

Detector

Slide

Push

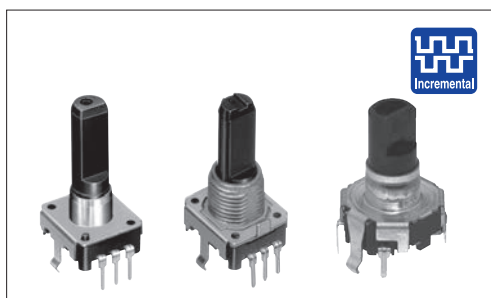
Rotary

Encoders

Power

Dual-in-line
Package Type

TACT Switch™

Metal
ShaftInsulated
ShaftHollow
ShaftRing
Type

■ Typical Specifications

Items		Specifications
Rating		0.5mA 5V DC
Operating life	Without detent	15,000cycles 30,000cycles (Lightest (jog))
	With detent	30,000cycles
Operating temperature range		EC12E: - 10°C to + 70°C EC12D: - 40°C to + 85°C

■ Product Line
Standard type

Standard type											
Length of the shaft (LM ₁) (mm)	Detent torque (mN・m)	Number of detent	Number of pulse	Operating direction	Minimum order unit (pcs.)		Product No.	Drawing No.			
					Japan	Export					
15	Standard 3 to 20	12	12	Vertical	2,400	2,400	EC12E1220407	2			
20							EC12E1220406	1			
25							EC12E1220405				
8.5 (Hollow shaft)	Lightest (jog) 3 ± 2				3,000	3,000	EC12E1220301	3			
20					2,400	2,400	EC12E1240405	1			
25							EC12E1240406				
8.5 (Hollow shaft)					3,000	3,000	EC12E1240301	3			
15	Standard 3 to 20	24	24		2,400	2,400	EC12E24204A2	2			
17.5							EC12E24204A7	1			
20							EC12E24204A8				
25							EC12E24204A9				
8.5 (Hollow shaft)	Lightest (jog) 3 ± 2				3,000	3,000	EC12E2420301	3			
20					2,400	2,400	EC12E24404A8	1			
25							EC12E24404A6				
8.5 (Hollow shaft)					3,000	3,000	EC12E2440301	3			
20	Lightest (jog) 10 max.	Without			2,400	2,400	EC12E24104A6	1			
25							EC12E2430404				
25	EC12E2430401										

With Bushing Type

Length of the shaft (LM ₁) (mm)	Detent torque (mN · m)	Number of detent	Number of pulse	Operating direction	Minimum order unit (pcs.)		Product No.	Drawing No.							
					Japan	Export									
25	Standard 3 to 20	12	12	Vertical	1,900	1,900	EC12E1220813	4							
20		24	24				EC12E2420802								
25							EC12E2420801								
30							EC12E2420803								
20	Standard 25 ± 15	Without					EC12E2430804								
25							EC12E2430803								
30							EC12E2460802								
30	Heavy 40 ± 15														

Note

Nuts and washers are not included. If required, please contact us.

Product Line

With Switch Type

Length of the shaft (LM ₁) (mm)	Detent torque (mN·m)	Number of detent	Number of pulse	Operating direction	Operating force of switch(N)	Travel of push-on switch (mm)	Minimum order unit (pcs.)		Product No.	Drawing No.
							Japan	Export		
17.5	5 ± 3	30	15	Vertical	3	0.5	1,280	2,560	EC12D1524403	5
	10 ± 5				EC12D1564402					
	5 ± 3				EC12D1524406					
	10 ± 5				EC12D1564404					

Packing Specifications

Tray

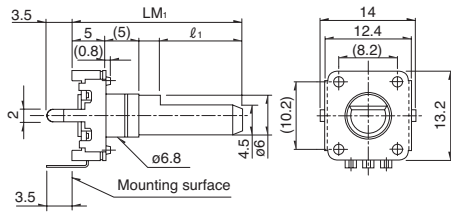
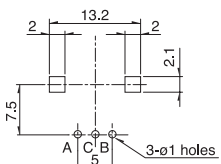
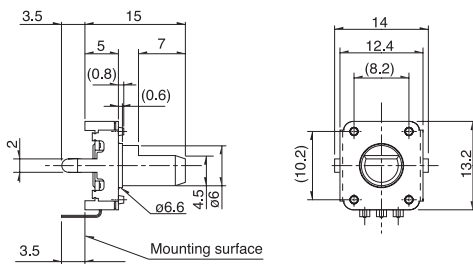
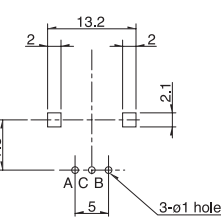
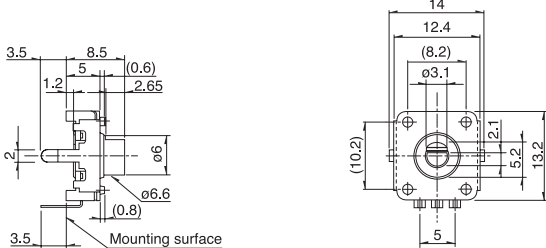
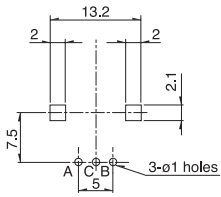
Product No.	Number of packages (pcs.)		Export package measurements (mm)
	1 case / Japan	1 case / export packing	
EC12E □□□ 03	3,000	3,000	369 × 525 × 204
EC12E □□□ 04	2,400	2,400	
EC12E □□□ 08	1,900	1,900	
EC12D	1,280	2,560	360 × 540 × 290

Notes

EC12D is suitable for automotive use.

Dimensions

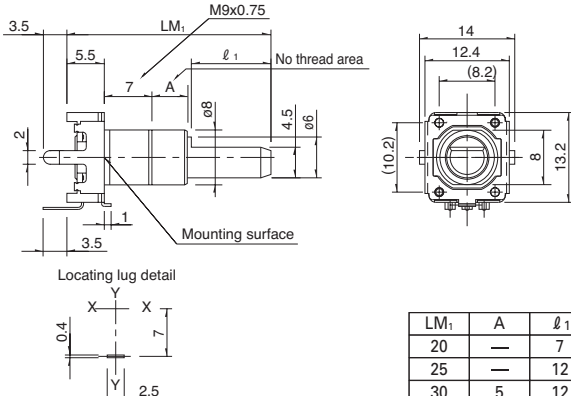
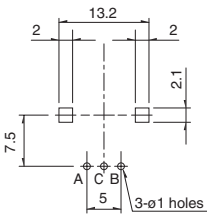
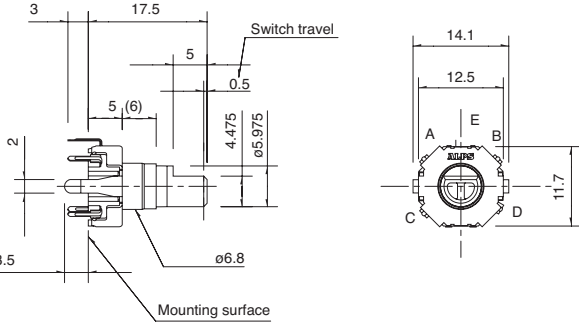
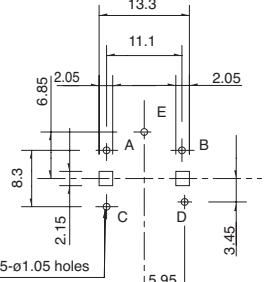
Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)								
1		 <table><tr><th>LM₁</th><th>ℓ₁</th></tr><tr><td>17.5</td><td>5</td></tr><tr><td>20</td><td>7</td></tr><tr><td>25</td><td>12</td></tr></table>	LM ₁	ℓ ₁	17.5	5	20	7	25	12	
LM ₁	ℓ ₁										
17.5	5										
20	7										
25	12										
2											
3											

Refer to P.176 for product varieties.
Refer to P.193 for soldering conditions.

Dimensions

Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)												
4		 <table><tr><th>LM₁</th><th>A</th><th>ℓ₁</th></tr><tr><td>20</td><td>—</td><td>7</td></tr><tr><td>25</td><td>—</td><td>12</td></tr><tr><td>30</td><td>5</td><td>12</td></tr></table>	LM ₁	A	ℓ ₁	20	—	7	25	—	12	30	5	12	
LM ₁	A	ℓ ₁													
20	—	7													
25	—	12													
30	5	12													
5	 														

12mm Size Insulated Shaft Type Product Varieties

Shaft Dimensions

Flat Type

Unit:mm

Technical drawing of a shaft assembly. The drawing shows a shaft with a mounting surface on the left. The total length of the shaft is labeled LM_1 . The length of the shaft section with the mounting surface is labeled l_1 . The diameter of the shaft is labeled $\phi 6$. The distance from the mounting surface to the end of the shaft is labeled 4.5. The distance from the mounting surface to the end of the shaft is also labeled 0.5.

※

※

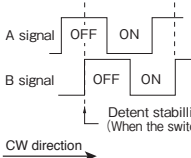
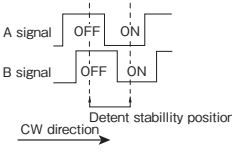
LM_1	l_1
17.5	5
20	7
22.5	7
25	12
30	12

※ Not available for types without detents

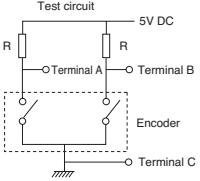
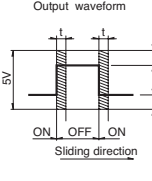
With bushing type

Technical drawing of a shaft assembly with a bushing. The drawing shows a shaft with a mounting surface on the left. The total length of the shaft is labeled LM_1 . The length of the shaft section with the mounting surface is labeled l_1 . The diameter of the shaft is labeled $\phi 8$. The distance from the mounting surface to the end of the shaft is labeled 4.5. The distance from the mounting surface to the end of the shaft is also labeled 0.6. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 7. The distance from the mounting surface to the end of the shaft is also labeled 5.5. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1. The distance from the mounting surface to the end of the shaft is also labeled 3.5. The distance from the mounting surface to the end of the shaft is also labeled 1

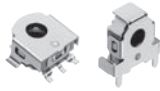
Output wave

EC12E  ※Detent position cannot be specified for B signal.	EC12D 
--	--

Sliding noise

Test circuit  Measurement condition : Rotation speed 360°/s	Output waveform  t : Masking time to avoid chattering	EC12E $V_1 = V_2 = 1.5V$ max. At $R = 10k\ \Omega$ Chattering : 3ms max. Bounce : 2ms max. EC12D $V_1 = V_2 = 2.5V$ max. At $R = 5k\ \Omega$ Chattering : 3ms max. Bounce : 2ms max.
--	--	---

List of Varieties

Type		Insulated Shaft Type			Hollow Shaft Type		
		12mm size		18mm size	5mm size		10mm size
Series		EC12E	EC12D	EC18A	EC05E		EC10E
Photo							
Output		Incremental (Two phase A and B)		Absolute type	Incremental (Two phase A and B)		
Shaft types		Single-shaft			Hollow shaft		
Operating direction		Vertical			Vertical	Horizontal	Horizontal
Number of pulse / Number of detent		12 / 12 24 / 24 24 / Without	15 / 30	12 positions 16 positions	12 / 12		12 / 24 12 / 12
Features		——	With push-on switch	Water Resisting Performance (IPX7)	Surface Mount Type		——
Dimensions (mm)	W	12.4	12.5	20	5.7	7.5	9.8
	D	13.2	11.7	18	6	3.3	4.4
	H	5		8.75	2.7	7.25	10.6 / 12.6 / 14.6
Operating temperature range		-10℃ to + 70℃	-40℃ to + 85℃	- 20℃ to + 60℃	- 30℃ to + 85℃		- 5℃ to + 45℃ - 30℃ to + 85℃ (For Automotive)
Operating life		15,000 cycles 30,000 cycles	30,000 cycles		100,000 cycles		
Automotive use		——		——	——		
Life cycle (availability)							
Electrical performance	Rating	0.5mA 5V DC	1mA 5V DC	1mA 10V DC	0.55mA 5.5V DC		1mA 5V DC
	Max./min. operating current (Resistive load)	5mA / 0.5mA	10mA / 1mA	——	0.55mA / —		——
	Insulation resistance	10MΩ min. 50V DC	100MΩ min. 250V DC	10MΩ min. 250V DC	50MΩ min. 50V DC		
	Voltage proof	50V AC for 1 minute	300V AC for 1 minute or 360V AC for 1s	50V AC for 1 minute or 60V AC for 2s	50V AC for 1 minute		
Mechanical performance	Rotational torque (Without detent)	10mN·m max. 25±15mN·m 40±15mN·m	——	——	——		——
	Detent torque	3 ± 2mN·m 3 to 20mN·m	5 ± 3mN·m 10 ± 5mN·m	60 ± 20mN·m	1.6 ± 1.3mN·m		5 ± 3mN·m 6 ± 3mN·m
	Push-pull strength	80N	100N	Push 100N / pull 50N	——		
Shaft configuration		Flat, Hollow Shaft	Flat		Hollow shaft		
Terminal type		Insertion			Reflow		Insertion
Switch Specifications	Switch type	——	Push-on switch	——	——		——
	Contact arrangement	——	Single pole and single throw (Push-on)	——	——		——
	Travel (mm)	——	0.5 ± 0.3	——	——		——
	Operating force (N)	——	3 ^{+1.5} ₋₁ 6 ^{+2.5} ₋₂	——	——		——
	Rating	——	1mA 5V DC	——	——		——
	Contact resistance	——	100mΩ max. for initial period; 200mΩ max. after operating life.	——	——		——
	Operating life	——	30,000times min.	——	——		——
Page		174		177	179		181

- Encoders Soldering Conditions 193
- Encoders Cautions 194

Notes

- The operating temperature range for automotive applications can be raised upon request. Please contact us for details.
- indicates applicability to all products in the series, while ○ indicates applicability to some products in the series.

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line
Package Type

TACT Switch™

Metal
Shaft

Insulated
Shaft

Hollow
Shaft

Ring
Type

Reference for Hand Soldering

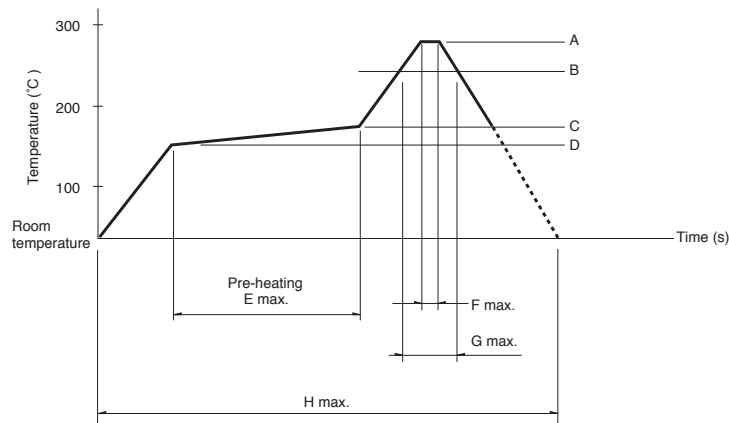
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11B, EC11E, EC11G, EC11K, EC12D, EC12E, EC18A, EC20A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC40A, EC45A, EC50A, EC60A, EM20B	350°C max.	3s max.	1 time
EC11J	350±10°C	3 ⁺¹ ₀ s	2 time

Reference for Dip Soldering

Series	Preheating		Dip soldering		No. of solders
	Soldering surface temperature	Heating time	Soldering temperature	Soldering time	
EC09E, EC11B, EC111, EC11E, EC11G, EC11K, EC18A, EC20A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC50A	100°C max.	2 min. max.	260±5°C	5±1s	2 time max.
EC10E, EC12D, EC12E	100°C max.	1 min. max.	260±5°C	3±1s	2 time max.
EC40A	110°C max.	1 min. max.	260°C max.	10s max.	1 time
EC45A, EC60A	100°C max.	2 min. max.	260°C max.	5s max.	2 time max.
EM20B	80°C max.	1 min. max.	260°C max.	3s max.	2 time max.

Condition for Reflow

Temperature profile



Series	A	B	C	D	E	F	G	H	No. of reflows
EC11J	260°C	230°C	180°C	150°C	2 min.max.	3s	40s	4 min. max	2 time max.
EC05E	250°C min.	230°C min.	180°C	150°C	60s to 120s	—	30s to 40s	—	2 time max.

Notes

- When using an infrared reflow oven, solder may sometimes not be applied. Be sure to use a hot air reflow oven or a type that uses infrared rays in combination with hot air.
- The temperatures given above are the maximum temperatures at the terminals of the potentiometer when employing a hot air reflow method. The temperature of the PC board and the surface temperature of the potentiometer may vary greatly depending on the PC board material, its size and thickness. Ensure that the surface temperature of the potentiometer does not rise to 250°C or greater.
- Conditions vary to some extent depending on the type of reflow bath used. Be sure to give due consideration to this prior to use.