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Middle Power LED Series
5630

LM561B Plus

CRI 90



Improved efficacy and performance of LM561B to provide better solution



Features & Benefits

- 0.3 W class middle power LED
- Mold resin for high reliability
- Standard form factor for design flexibility (5.6 × 3.0 mm)

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1. Characteristics

a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Ambient / Operating Temperature	T_a	-40 ~ +85	°C	-
Storage Temperature	T_{stg}	-40 ~ +120	°C	-
LED Junction Temperature	T_j	110	°C	-
Forward Current	I_F	180	mA	-
Peak Pulsed Forward Current	I_{fp}	300	mA	Duty 1/10, pulse width 10 ms
Assembly Process Temperature	-	260 <10	°C s	-
ESD (HBM)	-	±5	kV	-

b) Electro-optical Characteristics ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)

Item	Unit	CRI (R_a) Min.	Nominal CCT (K)	Rank	Bin	Min.	Typ.	Max.					
Forward Voltage (V_F)	V			WA	AZ	2.7	-	2.8					
					A1	2.8	-	2.9					
					A2	2.9	-	3.0					
					A3	3.0	-	3.1					
					A4	3.1	-	3.2					
					Luminous Flux (Φ_v)	lm	90	2700		S1	24.0	-	26.0
										S2	26.0	-	28.0
										S3	28.0	-	30.0
								3000		S1	24.5	-	26.5
										S2	26.5	-	28.5
										S3	28.5	-	30.5
								3500		S1	25.0	-	27.0
S2	27.0	-	29.0										
S3	29.0	-	31.0										
Reverse Voltage (@ 5 mA)	V				4000	S1	26.0	-	28.0				
						S2	28.0	-	30.0				
						S3	30.0	-	32.0				
					5000	S1	27.0	-	29.0				
						S2	29.0	-	31.0				
						S3	31.0	-	33.0				
					5700	S1	26.5	-	28.5				
						S2	28.5	-	30.5				
						S3	30.5	-	32.5				
6500	S1	26.0	-	28.0									
	S2	28.0	-	30.0									
	S3	30.0	-	32.0									
Color Rendering Index (R_a)	-				90	-	-						
Special CRI (R9)	-				50	-	-						
Thermal Resistance (junction to solder point)	$^\circ\text{C/W}$					-	15	-					
Beam Angle	$^\circ$					-	120	-					

Note:

Samsung maintains measurement tolerance of: forward voltage = $\pm 0.1 \text{ V}$, luminous flux = $\pm 5 \%$, CRI = ± 3 , R9 = ± 6.5

2. 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	T	5	4	1	M	P	7	W	A	R	0	S	1

Digit	PKG Information	Code	Specification	
1 2 3	Samsung Package Middle Power	SPM		
4 5	Color	WH	White	
6	Product Version	T		
7 8 9	Form Factor	541	5.6 x 3.0 x 0.7 mm; 4 pads;	
10	Sorting Current (mA)	M	65 mA	
11	Chromaticity Coordinates	P		
12	CRI	7	Min. 90	
13 14	Forward Voltage (V)	WA	2.7~3.2V (2,500 pcs/Reel)	
15 16	CCT (K)	W ☆ 2700 V ☆ 3000 U ☆ 3500 T ☆ 4000 R ☆ 5000 Q ☆ 5700 P ☆ 6500	Bin Code: W1, W2, W3, W4, W5, W6, W7, W8, W9, WA, WB, WC, WD, WE, WF, WG V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, VD, VE, VF, VG U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC, UD, UE, UF, UG T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC, TD, TE, TF, TG R1, R2, R3, R4, R5, R6, R7, R8, R9, RA, RB, RC, RP, RQ, RR, RS Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, QA, QB, QC, QP, QQ, QR, QS P1, P2, P3, P4, P5, P6, P7, P8, P9, PA, PB, PC, PP, PQ, PR, PS	☆ "0" (Whole bin) "M" (Quarter bin) "K" (K Kitting) or "S" (S Kitting)
17 18	Luminous Flux	S0	Bin Code:	S1, S2, S3

a) Luminous Flux Bins($I_F = 65 \text{ mA}$, $T_s = 25^\circ\text{C}$)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	Flux Bin	Flux Range (Φ_v , lm)
90	2700	SPMWHT541MP7WAW☆S0	S1	24.0 ~ 26.0
			S2	26.0 ~ 28.0
			S3	28.0 ~ 30.0
	3000	SPMWHT541MP7WAV☆S0	S1	24.5 ~ 26.5
			S2	26.5 ~ 28.5
			S3	28.5 ~ 30.5
	3500	SPMWHT541MP7WAU☆S0	S1	25.0 ~ 27.0
			S2	27.0 ~ 29.0
			S3	29.0 ~ 31.0
	4000	SPMWHT541MP7WAT☆S0	S1	26.0 ~ 28.0
			S2	28.0 ~ 30.0
			S3	30.0 ~ 32.0
	5000	SPMWHT541MP7WAR☆S0	S1	27.0 ~ 29.0
			S2	29.0 ~ 31.0
			S3	31.0 ~ 33.0
	5700	SPMWHT541MP7WAQ☆S0	S1	26.5 ~ 28.5
			S2	28.5 ~ 30.5
			S3	30.5 ~ 32.5
6500	SPMWHT541MP7WAP☆S0	S1	26.0 ~ 28.0	
		S2	28.0 ~ 30.0	
		S3	30.0 ~ 32.0	

Note:

"◆" can be "A" (2,500pcs) of reel taping

"☆" can be "0" (Whole bin), "M" (Quarter bin), "K" (K Kitting) or "S" (S Kitting) of the color binning

b) Kitting rule

1) K Kitting bin Concept

1. Under agreement between customer and SAMSUNG ELECTRONICS, SAMSUNG can supply kitting bin (VF, Color, Im).
2. A forward voltage (VF) of kitting bin is combined by a pair of same VF rank such as (A1+A1), (A2+A2), (A3+A3), (A4+A4) or (AZ+AZ).
3. A Chromaticity Coordinates of kitting bin is mixed by kitting procedure.(below kitting simulation)
4. A luminous flux(lm) of kitting bin is combined by a pair of IV rank such as (S1+S1), (S2+S2) or (S3+S3)

[Kitting example ; Warm white] (2700K, 3000K, 3500K, 4000K)

D	Y	E	F	Z	G
9	A	B	C		
5	6	7	8		
1	W	2	3	X	4

[Kitting example ; Cool white] (5000K, 5700K, 6500K)

9	Y	A	B	Z	C
5	6	7	8		
1	2	3	4		
P	W	Q	R	X	S

[Binning Information]

	Warm white		Cool white	
	Bin #1	Bin #2	Bin #1	Bin #2
VF	AZ	AZ	AZ	AZ
	A1	A1	A1	A1
	A2	A2	A2	A2
	A3	A3	A3	A3
	A4	A4	A4	A4
CIE	W (1, 2, 5, 6 bin)	Z (B, C, F, G bin)	W (1, 2, P, Q bin)	Z (7, 8, B, C bin)
	V (6, 7, A, B bin)	V (6, 7, A, B bin)	V (2, 3, 6, 7 bin)	V (2, 3, 6, 7 bin)
	X (3, 4, 7, 8 bin)	Y (9, A, D, E bin)	X (3, 4, R, S bin)	Y (5, 6, 9, A bin)
IV	S1	S1	S1	S1
	S2	S2	S2	S2
	S3	S3	S3	S3

※ Each of V,W,X,Y and Z can be one bin without details division

2) S Kitting bin Concept

- Under agreement between customer and SAMSUNG ELECTRONICS, SAMSUNG can supply kitting bin (VF, Color, lm).
- A forward voltage (VF) of kitting bin is combined by a pair of same VF rank such as (A1+A1), (A2+A2), (A3+A3), (A4+A4) or (AZ+AZ).
- A Chromaticity Coordinates of kitting bin is mixed by kitting procedure.(below kitting simulation)
- A luminous flux(lm) of kitting bin is combined by a pair of IV rank such as (S1+S1), (S2+S2) or (S3+S3)

[Kitting example ; Warm white]
(2700K, 3000K, 3500K, 4000K)

D	Y	E	F	Z	G
9	A	B	C		
5	6	7		8	
1	W	2	3	X	4

[Kitting example ; Cool white]
(5000K, 5700K, 6500K)

9	Y	A	B	Z	C
5	6	7	8		
1	2	3	4		
P	W	Q	R	X	S

[Binning Information]

	Warm white		Cool white	
	Bin #1	Bin #2	Bin #1	Bin #2
VF	AZ	AZ	AZ	AZ
	A1	A1	A1	A1
	A2	A2	A2	A2
	A3	A3	A3	A3
	A4	A4	A4	A4
CIE	W (1, 2, 5)	B	W (1, P, Q)	7
	X (3, 4, 8)	A	X (4, R, S)	6
	Y (9, D, E)	7	Y (5, 9, A)	3
	Z (C, F, G)	6	Z (8, B, C)	2
	6	6	2	2
	7	7	3	3
	A	A	6	6
	B	B	7	7
V (6, 7, A, B)	V (6, 7, A, B)	V (2, 3, 6, 7)	V (2, 3, 6, 7)	
IV	S1	S1	S1	S1
	S2	S2	S2	S2
	S3	S3	S3	S3

※ Each of V,W,X,Y and Z can be one bin without details division.

c) Color Bins ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)

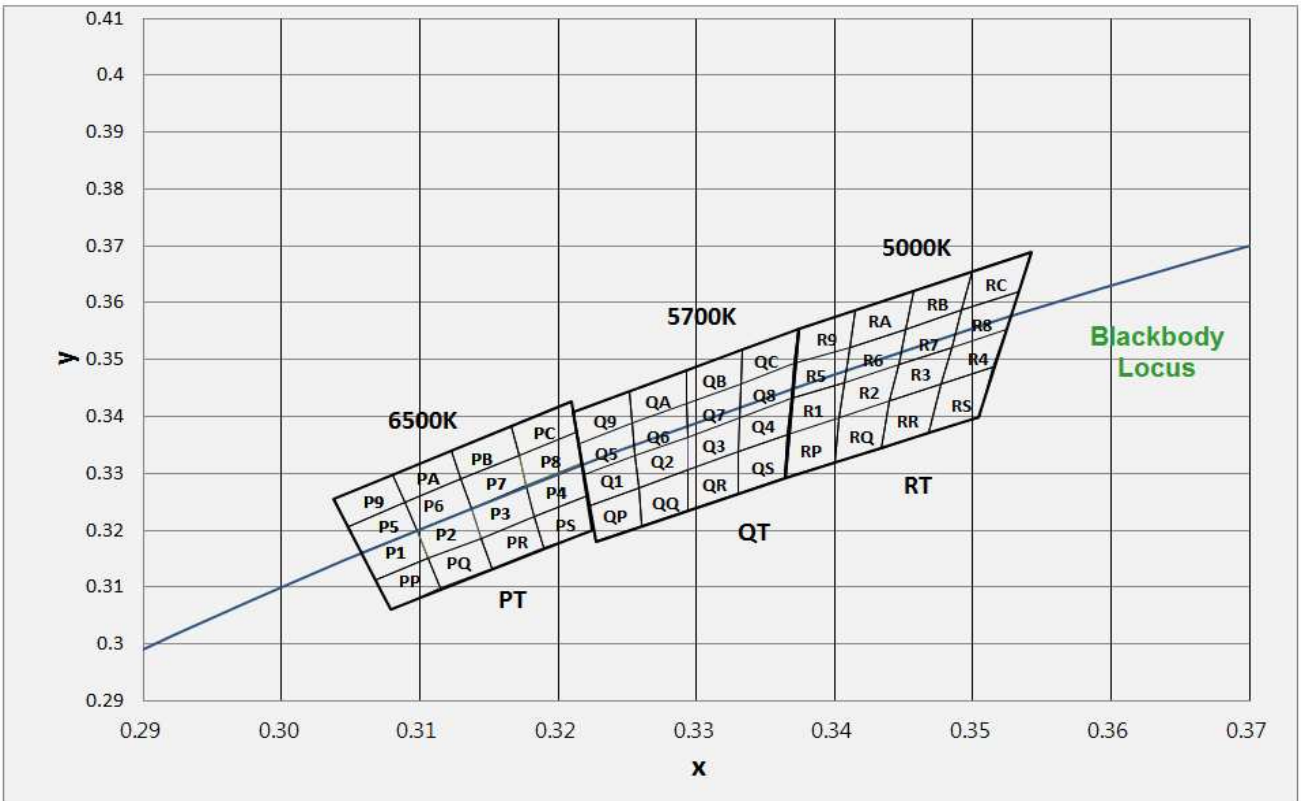
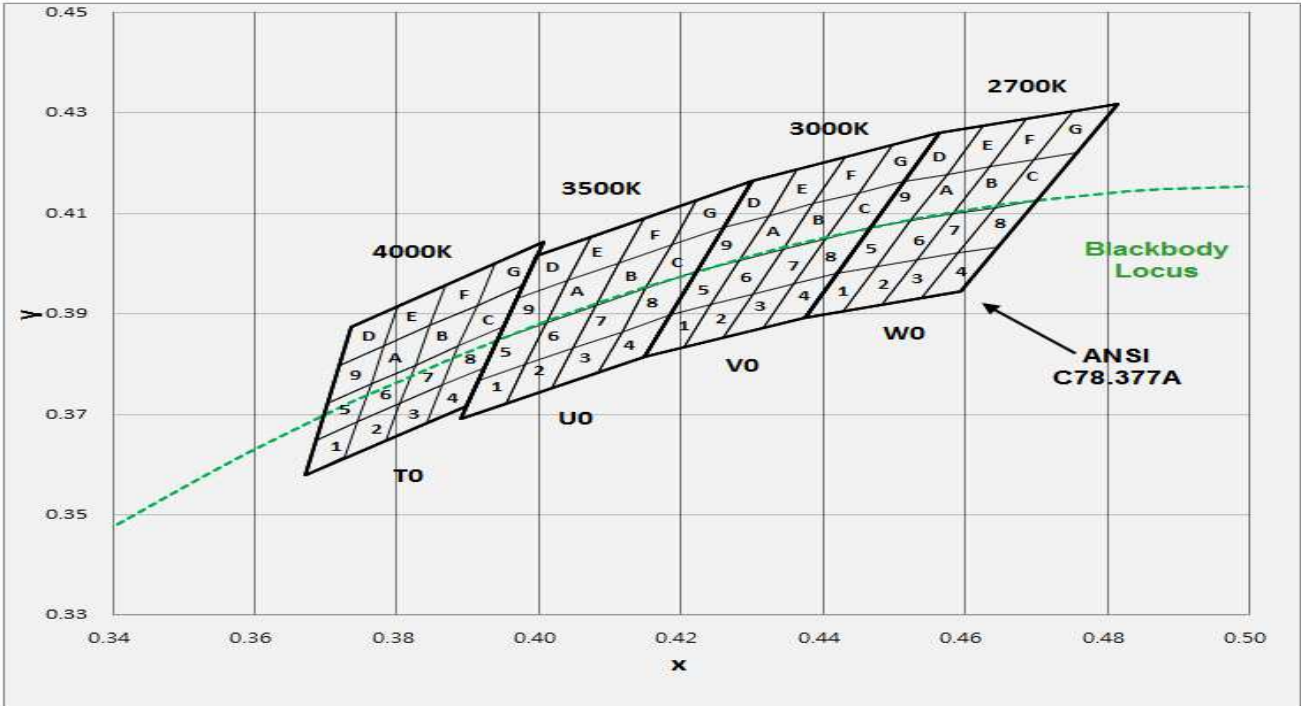
CRI (R_a) Min.	Nominal CCT (K)	Product Code	Color Rank	Chromaticity Bins
80	2700	SPMWHT541MP7XAW0S0	W0 (Whole bin)	W1, W2, W3, W4, W5, W6, W7, W8, W9, WA, WB, WC, WD, WE, WF, WG
		SPMWHT541MP7XAWM0	WM (Quarter bin)	W6, W7, WA, WB
		SPMWHT541MP7XAWSS0	WS (S Kitting)	W6, W7, WA, WB, WV, WW, WX, WY, WZ
		SPMWHT541MP7XAWK0	WK (K Kitting)	WV, WW, WX, WY, WZ
	3000	SPMWHT541MP7XAV0S0	V0 (Whole bin)	V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, VD, VE, VF, VG
		SPMWHT541MP7XAVMS0	VM (Quarter bin)	V6, V7, VA, VB
		SPMWHT541MP7XAVSS0	VS (S Kitting)	V6, V7, VA, VB, , VV, VW, VX, VY, VZ
		SPMWHT541MP7XAVKS0	VK (K Kitting)	VV, VW, VX, VY, VZ
	3500	SPMWHT541MP7XAU0S0	U0 (Whole bin)	U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC, UD, UE, UF, UG
		SPMWHT541MP7XAUMS0	UM (Quarter bin)	U6, U7, UA, UB
		SPMWHT541MP7XAUSS0	US (S Kitting)	U6, U7, UA, UB, , UV, UW, UX, UY, UZ
		SPMWHT541MP7XAUKS0	UK (K Kitting)	UV, UW, UX, UY, UZ
	4000	SPMWHT541MP7XAT0S0	T0 (Whole bin)	T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC, TD, TE, TF, TG
		SPMWHT541MP7XATMS0	TM (Quarter bin)	T6, T7, TA, TB
		SPMWHT541MP7XATSS0	TS (S Kitting)	T6, T7, TA, TB, , TV, TW, TX, TY, TZ
		SPMWHT541MP7XATKS0	TK (K Kitting)	TV, TW, TX, TY, TZ
5000	SPMWHT541MP7XAR0S0	R0 (Whole bin)	R1, R2, R3, R4, R5, R6, R7, R8, R9, RA, RB, RC, RD, RE, RF, RG	
	SPMWHT541MP7XARMS0	RM (Quarter bin)	R6, R7, RA, RB	
	SPMWHT541MP7XARSS0	RS (S Kitting)	R6, R7, RA, RB, RV, RW, RX, RY, RZ	
	SPMWHT541MP7XARKS0	RK (K Kitting)	RV, RW, RX, RY, RZ	
5700	SPMWHT541MP7XAQ0S0	Q0 (Whole bin)	Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, QA, QB, QC, QD, QE, QF, QG	
	SPMWHT541MP7XAQMS0	QM (Quarter bin)	Q6, Q7, QA, QB	
	SPMWHT541MP7XAQSS0	QS (S Kitting)	Q6, Q7, QA, QB, QV, QW, QX, QY, QZ	
	SPMWHT541MP7XAQKS0	QK (K Kitting)	QV, QW, QX, QY, QZ	

6500	SPMWHT541MP7XAP0S0	P0 (Whole bin)	P1, P2, P3, P4, P5, P6, P7, P8, P9, PA, PB, PC, PD, PE, PF, PG
	SPMWHT541MP7XAPMS0	PM (Quarter bin)	P6, P7, PA, PB
	SPMWHT541MP7XAPSS0	PS (S Kitting)	P6, P7, PA, PB, PV, PW, PX, PY, PZ
	SPMWHT541MP7XAPKS0	PK (K Kitting)	PV, PW, PX, PY, PZ

d) Voltage Bins ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ °C}$)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	Voltage Rank	Voltage Bin	Voltage Range (V)
-	-	-	WA (WK)	AZ	2.7 ~ 2.8
-	-	-		A1	2.8 ~ 2.9
-	-	-		A2	2.9 ~ 3.0
-	-	-		A3	3.0 ~ 3.1
-	-	-		A4	3.1 ~ 3.2
-	-	-			

e) Chromaticity Region & Coordinates ($I_f = 65 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)



e) Chromaticity Region & Coordinates ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)

Region	CIE x	CIE y	Region	CIE x	CIE y
W rank (2700 K)					
W1	0.4373	0.3893	W9	0.4465	0.4071
	0.4418	0.3981		0.4513	0.4164
	0.4475	0.3994		0.4573	0.4178
	0.4428	0.3906		0.4523	0.4085
W2	0.4428	0.3906	WA	0.4523	0.4085
	0.4475	0.3994		0.4573	0.4178
	0.4532	0.4008		0.4634	0.4193
	0.4483	0.3919		0.4582	0.4099
W3	0.4483	0.3919	WB	0.4582	0.4099
	0.4532	0.4008		0.4634	0.4193
	0.4589	0.4021		0.4695	0.4207
	0.4538	0.3931		0.4641	0.4112
W4	0.4538	0.3931	WC	0.4641	0.4112
	0.4589	0.4021		0.4695	0.4207
	0.4646	0.4034		0.4756	0.4221
	0.4593	0.3944		0.4700	0.4126
W5	0.4418	0.3981	WD	0.4513	0.4164
	0.4465	0.4071		0.4562	0.4260
	0.4523	0.4085		0.4624	0.4274
	0.4475	0.3994		0.4573	0.4178
W6	0.4475	0.3994	WE	0.4573	0.4178
	0.4523	0.4085		0.4624	0.4274
	0.4582	0.4099		0.4687	0.4289
	0.4532	0.4008		0.4634	0.4193
W7	0.4532	0.4008	WF	0.4634	0.4193
	0.4582	0.4099		0.4687	0.4289
	0.4641	0.4112		0.4750	0.4304
	0.4589	0.4021		0.4695	0.4207
W8	0.4589	0.4021	WG	0.4695	0.4207
	0.4641	0.4112		0.4750	0.4304
	0.4700	0.4126		0.4813	0.4319
	0.4646	0.4034		0.4756	0.4221

Region	CIE x	CIE y	Region	CIE x	CIE y
V rank (3000 K)					
V1	0.4147	0.3814	V9	0.4221	0.3984
	0.4183	0.3898		0.4259	0.4073
	0.4242	0.3919		0.4322	0.4096
	0.4203	0.3833		0.4281	0.4006
V2	0.4203	0.3833	VA	0.4281	0.4006
	0.4242	0.3919		0.4322	0.4096
	0.4300	0.3939		0.4385	0.4119
	0.4259	0.3853		0.4342	0.4028
V3	0.4259	0.3853	VB	0.4342	0.4028
	0.4300	0.3939		0.4385	0.4119
	0.4359	0.3960		0.4449	0.4141
	0.4316	0.3873		0.4403	0.4049
V4	0.4316	0.3873	VC	0.4403	0.4049
	0.4359	0.3960		0.4449	0.4141
	0.4418	0.3981		0.4513	0.4164
	0.4373	0.3893		0.4465	0.4071
V5	0.4183	0.3898	VD	0.4259	0.4073
	0.4221	0.3984		0.4299	0.4165
	0.4281	0.4006		0.4364	0.4188
	0.4242	0.3919		0.4322	0.4096
V6	0.4242	0.3919	VE	0.4322	0.4096
	0.4281	0.4006		0.4364	0.4188
	0.4342	0.4028		0.4430	0.4212
	0.4300	0.3939		0.4385	0.4119
V7	0.4300	0.3939	VF	0.4385	0.4119
	0.4342	0.4028		0.4430	0.4212
	0.4403	0.4049		0.4496	0.4236
	0.4359	0.3960		0.4449	0.4141
V8	0.4359	0.3960	VG	0.4449	0.4141
	0.4403	0.4049		0.4496	0.4236
	0.4465	0.4071		0.4562	0.4260
	0.4418	0.3981		0.4513	0.4164

e) Chromaticity Region & Coordinates

Region	CIE x	CIE y	Region	CIE x	CIE y
U rank (3500 K)					
U1	0.3889	0.3690	U9	0.3941	0.3848
	0.3915	0.3768		0.3968	0.3930
	0.3981	0.3800		0.4040	0.3966
	0.3953	0.3720		0.4010	0.3882
U2	0.3953	0.3720	UA	0.4010	0.3882
	0.3981	0.3800		0.4040	0.3966
	0.4048	0.3832		0.4113	0.4001
	0.4017	0.3751		0.4080	0.3916
U3	0.4017	0.3751	UB	0.4080	0.3916
	0.4048	0.3832		0.4113	0.4001
	0.4116	0.3865		0.4186	0.4037
	0.4082	0.3782		0.4150	0.3950
U4	0.4082	0.3782	UC	0.4150	0.3950
	0.4116	0.3865		0.4186	0.4037
	0.4183	0.3898		0.4259	0.4073
	0.4147	0.3814		0.4221	0.3984
U5	0.3915	0.3768	UD	0.3968	0.3930
	0.3941	0.3848		0.3996	0.4015
	0.4010	0.3882		0.4071	0.4052
	0.3981	0.3800		0.4040	0.3966
U6	0.3981	0.3800	UE	0.4040	0.3966
	0.4010	0.3882		0.4071	0.4052
	0.4080	0.3916		0.4146	0.4089
	0.4048	0.3832		0.4113	0.4001
U7	0.4048	0.3832	UF	0.4113	0.4001
	0.4080	0.3916		0.4146	0.4089
	0.4150	0.3950		0.4222	0.4127
	0.4116	0.3865		0.4186	0.4037
U8	0.4116	0.3865	UG	0.4186	0.4037
	0.4150	0.3950		0.4222	0.4127
	0.4221	0.3984		0.4299	0.4165
	0.4183	0.3898		0.4259	0.4073

Region	CIE x	CIE y	Region	CIE x	CIE y
T rank (4000 K)					
T1	0.3670	0.3578	T9	0.3702	0.3722
	0.3726	0.3612		0.3763	0.3760
	0.3744	0.3685		0.3782	0.3837
	0.3686	0.3649		0.3719	0.3797
T2	0.3726	0.3612	TA	0.3763	0.3760
	0.3783	0.3646		0.3825	0.3798
	0.3804	0.3721		0.3847	0.3877
	0.3744	0.3685		0.3782	0.3837
T3	0.3783	0.3646	TB	0.3825	0.3798
	0.3840	0.3681		0.3887	0.3836
	0.3863	0.3758		0.3912	0.3917
	0.3804	0.3721		0.3847	0.3877
T4	0.3840	0.3681	TC	0.3887	0.3837
	0.3898	0.3716		0.3950	0.3875
	0.3924	0.3794		0.3978	0.3958
	0.3863	0.3758		0.3912	0.3917
T5	0.3686	0.3649	TD	0.3719	0.3797
	0.3744	0.3685		0.3782	0.3837
	0.3763	0.3760		0.3802	0.3916
	0.3702	0.3722		0.3736	0.3874
T6	0.3744	0.3685	TE	0.3782	0.3837
	0.3804	0.3721		0.3847	0.3877
	0.3825	0.3798		0.3869	0.3958
	0.3763	0.376		0.3802	0.3916
T7	0.3804	0.3721	TF	0.3847	0.3877
	0.3863	0.3758		0.3912	0.3917
	0.3887	0.3836		0.3937	0.4001
	0.3825	0.3798		0.3869	0.3958
T8	0.3863	0.3758	TG	0.3912	0.3917
	0.3924	0.3794		0.3978	0.3958
	0.3950	0.3875		0.4006	0.4044
	0.3887	0.3836		0.3937	0.4001

e) Chromaticity Region & Coordinates

Region	CIE x	CIE y	Region	CIE x	CIE y
R rank (5000 K)					
R1	0.3366	0.3369	R9	0.3374	0.3554
	0.3369	0.3431		0.3371	0.3493
	0.3407	0.3460		0.3411	0.3522
	0.3403	0.3398		0.3415	0.3587
R2	0.3403	0.3398	RA	0.3415	0.3587
	0.3407	0.3460		0.3411	0.3522
	0.3446	0.3491		0.3451	0.3554
	0.3440	0.3427		0.3457	0.3621
R3	0.3446	0.3491	RB	0.3451	0.3554
	0.3440	0.3427		0.3457	0.3621
	0.3477	0.3458		0.3500	0.3655
	0.3485	0.3522		0.3492	0.3587
R4	0.3485	0.3522	RC	0.3492	0.3587
	0.3477	0.3458		0.3500	0.3655
	0.3514	0.3487		0.3542	0.3690
	0.3524	0.3554		0.3533	0.3620
R5	0.3371	0.3493	RP	0.3366	0.3369
	0.3369	0.3431		0.3364	0.3292
	0.3407	0.3460		0.3400	0.3320
	0.3411	0.3522		0.3403	0.3398
R6	0.3407	0.3460	RQ	0.3403	0.3398
	0.3411	0.3522		0.3400	0.3320
	0.3451	0.3554		0.3434	0.3344
	0.3446	0.3491		0.3440	0.3427
R7	0.3446	0.3491	RR	0.3440	0.3427
	0.3451	0.3554		0.3434	0.3344
	0.3492	0.3587		0.3468	0.3372
	0.3485	0.3522		0.3477	0.3458
R8	0.3485	0.3522	RS	0.3477	0.3458
	0.3492	0.3587		0.3468	0.3372
	0.3533	0.3620		0.3504	0.3398
	0.3524	0.3554		0.3514	0.3487

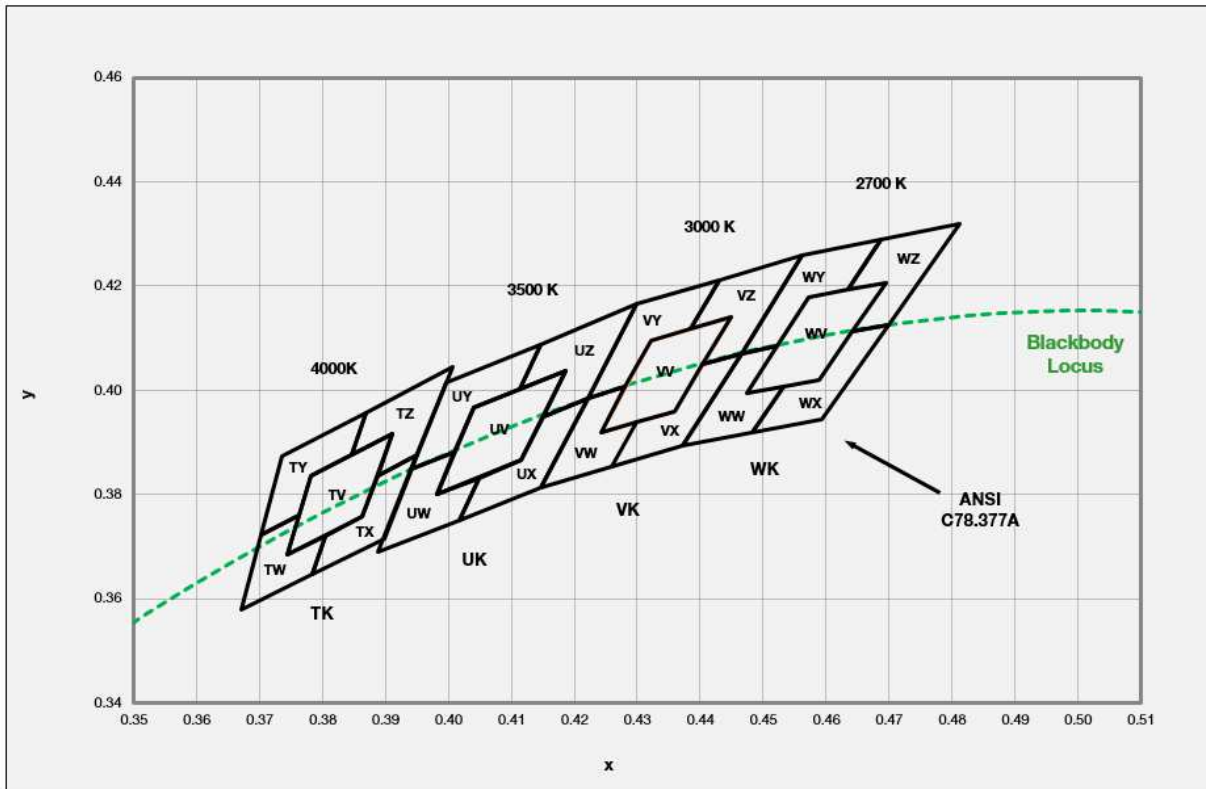
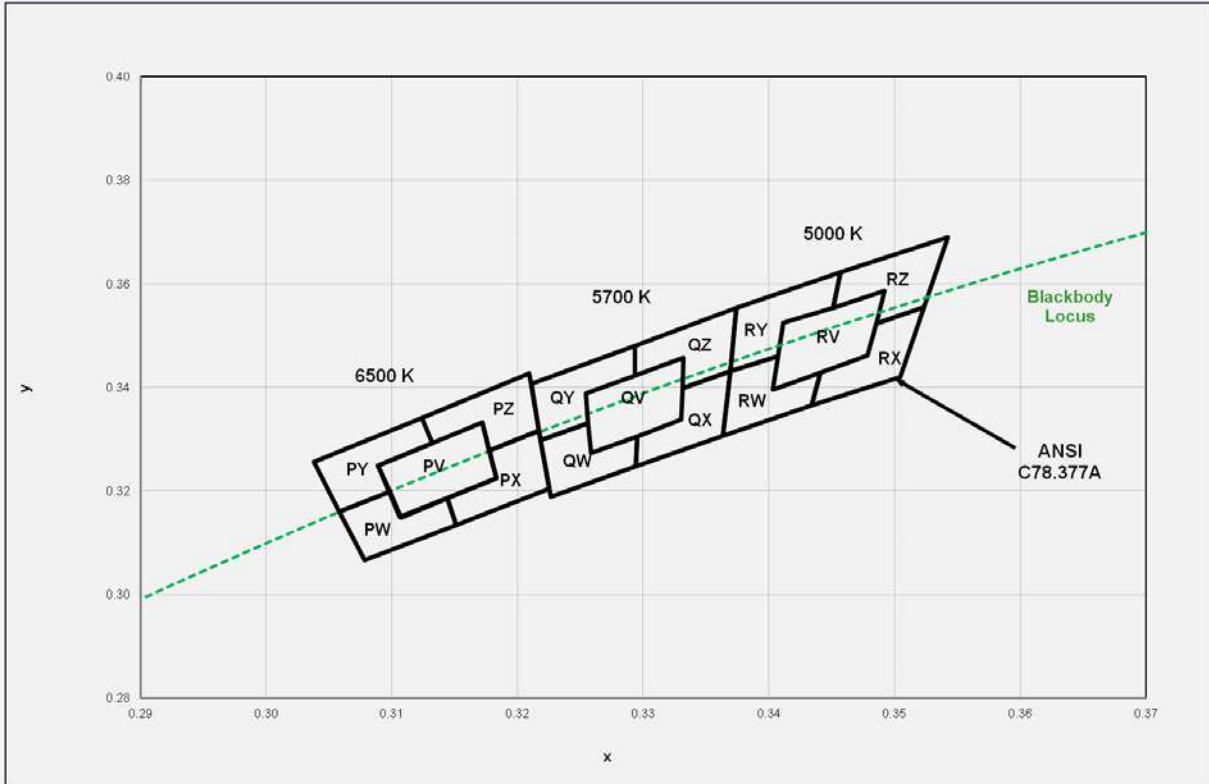
Region	CIE x	CIE y	Region	CIE x	CIE y
Q rank (5700 K)					
Q1	0.3218	0.3298	Q9	0.3211	0.3407
	0.3222	0.3243		0.3215	0.3353
	0.3258	0.3275		0.3254	0.3388
	0.3256	0.3331		0.3252	0.3444
Q2	0.3256	0.3331	QA	0.3252	0.3444
	0.3258	0.3275		0.3254	0.3388
	0.3294	0.3306		0.3293	0.3423
	0.3294	0.3364		0.3293	0.3481
Q3	0.3294	0.3364	QB	0.3293	0.3481
	0.3294	0.3306		0.3293	0.3423
	0.3330	0.3338		0.3332	0.3458
	0.3331	0.3398		0.3333	0.3518
Q4	0.3331	0.3398	QC	0.3333	0.3518
	0.3330	0.3338		0.3332	0.3458
	0.3366	0.3369		0.3371	0.3493
	0.3369	0.3431		0.3374	0.3554
Q5	0.3215	0.3353	QP	0.3222	0.3243
	0.3218	0.3298		0.3227	0.3180
	0.3256	0.3331		0.3260	0.3208
	0.3254	0.3388		0.3258	0.3275
Q6	0.3254	0.3388	QQ	0.3258	0.3275
	0.3256	0.3331		0.3260	0.3208
	0.3294	0.3364		0.3294	0.3235
	0.3293	0.3423		0.3294	0.3306
Q7	0.3293	0.3423	QR	0.3294	0.3306
	0.3294	0.3364		0.3294	0.3235
	0.3331	0.3398		0.3330	0.3266
	0.3332	0.3458		0.3330	0.3338
Q8	0.3332	0.3458	QS	0.3330	0.3338
	0.3331	0.3398		0.3330	0.3266
	0.3369	0.3431		0.3364	0.3292
	0.3371	0.3493		0.3366	0.3369

e) Chromaticity Region & Coordinates

Region	CIE x	CIE y	Region	CIE x	CIE y
P rank (6500 K)					
PP	0.3079	0.3060	P5	0.3058	0.316
	0.3115	0.3098		0.3098	0.3199
	0.3106	0.3150		0.3089	0.3249
	0.3068	0.3113		0.3048	0.3207
PQ	0.3115	0.3098	P6	0.3098	0.3199
	0.3152	0.3133		0.3137	0.3238
	0.3144	0.3186		0.313	0.329
	0.3106	0.3150		0.3089	0.3249
PR	0.3152	0.3133	P7	0.3137	0.3238
	0.3190	0.3170		0.3177	0.3278
	0.3183	0.3224		0.3172	0.3332
	0.3144	0.3186		0.313	0.329
PS	0.3190	0.3170	P8	0.3177	0.3278
	0.3225	0.3200		0.3217	0.3317
	0.3221	0.3261		0.3213	0.3373
	0.3183	0.3224		0.3172	0.3332
P1	0.3068	0.3113	P9	0.3048	0.3207
	0.3106	0.315		0.3089	0.3249
	0.3098	0.3199		0.308	0.3298
	0.3058	0.316		0.3038	0.3256
P2	0.3106	0.315	PA	0.3089	0.3249
	0.3144	0.3186		0.313	0.329
	0.3137	0.3238		0.3123	0.3341
	0.3098	0.3199		0.308	0.3298
P3	0.3144	0.3186	PB	0.313	0.329
	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		0.3213	0.3373
	0.3217	0.3317		0.3209	0.3427
	0.3177	0.3278		0.3166	0.3384

Note: Samsung maintains measurement tolerance of : Cx, Cy = ± 0.005

f) Kitting Chromaticity Region & Coordinates ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)



f) Kitting Chromaticity Region & Coordinates ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)

Region	CIE x	CIE y	Region	CIE x	CIE y
W rank (2700 K)					
WW	0.4475	0.3994			
	0.4589	0.4021			
	0.4695	0.4207			
	0.4573	0.4178			
WW	0.4373	0.3893	WY	0.4465	0.4071
	0.4483	0.3919		0.4523	0.4085
	0.4532	0.4008		0.4573	0.4178
	0.4475	0.3994		0.4634	0.4193
	0.4523	0.4085		0.4687	0.4289
	0.4465	0.4071		0.4562	0.4260
WX	0.4483	0.3919	WZ	0.4641	0.4112
	0.4593	0.3944		0.4700	0.4126
	0.4700	0.4126		0.4813	0.4319
	0.4641	0.4112		0.4687	0.4289
	0.4589	0.4021		0.4634	0.4193
	0.4532	0.4008		0.4695	0.4207

Region	CIE x	CIE y	Region	CIE x	CIE y
V rank (3000 K)					
VV	0.4242	0.3919			
	0.4359	0.3960			
	0.4449	0.4141			
	0.4322	0.4096			
VV	0.4147	0.3814	VY	0.4221	0.3984
	0.4259	0.3853		0.4281	0.4006
	0.4300	0.3939		0.4322	0.4096
	0.4242	0.3919		0.4385	0.4119
	0.4281	0.4006		0.4430	0.4212
	0.4221	0.3984		0.4299	0.4165
VX	0.4259	0.3853	VZ	0.4403	0.4049
	0.4373	0.3893		0.4465	0.4071
	0.4465	0.4071		0.4562	0.4260
	0.4403	0.4049		0.4430	0.4212
	0.4359	0.3960		0.4385	0.4119
	0.4300	0.3939		0.4449	0.4141

f) Kitting Chromaticity Region & Coordinates

Region	CIE x	CIE y	Region	CIE x	CIE y
U rank (3500 K)					
UV	0.3981	0.3800			
	0.4116	0.3865			
	0.4186	0.4037			
	0.4040	0.3966			
UW	0.3889	0.3690	UY	0.3941	0.3848
	0.4017	0.3751		0.4010	0.3882
	0.4048	0.3832		0.4040	0.3966
	0.3981	0.3800		0.4113	0.4001
	0.4010	0.3882		0.4146	0.4089
	0.3941	0.3848		0.3996	0.4015
UX	0.4017	0.3751	UZ	0.4150	0.3950
	0.4147	0.3814		0.4221	0.3984
	0.4221	0.3984		0.4299	0.4165
	0.4150	0.3950		0.4146	0.4089
	0.4116	0.3865		0.4113	0.4001
	0.4048	0.3832		0.4186	0.4037

Region	CIE x	CIE y	Region	CIE x	CIE y
T rank (4000 K)					
TV	0.3744	0.3685			
	0.3863	0.3758			
	0.3912	0.3917			
	0.3782	0.3837			
TW	0.3670	0.3578	TY	0.3702	0.3722
	0.3783	0.3646		0.3763	0.3760
	0.3804	0.3721		0.3782	0.3837
	0.3744	0.3685		0.3847	0.3877
	0.3763	0.3760		0.3869	0.3958
	0.3702	0.3722		0.3736	0.3874
TX	0.3783	0.3646	TZ	0.3887	0.3837
	0.3898	0.3716		0.3950	0.3875
	0.3950	0.3875		0.4006	0.4044
	0.3887	0.3837		0.3869	0.3958
	0.3863	0.3758		0.3847	0.3877
	0.3804	0.3721		0.3912	0.3917

f) Kitting Chromaticity Region & Coordinates

Region	CIE x	CIE y	Region	CIE x	CIE y
R rank (5000 K)					
RV	0.3403	0.3398			
	0.3477	0.3458			
	0.3492	0.3587			
	0.3411	0.3522			
RW	0.3364	0.3292	RY	0.3369	0.3431
	0.3434	0.3344		0.3407	0.346
	0.344	0.3427		0.3411	0.3522
	0.3403	0.3398		0.3451	0.3554
	0.3407	0.346		0.3457	0.3621
	0.3369	0.3431		0.3374	0.3553
RX	0.3434	0.3344	RZ	0.3485	0.3522
	0.3504	0.3398		0.3524	0.3554
	0.3524	0.3554		0.3542	0.369
	0.3485	0.3522		0.3457	0.3621
	0.3477	0.3458		0.3451	0.3554
	0.344	0.3427		0.3492	0.3587

Region	CIE x	CIE y	Region	CIE x	CIE y
Q rank (5700 K)					
QV	0.3258	0.3275			
	0.333	0.3338			
	0.3332	0.3458			
	0.3254	0.3388			
QW	0.3227	0.318	QY	0.3218	0.3298
	0.3294	0.3235		0.3256	0.3331
	0.3294	0.3306		0.3254	0.3388
	0.3258	0.3275		0.3293	0.3423
	0.3256	0.3331		0.3293	0.3481
	0.3218	0.3298		0.3211	0.3407
QX	0.3294	0.3235	QZ	0.3293	0.3423
	0.3364	0.3292		0.3332	0.3458
	0.3369	0.3431		0.3331	0.3398
	0.3331	0.3398		0.3369	0.3431
	0.333	0.3338		0.3374	0.3554
	0.3294	0.3306		0.3293	0.3481

f) Kitting Chromaticity Region & Coordinates

Region	CIE x	CIE y	Region	CIE x	CIE y
P rank (6500 K)					
PV	0.3106	0.315			
	0.3183	0.3224			
	0.3172	0.3332			
	0.3089	0.3249			
PW	0.3079	0.306	PY	0.3058	0.316
	0.3152	0.3133		0.3098	0.3199
	0.3144	0.3186		0.3089	0.3249
	0.3106	0.3150		0.313	0.329
	0.3098	0.3199		0.3123	0.3341
	0.3058	0.3160		0.3038	0.3256
PX	0.3152	0.3133	PZ	0.313	0.329
	0.3225	0.32		0.3172	0.3332
	0.3217	0.3317		0.3177	0.3278
	0.3177	0.3278		0.3217	0.3317
	0.3183	0.3224		0.3209	0.3427
	0.3144	0.3186		0.3123	0.3341

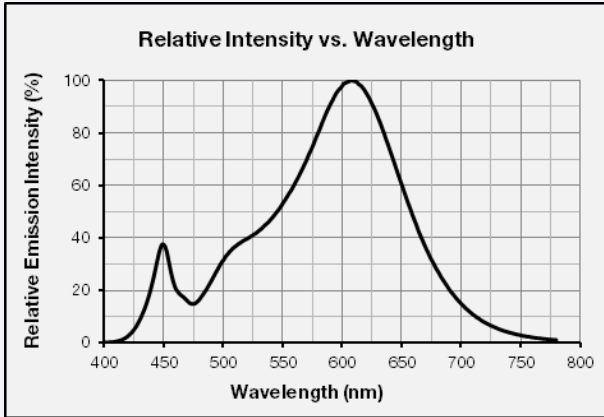
Note:

Samsung maintains measurement tolerance of: $C_x, C_y = \pm 0.005$

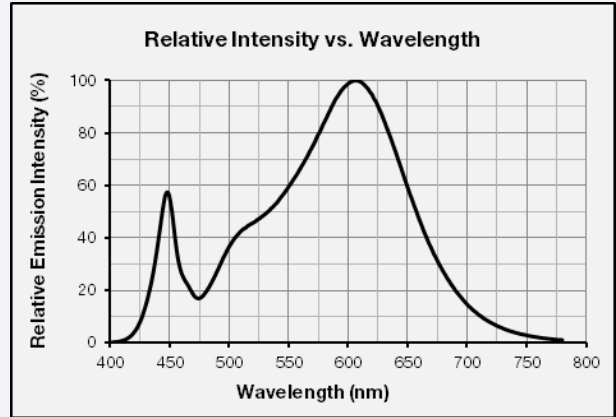
3. Typical Characteristics Graphs

a) Spectrum Distribution ($I_f = 65 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)

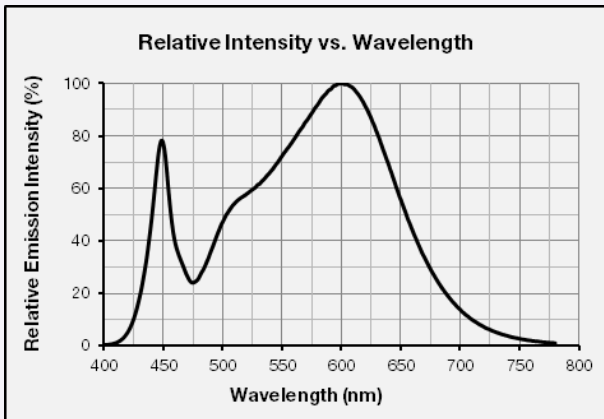
CCT: 2700 K (90 CRI)



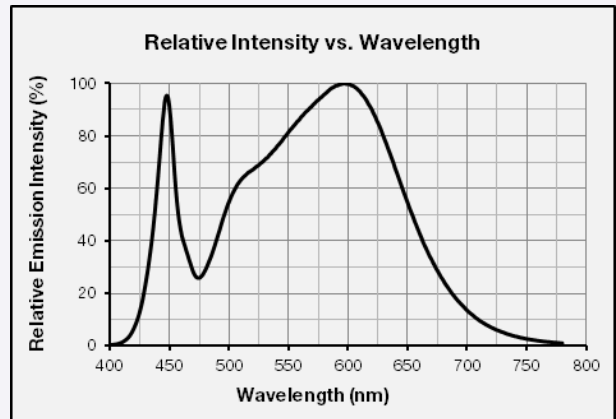
CCT: 3000 K (90 CRI)



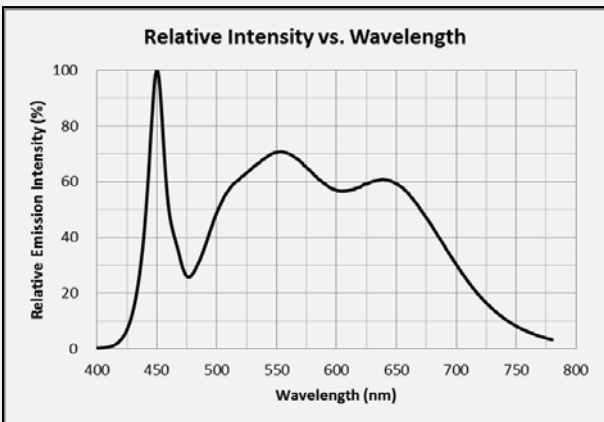
CCT: 3500 K (90 CRI)



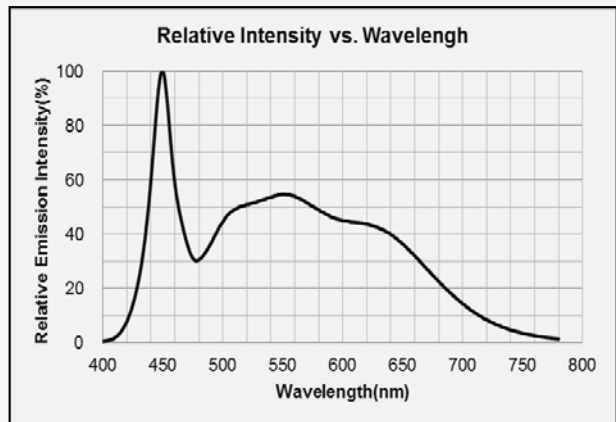
CCT: 4000 K (90 CRI)



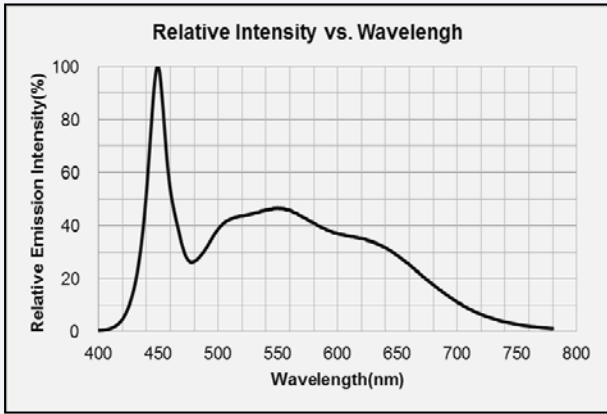
CCT: 5000 K (90 CRI)



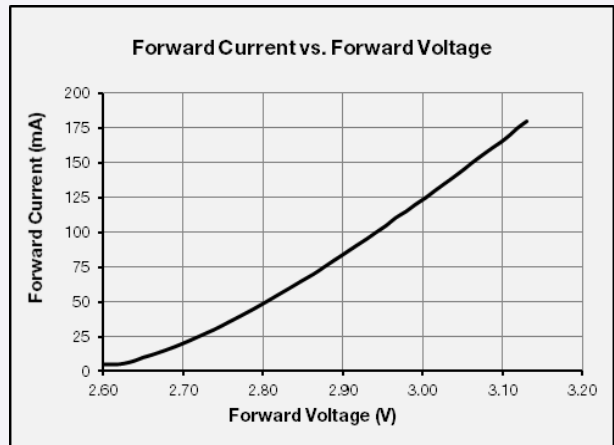
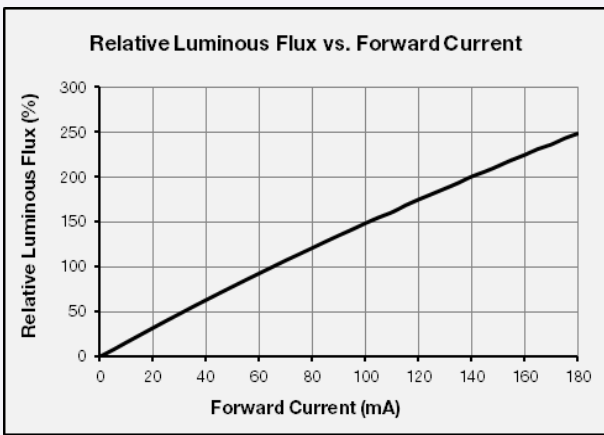
CCT: 5700 K (90 CRI)



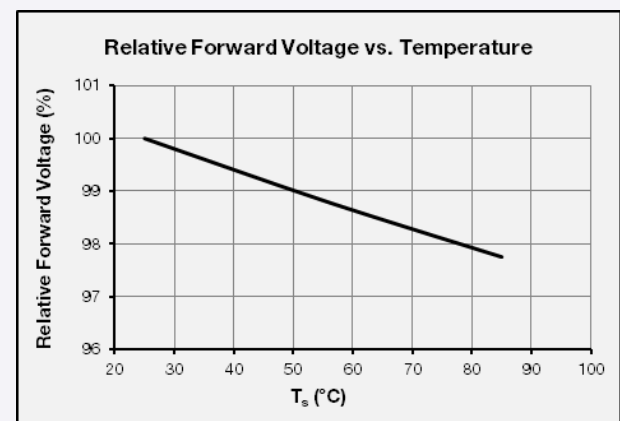
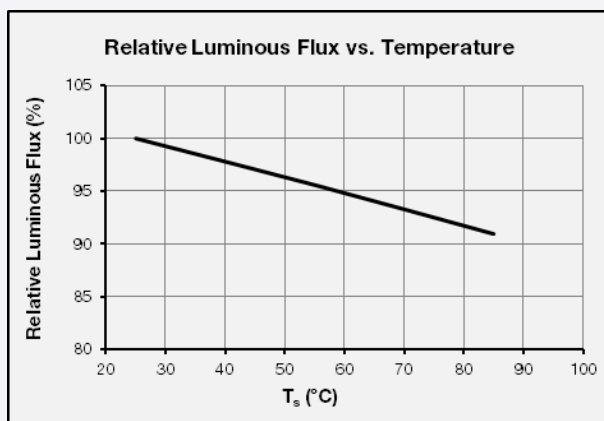
CCT: 6500 K (90 CRI)



b) Forward Current Characteristics ($T_s = 25^\circ\text{C}$)



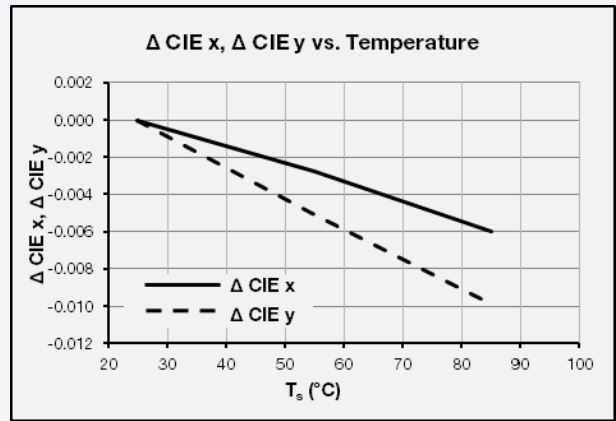
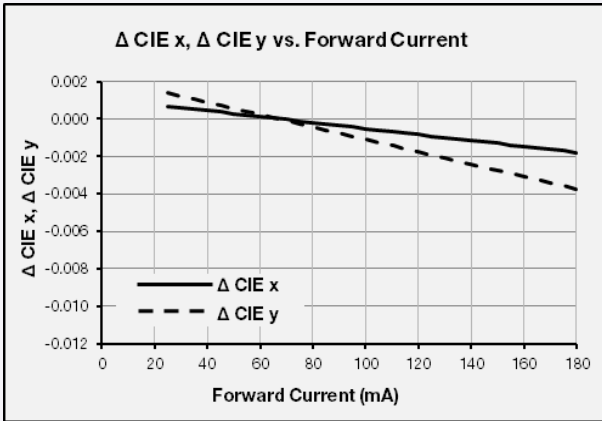
c) Temperature Characteristics ($I_f = 65\text{ mA}$)



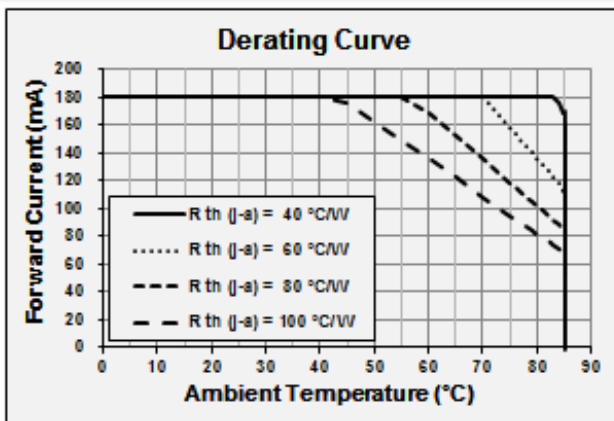
d) Color Shift Characteristics

$T_s = 25\text{ }^\circ\text{C}$

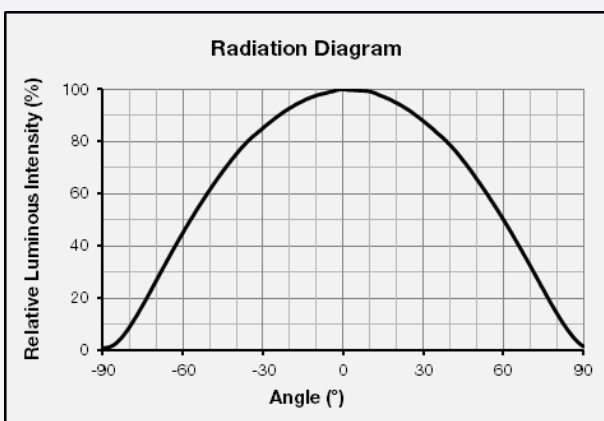
$I_F = 65\text{ mA}$



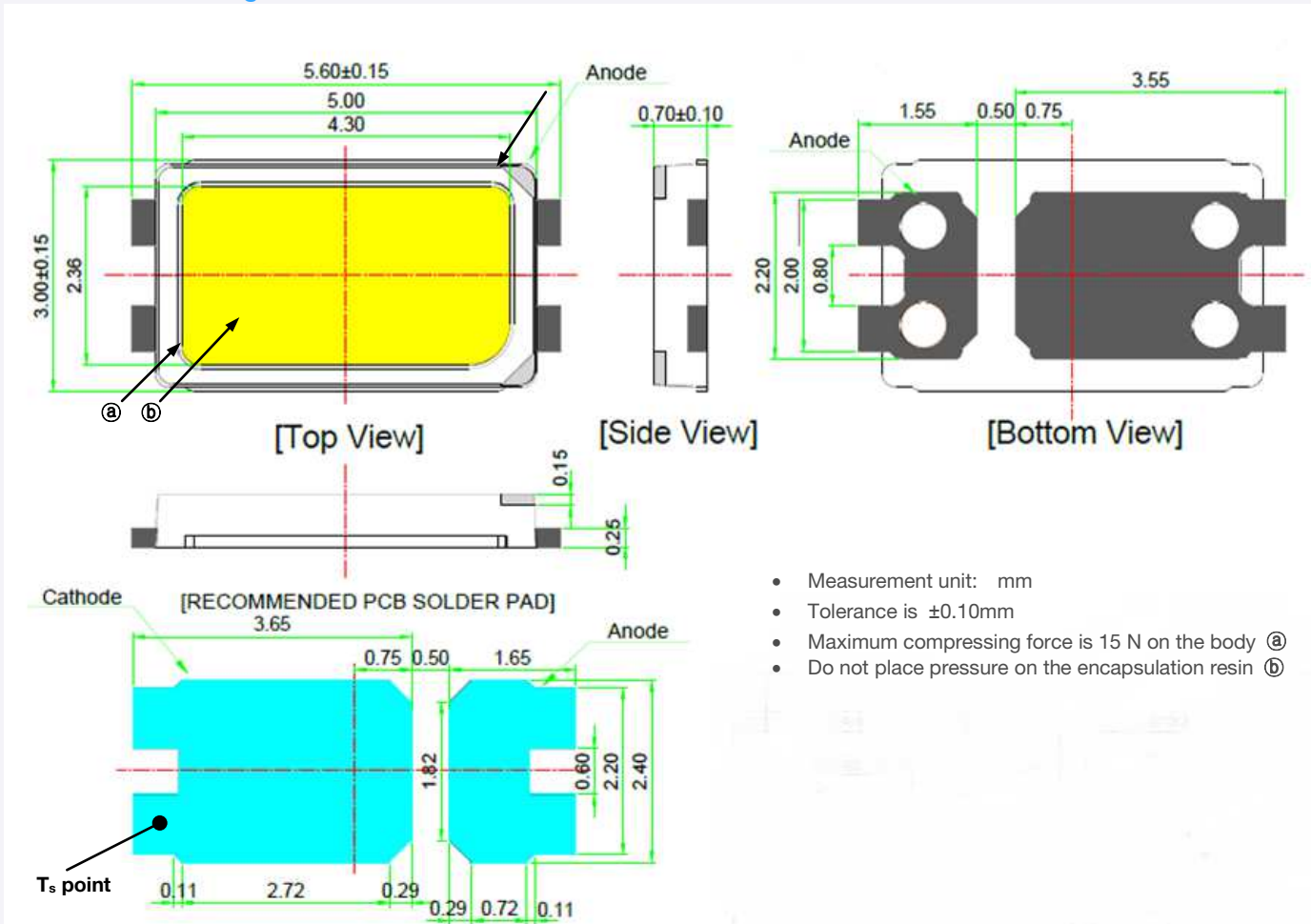
e) Derating Curve



f) Beam Angle Characteristics ($I_F = 65\text{ mA}$, $T_s = 25\text{ }^\circ\text{C}$)



4. Outline Drawing & Dimension



Notes:

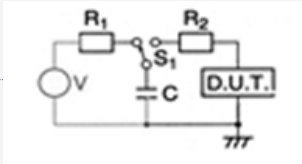
- 1) This LED has built-in ESD protection device(s) connected in parallel to LED chip(s).
- 2) T_s point and measurement method:
 - ① Measure one point at the cathode pad, if necessary remove PSR of PCB to reach T_s point.
 - ② All pads must be soldered to the PCB to dissipate heat properly, otherwise 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. Reliability Test Items & Conditions

a) Test Items

Test Item	Test Condition	Test Hour / Cycle	Sample No.	
High Temperature Life Test	85 °C, DC 180 mA	1000 h	22	
High Temperature Humidity Life Test	60 °C, 90 % RH, DC 180 mA	1000 h	22	
Powered Temperature Cycle Test	-40 °C / 10 min ↔ 85 °C / 10 min, sweep 20 min cycle on/off: each 5 min, DC 180 mA	100 cycles	22	
Thermal Cycle	-45 °C / 15 min ↔ 125 °C / 15 min → Hot plate 180 °C	500 cycles	100	
High Temperature Storage	120 °C	1000 h	11	
Low Temperature Storage	-40 °C	1000 h	11	
ESD (HBM)		R ₁ : 10 MΩ R ₂ : 1.5 kΩ C: 100 pF V: ±5 kV	5 times	30
		R ₁ : 10 MΩ R ₂ : 0 C: 200 pF V: ±0.5 kV	5 times	30
ESD (MM)				
Vibration Test	20~2000~20 Hz, 200 m/s ² , sweep 4 min X, Y, Z 3 direction, each 1 cycle	4 cycles	11	
Mechanical Shock Test	1500 g, 0.5 ms 3 shocks each X-Y-Z axis	5 cycles	11	

b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T _s = 25 °C)	Limit	
			Min	Max
Forward Voltage	V _F	I _F = 65 mA	Init. Value * 0.9	Init. Value * 1.1
Luminous Flux	Φ _v	I _F = 65 mA	Init. Value * 0.7	Init. Value * 1.1