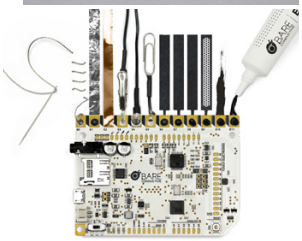
TOUCH BOARD®

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 (1.5.6 or later). 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	Freescale 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

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.

INPUT AND OUTPUT

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.

• **Touch electrodes** 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.
• **Serial** 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.
• **TWI (I2C)** Pins 2 (SDA) and 3 (SCL)	TWI (I2C) data and clock pins — these are used to communicate with the MPR121.
• **IRQ** Pin 4	This pin is used to detect interrupt events from the MPR121 — it should only be configured as an input.
• **SD-CS** 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.
• **D-CS** 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.
• **DREQ** 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.
• **MP3-RST** 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.
• **MP3-CS** Pin 9	This pin is use 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.
• **MIDI IN** 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.
• **HEADPHONE OUTPUT** 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.
• **EXTERNAL INTERRUPTS** 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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• **PWM** Pins 3, 5, 6, 9, 10, 11, and 13	Provide 8-bit PWM output.
• **SPI** On the ICSP header	Note that the SPI pins are not connected to any of the digital I/O pins as they are on the Arduino Uno. This means that if you have a shield that uses SPI, but does NOT have a 6-pin ICSP connector that connects to the Touch Board's 6-pin ICSP header, the shield will not work.
• **LED** Pin 13	There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it is off.
• **ANALOGUE INPUTS** A0-A5, A6-A11	Provide 10-bit ADC input, returning integers from 0-1023. All analog pins have (in addition) the same functionality as general purpose input / output (GP10) pins. A6 – A11 are on digital pins 4, 6, 8, 9, 10, and 12 respectively.
• **AREF**	Optional reference voltage for the analog inputs.
• **RESET**	Bring this line LOW to reset the ATmega32U4.

OVERCURRENT PROTECTION

The **Touch Board** has overcurrent protection for both the USB and battery power inputs. This protects them from trying to source too much current, which may damage them or the board. This protection is provided by two positive temperature coefficient (PTC) resettable fuses. The USB fuse has a holding current of 500mA and a trip current of 1000mA. The LiPo fuse has a holding current of 1100mA and a trip current of 2200mA. If these fuses trip, you will notice that the board loses power. You should switch off the board, and inspect it for faults, correcting any you find. After 20 seconds the fuses should reset and you can plug the board back in again.

PHYSICAL CHARACTERISTICS / PROGRAMMING

The **Touch Board** can be programmed using the Arduino IDE (1.5.6 or later). More details on how to do this can be found at **www.bareconductive.com/touch-board/**

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