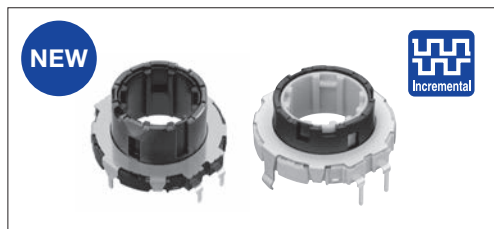


Ring encoder with 4mm height contribute to space saving and multifunctioning



#### Typical Specifications



| Items                       | Specifications |
|-----------------------------|----------------|
| Rating                      | 10mA 5V DC     |
| Operating life              | 50,000 cycles  |
| Operating temperature range | -40°C to +85°C |

#### Product Line

| Structure | Actuator length (mm) | Detent torque (mN·m)                                          | Number of detent | Number of pulse | Minimum order unit (pcs.) |              | Product No.  | No. |
|-----------|----------------------|---------------------------------------------------------------|------------------|-----------------|---------------------------|--------------|--------------|-----|
|           |                      |                                                               |                  |                 | Japan                     | Export       |              |     |
| Dip       | 9                    | 7±5                                                           | 30               | 15              | 600                       | 1,200        | EC21A1540401 | 1   |
|           |                      | 16±7                                                          |                  |                 |                           |              | EC21A1520401 |     |
|           | 18                   |                                                               | 9                | 240             | 480                       | EC21A0920401 | 2            |     |
|           | 15                   |                                                               | 30               | 15              | 600                       | 1,200        | EC21A1520407 | 3   |
| Reflow    | 12                   | 17±8 (Initial), 12 <sup>+7</sup> <sub>-4</sub> (After reflow) |                  |                 | 640                       | 640          | EC21C1520401 | 4   |

#### Packing Specifications

Tray

| Product No.  | Number of packages (pcs.) |                         | Export package measurements (mm) |
|--------------|---------------------------|-------------------------|----------------------------------|
|              | 1 case / Japan            | 1 case / export packing |                                  |
| EC21A09      | 240                       | 480                     | 375×285×223                      |
| EC21A15      | 600                       | 1,200                   | 364×508×192                      |
| EC21A1520407 | 600                       | 1,200                   | 360×540×290                      |
| EC21C        | 640                       | 640                     | 310×400×185                      |

#### Dimensions

Unit:mm

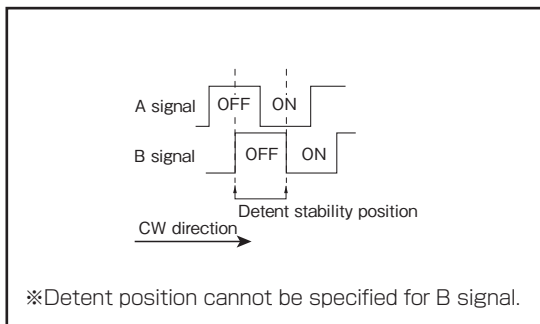
| No. | Photo | Style | PC board mounting hole dimensions (Viewed from mounting side) |
|-----|-------|-------|---------------------------------------------------------------|
| 1   |       |       | <p>Do not wire the shaded area</p>                            |

## ■ Dimensions

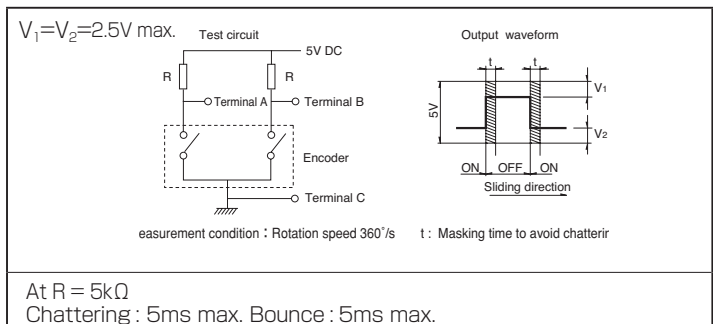
Unit:mm

| No. | Photo | Style | PC board mounting hole dimensions<br>(Viewed from mounting side) |
|-----|-------|-------|------------------------------------------------------------------|
| 2   |       |       | <p>Do not wire the shaded area</p>                               |
| 3   |       |       | <p>Do not wire the shaded area</p>                               |
| 4   |       |       | <p>Do not wire the shaded area</p>                               |

## ■ Output Wave



## ■ Sliding Noise



| Type                                  |                                                 | Ring type                                                                         |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                 |
|---------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------|
|                                       |                                                 | 21mm size                                                                         |                                                                                   | 28mm size                                                                         | 35mm size                                                                           |                                                                                     |                                                                                     |                                 |
| Series                                |                                                 | EC21A                                                                             | EC21C                                                                             | EC28A                                                                             | EC35A                                                                               | EC35AH                                                                              | EC35B                                                                               |                                 |
| Photo                                 |                                                 |  |  |  |   |  |  |                                 |
| Output                                |                                                 | Incremental<br>(Two phase A and B )                                               |                                                                                   |                                                                                   |                                                                                     | Incremental<br>( Three phase A, B and C)                                            | Incremental<br>(Two phase A and B ) /<br>Self-return switch                         |                                 |
| Shaft types                           |                                                 | Ring type                                                                         |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                 |
| Number of pulse /<br>Number of detent |                                                 | 9/18<br>15/30                                                                     | 15/30                                                                             | 15/30<br>18/18                                                                    | 15/30                                                                               | 6×ABC/18<br>10×ABC/30                                                               | 15/30                                                                               |                                 |
| Dimensions<br>(mm)                    | W                                               | 21.6                                                                              | 22                                                                                | 28                                                                                | 35                                                                                  |                                                                                     | 35                                                                                  |                                 |
|                                       | D                                               |                                                                                   | 21.6                                                                              | 29                                                                                |                                                                                     |                                                                                     | 37                                                                                  |                                 |
|                                       | H                                               | 4                                                                                 |                                                                                   |                                                                                   | 4.5                                                                                 |                                                                                     | 12.1                                                                                |                                 |
| Operating temperature range           |                                                 | -40℃ to +85℃                                                                      |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                 |
| Operating life                        |                                                 | 50,000 cycles                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                     | 30,000 cycles                                                                       |                                 |
| Automotive use                        |                                                 |  |  |  |  |  |  |                                 |
| Life cycle (availability)             |                                                 |  |  |  |  |  |  |                                 |
| Electrical<br>performance             | Rating                                          |                                                                                   | 10mA 5V DC                                                                        |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                 |
|                                       | Max./min. operating<br>current (Resistive load) |                                                                                   | 10mA / 1mA                                                                        |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                 |
|                                       | Insulation resistance                           |                                                                                   | 100MΩ min. 250V DC                                                                |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                 |
|                                       | Voltage proof                                   |                                                                                   | 300V AC for 1minute<br>or 360V AC for 2s                                          | 300V AC for 1minute<br>or 360V AC for 1s                                          | 300V AC for 1minute or 360V AC for 2s                                               |                                                                                     | 300V AC for 1minute<br>or 360V AC for 1s                                            |                                 |
| Mechanical<br>performance             | Detent torque                                   |                                                                                   | 7±5mN·m<br>16±7mN·m                                                               | 17±8mN·m (Initial)<br>12±4mN·m<br>(After reflow)                                  | 7±5mN·m<br>12±7mN·m<br>20±10mN·m                                                    | 18±7mN·m                                                                            | 12±5mN·m<br>18±7mN·m<br>30±15mN·m                                                   | 20±10mN·m                       |
|                                       | Push-pull<br>strength                           | Push                                                                              | 100N                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                 |
|                                       |                                                 | Pull                                                                              | 100N                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                 |
| Shaft configuration                   |                                                 | Ring type                                                                         |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                 |
| Terminal type                         |                                                 | Insertion                                                                         |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                 |
| Switch<br>Specifications              | Switch type                                     |                                                                                   | —                                                                                 | —                                                                                 | —                                                                                   | —                                                                                   | —                                                                                   | Self-return<br>switch           |
|                                       | Contact<br>arrangement                          |                                                                                   | —                                                                                 | —                                                                                 | —                                                                                   | —                                                                                   | —                                                                                   | Single pole and<br>double throw |
|                                       | Travel (mm)                                     |                                                                                   | —                                                                                 | —                                                                                 | —                                                                                   | —                                                                                   | —                                                                                   | 2.8±0.5                         |
|                                       | Operating force (N)                             |                                                                                   | —                                                                                 | —                                                                                 | —                                                                                   | —                                                                                   | —                                                                                   | 3.8±1.5                         |
|                                       | Switch ON position                              |                                                                                   | —                                                                                 | —                                                                                 | —                                                                                   | —                                                                                   | —                                                                                   | 15° ±5°                         |
|                                       | Rotational torque                               |                                                                                   | —                                                                                 | —                                                                                 | —                                                                                   | —                                                                                   | —                                                                                   | 40±25mN·m                       |
|                                       | Rating                                          |                                                                                   | —                                                                                 | —                                                                                 | —                                                                                   | —                                                                                   | —                                                                                   | 10mA 5V DC                      |
|                                       | Contact resistance                              |                                                                                   | —                                                                                 | —                                                                                 | —                                                                                   | —                                                                                   | —                                                                                   | 200mΩ max.                      |
|                                       | Operating life                                  |                                                                                   | —                                                                                 | —                                                                                 | —                                                                                   | —                                                                                   | —                                                                                   | 15,000 cycles                   |
| Page                                  |                                                 | 296                                                                               |                                                                                   | 298                                                                               | 299                                                                                 | 300                                                                                 | 302                                                                                 |                                 |

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#### Note

● Indicates applicability to all products in the series.

## Reference for Manual Soldering

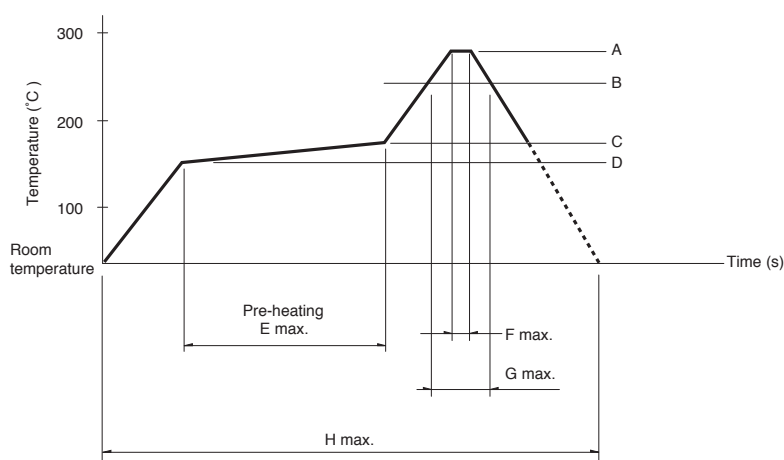
| Series                                                                                                                                                           | Tip temperature | Soldering time                 | No. of solders |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------|----------------|
| EC05E, EC09E, EC10E, EC111, EC11B, EC11E, EC11G, EC11K, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC40A, EC45A, EC50A, EC60B, EM11B, EM20B, EC21C | 350°C max.      | 3s max.                        | 1 time         |
| EC11J                                                                                                                                                            | 350±10°C        | 3 <sup>+1</sup> <sub>0</sub> 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, EC21A, EC28A, EC35A, EC35AH, EC35B, EC50A, EC60B | 100°C max.                    | 2 min. max.  | 260±5°C               | 5±1s           | 2 time max.    |
| EC10E, EC12D, EC12E, EM11B                                                                        | 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                                                                                             | 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.    |

## 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 time max.    |
| EC05E  | 250°C min.     | 230°C min. | 180°C | 150°C | 60s to 120s | —  | 30s to 40s | —           | 2 time max.    |
| EC21C  | 230°C to 245°C | 220°C      | 200°C | 150°C | 60s to 120s | —  | 25s to 60s | 300 max.    | 1 time max.    |

### 注記

- 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.