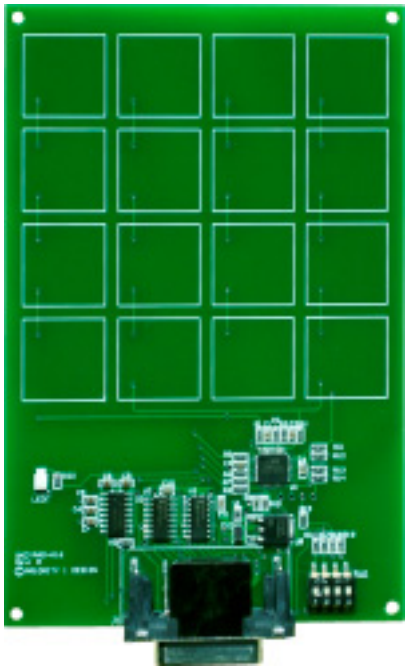
# QKEYPAD-K16
# 16 Key Proximity Touch Sensing Keypad

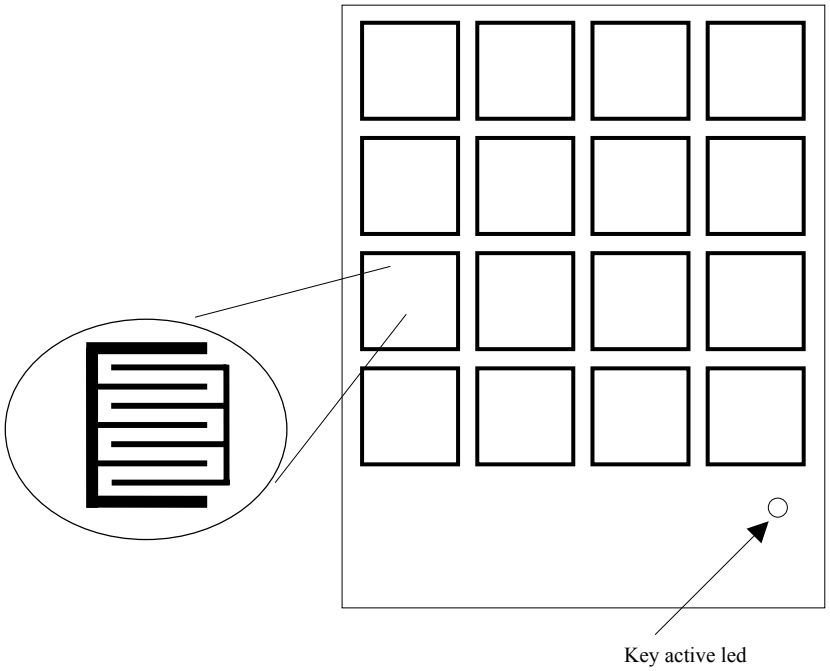
The QKEYPAD-K16 is a 16 key proximity touch sensing keypad intended to detect human touch through any dielectric panel up to a thickness of 10 mm. This product is designed specifically for OEM users needing to provide data entry into a sealed or protected environment.



- **16 touch keys through any dielectric up to 10 mm thick.**
- **4 x 4 Analog crosspoint switch output to mimic traditional electromechanical keypads.**
- **RS232 serial output and TTL Uart port. 9600 baud.**
- **User selectable sensitivity ranges via DIP switches.**
- **Key active LED indicator.**
- **Autocalibrating with noise and adjacent key suppression.**
- **100% surface mount components to ensure easy mounting against any flat panel.**
- **Access to power and signals lines via industry standard DB15 connector.**

## Description –

When placed behind a panel made from any dielectric material such as glass, wood, or plastic the contacting surface becomes a touch sensitive keypad with 16 discrete keys. During operation minute amounts of charge is coupled by a set of 16 electrodes through the overlying panel. Any contact with the panel over the area of the electrodes causes charge to leak away from the electrodes and a corresponding drop in voltage is detected as a key activation.

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## ABSOLUTE MAXIMUM RATINGS (1)

| | |
|---|---|
| V+ to GND | -0.3V to 15V |
| Digital Inputs to GND | –0.3V to 5V |
| Operating Temperature Range | 0° C to 85°C |
| Storage Temperature Range | 0° C to 85°C |

NOTE: (1) Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. Exposure to absolute maximum conditions for extended periods may affect unit reliability.

### Connector Pin Description

Interface is via industry standard 15 way D-Connector, female. This connector carries both the unit input power and output signal lines. Table 1. describes the pin connections to the unit.

| Pin | Label | Direction | Description |
|---|---|---|---|
| 1 | X0 | In/Out | Keypad row scan line 0 |
| 2 | X1 | In/Out | Keypad row scan line 1 |
| 3 | X2 | In/Out | Keypad row scan line 2 |
| 4 | X3 | In/Out | Keypad row scan line 3 |
| 5 | Y0 | In/Out | Keypad Column scan line 0 |
| 6 | Y1 | In/Out | Keypad Column scan line 1 |
| 7 | Y2 | In/Out | Keypad Column scan line 2 |
| 8 | Y3 | In/Out | Keypad Column scan line 3 |
| 9 | V+ | In | Positive DC supply line. (5.5-15V) |
| 10 | GND | - | Ground |
| 11 | GND | - | Ground |
| 12 | GND | - | Ground |
| 13 | RX | In | RS232 Serial Input. |
| 14 | TX(RS232) | Out | RS232 Serial Output. |
| 15 | TX | Out | Uart Output line (1) TTL level only |

**Table 1. Unit interface: DB15 pin description.**
NOTE: (1) This uart output voltage level is standard TTL. Care must be taken to ensure that voltages outside the range of –0.3V to 5V are not applied to this line

### Interface Selection

The interface is available in two forms. A 4x4 analog crosspoint matrix, and a serial output. The serial output can be in RS232 or TTL levels depending on which pin is connected. Figure 1. Illustrates the equivalent circuit output when the analog crosspoint matrix is used.
The row to column key definitions are as shown in Figure 2. The row to column connections for inactive keys are effectively open circuit. When a key is selected the row to column connection remains active until the key is released.
The uart output will transmit codes as shown in Figure 2 whenever the corresponding key is activated. Codes are sent once at the point of contact detection. No key release codes are sent.
The uart is configured for 9600 baud, 8 data bits, no parity, 1 stop bit.

Switch positions 1 to 4 control the sensitivity of the unit. Selecting a larger sensitivity will allow the unit to sense contact through a greater thickness of panel; however will also increase the incidence of false triggers due to external factors such as noise. The user should first start with the least sensitive position and gradually increase the sensitivity setting until a reliable performance is achieved. See Table 2 .User Selector switch for a description of these settings.

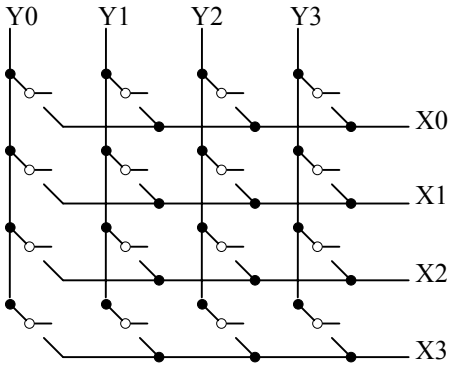



**Figure 1. Equivalent circuit of 4x4 analog crosspoint output.**

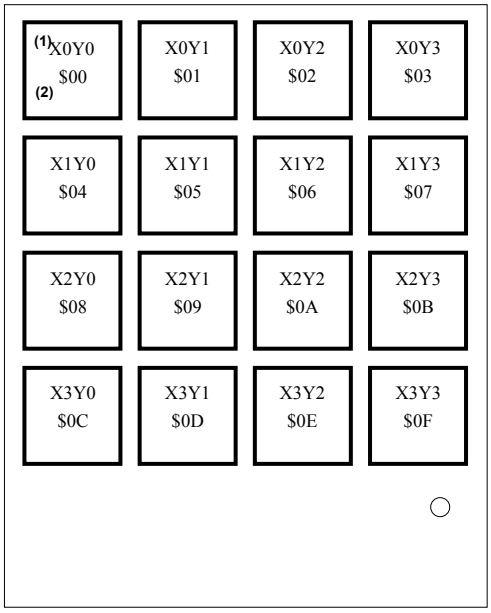



**Figure 2. Key descriptions**
NOTE: (1) Upper designations indicate row-column connections while the analog crosspoint output is being used.
NOTE: (2) Lower designations indicate hex codes output while uart output is enabled.
The Qkeypad unit is shown with component less side facing.

| SW1-4 | SW1-3 | SW1-2 | SW1-1 | Sensitivity | Example |
|---|---|---|---|---|---|
| Off | Off | Off | Off | Highest | 10mm glass |
| Off | Off | Off | On | .. | .. |
| Off | Off | On | Off | .. | .. |
| Off | Off | On | On | .. | .. |
| Off | On | Off | Off | .. | .. |
| Off | On | Off | On | .. | .. |
| Off | On | On | Off | .. | .. |
| Off | On | On | On | default | 3mm glass |
| On | Off | Off | Off | .. | .. |
| On | Off | Off | On | .. | .. |
| On | Off | On | Off | .. | .. |
| On | Off | On | On | .. | .. |
| On | On | Off | Off | .. | .. |
| On | On | Off | On | .. | .. |
| On | On | On | Off | .. | .. |
| On | On | On | On | lowest | Thin plastic sheet |

**Table 2.** User Selector switch.

**Principle of Operation:**
The Qkeypad unit has on its surface 16 proximity key sensing areas. The sensing areas consist of simple tracks of conducting material that when pulsed with an electric charge creates an electrostatic field surrounding each proximity key area. When a non-conductive panel is placed over the Qkeypad the electrostatic field permeates through the panel above the sensing area. When contact is made by the human finger some of the charge flowing through the overlying panel is "leaked" away as shown in Figure 3.

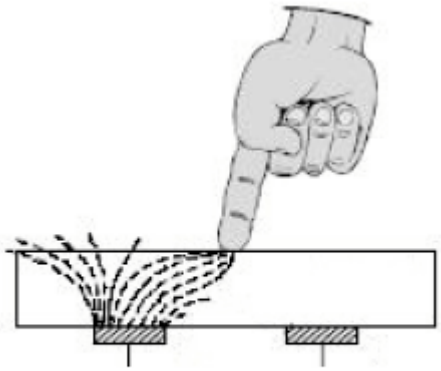
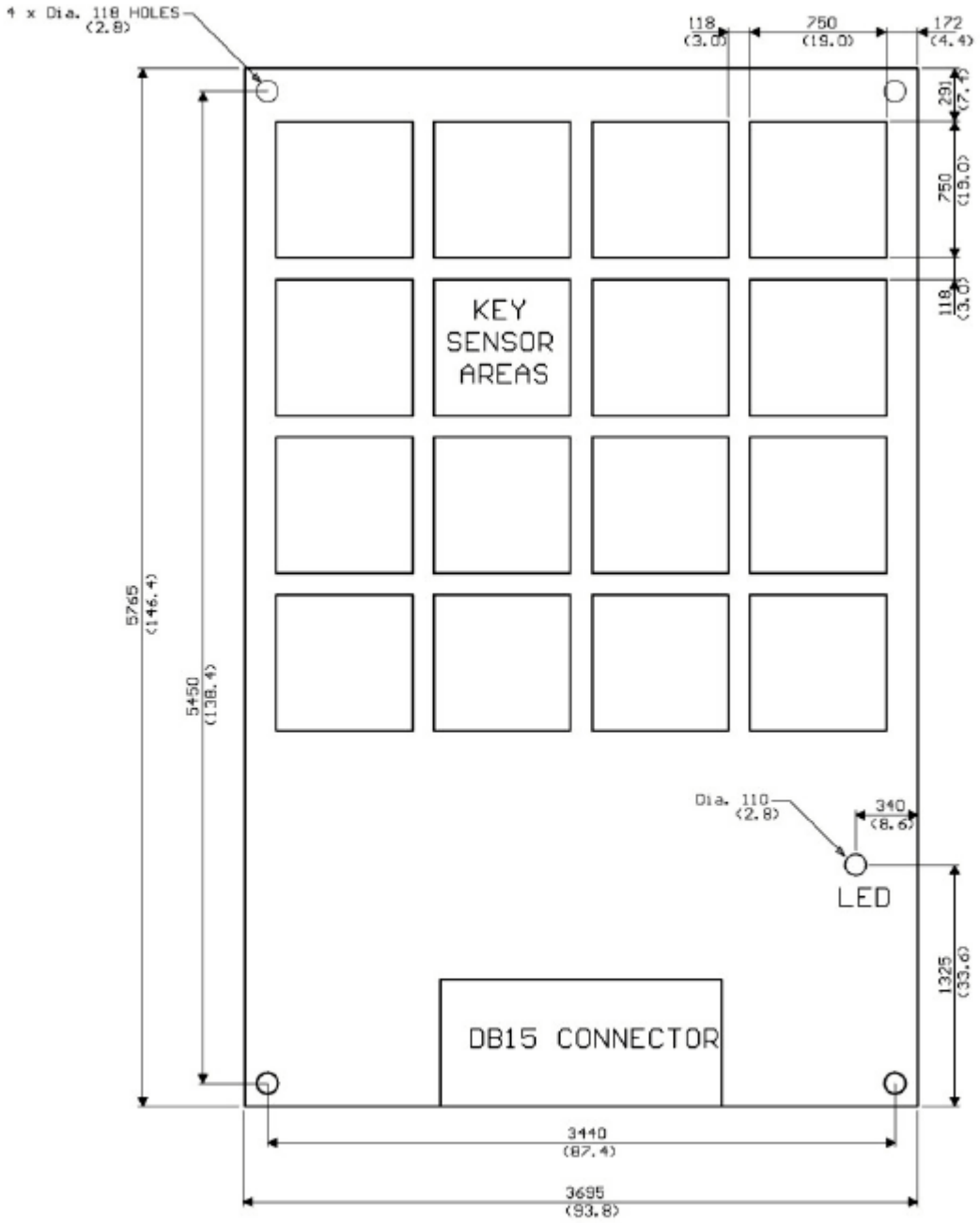


Figure 3

This leaking away of charge is detected by the associated circuitry as a change in voltage levels. When the change in voltage beyond a certain reference level reaches a defined trigger point the Qkeypad detects this as a key press. In practice any object near the sensing electrodes will cause some leaking of charge to occur. Also water droplets and other surface contaminates will cause coupling of the electrostatic field between the individual proximity keys. To avoid a false trigger an individual reference voltage is generated for each proximity key area. Additionally the reference voltage is adjusted periodically to allow for any fluctuating influences such as water moisture that would change with time at a rate much slower than would be the case for a genuine key press.

**Dimensions:**




All Dimensions in mils and (mm)
Copper side view.

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