

Superior Efficacy & Lumen output with Small Form Factor

Z Power LED – Z5-M4



Product Brief

Description

- The Z-Power series is designed for high flux output applications with high current operation capability.
- It incorporates state of the art SMD design and low thermal resistant material.
- The Z Power LED is ideal light sources for directional lighting applications such as Spot Lights, various outdoor applications, automotive lightings and high performance torches .

Features and Benefits

- High Lumen Output and Efficacy
- Designed for high current operation
- Low Thermal Resistance
- ANSI compliant Binning
- Ceramic package

Key Applications

- Architectural
- Industrial
- Outdoor area
- Exterior Lighting
- Commercial

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Performance Characteristics

Table 1. Product Selection Guide, $I_F=700\text{mA}$, $T_J=85^\circ\text{C}$

CRI Min	CCT	Performance	Flux & lm/W(Typ.) $I_F=700\text{mA}$	
			E1	E2
70	6500K	Flux	363	374
		lm/W	185	191
	5700K	Flux	366	377
		lm/W	187	192
	5000K	Flux	371	379
		lm/W	189	193
	4000K	Flux	374	382
		lm/W	191	195
	3500K	Flux	367	378
		lm/W	187	193
	3000K	Flux	351	356
		lm/W	179	182
	2700K	Flux	334	344
		lm/W	170	176
	2200K	Flux	300	-
		lm/W	153	
80	6500K	Flux	336	347
		lm/W	171	177
	5700K	Flux	338	348
		lm/W	172	178
	5000K	Flux	343	353
		lm/W	175	180
	4000K	Flux	343	353
		lm/W	175	180
	3500K	Flux	339	349
		lm/W	173	178
	3000K	Flux	322	327
		lm/W	164	167
	2700K	Flux	309	318
		lm/W	158	162
90	6500K	Flux	301	308
		lm/W	154	157
	5700K	Flux	303	310
		lm/W	155	158
	5000K	Flux	305	312
		lm/W	156	159
	4000K	Flux	302	309
		lm/W	154	157
	3500K	Flux	287	294
		lm/W	146	150
	3000K	Flux	271	277
		lm/W	138	141
	2700K	Flux	259	265
		lm/W	132	135

Notes :

- (1) Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.
- (2) Seoul Semiconductor maintains a tolerance of $\pm 7\%$ on flux and power measurements
- (3) Typ lumen table is only for reference .

Performance Characteristics

Table 2. Characteristics

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max. ^[4]	
Forward Current	I_F	-	700	2000 ^[1]	mA
Peak Pulsed Forward Current ^[2]	I_F			2600	mA
Forward Voltage (@700mA, 85°C)	V_F	-	-	3.00	V
Junction Temperature	T_j	-	-	150	°C
Operating Temperature	T_{op}	-40	-	105	°C
Storage Temperature	T_{stg}	-40	-	125	°C
Viewing angle	θ		120		degree
Thermal resistance (J to S) ^[3]	$R\theta_{J-S}$	-	3	-	K/W
ESD Sensitivity(HBM)		Class 3B JEDEC JS-001-2017			

Notes :

(1) Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.

Color coordinate : ± 0.005 , CCT $\pm 5\%$ tolerance.

(2) Seoul Semiconductor maintains a tolerance of $\pm 7\%$ on flux and power measurements.

(3) Φ_V is the total luminous flux output as measured with an integrating sphere.

(4) Tolerance is ± 2.0 on CRI measurements.

(5) Tolerance is $\pm 0.06V$ on forward voltage measurements.

(6) $R\theta_{J-S}$ is tested at 700mA.

- It is recommended to use it in the condition that the reliability is secured within the Max value.
- Thermal resistance can be increased substantially depending on the heat sink design/operating condition, and the maximum possible driving current will decrease accordingly.

Characteristics Graph

Fig 1. Color Spectrum

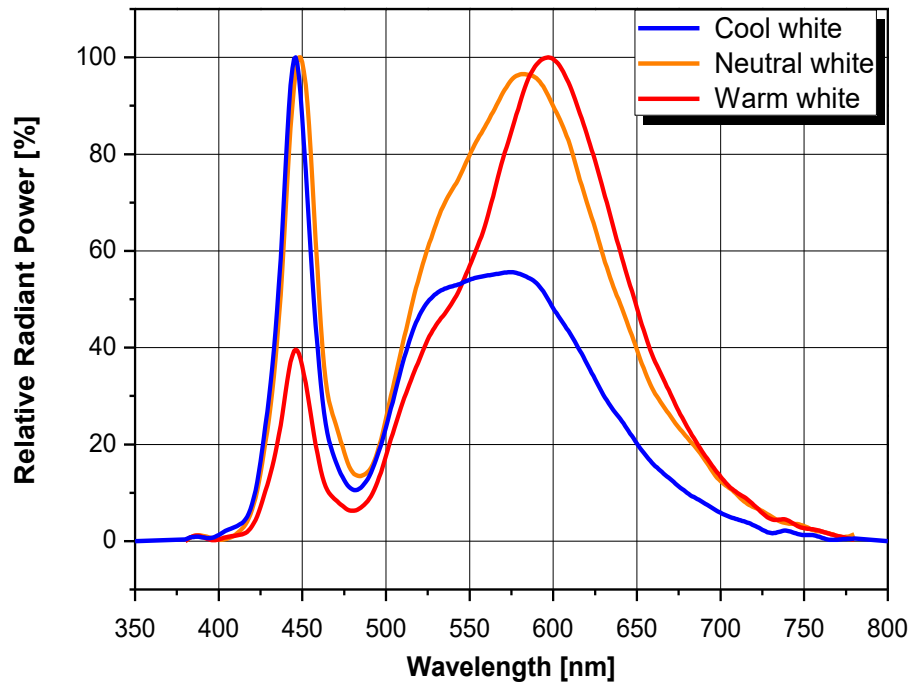
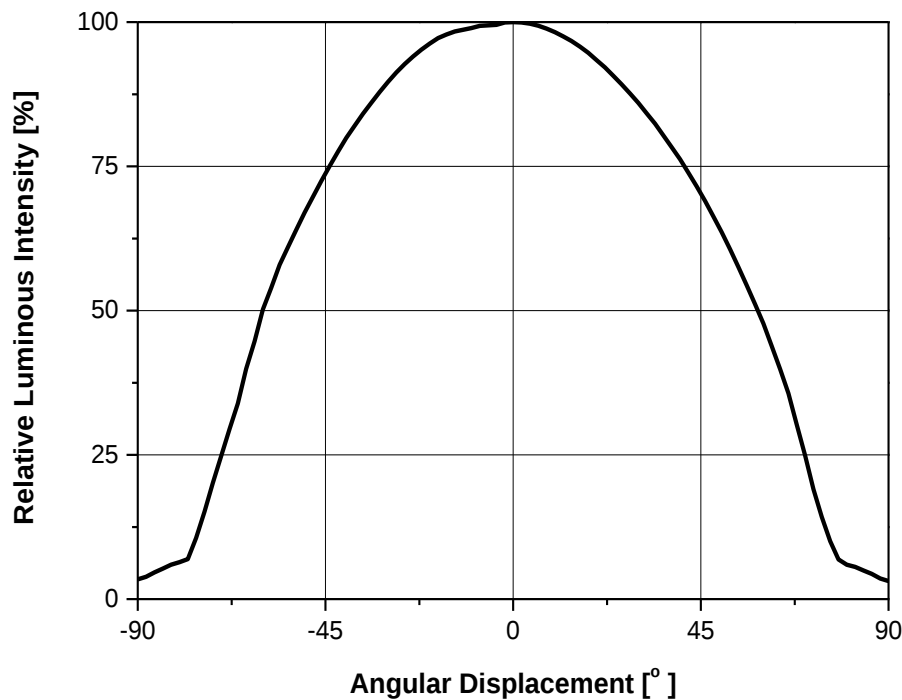


Fig 2. Typical Spatial Distribution



- Using less than 100mA is not recommended

Characteristics Graph

Fig 3. Forward Voltage vs. Forward Current, $T_j=85^{\circ}\text{C}$

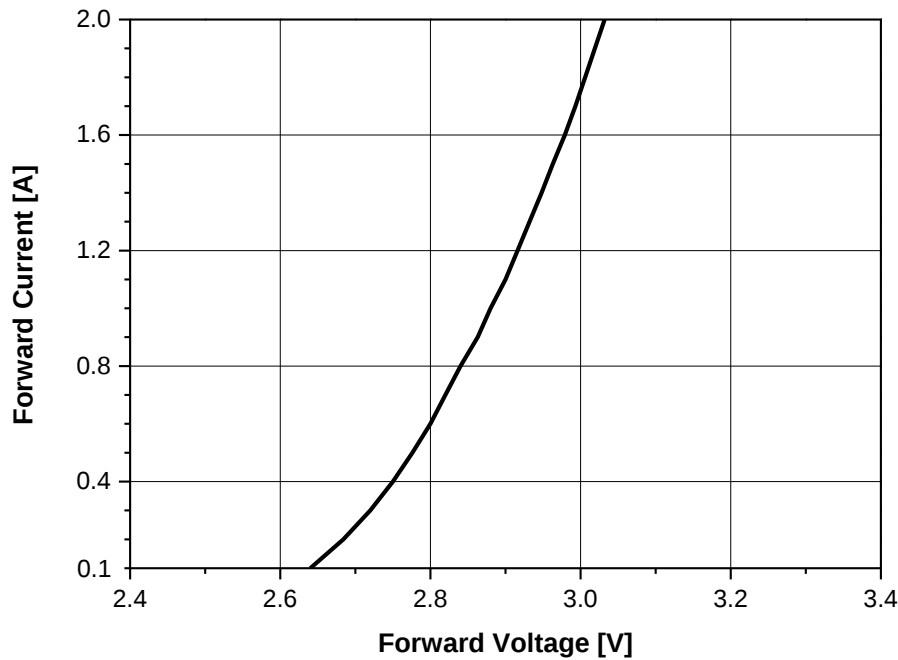
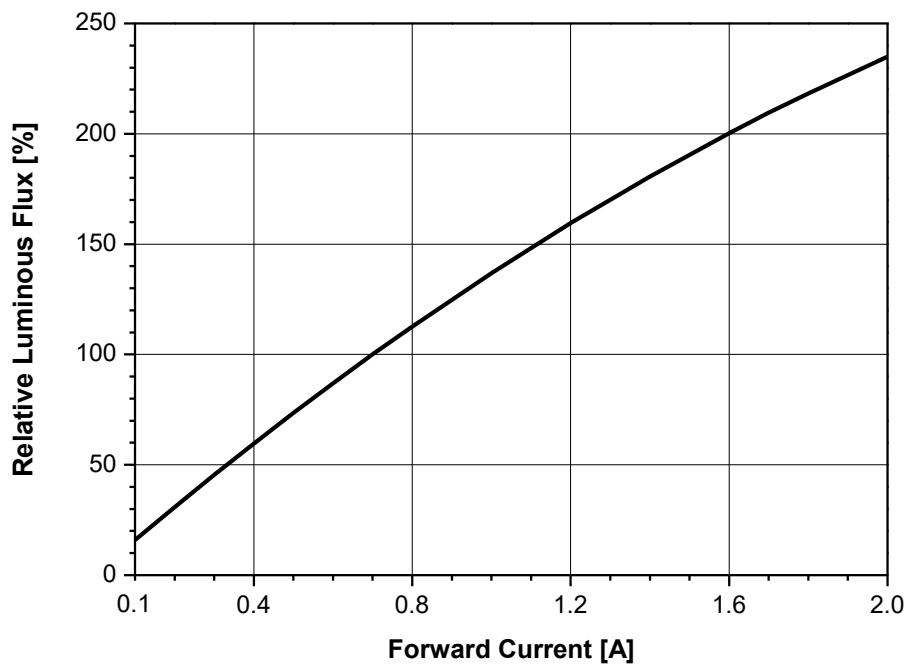


Fig 4. Forward Current vs. Relative Luminous Flux, $T_j=85^{\circ}\text{C}$



- Using less than 100mA is not recommended

Characteristics Graph

Fig 5. Forward Current vs. CIE X, Y Shift, $T_j=85^{\circ}\text{C}$

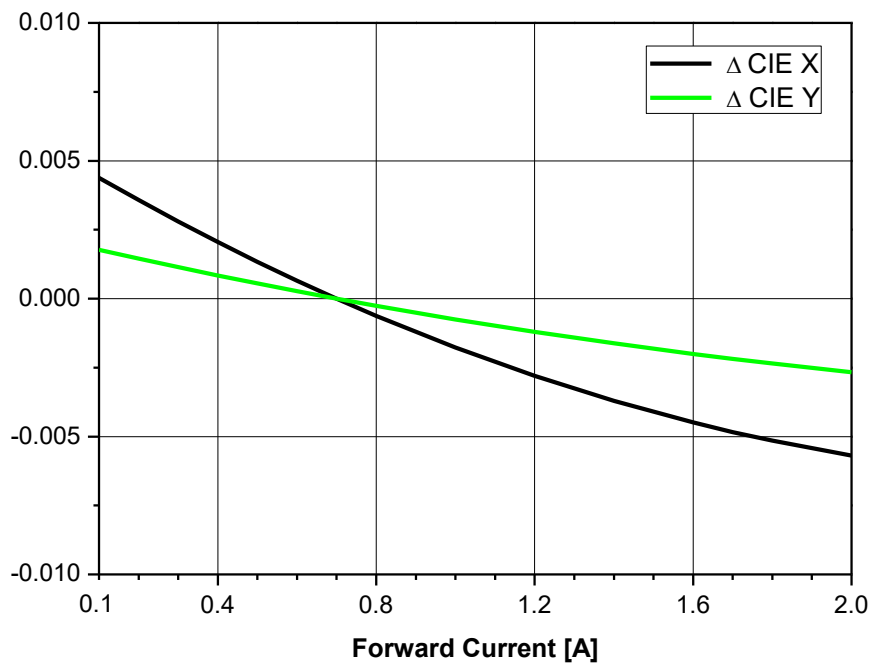
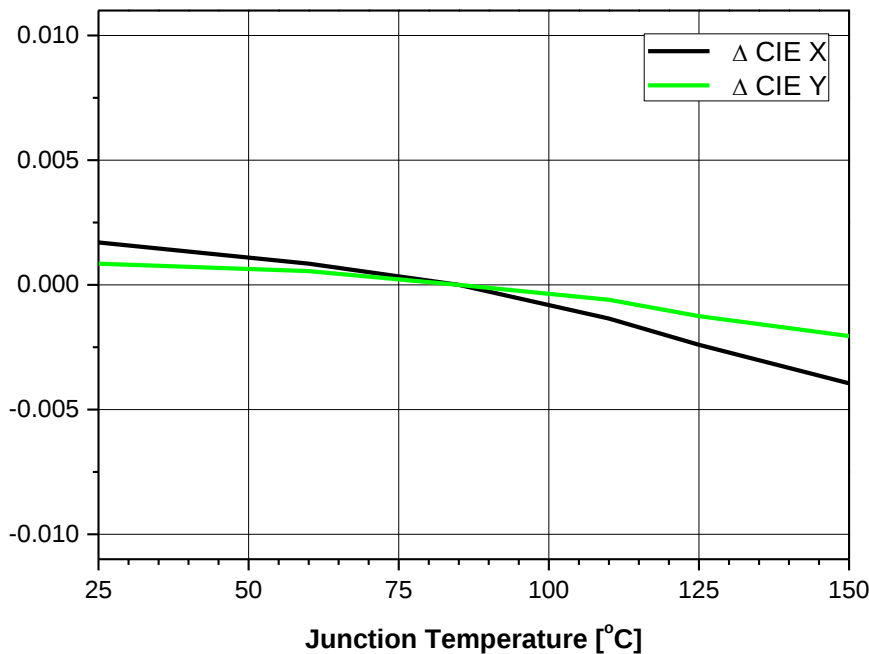


Fig 6. Junction Temp. vs. CIE X, Y Shift, $I_F=700\text{mA}$



- Using less than 100mA is not recommended

Characteristics Graph

Fig 7. Relative Light Output vs. Junction Temperature, $I_F=700\text{mA}$

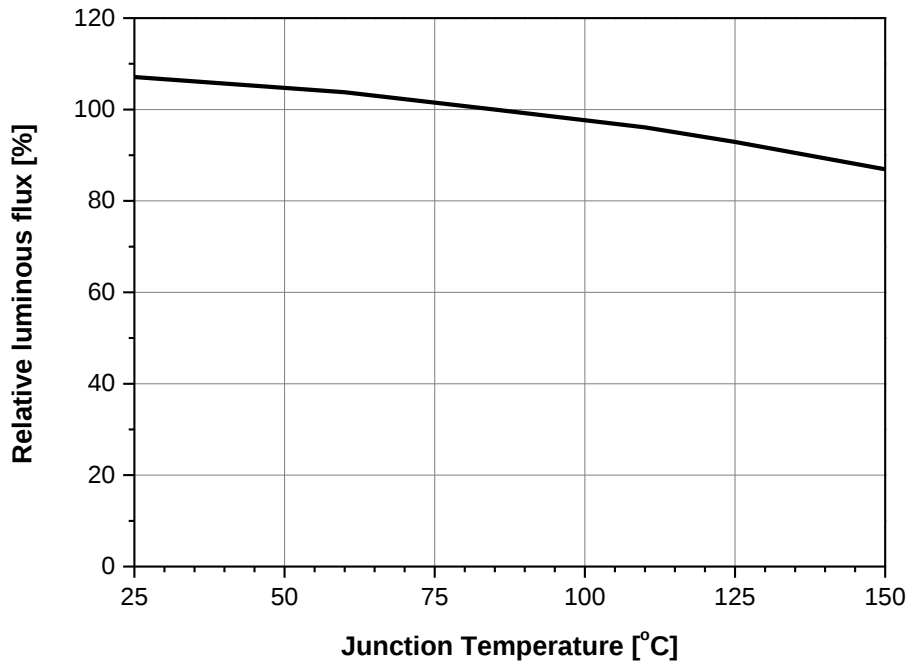
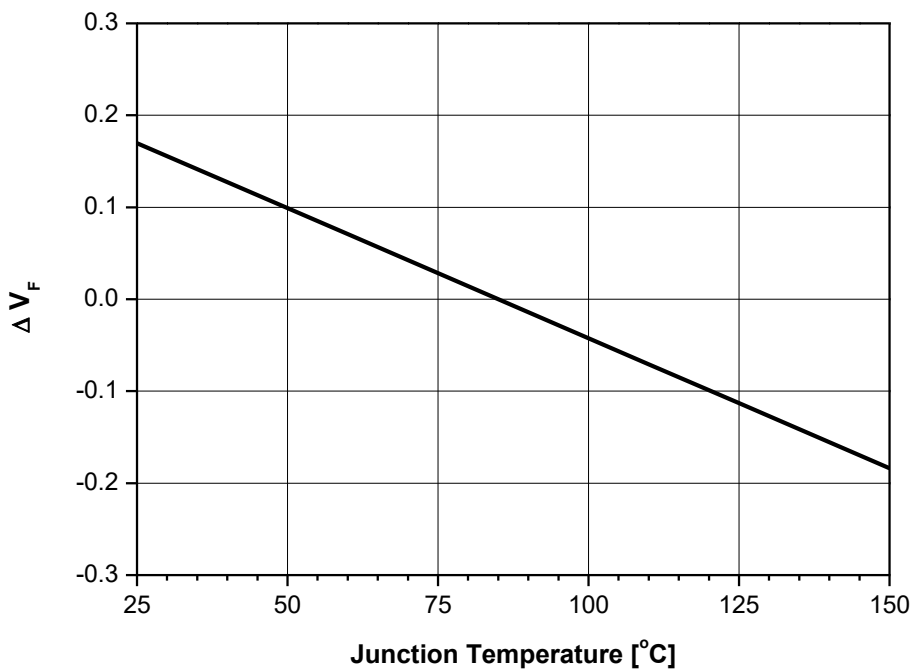


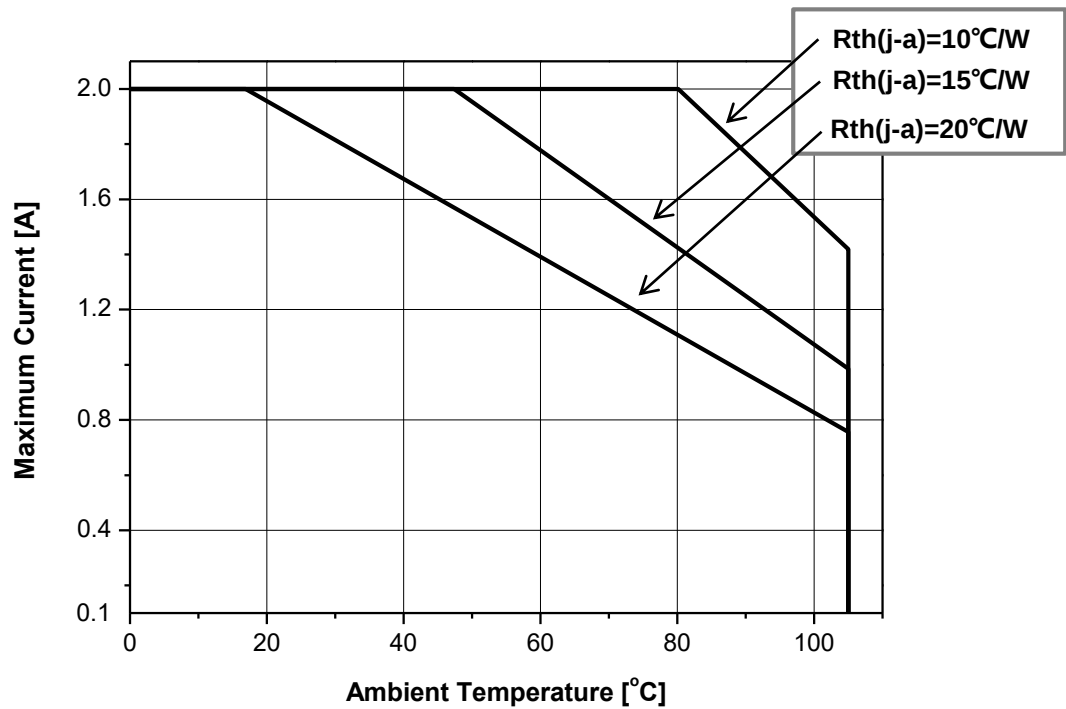
Fig 8. Relative Forward Voltage vs. Junction Temperature, $I_F=700\text{mA}$



- Using less than 100mA is not recommended

Characteristics Graph

Fig 9. Maximum Forward Current vs. Ambient Temperature, $T_j(\text{max.})=150^{\circ}\text{C}$



- Using less than 100mA is not recommended

Color Bin Structure

Table 3. Bin Code description, $I_F=700\text{mA}$, $T_j=85^\circ\text{C}$

Bin Code	Luminous Flux [lm]	
	Min.	Max.
235	235	250
250	250	265
265	265	280
280	280	295
295	295	310
310	310	325
325	325	340
340	340	355
355	355	370
370	370	385
385	385	400

Bin Code	Forward Voltage (V)	
	Min.	Max.
290	2.75	2.90
300	2.90	3.00

Notes :

(1) Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.

Color coordinate : ± 0.005 , CCT $\pm 5\%$ tolerance.

(2) Seoul Semiconductor maintains a tolerance of $\pm 7\%$ on flux and power measurements.

(3) Φ_v is the total luminous flux output as measured with an integrating sphere.

(4) Tolerance is ± 2.0 on CRI measurements.

(5) Tolerance is $\pm 0.06\text{V}$ on forward voltage measurements.

Color Bin Structure

Table 4. Flux Bin Distribution
 **Available Bin**

CRI	CCT	Model	CIE	Flux Bin										
70	6000 ~ 7000K	E1	A	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	5300 ~ 6000K	E1	B	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	4700 ~ 5300K	E1	C	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	3700 ~ 4200K	E1	E	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	3200 ~ 3700K	E1	F	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	2900 ~ 3200K	E1	G	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	2600 ~ 2900K	E1	H	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	2300 ~ 2100K	E1	K	235	250	265	280	295	310	325	340	355	370	385
80	6000 ~ 7000K	E1	A	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	5300 ~ 6000K	E1	B	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	4700 ~ 5300K	E1	C	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	3700 ~ 4200K	E1	E	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	3200 ~ 3700K	E1	F	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	2900 ~ 3200K	E1	G	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	2600 ~ 2900K	E1	H	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
90	6000 ~ 7000K	E1	A	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	5300 ~ 6000K	E1	B	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	4700 ~ 5300K	E1	C	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	3700 ~ 4200K	E1	E	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	3200 ~ 3700K	E1	F	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	2900 ~ 3200K	E1	G	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385
	2600 ~ 2900K	E1	H	235	250	265	280	295	310	325	340	355	370	385
		E2		235	250	265	280	295	310	325	340	355	370	385

Notes :

(1) Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.

Color coordinate : ± 0.005 , CCT $\pm 5\%$ tolerance.

(2) Seoul Semiconductor maintains a tolerance of $\pm 7\%$ on flux and power measurements.

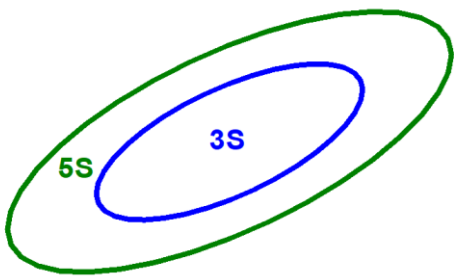
(3) Φ_v is the total luminous flux output as measured with an integrating sphere.

(4) Tolerance is ± 2.0 on CRI measurements.

(5) Tolerance is $\pm 0.06V$ on forward voltage measurements.

Color Bin Structure

CIE Chromaticity Diagram $T_j=85^{\circ}\text{C}$, $I_F=700\text{mA}$



Order	Box Packing Method
xx3S	3S(3step) Single
xx4M	3S(3step) Single or 3S+5S Mixing

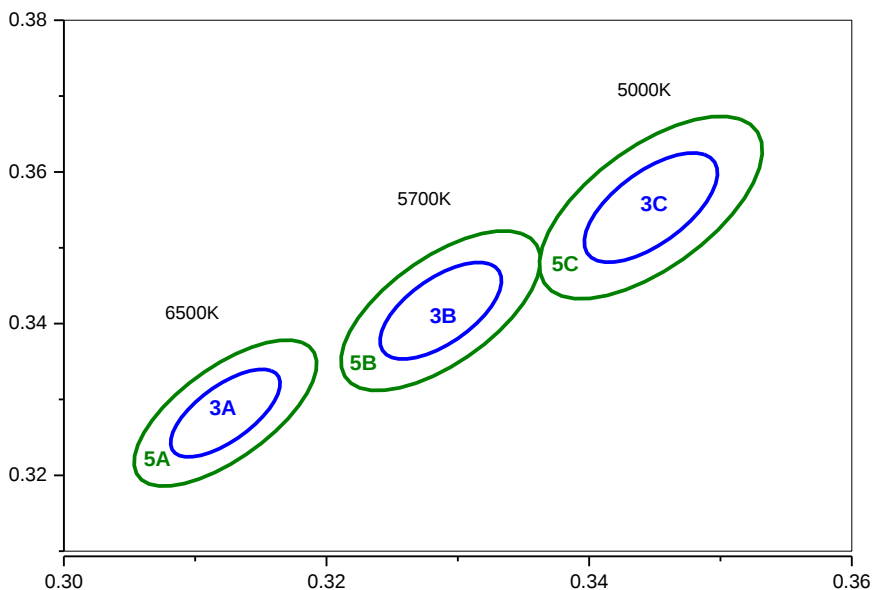
Order	Box Packing Method
xx5S	5S(5step) Single

Notes :

1. xx3S Order will ship 3S only
 2. xx5S Order will ship 5S (=also include 3S)
 3. xx4M Order will ship 3S & 5S Mixing(=also include 3S)
 4. Doughnut Bin will not ship alone(=Will ship with mixing bin)
- * 'xx' can be 65=6500K, 56=5600K, 50=5000K, 40=4000K, 30=3000K, 27= 2700K,22=2200K

Color Bin Structure

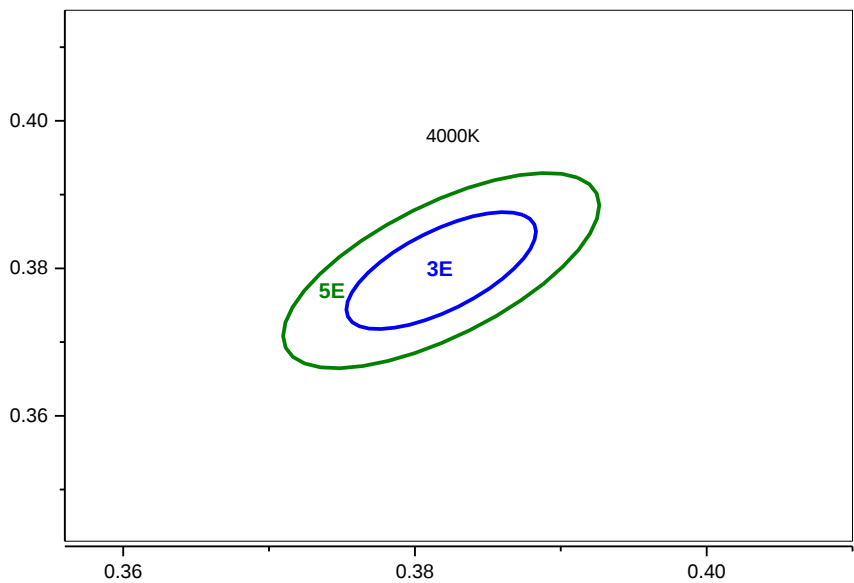
CIE Chromaticity Diagram (Cool White), $T_j=85^{\circ}\text{C}$, $I_F=700\text{mA}$



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	58	Ellipse	59	Ellipse	60
Rotation Angle		Rotation Angle		Rotation Angle	
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	58	Ellipse	59	Ellipse	60
Rotation Angle		Rotation Angle		Rotation Angle	

Color Bin Structure

CIE Chromaticity Diagram (Neutral White), $T_j=85^{\circ}\text{C}$, $I_F=700\text{mA}$

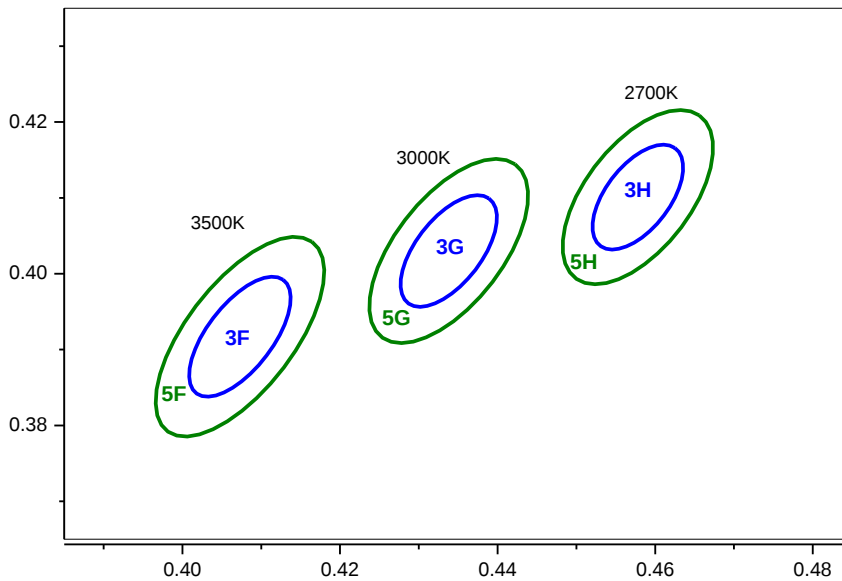


4000K 3Step	
3E	
Center point	0.3818 : 0.3797
Major Axis a	0.0094
Minor Axis b	0.0041
Ellipse	53.4
Rotation Angle	

4000K 5Step	
5E	
Center point	0.3818 : 0.3797
Major Axis a	0.0157
Minor Axis b	0.0067
Ellipse	53
Rotation Angle	

Color Bin Structure

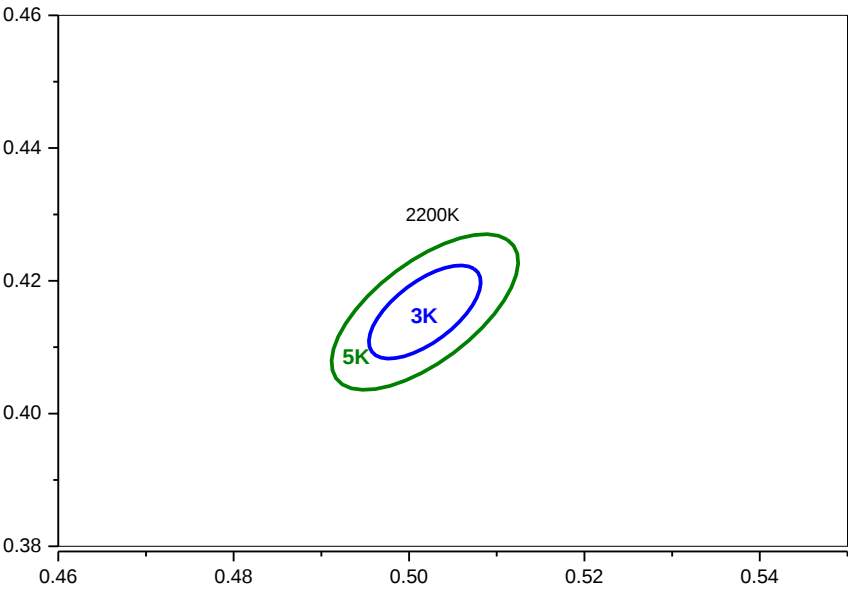
CIE Chromaticity Diagram (Warm White), $T_j=85^{\circ}\text{C}$, $I_F=700\text{mA}$



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

Color Bin Structure

CIE Chromaticity Diagram (Soft Warm White), $T_j=85^{\circ}\text{C}$, $I_F=700\text{mA}$



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

Mixing order kiting combination

Kiting Combination with xx4M

Combination	Reel	FLUX	CIE	VF	Qty
Kiting_a	Reel 1	xxx	3S	290	900
	Reel 2	xxx	3S	290	900
Kiting_b	Reel 1	xxx	3S	290	900
	Reel 2	xxx	5S	290	900
Kiting_c	Reel 1	xxx	3S	290	900
	Reel 2	xxx	3S	300	900
Kiting_d	Reel 1	xxx	3S	290	900
	Reel 2	xxx	5S	300	900

Product Nomenclature

Table 5. Nomenclature example

S Z 5 - M 4 - W x - C x - E x A N 0 0 0 a b c d d e e f f f																													
X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	X ₂₀	X ₂₁	X ₂₂	X ₂₃	X ₂₄	X ₂₅	X ₂₆	X ₂₇	X ₂₈	X ₂₉	X ₃₀
Code digits		Value		References														Description											
X ₁		S		Seoul Semiconductor														Company											
X ₂ X ₃		Z5		Series														Z5 Series											
X ₄		-		-														-											
X ₅ X ₆		Mx		Chip Size																									
X ₇		-		-														-											
X ₈ X ₉		Wx		CCT														W0:5000K~6500K WN:4000K WW:2200K~3500K											
X ₁₀		-		-														-											
X ₁₁ X ₁₂		Cx		CRI														C7:CRI70 C8:CRI80 C9:CRI90											
X ₁₃		-		-														-											
X ₁₄ X ₁₅		Ex		Technology																									
X ₁₆ X ₁₇		Ax		PCB														A3:AL2O3 AN:ALN											
X ₁₈ X ₁₉ X ₂₀		000		Internalcode																									
X ₂₁ X ₂₂ X ₂₃		abc		Flux (Min)														xxx											
X ₂₄ X ₂₅		dd		CCT														65=6500K, 57=5700K, 50=5000K,40=4000K, 35=3500K,30=3000K, 27= 2700K,22=2200K											
X ₂₆ X ₂₇		ee		Step														3S:3step single /5S: 5step single / 4M: 4step Mixing											
X ₂₈ X ₂₉ X ₃₀		fff		VF Bin(Max)														xxx											

Product Nomenclature

Table 6. E1 Product Selection Table

Reference P/N	Order code	Flux bin (Min)	CCT	Step	VF bin (Max)
SZ5-M4-W0-C7-E1AN000	xxx65xS290	xxx:340	65:6500K	3S: 3step single 5S: 5step single	290
	xxx57xS290	xxx:340	57:5700K		
	xxx50xS290	xxx:355	50:5000K		
SZ5-M4-WN-C7-E1AN000	xxx40xS290	xxx:355	40:4000K		
SZ5-M4-WW-C7-E1AN000	xxx35xS290	xxx:340	35:3500K		
	xxx30xS290	xxx:340	30:3000K		
	xxx27xS290	xxx:310	27:2700K		
	xxx22xS290	xxx:280	22:2200K		
SZ5-M4-W0-C8-E1AN000	xxx65xS290	xxx:325	65:6500K		
	xxx57xS290	xxx:325	57:5700K		
	xxx50xS290	xxx:325	50:5000K		
SZ5-M4-WN-C8-E1AN000	xxx40xS290	xxx:325	40:4000K		
SZ5-M4-WW-C8-E1AN000	xxx35xS290	xxx:310	35:3500K		
	xxx30xS290	xxx:310	30:3000K		
	xxx27xS290	xxx:280	27:2700K		
SZ5-M4-W0-C9-E1AN000	xxx65xS290	xxx:280	65:6500K		
	xxx57xS290	xxx:280	57:5700K		
	xxx50xS290	xxx:280	50:5000K		
SZ5-M4-WN-C9-E1AN000	xxx40xS290	xxx:280	40:4000K		
SZ5-M4-WW-C9-E1AN000	xxx35xS290	xxx:265	35:3500K		
	xxx30xS290	xxx:250	30:3000K		
	xxx27xS290	xxx:235	27:2700K		

Product Nomenclature

Table 7. E1 Product Selection Table

Reference P/N	Order code	Flux bin (Min)	CCT	Step	VF bin (Max)
SZ5-M4-W0-C7-E1AN000	xxx654Mxxx	xxx:340	65:6500K	4M: 4step Mixing	ALL
	xxx574Mxxx	xxx:340	57:5700K		
	xxx504Mxxx	xxx:355	50:5000K		
SZ5-M4-WN-C7-E1AN000	xxx404Mxxx	xxx:355	40:4000K		
SZ5-M4-WW-C7-E1AN000	xxx354Mxxx	xxx:340	35:3500K		
	xxx304Mxxx	xxx:340	30:3000K		
	xxx274Mxxx	xxx:310	27:2700K		
	xxx224Mxxx	xxx:280	22:2200K		
SZ5-M4-W0-C8-E1AN000	xxx654Mxxx	xxx:325	65:6500K		
	xxx574Mxxx	xxx:325	57:5700K		
	xxx504Mxxx	xxx:325	50:5000K		
SZ5-M4-WN-C8-E1AN000	xxx404Mxxx	xxx:325	40:4000K		
SZ5-M4-WW-C8-E1AN000	xxx354Mxxx	xxx:310	35:3500K		
	xxx304Mxxx	xxx:310	30:3000K		
	xxx274Mxxx	xxx:280	27:2700K		
SZ5-M4-W0-C9-E1AN000	xxx654Mxxx	xxx:280	65:6500K		
	xxx574Mxxx	xxx:280	57:5700K		
	xxx504Mxxx	xxx:280	50:5000K		
SZ5-M4-WN-C9-E1AN000	xxx404Mxxx	xxx:280	40:4000K		
SZ5-M4-WW-C9-E1AN000	xxx354Mxxx	xxx:265	35:3500K		
	xxx304Mxxx	xxx:250	30:3000K		
	xxx274Mxxx	xxx:235	27:2700K		

Product Nomenclature

Table 8. E2 Product Selection Table

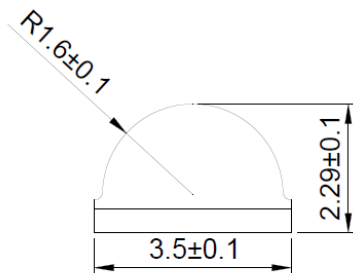
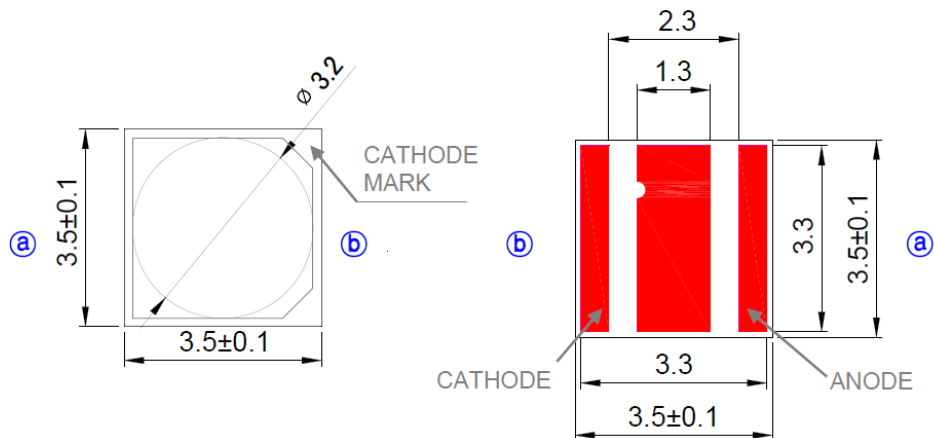
Reference P/N	Order code	Flux bin (Min)	CCT	Step	VF bin (Max)
SZ5-M4-W0-C7-E2AN000	xxx65xS290	xxx:355	65:6500K	3S: 3step single 5S: 5step single	290
	xxx57xS290	xxx:355	57:5700K		
	xxx50xS290	xxx:370	50:5000K		
SZ5-M4-WN-C7-E2AN000	xxx40xS290	xxx:370	40:4000K		
SZ5-M4-WW-C7-E2AN000	xxx35xS290	xxx:355	35:3500K		
	xxx30xS290	xxx:340	30:3000K		
	xxx27xS290	xxx:325	27:2700K		
SZ5-M4-W0-C8-E2AN000	xxx65xS290	xxx:340	65:6500K		
	xxx57xS290	xxx:340	57:5700K		
	xxx50xS290	xxx:340	50:5000K		
SZ5-M4-WN-C8-E2AN000	xxx40xS290	xxx:340	40:4000K		
SZ5-M4-WW-C8-E2AN000	xxx35xS290	xxx:325	35:3500K		
	xxx30xS290	xxx:310	30:3000K		
	xxx27xS290	xxx:295	27:2700K		
SZ5-M4-W0-C9-E2AN000	xxx65xS290	xxx:295	65:6500K		
	xxx57xS290	xxx:295	57:5700K		
	xxx50xS290	xxx:295	50:5000K		
SZ5-M4-WN-C9-E2AN000	xxx40xS290	xxx:295	40:4000K		
SZ5-M4-WW-C9-E2AN000	xxx35xS290	xxx:280	35:3500K		
	xxx30xS290	xxx:265	30:3000K		
	xxx27xS290	xxx:235	27:2700K		

Product Nomenclature

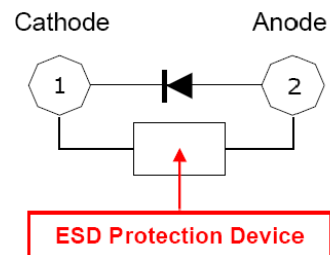
Table 9. E2 Product Selection Table

Reference P/N	Order code	Flux bin (Min)	CCT	Step	VF bin (Max)
SZ5-M4-W0-C7-E2AN000	xxx654Mxxx	xxx:355	65:6500K	4M: 4step Mixing	ALL
	xxx574Mxxx	xxx:355	57:5700K		
	xxx504Mxxx	xxx:370	50:5000K		
SZ5-M4-WN-C7-E2AN000	xxx404Mxxx	xxx:370	40:4000K		
SZ5-M4-WW-C7-E2AN000	xxx354Mxxx	xxx:355	35:3500K		
	xxx304Mxxx	xxx:340	30:3000K		
	xxx274Mxxx	xxx:325	27:2700K		
SZ5-M4-W0-C8-E2AN000	xxx654Mxxx	xxx:340	65:6500K		
	xxx574Mxxx	xxx:340	57:5700K		
	xxx504Mxxx	xxx:340	50:5000K		
SZ5-M4-WN-C8-E2AN000	xxx404Mxxx	xxx:340	40:4000K		
SZ5-M4-WW-C8-E2AN000	xxx354Mxxx	xxx:325	35:3500K		
	xxx304Mxxx	xxx:310	30:3000K		
	xxx274Mxxx	xxx:295	27:2700K		
SZ5-M4-W0-C9-E2AN000	xxx654Mxxx	xxx:295	65:6500K		
	xxx574Mxxx	xxx:295	57:5700K		
	xxx504Mxxx	xxx:295	50:5000K		
SZ5-M4-WN-C9-E2AN000	xxx404Mxxx	xxx:295	40:4000K		
SZ5-M4-WW-C9-E2AN000	xxx354Mxxx	xxx:280	35:3500K		
	xxx304Mxxx	xxx:265	30:3000K		
	xxx274Mxxx	xxx:235	27:2700K		

Mechanical Dimensions

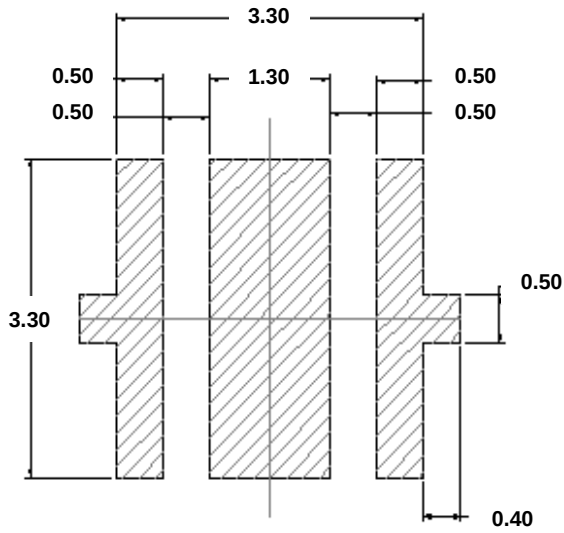


Circuit

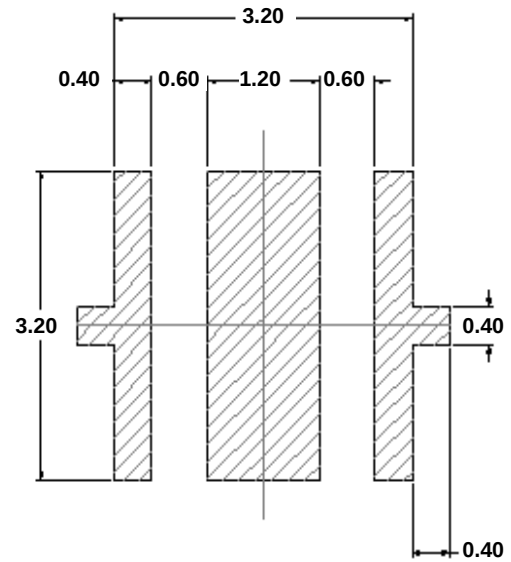


- (1) All dimensions are in millimeters.
- (2) Scale : none
- (3) Undefined tolerance is ± 0.1 mm

Recommended Solder Pad



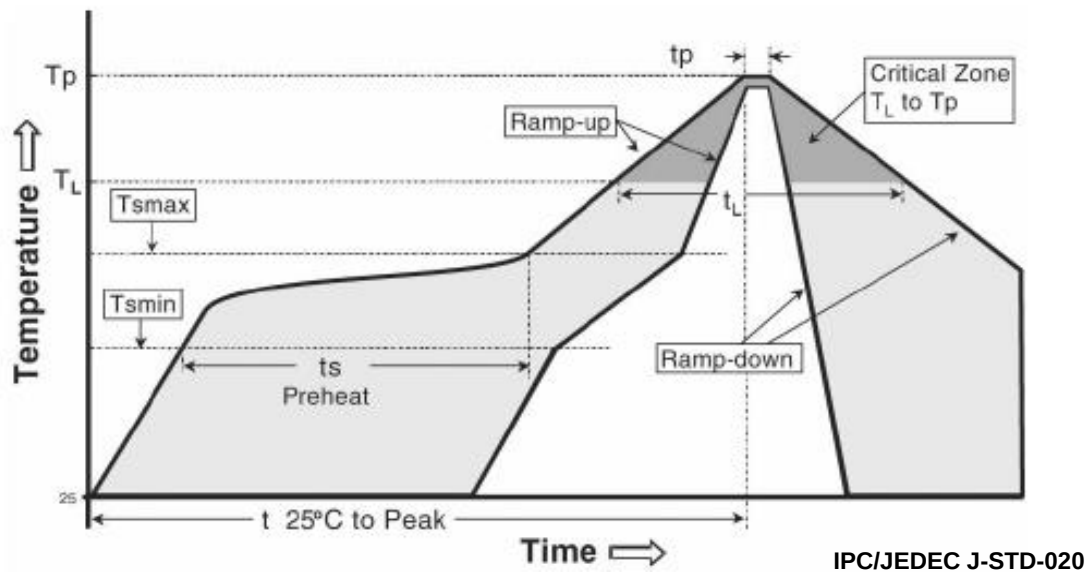
Recommended PCB Solder Pad



Recommended Stencil Pattern

- (1) All dimensions are in millimeters.
- (2) Scale : none
- (3) This drawing without tolerances are for reference only.
- (4) Undefined tolerance is $\pm 0.1\text{mm}$.

Reflow Soldering Characteristics

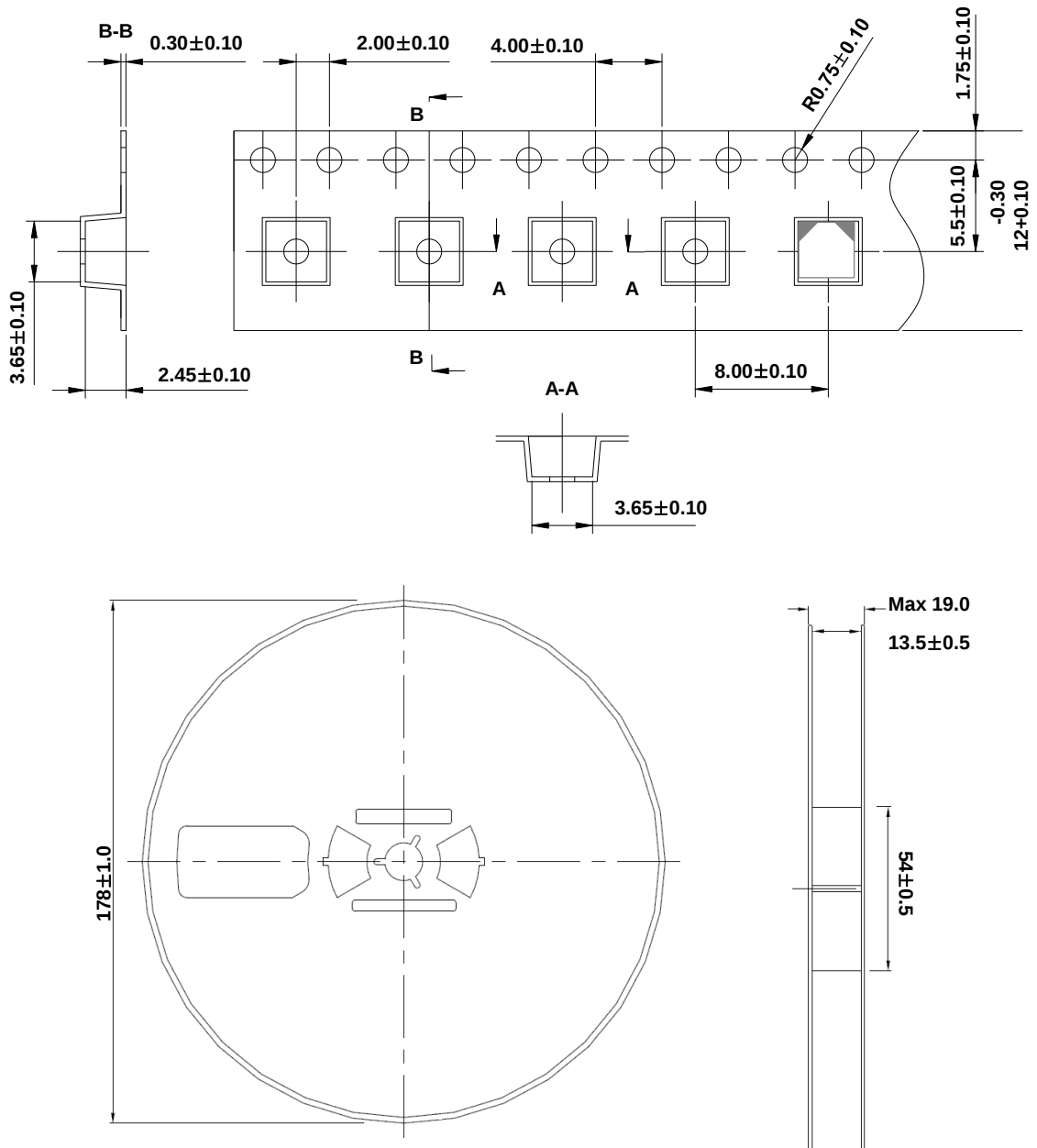


Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T _{smax} to T _p)	3° C/second max.	3° C/second max.
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (T_{smin} to T_{smax}) (t_s)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-180 seconds
Time maintained above: - Temperature (T_L) - Time (t_L)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak Temperature (T _p)	215°C	260°C
Time within 5°C of actual Peak Temperature (t _p) ²	10-30 seconds	20-40 seconds
Ramp-down Rate	6 °C/second max.	6 °C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

Caution

- (1) Reflow soldering is recommended not to be done more than two times. In the case of more than 24 hours passed soldering after first, LEDs will be damaged.
- (2) Repairs should not be done after the LEDs have been soldered. When repair is unavoidable, suitable tools must be used.
- (3) Die slug is to be soldered.
- (4) When soldering, do not put stress on the LEDs during heating.
- (5) After soldering, do not warp the circuit board.

Emitter Tape & Reel Packaging

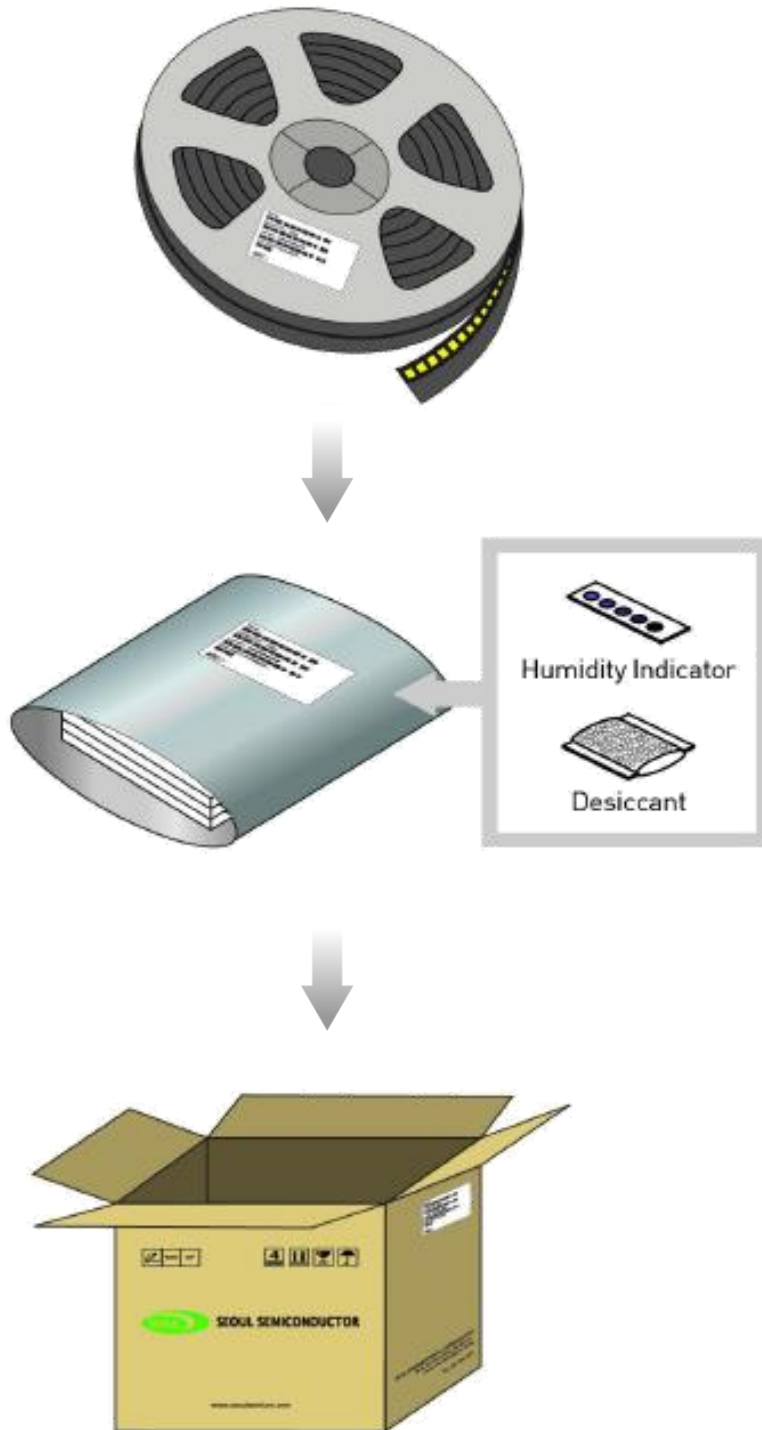


Notes :

UNIT: mm

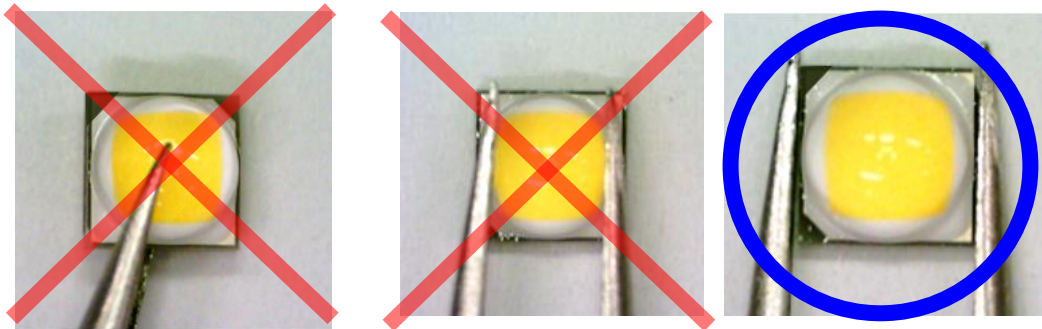
- Quantity : 900pcs/Reel
- Cumulative Tolerance : Cumulative Tolerance/10 pitches to be $\pm 0.2\text{mm}$
- Adhesion Strength of Cover Tape : Adhesion strength to be 10-60g when the cover tape is turned off from the carrier tape at the angle of 10° to the carrier tape
- Package : P/N, Manufacturing data Code No. and quantity to be indicated on a damp proof Package

Packaging Information



Handling of Silicone Resin for LEDs

- (1) During processing, mechanical stress on the surface should be minimized as much as possible. Sharp objects of all types should not be used to pierce the sealing compound.



- (2) In general, LED should only be handled from the side. By the way, this also applies to LED without a silicone sealant, since the surface can also become scratched.
- (3) When populating boards in SMT production, there are basically no restrictions regarding the form of the pick and place nozzle, except that mechanical pressure on the surface of the resin must be prevented. This is assured by choosing a pick and place nozzle which is larger than the LED's reflector area.
- (4) Silicone differs from materials conventionally used for the manufacturing of LEDs. These conditions must be considered during the handling of such devices. Compared to standard encapsulants, silicone is generally softer, and the surface is more likely to attract dust. As mentioned previously, the increased sensitivity to dust requires special care during processing. In cases where a minimal level of dirt and dust particles cannot be guaranteed, a suitable cleaning solution must be applied to the surface after the soldering of components.
- (5) Seoul Semiconductor suggests using isopropyl alcohol for cleaning. In case other solvents are used, it must be assured that these solvents do not dissolve the package or resin. Ultrasonic cleaning is not recommended. Ultrasonic cleaning may cause damage to the LED.
- (6) Please do not mold this product into another resin (epoxy, urethane, etc) and do not handle this product with acid or sulfur material in sealed space.
- (7) Avoid leaving fingerprints on silicone resin parts.

Precaution for Use

(1) Storage

To avoid the moisture penetration, we recommend storing LED in a dry box with a desiccant . The recommended storage temperature range is 5°C to 30°C and a maximum humidity of RH50%.

(2) Use Precaution after Opening the Packaging

Use SMD techniques properly when solder the LED as separation of the lens may affect the light output efficiency.

Pay attention to the following:

- a. Recommend conditions after opening the package
 - Sealing / Temperature : 5 ~ 30°C Humidity : less than RH60%
- b. If the package has been opened more than 4 weeks (**MSL 2a**) or the color of the desiccant changes, components should be dried for 10-24hr at 65±5°C

(3) Do not apply mechanical force or excess vibration during the cooling process to normal temperature after soldering.

(4) Do not rapidly cool device after soldering.

(5) Components should not be mounted on warped (non coplanar) portion of PCB.

(6) Radioactive exposure is not considered for the products listed here in.

(7) Gallium arsenide is used in some of the products listed in this publication. These products are dangerous if they are burned or shredded in the process of disposal. It is also dangerous to drink the liquid or inhale the gas generated by such products when chemically disposed of.

(8) This device should not be used in any type of fluid such as water, oil, organic solvent and etc. When washing is required, IPA (Isopropyl Alcohol) should be used.

(9) When the LED are in operation the maximum current should be decided after measuring the package temperature.

(10) The appearance and specifications of the product may be modified for improvement without notice.

(11) Long time exposure of sunlight or occasional UV exposure will cause lens discoloration.

Precaution for Use

(12) VOCs (Volatile organic compounds) emitted from materials used in the construction of fixtures can penetrate silicone encapsulants of LED and discolor when exposed to heat and photonic energy. The result can be a significant loss of light output from the fixture. Knowledge of the properties of the materials selected to be used in the construction of fixtures can help prevent these issues.

(13) Attaching LEDs, do not use adhesives that outgas organic vapor.

(14) The driving circuit must be designed to allow forward voltage only when it is ON or OFF. If the reverse voltage is applied to LED, migration can be generated resulting in LED damage.

(15) LED is 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 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 LED 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)

Precaution for Use

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:

- A surge protection circuit
- An appropriately rated over voltage protection device
- A current limiting device

Company Information

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Company Information

Seoul Semiconductor (www.SeoulSemicon.com) manufactures and packages a wide selection of light emitting diodes (LEDs) for the automotive, general illumination/lighting, Home 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", "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 and Acirch2, high-brightness LEDs, mid-power LEDs, side-view LEDs, and through-hole type LEDs as well as custom modules, displays, and sensors.

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