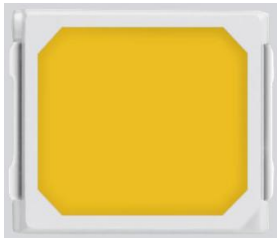
S P E C I F I C A T I O N S

Middle Power LED Series
2835 0.5W Room Temp
LM281B+ EVO
PL rank



Designed for better lm/$ (Ambient, Linear)

Features & Benefits

- **0.5W Class mid power LED**
- **Standard form factor for design flexibility (2.8 × 3.5 mm)**

Dongbu LED Co., Ltd.
53-24 , Dongtansandan 6-gil , Hwaseong-si , Gyeonggi-do , Republic of Korea 18487
Tel. : +82 - 70 - 8874 - 9943 Fax. : +82 - 31 - 373 - 7626
http : //www.dongbuled-s.com

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1. Product Code Information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
S	P	M	W	H	1	2	2	8	M	D	5	W	A	T	0	P	L

Digit	PKG Information	Code	Specification			
1 2 3	Dongbu Package Middle Power	SPM	Mddle power			
4 5	Color	WH	White			
6	Product Version	1	Without Zener			
7 8 9	Form Factor	228	2.8 x 3.5 x 0.7 mm 2 pads			
10	Sorting Current (mA)	M	65 mA			
11	Chromaticity Coordinates	D	ANSI Standard			
12	CRI	5	Min. 80			
		7	Min. 90			
13 14	Forward Voltage (V)	WA or WK	2.6 ~ 3.0	Bin Code	AY	2.6 ~ 2.7
					AZ	2.7 ~ 2.8
					A1	2.8 ~ 2.9
					A2	2.9 ~ 3.0
			WA : 4,000ea, WK : 16,000ea per reel			
		WN or WM	2.6 ~ 2.8	Bin Code	AY	2.6 ~ 2.7
					AZ	2.7 ~ 2.8
			WN : 4,000ea, WM : 16,000ea per reel			
15 16	CCT (K)	W☆	2700	Bin Code	W1, W2, W3, W4, W5, W6, W7, W8, W9, WA, WB WC, WD, WE, WF, WG, WN, WP, WQ, WR, WS, WT, WU	
		V☆	3000		V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC VD, VE, VF, VG, VN, VP, VQ, VR, VS, VT, VU	
		U☆	3500		U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC UD, UE, UF, UG, UN, UP, UQ, UR, US, UT, UU	
		T☆	4000		T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC TD, TE, TF, TG, TN, TP, TQ, TR, TS, TT, TU	
		R☆	5000		R1, R2, R3, R4, R5, R6, R7, R8, R9, RA, RB, RC RD, RE, RF, RG, RN, RP, RQ, RR, RS, RT, RU	
		Q☆	5700		Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, QA, QB, QC QD, QE, QF, QG, QN, QP, QQ, QR, QS, QT, QU	
		P☆	6500		P1, P2, P3, P4, P5, P6, P7, P8, P9, PA, PB, PC PD, PE, PF, PG, PN, PP, PQ, PR, PS, PT, PU	
			☆ : "0" (Whole bin), "M" (Quarter bin), “K” (K Kitting bin), “Y”(Y Kitting bin) or “U” (Mac3 only)			
17 18	Luminous Flux	PL		Bin Code	PL	

2. Characteristics

(1) Absolute Maximum Ratings

Item	Symbol	Rating	Unit	Condition
Ambient / Operating Temperature	T_a	-40 ~ +85	ºC	
Storage Temperature	T_{stg}	-40 ~ +85	℃	
LED Junction Temperature	T_j	125	℃	
Forward Current	I_F	300	mA	
Peak Pulsed Forward Current	I_{Fp}	450	mA	Duty 1/10, pulse width 10ms
Assembly Process Temperature		260<10	℃/S	
ESD (HBM)		2	KV	

* Note

Proper current derating must be observed to maintain junction temperature below the maximum at all time.

It is recommended minimum current 10mA in order to avoid un-even brightness, and may vary depending on circuit configuration

(2) Electro-optical Characteristics (I_F = 65 mA, T_a = 25 ºC)

Item	Unit	Rank	Bin	Min.	Typ.	Max.
Forward Voltage (VF)	V	WA or WK	AY	2.6		2.7
			AZ	2.7		2.8
			A1	2.8		2.9
			A2	2.9		3.0
		WN or WM	AY	2.6		2.7
			AZ	2.7		2.8
Color Rendering Index (Ra)		5		80		
		7		90		
Special CRI (R9)	For Ra 90			50		
Thermal Resistance (junction to solder point)	ºC/W				12	
Beam Angle	°				120	

* Note

Dongbu maintains measurement tolerance of: forward voltage = ±0.1 V, CRI = ±3, R9 = ±6.5

(3) Luminous Flux Bins (I_F = 65 mA, T_a = 25ºC)

Item	CRI (Ra) Min.	Norminal CCT(K)	Bin	65mA Min.	65mA Max.
Luminous Flux (Φv)	80	2700	PL	35.0	37.0
		3000	PL	36.0	38.0
		3500	PL	37.0	39.0
		4000	PL	38.0	40.0
		5000	PL	38.0	40.0
		5700	PL	37.5	39.5
		6500	PL	37.5	39.5
	90	2700	PL	30.0	32.0
		3000	PL	31.0	33.0
		3500	PL	31.5	33.5
		4000	PL	32.5	34.5
		5000	PL	32.5	34.5
		5700	PL	32.0	34.0
		6500	PL	32.0	34.0

* Note :

Dongbu maintains measurement tolerance of: forward voltage = ±0.1V, luminous flux = ±5 %, CRI = ±3

(4) Luminous Flux Bins (I_F = 65 mA, T_a = 25ºC)

CRI (Ra) Min.	Nominal CCT (K)	Product Code	Flux Bin	Flux Range (Φ_v, lm)
80	2700	SPMWH1228MD5WAW☆PL	PL	35.0 ~ 37.0
	3000	SPMWH1228MD5WAV☆PL	PL	36.0 ~ 38.0
	3500	SPMWH1228MD5WAU☆PL	PL	37.0 ~ 39.0
	4000	SPMWH1228MD5WAT☆PL	PL	38.0 ~ 40.0
	5000	SPMWH1228MD5WAR☆PL	PL	38.0 ~ 40.0
	5700	SPMWH1228MD5WAQ☆PL	PL	37.5 ~ 39.5
	6500	SPMWH1228MD5WAP☆PL	PL	37.5 ~ 39.5
90	2700	SPMWH1228MD7WAW☆PL	PL	30.0 ~ 32.0
	3000	SPMWH1228MD7WAV☆PL	PL	31.0 ~ 33.0
	3500	SPMWH1228MD7WAU☆PL	PL	31.5 ~ 33.5
	4000	SPMWH1228MD7WAT☆PL	PL	32.5 ~ 34.5
	5000	SPMWH1228MD7WAR☆PL	PL	32.5 ~ 34.5
	5700	SPMWH1228MD7WAQ☆PL	PL	32.0 ~ 34.0
	6500	SPMWH1228MD7WAP☆PL	PL	32.0 ~ 34.0

* Note :

"☆" can be "0" (Whole bin), "M" (Quarter bin), “K” (K Kitting bin), “Y”(Y Kitting bin) or “U” (Mac3 only) of the color binning

(5) Voltage Bins (I_F = 65 mA, T_a = 25 ºC)

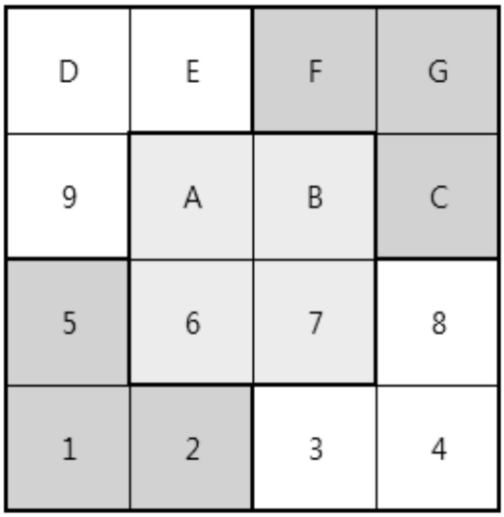
CRI (Ra) Min.	Nominal CCT (K)	Product Code	Voltage Rank	Voltage Bin	Voltage Range (V)
			WA or WK	AY	2.6 ~ 2.7
				AZ	2.7 ~ 2.8
				A1	2.8 ~ 2.9
				A2	2.9 ~ 3.0
			WN or WM	AY	2.6 ~ 2.7
				AZ	2.7 ~ 2.8

(6) Kitting rule

a) K Kitting bin Concept

1. Under agreement between customer and Dongbu LED, Dongbu can supply kitting bin (VF, Color, lm).
2. A forward voltage (VF) of kitting bin is combined by a pair of same VF rank such as (AY+AY), (AZ+AZ), (A1+A1) or (A2+A2)
3. A Chromaticity Coordinates of kitting bin is mixed by kitting procedure.(below kitting simulation)

[Kitting example]



[Binning Information]

	Bin #1	Bin #2
VF	AY	AY
	AZ	AZ
	A1	A1
	A2	A2
CIE	1, 2, 5 bin	C, F, G bin
	6, 7, A, B bin	6, 7, A, B bin
	3, 4, 8 bin	9, D, E bin

(6) Kitting rule

b) Y Kitting bin Concept

1. Under agreement between customer and Dongbu LED, Dongbu can supply kitting bin (VF, Color, lm).
2. A forward voltage (VF) of kitting bin is combined by a pair of same VF rank such as (AY+AY), (AZ+AZ), (A1+A1) or (A2+A2)
3. A Chromaticity Coordinates of kitting bin is mixed by kitting procedure.(below kitting simulation)

[Kitting example]



[Binning Information]

	Bin #1	Bin #2
VF	AY	AY
	AZ	AZ
	A1	A1
	A2	A2
CIE	U	U
	N	R
	P	S
	Q	T

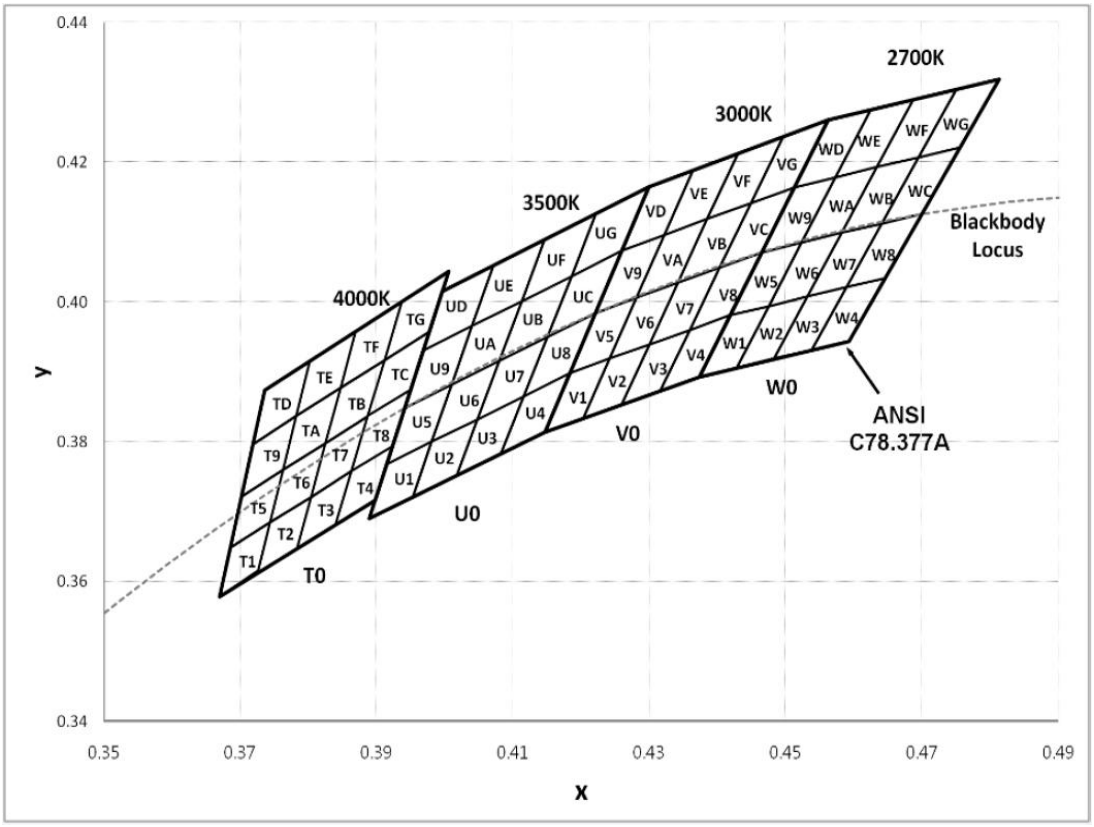
(7) Color Bins (I_F = 65 mA, T_a = 25 ºC)

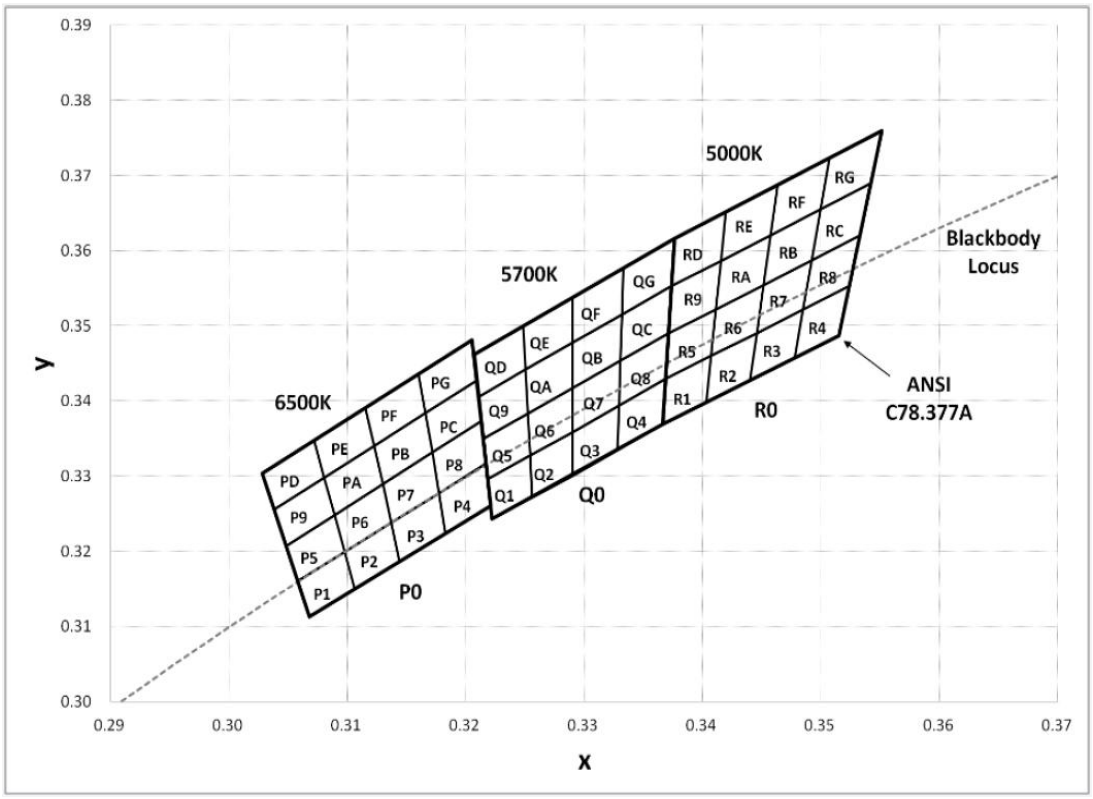
CRI (Ra) Min.	Norminal CCT (K)	Product Code	Code Rank	Chromaticity Bins
80 or 90	2700	SPMWH1228MD★WAW0PL	W0 (Whole bin)	W1,W2,W3,W4,W5,W6,W7,W8,W9,WA,WB,WC,WD,WE,WF,WG
		SPMWH1228MD★WAWMPL	WM (Quarter bin)	W6, W7, WA, WB
		SPMWH1228MD★WAWKPL	WK (K Kitting bin)	W1,W2,W3,W4,W5,W6,W7,W8,W9,WA,WB,WC,WD,WE,WF,WG
		SPMWH1228MD★WAWUPL	WU (Mac3 Only)	WU
		SPMWH1228MD★WAWYPL	WY (Y Kitting bin)	WN, WP, WQ, WR, WS, WT, WU
	3000	SPMWH1228MD★WAV0PL	V0 (Whole bin)	V1,V2,V3,V4,V5,V6,V7,V8,V9,VA,VB,VC,VD,VE,VF,VG
		SPMWH1228MD★WAVMPL	VM (Quarter bin)	V6, V7, VA, VB
		SPMWH1228MD★WAVKPL	VK (K Kitting bin)	V1,V2,V3,V4,V5,V6,V7,V8,V9,VA,VB,VC,VD,VE,VF,VG
		SPMWH1228MD★WAVUPL	VU (Mac3 Only)	VU
		SPMWH1228MD★WAVYPL	VY (Y Kitting bin)	VN, VP, VQ, VR, VS, VT, VU
	3500	SPMWH1228MD★WAU0PL	U0 (Whole bin)	U1,U2,U3,U4,U5,U6,U7,U8,U9,UA,UB,UC,UD,UE,UF,UG
		SPMWH1228MD★WAUMPL	UM (Quarter bin)	U6, U7, UA, UB
		SPMWH1228MD★WAUKPL	UK (K Kitting bin)	U1,U2,U3,U4,U5,U6,U7,U8,U9,UA,UB,UC,UD,UE,UF,UG
		SPMWH1228MD★WAUUPL	UU (Mac3 Only)	UU
		SPMWH1228MD★WAUYPL	UY (Y Kitting bin)	UN, UP, UQ, UR, US, UT, UU
	4000	SPMWH1228MD★WAT0PL	T0 (Whole bin)	T1,T2,T3,T4,T5,T6,T7,T8,T9,TA,TB,TC,TD,TE,TF,TG
		SPMWH1228MD★WATMPL	TM (Quarter bin)	T6, T7, TA, TB
		SPMWH1228MD★WATKPL	TK (K Kitting bin)	T1,T2,T3,T4,T5,T6,T7,T8,T9,TA,TB,TC,TD,TE,TF,TG
		SPMWH1228MD★WATUPL	TU (Mac3 Only)	TU
		SPMWH1228MD★WATYPL	TY (Y Kitting bin)	TN, TP, TQ, TR, TS, TT, TU
	5000	SPMWH1228MD★WAR0PL	R0 (Whole bin)	R1,R2,R3,R4,R5,R6,R7,R8,R9,RA,RB,RC,RD,RE,RF,RG
		SPMWH1228MD★WARMPL	RM (Quarter bin)	R6, R7, RA, RB
		SPMWH1228MD★WARKPL	RK (K Kitting bin)	R1,R2,R3,R4,R5,R6,R7,R8,R9,RA,RB,RC,RD,RE,RF,RG
		SPMWH1228MD★WARUPL	RU (Mac3 Only)	RU
		SPMWH1228MD★WARYPL	RY (Y Kitting bin)	RN, RP, RQ, RR, RS, RT, RU
	5700	SPMWH1228MD★WAQ0PL	Q0 (Whole bin)	Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q9,QA,QB,QC,QD,QE,QF,QG
		SPMWH1228MD★WAQMPL	QM (Quarter bin)	Q6, Q7, QA, QB
		SPMWH1228MD★WAQKPL	QK (K Kitting bin)	Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q9,QA,QB,QC,QD,QE,QF,QG
		SPMWH1228MD★WAQUPL	QU (Mac3 Only)	QU
		SPMWH1228MD★WAQYPL	QY (Y Kitting bin)	QN, QP, QQ, QR, QS, QT, QU
	6500	SPMWH1228MD★WAP0PL	P0 (Whole bin)	P1,P2,P3,P4,P5,P6,P7,P8,P9,PA,PB,PC,PD,PE,PF,PG
		SPMWH1228MD★WAPMPL	PM (Quarter bin)	P6, P7, PA, PB
		SPMWH1228MD★WAPKPL	PK (K Kitting bin)	P1,P2,P3,P4,P5,P6,P7,P8,P9,PA,PB,PC,PD,PE,PF,PG
		SPMWH1228MD★WAPUPL	PU (Mac3 Only)	PU
		SPMWH1228MD★WAPYPL	PY (Y Kitting bin)	PN, PP, PQ, PR, PS, PT, PU

* Note :

"★" can be "5" (Ra 80) or "7" (Ra 90)

(8) Chromaticity Region & Coordinates for whole bin or quarter bin or K kitting bin (I_F = 65 mA, T_a = 25 ºC)





(9) Chromaticity Region & Coordinates

Region	CIE x	CIE y	Region	CIE x	CIE y	Region	CIE x	CIE y	Region	CIE x	CIE y
W Rank (2700K)						V Rank (3000K)					
W1	0.4373	0.3893	W9	0.4465	0.4071	V1	0.4147	0.3814	V9	0.4221	0.3984
	0.4418	0.3981		0.4513	0.4164		0.4183	0.3898		0.4259	0.4073
	0.4475	0.3994		0.4573	0.4178		0.4242	0.3919		0.4322	0.4096
	0.4428	0.3906		0.4523	0.4085		0.4203	0.3833		0.4281	0.4006
W2	0.4428	0.3906	WA	0.4523	0.4085	V2	0.4203	0.3833	VA	0.4281	0.4006
	0.4475	0.3994		0.4573	0.4178		0.4242	0.3919		0.4322	0.4096
	0.4532	0.4008		0.4634	0.4193		0.4300	0.3939		0.4385	0.4119
	0.4483	0.3919		0.4582	0.4099		0.4259	0.3853		0.4342	0.4028
W3	0.4483	0.3919	WB	0.4582	0.4099	V3	0.4259	0.3853	VB	0.4342	0.4028
	0.4532	0.4008		0.4634	0.4193		0.4300	0.3939		0.4385	0.4119
	0.4589	0.4021		0.4695	0.4207		0.4359	0.3960		0.4449	0.4141
	0.4538	0.3931		0.4641	0.4112		0.4316	0.3873		0.4403	0.4049
W4	0.4538	0.3931	WC	0.4641	0.4112	V4	0.4316	0.3873	VC	0.4403	0.4049
	0.4589	0.4021		0.4695	0.4207		0.4359	0.3960		0.4449	0.4141
	0.4646	0.4034		0.4756	0.4221		0.4418	0.3981		0.4513	0.4164
	0.4593	0.3944		0.4700	0.4126		0.4373	0.3893		0.4465	0.4071
W5	0.4418	0.3981	WD	0.4513	0.4164	V5	0.4183	0.3898	VD	0.4259	0.4073
	0.4465	0.4071		0.4562	0.4260		0.4221	0.3984		0.4299	0.4165
	0.4523	0.4085		0.4624	0.4274		0.4281	0.4006		0.4364	0.4188
	0.4475	0.3994		0.4573	0.4178		0.4242	0.3919		0.4322	0.4096
W6	0.4475	0.3994	WE	0.4573	0.4178	V6	0.4242	0.3919	VE	0.4322	0.4096
	0.4523	0.4085		0.4624	0.4274		0.4281	0.4006		0.4364	0.4188
	0.4582	0.4099		0.4687	0.4289		0.4342	0.4028		0.4430	0.4212
	0.4532	0.4008		0.4634	0.4193		0.4300	0.3939		0.4385	0.4119
W7	0.4532	0.4008	WF	0.4634	0.4193	V7	0.4300	0.3939	VF	0.4385	0.4119
	0.4582	0.4099		0.4687	0.4289		0.4342	0.4028		0.4430	0.4212
	0.4641	0.4112		0.4750	0.4304		0.4403	0.4049		0.4496	0.4236
	0.4589	0.4021		0.4695	0.4207		0.4359	0.3960		0.4449	0.4141
W8	0.4589	0.4021	WG	0.4695	0.4207	V8	0.4359	0.3960	VG	0.4449	0.4141
	0.4641	0.4112		0.4750	0.4304		0.4403	0.4049		0.4496	0.4236
	0.4700	0.4126		0.4813	0.4319		0.4465	0.4071		0.4562	0.4260
	0.4646	0.4034		0.4756	0.4221		0.4418	0.3981		0.4513	0.4164

(9) Chromaticity Region & Coordinates

Region	CIE x	CIE y	Region	CIE x	CIE y	Region	CIE x	CIE y	Region	CIE x	CIE y
U Rank (3500K)						T Rank (4000K)					
U1	0.3889	0.3690	U9	0.3941	0.3848	T1	0.3670	0.3578	T9	0.3702	0.3722
	0.3915	0.3768		0.3968	0.3930		0.3726	0.3612		0.3763	0.3760
	0.3981	0.3800		0.4040	0.3966		0.3744	0.3685		0.3782	0.3837
	0.3953	0.3720		0.4010	0.3882		0.3686	0.3649		0.3719	0.3797
U2	0.3953	0.3720	UA	0.4010	0.3882	T2	0.3726	0.3612	TA	0.3763	0.3760
	0.3981	0.3800		0.4040	0.3966		0.3783	0.3646		0.3825	0.3798
	0.4048	0.3832		0.4113	0.4001		0.3804	0.3721		0.3847	0.3877
	0.4017	0.3751		0.4080	0.3916		0.3744	0.3685		0.3782	0.3837
U3	0.4017	0.3751	UB	0.4080	0.3916	T3	0.3783	0.3646	TB	0.3825	0.3798
	0.4048	0.3832		0.4113	0.4001		0.3840	0.3681		0.3887	0.3836
	0.4116	0.3865		0.4186	0.4037		0.3863	0.3758		0.3912	0.3917
	0.4082	0.3782		0.4150	0.3950		0.3804	0.3721		0.3847	0.3877
U4	0.4082	0.3782	UC	0.4150	0.3950	T4	0.3840	0.3681	TC	0.3887	0.3837
	0.4116	0.3865		0.4186	0.4037		0.3898	0.3716		0.3950	0.3875
	0.4183	0.3898		0.4259	0.4073		0.3924	0.3794		0.3978	0.3958
	0.4147	0.3814		0.4221	0.3984		0.3863	0.3758		0.3912	0.3917
U5	0.3915	0.3768	UD	0.3968	0.3930	T5	0.3686	0.3649	TD	0.3719	0.3797
	0.3941	0.3848		0.3996	0.4015		0.3744	0.3685		0.3782	0.3837
	0.4010	0.3882		0.4071	0.4052		0.3763	0.3760		0.3802	0.3916
	0.3981	0.3800		0.4040	0.3966		0.3702	0.3722		0.3736	0.3874
U6	0.3981	0.3800	UE	0.4040	0.3966	T6	0.3744	0.3685	TE	0.3782	0.3837
	0.4010	0.3882		0.4071	0.4052		0.3804	0.3721		0.3847	0.3877
	0.4080	0.3916		0.4146	0.4089		0.3825	0.3798		0.3869	0.3958
	0.4048	0.3832		0.4113	0.4001		0.3763	0.3760		0.3802	0.3916
U7	0.4048	0.3832	UF	0.4113	0.4001	T7	0.3804	0.3721	TF	0.3847	0.3877
	0.4080	0.3916		0.4146	0.4089		0.3863	0.3758		0.3912	0.3917
	0.4150	0.3950		0.4222	0.4127		0.3887	0.3836		0.3937	0.4001
	0.4116	0.3865		0.4186	0.4037		0.3825	0.3798		0.3869	0.3958
U8	0.4116	0.3865	UG	0.4186	0.4037	T8	0.3863	0.3758	TG	0.3912	0.3917
	0.4150	0.3950		0.4222	0.4127		0.3924	0.3794		0.3978	0.3958
	0.4221	0.3984		0.4299	0.4165		0.3950	0.3875		0.4006	0.4044
	0.4183	0.3898		0.4259	0.4073		0.3887	0.3836		0.3937	0.4001

(9) Chromaticity Region & Coordinates

Region	CIE x	CIE y	Region	CIE x	CIE y	Region	CIE x	CIE y	Region	CIE x	CIE y
R Rank (5000K)						Q Rank (5700K)					
R1	0.3366	0.3369	R9	0.3374	0.3554	Q1	0.3218	0.3298	Q9	0.3211	0.3407
	0.3369	0.3431		0.3371	0.3493		0.3222	0.3243		0.3215	0.3353
	0.3407	0.3460		0.3411	0.3522		0.3258	0.3275		0.3254	0.3388
	0.3403	0.3398		0.3415	0.3587		0.3256	0.3331		0.3252	0.3444
R2	0.3403	0.3398	RA	0.3415	0.3587	Q2	0.3256	0.3331	QA	0.3252	0.3444
	0.3407	0.3460		0.3411	0.3522		0.3258	0.3275		0.3254	0.3388
	0.3446	0.3491		0.3451	0.3554		0.3294	0.3306		0.3293	0.3423
	0.3440	0.3427		0.3457	0.3621		0.3294	0.3364		0.3293	0.3481
R3	0.3446	0.3491	RB	0.3451	0.3554	Q3	0.3294	0.3364	QB	0.3293	0.3481
	0.3440	0.3427		0.3457	0.3621		0.3294	0.3306		0.3293	0.3423
	0.3477	0.3458		0.3500	0.3655		0.3330	0.3338		0.3332	0.3458
	0.3485	0.3522		0.3492	0.3587		0.3331	0.3398		0.3333	0.3518
R4	0.3485	0.3522	RC	0.3492	0.3587	Q4	0.3331	0.3398	QC	0.3333	0.3518
	0.3477	0.3458		0.3500	0.3655		0.3330	0.3338		0.3332	0.3458
	0.3514	0.3487		0.3542	0.3690		0.3366	0.3369		0.3371	0.3493
	0.3524	0.3554		0.3533	0.3620		0.3369	0.3431		0.3374	0.3554
R5	0.3371	0.3493	RD	0.3376	0.3616	Q5	0.3215	0.3353	QD	0.3207	0.3462
	0.3369	0.3431		0.3374	0.3554		0.3218	0.3298		0.3211	0.3407
	0.3407	0.3460		0.3415	0.3587		0.3256	0.3331		0.3252	0.3444
	0.3411	0.3522		0.3420	0.3652		0.3254	0.3388		0.3250	0.3501
R6	0.3407	0.3460	RE	0.3415	0.3587	Q6	0.3254	0.3388	QE	0.3250	0.3501
	0.3411	0.3522		0.3420	0.3652		0.3256	0.3331		0.3252	0.3444
	0.3451	0.3554		0.3463	0.3687		0.3294	0.3364		0.3293	0.3481
	0.3446	0.3491		0.3457	0.3621		0.3293	0.3423		0.3292	0.3539
R7	0.3446	0.3491	RF	0.3457	0.3621	Q7	0.3293	0.3423	QF	0.3292	0.3539
	0.3451	0.3554		0.3463	0.3687		0.3294	0.3364		0.3293	0.3481
	0.3492	0.3587		0.3507	0.3724		0.3331	0.3398		0.3333	0.3518
	0.3485	0.3522		0.3500	0.3655		0.3332	0.3458		0.3334	0.3578
R8	0.3485	0.3522	RG	0.3500	0.3655	Q8	0.3332	0.3458	QG	0.3334	0.3578
	0.3492	0.3587		0.3507	0.3724		0.3331	0.3398		0.3333	0.3518
	0.3533	0.3620		0.3551	0.3760		0.3369	0.3431		0.3374	0.3554
	0.3524	0.3554		0.3542	0.3690		0.3371	0.3493		0.3376	0.3616

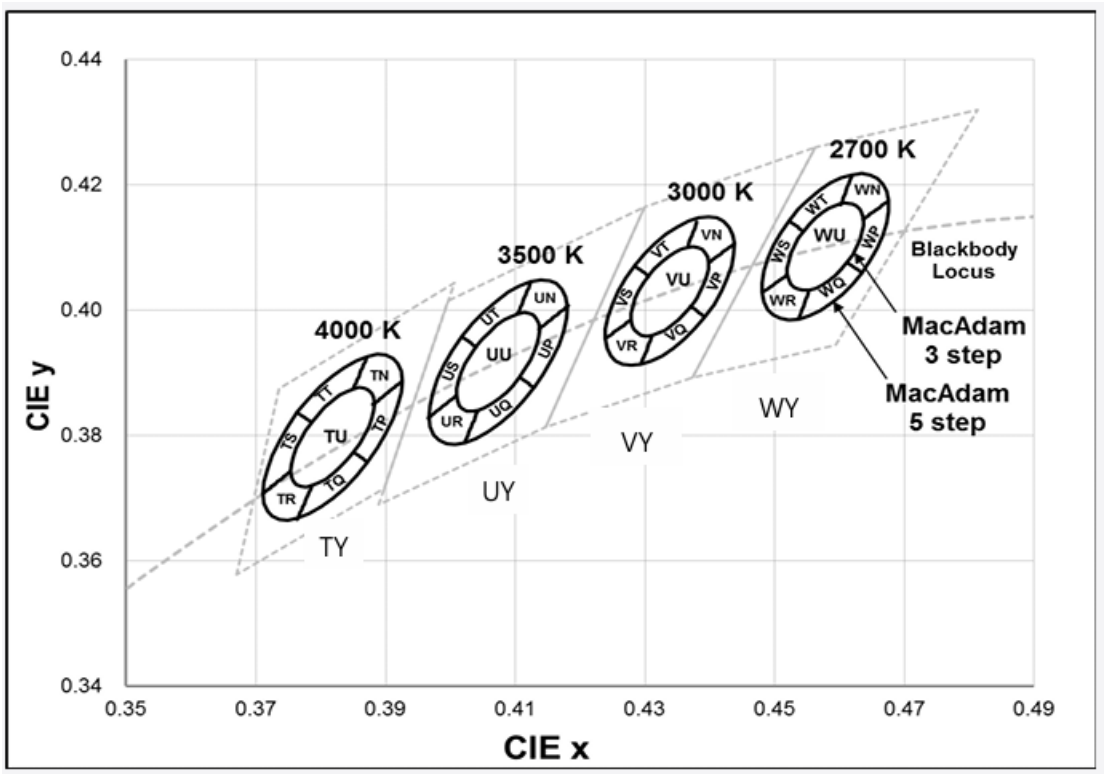
(9) Chromaticity Region & Coordinates

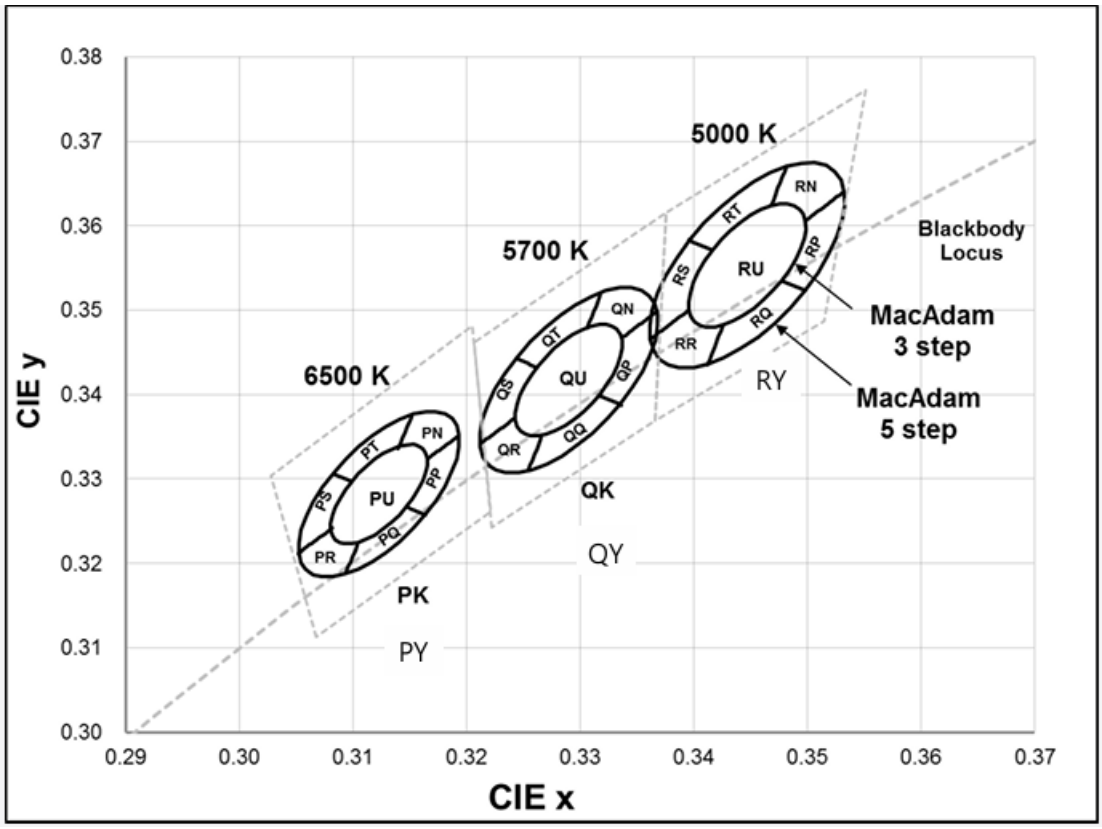
Region	CIE x	CIE y	Region	CIE x	CIE y
P Rank (6500K)					
P1	0.3068	0.3113	P9	0.3048	0.3207
	0.3106	0.3150		0.3089	0.3249
	0.3098	0.3199		0.3080	0.3298
	0.3058	0.3160		0.3038	0.3256
P2	0.3106	0.3150	PA	0.3089	0.3249
	0.3144	0.3186		0.3130	0.3290
	0.3137	0.3238		0.3123	0.3341
	0.3098	0.3199		0.3080	0.3298
P3	0.3144	0.3186	PB	0.3130	0.3290
	0.3183	0.3224		0.3172	0.3332
	0.3177	0.3278		0.3166	0.3384
	0.3137	0.3238		0.3123	0.3341
P4	0.3183	0.3224	PC	0.3172	0.3332
	0.3221	0.3261		0.3214	0.3373
	0.3218	0.3317		0.3210	0.3427
	0.3177	0.3278		0.3166	0.3384
P5	0.3058	0.3160	PD	0.3038	0.3256
	0.3098	0.3199		0.3080	0.3298
	0.3089	0.3249		0.3072	0.3348
	0.3048	0.3207		0.3028	0.3304
P6	0.3098	0.3199	PE	0.3080	0.3298
	0.3137	0.3238		0.3123	0.3341
	0.3130	0.3290		0.3115	0.3391
	0.3089	0.3249		0.3072	0.3348
P7	0.3137	0.3238	PF	0.3123	0.3341
	0.3177	0.3278		0.3166	0.3384
	0.3172	0.3332		0.3160	0.3436
	0.3130	0.3290		0.3115	0.3391
P8	0.3177	0.3278	PG	0.3166	0.3384
	0.3218	0.3317		0.3210	0.3427
	0.3214	0.3373		0.3206	0.3481
	0.3172	0.3332		0.3160	0.3436

* Note :

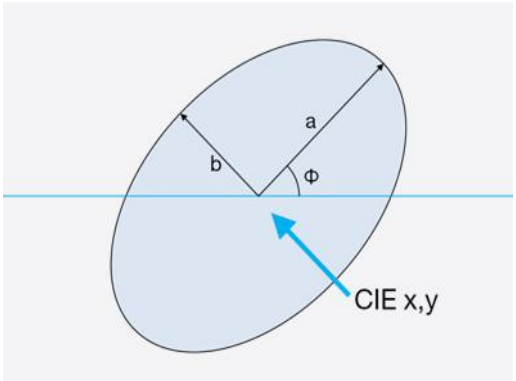
Dongbu maintains measurement tolerance of: Cx, Cy = ±0.005

(10) Chromaticity Region & Coordinates for Y kitting bin or mac3 only bin (I_F = 65 mA, T_a = 25 ºC)





(10) Chromaticity Region & Coordinates

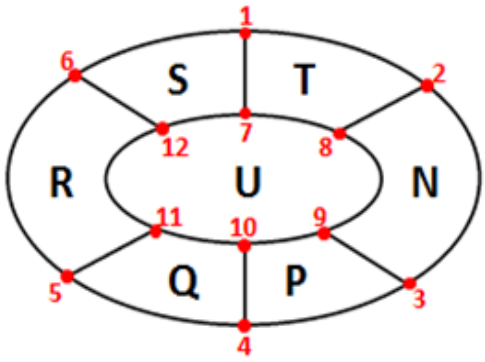


MacAdam	CCT (K)	Center point		Major-axis	Minor-axis	Rotation
		CIE x	CIE y	a	b	Φ
3 step	2700	0.4578	0.4101	0.0081	0.0042	53.70
	3000	0.4338	0.403	0.0083	0.0041	53.22
	3500	0.4073	0.3917	0.0093	0.0041	54.00
	4000	0.3818	0.3797	0.0094	0.004	53.72
	5000	0.3447	0.3553	0.0082	0.0035	59.62
	5700	0.3287	0.3417	0.0075	0.0032	59.10
	6500	0.3123	0.3282	0.0067	0.0029	58.57
5 step	2700	0.4578	0.4101	0.0135	0.0070	53.70
	3000	0.4338	0.403	0.0138	0.0068	53.22
	3500	0.4073	0.3917	0.0155	0.0068	54.00
	4000	0.3818	0.3797	0.0157	0.0067	53.72
	5000	0.3447	0.3553	0.0137	0.0058	59.62
	5700	0.3287	0.3417	0.0125	0.0053	59.10
	6500	0.3123	0.3282	0.0112	0.0048	58.57

* Note :

Dongbu maintains measurement tolerance of: Cx, Cy = ±0.005

(10) Chromaticity Region & Coordinates



CCT	Region	CIE X	CIE Y	CCT	Region	CIE X	CIE Y	CCT	Region	CIE X	CIE Y	CCT	Region	CIE X	CIE Y	CCT	Region	CIE X	CIE Y
2700K	1	0.4521	0.4142	3000K	1	0.4283	0.4071	3500K	1	0.4018	0.3957	4000K	1	0.3764	0.3837	5000K	1	0.3397	0.3583
	2	0.4619	0.4216		2	0.4382	0.4146		2	0.4125	0.4046		2	0.3871	0.3926		2	0.3482	0.3670
	3	0.4675	0.4175		3	0.4437	0.4105		3	0.4180	0.4005		3	0.3925	0.3887		3	0.3532	0.3640
	4	0.4634	0.4059		4	0.4393	0.3989		4	0.4128	0.3877		4	0.3872	0.3758		4	0.3497	0.3524
	5	0.4537	0.3986		5	0.4293	0.3913		5	0.4022	0.3788		5	0.3765	0.3668		5	0.3412	0.3436
	6	0.4481	0.4028		6	0.4239	0.3954		6	0.3966	0.3828		6	0.3711	0.3707		6	0.3362	0.3465
	7	0.4544	0.4126		7	0.4305	0.4054		7	0.4040	0.3941		7	0.3786	0.3821		7	0.3417	0.3571
	8	0.4603	0.4170		8	0.4364	0.4100		8	0.4104	0.3994		8	0.3850	0.3874		8	0.3468	0.3623
	9	0.4636	0.4145		9	0.4397	0.4075		9	0.4137	0.3970		9	0.3882	0.3851		9	0.3498	0.3605
	10	0.4612	0.4076		10	0.4371	0.4005		10	0.4106	0.3893		10	0.3850	0.3773		10	0.3477	0.3535
	11	0.4553	0.4032		11	0.4311	0.3960		11	0.4042	0.3840		11	0.3786	0.3720		11	0.3426	0.3483
	12	0.4520	0.4057		12	0.4279	0.3984		12	0.4009	0.3864		12	0.3754	0.3743		12	0.3396	0.3500
5700K	1	0.3242	0.3445	6500K	1	0.3082	0.3307												
	2	0.3320	0.3524		2	0.3153	0.3377												
	3	0.3365	0.3496		3	0.3194	0.3352												
	4	0.3333	0.3390		4	0.3164	0.3257												
	5	0.3254	0.3310		5	0.3093	0.3187												
	6	0.3209	0.3338		6	0.3052	0.3212												
	7	0.3260	0.3434		7	0.3098	0.3297												
	8	0.3307	0.3481		8	0.3141	0.3339												
	9	0.3334	0.3464		9	0.3166	0.3324												
	10	0.3314	0.3401		10	0.3148	0.3267												
	11	0.3267	0.3353		11	0.3105	0.3225												
	12	0.3240	0.3369		12	0.3080	0.3240												

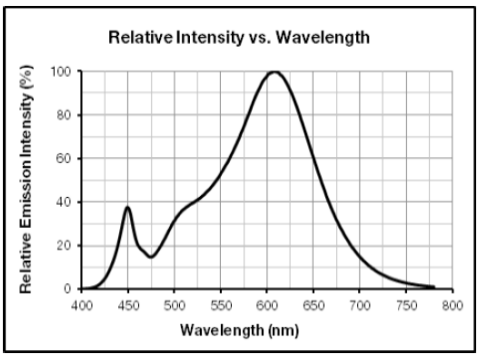
* Note :

Dongbu maintains measurement tolerance of: Cx, Cy = ±0.005

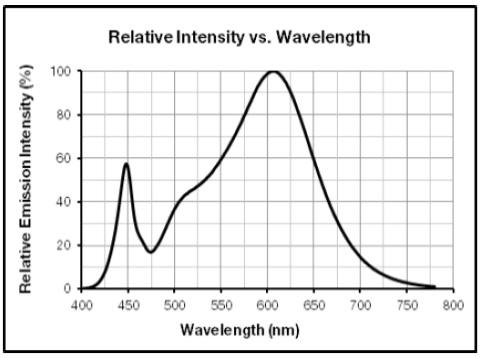
3. Typical Characteristics Graphs

(1) Spectrum Distribution (I_F = 65 mA, T_a = 25 ºC)

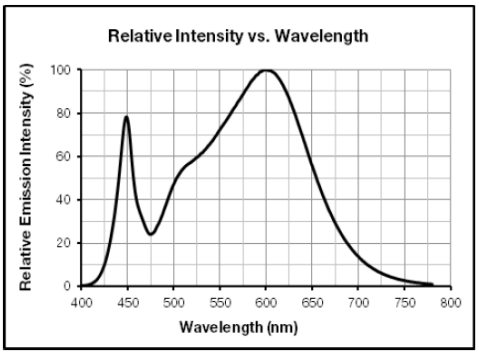
CCT : 2700 K (80 CRI)



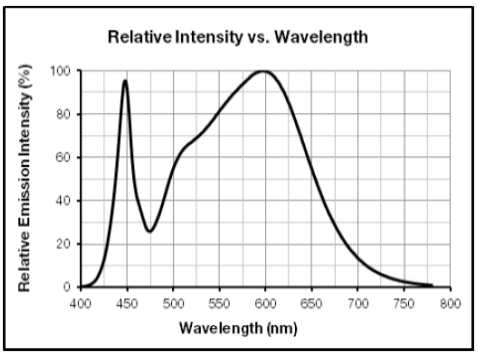
CCT : 3000 K (80 CRI)



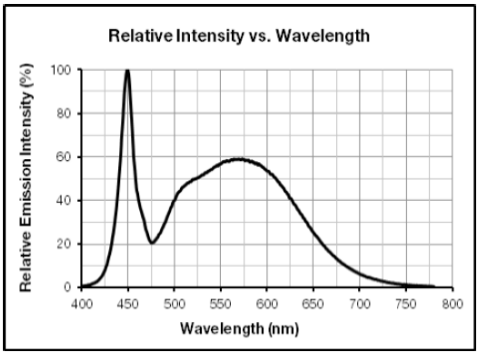
CCT : 3500 K (80 CRI)



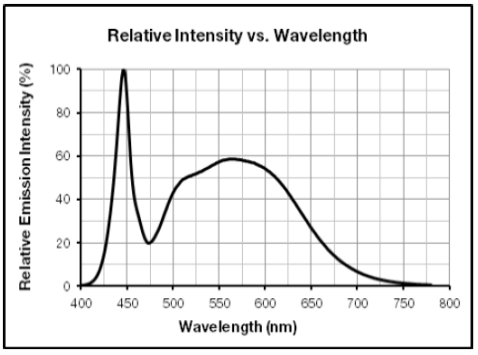
CCT : 4000 K (80 CRI)



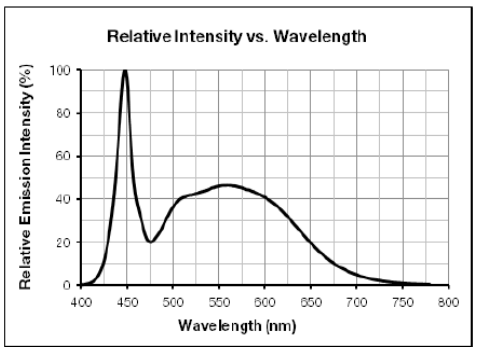
CCT : 5000 K (80 CRI)



CCT : 5700 K (80 CRI)



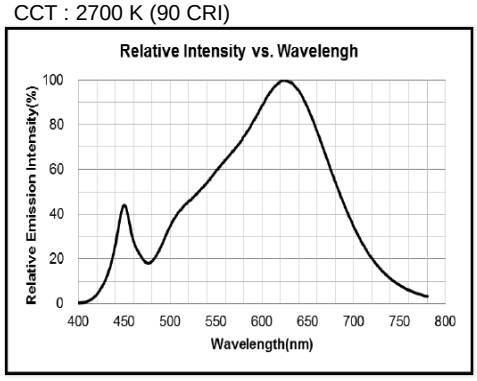
CCT : 6500 K (80 CRI)



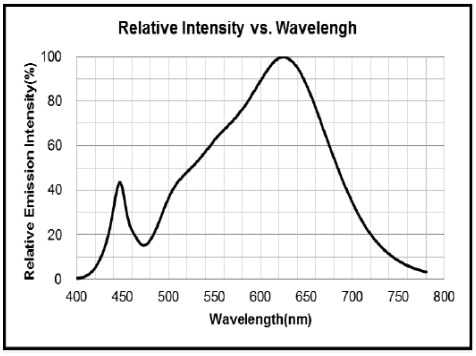
3. Typical Characteristics Graphs

(1) Spectrum Distribution (I_F = 65 mA, T_a = 25 ºC)

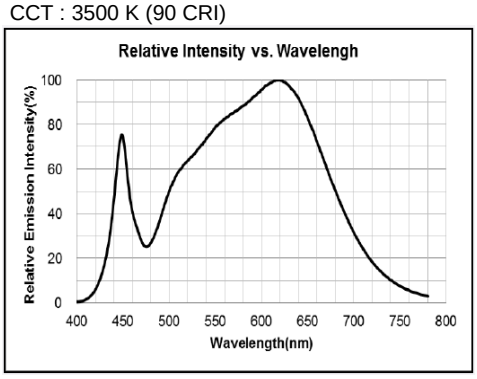
CCT : 2700 K (90 CRI)



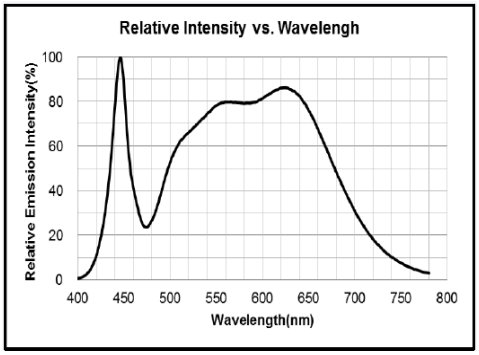
CCT : 3000 K (90 CRI)



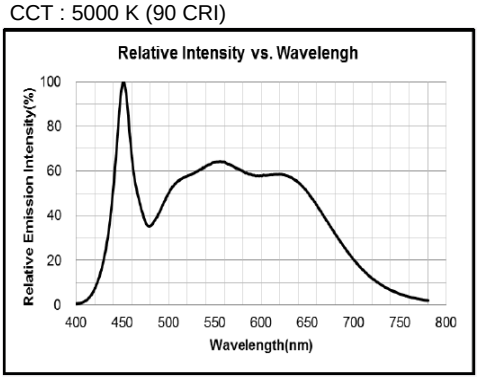
CCT : 3500 K (90 CRI)



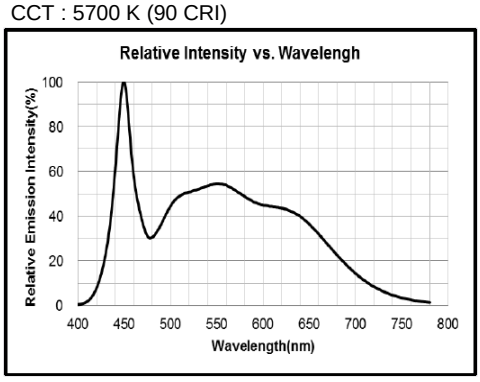
CCT : 4000 K (90 CRI)



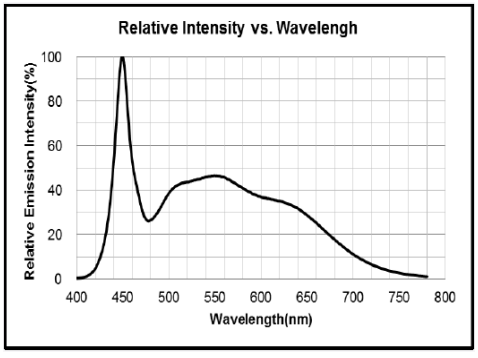
CCT : 5000 K (90 CRI)



CCT : 5700 K (90 CRI)

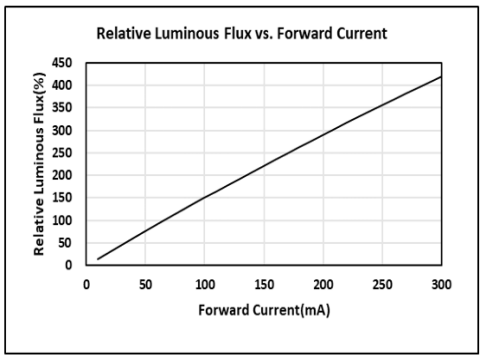


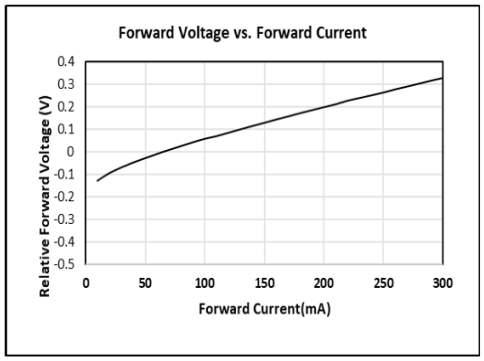
CCT : 6500 K (90 CRI)



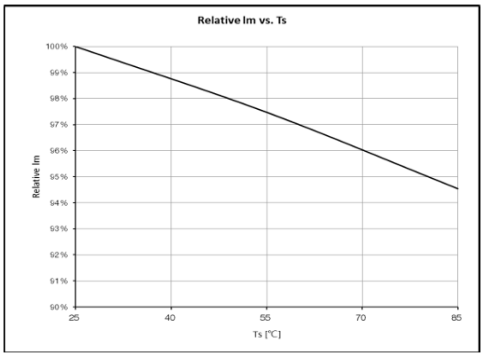
3. Typical Characteristics Graphs

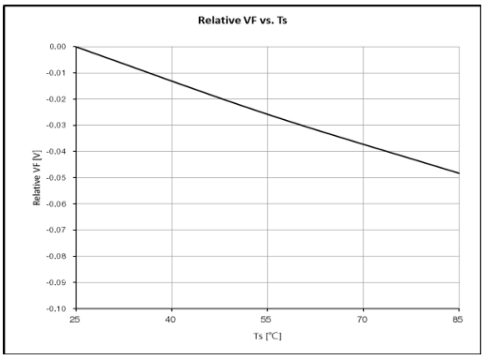
(2) Forward Current Characteristics (T_a=25 ºC)



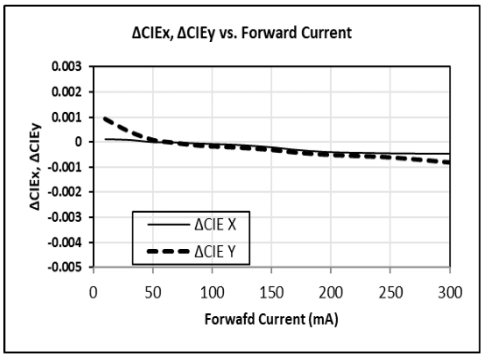


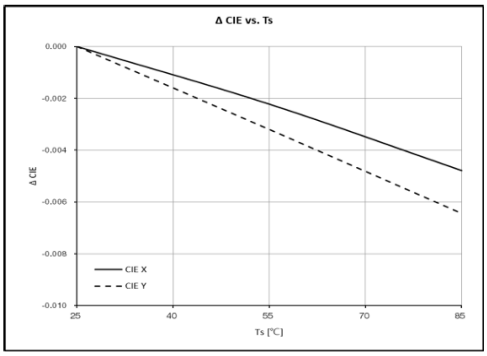
(3)Temperature Characteristics (I_F=65 mA)



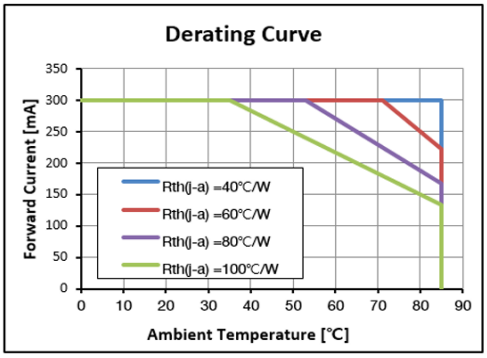


(4) Color Shift Characteristics (I_F=65 mA, T_a=25 ºC)

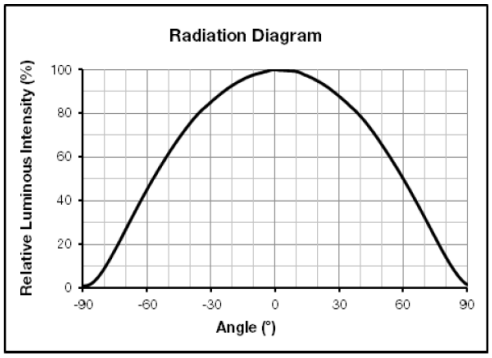




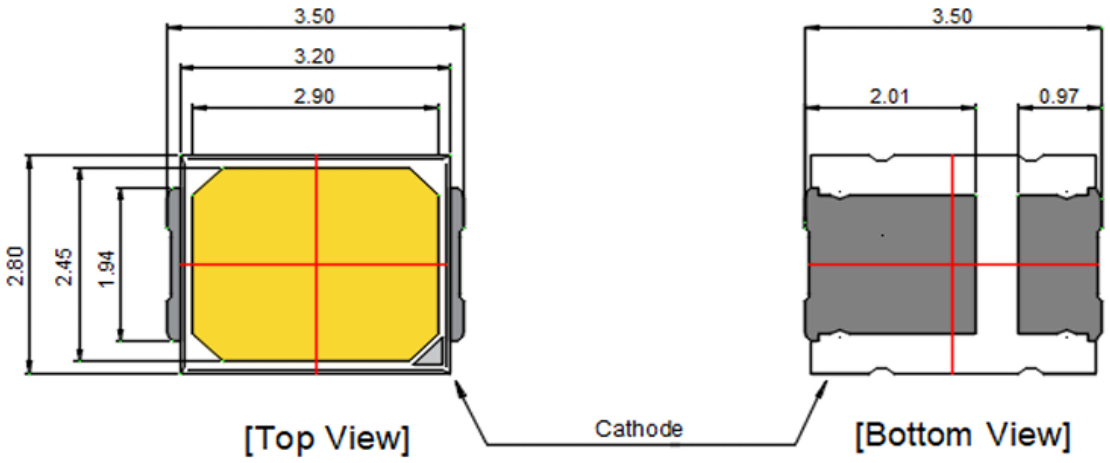
(5) Derating Curve

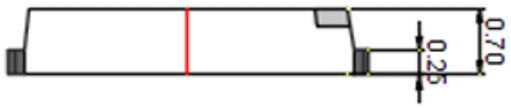


(6) Beam Angle Characteristics (I_F=65 mA, T_a=25 ºC)



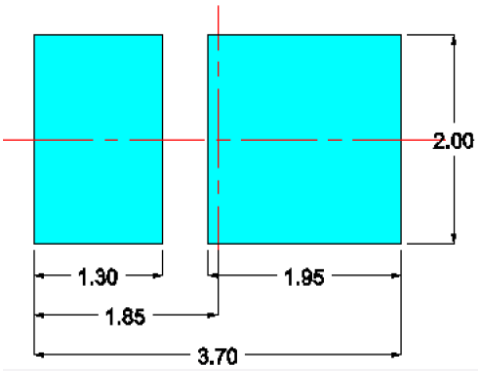
4. Outline Drawing & Dimension





[Side View]

[Recommended PCB Solder Pad]



- Measurement unit : mm
- Tolerance : ± 0.1mm

* Note :

1) T_s point and measurement method:

① Measure one point at the cathode pad, if necessary remove PSR of PCB to reach T_s point.

② All pads must be soldered to the PCB to dissipate heat properly, otherwise the LED can be damaged

Precautions:

1) Pressure on the LEDs will influence to the reliability of the LEDs. Precautions should be taken to avoid strong pressure on the LEDs. Do not put stress on the LEDs during heating.

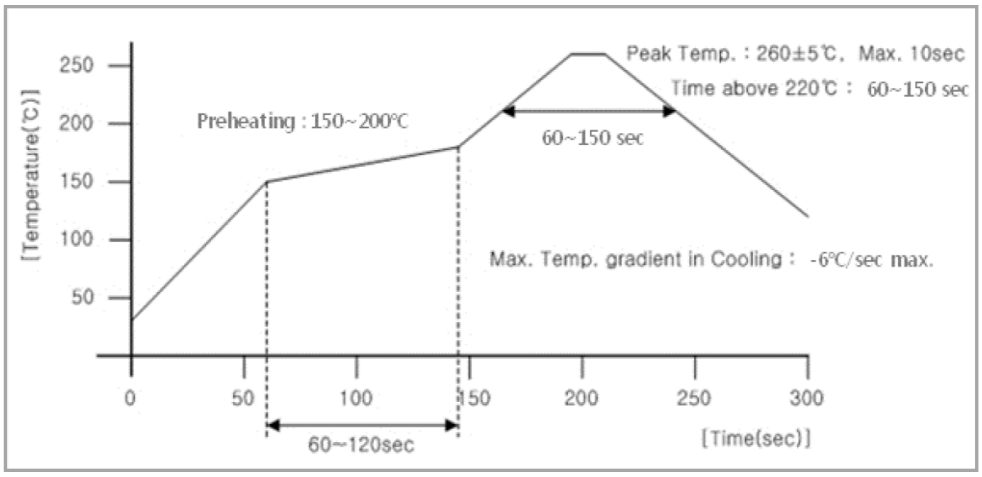
2) Re-soldering should not be done after the LEDs have been soldered. If re-soldering is unavoidable, LED`s characteristics should be carefully checked before and after such repair.

3) Do not stack assembled PCBs together. Since materials of LEDs is soft, abrasion between two PCB assembled with LED might cause catastrophic failure of the LEDs.

5. Soldering Conditions

(1) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



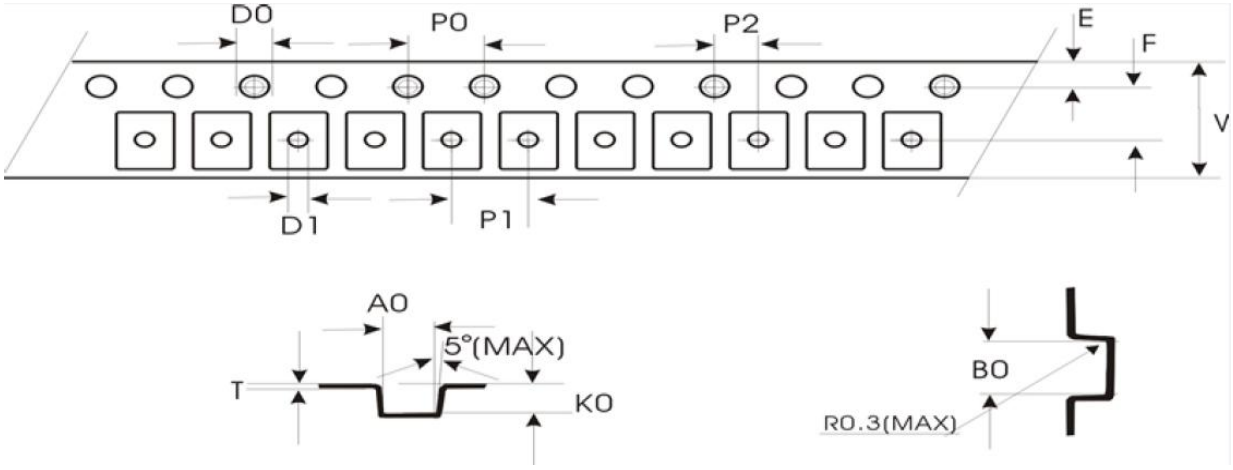
(2) Manual Soldering Conditions

Not more than 5 seconds @ max. 300 ºC, under soldering iron.

6. Tape & Reel

(1) Taping Dimension

(unit : mm)

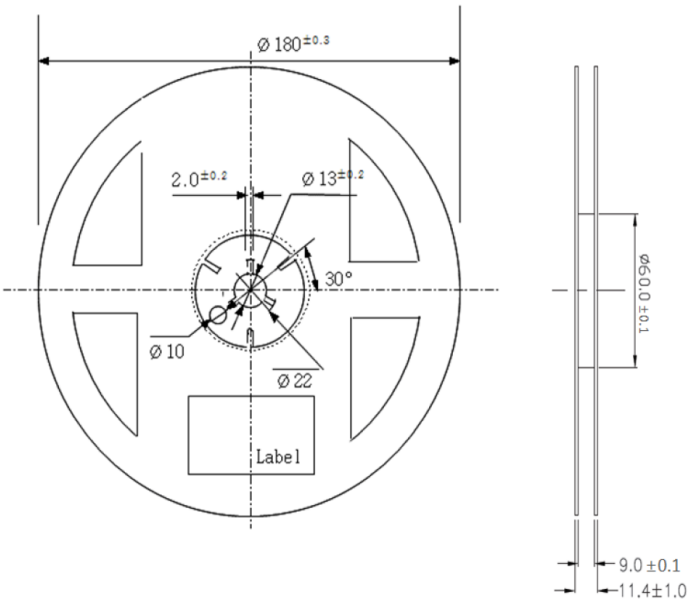


A0	3.10±0.1	P0	4.00±0.1	T	0.20±0.05	D0	1.60(MAX)
B0	3.70±0.1	P1	4.00±0.1	E	1.75±0.1	D1	1.05(MIN)
K0	1.00±0.1	P2	2.00±0.1	F	3.50±0.05	V	8.00±0.1

6. Tape & Reel

(2) Reel Dimension (Max 4,000 pcs)

(unit : mm)



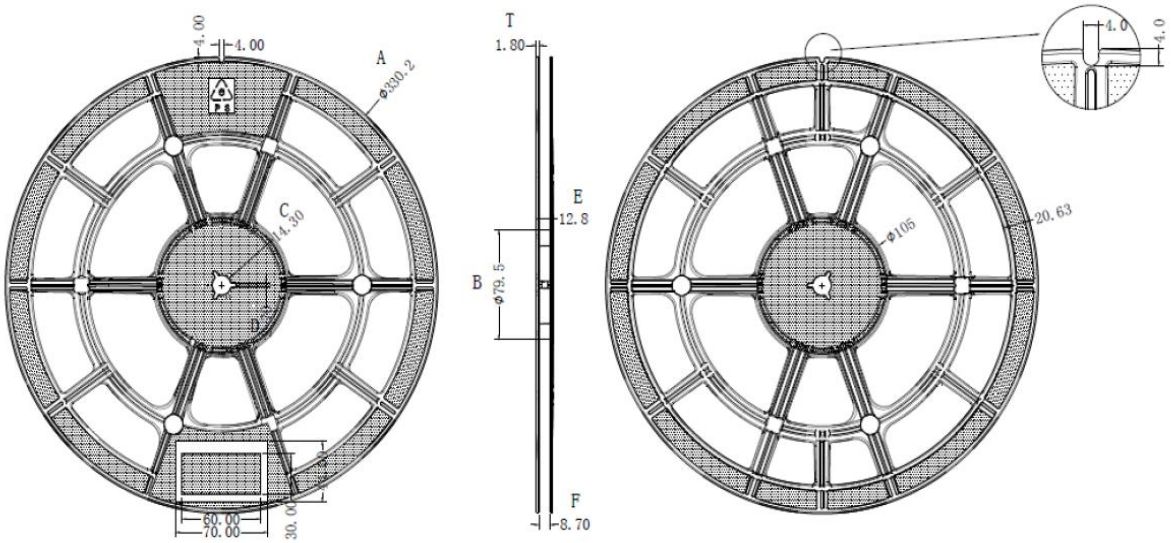
*** Note :**

1) Quantity: The quantity/reel is 4,000 pcs

2) All dimensions are millimeters (tolerance : ±0.2mm)

3) Packaging: P/N, Manufacturing data code no. and quantity are indicated on the aluminum packing bag

(3) Reel Dimension (Max 16,000 pcs)



A±2	B±0.5	C±0.2	D±0.2	E±0.5	$F^{+2}_{-0.3}$	T±0.2
Ø330.2	Ø79.5	Ø14.3	2.7	12.8	8.7	1.8

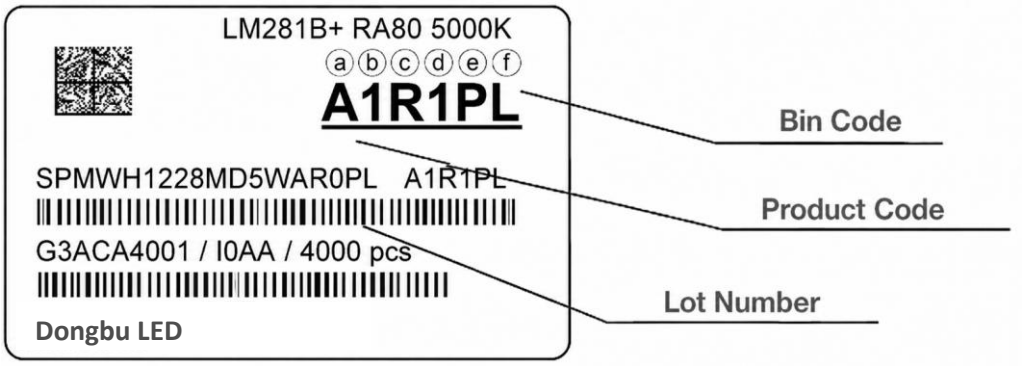
1) Quantity: The quantity/reel is 16,000 pcs

2) All dimensions are millimeters (tolerance : ±0.2mm)

3) Packaging: P/N, Manufacturing data code no. and quantity are indicated on the aluminum packing bag

7. Label Structure

(1) Label Structure



*** Note : Denoted bin code and product code above is only an example (see description on page 3)**

Bin Code

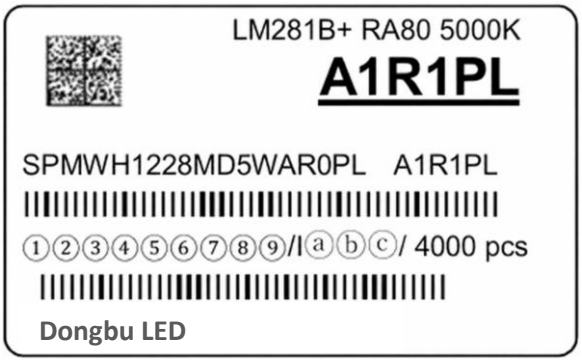
ⓐⓑ: Forward Voltage bin (refer to page 6)

ⓒⓓ: Chromaticity bin (refer to page 10-17)

ⓔⓕ: Luminous Flux bin (refer to page 5~6)

(2) Lot Number

The lot number is composed of the following characters:



①②③④⑤⑥⑦⑧⑨ / Ⅰⓐⓑⓒ / 4,000 pcs

①② : Production site (GP : Shenzhen, China, G3 : Nanchang, China, GD : Zhongshan, China)

③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)

④ : Year (C: 2018, D: 2019, E: 2020, F: 2021, G: 2022…)

⑤ : Month (1~9, A, B, C)

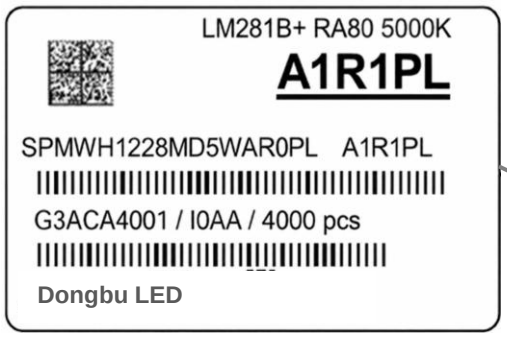
⑥ : Day (1~9, A, B~V)

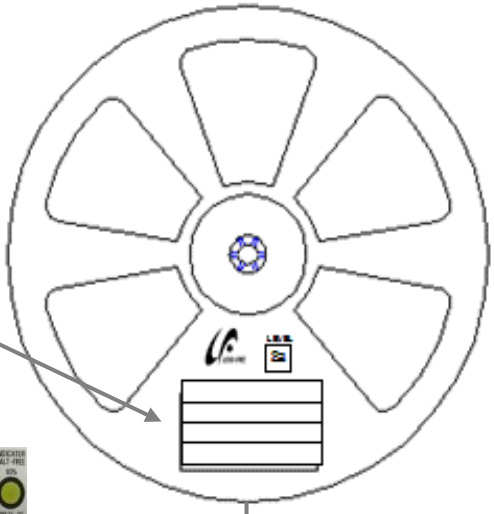
⑦⑧⑨ ⓐⓑⓒ : Product serial number

8. Packing Structure

(1) Packing Process (The quantity of PKG on the Reel to be Max 4,000 pcs)

Reel

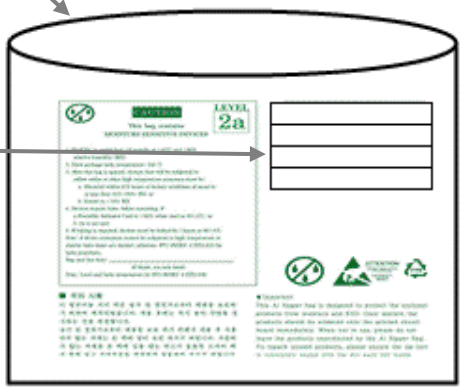




Aluminum Vinyl Packing Bag



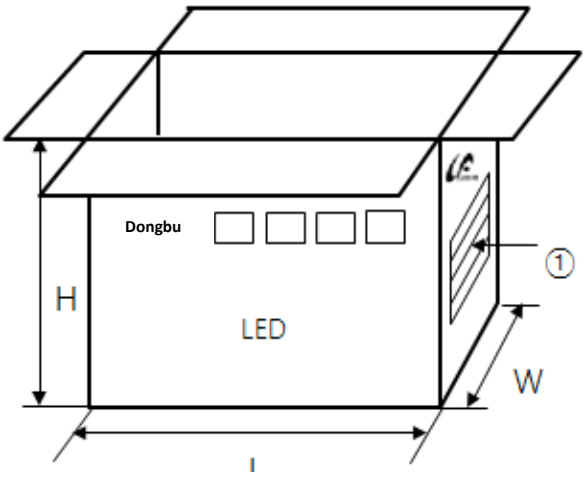




Outer Box

Material: Paper (SW3B(B))

Type	Size (mm)			Note
	L	W	H	
7 inch L	245 ± 5	220 ± 5	182 ± 5	Up to 10 reels
7 inch S	245 ± 5	220 ± 5	86 ± 5	Up to 5 reels



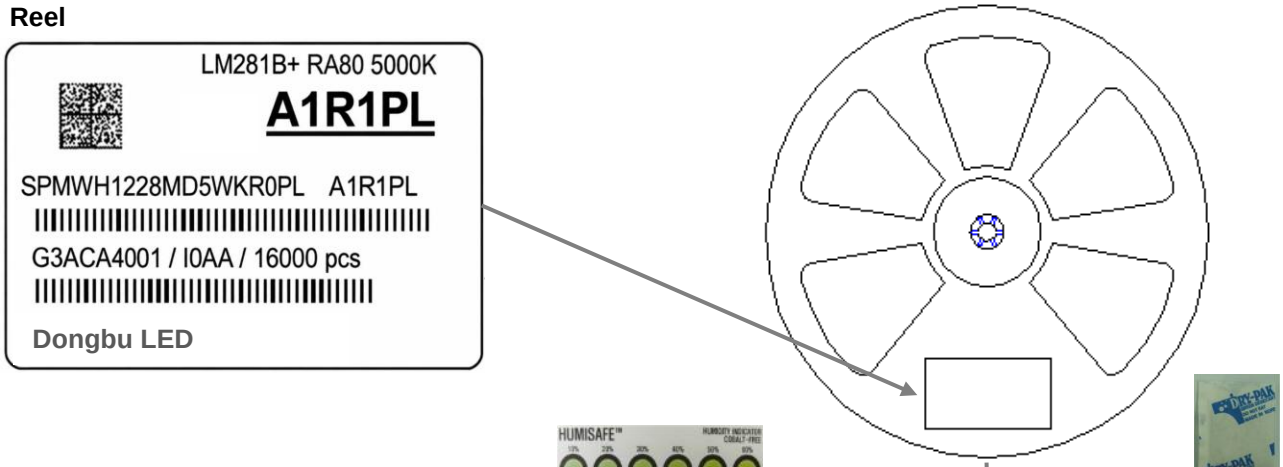
① Side Label



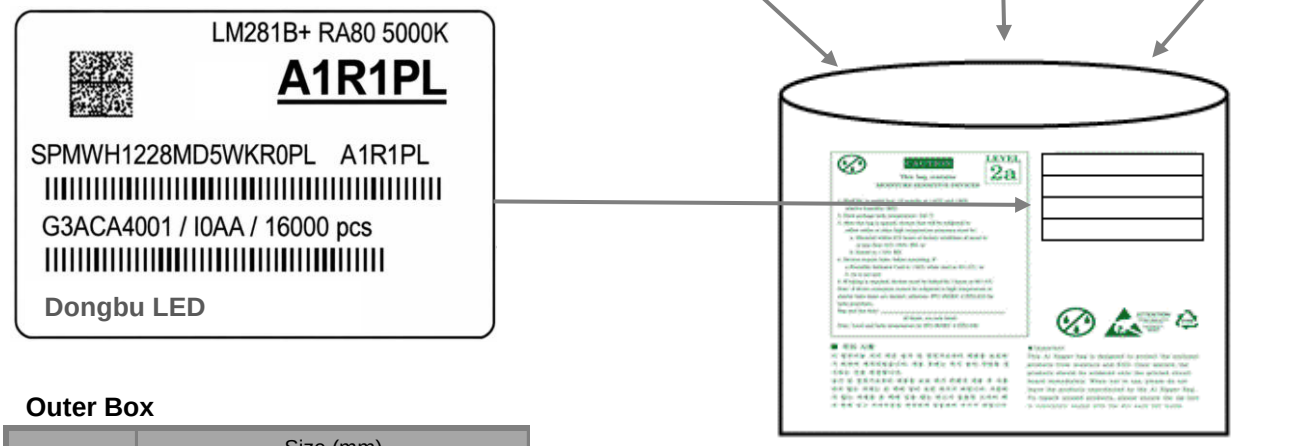
8. Packing Structure

(2) Packing Process (The quantity of PKG on the Reel to be Max 16,000 pcs)

Reel

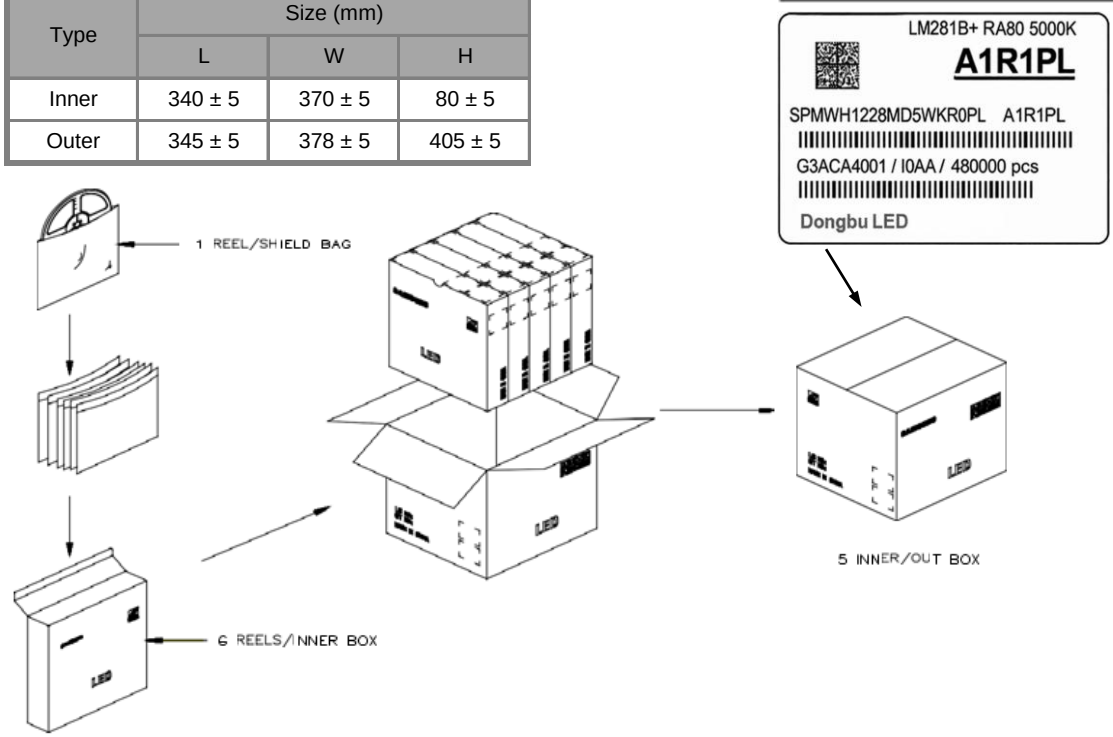


Aluminum Vinyl Packing Bag



Outer Box

Type	Size (mm)		
	L	W	H
Inner	340 ± 5	370 ± 5	80 ± 5
Outer	345 ± 5	378 ± 5	405 ± 5

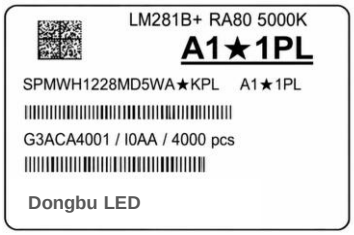


8. Packing Structure

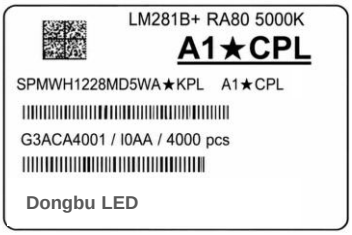
(3) Packing Process for kitting (The quantity of PKG on the Reel to be Max 4,000 pcs)

Reel

Kitting 'A'

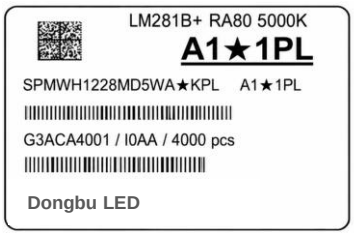


Kitting 'B'



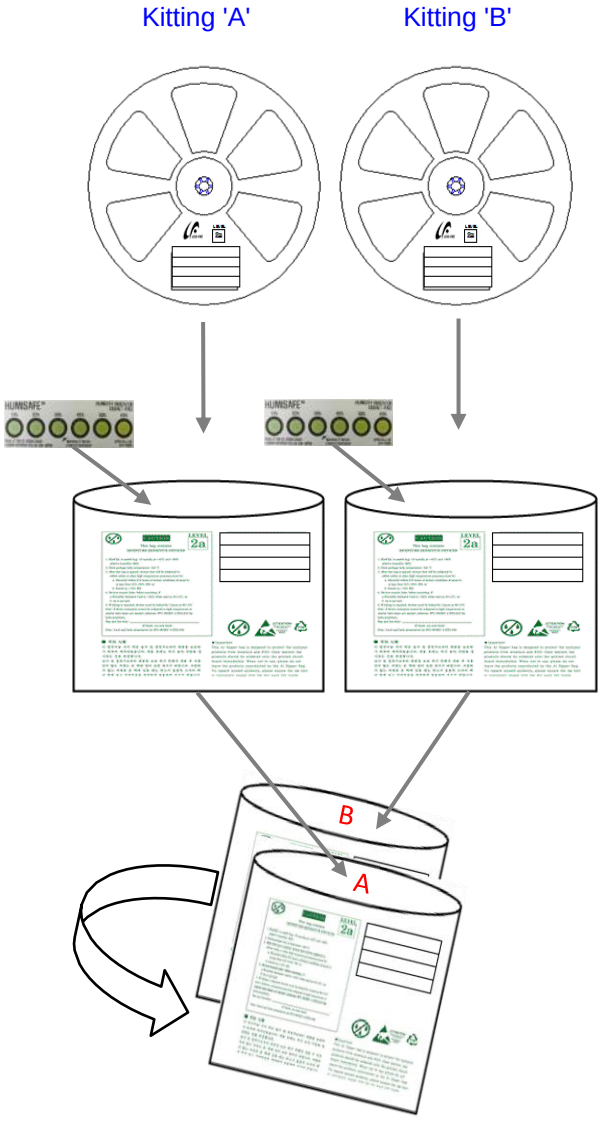
Aluminum Vinyl Packing Bag

Kitting 'A'



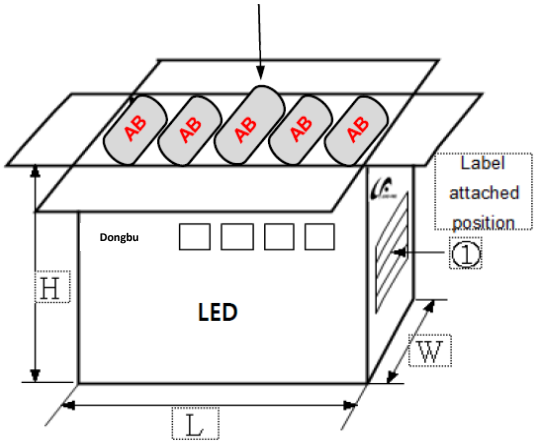
Kitting 'B'





Material : Paper (SW3B(B))

Type	Size (mm)			Note
	L	W	H	
7 inch L	245 ± 5	220 ± 5	182 ± 5	Up to 10 reels

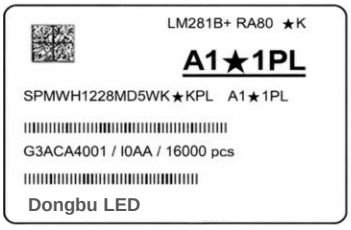


8. Packing Structure

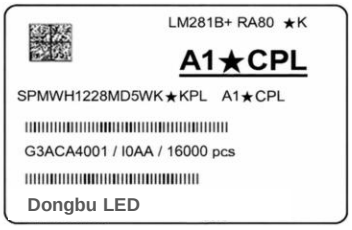
(4) Packing Process for kitting (The quantity of PKG on the Reel to be Max 16,000 pcs)

Reel

Kitting 'A'

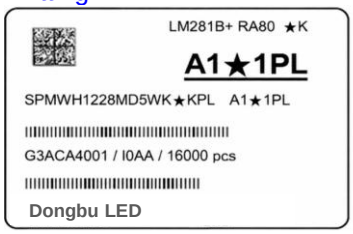


Kitting 'B'

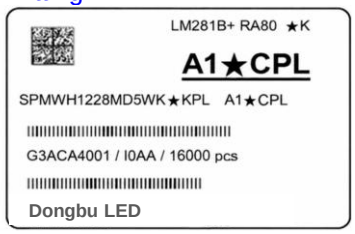


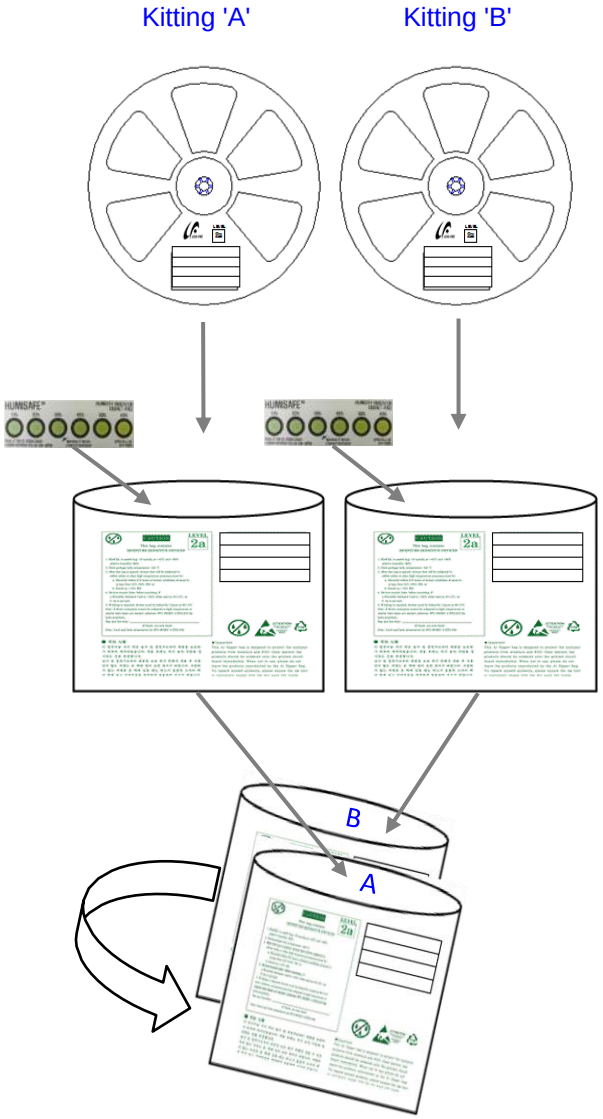
Aluminum Vinyl Packing Bag

Kitting 'A'



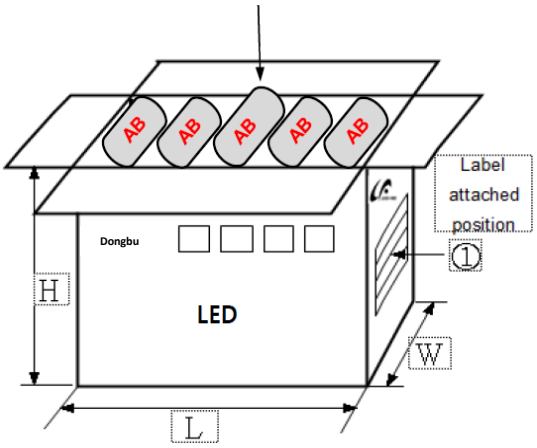
Kitting 'B'





Material : Paper (SW3B(B))

Type	Size (mm)			Note
	L	W	H	
13 inch L	378 ± 5	345 ± 5	405 ± 5	Up to 10 reels



8. Packing Structure

(5) Aluminum Vinyl Packing Bag



(6) Example of Humidity Indicator Card inside Aluminum Vinyl Bag



9. Precautions in Handling & Use

(1) For over-current protection, users are recommended to apply resistors connected in series with the LEDs to mitigate sudden change of the forward current caused by shift of forward voltage.

(2) This device should not be used in any type of fluid such as water, oil, organic solvent, etc. When cleaning is required, IPA is recommended as the cleaning agent. Some solvent-based cleaning agent may damage the silicone resins used in the device.

(3) When the device is in operation, the forward current should be carefully determined considering the maximum ambient temperature and corresponding junction temperature.

(4) LEDs must be stored in a clean environment.
(shelf life of sealed bags is 12 months at temperature 0~40 ºC, 0~90 % RH).

(5) After storage bag is opened, device subjected to soldering, solder reflow, or other high temperature processes must be:
a. Mounted within 672 hours (28 days) at an assembly line with a condition of no more than 30 ºC / 60 % RH*$_{Note\ 1}$, or
b. Mounted within 24 hours (1 day) at an assembly line with a condition of more than 30 ºC / 70 % RH*$_{Note\ 2}$, or
c. Stored at <10 % RH

*Note 1, 2: IPC/JEDEC J-STD-033A, Recommended Equivalent Total Floor Life Table

Package Type and Body Thickness	Moisture Sensitivity Level	Maximum Percent Relative Humity						Temperature
		40%	50%	60%	70%	80%	90%	
Body Thickness <2.1mm	Level2a	∞	∞	28	1	1	1	30℃
		∞	∞	∞	2	1	1	25℃
		∞	∞	∞	2	2	1	20℃

(6) Repack unused devices with anti-moisture packing, fold to close any opening and then store in a dry place.

(7) Devices require baking before mounting, if humidity card reading is >60 % at 23 ± 5 ºC.

(8) Devices must be baked for 10~24 hours at 60 ± 5 ºC, if baking is required.

(9) The LEDs are sensitive to the static electricity and surge current. It is recommended to use a wrist band or anti-electrostatic glove when handling the LEDs. If voltage exceeding the absolute maximum rating is applied to LEDs, it may cause damage or even destruction to LED devices. Damaged LEDs may show some unusual characteristics such as increase in leakage current, lowered turn-on voltage, or abnormal lighting of LEDs at low current.

(10) VOCs (Volatile Organic Compounds) can be generated from adhesives, flux, hardener or organic additives used in luminaires (fixtures). Transparent LED silicone encapsulant is permeable to those chemicals and they may lead to a discoloration of encapsulant when they exposed to heat or light. This phenomenon can cause a significant loss of light emitted (output) from the luminaires. In order to prevent these problems, we recommend users to know the physical properties of materials used in luminaires and they must be carefully selected.

9. Precautions in Handling & Use

(11) Risk of sulfurization (or tarnishing)

The LED from Dongbu uses a silver-plated lead frame and its surface color may change to black (or dark colored) when it is exposed to sulfur (S), chlorine (Cl) or other halogen compound. Sulfurization of lead frame may cause intensity degradation, change of chromaticity coordinates and, in extreme cases, open circuit. It requires caution. Due to possible sulfurization of lead frame, LED should not be used and stored together with oxidizing substances made of materials such as rubber, plain paper, lead solder cream, etc.