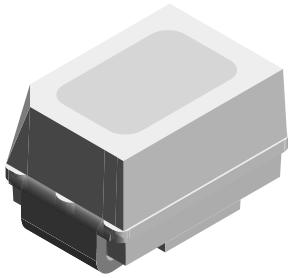
Low Current Mini SMD LED



FEATURES

- SMD LED with exceptional brightness
- Luminous intensity categorized
- Compatible with automatic placement equipment
- Available in 8 mm tape
- Low profile package
- Non-diffused lens: excellent for coupling to light pipes and backlighting
- Low power consumption
- IR reflow soldering according to J-STD-020
- Luminous intensity ratio in one packaging unit $I_{Vmax.}/I_{Vmin.} \leq 1.6$
- Preconditioning according to JEDEC® level 2a
- ESD-withstand voltage: up to 2 kV according to JESD22-A114-B
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

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: ± 60°

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.		
VLMS2000-GS08	Super red	2.24	4.5	-	2	-	630	-	2	-	1.8	2.2	2	AlInGaP on GaAs
VLMS20H2K1-GS08	Super red	3.55	-	9	2	-	630	-	2	-	1.8	2.2	2	AlInGaP on GaAs
VLMS20H2L1-GS08	Super red	3.55	-	14	2	-	630	-	2	-	1.8	2.2	2	AlInGaP on GaAs
VLMS20J2L1-GS08	Super red	5.6	-	14	2	-	630	-	2	-	1.8	2.2	2	AlInGaP on GaAs
VLMK20K1L2-GS08	Orange red	7.1	-	18	2	612	622	624	2	-	1.8	2.2	2	AlInGaP on GaAs
VLMO20J2M1-GS08	Soft orange	5.6	-	22.4	2	598	605	611	2	-	1.8	2.2	2	AlInGaP on GaAs
VLMY2000-GS08	Yellow	3.55	7.1	-	2	581	588	594	2	-	1.8	2.2	2	AlInGaP on GaAs
VLMY20K1L2-GS08	Yellow	7.1	-	18	2	581	588	594	2	-	1.8	2.2	2	AlInGaP on GaAs
VLMP20D2G1-GS08	Pure green	0.56	-	2.24	2	555	-	565	2	-	1.8	2.2	2	AlInGaP on GaAs

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ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified) **VLMS20.., VLMK20.., VLMO20.., VLMY20.., VLMP20..**				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Reverse voltage (1)		V_R	5	V
DC forward current	$T_{amb} \leq 100$ °C	I_F	15	mA
Surge forward current	$t_p \leq 10$ µs	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 mm²)	R_{thJA}	580	K/W

Note

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

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified) **VLMS20.., SUPER RED**							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Luminous intensity (1)	I_F = 2 mA	VLMS2000	I_V	2.24	4.5	-	mcd
		VLMS20H2K1	I_V	3.55	-	9	mcd
		VLMS20H2L1	I_V	3.55	-	14	mcd
		VLMS20J2L1	I_V	5.6	-	14	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	-	°
Forward voltage	I_F = 2 mA		V_F	-	1.8	2.2	V
Reverse voltage	I_R = 10 µA		V_R	5	-	-	V
Junction capacitance	V_R = 0 V, f = 1 MHz		C_j	-	15	-	pF

Note

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

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified) **VLMK20K1L2, ORANGE RED**							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Luminous intensity (1)	I_F = 2 mA	VLMK20K1L2	I_V	7.1	-	18	mcd
Dominant wavelength	I_F = 2 mA		λ_d	612	622	624	nm
Peak wavelength	I_F = 2 mA		λ_p	-	615	-	nm
Angle of half intensity	I_F = 2 mA		φ	-	± 60	-	°
Forward voltage	I_F = 2 mA		V_F	-	1.8	2.2	V
Reverse voltage	I_R = 10 µA		V_R	5	-	-	V
Junction capacitance	V_R = 0 V, f = 1 MHz		C_j	-	15	-	pF

Note

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

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OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
VLMO20J2M1, SOFT ORANGE

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity (1)	I_F = 2 mA	VLMO20J2M1	I_V	5.6	-	22.4	mcd
Dominant wavelength	I_F = 2 mA		λ_d	598	605	611	nm
Peak wavelength	I_F = 2 mA		λ_p	-	610	-	nm
Angle of half intensity	I_F = 2 mA		φ	-	± 60	-	°
Forward voltage	I_F = 2 mA		V_F	-	1.8	2.2	V
Reverse voltage	I_R = 10 µA		V_R	5	-	-	V
Junction capacitance	V_R = 0 V, f = 1 MHz		C_j	-	15	-	pF

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

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
VLMY20.., YELLOW

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity (1)	I_F = 2 mA	VLMY2000	I_V	3.55	7.1	-	mcd
		VLMY20K1L2	I_V	7.1	-	18	mcd
Dominant wavelength	I_F = 2 mA		λ_d	581	588	594	nm
Peak wavelength	I_F = 2 mA		λ_p	-	590	-	nm
Angle of half intensity	I_F = 2 mA		φ	-	± 60	-	°
Forward voltage	I_F = 2 mA		V_F	-	1.8	2.2	V
Reverse voltage	I_R = 10 µA		V_R	5	-	-	V
Junction capacitance	V_R = 0 V, f = 1 MHz		C_j	-	15	-	pF

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

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
VLMP20.., PURE GREEN

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity (1)	I_F = 2 mA	VLMP20D2G1	I_V	0.56	-	2.24	mcd
Dominant wavelength	I_F = 2 mA		λ_d	555	-	565	nm
Peak wavelength	I_F = 2 mA		λ_p	-	565	-	nm
Angle of half intensity	I_F = 2 mA		φ	-	± 60	-	°
Forward voltage	I_F = 2 mA		V_F	-	1.8	2.2	V
Reverse voltage	I_R = 10 µA		V_R	5	-	-	V
Junction capacitance	V_R = 0 V, f = 1 MHz		C_j	-	15	-	pF

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

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COLOR CLASSIFICATION

GROUP	DOM. WAVELENGTH (nm)							
	SOFT ORANGE		YELLOW		ORANGE RED		PURE GREEN	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
0	-	-	-	-	-	-	555	559
1	598	601	581	584	-	-	558	561
2	600	603	583	586	-	-	560	563
3	602	605	585	588	-	-	562	565
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

LUMINOUS INTENSITY CLASSIFICATION

GROUP		LUMINOUS INTENSITY I_V (mcd)	
STANDARD	OPTIONAL	MIN.	MAX.
D	2	0.56	0.71
E	1	0.71	0.9
	2	0.9	1.12
F	1	1.12	1.4
	2	1.4	1.8
G	1	1.8	2.24
	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 ± 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 in any one reel.
  In order to ensure availability, single wavelength groups will not be orderable

CROSSING TABLE

VISHAY	OSRAM
VLMS20H2K1	LSM67K-H2K1
VLMS20J2L1	LSM67K-J2L1
VLMS20H2L1	LSM67K-H2L1
VLMO20J2L1	LOM67K-J2L1
VLMO20J2M1	LOM67K-J2M1
VLMY20J1K2	LYM67K-J1K2
VLMY20K1L2	LYM67K-K1L2
VLMP20D2G1	LPM67K-D2G1

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TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

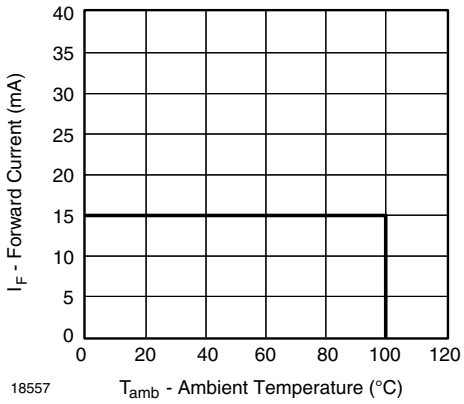


Fig. 1 - Forward Current vs. Ambient Temperature

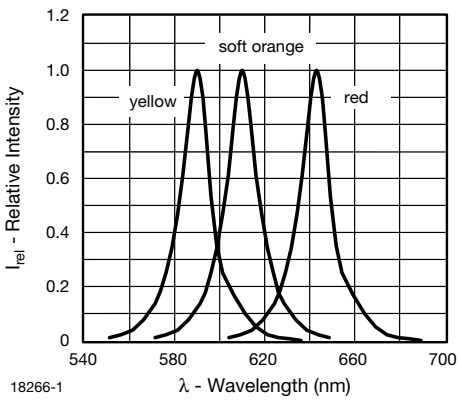


Fig. 4 - Relative Intensity vs. Wavelength

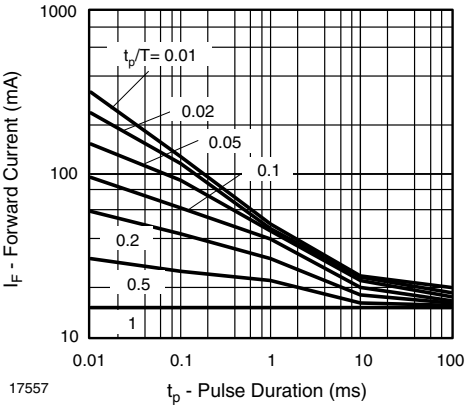


Fig. 2 - Forward Current vs. Pulse Length

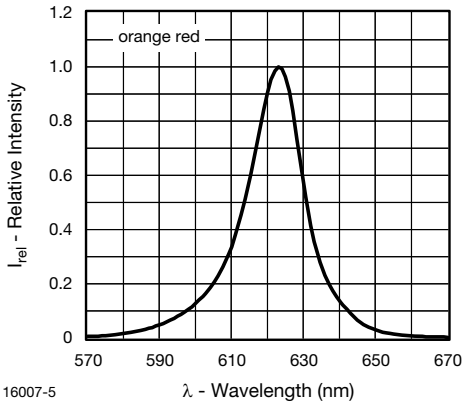


Fig. 5 - Relative Intensity vs. Wavelength

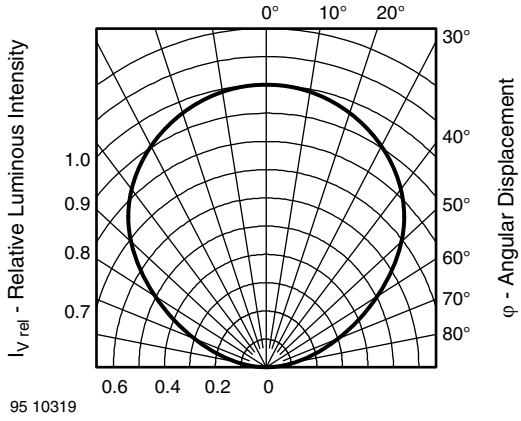


Fig. 3 - Relative Luminous Intensity vs. Angular Displacement

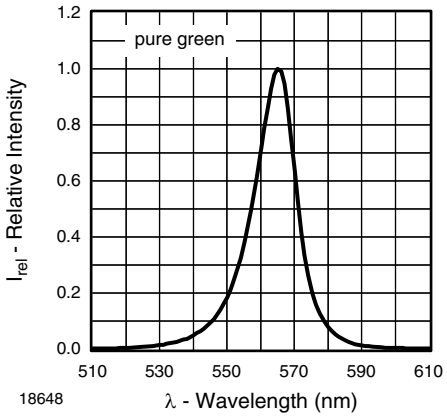


Fig. 6 - Relative Intensity vs. Wavelength

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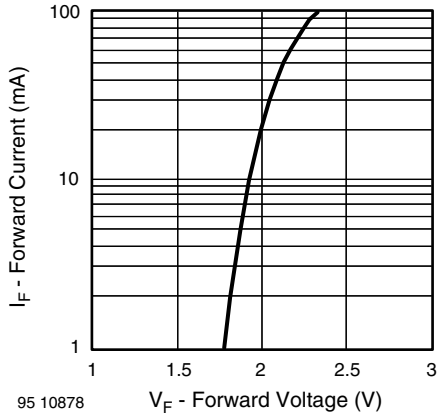


Fig. 7 - Forward Current vs. Forward Voltage

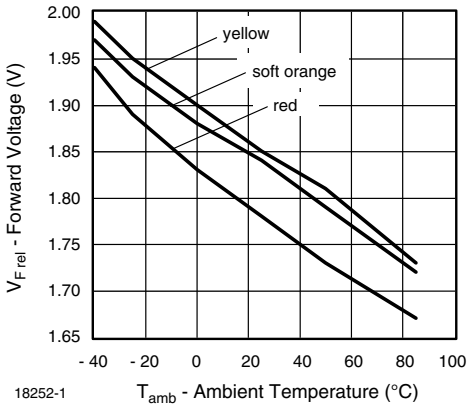


Fig. 10 - Forward Voltage vs. Ambient Temperature

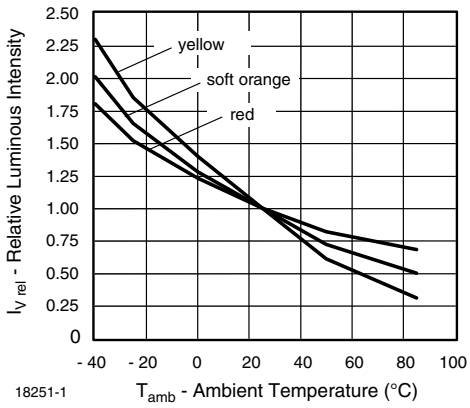


Fig. 8 - Relative Luminous Intensity vs. Ambient Temperature

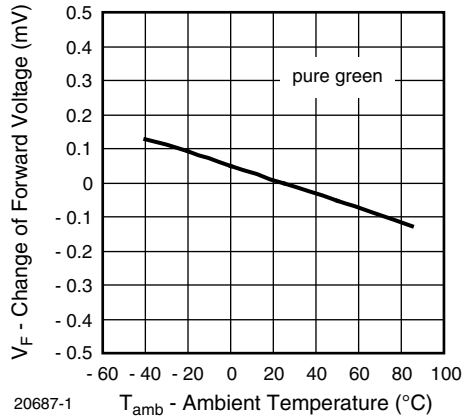


Fig. 11 - Change of Forward Voltage vs. Ambient Temperature

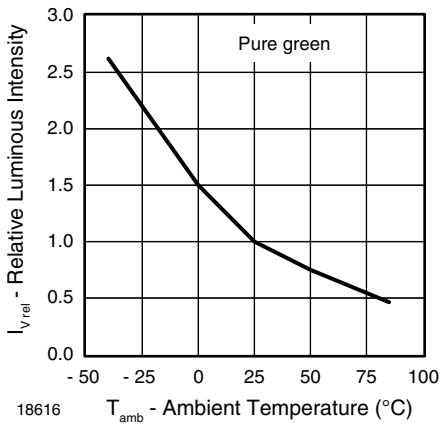
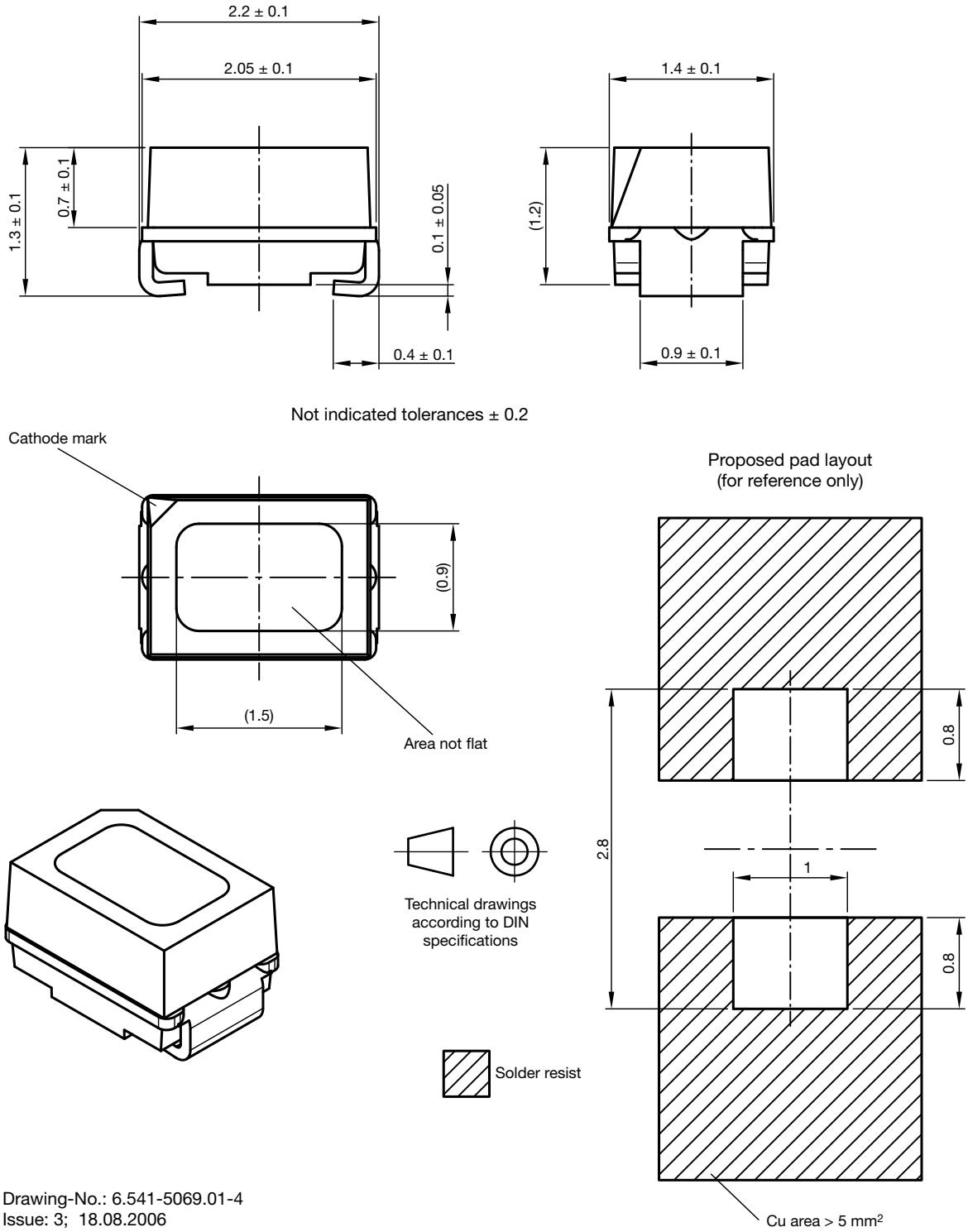


Fig. 9 - Relative Luminous Intensity vs. Ambient Temperature

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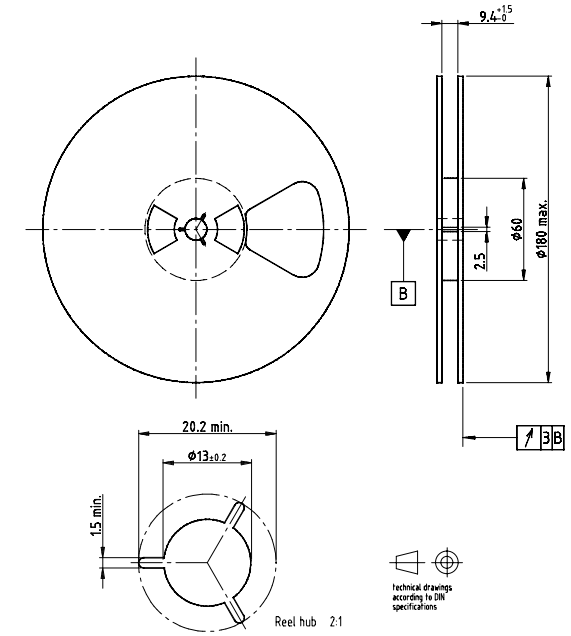
PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.541-5069.01-4
Issue: 3; 18.08.2006

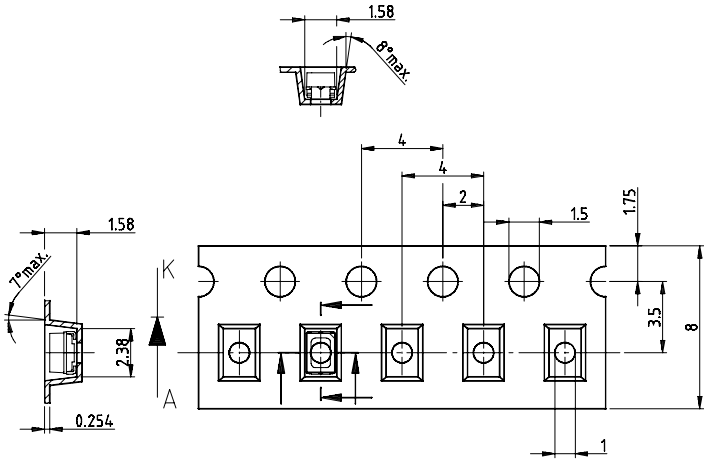
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REEL DIMENSIONS in millimeters



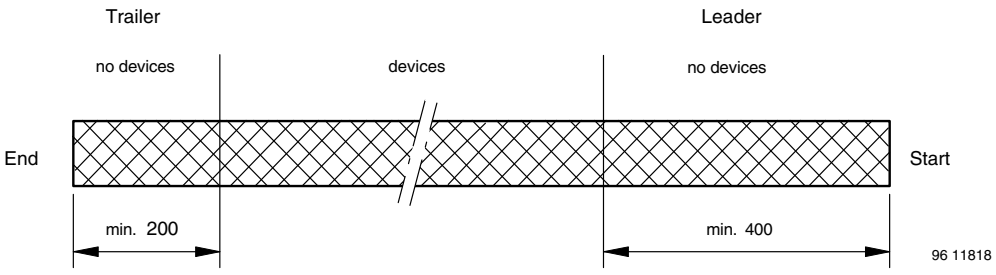
Drawing-No.: 9.800-5051.V5-4
Issue: 1; 25.07.02
16938

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

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COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3

0.1 N to 1.3 N

300 mm/min ± 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+	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

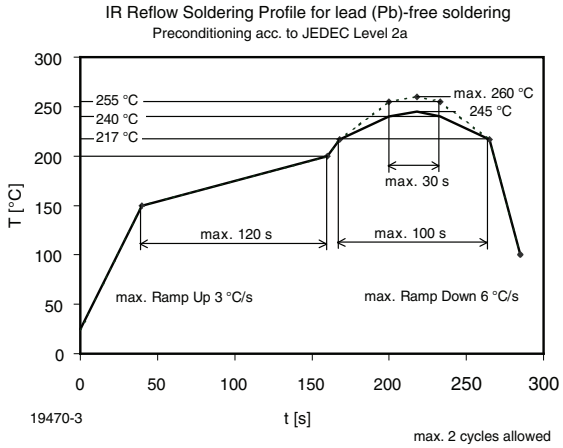
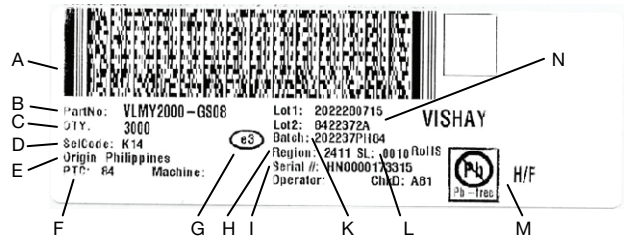


Fig. 12 - Vishay Lead (Pb)-free Reflow Soldering Profile
(according to J-STD-020)

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BAR CODE PRODUCT LABEL (example)



A. 2D barcode

B. Part No: Vishay part number

C. QTY: quantity

D. SelCode: selection bin code

E. Country of origin

F. PTC: production plant code

G. Termination finish

H. Region code

I. Serial#: serial number

K. Batch number: year, week, country code, plant code

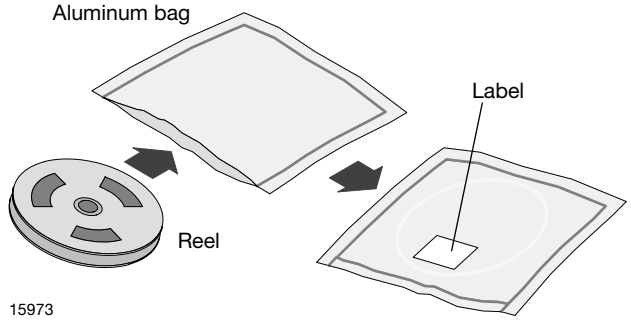
L. SL: storage location

M. Environmental symbols: RoHS, lead (Pb)-free, halogen-free

N. Lot numbers

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 METHOF 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.

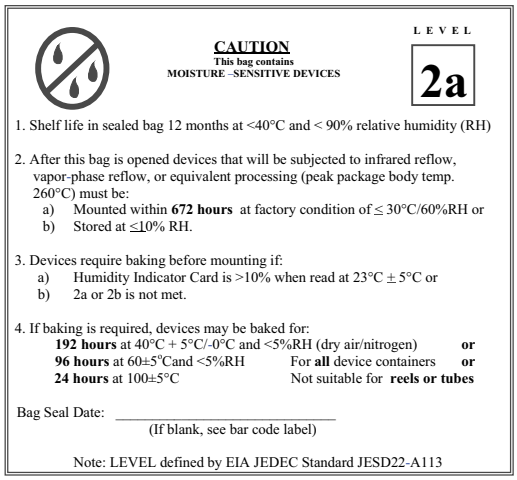
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

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°Cand <5%RH For **all** device containers **or**
   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

19786

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 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.

For technical questions, contact: LED@vishay.com
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