

Joystick Mechanical Button Integration Note – Reference Design



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1. DESCRIPTION AND APPLICATION

1.1 DESCRIPTION

Joystick integration into customer products is dependent upon many factors. The described simple implementation case provides superior protection from external loads and protection against incidental water contact. This is similar to protection provided in portable gaming devices present in the market today.

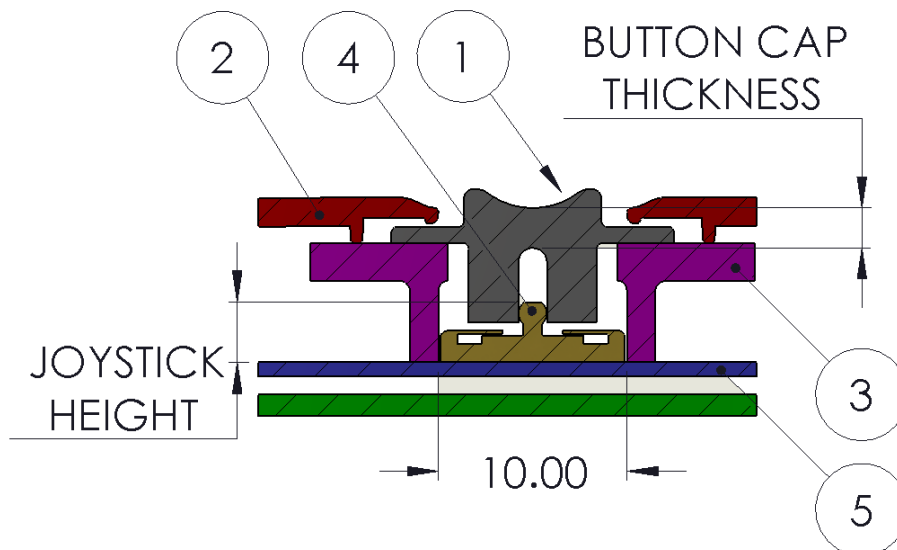
1.2 APPLICATION

Joystick is developed for hand held telecommunication and electronic devices. Document describes a joystick implementation where minimizing height or maintaining a water-tight seal are not a concern. This design is taken from the Knowles Navigator unit. Refer to manufacturer's website (www.knowles.com) for current application notes.

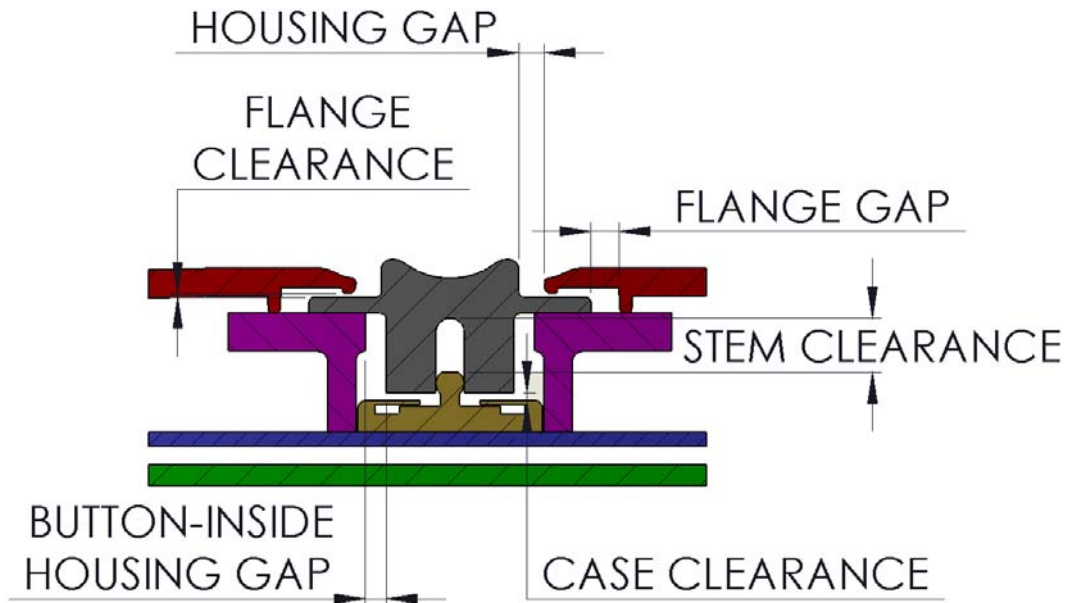
2. STACK-UP

The following parts are required in this design:

- 1 – Button
- 2 - Outside Housing
- 3 - Inside Housing
- 4 - Joystick
- 5 - PCB



3. PART DESIGN CONSIDERATIONS



Button

Part shown is made from polycarbonate with a 7.3 mm diameter and 1 mm concave depth. Part is supported by the inside housing. Housing gap is set to device travel plus assembly tolerance from button to housing opening. Button movement is limited by the gap from the inside housing to button. A dust seal between the button and the inside housing exists since the surfaces are flat and always overlapping. Customers wanting to experiment with different shapes should replacing this part and use multiple units so that side-to-side comparisons can be considered.

Outside Housing

Outside housing needs to protect the button from excessive vertical or side loading while providing finger access to the button. Design shown has a 0.7mm deep recess in the housing. The button cap protrudes 0.4mm past the housing surface. A flange on the inside of the housing sets the flange clearance. This must always be greater than zero to keep the button free sliding. The flange also determines the flange gap. This should be set to the button travel plus an allowance for button to outside housing misalignment.

Inside Housing

Material selected is nylon for its bearing properties and low surface energy. Inside housing locates off of the joystick. It also provides the floor of the cavity that the button flange slides upon. In this design, the inside dimension that straddles the joystick is 10mm. If watertight construction is desired, then a gasket would be needed to seal this housing. Contact Knowles for application support on waterproofing.

Joystick

Joystick implemented with no significant vertical placed on the part. This provides maximum protection against shock. If a design requires the case clearance to be eliminated, then the base of the button must extend to the edges of the joystick cover. Caution! Vertical loading on the joystick ball can break the unit. Make sure that stem clearance is always present. Button designs that interfere with the ball will likely cause the unit to fail.

PCB

This design transmits button forces directly to the PCB. The PCB is clamped between the outside housings. Possible concerns include any negative results of flexing the PCB, including cracking of the PCB or cracking traces within the PCB. As a result, the PCB must be well supported to mitigate these effects.

4. STACK-UP HEIGHT

Stack-up height is strongly influenced by other design decisions. In the case of the reference design, the overall device size was chosen to be a good fit in the hand. This results in a 9.2mm stack-up height from surface of PCB to highest point on button.

Using the same principles and materials, but switching from a concave to convex button shape would result in a stack-up as short as 4.0mm. The button's crown would likely be flush to sub-flush of the outside surface. The limiting stack-up loops are:

- 1> Joystick (3.2mm), stem clearance (0.2mm) and button cap (0.6mm), or
- 2> Joystick case (1.6mm), case clearance (0.2mm), inside housing (0.6mm), button flange (0.7mm), flange clearance (0.2mm) and housing (0.7mm)



KJ-33000

Switching the button to metal and directly supporting the button off of the PCB would allow further shortening to 3.7mm. Contact your local sales or manufacturing representative for application support.

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