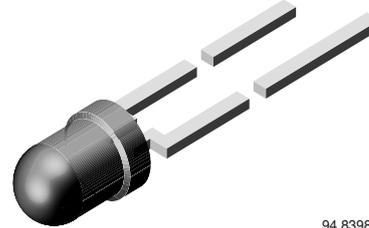


## High Speed Infrared Emitting Diode, 870 nm, GaAlAs Double Hetero

### Description

The TSHA440..series are high efficiency infrared emitting diodes in GaAlAs on GaAlAs technology, molded in a clear, untinted plastic package.

In comparison with the standard GaAs on GaAs technology these high intensity emitters feature about 50 % radiant power improvement.



94 8398

### Features

- Extra high radiant power
- High radiant intensity for long transmission distance
- Suitable for high pulse current operation
- Standard T-1 (Ø 3 mm) package for low space application
- Angle of half intensity  $\phi = \pm 20^\circ$
- Peak wavelength  $\lambda_p = 875 \text{ nm}$
- High reliability
- Good spectral matching to Si photodetectors
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

### Applications

Infrared remote control and free air transmission systems with high power requirements in combination with PIN photodiodes or phototransistors.

Because of the very low radiance absorption in glass at the wavelength of 875 nm, this emitter series is also suitable for systems with panes in the transmission range between emitter and detector.

### Absolute Maximum Ratings

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

| Parameter                           | Test condition                          | Symbol            | Value         | Unit             |
|-------------------------------------|---|-------------------|---------------|------------------|
| Reverse Voltage                     |   | $V_R$             | 5             | V                |
| Forward current                     |   | $I_F$             | 100           | mA               |
| Peak Forward Current                | $t_p/T = 0.5$ , $t_p = 100 \mu\text{s}$ | $I_{FM}$          | 200           | mA               |
| Surge Forward Current               | $t_p = 100 \mu\text{s}$                 | $I_{FSM}$         | 2             | A                |
| Power Dissipation                   |   | $P_V$             | 180           | mW               |
| Junction Temperature                |   | $T_j$             | 100           | $^\circ\text{C}$ |
| Operating Temperature Range         |   | $T_{\text{amb}}$  | - 55 to + 100 | $^\circ\text{C}$ |
| Storage Temperature Range           |   | $T_{\text{stg}}$  | - 55 to + 100 | $^\circ\text{C}$ |
| Soldering Temperature               | $t \leq 5 \text{ sec}$ , 2 mm from case | $T_{\text{sd}}$   | 260           | $^\circ\text{C}$ |
| Thermal Resistance Junction/Ambient |   | $R_{\text{thJA}}$ | 450           | K/W              |

### Electrical Characteristics

T<sub>amb</sub> = 25 °C, unless otherwise specified

| Parameter                           | Test condition                                  | Symbol                      | Min | Typ.  | Max | Unit |
|-------------------------------------|---|-----------------------------|-----|-------|-----|------|
| Forward Voltage                     | I <sub>F</sub> = 100 mA, t <sub>p</sub> = 20 ms | V <sub>F</sub>              |     | 1.5   | 1.8 | V    |
|                                     | I <sub>F</sub> = 1.5 A, t <sub>p</sub> = 100 μs | V <sub>F</sub>              |     | 3.2   | 4.9 | V    |
| Temp. Coefficient of V <sub>F</sub> | I <sub>F</sub> = 100 mA                         | TK <sub>V<sub>F</sub></sub> |     | - 1.6 |     | mV/K |
| Reverse Current                     | V <sub>R</sub> = 5 V                            | I <sub>R</sub>              |     |       | 100 | μA   |
| Junction capacitance                | V <sub>R</sub> = 0 V, f = 1 MHz, E = 0          | C <sub>j</sub>              |     | 20    |     | pF   |

### Optical Characteristics

T<sub>amb</sub> = 25 °C, unless otherwise specified

| Parameter                           | Test condition          | Symbol           | Min | Typ.  | Max | Unit |
|-------------------------------------|-------------------------|------------------|-----|-------|-----|------|
| Temp. Coefficient of φ <sub>e</sub> | I <sub>F</sub> = 100 mA | TKφ <sub>e</sub> |     | - 0.7 |     | %/K  |
| Angle of Half Intensity             |                         | φ                |     | ± 20  |     | deg  |
| Peak Wavelength                     | I <sub>F</sub> = 100 mA | λ <sub>p</sub>   |     | 875   |     | nm   |
| Spectral Bandwidth                  | I <sub>F</sub> = 100 mA | Δλ               |     | 80    |     | nm   |
| Temp. Coefficient of λ <sub>p</sub> | I <sub>F</sub> = 100 mA | TKλ <sub>p</sub> |     | 0.2   |     | nm/K |
| Rise Time                           | I <sub>F</sub> = 100 mA | t <sub>r</sub>   |     | 600   |     | ns   |
|                                     | I <sub>F</sub> = 1.5 A  | t <sub>r</sub>   |     | 300   |     | ns   |
| Fall Time                           | I <sub>F</sub> = 100 mA | t <sub>f</sub>   |     | 600   |     | ns   |
|                                     | I <sub>F</sub> = 1.5 A  | t <sub>f</sub>   |     | 300   |     | ns   |
| Virtual Source Diameter             |                         | ∅                |     | 1.8   |     | mm   |

### Type Dedicated Characteristics

T<sub>amb</sub> = 25 °C, unless otherwise specified

| Parameter         | Test condition                                   | Part     | Symbol         | Min | Typ. | Max | Unit  |
|-------------------|--|----------|----------------|-----|------|-----|-------|
| Radiant Intensity | I <sub>F</sub> = 100 mA, t <sub>p</sub> = 20 ms  | TSHA4400 | I <sub>e</sub> | 12  | 20   | 60  | mW/sr |
|                   |  | TSHA4401 | I <sub>e</sub> | 16  | 30   | 60  | mW/sr |
|                   | I <sub>F</sub> = 1.5 mA, t <sub>p</sub> = 100 μs | TSHA4400 | I <sub>e</sub> | 140 | 240  |     | mW/sr |
|                   |  | TSHA4401 | I <sub>e</sub> | 190 | 360  |     | mW/sr |
| Radiant Power     | I <sub>F</sub> = 100 mA, t <sub>p</sub> = 20 ms  | TSHA4400 | φ <sub>e</sub> |     | 20   |     | mW    |
|                   |  | TSHA4401 | φ <sub>e</sub> |     | 24   |     | mW    |

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

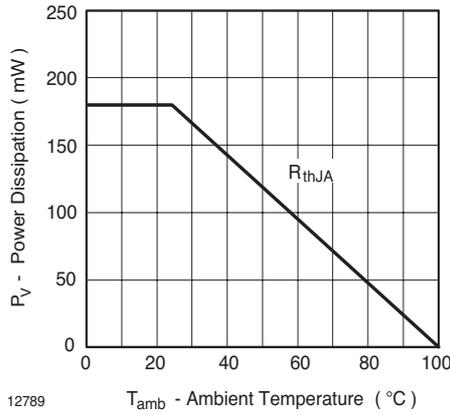


Figure 1. Power Dissipation vs. Ambient Temperature

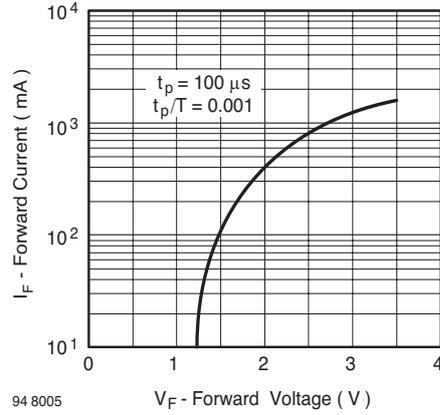


Figure 4. Forward Current vs. Forward Voltage

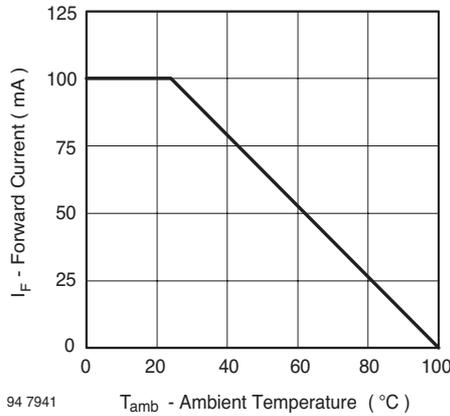


Figure 2. Forward Current vs. Ambient Temperature

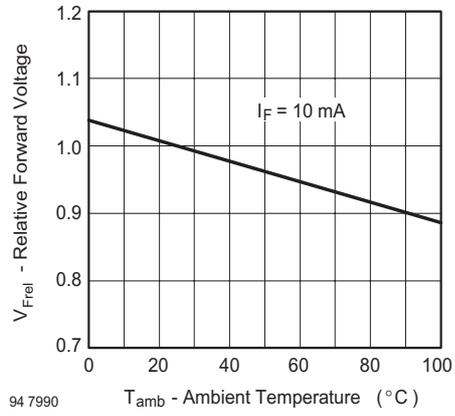


Figure 5. Relative Forward Voltage vs. Ambient Temperature

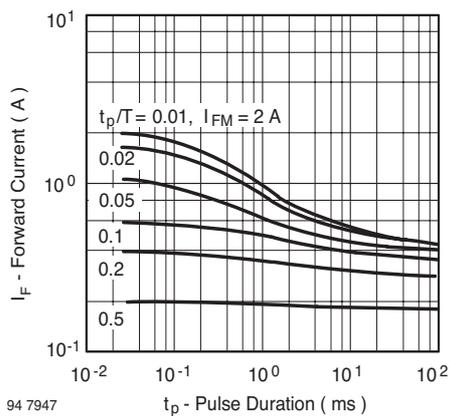


Figure 3. Pulse Forward Current vs. Pulse Duration

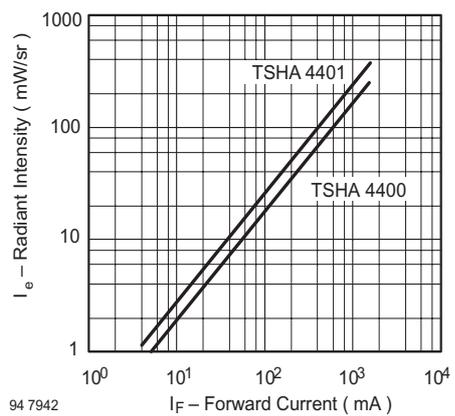


Figure 6. Radiant Intensity vs. Forward Current

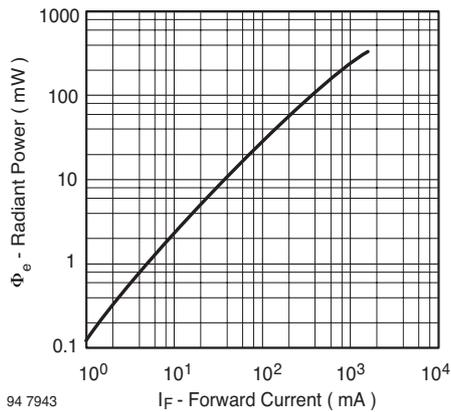


Figure 7. Radiant Power vs. Forward Current

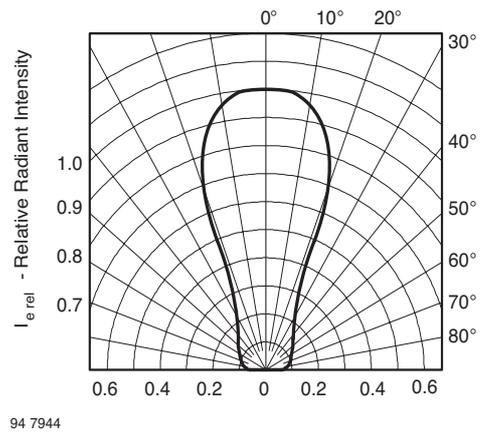


Figure 10. Relative Radiant Intensity vs. Angular Displacement

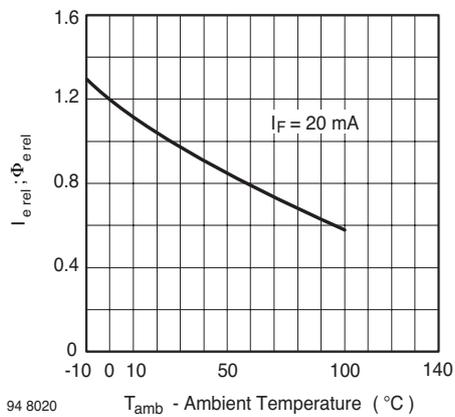


Figure 8. Rel. Radiant Intensity/Power vs. Ambient Temperature

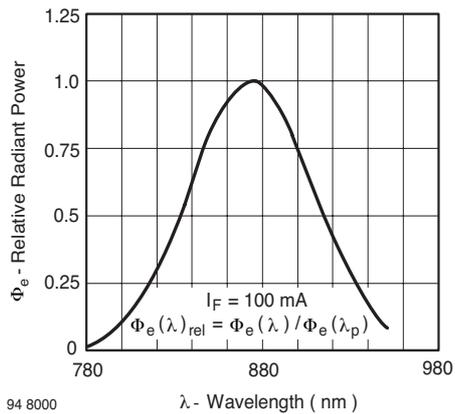
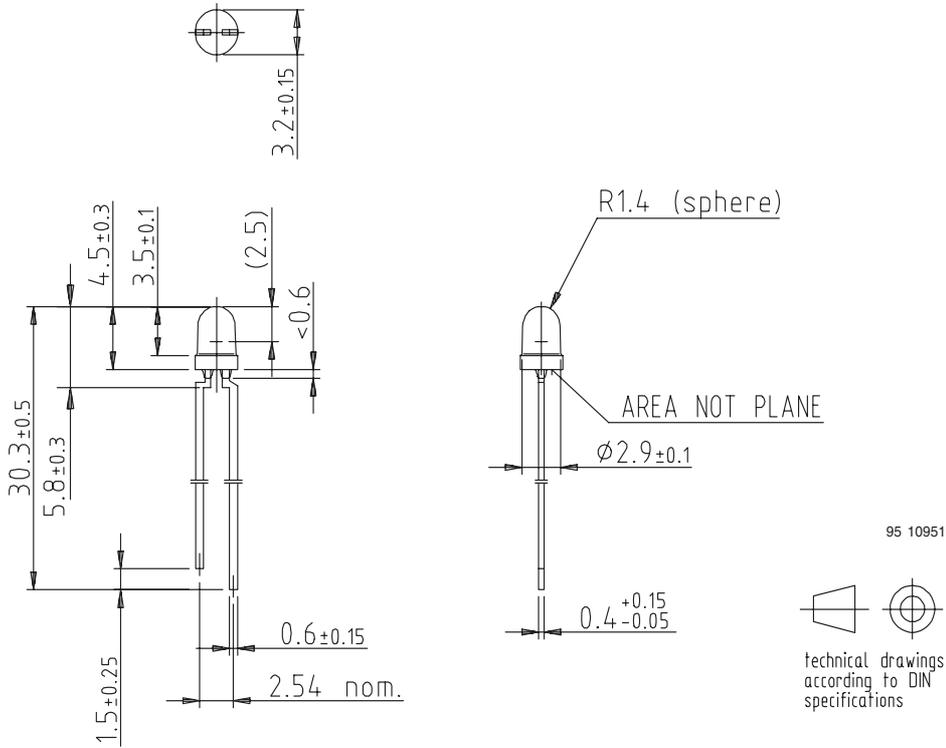


Figure 9. Relative Radiant Power vs. Wavelength

## 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



### Notice

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.