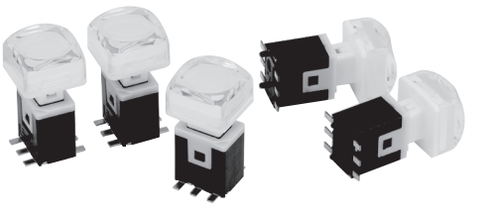
Sunmulon

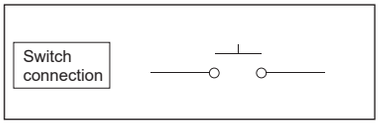
K2 Illuminated Pushbutton Switch

K2

SMT momentary switch
concave, raised dot, Flat button

- Depth behind panel：Only 12 mm
- LED Full-Face, Multi-Color
- Terinal : Surface Mount Terminal
- Selectable with or without Click feeling.





CHARACTERISTICS

Button size		Square：□12 mm, □15 mm
Contact Material		Gold-Plated
Rating (Resistive Load)		DC 24 V 20 mA
Insulation Resistance		More than 100 MΩ at DC 500 V
Dielectric Strength		AC 1000 V RMS between N and NO terminal AC 1500 V RMS between terminals and ground 50／60 Hz for 60 sec. at normal ambient temperature and humidity
Contact Resistance		Less than 200 mΩ at DC 6 V 0.1 A
Vibration Resistance		10 to 55 Hz, Amplitude 1.5 mm
Mechanical Life	Momentary	More than 3,000,000 operations
Electrical Life (Resistive Load)		More than 3,000,000 operations
Operating Force		2.0 N　　max.
Total Travel		4.0 mm　max.
Weight		2.9 g
Ambient Operating Temperature		－15℃ to 50℃（No Condensation）
Ambient Operating Humidity		85%RH MAX.（No Freeze）
Ambient Storage Temperature, Humidity		Indoors at a temperature of 25℃ or less and relative humidity of 50% or less

https://www.sunmulon.co.jp/english/products/switch_e/k2.html

◇Dimensions：page K2-3
◇Ordering code：page K2-4～5
◇Internal connection arrangements：page K2-7
◇LED specifications：page K2-8～9
◇Terminals / PCB hole cutout：page K2-10

SPECIFICATIONS

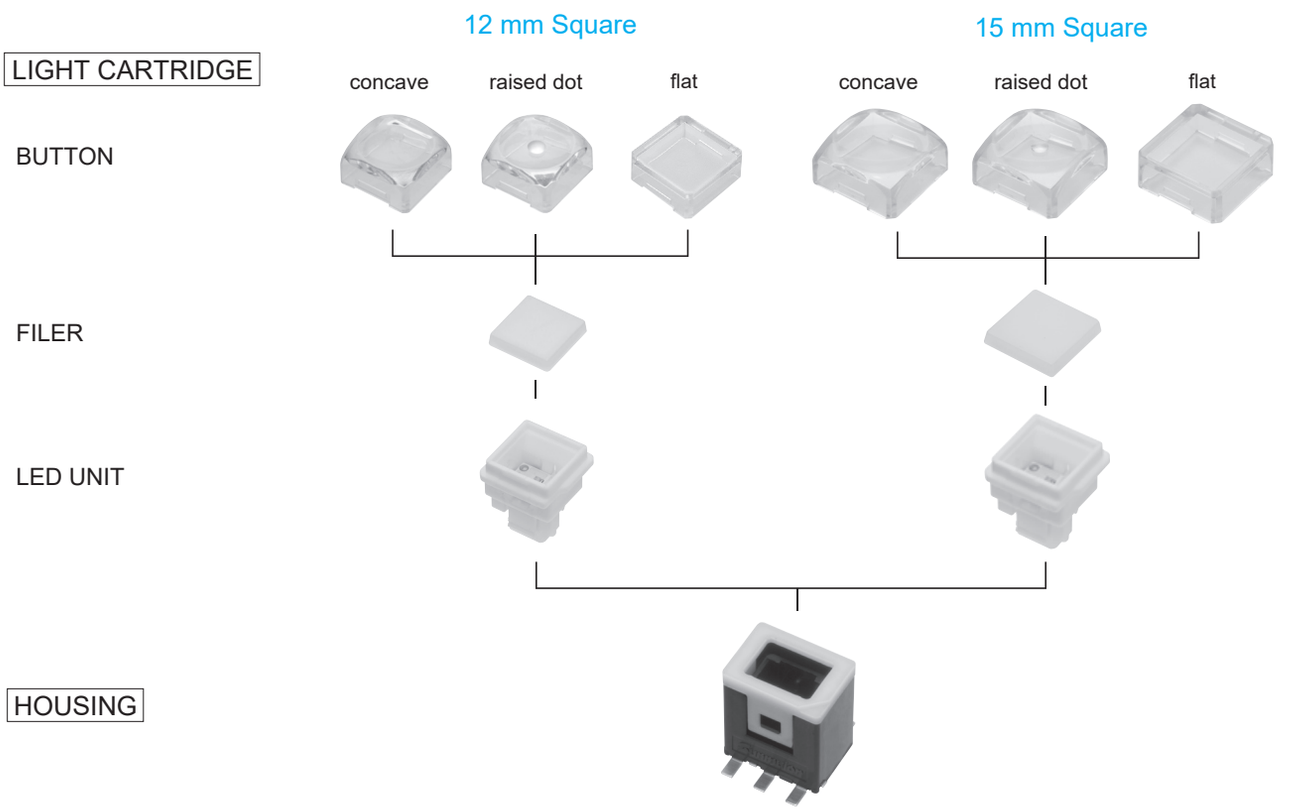
Button size	Square	12 mm	15 mm
Illumination type	Full-Face	A	A
	Dual-Color	A	A
Contact	SPST	A	A
Terminal	SMT	A	A
RoHS（10 Substances）		Conform to standards	

A : Applicable

CONTACT RATINGS

Rating	DC 24V 20 mA（Resistive load）

STRUCTURE



ILLUMINATION TYPES

Common for each button size.

LED color symbol

7	Red	8	Green	9	Yellow	18	Super Green

※ Yellow (9) is actually “ORANGE Yellow” not Lemon Yellow.

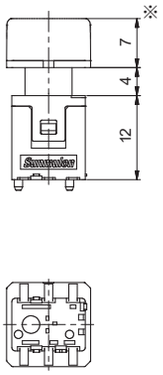
Full-Face	7　8　9
Dual-Color	7･8　7･18

DIMENSIONS

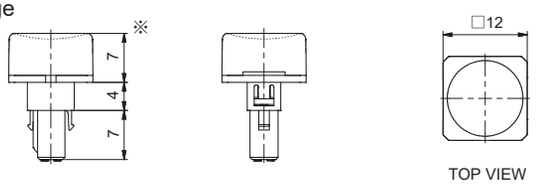
12 mm Button

3D
DXF

Assembled Part

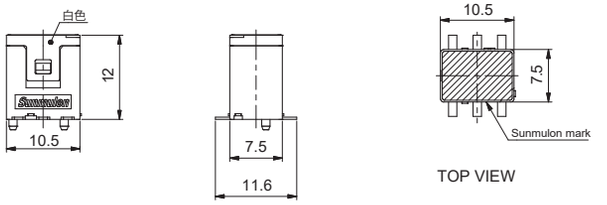


Light cartridge



※ The height of the button is the same for the raise dot button.

Housing

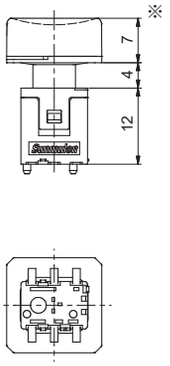


The hatched section ▨ is covered with a heat-resistant seal.

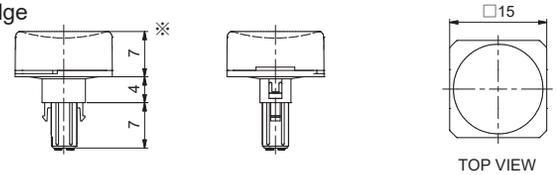
15 mm Button

3D
DXF

Assembled Part

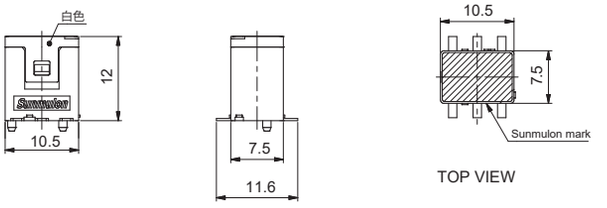


Light cartridge



※ The height of the button is the same for the raise dot button and the flat button.

Housing



The hatched section ▨ is covered with a heat-resistant seal.

3D, DXF data download site ： **https://www.sunmulon.co.jp/download/**

Tolerance：± 0.4mm

ORDERING CODE 【Full-Face】

LIGHT CARTRIDGE

K2 — □ □ □ □ □

● BUTTON SIZE

12	12 mm Square
15	15 mm Square

● BUTTON SHAPE

K	Concave
P	Raised dot
S	Flat
X	Without button

※2)

● LED COLOR

7	Red
8	Green
9	Yellow
X	Without LED

※1)

For protecting LED, use external protective resistor.

● FILTER COLOR

4	Milk-white
X	Without filter

※2)

● BUTTON COLOR

C	Clear
X	Without button

※2)

● NOTES

※1) The color of "Yellow" for LED (9) is actually "Orange Yellow" not Lemon Yellow.

※2) In case of selecting without button (X), without filter (X), please order button and filter separately.

HOUSING

K2 □ — K M

● CIRCUIT CHARACTERISTIC AND OPERATIONAL FEEL

M	Momentary, with click feel
S	Momentary, without click feel

● TERMINAL

M	Surface-mounted terminal

● HOUSING COLOR

K	Black

◇Dimensions：page K2-3 ◇Internal connection arrangements：page K2-7 ◇LED Specifications：page K2-8～9
◇Terminals / PCB hole cutout：page K2-10

ORDERING CODE 【Dual-Color】

LIGHT CARTRIDGE

K2 — □ □ □ □ □

● BUTTON SIZE

12	12 mm Square
15	15 mm Square

● BUTTON SHAPE

K	Concave
P	Raised dot
S	Flat
X	Without button ※1)

● LED COLOR

78	Dual-color (Red / Green)
718	Dual-Color (Red / Super Green)

For protecting LED, use external protective resistor.

● FILTER COLOR

4	Milk-white
X	Without filter ※1)

● BUTTON COLOR

C	Clear
X	Without button ※1)

● NOTES

※1) In case of selecting without button (X), without filter (X), please order button and filter separately.

HOUSING

K2 □ — K M

● CIRCUIT CHARACTERISTIC AND OPERATIONAL FEEL

M	Momentary, with click feel
S	Momentary, without click feel

● TERMINAL

M	Surface-mounted terminal

● HOUSING COLOR

K	Black

◇Dimensions：page K2-3 ◇Internal connection arrangements：page K2-7 ◇LED Specifications：page K2-8～9
◇Terminals / PCB hole cutout：page K2-10

REPLACEMENT PARTS

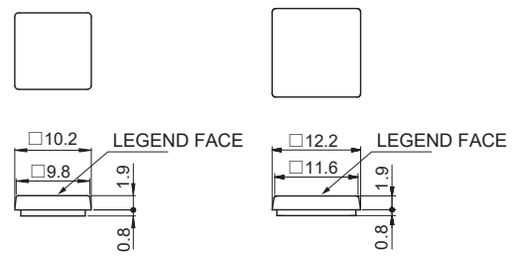
● BUTTON

	Concave	Raised dot	Flat
12 mm Square	KA-4603-1CC	KA-4603-2CC	KA-4730-1CC
15 mm Square	KA-4768-1CC	KA-4768-2CC	KA-4769-1CC

● FILTER

	Milk-White
12 mm Square	KA-4604-LM
15 mm Square	KA-4770-LM

FILTER DIMENSIONS

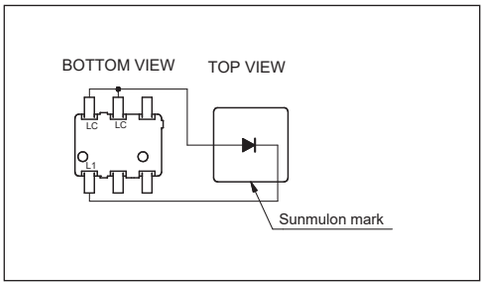


KA-4604-LM KA-4770-LM

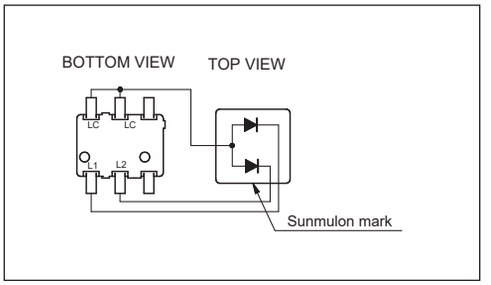
Tolerance：± 0.4mm

INTERNAL CONNECTION ARRANGEMENT

● Full-Face



● Dual-Color



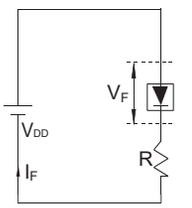
● Dual-Color combination

Terminals	LED Color	
LC-L1	Red	Red
LC-L2	Green	Super Green

LED SPECIFICATIONS【Full-Face】

Item \ Color			Red	Green	Yellow
Max. Forward Current	I_{FM}	(mA)	25	20	25
Power Dissipation		(mW)	60	48	60
DC Reverse Voltage	V_R	(V)	5	5	5
Forward Voltage	V_F (Typ.)※	(V)	1.9	2.1	1.9
Dominant wavelength	λd※	(nm)	626	572	595
Forward current under the above conditions※		(mA)	20	20	20
Maximum Forward Current			Figure 1		
Pulse Lighting	Pulse Width PW	(μs)	400		
	Duty Ratio D_R		10^{-1}		
	Allowable forward current I_{FP}	(mA)	92		

● Wiring Diagram

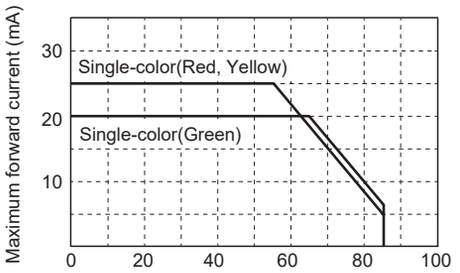


Refer to the following formula
to calculate external resistance values.

$$R = \frac{V_{DD} - V_F}{I_F}$$

V_{DD} : Supply Voltage
V_F : Forward Voltage
I_F : Forward Current

● Maximum forward current ― Ambient temperature



(Figure 1)

● Reference external resistor

Since LED protection resistors are not built-in, connect resistors in series referring to the table below.

Ta=25°C

Button size	Color / Voltage	Red	Green	Yellow
12 mm	DC 5V	620Ω1/16W	270Ω 1/8W	330Ω1/16W
	DC 12V	2kΩ 1/8W	910Ω 1/4W	1.1kΩ 1/4W
	DC 24V	4.3kΩ 1/4W	2kΩ 1/2W	2.4kΩ 1/2W
	Reference forward current (mA)	5	11	9
15 mm	DC 5V	510Ω1/16W	91Ω1/16W	300Ω1/16W
	DC 12V	1.6kΩ 1/4W	820Ω 1/4W	1kΩ 1/4W
	DC 24V	3.6kΩ 1/2W	2kΩ 1/2W	2.2kΩ 1/2W
	Reference forward current (mA)	6	10	10

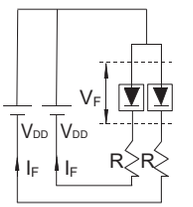
For resistance value calculation
https://www.sunmulon.co.jp/english/products/led.html
The resistance value can be calculated just by entering the items.

LED SPECIFICATIONS【Dual-Color】

Item \ Color		Red・Green (78)			Red・Super Green (718)	
		Red	Green		Red	Super Green
			□12	□15		
Max. Forward Current I_{FM}	(mA)	25(17)	20(14)	20(14)	20(16)	10(8)
Power Dissipation	(mW)	60	48	48	48	38
DC Reverse Voltage V_R	(V)	5	5	10	5	5
Forward Voltage V_F (Typ.)※	(V)	1.9	2.1	4.2	1.8	3.4
Dominant wavelength λd ※	(nm)	626	572	572	626	525
Forward current under the above conditions ※	(mA)	20	20	20	10	10
Maximum Forward Current		Figure 2			Figure 3	
Pulse Lighting: Pulse Width PW	(μs)	400			400	15
Pulse Lighting: Duty Ratio D_R		10^{-1}			10^{-1}	10^{-1}
Pulse Lighting: Allowable forward current I_{FP}	(mA)	92			92	50

※ In case of Simultaneous lighting, please follow the figures in ( ) .

● Wiring Diagram

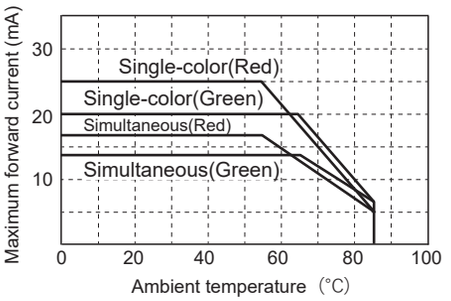


Refer to the following formula
to calculate external resistance values.

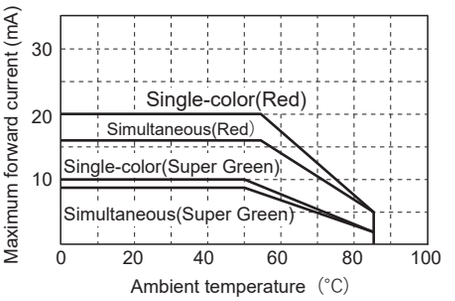
$$R = \frac{V_{DD} - V_F}{I_F}$$

V_{DD} : Supply Voltage
V_F : Forward Voltage
I_F : Forward Current

● Maximum forward current ― Ambient temperature



(Figure 2)



(Figure 3)

● Reference external resistor

Since LED protection resistors are not built-in, connect resistors in series referring to the table below.

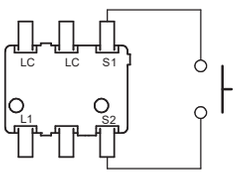
Ta=25°C

Button size	Color / Voltage	Red・Green (78) Red	Red・Green (78) Green	Red・Super Green (718) Red	Red・Super Green (718) Super Green
12 mm	DC 5V	620Ω 1/16W	270Ω 1/8W	510Ω 1/16W	910Ω 1/16W
	DC 12V	2kΩ 1/8W	910Ω 1/4W	1.6kΩ 1/4W	3.6kΩ 1/16W
	DC 24V	4.3kΩ 1/4W	2kΩ 1/2W	3.6kΩ 1/2W	8.2kΩ 1/8W
	Reference forward current (mA)	5	11	6	3
15 mm	DC 5V	510Ω 1/16W	91Ω 1/16W	360Ω 1/16W	620Ω 1/16W
	DC 12V	1.6kΩ 1/4W	820Ω 1/4W	1.2kΩ 1/4W	2.4kΩ 1/8W
	DC 24V	3.6kΩ 1/2W	2kΩ 1/2W	2.7kΩ 1/2W	5.6kΩ 1/4W
	Reference forward current (mA)	6	10	8	4

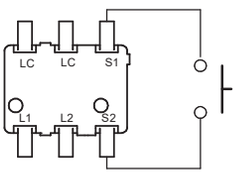
For resistance value calculation
https://www.sunmulon.co.jp/english/products/led.html
The resistance value can be calculated just by entering the items.

TERMINALS／PCB HOLE CUTOUT

● TERMINALS LAYOUT（BOTTOM VIEW）

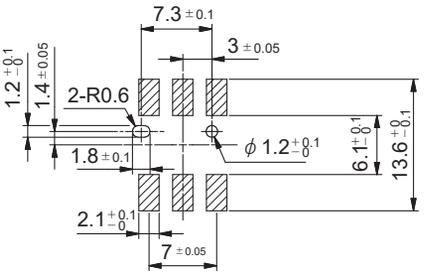


Full-Face

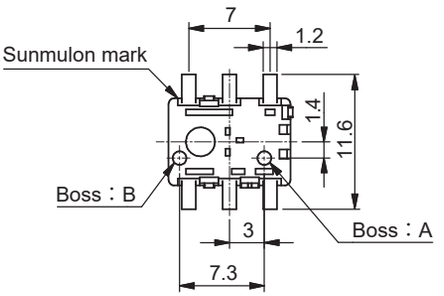


Dual-Color

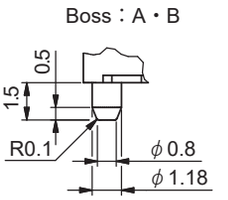
● PCB hole cutout （TOP VIEW）



TERMINAL SHAPE



BOTTOM VIEW



Tolerance：± 0.4mm

SOLDERING SPECIFICATIONS

● Soldering

(1) Conduct preliminary testing for confirming the soldering conditions.
Switches could be deformed by heat depending on the pattern and land on the PCB.

(2) The number of soldering is no more than twice, including corrective re-soldering.
When soldering repeatedly, wait at least five minutes between the first and second soldering until the work cools to room temperature.
Continuous heating can result in deformity of outer contours are deterioration.

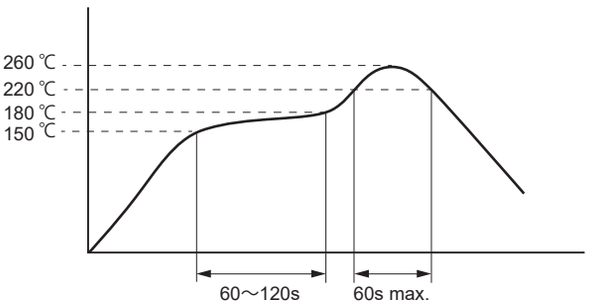
● Recommended conditions for reflow soldering (When attaching single terminal)

Please set a reflow furnace referring to the remperature profile example shown below for the terminal temperature.
Deformity could result due to the heat if the product temperature exceeds 260℃, therefore ensure that the temperature on the product surface remains below 260℃.

Pre-heating : 150℃ to 180℃
60 to 120 sec
Reflow : 220℃ or above
within 30 to 60 sec
Solder type : Sn 96.5
Ag 3
Cu 0.5
※A30C 5 (JIS indication)

※Consult with us if you wish to attach parts continuously or in high density.

【Temperature profile example when lead-free solder is used】



● Manual soldering

(1) Soldering temperture : 350℃ or less at tip of soldering iron.
(2) Soldering time : within 3 sec

● Cleaning

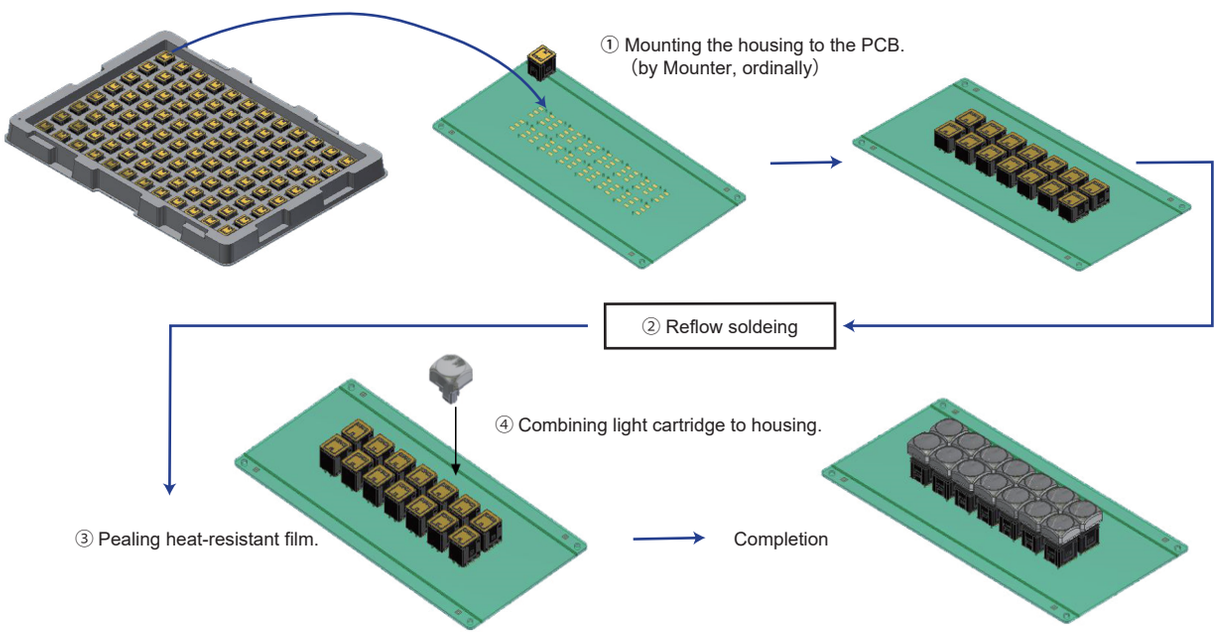
The switches are not washable.
Washing may cause flux and foreign mtter on the PCB to get inside the swtch along with cleaning fluid, and could cause failure.

● PCB

(1) When recommend confirming thichness of the PCB, pattern on the PCB and land prior to volume production.

(2) Handle the PCB carefully when dividing the PCB could get inside the switches.
Avoid piling assembled PCB.

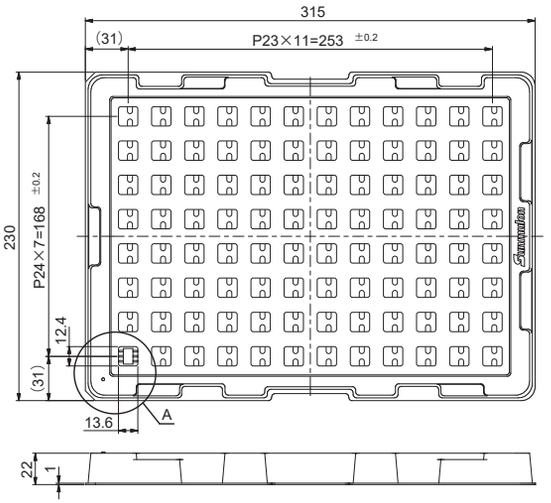
SURFACE MOUNTING PROCESS

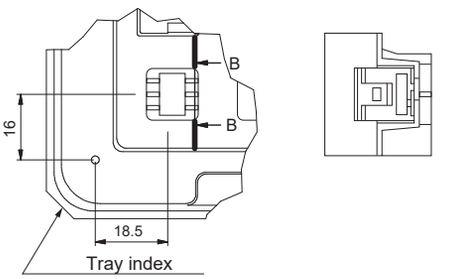


Tolerance : ± 0.4mm

PACKAGING SPECIFICATIONS

● The housing of K2 series switches is delivered in a tray. Tray specifications are as shown below.



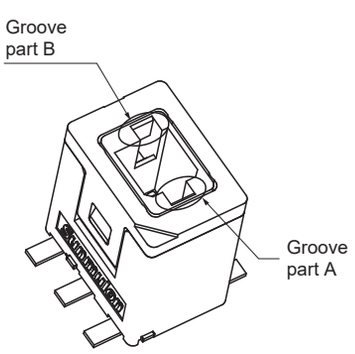


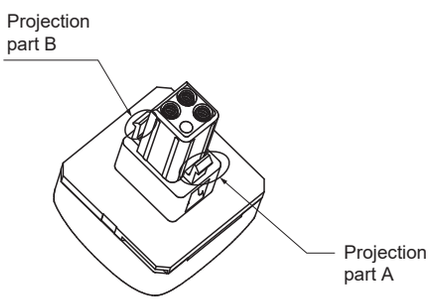
Tray	Part no.	K2-4704

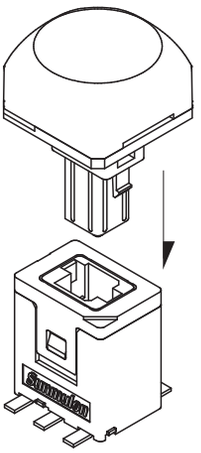
The light cartridge is always delivered in a product box.

ASSEMBLY

● Mounting the light cartridge







To combine the light cartridge with the housing, remove the seal attached to the housing.
There is a proper direction for combining the light cartridge with the housing.
As shown in the above diagram, insert the light cartridge by aligning the projection part A with the groove part A, and the projection part B with the groove part B.

Tolerance：± 0.4mm

PRECAUTIONS FOR CORRECT USE

● Handling of switches

(1) Usage environment

Prior to setting the product in the environment for actual usage, check that no corrosive or other gas is emitted from component parts in the vicinity.

Avoid using in atmospheres containing sulfidizing gas (H2S, SO2), ammonia gas (NH3), nitrate gas (NH3), chlorine gas (CL2) or other corrosive gases, or under high temperature or humidity.

(2) Contact errors could result if silicon is present in the vicinity of the switch.

Remove the source of silicon if silicon oil, silicon filler, silicon wire or other silicon products are present around the switch.

(3) Dust-prevention measures

Avoid using the switches in places where dust is generated.

(4) Waterproofing and drip-proofing

The switches are not waterproof or drip-proof. Avoid installing or using them in places where they might be splashed with liquids.

(5) Automatic mounting

The switches can be mounted automatically on baseboards, but this may not be possible with some types of mounting machines. We recommend checking beforehand when using the product this way.

(6) Strength of terminals

Note that if a terminal is bent or twisted, its strength declines and the terminal could break.

● Matters for caution when storing

(1) Storage environment

When storing the product, please take full consideration that the atmosphere, humidity and other storage conditions could affect the ease of soldering of terminals and packaging functions.

-Packaging material is expected to age more rapidly under high temperatures and humidity. We recommend storing the products indoors at temperatures up to 258C and relative humidity up to 50%.

-Avoid storing the products in an environment with sulfidizing or other corrosive gases.

-Avoid direct sunlight and dust.

(2) Storage conditions

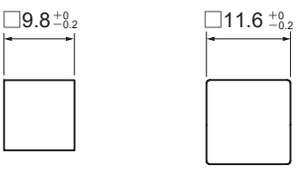
Store the products in the packaging.

Use products promptly after opening the packaging, and store the remaining products in an area free of gas, humidity and other factors witch ight affect performance.

Handle the products carefully to prevent damage to terminals from deforming.

● Character films

The character film is not included in the package. To use the character film, use a heat resistant film of 0.1 mm thickness or less.
Please refer to the figure below.



12 mm　　15 mm

Tolerance：± 0.4mm

As of June 2022

Safety Precautions for All Illuminted Pushbutton Switches

1. Notes on contents of Catalogs

(1) Rated values, performance values, and specification values of Sumulon products listed in this catalog are values acquired under respective conditions in independent testing, and do not guarantee values gained in combined conditions.

(2) The ambient operating temperature(humidity) is guaranteed by evaluation based on characteristics, and does not guarantee continuous use for a long period of time near the upper or lower limit of the ambient operating temperature(humidity) or permanent use at that temperature(humidity).

(3) Reference data and reference values listed in catalogs are for reference purposes only, and do not guarantee that the product will always operate appropriately in that range.

(4) The specifications / appearance and accessories of Sunmulon products listed in catalogs are subject to change or termination of sales without notice, for improvemnet or other reasons.

(5) The content of catalogs is subject to change without notice.

2. Note on applications

(1) If using Sunmulon products in combination with other products, confirm the following suitability by yourself. Sunmulon shall provide no guarantees regarding the combination suitability.
(a) Regulations, satndards, or laws to which your machinery, equipment, ect. must conform
(b) Functionality and safety of your machinery and equipment

(2) Wiring and installation that ensures the Sunmulon product used in your system, machine, device, or the like can perform and function according to its specifications.

(3) When using Sunmulon products, be cautious when implementing the following.
(a) Use of Sunmulon products with sufficient allowance for rating and performance.
(b) Safety design, including redundant design and malfunction prevention design that prevents other danger and damage even in the event that Sumulon product fails.

(4) Sunmulon products are designed and manufactured as general-purpose products for general industrial products. They are not intended for use in the following applications, and in the event that you use Sunmulon product for these applications, unless otherwise agreed upon between you and Sunmulon, Sunmulon shall provide no guarantees whatsoever regarding Sunmulon products.
(a) Safety devices intended for human body protection
(b) Direct control of transport equipmnt (railroads / airplanes / ships / vehicles / vehicle instruments, etc.)
(c) Space equipment, submarine equipment
(d) Nuclear power control equipment, radiation related equipment
(e) Combustion equipment, electric heat equipment
(f) Disaster prevention and security equipment
(g) Elevating equipment
(h) Amusement facilities
(i) Facilities subject to government or industry regulations
(j) Use in applications that require a high degree of safety, any other equipment, instruments, or the like that could endanger life or human health

3. Warranty

(1) The warranty period for Sunmulon products shall be 1 year after purchase or delivery to the specified location.

(2) Warranty scope should a failure occur in Sunmulon product during the above warranty period for reasons attributable to Sunmulon, then Sunmulon shall provide that product, free of charge, the same quantity. Further, in no event shall liability of Sunmulon exceed the individual price of the product on which liability is asserted.

(3) Failures cause by the following reasons shall be deemed outside the scope of this warranty.
(a) The product was handled or used deviating from conditions / environment listed in the catalogs
(b) The failure was caused by reasons other than Sunmulon product
(c) Modification or repair was performed by a party other than Sunmulon
(d) Replacement of maintenance parts, installation of accessories, or the like was not performed properly in accordance with the user's manual and catalogs
(e) The failure could not have been predicted with the scientific and technical standards at the time when the product was shipped from Sunmulon
(f) The failure was due to other causes not attributable to Sunmulon (including cases of force majeure such as natural disasters and other disasters)

(4) The warranty listed in this Safety Precautions is the full and complete warranty for Sunmulon products, and Sunmulon shall bear no liability whatsoever regarding special damages, indirect damages, incidental damages, or passive damages that occurred due to Sunmulon product.

4. Handling precautions for switch

(1) Do not perform wiring with power supplied to the switch. Do not touch the terminals or other charged parts of the switch while power is being supplied. Doing so may result in electric shock.

(2) Be careful of electrostatic breakdown when handling.

(3) Do not drop or otherwise apply strong force to the switch.

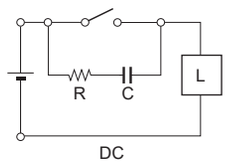
(4) Do not place heavy objects on the switch.

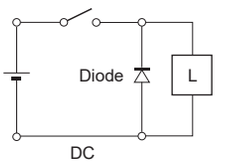
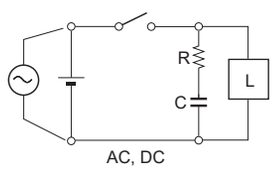
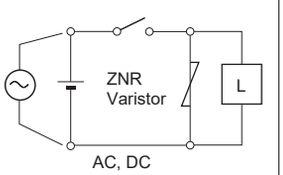
(5) Do not operate or use the housing (switch unit) by itself. Use the switch with assembled the illuminated part (LED module or button).

(6) Pushbutton switches are designed to be operated by fingertips. Operating the switch using a sharp object (screwdrivers, tweezers, etc.), hard object (metal, etc.), or with a large or sudden force, may cause deform or damage the switch.

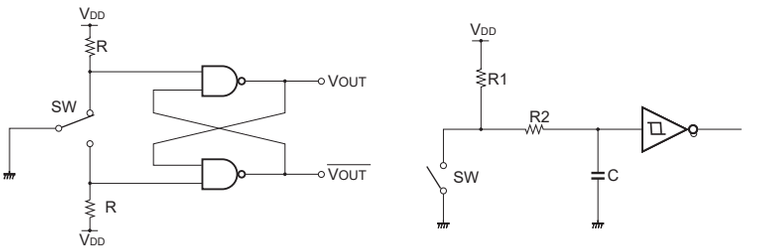
(7) Do not use the switch under loads that exceed the rated switching capacity or other contact ratings. Doing so may result in welding of the contact, or burnout accidents.

(8) For inductive load, the arc by back EMF may cause contact failure. Insertion of arc prevention circuit as the following is recommended.

<table>
<tr><th>Circuit</th><th>Element selection</th><th>Circuit</th><th>Element selection</th></tr>
<tr><td> 
</td><td rowspan="2">C：1 to 0.5 μF × switch current (A)
R：0.5 to 1 Ω × switch voltage (V)

The values may change according to the characteristics of the load. Determine ideal capacitance and resistance values through testing.</td><td> 
</td><td>The diode must withstand a peak inverse voltage 4 times higher than the power supply voltage and regarding a forward current must as high or higher than the load current.</td></tr>
<tr><td> 
</td><td> 
</td><td>Use a varistor that can withstand the power supply voltage sufficiently. (1.5 times or more)</td></tr>
</table>

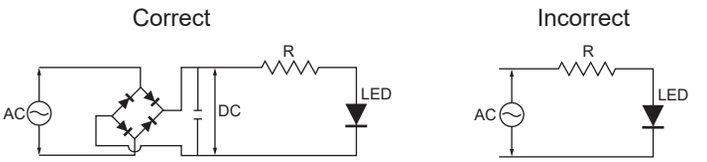
(9) Following circuits show examples of an anti-chattering circuit.



(10) Illumination

(a) Do not apply a voltage between the LED terminal that is greater than the rated voltage. Doing so may damage the LED, cause lighting failure.

(b) LEDs cannot be lit directly by AC circuit should be provided rectifier smoothing circuit for products other than AC input type.



(c) When wiring, pay attention to the polarity of the terminals.

(d) Simultaneous lighting may not be possible with Dual-Color illumination or Split-Face illumination (2, 3, or 4 split illumination), check the catalog.

(e) Apply voltage directly to LEDs of Non-built-in resistor type will damage the LEDs, so connect an appropriate external resistor.

(11) Wiring

(a) Do not apply a soldering iron to the switch housing. Doing so may deform the terminals and cause defects.

(b) See catalog for models compatible with flux prevention measures terminal. Be careful not to allow flux to panetrate sliding parts such as buttons. Use non-corrosive rosin solution as flux for dip soldering.

(c) For soldering other than flux-preventive models, hand solder with the terminals facing down to prevent flux from penetrating into the switch.

(d) The housing of KA, K2, and K9 series are designed for reflow soldering.

(e) Use the appropriate wire size for the applied voltage and current, and solder properly. Use of the product with incomplete soldering may cause abnormal heat generation, resulting in a fire hazard.

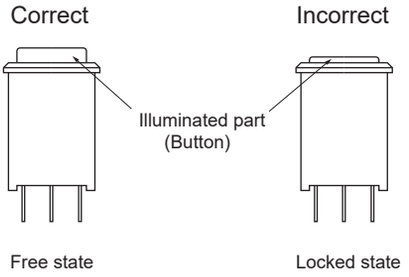
(f) After wiring is completed, maintain an appropriate insulation distance.

(12) Usage environment
(a) Do not use in the presence of flammable or explosive gases such as gasoline, thinner, LPG, etc.
(b) Avoid using the product in places where corrosive or silicon gas is generated, high temperature, high humidity, sea breeze or direct sunlight.
(c) Provide appropriate protection when using the product in places where it is exposed to water, oil, metal powder, or dust.
(d) Do not use the product in a place subject to vibration or shock. It may cause malfunction or damage.
(e) When installed in a close grouping or continuously lit, the ambient temperature may exceed the specified value due to heat generation. Take measures such as ventilation and lowering the operating voltage.
(f) When checking the actual equipment, load conditions and operating environment should be the same as the actual operating conditions.
(g) The ambient temperature for storage is －25℃ to 65 ℃ (No freeze, no condensation).

(13) When wiping off dirt on the exterior of the switch and accessories such as side plates, wipe lightly with a soft, dry cloth. Organic solvents such as thinner, benzene, alcohol, or other acidic chemicals may cause deformation, discoloration, or malfunction.

(14) Store the product away from malignant gases, dust, high temperature and high humidity, and keep it in our packing condition.

(15) When removing the illuminated part (or button) from the alternate switch housing, switch state should be in a free state.



Removal in a locked state may cause malfunction or damage to alternate switch.

(16) Periodic inspection and replacement
(a) Although mechanical and electrical durability are listed in the specifications column, deterioration of various parts (deterioration of resins and corrosion of metal parts) is possible due to the operating environment and method of use. We ask that you implement inspections for Sunmulon products to prevent accidents from occurring by conducting periodic inspections and replacements.
(b) When the switch is left unused or stored for long periods, contact reliability may deteriorate due to oxidation of contacts, which may cause continuity failure, etc. Therefore, it is necessary to check the operation before use.

(17) Service scope
The price of Sunmulon products do not include the cost of services, such as dispatching technicians.