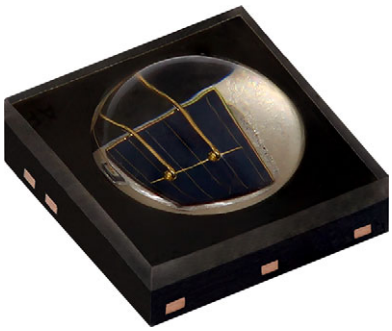
High Power Infrared Emitting Diode, 940 nm, Surface Emitter Technology



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 1.8
- Peak wavelength: λ_p = 950 nm
- AEC-Q102 qualified
- Angle of half intensity: φ = ± 60°
- 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

AUTOMOTIVE GRADE

Pb-free

e4

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

LINKS TO ADDITIONAL RESOURCES

Application Notes

3D Models

DESCRIPTION

As part of the Astral portfolio, the VSMA1094601X02 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.

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)	$\lambda_{centroid}$ (nm)	t_r (ns)
VSMA1094601X02	460	± 60	950	945	10

Note

- Test conditions see table “Basic Characteristics”

ORDERING INFORMATION			
ORDERING CODE	PACKAGING	REMARKS	PACKAGE FORM
VSMA1094601X02	Tape and reel	MOQ: 600 pcs, 600 pcs/reel	High power with lens

Note

- MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °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 µs	I_{FSM}	5	A
Power dissipation		P_V	5	W
Junction temperature		T_j	145	°C
Ambient temperature range		T_{amb}	-40 to +125	°C
Storage temperature range		T_{stg}	-40 to +125	°C
Soldering temperature	According to Fig. 11, J-STD-020E	T_{sd}	260	°C
Thermal resistance junction to solder point real (1)	JESD 51	$R_{thJSP,real}$	< 7	K/W
ESD sensitivity	According to ANSI / ESDA / JEDEC JS-001	V_{ESD}	10	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

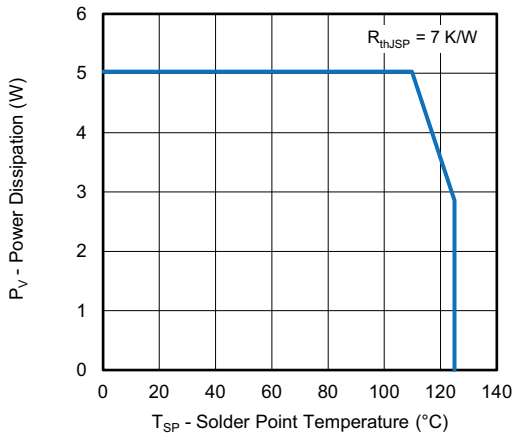


Fig. 1 - Power Dissipation Limit vs. Solder Point Temperature

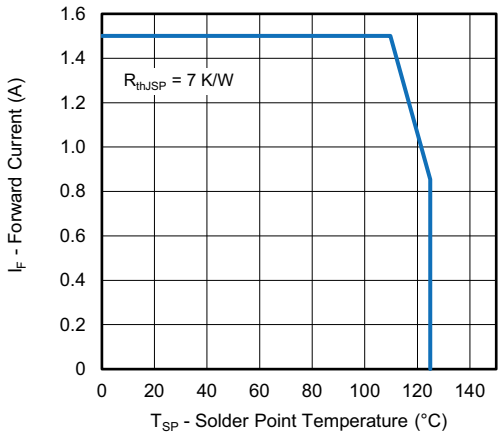


Fig. 2 - Forward Current Limit vs. Solder Point Temperature

BASIC CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Forward voltage	I_F = 0.35 A, t_p = 10 ms	V_F	2.2	2.6	3.0	V
	I_F = 1 A, t_p = 100 µs	V_F	2.3	2.8	3.1	V
	I_F = 1.5 A, t_p = 100 µs	V_F	2.6	2.9	3.3	V
	I_F = 5 A, t_p = 100 µs	V_F	3.1	3.7	4.2	V
Temperature coefficient of V_F	I_F = 1 A, t_p = 100 µs		-	-1.23	-	mV/K
Reverse current (1)		I_R	Not designed for reverse operation			µA
Radiant intensity	I_F = 0.35 A, t_p = 10 ms	I_e	135	170	205	mW/sr
	I_F = 1 A, t_p = 100 µs	I_e	370	460	550	mW/sr
	I_F = 1.5 A, t_p = 100 µs	I_e	550	690	830	mW/sr
	I_F = 5 A, t_p = 100 µs	I_e	1675	2100	2550	mW/sr
Radiant power	I_F = 1 A, t_p = 100 µs	ϕ_e	-	1250	-	mW
	I_F = 1.5 A, t_p = 100 µs	ϕ_e	-	1850	-	mW
Temperature coefficient of ϕ	I_F = 1 A, t_p = 100 µs	TK_ϕ	-	-0.20	-	%/K
Angle of half intensity		φ	-	± 60	-	°
Peak wavelength	I_F = 1 A, t_p = 100 µs	λ_p	940	950	965	nm
Centroid wavelength	I_F = 1 A, t_p = 100 µs	$\lambda_{centroid}$	-	945	-	nm
Spectral bandwidth	I_F = 1 A, t_p = 100 µs	$\Delta\lambda$	-	35	-	nm
Temperature coefficient of λ_p	I_F = 100 mA, t_p = 20 ms	$TK_{\lambda p}$	-	0.31	-	nm/K
Rise time	I_F = 1 A, R_L = 50 Ω	t_r	-	10	-	ns
Fall time	I_F = 1 A, R_L = 50 Ω	t_f	-	13	-	ns

Note

(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.

RADIANT INTENSITY BINNING (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**SELECTION CODE**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Radiant intensity	I_F = 1 A, t_p = 100 µs	0	I_e	370	460	550	mW/sr
		1		370	n/a	430	mW/sr
		2		430		490	mW/sr
		3		490		550	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 °C, unless otherwise specified)

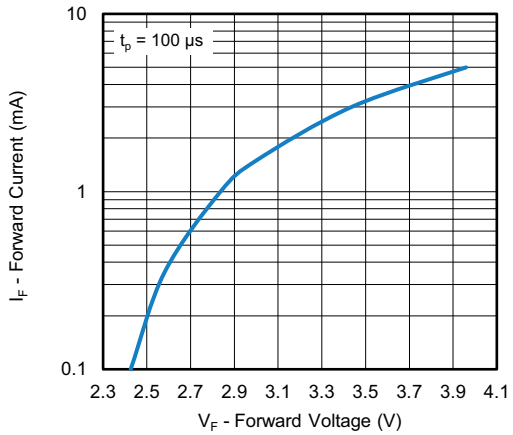


Fig. 3 - Forward Current vs. Forward Voltage

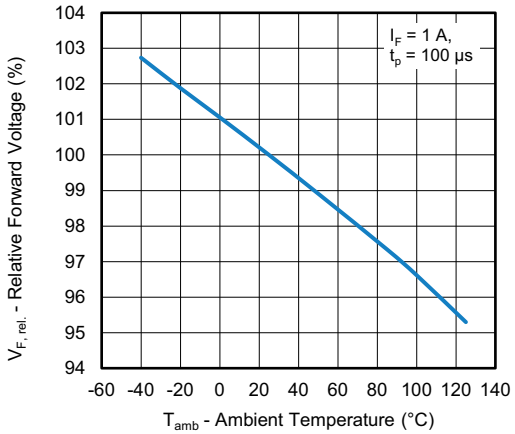


Fig. 4 - Relative Forward Voltage vs. Ambient Temperature

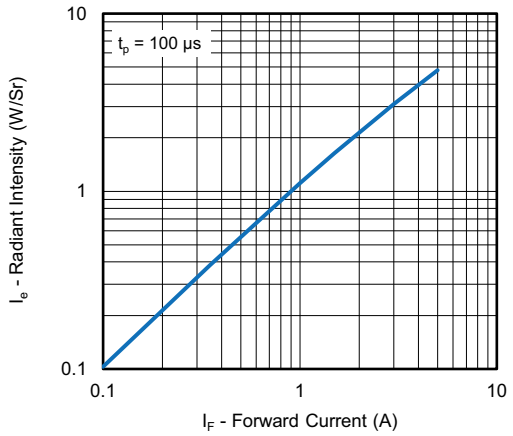


Fig. 5 - Relative Radiant Intensity vs. Forward Current

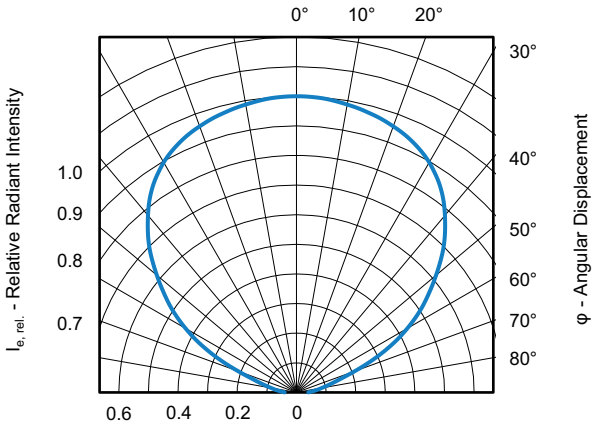


Fig. 8 - Relative Radiant Intensity vs. Angular Displacement

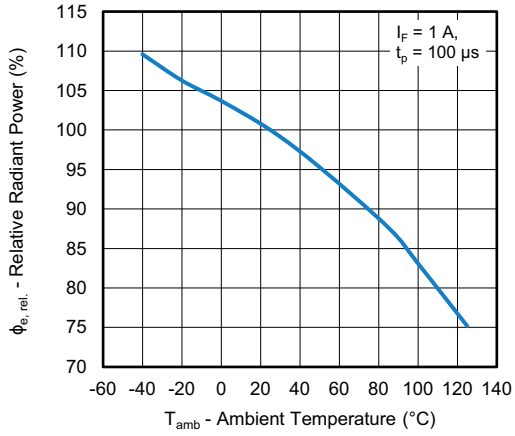


Fig. 6 - Relative Radiant Power vs. Ambient Temperature

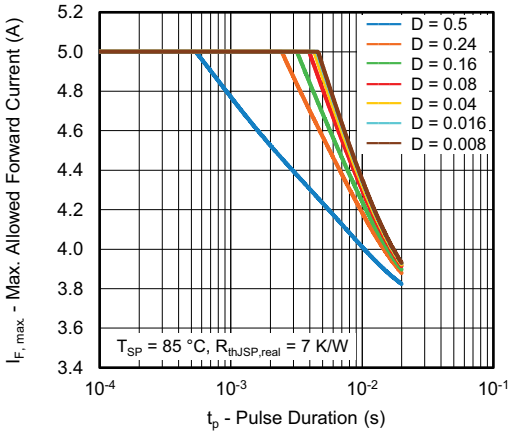


Fig. 9 - Max. Allowed Forward Current vs. Pulse Duration

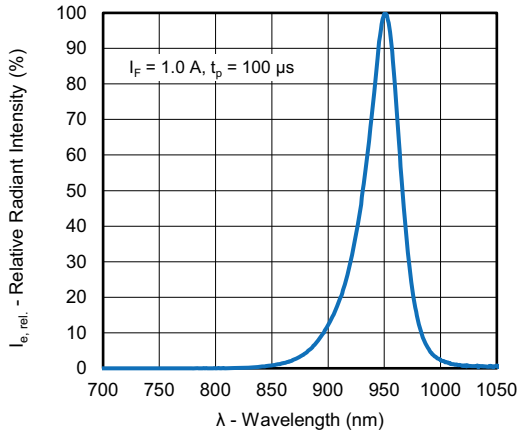
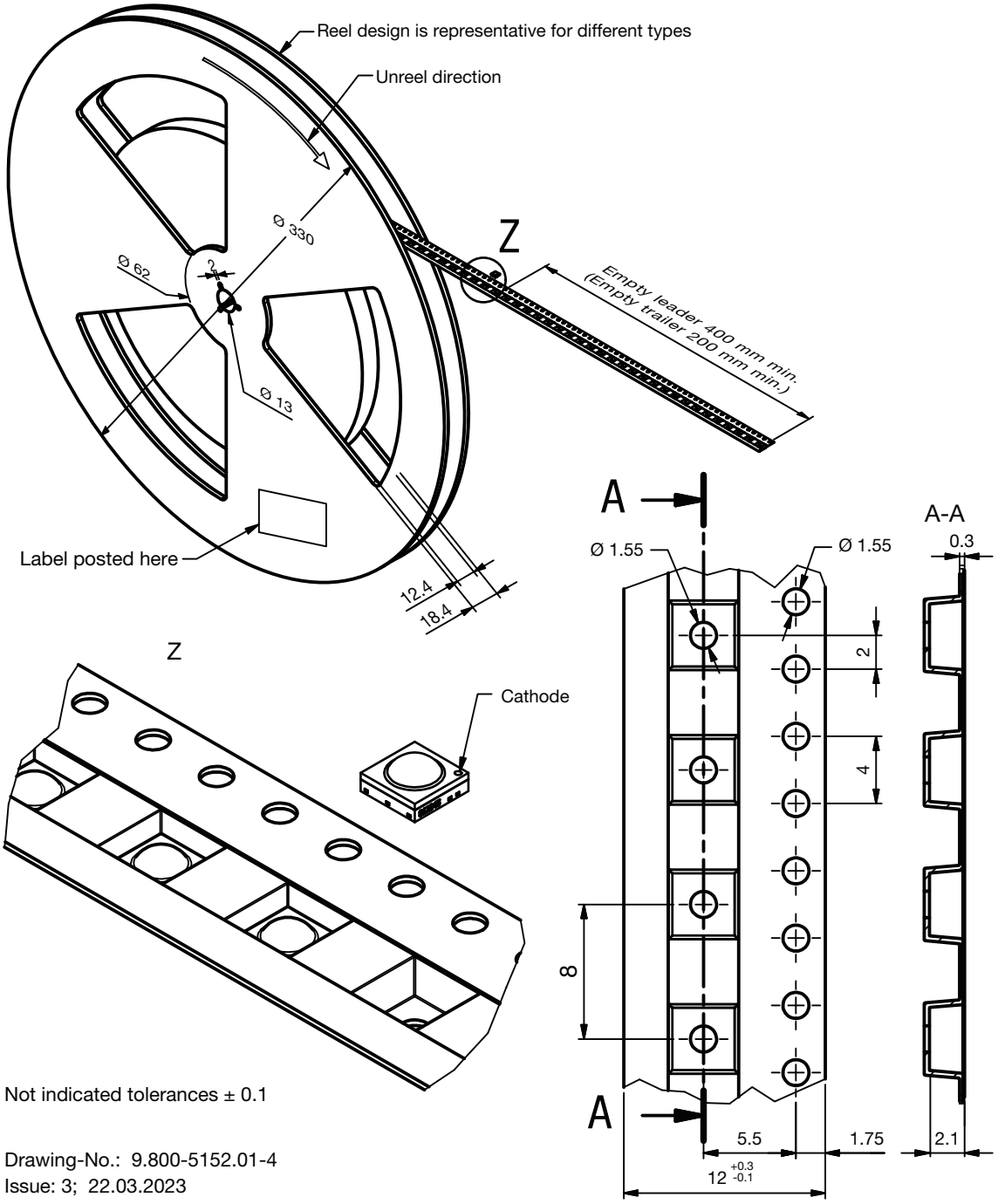


Fig. 7 - Relative Radiant Intensity vs. Wavelength

TAPING DIMENSIONS in millimeters



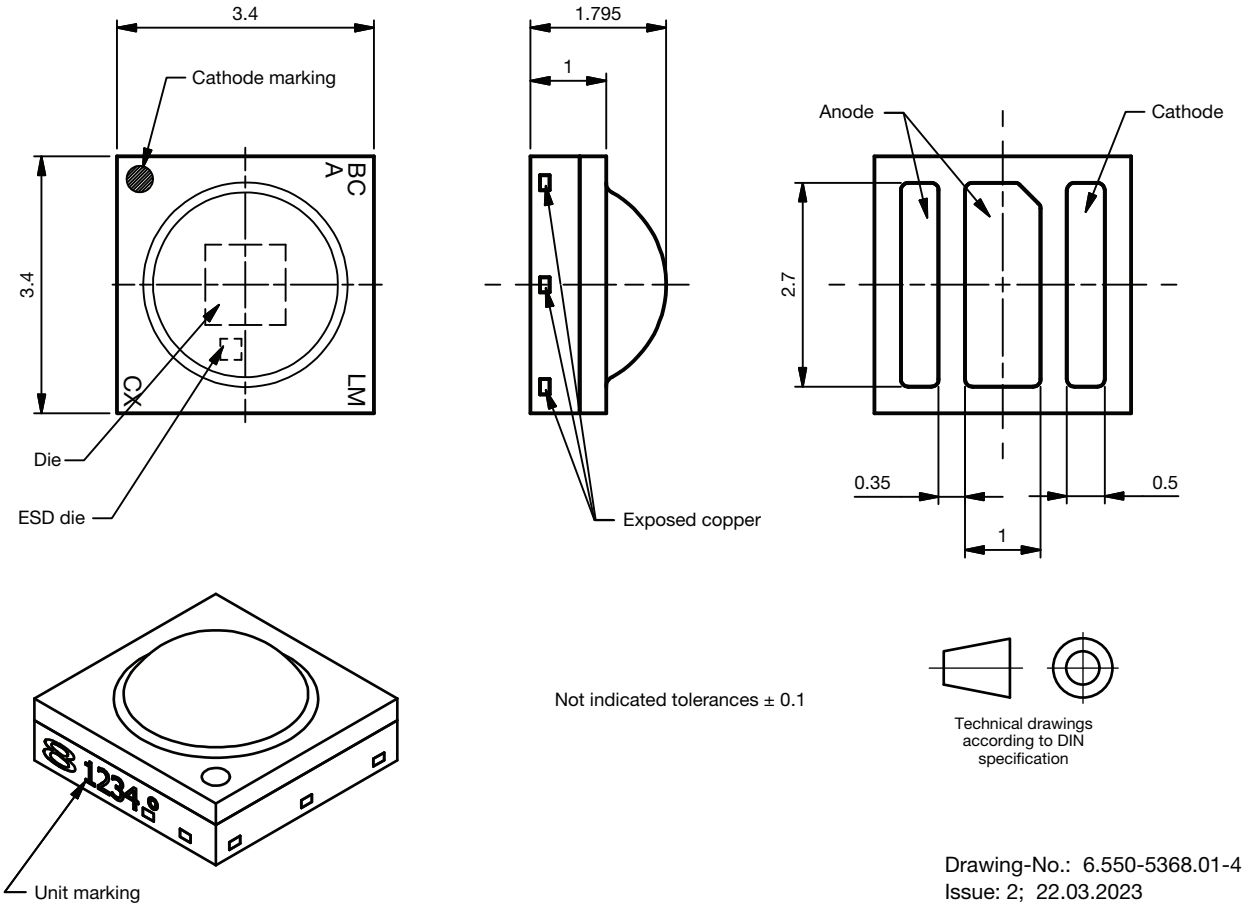
Not indicated tolerances ± 0.1

Drawing-No.: 9.800-5152.01-4
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 ± 0.1

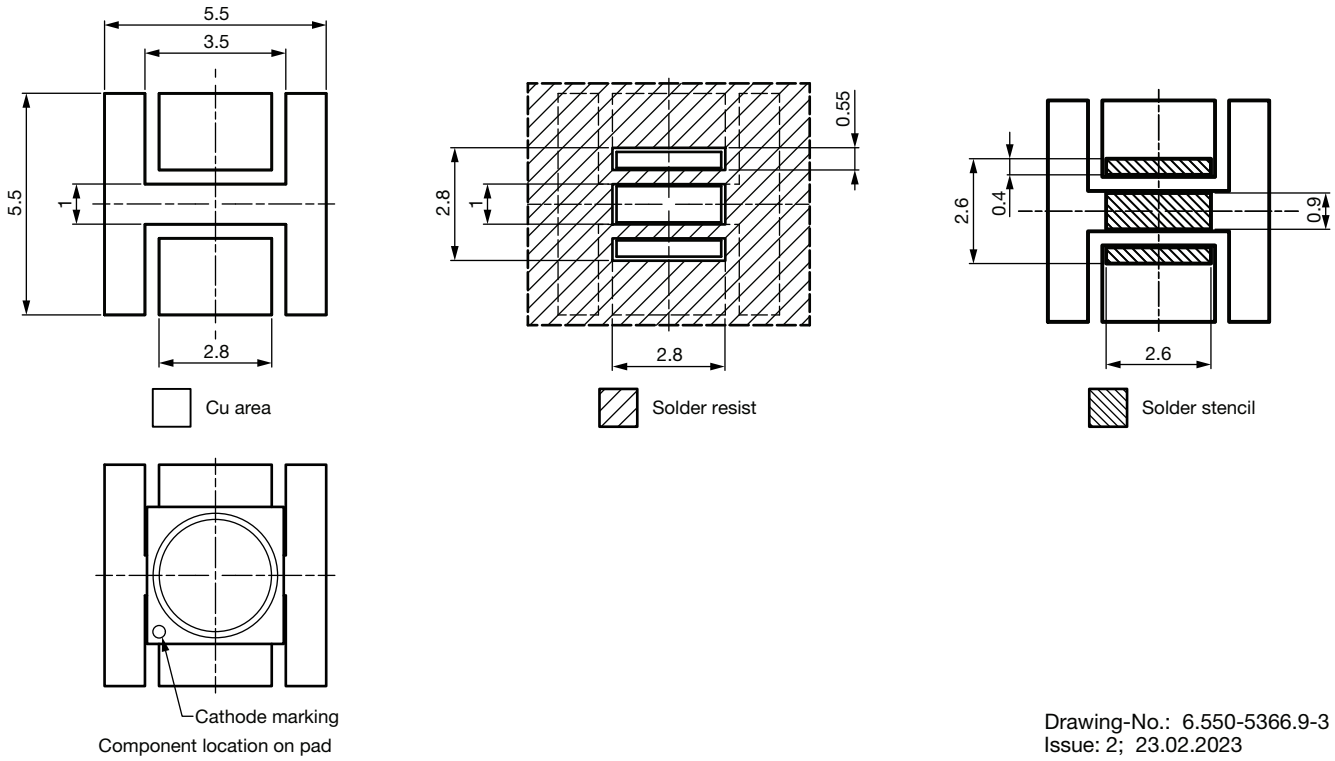
Technical drawings according to DIN specification

Drawing-No.: 6.550-5368.01-4
Issue: 2; 22.03.2023

Notes

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

RECOMMENDED FOOTPRINT



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

SOLDER PROFILE

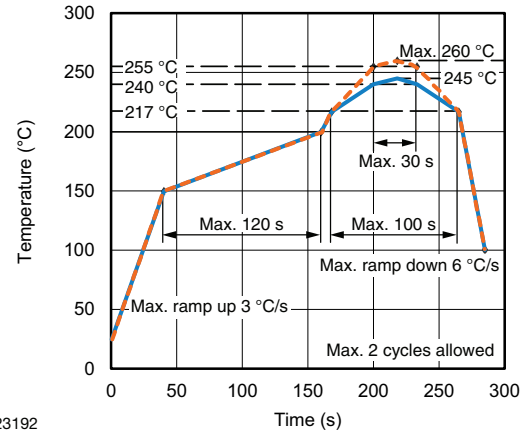


Fig. 10 - Lead (Pb)-free (Sn) Infrared Reflow Solder Profile According to J-STD-020E for Surface-Mount Components

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_{amb} < 30 °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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