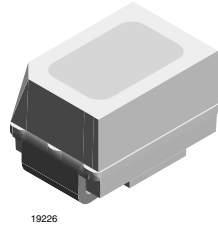


Low Current Mini SMD LED



19226

DESCRIPTION

The new low current 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 and the low forward current. 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: low current
- Angle of half intensity: $\pm 60^\circ$

FEATURES

- SMD LEDs with exceptional brightness
- Luminous intensity categorized
- Compatible with automatic placement equipment
- Compatible with IR reflow, vapor phase and wave solder processes acc. to CECC 00802 and J-STD-020C
- 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 ≤ 1.6
- Lead (Pb)-free device
- Preconditioning: acc. to JEDEC level 2a
- ESD-withstand voltage: up to 2 kV according to JESD22-A114-B



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
VLMS2000-GS08	Red, $I_V > 2.24$ mcd	AllnGaP on GaAs
VLMS20H2K1-GS08	Red, $I_V = (3.55 \text{ to } 9.00)$ mcd	AllnGaP on GaAs
VLMS20J2L1-GS08	Red, $I_V = (5.60 \text{ to } 14.00)$ mcd	AllnGaP on GaAs
VLMS20H2L1-GS08	Red, $I_V = (3.55 \text{ to } 14.00)$ mcd	AllnGaP on GaAs
VLMO2000-GS08	Orange, $I_V > 4.5$ mcd	AllnGaP on GaAs
VLMO20J2L1-GS08	Orange, $I_V = (5.60 \text{ to } 14.00)$ mcd	AllnGaP on GaAs
VLMO20K2M1-GS08	Orange, $I_V = (9.00 \text{ to } 22.40)$ mcd	AllnGaP on GaAs
VLMO20J2M1-GS08	Orange, $I_V = (5.60 \text{ to } 22.40)$ mcd	AllnGaP on GaAs

PARTS TABLE		
PART	COLOR, LUMINOUS INTENSITY	TECHNOLOGY
VLMY2000-GS08	Yellow, $I_V > 3.55$ mcd	AllnGaP on GaAs
VLMY20J1K2-GS08	Yellow, $I_V = (4.50 \text{ to } 11.20)$ mcd	AllnGaP on GaAs
VLMY20K1L2-GS08	Yellow, $I_V = (7.10 \text{ to } 18.00)$ mcd	AllnGaP on GaAs
VLMY20J1L2-GS08	Yellow, $I_V = (4.50 \text{ to } 18.00)$ mcd	AllnGaP on GaAs
VLMK2000-GS08	Amber, $I_V > 7.1$ mcd	AllnGaP on GaAs
VLMK20J2L1-GS08	Amber, $I_V = (5.60 \text{ to } 14.00)$ mcd	AllnGaP on GaAs
VLMK20K1L2-GS08	Amber, $I_V = (7.10 \text{ to } 18.00)$ mcd	AllnGaP on GaAs
VLMK20J2L2-GS08	Amber, $I_V = (5.60 \text{ to } 18.00)$ mcd	AllnGaP on GaAs

ABSOLUTE MAXIMUM RATINGS ¹⁾ VLMS20.., VLMO20.., VLMY20., VLMK20..				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage ²⁾		V_R	5	V
DC Forward current	$T_{amb} \leq 100$ °C	I_F	15	mA
Surge forward current	$t_p \leq 10$ μ s	I_{FSM}	0.1	A
Power dissipation		P_V	40	mW
Junction temperature		T_j	125	°C
Operating temperature range		T_{amb}	- 40 to + 100	°C
Storage temperature range		T_{stg}	- 40 to + 100	°C
Thermal resistance junction/ambient	mounted on PC board (pad size > 5 mm ²)	R_{thJA}	580	K/W

Note:

¹⁾ $T_{amb} = 25$ °C, unless otherwise specified

²⁾ Driving the LED in reverse direction is suitable for a short term application

OPTICAL AND ELECTRICAL CHARACTERISTICS ¹⁾ VLMS20.., RED							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN	TYP.	MAX	UNIT
Luminous intensity ²⁾	$I_F = 2$ mA	VLMS2000	I_V	2.24	4.5		mcd
		VLMY20H2K1	I_V	3.55		9.00	mcd
		VLMY20J2L1	I_V	5.60		14.00	mcd
		VLMY20H2L1	I_V	3.55		14.00	mcd
Dominant wavelength	$I_F = 2$ mA		λ_d		630		nm
Peak wavelength	$I_F = 2$ mA		λ_p		643		nm
Angle of half intensity	$I_F = 2$ mA		φ		± 60		deg
Forward voltage	$I_F = 2$ mA		V_F		1.8	2.2	V
Reverse voltage	$I_R = 10$ μ A		V_R	5			V
Junction capacitance	$V_R = 0, f = 1$ MHz		C_j		15		pF

Note:

¹⁾ $T_{amb} = 25$ °C, unless otherwise specified

²⁾ In one Packing Unit $I_{Vmax}/I_{Vmin} \leq 2.0$



OPTICAL AND ELECTRICAL CHARACTERISTICS¹⁾ VLMO20..., ORANGE							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN	TYP.	MAX	UNIT
Luminous intensity ²⁾	$I_F = 2 \text{ mA}$	VLMO2000	I_V	4.5	9		mcd
		VLMO20J2L1	I_V	5.60		14.00	mcd
		VLMO20K2M1	I_V	9.00		22.40	mcd
		VLMO20J2M1	I_V	5.60		22.40	mcd
Dominant wavelength	$I_F = 2 \text{ mA}$		λ_d	598	605	611	nm
Peak wavelength	$I_F = 2 \text{ mA}$		λ_p		610		nm
Angle of half intensity	$I_F = 2 \text{ mA}$		φ		± 60		deg
Forward voltage	$I_F = 2 \text{ mA}$		V_F		1.8	2.2	V
Reverse voltage	$I_R = 10 \mu\text{A}$		V_R	5			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 CHARACTERISTICS¹⁾ VLMY20..., YELLOW							
PARAMETER	TEST CONDITION	SYMBOL	SYMBOL	MIN	TYP.	MAX	UNIT
Luminous intensity ²⁾	$I_F = 2 \text{ mA}$	VLMY2000	I_V	3.55	7.1		mcd
		VLMY20J1K2	I_V	4.50		11.20	mcd
		VLMY20K1L2	I_V	7.10		18.00	mcd
		VLMY20J1L2	I_V	4.50		18.00	mcd
Dominant wavelength	$I_F = 2 \text{ mA}$		λ_d	581	588	594	nm
Peak wavelength	$I_F = 2 \text{ mA}$		λ_p		590		nm
Angle of half intensity	$I_F = 2 \text{ mA}$		φ		± 60		deg
Forward voltage	$I_F = 2 \text{ mA}$		V_F		1.8	2.2	V
Reverse voltage	$I_R = 10 \mu\text{A}$		V_R	5			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 CHARACTERISTICS¹⁾ VLMK20..., AMBER							
PARAMETER	TEST CONDITION		SYMBOL	MIN	TYP.	MAX	UNIT
Luminous intensity ²⁾	$I_F = 2 \text{ mA}$	VLMK2000	I_V	7.1	16		mcd
		VLMK20J2L1	I_V	5.60		14.00	mcd
		VLMK20K1L2	I_V	7.10		18.00	mcd
		VLMK20J2L2	I_V	5.60		18.00	mcd
Dominant wavelength	$I_F = 2 \text{ mA}$		λ_d	612	622	624	nm
Peak wavelength	$I_F = 2 \text{ mA}$		λ_p		615		nm
Angle of half intensity	$I_F = 2 \text{ mA}$		φ		± 60		deg
Forward voltage	$I_F = 2 \text{ mA}$		V_F		1.8	2.2	V
Reverse voltage	$I_R = 10 \mu\text{A}$		V_R	5			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 $I_{Vmax}/I_{Vmin} \leq 2.0$



COLOR CLASSIFICATION								
GROUP	DOMINANT WAVELENGTH (NM)							
	RED		SOFT ORANGE		YELLOW		AMBER	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1	611	618	598	601	581	584		
2	614	622	600	603	583	586		
3			602	605	585	588		
4			604	607	587	590		
5			606	609	589	592		
6			608	611	591	594		
7							610	613
8							612	616
9							615	620
10							619	624

Note:
Wavelengths are tested at a current pulse duration of 25 ms and an accuracy of ± 1 nm.

CROSSING TABLE	
VISHAY	OSRAM
VLMS20H2K1	LSM67K-H2K1
VLMS20J2L1	LSM67K-J2L1
VLMS20H2L1	LSM67K-H2L1
VLMO20J2L1	LOM67K-J2L1
VLMO20K2M1	LOM67K-K2M1
VLMO20J2M1	LOM67K-J2M1
VLMY20J1K2	LYM67K-J1K2
VLMY20K1L2	LYM67K-K1L2
VLMY20J1L2	LYM67K-J1L2

TYPICAL CHARACTERISTICS

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

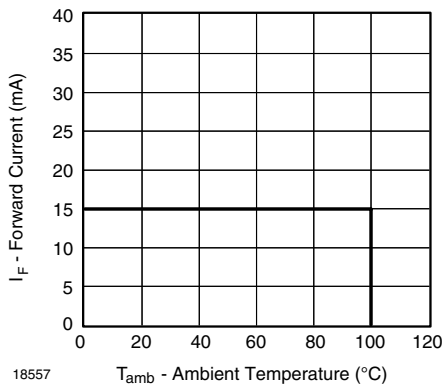


Figure 1. Forward Current vs. Ambient Temperature

LUMINOUS INTENSITY CLASSIFICATION			
GROUP	LUMINOUS INTENSITY (MCD)		
	STANDARD	OPTIONAL	MAX
G	1	-	-
	2	2.24	2.8
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
	2	9	11.2
L	1	11.2	14
	2	14	18
M	1	18	22.4
	2	22.4	35.5
N	1	35.5	45
	2	45	56

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.

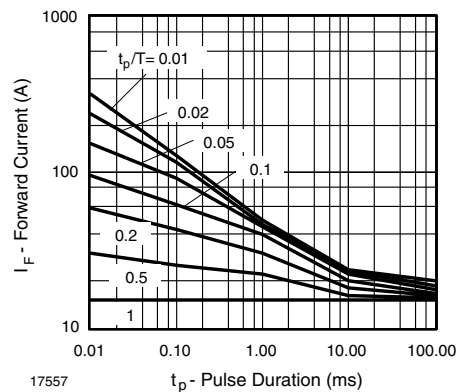


Figure 2. Forward Current vs. Pulse Length

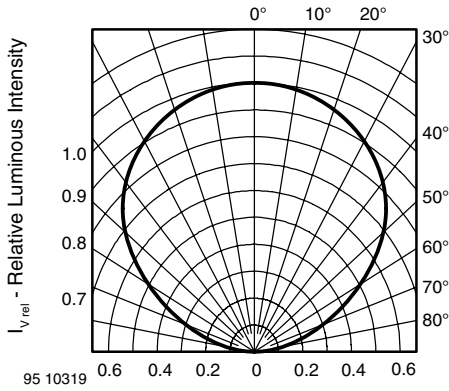


Figure 3. Rel. Luminous Intensity vs. Angular Displacement

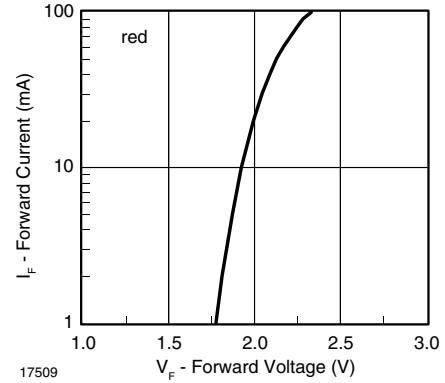


Figure 6. Forward Current vs. Forward Voltage

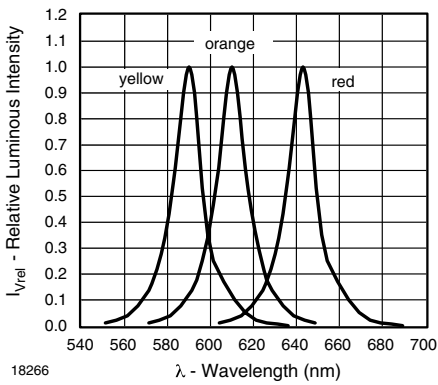


Figure 4. Relative Intensity vs. Wavelength

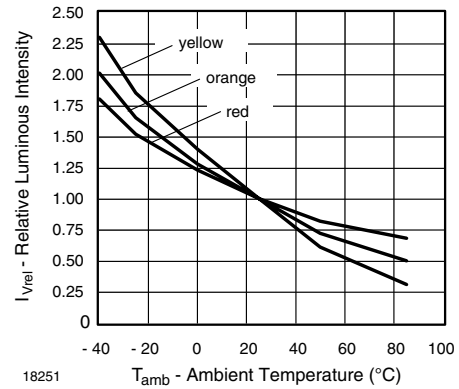


Figure 7. Rel. Luminous Intensity vs. Ambient Temperature

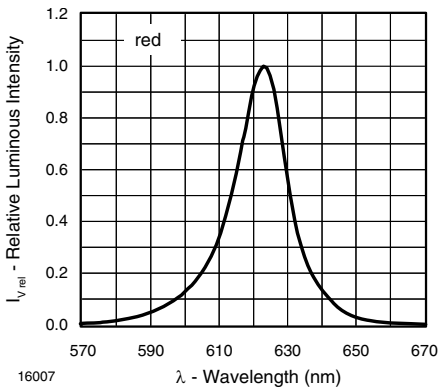


Figure 5. Relative Luminous Intensity vs. Wavelength

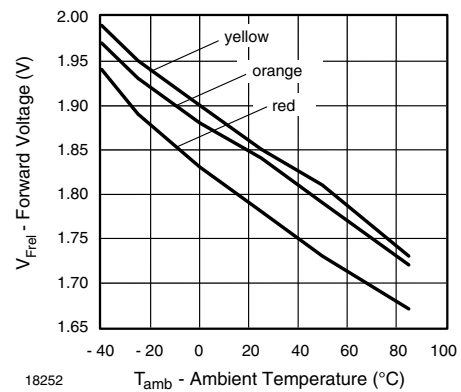
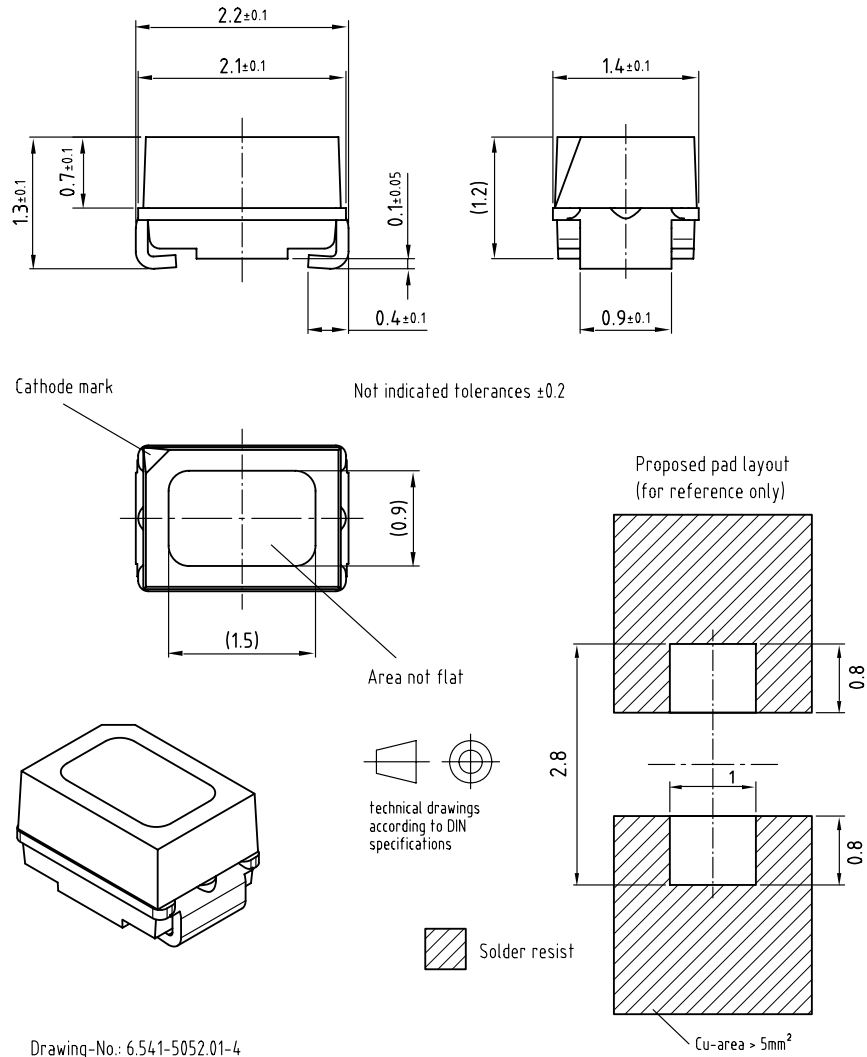


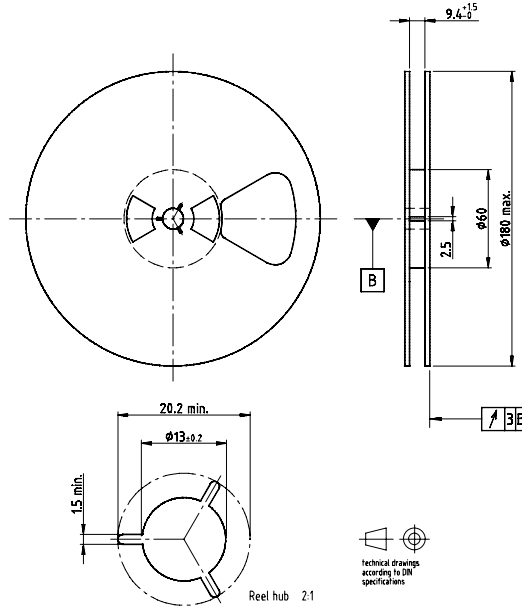
Figure 8. Forward Voltage vs. Ambient Temperature

PACKAGE DIMENSIONS in millimeters



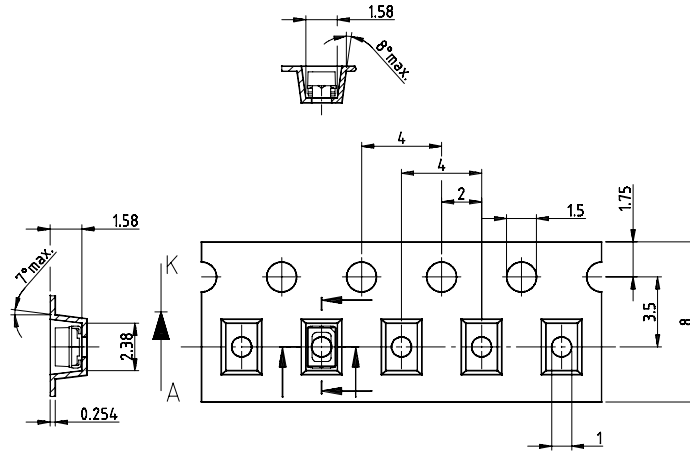
Drawing-No.: 6.541-5052.01-4
Issue: 3; 22.04.03
16892

REEL DIMENSIONS in millimeters



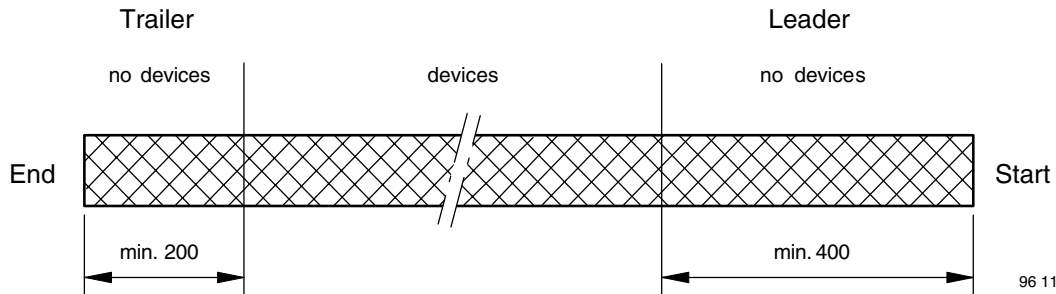
Drawing-No: 9.800-5051.V5-4
Issue: 1; 25.07.02
16938

TAPE DIMENSIONS in millimeters



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

LEADER AND TRAILER 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.

VISHAY SEMICONDUCTOR GMBH STANDARD BAR CODE PRODUCT LABEL (FINISHED GOODS)		
PLAIN WRITTING	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
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

SOLDERING PROFILE

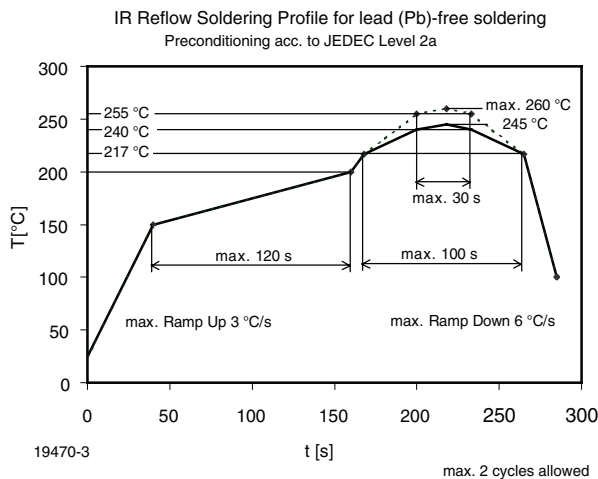


Figure 9. Vishay Lead (Pb)-free Reflow Soldering Profile (acc. to J-STD-020C)

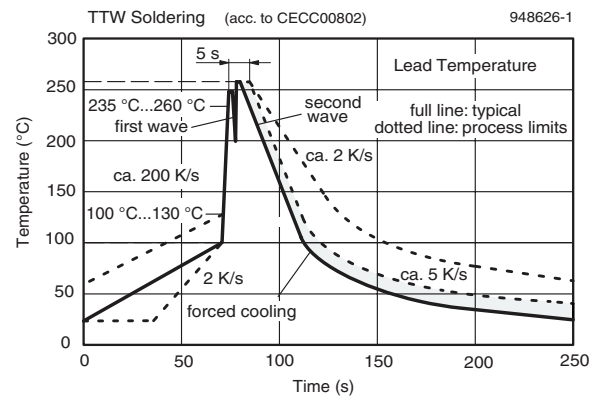


Figure 10. Double Wave Soldering of Opto Devices (all Packages)

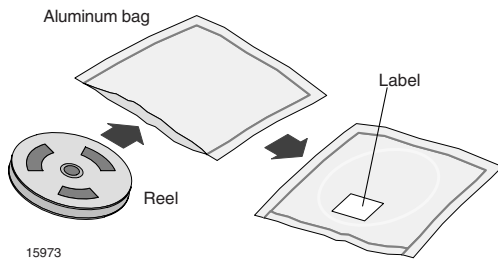
BAR CODE PRODUCT LABEL EXAMPLE:



- A) Type of component
- B) Manufacturing plant
- C) SEL - selection code (bin):
e.g.: J2 = code for luminous intensity group
4 = code for color group
- D) Date code year/week
- E) Day code (e.g. 4: Thursday)
- 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 ≤ 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.

CAUTION
This bag contains
MOISTURE-SENSITIVE DEVICES

LEVEL

2a

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 **672 hours** 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:

192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen)	or
96 hours at 60±5°C and <5%RH	For all device containers
24 hours at 100±5°C	Not suitable for reels or tubes

Bag Seal Date: _____
(If blank, see bar code label)

Note: LEVEL defined by EIA JEDEC Standard JESD22-A113

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. 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.



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



Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.