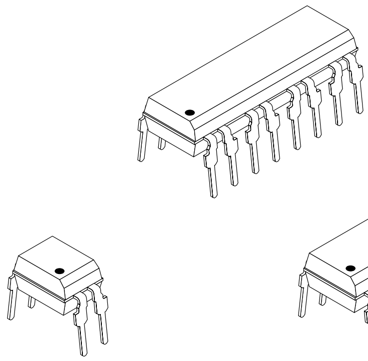
# Optocoupler with Phototransistor Output

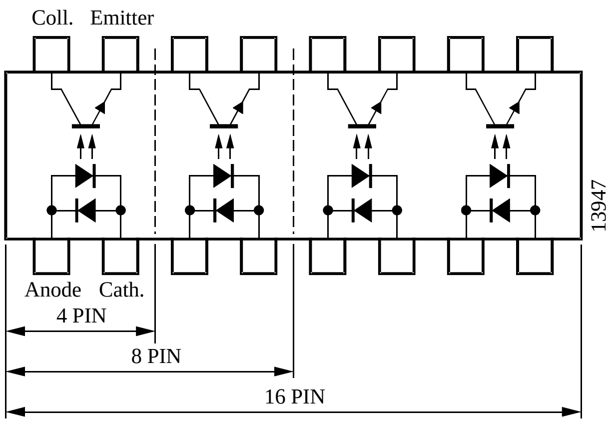
## Description

The K814P/ K824P/ K844P consist of a phototransistor optically coupled to 2 gallium arsenide infrared-emitting diodes (reversed polarity) in an 4-lead up to 16-lead plastic dual inline package.
The elements are mounted on one leadframe using a **coplanar technique,** providing a fixed distance between input and output for highest safety requirements.




## Applications

Feature phones, answering machines, PABX, fax machines




## Features

- Endstackable to 2.54 mm (0.1’) spacing
- DC isolation test voltage $V_{IO}$ = 5 kV
- Low coupling capacitance of typical 0.3 pF
- **C**urrent **T**ransfer **R**atio (CTR) of typical 100%
- Low temperature coefficient of CTR
- Wide ambient temperature range
- **U**nderwriters **L**aboratory (UL) 1577 recognized, file number E-76222
- **CSA** (C–UL) 1577 recognized, file number E-76222 – Double Protection
- Coupling System U

## Order Instruction

| Ordering Code | CTR Ranking | Remarks |
|---|---|---|
| K814P | < 20% | 4 Pin Single channel |
| K824P | < 20% | 8 Pin Dual channel |
| K844P | < 20% | 16 Pin Quad channel |

## 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 | $t_p \leq 10\ \mu s$ | $I_{FSM}$ | ±1.5 | A |
| Power dissipation | $T_{amb} \leq 25^\circ C$ | $P_V$ | 100 | mW |
| Junction temperature | | $T_j$ | 125 | °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 | | $I_C$ | 50 | mA |
| Peak collector current | $t_p/T = 0.5$, $t_p \leq 10$ ms | $I_{CM}$ | 100 | mA |
| Power dissipation | $T_{amb} \leq 25^\circ C$ | $P_V$ | 150 | mW |
| Junction temperature | | $T_j$ | 125 | °C |

### Coupler

| Parameter | Test Conditions | Symbol | Value | Unit |
|---|---|---|---|---|
| AC Isolation test voltage (RMS) | t = 1 min | $V_{IO}$ [1)] | 5 | kV |
| Total power dissipation | $T_{amb} \leq 25^\circ C$ | $P_{tot}$ | 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, $t \leq 10$ s | $T_{sd}$ | 260 | °C |
| [1)] Related to standard climate 23/50 DIN 50014 | | | | |

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

### Input (Emitter)

| Parameter | Test Conditions | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Forward voltage | $I_F$ = ±50 mA | $V_F$ | | 1.25 | 1.6 | V |
| Reverse current | $V_R$ = ±6 V | $I_R$ | | | 10 | μA |

### Output (Detector)

| Parameter | Test Conditions | 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 Conditions | 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 (CTR)

| Parameter | Test Conditions | Type | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_C/I_F$ | $V_{CE}$ = 5 V, $I_F$ = ± 5 mA | | CTR | 0.2 | | 3.0 | |

## Switching Characteristics

| Parameter | Test Conditions | Symbol | Typ. | 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 | | $t_r$ | 3.0 | μs |
| Fall time | | $t_f$ | 4.7 | μs |
| Storage time | | $t_s$ | 0.3 | μs |
| Turn-on time | | $t_{on}$ | 6.0 | μs |
| Turn-off time | | $t_{off}$ | 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 | | $t_{off}$ | 18.0 | μs |

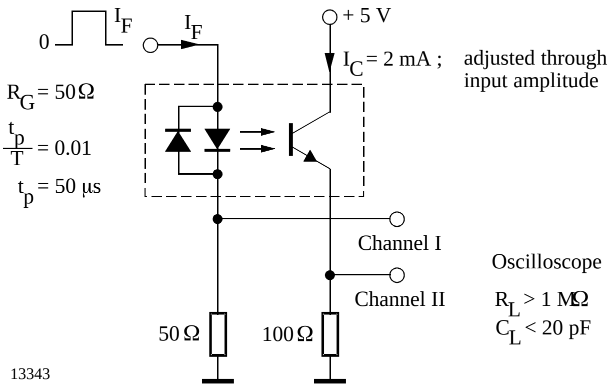



Figure 1.  Test circuit, non-saturated operation

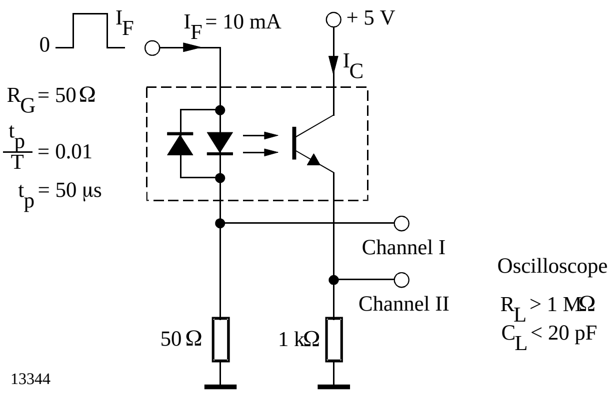



Figure 2.  Test circuit, saturated operation

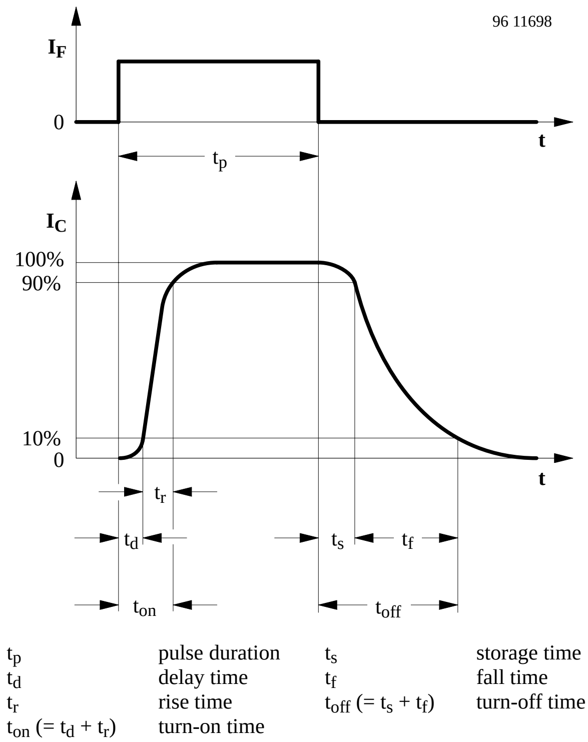



Figure 3.  Switching times

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

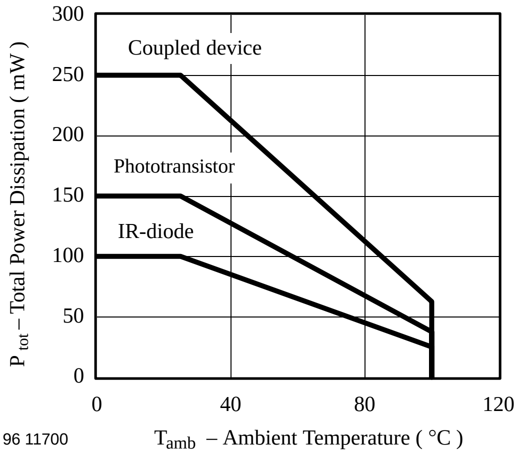



Figure 4. Total Power Dissipation vs. Ambient Temperature

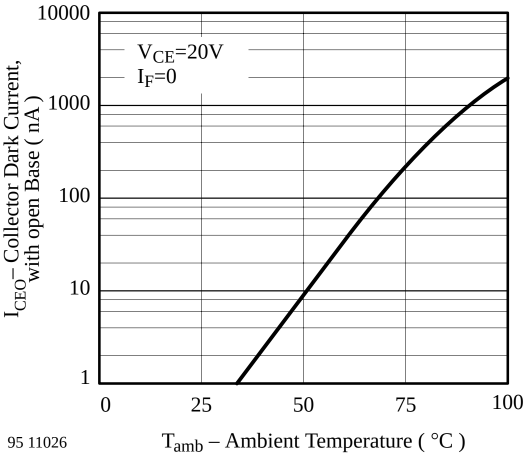



Figure 7. Collector Dark Current vs. Ambient Temperature

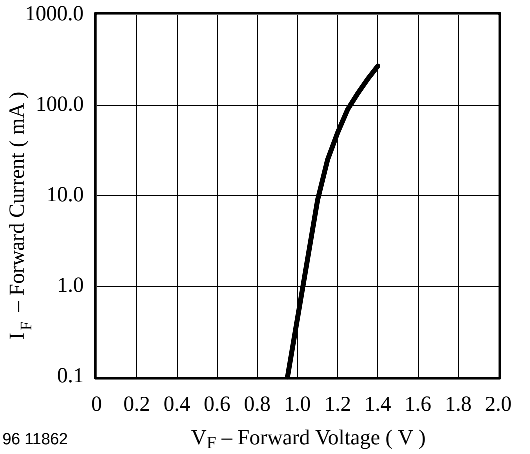



Figure 5. Forward Current vs. Forward Voltage

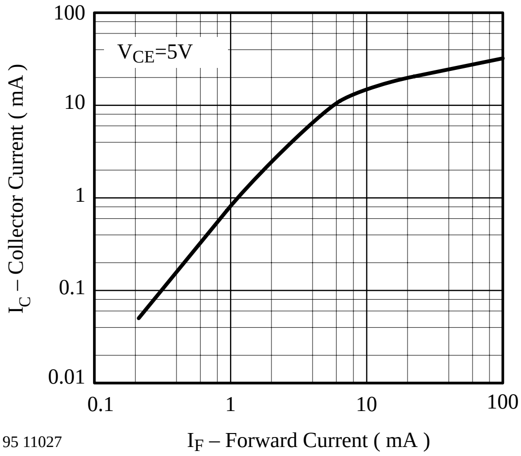



Figure 8. Collector Current vs. Forward Current

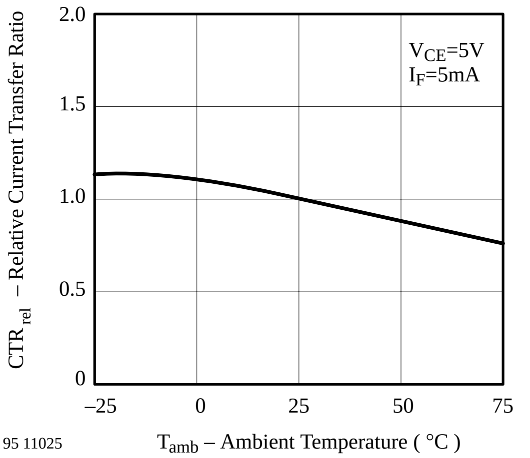



Figure 6. Relative Current Transfer Ratio vs. Ambient Temperature

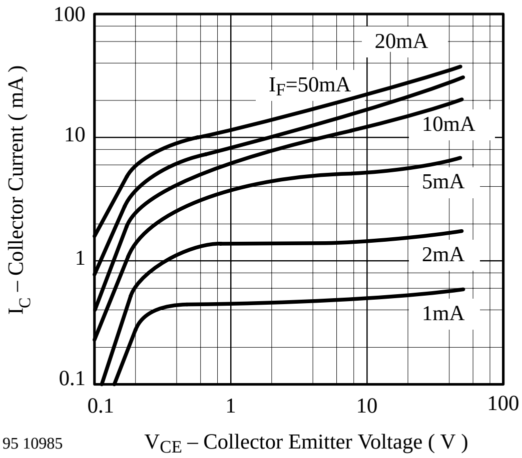



Figure 9. Collector Current vs. Collector Emitter Voltage

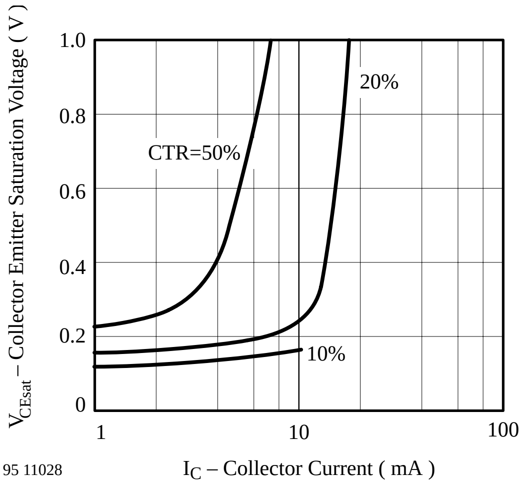



Figure 10. Collector Emitter Saturation Voltage vs. Collector Current

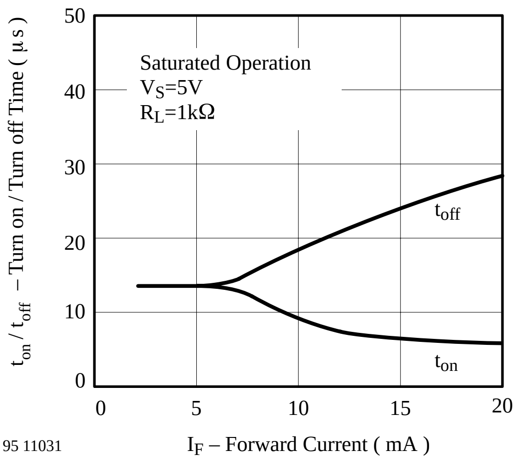



Figure 12. Turn on / off Time vs. Forward Current

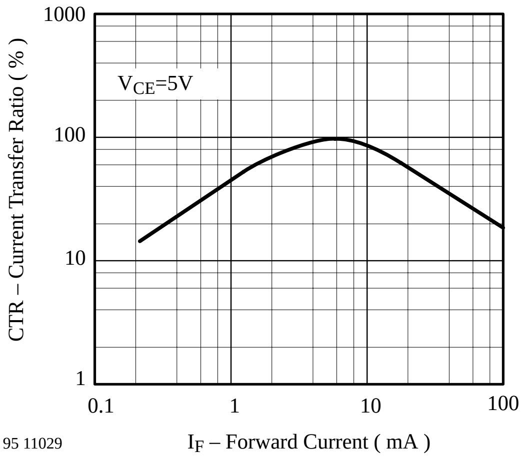



Figure 11. Current Transfer Ratio vs. Forward Current

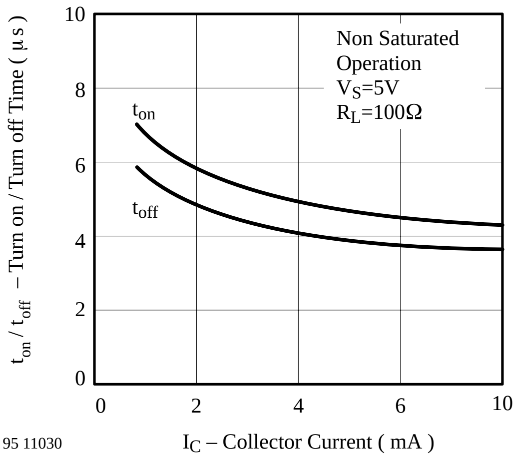



Figure 13. Turn on / off Time vs. Collector Current

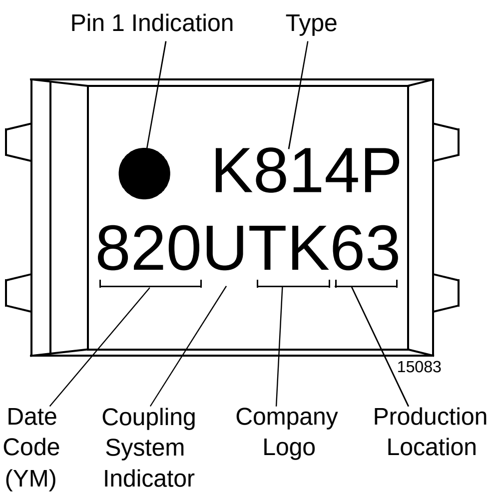
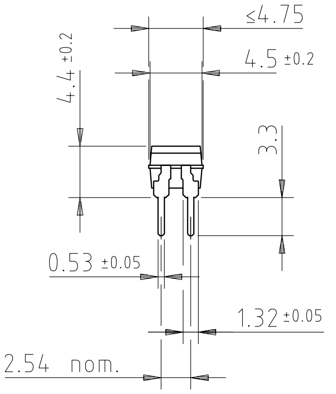
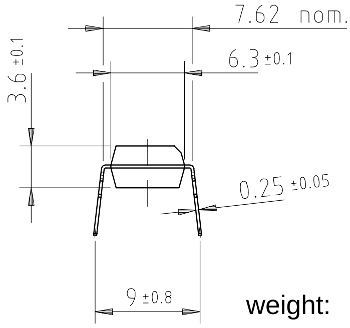



Figure 14. Marking example

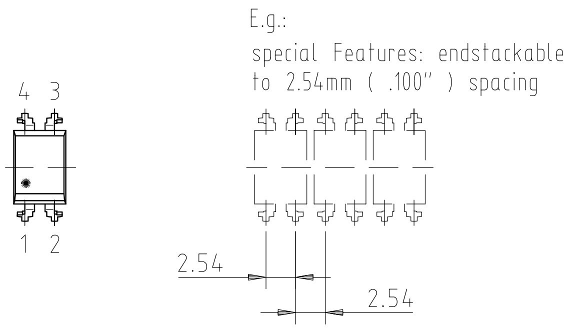
## Dimensions of K814P in mm

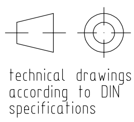



weight: ca. 0.25 g
creepage distance: ≧ 6 mm
air path: ≧ 6 mm

after mounting on PC board

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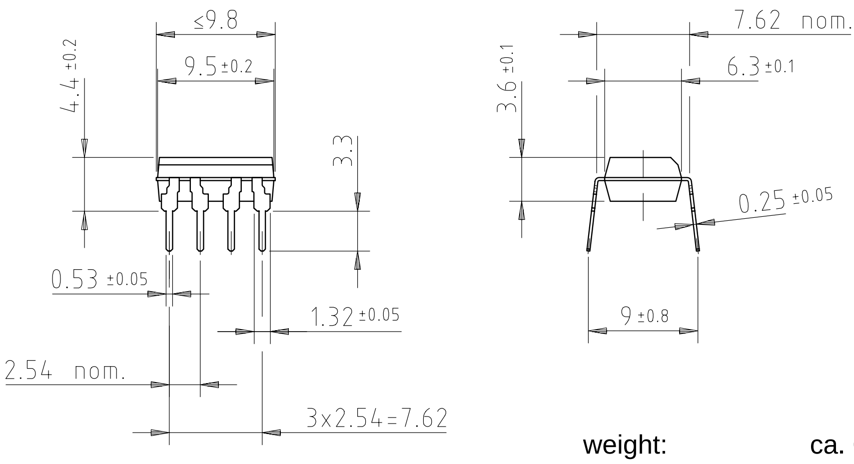
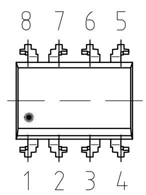
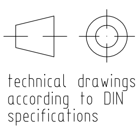
## Dimensions of K824P in mm




weight: ca. 0.55 g
creepage distance: ≧ 6 mm
air path: ≧ 6 mm

after mounting on PC board

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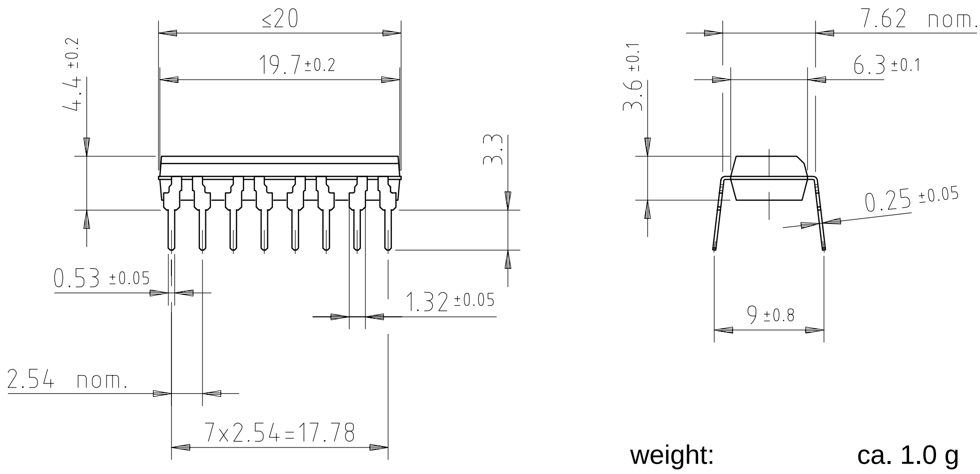
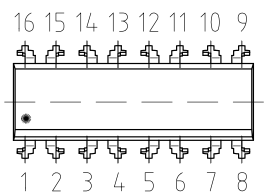
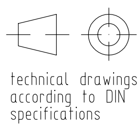
## Dimensions of K844P in mm




weight: ca. 1.0 g
creepage distance: ≧ 6 mm
air path: ≧ 6 mm

after mounting on PC board

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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 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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