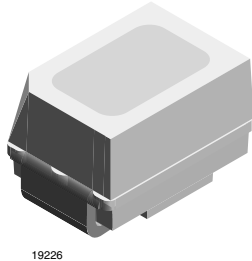


## Standard Mini SMD LED



19226

### 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
- Luminous intensity ratio in one packaging unit  
 $I_{Vmax}/I_{Vmin} \leq 2.0$ , optional  $\leq 1.6$
- Lead (Pb)-free device



### 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 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:  $\pm 60^\circ$

### 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	TECHNOLOGY
TLMS2100-GS08	Red, $I_V = 7.5$ mcd (typ.)	GaAsP on GaP
TLMO2100-GS08	Soft orange, $I_V = 7.5$ mcd (typ.)	GaAsP on GaP
TLMY2100-GS08	Yellow, $I_V = 7.5$ mcd (typ.)	GaAsP on GaP
TLMG2100-GS08	Green, $I_V = 10$ mcd (typ.)	GaP on GaP
TLMP2100-GS08	Pure green, $I_V = 2.2$ mcd (typ.)	GaP on GaP
TLMB2100-GS08	Blue, $I_V = 7$ mcd (typ.)	GaN



<b>ABSOLUTE MAXIMUM RATINGS<sup>1)</sup> TLMS2100, TLMO2100, TLMY2100, TLMG2100, TLMP2100</b>				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage <sup>2)</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	$T_{amb} \leq 60\text{ }^\circ\text{C}$	$P_V$	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	$^\circ\text{C}$
Soldering temperature	according IPC 9501	$T_{sd}$	245	$^\circ\text{C}$
Thermal resistance junction/ambient	mounted on PC board (pad size > 5 mm <sup>2</sup> )	$R_{thJA}$	480	K/W

Note:

<sup>1)</sup>  $T_{amb} = 25\text{ }^\circ\text{C}$ , unless otherwise specified

<sup>2)</sup> Driving the LED in reverse direction is suitable for a short term application

<b>ABSOLUTE MAXIMUM RATINGS<sup>1)</sup> TLMB2100</b>				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage <sup>2)</sup>		$V_R$	5	V
DC Forward current	$T_{amb} \leq 60\text{ }^\circ\text{C}$	$I_F$	20	mA
Surge forward current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	0.1	A
Power dissipation	$T_{amb} \leq 60\text{ }^\circ\text{C}$	$P_V$	90	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	$^\circ\text{C}$
Soldering temperature	according IPC 9501	$T_{sd}$	245	$^\circ\text{C}$
Thermal resistance junction/ambient	mounted on PC board (pad size > 5 mm <sup>2</sup> )	$R_{thJA}$	480	K/W

Note:

<sup>1)</sup>  $T_{amb} = 25\text{ }^\circ\text{C}$ , unless otherwise specified

<sup>2)</sup> Driving the LED in reverse direction is suitable for a short term application

<b>OPTICAL AND ELECTRICAL CHARACTERISTICS<sup>1)</sup> TLMS2100, RED</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN	TYP.	MAX	UNIT
Luminous intensity <sup>2)</sup>	$I_F = 10\text{ mA}$	$I_V$	2.5	7.5		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	$I_F = 10\text{ mA}$	$\phi$		$\pm 60$		deg
Forward voltage	$I_F = 20\text{ mA}$	$V_F$		2.1	3.0	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$	$V_R$	6	15		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  $I_{Vmax}/I_{Vmin} \leq 2.0$

**OPTICAL AND ELECTRICAL CHARACTERISTICS<sup>1)</sup> TLMO2100, SOFT ORANGE**

PARAMETER	TEST CONDITION	SYMBOL	MIN	TYP.	MAX	UNIT
Luminous intensity <sup>2)</sup>	$I_F = 10 \text{ mA}$	$I_V$	3.2	7.5		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	$I_F = 10 \text{ mA}$	$\varphi$		$\pm 60$		deg
Forward voltage	$I_F = 20 \text{ mA}$	$V_F$		2.1	3	V
Reverse voltage	$I_R = 10 \mu\text{A}$	$V_R$	6	15		V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$	$C_j$		15		pF

Note:

1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified2) In one packing unit  $I_{Vmax}/I_{Vmin} \leq 2.0$ **OPTICAL AND ELECTRICAL CHARACTERISTICS<sup>1)</sup> TLMY2100, YELLOW**

PARAMETER	TEST CONDITION	SYMBOL	MIN	TYP.	MAX	UNIT
Luminous intensity <sup>2)</sup>	$I_F = 10 \text{ mA}$	$I_V$	3.2	7.5		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	$I_F = 10 \text{ mA}$	$\varphi$		$\pm 60$		deg
Forward voltage	$I_F = 20 \text{ mA}$	$V_F$		2.2	3	V
Reverse voltage	$I_R = 10 \mu\text{A}$	$V_R$	6	15		V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$	$C_j$		15		pF

Note:

1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified2) In one packing unit  $I_{Vmax}/I_{Vmin} \leq 2.0$ **OPTICAL AND ELECTRICAL CHARACTERISTICS<sup>1)</sup> TLMG2100, GREEN**

PARAMETER	TEST CONDITION	SYMBOL	MIN	TYP.	MAX	UNIT
Luminous intensity <sup>2)</sup>	$I_F = 10 \text{ mA}$	$I_V$	6.3	10		mcd
Dominant wavelength	$I_F = 10 \text{ mA}$	$\lambda_d$	562	568	575	nm
Peak wavelength	$I_F = 10 \text{ mA}$	$\lambda_p$		565		nm
Angle of half intensity	$I_F = 10 \text{ mA}$	$\varphi$		$\pm 60$		deg
Forward voltage	$I_F = 20 \text{ mA}$	$V_F$		2.2	3.0	V
Reverse voltage	$I_R = 10 \mu\text{A}$	$V_R$	6	15		V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$	$C_j$		15		pF

Note:

1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified2) In one packing unit  $I_{Vmax}/I_{Vmin} \leq 2.0$

OPTICAL AND ELECTRICAL CHARACTERISTICS <sup>1)</sup> TLMP2100, PURE GREEN						
PARAMETER	TEST CONDITION	SYMBOL	MIN	TYP.	MAX	UNIT
Luminous intensity <sup>2)</sup>	$I_F = 10 \text{ mA}$	$I_V$	1.0	2.2		mcd
Dominant wavelength	$I_F = 10 \text{ mA}$	$\lambda_d$	555	560	565	nm
Peak wavelength	$I_F = 10 \text{ mA}$	$\lambda_p$		555		nm
Angle of half intensity	$I_F = 10 \text{ mA}$	$\phi$		$\pm 60$		deg
Forward voltage	$I_F = 20 \text{ mA}$	$V_F$		2.4	3	V
Reverse voltage	$I_R = 10 \mu\text{A}$	$V_R$	6	15		V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$	$C_j$		15		pF

Note:

1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified

2) In one packing unit  $I_{Vmax}/I_{Vmin} \leq 2.0$

OPTICAL AND ELECTRICAL CHARACTERISTICS <sup>1)</sup> TLMB2100, BLUE						
PARAMETER	TEST CONDITION	SYMBOL	MIN	TYP.	MAX	UNIT
Luminous intensity <sup>2)</sup>	$I_F = 10 \text{ mA}$	$I_V$	4.0	7.0		mcd
Dominant wavelength	$I_F = 10 \text{ mA}$	$\lambda_d$		465		nm
Peak wavelength	$I_F = 10 \text{ mA}$	$\lambda_p$		428		nm
Angle of half intensity	$I_F = 10 \text{ mA}$	$\phi$		$\pm 60$		deg
Forward voltage	$I_F = 20 \text{ mA}$	$V_F$		3.9	4.5	V
Reverse voltage	$I_R = 10 \mu\text{A}$	$V_R$	5.0			V

Note:

1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified

2) In one packing unit  $I_{Vmax}/I_{Vmin} \leq 2.0$

## TYPICAL CHARACTERISTICS

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

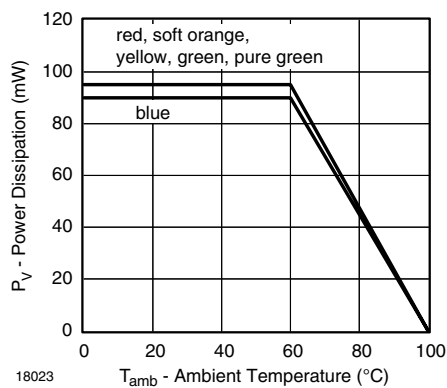


Figure 1. Power Dissipation vs. Ambient Temperature

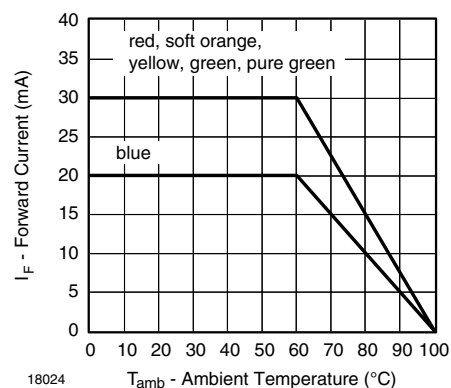


Figure 2. Forward Current vs. Ambient Temperature

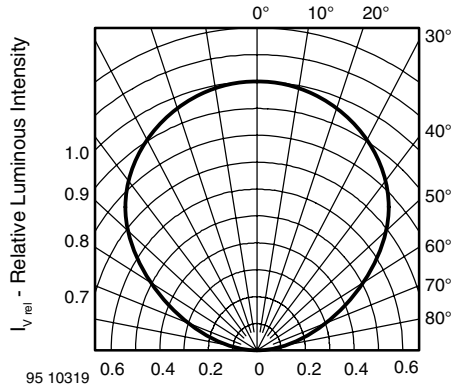
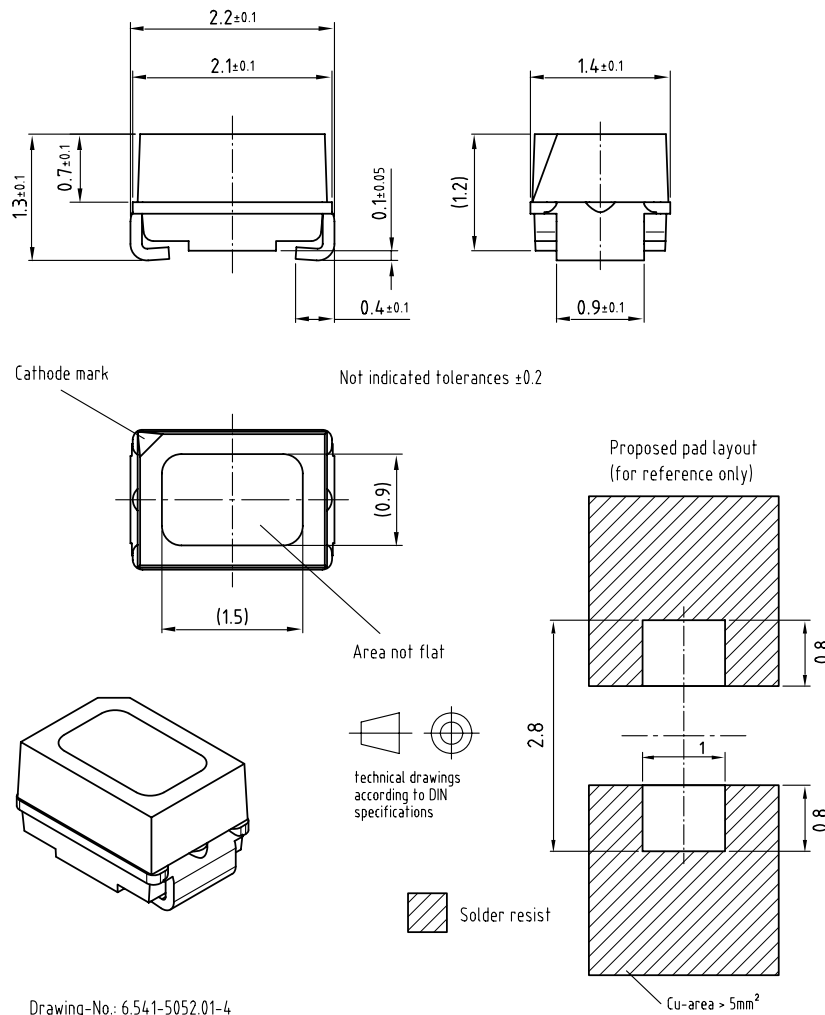


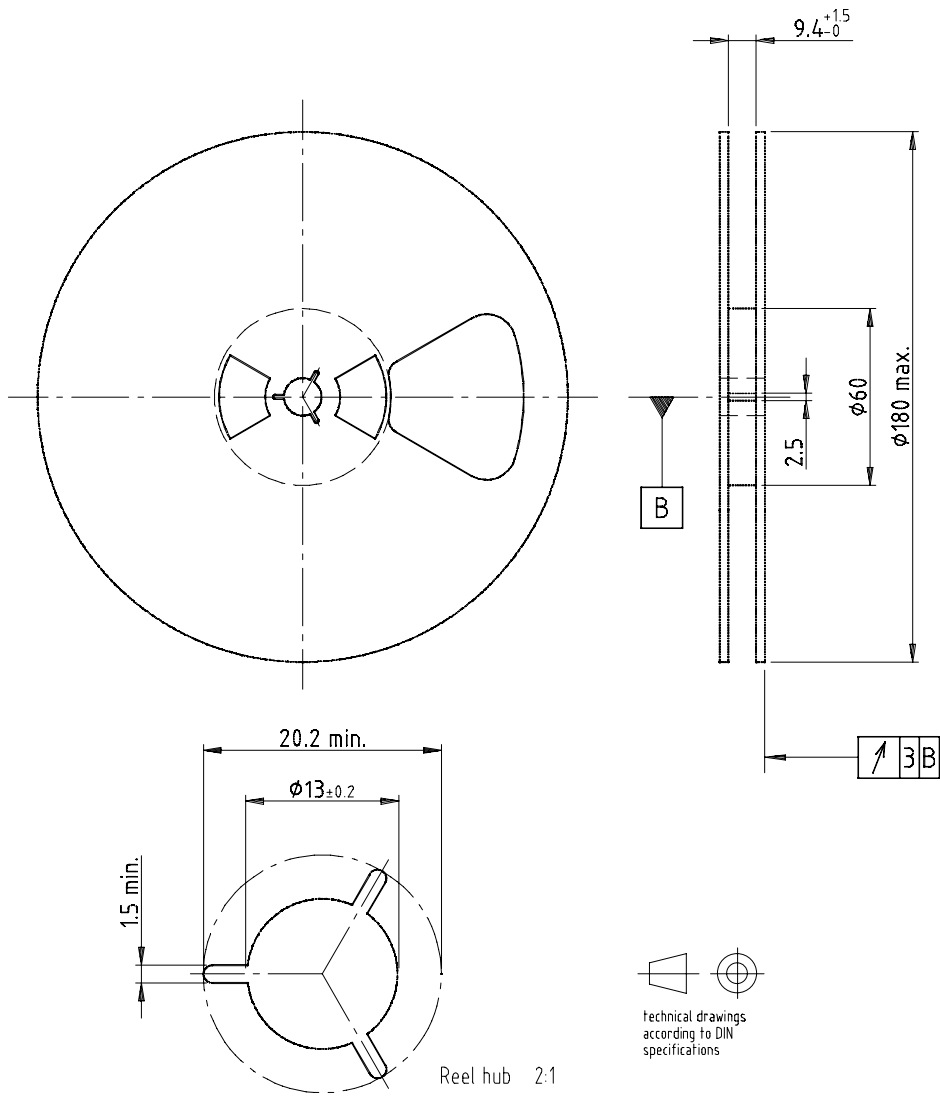
Figure 3. Rel. Luminous Intensity vs. Angular Displacement

**PACKAGE DIMENSIONS** in millimeters



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

**REEL DIMENSIONS** in millimeters

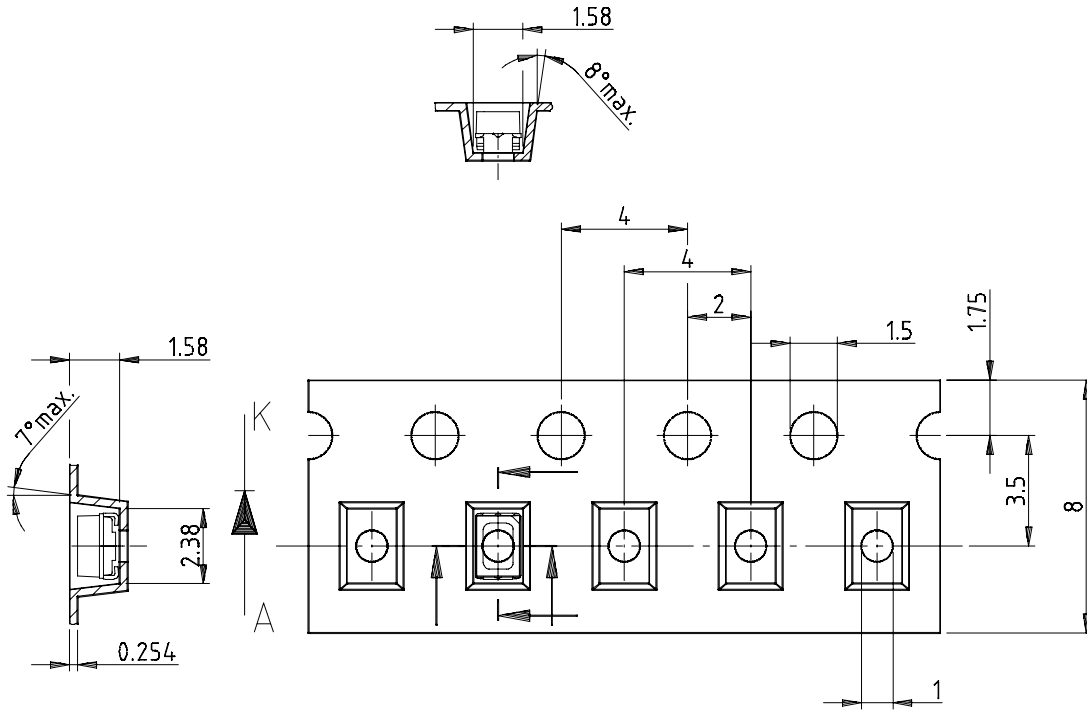


Drawing-No.: 9.800-5051.V5-4

Issue: 1; 25.07.02

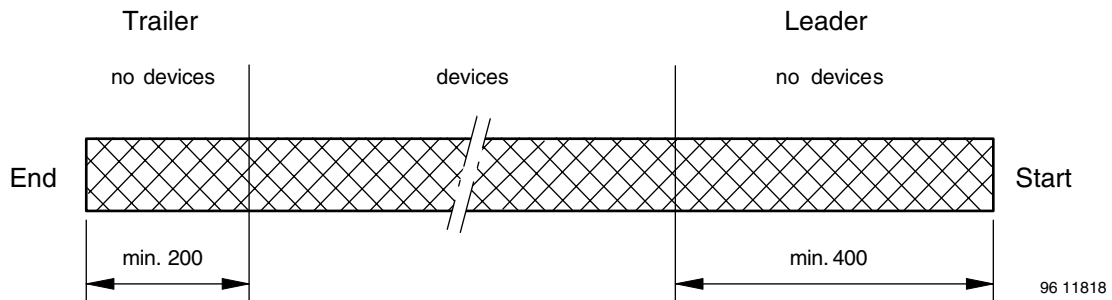
16938

**TAPE DIMENSIONS** in millimeters



Drawing-No.: 9.700-5266.01-4  
Issue: 1; 05.06.02  
16939

**LEADER AND TRAILER** 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 ° - 180 ° peel angle

**LABEL**

**Standard bar code labels for finished goods**

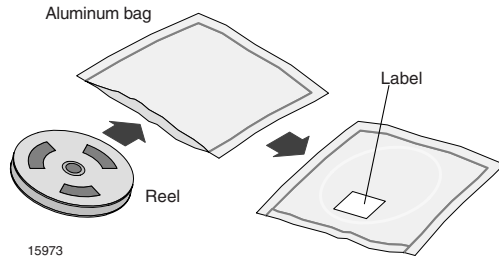
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain 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 <sup>+</sup>	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.



### 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 1 year under these conditions moisture content will be too high for reflow soldering.

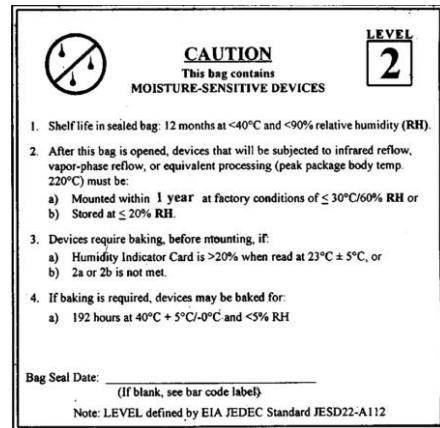
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

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 2 label is included on all dry bags.



Example of JESD22-A112 level 2 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. 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.

**Vishay Semiconductors****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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