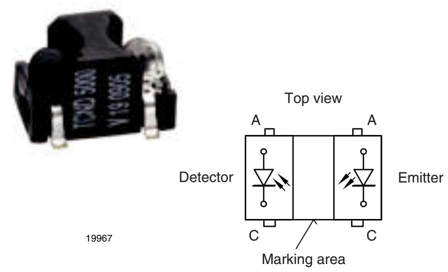
Reflective Optical Sensor with PIN Photodiode Output

Description

The TCND5000 is a reflective sensor that includes an infrared emitter and PIN photodiode in a surface mount package which blocks visible light.



Features

- Package type: Surface mount
- Detector type: PIN Photodiode
- Dimensions:
  L 6 mm x W 4.3 mm x H 3.75 mm
- Peak operating distance: 6 mm
- Peak operating range: 2 mm to 25 mm
- Typical output current under test: I_{ra} > 0.11 µA
- Daylight blocking filter
- High linearity
- Emitter wavelength 940 nm
- Lead (Pb)-free soldering released
- Lead (Pb)-free component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC
- Minimum order quantity 2000 pcs, 2000 pcs/reel

Pb
Pb-free
e3

Applications

- Proximity sensor
- Object sensor
- Motion sensor
- Touch key

Absolute Maximum Ratings

T_{amb} = 25 °C, unless otherwise specified

Input (Emitter)

Parameter	Test condition	Symbol	Value	Unit
Reverse Voltage		V_R	5	V
Forward current		I_F	100	mA
Peak Forward Current	t_p = 50 µs, T = 2 ms, T_{amb} = 25 °C	I_{FM}	500	mA
Power Dissipation		P_V	190	mW
Junction Temperature		T_j	100	°C

Output (Detector)

Parameter	Test condition	Symbol	Value	Unit
Reverse Voltage		V_R	60	V
Power Dissipation		P_V	75	mW
Junction Temperature		T_j	100	°C

Sensor

Parameter	Test condition	Symbol	Value	Unit
Operating Temperature Range		T_{amb}	- 40 to + 85	°C
Storage Temperature Range		T_{stg}	- 40 to + 100	°C
Soldering Temperature	acc. fig. 14	T_{sd}	260	°C

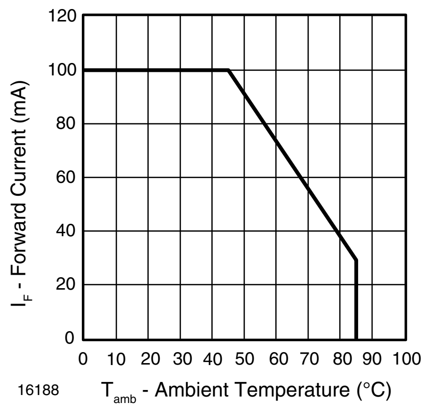


Figure 1. Forward Current Limit vs. Ambient Temperature

Electrical Characteristics

T_{amb} = 25 °C, unless otherwise specified

Input (Emitter)

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward Voltage	I_F = 20 mA, t_p = 20 ms	V_F		1.2	1.5	V
Temp. Coefficient of V_F	I_F = 1 mA	TK_{VF}		- 1.3		mV/K
Reverse Current	V_R = 5 V	I_R			10	µA
Junction Capacitance	V_R = 0 V, f = 1 MHz, E = 0	C_j		25		pF
Radiant Intensity	I_F = 20 mA, t_p = 20 ms	I_e		7	75	mW/sr
Angle of Half Intensity		φ		± 12		deg
Peak Wavelength	I_F = 100 mA	λ_p	930	940		nm
Spectral Bandwidth	I_F = 100 mA	$\Delta\lambda$		50		nm
Temp. Coefficient of λ_p	I_F = 100 mA	$TK\lambda_p$		0.2		nm/K
Rise Time	I_F = 100 mA	t_r		800		ns
Fall Time	I_F = 100 mA	t_f		800		ns
Virtual Source Diameter	Method: 63 % encircled energy	Ø		1.2		mm

see figures 2 to 8 accordingly

Output (Detector)

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward Voltage	I_F = 50 mA	V_F		1.0	1.3	V
Breakdown Voltage	I_R = 100 µA	V_{BR}	60			V
Reverse Dark Current	V_R = 10 V, E = 0	I_{ro}		1	10	nA
Diode capacitance	V_R = 5 V, f = 1 MHz, E = 0	C_D		1.8		pF
Reverse Light Current	E_e = 1 mW/cm^2 λ = 950 nm, V_R = 5 V	I_{ra}		12		µA
Temp. Coefficient of I_{ra}	V_R = 5 V, λ = 870 nm	TK_{ira}		0.2		%/K
Angle of Half Intensity		φ		± 15		deg
Wavelength of Peak Sensitivity		λ_p		930		nm
Range of Spectral Bandwidth		$\lambda_{0.5}$		840 to 1050		nm

see figures 9 to 12 accordingly

Sensor

T_{amb} = 25 °C, unless otherwise specified

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Reverse Light Current	V_R = 2.5 V, I_F = 20 mA D = 30 mm reflective mode: see figure 2	I_{ra}	110			nA

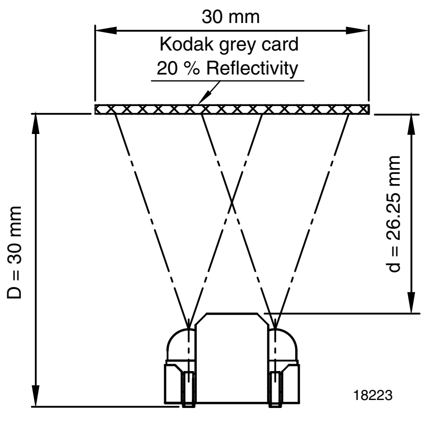


Figure 2. Test Circuit

Typical Characteristics

T_{amb} = 25 °C, unless otherwise specified

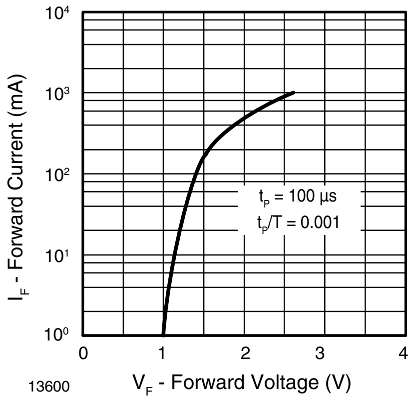


Figure 3. Forward Current vs. Forward Voltage

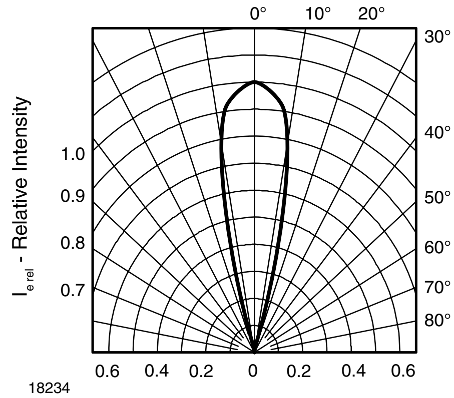


Figure 6. Relative Radiant Intensity vs. Angular Displacement

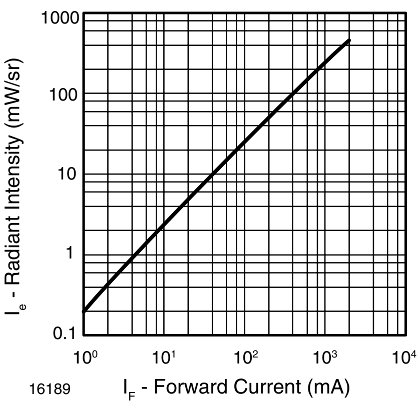


Figure 4. Radiant Intensity vs. Forward Current

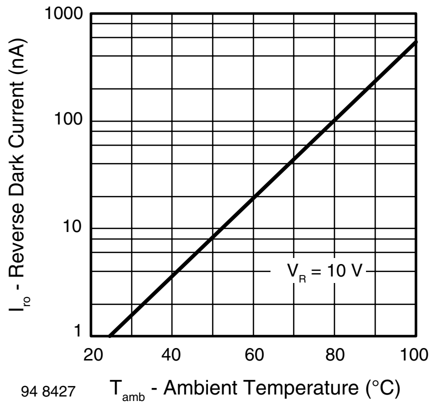


Figure 7. Reverse Dark Current vs. Ambient Temperature

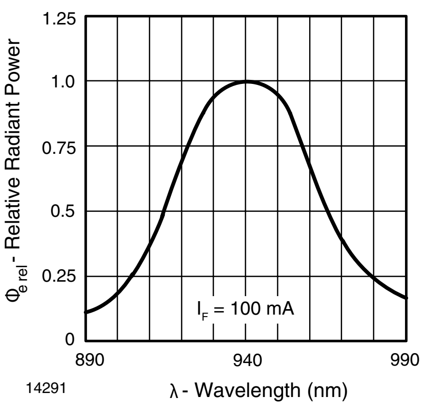


Figure 5. Relative Radiant Power vs. Wavelength

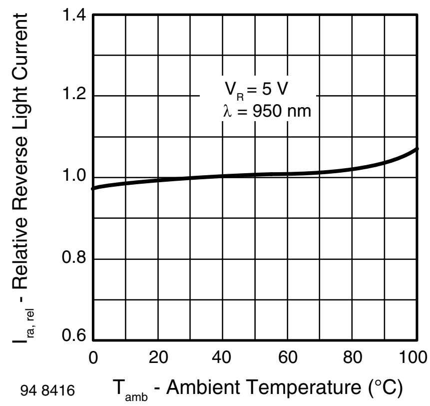


Figure 8. Relative Reverse Light Current vs. Ambient Temperature

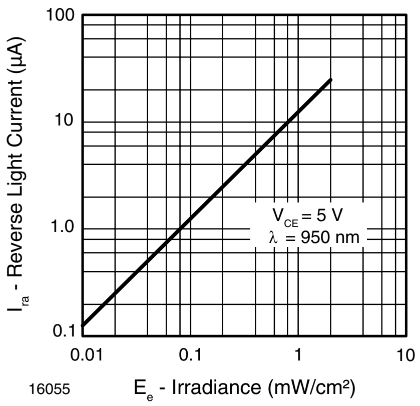


Figure 9. Reverse Light Current vs. Irradiance

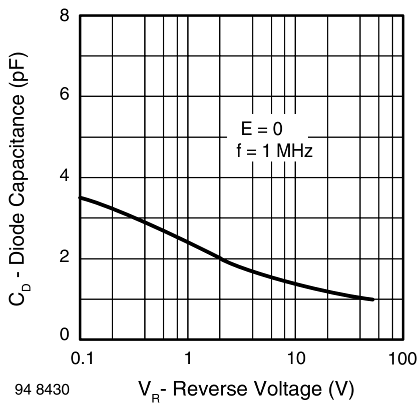


Figure 10. Diode Capacitance vs. Reverse Voltage

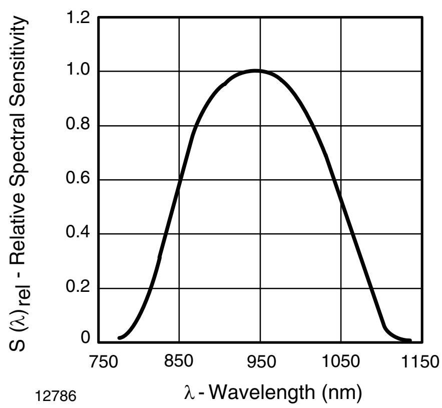


Figure 11. Relative Spectral Sensitivity vs. Wavelength

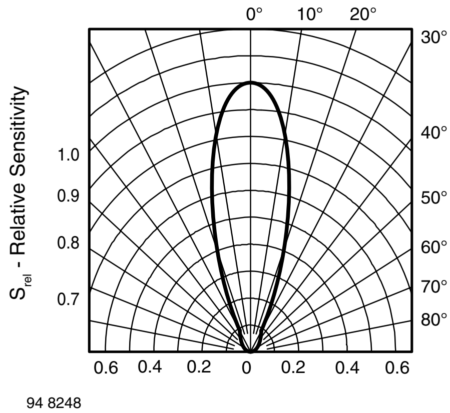


Figure 12. Relative Radiant Sensitivity vs. Angular Displacement

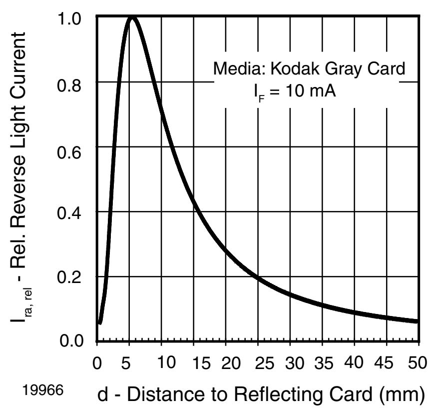
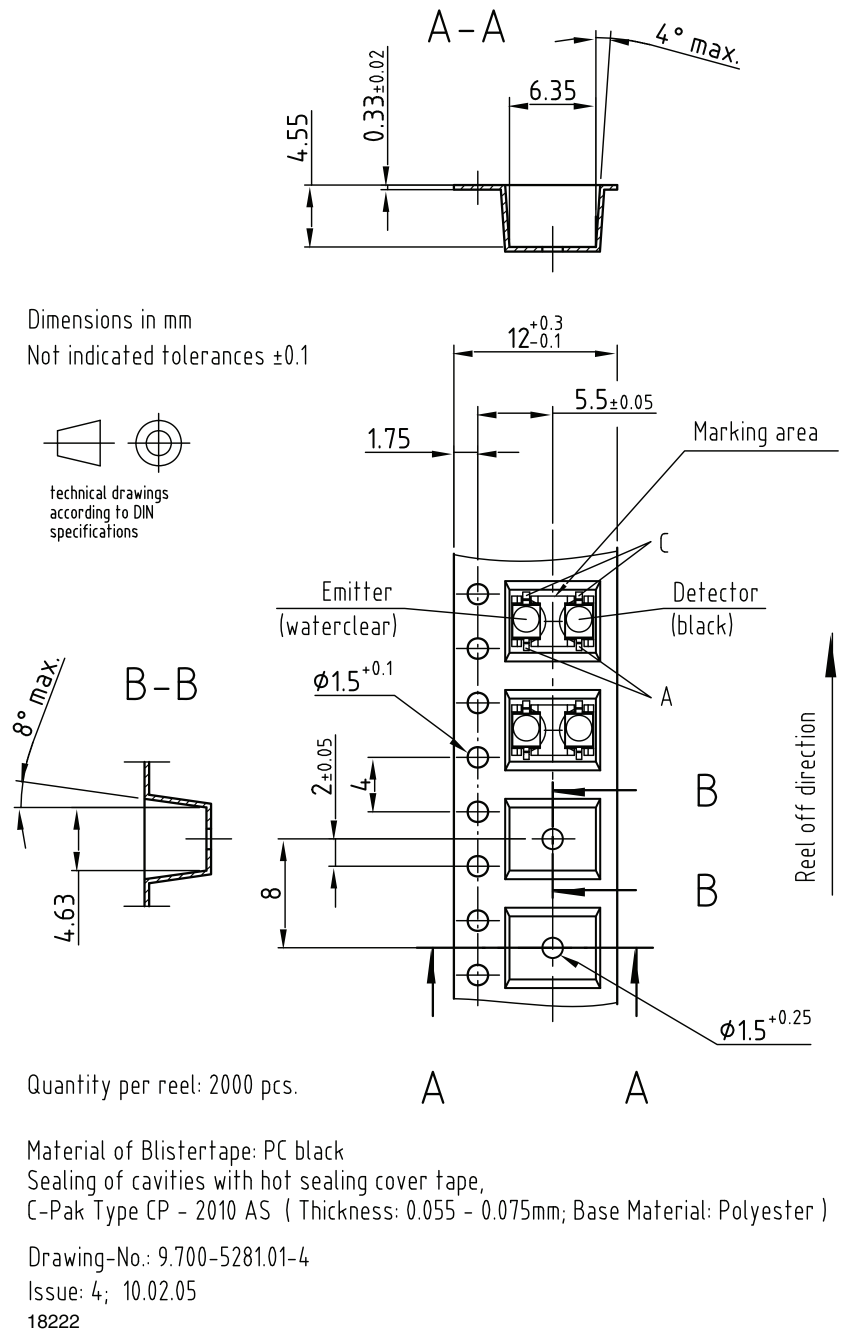
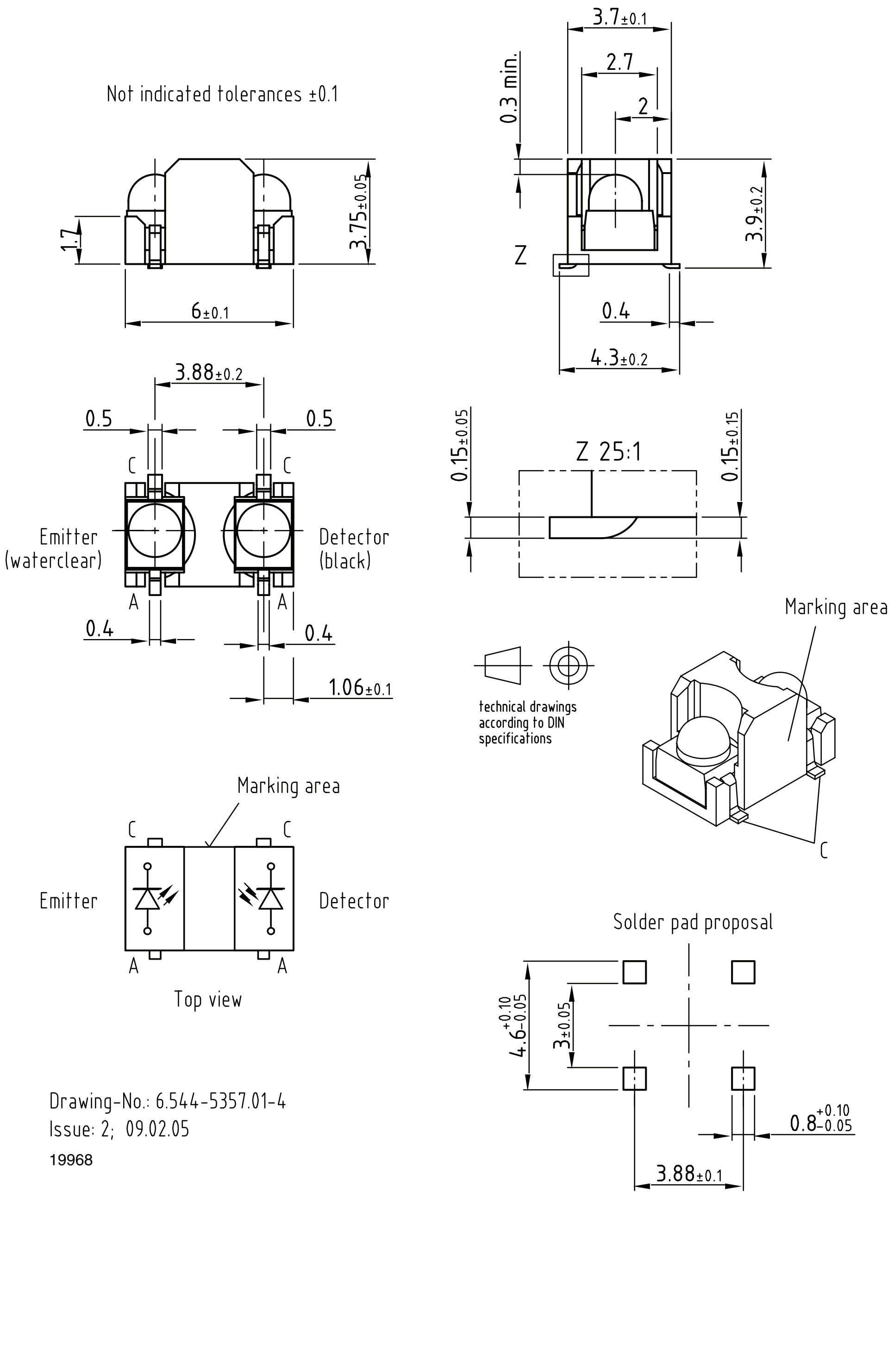


Figure 13. Relative Reverse Light Current vs. Distance

Taping


A – A
4° max.
6.35
4.55
0.33±0.02
Dimensions in mm
Not indicated tolerances ±0.1
technical drawings
according to DIN
specifications
12+0.3 -0.1
5.5±0.05
1.75
Marking area
C
Emitter
(waterclear)
Detector
(black)
A
ø1.5+0.1
B – B
8° max.
4.63
2±0.05
4
8
B
B
Reel off direction
ø1.5+0.25
A
A
Quantity per reel: 2000 pcs.
Material of Blistertape: PC black
Sealing of cavities with hot sealing cover tape,
C-Pak Type CP - 2010 AS (Thickness: 0.055 - 0.075mm; Base Material: Polyester)
Drawing-No.: 9.700-5281.01-4
Issue: 4; 10.02.05
18222

Package Dimensions in mm



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Precautions For Use

1. Over-current-proof

Customer must apply resistors for protection, otherwise slight voltage shift will cause big current change (Burn out will happen).

2. Storage

2.1 Storage temperature and rel. humidity conditions are: 5 °C to 30 °C, R.H. 60 %

2.2 Floor life must not exceed 72 h, acc. to JEDEC level 4, J-STD-020.

Once the package is opened, the products should be used within 72 h. Otherwise, they should be kept in a damp proof box with desiccant.

Considering tape life, we suggest to use products within one year from production date.

2.3 If opened more than 72 h in an atmosphere 5 °C to 30 °C, R.H. 60 %, devices should be treated at 60 °C ± 5 °C for 15 hrs.

2.4 If humidity indicator in the package shows pink color (normal blue), then devices should be treated with the same conditions as 2.3

Reflow Solder Profiles

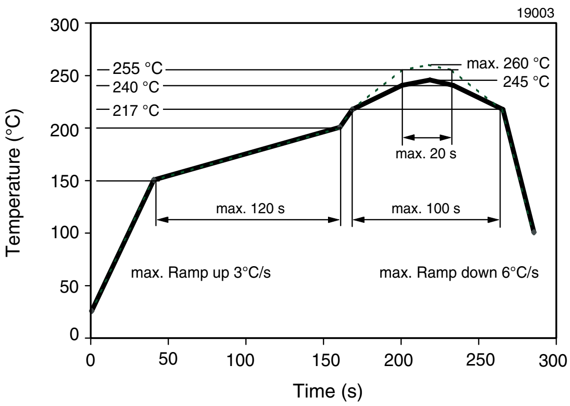

Figure 14. Lead (Pb)-Free Reflow Solder Profile

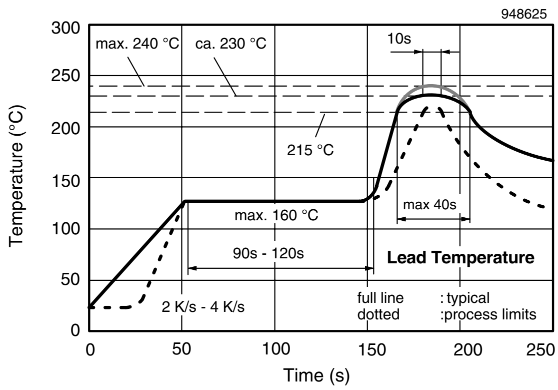

Figure 15. Lead Tin (SnPb) Reflow Solder Profile

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.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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