



SEOUL SEMICONDUCTOR

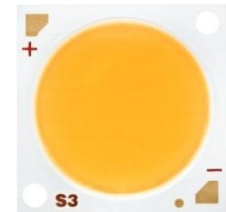
Chip On Board (COB) Presentation

Seoul Semiconductor

August 2014

COB

- COB series series designed for best efficacy (lm/W) in chip on board
- Broad portfolio of color temperature and color rendering indexes to meet the demands of a wide variety of general illumination applications
- Optimized for high efficacy applications delivering up to 149lm/W @80W 5000K CRI70
- 3- and 4- step McAdam center bin for warm and neutral white
- Market conform size fits to widely used connectors, reflectors, heatsinks and typical currents and voltages for existing driver solution
- Best lm/€ due to own chip production



COB Key Figures

Performance

- High lumen output package in Warm White with up to a typical 10800 lumen (3000K, CRI 8380W) with a maximum power of 165W and up to 20.000 lumen
- Efficiency up to typ. 149 lm/W in 5000K, CRI 70, 80W and 11800lumen

Color

- Wide white spectrum color temperature range between 2600K and 6000K
- CRI minimum with options of 70, 80 and 90

Reliability

- LM80 testing
 - Finished for models up to ZC16 with 9000h test
 - Running for models up to ZC40 – Final data available in Dec 2014
- Easy Tc point measurement place
- Longer creepage distance in voltage pads, more security

COB Key Figures

Electrical

- Excellent hot lumen maintenance compared to competition
- Drive currents suitable for market conform power supplies (180mA, 350mA, 500mA, 700mA, 1000mA, 1500mA)

Mechanical / Thermal

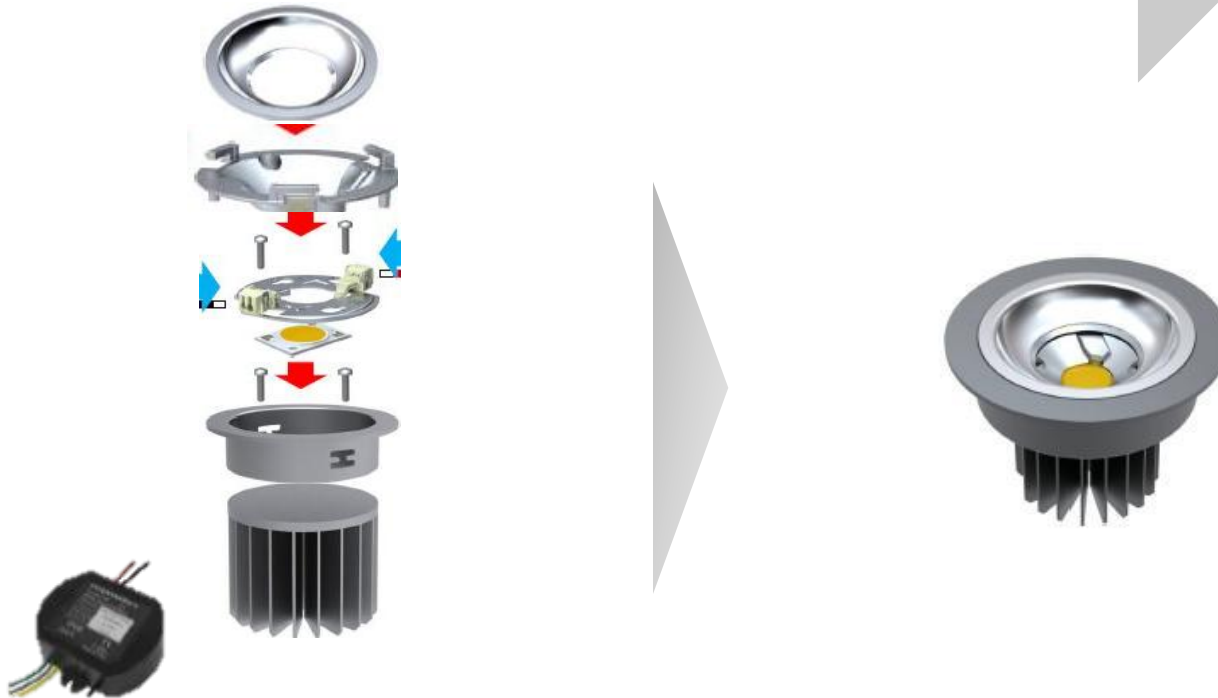
- Zhaga applicable light emitting surface (LES) diameter
- Thermal resistance down to $R_{th JS} = 0,2K/W$
- Max. junction temperature 125°C

Why COB?

**Small
LES & Optic**

**Flexible design
Reduced lead time & cost**

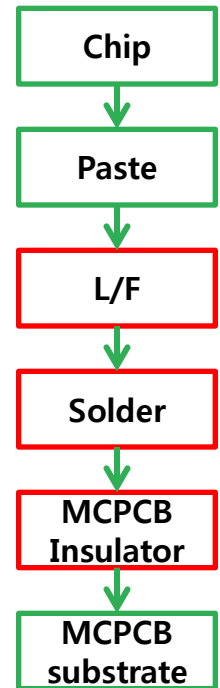
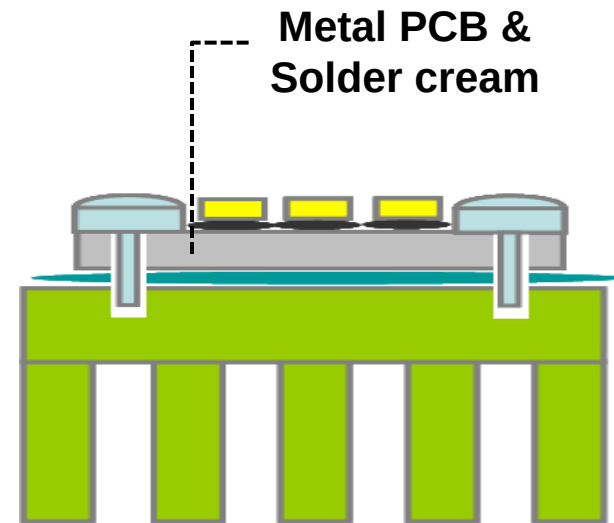
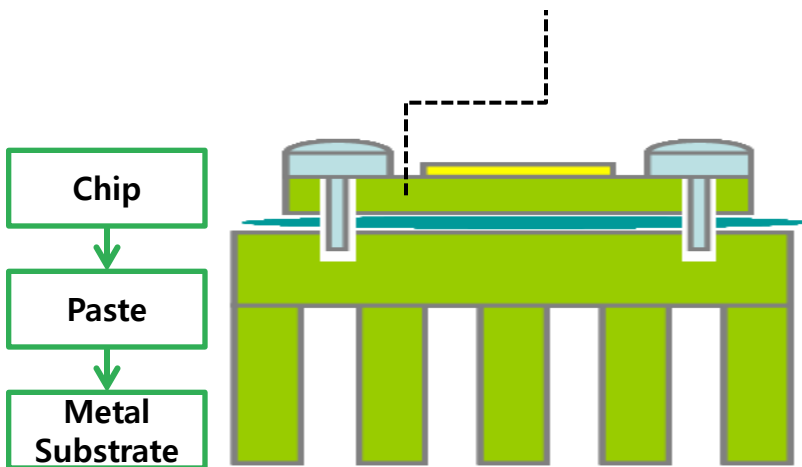
**Reduce your assembly
time!**



Why COB?

An excellent thermal management with a short thermal path and connected heat sink

Directly Connected to heat sink



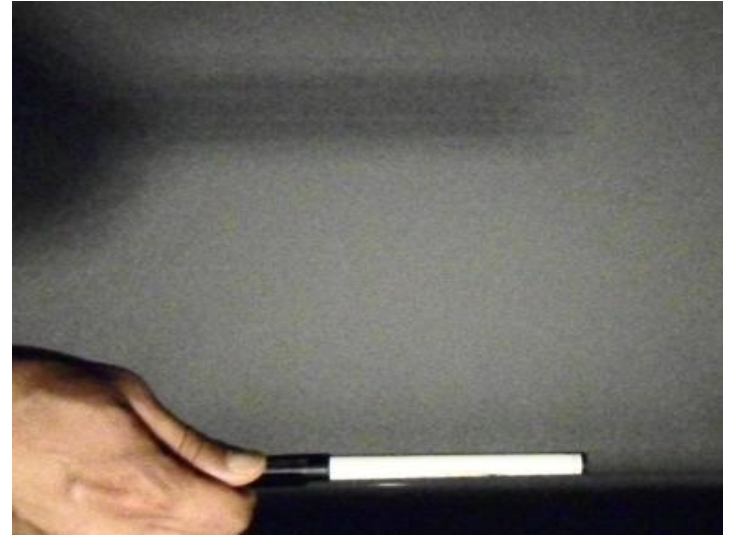
Why COB?

The best quality of light with no multiple shadows

Single shadow



Multiple shadow



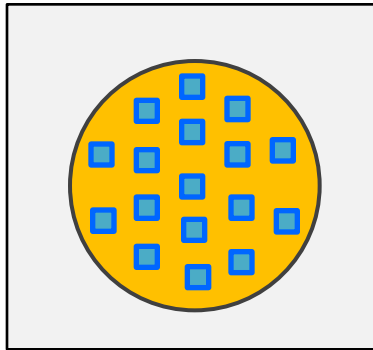


The same chip in 5630 package

**About 6,000 Million 5630s have
lighted up the whole world since
2007.**

Material & Structure

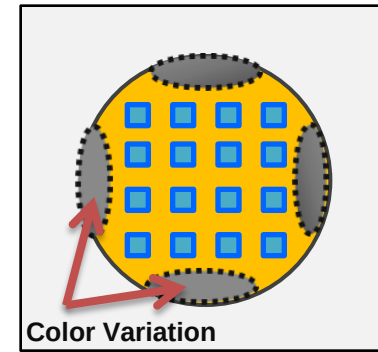
The best optimized chip array design



Chip location
in zigzags

1. Better lumen extraction
2. More homogenous color

Competitors



Chip location
in general

1. Color variation at the edges
2. Lower lumen extraction models

COB Applications

- Indoor lighting



- Spot light and retrofit lamps

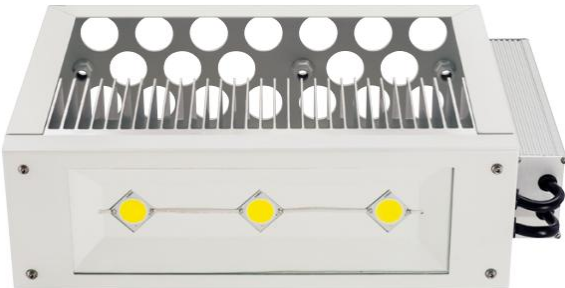


COB Applications

- Architectural light and outdoor applications



- High-bay lighting



COB Product Overview

Specification

> ZC(Z-Power COB)

[Compare](#)
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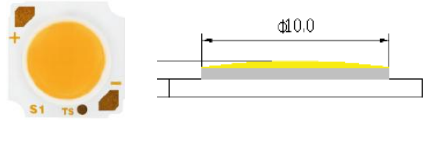
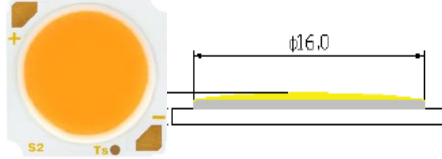
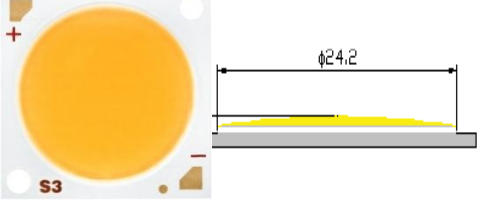
Part No.	Color	P[W]	Size[mm]	VF[V]	Φv[lm]	CCT	CRI	IF[mA]	2θ[°]	Certificate	DataSheet
 SDW01F1B 		4.5	13.5*13.5	9	590	5,000	Min.70	500	120		
 SDW81F1B 		4.5	13.5*13.5	9	500	3,000	Min.80	500	120		
 SDW01F1C 		6.7	13.5x13.5	37	870	5,000	Min.70	180	120		
 SDW81F1C 		6.7	13.5x13.5	37	710	2,700	Min.80	180	120		
 SDW91F1C 		6.5	13.5x13.5	38	680	4,000	Min.90	180	120		
 SDW02F1C 		13.0	19.0x19.0	37	1,780	5,000	Min.70	350	120		
 SDW82F1C 		13.0	19.0x19.0	37	1,440	2,700	Min.80	350	120		
 SDW92F1C 	 	13.0	19.0x19.0	37	1,385	2,700 - 4,000	Min.90	350	120		
 SDW03F1C 		18.5	19.0x19.0	37	2,520	5,000	Min.70	500	120		
 SDW83F1C 		18.5	19.0x19.0	37	2,050	2,700	Min.80	500	120		
 SDW93F1C 	 	18.5	19.0x19.0	37	1,940	2,700 - 4,000	Min.90	500	120		
 SDW04F1C 		25.9	28.0x28.0	37	3,650	5,000	Min.70	700	120		
 SDW84F1C 		25.9	28.0x28.0	37	3,000	2,700	Min.80	700	120		
 SDW94F1C 	 	25.9	28.0x28.0	37	2,770	2,700 - 4,000	Min.90	700	120		
 SDW05F1C 		37.0	28.0x28.0	37	5,030	5,000	Min.70	1,000	120		
 SDW85F1C 		37.0	28.0x28.0	37	4,100	2,700	Min.80	1,000	120		
 SDW95F1C 	 	37.0	28.0x28.0	37	3,885	2,700 - 4,000	Min.90	1,000	120		

 New Product
  Under Development
  Mass Production
  Automotive

COB Luminous Flux Groups

Part Number	Luminous Flux (lm) @ $I_f = 180\text{mA}$			Color Chromaticity Coordinate @ $I_f = 350\text{mA}$	Typical Forward Voltage (V_f)		
	Bin Code	Min.	Max.		Bin Code	Min.	Max.
SDW01F1C	C	700	800	Refer to page.13	D	32.0	36.0
	D	800	900		E	36.0	40.0
	E	900	1100				
SDW81F1C	B2	635	700	Refer to page.14	D	32.0	36.0
	C	700	800		E	36.0	40.0
	D	800	900				
SDW02F1C	G1	1400	1600	Refer to page.13	D	32.0	36.0
	G2	1600	1800		E	36.0	40.0
	H1	1800	2400				
SDW82F1C	F2	1250	1400	Refer to page.14	D	32.0	36.0
	G1	1400	1600		E	36.0	40.0
	G2	1600	1800				
SDW03F1C	H1	1800	2400	Refer to page.13	D	32.0	36.0
	H2	2400	2900		E	36.0	40.0
SDW83F1C	G2	1600	1800	Refer to page.14	D	32.0	36.0
	H1	1800	2400		E	36.0	40.0
SDW04F1C	J1	2900	3400	Refer to page.13	D	32.0	36.0
	J2	3400	3900		E	36.0	40.0
	K1	3900	4500				
SDW84F1C	H2	2400	2900	Refer to page.14	D	32.0	36.0
	J1	2900	3400		E	36.0	40.0
	J2	3400	3900				
SDW05F1C	K1	3900	4500	Refer to page.13	D	32.0	36.0
	K2	4500	5100		E	36.0	40.0
	L1	5100	5800				
SDW85F1C	J2	3400	3900	Refer to page.14	D	32.0	36.0
	K1	3900	4500		E	36.0	40.0
	K2	4500	5100				

COB Overview – CRI 80

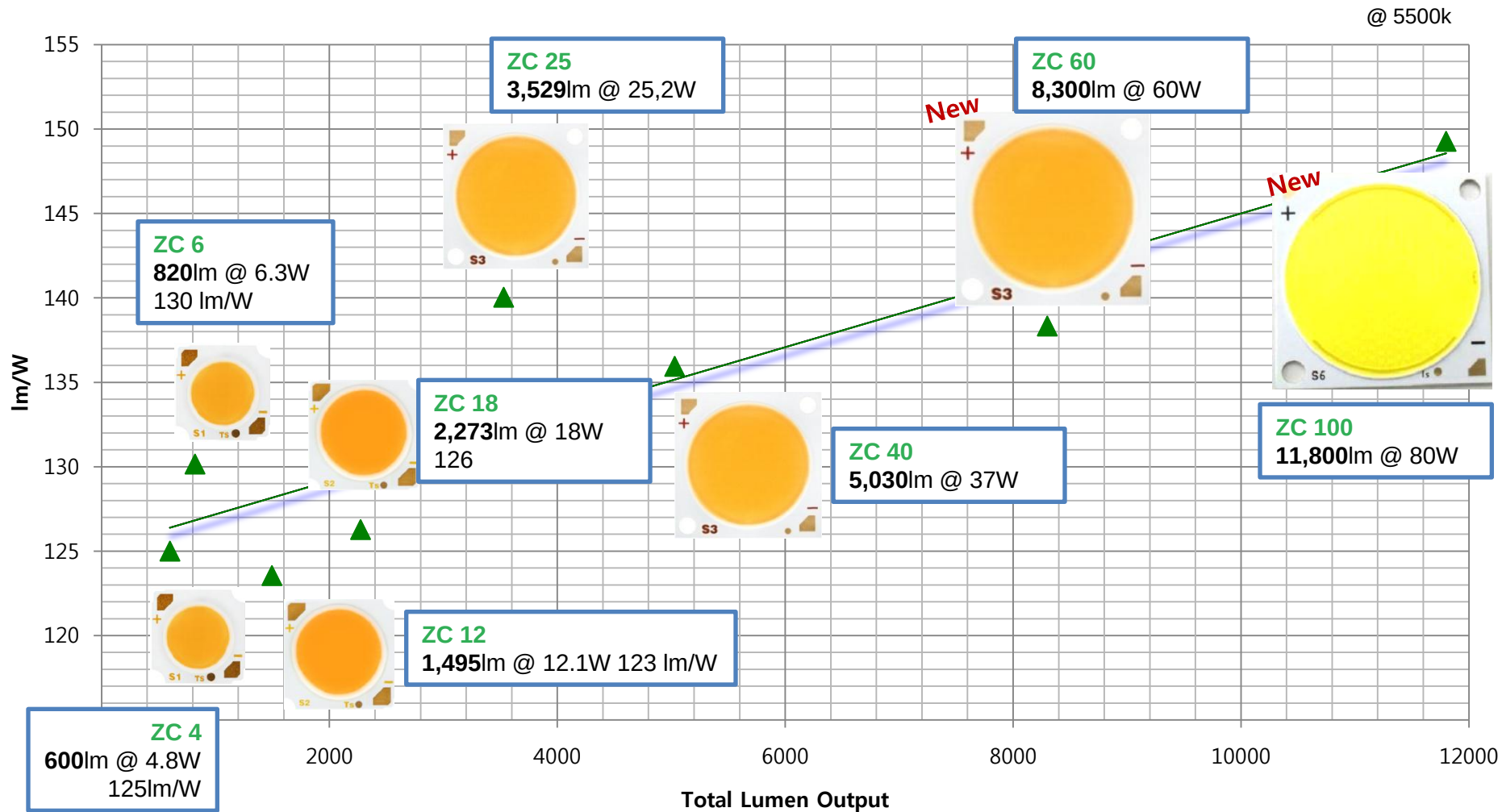
Package size[mm] LED Size[mm]		13.5*13.5*2.3(t) Φ8.4						19.0*19.0*2.3(t) Φ14.0						28.0*28.0*2.3(t) Φ22.2					
																			
Part name		SBW*1F1B (For MR16)			SDW81F1C			SDW82F1C			SDW83F1C			SDW84F1C			SDW*5F1C		
Operating Condition	Series /Parallel	3S / 5P			12S / 2P			12S / 3P			12S / 4P			12S / 6P			12S / 8P		
	IF[Max]				460			690			940			1380			1280		
	IF[mA]	500			180			350			500			700			1000		
	VF[V]	9.5			35			34.7			36			36			37		
	Power [W]	4.8			6,3			12,1			18			25,2			37,0		
Characteristics	CCT	Flux [lm] typ	lm/W	CRI [typ]	Flux [lm] typ	lm/W	CRI [typ]	Flux [lm] typ	lm/W	CRI [typ]	Flux [lm] typ	lm/W	CRI [typ]	Flux [lm] typ	lm/W	CRI [typ]	Flux [lm] typ	lm/W	CRI [typ]
	5000K	600	125	68	820	130	80	1680	139	80	2273	126	80	3529	140	80	5030	135	70
	4000K	-	-	-	775	123	80	1590	131	80	2220	123	80	3400	135	80	4650	125	80
	3000K	-	-	-	750	119	80	1530	126	80	2128	118	80	3245	129	80	4300	115	80
	2700K	480	100	80	720	114	80	1480	122	80	2090	116	80	3173	126	80	4100	110	80

COB Overview – CRI 80

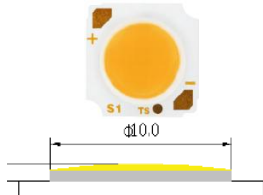
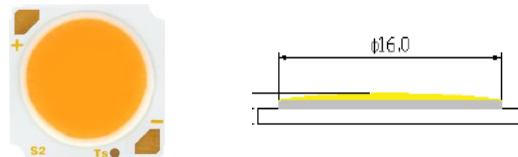
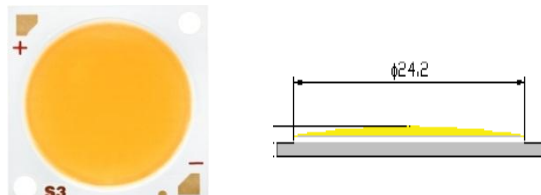
Package size[mm] LED Size[mm]		28*28*1,6(t) Φ22.2			38*38*1,6(t) Φ33.6		
							
Part name		SDW86F1C			SDW87F1C		
Operating Condition	Series /Parallel	18S / 8P			18S / 14P		
	IF[Max]	1700			3000		
	IF[mA]	1100			1500		
	VF[V]	54,5			53		
	Power [W]	60			79,5		
Characte -ristics	CCT	Flux [lm] typ	lm/W	CRI [typ]	Flux [lm] typ	lm/W	CRI [typ]
	5000K	8300	138	70	11800	149	70
	4000K	8000	133	80	11400	144	80
	3000K	7600	127	80	11000	139	80
	2700K	7300	122	80	10500	132	80

COB Overview – CRI 80

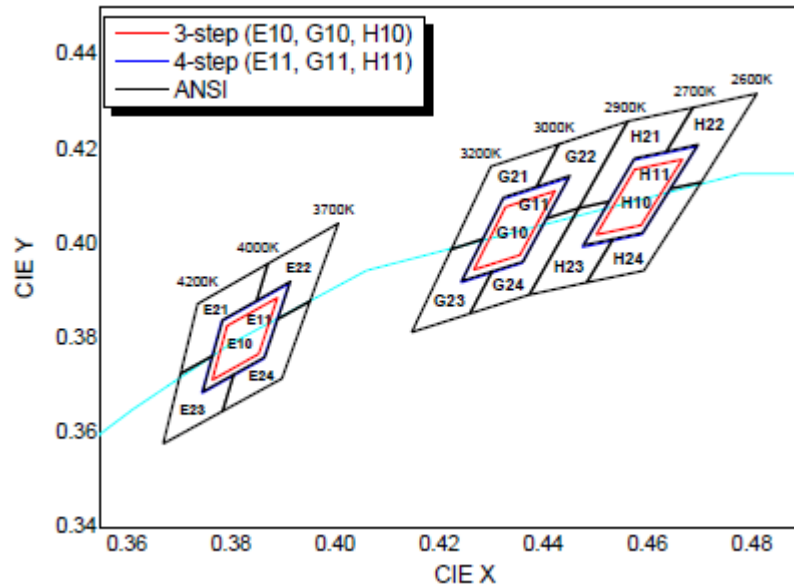
Brightness range of COB



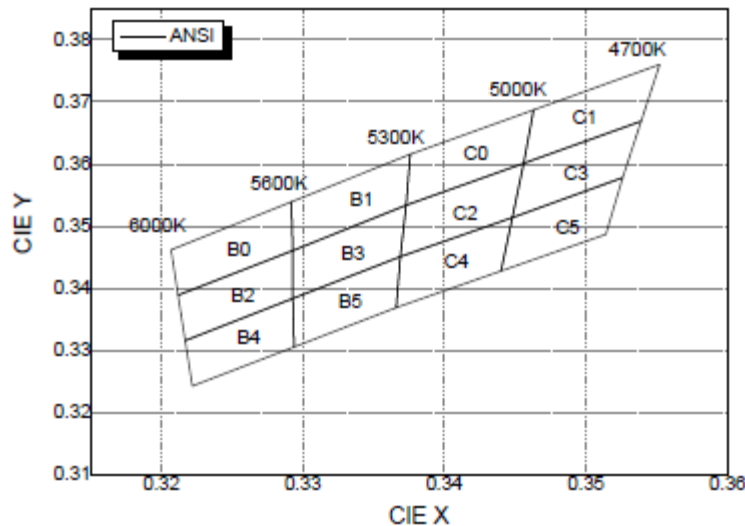
COB Overview – CRI 90

Package size[mm] LED Size[mm]		13.5*13.5*2.3(t) Φ8.4			19.0*19.0*2.3(t) Φ14.0						28.0*28.0*2.3(t) Φ22.2					
																
Part name		SDW91F1C			SDW92F1C			SDW93F1C			SDW*4F1C			SDW*5F1C		
Operating Condition	Series /Parallel	12S / 2P			12S / 3P			12S / 4P			12S / 6P			12S / 8P		
	IF[mA]	180			350			500			700			1000		
	VF[V]	35			36			36			37			37		
	Power [W]	6,3			12,6			18			25,9			37,0		
Characte- -ristics	CCT	Flux [lm] typ	lm/W	CRI [min]	Flux [lm] typ	lm/W	CRI [min]	Flux [lm] typ	lm/W	CRI [min]	Flux [lm] typ	lm/W	CRI [min]	Flux [lm] typ	lm/W	CRI [min]
	4000K	680	108	90	1385	110	90	1940	108	90	2845	110	90	3885	105	90
	3000K	635	101	90	1295	103	90	1810	101	90	2640	102	90	3625	98	90
	2700K	600	95	90	1230	98	90	1720	96	90	2510	97	90	3440	93	90

COB Color Bin Structure

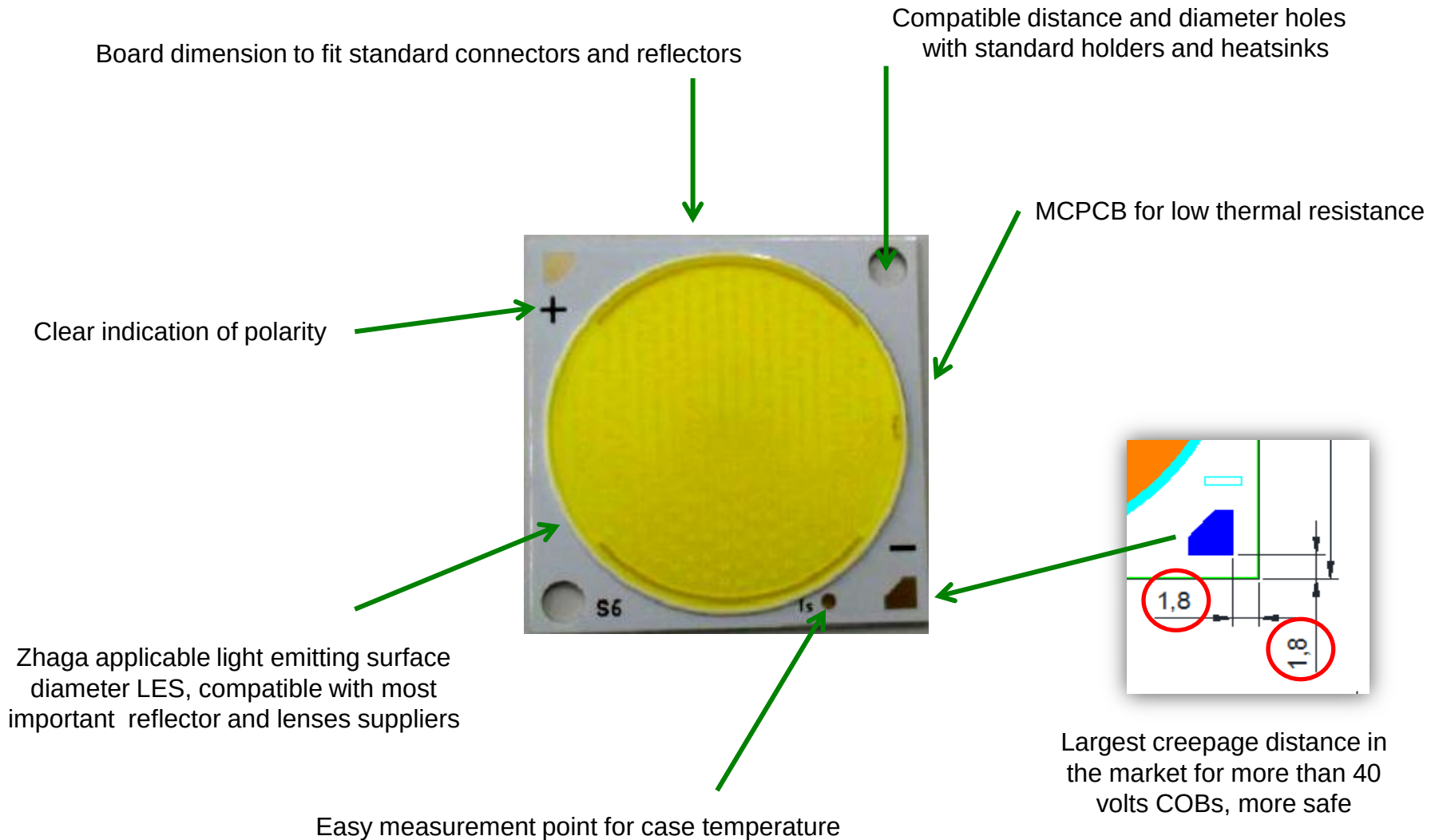


Center bin with 3- and 4-step MacAdams for warm and neutral white

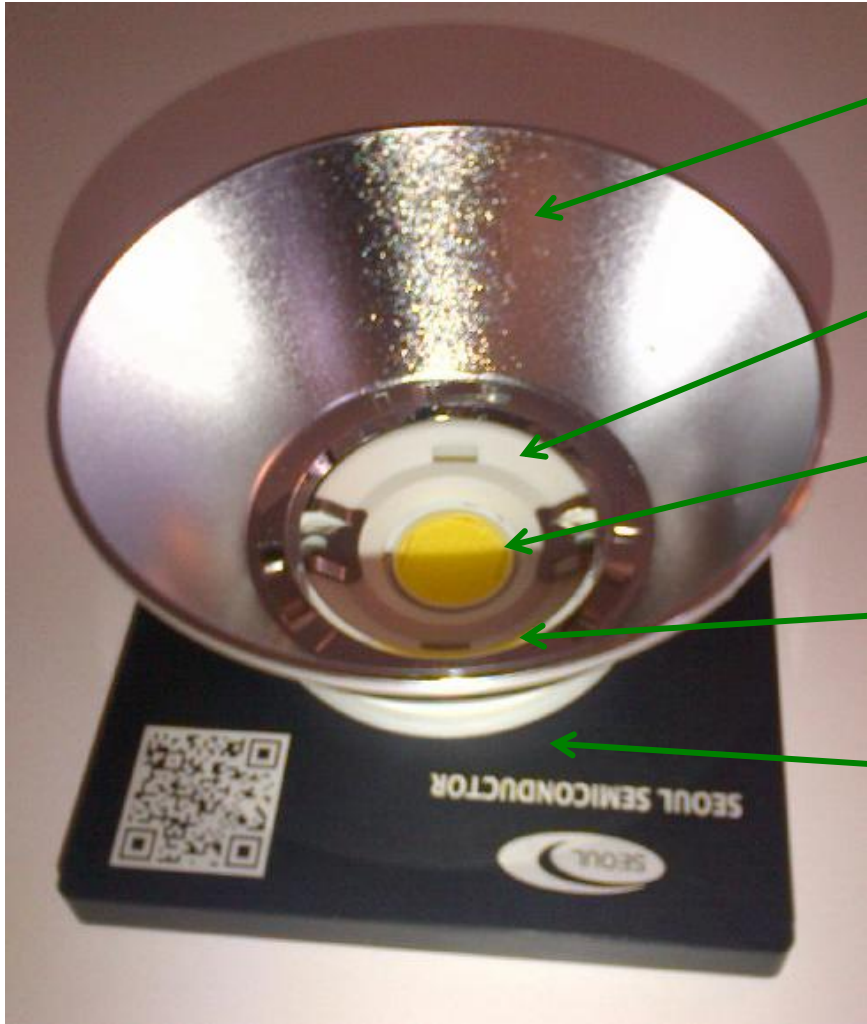


1/6 Ansi – compatible chromaticity bin for cold white (rank B & C)

COB – Features



COB – Connectors / Reflectors



Reflector (optional: optic on top of reflector)

Connector (electrical connection of COB + holder for reflector)

COB from SSC: light source

Thermal interface (e.g. paste, tape, TIM) for better heat dissipation) under the LED COB

Heat sink

COB – Connectors / Reflectors

Standard Connectors:

BJB

for ZC12 and ZC18: 47.319.2021
for ZC25 and ZC40: 47.319.2030



Molex

for ZC6: 180414-0102
for ZC12 and ZC18: 180414-0103
for ZC25 and ZC40: 180416-0104



TE

for ZC12 and ZC18: 2213254-1&2
for ZC12 and ZC18: 2-2154857-1
for ZC25 and ZC40: 2-2154857-2



Ideal Industries

for ZC12 and ZC18: 50-2103CT
for ZC25 and ZC40: 50-2204CT



COB – Connectors / Reflectors

Standard Reflectors

- Ledil

for ZC6: Reflector family Mirella

for ZC12 and ZC18: Reflector family Lena and Lenina

for ZC25 and ZC40: Reflector family Lenina and Mirella



- Khatod

for ZC6: KCLP1466ST, KCLP1467ST, KCLP1468ST, KCLP1469ST, KCLP1470ST, PL50SIL

for ZC12 and ZC18: KCLP1461ST, KCLP1462ST, KCLP1463ST, KCLP1464ST, KCLP1465ST, PL1764SR, PL1765SR, PL1771SR, PL1772SR

for ZC25 and ZC40: KCLP1477ST, KCLP1478ST, KCLP1479ST, KCLP1470ST, KCLP1465ST, PL1743NA, PL1724NA, PL1731NA, PL173ME, PL1724ME, PL1743ME, PL1724WI, PL1743WI, PL1731WI



Fresnel lenses available for all Seoul COB leds

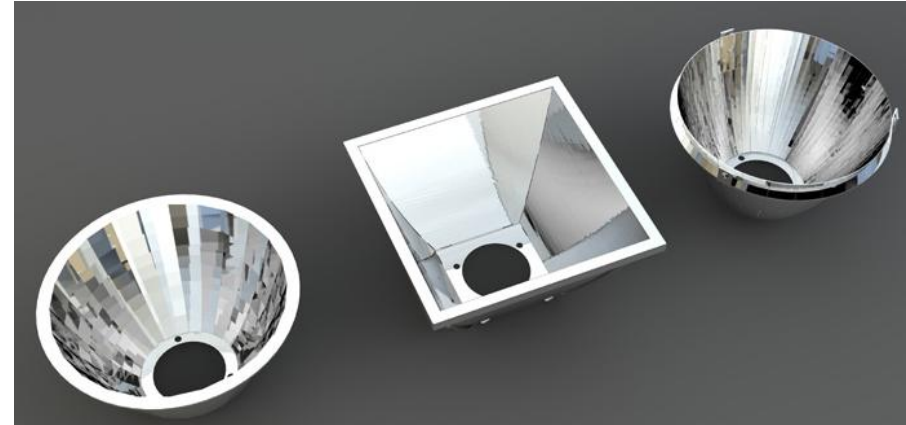
COB – Connectors / Reflectors

- **Alux-luxar**

for ZC6: KLC100, KLC200, KLC300, KLC400, KLC500,
KLC600, KLC700, KLC800, KLC900

for ZC12 and ZC18: KLC1000, KLC1100, KLC1200
KLC1300, KLC1400, KLC1500, KLC1600, KLC1700
KLC1800, KLC1900, KLC2000, KLC2100

for ZC25 and ZC40: KLC2200, KLC2300, KLC2400,
KLC2500, KLC2600, KLC2700, KLC2800, KLC2900
KLC3000, KLC3100, KLC3200, KLC3300, KLC3400



- **Lednlight (Gaggione)**

for ZC12 and ZC18: 47.319.2020

for ZC25 and ZC40: 47.319.2032



COB – Connectors / Reflectors

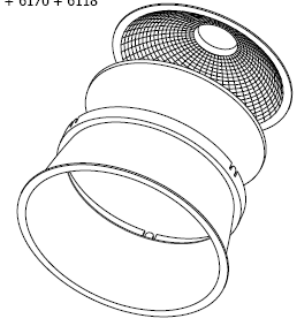
- ACL-Lichttechnik

for ZC12 and ZC18: 5840, 5841, 5842, 5846 and 5848

for ZC25 and ZC40: QR3 and QR5 lines



6117 + 6170 + 6118



Existing Citizen CLL0x0 optics from all optic vendors should be compatible with ZC series. Slight variances in FWHM.

CLL05* compatible with ZC100

CLL04* compatible with ZC25 and ZC40 and ZC60

CLL03* compatible with ZC18 and ZC12

CLL02* compatible with ZC6

→ List of connectors and reflectors will be continuously updated / extended

COB – Heatsinks

- Mechatronix

for ZC6 – ZC12 – ZC18 (Compatible Zhaga Book 3 holder):

Pin fins - LPF4768-ZHP with a thermal resistance R_{th} 3.9 °C/W

Pin fins - LPF6050-ZHC with a thermal resistance R_{th} 4 °C/W

Pico 4750 - with a thermal resistance R_{th} 5,2 °C/W

Pico 4780 - with a thermal resistance R_{th} 4,2 °C/W

for ZC25 (Compatible Zhaga Book 3 holder):

Pin fins - LPF8050-ZHC with a thermal resistance R_{th} 2,34 °C/W

for ZC40 (Compatible Zhaga Book 3 holder):

Pin fins - LPF11180-ZHE with a thermal resistance R_{th} 1,07 °C/W

Nano 7050 - with a thermal resistance R_{th} 2,2 °C/W

Nano 7050 - with a thermal resistance R_{th} 1,8 °C/W

Micro 8630 - with a thermal resistance R_{th} 1,8 °C/W

Micro 8650 - with a thermal resistance R_{th} 1,5 °C/W

Micro 8680 - with a thermal resistance R_{th} 1,2 °C/W

ModuLED 9950- with a thermal resistance R_{th} 1,34 °C/W

ModuLED 9980- with a thermal resistance R_{th} 1,02 °C/W

IceLED 450 Active Cooling - with a thermal resistance R_{th} 0,46-0,58 °C/W

IceLED 550 Active Cooling - with a thermal resistance R_{th} 0,46 °C/W



COB – Heatsinks

- Mingfa

for ZC4 - ZC6 – ZC12

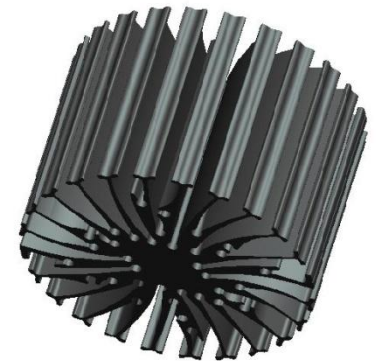
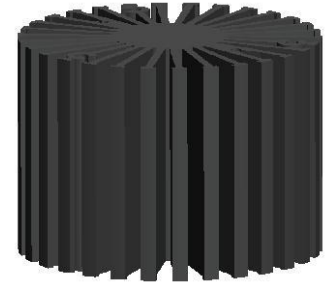
with a thermal resistance R_{th} 2.9 °C/W

for ZC18 - ZC25

with a thermal resistance R_{th} 1.75 °C/W

for ZC40

with a thermal resistance R_{th} 0.92 °C/W



COB – Drivers

- Meanwell
- TCI
- ELT
- Moons
- Harvard
- Friwo
- EldoLED
- Inpotron
- HEC
- Moso Power



Summary COB



- 7 different powers (6W,12W, 18W,25W, 40W, 60W, 100W) with wider range of lumen output (550lm – 11800lm)
- Color temperature range from 2600K – 6000K and minimum CRI options of 70, 80 and 90
- Efficacies of up to 149lm/W in cool white (5000K) and up to 137lm/W in warm white (3000K) for CRI 80
- Thermal resistance down to Rth JS (typ) 0,2K/W
- Standardized drive currents 350mA-700mA-1A-1,5A
- ANSI compliant 3 McAdam center binning
- Existing ecosystem of ready to fit optic and holder solutions
- Excellent lm/€

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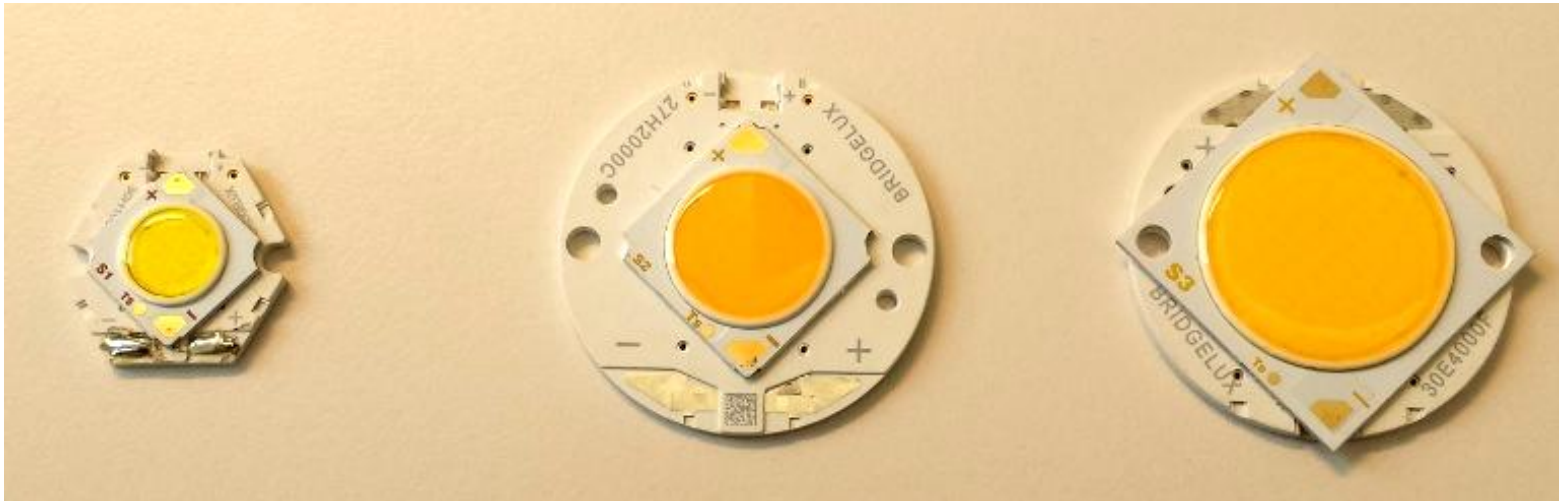
Benchmarking

- Efficacies in all packages almost equivalent to the competition; ZC25 is our best lm/W package with 140lm/W – New ZC100 is better 150lm/W
- Similar voltages and currents as the competitors (Citizen)
- 3 step MacAdam binning
- Better droop characteristics than Citizen
- Larger creepage distance than Citizen for more than 40volts COBs
- Between 10-20% Higher lm/W at max current than C company

Only for internal use!

Benchmarking

- Diameter and distance between holes, all are compatible with Citizen and S1 and S3 are compatible with Bridgelux (but LES are different size with B)



VERO10
=
SSC S1

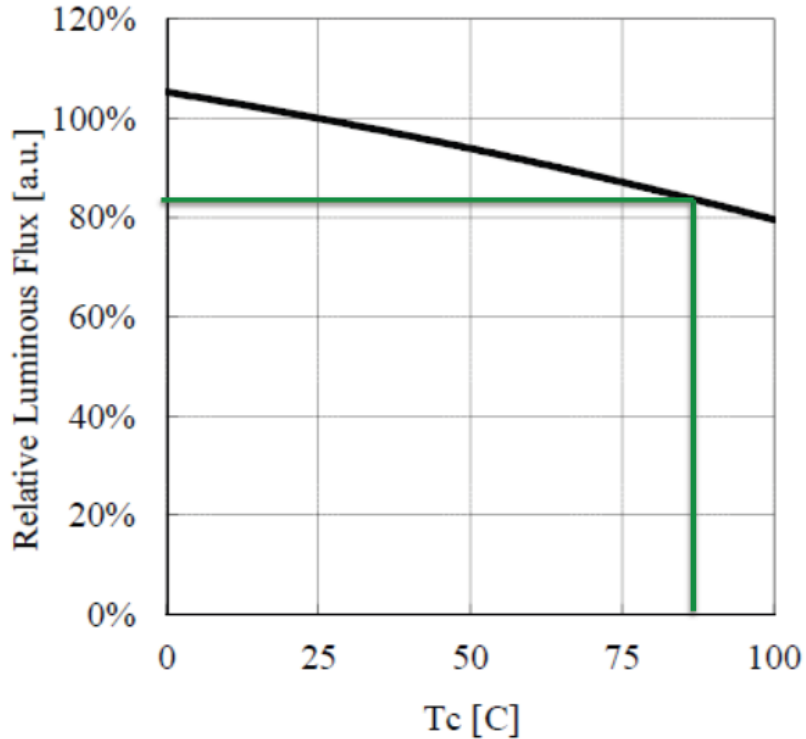
VERO 13
≠
SSC S2

VERO 18
=
SSC S3

Only for internal use!

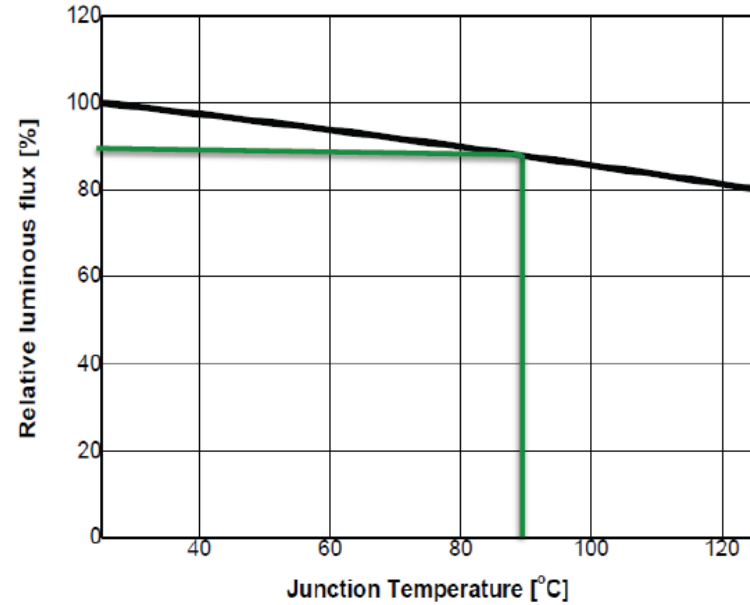
Benchmarking – Citizen droop

Citizen



At 85C ~15%

SSC

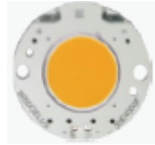


At 85C ~10%

Only for internal use!

Benchmarking

Condition: T_c = 25°C

Company	SSC		C*(ver.3)		C* (ver.2)		C*		B*	
	12W	40W	12W	40W	12W	40W	12W	40W	12W	40W
Image										
CCT	3000K		3000K							
SIZE[mm]	19*19	28*28	19*19	28*28	19*19	28*28	15.85*15.85	23.85*23.85	Φ36.2	Φ36.2
LES, Φ [mm]	16	24.2	17	24.5	17	24.5	10.5	21	9.9	18.4
IF [mA]	350	1000	450	1080	360	1080	350	1100	500	1050
VF [V]	36	37	35.7	35.7	34.9	34.9	37	37	32.5	29.5
Power[W]	12.6	37	16	38.5	12.5	37.6	12.9	40.7	16.3	31
Flux [lm]	1530	4300	2110	5050	1331	4011	1290	4230	1950	3780
lm/W (T _j 25C to 85C)	121→112 (-7.4%)	116→105 (-9.4%)	132→112 (-15%)	131→111 (-15%)	122→106 (-13%)	122→106 (-13%)	107→100 (-6.5%)	111→104 (-6.5%)	120→112 (-6.6%)	122→112 (-6.6%)

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