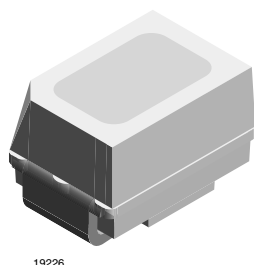


## Power Mini SMD LED



19226

### 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  $I_{Vmax}/I_{Vmin} \leq 2.0$ , optional  $\leq 1.6$
- Lead (Pb)-free device
- ESD withstand voltage: up to 2 kV according to JESD22-A114-B
- Preconditioning: according to JEDEC level 2a



### DESCRIPTION

The new MiniLED series have 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 reliability 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:  $\pm 60^\circ$

### 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	TECHNOLOGY
VLMP232M2N2-GS08	Pure green, $I_V = (22.4 \text{ to } 45) \text{ mcd}$	AlInGaP on GaAs
VLMP232N1P1-GS08	Pure green, $I_V = (28 \text{ to } 56) \text{ mcd}$	AlInGaP on GaAs
VLMP232M2P1-GS08	Pure green, $I_V = (22.4 \text{ to } 56) \text{ mcd}$	AlInGaP on GaAs



**ABSOLUTE MAXIMUM RATINGS <sup>1)</sup> VLMP232..**

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage <sup>2)</sup>		$V_R$	5	V
DC Forward current	$T_{amb} \leq 80\text{ }^{\circ}\text{C}$	$I_F$	40	mA
Surge forward current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	0.1	A
Power dissipation		$P_V$	110	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>  $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified<sup>2)</sup> Driving the LED in reverse direction is suitable for a short term application**OPTICAL AND ELECTRICAL CHARACTERISTICS <sup>1)</sup> VLMP232.., PURE GREEN**

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>2)</sup>	$I_F = 30\text{ mA}$	VLMP232M2N2	$I_V$	22.4		45	mcd
		VLMP232N1P1	$I_V$	28		56	mcd
		VLMP232M2P1	$I_V$	22.4		56	mcd
Dominant wavelength	$I_F = 30\text{ mA}$		$\lambda_d$	555	558	565	nm
Peak wavelength	$I_F = 30\text{ mA}$		$\lambda_p$		555		nm
Angle of half intensity	$I_F = 30\text{ mA}$		$\varphi$		$\pm 60$		deg
Forward voltage	$I_F = 30\text{ mA}$		$V_F$		2.2	2.6	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$		$V_R$	5			V
Junction capacitance	$V_R = 0$ , $f = 1\text{ MHz}$		$C_j$		15		pF

Note:

<sup>1)</sup>  $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified<sup>2)</sup> In one packing unit  $I_{Vmax}/I_{Vmin.} \leq 2.0$ **LUMINOUS INTENSITY CLASSIFICATION**

GROUP	LIGHT INTENSITY (mcd)		
	STANDARD	OPTIONAL	MAX.
M	1	18	22.4
	2	22.4	28
N	1	28	35.5
	2	35.5	45
P	1	45	56
	2	56	71

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)	
	PURE GREEN	
	MIN.	MAX.
0	555	559
1	558	561
2	560	563
3	562	565

Note:

Wavelengths are tested at a current pulse duration of 25 ms and an accuracy of  $\pm 1\text{ nm}$ .**CROSSING TABLE**

VISHAY	OSRAM
VLMP232M2P1	LPM675-M2P1



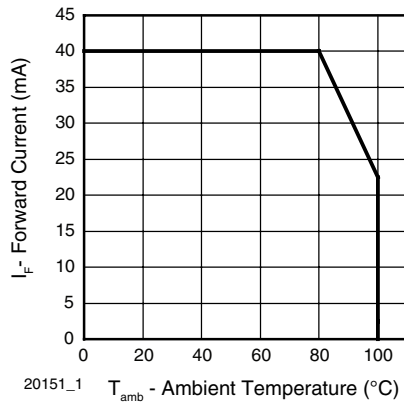
**TYPICAL CHARACTERISTICS**
 $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified


Figure 1. Forward Current vs. Ambient Temperature

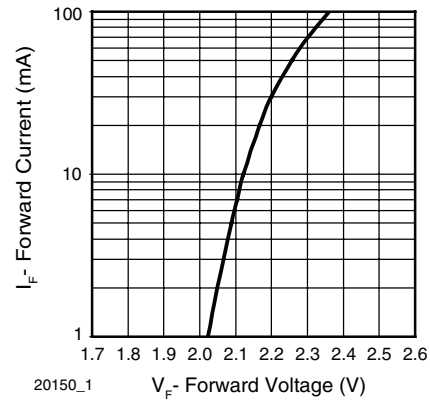


Figure 4. Forward Current vs. Forward Voltage

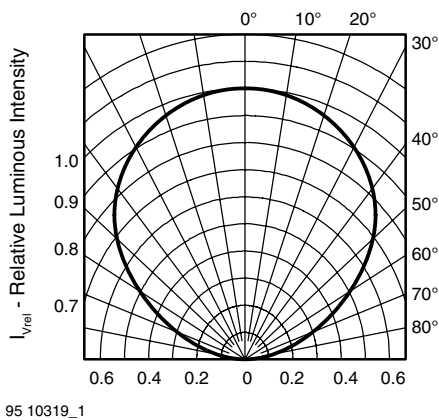


Figure 2. Rel. Luminous Intensity vs. Angular Displacement

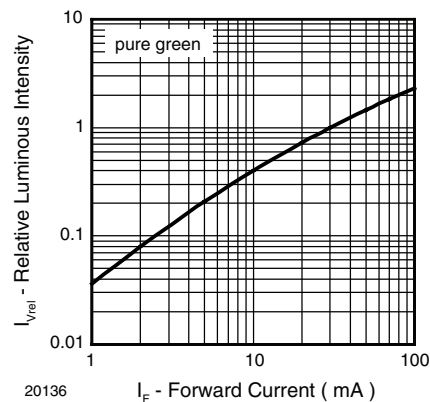


Figure 5. Relative Luminous Intensity vs. Forward Current

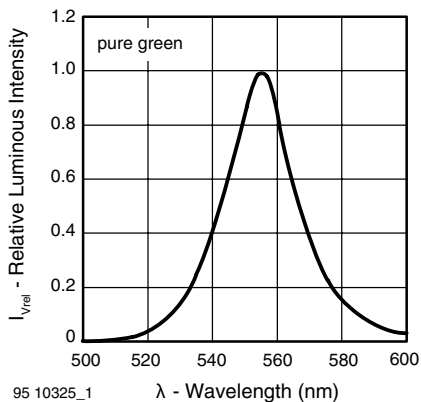


Figure 3. Relative Intensity vs. Wavelength

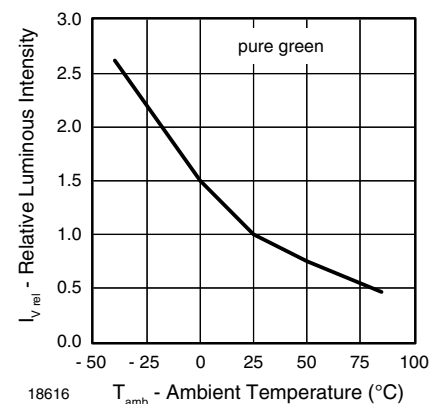


Figure 6. Rel. Luminous Intensity vs. Ambient Temperature



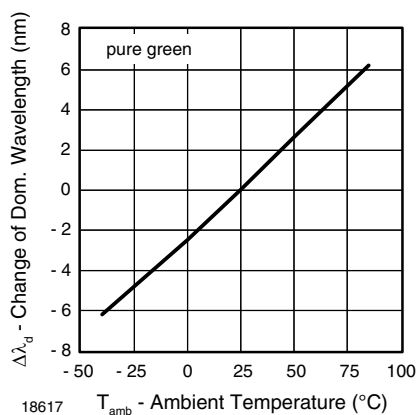


Figure 7. Change of Dominant Wavelength vs. Ambient Temperature

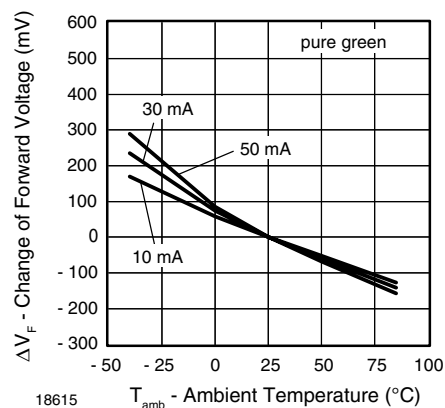
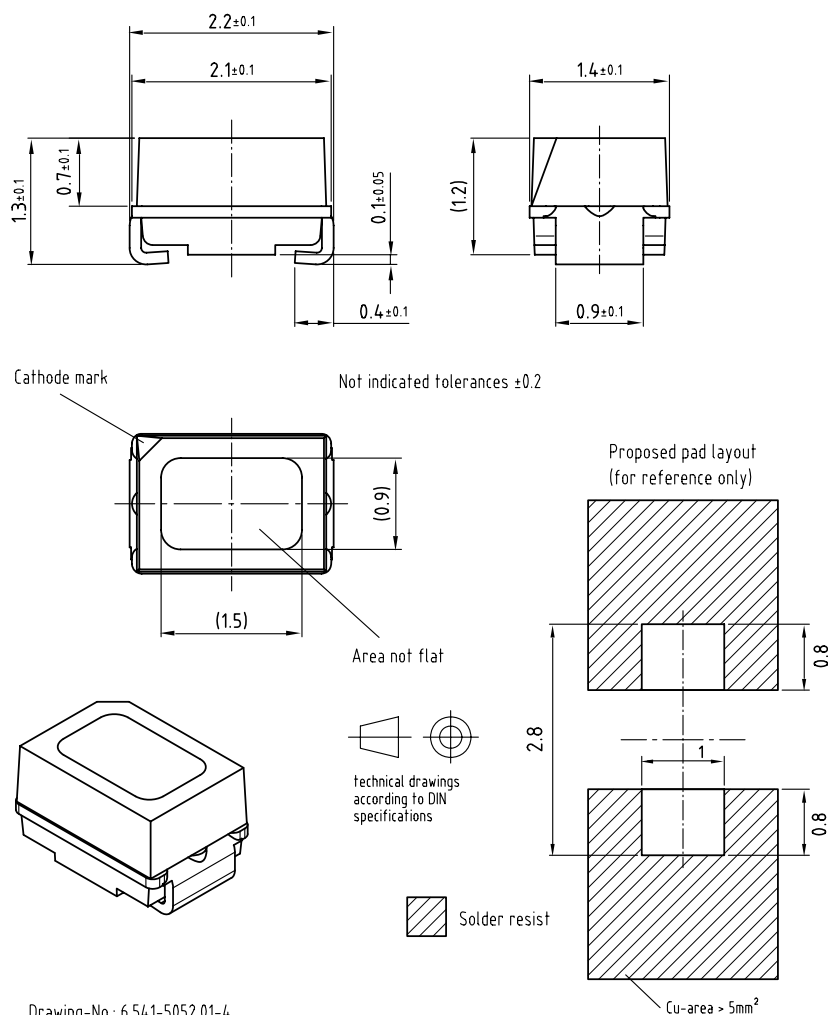


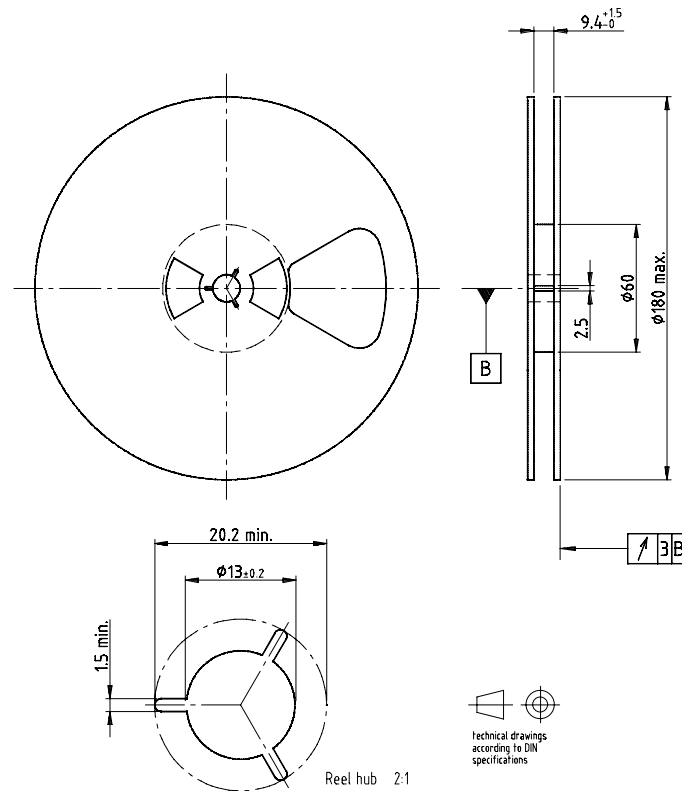
Figure 8. Change of Forward Voltage vs. Ambient Temperature

### PACKAGE DIMENSIONS in millimeters



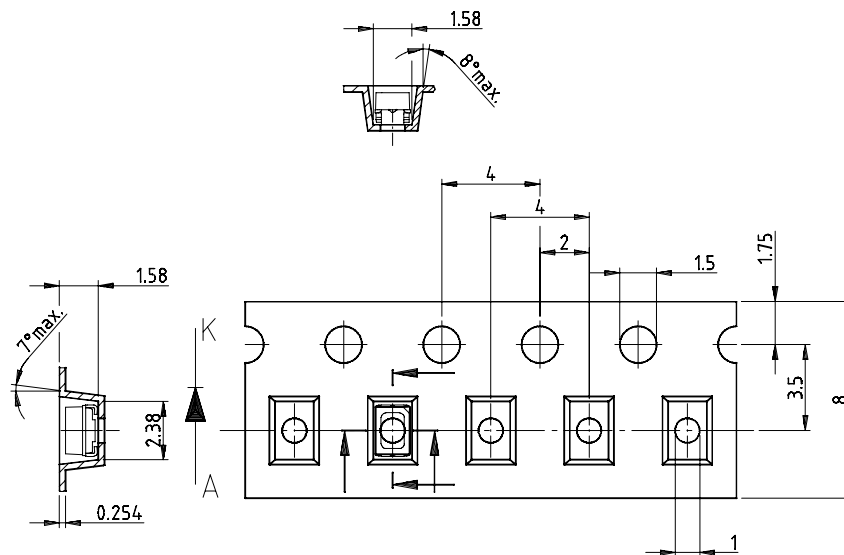
Drawing-No.: 6.541-5052.01-4  
Issue: 3; 22.04.03  
16892



**REEL DIMENSIONS** in millimeters


Drawing-No.: 9.800-5051.V5-4  
Issue: 1; 25.07.02

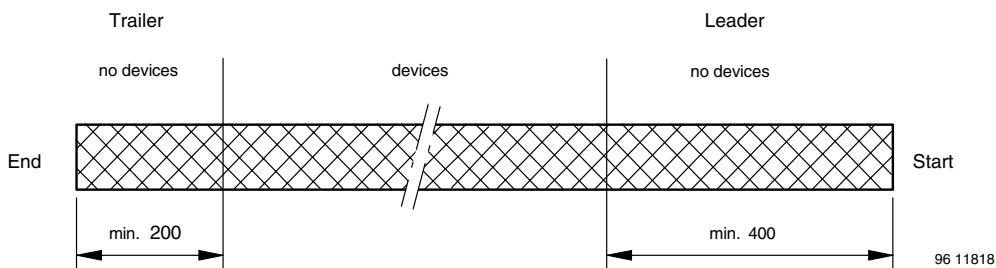
16938

**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 to 1.3 N

300 ± 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.

**VISHAY SEMICONDUCTOR GMBH STANDARD BAR CODE PRODUCT LABEL** (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 <sup>+</sup>	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
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17



## SOLDERING PROFILE

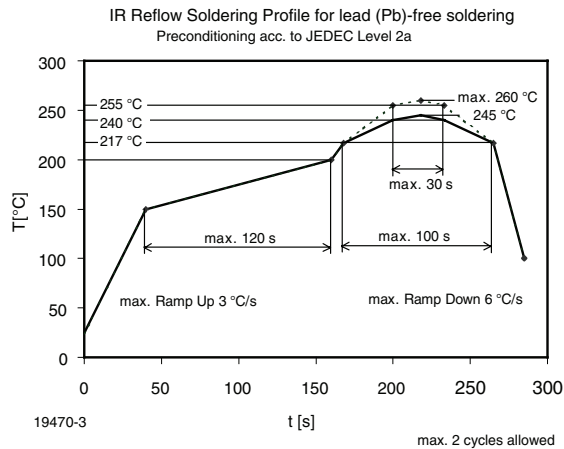
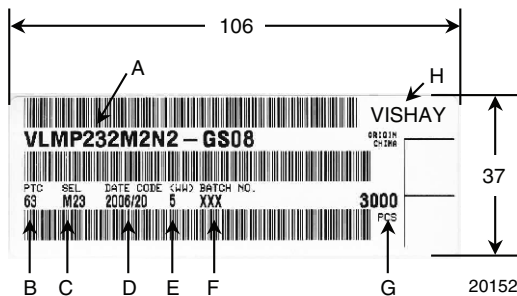


Figure 9. Vishay Lead (Pb)-free Reflow Soldering Profile  
(acc. to J-STD-020C)

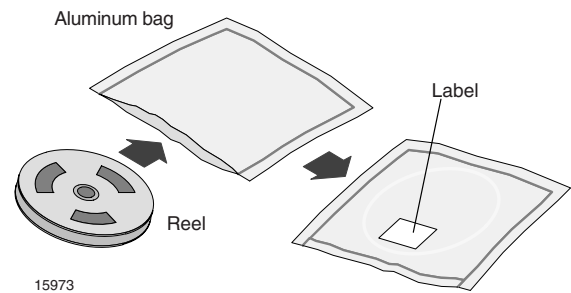
## BAR CODE PRODUCT LABEL EXAMPLE:



- A) Type of component
- B) Manufacturing plant
- C) SEL - selection code (bin):  
e.g.: M2 = code for luminous intensity group  
3 = code for color group
- D) Date code year/week
- E) Day code (e.g. 5: Friday)
- 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.



## 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. Electro-static 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 <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <b>2a</b> </div>						
1. Shelf life in sealed bag 12 months at $<40^{\circ}\text{C}$ 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. $260^{\circ}\text{C}$ ) must be: <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>								
3. Devices require baking before mounting if: <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>								
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 <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 style="width: 50%; text-align: right;"><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 style="text-align: right;">For <b>all</b> device containers <b>or</b></td> </tr> <tr> <td><b>24 hours</b> at <math>100 \pm 5^{\circ}\text{C}</math></td> <td style="text-align: right;">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 <b>all</b> 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 <b>all</b> 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								

19786

Example of JESD22-A112 level 2a label



**OZONE DEPLETING SUBSTANCES POLICY STATEMENT**

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively.
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA.
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany





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