

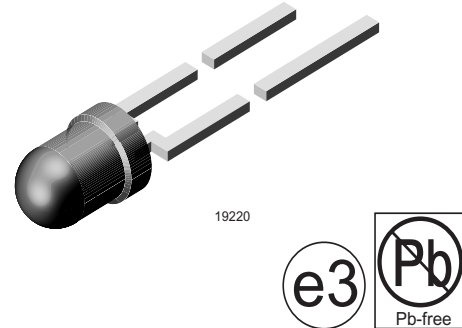
## High Efficiency LED, $\varnothing$ 3 mm Tinted Total Diffused Package

### Description

The TLH.46.. series was developed for applications which need a very wide radiation angle like backlighting, general indicating and lighting purposes.

It is housed in a 3 mm tinted total diffused plastic package. The wide viewing angle of these devices provides a high on-off contrast.

Several selection types with different luminous intensities are offered. All LEDs are categorized in luminous intensity groups. The green and yellow LEDs are categorized additionally in wavelength groups.



That allows users to assemble LEDs with uniform appearance.

### Features

- Choice of three bright colors
- Standard T-1 package
- Small mechanical tolerances
- Suitable for DC and high peak current
- Very wide viewing angle
- Luminous intensity categorized
- Yellow and green color categorized
- Lead-free device

### Applications

Status lights  
OFF / ON indicator  
Background illumination  
Readout lights  
Maintenance lights  
Legend light

### Parts Table

| Part     | Color, Luminous Intensity | Angle of Half Intensity ( $\pm\phi$ ) | Technology   |
|----------|---------------------------|---------------------------------------|--------------|
| TLHR4600 | Red, $I_V > 1$ mcd        | 60 °                                  | GaAsP on GaP |
| TLHR4601 | Red, $I_V > 1.6$ mcd      | 60 °                                  | GaAsP on GaP |
| TLHR4605 | Red, $I_V > 2.5$ mcd      | 60 °                                  | GaAsP on GaP |
| TLHY4600 | Yellow, $I_V > 0.63$ mcd  | 60 °                                  | GaAsP on GaP |
| TLHY4601 | Yellow, $I_V > 1$ mcd     | 60 °                                  | GaAsP on GaP |
| TLHY4605 | Yellow, $I_V > 2.5$ mcd   | 60 °                                  | GaAsP on GaP |
| TLHG4600 | Green, $I_V > 1$ mcd      | 60 °                                  | GaP on GaP   |
| TLHG4601 | Green, $I_V > 1.6$ mcd    | 60 °                                  | GaP on GaP   |
| TLHG4605 | Green, $I_V > 4$ mcd      | 60 °                                  | GaP on GaP   |

### Absolute Maximum Ratings

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

TLHR46.., TLHY46.., TLHG46..,

| Parameter                           | Test condition                            | Symbol     | Value         | Unit               |
|-------------------------------------|-------------------------------------------|------------|---------------|--------------------|
| Reverse voltage                     |                                           | $V_R$      | 6             | V                  |
| DC Forward current                  | $T_{amb} \leq 60\text{ }^{\circ}\text{C}$ | $I_F$      | 30            | mA                 |
| Surge forward current               | $t_p \leq 10\text{ }\mu\text{s}$          | $I_{FSM}$  | 1             | A                  |
| Power dissipation                   | $T_{amb} \leq 60\text{ }^{\circ}\text{C}$ | $P_V$      | 100           | mW                 |
| Junction temperature                |                                           | $T_j$      | 100           | $^{\circ}\text{C}$ |
| Operating temperature range         |                                           | $T_{amb}$  | - 20 to + 100 | $^{\circ}\text{C}$ |
| Storage temperature range           |                                           | $T_{stg}$  | - 55 to + 100 | $^{\circ}\text{C}$ |
| Soldering temperature               | $t \leq 5\text{ s}$ , 2 mm from body      | $T_{sd}$   | 260           | $^{\circ}\text{C}$ |
| Thermal resistance junction/ambient |                                           | $R_{thJA}$ | 400           | K/W                |

### Optical and Electrical Characteristics

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

#### Red

TLHR46..

| Parameter                        | Test condition                 | Part     | Symbol      | Min | Typ.     | Max | Unit |
|----------------------------------|--------------------------------|----------|-------------|-----|----------|-----|------|
| Luminous intensity <sup>1)</sup> | $I_F = 10\text{ mA}$           | TLHR4600 | $I_V$       | 1   | 2        |     | mcd  |
|                                  |                                | TLHR4601 | $I_V$       | 1.6 | 3.5      |     | mcd  |
|                                  |                                | TLHR4605 | $I_V$       | 2.5 | 6        |     | mcd  |
| Dominant wavelength              | $I_F = 10\text{ mA}$           |          | $\lambda_d$ | 612 |          | 625 | nm   |
| Peak wavelength                  | $I_F = 10\text{ mA}$           |          | $\lambda_p$ |     | 635      |     | nm   |
| Angle of half intensity          | $I_F = 10\text{ mA}$           |          | $\varphi$   |     | $\pm 60$ |     | deg  |
| Forward voltage                  | $I_F = 20\text{ mA}$           |          | $V_F$       |     | 2        | 3   | V    |
| Reverse voltage                  | $I_R = 10\text{ }\mu\text{A}$  |          | $V_R$       | 6   | 15       |     | V    |
| Junction capacitance             | $V_R = 0$ , $f = 1\text{ MHz}$ |          | $C_j$       |     | 50       |     | pF   |

<sup>1)</sup> in one Packing Unit  $I_{Vmin}/I_{Vmax} \leq 0.5$

#### Yellow

TLHY46..

| Parameter                        | Test condition                 | Part     | Symbol      | Min  | Typ.     | Max | Unit |
|----------------------------------|--------------------------------|----------|-------------|------|----------|-----|------|
| Luminous intensity <sup>1)</sup> | $I_F = 10\text{ mA}$           | TLHY4600 | $I_V$       | 0.63 | 2        |     | mcd  |
|                                  |                                | TLHY4601 | $I_V$       | 1    | 3.5      |     | mcd  |
|                                  |                                | TLHY4605 | $I_V$       | 2.5  | 5        |     | mcd  |
| Dominant wavelength              | $I_F = 10\text{ mA}$           |          | $\lambda_d$ | 581  |          | 594 | nm   |
| Peak wavelength                  | $I_F = 10\text{ mA}$           |          | $\lambda_p$ |      | 585      |     | nm   |
| Angle of half intensity          | $I_F = 10\text{ mA}$           |          | $\varphi$   |      | $\pm 60$ |     | deg  |
| Forward voltage                  | $I_F = 20\text{ mA}$           |          | $V_F$       |      | 2.4      | 3   | V    |
| Reverse voltage                  | $I_R = 10\text{ }\mu\text{A}$  |          | $V_R$       | 6    | 15       |     | V    |
| Junction capacitance             | $V_R = 0$ , $f = 1\text{ MHz}$ |          | $C_j$       |      | 50       |     | pF   |

<sup>1)</sup> in one Packing Unit  $I_{Vmin}/I_{Vmax} \leq 0.5$



## Green

### TLHG46..

| Parameter                        | Test condition               | Part     | Symbol      | Min | Typ.     | Max | Unit |
|----------------------------------|------------------------------|----------|-------------|-----|----------|-----|------|
| Luminous intensity <sup>1)</sup> | $I_F = 10 \text{ mA}$        | TLHG4600 | $I_V$       | 1   | 2        |     | mcd  |
|                                  |                              | TLHG4601 | $I_V$       | 1.6 | 3.5      |     | mcd  |
|                                  |                              | TLHG4605 | $I_V$       | 4   | 6        |     | mcd  |
| Dominant wavelength              | $I_F = 10 \text{ mA}$        |          | $\lambda_d$ | 562 |          | 575 | nm   |
| Peak wavelength                  | $I_F = 10 \text{ mA}$        |          | $\lambda_p$ |     | 565      |     | nm   |
| Angle of half intensity          | $I_F = 10 \text{ mA}$        |          | $\phi$      |     | $\pm 60$ |     | deg  |
| Forward voltage                  | $I_F = 20 \text{ mA}$        |          | $V_F$       |     | 2.4      | 3   | V    |
| Reverse voltage                  | $I_R = 10 \mu\text{A}$       |          | $V_R$       | 6   | 15       |     | V    |
| Junction capacitance             | $V_R = 0, f = 1 \text{ MHz}$ |          | $C_j$       |     | 50       |     | pF   |

<sup>1)</sup> in one Packing Unit  $I_{V\min}/I_{V\max} \leq 0.5$

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

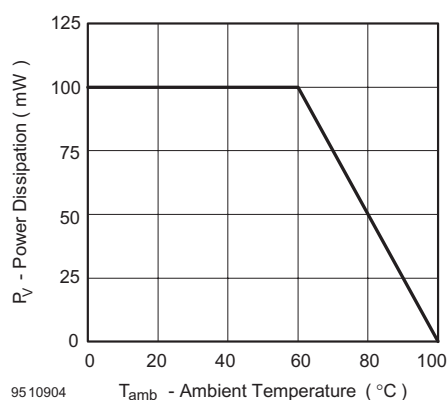


Figure 1. Power Dissipation vs. Ambient Temperature

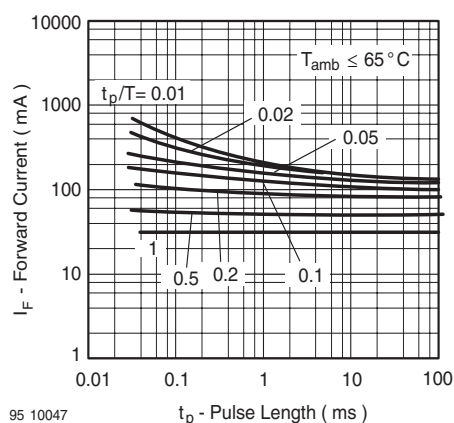


Figure 3. Forward Current vs. Pulse Length

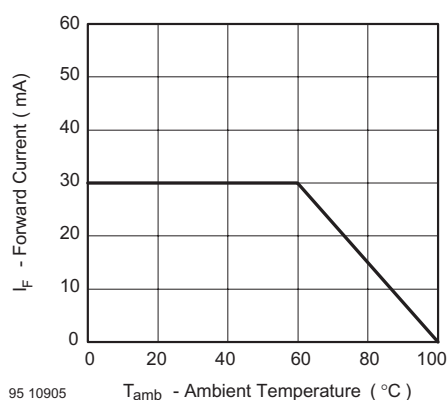


Figure 2. Forward Current vs. Ambient Temperature for InGaN

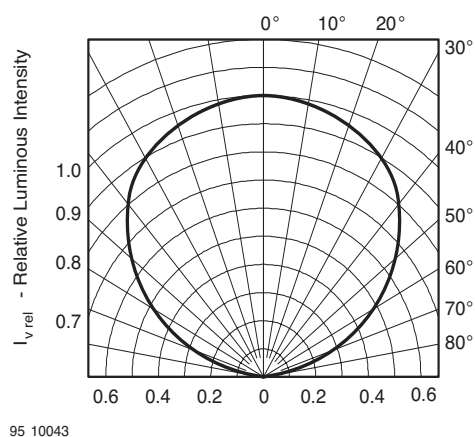


Figure 4. Rel. Luminous Intensity vs. Angular Displacement

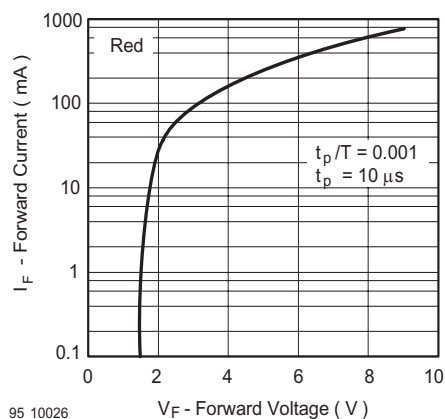


Figure 5. Forward Current vs. Forward Voltage

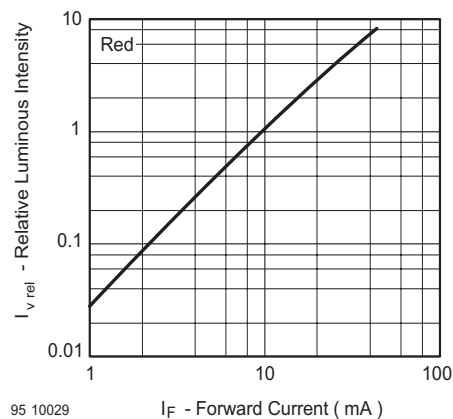


Figure 8. Relative Luminous Intensity vs. Forward Current

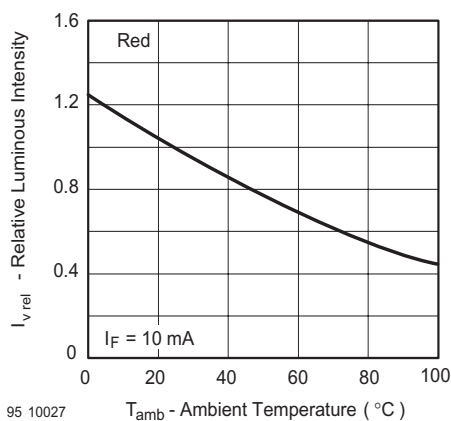


Figure 6. Rel. Luminous Intensity vs. Ambient Temperature

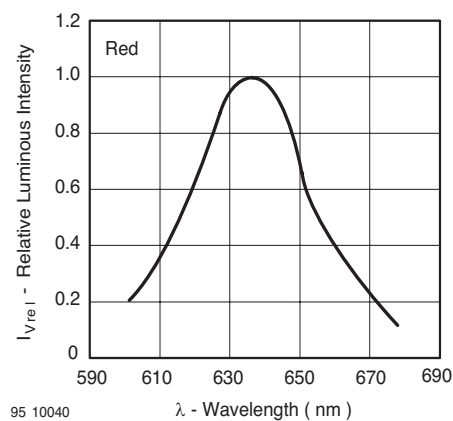


Figure 9. Relative Intensity vs. Wavelength

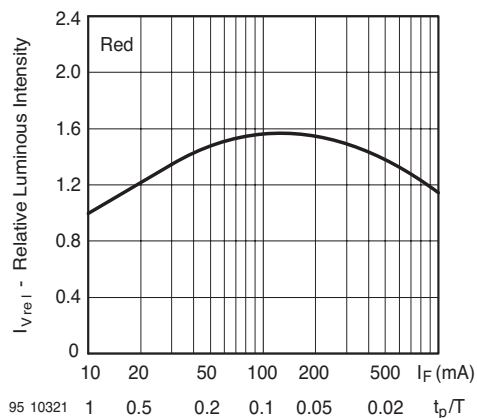


Figure 7. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

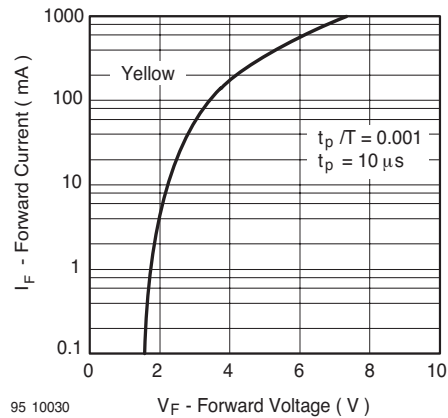


Figure 10. Forward Current vs. Forward Voltage

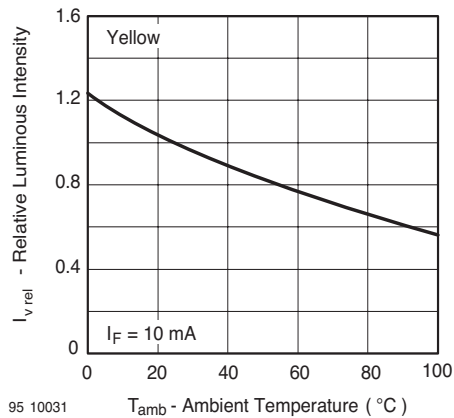


Figure 11. Rel. Luminous Intensity vs. Ambient Temperature

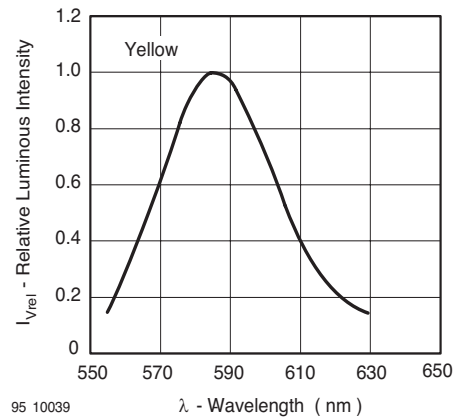


Figure 14. Relative Intensity vs. Wavelength

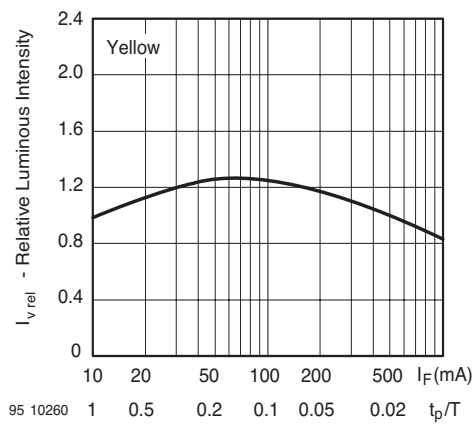


Figure 12. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

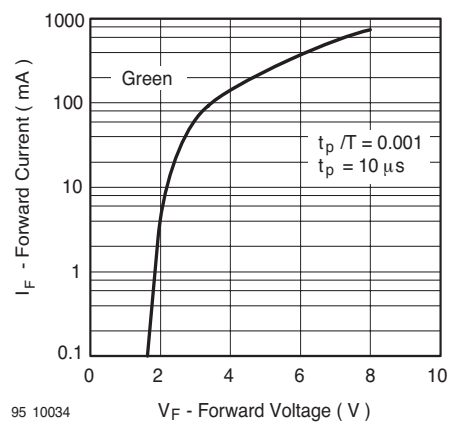


Figure 15. Forward Current vs. Forward Voltage

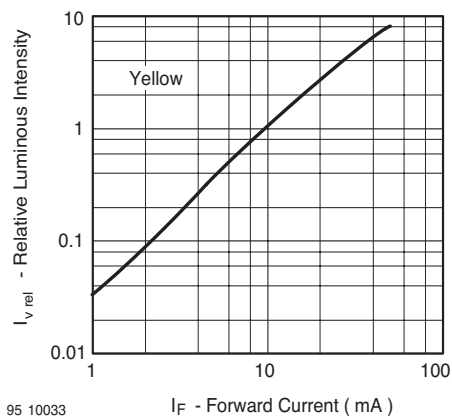


Figure 13. Relative Luminous Intensity vs. Forward Current

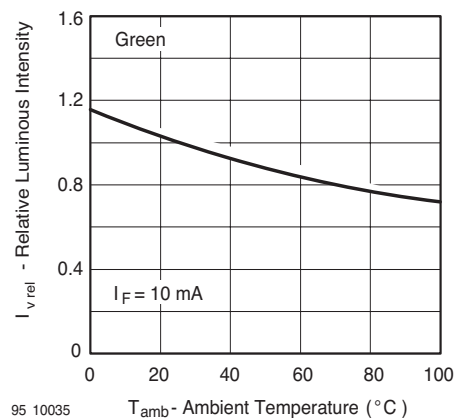


Figure 16. Rel. Luminous Intensity vs. Ambient Temperature

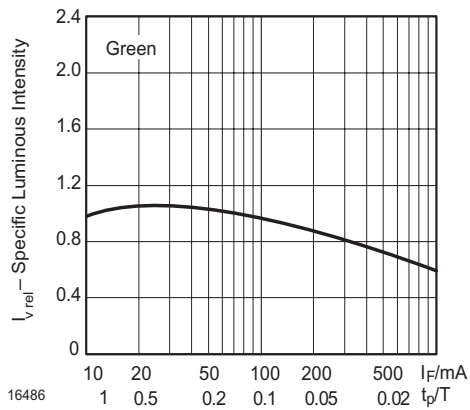


Figure 17. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

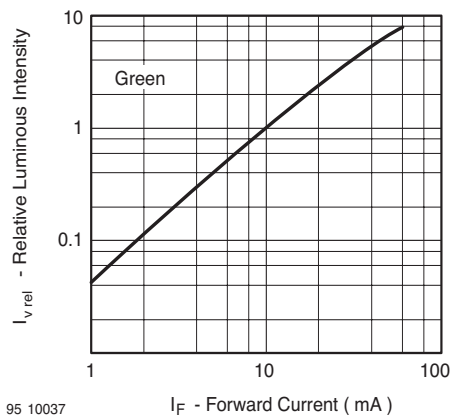


Figure 18. Relative Luminous Intensity vs. Forward Current

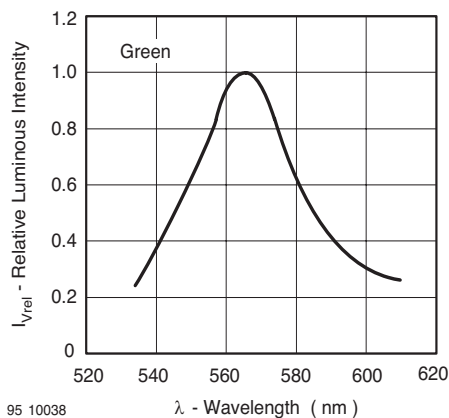
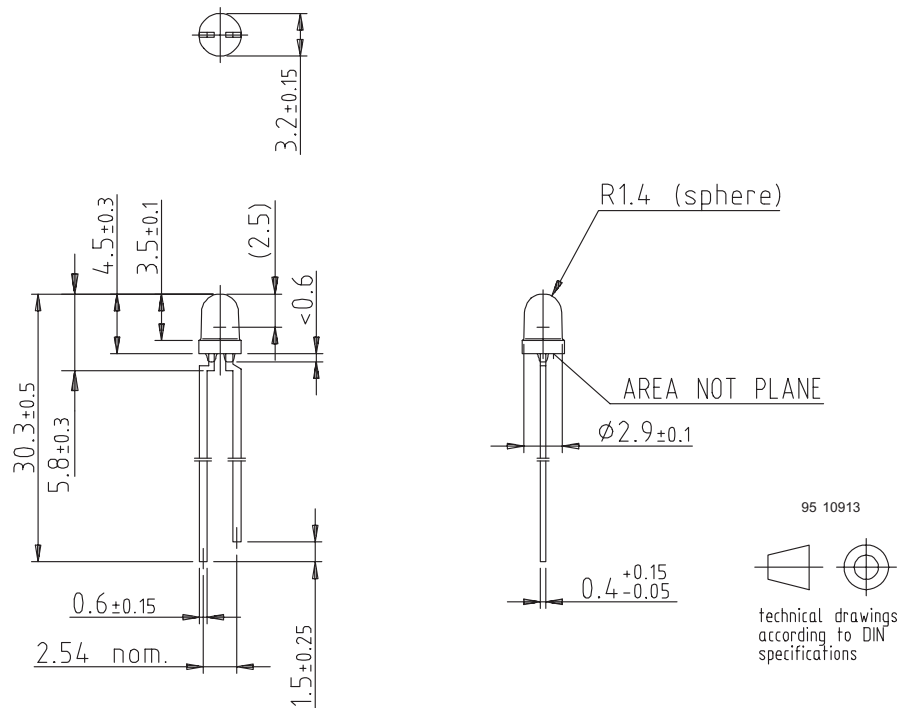


Figure 19. Relative Intensity vs. Wavelength

## Package Dimensions 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.

**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.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany  
Telephone: 49 (0)7131 67 2831, Fax number: 49 (0)7131 67 2423