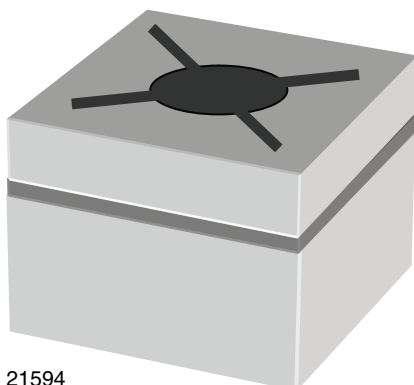


## Specification of GaAlAs IR Emitting Diode Chip



21594

### FEATURES

- Package type: chip
- Package form: single chip
- Technology: double hetero
- Dimensions chip (L x W x H in mm): 0.37 x 0.37 x 0.19
- Peak wavelength:  $\lambda = 940$  nm
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### DESCRIPTION

TB9414VA is an infrared, 940 nm emitting diode in GaAlAs double hetero technology with high radiant power and high speed. Anode is the bond pad on top.

### GENERAL INFORMATION

The datasheet is based on Vishay optoelectronics sample testing under certain predetermined and assumed conditions, and is provided for illustration purpose only. Customers are encouraged to perform testing in actual proposed packaged and used conditions. Vishay optoelectronics die products are tested using Vishay optoelectronics based quality assurance procedures and are manufactured using Vishay optoelectronics established processes. Estimates such as those described and set forth in this datasheet for semiconductor die will vary depending on a number of packaging, handling, use, and other factors. Therefore sold die may not perform on an equivalent basis to standard package products.

### PRODUCT SUMMARY

| COMPONENT | $\phi_e$ (mW) | $I_e$ (mW/sr) | $\phi$ (deg) | $\lambda_p$ (nm) | $t_r$ (ns) |
|-----------|---------------|---------------|--------------|------------------|------------|
| TB9414VA  | 21            | 4.3           | $\pm 80$     | 940              | 15         |

#### Note

- Test condition see table "Basic Characteristics"

### ORDERING INFORMATION

| ORDERING CODE | PACKAGING          | REMARKS         | PACKAGE FORM |
|---------------|--------------------|-----------------|--------------|
| TB9414VA-SF-F | wafer sawn on foil | MOQ: 40 000 pcs | chip         |

#### Note

- MOQ: minimum order quantity

### ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25$ °C, unless otherwise specified)

| PARAMETER                         | TEST CONDITION      | SYMBOL     | VALUE       | UNIT |
|-----------------------------------|---------------------|------------|-------------|------|
| Forward current                   |                     | $I_F$      | 100         | mA   |
| Reverse voltage                   |                     | $V_R$      | 5           | V    |
| Surge forward current             | $t_p = 100$ $\mu$ s | $I_{FSM}$  | 1           | A    |
| Junction temperature              |                     | $T_j$      | 125         | °C   |
| Operating temperature range       |                     | $T_{amb}$  | -40 to +100 | °C   |
| Storage temperature range chip    |                     | $T_{stg1}$ | -40 to +100 | °C   |
| Storage temperature range on foil |                     | $T_{stg2}$ | -40 to +50  | °C   |

| <b>BASIC CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                               |                 |      |            |      |       |
|-----------------------------------------------------------------------------------------------------|-------------------------------|-----------------|------|------------|------|-------|
| PARAMETER                                                                                           | TEST CONDITION                | SYMBOL          | MIN. | TYP.       | MAX. | UNIT  |
| Forward voltage                                                                                     | $I_F = 100\text{ mA}$         | $V_F$           | 1.1  | 1.35       | 1.6  | V     |
| Radiant power <sup>(1)</sup>                                                                        | $I_F = 100\text{ mA}$         | $\phi_e$        | 13.7 | 21         | 28   | mW    |
| Radiant intensity <sup>(2)</sup>                                                                    | $I_F = 100\text{ mA}$         | $I_e$           | 2.8  | 4.3        | 5.8  | mW/sr |
| Radiant power (epoxy encapsulated)                                                                  | $I_F = 100\text{ mA}$         | $\phi_e$        | 29   | 44         | 60   | mW    |
| Radiant power chip <sup>(3)</sup>                                                                   | $I_F = 50\text{ mA}$          | $\phi_e$        | 3.4  | 5.2        | 7    | mW    |
| Temperature coefficient of radiant power                                                            | $I_F = 100\text{ mA}$         | $TK_{\phi_e}$   |      | -0.51      |      | %/K   |
| Reverse voltage                                                                                     | $I_R = 10\text{ }\mu\text{A}$ | $V_R$           | 5    | 17         | 50   | V     |
| Temperature coefficient of forward voltage                                                          | $I_F = 1\text{ mA}$           | $TK_{V_F}$      |      | -1.8       |      | mV/K  |
| Angle of half intensity                                                                             | $I_F = 100\text{ mA}$         | $\phi$          |      | $> \pm 80$ |      | deg   |
| Peak wavelength                                                                                     | $I_F = 30\text{ mA}$          | $\lambda_p$     | 920  | 940        | 960  | nm    |
| Spectral bandwidth                                                                                  | $I_F = 30\text{ mA}$          | $\lambda_{0.5}$ | 15   | 25         | 45   | nm    |
| Rise time/fall time                                                                                 | $I_F = 100\text{ mA}$         | $t_r, t_f$      | 7    | 15         | 25   | ns    |

**Notes**

- (1) The measurements are based on samples of die which are mounted on a TO-18 gold header without resin coating
- (2) The radiant intensity,  $I_e$ , is measured on the geometric axis of the TO-18 header
- (3) The radiant power,  $\phi_e$ , is measured with chip on bare plate and aperture angle about  $30^{\circ}$ , as indicated on the label of each wafer

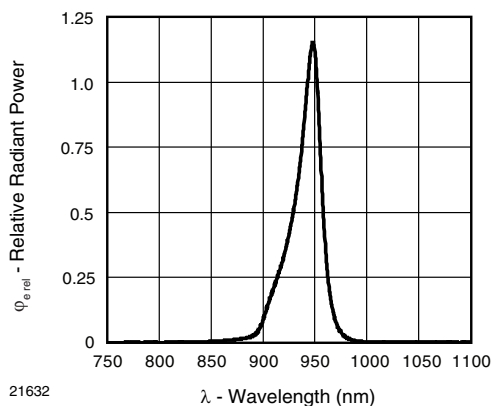
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Relative Spectral Emission  
 $\phi_{e,rel} = f(\lambda)$

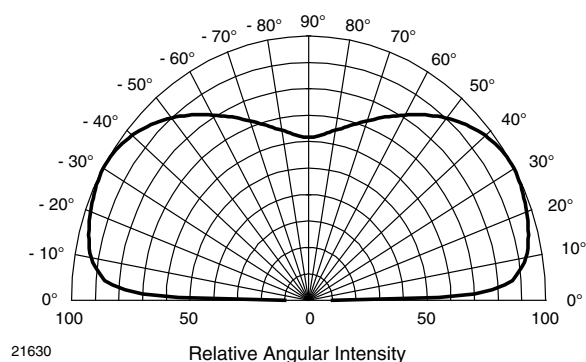
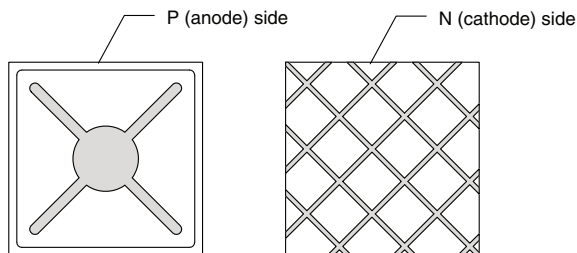


Fig. 2 - Radiant Characteristics  
 $I_{rel} = f(\phi)$

**DIMENSIONS**

Electrode pattern:



Sectional view (schematic):

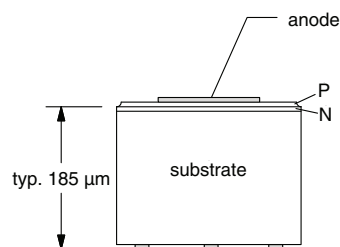


Fig. 3

**MECHANICAL DIMENSIONS**

| PARAMETER                         | SYMBOL | MIN.          | TYP. | MAX. | UNIT            |
|-----------------------------------|--------|---------------|------|------|-----------------|
| Length of chip edge (x-direction) | $L_x$  |               | 0.37 |      | mm              |
| Length of chip edge (y-direction) | $L_y$  |               | 0.37 |      | mm              |
| Emission area                     | $A_E$  | 0.325 x 0.325 |      |      | mm <sup>2</sup> |
| Die height                        | H      |               | 0.19 |      | mm              |
| Diameter of bondpad               | d      |               | 0.11 |      | mm              |

**ADDITIONAL INFORMATION**

|                                 |               |
|---------------------------------|---------------|
| Frontside metallization, anode  | aluminum      |
| Backside metallization, cathode | gold alloy    |
| Dicing                          | sawing        |
| Die bonding technology          | epoxy bonding |

**Note**

- All chips are checked in accordance with the Vishay Semiconductor, specification of visual inspection FVOV6870. The visual inspection shall be made in accordance with the "specification of visual inspection as referenced". The visual inspection of chip backside is performed with stereo microscope with incident light and 40x to 80x magnification. The quality inspection (final visual inspection) is performed by production. An additional visual inspection step as special release procedure by QM is not installed.

**HANDLING AND STORAGE CONDITIONS**

- The hermetically sealed shipment lots shall be opened in temperature and moisture controlled cleanroom environment only. It is mandatory to follow the rules for disposition of material that can be hazardous for humans and environment.
- Product must be handled only at ESD safe workstations. Standard ESD precautions and safe work environments are as defined in MIL-HDBK-263.
- Singulated die are not to be handled with tweezers. A vacuum wand with non metallic ESD protected tip should be used.

**PACKING**

Chips are fixed on adhesive foil. Upon request the foils can be mounted on plastic frame or disco frame. For shipment, the wafers are arranged to stacks and hermetically sealed in plastic bags to ensure protection against environmental influence (humidity and contamination).

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