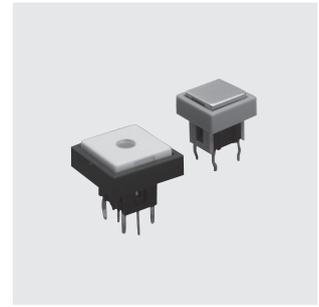


# TM & TR

## Ultra-Miniature Illuminated Pushbutton Switches



RoHS Compliant

### Series

Conductive Rubber Contact (TR type)  
Metal Contact (TM type)

### Features

#### 1. Two Types of Contacts

TR series: Conductive rubber contact for soft tactile feel.  
TM series: Metal contact for sharp tactile feel.

#### 2. PC Board Mount

Terminal pitch is in inches (multiples of 2.54 mm) for all models.  
The unique terminal shape prevents the terminal pins from coming loose from the PC board during dip soldering.

#### 3. Enhanced Resistance to Soldering Heat

Improved terminal structure protects the contacts from soldering heat.  
In addition, each pole has two terminals which can be used as a jumper wire.

#### 4. Ultra-Miniature Switch with LED

LED is built into miniature housing.

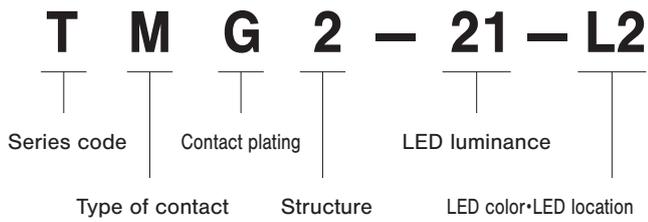
#### 5. Wide Variety of Accessories

A wide variety of accessories are available, including color buttons and mounting frames.

### Specifications

|                                 |  |                 |
|---------------------------------|--|-----------------|
| Rating                          | TR : 10mA 12VDC max. 10 $\mu$ A Min.   |                 |
|                                 | TM : 1VA max. (50mA max.48VDC max)   | 0.5mA min.      |
|                                 | TMG : 1VA Max. (50mA max.48VDC max.)   | 10 $\mu$ A min. |
| Initial contact resistance      | TR : 500 $\Omega$ max. (1mA 2VDC at 1.47N {150gf})<br>TM : 100m $\Omega$ max<br>(1.5mA 200 $\mu$ VAC at 1.96N {200gf}) |                 |
| Dielectric strength             | 250VAC 1 minute  |                 |
| Insulation resistance           | 100M $\Omega$ min  | (100VDC)        |
| Electrical life                 | TR : 100,000 operations<br>TM : 300,000 operations   |                 |
| Contact Bounce                  | TR : 3 msec. max. (Initial value)<br>TM : 10 msec. max. (Initial value)  |                 |
| Travel                          | TR : 1 mm<br>TM : 0.25 mm  |                 |
| Operating force (at peak force) | TR : 0.98 $\pm$ 0.39N<br>TM : 1.37 $\pm$ 0.39N   |                 |
| Operating temperature range     | -25 $\sim$ +70 $^{\circ}$ C  |                 |
| Storage temperature range       | -40 $\sim$ +70 $^{\circ}$ C  |                 |

■ Part Numbering



■ Type of Contacts and Contact Plating

| Code | Type of contact           | Contact Plating |
|------|---------------------------|-----------------|
| R    | Conductive rubber contact | Gold plated     |
| M    | Metal contact             | Silver plated   |
| MG   | Metal contact             | Gold plated     |

Note : The contacts of TR series are all gold-plated.

■ LED Specifications

TR2-21 • TM2-21

| Symbol | Color | Forward Current (IF) | Forward V (VF) |      | Reverse Voltage (VR) |
|--------|-------|----------------------|----------------|------|----------------------|
|        |       |                      | nom.           | max. |                      |
| 2      | Red   | 30mA                 | 2.0V           | 2.5V | DC5V                 |
| 5      | Green | 25mA                 | 2.2V           | 2.5V | DC5V                 |
|        |       | 30mA                 | 2.1V           | 2.5V | DC5V                 |

■ Operating Force vs. Stroke Characteristics

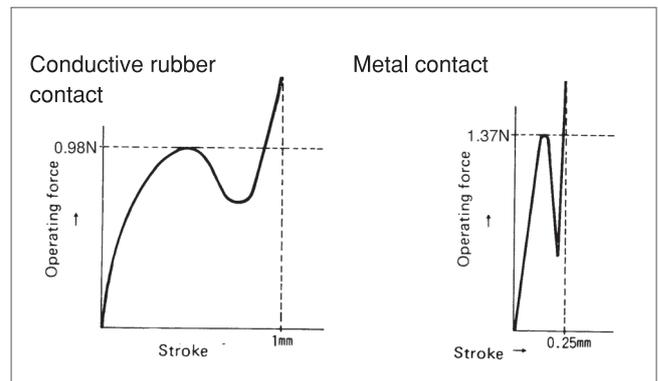


Fig.A

■ Structure

| Fig.         | 1   | 2   |
|--------------|---|---|
| Construction |  |  |
|              | Without LED   | With LED in button stem   |

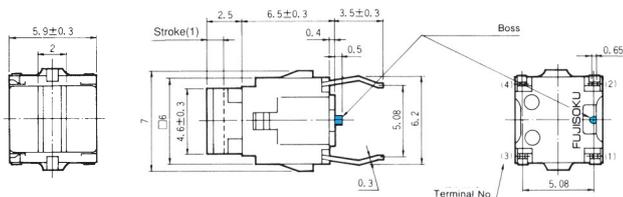
■ LED Location

| Symbol | ※LED location   |
|--------|---|
|        | TR2 • TM2   |
| L ■    |  |

※When color button is mounted.

**TR1**

SPST

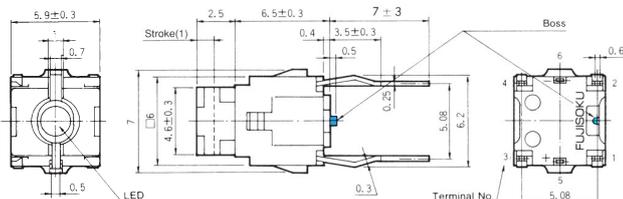


Terminal numbers are not shown on the switch.

| Part No.             | Switching function |                | Circuit diagrams |
|----------------------|--------------------|----------------|------------------|
|                      |                    |                |                  |
| <b>TR1-01</b>        | OFF                | (ON)           |                  |
| Connecting terminals | —                  | 1 — 3<br>2 — 4 |                  |

**TR2**

SPST

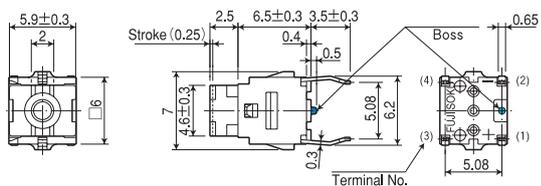


Terminal numbers are not shown on the switch.

| Part No.             | Switching function |                | Circuit diagrams |
|----------------------|--------------------|----------------|------------------|
|                      |                    |                |                  |
| <b>TR2-21-L</b>      | OFF                | (ON)           |                  |
| Connecting terminals | —                  | 1 — 3<br>2 — 4 |                  |
| LED circuit          | 5 (+)  (-) 6       |                |                  |

**TM1**

SPST

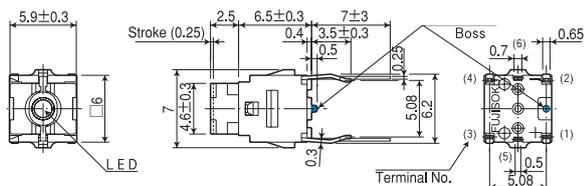
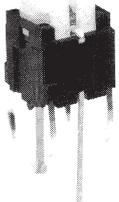


Terminal numbers are not shown on the switch.

| Part No.                        | Switching function |                | Circuit diagrams |
|---------------------------------|--------------------|----------------|------------------|
|                                 |                    |                |                  |
| <b>TM1-01</b><br><b>TMG1-01</b> | OFF                | (ON)           |                  |
| Connecting terminals            | —                  | 1 — 3<br>2 — 4 |                  |

**TM2**

SPST



Terminal numbers are not shown on the switch.

| Part No.                            | Switching function |                | Circuit diagrams |
|-------------------------------------|--------------------|----------------|------------------|
|                                     |                    |                |                  |
| <b>TM2-21-L</b><br><b>TMG2-21-L</b> | OFF                | (ON)           |                  |
| Connecting terminals                | —                  | 1 — 3<br>2 — 4 |                  |
| LED circuit                         | 5 (+)  (-) 6       |                |                  |

**Mounting Dimension**

| Part No.  | TR1 · TM1 · TMG1<br>□ 7.5 Button<br>□ 7.5 Mounting Frame | TR1 · TM1 · TMG1<br>TR2 · TM2 · TMG2<br>□ 10 Button<br>□ 10 Mounting Frame | TR1 · TM1 · TMG1<br>□ 12.6 Button<br>□ 12.6 Mounting Frame | TR2 · TM2 · TMG2<br>□ 7.5 Button<br>□ 7.5 Mounting Frame |
|---|--|--|--|--|
| Mounting<br>(Top view)  |  |  |  |  |
| Button + Switch   |  |  |  |  |
| Button + Mounting Frame + Switch  |  |  |  |  |
| ※▲ : The center of the switch    ■ : The center of the button    ● : Boss |  |  |  |  |

○ When the switch is used only with the button and without the mounting frame, be sure to give designing consideration to guide the button with the mounting panel, considering rattling, etc.  
(Reference: Standard cutout size = Button size + 0.4 ~ 0.5 mm)

**Packaging Specifications**

| Series         | TM1 · TMG1 · TR1                     | TM2 · TR2 · TMG2                       |
|----------------|--------------------------------------|--|
| Specifications | Stick<br><br>100 pcs./stick<br>Φ=630 | Zipper Plastic Bag<br><br>50 pcs./pack |

**Optional Accessories**

《Sold Separately》

| Part Name  | □ 12.6 Color Button<br>TR1<br>TM1 |
|------------|-----------------------------------|
| Dimensions |                                   |
| Dark gray  | 140000480720                      |
| Gray       | 140000480721                      |
| Light gray | 140000480722                      |
| Ivory      | 140000480723                      |

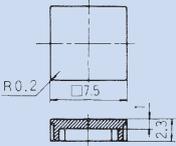
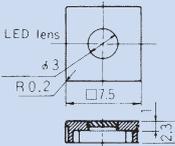
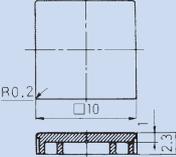
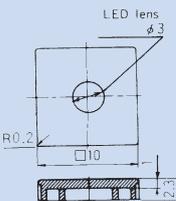
: Optional Accessories

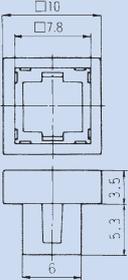
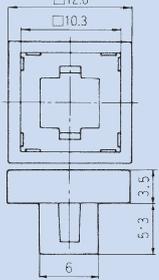
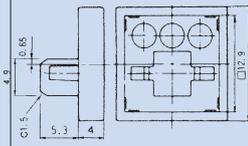
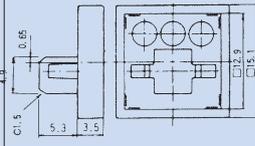
**Switch Operation**

- (1) Operating force should be 9.8 N or less.
- (2) Do not operate the switch right after soldering.
- (3) Do not solder the switch with the actuator pressed down.

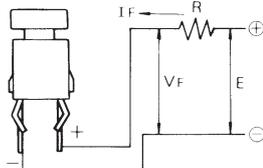
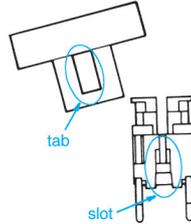
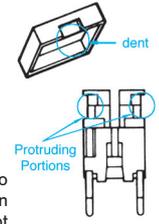
**Optional Accessories**

《Sold Separately》

| Part Name  | □7.5 Color Button   |   | □10 Color Button   |   |
|------------|---|---|--|---|
|            | TR1 • TM1   | TR2 • TM2   | TR1 • TM1  | TR2 • TM2   |
| Dimensions |  |  |  |  |
| Dark gray  | 140000480712  | 140007480068  | 140000480716   | 140007480117  |
| Gray       | 140000480713  | 140007480069  | 140000480717   | 140007480118  |
| Light gray | 140000480714  | 140007480070  | 140000480718   | 140007480119  |
| Ivory      | 140000480715  | 140007480071  | 140000480719   | 140007480120  |
| Silver     | 140000480764  | 140007480076  | 140000480765   | 140007480125  |
| Red        | 140000480744  | —   | 140000480748   | —   |
| Green      | 140000480746  | —   | 140000480750   | —   |
| Blue       | 140000480745  | —   | 140000480749   | —   |

| Part Name  | □7.5 Button type Mounting Frame   | □10 Button type Mounting Frame  | □12.6 Button type Mounting Frame   |   |
|------------|---|---|--|---|
|            | TM1 • TM2 • TR1 • TR2   | TM1 • TM2 • TR1 • TR2   | TM1  | TR1   |
| Dimensions |  |  |  |  |
| Dark gray  | 140000340143  | 140000340147  | 140000340215   | 140000340151  |
| Gray       | 140000340144  | 140000340148  | 140000340216   | 140000340152  |
| Light gray | 140000340145  | 140000340149  | 140000340217   | 140000340153  |
| Ivory      | 140000340146  | —   | —  | —   |

**Handling Precautions**

|                      |  |   |  |
|----------------------|--|---|--|
| LED circuit          | Current to be applied to the LED must be lower than the forward current (IF) indicated in the LED Specifications of each switches. Resistance value R should be calculated using the formula on the right. |  | Calculation Example : E = 5 V<br>$I_F = 2.0\text{mA}$<br><br>$R = \frac{E - V_F}{I_F} = \frac{5 - 2.0}{0.02} = 150\Omega$<br><br>Use $V_F = 2.0\text{V}$ to calculate. |
| Accessories mounting |   |   | 1. Installing the mounting frame<br>Install the mounting frame so that the tab on the frame is in the same direction as the slot on the switch.                        |
|                      |   |   | 2. Installing the button<br>Install the button so that the recess on the button is in the same direction as the protruding portion on the switch.                      |
|                      |  |   | The mounting frame cannot be installed with the switch button installed.   |

**Ambient Conditions**

- (1) In case of switches with silver-plated contacts, do not use in an environment where there is corrosive gas such as sulfuric or ammonia gas which may affect the silver plating.
- (2) TM and TR series are open-structure switches and should not be used in a dusty environment.

**Soldering Specifications**

| Series           | TM                       | TR                       |
|------------------|--------------------------|--------------------------|
| Manual soldering | 380°C Max.<br>3sec. Max. | 380°C Max.<br>3sec. Max. |
| Auto soldering   | 275°C Max.<br>6sec. Max. | 265°C Max.<br>6sec. Max. |

- Preheating in the flow line should be 80°C to 120°C and within 120 seconds.
- Do not dip solder the switches with color buttons or mounting frames attached.  
Soldering heat may deform the accessories or cause ingress of flux.

**Flux Cleaning**

- (1) Solvents : Fluorine or Alcohol type
- (2) The TM/TR series are not washable. To wash the PC board, clean the soldering surface of the PC board with a brush so that the switch is not exposed to the cleaning solution.
- (3) After soldering, wait until the temperature of the terminals cool down to 90°C or below or until the parts are exposed to room temperature for more than 5 min. before washing.

**Table of Part Numbers**

| Contact plating |           | Series   | TM1-01        |                | TR1-01        | TM2-21           |                     | TR2-21             |
|-----------------|-----------|----------|---------------|----------------|---------------|------------------|---------------------|--------------------|
|                 |           |          | Silver Plated | Gold Plated    | Gold Plated   | Silver Plated    | Gold Plated         | Gold Plated        |
| 仕様/Located      |           |          |               |                |               |                  |                     |                    |
| Non-illuminated |           |          | <b>TM1-01</b> | <b>TMG1-01</b> | <b>TR1-01</b> | —                | —                   | —                  |
| Illuminated     | LED color | 2 Red    | —             | —              | —             | <b>TM2-21-L2</b> | ☆ <b>TMG2-21-L2</b> | ☆ <b>TR2-21-L2</b> |
|                 |           | 5 Green  | —             | —              | —             | <b>TM2-21-L5</b> | <b>TMG2-21-L5</b>   | <b>TR2-21-L5</b>   |
|                 |           | 8 Yellow | —             | —              | —             | <b>TM2-21-L8</b> | <b>TMG2-21-L8</b>   | ☆ <b>TR2-21-L8</b> |

● The above part numbers do not include accessories. Buttons and mounting frames need to be ordered separately. ☆ : Semi-standard products.