

**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		250		Vac
	for 1 minute (leakage current 1 mA)		300		Vac
	for 2 seconds (leakage current 1 mA)				
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

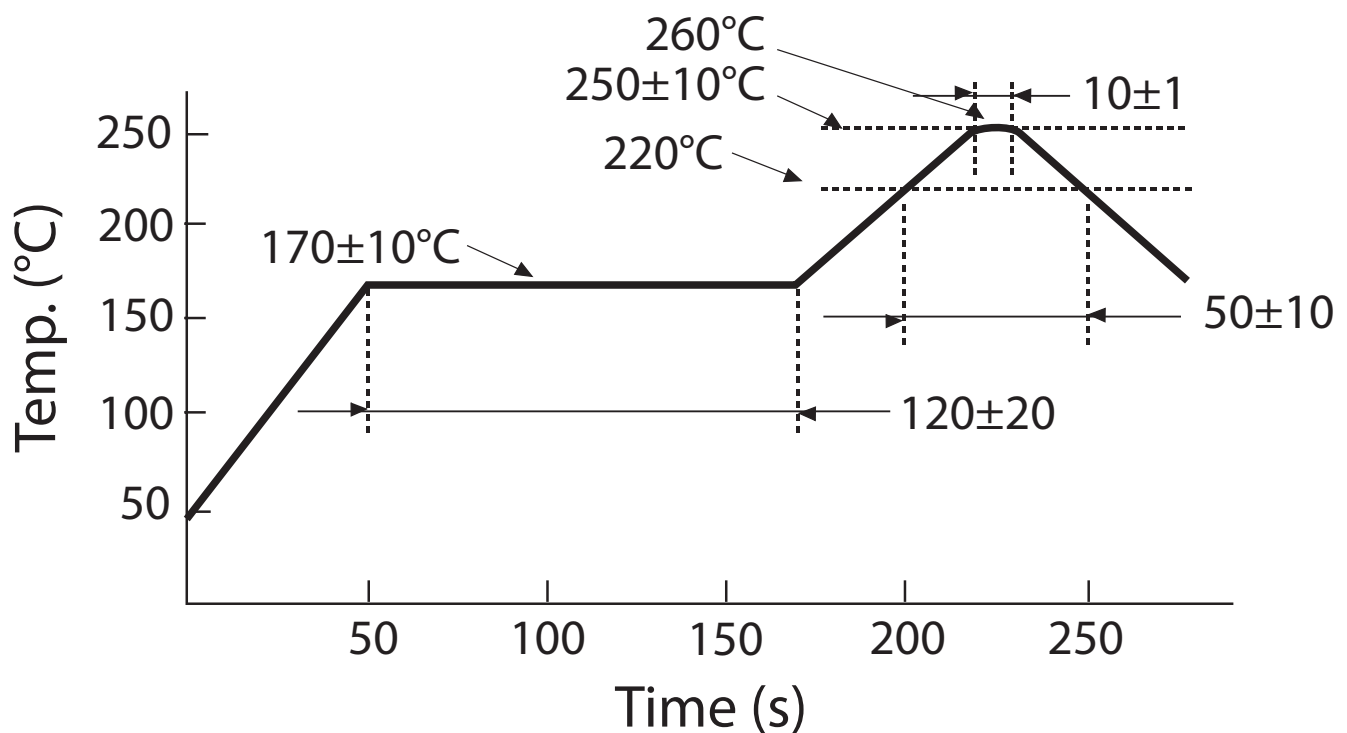
parameter	conditions/description	min	typ	max	units
shaft load	pull static load for 20 seconds		100		N
	push static load for 10 seconds		100		N
rotational torque		10	15	20	mN·m
terminal strength	a static load of 3 N applied to tip of terminals for 10 s				
side thrust strength of shaft	a load of 80 N 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

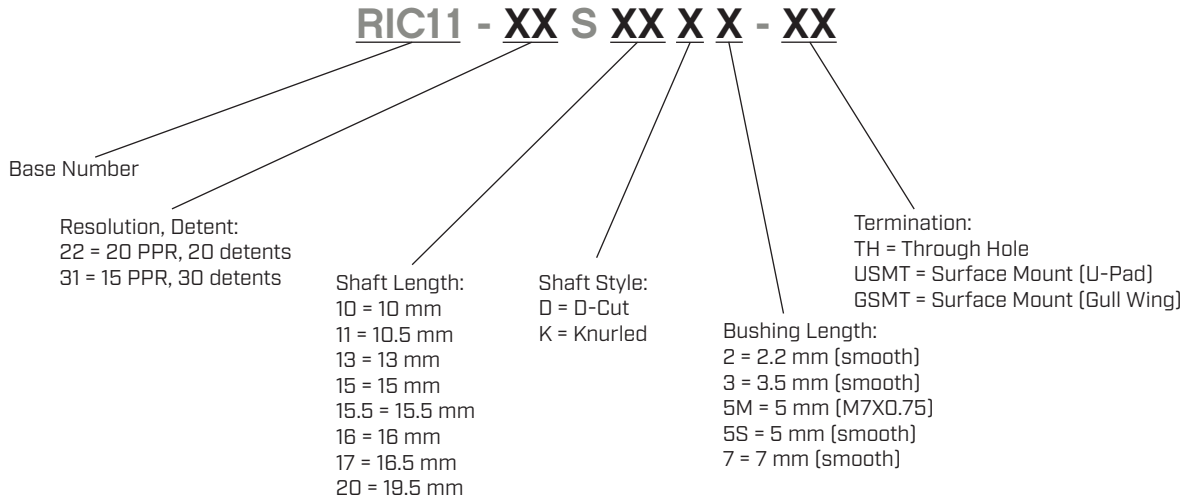
parameter	conditions/description	min	typ	max	units
operating temperature		-40		85	°C
storage temperature		-40		85	°C
RoHS	yes				

## 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



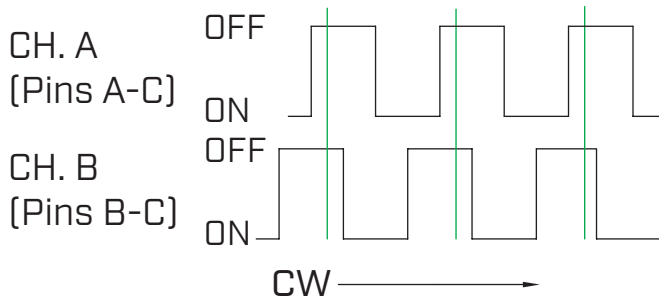
## PART NUMBER KEY



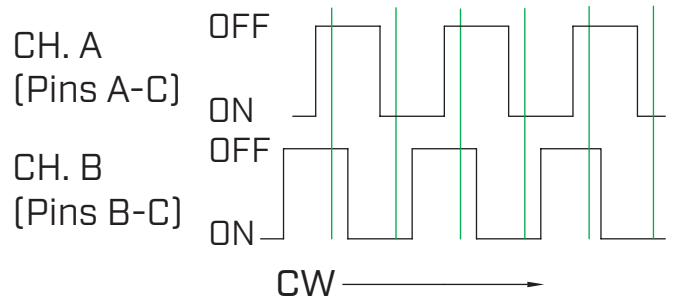
Note: 2. See Shaft Types and Mechanical Drawings for available configurations.

## OUTPUT WAVEFORM

20 PPR, 20 Detent Models



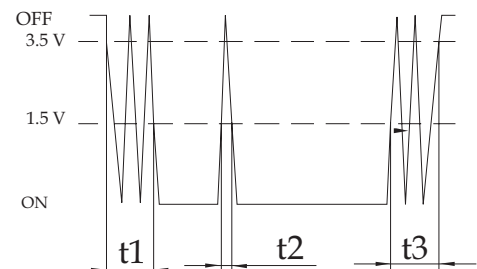
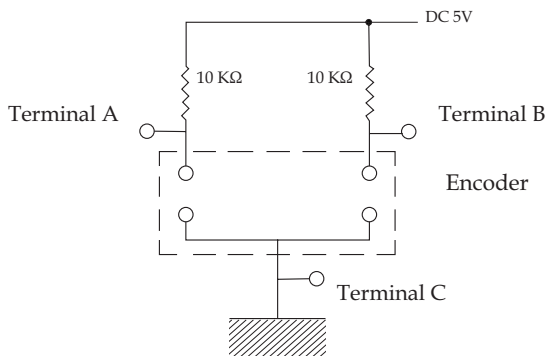
15 PPR, 30 Detent Models



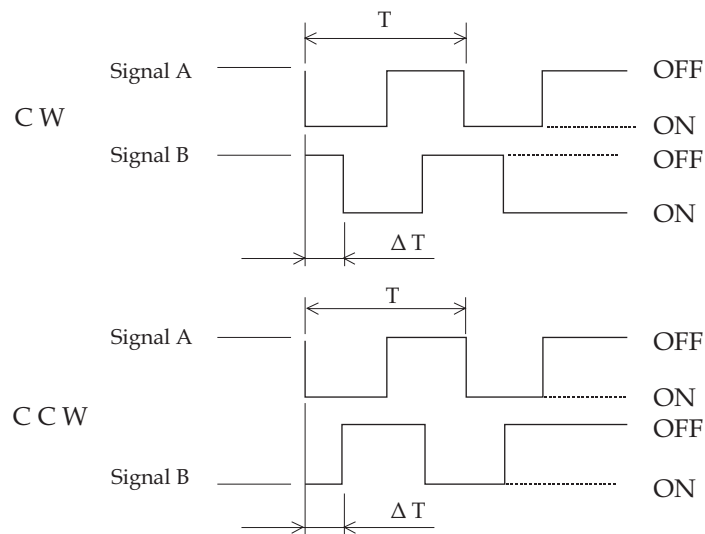
## SWITCHING CHARACTERISTICS

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.



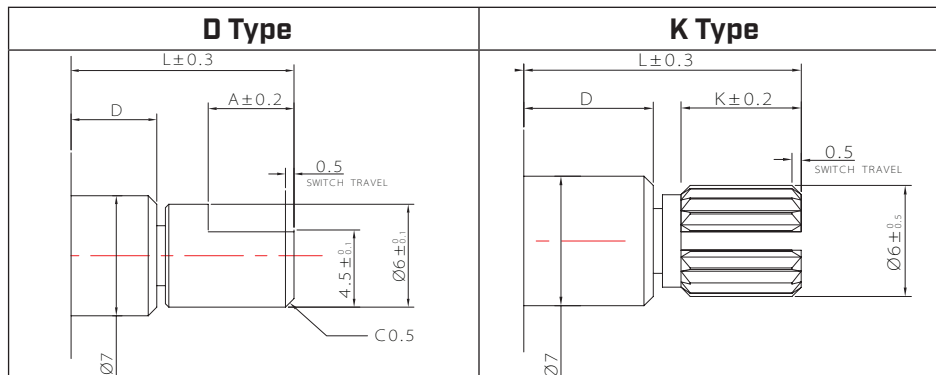
## PHASE DIFFERENCE



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

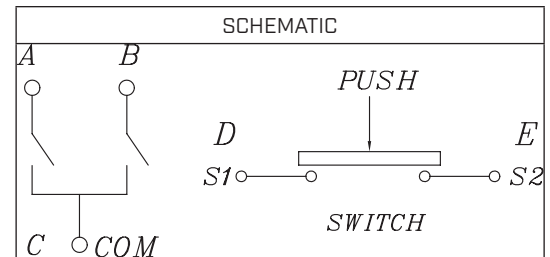
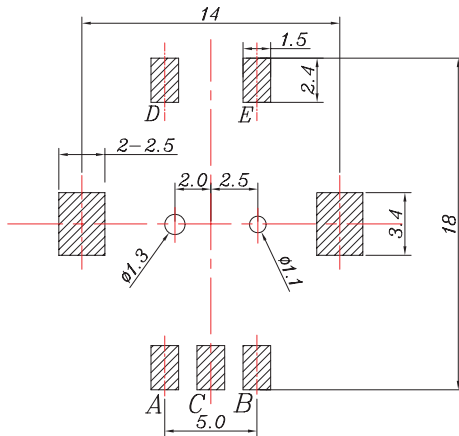
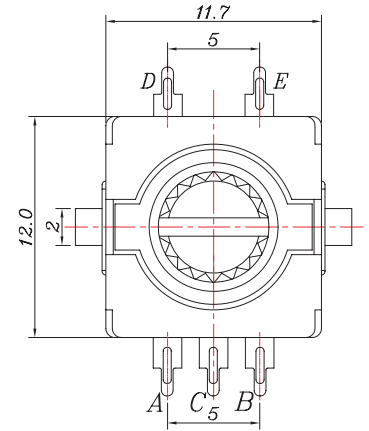
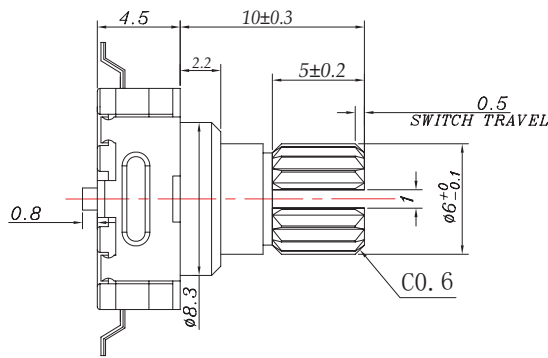
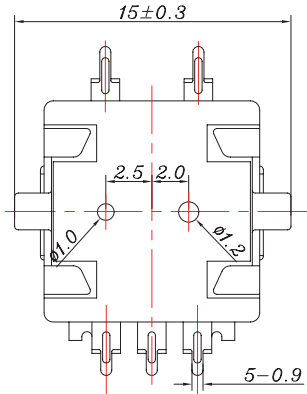
	10K	10K	11K	15K
D	2.2	3.5	5	7
L	10	10	10.5	15
A	5	5	3.5	6.5

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

## MECHANICAL DRAWING (RIC11-31S10K2-GSMT)

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	
terminals	phosphor copper	

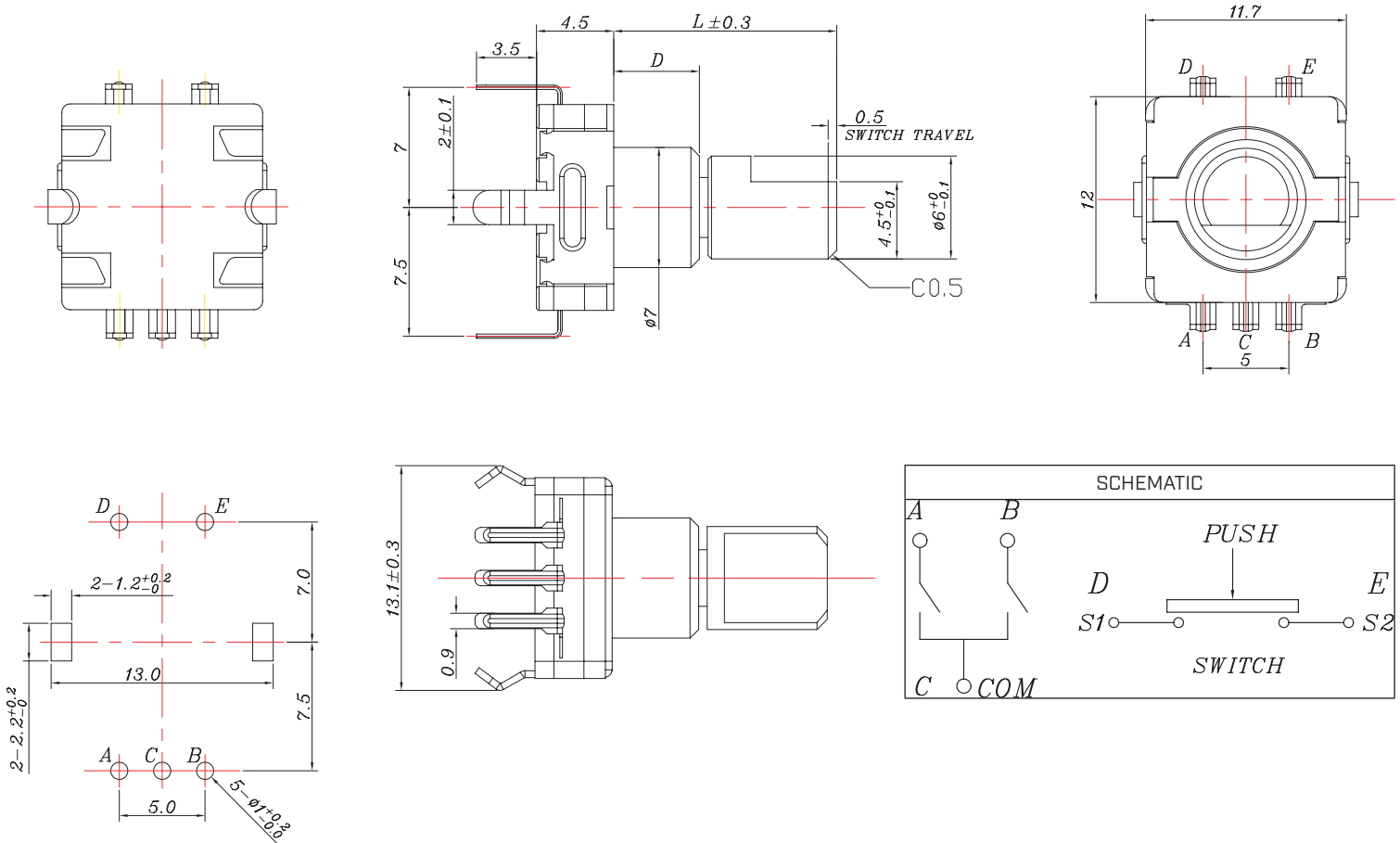


Recommended PCB Layout  
 Top View

## MECHANICAL DRAWING (THROUGH HOLE 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	PBT	
bracket	SPCC	
bushing	zinc alloy	
shaft	aluminum/zinc alloy	
terminals	phosphor copper	

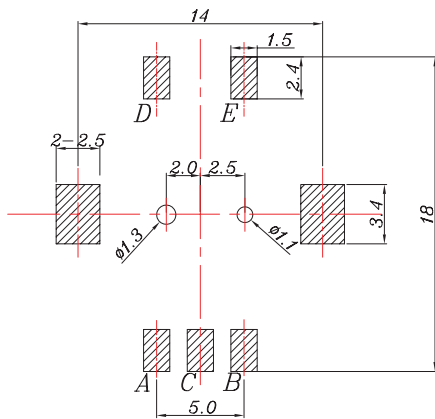
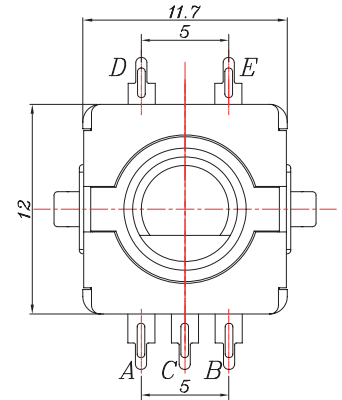
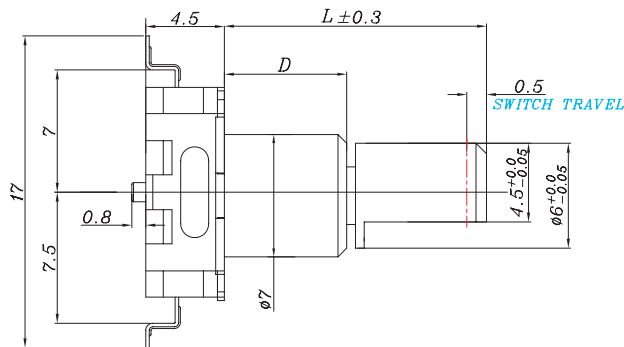
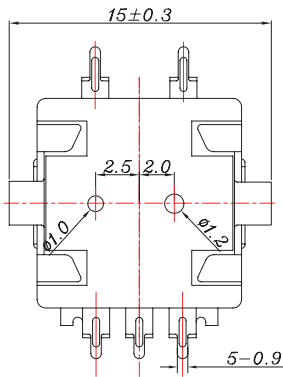


Recommended PCB Layout  
Top View

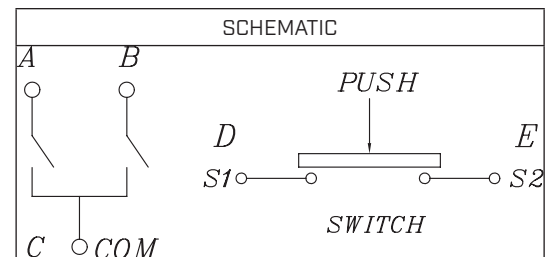
## MECHANICAL DRAWING (GULL WING SMT MODELS)

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	



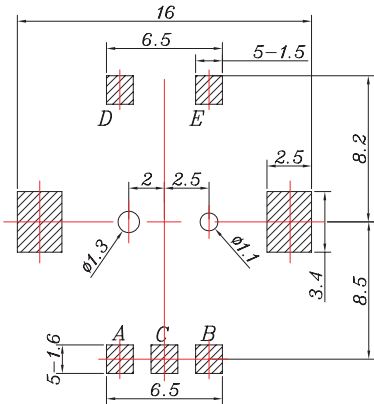
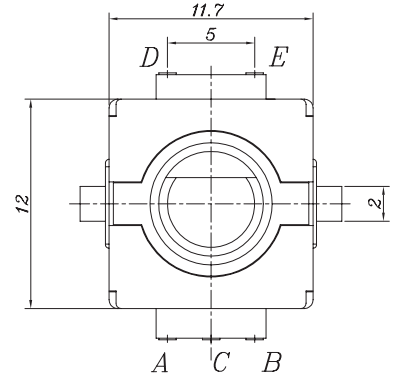
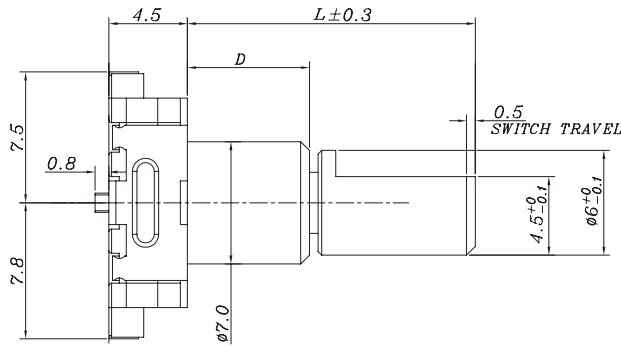
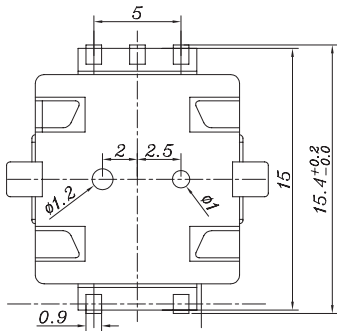
Recommended PCB Layout  
 Top View



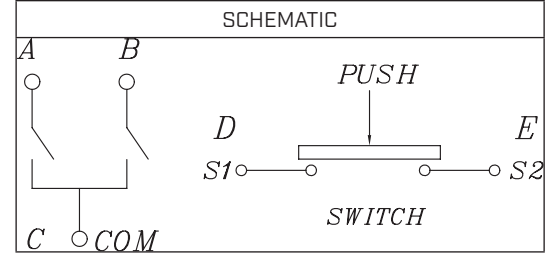
## MECHANICAL DRAWING (U SHAPE SMT MODELS)

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	



Recommended PCB Layout  
Top View

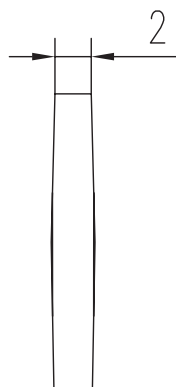
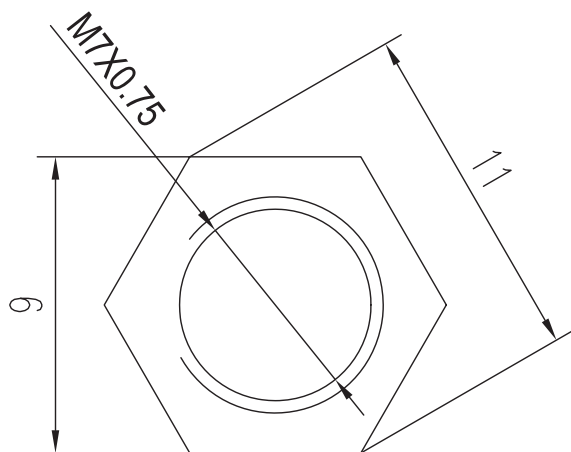




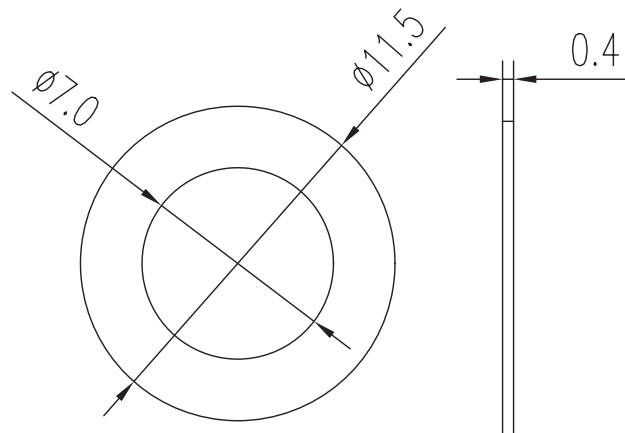
## MOUNTING HARDWARE

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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