

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



## LINKS TO ADDITIONAL RESOURCES



## DESCRIPTION

As part of the [Astral](#) portfolio, the VSMA1094401X02 is an infrared, 940 nm emitting diode. It features a double stack emitter chip for highest radiant power while minimizing the red glow effect. 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:  $\lambda_p = 950$  nm
- AEC-Q102 qualified
- Angle of half intensity:  $\phi = \pm 40^\circ$
- Designed for high drive currents: up to 1.5 A (DC) and up to 5 A (pulsed)
- Low thermal resistance:  $R_{thJSP} < 7$  K/W
- ESD: up to 10 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)

AUTOMOTIVE  
GRADE

**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

## 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)	$\lambda_{\text{centroid}}$ (nm)	$t_r$ (ns)
VSMA1094401X02	860	$\pm 40$	950	945	10

### Note

- Test conditions see table “Basic Characteristics”

## ORDERING INFORMATION

ORDERING CODE	PACKAGING	REMARKS	PACKAGE FORM
VSMA1094401X02	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	$R_{thJSP, real}$	< 7	K/W
ESD sensitivity	According to ANSI / ESDA / JEDEC JS-001	$V_{ESD}$	10	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

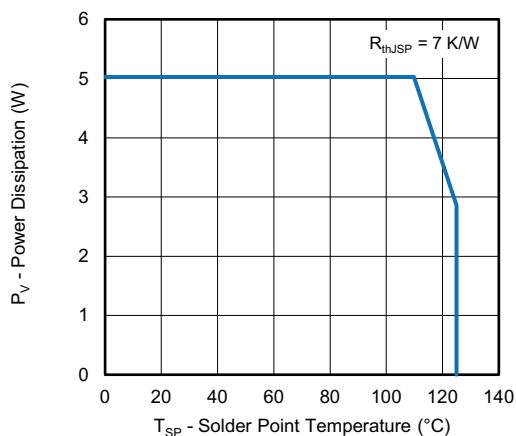


Fig. 1 - Power Dissipation Limit vs. Solder Point Temperature

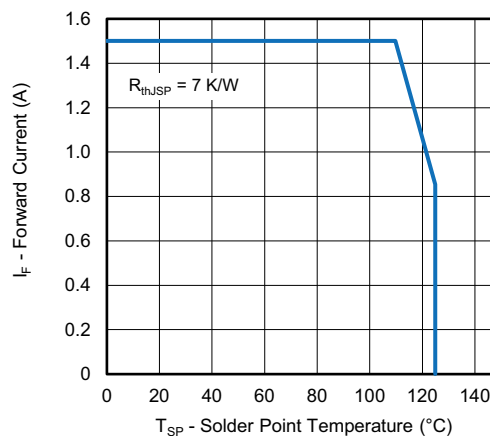


Fig. 2 - Forward Current Limit vs. Solder Point Temperature

<b>BASIC CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Forward voltage	$I_F = 0.35\text{ A}$ , $t_p = 10\text{ ms}$	$V_F$	2.2	2.6	3.0	V
	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$V_F$	2.3	2.8	3.1	V
	$I_F = 1.5\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$V_F$	2.6	2.9	3.3	V
	$I_F = 5\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$V_F$	3.1	3.7	4.2	V
Temperature coefficient of $V_F$	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$		-	-1.23	-	mV/K
Reverse current <sup>(1)</sup>		$I_R$	Not designed for reverse operation			$\mu\text{A}$
Radiant intensity	$I_F = 0.35\text{ A}$ , $t_p = 10\text{ ms}$	$I_e$	250	320	420	mW/sr
	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$I_e$	680	860	1050	mW/sr
	$I_F = 1.5\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$I_e$	1000	1300	1600	mW/sr
	$I_F = 5\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$I_e$	3050	3850	4650	mW/sr
Radiant power	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$\phi_e$	-	1250	-	mW
	$I_F = 1.5\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$\phi_e$	-	1850	-	mW
Temperature coefficient of $\phi$	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$TK_{\phi}$	-	-0.20	-	%/K
Angle of half intensity		$\phi$	-	$\pm 40$	-	$^{\circ}$
Peak wavelength	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$\lambda_p$	940	950	965	nm
Centroid wavelength	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$\lambda_{\text{centroid}}$	-	945	-	nm
Spectral bandwidth	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	$\Delta\lambda$	-	35	-	nm
Temperature coefficient of $\lambda_p$	$I_F = 100\text{ mA}$ , $t_p = 20\text{ ms}$	$TK_{\lambda_p}$	-	0.31	-	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

**Note**

- <sup>(1)</sup> 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.

<b>RADIANT INTENSITY BINNING</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	SELECTION CODE	SYMBOL	MIN.	TYP.	MAX.	UNIT
Radiant intensity	$I_F = 1\text{ A}$ , $t_p = 100\text{ }\mu\text{s}$	0	$I_e$	680	860	1050	mW/sr
		1		680	n/a	800	mW/sr
		2		800		925	mW/sr
		3		925		1050	mW/sr

**Note**

- Each reel will contain a single selection code. The label on the bag indicates the selection code. Production shipments can include multiple selection codes in multiple bags.

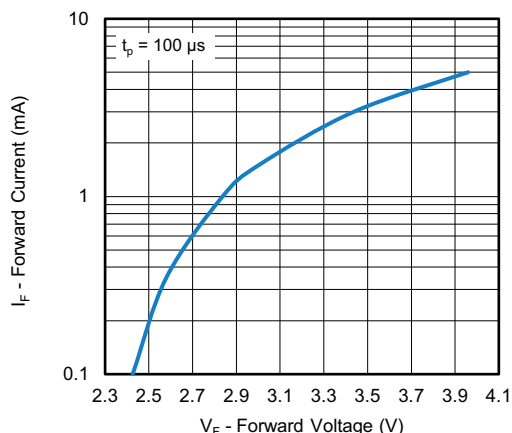
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 3 - Forward Current vs. Forward Voltage

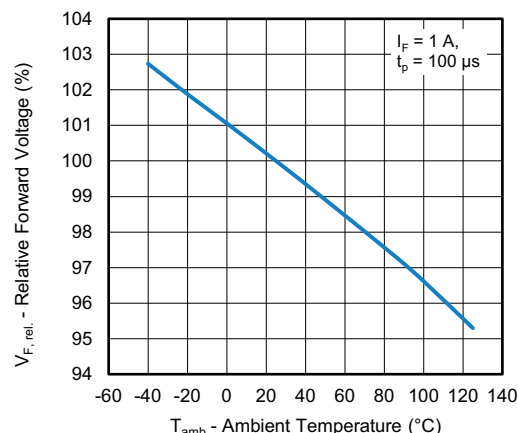


Fig. 4 - Relative Forward Voltage vs. Ambient Temperature

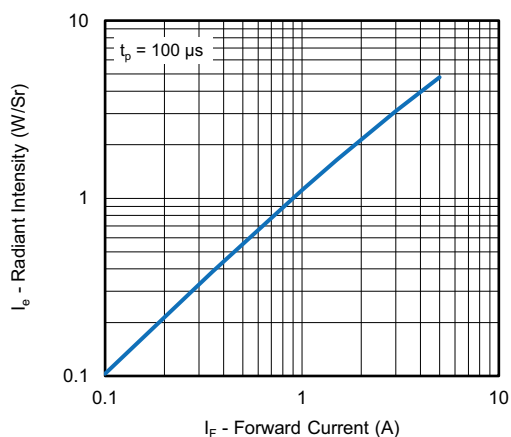


Fig. 5 - Relative Radiant Intensity vs. Forward Current

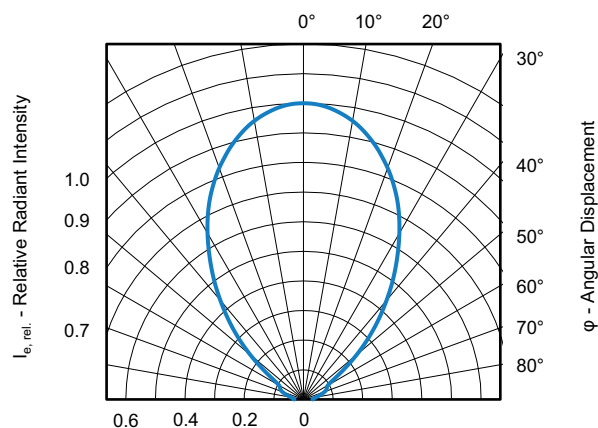


Fig. 8 - Relative Radiant Intensity vs. Angular Displacement

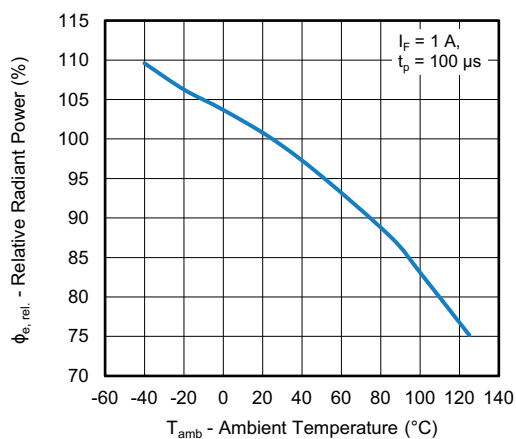


Fig. 6 - Relative Radiant Power vs. Ambient Temperature

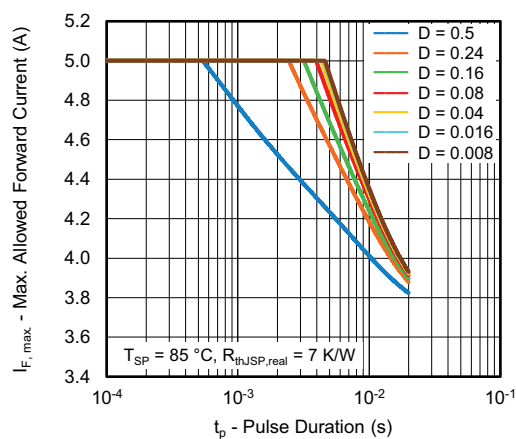


Fig. 9 - Max. Allowed Forward Current vs. Pulse Duration

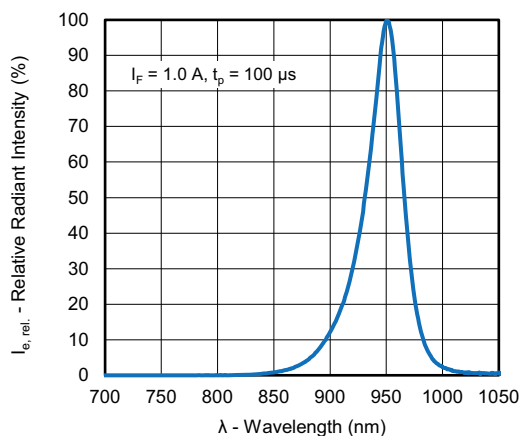
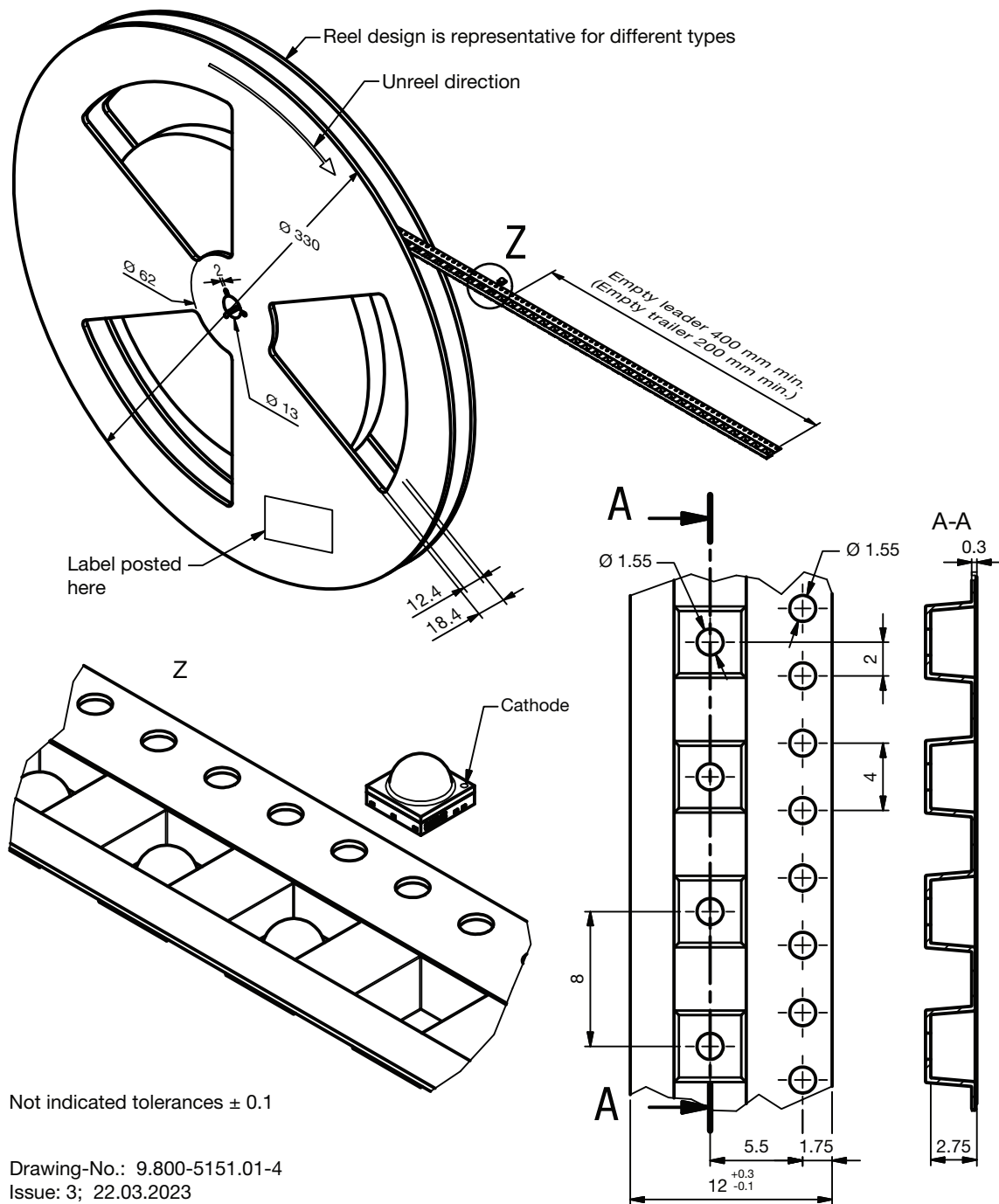
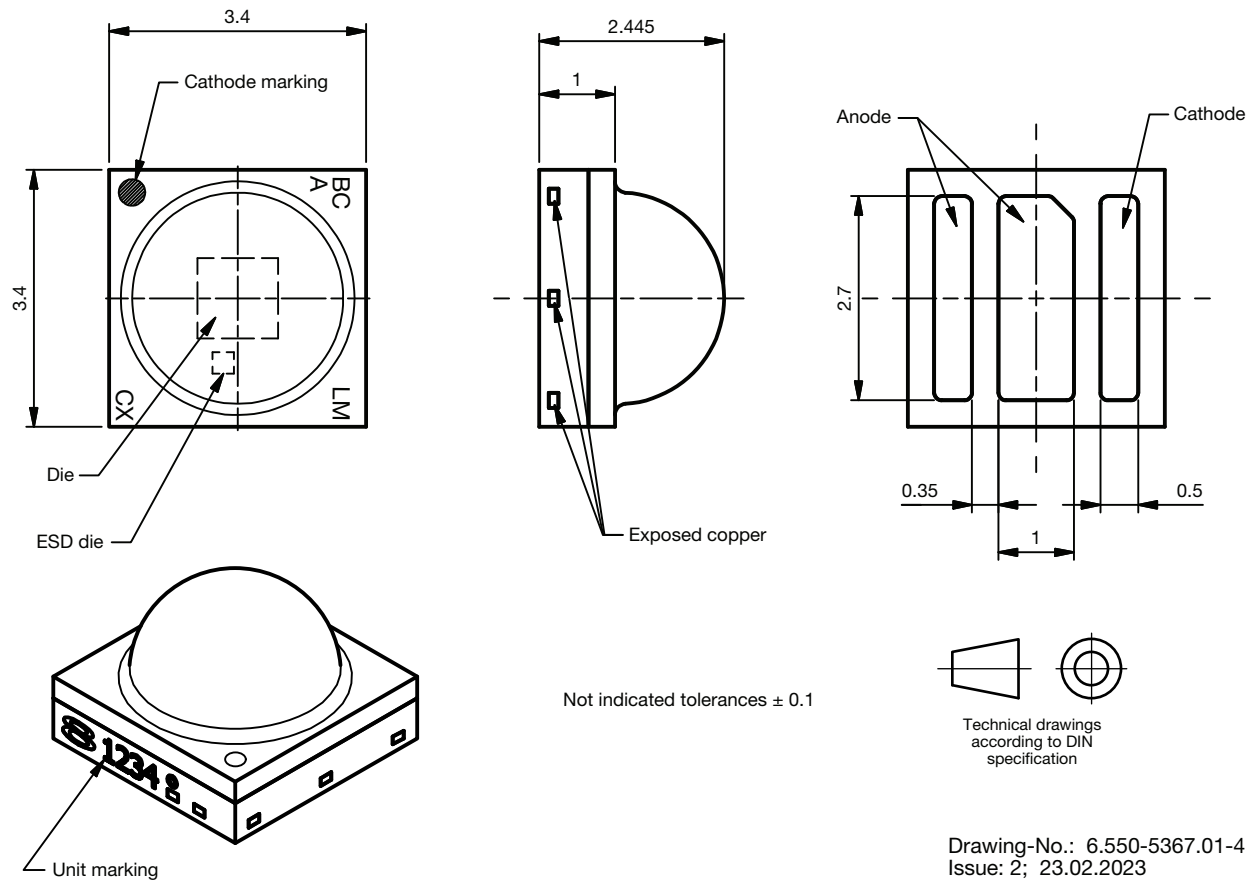


Fig. 7 - Relative Radiant Intensity vs. Wavelength

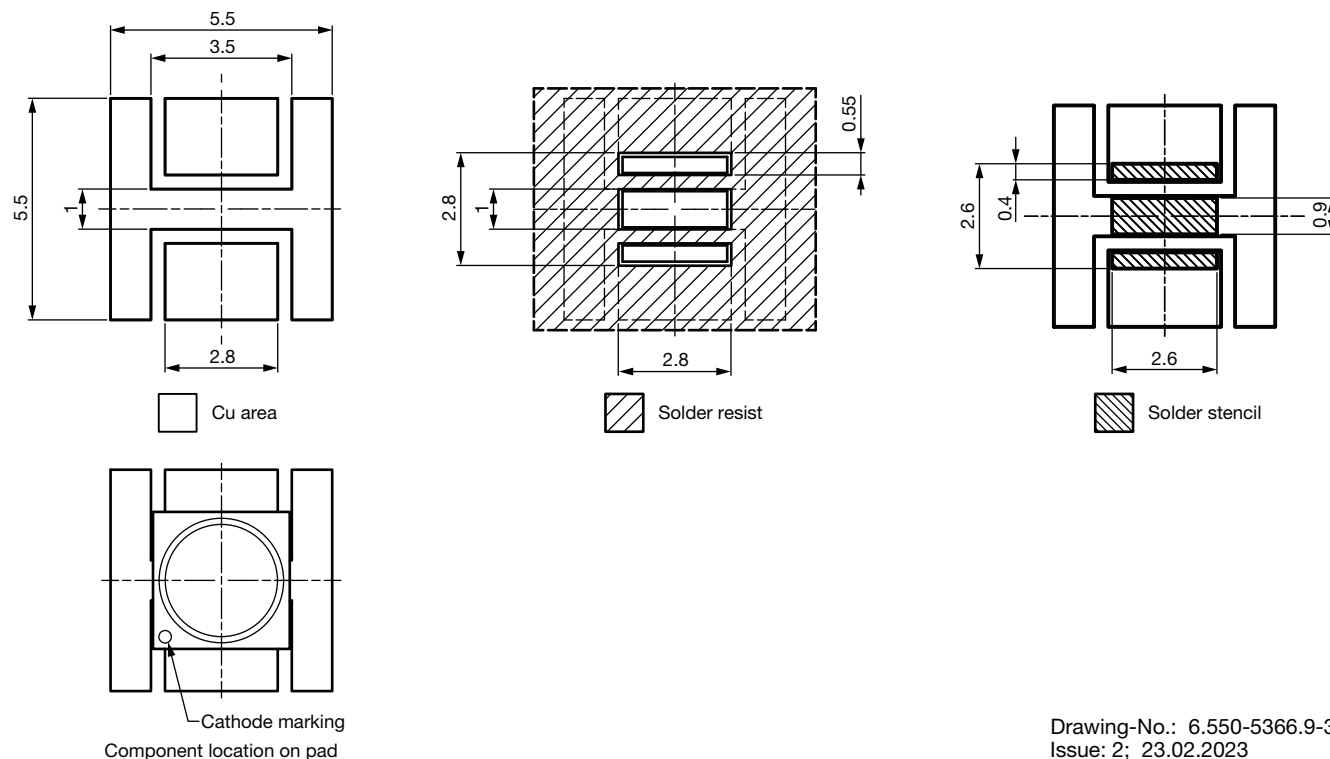
**TAPING DIMENSIONS** in millimeters

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

## RECOMMENDED FOOTPRINT



## SOLDER PROFILE

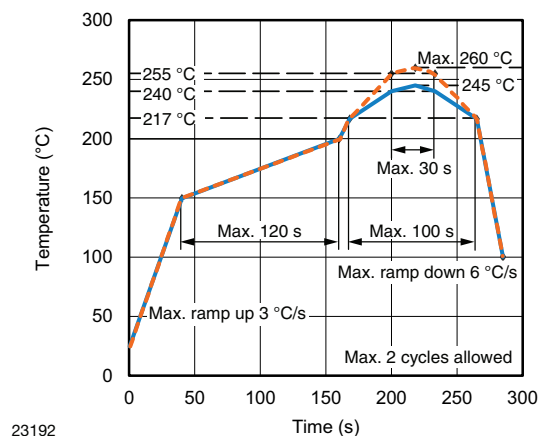


Fig. 10 - Lead (Pb)-free (Sn) Infrared Reflow Solder Profile According to J-STD-020E for Surface-Mount Components

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

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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