Highbright 0603 ChipLED

DESCRIPTION

The new ChipLED series have been designed in the smallest SMD package. This innovative ChipLED technology opens the way to

- smaller products of higher performance
- more design in flexibility
- enhanced applications

The 0603 LED is an obvious solution for small-scale, high brightness products that are expected to work reliably in an arduous environment.

PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD 0603 ChipLED
- Product series: standard
- Angle of half intensity: ± 65°

FEATURES

- Super thin ChipLED with exceptional brightness 1.6 mm x 0.8 mm x 0.8 mm (L x W x H)
- High reliability PCB based
- Wavelength (465 to 475) nm (blue), typ. 525 nm (true green), typ. 571 nm (yellow green), (584.5 to 597) nm (yellow), typ. 605 nm (soft orange), typ. 631 nm (super red)
- InGaN blue available with protection diode, device type VLMB1310 with HBM 8000 V
- AllnGaP and InGaN technology
- Viewing angle: Extremely wide 130°
- Grouping parameter: Luminous intensity, wavelength, V_F
- Available in 8 mm tape on 7" diameter reel
- Compatible to IR reflow soldering
- Preconditioning according to JEDEC level 3
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free
e4
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

APPLICATIONS

- Backlight keypads
- Navigation systems
- Cellular phone displays
- Displays for industrial control systems
- Miniaturized color effects
- Traffic displays

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.		
VLMS1300-GS08	Super red	18	54	-	20	-	631	-	20	-	2.0	2.4	20	AllnGaP
VLMO1300-GS08	Soft orange	45	90	-	20	-	605	-	20	-	2.0	2.4	20	AllnGaP
VLMY1300-GS08	Yellow	28	-	180	20	584.5	-	597	20	1.8	-	2.4	20	AllnGaP
VLMG1300-GS08	Yellow green	18	35	-	20	-	571	-	20	-	2.0	2.4	20	AllnGaP
VLMTG1300-GS08	True green	71	-	450	20	-	525	-	20	2.8	3.2	3.6	20	InGaN
VLMB1300-GS08	Blue	28	-	180	20	465	-	475	20	2.8	-	3.8	20	InGaN
VLMB1310-GS08	Blue	28	-	180	20	465	-	475	20	2.8	-	3.8	20	InGaN

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified) **VLMS1300, VLMO1300, VLMY1300, VLMG1300** (AlInGaP technology)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Reverse voltage (1)		V_R	5	V
DC forward current		I_F	30	mA
Surge forward current	1/10 duty cycle, 0.1 ms pulse width	I_{FSM}	80	mA
Power dissipation	$T_{amb} \leq 25$ °C	P_V	75	mW
Operating temperature range		T_{amb}	- 35 to + 85	°C
Storage temperature range		T_{stg}	- 45 to + 85	°C
IRED solder conditions	according Vishay specifications	T_{st}	260	°C

Note

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

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified) **VLMTG1300, VLMB1300, VLMB1310** (InGaN technology)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
DC forward current		I_F	20	mA
Surge forward current	1/10 duty cycle, 0.1 ms pulse width	I_{FSM}	100	mA
Power dissipation	$T_{amb} \leq 25$ °C	P_V	76	mW
ESD thershold, for VLMB1310 with protection only	HBM	$th_{ESD\ HBM}$	8000	V
Operating temperature range		T_{amb}	- 20 to + 80	°C
Storage temperature range		T_{stg}	- 30 to + 100	°C
IRED solder conditions	according Vishay specifications	T_{st}	260	°C

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified) **VLMS1300, SUPER RED**						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Luminous intensity	I_F = 20 mA	I_V	18	54	-	mcd
Dominant wavelength	I_F = 20 mA	λ_d	-	631	-	nm
Peak wavelength	I_F = 20 mA	λ_p	-	639	-	nm
Angle of half intensity	I_F = 20 mA	φ	-	± 65	-	deg
Spectral line half width	I_F = 20 mA	$\Delta\lambda$	-	20	-	nm
Forward voltage	I_F = 20 mA	V_F	-	2.0	2.4	V
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j	-	40	-	pF
Reverse current	V_R = 5 V	I_R	-	-	10	μA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified) **VLMO1300, SOFT ORANGE**						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Luminous intensity	I_F = 20 mA	I_V	45	90	-	mcd
Dominant wavelength	I_F = 20 mA	λ_d	-	605	-	nm
Peak wavelength	I_F = 20 mA	λ_p	-	611	-	nm
Angle of half intensity	I_F = 20 mA	φ	-	± 65	-	deg
Spectral line half width	I_F = 20 mA	$\Delta\lambda$	-	17	-	nm
Forward voltage	I_F = 20 mA	V_F	-	2.0	2.4	V
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j	-	40	-	pF
Reverse current	V_R = 5 V	I_R	-	-	10	μA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified) **VLMY1300, YELLOW**						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Luminous intensity	I_F = 20 mA	I_V	28	-	180	mcd
Dominant wavelength	I_F = 20 mA	λ_d	584.5	-	597	nm
Peak wavelength	I_F = 20 mA	λ_p	-	588	-	nm
Angle of half intensity	I_F = 20 mA	φ	-	± 65	-	deg
Spectral line half width	I_F = 20 mA	$\Delta\lambda$	-	15	-	nm
Forward voltage	I_F = 20 mA	V_F	1.8	-	2.4	V
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j	-	40	-	pF
Reverse current	V_R = 5 V	I_R	-	-	10	μA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified) **VLMG1300, YELLOW GREEN**						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Luminous intensity	I_F = 20 mA	I_V	18	35	-	mcd
Dominant wavelength	I_F = 20 mA	λ_d	-	571	-	nm
Peak wavelength	I_F = 20 mA	λ_p	-	574	-	nm
Angle of half intensity	I_F = 20 mA	φ	-	± 65	-	deg
Spectral line half width	I_F = 20 mA	$\Delta\lambda$	-	15	-	nm
Forward voltage	I_F = 20 mA	V_F	-	2.0	2.4	V
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j	-	40	-	pF
Reverse current	V_R = 5 V	I_R	-	-	10	μA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified) **VLMTG1300, TRUE GREEN**						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Luminous intensity	I_F = 20 mA	I_V	71	-	450	mcd
Dominant wavelength	I_F = 20 mA	λ_d	-	525	-	nm
Peak wavelength	I_F = 20 mA	λ_p	-	530	-	nm
Angle of half intensity	I_F = 20 mA	φ	-	± 65	-	deg
Spectral line half width	I_F = 20 mA	$\Delta\lambda$	-	35	-	nm
Forward voltage	I_F = 20 mA	V_F	2.8	3.2	3.6	V
Reverse current	V_R = 5 V	I_R	-	-	10	μA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified) **VLMB1300, VLMB1310, BLUE**						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Luminous intensity	I_F = 20 mA	I_V	28	-	180	mcd
Dominant wavelength	I_F = 20 mA	λ_d	465	-	475	nm
Peak wavelength	I_F = 20 mA	λ_p	-	468	-	nm
Angle of half intensity	I_F = 20 mA	φ	-	± 65	-	deg
Spectral line half width	I_F = 20 mA	$\Delta\lambda$	-	25	-	nm
Forward voltage	I_F = 20 mA	V_F	2.8	-	3.8	V
Reverse current (except VLMB1310)	V_R = 5 V	I_R	-	-	10	μA
Reverse voltage (VLMB1310 only)	I_R = 10 mA	V_R	0.6	-	1.2	V

LUMINOUS INTENSITY CLASSIFICATION		
GROUP	LUMINOUS INTENSITY (mcd)	
	MIN.	MAX.
M	18	28
N	28	45
P	45	71
Q	71	112
R	112	180
S	180	280
T	280	450

Note

- Luminous intensity is tested at a current pulse duration of 25 ms and an accuracy of ± 15 %.
  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.

COLOR CLASSIFICATION			
COLOR	GROUP	DOMINANT WAVELENGTH (nm)	
		MIN.	MAX.
Yellow	H	584.5	587.5
	J	587.5	589.5
	K	589.5	592
	L	592	594.5
	M	594.5	597
Yellow green	C	567.5	570.5
	D	570.5	573.5
	E	573.5	576.5
True green	AP	520	525
	AQ	525	530
	AR	530	535
Blue	AC	465	470
	AD	470	475

Note

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

FORWARD VOLTAGE CLASSIFICATION			
COLOR	GROUP	FORWARD VOLTAGE (V)	
		MIN.	MAX.
Yellow	F2	1.8	2.1
	F3	2.1	2.4
Yellow green	4	1.9	2
	5	2	2.1
	6	2.1	2.2
	7	2.2	2.3
	8	2.3	2.4
True green	D7	2.8	3
	D8	3	3.2
	D9	3.2	3.4
	D10	3.4	3.6
Blue	D7	2.8	3
	D8	3	3.2
	D9	3.2	3.4
	D10	3.4	3.6
	D11	3.6	3.8

Note

- Forward voltage is measured with a tolerance of ± 0.1 V.

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

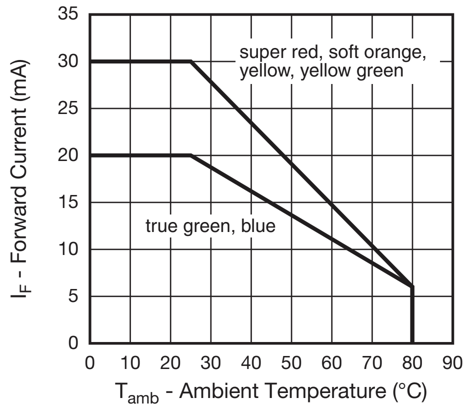


Fig. 1 - Forward Current vs. Ambient Temperature

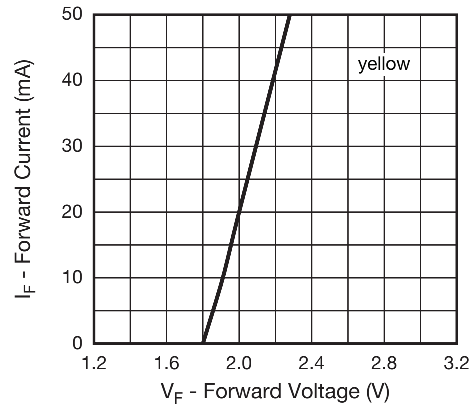


Fig. 4 - Forward Current vs. Forward Voltage (yellow)

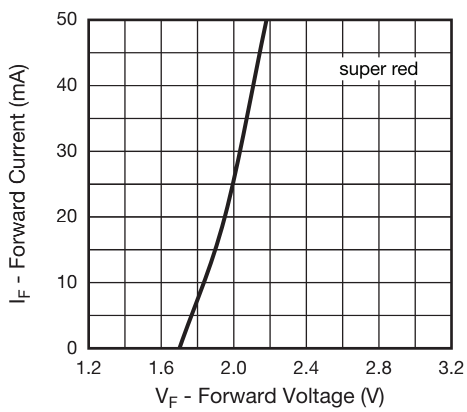


Fig. 2 - Forward Current vs. Forward Voltage (super red)

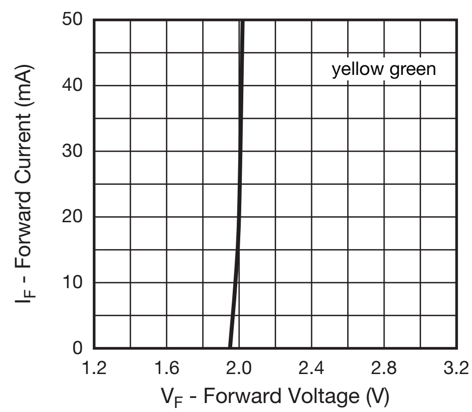


Fig. 5 - Forward Current vs. Forward Voltage (yellow green)

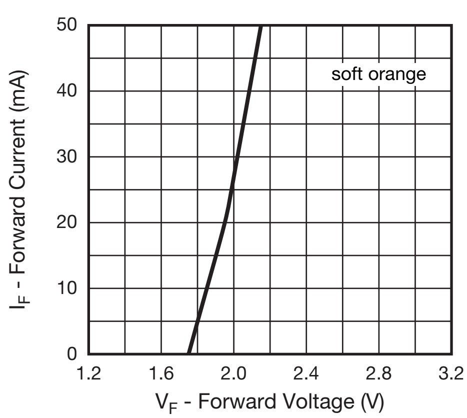


Fig. 3 - Forward Current vs. Forward Voltage (soft orange)

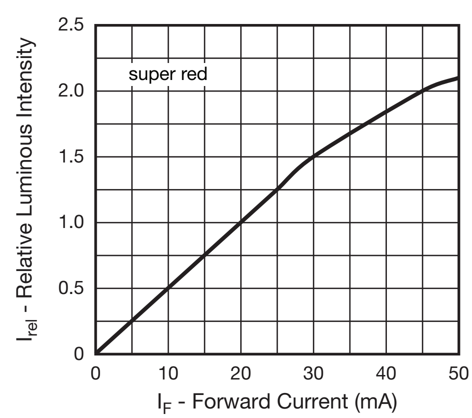


Fig. 6 - Relative Luminous Intensity vs. Forward Current (super red)

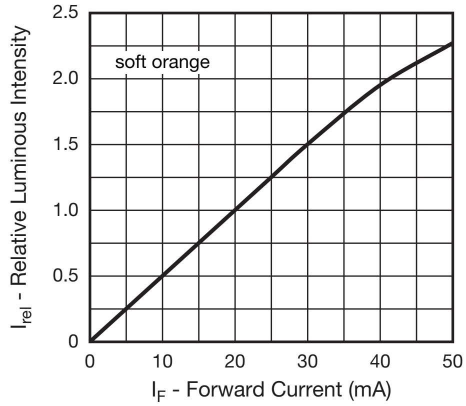


Fig. 7 - Relative Luminous Intensity vs. Forward Current (soft orange)

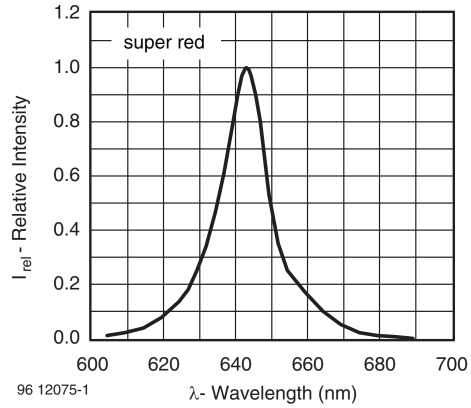


Fig. 10 - Relative Intensity vs. Wavelength (super red)

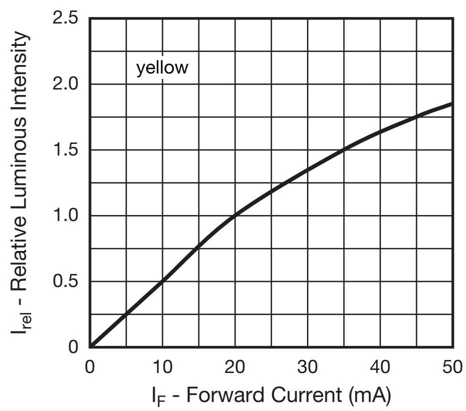


Fig. 8 - Relative Luminous Intensity vs. Forward Current (yellow)

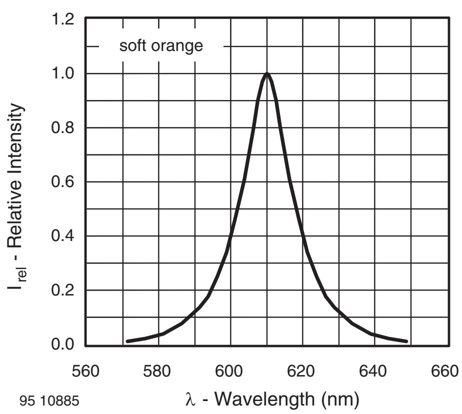


Fig. 11 - Relative Intensity vs. Wavelength (soft orange)

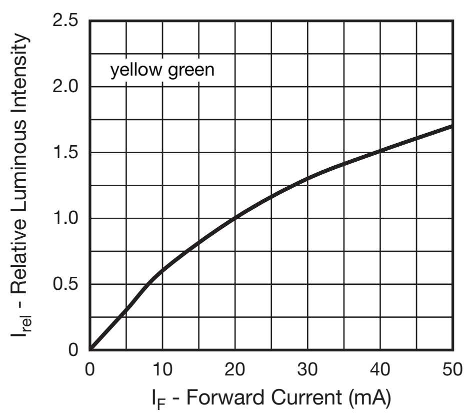


Fig. 9 - Relative Luminous Intensity vs. Forward Current (yellow green)

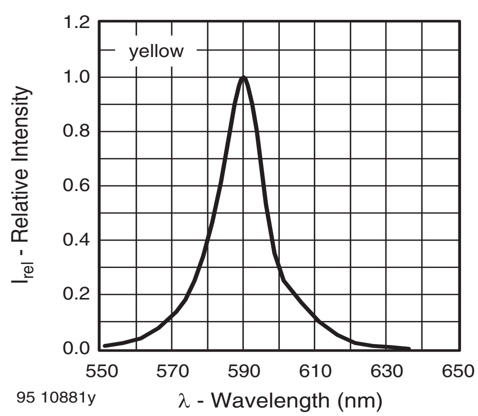


Fig. 12 - Relative Intensity vs. Wavelength (yellow)

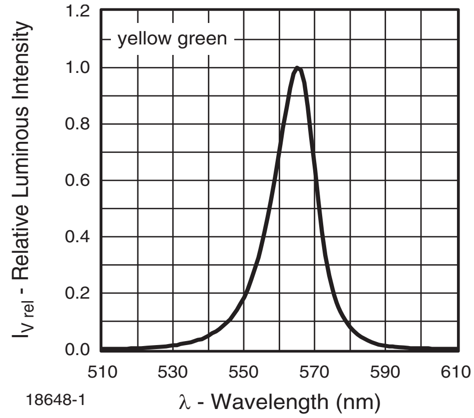


Fig. 13 - Relative Intensity vs. Wavelength (yellow green)

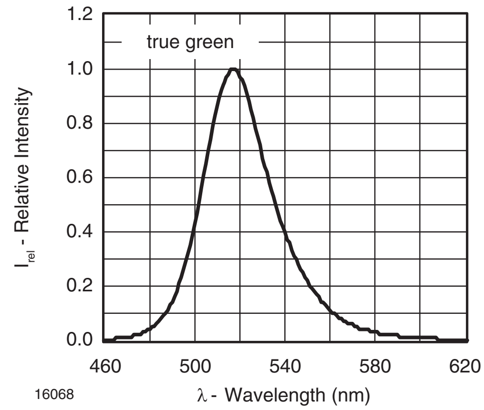


Fig. 16 - Relative Intensity vs. Wavelength (true green)

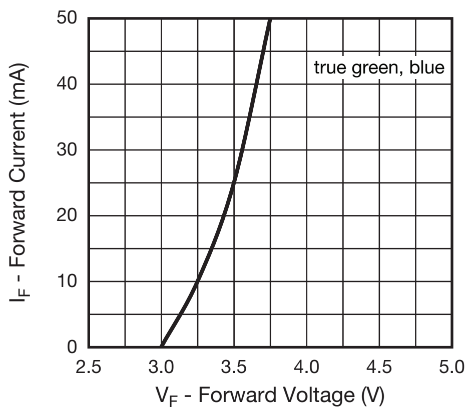


Fig. 14 - Forward Current vs. Forward Voltage (true green, blue)

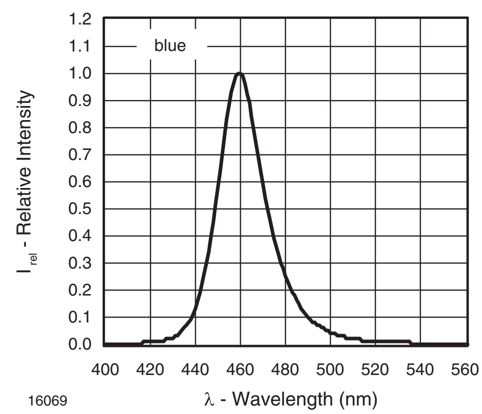


Fig. 17 - Relative Intensity vs. Wavelength (blue)

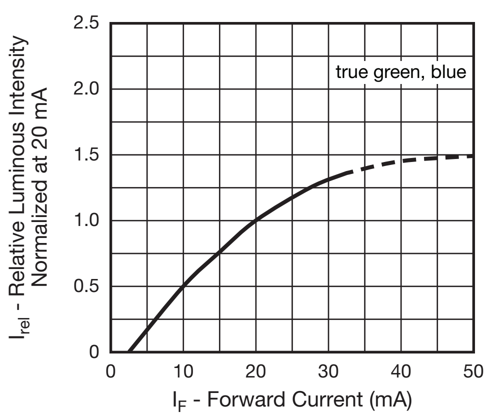


Fig. 15 - Relative Luminous Intensity vs. Forward Current (true green, blue)

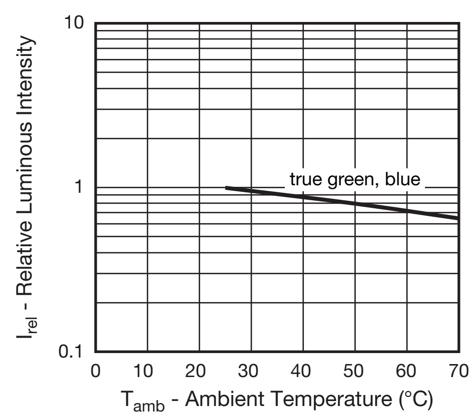


Fig. 18 - Relative Luminous Intensity vs. Ambient Temperature

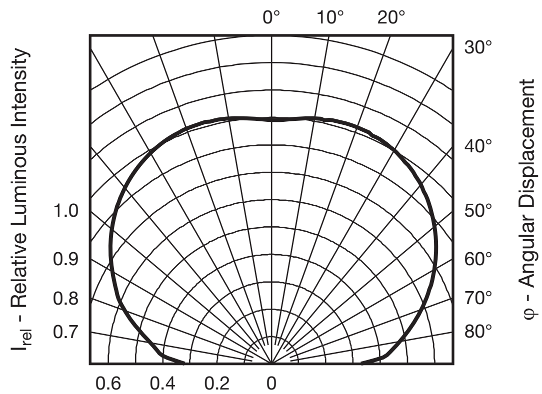
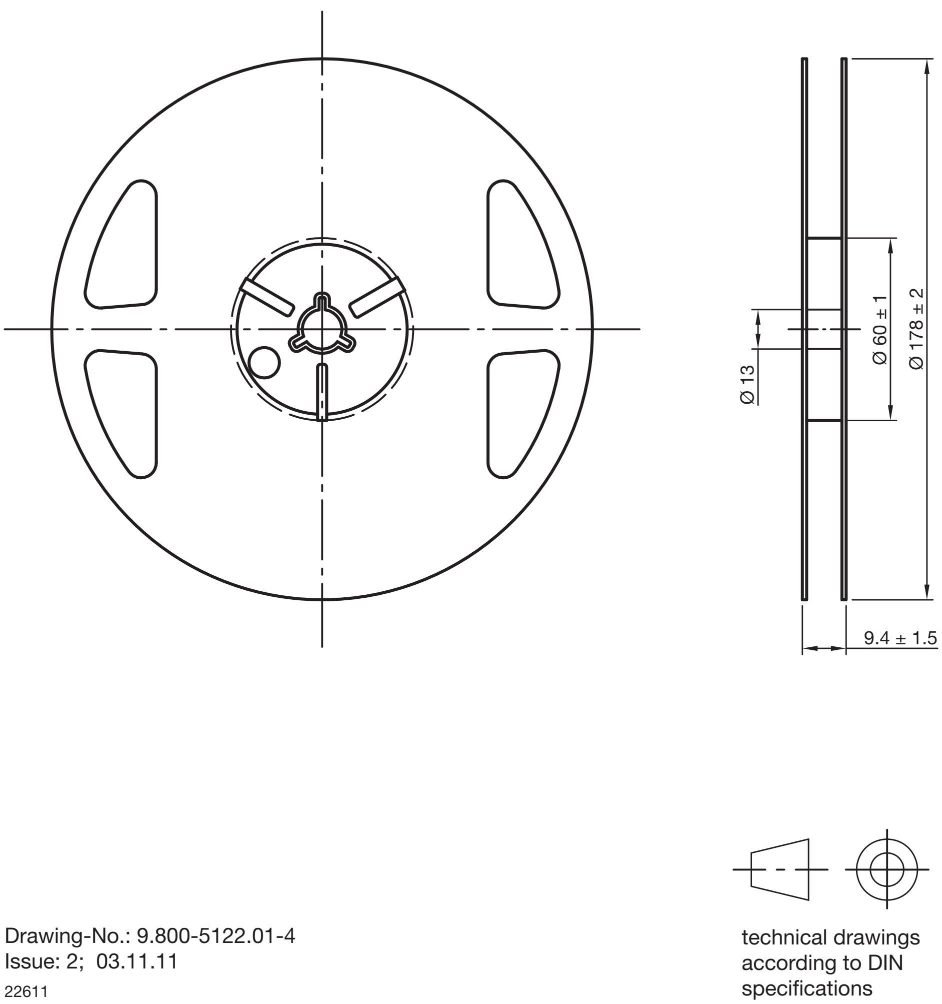


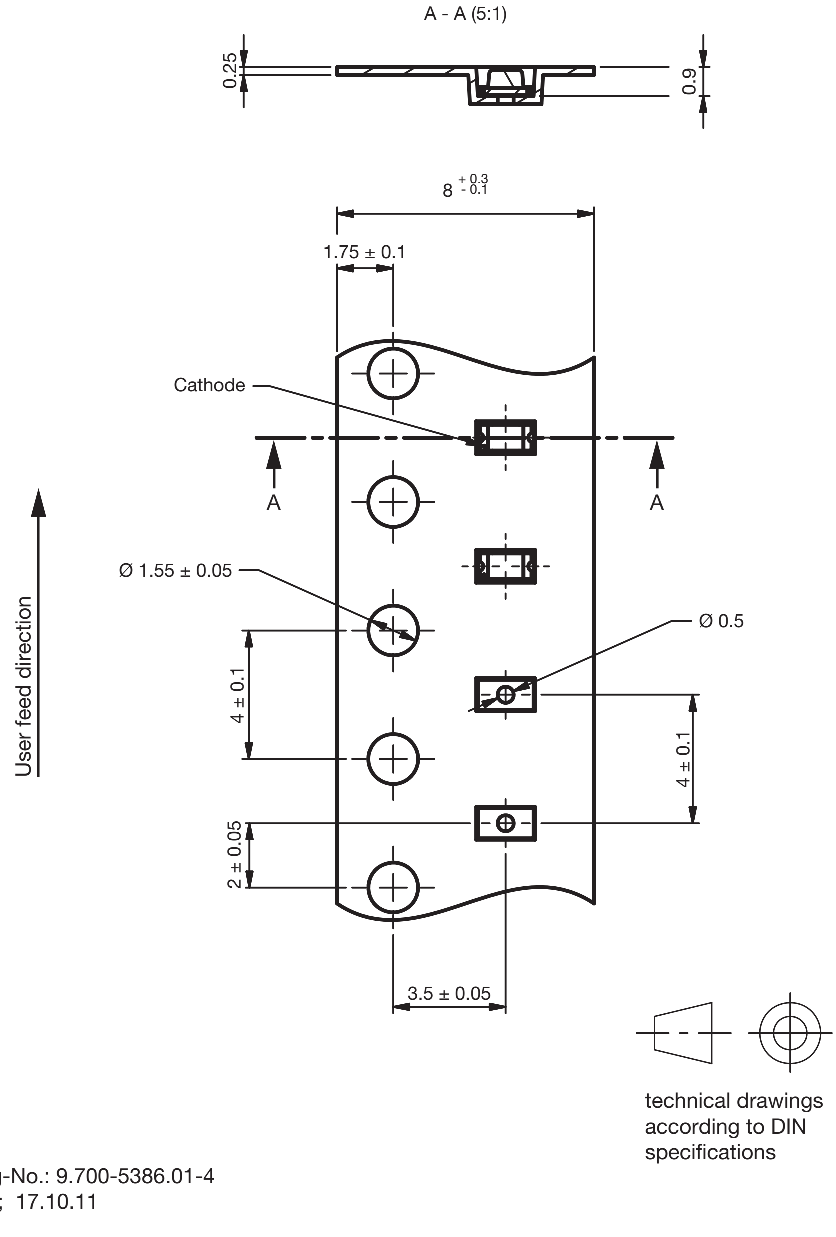
Fig. 19 - Relative Luminous Intensity vs. Angular Displacement

REEL DIMENSIONS in millimeters



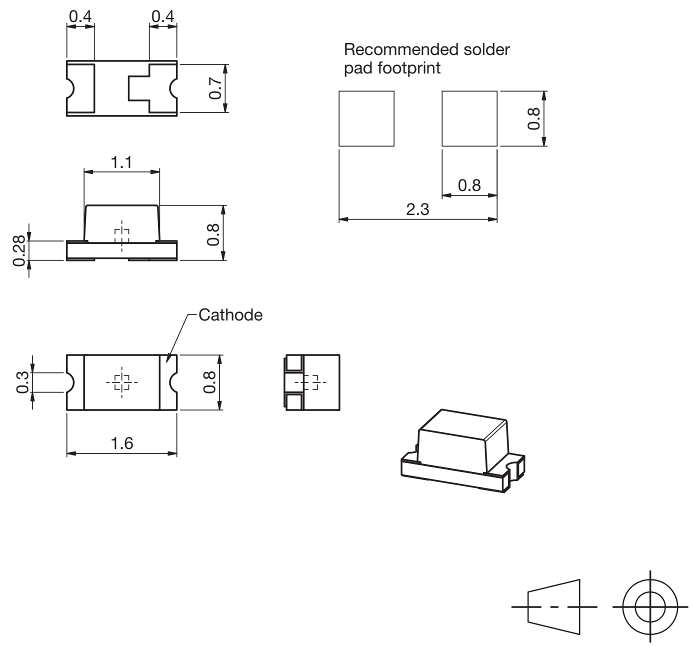
TAPE DIMENSIONS in millimeters

VLMG 13.., VLMY 13.., VLMO 13.., VLMS 13.., VLMB 13.., VLMB131..



PACKAGE DIMENSIONS in millimeters

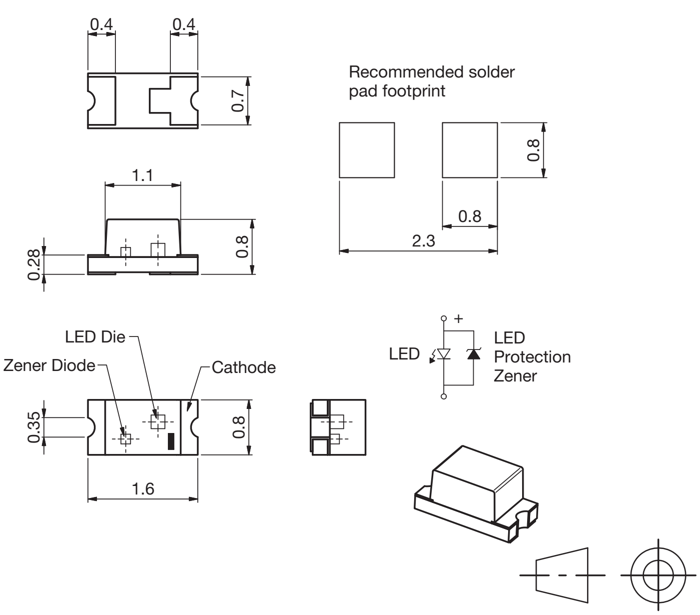
VLMG 13.., VLMY 13.., VLMO 13.., VLMS 13..



Not indicated tolerances ± 0.2

Drawing-No.: 6.541-5092.01-4
Issue: 1; 17.10.11
22615

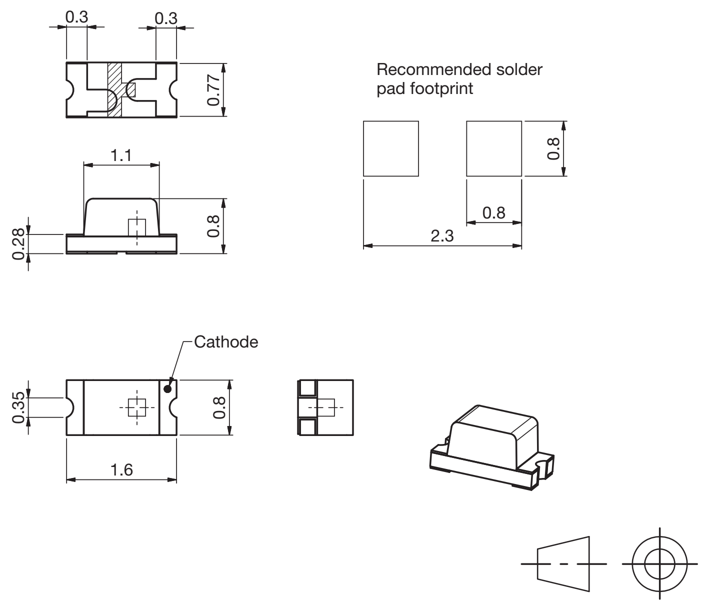
VLMB 131..



Not indicated tolerances ± 0.2

Drawing-No.: 6.541-5093.01-4
Issue: 1; 17.10.11
22616

VLMB 130., VLMTG 130.



Not indicated tolerances ± 0.2

Drawing-No.: 6.541-5094.01-4
Issue: 1; 17.10.11
22617

technical drawings according to DIN specifications

SOLDERING PROFILE

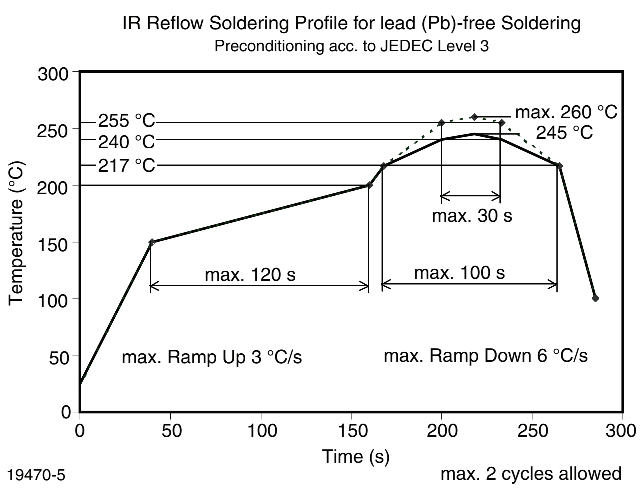


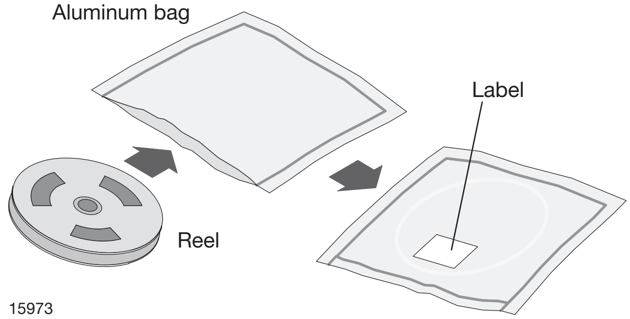
Fig. 20 - Vishay Lead (Pb)-free Reflow Soldering Profile (according to J-STD-020C)

BAR CODE PRODUCT LABEL (example only)

A. 2D barcode
B. Vishay part number
C. Quantity
D. PTC = selection code (binning)
E. Code of manufacturing plant
F. Batch = date code: year/week/plant code
G. Region code
H. SL = sales location
I. Terminations finishing
K. Lead (Pb)-free symbol
L. Halogen-free symbol
M. RoHS symbol

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:

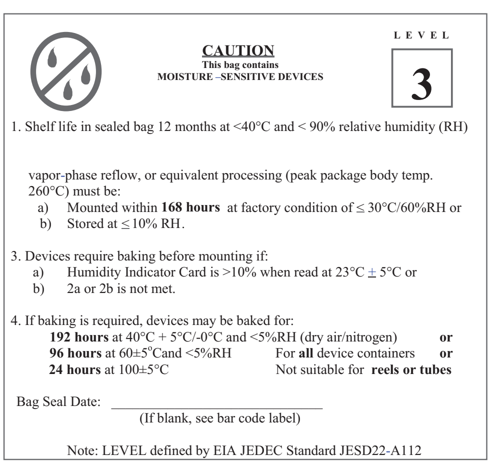
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 168 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 3 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
3

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

vapor-phase reflow, or equivalent processing (peak package body temp. 260°C) must be:
a) Mounted within **168 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 **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-A112

20003

Example of JESD22-A112 Level 3 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.

Disclaimer

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