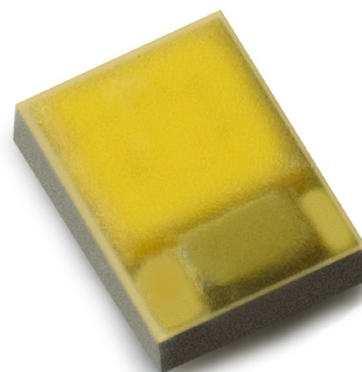




# LUXEON Z

High-flux density in a micro footprint package for precise optimal control

LUXEON Z is a high-power 1.3mm x 1.7mm LED that enables never before seen color consistency, luminance, flux density and design flexibility for lighting solutions. LUXEON Z ES is undomed, a feature that provides un-matched optical flexibility for precise beam angle control. Tested and binned at application conditions, 85°C and available in 1-, 3- and 5-step MacAdam ellipse color binning. The LUXEON Z ES emitters are an ideal choice for indoor and outdoor light sources requiring superior beam angles, higher efficacy and lower costs.



## FEATURES AND BENEFITS

- 1.3mm x 1.7mm micro footprint enables high degree of design flexibility
- Undomed design allows precise optical control
- 1A max drive current allows for more flux per LED
- 1-, 3- and 5-step MacAdam ellipse color binning for superior Quality of Light

## PRIMARY APPLICATIONS

- Architectural
- Downlights
- Indoor Area Lighting
- Lamps
- Outdoor
- Specialty Lighting
- Spotlights

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# General Information

## Product Nomenclature

LUXEON Z emitters are specified and binned under “hot” conditions comparable to those found in “real-world” lighting products. The test conditions for LUXEON Z is 500mA DC with junction temperature at 85°C.

The part number designation is explained as follows:

L X Z n - a b c d - y

Where:

- n — 1 for LUXEON Z
- a, b — designates nominal ANSI CCT (27 for 2700K, 30 for 3000K, RB for Royal Blue)
- c, d — designates minimum CRI performance (7 for 70 CRI, 8 for 80 CRI, 9 for 90 CRI)
- y — 1 designates 1 SDCM\*, 3 designates 3 SDCM and 5 designates 5 SDCM (only for 80 and 90 CRI versions. 70 CRI parts or lower will not have a SDCM designation and all parts are binned within a 5 step SDCM).

Therefore, 5 SDCM 3000K/80 CRI LUXEON Z will have the following part number:

L X Z 1 - 3 0 8 0 - 5

## Average Lumen Maintenance Characteristics

LUXEON Z products are tested in compliance with LM-80. Please visit [www.lumileds.com](http://www.lumileds.com) or contact your local Lumileds Technical Solutions Manager for TM-21 extrapolations or other support.

## Environmental Compliance

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

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\* 1 SDCM is available on special request. Please contact your Sales representative.

# Product Selection

## Product Selection for LUXEON Z Emitters Junction Temperature = 85°C

Table 1. LUXEON Z

| Part Number | Nominal CCT | Min CRI | 500mA          |                   |                |                         | 700mA             |                |                         | 1A                |                |                         |
|-------------|-------------|---------|----------------|-------------------|----------------|-------------------------|-------------------|----------------|-------------------------|-------------------|----------------|-------------------------|
|             |             |         | Min. Flux (lm) | Typical Flux (lm) | Typical Vf (V) | Typical Efficacy (lm/W) | Typical Flux (lm) | Typical Vf (V) | Typical Efficacy (lm/W) | Typical Flux (lm) | Typical Vf (V) | Typical Efficacy (lm/W) |
| LXZ1-2780-y | 2700K       | 80      | 100            | 115               | 2.80           | 82                      | 147               | 2.85           | 74                      | 191               | 2.89           | 66                      |
| LXZ1-3080-y | 3000K       | 80      | 110            | 124               | 2.80           | 89                      | 159               | 2.85           | 80                      | 206               | 2.89           | 71                      |
| LXZ1-3580-y | 3500K       | 80      | 110            | 124               | 2.80           | 89                      | 159               | 2.85           | 80                      | 206               | 2.89           | 71                      |
| LXZ1-4080-y | 4000K       | 80      | 120            | 130               | 2.80           | 93                      | 166               | 2.85           | 83                      | 216               | 2.89           | 75                      |
| LXZ1-4070   | 4000K       | 70      | 120            | 134               | 2.80           | 96                      | 172               | 2.85           | 86                      | 223               | 2.89           | 77                      |
| LXZ1-5070   | 5000K       | 70      | 130            | 148               | 2.80           | 106                     | 189               | 2.85           | 95                      | 246               | 2.89           | 85                      |
| LXZ1-5770   | 5700K       | 70      | 140            | 152               | 2.80           | 109                     | 195               | 2.85           | 98                      | 253               | 2.89           | 88                      |
| LXZ1-6565   | 6500K       | 65      | 140            | 154               | 2.80           | 110                     | 197               | 2.85           | 99                      | 256               | 2.89           | 89                      |

Notes for Table 1:

1. All LUXEON Z emitters above are tested and binned at 500mA/85°C.
2. Lumileds maintains a tolerance of  $\pm 6.5\%$  on luminous flux and  $\pm 2$  on CRI measurements.
3. In the part number the -y is the designation for the color requirement. On 80 CRI versions -3 designates 3 SDCM and -5 designates 5 SDCM. 70CRI parts or lower will not have a SDCM designation and all parts are binned within a 5 step SDCM.

## Optical Characteristics

### LUXEON Z at Test Current 500mA, Junction Temperature 85°C

Table 2.

| Nominal ANSI CCT | Color Temperature CCT Typical | Typical Total Included Angle <sup>1</sup> (degrees) $\theta_{0.90V}$ | Typical Viewing Angle <sup>2</sup> (degrees) $2\theta_{1/2}$ |
|------------------|-------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------|
| 2200K            | 2230K                         | 160                                                                  | 120                                                          |
| 2700K            | 2725K                         | 160                                                                  | 120                                                          |
| 3000K            | 3045K                         | 160                                                                  | 120                                                          |
| 3500K            | 3465K                         | 160                                                                  | 120                                                          |
| 4000K            | 3985K                         | 160                                                                  | 120                                                          |
| 5000K            | 5028K                         | 160                                                                  | 120                                                          |
| 5700K            | 5665K                         | 160                                                                  | 120                                                          |
| 6500K            | 6250K                         | 160                                                                  | 120                                                          |

Notes for Table 2:

1. Total angle at which 90% of total luminous flux is captured.
2. Viewing angle is the off axis angle from lamp centerline where the luminous intensity is  $\frac{1}{2}$  of the peak value.

# Electrical Characteristics

## LUXEON Z at Test Current 500mA, Junction Temperature 85°C

Table 3.

| Nominal ANSI CCT | Forward Voltage Vf, <sup>1</sup><br>(V) |      | Typical Temperature<br>Coefficient of Forward Voltage <sup>2</sup><br>(mV/°C)<br>$\Delta V_F / \Delta T_J$ | LUXEON Z<br>Typical Thermal Resistance<br>Junction to Electrical Pads (°C/W)<br>$R\theta_{J-C}$ |
|------------------|-----------------------------------------|------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|                  | Min.                                    | Max. |                                                                                                            |                                                                                                 |
| 2200K            | 2.5                                     | 3.25 | -1.6                                                                                                       | N/A                                                                                             |
| 2700K            | 2.5                                     | 3.25 | -1.6                                                                                                       | 6                                                                                               |
| 3000K            | 2.5                                     | 3.25 | -1.6                                                                                                       | 6                                                                                               |
| 3500K            | 2.5                                     | 3.25 | -1.6                                                                                                       | 6                                                                                               |
| 4000K            | 2.5                                     | 3.25 | -1.6                                                                                                       | 6                                                                                               |
| 5000K            | 2.5                                     | 3.25 | -1.6                                                                                                       | 6                                                                                               |
| 5700K            | 2.5                                     | 3.25 | -1.6                                                                                                       | 6                                                                                               |
| 6500K            | 2.5                                     | 3.25 | -1.6                                                                                                       | 6                                                                                               |

Notes for Table 3:

1. Lumileds maintains a tolerance of  $\pm 0.06V$  on forward voltage measurements.
2. Measured between  $T_J = 25^\circ C$  and  $T_J = 110^\circ C$  at  $I_F = 500mA$  for LUXEON Z.

## Absolute Maximum Ratings

Table 4.

| Parameter                                       | LUXEON Z                                                     |
|-------------------------------------------------|--------------------------------------------------------------|
| DC Forward Current (mA) <sup>1,2</sup>          | 1000                                                         |
| Peak Pulsed Forward Current (mA) <sup>1,3</sup> | 1200                                                         |
| ESD Sensitivity                                 | < 8000V Human Body Model (HBM)<br>Class 3A JEDEC JS-001-2012 |
| LED Junction Temperature <sup>1</sup>           | 135°C                                                        |
| Operating Case Temperature at 700mA             | -40°C - 135°C                                                |
| Storage Temperature                             | -40°C - 135°C                                                |
| Soldering Temperature                           | JEDEC 020c 260°C                                             |
| Allowable Reflow Cycles                         | 3                                                            |
| Reverse Voltage (Vr) <sup>5,6</sup>             | LUXEON Z 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.  
For additional information on thermal measurement guidelines please refer to Application Briefs AB105 and AB120.
2. Residual periodic variations due to power conversion from alternating current (AC) to direct current (DC), also called "ripple", with frequencies  $\geq 100$  Hz and amplitude  $\leq 150mA$  and  $200mA$  respectively are acceptable, assuming the average current throughout each cycle does not exceed  $1200mA$  and  $1000mA$  respectively.
3. Pulsed operation with a peak drive current of  $1350mA$  and  $1200mA$  respectively are acceptable if the pulse on-time is  $\leq 5$  ms per cycle and the duty cycle is  $\leq 50\%$ .
4. Transient reverse voltages and surge currents due to electrical switching or supply interruptions are acceptable if these events do not last for more than 10ms, the amplitude of the reverse voltage does not exceed 5V and the reverse current is less than  $200\mu A$ .
5. Maximum 5V reverse for up to 10s is an acceptable beginning of life, one time test condition.

# JEDEC Moisture Sensitivity

Table 5.

| Level | Floor Life |                                    | Soak Requirements Standard |               |
|-------|------------|------------------------------------|----------------------------|---------------|
|       | Time       | Conditions                         | Time                       | Conditions    |
| 1     | unlimited  | $\leq 30^{\circ}\text{C}$ / 85% RH | 168h + 5 / - 0             | 85°C / 85% RH |

## Mechanical Dimensions of LUXEON Z

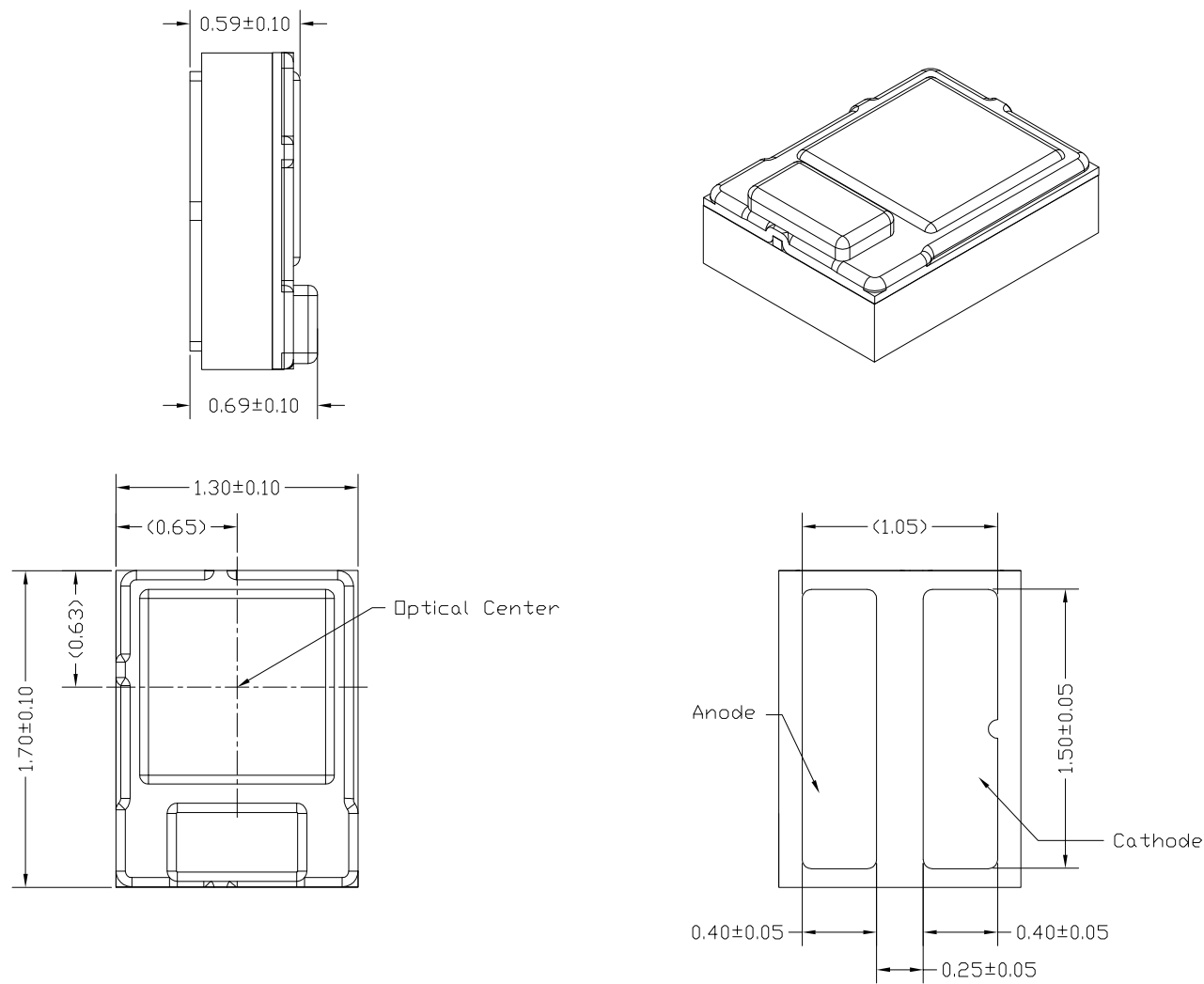
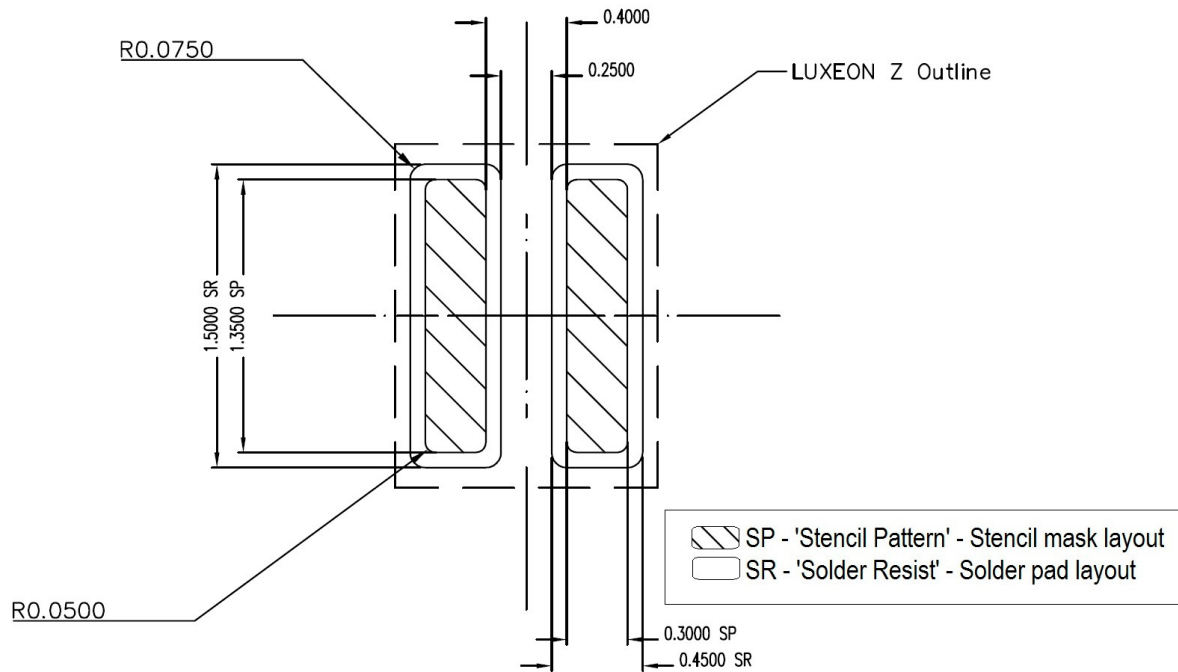


Figure 1. Package outline drawing for LUXEON Z.

- Notes for Figure 1:
- 1. Do not handle the device by the top of package. Excessive force on the top of the package may damage the surface or the interior of the device.
  - 2. Drawings not to scale.
  - 3. All dimensions are in millimeters.
  - 4. Both the anode and cathode contact pads are also the thermal pads.

# Solder Pad Design



**Figure 2. Solder pad layout for LUXEON Z.**

**Notes for Figure 2:**

1. The drawing above shows the recommended solder pad layout on Printed Circuit Board (PCB).
2. Application Brief AB105 provides the details of the PCB board layout design. In addition, the .dwg files are available at [www.lumileds.com](http://www.lumileds.com).

# Relative Spectral Distribution

## Relative Spectral Distribution vs. Wavelength Characteristics

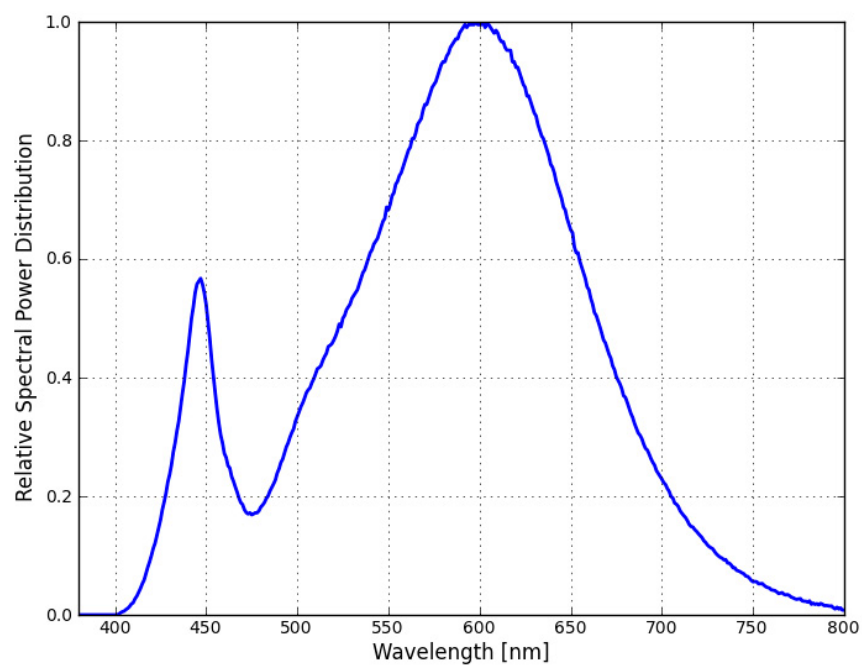


Figure 3.



# Light Output Characteristics

Relative Light Output vs. Junction Temperature for LUXEON Z White,  
Test Current at 500mA

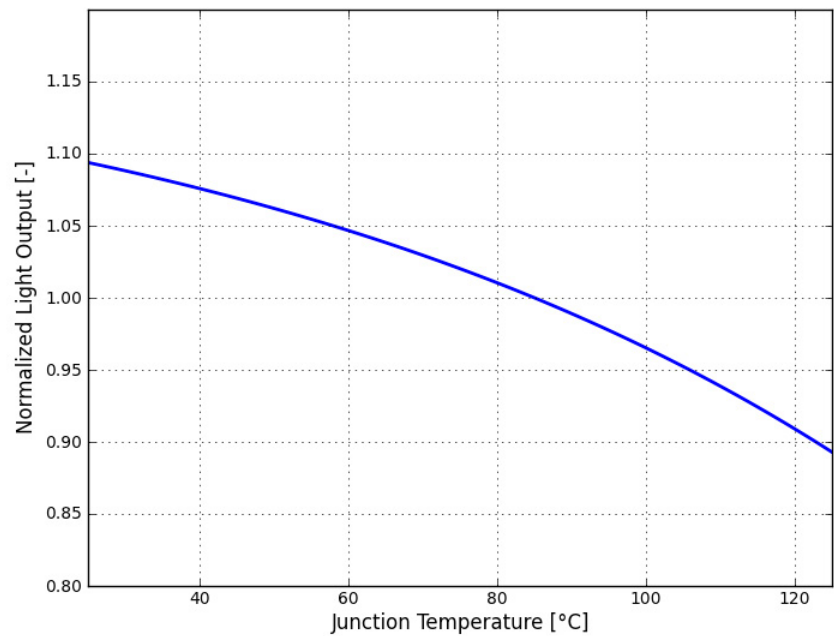


Figure 4.

Relative Light Output vs. Forward Current for LUXEON Z White,  
Junction Temperature = 85°C

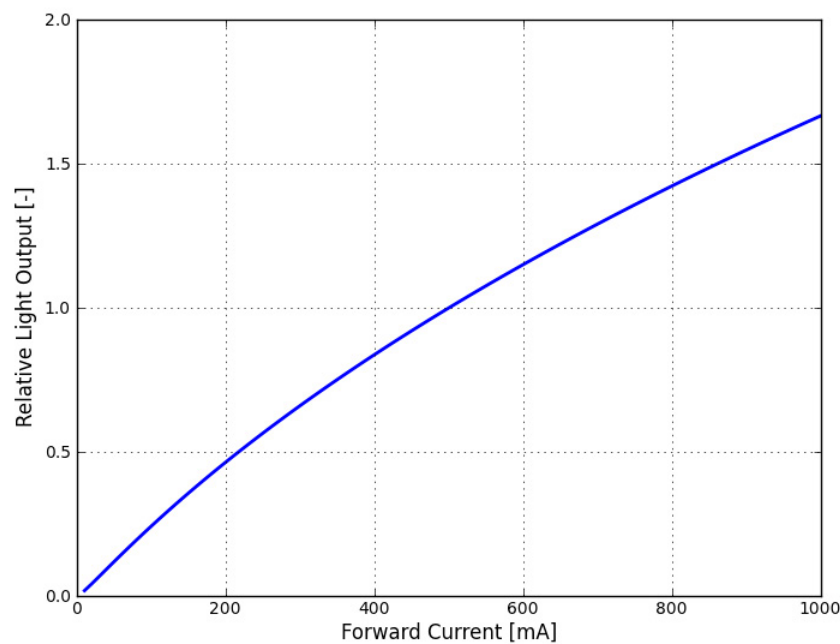


Figure 5.

Forward Current Characteristics for LUXEON Z White,  
Junction Temperature = 85°C

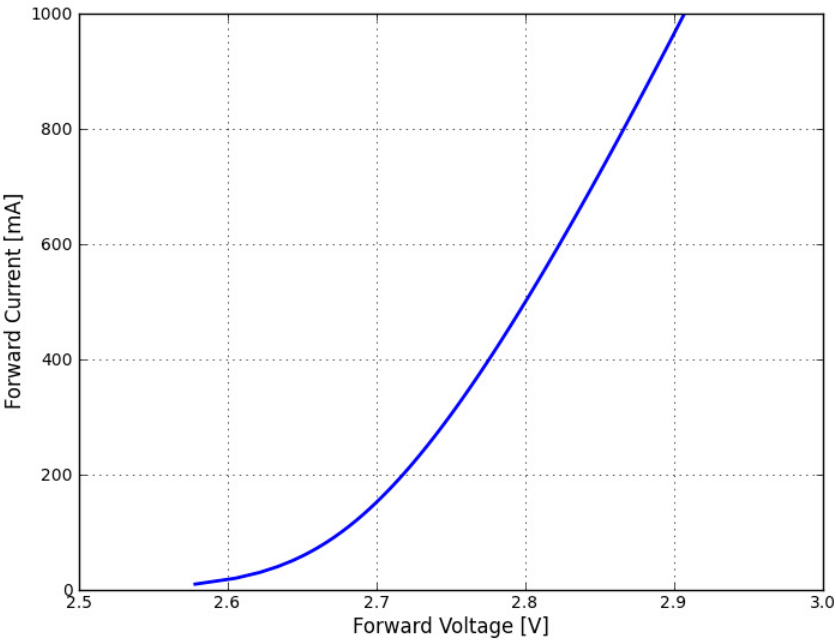


Figure 6.

# Typical Spatial Radiation Pattern

## LUXEON Z

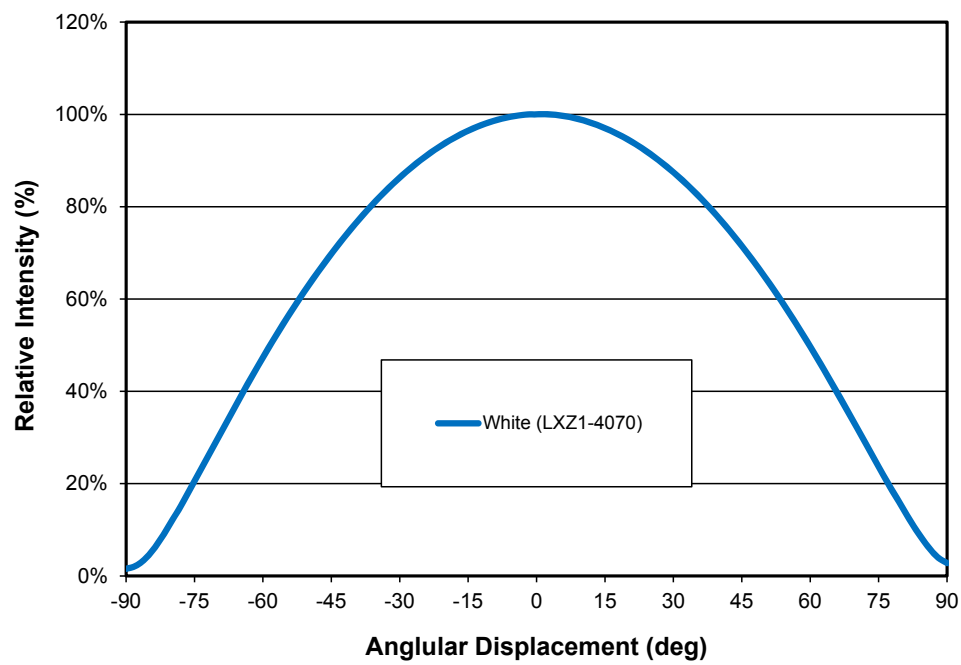


Figure 7.

## LUXEON Z Typical Polar Radiation Pattern

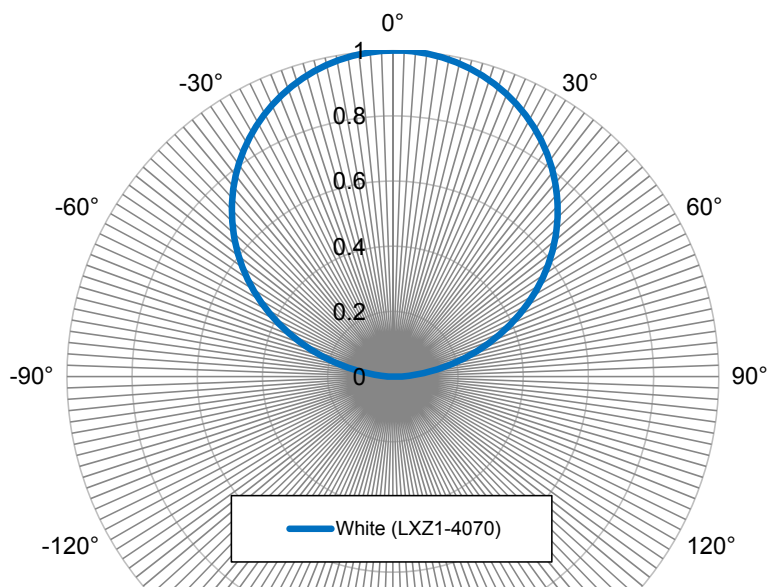


Figure 8.

# Emitter Pocket Tape Packaging for LUXEON Z

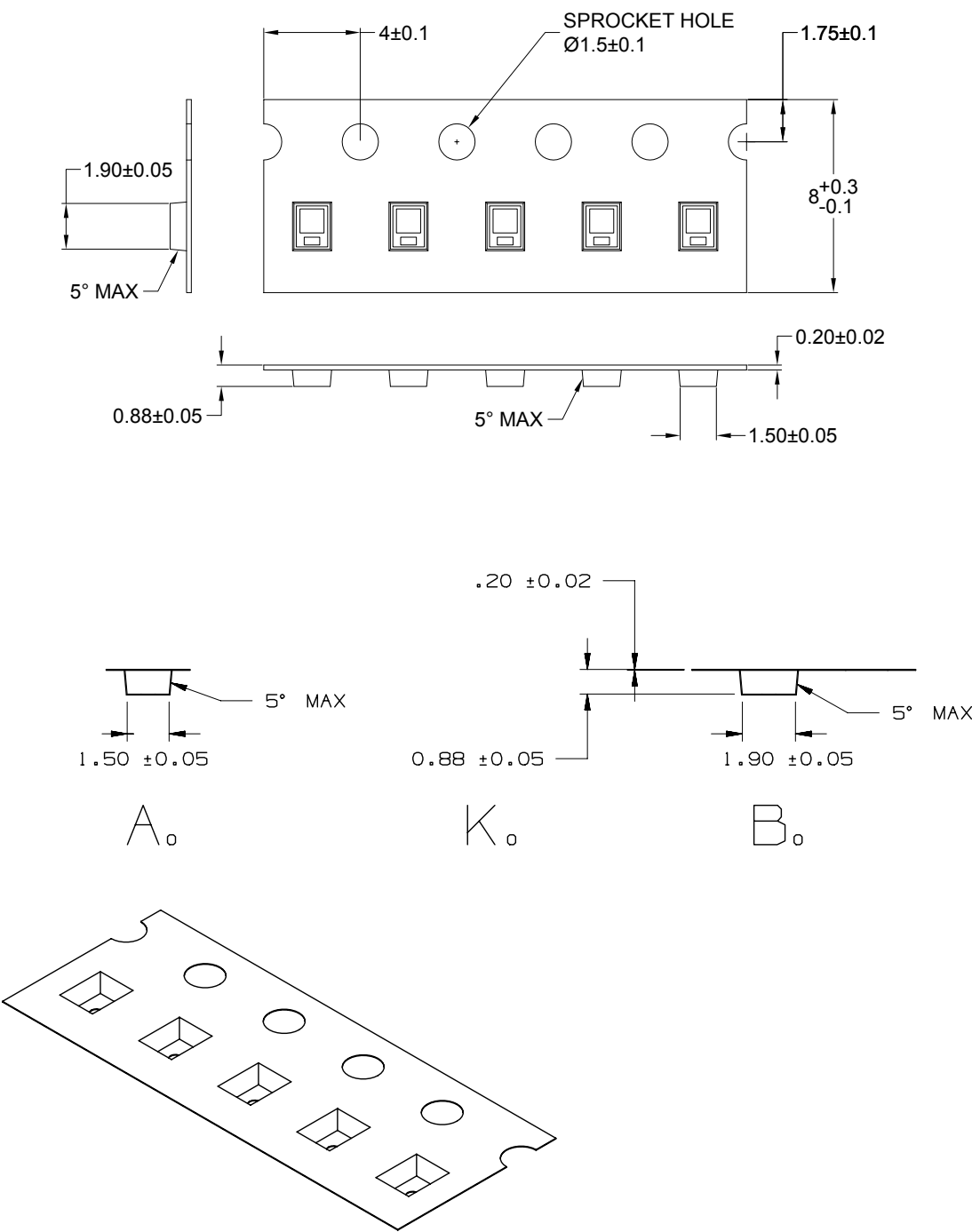


Figure 9. Emitter pocket tape packaging for LUXEON Z.

Notes for Figure 9:  
1. All dimensions are in millimeters

## Emitter Reel Packaging for LUXEON Z

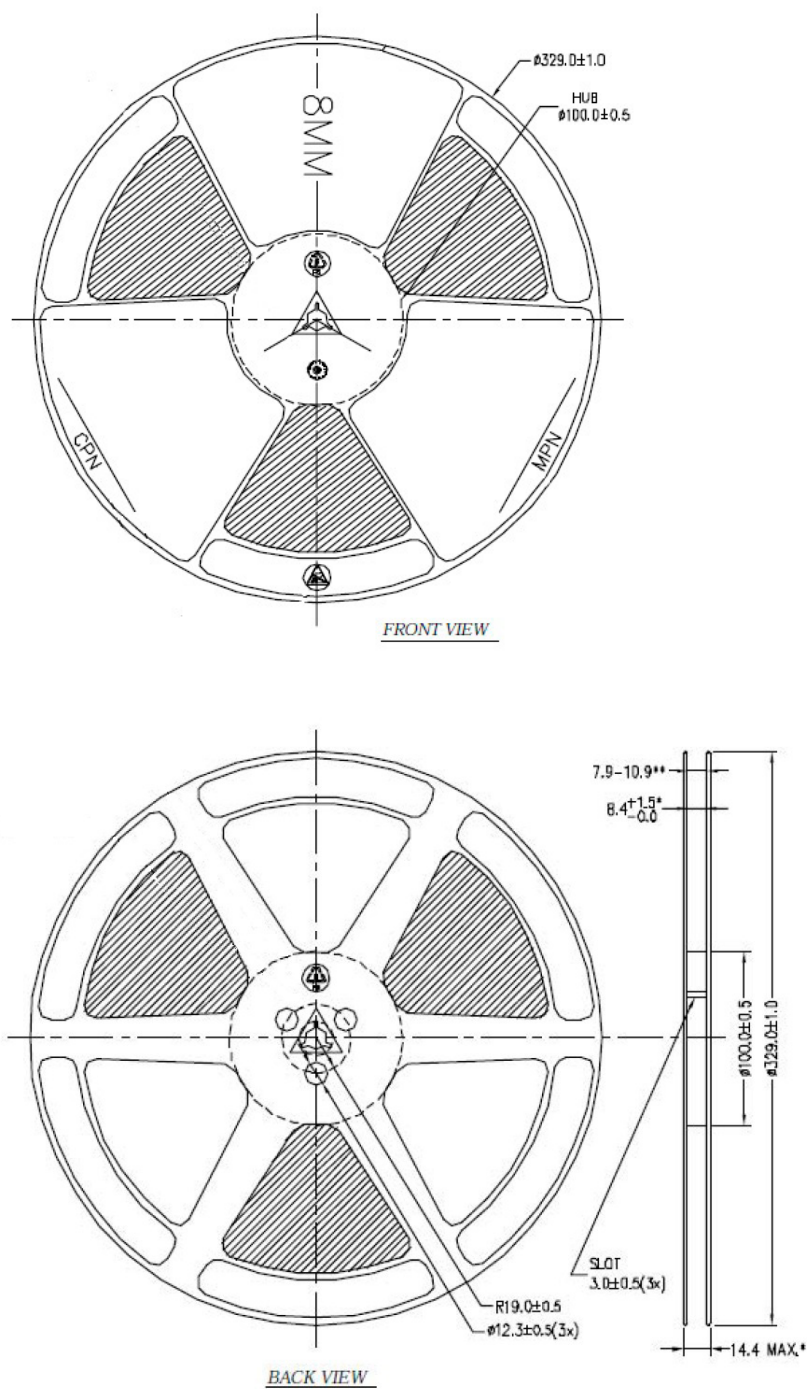


Figure 10. Emitter reel packaging for LUXEON Z.

# Product Binning and Labeling

## Purpose of Product Binning

In the manufacturing of semiconductor products, there are variations in performance around the average values given in the technical data sheets. For this reason, Lumileds bins the LED components for luminous flux and forward voltage ( $V_f$ ). Color is offered in a single 1 step, 3-step or 5-step MacAdam ellipse color space centered on the ANSI CCT color bins. For additional information please review the MacAdam ellipse technical definition section.

## Decoding Product Bin Labeling

LUXEON Z emitters are labeled using a four digit alphanumeric code (CAT code) depicting the bin values for emitters packaged on a single reel. All emitters packaged within a reel are of the same 3-variable bin combination. Reels of LUXEON Z emitters are labeled with a four digit alphanumeric CAT code following the format below.

ABCD

A = Flux/Radiometric power bin (L, M, etc.)

B and C = Color Bin (5A, 5B, 5C, 5D, 50, 30, 3U, 3L, 10)

D =  $V_f$  bin (P, R, S)

**Table 6. LUXEON Z Cat Code Logic**

| A               | B            | C                                                                           | D         |
|-----------------|--------------|-----------------------------------------------------------------------------|-----------|
|                 | 1 for 1 step | 0 for 1 step                                                                |           |
| Flux bin per DS | 3 for 3 step | 0 for 70CRI<br>U or L (above (U) or below (L) black body line)<br>for 80CRI | $V_f$ bin |
|                 | 5 for 5 step | A/B/C/D (5 step quadrant for 80 and 90CRI),<br>0 for 70CRI or less          |           |

### 70CRI:

1. Only 5 step available eg: LXZ2-4070 etc will, by default, mean 5 step.
2. 3 step and 1 step are sub sets of 5 step hence the cat code will state 30 or 10 if the part is actually 3 or 1 step .

### 80/90CRI:

1. 1 step available in 2280/90, 2780/90, 3080/90, 3580 only. Please contact your Philips Lumileds Sales representative for support.
2. 3U and 3L will be the color bin cat codes. For product below black body below work with your distribution representative on supportability per volume requirements.

# Luminous Flux and Forward Voltage Bins

Table 7 lists the standard photometric luminous flux bins for LUXEON Z emitters (tested and binned at 500mA, and  $T_j = 85^\circ\text{C}$ ). Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins are available in all colors.

**Table 7. Flux Bins**

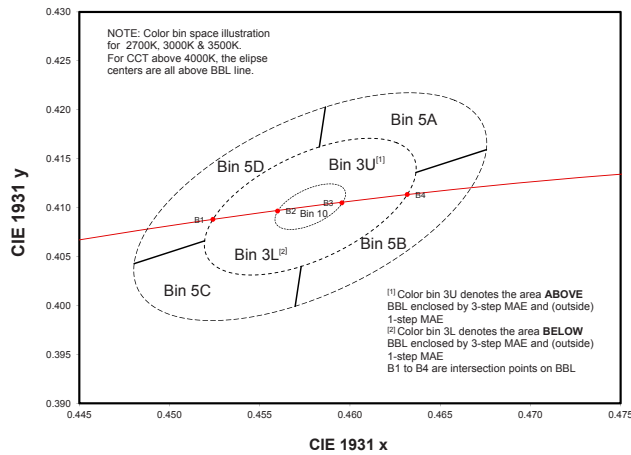
| Bin Code | Minimum Photometric Flux (lm) | Maximum Photometric Flux (lm) |
|----------|-------------------------------|-------------------------------|
| D        | 130                           | 140                           |
| E        | 140                           | 150                           |
| F        | 150                           | 160                           |
| G        | 160                           | 170                           |
| H        | 170                           | 180                           |
| J        | 180                           | 190                           |
| K        | 190                           | 200                           |
| L        | 200                           | 210                           |
| M        | 210                           | 220                           |
| N        | 220                           | 230                           |
| P        | 230                           | 240                           |
| Q        | 240                           | 250                           |
| R        | 250                           | 260                           |
| S        | 260                           | 270                           |

Table 8 lists minimum and maximum  $V_f$  bin values per emitter. Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.

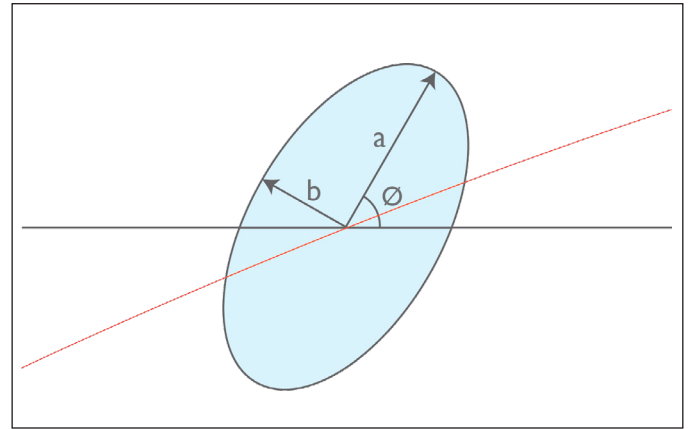
**Table 8.  $V_f$  Bins**

| Bin Code | Minimum Forward Voltage (V) | Maximum Forward Voltage (V) |
|----------|-----------------------------|-----------------------------|
| P        | 2.50                        | 2.75                        |
| R        | 2.75                        | 3.00                        |
| S        | 3.00                        | 3.25                        |

# LUXEON Z: 1-step, 3-step (above and below blackbody) and 5-step MacAdam Ellipse Color Definition



Color Space Definition for Above and Below Blackbody



Parameter Definition of MacAdam Ellipse

Table 9. LUXEON Z 1-step MacAdam Ellipse Parameters

| Nominal ANSI CCT | Color Space                   | Center Point (cx, cy) | Major Axis, a | Minor Axis, b | Ellipse Rotation Angle (degrees) |
|------------------|-------------------------------|-----------------------|---------------|---------------|----------------------------------|
| 2200K            | Single 1-step MacAdam ellipse | (0.5020, 0.4156)      | 0.00287       | 0.00132       | 49.27                            |
| 2700K            | Single 1-step MacAdam ellipse | (0.4578, 0.4101)      | 0.00270       | 0.00140       | 53.70                            |
| 3000K            | Single 1-step MacAdam ellipse | (0.4338, 0.4030)      | 0.00278       | 0.00136       | 53.22                            |
| 3500K            | Single 1-step MacAdam ellipse | (0.4073, 0.3917)      | 0.00309       | 0.00138       | 54.00                            |

Only available in 80 and 90CRI.

Table 10. LUXEON Z 3-step MacAdam Ellipse Parameters

| Nominal ANSI CCT | Color Space                   | Center Point (cx, cy) | Major Axis, a | Minor Axis, b | Ellipse Rotation Angle (degrees) |
|------------------|-------------------------------|-----------------------|---------------|---------------|----------------------------------|
| 2200K            | Single 3-step MacAdam ellipse | (0.5020, 0.4156)      | 0.00863       | 0.00398       | 49.27                            |
| 2700K            | Single 3-step MacAdam ellipse | (0.4578, 0.4101)      | 0.00810       | 0.00420       | 53.7                             |
| 3000K            | Single 3-step MacAdam ellipse | (0.4338, 0.4030)      | 0.00834       | 0.00408       | 53.2                             |
| 3500K            | Single 3-step MacAdam ellipse | (0.4073, 0.3917)      | 0.00927       | 0.00414       | 54.0                             |
| 4000K            | Single 3-step MacAdam ellipse | (0.3818, 0.3797)      | 0.00939       | 0.00402       | 53.7                             |
| 5000K            | Single 3-step MacAdam ellipse | (0.3447, 0.3553)      | 0.00822       | 0.00354       | 59.6                             |

Only available in 80 and 90CRI.

Table 11. LUXEON Z 5-step MacAdam Ellipse Parameters

| Nominal ANSI CCT | Color Space                   | Center Point (cx, cy) | Major Axis, a | Minor Axis, b | Ellipse Rotation Angle (degrees) |
|------------------|-------------------------------|-----------------------|---------------|---------------|----------------------------------|
| 2200K            | Single 5-step MacAdam ellipse | (0.5020, 0.4156)      | 0.01438       | 0.00663       | 49.27                            |
| 2700K            | Single 5-step MacAdam ellipse | (0.4578, 0.4101)      | 0.01350       | 0.00700       | 53.7                             |
| 3000K            | Single 5-step MacAdam ellipse | (0.4338, 0.4030)      | 0.01390       | 0.00680       | 53.2                             |
| 3500K            | Single 5-step MacAdam ellipse | (0.4073, 0.3917)      | 0.01545       | 0.00690       | 54.0                             |
| 4000K            | Single 5-step MacAdam ellipse | (0.3818, 0.3797)      | 0.01565       | 0.00670       | 53.7                             |
| 5000K            | Single 5-step MacAdam ellipse | (0.3447, 0.3553)      | 0.01370       | 0.00590       | 59.6                             |
| 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                            |

Available in 70, 80 and 90CRI.

Note for Tables 9, 10 & 11:

- Lumileds maintains a tester tolerance of  $\pm 0.005$  on x, y color coordinates.



# About Lumileds

Lumileds is the light engine leader, delivering innovation, quality, and reliability.

For 100 years, Lumileds commitment to innovation has helped customers pioneer breakthrough products in the automotive, consumer and illumination markets.

Lumileds is shaping the future of light with our LEDs and automotive lamps, and helping our customers illuminate how people see the world around them.

To learn more about our portfolio of light engines visit [www.lumileds.com](http://www.lumileds.com).



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Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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