Robotic Hand Development Board

Features

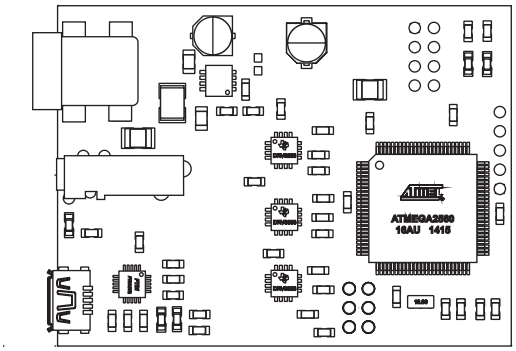
- 6 Bidirectional Motor control
- USB Programming (with Bootloader)
- Arduino IDE Compatible
- Compatible with Firgelli PQ12 -P Actuators
- Atmel Atmega2560 Microcontroller
- Flash Memory: 256KB
- EEPROM: 4KB
- 16MHz Clock

Applications

- Robotics
- Research
- Education
- Prosthetics
- Hobbyist Electronics
- Robot - Human Interaction

Compliance

This deice is sold as a development platform and therefore has not been tested or approved by any agency or approval body for Electrical Safety, and Electromagnetic Compatibility.



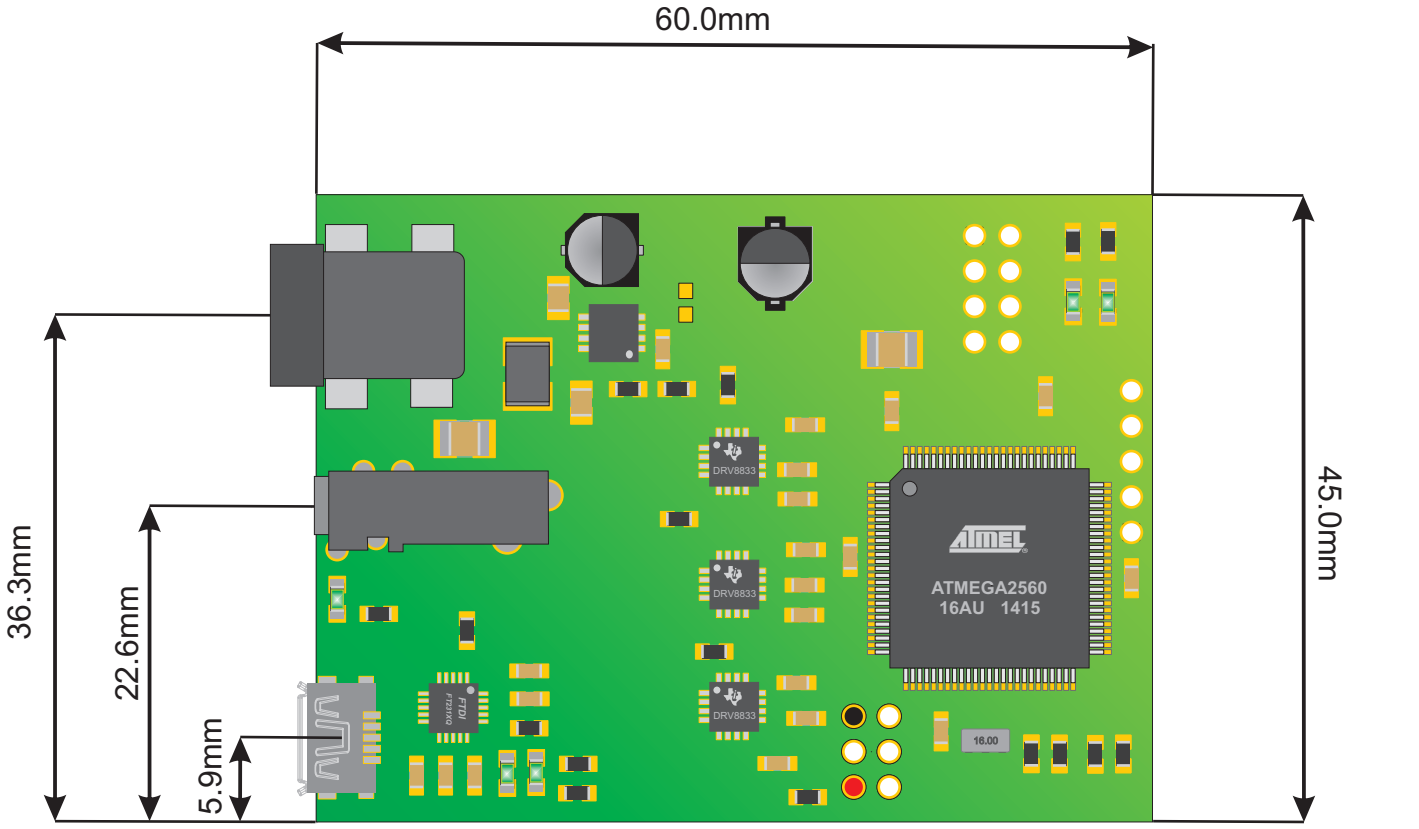
Description

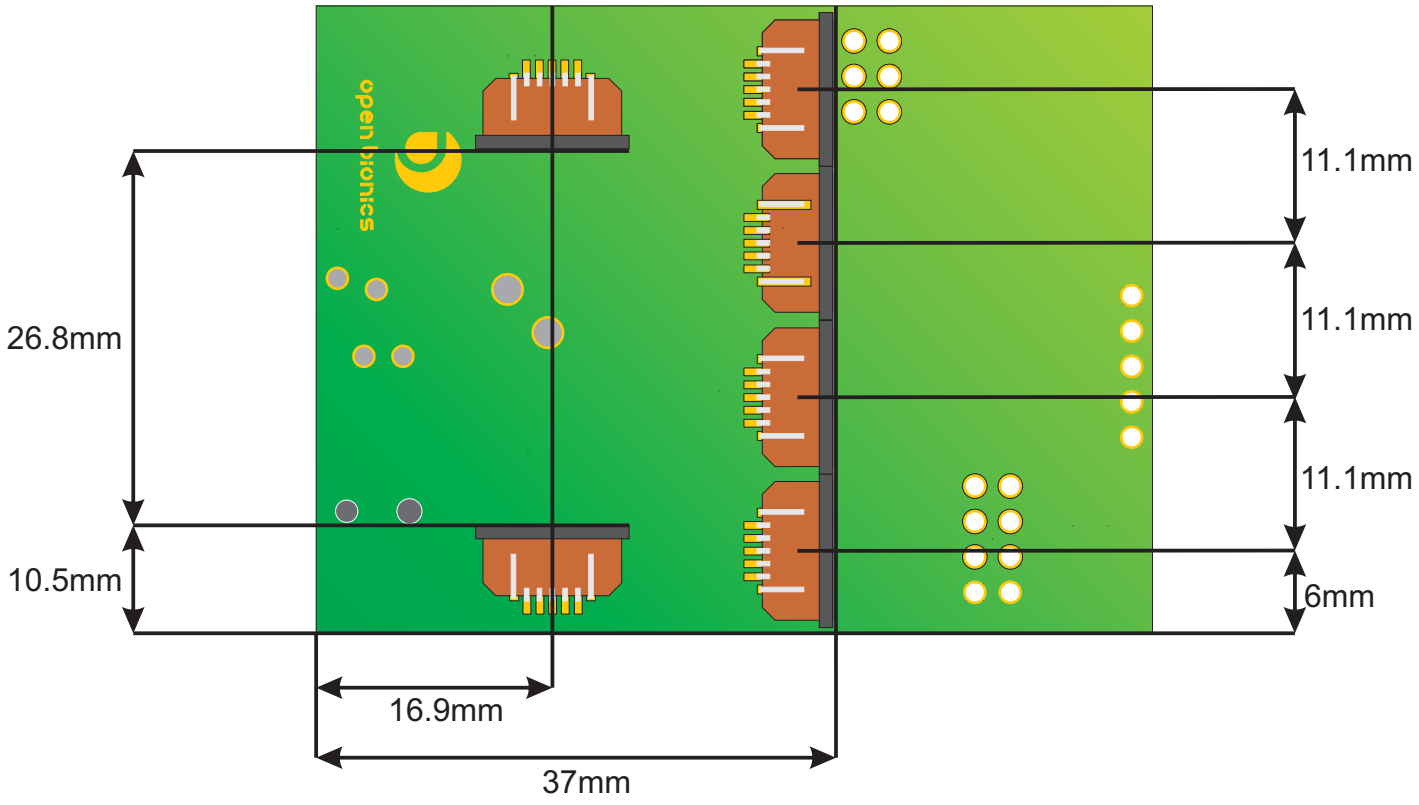
The Almond board is designed to be embedded within robotics projects, from balancing robots to robotic hands. It can control up to 6 motors simultaneously, and can be controlled via Serial, I2C or SPI.

The Almond board is promotes maximum versatility as it is compact and has a multitude of spare pins broken out, to allow incorporation into a multitude of projects.

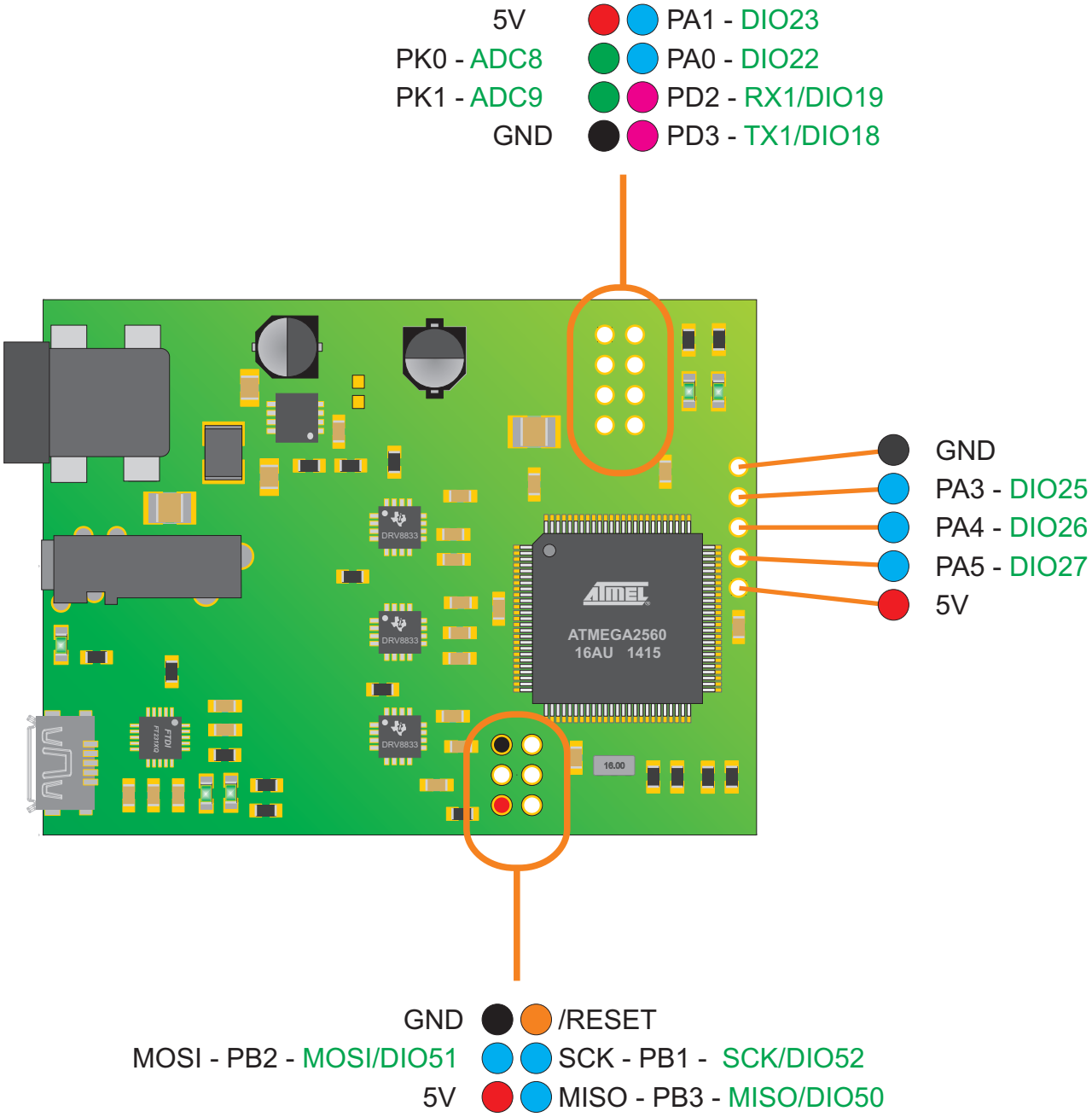
The Almond board is designed to integrate into the Open Bionics Ada hand, but can be used for any robotic project.

Mechanical Layout.



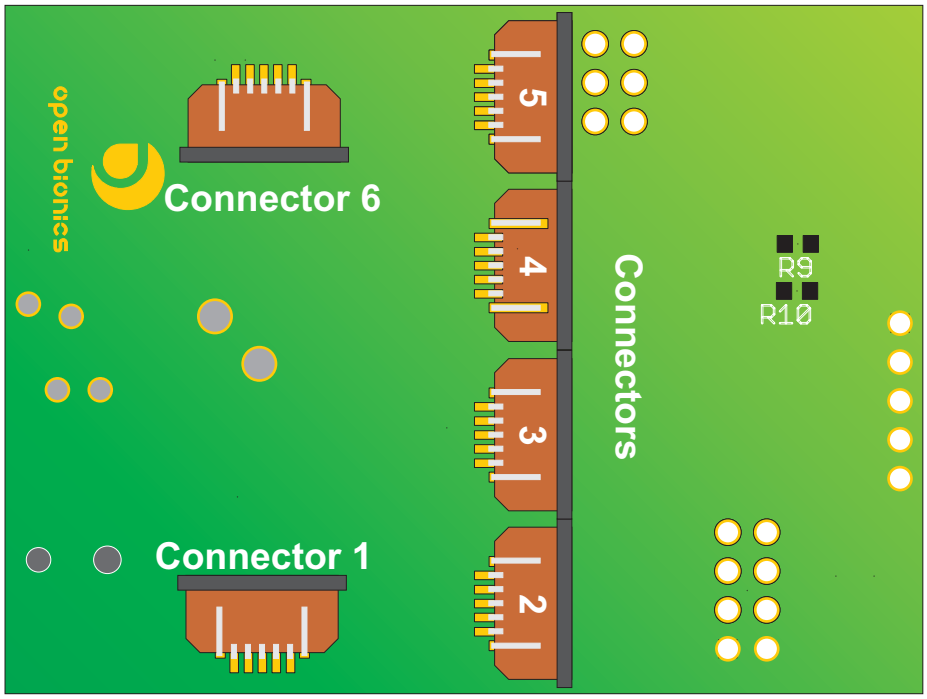


PCB Layout.



Arduino Functions in green.

Connector Layout.



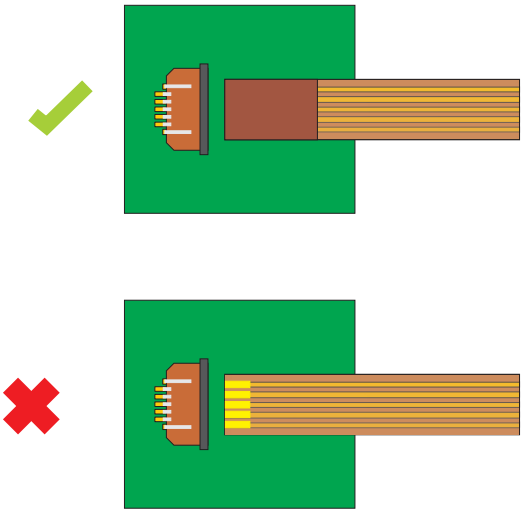
Spare GPIO:
The Almond board includes s variety of unused pins which have been broken out (previous page) to allow it to be as versatile as possible.

2 Analogue pins
10 Digital pins (some used for SPI/I2C)
I2C
SPI

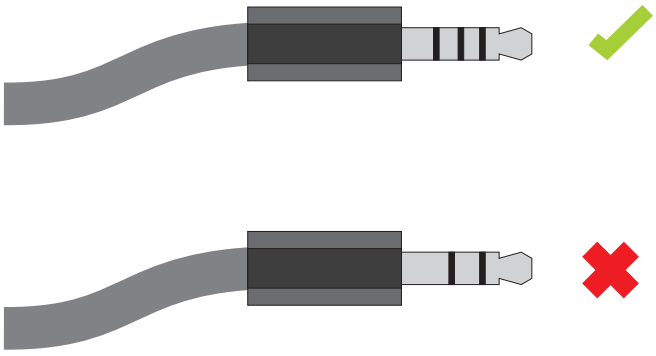
Pin Mapping.

Function	Package Pin	Atmel Pin	ARDUINO PIN	MOTOR1	MOTOR2	MOTOR3	MOTOR4	MOTOR5	MOTOR6
Actuators	5	PE3	Digital 5						
	6	PE4	Digital 2						
	97	PF0	Analogue 0	SENSE					
	7	PE5	Digital 3						
	15	PH3	Digital 6						
	96	PF1	Analogue 1		SENSE				
	16	PH4	Digital 7						
	17	PH5	Digital 8						
	95	PF2	Analogue 2			SENSE			
	18	PH6	Digital 9						
	23	PB4	Digital 10						
	94	PF3	Analogue 3				SENSE		
	24	PB5	Digital 11						
	25	PB6	Digital 12						
	93	PF4	Analogue 4					SENSE	
	26	PB7	Digital 13						
	1	PG5	Digital 4						
	92	PF5	Analogue 5						SENSE
3.5mm Jack	43	PD0	Digital21 (SCL)						
	91	PF6	Analogue 6						
	63	PJ0	Digital 15 (RXD3)						
	44	PD1	Digital20(SDA)						
	90	PF7	Analogue 7						
L.E.D's	13	PH1	Digital 16	Palm LED					
	76	PA2	Digital 24						

Motor Connection.



Ext. Communication Connector



Ext. Communication Connector IMPORTANT

The 3.5mm connector at the rear of the board is intended for communicating with external sensors. As standard the connector is setup for both I2C and analogue inputs, where the desired function is selected in software. The connector can also be configured for UART, as detailed below.

Setup for Analogue Input:

Set ADC6 and ADC7 as analogue inputs, ensure I2C Digital Pins 51 & 52 are not configured, and therefore left “floating”. Configuration of these pins will directly affect the input analogue values of the ADC channels.

The analogue pins can also be configured as a digital pins, for push buttons, tilt switches etc.

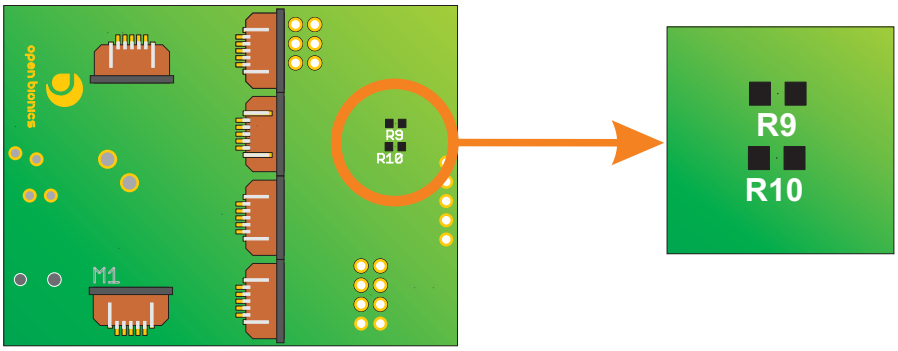
Setup for I2C Input:

Set ADC6 and ADC7 as digital outputs and set the pin HIGH. As ADC 6&7 are attached to the bus through two 10K resistors, these then become the required pull up needed for the I2C protocol. Digital Pins 51 & 52 can be now used as SCL & SDA respectively.

Note: The pull-up values for the bus in this configuration is considered high (10K), but for most applications should be sufficient, additional resistors can be added. Board resistors should be factored into calculations, or disabled (leaving ADC 6&7 floating).

Setup for UART (Requires small hardware alteration):
Resistors 9 & 10 require fitting (0ohms) or pads shorted (see diagram on next page) and ADC 6&7, digital pins 51&52, should all be left floating. This connects UART port 3 to the headphone jack.

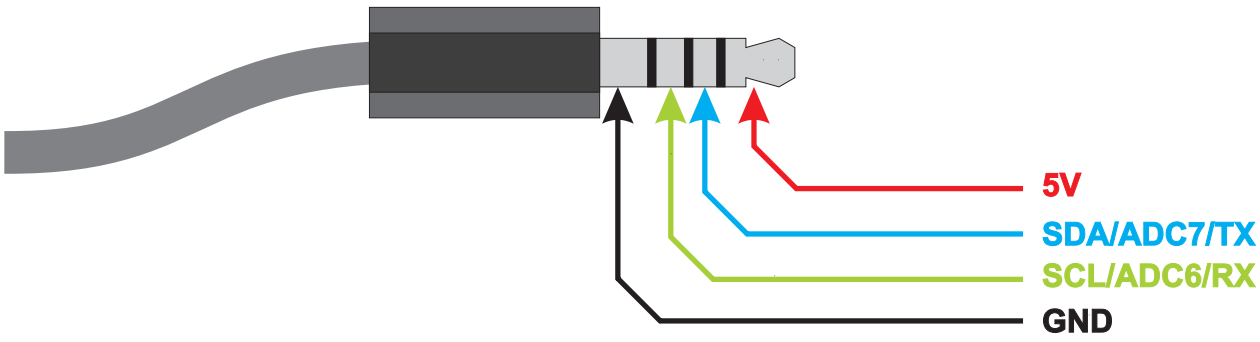
Ext. Communication Connector IMPORTANT



UART Hardware Alteration

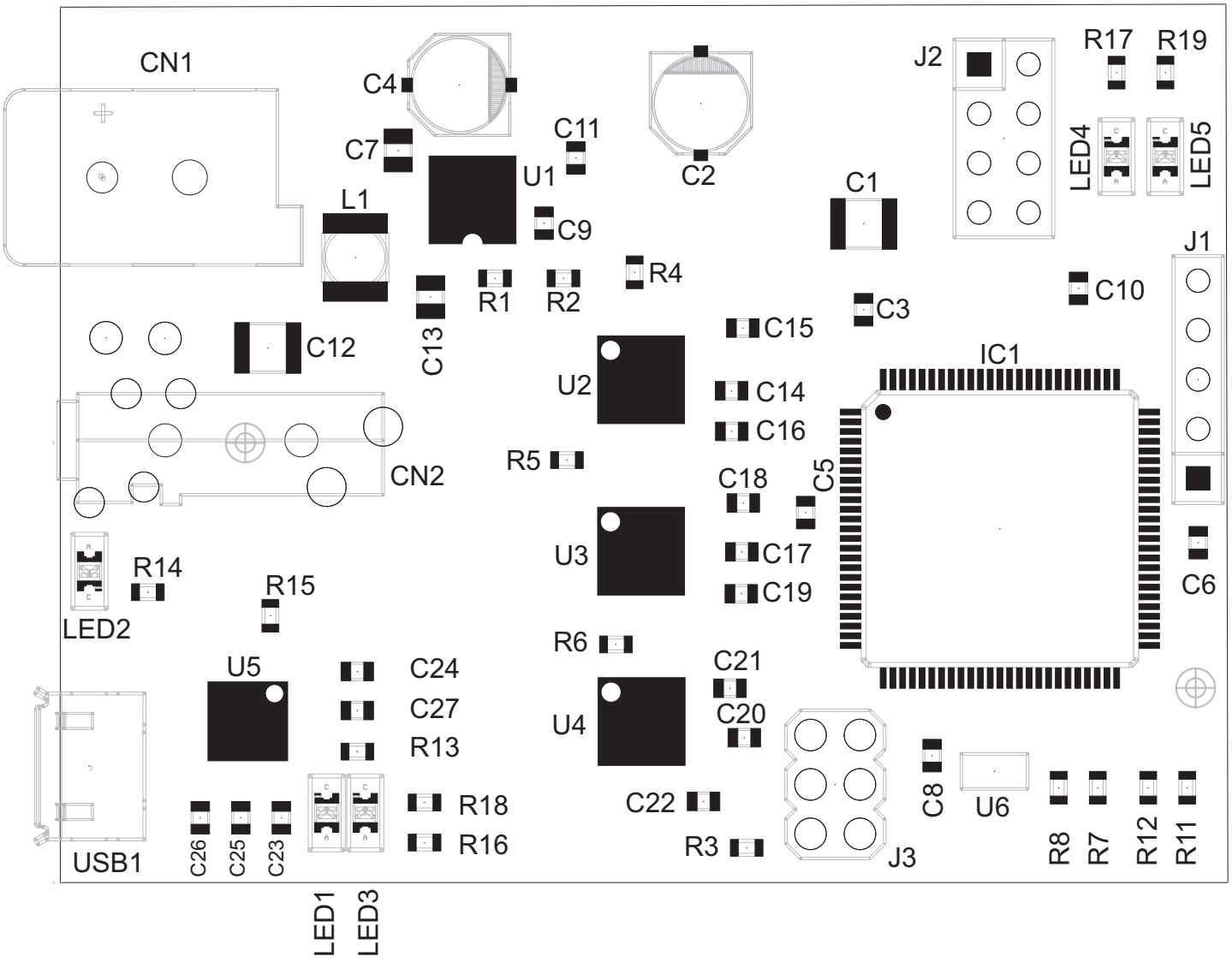
Resistor pads R9 & R10 can be found on the underneath of the board. In order to use UART 0ohm resistors should be fitted, or alternatively shorted with solder.

Ext. Communication Connector Pin Out.



It is important that only a 4-Pole 3.5mm Jack is used with the Almond board, as a 3 pole may cause damage to the microcontroller. It should be noted that signal strength can degrade with cable length.

Component Placement.



Component Placement.

Part	Value	Device
C1	100nF	C-EUC1210
C2, C4	47uF	CPOL-EUC
C3, C5, C6, C8, C9, C10, C14, C17	100nF	C-EUC0603
C20, C23, C24, C25, C26, C27	100nF	C-EUC0603
C7, C13	10uF	C-EUC0805
C11	DNF	C-EUC0603
C12	22uF	C-EUC1210
C15, C18, C21	2.2uF	C-EUC0603
C16, C19, C22	10nF	C-EUC0603
CN1	ManNum: 694106106102	DCBARRELSMT
CN2	CLIFF_FC68127_3.5MM_4POLE	CLIFF_FC68127_3.5MM_4POLE
GND_TEST, VCC_TEST	DNF	HEADER-1X1ROUND
IC1	ATMEGA2560-16AU	ATMEGA2560-16AU
J1	CON_HEADER_1X05-PTH	CON_HEADER_1X05-PTH
J2	CON_HEADER_2X04-PTH	CON_HEADER_2X04-PTH
J3	DNF	AVRISP-6
L1	L1812 - 3.3uH - 1800403RL	INDUCTOR-L1812
LED2, LED4	Blue	LED0805
LED1, LED3, LED5	Green	LED0805
M1, M2, M3, M4, M5, M6	SFW5R-1STE1LF	SFW5R-1STE1LF
R1	100K	R-EU_R0603
R2	19.1K	R-EU_R0603
R3, R4, R5, R6, R7, R11	10K	R-EU_R0603
R8, R12	0R	R-EU_R0603
R9, R10	DNF	R-EU_R0603
R13, R14, R15, R16, R17, R18, R19	1K	R-EU_R0603
U1	ST1S10PUR	ST1S10PUR
U2, U3, U4	DRV8833RTYT	DRV8833RTYT
U5	FT231XQ-R	FT231XQ-R
U6	CSTCE_V13C_CERAMIC_RES	CSTCE_V13C_CERAMIC_RES
USB1	CON-USB-F-MICRO-B	CON-USB-F-MICRO-B