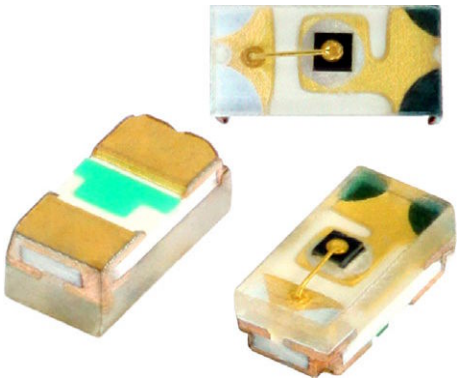
Ultrabright 0402 ChipLED



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 (except super red and soft orange), 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
HALOGEN FREE
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.

APPLICATIONS

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

PRODUCT GROUP AND PACKAGE DATA

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

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.		
VLMS1500-GS08	Super red	18	54	180	20	-	631	-	20	1.80	2.00	2.40	20	AlInGaP
VLMS1501-GS08	Super red	28	54	180	20	-	631	-	20	1.80	2.00	2.40	20	AlInGaP
VLMS1502-GS08	Super red	45	-	112	20	624	631	636	20	1.80	2.00	2.40	20	AlInGaP
VLMO1500-GS08	Soft orange	45	90	280	20	598	605	612	20	1.80	2.00	2.40	20	AlInGaP
VLMY1500-GS08	Yellow	28	90	180	20	587	590	597	20	1.80	2.00	2.40	20	AlInGaP
VLMY1501-GS08	Yellow	45	90	180	20	587	590	597	20	1.80	2.00	2.40	20	AlInGaP
VLMG1500-GS08	Yellow green	18	35	112	20	567.5	571	576.5	20	1.90	2.00	2.40	20	AlInGaP
VLMTG1500-GS08	True green	28	-	280	5	520	-	535	5	2.50	-	3.10	5	InGaN
VLMTG1501-GS08	True green	56	-	180	5	520	-	535	5	2.50	-	3.10	5	InGaN
VLMB1500-GS08	Blue	11.2	28	45	5	470	472	475	5	2.65	2.80	3.15	5	InGaN
VLMB1501-GS08	Blue	22.4	28	71	5	470	472	475	5	2.65	2.80	3.15	5	InGaN

For technical questions, contact: LED@vishay.com

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified) **VLMS150., VLMO1500, VLMY150., 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) **VLMB150., VLMTG150.** (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) **VLMS150., SUPER RED**							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Luminous intensity	I_F = 20 mA	VLMS1500	I_V	18	54	180	mcd
	I_F = 20 mA	VLMS1501	I_V	28	54	180	mcd
	I_F = 20 mA	VLMS1502	I_V	45	-	112	mcd
Dominant wavelength	I_F = 20 mA	VLMS1500	λ_d	-	631	-	nm
	I_F = 20 mA	VLMS1501	λ_d	-	631	-	nm
	I_F = 20 mA	VLMS1502	λ_d	624	631	636	nm
Peak wavelength	I_F = 20 mA		λ_p	-	639	-	nm
Angle of half intensity	I_F = 20 mA		φ	-	± 65	-	°
Spectral line half width	I_F = 20 mA		$\Delta\lambda$	-	20	-	nm
Forward voltage	I_F = 20 mA		V_F	1.80	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**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Luminous intensity	I_F = 20 mA	VLMO1500	I_V	45	90	280	mcd
Dominant wavelength	I_F = 20 mA		λ_d	598	605	612	nm
Peak wavelength	I_F = 20 mA		λ_p	-	611	-	nm
Angle of half intensity	I_F = 20 mA		φ	-	± 65	-	°
Spectral line half width	I_F = 20 mA		$\Delta\lambda$	-	17	-	nm
Forward voltage	I_F = 20 mA		V_F	1.80	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)
VLMY150., YELLOW

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	I_F = 20 mA	VLMY1500	I_V	28	90	180	mcd
	I_F = 20 mA	VLMY1501	I_V	45	90	180	mcd
Dominant wavelength	I_F = 20 mA		λ_d	587	590	597	nm
Peak wavelength	I_F = 20 mA		λ_p	-	588	-	nm
Angle of half intensity	I_F = 20 mA		φ	-	± 65	-	°
Spectral line half width	I_F = 20 mA		$\Delta\lambda$	-	15	-	nm
Forward voltage	I_F = 20 mA		V_F	1.80	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	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	I_F = 20 mA	VLMG1500	I_V	18	35	112	mcd
Dominant wavelength	I_F = 20 mA		λ_d	567.5	571	576.5	nm
Peak wavelength	I_F = 20 mA		λ_p	-	574	-	nm
Angle of half intensity	I_F = 20 mA		φ	-	± 65	-	°
Spectral line half width	I_F = 20 mA		$\Delta\lambda$	-	15	-	nm
Forward voltage	I_F = 20 mA		V_F	1.9	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)
VLMTG150., TRUE GREEN

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	I_F = 5 mA	VLMTG1500	I_V	28.0	-	280	mcd
	I_F = 5 mA	VLMTG1501	I_V	56	-	180	mcd
Dominant wavelength	I_F = 5 mA		λ_d	520	-	535	nm
Peak wavelength	I_F = 5 mA		λ_p	-	525	-	nm
Angle of half intensity	I_F = 5 mA		φ	-	± 65	-	°
Spectral line half width	I_F = 5 mA		$\Delta\lambda$	-	35	-	nm
Forward voltage	I_F = 5 mA		V_F	2.50	-	3.10	V
Reverse current	V_R = 5 V		I_R	-	-	10	µA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
VLMB150., BLUE

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	I_F = 5 mA	VLMB1500	I_V	11.2	28	45	mcd
	I_F = 5 mA	VLMB1501	I_V	22.4	28	71	mcd
Dominant wavelength	I_F = 5 mA		λ_d	470	472	475	nm
Peak wavelength	I_F = 5 mA		λ_p	-	468	-	nm
Angle of half intensity	I_F = 5 mA		φ	-	± 65	-	°
Spectral line half width	I_F = 5 mA		$\Delta\lambda$	-	25	-	nm
Forward voltage	I_F = 5 mA		V_F	2.65	2.80	3.15	V
Reverse current	V_R = 5 V		I_R	-	-	10	µA

LUMINOUS INTENSITY CLASSIFICATION

GROUP	LUMINOUS INTENSITY (mcd)	
	MIN.	MAX.
VLMS150x, VLMO1500, VLMY150x, VLMTG1500, VLMG1500, VLMB1500		
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
VLMB1501, VLMTG1501		
M2	22.4	28
N1	28	35.5
N2	35.5	45
P1	45	56
P2	56	71
Q1	71	90
Q2	90	112
R1	112	140
R2	140	180

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
True green	AP	520	525
	AQ	525	530
	AR	530	535
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
True green	E6	2.50	2.70
	E7	2.70	2.90
	E8	2.90	3.10
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)

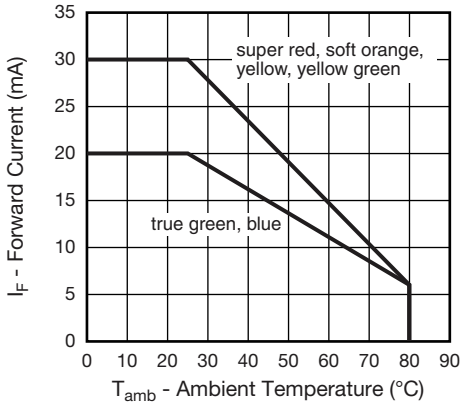


Fig. 1 - Forward Current vs. Ambient Temperature

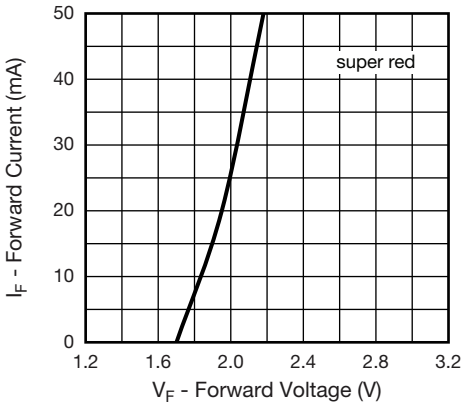


Fig. 2 - Forward Current vs. Forward Voltage (super red)

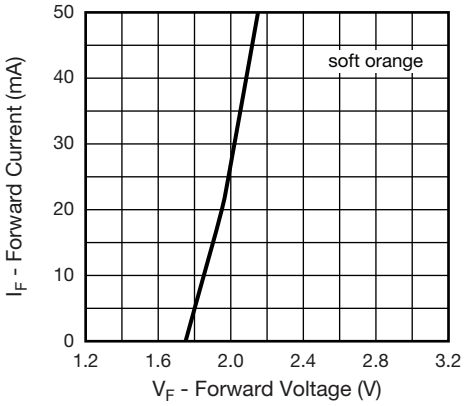


Fig. 3 - Forward Current vs. Forward Voltage (soft orange)

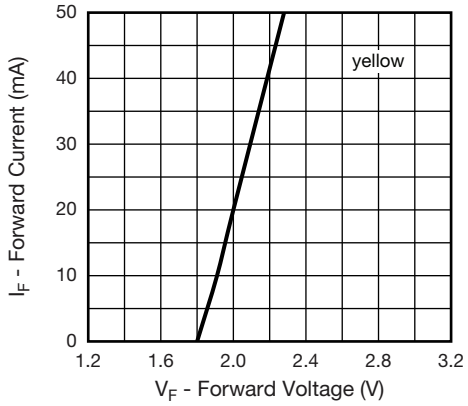


Fig. 4 - Forward Current vs. Forward Voltage (yellow)

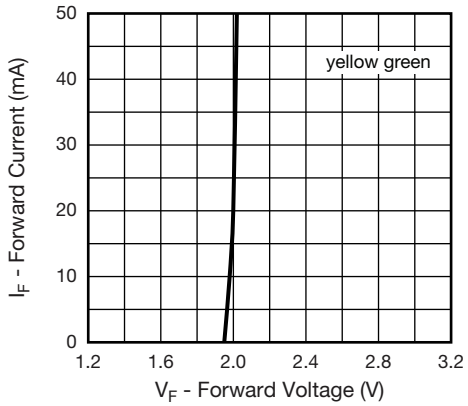


Fig. 5 - Forward Current vs. Forward Voltage (yellow green)

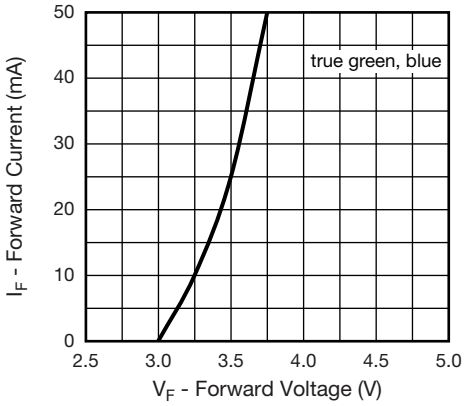


Fig. 6 - Forward Current vs. Forward Voltage (true green, blue)

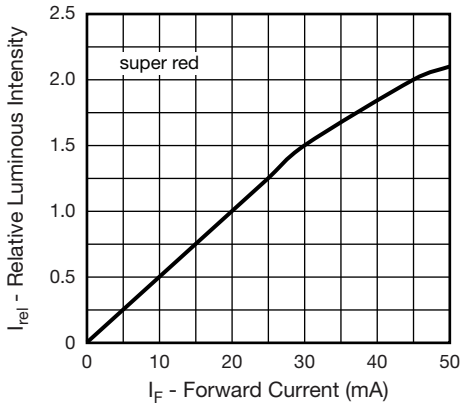


Fig. 7 - Relative Luminous Intensity vs. Forward Current (super red)

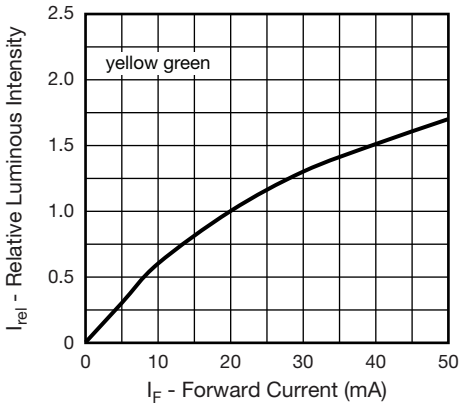


Fig. 10 - Relative Luminous Intensity vs. Forward Current (yellow green)

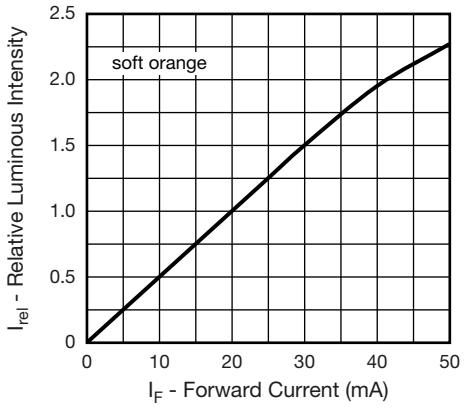


Fig. 8 - Relative Luminous Intensity vs. Forward Current (soft orange)

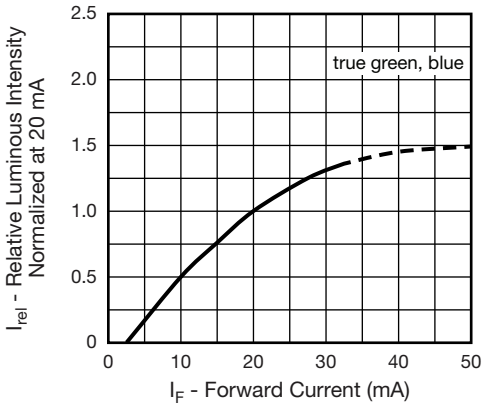


Fig. 11 - Relative Luminous Intensity vs. Forward Current (true green, blue)

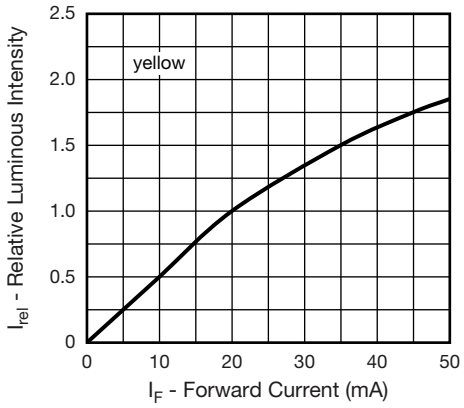


Fig. 9 - Relative Luminous Intensity vs. Forward Current (yellow)

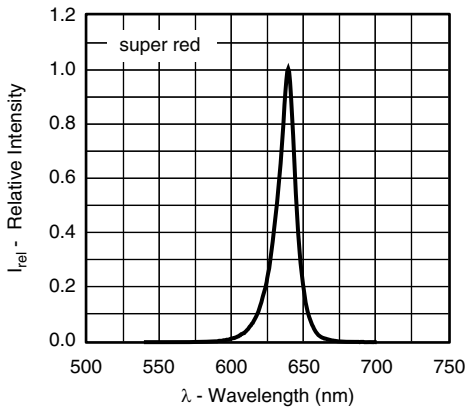


Fig. 12 - Relative Intensity vs. Wavelength (super red)

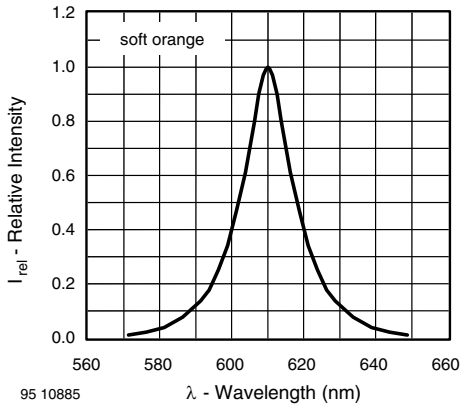


Fig. 13 - Relative Intensity vs. Wavelength (soft orange)

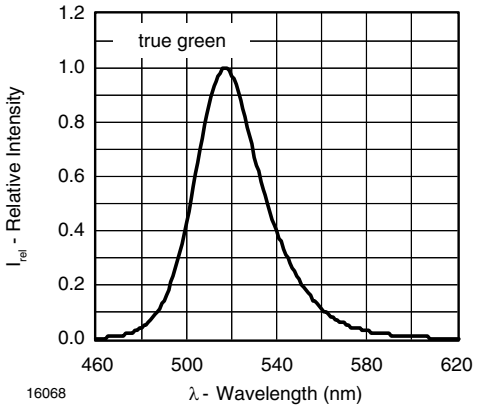


Fig. 16 - Relative Intensity vs. Wavelength (true green)

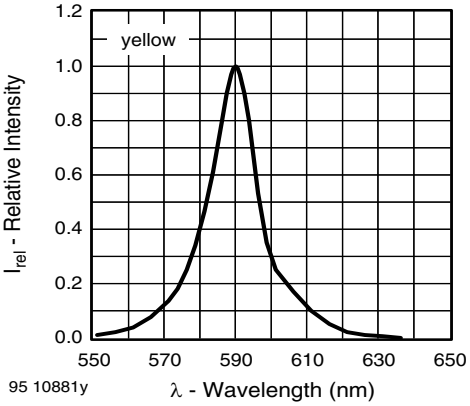


Fig. 14 - Relative Intensity vs. Wavelength (yellow)

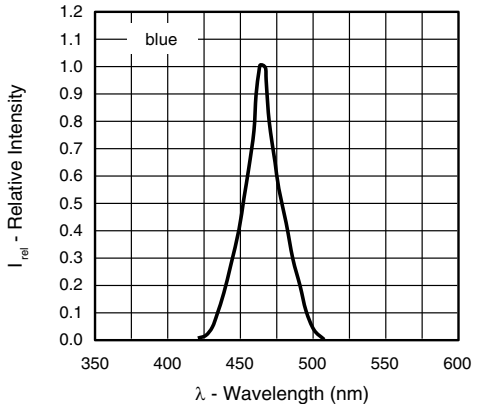


Fig. 17 - Relative Intensity vs. Wavelength (blue)

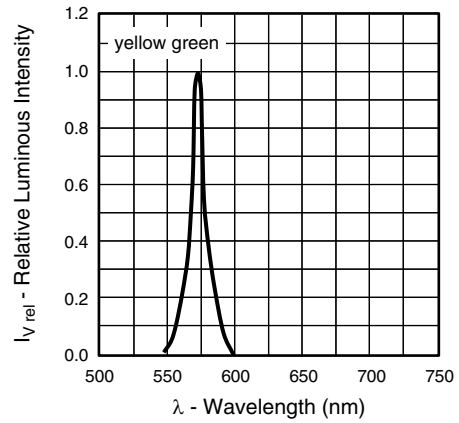


Fig. 15 - Relative Intensity vs. Wavelength (yellow green)

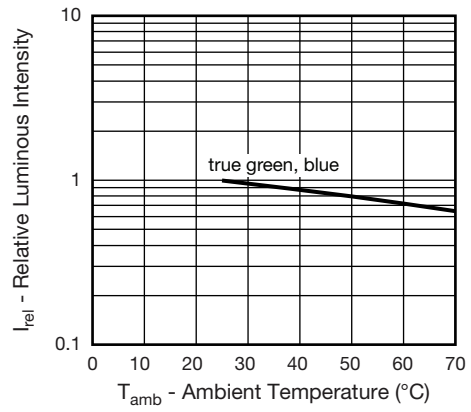


Fig. 18 - Relative Luminous Intensity vs. Ambient Temperature

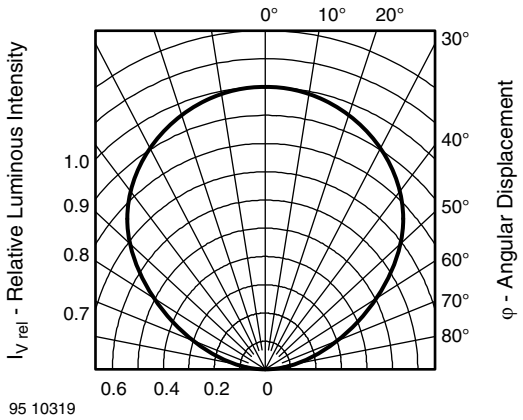
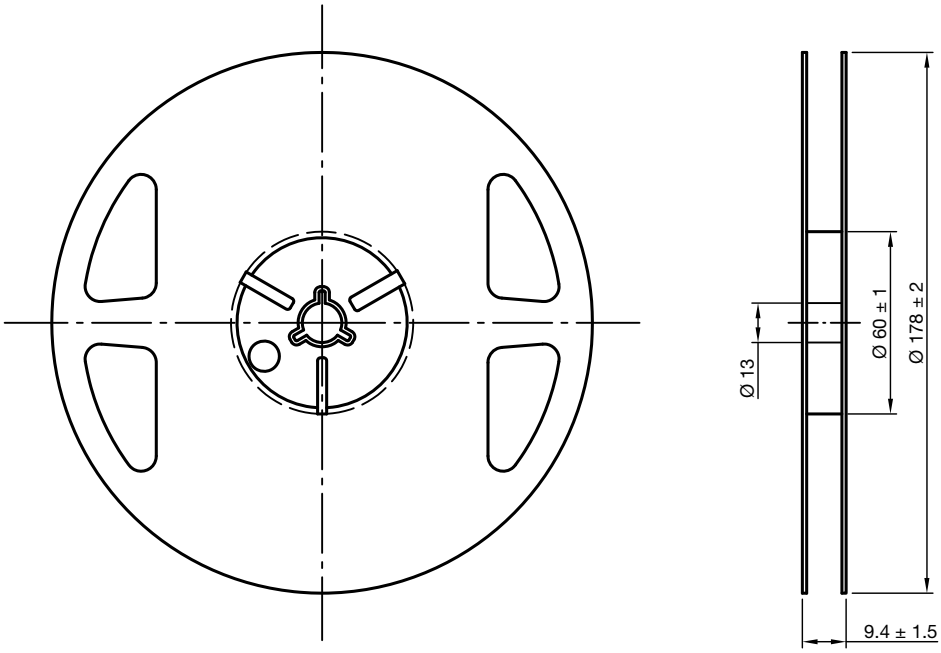


Fig. 19 - Relative Luminous Intensity vs. Angular Displacement

REEL DIMENSIONS in millimeters



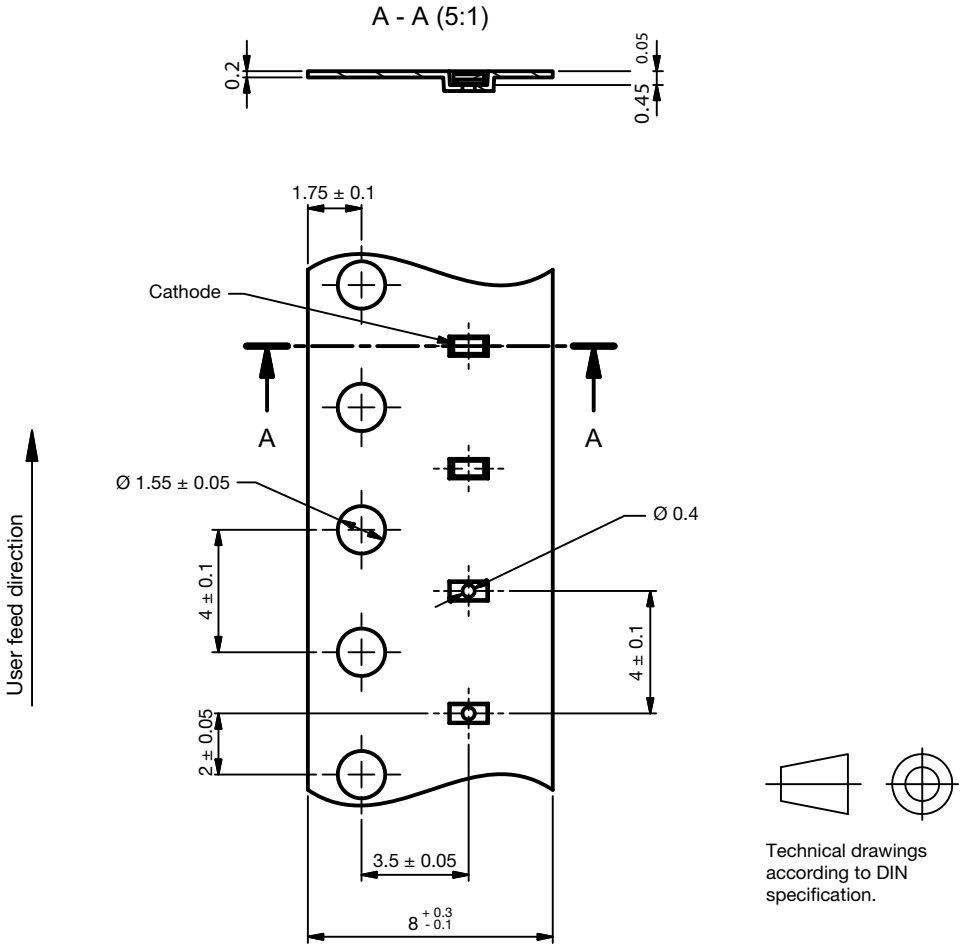
Drawing-No.: 9.800-5122.01-4
Issue: 2; 03.11.11
22611

technical drawings
according to DIN
specifications

Reels come in quantity of 3000 units.
MOQ: 3 reels (9000 pcs)

TAPE DIMENSIONS in millimeters

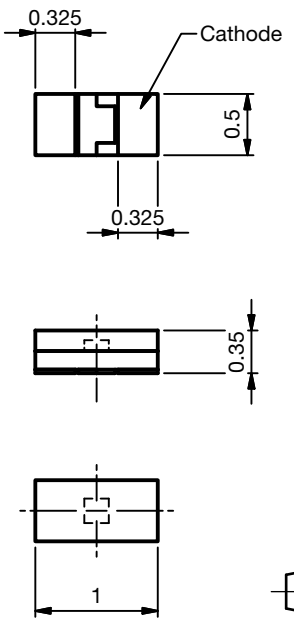
VLMx150x-Series



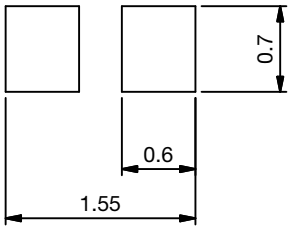
Drawing-No.: 9.700-5388.01-4
Issue: 1; 20.03.12

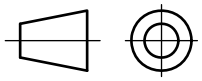
PACKAGE DIMENSIONS in millimeters

VLMx150x-Series



Recommended solder pad footprint

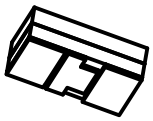




Technical drawings according to DIN specification

Not indicated tolerances ± 0.1

Drawing-No.: 6.541-5096.01-4
Issue: 2; 10.03.21



SOLDERING PROFILE

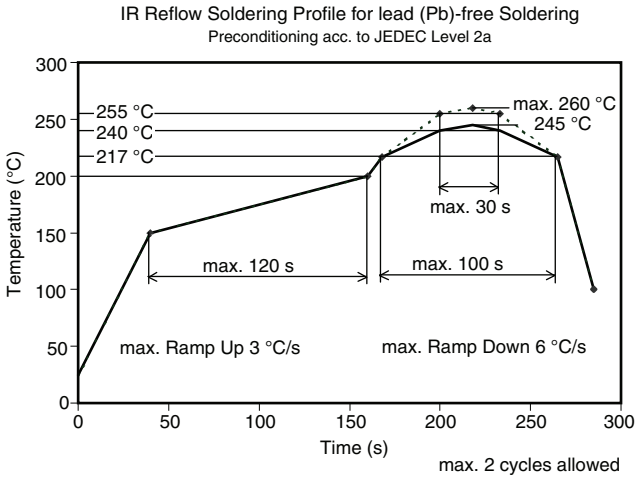
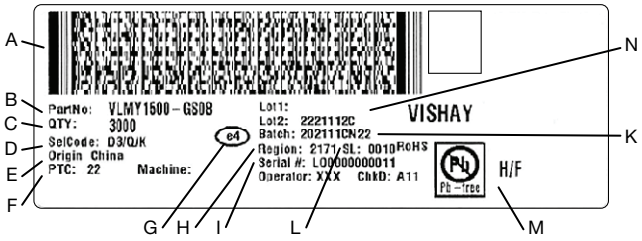


Fig. 20 - Vishay Lead (Pb)-free Reflow Soldering Profile (according to J-STD-020C)

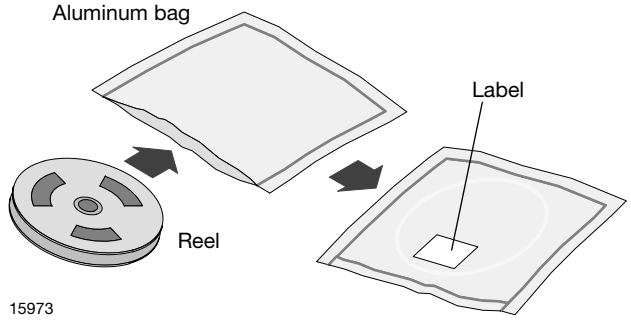
BAR CODE PRODUCT LABEL (Example only)



A. 2D barcode
B. Part No: Vishay part number
C. QTY: quantity
D. SelCode: selection bin code
E. Country of origin
F. PTC: product 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 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:

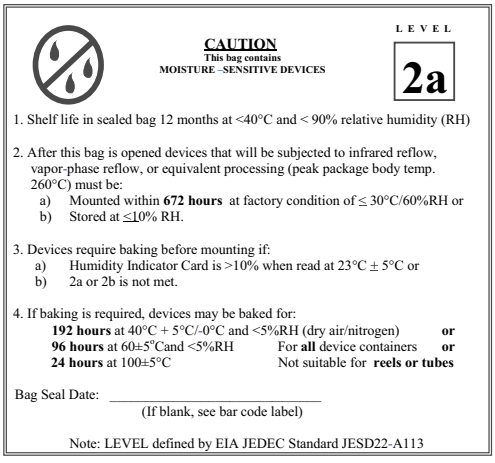
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

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.



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.

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