

OSRAM SFH 9206

Datasheet

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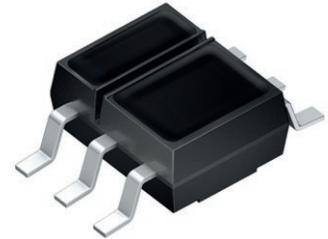
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Reflective Interrupter

SFH 9206

940nm emitter with a silicon NPN phototransistor
in a SMT package



Applications

- Position & Angle Sensing

Features

- Qualifications: The product qualification test plan is based on the guidelines of AEC-Q101-REV-C, Stress Test Qualification for Automotive Grade Discrete Semiconductors.
- ESD: 2 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)
- 940nm emitter in combination with a silicon NPN phototransistor
- Optimal operating distance 1 mm to 5 mm
- Daylight cut-off filter
- Emitter and detector electrically isolated
- Soldering Methode: IR Reflow Soldering
- Product complies to MSL Level 4

Ordering Information

Type	Ordering Code
SFH 9206	Q65111A3179
SFH 9206-5/6	Q65111A3177
SFH 9206-6/7	Q65111A3178

Maximum Ratings

$T_A = 25\text{ °C}$

Parameter	Symbol		Values
Emitter			
Reverse voltage	V_R	max.	5 V
Forward current	I_F	max.	50 mA
Forward current pulsed $t_p \leq 100\ \mu\text{s}$, $D = 0.005$	$I_{F\text{ pulse}}$	max.	0.7 A
Power consumption	P_{tot}	max.	100 mW
Detector			
Emitter-collector voltage	V_{EC}	max.	7 V
Collector current	I_C	max.	10 mA
Collector-emitter voltage	V_{CE}	max.	16 V
Collector-emitter voltage $t \leq 2\text{ min}$	V_{CE}	max.	30 V
Interrupter			
Operating temperature	T_{op}	min.	-40 °C
		max.	100 °C
Storage temperature	T_{stg}	min.	-40 °C
		max.	100 °C
Ambient temperature range	T_A	min.	-40 °C
		max.	100 °C
Total power dissipation	P_{tot}	max.	150 mW
ESD withstand voltage acc. to ANSI/ESDA/JEDEC JS-001 - HBM	V_{ESD}	max.	2 kV

Characteristics

$T_A = 25\text{ °C}$

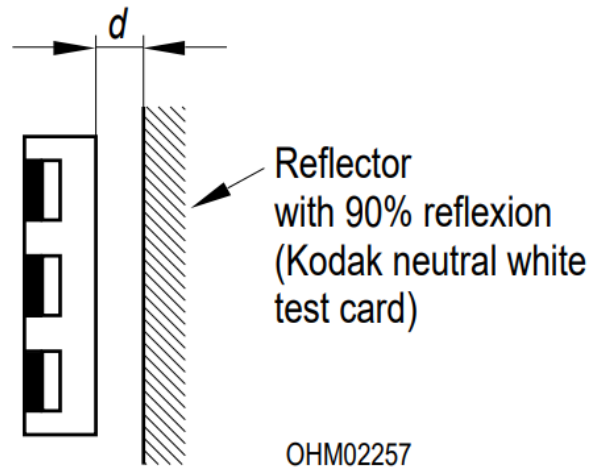
Parameter	Symbol		Values
Emitter			
Peak wavelength $I_F = 50\text{ mA}$, $t_p = 20\text{ ms}$	λ_{peak}	typ.	950 nm
Forward voltage ⁵⁾ $I_F = 50\text{ mA}$, $t_p = 20\text{ ms}$	V_F	typ. max.	1.45 V 1.7 V
Reverse current $V_R = 5\text{ V}$	I_R		not designed for reverse operation
Thermal resistance junction – ambient ⁴⁾	R_{thJA}	max.	495 K/W
Detector			
Dark current $V_{CE} = 16\text{ V}$, $E = 0$	I_{CE0}	typ. max.	1 nA 50 nA
Capacitance $V_{CE} = 0\text{ V}$, $f = 1\text{ MHz}$, $E = 0$	C_{CE}	typ.	5 pF
Photocurrent (ambient light sensitivity) $V_{CE} = 5\text{ V}$, $E_V = 1000\text{ lx}$	I_{PCE}	typ.	1 mA
Thermal resistance junction – ambient ⁴⁾	R_{thJA}	max.	495 K/W
Interrupter			
Collector-emitter current ⁶⁾ Kodak neutral white testcard with 90% reflection; $I_F = 10\text{ mA}$, $V_{CE} = 5\text{ V}$, $d = 1\text{ mm}$	I_{PCE}	min. typ. max.	180 μA 600 μA 1800 μA
Collector-emitter saturation voltage Kodak neutral white testcard with 90% reflection; $I_F = 10\text{ mA}$, $I_C = 55\text{ }\mu\text{A}$, $d = 1\text{ mm}$	$V_{CE\text{sat}}$	typ. max.	200 mV 600 mV
Switching Times			
Turn-on time ⁷⁾ $V_{CC} = 5\text{ V}$, $I_C = 100\text{ }\mu\text{A}$, $R_L = 1\text{ k}\Omega$	t_{on}	typ.	40 μs
Turn-off time ⁷⁾ $V_{CC} = 5\text{ V}$, $I_C = 100\text{ }\mu\text{A}$, $R_L = 1\text{ k}\Omega$	t_{off}	typ.	45 μs
Rise time ⁷⁾ $V_{CC} = 5\text{ V}$, $I_C = 100\text{ }\mu\text{A}$, $R_L = 1\text{ k}\Omega$	t_r	typ.	30 μs
Fall time ⁷⁾ $V_{CC} = 5\text{ V}$, $I_C = 100\text{ }\mu\text{A}$, $R_L = 1\text{ k}\Omega$	t_f	typ.	40 μs

Photocurrent Groups

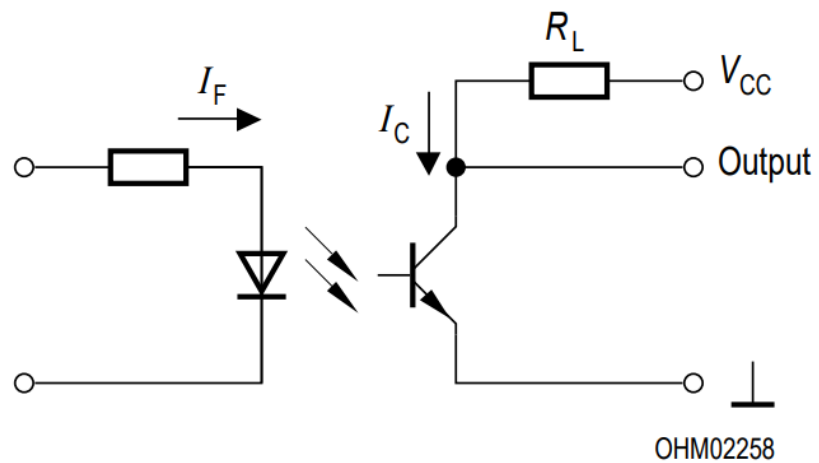
$T_A = 25\text{ °C}$

Group	Photocurrent ⁶⁾ $V_{CE} = 5\text{ V}; I_F = 10\text{ mA},$ $d = 1\text{ mm (Kodak neutral white 90%)}$ min. I_{PCE}	Photocurrent ⁶⁾ $V_{CE} = 5\text{ V}; I_F = 10\text{ mA},$ $d = 1\text{ mm (Kodak neutral white 90%)}$ max. I_{PCE}
	4	180 μA
5	280 μA	450 μA
6	450 μA	710 μA
7	710 μA	1120 μA
8	1120 μA	1800 μA

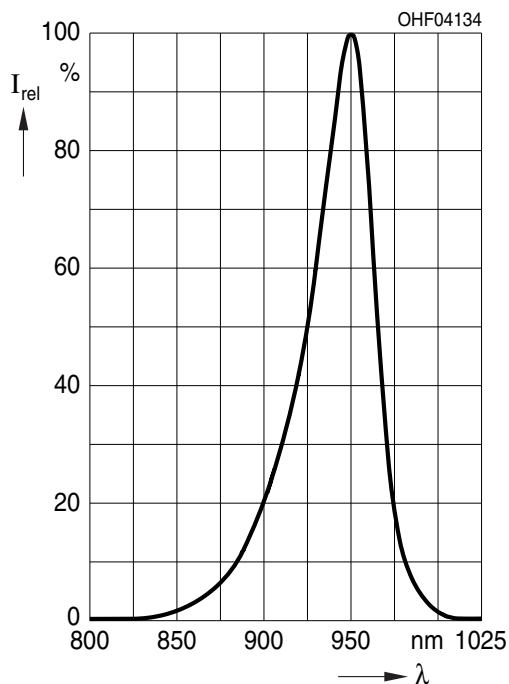
Mechanical test setup



Test Circuit for Switching and Response Time

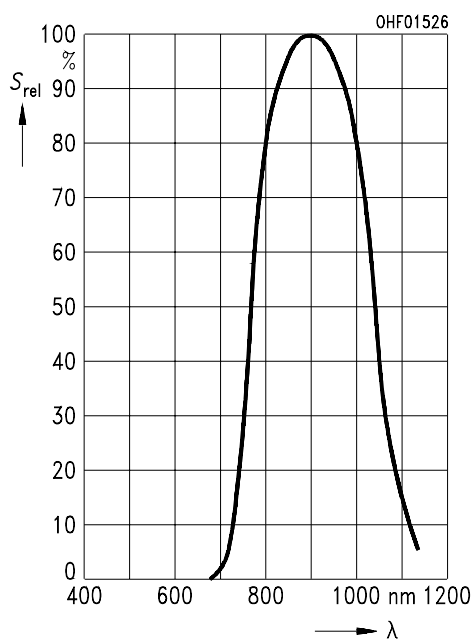


Relative Spectral Emission ¹⁾

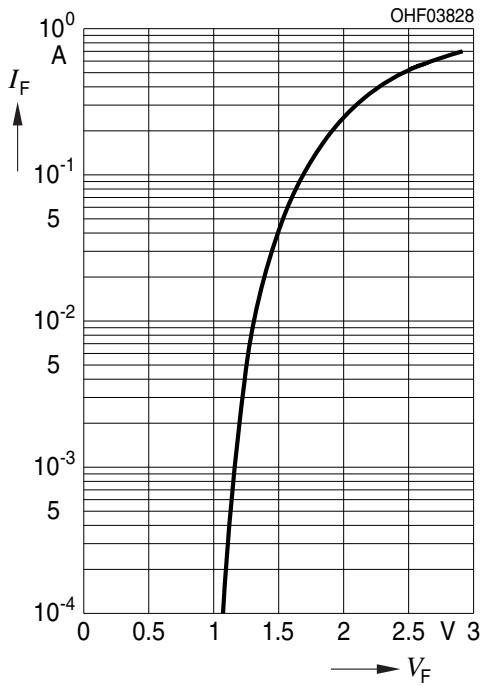


Relative Spectral Sensitivity ^{1), 2)}

■ phototransistor: $S_{rel} = f(\lambda)$

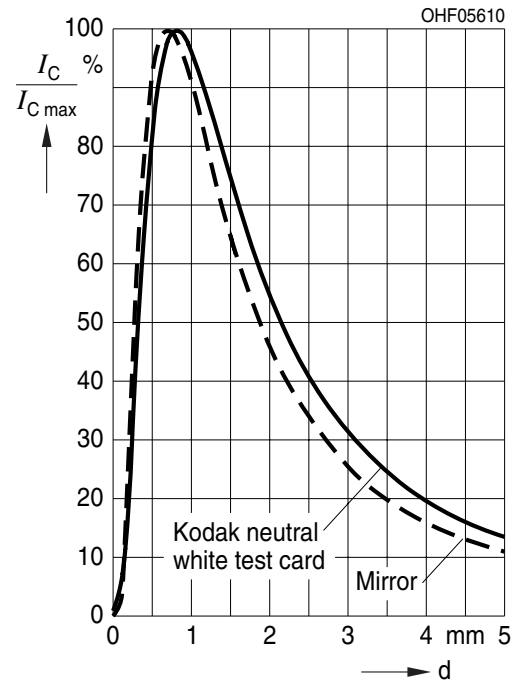


Forward current ¹⁾



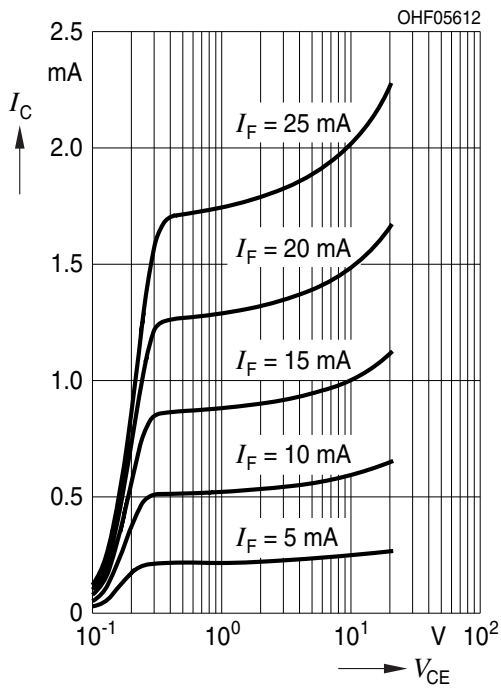
Collector Current ^{1), 2)}

■ phototransistor: $I_{C,rel} = f(d)$



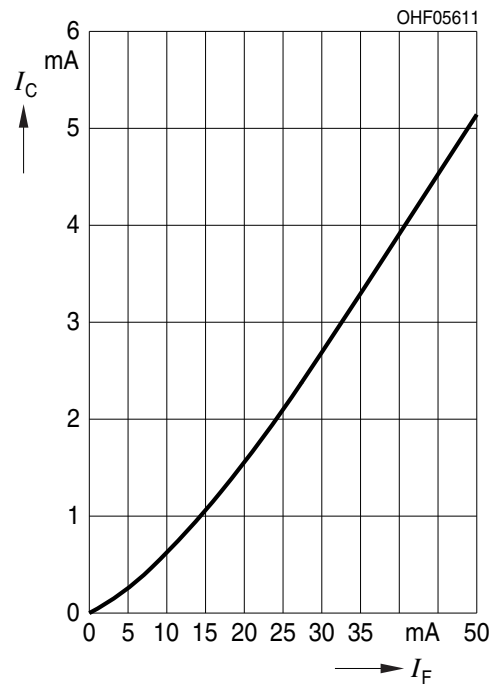
Photocurrent ^{1), 2)}

■ phototransistor: $I_{PCE} = f(V_{CE})$;
d = 1 mm (Kodak 90%)



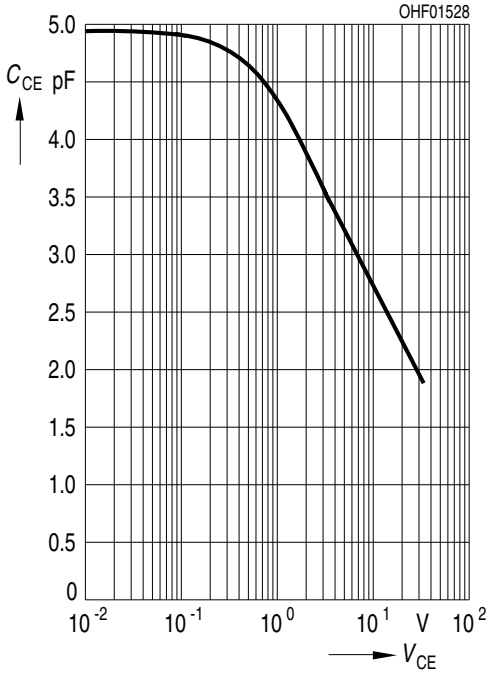
Collector Current ^{1), 2)}

■ phototransistor: $I_C = f(I_F)$;
d = 1 mm (Kodak 90%)



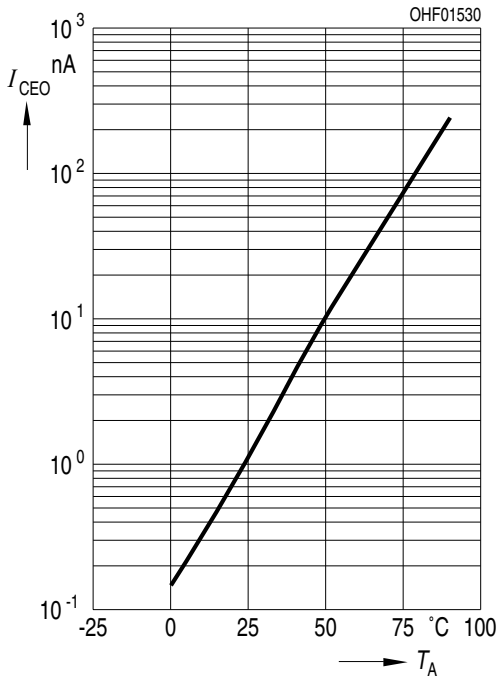
Collector-Emitter Capacitance ^{1), 2)}

■ phototransistor: $C_{CE} = f(V_{CE})$; $f = 1 \text{ MHz}$; $E = 0$



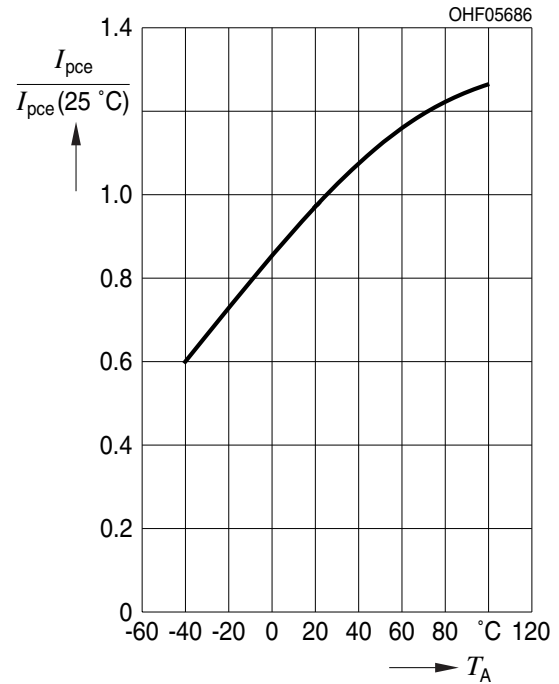
Dark Current ¹⁾

■ phototransistor: $I_{CE0} = f(T_A)$; $V_{CE} = 20 \text{ V}$; $E = 0$

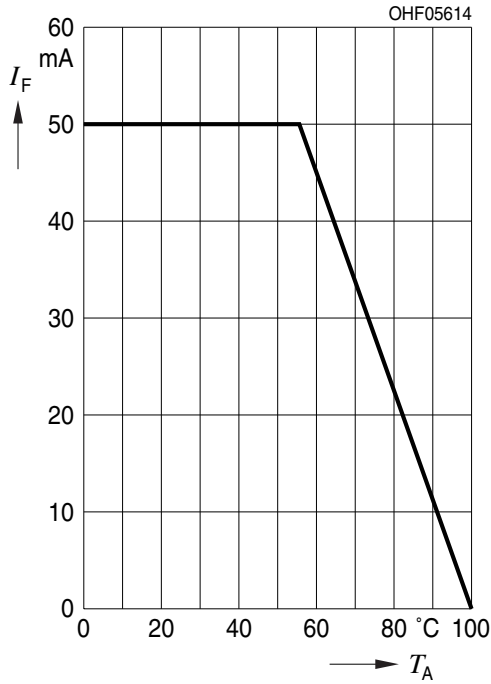


Photocurrent ¹⁾

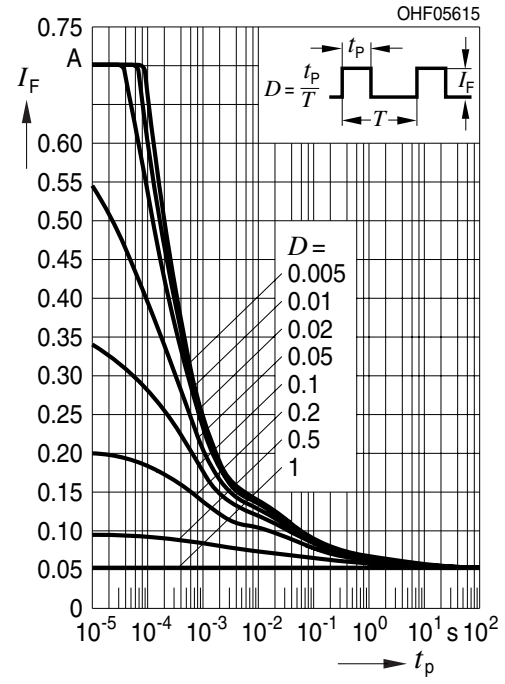
■ phototransistor: $I_{PCE,rel} = f(T_A)$; $V_{CE} = 5 \text{ V}$; $I_F = 10 \text{ mA}$



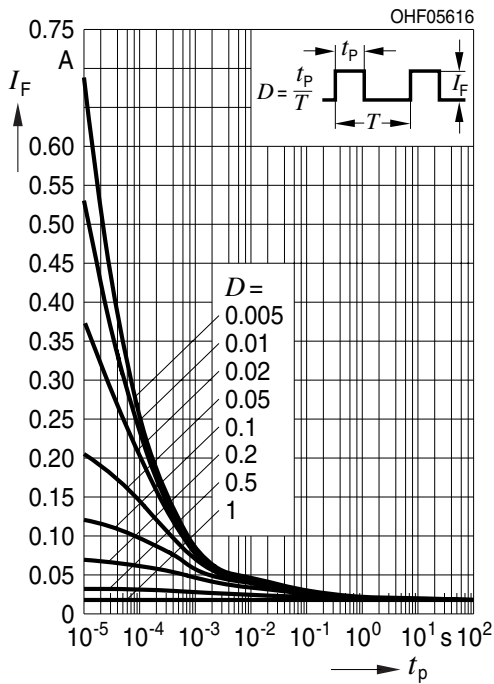
Max. Permissible Forward Current



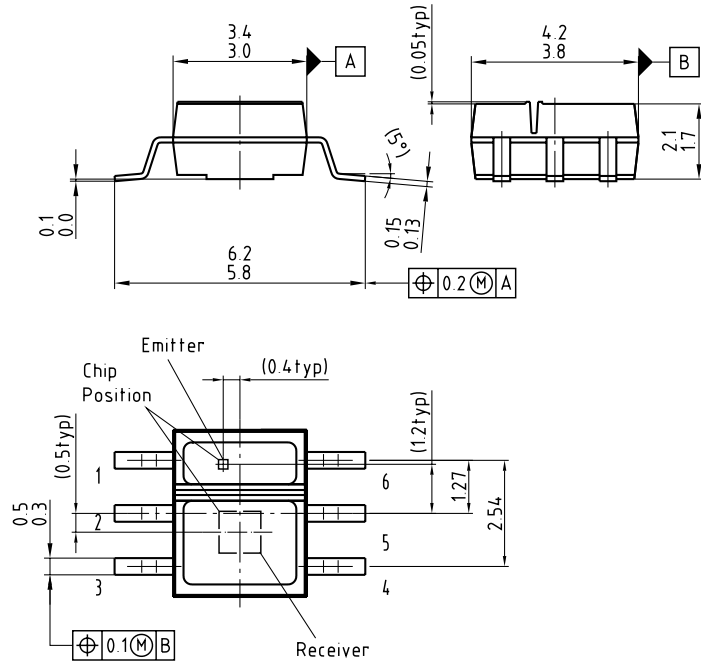
Permissible Pulse Handling Capability



Permissible Pulse Handling Capability



Dimensional Drawing ³⁾



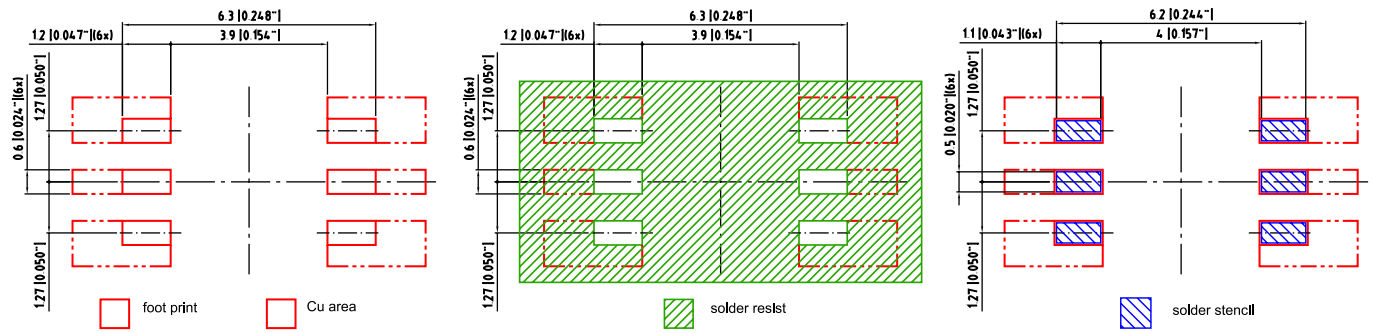
C63062-A3059-A11 -01

Further Information:

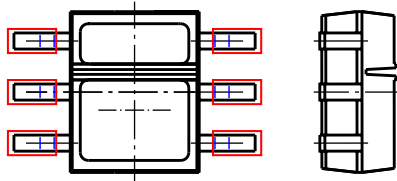
Approximate Weight: 42.0 mg

Pin	Description
1	Anode
2	-
3	Emitter
4	Collector
5	-
6	Cathode

Recommended Solder Pad ³⁾



Component Location on Pad



E062.3010.158 -01

Reflow Soldering Profile

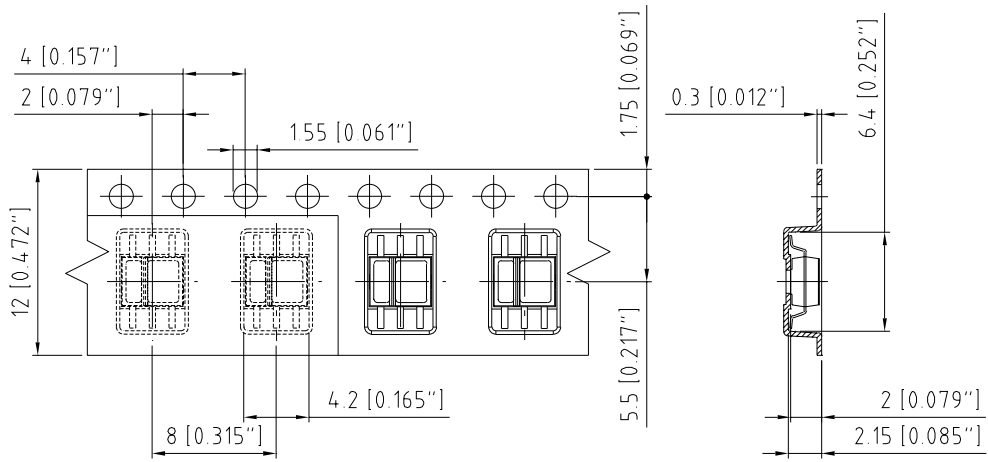
Product complies to MSL Level 4 acc. to JEDEC J-STD-020E



Profile Feature	Symbol	Pb-Free (SnAgCu) Assembly			Unit
		Minimum	Recommendation	Maximum	
Ramp-up rate to preheat ^{*)} 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 ^{*)} 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

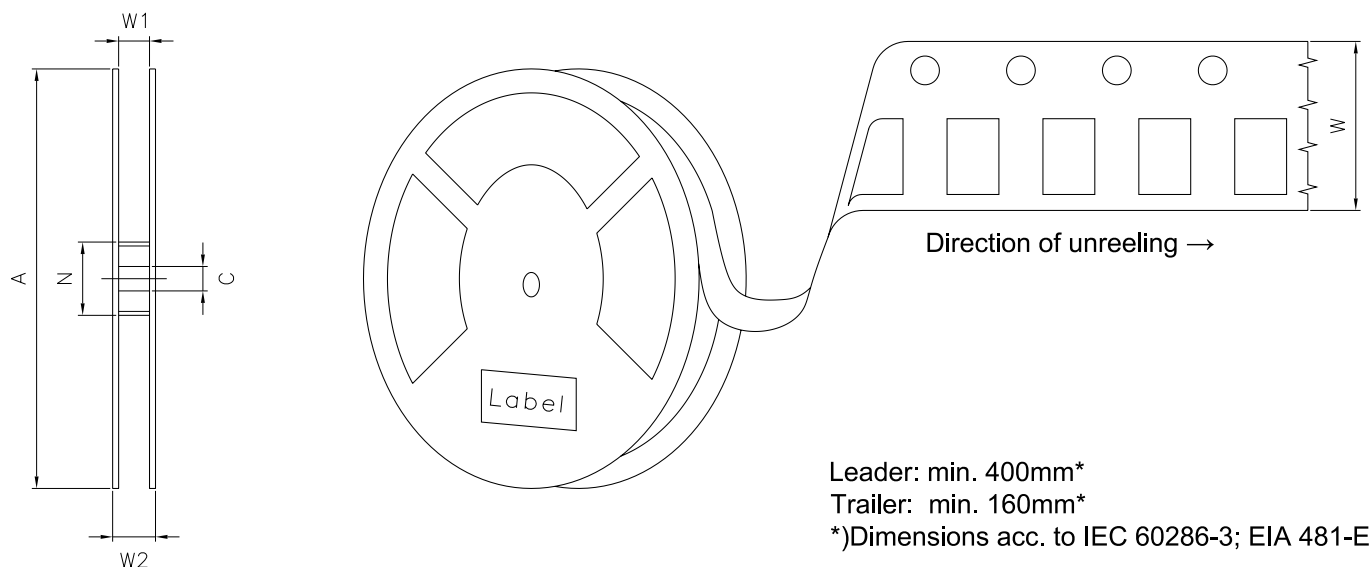
All temperatures refer to the center of the package, measured on the top of the component
^{*)} slope calculation DT/Dt : Dt max. 5 s; fulfillment for the whole T-range

Taping ³⁾



C63062-A3059-B10 -03

Tape and Reel ⁴⁾



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	1000

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

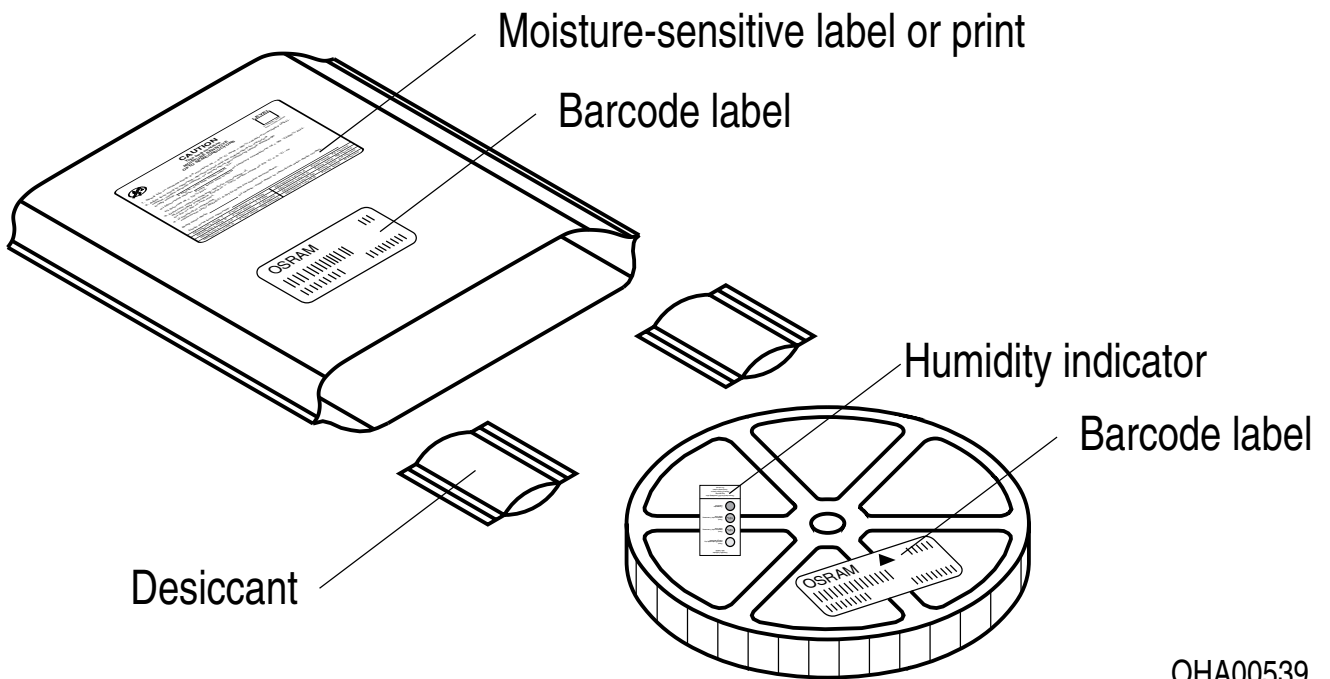
ML Temp ST
X XXX °C X

Pack: RXX
DEMY XXX
X_X123_1234.1234 X

The diagram shows a rectangular label with rounded corners. It contains the OSRAM logo and product name at the top left. To the right are fields for 'LX XXXX' and 'BIN1: XX-XX-X-XXX-X'. Below this is 'RoHS Compliant'. The main body of the label features three rows of information, each with a barcode: '(6P) BATCH NO: 1234567890', '(1T) LOT NO: 1234567890 (9D) D/C: 1234', and '(X) PROD NO: 123456789 (Q) QTY: 9999 (G) GROUP: XX-XX-X-X'. To the right of the second row is a 'No moisture' symbol (a circle with a diagonal line and three drops) and 'ML Temp ST X XXX °C X'. Below that is 'Pack: RXX', 'DEMY XXX', and 'X_X123_1234.1234 X'. A QR code is located on the right side of the label.

OHA04563

Dry Packing Process and Materials ³⁾



OHA00539

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.

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) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with ± 0.1 and dimensions are specified in mm.
- 3) **Tape and Reel:** All dimensions and tolerances are specified acc. IEC 60286-3 and specified in mm.
- 4) **Thermal resistance:** Mounting on PC-board with $> 5 \text{ mm}^2$ pad size.
- 5) **Forward Voltage:** The forward voltages are measured with a tolerance of $\pm 0.1 \text{ V}$.
- 6) **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 $\pm 11 \%$.
- 7) **Switching Time:** IC as a function of the forward current of the emitting diode, the degree of reflection and the distance between reflector and component(d).

Revision History

Version	Date	Change
1.6	2021-06-23	New Layout
1.7	2022-09-09	Applications Description New Layout



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。

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