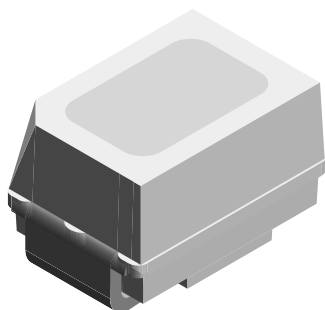


## Power Mini SMD LED



19226

### DESCRIPTION

The new MiniLED series has been designed in a small white SMT package. The feature of the device is the very small package 2.3 mm x 1.3 mm x 1.4 mm. The MiniLED is an obvious solution for small-scale, high-power products that are expected to work reliably in an arduous environment. This is often the case in automotive and industrial application.

### PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD MiniLED
- Product series: power
- Angle of half intensity:  $\pm 60^\circ$

### FEATURES

- SMD LEDs with exceptional brightness
- Luminous intensity categorized
- Compatible with automatic placement equipment
- IR reflow soldering
- Available in 8 mm tape
- Low profile package
- Non-diffused lens: excellent for coupling to light pipes and backlighting
- Low power consumption
- Luminous intensity ratio in one packing unit  $I_{Vmax}/I_{Vmin} \leq 1.6$
- AEC-Q101 qualified
- 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

- Automotive: backlighting in dashboards, and switches
- Telecommunication: indicator and backlighting in telephone and fax
- Indicator and backlight for audio and video equipment
- Indicator and backlight in office equipment
- Flat backlight for LCDs, switches, and symbols

### PARTS TABLE

PART	COLOR	LUMINOUS INTENSITY (mcd)			at $I_F$ (mA)	WAVELENGTH (nm)			at $I_F$ (mA)	FORWARD VOLTAGE (V)			at $I_F$ (mA)	TECHNOLOGY
		MIN.	TYP.	MAX.		MIN.	TYP.	MAX.		MIN.	TYP.	MAX.		
VLMK23P2R1-GS08	Red	56	120	140	20	-	630	-	20	-	1.9	2.6	20	AlInGaP on GaAs
VLMK23Q2S1-GS08	Red	90	125	224	20	-	630	-	20	-	1.9	2.6	20	AlInGaP on GaAs
VLMK23P2S1-GS08	Red	56	125	224	20	-	630	-	20	-	1.9	2.6	20	AlInGaP on GaAs
VLMK23R1S1-GS08	Red	112	130	224	20	-	630	-	20	-	1.9	2.6	20	AlInGaP on GaAs
VLMF23Q2S1-GS08	Soft orange	90	180	224	20	598	605	611	20	-	2	2.6	20	AlInGaP on GaAs
VLMF23R2T1-GS08	Soft orange	140	180	355	20	598	605	611	20	-	2	2.6	20	AlInGaP on GaAs
VLMF23Q2T1-GS08	Soft orange	90	180	355	20	598	605	611	20	-	2	2.6	20	AlInGaP on GaAs
VLME23Q2S1-GS08	Yellow	90	170	224	20	581	588	594	20	-	2	2.6	20	AlInGaP on GaAs
VLME23R2T1-GS08	Yellow	140	190	355	20	581	588	594	20	-	2	2.6	20	AlInGaP on GaAs
VLME23Q2T1-GS08	Yellow	90	170	355	20	581	588	594	20	-	2	2.6	20	AlInGaP on GaAs

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**VLMK23.., VLMF23.., VLME23..**

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage <sup>(1)</sup>		$V_R$	5	V
DC Forward current	$T_{amb} \leq 80\text{ }^{\circ}\text{C}$	$I_F$	30	mA
Surge forward current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	0.1	A
Power dissipation		$P_V$	80	mW
Junction temperature		$T_j$	+125	$^{\circ}\text{C}$
Operating temperature range		$T_{amb}$	-40 to +100	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	-40 to +100	$^{\circ}\text{C}$
Thermal resistance junction / ambient	Mounted on PC board (pad size > 5 mm <sup>2</sup> )	$R_{thJA}$	580	K/W

**Note**

<sup>(1)</sup> Driving the LED in reverse direction is suitable for a short term application

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**VLMK23.., RED**

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>(1)</sup>	$I_F = 20\text{ mA}$	VLMK23P2R1	$I_V$	56	120	140	mcd
		VLMK23Q2S1	$I_V$	90	125	224	mcd
		VLMK23P2S1	$I_V$	56	125	224	mcd
		VLMK23R1S1	$I_V$	112	130	224	mcd
Dominant wavelength	$I_F = 20\text{ mA}$		$\lambda_d$	-	630	-	nm
Peak wavelength	$I_F = 20\text{ mA}$		$\lambda_p$	-	643	-	nm
Angle of half intensity	$I_F = 20\text{ mA}$		$\phi$	-	$\pm 60$	-	deg
Forward voltage	$I_F = 20\text{ mA}$		$V_F$	-	1.9	2.6	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$		$V_R$	5	-	-	V
Junction capacitance	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$		$C_j$	-	15	-	pF

**Note**

<sup>(1)</sup> In one packing unit  $I_{Vmax}/I_{Vmin.} \leq 1.6$

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**VLMF23.., SOFT ORANGE**

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>(1)</sup>	$I_F = 20\text{ mA}$	VLMF23Q2S1	$I_V$	90	180	224	mcd
		VLMF23R2T1	$I_V$	140	180	355	mcd
		VLMF23Q2T1	$I_V$	90	180	355	mcd
Dominant wavelength	$I_F = 20\text{ mA}$		$\lambda_d$	598	605	611	nm
Peak wavelength	$I_F = 20\text{ mA}$		$\lambda_p$	-	610	-	nm
Angle of half intensity	$I_F = 20\text{ mA}$		$\phi$	-	$\pm 60$	-	deg
Forward voltage	$I_F = 20\text{ mA}$		$V_F$	-	2	2.6	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$		$V_R$	5	-	-	V
Junction capacitance	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$		$C_j$	-	15	-	pF

**Note**

<sup>(1)</sup> In one packing unit  $I_{Vmax}/I_{Vmin.} \leq 1.6$

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**VLME23.., YELLOW**

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>(1)</sup>	$I_F = 20\text{ mA}$	VLME23Q2S1	$I_V$	90	170	224	mcd
		VLME23R2T1	$I_V$	140	190	355	mcd
		VLME23Q2T1	$I_V$	90	170	355	mcd
Dominant wavelength	$I_F = 20\text{ mA}$		$\lambda_d$	581	588	594	nm
Peak wavelength	$I_F = 20\text{ mA}$		$\lambda_p$	-	590	-	nm
Angle of half intensity	$I_F = 20\text{ mA}$		$\phi$	-	$\pm 60$	-	deg
Forward voltage	$I_F = 20\text{ mA}$		$V_F$	-	2	2.6	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$		$V_R$	5	-	-	V
Junction capacitance	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$		$C_j$		15	-	pF

**Note**

<sup>(1)</sup> In one packing unit  $I_{Vmax}/I_{Vmin.} \leq 1.6$

**LUMINOUS INTENSITY CLASSIFICATION**

GROUP	LIGHT INTENSITY (mcd)		
	STANDARD	OPTIONAL	MIN. MAX.
P		2	56 71
Q		1	71 90
		2	90 112
R		1	112 140
		2	140 180
S		1	180 224
		2	224 280
T		1	280 355

**Note**

- Luminous intensity is tested at a current pulse duration of 25 ms and an accuracy of  $\pm 11\%$ .  
The above type numbers represent the order groups which include only a few brightness groups. Only one group will be shipped on each reel (there will be no mixing of two groups on each reel).  
In order to ensure availability, single brightness groups will not be orderable.  
In a similar manner for colors where wavelength groups are measured and binned, single wavelength groups will be shipped on any one reel.  
In order to ensure availability, single wavelength groups will not be orderable.

**COLOR CLASSIFICATION**

GROUP	DOMINANT WAVELENGTH (nm)			
	SOFT ORANGE		YELLOW	
	MIN.	MAX.	MIN.	MAX.
1	598	601	581	584
2	600	603	583	586
3	602	605	585	588
4	604	607	587	590
5	606	609	589	592
6	608	611	591	594

**Note**

- Wavelengths are tested at a current pulse duration of 25 ms.

**CROSSING TABLE**

VISHAY	OSRAM
VLME23Q2S1	LYM676Q2S1
VLME23R2T1	LYM676R2T1
VLME23Q2T1	LYM676Q2T1
VLMF23Q2S1	LOM676Q2S1
VLMF23R2T1	LOM676R2T1
VLMF23Q2T1	LOM676Q2T1
VLMK23P2R1	LSM676P2R1
VLMK23Q2S1	LSM676Q2S1
VLMK23P2S1	LSM676P2S1

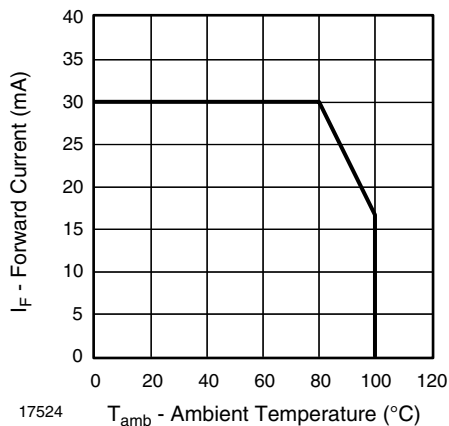
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Forward Current vs. Ambient Temperature

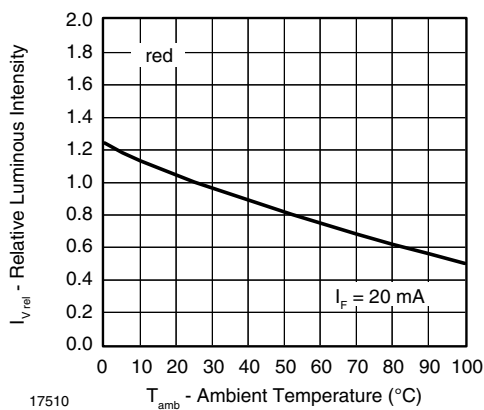


Fig. 4 - Relative Luminous Intensity vs. Ambient Temperature

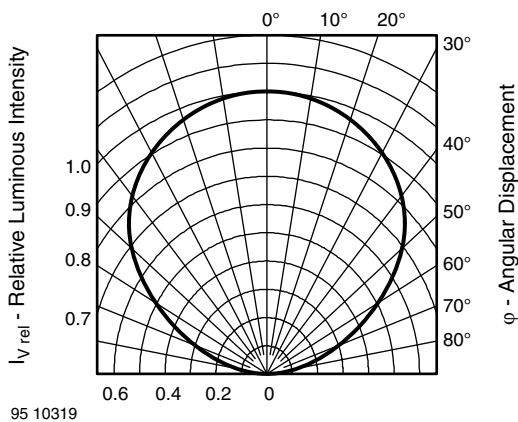


Fig. 2 - Relative Luminous Intensity vs. Angular Displacement

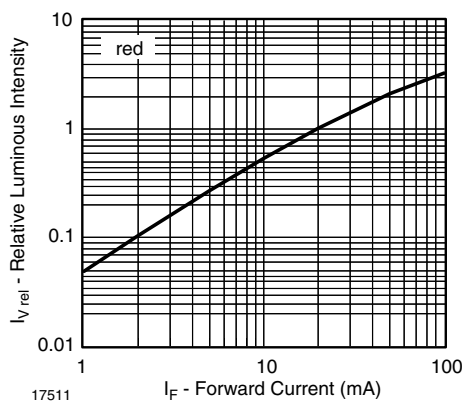


Fig. 5 - Relative Luminous Intensity vs. Forward Current

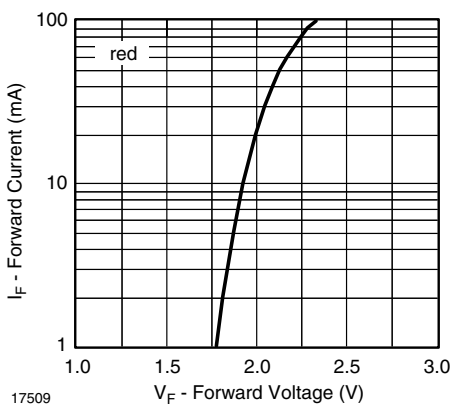


Fig. 3 - Forward Current vs. Forward Voltage

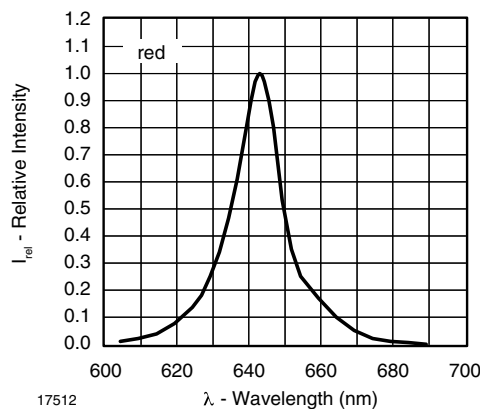


Fig. 6 - Relative Intensity vs. Wavelength

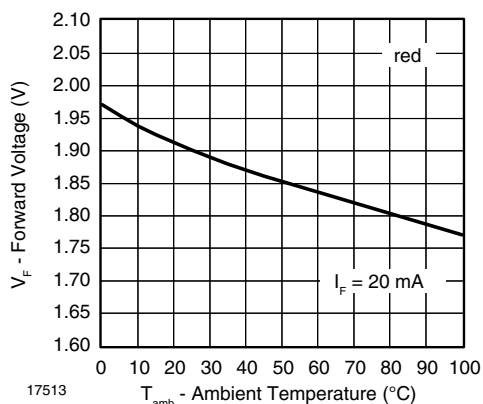


Fig. 7 - Relative Intensity vs. Wavelength

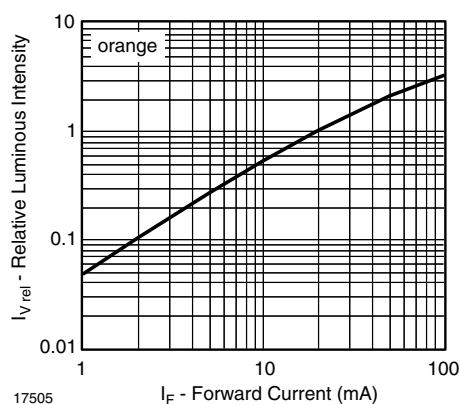


Fig. 10 - Relative Luminous Intensity vs. Forward Current

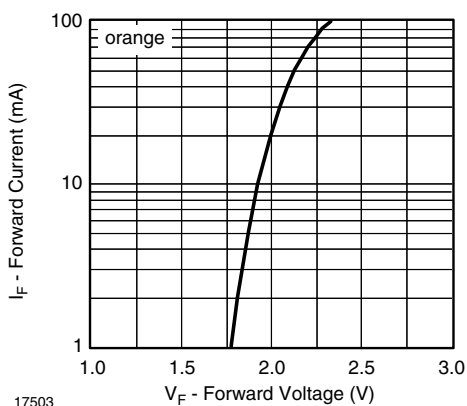


Fig. 8 - Forward Current vs. Forward Voltage

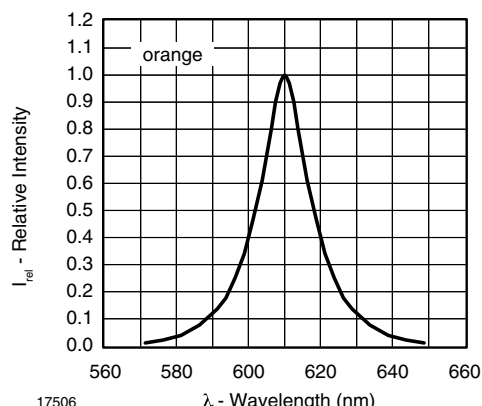


Fig. 11 - Relative Intensity vs. Wavelength

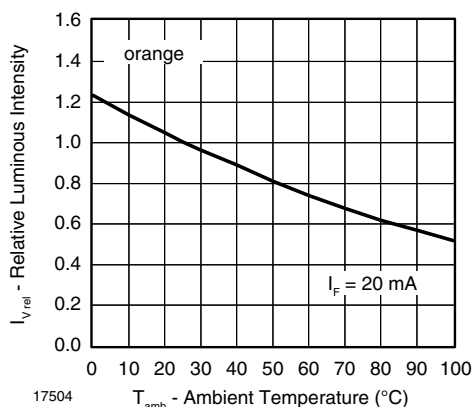


Fig. 9 - Relative Luminous Intensity vs. Ambient Temperature

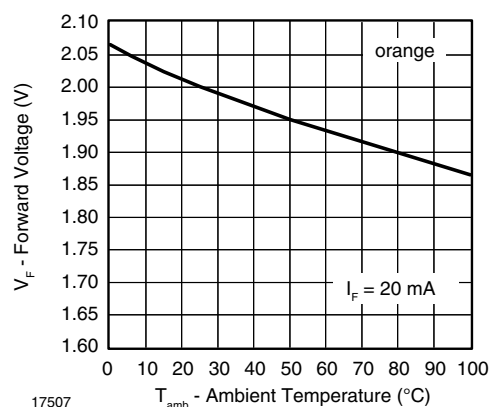


Fig. 12 - Forward Voltage vs. Ambient Temperature

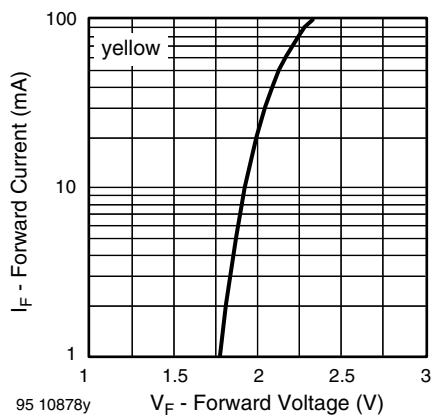


Fig. 13 - Forward Current vs. Forward Voltage

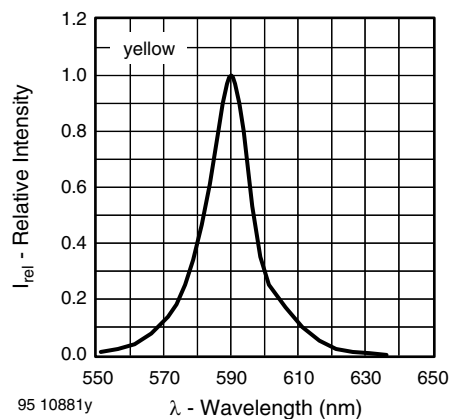


Fig. 16 - Relative Intensity vs. Wavelength

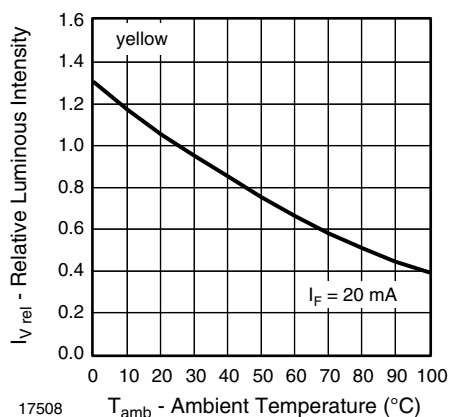


Fig. 14 - Relative Luminous Intensity vs. Ambient Temperature

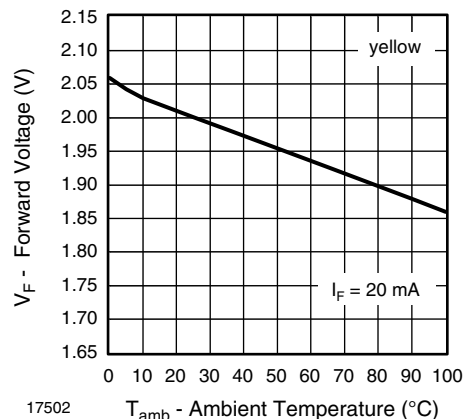


Fig. 17 - Forward Voltage vs. Ambient Temperature

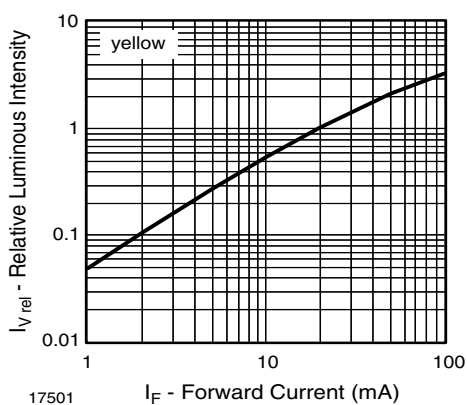
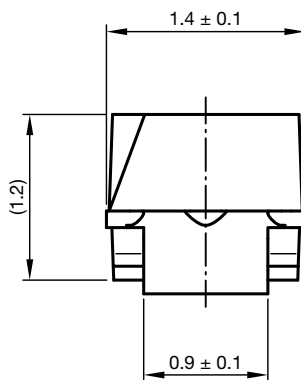
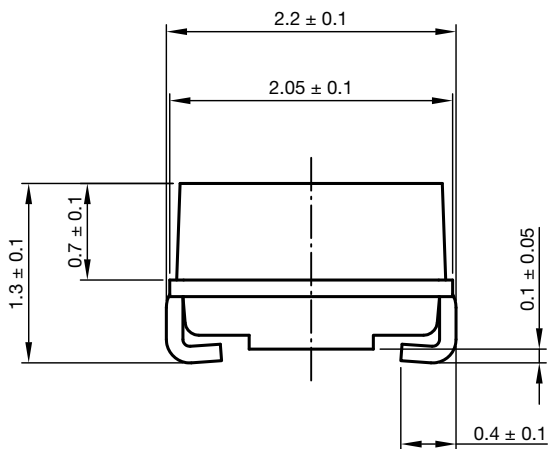


Fig. 15 - Relative Luminous Intensity vs. Forward Current

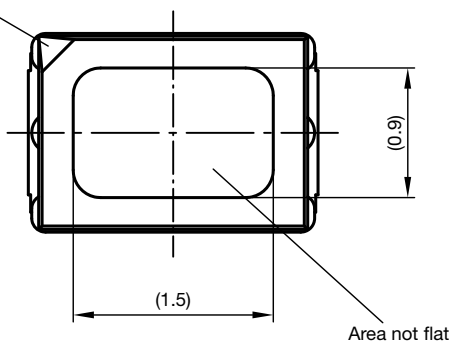


**PACKAGE DIMENSIONS** in millimeters

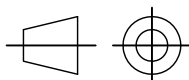
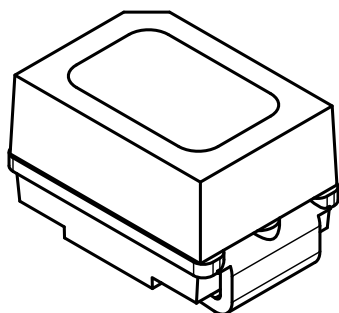
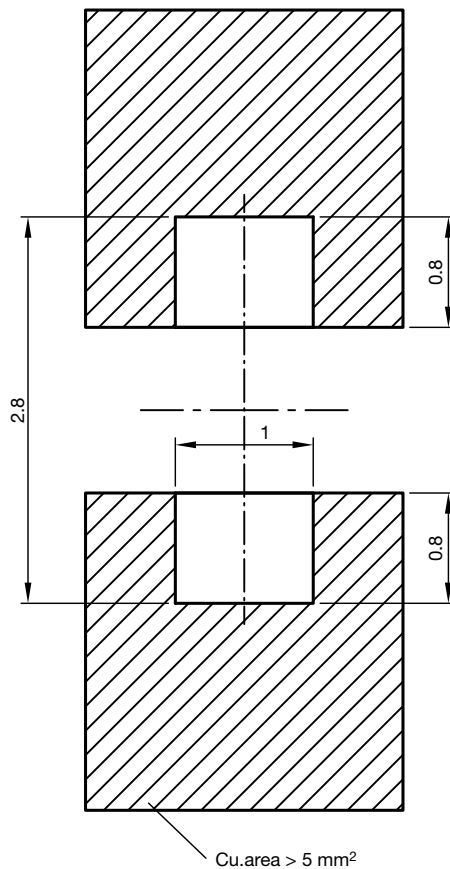


Not indicated tolerances  $\pm 0.2$

Cathode mark



Proposed pad layout  
(for reference only)



technical drawings  
according to DIN  
specifications

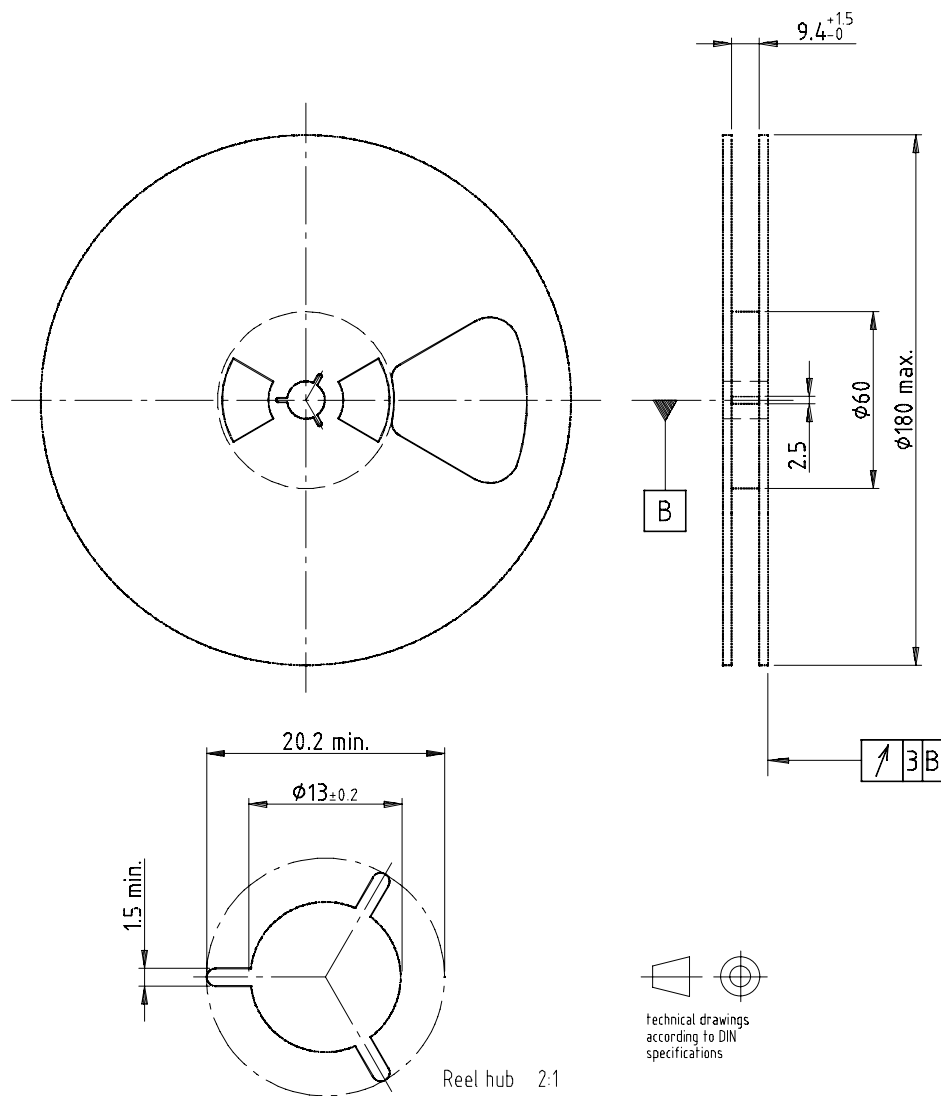


Solder resist

Drawing-No.: 6.541-5069.01-4  
Issue: 2; 24.11.14



**REEL DIMENSIONS** in millimeters

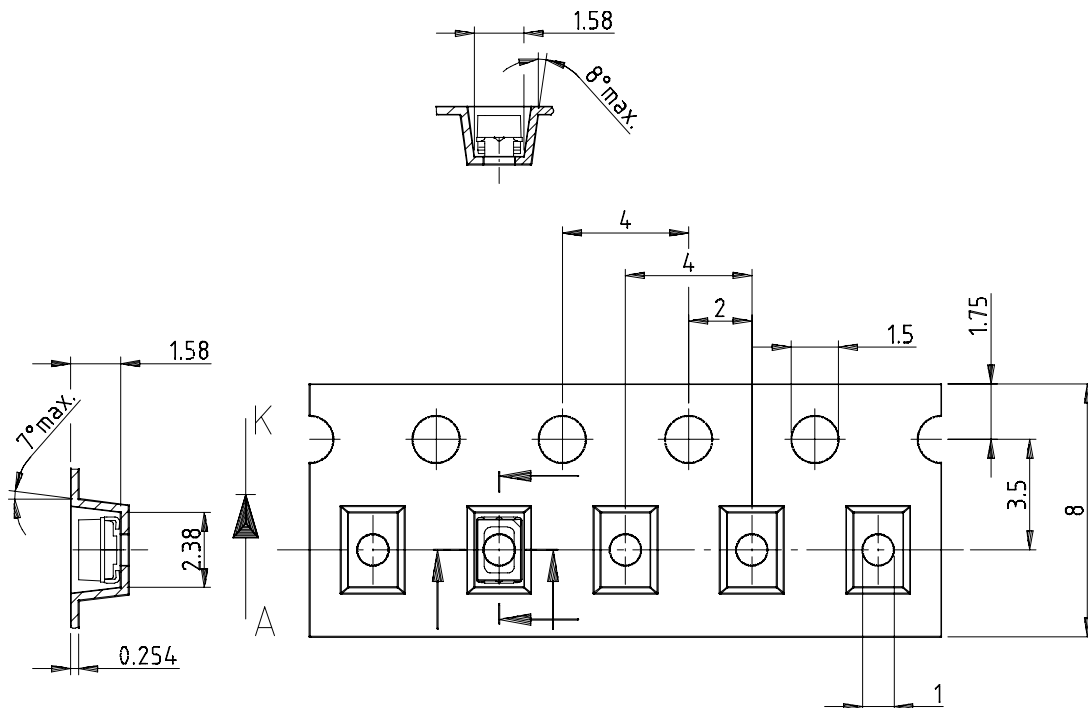


Drawing-No.: 9.800-5051.V5-4

Issue: 1; 25.07.02

16938

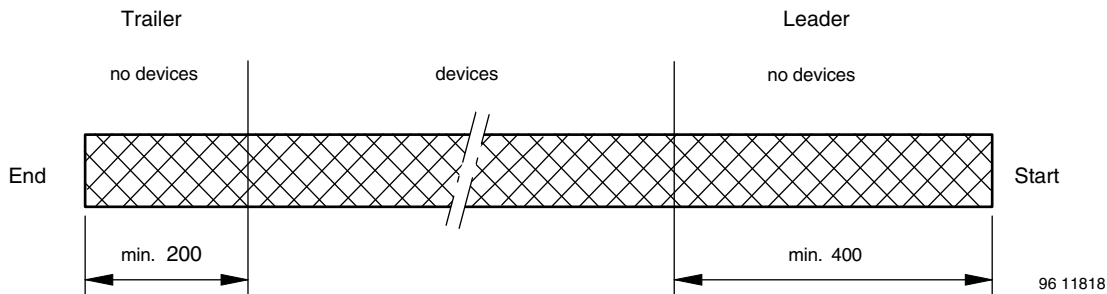


**TAPE DIMENSIONS** in millimeters


Drawing-No.: 9.700-5266.01-4

Issue: 1; 05.06.02

16939

**LEADER AND TRAILER DIMENSIONS** in millimeters


GS08 = 3000 pcs

**COVER TAPE PEEL STRENGTH**

According to DIN EN 60286-3

0.1 N to 1.3 N

300 mm/min  $\pm$  10 mm/min

165° to 180° peel angle

**LABEL**
**Standard bar code labels for finished goods**

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

<b>VISHAY SEMICONDUCTOR GMBH STANDARD BAR CODE PRODUCT LABEL</b> (finished goods)		
PLAIN WRITING	ABBREVIATION	LENGTH
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by:	ACC	-
Packed by:	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
LONG BAR CODE TOP	TYPE	LENGTH
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
SHORT BAR CODE BOTTOM	TYPE	LENGTH
Data-code	N	3
Selection-code	X	3
Batch-number	X	10
Filter	-	1
Total length	-	17

## SOLDERING PROFILE

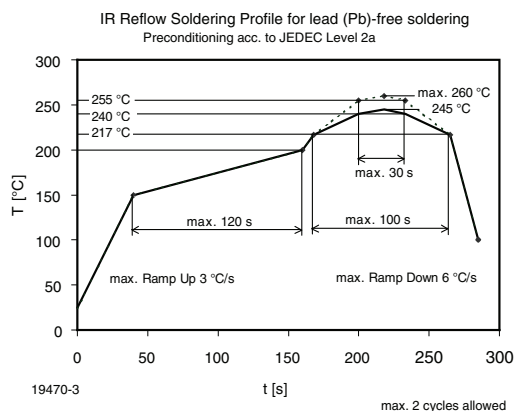
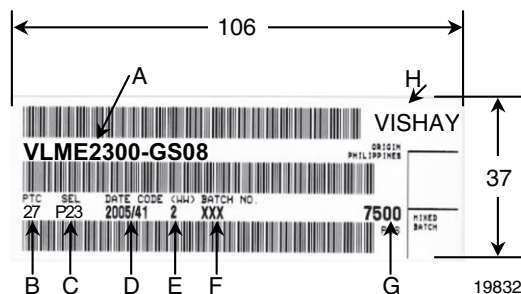


Fig. 18 - Vishay Lead (Pb)-free Reflow Soldering Profile  
(according to J-STD-020)

## BAR CODE PRODUCT LABEL (example)

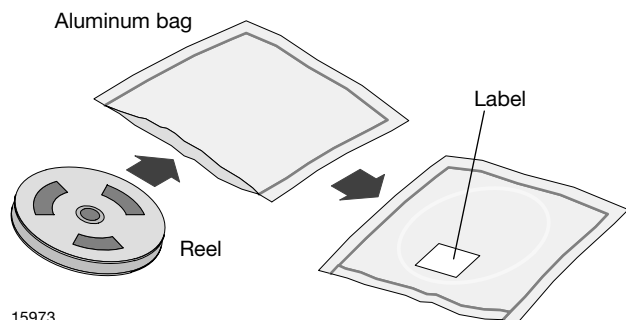


- A. Type of component
- B. Manufacturing plant
- C. SEL - selection code (bin):  
e.g.: P2 = code for luminous intensity group  
3 = code for color group
- D. Date code year / week
- E. Day code (e.g. 2: Tuesday)
- F. Batch no.
- G. Total quantity
- H. Company code



## DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



15973

## FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

## RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 672 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C / - 0 °C and < 5 % RH (dry air / nitrogen) or

96 h at 60 °C + 5 °C and < 5 % RH for all device containers or

24 h at 100 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC® standard JESD22-A112 level 2a label is included on all dry bags.

	<b>CAUTION</b> This bag contains MOISTURE-SENSITIVE DEVICES	LEVEL <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <b>2a</b> </div>						
1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)								
2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 260°C) must be:								
a) Mounted within <b>672 hours</b> at factory condition of ≤ 30°C/60%RH or b) Stored at ≤10% RH.								
3. Devices require baking before mounting if:								
a) Humidity Indicator Card is >10% when read at 23°C ± 5°C or b) 2a or 2b is not met.								
4. If baking is required, devices may be baked for:								
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"><b>192 hours</b> at 40°C + 5°C/-0°C and &lt;5%RH (dry air/nitrogen)</td> <td style="width: 50%; text-align: right;"><b>or</b></td> </tr> <tr> <td><b>96 hours</b> at 60±5°C and &lt;5%RH</td> <td style="text-align: right;">For all device containers <b>or</b></td> </tr> <tr> <td><b>24 hours</b> at 100±5°C</td> <td style="text-align: right;">Not suitable for <b>reels or tubes</b></td> </tr> </table>			<b>192 hours</b> at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen)	<b>or</b>	<b>96 hours</b> at 60±5°C and <5%RH	For all device containers <b>or</b>	<b>24 hours</b> at 100±5°C	Not suitable for <b>reels or tubes</b>
<b>192 hours</b> at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen)	<b>or</b>							
<b>96 hours</b> at 60±5°C and <5%RH	For all device containers <b>or</b>							
<b>24 hours</b> at 100±5°C	Not suitable for <b>reels or tubes</b>							
Bag Seal Date: _____ (If blank, see bar code label)								
Note: LEVEL defined by EIA JEDEC Standard JESD22-A113								

15796

Example of JESD22-A112 level 2a label

## ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electrostatic sensitive devices warning labels are on the packaging.

## VISHAY SEMICONDUCTORS STANDARD BAR CODE LABEL

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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