SFH 9206

Reflective Interrupter

Applications

- Industrial Automation (Machine Controls, Light Barriers, Vision Controls)

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 °C

Parameter	Symbol		Values
Emitter			
Reverse voltage	V_R	max.	5 V
Forward current	I_F	max.	50 mA
Surge current $t_p \leq 10$ µs, D = 0	I_{FSM}	max.	0.7 A
Power consumption	P_{tot}	max.	100 mW
Thermal resistance junction – ambient [1)]	R_{thJA}	max.	495 K/W
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 ≤ 2 min	V_{CE}	max.	30 V
Total Power dissipation	P_{tot}	max.	100 mW
Thermal resistance junction – ambient [1)]	R_{thJA}	max.	495 K/W
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
Electrostatic discharge	V_{EDS}	max.	2 kV

Characteristics

T_A = 25 °C

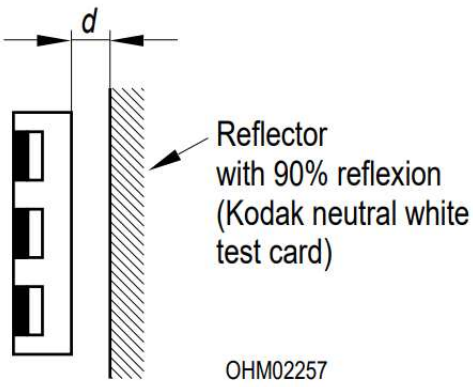
Parameter	Symbol		Values
Emitter			
Peak wavelength	λpeak	typ.	950 nm
IF = 50 mA, tp = 20 ms			
Forward voltage	VF	typ.	1.45 V
IF = 50 mA, tp = 20 ms		max.	1.8 V
Reverse current	IR		not designed for
VR = 5 V			reverse operation
Detector			
Dark current	ICE0	typ.	1 nA
VCE = 16 V, E = 0		max.	50 nA
Capacitance	CCE	typ.	5 pF
VCE = 0 V, f = 1 MHz, E = 0			
Photocurrent (ambient light sensitivity)	IPCE	typ.	1 mA
VCE = 5 V, EV = 1000 lx			
Interrupter			
Collector-emitter current	IPCE	min.	160 µA
Kodak neutral white testcard with 90% reflection;		typ.	600 µA
IF = 10 mA, VCE = 5 V, d = 1 mm		max.	2000 µA
Collector-emitter saturation voltage	VCEsat	typ.	200 mV
Kodak neutral white testcard with 90% reflection;		max.	600 mV
IF = 10 mA, IC = 55 µA, d = 1 mm			
Switching Times			
Turn-on time 2)	ton	typ.	40 µs
VCC = 5 V, IC = 100 µA, RL = 1 kΩ			
Turn-off time 2)	toff	typ.	45 µs
VCC = 5 V, IC = 100 µA, RL = 1 kΩ			
Rise time 2)	tr	typ.	30 µs
VCC = 5 V, IC = 100 µA, RL = 1 kΩ			
Fall time 2)	tf	typ.	40 µs
VCC = 5 V, IC = 100 µA, RL = 1 kΩ			

Photocurrent Groups

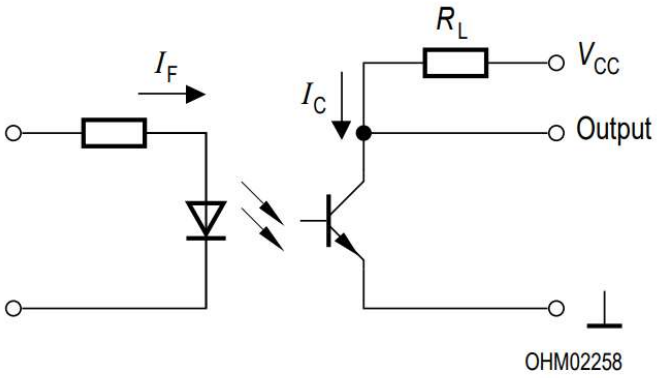
T_A = 25 °C

Group	Photocurrent V_{CE} = 5 V; λ = 940 nm; Ee = 0.1 mW/cm² min. I_{PCE}	Photocurrent V_{CE} = 5 V; λ = 940 nm; Ee = 0.1 mW/cm² max. I_{PCE}
4	180 µA	280 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



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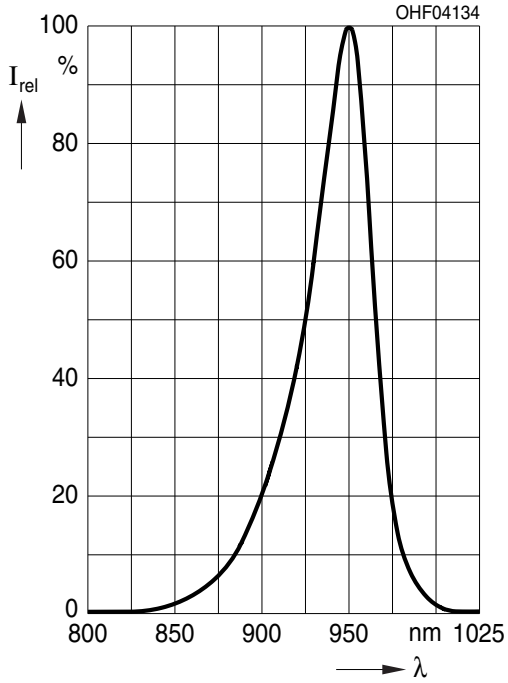
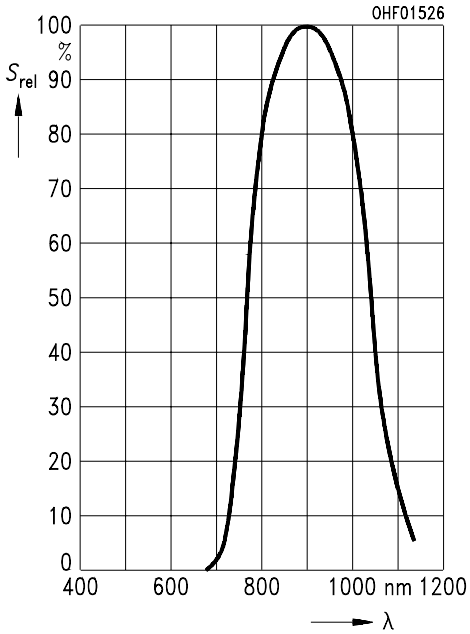
Relative Spectral Emission [1)]

(typ) $I_{rel} = f(\lambda)$, $T_A = 25°C$



Relative Spectral Sensitivity [1)]

$S_{rel} = f(\lambda)$, $T_A = 25°C$



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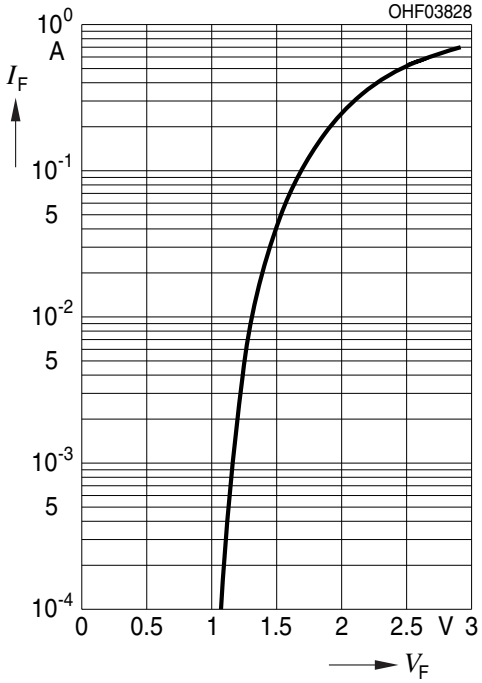
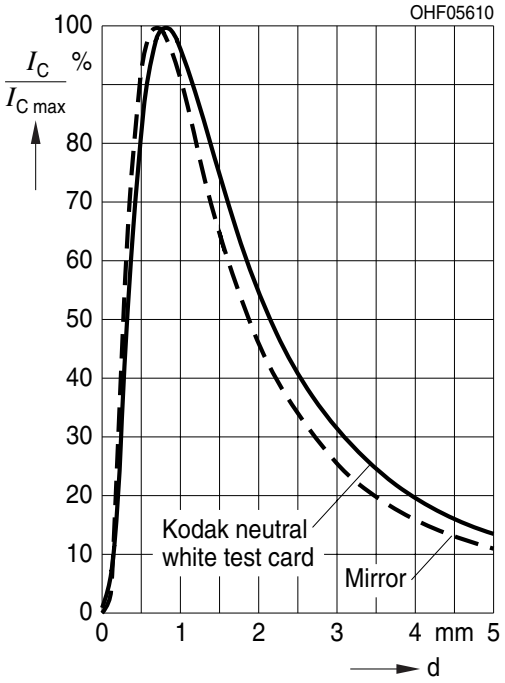
Forward current [1)]

$I_F = f(V_F)$m single pulse, t_p = 100 µs



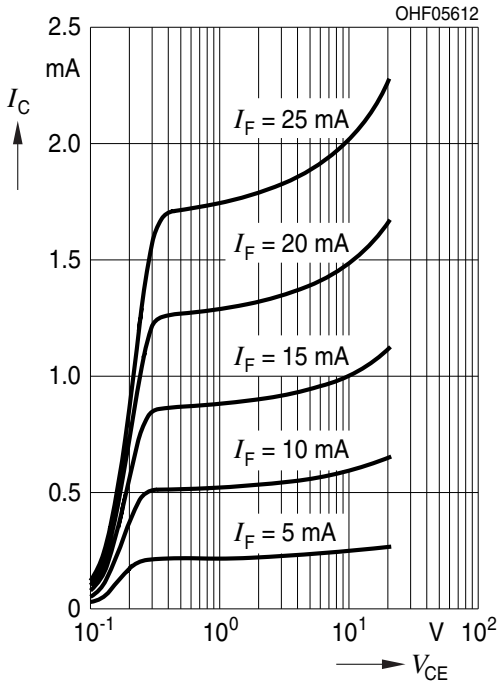
Collector Current [1)]

$I_C / I_{Cmax} = f(d)$, T_A = 25°C



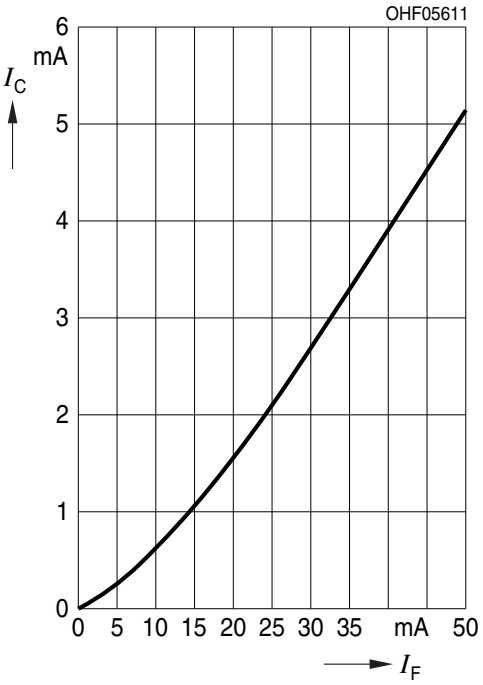
Photocurrent [1)]

$I_C = f(V_{CE})$, d = 1 mm, 90% reflection, T_A = 25°C



Collector Current [1)]

$I_C = f(I_F)$, d = 1 mm, 90% reflection, T_A = 25°C



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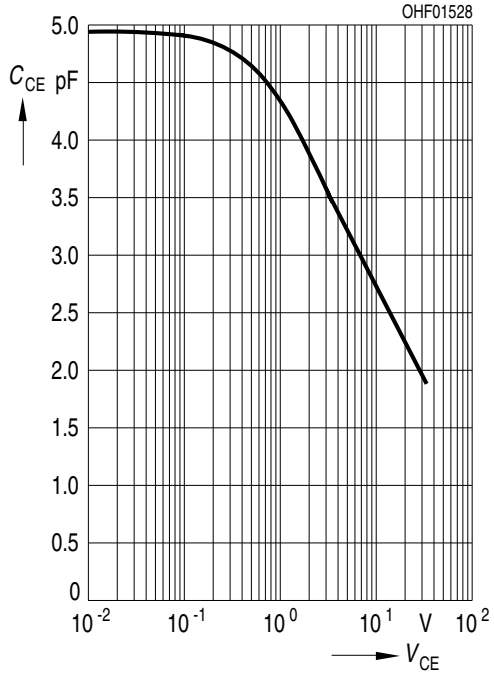
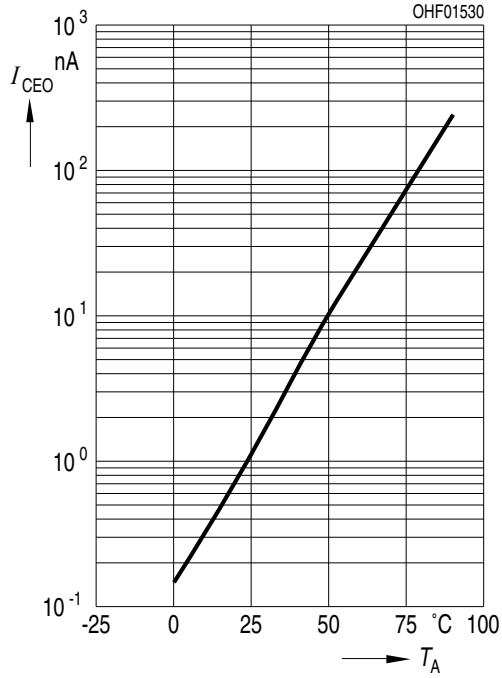
Collector-Emitter Capacitance [1)]

$C_{CE} = f(V_{CE})$, f = 1 MHz, E = 0, T_A = 25°C



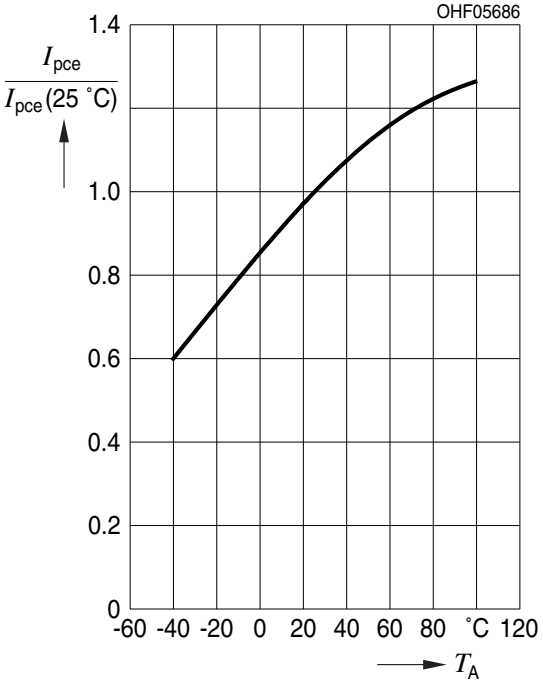
Dark Current [1)]

$I_{CEO} = f(T_A)$, V_{CE} = 20 V, E = 0



Photocurrent [1)]

$I_{PCE} / I_{PCE}(25°C) = f(T_A)$, V_{CE} = 5 V, If = 10 mA



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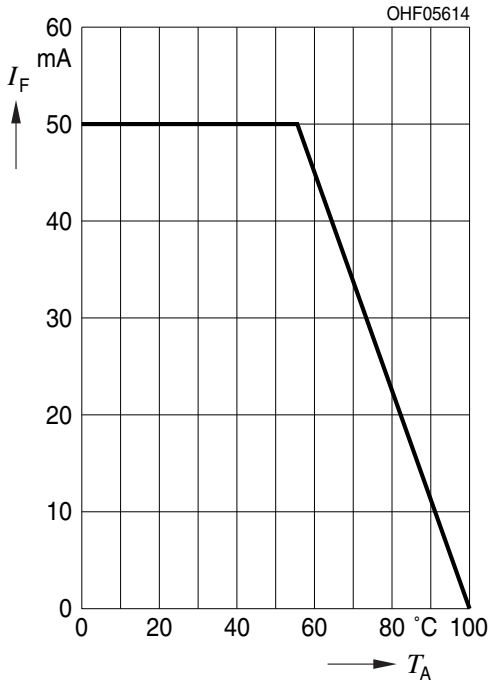
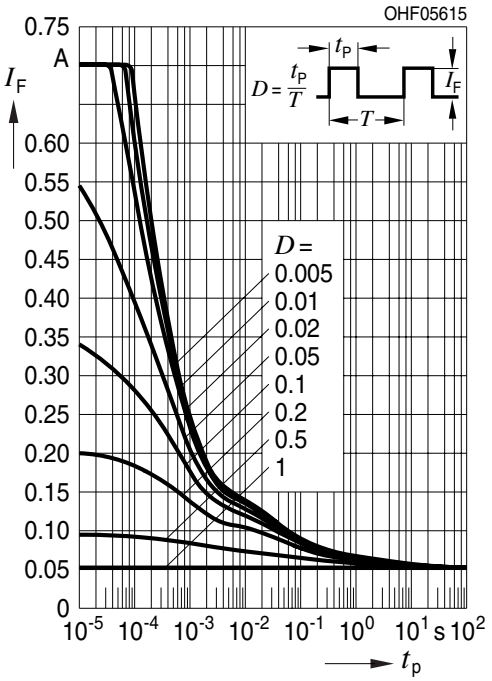
Max. Permissible Forward Current

$I_F = f(T_A)$



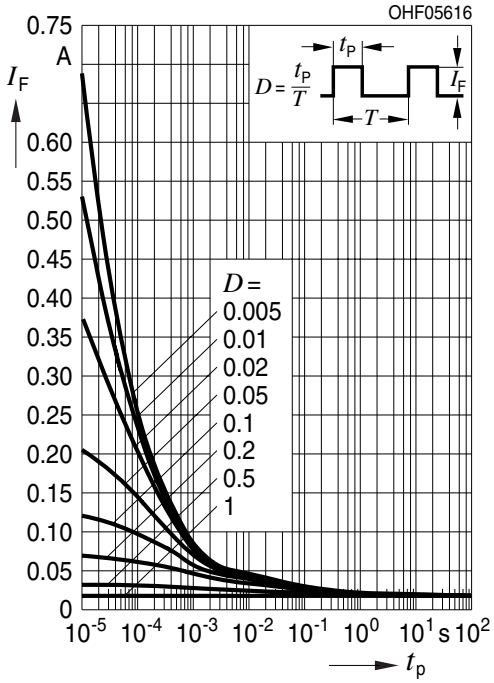
Permissible Pulse Handling Capability

$I_F = f(t_p)$, T_A = 25°C, duty cycle D = parameter



Permissible Pulse Handling Capability

$I_F = f(t_p)$, T_A = 85°C, duty cycle D = parameter



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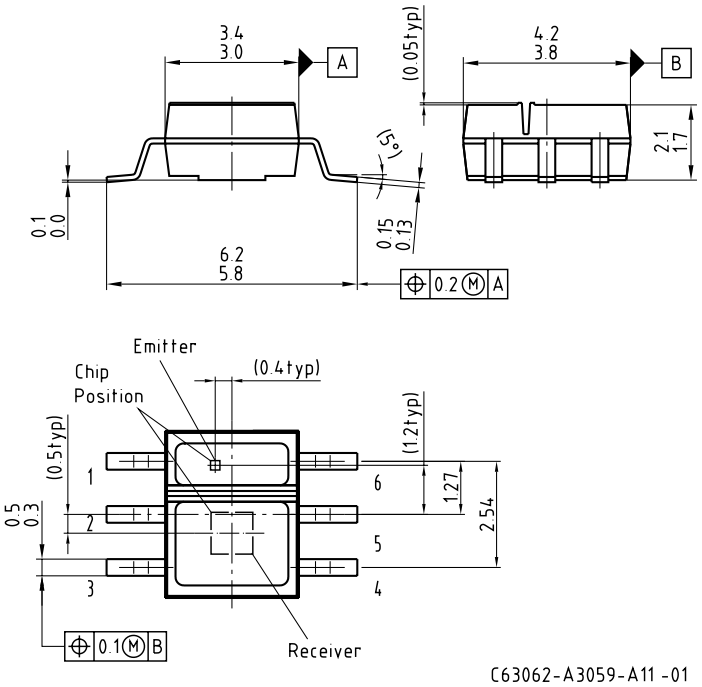
Dimensional Drawing [2)]



Further Information:

Approximate Weight: 42.0 mg

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

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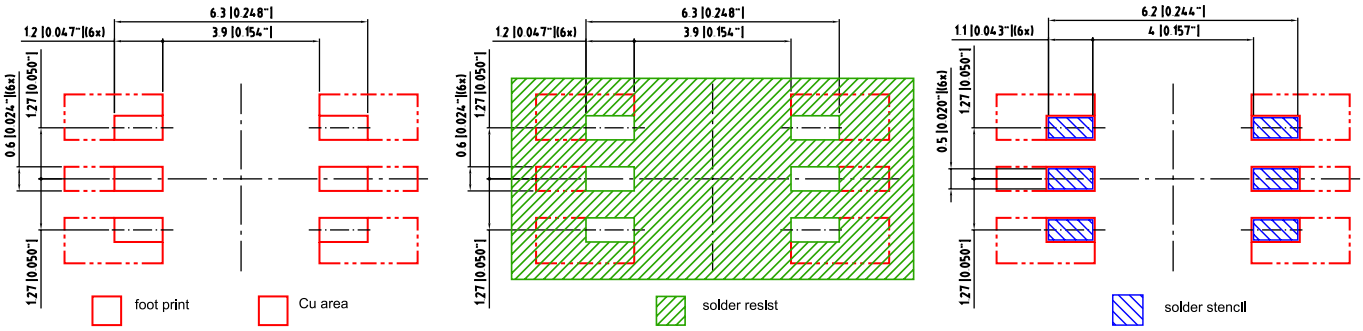
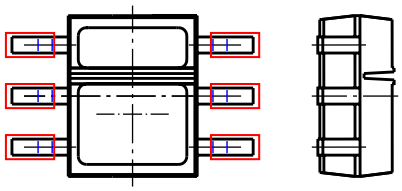
Recommended Solder Pad [2)]



Component Location on Pad



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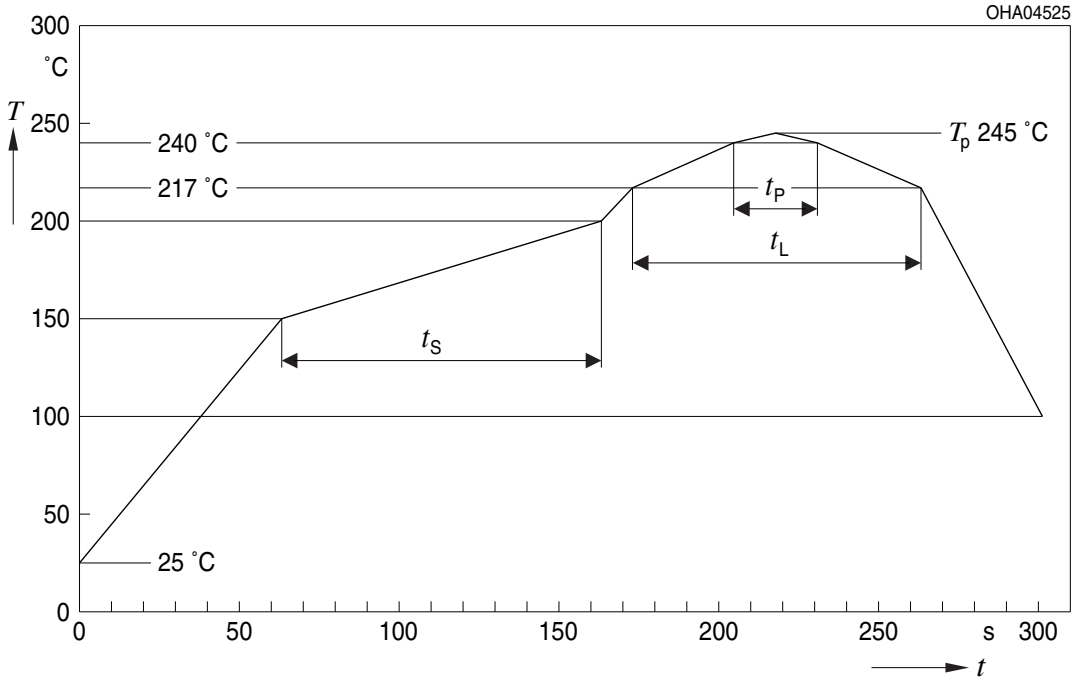
Reflow Soldering Profile

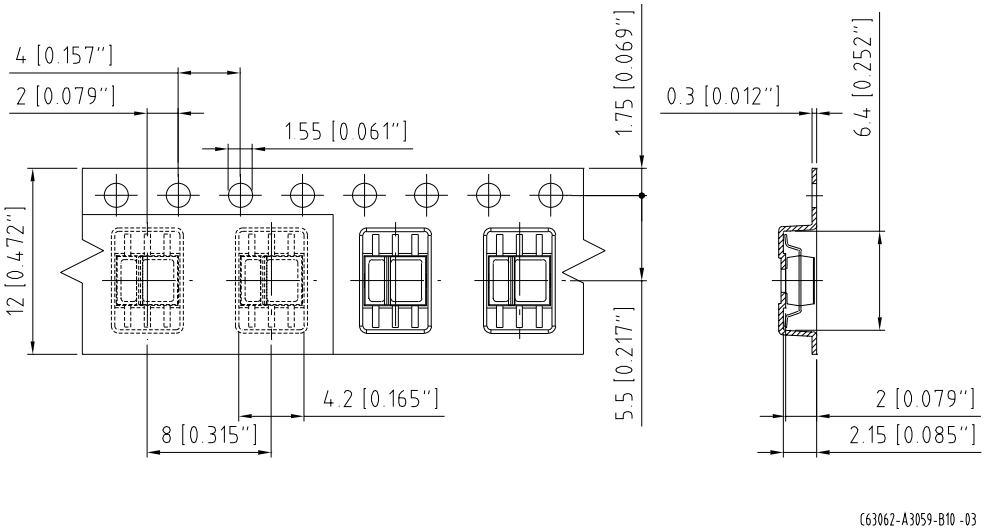
Product complies to MSL Level 4 acc. to JEDEC J-STD-020E



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 [2)]



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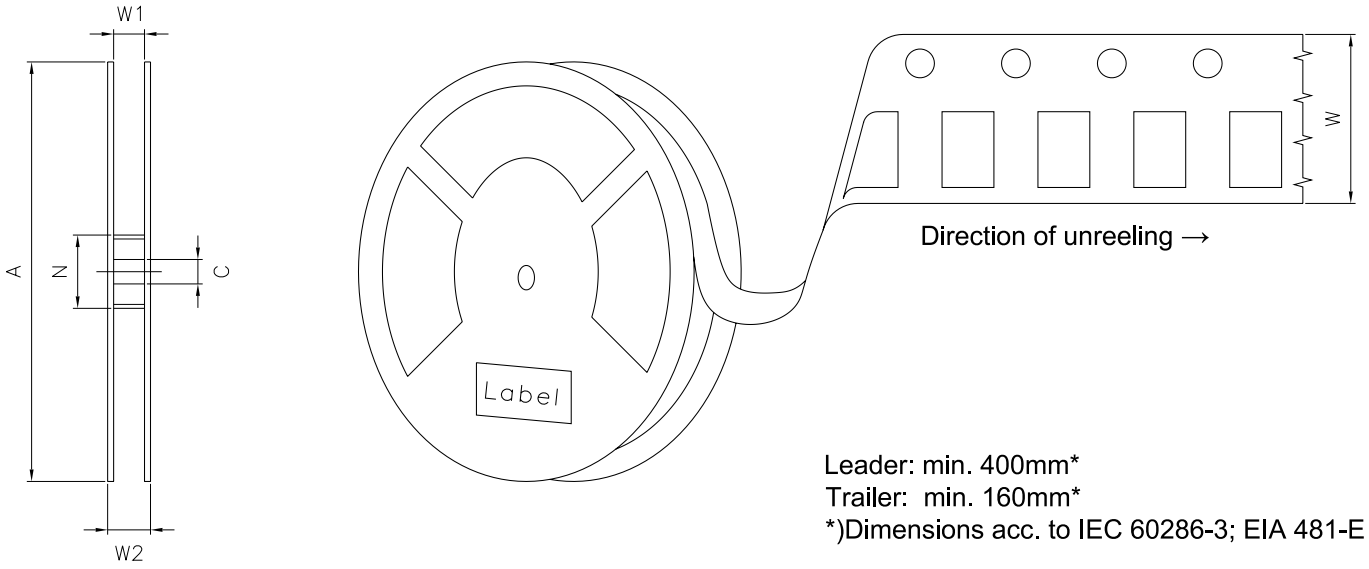
Tape and Reel [3)]

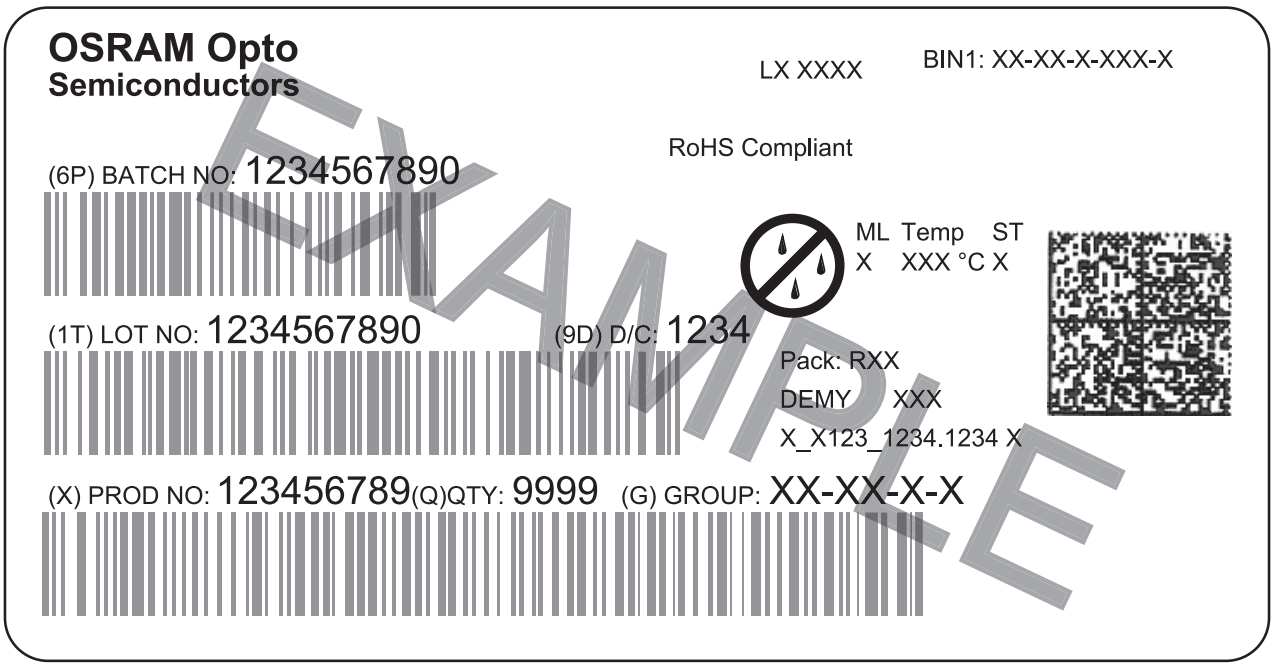


Leader: min. 400mm*
Trailer: min. 160mm*
*)Dimensions acc. to IEC 60286-3; EIA 481-E

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)



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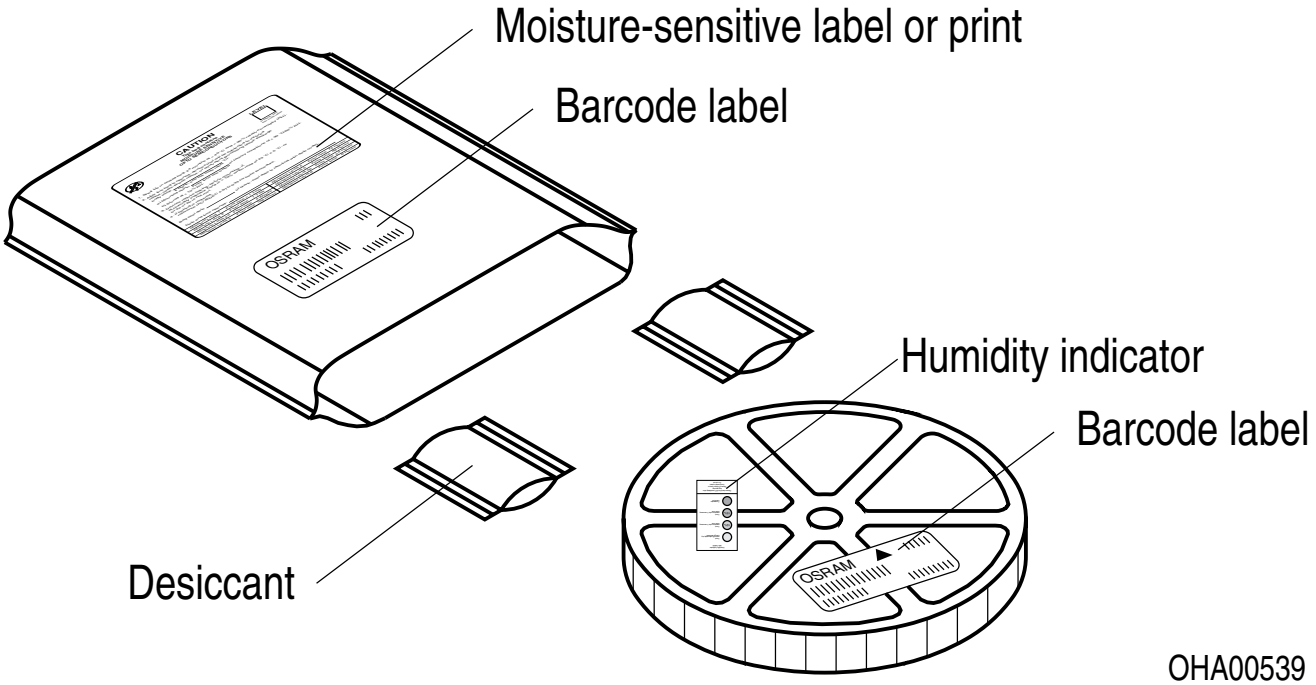
Dry Packing Process and Materials [2)]



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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) **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 mm^2 pad size.
5) I_C 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

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