



Electronics for the Future

Low current LED series

0603 size CSL1901 series (2mA)

0402 size SML-P11 series (1mA)

0603 size SMLD12 series (5mA)

0402 size SMLP14 series (5mA)

0603 size SML-D22 Series (5mA)

2024

Module Business Unit

LED Division

Rev.005

Features of ROHM LEDs



ROHM is one of the few LED suppliers that manufactures their own dies

Integrated production

Epi	Die	Assembly	Finished Product

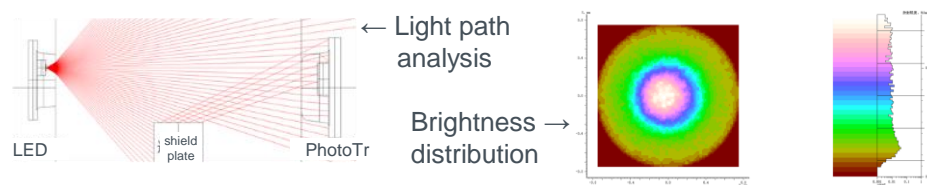
- Quality Management
- Production Control
- Development System

Some products are manufactured by separate processes.

Capable of responding to detailed requests for color and brightness

Color	IR	IR	V	U	U2	D	Y	W	M	P	E	E2	B	WB
Dominant wavelength (nm)	940	850	630	620	615	605	590	580	572	560	525	505	470	White
Chip Type	AlGaAs System		AlGaInP System							InGaN System				

Optical simulation and other support tools are provided for customer development



A wide range of services available from a comprehensive semiconductor manufacturer

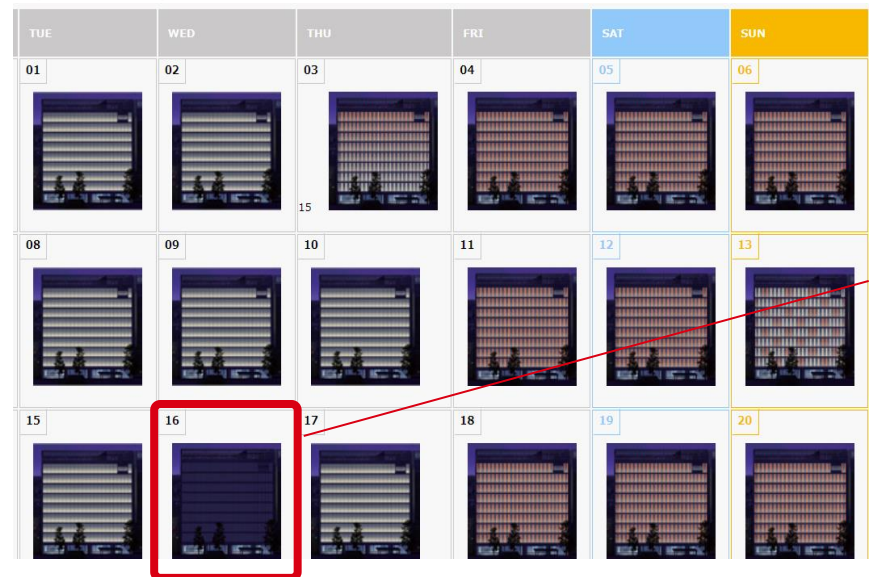


“Kyo-no-Hikari-Koyomi”

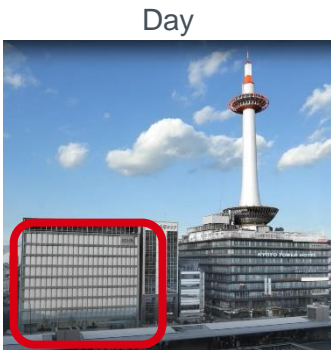
ROHM has been lighting up the Kyoto Station building since 2010. Created using original LED technology in collaboration with Mikiko Ishii’s design, ‘Kyo no Hikari Koyomi’ expresses Kyoto’s delicate seasonal atmosphere and traditional events through light.

Combining ROHM’s full-color LEDs and LED modules with optimizable color temperature in both vertical and horizontal directions ensures gentle, soft lighting similar to that through shoji (paper sliding door), in harmony with the streetscapes of Kyoto.

〈Schedule〉



Delicate Japanese sensibility is expressed by subtly adjusting the color temperature according to the season.



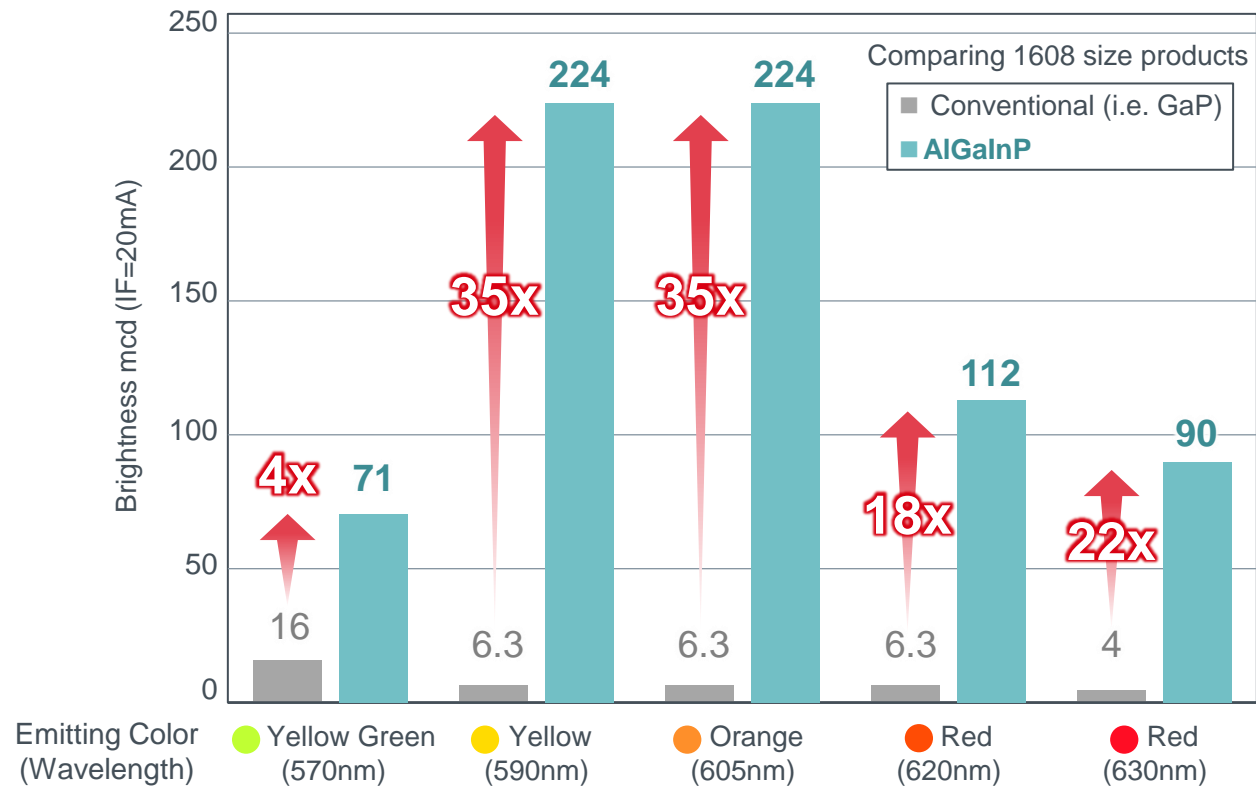
On the 16th of every month, we participate in the "DO YOU KYOTO?" light-down campaign promoted by Kyoto City to turn lights. (Unified Action Light-Down calls for turning off outdoor lights, etc.)

Why Low current LEDs are needed?

■ Increased luminous intensity of LED devices

In the past 20 years, compared to 2000, LED elements have achieved a significant increase in luminous intensity

Energy Saving High Efficiency Light Emitting AlGaInP-Based Elements



Device brightness has significantly increased over 20 years (compared to 2000)

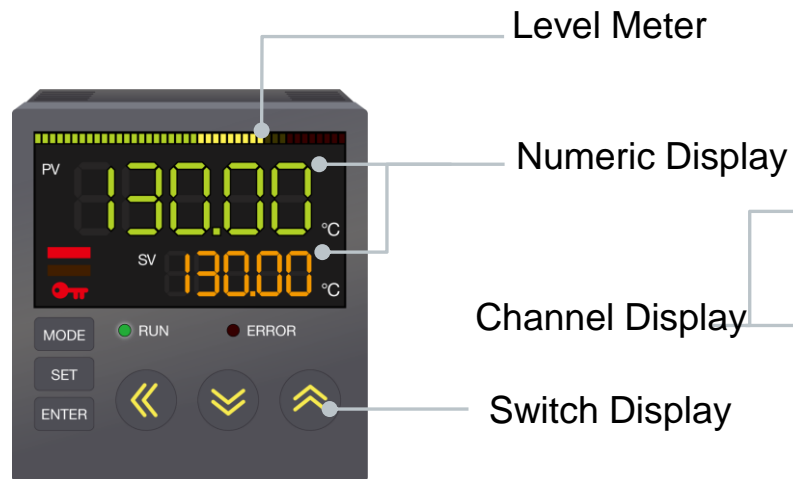
Achieves high brightness for outdoor use

Why Low current LEDs are needed?

■ Indoor product display area required brightness

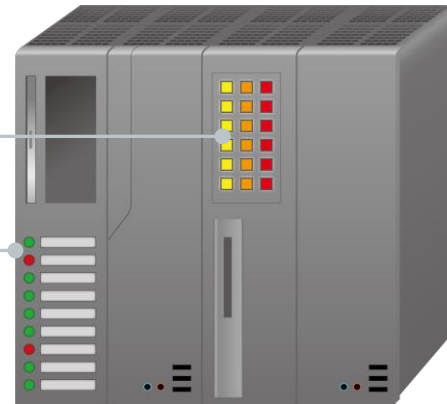
Places where a single LED displays one dot should not be too bright.
Conventional brightness is good.

■ Temperature Regulator



■ PLC

(Programmable Logic Controller)



One LED used per dot display

■ Wearables



Need to reduce current
for battery-driven applications

Conventional brightness is sufficient for indoor display equipment.

Why Low current LEDs are needed?

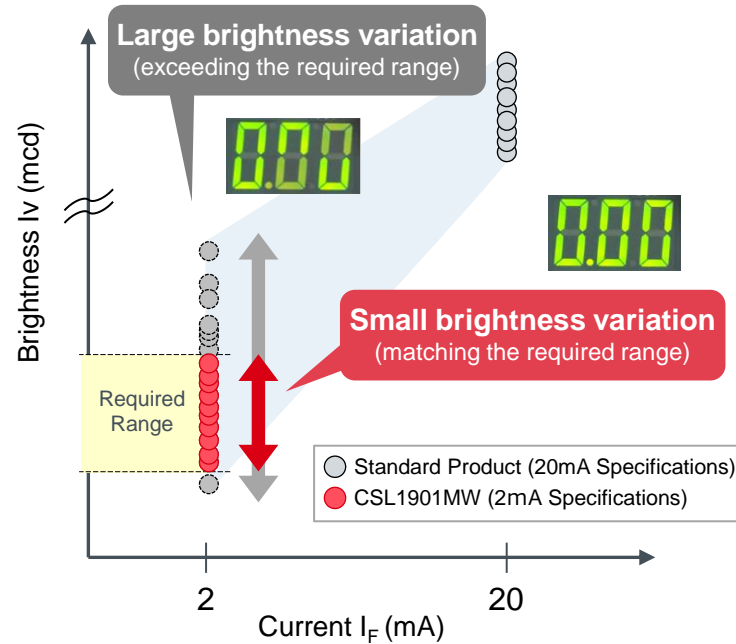
■ To reduce display brightness

- Developing elements with less variation in the low current region
- Brightness sorting at low currents ensures brightness in the low current range

20mA sorted product used

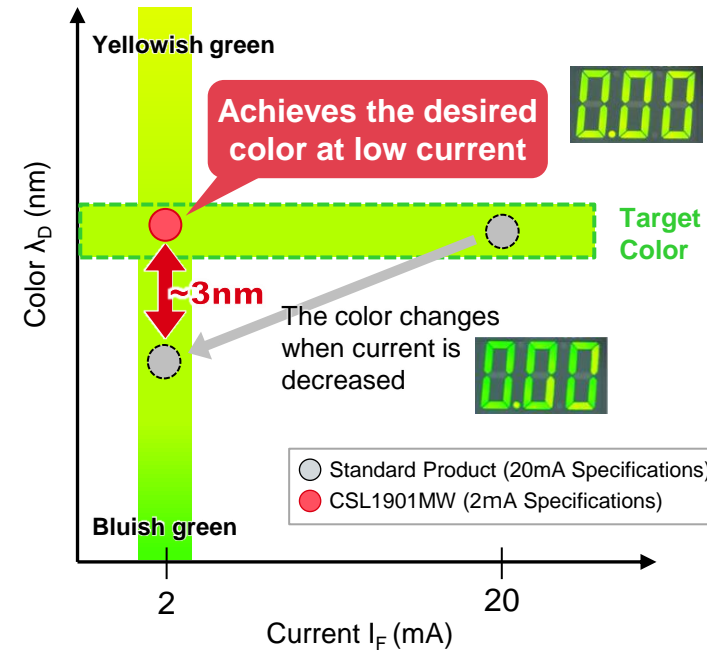


Uses low-current-selected products



2mA (low current) luminous intensity guarantee halves brightness variation

Wavelength change due to current (570nm product)



Dominant wavelength 2mA measurement (low current) halves color variation

ROHM Low Current Selective LED Lineup

1608 size

Size : mm

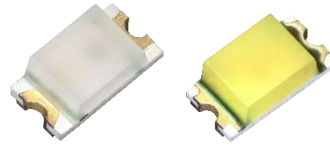
2mA sorting type



CSL1901 series
1.6×0.8×0.55t

V U D Y M

5mA sorting type

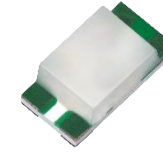


SMLD12 series
1.6×0.8×0.55t

E E2 E3 B WB

Universal color support

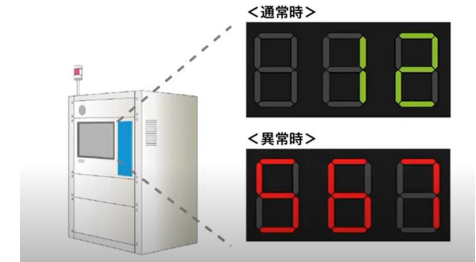
Dual colors 5mA sorting type



SML-D22 series
1.6×0.8×0.55t

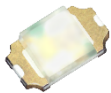
V Y U M

2-COLOR



1006 size

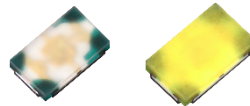
0402 inch size 1mA sorting type



SML-P11 series
1.0×0.6×0.2t

V U D Y M

0402 inch size 5mA sorting type



SMLP14 series
1.0×0.6×0.2t

E B WB





0603 size 2mA sorting LED: CSL1901 series

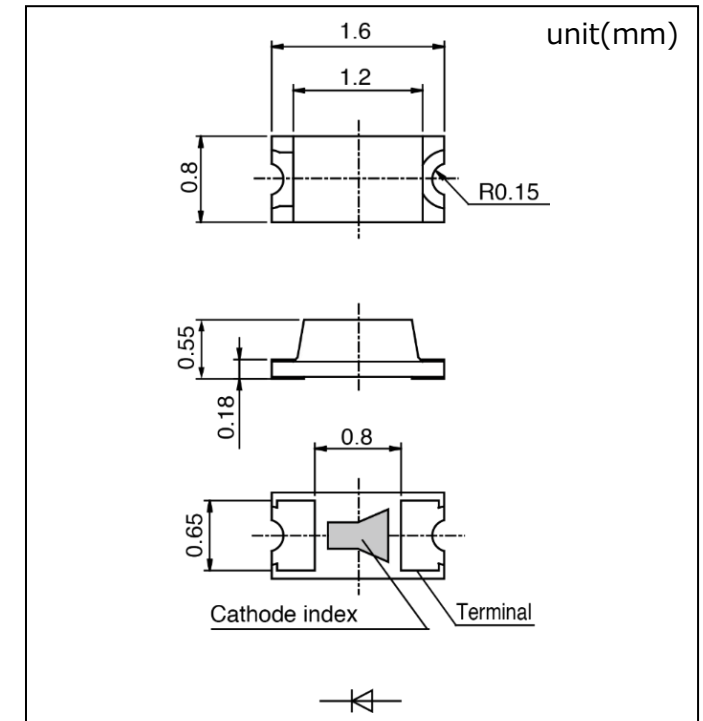
Product Lineup

0603 size surface mount type Low current guarantee reduces uneven luminous intensity and chromaticity!

Part No.	Absolute Max. Ratings		Electrical and optical Characteristics(IF=2mA)			
	IF [mA] (Ta=25°C)	Topr [°C]	VF (typ.) [V]	λD(Typ.) [nm]	Brightness IV (mcd)	
					Min.	Max.
■ CSL1901VW	20	-40~+85	2.0	630	1.6	6.3
■ CSL1901UW				620	2.5	10
■ CSL1901DW				605	6.3	25
■ CSL1901YW				590		
■ CSL1901MW				570	1	4



**luminous intensity and wavelength
guaranteed at low current**





Case Study

PLC equipment



Requests

As an indoor device, 7 segments and indicators are densely placed in a small space area.

7Seg and indicator are placed densely in a small space.

If it is too bright, it is difficult to see the display.

If the current is turned down, unevenness in the brightness of the 7-segment display will occur.



No uneven brightness in 7 segments.

No unevenness in brightness in 7 segments.
Good visibility indoors.

Image for reference only.

Optimal Applications

Various light sources for 7Seg



Various Level Meter Indicators



Vivid display without uneven brightness and chromaticity



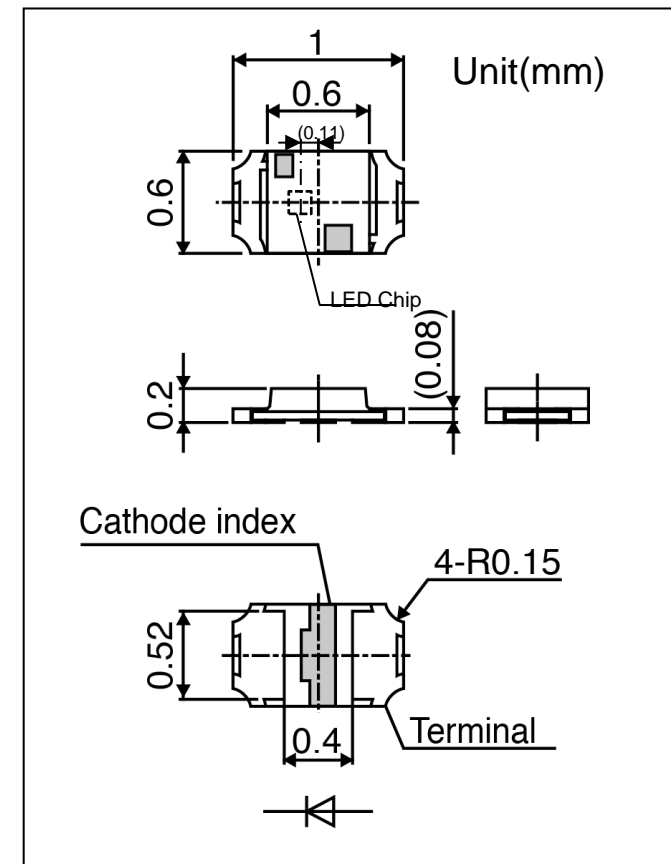
0402 size 1mA sorting LED: SML-P11 series

Product Lineup

Ultra-small and thin package (1.0 x 0.6 mm t=0.2 mm) 1 mA for light intensity sorting

Part No.	Absolute Max. Ratings		Electrical and optical Characteristics (IF=1mA)			
	IF [mA] (Ta=25°C)	Topr [°C]	VF (typ.) [V]	λD(Typ.) [nm]	Brightness IV (mcd)	
					Min.	Max.
■ SML-P11VT(R)	20	-40~+85	1.8	626	1.6	6.3
■ SML-P11UT(R)				621	1	6.3
■ SML-P11DT(R)				605	6.3	25
■ SML-P11YT(R)			1.9	586	4	16
■ SML-P11MT(R)				570	1	4


Guaranteed luminous intensity and wavelength at low current

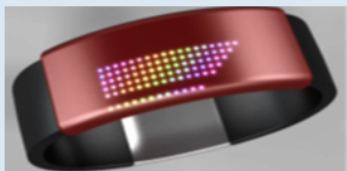




0402 size 1mA measurement LED: SML-P11 series

Adoption Example

Wearable Equipment



Requests

We want to reduce the current consumption of LEDs in battery-powered products.

We want to reduce the variation of brightness because we use multiple LEDs.



Power consumption is saved by using LEDs at 1mA.

No unevenness in brightness even with multiple lights on at the same time

No uneven brightness even with multiple lights on at the same time.

No need to adjust light intensity.

→ Adopt SML-P11 series

Image for reference only.

Optimal Applications

Wearable equipment Light source

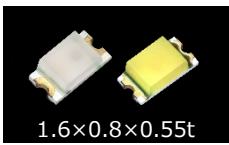


PLC Light Source



Temperature regulator
Light source





0603 size 5mA sorting LED: SMLD1 series (blue, white)

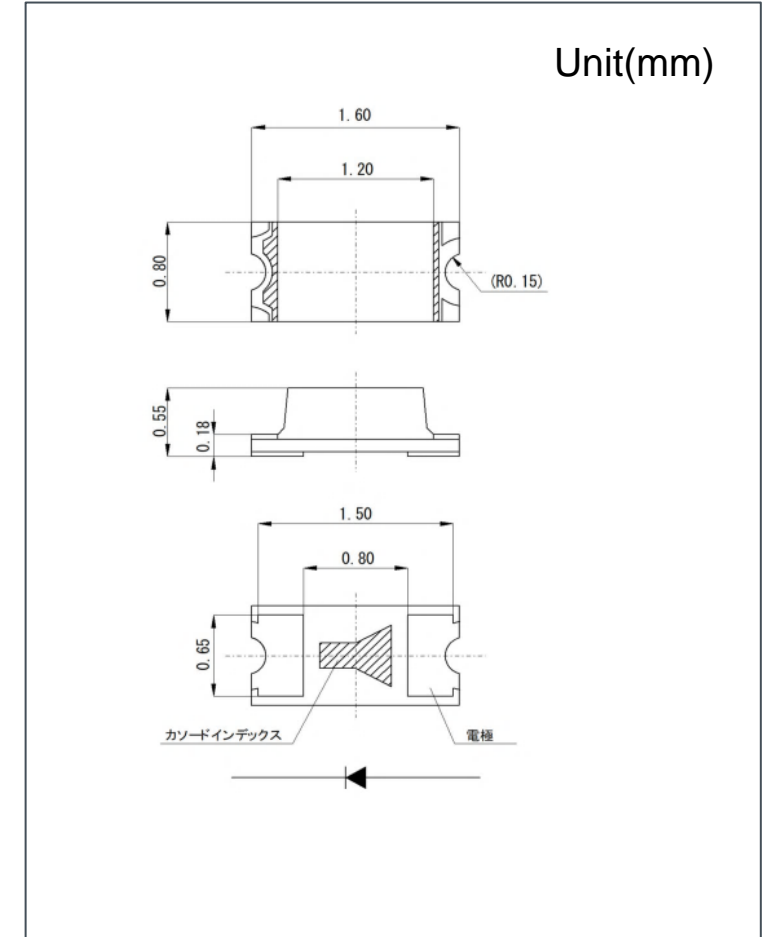
Product Lineup

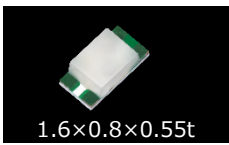
0603 size surface mount type Low current guarantee reduces uneven luminous intensity and chromaticity!

Part No.	Absolute Max. Ratings		Electrical and optical Characteristics (IF = 5mA)				
	IF [mA] (Ta=25°C)	Topr [°C]	VF(Typ.) [V]	λD (Typ.) [nm]	[X,Y] (Typ.)	IV(mcd)	
						Min.	Max.
■ SMLD12EN1W	20	-40~ +100	3	527	-	56	220
■ SMLD12E2N1W			2.9	505	-	56	140
■ SMLD12E3N1W				496	-		
■ SMLD12BN1W				470	-	14	56
□ SMLD12WBN1W				-	(0.295,0.280)	56	220



Guaranteed luminous intensity and wavelength at low current







0603 size 5mA sorting LED: SMLD22 series (2 colors)

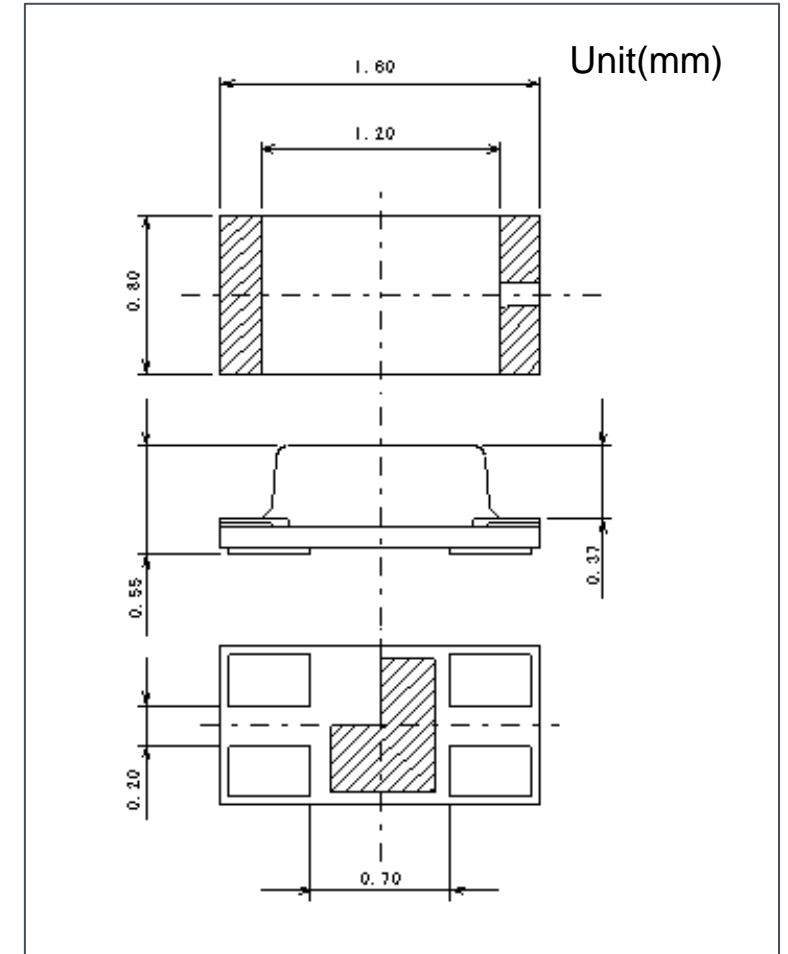
Product Lineup

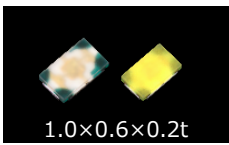
0603 size surface mount type Low current guarantee reduces uneven luminous intensity and chromaticity!

Part No.	Absolute Max. Ratings		Electrical and optical Characteristics (IF = 5mA)			
	IF [mA] (Ta=25°C)	Topr [°C]	VF(Typ.) [V]	λD(Typ.) [nm]	IV(mcd)	
					Min.	Max.
 SML-D22MUW	25	-40~+105	2.0	570	6	16
			1.9	620	10	25
 SML-D22YVW			2.0	488	16	40
			1.9	429	16	25



Guaranteed luminous intensity and wavelength at low current








0402 size 5mA sorting LED: SMLP14 series (blue, white)



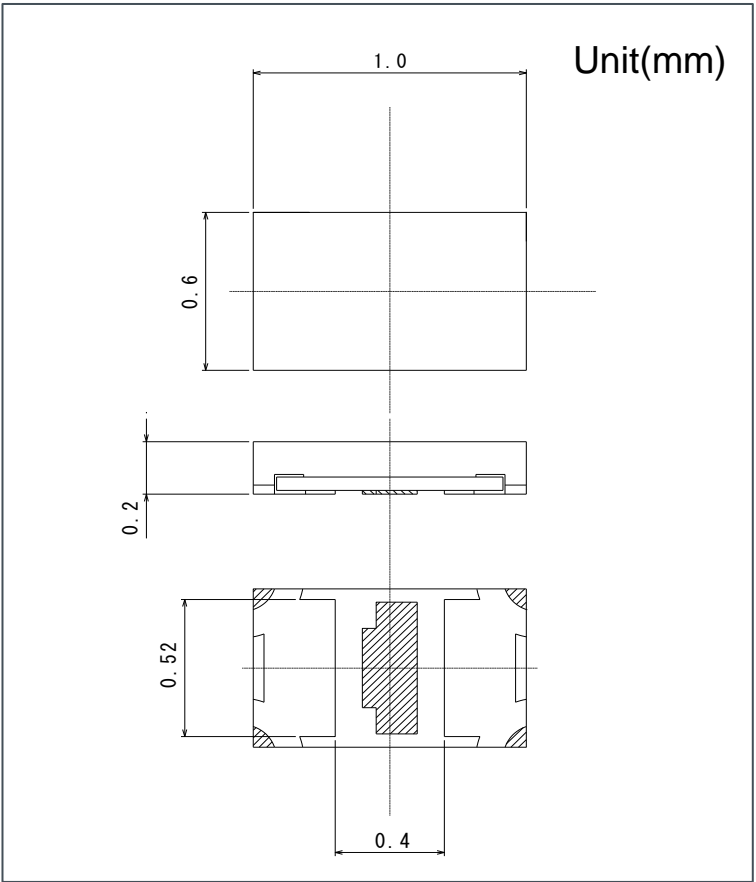
Product Lineup

Ultra-small and thin package (1.0 x 0.6 mm t=0.2 mm) 5 mA for light intensity sorting

Part No.	Absolute Max. Ratings		Electrical and optical Characteristics (IF=5mA)				
	IF [mA] (Ta=25°C)	Topr [°C]	VF(Typ.) [V]	λD(Typ.) [nm]	[X,Y] (Typ.)	IV(mcd)	
						Min.	Max.
 SMLP14ECNW	10	-40~+85	3	527	-	56	360
 SMLP14BCNW			2.9	470	-	14	90
 SMLP14WBCN1W				-	(0.30,0.30)	56	220



Guaranteed luminous intensity and wavelength at low current



5mA sorting LED SMLD12, SMLP14, SML-D22 series

Adoption examples

Electronic Cigarettes



Image is for reference only.

[Request]

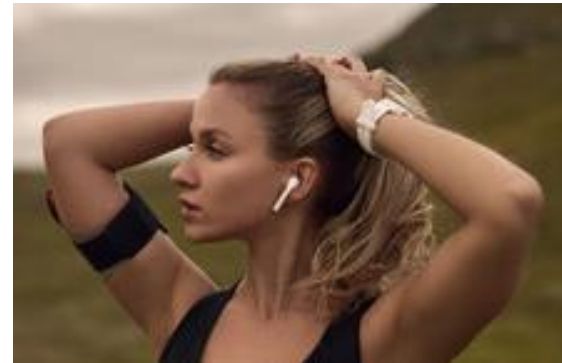
To be small in size and low in consumption
Low current products are needed, but
but also need luminous intensity



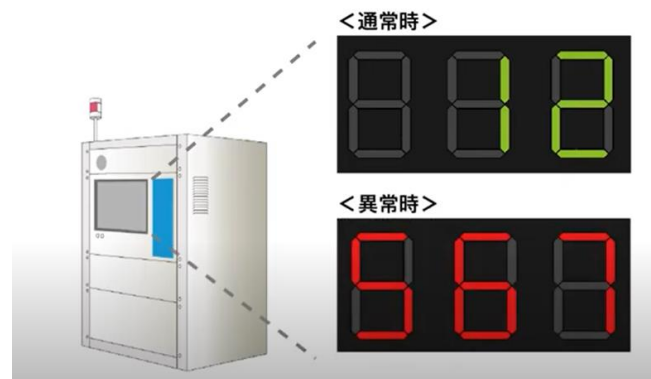
Compact white color
SMLP12WBNCW adopted

Optimal Applications

Wearable device light source



Light source for display devices for industrial equipment



Low Current type

Package (mm)	Emitting Color	Part No.	Electrical and Optical Characteristics (T _a =25°C)										Absolute Maximum Ratings (T _a =25°C)					
			Dominant Wavelength λ_D / Chromaticity Coordinates (x, y)		Luminous Intensity I _v				Forward Voltage V _F		Reverse Current I _R		Power Dissipation P _D (mW)	Forward Current I _F (mA)	Peak Forward Current I _{FP} (mA)	Reverse Voltage V _R (V)	Operating Temperature T _{opr} (°C)	Storage Temperature T _{stg} (°C)
			Typ* (nm)	I _F (mA)	Min (mcd)	Typ (mcd)	Max (mcd)	I _F (mA)	Typ (V)	I _F (mA)	Max (μ A)	V _R (V)						
 PICOLED™-eco 1.0x0.6 (t=0.2)	Red	SML-P11VT (R)	626	1	2	4	6	1	1.8	1	10	5	50	20	100*2	5	-40 to +85	-40 to +100
		SML-P11UT (R)	621	1	1	3	6	1	1.8	1	10	5	50	20	100*2	5	-40 to +85	-40 to +100
	Orange	SML-P11DT (R)	605	1	4	7	16	1	1.9	1	10	5	52	20	100*2	5	-40 to +85	-40 to +100
	Yellow	SML-P11YT (R)	586	1	4	8	16	1	1.9	1	10	5	52	20	100*2	5	-40 to +85	-40 to +100
	Yellow Green	SML-P11MT (R)	569	1	1	2	4	1	1.9	1	10	5	54	20	100*2	5	-40 to +85	-40 to +100
 PICOLED™ 1.0x0.6 (t=0.2)	Green	New SMLP14ECNW	527	5	56	110	220	5	3.0	5	100	5	34	10	50*2	5	-40 to +85	-40 to +100
	Blue	New SMLP14BCNW	470	5	9	25	56	5	2.9	5	100	5	33	10	50*2	5	-40 to +85	-40 to +100
	White	SMLP14WBCN1W	(x, y) (0.30, 0.30)	5	90	180	360	5	2.9	5	100	5	33	10	50*2	5	-40 to +85	-40 to +100
 1.6x0.8 (t=0.55)	Red	New CSL1901VW	630	2	1.6	4.8	6.3	2	1.8	2	10	5	44	20	100*2	5	-40 to +85	-40 to +100
		New CSL1901UW	620	2	2.5	6	10	2	1.8	2	10	5	44	20	100*2	5	-40 to +85	-40 to +100
	Orange	New CSL1901DW	605	2	6.3	9.4	25	2	1.8	2	10	5	44	20	100*2	5	-40 to +85	-40 to +100
	Yellow	New CSL1901YW	590	2	6.3	9.4	25	2	1.8	2	10	5	44	20	100*2	5	-40 to +85	-40 to +100
	Yellow Green	New CSL1901MW	570	2	1	3	4	2	1.8	2	10	5	44	20	100*2	5	-40 to +85	-40 to +100
	Green	SMLD12EN1W	527	5	56	140	220	5	3.0	5	10	5	70	20	100*2	5	-40 to +100	-40 to +100
	Blue Green	SMLD12E2N1W	505	5	56	120	140	5	2.9	5	10	5	66	20	100*2	5	-40 to +100	-40 to +100
		SMLD12E3N1W	496	5	56	85	140	5	2.9	5	10	5	66	20	100*2	5	-40 to +100	-40 to +100
	Blue	SMLD12BN1W	470	5	14	40	56	5	2.9	5	10	5	66	20	100*2	5	-40 to +100	-40 to +100
	White	SMLD12WBN1W	(x, y) (0.295, 0.280)	5	56	120	220	5	2.9	5	10	5	66	20	100*2	5	-40 to +100	-40 to +100
 1.6x0.8 (t=0.55)	Yellow Green	SML-D22MUW	570	5	6	10	16	5	2.0	5	10	5	67	25	100*2	5	-40 to +105	-40 to +110
	Red		620	5	10	16	25	5	1.9	5	10	5	65	25	100*2	5	-40 to +105	-40 to +110
	Yellow	SML-D22YVW	588	5	16	25	40	5	2.0	5	10	5	67	25	100*2	5	-40 to +105	-40 to +110
	Red		629	5	10	16	25	5	1.9	5	10	5	65	25	100*2	5	-40 to +105	-40 to +110
 1.3x1.5 (t=0.6)	Blue	New SML522BUNW	470	5	9	22	36	5	2.9	5	10	5	66	20	60*2	5	-40 to +85	-40 to +100
	Red		624	5	10	21	40	5	1.9	5	10	5	50	20	60*2	5	-40 to +85	-40 to +100

*1 Duty≤1/5, 200Hz *2 Duty≤1/10, 1kHz *3 Duty≤1/20, 1ms *4 Duty≤1/5, 1kHz *5 Duty≤1/10, pulse width 10ms Max

*Luminous intensity for white color is noted with chromaticity coordinate (x, y).

Note: PICOLED™ is a trademark or a registered trademark of ROHM Co., Ltd.

Red (V, U) Quick Reference of Luminous intensity

Package Structure	Package Size (mm)	Height (mm)	Luminous Intensity (mcd) I_F (mA)	1.0 to 1.6	1.6 to 2.5	2.5 to 4.0	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	160 to 250	250 to 400	400 to 630	630 to 1000	1000 to 1600	1600 to 2500	2500 to 3120
Mini-mold	1006	0.2	1			SML-P11VT (R)															
						SML-P11UT (R)															
	1608	0.55	2			CSL1901VW															
						CSL1901UW															

Orange (D) Quick Reference of Luminous intensity

Package Structure	Package Size (mm)	Height (mm)	Luminous Intensity (mcd) I_F (mA)	1.0 to 1.6	1.6 to 2.5	2.5 to 4.0	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	160 to 250	250 to 400	400 to 630	630 to 1000	1000 to 1600	1600 to 2800
Mini-mold	1006	0.2	1					SML-P11DT (R)												
	1608	0.55	2					CSL1901DW												

Yellow (Y, W) Quick Reference of Luminous intensity

Package Structure	Package Size (mm)	Height (mm)	Luminous Intensity (mcd) I_F (mA)	1.0 to 1.6	1.6 to 2.5	2.5 to 4.0	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	160 to 250	250 to 400	400 to 630	630 to 1000	1000 to 1600	1600 to 2800
Mini-mold	1006	0.2	1					SML-P11YT (R)												
	1608	0.55	2					CSL1901YW												

Yellow Green (M), Green (P, F) Quick Reference of Luminous intensity

Package Structure	Package Size (mm)	Height (mm)	Luminous Intensity (mcd) I_F (mA)	0.63 to 1.0	1.0 to 1.6	1.6 to 2.5	2.5 to 4.0	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	160 to 250	250 to 400	400 to 630	630 to 1000	1000 to 1800	1800 to 2500
Mini-mold	1006	0.2	1			SML-P11MT (R)															
	1608	0.55	2			CSL1901MW															

Green (E)/Blue Green (E2, E3) Quick Reference of Luminous intensity

Package Structure	Package Size (mm)	Height (mm)	<div>Luminous Intensity (mcd) I_F (mA)</div>	9.0 to 14	14 to 22	22 to 36	36 to 56	56 to 90	90 to 140	140 to 220	220 to 360	360 to 560	560 to 900	900 to 1400	1400 to 2200	2200 to 3600	3600 to 5600
Mini-mold	1006	0.2	5					SMLP14ECNW									
	1608	0.55						SMLD12EN1W									
								SMLD12E2N1W									
								SMLD12E3N1W									

Blue (B) Quick Reference of Luminous intensity

Package Structure	Package Size (mm)	Height (mm)	Luminous Intensity (mcd) I _F (mA)	0.9 to 1.4	1.4 to 2.2	2.2 to 3.6	3.6 to 5.6	5.6 to 9.0	9 to 14	14 to 22	22 to 36	36 to 56	56 to 90	90 to 140	140 to 220	220 to 360	360 to 560	560 to 900	900 to 1400
Mini-mold	1006	0.2	5						SMLP14BCNW										
	1608	0.55							SMLD12BN1W										

White (WB) Quick Reference of Luminous intensity

Package Structure	Package Size (mm)	Height (mm)	Luminous Intensity (mcd) I _F (mA)	9 to 14	14 to 22	22 to 36	36 to 56	56 to 90	90 to 140	140 to 220	220 to 360	360 to 560	560 to 900	900 to 1100	1100 to 1400	1400 to 1800	1800 to 2200	2200 to 2800	2800 to 3600	3600 to 7000	7000 to 8500
Mini-mold	1006	0.2	5						SMLP14WBCNIW												
	1608	0.55							SMLD12WBN1W												

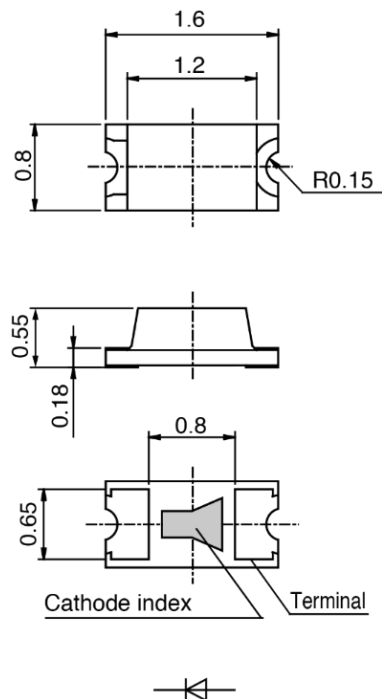
2 Colors Quick Reference of Luminous intensity

Package Structure	Package Size (mm)	Height (mm)	I _F (mA)	Luminous Intensity (mcd) Emitting Color	2.5 to 4.0	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160
Mini-mold	1315	0.6	5	Red				SML522BUNW					
				Blue									
	1608	0.55	5	Yellow Green			SML-D22MUW						
				Red									
				Yellow				SML-D22YVW					
				Red									

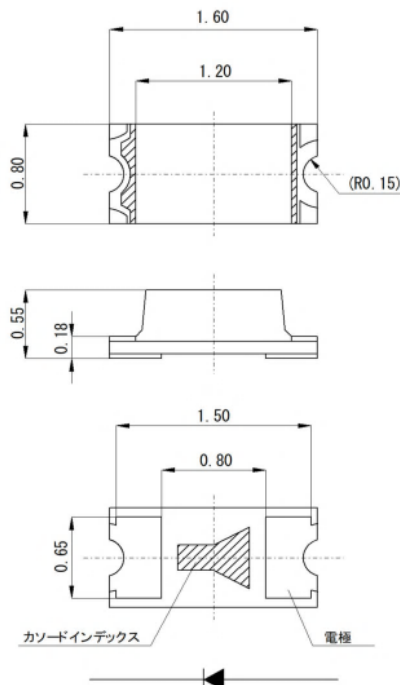
Outline Drawing and Recommended Pattern

Outline
Drawing

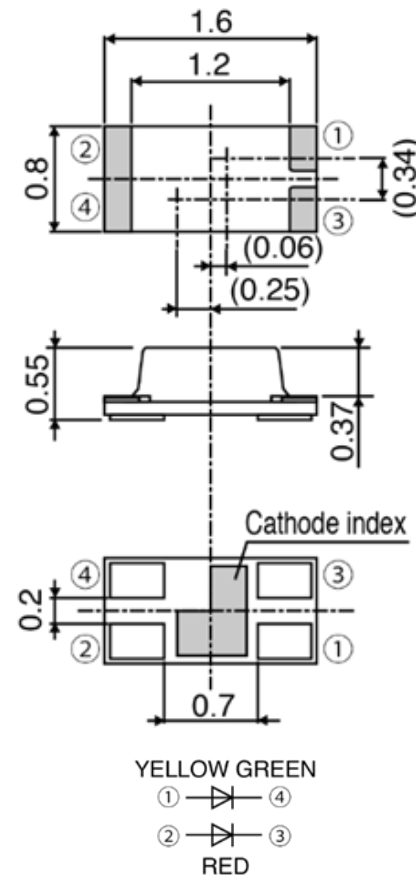
■ CSL19 Series



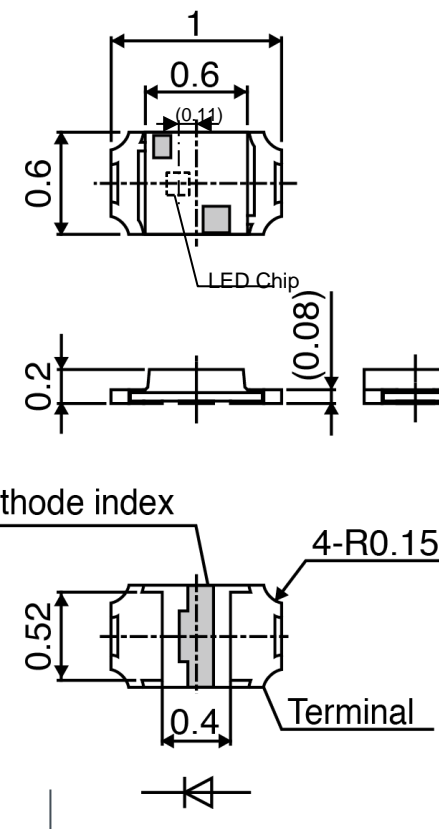
■ SMLD12 Series



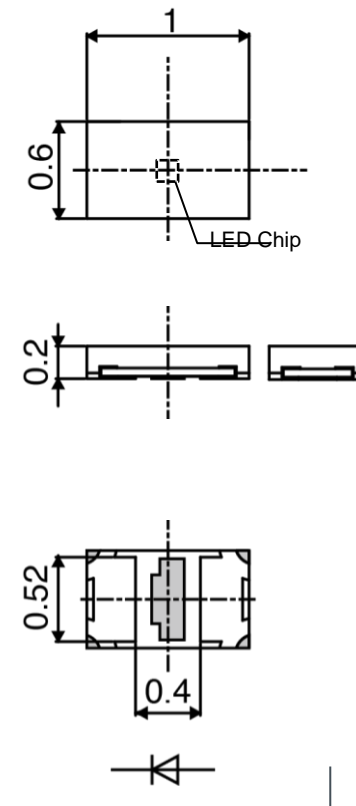
■ SML-D2 series



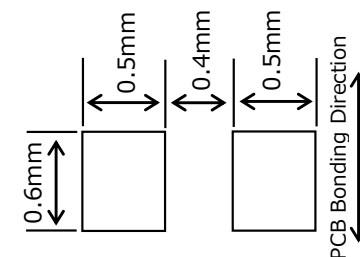
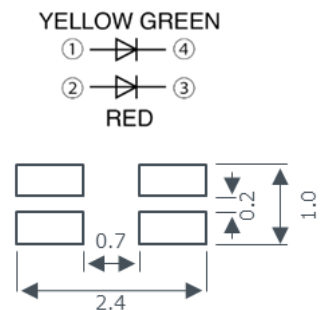
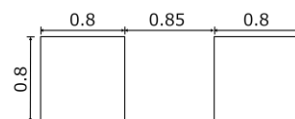
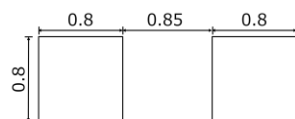
■ SML-P1 series



■ SMLP14 series



Recommended
Pattern



Reference

Mask open area ratio : 80%
Mask thickness : 80~100μm

Package Lineup

unit(mm)

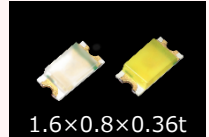
Top view

★ AEC-Q102

★: Reverse mount available

1608size

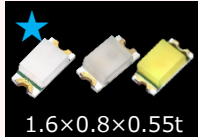
SML-E1/EN series



1.6×0.8×0.36t

V U D Y M P
E B WB

SML-D1 series



1.6×0.8×0.55t

V U D Y3 Y W M
F P E E2 E3 B WB

CSL19 series



1.6×0.8×0.55t

V U D Y M

CSL09 series



1.6×0.8×1.24t

V U D Y W M P
E B

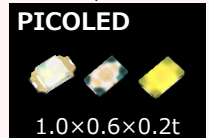
CSL11 series



1.6×0.8×0.55t

WB

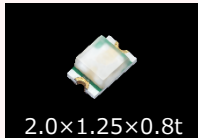
SML-P1/P14 series



1.0×0.6×0.2t

V U U2 D Y3 Y W
Y2 M2 M F P E B
WB IR

SML-H1 series



2.0×1.25×0.8t

V U D Y M P
TB

SML-M1/MN series



2.0×1.25×0.8t

V U D Y M P
E B WB IR

SML-Z1/ZN series



3.5×2.8×1.9t

V U D Y M F P
E B WB

CSL10 series



1.6×0.8×1.06t

E B

High Power(White)

SMLK1 * series



4.5×2.0×0.6t

WB

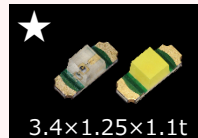
SML-S1 series



3.2×1.6×1.85t

V U D Y M P
E B IR

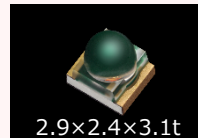
SML-81 series



3.4×1.25×1.1t

V U D W M
B WB TB

CSL07 series



2.9×2.4×3.1t

U D

Side view

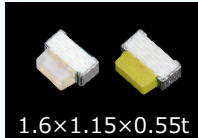
CSL04 series



2.8×1.2×0.8t

WB

SML-A1 series



1.6×1.15×0.55t

V U D Y W M P
E B WB

Multi color

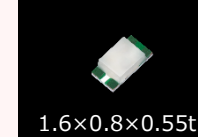
SML-P24 series



1.0×1.0×0.2t

M U

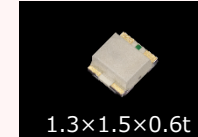
SML-D22 series



1.6×0.8×0.55t

M U V Y

SML-52 series



1.3×1.5×0.6t

B U M U M D M Y

SML-82 series



3.4×1.25×1.1t

M V

SMLP34RGB



1.0×1.0×0.2t

SMLP36RGB



1.5×1.0×0.2t

MSL0402RGB



1.8×1.6×0.5tz

SMLVN6RGB



3.5×2.8×0.6t

MSL0601RGB



2.9×1.35×1.0t

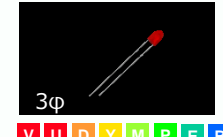
MSL0104RGB



6.9×2.2×2.15t

Lamp

SLI/SLR-343 series



3φ

V U D Y M P E B WB

SLI/SLA-560 series



5φ

U D Y M E B WB

SLI/SLA-580 series



5φ

U D Y M E B

SLR-56 series



5φ

V D Y M E B

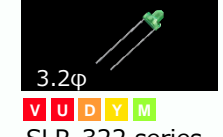
SLI-430 series



4φ

U D Y M

SLR/SLI-325 series



3.2φ

V U D Y M

SLR-322 series



3φ

V D Y M


①ROHM HP(LED)

Go to HP for data related !
Can be obtained with individual product data


Tools

MODELS

 SMLD12EN1W SPICE Model

 SMLD12EN1W Ray Data

2D/3D/CAD

 SMLD12EN1W 3D STEP Data

 Parasolid X_T File


 3D eDrawings Data


CHARACTERISTICS DATA

 Electrical Static Discharge (ESD)

Packaging & Quality


MANUFACTURING DATA

 Reliability Test Result

 Factory Information

ENVIRONMENTAL DATA

 About Flammability of Materials

 Compliance of the ELV directive

 MSDS

 Compliance of the RoHS / ELV directive

EXPORT INFORMATION

 About Export Regulations

ROHM YouTube

~LED Product Videos~



 click



 click



 click



 click



 click



 click

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