THE NEW VISION OF TOUCH™

QSlide™

QUANTUM
RESEARCH GROUP

E411

User Manual

The New Vision of Touch^{TM}

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# 1 E411 Overview

1.1 Introduction

This kit is designed for the evaluation and development of applications using the QT411-ISSG QSlide™ IC. The kit includes an evaluation assembly (E411 – see *Figure 1*), cables and QSlide software. The E411 has a serial interface allowing connection to a PC for control and data viewing via a USB to SPI adapter card and QSlide PC software

This unique IC allows designers to create speed or volume controls using a slider, menu bars, and other more exotic forms of human interface on the panel of an appliance or personal electronic device. Generally it can be used to replace any form of linear control, through a completely sealed panel.

Refer also to the QT411-ISSG datasheet.

1.2 Contents of Kit

1 x E411 evaluation assembly

1 x E411 evaluation board (complete with components and self-adhesive on one side)

1 x USB-PC cable

1 x USB-SPI adapter card

1 x 14-way flat flexible cable (FFC)

2 x Sample QT411-ISSG ICs

1 x CD-ROM containing QSlide and User Manual

1 x 'Getting Started' Guide

6 x Rubber feet
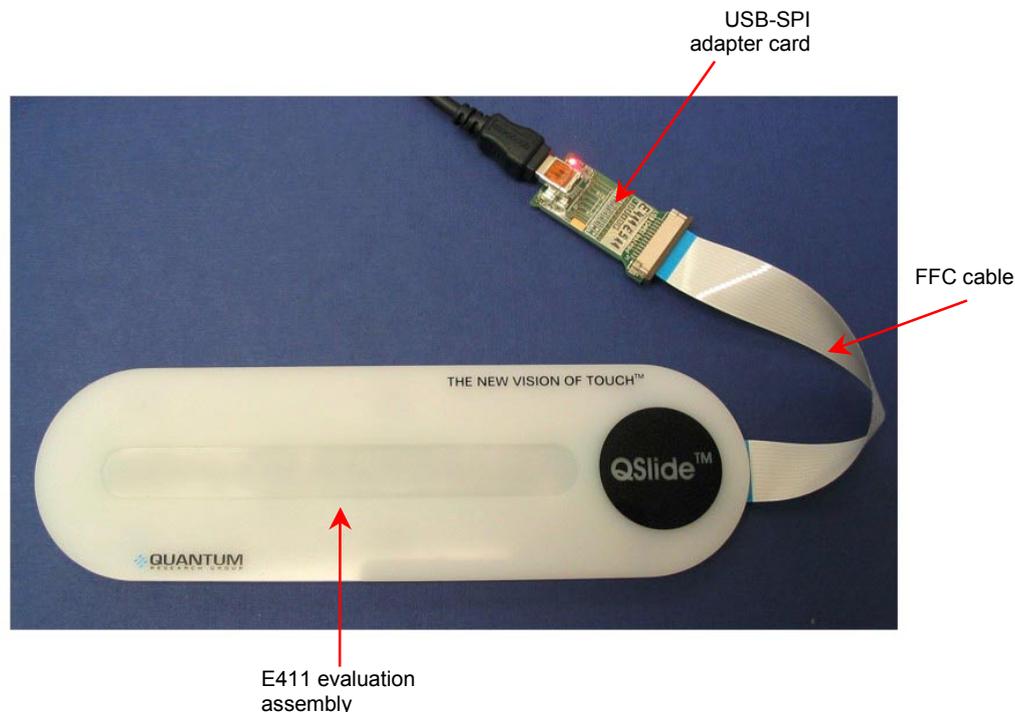
*Figure 1: Evaluation Assembly and USB-SPI Adapter Card*

2   Mounting the Spare E411 Board

A spare E411 board is included to allow testing on different applications. It can be adhered to plastic, glass, or any other dielectric panel. Follow these steps to attach the E411 board and refer to *Figure 2*:

1. Use ESD precautions when working with the E411 board.

2. Remove the paper backing from the E411 board and adhere the board to the rear of the dielectric panel. Bend the PCB slightly, while smoothing it to remove any air bubbles.

    Note: The board does allow some flexing, but care must be taken not to bend it too far as this can crack the SMT components.

3. If planning to use the board on a level surface then attach the rubber feet to elevate the board.
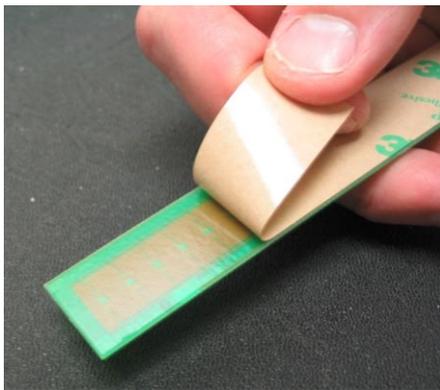
remove the backing paper
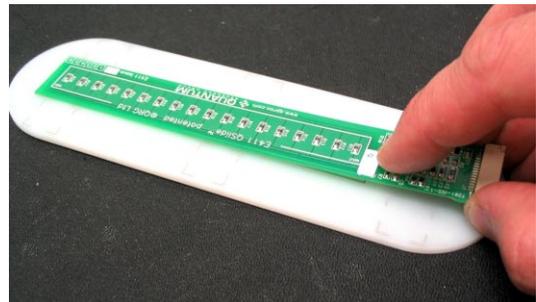
bend the board slightly

attach the rubber feet (if applicable)

Figure 2: Mounting the Spare E411 Board

3   Setting Up the E411

To prepare the E411 for use, proceed as follows:

1. Using the flat flexible cable (FFC) provided, connect the E411 assembly to the USB-SPI adapter card, ensuring correct orientation of the FFC. With the E411 connector lock open (*Figure 3*), carefully insert the end of the cable into the con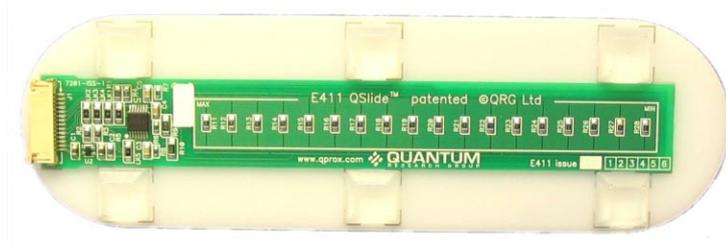nector. Once fully inserted, push the connector lock tabs to close them. Check that they are fully engaged. Repeat for the USB-SPI adapter card.

2. Using the USB cable provided, connect the USB-SPI card to the PC. LED 1 is constantly lit to indicate that there is power to the card.

3. Install the software; either method is acceptable:

    a. Put the supplied CD in the CD drive of the PC. Copy the contents of the CD to your PC. Double-click the QSlide software to open it.

        OR

    b. Go to www.qprox.com, point to the **Support** tab and click **Download Archive**. Click **Software** and then the **QSlide** link. A dialog box appears asking if you want to run or save the file that you are about to download. Click **Run**. This automatically downloads the software.

        If a dialog box appears saying "The publisher could not be verified. Are you sure you want to run this software?" click **Run**.

4. QSlide software is displayed on the PC screen. LED 1 now flickers continuously to indicate that QSlide is communicating with the E411 assembly. Refer to *Section 4.2, Page 6* about using the E411.

connector lock open

E411 assembly – connector lock open

connector lock engaged

E411 assembly – connector lock engaged

connector lock open

USB card – connector lock open

connector lock engaged

USB card – connector lock engaged

LED 1

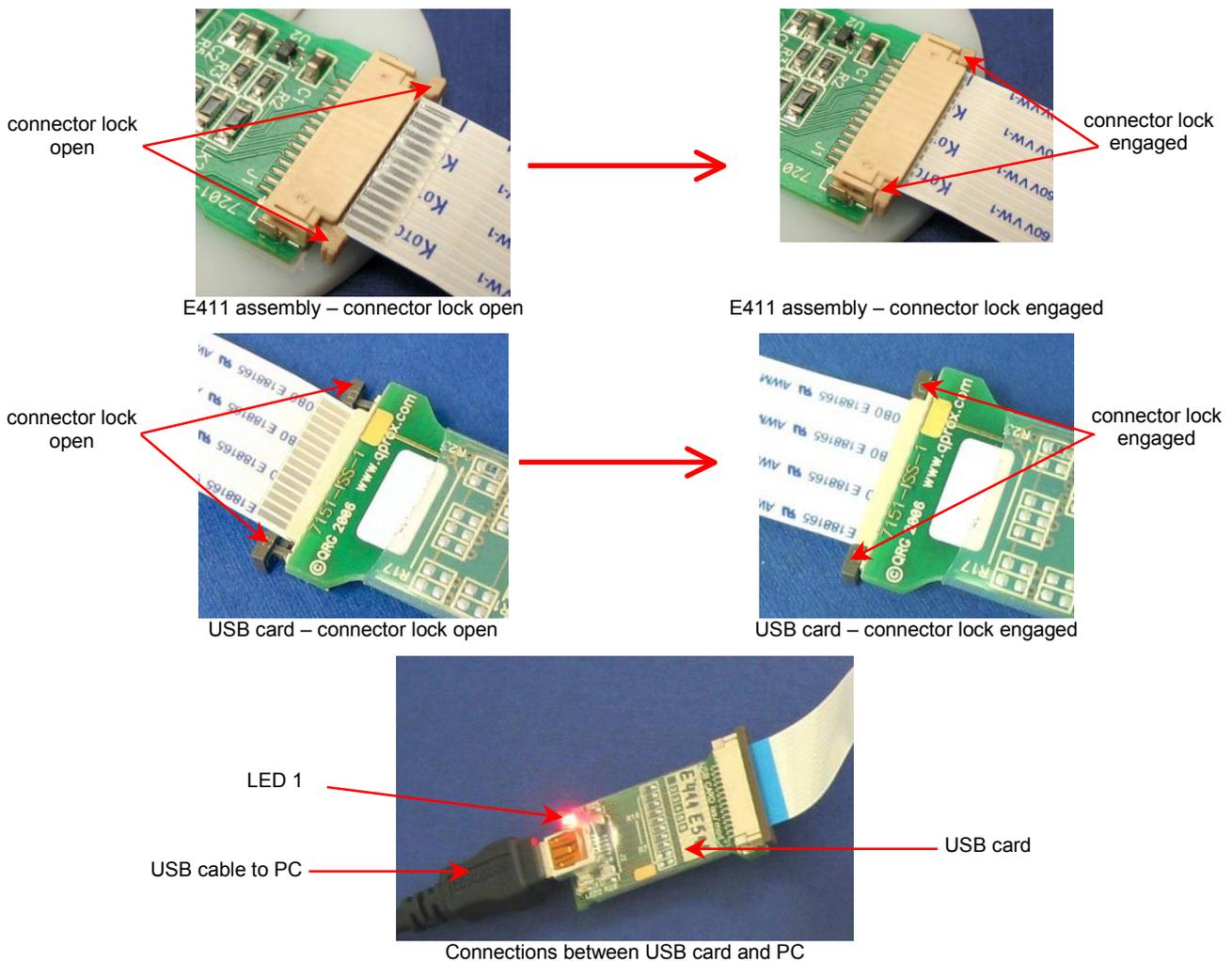USB cable to PC

USB card

Connections between USB card and PC

Figure 3: E411 and USB Connectors

4 QSlide

4.1 Introduction

QSlide software is used for the E411 evaluation assembly. With QSlide you can send commands and monitor signals in real time (see *Sections 4.2 and Section 4.3*).
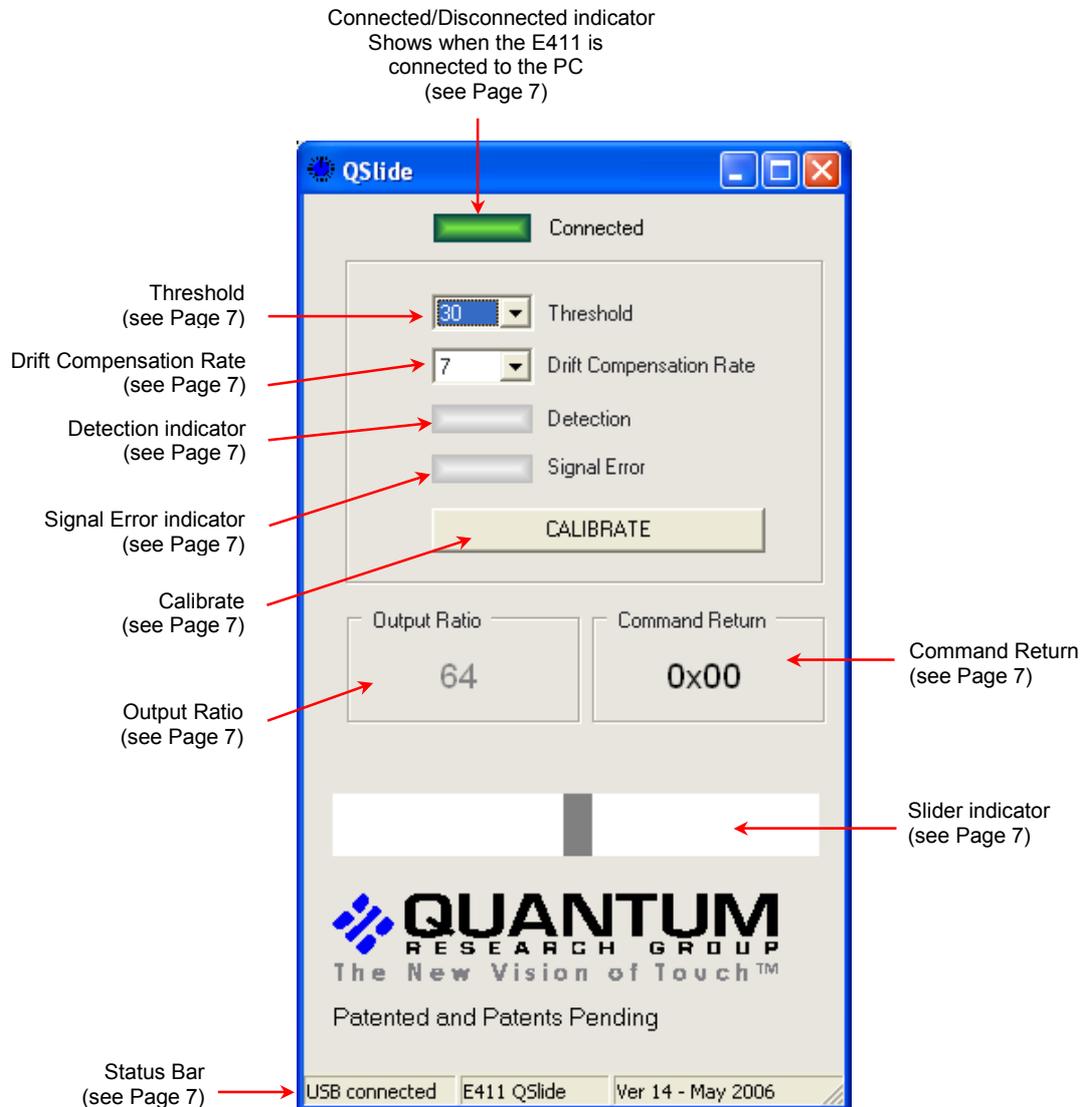
Connected/Disconnected indicator
Shows when the E411 is
connected to the PC
(see Page 7)

Threshold
(see Page 7)

Drift Compensation Rate
(see Page 7)

Detection indicator
(see Page 7)

Signal Error indicator
(see Page 7)

Calibrate
(see Page 7)

Output Ratio
(see Page 7)

Command Return
(see Page 7)

Slider indicator
(see Page 7)

Status Bar
(see Page 7)

Figure 4: QSlide Information Areas

4.2 How to Use the E411 Assembly

1. Place the E411 assembly on a level surface.

2. Keeping clear of the E411, click **Calibrate**. Do this every time the E411 is moved, to calibrate it.

3. Touch the slider area of the E411 assembly with your finger. Either slide your finger across the surface or touch the slider at any point. As you do so the **Detection** indicator lights, **Output Ratio** shows the numerical slider position and **Command Return** gives the hexadecimal equivalent. When you remove your finger, the last position touched will be locked on the display. LED 2 on the USB card lights every time the E411 assembly is touched, for the duration of the touch.

4. If the QSlide software is not detecting, or detection is sporadic, decrease the **Threshold** slightly.

5. Refer to *Section 4.3, Page 7* for details of which parameters you can change.

4.3 QSlide Parameters

Refer to *Figure 4*, *Page 6* to see the parameter areas of the QSlide software.

(refer to the QT411-ISSG datasheet for more information)

Connected/Disconnected indicator is lit all the time that the E411 is connected to the PC but goes out when the E411 is disconnected from the PC.

Threshold sets the amount of signal change which will cause the E411 to register touch detection. The default = **25**. Click the **Threshold** arrow and select a new threshold, if required.

Drift Compensation Rate sets the adaptive drift compensation rate. The numbers represent seconds per reference level. The default = **5**. Click the **Drift Compensation Rate** arrow and select a new rate, if required.

Detection indicator lights when a touch is detected on the E411 assembly and goes out when the touch is removed.

Slider indicator moves as you move your finger along the E411 slider. When the touch is removed the slider indicator shows the last reported touch position. The indicator does not move when only proximity is detected.

Note: if **Threshold** is set to a very low level, the indicator may move if the user's hand is in close proximity.

Signal Error indicates that the signal has the wrong polarity, usually due to E411 assembly movement. Clicking **Calibrate** will resolve the error.

Calibrate - calibration should be performed with the E411 assembly in the position in which it will be used, with hands at a distance, to get a valid reference level. Once positioned, click **Calibrate** to calibrate the E411 assembly.

Note: the E411 assembly may need to be recalibrated if it is moved.

Output Ratio shows the numerical slider position, with touch, from 0 to 127. This changes in real time as the position of touch on the E411 slider changes.

Command Return represents the QT411's response status byte in hexadecimal. This is useful for diagnostic purposes. It changes in real time as the position of touch on the E411 slider changes.

The **Status Bar** indicates if the USB is connected and also which version of QSlide software is present.

5   E411 Assembly Details
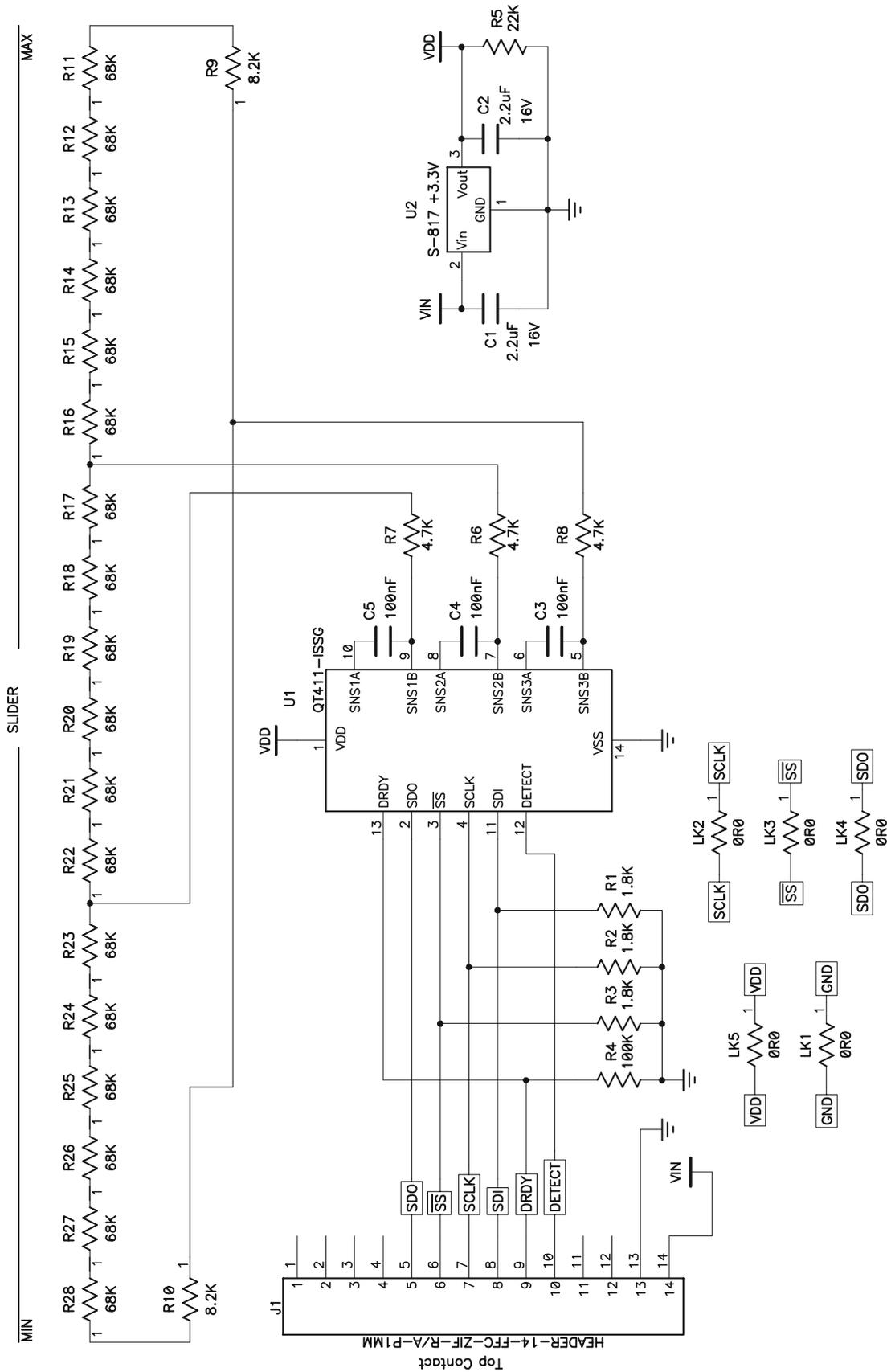
5.1 Circuit Diagram

Figure 5: E411 Circuit Diagram
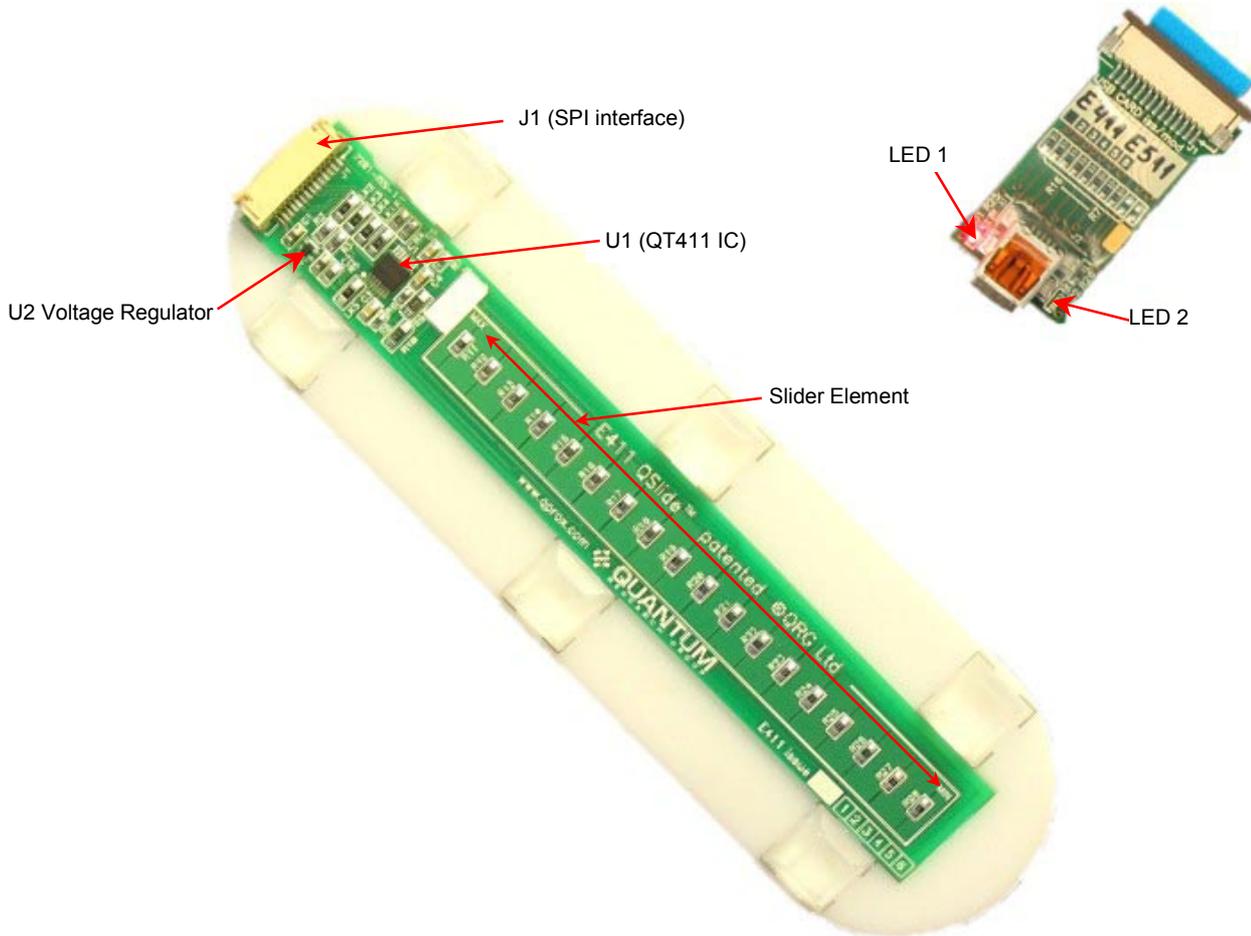
5.2 E411 Assembly Components

Figure 6: E411 and USB-SPI Adapter Card Assembly Details

J1, SPI Interface Connector

This connector provides all signals and power needed to communicate with the USB adapter or an external host, such as a microcontroller.

If you wish to connect the E411 to a microcontroller and operate the QT411 in Sleep mode you will need to provide in your interface circuit a 1nF capacitor between DETECT (J1 pin 10) and GND. Refer to the QT411 datasheet for more information.

Table 1: J1, SPI Interface Connector

Pin	Name	Pin	Name
1	N/C	8	SDI
2	N/C	9	DRDY
3	N/C	10	DETECT
4	N/C	11	N/C
5	SDO	12	N/C
6	/SS	13	VSS
7	SCLK	14	VIN

U1, QT411 IC

Table 2: U1 (QT411 IC)

Pin	Name	Pin	Name
1	VDD	8	SNS2A
2	SDO - serial data (output)	9	SNS1B
3	/SS - slave select (input)	10	SNS1A
4	SCLK - serial clock (input)	11	SDI - serial data (input)
5	SNS3B	12	DETECT - active high (output)
6	SNS3A	13	DRDY - data ready (output)
7	SNS2B	14	VSS

U2, Voltage Regulator

The E411 uses a Low Dropout (LDO) regulator to regulate the 5V coming from the USB adapter card down to 3.3V. Resistor R5 is used to provide a minimum load on the regulator when the QT411 goes to sleep between acquisitions; this is necessary for regulator transient stability.

Since the QT411 works on a lower voltage (3.3V) than the USB card (5.0V), the signals from the USB card to the E411 must be level-shifted down. This is done using resistive dividers R1, R2 and R3, plus a set of resistors placed in series with the signal lines on the USB card.

Slider Element

The slider consists of resistors R11...R28 and the copper pads to which they connect.
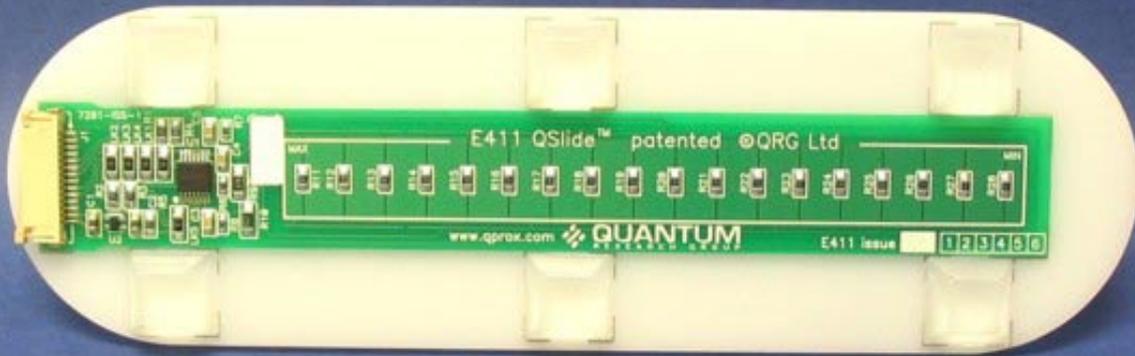
Sampling Capacitors

C3, C4 and C5 are the Cs sampling capacitors. Increasing their value will increase sensitivity and resolution of measurement, but will also tend to make the response time slower.

LED 1 (on USB card) – before the QSlide software is running, LED 1 will be on constantly, to indicate that the USB card is connected to the PC and has power (see *Figure 6*). Once the QSlide software is running, LED 1 flickers continuously to indicate that the software is communicating with the E411 assembly.

LED 2 (on USB card) – stays on when the E411 assembly is touched, for the duration of the touch (see *Figure 6*).

6   Troubleshooting

Problem	Potential Cause and Solution

Software will not communicate with PC	▶ **Bad SPI or USB connection**
	    Check that the USB cables are connected properly.
	    Check/replace cables
	    Ensure that the E411 assembly is getting power and the USB card LED 1 is on

Noisy or erratic signal	▶ **Noisy power supply**
	    Try a different USB port or PC
	▶ **Cables or E411 assembly too close to strong noise source**
	(such as a power line or switching noise source)
	    Increase the distance between the E411 assembly and the noise source
	    Place a grounded metal shield between the noise source and the E411 assembly
	▶ **E411 assembly is not mechanically stable**
	    Prevent E411 assembly from moving around
	▶ **Strong RFI from a transmitter or adjacent digital product**
	    Remove the noise source or shield against it
	▶ **USB cable connected via a USB hub**
	    Connect the USB cable directly to the PC

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