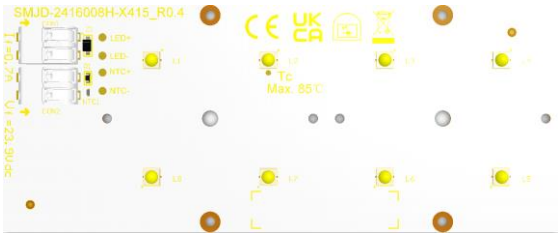
DC Type

SMJD-2416008H-X415



Product Brief

Description

- This reference module is based on White Colored surface-mount LED comes in standard package dimension. Package Size : 3.5x3.5x2.29mm
- The package design coupled with careful selection of component materials allow these products to perform with high reliability .

Features and Benefits

- High Intensity output and high luminance
- High Efficacy
- Compatible with 3rd party optics
- Lead free product
- RoHS compliant

Key Applications

- Street Lighting
- Area Lighting
- Residential Lighting
- Urban Lighting

Table 1. Order Code

Nominal CCT (K)	CRI	Lens Type	Order Code
6500	70	No lens	SMJD-2416008H-X41500C51A057ALL
5700	70	No lens	SMJD-2416008H-X41500C51B057ALL
5000	70	No lens	SMJD-2416008H-X41500C51C057ALL
4000	70	No lens	SMJD-2416008H-X41500C62E057ALL
3500	70	No lens	SMJD-2416008H-X41500C40F057ALL
3000	70	No lens	SMJD-2416008H-X41500C40G057ALL
2700	70	No lens	SMJD-2416008H-X41500C29H057ALL
2200	70	No lens	SMJD-2416008H-X41500C18K057ALL

Table of Contents

Performance Characteristics

Table 2. Electro Optical Characteristics T_C = 25°C, I_F = 700mA

Parameter	Symbol	Value			Unit	Mark
		Min.	Typ.	Max.		
Luminous Flux	Φ_V [2]	2330	2510	-	lm	A, B, C rank
		2440	2620	-		E rank
		2230	2400	-		F,G rank
		2130	2290	-		H rank
		2030	2180	-		K rank
Luminous Efficiency	LPW	-	150	-	Lm/W	A, B, C rank
		-	157	-		E rank
		-	144	-		F,G rank
		-	137	-		H rank
		-	131	-		K rank
Correlated Color Temperature [3]	CCT	6000	6500	7000	K	A05
		5300	5700	6000		B05
		4700	5000	5300		C05
		3700	4000	4200		E05
		3200	3500	3700		F05
		2900	3000	3200		G05
		2600	2700	2900		H05
		2100	2200	2300		K05
CRI	Ra	70	-	-	-	
Color Consistency	-	-	-	5	SDCM	
Input Voltage [4]	V_{in}	22	23.9	25	Vdc	
Input Current	I_F	-	0.7	-	A	-
Power	P		16.7		W	
Viewing Angle	$2\Theta_{1/2}$		120		deg.	

Notes :

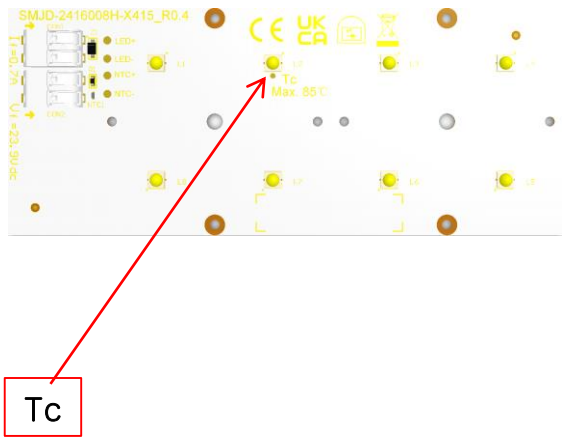
1. The above data were tested at Tc= 25ºC.
2. ΦV is the total luminous flux output measured with an integrated sphere.
3. Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.
4. To use the module properly, recommend to drive the module by a Constant Current Source (CCS). But the Maximum output voltage of the CCS should be limited by referring this sheet

Absolute Maximum Ratings

Table3. Absolute Maximum Ratings, Tc= 25ºC

Parameter	Symbol	Unit	Value	Remark
Power Consumption	P	W	36	$P_{\_Typ.}$= 16.7W
Driving Current(2)	I_F	A	1.4	$I_{F\_Typ.}$ = 0.7A
Operating Temperature(3)	Tc	ºC	- 40 ~ 85	Reference point
Storage Temperature	T_{stg}	ºC	- 40 ~ 100	With no power
ESD Sensitivity	-	KV	±8.0	HBM

ILLUSTRATION 1: How to predict components temperature (4)



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 module is around 23.9VDC and V_{F_MAX} is around 25VDC, respectively.

(3) Operating temperature was tested at the assigned Tc point on the PCB.

(4) To ensure the module works properly, DO NOT let the Tc upper than 85 ºC;

Characteristic Graph

Fig 1. Relative Spectral Distribution vs. Wavelength Characteristic

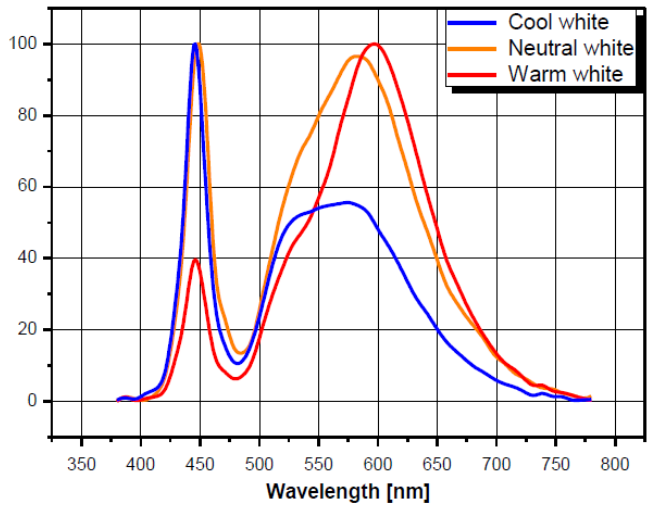
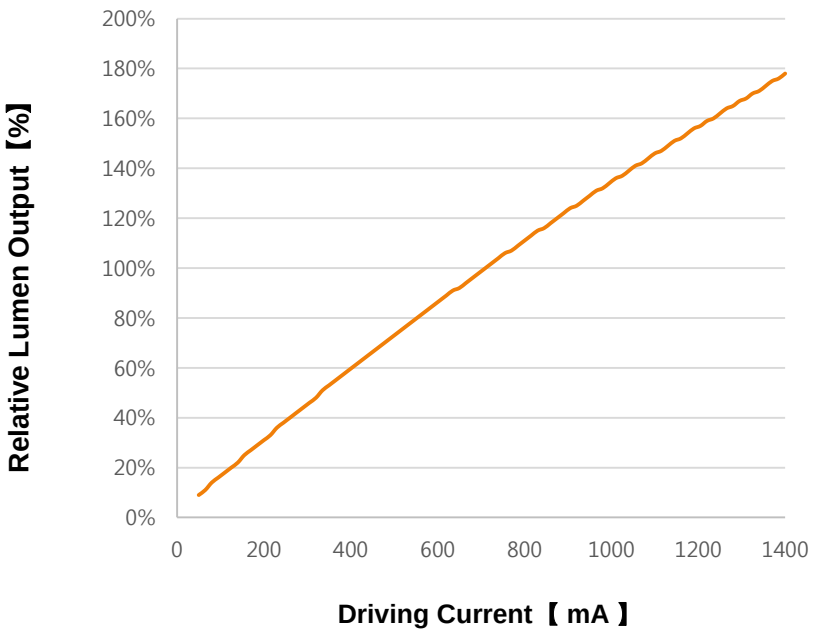


Fig 2. Forward Current vs. Relative Luminous Flux, Tc=25℃



Characteristic Graph

Fig 3. Forward Current vs. Forward Voltage, Tc=25℃

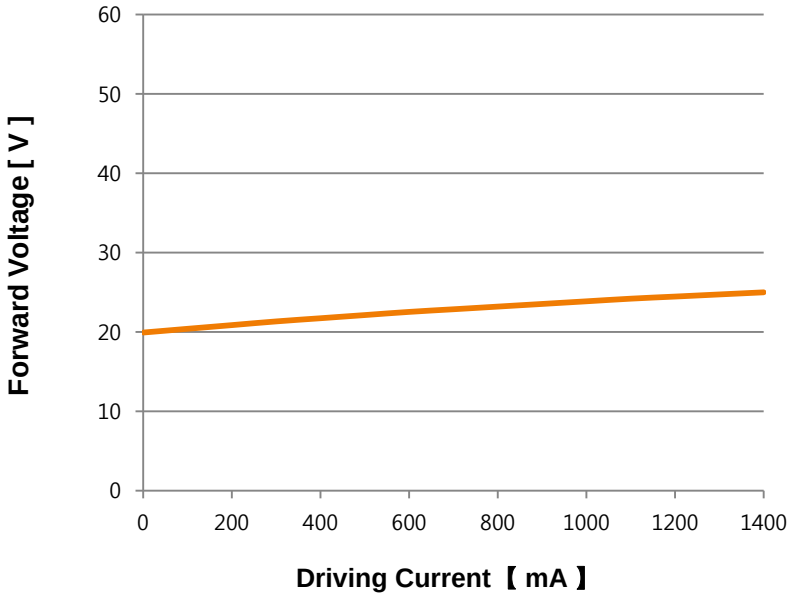
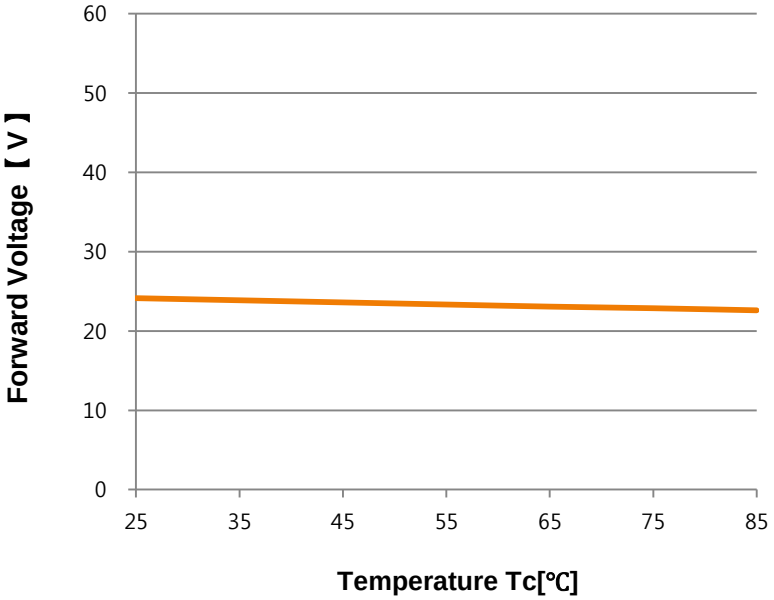


Fig 4. Forward voltage vs. Temperature, I_F=700mA



Characteristic Graph

Fig 5. Flux and Efficacy vs. Temperature (at I_F=700mA)

Tc [ºC]	Flux[%]	Efficacy[%]
25	100.0	100.0
45	98.8	99.8
65	97.2	99.1
85	95.2	97.8

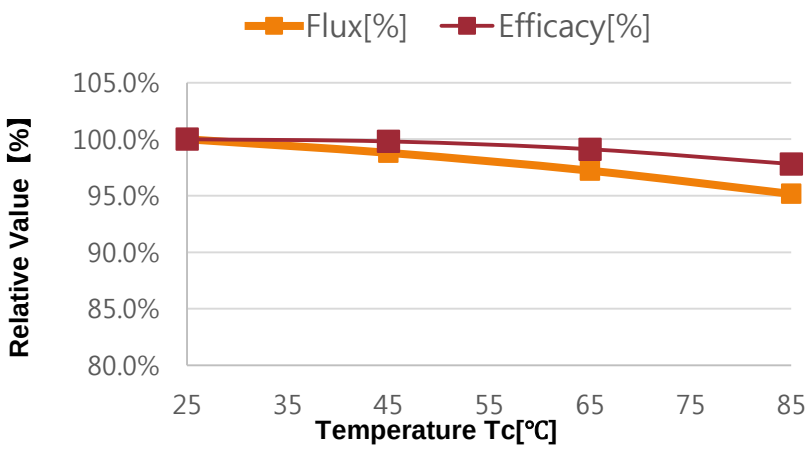
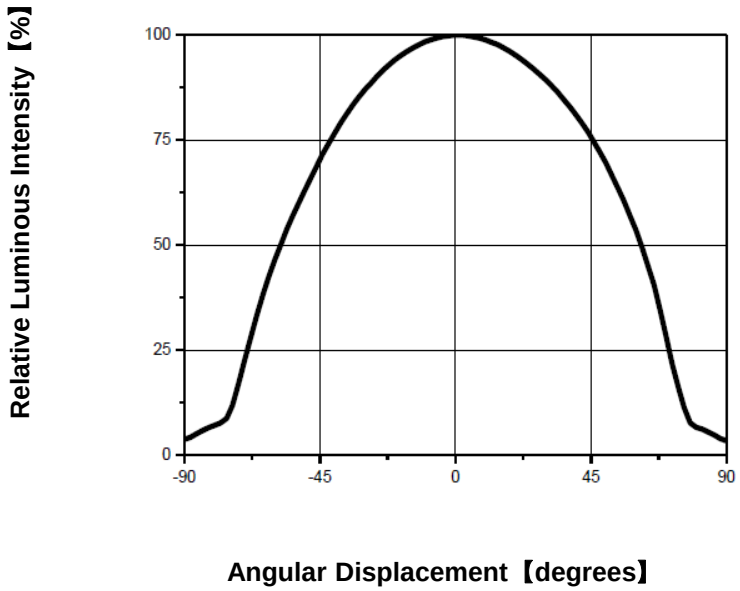
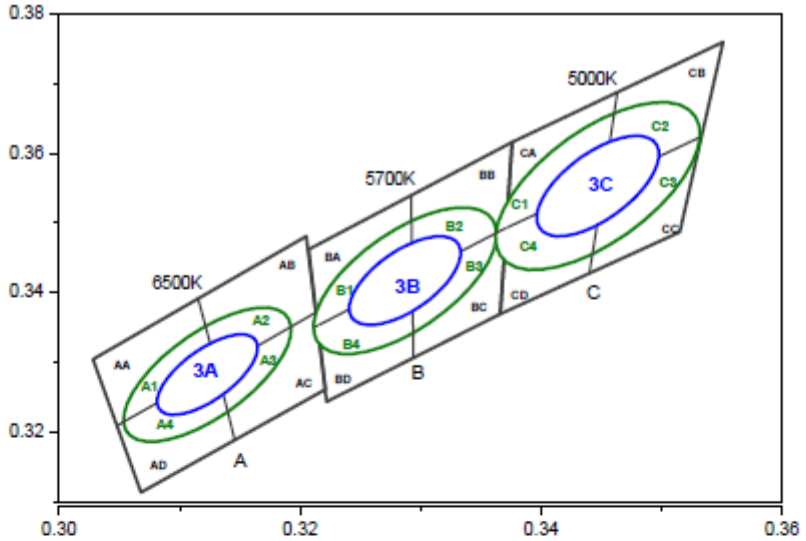


Fig 6. Typical Spatial Distribution



Color Bin Structure

Fig 7. CIE Chromaticity Diagram



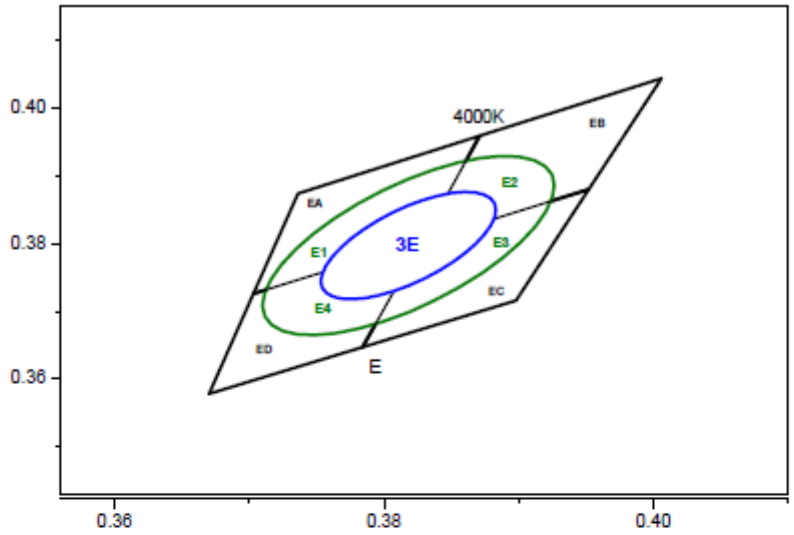
6500K 3Step		5700K 3Step		5000K 3Step	
3A		3B		3C	
Center point	0.3123 : 0.3282	Center point	0.3287 : 0.3417	Center point	0.3447 : 0.3553
Major Axis a	0.0066	Major Axis a	0.0072	Major Axis a	0.0081
Minor Axis b	0.0027	Minor Axis b	0.0032	Minor Axis b	0.0035
Ellipse Rotation Angle	58	Ellipse Rotation Angle	59	Ellipse Rotation Angle	60

6500K 5Step		5700K 5Step		5000K 5Step	
5A		5B		5C	
Center point	0.3123 : 0.3282	Center point	0.3287 : 0.3417	Center point	0.3447 : 0.3553
Major Axis a	0.0110	Major Axis a	0.0119	Major Axis a	0.0135
Minor Axis b	0.0045	Minor Axis b	0.0052	Minor Axis b	0.0059
Ellipse Rotation Angle	58	Ellipse Rotation Angle	59	Ellipse Rotation Angle	60

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	0.3290	0.3048	0.3209
0.3048	0.3209	0.3131	0.3290	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

Color Bin Structure

Fig 8. CIE Chromaticity Diagram



4000K 3Step

3E	
Center point	0.3818 : 0.3797
Major Axis a	0.0094
Minor Axis b	0.0041
Ellipse Rotation Angle	53.4

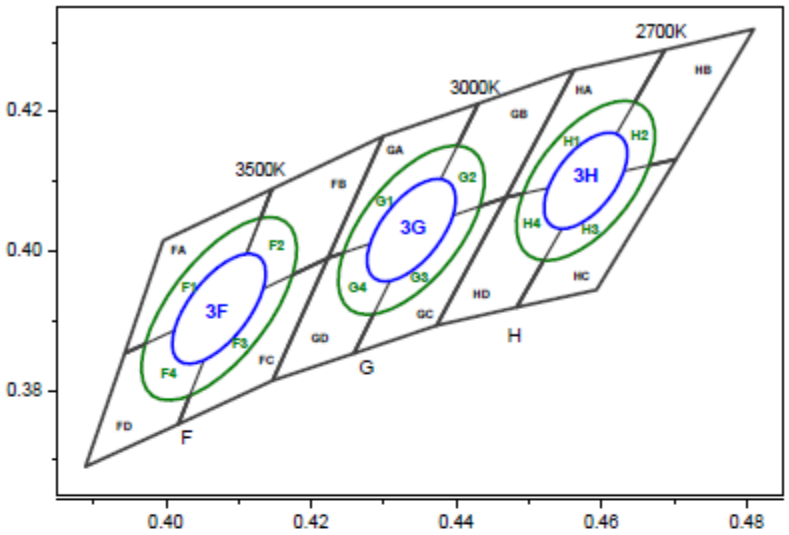
4000K 5Step

5E	
Center point	0.3818 : 0.3797
Major Axis a	0.0157
Minor Axis b	0.0067
Ellipse Rotation Angle	53

EA		EB		EC		ED	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3736	0.3874	0.3871	0.3959	0.3828	0.3803	0.3703	0.3726
0.3703	0.3726	0.3828	0.3803	0.3784	0.3647	0.3670	0.3578
0.3828	0.3803	0.3952	0.3880	0.3898	0.3716	0.3784	0.3647
0.3871	0.3959	0.4006	0.4044	0.3952	0.3880	0.3828	0.3803

Color Bin Structure

Fig 9. CIE Chromaticity Diagram

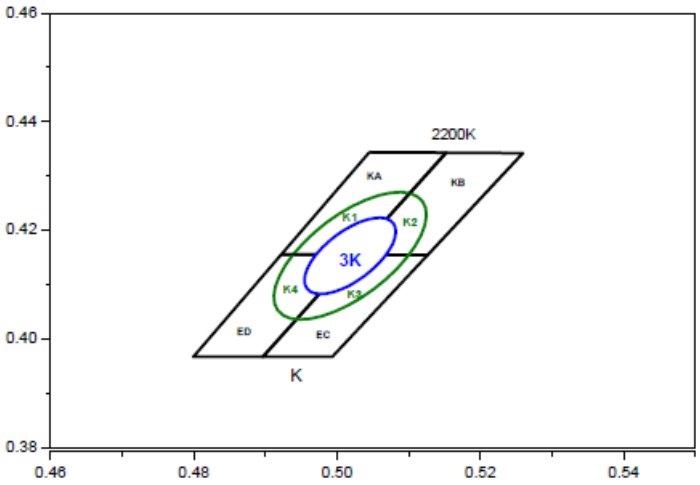


3500K 3Step		3000K 3Step		2700K 3Step	
3F		3G		3H	
Center point	0.4073 : 0.3917	Center point	0.4338 : 0.4030	Center point	0.4578 : 0.4101
Major Axis a	0.0093	Major Axis a	0.0086	Major Axis a	0.0080
Minor Axis b	0.0042	Minor Axis b	0.0042	Minor Axis b	0.0041
Ellipse Rotation Angle	54	Ellipse Rotation Angle	54	Ellipse Rotation Angle	54
3500K 5Step		3000K 5Step		2700K 5Step	
5F		5G		5H	
Center point	0.4073 : 0.3917	Center point	0.4338 : 0.4030	Center point	0.4578 : 0.4101
Major Axis a	0.0155	Major Axis a	0.0142	Major Axis a	0.0132
Minor Axis b	0.0068	Minor Axis b	0.0068	Minor Axis b	0.0068
Ellipse Rotation Angle	54	Ellipse Rotation Angle	54	Ellipse Rotation Angle	54

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	0.3920	0.3943	0.3853
0.3943	0.3853	0.4082	0.3920	0.4017	0.3751	0.3889	0.3690
0.4082	0.392	0.4223	0.3990	0.4147	0.3814	0.4017	0.3751
0.4146	0.4089	0.4299	0.4165	0.4223	0.3990	0.4082	0.3920
GA		**GB**		**GC**		**GD**	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4299	0.4165	0.4430	0.4212	0.4345	0.4033	0.4223	0.399
0.4223	0.3990	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
0.4430	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

Color Bin Structure

Fig 10. CIE Chromaticity Diagram



2200K 3Step

3K	
Center point	0.5018 : 0.4153
Major Axis a	0.0086
Minor Axis b	0.0040
Ellipse Rotation Angle	49.3

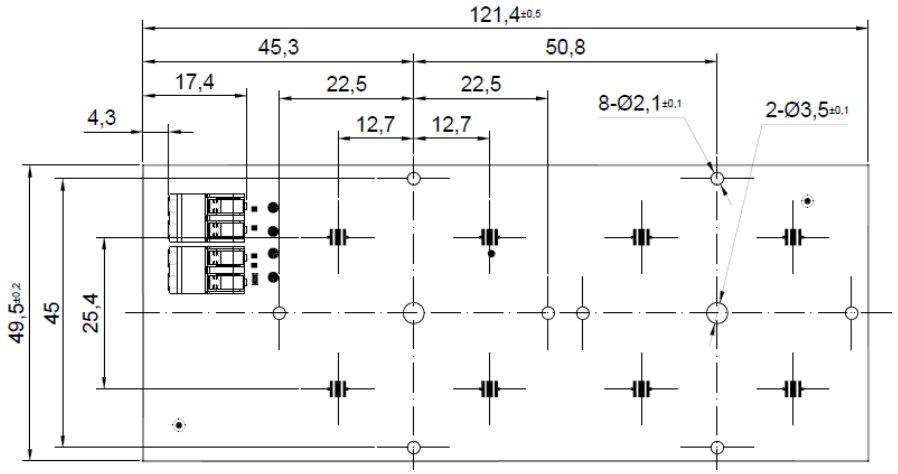
2200K 5Step

5K	
Center point	0.5018 : 0.4153
Major Axis a	0.0144
Minor Axis b	0.0066
Ellipse Rotation Angle	49.3

KA		KB		KC		KD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.5045	0.4344	0.5152	0.4343	0.5024	0.4155	0.4922	0.4156
0.4922	0.4156	0.5024	0.4155	0.4896	0.3967	0.4799	0.3967
0.5024	0.4155	0.5126	0.4155	0.4993	0.3967	0.4896	0.3967
0.5152	0.4343	0.5259	0.4342	0.5126	0.4155	0.5024	0.4155

Mechanical Dimensions

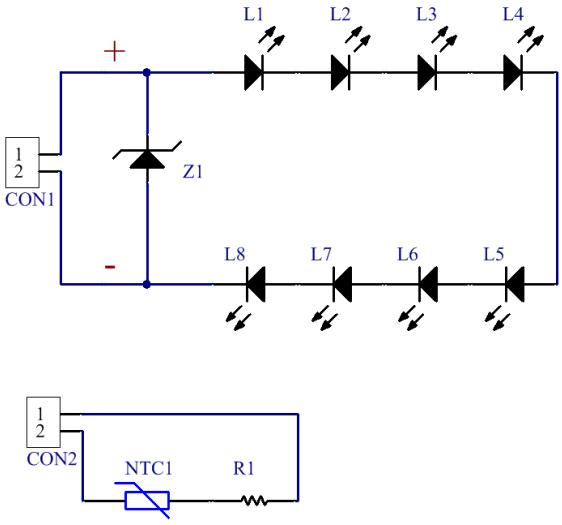
Fig 11. Mechanical Diagram



(1) All dimensions are in mm
(2) Not to Scale
(3) Module thickness 6.2 ± 0.1 mm

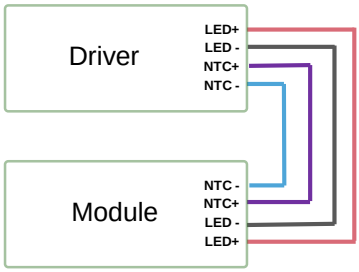
Circuit Drawing

Fig 12. Schematic Diagram

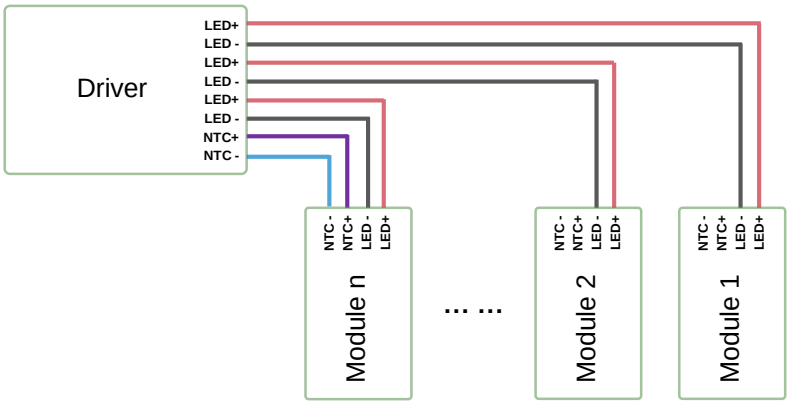


Application Information

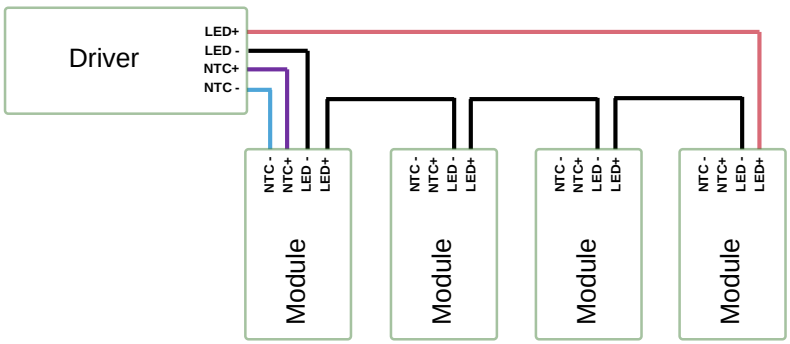
a). Connection between driver and module



c). Drive with multi output channels for group application



b). In series all modules for group application



Notes :

(1) For series application, The maximum number of modules in series allowed should be not more than 6.

Application Information

a). Application

IP rating	No IP-rating
Over Temperature Detection	A resistor and NTC in series, where R=2KOhm, R_{NTC}=15K Ohm NTC: NCP15XW153J03RC
Dimming	NO

Product Nomenclature

Product Name Rule:

S M J D - 24 16 008 H - X 4 15

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

①: SMJD – Seoul DC Module
② ~ ⑧: Refer to below table

Voltage				Power				LED Qty.						LED Type		Customer (Free)		CNT		FREE	
②				③				④						⑤		⑥		⑦		⑧	
2		4		1		6		0		0		8		H		X		4		15	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	H	3535	X	Reference	4	4way	15	Zhaga Book 15
1	10V	1	1V	1	10W	1	1W	1	100EA	1	10EA	1	1EA								
2	20V	2	2V	2	20W	2	2W	2	200EA	2	20EA	2	2EA								
3	30V	3	3V	3	30W	3	3W	3	300EA	3	30EA	3	3EA								
…	…	…	…	…	…	…	…	…	…	…	…	…	…								
9	90V	9	9V	9	90W	9	9W	9	900EA	9	90EA	9	9EA								
A	100V			A	100W			A	1000EA												
B	110V			B	110W																
…	…			…	…																
Z	350V			Z	350W																

Comments Rule:

(00 WN 70)

A B C

Lens Type		CCT		CRI	
A		B		C	
00		W0		70	
00	No lens	W0	6500K	70	CRI70
			5700K		
			5000K		
		WN	4000K		
		WW	3000K		
			2700K		
			2200K		

Product Nomenclature

Characteristics Rule:

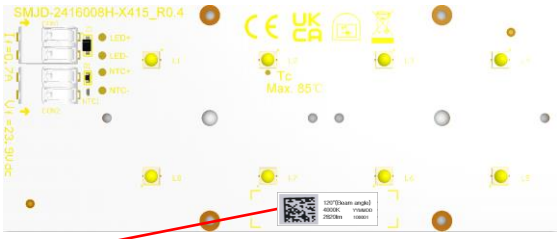
00 C62 E05 7 ALL

A B C D E

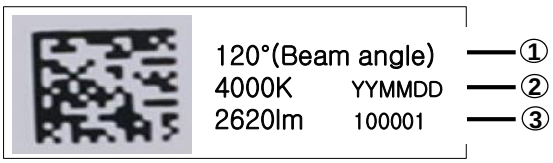
Lens type		Flux bin		CCT bin		CRI bin		VF Bin(1)	
A		B		C		D		E	
00		E01		E05		7		ALL	
00	No lens	C51	2510lm	A05	6500K 5-step	7	CRI70	ALL	DC 22~25V
		C62	2620lm	B05	5700K 5-step				
		C40	2400lm	C05	5000K 5-step				
		C29	2290lm	E05	4000K 5-step				
		C18	2180lm	F05	3500K 5-step				
				G05	3000K 5-step				
				H05	2700K 5-step				
				K05	2200K 5-step				

Marking Information

Fig 13. Marking Point



QR Code Information



	QR Code Information							
Items	Factory	SAP Code	SMT Date	Rank Information	Line No.	Lot No.	Product	Notes
Digits	1 Digit	7 Digit	6 Digit	10 Digit	1 Digit	1 Digit	5 Digit	In Total 31 Digits
Information	*	*******	YYMMDD	C62E057ALL(1)	1~9, A~Z	1~9, A~Z	00001	

Plain Code Information

No.	Item	Information	Digits	Remark
①	Beam angle	120° (Beam angle)	16Digit	Beam angle
②	CCT	4000K	5Digit	Refer to Page4
	Date	YYMMDD	6Digit	SMT date
③	Flux	2620lm	6Digit	Refer to Page4
	Lot No.	1	1 Digit	0~9,A~Z
	Sequence No.	00001	5 Digit	00001 ~ 99999

Notes :

(1) Module Flux code rule as below table

Symbol	lm	Symbol	lm	Symbol	lm	Symbol	lm
D91	3910	O50	14500	R50	17500	U50	20500
M20	12200	P50	15500	S50	18500	V20	21200
N00	13000	Q50	16500	T50	19500	W00	22000

Label Information

PO Number	**XXXXXX**
Supplier Part Number	**SMJD-2416008H-X41500C62E057ALL(1)**
Bin Code	**C62E057ALL (2)**
Quantity	**XX**
Country of Origin	**XX (3)**
Date Code	**YYYYWW (4)**
Lot Code	**YYMDDXXXXX- XXXXXXX (5)**
SEOUL	**SEOUL SEMICONDUCTOR CO.,LTD.**

Notes

(1) Please refer to SPEC page 17 (30 digit code)
(2) Please refer to SPEC page 18
(3) Country of Origin: 2 digit code . For example : KR : Korea, CN : China, VN : Vietnam
(4) Date Code : YYYYWW : Packing Date: Year + Week
(5) Lot Code :
Initial of manufacture is refer to the 2D code rule.
YYMDD : Packing Date (Oct. : A, Nov. : B, Dec. : C)
X : Initial of Manufacturer
XXXX : Sealing Pack No.
XXXXXXX : SSC SAP Code
(6) It is attached to the top left corner of the box.

TOTAL Quantity

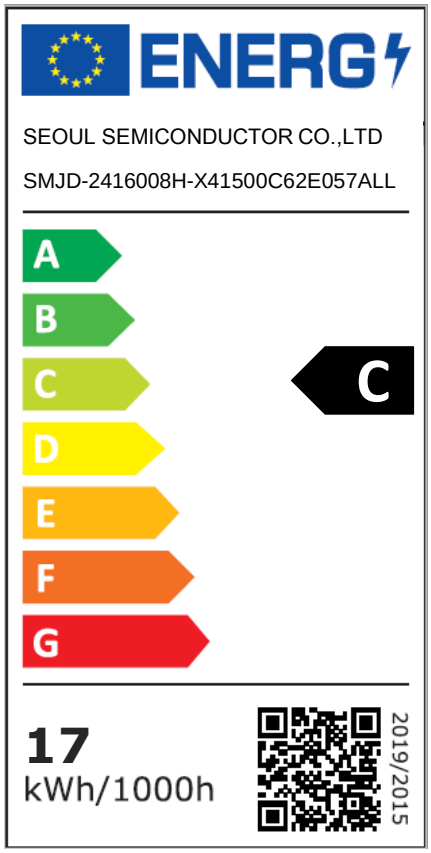
XXX

SEOUL **SEOUL SEMICONDUCTOR CO.,LTD.**

Notes

(1) It is attached to the bottom right corner of the box.

Label Information



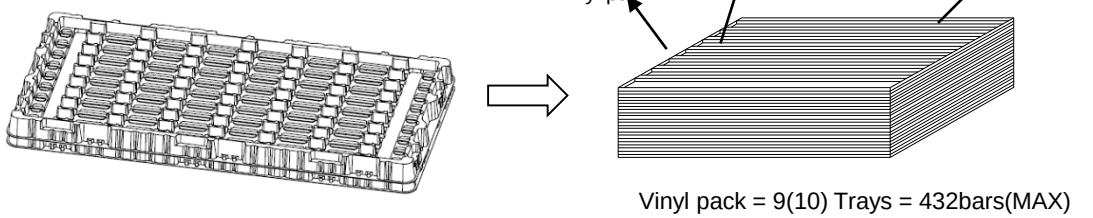
Notes

(1) The above is just an example, and the correct label must be downloaded from EPREL system
(2) The label size should be 72mm*36mm
(3) The background of the label shall be 100% white.
(4) The typefaces shall be Verdana and Calibri.
(5) Colours shall be CMYK – cyan, magenta, yellow and black,
following this example: 0-70-100-0: 0 % cyan, 70 % magenta, 100 % yellow, 0 % black.
(6) It is attached to the top right corner of the box.

Packaging Specification

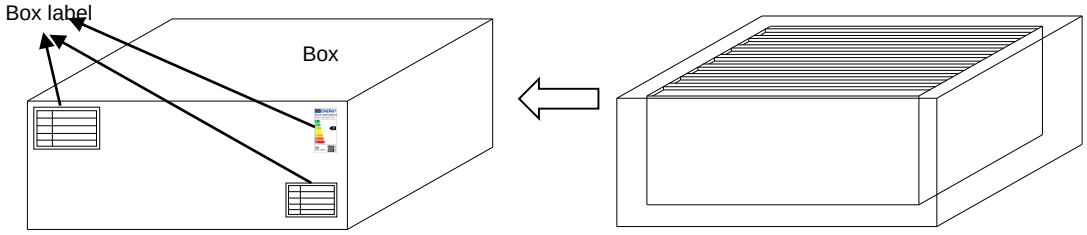
Model	Tray		Box		Pallet	
	Size (mm)	Q'ty per tray (ea)	Size (mm)	Q'ty per tray (ea)	Saze (mm)	Q'ty per tray (ea)
SMJD-2416008H-X415	580 x 430 x 30	48	600 x 448 x 202	432	1200 x 1000	8640

Note:
1box=9trays(+1dummy)=432ea
1pallet=20box(4box*5layer=20box)=8640ea



Vinyl pack = 9(10) Trays = 432bars(MAX)

(Top tray is used as a rid.)



1 Box = 9(10) Trays = 432bars (MAX)

Precaution for Use

(1) Check the appearance of module before wiring/ assembly, DO NOT use the LED cracked or PCB damaged module.
(2) The module was designed to be driven with DC source, recognize the polarities of the module was necessity.
(3) It was SELV module, DO NOT connect the LED directly to main power during wiring.
(4) DO NOT let the LED packages contacted with any hard matters.
(5) There was no current regulator built in module, unevenly load between different parallel modules may occur due to the modules V_F variance .
(6) Please do not use together with the materials containing Sulfur.
(7) Please do not make any modification on module.

Precaution for Use

(8) LEDs are sensitive to Electro-Static Discharge (ESD) and Electrical Over Stress (EOS).
Below is a list of suggestions that Seoul Semiconductor purposes to minimize these effects.

a. ESD (Electro Static Discharge)
Electrostatic discharge (ESD) is the defined as the release of static electricity when two objects come into contact. While most ESD events are considered harmless, it can be an expensive problem in many industrial environments during production and storage. The damage from ESD to an LEDs may cause the product to demonstrate unusual characteristics such as:

- Increase in reverse leakage current lowered turn-on voltage
- Abnormal emissions from the LED at low current

The following recommendations are suggested to help minimize the potential for an ESD event:
One or more recommended work area suggestions:

- Ionizing fan setup
- ESD table/shelf mat made of conductive materials
- ESD safe storage containers

One or more personnel suggestion options:

- Antistatic wrist-strap
- Antistatic material shoes
- Antistatic clothes

Environmental controls

- Humidity control (ESD gets worse in a dry environment)

b. EOS (Electrical Over Stress)
Electrical Over-Stress (EOS) is defined as damage that may occur when an electronic device is subjected to a current or voltage that is beyond the maximum specification limits of the device.
The effects from an EOS event can be noticed through product performance like:
Changes to the performance of the LED package (If the damage is around the bond pad area and since the package is completely encapsulated the package may turn on but flicker show severe performance degradation.)
Changes to the light output of the luminaire from component failure
Components on the board not operating at determined drive power
Failure of performance from entire fixture due to changes in circuit voltage and current across total circuit causing trickle down failures
It is impossible to predict the failure mode of every LED exposed to electrical overstress as the failure modes have been investigated to vary, but there are some common signs that will indicate an EOS event has occurred.

- Damaged may be noticed to the bond wires (appearing similar to a blown fuse).
- Damage to the bond pads located on the emission surface of the LED package (shadowing can be noticed around the bond pads while viewing through a microscope).
- Anomalies noticed in the encapsulation and phosphor around the bond wires.
- This damage usually appears due to the thermal stress produced during the EOS event.

c. To help minimize the damage from an EOS event Seoul Semiconductor recommends utilizing

- qualified LED driver with no big over shoot out put
- Isolated driver that to prevent harmful peaks passed to module.
- A current limiting device

Storage before use

(1) Do not impact or place pressure on this product because even a small amount of pressure can damage the product. The product should also not be placed in high temperatures, high humidity or direct sunlight since the device is sensitive to these conditions.

(2) 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.

Guidelines for properly working with Module

(1) Discharge the lighting system a minimum of 2-3 times prior to working with the module.
(2) Use only properly rated test equipment and tools for the rated voltage and current of the product being tested.
(3) It is strongly suggested to wear rubber insulated gloves and rubber bottom shoes.
(4) Do not wear any conductive items (such as jewelry) which could accidentally contact electric circuits.
(5) Perform several tests with power off and the lighting system unplugged.
(6) Faults, lightning, or switching transients can cause voltage surges in excess of the normal ratings.
(7) Internal component failure can cause excessive voltages.
(8) Stored or residual electricity in long wire could be hazardous.
(9) Make sure proper discharge prior to starting work.

Company Information

Published by

Company Information

Seoul Semiconductor (SeoulSemicon.com) manufacturers 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 it's 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

Information in this document is provided in connection with Seoul Semiconductor products. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Seoul Semiconductor hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party. The appearance and specifications of the product can be changed to improve the quality and/or performance without notice.

Revision History

Revision	Date	Page	Remarks
Rev0.1	2020-10-22	All	Preliminary data sheet for SMJD-2416008H-X415
Rev0.2	2020-11-20	11	Update PKG type
Rev0.3	2021-05-18	All	Adopt new format
Rev0.4	2021-05-21	5	Update the maximum power and ESD value
Rev0.5	2021-06-03	19,21	Add related EPREL information
Rev0.6	2021-07-09	1	Add UKCA logo
Rev0.7	2021-09-02	All	Add 2200K parameters