



### FEATURES AND BENEFITS

- Simple to integrate: QTC Pills can be easily interposed between contacts or used to replace contacts in existing switch designs
- Spark prevention: QTC Pills deliver solid state, contactless switching which prevents sparking
- Proportional control: QTC's pressure sensitivity provides direct control of voltage or current with applied pressure e.g. for motor speed control
- Environmental performance: because the switching takes place within the pill itself, switches can be easily constructed to IP65 and beyond
- High current capability: QTC Pills can carry currents of up to 10A in 40V circuits providing direct switching of equipment
- High reliability: QTC Pills have been tested to over 1 million key presses and stand up to considerable overpressure
- Lower product cost: QTC Pills allow for simpler switch design, meaning lower product costs

## Retrofittable Components for Improved Switching Performance

The basic design of low power switches has not changed substantially over many years. However the advent of QTC<sup>1</sup> now allows switch manufacturers to easily add new functionality to existing switch designs or to develop new, simpler, more reliable designs.

### Making Contact

Most mechanical switch designs involve the physical coming together of two contacts to complete the circuit. QTC allows a different approach to be taken. QTC is essentially a non-conductor<sup>2</sup> in its normal state. However, under pressure, QTC starts to conduct and under sufficient pressure its resistance drops to less than 1 ohm.

This property allows switches to be constructed that essentially have no contacts. However, it also allows for improvement to existing designs by interposing QTC Pills between the existing contacts in a switch. An example design is shown overleaf.

### Soft Start

Because QTC's resistance doesn't drop instantly but drops away exponentially as pressure increases, this enables the current through the switch to slowly increase as the switch is closed, giving a soft start.

### No Arcing

The same mechanism, combined with the fact that there is no physical contact gap required, serves to ensure that there is reduced possibility of arcing, which improves safety and contact life.

### Proportional Control

The gradual drop in resistance described earlier allows for a standard switch to offer full proportional control of a load. An existing momentary spring-loaded switch can be 'upgraded' to provide proportional control simply by inserting a QTC Pill between the existing contacts. Direct uses therefore include, for

instance, controlling the speed of a motor or brightness of a lamp.

### Handling Tough Environments

QTC Pills are inherently resilient to tough environmental conditions, easily surpassing IP65 standards. Moreover, switches comprising two connectors and a Pill can be embedded in any suitable elastomeric compound to provide fully sealed switches with no internal moving parts. Indeed QTC itself can be used as the medium in which the connectors are embedded.

### Reliability and Reduced Cost

QTC Pills are reliable, having been tested to over 1 million switch operations with no degradation. Overall switch reliability can be improved because switches can be designed that are simpler, with fewer moving parts. This additional simplicity is also reflected in reduced product cost and simpler manufacturing.

### A Pill for Everything

Peratech offers standard pills that meet most needs but can also develop custom pill variants to meet more specific switching needs. You can be sure that there is a pill to help create new, innovative products to win new markets.

1. Quantum Tunnelling Composite.

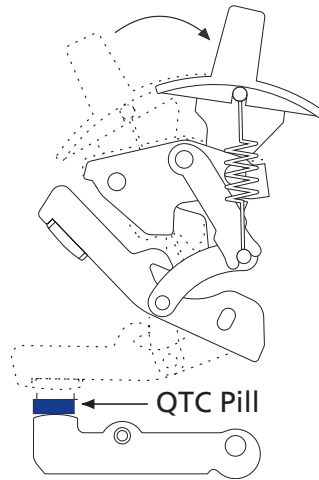
2. Resistance ranges from over 10M ohms to less than 1 ohm

## Example Design

The design on the right shows the addition of a QTC Pill to the bottom contact of a mechanical switch. When the top contact is moved to the closed position, it applies pressure to the QTC Pill and conduction starts.

In this arrangement the resistance of the QTC falls quickly on contact but the current inrush is controlled leading to minimal spikes and little contact bounce.

## SAMPLE DESIGN



## SPECIFICATIONS

### Dimensions

Width	3.6 mm
Length	3.6 mm
Thickness	1.0 mm

### Mechanical

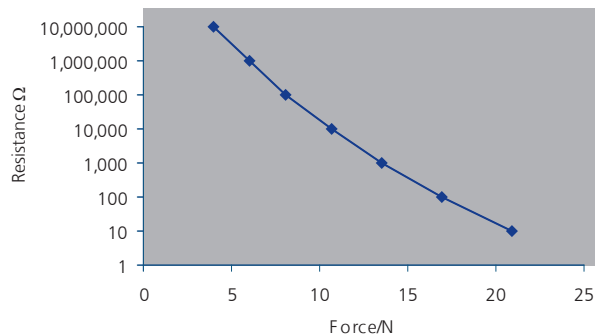
Weight	0.04 g
Density	4.0 gcm <sup>-3</sup>
Hardness	60 Shore A
Force Range	0 N - 100 N
Lifetime	> 1,000,000 compressions
Operating Temp Range	-20°C to 120°C
Humidity Range	0 - 100%

### Electrical

Unstrained resistivity	> 7 x 10 <sup>12</sup> Ohm cm
Typical resistance range	> 10 <sup>12</sup> Ohms to < 1 Ohm
Operating Voltage	0 - 40 V
Max Current	10 A
Unstrained Dielectric Constant (1 KHz)	23.5

## SWITCHING PERFORMANCE

log (Resistance) vs Force



For more information,  
visit our web site at  
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