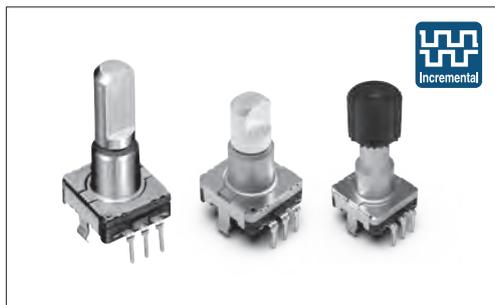


Compact and highly reliable type available in many varieties



Typical Specifications

Items	Specifications
Output signal	Two phase of A, B Self-return switch (EC111)
Rating	10mA 5V DC
Operating life	15,000 cycles
Operating temperature range	-40°C to +85°C

Product Line

Structure	Shaft configuration	Length of the shaft (mm)	Torque (mN·m)	Number of detent	Number of pulse	Push-on switch	Travel of push-on switch (mm)	Minimum order unit (pcs.)		Product No.	Drawing No.					
								Japan	Export							
Vertical	Flat	20	10±7	18	9	Without	—	1,200	2,400	EC11E09204A4	1					
										EC11E15204A3						
										EC11E1820402						
										10±7	36	18	9	With	0.5	EC11E09244BS
			EC11E15244G1													
			EC11E18244AU													
			EC11E09244AQ													
			10±7	30	15	9	With			1.5	EC11E15244B2	2				
		EC11E18244A5														
		15						10±7	30		15		Without	—	EC11N1520401	3
															20	30
		20	30	15	With	1.5	EC11N1525404	4								
							20	30	15	With	1.5	EC11N1524403	4			
		20	30	15	With	1.5						EC11N1525405	4			
							Less shaft wobble	Serrated	25	12±7	30	With	1.5	1,000	2,000	EC11M1565403
		8.5±5	Without	EC11M1575403	6											
Self-return switch	Flat	15	3 to 30	Without	Self-return switch	Without	—	1,200	2,400	EC1110120005	7					
		20								3 to 30	Without	Self-return switch	With	0.5	EC111012010H	8
															20	

Note

Other varieties are also available. Please inquire.

Packing Specifications

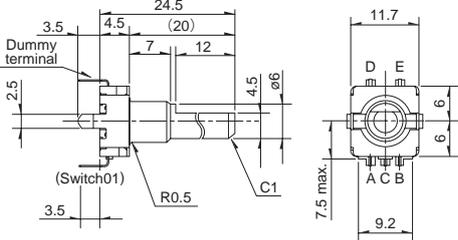
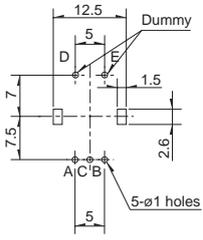
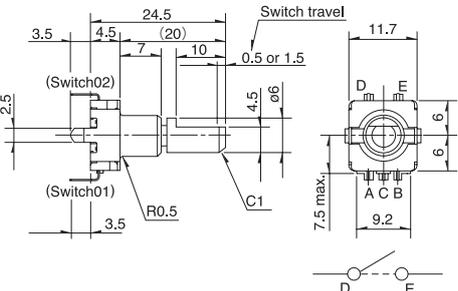
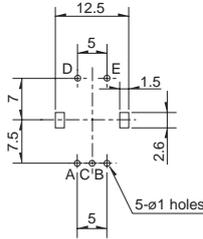
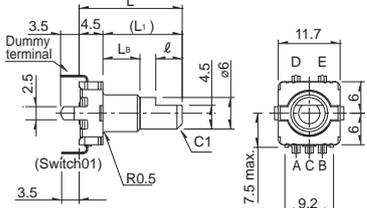
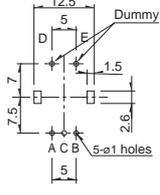
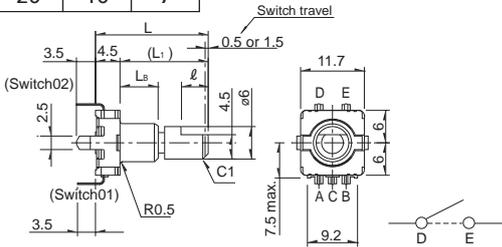
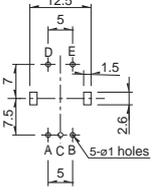
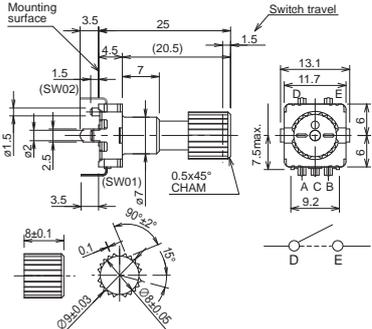
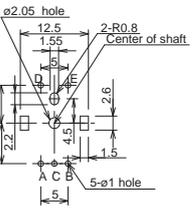
Tray

Product No.	Number of packages (pcs.)		Export package measurements (mm)
	1 case /Japan	1 case /export packing	
EC11E/EC11N	1,200	2,400	540×360×254
EC11M	1,000	2,000	
EC111	1,200	2,400	507×363×216

Refer to P.250 for product varieties.
Refer to P.251 for switch specifications.
Refer to P.275 for soldering conditions.

Dimensions

Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)												
1	 <p>EC11E Vertical</p>														
2	 <p>EC11E Vertical with push-on switch (travel 0.5mm / 1.5mm)</p>														
3	 <p>EC11N Vertical</p>	<table border="1" data-bbox="539 1048 810 1137"> <thead> <tr> <th>L</th> <th>L₁</th> <th>L_B</th> <th>ℓ</th> </tr> </thead> <tbody> <tr> <td>19.5</td> <td>15</td> <td>7</td> <td>5</td> </tr> <tr> <td>24.5</td> <td>20</td> <td>10</td> <td>7</td> </tr> </tbody> </table> 	L	L ₁	L _B	ℓ	19.5	15	7	5	24.5	20	10	7	
L	L ₁	L _B	ℓ												
19.5	15	7	5												
24.5	20	10	7												
4	 <p>EC11N Vertical with push-on switch (travel 0.5mm / 1.5mm)</p>	<table border="1" data-bbox="539 1406 810 1496"> <thead> <tr> <th>L</th> <th>L₁</th> <th>L_B</th> <th>ℓ</th> </tr> </thead> <tbody> <tr> <td>19.5</td> <td>15</td> <td>7</td> <td>5</td> </tr> <tr> <td>24.5</td> <td>20</td> <td>10</td> <td>7</td> </tr> </tbody> </table> 	L	L ₁	L _B	ℓ	19.5	15	7	5	24.5	20	10	7	
L	L ₁	L _B	ℓ												
19.5	15	7	5												
24.5	20	10	7												
5	 <p>EC11M Vertical with push-on switch (travel 1.5mm)</p>														

Encoders

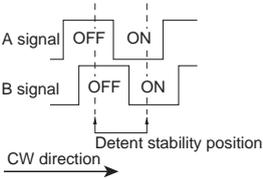
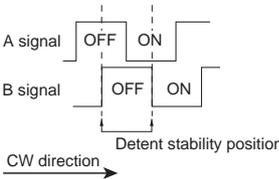
Metal Shaft

Insulated Shaft

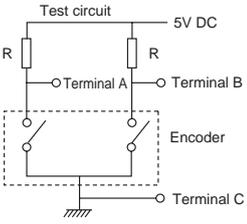
Through Shaft Type

Ring Type

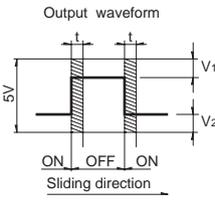
Output Wave

EC11E, EC11N, EC11M	EC11E
<p>EC11E 30 detents, 15 pulse EC11N, EC11M</p> 	<p>Detent stability position cannot be specified for B signal EC11E 18 detents 9 pulse EC11E 36 detents 18 pulse</p> 

Sliding Noise



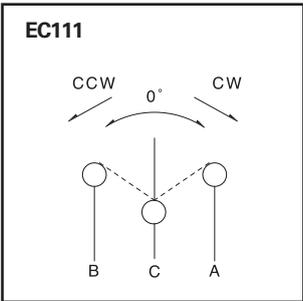
Measurement condition : Rotation speed 360°/s t : Masking time to avoid chattering



EC11E/EC11N/EC11M

$V_1=V_2=1.5V$ max.
At R = 5kΩ
Chattering : 3ms max.
Bounce : 2ms max.

Circuit Diagram



Encoders
Metal Shaft
Insulated Shaft
Through Shaft Type
Ring Type

1 1 mm Size Metal Shaft Type / Product Varieties

In addition to the Product Line, we accommodate the following specifications. Combinations not included in the Product Line are treated as semi-standard products.

■ Shaft Dimensions

1. Single-shaft Type

1) Serrated Type

Unit:mm

EC11 (Except EC11M)
Style (Shaft diameter: $\phi 6$)

● Detailed dimensions

L_1	L_B	l_1	l_2	S_1
20	7	6	1	7
25	10	10	2	11

EC11M
Style (Shaft diameter: $\phi 9$)

● Detailed dimensions

L	L_1	L_B
18	13.5	5
25	20.5	7
28	23.5	10

2) Flat Type

Unit:mm

EC11
Style (Shaft diameter: $\phi 6$)

● Detailed dimensions

L_1	L_B	l
15	5	7
15	7	5 (6)
20	7	10 (12)
25	10	12

※1 Does not comply with EC111

Values in parentheses apply to products without push-on switch.

3) Slotted Type

Unit:mm

EC11
Style (Shaft diameter: $\phi 6$)

● Detailed dimensions

L_1	L_B
15	7
20	7
25	10

Notes

1. Shaded areas in shaft type details indicate specifications included in the product lineup on P.246
2. Other varieties are also available. Please inquire.

1 1 mm Size Metal Shaft Type / Switch Specifications

1. EC11E/EC11N/EC111 Series

Switch type		Momentary push switch	
Contact arrangement		Single pole and single throw (Push-on)	
Travel (mm)		0.5±0.3	1.5±0.5
Operating force		6 ^{+2.5} / ₋₂ N	4±2N
Operating life		20,000 times	
Electrical performance	Rating	0.1A 5V DC (500μA 5V DC min. ratings)	
	Contact resistance	100mΩ max. for initial period, 200mΩ max. after operating life.	
	Insulation resistance	100MΩ min. 250V DC	
	Voltage proof	300V AC for 1 minute or 360V AC for 2 second	

2. EC11M Series

Switch type		Momentary push switch	
Contact arrangement		Single pole and single throw (Push-on)	
Travel (mm)		1.5±0.35	
Operating force		5±2N	
Operating life		20,000 times	
Electrical performance	Rating	0.15A 5V DC (500μA 5V DC min. ratings)	
	Contact resistance	100mΩ max. for initial period, 200mΩ max. after operating life.	
	Insulation resistance	100MΩ min. 250V DC	
	Voltage proof	300V AC for 1 minute or 360V AC for 2 second	

Encoders

Metal Shaft

Insulated Shaft

Through Shaft Type

Ring Type

Encoders

List of Varieties

Type		Metal shaft											
		9mm size		11mm size									
Series		EC09E		EC11E		EC11N		EC11M		EC111			
Photo													
Output		Incremental (Two phase A and B)								Self-return switch			
Shaft types		Single-shaft											
Control part orientation		Vertical											
Number of pulse / Number of detent		15/30		9/18 15/30 18/36		15/30		15/30 15/without		—			
Features		—		—		—		Less shaft wobble		—			
Dimensions (mm)		W		9.5		11.7							
		D		12						13			
		H		4.5						5			
Operating temperature range		-40°C to +85°C											
Operating life		15,000 cycles											
Automotive use		●		●		●		●		●			
Life cycle (availability)													
Electrical performance		Rating		10mA 5V DC									
		Max./min. operating current (Resistive load)		10mA /1mA									
		Insulation resistance		100MΩ min. 250V DC									
		Voltage proof		300V AC for 1 minute or 360V AC for 1s		300V AC for 1 minute or 360V AC for 2s							
Mechanical performance		Rotational torque (Without detent)		—		—		8.5±5mN·m		3 to 30mN·m			
		Detent torque		8±5mN·m		10±7mN·m				12±7mN·m		—	
		Push-pull strength		100N									
Shaft configuration		Flat		Flat, Slotted, Serrated		Flat		Serrated		Flat, Slotted, Serrated			
Terminal type		Insertion											
Switch Specifications		Switch type		Push-on switch									
		Contact arrangement		Single pole and single throw (Push-on)									
		Travel (mm)		0.5±0.3	1.5±0.5	0.5±0.3	1.5±0.5	0.5±0.3	1.5±0.5	1.5±0.35	0.5±0.3	1.5±0.5	
		Operating force (N)		6 \pm $\frac{2.5}{2}$	4±2	6 \pm $\frac{2.5}{2}$	4±2	6 \pm $\frac{2.5}{2}$	4±2	5±2	6 \pm $\frac{2.5}{2}$	4±2	
		Rating		10mA 5V DC (1mA 5V DC min. ratings)		0.1A 5V DC (500μA 5V DC min. ratings)							
		Contact resistance		100mΩ max. for initial period; 200mΩ max. after operating life.									
		Operating life		10,000 times		20,000 times							
Page		244		246									

Encoders Soldering Conditions	275
Encoders Cautions	276

Notes

- Indicates applicability to all products in the series.

Reference for Manual Soldering

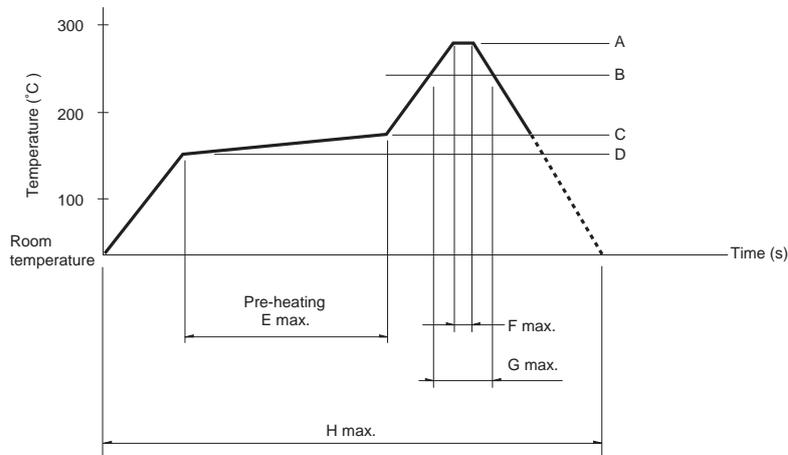
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11E, EC11M, EC11N, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC40A, EC50A, EM11B, EC21C, EC28C, EC35CH	350°C max.	3s max.	1 time

Reference for Dip Soldering

Series	Preheating		Dip soldering		No. of solders
	Soldering surface temperature	Heating time	Soldering temperature	Soldering time	
EC09E, EC111, EC11E, EC11M, EC11N, EC18A, EC21A, EC28A, EC35A, EC35AH, EC50A	100°C max.	2 min. max.	260±5°C	5±1s	2 times max.
EM11B	100°C max.	1 min. max.	260°C max.	3s max.	2 times max.
EC10E, EC12D, EC12E	100°C max.	1 min. max.	260±5°C	3±1s	2 times max.
EC40A	110°C max.	1 min. max.	260°C max.	10s max.	1 time

Example of Reflow Soldering Condition

Temperature profile



Series	A	B	C	D	E	F	G	H	No. of reflows
EC05E	250°C min.	230°C min.	180°C	150°C	60s to 120s	—	30s to 40s	—	2 times max.
EC21C	230°C to 245°C	220°C	200°C	150°C	60s to 120s	—	25s to 60s	300s max.	1 time max.
EC28C, EC35CH	260°C	230°C	180°C	150°C	2 min. min.	3s	40s	230s max.	1 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 encoder when employing a hot air reflow method. The temperature of the PC board and the surface temperature of the encoder may vary greatly depending on the PC board material, its size and thickness. Ensure that the surface temperature of the encoder 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.