

High Power Infrared Emitting Diode, 940 nm, Surface Emitter Technology



LINKS TO ADDITIONAL RESOURCES



Application Notes



3D Models

DESCRIPTION

As part of the [Astral](#) portfolio, the VSMA1094400X02 is an infrared, 940 nm emitting diode. It features a double stack emitter chip for highest radiant power. The 42 mil chip size allows 1.5 A DC operation and supports pulsed currents up to 5.0 A.

FEATURES

- Package type: surface-mount
- Package form: high power SMD with lens
- Dimensions (L x W x H in mm): 3.4 x 3.4 x 2.45
- Peak wavelength: $\lambda_p = 945$ nm
- AEC-Q102 qualified
- Angle of half intensity: $\varphi = \pm 40^\circ$
- Designed for high drive currents: up to 1.5 A (DC) and up to 5 A (pulsed)
- Low thermal resistance: $5\text{ K/W} < R_{th,JSP} < 9\text{ K/W}$
- ESD: up to 5 kV (according to ANSI / ESDA / JEDEC® JS-001)
- Floor life: 168 h, MSL 3, according to J-STD-020E
- Lead (Pb)-free reflow soldering
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



APPLICATIONS

- Driver and occupant monitoring
- Eye tracking
- Safety and security, CCTV

PRODUCT SUMMARY

COMPONENT	I_e (mW/sr) at $I_F = 1.0$ A	φ (°)	λ_p (nm)	$\lambda_{\text{centroid}}$ (nm)	t_r (ns)
VSMA1094400X02	1025	± 40	945	940	10

Note

- Test conditions see table “Basic Characteristics”

ORDERING INFORMATION

ORDERING CODE	PACKAGING	REMARKS	PACKAGE FORM
VSMA1094400X02	Tape and reel	MOQ: 600 pcs, 600 pcs/reel	High power with lens

Note

- MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25 \text{ }^{\circ}\text{C}$, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage		V_R	5	V
Minimum forward current		$I_F, \text{min.}$	100	mA
Forward current		I_F	1.5	A
Surge forward current	$t_p = 100 \mu\text{s}$	I_{FSM}	5	A
Power dissipation		P_V	5	W
Junction temperature		T_j	145	$^{\circ}\text{C}$
Ambient temperature range		T_{amb}	-40 to +125	$^{\circ}\text{C}$
Storage temperature range		T_{stg}	-40 to +125	$^{\circ}\text{C}$
Soldering temperature	According to Fig. 11, J-STD-020E	T_{sd}	260	$^{\circ}\text{C}$
Thermal resistance junction to solder point real ⁽¹⁾	JESD 51	$R_{thJSP,real}$	5 to 9	K/W
Thermal resistance junction to ambient real	JESD 51	$R_{thJA,real}$	80	K/W
ESD sensitivity	According to ANSI / ESDA / JEDEC JS-001	V_{ESD}	5	kV

Note

⁽¹⁾ Thermal resistance junction to solder point real has been measured with the part mounted on an ideal heatsink and the optical output power has been deducted from the total electrical power dissipation

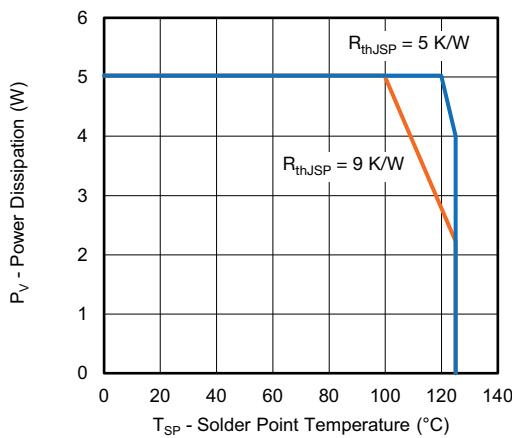


Fig. 1 - Power Dissipation Limit vs. Solder Point Temperature

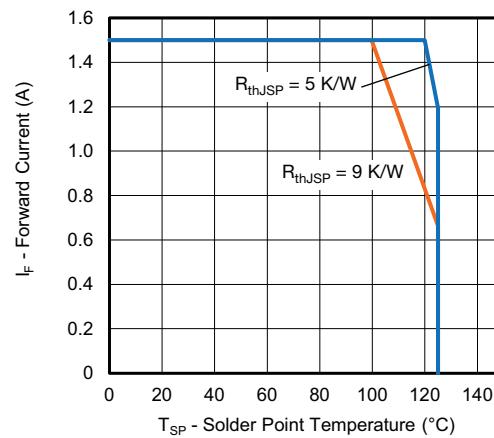


Fig. 2 - Forward Current Limit vs. Solder Point Temperature

BASIC CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Forward voltage	$I_F = 0.35 \text{ A}, t_p = 10 \text{ ms}$	V_F	2.1	2.7	3.0	V
	$I_F = 1 \text{ A}, t_p = 100 \mu\text{s}$	V_F	2.2	2.9	3.1	V
	$I_F = 1.5 \text{ A}, t_p = 100 \mu\text{s}$	V_F	2.6	3.1	3.35	V
	$I_F = 5 \text{ A}, t_p = 100 \mu\text{s}$	V_F	2.7	3.8	4.2	V
Temperature coefficient of V_F	$I_F = 1 \text{ A}, t_p = 100 \mu\text{s}$		-	-3	-	mV/K
Reverse current ⁽¹⁾		I_R	Not designed for reverse operation			μA
Radiant intensity ⁽²⁾	$I_F = 0.35 \text{ A}, t_p = 10 \text{ ms}$	I_e	265	365	495	mW/sr
	$I_F = 1 \text{ A}, t_p = 100 \mu\text{s}$	I_e	750	1025	1375	mW/sr
	$I_F = 1.5 \text{ A}, t_p = 100 \mu\text{s}$	I_e	1115	1525	2045	mW/sr
	$I_F = 5 \text{ A}, t_p = 100 \mu\text{s}$	I_e	3370	4620	6200	mW/sr
Radiant power	$I_F = 1 \text{ A}, t_p = 100 \mu\text{s}$	ϕ_e	-	1450	-	mW
	$I_F = 1.5 \text{ A}, t_p = 100 \mu\text{s}$	ϕ_e	-	2125	-	mW
Temperature coefficient of ϕ	$I_F = 1 \text{ A}, t_p = 100 \mu\text{s}$	TK_ϕ	-	-0.15	-	%/K
Angle of half intensity		φ	-	± 40	-	°
Peak wavelength	$I_F = 1 \text{ A}, t_p = 100 \mu\text{s}$	λ_p	-	945	-	nm
Centroid wavelength	$I_F = 1 \text{ A}, t_p = 100 \mu\text{s}$	$\lambda_{\text{centroid}}$	-	940	-	nm
Spectral bandwidth	$I_F = 1 \text{ A}, t_p = 100 \mu\text{s}$	$\Delta\lambda$	-	39	-	nm
Temperature coefficient of λ_p	$I_F = 100 \text{ mA}, t_p = 20 \text{ ms}$	TK_{λ_p}	-	0.3	-	nm/K
Rise time	$I_F = 1 \text{ A}, R_L = 50 \Omega$	t_r	-	10	-	ns
Fall time	$I_F = 1 \text{ A}, R_L = 50 \Omega$	t_f	-	13	-	ns

Notes

- (1) This infrared LED is designed to be operated within the specified forward current range. Continuous reverse operation must be avoided because it may damage the infrared LED.
(2) The radiant intensity values have been measured with a tolerance of ± 11 %

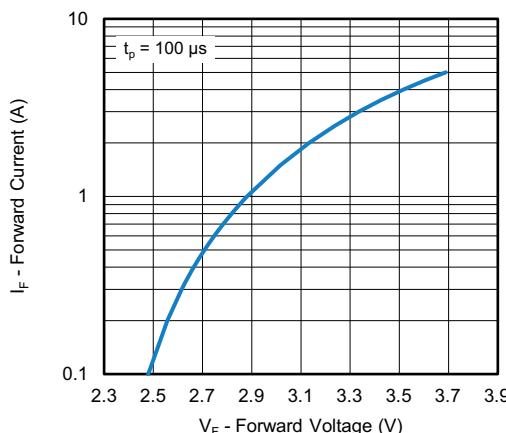
BASIC CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, unless otherwise specified)


Fig. 3 - Relative Radiant Intensity vs. Forward Current

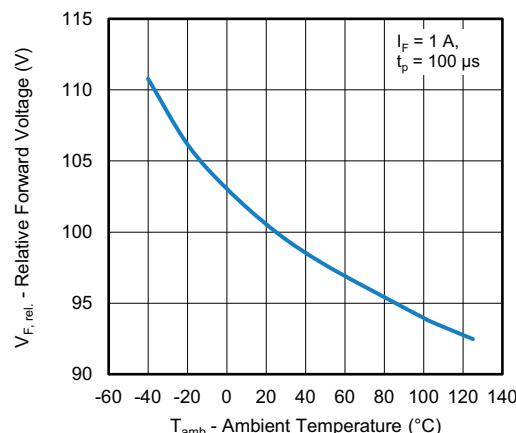


Fig. 4 - Relative Forward Voltage vs. Ambient Temperature

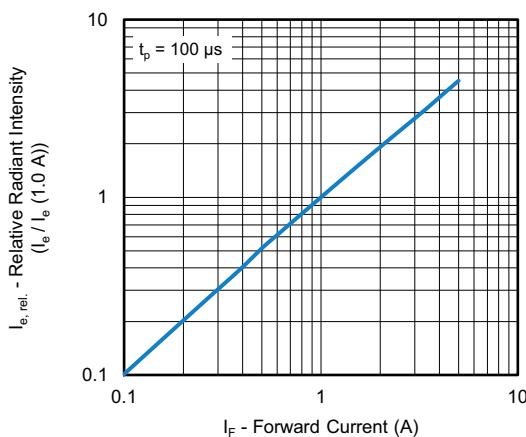


Fig. 5 - Relative Radiant Intensity vs. Forward Current

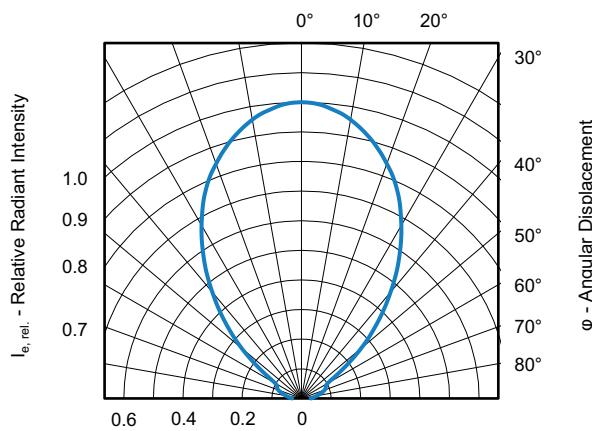


Fig. 8 - Relative Radiant Intensity vs. Angular Displacement

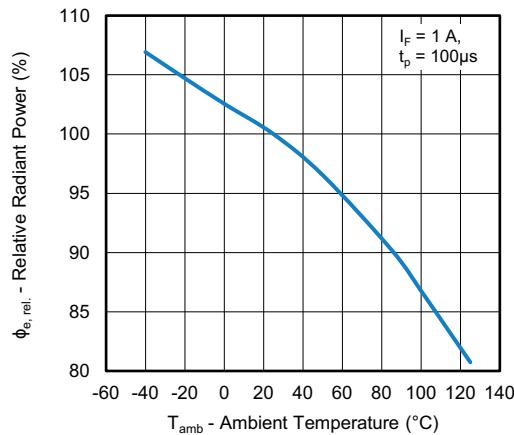


Fig. 6 - Relative Radiant Power vs. Ambient Temperature

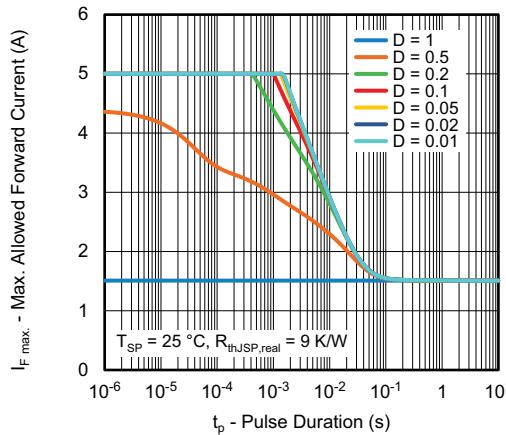


Fig. 9 - Max. Allowed Forward Current vs. Pulse Duration

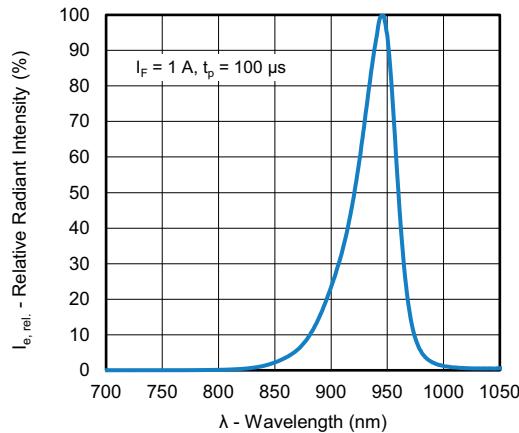


Fig. 7 - Relative Radiant Intensity vs. Wavelength

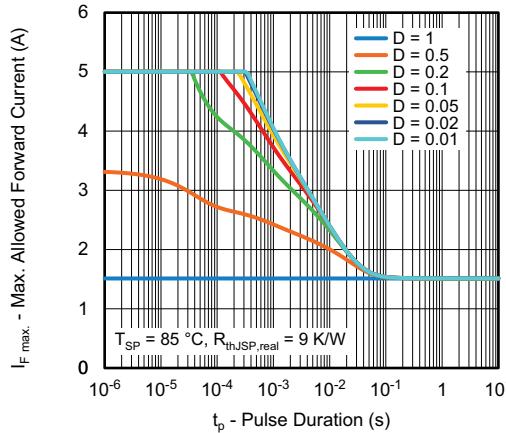
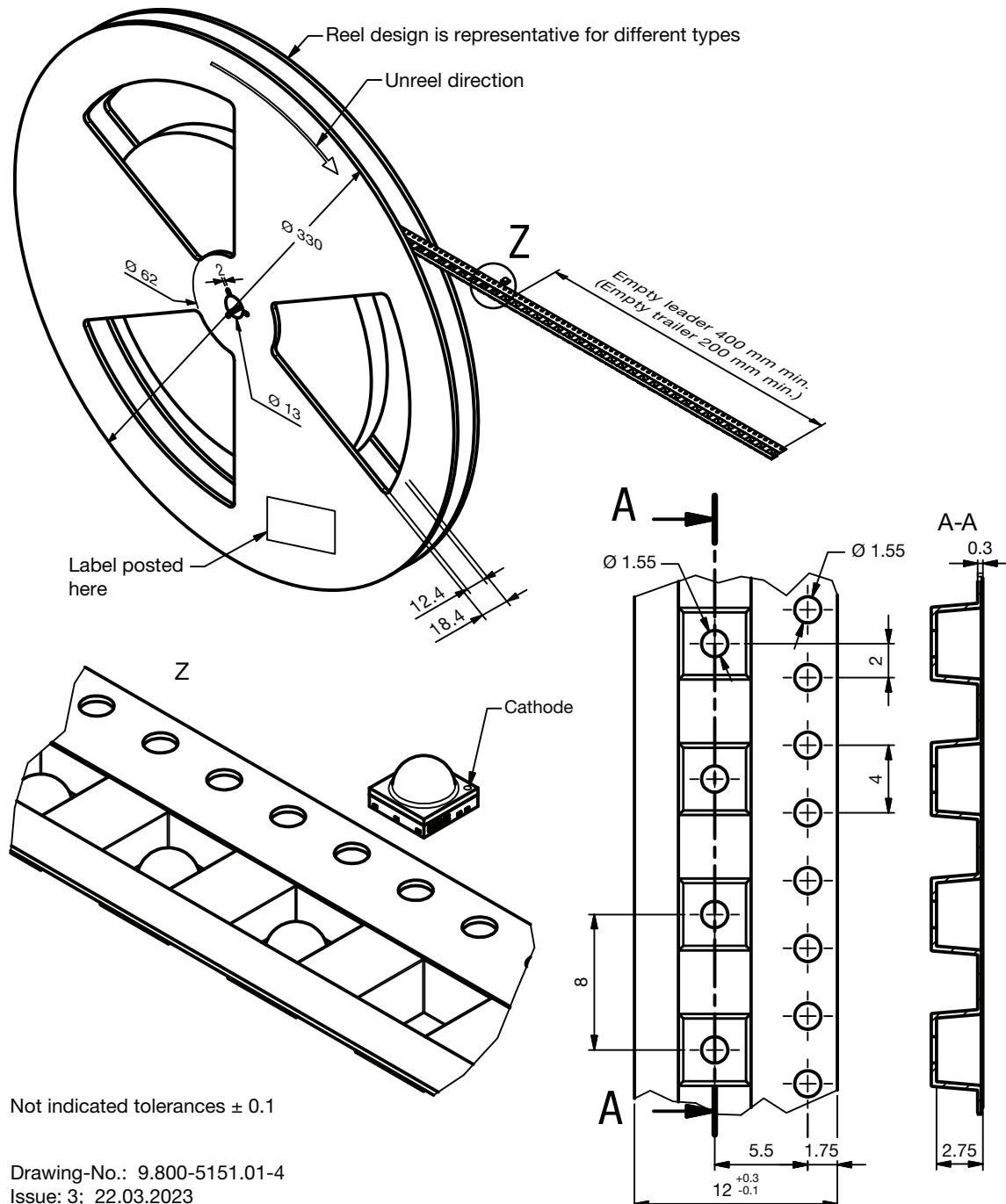
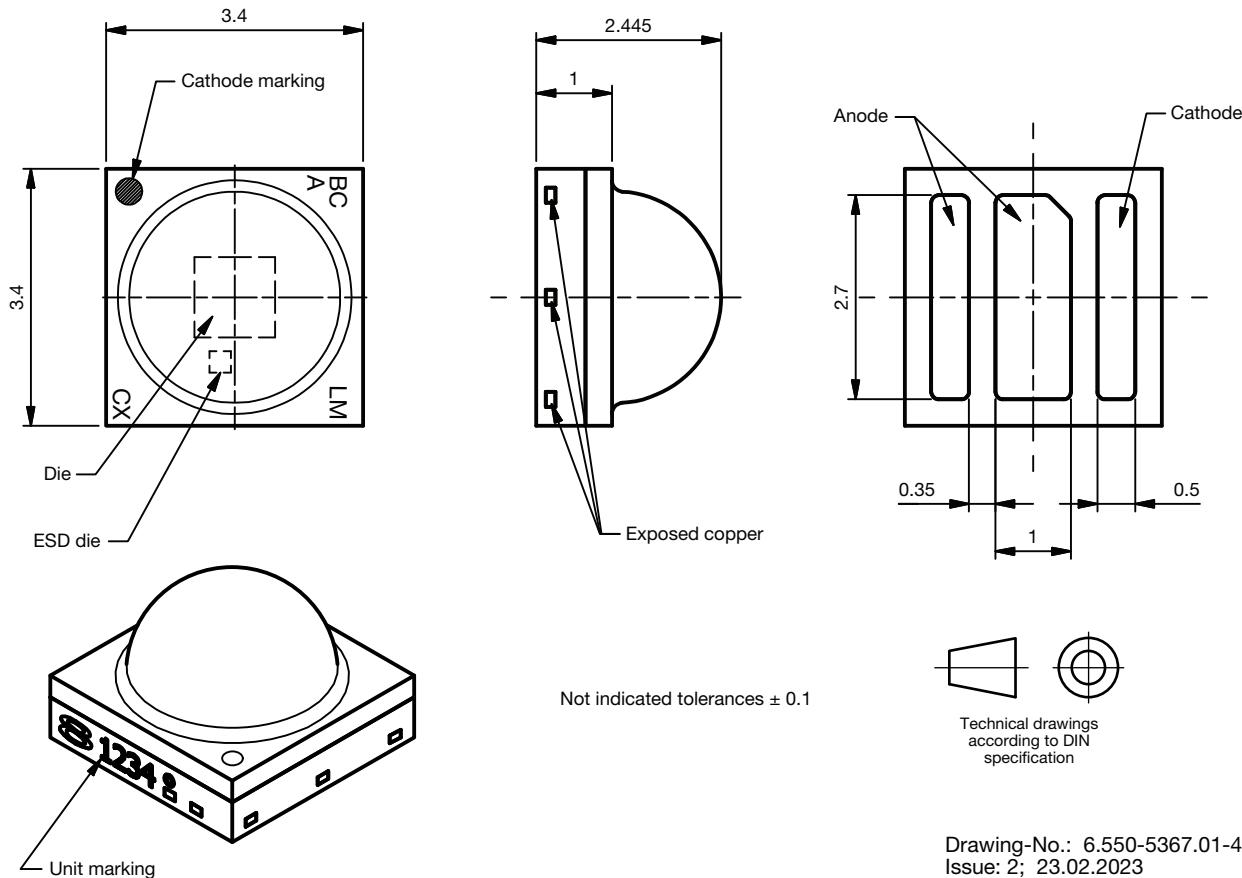


Fig. 10 - Max. Allowed Forward Current vs. Pulse Duration

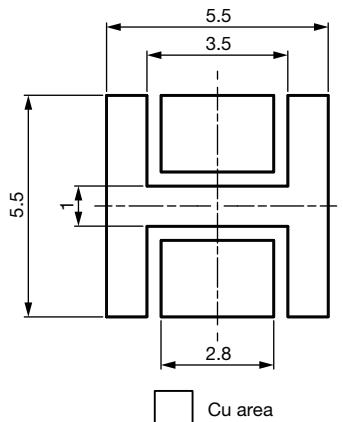
TAPING DIMENSIONS in millimeters

Notes

- Empty component pockets sealed with top cover tape
- 7 inch reel - 600 pieces per reel
- The maximum number of consecutive missing lamps is two
- In accordance with ANSI / EIA 481-1-A-1994 specifications

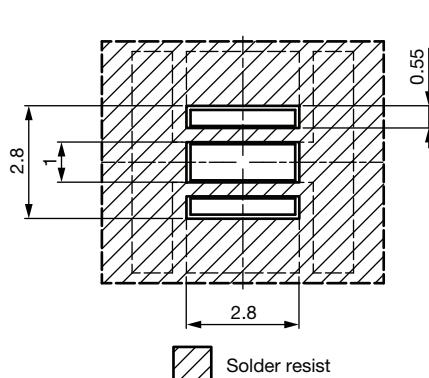
PACKAGE DIMENSIONS in millimeters

Notes

- Tolerance is ± 0.10 mm (0.004") unless otherwise noted
- Specifications are subject to change without notice

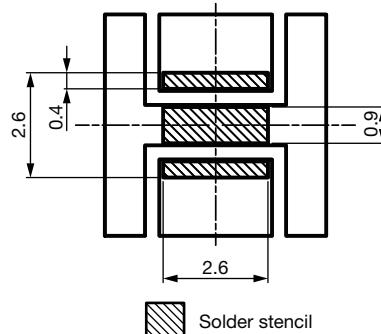
RECOMMENDED FOOTPRINT



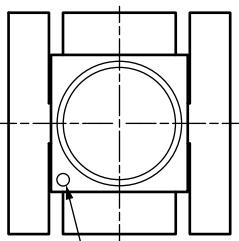
Cu area



Solder resist



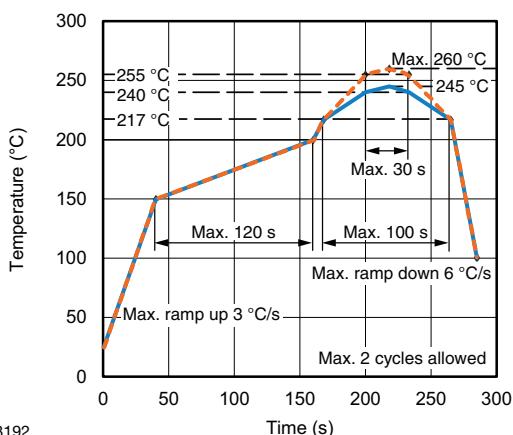
Solder stencil



Cathode marking
Component location on pad

Drawing-No.: 6.550-5366.9-3
Issue: 2; 23.02.2023

SOLDER PROFILE



23192

Fig. 11 - Lead (Pb)-free (Sn) Infrared Reflow Solder Profile According to J-STD-020E for Surface-Mount Components

DRYPACK

Devices are packed in moisture barrier bags (MBB) to prevent the products from moisture absorption during transportation and storage. Each bag contains a desiccant.

FLOOR LIFE

Floor life (time between soldering and removing from MBB) must not exceed the time indicated on MBB label:

Floor life: 168 h

Conditions: $T_{amb} < 30^{\circ}\text{C}$, RH < 60 %

Moisture sensitivity level 3, according to J-STD-020E

DRYING

In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-033D or label. Devices taped on reel dry using recommended conditions 192 h at 40 °C (+ 5 °C), RH < 5 %.

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