![Chipsmall logo]

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With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

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Overview

The E160 board is designed for rapid evaluation of the QT160 six channel QTouch™ IC. The board includes six keys with corresponding backlighting LEDs to indicate touch on each key.

The keys are made using circles of copper area around empty holes in a PCB located under the plastic panel. The overlying panel is made of ordinary untreated transparent plastic.

Under the plastic panel are two PCB's - the lower board contains all circuitry and the LEDs, while the upper board contains only the sensing keypads.

There is no direct electrical connection between the two PCB's - the connection from the lower board to the upper keypad PCB is made via capacitive coupling, which is far easier to assemble and disassemble.

Two slide switches are provided to allow you to change the QT160's options.

The board should be powered by an external 7V - 12V DC supply. A 9V alkaline battery can be used but when it runs low the operation will become erratic. There is no low voltage indicator on the E160.

Using the E160

1. Connect a power supply (like a 9V battery) to the board; keep the power switch off.

2. Place the E160 on a flat surface and turn on the power switch.

3. Wait 1 second to allow the QT160 to self-calibrate; after this time you can touch the keys to make them light up.

Note that you cannot make any two adjacent keys turn on. This is because of the AKS™ feature which suppresses adjacent key touches (see QT160 datasheet for details on how and why).

How it Works

The gains of the keys are set high enough by using appropriate values of Cs sample caps so that the sense fields will penetrate up and through the plastic panel into the centers of the circles. The keys do not have to be isolated from each other via ground traces; since the QT160 channels acquire in time-sequence, they do not cross-interfere with each other. Furthermore, each sense electrode is connected to ground while waiting its turn to sense, so that the touch action from one key does not bleed across into adjacent keys.

This configuration lets the sense fields permeate the center of each key but not outwards from each key. Touching near the edge of one key will not cause an adjacent key to detect. The AKS feature also helps to suppress cross coupling between adjacent keys.

A schematic of the E160 can be found at the end of this guide.

Board Details

Battery & Power Switch
The power switch is located next to the power connector. Due to the current drain of the board, it is advised to leave this switch off when not in use.

Always use a 9V alkaline battery.

Although power is regulated onboard via a 78L05 device, raw power should be free from switching noise and short-term fluctuations for best performance.

Circuitry
The sensing circuitry is located entirely in the center area. This includes the voltage regulator, the QT160, the six Cs sampling capacitors, and series-resistors in-line with each key to attenuate RFI.

The LED driver transistors are located under each key.

The LED's are bypassed to circuit ground via bypass capacitors to prevent them from reacting with the capacitance of the keys when the LED's switch on. This is essential to prevent signal 'stiction' from occurring. The junction capacitance across an LED drops as the LED is forward biased; any coupling from the LED to the electrode ring will be influenced by this change. The bypass caps act to swamp this capacitance change with a much larger one, thus stabilizing the detection.

Keys
The six keys on the board are simply wide circular traces surrounding open holes in a PCB layer under the plastic panel. The plastic panel couples the sense field up from the ring and into the centers of the keys.

Key sensitivity is governed by the value of Cs for each key; Cs values can differ on a key-by-key basis. Increasing Cx increases sensitivity in direct proportion.

Recalibration Timeout (Max On-Duration)
The keys have an automatic recalibration timeout function that allows recovery from 'stuck key' conditions that may be caused by foreign objects. The timeout period is set via the option switches. This can be ten seconds, sixty seconds or infinite (no recalibration).

If a key has been in *continuous* detection for the recalibration timeout period, it will automatically recalibrate itself to the signal present at the moment of

recalibration. This can be demonstrated by touching a key for the duration of the timeout setting in 10 second DC mode and waiting for the LED to go out.

The recalibration of one key will not cause the recalibration of any other key.

AKS™ Adjacent Key Suppression

AKS is used to suppress the activation of two neighboring keys at the same time; only the key with the strongest signal level can activate. This solves the problem that occurs when a finger placed on a key also overlaps a neighboring key, potentially triggering it as well as the intended key. AKS also helps to solve the problem of water films on the surface: A contact with a key having a water film bridging to another key can lead to both keys becoming active. With AKS, only the stronger key will survive.

If two neighboring switches have been touched and one activates, the second (which appears dead) will activate when the first one is released.

Drift Compensation

Each key compensates for signal drift due to humidity, temperature effects, dielectric changes, etc. and will do so continuously over the life of the sensor.

The drift compensation mechanism only occurs at times when a valid touch is not being sensed, and operates individually for each key.

Option Switches

The two option switches control the toggle mode and recalibration delay. These switches affect all 6 sensing channels equally, although each channel operates independently of the others. So if the switches are set for a 60s timeout, all keys must obey the 60s timeout rule; each key will recalibrate independently of the other keys.

The switch settings are summarized below.

Table 1 - Option Switch Settings

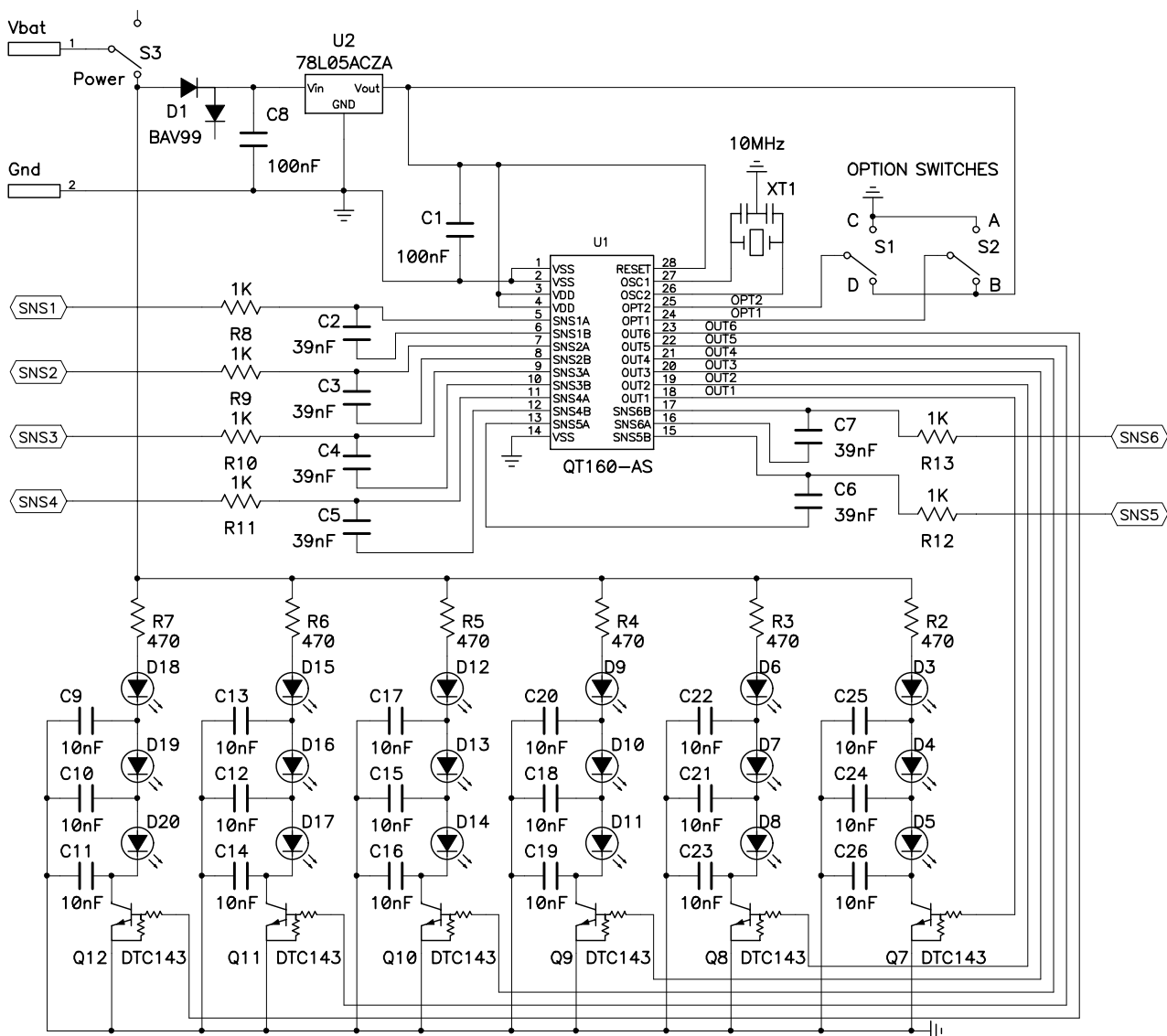|	A	B	C	D	Max On-Duration
Toggle		■		■	10s
DC Out	■			■	10s
DC Out		■	■		60s
DC Out	■		■		infinite

Figure 1 - E160 Schematic

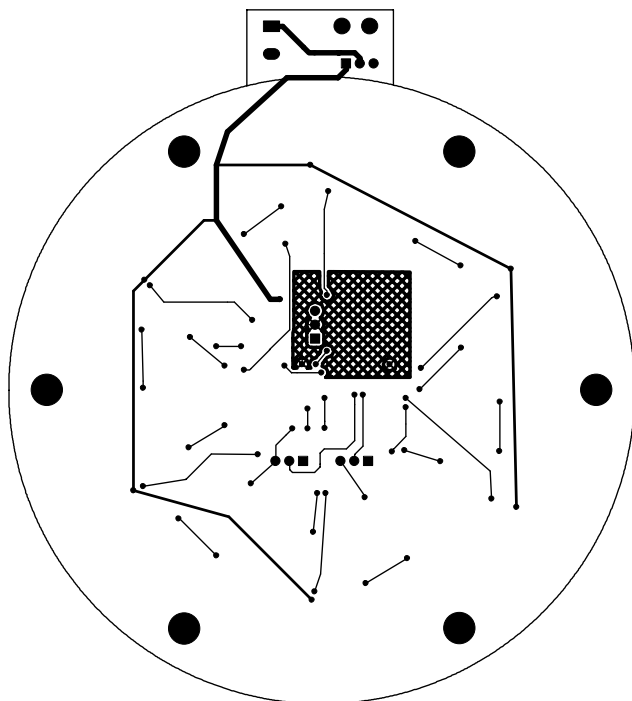## Figure 2 - PCB Silk Layer
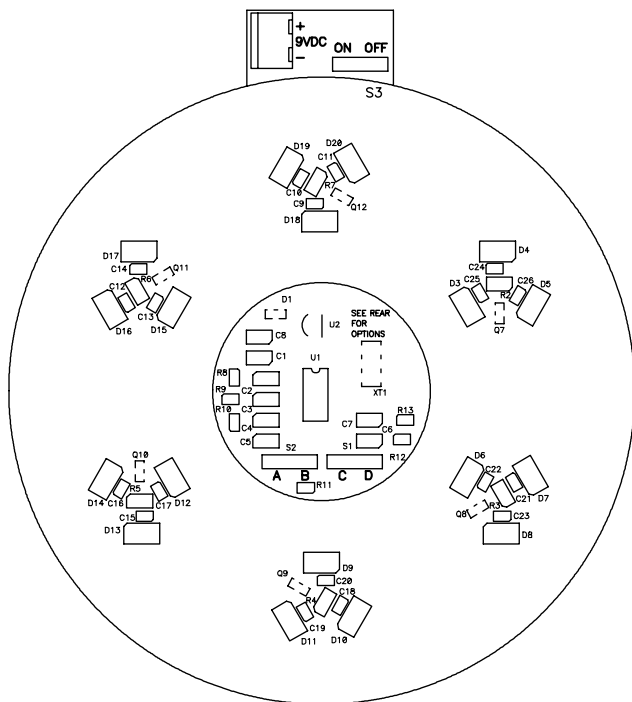
Figure 3 - PCB Component Layer
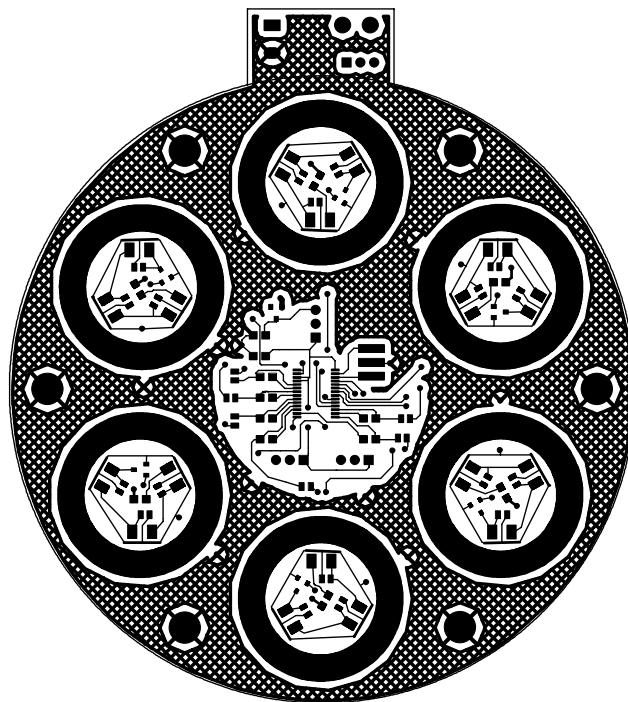
Figure 4 - PCB Solder Layer