Using Philipp™ Springs to Create Touch Keys

Applies to all QTouch™ devices such as QT1xx, QT240, and QT1xxx ICs

1. Introduction

The Philipp™ spring is a simple and cost-effective method of creating a touch key on a dielectric front panel such as glass or plastic, using a conventional PCB behind the panel. The method connects a pad on the PCB to bridge a space of up to a few cm of air gap to the rear of a dielectric panel to form an electrode.

In its simplest form the method consists of:

- A means to attach the spring to the PCB;
- The body of the spring, which is compressible to ensure that variations in the air gap distance can be bridged;
- A large and more easily compressible conical section which collapses first, to allow the formation of a behind-the-panel electrode disc as pressure is applied.

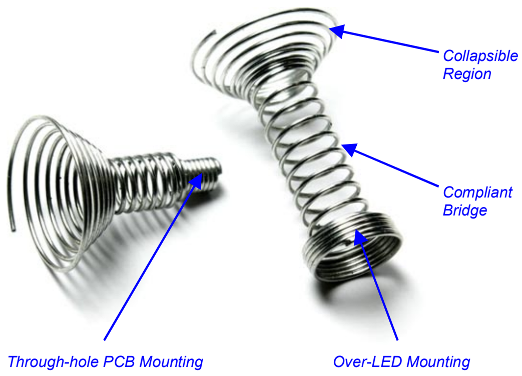
The spring can also allow for a hollow center to permit backlighting with an LED. The fact that the spring can conform to the interior panel surface means that the panel and the PCB do not need to be parallel to each other: the front panel can be sloped or curved.

2. Spring Material

The spring can be made form any conductive material which retains its shape and elasticity over prolonged periods of compression – typically, tin or nickel plated spring steel is used, but conductive plastic could also be used for this function.

The conductivity can be provided by carbon loading of the plastic material. The resistance from end to end should be less than 5K ohms in most applications. The cost of a wire spring is very low, and it is difficult to see at this writing how a plastic spring could compete with a wire spring, but it is possible.

Fig 1 - Basic Spring Shapes



3. Shapes

There are two basic shapes as shown in Fig. 1. Both use a conical section which interfaces to the panel; this section will always collapse first under pressure, since the spring constant of a larger diameter spring is always lower than that of a narrow diameter. Therefore the spring will always collapse ‘top down’, with the center compliant bridge part collapsing last. The conical end collapses into a plane against the panel to form the electrode surface (Figs. 2, 3, 4). The thickness of the electrode plane is defined by the wire gauge.

The center section of the spring can be designed to bridge a range of air gaps up to a few centimeters. The spring rate in this section can be designed to provide reasonable force between the PCB and the front panel. Wire diameter, wire type, and winding density play a direct part in setting the spring rate.

Finally there is the PCB end, which can come in several different variations. One simple variation is to wind the

Fig. 2 - Spring before compression.

Fig. 3 - Spring after compression; the conical section collapses to form an electrode disk.

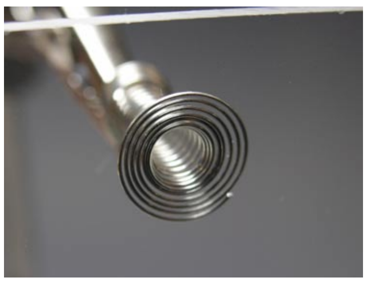


Fig 4 - Compressed spring, viewed from front through a clear panel. The channel in the middle can be used for an LED (as with the S-presso).

spring very tightly in this area to allow insertion into a pad on the PCB for soldering (Fig. 1, left).

The second basic variation is to use a wider winding on the PCB end, to allow the insertion of a standoff for alignment or for an LED which can provide spot illumination inside the key area. The pad on the PCB should be tinned and uncoated so that a connection is made under pressure when the panel is assembled.

4. Licensing

Philipp™ springs are patent-pending worldwide and licensing arrangements are expected from users. The technology will only be available to customers who also use Quantum's sensing chips.

Please consult Quantum for our easy licensing options on this technology.

5. Where to Buy

Quantum can advise on suitable sources of springs on request.

Fig. 5 - Asus S-presso uses Philipp™ springs attached to LED mounts to bridge the air gap to the panel and to simultaneously allow key backlighting.

Fig. 6 - S-presso interior panel moulding has round recesses to the hold collapsed conical spring sections in position.

Fig. 7 - Exterior of S-presso front touch panel.

QUANTUM
RESEARCH GROUP

Corporate Headquarters
1 Mitchell Point
Ensign Way, Hamble SO31 4RF
Great Britain
Tel: +44 (0)23 8056 5600 Fax: +44 (0)23 80565600

www.qprox.com

North America
651 Holiday Drive Bldg. 5 / 300
Pittsburgh, PA 15220 USA
Tel: 412-391-7367 Fax: 412-291-1015