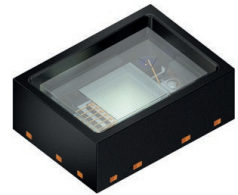


# V105Q131A-940

## BIDOS® P2433 Q

940 nm Multi-Mode VCSEL Power Array  
 Designed for Sensor Field of Interest : 72° x 58°



### Applications

- 3D Sensing
- Access Control (IRIS/Vein Scan, Face Recognition)
- Gaming (AR/VR)
- Gesture Recognition

### Features:

- Package: QFN Package
- ESD: 2 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)
- Very small SMT package
- VCSEL power array
- IR Laser with photodiode

### Ordering Information

$I_F = 4 \text{ A}$ ;  $t_p = 300 \text{ } \mu\text{s}$ ;  $D = 0.05$ ;  $T_A = 25 \text{ } ^\circ\text{C}$

| Type          | Optical output power<br>typ.<br>$P_{opt}$ | Ordering Code |
|---------------|---|---------------|
| V105Q131A-940 | 3 W                                       | Q65113A1627   |

## Maximum Ratings

$T_A = 25\text{ °C}$

| Parameter   | Symbol    |      | Values                             |
|---|-----------|------|------------------------------------|
| Operating temperature<br>(refers to $T_A$ ; $T_A = 85\text{ °C}$ with reduced efficiency) | $T_{op}$  | min. | -20 °C                             |
|   |           | max. | 85 °C                              |
| Storage temperature   | $T_{stg}$ | min. | -40 °C                             |
|   |           | max. | 100 °C                             |
| Soldering temperature<br>$t_{max} = 10\text{ s}$  | $T_S$     | max. | 260 °C                             |
| ESD withstand voltage<br>acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)                    | $V_{ESD}$ | max. | 2 kV                               |
| <b>IR Laser</b>   |           |      |                                    |
| Surge current<br>$t_p \leq 500\text{ }\mu\text{s}$ ; $D = 0.01$                           | $I_{FSM}$ | max. | 6 A                                |
| Reverse voltage <sup>5)</sup>   | $V_R$     | max. | Not designed for reverse operation |
| <b>Photodiode</b>   |           |      |                                    |
| Reverse voltage <sup>5)</sup>   | $V_R$     | max. | 20 V                               |

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device.

## Characteristics

$t_p = 300 \mu\text{s}$ ;  $D = 0.05$ ;  $T_A = 25 \text{ }^\circ\text{C}$

| Parameter   | Symbol                  |                      | Values                     |
|---|-------------------------|----------------------|----------------------------|
| <b>IR Laser</b>   |                         |                      |                            |
| Peak wavelength <sup>6)</sup>   | $\lambda_{\text{peak}}$ | min.<br>typ.<br>max. | 931 nm<br>940 nm<br>949 nm |
| Optical output power <sup>7)</sup><br>$I_F = 4 \text{ A}$                       | $P_{\text{opt}}$        | min.<br>typ.         | 2.85 W<br>3.00 W           |
| Field of view (HFOV)<br>Angle at $E_{e,50\%}$ level, normalized to the centroid | $\Theta_{\parallel}$    | typ.                 | 74 °                       |
| Field of view (VFOV)<br>Angle at $E_{e,50\%}$ level, normalized to the centroid | $\Theta_{\perp}$        | typ.                 | 61 °                       |
| Dimensions of chip area   | $L \times W$            | typ.                 | 0.9 x 1.0<br>mm x mm       |
| Slope efficiency<br>$I_F = 1 \text{ A} \dots 2 \text{ A}$                       | $\eta$                  | min.<br>typ.         | 0.70 W/ A<br>0.85 W/ A     |
| Power conversion efficiency<br>$I_F = 4 \text{ A}$                              | $\eta_{\text{tot}}$     | typ.                 | 36 %                       |
| Threshold current   | $I_{\text{th}}$         | typ.<br>max.         | 0.5 A<br>0.7 A             |
| Forward voltage <sup>8)</sup><br>$I_F = 4 \text{ A}$                            | $V_F$                   | min.<br>typ.<br>max. | 1.95 V<br>2.20 V<br>2.45 V |
| Rise time<br>10% and 90% of $I_{e \text{ max}}$                                 | $t_r$                   | typ.                 | 1 ns                       |
| Fall time<br>10% and 90% of $I_{e \text{ max}}$                                 | $t_f$                   | typ.                 | 1 ns                       |
| Temperature coefficient of wavelength   | $TC_{\lambda}$          | typ.                 | 0.07 nm/ K                 |
| Thermal resistance junction solder point real<br>$t_p = 0.01 \text{ s}$         | $R_{\text{thJS real}}$  | max.                 | 11 K/ W                    |

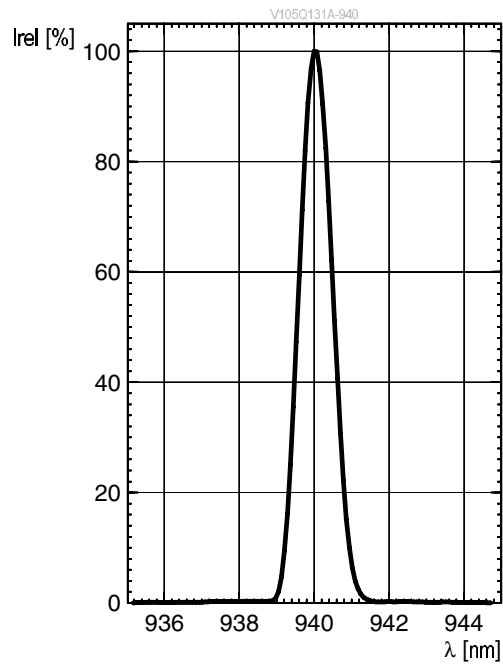
## Characteristics

$T_A = 25\text{ °C}$

| Parameter   | Symbol                   |              | Values                 |
|---|--------------------------|--------------|------------------------|
| <b>Photodiode</b>   |                          |              |                        |
| Wavelength of max sensitivity   | $\lambda_{S\text{ max}}$ | typ.         | 840 nm                 |
| Spectral range of sensitivity   | $\lambda_{10\%}$         | typ.         | 400 ... 1100 nm        |
| Photocurrent<br>$\lambda = 940\text{ nm}$ , $E_e = 0.5\text{ mW/cm}^2$ , $V_R = 3.3\text{ V}$                           | $I_P$                    | typ.         | 0.188 $\mu\text{A}$    |
| Photocurrent<br>with VCSEL @ $I_F = 4\text{ A}$ , $V_R = 3.3\text{ V}$  | $I_P$                    | typ.         | 400 $\mu\text{A}$      |
| Dimensions of chip area   | L x W                    | typ.         | 0.38 x 0.38<br>mm x mm |
| Forward voltage<br>$I_F = 10\text{ mA}$ , $E = 0$   | $V_F$                    | typ.<br>max. | 0.85 V<br>1.00 V       |
| Capacitance<br>$E_e = 0\text{ mW/cm}^2$ , $f = 1\text{ MHz}$ , $V_R = 0\text{ V}$                                       | $C_0$                    | typ.         | 1.3 pF                 |
| Dark current<br>$V_R = 3.3\text{ V}$  | $I_R$                    | typ.<br>max. | 0.1 nA<br>30 nA        |
| Open-circuit voltage<br>$\lambda = 940\text{ nm}$ , $E_e = 0.5\text{ mW/cm}^2$  | $V_O$                    | typ.         | 260 mV                 |
| Short-circuit current<br>$\lambda = 940\text{ nm}$ , $E_e = 0.5\text{ mW/cm}^2$ , $V_R = 0\text{ V}$                    | $I_{SC}$                 | typ.         | 188 nA                 |
| Rise time<br>$\lambda = 940\text{ nm}$ , $V_R = 0.7\text{ V}$ , $R_L = 50\ \Omega$                                      | $t_r$                    | typ.         | 205 ns                 |
| Fall time<br>$\lambda = 940\text{ nm}$ , $V_R = 0.7\text{ V}$ , $R_L = 50\ \Omega$                                      | $t_f$                    | typ.         | 215 ns                 |
| Temperature coefficient of sensitivity<br>$\lambda = 940\text{ nm}$ , $E_e = 0.5\text{ mW/cm}^2$ , $V_R = 3.3\text{ V}$ | $TC_I$                   | typ.         | 0.23 %/ K              |

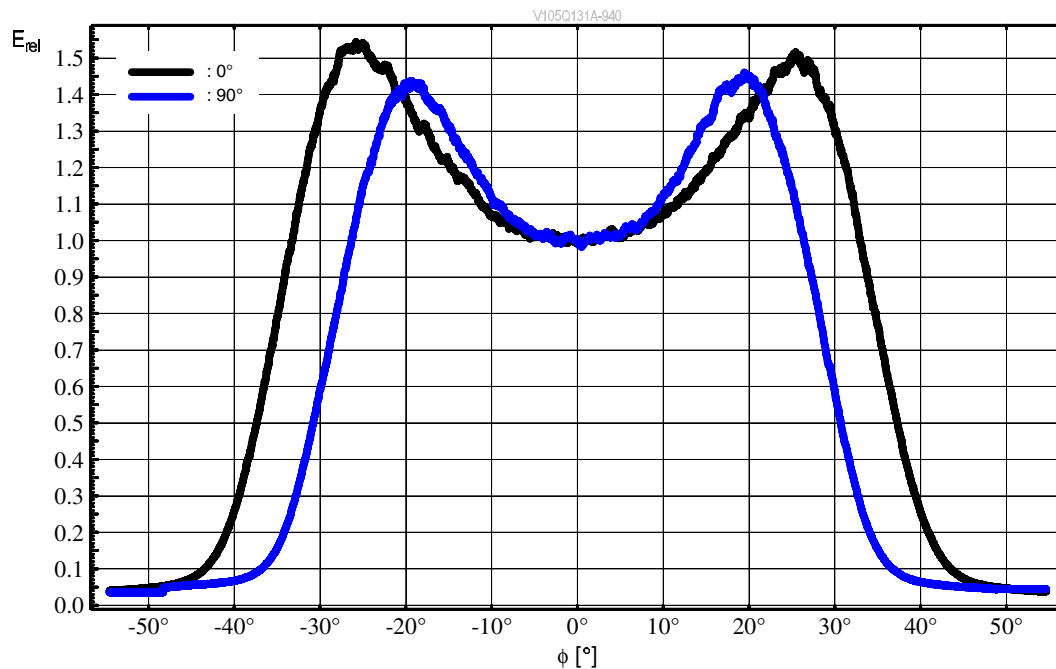
### Relative Spectral Emission <sup>1), 2)</sup>

- infrared (940 nm):  $I_{e,rel} = f(\lambda)$ ;  $I_F = 4000 \text{ mA}$ ;  $t_p = 300 \mu\text{s}$ ;  $D = 0.05$



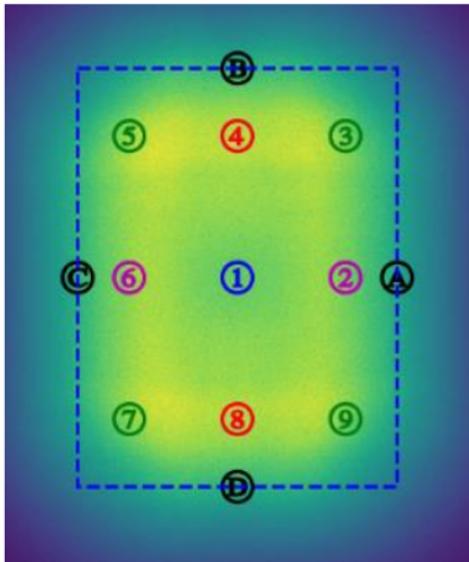
### Radiation Characteristics <sup>1), 2)</sup>

- infrared (940 nm):  $E_{e,rel} = f(\phi)$ ;  $I_F = 4 \text{ A}$ ;  $t_p = 300 \mu\text{s}$ ;  $D = 0.05$



## Far-Field Illumination Pattern <sup>2)</sup>

- infrared (940 nm):  $I_{rel} = f(\phi)$ ;  $I_F = 4 \text{ A}$ ;  $t_p = 300 \mu\text{s}$ ;  $D = 0.05$

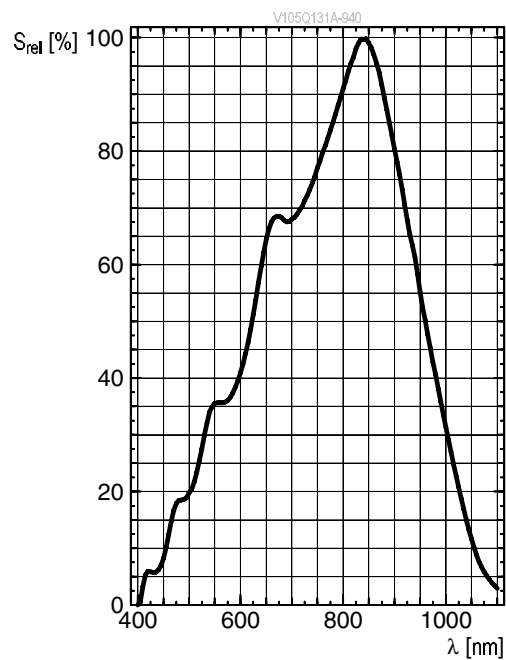


|   | Min  | Typ  | Max  |
|---|------|------|------|
| 1 | 100% | 100% | 100% |
| 2 | 115% | 138% | 160% |
| 3 | 125% | 145% | 165% |
| 4 | 120% | 143% | 165% |
| 5 | 125% | 145% | 165% |
| 6 | 115% | 138% | 160% |
| 7 | 125% | 145% | 165% |
| 8 | 120% | 143% | 165% |
| 9 | 125% | 145% | 165% |
| A | 70%  | 90%  | 110% |
| B | 70%  | 90%  | 110% |
| C | 70%  | 90%  | 110% |
| D | 70%  | 90%  | 110% |

Sensor FOI 72°(H) x 58°(V) (dotted line)

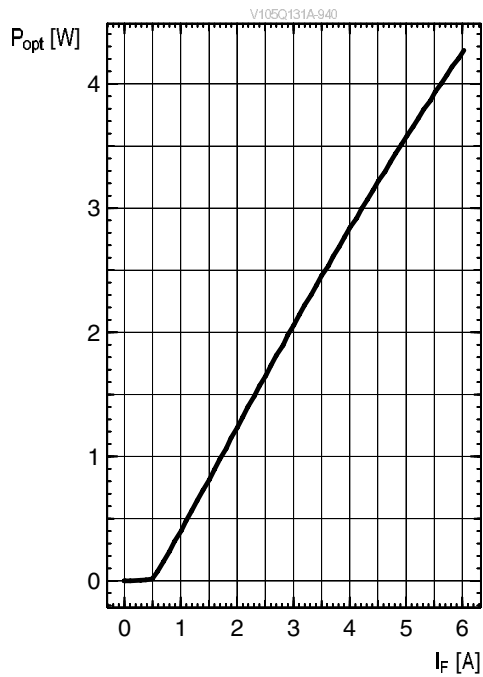
## Relative Spectral Sensitivity <sup>1), 2)</sup>

- photodiode:  $S_{rel} = f(\lambda)$ ;  $V_R = 3.3 \text{ V}$



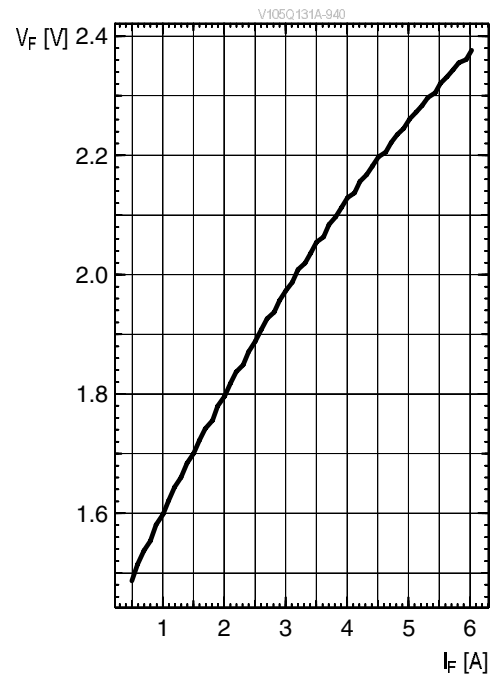
### Optical Output Power <sup>1), 2)</sup>

- infrared (940 nm):  $P_{opt} = f(I_F)$ ;  $t_p = 300 \mu s$ ;  $D = 0.05$



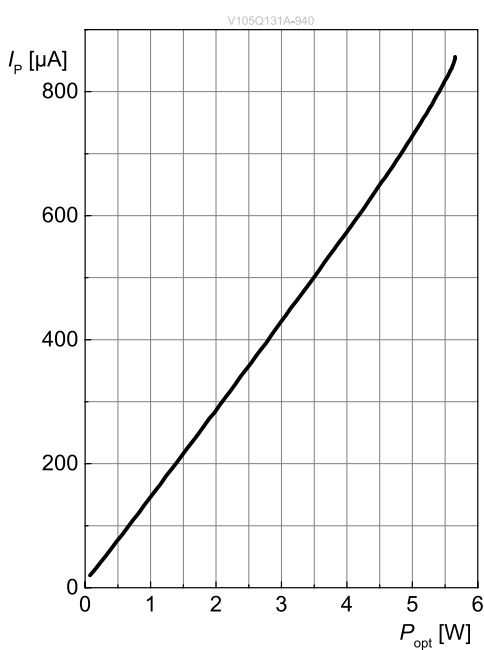
### Forward Voltage <sup>1), 2)</sup>

- infrared (940 nm):  $V_F = f(I_F)$ ;  $t_p = 300 \mu s$ ;  $D = 0.05$



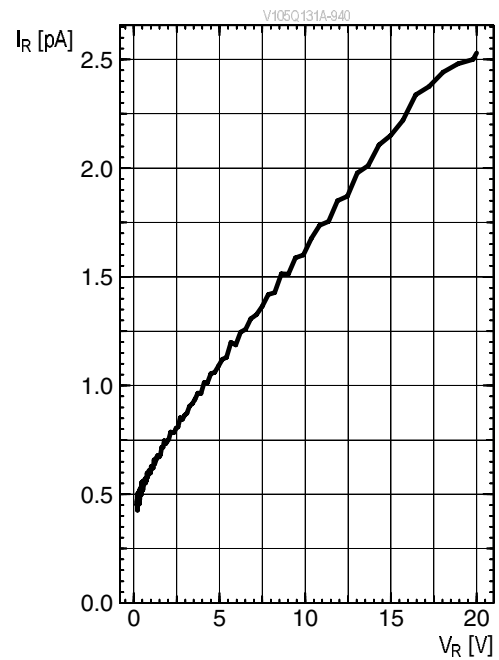
### Photocurrent <sup>1), 2)</sup>

- photodiode:  $I_p = f(P_{opt})$



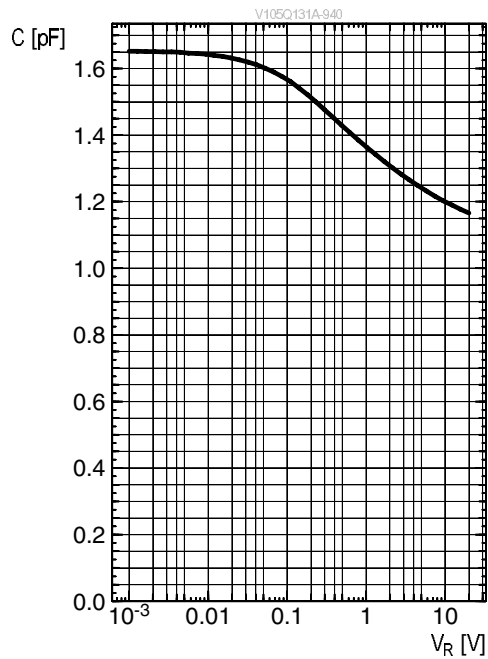
### Dark Current <sup>1), 2)</sup>

- photodiode:  $I_R = f(V_R)$ ;  $E = 0$



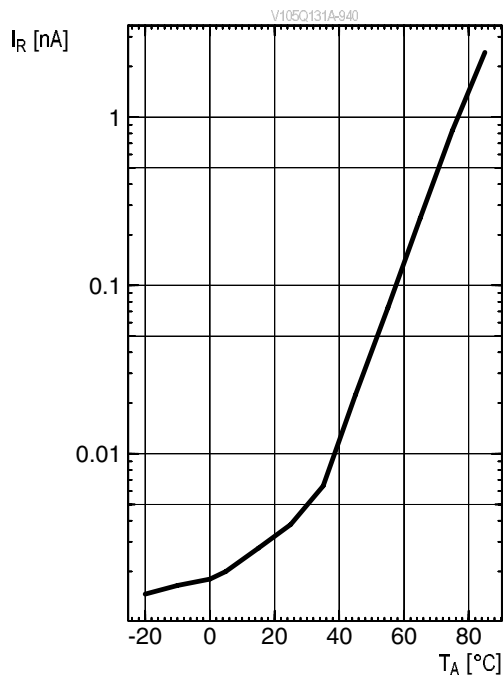
## Capacitance <sup>1), 2)</sup>

■ photodiode:  $C = f(V_R)$ ;  $f = 1\text{MHz}$ ;  $E = 0$



## Dark Current <sup>1)</sup>

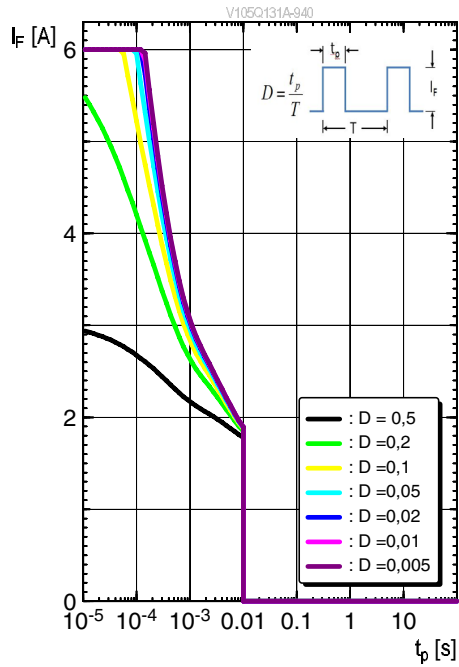
■ photodiode:  $I_R = f(T_A)$ ;  $E = 0$ ;  $V_R = 3.3\text{ V}$



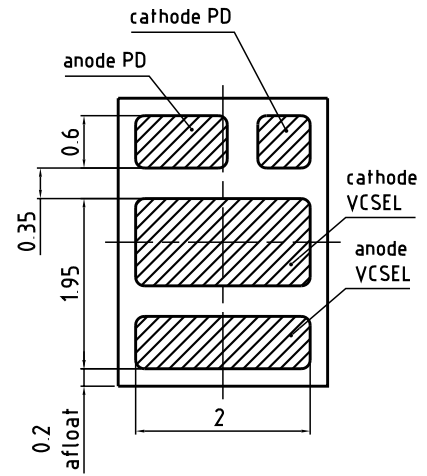
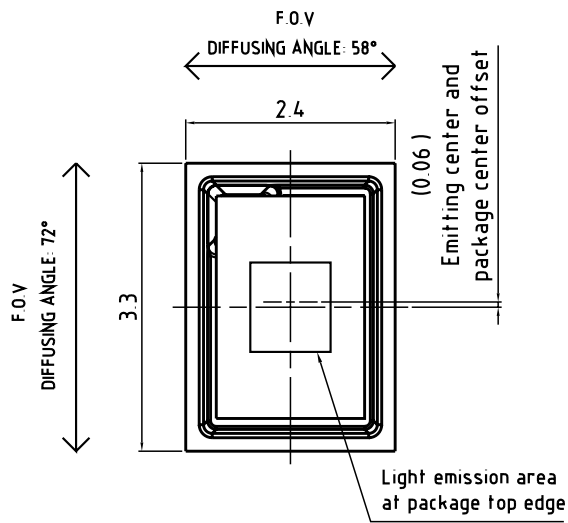


## Permissible Pulse Handling Capability

- infrared (940 nm):  $I_F = f(t_p)$ ;  $D = \text{param.}$ ;  $T_S = 85^\circ\text{C}$ ;  
(not characterized for DC condition)



### Dimensional Drawing <sup>3)</sup>



general tolerance  $\pm 0.1$

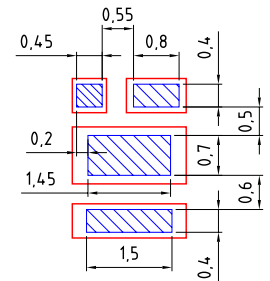
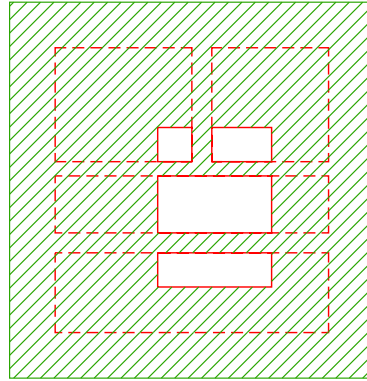
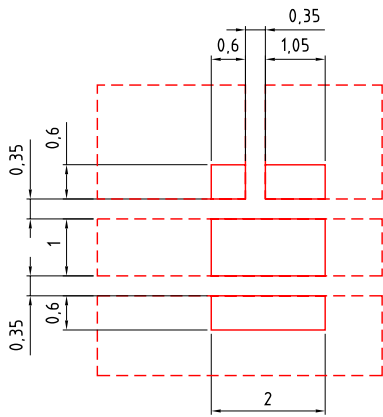
lead finish Au



C67062-A0363-A2-01


### Further Information:


Approximate Weight: 20.0 mg

Recommended Solder Pad <sup>3)</sup>



 foot print     Cu area

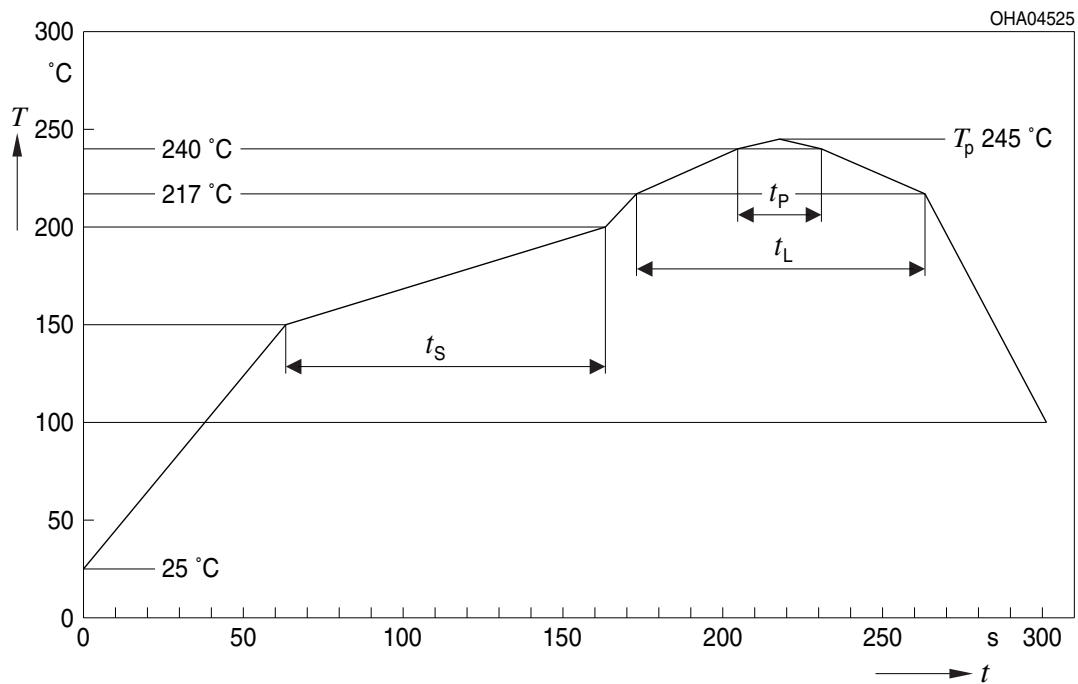
 solder resist

 solder stencil

E062.3010.294-02

## Reflow Soldering Profile

Product complies to MSL Level 3 acc. to JEDEC J-STD-020E

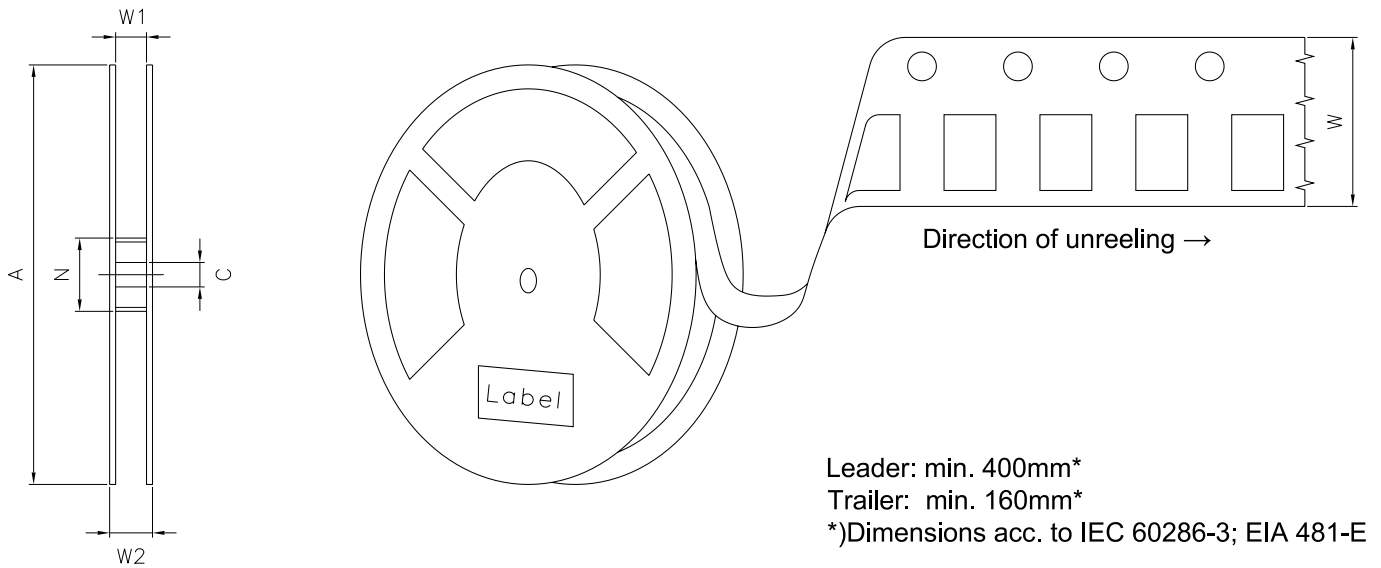


| Profile Feature   | Symbol | Pb-Free (SnAgCu) Assembly |                |         | Unit |
|---|--------|---------------------------|----------------|---------|------|
|   |        | Minimum                   | Recommendation | Maximum |      |
| Ramp-up rate to preheat <sup>*)</sup><br>25 °C to 150 °C          |        |                           | 2              | 3       | K/s  |
| Time $t_s$<br>$T_{Smin}$ to $T_{Smax}$                            | $t_s$  | 60                        | 100            | 120     | s    |
| Ramp-up rate to peak <sup>*)</sup><br>$T_{Smax}$ to $T_p$         |        |                           | 2              | 3       | K/s  |
| Liquidus temperature  | $T_L$  |                           | 217            |         | °C   |
| Time above liquidus temperature                                   | $t_L$  |                           | 80             | 100     | s    |
| Peak temperature  | $T_p$  |                           | 245            | 260     | °C   |
| Time within 5 °C of the specified peak<br>temperature $T_p - 5$ K | $t_p$  | 10                        | 20             | 30      | s    |
| Ramp-down rate*<br>$T_p$ to 100 °C                                |        |                           | 3              | 6       | K/s  |
| Time<br>25 °C to $T_p$  |        |                           |                | 480     | s    |

All temperatures refer to the center of the package, measured on the top of the component

\* slope calculation  $DT/Dt$ :  $Dt$  max. 5 s; fulfillment for the whole T-range

## Tape and Reel <sup>4)</sup>



## Reel Dimensions

| A      | W                     | $N_{\min}$ | $W_1$         | $W_{2\max}$ | Pieces per PU |
|--------|-----------------------|------------|---------------|-------------|---------------|
| 180 mm | $12 + 0.3 / - 0.1$ mm | 60 mm      | $12.4 + 2$ mm | 18.4 mm     | 2000          |

### Barcode-Product-Label (BPL)

**OSRAM Opto Semiconductors** LX XXXX BIN1: XX-XX-X-XXX-X

RoHS Compliant

(6P) BATCH NO: 1234567890

(1T) LOT NO: 1234567890 (9D) D/C: 1234

(X) PROD NO: 123456789(Q)QTY: 9999 (G) GROUP: XX-XX-X-X

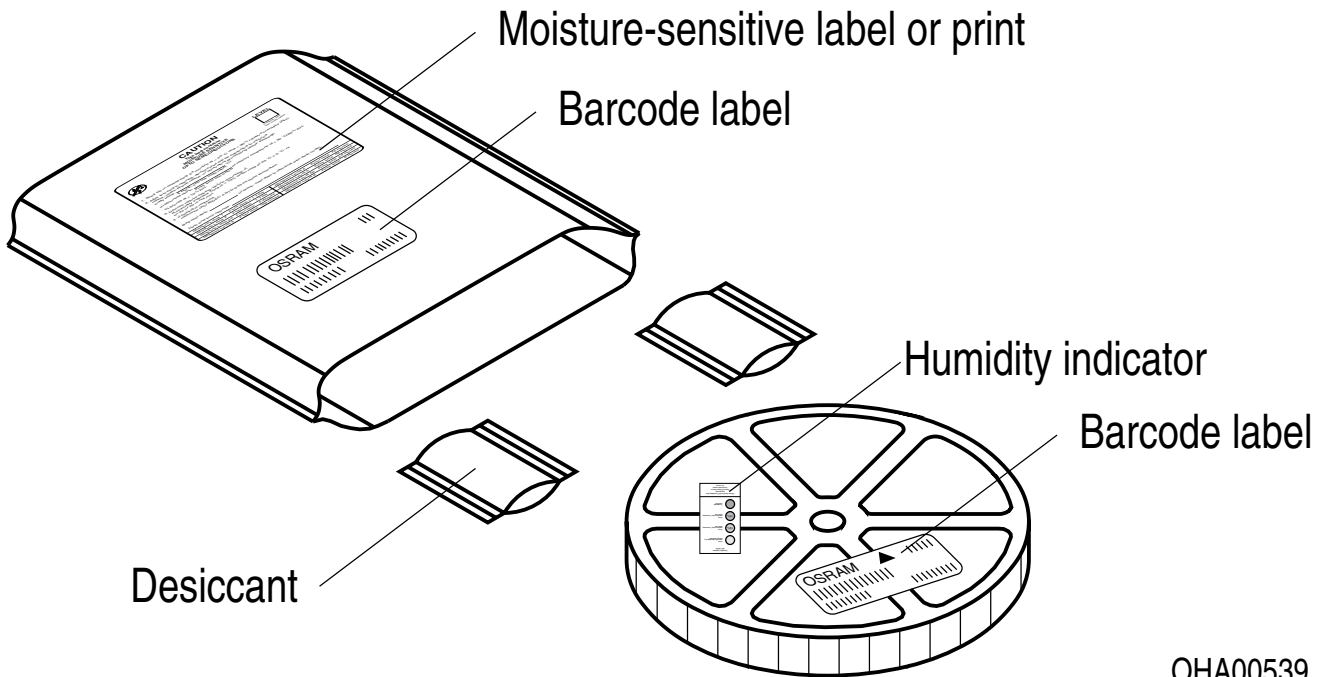
ML Temp ST  
X XXX °C X

Pack: RXX  
DEMY XXX  
X\_X123\_1234.1234 X

The diagram shows a rectangular label with rounded corners. It contains the OSRAM logo and name, a part number (LX XXXX), and a bin number (BIN1: XX-XX-X-XXX-X). It features three main barcode sections: a 6-digit batch number, a 1-digit lot number and 9-digit date code, and an 8-digit product number with quantity and group information. A RoHS Compliant logo is present, along with a moisture sensitivity symbol (a circle with a diagonal line and three droplets) and a temperature specification (ML Temp ST X XXX °C X). A QR code is located on the right side. The label also includes packaging information (Pack: RXX, DEMY XXX, X\_X123\_1234.1234 X).

OHA04563

### Dry Packing Process and Materials



OHA00539

## Notes

Depending on the mode of operation, these devices emit highly concentrated visible and non visible light which can be hazardous to the human eye. Products which incorporate these devices have to follow the safety precautions given in IEC 60825-1.

Subcomponents of this device contain, in addition to other substances, metal filled materials including silver. Metal filled materials can be affected by environments that contain traces of aggressive substances. Therefore, we recommend that customers minimize device exposure to aggressive substances during storage, production, and use. Devices that showed visible discoloration when tested using the described tests above did show no performance deviations within failure limits during the stated test duration. Respective failure limits are described in the IEC60810.

For further application related information please visit [www.osram-os.com/appnotes](http://www.osram-os.com/appnotes)

## Disclaimer

### **Attention please!**

The information describes the type of component and shall not be considered as assured characteristics. Terms of delivery and rights to change design reserved. Due to technical requirements components may contain dangerous substances.

For information on the types in question please contact our Sales Organization.

If printed or downloaded, please find the latest version on the OSRAM OS website.

### **Packing**

Please use the recycling operators known to you. We can also help you – get in touch with your nearest sales office. By agreement we will take packing material back, if it is sorted. You must bear the costs of transport. For packing material that is returned to us unsorted or which we are not obliged to accept, we shall have to invoice you for any costs incurred.

### **Product and functional safety devices/applications or medical devices/applications**

OSRAM OS components are not developed, constructed or tested for the application as safety relevant component or for the application in medical devices.

OSRAM OS products are not qualified at module and system level for such application.

In case buyer – or customer supplied by buyer – considers using OSRAM OS components in product safety devices/applications or medical devices/applications, buyer and/or customer has to inform the local sales partner of OSRAM OS immediately and OSRAM OS and buyer and /or customer will analyze and coordinate the customer-specific request between OSRAM OS and buyer and/or customer.



## Glossary

- 1) **Typical Values:** Due to the special conditions of the manufacturing processes of semiconductor devices, the typical data or calculated correlations of technical parameters can only reflect statistical figures. These do not necessarily correspond to the actual parameters of each single product, which could differ from the typical data and calculated correlations or the typical characteristic line. If requested, e.g. because of technical improvements, these typ. data will be changed without any further notice.
- 2) **Testing temperature:** TA = 25°C (unless otherwise specified)
- 3) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with  $\pm 0.1$  and dimensions are specified in mm.
- 4) **Tape and Reel:** All dimensions and tolerances are specified acc. IEC 60286-3 and specified in mm.
- 5) **Reverse Operation:** This product is intended to be operated applying a forward current within the specified range. Applying any continuous reverse bias or forward bias below the voltage range of light emission shall be avoided because it may cause migration which can change the electro-optical characteristics or damage the LED.
- 6) **Wavelength:** The wavelengths are measured with a tolerance of  $\pm 1$  nm.
- 7) **Brightness:** The brightness values are measured with a tolerance of  $\pm 11\%$ .
- 8) **Forward Voltage:** The forward voltages are measured with a tolerance of  $\pm 0.1$  V.

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## Revision History

| Version | Date       | Change          |
|---------|------------|-----------------|
| 1.0     | 2021-09-13 | Initial Version |

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