to 125 %, DIP-6
TCDT1103	CTR 100 to 200 %, DIP-6
TCDT1100G	CTR > 40 %, DIP-6
TCDT1101G	CTR 40 to 80 %, DIP-6
TCDT1102G	CTR 63 to 125 %, DIP-6
TCDT1103G	CTR 100 to 200 %, DIP-6

### Note

G = leadform 10.16 mm; G is not marked on the body.



<b>ABSOLUTE MAXIMUM RATINGS (1)</b>				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		$V_R$	5	V
Forward current		$I_F$	60	mA
Forward surge current	$t_p \leq 10 \mu s$	$I_{FSM}$	3	A
Power dissipation		$P_{diss}$	100	mW
Junction temperature		$T_j$	125	°C
<b>OUTPUT</b>				
Collector emitter voltage		$V_{CEO}$	32	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	50	mA
Collector peak current	$t_p/T = 0.5, t_p \leq 10 ms$	$I_{CM}$	100	mA
Power dissipation		$P_{diss}$	150	mW
Junction temperature		$T_j$	125	°C
<b>COUPLER</b>				
Isolation test voltage (RMS)		$V_{ISO}$	5300	$V_{RMS}$
Total power dissipation		$P_{tot}$	250	mW
Ambient temperature range		$T_{amb}$	- 55 to + 100	°C
Storage temperature range		$T_{stg}$	- 55 to + 125	°C
Soldering temperature (2)	2 mm from case, $t \leq 10 s$	$T_{sld}$	260	°C

**Notes**(1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , 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.

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

<b>ELECTRICAL CHARACTERISTICS</b>						
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	$V_R = 0, f = 1 \text{ MHz}$	$C_j$		50		pF
<b>OUTPUT</b>						
Collector emitter voltage	$I_C = 1 \text{ mA}$	$V_{CEO}$	32			V
Emitter collector voltage	$I_E = 100 \mu\text{A}$	$V_{ECO}$	7			V
Collector emitter cut-off current	$V_{CE} = 20 \text{ V}, I_F = 0, E = 0$	$I_{CEO}$		200		nA
<b>COUPLER</b>						
Collector emitter saturation voltage	$I_F = 10 \text{ mA}, I_C = 1 \text{ mA}$	$V_{CEsat}$			0.3	V
Cut-off frequency	$V_{CE} = 5 \text{ V}, I_F = 10 \text{ mA}, R_L = 100 \Omega$	$f_c$		110		kHz
Coupling capacitance	$f = 1 \text{ MHz}$	$C_k$		0.3		pF

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

Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluations. 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
$I_C/I_F$	$V_{CE} = 5\text{ V}, I_F = 10\text{ mA}$	TCDT1100	CTR	40			%
		TCDT1100G	CTR				%
		TCDT1101	CTR	40		80	%
		TCDT1101G	CTR				%
		TCDT1102	CTR	63		125	%
		TCDT1102G	CTR				%
		TCDT1103	CTR	100		200	%
		TCDT1103G	CTR				%

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		$V_{IOTM}$			6	kV
Safety temperature		$T_{si}$			150	°C

**Note**

According to DIN EN 60747-5-5 (see figure 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 figure 2)	$V_{IOTM}$	6			kV
		$V_{pd}$	1.3			kV
Insulation resistance	$V_{IO} = 500\text{ V}$	$R_{IO}$	$10^{12}$			$\Omega$
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ °C}$	$R_{IO}$	$10^{11}$			$\Omega$
	$V_{IO} = 500\text{ V}, T_{amb} = 150\text{ °C}$ (construction test only)	$R_{IO}$	$10^9$			$\Omega$

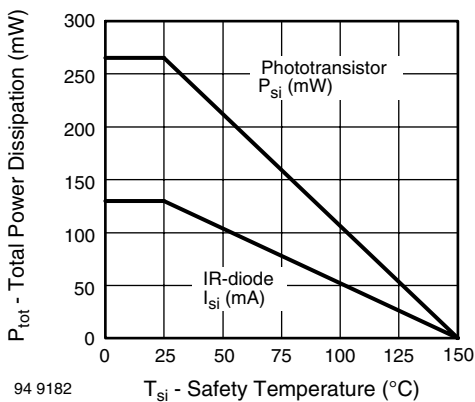


Fig. 1 - Derating Diagram

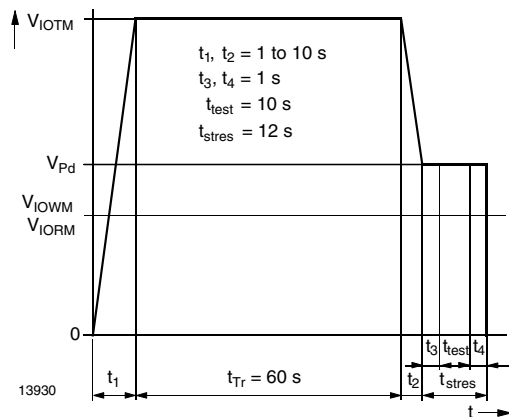


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-5/DIN EN 60747-; IEC60747

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Delay time	$V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\ \Omega$ , (see figure 3)	$t_d$		4.0		$\mu\text{s}$
Rise time	$V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\ \Omega$ , (see figure 3)	$t_r$		7.0		$\mu\text{s}$
Fall time	$V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\ \Omega$ , (see figure 3)	$t_f$		6.7		$\mu\text{s}$
Storage time	$V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\ \Omega$ , (see figure 3)	$t_s$		0.3		$\mu\text{s}$
Turn-on time	$V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\ \Omega$ , (see figure 3)	$t_{on}$		11.0		$\mu\text{s}$
Turn-off time	$V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\ \Omega$ , (see figure 3)	$t_{off}$		7.0		$\mu\text{s}$
Turn-on time	$V_S = 5\text{ V}$ , $I_C = 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$ , (see figure 4)	$t_{on}$		25.0		$\mu\text{s}$
Turn-off time	$V_S = 5\text{ V}$ , $I_C = 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$ , (see figure 4)	$t_{off}$		42.5		$\mu\text{s}$

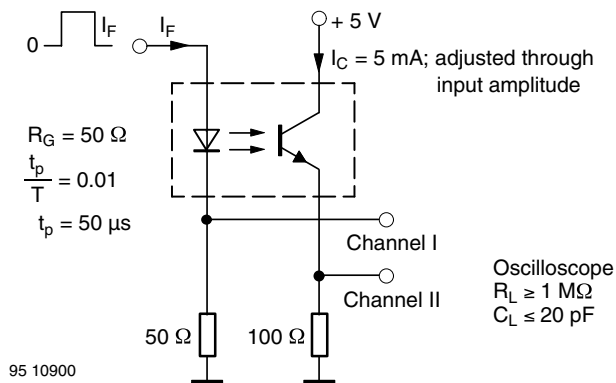


Fig. 3 - Test Circuit, Non-Saturated Operation

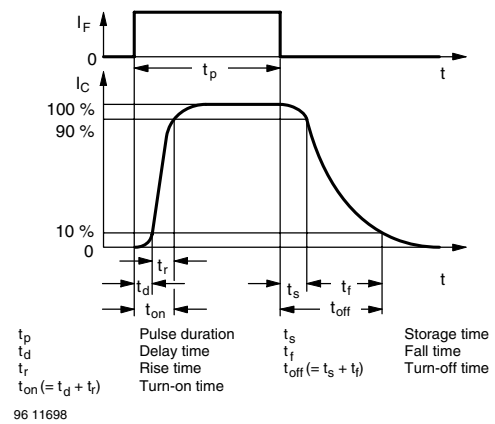


Fig. 5 - Switching Times

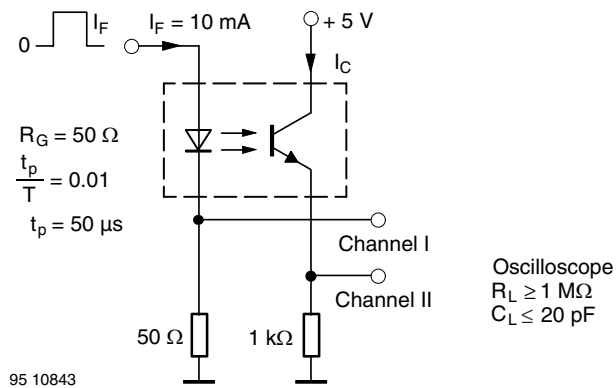


Fig. 4 - Test Circuit, Saturated Operation

## TYPICAL CHARACTERISTICS

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

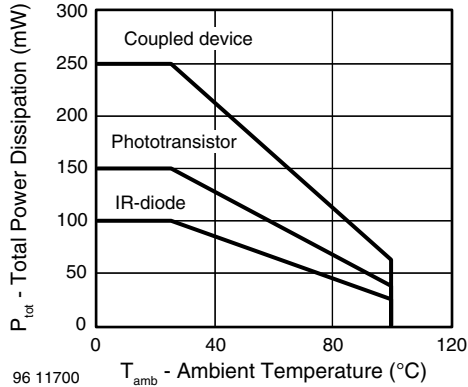


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

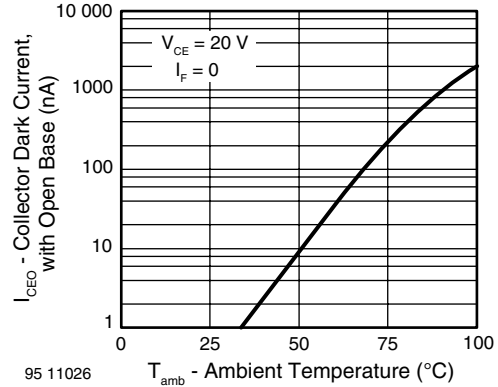


Fig. 9 - Collector Dark Current vs. Ambient Temperature

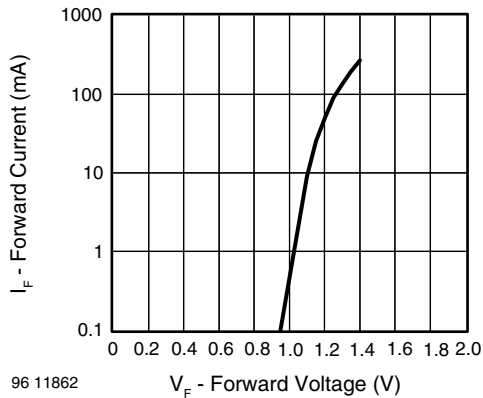


Fig. 7 - Forward Current vs. Forward Voltage

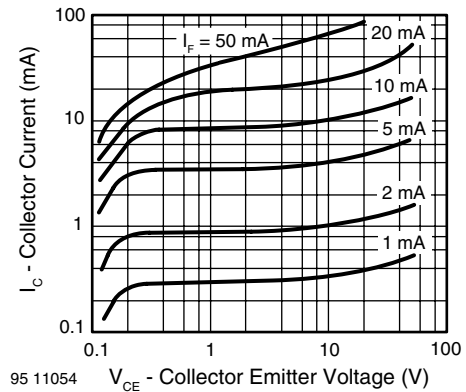


Fig. 10 - Collector Current vs. Collector Emitter Voltage

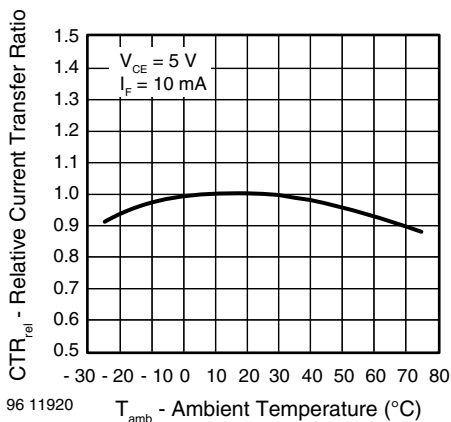


Fig. 8 - Relative Current Transfer Ratio vs. Ambient Temperature

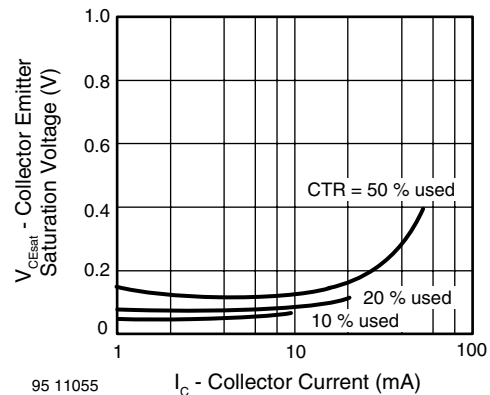


Fig. 11 - Collector Emitter Saturation Voltage vs. Collector Current

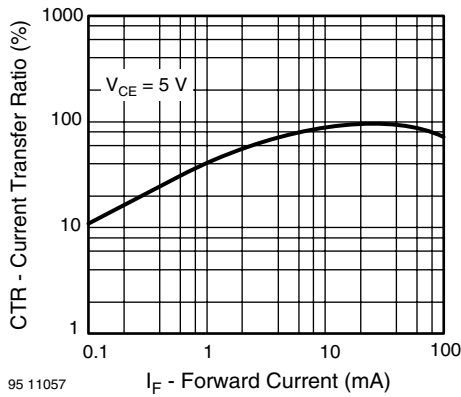


Fig. 12 - Current Transfer Ratio vs. Forward Current

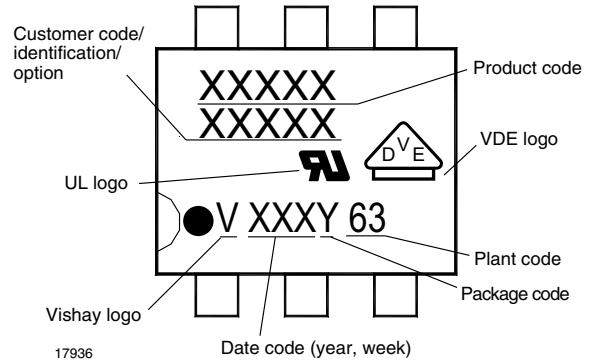


Fig. 15 - Marking Example

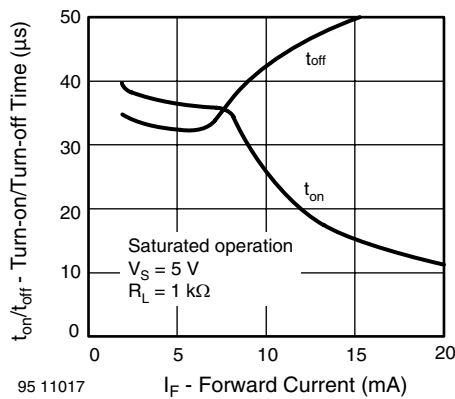


Fig. 13 - Turn-on/off Time vs. Forward Current

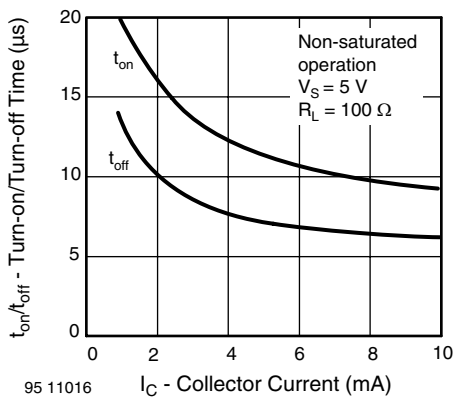


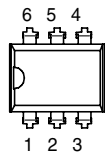
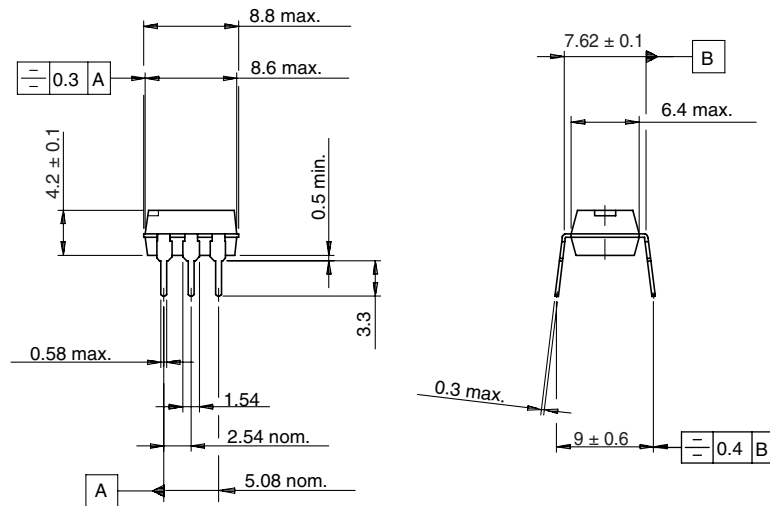
Fig. 14 - Turn-on/off Time vs. Collector Current

# TCDT1100/TCDT1100G

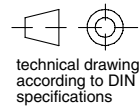
Vishay Semiconductors Optocoupler, Phototransistor Output



## PACKAGE DIMENSIONS in millimeters

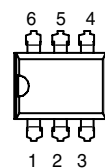
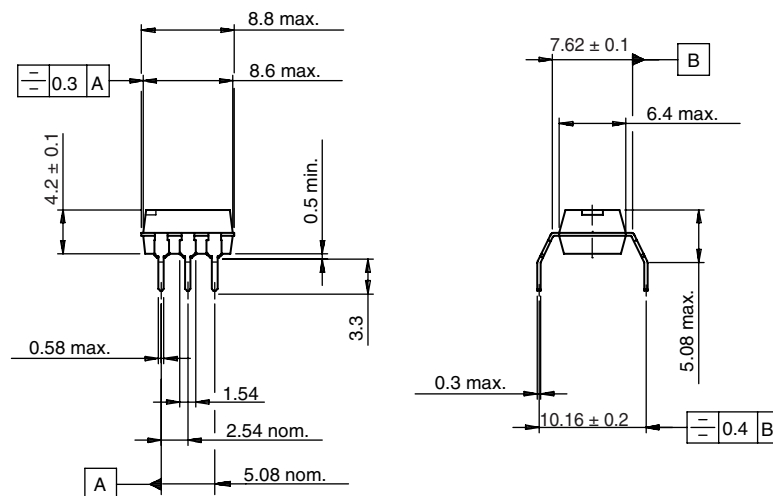


Weight: ca. 0.50 g  
Creepage distance: > 6 mm  
Air path: > 6 mm  
after mounting on PC board

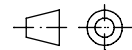


technical drawings  
according to DIN  
specifications

14770



Weight: ca. 0.50 g  
Creepage distance: > 8 mm  
Air path: > 8 mm  
after mounting on PC board



technical drawings  
according to DIN  
specifications

14771

**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.

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