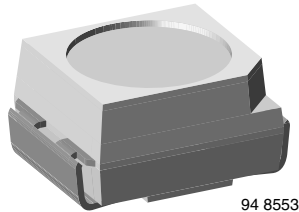


# High Speed Infrared Emitting Diode, 940 nm, GaAlAs Double Hetero



## DESCRIPTION

VSMB3940X01 is an infrared, 940 nm emitting diode in GaAlAs double hetero (DH) technology with high radiant power and high speed, molded in a PLCC-2 package for surface mounting (SMD).

## FEATURES

- Package type: surface mount
- Package form: PLCC-2
- Dimensions (L x W x H in mm): 3.5 x 2.8 x 1.75
- Peak wavelength:  $\lambda_p = 940$  nm
- High reliability
- High radiant power
- High radiant intensity
- Angle of half intensity:  $\varphi = \pm 60^\circ$
- Low forward voltage
- Suitable for high pulse current operation
- High modulation bandwidth:  $f_c = 24$  MHz
- Good spectral matching with Si photodetectors
- Floor life: 168 h, MSL 3, acc. J-STD-020
- Lead (Pb)-free reflow soldering acc. J-STD-020
- AEC-Q101 qualified
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Find out more about Vishay's Automotive Grade Product requirements at: [www.vishay.com/applications](http://www.vishay.com/applications)

 AUTOMOTIVE  
GRADE

**RoHS**  
COMPLIANT  
**GREEN**  
[5-2008]\*\*

## APPLICATIONS

- IrDA compatible data transmission
- Miniature light barrier
- Photointerrupters
- Optical switch
- Control and drive circuits
- Shaft encoders

## PRODUCT SUMMARY

COMPONENT	$I_e$ (mW/sr)	$\varphi$ (deg)	$\lambda_p$ (nm)	$t_r$ (ns)
VSMB3940X01	13	$\pm 60$	940	15

### Note

Test conditions see table "Basic Characteristics"

## ORDERING INFORMATION

ORDERING CODE	PACKAGING	REMARKS	PACKAGE FORM
VSMB3940X01-GS08	Tape and reel	MOQ: 7500 pcs, 1500 pcs/reel	PLCC-2
VSMB3940X01-GS18	Tape and reel	MOQ: 8000 pcs, 8000 pcs/reel	PLCC-2

### Note

MOQ: minimum order quantity

\*\* Please see document "Vishay Material Category Policy": [www.vishay.com/doc?99902](http://www.vishay.com/doc?99902)

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage		$V_R$	5	V
Forward current		$I_F$	100	mA
Peak forward current	$t_p/T = 0.5$ , $t_p = 100 \mu s$	$I_{FM}$	200	mA
Surge forward current	$t_p = 100 \mu s$	$I_{FSM}$	1.5	A
Power dissipation		$P_V$	160	mW
Junction temperature		$T_j$	100	$^{\circ}C$
Operating temperature range		$T_{amb}$	- 40 to + 85	$^{\circ}C$
Storage temperature range		$T_{stg}$	- 40 to + 100	$^{\circ}C$
Soldering temperature	$t \leq 5$ s, 2 mm from case	$T_{sd}$	260	$^{\circ}C$
Thermal resistance junction/ambient	J-STD-051, leads 7 mm, soldered on PCB	$R_{thJA}$	250	K/W

**Note**

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

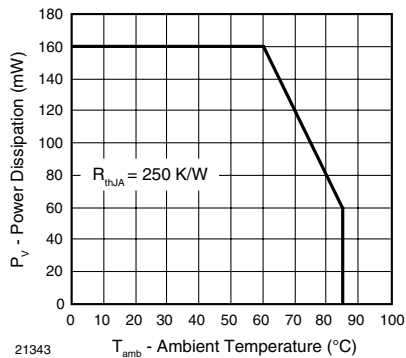


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

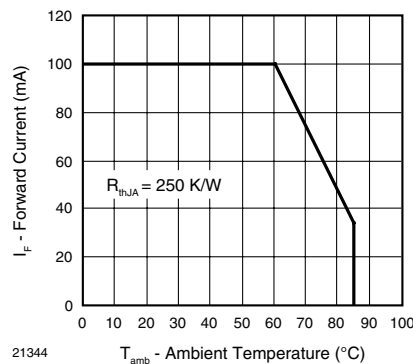


Fig. 2 - Forward Current Limit vs. Ambient Temperature

BASIC CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Forward voltage	$I_F = 100$ mA, $t_p = 20$ ms	$V_F$	1.15	1.35	1.6	V
	$I_F = 1$ A, $t_p = 100 \mu s$	$V_F$		2.2		V
Temperature coefficient of $V_F$	$I_F = 1$ mA	$TK_{V_F}$		- 1.8		mV/K
	$I_F = 100$ mA	$TK_{V_F}$		- 1.1		mV/K
Reverse current	$V_R = 5$ V	$I_R$			10	$\mu A$
Junction capacitance	$V_R = 0$ V, $f = 1$ MHz, $E = 0$ mW/cm <sup>2</sup>	$C_J$		70		pF
Radiant intensity	$I_F = 100$ mA, $t_p = 20$ ms	$I_e$	7	13	21	mW/sr
	$I_F = 1$ A, $t_p = 100 \mu s$	$I_e$		130		mW/sr
Radiant power	$I_F = 100$ mA, $t_p = 20$ ms	$\phi_e$		40		mW
Temperature coefficient of $\phi_e$	$I_F = 1$ mA	$TK_{\phi_e}$		- 1.1		%/K
	$I_F = 100$ mA	$TK_{\phi_e}$		- 0.51		%/K
Angle of half intensity		$\varphi$		$\pm 60$		deg
Peak wavelength	$I_F = 30$ mA	$\lambda_p$		940		nm
Spectral bandwidth	$I_F = 30$ mA	$\Delta\lambda$		25		nm
Temperature coefficient of $\lambda_p$	$I_F = 30$ mA	$TK_{\lambda_p}$		0.25		nm/K
Rise time	$I_F = 100$ mA, 20 % to 80 %	$t_r$		15		ns
Fall time	$I_F = 100$ mA, 20 % to 80 %	$t_f$		15		ns
Cut-off frequency	$I_{DC} = 70$ mA, $I_{AC} = 30$ mA pp	$f_c$		24		MHz
Virtual source diameter		$d$		0.5		mm

**Note**

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

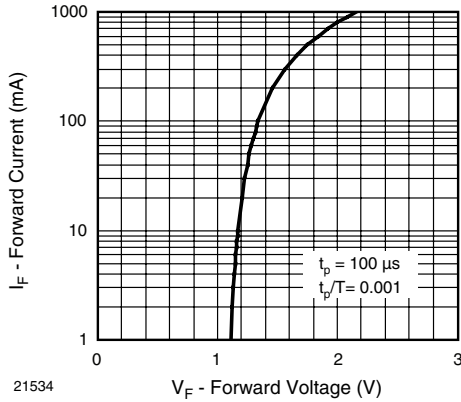
**BASIC CHARACTERISTICS**
 $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified


Fig. 3 - Forward Current vs. Forward Voltage

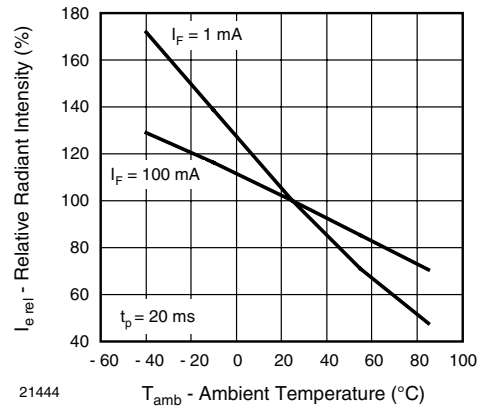


Fig. 6 - Relative Radiant Intensity vs. Ambient Temperature

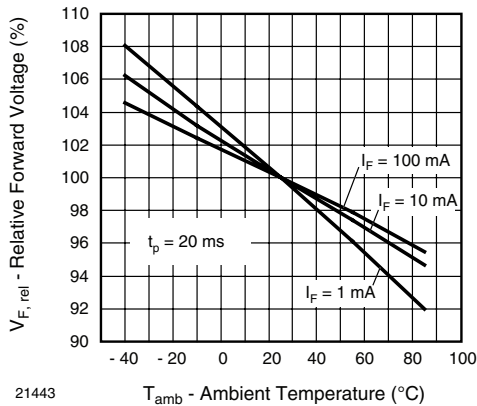


Fig. 4 - Relative Forward Voltage vs. Ambient Temperature

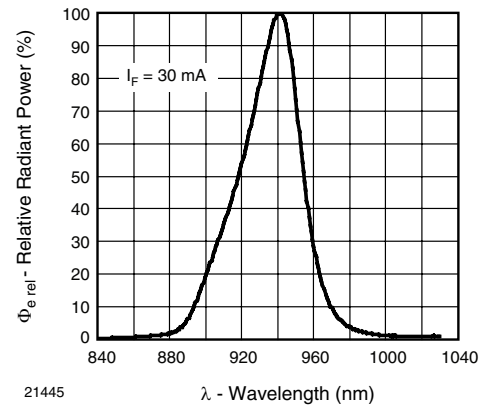


Fig. 7 - Relative Radiant Power vs. Wavelength

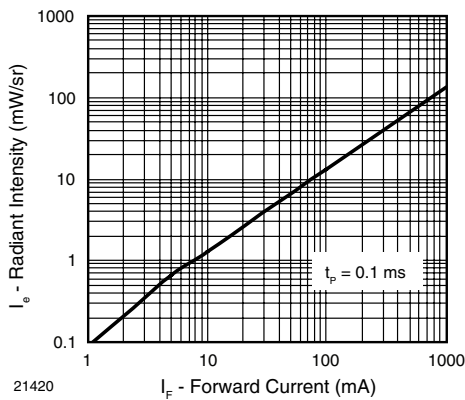


Fig. 5 - Radiant Intensity vs. Forward Current

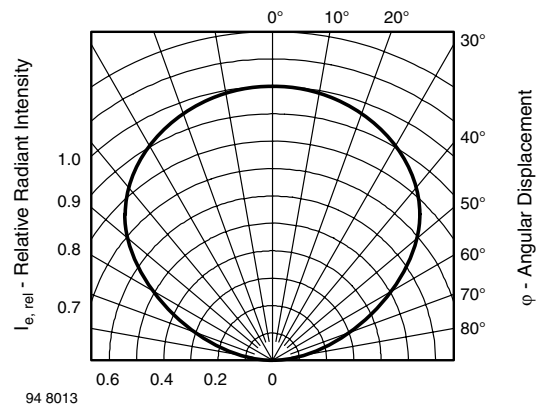
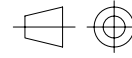
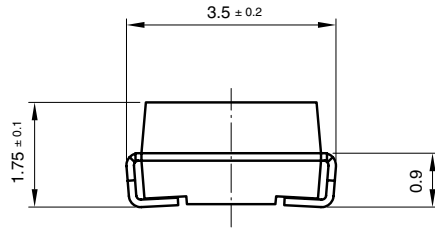
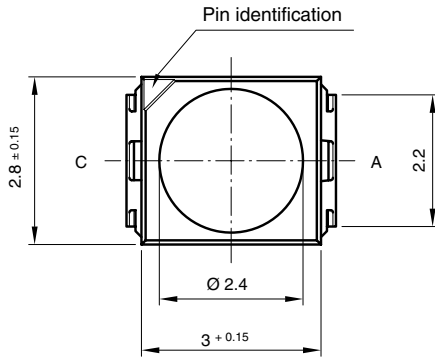


Fig. 8 - Relative Radiant Intensity vs. Angular Displacement

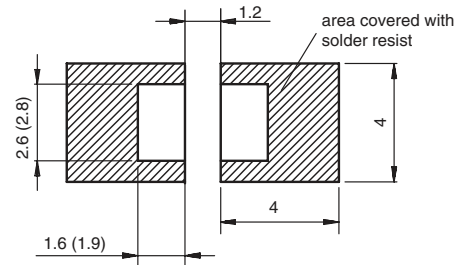
## PACKAGE DIMENSIONS in millimeters



technical drawings according to DIN specifications



### Mounting Pad Layout



Drawing-No.: 6.541-5067.01-4  
Issue: 5; 04.11.08  
20541

## SOLDER PROFILE

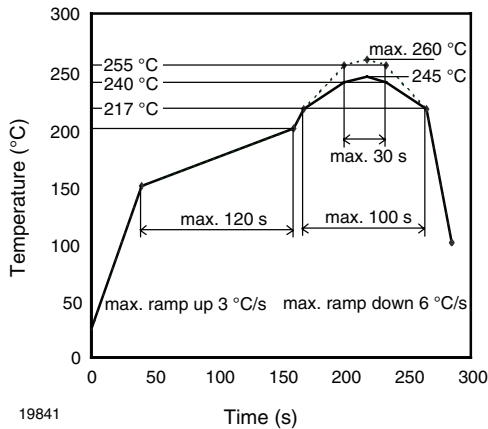


Fig. 9 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020

## DRYPACK

Devices are packed in moisture barrier bags (MBB) to prevent the products from moisture absorption during transportation and storage. Each bag contains a desiccant.

## FLOOR LIFE

Floor life (time between soldering and removing from MBB) must not exceed the time indicated on MBB label:

Floor life: 168 h

Conditions:  $T_{amb} < 30\text{ }^{\circ}\text{C}$ ,  $\text{RH} < 60\%$

Moisture sensitivity level 3, acc. to J-STD-020.

## DRYING

In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-020 or label. Devices taped on reel dry using recommended conditions 192 h at  $40\text{ }^{\circ}\text{C} (+ 5\text{ }^{\circ}\text{C})$ ,  $\text{RH} < 5\%$ .

### TAPE AND REEL

PLCC-2 components are packed in antistatic blister tape (DIN IEC (CO) 564) for automatic component insertion. Cavities of blister tape are covered with adhesive tape.

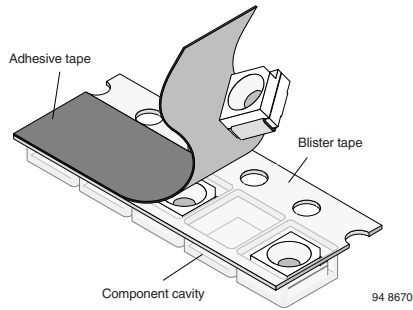


Fig. 10 - Blister Tape

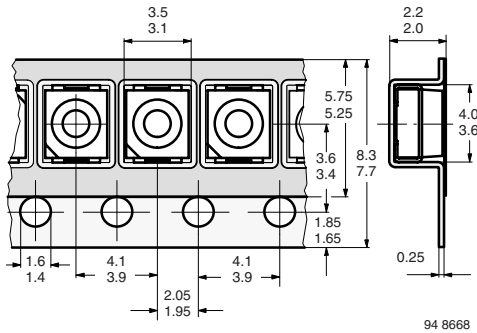


Fig. 11 - Tape Dimensions in mm for PLCC-2

### MISSING DEVICES

A maximum of 0.5 % of the total number of components per reel may be missing, exclusively missing components at the beginning and at the end of the reel. A maximum of three consecutive components may be missing, provided this gap is followed by six consecutive components.

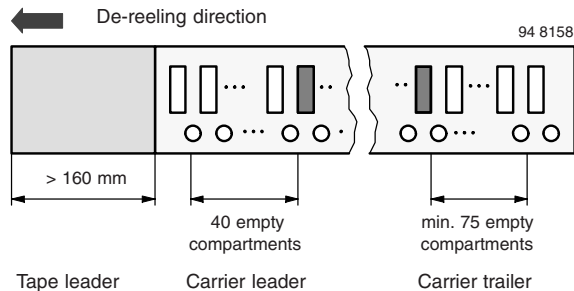


Fig. 12 - Beginning and End of Reel

The tape leader is at least 160 mm and is followed by a carrier tape leader with at least 40 empty compartments. The tape leader may include the carrier tape as long as the cover tape is not connected to the carrier tape. The least component is followed by a carrier tape trailer with a least 75 empty compartments and sealed with cover tape.

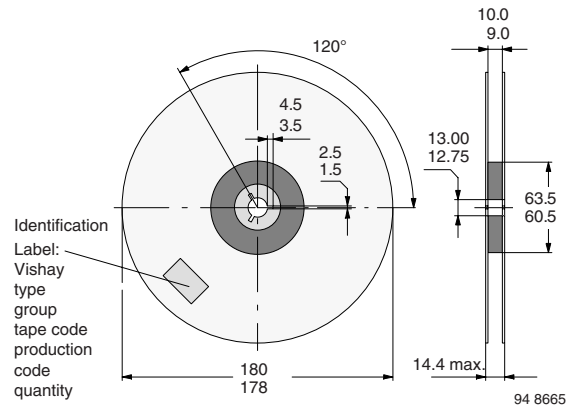


Fig. 13 - Dimensions of Reel-GS08

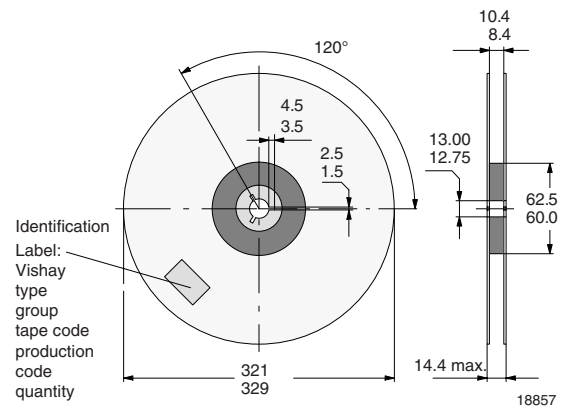


Fig. 14 - Dimensions of Reel-GS18

### COVER TAPE REMOVAL FORCE

The removal force lies between 0.1 N and 1.0 N at a removal speed of 5 mm/s. In order to prevent components from popping out of the blisters, the cover tape must be pulled off at an angle of 180° with regard to the feed direction.



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