

Compact and highly reliable type available in many varieties



### Typical Specifications

Items	Specifications
Output signal	Two phase of A, B Self-return switch (EC111 / EC11E0B)
Rating	10mA 5V DC
Operating life	15,000 cycles 100,000 cycles (EC11K / EC11J)
Operating temperature range	-40°C to +85°C

### Product Line

\*Products marked with a are not recommended for new designs

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)	Operating life (cycles)	Minimum order unit (pcs.)		Product No.	Drawing No.														
									Japan	Export																
Horizontal	Flat	20	12±7	30	15	Without	—	15,000	700	1,400	EC11B15202AN	1														
						With	0.5				EC11B15242AZ	2														
							1.5				EC11B15242B1	3														
Vertical	Flat	20	10±7	18	9	Without	—	15,000	1,200	2,400	EC11E09204A4	4														
				30	15						EC11E15204A3	4														
				36	18						EC11E1820402	4														
				18	9						EC11E09244BS	4														
				30	15						EC11E15244G1	4														
				7 ± 3/4	Without						EC11E153440D	5														
		20	10±7	30	18	15	With				0.5	15,000	1,200	2,400	EC11E18244AU	5										
															7 ± 3/4	Without	EC11E183440C	5								
															10±7	18	9	EC11E09244AQ	5							
															30	15	EC11E15244B2	5								
															7 ± 3/4	Without	EC11E1534408	5								
															10±7	36	18	EC11E18244A5	5							
															7 ± 3/4	Without	EC11E1834403	5								
															15	10±7	30	15	15	Without	—	15,000	1,200	2,400	EC11N1520401	6
																									With	0.5
1.5	EC11N1525404	7																								
20	10±7	30	15	15	Without	—	15,000	1,200	2,400	EC11N1520402	6															
										With	0.5	EC11N1524403	7													
											1.5	EC11N1525405	7													
Less shaft wobble	Serrated	25	12±7	Without	30	With	1.5	10,000	1,000	2,000	EC11G1560414	8														
			8.5±5								EC11G1574402	9														
			12±7								EC11G1564411	10														
			8.5±5								Without	EC11M1565403	9													
Vertical	Flat	20	12±5	18	9	Without	—	100,000	1,000	2,000	EC11K0920404	11														
				30	15						EC11K1520406	11														
				18	9						With	0.5	EC11K0924404	12												
				30	15								EC11K1524406	12												
				18	9								EC11K0925416	12												
				30	15								EC11K1525413	12												
				30	15								EC11K1525413	12												

### Note

Other varieties are also available. Please inquire.

Refer to P.267 for attached parts.  
Refer to P.268 for product varieties.  
Refer to P.270 for switch specifications.  
Refer to P.299 for soldering conditions.

# EC11 1 1 mm Size Metal Shaft Type

## 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)	Operating life (cycles)	Minimum order unit (pcs.)		Product No.	Drawing No.				
									Japan	Export						
Reflow	Flat	20	12±5 (Initial) 10±4 (After reflow)	18	9	Without	—	100,000	600	600	<b>EC11J0920404</b>	13	⚠			
				30	15						<b>EC11J152040F</b>					
				18	9	With	0.5				15,000	1,200	2,400	<b>EC11J0924411</b>	14	⚠
				30	15									<b>EC11J1524413</b>		
				18	9									<b>EC11J0925403</b>		
				30	15									<b>EC11J1525402</b>		
Push lock	20-tooth Serrated	25	10±7	30	15	Without	—	15,000	800	1,600	<b>EC11E152T409</b>	15	⚠			
		26.4				With	8				<b>EC11E152U402</b>	16	⚠			
Self-return switch	Flat	15	3 to 30	Without	Self-return switch	Without	—	15,000	1,200	2,400	<b>EC1110120005</b>	17				
		20				With	0.5				<b>EC111012010H</b>	18	⚠			
						1.5	<b>EC1110120201</b>									
Dual-shaft	Slotted	Inner-shaft=25	10±7	30	15	Without	—	15,000	700	1,400	<b>EC11EBB24C03</b>	19	⚠			
		Outer-shaft=15				With	1.5				<b>EC11E0B2LB01</b>	20	⚠			
	Flat	Inner-shaft=25	3 to 30	Without	Self-return switch	Without	—									
		Outer-shaft=15				With	1.5									
Slotted	Outer-shaft=15															

### Note

Other varieties are also available. Please inquire.

## Packing Specifications

### Tray


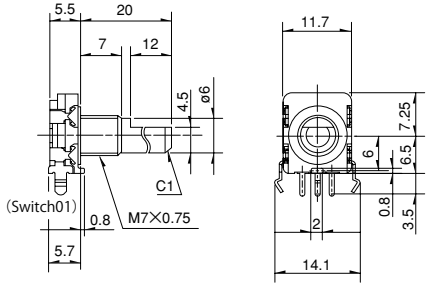
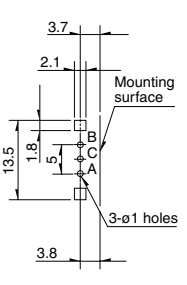

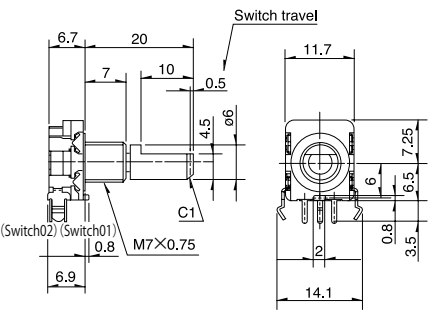
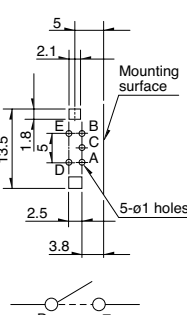

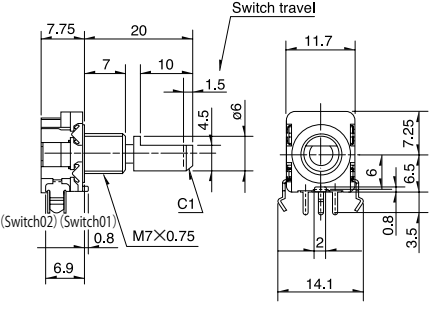
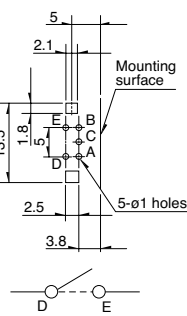

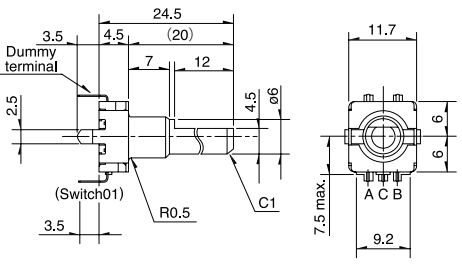
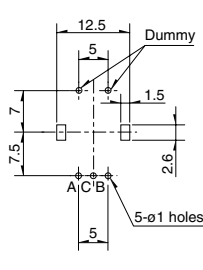

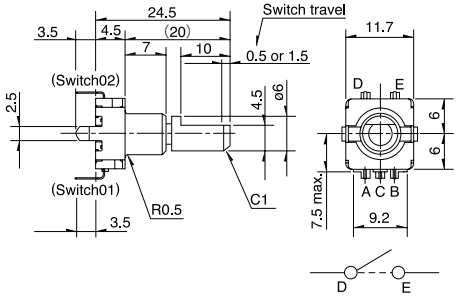
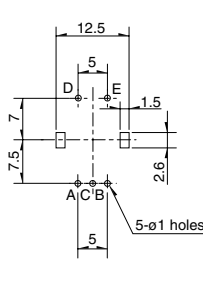
Product No.	Number of packages (pcs.)		Export package measurements (mm)
	1 case /Japan	1 case /export packing	
<b>EC11B</b>	700	1,400	524×374×201
<b>EC11E09/15/18/EC11N</b>	1,200	2,400	540×360×250
<b>EC11G/EC11K/EC11M</b>	1,000	2,000	
<b>EC11J</b>	600	600	369×283×263
<b>EC11E152T/U</b>	800	1,600	507×363×230
<b>EC111</b>	1,200	2,400	507×363×216
<b>EC11E0B/BB</b>	700	1,400	

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Refer to P.267 for attached parts.  
Refer to P.268 for product varieties.  
Refer to P.270 for switch specifications.  
Refer to P.299 for soldering conditions.

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■ Dimensions

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
1			
2			
3			
4			
5			

Encoders


Metal Shaft

Insulated Shaft

Through Shaft Type


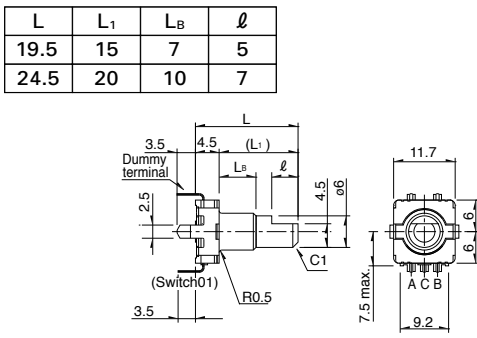
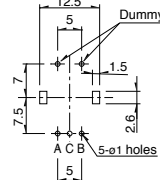

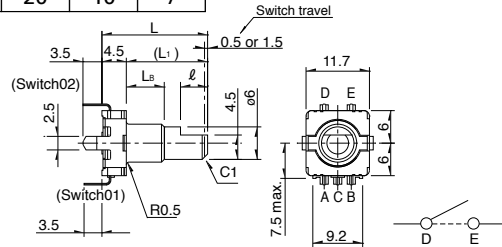
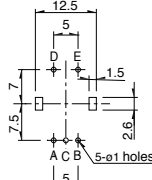

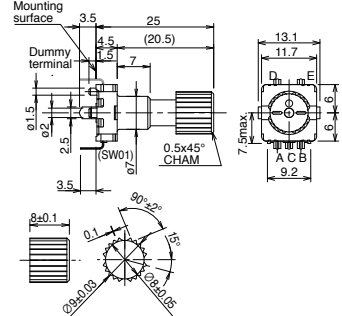
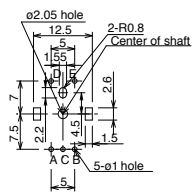


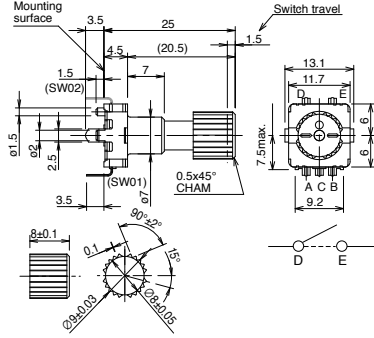
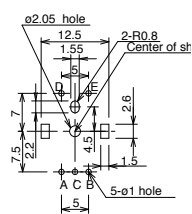
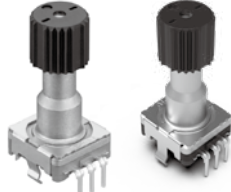

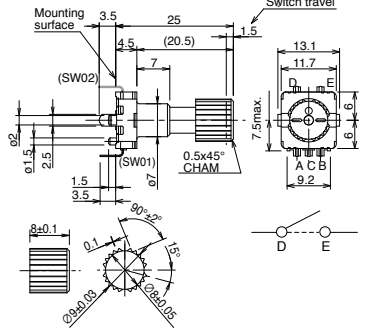
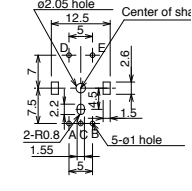
Ring Type

# EC11 1.1 mm Size Metal Shaft Type

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## Dimensions



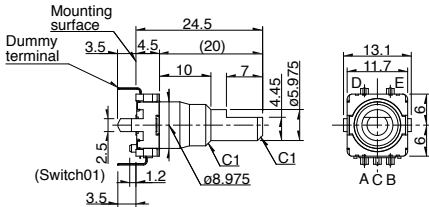
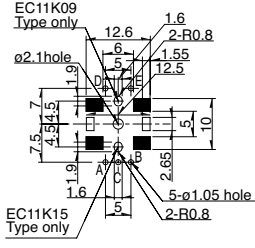


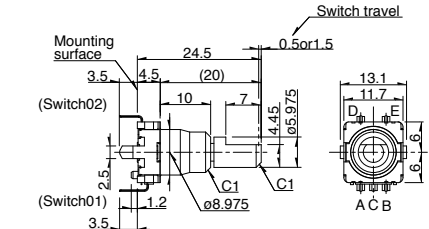
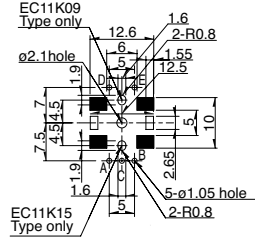


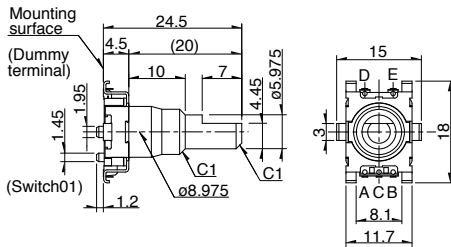
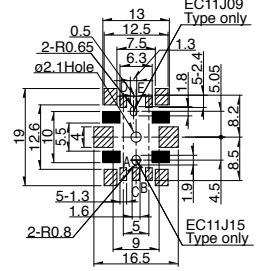


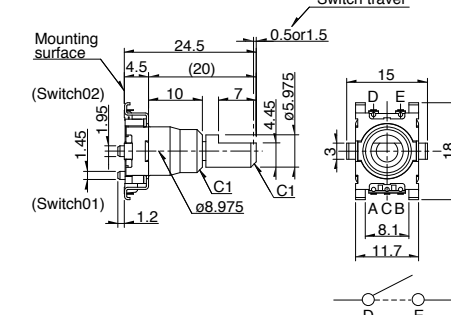
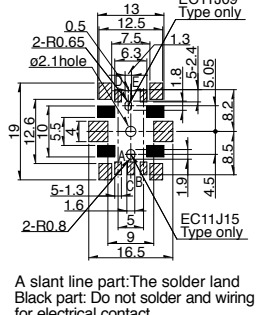


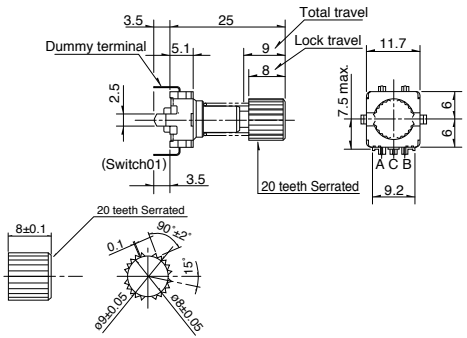
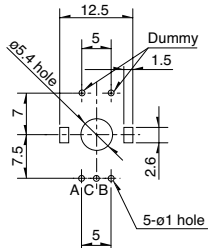
Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)												
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L	L <sub>1</sub>	L <sub>B</sub>	ℓ												
19.5	15	7	5												
24.5	20	10	7												
7		<table border="1"> <thead> <tr> <th>L</th> <th>L<sub>1</sub></th> <th>L<sub>B</sub></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 <sub>1</sub>	L <sub>B</sub>	ℓ	19.5	15	7	5	24.5	20	10	7	
L	L <sub>1</sub>	L <sub>B</sub>	ℓ												
19.5	15	7	5												
24.5	20	10	7												
8															
9	 <p> EC11G      EC11M</p>														
10	 <p> EC11G      EC11M</p>														

\*Products marked with a  are not recommended for new designs

Dimensions

Unit:mm

No.	Photo	形状	PC board mounting hole dimensions (Viewed from mounting side)
11	 <p><b>EC11K Vertical</b> </p>		 <p>Black part : Do not solder and no wiring for electrical contact.</p>
12	 <p><b>EC11K Vertical with push-on switch (travel 0.5mm / 1.5mm)</b> </p>		 <p>Black part : Do not solder and no wiring for electrical contact.</p>
13	 <p><b>EC11J Reflow</b> </p>		 <p>A slant line part: The solder land Black part: Do not solder and wiring for electrical contact</p>
14	 <p><b>EC11J Reflow with push-on switch (travel 0.5mm / 1.5mm)</b> </p>		 <p>A slant line part: The solder land Black part: Do not solder and wiring for electrical contact</p>
15	 <p><b>EC11E152T Push-lock mechanism with push-lock switch</b> </p>		

Encoders


Metal Shaft

Insulated Shaft

Through Shaft Type



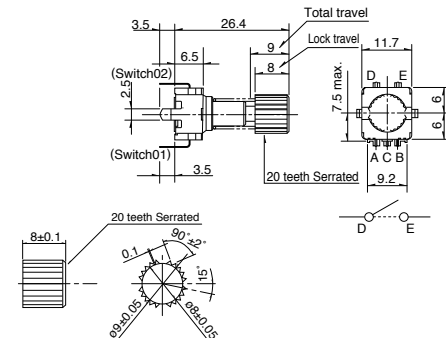
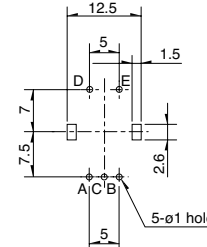

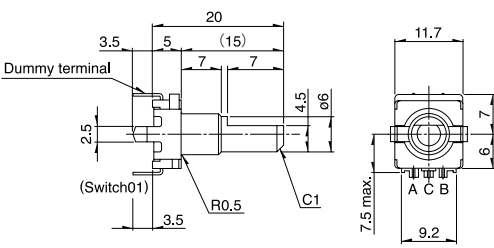
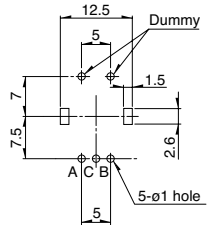

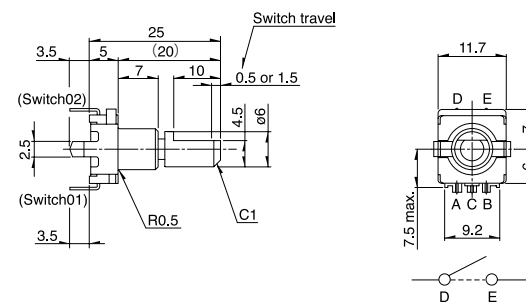
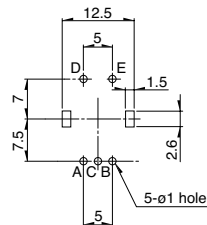
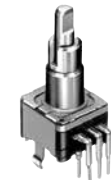

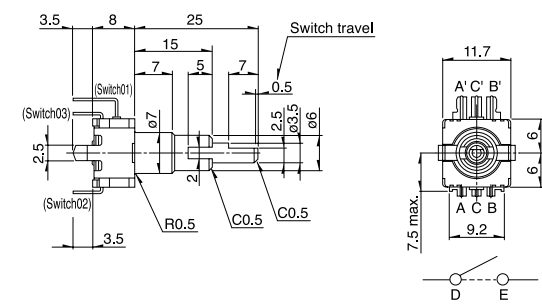
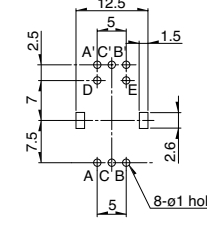
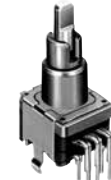

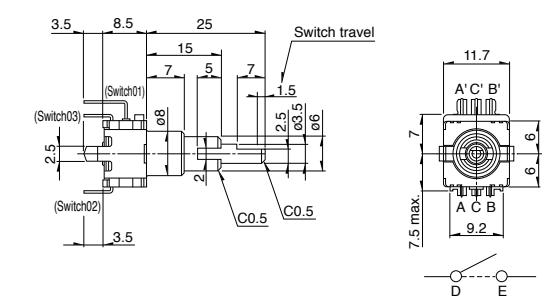
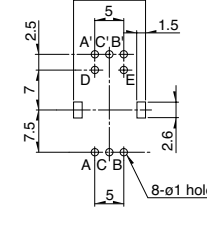
Ring Type

# EC11 1.1 mm Size Metal Shaft Type

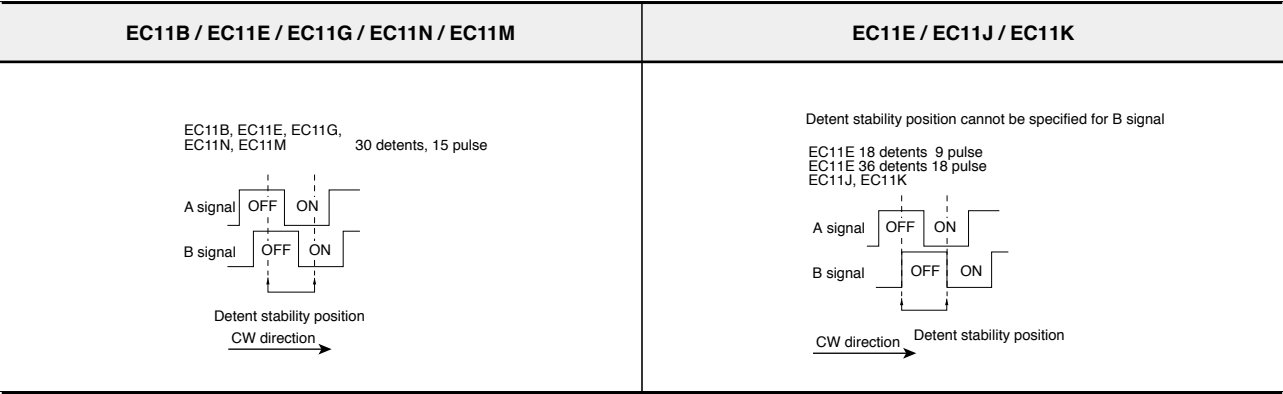
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## Dimensions

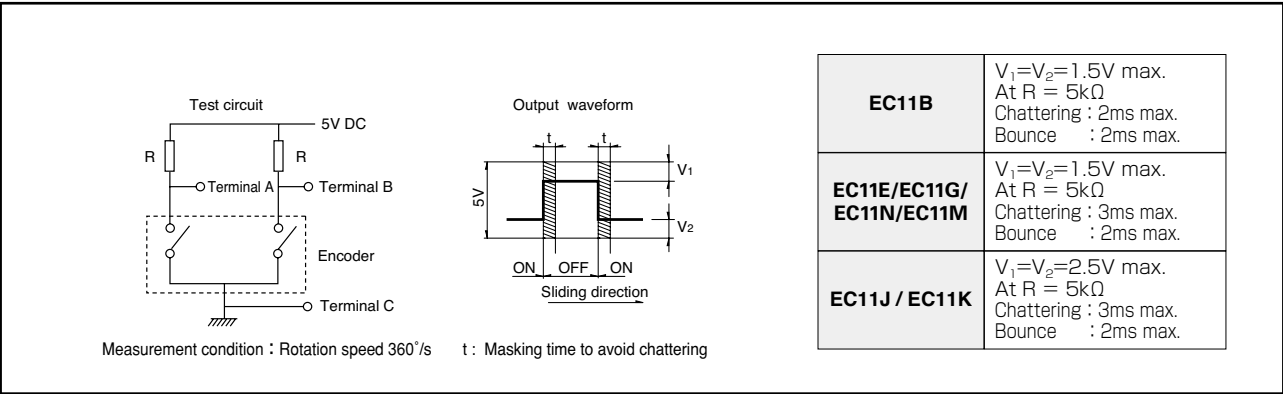
Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
16	 <p><b>EC11E152U</b> Push-lock mechanism with push-lock switch</p> 	 <p>Technical drawings for EC11E152U showing side view, top view, and detail of the 20 teeth serrated shaft. Dimensions include 3.5, 26.4, 6.5, 9, 11.7, 7.5 max., 8, 2.5, 3.5, 20 teeth Serrated, 8±0.1, 0.1, 90°±3.2, 15°, 0.05±0.05, 0.05±0.05, 9.2, 6, 6, 7.5 max., 11.7, 9.2, 6, 6, 5, 5, 1.5, 7, 7.5, 2.6, 5, 5-ø1 hole, A C B, D E.</p>	 <p>PC board mounting hole dimensions for EC11E152U: 12.5, 5, 1.5, 7, 7.5, 2.6, 5, 5-ø1 hole, A C B, D E.</p>
17	 <p><b>EC111</b> Self-return switch</p>	 <p>Technical drawings for EC111 showing side view, top view, and detail of the dummy terminal. Dimensions include 20, 3.5, 5, 7, 7, 4.5, 0.6, 2.5, 3.5, R0.5, C1, 7.5 max., 11.7, 7, 6, 9.2, 7.5 max., 11.7, 7, 6, 9.2, 5, 5, 1.5, 7, 7.5, 2.6, 5, 5-ø1 hole, A C B, D E.</p>	 <p>PC board mounting hole dimensions for EC111: 12.5, Dummy, 5, 1.5, 7, 7.5, 2.6, 5, 5-ø1 hole, A C B, D E.</p>
18	 <p><b>EC111</b> Self-return switch with push-on switch (travel 0.5mm / 1.5mm)</p>	 <p>Technical drawings for EC111 showing side view, top view, and detail of the switch travel. Dimensions include 25, 3.5, 5, 7, 10, 0.5 or 1.5, 4.5, 0.6, 2.5, 3.5, R0.5, C1, 7.5 max., 11.7, 7, 6, 9.2, 7.5 max., 11.7, 7, 6, 9.2, 5, 5, 1.5, 7, 7.5, 2.6, 5, 5-ø1 hole, A C B, D E.</p>	 <p>PC board mounting hole dimensions for EC111: 12.5, 5, 1.5, 7, 7.5, 2.6, 5, 5-ø1 hole, A C B, D E.</p>
19	 <p><b>EC11E</b> Dual-shaft type with push-on switch (travel 0.5mm) Inner shaft: encoder Outer shaft: encoder</p> 	 <p>Technical drawings for EC11E showing side view, top view, and detail of the switch travel. Dimensions include 25, 3.5, 8, 15, 7, 5, 7, 0.5, 2.5, 0.3, 0.6, 2.5, 3.5, R0.5, C0.5, C0.5, 7.5 max., 11.7, 7, 6, 9.2, 7.5 max., 11.7, 7, 6, 9.2, 5, 5, 1.5, 7, 7.5, 2.6, 5, 8-ø1 hole, A' C' B', A C B, D E.</p>	 <p>PC board mounting hole dimensions for EC11E: 12.5, 2.5, 5, 1.5, 7, 7.5, 2.6, 5, 8-ø1 hole, A' C' B', A C B, D E.</p>
20	 <p><b>EC11E</b> Dual-shaft type with push-on switch (travel 1.5mm) Inner shaft: encoder Outer shaft: self-return switch</p> 	 <p>Technical drawings for EC11E showing side view, top view, and detail of the switch travel. Dimensions include 25, 3.5, 8.5, 15, 7, 5, 7, 1.5, 2.5, 0.3, 0.6, 2.5, 3.5, R0.5, C0.5, C0.5, 7.5 max., 11.7, 7, 6, 9.2, 7.5 max., 11.7, 7, 6, 9.2, 5, 5, 1.5, 7, 7.5, 2.6, 5, 8-ø1 hole, A' C' B', A C B, D E.</p>	 <p>PC board mounting hole dimensions for EC11E: 12.5, 2.5, 5, 1.5, 7, 7.5, 2.6, 5, 8-ø1 hole, A' C' B', A C B, D E.</p>

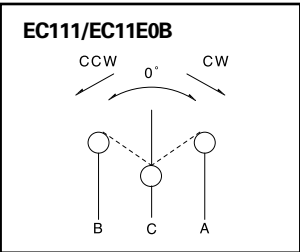
Output Wave



Sliding Noise



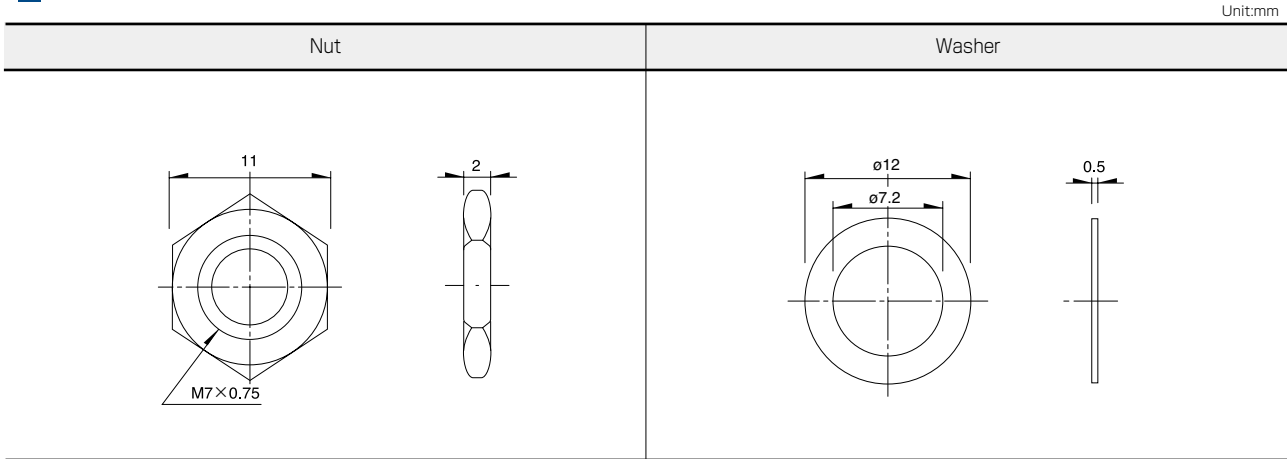
Circuit Diagram



11mm Size Metal Shaft Type / Attached Parts

The following parts are included with the product.

EC11B Series



# 1 1 mm Size Metal Shaft Type / Product Varieties

## Shaft Dimensions

### 1. Single-shaft Type

#### 1) Serrated Type

Unit:mm

<p><b>EC11</b> Style (Shaft diameter: <math>\phi 6</math>) Not applicable for EC11E and EC11G with push-lock mechanism</p>		<p>● Detailed dimensions</p> <table border="1"> <thead> <tr> <th><math>L_1</math></th> <th><math>L_B</math></th> <th><math>l_1</math></th> <th><math>l_2</math></th> <th><math>S_1</math></th> </tr> </thead> <tbody> <tr> <td>20</td> <td>7</td> <td>6</td> <td>1</td> <td>7</td> </tr> <tr> <td>25</td> <td>10</td> <td>10</td> <td>2</td> <td>11</td> </tr> </tbody> </table> <p>※ <math>L_B=7</math> for EC11B.</p>	$L_1$	$L_B$	$l_1$	$l_2$	$S_1$	20	7	6	1	7	25	10	10	2	11
$L_1$	$L_B$	$l_1$	$l_2$	$S_1$													
20	7	6	1	7													
25	10	10	2	11													
<p><b>EC11K / EC11J</b> Style (Shaft diameter: <math>\phi 6</math>)</p>		<p>● Detailed dimensions</p> <table border="1"> <thead> <tr> <th><math>L_1</math></th> <th><math>L_B</math></th> <th><math>l_1</math></th> </tr> </thead> <tbody> <tr> <td>15</td> <td>7</td> <td>5</td> </tr> <tr> <td>20</td> <td>10</td> <td>6</td> </tr> </tbody> </table>	$L_1$	$L_B$	$l_1$	15	7	5	20	10	6						
$L_1$	$L_B$	$l_1$															
15	7	5															
20	10	6															
<p><b>EC11G</b> Style (Shaft diameter: <math>\phi 9</math>)</p>		<p>● Detailed dimensions</p> <table border="1"> <thead> <tr> <th>L</th> <th><math>L_1</math></th> <th><math>L_B</math></th> </tr> </thead> <tbody> <tr> <td>18</td> <td>13.5</td> <td>5</td> </tr> <tr> <td>25</td> <td>20.5</td> <td>7</td> </tr> <tr> <td>28</td> <td>23.5</td> <td>10</td> </tr> </tbody> </table>	L	$L_1$	$L_B$	18	13.5	5	25	20.5	7	28	23.5	10			
L	$L_1$	$L_B$															
18	13.5	5															
25	20.5	7															
28	23.5	10															

#### 2) Flat Type

Unit:mm

<p><b>EC11</b> Style (Shaft diameter: <math>\phi 6</math>)</p>		<p>● Detailed dimensions</p> <table border="1"> <thead> <tr> <th><math>L_1</math></th> <th><math>L_B</math></th> <th><math>l</math></th> </tr> </thead> <tbody> <tr> <td>15</td> <td>5</td> <td>7</td> </tr> <tr> <td>15</td> <td>7</td> <td>5 (6)</td> </tr> <tr> <td>20</td> <td>7</td> <td>10 (12)</td> </tr> <tr> <td>25</td> <td>10</td> <td>12</td> </tr> </tbody> </table> <p>※1 Does not comply with EC111                  ※2 <math>L_B=7</math> for EC11B.                  Values in parentheses apply to products without push-on switch.</p>	$L_1$	$L_B$	$l$	15	5	7	15	7	5 (6)	20	7	10 (12)	25	10	12
$L_1$	$L_B$	$l$															
15	5	7															
15	7	5 (6)															
20	7	10 (12)															
25	10	12															
<p><b>EC11K / EC11J</b> Style (Shaft diameter: <math>\phi 5.975</math>)</p>		<p>● Detailed dimensions</p> <table border="1"> <thead> <tr> <th><math>L_1</math></th> <th><math>L_B</math></th> <th><math>l</math></th> </tr> </thead> <tbody> <tr> <td>15</td> <td>7</td> <td>5</td> </tr> <tr> <td>20</td> <td>10</td> <td>7</td> </tr> </tbody> </table>	$L_1$	$L_B$	$l$	15	7	5	20	10	7						
$L_1$	$L_B$	$l$															
15	7	5															
20	10	7															

### Notes

- The highlighted figures in shaft types refer to Product Specifications in P.261 and P.262.
- Other varieties are also available. Please inquire.



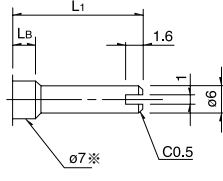
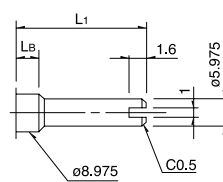
# 1 1 mm Size Metal Shaft Type / Product Varieties

## Shaft Dimensions

### 1. Single-shaft Type

#### 3) Slotted Type

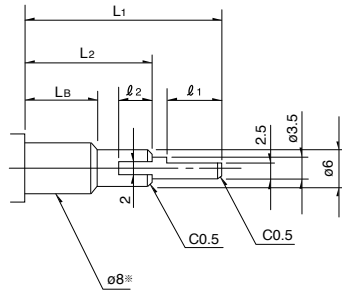
Unit:mm

<p><b>EC11</b> Style (Shaft diameter : <math>\phi 6</math>)</p>  <p><math>\phi 7</math>※ ※M7 for EC11B.</p>	<p>● Detailed dimensions</p> <table border="1" data-bbox="989 347 1404 481"> <thead> <tr> <th><math>L_1</math></th> <th><math>L_B</math></th> </tr> </thead> <tbody> <tr> <td>15</td> <td>7</td> </tr> <tr> <td>20</td> <td>7</td> </tr> <tr> <td>25</td> <td>10</td> </tr> </tbody> </table> <p>※ ※<math>L_B=7</math> for EC11B</p>	$L_1$	$L_B$	15	7	20	7	25	10
$L_1$	$L_B$								
15	7								
20	7								
25	10								
<p><b>EC11K / EC11J</b> Style (Shaft diameter : <math>\phi 5.975</math>)</p>  <p><math>\phi 5.975</math> <math>\phi 8.975</math> C0.5</p>	<p>● Detailed dimensions</p> <table border="1" data-bbox="989 571 1404 660"> <thead> <tr> <th><math>L_1</math></th> <th><math>L_B</math></th> </tr> </thead> <tbody> <tr> <td>15</td> <td>7</td> </tr> <tr> <td>20</td> <td>10</td> </tr> </tbody> </table>	$L_1$	$L_B$	15	7	20	10		
$L_1$	$L_B$								
15	7								
20	10								

### 2. Standard Dimensions and Configuration of Dual-shaft Type

#### Flat Type

Unit:mm

<p><b>EC11E</b> Style (Inner-shaft : <math>\phi 3.5</math> Outer-shaft : <math>\phi 6</math>)</p>  <p><math>\phi 8</math>※ ※ <math>\phi 7</math> for type with inner / outer shaft encoders (EC11EBB)</p>	<p>● Detailed dimensions</p> <table border="1" data-bbox="981 929 1404 1064"> <thead> <tr> <th><math>L_1</math></th> <th><math>L_2</math></th> <th><math>L_B</math></th> <th><math>l_1</math></th> <th><math>l_2</math></th> </tr> </thead> <tbody> <tr> <td>20</td> <td>10</td> <td>5</td> <td>7</td> <td>4</td> </tr> <tr> <td>25</td> <td>15</td> <td>7</td> <td>7</td> <td>5</td> </tr> <tr> <td>30</td> <td>20</td> <td>10</td> <td>7</td> <td>5</td> </tr> </tbody> </table>	$L_1$	$L_2$	$L_B$	$l_1$	$l_2$	20	10	5	7	4	25	15	7	7	5	30	20	10	7	5
$L_1$	$L_2$	$L_B$	$l_1$	$l_2$																	
20	10	5	7	4																	
25	15	7	7	5																	
30	20	10	7	5																	

#### Notes

- The highlighted figures in shaft types refer to Product Specifications in P.261 and P.262.
- Other varieties are also available. Please inquire.

# 1 mm Size Metal Shaft Type / Switch Specifications

## 1. EC11B Series

Switch type		Momentary push switch	
Contact arrangement		Single pole and single throw (Push-on)	
Travel (mm)		$0.5^{+0.4}_{-0.3}$	$1.5 \pm 0.5$
Operating force		$6 \pm 3\text{N}$	$5 \pm 2\text{N}$
Operating life		25,000 times	20,000 times
Electrical performance	Rating	0.1A 5V DC (500 $\mu$ A 5V DC min. ratings)	
	Contact resistance	100m $\Omega$ max. for initial period, 200m $\Omega$ max. after operating life.	
	Insulation resistance	100M $\Omega$ min. 250V DC	
	Voltage proof	300V AC for 1 minute or 360V AC for 2 second	

## 2. EC11E/EC11N/EC11I Series

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

## 3. EC11G/EC11M Series

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

## 4. EC11K/EC11J Series











Switch type		Momentary push switch	
Contact arrangement		Single pole and single throw (Push-on)	
Travel (mm)		$0.5 \pm 0.3$	$1.5 \pm 0.5$
Operating force		$5 \pm 2\text{N}$	$4 \pm 2\text{N}$
Operating life		1,000,000 times	100,000 times
Electrical performance	Rating	0.1A 5V DC (0.1mA 5V DC min. ratings)	
	Contact resistance	100m $\Omega$ max. for initial period, 200m $\Omega$ max. after operating life.	
	Insulation resistance	100M $\Omega$ min. 250V DC	
	Voltage proof	300V AC for 1 minute or 360V AC for 1 second	

## 5. EC11E152U Series

Switch type		Push lock mechanism switch	
Contact arrangement		Single pole and single throw (Push-on)	
Travel (mm)		$8 \pm 0.8$	
Operating force		8N max.	
Operating life		10,000 times	
Electrical performance	Rating	0.1A 5V DC (500 $\mu$ A 5V DC min. ratings)	
	Contact resistance	100m $\Omega$ max. for initial period, 200m $\Omega$ max. after operating life.	
	Insulation resistance	100M $\Omega$ min. 250V DC	
	Voltage proof	300V AC for 1 minute or 360V AC for 2 second	

# Encoders

## List of Varieties

Type		Metal shaft																			
		9mm size			11mm size																
Series		EC09E			EC11B		EC11E				EC11N										
Photo																					
Output		Incremental (Two phase A and B )																			
Shaft types		Single-shaft						Dual-shaft			Single-shaft										
Operating direction		Vertical			Horizontal			Vertical													
Number of pulse / Number of detent		15/30						9/18 15/30 or without 18/36 or without			15/30										
Features		—			—		Without detent Push-lock mechanism			—			—								
Dimensions (mm)		W		9.5			11.7														
		D					13.75			12											
		H		4.5			5.5/6.7/7.75			4.5		8/8.5		4.5							
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)		—			—		7 ± 3mN·m		—			—							
		Detent torque		8 ± 5mN·m			12 ± 7mN·m			10 ± 7mN·m											
		Push-pull strength		100N																	
Shaft configuration		Flat			Flat, Slotted, Serrated				Inner-shaft : Flat Outer-shaft : Slotted		Flat										
Terminal type		Insertion																			
Switch Specifications		Switch type		Push-on switch						Push-lock mechanism switch *	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		0.5 ± 0.3		1.5 ± 0.5			
		Operating force (N)		6 ± 2.5		4 ± 2		6 ± 3		5 ± 2		6 ± 2.5		4 ± 2		8 max.		6 ± 2.5		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			25,000 times		20,000 times			10,000 times		20,000 times							
Page		259			261																

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### Notes

- \*marked specification is only applicable to EC11E152U402.
- Indicates applicability to all products in the series.

**\*Products marked with a  are not recommended for new designs**

# Encoders

## List of Varieties

Type		Metal shaft								
		1.1 mm size								
Series		EC11G	EC11M	EC111	EC11K	EC11J	EM11B			
Photo		 								
Output		Incremental (Two phase A and B)		Self-return switch	Incremental (Two phase A and B)					
Shaft types		Single-shaft								
Operating direction		Vertical								
Number of pulse / Number of detent		15/30 15/without		—	9/18 15/30		16/16			
Features		Less shaft wobble		—	—	Surface Mount type		Magnetic type		
Dimensions (mm)	W	11.7						10.8		
	D	12	13	12	15.3		11			
	H	4.5	5	4.5		7.5				
Operating temperature range		−40°C to +85°C						−30°C to +85°C		
Operating life		15,000 cycles			100,000 cycles			1,000,000 cycles		
Automotive use										
Life cycle (availability)										
Electrical performance	Rating	10mA 5V DC						10mA 5V±5% DC		
	Max./min. operating current (Resistive load)	10mA / 1mA						15mA / —		
	Insulation resistance	100MΩ min. 250V DC						100MΩ min. 100V DC		
	Voltage proof	300V AC for 1 minute or 360V AC for 2s			300V AC for 1 minute or 360V AC for 1s			250V AC for 1 minute or 300V AC for 2s		
Mechanical performance	Rotational torque (Without detent)	8.5±5mN·m		3 to 30mN·m		—	—	—		
	Detent torque	12±7mN·m		—	12±5mN·m		12±5mN·m (Initial) 10±4mN·m (After reflow)		10±5mN·m	
	Push-pull strength	100N								
Shaft configuration		Serrated		Flat, Slotted, Serrated				Flat		
Terminal type		Insertion					Reflow	Insertion		
Switch Specifications	Switch type	Push-on switch								
	Contact arrangement	Single pole and single throw (Push-on)								
	Travel (mm)	1.5±0.35		0.5±0.3	1.5±0.5	0.5±0.3	1.5±0.5	0.5±0.3	1.5±0.5	0.5 ± <sub>0.2</sub> <sup>0.3</sup>
	Operating force (N)	5±2		6 ± <sub>2</sub> <sup>2.5</sup>	4±2	5±2	4±2	5±2	4±2	5.5±3
	Rating	0.1A 5V DC (500μA 5V DC min. ratings)				0.1A 5V DC (0.1mA 5V DC min. ratings)			5mA 5V DC (50mA 12V DC max. ratings)	
	Contact resistance	100mΩ max. for initial period, 200mΩ max. after operating life.						500mΩ max. for initial period, 5mΩ max. after operating life.		
	Operating life	20,000 times			1,000,000 times	100,000 times	1,000,000 times	100,000 times	1,000,000 times	
Page		261						271		

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### Note

● Indicates applicability to all products in the series.

\*Products marked with a  are not recommended for new designs

## Reference for Manual Soldering

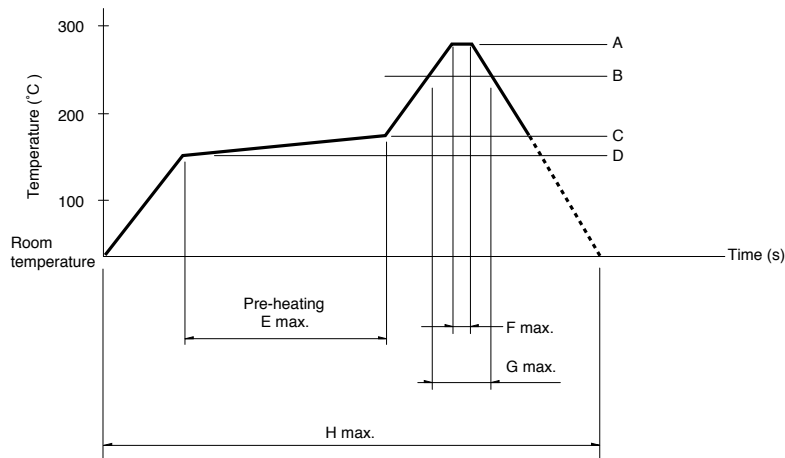
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11B, EC11E, EC11G, EC11K, EC11M, EC11N, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC40A, EC45A, EC50A, EC60B, EM11B, EC21C, EC28C, EC35CH	350°C max.	3s max.	1 time
EC11J	350±10°C	3 <sup>+1</sup> <sub>0</sub> s	2 times

## 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, EC11M, EC11N, EC18A, EC21A, EC28A, EC35A, EC35AH, EC50A, EC60B	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
EC45A	100°C max.	2 min. max.	260°C max.	5s max.	2 times max.

## Example of Reflow Soldering Condition

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 times max.
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.