SEOUL SEMICONDUCTOR

Новые технологии для освещения от Seoul Semiconductor

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Kiew
13 September

1. Seoul Semiconductor: причины успеха.
2. Бескорпусные светодиоды WICOP:

   кристалл + люминофор и ничего лишнего.
3. Полуваттники в корпусе 3528 от Seoul Semiconductor:

   Корейский светодиод по "китайской" цене.
4. Звезда по имени Солнце:

   Технология Sunlike - светодиоды со спектром солнечного света.
5. Бездрайверная эпопея:

   Эпизод 4 - Nano- и Microdriver и никаких пульсаций!

1 Seoul Semiconductor: причины успеха

Corporate Summary

50% + CAGR Every 5 Years

1. Established in Feb 1992

2. Current SSC

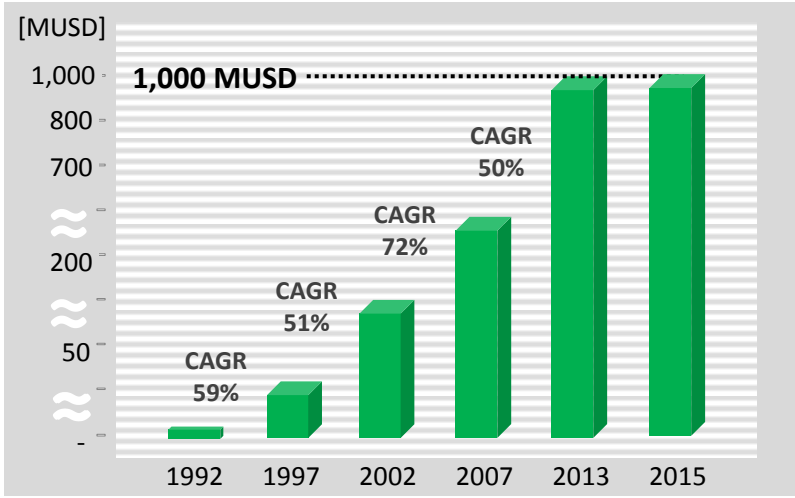
- Sales Revenue : $1.0B (2015)
- Capacity : 1.8B packages per month

3. Market Share

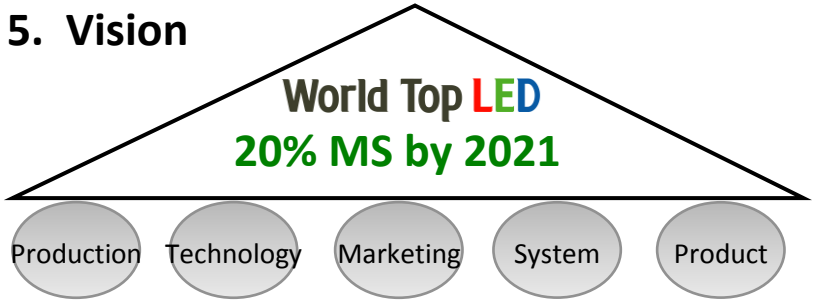
- World 4th (2016, SU Report)
- World 3rd without captive market
- World 1st Korean LED supplier

Rank	Company	Location	Revenues	% Share
1	Nichia	Japan	$2,029,200,000	13%
2	Osram Opto	Germany	$1,311,750,000	9%
3	Lumileds	USA	$1,213,940,000	8%
4	Seoul Semiconductor	South Korea	$772,547,586	5%

4. Growth History ('92 ~ '15)



5. Vision



Seoul's Technologies

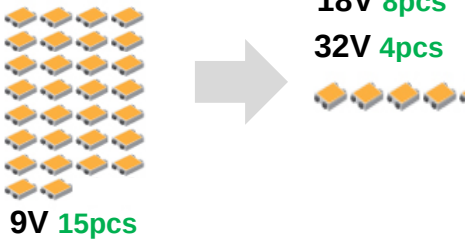
Has introduced the world's first LED technologies

2009

AcrichMJT Multi Junction Technology

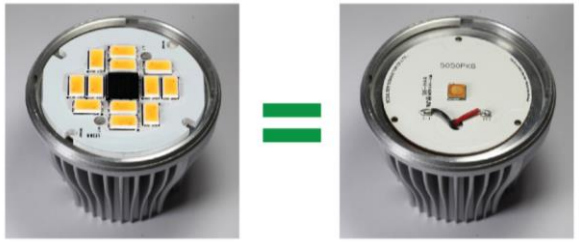
Driven at high voltage

110V/220V
at home



2012

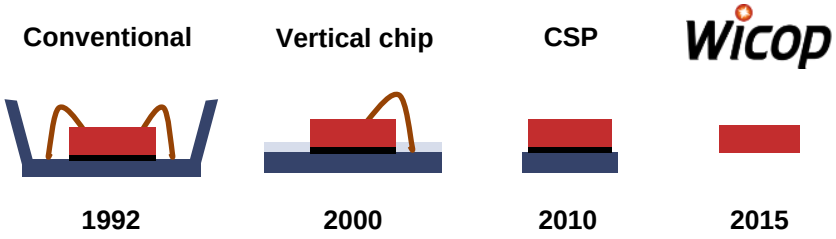
nPola ***Same area, but 10X brighter***



Conventional LED Bulb | nPola LED Bulb

2015

WICOP ***Beyond CSP***



2005

violeds ***Full-range UV LED solutions***

Applied to space station

Seoul's Technologies

Developed proper Solutions in Lighting

Product

Technology Trend

- ***Color Quality*** *(CRI, CrispWhite, Vivid, GAI)*
- ***Human Centric Light*** *(Circadian, CCT Tuning)*
- ***Wall Plug Efficacy***
- ***Cost***

SSC's Solution

- ***WICOP*** — Y22
- ***Acrich MJT*** — 5630, 3030, 3528
- ***Filament***
- ***SunLike*** — COB, 3030
- ***Driver*** — Nano, Micro
- ***?***

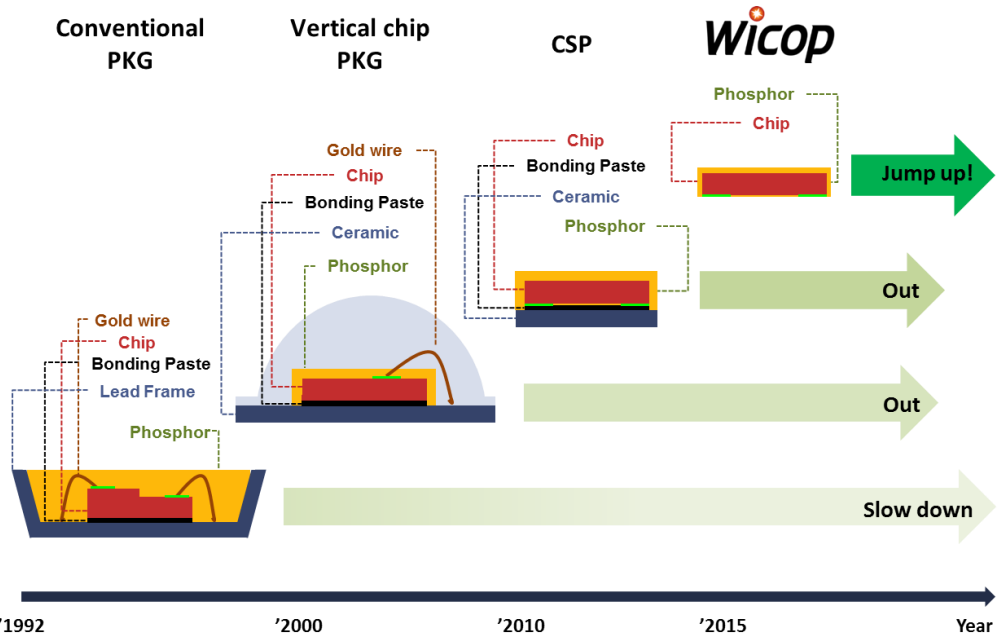
2 WICOP:

кристалл + люминофор

и ничего лишнего.

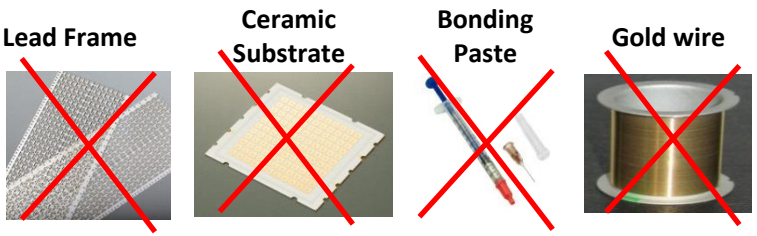
WICOP – и ничего лишнего!

Innovation of Packageless LED



Production Facilities

Raw Materials



Development of Wicop

Wicop in TV & Auto

Wicop in Lighting

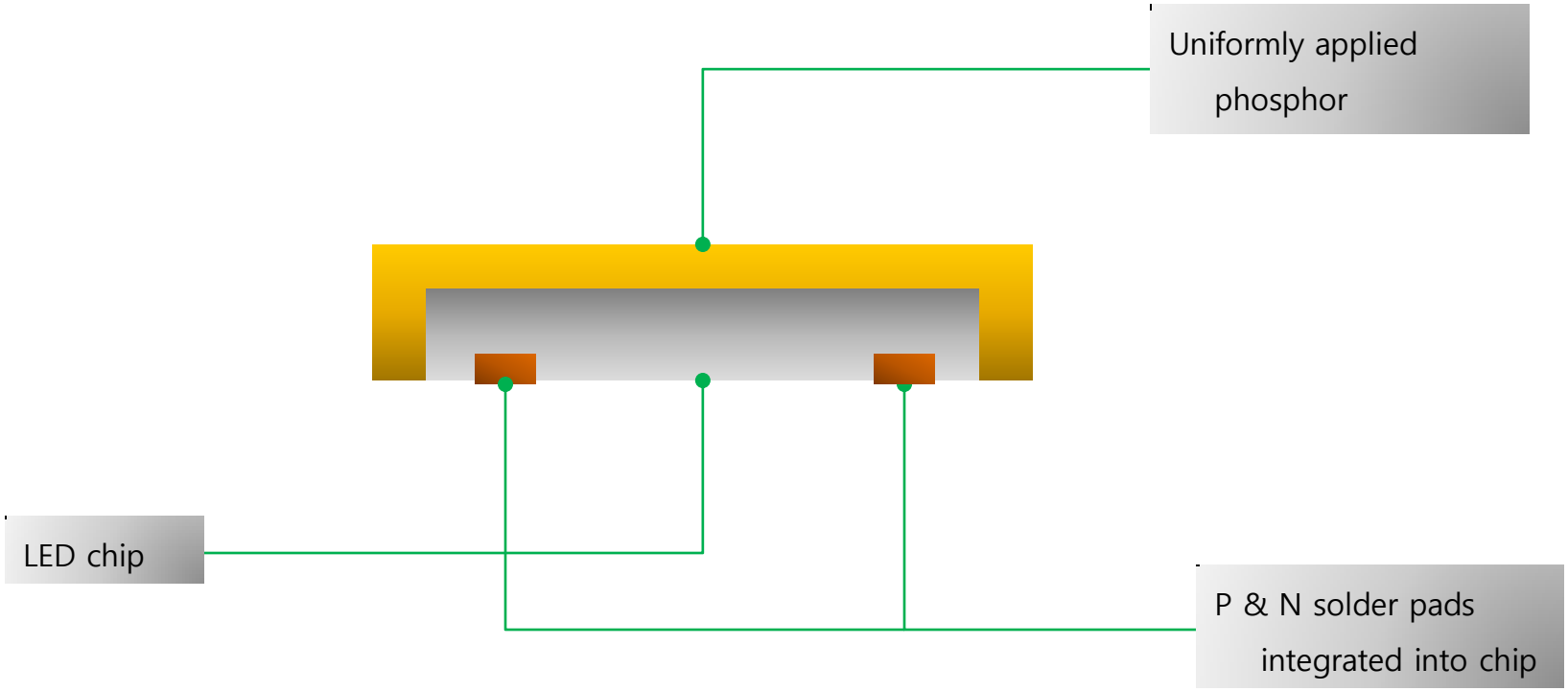
Next?

Higher lm/W

WICOP – максимальная простота

WICOP: ***Wafer Level Integrated Chip on PCB***

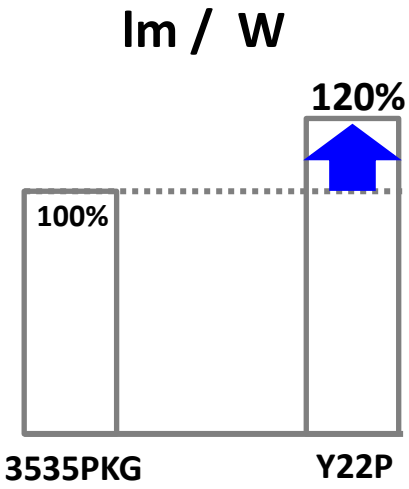
The simplest LED: LED chip with phosphor and solderable pads that can be directly mounted on a PCB

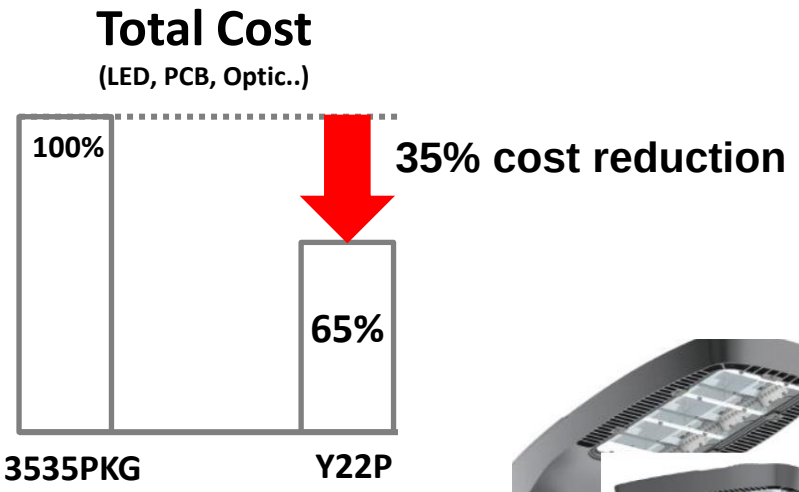


WICOP – вот тебе и первая выгода!

Efficacy & Cost

20% higher efficacy, 30% Cost Down





	3535	Y22P	Remark
Current	1.2 A		
System power	400 W		
Flux	40000 lm	48000 lm	20% ↑
Efficacy	100 lm/W	120 lm/W	20% ↑
Remark	100pcs, Street lighting		

# of LEDs ↓

PCB Size ↓

Under same performance

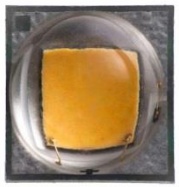
with same heat sink size

WICOP – вот тебе и вторая выгода!

Color distribution

Best Color over Angle (COA) Solution with Wicop

High Power	WICOP
- Complex manufacturing - Color variation	- Simple Optics - Small Color variation(u'-v')



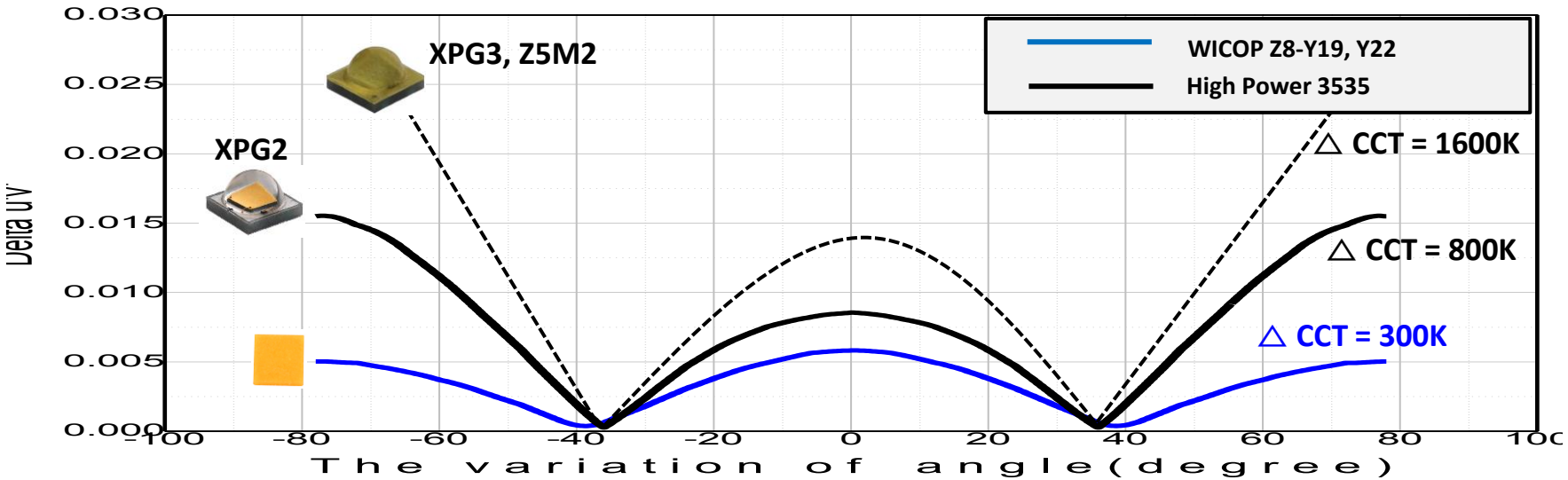
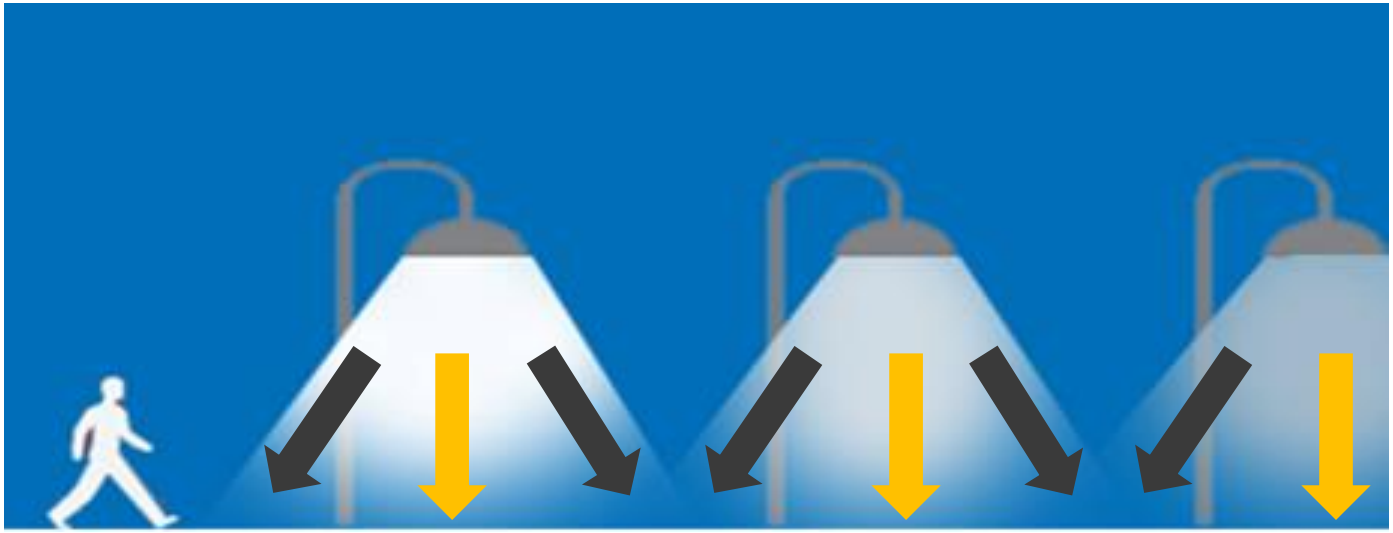


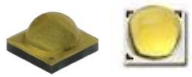
Fig) Delta u'v' graph through the variation of angle

COA – в жизни это выглядит так:

Color Over Angle

If delta CCT is 1600K,



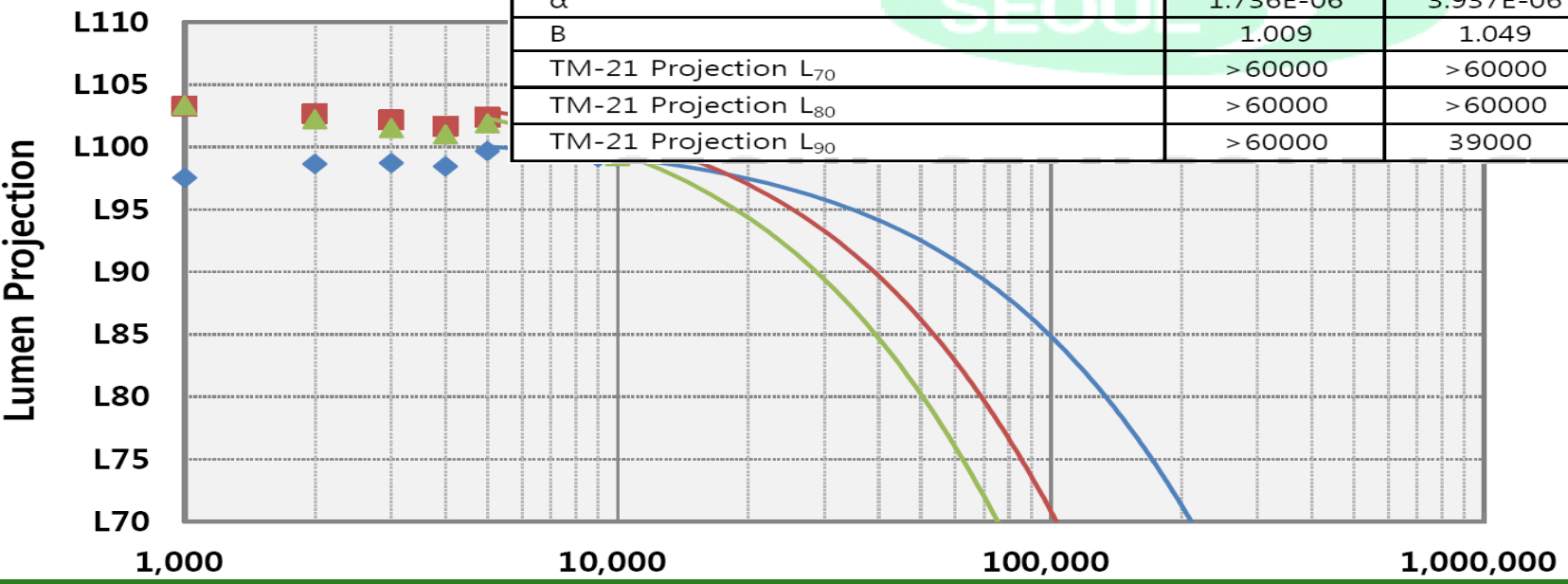


Based on Z5M2, XPG3, LuxeonTX @5000K, 70CRI

WICOP – светить всегда!!!

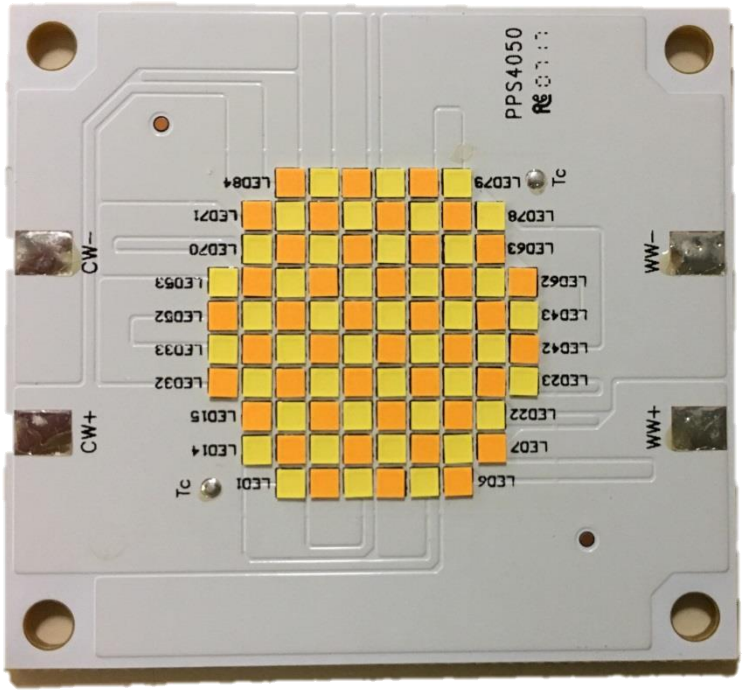
Summary of LM80 Test results for Y22

Items	Nominal Case Temperature		
	55 ℃	85 ℃	105 ℃
Number of LED tested	20	20	20
Drive Current	1 050 mA	1 050 mA	1 050 mA
Measurment Current	1 050 mA	1 050 mA	1 050 mA
Test Duration	10 000 h	10 000 h	10 000 h
Actual Case Temperature	≥53.3 ℃	≥83.6 ℃	≥103.4 ℃
Actual Ambient Temperature	≥51.6 ℃	≥81.5 ℃	≥101.4 ℃
Air Flow Velocity	≤0.84 m/s	≤0.54 m/s	≤0.17 m/s
Averaged Initial Luminous Flux	362.3 lm	351.2 lm	346.5 lm
Averaged Initial CCT	2972 K	2998 K	2983 K
Averaged Forward Voltage	3.04 V	3.05 V	3.05 V
Averaged Lumen Maintenance	99.1 %	100.7 %	99.3 %
Averaged Chromacity Shift	0.002 1	0.003 5	0.004 5
α	1.736E-06	3.937E-06	5.402E-06
B	1.009	1.049	1.051
TM-21 Projection L_{70}	>60000	>60000	>60000
TM-21 Projection L_{80}	>60000	>60000	51000
TM-21 Projection L_{90}	>60000	39000	29000



WICOP –невероятная гибкость решений

Ultra high power in smaller form factors



Example of an 260W LED module with 84 LEDs & PCB footprint of 45 x 50mm

Y19

Size: 1.9 x 1.9
Thickness: 0.4 mm

SZ8-Y19-XX-XX

Features & Benefits

- Phosphor film directly attached to chip surface
- Enhanced High Luminous Flux
- Competitive Cent/lm
- Perfect color uniformity

LM80

- 10000hrs : Finished @ 0.7A DLC 4.1 (Premium)

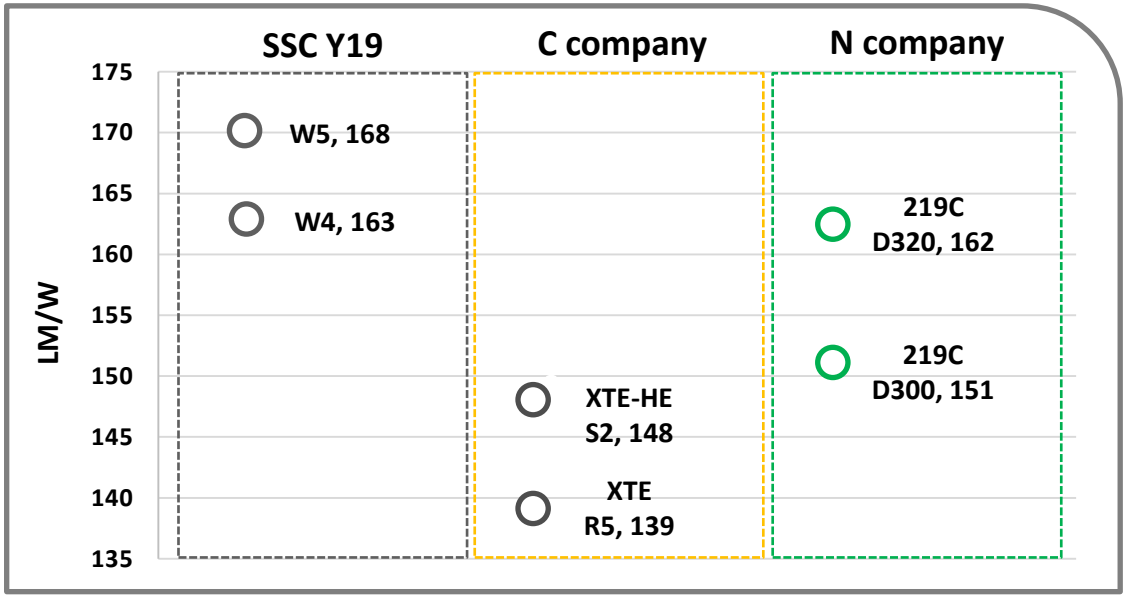
● **Electrical Optical Characteristics**

@ Tj = 85 °C

CCT	5000K	4000K	3000K
Power [W]	2	2	2
Current [mA]	700	700	700
FLUX [lm] min	299	270	256
VF [V]	2.86	2.86	2.86
Efficacy [lm/W]	149	135	128
CRI	Min 70	Min 80	Min 80

WICOP Y19 и конкуренты

➢ Y19

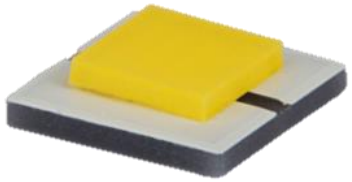


4000K CRI70 @350mA 85℃		Power Typ [W]	Flux [lm]		lm/W (min)	Remark
			Min	Max		
C company	XTE (R5)	1.0	139	148	139	
	XTE-HE (S2)	1.0	148	156	148	
N company	219-D320	0.99	160	170	162	
	219-D300	0.99	150	160	151	
Y19	W5	0.98	167	174	170	
	W4	0.98	160	167	163	

- lm/W = min Flux / typ Watt

Y22 & Y22P

Size: 2.2 x 2.2
Thickness: 0.4 mm



Size: 3.5x 3.5
Thickness: 0.9 mm

SZ8-Y22-XX-XX

Features & Benefits

- Simplest structure, Chip and Phosphor only
- Highest Luminous Flux
- World highest lm/W with the best lm/$
- Perfect color uniformity
- Y22P : 3535 foot print

LM80

- 9000hrs : finished @1.05A , 1.5A DLC 4.1 (Premium)

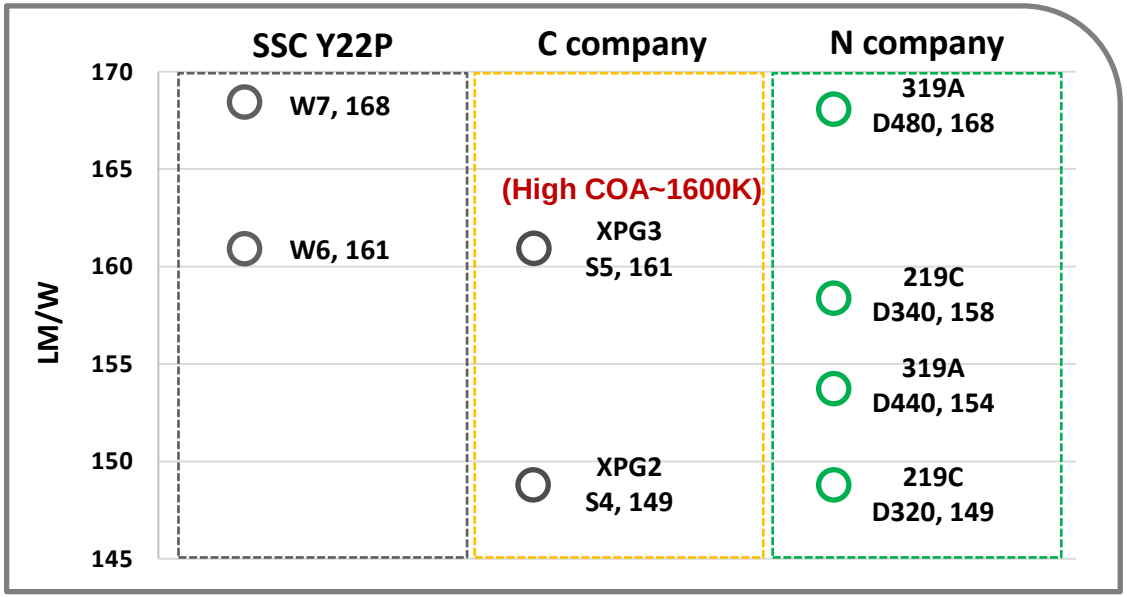
● **Electrical Optical Characteristics**

@ Tj = 85 °C

CCT	5000K	4000K	3000K
Power [W]	1.95	1.95	1.95
Current [mA]	700	700	700
min FLUX [lm]	330	328	284
VF [V]	2.78	2.78	2.78
min Efficacy [lm/W]	170	168	146
CRI	Min 70	Min 70	Min 80

WICOP Y22 и конкуренты

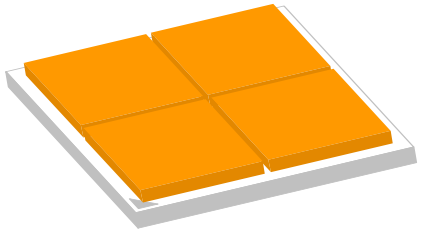
➢ Y22 / Y22P



4000K CRI70 @700mA 85℃		Power Typ [W]	Flux [lm]		lm/W (min)	Remark
			Min	Max		
C company	XPG3-S5	1.981	318	337	161	
	XPG2-S4	2.03	303	318	149	
N company	219-D340	2.002	316	335	158	
	219-D320	2.002	298	316	149	
	319A-D480f2(3W)	1.97	331	359	168	
	319A-D440f2(3W)	1.97	304	331	154	Typ. 327lm, 166lm/W
Y22/Y22P	W7	1.946	327	341	168	
	W6	1.946	313	327	161	

- lm/W = min Flux / typ Watt

Y50P



Size: 5.0 x 5.0
Thickness: 0.9 mm

SZ8-Y50-XX-XX-P

Features & Benefits

- WICOP 4pcs array on SMT substrate : 5.0x5.0 mm
- Enhanced High Luminous Flux
- Best lm/W at 8W
- Perfect color uniformity
- Optimized Application: Outdoor area
- 4 Cluster of Y22 & (Y19)

LM80

- 9000hrs : Finished @ 1.05A, 1.5A DLC 4.1 (Premium)

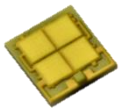
● **Electrical Optical Characteristics** @ Tj = 85 °C

	Min	Typ	Max
CCT	-	4000K	-
Power [W]	-	7.84	-
Current [mA]	-	700	-
FLUX [lm]	1183	1236	1289
VF [V]	-	11.2	-
Efficacy [lm/W]	-	158	
CRI	70	-	-

WICOP Y50P и конкуренты

➢ Y50P

Manufacturer	Pkg Type	RANK			SPL Q'ty	Remark
		Flux	CCT	Vf		
L Company	7070 Ceramic	T	4000k CRI70	G	5	970~1040lm
O Company	P10 Plastic	RP	40S3	L5	5	1120~1210lm

T_a=25℃		SSC/Y50P	Manufacturer L 7070 Ceramic	Manufacturer O 7070 Plastic
PKG/Chip image				
PKG size(mm³)		5.0x5.0x0.95(t)	4.2x4.4x0.5(t)	7.7x7.7x3.45(t)
PKG @8.0W	IF/P_E	0.7A/8.0W	0.7A/8.0W	0.7A/8.2W
	Flux(lm)	1316.99 100.00%	1074.77 81.61%	1266.5 96.17%
	VF(V)	11.49	11.41	11.74
	Efficacy(lm/W)	163.8 100.00%	134.58 82.20%	154.18 94.10%
	CIE(Cx, Cy)	0.386, 0.379	0.391, 0.392	0.389, 0.390
	CCT(K)/CRI(R_a)	3898 / 72.4	3847 / 70.6	3910 / 73.6
	Flux(lm) Same CRI	1316.99 100.00%	1055.42 80.10%	1281.7 97.30%
	Efficacy(lm/W) Same CRI	163.8 100.00%	132.16 80.70%	156.03 95.30%
PKG @8.0W /T_c85	Flux(lm)	1190.56 100.00%	943.55 79.30%	1107.39 93.00%
	VF(V)	11.12	10.99	11.43

- lm/W = min Flux / typ Watt

WICOP Y11 / Y15

Features & Benefits

- Phosphor film directly attached to chip surface
- Enhanced High Luminous Flux
- Competitive Cent/lm
- Perfect color uniformity
- Optimized Application: Indoor/Outdoor area, Bulb, Down light
- Compact footprint enables system level cost saving

Y11

1.14 x 1.14

Y11

LM80

- 6000hrs (@500mA) : Done

Electrical Optical Characteristics @25°C

	3V		6V		9V	
CCT	4000K	2700K	4000K	2700K	4000K	2700K
Power [W]	1.1	1.1	1.1	1.1	1.1	1.1
Current [mA]	350	350	175	175	115	115
FLUX [lm]	150	138	150	138	147	135
VF [V]	3.2	3.2	6.3	6.3	9.5	9.5
Efficacy [lm/W]	136	125	136	125	134	124
CRI	80	80	80	80	80	80

Y15

1.41 x 1.41

SZ8-Y15-Wx-Cx

LM80

- 6000hrs (@700mA) : Done

Electrical Optical Characteristics @85°C

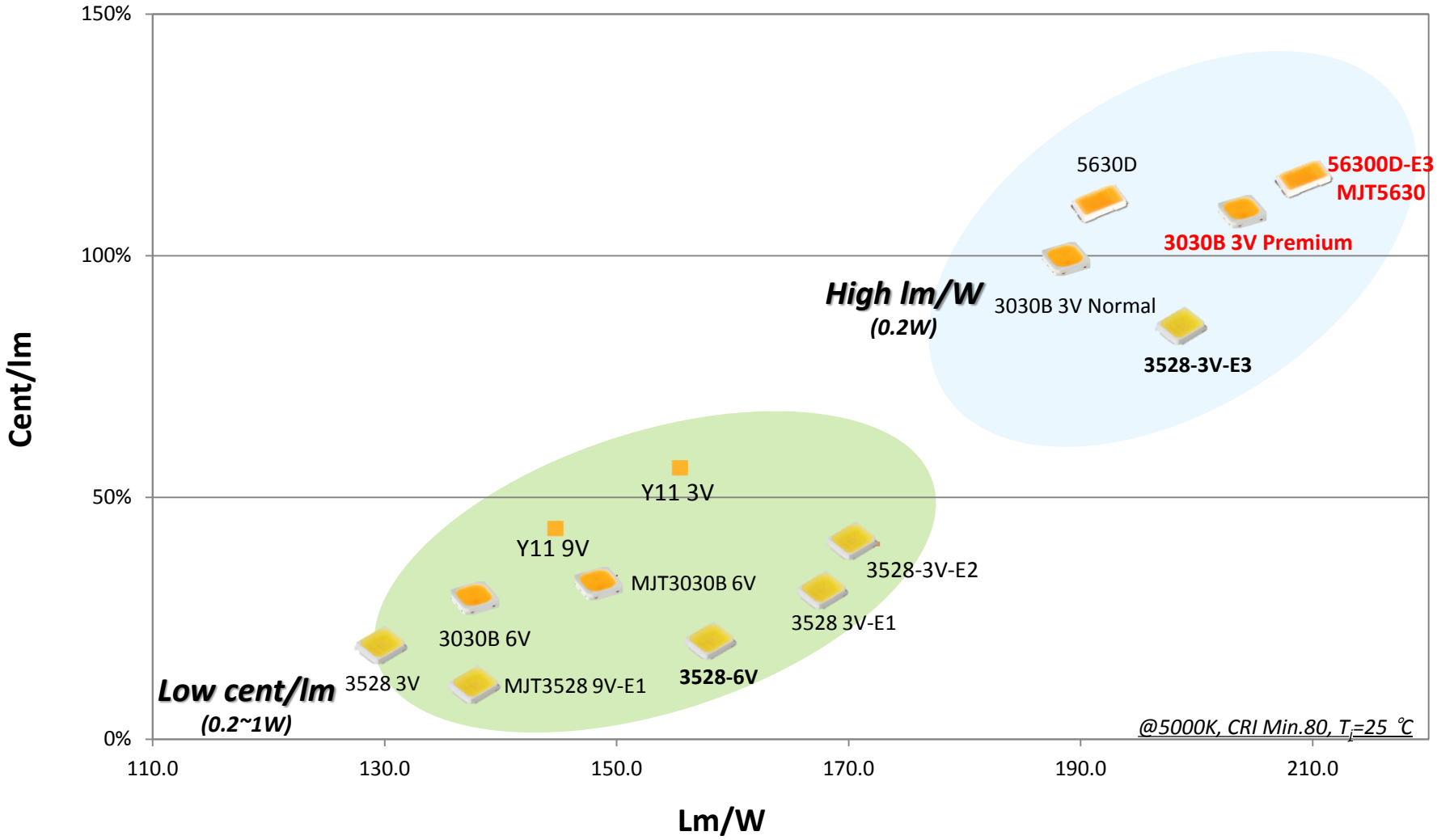
CCT	4000K	2700K
Power [W]	0.98	0.98
Current [mA]	350	350
FLUX [lm]	133	120
VF [V]	2.8	2.8
Efficacy [lm/W]	136	122
CRI	80	80

3

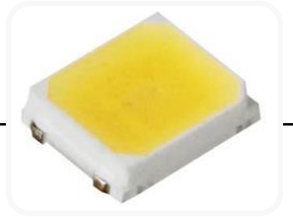
3528 :

Корейский светодиод по китайской цене.

3.2. Mid Power


150%
100%
50%
0%
Cent/lm
110.0
130.0
150.0
170.0
190.0
210.0
Lm/W
5630D
56300D-E3
MJT5630
3030B 3V Premium
High lm/W
(0.2W)
3030B 3V Normal
3528-3V-E3
Y11 3V
Y11 9V
MJT3030B 6V
3528-3V-E2
3528 3V-E1
3030B 6V
3528 3V
MJT3528 9V-E1
3528-6V
Low cent/lm
(0.2~1W)
@5000K, CRI Min.80, Tj=25 ℃

3528



< 3528 Line-up >

MJT

3V	6V	9V	12V	18V	32V
3V 3V-E1, E2, E3 3V-2PD	6V-2SD	9V 9V-E1	12V-E1	18V 18V-E1	32V-E1

< MJT3528 Strengths >

- **Reduce PKG Quantity → Cost down**

110V Bulb

9V 16pcs

20% ↓

PKG Q'ty

50% ↓

12V 12pcs

18V 8pcs

- **Use linear driver → Cost down**

230V Bulb

9V 9pcs → AC-DC Driver

Driver Cost $ 0.1↓

32V 9pcs → Linear Driver

5630

5630D

188 lm/W
@65mA, 4000K

LM80 DLC 4.1 (Premium)

- 15khr @65mA L70 > 50khr / L90 > 36khr

5630D-E3

207 lm/W
@65mA, 4000K

LM80 DLC 4.1 (Premium)

- 10khrs @200mA L70 > 50khr / L90 > 36khr

MJT5630D

208 lm/W
@32mA, 4000K

LM80 DLC 4.1 (Premium)

- 10khrs @70mA L70 > 50khr / L90 > 36khr

3030

3030B-P

STWxC2PB-E1

3V

200 lm/W

@65mA, 4000K

LM80 DLC 4.1 (Premium)

- 10khrs @ 300mA L70 > 50khr / L90 > 36khr

3030B

STWxC2SB

6V

145 lm/W

@150mA, 4000K

LM80 DLC 4.1 (Premium)

- 9khrs @150mA & 200mA
  L70 > 50khr / L90 > 36khr

MJT3030B

SAWxC22B

158 lm/W

@150mA, 4000K

LM80 DLC 4.1 (Premium)

- 9khrs @ 150mA L70 > 50khr / L90 > 36khr

High reliability product

Optimized for Tube & Linear lighting

Optimized for Bulb & Industrial lighting

4 Звезда по имени Солнце: Sunlike – технология солнечного света

History of Lighting

Our biological clock is adjusted by natural Sunlight

Sunshine	Fire		Incandescent lamp	Florescent lamp	White LED	SunLike Powered by TRI-R
						
4 million years ago	0.5 million years ago	3 B.C.	1879	1936	1996	

Blackbody radiation (Natural light) → Artificial light

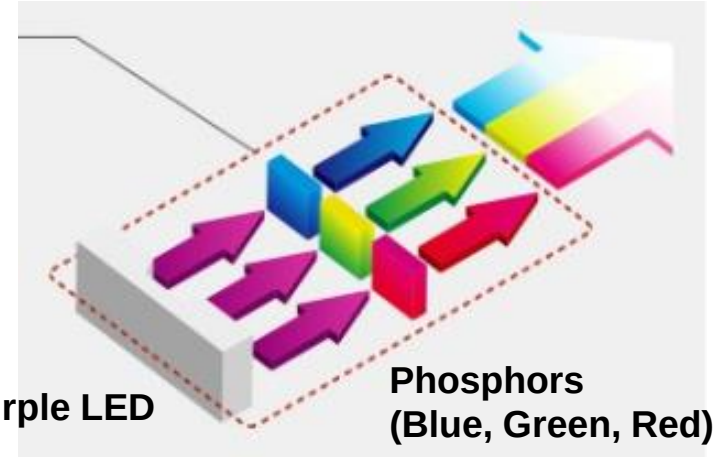
Sunlike = НОВАЯ ЭРА В ИСТОРИИ ЧЕЛОВЕЧЕСТВА!

1. Здоровый свет
2. Правильное цветовосприятие
3. Четкость и отсутствие бликов

SunLike SEOUL Powered by TRI-R

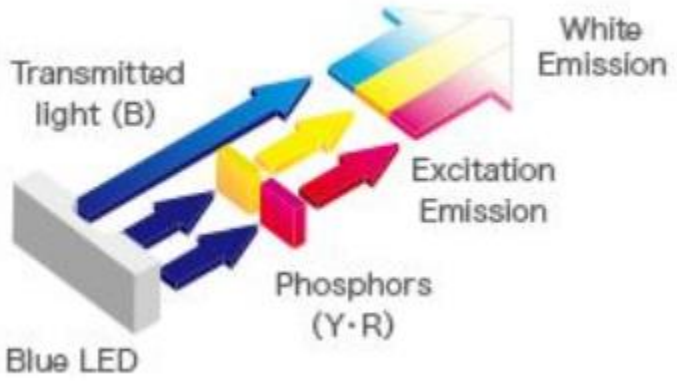
SunLike Core Technology

TRI-R

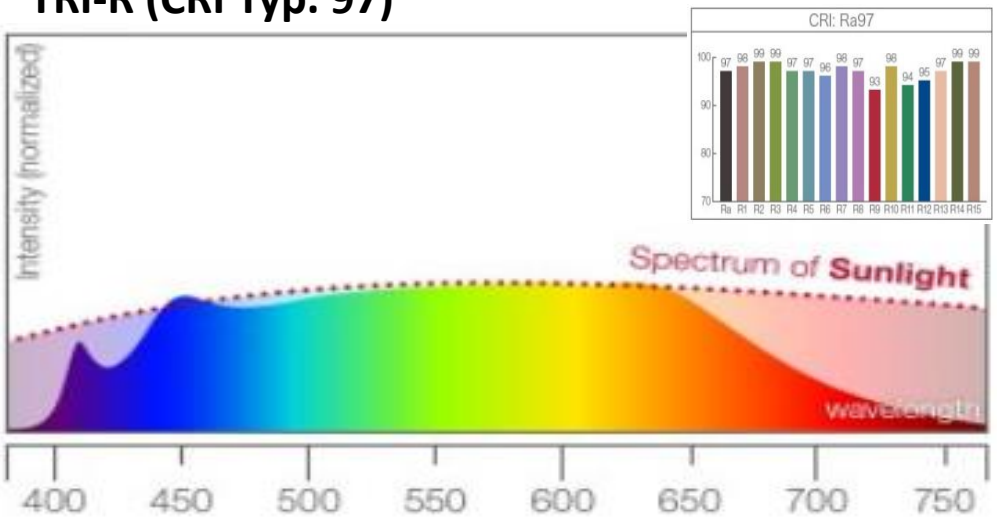


VS.

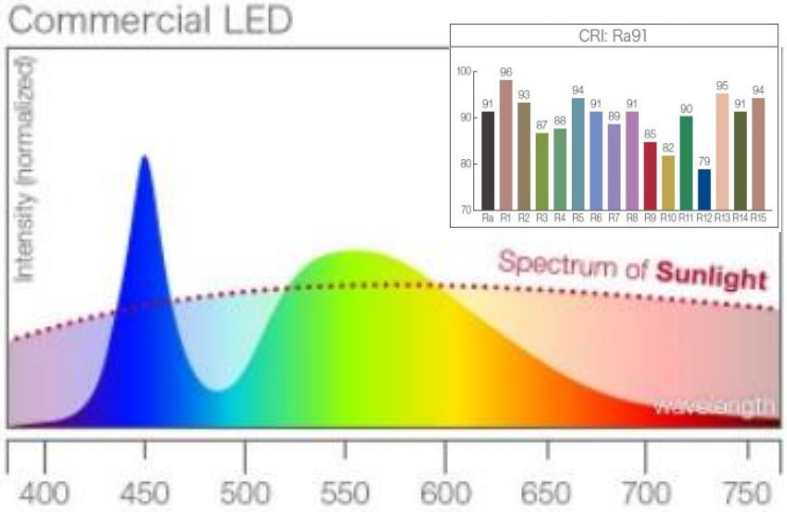
Ordinary LED (B+YR)



TRI-R (CRI Typ. 97)



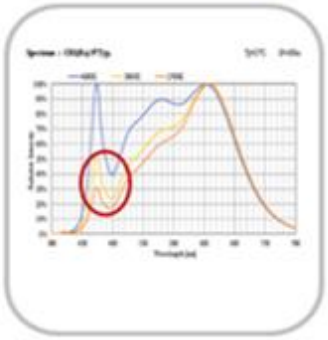
Commercial LED



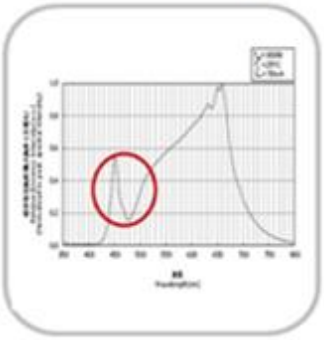
SunLike Core Technology

Blue based CRI>95 & Near UV converted spectrums vs Sunlike

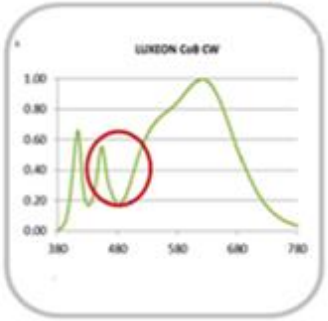
Blue Pump



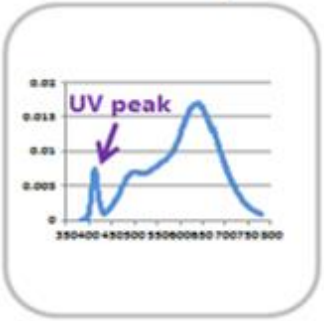
Blue Pump



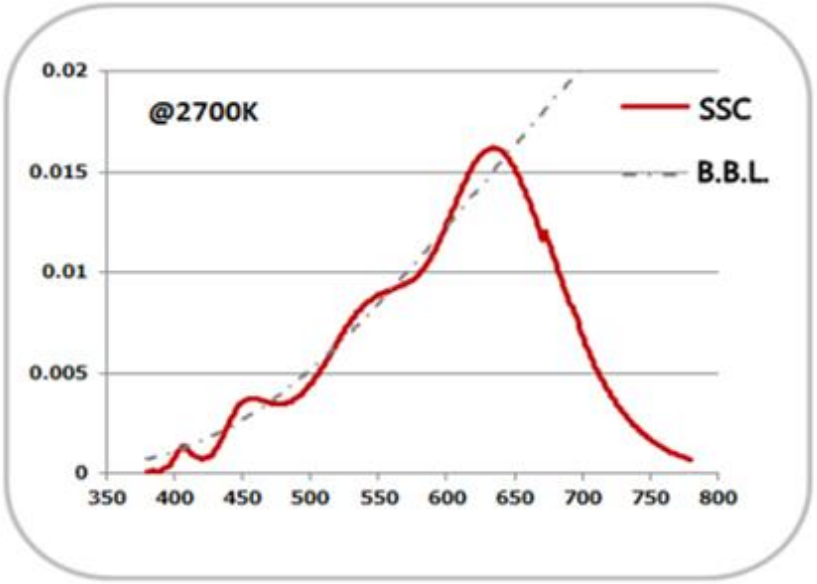
Violet Pump



UV Pump



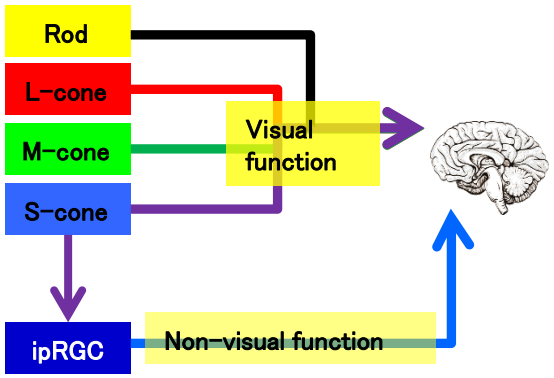
- ✓ Less Blue effect & UV leakage
- ✓ 15% higher lm/W

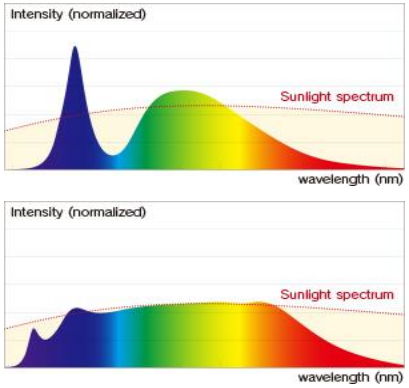


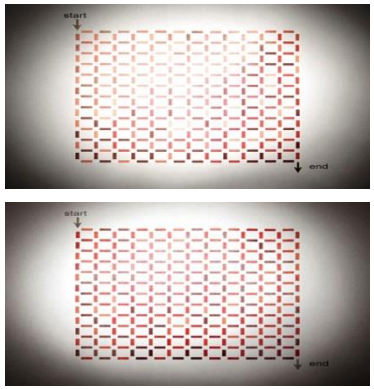
Spectrums shown above are taken from datasheets of products available in the market

Why Sunlike ?

Color Quality → Top class of lighting "Well-being and Clean"







1. Health & Well-being

Health care
Quality of sleep

Residential

Children room

Hospital

2. Exact and True Color

Natural light

Dressing & fitting rooms

Retail Store

Kitchen

3. Good Visibility

Vividness
Eye protection

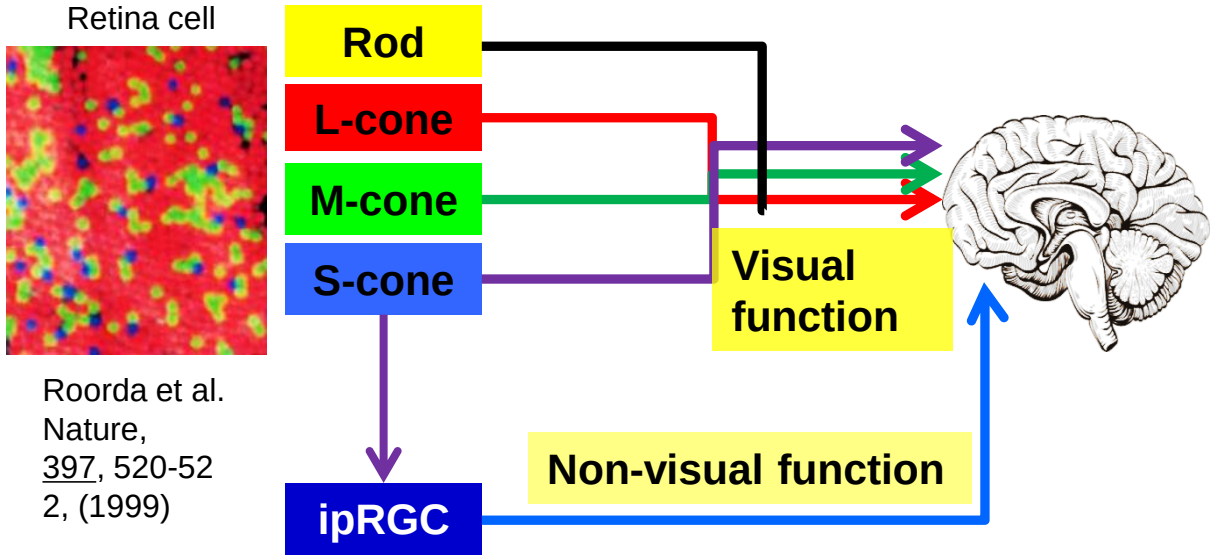
Desk lamp

Study room

School, Surgery room

Well-being light : Healthy and high quality of sleep

Short wavelength blue light causes glare effect & sleep disorder



*L-cone : Long wavelength, Red / M-cone : Medium wavelength, Green / S-cone : Short wavelength, Blue

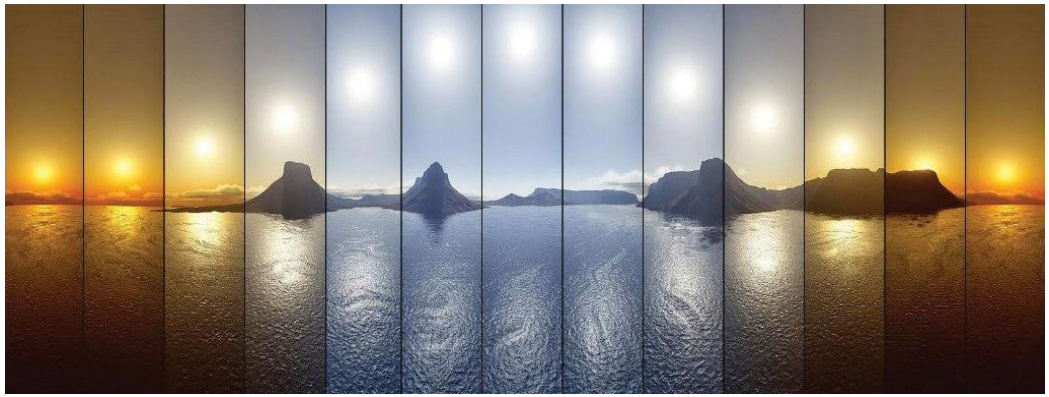
- **S-cone, less than 6% of Retina recognizes “Blue”.**
- **ipRGC only reacts to blue wavelengths→ Affects biological clock suppressing Melatonin production at night-time**

Well-being light : Human Centric Lighting (HCL)

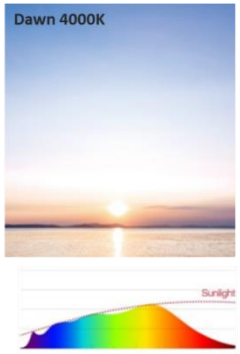
Sunlike luminaires can replicate sunlight spectra during the course of a day

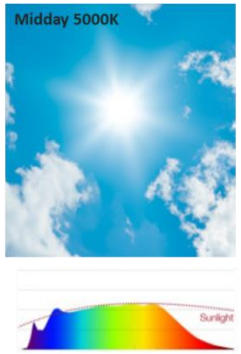
Human Centric Lighting

- Luminaire makers can reproduce the sun at the different times of the day



- Combining 2700K – 4000K and 6500K – Sunlike LEDs in one luminaire

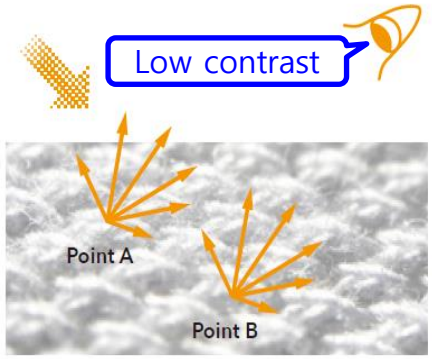


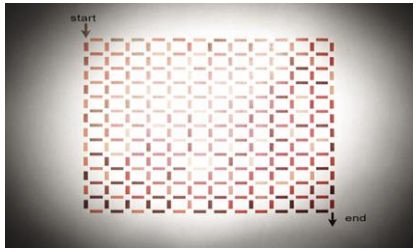


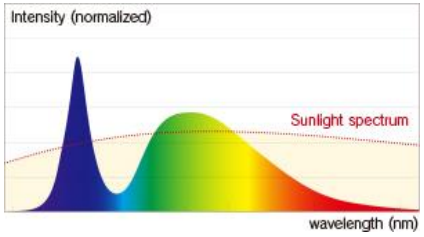
Clear light with less glare

Eye protection – Less glare – Bring textures to life

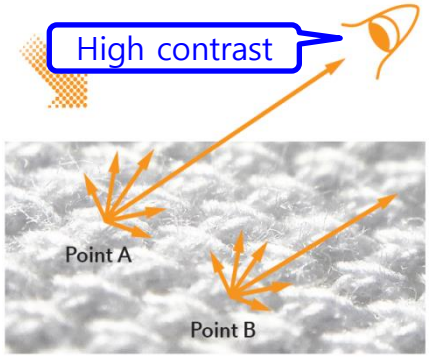
Ordinary LED

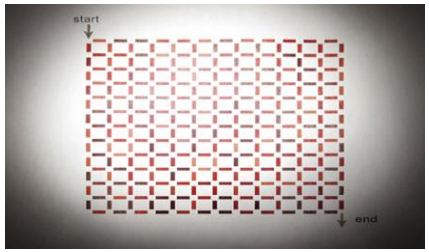


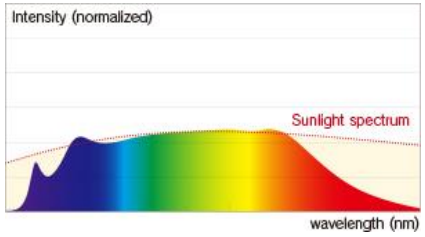




SunLike







Application : Healthy environments, Quality of sleep

Health care lighting for circadian rhythm

SunLike SEOUL Powered by

Lighting with circadian rhythm

- Sound sleep
- Pleasant & active during the day
- Health/Well-being

Conventional LED with Blue peaks at Night

Disorder of circadian rhythm/
Suppression of Melatonin production

- Sleep disorder
- Cancer, Heart disease
- Diabetes, Obesity

Application : Circadian Lighting for Workspaces & 24x7 Environments

Less glare, Well-being lighting

Design offices & Study rooms

Children's Nurseries

24 x 7 Work Environments

Health care lighting

Application : Clear, Natural color

Experience genuine color in-and-outside

Fitting room

Real colors for clothes

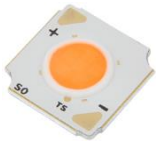
Dresser

Real colors for make-up

Product Line-up

MJT COB

- ***SunLike 6W MJT COB***

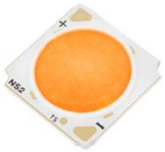


Part No.		SAWS0661A
Size (mm)		13.5x13.5
LES (Φ)		6
Rated IF (A)		0.17 A
Typ. Vf @Tj=85		36.1 V
Typ. Flux @Tj=85	3000K	516 lm
	4000K	550 lm
	5000K	557 lm

- ***SunLike 10W MJT COB***

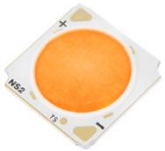
Part No.		SAWS1063A
Size (mm)		13.5x13.5
LES (Φ)		9.8
Rated IF (A)		0.29 A
Typ. Vf @**Tj=85**		34.8 V
Typ. Flux **@Tj=85**	3000K	900 lm
	4000K	955 lm
	5000K	970 lm

- ***SunLike 15W MJT COB***



Part No.		SAWS1564A
Size (mm)		19x19
LES (Φ)		14.5
Rated IF (A)		0.43 A
Typ. Vf @**Tj=85**		35.0 V
Typ. Flux **@Tj=85**	3000K	1,380 lm
	4000K	1,469 lm
	5000K	1,490 lm

- ***SunLike 25W MJT COB***



Part No.		SAWS1566A
Size (mm)		19x19
LES (Φ)		14.5
Rated IF (A)		0.72 A
Typ. Vf @**Tj=85**		35.2 V
Typ. Flux **@Tj=85**	3000K	2,226 lm
	4000K	2,370 lm
	5000K	2,404 lm

Advantages & Benefits

- Sunlike spectrum
- CRI ≥ 97 & R1~R14 >90
- Rf=97, Rg=102 under TM30-15 (2700K ~ 5000K)
- 3000K~5000K line up. 2700K & 6500K to be available soon

Product Line-up

3030

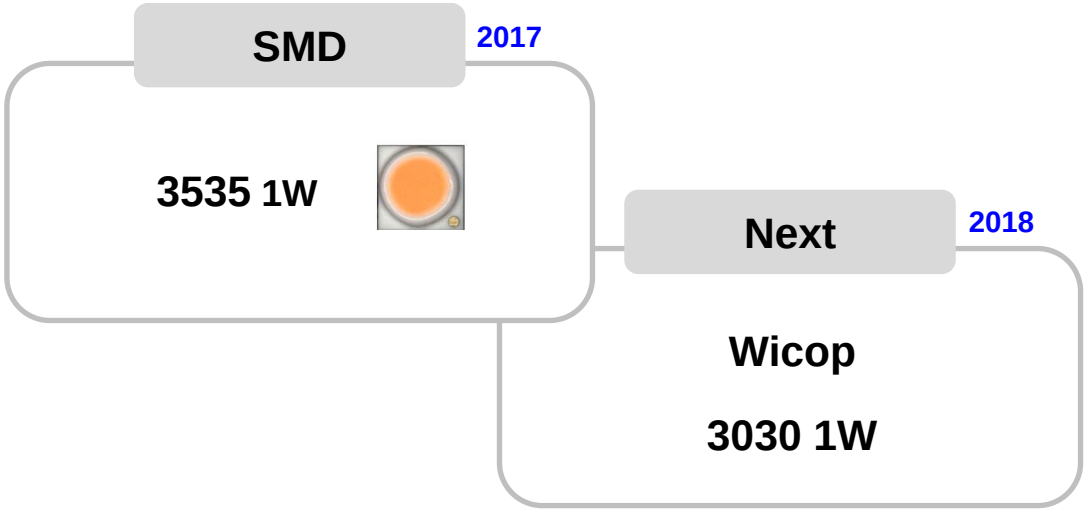
- *SunLike 3030*

Size (mm)	30 x 30			
CRI (Min.)	96			
CCT	2700	3000	4000	5000
Power (W)	0.2			
Vf (V)	2.96			
If (A)	0.065			
Flux (lm)	19.5	20.2	21.2	21.2
lm/W	98	101	106	106

Advantages & Benefits

- **Sunlike spectrum**
- **CRI ≥ 95**
- Linear application for retail , Architectural Appl.
- 2700K~5000K line up. 6500K to be available soon

▪It's the only mid-power package in the market with Sun spectrum



Comparison with existing SSC LED products

✓Already , SSC products are optimized for CRI and TM30 criteria of R_f R_g

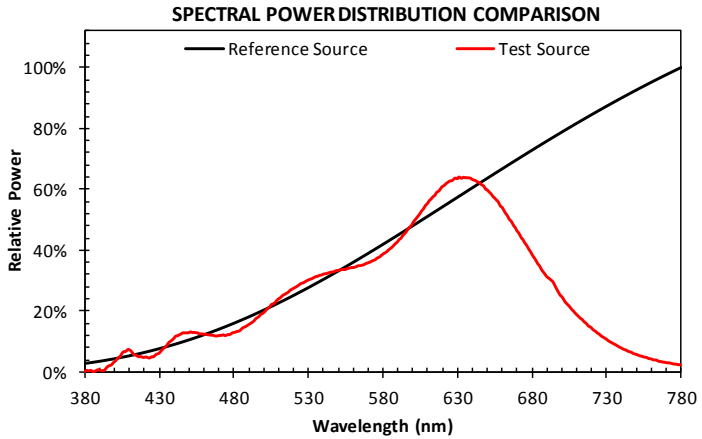
SSC CRI Target	CRI 70			CRI 80			CRI 90			Sun like		
White Target	Cool	Neutral	Warm	Cool	Neutral	Warm	Cool	Neutral	Warm	Cool	Neutral	Warm
CRI	70.3	74.3	71.9	84.0	80.1	83.8	89.4	90.5	91.8	98	98	97
TM30-R_f	67.2	71.2	70.9	82.5	80.2	84.6	86.9	89.4	88.6	97	97	96
TM30-R_g	95.8	97.7	95.6	95.7	96.8	96.9	102.4	101.2	102.4	101	101	102
CIE-x	0.3476	0.3847	0.4549	0.3502	0.3779	0.4639	0.3439	0.3833	0.4575	0.3456	0.3818	0.4595
CIE-y	0.3567	0.3756	0.4138	0.3559	0.3831	0.4133	0.3508	0.3847	0.4073	0.3573	0.3816	0.4107
CCT	4925K	3876K	2796K	4826K	4115K	2666K	5044K	3981K	2707K	5000K	4000K	2706K
D_{uv}	0.0016	-0.0018	0.0016	0.0001	0.0037	0.0007	0.0001	0.0029	-0.0010	0.0027	0.0019	0.0001

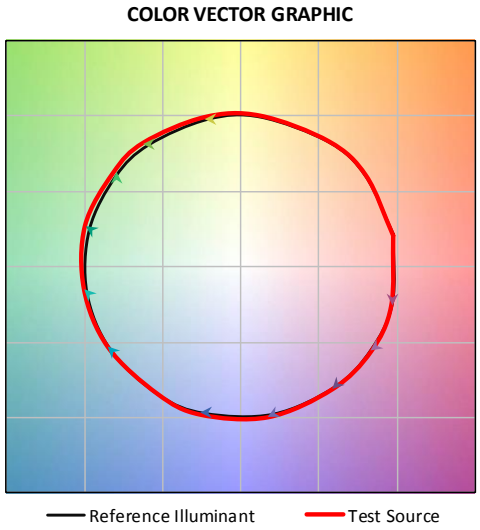
Test results for: Sunlike Warm 2700K

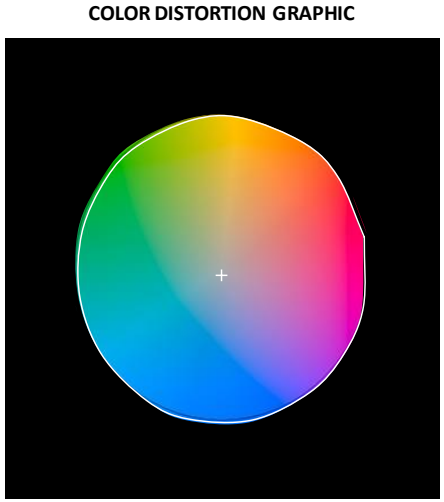
Source:

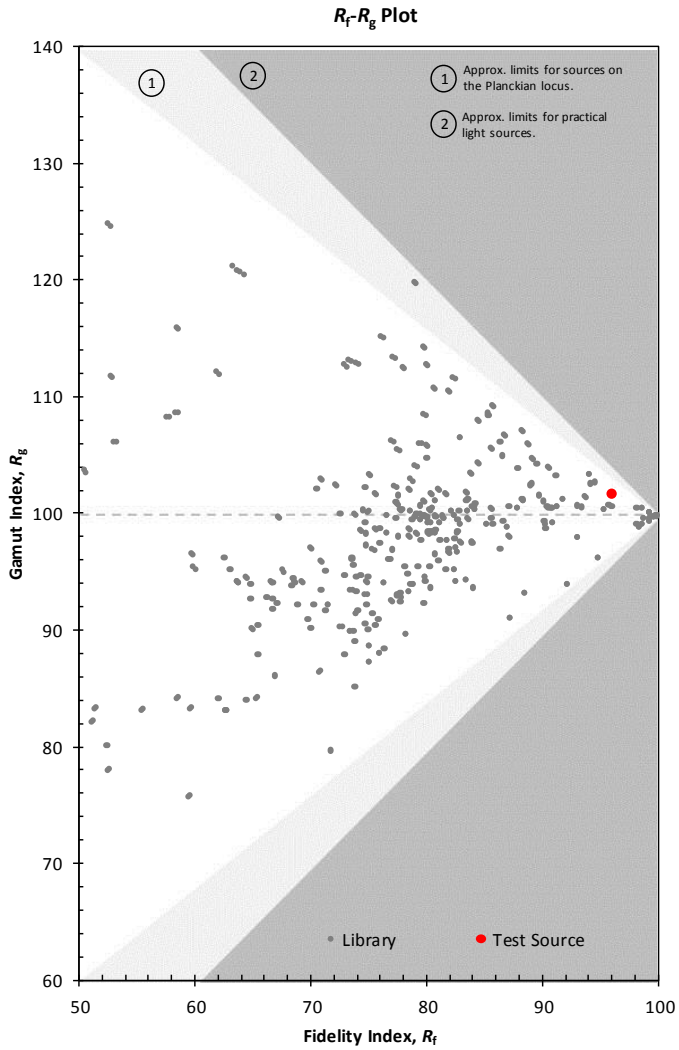
Test Source

R_f	96
R_g	102
CCT (K)	2706
D_{uv}	0.0001
x	0.4595
y	0.4107
CIE R_a	97







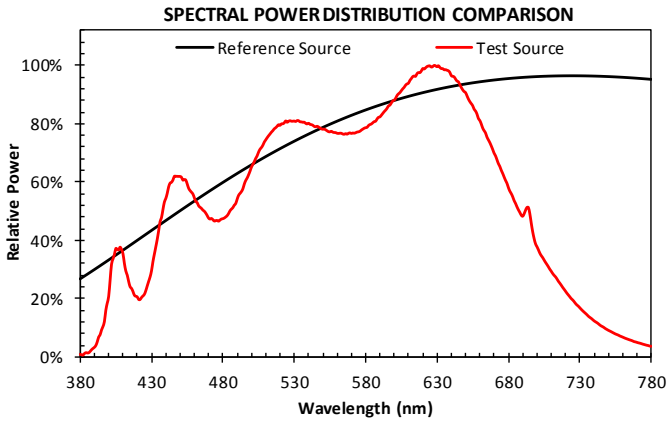


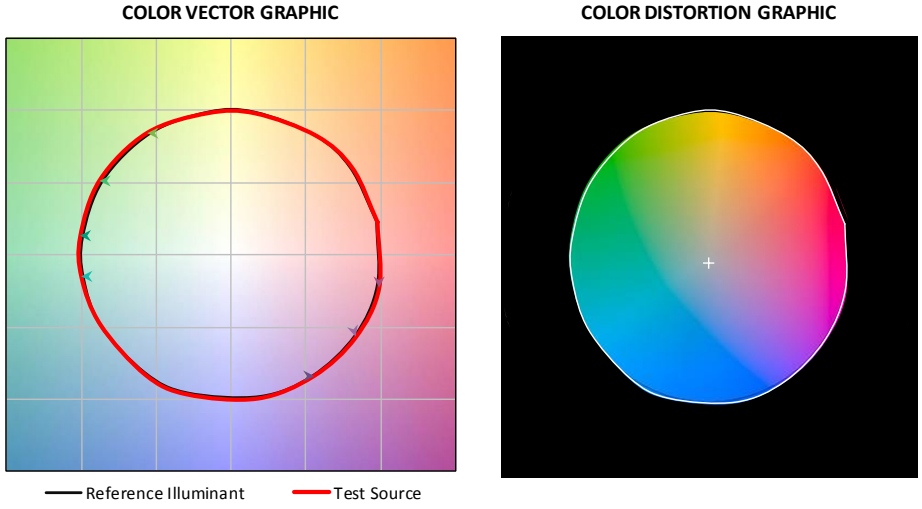
Test results for: Sunlike Neutral 4000K

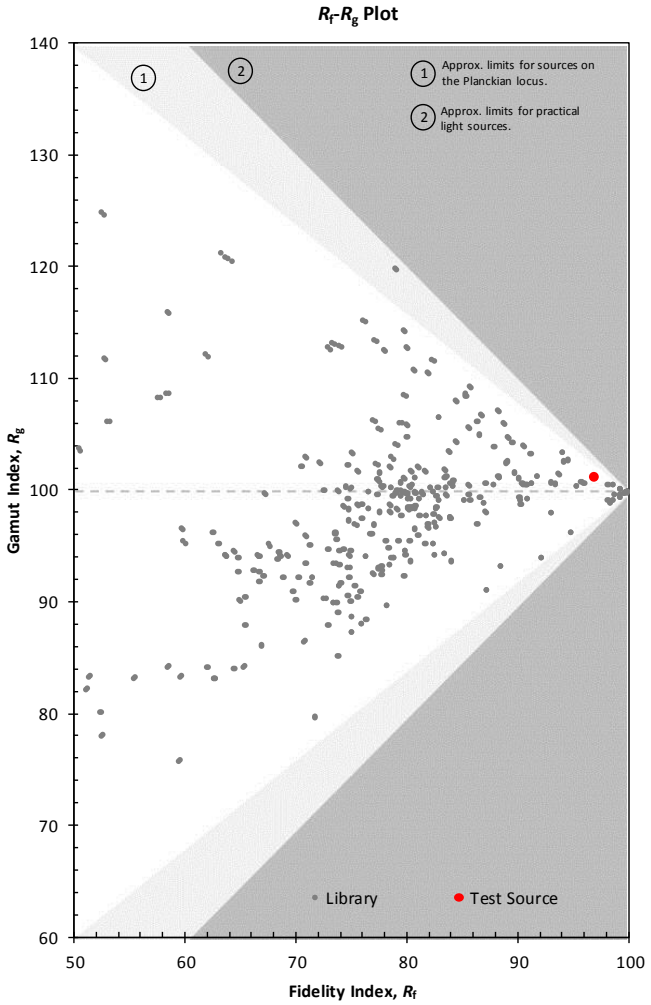
Source:

Test Source

R_f	97
R_g	101
CCT (K)	4000
D_{uv}	0.0019
x	0.3818
y	0.3816
CIE R_a	98





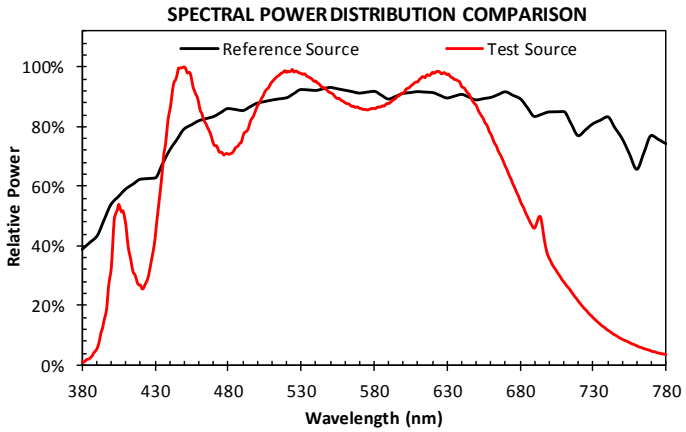


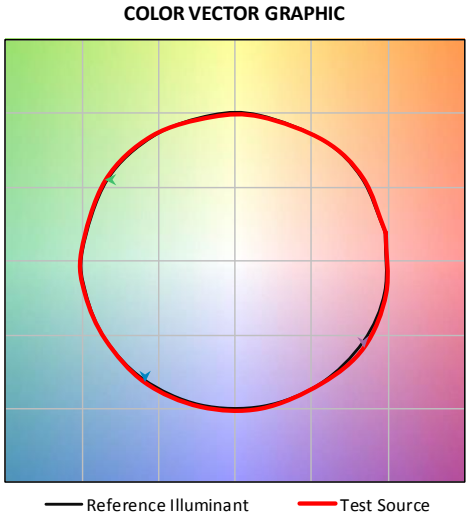
Test results for: Sunlike Cold 5000K

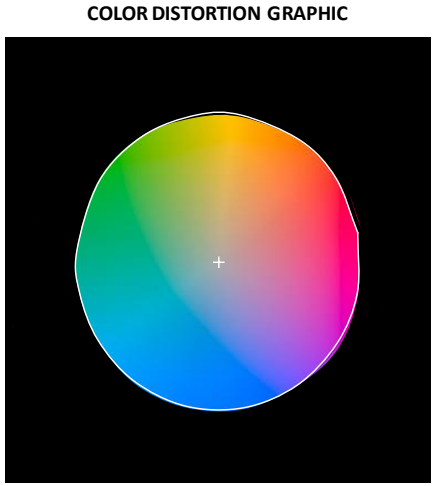
Source:

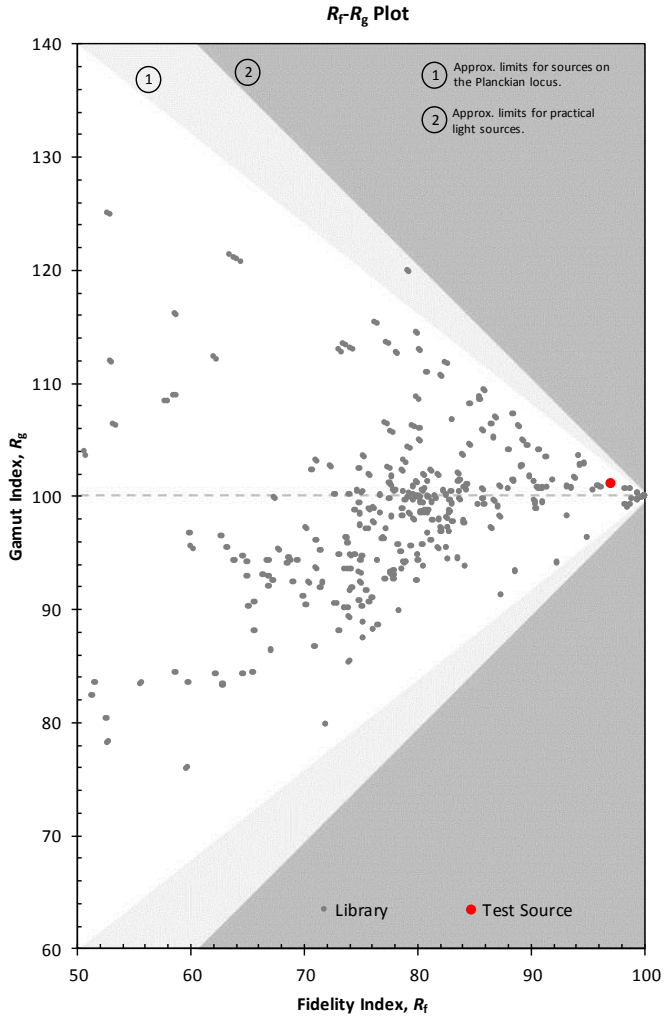
Test Source

R_f	97
R_g	101
CCT (K)	5000
D_{uv}	0.0027
x	0.3456
y	0.3573
CIE R_a	98

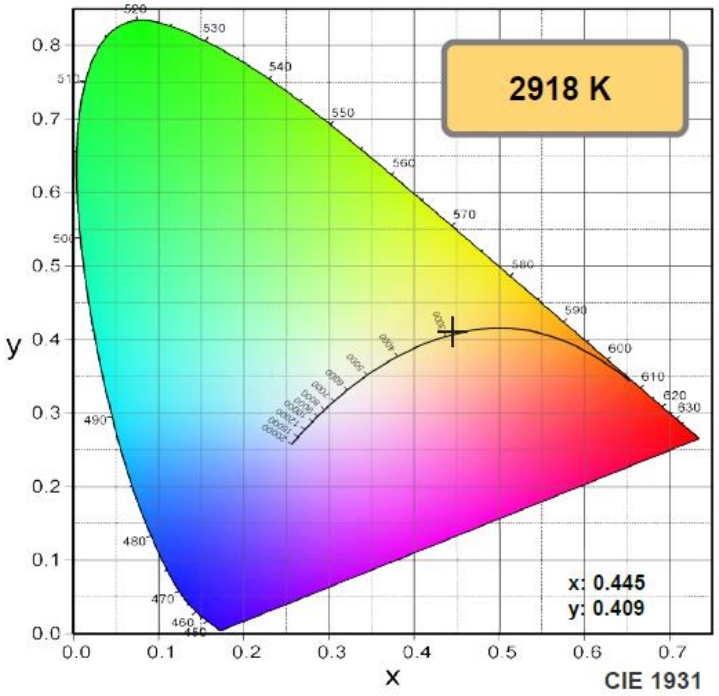


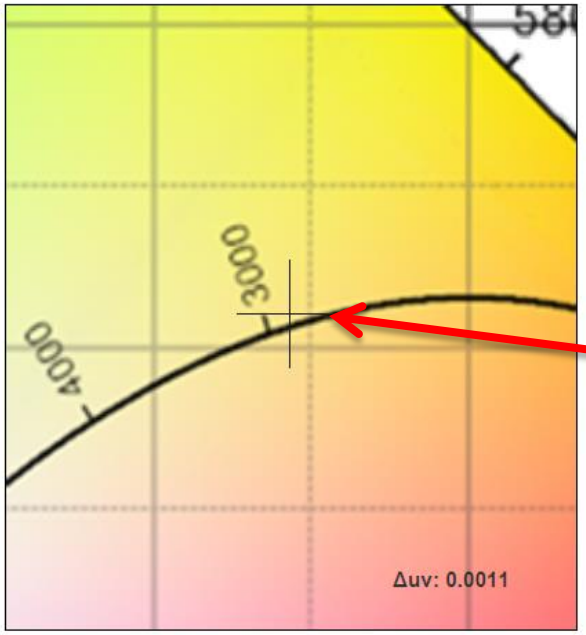






Test results for: Sunlike 3000K





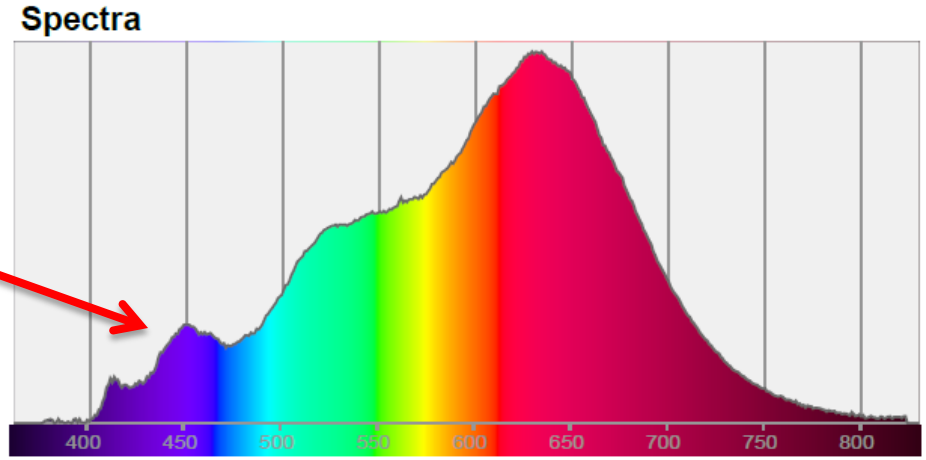
Color point in the BBL

Means real color as the Sun

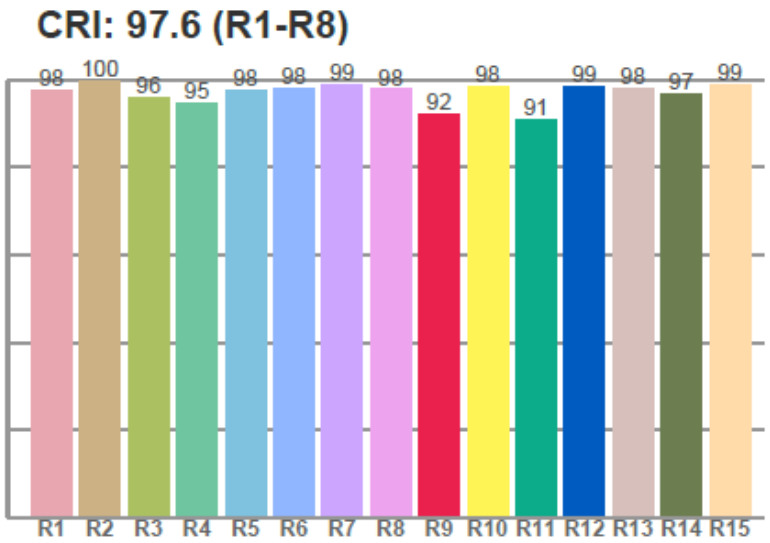
Delta UV < 0.001
NO color deviation

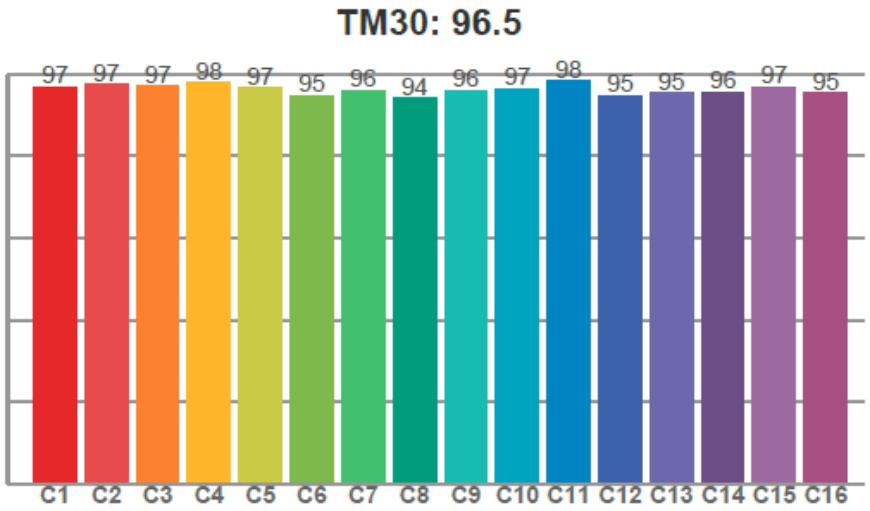
NO UV/Blue peak

NO Color distortion
NO Health disorder

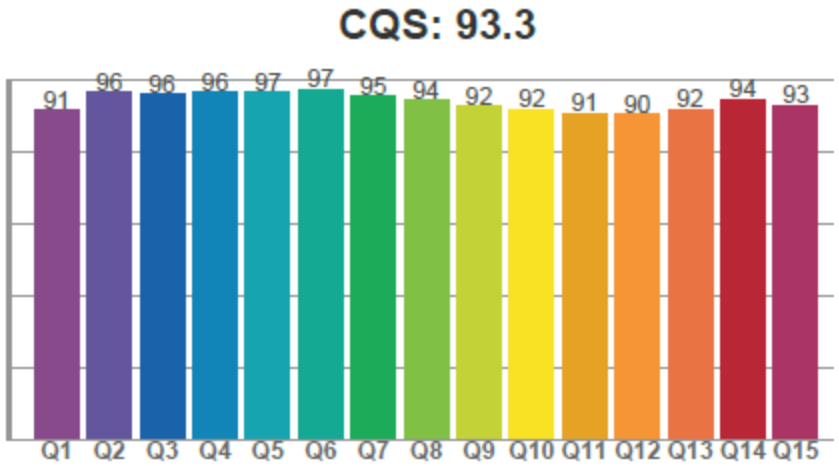


Test results for: Sunlike 3000K

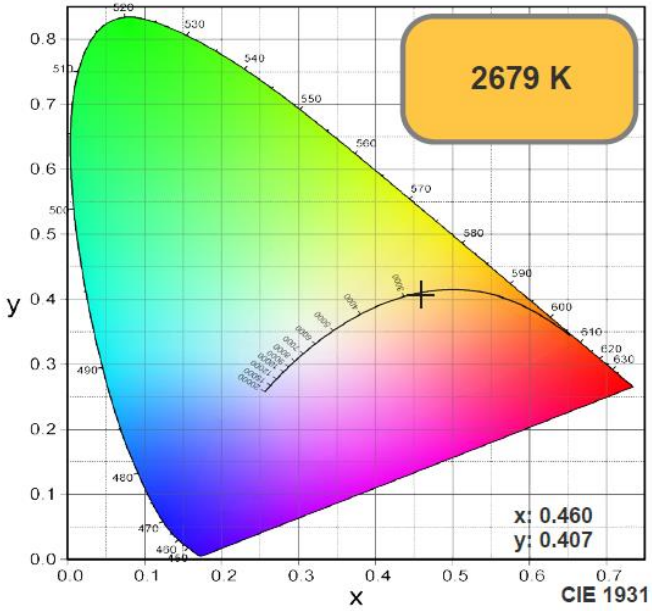


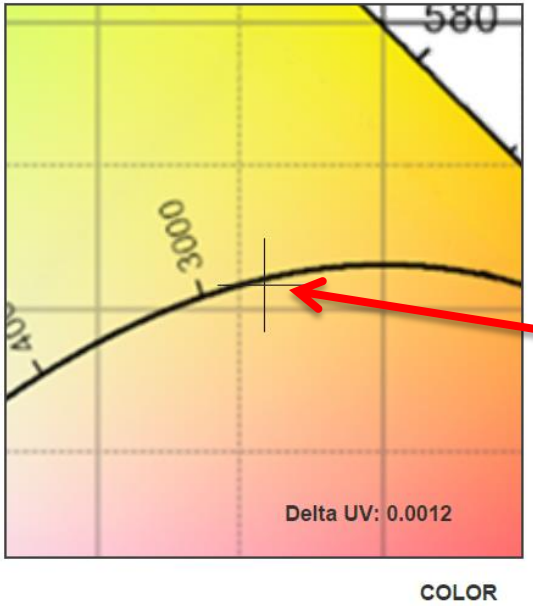


Sunlike offers the highest values in all accepted Color Metrics in the market (TM30, CRI, CQS)



Test results for: Soraa bulb 2700K





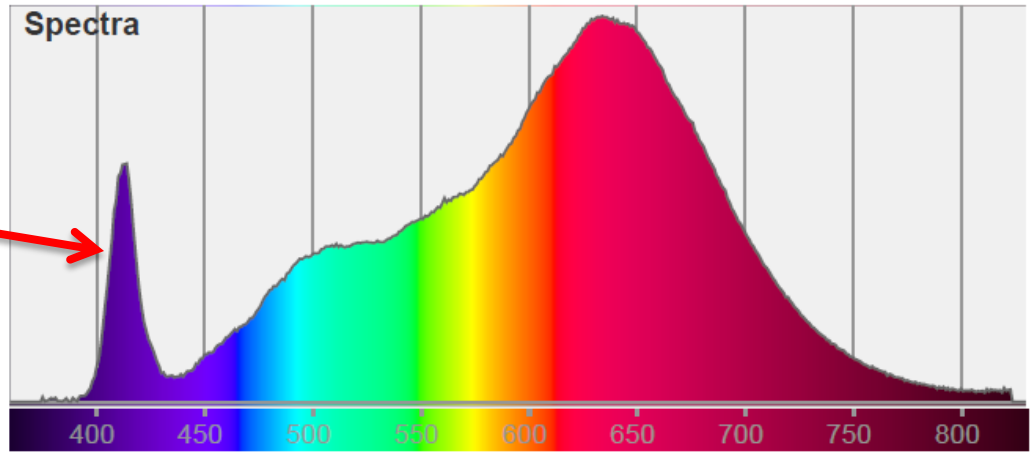
Color point in the BBL

Means real color as the Sun

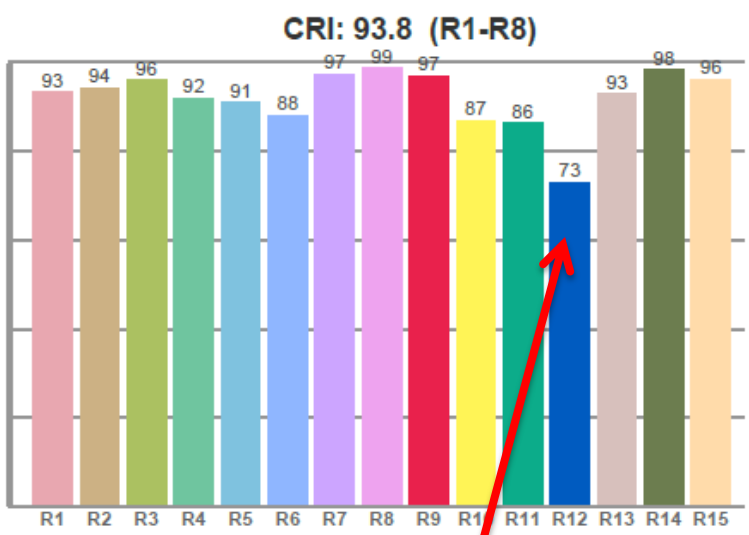
Delta UV < 0.001
NO color deviation

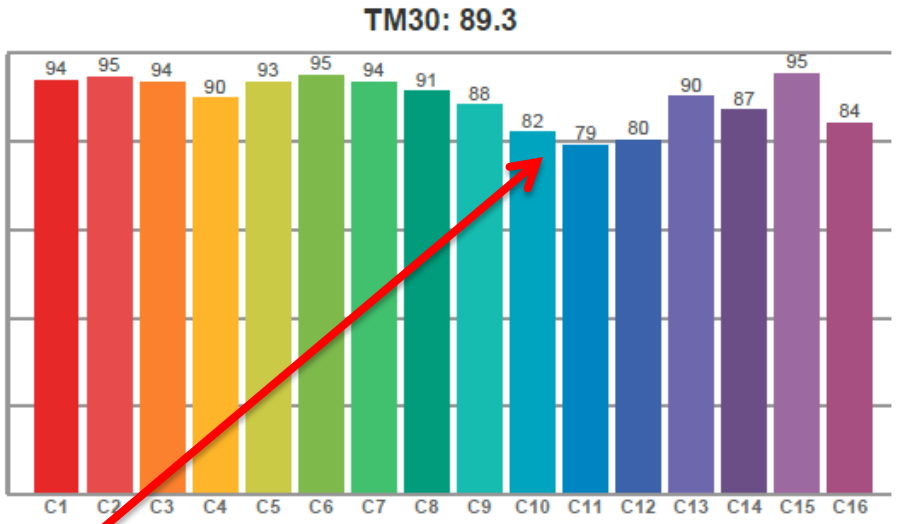
Big near UV peak

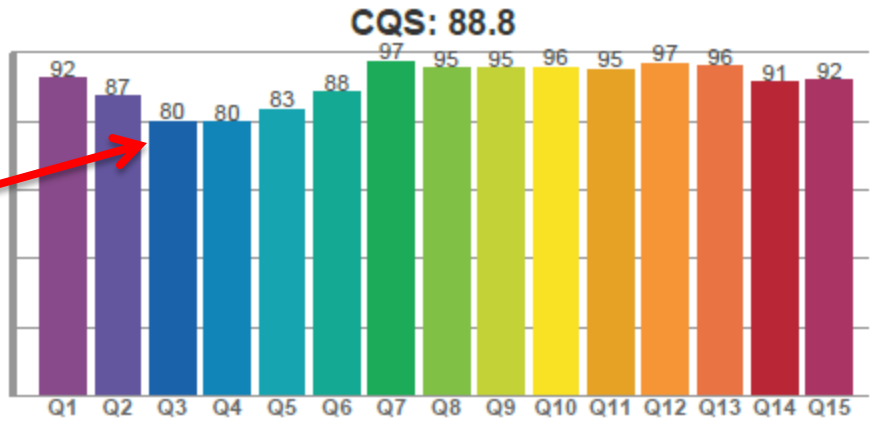
Color distortion
Health disorder



Test results for: Soraa bulb 2700K

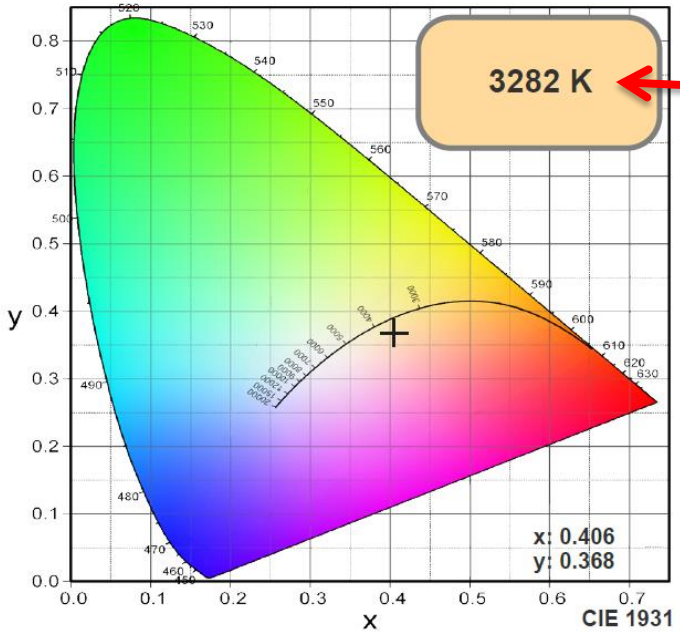


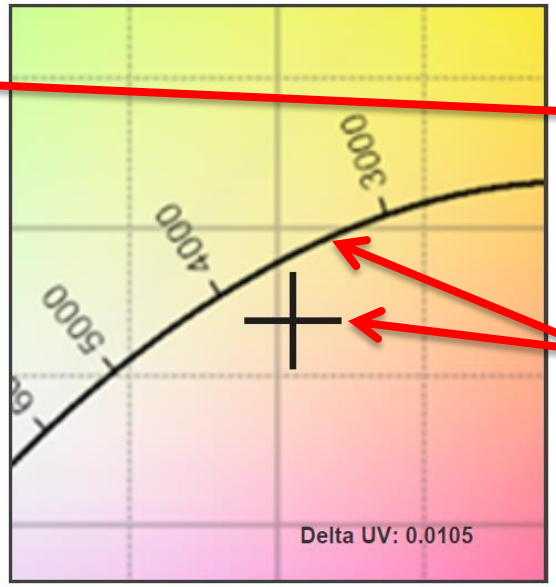




Low values in Blue and Cyan

Test results for: Lumileds Crispy color 3000K





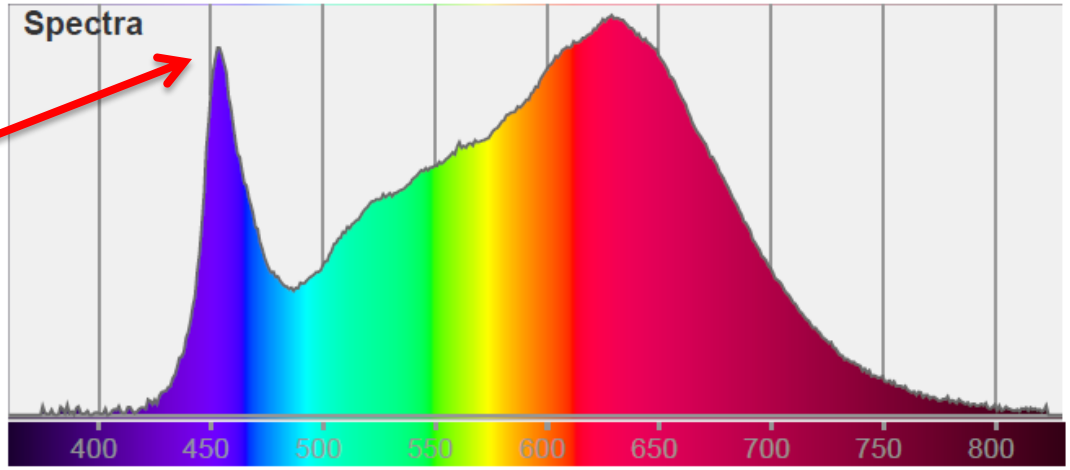
Big color distortion going to pinkish

CCT distortion –3000K to 3280K

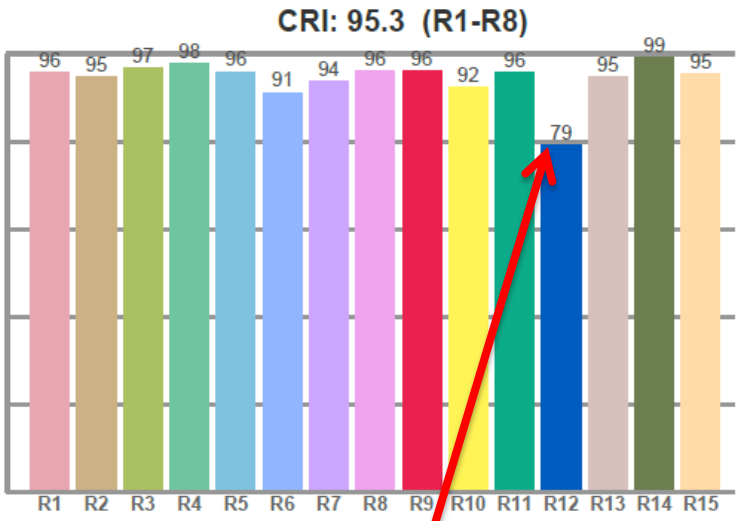
Delta UV very Big
> 0,01 means no real colors as Sun

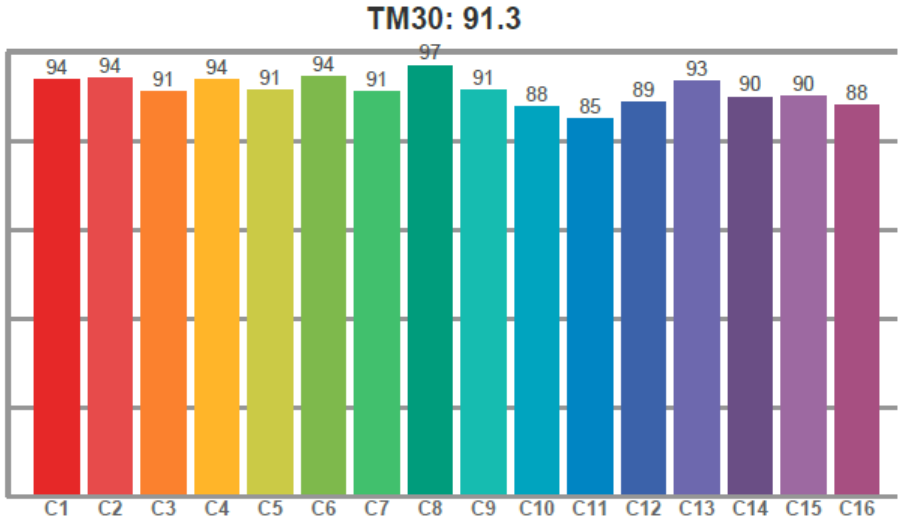
Big blue peak

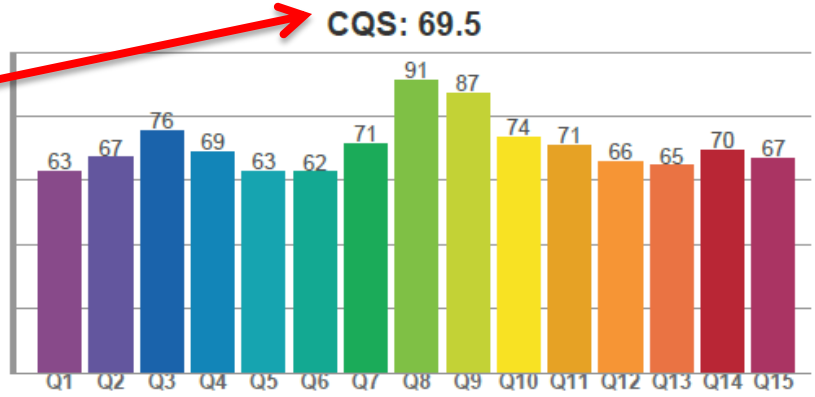
Color distortion
Health disorder



Test results for: Lumileds Crispy color 3000K





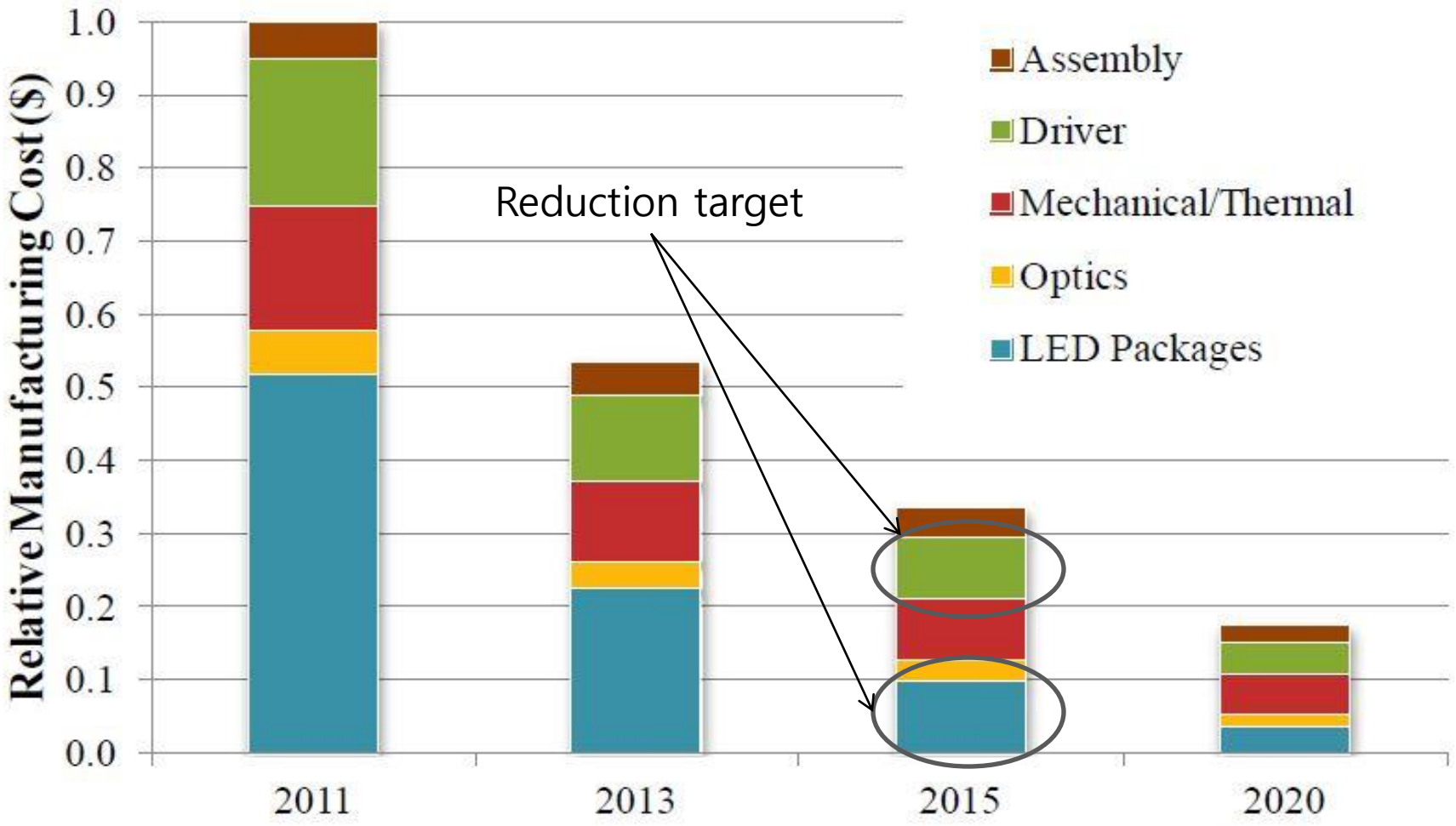


Low values in Blue and Cyan

Very low CQS (Color Quality Scale) meaning this LED is prepared for high CRI/TM30 metrics only, but not really good for color reproduction based on CQS

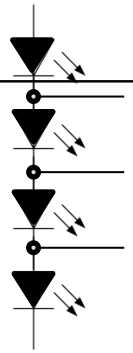
5 Бездрайверная эпопея:
Эпизод 4 - Nano- Microdriver и никаких пульсаций!

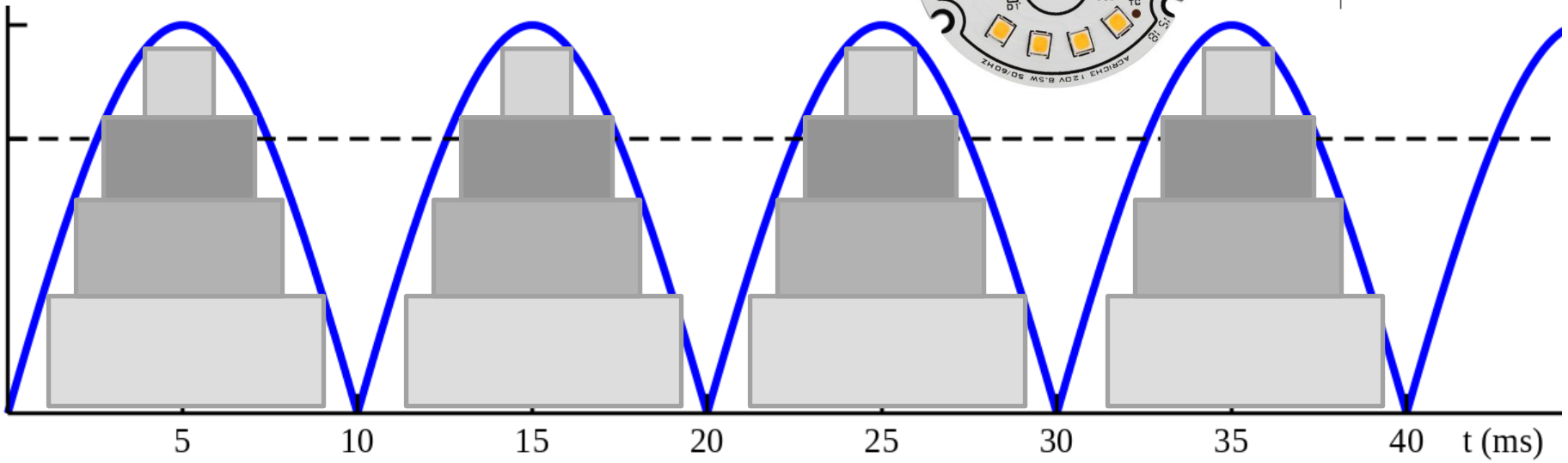
Lighting Fixture cost



Ты помнишь, как все начиналось!

Acrich 1,2 &3

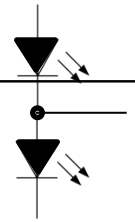


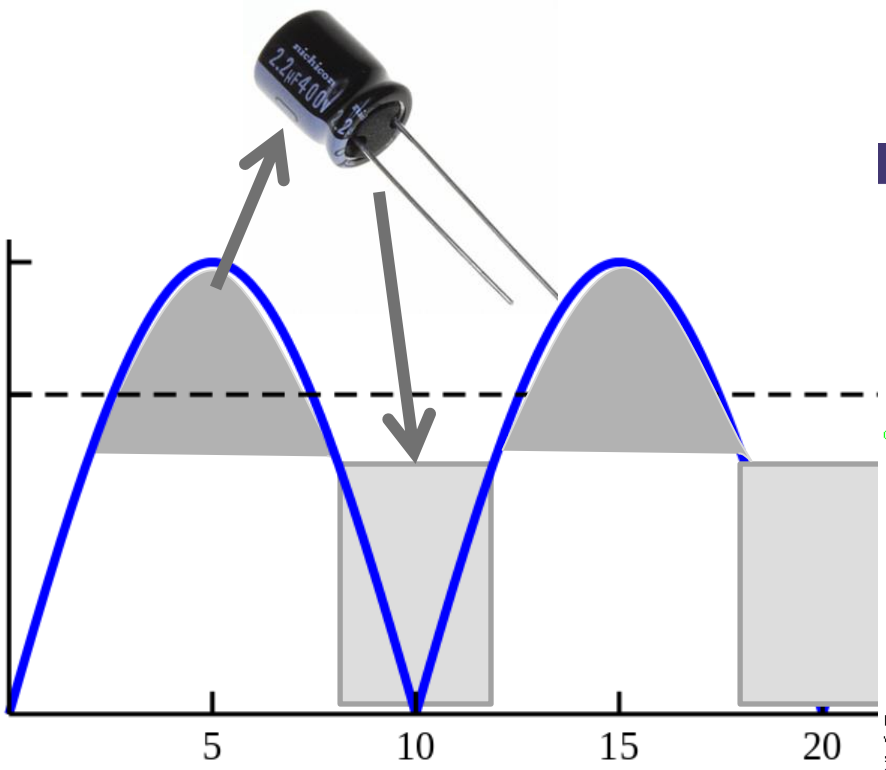


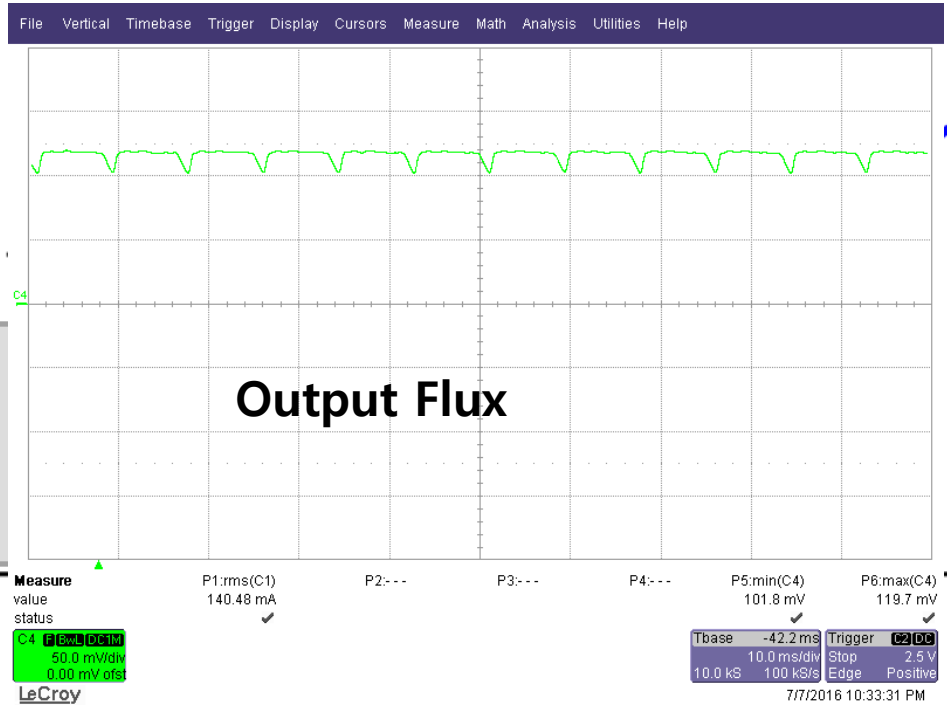
Strong Product
6-30W
Efficiency ~78%
PF 0.95
No E-Cap
<15% THD
Phase Cut or Analog dimming

Weakness
100% Flicker

New Technology – Acrich4







Strong Product

Efficiency around 85%

PF 0.9

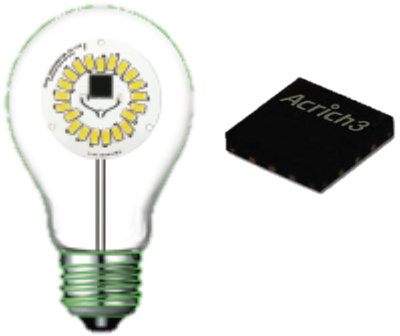
Flicker < 5%

Less LEDs used

Adding a low flicker model

Acrich

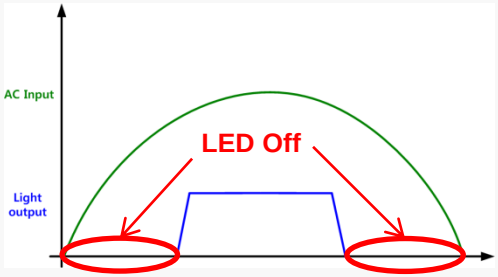
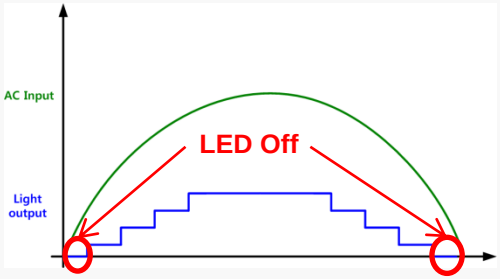
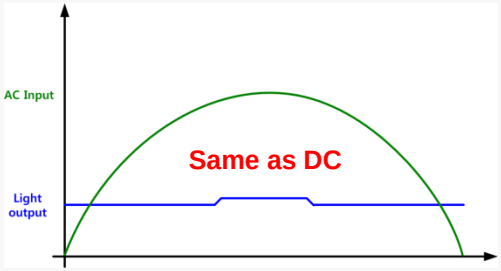
Acrich 2 & Acrich 3



New **Acrich 4.0**

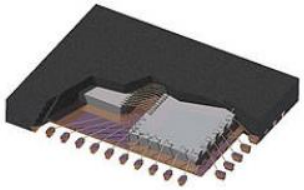
Premium performance
Premium Cost

Acrich 3 is not replaced by Acrich 4

Acrich	Acrich 2 & Acrich 3	Acrich 4
• The world's first AC-driven LED light source	• 4-Step AC-driven Solution Percent Flicker 30% ↓	• Percent Flicker ≤ 5%
		

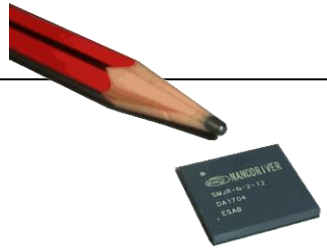
2 исполнения драйвера

- NanoDriver
  - Smallest size AC Module or Driver
  - Simple to implement(Less R&D) smaller volume custom modules
  - Higher material cost than discrete



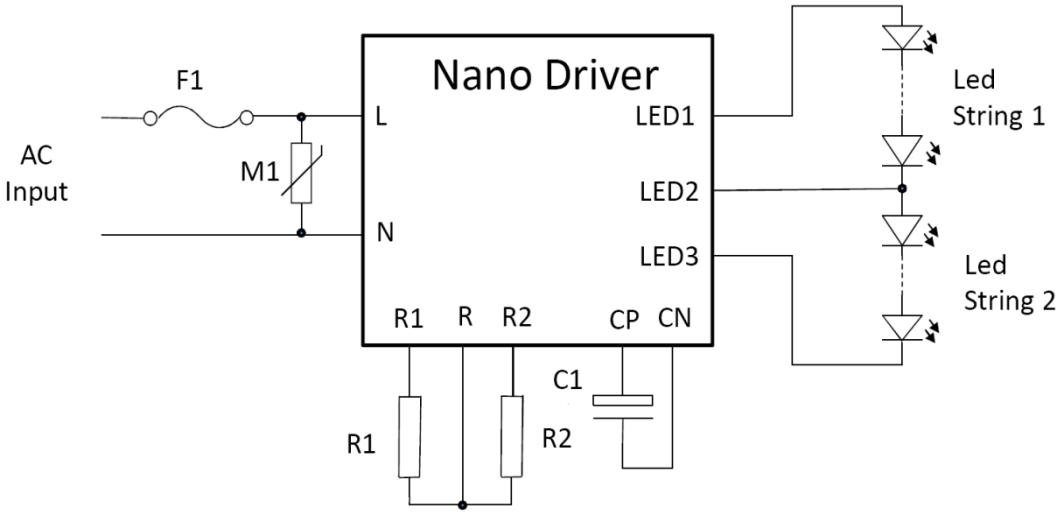
- MicroDriver
  - Smallest Driver for use with a DC Module or COB
  - Competitive cost for comparable separate driver

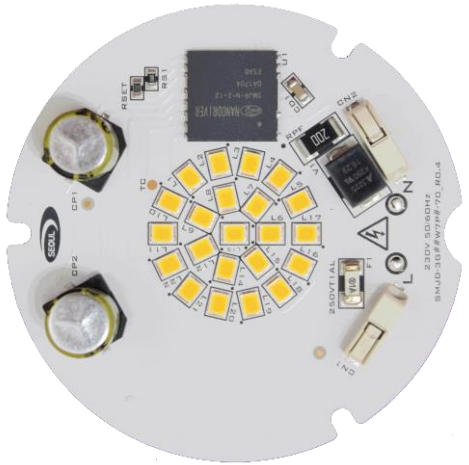
NanoDriver Models



Part No.	Vin [Vac]	P [W]		Flux [lm]	
		Min.	Max.	Min.	Max.
SMJR-N-1-16	120	8	16	700	1,600
SMJR-N-1-24	120	12	24	1,200	2,400
SMJR-N-2-16	230	10	16	900	1,600
SMJR-N-2-24	230	12	24	1,200	2,400

NanoDriver Schematic



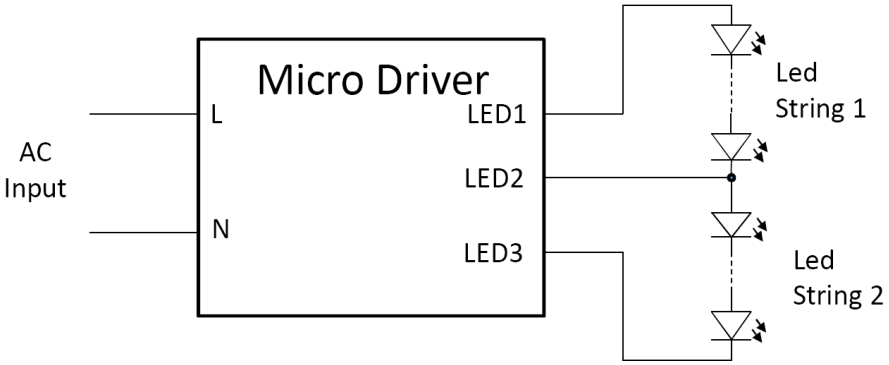


KEEP IT
SIMPLE

MicroDriver Models

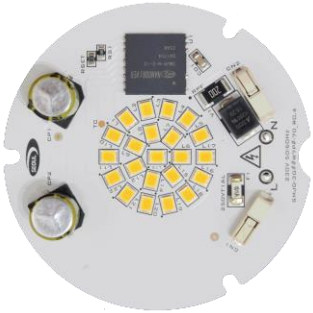
Fixture Output (Lumens reference)	Driver Current (A)	Output Power	Model Number	
			120V input	230V input
900	88mA	9.5W	SMJR-M-120-9	SMJR-M-230-9
1200	106mA	11.5W	SMJR-M-120-11	SMJR-M-230-11
1500	144mA	15.5W	SMJR-M-120-14	SMJR-M-230-14
2000	190mA	20.5W	SMJR-M-120-19	SMJR-M-230-19
2400	227mA	24.5W	SMJR-M-120-23	SMJR-M-230-23

MicroDriver Schematic

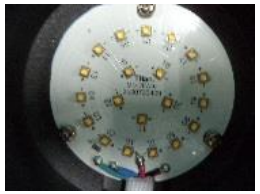


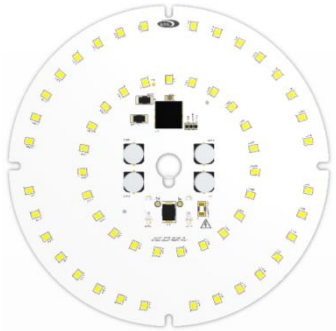
NANODRIVER

Comparisons with existing products



Comparison with company T*



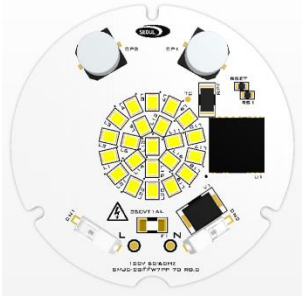
Electrical Optical Characteristics (Tj=25℃)

		T*		SSC	
		Fixture	Module	Fixture	Module
Size		138mm	58mm	138mm	160mm
Flux[lm]		2217.4	2358.6	2707.6	2880
CRI		80		80	
CCT		4000		4000	
lm/W		59.1	62.9	112.8	120
Power[W]		37.5		24	
Current[mA]		167.5		116	
PF		0.9716		0.9 ↑	
THD[%]		12.51		47	
Operating	TRIAC	Non- Dimming		Yes	
	Trailing	Non-Dimming		Yes	
% Flicker		0.37%		<10%	
Cost	driver	-	$ 6.281	-	$ 2.98
	LED(2525)	-	$ 1.6(20ea)	-	$ 1.045(55ea)
	Total	-	$7.88	-	$ 4

Comparison with company O*



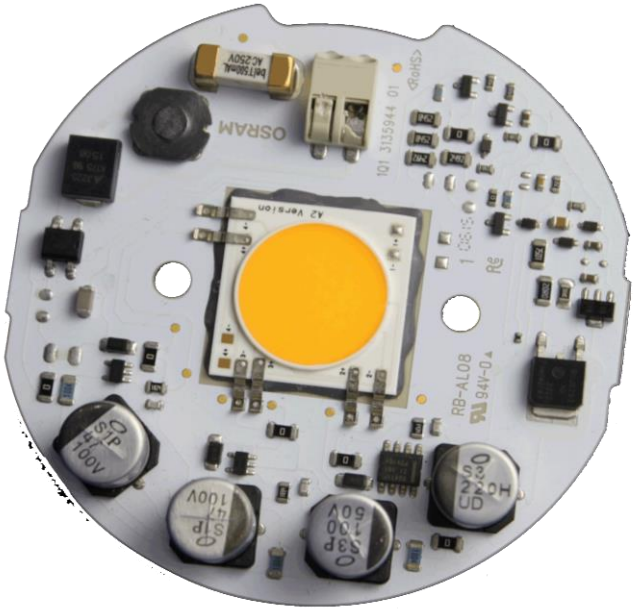
O*

SSC


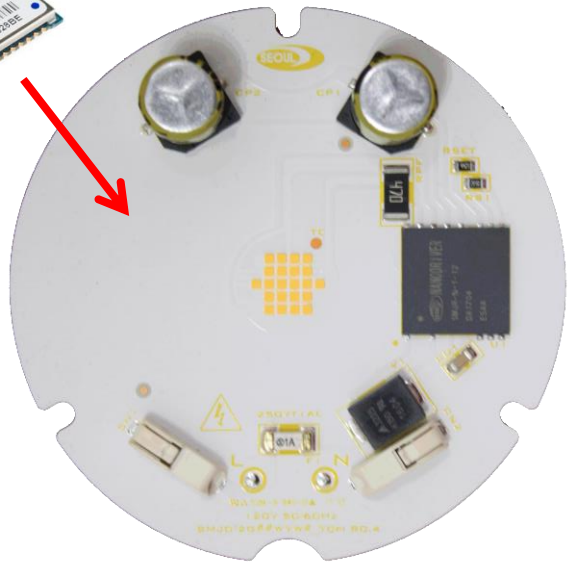
Electrical Optical Characteristics (Tj=25℃)

		O*		SSC	
		Fixture	Module	Fixture	Module
Size		80mm	14X14mm	80mm	70mm
Flux[lm]		869.1	956.0	864	960
CRI		80		80	
CCT		4000		4000	
lm/W		101.9	112.1	108	120
Power[W]		8.53		8	
Current[mA]		39.64		38.65	
PF		0.9352		>0.9	
Operating	TRIAC	Non-Dimming		Yes	
	Trailing	Non Dimming		Yes	
% Flicker		19.93		<10%	
Cost	driver	-	$2.790	-	$ 1.98
	LED(COB)	-	$ 0.9(1ea)	-	$ 0.418 (22ea)
	Total	-	$3.60-	-	$ 2.50

Comparison with company O*



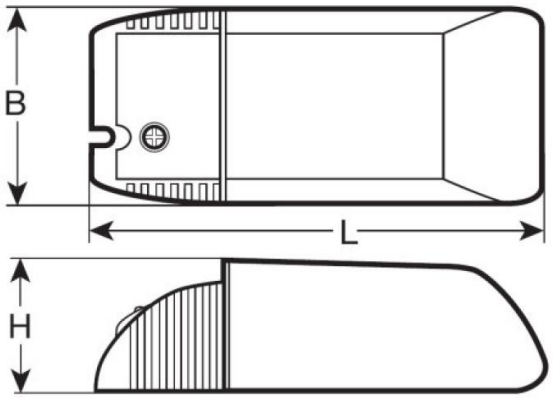
Room to add
Dali, Zigbee, Zwave, Bluetooth,…



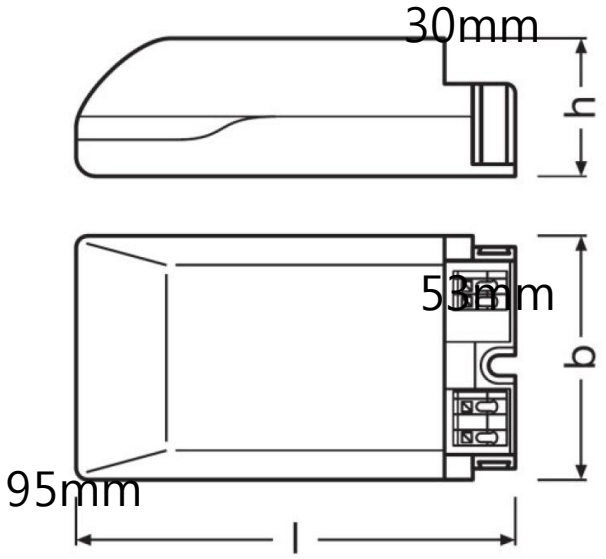
O* 1800lm	SSC NanoDriver 1200lm
62 Parts +COB	**9 Parts +22 Y11 leds**
78mm	**70mm**
1.5mm creepage	**6mm creepage**
Non Dimmable	**Phase Cut dimmable**

Micro competitive comparison

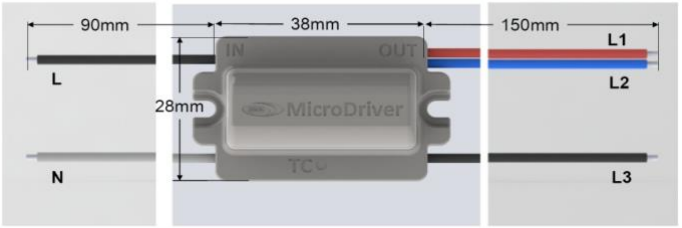
Competitor Driver O* - Size comparison



OTe 9/220...240/700 PC



OTe 10/220...240/700 PC, OTe 13/220...240/350 PC, OTe 18/220...240/500 PC, OTe 18/220...240/350 PC, OTe 25/220...240/700 PC



MicroDriver Market Conclusion

- Strongest Points:
  1. Smallest size
  2. Low Flicker
  3. Low Inrush

- Micro driver weak points
  - No Short Circuit Protection
  - Non-isolated AC
  - THD

- Pricing very competitive

Target Applications for Micro driver

- The worlds thinnest and smallest driver
- Residential
- Fixtures
  1. Down Lights
  2. Flush mount
  3. Sconce
  4. Spot & Track
  5. Light Panels

THANK YOU!

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Посчитаем, уважаемые кроты!

SSC LED CALCULATION TOOL

	LED 1	LED 2	LED 3
LED Product	E3-5630D	Z5M2	Wicop Y50
	E3-STW8Q14D	SZ5-M2-Wx-Cx	SZ8-Y50-WN-CX-XX
LED BIN lumens	U7	W5	H
min.lm	36.9	299	1290
MAX.lm	39.4	313	1419
LED Vf bins	Y1	G	F
min. VF	2.7	2.75	10.5
MAX.VF	2.8	3	10.8
Tj of your system	65	85	85
MAX. Tj	125	145	145
Current in mA	65	700	700
MAX. mA	200	1500	1500
lm min	34.6	299.4	1275.2
lm MAX	36.9	313.4	1402.7
Vf min.	2.65	2.75	10.50
Vf MAX	2.75	3.00	10.80
lm/w min	193.6		
lm/w MAX	214.2		

SEOUL SEMICONDUCTOR

REV10 . done by MJN

Results to Excel

MJT COB Selecting Tool

Rev 1.5

Light Color & COB type		
CCT	CRI	Type
E	Min. 80	Standard

Target property	
Item	Value
Flux	1,000 lm

Temperature	
Item	Value
Tj	85 ℃

Notice:
This document is provided for informational purposes only and is not a warranty or a specification. For product specifications, please

Model	Part Number	Size [mm]	LES [mm]	CCT Bin code	CRI Min.	If [mA]	Vf [V]	Flux [lm]	Pd [W]	Efficacy [lm/W]	Tj [℃]
MJT COB	SAW80661A	13.5 x 13.5 x 1.45	6.0	E	80	200	35.3	1,004	7.1	142.3	85.0
MJT COB	SAW81062A	13.5 x 13.5 x 1.45	9.8	E	80	179	33.0	1,002	5.9	169.5	85.0
MJT COB	SAW81063A	13.5 x 13.5 x 1.45	9.8	E	80	179	32.3	1,002	5.8	173.3	85.0
MJT COB	SAW81564A	19.0 x 19.0 x 1.45	14.5	E	80	167	31.8	1,001	5.3	188.3	85.0
MJT COB	SAW81565A	19.0 x 19.0 x 1.45	14.5	E	80	167	31.6	1,002	5.3	189.8	85.0
MJT COB	SAW81566A	19.0 x 19.0 x 1.45	14.5	E	80	180	31.5	1,073	5.7	188.9	85.0
MJT COB	SAW82296A	28.0 x 28.0 x 1.45	22.0	E	80	148	47.1	1,382	7.0	198.4	85.0
MJT COB	SAW82298A	28.0 x 28.0 x 1.45	22.0	E	80	220	47.2	1,958	10.4	188.6	85.0
MJT COB	SAW822AAA	28.0 x 28.0 x 1.45	22.0	E	80	300	52.6	2,926	15.8	185.5	85.0
MJT COB	SAW833EAA	38.0 x 38.0 x 1.45	32.8	E	80	300	73.6	4,211	22.1	190.7	85.0
MJT COB	SAW833GCA	38.0 x 38.0 x 1.45	32.8	E	80	370	84.2	5,771	31.1	185.3	85.0

THANK YOU!

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