

# Lumileds Illumination Business Strategy and Product Overview Lumileds

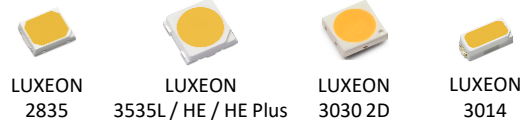
# Illumination Product Portfolio

A comprehensive portfolio of application optimized LUXEON LEDs and the infinitely configurable Matrix Platform

## High Power LEDs



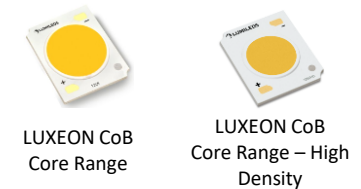
## Mid Power & Low Power LEDs



## Infrared LEDs



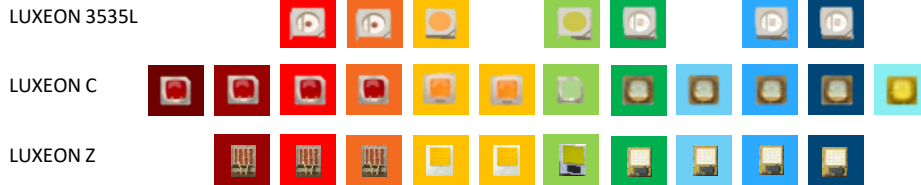
## Chip on Board LEDs



## Stylist Series



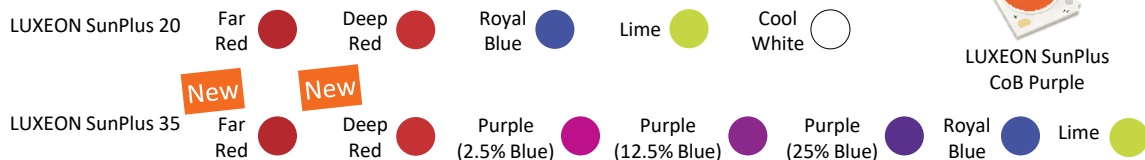
## Color LEDs



## UV



## Horticulture LEDs



## Matrix Platform



Infinitely configurable, integrated LED light engines tailored to the most demanding requirements. Yours.

# LUXEON Colors Family



# LUXEON Color Portfolio Overview

Several options to meet the different application needs

## LUXEON C

Domed

High lumen output

- Maximize lumen output
- One focal length across all colors
- Largest color gamut in the industry
- Ideal for color mixing applications

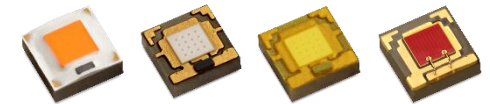


## LUXEON CZ

Un-domed

Maximum punch

- Maximize punch
- Leverages LUXEON C technology and footprint
- One focal length across all colors



## 3535L Colors

Un-domed

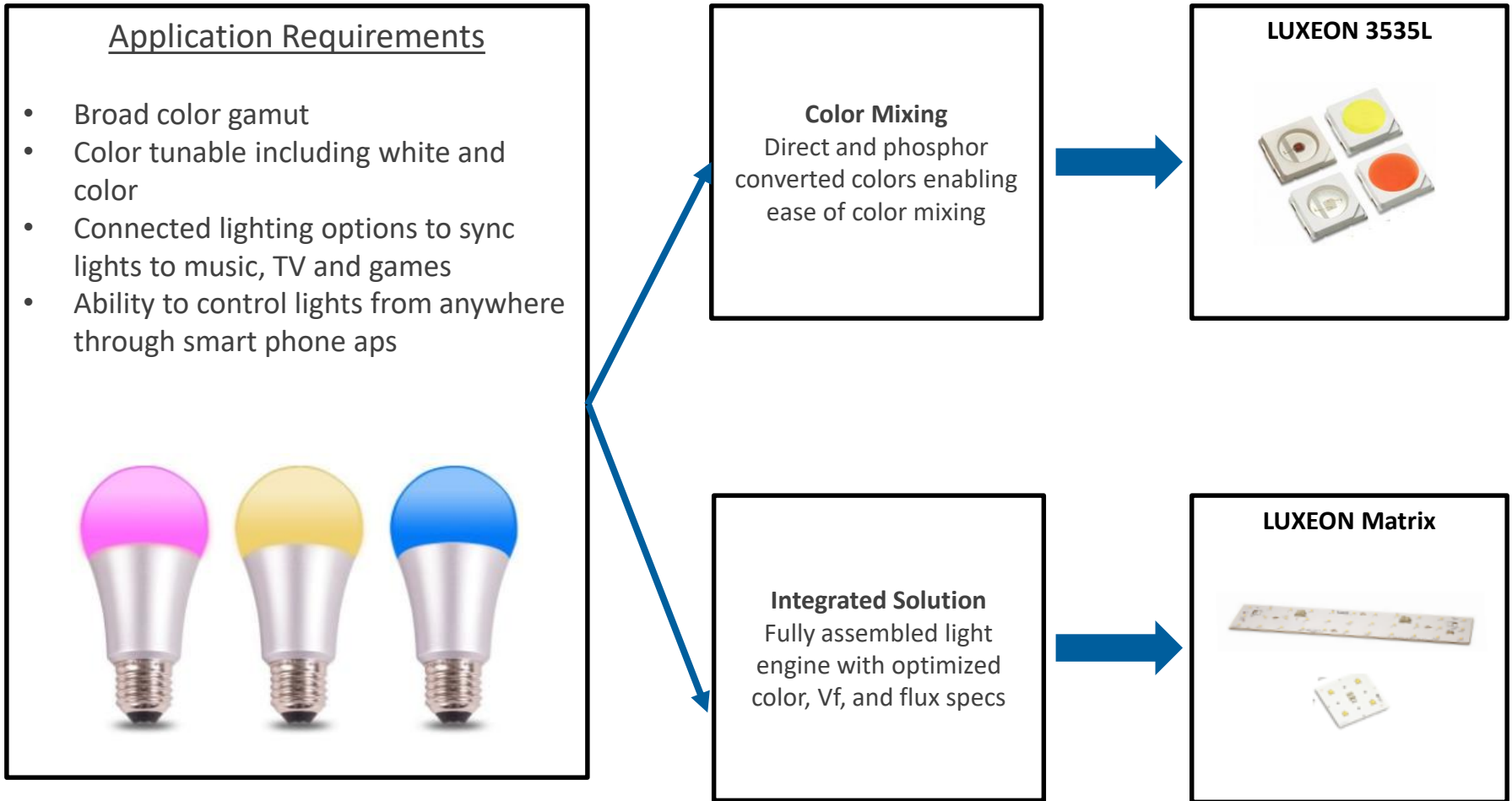
Low cost color alternative for entry level designs

- Ideal for cost efficient designs and short throw architecture
- Robust 8 Color Portfolio, Full range 3V White available
- Industry standard 3535 package



# Architecture/Entertainment – RGB Lamp

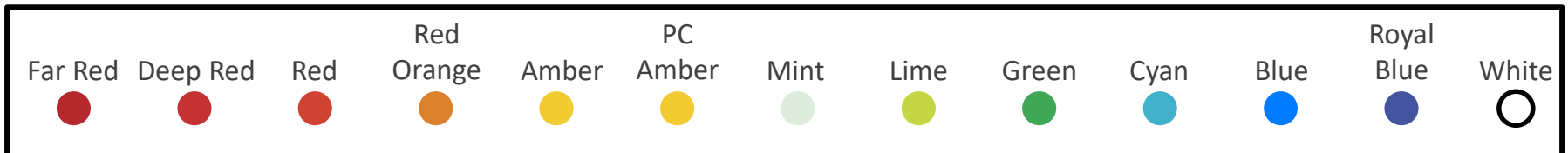
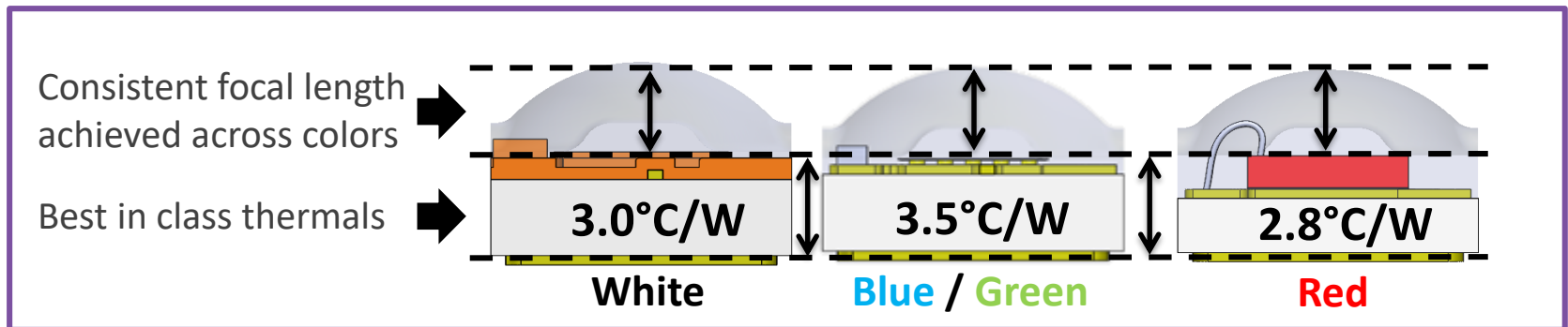
Variety color options to set the atmosphere in a room



## Product Details: LUXEON C

Compact color emitters for high lumen output and flawless color mixing

- Domed emitter providing high lumen output
- Consistent focal length for ease of color mixing in any system
- Lowest thermal resistance enabling brighter, lower cost, more efficient systems
- Completely hot tested eliminating unwanted surprises in color shift; all colors and whites @ 85°C Tj
- Broadest color portfolio ensuring largest color gamut



# LUXEON C Maximizes Flux Output

Competitive performance across the entire color gamut

	LUXEON C	Cree XQE HD	Osram SSL
Red	48	47	46
Green	117	100	117
Blue	41	38	36
PCA	94	78	100
3000K/80	102	100	114

Data listed @350mA/85C

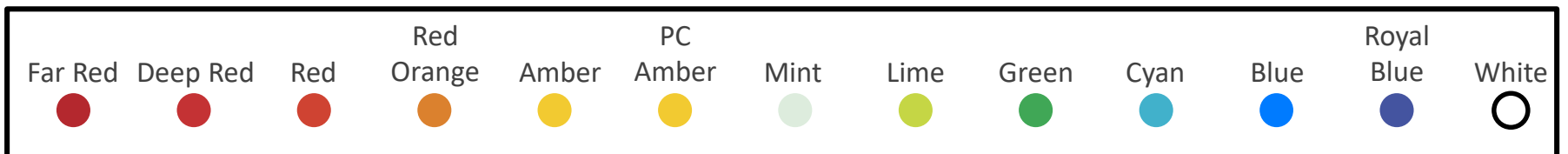
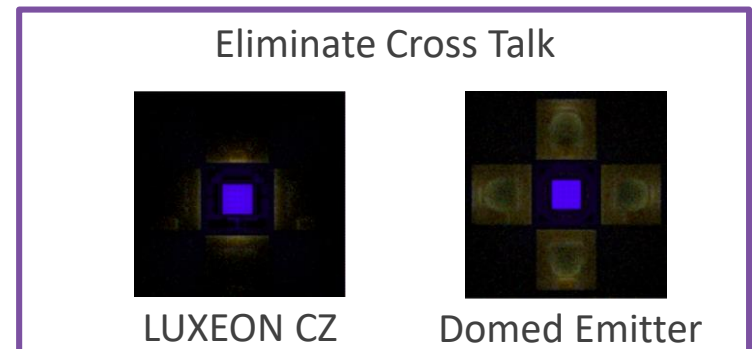
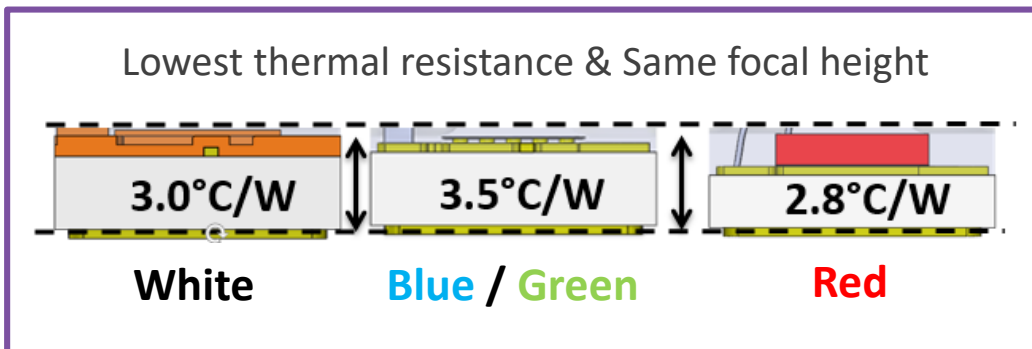
- LUXEON C flux performance enables competitive designs in any application
- Combination of low Vf and low thermal resistance ensures high efficacy at the system level

Samples available now

## Product Details: LUXEON CZ

Compact color emitters for maximum punch, flawless color mixing and narrow beam angles

- Consistent focal length for ease of color mixing in any system
- Eliminate cross talk in close packed applications
- Achieve narrow beam angles
- Lowest thermal resistance enabling brighter, lower cost, more efficient systems
- Broadest color portfolio ensuring largest color gamut

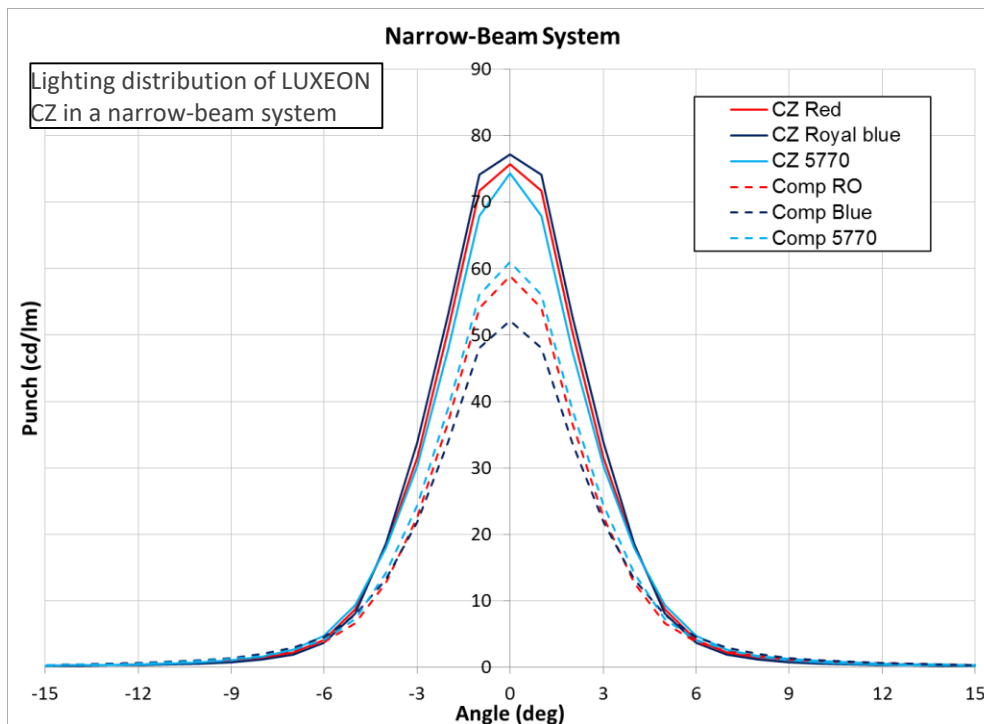




# LUXEON CZ Maximizes Punch in Narrow Beam Applications

Industry leading punch offering over 40% advantage vs other undomed emitters

- LUXEON CZ punch outperforms other undomed emitters across the color gamut
- Small source size simplifies narrow beam optics design



	LUXEON CZ	Competition	Comparison
	cd/lm	cd/lm	%Δ (cd/lm)
<b>Red/RO</b>	76	59	28%
<b>RB/Blue</b>	77	52	48%
<b>5770</b>	74	61	21%


































## Product Details: LUXEON 3535L Color

Lumileds LEDs that deliver the right amount of color you need. No more. No less.

- Full color palette for a wider spectrum range, including Phosphor Converted Amber and Lime
- Ideal color option for cost effective designs in an industry standard 3535 package
- Same focal height as other LUXEON Color family parts – optically compatible
- Single die and single source architecture for optical control



# LUXEON Color Portfolio Overview

Color	LUXEON C	LUXEON CZ	LUXEON 3535L Colors
Violet			
Royal Blue			
Blue			
Cyan			
Green			
Amber			
PC Amber			
Red-Orange			
Red			
Deep Red			
Far Red			
Lime			
Mint			

# LUXEON Mid & Low Power



# Mid and Low Power Portfolio Overview

Several options to meet all professional application needs

## LUXEON 3535L

+ Efficacy  
+ Long Lifetime

- High Efficacy
- Highest available max current
- Application flexible, from high efficacy to high light output



LUXEON 3535L HE



LUXEON 3535L HE Plus

## LUXEON 2835

+ High Light Output  
+ Long Lifetime

- Variety of voltage and light output options in common package
- Industry best lifetime and reliability
- Application-specific color targeting



LUXEON 2835C

3V, 6V options



LUXEON 2835E

3V, 6V, and 9V options

## LUXEON 3030 2D

+ High Light Output  
+ Industry Standard Package

- Industry best performance and reliability
- Hot color targeting for best color stability
- High Voltage option available



LUXEON 3030 2D



LUXEON 3030 HV

## LUXEON Stylist Series

- Solutions for specialty applications
- Spectral Engineering solutions for:
  - Fashion/Retail, Restaurants, Fresh Food



LUXEON 3535L HE



LUXEON 2835



LUXEON 3014

# LUXEON 3030 2D





## LUXEON 3030 2D

High flux hot color targeted 6V reliable package

- Mid power offering delivering up to 120 lumens, 165 lm/W @ 120mA 4000K 80CRI
- Enable high performance outdoor and fixture designs with over 200 lm/W
- Maximum drive current of 240mA exceeding 220 lumens
- Hot-color targeting ensures color within ANSI bin at typical operating conditions
- Offered wide range of CCTs in 70CRI, 80CRI and 90CRI
- Superior reliability affirms long lifetime, DLC Premium achievable at 120mA, 105C

**Delivers leading performance for various cost competitive retrofit applications**



Spot module



High Bay



Street light



# LUXEON 3030 2D Benchmarking

Better performance and higher driving capability than Seoul

Lumileds LUXEON 3030 2D vs. Seoul Semiconductor STW8C2SB, referenced to 100mA

Product	# of die	CCT/CRI	Bin	$V_{f\_typ}$	(lm)	lm/W	$I_f$ max [mA]
LUXEON 3030 2D	2	5000/80	N (typ. bin)	6.0	99	165	240
Seoul 3030	2		L30 (typ. bin)	6.1	96	157	200
LUXEON 3030 2D	2	3000/80	L (typ. bin)	6.0	90	150	240
Seoul 3030	2		K28 (typ. bin)	6.1	87	143	200

1. 3% higher flux than Seoul typical bin at 5000K 80CRI
2. 3% higher flux than Seoul typical bin at 3000K 80CRI
3. 20% higher drive capability
4. 0.1V lower typical Vf





# LUXEON 3030 2D Benchmarking

Comparable performance and higher driving capability than Nichia

Lumileds LUXEON 3030 2D vs. Nichia NF2L(W)757GR series, referenced to 100mA

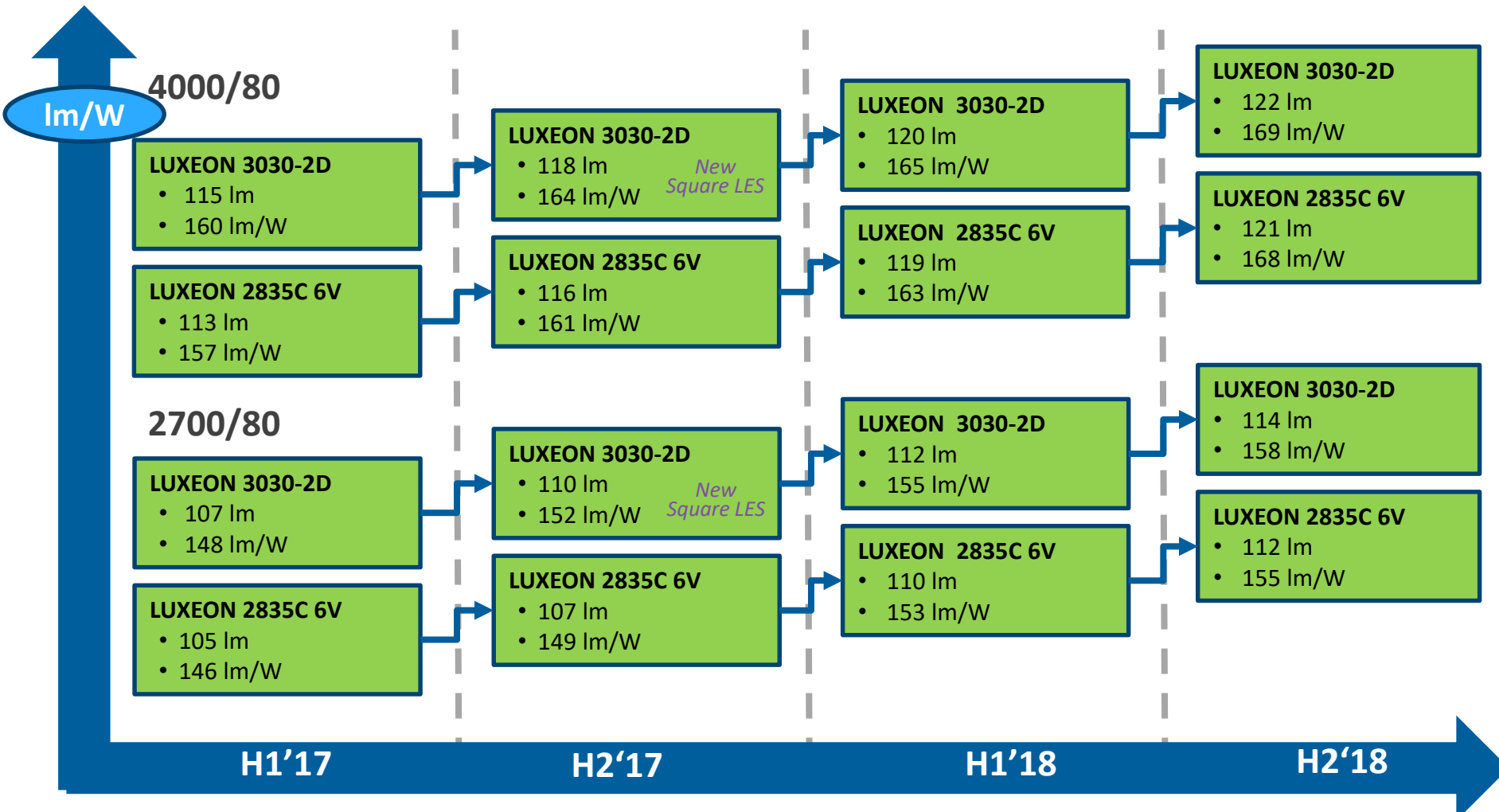
Product	# of die	CCT/CRI	Bin	$V_f$ typ	(lm)	lm/W	$I_f$ max [mA]
LUXEON 3030 2D	2	5000/80	N (typ. bin)	6.0	99	165	240
Nichia 757	2		P20 (typ. bin)	6.0	100	167	200
LUXEON 3030 2D	2	3000/80	L (typ. bin)	6.0	90	150	240
Nichia 757	2		P19 (typ. bin)	6.0	91	152	200

1. Comparable with Nichia's typical bin at 5000K/3000K 80CRI
2. 5 degree higher maximum junction temperature
3. 20% higher drive capability

# Lumileds Roadmap Mid-Power LEDs

LUXEON 2835C 6V / 3030-2D (120mA, 25°C)

Released product

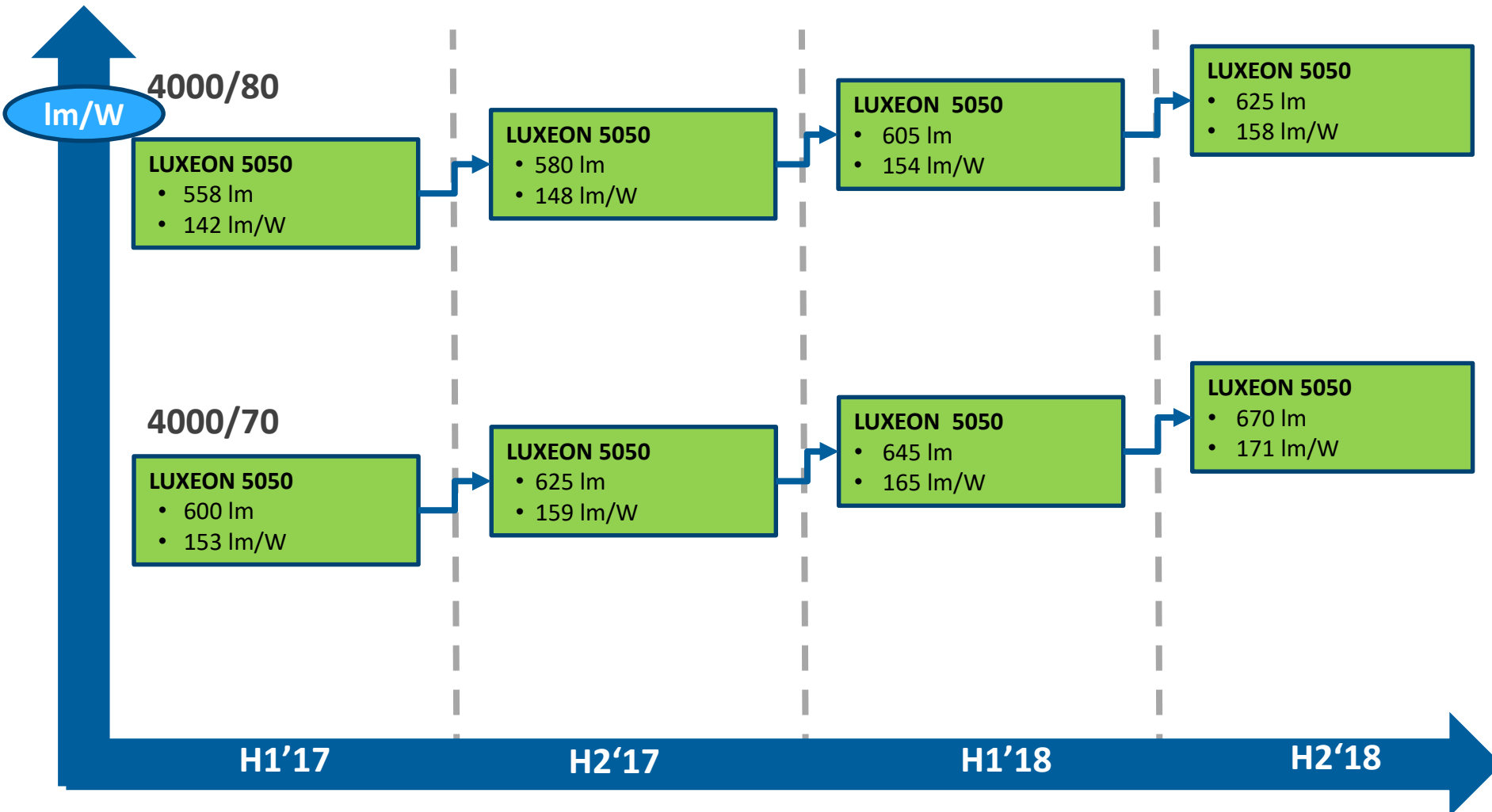


• Positions of boxes not to scale - meant to illustrate relative positioning only

# Lumileds Roadmap Mid-Power LEDs

LUXEON 5050 (160mA, 25°C)

Released product



• Positions of boxes not to scale - meant to illustrate relative positioning only



# LUXEON 5050

High efficacy and lumens in a multi-die, high power package, enabling low system costs

## Features and Benefits

- Next generation 2W product further decreasing emitter count
- High lm/W exceeding industrial/outdoor requirements
- Single round optical source (4.6mm diameter) compatible with most current 2W optics
- Lowest thermal resistance (1.9K/W)
- 6V and 24V option, easy to match with existing driver design

CRI	2700K	3000K	3500K	4000K	5000K	5700K	6500K
70	✓	✓		✓	✓	✓	✓
80	✓	✓	✓	✓	✓	NEW	✓
90	✓	✓	✓	✓	NEW	NEW	



- 5000K/90, 5700K/80 and 5700K/90 will be launched in Nov 2017. Target to Stadium appl.
- Flux upgrade 3-4% in January 2018

5050	Target Applications	Typ. Performance at 24.5V, 160mA, 25°C	Typ. Performance at 2W, 24.5V, 80mA, 25°C	Footprint
3000K 80CRI	PAR16/20, 35/50W MR16 and GU10	555 lm @ 142 lm/W	298lm 164lm/W	
4000K 70CRI	Outdoor / High Bay	625 lm @ 159lm/W	339lm @186lm/W	

# LUXEON 5050 enable high efficacy at low system cost

Single light source, High efficacy lighting solution

## Directional lamp



**MR16, PAR, Spotlight**

- Single Source
- High Lumen Density

## Industrial



**High bay, Low bay,  
Flood light, Stadium**

- High Lumen/\$
- High lm/W
- Low LED Count

## Outdoor Area

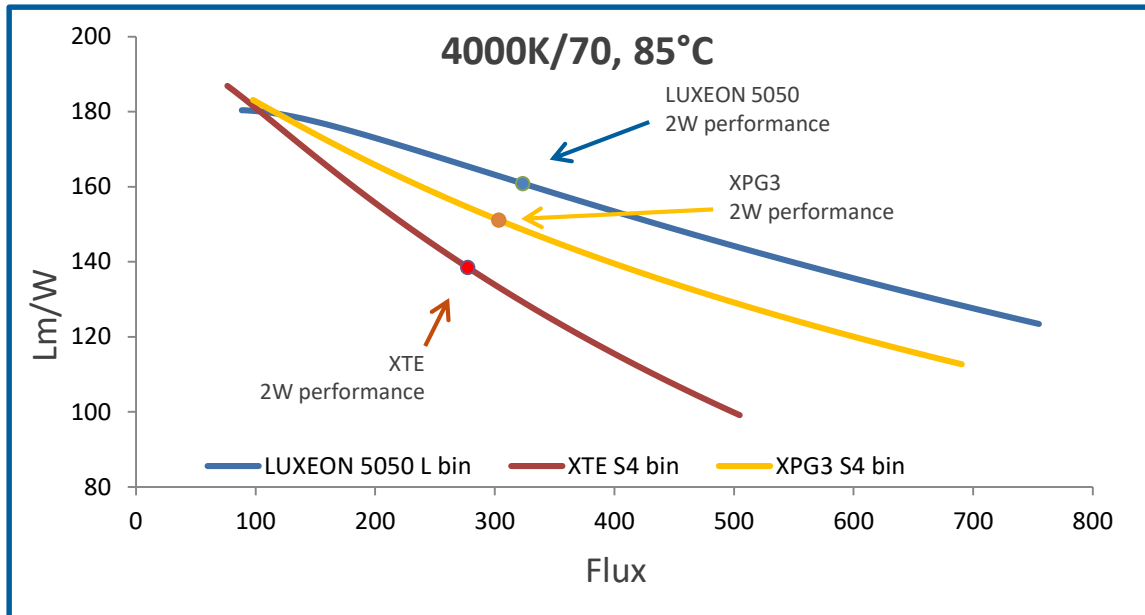


**Streetlight, Canopy,  
Tunnel light, Area light**

- High Lumen/\$
- High lm/W
- Low LED Count

# LUXEON 5050 compared with high power solutions

Double the light output and ~15% higher efficiency than competing high power solution



4000K 70 CRI @85°C	LUXEON 5050	Cree XTE (1mm <sup>2</sup> )	Cree XPG3(2mm <sup>2</sup> )	LUXEON 5050 leading in performance @2W
<b>Bin</b>	L (600lm min)	S4 (164lm min)	S4 (164lm min)	Top bin of Cree part
<b>Flux at 2W</b>	<b>323</b>	277	303	<b>&gt;16% more Flux/Efficacy than XTE. &gt;6% more Flux/Efficacy than XPG3</b>
<b>Lm/W at 2W</b>	<b>161</b>	138	151	
<b>Rth</b>	<b>1.9K/W</b>	5K/W	3K/W	2.6X better than XTE,

# LUXEON 5050 roadmap

Performance upgrade to continue market leadership

Typical flux at 160mA, 24.5V

