

## SERIES: RIC11 | DESCRIPTION: MECHANICAL INCREMENTAL ENCODER

### FEATURES

- multiple shaft options
- different mounting options
- different resolution and detent options



### ELECTRICAL

| parameter               | conditions/description                                                             | min | typ | max | units      |
|-------------------------|------------------------------------------------------------------------------------|-----|-----|-----|------------|
| power supply            |                                                                                    |     | 5   |     | V          |
| current consumption     | each lead                                                                          | 0.5 |     | 10  | mA         |
|                         | common lead                                                                        | 0.5 | 1   | 10  | mA         |
| output                  | 2-bit quadrature, channel A leads channel B by 90° with counter-clockwise rotation |     |     |     |            |
| output phase difference | $\Delta T \geq 6$ ms @ 60 rpm [see output waveform]                                |     |     |     |            |
| output resolution       | 15, 20 PPR                                                                         |     |     |     |            |
| detent step angle       | 20 detent models                                                                   | 16  | 18  | 20  | °          |
|                         | 30 detent models                                                                   | 10  | 12  | 14  | °          |
| insulation resistance   | at 250 Vdc, for 1 minute between terminals and bushing                             | 100 |     |     | M $\Omega$ |
| dielectric strength     | for 1 minute between terminals and bushing                                         |     | 300 |     | Vac        |

Notes: 1. All specifications measured at 15~35°C, humidity at 25~85%, under 86~106 kPa pressure, unless otherwise noted.

### PUSH SWITCH SPECIFICATIONS

| parameter             | conditions/description                                                      | min | typ        | max | units      |
|-----------------------|-----------------------------------------------------------------------------|-----|------------|-----|------------|
| rating                | 5 Vdc, 10 mA [1 mA min]                                                     |     |            |     |            |
| contact resistance    | voltage step-down test at 5 Vdc, 1 mA                                       |     |            | 100 | m $\Omega$ |
| insulation resistance | at 250 Vdc, for 1 minute between terminals and bushing                      | 100 |            |     | M $\Omega$ |
| dielectric strength   | between terminals and bushing                                               |     |            |     | Vac        |
|                       | for 1 minute (leakage current 1 mA)<br>for 2 seconds (leakage current 1 mA) |     | 250<br>300 |     | Vac        |
| operating push force  |                                                                             | 3   | 5          | 7   | N          |
| travel                |                                                                             | 0.3 | 0.5        | 0.7 | mm         |
| bounce                | shaft rotated at 1 cycles/s [OFF-ON-OFF]                                    |     |            | 10  | ms         |
| push switch life      | at 1800~2000 cycles/hour without electrical load                            |     | 20,000     |     | cycles     |

## MECHANICAL

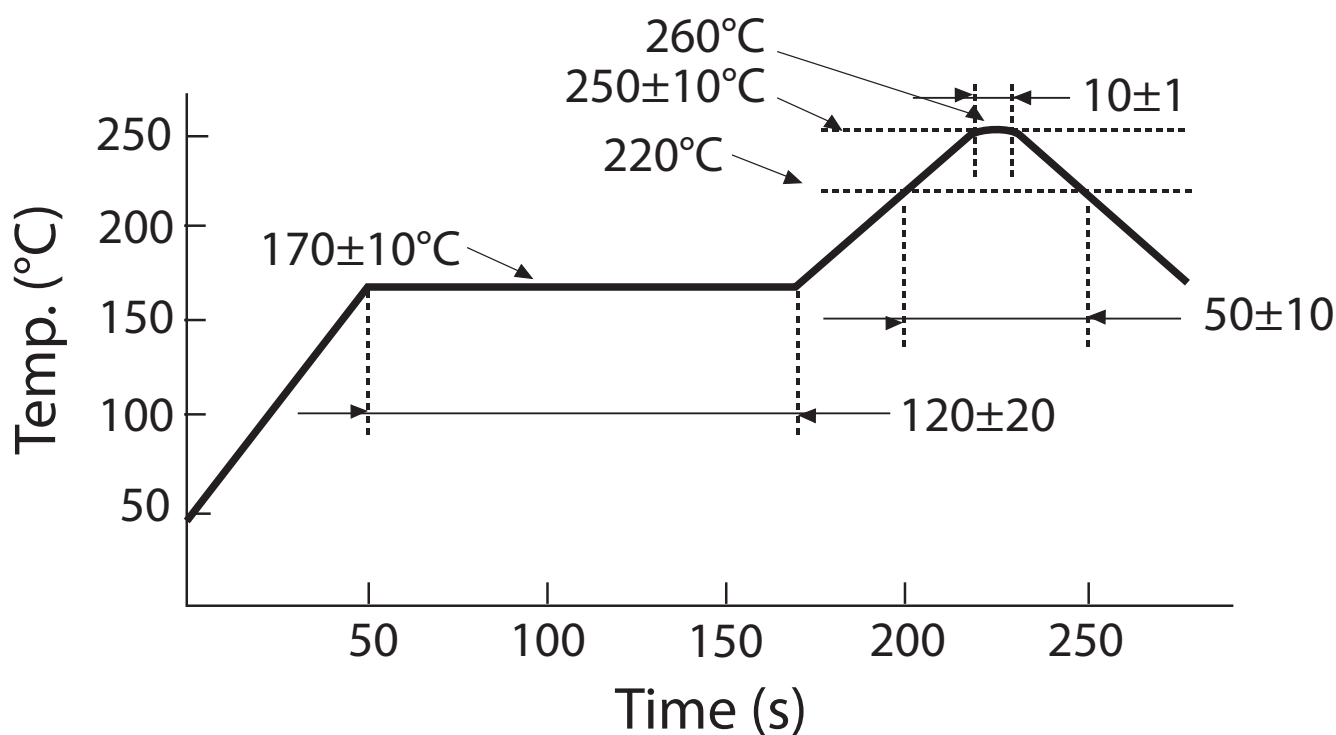
| parameter                       | conditions/description                                                                                      | min | typ     | max | units  |
|---------------------------------|-------------------------------------------------------------------------------------------------------------|-----|---------|-----|--------|
| shaft load                      | pull static load for 20 seconds                                                                             |     | 100     |     | N      |
|                                 | push static load for 10 seconds                                                                             |     | 100     |     | N      |
| rotational torque               |                                                                                                             | 10  | 15      | 20  | mN·m   |
| terminal strength               | a static load of 3 N applied to tip of terminals for 10 s                                                   |     |         |     |        |
| side thrust strength of shaft   | a load of 80 N applied at the point 5 mm from the tip of the shaft perpendicular to the shaft axis for 10 s |     |         |     |        |
| shaft play in rotational wobble | testing by angle board                                                                                      |     |         | 2   | °      |
| shaft play in axial direction   | pull/push load of 0.5 N applied on the shaft                                                                |     |         | 0.2 | mm     |
| rotational life                 | at 600~800 cycles/hour without electrical load                                                              |     | 100,000 |     | cycles |

## ENVIRONMENTAL

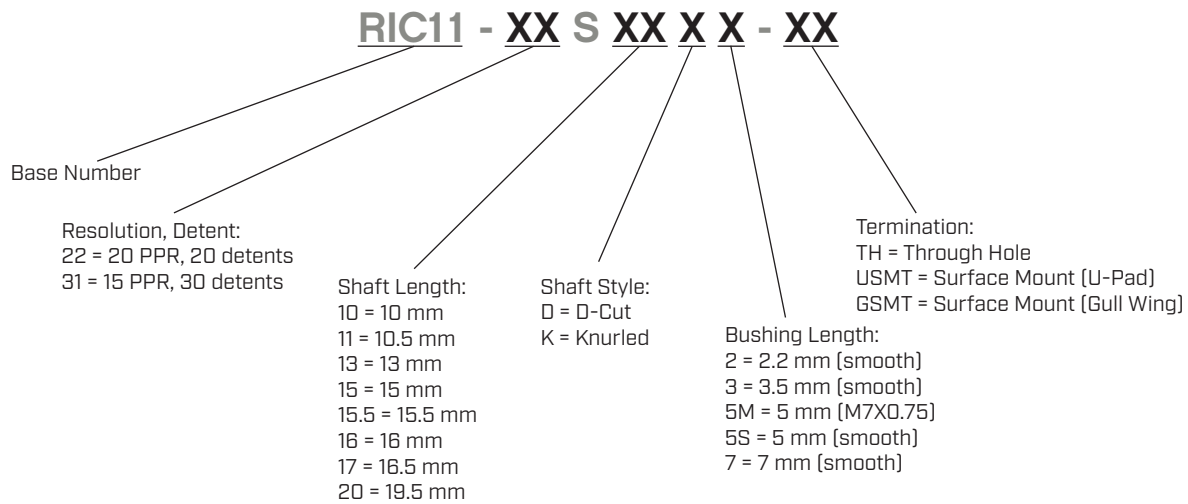
| parameter             | conditions/description | min | typ | max | units |
|-----------------------|------------------------|-----|-----|-----|-------|
| operating temperature |                        | -40 |     | 85  | °C    |
| storage temperature   |                        | -40 |     | 85  | °C    |
| RoHS                  | yes                    |     |     |     |       |

## SOLDERABILITY

| parameter        | conditions/description                 | min | typ | max | units |
|------------------|----------------------------------------|-----|-----|-----|-------|
| hand soldering   | for maximum 3 seconds                  |     |     | 350 | °C    |
| reflow soldering | only suitable for surface mount models |     | 260 |     | °C    |



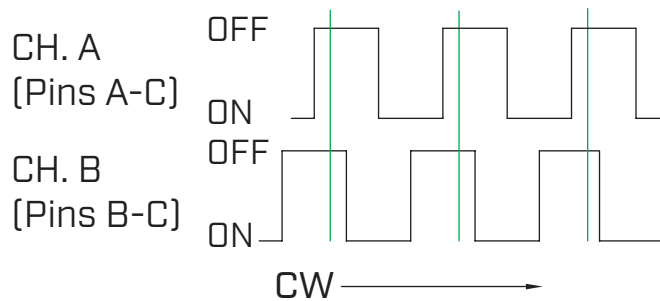
## PART NUMBER KEY



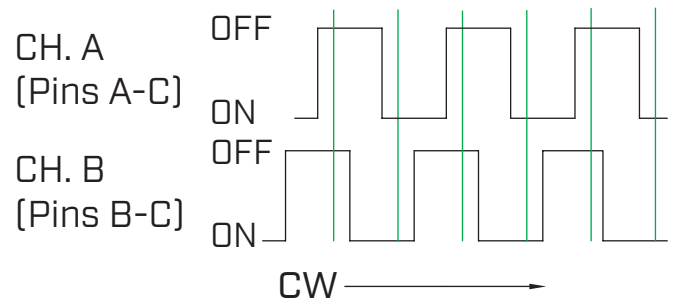
Note: 2. See Shaft Types and Mechanical Drawings for available configurations.

## OUTPUT WAVEFORM

20 PPR, 20 Detent Models



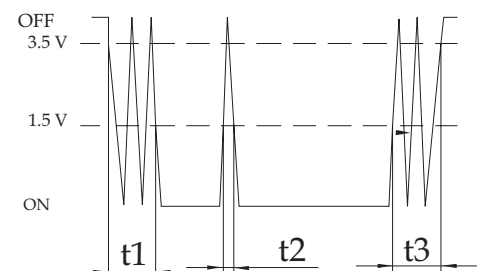
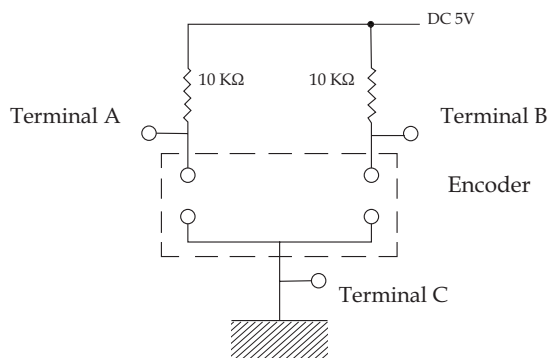
15 PPR, 30 Detent Models



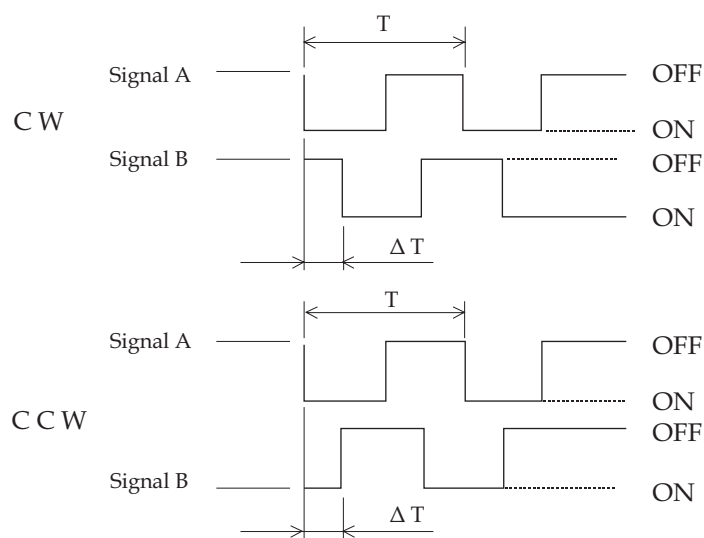
## SWITCHING CHARACTERISTICS

| parameter              | conditions/description                                                                                                                                                                                                                                                                                      | value                        |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| chattering             | signal's passage of time from 1.5 V to 3.5 V of each switching position (OFF to ON or ON to OFF)                                                                                                                                                                                                            | $t_1, t_3 \leq 3 \text{ ms}$ |
| sliding noise (bounce) | time of voltage change exceeds 1.5 V in code ON area. When the bounce has code ON time less than 1 ms between chattering [ $t_1$ or $t_3$ ], the voltage change shall be regarded as a part of chattering. When the code ON time between 2 bounces is less than 1 ms, they are regarded as 1 linked bounce. | $t_2 \leq 2 \text{ ms}$      |
| sliding noise          | voltage change in code OFF area                                                                                                                                                                                                                                                                             | 3.5 V min                    |

Notes: 3. Testing at 60 RPM.  
4. Code OFF: The area which the voltage is 3.5 V or more. Code ON: The area which the voltage is 1.5 V or less.



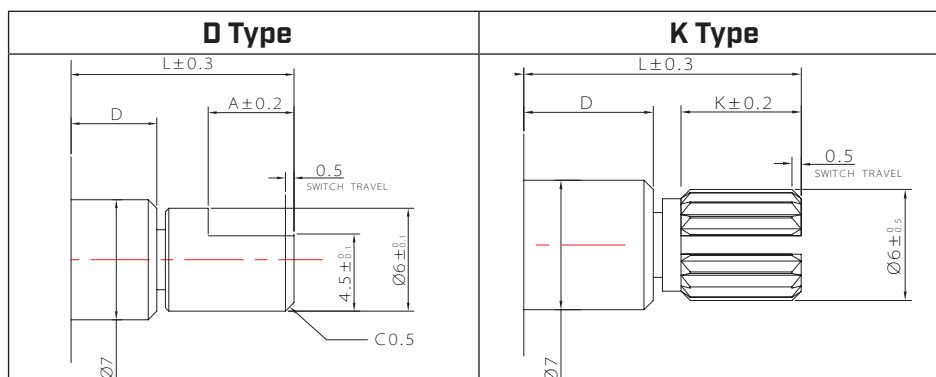
## PHASE DIFFERENCE



At 60 RPM constant speed:  $\Delta T \geq 6$  ms

## SHAFT TYPES

units: mm  
 tolerance:  
 $X \leq 10.00$ :  $\pm 0.30$  mm  
 $10.00 < X \leq 100.00$ :  $\pm 0.50$  mm  
 unless otherwise noted



| D=5 |     |     |     |
|-----|-----|-----|-----|
|     | 10D | 13D | 16D |
| L   | 10  | 13  | 16  |
| A   | 4   | 5   | 10  |

|   | 10K | 10K | 11K  | 15K |
|---|-----|-----|------|-----|
| D | 2.2 | 3.5 | 5    | 7   |
| L | 10  | 10  | 10.5 | 15  |
| A | 5   | 5   | 3.5  | 6.5 |

| D=7 |     |       |      |      |
|-----|-----|-------|------|------|
|     | 15D | 15.5D | 17D  | 20D  |
| L   | 15  | 15.5  | 16.5 | 19.5 |
| A   | 7   | 6     | 8    | 11   |



units: mm  
tolerance:  
X≤10.00: ±0.30 mm  
10.00<X≤100.00: ±0.50 mm  
unless otherwise noted

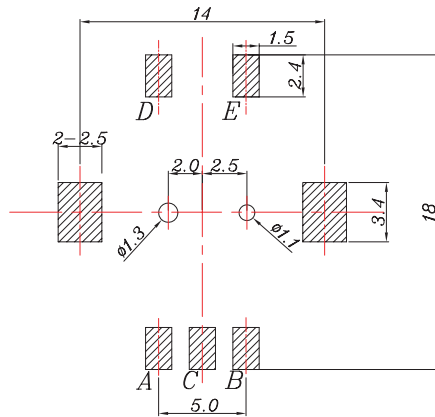
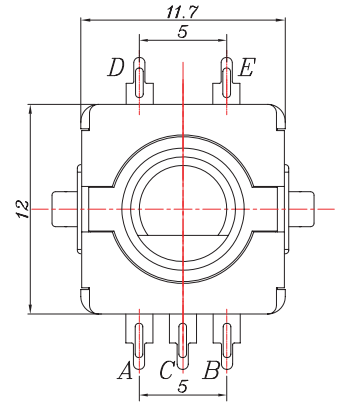
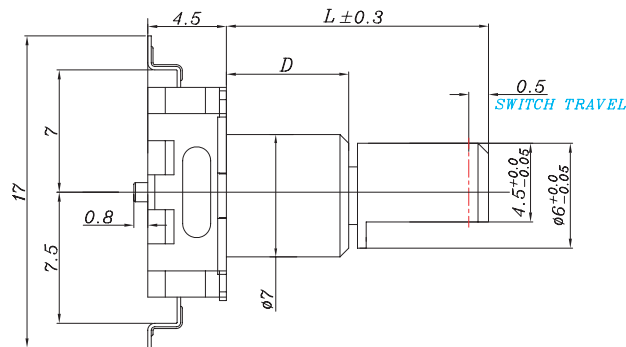
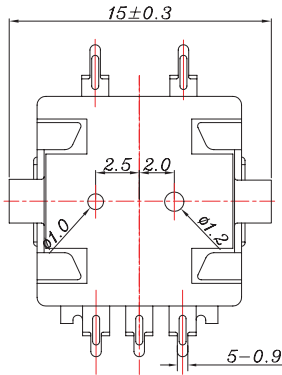
| DESCRIPTION | MATERIAL            | PLATING/COLOR |
|-------------|---------------------|---------------|
| housing     | PBT                 |               |
| bracket     | SPCC                |               |
| bushing     | zinc alloy          |               |
| shaft       | aluminum/zinc alloy |               |
| terminals   | phosphor copper     |               |



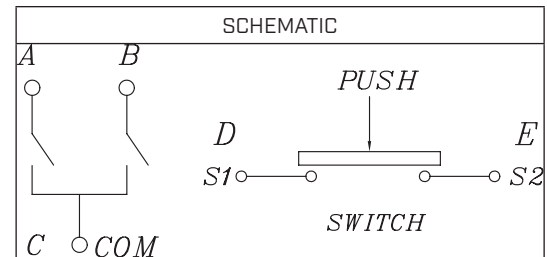
## MECHANICAL DRAWING (GULL WING SMT MODELS)

units: mm  
 tolerance:  
 $X \leq 10.00$ :  $\pm 0.30$  mm  
 $10.00 < X \leq 100.00$ :  $\pm 0.50$  mm  
 unless otherwise noted

| DESCRIPTION | MATERIAL            | PLATING/COLOR |
|-------------|---------------------|---------------|
| housing     | LCP                 |               |
| bracket     | SPCC                |               |
| bushing     | zinc alloy          |               |
| shaft       | aluminum/zinc alloy |               |
| terminals   | phosphor copper     |               |



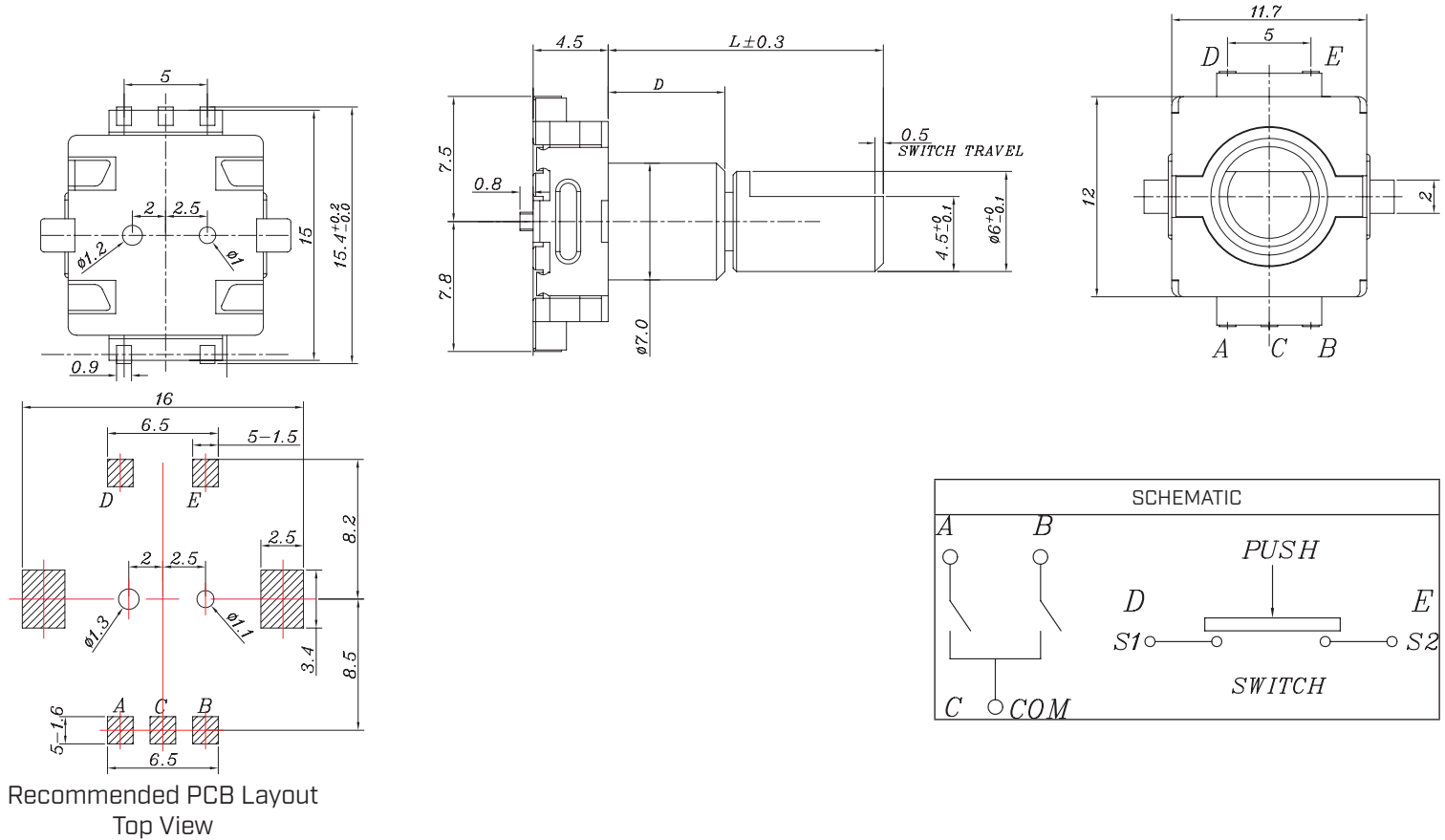
Recommended PCB Layout  
Top View



## MECHANICAL DRAWING (U SHAPE SMT MODELS)

units: mm  
 tolerance:  
 $X \leq 10.00$ :  $\pm 0.30$  mm  
 $10.00 < X \leq 100.00$ :  $\pm 0.50$  mm  
 unless otherwise noted

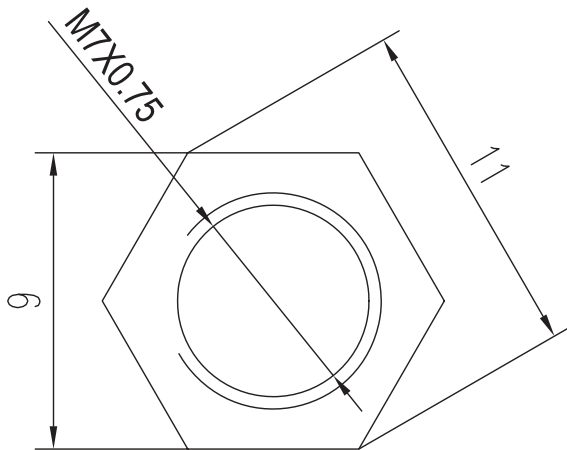
| DESCRIPTION | MATERIAL            | PLATING/COLOR |
|-------------|---------------------|---------------|
| housing     | LCP                 |               |
| bracket     | SPCC                |               |
| bushing     | zinc alloy          |               |
| shaft       | aluminum/zinc alloy |               |
| terminals   | phosphor copper     |               |



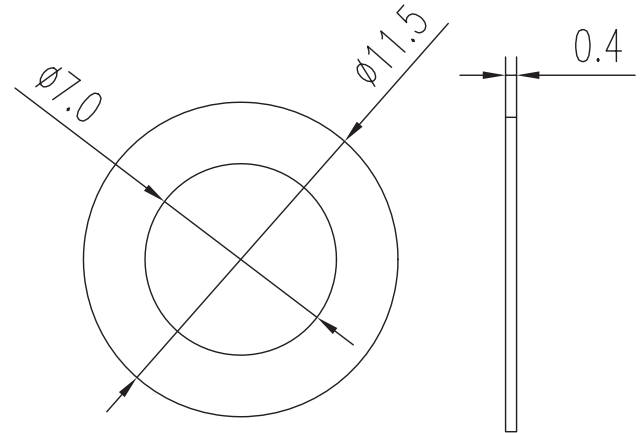
## MOUNTING HARDWARE

units: mm

### Nut



### Washer



## REVISION HISTORY

| rev. | description     | date       |
|------|-----------------|------------|
| 1.0  | initial release | 09/20/2023 |

The revision history provided is for informational purposes only and is believed to be accurate.



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