



Innovation enriches life
Product Catalogue
2020



About us

SHENZHEN REFOND OPTOELECTRONICS CO.,LTD(hereinafter referred to "Refond"), a world renowned LED packaging solution and product provider, specializing in the development and production of LED light sources and application solutions.Since the foundation in 2000, Refond hold the core competitiveness: scientific and technological innovation, technology-leading and product- customized. We established deep business and strategic cooperation with top international brands. For the moment, we focus on the development and business layout of Mini LED、Micro LED and AI sensor components, enhancing our core competitiveness and sustainable profitability.After over years of development and accumulation, with technology innovation, Refond help customers in various industries to meet the needs of current and future social development. In the future, Refond will strive to uphold the philosophy of "innovation enriches life", integrate global resources and technology, and pursue continuous innovation and development, committed to realize the corporate vision of becoming a leading global technology company.

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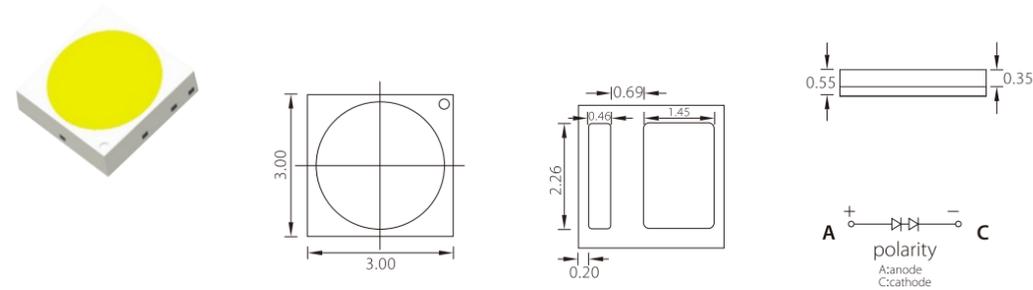
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Special lighting	<ul style="list-style-type: none">◦ Decorative lighting LED◦ Ultraviolet LED◦ Infrared LED◦ Horticulture LED◦ Automotive lighting LED



General Lighting



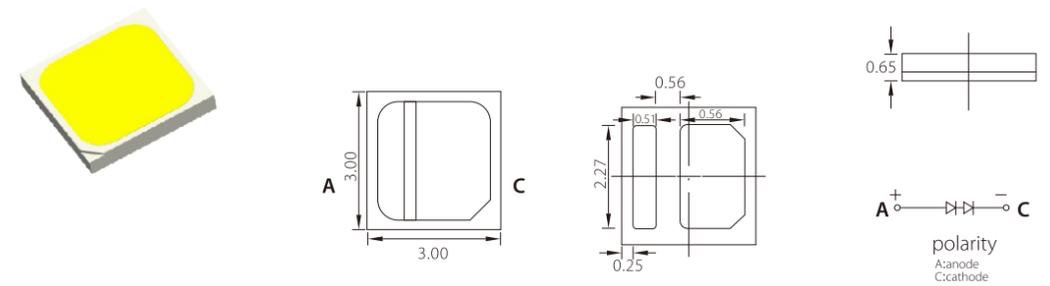
EMC3030



Typical Electrical & Optical characteristics

Part No.	L/F Type	Color	CRI (min)	ϕ (lm)	Efficacy (lm/w)	VF (V)	IF (mA)	Po (W)	50% Power Angle	Tj (°C)	Qty Pack (pcs)
RF-Q30PA27A-24-J2	Round	2700K	70	148	162	5.8 6.2	150	0.9	120	125	5000
RF-Q30PA30A-24-J2		3000K	70	152	166						
RF-Q30PA40A-24-J2		4000K	70	158	173						
RF-Q30PA50A-24-J2		5000K	70	158	173						
RF-Q30PA57A-24-J2		5700K	70	158	173						
RF-Q30PA65A-24-J2		6500K	70	157	172						
RF-Q30PA27B-24-J2	Round	2700K	80	135	148	5.8 6.2	150	0.9	120	125	5000
RF-Q30PA30B-24-J2		3000K	80	142	155						
RF-Q30PA40B-24-J2		4000K	80	148	162						
RF-Q30PA50B-24-J2		5000K	80	148	162						
RF-Q30PA57B-24-J2		5700K	80	148	162						
RF-Q30PA65B-24-J2		6500K	80	147	161						

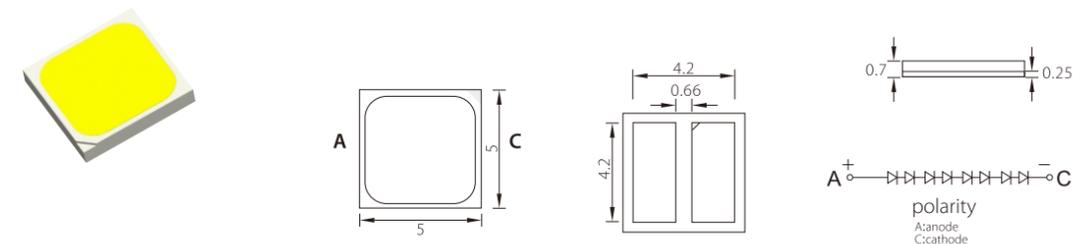
EMC3030



Typical Electrical & Optical characteristics

Part No.	L/F Type	Color	CRI (min)	ϕ (lm)	Efficacy (lm/w)	VF (V)	IF (mA)	Po (W)	50% Power Angle	Tj (°C)	Qty Pack (pcs)
RF-Q30SA27A-24-J2	Square	2700K	70	150	164	5.8 6.2	150	0.9	120	125	5000
RF-Q30SA30A-24-J2		3000K	70	157	172						
RF-Q30SA40A-24-J2		4000K	70	165	180						
RF-Q30SA50A-24-J2		5000K	70	165	180						
RF-Q30SA57A-24-J2		5700K	70	165	180						
RF-Q30SA65A-24-J2		6500K	70	164	179						
RF-Q30SA27B-24-J2	Square	2700K	80	138	151	5.8 6.2	150	0.9	120	125	5000
RF-Q30SA30B-24-J2		3000K	80	146	160						
RF-Q30SA40B-24-J2		4000K	80	153	167						
RF-Q30SA50B-24-J2		5000K	80	153	167						
RF-Q30SA57B-24-J2		5700K	80	153	167						
RF-Q30SA65B-24-J2		6500K	80	152	166						

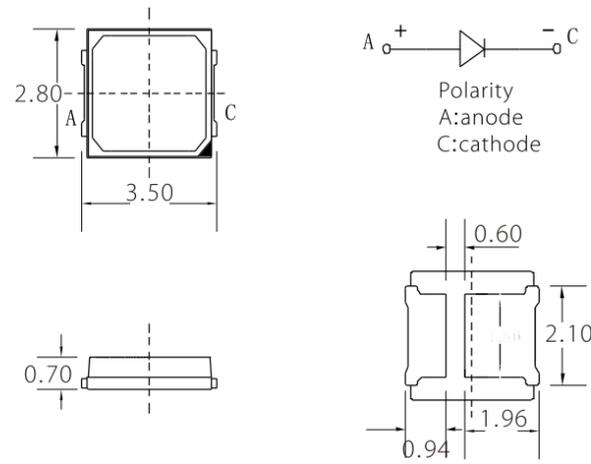
EMC5050



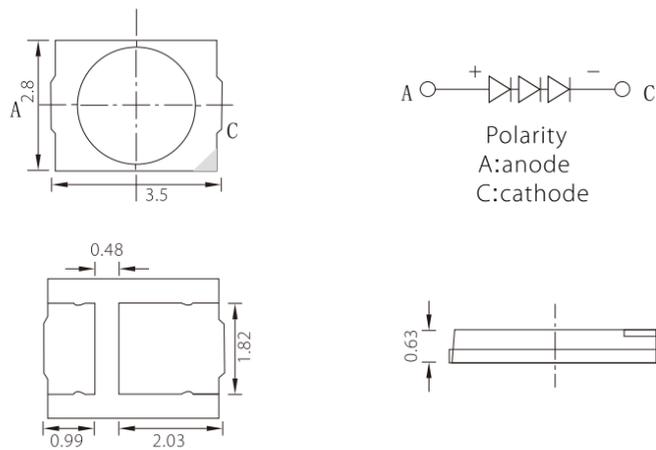
Typical Electrical & Optical characteristics

Part No.	L/F Type	Color	CRI (min)	ϕ (lm)	Efficacy (lm/w)	VF (V)	IF (mA)	Po (W)	50% Power Angle	Tj (°C)	Qty Pack (pcs)
RF-Q50SA27A-24-H8	Square	2700K	70	730	143	24 28	200	5	120	125	5000
RF-Q50SA30A-24-H8		3000K	70	770	151						
RF-Q50SA40A-24-H8		4000K	70	810	159						
RF-Q50SA50A-24-H8		5000K	70	810	159						
RF-Q50SA57A-24-H8		5700K	70	810	159						
RF-Q50SA65A-24-H8		6500K	70	800	157						
RF-Q50SA27B-24-H8	Square	2700K	80	675	132	24 28	200	5	120	125	5000
RF-Q50SA30B-24-H8		3000K	80	720	141						
RF-Q50SA40B-24-H8		4000K	80	750	147						
RF-Q50SA50B-24-H8		5000K	80	750	147						
RF-Q50SA57B-24-H8		5700K	80	750	147						
RF-Q50SA65B-24-H8		6500K	80	740	145						

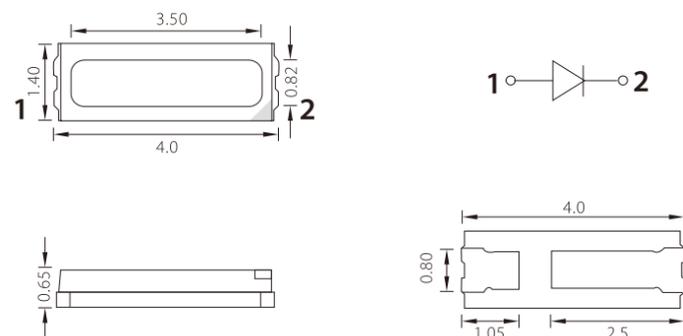
2835 square cup size



2835 round cup size



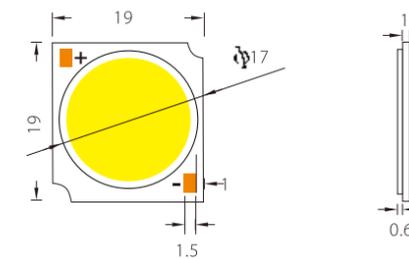
4014 physical dimension



Typical Electrical & Optical characteristics

LED Series	Picture	Part No.	Color	CRI (min)	ϕ (lm)	Efficacy (lm/w)	VF (V)	IF (mA)	Po (W)	Tj (°C)	IF-Max (mA)	2 θ 1/2 (°)
2835		RF-P**MI32DS-AF-N-Y	6500K	70	27	43	3.15	60	0.2	43	115	120
		RF-P*HI32DS BF-N-Y	6500K	80	27	43	3.15	60	0.2	43	115	120
		RF-THI32DS-CF-N-Y	6500K	80	29	67	2.9	60	0.2	67	115	120
		RF-H**HI32DS-EF-2N	6500K	80	33.5	03	2.75	60	0.2	03	125	120
2835		RF-P*HI32DS-FF-J-01	6500K	80	65	35	3.2	150	0.5	35	125	120
		RF-P*HI32DS-FH-J	6500K	80	70	48	3.15	150	0.5	48	125	120
		RF-H**HI32DS-EF-2J	6500K	80	75	69	2.95	150	0.5	69	125	120
2835		RF-W*HP32DS-AF-J2	6500K	80	117	22	6.4	150	1	22	125	120
		RF-W*HP32DS-AF-13	6500K	80	123	36	9.05	100	1	36	125	120
		RF**HP32DS-BF-13	6500K	80	122	35	9.05	100	1	35	125	120
2835		RF-T6HP32DS-DF-13	6500K	78	135	49	9.05	100	1	49	125	120
		RF-R*HP32DS-BF-3-Y	6500K	80	127	41	9.0	100	1	41	125	120
		RF-W*HV32DS- BF-N	6500K	80	70	28	9.10	60	0.6	28	125	120
2835 高压		RF-W*HV32DS-FF-F	6500K	80	70	27	18.4	30	0.6	27	125	120
		RF-W*HV32DS-EF-G2	6500K	80	122	37	17.8	50	1.0	37	125	120
		RF-W*HV32DS-FH-F2	6500K	80	142	27	37.4	30	1.0	27	125	120
		RF-W*HV32DS-FF-E3	6500K	80	150	38	54.3	20	1.0	38	125	120
4140		RF 4014W*H-CF-N-Y	5700K	80	25	32	3.15	60	0.2	32	115	120
		RF 4014W*H-DF-N-Y	5700K	80	27	53	2.95	60	0.2	53	115	120
4140		RF 4010W*H-CFN-Y	5700K	80	26.8	53	2.92	60	0.2	53	115	120
		RF 4010W*H-FF-N-Y	5700K	80	28.5	64	2.9	50	0.2	64	115	120

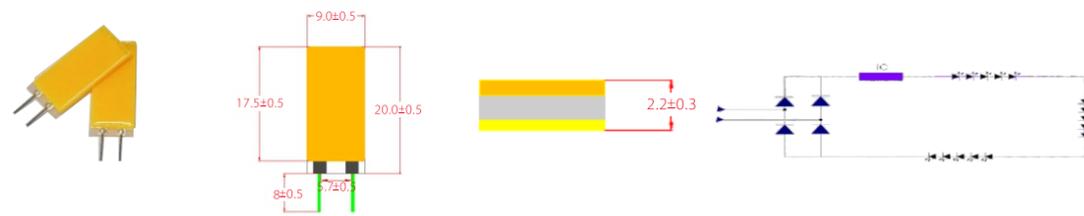
COB



Typical Electrical & Optical Characteristics

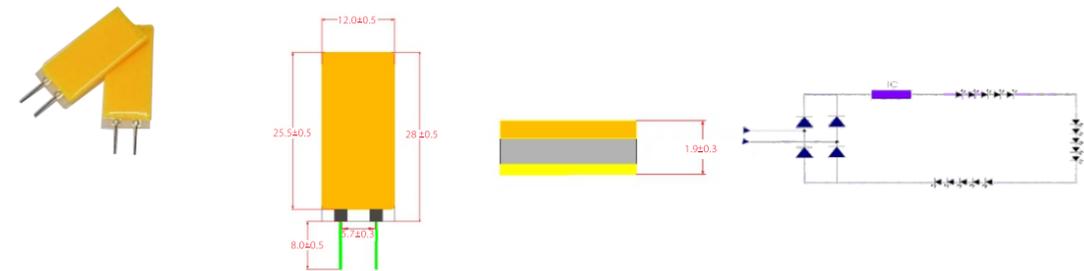
Part No.	L/F Type	Color	Test Condition (V)	IV (lm)	P (W)	Ra (min)	2 θ 1/2 (°)
A19A-W3EE1512-C0	19*19*1.6mm	3000K	450	1450	15	97	120
A19A-W4EE1512-C0	19*19*1.6mm	4000K	450	1550	15	97	120
A19A-W5EE1512-C0	19*19*1.6mm	5000K	450	1550	15	97	120

Ceramic filament



Typical Electrical & Optical Characteristics

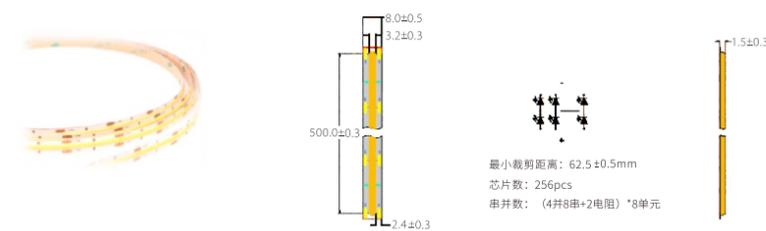
Part No.	L/F Type	Color	Test Condition (V)	IV (lm)	P (W)	Ra (min)	2θ1/2 (°)
RF-G9CW2K1J-TA	9*20mil	2700K	AC 230	95-115	0.8-1.2	82	360
RF-G9CW2K1J-TB	9*20mil	2700K	AC 230	190-230	1.6-2.0	82	360
RF-G9CW2K1 J-TB2	9*20mil	2700K	AC 230	230-270	1.8-2.2	82	360
RF-G9CW2K1E-TA	9*20mil	2700K	AC 120	95-115	0.8-1.2	82	360
RF-G9CW2K1E-TB	9*20mil	2700K	AC 120	190-230	1.6-2.0	82	360



Typical Electrical & Optical Characteristics

Part No.	L/F Type	Color	Test Condition (V)	IV (lm)	P (W)	Ra (min)	2θ1/2 (°)
RF-G9CW2K1J-TC3	12*28mil	2700K	AC 230	330-370	2.4-3.1	82	360
RF-G9CW2K1 J-TC4	12*28mil	2700K	AC 230	380-420	2.4-3.1	82	360
RF-G9CW2K1J-TD	12*28mil	2700K	AC 230	450-510	2.7-3.3	82	360
RF-G9CW2K1E-TC3	12*28mil	2700K	AC 120	330-370	2.4-3.1	82	360
RF-G9CW2K1E-TD	12*28mil	2700K	AC 120	450-510	2.7-3.3	82	360

Flexible Strips



Typical Electrical & Optical Characteristics

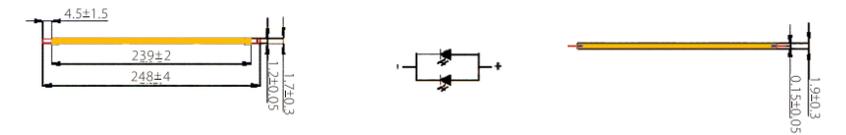
Part No.	L/F Type	Color	Test Condition (mA)	IV (lm)	Vf (V)	Ra (min)	2θ1/2 (°)
RF-FP3MW2E24-D9	500*8.0mm	2700K	215	350-450	24	92	360
RF-FP3MW3E24-D9	500*8.0mm	3000K	215	400-500	24	92	360
RF-FP3MW4E24-D9	500*8.0mm	4000K	215	450-550	24	92	360
RF-FP3MW6E24-D9	500*8.0mm	6500K	215	470-570	24	92	360

Flexible Strips



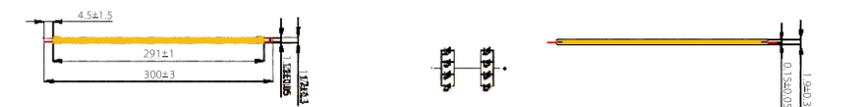
Typical Electrical & Optical Characteristics

Part No.	L/F Type	Color	Test Condition (mA)	IV (lm)	Vf (V)	Ra (min)	2θ1/2 (°)
RF-FPR2W2C1G-T5	134*1.5mm	2200K	20	320-380	135	82	360
RF-FPR2W2E1G-T5	134*1.5mm	2700K	20	350-410	135	82	360
RF-FPR2W2C1K-T5	134*1.5mm	2700K	10	320-380	270	82	360
RF-FPR2W2E1K-T5	134*1.5mm	2700K	10	350-410	270	82	360



Typical Electrical & Optical Characteristics

Part No.	L/F Type	Color	Test Condition (V)	IV (lm)	Vf (V)	Ra (min)	2θ1/2 (°)
RF-FPR4W2C1G-T5	248*1.5mm	2200K	40	640-720	135	82	360
RF-FPR4W2E1G-T5	248*1.5mm	2700K	40	720-800	135	82	360
RF-FPR4W2C1K-T5	248*1.5mm	2700K	20	640-720	270	82	360
RF-FPR4W2E1K-T5	248*1.5mm	2700K	20	720-800	270	82	360



Typical Electrical & Optical Characteristics

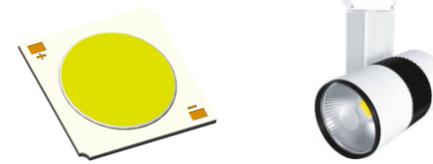
Part No.	L/F Type	Color	Test Condition (mA)	IV (lm)	Vf (V)	Ra (min)	2θ1/2 (°)
RF-FPR6W2C1G-T5	300*1.5mm	2200K	40	680-760	135	82	360
RF-FPR6W2E1G-T5	300*1.5mm	2700K	40	760-840	135	82	360
RF-FPR6W2C1K-T5	300*1.5mm	2700K	20	680-760	270	82	360
RF-FPR6W2E1K-T5	300*1.5mm	2700K	20	760-840	270	82	360

COB LED

Refond COB,
Show you what is the true color!



Spectrum product



Product Character

- Used for fresh area lighting in the supermarket, working environment temperature is - 20 to 45°C
- High reliability: Low thermal resistance, long lifetime
- Good color consistency; MacAdam 3/5 SDCM is available
- Surface light source, emitting uniform light, easy to make secondary light distribution, eliminating the glare and light spot
- Easy assembling to down the cost
- Lead free and RoHS compliant

Product Description

Specially designed for fresh food lighting with professional and directional spectrum, Make commodities such as fresh fruits and vegetables to be delicate and charming, even transcendental inviting

Customized COB is available for fresh meat, dried meat, vegetables, fruits, seafood, aquatic products, fresh freezers, bread, and stone pavilion etc by offering various kinds of fixed-point spectrum

light source and commercial lighting series

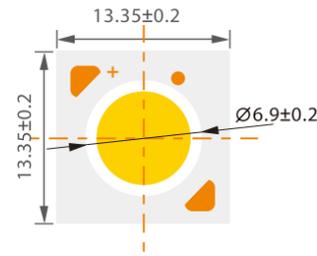
Product Character

- High reliability: low thermal resistance, long life span, LM-80/LM90 report available
- High quality light: customized spectrum for fresh lighting, clothing lighting, pavilion lighting and jewelry lighting
- Good uniformity, MacAdam 3/5 SDCM
- Surface light source, emitting uniform light, easy to make secondary light distribution, eliminating the glare and light spot
- Full series to meet different requirement from customers, cover high light effect, cost efficiency and customized spectrum series
- Easy assembling to down the cost
- Lead free and RoHS compliant

Product Application

- Track light
- Ceiling light
- Bulb
- General USE
- Down light
- Floor light
- Spot light

C13A Series



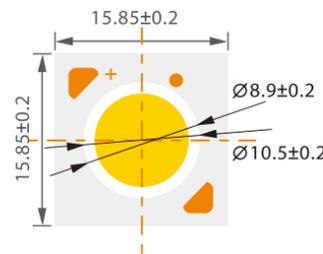
Application



Typical Electrical & Optical Characteristics

Part No.	P (W)	VF (V)	CRI	Efficacy (lm/W)	Φ _v (lm)	IF (mA)	CCT (K)	2θ1/2 (°)
C13A-W**T0512-C6	5	35.5	≥80	145	720	140	3000	125
C13A-W**V0512-C5	5	35.5	≥90	130	646	140	3000	125
C13A-W**T0712-C6	7	35.5	≥80	145	1030	200	3000	125
C13A-W**V0712-C5	7	35.5	≥90	130	930	200	3000	125

C16A Series



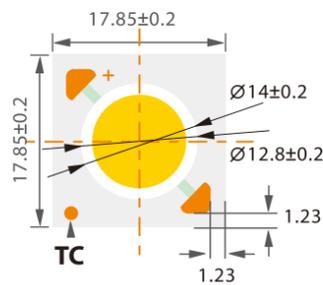
Application



Typical Electrical & Optical Characteristics

Part No.	P (W)	VF (V)	CRI	Efficacy (lm/W)	Φ _v (lm)	IF (mA)	CCT (K)	2θ1/2 (°)
C16A-W**T0712-C6	7	35.5	≥80	145	1020	200	3000	125
C16A-W**V0712-C5	7	35.5	≥90	130	930	200	3000	125
C16A-W**T1212-C5	12	35.5	≥80	135	1680	350	3000	125
C16A-W**V1212-C4	12	35.5	≥90	121	1500	350	3000	125

C18A Series



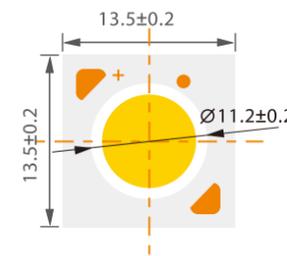
Application



Typical Electrical & Optical Characteristics

Part No.	P (W)	VF (V)	CRI	Efficacy (lm/W)	Φ _v (lm)	IF (mA)	CCT (K)	2θ1/2 (°)
C18A-W**T1612-C6	16	35.5	≥80	145	2320	450	3000	125
C18A-W**V1612-C5	16	35.5	≥90	130	2080	450	3000	125
C18A-W**T2012-C5	20	35.5	≥80	135	2630	550	3000	125
C18A-W**V2012-C4	20	35.5	≥90	120	2370	550	3000	125

A13B Series



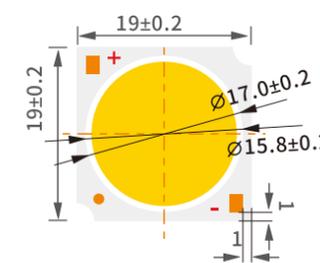
Application



Typical Electrical & Optical Characteristics

Part No.	P (W)	VF (V)	CRI	Efficacy (lm/W)	Φ _v (lm)	IF (mA)	CCT (K)	2θ1/2 (°)
A13B-W**T0712-P6	7	35	≥80	150	945	180	3000	125
A13B-W**V0712-P4	7	35	≥90	135	850	180	3000	125
A13B-W**T0912-P6	9	35	≥80	145	1370	270	3000	125
A13B-W**V0912-P5	9	35	≥90	130	1230	270	3000	125
A13B-W**T1212-P5	12	35	≥80	140	1760	360	3000	125
A13B-W**V1212-P3	12	35	≥90	126	1580	360	3000	125

A19A Series



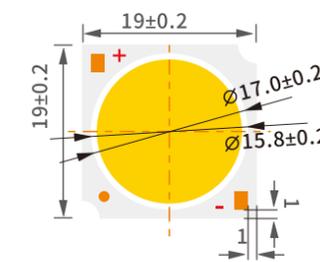
Application



Typical Electrical & Optical Characteristics

Part No.	P (W)	VF (V)	CRI	Efficacy (lm/W)	Φ _v (lm)	IF (mA)	CCT (K)	2θ1/2 (°)
A19A-W**T1812-P6	18	35	≥80	150	2360	450	3000	125
A19A-W**V1812-P4	18	35	≥90	135	2130	450	3000	125
A19A-W**T2712-P6	25	35	≥80	145	3550	700	3000	125
A19A-W**V2712-P4	25	35	≥90	130	3190	700	3000	125
A19A-W**T3612-P5	31	35	≥80	140	4400	900	3000	125
A19A-W**V3612-P3	31	35	≥90	125	3970	900	3000	125

Fresh series



Typical Electrical & Optical Characteristics

Part No.	P (W)	VF (V)	CRI	Efficacy (lm/W)	Φ _v (lm)	IF (mA)	CCT (K)	2θ1/2 (°)
A19A-W1CM3612-S0	36	36	85	90	3060	1000	1800	125
A19A-W3DV3612-S3	36	36	90	120	4140	1000	3000	125
A19A-W5RV3612-S2	36	36	90	110	3780	1000	5000	125
A19A-W4VV3612-S4	36	36	90	130	4500	1000	4000	125
A19A-W3FS3612-S0	36	36	70	90	3060	1000	3000	125
A19A-W3FS3612-S0	36	36	85	110	3780	1000	3000	125

notes : fresh spectral color standard: 1C (Cured meat), 3D (Dried food), 5R (Refrigerator), 4V (Vegetables), 3F (Fresh meat), 3B (Bread)

Dimming COB



Typical Electrical & Optical Characteristics

Typical Electrical & Optical Characteristics

Part No.	VF (V)	CCT (K)	CRI	Flux (lm)	IF (mA)	2θ1/2 (°)	Size (L*W*Hmm)	LES (mm)
RF-A13A-WCT0912-S1	36	2700	>80	900	250	120	13.5*1.35*1.6	10
	36	5700	>80	1050	250	120		
RF-A19A-WCT2512-S1	36	2700	>80	2380	700	120	19*19*1.6	16
	36	5700	>80	2650	700	120		
RF-A23A-WCT3512-S1	36	2700	>80	3180	1000	125	23*23*1.6	20
	36	5700	>80	4100	1000	125		

Advantages

- Different CCT available
- High light uniformity
- Customized spectrum and cost effective

Product Character

- Flip chip package
- Low thermal resistance
- High reliability

Product Application

- Intelligent lighting
- Commercial lighting

High power density COB

Dimension(L*W*H): 15mm*12mm*1.6mm



Typical Electrical & Optical Characteristics

Part No.	VF (V)	CCT (K)	CRI	Flux (lm)	IF (mA)	2θ1/2 (°)	Tj@max (°C)	Rth (pcs)	LES (mm)
RF-F15A-W3ET0504-P1	12	3000	>90	420	400	115	135	1000	3
RF-F15B-W3ET2012-P1	36	3000	>90	1560	500	115	135	1000	6
RF-F15C-W3ET3012-P1	36	3000	>90	2800	800	115	135	1000	9

Advantages

- High power density
- Low thermal resistance
- Cost effective

Product Character

- Eutectic package
- High reliability

Production Application

- Intelligent lighting
- Commercial lighting

Flip Chip Outdoor COB Series

Product Character

- High reliability
- Flip chip package to avoid the failure from broken gold wire and guarantee a long lifespan
- Good uniformity: MacAdam 3/5 SDCM
- High adaptability to down the developing cost
- Easily assembling to down the cost
- Lead free and ROHS compliant

Product Application

- Spotlight
- High bay in the warehouse and factory
- Treet Light
- General Use



Backlighting & Display

Indication---CHIPLED series
Display---RGB LED series

Indication-CHIPLED series



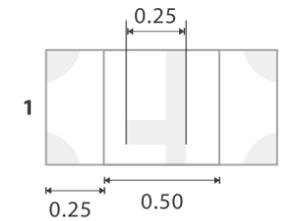
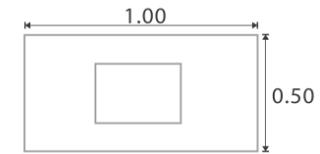
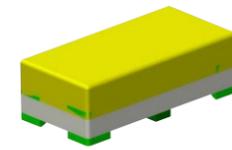
The First CHIPLED Manufacturer in China
Global Patent Approved

Product series

- 0402 series (0402: 1.0*0.5*0.4mm)
- 0603 series (B190、 B191: 1.6*0.8*0.7mm)
- 0603 series (M190: 1.6*0.8*0.4mm)
- 0603 Bi-color and RGB series(S196、 S198: 1.6*1.6*0.7mm)
- 0805 series(B170: 2.0*1.25*0.7mm)
- 1206 series (S150: 3.2*1.6*0.7mm)
- 1206 Bi-color and RGB series (S155: 3.2*2.7*0.7mm)
- 1204 series (T112: 3.2*1.0*1.5mm)
- 1204 Bi-color series (S115: 3.2*1.0*1.48mm)
- 1204 RGB series (S118: 3.2*1.0*1.48mm)

0402 Series

Dimension(L*W*H): 1.0*0.5*0.4mm



Parameter

Part No.	Color	IF (mA)	λD (nm)	VF (V)	IV (mcd)	2θ _{1/2} (°)
RF-BU0402TS-CE-B	Blue	5	470	2.8	70	140
RF-GN0402TS-CF-B	Green	5	522	2.5	290	140
RF-YU0402TS-AE-B	Yellow	5	588	1.9	15	140
RF-OU0402TS-CE-B	Orange	5	622	1.9	28	140
RF-WU0402DS-DD-B	White	5	0.27/0.27	2.75	230	140

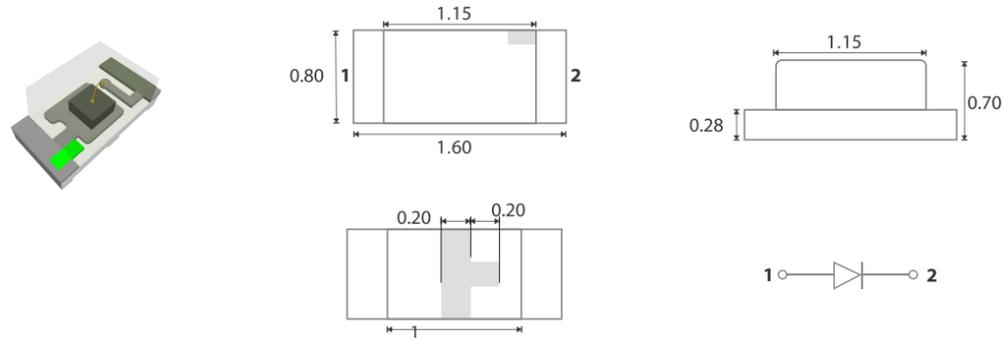
Product Application

Mainly used in the wearable market: the elderly care areas, mobile medical, child anti-lost, smart glasses, smart bands, smart watches



0603 IR Series

Dimension(L*W*H): 1.6*0.8*0.7mm



Parameter:

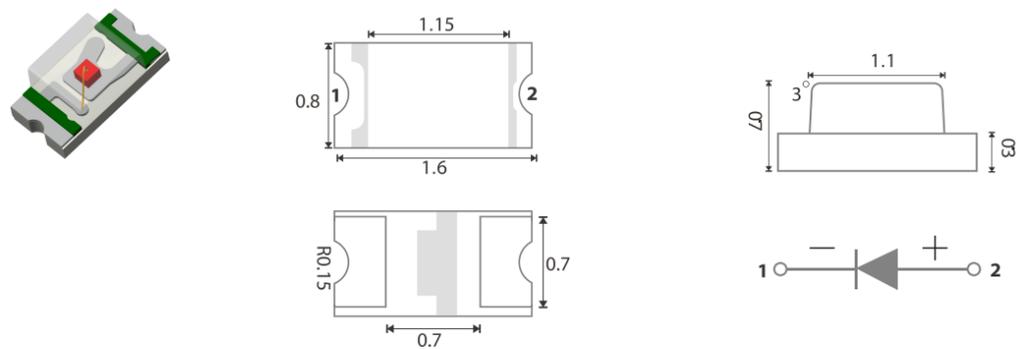
Part No.	IF (mA)	Radiant intensity	Peak Wavelength	Spectral bandwidth	Reverse Voltage	$2\theta_{1/2}$ (°)
RF-IRBB191TS-14-G	50	5.5mw/sr	850 nm	80nm	1.3V	140
RF-IRDB191TS-14-G	50	5mw/sr	940 nm	50nm	1.2V	140

Product Character

Infrared sensor, infrared remote control, smoke detector, infrared application system

B190 Series

Dimension(L*W*H): 1.6*0.8*0.7mm

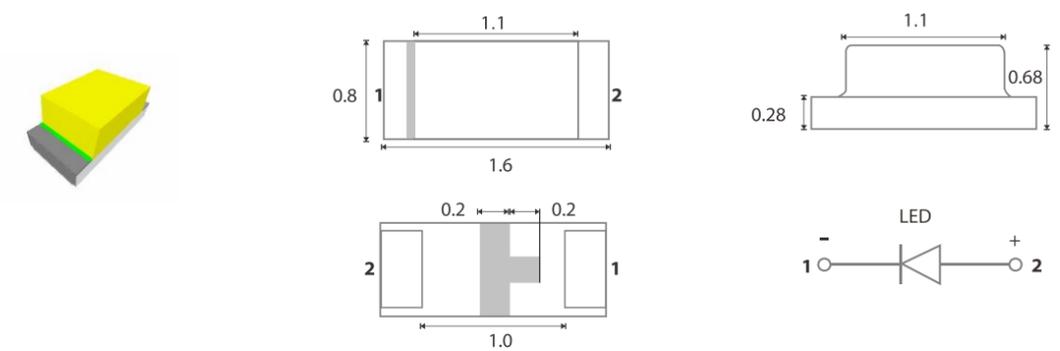


Parameter:

Part No.	Color	IF (mA)	λ_D (nm)	VF (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-GTB190TS-CA	Yellow Green	20	568	2	20	140
RF-YUB190TS-CA	Yellow	20	588	2	120	140
RF-AUB190TS-CA	Amber	20	603	2	120	140
RF-OUB190TS-CA	Orange	20	620	1.8	120	140
RF-WUB190DS-DD	Whiet	20	0.255/0.240	3.1	800	140

B191 Series

Dimension(L*W*H): 1.6mm*0.8mm*0.7mm

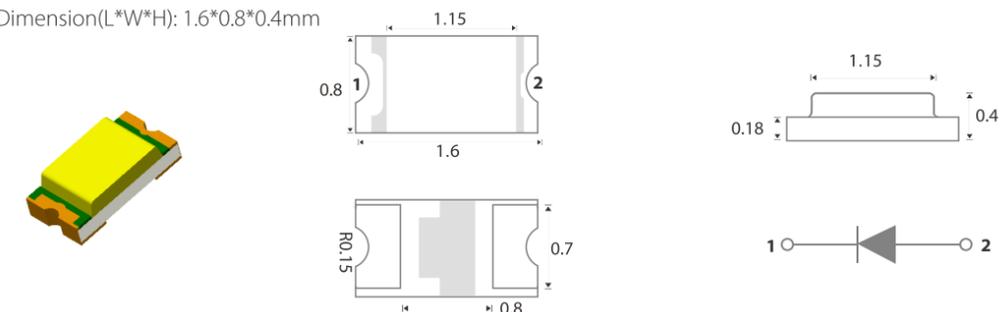


Parameter:

Part No.	Color	IF (mA)	λ_D (nm)	VF (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-WUB191DS-DD	White	20	0.255/0.240	3.1	800	140
RF-WUB191DS-DD-P Europe and the United States patent	White	20	0.255/0.240	3.1	800	140
RF-WUB191DS-DD-GP Global patent	White	20	0.255/0.240	3.1	800	140
RF-BWB191DS-DD	White	20	0.227/0.185	3.1	700	140
RF-BWB191DS-CE	White	20	0.215/0.170	3.1	430	140
RF-BWB191DS-EB-C	White	10	0.2196/0.2164	3	350	140
RF-BUB191TS-CE	Blue	20	470	3.1	160	140
RF-GNB191TS-CF	Green	20	522	2.8	600	140
RF-YUB191TS-AE	Yellow	20	590	2	180	140
RF-OUB191TS-CE	Orange	20	622	2	120	140
RF-GTB191TS-BC	Yellow Green	20	570	2	70	140

M190 Series

Dimension(L*W*H): 1.6*0.8*0.4mm

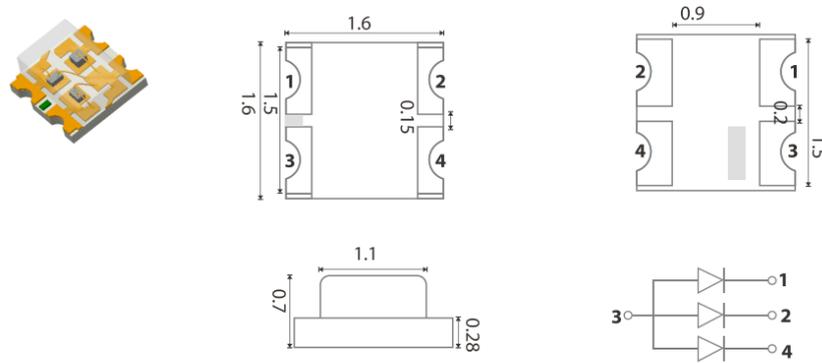


Parameter:

Part No.	Color	IF (mA)	λ_D (nm)	VF (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-WNM190DS-DB-B	White	5	0.265/0.25	3	150	160
RF-WUM190DS-DC-B	White	5	0.26/0.25	3	150	160

S196/S198 Series

Dimension(L*W*H): 1.6*1.6*0.7mm

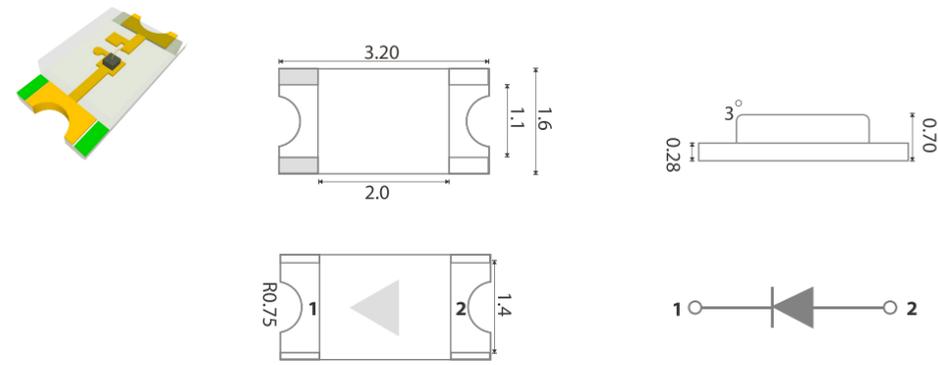


Parameter:

Part No.	Color	IF (mA)	λ_D (nm)	V _F (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-P1S196TSB49	Yellow	20	590	2	120	160
	Green	20	522	3.1	560	160
	Red	20	630	2	60	160
RFP1S196TSB53	Yellow	20	570	2	50	160
	Green	20	522	3.1	560	160
RF-P1S196TS-B54	Red	20	615-630	1.6-2.4	150-430	140
	Green	20	515-530	2.6-3.4	330-700	140
RFP2S196TSB38	Orange	20	622	2	120	160
	Blue	20	460	3.1	50	160
RFW3S198TSA12	Orange	20	622	2	120	160
	Green	20	522	3.1	560	160
RFW3S198TSA12	Blue	20	470	3.1	140	160
	Yellow	20	590	2	120	160
RFW3S198TSA37	Green	20	522	3.1	560	160
	Blue	20	470	3.1	140	160
RFW3S198TSA41	Red	20	630	2	60	160
	Green	20	523	3.1	560	160
	Blue	20	470	3.1	140	160

S150 Series

Dimension(L*W*H): 3.2*1.6*0.7mm

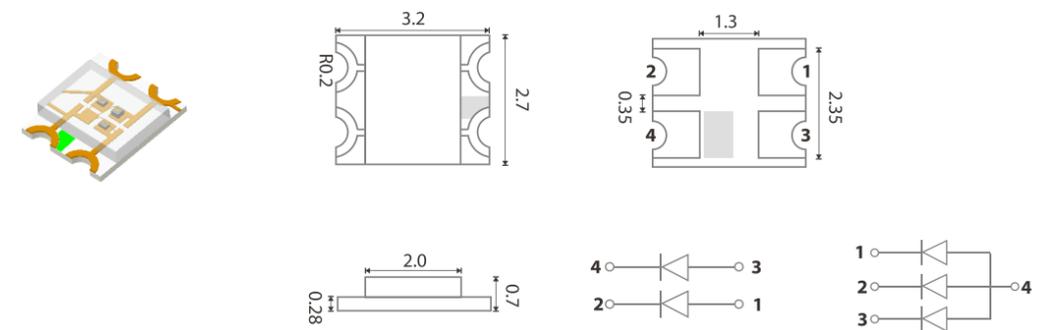


Parameter:

Part No.	Color	IF (mA)	λ_D (nm)	V _F (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-GSS150TS-BC	Yellow Green	20	570	2	50	140
RF-BNS150TS-CE	Blue	20	470	3.1	180	140
RF-YUS150TS-AE	Yellow	20	590	2	180	140
RF-GNS150TS-CF	Green	20	522	3.1	560	140
RF-OUS150TS-CE	Orange	20	620	2	180	140
RF-RUS150TS-BD	Red	20	630	2	65	140

S155 Series

Dimension(L*W*H): 3.2*2.7*0.7mm



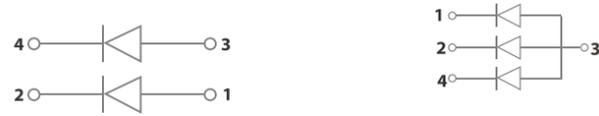
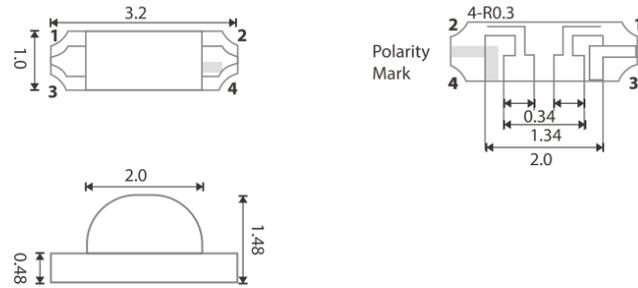
Parameter:

Part No.	Color	IF (mA)	λ_D (nm)	V _F (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-P3S155TSB51	Yellow	20	587	2	120	160
	Yellow Green	20	570	2	30	160
RFP3S155TSB53	Red	20	630	2	30	160
	Yellow Green	20	570	2	30	160
RFP3S155TSB54	Orange	20	622	2	90	160
	Green	20	522	3.1	560	160
RFW2S155TSA41	Red	20	630	2	30	160
	Green	20	523	3.1	560	160
	Blue	20	470	3.1	140	160



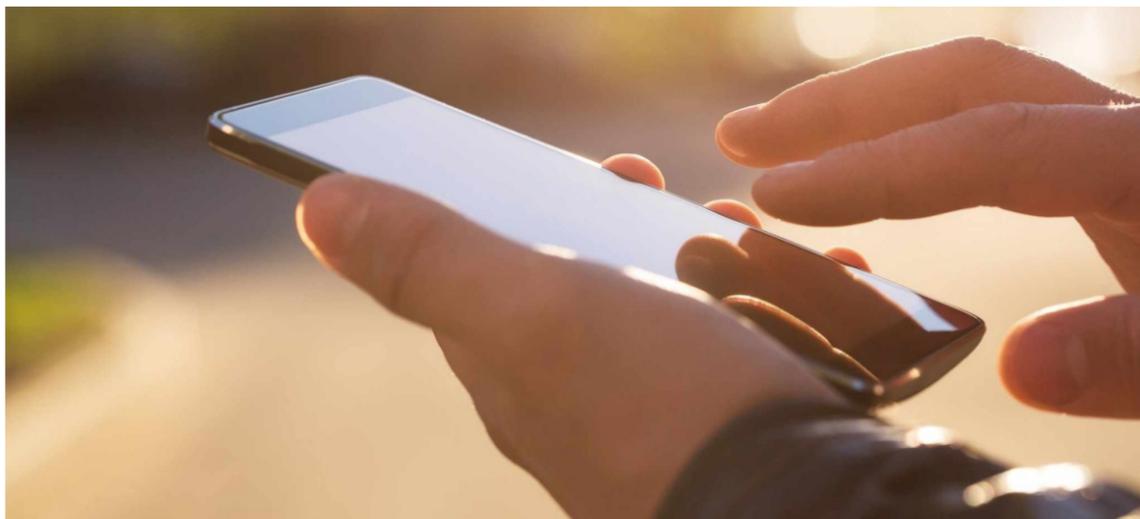
S115/S118 Series

Dimension(L*W*H): 3.2*1.0*1.48mm



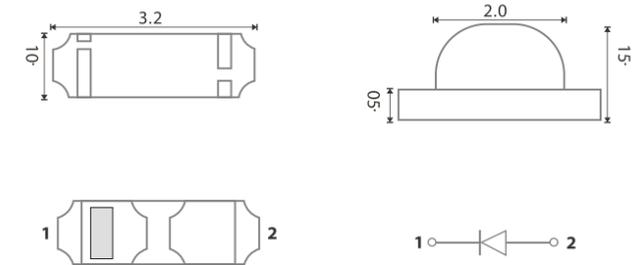
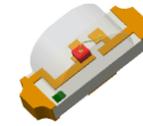
Parameter:

Part No.	Color	IF (mA)	λD (nm)	VF (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-W1S118TS-A42	Orange	20	622	2	90	160
	Green	20	522	3.1	560	160
	Blue	20	470	3.1	140	160
RF-W2S118TS-A41	Red	20	630	2	60	160
	Green	20	523	3.1	560	160
	Blue	20	470	3.1	140	160
RF-P3S115TS-B09	Orange	20	622	2	90	160
	Yellow	20	570	2	50	160
RF-P3S115TS-B37	Green	20	570	2	40	160
	Yellow	20	587	2	90	160
RF-P3S115TS-B51	Green	20	570	2	40	160
	Yellow	20	587	2	90	160
RF-P3S115TS-B52	Red	20	630	2	60	160
	Yellow	20	587	2	90	160



T112 Series

Dimension(L*W*H): 3.2*1.0*1.5mm

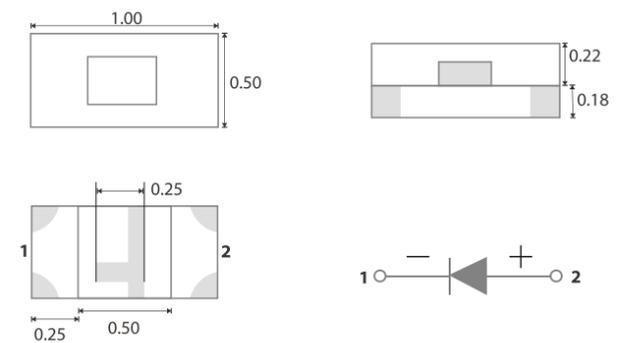


Parameter:

Part No.	Color	IF (mA)	λD (nm)	VF (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-RUT112TSBD	Red	20	630	2	50	160
RFOUT112TSGE	Orange	20	622	2	90	160
RFYUT112TSAE	Yellow	20	588	2	90	160
RFBNT112TSGF	Blue	20	470	3.1	90	160
RFGNT112TSGF	Green	20	523	3.1	330	160
RFGST112TSBC	Yellow	20	570	2	40	160
	Green					

0402 IR Series

Dimension(L*W*H): 1.0*0.5*0.4mm

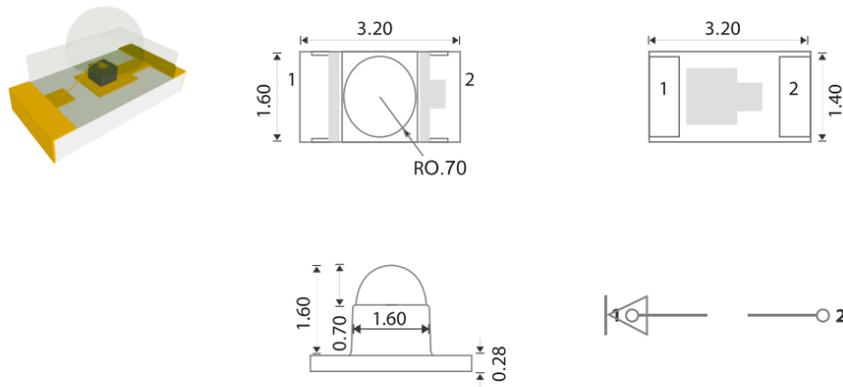


Parameter:

Part No.	Test Condition(mA)	Radiant intensity	Peak Wavelength	Spectral bandwidth	Reverse Voltage	$2\theta_{1/2}$ (°)
RF-IRB0402TS-10-G	50	4.5mw/sr	850 nm	30nm	1.3V	140
RF-IRD0402TS-10-G	50	4mw/sr	940 nm	30nm	1.2V	140

L150 Series

Dimension(L*W*H):3.2*1.6*1.88mm



Part No.	Color	IF (mA)	λD (nm)	VF (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-AUL150TS-CB-E1	Amber	20	600-615	1.8-2.4	530-2800	30
RF-BUL150TS-CE-E1	Blue	20	460-470	2.8-3.4	150-1200	30
RF-GUL150TS-BE-E1	Yellow-green	20	565-575	1.6-2.4	150-1200	30
RF-OUL150TS-CA-E1	Orange	20	620-630	1.8-2.3	1200-4300	30
RF-RUL150TS-CA-E1	Red	20	625-640	1.8-2.4	230-1200	30
RF-TUL150TS-CG-E1	Green	20	515-530	2.8-3.5	1200-10000	30
RF-YUL150TS-AC-E1	Yellow	20	585-595	1.8-3.0	530-2800	30

L191 Series

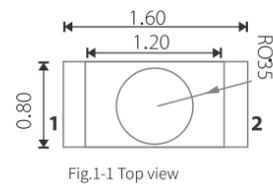


Fig.1-1 Top view

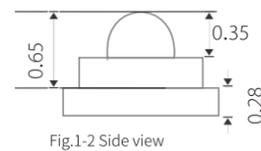


Fig.1-2 Side view

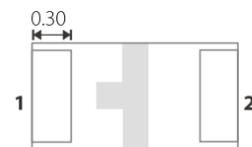


Fig.1-3 Bottom view

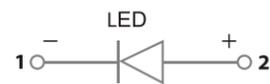
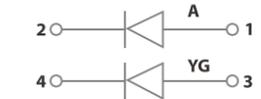
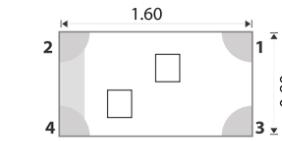
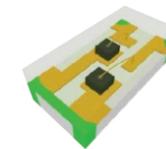


Fig.1-4 Polarity

Part No.	Color	IF (mA)	λD (nm)	VF (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-AUL191TS-BC-E1	Amber	20	600-610	1.6-2.4	350-800	60
RF-BUL191TS-BC-E1	Blue	20	460-475	2.6-3.8	230-650	60
RF-BWL191DS-DD-E1	Blue	20	X:0.2320-0.2553 Y:0.2008-0.2346	2.8-3.6	350-800	60
RF-GUL191TS-BC-E1	Yellow-green	20	565-575	1.8-2.4	100-530	60
RF-OUL191TS-BC-E1	Orange	20	615-630	1.6-2.4	230-650	60
RF-TUL191TS-BC-E1	Green	20	520-530	2.8-3.6	530-1200	60
RF-YUL191TS-BC-E1	Yellow	20	585-595	1.6-2.4	350-650	60

S191 Series

Dimension(L*W*H):1.6*0.8*0.4mm

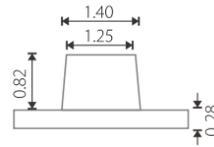
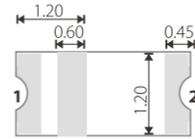
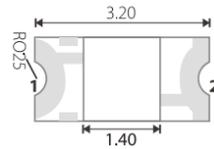
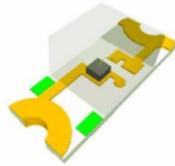


Parameter:

Part No.	Color	IF (mA)	λD (nm)	VF (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-P1S191TS-B47	Amber	5	600-610	1.8-2.4	8-100	140
	Yellow-green	5	565-575	1.8-2.4	5-65	140
RF-P1S191TS-B47-E0	Amber	20	600-610	1.8-2.6	70-200	140
	Yellow-green	20	565-570	1.8-2.6	30-80	140
RF-P1S191TS-B51	Yellow-green	5	565-575	1.8-2.4	5-65	140
	Yellow	5	585-595	1.8-2.4	8-100	140
RF-P1S191TS-B51-E1	Yellow-green	20	565-575	1.8-2.4	18-100	140
	Yellow	20	585-595	1.8-2.4	65-350	140
RF-P1S191TS-B53	Yellow-green	5	565-575	1.8-2.4	5-65	140
	Red	5	615-630	1.8-2.4	8-100	140
RF-P1S191TS-B59-E1	Green	20	520-530	2.6-3.6	280-800	140
	Red	20	620-630	1.6-2.2	100-300	140
RF-P1S191TS-B61-E0	Amber	20	600-610	1.8-2.6	4-17	140
	Yellow-green	20	565-575	1.8-2.6	8-28	140
RF-P1S191TS-B62-E0	Yellow	20	585-595	1.6-2.4	70-230	140
	Blue	20	465-475	2.6-3.6	70-230	140

R150 Series

Dimension(L*W*H):3.2*1.25*1.1mm



Parameter:

Part No.	Color	IF (mA)	λ_D (nm)	VF (V)	IV (mcd)	$2\theta_{1/2}$ (°)
RF-AUR150TS-BF-E1	Amber	20	600-615	1.8-2.4	90-260	140
RF-BUR150TS-BF-E1	Blue	20	460-470	2.8-3.4	80-230	140
RF-GUR150TS-BF-E1	Yellow-green	20	565-575	1.8-2.4	18-65	140
RF-OUR150TS-BF-E1	Orange	20	620-630	1.8-2.3	100-250	140
RF-RUR150TS-BF-E1	Red	20	625-640	1.8-2.4	20-200	140
RF-TUR150TS-CE-E1	Green	20	517.5-530	2.8-3.5	260-900	140
RF-WUR150DS-EC-E1	Blue	20	X:0.2565-0.2833 Y:0.2644-0.2982	2.6-3.4	150-530	140
RF-YUR150TS-CA-E1	Yellow	20	585-595	1.8-3.0	90-260	140



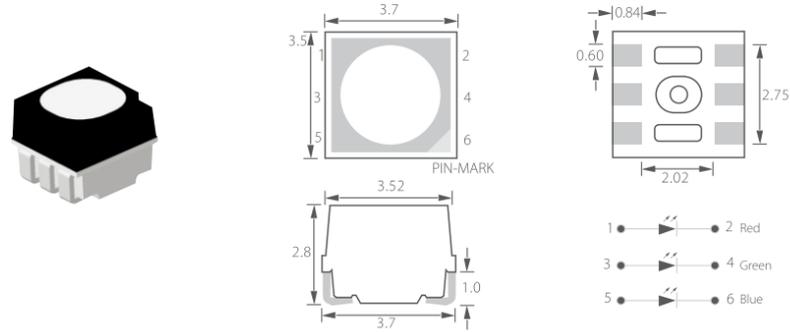
Display-RGB LED series



Product Features

- 
High contrast:
All black Inkjet technology (Surface&Side view); The inner cavity of SMD is a white high-reflectance modified PPA layer; and ensure the highest reflection efficiency
- 
High outdoor performance:
1. Complete outdoor waterproof, Anti-moisture, Anti-UV, Anti-salt spray product capability, IPX5 waterproof grade.
2. REFOND full-color SMD LEDs are designed for high performance SMD outdoor display
- 
Low degradation, High reliability:
1. Adopt high reliability chemical material design;
2. with unique package technology to ensure the entire product life cycle and provide stable light output"
- 
Diffusion design:
1. Matte surface, soft light shape, surface light source characteristics
2. Lambertian diffused viewing angle, good RGB mixed light effect
- 
High anti-back pressure:
Use brand luminous chip, control semiconductor anti-back pressure specifications from materials, and with strict production line grading control to ensure the requirements of high frequency refresh display
- 
Customized material design:
pure gold wire, C194 Copper material carrier, imported epoxy glue and modified PPA stand material design, to ensure long term work stability of quality
- 
Low lead design:
1. 3535 PIN High: 1.00mm
2. 2828PIN High 0.65mm
3. Convenient for customers to fill glue and do mask design, and make the LED luminous surface higher than mask.

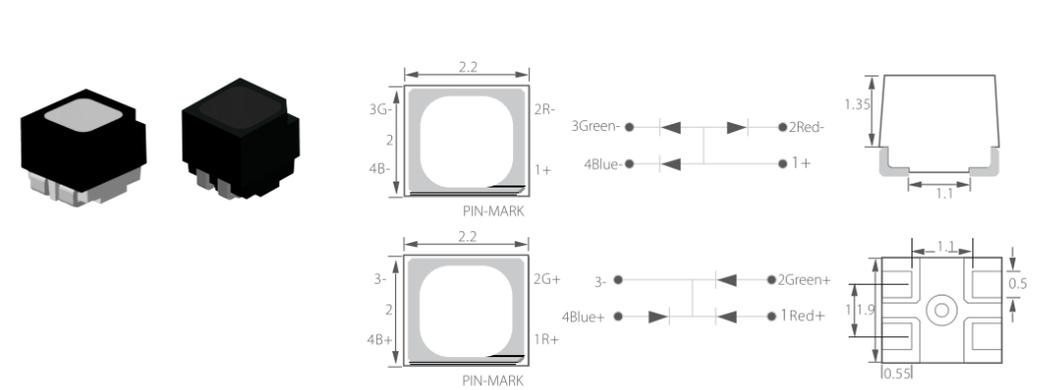
3535 Series (Outdoor)



Ta = 25°C Typical Electrical & Optical Characteristics

Part Number	L/F Type	Color	Test Condition (mA)	IV (mcd)	λD(nm)	VF(V)	50% Power Angle
RF-W1SA35IS-A42	Surface Black	R	20	1150	618-628	1.7-2.4	110
		G	20	2300	518-530	2.7-3.4	
		B	20	520	464-474	2.7-3.4	
RF-W1SA35IS-A43	Surface Black	R	20	820	618-628	1.7-2.4	110
		G	20	1900	518-530	2.7-3.4	
		B	20	430	464-474	2.7-3.4	
RF-W1SA35IS-A47	Surface Black	R	20	700	618-628	1.7-2.4	110
		G	20	1500	518-530	2.7-3.4	
		B	20	380	464-474	2.7-3.4	

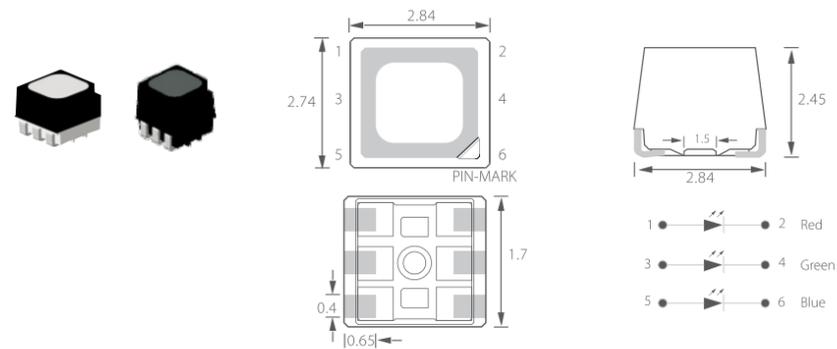
1921 series (Outdoor)



Ta = 25°C Typical Electrical & Optical Characteristics

Part Number	L/F Type	Color	Test Condition (mA)	IV (mcd)	λD(nm)	VF(V)	50% Power Angle
RF-W1SA21IS-A49	Surface Black	R	15	520	618-628	1.7-2.4	110
		G	15	1100	518-530	2.7-3.4	
		B	10	200	464-474	2.7-3.4	
RF-W1SA21HS-A45	All Black	R	15	350	618-628	1.7-2.4	110
		G	15	740	518-530	2.7-3.4	
		B	10	115	464-474	2.7-3.4	
RF-W2SA21HS-N44 (Common-cathode)	All Black	R	15	350	618-628	1.7-2.4	110
		G	15	740	518-530	2.7-3.4	
		B	10	115	464-474	2.7-3.4	

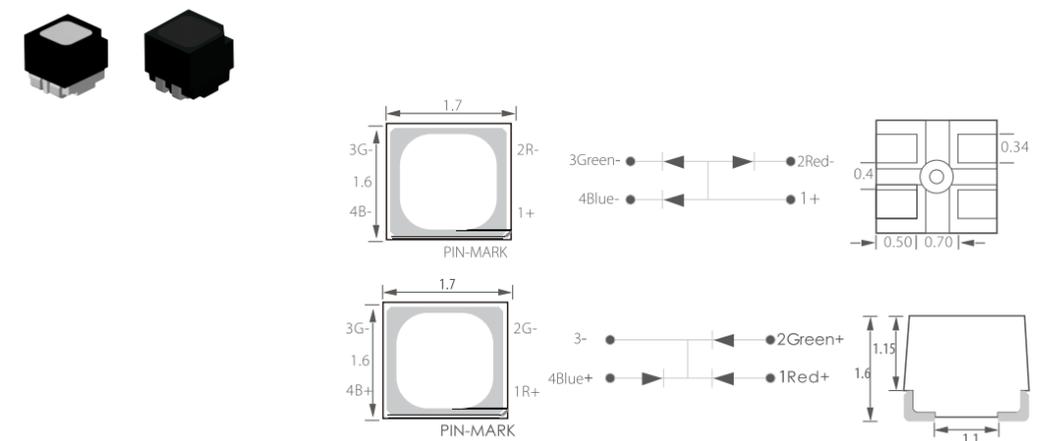
2727 Series(Outdoor)



Ta = 25°C Typical Electrical & Optical Characteristics

Part No.	L/F Type	Color	Test Condition (mA)	IV (mcd)	λD (nm)	VF(V)	50% Power Angle
RF-W1SA28IS-A43	Surface Black	R	20	780	618-628	1.7-2.4	110
		G	20	1850	518-530	2.7-3.4	
		B	20	420	464-474	2.7-3.4	
RF-W1SA28IS-A47	Surface Black	R	20	680	618-628	1.7-2.4	110
		G	20	1500	518-530	2.7-3.4	
		B	20	380	464-474	2.7-3.4	
RF-W1SA27HS-A43H	ALL Black	R	20	530	618-628	1.7-2.4	110
		G	20	1000	518-530	2.7-3.4	
		B	20	210	464-474	2.7-3.4	

1515 Series (Outdoor)



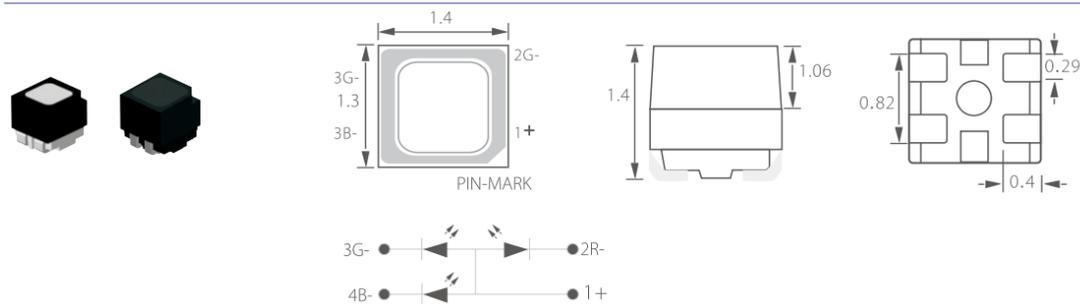
Ta = 25°C Typical Electrical & Optical Characteristics

Part Number	L/F Type	Color	Test Condition (mA)	IV (mcd)	λD(nm)	VF(V)	50% Power Angle
RF-W1SA15IS-A47	Surface Black	R	10	320	618-628	1.7-2.4	110
		G	10	800	518-530	2.5-3.3	
		B	5	110	464-474	2.5-3.3	
RF-W1SA15HS-A47	All Black	R	10	220	618-628	1.7-2.4	110
		G	10	440	518-530	2.5-3.3	
		B	5	52	464-474	2.5-3.3	
RF-W1SA15HS-N47 (Common-cathode)	All Black	R	10	220	618-628	1.7-2.4	110
		G	10	440	518-530	2.5-3.3	
		B	5	52	464-474	2.5-3.3	

Special Lighting

- Decorative lighting
- UV LED
- IR LED
- Horticulture LED
- Automotive lighting LED

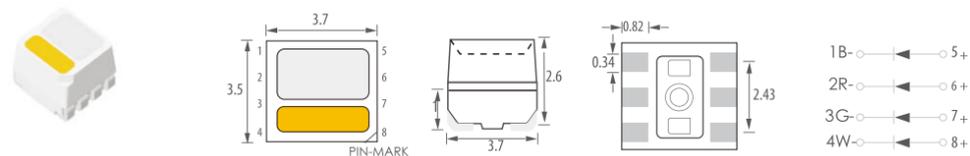
1212 Series (Outdoor)



Ta = 25°C Typical Electrical & Optical Characteristics

Part Number	L/F Type	Color	Test Condition (mA)	IV (mcd)	λD (nm)	VF(V)	50% Power Angle
RF-W2SA12IS-A47	Surface Black	R	10	270	618-628	1.7-2.4	110
		G	10	620	518-530	2.5-3.3	
		B	5	75	464-474	2.5-3.3	
RF-W2SA12HS-A47	All Black	R	10	180	618-628	1.7-2.4	110
		G	10	440	518-530	2.5-3.3	
		B	5	55	464-474	2.5-3.3	

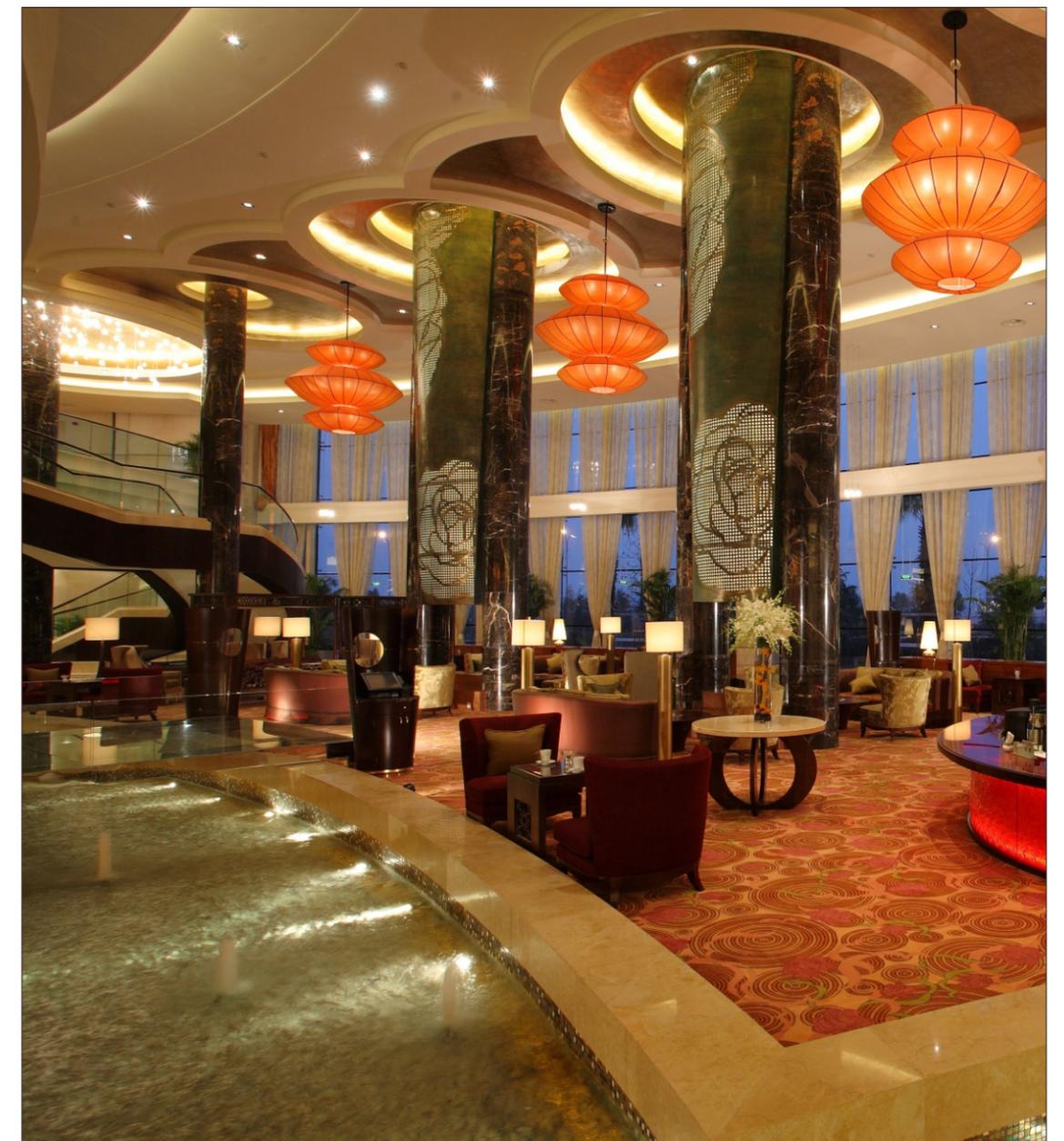
RGB+W Series



Ta = 25°C Typical Electrical & Optical Characteristics

Part Number	L/F Type	Color	Test Condition (mA)	IV (mcd)	λD (nm)	VF(V)	50% Power Angle
F-W1SA35WS-AW2-**	Surface Black	R	20	825	618-628	1.7-2.4	110
		G	20	2180	525-535	2.7-3.4	
		B	20	485	460-470	2.7-3.4	
		w	20	2450	3000K 4000K 5000K	2.7-3.4	

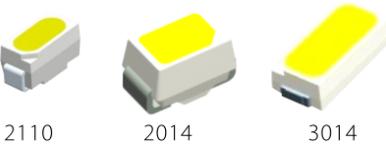
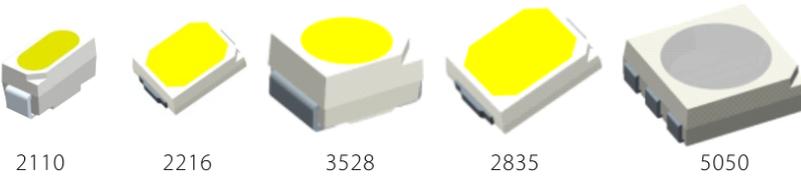
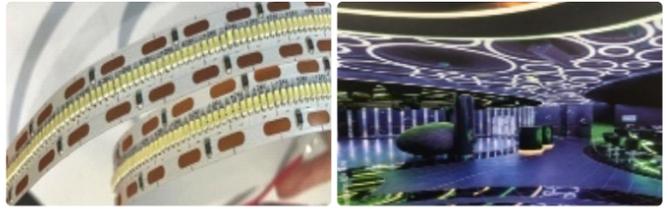
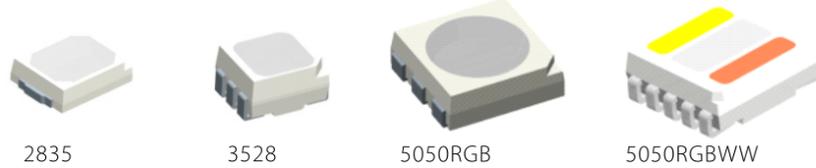
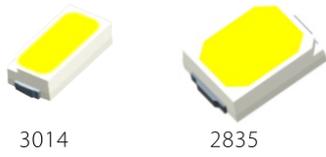
Decorative lighting



Summary of Refond Decorative Product



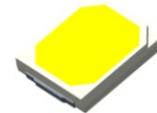
Summary of Refond Decorative Product

Application	LED types	Pictures of terminal application
Home appliance & industrial equipment	 <p>2110 2014 3014</p>	
Strips	 <p>2110 2216 3528 2835 5050</p>	
Smart lighting	 <p>2835 3528 5050RGB 5050RGBWW</p>	
Advertising	 <p>3014 2835</p>	
Medical beauty	 <p>3528 2835</p>	
Horti-cultural	 <p>2835</p>	

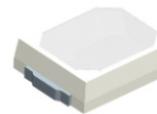
Industrial equipment and smart lighting



2014Color
2*1.4*1.3mm



2835White
2.8*3.5*0.75mm



2835Color
2.8*3.5*0.75mm &
2.8*3.5*0.65mm

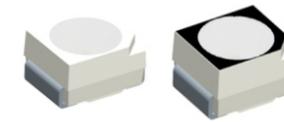


- Plenty of models and specifications
- Small size, easy to design
- Can replace chip LED and has more excellent reliability. Rich application experience of big companies of home device in domestic and international.
- Rich Color

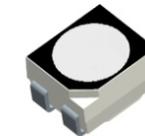
Typical characteristics (for reference only)

Part No.	Ra	Iv (mcd)	Flux (lm)	Wd (nm)	Vf (V)	If (mA)	L*W*H (mm)
RF-AURK14TS-ED		265		603	2.1	20	2*1.4*1.3
RF-BNRK14TS-CE		392		470	3.1	20	2*1.4*1.3
RF-GNRK14TS-CF		1600		520	3.1	20	2*1.4*1.3
RF-GSRK14TS-ED		50		570	2.1	20	2*1.4*1.3
RF-OURK14TS-CE		320		621	2.1	20	2*1.4*1.3
RF-YURK14TS-AE		310		590	2.1	20	2*1.4*1.3
RF-BNRI35TS-DK-2T			17	455	3.1	300	2.8*3.5*0.65
RF-GNRI35TS-DK-2T			77	525	3.1	300	2.8*3.5*0.65
RF-GNRI35TS-DK-J			49	525	3.1	150	2.8*3.5*0.75
RF-OURI35TS-EK-2T			35	622	2.1	300	2.8*3.5*0.65
RF-OURI35TS-EK-J			18	622	2.1	150	2.8*3.5*0.75
RF-YURI35TS-EK-J			16	590	2.1	150	2.8*3.5*0.75
RF-BNRI35TS-DK-J			12	470	3.1	150	2.8*3.5*0.75
RF-BNRI35TS-DF-N		900		452	2.9	60	2.8*3.5*0.75
RF-65MI35DS-DF-N-Y	70		28		2.9	60	2.8*3.5*0.75

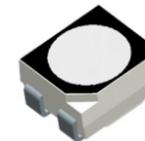
Industrial equipment and smart lighting



3528 Color1



3528 Color2



3528 Color3



- High reliability
- Plenty of models and specifications

Typical characteristics (for reference only)

3528 Color1 Part No.	Iv (mcd)	Wd (nm)	Vf (V)	If (mA)	L*W*H (mm)
RF-AURA30TS-ED	320	605	2.1	20	3.5*2.8*1.8
RF-BNRA30TS-CE	380	470	3.1	20	3.5*2.8*1.8
RF-GNRA30TS-CF	1600	522	3.1	20	3.5*2.8*1.8
RF-GSRA30TS-BC	70	570	2.1	20	3.5*2.8*1.8
RF-OURA30TS-CE	340	621	2.1	20	3.5*2.8*1.8
RF-YURA30TS-AE	290	605	2.1	20	3.5*2.8*1.8
RF-YURA30TS-AK	660	590	2.1	20	3.5*2.8*1.8
RF-AURA30BS-ED-H	803	604	2.1	20	3.5*2.8*1.8
RF-BNRA30BS-CE-H	479	468	2.1	20	3.5*2.8*1.8
RF-GNRA30BS-CE-H	2428	521	2.9	20	3.5*2.8*1.8
RF-OURA30BS-CG-H	893	620	2.0	20	3.5*2.8*1.8
RF-YURA30BS-AF-H	955	592	2.2	20	3.5*2.8*1.8
RF-YURA30TS-AG-FY	1300	590	2.2	30	3.5*2.8*1.8
RF-YURA30TS-AG-FY(M)	1190	590	2.2	30	3.5*2.8*1.8

3528 Color2 Part No.	Iv(mcd)			Wd(nm)			Vf(V)			If(mA)			L*W*H(mm)
	R/Y	YG/G	B	R/Y	YG/G	B	R/Y	YG/G	B	R/Y	YG/G	B	
RF-P5RA30BS-B22	300	65		621	569		2.1	2.0		20	20		3.5*2.8*1.8
RF-P5RA30BS-B23	300		360	621		470	2.1		3.1	20	20		3.5*2.8*1.8
RF-P5RA30BS-B30	210		360	588		470	2.0		3.1	20	20		3.5*2.8*1.8
RF-P2RA30BS-B27-C	155		237	621		470	2.0		2.8	10	10		3.5*2.8*1.8
RF-P2RA30BS-B31	445	1420		619	523		2.1	3.0		20	20		3.5*2.8*1.8
RF-P2RA30BS-B51	210	38		590	572		2.1	2.1		20	20		3.5*2.8*1.8
RF-P2RA30BS-B53	46	37		628	571		1.9	2.1		20	20		3.5*2.8*1.8
RF-P2RA30BS-B55	146/223			631/590			2.0/2.1			20/20			3.5*2.8*1.8

3528 Color3 Part No.	Iv(mcd)			Wd(nm)			Vf(V)			If(mA)			L*W*H(mm)
	R	G	B	R	G	B	R	G	B	R	G	B	
RF-W2SA30BS-A15	280	1350	370	620	522	468	2.0	3.1	3.1	20	20	20	3.5*2.8*1.8
RF-W7SP30TS-A44	840	2000	470	620	523	468	2.2	3.1	2.9	20	20	20	3.5*2.8*1.8
RF-W3SA30TS-A20	320	1200	370	620	518	468	2.0	3.2	3.2	20	20	20	3.5*2.8*1.8

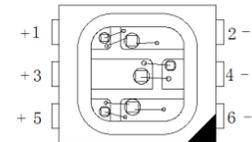
Electronic appliances



3528 White 3.5*2.8*1.8mm
2835 PC 2.8*3.5*0.75mm
2835 White 2.8*3.5*0.75mm
2216 White 2.2*1.6*0.62mm
3014E White 3*1.4*0.7mm
3014E White 3*1.4*0.8mm



3528 Color
3.5*2.8*1.85mm



- ESD protection
- Plenty of products meet different needs.

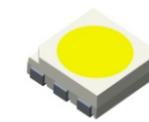
Typical characteristics (for reference only)

Part No.	Ra	Flux (lm)	Iv (mcd)	CCT(K)/x,y	Wd (nm)	Vf (V)	If (mA)	Vz(V)	L*W*H (mm)
RG-W65MA30DS-CE-E-Y	70		2770	6500		3	20		3.5*2.8*1.8
RG-W**HI35DS-FF-J	80	65-72		2700-6500		3.1	150		2.8*3.5*0.65
RG-**HI35DS-DF-2J-Y	80	68-81		2700-6500		2.9	150		2.8*3.5*0.75
RG-**HI35DS-FE-N-Y	80	28-33		2700-6500		2.9	60		2.8*3.5*0.75
RG-PIRI35DS-EC-E-YZ			575	0.49,0.17	650	3	20	11-17@Iz=10mA	2.8*3.5*0.75
RG-**TI35DS-CF-2N-YZ	90	16-17.5		2200/2400		2.9	60	11-17@Iz=10mA	2.8*3.5*0.75
RG-20HI35DS-ED-N-Y	80	18.7		2000		3	60		2.8*3.5*0.75
RG-57TI16DS-EE-Y	90	7.5		5700		2.9	30		2.2*1.6*0.62
RG-**HC13DS-EC-F-Y	80	11.5-13		2400-6500		2.9	30		3.0*1.4*1.32
RG-WCRC13DS-EC-F-Y		11		0.25,0.24		2.9	30		3.0*1.4*1.32
RG-**HK13DS-ED-E-Y	80		2775-2900	2700-6500		2.8	20		3.0*1.4*0.8
RF-65MI13DS-EE-YZ	70	6-10		0.32,0.32		2.8	20	8-13@Iz=10mA	3.0*1.4*0.7
RF-WC2RI13DS-EE-Y		4-8		0.24,0.21		2.8	20	8-13@Iz=10mA	3.0*1.4*0.7
RF-BWRI13DS-ED-D-YZ		3-7		0.24,0.21		2.7	15	13-16@Iz=10mA	3.0*1.4*0.7
			770		620	2.1	20	8-13@Iz=10mA	
RF-W7SP30TS-A46-Z		1450			520	3	20	8-13@Iz=10mA	3.5*2.8*1.85
		350			468	3	20	8-13@Iz=10mA	

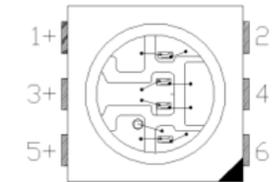
Electronic appliances



2014 PC
2*1.4*1.3mm



5050 White

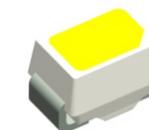


- ESD>8000V (HBM)
- Different package models are available
- High color quality, high color fidelity and color rendition

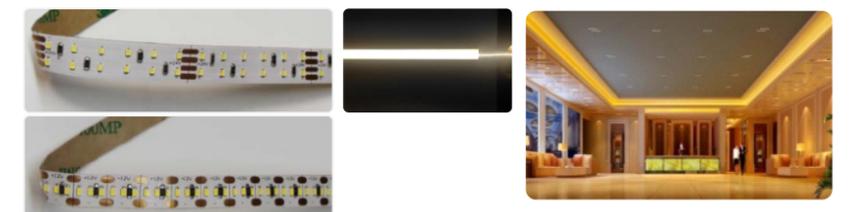
Typical characteristics (for reference only)

Part No.	Ra	Iv (mcd)	Flux (lm)	x,y	Wd (nm)	Vf (V)	If (mA)	Vz(V)
RF-WCRK14DS-CE-YZ			6	0.28,0.28		3.1	10	8-13@Iz=10mA
RF-WCRK14DS-CE-A-YZ		558				2.8	5	8-13@Iz=10mA
RF-PARK14DS-EE-A-YZ		1219		0.25,0.26	586	3.1	10	8-13@Iz=10mA
RF-PGRK14DS-EE-A-YZ		1143		0.36,0.57	560	3.1	10	8-13@Iz=10mA
RF-32HA30DS-EC-YZ	80		8	0.42,0.39		2.9	20	8-13@Iz=10mA
RF-32HA50DS-EE-4M-YZ	80		35	0.42,0.40		3.1	80	11-17@Iz=10mA

Strip Lighting & Back Lighting 2014



2014 White
2*1.4*1.3mm



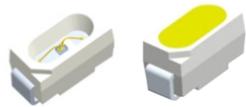
- Mini size, suitable for ultra high density strip, provide smooth and soft light
- High mechanical strength can withstand bending
- Customized color bin

Typical characteristics (for reference only)

Part No.	Ra (min)	Flux (lm)	CCT (K)	Vf (V)	If (mA)	L*W*H (mm)
RF-W**TK14DS-EC-Y	90	3-9	1700-7200 ERP	2.8	20	2*1.4*1.3
RF-**HK14DS-EE-Y	80	5-9	2600-6800 ERP	2.8	20	2*1.4*1.3

Strip Lighting & Back Lighting

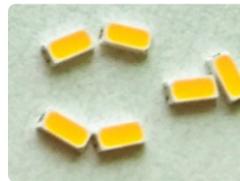
2110



New



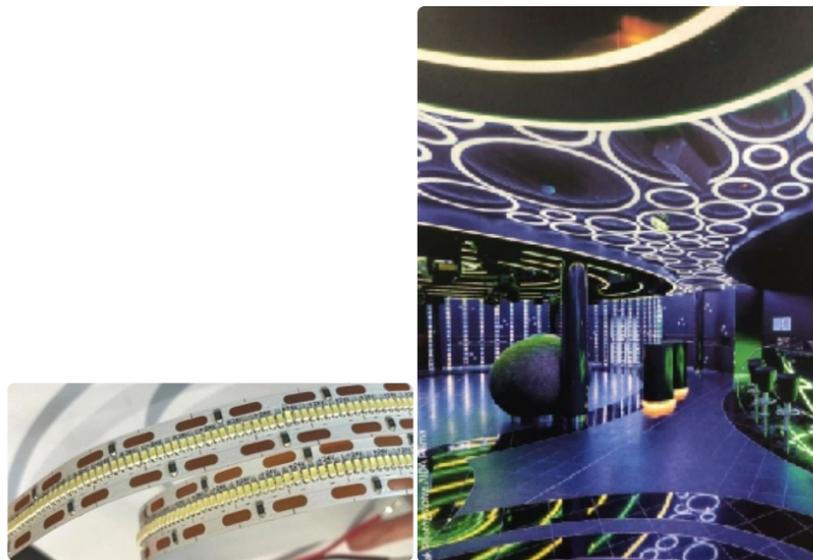
2110



3014



3528



- Small size and maximum 700LED/meter
- High mechanical strength, resistant to flexural fracture
- One small bin LED for every shipment, have good color consistency
- Domestic and International IPR

Typical characteristics (for reference only)

Part No.	Ra (min)	Iv (mcd)	Flux (lm)	CCT (K) /CIE	Wd (nm)	Vf (V)	If (mA)	L*W*H (mm)
RF-**TK10DS-EC-F-Y	90		7-12	1800-10000		2.8	30	2.1*1.0*1.1
RF-BNRK10TS-CE-F		500			465	3	30	2.1*1.0*1.1
RF-GNRK10TS-CE-F		2000			520	3	30	2.1*1.0*1.1
RF-OURK10TS-CE-F		400			620	2.1	30	2.1*1.0*1.1
RF-PIRK10DS-F-Y			3.2	(0.432,0.185)		3	30	2.1*1.0*1.1

Strip Lighting & Back Lighting

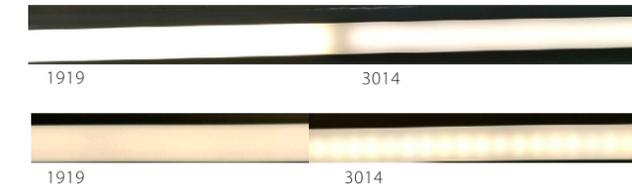
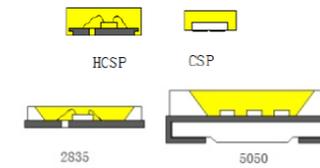
HCSP1919



New



- Large view angle, five-sided light-out, no dark area near the strip
- CSP package of horizontal chip, high lm/W & lm/\$
- Silicone molding, High reliability
- Low thermal resistance, resistance to high current
- High strength for soft strip
- Intellectual Property



	2835	5050	HCSP	CSP
Size	2.8*3.5	5.0*5.0	≤2.0*2.0	≤1.5*1.5
Emitting area	Single side emitting	Single side emitting	Five side emitting	Five side emitting
viewing angle	110°-120°	110°-120°	130°~175°	130°~150°
Power	≤1W	≤0.3W	≤3W	≤3W
Rth	≈12	≈80	≈5	≈5
lm/w	++++	++	+++	+
production efficiency	+++	+	++++	++++
Air tightness	MSL3	MSL3	MSL3	MSL3
SMT	++++	++++	+++	+
cost	++++	++	+++	+

Typical characteristics (for reference only)

Part No.	Ra (min)	Iv (mcd)	Flux (lm)	CCT (K) /CIE	Vf (V)	If (mA)	L*W*H (mm)
RF-**TI19DS-DF-N-Y	90	/	16-24	1800-10000(ERP)	3.0	60	1.9*1.9*0.7
RF-**TI19DS-DF-2N-Y	90	/	16-26	1800-10000(ERP)	2.9	60	1.9*1.9*0.7

Strip Lighting & Back Lighting

3014



3014S Color
3*1.4*1.32mm



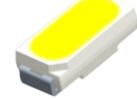
3014S White
3*1.4*1.32mm



3014N2 White
3*1.4*0.7mm



3014N2 Color
3*1.4*0.7mm



3014E White
3*1.4*0.8mm



- Various packaging models are provided according to different application requirements, front view and side view are offered. Different strengths meet the needs of soft and hard strips.

- All CCT Range
- Special color bin & color point customized
- LM-80

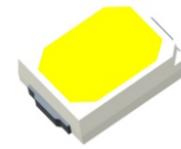
N:Normal; E:Enhance; S:Side View

Typical characteristics (for reference only)

Part No.	Ra (min)	Flux (lm)	Iv (mcd)	CCT (K)	Wd (nm)	Vf (V)	If (mA)	L*W*H (mm)
RF-(P)**HC13DS-EC-F-Y	80	9-14		2600-7200 ERP		2.9	30	3*1.4*1.32
RF-**HC13DS-EC-Y	80	6-11		1800-12000 ANSI		2.9	20	3*1.4*1.32
RF-BNRC13TS-CE			422		470	3.1	20	3*1.4*1.32
RF-GNRC13TS-CF			1700		520	3.1	20	3*1.4*1.32
RF-OURC13TS-CE			345		620	2.1	20	3*1.4*1.32
RF-YURC13TS-AE			270		590	2.0	20	3*1.4*1.32
RF-RURI13TS-CE			850		620	2.0	20	3*1.4*0.7
RF-PIRC13DS-AH			530	(0.432,0.185)		3.0	20	3*1.4*1.32
RF-AURC13TS-AE			250		602	2.1	20	3*1.4*1.32
RF-**HI13DS-ED-F	80	9-15		2700-6100 ANSI		2.9	30	3*1.4*0.7
RF-**HK13DS-ED-F-Y	80	9-15		2600-6500 ANSI		3.2	30	3*1.4*0.8
RF-**TK13DS-ED-F-Y	90	8-14		2600-6500 ANSI		3.2	30	3*1.4*0.8
RF-**HI13DS-DF-N-Y	80	22-28		2700-10000 ANSI		3.1	60	3*1.4*0.7

Strip Lighting & Back Lighting

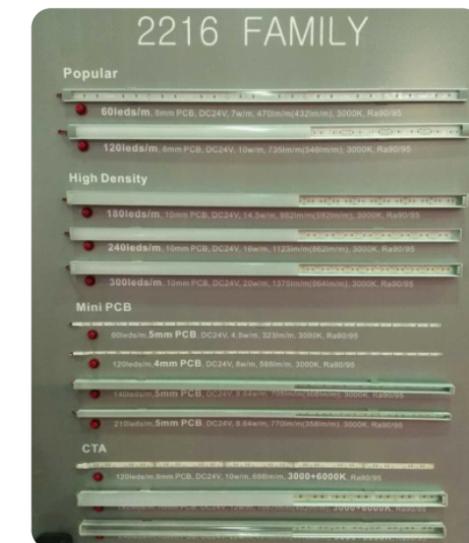
2216



2216White
2.2*1.6*0.62mm



- Originated
- The largest capacity and color consistency of each lot excellent
- All color bin, All CRI, Full spectrum
- SCDM=1 are Available
- Small and compact, suitable for different PCB size, different density, different combination styles of strip
- LM-80

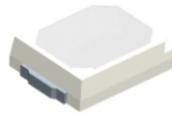


Typical characteristics (for reference only)

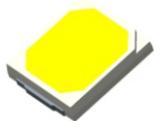
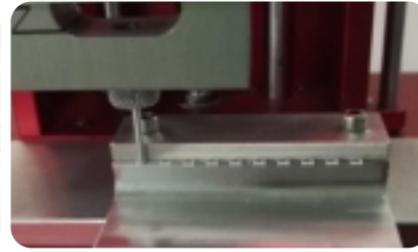
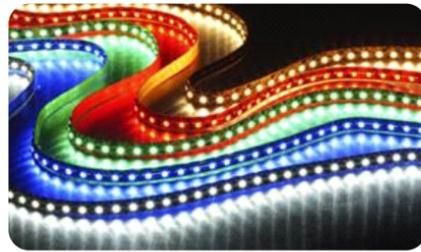
Part No.	Ra (min)	Flux (lm)	Iv (mcd)	CCT (K)	Wd (nm)	Vf (V)	If (mA)	L*W*H (mm)
RF-K**TI16DS-EE-Y	90	5-10		2600-6800 ERP		3	20	2.2*1.6*0.62
RF-W**QI16DS-EE-Y	95	4-8		2500-6500 Full Spectrum	465	3	20	2.2*1.6*0.62
RF-**QI16DS-EE-Y	95	4-7		2200-7100 ANSI	520	3	20	2.2*1.6*0.62
RF-**TI16DS-EE-Y	90	4-10		1700-7100 ANSI	620	3	20	2.2*1.6*0.62
RF-AURI16TS-ED			267		603	2	20	2.2*1.6*0.62
RF-BNRI16TS-CE			387		470	3.2	20	2.2*1.6*0.62
RF-GNRI16TS-CF			1450		524	3.1	20	2.2*1.6*0.62
RF-OURI16TS-CE			306		621	2	20	2.2*1.6*0.62
RF-YURI16TS-AE			172		590	2.1	20	2.2*1.6*0.62

Strip Lighting & Back Lighting

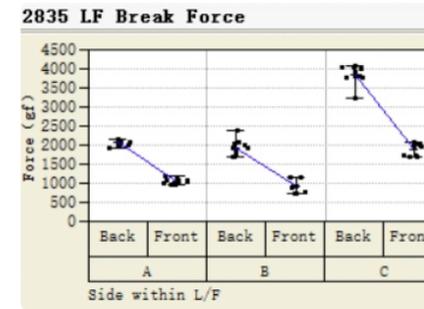
2835



2835Color
2.8*3.5*0.8mm



2835White
2.8*3.5*0.8mm



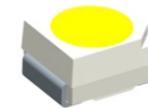
- High mechanical strength, resistant to flexural fracture
- High power, high Luminous intensity, high light efficiency
- SCDM=1 are Available
- A variety of color and white light for selection, customized development according to the needs
- LM-80

Typical characteristics (for reference only)

Part No.	Ra (min)	Flux (lm)	CCT (K)	Wd (nm)	Vf (V)	If (mA)	L*W*H (mm)
RF-W**QI35DS-EF-N-Y	95	12-22	2500-6500 Full Spectrum		3.0	60	2.8*3.5*0.75
RF-BNRI35TS-DK-2T		17		455	3.1	300	2.8*3.5*0.65
RF-GNRI35TS-DK-2T		77		525	3.1	300	2.8*3.5*0.65
RF-GNRI35TS-DK-J		49		525	3.1	150	2.8*3.5*0.75
RF-OURI35TS-EK-2T		35		622	2.1	300	2.8*3.5*0.65
RF-OURI35TS-EK-J		18		622	2.1	150	2.8*3.5*0.75
RF-WCRI35DS-EF-J-Y		45-65	8000-13000		3.1	150	2.8*3.5*0.65
RF-XXHI35DS-CF-N-Y	80	16-26	2600-6800 ERP		3.0	60	2.8*3.5*0.75
RF-XXTI35DS-CF-N-Y	90	14-24	2600-6800 ERP		3.0	60	2.8*3.5*0.75
RF-XXHI35DS-DF-2N-Y	80	24-33	2600-6800 ERP		3.0	60	2.8*3.5*0.75
RF-YURI35TS-EK-J		16		590	2.1	150	2.8*3.5*0.75
RF-BNRI35TS-DK-J		15		470	3.1	150	2.8*3.5*0.75
RF-XXQI35DS-DF-N-Y	95	12-24	2250-7050 ANSI		3.1	60	2.8*3.5*0.75

Strip Lighting & Back Lighting

3528 White



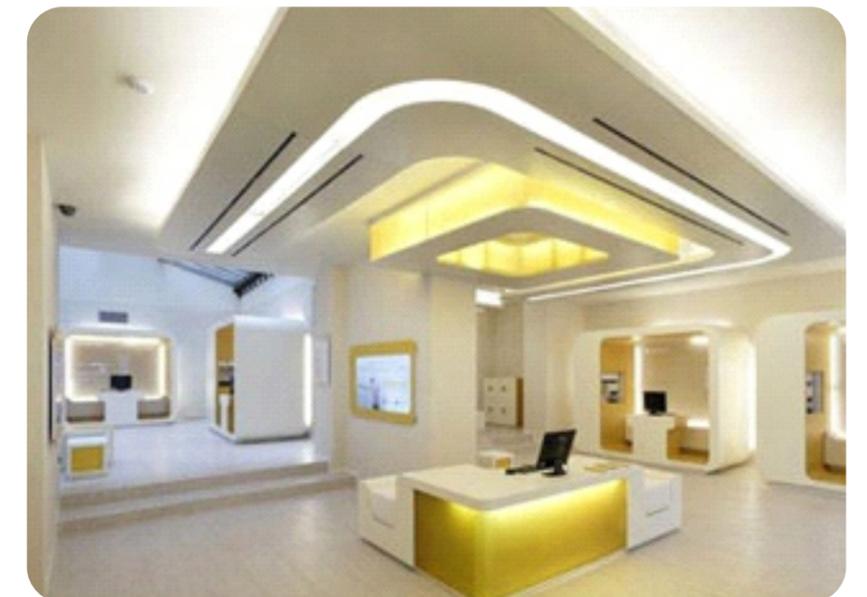
3528 White



- SCDM=1 are Available
- Plenty of models and specifications
- LM-80

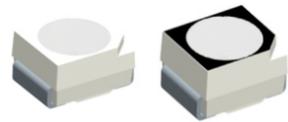
Typical characteristics (for reference only)

Part No.	Ra (min)	Iv (mcd)	Flux (lm)	CCT (K)	Vf (V)	If (mA)	L*W*H (mm)
RF-K**HK30DS-EC-Y	80		6-10	2600-6800 ERP	3.0	20	3.5*2.8*1.4
RF-K**TK30DS-EC-Y	90		5-9	2600-6800 ERP	3.0	20	3.5*2.8*1.4
RF-**HA30DS-ED-F-Y	80		8-14	2700-7100 ANSI	3.2	30	3.5*2.8*1.8
RF-**HA30DS-**-F-Y	80		9-14	3000-7000 ANSI	3.2	30	3.5*2.8*1.8
RF-WCHK30DS-CE-Y	80		5-9	10000-22000	3.0	20	3.5*2.8*1.4
RF-**MA30DS-EE-F	70		8-14	2700-7000 ANSI	3.2	30	3.5*2.8*1.8
RF-**QA30DS-EE-Y	95		4-8	2200-6500 ANSI	3.0	20	3.5*2.8*1.8
RF-INRA30DS-ED		2400		2100-2400	3.0	20	3.5*2.8*1.8
RF-**RA30DS-EE-F		2800-4800		2000-20000	3.2	30	3.5*2.8*1.8
RF-W**QK30DS-EE-F-Y	95		5-10	2600-6800 Full Spectrum	3.0	30	3.5*2.8*1.4
RF-**HI30DS-HH-F	80		8-12	2600-6800 ANSI	3.1	30	3.5*2.8*1.0



Strip Lighting & Back Lighting

3528 Color



3528 Color1



- Cooperation experience with big companies , no quality issue
- Rich Color
- Customized

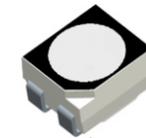
Typical characteristics (for reference only)

3528 Color1 Part No.	Iv (mcd)	Wd (nm)	Vf (V)	If (mA)	L*W*H (mm)
RF-AURA30TS-ED	320	605	2.1	20	3.5*2.8*1.8
RF-BNRA30TS-CE	380	470	3.1	20	3.5*2.8*1.8
RF-GNRA30TS-CF	1600	522	3.1	20	3.5*2.8*1.8
RF-GSRA30TS-BC	70	570	2.1	20	3.5*2.8*1.8
RF-OURA30TS-CE	340	621	2.1	20	3.5*2.8*1.8
RF-YURA30TS-AE	290	605	2.1	20	3.5*2.8*1.8
RF-YURA30TS-AK	660	590	2.1	20	3.5*2.8*1.8
RF-AURA30BS-ED-H	803	604	2.1	20	3.5*2.8*1.8
RF-BNRA30BS-CE-H	479	468	2.1	20	3.5*2.8*1.8
RF-GNRA30BS-CE-H	2428	521	2.9	20	3.5*2.8*1.8
RF-OURA30BS-CG-H	893	620	2.0	20	3.5*2.8*1.8
RF-YURA30BS-AF-H	955	592	2.2	20	3.5*2.8*1.8
RF-YURA30TS-AG-FY	1300	590	2.2	30	3.5*2.8*1.8
RF-YURA30TS-AG-FY(M)	1190	590	2.2	30	3.5*2.8*1.8

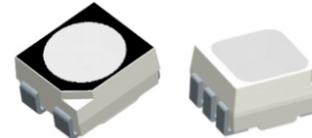


Strip Lighting & Back Lighting

3528 Color



3528 Color2



3528 Color3

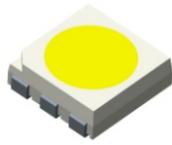
- Cooperation experience with big companies , no quality issue
- Rich Color
- Customized

3528 Color2 Part No.	Iv(mcd)			Wd(nm)			Vf(V)			If(mA)			L*W*H(mm)
	R/Y	YG/G	B	R/Y	YG/G	B	R/Y	YG/G	B	R/Y	YG/G	B	
RF-P5RA30BS-B22	300	65		621	569		2.1	2.0		20	20		3.5*2.8*1.8
RF-P5RA30BS-B23	300		360	621		470	2.1		3.1	20		20	3.5*2.8*1.8
RF-P5RA30BS-B30	210		360	588		470	2.0		3.1	20		20	3.5*2.8*1.8
RF-P2RA30BS-B27-C	155		237	621		470	2.0		2.8	10		10	3.5*2.8*1.8
RF-P2RA30BS-B31	445	1420		619	523		2.1	3.0		20	20		3.5*2.8*1.8
RF-P2RA30BS-B51	210	38		590	572		2.1	2.1		20	20		3.5*2.8*1.8
RF-P2RA30BS-B53	46	37		628	571		1.9	2.1		20	20		3.5*2.8*1.8
RF-P2RA30BS-B55	146/223			631/590			2.0/2.1			20/20			3.5*2.8*1.8

3528 Color3 Part No.	Iv(mcd)			Wd(nm)			Vf(V)			If(mA)			L*W*H(mm)
	R	G	B	R	G	B	R	G	B	R	G	B	
RF-W2SA30BS-A15	280	1350	370	620	522	468	2.0	3.1	3.1	20	20	20	3.5*2.8*1.8
RF-W7SP30TS-A44	840	2000	470	620	523	468	2.2	3.1	2.9	20	20	20	3.5*2.8*1.8
RF-W3SA30TS-A20	320	1200	370	620	518	468	2.0	3.2	3.2	20	20	20	3.5*2.8*1.8



5050 White



5050 White



- MSL3
- Different current and voltage output modes are available

Typical characteristics (for reference only)

Part No.	Ra (min)	Iv (mcd)	CCT (K)	Vf (V)	If (mA)	L*W*H (mm)
RF-**HA50DS-EE-Y	80	4300-10000	2300-7000	3.0	60	5.4*5.0*1.6

Strip Lighting & Back Lighting 5050RGBW

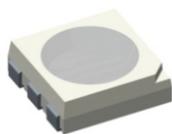


L*W*H(mm) 5.4*5.0*1.55



- Highly integrated, Colorful, Perfect mixed light effect
- Strip can realize compact distribution with 5050RGBW LED
- Various colors can be adjusted and controlled
- Color temperature can be customized

5050 Multicolor



5050 Color



- MSL3
- Perfect mixed light
- Color bin can be offered in two ways: color and mixed white
- LM-80

Typical characteristics (for reference only)

Part No.	Iv(mcd)			Wd(nm)			Vf(V)			If(mA)			L*W*H(mm)
	R	G	B	R	G	B	R	G	B	R	G	B	
RF-W2SA50TS-A39R	790	1600	360	620	520	468	2.2	3.1	3.2	20	20	20	5.4*5.0*1.6

Part No.	Iv(mcd)				Wd(nm)				Vf(V)			If(mA)			L*W*H(mm)
	R	G	B	W	R	G	B	XY	R	G	B	R	G	B	
RF-W2SA50TS-A38	750	1600	350	2300	620	520	465	0.265,0.225	2.2	3.2	3.3	20	20	20	5.4*5.0*1.6

Typical characteristics (for reference only)

Part No.	If (mA)	Ra (min)	CCT (K)	Iv (mcd&lm)	Wd (nm)
RF-W2SA50TS-R24W	R=G=B=W=20	80	W: 2300K—2500K	R: 700-1200mcd G: 1900-2400mcd B: 400-750mcd W: 6.0-8.5lm	618-623 520-525 468-473 /
RF-W2SA50TS-R26W	R=G=B=W=20	80	W: 2550K—2750K	R: 700-1200mcd G: 1900-2400mcd B: 400-750mcd W: 6.0-9.0lm	618-623 520-525 468-473 /
RF-W2SA50TS-R30W	R=G=B=W=20	80	W: 3200K	R: 700-1200mcd G: 1900-2400mcd B: 400-750mcd W: 6.0-9.0lm	618-623 520-525 468-473 /
RF-W2SA50TS-R35W	R=G=B=W=20	80	W: 3300K—3600K	R: 700-1200mcd G: 1900-2400mcd B: 400-750mcd W: 6.0-9.0lm	618-623 520-525 468-473 /
RF-W2SA50TS-R40W	R=G=B=W=20	80	W: 4000K	R: 700-1200mcd G: 1900-2400mcd B: 400-750mcd W: 6.0-9.0lm	618-623 520-525 468-473 /
RF-W2SA50TS-R60W	R=G=B=W=20	80	W: 6000K	R: 700-1200mcd G: 1900-2400mcd B: 400-750mcd W: 6.0-9.0lm	618-623 520-525 468-473 /

Strip Lighting & Back Lighting

5050 RGB WW



L*W*H(mm): 5.4*5.0*1.65*0.75

- Highly integrated, Colorful, Perfect mixed light effect
- Strip can realize compact distribution with 5050RGBW LED
- Tunable and controllable light and color, from "1" to "N", one product achieves infinite possibilities
- The first patent product of the world

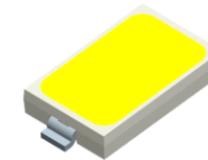


Typical characteristics (for reference only)

Part No.	If (mA)	Ra (min)	CCT (K)	Iv (mcd&lm)	Wd (nm)
RF-W2SA50TS-A39W	R=G=B=W1=W2=20	80	W1: 2400K W2: 6500K	R: 800-1200mcd	618-623
				G: 1400-2200mcd	518-523
				B: 350-650mcd	465-470
				W1: 5.0-8.5lm	/
				W2: 6.0-9.0lm	/
RF-W2SA50TS-A40W	R=G=B=W1=W2=20	80	W1: 1950K: W2: 8000K	R: 800-1200mcd	618-623
				G: 1400-2200mcd	518-523
				B: 350-650mcd	465-470
				W1: 3.5-8.5lm	/
				W2: 6.0-9.0lm	/
RF-W2SA50TS-A43W	R=G=B=20 W1=W2=20	95	W1: 2700K W2: 6500K	R: 800-1200mcd	618-623
				G: 1400-2200mcd	518-523
				B: 350-650mcd	466-471
				W1: 7.5-10.0lm	/
				W2: 8.0-10.5lm	/
RF-W2SA50TS-A45W	R=G=B=W1=W2=20	80	W1: 2400K W2: 6500K	R: 530-850mcd	618-623
				G: 1300-1700mcd	515-520
				B: 280-530mcd	465-470
				W1: 5-8.5lm	/
				W2: 7-9.5lm	/
RF-W2SA50TS-A46W	R=G=B=W1=W2=20	95	W1: 3000K W2: 6000K	R: 700-1200mcd	619-624
				G: 1400-2200mcd	518-523
				B: 350-650mcd	466-471
				W1: 5-7.5lm	/
				W2: 6-8.5lm	/
RF-W2SA50TS-A48W	R=G=B=W1=W2=20	80	W1=W2: 6500K	R: 800-1200mcd	618-623
				G: 1400-2200mcd	518-523
				B: 350-650mcd	465-470
				W1: 6.5-9.0lm	/
				W2: 6.5-9.0lm	/

Strip Lighting & Back Lighting

5730



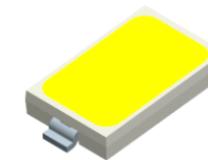
- MSL3
- Large lighting emitting surface
- Meet customer's requirements for product continuity
- LM-80

Typical characteristics (for reference only)

Part No.	Ra (min)	Flux (lm)	CCT (K)	Vf (V)	If (mA)	L*W*H (mm)
RF-84RI57DS-CF-W-Y		18-24	7800-9500	3.0	50	5.7*3.0*0.9
RF-PXHI57DS-FD-J	80	40-75	2800-4300 ANSI	3.0	150	5.7*3.0*0.9
RF-WCRI57DS-CF-N-Y		12-18		3.0	60	5.7*3.0*0.9
RF-XXQI57DS-FD-X-Y	95	18-28	2600-6800 ANSI	2.8	65	5.7*3.0*0.9
RF-XXHI57DS-DF-2J-Y	80	65-75	2600-6800 ANSI	2.9	150	5.7*3.0*0.9
RF-XXHI57DS-EF-2J-Y	80	70-80	2600-6800 ANSI	2.9	150	5.7*3.0*0.9

Strip Lighting & Back Lighting

3020

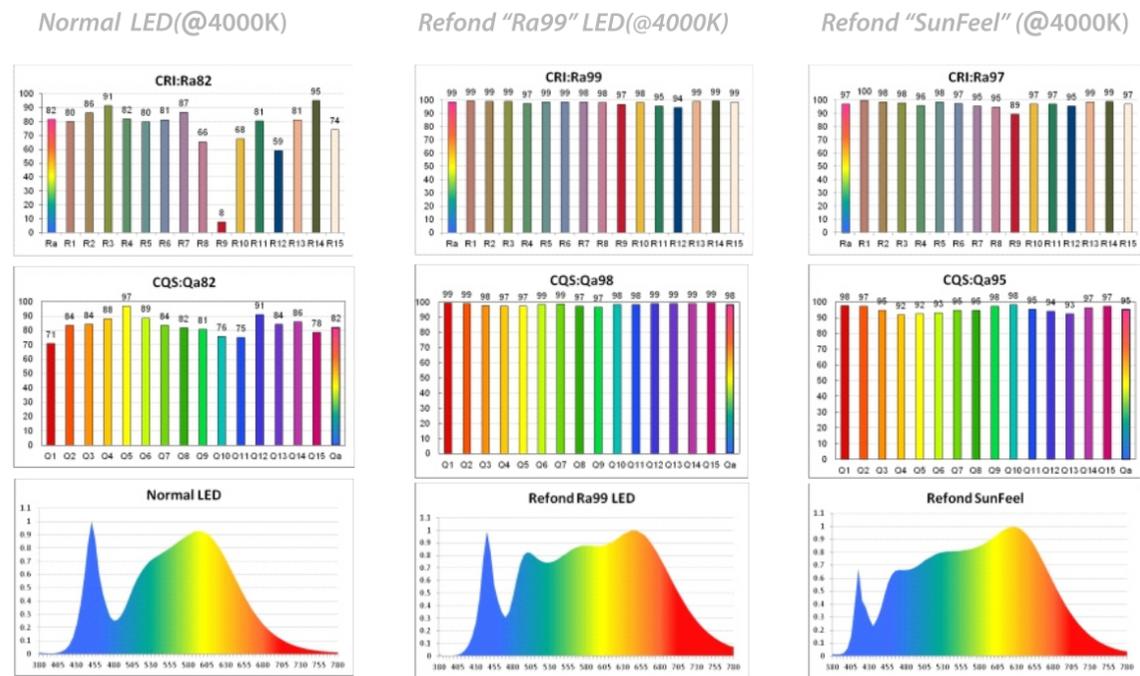


- Maintain the product to meet the customer's product continuity needs

Typical characteristics (for reference only)

Part No.	Ra (min)	Flux (lm)	CCT (K)	Vf (V)	If (mA)	L*W*H (mm)
RF-**TI200DS-**-F-Y	90	6-10	2200-6600 ANSI	3.2	30	3.0*2.0*1.3
RF-**HA20DS-EE-F-Y	80	8-15	2200-7100 ANSI	3.2	30	3.0*2.0*1.3

High Color Quality Product

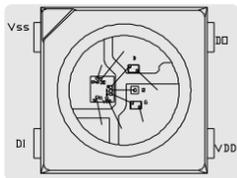
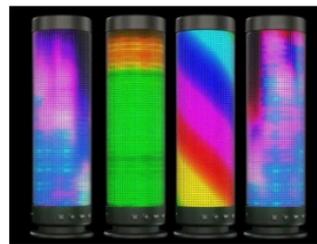


Full Spectrum, Close to Sunlight, Provide solutions to HCL
Refond "Ra99" & "SunFeel" LED Package: 2216/3014/3528/2835/5730/5050

RGB+IC



RF-W7SA50TS-A51-IC
5050

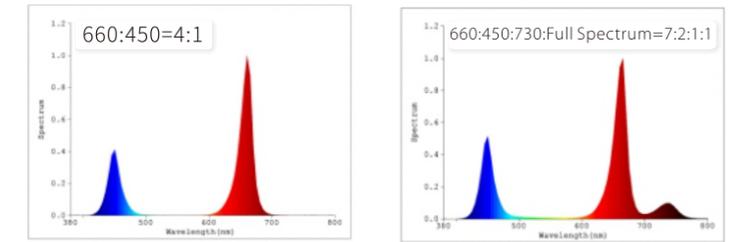


IC:MW1862D

- Compact structure to meet the demand of dense distribution applications
- Good reliability
- Packaging size, light and color etc. can be customized
- The first product in LED industry, originally designed by Refond.

NO.	Symbol	Function description	Notes
1	VDD	Power supply LED	3.5-5.5V
2	DOUT	Control data signal output	to next led
3	VSS	Ground	GND
4	DIN	Control data signal input	0-255

Horticulture Lighting

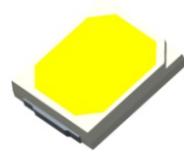


- Superior lifetime and stable spectrum
- High corrosion resistance
- Robust in high humidity and high temperature environment
- High energy efficacy in $\mu\text{mol/J}$
- A variety of colors and white lights are available, Products can be customized

Typical characteristics (for reference only)

Part No.	Color	Peak wavelength Wp(nm)	PPF/W $\mu\text{mol/J}$	Forward Voltage Vf(V)	Test Condition If(mA)
RF-W**QI35DS-EF-N-Y	Full SpectrumRa95 2700K-6500K	/	2.12	3.1	60
RF-AL-T2835**	PCR	610-660	1.7	3	300
RF-AL-A28352F0RB-00	RB	450	2.8	3	100
RF-AL-A28352F0DR-00	DR	660	2.25	2	100
RF-AL-T28352H0FR-00	FR	730	2.03	2	150
RF-AL-T28352F20RB-00	RB	450	2.45	6	100
RF-AL-T283522J0DR-00	DR	660	2.6	2	300
RF-AL-T283522J0FR-00	FR	730	2.32	2	300
RF-AL-E3030L2K0RB-00	RB	450	2.51	3	350
RF-AL-E3030L2K0DR-00	DR	660	2.82	1.9	350
RF-AL-E3030L2K0FR-00	FR	730	2.35	1.8	350
RF-AL-E3030L2K0RB-01	RB	450	2.56	3	350
RF-AL-E3030L2K0DR-01	DR	660	2.79	1.9	350
RF-AL-E3030L2K0FR-01	FR	730	2.4	1.8	350

Medical beauty



2835 White



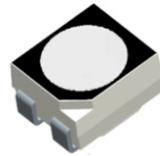
Photon beauty instrument

Mono color or multicolor combination of red, blue, yellow and IR



Photon beauty instrument

High CRI high LM/W white LED



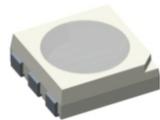
3528



Rejuvenation mask
LED red blue orange



Light wave water meter
590nm



5050 Color

Typical characteristics (for reference only)

LED	Part No.	intensity	Wd (nm)	CCT (K)	Vf (V)	If (mA)	L*W*H (mm)
3528	RA30S2-RUS-BR	800mcd	622		1.8	20	3.5*2.8*1.8*0.8
		30mW	850		1.6	20	
2835	RF-W**QI35DS-FE-N-Y	16-26lm		2700/3000/ 6000/6500	2.8	60	2.8*3.5*0.8*0.5
2835	RF-OURI35TS-CE-U-Y	1350mcd	630		2.3	40	2.8*3.5*0.8*0.5
2835	RF-IRRI35TS-CE-2H-Y		940		2.5	100	2.8*3.5*0.8*0.5
3014	RF-BNRI13TS-ED-U-Y	900mcd	455		3	40	3*1.4*0.7*0.4
5050	RF-RA50TS-CE		845		1.3	20	5.4*5.0*1.6*0.8
5050	RF-RUA50TS-CE	270mcd	655		1.9	20	5.4*5.0*1.6*0.8
5050	RF-MCRA50TS-UVRIR-3E	28mcd	410		3.3	20	5.4*5.0*1.6*0.8
		850mcd	625		2.1	20	
		4mw	850		1.5	20	
3528	RF-W2SA30TS-RBA	290mcd	600		2	20	3.5*2.8*1.8*0.8
		210mcd	450		3.2	20	
		250mcd	640		2	20	

Wavelength	application/function
UVC	260nm、280nm Sterilization
UVB	308nm、311nm, Treatment of psoriasis, atopic dermatitis, vitiligo, etc.
UVA	365+395nm nail curing
415nm	415nm surface skin treatment
420-470 nm	Phototherapy such as jaundice treatment, etc.
515-525 nm	Neutralize, calm, relieve stress and eye fatigue
590-595 nm	590nm Promotes cell growth, breaks down melanin, resists aging, resists spots, whitens, removes spots and reproduces whitening luster
620-630 nm	630nm Deep into the dermis of the skin, promote collagen regeneration, anti-wrinkle
670-690 nm	680nm Accelerate cell metabolism, improve muscle absorption, assist whitening and dilute dark circles
760 nm	improve skin blood circulation, promote collagen accumulation and healing, and arouse skin vitality from the inside out
850 nm	
930 nm	
High quality white light series	Lighting, decorative light, etc.



UVLED



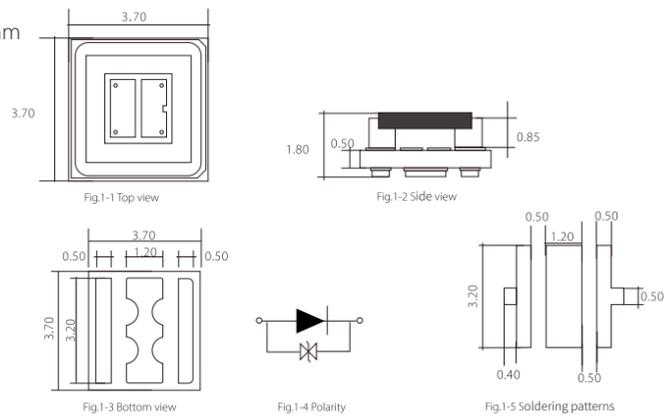
Full range of UVA,UVB,UVC, at your choice!

- High Power 3535 Single Chip Packaging'View Angle 120°&60°;
- Multi-Chip Packaging UVCOB with Quartz Lens' High Light Uniformity' Over 20W/CM2 ;
- 4 Chips Inorganic Lens Packaging 7070.

UVC 3737 Series

UVC 3737 Series

Dimension(L*W*H): 3.7mm*3.7mm*1.8mm



NOTES
1. All dimensions are in millimeters(mm) ;
2. Tolerance is ± 0.1mm unless special notice.

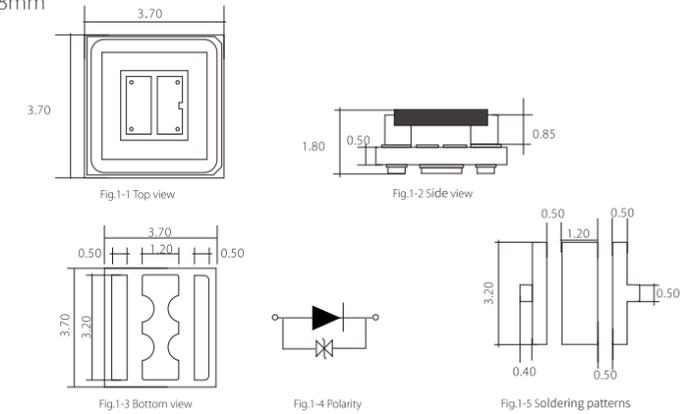
Parameter(Typical)

Part NO.	Po(W)	λP(nm)	Vf(V)	IF(mA)	Φe(mW)	2θ1/2(°)
RF-C37N0-URP-AR	0.1-0.2	270-280	4.5-7.5	20	1-3	120
RF-C37N0-URT-AR	0.2-0.4	270-280	4.5-7.5	50	3-6	120
RF-C37N0-URH-AR	0.65-1.1	270-280	4.5-7.5	150	10-15	120
RF-C37E0-URP-AR	0.2-1	270-280	4.5-7.5	20	1-3	120
RF-C37E0-URT-AR	0.2-1	270-280	4.5-7.5	50	3-6	120
RF-C37P0-URT-AR	0.65-1.1	270-280	4.5-7.5	150	10-15	120
RF-C37P0-URH-AR	0.9-1.5	270-280	4.5-7.5	200	18-22	120

UVB 3737 Series

UVB 3737 Series

Dimension(L*W*H): 3.7mm*3.7mm*1.8mm



NOTES
1. All dimensions are in millimeters(mm) ;
2. Tolerance is ± 0.1mm unless special notice.

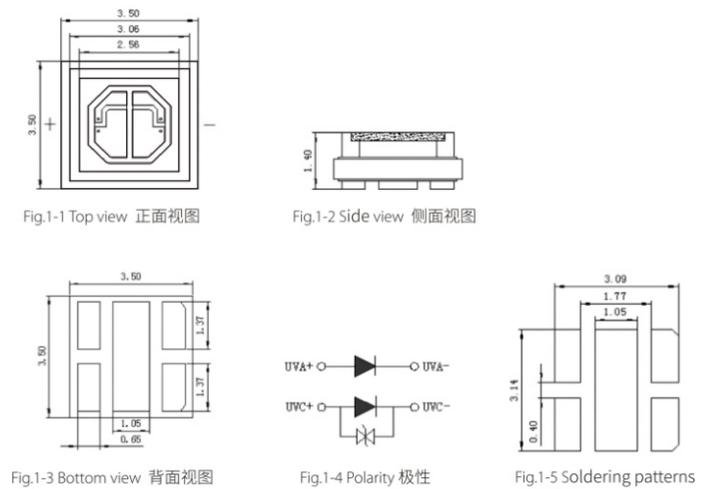
Parameter(Typical)

Part NO.	Po(W)	λP(nm)	Vf(V)	IF(mA)	Φe(mW)	2θ1/2(°)
RF-C37D0-UTP-AR	0.2-0.4	309-313	4.5-7.5	50	6-8	120
RF-C37D0-UTH-AR	0.65-1.1	309-313	4.5-7.5	150	15-25	120
RF-C37D0-UWT-AR	0.2-0.4	306-310	4.5-7.5	50	6-8	120
RF-C37D0-UWH-AR	0.65-1.1	306-310	4.5-7.5	150	15-25	120

UVC+UVA 3535 Series

UVC 3535 Series

Dimension(L*W*H): 3.5mm*3.5mm*1.4mm



NOTES
1. All dimensions are in millimeters(mm) ;
2. Tolerance is ± 0.1mm unless special notice.

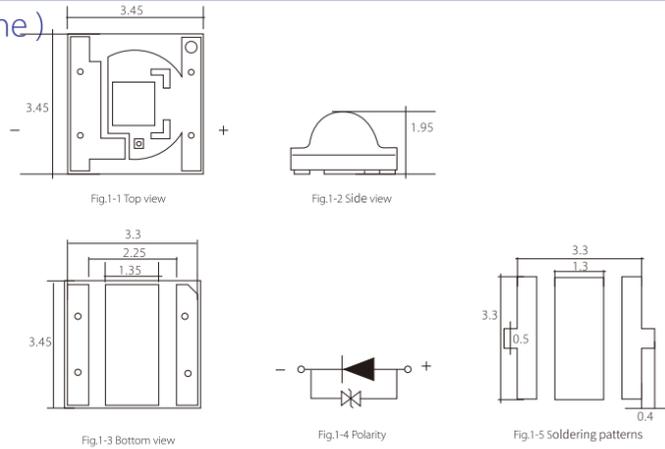
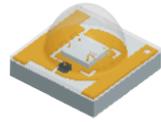
Parameter(Typical)

Part NO.	Po(W)	λP(nm)	Vf(V)	IF(mA)	Φe(mW)	2θ1/2(°)
RF-C35N0-UACP-AR	0.1-0.2	270-280	4.5-7.5	20	1-3	120
RF-C35N0-UACP-AR	0.06-0.1	390-410	2.8-3.4	40	20-40	120
RF-C35N0-UACT-AR	0.2-0.4	270-280	4.5-7.5	50	3-6	120
RF-C35N0-UACT-AR	0.06-0.1	390-410	2.8-3.4	40	20-40	120
RF-C35E0-UACP-AR	0.1-0.2	270-280	4.5-7.5	20	1-3	120
RF-C35E0-UACP-AR	0.06-0.1	390-410	2.8-3.4	40	20-40	120

UV 3535 120° Series

UVXC35 120°Series (Lead Frame)

Dimension(L*W*H): 3.45mm*3.45mm*1.4mm



NOTES

1. All dimensions are in millimeters(mm) ;
2. Tolerance is ± 0.1 mm unless special notice

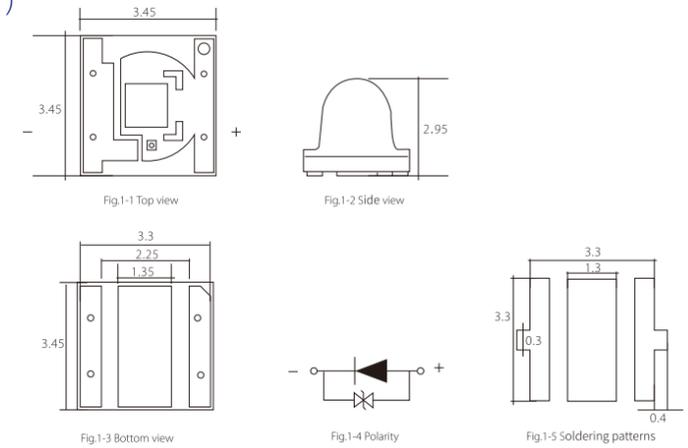
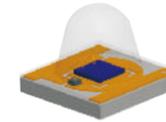
Parameter(Typical)

Part Number	Po(W)	λ P(nm)	Vo(V)	IF(mA)	Φ_e (mW)	2 θ 1/2(°)
RC35E0-UBE-AR	2-3	365-370	3.0-3.8	500	675-940	120
RC35E0-UEE-AR	2-3	380-390	3.0-3.8	700	1110-1310	120
RC35E0-UHE-AR	2-3	390-400	3.0-3.8	700	1110-1310	120
RC35E0-UIE-AR	2-3	400-410	3.0-3.8	700	1110-1310	120
RC35E0-UKE-AR	2-3	410-420	3.0-3.8	700	1110-1310	120

UV 3535 High Power 60° Series

RC 35 60° Series (Lead Frame)

Dimension(L*W*H): 3.45*3.45*2.95mm



NOTES

1. All dimensions are in millimeters(mm) ;
2. Tolerance is ± 0.1 mm unless special notice

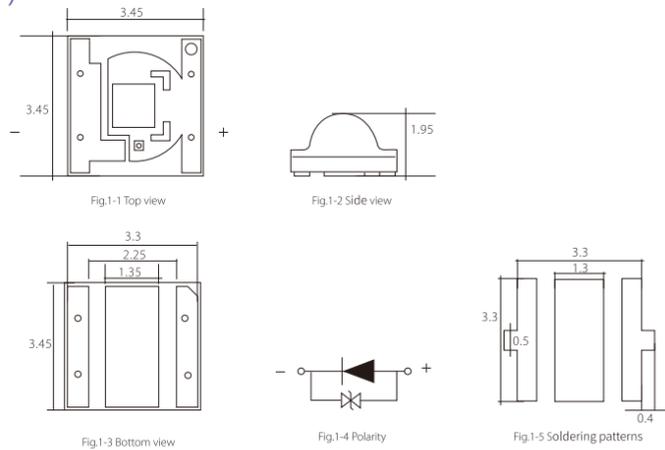
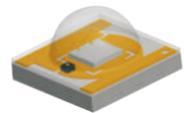
Parameter(Typical)

Part NO.	Po(W)	λ P(nm)	Vo(V)	IF(mA)	Φ_e (mW)	2 θ 1/2(°)
RC35E6-UBE-AR	2-3	365-370	3.0-3.8	500	675-940	60
RC35E6-UEE-AR	2-3	380-390	3.0-3.8	700	1110-1310	60
RC35E6-UHE-AR	2-3	390-400	3.0-3.8	700	1110-1310	60
RC35E6-UIE-AR	2-3	400-410	3.0-3.8	700	1110-1310	60
RC35E6-UKE-AR	2-3	410-420	3.0-3.8	700	1110-1310	60

UV3535 High Power 120° Series

RC 35 120° Series (Lead Frame)

Dimension(L*W*H): 3.45*3.45*1.95mm



NOTES

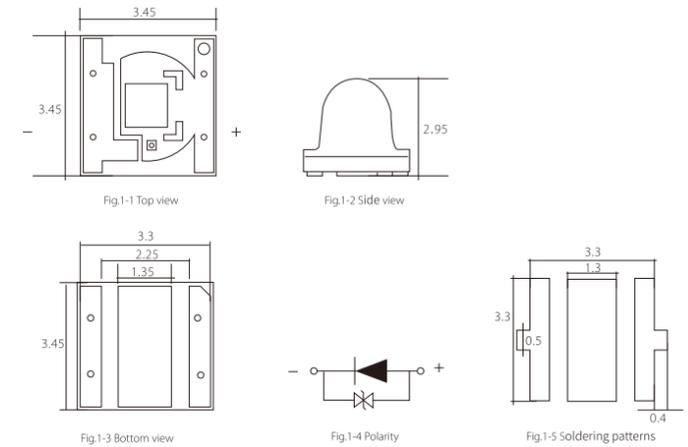
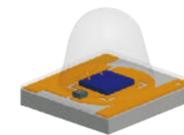
1. All dimensions are in millimeters(mm) ;
2. Tolerance is ± 0.1 mm unless special notice

Parameter(Typical)

Part NO.	Po(W)	λ P(nm)	Vo(V)	IF(mA)	Φ_e (mW)	2 θ 1/2(°)
RC35E6-UBE-ER	2-3	365-370	3.0-3.8	500	675-940	120
RC35E6-UEE-AR	2-3	380-390	3.0-3.8	700	1110-1310	120
RC35E6-UHE-AR	2-3	390-400	3.0-3.8	700	1110-1310	120
RC35E6-UIE-AR	2-3	400-410	3.0-3.8	700	1110-1310	120
RC35E6-UKE-AR	2-3	410-420	3.0-3.8	700	1110-1310	120

RC35 60° Series (Lead Frame)

Dimension(L*W*H):3.45*3.45*1.95mm



NOTES

1. All dimensions are in millimeters(mm) ;
2. Tolerance is ± 0.1 mm unless special notice

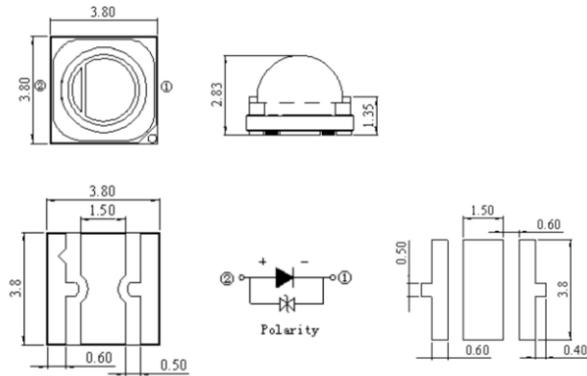
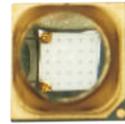
Parameter(Typical)

Part NO.	Po(W)	λ P(nm)	Vo(V)	IF(mA)	Φ_e (mW)	2 θ 1/2(°)
RC35E0-UBE-ER	2-3	365-370	3.0-3.8	500	675-940	120
RC35E0-UEE-ER	2-3	380-390	3.0-3.8	700	1110-1310	120
RC35E0-UHE-ER	2-3	390-400	3.0-3.8	700	1110-1310	120
RC35E0-UIE-ER	2-3	400-410	3.0-3.8	700	1110-1310	120
RC35E0-UKE-ER	2-3	410-420	3.0-3.8	700	1110-1310	120

UV 3838 High Power 60° Quartz Lens Series

RC38 60° Series(Lead Frame + Quartz Lens)

Dimension(L*W*H): 3.8*3.8*2.83mm



NOTES

1. All dimensions are in millimeters(mm)
2. Tolerance is ± 0.1 mm unless special notice

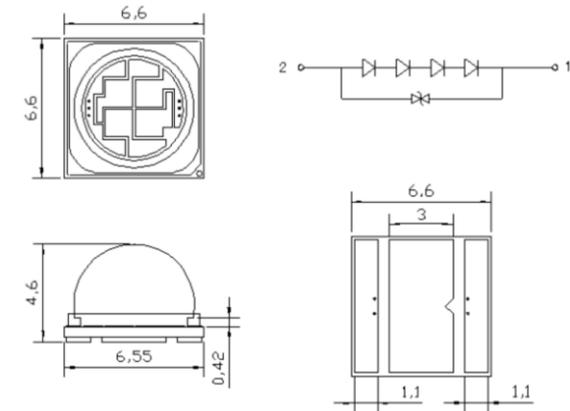
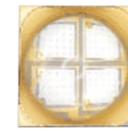
Parameter(Typical)

Part NO.	Po(W)	λP (nm)	V _o (V)	IF(mA)	Φ_e (mW)	2 θ 1/2(°)
RC35L6-UBP-AR	3-4	365	3.2-3.8	700	1110-1310	60
RC35L6-UEP-AR	3-4	385	3.2-3.8	1000	1825-2150	60
RC35L6-UGP-AR	3-4	395	3.2-3.8	1000	1825-2150	60
RC35L6-UIP-AR	3-4	405	3.2-3.8	1000	1825-2150	60

UV6565 Highpower 60° quartz lens Series

RC65(4S) 60° Series(Lead Frame+Quartz Lens)

Dimension(L*W*H): 6.5*6.5*4.6mm



NOTES

1. All dimensions are in millimeters(mm)
2. Tolerance is ± 0.1 mm unless special notice

Parameter(Typical)

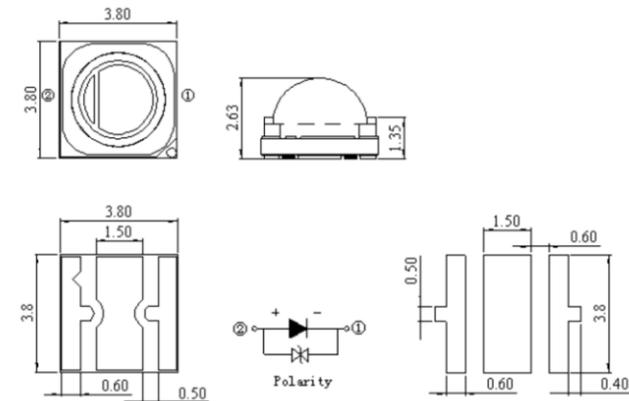
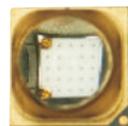
Part NO.	Po(W)	λP (nm)	V _f (V)	IF(mA)	Φ_e (mW)	2 θ 1/2(°)
RC65L6-UBP-AR-04	9-10	365-370	13.0-16.0	700	> 5500	120
RC65L6-UEP-AR-04	13-16	380-390	13.0-16.0	1000	> 7500	120
RC65L6-UGP-AR-04	13-16	390-400	13.0-16.0	1000	> 7500	120
RC65L6-UIP-AR-04	13-16	400-410	13.0-16.0	1000	> 7500	120

Description: Can provide customized products.

Uv3838 High Power 120° Quartz Lens Series

38 120° Series (Lead Frame+Quartz Lens)

Dimension(L*W*H): 3.8*3.8*2.63mm



NOTES

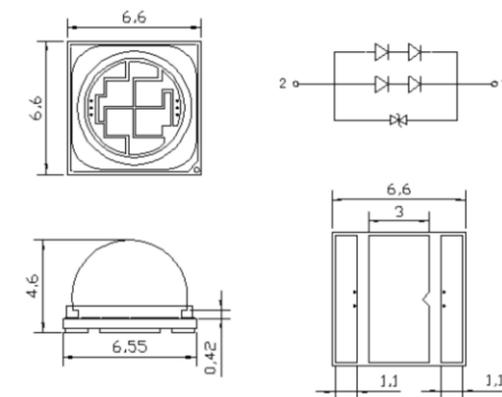
1. All dimensions are in millimeters(mm)
2. Tolerance is ± 0.1 mm unless special notice

Parameter(Typical)

Part NO.	Po(W)	λP (nm)	V _o (V)	IF(mA)	Φ_e (mW)	2 θ 1/2(°)
RC35L0-UBP-AR	3-4	365	3.2-3.8	700	1110-1310	120
RC35L0-UEP-AR	3-4	385	3.2-3.8	1000	1825-2150	120
RC35L0-UGP-AR	3-4	395	3.2-3.8	1000	1825-2150	120
RC35L0-UIP-AR	3-4	405	3.2-3.8	1000	1825-2150	120

RC65(2S2P) 60° Series (Lead Frame+Quartz Lens)

Dimension(L*W*H): 6.5*6.5*4.6mm



NOTES

1. All dimensions are in millimeters(mm)
2. Tolerance is ± 0.1 mm unless special notice

Parameter(Typical)

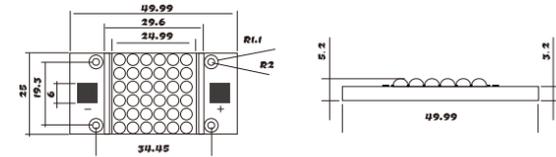
Part NO.	Po(W)	λP (nm)	V _f (V)	IF(mA)	Φ_e (mw) (700Ma)	2 θ 1/2(°)
RC65L6-UBP-AR-22	9-10	365-370	6.6-8.0	1400	> 5500	60
RC65L6-UEP-AR-22	13-16	380-390	6.6-8.0	2000	> 7500	60
RC65L6-UGP-AR-22	13-16	390-400	6.6-8.0	2000	> 7500	60
RC65L6-UIP-AR-22	13-16	400-410	6.6-8.0	2000	> 7500	60

Description: Can provide customized products.

UV 300W COB Series

RT25 UV COB 60° Series (Lead Frame+Quartz Lens)

Dimension(L*W*H): 25*50*5.2mm
Lighting Area Size



NOTES

1. All dimensions are in millimeters(mm)
2. Tolerance is ± 0.1 mm unless special notice

Parameter(Typical)

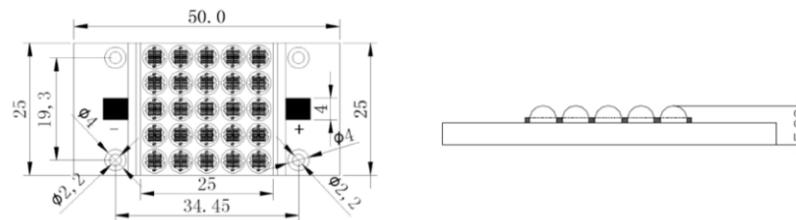
Part NO.	Po(W)	λP (nm)	Vf(V)	IF(mA)	Φ_e (mW)	2 θ 1/2(°)
RT25E9-COBUBP-1212	200-300	365-370	40-45	6.6	≥ 14	60
RT25E9-COBUEP-1212	200-300	380-385	40-45	6.6	≥ 20	60
RT25E9-COBUGP-1212	200-300	390-395	40-45	6.6	≥ 24	60
RT25E9-COBUIP-1212	200-300	400-410	40-45	6.6	≥ 24	60

Description: Can provide customized products.

UV 200W COB Series

RT 25 UV COB 60° Series (Lead Frame+Quartz Lens)

Dimension(L*W*H): 25*50*5.9mm
Lighting Area Size



NOTES

1. All dimensions are in millimeters(mm)
2. Tolerance is ± 0.1 mm unless special notice

Parameter(Typical)

Part NO.	Po(W)	λP (nm)	Vf(V)	IF(mA)	Φ_e (W/cm ²)	2 θ 1/2(°)
RT25E9-COBUBP-1010	100-200	365-370	35-40	5.5	≥ 12	60
RT25E9-COBUEP-1010	100-200	380-385	35-40	5.5	≥ 16	60
RT25E9-COBUGP-1010	100-200	390-395	35-40	5.5	≥ 20	60
RT25E9-COBUIP-1010	100-200	400-410	35-40	5.5	≥ 20	60

Description: Can provide customized products.

UV 2835 LED Series

UV 2835 LED Series

Dimension(L*W*H): 2.8*3.5*0.65mm

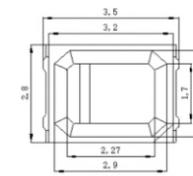


Fig.1-1 Top view

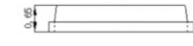


Fig.1-2 Side view

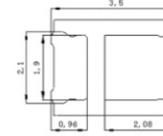


Fig.1-3 Bottom view



Fig.1-4 Polarity

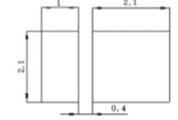


Fig.1-5 Soldering patterns

NOTES

1. All dimensions are in millimeters
2. Tolerances are 0.1mm, unless special notice

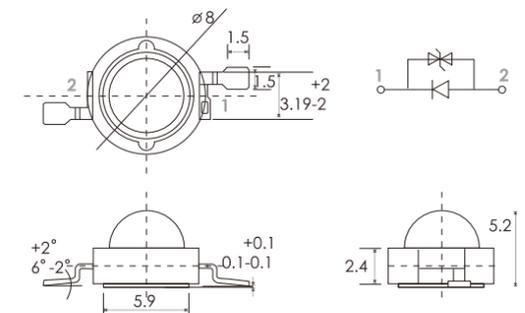
Parameter(Typical)

Part Number	Po(W)	λP (nm)	Vf(V)	IF(mA)	Φ_e (mW)	2 θ 1/2(°)
RP32E0-UBY-SR	0.3	365-370	3.2-4.0	60	45-56	120
RP32E0-UEY-SR	0.5	380-390	3.2-4.0	150	112-180	120
RP32E0-UHY-SR	0.5	390-400	3.2-3.6	150	112-180	120
RP32E0-UIY-SR	0.5	400-410	3.2-3.6	150	112-180	120
RP32E0-UKY-SR	0.5	410-420	3.2-3.6	150	112-180	120

UV PW16 LED Series

UV K2 LED Series

Dimension(L*W*H): 14.2*8.05*5.2mm



NOTES

1. All dimensions are in millimeters
2. Tolerances are 0.1mm, unless special notice

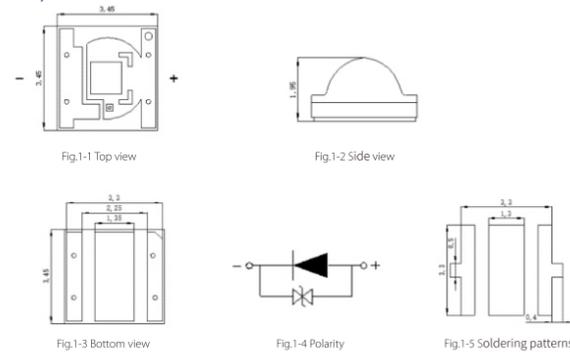
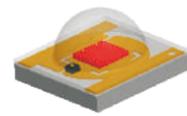
Parameter(Typical)

Part NO.	Po(W)	λP (nm)	Vf(V)	IF(mA)	Φ_e (mW)	2 θ 1/2(°)
RW16E0-UBC-FT	1-2	365-370	3.2-4.0	350	≥ 410	120
RW16E0-UEC-FT	1-2	380-390	3.2-4.0	350	≥ 512	120
RW16E0-UHC-FT	1-2	390-400	3.2-3.6	350	≥ 560	120
RW16E0-UIC-FT	1-2	400-410	3.2-3.6	350	≥ 560	120
RW16E0-UKC-FT	1-2	390-400	3.2-3.6	350	≥ 560	120

3535 120° LED Series

RC 35 120° LED Series (Lead Frame)

Dimension(L*W*H): 3.45mm*3.45mm*1.95mm



NOTES

1. All dimensions are in millimeters(mm)
2. Tolerance is ± 0.1mm unless special notice

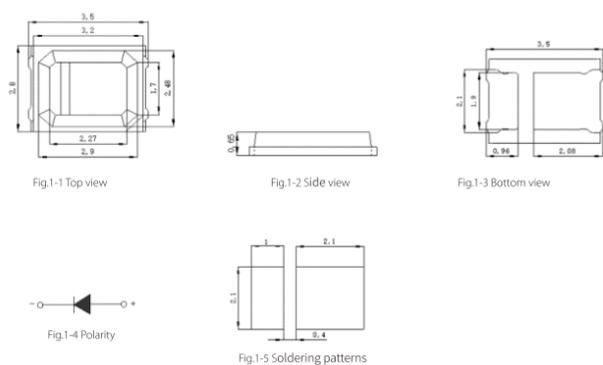
Parameter(Typical)

Part NO.	Po(W)	λP(nm)	Vf(V)	IF(mA)	Φe(mW)	2θ1/2(°)
RC35E 1-SBE-FR	1-2	440-450	2.8-3.6	350	≥450	120
RC35E 1-BNE-FR	1-2	460-470	2.8-3.6	350	≥450	120
RC35E 1-RUD-FR	1-2	615-630	1.8-2.6	350	≥40LM	120
RC35G1-RBD-FR	1-2	655-665	1.8-2.6	350	≥224	120
RC35E 1-RD-FR	1-2	730-740	1.8-2.6	350	≥224	120
RF-C35H1-SBE-FR	1-3	435-450	2.8-3.6	700	1400-1650	120
RF-C35H1-RBD-FR	1-3	655-670	1.8-2.6	700	700-800	120
RF-C35H1-IRD-FR	1-3	730-740	1.8-2.6	700	560-660	120
RF-C35H1-RBK-FR	1-3	655-670	1.8-2.6	700	750-850	120
RF-C35H1-RBM-FR	1-3	655-670	1.8-2.6	700	800-900	120

2835 120° Series

2835 120° LED Series

Dimension(L*W*H): 2.8mm*3.5mm*0.65mm



NOTES

1. All dimensions are in millimeters (mm)
2. Tolerance is ± 0.1mm unless special notice

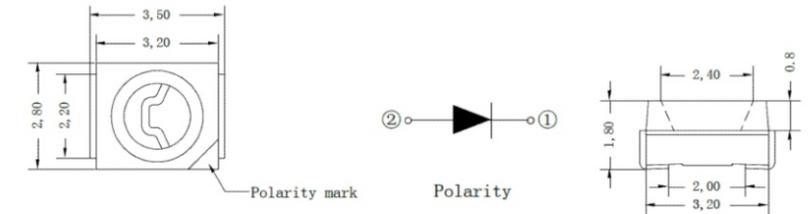
Parameter(Typical)

Part NO.	Po(W)	λP(nm)	Vo(V)	IF(mA)	Φe(mW)	2θ1/2(°)
RA32A1-BNU-FR	0.2-0.5	440-455	2.8-3.6	100	140-224	120
RA32E 1-RT-FR	0.2-0.5	730-740	1.8-2.6	150	90-140	120
RA32E 1-RBT-FR	0.2-0.5	670-690	1.8-2.6	100	56-106	120
RA32E 1-RUT-FR	0.2-0.5	655-665	1.8-2.6	100	70-112	120
RP32E 1-RUT-FR	0.2-0.5	628-638	1.8-2.6	150	90-140	120
RP32E 1-YUT-FR	0.2-0.5	585-595	1.8-2.6	150	100-130	120

3528 120° LED Series

3528 120° LED Series

Dimension(L*W*H): 3.5mm*2.8mm*1.8mm



NOTES

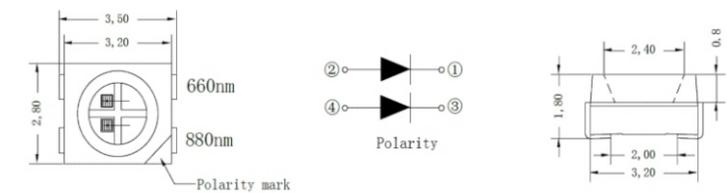
1. All dimensions are in millimeters(mm)
2. Tolerance is ± 0.1mm unless special notice

Parameter(Typical)

Part NO.	Po(W)	λP(nm)	Vo(V)	IF(mA)	Φe(mW)	2θ1/2(°)
RF-A35E0-IRT-FR	0.04	840-850	1.2-1.6	20	10-15	120

3528 120° LED Series

Dimension(L*W*H): 3.5mm*2.8mm*1.8mm



NOTES

1. All dimensions are in millimeters
2. Tolerances are 0.1mm, unless special notice

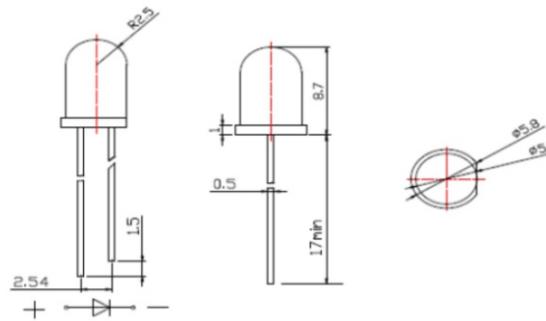
Parameter(Typical)

Part NO.	Po(W)	λP(nm)	Vf(V)	IF(mA)	Φe(mW)	2θ1/2(°)
RF-A35E2-RIN-FR	0.05	655-660 875-880	1.8-2.4 1.2-1.6	20	12-18 7-12	120
RF-A35E2-RRJ-FR	0.05	605-615 625-635	1.8-2.4 1.8-2.4	20	6-10 10-15	120
RF-A35E2-URN-FR	0.05	405-415 625-635	2.8-3.6 1.8-2.4	20	10-15 10-15	120

P05 Series

P05 Series

Dimension: $\Phi 5\text{mm}$



NOTES

- All dimensions are in millimeters(mm)
- Tolerance is $\pm 0.1\text{mm}$ unless special notice

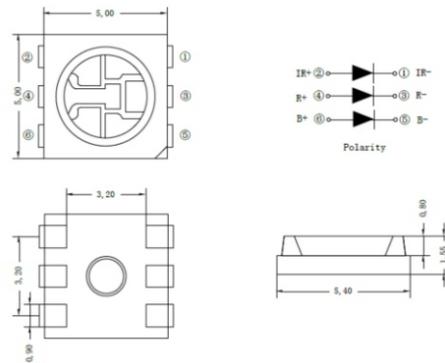
Parameter(Typical)

Part NO.	Po(W)	$\lambda P(\text{nm})$	Vf(V)	If(mA)	$\Phi e(\text{mW})$	$2\theta 1/2(^{\circ})$
RF-P05E0-RT-FS	0.05	840-850	1.2-1.6	20	20-40	10
RF-P05E0-RBT-FS	0.05	655-665	1.8-2.4	20	300-600	10
RF-P05E0-RUT-FS	0.05	625-635	1.8-2.4	20	6000-8000	10
RF-P05E0-UKT-FS	0.05	410-420	2.8-3.6	20	400-800	10

5050 120° LED Series

5050 120° LED Series

Dimension(L*W*H): 5.0mm*5.0mm*1.55mm



NOTES

- All dimensions are in millimeters(mm)
- Tolerance is $\pm 0.1\text{mm}$ unless special notice

Parameter(Typical)

Part NO.	Po(W)	$\lambda P(\text{nm})$	Vf(V)	If(mA)	$\Phi e(\text{mW})$	$2\theta 1/2(^{\circ})$
RF-P50E2-RIT-FR	0.1	620-630 840-850	1.8-2.4 1.2-1.6	20	12-20 10-16	120
RF-P50E3-BRI-FR	0.12	620-630 840-850 460-470	1.8-2.4 1.2-1.6 3.0-3.6	20	12-20 10-16 14-20	120

IR LED



"1:12" Alternative makes the Application Easier!

REFOND IR LED product features and introduction

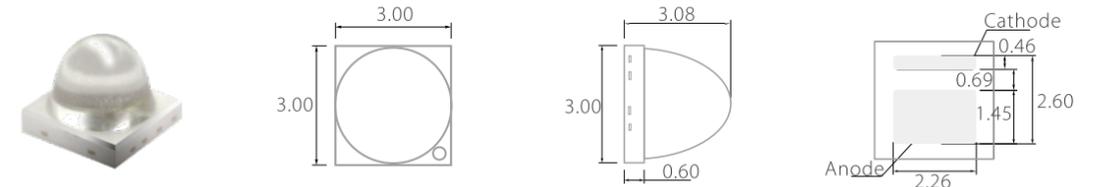
3W EMC Packaging; One-Time Molding Lens

Middle and High Power SMD LED with One-Time Molding Lens, No need Extra Optical Processing, Replacing with 1:12 Against DIP Led.

RE35,R35 full range of products pass the HALT test

RE30 20° Series (EMC)

Dimension (L*W*H) : 3.00*3.00*3.08mm

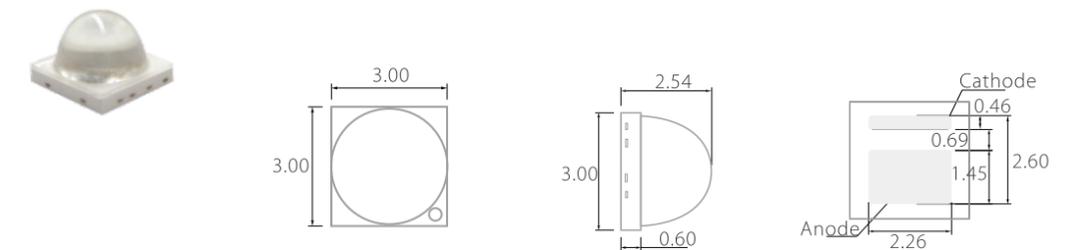


Parameter

Part No.	If(mA)	Vf(V)	Po(mW)	$\lambda P(\text{nm})$	$2\theta 1/2(^{\circ})$
RE30A3-IRT-FS	400	1.4-2.0	280-350	830-870	20
RE30A3-IRX-FS	500	1.4-2.0	280-450	830-870	20
RE30A3-IQX-FS	500	1.4-2.0	224-450	930-970	20

RE30 60° Series (EMC)

Dimension (L*W*H) : 3.00*3.00*2.54mm

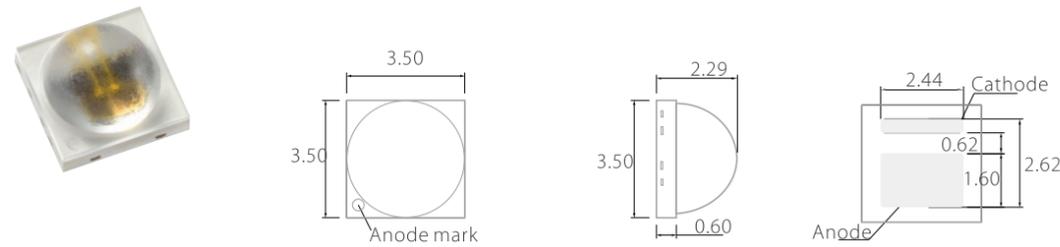


Parameter

Part No.	If(mA)	Vf(V)	Po(mW)	$\lambda P(\text{nm})$	$2\theta 1/2(^{\circ})$
RE30A6-IRT-FS	400	1.4-2.0	280-350	840-870	40
RE30A6-IRX-FS	500	1.4-2.0	350-450	840-870	40
RE30A6-IQX-FS	500	1.4-2.0	280-450	930-960	40

RE30 90° Series (EMC)

Dimension (L*W*H) : 3.50*3.50*2.29mm

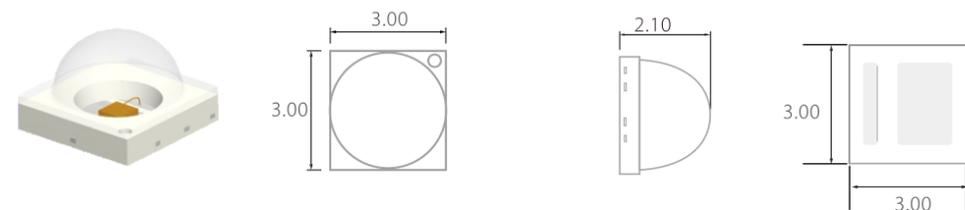


Parameter

Part No.	If (mA)	Vf (V)	Po (mW)	λP (nm)	2θ1/2 (°)
RF-E35A9-IRX-FR	500	1.4-2.0	280-350	830-870	90
RF-E35A9-IRB-FR	1000	1.4-2.0	710-1120	830-870	90
RF-E35S9-IRB-FR	1000	1.4-2.0	710-1120	830-870	90
RF-E35Q9-IRB-FR	1000	1.4-2.0	710-1120	830-870	
RF-E35A9-IQD-FR	1000	1.4-2.0	680-1120	930-970	90
RF-E35A9-IPD-FR	1000	1.4-2.0	560-1120	930-970	
RF-E35A9-IRD-FR	1500	1.4-2.0	1200-1400	830-870	90

RE30 100° Series (EMC)

Dimension (L*W*H) : 3.0*3.0*2.1mm

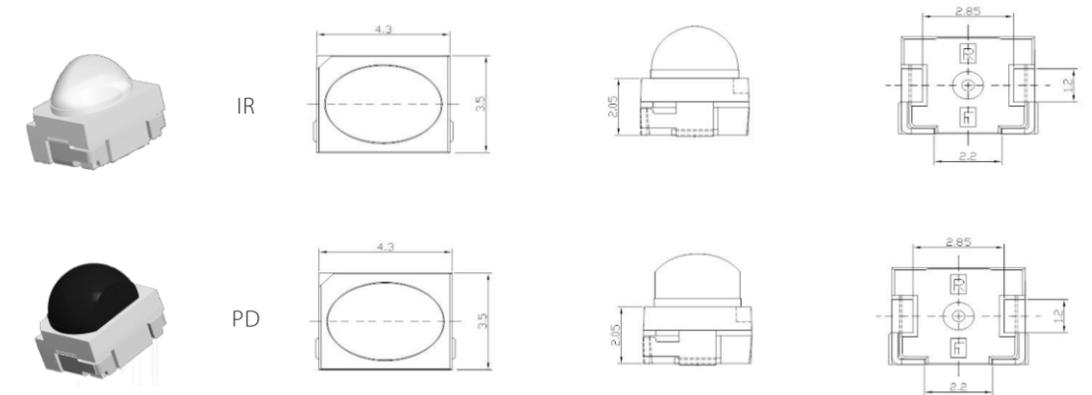


Parameter

Part No.	If (mA)	Vf (V)	Po (mW)	λP (nm)	2θ1/2 (°)
RE30AX-IRT-FS	400	1.4-2.0	280-350	840-870	100
RE30AX-IRT-FS	500	1.4-2.0	350-450	840-870	100
RE30AX-IQX-FS	500	1.4-2.0	280-450	930-960	100

4335 IR+PD Series (PLCC)

Dimension (L*W*H) : 4.3*3.5*3.85mm
Dimension (L*W*H) : 4.3*3.5*3.95mm



Parameter

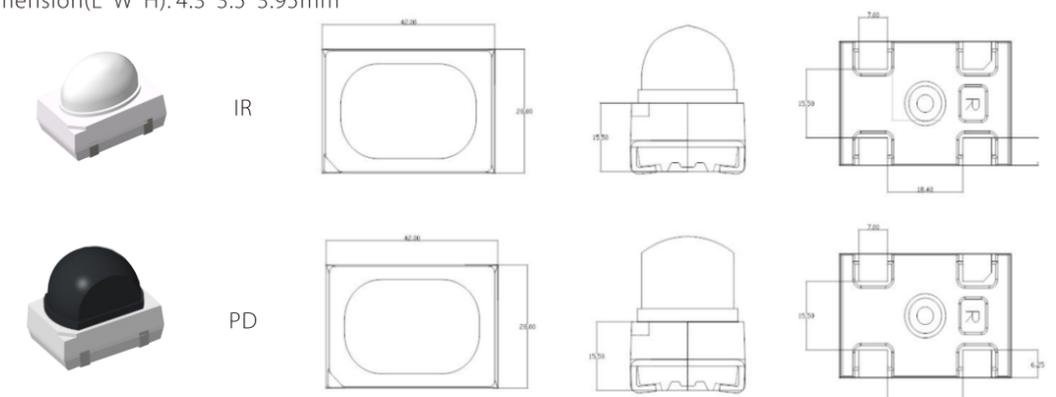
Part No.	If (mA)	Vf (V)	Ie (mW/sr)	λP (nm)	2θ1/2 (°)
RF-P43D6-IPL-FT	50	1.2-1.8	28-45	930-970	X:73 Y:22
RF-P43D6-IPN-FT	50	1.2-1.8	28-45	930-970	X:73 Y:22

Parameter

Part No.	If (mA)	Vf (V)	Ie (mW/sr)	λP (nm)	2θ1/2 (°)
RF-P43D8-PQD-FU	50	0.8-1.4	28-45	930-970	X:78 Y:65
RF-P43D8-PQG-FU	50	0.8-1.4	28-45	930-970	X:82 Y:71

4228 IR+PD Series (PLCC)

IR Dimension (L*W*H): 4.2*2.8*3.3mm
PD Dimension (L*W*H): 4.3*3.5*3.95mm



Parameter

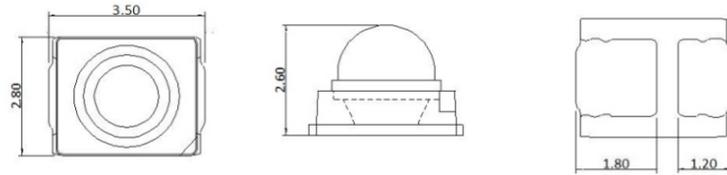
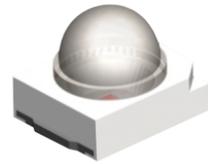
Part No.	If (mA)	Vf (V)	Ie (mW/sr)	λP (nm)	2θ1/2 (°)
RF-P42D6-IPJ-FT	50	1.2-1.8	28-45	930-970	X: 18 Y:72
RF-P42D6-IPL-FT	50	1.2-1.8	28-45	930-970	X: 18 Y:72

Parameter

Part No.	If (mA)	Vf (V)	S (μA/(mW/cm ²))	λP (nm)	2θ1/2 (°)
RF-P42D8-PQD-FU	50	0.8-1.4	18-45	930-970	X: 83 Y:67

2835lens 17°series(PLCC)

Dimension(L*W*H): 3.5*2.8*2.6mm

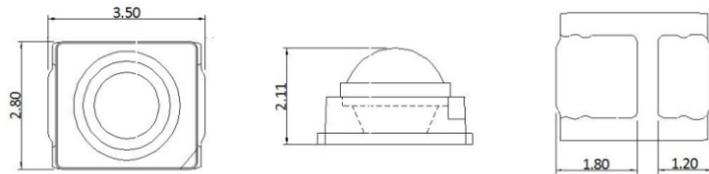


Parameter

Part No.	If (mA)	Vf (V)	Ie (mW/sr)	λP (nm)	2θ1/2 (°)
RF-P28Q3-IRJ-FT	50	1.4-1.8	28-45	830-870	17
RF-P28Q3-IRN-FT	100	1.4-1.8	45-112	830-870	17
RF-P28A3-IRN-FT	100	1.4-1.8	45-112	830-870	17

2835lens 60°series(PLCC)

Dimension(L*W*H): 3.5*2.8*2.11mm

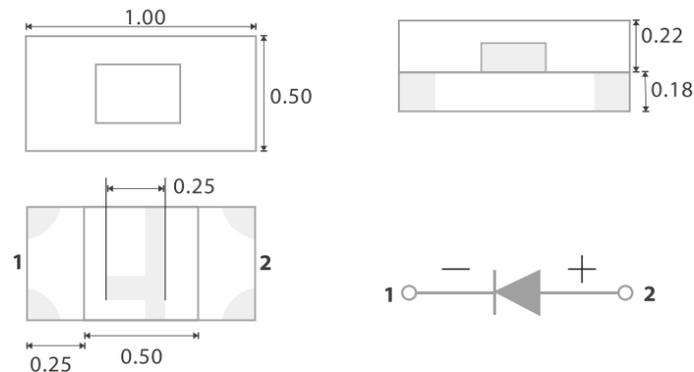
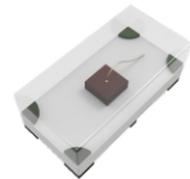


Parameter

Part No.	If (mA)	Vf (V)	Ie (mW/sr)	λP (nm)	2θ1/2 (°)
RF-P28Q6-IRJ-FT	50	1.4-1.8	28-45	830-870	72
RF-P28Q6-IRN-FT	100	1.4-1.8	45-112	830-870	72
RF-P28A6-IRN-FT	100	1.4-1.8	45-112	830-870	72

0402 IR series

Dimension(L*W*H): 1.0*0.5*0.4mm



Parameter

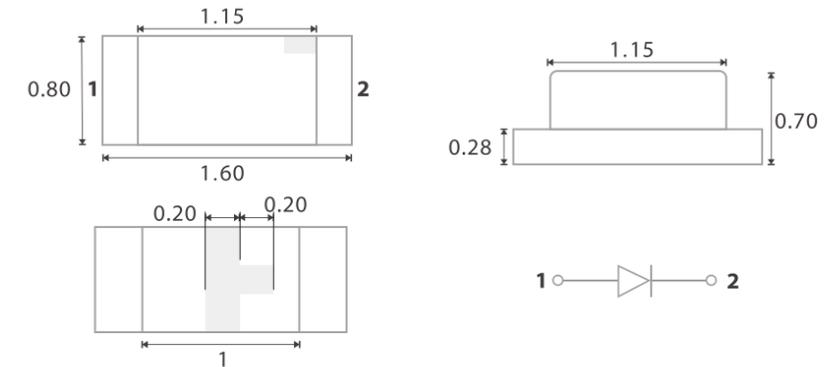
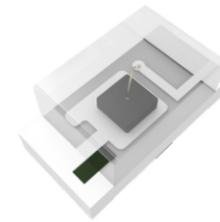
Part No.	Test Condition (mA)	Radiant intensity	Peak Wavelength	Spectral bandwidth	Reverse Voltage	2θ1/2 (°)
RF-IRB0402TS-10-G	50	4.5mw/sr	850 nm	30nm	1.3V	140
RF-IRD0402TS-10-G	50	4mw/sr	940 nm	30nm	1.2V	140

Product Application

Close range sensor, mobile devices, intelligent household

0603 IR series

Dimension(L*W*H): 1.6*0.8*0.7mm



Parameter

Part No.	If (mA)	Radiant intensity	Peak Wavelength	Spectral bandwidth	Reverse Voltage	2θ1/2 (°)
RF-IRBB191TS-14-G	50	5.5mw/sr	850 nm	80nm	1.3V	140
RF-IRDB191TS-14-G	50	5mw/sr	940 nm	50nm	1.2V	140

Product Application

Infrared sensor, infrared remote control, smoke detector, infrared application system

Horticulture LED

Plant Lighting Solution, One-Stop from Refond!

Parameter(Typical)

Part Number	Po(W)	λP(nm)	Vf(V)	IF(mA)	2θ½(°)
RC35G1-RBD-FR	280-355	650-670	1.6-2.6	350	120
RC35E1-IRD-FR	180-280	730-745	1.6-2.6	350	120
RC35E1-SBE-FR	450-260	430-450	2.6-3.6	350	120

Parameter(Typical)

Part Number	Radiant flux(mW)min	λP(nm)	Vf(V)	IF(mA)	2θ½(°)
RA32A1-BNU-FR	180-280	440-450nm	2.8-3.6	150	120°
RA32E1-RUT-FR	90	655-665nm	1.8-2.4	150	120°
RA32E1-IRT-FR	56	730-740nm	1.8-2.6	150	120°

Parameter(Typical)

RFOND TYPE	Radiant flux(mW)	λP(nm)	Vf(V)	IF(mA)	2θ½(°)
RE30E1-UIE-FR	415-485mW	400-410nm	3.0-3.6V	350mA	120°
RE30E1-BNE-FR	415-575mW	450-460nm	3.2-3.6V	350mA	120°
RE30E1-IRD-FR	210-295mW	730-740nm	1.8-2.2V	350mA	120°
RE30E1-RBD-FR	250-350mW	650-660nm	2.0-2.6V	350mA	120°
RE30E1-RUD-FR	250-350mW	630-640nm	2.0-2.6V	350mA	120°
RE30E1-SBE-FR	575-800mW	440-450nm	3.2-3.6V	350mA	120°
RF-IMRE30DS-GA-Y	80-90lm	(0.49,0.42)	3.0-3.6V	350mA	120°

Automotive Lighting LED



Automotive Interior Series

Product Features

- Moisture Sensitivity Level 2
- Electrostatic Discharge Withstand Voltage Level $\geq 2000V / \geq 8000V$ (ESD Protection Device)
- Sulfide Protection may selectively Primer process or Gold Plating
- RoHS Compliant

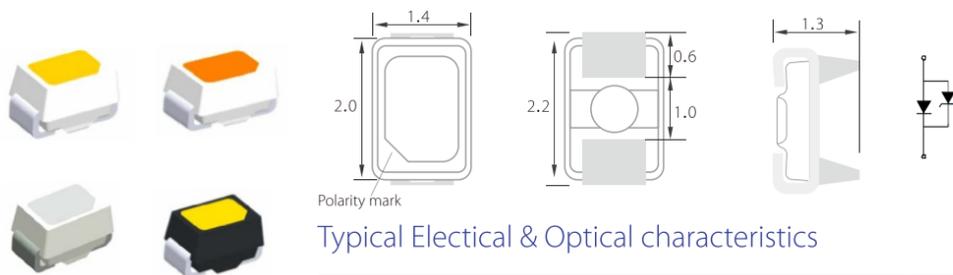
Product Description

Highly Reliable LEDs for Automotive , Qualification test plan is based AEC-Q102

Product Application

- Dashboard
- Switch&Button
- Map Lighting
- Ambient
- Monitor

2014 Series



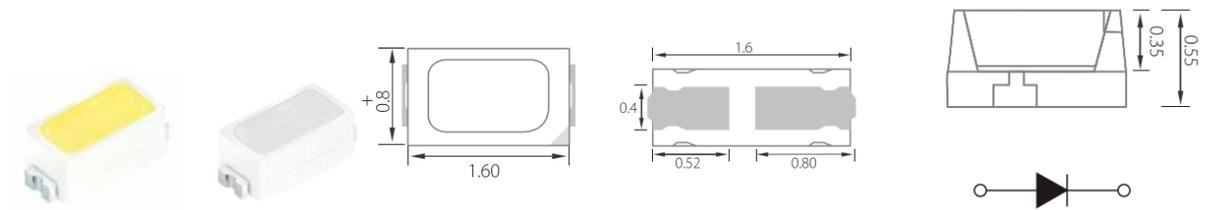
Typical Electrical & Optical characteristics

Part No.	IV(mcd)		Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)		Color
	Typ	Max		Typ	Max			Typ	Max	
RF-A2P14-Y895-Y3	900		2.0	20	30	120	300	115		Yellow
RF-A2P14-R215-R5	850		2.0	20	30	120	300	115		Red
RF-A2P14-R315-R5	700		2.0	20	30	120	300	115		Red
RF-A2P14-W755-A3	600		3.0	20	30	120	300	115		White
RF-A1P14-W415-A4	2000		3.0	20	30	120	300	115		White
RF-A2P14-WY56-A4	2800		3.0	30	30	120	300	115		PC Amber
RF-A1P1A-WY82-A3	50		3.0	5	30	120	300	115		PC Amber

Application: Dashboard Backlight, Switch Backlight, Atmosphere Light



1608 Series



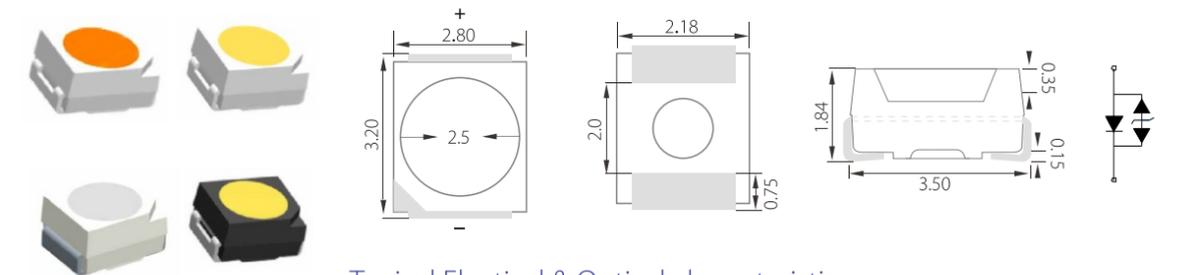
Typical Electrical & Optical characteristics

Part No.	IV(mcd)		Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)		Color
	Typ	Max		Typ	Max			Typ	Max	
RF-A2P08-W752-A3	650		3.0	5	20	120	300	115		White
RF-A2P08-W265-A3	2000		3.0	20	30	120	300	115		White
RF-A2P08-G2A5-G2	135		3.0	20	30	120	300	115		Green
RF-A2P08-Y9A5-Y2	53		2.0	20	30	120	300	115		Yellow

Application: Dashboard Backlight, Switch Backlight, Atmosphere Light



3528 PLCC2 Series



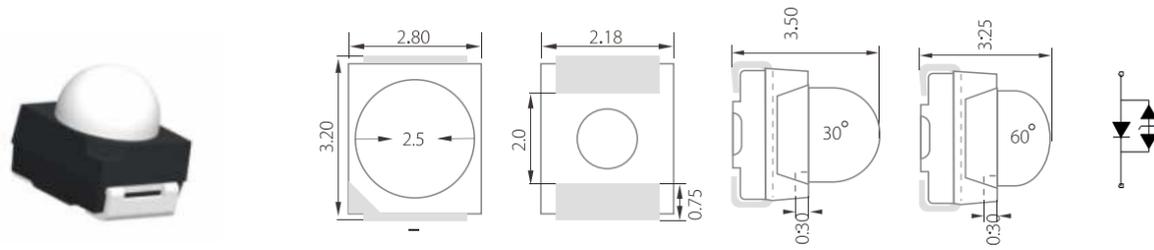
Typical Electrical & Optical characteristics

Part No.	IV(mcd)		Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)		Color
	Typ	Max		Typ	Max			Typ	Max	
RF-A1A30-WA10-A3	90		3.0	2	30	120	300	115		White
RFA1A30WB32A3 -	700		3.0	5	30	120	300	115		White
RF-A1A30-W555-A4	2800		3.0	20	30	120	300	115		White
RF-A1A30-WYS2-A6	600		3.0	5	30	120	300	115		PC Amber
RF-A2A30-R325-R2	750		2.0	20	30	120	300	115		Red
RF-A2A30-R215-R5	1000		2.0	20	30	120	300	115		Red
RF-A2A30-R055-R2	300		2.0	20	30	120	300	115		Orange

Application: Dashboard Backlight, Switch Backlight, Atmosphere Light



3528 PLCC2 LENS Series

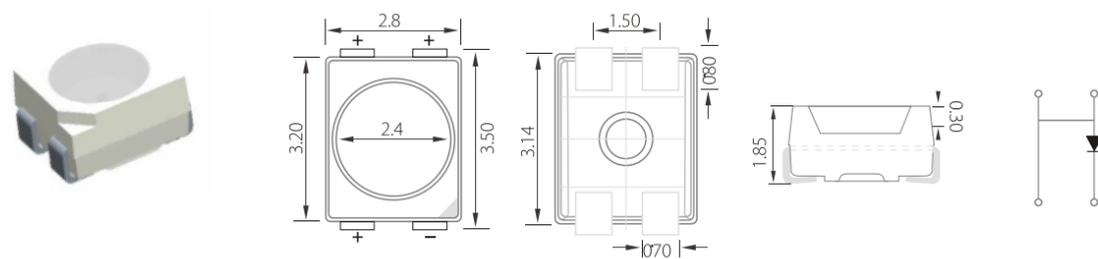


Typical Electrical & Optical characteristics

Part No.	IV(mcd)		X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)		Color
	Typ	Max			Typ	Max			Typ	Max	
RFA2B30Y905Y2-	3500		590	2.0	20	30	30	130	125		Yellow
RFA2B30R305R4-	4300		630	2.0	20	30	30	130	125		Red
RFA2B30-G255-G6	7000		525	3.0	20	30	30	130	125		Green
RFA2B30B705A5†	1800		470	3.0	20	30	30	130	125		Blue
RFA2B3AY905Y2-	1800		590	2.0	20	30	60	130	125		Yellow
RFA2B3AR305R4-	2200		630	2.0	20	30	60	130	125		Red
RFA2B3A-G255-G6	3500		525	3.0	20	30	60	130	125		Green
RFA2B3AB705A5†	900		470	3.0	20	30	60	130	125		Blue



3528 PLCC4 IR Series



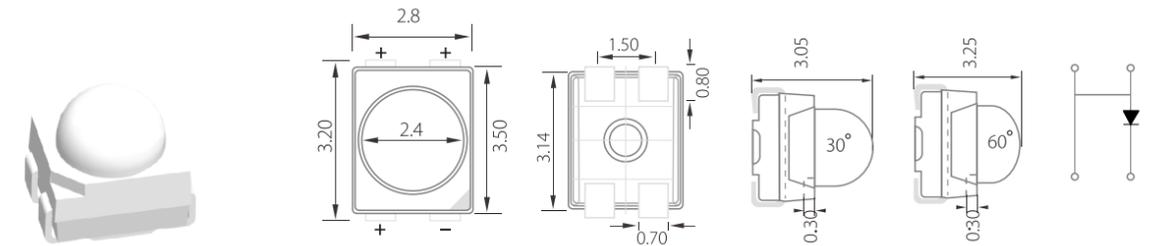
Typical Electrical & Optical characteristics

Part No.	Radiant Intensity (mW/sr)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)		Color
				Typ	Max			Typ	Max	
RFA2A31H50CH4-	22	850	3.0	100	120	120	130	115		IR
RFA2A31H40CH4-	18	940	3.0	100	120	120	130	115		IR
RFA2A312HHCH4-	22/18	850/940	2.0	100	120	120	130	115		Bi-color

Application: Dashboard Backlight, Switch Backlight



3528 PLCC4 IR LENS Series



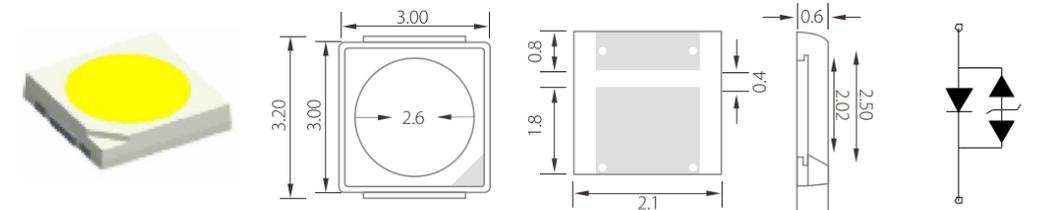
Typical Electrical & Optical characteristics

Part No.	Radiant Intensity (mW/sr)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)		Color
				Typ	Max			Typ	Max	
RFA2B31H50CH4-	180	850	2.0	100	120	30	130	125		IR
RFA2B31H40CH4-	100	940	2.0	100	120	30	130	125		IR
RFA2B3BH50CH4-	55	850	2.0	100	120	60	130	125		IR
RFA2B3BH40CH4-	35	940	2.0	100	120	60	130	125		IR

Application: Dashboard Backlight, Switch Backlight



3030 Series



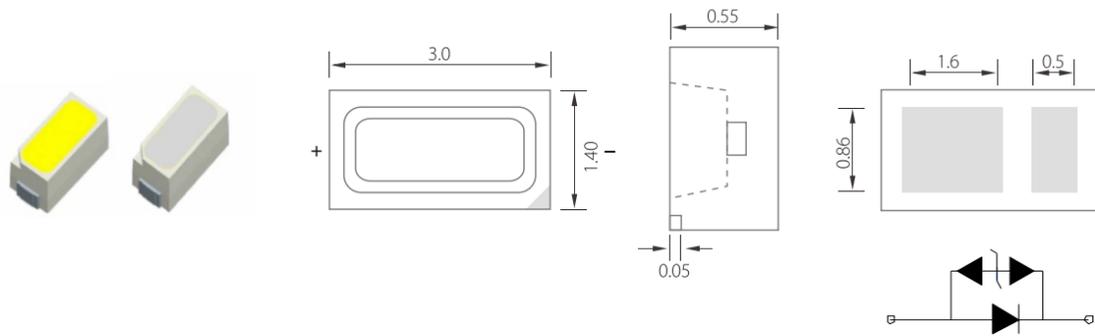
Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)		Ra	Color
				Typ	Max			Typ	Max		
RF-A1E30-W42E-V1	18	(0.37,0.37)	3.0	150	200	120	12	115	97		Full Spectrum

Application: Reading Light



3014 Series



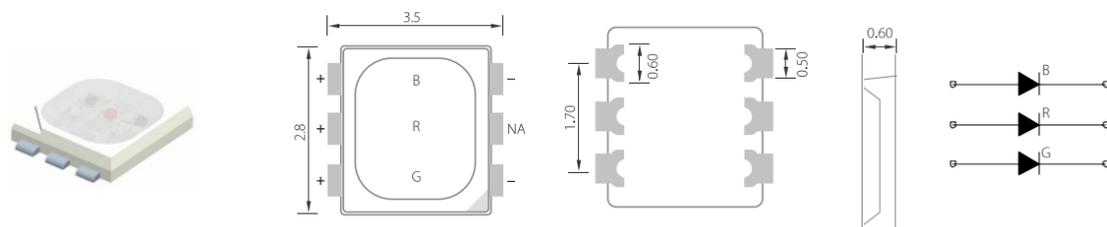
Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/ λ D (nm)	Efficacy (lm/W)	Vf(V)	If (mA)	$2\theta_{1/2}$ (°)	Rthj-sel. (K/W)	TJMax. (°C)	Color	
	Typ	Typ	Typ	Typ	Typ	Typ	Typ	Max		
RF-A2F30-R23D -R6	18	623	/	2.0	120	150	120	300	115	Red
RF-A2F30-Y93DY6	18	593	/	2.0	120	150	120	300	115	Yellow
RF-A1F30-W15BA8	35	(0.28,0.27)	110	3.0	90	120	120	300	115	White
RFA1F30W75BA8-	32	(0.30,0.29)	107	3.0	90	120	120	300	115	White

Application: LCD Backlight



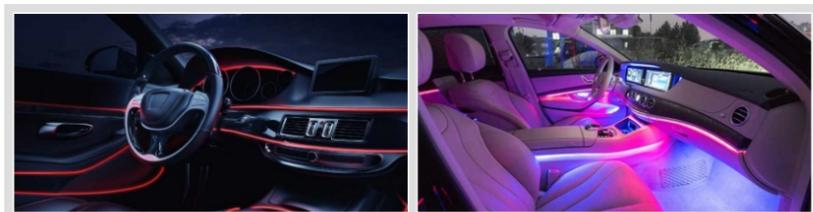
3528 RGB Series



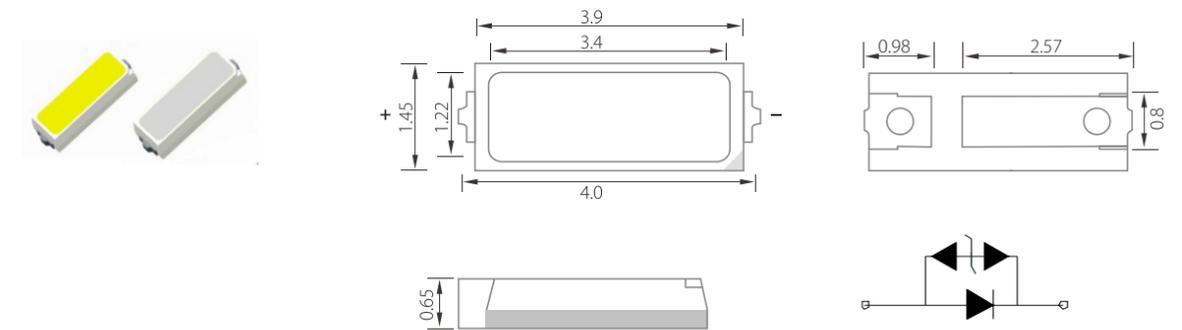
Typical electrical & Optical characteristics

Part No.	IV(mcd)	X/Y/ λ D(nm)	Vf(V)	If (mA)	$2\theta_{1/2}$ (°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ	Typ	Typ	Typ	Typ	Typ	Max	
RF-A2A38-RGBT-W1	350-800	620	2.0	14	30	120	300	R
	800-1800	525	3.0	11	30	120	300	G
	150-430	470	3.0	9	30	120	300	B

Application: Atmosphere Light



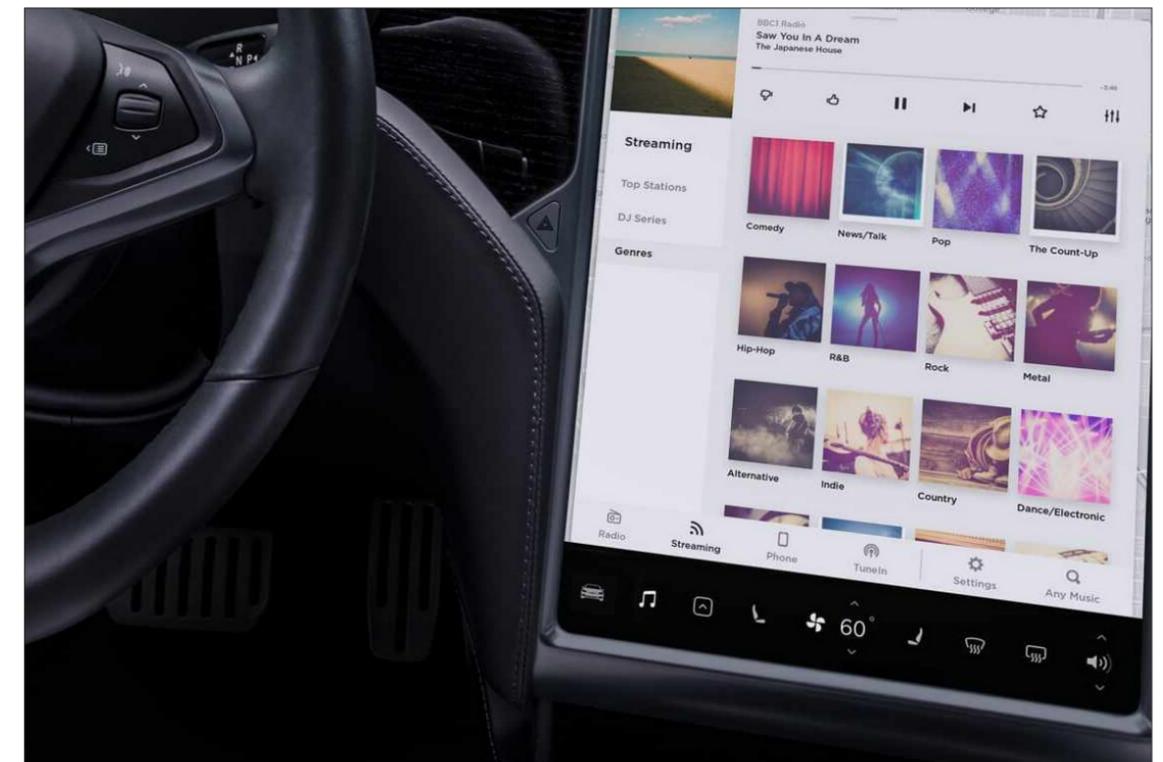
4014 Series



Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/ λ D (nm)	Efficacy (lm/W)	Vf(V)	If (mA)	$2\theta_{1/2}$ (°)	Rthj-sel. (K/W)	TJMax. (°C)	Color	
	Typ	Typ	Typ	Typ	Typ	Typ	Typ	Max		
RF-A2F40-R23D -R6	18	623	/	2.0	120	150	120	300	115	Red
RF-A2F40-Y93DY6	18	593	/	2.0	120	150	120	300	115	Yellow
RF-A1F40-W15BA8	35	(0.28,0.27)	110	3.0	90	120	120	300	115	White
RFA1F40W75BA8-	32	(0.30,0.29)	107	3.0	90	120	120	300	115	White

Application: LCD Backlight



Automotive exterior application

Product features

- Moisture sensitivity Level 2
- Electrostatic discharge withstand voltage level $\geq 2000V$ / $\geq 8000V$ (ESD protection device)
- Primer process or gold plating may be selected as sulfide protection
- RoHS compliant

Product description

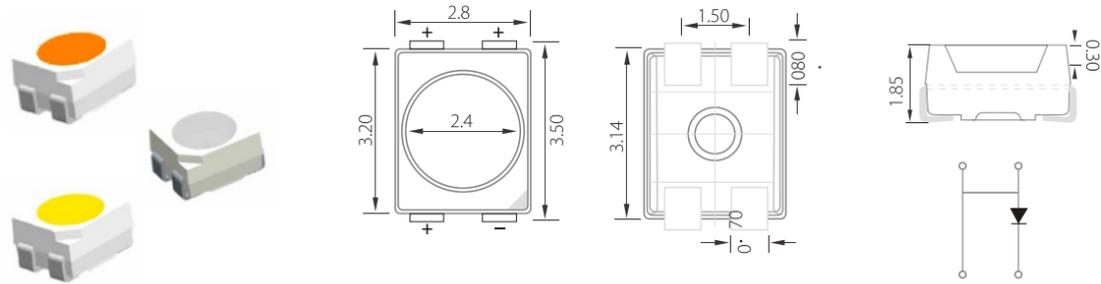
Highly reliable LEDs for automotive , qualification test plan is based AEC-Q101/Q102

Product application

- CHMSL
- RCL(Stop/Turn)
- TSL(Front/Rear)
- DRL
- Fog lamp
- Reverse lamp



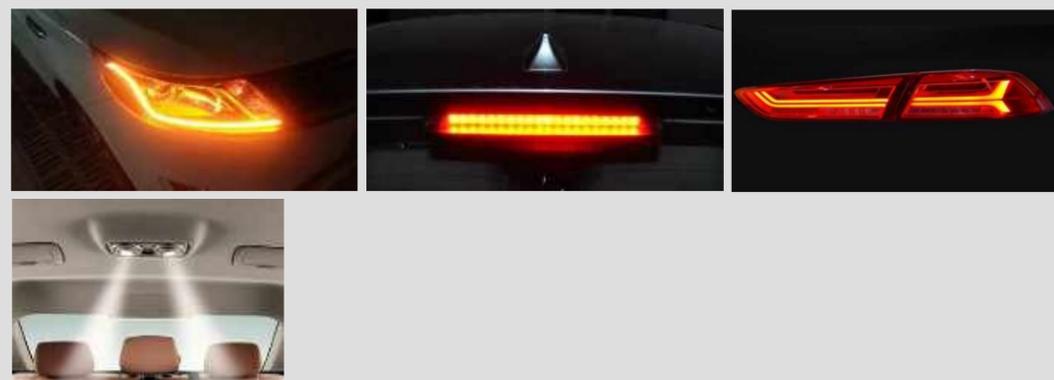
3528 PLCC4 Series



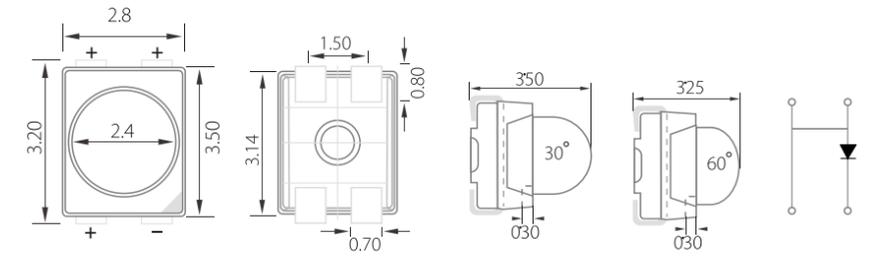
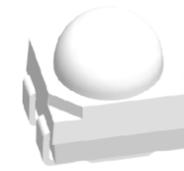
Typical electrical & Optical characteristics

Part No.	IV(mcd)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ		Typ	Typ	Max				
RF-A2A31-Y898-Y3	2800	589	2.0	50	70	120	130	125	Yellow
RF-A2A31-R228-R4	2800	622	2.0	50	70	120	130	125	Red
RF-A2A31-R328-R5	2300	632	2.0	50	70	120	130	125	Red
RF-A2A31-W558-A4	6500	(0.33,0.34)	3.0	50	70	120	130	125	White
RF-A2A31-WY58-A6	5000	(0.57,0.42)/590	3.0	50	70	120	130	125	PC Amber

Application: CHMSL, Rear Combination Lamp, Lamp Gesture recognition



3528 PLCC4 LENS Series



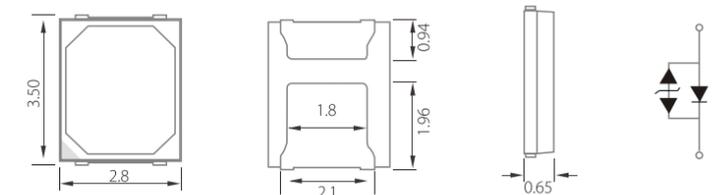
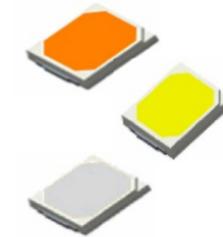
Typical electrical & Optical characteristics

Part No.	IV(mcd)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ		Typ	Typ	Max				
RF-A2B31-Y898-Y3	12000	589	2.0	50	70	30	130	125	Yellow
RF-A2B31-R218-R4	12000	621	2.0	50	70	30	130	125	Orange
RF-A2B31-R318-R5	9000	631	2.0	50	70	30	130	125	Red
RF-A2B3B-Y898-Y3	5000	589	2.0	50	70	60	130	125	Yellow
RF-A2B3B-R228-R4	5000	622	2.0	50	70	60	130	125	Orange
RF-A2B3B-R318-R5	4000	631	2.0	50	70	60	130	125	Red

Application: CHMSL, Rear Combination Lamp, Gesture recognition



2835 Series



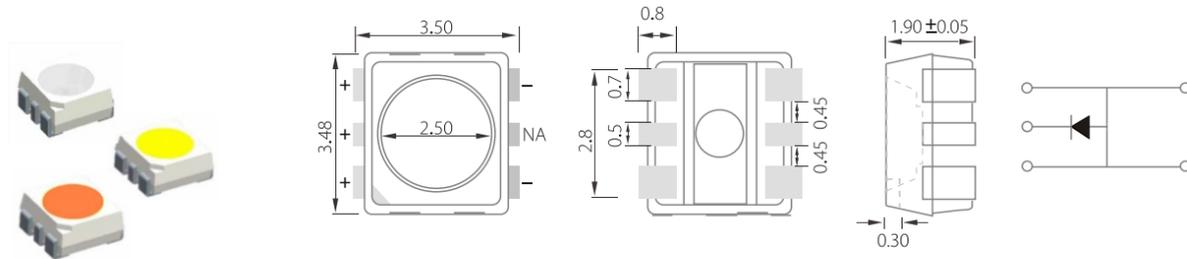
Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ		Typ	Typ	Max				
RF-A1T28-W559-A6	28	(0.30,0.32)	3.0	60	90	120	21	125	White
RF-A1T28-WY59-A4	15	(0.57,0.42)/590	3.0	60	90	120	21	125	PC Amber
RFA2T28W57EA9-	65	(0.33,0.34)	3.0	150	200	120	21	150	White
RF-A1T28-R21E-R6	24	621	2.0	150	200	120	21	150	Red
RF-A1T28-Y93E-Y6	24	593	2.0	150	200	120	21	150	Yellow

Application: Turning Signal light, Daytime Running Light, Rear Combination Lamp, Reading Light



3535 PLCC6 Series



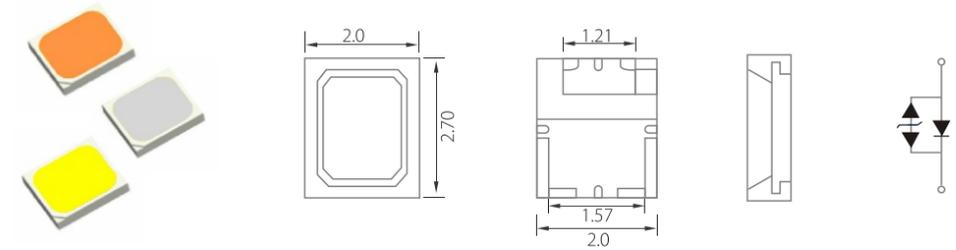
Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2(°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ			Typ	Typ				
RF-A2T35-Y93E-Y6	24	593	2.0	150	200	120	21	150	Yellow
RF-A2T35-R21E-R6	24	621	2.0	150	200	120	21	150	Red
RF-A2T35-WY5E-A8	45	(0.57,0.42)/590	3.0	150	200	120	21	150	PC Amber
RF-A2T35-W57E-A8	70	(0.33,0.34)	3.0	150	200	120	21	150	White

Application: Turning Signal light, Rear Combination Lamp



EMC2720 Series



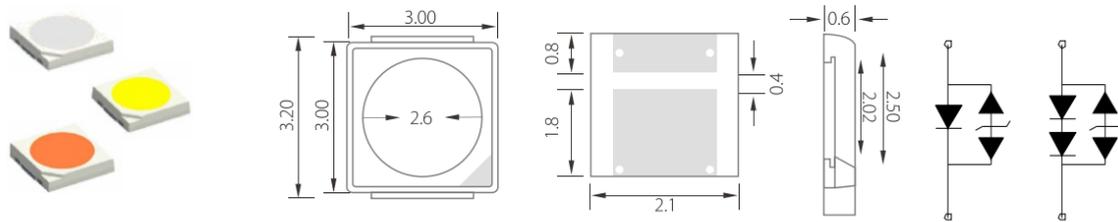
Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2(°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ			Typ	Typ				
RFA2E27W56EA9B	145	(0.33,0.34)	6.0	150	200	120	12	150	White
RFA1E27WY5HB8 -	60	(0.57,0.42)/590	3.0	350	400	120	12	150	PC Amber
RFA1E27R22HR8 -	55	622	2.0	350	400	120	12	150	Red

Application: Turning Signal light, Daytime Running Light, Rear Combination Lamp, Reading Light



EMC 3030 Series



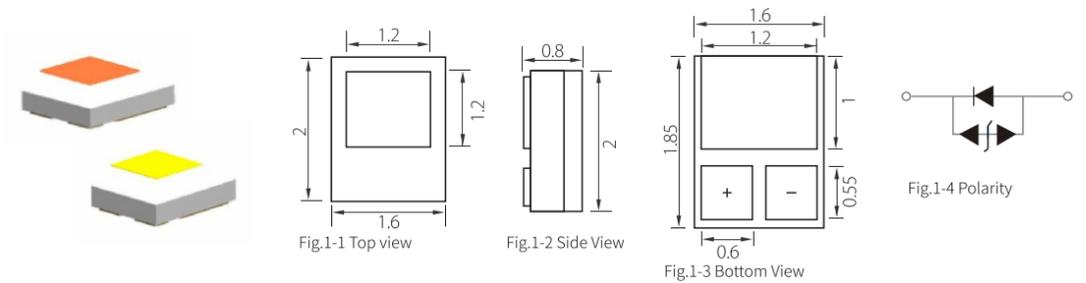
Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2(°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ			Typ	Typ				
RF-A1E30-R22H-R8	55	622	2.0	350	400	120	12	150	Orange
RF-A2E30-W56E-A9B	145	(0.33,0.34)	6.0	150	200	120	12	150	White
RF-A1E30-WY5H-B8	65	(0.57,0.42)/590	3.0	350	400	120	12	150	PC Amber

Application: CHMSL, Rear Combination Lamp, Lamp Gesture recognition



Ceramic 1 Chips Series



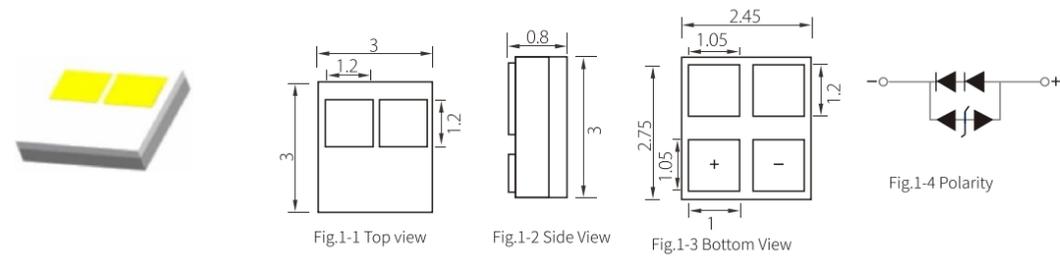
Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2(°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ			Typ	Typ				
RFA3H10W57PE5 -	325	(0.33,0.34)	3.2	1000	1200	120	4.5	140	White
RF-A3H10-WY5P-E5	170	(0.57,0.42)/590	3.2	1000	1200	120	4.5	140	PC Amber
RF-B4H10-W57P-E4	300	(0.33,0.34)	3.2	1000	1000	120	4.5	140	White
RF-B4H10-WY5P-E4	155	(0.57,0.42)/590	3.2	1000	1000	120	4.5	140	PC Amber

Application: Turning Signal light, Daytime Running Light, Rear Combination Lamp, Reading Light



Ceramic 2 Chips Series



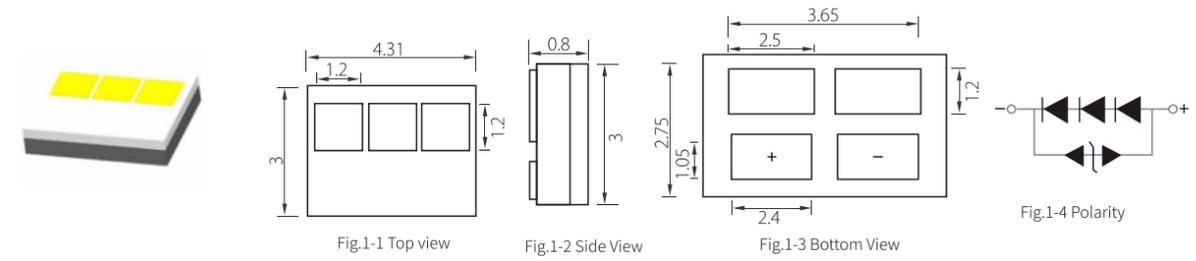
Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ	Typ	Typ	Typ	Max	Typ	Typ		
RF-A3H22-W57P-E5	650	(0.33,0.34)	6.5	1000	1200	120	2.9	140	White
RF-A3H22-W57P-E4	600	(0.33,0.34)	6.5	1000	1200	120	2.9	140	White

Application: Head Lamp



Ceramic 3 Chips Series



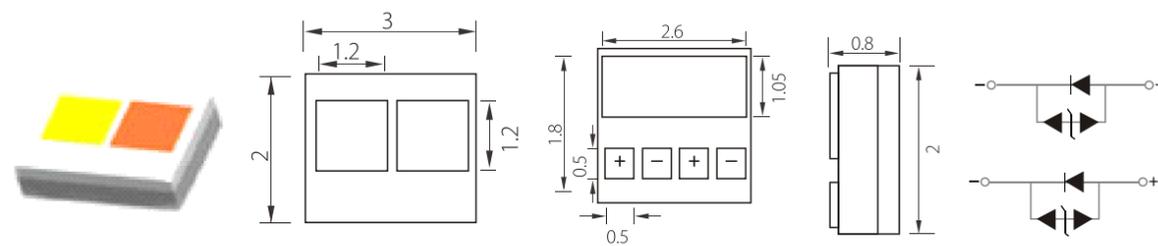
Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ	Typ	Typ	Typ	Max	Typ	Typ		
RF-A3H30-W57P-E5	930	(0.33,0.34)	10	1000	1200	120	2.9	140	White

Application: Head Lamp



Ceramic 2 Chips Bi-Color Series



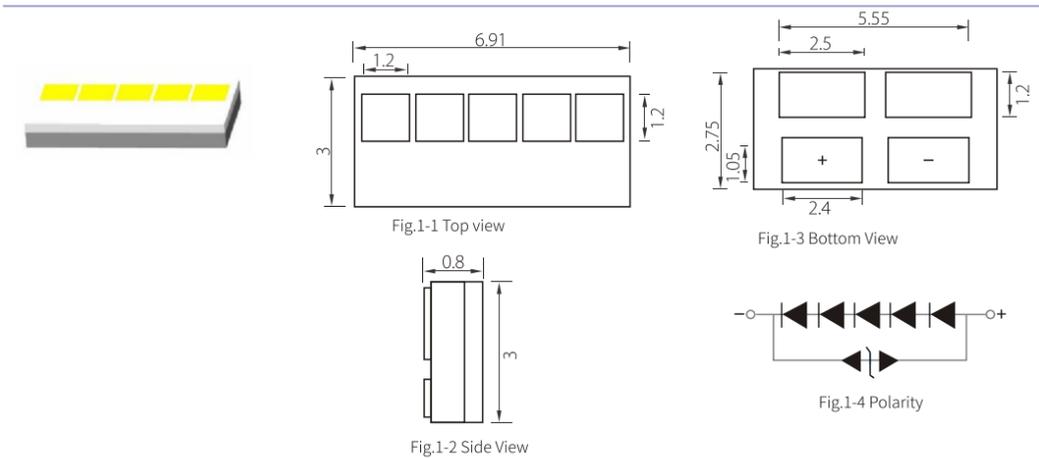
Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ	Typ	Typ	Typ	Max	Typ	Typ		
RF-A3H21-2W2P-B1	White:325 Amber:170	White:(0.33,0.34) Amber:(0.57,0.42)	3.2	1000	1200	120	3.2	140	Bi-color

Application: Turning Signal light, Daytime Running Light



Ceramic 5 Chips Series



Typical electrical & Optical characteristics

Part No.	Luminous Flux(lm)	X/Y/λD(nm)	Vf(V)	If (mA)		2θ1/2 (°)	Rthj-sel. (K/W)	TJMax. (°C)	Color
	Typ	Typ	Typ	Typ	Max	Typ	Typ		
RF-A3H50-W57P-E5	1350	(0.33,0.34)	16	1000	1200	120	2.2	140	White

Application: Head Lamp



Exterior lighting



- High power output and high luminance
- Small size, easy to match
- Hot pressing eutectic process, high thermal conductivity AlN ceramic substrate, low thermal resistance
- High heat resistance inorganic phosphor coating, high moisture resistance
- High reliability
- AEC-Q102

Typical Characteristics

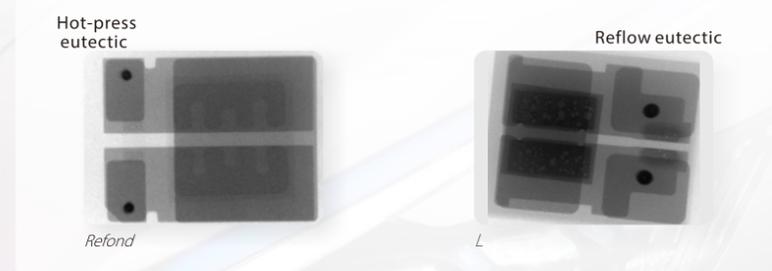
Series	IF(mA)	Φ(lm)	CCT(k)	WLD (nm)	2T1/2(°)	Rth(kw)	L*W*T(mm)
2016	700	250	6000	-	120	4.5	2.0*1.6*0.82
2016	700	70	1700	590	120	4.5	2.0*1.6*0.82

Application



Hot pressing eutectic process, good products are made by Refond.

-In 2018, Refond took the lead in introducing hot-press eutectic equipment, focusing on high-end automotive products.



Type	Testing Current(mA)	Thermostat Temperature	Junction temperature	Rthj-s(K/W)
Hot-press eutectic	1000	25°C	60.59°C	3.55
Reflow eutectic	1000	25°C	65.35°C	4.32

- The hot-press eutectic process has a low void ratio, comparing to reflow process is basically void-free.
- The hot-press eutectic process has lower thermal resistance, 20% decrease compared to reflow process.

Automotive LED Product Series

Product series	Power (W)	Interior					
		Switch	Dashboard	Map	Atmosphere	Induction	Display
Mini2014	0.1	✓	✓		✓		
Mini2014B	0.1	✓	✓				
3528 PLCC2	0.1	✓	✓	✓			
3528B PLCC2	0.1	✓	✓				
3528 PLCC2 Lens	0.1	✓	✓				
3528B PLCC2 Lens	0.1						
3528 PLCC4	0.2			✓			

Automotive LED Product Series

Product series	Power (W)	Interior					
		Switch	Dashboard	Map	Atmosphere	Induction	Display
3528 PLC4IR	0.2					✓	
3528 PLCC4 Lens	0.2						
3528 PLCC4 IR Lens	0.2					✓	
2835	0.5			✓			
35358 PLCC6	0.5			✓			
3535 RGB	0.2	✓					
EMC3030	0.5-1			✓			

Automotive LED Product Series

Product series	Power (W)	Interior					
		Switch	Dashboard	Map	Atmosphere	Induction	Display
 2720	1-3			✓			
 EMC 3030 VCSEL	2					✓	
 HL mono chip	1-3			✓			
 0603 0.4T	0.06	✓	✓				
 0603 0.7T	0.06	✓	✓				
 0805 0.7T	0.06	✓	✓				
 1206 0.7T	0.06	✓	✓				

Automotive LED Product Series

Product series	Power (W)	Exterior							
		Outline lamp	stop lamp	CHMSL	reversing light	DRL	turn light	Fog Light	Head lamp
 3528 PLCC4	1-3					✓	✓	✓	
 EMC 3030 VCSEL	2								
 HL mono chip	1-3					✓	✓	✓	
 HL bi-chips	7								✓
 HL tri-chips	11								✓
 HL five-chips	18								✓

Automotive LED Product Series

Product series	Power (W)	Exterior							
		Outline lamp	stop lamp	CHMSL	reversing light	DRL	turn light	Fog Light	Head lamp
 3528 PLCC4	0.2	✓	✓	✓				✓	
 3528 PLCC4 Lens	0.2	✓	✓	✓				✓	
 3528 PLCC4 IR Lens	0.2								
 2835	0.5	✓	✓			✓	✓	✓	
 35358 PLCC6	0.5	✓	✓			✓	✓	✓	
 EMC3030	0.5-1					✓	✓		

