Multi SMD LED RGB

FEATURES

- Utilizing high brightness AlInGaP and InGaN chip technologies
- 6 pin RGB SMD LED package allows independent control of each chip
- Compact package outline dimensions (L x W x H in mm): 3.5 x 2.8 x 1.45
- AEC-Q101 qualified, according to version D
- Qualified according to JEDEC® moisture sensitivity level 2
- Compatible to IR reflow soldering
- Operation temperature range: -40 °C to 110 °C
- Excellent corrosion robustness (H_2S)
- ESD-withstand voltage: up to 2 kV according to JESD22-A114-B
- Luminous intensities and colors categorized per reel
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

e4

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

DESCRIPTION

The VLMRGB611.. is a high brightness tricolor LED designed primarily for interior automotive lighting, RGB displays and backlights. It is using the popular 3528 SMD package with white reflector and lambertian emission characteristic. The PLCC-6 package allows independent individual driving of each chip also in serial circuits and thus a gapless coverage of a wide color space by additive color mixing. It provides high reliability in a large temperature range from -40 °C to +110°C, using highly suitable UV stable package materials and corrosion resistant metal surfaces.

PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD PLCC-6
- Product series: RGB
- Angle of half intensity: ± 60°

APPLICATIONS

- Automotive, interior lighting
- Wide range of accent and decorative lighting
- Displays: full color message and displays video boards
- Consumer appliances: backlight LCDs, PDAs, TVs
- Industry: white goods such as ovens, microwaves, 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.		
VLMRGB6112-00-GS08	Red	560	730	920	20	618	624	629	20	1.8	2.0	2.4	20	AlInGaP
	True green	900	1030	1800	20	519	526	534	20	2.7	3.1	3.6	20	InGaN
	Blue	180	230	450	20	463	469	476	20	2.7	3.0	3.6	20	InGaN

Note

- Measurement accuracy: ± 11 % for luminous intensity, ± 1 nm for dominant wavelength, ± 0.1 V for forward voltage

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)
VLMRGB6112.., RED

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Forward current		I_F	30	mA
Power dissipation		P_{tot}	72	mW
Junction temperature		T_j	115	°C
Peak forward current	t_p < 100 µs, duty cycle = 0.1	I_{FM}	100	mA
Thermal resistance junction-to-solder point, 1 chip		R_{thJP}	170	K/W
Thermal resistance junction-to-ambient, 1 chip	Mounted on FR4 PC board (t = 1.6 mm) with Cu pad size > 16 mm^2	R_{thJA}	210	K/W
Operating temperature		T_{amb}	-40 to +110	°C
Storage temperature		T_{stg}	-40 to +110	°C
ESD voltage	HBM	V_{ESD}	2000	V

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)
VLMRGB6112.., TRUE GREEN, BLUE

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Forward current		I_F	30	mA
Power dissipation		P_{tot}	114	mW
Junction temperature		T_j	125	°C
Peak forward current	t_p < 100 µs, duty cycle = 0.1	I_{FM}	100	mA
Thermal resistance junction-to-solder point, 1 chip		R_{thJP}	170	K/W
Thermal resistance junction-to-ambient, 1 chip	Mounted on FR4 PC board (t = 1.6 mm) with Cu pad size > 16 mm^2	R_{thJA}	210	K/W
Operating temperature		T_{amb}	-40 to +110	°C
Storage temperature		T_{stg}	-40 to +110	°C
ESD voltage	HBM	V_{ESD}	2000	V

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
VLMRGB6112.., RED, TRUE GREEN, BLUE

PARAMETER	TEST CONDITION	PART	COLOR	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	I_F = 20 mA	VLMRGB6112-00	red	I_V	560	730	920	mcd
			true green		900	1030	1800	
			blue		180	230	450	
Dominant wavelength		VLMRGB6112-00	red	λ_d	618	624	629	nm
			true green		519	526	534	
			blue		463	469	476	
Peak wavelength			red	λ_p	-	630	-	nm
			true green		-	518	-	
			blue		-	468	-	
Spectral half width at 50 % I_{rel} max.			red	$\Delta\lambda_{0.5}$	-	20	-	nm
			true green		-	35	-	
			blue		-	25	-	
Angle of half intensity			red	φ	-	± 60	-	deg
			true green					
			blue					
Forward voltage			red	V_F	1.8	2.0	2.4	V
			true green		2.7	3.1	3.6	
			blue		2.7	3.0	3.6	
Reverse current (1)	V_R = 12 V	VLMRGB6112-00	red	I_R	-	-	10	µA
Reverse voltage (1)	I_{FZ} = 20 mA		true green	V_R	-	-	1.2	V
			blue					

Notes
- Not designed for operating in reverse direction.
  Measurement accuracy: ± 11 % for luminous intensity, ± 1 nm fir dominant wavelength, ± 0.1 V for forward voltage

(1) Only applied for testing purpose

LUMINOUS INTENSITY CLASSIFICATION

COLOR	GROUP	LUMINOUS INTENSITY I_V (mcd)	
		MIN.	MAX.
Blue	S1	180	224
	S2	224	280
	T1	280	355
	T2	355	450
Red	U2	560	710
	V1	710	920
True green	V2	900	1120
	AA	1120	1400
	AB	1400	1800

Note

- Luminous intensity is tested at a current pulse duration of 25 ms and an accuracy of ± 11 %.
  The above classification represents the brightness range which includes only a few brightness groups. Only one group per color 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

COLOR CLASSIFICATION

GROUP	DOM. WAVELENGTH (nm)					
	BLUE		RED		TRUE GREEN	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
1	463	467	-	-	-	-
2	467	471	-	-	-	-
3	471	476	-	-	-	-
4	-	-	618	629	-	-
5	-	-	-	-	519	524
6	-	-	-	-	524	529
7	-	-	-	-	529	534

Note

- Wavelengths are tested at a current pulse duration of 25 ms and an accuracy of ± 1 nm. Only one wavelength group is allowed for each chip within one reel

MARKING EXAMPLE FOR SELECTION CODE ON LABEL

Selection code: V1V2S2-462 (sequence: RGB for both, I_V and color groups)

- V1V2S2:
  - I_V group red: V1 (710 mcd to 920 mcd)
  - I_V group green: V2 (900 mcd to 1120 mcd)
  - I_V group blue: S2 (224 mcd to 280 mcd)
- 462:
  - color group red: 4 (618 nm to 629 nm)
  - color group green: 6 (524 nm to 529 nm)
  - color group blue: 2 (467 nm to 471 nm)

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

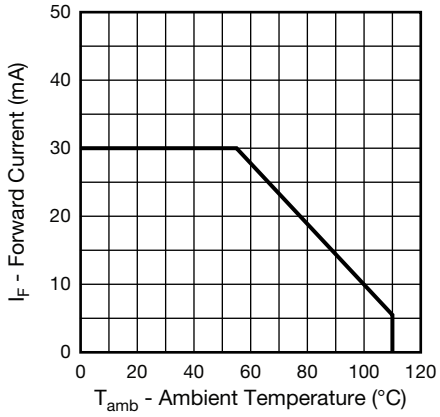


Fig. 1 - Forward Current vs. Ambient Temperature

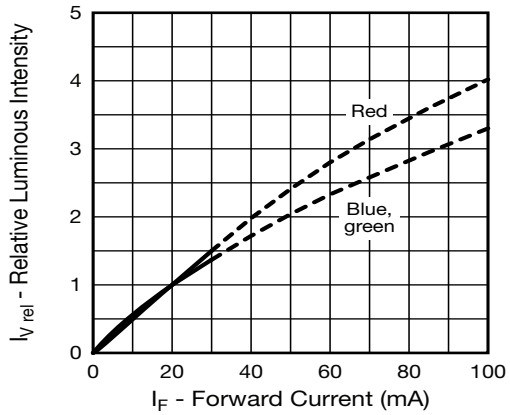


Fig. 4 - Relative Luminous Intensity vs. Forward Current

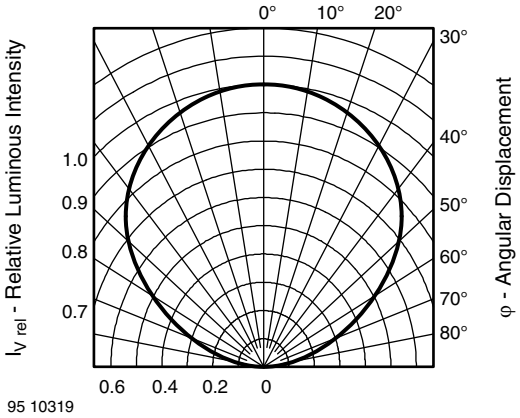


Fig. 2 - Relative Luminous Intensity vs. Angular Displacement

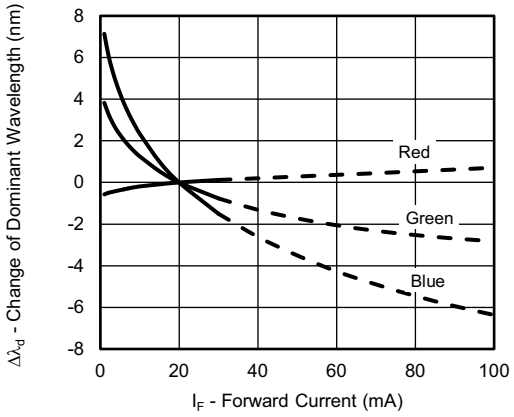


Fig. 5 - Change of Dominant Wavelength vs. Forward Current

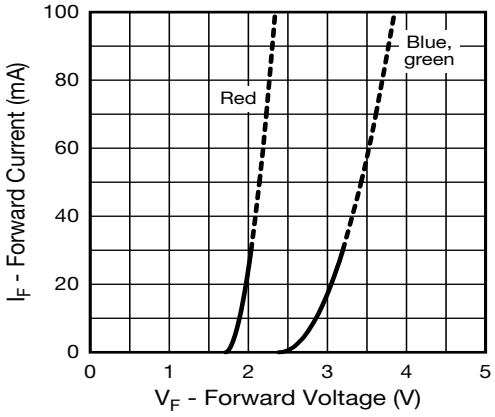


Fig. 3 - Forward Current vs. Forward Voltage

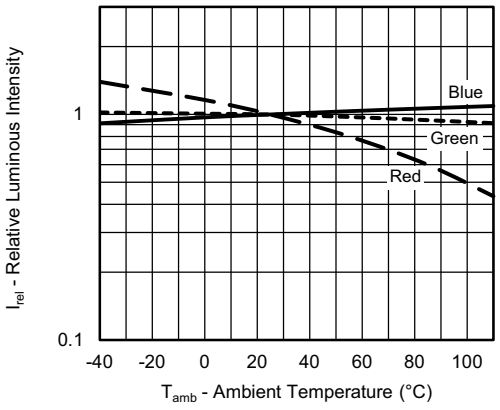


Fig. 6 - Relative Luminous Intensity vs. Ambient Temperature

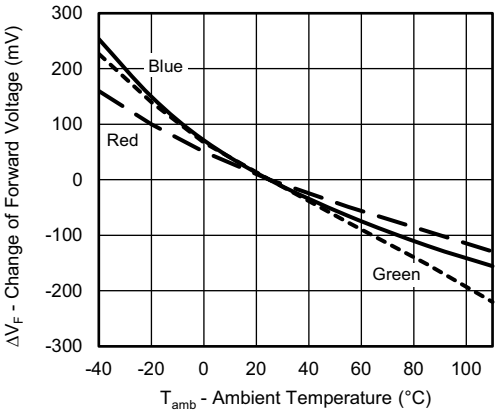


Fig. 7 - Change of Forward Voltage vs. Ambient Temperature

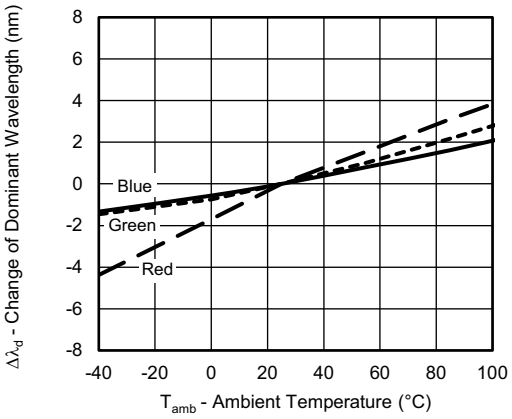


Fig. 8 - Change of Dominant Wavelength vs. Ambient Temperature

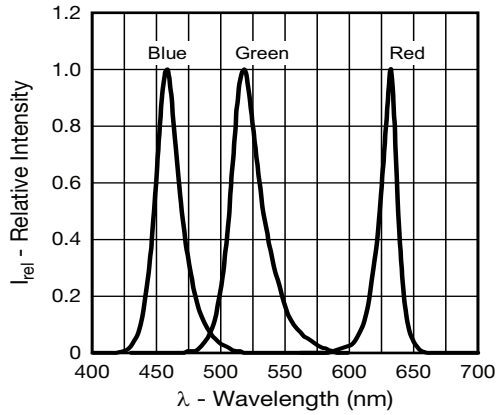
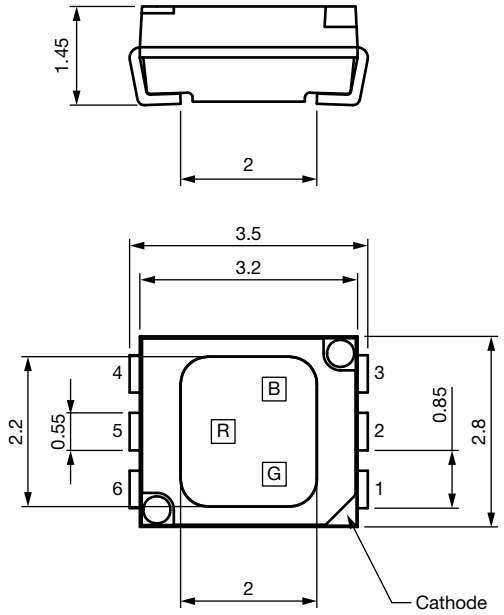
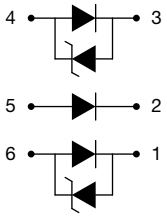


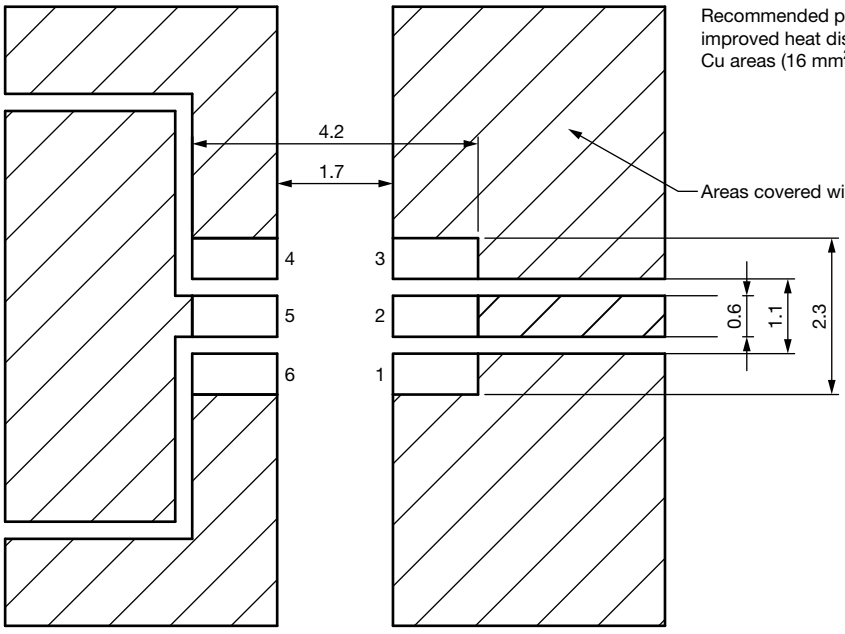
Fig. 9 - Relative Intensity vs. Wavelength

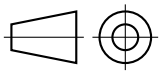
PACKAGE DIMENSIONS / SOLDERING PADS DIMENSIONS in millimeters



Source Color	Pin Assignment
InGaN Green	1, 6
AlInGaP Red	2, 5
InGaN Blue	3, 4





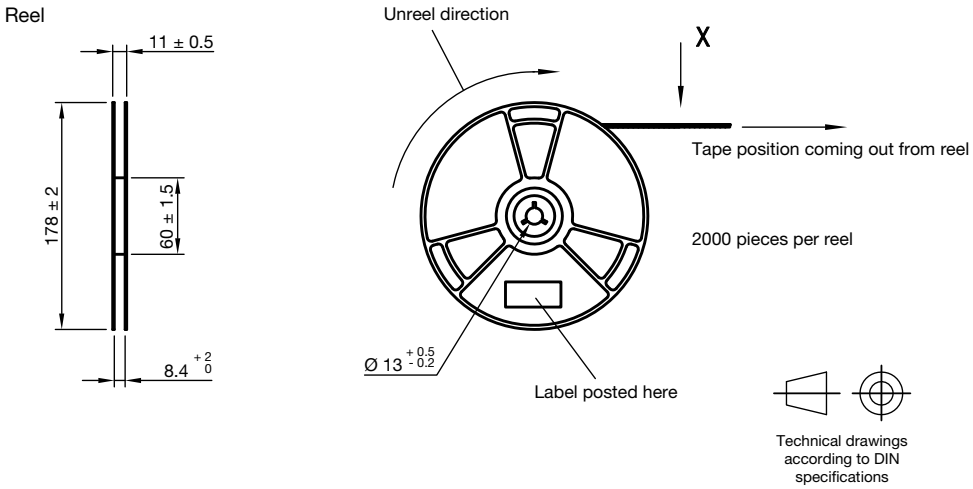


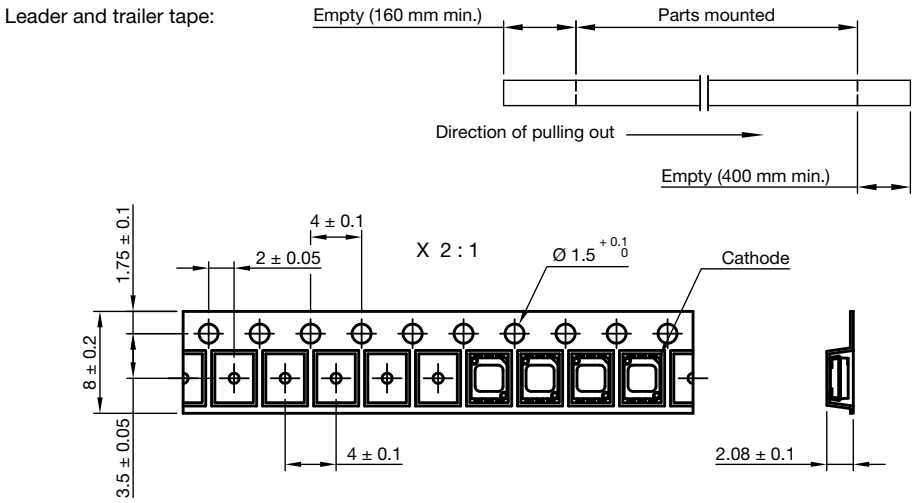
Technical drawing
according to DIN
specifications

Drawing-No.: 6.541-5111.01-4
Issue: 2; 11.04.17

Not indicated tolerances ± 0.1

TAPING DIMENSIONS in millimeters





Drawing-No.: 9.800-5136.01-4
Issue: 1; 16.09.15

SOLDERING PROFILE

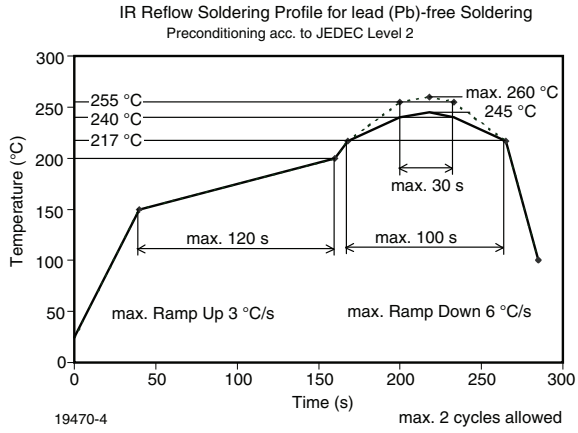
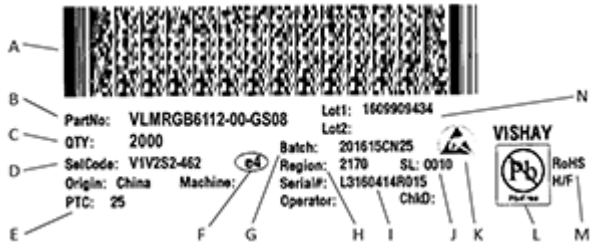


Fig. 10 - Vishay Lead (Pb)-free Reflow Soldering Profile
According to J-STD-020

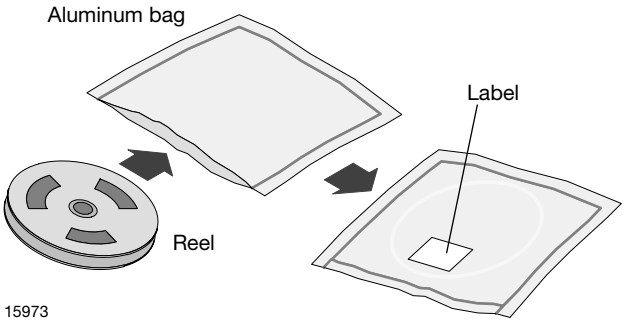
BAR CODE PRODUCT LABEL (example)



A. 2D bar code
B. Vishay part number
C. Quantity
D. Selection code (bin): brightness and color groups
E. Code of manufacturing plant
F. Termination plating finish
G. Batch = date code: year / week / plant code
H. Region code
I. Internal serial number
J. Sales location
K. ESD symbol
L. Lead (Pb)-free symbol
M. RoHS symbol, halogen-free symbol
N. Internal lot numbers

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



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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:

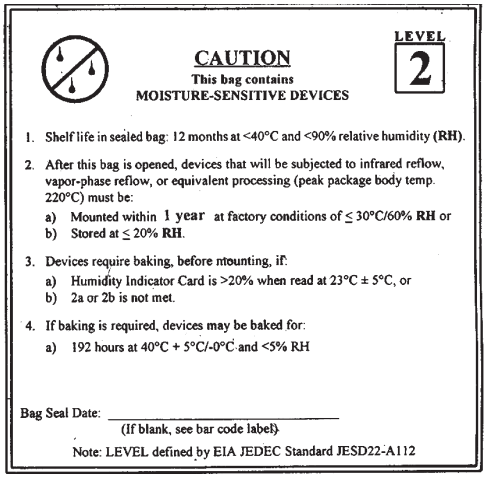
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 1 year 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 2 label is included on all aluminum dry bags.



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Example of JESD22-A112 level 2 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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