



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



## DESCRIPTION

As part of the SurfLight™ portfolio, the VSMA1094250X02 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 2.9
- Peak wavelength:  $\lambda_p = 945$  nm
- AEC-Q102 qualified
- Angle of half intensity:  $\phi = \pm 28^\circ$
- Designed for high drive currents: up to 1.5 A (DC) and up to 5 A (pulsed)
- Low thermal resistance:  $5 \text{ K/W} < R_{thJSP} < 9 \text{ K/W}$
- 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](http://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	$\phi$ (°)	$\lambda_p$ (nm)	$\lambda_{centroid}$ (nm)	$t_r$ (ns)
VSMA1094250X02	1350	$\pm 28$	945	940	10

### Note

- Test conditions see table “Basic Characteristics”

ORDERING INFORMATION			
ORDERING CODE	PACKAGING	REMARKS	PACKAGE FORM
VSMA1094250X02	Tape and reel	MOQ: 600 pcs, 600 pcs/reel	High power with lens

### Note

- MOQ: minimum order quantity

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage		$V_R$	5	V
Minimum forward current		$I_{F, min.}$	100	mA
Forward current		$I_F$	1.5	A
Surge forward current	$t_p = 100\text{ }\mu\text{s}$	$I_{FSM}$	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 <sup>(1)</sup>	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**

- <sup>(1)</sup> 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

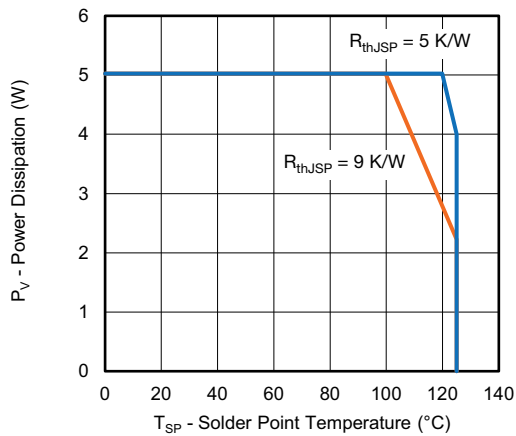


Fig. 1 - Power Dissipation Limit vs. Solder Point Temperature

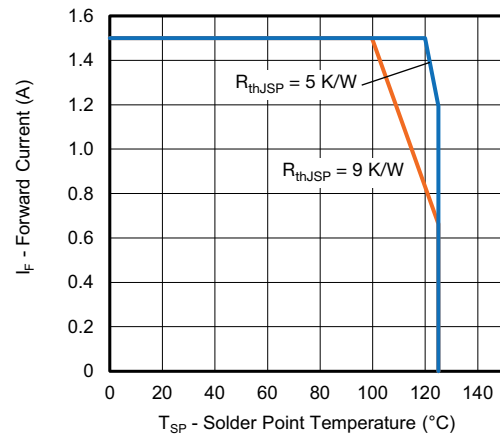


Fig. 2 - Forward Current Limit vs. Solder Point Temperature

<b>BASIC CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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
	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$V_F$	2.2	2.9	3.1	V
	$I_F = 1.5\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$V_F$	2.6	3.1	3.35	V
	$I_F = 5\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$V_F$	2.7	3.8	4.2	V
Temperature coefficient of $V_F$	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$		-	-3	-	mV/K
Reverse current <sup>(1)</sup>		$I_R$	Not designed for reverse operation			$\mu\text{A}$
Radiant intensity <sup>(2)</sup>	$I_F = 0.35\text{ A}$ , $t_p = 10\text{ ms}$	$I_e$	415	500	670	mW/sr
	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$I_e$	1120	1350	1800	mW/sr
	$I_F = 1.5\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$I_e$	1660	2000	2700	mW/sr
	$I_F = 5\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$I_e$	4975	6000	8000	mW/sr
Radiant power	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$\phi_e$	-	1450	-	mW
	$I_F = 1.5\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$\phi_e$	-	2125	-	mW
Temperature coefficient of $\phi$	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$TK_{\phi}$	-	-0.15	-	%/K
Angle of half intensity		$\varphi$	-	$\pm 28$	-	$^{\circ}$
Peak wavelength	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$\lambda_p$	-	945	-	nm
Centroid wavelength	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$\lambda_{centroid}$	-	940	-	nm
Spectral bandwidth	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$\Delta\lambda$	-	39	-	nm
Temperature coefficient of $\lambda_p$	$I_F = 100\text{ mA}$ , $t_p = 20\text{ ms}$	$TK_{\lambda_p}$	-	0.3	-	nm/K
Rise time	$I_F = 1\text{ A}$ , $R_L = 50\text{ }\Omega$	$t_r$	-	10	-	ns
Fall time	$I_F = 1\text{ A}$ , $R_L = 50\text{ }\Omega$	$t_f$	-	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  $\pm 11\%$

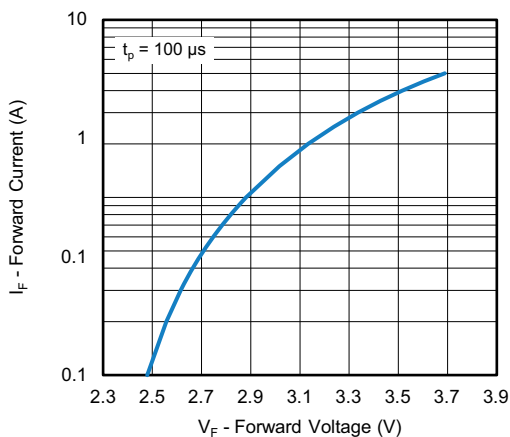
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 3 - Forward Current vs. Forward Voltage

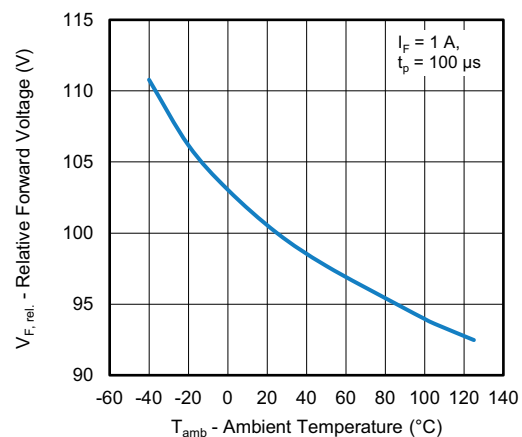


Fig. 4 - Relative Forward Voltage vs. Ambient Temperature

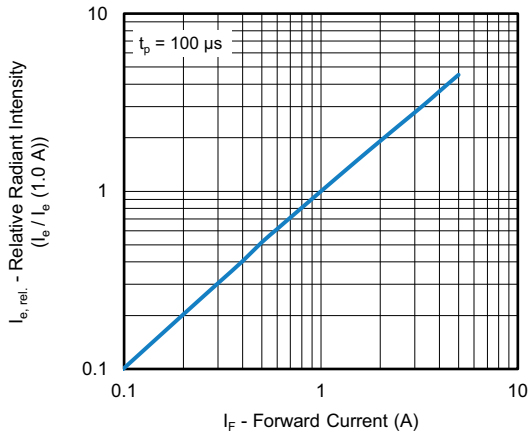


Fig. 5 - Relative Radiant Intensity vs. Forward Current

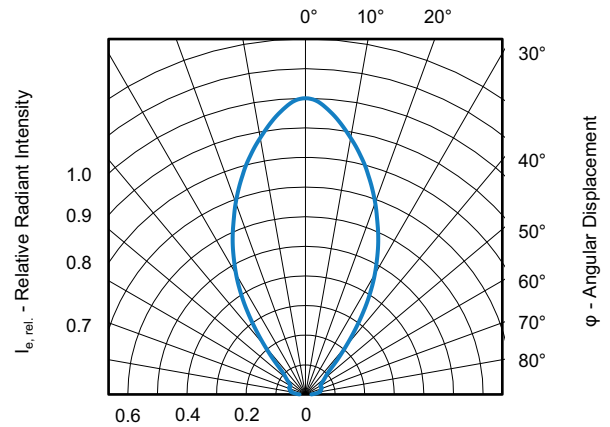


Fig. 8 - Relative Radiant Intensity vs. Angular Displacement

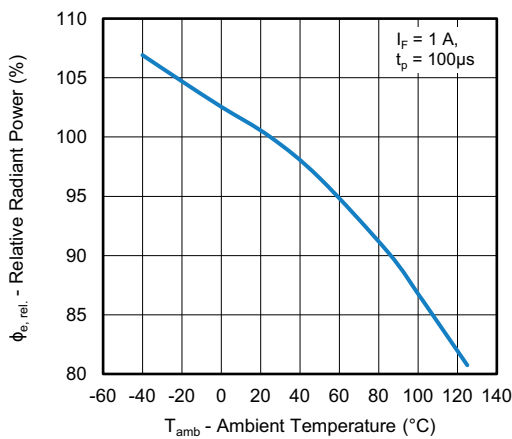


Fig. 6 - Relative Radiant Power vs. Ambient Temperature

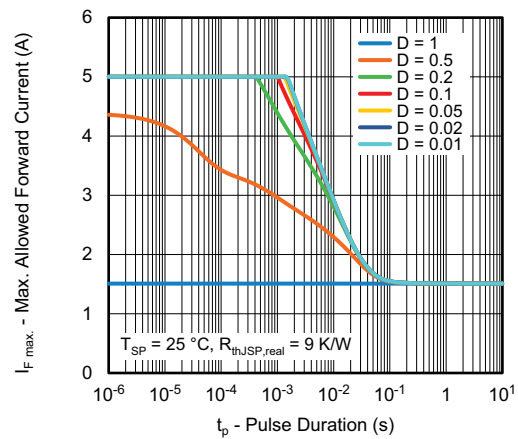


Fig. 9 - Max. Allowed Forward Current vs. Pulse Duration

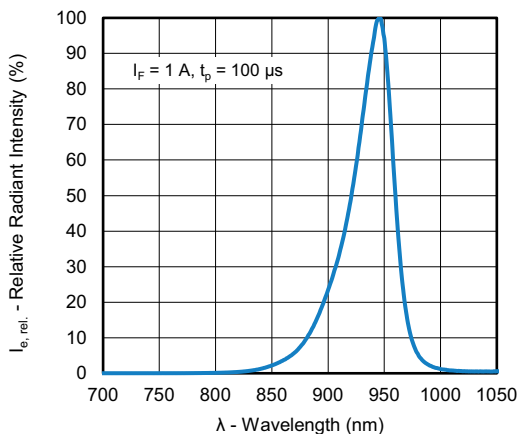


Fig. 7 - Relative Radiant Intensity vs. Wavelength

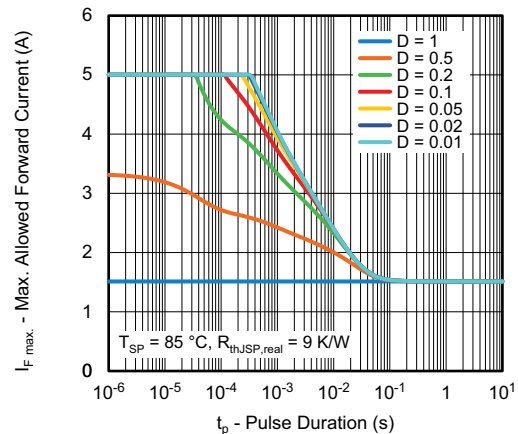
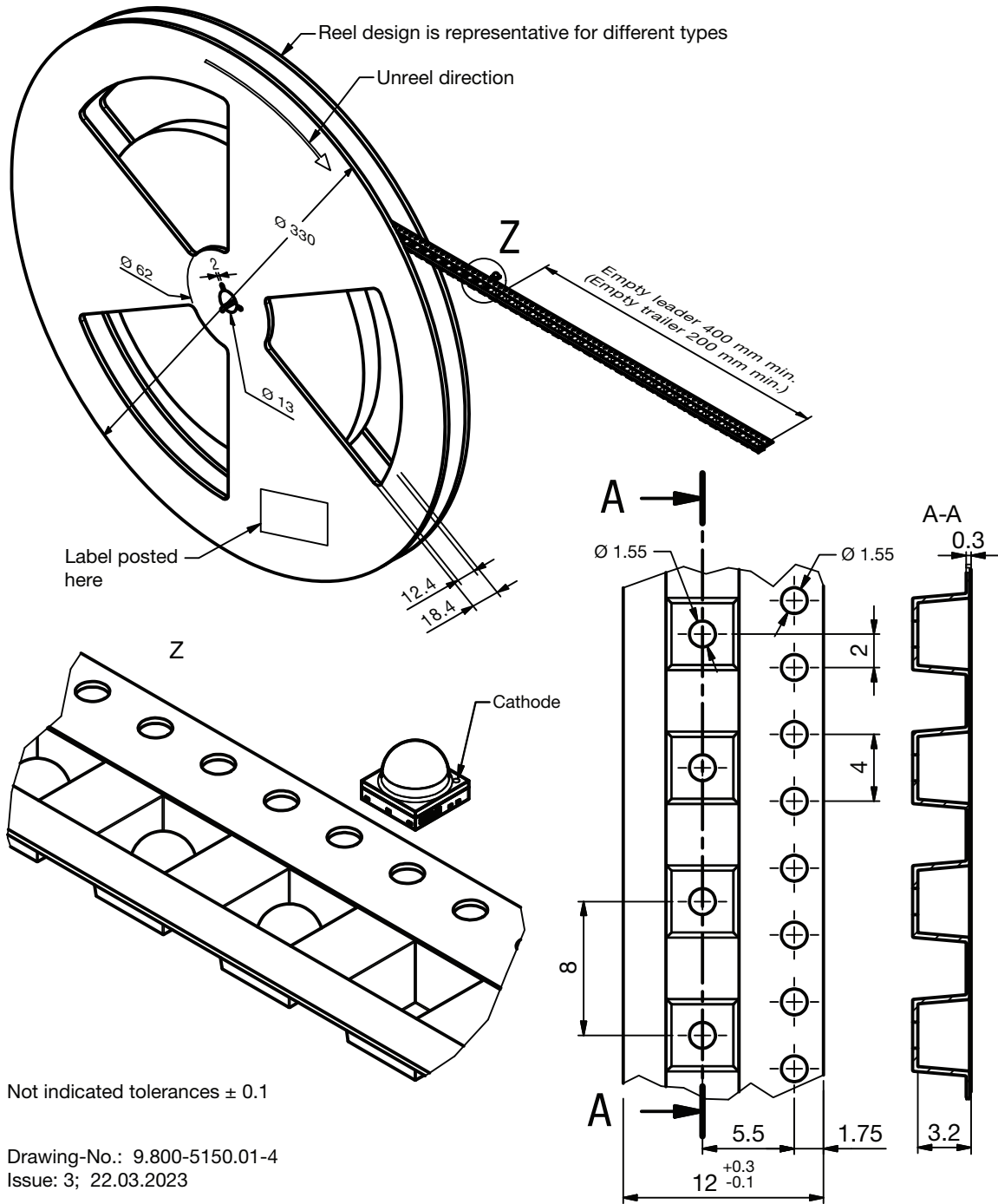


Fig. 10 - Max. Allowed Forward Current vs. Pulse Duration

**TAPING DIMENSIONS** in millimeters



Not indicated tolerances  $\pm 0.1$

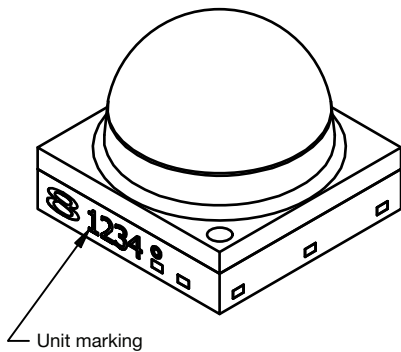
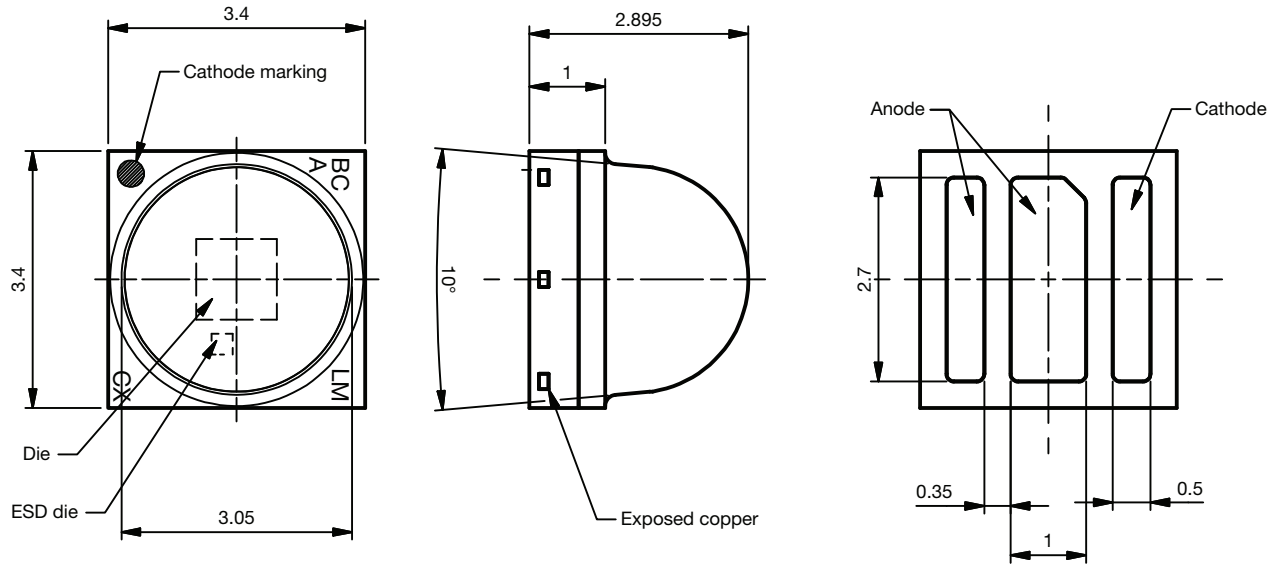
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Issue: 3; 22.03.2023

**Notes**

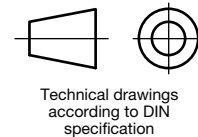
- Empty component pockets sealed with top cover tape
- 7 inch reel - 600 pieces per reel
- The maximum number of consecutive missing lamps is two
- In accordance with ANSI / EIA 481-1-A-1994 specifications



**PACKAGE DIMENSIONS** in millimeters



Not indicated tolerances  $\pm 0.1$

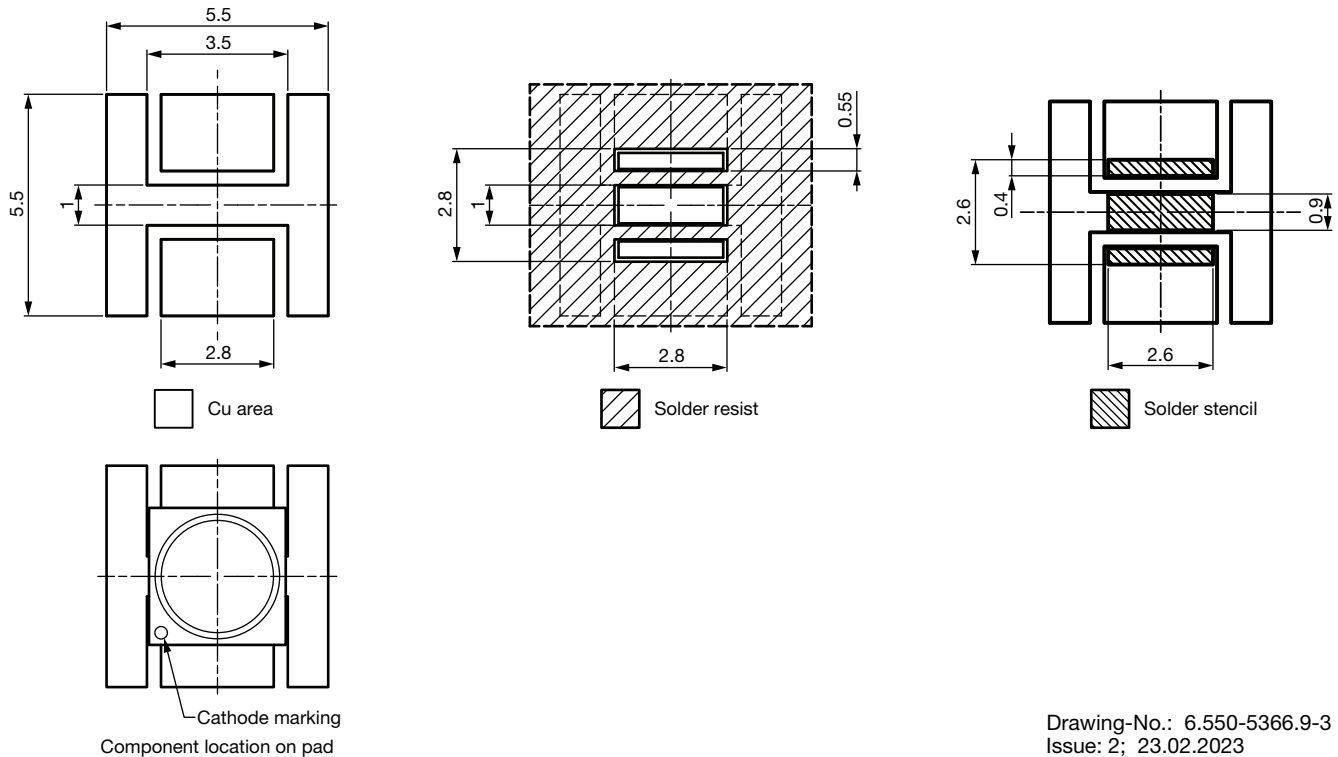


Drawing-No.: 6.550-5366.01-4  
Issue: 2; 23.02.2023

**Notes**

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

**RECOMMENDED FOOTPRINT**



**SOLDER PROFILE**

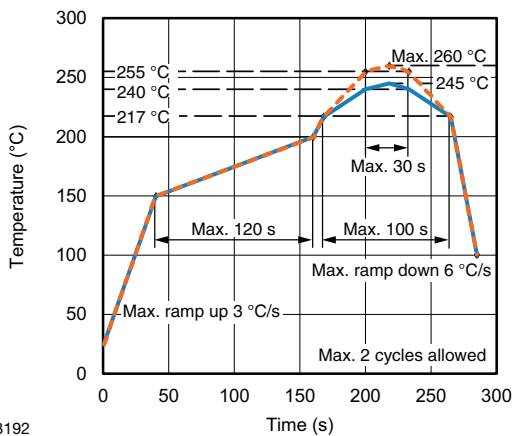


Fig. 11 - Lead (Pb)-free (Sn) Infrared Reflow Solder Profile According to J-STD-020E for Surface-Mount Components

**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:  $T_{amb} < 30\text{ °C}$ ,  $RH < 60\%$

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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