

股票代码：002449



CHIP LED器件

NATIONSTAR

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FOSHAN NATIONSTAR OPTOELECTRONICS CO.,LTD

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高端CHIP LED制造商

公司简介



国星光电总部 佛山华宝厂区
公司总部，LED器件、LED组件生产基地
占地面积：60,600平方米
建筑面积：139,000平方米

佛山市国星光电股份有限公司是专业从事研发、生产、销售LED及LED应用产品的高新技术企业，国家火炬计划重点高新技术企业。

公司建于1969年，1976年开始涉足LED封装，是国内最早生产LED的企业之一。经过四十多年的发展，公司借助资金、技术、人才和管理等方面的优势为行业所认可。2014年，广东省属大型国有骨干企业广晟资产经营有限公司入资，国星光电成为混合所有制模式的实践者。

公司先后通过了ISO9001质量管理体系认证、ISO14001环境管理体系认证、ISO/TS16949质量管理体系认证、OHSAS18001职业健康安全管理体系认证。

国星光电坚信创新推动发展，科技引领未来；产品是基础，质量是关键。公司发展以封装主营业务，建立完善LED全产业链，实现垂直一体化。

未来，国星光电将坚持LED产业链整合，坚持科技兴企、人才领先、管理规范、文化优秀，致力于成为全面领先的LED企业，努力推动LED产业的发展。

CHIP LED事业部简介

国星光电2000年开始研发、生产CHIP LED产品，是国内最早进入CHIP LED封装行业的企业，应用领域包括信号指示、家电、小尺寸背光、汽车、红外、光敏等。

CHIP LED事业部成立于2015年10月，配有先进的自动化生产线及生产设备、国际领先的品质检测及可靠性验证设备，致力于研发、生产及销售CHIP LED器件，目标定位高端CHIP LED制造商。



企业荣誉



2014年，国星光电LED光组件检测联合实验室获授权



半导体照明技术标准工作组成员单位



广东省高新技术企业



国家火炬计划重点高新技术企业



全国质量和服务诚信优秀企业



广东省名牌产品



广东省创新型企业

体系认证



ISO9001质量管理
体系证书



ISO-TS16949质量管
理体系证书



OHSAS18001职业健康
安全管理体系证书



ISO14001环境管理
体系证书

合作伙伴



HUAWEI

Panasonic

CASIO



TP-LINK

SanDisk 闪迪

net·core 磊科



FOXCONN
富士康科技集团

Hisense 海信

Vanward 万和

FLEXTRONICS X
伟创力



美的 Midea

Haier

志高 CHIGO

铁将军

FORYOU
ADAYO 华阳集团

Tongda

TAIKING

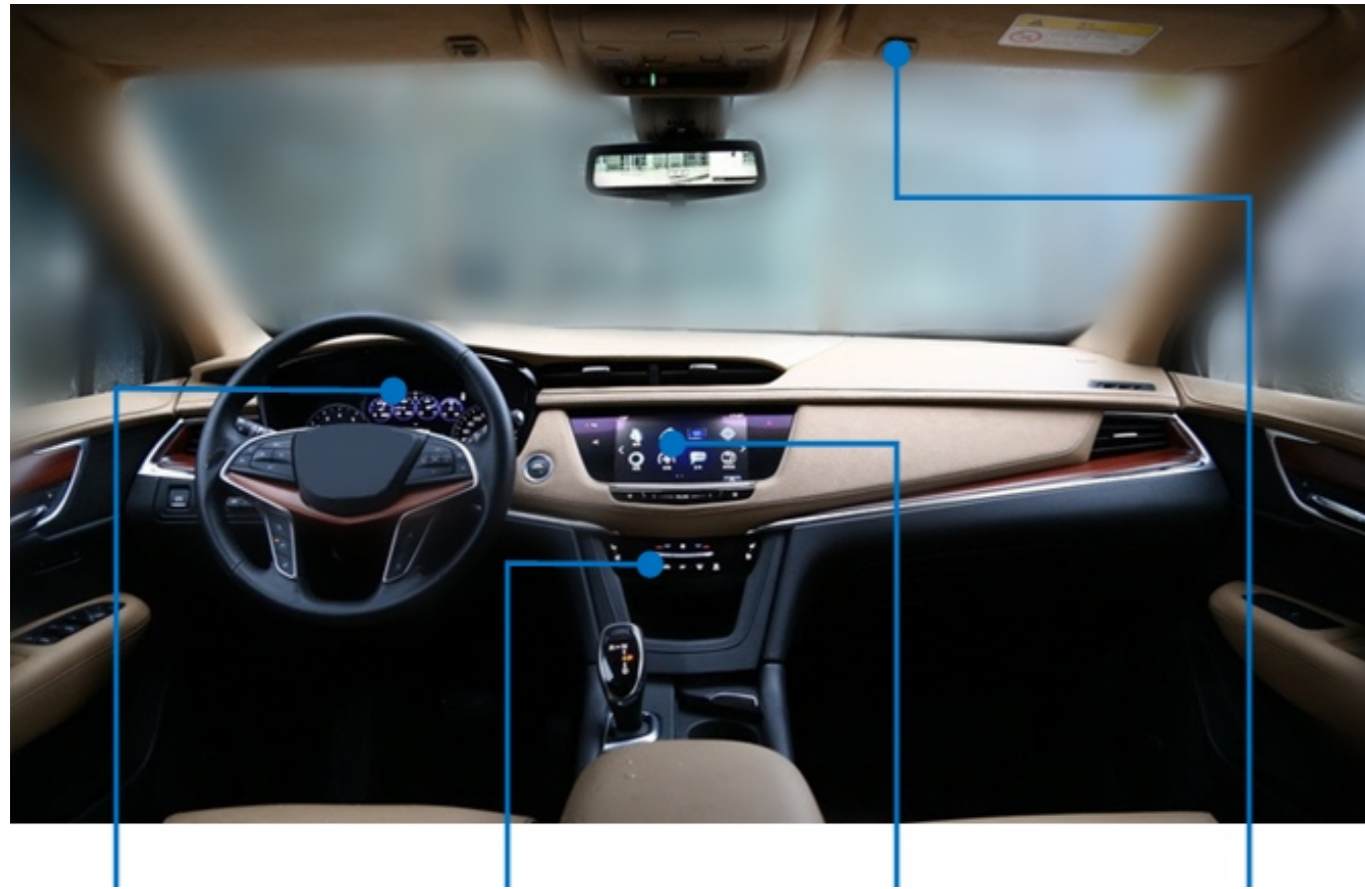
产品应用案例

一、指示



产品应用案例

二、车载



①仪表盘背光 ②车载音频、空调、按键背光 ③多媒体背光 ④车内指示照明



⑤边信号灯 ⑥昼行灯 ⑦车头灯 ⑧转向灯 ⑨高位刹车灯 ⑩后尾灯

产品应用案例

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产品应用案例

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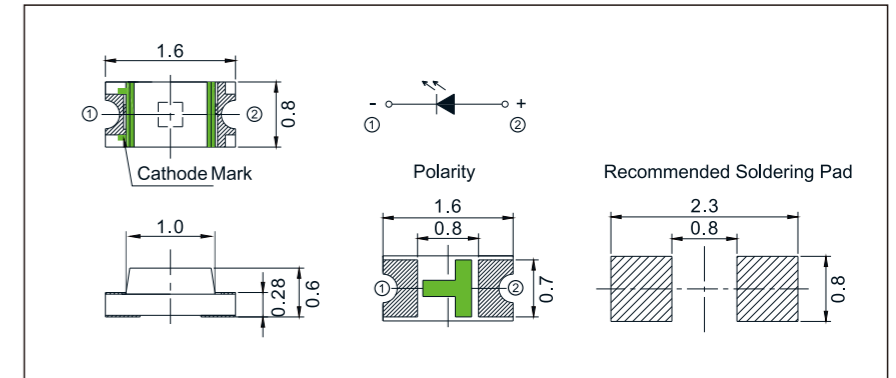
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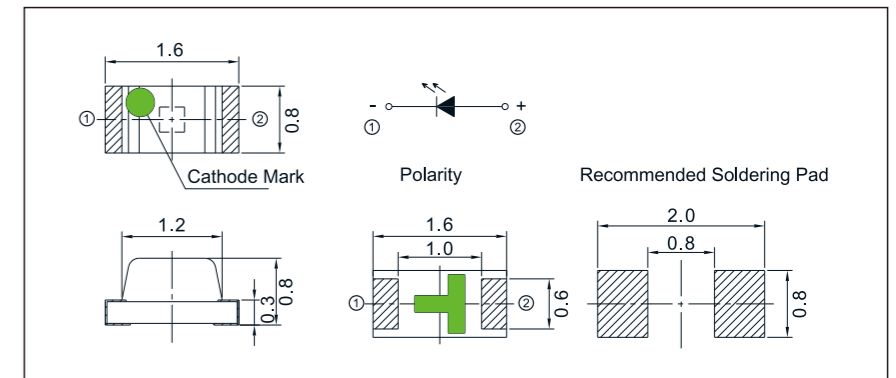
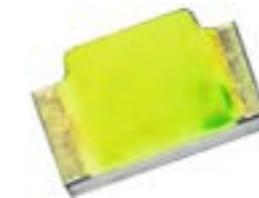
Indicator/CHIP LED/Top View

D1608



Product	Size (LxWxHmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-D1608HRK-620D	1.6x0.8x0.6	Red	20	620	2.0	80	150	130
FC-D1608HOK-600H	1.6x0.8x0.6	Orange	20	605	2.0	100	180	130
FC-D1608HYK-588J	1.6x0.8x0.6	Yellow	20	589	2.0	70	150	130
FC-D1608HGK-572C	1.6x0.8x0.6	Yellow Green	20	570	2.0	20	36	130
FC-D1608UGK-520D10	1.6x0.8x0.6	Green	10	525	3.0	500	900	130
FC-D1608BK-470H10	1.6x0.8x0.6	Blue	10	470	3.0	80	180	130
FC-D1608WD-460H5	1.6x0.8x0.6	White	5	(0.29, 0.29)	3.0	400	850	130

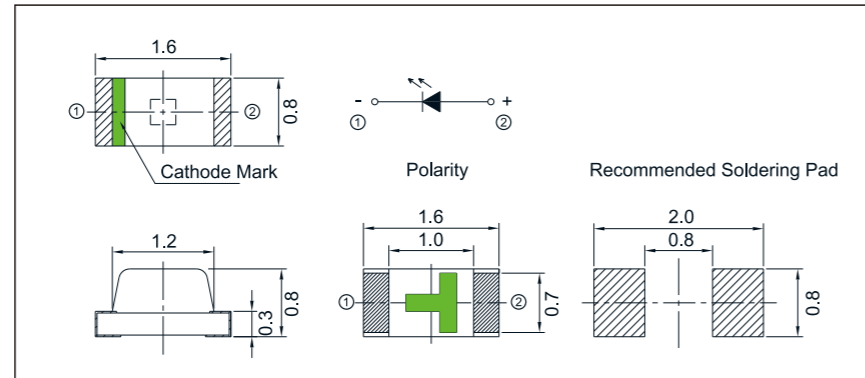
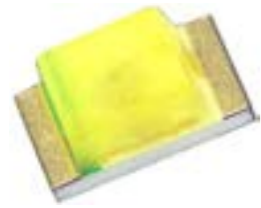
A1608



Product	Size (LxWxHmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-A1608WD3-460Q	1.6x0.8x0.8	White	20	(0.24, 0.21)	3.0	570	850	130
FC-A1608WD-455Q	1.6x0.8x0.8	White	20	(0.26, 0.24)	3.0	770	1020	130
FC-A1608WD3-457XE	1.6x0.8x0.8	White	20	(0.24, 0.20)	3.0	700	1020	130
FC-A1608WD-455H	1.6x0.8x0.8	White	5	(0.28, 0.28)	2.8	240	330	130

Indicator/CHIP LED/Top View

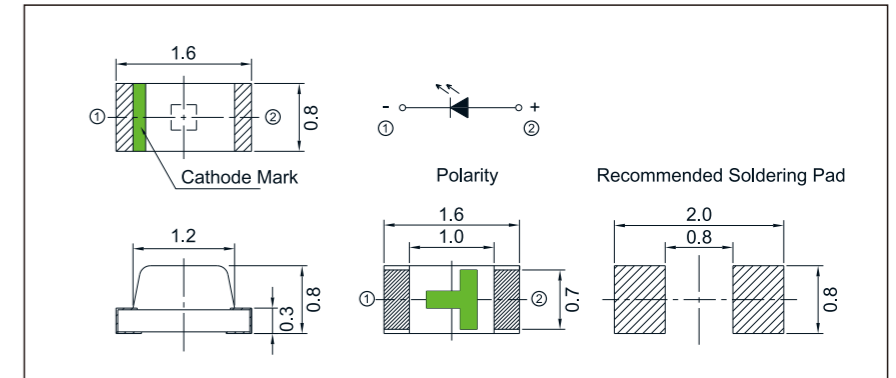
1608



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-1608HRK-620H	1.6×0.8×0.8	Red	20	625	2.0	65	120	130
FC-1608YOXK-600H08	1.6×0.8×0.8	Orange	20	604	2.0	100	220	130
FC-1608HYK-585F08	1.6×0.8×0.8	Yellow	20	588	2.0	80	150	130
FC-1608HGK-572E	1.6×0.8×0.8	Yellow Green	20	572	2.1	45	80	130
FC-1608UGK-520D	1.6×0.8×0.8	Green	20	527	3.0	500	900	130
FC-1608BK-465G5	1.6×0.8×0.8	Blue	5	470	2.9	30	55	130
FC-1608SEK-624C	1.6×0.8×0.8	Red	20	625	2.0	45	120	130
FC-1608YOEK-605C	1.6×0.8×0.8	Orange	20	604	2.0	65	150	130
FC-1608HYK-580F	1.6×0.8×0.8	Yellow	20	588	2.0	70	150	130
FC-1608HYK-588M	1.6×0.8×0.8	Yellow	20	588	2.1	100	200	130
FC-1608HGK-572E	1.6×0.8×0.8	Yellow Green	20	570	2.1	36	80	130
FC-1608UGK-520D	1.6×0.8×0.8	Green	20	527	3.0	500	1080	130
FC-1608BK-470ME	1.6×0.8×0.8	Blue	20	472	3.1	120	270	130
FC-1608WD3-460NE	1.6×0.8×0.8	White	20	(0.24, 0.20)	3.0	400	520	130
FC-1608WD4-460K	1.6×0.8×0.8	White	20	(0.28, 0.26)	3.0	400	630	130

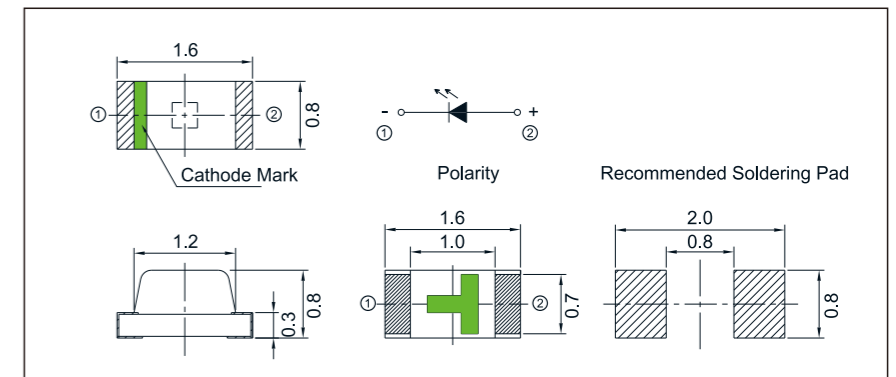
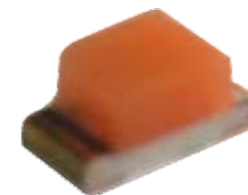
Indicator/CHIP LED/Top View

1608 Ice Blue



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-1608WBD-457M	1.6×0.8×0.8	Sky Blue	20	(0.18, 0.20)	3.0	500	800	130
FC-1608WBD-460NE	1.6×0.8×0.8	Ice Blue	20	(0.20, 0.24)	3.0	400	70030	130

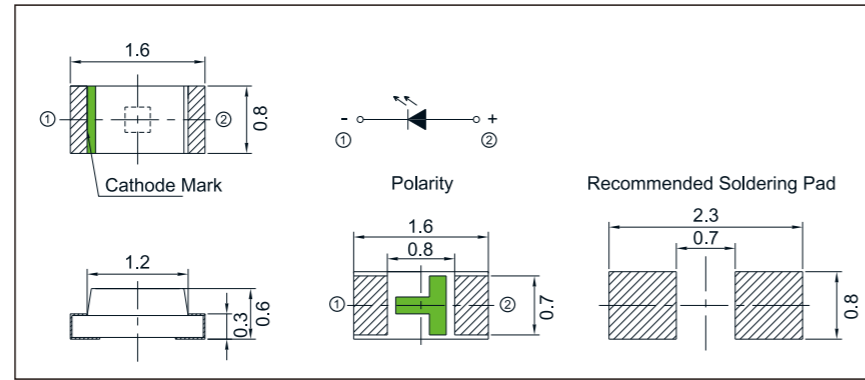
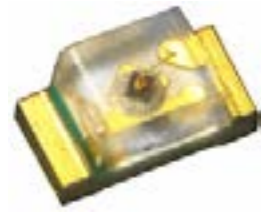
1608 Pink



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-1608WPD-462M	1.6×0.8×0.8	Pink	20	(0.35, 0.18)	3.0	100	400	130

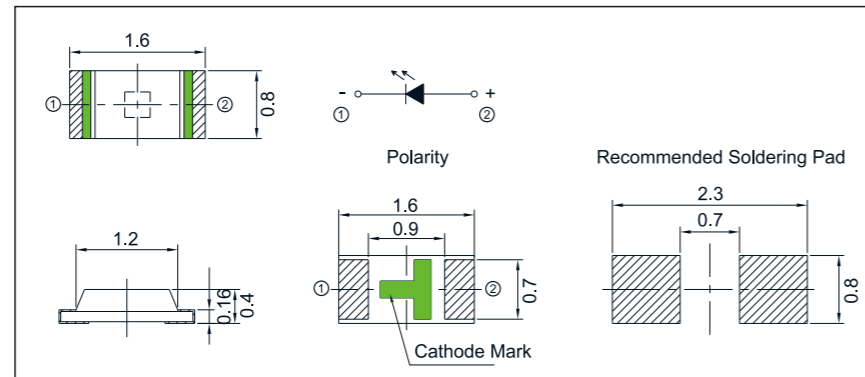
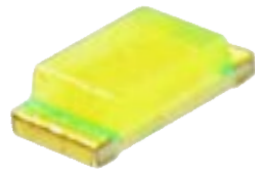
Indicator/CHIP LED/Top View

T1608



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-T1608HRK-620N	1.6×0.8×0.6	Red	20	625	2.0	80	150	130
FC-T1608HOK-600N	1.6×0.8×0.6	Orange	20	604	2.0	100	220	130
FC-T1608HYK-588N	1.6×0.8×0.6	Yellow	20	588	2.0	100	180	130
FC-T1608HGK-572N	1.6×0.8×0.6	Yellow Green	20	572	2.1	45	80	130
FC-T1608UGK-520N	1.6×0.8×0.6	Green	20	527	3.0	500	900	130
FC-T1608BK-465N	1.6×0.8×0.6	Blue	5	470	2.9	30	55	130
FC-T1608WD-460N	1.6×0.8×0.6	White	5	(0.27, 0.24)	3.0	200	500	130

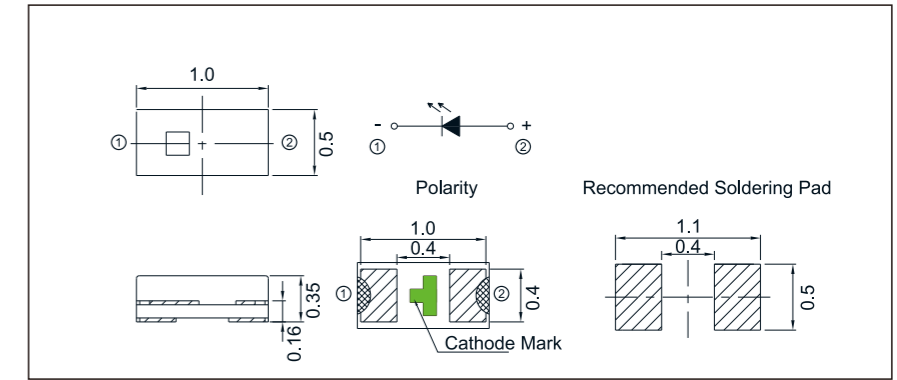
F1608



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-F1608HYK-589C5	1.6×0.8×0.4	Yellow	5	590	1.9	10	45	130
FC-F1608GEK-572C5	1.6×0.8×0.4	Yellow Green	5	570	1.9	6	24	130
FC-F1608BK-470H5	1.6×0.8×0.4	Blue	5	472	3.0	30	55	130
FC-F1608WD-455K5	1.6×0.8×0.4	White	5	(0.29, 0.30)	3.0	200	360	130

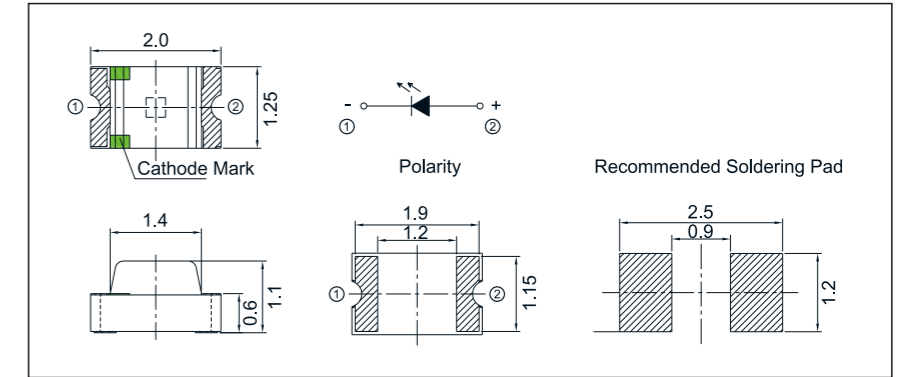
Indicator/CHIP LED/Top View

1005



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-F1005HRK-620H5	1.0×0.5×0.35	Red	5	625	2.0	65	120	130
FC-F1005HOK-600H5	1.0×0.5×0.35	Orange	5	604	2.0	100	220	130
FC-F1005HYK-589K5	1.0×0.5×0.35	Yellow	5	588	2.0	80	150	130
FC-F1005YGK-572J5	1.0×0.5×0.35	Yellow Green	5	572	2.1	45	80	130
FC-F1005UGK-520M5	1.0×0.5×0.35	Green	5	527	3.0	500	900	130
FC-F1005BK-470G5	1.0×0.5×0.35	Blue	5	470	2.9	30	55	130
FC-F1005WD-455K5	1.0×0.5×0.35	White	5	(0.26, 0.25)	2.6	150	360	130

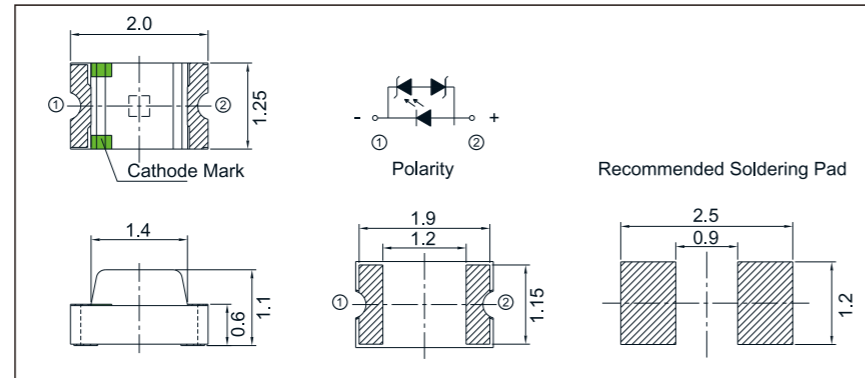
2012



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-2012HRK-660	2.0×1.25×1.1	Red	20	630	2.0	6	20	130
FC-2012HRK-620D	2.0×1.25×1.1	Red	20	620	2.2	80	180	130
FC-2012YOXK(5)-600H	2.0×1.25×1.1	Orange	5	605	1.8	30	65	130
FC-2012HYK-588J	2.0×1.25×1.1	Yellow	20	589	2.1	80	150	130
FC-2012GHK-570A08	2.0×1.25×1.1	Yellow Green	20	573	2.0	20	36	130
FC-2012UGK-520D5	2.0×1.25×1.1	Green	5	532	2.7	180	330	130
FC-A2012BK-470H2	2.0×1.25×1.1	Blue	2	474	2.8	20	55	130
FC-A2012WD-457H5	2.0×1.25×1.1	White	5	(0.26, 0.24)	2.8	200	360	130
FC-2012WBV-460G	2.0×1.25×1.1	White	15	(0.29, 0.29)	3.0	400	850	130

Indicator/CHIP LED/Top View

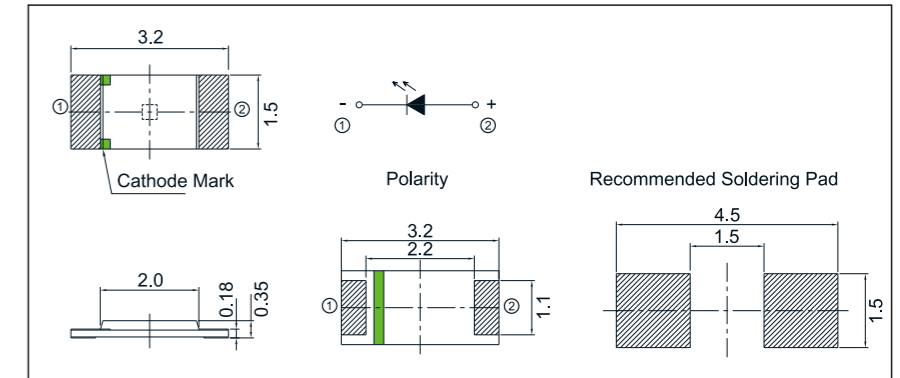
2012



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-2012BK-470NS5	2.0×1.25×1.1	Blue	5	470	2.8	120	300	130
FC-S2012WBY(5)-460K	2.0×1.25×1.1	White	1	(0.28, 0.31)	2.6	20	45	130
FC-A2012WD3-457QS	2.0×1.25×1.1	White	20	(0.24, 0.20)	3.0	850	1020	130

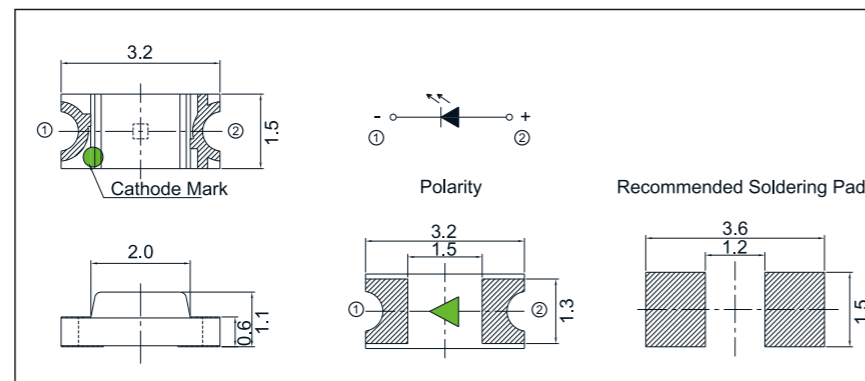
Indicator/CHIP LED/Top View

F3215



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-F3215HRK-620D	3.2×1.5×0.35	Red	20	620	2.0	100	270	130
FC-F3215HOK-605E	3.2×1.5×0.35	Orange	20	605	2.0	65	120	130
FC-F3215HYK-589D	3.2×1.5×0.35	Yellow	20	590	2.0	50	125	130
FC-F3215HGK-572C	3.2×1.5×0.35	Yellow Green	20	572	2.1	25	80	130
FC-F3215BK-470D	3.2×1.5×0.35	Blue	20	470	3.0	200	360	130
FC-F3215WD-460M	3.2×1.5×0.35	White	20	(0.29, 0.29)	3.0	600	1200	130

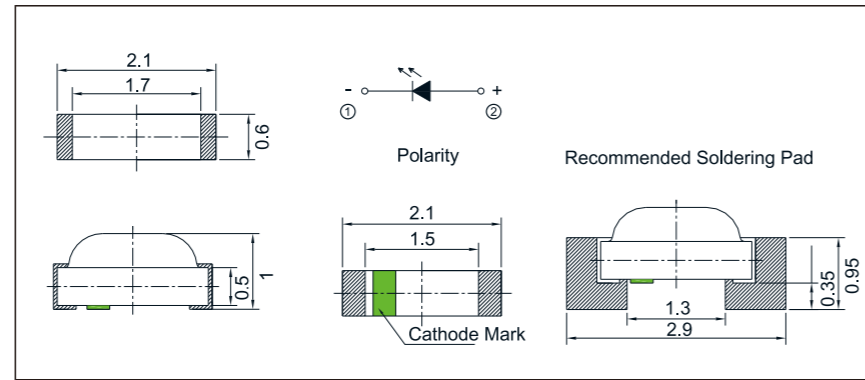
3215



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-3215HRK-620D	3.2×1.5×1.1	Red	20	620	2.1	65	150	130
FC-3215HRK-625H	3.2×1.5×1.1	Red	20	623	2.2	270	500	130
FC-3215HOK-600H	3.2×1.5×1.1	Orange	20	604	2.1	100	180	130
FC-3215HYK-588J	3.2×1.5×1.1	Yellow	20	589	2.1	65	150	130
FC-3215GHK-570A08	3.2×1.5×1.1	Yellow Green	5	571	2.0	5	11	130
FC-3215UGK-520D	3.2×1.5×1.1	Green	20	521	3.1	330	750	130
FC-3215BK-470H10	3.2×1.5×1.1	Blue	20	469	3.0	55	100	130
FC-3215WD-460M	3.2×1.5×1.1	White	5	(0.27, 0.25)	2.7	150	250	130

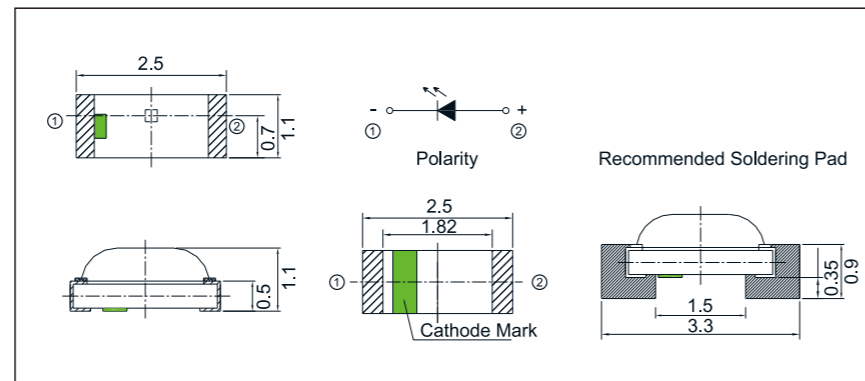
Indicator/CHIP LED/Side View

2110



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-2110HRK-620M	2.1×1.0×0.6	Red	20	624	2.0	100	220	130
FC-2110HYK-588M	2.1×1.0×0.6	Yellow	20	588	2.0	70	150	130
FC-2110YGK-572K	2.1×1.0×0.6	Yellow Green	20	572	2.1	30	100	130
FC-2110BK-470L	2.1×1.0×0.6	Blue	20	470	3.0	30	80	130
FC-2110WD-455K	2.1×1.0×0.6	White	5	(0.27, 0.22)	2.8	30	100	130

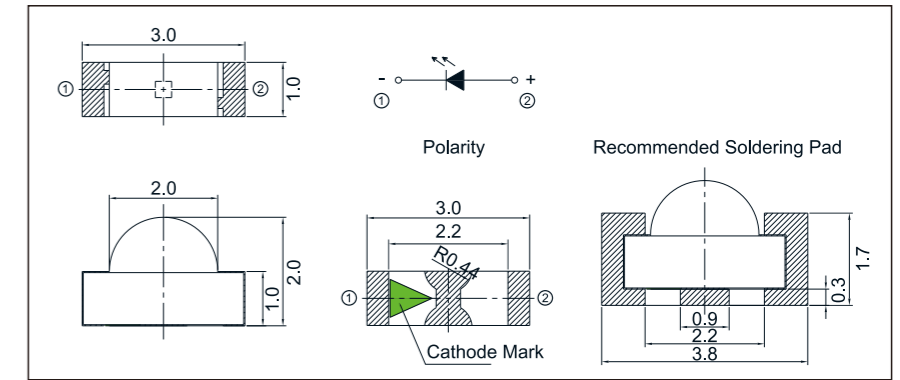
2510



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-2510YEW-589F	2.5×1.0×1.0	Yellow	20	591	2.1	80	200	130
FC-2510GEW-572D	2.5×1.0×1.0	Yellow Green	20	572	2.1	20	100	130

Indicator/CHIP LED/Side View

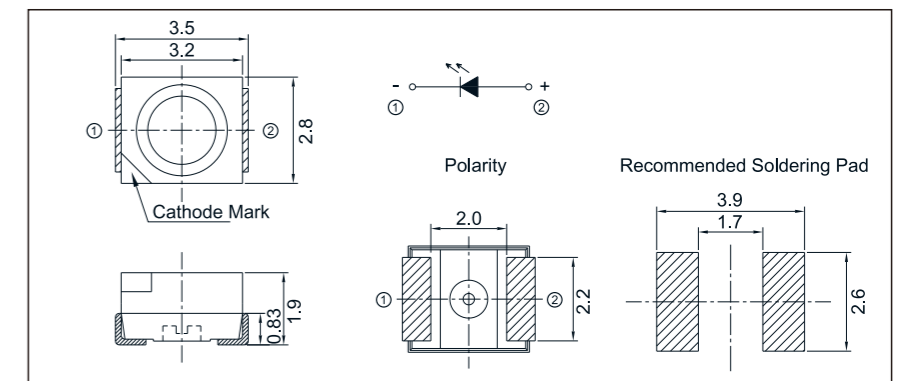
3010



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-3010HRK-630H	3.0×2.0×1.0	Red	20	630	1.8	30	100	130
FC-3010UGK-520N	3.0×2.0×1.0	Green	20	520	3.2	150	400	130
FC-3010BK-470M	3.0×2.0×1.0	Blue	20	467	3.2	80	200	130

Indicator/TOP LED/Top View

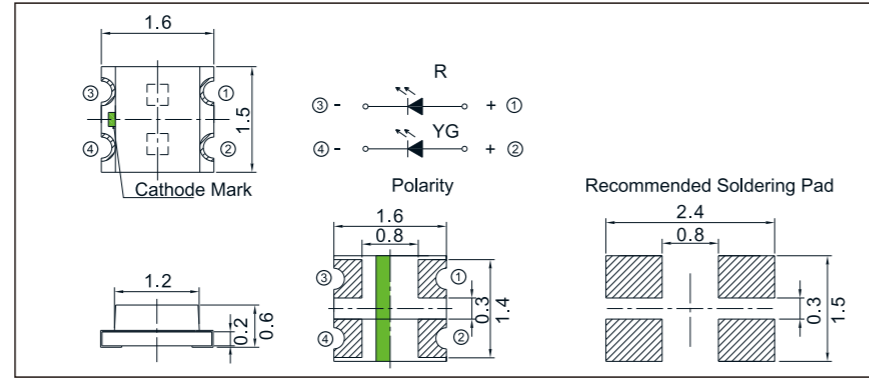
3528



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FM-3528HRW-624S	3.5×2.8×1.9	Red	20	620	2.0	450	1000	130
FM-3528HOW-603S	3.5×2.8×1.9	Orange	20	605	2.0	165	580	130
FM-3528HYW-589S	3.5×2.8×1.9	Yellow	20	589	2.1	600	1300	130
FM-3528YGW-571S	3.5×2.8×1.9	Yellow Green	20	570	2.1	60	280	130
FM-3528UGW-522T	3.5×2.8×1.9	Green	20	525	3.0	960	1900	130
FM-3528BW-470H	3.5×2.8×1.9	Blue	20	470	3.0	300	650	130

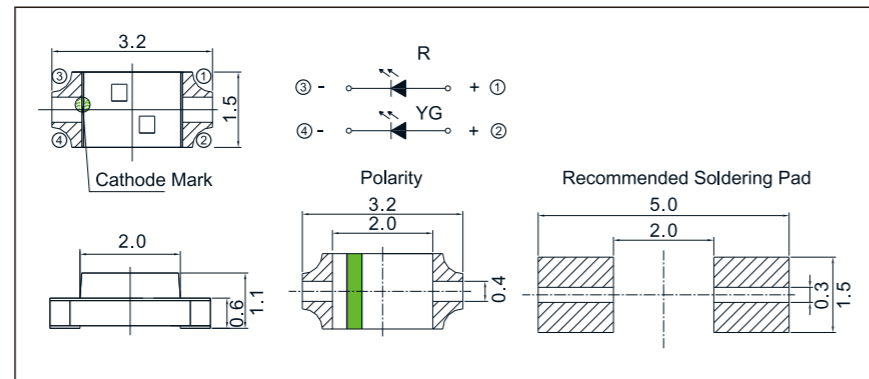
Indicator/CHIP LED/Top View

1616 Bi-Color



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-1616RGK	1.6×1.5×0.6	Red Yellow Green	20	R : 625 YG : 572	R : 2.0 YG : 2.0	R : 80 YG : 20	R : 180 YG : 65	130
FC-1616DRGK	1.6×1.5×0.6	Dark Red Yellow Green	20	R : 630 YG : 572	R : 2.0 YG : 2.0	R : 20 YG : 20	R : 80 YG : 65	130
FC-1616RBK	1.6×1.5×0.6	Red Blue	20	R : 625 B : 470	R : 2.0 B : 3.0	R : 80 B : 36	R : 180 B : 80	130
FC-1616DRBK	1.6×1.5×0.6	Dark Red Blue	20	R : 630 B : 470	R : 2.0 B : 3.0	R : 45 B : 36	R : 120 B : 80	130
FC-1616YGK	1.6×1.5×0.6	Yellow Green Yellow	20	YG : 572 Y : 588	YG : 2.0 Y : 2.0	YG : 20 Y : 36	YG : 65 Y : 80	130
FC-1616OGK	1.6×1.5×0.6	Orange Yellow Green	20	O : 605 YG : 572	O : 2.0 YG : 2.0	O : 100 YG : 20	O : 150 YG : 65	130

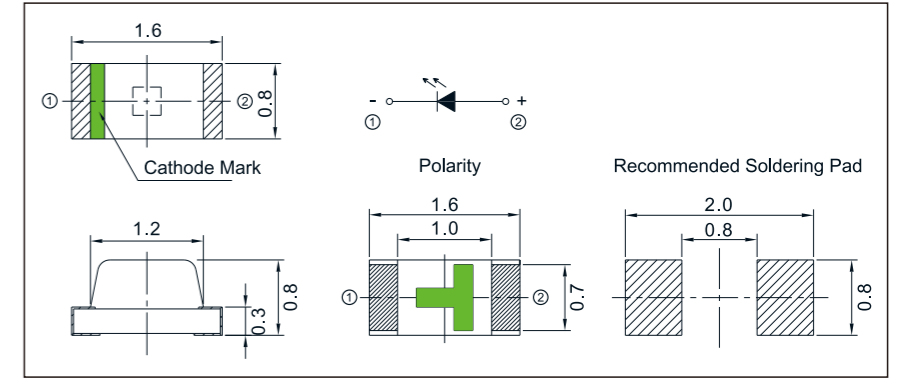
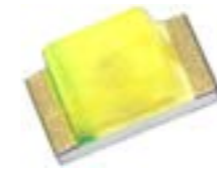
3215 Bi-Color



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-3215RGK	3.2×1.5×1.1	Red Yellow Green	20	R : 625 YG : 572	R : 2.0 YG : 2.0	R : 80 YG : 20	R : 180 YG : 65	130
FC-3215RBK	3.2×1.5×1.1	Red Blue	20	R : 625 B : 470	R : 2.0 B : 3.0	R : 80 B : 36	R : 180 B : 80	130
FC-3215YGK	3.2×1.5×1.1	Yellow Green Yellow	20	YG : 572 Y : 588	YG : 2.0 Y : 2.0	YG : 20 Y : 36	YG : 65 Y : 80	130

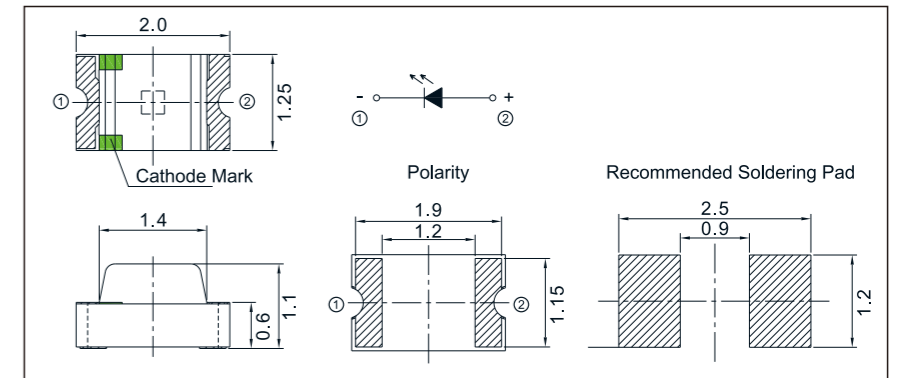
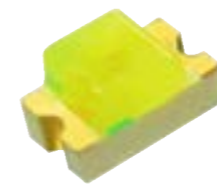
Vehicle/CHIP LED/Top View

1608



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-1608SEK-624C-AM	1.6×0.8×0.8	Red	20	625	2.0	45	120	130
FC-1608HYK-588M-AM	1.6×0.8×0.8	Yellow	20	588	2.1	100	200	130
FC-1608HGK-572E-AM	1.6×0.8×0.8	Yellow Green	20	570	2.1	36	80	130
FC-1608BK-470E-AM	1.6×0.8×0.8	Blue	20	472	3.1	100	220	130
FC-A1608WD-455Q-AM	1.6×0.8×0.8	White	20	(0.26, 0.24)	3.0	770	1020	130

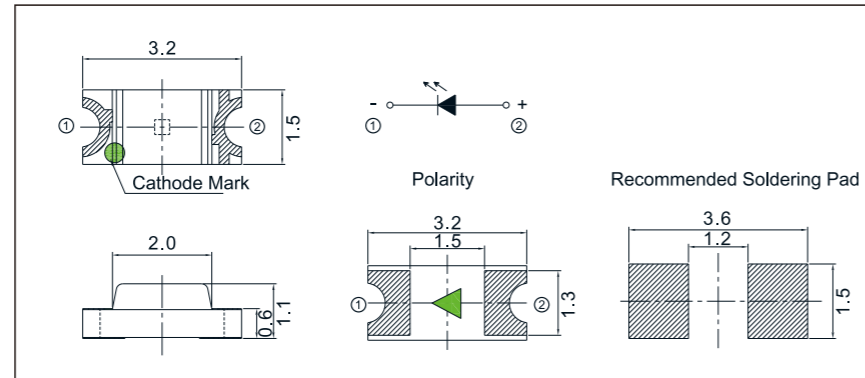
2012



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-2012HRK-620D-AM	2.0×1.25×1.1	Red	20	620	2.2	80	180	130
FC-2012HYK-588J-AM	2.0×1.25×1.1	Yellow	20	589	2.1	80	150	130
FC-2012GHK-570A08-AM	2.0×1.25×1.1	Yellow Green	20	573	2.0	20	36	130
FC-2012WD-460G-AM	2.0×1.25×1.1	White	5	(0.29, 0.29)	3.0	400	850	130
FC-2012WBD-465Q5B-AM	2.0×1.25×1.1	Ice Blue	5	(0.19, 0.26)	2.8	400	850	130
FC-2012WBD-465Q2G-AM	2.0×1.25×1.1	Ice Blue	5	(0.19, 0.38)	3.0	500	900	130

Vehicle/CHIP LED/Top View

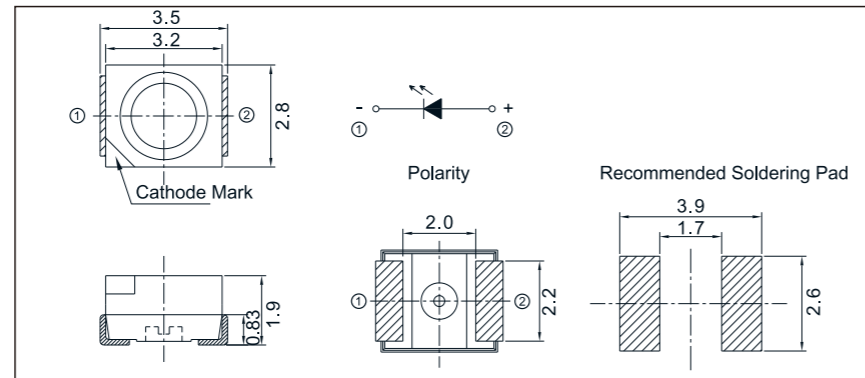
3215



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FC-3215HRK-620D-AM	3.2×1.5×1.1	Red	20	620	2.1	65	150	130
FC-3215HYK-588J-AM	3.2×1.5×1.1	Yellow	20	589	2.1	65	150	130
FC-3215GHK-570A08-AM	3.2×1.5×1.1	Yellow Green	5	571	2.0	5	11	130
FC-3215WD-460M-AM	3.2×1.5×1.1	White	5	(0.27, 0.25)	2.7	150	250	130

Vehicle/TOP LED/Top View

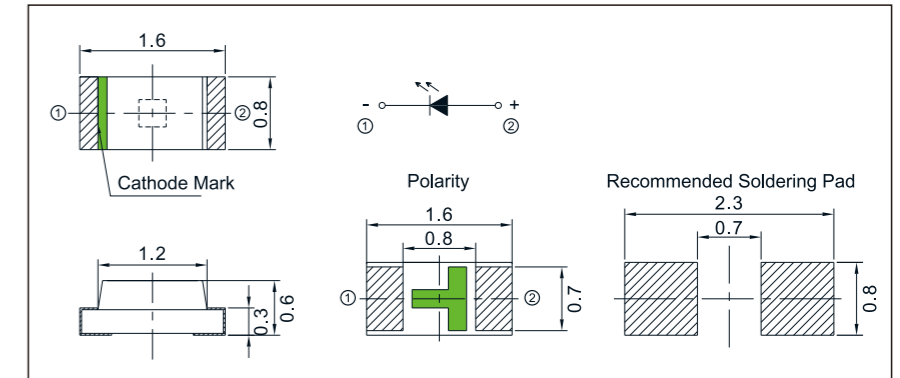
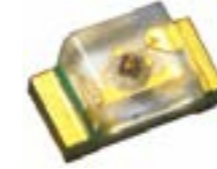
3528



Product	Size (L×W×Hmm)	Color	I _F (mA)	λ _D (nm)/CIE(x, y)	V _F (V) Typ.	I _v (mcd) Min	I _v (mcd) Max	Viewing Angle (°)
FM-3528HRA-624S-AM	3.5×2.8×1.9	Red	20	620	2.0	450	1000	130
FM-3528HOA-603S-AM	3.5×2.8×1.9	Orange	20	605	2.0	165	580	130
FM-3528HYA-589S-AM	3.5×2.8×1.9	Yellow	20	589	2.1	600	1300	130
FM-3528YGA-571S-AM	3.5×2.8×1.9	Yellow Green	20	570	2.1	60	280	130
FM-3528UGA-522T-AM	3.5×2.8×1.9	Green	20	525	3.0	960	1900	130
FM-3528BA-470H-AM	3.5×2.8×1.9	Blue	20	470	3.0	300	650	130

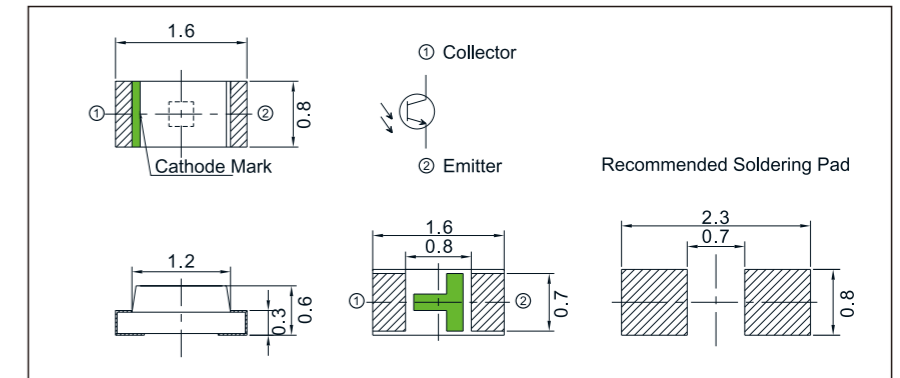
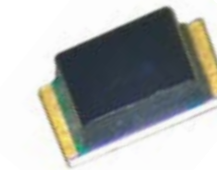
Infrared LED and Photo Transistor

T1608



Product	Size (L×W×Hmm)	λ _D (nm)	V _F (V) Typ.	V _F (V) Max	I _e (mW/sr) Min	I _e (mW/sr) Typ.	Viewing Angle (°)
FC-1608IK-940	1.6×0.8×0.8	940	1.2	1.5	0.5	1.1	150
FC-1608IK-850	1.6×0.8×0.8	850	1.5	1.8	2.0	2.5	150

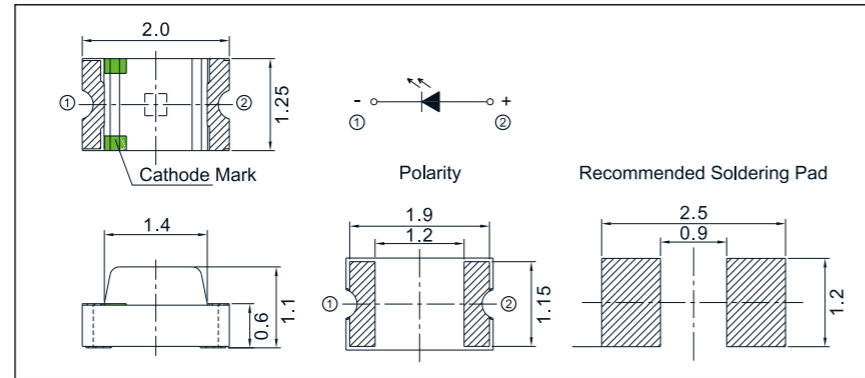
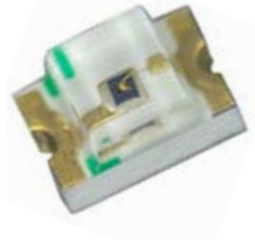
T1608



Product	Size (L×W×Hmm)	λ _D (nm)	Rise/Fall Time(us)	V _{ce(sat)} -Max	I _{c(on)} -Min (mA)	I _{c(on)} -Typ (mA)	I _{c(on)} -Max (mA)
FC-T1608PDK	1.6×0.8×0.6	940	15/15	0.4	0.15	0.45	-

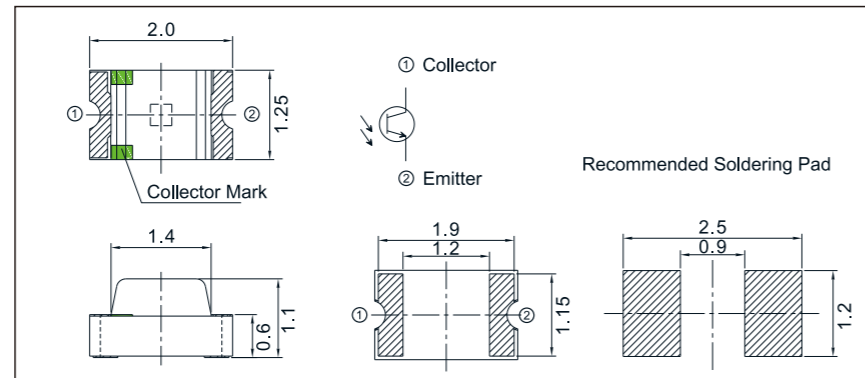
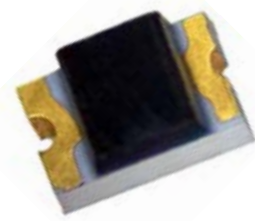
Infrared LED and Photo Transistor

2012



Product	Size (L×W×Hmm)	λ_D (nm)	V_F (V) Typ.	V_F (V) Max	I_e (mW/sr) Min	I_e (mW/sr) Typ.	Viewing Angle (°)
FC-2012IK-940	2.0×1.25×1.1	940	1.2	1.5	0.6	1.2	120
FC-2012IK-850	2.0×1.25×1.1	850	1.5	1.8	2.0	2.7	120

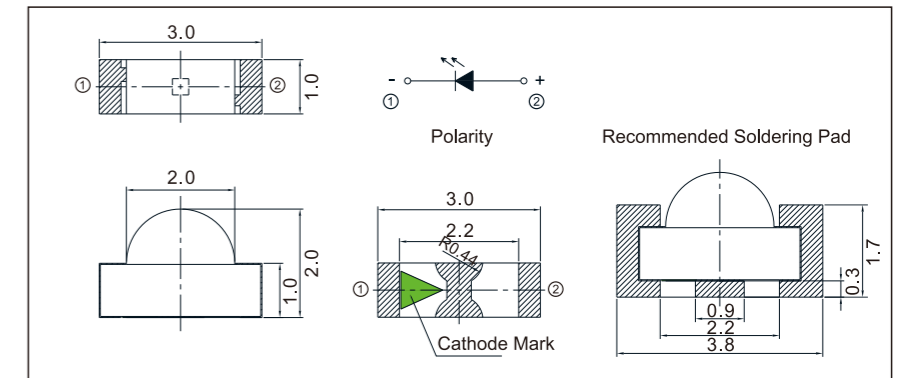
2012



Product	Size (L×W×Hmm)	λ_D (nm)	Rise/Fall Time(us)	$V_{ce(sat)}$ -Max	$I_{c(on)}$ -Min (mA)	$I_{c(on)}$ -Typ (mA)	$I_{c(on)}$ -Max (mA)
FC-2012PDK	2.0×1.25×1.1	940	15/15	0.4	0.1	0.5	-

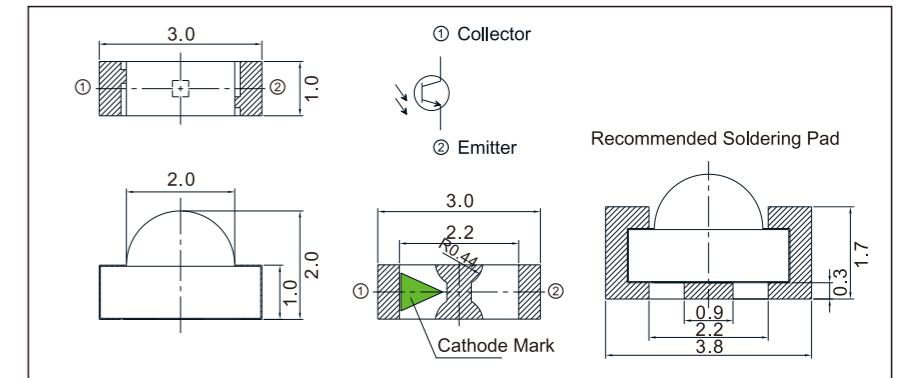
Infrared LED and Photo Transistor

3010



Product	Size (L×W×Hmm)	λ_D (nm)	V_F (V) Typ.	V_F (V) Max	I_e (mW/sr) Min	I_e (mW/sr) Typ.	Viewing Angle (°)
FC-3010IK-940	3.0×1.0×2.0	940	1.2	1.5	1.0	3.5	160
FC-3010IK-850	3.0×1.0×2.0	850	1.5	1.8	3.0	7.3	160

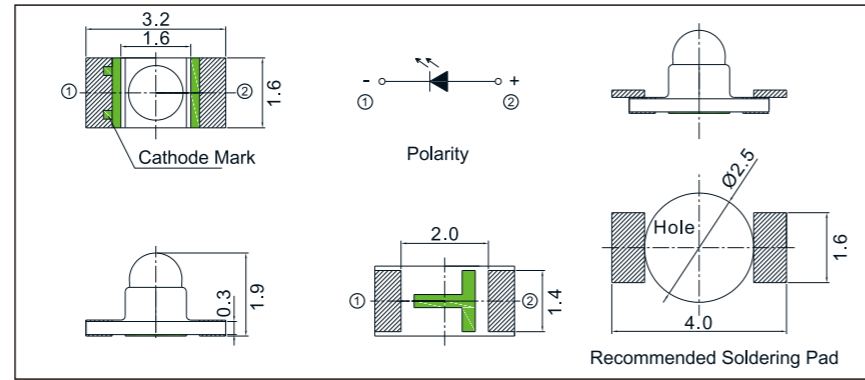
3010



Product	Size (L×W×Hmm)	λ_D (nm)	Rise/Fall Time(us)	$V_{ce(sat)}$ -Max	$I_{c(on)}$ -Min (mA)	$I_{c(on)}$ -Typ (mA)	$I_{c(on)}$ -Max (mA)
FC-3010PDK	3.0×1.0×2.0	940	15/15	0.4	0.1	0.5	-

Infrared LED and Photo Transistor

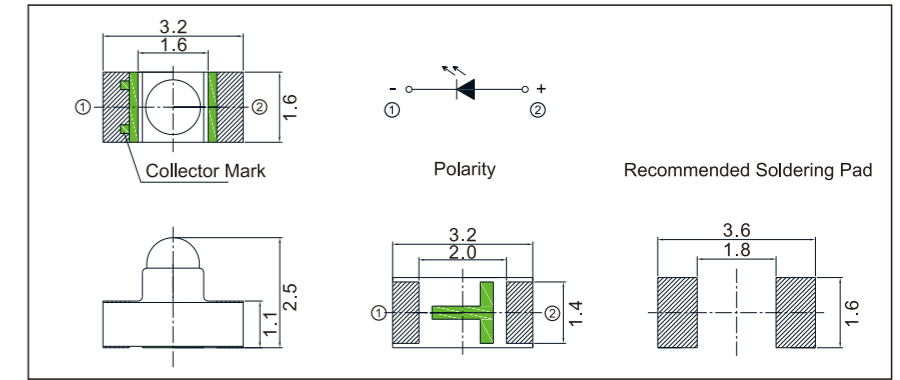
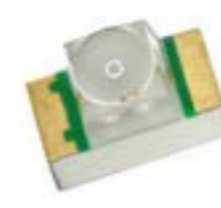
3216



Product	Size (L×W×Hmm)	λ_D (nm)	V_F (V) Typ.	V_F (V) Max	I_e (mW/sr) Min	I_e (mW/sr) Typ.	Viewing Angle (°)
FC-3216IK-940	3.2×1.6×1.95	940	1.2	1.5	1.0	3.0	20
FC-3216IK-850	3.2×1.6×1.95	850	1.4	1.7	10	20	20

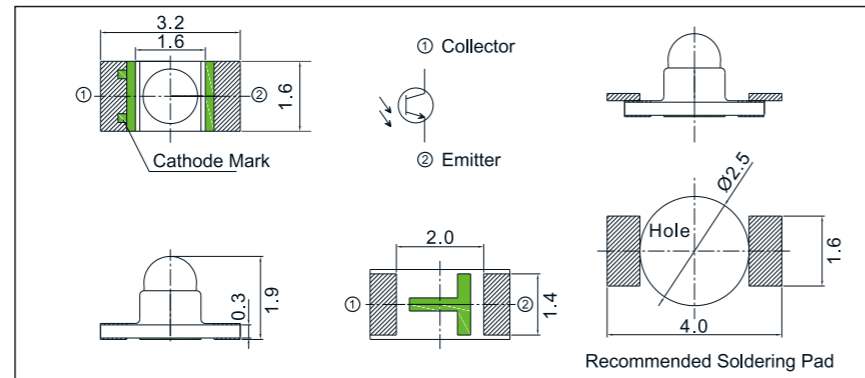
Infrared LED and Photo Transistor

3216



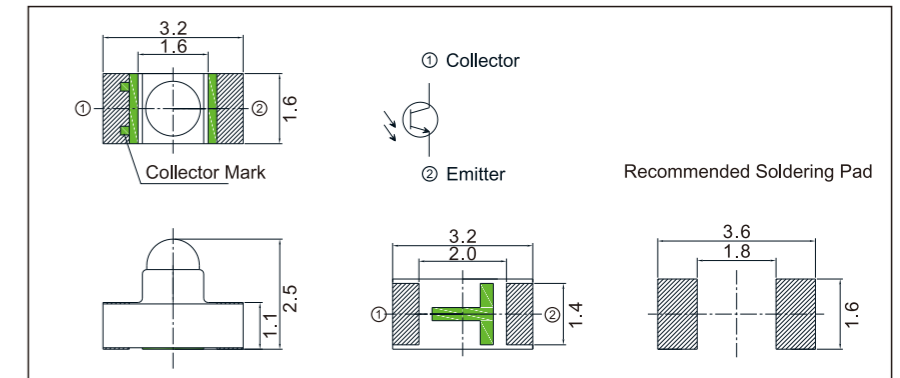
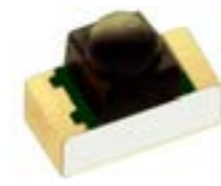
Product	Size (L×W×Hmm)	λ_D (nm)	V_F (V) Typ.	V_F (V) Max	I_e (mW/sr) Min	I_e (mW/sr) Typ.	Viewing Angle (°)
FC-3216IK-940C	3.2×1.6×2.5	940	1.2	1.5	1.0	4.0	20
FC-3216IK-850C	3.2×1.6×2.5	850	1.4	1.7	10	20	20

3216



Product	Size (L×W×Hmm)	λ_D (nm)	Rise/Fall Time(us)	$V_{ce(sat)}$ -Max	$I_{c(on)}$ -Min (mA)	$I_{c(on)}$ -Typ (mA)	$I_{c(on)}$ -Max (mA)
FC-3216PDK	3.2×1.6×1.95	940	15/15	0.4	-	1.1	-

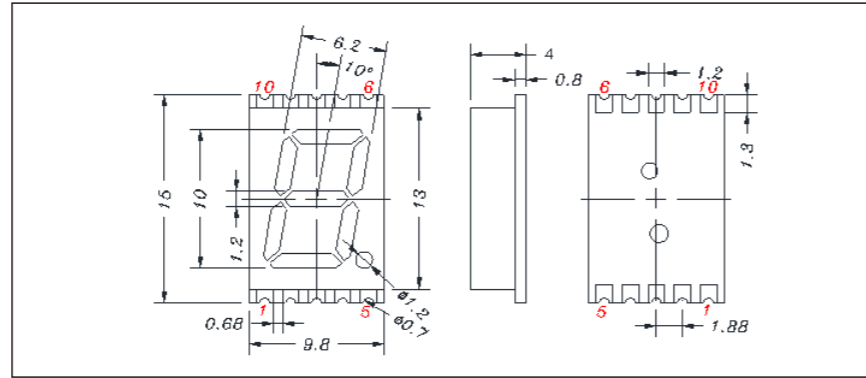
3216



Product	Size (L×W×Hmm)	λ_D (nm)	Rise/Fall Time(us)	$V_{ce(sat)}$ -Max	$I_{c(on)}$ -Min (mA)	$I_{c(on)}$ -Typ (mA)	$I_{c(on)}$ -Max (mA)
FC-3216PDK-C	3.2×1.6×2.5	940	15/15	0.4	-	1.1	-

SMD Displays/039

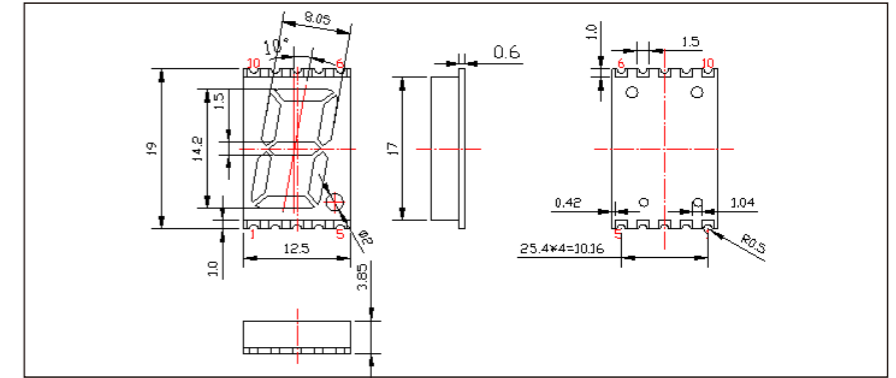
1039



Product	Height mm(inch)	Color	Width (mm)	CC/CA	λ (nm)/CIE(x, y)	Resin Color	Face Color	Iv(mcd) Min/Max
FCR-1039HR-620A1GD	10 (0.39)	Red	6.2	CA	620	White	Gray	50/120
FCR-1039HY-588A1GD	10 (0.39)	Yellow	6.2	CA	588	White	Gray	50/120
FCR-1039YG-570A1GD	10 (0.39)	Yellow Green	6.2	CA	570	White	Gray	30/80
FCR-1039UG-520A1GD	10 (0.39)	Green	6.2	CA	520	White	Gray	200/500
FCR-1039B-465A1GD	10 (0.39)	Blue	6.2	CA	465	White	Gray	80/200
FCR-1039W-455A1GD	10 (0.39)	White	6.2	CA	(0.27, 0.26)	White	Gray	630/930

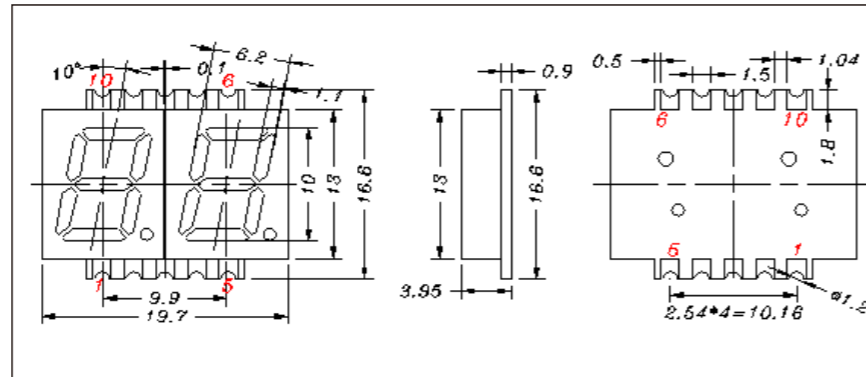
SMD Displays/056

1056



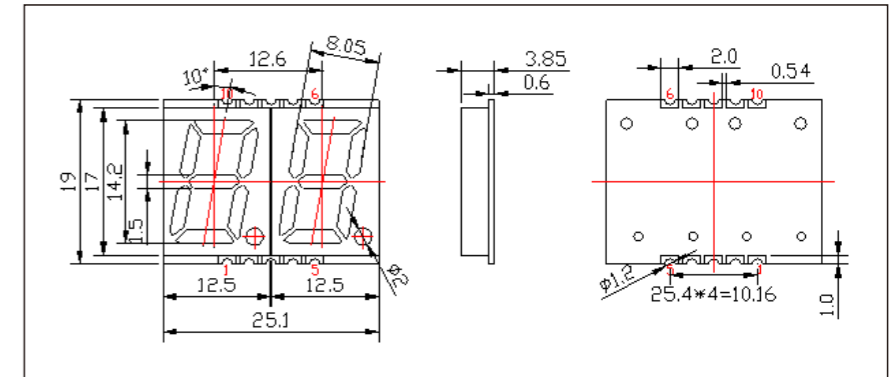
Product	Height mm(inch)	Color	Width (mm)	CC/CA	λ (nm)/CIE(x, y)	Resin Color	Face Color	Iv(mcd) Min/Max
FCR-1056HR-620A1BD	14.2 (0.56)	Red	8.05	CA	620	White	Black	50/120
FCR-1056HY-588A1BD	14.2 (0.56)	Yellow	8.05	CA	588	White	Black	50/120
FCR-1056YG-570A1BD	14.2 (0.56)	Yellow Green	8.05	CA	570	White	Black	30/80
FCR-1056UG-520A1BD	14.2 (0.56)	Green	8.05	CA	520	White	Black	200/500
FCR-1056B-465A1BD	14.2 (0.56)	Blue	8.05	CA	465	White	Black	80/200
FCR-1056W-455A1BD	14.2 (0.56)	White	8.05	CA	(0.27, 0.26)	White	Black	630/930

2039



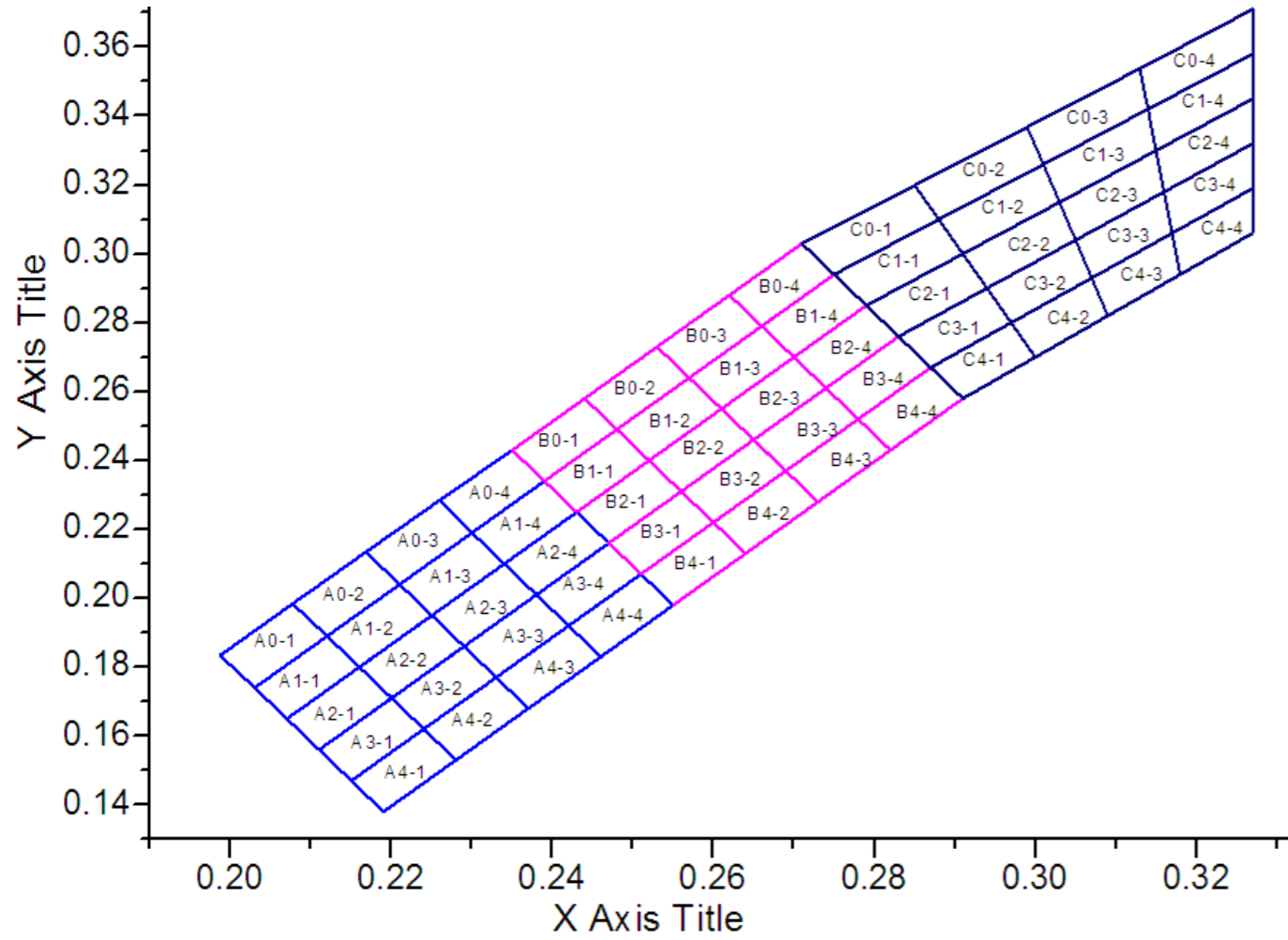
Product	Height mm(inch)	Color	Width (mm)	CC/CA	λ (nm)/CIE(x, y)	Resin Color	Face Color	Iv(mcd) Min/Max
FCR-2039HR-620A1GD	10 (0.39)	Red	6.2	CA	620	White	Gray	50/120
FCR-2039HY-588A1GD	10 (0.39)	Yellow	6.2	CA	588	White	Gray	50/120
FCR-2039YG-570A1GD	10 (0.39)	Yellow Green	6.2	CA	570	White	Gray	30/80
FCR-2039UG-520A1GD	10 (0.39)	Green	6.2	CA	520	White	Gray	200/500
FCR-2039B-465A1GD	10 (0.39)	Blue	6.2	CA	465	White	Gray	80/200
FCR-2039W-455A1GD	10 (0.39)	White	6.2	CA	(0.27, 0.26)	White	Gray	630/930

2056



Product	Height mm(inch)	Color	Width (mm)	CC/CA	λ (nm)/CIE(x, y)	Resin Color	Face Color	Iv(mcd) Min/Max
FCR-2056HR-620A1BD	14.2 (0.56)	Red	8.05	CA	620	White	Black	50/120
FCR-2056HY-588A1BD	14.2 (0.56)	Yellow	8.05	CA	588	White	Black	50/120
FCR-2056YG-570A1BD	14.2 (0.56)	Yellow Green	8.05	CA	570	White	Black	30/80
FCR-2056UG-520A1BD	14.2 (0.56)	Green	8.05	CA	520	White	Black	200/500
FCR-2056B-465A1BD	14.2 (0.56)	Blue	8.05	CA	465	White	Black	80/200
FCR-2056W-455A1BD	14.2 (0.56)	White	8.05	CA	(0.27, 0.26)	White	Black	630/930

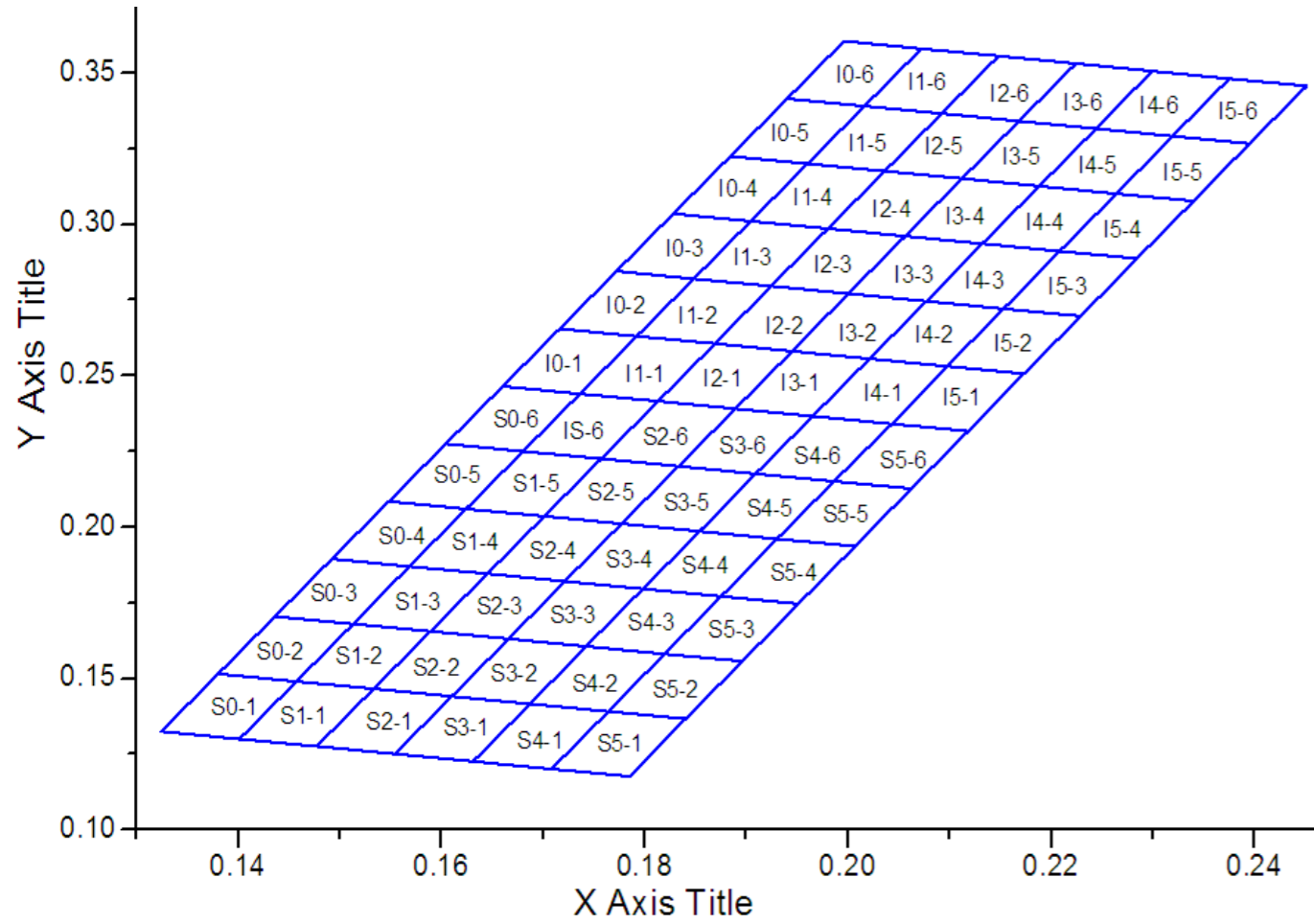
Chromaticity Diagram 1



色区		Bottom	Left	Top	Right	色区		Bottom	Left	Top	Right
A0-1	X	0.203	0.199	0.208	0.212	B0-1	X	0.239	0.235	0.244	0.248
	Y	0.174	0.183	0.198	0.189		Y	0.234	0.243	0.258	0.249
A0-2	X	0.212	0.208	0.217	0.221	B0-2	X	0.248	0.244	0.253	0.257
	Y	0.189	0.198	0.213	0.204		Y	0.249	0.258	0.273	0.264
A0-3	X	0.221	0.217	0.226	0.230	B0-3	X	0.257	0.253	0.262	0.266
	Y	0.204	0.213	0.229	0.219		Y	0.264	0.273	0.288	0.279
A0-4	X	0.230	0.226	0.235	0.239	B0-4	X	0.266	0.262	0.271	0.275
	Y	0.219	0.229	0.243	0.234		Y	0.279	0.288	0.303	0.294
C0-1	X	0.275	0.271	0.285	0.288	C0-3	X	0.301	0.299	0.313	0.314
	Y	0.294	0.303	0.320	0.310		Y	0.326	0.337	0.354	0.342
C0-2	X	0.288	0.285	0.299	0.301	C0-4	X	0.314	0.313	0.327	0.327
	Y	0.310	0.320	0.337	0.326		Y	0.342	0.354	0.371	0.358
A1-1	X	0.207	0.203	0.212	0.216	A2-1	X	0.211	0.207	0.216	0.22
	Y	0.165	0.174	0.189	0.18		Y	0.156	0.165	0.18	0.171
A1-2	X	0.216	0.212	0.221	0.225	A2-2	X	0.22	0.216	0.225	0.229
	Y	0.18	0.189	0.204	0.195		Y	0.171	0.18	0.195	0.186

色区		Bottom	Left	Top	Right	色区		Bottom	Left	Top	Right
A1-3	X	0.225	0.221	0.23	0.234	A2-3	X	0.229	0.225	0.234	0.238
	Y	0.195	0.204	0.219	0.21		Y	0.186	0.195	0.21	0.201
A1-4	X	0.234	0.23	0.239	0.243	A2-4	X	0.238	0.234	0.243	0.247
	Y	0.21	0.219	0.234	0.225		Y	0.201	0.21	0.225	0.216
A3-1	X	0.215	0.211	0.22	0.224	A4-1	X	0.219	0.215	0.224	0.228
	Y	0.147	0.156	0.171	0.162		Y	0.138	0.147	0.162	0.153
A3-2	X	0.224	0.22	0.229	0.233	A4-2	X	0.228	0.224	0.233	0.237
	Y	0.162	0.171	0.186	0.177		Y	0.153	0.162	0.177	0.168
A3-3	X	0.233	0.229	0.238	0.242	A4-3	X	0.237	0.233	0.242	0.246
	Y	0.177	0.186	0.201	0.192		Y	0.168	0.177	0.192	0.183
A3-4	X	0.242	0.238	0.247	0.251	A4-4	X	0.246	0.242	0.251	0.255
	Y	0.192	0.201	0.216	0.207		Y	0.183	0.192	0.207	0.198
B1-1	X	0.243	0.239	0.248	0.252	B2-1	X	0.247	0.243	0.252	0.256
	Y	0.225	0.234	0.249	0.24		Y	0.216	0.225	0.24	0.231
B1-2	X	0.252	0.248	0.257	0.261	B2-2	X	0.256	0.252	0.261	0.265
	Y	0.24	0.249	0.264	0.255		Y	0.231	0.24	0.255	0.246
B1-3	X	0.261	0.257	0.266	0.27	B2-3	X	0.265	0.261	0.27	0.274
	Y	0.255	0.264	0.279	0.27		Y	0.246	0.255	0.27	0.261
B1-4	X	0.27	0.266	0.275	0.279	B2-4	X	0.274	0.27	0.279	0.283
	Y	0.27	0.279	0.294	0.285		Y	0.261	0.27	0.285	0.276
B3-1	X	0.251	0.247	0.256	0.26	B4-1	X	0.255	0.251	0.26	0.264
	Y	0.207	0.216	0.231	0.222		Y	0.198	0.207	0.222	0.213
B3-2	X	0.26	0.256	0.265	0.269	B4-2	X	0.264	0.26	0.269	0.273
	Y	0.222	0.231	0.246	0.237		Y	0.213	0.222	0.237	0.228
B3-3	X	0.269	0.265	0.274	0.278	B4-3	X	0.273	0.269	0.278	0.282
	Y	0.237	0.246	0.261	0.252		Y	0.228	0.237	0.252	0.243
B3-4	X	0.278	0.274	0.283	0.287	B4-4	X	0.282	0.278	0.287	0.291
	Y	0.252	0.261	0.276	0.267		Y	0.243	0.252	0.267	0.258
C1-1	X	0.279	0.275	0.288	0.291	C2-1	X	0.283	0.279	0.291	0.294
	Y	0.285	0.294	0.31	0.3		Y	0.276	0.285	0.3	0.29
C1-2	X	0.291	0.288	0.301	0.303	C2-2	X	0.294	0.291	0.303	0.305
	Y	0.3	0.31	0.326	0.315		Y	0.29	0.3	0.315	0.304
C1-3	X	0.303	0.301	0.314	0.315	C2-3	X	0.305	0.303	0.315	0.316
	Y	0.315	0.326	0.342	0.33		Y	0.304	0.315	0.33	0.318
C1-4	X	0.315	0.314	0.327	0.327	C2-4	X	0.316	0.315	0.327	0.327
	Y	0.33	0.342	0.358	0.345		Y	0.318	0.33	0.345	0.332
C3-1	X	0.287	0.283	0.294	0.297	C4-1	X	0.291	0.287	0.297	0.3
	Y	0.267	0.276	0.29	0.28		Y	0.258	0.267	0.28	0.27
C3-2	X	0.297	0.294	0.305	0.307	C4-2	X	0.3	0.297	0.307	0.309
	Y	0.28	0.29	0.304	0.293		Y	0.27	0.28	0.293	0.282
C3-3	X	0.307	0.305	0.316	0.317	C4-3	X	0.309	0.307	0.317	0.318
	Y	0.293	0.304	0.318	0.306		Y	0.282	0.293	0.306	0.294
C3-4	X	0.317	0.316	0.327	0.327	C4-4	X	0.318	0.317	0.327	0.327
	Y	0.306	0.318	0.332	0.319		Y	0.294	0.306	0.319	0.306

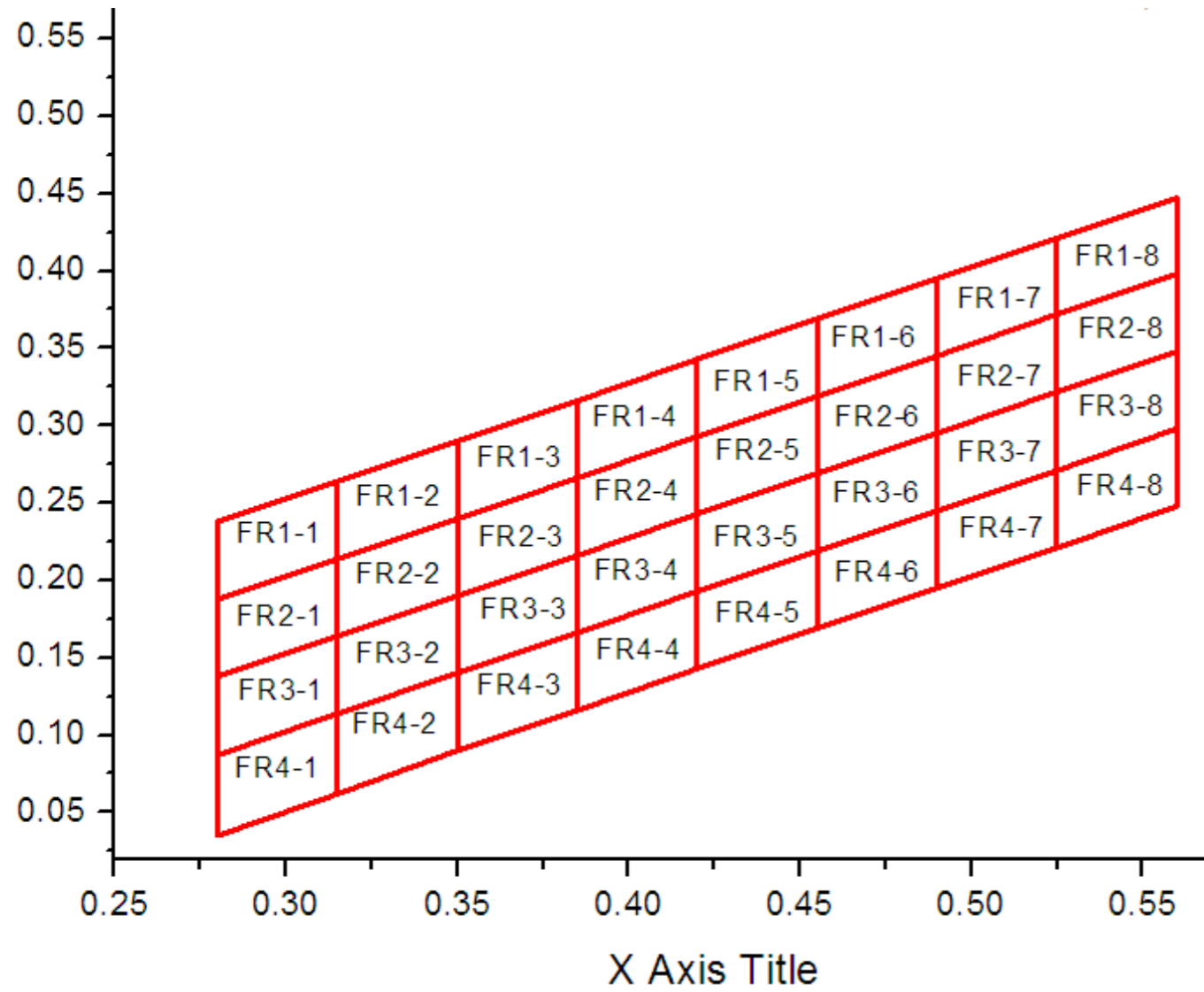
Chromaticity Diagram 2



色区		Bottom	Left	Top	Right	色区		Bottom	Left	Top	Right
S0-1	X	0.1324	0.138	0.1457	0.1401	S3-1	X	0.1554	0.161	0.1687	0.1631
	Y	0.1325	0.1515	0.149	0.13		Y	0.1251	0.1441	0.1416	0.1226
S0-2	X	0.138	0.1436	0.1513	0.1457	S3-2	X	0.161	0.1666	0.1742	0.1687
	Y	0.1515	0.1705	0.168	0.149		Y	0.1441	0.1631	0.1606	0.1416
S0-3	X	0.1436	0.1492	0.1568	0.1513	S3-3	X	0.1666	0.1721	0.1798	0.1742
	Y	0.1705	0.1895	0.187	0.168		Y	0.1631	0.1821	0.1796	0.1606
S0-4	X	0.1492	0.1548	0.1624	0.1568	S3-4	X	0.1721	0.1777	0.1854	0.1798
	Y	0.1895	0.2085	0.206	0.187		Y	0.1821	0.2011	0.1986	0.1796
S0-5	X	0.1548	0.1604	0.168	0.1624	S3-5	X	0.1777	0.1833	0.1909	0.1854
	Y	0.2085	0.2275	0.225	0.206		Y	0.2011	0.2201	0.2176	0.1986
S0-6	X	0.1604	0.166	0.1736	0.168	S3-6	X	0.1833	0.1889	0.1965	0.1909
	Y	0.2275	0.2465	0.244	0.225		Y	0.2201	0.2391	0.2366	0.2176
S1-1	X	0.1401	0.1457	0.1533	0.1477	S4-1	X	0.1631	0.1687	0.1764	0.1708
	Y	0.13	0.149	0.1466	0.1276		Y	0.1226	0.1416	0.1391	0.1201
S1-2	X	0.1457	0.1513	0.1589	0.1533	S4-2	X	0.1687	0.1742	0.1819	0.1764
	Y	0.149	0.168	0.1656	0.1466		Y	0.1416	0.1606	0.1581	0.1391
S1-3	X	0.1513	0.1568	0.1645	0.1589	S4-3	X	0.1742	0.1798	0.1875	0.1819
	Y	0.168	0.187	0.1846	0.1656		Y	0.1606	0.1796	0.1771	0.1581
S1-4	X	0.1568	0.1624	0.1701	0.1645	S4-4	X	0.1798	0.1854	0.193	0.1875
	Y	0.187	0.206	0.2036	0.1846		Y	0.1796	0.1986	0.1961	0.1771

色区		Bottom	Left	Top	Right	色区		Bottom	Left	Top	Right
S1-5	X	0.1624	0.168	0.1757	0.1701	S4-5	X	0.1854	0.1909	0.1986	0.193
	Y	0.206	0.225	0.2226	0.2036		Y	0.1986	0.2176	0.2151	0.1961
S1-6	X	0.168	0.1736	0.1813	0.1757	S4-6	X	0.1909	0.1965	0.2043	0.1986
	Y	0.225	0.244	0.2416	0.2226		Y	0.2176	0.2366	0.2341	0.2151
S2-1	X	0.1477	0.1533	0.161	0.1554	S5-1	X	0.1708	0.1764	0.184	0.1785
	Y	0.1276	0.1466	0.1441	0.1251		Y	0.1201	0.1391	0.1367	0.1177
S2-2	X	0.1533	0.1589	0.1666	0.161	S5-2	X	0.1764	0.1819	0.1896	0.184
	Y	0.1466	0.1656	0.1631	0.1441		Y	0.1391	0.1581	0.1557	0.1367
S2-3	X	0.1589	0.1645	0.1721	0.1666	S5-3	X	0.1819	0.1875	0.1951	0.1896
	Y	0.1656	0.1846	0.1821	0.1631		Y	0.1581	0.1771	0.1747	0.1557
S2-4	X	0.1645	0.1701	0.1777	0.1721	S5-4	X	0.1875	0.193	0.2007	0.1951
	Y	0.1846	0.2036	0.2011	0.1821		Y	0.1771	0.1961	0.1937	0.1747
S2-5	X	0.1701	0.1757	0.1833	0.1777	S5-5	X	0.193	0.1986	0.2062	0.2007
	Y	0.2036	0.2226	0.2201	0.2011		Y	0.1961	0.2151	0.2127	0.1937
S2-6	X	0.1757	0.1813	0.1889	0.1833	S5-6	X	0.1986	0.2043	0.2118	0.2062
	Y	0.2226	0.2416	0.2391	0.2201		Y	0.2151	0.2341	0.2317	0.2127
I0-1	X	0.166	0.1716	0.1792	0.1736	I3-1	X	0.1889	0.1945	0.2021	0.1965
	Y	0.2465	0.2655	0.263	0.244		Y	0.2391	0.2581	0.2556	0.2366
I0-2	X	0.1716	0.1772	0.1848	0.1792	I3-2	X	0.1945	0.2	0.2077	0.2021
	Y	0.2655	0.2845	0.282	0.263		Y	0.2581	0.2771	0.2746	0.2556
I0-3	X	0.1772	0.1828	0.1904	0.1848	I3-3	X	0.2	0.2056	0.2132	0.2077
	Y	0.2845	0.3035	0.301	0.282		Y	0.2771	0.2961	0.2936	0.2746
I0-4	X	0.1828	0.1884	0.196	0.1904	I3-4	X	0.2056	0.2112	0.2188	0.2132
	Y	0.3035	0.3225	0.32	0.301		Y	0.2961	0.3151	0.3126	0.2936
I0-5	X	0.1884	0.194	0.2016	0.196	I3-5	X	0.2112	0.2168	0.2244	0.2188
	Y	0.3225	0.3415	0.339	0.32		Y	0.3151	0.3341	0.3316	0.3126
I0-6	X	0.194	0.1996	0.2072	0.2016	I3-6	X	0.2168	0.2224	0.2299	0.2244
	Y	0.3415	0.3605	0.358	0.339		Y	0.3341	0.3531	0.3506	0.3316
I1-1	X	0.1736	0.1792	0.1869	0.1813	I4-1	X	0.1965	0.2021	0.2097	0.2043
	Y	0.244	0.263	0.2606	0.2416		Y	0.2366	0.2556	0.2531	0.2341
I1-2	X	0.1792	0.1848	0.1924	0.1869	I4-2	X	0.2021	0.2077	0.2153	0.2097
	Y	0.263	0.282	0.2796	0.2606		Y	0.2556	0.2746	0.2721	0.2531
I1-3	X	0.1848	0.1904	0.198	0.1924	I4-3	X	0.2077	0.2132	0.2208	0.2153
	Y	0.282	0.301	0.2986	0.2796		Y	0.2746	0.2936	0.2911	0.2721
I1-4	X	0.1904	0.196	0.2036	0.198	I4-4	X	0.2132	0.2188	0.2264	0.2208
	Y	0.301	0.32	0.3176	0.2986		Y	0.2936	0.3126	0.3101	0.2911
I1-5	X	0.196	0.2016	0.2092	0.2036	I4-5	X	0.2188	0.2244	0.2319	0.2264
	Y	0.32	0.339	0.3366	0.3176		Y	0.3126	0.3316	0.3291	0.3101
I1-6	X	0.2016	0.2072	0.2148	0.2092	I4-6	X	0.2244	0.2299	0.2375	0.2319
	Y	0.339	0.358	0.3556	0.3366		Y	0.3316	0.3506	0.3481	0.3291
I2-1	X	0.1813	0.1869	0.1945	0.1889	I5-1	X	0.2043	0.2097	0.2173	0.2118
	Y	0.2416	0.2606	0.2581	0.2391		Y	0.2341	0.2531	0.2507	0.2317
I2-2	X	0.1869	0.1924	0.2	0.1945	I5-2	X	0.2097	0.2153	0.2229	0.2173
	Y	0.2606	0.2796	0.2771	0.2581		Y	0.2531	0.2721	0.2697	0.2507
I2-3	X	0.1924	0.198	0.2056	0.2	I5-3	X	0.2153	0.2208	0.2284	0.2229
	Y	0.2796	0.2986	0.2961	0.2771		Y	0.2721	0.2911	0.2887	0.2697
I2-4	X	0.198	0.2036	0.2112	0.2056	I5-4	X	0.2208	0.2264	0.234	0.2284
	Y	0.2986	0.3176	0.3151	0.2961		Y	0.2911	0.3101	0.3077	0.2887
I2-5	X	0.2036	0.2092	0.2168	0.2112	I5-5	X	0.2264	0.2319	0.2395	0.234
	Y	0.3176	0.3366	0.3341	0.3151		Y	0.3101	0.3291	0.3267	0.3077
I2-6	X	0.2092	0.2148	0.2224	0.2168	I5-6	X	0.2319	0.2375	0.2451	0.2395
	Y	0.3366	0.3556	0.3531	0.3341		Y	0.3291	0.3481	0.3457	0.3267

Chromaticity Diagram 3



色区		Bottom	Left	Top	Right	色区		Bottom	Left	Top	Right
FR1-1	X	0.28	0.28	0.315	0.315	FR2-1	X	0.28	0.28	0.315	0.315
	Y	0.188	0.238	0.264	0.214		Y	0.138	0.188	0.214	0.164
FR1-2	X	0.315	0.315	0.35	0.35	FR2-2	X	0.315	0.315	0.35	0.35
	Y	0.214	0.264	0.29	0.24		Y	0.164	0.214	0.24	0.19
FR1-3	X	0.35	0.35	0.385	0.385	FR2-3	X	0.35	0.35	0.385	0.385
	Y	0.24	0.29	0.316	0.266		Y	0.19	0.24	0.266	0.216
FR1-4	X	0.385	0.385	0.42	0.42	FR2-4	X	0.385	0.385	0.42	0.42
	Y	0.266	0.316	0.343	0.293		Y	0.216	0.266	0.293	0.243
FR1-5	X	0.42	0.42	0.455	0.455	FR2-5	X	0.42	0.42	0.455	0.455
	Y	0.293	0.343	0.369	0.319		Y	0.243	0.293	0.319	0.269
FR1-6	X	0.455	0.455	0.49	0.49	FR2-6	X	0.455	0.455	0.49	0.49
	Y	0.319	0.369	0.395	0.345		Y	0.269	0.319	0.345	0.295
FR1-7	X	0.49	0.49	0.525	0.525	FR2-7	X	0.49	0.49	0.525	0.525
	Y	0.345	0.395	0.421	0.372		Y	0.295	0.345	0.372	0.322
FR1-8	X	0.525	0.525	0.56	0.56	FR2-8	X	0.525	0.525	0.56	0.56
	Y	0.372	0.421	0.447	0.398		Y	0.322	0.372	0.398	0.348
FR3-1	X	0.28	0.28	0.315	0.315	FR4-1	X	0.28	0.28	0.315	0.315
	Y	0.087	0.138	0.164	0.114		Y	0.035	0.087	0.114	0.062
FR3-2	X	0.315	0.315	0.35	0.35	FR4-2	X	0.315	0.315	0.35	0.35
	Y	0.114	0.164	0.19	0.14		Y	0.062	0.114	0.14	0.09
FR3-3	X	0.35	0.35	0.385	0.385	FR4-3	X	0.35	0.35	0.385	0.385
	Y	0.14	0.19	0.216	0.166		Y	0.09	0.14	0.166	0.116
FR3-4	X	0.385	0.385	0.42	0.42	FR4-4	X	0.385	0.385	0.42	0.42
	Y	0.166	0.216	0.243	0.193		Y	0.116	0.166	0.193	0.143
FR3-5	X	0.42	0.42	0.455	0.455	FR4-5	X	0.42	0.42	0.455	0.455
	Y	0.193	0.243	0.269	0.219		Y	0.143	0.193	0.219	0.169
FR3-6	X	0.455	0.455	0.49	0.49	FR4-6	X	0.455	0.455	0.49	0.49
	Y	0.219	0.269	0.295	0.245		Y	0.169	0.219	0.245	0.195
FR3-7	X	0.49	0.49	0.525	0.525	FR4-7	X	0.49	0.49	0.525	0.525
	Y	0.245	0.295	0.322	0.271		Y	0.195	0.245	0.271	0.221
FR3-8	X	0.525	0.525	0.56	0.56	FR4-8	X	0.525	0.525	0.56	0.56
	Y	0.271	0.322	0.348	0.298		Y	0.221	0.271	0.298	0.248

