A world first in surface-mountable switches

Switch with features new and never before seen

KA Surface-mounted illuminating switch

Sunmulon Co., Ltd.
KA Surface-mounted Illuminating Switch

The world's first surface-mountable illuminating pushbutton.

Two types of switching action - with or without audible click.
Concave and raised dot buttons further increases the feel and tactile feedback.

- Surface-mountable terminals for fast, reliable connection
- Pioneering manufacturing techniques prevent slanting and twisting during mounting, which improves counting accuracy and reduces corrections of bent switches and defects.
- Easy to assemble modular switch design features separate body and lighting section. Body is mounted to PCB and then assembled with the lighting section.
- Stable, consistent color and brightness
- Multicolored RGB and dual-color (red/green, red/super green) LEDs allow any color to be emitted.
- Lighting section
  Four options available: 17.4mm size (raised dot or concave button); 12mm size (raised dot or concave button).

*Information correct at time of publishing August 2012

<table>
<thead>
<tr>
<th>Contact</th>
<th>Gold-Plated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Rating</td>
<td>Maximum load: DC24V, 20 mA (resistance load)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>100 MΩ or greater with a DC 500 Megger</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>Between terminals of the same pole: AC1000V</td>
</tr>
<tr>
<td></td>
<td>Between terminals and the ground: AC1500V</td>
</tr>
<tr>
<td></td>
<td>At 50/60 Hz, each for 60 sec. and normal temperature and humidity</td>
</tr>
<tr>
<td>Contact Resistance</td>
<td>200 mΩ or less (initial), measured by voltage descent method or milliohmmeter, at DC6V and 0.05A</td>
</tr>
<tr>
<td>Electrical life</td>
<td>More than 3 million operations at max. rated load</td>
</tr>
<tr>
<td>Mechanical life</td>
<td>More than 3 million operations</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>−15°C to +50°C</td>
</tr>
<tr>
<td>Ambient Humidity</td>
<td>85% RH (max.)</td>
</tr>
</tbody>
</table>

| Operating Force (Max.)   | 2.0N |
| Total Travel (mm Max.)   | 4.0mm |
STRUCTURE

LIGHT CARTRIDGE
Button

FILTER

Operation button
(Three types for each LED color)

HOUSING
Switch main body
(Two types: With or without audible click)

DIMENSIONS

17.4mm square button

UNIT

LIGHT CARTRIDGE

HOUSING

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

General tolerance of drawings: ±0.4 mm
### DIMENSIONS

12mm square button

**UNIT**

**LIGHT CARTRIDGE**

**HOUSING**

Housing is common to all the buttons.

General tolerance of drawings: ±0.4 mm

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

### INTERNAL CONNECTION ARRANGEMENTS

- **Dual-color light emitted**

- **Multicolor light emitted**

<table>
<thead>
<tr>
<th>Terminals</th>
<th>LED color combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC-L1</td>
<td>Dual-color&lt;br&gt;Red</td>
</tr>
<tr>
<td>LC-L2</td>
<td>Dual-color&lt;br&gt;Green</td>
</tr>
<tr>
<td>LC-L3</td>
<td>Dual-color&lt;br&gt;—</td>
</tr>
</tbody>
</table>

### TERMINALS LAYOUT

- **Dual-color**

- **Multicolor**
**TERMINAL SHAPE / PCB HOLE CUT-OUT**

- **Terminal dimensions**

![Terminal dimensions diagram](image)

- **Boss dimensions**

![Boss dimensions diagram](image)

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

![Recommended PAD PCB hole cut-out](image)

**LED RATINGS / PROTECTIVE PESISTENCE**

### LED ratings

<table>
<thead>
<tr>
<th>Item</th>
<th>Full-face LED lighting (Ta=25°C)</th>
<th>Multicolor (22)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dual-color (78)</td>
<td>Dual-color (718)</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Green</td>
</tr>
<tr>
<td>Max. operating current (mA)</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Maximum allowable loss (mW)</td>
<td>75</td>
<td>65</td>
</tr>
<tr>
<td>DC backward voltage (V)</td>
<td>2.0</td>
<td>4.2</td>
</tr>
<tr>
<td>Forward voltage (standard values) (V)</td>
<td>624</td>
<td>572</td>
</tr>
<tr>
<td>Dominant wavelength (n.m.)</td>
<td>9.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Recommended operating current (mA)</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Current reduction ratio with respect to usage temperature</td>
<td>Figure 3</td>
<td>Figure 4</td>
</tr>
<tr>
<td>Conditions when pulse is lit</td>
<td>Pulse width (µs)</td>
<td>100</td>
</tr>
<tr>
<td>Duty ratio (D)</td>
<td>10⁻¹</td>
<td>10⁻¹</td>
</tr>
<tr>
<td>Allowable forward current for pulse (mA)</td>
<td>100</td>
<td>92</td>
</tr>
</tbody>
</table>

Wiring diagram

Calculate the external resistance values referring to the following equation.

\[
R = \frac{V_{CC}-V_F}{I_F}
\]

where:
- \( V_F \) : LED forward voltage
- \( V_{CC} \) : Power supply voltage
- \( I_F \) : Recommended operating current

### Allowable forward current — Ambient temperature

![Allowable forward current vs. Ambient temperature](image)

### Reference external resistance values

(Determine the resistance value referring to the table below when making the brightness of each color nearly uniform.) Ta=25°C

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Color</th>
<th>Dual-color (78)</th>
<th>Dual-color (718)</th>
<th>Multicolor (22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5V</td>
<td>Red</td>
<td>330Ω 1/8W</td>
<td>43Ω 1/8W</td>
<td>330Ω 1/8W</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>330Ω 1/8W</td>
<td>43Ω 1/8W</td>
<td>510Ω 1/8W</td>
</tr>
<tr>
<td>12V</td>
<td>Red</td>
<td>1kΩ 1/4W</td>
<td>390Ω 1/2W</td>
<td>1kΩ 1/4W</td>
</tr>
<tr>
<td></td>
<td>Super green</td>
<td>1kΩ 1/4W</td>
<td>2.2kΩ 1/2W</td>
<td>4.3kΩ 1/4W</td>
</tr>
<tr>
<td>24V</td>
<td>Red</td>
<td>2.2kΩ 1/2W</td>
<td>1kΩ 1W</td>
<td>2.2kΩ 1/2W</td>
</tr>
<tr>
<td></td>
<td>Super green</td>
<td>1kΩ 1/4W</td>
<td>1kΩ 1W</td>
<td>2.2kΩ 1/2W</td>
</tr>
<tr>
<td></td>
<td>Super blue</td>
<td>1kΩ 1/4W</td>
<td>1kΩ 1W</td>
<td>2.2kΩ 1/2W</td>
</tr>
</tbody>
</table>

Current value (reference value) | 10 | 20 | 10 | 5 | 3 | 2 | 2 | 2 |
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.

*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.

*Evaluation units for surface mounting are available (for a fee).
### LIGHT CARTRIDGE

- **BUTTON**
  
  | 12 | 12 square |
  | 17 | 17.4 square |

- **BUTTON SHAPE**
  
  | K | Concave button |
  | P | Raise dot button |
  | X | Without button |

- **LED COLOR**
  
  | 78 | Red and green |
  | 718 | Red and super green |
  | 22 | Multicolored |
  | X | Without LED |

- **OPERATIONAL FEEL ※1**
  
  | Blank | Without momentary click feel |
  | M | With momentary click feel |

### HOUSING

- **CIRCUIT CHARACTERISTIC AND OPERATIONAL FEEL ※1**
  
  | M | With momentary click feel |
  | S | Without momentary click feel |

- **TERMINAL**
  
  | M | Surface-mounted terminal |

- **HOUSING COLOR**
  
  | K | Black |

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* **Caution**

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

※ 1 If you specify the M(with momentary click feel) in the HOUSING (KAM-KM), please specify the M(with momentary click feel) in the LIGHT CARTRIDGE.
**PACKAGING SPECIFICATIONS**

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

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.

<table>
<thead>
<tr>
<th>Tray index</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.4-square</td>
<td>KA-4600</td>
</tr>
<tr>
<td>12-square</td>
<td></td>
</tr>
</tbody>
</table>

**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.

*For other handling precautions, refer to our comprehensive collection of brochures or PDF brochures available on our website.*