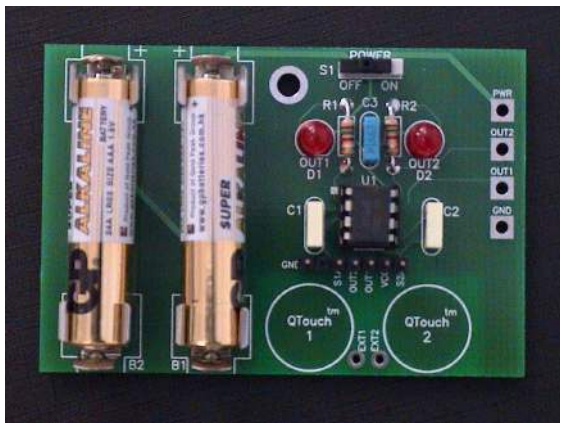
E3B USER'S GUIDE

for use with the QT310 and QT320 family

Overview



The E3B eval board works with Quantum's QT31x and QT32x QTouch ICs. Either type of device can be inserted into the 8-pin DIP socket.

QT31x - single-channel devices use the QTouch-1 sense pad.

QT32x - two-channel devices use both the QTouch-1 and QTouch-2 sense pads.

Both series of devices use the header strip for feature cloning of setups or uploading and downloading of information to and from a host such as a PC. The board and these two series of devices are compatible with QT3View windows software.

For detailed information about the ICs for this board please refer to the QT310 and QT320 datasheets (or datasheets for future devices in these series).

Fast Start

To begin using the board right away:

1. Insert 2 AAA alkaline batteries into the battery holders. Make sure the small power switch is 'off'.
2. Hold the board in one hand on the battery side of the board, keeping your fingers away from the QTouch pad areas, and generally the entire lower right quadrant of the board on either surface to prevent the IC from calibrating to your fingertips.
3. Turn on the power switch.
4. Touch either 'QTouch' pad area (QT320) or the QTouch-1 pad (QT310). The corresponding LED will change state when touched, in a way that depends on how the chip was setup using the cloning adaptor (see factory defaults).

If you are touching on or around the touch pads when you turn the switch on, it will calibrate to ignore your fingers. If this happens, take your fingers away and cycle the power switch again.

Because of Kirchoff's Current Law ("all currents must return to their origin", which also applies to capacitive fields), the sensor is less sensitive if you are not holding it or if the board's ground is not electrically coupled to something else. Thus, placing the board on your desk will result in less sensitivity than if you hold it by the batteries or connect the board's ground to something larger (or to earth ground).

Unstable operation will occur if you simply place the board on a desktop and try it, unless rubber feet are used. The board will rock when touched leading to strong variations in background signals which will affect operation. Make sure the board is firm and cannot rock, even by a slight amount.

An external piece of metal foil or a wire loop can be connected to the board and attached to the rear of a surface of your choice (plastic, glass, wood, or stone will all work fine) to create fully self-calibrating touch buttons (be sure to connect the board's ground to something else for best results - or, power from an external power supply.

External power - please note! When using external power, limit the voltage to 5v DC max, using the marked connection points. Be sure to remove the batteries first, or you may cause an explosion or leakage hazard as the batteries will try to charge up from the external supply!

Board Details

Batteries
Use 2x AAA alkaline batteries for best performance. External power may be used if the batteries are removed. Power consumption depends on the operating mode chosen.

Power Connections
The provided connection points (+PWR, GND) can be used to power the board. The voltage should be between +2.5 and +5 volts DC, regulated. Power should be free from switching noise and short-term fluctuations for best performance. Almost any linear regulator will work. Be sure not to share this power with other circuits that may inject noise or supply fluctuations into the board, as erroneous operation will result (example: relays, digital logic, etc). If external power is used, be sure to remove the batteries.

'Out' Connections
The Out pins (Out1, Out2) are driven directly by the Out pins of the IC. Be careful not to load these pins excessively, keeping source or sink current to under 2mA. The onboard LED is also driven from this line (see schematic diagram). Depending on the cloned Setups of IC, this output may be active high or active low.

It is not advised *to connect an external pullup resistor to a voltage source other than the same source powering the board. An external voltage source can back-feed the board with current and attempt to charge the batteries via the internal clamp diodes in the device, and in general is not good practice.*

'Ext' Sense Connector Pads
These pins (EXT1, EXT2) provide a way to connect the device to external sensing electrodes. The load should have low capacitance (Cx) for best results. High Cx will decrease apparent sensitivity. Shielded cable can be used over limited distances, usually with an increase in C1 and/or C2 to compensate for the increased Cx loading.

C1 / C2 Capacitors
The C1 and C2 capacitors (referred to generically as Cs or 'sample' capacitors) are socketed and can be replaced for experimentation. Generally, higher values of Cs will increase sensitivity. This increase is proportional to Cs. Use decent grade capacitors (avoid cheap ceramic capacitors in favor of plastic film types or at worst, X7R 5% types for best results). A typical minimum total value of Cs is 2nF on this board.

C3 Balance Capacitor
The C3 balance capacitor exists to balance the sensitivity of the two sensing channels to make them equal. Without this capacitor, Sensor 1 will appear more sensitive than Sensor 2. The inequality can be used to advantage in some applications. The other methods of making the channels appear equal include a) reducing C1 relative to C2, and b) changing the trip-point threshold via the cloning process (or both in conjunction). C3 is a 5pF capacitor which can also be implemented by intentionally adding some stray Cx to channel 1.

R3 / R4 Series Resistors
These resistors are used to reduce the currents induced by ESD transients to safe levels. They also roll off the edges of the QT pulses thus reducing RF harmonics to an even lower level. The values are not critical but they should not be so large that they interfere with sensing. Typical values range from 1K to 47K. When connecting the EXT pins to a larger Cx load, it may be necessary to reduce one or both of these resistances. If a lowering of the resistor increases sensitivity, the resistor value is too high.

LEDs
The LEDs are driven directly from the IC. Depending on whether the output(s) have been configured as active-low or active high, the LEDs may be normally off or on respectively.