Overview
Touch sensors are finding their way into many applications, from mobile phones to remote controls and appliance control panels. Mechanical button and switch replacement continues to be implemented in a wide variety of applications. Touch sensors with simple linear or rotational sliders, rotary wheels and touch pads offer significant advantages for more intuitive user interfaces. They are more convenient to use without moving parts and provide increased reliability. Using touch sensors allows the designer greater freedom, while reducing overall system cost. The consumer can now enjoy a more appealing, intuitive interface often with a more contemporary look.

Freescale’s touch sensors are designed to detect touch and even the presence of objects without relying on physical contact. Touch sensors can support multiple electrodes, where several different applications can be controlled by one sensor. By multiplexing the electrodes, the single sensor becomes an extension for detection at multiple points. For example, capacitive touch sensors are user interface controllers that manage multiple configurations of touch pads, sliders, rotary positions and mechanical keys. Freescale offers a broad portfolio of touch sensors as both standard products and software solutions for applications ranging from gaming controllers to occupant detection. Target markets include consumer, appliance, automotive, industrial, medical and networking.

Applications
- Gaming controllers
- Home entertainment
- Home appliances
- Cellular handsets
- Portable media devices

Features
- Multiple electrode configurations
- Voltage operation range of 1.8 V–18 V
- Analog or digital (I²C) interface
- Minimal software integration
- Rotary wheel, linear sliders and touch pad options
- Temperature ranges from -40°C to +110°C
- Various package options

Benefits
- Mechanical button and switch replacement on a wide variety of applications
- Provides more intuitive user interfaces
- Increases reliability without moving parts
- Allows greater design freedom
- Provides a more contemporary look
- Reduces overall system cost

Electric-Field Block Diagram

MPR08x Block Diagram

MCU with Touch Sensing Software Block Diagram
Design Challenges

Below are examples of several electrode layouts. Electrodes in Freescale touch sensors can be widely spaced due to shield driver circuitry, which isolates the electrode signals from external interference as they are transmitted through wires or coax cables to the sensor. This allows designers to use advanced sensing technology to develop large arrays of separate electrodes that can perform identical functions over a wider area. Use the shield driver if there is a need to remotely locate the electrodes. Keep the traces to the electrodes as small and thin as possible.

Please see Freescale’s application note AN1985, section 3.1 on electrode/pad design or contact your Freescale sales representative.

Single Pad
- Simplest to implement
- Requires human body to be at virtual ground (For non-battery powered applications)
- Can be any shape
- Most sensitive approach

Multiplexed Pads
- Can support more pads (e.g. eight electrode connections can support up to 36 pads)
- Uses human body to complete electrical path
- Can realize slider controls