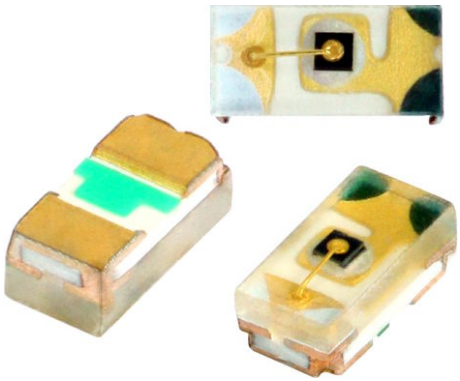
Ultrabright 0402 ChipLED



FEATURES

- Super thin ChipLED with exceptional brightness 1.0 mm x 0.5 mm x 0.35 mm (L x W x H)
- High reliability PCB based
- Wavelength (470 to 475) nm (blue), typ. 571 nm (yellow green), (587 to 597) nm (yellow), typ. 605 nm (soft orange), typ. 631 nm (super red)
- AlInGaP 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 2a
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e4

RoHS COMPLIANT

GREEN (5-2008)

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 0402 LED is an obvious solution for small-scale, high brightness products that are expected to work reliable in an arduous environment.

PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD 0402 ChipLED
- Product series: standard
- Angle of half intensity: ± 65°

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)			FORWARD VOLTAGE (V)			TECHNOLOGY
		MIN.	TYP.	MAX.		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
VLMS1500-GS08	Super red	18	54	-	20	-	631	-	-	2.0	2.4	AlInGaP
VLMO1500-GS08	Soft orange	45	90	-	20	-	605	-	-	2.0	2.4	AlInGaP
VLMY1500-GS08	Yellow	28	-	180	20	587	-	597	-	2.0	2.4	AlInGaP
VLMG1500-GS08	Yellow green	18	35	-	20	-	571	-	-	2.0	2.4	AlInGaP
VLMB1500-GS08	Blue	11.2	-	45	5	470	-	475	2.65	-	3.15	InGaN

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)
VLMS1500, VLMO1500, VLMY1500, VLMG1500 (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}	- 30 to + 85	°C
Storage temperature range		T_{stg}	- 40 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) **VLMB1500** (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
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) **VLMS1500, 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
Reverse current	V_R = 5 V	I_R	-	-	10	µA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified) **VLMO1500, 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
Reverse current	V_R = 5 V	I_R	-	-	10	µA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified) **VLMY1500, 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	587	-	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	-	2.0	2.4	V
Reverse current	V_R = 5 V	I_R	-	-	10	µA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
VLMG1500, 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)
VLMB1500, BLUE

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	I_F = 5 mA	I_V	11.2	-	45	mcd
Dominant wavelength	I_F = 5 mA	λ_d	470	-	475	nm
Peak wavelength	I_F = 5 mA	λ_p	-	468	-	nm
Angle of half intensity	I_F = 5 mA	φ	-	± 65	-	deg
Spectral line half width	I_F = 5 mA	$\Delta\lambda$	-	25	-	nm
Forward voltage	I_F = 5 mA	V_F	2.65	-	3.15	V
Reverse current	V_R = 5 V	I_R	-	-	10	µA

LUMINOUS INTENSITY CLASSIFICATION

GROUP	LUMINOUS INTENSITY (mcd)	
	MIN.	MAX.
L	11.2	18
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	J	587	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
Blue	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	D2	1.8	2.0
	D3	2.0	2.2
	D4	2.2	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
Blue	1	2.65	2.75
	2	2.75	2.85
	3	2.85	2.95
	4	2.95	3.05
	5	3.05	3.15

Note

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

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

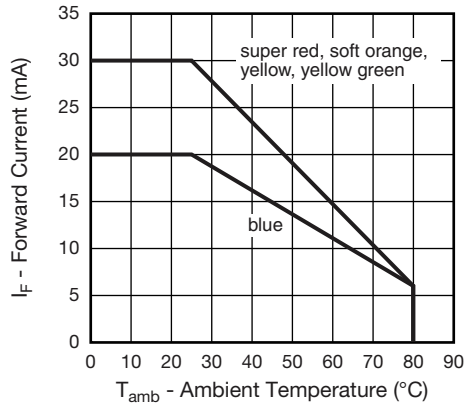


Fig. 1 - Forward Current vs. Ambient Temperature

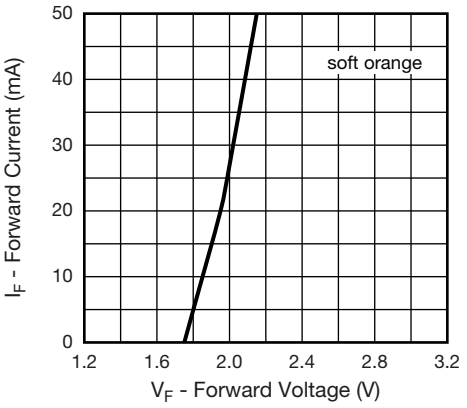


Fig. 3 - Forward Current vs. Forward Voltage (soft orange)

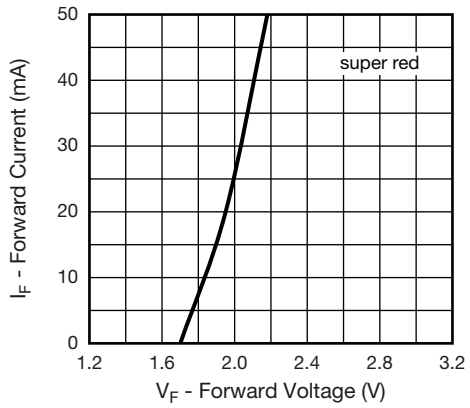


Fig. 2 - Forward Current vs. Forward Voltage (super red)

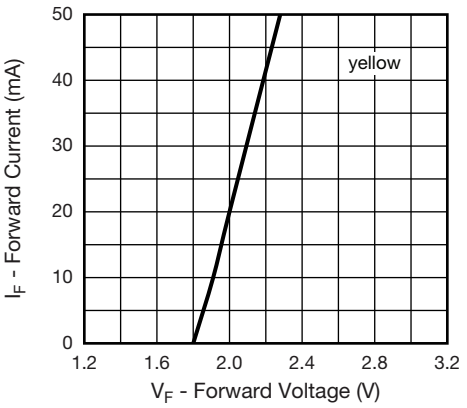


Fig. 4 - Forward Current vs. Forward Voltage (yellow)

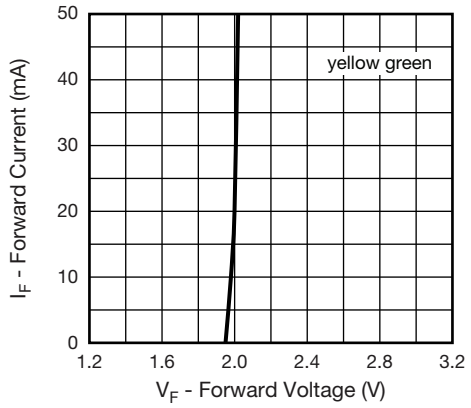


Fig. 5 - Forward Current vs. Forward Voltage (yellow green)

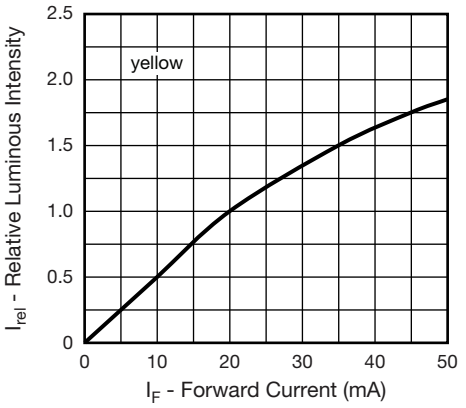


Fig. 8 - Relative Luminous Intensity vs. Forward Current (yellow)

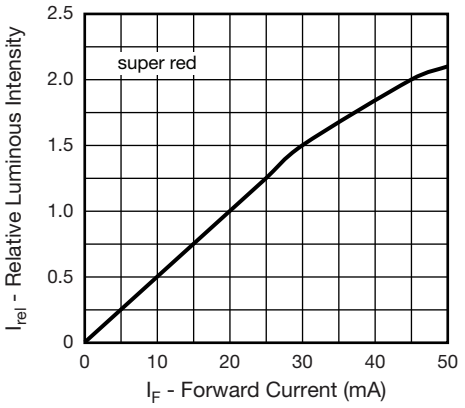


Fig. 6 - Relative Luminous Intensity vs. Forward Current (super red)

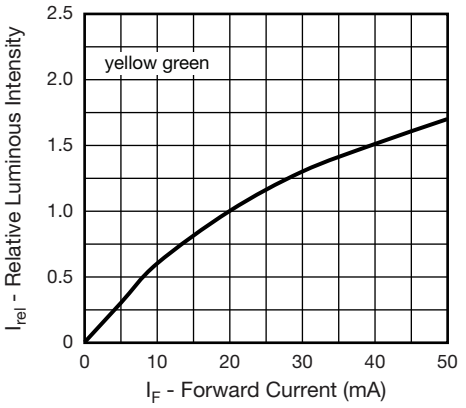


Fig. 9 - Relative Luminous Intensity vs. Forward Current (yellow green)

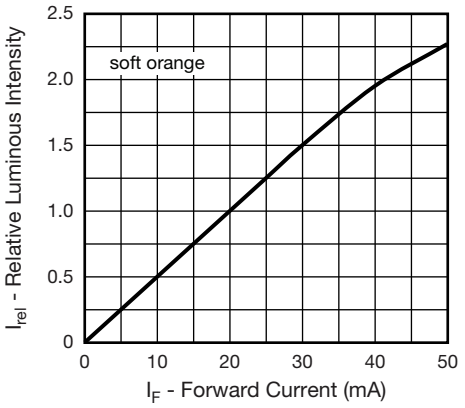


Fig. 7 - Relative Luminous Intensity vs. Forward Current (soft orange)

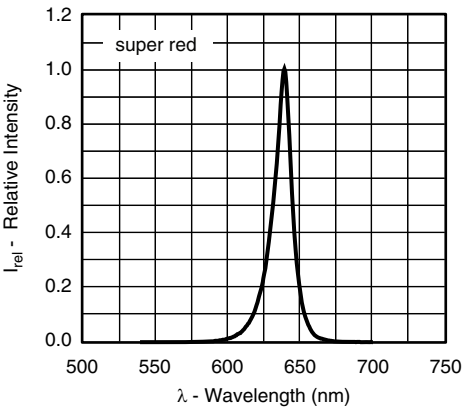


Fig. 10 - Relative Intensity vs. Wavelength (super red)

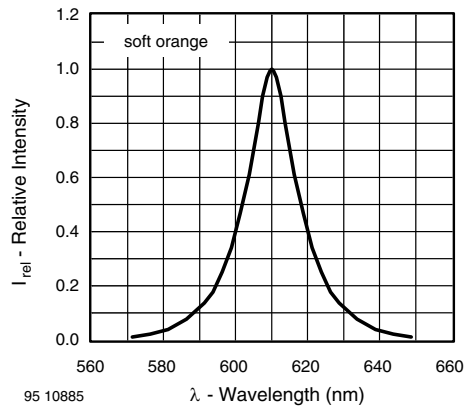


Fig. 11 - Relative Intensity vs. Wavelength (soft orange)

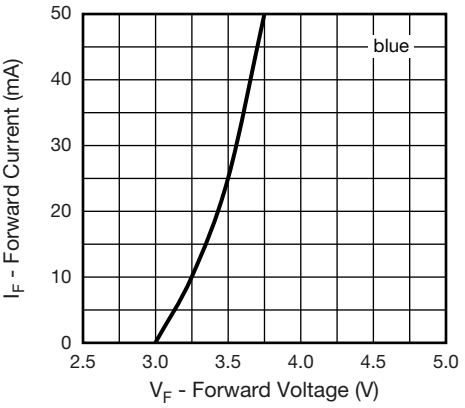


Fig. 14 - Forward Current vs. Forward Voltage (blue)

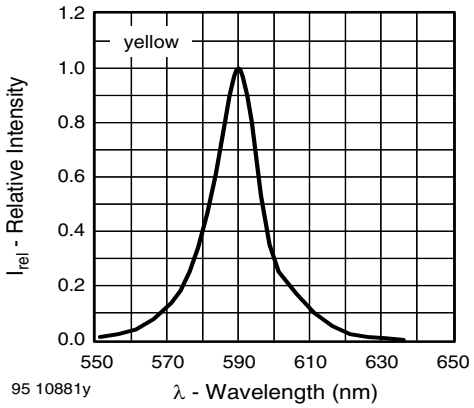


Fig. 12 - Relative Intensity vs. Wavelength (yellow)

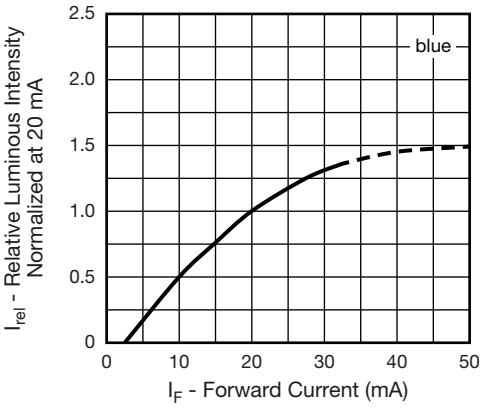


Fig. 15 - Relative Luminous Intensity vs. Forward Current (blue)

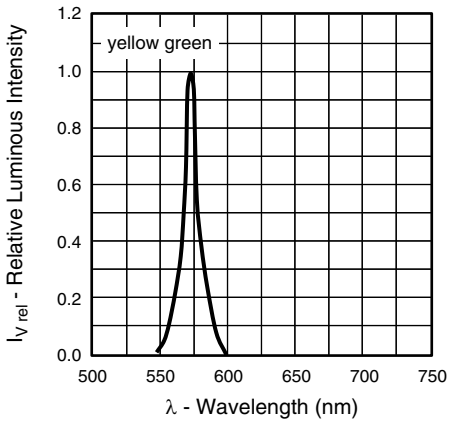


Fig. 13 - Relative Intensity vs. Wavelength (yellow green)

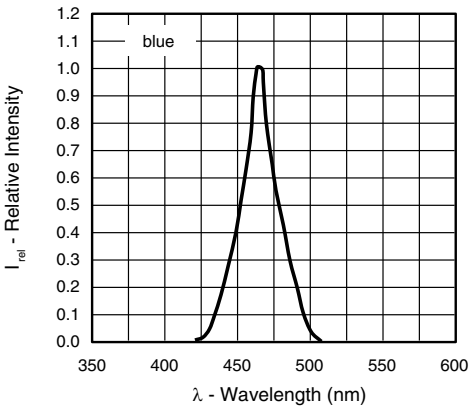


Fig. 16 - Relative Intensity vs. Wavelength (blue)

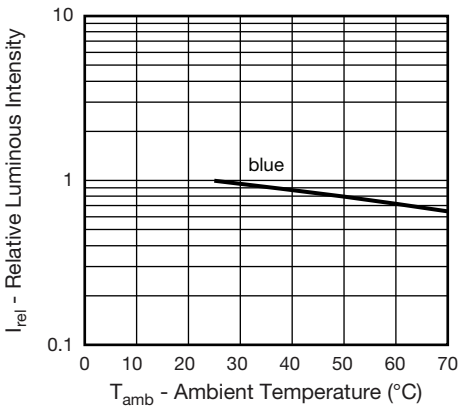


Fig. 17 - Relative Luminous Intensity vs. Ambient Temperature

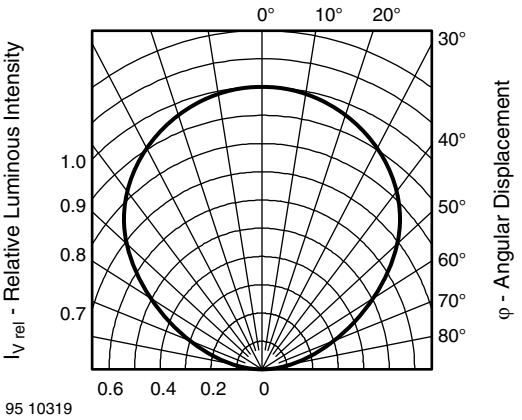
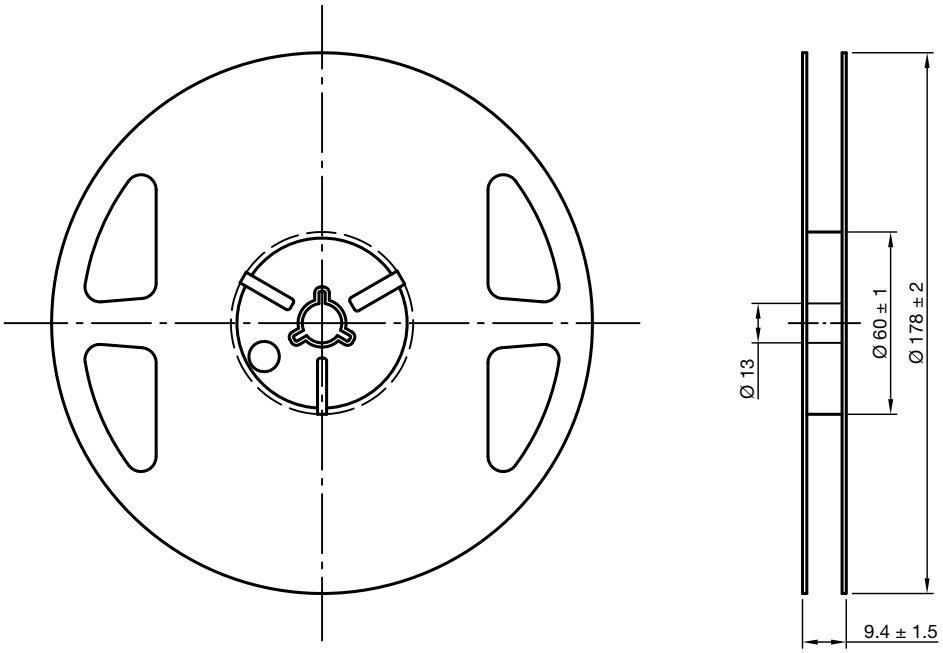


Fig. 18 - Relative Luminous Intensity vs. Angular Displacement

REEL DIMENSIONS in millimeters

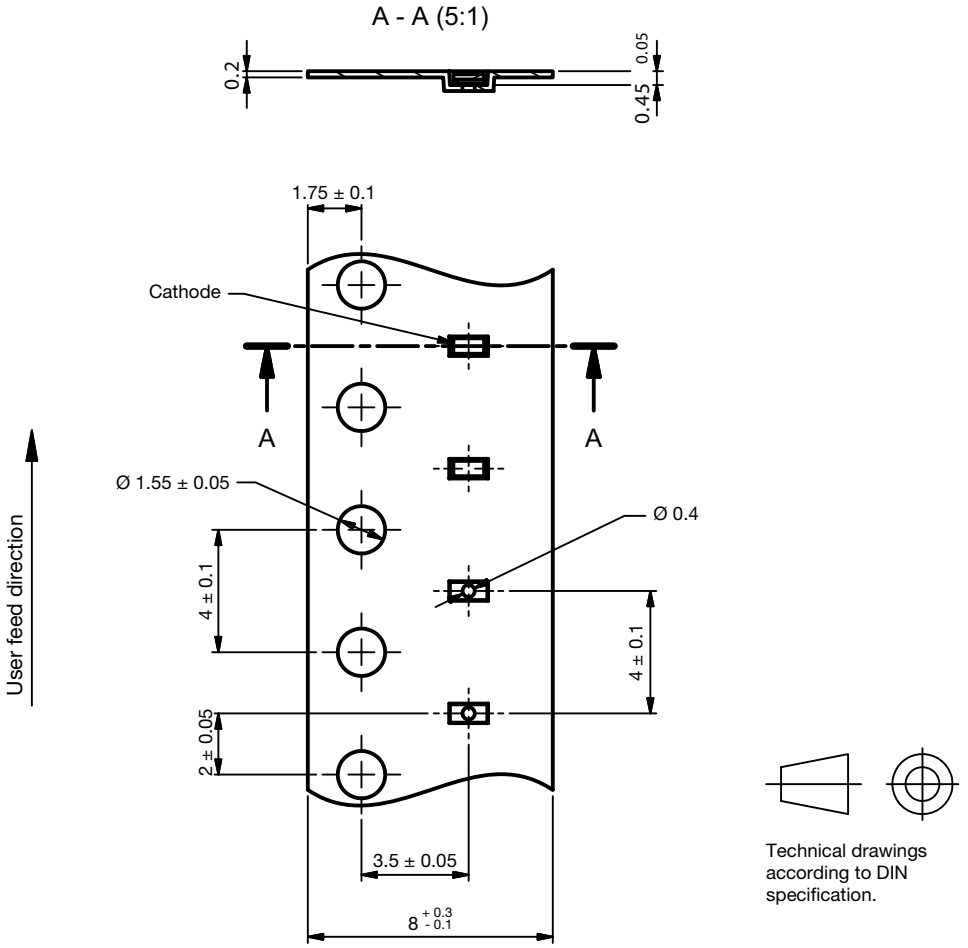


Drawing-No.: 9.800-5122.01-4
Issue: 2; 03.11.11
22611

technical drawings
according to DIN
specifications

TAPE DIMENSIONS in millimeters

VLMS1500, VLMO1500, VLMY1500, VLMG1500, VLMB1500

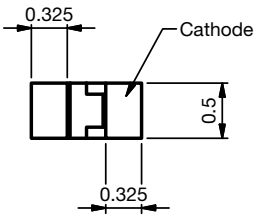


Technical drawings according to DIN specification.

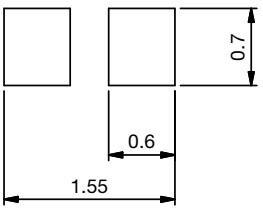
Drawing-No.: 9.700-5388.01-4
Issue: 1; 20.03.12

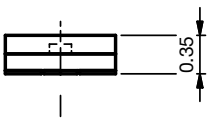
PACKAGE DIMENSIONS in millimeters

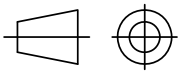
VLMS1500, VLMO1500, VLMY1500, VLMG1500, VLMB1500



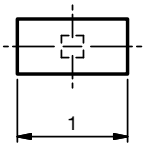
Recommended solder pad footprint

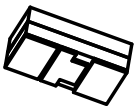






Technical drawings according to DIN specification





Not indicated tolerances ± 0.2

Drawing-No.: 6.541-5096.01-4
Issue: 1; 20.03.12

SOLDERING PROFILE

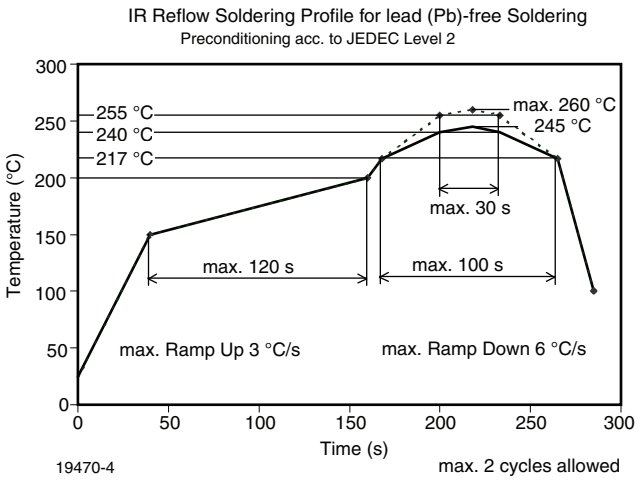
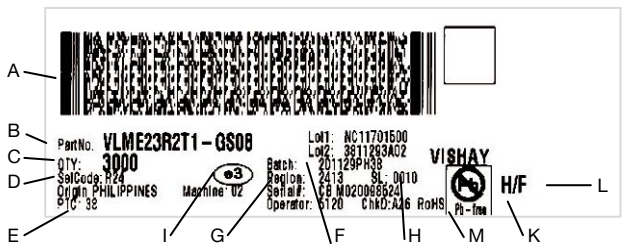


Fig. 19 - Vishay Lead (Pb)-free Reflow Soldering Profile (according to J-STD-020C)

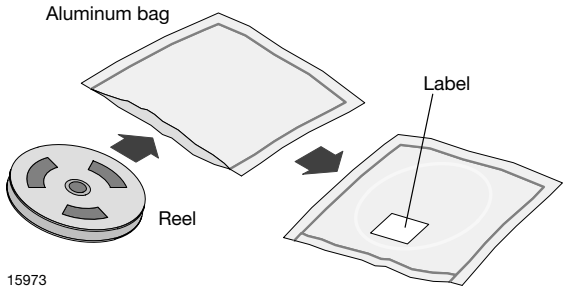
BAR CODE PRODUCT LABEL (example only)



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 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)

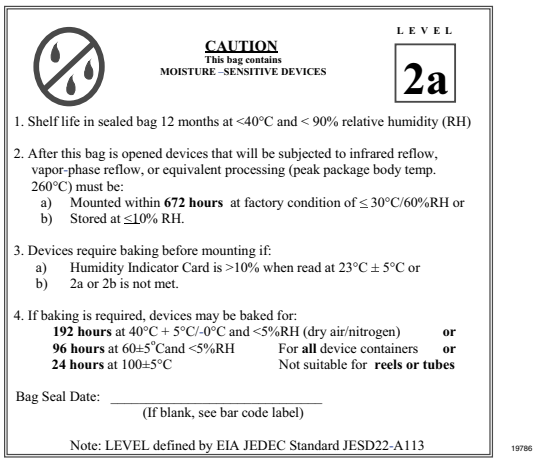
or

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. 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.

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