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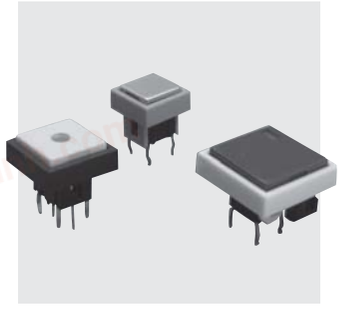
TM & TR

Ultra-Miniature Illuminated Pushbutton Switches



RoHS Compliant

■Series

Conductive Rubber Contact（**TR** type）
Mettal 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.
6. **Compatible With Lead-Free Soldering (TM Series)**
   Heat-resistant resin for lead-free soldering.

■ Specifications

Rating	**TR**：10mA 12VDC max. 10 μA Min.	
	TM：1VA max.（50mA max.48VDC max）	0.5mA min.
	TMG：1VA Max.（50mA max.48VDC max.）	10 μA min.
Initial contact resistance	**TR**：500 Ω max.（1mA 2VDC at 1.47N｛150gf｝） **TM**：100m Ω max （1.5mA 200 μ VAC at 1.96N｛200gf｝）	
Dielectric strength	250VAC 1 minute	
Insulation resistance	100MΩ min （100VDC）	
Electrical life	**TR**：100,000 operations **TM**：300,000 operations	
Contact Bounce	**TR**：3 msec. max.（Initial value） **TM**：10 msec. max.（Initial value）	
Travel	**TR**：1 mm **TM**：0.25 mm	
Operating force（at peak force）	**TR**：0.98±0.39N **TM**：1.37±0.39N	
Operating temperature range	−25～+70℃	
Storage temperature range	−40～+70℃	

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■Part Numbering

T M G 2 — 21 — L2

- T: Series code
- M: Type of contact
- G: Contact plating
- 2: Structure
- 21: LED luminance
- L2: LED color•LED location

■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

Simbol	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
6	Blue	30mA	3.8V	4.5V	DC5V
8	Yellow	30mA	2.1V	2.5V	DC5V

TR3—21 • TM3—21

Simbol	Color	Forward Current (IF)	Forward V (VF)		Reverse Voltage (VR)
			nom.	max.	
2	Red	20mA	2.0V	3.0V	DC3V
5	Green	25mA	2.1V	3.0V	DC3V
8	Yellow	20mA	2.1V	3.0V	DC3V

■Operating Force vs. Stroke Characteristics

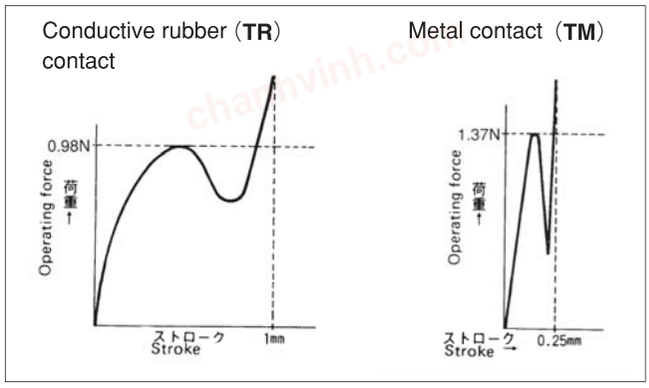

Fig.**A**

■Structure

Fig.	1	2	3
Construction	 Without LED	 With LED in button stem	 With LED in side frame

■LED Location

Symbol	※LED location	
	TR2 • TM2	TR3 • TM3
L■		
LO■		
LOO■		
L■O■		

※When color button is mounted.

LED color to be specified in ■

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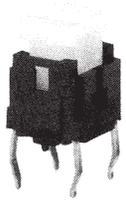
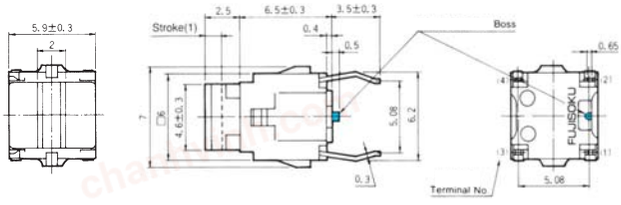
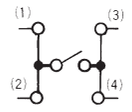
TR (Conductive Rubber Contact)

TR1 SPST



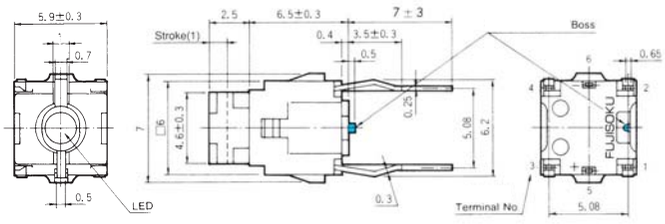


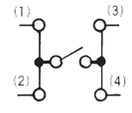
Part No.	Switching function		Circuit diagrams
	■	↓Push ■	
TR1−01	OFF	(ON)	
Connecting terminals	——	1 — 3 2 — 4	

Terminal numbers are not shown on the switch.

TR2 SPST

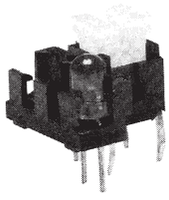


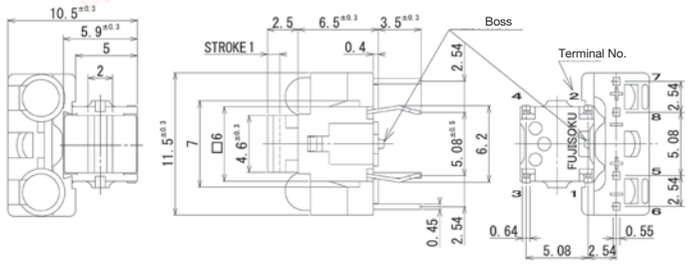


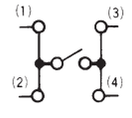
Part No.	Switching function		Circuit diagrams
	■	↓Push ■	
TR2−21−L ■	OFF	(ON)	
Connecting terminals	——	1 — 3 2 — 4	
LED circuit	5 (+) (−) 6		

Terminal numbers are not shown on the switch.

TR3 SPST





Part No.	Switching function		Circuit diagrams
	■	↓Push ■	
TR3−21−L■ (−LO■、LOO■ −L■O■)	OFF	(ON)	
Connecting terminals	——	1 — 3 2 — 4	
LED circuit	Single LED	(+) (−)	
	Dual Color separate LED	5 (+) 6 7 (−) 8	

The photo shows
TR3−21−L ■

Terminal numbers are not shown on the switch.

(ON) : Momentary

LED color to be specified in ■

■ : Refer to "Table of Part Numbers" on P.169 for a full list of part numbers.

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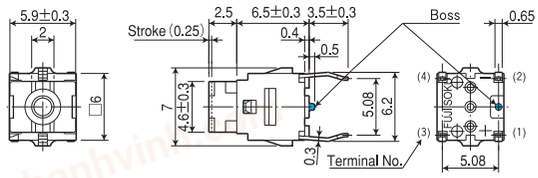
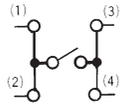
TM (Metal Contact)

TM1 SPST



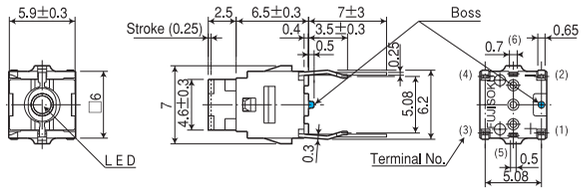


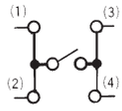
Part No.	Switching function		Circuit diagrams
	■	↓Push ■	
TM1−01 TMG1−01	OFF	(ON)	
Connecting terminals	——	1 — 3 2 — 4	

Terminal numbers are not shown on the switch.

TM2 SPST

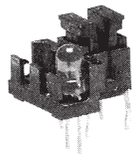


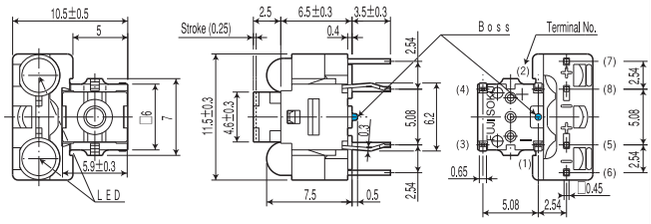


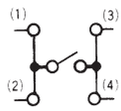
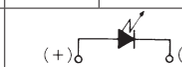
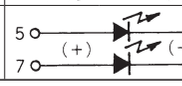
Part No.	Switching function		Circuit diagrams
	■	↓Push ■	
TM2-21-L ■ TMG2-21-L ■	OFF	(ON)	
Connecting terminals	——	1 — 3 2 — 4	
LED circuit			

Terminal numbers are not shown on the switch.

TM3 SPST





Part No.	Switching function		Circuit diagrams
	■	↓Push ■	
TM3−21−L■ (−LO■、LOO■ −L■O■) TMG3−21−L■ (−LO■、LOO■ −L■O■)	OFF	(ON)	
Connecting terminals	——	1 — 3 2 — 4	
LED circuit	Single LED		
	Dual Color separate LED		

The photo shows
TM3−21−L ■

Terminal numbers are not shown on the switch.

★ : Made to order products.

(ON) : Momentary

LED color to be specified in ■

Refer to “Table of Part Numbers” on P.169 for a full list of part numbers.

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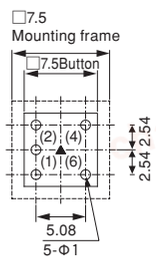
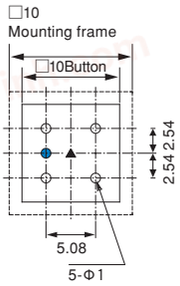
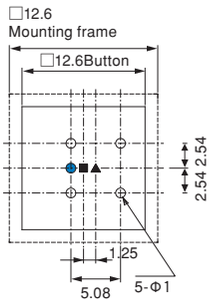
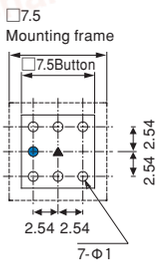
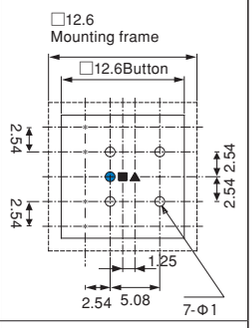
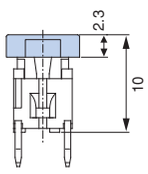
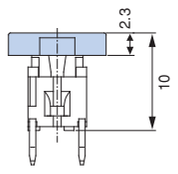
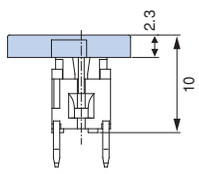
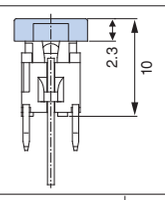
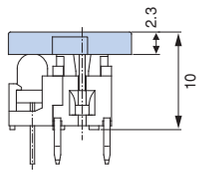
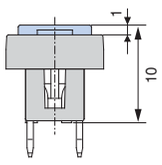
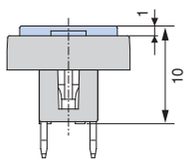
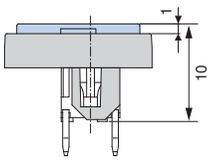
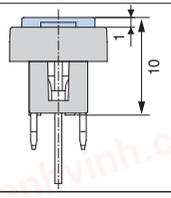
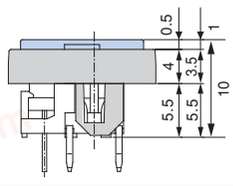
■ Mounting Dimension

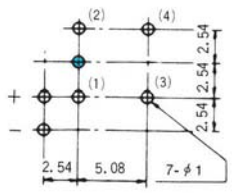
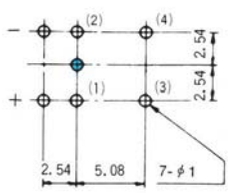
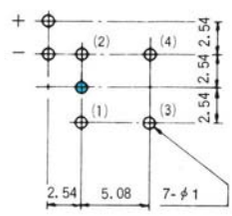
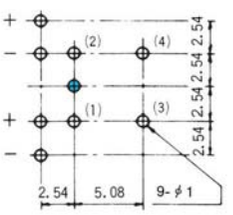
Part No.	TR1・TM1・TMG1 □7.5/**Button** □7.5/**Mounting Frame**	TR1・TM1・TMG1 TR2・TM2・TMG2 □ 10/**Button** □ 10/**Mounting Frame**	TR1・TM1・TMG1 □12.6/**Button** □12.6/**Mounting Frame**	TR2・TM2・TMG2 □7.5/**Button** □7.5**Mounting Frame**	TR3・TM3・TMG3 □12.6/**Button** □12.6/**Mounting Frame**
Mounting (Top 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)

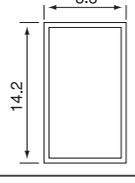
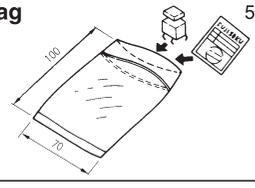
■ PC Hole Layouts (TR3・TM3・TMG3)

(Top view)

Type	TR/TM3 – L■・TMG3 – L■	TR/TM3 – LO■・TMG3 – LO■	TR/TM3 – LOO■・TMG3 – LOO■	TR/TM3 – L■O■・TMG3 – L■O■
Hole Layouts				

●Pay attention to the polarity of the LED.
●LED color to be specified in ■

■ Packaging Specifications

Series	TM1・TMG1・TR1	TM2・TR2・TMG2・ TM3・TR3・TMG3・
Specifications	**Stick**  100 pcs/stick ℓ =**630**	**Zipper Plastic Bag**  50 pcs/pack

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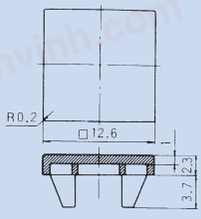
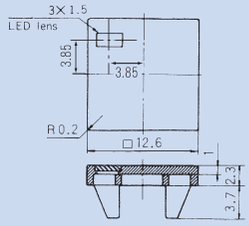
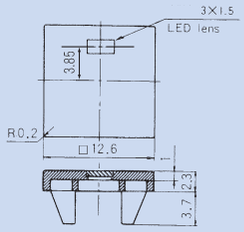
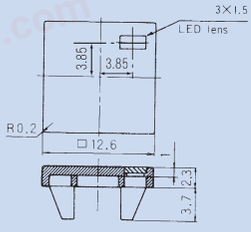
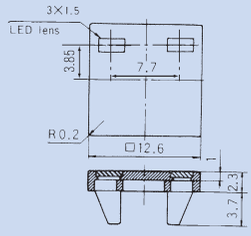
■Optional Accessories

《Sold Separately》

Part Name	□12.6 Color Button		
	TR1 TM1	TR3－L■ TM3－L■	TR3－L0■ TM3－L0■
Dimensions （ABS）			
Dark gray	140000480720	140000481301	140000481302
Gray	140000480721	140000481330	140000481337
Light gray	140000480722	140000481331	140000481338
Ivory	140000480723	140000481332	140000481339
Silver	140000480766	140007480085	140007480103
Red	140000480752	140000481333	140000481340
Green	140000480754	140000481335	140000481342
Blue	140000480753	140000481334	140000481341
Brown	140000480755	140000481336	140000481343

Part Name	□12.6 Color Button	
	TR3－L00■ TM3－L00■	TR3－L■0■ TM3－L■0■
Dimensions （ABS）		
Dark gray	140007480086	140007480104
Gray	140007480087	140007480105
Light gray	140007480088	140007480106
Ivory	140007480089	140007480107
Silver	140007480094	140007480112
Red	140007480090	140007480108
Green	140007480092	140007480110
Blue	140007480091	140007480109
Brown	140007480093	140007480111

■ Notes For Operating the Switch ··· Refer to P.183

: Optional Accessories

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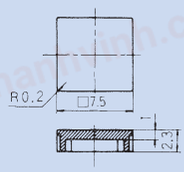
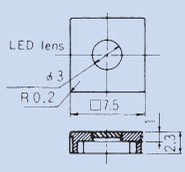
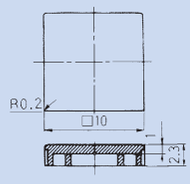
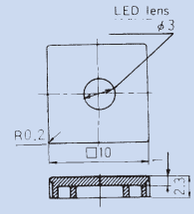
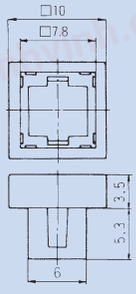
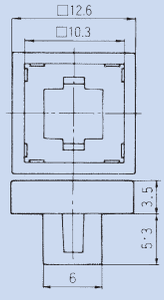
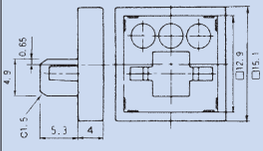
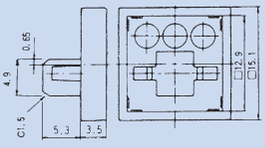
■Optional Accessories

《Sold Separately》

Part Name	□7.5 Color Button		□10 /Color Button	
	TR1・TM1	TR2・TM2	TR1・TM1	TR2・TM2
Dimensions (ABS)				
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	140007480072	140000480748	140007480121
Green	140000480746	140007480074	140000480750	140007480123
Blue	140000480745	140007480073	140000480749	140007480122
Brown	140000480747	140007480075	140000480751	140007480124

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・TM3	TR1・TR3
Dimensions (ABS)				
Dark gray	140000340143	140000340147	140000340215	140000340151
Gray	140000340144	140000340148	140000340216	140000340152
Light gray	140000340145	140000340149	140000340217	140000340153
Ivory	140000340146	140000340150	140000340218	140000340154

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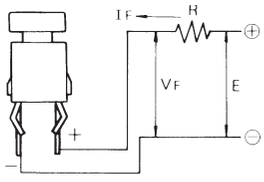
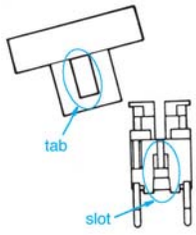
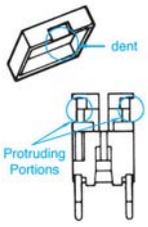
■Handling Precautions

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, IF = 2.0mA $R=\frac{E-V_F}{I_F}$ $R=\frac{5-2.0}{0.02}=150\Omega$ Use VF=2.0V to calculate.
Accessories mounting	 1.Installing the mounting frame 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 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℃ Max. 3sec. Max.	380℃ Max. 3sec. Max.
Auto soldering	275℃ Max. 6sec. Max.	265℃ Max. 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 Alcohl 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℃ or below or until the parts are exposed to room temperature for more than 5 min. before washing.

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■Table of Part Numbers

Series / Contact plating / LED /Located			TM1—01		TR1—01	TM2—21		TR2—21
			Silver Plated	Gold Plated	Gold Plated	Silver Plated	Gold Plated	Gold Plated
Non-illuminated			TM1—01	TMG1—01	TR1—01	———	———	———
Illuminated	LED color	2 Red	——	——	——	TM2—21—L2	☆ TMG2—21—L2	☆ TR2—21—L2
		5 Green	——	——	——	TM2—21—L5	TMG2—21—L5	TR2—21—L5
		6 Blue	——	——	——	☆ TM2—21—L6	▲ TMG2—21—L6	☆ TR2—21—L6
		8 Yellow	——	——	——	TM2—21—L8	TMG2—21—L8	☆ TR2—21—L8

Series / Contact plating / LED color			TR3—21
			Gold Plated
LED color		2(Red)	☆TR3—21—L2
		5(Green)	☆TR3—21—L5
		8(Yellow)	☆TR3—21—L8
		2	★TR3—21—L02
		5	☆TR3—21—L05
		8	☆TR3—21—L08
		2	★TR3—21—L002
		5	☆TR3—21—L005
		8	▲TR3—21—L008
	TM3 TR3 ① ② 	①2 ②5	★TR3—21—L205
		2 8	▲TR3—21—L208
		5 2	▲TR3—21—L502
		5 8	☆TR3—21—L508
		8 2	———
		8 5	▲TR3—21—L805
		2 2	▲TR3—21—L202
		5 5	☆TR3—21—L505
		8 8	☆TR3—21—L808

Series / Contact plating / LED color			TM3 plated—21	
			Silver Plated	Gold Plated
LED color		2	TM3—21—L2	☆TMG3—21—L2
		5	TM3—21—L5	★TMG3—21—L5
		8	☆TM3—21—L8	★TMG3—21—L8
		2	☆TM3—21—L02	☆TMG3—21—L02
		5	TM3—21—L05	———
		8	☆TM3—21—L08	☆TMG3—21—L08
		2	☆TM3—21—L002	———
		5	TM3—21—L005	★TMG3—21—L005
		8	★TM3—21—L008	———
	TM3 TR3 ① ② 	①2 ②5	☆TM3—21—L205	☆TMG3—21—L205
		2 8	★TM3—21—L208	▲TMG3—21—L208
		5 2	▲TM3—21—L502	▲TMG3—21—L502
		5 8	▲TM3—21—L508	———
		8 2	☆TM3—21—L802	———
		8 5	☆TM3—21—L805	———
		2 2	☆TM3—21—L202	★TMG3—21—L202
		5 5	☆TM3—21—L505	▲TMG3—21—L505
		8 8	★TM3—21—L808	———

●The above part numbers do not include accessories. Buttons and mounting frames need to be ordered separately.

▲ : Inquiry products. ☆ : Semi-standard products. ★ : Made to order products.