

V102Q123A-940



Features:

- Package: QFN Package
- ESD: 2 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)
- IR laser wavelength 940nm
- VCSEL power array
- 1 Watt up to 2.5 Watts of power
- Die size 0.870 x 0.870 nm
- Package size: (WxDxH) 2.4 mm x 3.3 mm x 1.2 mm
- IR Laser with photodiode

Applications

- 3D Capturing
- Access Control (IRIS/Vein Scan, Face Recognition)
- Augmented Reality, Mixed Reality
- Gesture Recognition
- Virtual Reality

Note

Depending on the mode of operation, these devices emit highly concentrated non visible infrared 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 "Safety of laser products".

Ordering Information

$T_A = 25\text{ °C}$, $I_F = 2.7\text{ A}$, $t_p = 300\text{ }\mu\text{s}$; $D = 0.05$

Type	Peak output power P_{opt} [W]	Ordering Code
V102Q123A-940	typ. 2	Q65112A9854

Maximum Ratings

Parameter	Symbol	Values	Unit
Operating temperature range (85°C with reduced efficiency)	T_{op}	-20 ... 85	°C
Storage temperature range	T_{stg}	-40 ... 85	°C
Soldering temperature ($t_{max} = 10$ s)	T_S	260	°C
ESD withstand voltage (acc. to ANSI/ ESDA/ JEDEC JS-001 - HBM)	V_{ESD}	2	kV

IR Laser

Forward Current (CW mode)	I_F	2.5	A
Surge current ($t_p \leq 600$ μ s, $D = 0.01$)	I_{FSM}	4	A
Reverse voltage ^{2) page 14}	V_R	5	V

Photodiode

Reverse voltage	V_R	5	V
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Note: Stresses beyond those listed under Maximum Ratings may cause permanent damage to the device.

Characteristics ($T_A = 25$ °C , $t_p = 300$ μ s; $D = 0.05$)

Parameter	Symbol	Values	Unit
Peak emission wavelength ^{5) page 14}	(min) (typ) (max)	λ_{peak}	930 945 nm nm
Peak output power ^{1) page 14} ($I_F = 2.7$ A)	(min) (typ)	P_{opt}	2.0 2.15 W W
Threshold current	(typ) (max)	I_{th}	0.25 0.40 A A
Slope efficiency ($I_F = 0.1$ W... 0.5 W)	(min) (typ)	η	0.7 0.85 W/A W/A
Power conversion efficiency ($I_F = 2.7$ A)	(typ)	η_{tot}	38 %
Field of View incl. OE (HFOV)	(min)	$\Theta_{ }$	50 °
Field of View incl. OE (VFOV)	(min)	Θ_{\perp}	63 °
Chip dimensions	(typ)	L x W	0.87 x 0.87 mm x mm

Parameter		Symbol	Values	Unit
Rise and fall times of I_e (20% and 80% of $I_{e\max}$)	(typ)	t_r / t_f	1	ns
Forward voltage ^{4) page 14} ($I_F = 2.7$ A)	(min) (typ) (max)	V_F	1.75 2.2 2.25	V V V
Temperature coefficient of Wavelength	(typ)	TC_λ	0.07	nm/K
Thermal resistance junction solder point real	(max)	R_{thJS}	11	K / W

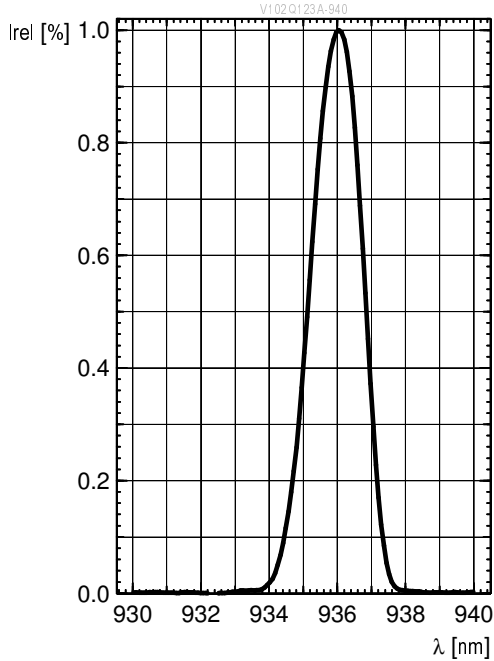
Photodiode

Wavelength of max sensitivity	(typ)	$\lambda_{S\max}$	910	nm
Spectral range of sensitivity	(typ)	$\lambda_{10\%}$	400 ... 1100	nm
Photocurrent ($\lambda = 940$ nm, $E_e = 0.5$ mW/cm ² , $V_R = 3.3$ V)	(typ)	I_P	310	nA
Photocurrent (Std. light A, $E_v = 1000$ lx; $V_R = 3.3$ V)	(typ)	I_P	890	nA
Photocurrent ^{3) page 14} (with VCSEL @ $I_F = 2.7$ A, $V_R = 3.3$ V)	(min) (typ) (max)	I_P	420 600 680	μ A μ A μ A
Dark current ($V_R = 3.3$ V)	(typ) (max)	I_R	0.1 30	nA nA
Chip dimensions	(typ)	L x W	0.36 x 0.36	mm x mm
Rise and fall time (10% and 90%) ($\lambda = 940$ nm, $V_R = 3.3$ V, $R_L = 50$ Ω)	(typ)	t_r, t_f	320/ 200	ns
Forward voltage ^{4) page 14} ($I_F = 10$ mA, $E = 0$)	(typ) (max)	V_F	0.9 1.25	V V
Open-circuit voltage ($\lambda = 940$ nm, $E_e = 0.5$ mW/cm ²)	(typ)	V_O	260	mV
Short-circuit current ($\lambda = 940$ nm, $E_e = 0.5$ mW/cm ² , $V_R = 0$ V)	(typ)	I_{SC}	270	nA
Short-circuit current (Std. light A, $E_v = 1000$ lx, $V_R = 0$ V)	(typ)	I_{SC}	810	nA
Capacitance ($E_e = 0$ mW/cm ² , $f = 1$ MHz, $V_R = 0$ V)	(typ)	C_0	2.1	pF
Temperature coefficient of Sensitivity ($\lambda = 940$ nm, $E_e = 0.5$ mW/cm ² , $V_R = 3.3$ V)	(typ)	TC_I	0.23	%/K
Temperature coefficient of Voltage ($I_F = 10$ mA, $E = 0$)	(typ)	TC_V	-1.2	mV/K

Diagrams
IR Laser

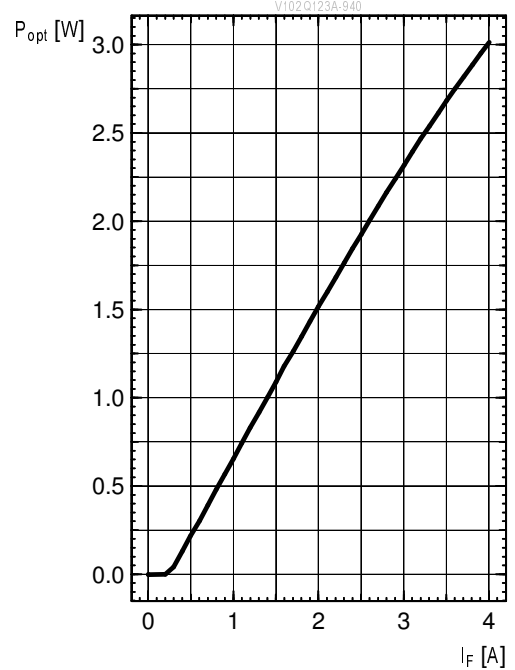
Relative Spectral Emission ^{6) page 14}

$I_{rel} = f(\lambda)$, $t_p = 300 \mu s$; $D = 0.05$, $T_A = 25^\circ C$



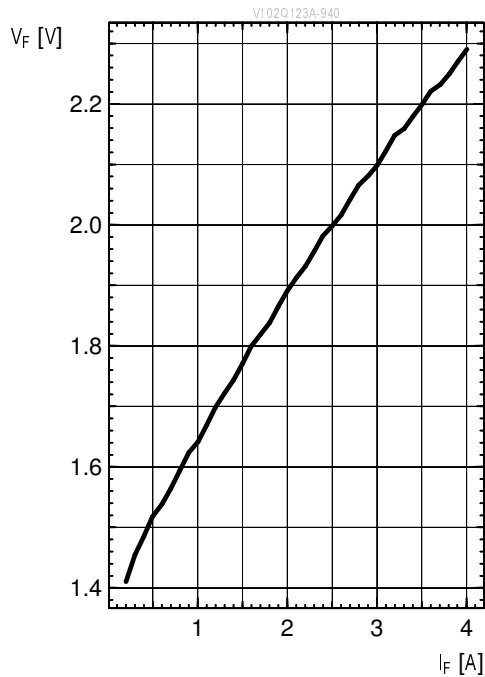
Optical output power ^{6) page 14}

$P_{opt} = f(I_F)$, $t_p = 300 \mu s$; $D = 0.05$, $T_A = 25^\circ C$



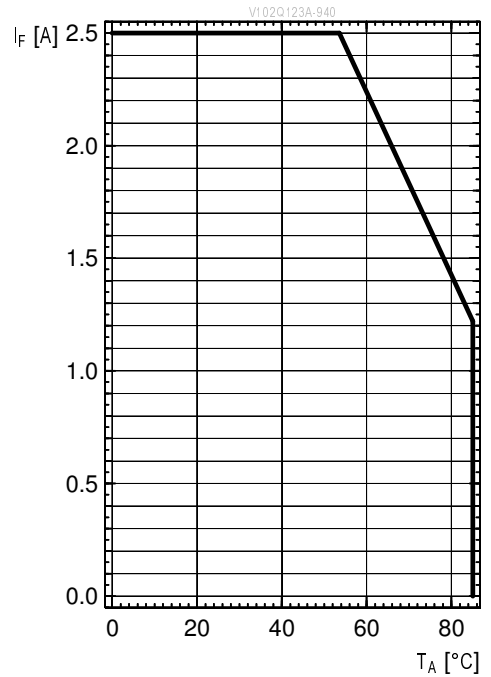
Forward Current ^{6) page 14}

$I_F = f(V_F)$, $t_p = 300 \mu s$; $D = 0.05$, $T_A = 25^\circ C$



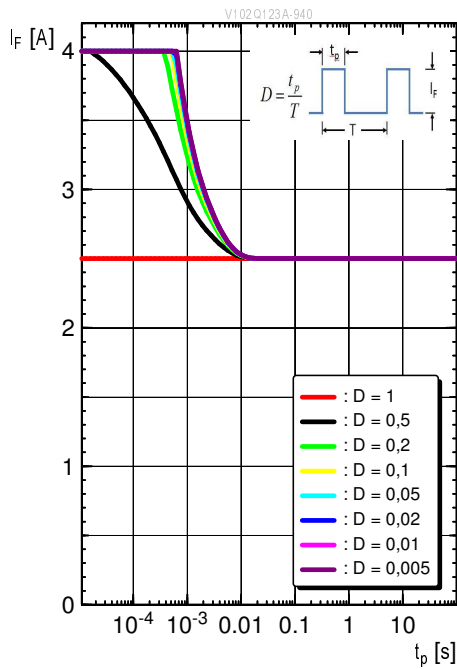
Max. Permissible Forward Current

$I_{F, max} = f(T_A)$, $R_{thJS} = 11 K / W$



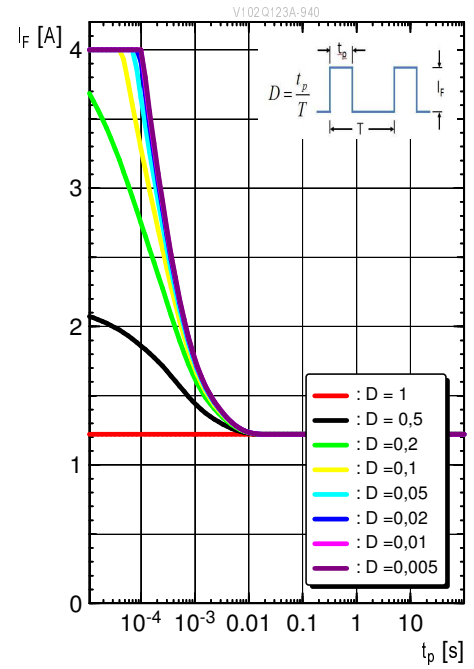
Permissible Pulse Handling Capability

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



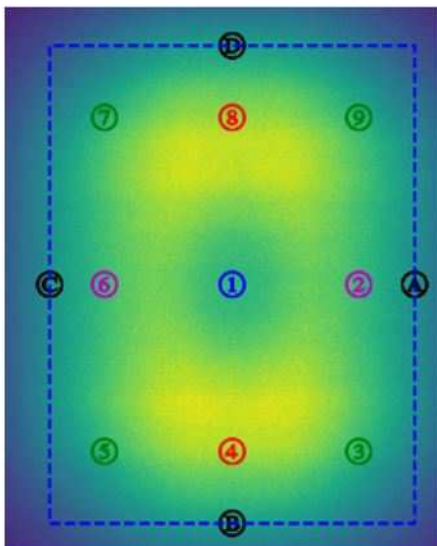
Permissible Pulse Handling Capability

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



Far-Field Illumination Pattern ^{6) page 14}

$I_{rel} = f(\phi)$, $t_p = 300\ \mu\text{s}$; $D = 0.05$, $T_A = 25\text{ °C}$

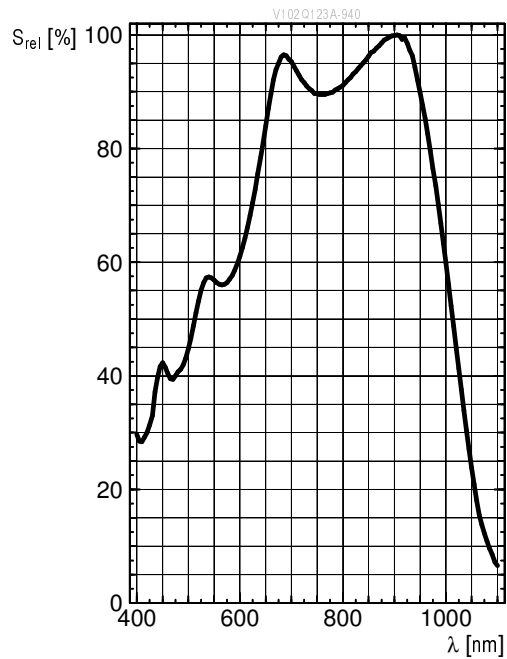


	Min	Typ	Max
1	100%	100%	100%
2	90%	105%	135%
3	75%	90%	130%
4	105%	135%	160%
5	75%	90%	130%
6	90%	105%	135%
7	75%	90%	130%
8	105%	135%	160%
9	75%	90%	130%
A	65%	80%	110%
B	65%	80%	110%
C	65%	80%	110%
D	65%	80%	110%

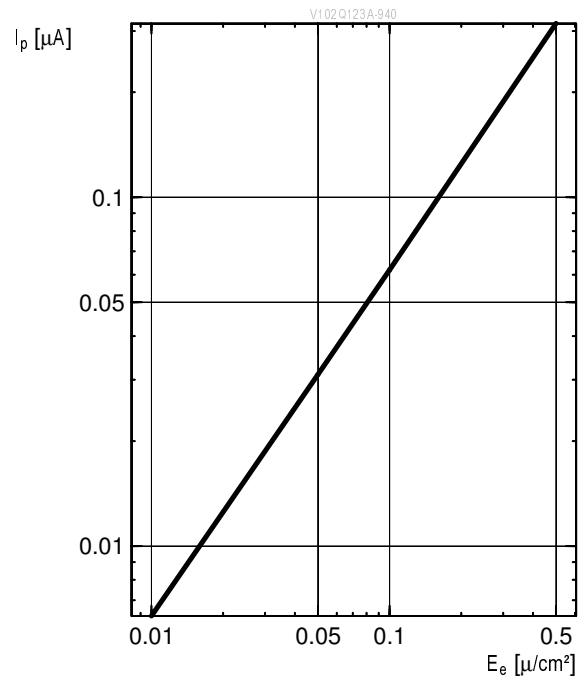
----- FOI = 50°(h) x 63°(v)

Diagrams
Photodiode**Relative Spectral Sensitivity** ^{6) page 14}

$$S_{\text{rel}} = f(\lambda), V_R = 3.3 \text{ V}, T_A = 25^\circ\text{C}$$

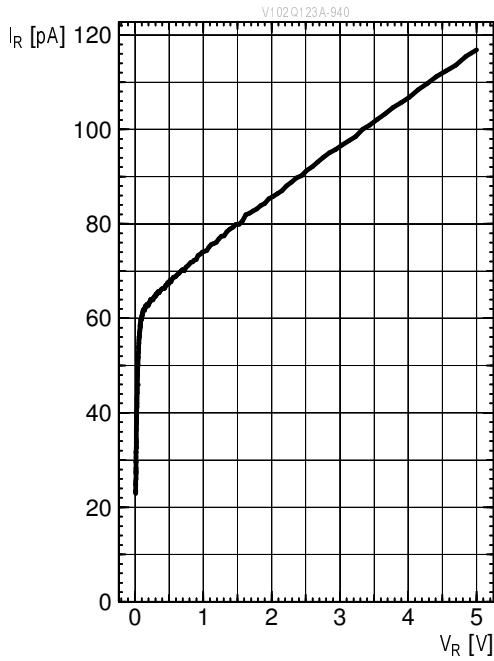
**Photocurrent** ^{6) page 14}

$$I_p = f(E_e), V_R = 3.3 \text{ V}, T_A = 25^\circ\text{C}$$



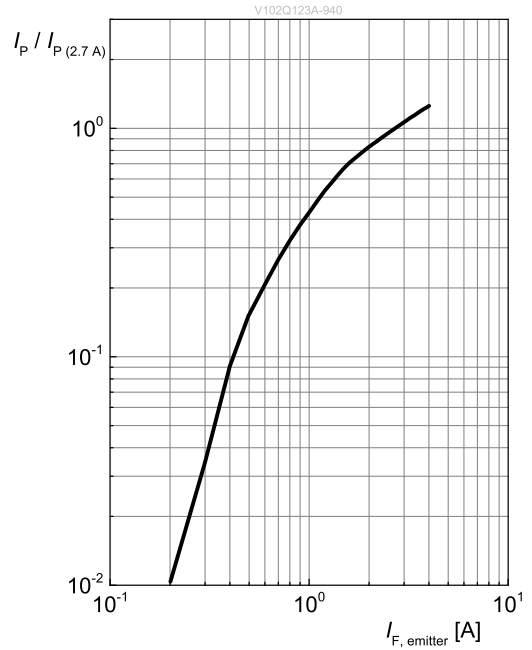
Dark Current ^{6) page 14}

$I_R = f(V_R)$



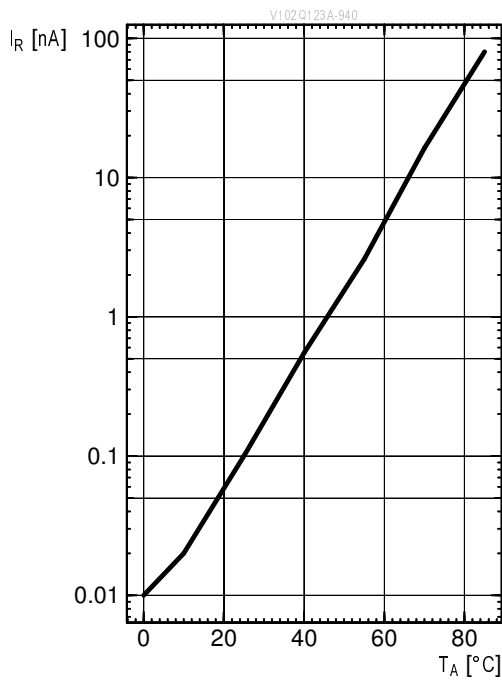
Photocurrent ^{6) page 14}

$I_{P,rel} = f(I_{F,emitter}), V_R = 3.3 V, T_A = 25^\circ C$



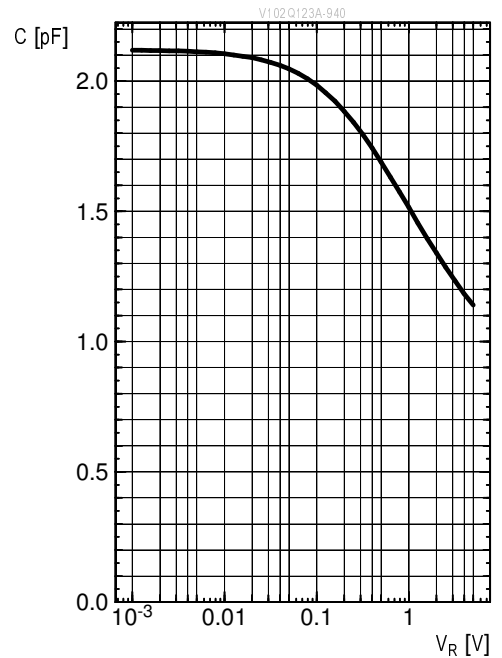
Dark Current ^{6) page 14}

$I_R = f(T_A), V_R = 3.3 V$

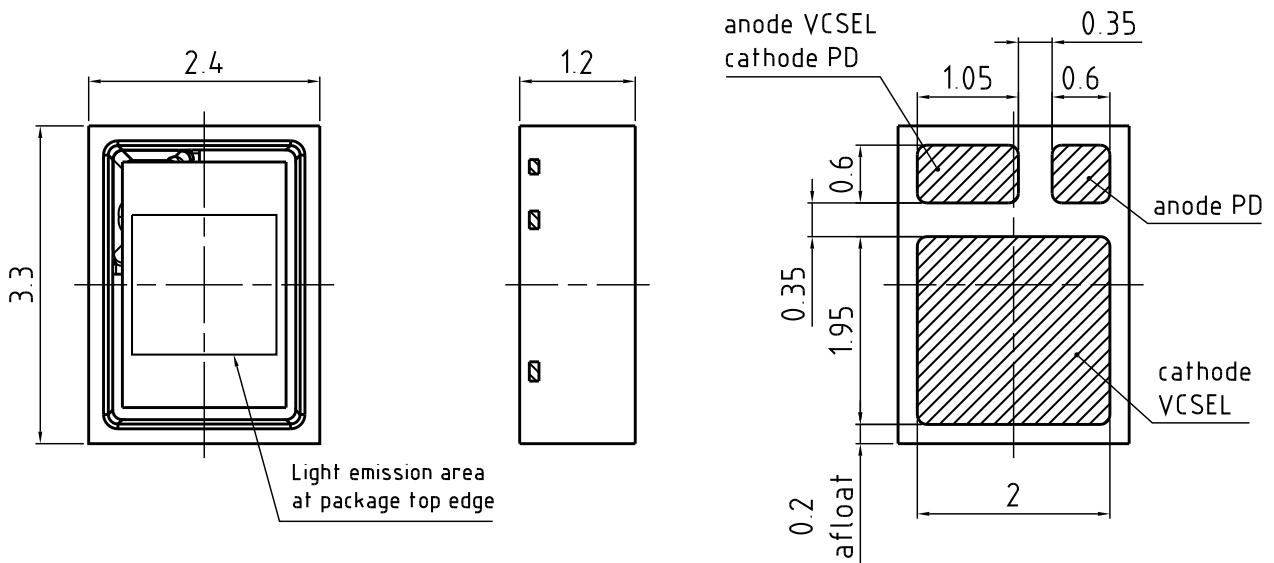


Capacitance ^{6) page 14}

$C = f(V_R), f = 1 MHz, T_A = 25^\circ C$



Dimensional Drawing ^{7) page 14}



general tolerance ± 0.1

lead finish NiPdAu

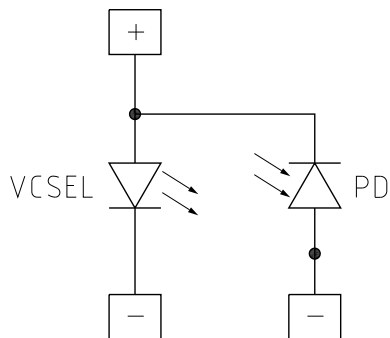
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Dimensions in mm.

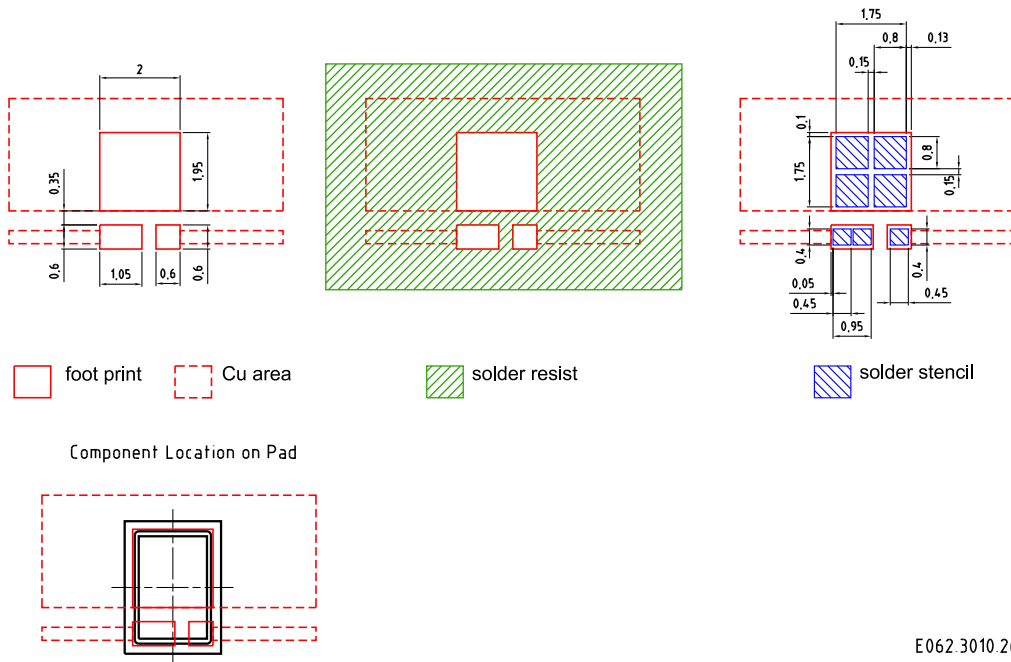
Approximate Weight:

20 mg

Electrical internal circuit



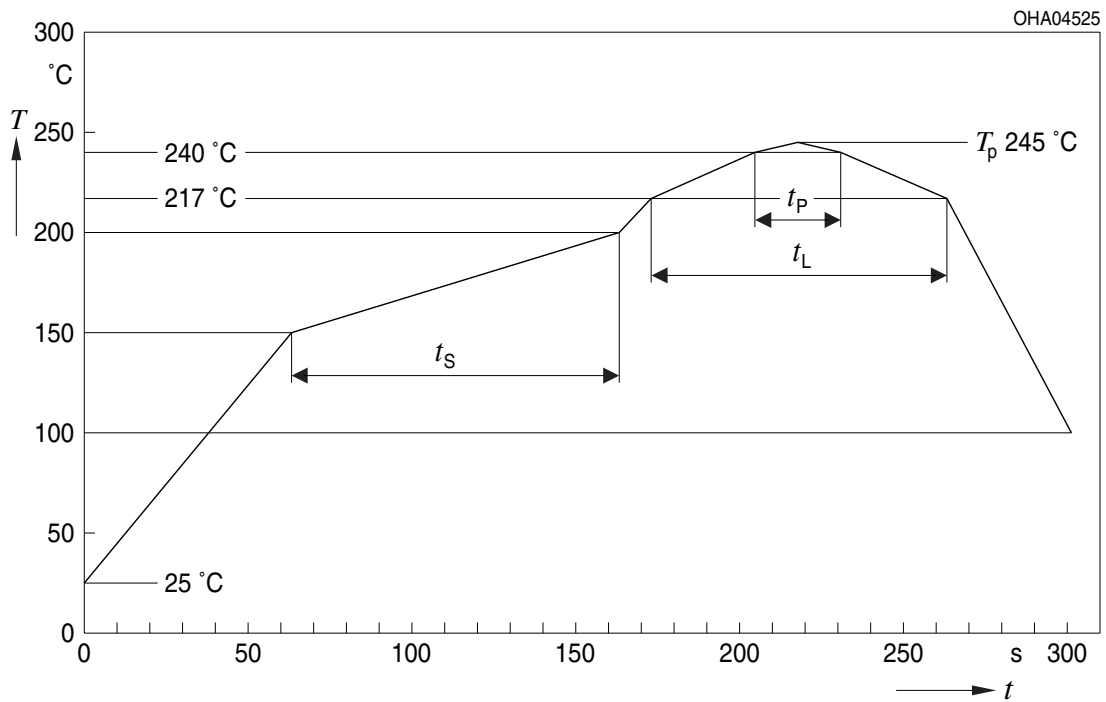
Recommended Solder Pad



Dimensions in mm.

Reflow Soldering Profile

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

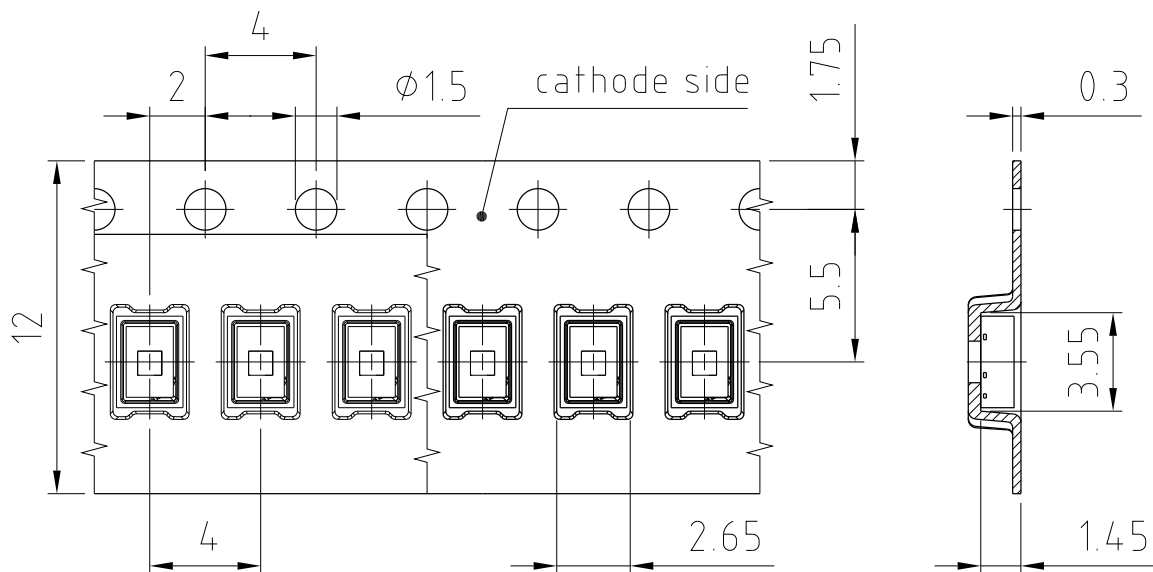


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Profil-Charakteristik Profile Feature	Symbol Symbol	Pb-Free (SnAgCu) Assembly			Einheit Unit
		Minimum	Recommendation	Maximum	
Ramp-up Rate to Preheat*) 25 °C to 150 °C			2	3	K/s
Time t_s T_{Smin} to T_{Smax}	t_s	60	100	120	s
Ramp-up Rate to Peak*) 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

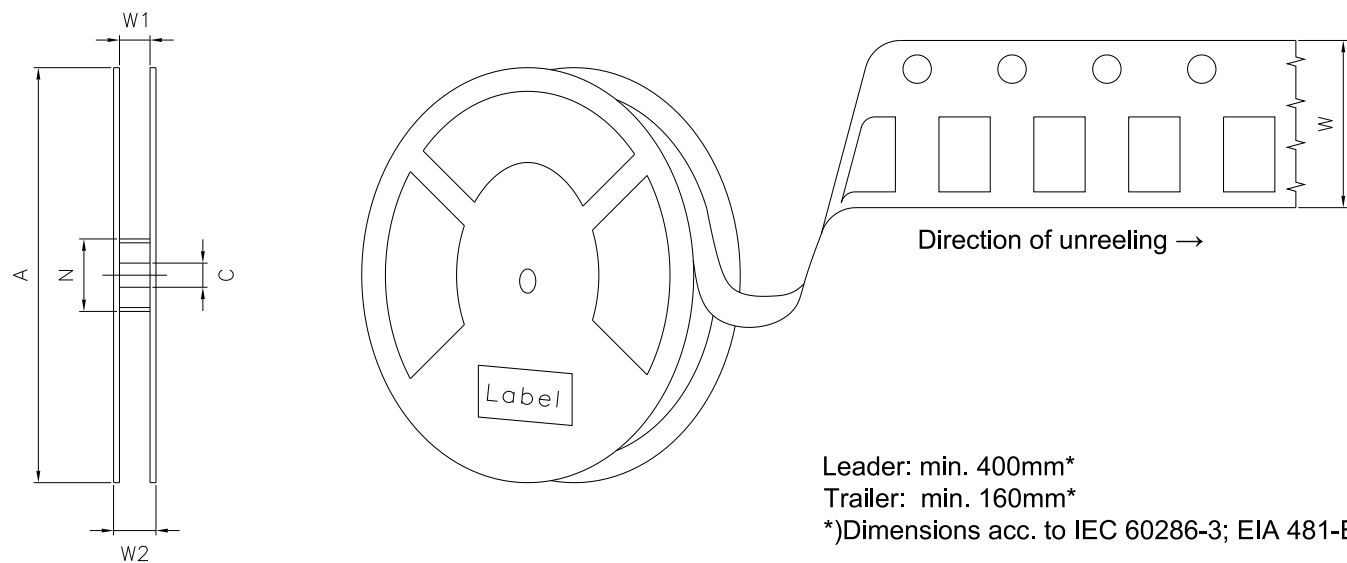


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Dimensions in mm.

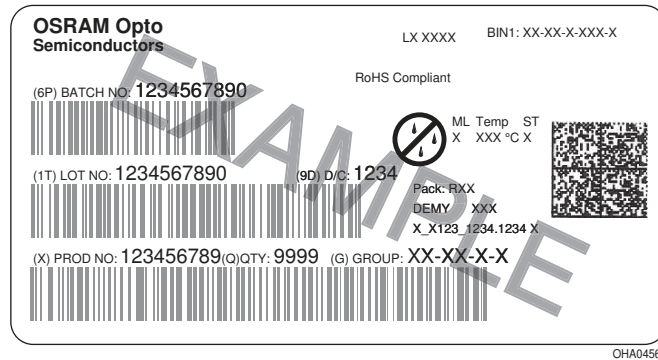
Tape and Reel

12 mm tape with 2000 pcs. on \varnothing 180 mm or 8000 pcs. on \varnothing 330 mm reel

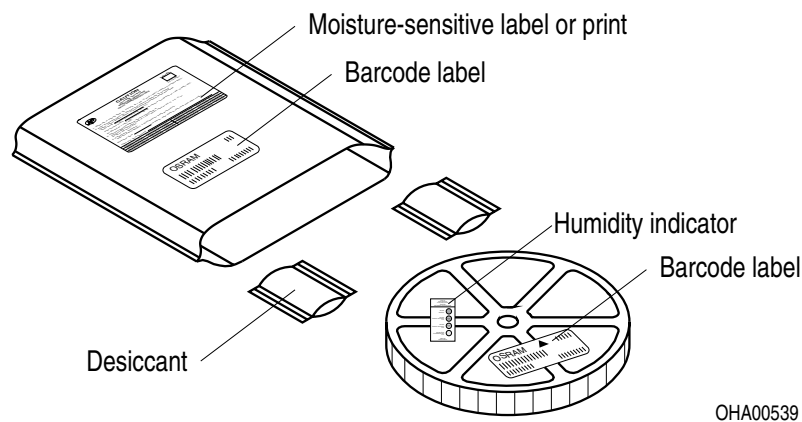
**Reel dimensions [mm]**

A	W	N _{min}	W ₁	W _{2max}
180	12	60	12.4	18.4
330	12	60	12.4	18.4

Barcode-Product-Label (BPL)



Dry Packing Process and Materials



Note:

Moisture-sensitive product is packed in a dry bag containing desiccant and a humidity card. Regarding dry pack you will find further information in the internet. Here you will also find the normative references like JEDEC.

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Glossary

- 1) **Brightness:** The brightness values are measured with a tolerance of $\pm 11\%$.
- 2) **Reverse Operation:** Reverse Operation of 10 hours is permissible in total. Continuous reverse operation is not allowed.
- 3) **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 $\pm 11\%$.
- 4) **Forward voltage:** The forward voltages are measured with a tolerance of ± 0.1 V.
- 5) **Wavelength:** The wavelengths are measured with a tolerance of ± 1 nm.
- 6) **Typical Values:** Due to the special conditions of the manufacturing processes of LED, 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.
- 7) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with ± 0.1 and dimensions are specified in mm.

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