

# OSRAM V105Q121A-850

## Datasheet

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Tobelbader Strasse 30, 8141 Premstaetten, Austria

Phone +43 3136 500-0

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BIDOS™ P2433 Q

# V105Q121A-850

850 nm Multi-Mode VCSEL Power Array  
Designed for Sensor Field of Interest : 60° x 45°



## Applications

- Access Control & Security

## Features

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

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## Ordering Information

Type	Optical output power typ. $P_{opt}$	Ordering Code
V105Q121A-850	3 W	Q65113A5438

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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 must follow the safety precautions given in the “Notes” section.

## Maximum Ratings

 $T_A = 25\text{ °C}$ 

Parameter	Symbol		Values
Operating temperature (refers to $T_A$ ; $T_A = 85\text{ °C}$ with reduced efficiency)	$T_{op}$	min. max.	-20 °C 85 °C
Storage temperature	$T_{stg}$	min. max.	-40 °C 100 °C
Soldering temperature $t_{max} = 10\text{ s}$	$T_s$	max.	260 °C
ESD withstand voltage acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)	$V_{ESD}$	max.	2 kV
<b>IR Laser</b>			
Junction temperature	$T_j$	max.	125 °C
Forward current pulsed $t_p \leq 500\text{ }\mu\text{s}$ ; $D = 0.01$	$I_{F\ pulse}$	max.	6 A
Reverse voltage <sup>5)</sup>	$V_R$		Not designed for reverse operation
<b>Photodiode</b>			
Reverse voltage <sup>5)</sup>	$V_R$	max.	20 V
Breakdown voltage	$V_{BR}$	min.	50 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. typ. max.	840 nm 850 nm 860 nm
Optical output power <sup>7)</sup> $I_F = 4 \text{ A}$	$P_{\text{opt}}$	min. typ.	2.4 W 3.00 W
Field of view (HFOV) Angle at Ee,50% level, normalized to the centroid	$\Theta_{\parallel}$	typ.	63 °
Field of view (VFOV) Angle at Ee,50% level, normalized to the centroid	$\Theta_{\perp}$	typ.	50 °
Dimensions of chip area	$L \times W$	typ.	0.9 x 1.0 mm x mm
Slope efficiency $I_F = 1 \text{ A} \dots 2 \text{ A}$	$\eta$	typ.	0.95 W/ A
Power conversion efficiency $I_F = 4 \text{ A}$	$\eta_{\text{tot}}$	typ.	38 %
Threshold current	$I_{\text{th}}$	typ.	0.9 A
Forward voltage <sup>8)</sup> $I_F = 4 \text{ A}$	$V_F$	min. typ. max.	1.95 V 2.10 V 2.45 V
Rise time 10% and 90% of $I_{e \text{ max}}$	$t_r$	typ.	1 ns
Fall time 10% and 90% of $I_{e \text{ max}}$	$t_f$	typ.	1 ns
Temperature coefficient of wavelength	$TC_{\lambda}$	typ.	0.06 nm/ K
Thermal resistance junction solder point real $t_p = 0.01 \text{ s}$	$R_{\text{thJS real}}$	max.	11 K/ W

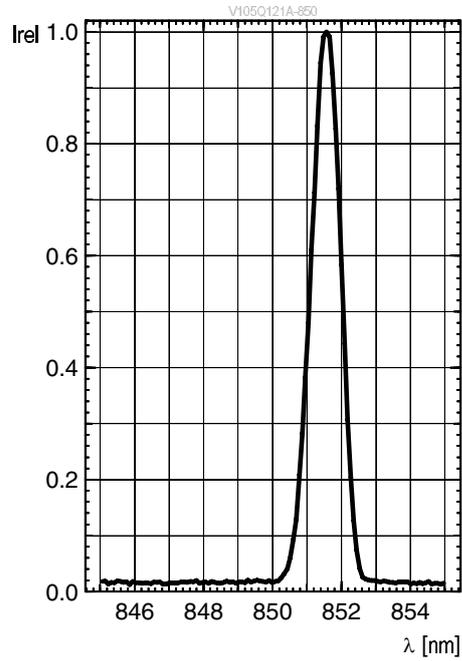
## Characteristics

$T_A = 25\text{ °C}$

Parameter	Symbol		Values
<b>Photodiode</b>			
Wavelength of max sensitivity	$\lambda_{S\ max}$	typ.	800 nm
Spectral range of sensitivity	$\lambda_{10\%}$	typ.	450 ... 1050 nm
Photocurrent $\lambda = 850\text{ nm}$ , $E_e = 0.5\text{ mW/cm}^2$ , $V_R = 3.3\text{ V}$	$I_P$	typ.	0.25 $\mu\text{A}$
Photocurrent <sup>9)</sup> with VCSEL @ $I_F = 4\text{ A}$ ; $\lambda = 850\text{ nm}$ ; $V_R = 3.3\text{ V}$	$I_P$	typ.	0.50 mA
Dimensions of chip area	L x W	typ.	0.38 x 0.38 mm x mm
Dark current $V_R = 3.3\text{ V}$ , $E = 0$	$I_R$	typ. max.	0.1 nA 30 nA
Open-circuit voltage $\lambda = 850\text{ nm}$ , $E_e = 0.5\text{ mW/cm}^2$	$V_O$	typ.	320 mV
Short-circuit current $\lambda = 850\text{ nm}$ , $E_e = 0.5\text{ mW/cm}^2$ , $V_R = 0\text{ V}$	$I_{SC}$	typ.	235 nA
Rise time 10 %/ 90%; $\lambda = 850\text{ nm}$	$t_r$	typ.	1 ns
Fall time 10 %/ 90%; $\lambda = 850\text{ nm}$	$t_f$	typ.	1 ns
Forward voltage $I_F = 10\text{ mA}$ , $E = 0$	$V_F$	typ. max.	0.85 V 1.00 V
Capacitance $E_e = 0\text{ mW/cm}^2$ , $f = 1\text{ MHz}$ , $V_R = 0\text{ V}$	$C_0$	typ.	2 pF
Temperature coefficient of sensitivity $\lambda = 940\text{ nm}$ , $E_e = 0.5\text{ mW/cm}^2$ , $V_R = 3.3\text{ V}$	$TC_i$	typ.	0.23 %/ K

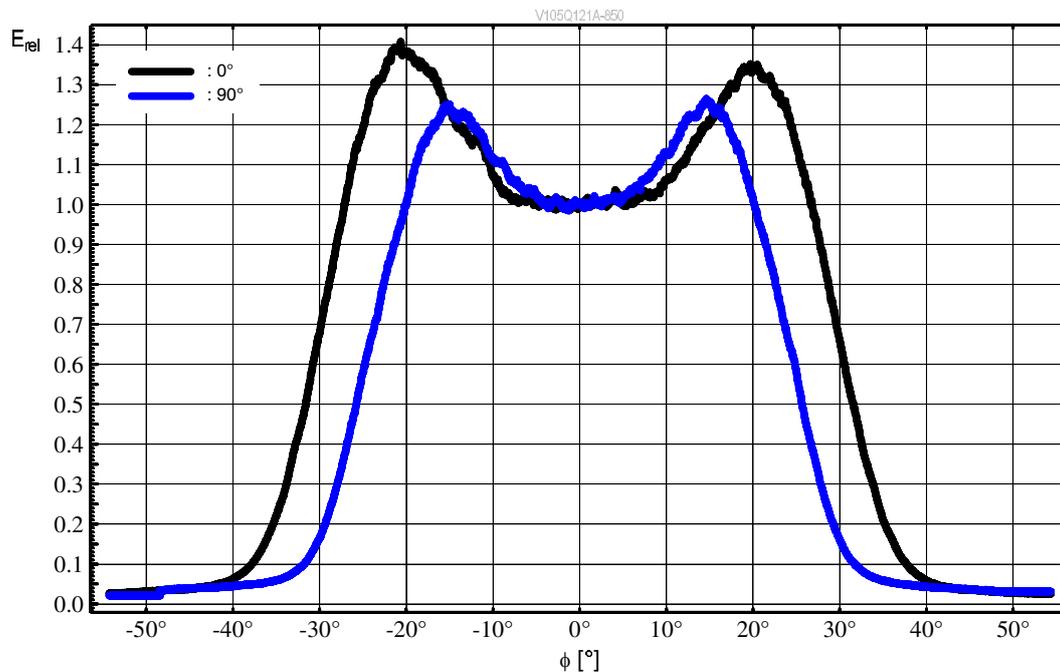
### Relative Spectral Emission <sup>1), 2)</sup>

- infrared (850 nm):  $I_{e,rel} = f(\lambda)$ ;  $I_F = 4000 \text{ mA}$ ;  $t_p = 300 \mu\text{s}$



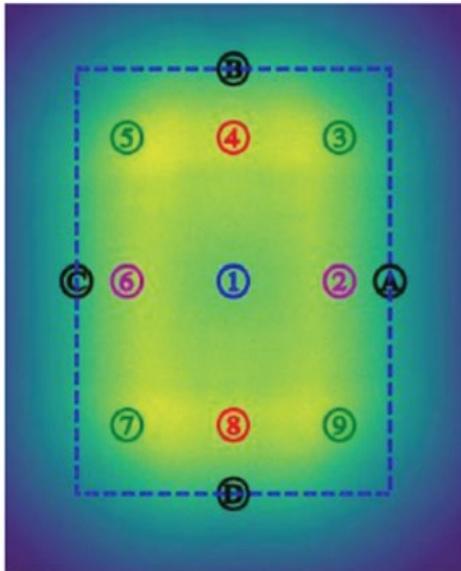
### Radiation Characteristics <sup>1), 2)</sup>

- infrared (850 nm):  $E_{e,rel} = f(\phi)$ ;  $I_F = 4000 \text{ mA}$ ;  $t_p = 300 \mu\text{s}$ ;  $D = 0.05$



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

- infrared (850 nm):  $I_{e,rel} = f(\varphi)$ ;  $I_F = 4000 \text{ mA}$ ;  $t_p = 300 \text{ }\mu\text{s}$ ;  $D = 0.05$

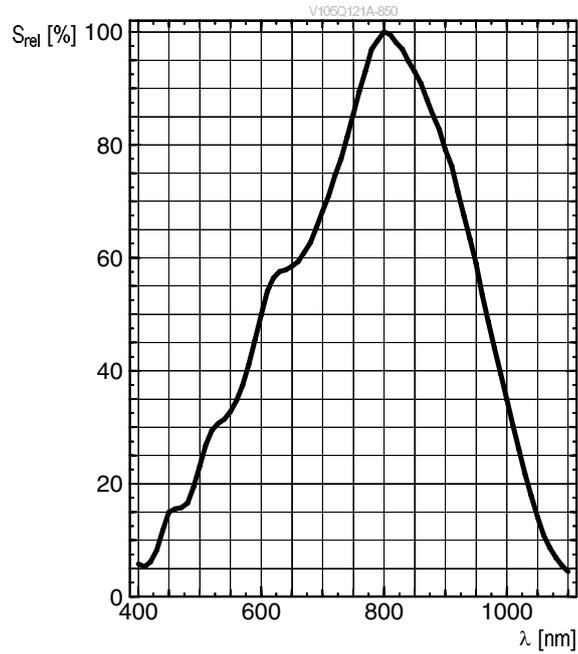


Sensor FOI 60°(H) x 45°(V) (dotted line)

	Min	Typ	Max
1	100%	100%	100%
2	100%	120%	140%
3	110%	135%	160%
4	110%	133%	155%
5	110%	135%	160%
6	100%	120%	140%
7	110%	135%	160%
8	110%	133%	155%
9	110%	135%	160%
A	65%	85%	105%
B	70%	90%	110%
C	65%	85%	105%
D	70%	90%	110%

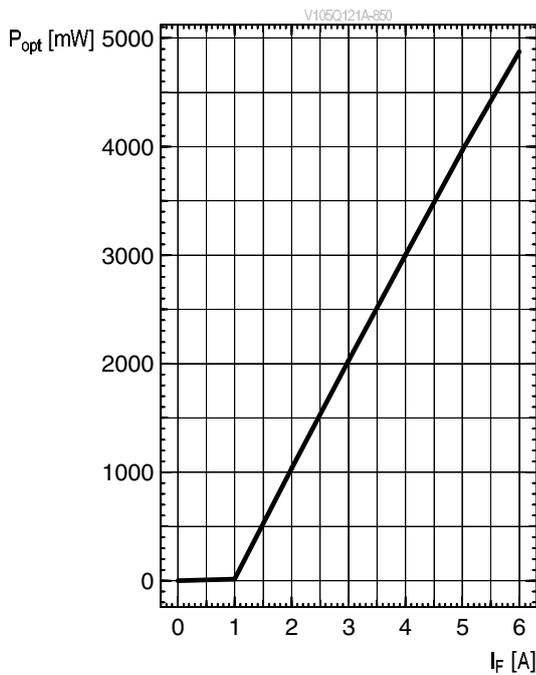
## Relative Spectral Sensitivity <sup>1), 2)</sup>

■ photodiode:  $S_{rel} = f(\lambda)$



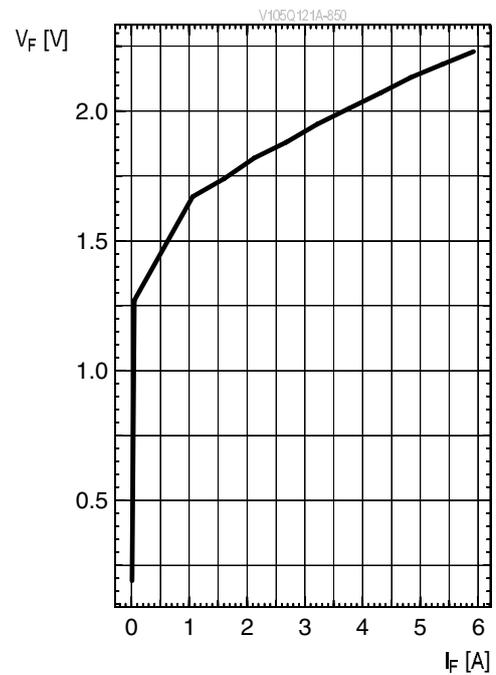
## Optical Output Power <sup>1), 2)</sup>

• infrared (850 nm):  $P_{opt} = f(I_F)$ ;  $t_p = 300 \mu s$ ;  $D = 0.05$



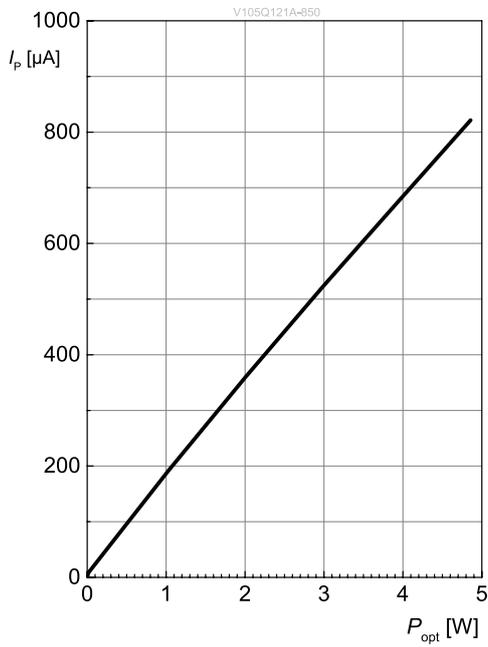
## Forward Voltage <sup>1), 2)</sup>

• infrared (850 nm):  $V_F = f(I_F)$ ;  $t_p = 300 \mu s$ ;  $D = 0.05$



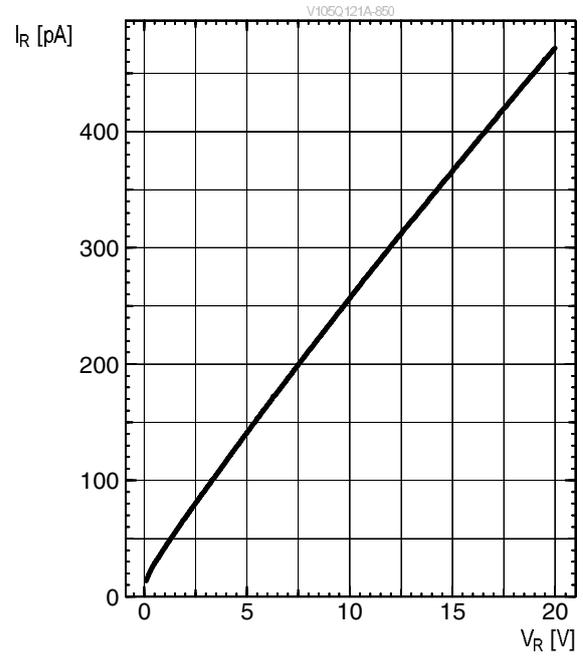
### Photocurrent 1), 2)

■ photodiode:  $I_p = f(P_{opt}); V_R = 3.3\text{ V}$



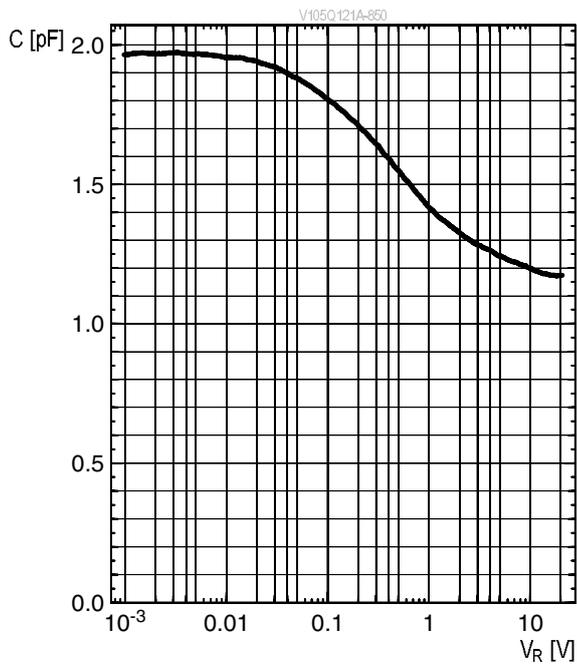
### Dark Current 1), 2)

■ photodiode:  $I_R = f(V_R)$



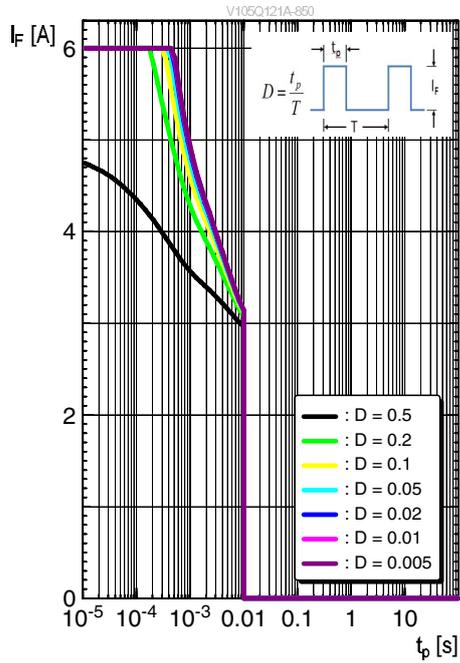
### Capacitance 1), 2)

■ photodiode:  $C = f(V_R)$



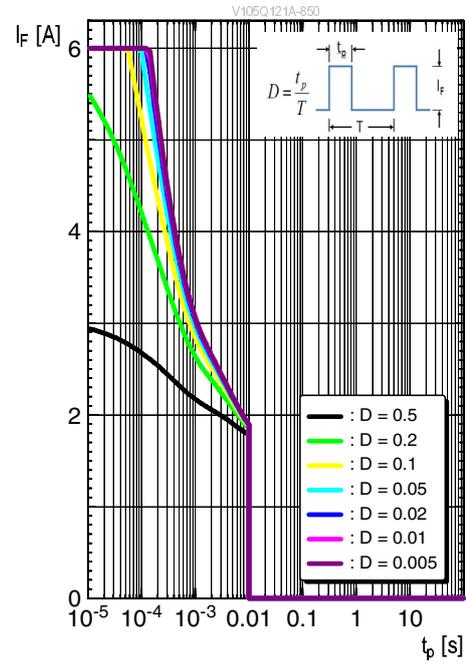
### Permissible Pulse Handling Capability

• infrared (850 nm):  $I_F = f(t_p)$ ;  $D = \text{param.}$ ;  $T_A = 25\text{ °C}$

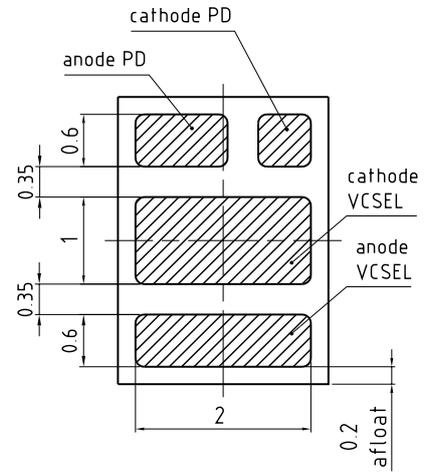
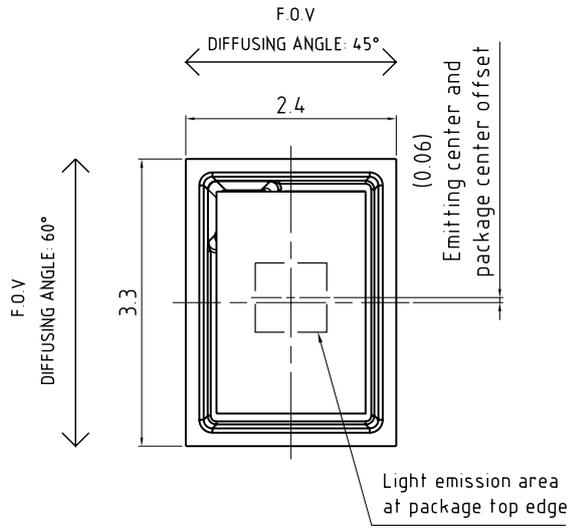


### Permissible Pulse Handling Capability

• infrared (850 nm):  $I_F = f(t_p)$ ;  $D = \text{param.}$ ;  $T_A = 85\text{ °C}$



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



general tolerance  $\pm 0.1$

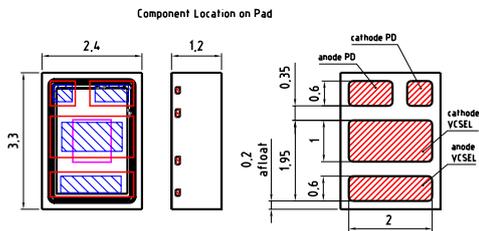
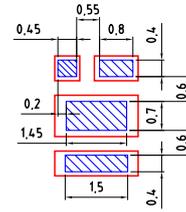
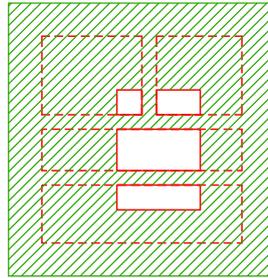
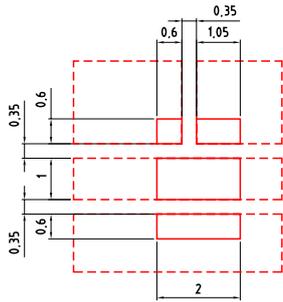
lead finish Au 

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### Further Information:

Approximate Weight: 20.0 mg

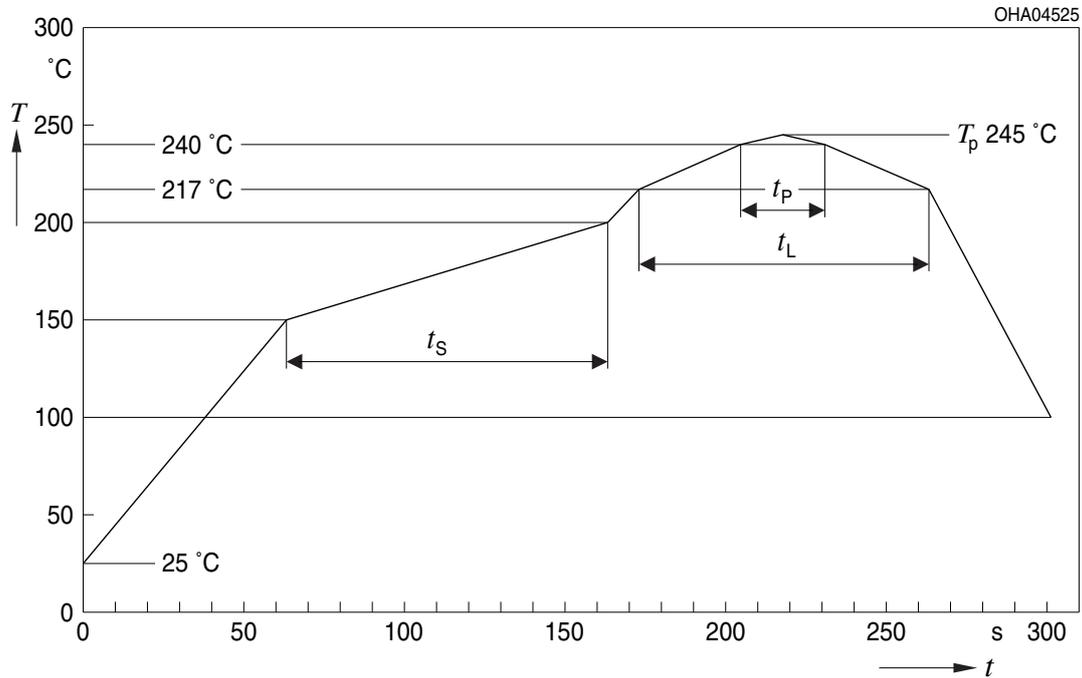
### Recommended Solder Pad <sup>3)</sup>



E062.3010.294-03

## Reflow Soldering Profile

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

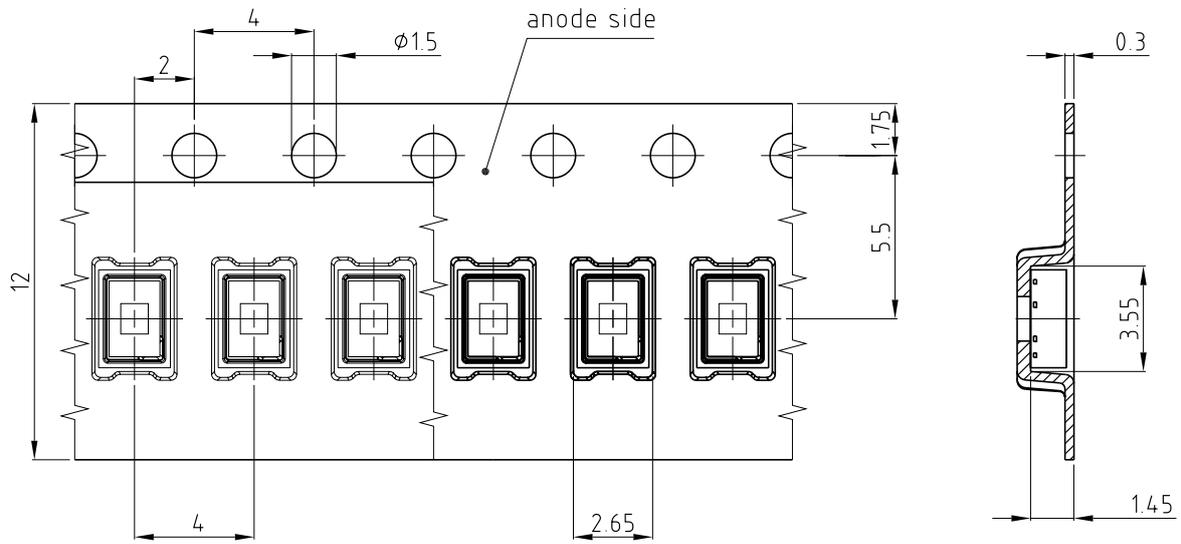


Profile Feature	Symbol	Pb-Free (SnAgCu) Assembly			Unit
		Minimum	Recommendation	Maximum	
Ramp-up rate to preheat <sup>*)</sup> 25 °C to 150 °C			2	3	K/s
Time $t_s$ $T_{Smin}$ to $T_{Smax}$	$t_s$	60	100	120	s
Ramp-up rate to peak <sup>*)</sup> $T_{Smax}$ to $T_p$			2	3	K/s
Liquidus temperature	$T_L$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

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

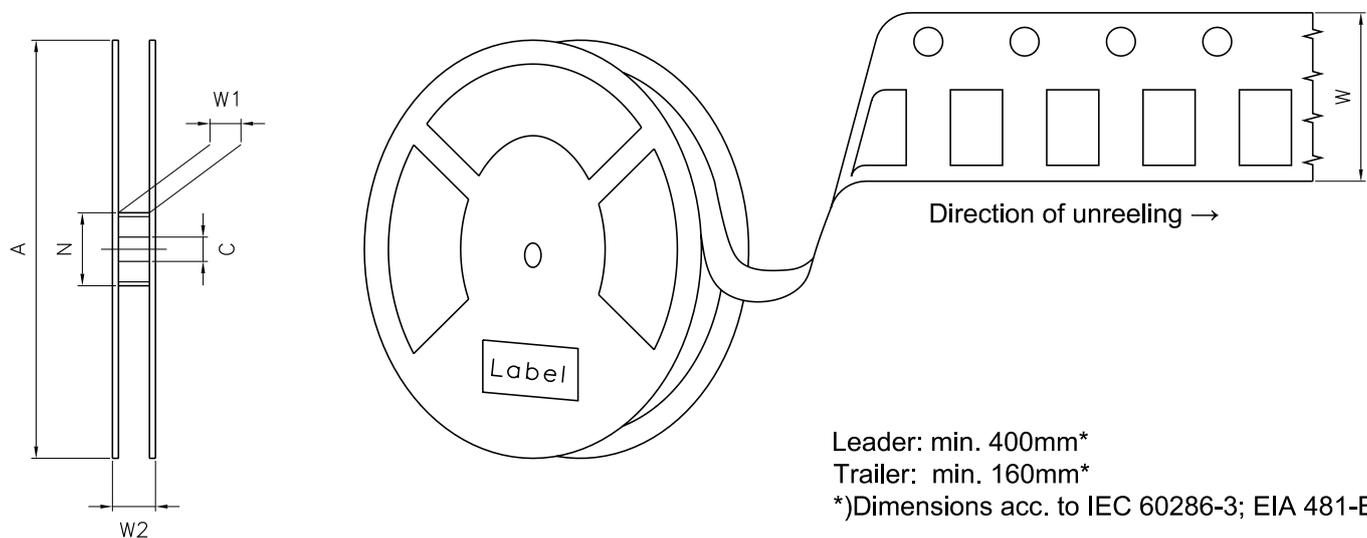
\* slope calculation  $DT/Dt$ :  $Dt$  max. 5 s; fulfillment for the whole T-range

Taping <sup>3)</sup>



C67062-A0363-B6-04

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



## Reel Dimensions

A	W	N <sub>min</sub>	W <sub>1</sub>	W <sub>2max</sub>	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** 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

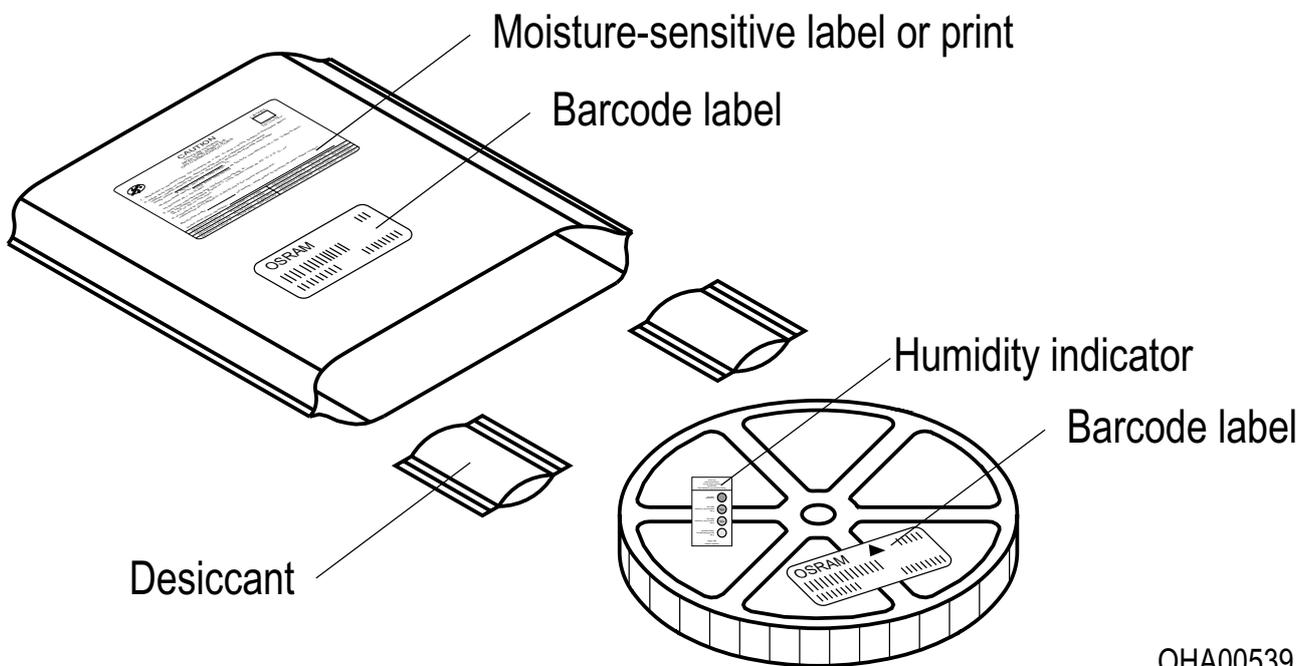
ML Temp ST  
X XXX °C X

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

The diagram shows a rectangular label with rounded corners. It features the OSRAM logo at the top left. To the right of the logo are the fields 'LX XXXX' and 'BIN1: XX-XX-X-XXX-X'. Below the logo is the text 'RoHS Compliant'. The label contains three main rows of information, each with a corresponding barcode: 1. '(6P) BATCH NO: 1234567890' with a standard 1D barcode. 2. '(1T) LOT NO: 1234567890' and '(9D) D/C: 1234' with a 2D barcode. 3. '(X) PROD NO: 123456789 (Q) QTY: 9999 (G) GROUP: XX-XX-X-X' with a 2D barcode. To the right of the second row is a circular icon with a diagonal line and three droplets, representing a moisture-sensitive component. Next to it is the text 'ML Temp ST X XXX °C X'. Below the circular icon is the text 'Pack: RXX', 'DEMY XXX', and 'X\_X123\_1234.1234 X'. To the right of the label is a square QR code. A large, semi-transparent watermark 'EXAMPLE' is overlaid across the center of the label.

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 <https://ams-osram.com/support/application-notes>

## 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 our 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

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

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

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

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## 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:**  $T_A = 25^\circ\text{C}$  (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.
- 9) **Photocurrent:** The photocurrent values are measured (by irradiating the devices with a homogenous light source and applying a voltage to the device) with a tolerance of  $\pm 11\%$ .

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## Revision History

Version	Date	Change
1.0	2023-11-23	Initial Version
1.1	2024-06-26	Recommended Solder Pad Taping
1.2	2025-02-04	Characteristics
1.3	2025-05-28	Brand



EU RoHS and China RoHS compliant product

此产品符合欧盟 RoHS 指令的要求；  
按照中国的相关法规和标准，  
不含有毒有害物质或元素。

**Published by ams-OSRAM AG**

Tobelbader Strasse 30, 8141 Premstaetten, Austria

Phone +43 3136 500-0

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