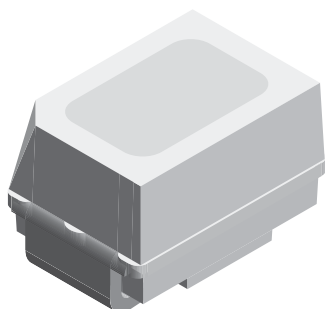


## Standard Mini SMD LED



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 of course.

### PRODUCT GROUP AND PACKAGE DATA

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

### FEATURES

- SMD LEDs with exceptional brightness
- Luminous intensity categorized
- Compatible with automatic placement equipment
- EIA and ICE standard package
- 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
- ESD-withstand voltage: up to 2 kV (HBM) according to JESD22-A114-B
- Luminous intensity ratio in one packaging unit  $I_{Vmax}/I_{Vmin.} \leq 1.6$
- Preconditioning according to JEDEC® level 2a
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**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
- General use

### 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.		
VLMS2100-GS08	Red	2.8	7.0	-	10	624	628	636	10	-	2.1	3	20	GaAsP on GaP
VLMS21H2K1-GS08	Red	3.55	7.0	9	10	624	628	636	10	-	2.1	3	20	GaAsP on GaP
VLMS21J2L1-GS08	Red	5.6	7.0	14	10	624	628	636	10	-	2.1	3	20	GaAsP on GaP
VLMS21H2L1-GS08	Red	3.55	7.0	14	10	624	628	636	10	-	2.1	3	20	GaAsP on GaP
VLMO2100-GS08	Soft orange	3.55	7.3	-	10	598	605	611	10	-	2.1	3	20	GaAsP on GaP
VLMO21H2K1-GS08	Soft orange	3.55	7.3	9	10	598	605	611	10	-	2.1	3	20	GaAsP on GaP
VLMO21J2L1-GS08	Soft orange	5.6	7.3	14	10	598	605	611	10	-	2.1	3	20	GaAsP on GaP
VLMY2100-GS08	Yellow	3.55	7.7	-	10	581	588	594	10	-	2.2	3	20	GaAsP on GaP

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**VLMS21.., VLMO21.., VLMY21..**

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage <sup>(1)</sup>		$V_R$	6	V
DC forward current	$T_{amb} \leq 60\text{ }^{\circ}\text{C}$	$I_F$	30	mA
Surge forward current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	0.5	A
Power dissipation		$P_V$	95	mW
Junction temperature		$T_j$	+100	$^{\circ}\text{C}$
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> )	$R_{thJA}$	480	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)  
**VLMS21.., RED**

PARAMETER	TEST CONDITION	PARTS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>(1)</sup>	$I_F = 10\text{ mA}$	VLMS2100	$I_V$	2.8	7.0	-	mcd
	$I_F = 10\text{ mA}$	VLMS21H2K1	$I_V$	3.55	7.0	9	mcd
	$I_F = 10\text{ mA}$	VLMS21J2L1	$I_V$	5.6	7.0	14	mcd
	$I_F = 10\text{ mA}$	VLMS21H2L1	$I_V$	3.55	7.0	14	mcd
Dominant wavelength	$I_F = 10\text{ mA}$		$\lambda_d$	624	628	636	nm
Peak wavelength	$I_F = 10\text{ mA}$		$\lambda_p$	-	640	-	nm
Angle of half intensity	$I_F = 10\text{ mA}$		$j$	-	$\pm 60$	-	deg
Forward voltage	$I_F = 20\text{ mA}$		$V_F$	-	2.1	3	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$		$V_R$	6	15	-	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)  
**VLMO21.., SOFT ORANGE**

PARAMETER	TEST CONDITION	PARTS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>(1)</sup>	$I_F = 10\text{ mA}$	VLMO2100	$I_V$	3.55	7.3	-	mcd
	$I_F = 10\text{ mA}$	VLMO21H2K1	$I_V$	3.55	7.3	9	mcd
	$I_F = 10\text{ mA}$	VLMO21J2L1	$I_V$	5.6	7.3	14	mcd
Dominant wavelength	$I_F = 10\text{ mA}$		$\lambda_d$	598	605	611	nm
Peak wavelength	$I_F = 10\text{ mA}$		$\lambda_p$	-	605	-	nm
Angle of half intensity	$I_F = 10\text{ mA}$		$j$	-	$\pm 60$	-	deg
Forward voltage	$I_F = 20\text{ mA}$		$V_F$	-	2.1	3	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$		$V_R$	6	15	-	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)  
**VLMY21.., YELLOW**

PARAMETER	TEST CONDITION	PARTS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>(1)</sup>	$I_F = 10\text{ mA}$	VLMY2100	$I_V$	3.55	7.7	-	mcd
Dominant wavelength	$I_F = 10\text{ mA}$		$\lambda_d$	581	588	594	nm
Peak wavelength	$I_F = 10\text{ mA}$		$\lambda_p$	-	585	-	nm
Angle of half intensity	$I_F = 10\text{ mA}$		$\phi$	-	$\pm 60$	-	deg
Forward voltage	$I_F = 20\text{ mA}$		$V_F$	-	2.2	3	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$		$V_R$	6	15	-	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)		
	OPTIONAL	MIN	MAX
H	1	2.8	3.55
	2	3.55	4.5
J	1	4.5	5.6
	2	5.6	7.1
K	1	7.1	9.0
	2	9.0	11.2
L	1	11.2	14.0
	2	14.0	18.0
M	1	18.0	22.4
	2	22.4	28.0
N	1	28.0	35.5
	2	35.5	45.0

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

**Note**

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

**CROSSING TABLE**

VISHAY	OSRAM
VLMS2100	LSM670
VLMS21H2K1	LSM670-H2K1
VLMS21J2L1	LSM670-J2L1
VLMS21H2L1	LSM670-H2L1
VLMO2100	LOM670
VLMO21H2K1	LOM670-H2K1
VLMO21J2L1	LOM670-J2L1
VLMY2100	LYM670

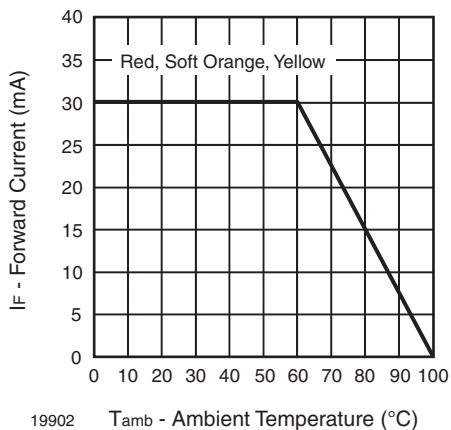
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Forward Current vs. Ambient Temperature

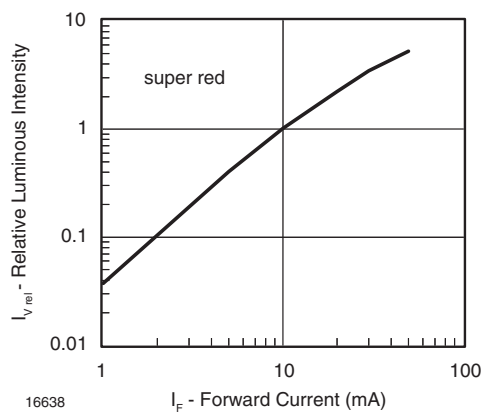


Fig. 4 - Relative Luminous Intensity vs. Forward Current

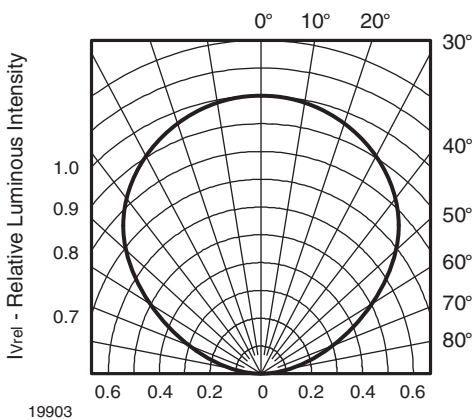


Fig. 2 - Relative Luminous Intensity vs. Angular Displacement

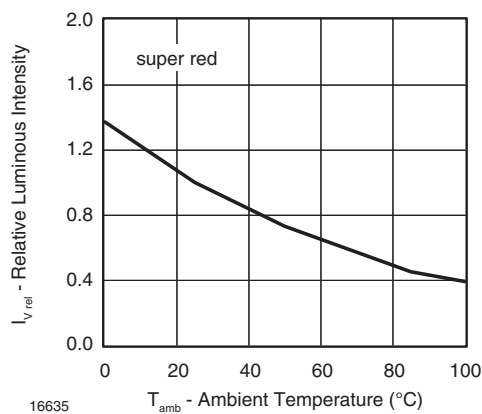


Fig. 5 - Relative Luminous Intensity vs. Ambient Temperature

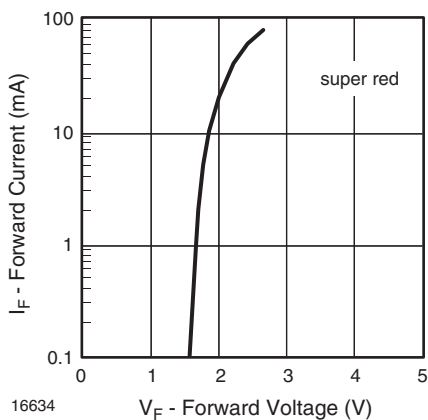


Fig. 3 - Forward Current vs. Forward Voltage

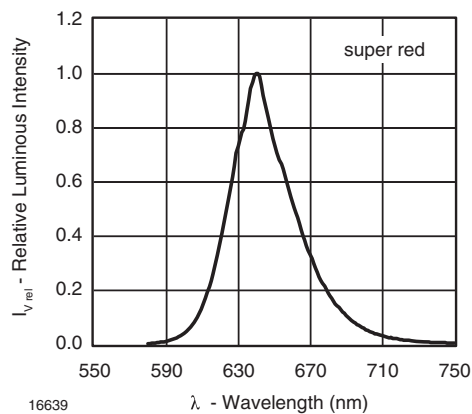


Fig. 6 - Relative Intensity vs. Wavelength

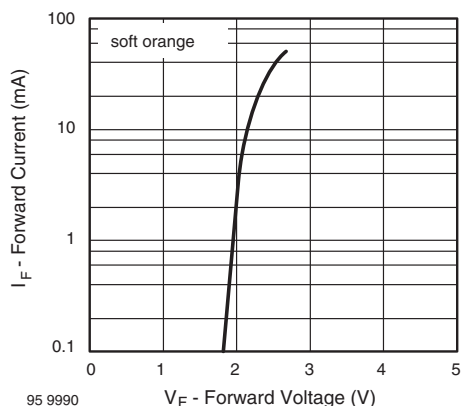


Fig. 7 - Forward Current vs. Forward Voltage

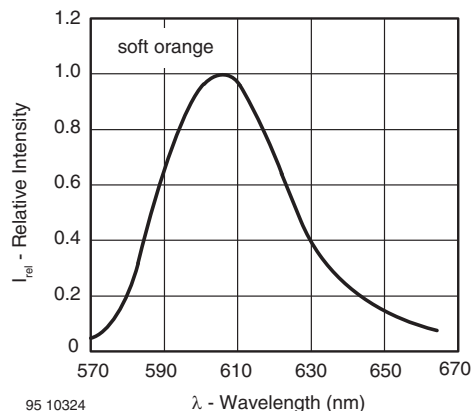


Fig. 10 - Relative Intensity vs. Wavelength

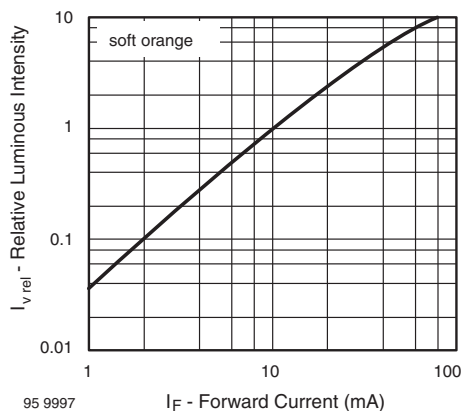


Fig. 8 - Relative Luminous Intensity vs. Forward Current

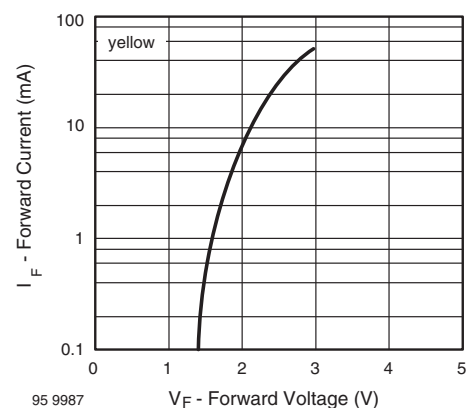


Fig. 11 - Forward Current vs. Forward Voltage

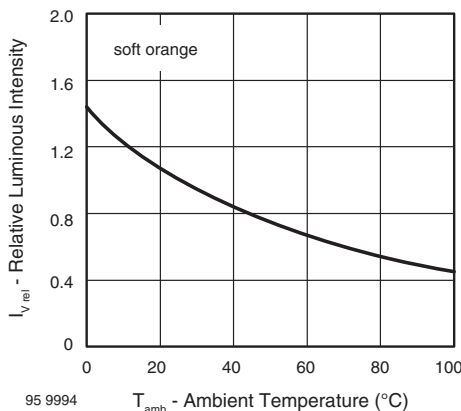


Fig. 9 - Relative Luminous Intensity vs. Ambient Temperature

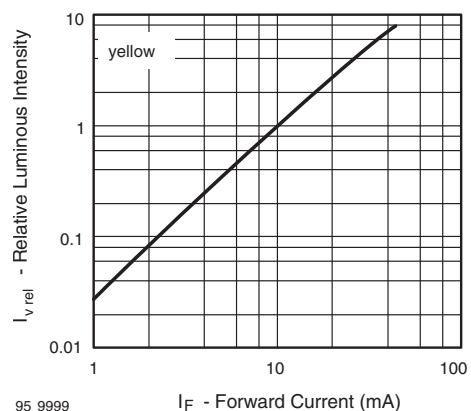


Fig. 12 - Relative Luminous Intensity vs. Forward Current

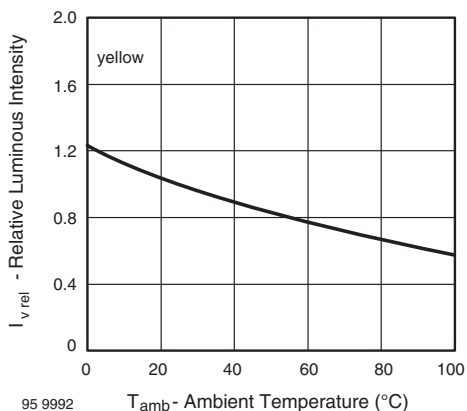


Fig. 13 - Relative Luminous Intensity vs. Ambient Temperature

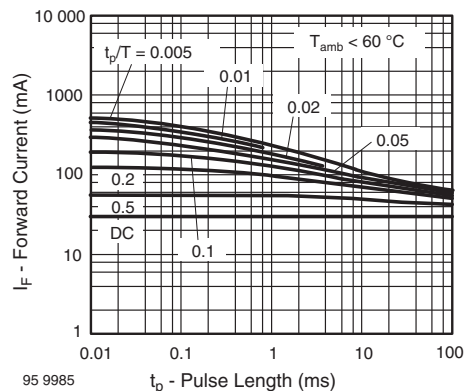


Fig. 15 - Pulse Forward Current vs. Pulse Duration

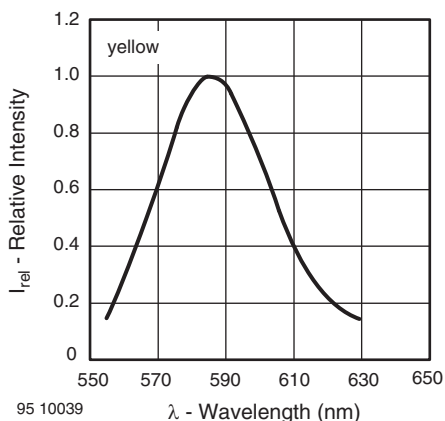
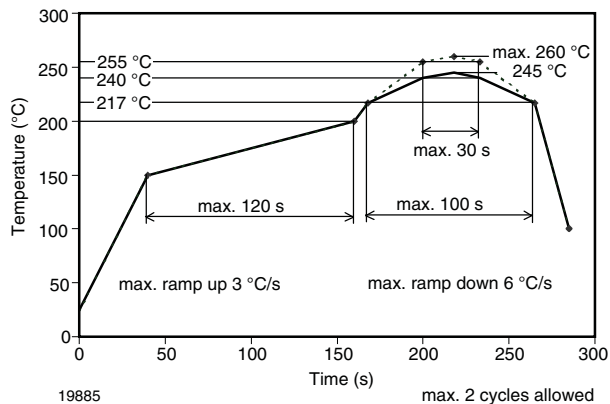


Fig. 14 - Relative Intensity vs. Wavelength

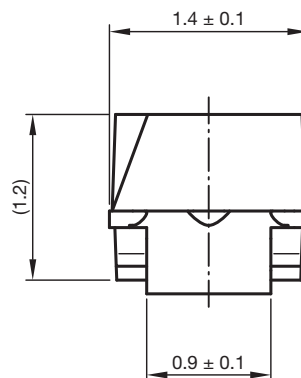
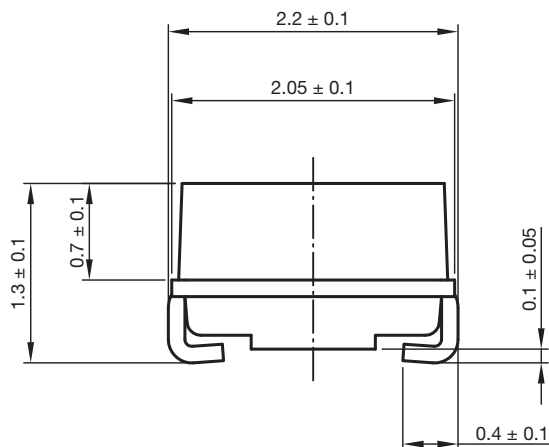
## SOLDERING PROFILE

IR Reflow Soldering Profile for Lead (Pb)-Free Soldering  
Preconditioning according to JEDEC level 2a

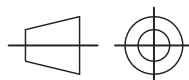
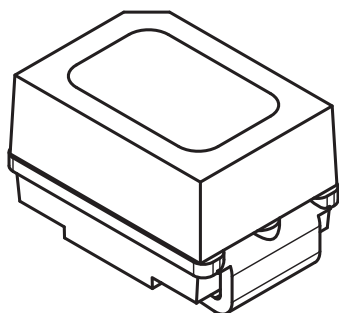
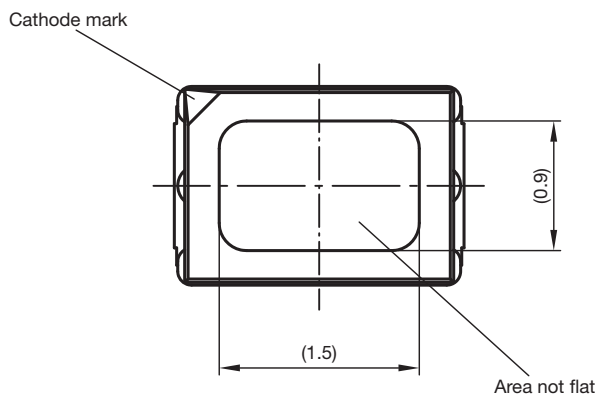

Fig. 16 - Vishay Leadfree Reflow Soldering Profile  
(acc. to J-STD-020)



**PACKAGE DIMENSIONS** in millimeters



Not indicated tolerances  $\pm 0.2$

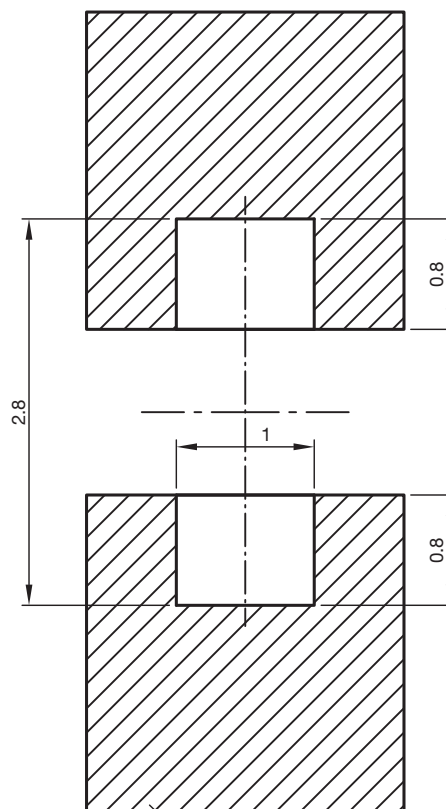


technical drawings  
according to DIN  
specifications



Solder resist

Proposed pad layout  
(for reference only)

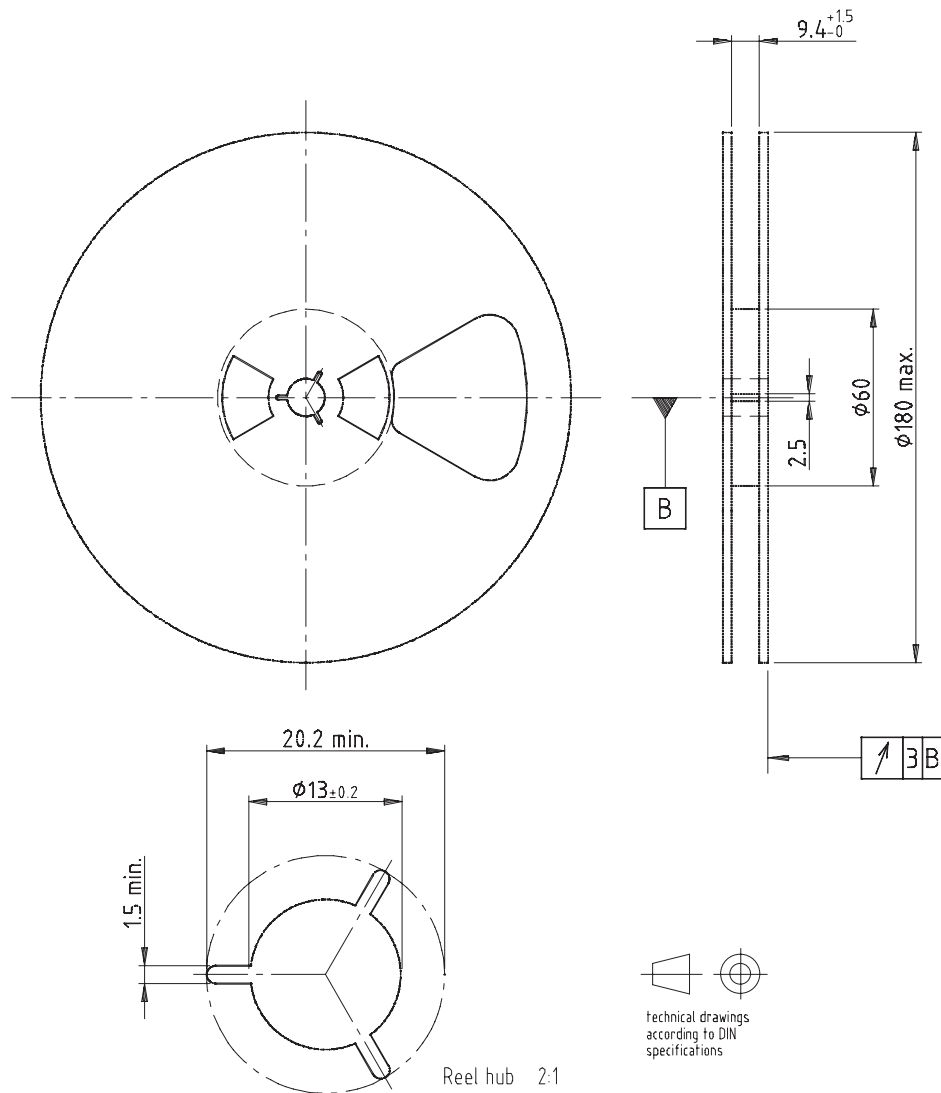


Cu.area > 5 mm<sup>2</sup>

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



**REEL DIMENSIONS** in millimeters

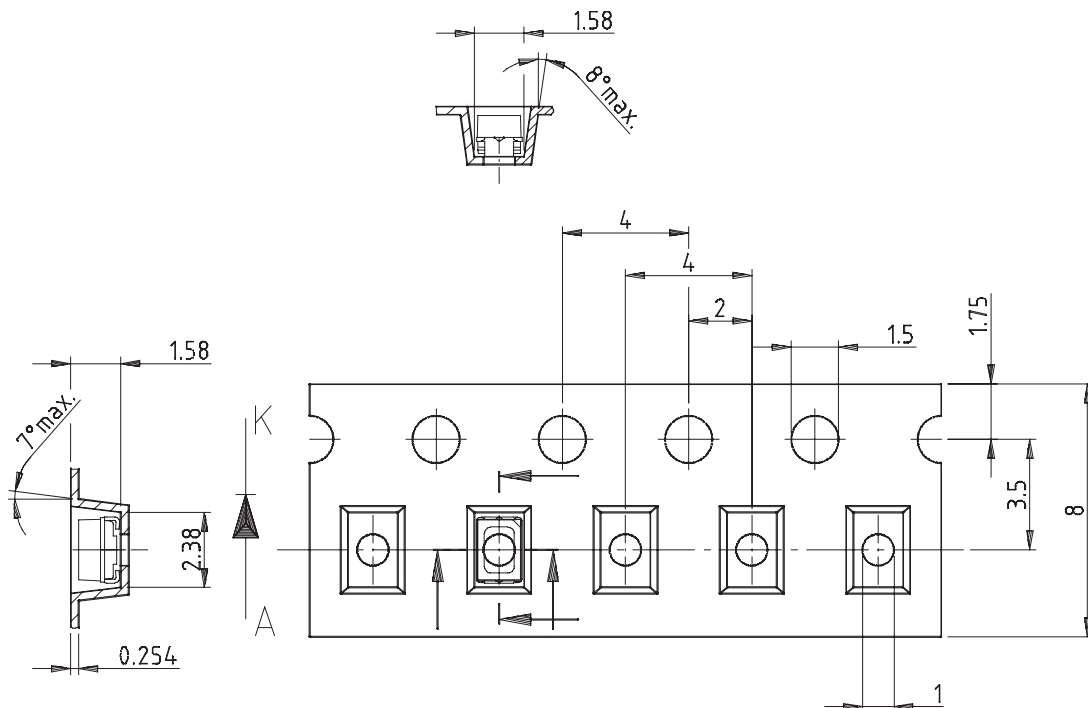


Drawing-No.: 9.800-5051.V5-4

Issue: 1; 25.07.02

16938

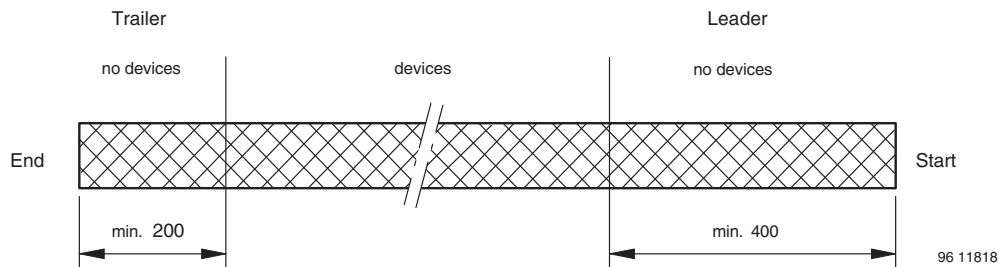


**TAPE DIMENSIONS** in millimeters


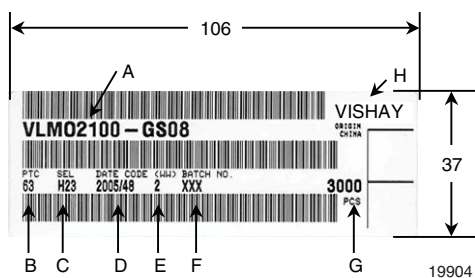
Drawing-No.: 9.700-5266.01-4

Issue: 1; 05.06.02

16939

**LEADER AND TRAILER DIMENSIONS** in millimeters

**Note**

- GS08 = 3000 pcs

**BAR CODE PRODUCT LABEL**


- A) Type of component
- B) Manufacturing plant
- C) SEL - Selection code (bin):  
e.g.: H2 = bode for luminous intensity group  
3 = bode for color group
- D) Date code year / week
- E) Day code (e.g. 2: Tuesday)
- F) Batch no.
- G) Total quantity
- H) Company code

## 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

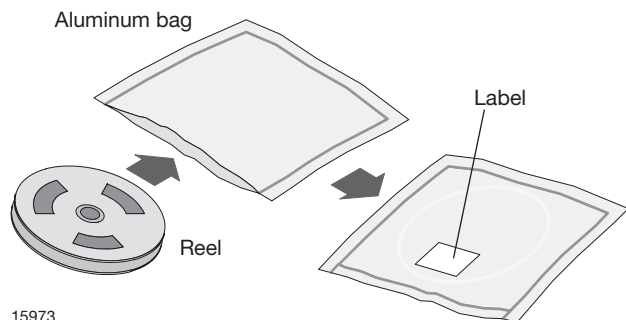
### Standard bar code labels for finished goods

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 (finished goods)</b>		
<b>PLAIN WRITTING</b>	<b>ABBREVIATION</b>	<b>LENGTH</b>
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
<b>LONG BAR CODE TOP</b>	<b>TYPE</b>	<b>LENGTH</b>
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
<b>SHORT BAR CODE BOTTOM</b>	<b>TYPE</b>	<b>LENGTH</b>
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

## 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  $\leq 60\%$  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.

## 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 LABELS

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.

	<b>CAUTION</b> This bag contains MOISTURE -SENSITIVE DEVICES	LEVEL <b>2a</b>						
<p>1. Shelf life in sealed bag 12 months at <math>&lt;40^{\circ}\text{C}</math> and <math>&lt; 90\%</math> relative humidity (RH)</p> <p>2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. <math>260^{\circ}\text{C}</math>) must be:</p> <ul style="list-style-type: none"><li>a) Mounted within <b>672 hours</b> at factory condition of <math>\leq 30^{\circ}\text{C}/60\%\text{RH}</math> or</li><li>b) Stored at <math>\leq 10\%</math> RH.</li></ul> <p>3. Devices require baking before mounting if:</p> <ul style="list-style-type: none"><li>a) Humidity Indicator Card is <math>&gt;10\%</math> when read at <math>23^{\circ}\text{C} \pm 5^{\circ}\text{C}</math> or</li><li>b) 2a or 2b is not met.</li></ul> <p>4. If baking is required, devices may be baked for:</p> <table border="0"><tr><td><b>192 hours</b> at <math>40^{\circ}\text{C} + 5^{\circ}\text{C}/-0^{\circ}\text{C}</math> and <math>&lt;5\%\text{RH}</math> (dry air/nitrogen)</td><td><b>or</b></td></tr><tr><td><b>96 hours</b> at <math>60 \pm 5^{\circ}\text{C}</math> and <math>&lt;5\%\text{RH}</math></td><td>For all device containers <b>or</b></td></tr><tr><td><b>24 hours</b> at <math>100 \pm 5^{\circ}\text{C}</math></td><td>Not suitable for <b>reels or tubes</b></td></tr></table>			<b>192 hours</b> at $40^{\circ}\text{C} + 5^{\circ}\text{C}/-0^{\circ}\text{C}$ and $<5\%\text{RH}$ (dry air/nitrogen)	<b>or</b>	<b>96 hours</b> at $60 \pm 5^{\circ}\text{C}$ and $<5\%\text{RH}$	For all device containers <b>or</b>	<b>24 hours</b> at $100 \pm 5^{\circ}\text{C}$	Not suitable for <b>reels or tubes</b>
<b>192 hours</b> at $40^{\circ}\text{C} + 5^{\circ}\text{C}/-0^{\circ}\text{C}$ and $<5\%\text{RH}$ (dry air/nitrogen)	<b>or</b>							
<b>96 hours</b> at $60 \pm 5^{\circ}\text{C}$ and $<5\%\text{RH}$	For all device containers <b>or</b>							
<b>24 hours</b> at $100 \pm 5^{\circ}\text{C}$	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								

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Example of JESD22-A112 level 2a label



## 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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