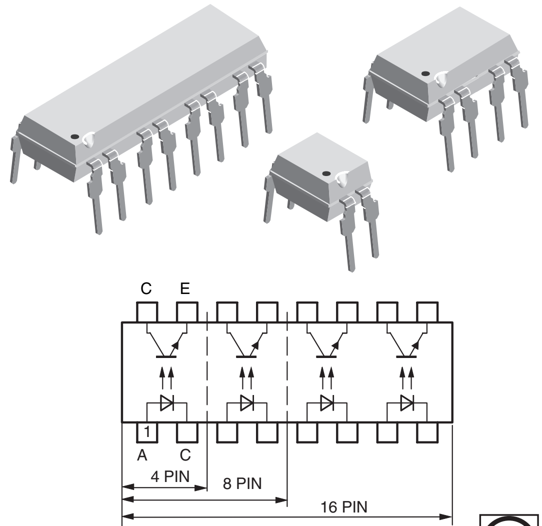
# Optocoupler, Phototransistor Output

## Features

- Endstackable to 2.54 mm (0.1") spacing
- DC isolation test voltage $V_{ISO}$ = 5000 $V_{RMS}$
- Low coupling capacitance of typical 0.3 pF
- **C**urrent **T**ransfer **R**atio (CTR) selected into groups
- Low temperature coefficient of CTR
- Wide ambient temperature range
- Available in single, dual and quad channel packages
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

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## Agency Approvals

- UL1577, File No. E76222 System Code U, Double Protection
- CSA 93751

## Applications

Programmable logic controllers, modems, answering machines, general applications

## Description

In the K817P/ K827PH/ K847PH parts each channel consist of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-pin (single); 8 pin (dual); 16-pin (quad) plastic dual inline package.

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

## Order Information

| Part | Remarks |
|---|---|
| K817P | CTR 50 - 600 %, DIP-4 |
| K817P1 | CTR 40 - 80 %, DIP-4 |
| K817P2 | CTR 63 - 125 %, DIP-4 |
| K817P3 | CTR 100 - 200 %, DIP-4 |
| K817P4 | CTR 160 - 320 %, DIP-4 |
| K817P5 | CTR 50 - 150 %, DIP-4 |
| K817P6 | CTR 100 - 300 %, DIP-4 |
| K817P7 | CTR 80 - 160 %, DIP-4 |
| K817P8 | CTR 130 - 260 %, DIP-4 |
| K817P9 | CTR 200 - 400 %, DIP-4 |
| K827PH | CTR 50 - 600 %, DIP-8 |
| K847PH | CTR 50 - 600 %, DIP-16 |

## Absolute Maximum Ratings

$T_{amb}$ = 25 °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 Rating for extended periods of the time can adversely affect reliability.

### Input

| Parameter | Test condition | 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 | | $P_{diss}$ | 100 | mW |
| Junction temperature | | $T_j$ | 125 | °C |

### Output

| Parameter | Test condition | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector emitter voltage | | $V_{CEO}$ | 70 | 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 |

### Coupler

| Parameter | Test condition | Symbol | Value | Unit |
|---|---|---|---|---|
| AC isolation test voltage (RMS) | t = 1 min | $V_{ISO}$ [1)] | 5000 | $V_{RMS}$ |
| Total power dissipation | | $P_{tot}$ | 250 | mW |
| Operating ambient temperature range | | $T_{amb}$ | - 40 to + 100 | °C |
| Storage temperature range | | $T_{stg}$ | - 55 to + 125 | °C |
| Soldering temperature | 2 mm from case, t ≤ 10 s | $T_{sld}$ | 260 | °C |

[1)] Related to standard climate 23/50 DIN 50014

## Electrical Characteristics

$T_{amb}$ = 25 °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.

### Input

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

## Output

| Parameter | Test condition | Symbol | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Collector emitter voltage | $I_C$ = 100 μA | $V_{CEO}$ | 70 | | | V |
| Emitter collector voltage | $I_E$ = 100 μA | $V_{ECO}$ | 7 | | | V |
| Collector dark current | $V_{CE}$ = 20 V, $I_F$ = 0, E = 0 | $I_{CEO}$ | | | 100 | nA |

## Coupler

| Parameter | Test condition | Symbol | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Collector emitter saturation voltage | $I_F$ = 10 mA, $I_C$ = 1 mA | $V_{CEsat}$ | | | 0.3 | V |
| Cut-off frequency | $I_F$ = 10 mA, $V_{CE}$ = 5 V, $R_L$ = 100 Ω | $f_c$ | | 100 | | kHz |
| Coupling capacitance | f = 1 MHz | $C_k$ | | 0.3 | | pF |

## Current Transfer Ratio

| Parameter | Test condition | Part | Symbol | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_C/I_F$ | $V_{CE}$ = 5 V, $I_F$ = 5 mA | K817P | CTR | 50 | | 600 | % |
| | | K827PH | CTR | 50 | | 600 | % |
| | | K847PH | CTR | 50 | | 600 | % |
| | $V_{CE}$ = 5 V, $I_F$ = 10 mA | K817P1 | CTR | 40 | | 80 | % |
| | | K817P2 | CTR | 63 | | 125 | % |
| | | K817P3 | CTR | 100 | | 200 | % |
| | | K817P4 | CTR | 160 | | 320 | % |
| | $V_{CE}$ = 5 V, $I_F$ = 5 mA | K817P5 | CTR | 50 | | 150 | % |
| | | K817P6 | CTR | 100 | | 300 | % |
| | | K817P7 | CTR | 80 | | 160 | % |
| | | K817P8 | CTR | 130 | | 260 | % |
| | | K817P9 | CTR | 200 | | 400 | % |

## Switching Characteristics

| Parameter | Test condition | Symbol | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Delay time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_d$ | | 3.0 | | μs |
| Rise time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_r$ | | 3.0 | | μs |
| Fall time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_f$ | | 4.7 | | μs |
| Storage time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_s$ | | 0.3 | | μs |
| Turn-on time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_{on}$ | | 6.0 | | μs |
| Turn-off time | $V_S$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (see figure 1) | $t_{off}$ | | 5.0 | | μs |
| Turn-on time | $V_S$ = 5 V, $I_F$ = 10 mA, $R_L$ = 1 kΩ (see figure 2) | $t_{on}$ | | 9.0 | | μs |
| Turn-off time | $V_S$ = 5 V, $I_F$ = 10 mA, $R_L$ = 1 kΩ (see figure 2) | $t_{off}$ | | 18.0 | | μs |

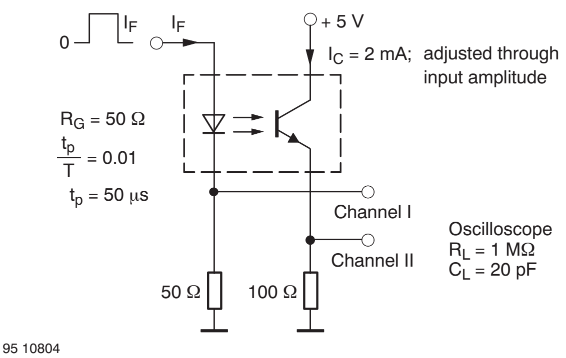



Figure 1. Test circuit, non-saturated operation

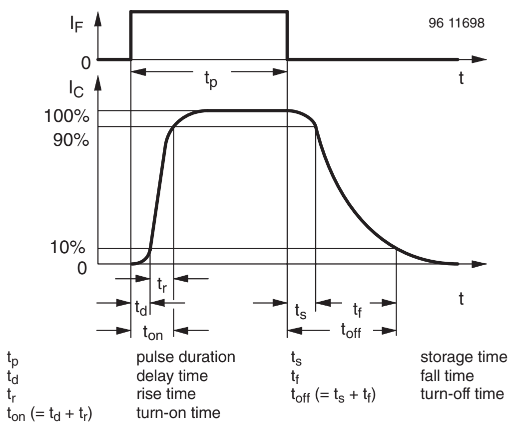



Figure 3. Switching Times

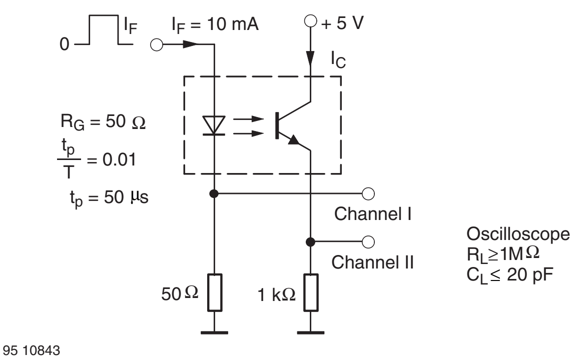



Figure 2. Test circuit, saturated operation

## Typical Characteristics (Tamb = 25 °C unless otherwise specified)

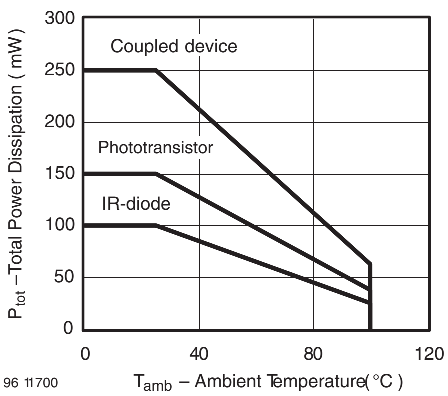



Figure 4. Total Power Dissipation vs. Ambient Temperature

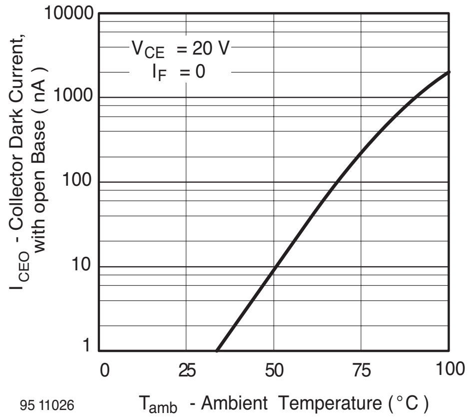



Figure 7. Collector Dark Current vs. Ambient Temperature

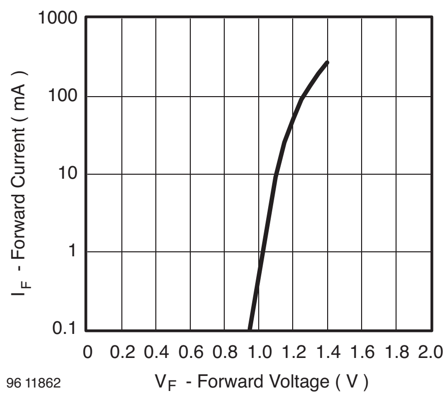



Figure 5. Forward Current vs. Forward Voltage

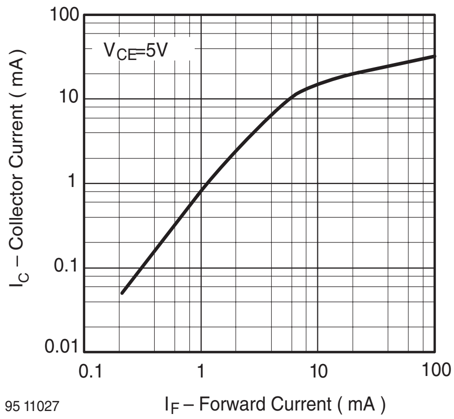



Figure 8. Collector Current vs. Forward Current

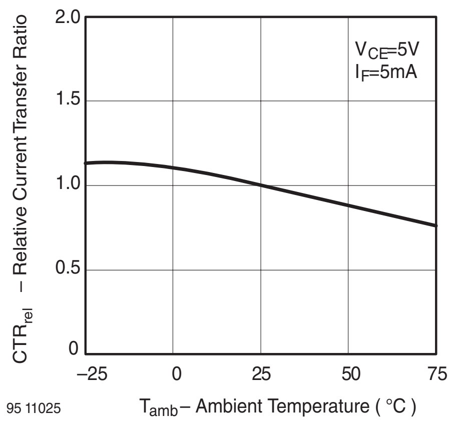



Figure 6. Relative Current Transfer Ratio vs. Ambient Temperature

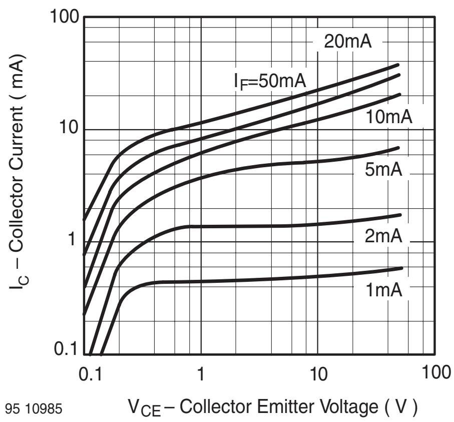



Figure 9. Collector Current vs. Collector Emitter Voltage

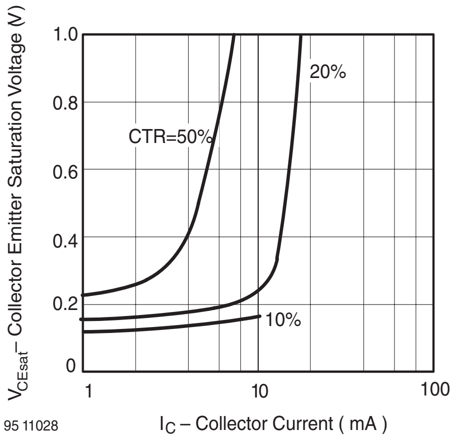



Figure 10. Collector Emitter Saturation Voltage vs. Collector Current

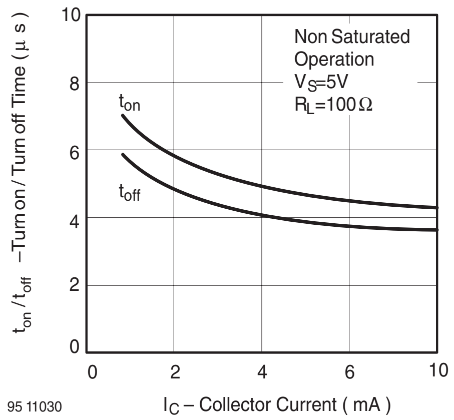



Figure 13. Turn on / off Time vs. Collector Current

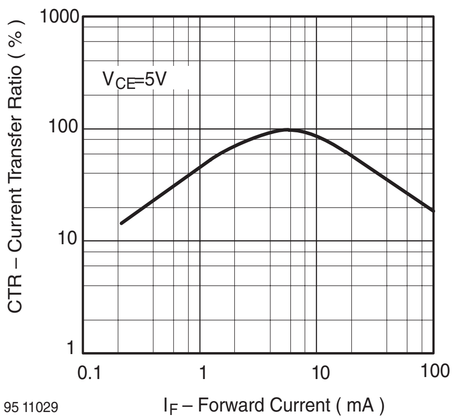



Figure 11. Current Transfer Ratio vs. Forward Current

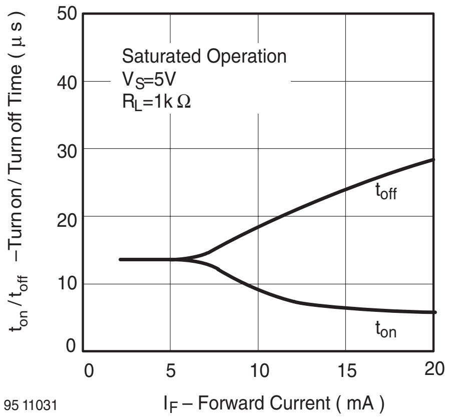
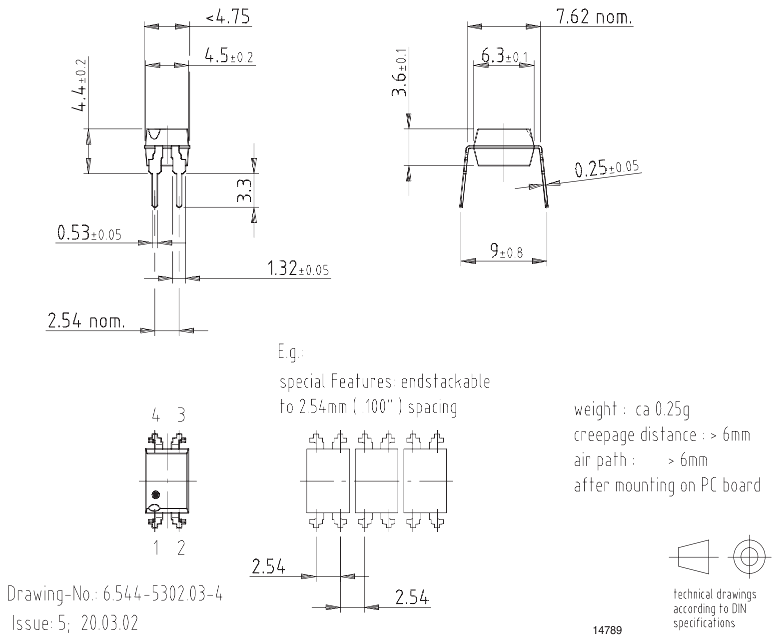



Figure 12. Turn on / off Time vs. Forward Current

## Package Dimensions in mm

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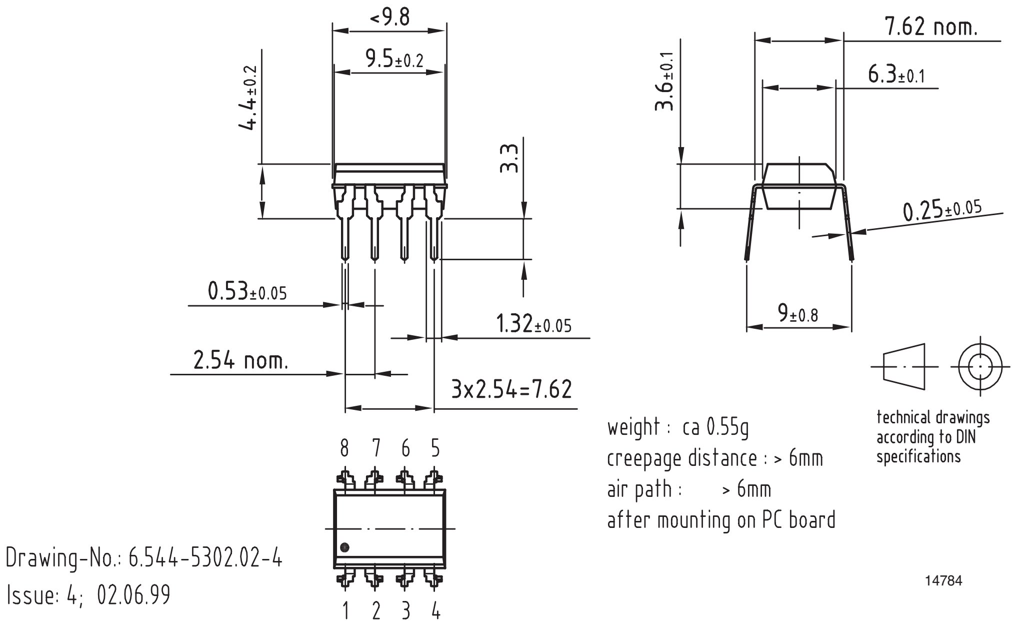

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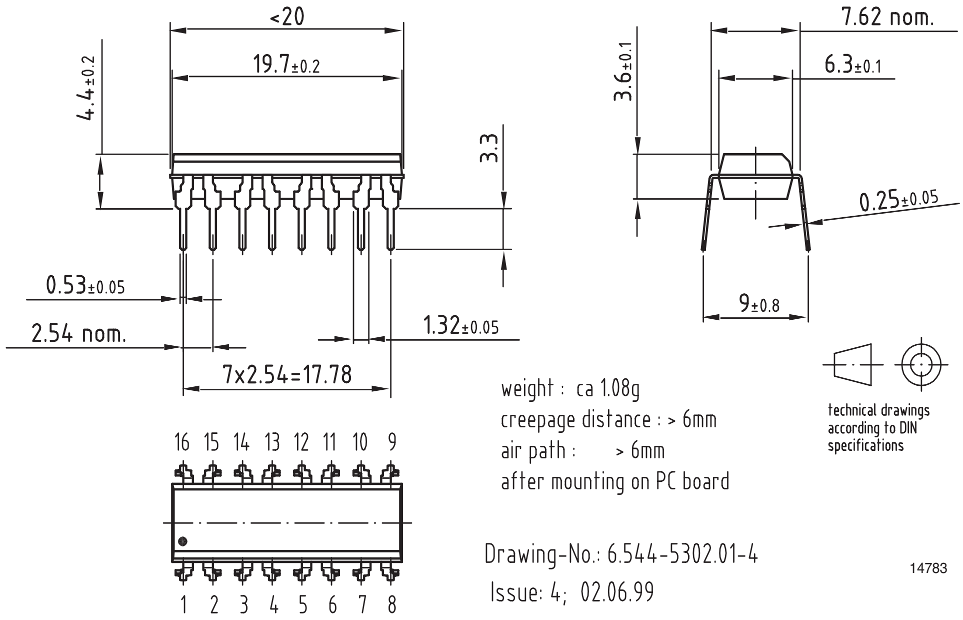

## Ozone Depleting Substances Policy Statement

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 operatingsystems 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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