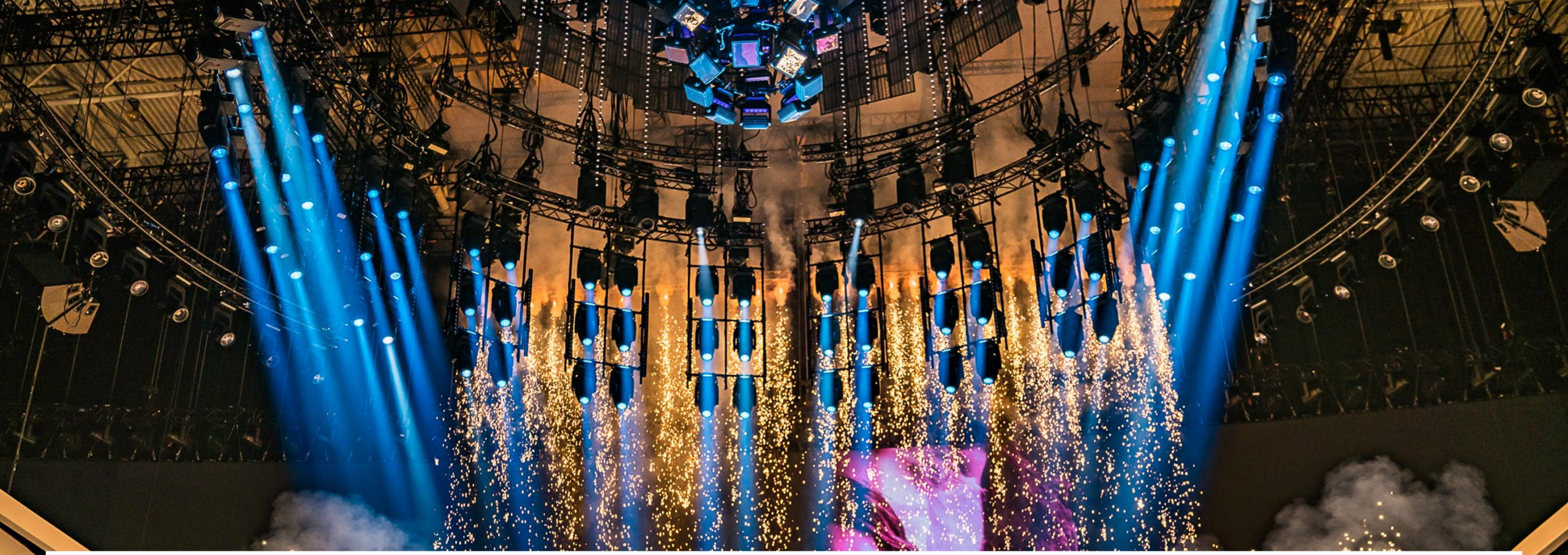

# Product Presentation

## OSLON® PURE 1010 - Chip-Scale Packages (CSP)

### Smallest 1mm² CSP in the market

**Light is OSRAM**

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# OSLON® Pure 1010 – Chip Scale Package (CSP)

## Target applications and products

### Indoor / Retail

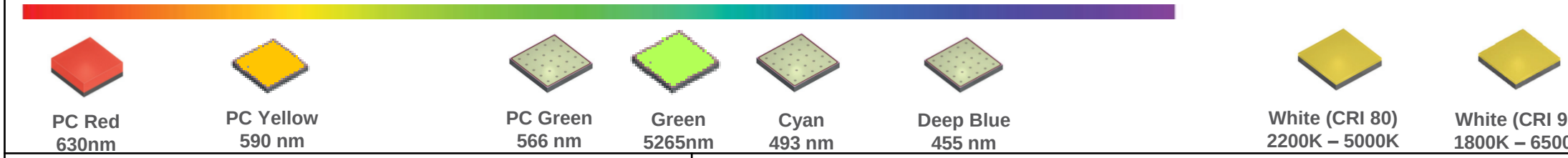
#### High Density Cluster Spots (White & CCT-tuneable)

### Special Lighting

#### Architectural Lighting

#### Customized Spectra/ Stage Lighting

**PRODUCTS:**




**KEY FEATURES**

- Industry's first "real" chip scale package (1 x 1 mm²)
- Superior and high flux density
- Best in class Color-Over-Angle
- Enables customized very high density clustering
- Offers best Center Beam Candela Power (CBCP) & Cd/W

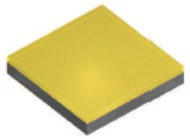
**KEY FEATURES**

- Industry's first "real" chip scale package (1 x 1 mm²)
- Simple customized high density clustering
- Small LES customized color spectrum feasible – color mixing happens before secondary optics
- Reduction of secondary optics size and costs

# OSLON® PURE 1010 White

## Overview

**1010 LED**
**1 - 3 W**



1.0 x 1.0 x 0.17 mm

### Key Messages & Features

- Industry's first "real" chip scale package (1 x 1 $mm^2$)
- Best in class Color-Over-Angle
- Highly flexible for customized high density clustering
- Perfect for customized arrays in Spot- ,Downlights & color tunable applications

### Key Applications

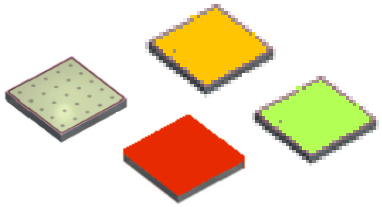
- Narrow Beam Spot Lighting
- Tunable CCT cluster
- Shop Lighting

| Type | Min CRI | CCT Range (K) | Binning (mA) | Typ. Vf (V) | Typ. Flux (lm) | Typ. Eff (lm/W) | Product Release |
|---|---|---|---|---|---|---|---|
| GW VJLPE1.EM | 80 | 2200 | 350 | 2.80 | **88** | **89** | In Production |
| | | 2700 | | | 96 | 98 | |
| | | 3000 | | | 100 | 102 | |
| | | 4000 | | | 110 | 113 | |
| | | 5000 | | | 115 | 118 | |
| GW VJLPE1.CM | 90 | 1800 | | | **55** | **57** | In Production |
| | | 2700 | | | 76 | 78 | |
| | | 3000 | | | 84 | 86 | |
| | | 3500 | | | 88 | 90 | |
| | | 4000 | | | 95 | 97 | |
| | | 5000 | | | 101 | 103 | |
| | | 6500 | | | **103** | **105** | |

# OSLON® PURE 1010 Colors

## Overview

### 1010 LED
### 1-3 W



1.0 x 1.0 x 0.17 mm

### Key Messages & Features

- Industry's first "real" chip scale package (1 x 1 $mm^2$)
- Simple customized high density clustering
- Small LES customized color spectrum feasible – color mixing before secondary optics
- Reduction of secondary optics size and costs

### Key Applications

- Studio Lighting
- Architectural Lighting
- Special Spectrum Lighting (e.g. Food)

| Type | Ldom (nm) | Binning (mA) | Typ. Vf (V) | Typ. Power (W) | Typ. Flux (lm) | Typ. Eff (lm/W) |
|---|---|---|---|---|---|---|
| **PC Red* (GR VJLPE1)** | 630 | 700 mA | 2.8 | 2W | 43.5 | 21 |
| **Green (GT VJLPE1)** | 525 | | 2.8 | | 214 | 108 |
| **Deep Blue (GD VJLPE1)** | 455 | | | | 31 | 15 |
| **PC Yellow * (GY VJLPE1)** | 590 | | 2.8 | | 195 | 98 |
| **Cyan (GC VJLPE1)** | 493 | | 2.8 | | 120 | 62 |
| **PC Green* (GG VJLPE1)** | 566 | | 2.9 | | 274 | 131 |

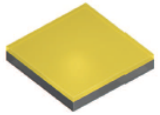
* Phosphor converted

# OSLON® PURE 1010

## Benefits versus volume emitting CSP

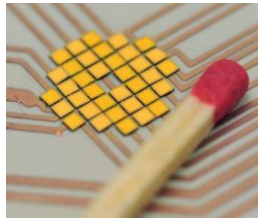
### OSLON® Pure 1010

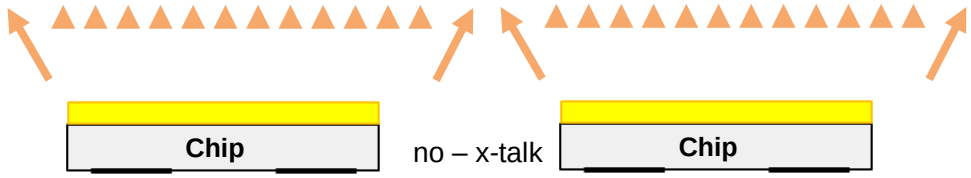
- **Surface emitting Flip Chip**
- **Size: 1.01 x 1.01 x 0.17 mm**
- **Phosphor Layer on top of chip**



**Advantages:**

- **Good light control for 2nd optics design**
- **No cross-talk when LEDs are densely clustered**



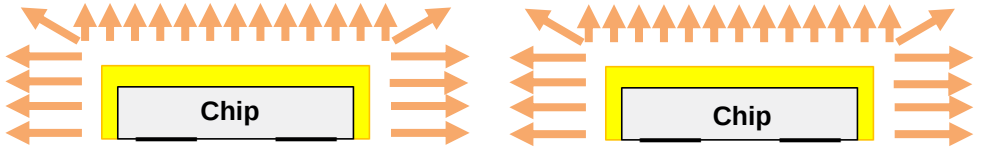



### Volume Emitting CSP (Competition)

- **Volume emitting Flip chip**
- **Size: 1.41mm x 1.41mm x 0.41**
- **Phosphor cover top & sides of chip**

**Disadvantages:**

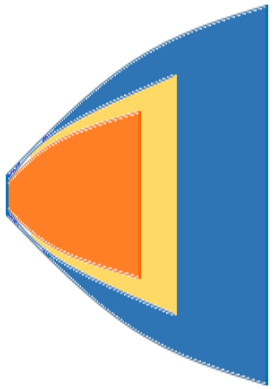
- **Poor light control for 2nd optics design**
- **Light emitted from side is not usable and will cause cross talk / color shift when LEDs are densely clustered**

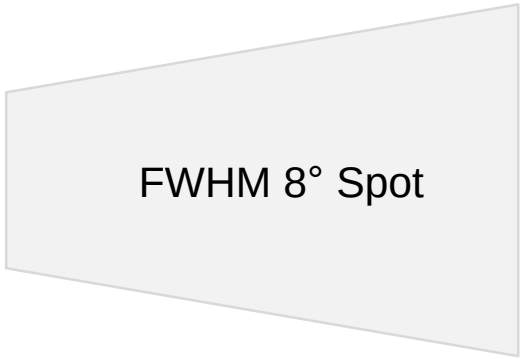


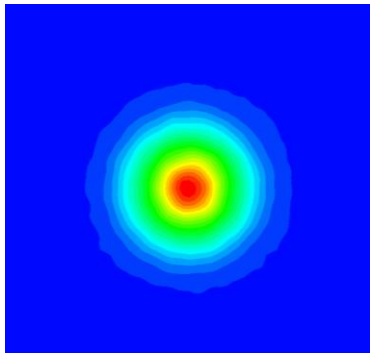
# OSLON® PURE 1010 : System Level Benefits

## PURE 1010 vs top emitter on optics size

Relative Reflector Size





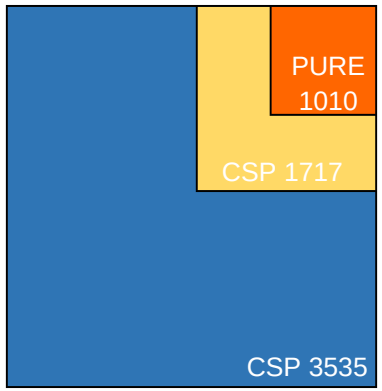



Reflector for 3535

Reflector for PURE 1010

**SIZE DOES MATTER !**

Relative LED Surface




***Reflector Radius Ratio**
**1.0 : 1.4 : 2.3**

***Reflector Height Ratio**
**1.0 : 1.2 : 2.0**

**1717 CSP packages require 40% larger reflector radius & 20% larger reflector height.**

**3535 CSP packages require 230% larger reflector radius & 200% larger reflector height.**

*Optical simulation result, normalized at same candela value.



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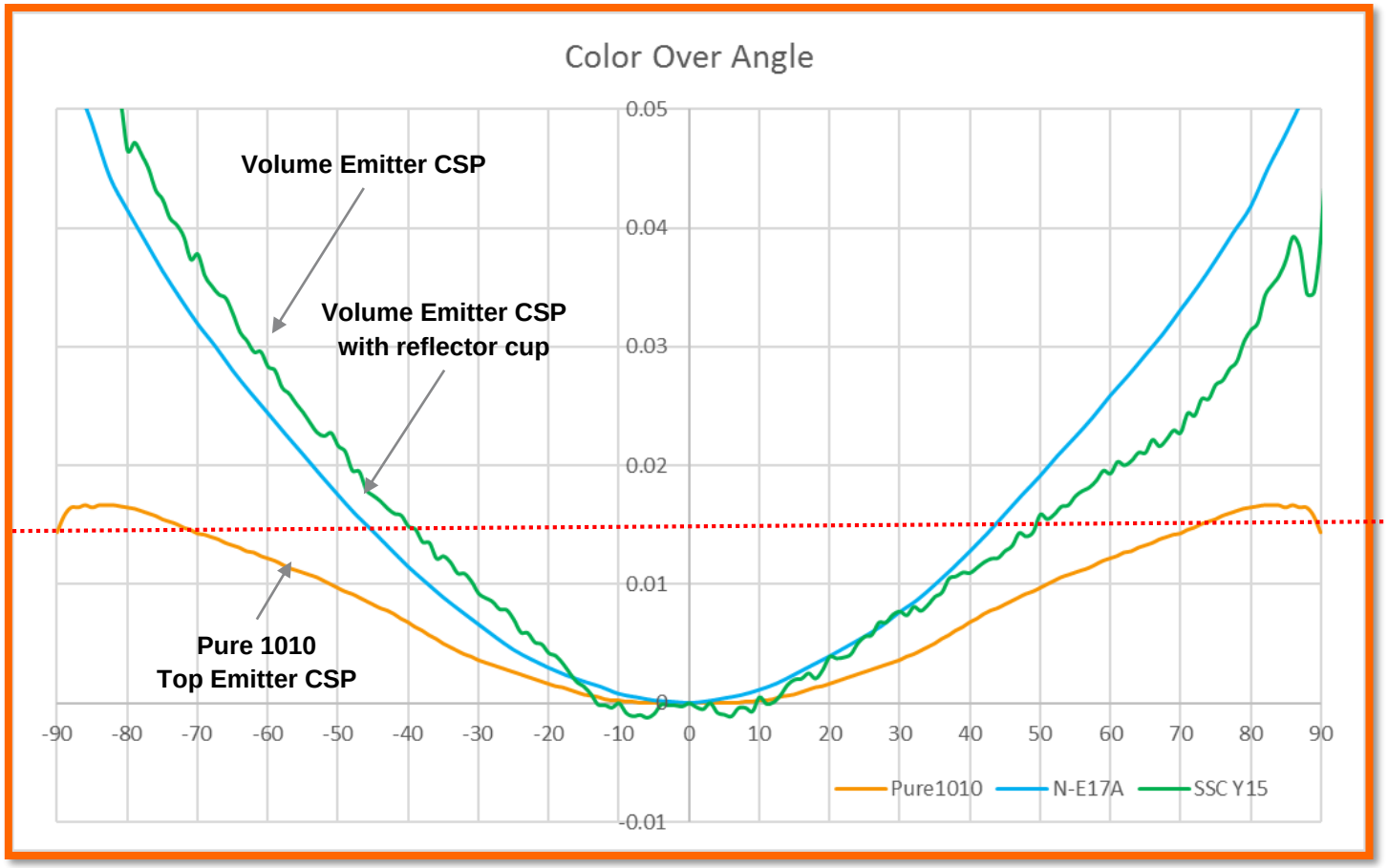
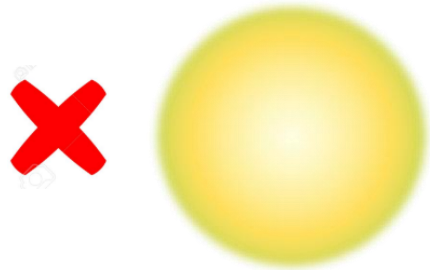
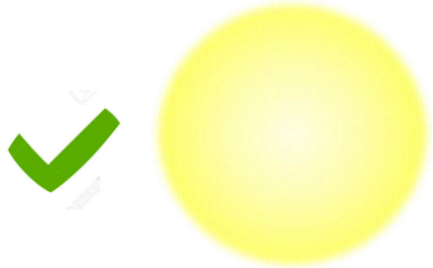
# OSLON® PURE 1010 : System Level Benefits

## Superior color quality – Color over angle




**Poor CoA = Poor Homogeneity Control on Spot application**





**Good CoA = Good Homogeneity Control on Spot application**



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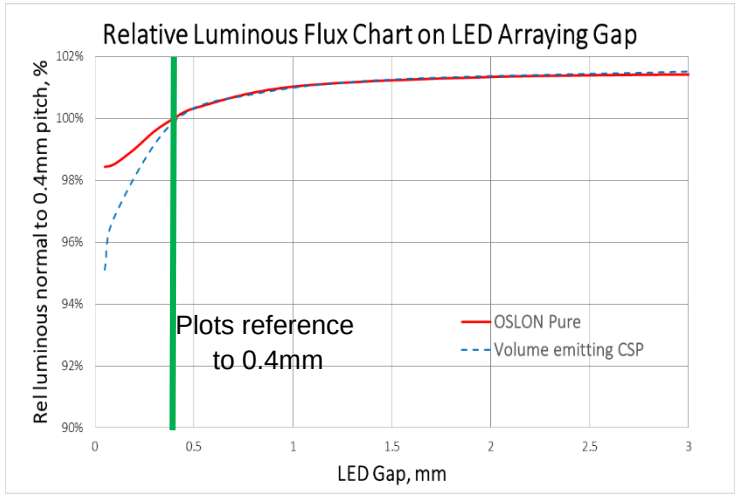
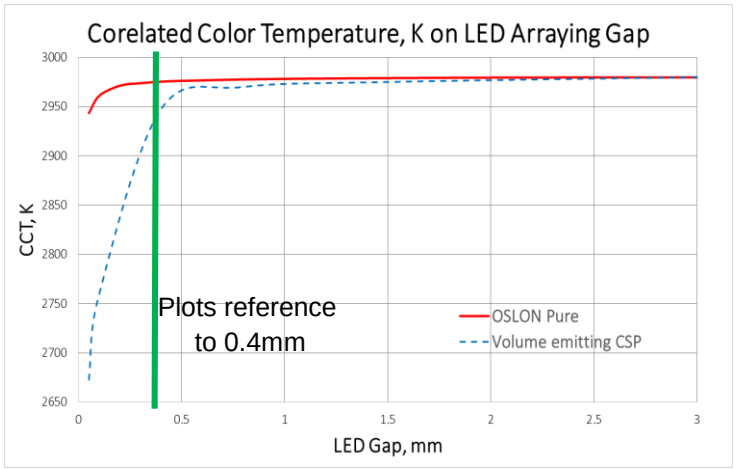
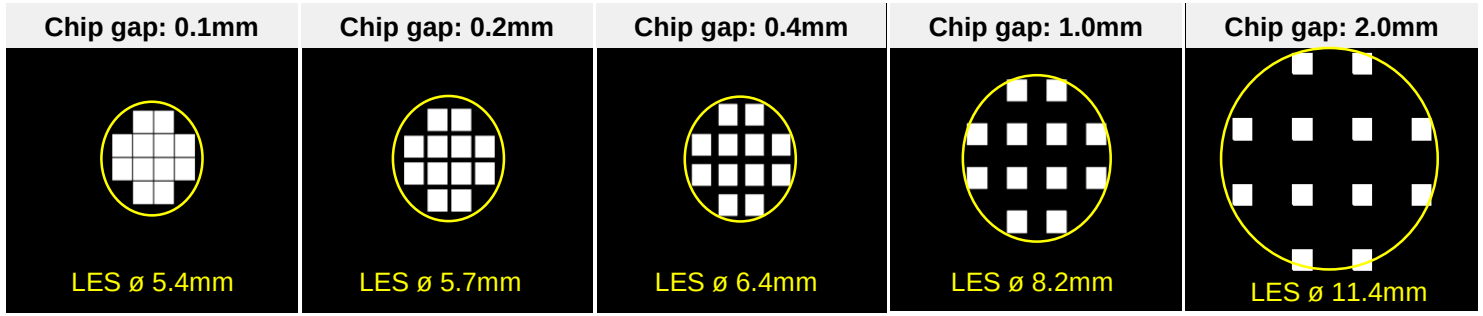
# OSLON® PURE 1010 : Small LES without Performance Drop

## PURE 1010 vs volume emitters – Clustering comparison




**CONCLUSION:**

- **Strong efficiency drop in volume-emitters CSP cluster when distance decreased, required highly reflective surface.**
- **OSLON PURE top emitter CSP radiate almost 100% to the top → tight packing possible – Chip to Chip distance <100µm possible**
- **OSLON PURE enables highest LED counts/LES with minimum light recycling → Smaller secondary optics !**
- **OSLON PURE offer minimum color shift <40K even with only 50µm LED gap, whereas volume emitters are >250K.**

# OSLON® PURE 1010

## Reference design

**White Tunable CSP Cluster**

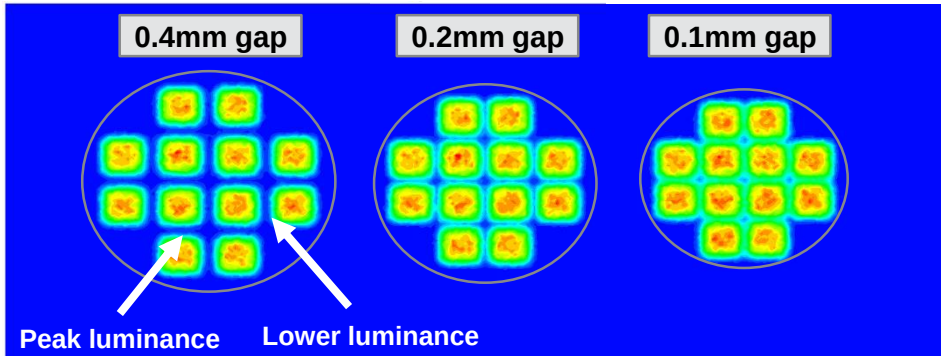
**Key Features**

- Lack of bond wires and CSP dimensions allow dense clustering type of module design
- Seamless and flexible assembly on boards
- Enables customer specific arrays.

**Narrow Beam Spotlight**

**Key Features**

- Small form factor and high luminance enables best-in-class spotlight optical design
- High luminance reduces optical complexity especially on narrow beam angle spots
- Enables lower system costs and slim luminaire designs




**Flux Density**

**Lower**

**VS**

**Higher**



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