



# Touch Board®

## Technical Data Sheet

### PRODUCT DESCRIPTION

The **Touch Board** is a microcontroller board with dedicated capacitive touch and MP3 decoder ICs. It has a headphone socket and micro SD card holder (for file storage), as well as having 12 capacitive touch electrodes. It is based around the ATmega32U4 and runs at 16MHz from 5V. It has a micro USB connector, a JST connector for an external lithium polymer (LiPo) cell, a power switch and a reset button.

It is similar to the Arduino Leonardo board and can be programmed using the Arduino IDE. The ATmega32U4 can appear to a connected computer as a mouse or a keyboard, (HID) serial port (CDC) or USB MIDI device.

### SUMMARY

|                                   |  |
|-----------------------------------|--|
| • Microcontroller                 | Atmel ATmega32U4   |
| • Touch IC                        | Resurgent Semiconductor MPR121   |
| • MP3 decoder IC                  | VLSI Solution VS1053b  |
| • Audio output                    | 15mW into 32Ω via 3.5mm stereo socket  |
| • Removable storage               | up to 32GB via micro SD card   |
| • Input voltage                   | 3.0V DC – 5.5V DC  |
| • Operating voltage               | 5V DC  |
| • Max. output current (5V rail)   | 400mA (100mA at startup)   |
| • Max. output current (3.3V rail) | 300mA  |
| • LiPo cell connector             | 2-way JST PH series - pin 1 +ve, pin 2 -ve   |
| • LiPo charge current             | 200mA  |
| • Capacitive touch electrodes     | 12 (of which 8 can be configured as digital I/O)   |
| • Digital I/O Pins                | 20 (of which 3 are used for the MPR121 and 5 are used for the VS1053b — the latter can be unlinked via solder blobs) |
| • PWM channels                    | 7 (shared with digital I/O pins)   |
| • Analogue input channels         | 12 (shared with digital I/O pins)  |
| • Flash memory                    | 32 kB (ATmega32U4) of which 4kB used by bootloader   |
| • SRAM                            | 2.5kB (ATmega32U4)   |
| • EEPROM                          | 1kB (ATmega32U4)   |
| • Clock speed                     | 16MHz (ATmega32U4), 12.288MHz (VS1053b)  |
| • DC current per I/O pin          | 40mA sink and source (ATmega32U4), 12mA source / 1.2mA sink (MPR121)   |
| • Analogue input resistance       | 100MΩ typical (ATmega32U4)   |

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## POWER

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The **Touch Board** can be powered via the micro USB connection or from a 3.7V lithium polymer (LiPo) cell connected to the 2-way JST PH series connector. The power switch will switch the board on or off when powered by either power source. If power is supplied over USB whilst the LiPo cell is connected, then the charge LED will illuminate and the LiPo will charge from USB power, regardless of power switch position.

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## INPUT AND OUTPUT

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The **Touch Board** has the same I/O layout as the Arduino Leonardo, with two important differences. Firstly, some of the Leonardo pins are used to drive the MPR121, VS1053b and micro SD card. If you want to use these pins in your project, you can disconnect them from the components they are connected to by removing the appropriate solder blobs on the board. However, if you do this, you will not be able to use the functionality provided by the components the pins were connected to, unless you re-make the blobs. Please reference the **Touch Board Pin Map** and **Touch Board and Shields Guide** documents for more information.

Secondly, there are 12 capacitive touch electrodes, brought out to contacts along the top edge, which afford connecting through painting, alligator clips or M3 hardware, and a row of 0.1" / 2.54mm pitch pads on the right side, for you to solder a header to if you wish. 8 of these can be used as digital I/O. Each special pin function is explained below.

|  |   |
|--|---|
| • <b>Touch electrodes</b><br>E0-E11                | These connect to the MPR121 and provide capacitive touch / proximity sensing. E4-E11 can optionally be used as 3.3V digital inputs or outputs.  |
| • <b>Serial</b><br>Pins 0 (RX) and 1 (TX)          | Used to receive (RX) and transmit (TX) TTL serial data using the ATmega32U4 UART. This is separate to the USB serial (CDC) functionality, so the board effectively has two serial ports — one virtual over USB and one physical.  |
| • <b>TWI (I2C)</b><br>Pins 2 (SDA) and 3 (SCL)     | TWI (I2C) data and clock pins — these are used to communicate with the MPR121.  |
| • <b>IRQ</b><br>Pin 4                              | This pin is used to detect interrupt events from the MPR121 — it should only be configured as an input.   |
| • <b>SD-CS</b><br>Pin 5                            | This pin is used to select the micro SD card on the SPI bus. You can disconnect it from the micro SD card pin for your own use by removing the solder blob adjacent to the output pad.  |
| • <b>D-CS</b><br>Pin 6                             | This pin is used to select the data input on the VS1053b. You can disconnect it from the VS1053b pin for your own use by removing the solder blob adjacent to the output pad.   |
| • <b>DREQ</b><br>Pin 7                             | This pin is used to detect data request events from the VS1053b. You can disconnect it from the VS1053b pin for your own use by removing the solder blob adjacent to the output pad.  |
| • <b>MP3-RST</b><br>Pin 8                          | This pin is used to reset the VS1053b. You can disconnect it from the VS1053b pin for your own use by removing the solder blob adjacent to the output pad.  |
| • <b>MP3-CS</b><br>Pin 9                           | This pin is used to select the instruction input on the VS1053b. You can disconnect it from the VS1053b pin for your own use by removing the solder blob adjacent to the output pad.  |
| • <b>MIDI IN</b><br>Pin 10                         | This pin can be used to pass MIDI data to the VS1053b and have it behave as a MIDI synthesiser as opposed to an MP3 player. By default, this is not connected, but you can complete the connection to pin 10 by placing a solder blob across the pair of rectangular pads provided adjacent to the output pad. You will also need to place a solder blob on the "MIDI on" pad pair above the ICSP header. |
| • <b>HEADPHONE OUTPUT</b><br>AGND, R, L            | These pins provide the headphone output from the VS1053b on 0.1" / 2.54mm pitch pads that you can solder a pin header to if you wish, as an alternative to the 3.5mm socket.  |
| • <b>EXTERNAL INTERRUPTS</b><br>Pins 0, 1, 2, 3, 7 | These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.  |

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