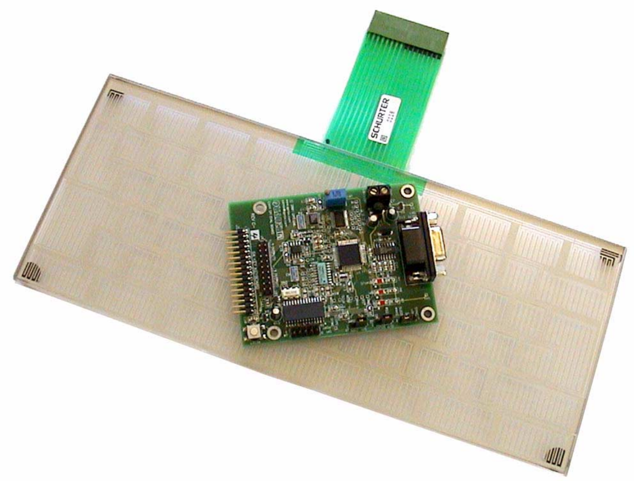
E6325 / E6485 / E6645 USER'S GUIDE

Overview



These boards are designed for evaluation and prototyping of the QT60325, QT60485 and QT60645 'glass touch' matrix ICs. They include all circuitry and materials required to make a fully functioning through-panel matrix touch control. This board has an RS-232 serial interface that allows connection to a PC for function setup and data viewing.

The board makes use of QmBtn software, which is included.

The QT chip in these boards use an SPI interface which can communicate at high speed using a synchronously clocked datastream. This is useful for embedded applications where the device is a slave to a host microcontroller.

The board contains a SPI to UART converter processor which translates between the two interface styles. It is possible to communicate with the QT chip using either the SPI or UART interfaces (UART via RS-232 or via direct UART-to-UART communications).

A 16-pin ribbon cable header connector on the end of the board allows connection to a matrix panel. A 64-key sample matrix and plastic panel are supplied with the E664 and E648, and a 32-key panel and matrix are supplied with the E632.

Dwell time, which affects susceptibility to surface moisture, can be adjusted via an on-board potentiometer.

LED status indicators show detection and error states.

PCB artwork for the board can be obtained free of charge by contacting Quantum.

For more detailed information about this product refer to the QT60645 datasheet.

Materials Provided

1x E6xx Eval board
1x Matrix Flex circuit (64 keys for E664 and E648, 32 keys for E632)
1x Plastic panel
1x RS232 serial cable
10x Rubber feet
1x 9V battery snap
1x QmBtn user guide
1x CD Rom with QmBtn software (or download latest from the website)

You will also need: An 8 to 20V clean DC power supply, and a PC running any recent version of Windows (98, 98SE, NT4, 2000, XP) upwards, with a free serial com port (Com 1 or Com 2).

Preparation

You need to prepare the matrix and board before you can plug it in with the following steps:

1. Adhere the supplied flex circuit to a plastic panel (one of each supplied).

   Tip: Roll the flex circuit onto the panel starting from a short edge, first carefully lining up the flex with the plastic. Roll the flex down onto the panel while using one hand to smooth it on to eliminate air pockets. It helps to have a second set of hands.

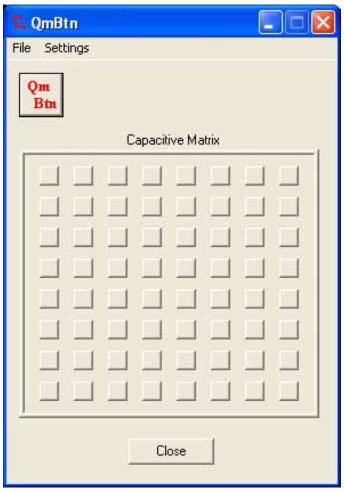
2. Place 6 rubber feet (supplied) on the flex side of the plastic so that when the completed panel is set onto a desk, it will be elevated and mechanically stable (otherwise you will get wildly fluctuating signal levels when you press on the panel).
3. Attach the 9V battery snap or other power leads to the board's power terminal block.
4. Place 4 rubber feet on the PCB so that it will be elevated and mechanically stable.

Setup

After you have prepared the board and matrix, get the unit to run as follows:

1. Plug the matrix tail into the 16-way in-line male connector the board. The matrix panel should be flex side down so that you will touch the plastic panel, not the flex.
2. Connect the board to a PC using the RS232 serial cable (included). Make sure the serial port is not being used by any other application or driver.
3. Run QmBtn on the PC (found on the supplied CD or from our website).
4. Apply +8 to +20VDC to the screw terminal block. This may be a 9V alkaline battery or a bench supply.
5. The board should start communicating with QmBtn.

QmBtn should show an array of 64 buttons like this...



If the board does not communicate with the PC make sure that the O/P Select jumper is set to 'RS232' and cycle power off and on again.

If the setups are correct, touching the key areas on the panel will cause QmBtn buttons to depress. The last key touched will leave an 'X' on the key afterwards.

Further details on QmBtn are found in the QmBtn user guide and in the QT60645 datasheet.

Board Details

Power Connector
This screw terminal strip is used to power the board. The voltage should be between +8 and +20 volts DC. Power should be free from switching noise and short-term fluctuations for best performance.

SPI Port
This connector provides all signals needed to communicate directly to the QT60xx5 through the SPI lines. Two modes of SPI are possible: Master-Slave and Slave-only, depending on the setting of jumper J7.

A substantial section on QT60645 communications protocol is included in the QT60xx5 datasheet that is not repeated in this operation guide.

RS232 DB9 Connector
This connector provides communications between the E664 and the PC. It allows full control over the device including calibration and Setups. It also allows for real-time supervising of signal, reference and calibration information. The RS232 communications takes place via a converter processor that converts from SPI to RS232 in both directions.

Matrix Connector
This male 16-pin header provides the X-Y scan interface to the matrix electrode.

O/Pselect Jumper
This jumper allows you to switch betwen different communication modes:

RS232: The converter chip U6 will translate between RS232 and the QT60xx5's SPI port, enabling you to evaluate the part on a PC using QmBtn or your own software.

SPI: The QT60xx5 will be disabled, and the board provides only a translation function which you can use to debug a QT60xx5 located on your own board. The QT60xx5 does not communicate in this mode.

Open: Converter U6 becomes silent and all SPI lines are 3-state to allow communication between a host and the QT60xx5 through the SPI port connector.

SPI Type Jumper
This jumper lets you select between the two SPI mode, Slave-only or Master-Slave. More information can be found on these protocols in the QT60xx5 datasheet.

Wake/Sync Jumper
This performs two functions: Wake-up from sleep input or noise synchronization input.

For wake from sleep: Install a jumper between pins 2 and 3 to enable wake from sleep via any serial port transmission.

For noise synchronization: Feed a TTL or 5V CMOS synchronization pulse into pin 2 of J6 with respect to GND (pin 1).

Wake from Sleep: The device can be placed into an ultra low-power sleep mode via the setups process using QmBtn. The part will wake when a byte of data is received; the byte is not processed and should ideally be a null byte (0x00).

For more information on these functions, see the QT60xx5 datasheet.

Noise Synchronization: Feed a 5us sync pulse (normal logic high, pulse low) to pin 2 of J6 with respect to GND (pin 1). This will wake the part from sleep.

The QT60xx5's bursts can be synchronized to an external source of repetitive electrical noise, such as 50Hz or 60Hz, or possibly a buffered video display vertical sync signal, using this feature. External noise signals to be heavily suppressed, since the system and the noise become synchronized and no longer beat or alias with respect to each other. The sync occurs only at the burst for key 0 (X0Y0); the device waits for the sync signal for up to 50 ms after the end of a preceding full matrix scan (after key #63), then when a sync pulse is received, the matrix is scanned in its entirety one time. If no sync pulse is received in 50ms, the part wakes on its own and rescans the matrix one time then goes back to sleep. Sync pulses should be spaced no more than 49ms apart to prevent this from happening.

The most common type of noise is power-line related. If there is a lot of random signal noise on the keys (consistently more than +/- 4 counts), consider using this feature to eliminate the noise.

Noise can also be overcome by additional Detection Integrator filtering, or by increasing both Burst Length and the Threshold levels.

Dwell Time Potentiometer
This pot controls the delay from the rising edge of an X drive to the release of the sample gate on a selected Y line. This feature controls the acceptance time of the sampled charge, and can be used to suppress the effects of moisture on the touch panel. Circuits do not normally require a potentiometer but it is provided so that you can experiment with its effect.

The normal span of the pot is from 80ns to 2us. It must be adjusted using an oscilloscope probing on both an X line (test point XS, located below the QT60xx5) and the Y gate signal (YE, located next to U2 below the QT60xx5). Trigger on XS and display both XS and YE, and adjust the time between the rise of XS and the following edge of YE.

Reset / Recal Button
This button causes a reset and thus a recalibration of all keys. Pushing this button will normally act to center the signals and reference levels. The recalibrate button in QmBtn will also accomplish a recalibration of all or some keys depending on the Scope setting located above it. The reset button in QmBtn will cause a hard reset of the QT60xx5.

UART LED
The UART LED indicates activity on the UART lines from the host (i.e. the PC)

SPI LED
The SPI LED indicates activity on the SPI lines to the QT60xx5. When using the RS2323 communications mode, both the SPI and UART LEDs will flash at the same time.

STATUS LED
The Status LED is driven from the QT60xx5 and shows key and error activity. If there is a calibration error or another type of fault, this LED will glow solidly. If the part is working normally, and no keys are detecting, the LED will be off. If one or more keys are touched, the LED will flicker. The brightness of the flicker will be proportional to the number of keys detecting.

Trouble-Shooting

Will not communicate with the PC

- Bad serial connections
  - ➪ Check/replace serial cable
- Bad or conflicting Comm port on PC
  - ➪ Shut down other tasks that may also be using the same comm port, IRQ or I/O Address on the PC.
  - ➪ Use a different PC.
- Low battery or power supply out of usable range
  - ➪ Restore power to within correct range

Board will not calibrate

- Excess capacitive load
  - ➪ Reduce burst length, or,
  - ➪ Reduce Cx loading
- Shorted X or Y matrix line
- Low power supply voltage

Noisy or erratic signal

- Noisy power supply
- Matrix or matrix cable too close to a noise source such as a power line or switching noise source
- Ground loop interference
- Matrix or matrix cable not mechanically stable
- Strong RFI from a transmitter or adjacent digital product
- Insufficient signal filtering
  - ➪ Increase burst length and threshold level
  - ➪ Increase the detection integrator level