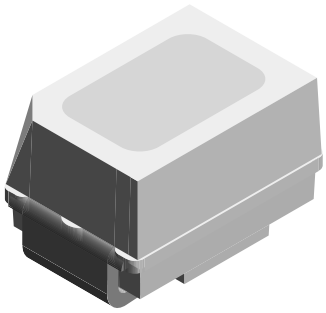
Power Mini SMD LED



19226

FEATURES

- Utilizing latest advanced AlInGaP technology
- Available in 8 mm tape
- Luminous intensity and color categorized per packing unit
- Luminous intensity ratio per packing unit $I_{Vmax.}/I_{Vmin.} \leq 1.6$
- ESD-withstand voltage: up to 2 kV according to JESD22-A114-B
- Preconditioning according to JEDEC® level 2a
- IR reflow soldering
- 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 MiniLED series has 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. The MiniLED is an obvious solution for small-scale, high-power products that are expected to work reliably in an arduous environment. This is often the case in automotive and industrial application.

PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Product series: power
- Package: SMD MiniLED
- Angle of half intensity: ± 60°

APPLICATIONS

- Traffic signals and signs
- Interior and exterior lighting
- Dashboard illumination
- Indicator and backlighting purposes for audio, video, LCDs switches, symbols, illuminated advertising etc.

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.		
VLMS235S2U1-GS08	Super red	224	370	560	20	626	630	639	20	1.8	2.1	2.6	20	AlInGaP on Si
VLMR235T2V1-GS08	Red	355	520	900	20	619	625	631	20	1.8	2.1	2.6	20	AlInGaP on Si
VLMK235T2V1-GS08	Amber	355	550	900	20	611	616	622	20	1.8	2.0	2.6	20	AlInGaP on Si
VLMO235U1V2-GS08	Soft orange	450	650	1120	20	600	605	611	20	1.8	2.0	2.6	20	AlInGaP on Si
VLMO235U2V2-35-08	Soft orange	560	700	1120	20	602	605	609	20	1.8	2.0	2.6	20	AlInGaP on Si
VLMY235T2V1-GS08	Yellow	355	520	900	20	583	589	594	20	1.8	2.1	2.6	20	AlInGaP on Si

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)
VLMS235.., VLMR235.., VLMK235.., VLMO235.., VLMY235..

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage (1)	Not designed for reverse operation	V_R	-	V
DC Forward current	$T_{amb} \leq 60$ °C (480 K/W)	I_F	50	mA
Power dissipation		P_V	130	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-to-ambient	Mounted on PC board (pad size > 16 mm²)	R_{thJA}	480	K/W

Note

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

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OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
VLMS235.., SUPER RED

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	I_F = 20 mA	VLMS235S2U1	I_V	224	370	560	mcd
Luminous flux/luminous intensity			ϕ_V/I_V	-	3	-	mlm/mcd
Dominant wavelength	I_F = 20 mA		λ_d	626	630	639	nm
Peak wavelength	I_F = 20 mA		λ_p	-	639	-	nm
Spectral bandwidth at 50 % $I_{rel\ max.}$	I_F = 20 mA		$\Delta\lambda$	-	18	-	nm
Angle of half intensity	I_F = 20 mA		φ	-	± 60	-	deg
Forward voltage	I_F = 20 mA		V_F	1.8	2.1	2.6	V
Reverse current	V_R = 5 V		I_R	-	0.01	10	µA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
VLMR235.., RED

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	I_F = 20 mA	VLMR235T2V1	I_V	355	520	900	mcd
Luminous flux/luminous intensity			ϕ_V/I_V	-	3	-	mlm/mcd
Dominant wavelength	I_F = 20 mA		λ_d	619	625	631	nm
Peak wavelength	I_F = 20 mA		λ_p	-	632	-	nm
Spectral bandwidth at 50 % $I_{rel\ max.}$	I_F = 20 mA		$\Delta\lambda$	-	18	-	nm
Angle of half intensity	I_F = 20 mA		φ	-	± 60	-	deg
Forward voltage	I_F = 20 mA		V_F	1.8	2.1	2.6	V
Reverse current	V_R = 5 V		I_R	-	0.01	10	µA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
VLMK235.., AMBER

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	I_F = 20 mA	VLMK235T2V1	I_V	355	550	900	mcd
Luminous flux/luminous intensity			ϕ_V/I_V	-	3	-	mlm/mcd
Dominant wavelength	I_F = 20 mA		λ_d	611	616	622	nm
Peak wavelength	I_F = 20 mA		λ_p	-	622	-	nm
Spectral bandwidth at 50 % $I_{rel\ max.}$	I_F = 20 mA		$\Delta\lambda$	-	18	-	nm
Angle of half intensity	I_F = 20 mA		φ	-	± 60	-	deg
Forward voltage	I_F = 20 mA		V_F	1.8	2.0	2.6	V
Reverse current	V_R = 5 V		I_R	-	0.01	10	µA

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
VLMO235.., SOFT ORANGE

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	I_F = 20 mA	VLMO235U1V2	I_V	450	650	1120	mcd
		VLMO235U2V2-35		560	700	1120	
Luminous flux/luminous intensity			ϕ_V/I_V	-	3	-	mlm/mcd
Dominant wavelength	I_F = 20 mA	VLMO235U1V2	λ_d	600	605	611	nm
		VLMO235U2V2-35		602	605	609	nm
Peak wavelength	I_F = 20 mA		λ_p	-	611	-	nm
Spectral bandwidth at 50 % $I_{rel\ max.}$	I_F = 20 mA		$\Delta\lambda$	-	17	-	nm
Angle of half intensity	I_F = 20 mA		φ	-	± 60	-	deg
Forward voltage	I_F = 20 mA		V_F	1.8	2.0	2.6	V
Reverse current	V_R = 5 V		I_R	-	0.01	10	µA

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OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
VLMY235.., YELLOW

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	I_F = 20 mA	VLMY235T2V1	I_V	355	520	900	mcd
Luminous flux/luminous intensity			ϕ_V/I_V	-	3	-	mlm/mcd
Dominant wavelength	I_F = 20 mA		λ_d	583	589	594	nm
Peak wavelength	I_F = 20 mA		λ_p	-	591	-	nm
Spectral bandwidth at 50 % $I_{rel\ max.}$	I_F = 20 mA		$\Delta\lambda$	-	17	-	nm
Angle of half intensity	I_F = 20 mA		φ	-	± 60	-	deg
Forward voltage	I_F = 20 mA		V_F	1.8	2.1	2.6	V
Reverse current	V_R = 5 V		I_R	-	0.01	10	µA

COLOR CLASSIFICATION

GROUP	DOMINANT WAVELENGTH (nm)					
	AMBER		SOFT ORANGE		YELLOW	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
1	611	618				
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

Note

- Wavelengths are tested at a current pulse duration of 25 ms

LUMINOUS INTENSITY CLASSIFICATION

GROUP	LUMINOUS INTENSITY (mcd)		
STANDARD	OPTIONAL	MIN.	MAX.
S	2	224	280
T	1	280	355
	2	355	450
U	1	450	560
	2	560	710
V	1	710	900
	2	900	1120

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 on any one reel.
  In order to ensure availability, single wavelength groups will not be orderable

CROSSING TABLE

VISHAY	OSRAM
VLMK235T2V1	LAM67B-T2V1-1
VLMS235S2U1	LS M67F-S2U2-1
VLMO235U2V2-35	LO M67F-U2AB-24
VLMY235T2V1	LY M67F-T2V2-36

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

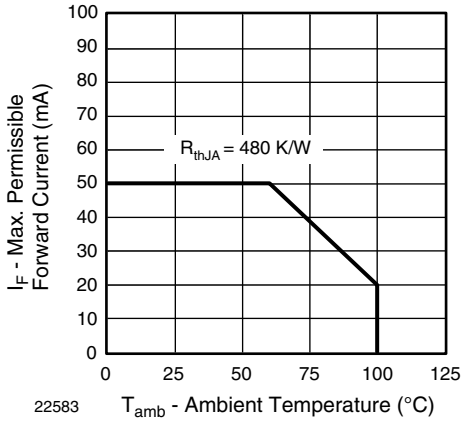


Fig. 1 - Maximum Permissible Forward Current vs. Ambient Temperature

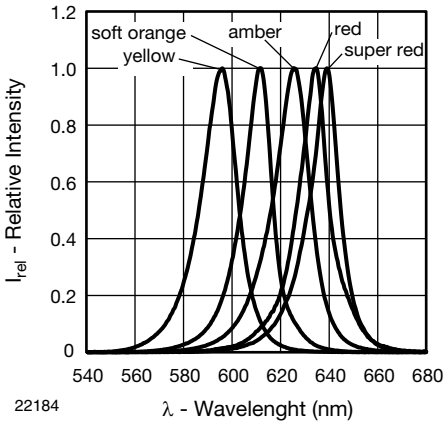


Fig. 4 - Relative Intensity vs. Wavelength

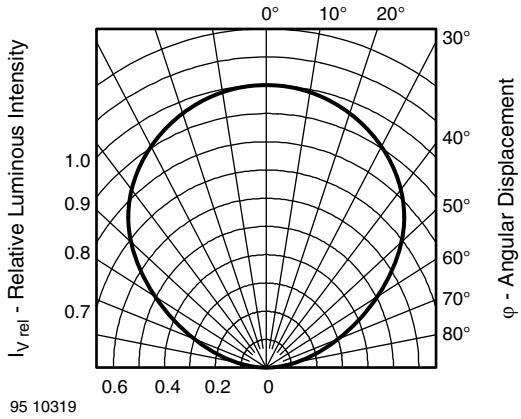


Fig. 2 - Relative Luminous Intensity vs. Angular Displacement

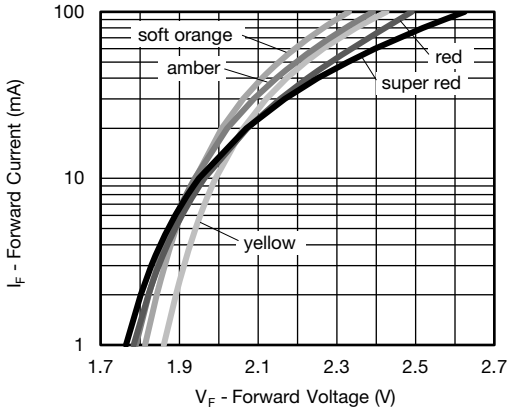


Fig. 5 - Forward Current vs. Forward Voltage

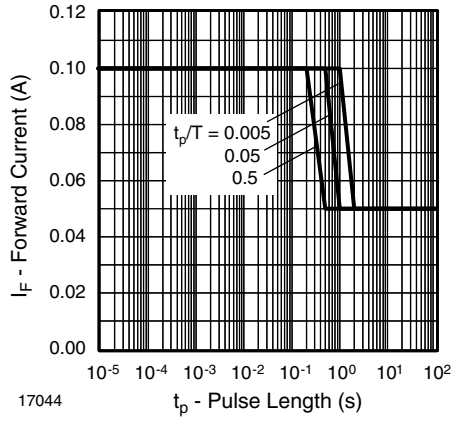


Fig. 3 - Forward Current vs. Pulse Length

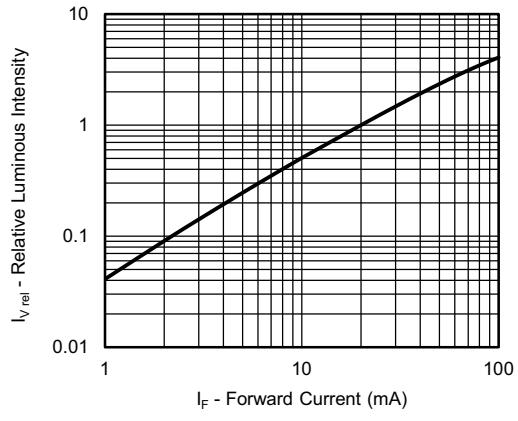


Fig. 6 - Relative Luminous Intensity vs. Forward Current

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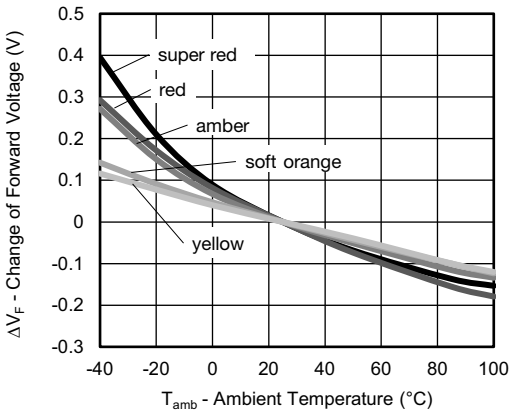


Fig. 7 - Change of Forward Voltage vs. Ambient Temperature

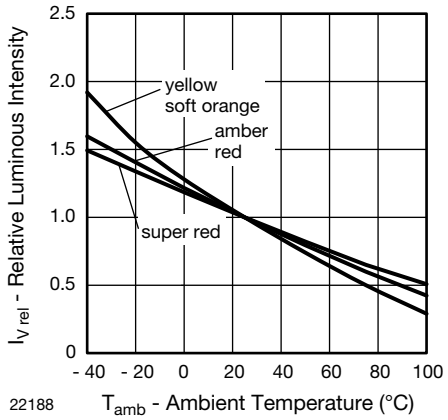


Fig. 8 - Relative Luminous Intensity vs. Ambient Temperature

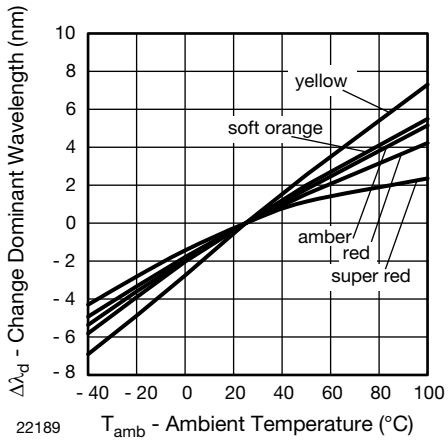
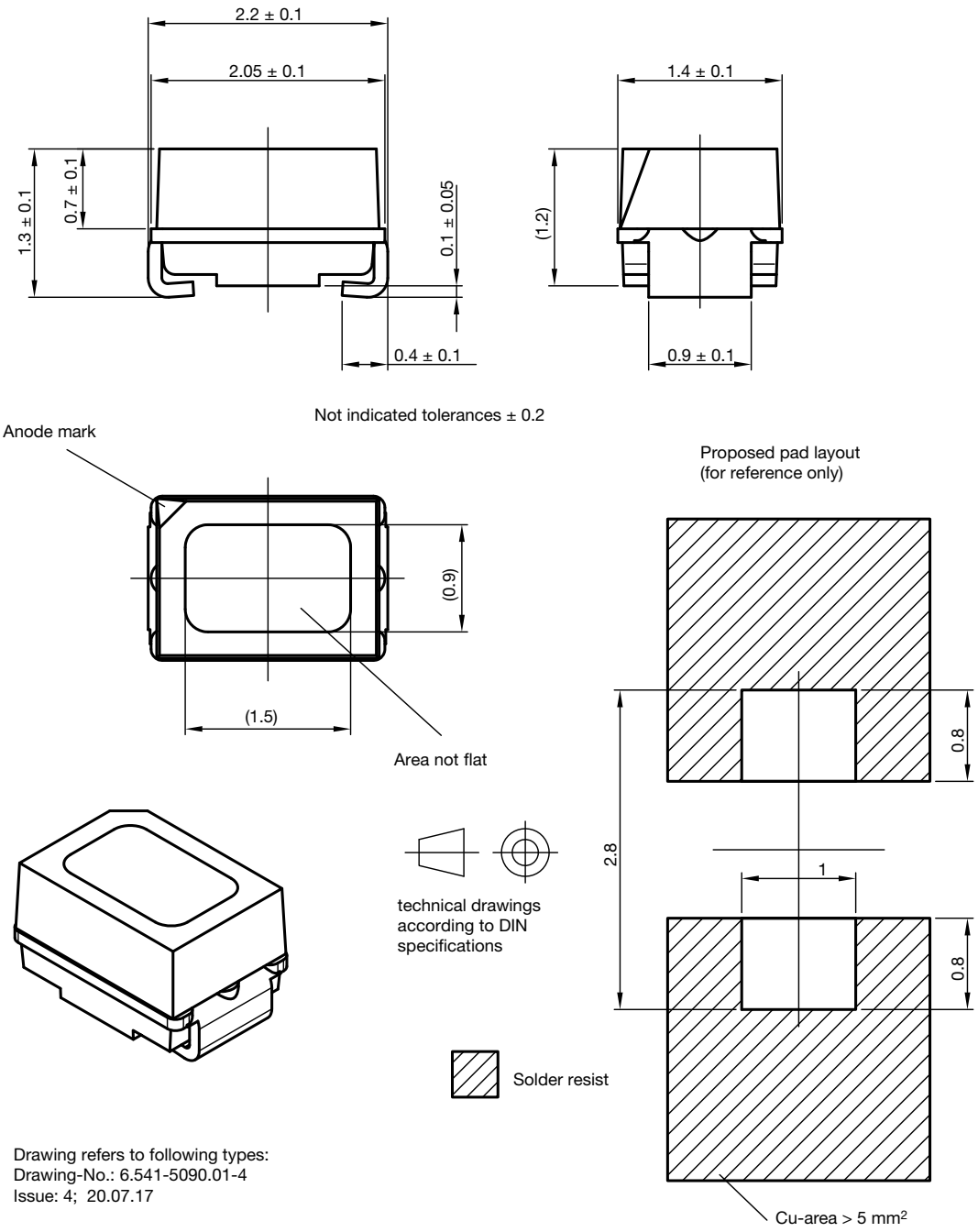


Fig. 9 - Change of Dominant Wavelength vs. Ambient Temperature

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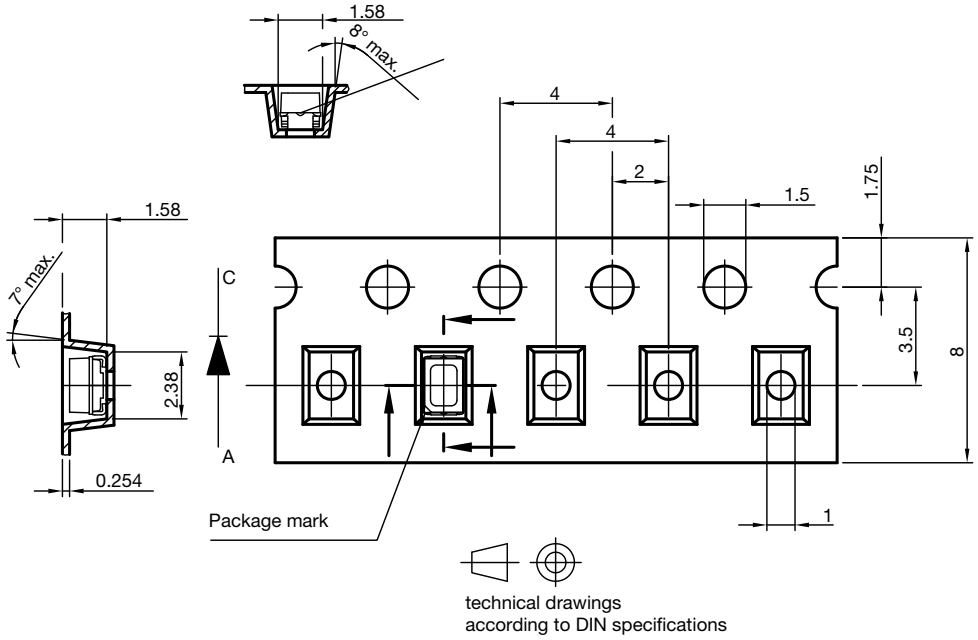
PACKAGE DIMENSIONS in millimeters



Drawing refers to following types:
Drawing-No.: 6.541-5090.01-4
Issue: 4; 20.07.17

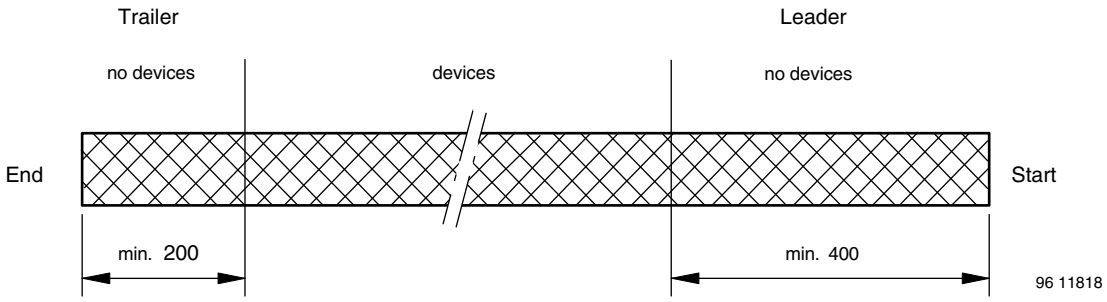
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TAPE DIMENSIONS in millimeters



Drawing refers to following types: Mini - SMD - LED with reverse polarity: VLM. 233..., VLM. 235...
Drawing-No.: 9.700-5381.01-4
Issue: 2; 20.07.17

LEADER AND TRAILER DIMENSIONS in millimeters



GS08 = 3000 pcs

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.

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SOLDERING PROFILE

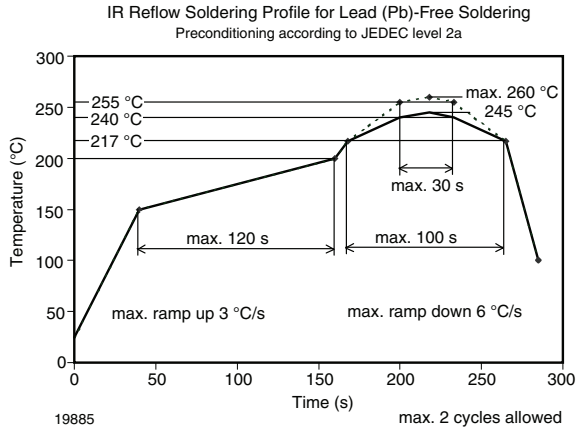
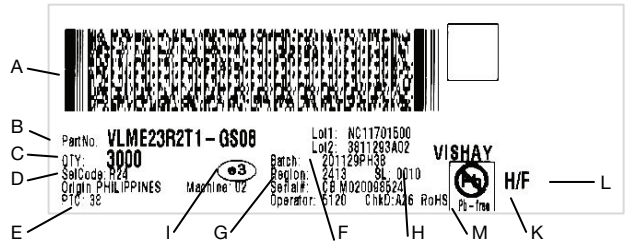


Fig. 10 - Vishay Lead (Pb)-free Reflow Soldering Profile (according to J-STD-020)

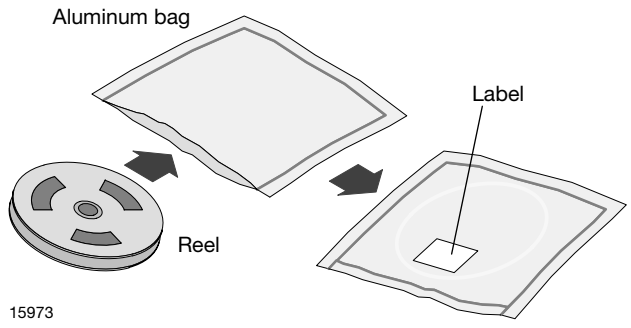
BAR CODE PRODUCT LABEL (example)



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

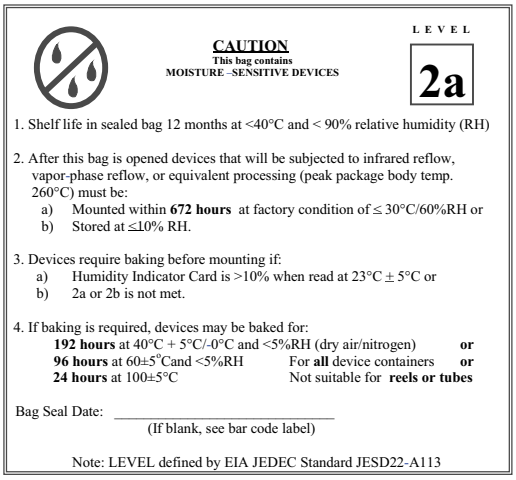
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

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.



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 LABEL

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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