

## Reference Module - Ra90 Series

The Ra90 Series utilizes Seoul's high performing and cost effective 3528 LEDs to deliver efficacies up to 162 Lm/W at typical driving currents. This solution features uniformity of light and color and enables easy installation with a Zhaga compatible mounting pattern.

### Applications:



### Features:

- High efficacy, long life
- Industry standard mechanical attributes
- Optimized for industry standard power supplies
- 3 SDCM
- Multiple CCT option

### Key Applications:

- Troffer Retrofit
- Linear lighting
- LED Panel
- Channel

**Overview: SMJD-2413048C-XXH1**  $I_F = 600\text{mA}$ ,  $T_p = 45^\circ\text{C}$

CCT	CRI	Flux		Dimension	Order Code
		Min.	Typ.		
6500	90	1940	2020	560 x 18 mm	SMJD-2413048C-XXH100C02A039AII
5700		1940	2040		SMJD-2413048C-XXH100C04B039AII
5000					SMJD-2413048C-XXH100C14C039AII
4500		2040	2140		SMJD-2413048C-XXH100C14D039AII
4000					SMJD-2413048C-XXH100C14E039AII
3500					SMJD-2413048C-XXH100C04F039AII
3000		1940	2040		SMJD-2413048C-XXH100C04G039AII
2700		1840	1940		SMJD-2413048C-XXH100B94H039AII

**Overview: SMJD-4826096C-XXH1**  $I_F = 600\text{mA}$ ,  $T_p = 45^\circ\text{C}$

CCT	CRI	Flux		Dimension	Order Code
		Min.	Typ.		
6500	90	3880	4050	1120 x 18 mm	SMJD-4826096C-XXH100E05A039AII
5700		3880	4090		SMJD-4826096C-XXH100E09B039AII
5000					SMJD-4826096C-XXH100E29C039AII
4500		4090	4290		SMJD-4826096C-XXH100E29D039AII
4000					SMJD-4826096C-XXH100E29E039AII
3500					SMJD-4826096C-XXH100E09F039AII
3000		3880	4090		SMJD-4826096C-XXH100E09G039AII
2700		3680	3880		SMJD-4826096C-XXH100D88H039AII

### Notes:

- [1] Above data tested with constant typical current at  $T_p = 45^\circ\text{C}$ .  
 [2]  $\Phi_v$  is the total luminous flux output measured with an integrated sphere, tolerance is 7%.  
 [3] Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.

**Electro Optical Characteristics: SMJD-2413048C-XXH1**  $I_F = 600\text{mA}$ ,  $T_p = 45^\circ\text{C}$ 

Parameter	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Luminous Efficiency	LPW		162		Lm/W	E rank
			155			C, D rank
			153			A, B, F, G rank
			147			H rank
Correlated Color Temperature <sup>[3]</sup>	CCT	6000	6500	7000	K	A rank
		5300	5700	6000		B rank
		4700	5000	5300		C rank
		4200	4500	4700		D rank
		3700	4000	4200		E rank
		3200	3500	3700		F rank
		2900	3000	3200		G rank
		2600	2700	2900		H rank
CRI	Ra	90				
Input Voltage	$V_F$	21	22	23	$V_{DC}$	@600mA
Power Consumption	P	12	13.2	14	W	

**Electro Optical Characteristics: SMJD-4826096C-XXH1**  $I_F = 600\text{mA}$ ,  $T_p = 45^\circ\text{C}$ 

Parameter	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Luminous Efficiency	LPW		161		Lm/W	E rank
			153			C, D rank
			152			A, B, F, G rank
			145			H rank
Correlated Color Temperature <sup>[3]</sup>	CCT	6000	6500	7000	K	A rank
		5300	5700	6000		B rank
		4700	5000	5300		C rank
		4200	4500	4700		D rank
		3700	4000	4200		E rank
		3200	3500	3700		F rank
		2900	3000	3200		G rank
		2600	2700	2900		H rank
CRI	Ra	90				
Input Voltage	$V_F$	43	44.5	46	$V_{DC}$	@600mA
Power Consumption	P	25	26.7	28	W	

**Notes:**

[1] Above data tested with constant typical current at  $T_p = 45^\circ\text{C}$ .

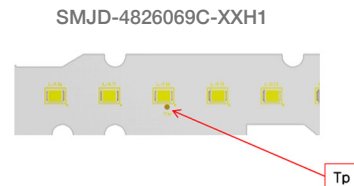
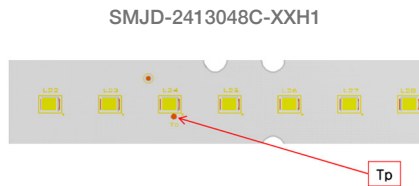
[2]  $\Phi_v$  is the total luminous flux output measured with an integrated sphere, tolerance is 7%.

[3] Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.

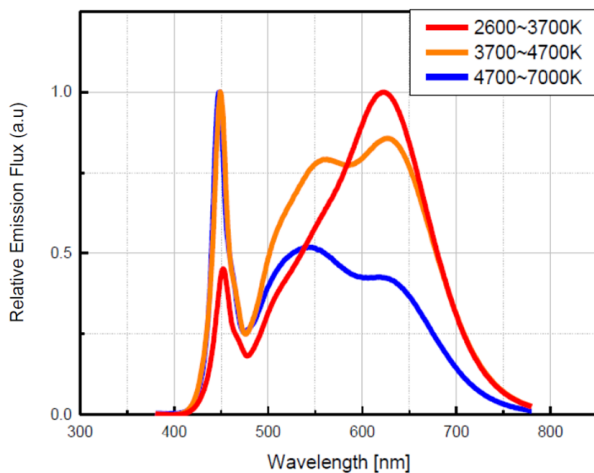
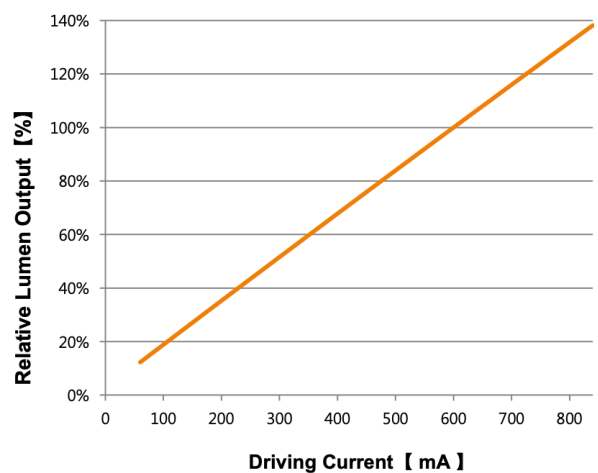
[4] To use the module properly, recommend to drive the module by a Constant Current Source (CCS). But the Maximum output voltage of the CCS should be limited by referring this sheet.

**Absolute Maximum Operating Specification:**  $T_p = 45^\circ\text{C}$ 

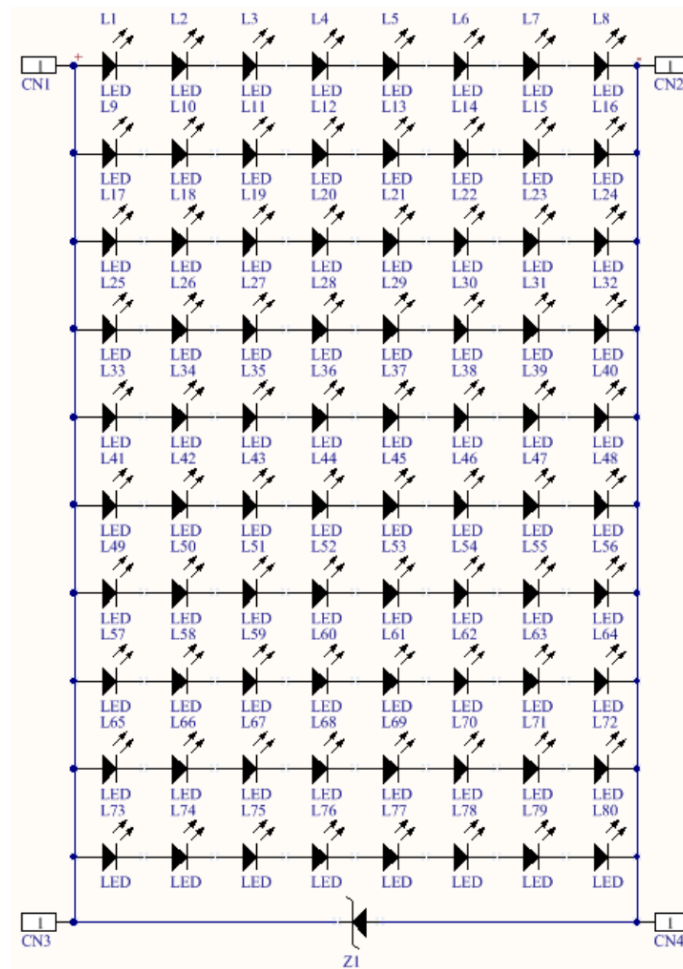
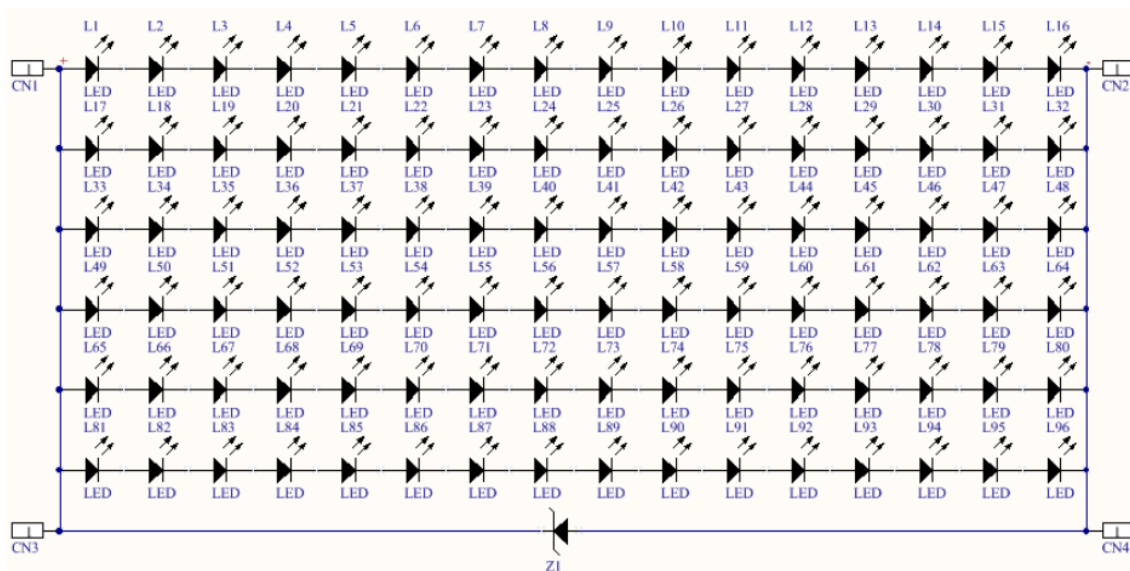
Model	Parameter	Symbol	Unit	Value	Remark
<b>SMJD-2413048C-XXH1</b>	Power Consumption	P	W	18.5	Typical VF of module is around 22VDC and VF_MAX is around 23VDC, respectively.
	Forward Voltage	$V_F$	V	22	
	Driving Current <sup>(2)</sup>	$I_F$	mA	840	
<b>SMJD-4826096C-XXH1</b>	Power Consumption	P	W	37	Typical VF of module is around 44.5VDC and VF_MAX is around 46VDC, respectively.
	Forward Voltage	$V_F$	V	44.5	
	Driving Current <sup>(2)</sup>	$I_F$	mA	840	
<b>All</b>	Operating Temperature <sup>(3)</sup>	$T_p$	$^\circ\text{C}$	-40 ~ 85	Reference point
	Storage Temperature	$T_{ctg}$	$^\circ\text{C}$	-40 ~ 100	With no power
	ESD Sensitivity	-	KV	$\pm 8$ $\pm 4$	IEC Air HBM

**Illustration: How to predict components temperature**

**Notes:**

- [1] All guarantee are based on the Absolute Maximum Ratings listed.  
[2] Please use a Constant Current Source (CCS) to drive the module, the typical  $V_F$  of each module is listed in remark section.  
[3] Operating temperature was tested at the assigned  $T_c$  point on the PCB.  
[4] To ensure the module works properly, DO NOT let  $T_p$  rise above  $85^\circ\text{C}$ .

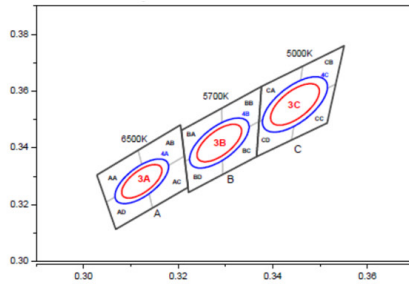
**Relative Spectral Distribution**
**• Relative Spectral Distribution vs. Wavelength**
**Relative Spectral Distribution vs. Wavelength Characteristic**

**Forward Current vs. Relative Luminous Flux,  $T_p=45^\circ\text{C}$** 


## Circuit Diagrams

**SMJD-2413048C-XXH1**

**SMJD-4826096C-XXH1**


## Color Bin Structure

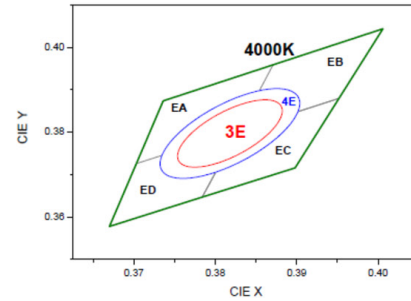
### • CIE Chromaticity Diagrams



6500K 3Step		5700K 3Step		5000K 3Step	
3A		3B		3C	
Center point	0.3123 : 0.3282	Center point	0.3287 : 0.3417	Center point	0.3447 : 0.3553
Major Axis a	0.00669	Major Axis a	0.00746	Major Axis a	0.00822
Minor Axis b	0.00285	Minor Axis b	0.00320	Minor Axis b	0.00354
Ellipse		Ellipse		Ellipse	
Rotation Angle	58.57	Rotation Angle	59.09	Rotation Angle	59.62

6500K 4Step		5700K 4Step		5000K 4Step	
4A		4B		4C	
Center point	0.3123 : 0.3282	Center point	0.3287 : 0.3417	Center point	0.3447 : 0.3553
Major Axis a	0.00892	Major Axis a	0.00995	Major Axis a	0.01096
Minor Axis b	0.00380	Minor Axis b	0.00427	Minor Axis b	0.00472
Ellipse		Ellipse		Ellipse	
Rotation Angle	58.57	Rotation Angle	59.09	Rotation Angle	59.62

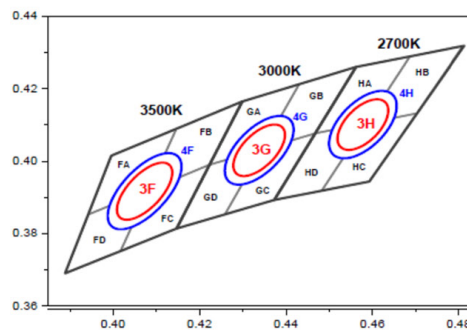
AA		AB		AC		AD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3028	0.3304	0.3115	0.3393	0.3131	0.329	0.3048	0.3209
0.3048	0.3209	0.3131	0.329	0.3146	0.3187	0.3068	0.3113
0.3131	0.329	0.3213	0.3371	0.3221	0.3261	0.3146	0.3187
0.3115	0.3393	0.3205	0.3481	0.3213	0.3371	0.3131	0.329
BA		BB		BC		BD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3207	0.3462	0.3292	0.3539	0.3293	0.3423	0.3215	0.3353
0.3215	0.3353	0.3293	0.3423	0.3294	0.3306	0.3222	0.3243
0.3293	0.3423	0.3371	0.3493	0.3366	0.3369	0.3294	0.3306
0.3292	0.3539	0.3376	0.3616	0.3371	0.3493	0.3293	0.3423
CA		CB		CC		CD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3376	0.3616	0.3463	0.3687	0.3452	0.3558	0.3371	0.3493
0.3371	0.3493	0.3452	0.3558	0.344	0.3428	0.3366	0.3369
0.3452	0.3558	0.3533	0.3624	0.3514	0.3487	0.344	0.3428
0.3463	0.3687	0.3551	0.376	0.3533	0.3624	0.3452	0.3558



4000K 3Step	
3E	
Center point	0.3818 : 0.3797
Major Axis a	0.00939
Minor Axis b	0.00402
Ellipse	
Rotation Angle	53.72

4000K 4Step	
4E	
Center point	0.3818 : 0.3797
Major Axis a	0.01252
Minor Axis b	0.00536
Ellipse	
Rotation Angle	53.72

EA		EB	
CIE X	CIE Y	CIE X	CIE Y
0.3736	0.3874	0.3871	0.3959
0.3703	0.3726	0.3828	0.3803
0.3828	0.3803	0.3952	0.388
0.3871	0.3959	0.4006	0.4044
EC		ED	
CIE X	CIE Y	CIE X	CIE Y
0.3828	0.3803	0.3703	0.3726
0.3784	0.3847	0.367	0.3578
0.3898	0.3716	0.3784	0.3647
0.3952	0.388	0.3828	0.3803



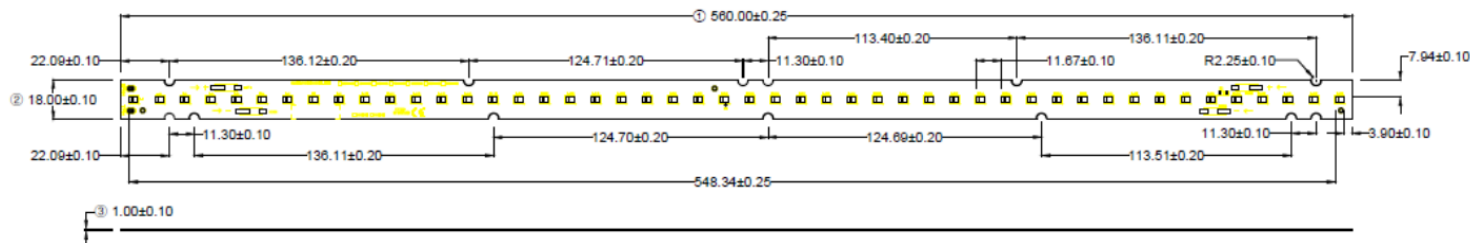
3500K 3Step		3000K 3Step		2700K 3Step	
3 Step		3 Step		3 Step	
Center point	0.4073 : 0.3917	Center point	0.4338 : 0.4030	Center point	0.4578 : 0.4101
Major Axis a	0.00927	Major Axis a	0.00834	Major Axis a	0.00810
Minor Axis b	0.00414	Minor Axis b	0.00408	Minor Axis b	0.00420
Ellipse		Ellipse		Ellipse	
Rotation Angle	54.00	Rotation Angle	53.22	Rotation Angle	53.70

3500K 4Step		3000K 4Step		2700K 4Step	
4 Step		4 Step		4 Step	
Center point	0.4073 : 0.3917	Center point	0.4338 : 0.4030	Center point	0.4578 : 0.4101
Major Axis a	0.01236	Major Axis a	0.01112	Major Axis a	0.01080
Minor Axis b	0.00552	Minor Axis b	0.00544	Minor Axis b	0.00560
Ellipse		Ellipse		Ellipse	
Rotation Angle	54.00	Rotation Angle	53.22	Rotation Angle	53.70

FA		FB		FC		FD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3996	0.4015	0.4146	0.4089	0.4082	0.392	0.3943	0.3853
0.3943	0.3853	0.4082	0.392	0.4017	0.3751	0.3889	0.369
0.4082	0.392	0.4223	0.399	0.4147	0.3814	0.4017	0.3751
0.4146	0.4089	0.4299	0.4165	0.4223	0.399	0.4082	0.392
GA		GB		GC		GD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4299	0.4165	0.443	0.4212	0.4345	0.4033	0.4223	0.399
0.4223	0.399	0.4345	0.4033	0.4259	0.3853	0.4147	0.3814
0.4345	0.4033	0.4468	0.4077	0.4373	0.3893	0.4259	0.3853
0.443	0.4212	0.4562	0.426	0.4468	0.4077	0.4345	0.4033
HA		HB		HC		HD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4562	0.426	0.4687	0.4289	0.4585	0.4104	0.4468	0.4077
0.4468	0.4077	0.4585	0.4104	0.4483	0.3919	0.4373	0.3893
0.4585	0.4104	0.4703	0.4132	0.4593	0.3944	0.4483	0.3919
0.4687	0.4289	0.481	0.4319	0.4703	0.4132	0.4585	0.4104

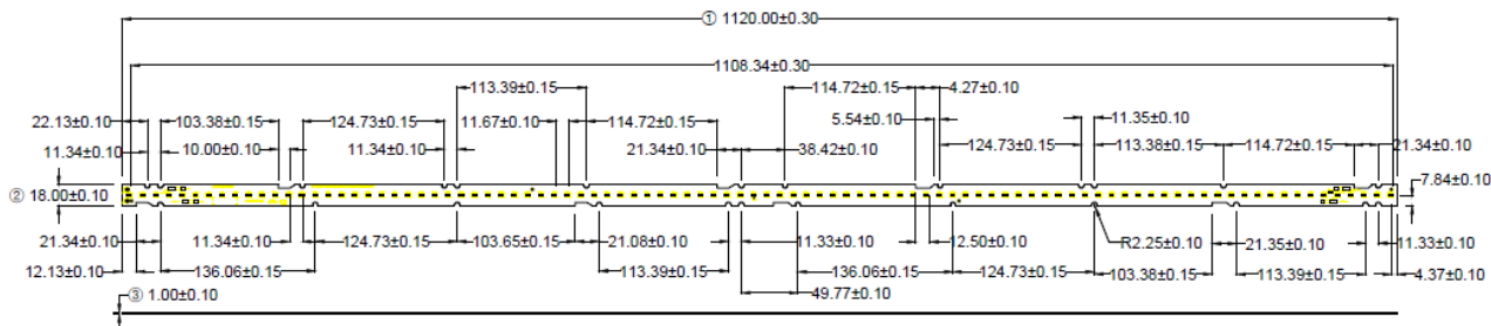
## Mechanical Dimensions

## SMJD-2413048C-XXH1



Dimension	Specification	Tolerance	Unit
Module Length	560	±0.25	mm
Module Width	18	±0.1	
PCB Thickness	1.0	±0.1	

## SMJD-4826096C-XXH1



Dimension	Specification	Tolerance	Unit
Module Length	1120	±0.3	mm
Module Width	18	±0.1	
PCB Thickness	1.0	±0.1	



## Product Nomenclature: Product Name Rule

\*Please refer to the following chart for example:

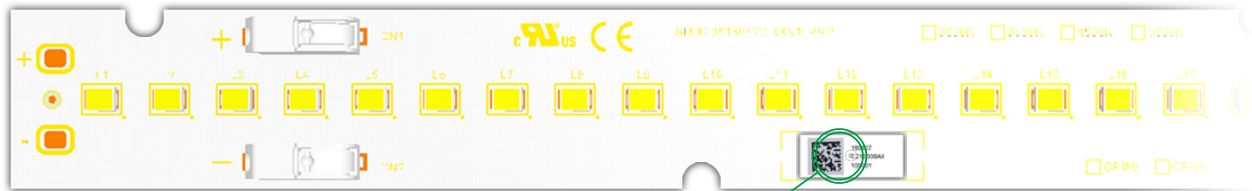
S M J D - 24 13 048 C - XX H 1										
Seoul DC Module										
Voltage		Power		LED Qty			Type	Custom	Dimming	Etc
2	4	1	3	0	4	8	C	XX	H	1
0 0V	0 0V	0 0W	0 0W	0 0ea	0 0ea	0 0ea	G 3030	XX ref	N Norm	1 vers
1 10V	1 1V	1 10W	1 1W	1 100ea	1 10ea	1 1ea			D Dim	
2 20V	2 2V	2 20W	2 2W	2 200ea	2 20ea	2 2ea			S STW8A2PD E1(H)(S)	
3 30V	3 3V	3 30W	3 3W	3 300ea	3 30ea	3 3ea			H STW9A2PD -E1(H)	
-	-	-	-	-	-	-			E etc	
9 90V	9 9V	9 90W	9 9W	9 900ea	9 90ea	9 9ea				
A 100V		A 100W		A 1000ea						
B 110V		B 110W		B 1100ea						
-		-		-						

## Product Nomenclature: Binning

\*Please refer to the following chart for example:

00 C14 E03 9 ALL				
Lens Type	Flux Bin	CCT Bin	CRI Bin	VF Bin
00	B05	E03	8	ALL
00 No Lens	C14 2140 lm	A03 6500k - 3 step	8 CRI 80	All 21 ~ 23V
	C04 2040 lm	B03 5700k - 3 step	9 CRI 90	
	C02 2020 lm	C03 5000k - 3 step		
	B94 1940 lm	D03 4500k - 3 step		
		E03 4000k - 3 step		
		F03 3500k - 3 step		
		G03 3000k - 3 step		
		H03 2700k - 3 step		

## Marking Information

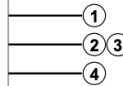


Marking point

QR Code  
Information



YYMMDD  
C14E039All  
100001



No.	Item	Information	Digits	Remark
	Date	YYMMDD	6 Digit	SMT date
<input type="checkbox"/>	Flux <sup>(1)</sup>	C14	3 Digit	C14=2140lm
<input type="checkbox"/>	CCT	X03 3-step	3 Digit	X=A,B,C,D,E,F,G,H
<input type="checkbox"/>	CRI	9	1 Digit	CRI=90
<input type="checkbox"/>	V <sub>F</sub>	All	3 Digit	Y1L or Y1H
<input type="checkbox"/>	Lot No.	1	1 Digit	0~9,A~Z
	Sequence No.	00001	5 Digit	00001 ~ 99999
<input type="checkbox"/>	QR Code	QR Code	-	Please refer to below table

**Note:**


\*Flux Bin - please refer to following chart for definitions:

## Flux Bin Definitions

Symbol	lm	Symbol	lm	Symbol	lm	Symbol	lm
B65	1650	O50	14500	R50	17500	U50	20500
M20	12200	P50	15500	S50	18500	V20	21200
N00	13000	Q50	16500	T50	19500	W00	22000



## Module QR Code Information

<div>  <b>QR Code Information</b> </div>								
Items	Factory	SAP Code	SMT Date	MP Information	Line No.	Lot No.	Product	Note
Digits	1 Digit	7 Digits	6 Digits	10 Digits	1 Digit	1 Digit	5 Digits	Total count is 31 Digits
Information	*	*****	YYMMDD	C14E03 9All	1~9, A~Z	1~9, A~Z	00001	

**Notes:**

[1] The QR code information is comprised of characters explained in the table above.

[2] The size of the QR code shall be no smaller than 4.5mm x 4.5mm and have a minimum QR code grade of 'C'.


Please note that QR code grade 'A' is preferred.

[3] If the component is too small to have a full label, the QR code may be printed on a label with a minimum size of 6mm X 6mm.

[4] The length of the QR code is 31 digits and includes all characters combined without spaces.

Example: XXXXXXXX191112C14E039All1100001

## Label Information

<b>PO Number</b> 	<b>XXXXXX</b> 
<b>Supplier Part Number</b> 	<b>SMJD-2413048C-XXH100C14E039ALL<sup>(1)</sup></b> 
<b>Bin Code</b> 	<b>C14E039ALL<sup>(2)</sup></b> 
<b>Quantity</b> 	<b>XX</b> 
<b>Country of Origin</b> 	<b>XX<sup>(3)</sup></b> 
<b>Date Code</b> 	<b>YYYYWW<sup>(4)</sup></b> 
<b>Lot Code</b> 	<b>YYMDDXXXXX- XXXXXXXX<sup>(5)</sup></b> 
	<b>SEOUL SEMICONDUCTOR CO.,LTD.</b>

**Notes:**

[1] & [2] Please refer to spec page

[3] Country of Origin: 2 digit code. For example: Chinese


Code: CN

YYMDD : Packing Date (Oct. : A, Nov. : B, Dec. : C)

X = Initial of Manufacturer

XXXX = Sealing Pack No.

XXXXXXXX = SSC SAP Code

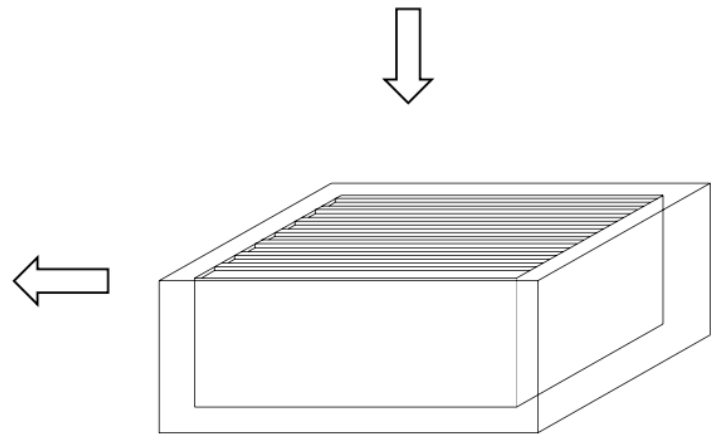
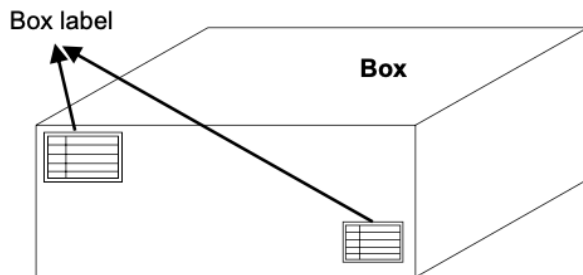
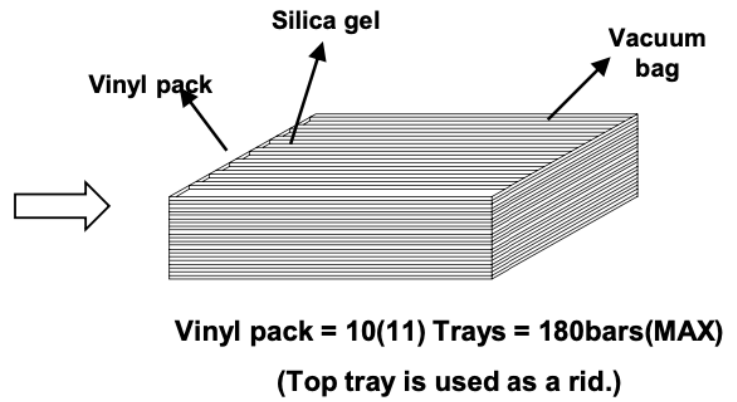
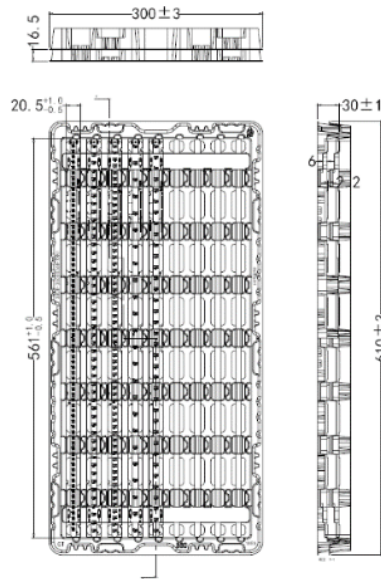
<b>TOTAL Quantity</b>        <b>XXX</b>
 <b>SEOUL SEMICONDUCTOR CO.,LTD.</b>

**Notes:**

[1] Attached to the bottom right corner of the carton box.

## Packaging Specification

Model	Tray		Box		Pallet	
	Size (mm)	Q'ty per tray	Size (mm)	Q'ty per box	Size (mm)	Q'ty per pallet
SMJD-2413048C-XXH1	610 x 300 x 30	18	625 x 325 x 220	180	1100 x 1100 x 150	4320
SMJD-4826096C-XXH1	1230 x 285 x 23	16	1260 x 305 x 183	144	1300 x 1100 x 150	3024



**1 Box = 10(11) Trays = 180bars (MAX)**

## Storage before use

1. When storing devices for a long period of time before usage, please following these guidelines.
  - The devices should be stored in the anti-static bag that it was shipped in from Seoul-Semiconductor with opening
  - If the anti-static bag has been opened, re-seal preventing air and moisture from being present in the bag.



# SEOUL SEMICONDUCTOR

## Company Information

Seoul Semiconductor (SeoulSemicon.com) manufactures and packages a wide selection of light emitting diodes (LEDs) for the automotive, general illumination/ lighting, appliance, signage and back lighting markets. The company is the world's fifth largest LED supplier, holding more than 10,000 patents globally, while offering a wide range of LED technology and production capacity in areas such as "nPola", deep UV LEDs, "Acrich", the world's first commercially produced AC LED, and "Acrich MJT - Multi-Junction Technology", a proprietary family of high-voltage LEDs. The company's broad product portfolio includes a wide array of package and device choices such as Acrich, high-brightness LEDs, mid-power LEDs, side-view LEDs, through-hole type LED lamps, custom displays, and sensors. The company is vertically integrated from epitaxial growth and chip manufacture in its fully owned subsidiary, Seoul Viosys, through packaged LEDs and LED modules in three Seoul Semiconductor manufacturing facilities. Seoul Viosys also manufactures a wide range of unique deep-UV wavelength devices.

## Legal Disclaimer

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