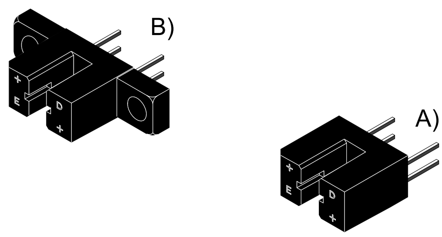
Transmissive Optical Sensor with Phototransistor Output

Description

This device has a compact construction where the emitting-light sources and the detectors are located face-to-face on the same optical axis. The operating wavelength is 950 nm. The detector consists of a phototransistor.



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Applications

- Contactless optoelectronic switch, control and counter

Features

- Compact construction
- No setting efforts
- Polycarbonate case protected against ambient light
- 2 case variations
- 3 different apertures
- CTR selected in groups (regarding fourth number of type designation)

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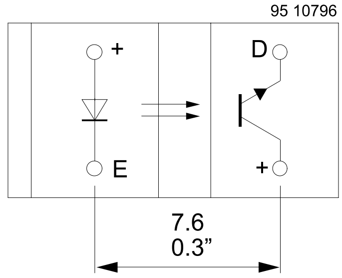


Top view

Order Instruction

Ordering Code	Resolution (mm) / Aperture (mm)	Remarks
TCST1103A)	0.6 / 1.0	No mounting flags
TCST2103B)		With two mounting flags
TCST1202A)	0.4 / 0.5	No mounting flags
TCST2202B)		With two mounting flags
TCST1300A)	0.2 / 0.25	No mounting flags
TCST2300B)		With two mounting flags

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}	3	A
Power dissipation	$T_{amb} \leq 25^\circ C$	P_V	100	mW
Junction temperature		T_j	100	°C

Output (Detector)

Parameter	Test Conditions	Symbol	Value	Unit
Collector emitter voltage		V_{CEO}	70	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	100	mA
Collector peak current	$t_p/T = 0.5$, $t_p \leq 10$ ms	I_{CM}	200	mA
Power dissipation	$T_{amb} \leq 25^\circ C$	P_V	150	mW
Junction temperature		T_j	100	°C

Coupler

Parameter	Test Conditions	Symbol	Value	Unit
Total power dissipation	$T_{amb} \leq 25^\circ C$	P_{tot}	250	mW
Operating temperature range		T_{amb}	–55 to +85	°C
Storage temperature range		T_{stg}	–55 to +100	°C
Soldering temperature	2 mm from case, $t \leq 5$ s	T_{sd}	260	°C

Electrical Characteristics (T_{amb} = 25°C)

Input (Emitter)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Forward voltage	I_F = 60 mA	V_F		1.25	1.6	V
Junction capacitance	V_R = 0, f = 1 MHz	C_j		50		pF

Output (Detector)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector emitter voltage	I_C = 1 mA	V_{CEO}	70			V
Emitter collector voltage	I_E = 10 μA	V_{ECO}	7			V
Collector dark current	V_{CE} = 25 V, I_F = 0, E = 0	I_{CEO}			100	nA

Coupler

Parameter	Test Conditions	Type	Symbol	Min.	Typ.	Max.	Unit
Current transfer ratio	V_{CE} = 5 V, I_F = 20 mA	TCST1103, TCST2103	CTR	10	20		%
		TCST1202, TCST2202	CTR	5	10		%
		TCST1300, TCST2300	CTR	1.25	2.5		%
Collector current	V_{CE} = 5 V, I_F = 20 mA	TCST1103, TCST2103	I_C	2	4		mA
		TCST1202, TCST2202	I_C	1	2		mA
		TCST1300, TCST2300	I_C	0.25	0.5		mA
Collector emitter saturation voltage	I_F = 20 mA, I_C = 1 mA	TCST1103, TCST2103	V_{CEsat}			0.4	V
	I_F = 20 mA, I_C = 0.5 mA	TCST1202, TCST2202	V_{CEsat}			0.4	V
	I_F = 20 mA, I_C = 0.1 mA	TCST1300, TCST2300	V_{CEsat}			0.4	V
Resolution, path of the shutter crossing the radiant sensitive zone	I_{Crel} = 10 to 90%	TCST1103, TCST2103	s		0.6		mm
		TCST1202, TCST2202	s		0.4		mm
		TCST1300, TCST2300	s		0.2		mm

Switching Characteristics

Parameter	Test Conditions	Symbol	Typ.	Unit
Turn-on time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω (see figure 1)	t_{on}	10.0	μs
Turn-off time		t_{off}	8.0	μs

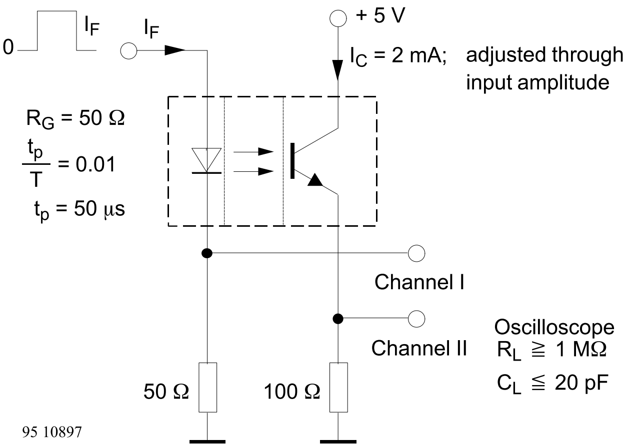
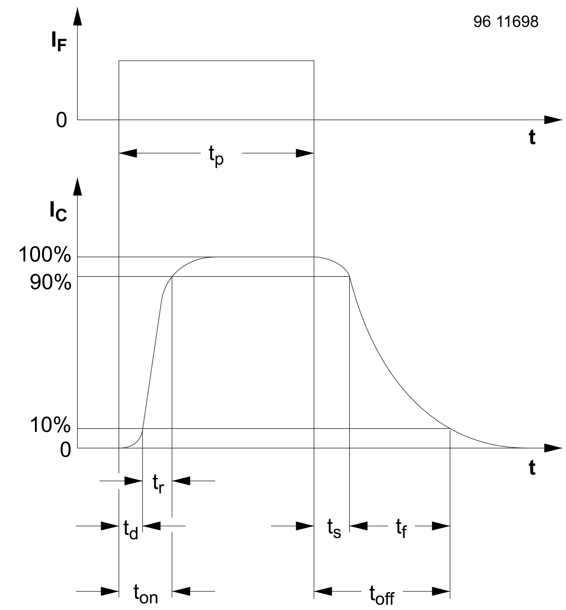


Figure 1. Test circuit, saturated operation



t_p	pulse duration	t_s	storage time
t_d	delay time	t_f	fall time
t_r	rise time	t_{off} (= t_s + t_f)	turn-off time
t_{on} (= t_d + t_r)	turn-on time		

Figure 2. Switching times

Typical Characteristics (T_{amb} = 25°C, unless otherwise specified)

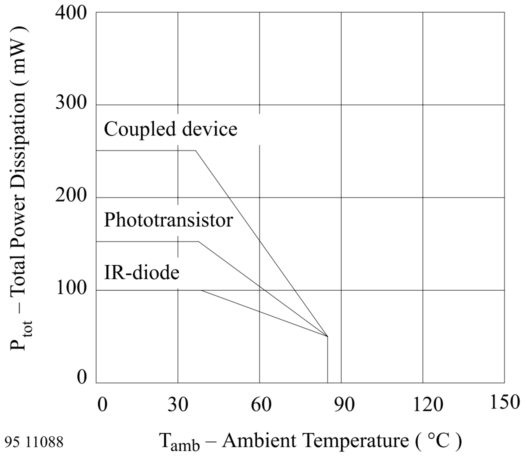


Figure 3. Total Power Dissipation vs. Ambient Temperature

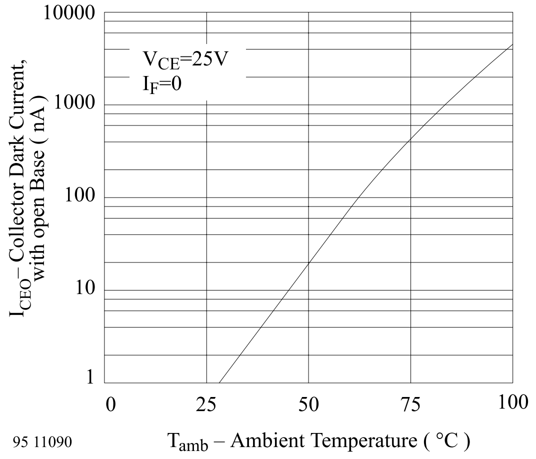


Figure 6. Collector Dark Current vs. Ambient Temperature

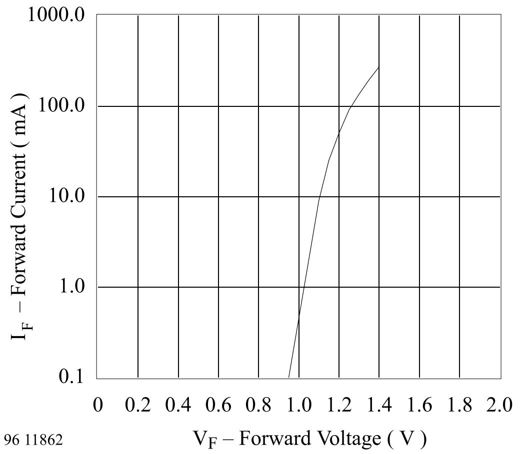


Figure 4. Forward Current vs. Forward Voltage

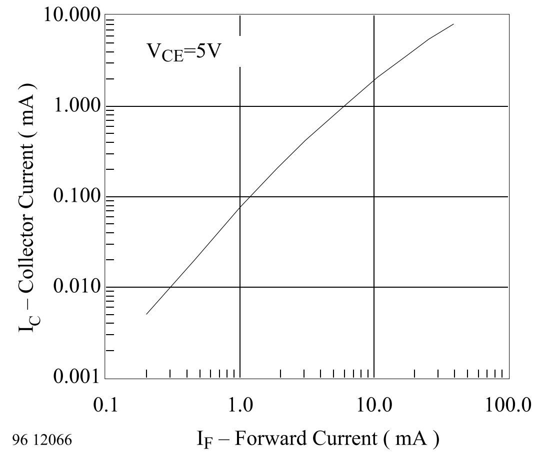


Figure 7. Collector Current vs. Forward Current

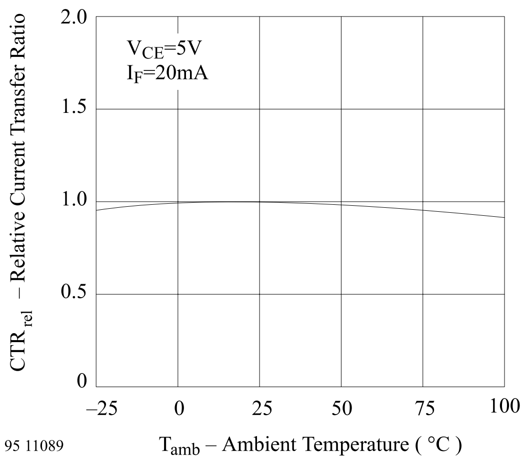


Figure 5. Relative Current Transfer Ratio vs. Ambient Temperature

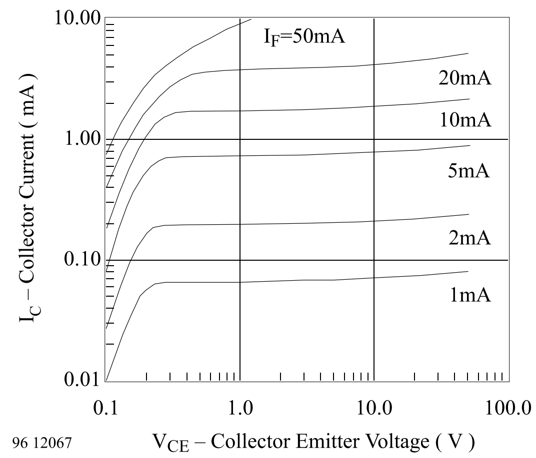


Figure 8. Collector Current vs. Collector Emitter Voltage

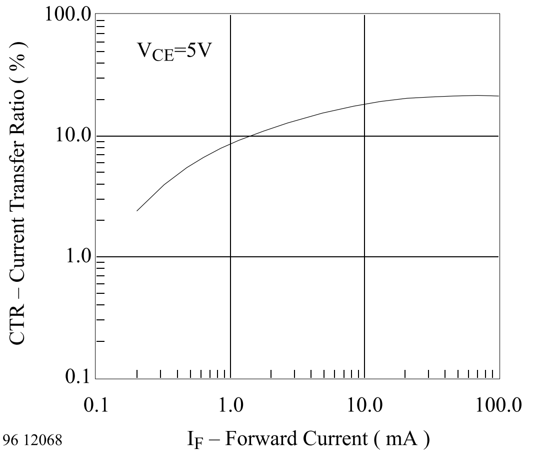


Figure 9. Current Transfer Ratio vs. Forward Current

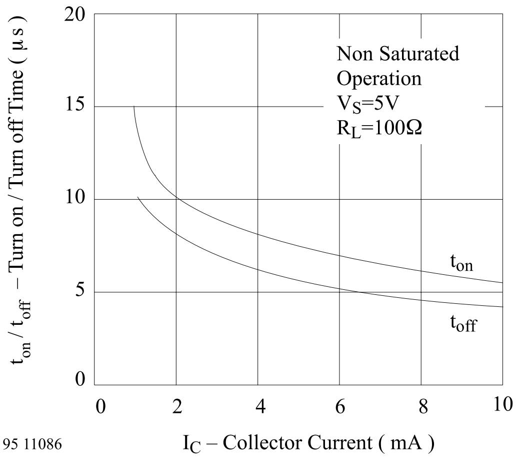


Figure 10. Turn on / off Time vs. Collector Current

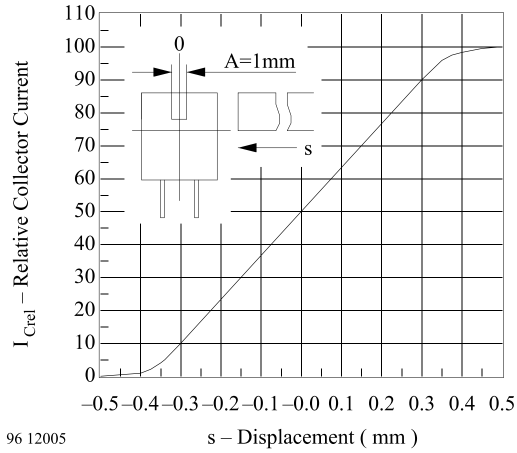


Figure 11. Relative Collector Current vs. Displacement

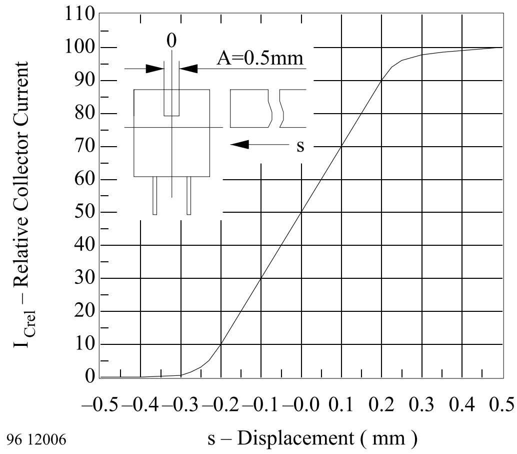


Figure 12. Relative Collector Current vs. Displacement

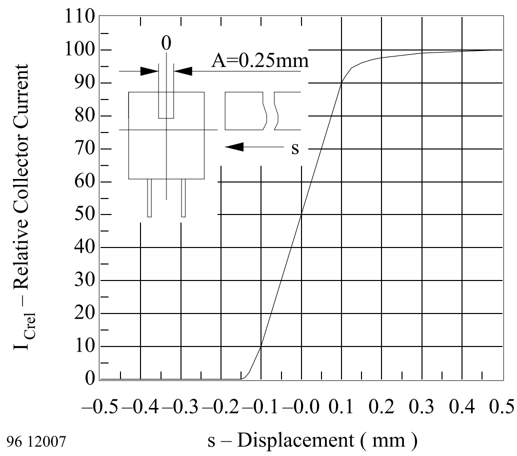
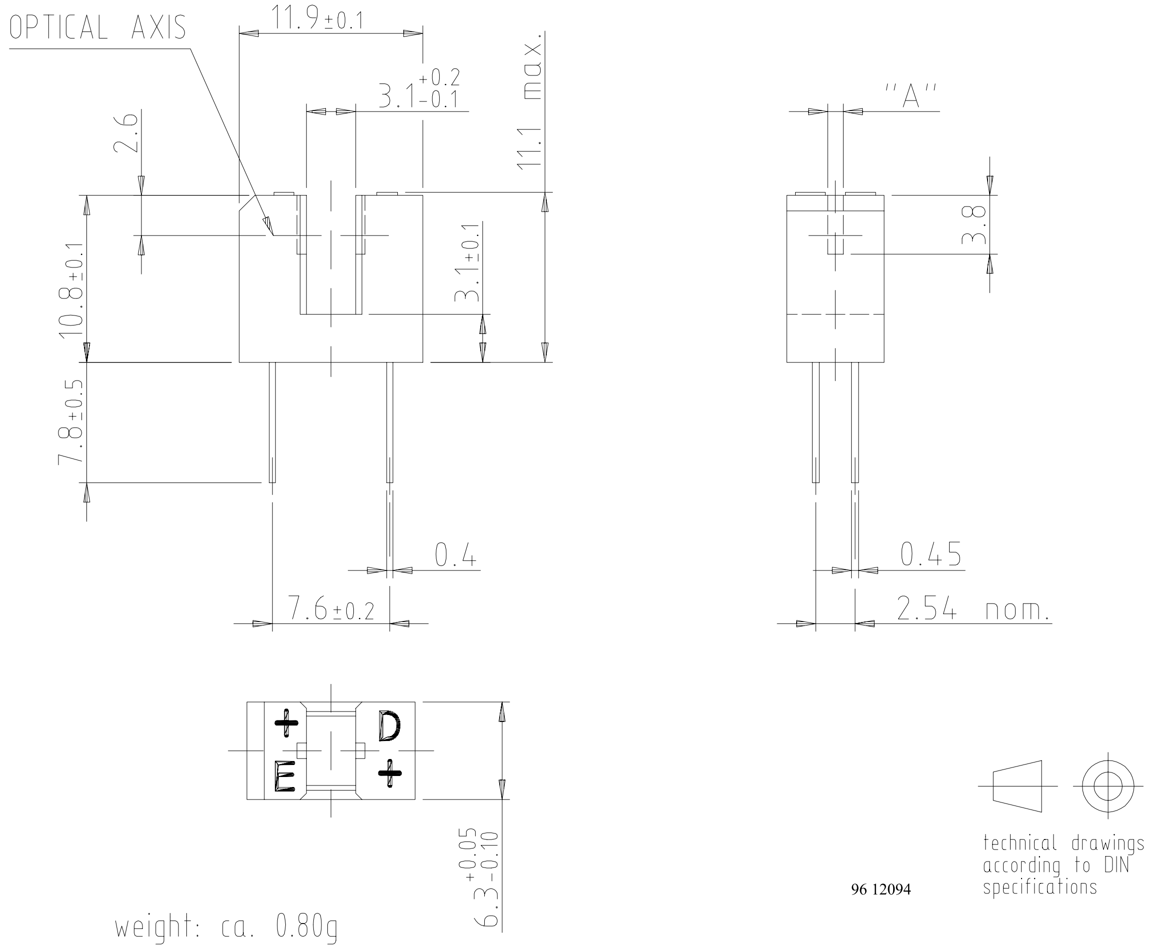
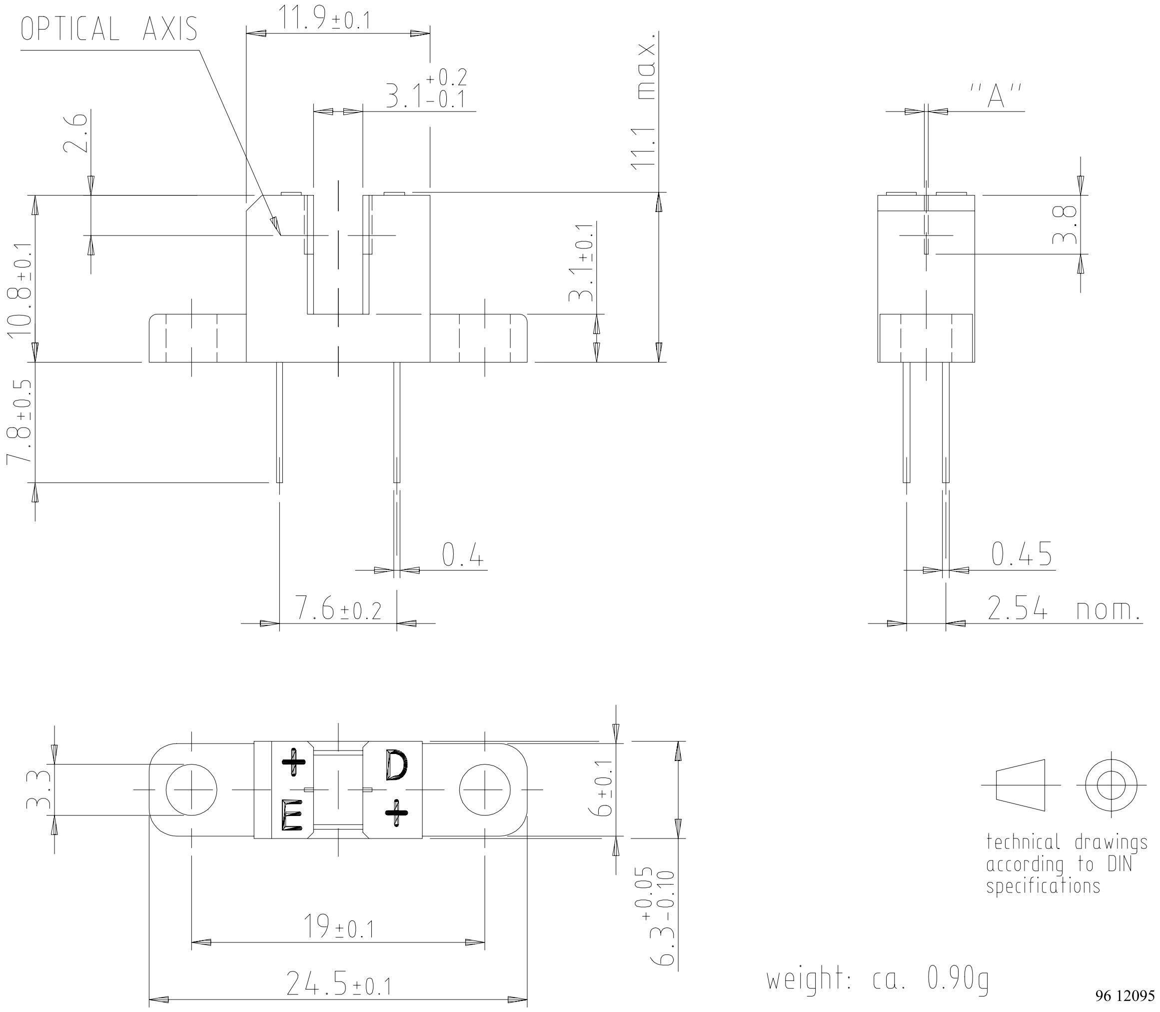


Figure 13. Relative Collector Current vs. Displacement

Dimensions of TCST1.0. in mm



Dimensions of TCST2.0. in mm



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.

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