



CITIZEN

LED EVENT 2016

**Mr. Navid Delassaee
Citizen Electronics Germany**

LED EVENT 2016

**Design en engineering trends voor
LED-applicaties**

**BE WOENSDAG 30 NOVEMBER 2016
TECHNOPOLIS, MECHELEN**

**NL DONDERDAG 1 DECEMBER 2016
CONGRESCENTRUM 1931
BRABANTHALLEN, DEN BOSCH**

LED with high color SATURATION



- CIE CRI is used as index of the appearance of color for a long time.
- However , CRI value is not always corresponding to real appearance of color at recently.

Ra82



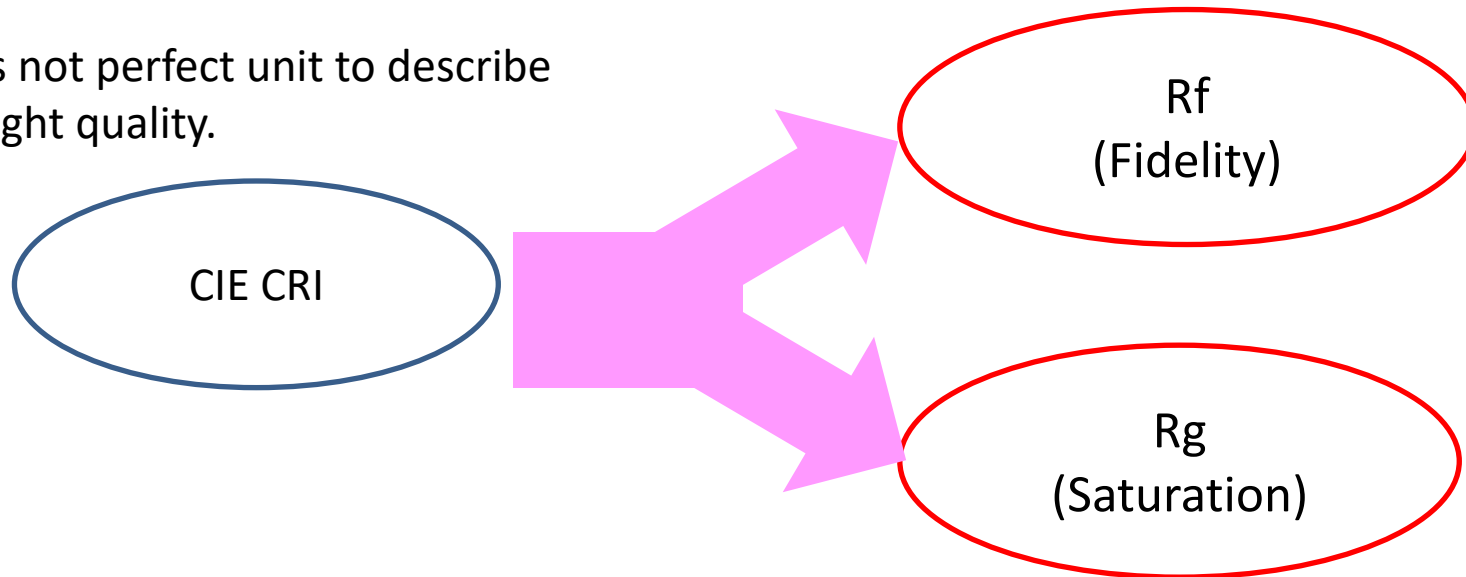
Ra71



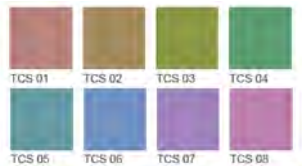
New calculation method is being considered to describe the color quality.

TM30-15 established two new units

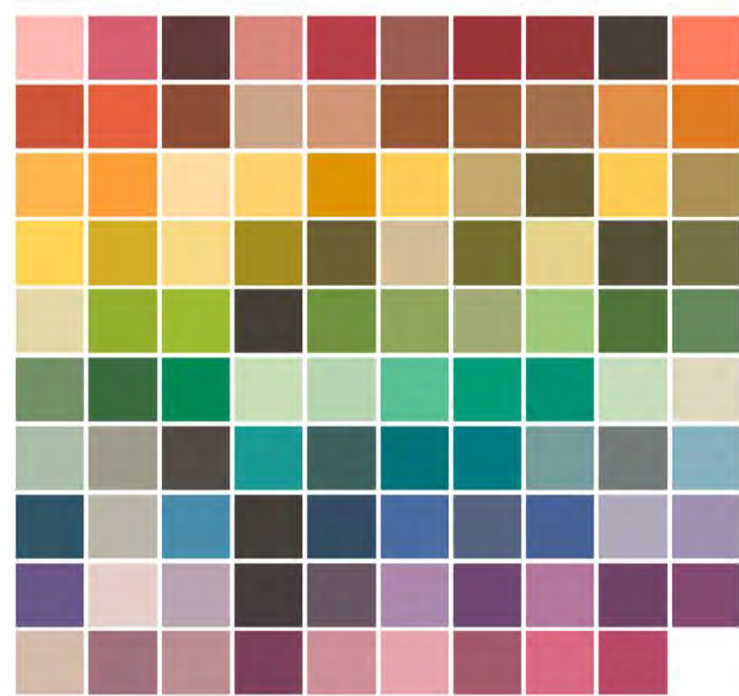
CRI is not perfect unit to describe the light quality.



Ra...Evaluate with 8 colors



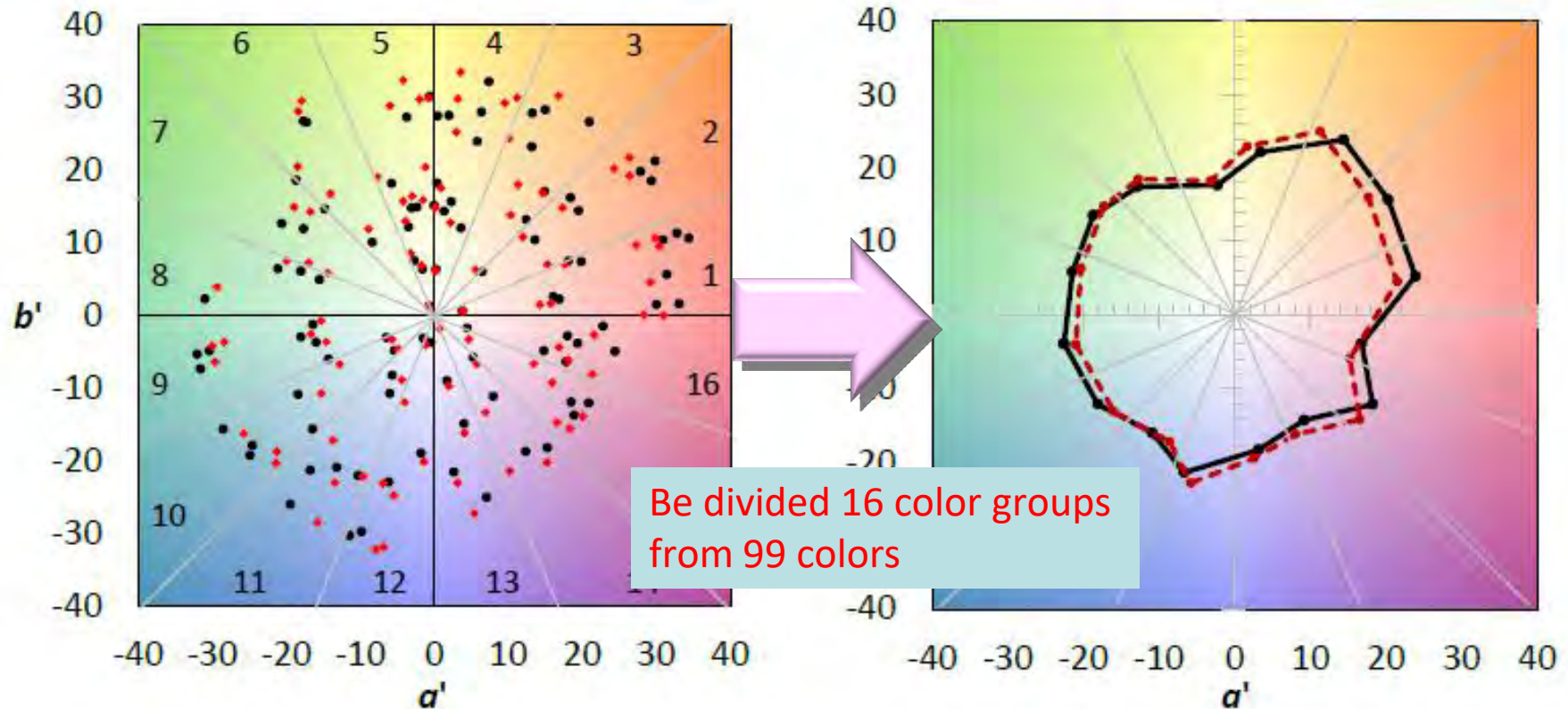
Rf (TM-30-15) ...Evaluate with 99 color



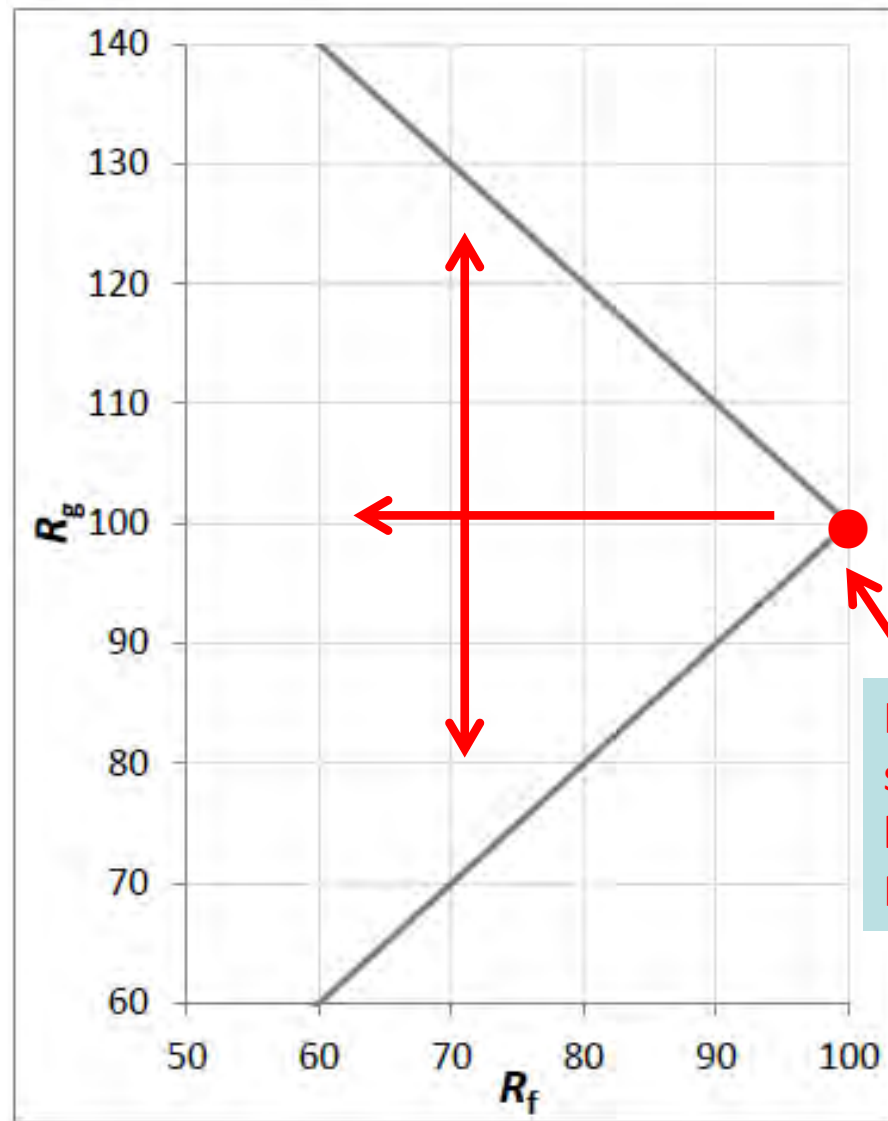
- Rf includes all thick, deep color together with soft, blur color.
- Ra figure does not include the thick, deep(vivid) color like “R9 ~ R14”.

...Rf can evaluate the color reproductivity more precisely

Relative Gamut Index: R_g

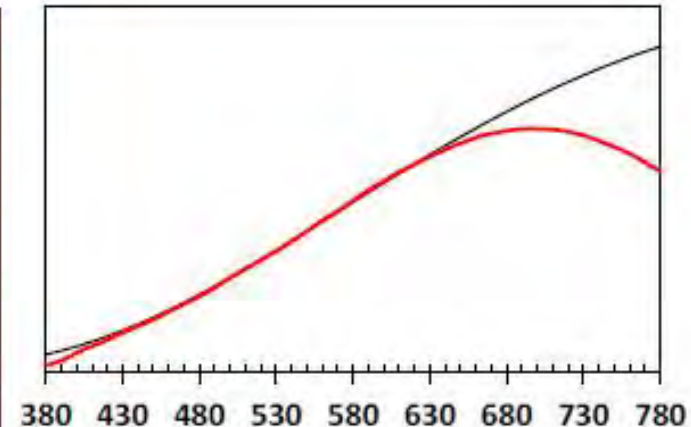
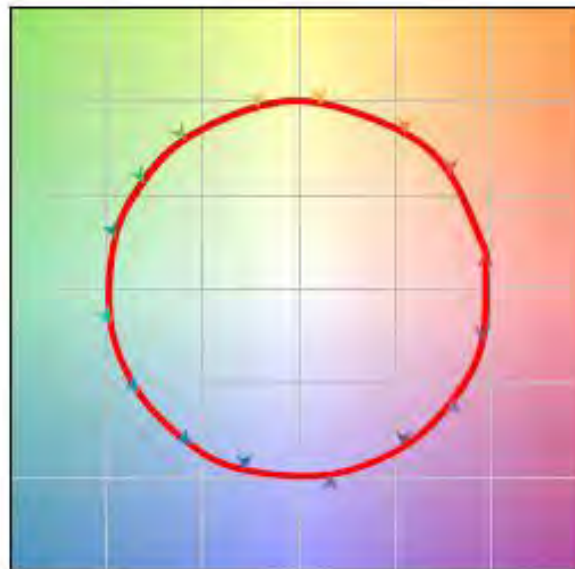


An R_g value greater than 100 indicates an average increase in saturation and
an R_g value less than 100 indicates an average decrease in saturation.

Relative Fidelity Index R_f and Gamut Index R_g 

It's specialized light source. It's like normal halogen.
 $R_f, R_g = 100$

Halogen MR16, 3000 K (Source No. 80)



$$R_f = 99$$

$$R_g = 99$$

$$R_{f,skin} = 99$$

$$CCT = 2988 \text{ K}$$

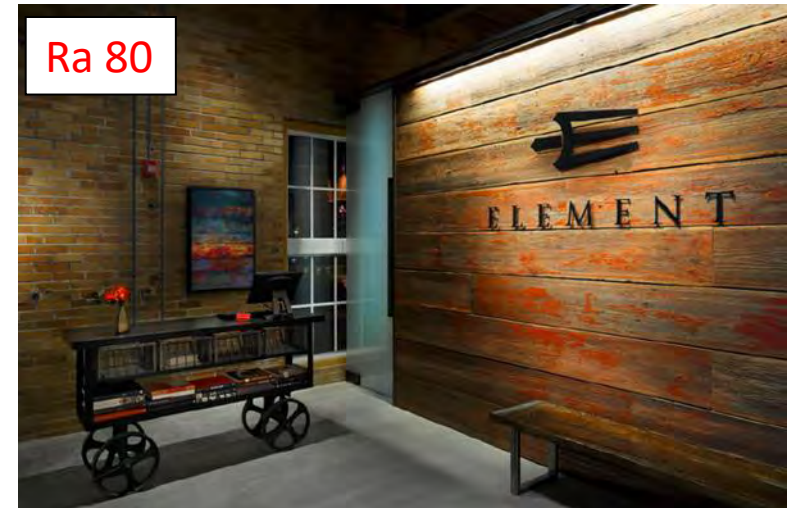
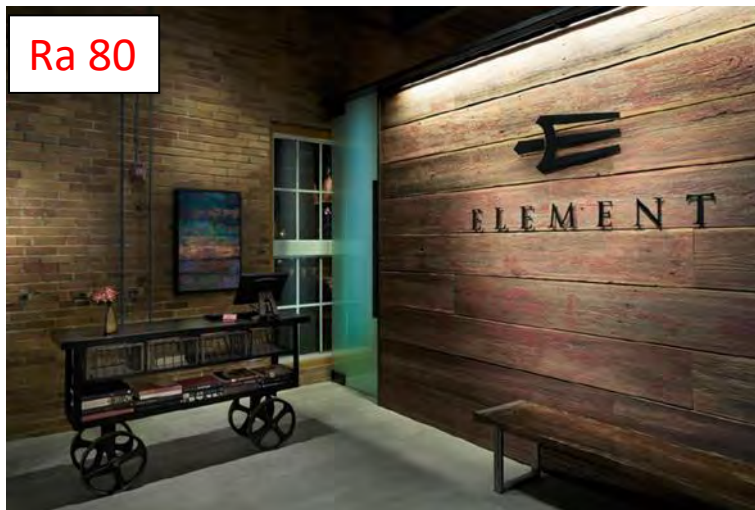
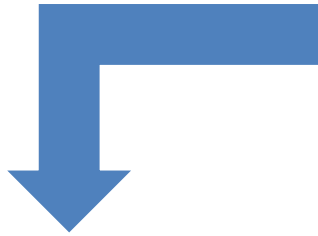
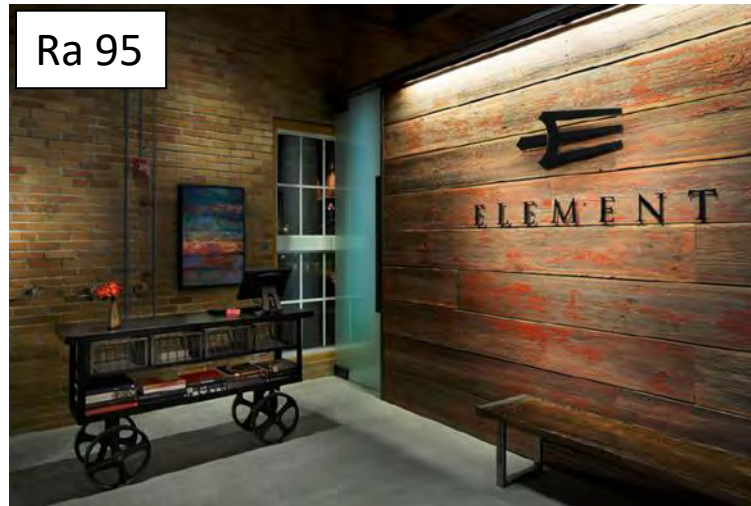
$$D_{uv} = 0.0010$$

$$R_a = 99$$

$$R_9 = 93$$

Why Rg and Vector graphic is needed?

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Why Rg and Vector graphic is needed?

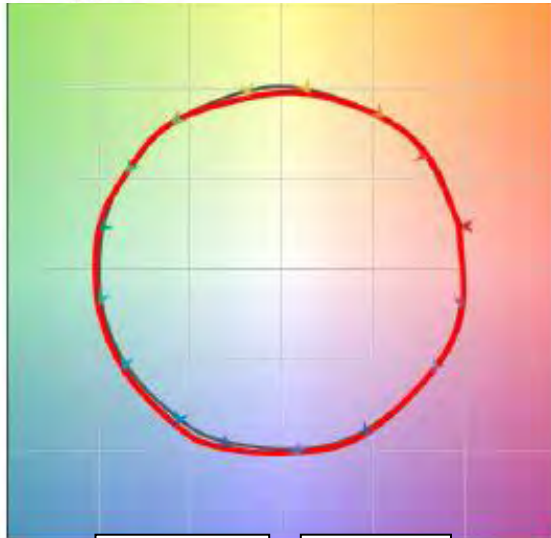
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Original

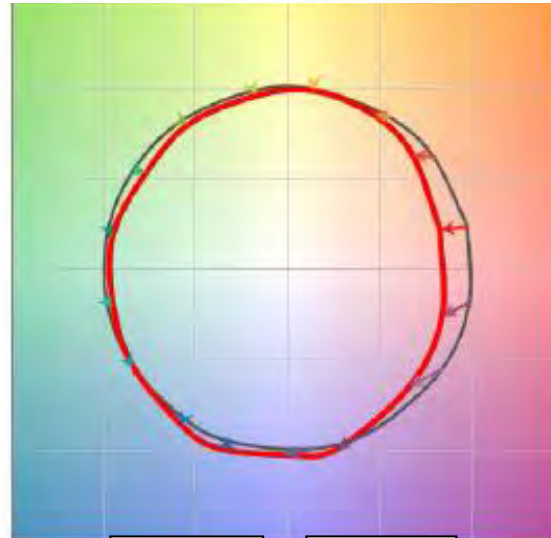
Desaturated

Red-Enhanced



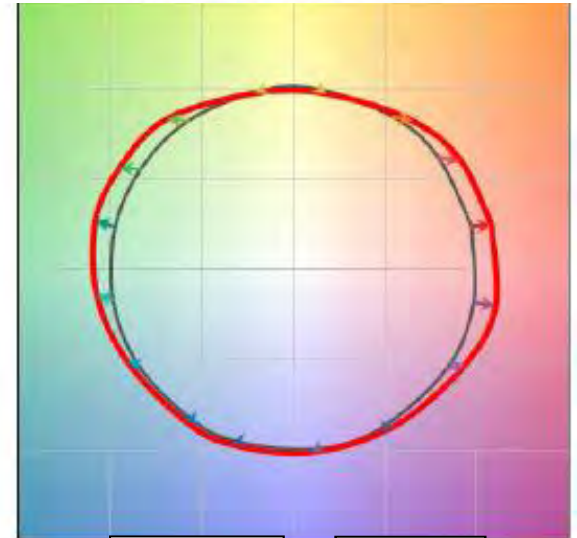
Rf 93
Rg 100

Ra 95



Rf 78
Rg 90

Ra 80



Rf 78
Rg 110

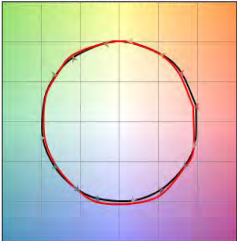
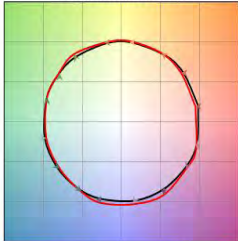
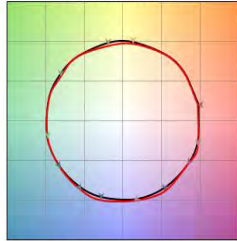
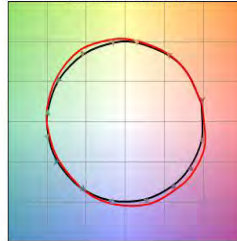
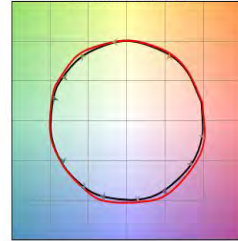
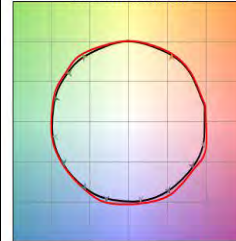
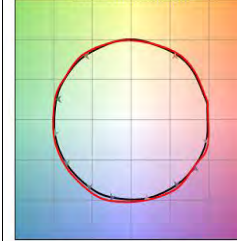
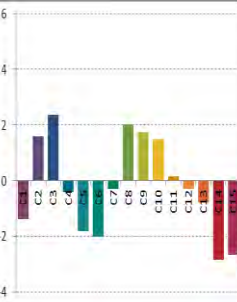
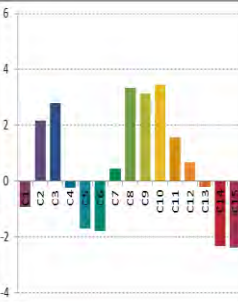
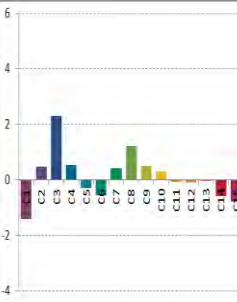
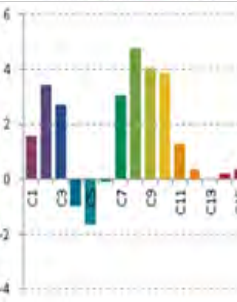
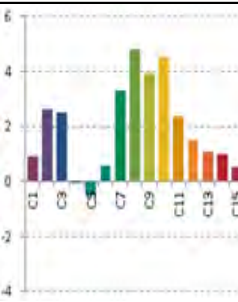
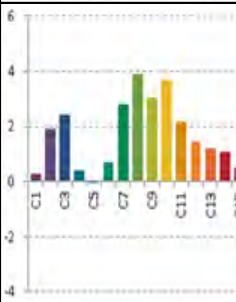
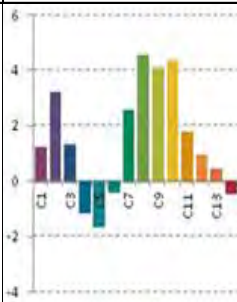
Ra 80



Brilliant Vivid

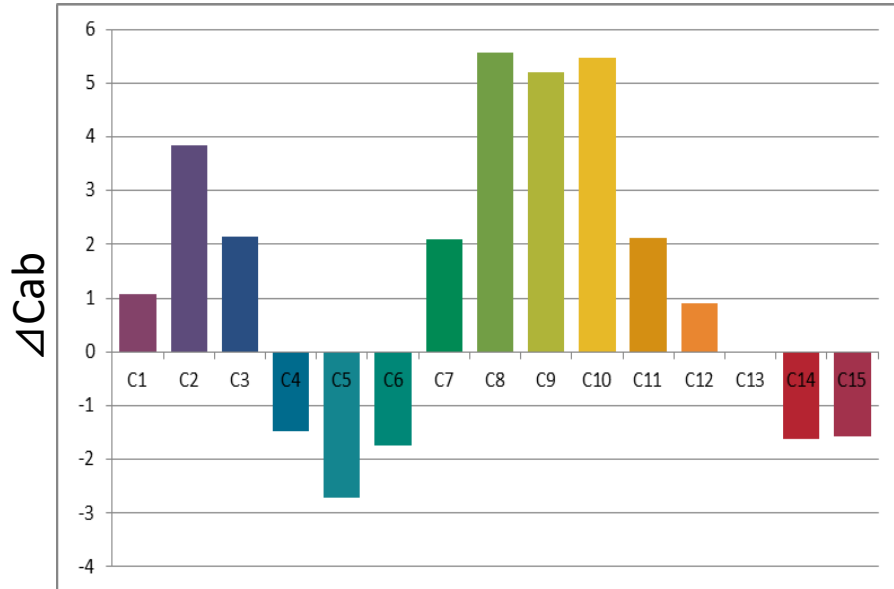


Ra 80

Type	Ra90 On BBL	Ra90 Below BBL	Typ Ra97	Vivid White	Vivid Warm	Vivid Warm Plus	Vivid Warm Plus2
CCT(K)	3000	3000	3000	4200	3400	3200	2800
Ra	93	94	98	94	95	96	95
Rf	91	91	94	90	93	94	94
Rg	100	102	100	106	105	105	104
Color Vector							
ΔC^*_{ab}							

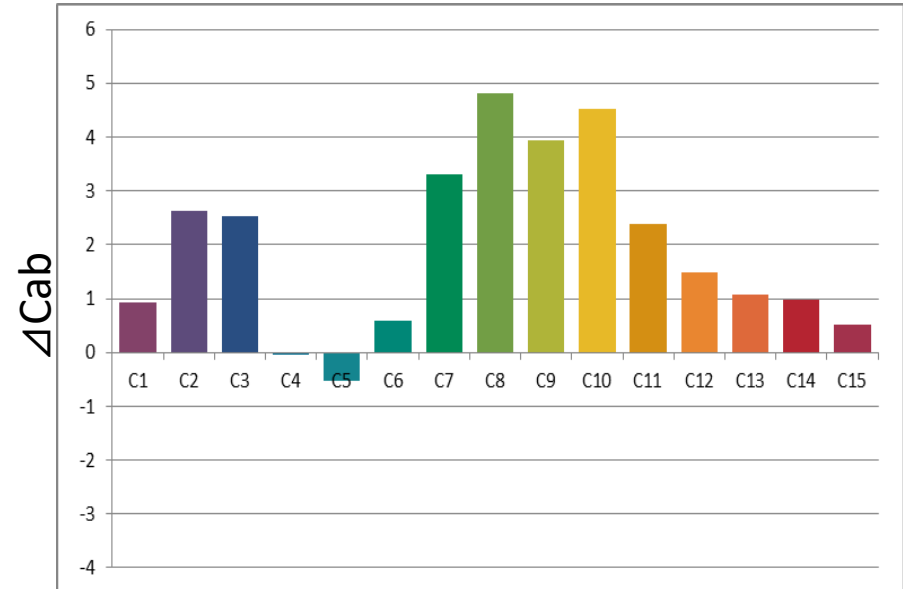
3000K Ra90min Below B.B.L.

Rg:105.3



Vivid Warm

Rg:105.8



As Rg figures takes the “average”, this issue can happen...

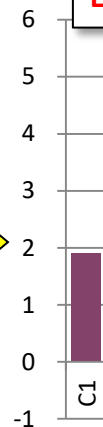
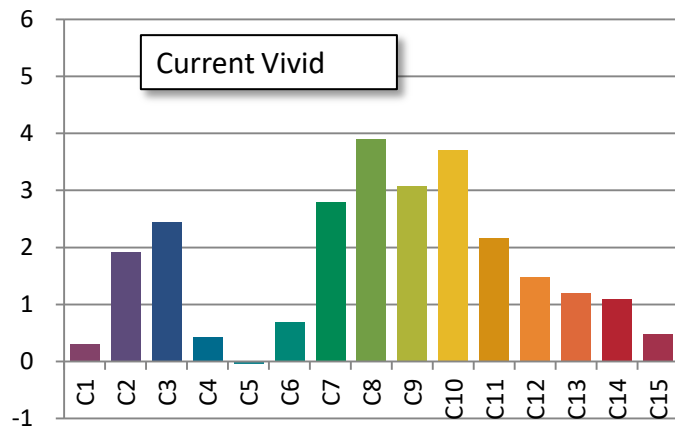
Similar Rg but not same color visibility.

This method is still not perfect.

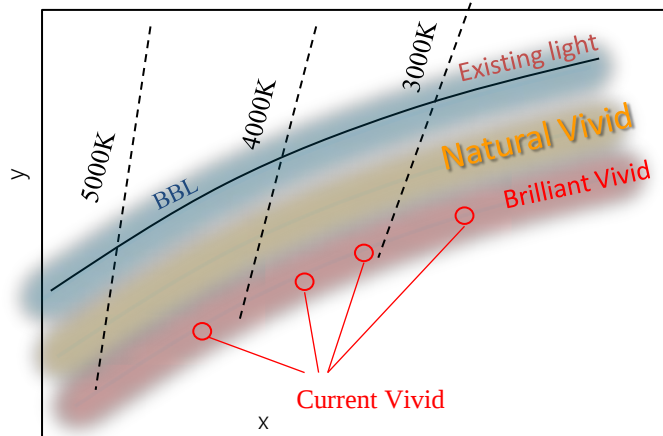


Vivid Lineup review & NEW Vivid
New Vivid

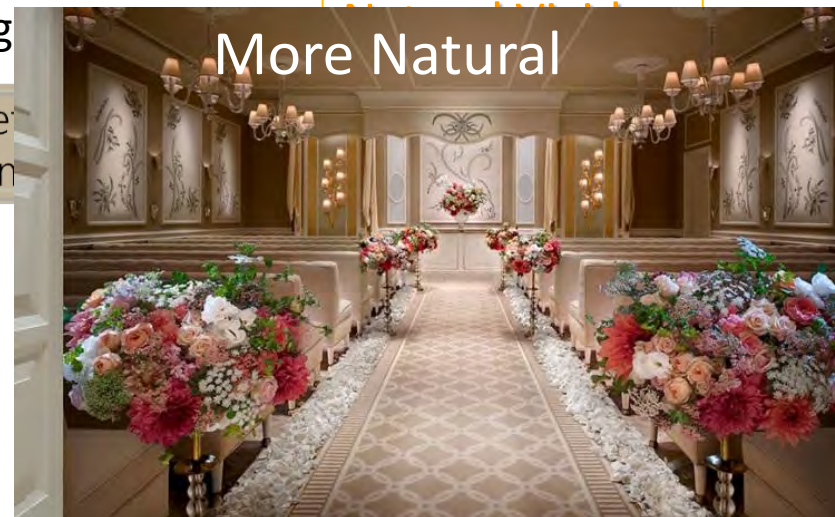
Method-1 Better color saturation



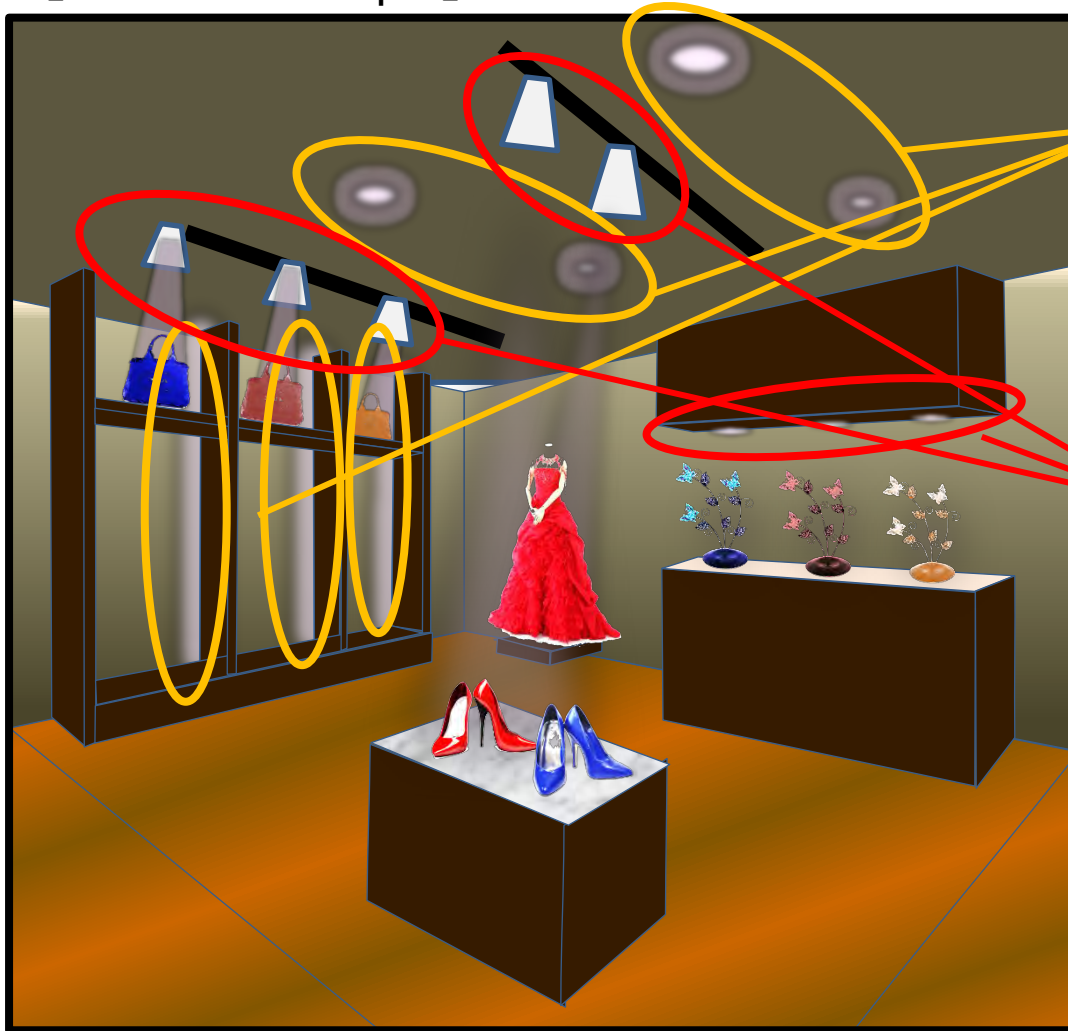
Method-2 Better compatibility with existing light



To make the atmosphere of high color saturation, the light color should be set to below BBL.



【Practical example】

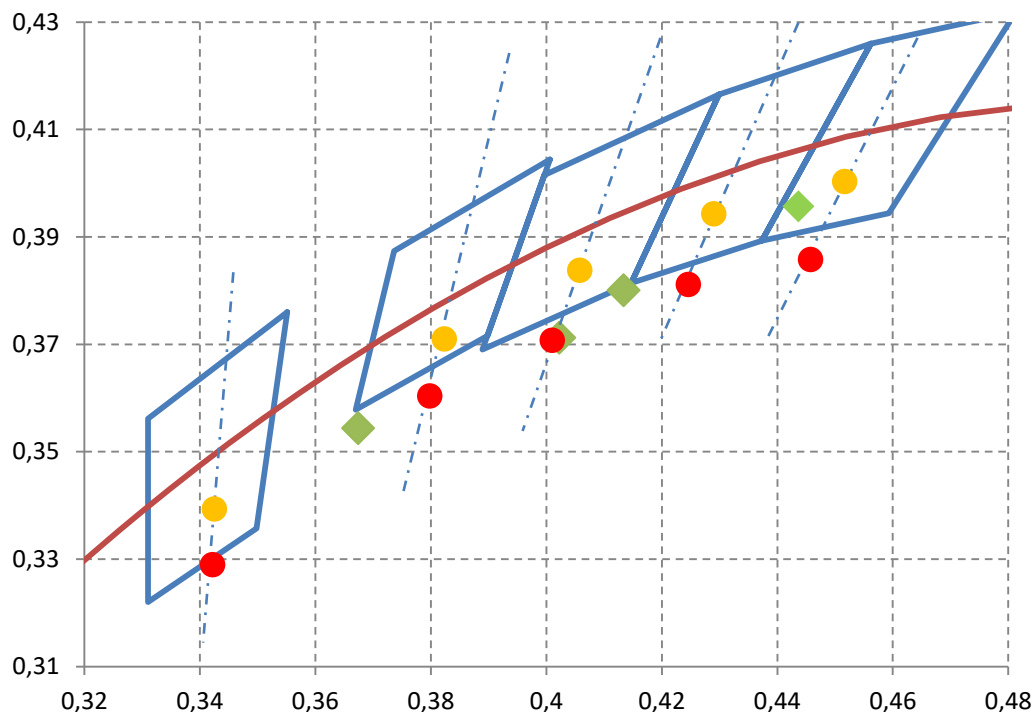


Natural Vivid

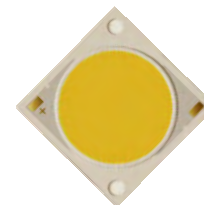
It becomes better compatibility for outside atmosphere and lighting for goods by using for base lighting. And, it is good for space lighting by better LPW.

Brilliant Vivid

It becomes possible to recognize the very small difference of color/texture in the goods by using for spotlight and cabinet lighting.



◆	Current Vivid	-	White (4200K)	Warm (3400K)	Warm Plus (3200K)	Warm Plus 2 (2800K)
●	Brilliant Vivid	5000K	4000K	3500K	3000K	2700K
●	Natural Vivid	5000K	4000K	3500K	3000K	2700K



CLU038-1208C4

IF=720mA, TJ=85°C

Brilliant Vivid

	5000K	4000K	3500K	3000K	2700K
Im	-	2420	2330	2220	2090
Im/W	-	97.3	94.1	89.4	84.6

Natural Vivid

	5000K	4000K	3500K	3000K	2700K
Im	-	None	None	2610	None
Im/W	-	None	None	105.1	None

Preliminary: under development.

Standard type COB

- CLU02*series: 1204
- CLU03*series: 1206 1208
- CLU04*series: 1212 1812



Standard type Variation

SMD

- CLL130series: 0101



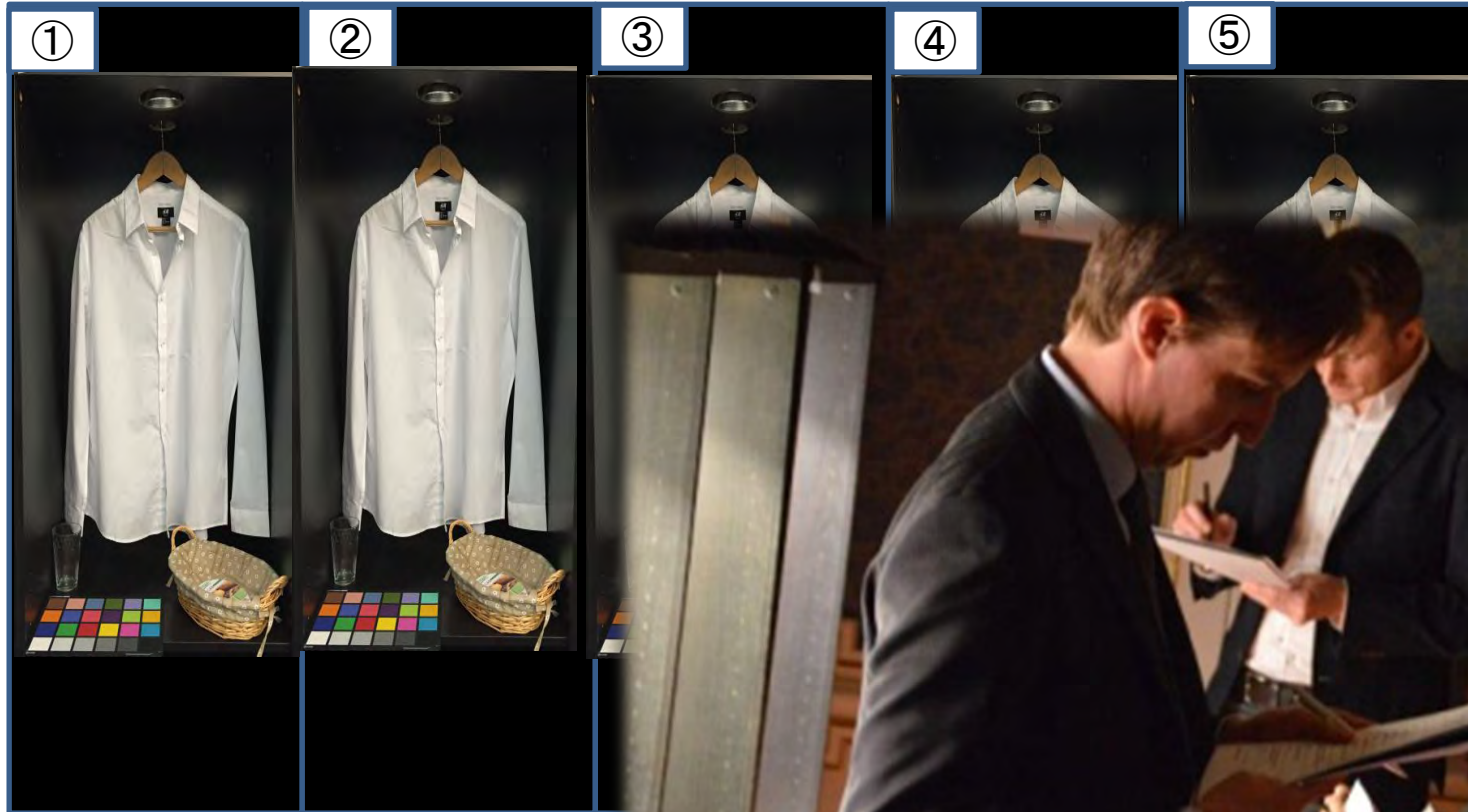
SMD

(HI type COB are not available)

Schedule

- Engineering Sample : October 2016
- Data sheet : November 2016
- Sample for sales promotion : January 2017
- Mass production : Q1 of 2017

Comparison of our next Vivid and competitor's COB



elincom

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Link movie Vivid

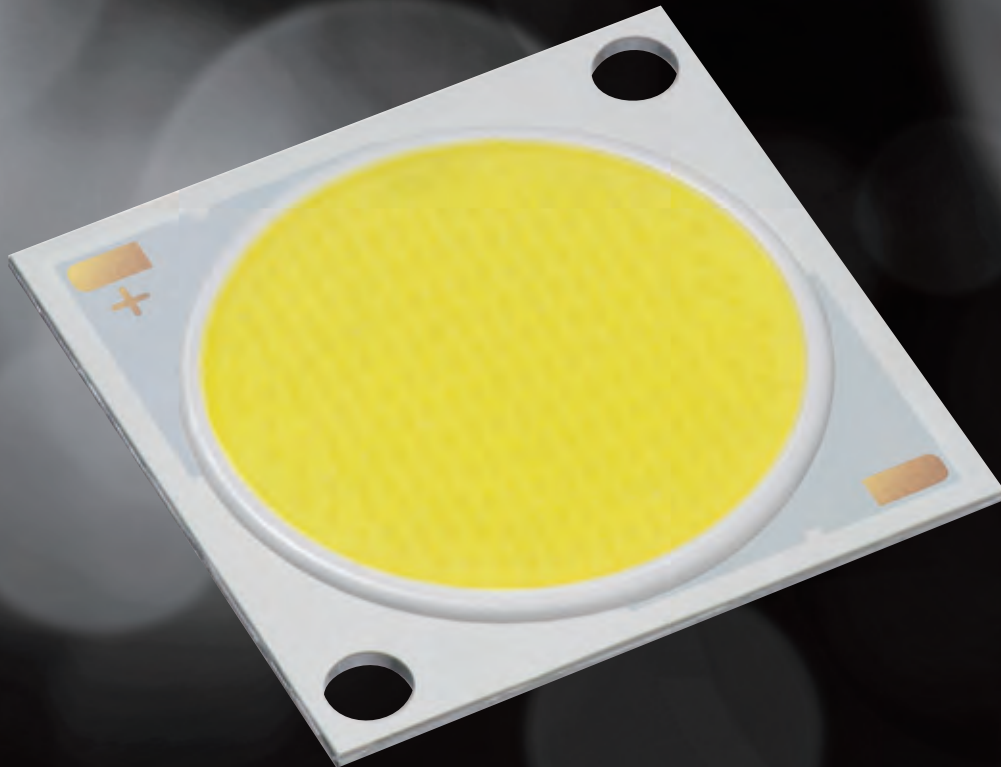
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LED for General Lighting 2017

Four Lighting Solutions

High efficacy and High Power

The advanced LED packaging technology with high thermal dissipation makes high efficacy and high power driving available.

Optimized module solutions save customers design resources and system cost.

Module

CITILED
The Light Engine

Point Source

Population of multi LED dies with narrow pitch in the LED package makes sharp point light source and has light beam control easier with optics.

High color quality

The advanced spectrum tuning technique makes high color quality LEDs suitable for many kinds of luminaire applications.

High efficacy & High Power	P.5
----------------------------	-----

Ver.6 COB	P.6
CLU550	P.13
CL-L104	P.14
PSL445	P.15
Compact SMD	P.16

Point Source	P.17
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High Intensity COB Ver.2	P.18
PSL440	P.20

High color quality	P.21
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Vivid Series Brilliant Type	P.23
Vivid Series Natural Type	P.23
Below B.B.L.	P.26
Super High CRI	P.26
Amber color COB	P.29
Blue color COB	P.30

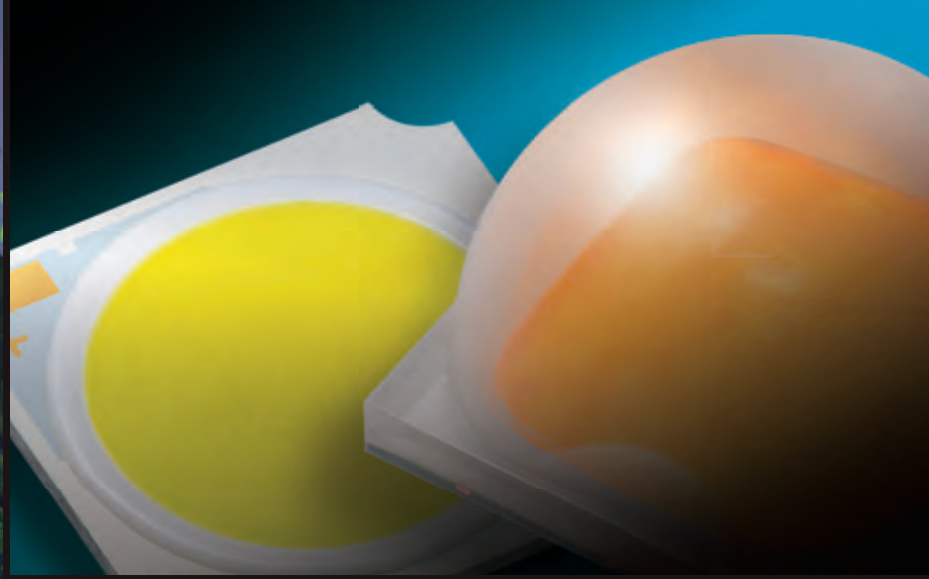
Module	P.31
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AC Disk Module	P.32
CSP Module	P.35

CITILED LED Product List

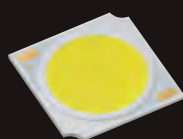
			65 CRI Typ.		70 CRI Min.			80 CRI Min.						90 CRI Min.				
			2,200K (Amber)	5,000K	3,000K	4,000K	5,000K	2,700K	3,000K	3,500K	4,000K	5,000K	5,700K	6,500K	2,700K	3,000K	3,500K	4,000K
COB	CLU028	1201C4																
		1202C4																
		1203C4																
		1204C4																
	CLU038	1205C4																
		1206C4																
		1208C4																
		1210C4																
	CLU048	1211C4																
		1212C4																
		1812C4																
		1818C4																
	CLU058	1825C4																
		3618C4																
	CLU550	3626C1																
	CLU551	3626C4																
	CLU701	0303C4																
		0304C4																
		1002C4																
	CLU711	1204C4																
	CLU721	1206C4																
	CLU731	1210C4																
	CL-L104	3W																
		6W																
SMD	PSL440																	
	PSL445																	
	CLL620																	
	CLL130																	
	CLL630																	
Module	LMAW-001																	
	LMAW-002																	
	LMAW-003																	
	LMAW-004																	
	LMAC-001																	
	LMZ001																	
	LMZ002																	

Note COB (chip on board) , SMD (surface mounted device)
Note Blue Color frames mean available products.

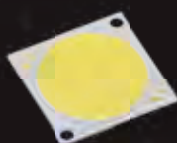


High efficacy
and
High Power

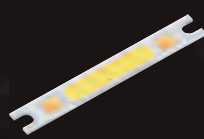
High efficacy and high
power LED solutions
make a great contribu-
tion to the high perfor-
mance luminaires and
luminaire design flex-
ibility.



Ver.6 COB



CLU550



CL-L104



PSL445



Compact SMD

Ver.6 COB

A wide variety of colors are available.
They can be used for a wide range of applications from outdoor to indoor.



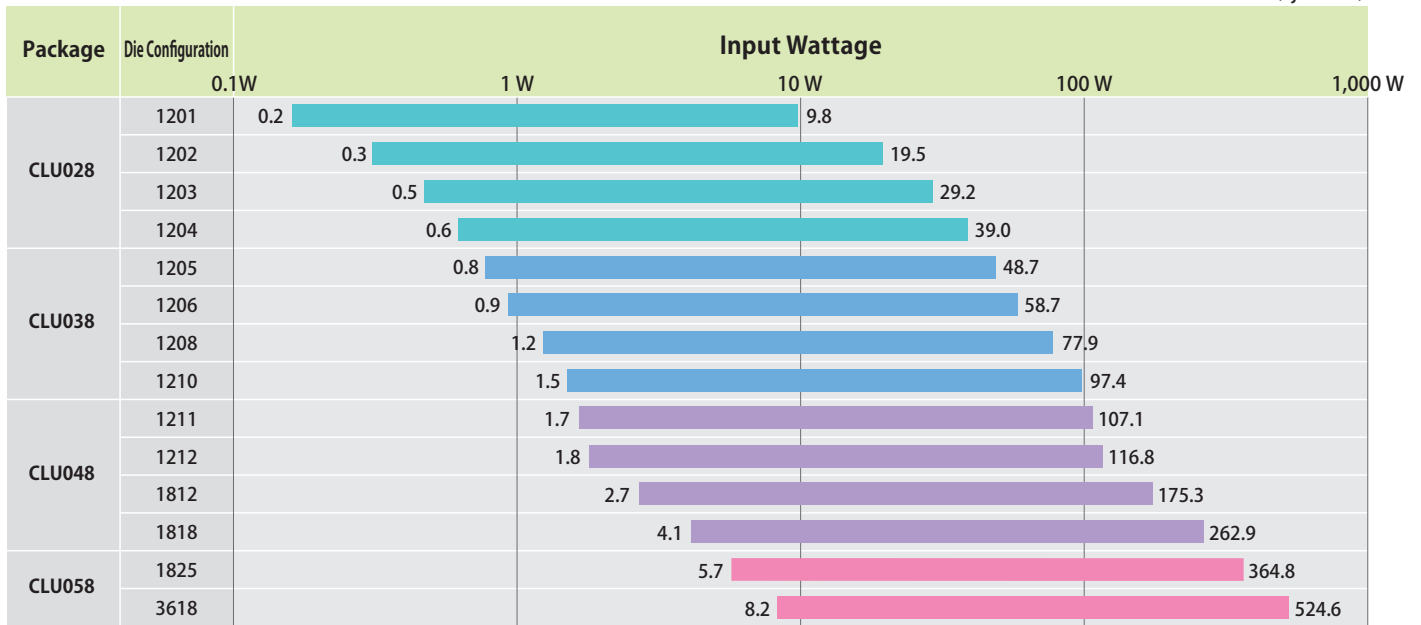
Ver.6 COB characteristics is greatly improved from Ver.5.

Ver.5	Ver.6
Efficacy	6.3% Up
CLU038-1208C4-303H5K2 119 lm/W	CLU038-1208C4-303H5M3-F1 126 lm/W
Thermal resistance	5.0% Down
CLU038-1210C4 0.42°C/W	CLU038-1210C4 0.40°C/W
Max. allowable case temperature	15°C Up
Max 105°C	Max 120°C
Max. allowable junction temperature	10°C Up
Max 140°C	Max 150°C

Note The increase rate depends on CCT and CRI (min 2%/ max 7%).

Wattage Range

(T_j = 85°C)

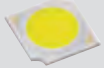


Color Variation

Package	Die Configuration	70 CRI Min. (ANSI 7-step quadrangle)			80 CRI Min. (3-step MacAdam ellipse)							90 CRI Min. (3-step MacAdam ellipse)				
		3,000K	4,000K	5,000K	2,700K	3,000K	3,500K	4,000K	5,000K	5,700K	6,500K	2,700K	3,000K	3,500K	4,000K	5,700K
CLU028	1201	●	●	●	●	●	●	●	●		●	●	●	●	●	
	1202	●	●	●	●	●	●	●	●		●	●	●	●	●	
	1203	●	●	●	●	●	●	●	●		●	●	●	●	●	
	1204	●	●	●	●	●	●	●	●		●	●	●	●	●	
CLU038	1205	●	●	●	●	●	●	●	●		●	●	●	●	●	
	1206	●	●	●	●	●	●	●	●		●	●	●	●	●	
	1208	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	1210	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
CLU048	1211	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	1212	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	1812	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	1818	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
CLU058	1825	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	3618	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Product List

(Tj = 85°C)

Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating	
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance Rj-c (°C/W)	Forward current (mA)	
 CLU028 (LES φ9.8mm)	CLU028-1201C4-30AL7M4-F1	70 Min.	3,000K	90	34.0	3.1	495	162	2.6	230	
	CLU028-1201C4-40AL7M4-F1	70 Min.	4,000K	90	34.0	3.1	509	166	2.6	230	
	CLU028-1201C4-50AL7M4-F1	70 Min.	5,000K	90	34.0	3.1	516	169	2.6	230	
	CLU028-1201C4-273M2M2-F1	80 Min.	2,700K	90	34.0	3.1	449	147	2.6	230	
	CLU028-1201C4-303M2M2-F1	80 Min.	3,000K	90	34.0	3.1	468	153	2.6	230	
	CLU028-1201C4-353M2M2-F1	80 Min.	3,500K	90	34.0	3.1	476	156	2.6	230	
	CLU028-1201C4-403M2M2-F1	80 Min.	4,000K	90	34.0	3.1	480	157	2.6	230	
	CLU028-1201C4-503M2M2-F1	80 Min.	5,000K	90	34.0	3.1	487	159	2.6	230	
	CLU028-1201C4-653M2M2-F1	80 Min.	6,500K	90	34.0	3.1	496	162	2.6	230	
	CLU028-1201C4-273H5M3-F1	90 Min.	2,700K	90	34.0	3.1	385	126	2.6	230	
	CLU028-1201C4-303H5M3-F1	90 Min.	3,000K	90	34.0	3.1	401	131	2.6	230	
	CLU028-1201C4-353H5M3-F1	90 Min.	3,500K	90	34.0	3.1	407	133	2.6	230	
	CLU028-1201C4-403H5M3-F1	90 Min.	4,000K	90	34.0	3.1	407	133	2.6	230	
	CLU028-1202C4-30AL7M4-F1	70 Min.	3,000K	180	34.0	6.1	979	160	1.5	460	
	CLU028-1202C4-40AL7M4-F1	70 Min.	4,000K	180	34.0	6.1	1,007	165	1.5	460	
	CLU028-1202C4-50AL7M4-F1	70 Min.	5,000K	180	34.0	6.1	1,017	166	1.5	460	
	CLU028-1202C4-273M2M2-F1	80 Min.	2,700K	180	34.0	6.1	886	145	1.5	460	
	CLU028-1202C4-303M2M2-F1	80 Min.	3,000K	180	34.0	6.1	924	151	1.5	460	
	CLU028-1202C4-353M2M2-F1	80 Min.	3,500K	180	34.0	6.1	941	154	1.5	460	
	CLU028-1202C4-403M2M2-F1	80 Min.	4,000K	180	34.0	6.1	948	155	1.5	460	
	CLU028-1202C4-503M2M2-F1	80 Min.	5,000K	180	34.0	6.1	960	157	1.5	460	
	CLU028-1202C4-653M2M2-F1	80 Min.	6,500K	180	34.0	6.1	978	160	1.5	460	
	CLU028-1202C4-273H5M3-F1	90 Min.	2,700K	180	34.0	6.1	762	125	1.5	460	
	CLU028-1202C4-303H5M3-F1	90 Min.	3,000K	180	34.0	6.1	791	129	1.5	460	
	CLU028-1202C4-353H5M3-F1	90 Min.	3,500K	180	34.0	6.1	803	131	1.5	460	
	CLU028-1202C4-403H5M3-F1	90 Min.	4,000K	180	34.0	6.1	805	132	1.5	460	
	CLU028-1203C4-30AL7M4-F1	70 Min.	3,000K	270	34.0	9.2	1,442	157	1.0	690	
	CLU028-1203C4-40AL7M4-F1	70 Min.	4,000K	270	34.0	9.2	1,483	162	1.0	690	
	CLU028-1203C4-50AL7M4-F1	70 Min.	5,000K	270	34.0	9.2	1,498	163	1.0	690	
	CLU028-1203C4-273M2M2-F1	80 Min.	2,700K	270	34.0	9.2	1,306	142	1.0	690	
	CLU028-1203C4-303M2M2-F1	80 Min.	3,000K	270	34.0	9.2	1,362	148	1.0	690	
	CLU028-1203C4-353M2M2-F1	80 Min.	3,500K	270	34.0	9.2	1,384	151	1.0	690	
	CLU028-1203C4-403M2M2-F1	80 Min.	4,000K	270	34.0	9.2	1,397	152	1.0	690	
	CLU028-1203C4-503M2M2-F1	80 Min.	5,000K	270	34.0	9.2	1,414	154	1.0	690	
	CLU028-1203C4-653M2M2-F1	80 Min.	6,500K	270	34.0	9.2	1,439	157	1.0	690	
	CLU028-1203C4-273H5M3-F1	90 Min.	2,700K	270	34.0	9.2	1,122	122	1.0	690	
	CLU028-1203C4-303H5M3-F1	90 Min.	3,000K	270	34.0	9.2	1,167	127	1.0	690	
	CLU028-1203C4-353H5M3-F1	90 Min.	3,500K	270	34.0	9.2	1,182	129	1.0	690	
	CLU028-1203C4-403H5M3-F1	90 Min.	4,000K	270	34.0	9.2	1,185	129	1.0	690	
	CLU028-1204C4-30AL7M4-F1	70 Min.	3,000K	360	34.0	12.2	1,888	154	0.86	920	
	CLU028-1204C4-40AL7M4-F1	70 Min.	4,000K	360	34.0	12.2	1,941	159	0.86	920	
	CLU028-1204C4-50AL7M4-F1	70 Min.	5,000K	360	34.0	12.2	1,960	160	0.86	920	
	CLU028-1204C4-273M2M2-F1	80 Min.	2,700K	360	34.0	12.2	1,709	140	0.86	920	
	CLU028-1204C4-303M2M2-F1	80 Min.	3,000K	360	34.0	12.2	1,783	146	0.86	920	
	CLU028-1204C4-353M2M2-F1	80 Min.	3,500K	360	34.0	12.2	1,814	148	0.86	920	
	CLU028-1204C4-403M2M2-F1	80 Min.	4,000K	360	34.0	12.2	1,830	150	0.86	920	

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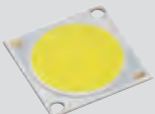
(T_j = 85°C)

Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)	Forward current (mA)
 CLU028 (LES φ9.8mm)	CLU028-1204C4-503M2M2-F1	80 Min.	5,000K	360	34.0	12.2	1,850	151	0.86	920
	CLU028-1204C4-653M2M2-F1	80 Min.	6,500K	360	34.0	12.2	1,884	154	0.86	920
	CLU028-1204C4-273H5M3-F1	90 Min.	2,700K	360	34.0	12.2	1,468	120	0.86	920
	CLU028-1204C4-303H5M3-F1	90 Min.	3,000K	360	34.0	12.2	1,528	125	0.86	920
	CLU028-1204C4-353H5M3-F1	90 Min.	3,500K	360	34.0	12.2	1,549	127	0.86	920
	CLU028-1204C4-403H5M3-F1	90 Min.	4,000K	360	34.0	12.2	1,552	127	0.86	920

 CLU038 (LES φ14.5mm)	CLU038-1205C4-30AL7M4-F1	70 Min.	3,000K	450	34.0	15.3	2,463	161	0.68	1,150
	CLU038-1205C4-40AL7M4-F1	70 Min.	4,000K	450	34.0	15.3	2,531	165	0.68	1,150
	CLU038-1205C4-50AL7M4-F1	70 Min.	5,000K	450	34.0	15.3	2,557	167	0.68	1,150
	CLU038-1205C4-273M2M2-F1	80 Min.	2,700K	450	34.0	15.3	2,231	146	0.68	1,150
	CLU038-1205C4-303M2M2-F1	80 Min.	3,000K	450	34.0	15.3	2,326	152	0.68	1,150
	CLU038-1205C4-353M2M2-F1	80 Min.	3,500K	450	34.0	15.3	2,366	155	0.68	1,150
	CLU038-1205C4-403M2M2-F1	80 Min.	4,000K	450	34.0	15.3	2,385	156	0.68	1,150
	CLU038-1205C4-503M2M2-F1	80 Min.	5,000K	450	34.0	15.3	2,414	158	0.68	1,150
	CLU038-1205C4-653M2M2-F1	80 Min.	6,500K	450	34.0	15.3	2,458	161	0.68	1,150
	CLU038-1205C4-273H5M3-F1	90 Min.	2,700K	450	34.0	15.3	1,916	125	0.68	1,150
	CLU038-1205C4-303H5M3-F1	90 Min.	3,000K	450	34.0	15.3	1,992	130	0.68	1,150
	CLU038-1205C4-353H5M3-F1	90 Min.	3,500K	450	34.0	15.3	2,020	132	0.68	1,150
	CLU038-1205C4-403H5M3-F1	90 Min.	4,000K	450	34.0	15.3	2,023	132	0.68	1,150
	CLU038-1206C4-30AL7M4-F1	70 Min.	3,000K	540	34.0	18.4	2,925	159	0.61	1,380
	CLU038-1206C4-40AL7M4-F1	70 Min.	4,000K	540	34.0	18.4	3,006	164	0.61	1,380
	CLU038-1206C4-50AL7M4-F1	70 Min.	5,000K	540	34.0	18.4	3,038	165	0.61	1,380
	CLU038-1206C4-273M2M2-F1	80 Min.	2,700K	540	34.0	18.4	2,651	144	0.61	1,380
	CLU038-1206C4-303M2M2-F1	80 Min.	3,000K	540	34.0	18.4	2,762	150	0.61	1,380
	CLU038-1206C4-353M2M2-F1	80 Min.	3,500K	540	34.0	18.4	2,811	153	0.61	1,380
	CLU038-1206C4-403M2M2-F1	80 Min.	4,000K	540	34.0	18.4	2,834	154	0.61	1,380
	CLU038-1206C4-503M2M2-F1	80 Min.	5,000K	540	34.0	18.4	2,867	156	0.61	1,380
	CLU038-1206C4-653M2M2-F1	80 Min.	6,500K	540	34.0	18.4	2,919	159	0.61	1,380
	CLU038-1206C4-273H5M3-F1	90 Min.	2,700K	540	34.0	18.4	2,276	124	0.61	1,380
	CLU038-1206C4-303H5M3-F1	90 Min.	3,000K	540	34.0	18.4	2,366	129	0.61	1,380
	CLU038-1206C4-353H5M3-F1	90 Min.	3,500K	540	34.0	18.4	2,401	131	0.61	1,380
	CLU038-1206C4-403H5M3-F1	90 Min.	4,000K	540	34.0	18.4	2,402	131	0.61	1,380
	CLU038-1208C4-30AL7M4-F1	70 Min.	3,000K	720	34.0	24.5	3,825	156	0.48	1,840
	CLU038-1208C4-40AL7M4-F1	70 Min.	4,000K	720	34.0	24.5	3,932	161	0.48	1,840
	CLU038-1208C4-50AL7M4-F1	70 Min.	5,000K	720	34.0	24.5	3,972	162	0.48	1,840
	CLU038-1208C4-273M2M2-F1	80 Min.	2,700K	720	34.0	24.5	3,465	142	0.48	1,840
	CLU038-1208C4-303M2M2-F1	80 Min.	3,000K	720	34.0	24.5	3,612	148	0.48	1,840
	CLU038-1208C4-353M2M2-F1	80 Min.	3,500K	720	34.0	24.5	3,676	150	0.48	1,840
	CLU038-1208C4-403M2M2-F1	80 Min.	4,000K	720	34.0	24.5	3,706	151	0.48	1,840
	CLU038-1208C4-503M2M2-F1	80 Min.	5,000K	720	34.0	24.5	3,749	153	0.48	1,840
	CLU038-1208C4-573M2M2-F1	80 Min.	5,700K	720	34.0	24.5	3,786	155	0.48	1,840
	CLU038-1208C4-653M2M2-F1	80 Min.	6,500K	720	34.0	24.5	3,817	156	0.48	1,840
	CLU038-1208C4-273H5M3-F1	90 Min.	2,700K	720	34.0	24.5	2,976	122	0.48	1,840
	CLU038-1208C4-303H5M3-F1	90 Min.	3,000K	720	34.0	24.5	3,095	126	0.48	1,840
	CLU038-1208C4-353H5M3-F1	90 Min.	3,500K	720	34.0	24.5	3,140	128	0.48	1,840

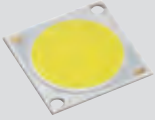
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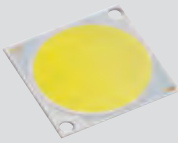
Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating	
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)	Forward current (mA)	
 CLU038 (LES ϕ 14.5mm)	CLU038-1208C4-403H5M3-F1	90 Min.	4,000K	720	34.0	24.5	3,142	128	0.48	1,840	
	CLU038-1208C4-573H5M3-F1	90 Min.	5,700K	720	34.0	24.5	3,250	133	0.48	1,840	
	CLU038-1210C4-30AL7M4-F1	70 Min.	3,000K	900	34.0	30.6	4,752	155	0.40	2,300	
	CLU038-1210C4-40AL7M4-F1	70 Min.	4,000K	900	34.0	30.6	4,884	160	0.40	2,300	
	CLU038-1210C4-50AL7M4-F1	70 Min.	5,000K	900	34.0	30.6	4,933	161	0.40	2,300	
	CLU038-1210C4-273M2M2-F1	80 Min.	2,700K	900	34.0	30.6	4,296	140	0.40	2,300	
	CLU038-1210C4-303M2M2-F1	80 Min.	3,000K	900	34.0	30.6	4,487	147	0.40	2,300	
	CLU038-1210C4-353M2M2-F1	80 Min.	3,500K	900	34.0	30.6	4,564	149	0.40	2,300	
	CLU038-1210C4-403M2M2-F1	80 Min.	4,000K	900	34.0	30.6	4,602	150	0.40	2,300	
	CLU038-1210C4-503M2M2-F1	80 Min.	5,000K	900	34.0	30.6	4,656	152	0.40	2,300	
	CLU038-1210C4-573M2M2-F1	80 Min.	5,700K	900	34.0	30.6	4,703	154	0.40	2,300	
	CLU038-1210C4-653M2M2-F1	80 Min.	6,500K	900	34.0	30.6	4,741	155	0.40	2,300	
	CLU038-1210C4-273H5M3-F1	90 Min.	2,700K	900	34.0	30.6	3,689	121	0.40	2,300	
	CLU038-1210C4-303H5M3-F1	90 Min.	3,000K	900	34.0	30.6	3,844	126	0.40	2,300	
	CLU038-1210C4-353H5M3-F1	90 Min.	3,500K	900	34.0	30.6	3,896	127	0.40	2,300	
	CLU038-1210C4-403H5M3-F1	90 Min.	4,000K	900	34.0	30.6	3,903	128	0.40	2,300	
	CLU038-1210C4-573H5M3-F1	90 Min.	5,700K	900	34.0	30.6	4,036	132	0.40	2,300	

 CLU048 (LES ϕ 22.0mm)	CLU048-1211C4-30AL7M4-F1	70 Min.	3,000K	990	34.0	33.7	5,440	162	0.36	2,530	
	CLU048-1211C4-40AL7M4-F1	70 Min.	4,000K	990	34.0	33.7	5,590	166	0.36	2,530	
	CLU048-1211C4-50AL7M4-F1	70 Min.	5,000K	990	34.0	33.7	5,648	168	0.36	2,530	
	CLU048-1211C4-273M2M2-F1	80 Min.	2,700K	990	34.0	33.7	4,926	146	0.36	2,530	
	CLU048-1211C4-303M2M2-F1	80 Min.	3,000K	990	34.0	33.7	5,137	153	0.36	2,530	
	CLU048-1211C4-353M2M2-F1	80 Min.	3,500K	990	34.0	33.7	5,227	155	0.36	2,530	
	CLU048-1211C4-403M2M2-F1	80 Min.	4,000K	990	34.0	33.7	5,269	157	0.36	2,530	
	CLU048-1211C4-503M2M2-F1	80 Min.	5,000K	990	34.0	33.7	5,330	158	0.36	2,530	
	CLU048-1211C4-573M2M2-F1	80 Min.	5,700K	990	34.0	33.7	5,384	160	0.36	2,530	
	CLU048-1211C4-653M2M2-F1	80 Min.	6,500K	990	34.0	33.7	5,427	161	0.36	2,530	
	CLU048-1211C4-273H5M3-F1	90 Min.	2,700K	990	34.0	33.7	4,231	126	0.36	2,530	
	CLU048-1211C4-303H5M3-F1	90 Min.	3,000K	990	34.0	33.7	4,400	131	0.36	2,530	
	CLU048-1211C4-353H5M3-F1	90 Min.	3,500K	990	34.0	33.7	4,463	133	0.36	2,530	
	CLU048-1211C4-403H5M3-F1	90 Min.	4,000K	990	34.0	33.7	4,468	133	0.36	2,530	
	CLU048-1211C4-573H5M3-F1	90 Min.	5,700K	990	34.0	33.7	4,621	137	0.36	2,530	
	CLU048-1212C4-30AL7M4-F1	70 Min.	3,000K	1,080	34.0	36.7	5,935	162	0.32	2,760	
	CLU048-1212C4-40AL7M4-F1	70 Min.	4,000K	1,080	34.0	36.7	6,099	166	0.32	2,760	
	CLU048-1212C4-50AL7M4-F1	70 Min.	5,000K	1,080	34.0	36.7	6,161	168	0.32	2,760	
	CLU048-1212C4-273M2M2-F1	80 Min.	2,700K	1,080	34.0	36.7	5,374	146	0.32	2,760	
	CLU048-1212C4-303M2M2-F1	80 Min.	3,000K	1,080	34.0	36.7	5,603	153	0.32	2,760	
	CLU048-1212C4-353M2M2-F1	80 Min.	3,500K	1,080	34.0	36.7	5,702	155	0.32	2,760	
	CLU048-1212C4-403M2M2-F1	80 Min.	4,000K	1,080	34.0	36.7	5,748	157	0.32	2,760	
	CLU048-1212C4-503M2M2-F1	80 Min.	5,000K	1,080	34.0	36.7	5,815	158	0.32	2,760	
	CLU048-1212C4-573M2M2-F1	80 Min.	5,700K	1,080	34.0	36.7	5,873	160	0.32	2,760	
	CLU048-1212C4-653M2M2-F1	80 Min.	6,500K	1,080	34.0	36.7	5,920	161	0.32	2,760	
	CLU048-1212C4-273H5M3-F1	90 Min.	2,700K	1,080	34.0	36.7	4,615	126	0.32	2,760	
	CLU048-1212C4-303H5M3-F1	90 Min.	3,000K	1,080	34.0	36.7	4,800	131	0.32	2,760	
	CLU048-1212C4-353H5M3-F1	90 Min.	3,500K	1,080	34.0	36.7	4,869	133	0.32	2,760	

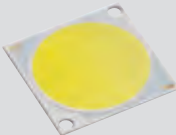
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(T_j = 85°C)

Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating	
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)	Forward current (mA)	
 CLU048 (LES ϕ 22.0mm)	CLU048-1212C4-403H5M3-F1	90 Min.	4,000K	1,080	34.0	36.7	4,873	133	0.32	2,760	
	CLU048-1212C4-573H5M3-F1	90 Min.	5,700K	1,080	34.0	36.7	5,041	137	0.32	2,760	
	CLU048-1812C4-30AL7M4-F1	70 Min.	3,000K	1,080	51.1	55.2	8,687	157	0.24	2,760	
	CLU048-1812C4-40AL7M4-F1	70 Min.	4,000K	1,080	51.1	55.2	8,927	162	0.24	2,760	
	CLU048-1812C4-50AL7M4-F1	70 Min.	5,000K	1,080	51.1	55.2	9,017	163	0.24	2,760	
	CLU048-1812C4-273M2M2-F1	80 Min.	2,700K	1,080	51.1	55.2	7,864	142	0.24	2,760	
	CLU048-1812C4-303M2M2-F1	80 Min.	3,000K	1,080	51.1	55.2	8,201	149	0.24	2,760	
	CLU048-1812C4-353M2M2-F1	80 Min.	3,500K	1,080	51.1	55.2	8,340	151	0.24	2,760	
	CLU048-1812C4-403M2M2-F1	80 Min.	4,000K	1,080	51.1	55.2	8,412	152	0.24	2,760	
	CLU048-1812C4-503M2M2-F1	80 Min.	5,000K	1,080	51.1	55.2	8,511	154	0.24	2,760	
	CLU048-1812C4-573M2M2-F1	80 Min.	5,700K	1,080	51.1	55.2	8,596	156	0.24	2,760	
	CLU048-1812C4-653M2M2-F1	80 Min.	6,500K	1,080	51.1	55.2	8,664	157	0.24	2,760	
	CLU048-1812C4-273H5M3-F1	90 Min.	2,700K	1,080	51.1	55.2	6,753	122	0.24	2,760	
	CLU048-1812C4-303H5M3-F1	90 Min.	3,000K	1,080	51.1	55.2	7,026	127	0.24	2,760	
	CLU048-1812C4-353H5M3-F1	90 Min.	3,500K	1,080	51.1	55.2	7,121	129	0.24	2,760	
	CLU048-1812C4-403H5M3-F1	90 Min.	4,000K	1,080	51.1	55.2	7,133	129	0.24	2,760	
	CLU048-1812C4-573H5M3-F1	90 Min.	5,700K	1,080	51.1	55.2	7,380	134	0.24	2,760	
	CLU048-1818C4-30AL7M4-F1	70 Min.	3,000K	1,620	51.1	82.8	12,677	153	0.16	4,140	
	CLU048-1818C4-40AL7M4-F1	70 Min.	4,000K	1,620	51.1	82.8	13,029	157	0.16	4,140	
	CLU048-1818C4-50AL7M4-F1	70 Min.	5,000K	1,620	51.1	82.8	13,162	159	0.16	4,140	
	CLU048-1818C4-273M2M2-F1	80 Min.	2,700K	1,620	51.1	82.8	11,480	139	0.16	4,140	
	CLU048-1818C4-303M2M2-F1	80 Min.	3,000K	1,620	51.1	82.8	11,970	145	0.16	4,140	
	CLU048-1818C4-353M2M2-F1	80 Min.	3,500K	1,620	51.1	82.8	12,181	147	0.16	4,140	
	CLU048-1818C4-403M2M2-F1	80 Min.	4,000K	1,620	51.1	82.8	12,279	148	0.16	4,140	
	CLU048-1818C4-503M2M2-F1	80 Min.	5,000K	1,620	51.1	82.8	12,423	150	0.16	4,140	
	CLU048-1818C4-573M2M2-F1	80 Min.	5,700K	1,620	51.1	82.8	12,547	152	0.16	4,140	
	CLU048-1818C4-653M2M2-F1	80 Min.	6,500K	1,620	51.1	82.8	12,648	153	0.16	4,140	
	CLU048-1818C4-273H5M3-F1	90 Min.	2,700K	1,620	51.1	82.8	9,860	119	0.16	4,140	
	CLU048-1818C4-303H5M3-F1	90 Min.	3,000K	1,620	51.1	82.8	10,256	124	0.16	4,140	
	CLU048-1818C4-353H5M3-F1	90 Min.	3,500K	1,620	51.1	82.8	10,403	126	0.16	4,140	
	CLU048-1818C4-403H5M3-F1	90 Min.	4,000K	1,620	51.1	82.8	10,411	126	0.16	4,140	
	CLU048-1818C4-573H5M3-F1	90 Min.	5,700K	1,620	51.1	82.8	10,771	130	0.16	4,140	

 CLU058 (LES ϕ 32.8mm)	CLU058-1825C4-30AL7M4-F1	70 Min.	3,000K	2,250	51.1	115.0	18,565	161	0.13	5,750	
	CLU058-1825C4-40AL7M4-F1	70 Min.	4,000K	2,250	51.1	115.0	19,080	166	0.13	5,750	
	CLU058-1825C4-50AL7M4-F1	70 Min.	5,000K	2,250	51.1	115.0	19,274	168	0.13	5,750	
	CLU058-1825C4-273M2M2-F1	80 Min.	2,700K	2,250	51.1	115.0	16,811	146	0.13	5,750	
	CLU058-1825C4-303M2M2-F1	80 Min.	3,000K	2,250	51.1	115.0	17,528	152	0.13	5,750	
	CLU058-1825C4-353M2M2-F1	80 Min.	3,500K	2,250	51.1	115.0	17,836	155	0.13	5,750	
	CLU058-1825C4-403M2M2-F1	80 Min.	4,000K	2,250	51.1	115.0	17,980	156	0.13	5,750	
	CLU058-1825C4-503M2M2-F1	80 Min.	5,000K	2,250	51.1	115.0	18,191	158	0.13	5,750	
	CLU058-1825C4-573M2M2-F1	80 Min.	5,700K	2,250	51.1	115.0	18,373	160	0.13	5,750	
	CLU058-1825C4-653M2M2-F1	80 Min.	6,500K	2,250	51.1	115.0	18,520	161	0.13	5,750	
	CLU058-1825C4-273H5M3-F1	90 Min.	2,700K	2,250	51.1	115.0	14,437	126	0.13	5,750	
	CLU058-1825C4-303H5M3-F1	90 Min.	3,000K	2,250	51.1	115.0	15,018	131	0.13	5,750	
	CLU058-1825C4-353H5M3-F1	90 Min.	3,500K	2,250	51.1	115.0	15,233	132	0.13	5,750	

(T_j = 85°C)

Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)	
 CLU058 (LES φ32.8mm)	CLU058-1825C4-403H5M3-F1	90 Min.	4,000K	2,250	51.1	115.0	15,247	133	0.13	5,750
	CLU058-1825C4-573H5M3-F1	90 Min.	5,700K	2,250	51.1	115.0	15,773	137	0.13	5,750
	CLU058-3618C4-30AL7M4-F1	70 Min.	3,000K	1,620	102.1	165.4	25,566	155	0.095	4,140
	CLU058-3618C4-40AL7M4-F1	70 Min.	4,000K	1,620	102.1	165.4	26,278	159	0.095	4,140
	CLU058-3618C4-50AL7M4-F1	70 Min.	5,000K	1,620	102.1	165.4	26,615	161	0.095	4,140
	CLU058-3618C4-273M2M2-F1	80 Min.	2,700K	1,620	102.1	165.4	23,110	140	0.095	4,140
	CLU058-3618C4-303M2M2-F1	80 Min.	3,000K	1,620	102.1	165.4	24,137	146	0.095	4,140
	CLU058-3618C4-353M2M2-F1	80 Min.	3,500K	1,620	102.1	165.4	24,562	148	0.095	4,140
	CLU058-3618C4-403M2M2-F1	80 Min.	4,000K	1,620	102.1	165.4	24,764	150	0.095	4,140
	CLU058-3618C4-503M2M2-F1	80 Min.	5,000K	1,620	102.1	165.4	25,120	152	0.095	4,140
	CLU058-3618C4-573M2M2-F1	80 Min.	5,700K	1,620	102.1	165.4	25,371	153	0.095	4,140
	CLU058-3618C4-653M2M2-F1	80 Min.	6,500K	1,620	102.1	165.4	25,573	155	0.095	4,140
	CLU058-3618C4-273H5M3-F1	90 Min.	2,700K	1,620	102.1	165.4	19,847	120	0.095	4,140
	CLU058-3618C4-303H5M3-F1	90 Min.	3,000K	1,620	102.1	165.4	20,681	125	0.095	4,140
	CLU058-3618C4-353H5M3-F1	90 Min.	3,500K	1,620	102.1	165.4	20,975	127	0.095	4,140
	CLU058-3618C4-403H5M3-F1	90 Min.	4,000K	1,620	102.1	165.4	20,998	127	0.095	4,140
	CLU058-3618C4-573H5M3-F1	90 Min.	5,700K	1,620	102.1	165.4	21,725	131	0.095	4,140

Note Product code and specifications in this catalog are subject to change without notice for the purpose of improvement, or manufacturing may be discontinued. Please contact our sales team in terms of release date and latest specifications for each product.

CLU550

500W COB Package



Color Variation

Package	Die Configuration	70 CRI Min. (ANSI 7-step quadrangle)				80 CRI Min. (3-step MacAdam ellipse)							90 CRI Min. (3-step MacAdam ellipse)
		3,000K	4,000K	5,000K	6,500K	2,700K	3,000K	3,500K	4,000K	5,000K	5,700K	6,500K	5,700K
CLU550	3626 (3613×2)	●	●	●	●	●	●	●	●	●	●	●	●

Product List

(T_j = 85°C)

Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating	
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)	Forward current (mA)	
 CLU550 (LES φ32.8mm)	CLU550-3626C1-30AL7G4-B24	70 Min.	3,000K	2,340	103.9	243.1	33,900	139	0.10	4,680	
	CLU550-3626C1-40AL7G4-B24	70 Min.	4,000K	2,340	103.9	243.1	35,500	146	0.10	4,680	
	CLU550-3626C1-50AL7G4-B24	70 Min.	5,000K	2,340	103.9	243.1	36,000	148	0.10	4,680	
	CLU550-3626C1-65AL7G4-B24	70 Min.	6,500K	2,340	103.9	243.1	36,650	151	0.10	4,680	
	CLU550-3626C1-273M2G2-B24	80 Min.	2,700K	2,340	103.9	243.1	30,250	124	0.10	4,680	
	CLU550-3626C1-303M2G2-B24	80 Min.	3,000K	2,340	103.9	243.1	31,700	130	0.10	4,680	
	CLU550-3626C1-353M2G2-B24	80 Min.	3,500K	2,340	103.9	243.1	32,500	134	0.10	4,680	
	CLU550-3626C1-403M2G2-B24	80 Min.	4,000K	2,340	103.9	243.1	33,150	136	0.10	4,680	
	CLU550-3626C1-503M2G2-B24	80 Min.	5,000K	2,340	103.9	243.1	33,800	139	0.10	4,680	
	CLU550-3626C1-573M2G2-B24	80 Min.	5,700K	2,340	103.9	243.1	34,100	140	0.10	4,680	
	CLU550-3626C1-653M2G2-B24	80 Min.	6,500K	2,340	103.9	243.1	34,400	141	0.10	4,680	
	CLU550-3626C1-573H5G3-B24	90 Min.	5,700K	2,340	103.9	243.1	28,730	118	0.10	4,680	

Note Product code and specifications in this catalog are subject to change without notice for the purpose of improvement, or manufacturing may be discontinued. Please contact our sales team in terms of release date and latest specifications for each product.

CL-L104

The successor of the first COB LED in the market.



CL-L104

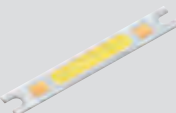
Color Variation

Package	Wattage	65 CRI Typ. (Original range)	80 CRI Min. (3-step MacAdam ellipse)					90 CRI Min. (3-step MacAdam ellipse)				
		5,000K	2,700K	3,000K	3,500K	4,000K	5,000K	2,700K	3,000K	3,500K	4,000K	5,000K
CL-L104	3W	●	●	●	●	●	●	●	●	●	●	●
	6W	●	●	●	●	●	●	●	●	●	●	●

Product List

(T_c = 25°C)

Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)	Forward current (mA)
 CL-L104 (3W)	CL-L104-C3N-F5	65 Typ.	5,000K	350	9.2	3.2	385	120	6.4	720
	CL-L104-MC3L2-F5	80 Min.	2,700K	350	9.2	3.2	295	92	6.4	720
	CL-L104-MC3L1-F5	80 Min.	3,000K	350	9.2	3.2	305	95	6.4	720
	CL-L104-MC3WW1-F5	80 Min.	3,500K	350	9.2	3.2	315	98	6.4	720
	CL-L104-MC3W1-F5	80 Min.	4,000K	350	9.2	3.2	320	99	6.4	720
	CL-L104-MC3N1-F5	80 Min.	5,000K	350	9.2	3.2	325	101	6.4	720
	CL-L104-HC3L2-F5	90 Min.	2,700K	350	9.2	3.2	250	78	6.4	720
	CL-L104-HC3L1-F5	90 Min.	3,000K	350	9.2	3.2	260	81	6.4	720
	CL-L104-HC3WW1-F5	90 Min.	3,500K	350	9.2	3.2	265	82	6.4	720
	CL-L104-HC3W1-F5	90 Min.	4,000K	350	9.2	3.2	275	85	6.4	720
	CL-L104-HC3N1-F5	90 Min.	5,000K	350	9.2	3.2	280	87	6.4	720

 CL-L104 (6W)	CL-L104-C6N-F5	65 Typ.	5,000K	700	9.2	6.4	760	118	5.0	1,440
	CL-L104-MC6L2-F5	80 Min.	2,700K	700	9.2	6.4	595	92	5.0	1,440
	CL-L104-MC6L1-F5	80 Min.	3,000K	700	9.2	6.4	610	95	5.0	1,440
	CL-L104-MC6WW1-F5	80 Min.	3,500K	700	9.2	6.4	630	98	5.0	1,440
	CL-L104-MC6W1-F5	80 Min.	4,000K	700	9.2	6.4	640	99	5.0	1,440
	CL-L104-MC6N1-F5	80 Min.	5,000K	700	9.2	6.4	650	101	5.0	1,440
	CL-L104-HC6L2-F5	90 Min.	2,700K	700	9.2	6.4	500	78	5.0	1,440
	CL-L104-HC6L1-F5	90 Min.	3,000K	700	9.2	6.4	520	81	5.0	1,440
	CL-L104-HC6WW1-F5	90 Min.	3,500K	700	9.2	6.4	530	82	5.0	1,440
	CL-L104-HC6W1-F5	90 Min.	4,000K	700	9.2	6.4	550	85	5.0	1,440
	CL-L104-HC6N1-F5	90 Min.	5,000K	700	9.2	6.4	565	88	5.0	1,440

Note Product code and specifications in this catalog are subject to change without notice for the purpose of improvement, or manufacturing may be discontinued. Please contact our sales team in terms of release date and latest specifications for each product.

PSL445

High power SMD Package

New lineup of high-power and high-efficacy SMD packages.



PSL445

- Efficacy : 161lm/W at T_j=85°C
- 630 lm output from 6.5mm package
- Application : Spotlight , High-Bay Lighting, Outdoor

Color Variation

Package	70 CRI Min. (ANSI 7-step quadrangle)		80 CRI Min. (3-step MacAdam ellipse)					80 CRI Min. (ANSI 7-step quadrangle)	90 CRI Min. (3-step MacAdam ellipse)					90 CRI Min. (ANSI 7-step quadrangle)
	4,000K	5,000K	2,700K	3,000K	3,500K	4,000K	5,000K	5,700K	2,700K	3,000K	3,500K	4,000K	5,000K	5,700K
PSL445	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Product List

Package	Product code	Electro-optical Characteristics								(T _j = 85°C)	
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)	Absolute Maximum Rating	Forward current (mA)
 PSL445	PSL445-0405C5-40AL7M4	70 Min.	4,000K	350	11.2	3.9	620	158	2.8	900	
	PSL445-0405C5-50AL7M4	70 Min.	5,000K	350	11.2	3.9	630	161	2.8	900	
	PSL445-0405C5-273M2M2	80 Min.	2,700K	350	11.2	3.9	535	136	2.8	900	
	PSL445-0405C5-303M2M2	80 Min.	3,000K	350	11.2	3.9	545	139	2.8	900	
	PSL445-0405C5-353M2M2	80 Min.	3,500K	350	11.2	3.9	565	144	2.8	900	
	PSL445-0405C5-403M2M2	80 Min.	4,000K	350	11.2	3.9	570	145	2.8	900	
	PSL445-0405C5-503M2M2	80 Min.	5,000K	350	11.2	3.9	575	147	2.8	900	
	PSL445-0405C5-57AM2M2	80 Min.	5,700K	350	11.2	3.9	585	149	2.8	900	
	PSL445-0405C5-273H5M3	90 Min.	2,700K	350	11.2	3.9	430	110	2.8	900	
	PSL445-0405C5-303H5M3	90 Min.	3,000K	350	11.2	3.9	455	116	2.8	900	
	PSL445-0405C5-353H5M3	90 Min.	3,500K	350	11.2	3.9	465	119	2.8	900	
	PSL445-0405C5-403H5M3	90 Min.	4,000K	350	11.2	3.9	495	126	2.8	900	
	PSL445-0405C5-503H5M3	90 Min.	5,000K	350	11.2	3.9	500	128	2.8	900	
	PSL445-0405C5-57AH5M3	90 Min.	5,700K	350	11.2	3.9	510	130	2.8	900	

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Compact SMD



- 3-step MacAdam ellipse with small SMD packages

Color Variation

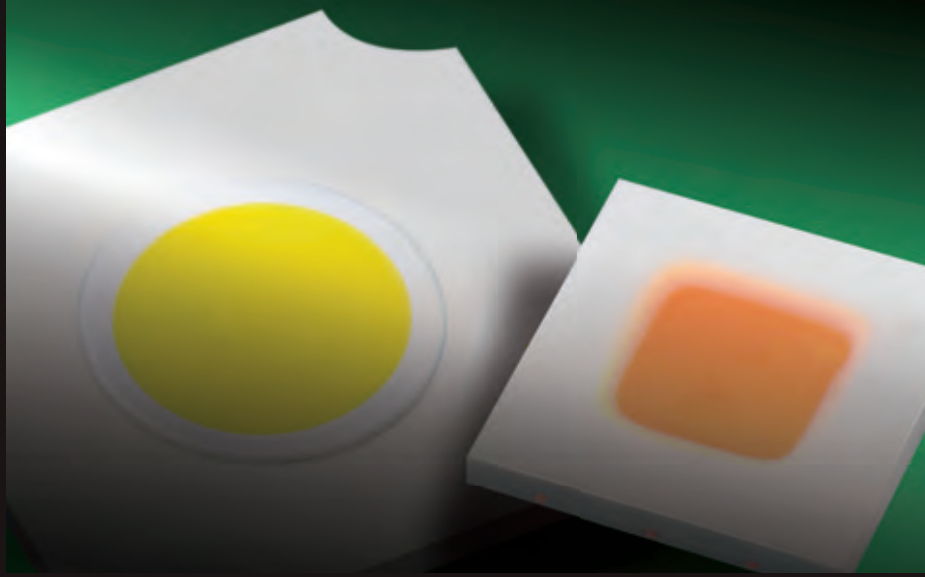
Package	80 CRI Min. (ANSI 7-step quadrangle)					80 CRI Min. (3-step MacAdam ellipse)				80 CRI Min. (Original range)	
	2,700K	3,000K	4,000K	5,000K	6,500K	2,700K	3,000K	3,500K	4,000K	5,000K	6,500K
CLL620				●	●	●	●	●	●		
CLL130				●	●	●	●	●	●		
CLL630	●	●	●							●	●

Product List

(Ts = 25°C)

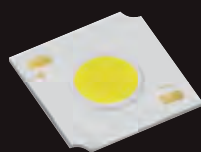
Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating	
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance Rj-c (°C/W)	Forward current (mA)	
 CLL620	CLL620-0101B2-273M1C5	80 Min.	2,700K	80	3.2	0.256	24.9	97.3	90	90	
	CLL620-0101B2-303M1C5	80 Min.	3,000K	80	3.2	0.256	25.5	99.6	90	90	
	CLL620-0101B2-353M1C5	80 Min.	3,500K	80	3.2	0.256	25.9	101.2	90	90	
	CLL620-0101B2-403M1C5	80 Min.	4,000K	80	3.2	0.256	27.0	105.5	90	90	
	CLL620-0101B2-50AM1C5	80 Min.	5,000K	80	3.2	0.256	27.5	107.4	90	90	
	CLL620-0101B2-65AM1C5	80 Min.	6,500K	80	3.2	0.256	26.5	103.5	90	90	
 CLL130	CLL130-0101C1-273M1F2	80 Min.	2,700K	65	2.87	0.187	24.3	130.0	40	85	
	CLL130-0101C1-303M1F2	80 Min.	3,000K	65	2.87	0.187	25.0	134.3	40	85	
	CLL130-0101C1-353M1F2	80 Min.	3,500K	65	2.87	0.187	26.1	140.1	40	85	
	CLL130-0101C1-403M1F2	80 Min.	4,000K	65	2.87	0.187	26.6	142.8	40	85	
	CLL130-0101C1-50AM1J1	80 Min.	5,000K	65	2.87	0.187	29.5	158.1	40	85	
	CLL130-0101C1-65AM1J1	80 Min.	6,500K	65	2.87	0.187	28.3	151.8	40	85	
 CLL630	CLL630-0101B2-27AM1A2	80 Min.	2,700K	60	3.1	0.186	19.1	102.7	120	80	
	CLL630-0101B2-30AM1A2	80 Min.	3,000K	60	3.1	0.186	19.6	105.4	120	80	
	CLL630-0101B2-40AM1A2	80 Min.	4,000K	60	3.1	0.186	20.6	110.8	120	80	
	CLL630-0101B2-50CM1A2	80 Min.	5,000K	60	3.1	0.186	21.0	112.9	120	80	
	CLL630-0101B2-65CM1A2	80 Min.	6,500K	60	3.1	0.186	20.2	108.6	120	80	

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Point Source

Point light source makes light beam control easier with optics and downsize luminaires.



High Intensity COB Ver.2



PSL440

High Intensity COB Ver.2

Small LES and high lumen density COB

- Downsize luminaires
- Application: Spotlight, Lamp



Color Variation

Package	Die Configuration	70 CRI Min. (ANSI 7-step quadrangle)	80 CRI Min. (3-step MacAdam ellipse)					90 CRI Min. (3-step MacAdam ellipse)			
		5,000K	2,700K	3,000K	3,500K	4,000K	5,000K	2,700K	3,000K	3,500K	4,000K
CLU701	0303		●	●	●	●	●	●	●	●	●
	0304		●	●	●	●	●	●	●	●	●
	1002	●	●	●	●	●	●	●	●	●	●
CLU711	1204	●	●	●	●	●	●	●	●	●	●
CLU721	1206	●	●	●	●	●	●	●	●	●	●
CLU731	1210	●	●	●	●	●	●	●	●	●	●

Product List

Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating	
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance Rj-c (°C/W)	Forward current (mA)	
 CLU701 (LES φ6.0mm)	CLU701-0303C4-273M2K1	80 Min.	2,700K	525	9.4	4.9	581	118	3.5	690	
	CLU701-0303C4-303M2K1	80 Min.	3,000K	525	9.4	4.9	607	123	3.5	690	
	CLU701-0303C4-353M2K1	80 Min.	3,500K	525	9.4	4.9	618	125	3.5	690	
	CLU701-0303C4-403M2K1	80 Min.	4,000K	525	9.4	4.9	625	127	3.5	690	
	CLU701-0303C4-503M2K1	80 Min.	5,000K	525	9.4	4.9	636	129	3.5	690	
	CLU701-0303C4-273H5K2	90 Min.	2,700K	525	9.4	4.9	480	97	3.5	690	
	CLU701-0303C4-303H5K2	90 Min.	3,000K	525	9.4	4.9	502	102	3.5	690	
	CLU701-0303C4-353H5K2	90 Min.	3,500K	525	9.4	4.9	511	103	3.5	690	
	CLU701-0303C4-403H5K2	90 Min.	4,000K	525	9.4	4.9	516	105	3.5	690	
	CLU701-0304C4-273M2K1	80 Min.	2,700K	700	9.4	6.6	775	118	2.7	920	
	CLU701-0304C4-303M2K1	80 Min.	3,000K	700	9.4	6.6	809	123	2.7	920	
	CLU701-0304C4-353M2K1	80 Min.	3,500K	700	9.4	6.6	824	125	2.7	920	
	CLU701-0304C4-403M2K1	80 Min.	4,000K	700	9.4	6.6	834	127	2.7	920	
	CLU701-0304C4-503M2K1	80 Min.	5,000K	700	9.4	6.6	848	129	2.7	920	
	CLU701-0304C4-273H5K2	90 Min.	2,700K	700	9.4	6.6	640	97	2.7	920	
	CLU701-0304C4-303H5K2	90 Min.	3,000K	700	9.4	6.6	668	102	2.7	920	
	CLU701-0304C4-353H5K2	90 Min.	3,500K	700	9.4	6.6	680	103	2.7	920	
	CLU701-0304C4-403H5K2	90 Min.	4,000K	700	9.4	6.6	687	104	2.7	920	

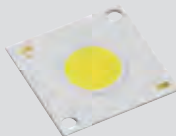
Note Product code and specifications in this catalog are subject to change without notice for the purpose of improvement, or manufacturing may be discontinued. Please contact our sales team in terms of release date and latest specifications for each product.

(T_j = 85°C)

Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)	Forward current (mA)
 CLU701 (LES φ6.0mm)	CLU701-1002C4-50AL7K3	70 Min.	5,000K	350	31.3	11.0	1,372	125	1.6	460
	CLU701-1002C4-273M2K1	80 Min.	2,700K	350	31.3	11.0	1,163	106	1.6	460
	CLU701-1002C4-303M2K1	80 Min.	3,000K	350	31.3	11.0	1,224	112	1.6	460
	CLU701-1002C4-353M2K1	80 Min.	3,500K	350	31.3	11.0	1,257	115	1.6	460
	CLU701-1002C4-403M2K1	80 Min.	4,000K	350	31.3	11.0	1,278	117	1.6	460
	CLU701-1002C4-503M2K1	80 Min.	5,000K	350	31.3	11.0	1,305	119	1.6	460
	CLU701-1002C4-273H5K2	90 Min.	2,700K	350	31.3	11.0	962	88	1.6	460
	CLU701-1002C4-303H5K2	90 Min.	3,000K	350	31.3	11.0	1,011	92	1.6	460
	CLU701-1002C4-353H5K2	90 Min.	3,500K	350	31.3	11.0	1,037	95	1.6	460
	CLU701-1002C4-403H5K2	90 Min.	4,000K	350	31.3	11.0	1,055	96	1.6	460

 CLU711 (LES φ8.5mm)	CLU711-1204C4-50AL7K3	70 Min.	5,000K	700	37.6	26.3	3,398	129	0.91	920
	CLU711-1204C4-273M2K1	80 Min.	2,700K	700	37.6	26.3	2,877	109	0.91	920
	CLU711-1204C4-303M2K1	80 Min.	3,000K	700	37.6	26.3	3,042	116	0.91	920
	CLU711-1204C4-353M2K1	80 Min.	3,500K	700	37.6	26.3	3,107	118	0.91	920
	CLU711-1204C4-403M2K1	80 Min.	4,000K	700	37.6	26.3	3,172	121	0.91	920
	CLU711-1204C4-503M2K1	80 Min.	5,000K	700	37.6	26.3	3,232	123	0.91	920
	CLU711-1204C4-273H5K2	90 Min.	2,700K	700	37.6	26.3	2,378	90	0.91	920
	CLU711-1204C4-303H5K2	90 Min.	3,000K	700	37.6	26.3	2,514	96	0.91	920
	CLU711-1204C4-353H5K2	90 Min.	3,500K	700	37.6	26.3	2,565	97	0.91	920
	CLU711-1204C4-403H5K2	90 Min.	4,000K	700	37.6	26.3	2,619	100	0.91	920

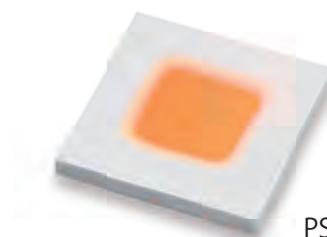
 CLU721 (LES φ11.0mm)	CLU721-1206C4-50AL7K3	70 Min.	5,000K	1,050	37.6	39.5	5,084	129	0.60	1,380
	CLU721-1206C4-273M2K1	80 Min.	2,700K	1,050	37.6	39.5	4,307	109	0.60	1,380
	CLU721-1206C4-303M2K1	80 Min.	3,000K	1,050	37.6	39.5	4,555	115	0.60	1,380
	CLU721-1206C4-353M2K1	80 Min.	3,500K	1,050	37.6	39.5	4,658	118	0.60	1,380
	CLU721-1206C4-403M2K1	80 Min.	4,000K	1,050	37.6	39.5	4,750	120	0.60	1,380
	CLU721-1206C4-503M2K1	80 Min.	5,000K	1,050	37.6	39.5	4,836	123	0.60	1,380
	CLU721-1206C4-273H5K2	90 Min.	2,700K	1,050	37.6	39.5	3,560	90	0.60	1,380
	CLU721-1206C4-303H5K2	90 Min.	3,000K	1,050	37.6	39.5	3,764	95	0.60	1,380
	CLU721-1206C4-353H5K2	90 Min.	3,500K	1,050	37.6	39.5	3,845	97	0.60	1,380
	CLU721-1206C4-403H5K2	90 Min.	4,000K	1,050	37.6	39.5	3,922	99	0.60	1,380

 CLU731 (LES φ13.0mm)	CLU731-1210C4-50AL7K3	70 Min.	5,000K	1,750	37.6	65.8	8,595	131	0.42	2,300
	CLU731-1210C4-273M2K1	80 Min.	2,700K	1,750	37.6	65.8	7,298	111	0.42	2,300
	CLU731-1210C4-303M2K1	80 Min.	3,000K	1,750	37.6	65.8	7,699	117	0.42	2,300
	CLU731-1210C4-353M2K1	80 Min.	3,500K	1,750	37.6	65.8	7,879	120	0.42	2,300
	CLU731-1210C4-403M2K1	80 Min.	4,000K	1,750	37.6	65.8	8,036	122	0.42	2,300
	CLU731-1210C4-503M2K1	80 Min.	5,000K	1,750	37.6	65.8	8,176	124	0.42	2,300
	CLU731-1210C4-273H5K2	90 Min.	2,700K	1,750	37.6	65.8	6,031	92	0.42	2,300
	CLU731-1210C4-303H5K2	90 Min.	3,000K	1,750	37.6	65.8	6,362	97	0.42	2,300
	CLU731-1210C4-353H5K2	90 Min.	3,500K	1,750	37.6	65.8	6,505	99	0.42	2,300
	CLU731-1210C4-403H5K2	90 Min.	4,000K	1,750	37.6	65.8	6,634	101	0.42	2,300

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PSL440

High lumen density SMD Package



PSL440

- Lumen density 107 lm/mm²
- Downsize luminaires
- Application : Spotlight, Lamp

Color Variation

Package	70 CRI Min. (ANSI 7-step quadrangle)		80 CRI Min. (3-step MacAdam ellipse)					80 CRI Min. (ANSI 7-step quadrangle)	90 CRI Min. (3-step MacAdam ellipse)					90 CRI Min. (ANSI 7-step quadrangle)
	4,000K	5,000K	2,700K	3,000K	3,500K	4,000K	5,000K	5,700K	2,700K	3,000K	3,500K	4,000K	5,000K	5,700K
PSL440	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Product List

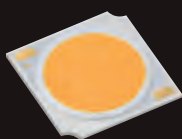
Package	Product code	Electro-optical Characteristics								(T _j = 85°C)	
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)	Absolute Maximum Rating	
 PSL440	PSL440-0404C5-40AL7M4	70 Min.	4,000K	700	12.0	8.4	1,009	120	3.5	900	
	PSL440-0404C5-50AL7M4	70 Min.	5,000K	700	12.0	8.4	1,025	122	3.5	900	
	PSL440-0404C5-273M2M2	80 Min.	2,700K	700	12.0	8.4	840	100	3.5	900	
	PSL440-0404C5-303M2M2	80 Min.	3,000K	700	12.0	8.4	875	104	3.5	900	
	PSL440-0404C5-353M2M2	80 Min.	3,500K	700	12.0	8.4	895	107	3.5	900	
	PSL440-0404C5-403M2M2	80 Min.	4,000K	700	12.0	8.4	900	107	3.5	900	
	PSL440-0404C5-503M2M2	80 Min.	5,000K	700	12.0	8.4	920	110	3.5	900	
	PSL440-0404C5-57AM2M2	80 Min.	5,700K	700	12.0	8.4	940	112	3.5	900	
	PSL440-0404C5-273H5M3	90 Min.	2,700K	700	12.0	8.4	675	80	3.5	900	
	PSL440-0404C5-303H5M3	90 Min.	3,000K	700	12.0	8.4	715	85	3.5	900	
	PSL440-0404C5-353H5M3	90 Min.	3,500K	700	12.0	8.4	725	86	3.5	900	
	PSL440-0404C5-403H5M3	90 Min.	4,000K	700	12.0	8.4	730	87	3.5	900	
	PSL440-0404C5-503H5M3	90 Min.	5,000K	700	12.0	8.4	735	88	3.5	900	
	PSL440-0404C5-57AH5M3	90 Min.	5,700K	700	12.0	8.4	755	90	3.5	900	

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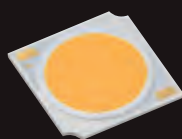


High color
quality

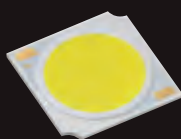
Vivid color provides
beautiful and enriched
high color quality light.



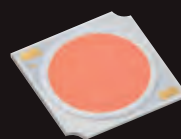
Vivid Series
Brilliant Type



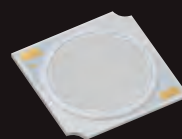
Vivid Series
Natural Type



Below B.B.L.,
Super High CRI



Amber color COB



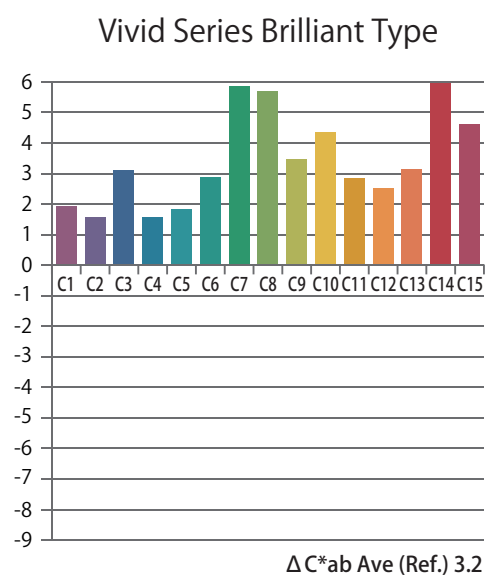
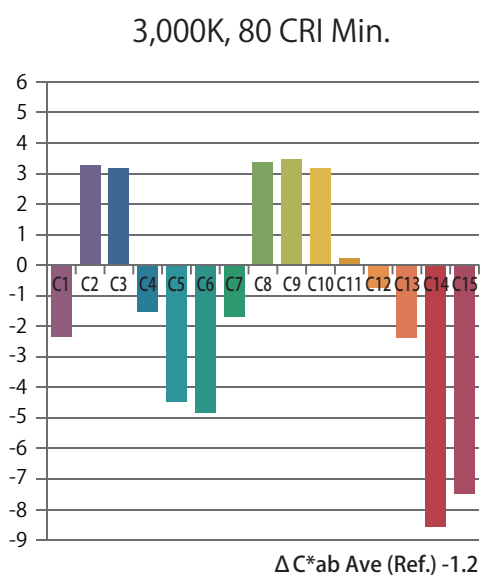
Blue color COB

Vivid Series expresses the subtle beauty of original color of objects.

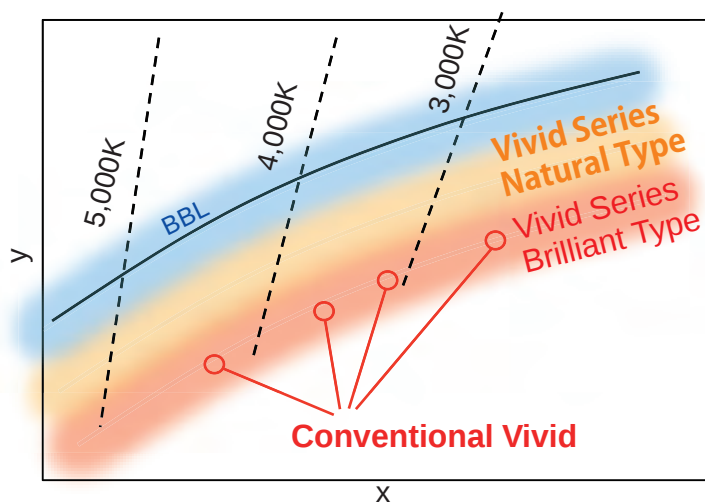
Vivid Series Brilliant Type has become the value of ΔC^*ab positive zone, it can bring out things original color vividly

Note ΔC^*ab is an index that represents the chroma difference.

● Comparison of the chroma difference



Two types of Vivid Series



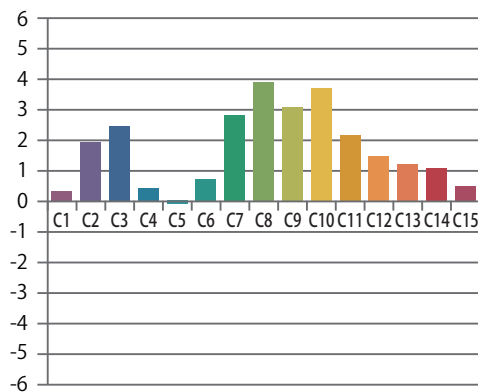
Vivid Series Brilliant Type

The chroma difference of the Brilliant type is twice as much as that of the standard vivid type.

● Comparison of the chroma difference with the standard Vivid type

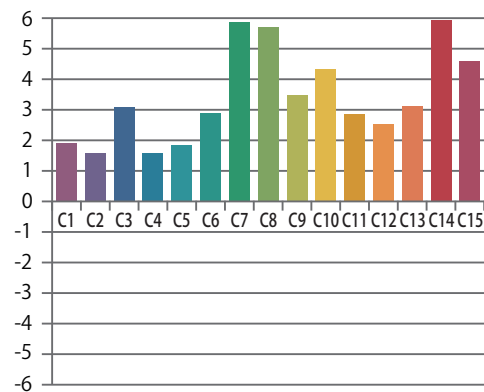


Conventional Vivid Series (Warm plus)



ΔC*ab Ave (Ref.) 1.6

Vivid Series Brilliant Type



ΔC*ab Ave (Ref.) 3.2

Vivid Series Natural Type

Natural color and high chroma light.



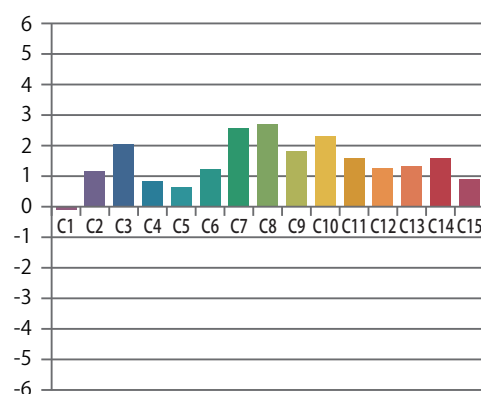
Standard light (5,000K, 80 CRI Min.)



Vivid Series Natural Type (5,000K)

● ΔC*ab (Vivid Series Natural Type)

Vivid Series Natural Type



ΔC*ab Ave (Ref.) 1.6

Color Variation

Package	Die Configuration	Vivid Series Brilliant Type					Vivid Series Natural Type				
		2,700K	3,000K	3,500K	4,000K	5,000K	2,700K	3,000K	3,500K	4,000K	5,000K
CLU028	1204	●	●	●	●	●	●	●	●	●	●
	1206	●	●	●	●	●	●	●	●	●	●
CLU038	1208	●	●	●	●	●	●	●	●	●	●
	1212	●	●	●	●	●	●	●	●	●	●
CLU048	1812	●	●	●	●	●	●	●	●	●	●

Product List

Vivid Series Brilliant Type

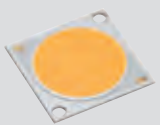
(T_j = 85°C)

Package	Product code	Electro-optical Characteristics							Absolute Maximum Rating	Δ C*ab Ave (Ref.)
		CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance Rj-c (°C/W)	Forward current (mA)	
 CLU028 (LES φ9.8mm)	CLU028-1204C4-27BV1N3	2,700K	360	34.6	12.5	1,001	80	0.91	720	3.2
	CLU028-1204C4-30BV1N3	3,000K	360	34.6	12.5	1,056	85	0.91	720	
	CLU028-1204C4-35BV1N3	3,500K	360	34.6	12.5	1,112	89	0.91	720	
	CLU028-1204C4-40BV1N3	4,000K	360	34.6	12.5	1,151	92	0.91	720	
	CLU028-1204C4-50BV1N3	5,000K	360	34.6	12.5	1,179	95	0.91	720	
 CLU038 (LES φ14.5mm)	CLU038-1206C4-27BV1N3	2,700K	540	34.6	18.7	1,554	83	0.64	1,080	3.2
	CLU038-1206C4-30BV1N3	3,000K	540	34.6	18.7	1,638	88	0.64	1,080	
	CLU038-1206C4-35BV1N3	3,500K	540	34.6	18.7	1,726	92	0.64	1,080	
	CLU038-1206C4-40BV1N3	4,000K	540	34.6	18.7	1,786	96	0.64	1,080	
	CLU038-1206C4-50BV1N3	5,000K	540	34.6	18.7	1,830	98	0.64	1,080	
	CLU038-1208C4-27BV1N3	2,700K	720	34.6	24.9	2,031	82	0.51	1,440	3.2
	CLU038-1208C4-30BV1N3	3,000K	720	34.6	24.9	2,141	86	0.51	1,440	
	CLU038-1208C4-35BV1N3	3,500K	720	34.6	24.9	2,256	91	0.51	1,440	
	CLU038-1208C4-40BV1N3	4,000K	720	34.6	24.9	2,335	94	0.51	1,440	
	CLU038-1208C4-50BV1N3	5,000K	720	34.6	24.9	2,392	96	0.51	1,440	
 CLU048 (LES φ22.0mm)	CLU048-1212C4-27BV1N3	2,700K	1,080	34.6	37.4	3,148	84	0.34	2,160	3.2
	CLU048-1212C4-30BV1N3	3,000K	1,080	34.6	37.4	3,319	89	0.34	2,160	
	CLU048-1212C4-35BV1N3	3,500K	1,080	34.6	37.4	3,497	94	0.34	2,160	
	CLU048-1212C4-40BV1N3	4,000K	1,080	34.6	37.4	3,619	97	0.34	2,160	
	CLU048-1212C4-50BV1N3	5,000K	1,080	34.6	37.4	3,708	99	0.34	2,160	
	CLU048-1812C4-27BV1N3	2,700K	1,080	52.0	56.2	4,610	82	0.25	2,160	3.2
	CLU048-1812C4-30BV1N3	3,000K	1,080	52.0	56.2	4,860	87	0.25	2,160	
	CLU048-1812C4-35BV1N3	3,500K	1,080	52.0	56.2	5,121	91	0.25	2,160	
	CLU048-1812C4-40BV1N3	4,000K	1,080	52.0	56.2	5,300	94	0.25	2,160	
	CLU048-1812C4-50BV1N3	5,000K	1,080	52.0	56.2	5,430	97	0.25	2,160	

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Vivid Series Natural Type

(T_j = 85°C)

Package	Product code	Electro-optical Characteristics							Absolute Maximum Rating	$\Delta C^*ab Ave$ (Ref.)
		CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)		
 CLU028 (LES $\phi 9.8mm$)	CLU028-1204C4-27NV1N2	2,700K	360	34.6	12.5	1,167	94	0.91	720	1.6
	CLU028-1204C4-30NV1N2	3,000K	360	34.6	12.5	1,246	100	0.91	720	
	CLU028-1204C4-35NV1N2	3,500K	360	34.6	12.5	1,290	104	0.91	720	
	CLU028-1204C4-40NV1N2	4,000K	360	34.6	12.5	1,324	106	0.91	720	
	CLU028-1204C4-50NV1N2	5,000K	360	34.6	12.5	1,368	110	0.91	720	
 CLU038 (LES $\phi 14.5mm$)	CLU038-1206C4-27NV1N2	2,700K	540	34.6	18.7	1,812	97	0.64	1,080	1.6
	CLU038-1206C4-30NV1N2	3,000K	540	34.6	18.7	1,934	104	0.64	1,080	
	CLU038-1206C4-35NV1N2	3,500K	540	34.6	18.7	2,002	107	0.64	1,080	
	CLU038-1206C4-40NV1N2	4,000K	540	34.6	18.7	2,054	110	0.64	1,080	
	CLU038-1206C4-50NV1N2	5,000K	540	34.6	18.7	2,123	114	0.64	1,080	
	CLU038-1208C4-27NV1N2	2,700K	720	34.6	24.9	2,368	95	0.51	1,440	1.6
	CLU038-1208C4-30NV1N2	3,000K	720	34.6	24.9	2,528	101	0.51	1,440	
	CLU038-1208C4-35NV1N2	3,500K	720	34.6	24.9	2,617	105	0.51	1,440	
	CLU038-1208C4-40NV1N2	4,000K	720	34.6	24.9	2,685	108	0.51	1,440	
	CLU038-1208C4-50NV1N2	5,000K	720	34.6	24.9	2,775	111	0.51	1,440	
 CLU048 (LES $\phi 22.0mm$)	CLU048-1212C4-27NV1N2	2,700K	1,080	34.6	37.4	3,670	98	0.34	2,160	1.6
	CLU048-1212C4-30NV1N2	3,000K	1,080	34.6	37.4	3,918	105	0.34	2,160	
	CLU048-1212C4-35NV1N2	3,500K	1,080	34.6	37.4	4,056	109	0.34	2,160	
	CLU048-1212C4-40NV1N2	4,000K	1,080	34.6	37.4	4,162	111	0.34	2,160	
	CLU048-1212C4-50NV1N2	5,000K	1,080	34.6	37.4	4,301	115	0.34	2,160	
	CLU048-1812C4-27NV1N2	2,700K	1,080	52.0	56.2	5,375	96	0.25	2,160	1.6
	CLU048-1812C4-30NV1N2	3,000K	1,080	52.0	56.2	5,739	102	0.25	2,160	
	CLU048-1812C4-35NV1N2	3,500K	1,080	52.0	56.2	5,941	106	0.25	2,160	
	CLU048-1812C4-40NV1N2	4,000K	1,080	52.0	56.2	6,095	109	0.25	2,160	
	CLU048-1812C4-50NV1N2	5,000K	1,080	52.0	56.2	6,299	112	0.25	2,160	

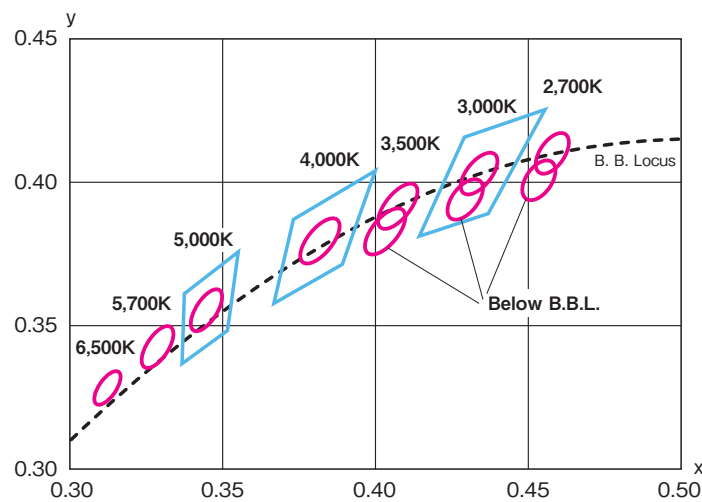
Note Product code and specifications in this catalog are subject to change without notice for the purpose of improvement, or manufacturing may be discontinued. Please contact our sales team in terms of release date and latest specifications for each product.

Below B.B.L., Super High CRI



Below B.B.L. :

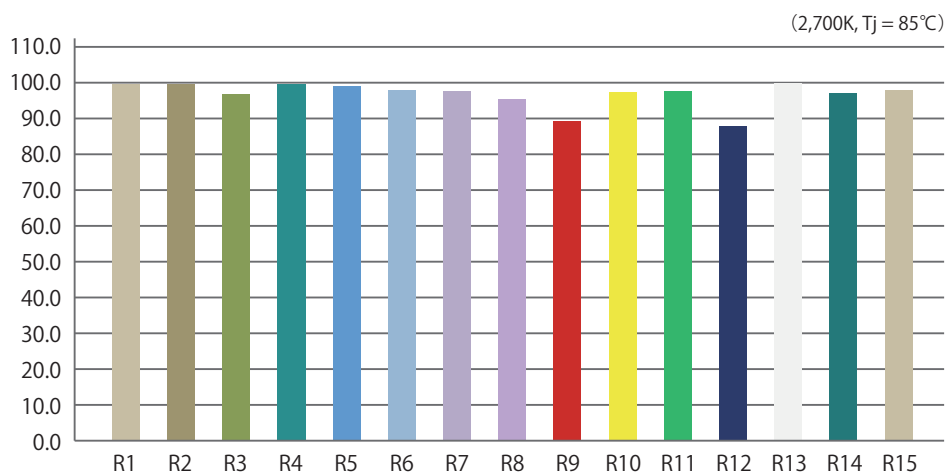
Below B.B.L. LED makes white objects beautiful



Super High CRI :

Super High CRI LED gives high color fidelity

Color Rendering Index



Color Variation

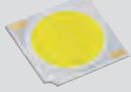
Package	Die Configuration	Below B.B.L. 90 CRI Min. (3-step MacAdam ellipse)			Super High-CRI 97 CRI Typ. (3-step MacAdam ellipse)		
		2,700K	3,000K	3,500K	2,700K	3,000K	4,000K
CLU028	1201				●	●	●
	1202				●	●	●
	1203	●	●	●	●	●	●
	1204				●	●	●
CLU038	1205	●	●	●	●	●	●
	1206	●	●	●	●	●	●
	1208	●	●	●	●	●	●
CLU048	1211	●	●	●	●	●	●
	1212	●	●	●	●	●	●

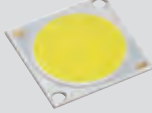
Product List

Below B.B.L.

(T_j = 85°C)

Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)	Forward current (mA)
 CLU028 (LES φ9.8mm)	CLU028-1203C4-273H6M3-F1	90 Min.	2,700K	270	34.0	9.2	1,065	116	1.0	690
	CLU028-1203C4-303H6M3-F1	90 Min.	3,000K	270	34.0	9.2	1,108	121	1.0	690
	CLU028-1203C4-353H6M3-F1	90 Min.	3,500K	270	34.0	9.2	1,123	122	1.0	690

 CLU038 (LES φ14.5mm)	CLU038-1205C4-273H6M3-F1	90 Min.	2,700K	450	34.0	15.3	1,820	119	0.68	1,150
	CLU038-1205C4-303H6M3-F1	90 Min.	3,000K	450	34.0	15.3	1,892	124	0.68	1,150
	CLU038-1205C4-353H6M3-F1	90 Min.	3,500K	450	34.0	15.3	1,920	125	0.68	1,150
	CLU038-1206C4-273H6M3-F1	90 Min.	2,700K	540	34.0	18.4	2,161	118	0.61	1,380
	CLU038-1206C4-303H6M3-F1	90 Min.	3,000K	540	34.0	18.4	2,247	122	0.61	1,380
	CLU038-1206C4-353H6M3-F1	90 Min.	3,500K	540	34.0	18.4	2,280	124	0.61	1,380
	CLU038-1208C4-273H6M3-F1	90 Min.	2,700K	720	34.0	24.5	2,827	115	0.48	1,840
	CLU038-1208C4-303H6M3-F1	90 Min.	3,000K	720	34.0	24.5	2,940	120	0.48	1,840
	CLU038-1208C4-353H6M3-F1	90 Min.	3,500K	720	34.0	24.5	2,982	122	0.48	1,840

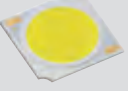
 CLU048 (LES φ22.0mm)	CLU048-1211C4-273H6M3-F1	90 Min.	2,700K	990	34.0	33.7	4,020	119	0.36	2,530
	CLU048-1211C4-303H6M3-F1	90 Min.	3,000K	990	34.0	33.7	4,181	124	0.36	2,530
	CLU048-1211C4-353H6M3-F1	90 Min.	3,500K	990	34.0	33.7	4,240	126	0.36	2,530
	CLU048-1212C4-273H6M3-F1	90 Min.	2,700K	1,080	34.0	36.7	4,385	119	0.32	2,760
	CLU048-1212C4-303H6M3-F1	90 Min.	3,000K	1,080	34.0	36.7	4,561	124	0.32	2,760
	CLU048-1212C4-353H6M3-F1	90 Min.	3,500K	1,080	34.0	36.7	4,625	126	0.32	2,760

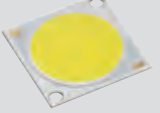
Note Product code and specifications in this catalog are subject to change without notice for the purpose of improvement, or manufacturing may be discontinued. Please contact our sales team in terms of release date and latest specifications for each product.

Super High CRI

(T_j = 85°C)

Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance R _{j-c} (°C/W)	
 CLU028 (LES φ9.8mm)	CLU028-1201C4-273H7M5-F1	97 Typ.	2,700K	90	34.0	3.1	345	113	2.6	230
	CLU028-1201C4-303H7M5-F1	97 Typ.	3,000K	90	34.0	3.1	358	117	2.6	230
	CLU028-1201C4-403H7M5-F1	97 Typ.	4,000K	90	34.0	3.1	367	120	2.6	230
	CLU028-1202C4-273H7M5-F1	97 Typ.	2,700K	180	34.0	6.1	681	111	1.5	460
	CLU028-1202C4-303H7M5-F1	97 Typ.	3,000K	180	34.0	6.1	708	116	1.5	460
	CLU028-1202C4-403H7M5-F1	97 Typ.	4,000K	180	34.0	6.1	726	119	1.5	460
	CLU028-1203C4-273H7M5-F1	97 Typ.	2,700K	270	34.0	9.2	1,005	109	1.0	690
	CLU028-1203C4-303H7M5-F1	97 Typ.	3,000K	270	34.0	9.2	1,044	114	1.0	690
	CLU028-1203C4-403H7M5-F1	97 Typ.	4,000K	270	34.0	9.2	1,069	116	1.0	690
	CLU028-1204C4-273H7M5-F1	97 Typ.	2,700K	360	34.0	12.2	1,314	107	0.86	920
	CLU028-1204C4-303H7M5-F1	97 Typ.	3,000K	360	34.0	12.2	1,367	112	0.86	920
	CLU028-1204C4-403H7M5-F1	97 Typ.	4,000K	360	34.0	12.2	1,402	115	0.86	920

 CLU038 (LES φ14.5mm)	CLU038-1205C4-273H7M5-F1	97 Typ.	2,700K	450	34.0	15.3	1,714	112	0.68	1,150
	CLU038-1205C4-303H7M5-F1	97 Typ.	3,000K	450	34.0	15.3	1,783	117	0.68	1,150
	CLU038-1205C4-403H7M5-F1	97 Typ.	4,000K	450	34.0	15.3	1,827	119	0.68	1,150
	CLU038-1206C4-273H7M5-F1	97 Typ.	2,700K	540	34.0	18.4	2,037	111	0.61	1,380
	CLU038-1206C4-303H7M5-F1	97 Typ.	3,000K	540	34.0	18.4	2,117	115	0.61	1,380
	CLU038-1206C4-403H7M5-F1	97 Typ.	4,000K	540	34.0	18.4	2,170	118	0.61	1,380
	CLU038-1208C4-273H7M5-F1	97 Typ.	2,700K	720	34.0	24.5	2,663	109	0.48	1,840
	CLU038-1208C4-303H7M5-F1	97 Typ.	3,000K	720	34.0	24.5	2,769	113	0.48	1,840
	CLU038-1208C4-403H7M5-F1	97 Typ.	4,000K	720	34.0	24.5	2,839	116	0.48	1,840

 CLU048 (LES φ22.0mm)	CLU048-1211C4-273H7M5-F1	97 Typ.	2,700K	990	34.0	33.7	3,786	112	0.36	2,530
	CLU048-1211C4-303H7M5-F1	97 Typ.	3,000K	990	34.0	33.7	3,938	117	0.36	2,530
	CLU048-1211C4-403H7M5-F1	97 Typ.	4,000K	990	34.0	33.7	4,036	120	0.36	2,530
	CLU048-1212C4-273H7M5-F1	97 Typ.	2,700K	1,080	34.0	36.7	4,130	112	0.32	2,760
	CLU048-1212C4-303H7M5-F1	97 Typ.	3,000K	1,080	34.0	36.7	4,295	117	0.32	2,760
	CLU048-1212C4-403H7M5-F1	97 Typ.	4,000K	1,080	34.0	36.7	4,403	120	0.32	2,760
	CLU048-1812C4-273H7M5-F1	97 Typ.	2,700K	1,080	51.1	55.2	6,044	110	0.24	2,760
	CLU048-1812C4-303H7M5-F1	97 Typ.	3,000K	1,080	51.1	55.2	6,288	114	0.24	2,760
	CLU048-1812C4-403H7M5-F1	97 Typ.	4,000K	1,080	51.1	55.2	6,444	117	0.24	2,760

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Amber color COB

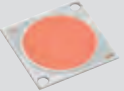
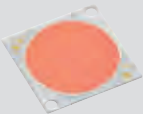
Replacement of High Pressure Sodium Lamps

The solution for the replacement of high pressure sodium lamps used in street lights, seaport lights and high masts.



- Life time projection : L70 at 50,000H
- Color Rendering : 65 CRI Typ.
- Efficacy : 140lm/W at Tj=85°C

Product List

Package	Product code	Electro-optical Characteristics								Absolute Maximum Rating
		CRI	CCT	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Thermal resistance Rj-c (°C/W)	Forward current (mA)
 CLU038 (LES ϕ 14.5mm)	CLU038-1208C4-22AL1K3	65 Typ.	2,200K	720	34.6	24.9	3,495	140	0.51	1,440
	CLU038-1210C4-22AL1K3	65 Typ.	2,200K	900	34.6	31.1	4,339	139	0.42	1,800
 CLU048 (LES ϕ 22.0mm)	CLU048-1212C4-22AL1K3	65 Typ.	2,200K	1,080	34.6	37.4	5,422	145	0.34	2,160
	CLU048-1812C4-22AL1K3	65 Typ.	2,200K	1,080	52.0	56.2	7,935	141	0.25	2,160
	CLU048-1818C4-22AL1K3	65 Typ.	2,200K	1,620	52.0	84.2	11,583	138	0.17	3,240
 CLU058 (LES ϕ 32.8mm)	CLU058-1825C4-22AL1K3	65 Typ.	2,200K	2,250	52.0	117.0	16,961	145	0.14	4,500
	CLU058-3618C4-22AL1K3	65 Typ.	2,200K	1,620	103.9	168.3	23,421	139	0.10	3,240
 CLU551 (LES ϕ 32.8mm)	CLU551-3626C4-22AL1K3-B24	65 Typ.	2,200K	2,340	103.9	243.1	32,789	135	0.07	3,900

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Blue color COB

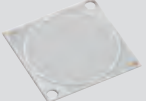
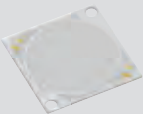
High Power Blue LED

High-power blue LED suitable for various applications such as lighting for swimming pools and architectural lighting.

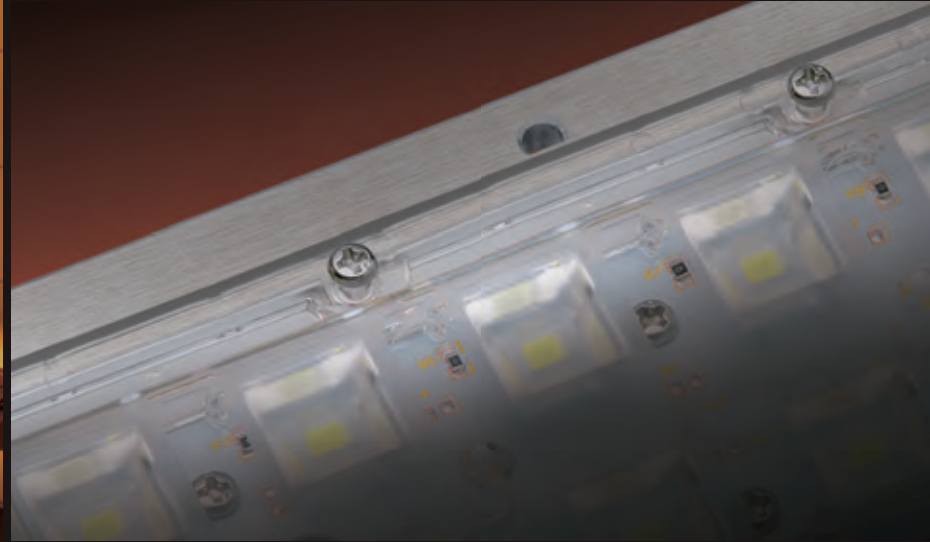
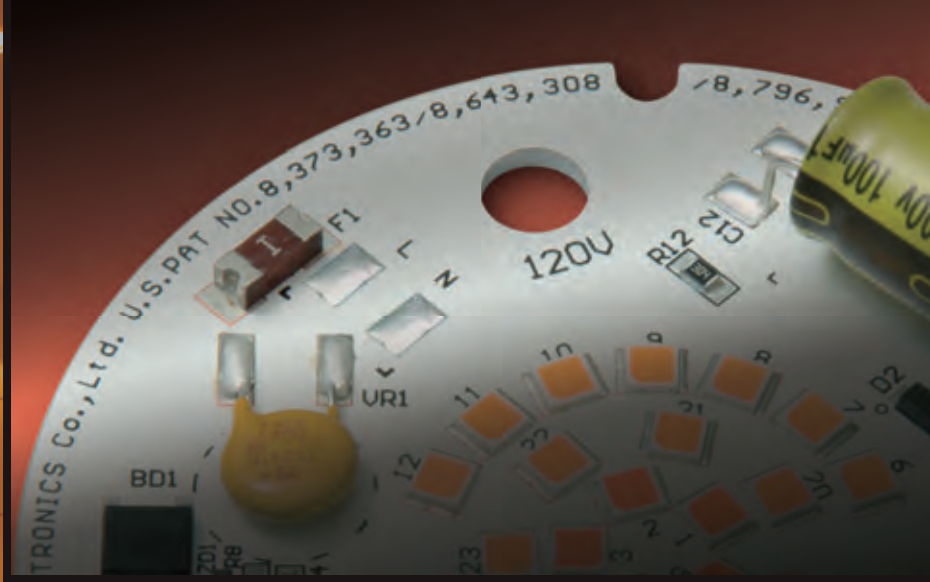
- High Power: Maximum output 474W
- Life time projection : L70 at 50,000H



Product List

Package	Product code	Electro-optical Characteristics							(T _c = 25°C)	
		Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Radiant Flux (W)		Wave Length Dominant (nm)		Thermal resistance R _{j-c} (°C/W)	Absolute Maximum Rating Forward current (mA)
 CLU038 (LES φ14.5mm)	CLU038-1208C4-B455-XX	720	35.8	25.8	11	17	445	465	0.51	1,440
	CLU038-1210C4-B455-XX	900	35.8	32.2	13	21	445	465	0.42	1,800
 CLU048 (LES φ22.0mm)	CLU048-1212C4-B455-XX	1,080	35.8	38.7	17	27	445	465	0.34	2,160
	CLU048-1812C4-B455-XX	1,080	53.6	57.9	25	39	445	465	0.25	2,160
	CLU048-1818C4-B455-XX	1,620	53.6	86.8	37	57	445	465	0.17	3,240
 CLU058 (LES φ32.8mm)	CLU058-1825C4-B455-XX	2,250	53.6	120.6	54	82	445	465	0.14	4,500
	CLU058-3618C4-B455-XX	1,620	107.1	173.5	75	113	445	465	0.10	3,240
 CLU551 (LES φ32.8mm)	CLU551-3626C4-B455-XX-B24	2,340	107.1	250.6	105	159	445	465	0.07	3,900

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Module

Compact module solution provides luminaire design flexibility with high efficacy and lumen density.



AC Disk Module



CSP Module

AC Disk Module

AC direct driving (AC 120V / 60Hz)

LMAW : AC Dim-to-Warm Module

All in one solution

- No need for separate Control IC
- Dimming to warm from 3,000K to 2,000K
- Simulate dimming to warm of incandescent bulbs
- Application :
 - Down light, Sconce lighting
 - Ceiling light (Flushmount lighting)



LMAW-001YA-01



LMAW-002YA-01



LMAW-003YA-01



LMAW-004YA-01

● Example of Dim-to-warm downlight



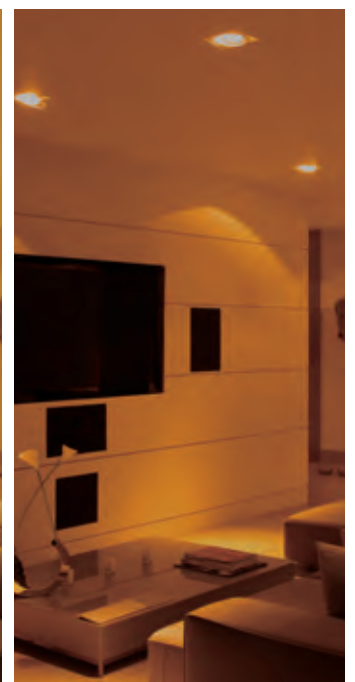
3,000K



2,700K



2,300K



2,000K

Color Variation

Package	2,000K, 80 CRI Min. / 3,000K, 90 CRI Min.
LMAW-001	●
LMAW-002	●
LMAW-003	●
LMAW-004	●

Product List

(3,000K, 90 CRI Min. T_c = 25°C)

Package	Product code	Electro-optical Characteristics							
		Diameter (mm)	CCT, CRI	LEDs	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Percent Flicker (%)	THD (%)
 LMAW-001	LMAW-001YA-01*	Φ 59	2,000K, 80 CRI Min. / 3,000K, 90 CRI Min.	2 colors	12.5	1,060	84.8	—	≤20
 LMAW-002	LMAW-002YA-01*	Φ 59	2,000K, 80 CRI Min. / 3,000K, 90 CRI Min.	2 colors	10.5	900	85.7	—	≤20
 LMAW-003	LMAW-003YA-01	Φ 45	2,000K, 80 CRI Min. / 3,000K, 90 CRI Min.	2 colors	9.1	740	81.3	—	≤20
 LMAW-004	LMAW-004YA-01	Φ 70	2,000K, 80 CRI Min. / 3,000K, 90 CRI Min.	2 colors	12.5	1,060	84.8	<30	≤20

* LMAW-001YA and 002YA are same product but different watt setting.

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LMAC : Lower Percent Flicker Module

- Lower Percent Flicker (<30%)
- High compatibility with TRIAC dimmer
- Application : Ceiling light, Down light, Spot light



LMAC-001YA-01

Color Variation

Package	3,000K, 90 CRI Min.
LMAC-001	●

Product List

(Tc = 25°C)

Package	Product code	Electro-optical Characteristics							
		Diameter (mm)	CCT, CRI	LEDs	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Percent Flicker (%)	THD (%)
 LMAC-001	LMAC-001YA-01	Φ 100	3,000K, 90 CRI Min.	Single Color	15.7	1,360	86.6	<30	≤20

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CSP Module

High performance module with high efficient CSP

- Downsizing, High Lumen Density
- Lighting system cost reduction
- Application : Street light, Highbay light, Flood light



Color Variation/ Heat sink

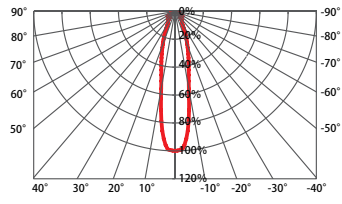
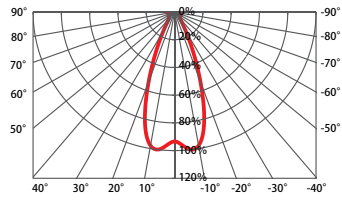
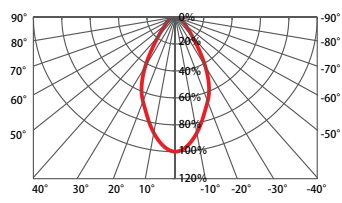
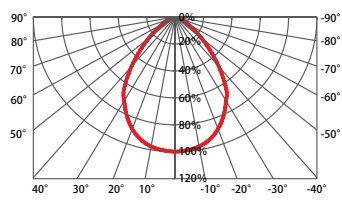
Package	70 CRI Min.		80 CRI Min.		Heat sink
	4,000K	5,000K	4,000K	5,000K	
LMZ001	●	●	●	●	
LMZ002	●	●	●	●	●

Product List

Package	Product type	Electro-optical Characteristics											Absolute Maximum Rating
		L (mm)	W (mm)	H (mm)	CCT	CRI	Forward current (mA)	Voltage Typ. (V)	Input power Typ. (W)	Luminous flux Typ. (lm)	Efficacy Typ. (lm/W)	Ths at typical wattage (°C)	
 LMZ001	LMZ001 without Heat sink	196.5	93.5	17.4	4,000K	70 Min.	1,050	46.4	48.7	6,750	139	25	1,350
		196.5	93.5	17.4	4,000K	80 Min.	1,050	46.4	48.7	6,150	126	25	1,350
		196.5	93.5	17.4	5,000K	70 Min.	1,050	46.4	48.7	6,950	143	25	1,350
		196.5	93.5	17.4	5,000K	80 Min.	1,050	46.4	48.7	6,650	136	25	1,350
 LMZ002	LMZ002 with Heat sink	230.0	71.5	50.4	4,000K	70 Min.	1,050	44.8	47.0	6,560	139	60	1,350
		230.0	71.5	50.4	4,000K	80 Min.	1,050	44.8	47.0	5,990	127	60	1,350
		230.0	71.5	50.4	5,000K	70 Min.	1,050	44.8	47.0	6,770	144	60	1,350
		230.0	71.5	50.4	5,000K	80 Min.	1,050	44.8	47.0	6,460	137	60	1,350

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Lens List

Type	Appearance	Directivity	FWHM (Ref.)
RS	 		25deg
M	 		40deg
W	 		55deg
WWW	 		78deg

Technical Note

● Chromaticity Range	P.38
● Structure of Product Code	P.39
● Outline Drawings	P.40
● Application Guide	P.45
● Customer Support	P.46

Ver.6 COB, CLU550, Below B.B.L., Super High CRI, High Intensity COB Ver.2, Amber color COB, PSL445, PSL440

● 3-step MacAdam Ellipse

Ver.6 COB, CLU550, High Intensity COB Ver.2

80 CRI Min. : 2,700K, 3,000K, 3,500K, 4,000K, 5,000K, 5,700K, 6,500K

90 CRI Min. : 2,700K, 3,000K, 3,500K, 4,000K, 5,700K

Below B.B.L.

90 CRI Min. : 2,700K, 3,000K, 3,500K

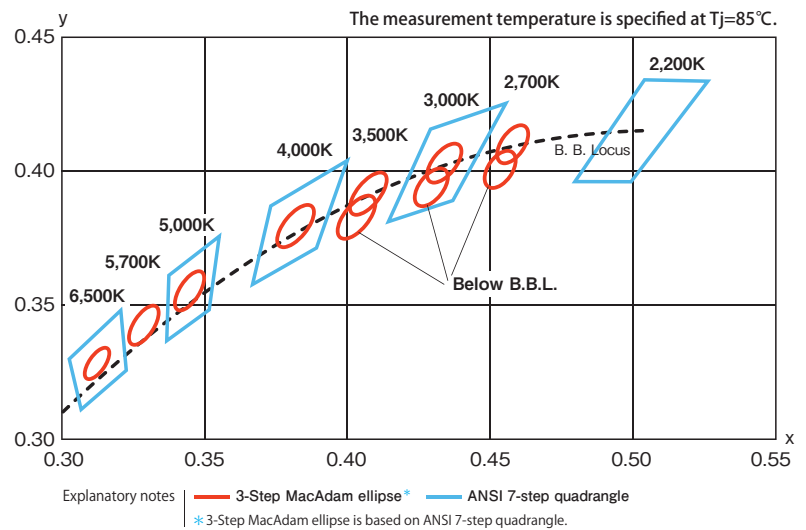
Super High CRI

97 CRI Typ. : 2,700K, 3,000K, 4,000K

PSL440, PSL445

80 CRI Min. : 2,700K, 3,000K, 3,500K, 4,000K, 5,000K

90 CRI Min. : 2,700K, 3,000K, 3,500K, 4,000K, 5,000K



● ANSI 7-step quadrangle

Ver.6 COB, CLU550, High Intensity COB Ver.2

70 CRI Min. : 3,000K, 4,000K, 5,000K, 6,500K

Amber color COB

65 CRI Typ. : 2,200K

PSL440, PSL445

70 CRI Min. : 4,000K, 5,000K

80 CRI Min. : 5,700K

90 CRI Min. : 5,700K

Compact SMD

● 3-step MacAdam Ellipse

CLL620, CLL130

80 CRI Min. : 2,700K, 3,000K, 3,500K, 4,000K

● ANSI 7-step quadrangle

CLL620, CLL130

80 CRI Min. : 5,000K, 6,500K

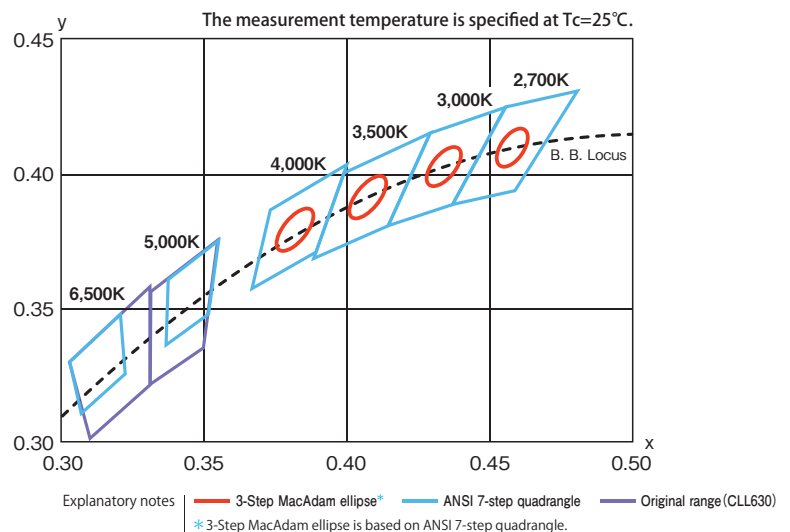
CLL630

80 CRI Min. : 2,700K, 3,000K, 4,000K

● Original range

CLL630

80 CRI Min. : 5,000K, 6,500K



CL-L104

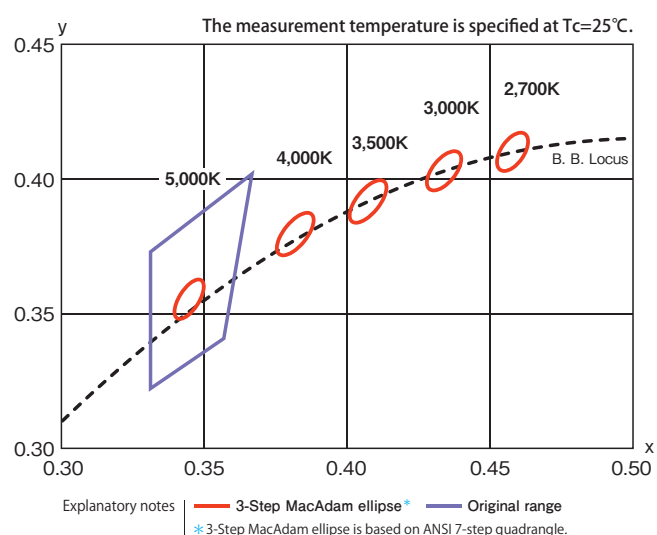
● 3-step MacAdam Ellipse

80 CRI Min. : 2,700K, 3,000K, 3,500K, 4,000K, 5,000K

90 CRI Min. : 2,700K, 3,000K, 3,500K, 4,000K, 5,000K

● Original range

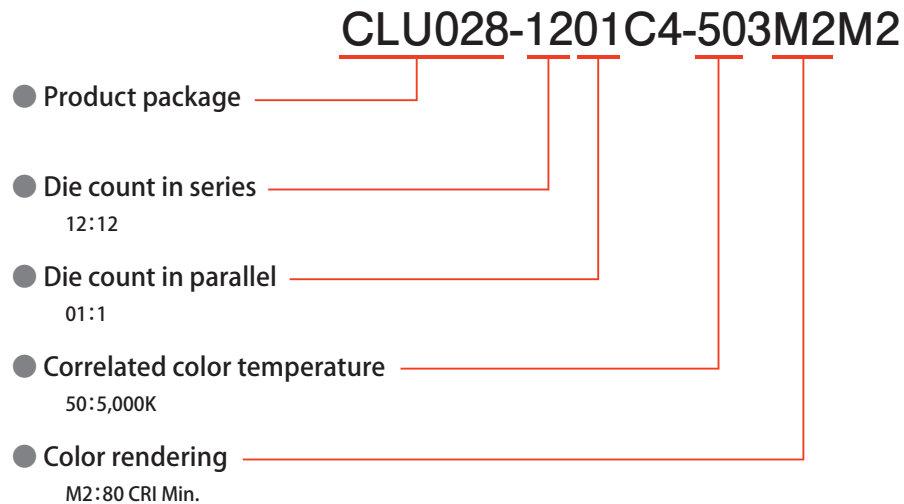
65 CRI Typ. : 5,000K



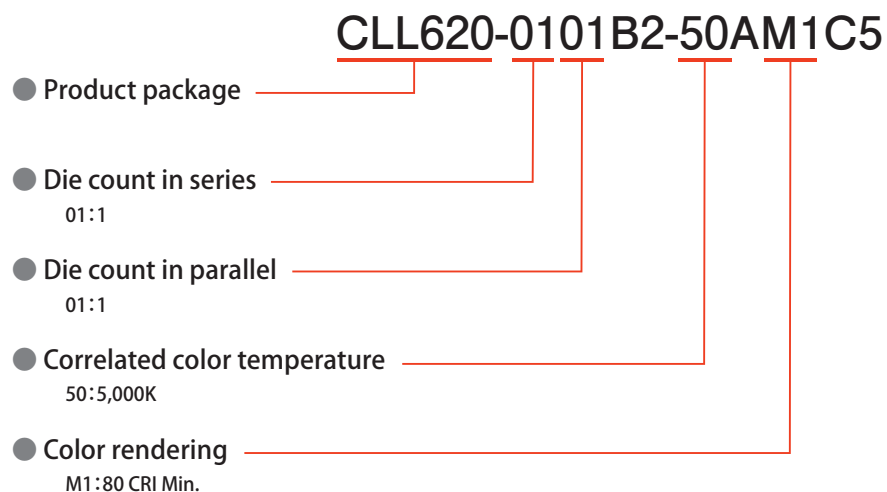


Structure of Product Code

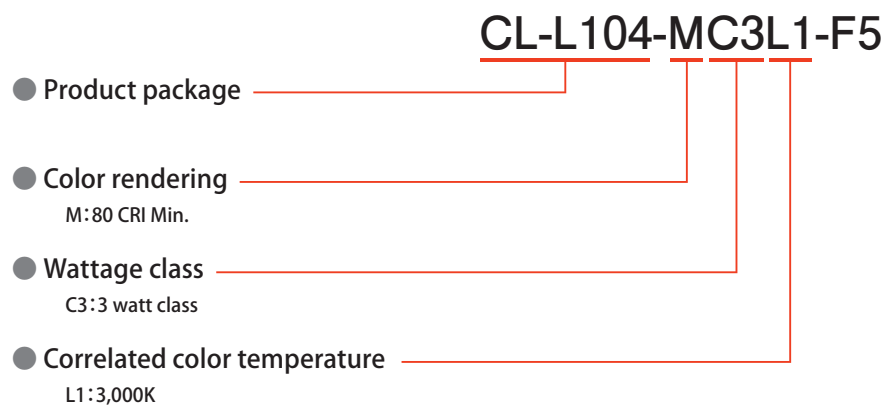
Ver.6 COB, CLU550, PSL445, PSL440, High Intensity COB Ver.2, Vivid Series Brilliant Type, Vivid Series Natural Type, Below B.B.L., Super High CRI, Amber color COB, Blue color COB



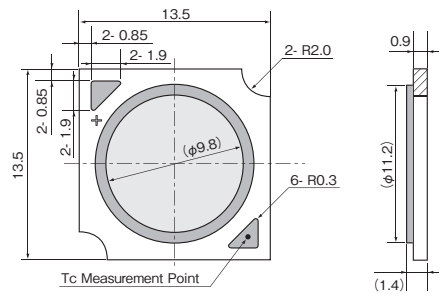
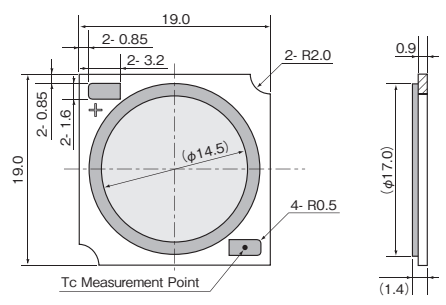
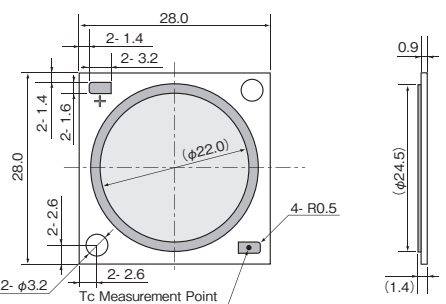
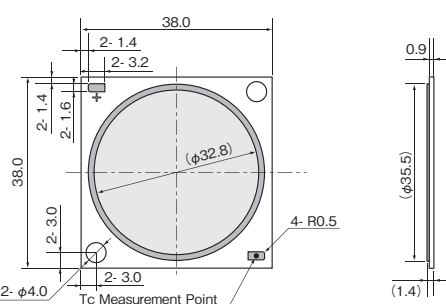
Compact SMD



CL-L104

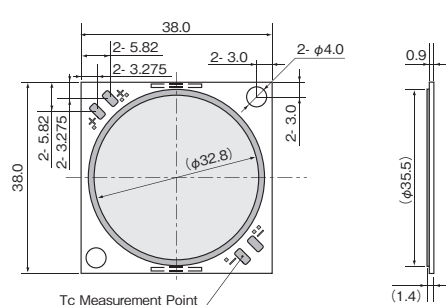


Ver.6 COB, Below B.B.L., Super High CRI, Vivid Series Brilliant Type,
Vivid Series Natural Type, Amber color COB, Blue color COB

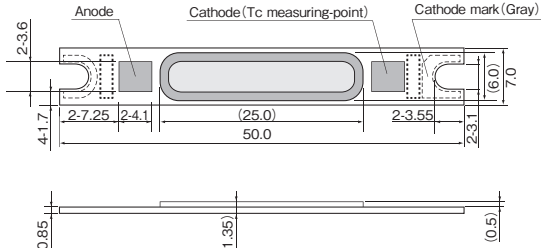
Package	Appearance (Actual size)	Outline drawing
CLU028	 13.5×13.5 mm	 Unit:mm
CLU038	 19.0×19.0 mm	 Unit:mm
CLU048	 28.0×28.0 mm	 Unit:mm
CLU058	 38.0×38.0 mm	 Unit:mm

Note "Appearance" in the above table shows the photos of Ver.6 COB, Below B.B.L. and Super High CRI. The photos of Vivid Series Brilliant Type and Vivid Series Natural Type are shown in Page 23. The photos of Amber color COBs are shown in Page 29. And, the photos of Blue color COBs are shown in Page 30. The CLU058 does not have Below B.B.L., Super High CRI, Vivid Series Brilliant Type and Vivid Series Natural Type.

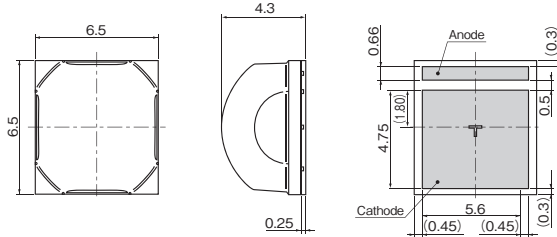
CLU550

CLU550	 38.0×38.0 mm	 Unit:mm
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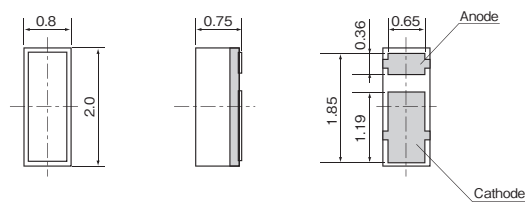
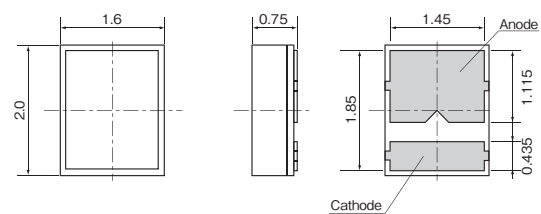
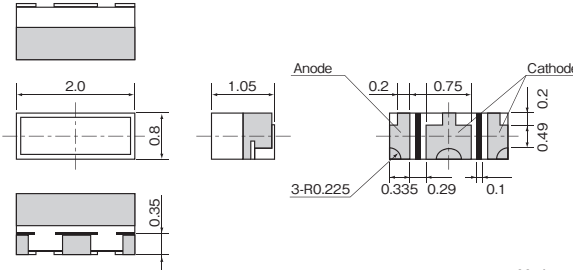
CL-L104

Package	Appearance (Actual size)	Outline drawing
CL-L104	 50.0×7.0 mm	 Unit:mm

PSL445

Package	Appearance	Outline drawing
PSL445	 6.5 (L) × 6.5 (W) × 4.3 (H) mm	 Unit:mm

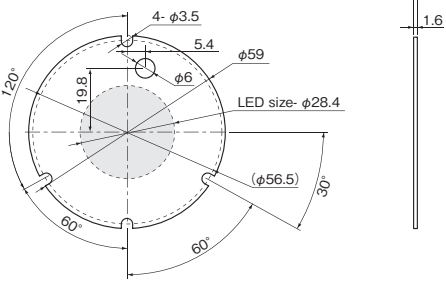
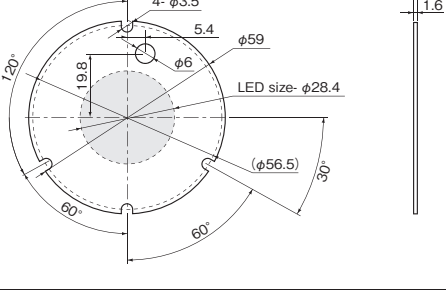
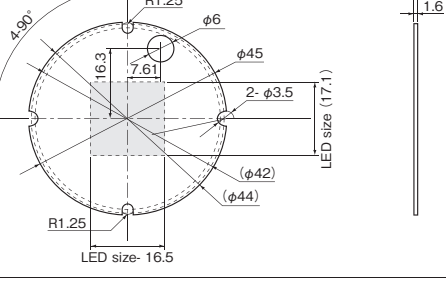
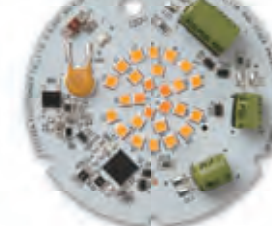
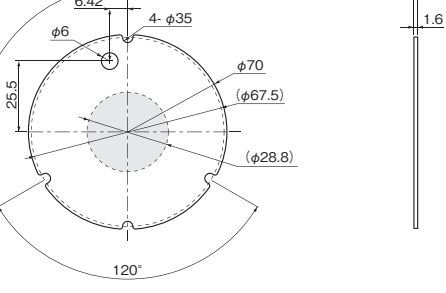
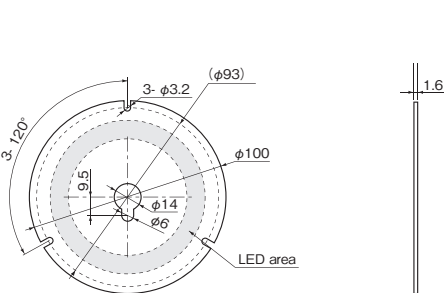
Compact SMD

CLL620	 0.8 (L) × 2.0 (W) × 0.75 (H) mm	 Unit:mm
CLL130	 1.6 (L) × 2.0 (W) × 0.75 (H) mm	 Unit:mm
CLL630	 1.05 (L) × 2.0 (W) × 0.8 (H) mm	 Unit:mm

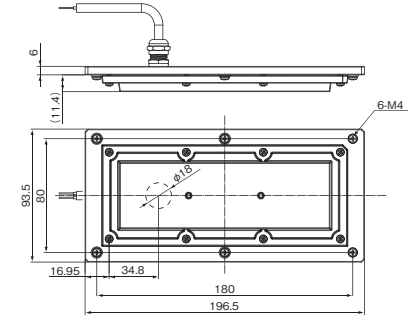
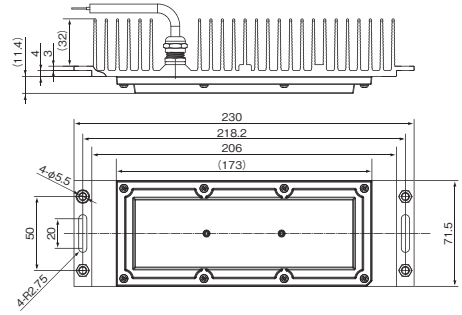
Package	Appearance (Actual size)	Outline drawing
CLU701		
CLU711		
CLU721		
CLU731		

Package	Appearance	Outline drawing
PSL440	6.5 (L) × 6.5 (W) × 0.95 (H) mm	Unit:mm

AC Disk Module

Package	Appearance	Outline drawing
LMAW-001A	 Φ59×1.6 mm	 Unit:mm
LMAW-002A	 Φ59×1.6 mm	 Unit:mm
LMAW-003A	 Φ45×1.6 mm	 Unit:mm
LMAW-004A	 Φ70×1.6 mm	 Unit:mm
LMAC-001A	 Φ100×1.6 mm	 Unit:mm

CSP Module

Package	Appearance	Outline drawing
LMZ001	 196.5 (L) × 93.5 (W) × 17.4 (H) mm	 Unit:mm
LMZ002	 230.0 (L) × 71.5 (W) × 50.4 (H) mm	 Unit:mm



Application Guide

Product	Lamp 	Downlight 	Spotlight 	Panel lighting 	Linear Ambient 	High-bay lighting 	Outdoor 
Ver.6 COB							
CLU550							
CLL104							
PSL445							
Compact SMD							
High Intensty COB Ver.2							
PSL440							
Vivid Series Brilliant Type							
Vivid Series Natural Type							
Below B.B.L.							
Super High CRI							
Amber color COB							
Blue color COB							
AC Disk Module							
CSP Module							

Note Orange Color frames mean preferable application for our products.

We offer various kinds of customer support.
Our goal is to support your application development efficiently.

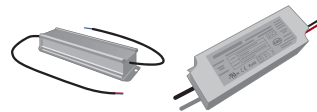
Solution Information

We have introduced a variety of solutions produced by manufacturers in several countries, in order to support business solutions.

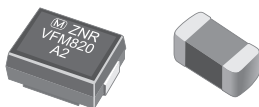
■ Optical solutions



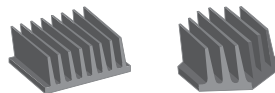
■ Electrical solutions



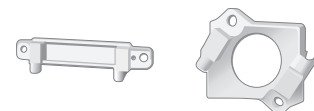
■ Electrical devices



■ Thermal solutions



■ Connectors



► <http://ce.citizen.co.jp/productse/solutions.php>

Application Notes

We have prepared a variety of technical information to support your development easily. Our application notes solve your design problems with Thermal management, Driving, LM80, Instruction Manual.

■ Instruction Manual (COB LED Package)



■ LM80 (Laboratory accreditation)



■ Thermal management



► <http://ce.citizen.co.jp/productse/technology.php>

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Contacts

Sales Offices

●Europe

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LED LINECARD



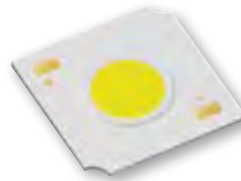
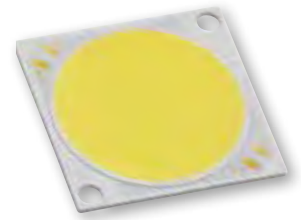
elincom

WE BELIEVE THAT ALL TECHNICAL DESIGNS CAN BE IMPROVED

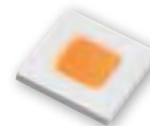
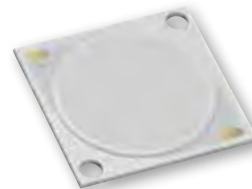
COB & SMD POWER LED'S

- 0,06W ~ 550W
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- No binning necessary Mac Adam step 2 / 3
- Round light output image
- Extremely durable
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CITIZEN
Micro HumanTech



CITILED
The Light Engine



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- 6W - 220W
- Constant voltage and constant current
- Programmable settings even with power off
- Emergency lighting led driver with integrated battery

FULHAM
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Elincom electronics BV
Klaverbaan 101
2908 KD Capelle aan den IJssel, The Netherlands
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Chamber of Commerce Rotterdam: 02330227