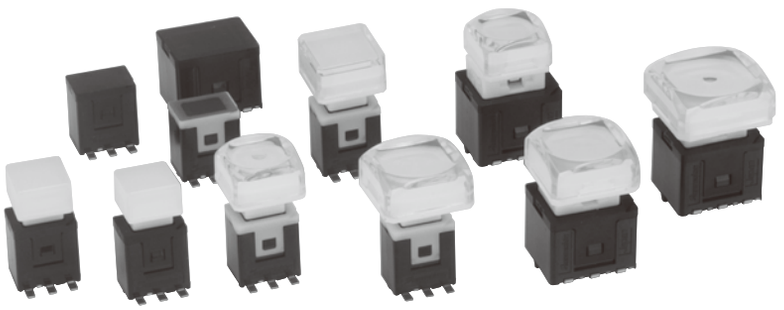
Sunmulon

RoHS LED SMT

SMT series

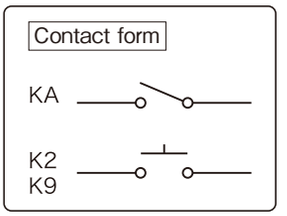
KA, K2, K9 SMT-compatible Illuminating Switch

Surface mounting (SMT) made possible in a world first for illuminating push-button switches



Maximum 70% reduction in installation costs! Improved installation quality!

- Helps reduce costs with a reduction in installation costs at the time of domestic production.
- Provides stable quality due to installation by machines at the time of overseas production.
- Reduces the tilts and twists at the time of mounting by utilizing original know-how to dramatically improve mounting accuracy.
  Also, there is no need for twist adjustments after mounting, so work efficiency will be increased drastically.
- Provides a smooth operational feel due to the introduction of the ball bearing structure (KA, K2)
- KA provides clear click feedback with a maximum 45% of the click rate.
  K2 achieves a maximum 30% of the click rate, and K9 a maximum 20% of the click rate.
- Easy assembly of parts including button, filter, light cartridge, and main body.
- Smooth and easy assembly at the time of writing name on the illuminating side
- Easy replacement of the light cartridge due to the structure that separates the main body and the light cartridge.
- Features:
  KA: High frequency, high durability, and high click rate to provide clear click feedback
  K2: Allows highly dense installation, and provides the same level of performance as KA.
  K9: For a 9 square button only



Comparison of Three Models

Model	KA			K2		K9
Button size	17.4 square	15 square	12 square	15 square	12 square	9 square
Button shape	Concave, raise dot	Concave, raise dot, flat				flat
Button structure	3 pieces					1 piece
Main body size	15×13×12mm			10.5×7.5×12mm		
Total length (including the button)	23mm					20mm
High density mounting pitch	Minimum 18mm			Minimum 15mm		
Click rate	About 45%			About 30%		About 20%
Overall movement (max)	4.0mm					2.0mm
Life	3 million times or more					300,000 times or more
Light color	Multicolor, dual-color			Dual-color, mono-color		

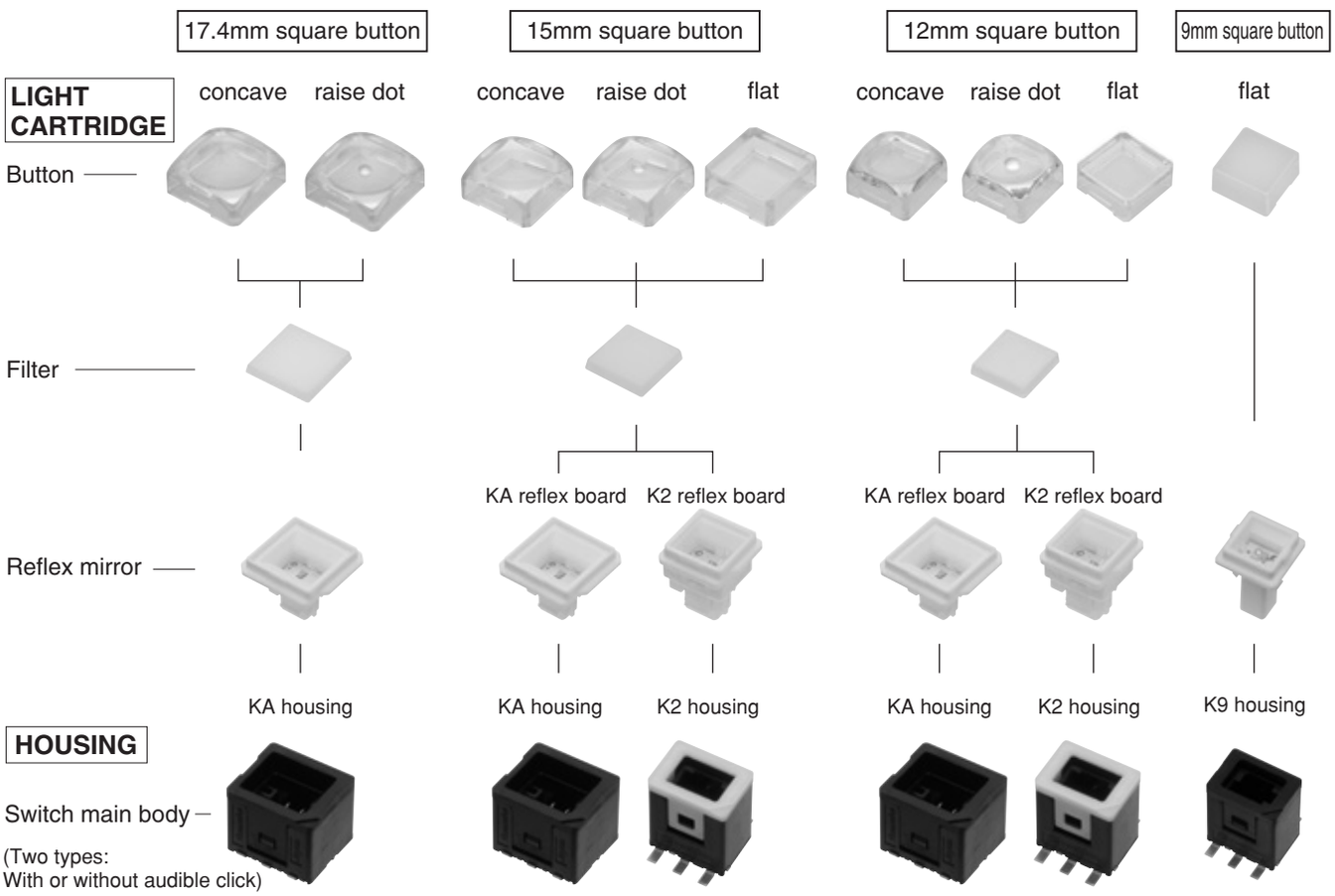
SPECIFICATIONS

Type	KA、K2	K9
Contact	Gold-Plated	
Electrical Rating	Maximum load: DC24V, 20 mA (resistance load)	
Insulation Resistance	100 MΩ or or greater with a DC 500 Megger	
Dielectric Strength	Between terminals of the same pole: AC1000V Between terminals and the ground: AC1500V At 50/60 Hz, each for 60 sec. and normal temperature and humidity	
Contact Resistance	200 mΩ or less (Initial), measured by voltage descent method or milliohmmeter, at DC6V and 0.1A	
Electrical life	More than 3 million operations at max. rated load	More than 3 hundred thousand operations at max. rated load
Mechanical life	More than 3 million operations	More than 3 hundred thousand operations
Ambient Temperature	−15°C to +50°C	
Ambient Humidity	85% RH (max.)	

OPERATING CHARACTERISTICS

KA、K2	Operating Force (Max.)	2.0N	Total Travel (Max.)	4.0mm
K9	Operating Force (Max.)	2.0N	Total Travel (Max.)	2.0mm

STRUCTURE

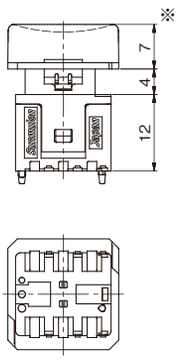


DIMENSIONS

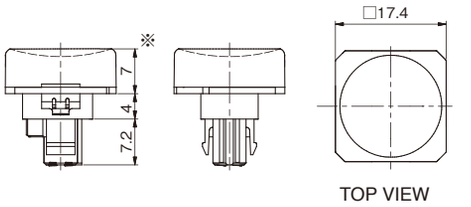
● KA

17.4mm square button

UNIT

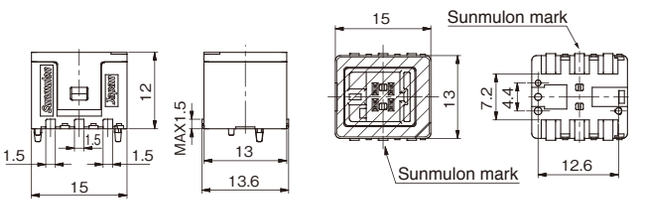


LIGHT CARTRIDGE



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

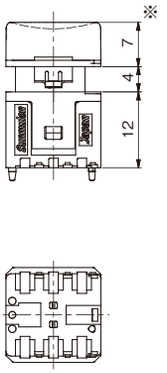
HOUSING



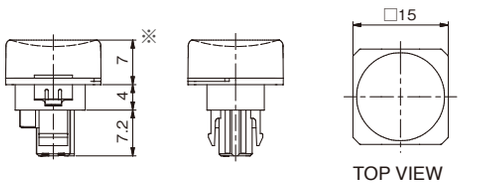
The hatched section is covered with a heat-resistant sticker.

15mm square button

UNIT

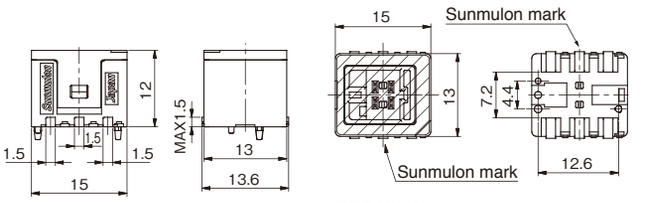


LIGHT CARTRIDGE



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

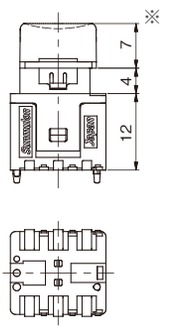
HOUSING



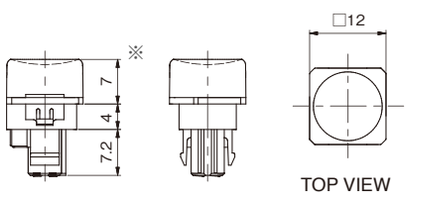
The hatched section is covered with a heat-resistant sticker.

12mm square button

UNIT

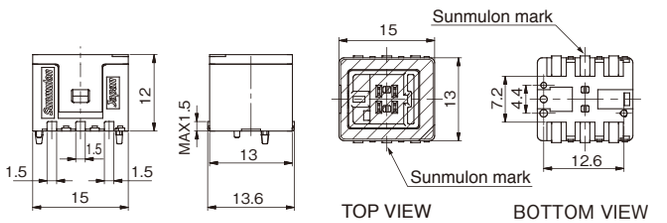


LIGHT CARTRIDGE



* 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 sticker.

Housing is common to all the buttons.

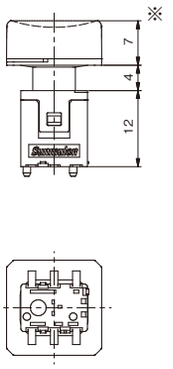
General tolerance of drawings: ±0.4 mm

DIMENSIONS

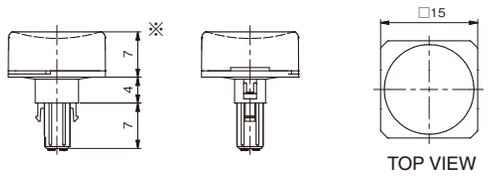
● K2

15mm square button

UNIT

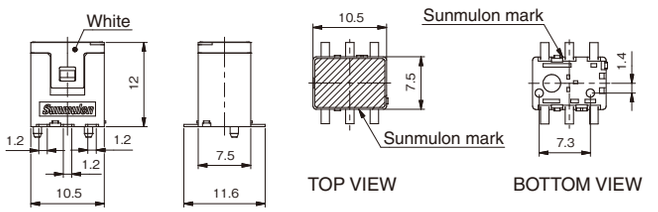


LIGHT CARTRIDGE



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

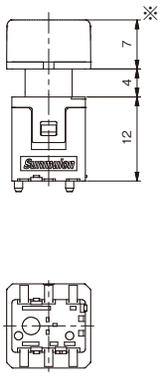
HOUSING



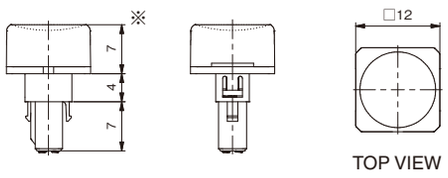
The hatched section  is covered with a heat-resistant sticker.

12mm square button

UNIT

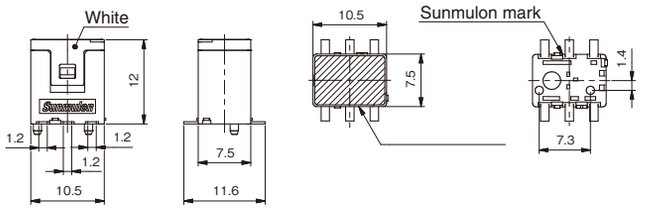


LIGHT CARTRIDGE



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

HOUSING



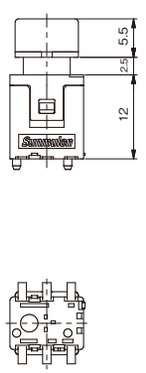
The hatched section  is covered with a heat-resistant sticker.

Housing is common to all the buttons.

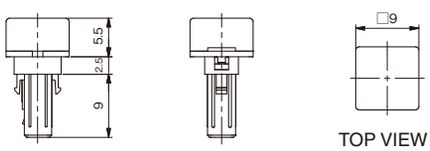
● K9

9mm square button

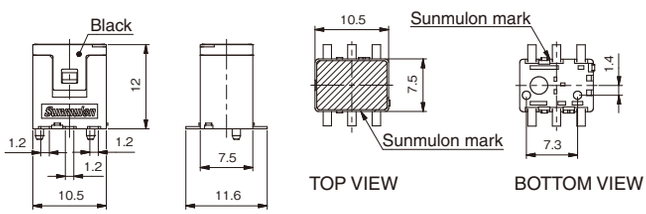
UNIT



LIGHT CARTRIDGE



HOUSING



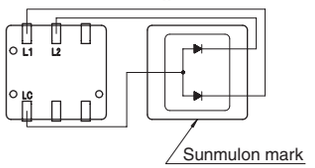
The hatched section  is covered with a heat-resistant sticker.

General tolerance of drawings: ±0.4 mm

INTERNAL CONNECTION ARRANGEMENTS

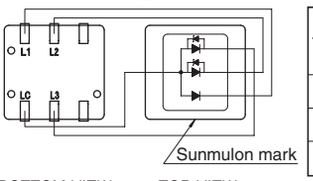
■ KA

• **Dual-color light emitted**



BOTTOM VIEW TOP VIEW

• **Multicolor light emitted**

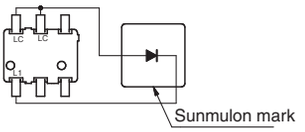


BOTTOM VIEW TOP VIEW

Terminals	LED color combination		
	Dual-color (78)	Dual-color (718)	Multicolor (22)
LC-L1	Red	Red	Red
LC-L2	Green	Super green	Super green
LC-L3			Super blue

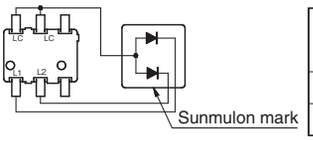
■ K2

• **Mono-color light emitted**



BOTTOM VIEW TOP VIEW

• **Dual-color light emitted**

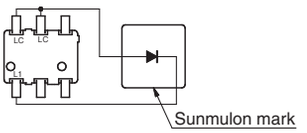


BOTTOM VIEW TOP VIEW

Terminals	LED color combination				
	Mono-color			Dual-color (78)	Dual-color (718)
LC-L1	Red	Green	Blue	Red	Red
LC-L2				Green	Super green

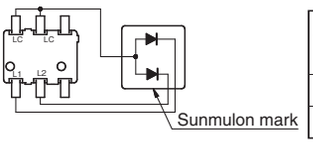
■ K9

• **Mono-color light emitted**



BOTTOM VIEW TOP VIEW

• **Dual-color light emitted**



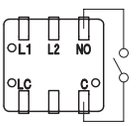
BOTTOM VIEW TOP VIEW

Terminals	LED color combination				
	Mono-color			Dual-color (78)	Dual-color (718)
LC-L1	Red	Green	Blue	Red	Red
LC-L2				Green	Super green

TERMINALS LAYOUT

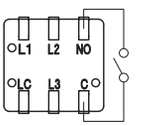
■ KA

• **Dual-color**



BOTTOM VIEW

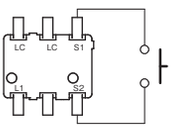
• **Multicolor**



BOTTOM VIEW

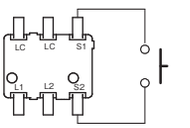
■ K2、K9

• **Mono-color**



BOTTOM VIEW

• **Dual-color**

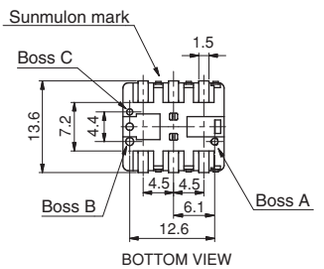


BOTTOM VIEW

TERMINAL SHAPE / PCB HOLE CUT-OUT

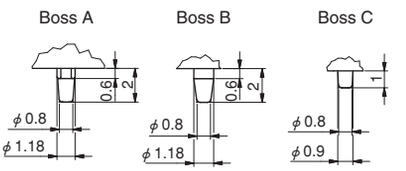
■ KA

• **Terminal dimensions**

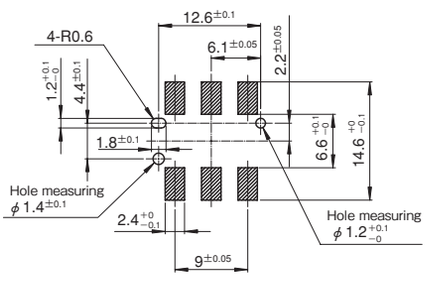


BOTTOM VIEW

• **Boss dimensions**



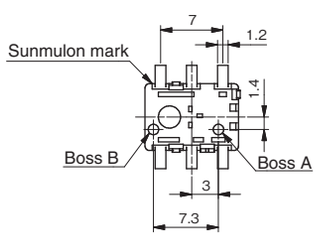
• **Recommended PAD PCB hole cut-out**



TOP VIEW

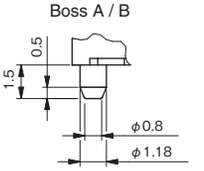
■ K2、K9

• **Terminal dimensions**

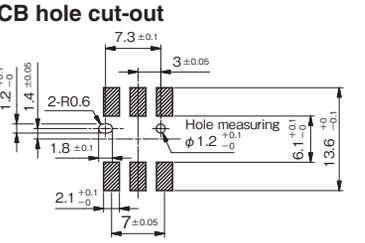


BOTTOM VIEW

• **Boss dimensions**



• **Recommended PAD PCB hole cut-out**



TOP VIEW

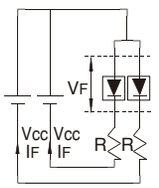
LED RATINGS / PROTECTIVE RESISTANCE

■ KA

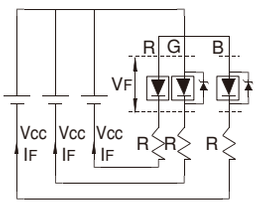
●LED ratings

Item \ Color		Full-face LED lighting (Ta=25℃)						
		Dual-color (78)		Dual-color (718)		Multicolor (22)		
		Red	Green	Red	Super green	Red	Super green	Super blue
Max. operating current	IFM (mA)	25	20	20	10	50	35	25
Maximum allowable loss	(mW)	60	48	48	38	127	124	88.7
						〔150〕		
DC backward voltage	VR (V)	5	10	5	5	5	—	—
Forward voltage	VF (V) (standard values) ※	1.9	4.2	1.8	3.4	2.2	3.2	3.2
Dominant wavelength	λd ※	626	572	626	525	622	530	468
Forward current under the conditions of the above-mentioned ※ mark	(mA)	20	20	10	10	20	20	20
Conditions when pulse is lit — Pulse width	PW (μs)	400		400	15	10^4	10^4	10^4
Conditions when pulse is lit — Duty ratio	DR	10^{-1}		10^{-1}		10^{-1}		
Conditions when pulse is lit — Allowable forward current for pulse	IFP(mA)	92		92	50	150	110	80
Wiring diagram		Figure 1				Figure 2		
Allowable forward current for operating temperature (including internal temperature)		Figure 3		Figure 4		Figure 5		

〔 〕indicate values when simultaneously lit



(Figure 1)



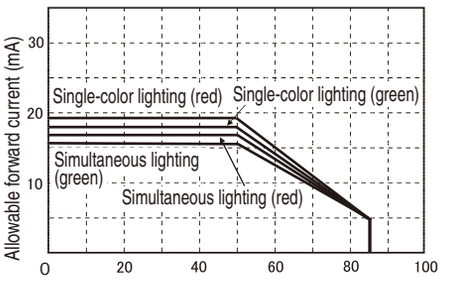
(Figure 2)

Refer to the following formula to calculate external resistance values.

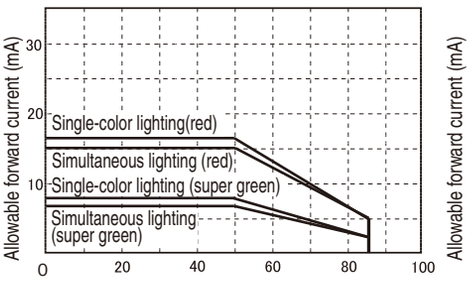
$$R = \frac{V_{CC} - V_F}{I_F}$$

V_F : LED forward voltage
V_{CC} : Power supply voltage
I_F : Recommended operating current

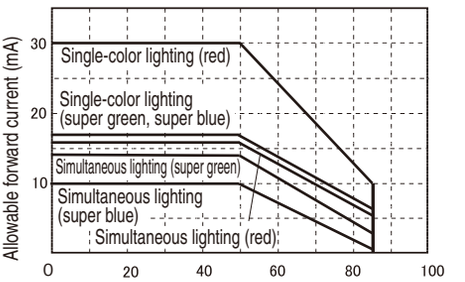
● Allowable forward current — Ambient temperature



(Figure 3)



(Figure 4)



(Figure 5)

●Reference external resistance values

(*When adjusting the brightness of other colors to be mostly uniform using solid green as a guide, reference the following table to determine resistance values.) Ta=25℃

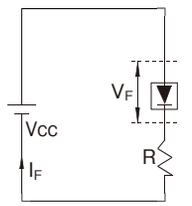
Button size	Color / Voltage	Dual-color (78)		Dual-color (718)		Multicolor (22)		
		Red	Green	Red	Super green	Red	Super green	Super blue
KA 17.4 square	5V	390Ω 1/16W	56Ω 1/16W	300Ω 1/16W	510Ω 1/16W	1.5kΩ 1/16W	1.2kΩ 1/16W	1.8kΩ 1/16W
	12V	1.3kΩ 1/4W	510Ω 1/4W	1kΩ 1/4W	2kΩ 1/8W	4.7kΩ 1/16W	5.1kΩ 1/16W	6.8kΩ 1/16W
	24V	2.7kΩ 1/2W	1.3kΩ 1W	2.2kΩ 1/2W	4.7kΩ 1/4W	10kΩ 1/8W	12kΩ 1/8W	16kΩ 1/16W
	Current value (reference value)	8	15	10	5	2.2	1.8	1.4
KA 15 square	5V	510Ω 1/16W	91Ω 1/16W	360Ω 1/16W	620Ω 1/16W	1.6kΩ 1/16W	1.5kΩ 1/16W	2kΩ 1/16W
	12V	1.6kΩ 1/4W	820Ω 1/4W	1.2kΩ 1/4W	2.4kΩ 1/8W	5.1kΩ 1/16W	6.2kΩ 1/16W	8.2kΩ 1/16W
	24V	3.6kΩ 1/2W	2kΩ 1/2W	2.7kΩ 1/2W	5.6kΩ 1/4W	11kΩ 1/8W	15kΩ 1/16W	18kΩ 1/16W
	Current value (reference value)	6	10	8	4	2	1.4	1.2
KA 12 square	5V	620Ω 1/16W	130Ω 1/16W	510Ω 1/16W	910Ω 1/16W	2kΩ 1/16W	1.8kΩ 1/16W	2.4kΩ 1/16W
	12V	2kΩ 1/8W	1kΩ 1/4W	1.6kΩ 1/4W	3.6kΩ 1/16W	6.2kΩ 1/16W	8.2kΩ 1/16W	10kΩ 1/16W
	24V	4.3kΩ 1/4W	2.4kΩ 1/2W	3.6kΩ 1/2W	8.2kΩ 1/8W	13kΩ 1/8W	18kΩ 1/16W	22kΩ 1/16W
	Current value (reference value)	5	8	6	3	1.7	1.2	1

LED RATINGS / PROTECTIVE RESISTANCE

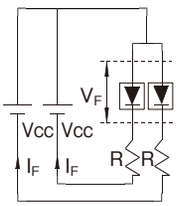
■ K2、K9

●LED ratings

Item \ Color		Full-face LED lighting (Ta=25℃)						
		Mono-color Figures in parentheses indicate □15.			Dual-color (78) Figures in parentheses indicate □15.		Dual-color (718)	
		Red	Green	Yellow	Red	Green	Red	Super green
Max. operating current	IFM (mA)	25	20	25	25	20	20	10
Maximum allowable loss	(mW)	60	48	60	60	48	48	38
DC backward voltage	VR (V)	5	5 〔10〕	5	5	5〔10〕	5	5
Forward voltage	VF (V) (standard values) ※	1.9	2.1 〔4.2〕	1.9	1.9	2.1〔4.2〕	1.8	3.4
Dominant wavelength	λd ※	626	572	595	626	572	626	525
Forward current under the conditions of the above-mentioned ※ mark (mA)		20	20	20	20	20	10	10
Conditions when pulse is lit	Pulse width PW (μs)	400			400		400	15
	Duty ratio DR	10^{-1}			10^{-1}		10^{-1}	
	Allowable forward current for pulse IFP(mA)	92			92		92	50
Wiring diagram		Figure 6			Figure 7			
Allowable forward current for operating temperature (including internal temperature)		Figure 8			Figure 9		Figure 10	



(Figure 6)



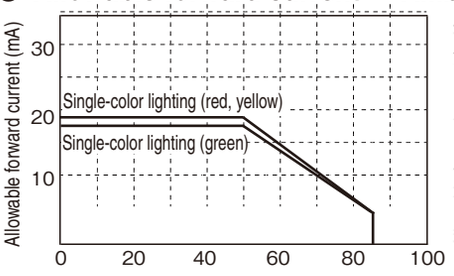
(Figure 7)

Refer to the following formula to calculate external resistance values.

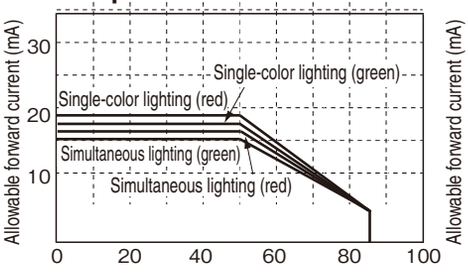
$R = \frac{V_{CC} - V_F}{I_F}$

V_F : LED forward voltage
V_{CC} : Power supply voltage
I_F : Recommended operating current

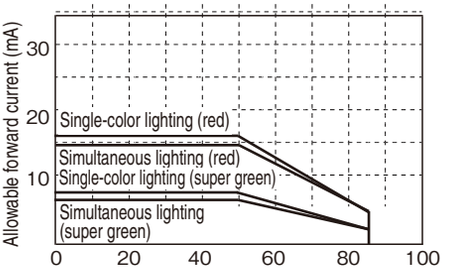
● Allowable forward current — Ambient temperature



(Figure 8)



(Figure 9)



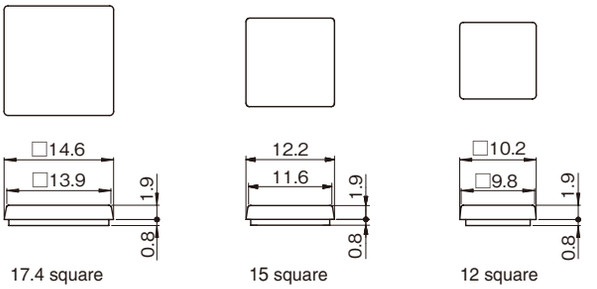
(Figure 10)

●Reference external resistance values

(*When adjusting the brightness of other colors to be mostly uniform using solid green as a guide, reference the following table to determine resistance values.) Ta=25℃

Button size	Color / Voltage	Mono-color (7) (8) (9)			Dual-color (78)		Dual-color (718)	
		Red	Green	Yellow	Red	Green	Red	Super green
K2 15 square	5V	510Ω 1/16W	91Ω 1/16W	300Ω 1/16W	510Ω 1/16W	91Ω 1/16W	360Ω 1/16W	620Ω 1/16W
	12V	1.6kΩ 1/4W	820Ω 1/4W	1kΩ 1/4W	1.6kΩ 1/4W	820Ω 1/4W	1.2kΩ 1/4W	2.4kΩ 1/8W
	24V	3.6kΩ 1/2W	2kΩ 1/2W	2.2kΩ 1/2W	3.6kΩ 1/2W	2kΩ 1/2W	2.7kΩ 1/2W	5.6kΩ 1/4W
	Current value (reference value)	6	10	10	6	10	8	4
K2 12 square	5V	620Ω 1/16W	270Ω 1/8W	330Ω 1/16W	620Ω 1/16W	270Ω 1/8W	510Ω 1/16W	910Ω 1/16W
	12V	2kΩ 1/8W	910Ω 1/4W	1.1kΩ 1/4W	2kΩ 1/8W	910Ω 1/4W	1.6kΩ 1/4W	3.6kΩ 1/16W
	24V	4.3kΩ 1/4W	2kΩ 1/2W	2.4kΩ 1/2W	4.3kΩ 1/4W	2kΩ 1/2W	3.6kΩ 1/2W	8.2kΩ 1/8W
	Current value (reference value)	5	11	9	5	11	6	3
K2 9 square	5V	910Ω 1/16W	390Ω 1/16W	470Ω 1/16W	910Ω 1/16W	390Ω 1/16W	750Ω 1/16W	1.2kΩ 1/16W
	12V	3kΩ 1/8W	1.3kΩ 1/4W	1.6kΩ 1/4W	3kΩ 1/8W	1.3kΩ 1/4W	2.4kΩ 1/8W	4.7kΩ 1/16W
	24V	6.8kΩ 1/4W	2.7kΩ 1/2W	3.6kΩ 1/2W	6.8kΩ 1/4W	2.7kΩ 1/2W	5.1kΩ 1/4W	11kΩ 1/8W
	Current value (reference value)	4	8	6	4	8	4	2

FILTER DIMENSIONS



REPLACEMENT PARTS

Button size	Concave button	Raise dot button	Flat button	Filter
17.4 square	KA-4590-1CC	KA-4590-2CC	———	KA-4591-LM
15 square	KA-4768-1CC	KA-4768-2CC	KA-4769-1CC	KA-4770-LM
12 square	KA-4603-1CC	KA-4603-2CC	KA-4730-1CC	KA-4604-LM
9 square	———	———	K9-4707-LM	———

SOLDERING SPECIFICATIONS

***Soldering**

(1) Conduct preliminary testing for confirming the soldering conditions.
Switches could be deformed by heat depending on the baseboard type, pattern and round.

(2) Perform soldering 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 and deterioration.

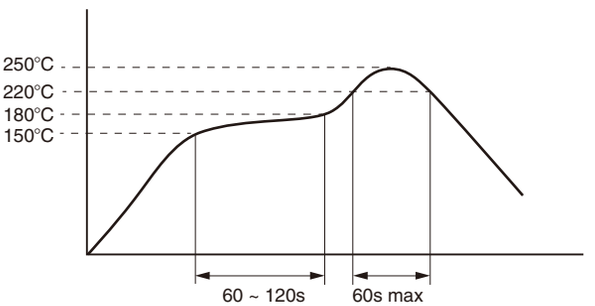
***Recommended conditions for reflow soldering** (when attaching single terminal)

Fix a thermocouple on the side of the terminal using a high melting point solder (high-temperature adhesive), and set a reflow furnace referring to the temperature profile example shown below for the terminal temperature. Deformity could result due to the heat if the product temperature exceeds 260°C,therefore ensure that the temperature on the product surface remains below 260°C.

Preliminary heating: 150°C to 180°C
60-120 sec
Actual heating : 220°C or above
Within 30-60 sec
Solder type : Sn96.5
Ag3
Cu0.5
*A30C5 (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 temperature: 350°C or less at tip of solder applicator
(2) Soldering time: within 3 sec

***Cleaning**

The switches may not be washed.
Washing may cause flux and foreign matter on the baseboard to get inside the switch along with detergent, and could cause failure.

***Printed baseboard**

(1) Resistance to soldering heat could be affected depending on the type, thickness and round pattern of the printed baseboard.
We recommend confirming the volume-production conditions of the printed baseboard beforehand.

(2) Handle the baseboard carefully after attaching the switches.
Scattered powder from baseboards could get inside the switch while separating the baseboard.
Avoid piling printed baseboards.

ORDERING CODE

■ KA

LIGHT CARTRIDGE

KA–□ □ □ □ □ □

● BUTTON

12	12 square
15	15 square
17	17.4 square

● BUTTON SHAPE

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

※Flat button is only 12 and 15 square type.

● LED COLOR

78	Red and green
718	Red and super green
22	Multicolored
X	Without LED

● OPERATIONAL FEEL ※2)

Blank	Without momentary click feel
M	With momentary click feel

● FILTER COLOR

	4	Milky white
※1)	X	Without filter

● BUTTON COLOR

	C	Clear
※1)	X	Without button

HOUSING

KA□–KM

● CIRCUIT CHARACTERISTIC AND OPERATIONAL FEEL※2)

M	With momentary click feel
S	Without momentary click feel

● TERMINAL

M	Surface-mounted terminal

● HOUSING COLOR

K	Black

***Caution**

※1) In case of using without a button, the filter must be ordered separately. Please specify the filter color as X (i.e. without filter).

※2) If you request M (with momentary click feel) for the operational feel of the housing, also specify M (with momentary click feel) for the operational feel of the light cartridge.
In case you request S (without momentary click feel) for the operation feel of the housing, specify blank for the operational feel of the light cartridge. Other combinations cannot be selected.

ORDERING CODE

■ K2

LIGHT CARTRIDGE

K2 — □ □ □ □ □

● BUTTON

12	12 square
15	15 square

● BUTTON SHAPE

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

● LED COLOR

7	Red
8	Green
9	Yellow
78	Red and Green
718	Red and Super Green
X	Without LED

● FILTER COLOR

	4	Milky white
※1)	X	Without filter

● BUTTON COLOR

	C	Clear
※1)	X	Without button

HOUSING

K2 □ — K M

● CIRCUIT CHARACTERISTIC AND OPERATIONAL FEEL※2)

M	With momentary click feel
S	Without momentary click feel

● TERMINAL

M	Surface-mounted terminal

● HOUSING COLOR

K	Black

***Caution**

※1) In case of using without a button, the filter must be ordered separately. Please specify the filter color as X (i.e. without filter).

※2) With or without momentary click feel cannot be selected for the light cartridge. They can be selected for the housing only.

ORDERING CODE

■ K9

LIGHT CARTRIDGE

K9 — 9 □ □ □ X

● BUTTON

9	9 square

● BUTTON SHAPE

※1)

S	Square flat
X	Without button

● LED COLOR

7	Red
8	Green
9	Yellow
78	Red and green
718	Red and super green
X	Without LED

● FILTER COLOR

X	Without filter

● BUTTON COLOR

※1)

M	Milky white
X	Without button

HOUSING

K9 □ — K M

● CIRCUIT CHARACTERISTIC AND OPERATIONAL FEEL ※2)

M	With momentary click feel
S	Without momentary click feel

● TERMINAL

M	Surface-mounted terminal

● HOUSING COLOR

K	Black

***Caution**

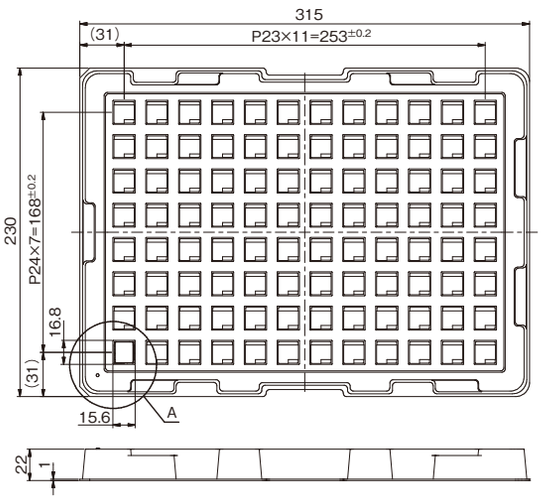
※1) In case of using without a button, place an order for the button separately.

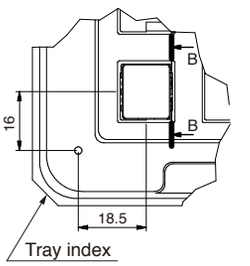
※2) With or without momentary click feel cannot be selected for the light cartridge. They can be selected for the housing only.

PACKING SPECIFICATIONS

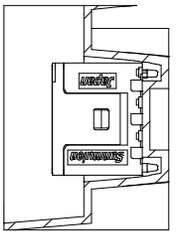
■ KA

●The main body of KA-type switches is delivered in a tray. Tray specifications are as shown below.





Section A details



B-B cross-section

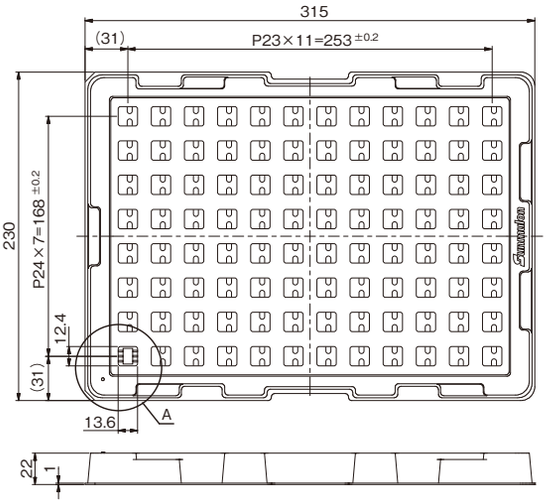
If ordered in 32 units or less, the order will be delivered in a product box. Trays, if needed, can be ordered by specifying the following product name and type.

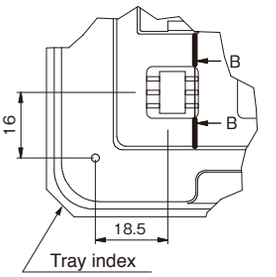
Tray	Type	KA-4600

The lighting section is always delivered in a product box.

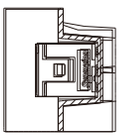
■ K2、K9

●The main body of K2-type and K9-type switches is delivered in a tray. Tray specifications are as shown below.





Section A details



B-B cross-section

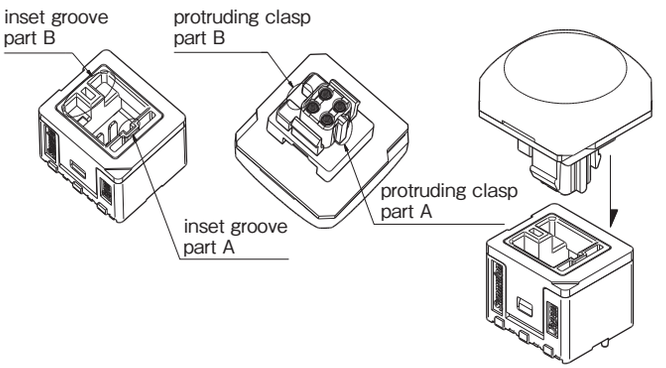
Trays, if needed, can be ordered by specifying the following product name and type.

Tray	Type	K2-4704

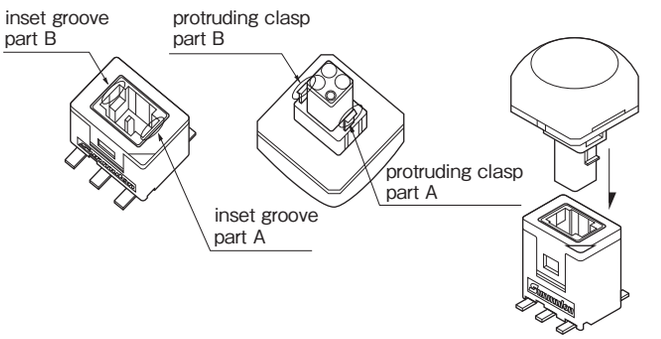
The lighting section is always delivered in a product box.

Handling Instructions (Correct Usage)

● Mounting the KA light cartridge

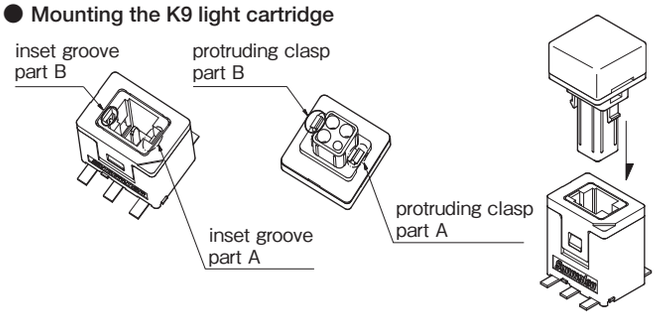


● Mounting the K2 light cartridge



* 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 protruding clasp part A with inset groove part A, and protruding clasp part B with inset groove part B.

● Mounting the K9 light cartridge



* There is a proper direction for combining the light cartridge and housing.
As shown in the above diagram, insert the light cartridge by aligning the protruding clasp part A with inset groove part A, and protruding clasp part B with inset groove part B.

HANDLING PRECAUTIONS

***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 25°C 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.

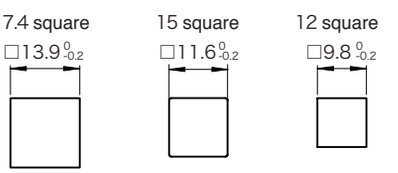
Use products promptly after opening the packaging, and store the remaining products in an area free of gas, humidity and other factors which might affect performance.

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

***Character films**

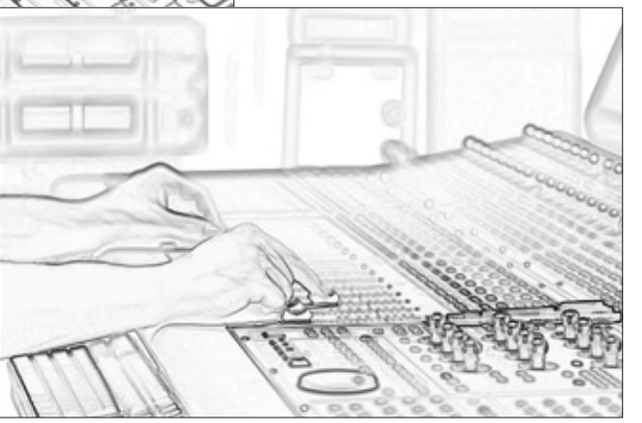
The character film is not included in the package. To use the character film, use a heat resistant film of 0.1mm thickness or less.

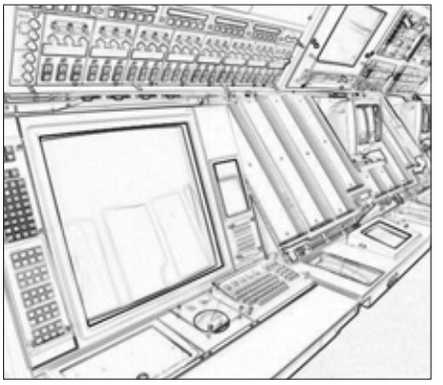
Please see the figure at right for dimensions.



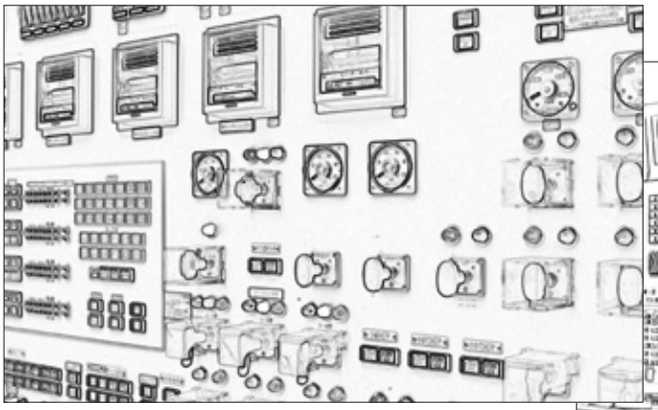
EXAMPLES OF APPLICATIONS

Broadcasting-related edit devices

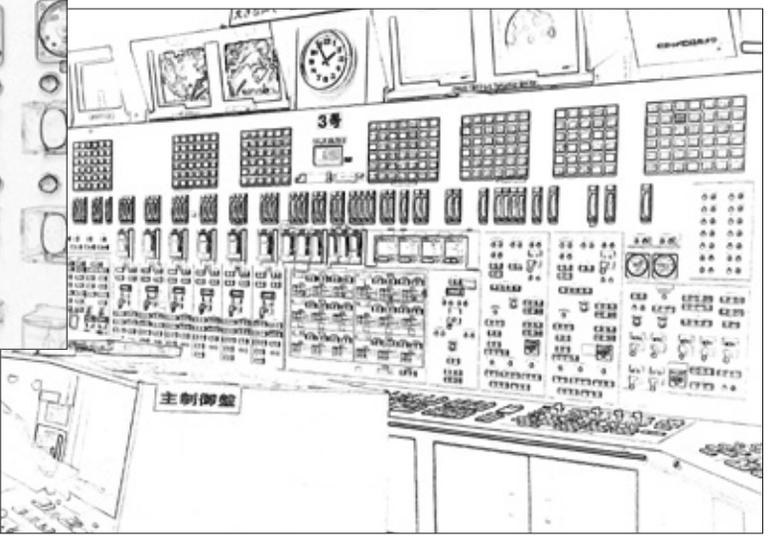




Controlled approach devices for airplanes



Control panel



Control room in a power station, etc.