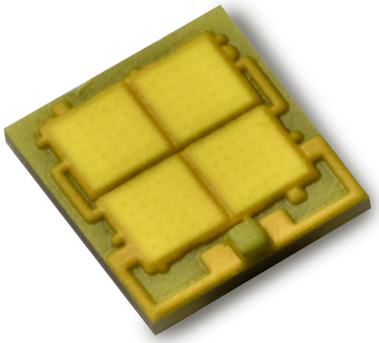
LUXEON MZ

Best combination of brightness, uniformity and luminance enabling precision light control



Introduction

LUXEON MZ emitters are illumination grade LEDs designed to enable indoor, outdoor and industrial applications with all of the features of LUXEON M including the identical solder footprint, but allowing for tighter beam control and higher punch due to a smaller apparent source size. With *Freedom from Binning* and leading performance, LUXEON MZ emitters deliver high efficacy and high flux density from a uniform source with tight correlated color temperature control.

Features

- Common Footprint
- Industry leading 11.2V package
- Exceptional luminance
- Small source size
- Exceeds ENERGY STAR® lumen maintenance requirements.

Benefits

- Interchangeable with LUXEON M
- Exceptional lm/W performance
- Improved punch
- Enables tight beam angles

Key Applications

- Downlights
- High bay and low bay
- Lamps
- Outdoor
- Spotlights

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Table of Contents

General Information

Product Nomenclature

LUXEON MZ emitters are specified and binned “hot” under conditions comparable to those found in “real-world” lighting products.

The part number designation is explained as follows:

L M Z a - b c d e - f g h j

Where:

a — designates minimum CRI (7 = 70, 8 = 80, 9 = 90)

b — is S for serially connected product with a typical forward voltage of 12V at test conditions

c — designates color designation (W = White, R = Royal Blue)

d e — designates CCT (27=2700K, 30=3000K, 35=3500K, 40=4000K, 50=5000K, 57=5700K, 65=6500K)

fghi — minimum flux lumen (optional)

The test condition for LUXEON MZ LMZa-Scde-fghj is 700 mA DC with a junction temperature of 85°C.

Therefore LUXEON MZ 12V products tested and binned at 700 mA follow the part numbering scheme:

L M Z 7 - S W 4 0 - x x x x

L M Z 7 - S W 5 0 - x x x x

L M Z 7 - S W 5 7 - x x x x

L M Z 8 - S W 2 7 - x x x x

L M Z 8 - S W 3 0 - x x x x

Average Lumen Maintenance Characteristics

Lumen maintenance for solid-state lighting devices (LEDs) is typically defined in terms of the percentage of initial light output remaining after a specified period of time. Philips Lumileds projects that LUXEON MZ products will deliver, on average, 70% lumen maintenance (L70) at 50,000 hours of operation at a forward current of up to 700 mA for LMZx-Sxxx. This projection is based on constant current operation with junction temperature maintained at or below 135°C. This performance is based on Philips Lumileds historical data from tests run on similar material systems, and internal LM-80-08 and reliability testing. Observation of design limits included in this data sheet is required in order to achieve this projected lumen maintenance.

Environmental Compliance

Philips Lumileds is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON MZ is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS directive. Philips Lumileds will not intentionally add the following restricted materials to the LUXEON MZ lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

Product Selection

Product Selection Guide for LUXEON MZ 12V White Junction Temperature = 85°C

Table 1.

Performance Characteristics at 700 mA				
Nominal CCT	Part Number	Minimum CRI	Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)
4000K	LMZ7-SW40	70	870	918
5000K	LMZ7-SW50	70	870	928
5700K	LMZ7-SW57	70	900	937
2700K	LMZ8-SW27	80	710	735
3000K	LMZ8-SW30	80	730	781

Notes for Table 1:

1. Philips Lumileds maintains a tolerance of ± 6.5% on flux measurements and ±2 on CRI.

Optical and Electrical Characteristics

Optical Characteristics for LUXEON MZ White at Test Current [1] Junction Temperature = 85°C

Table 2.

Nominal CCT	Part Number	Color Temperature CCT Typical (K)	Typical Total Included Angle [2] (degrees) $\theta_{0.90V}$	Typical Viewing Angle [3] (degrees) 2θ ½
2700K	LMZ8-SW27	2725	140	120
3000K	LMZ8-SW30	3045	140	120
4000K	LMZ7-SW40	3985	140	120
5000K	LMZ7-SW50	5028	140	120
5700K	LMZ7-SW57	5665	140	120

Notes for Table 2:

1. Test current is 700 mA for LMZx-SWxx.
2. Total included angle at which 90% of total luminous flux is captured.
3. Viewing angle is the off axis angle from lamp centerline where the luminous intensity is ½ of the peak value.

Electrical Characteristics for LUXEON MZ at Test Current [1] Junction Temperature = 85°C

Table 3.

Part Number	Forward Voltage V_f [1] [2] (V) I_f = 700 mA, 1400 mA and 2800 mA			Typical Temperature Coefficient of Forward Voltage [3] (mV/°C) $\Delta V_F / \Delta T_J$	Typical Thermal Resistance Junction to Thermal Pad (°C/W) $R\theta_{J-C}$
	Minimum	Typical	Maximum		
LMZx-Sxxx	10.5	11.2	11.7	-7.0	1.25

Notes for Table 3:
1. Test current is 700 mA for LMZx-SWxx.
2. Philips Lumileds maintains a tolerance of ± 0.06V on forward voltage measurements.
3. Measured between T_J = 25°C and T_J = 135°C.

Absolute Maximum Ratings

Table 4.

Parameter	Maximum Performance
DC Forward Current (mA) [1] [2]	1050 mA for LMZx-Sxxx
Peak Pulsed Forward Current (mA) [1] [3]	1200 mA for LMZx-Sxxx
ESD Sensitivity	≤ 8000V Human Body Model (HBM)Class 3B JESD22-A114-E< 400V Machine Model (MM) Class B JESD22-A115-B
LED Junction Temperature [1]	135°C
Operating Case Temperature at Test Current	-40°C - 120°C
Storage Temperature	-40°C - 120°C
Lead Soldering Temperature	JEDEC 020c 260°C
Allowable Reflow Cycles	3
Reverse Voltage (V_r)	LUXEON MZ LEDs are not designed to be driven in reverse bias.

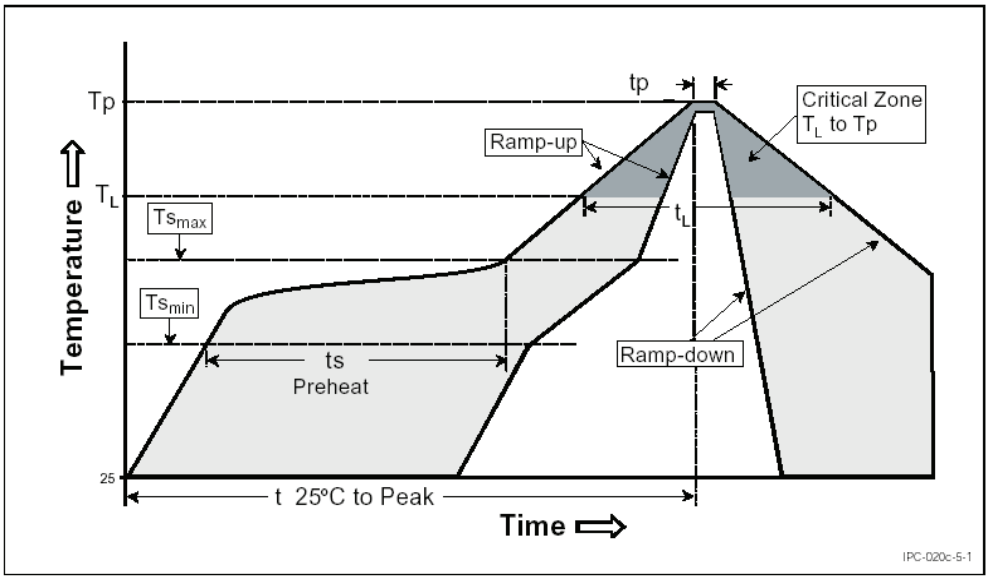
Notes for Table 4:
1. Proper current derating must be observed to maintain junction temperature below the maximum.
2. Residual periodic variations due to power conversion from alternating current (AC) to direct current (DC), also called "ripple", with frequencies ≥ 100Hz and amplitude ≤ 1200 mA for LMZx-Sxxx, products are acceptable, assuming the average current throughout each cycle does not exceed 1050 mA for LMZx-Sxxx.
3. Pulsed operation with a peak drive current of 1200 mA for LMZx-Sxxx, are acceptable if the pulse on time is ≤ 5ms per cycle and the duty cycle is ≤ 50%.

JEDEC Moisture Sensitivity

Table 5.

Level	Floor Life		Soak Requirements	
			Standard	
	Time	Conditions	Time	Conditions
1	unlimited	≤ 30°C / 85% RH	168 Hrs. + 5 / 0 Hrs.	85°C / 85% RH

Reflow Soldering Characteristics



Temperature Profile for Table 6.

Table 6.

Profile Feature	Lead Free Assembly
Average Ramp-Up Rate (Ts_{max} to T_p)	3°C / second max
Preheat Temperature Min (Ts_{min})	150°C
Preheat Temperature Max (Ts_{max})	200°C
Preheat Time (ts_{min} to ts_{max})	60 - 180 seconds
Liquidus Temperature (T_L)	217°C
Time Maintained Above Time (t_L)	60 - 150 seconds
Peak / Classification Temperature (T_p)	260°C
Time Within 5°C of Actual Peak Temperature (t_p)	20 - 40 seconds
Ramp-Down Rate	6°C / second max
Time 25°C to Peak Temperature	8 minutes max

Note for Table 6:

1. All temperatures refer to the application Printed Circuit Board (PCB), measured on the surface adjacent to the package body.

Mechanical Dimensions

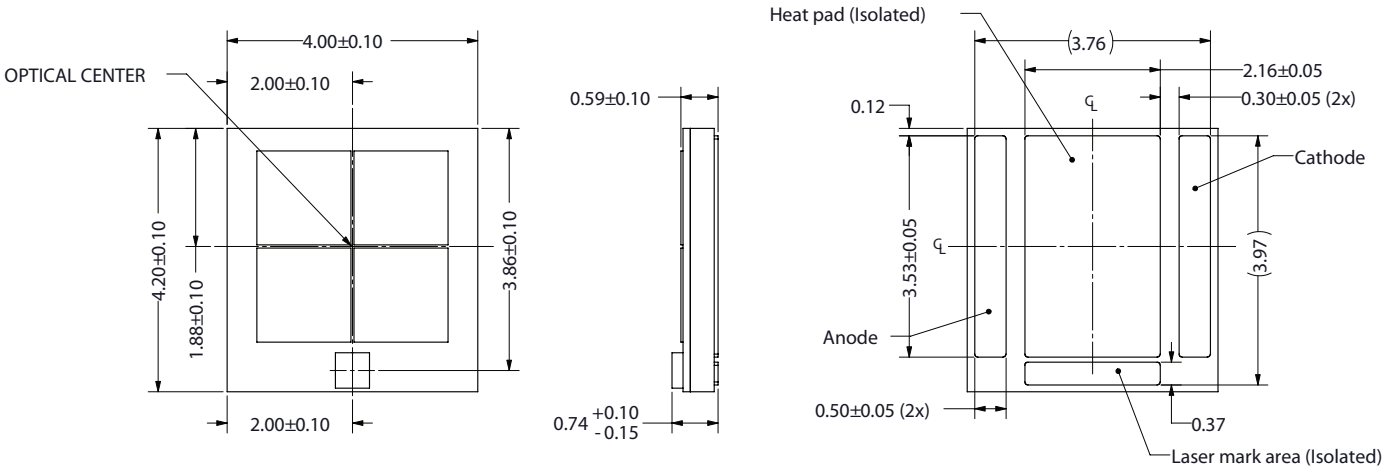


Figure 1.

Notes for Figure 1:

1. Do not handle the device by the lens. Excessive force on the lens may damage the lens itself or the interoir of the device.
2. Drawings not to scale.
3. All dimensions are in millimeters.

Solder Pad Design

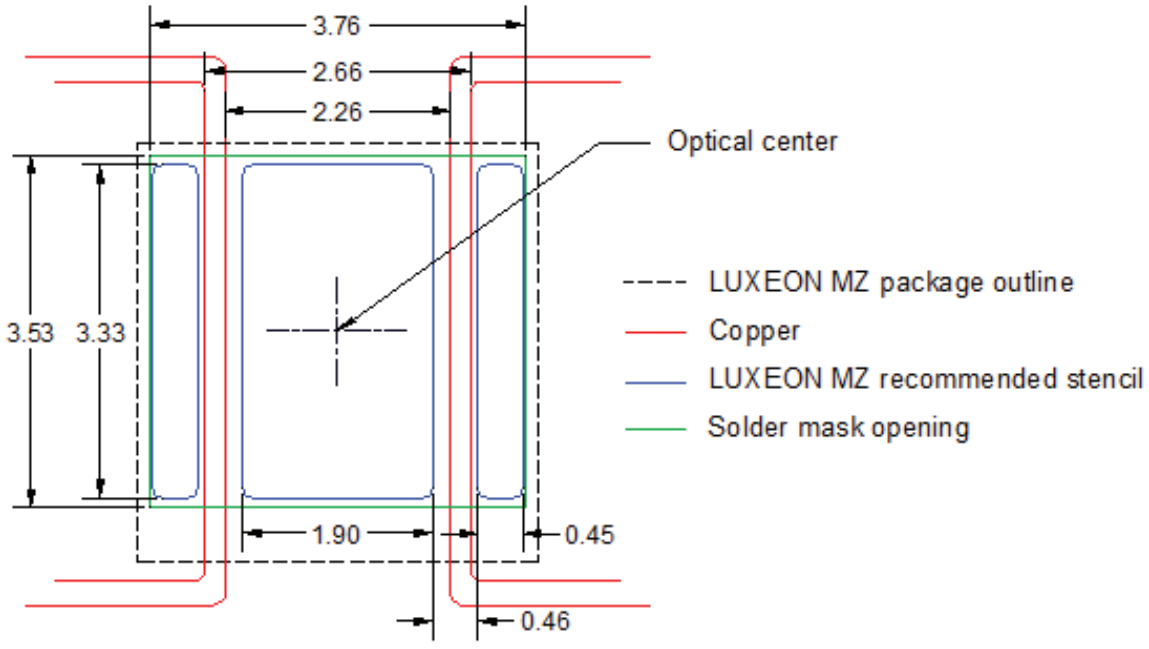


Figure 2.

Notes for Figure 2:

1. All dimensions are in millimeters.

Typical Relative Spectral Distribution vs. Wavelength Characteristics

LMZ7-SWxx at Test Current, Junction Temperature = 85°C

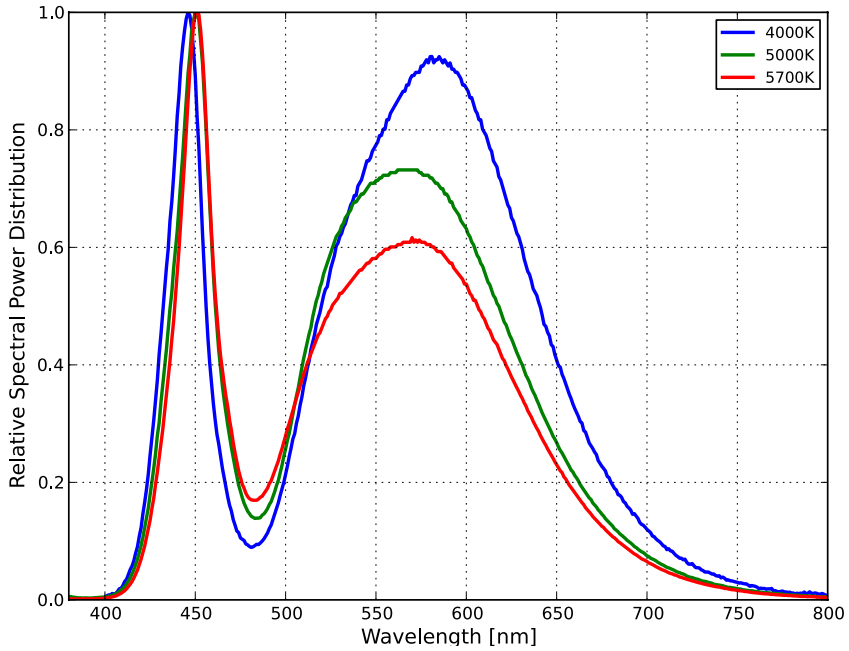


Figure 3. Color Spectrum of LMZ7-SWxx.

LMZ8-SWxx Test Current, Junction Temperature = 85°C

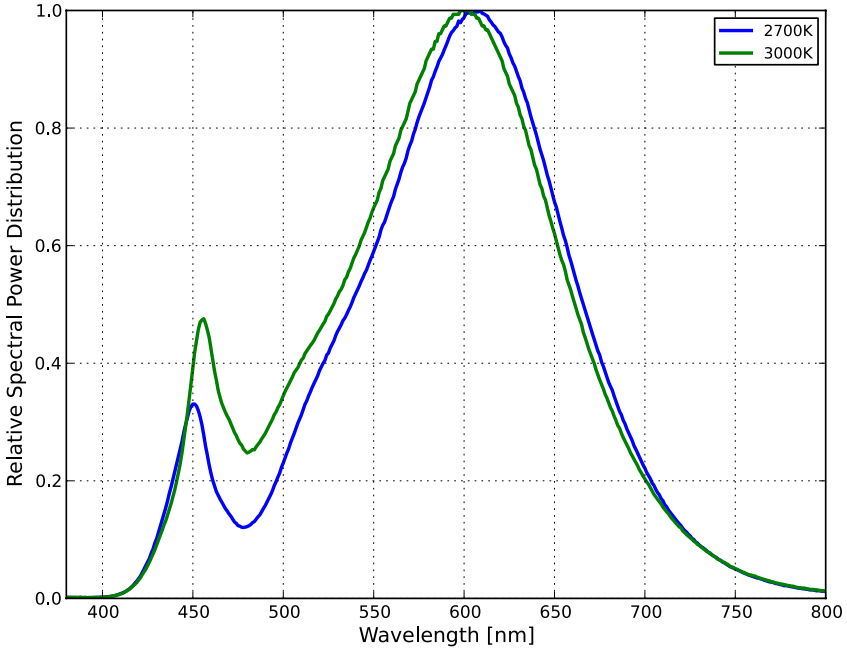


Figure 4. Color Spectrum of LMZ8-SWxx.

Typical Relative Light Output

Typical Relative Light Output vs. Junction Temperature Test Current at 700 mA

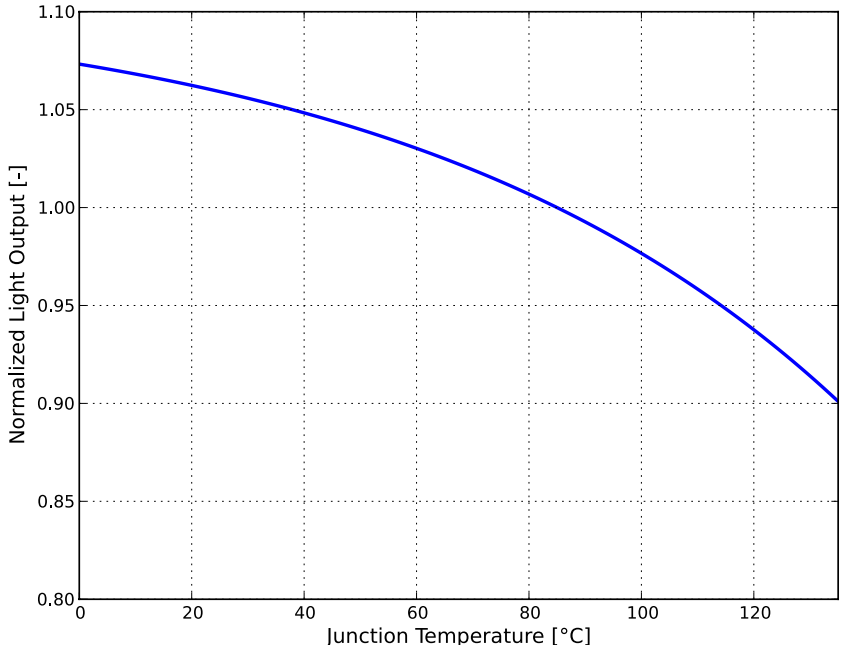


Figure 5. Typical relative light output vs. junction temperature, LMZx-SWxx.

Typical Relative Light Output vs. Forward Current Junction Temperature = 85°C

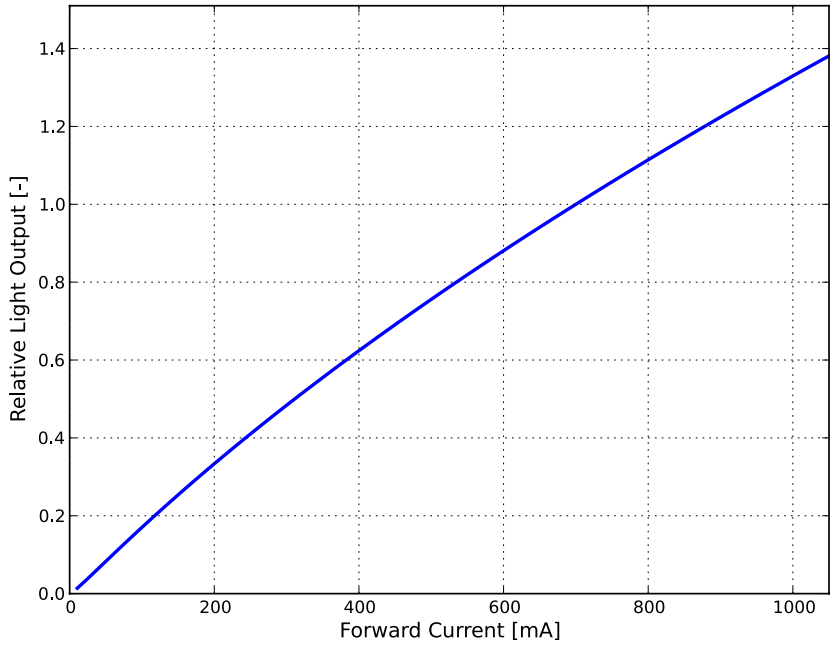


Figure 6. Typical relative light output vs. forward current, LMZx-SWxx.

Typical Forward Current Characteristics

Typical Forward Current vs. Forward Voltage
Junction Temperature = 85°C

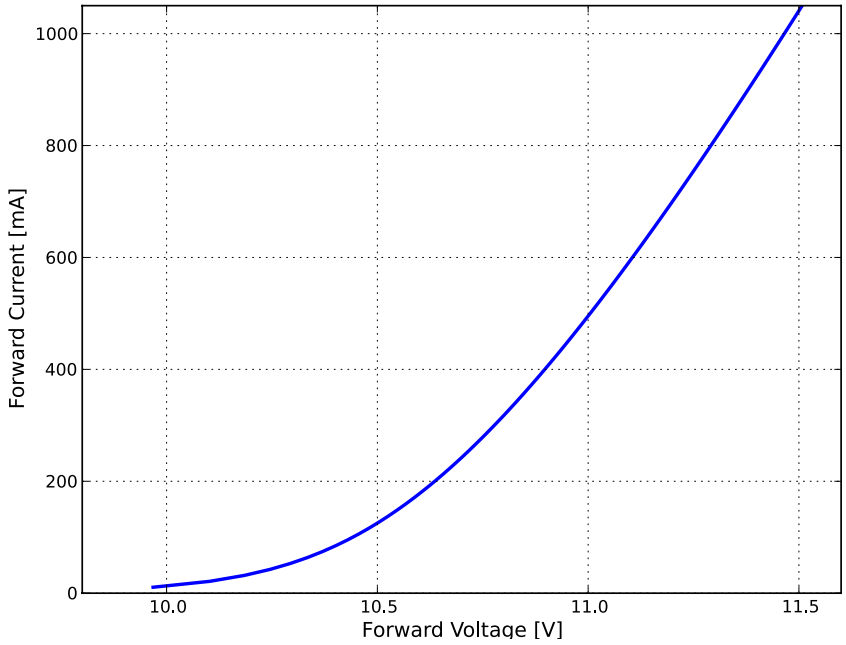


Figure 7. Typical forward current vs. forward voltage, LMZx-SWxx.

Radiation Patterns

Typical Spatial Radiation Pattern

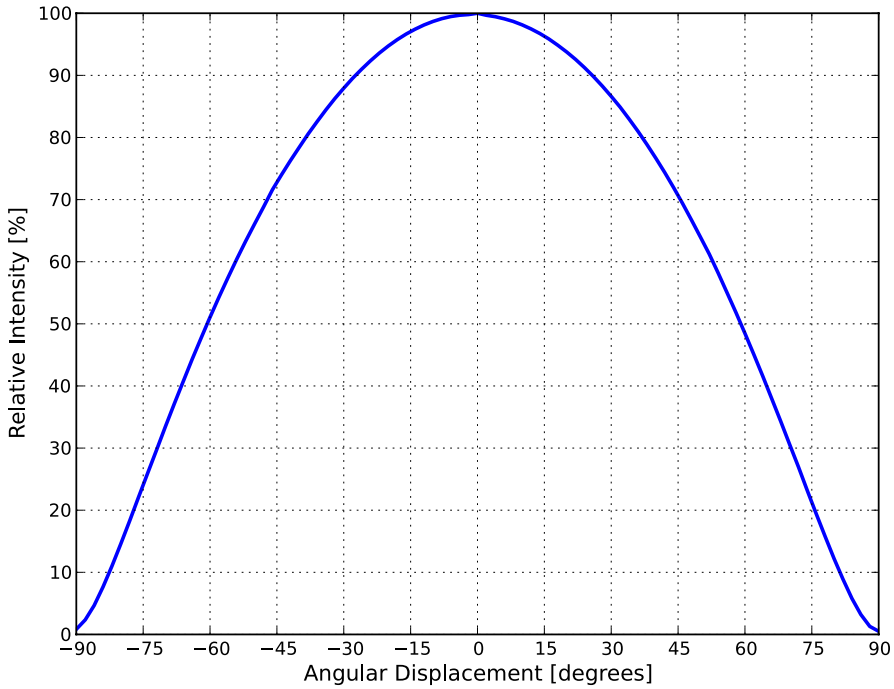


Figure 8. Typical spatial radiation pattern, LMZx-SWxx.

Typical Polar Radiation Pattern

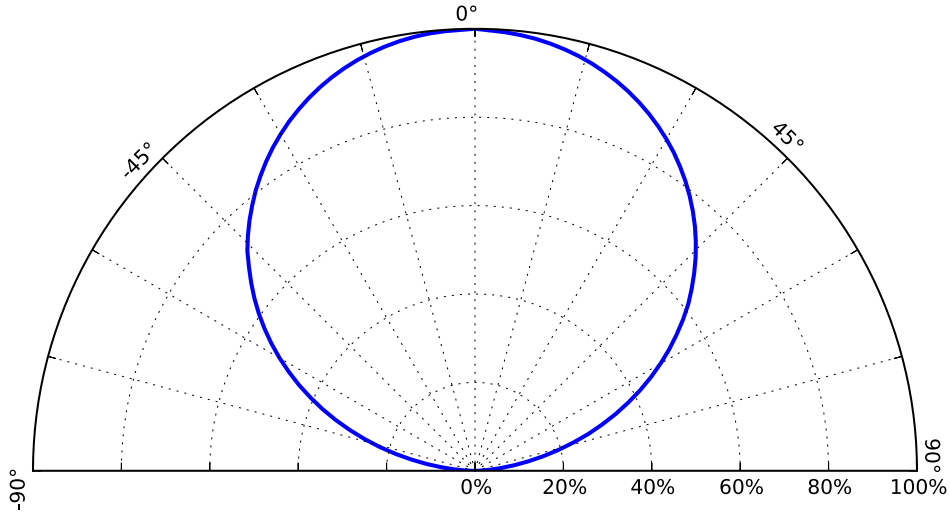
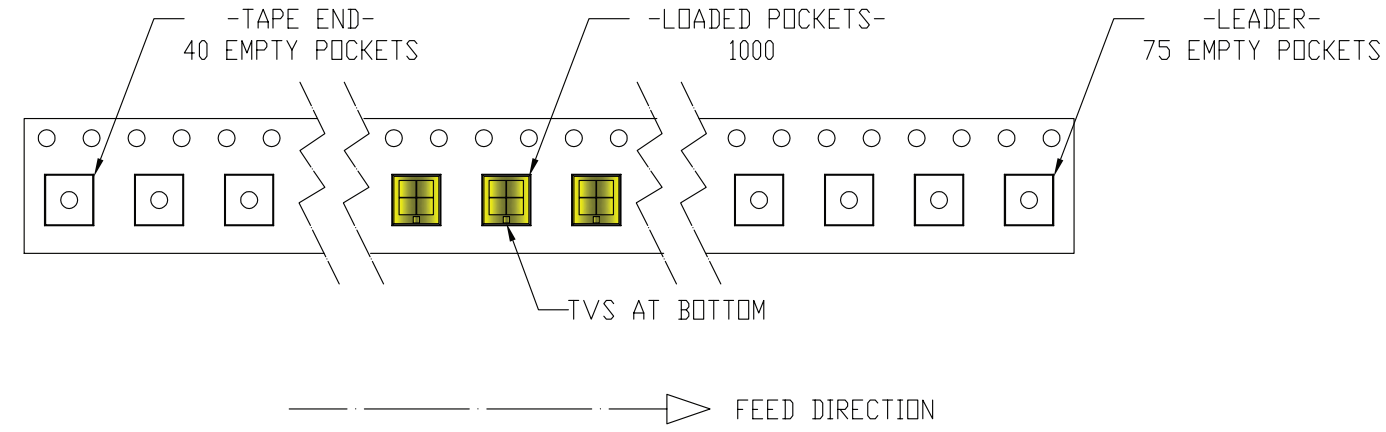


Figure 9. Typical polar radiation pattern, LMZx-SWxx.

Tape and Reel Packaging

Emitter Pocket Tape



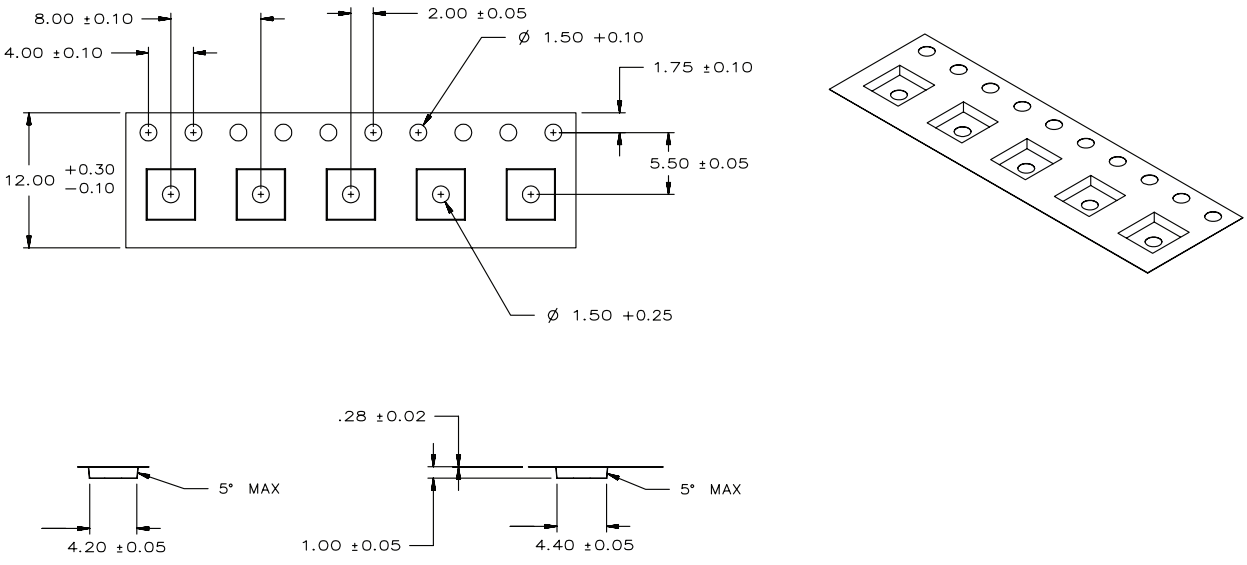


Figure 10.

Notes for Fig 10:
1. Dimensions are in millimeters

Emitter Reel Packaging

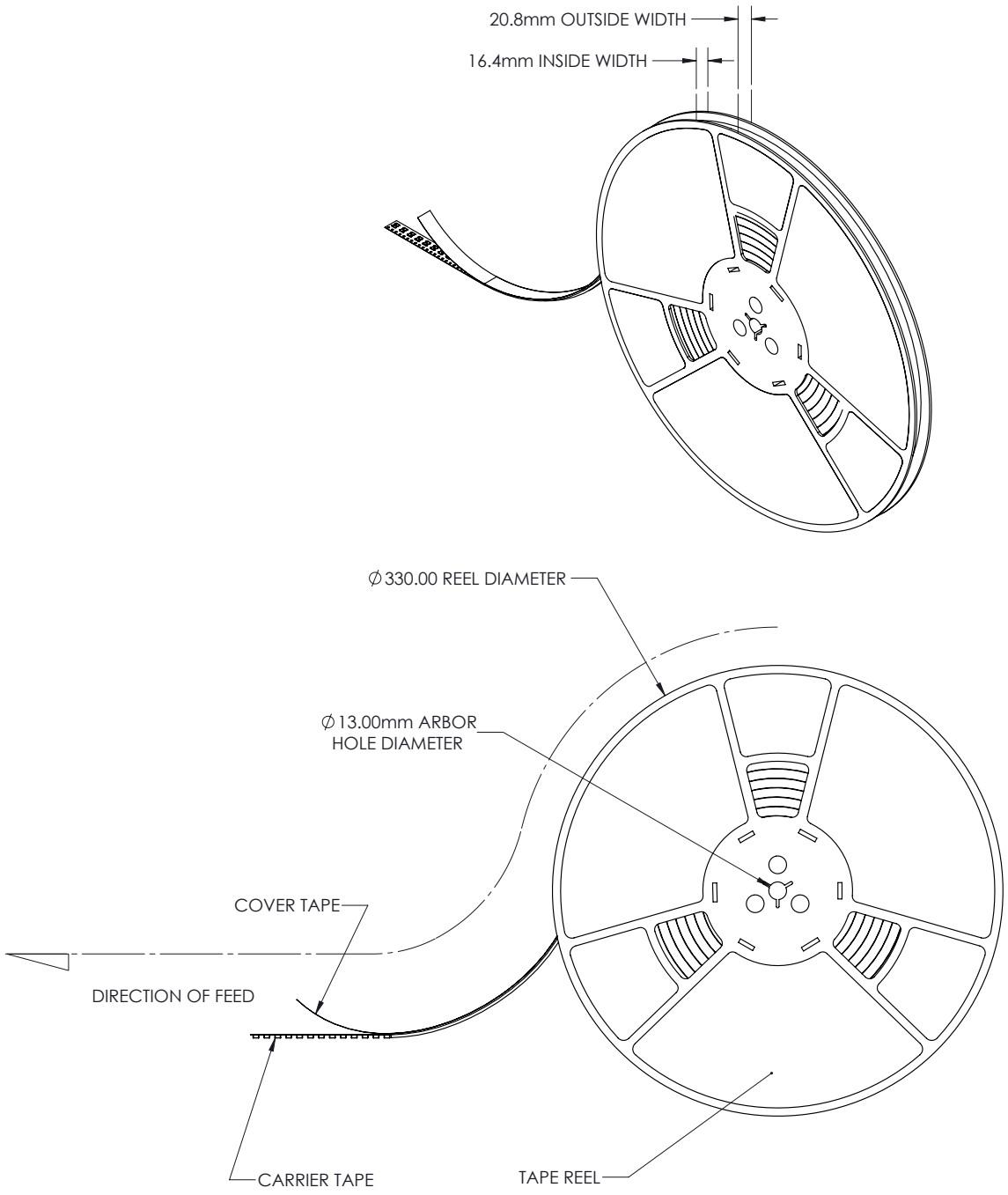


Figure 11. Emitter reel packaging.

Product Binning and Labeling

Purpose of Product Binning

In the manufacturing of semiconductor products, there is a variation of performance around the average values given in the technical data sheets. For this reason, Philips Lumileds bins the LED components for luminous flux, color, and forward voltage (V_f).

Decoding Product Bin Labeling

Reels with LUXEON MZ white emitters are labeled with a four digit alphanumeric code (CAT code) following the format below. All emitters packaged within a reel are of the same 4-variable bin combination.

For LMZx-SWxx, reels of emitters are labeled with a four digit alphanumeric CAT code following the format below.

A B C D

Where:

- A — designates luminous flux bin (See Table 7)
- B — designates color or CCT indication (1 for 6500K, 2 for 5700K, 3 for 5000K, 5 for 4000K, 6 for 3500K, 7 for 3000K, and 8 for 2700K)
- C — designates color consistency (5 for within 5-step MacAdam Ellipse, 3 for within 3-step MacAdam Ellipse). Detailed definitions for these color bins can be found in Table 8.
- D — designates V_f bin (F,G,H)

Luminous Flux Bins

Table 7 lists the standard photometric luminous flux bins for LUXEON MZ white emitters (LMZx-SWxx). LMZx-Swxx units are tested and binned at a drive current of 700 mA and a junction temperature of 85°C. Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.

Table 7. Luminous Flux Bins for White

Bin Code	Minimum Photometric Flux(lm)	Maximum Photometric Flux(lm)
K	550	590
L	590	630
M	630	680
N	680	730
P	730	780
Q	780	840
R	840	900
S	900	970
T	970	1040
U	1040	1120
V	1120	1200
W	1200	1290

LUXEON MZ MacAdam Color Bin Definition

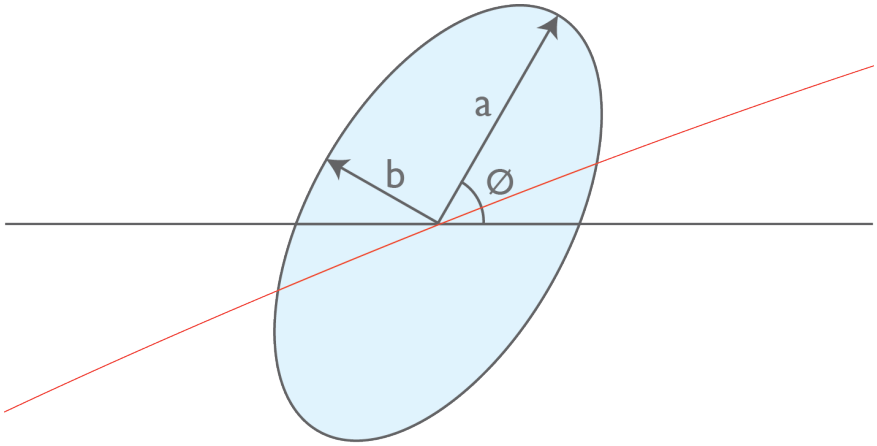


Table 8. LUXEON MZ Product Characteristics for 3-Step and 5-Step MacAdam Ellipse [1][2]

Nominal ANSI CCT	Color Space	Center Point (cx, cy)	Major Axis, a	Minor Axis, b	Ellipse Rotation Angle (degrees)
2700K	Single 3-step MacAdam ellipse	0.4578, 0.4101	0.00810	0.00420	53.70
3000K	Single 3-step MacAdam ellipse	0.4338, 0.4030	0.00834	0.00408	53.22
3500K	Single 3-step MacAdam ellipse	0.4073, 0.3917	0.00927	0.00414	54.00
4000K	Single 3-step MacAdam ellipse	0.3818, 0.3797	0.00939	0.00402	53.72
5000K	Single 3-step MacAdam ellipse	0.3447, 0.3553	0.00822	0.00354	59.62
3000K	Single 5-step MacAdam ellipse	0.4338, 0.4030	0.01390	0.00680	53.22
4000K	Single 5-step MacAdam ellipse	0.3818, 0.3797	0.01565	0.00670	53.72
5000K	Single 5-step MacAdam ellipse	0.3447, 0.3553	0.01370	0.00590	59.62
5700K	Single 5-step MacAdam ellipse	0.3287, 0.3417	0.01243	0.00533	59.09
6500K	Single 5-step MacAdam ellipse	0.3123, 0.3282	0.01115	0.00475	58.57

Notes for Table 8:

1. Philips Lumileds maintains a tester tolerance of ± 0.005 on x, y color coordinates.
2. Tested at 700 mA D.C. and Junction Temperature = 85°C.

Forward Voltage Bins

Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.

Table 9. Forward Voltage Bins for LMZx-SWxx

Bin Code	Minimum Forward Voltage (V)	Maximum Forward Voltage (V)
F	10.5	11.0
G	11.0	11.5
H	11.5	11.7

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Who We Are

Philips Lumileds focuses on one goal: Creating the world's highest performing LEDs. The company pioneered the use of solid-state lighting in breakthrough products such as the first LED backlit TV, the first LED flash in camera phones, and the first LED daytime running lights for cars. Today we offer the most comprehensive portfolio of high quality LEDs and uncompromising service.

Philips Lumileds brings LED's qualities of energy efficiency, digital control and long life to spotlights, downlights, high bay and low bay lighting, indoor area lighting, architectural and specialty lighting as well as retrofit lamps. Our products are engineered for optimal light quality and unprecedented efficacy at the lowest overall cost. By offering LEDs in chip, packaged and module form, we deliver supply chain flexibility to the inventors of next generation illumination.

Philips Lumileds understands that solid state lighting is not just about energy efficiency. It is about elegant design. Reinventing form. Engineering new materials. Pioneering markets and simplifying the supply chain. It's about a shared vision. Learn more about our comprehensive portfolio of LEDs at www.philipslumileds.com.

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