Iteaduino DUE

Overview

The Iteaduino DUE is a microcontroller board based on the Atmel SAM3X8E ARM Crotex-M3 core. It is the improvement board based on the Arduino DUE. It has 54 digital IO pins, 12 analog inputs, 4 UARTs, a 84MHz clock, an USB OTG capable connection, 2 DACs, 2 IIC, a power jack, an SPI header, a reset button and an erase button.
Warning: Unlike other Iteadduino boards, the Iteaduino Due board runs at 3.3V. The maximum voltage that the I/O pins can tolerate is 3.3V. Providing higher voltages, like 5V to an I/O pin could damage the board.

The board contains everything needed to support the microcontroller; simply connect it to a computer with a micro-USB cable or power it with a AC-to-DC adapter or battery to get started. The Due is compatible with all Arduino compatible shields that work at 3.3V and are compliant with the 1.0 Arduino compatible pinout.

The Due follows the 1.0 pinout:
TWI: SDA and SCL pins that are near to the AREF pin.
The IOREF pin which allows an attached shield with the proper configuration to adapt to the voltage provided by the board. This enables shield compatibility with a 3.3V board like the Due and AVR-based boards which operate at 5V. An unconnected pin, reserved for future use.

ARM Core benefits

The Due has a 32-bit ARM core that can outperform typical 8-bit microcontroller boards. The most significant differences are:

A 32-bit core, that allows operations on 4 bytes wide data within a single CPU clock.

CPU Clock at 84Mhz.

96 KBytes of SRAM.

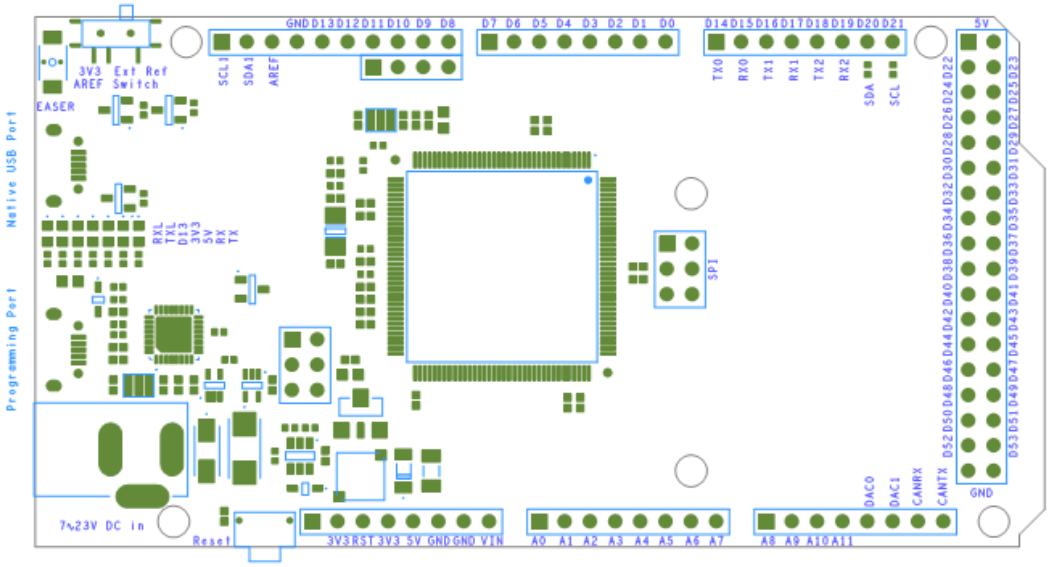
512 KBytes of Flash memory for code.

a DMA controller, that can relieve the CPU from doing memory intensive tasks.

Specifications:

Microcontroller	AT91SAM3X8E
Operating Voltage	3.3V
POWER Supply Voltage(recommanded)	7~24V
Power supply Max Voltage	26V
Digital IO pins	54(of which 12 provide PWM output)
Analog Input pins(ADC)	12
Analog Output pins(DAC)	2
Total DC Output current on all IO lines	130mA
DC current of 3.3V	800mA
DC current of 5V	800mA
Flash Memory	512KB all available for user application
SRAM	96KB(2 banks:64KB and 32KB)
Clock frequency	84MHz

Hardware top view:



Pin map:

Due Pin Number	SAM3X Pin Name	Mapped Pin Name
0	PA8	RX0
1	PA9	TX0
2	PB25	Digital Pin 2
3	PC28	Digital Pin 3
4	connected to both PA29 and PC26	Digital Pin 4
5	PC25	Digital Pin 5
6	PC24	Digital Pin 6
7	PC23	Digital Pin 7
8	PC22	Digital Pin 8
9	PC21	Digital Pin 9
10	connected to both PA28 and PC29	Digital Pin 10
11	PD7	Digital Pin 11
12	PD8	Digital Pin 12
13	PB27	Digital Pin 13 / Amber LED "L"
14	PD4	TX3
15	PD5	RX3
16	PA13	TX2
17	PA12	RX2
18	PA11	TX1
19	PA10	RX1
20	PB12	SDA
21	PB13	SCL
22	PB26	Digital Pin 22
23	PA14	Digital Pin 23

24	PA15	Digital Pin 24
25	PD0	Digital Pin 25
26	PD1	Digital pin 26
27	PD2	Digital Pin 27
28	PD3	Digital Pin 28
29	PD6	Digital Pin 29
30	PD9	Digital Pin 30
31	PA7	Digital Pin 31
32	PD10	Digital Pin 32
33	PC1	Digital Pin 33
34	PC2	Digital Pin 34
35	PC3	Digital Pin 35
36	PC4	Digital Pin 36
37	PC5	Digital Pin 37
38	PC6	Digital Pin 38
39	PC7	Digital Pin 39
40	PC8	Digital Pin 40
41	PC9	Digital Pin 41
42	PA19	Digital Pin 42
43	PA20	Digital Pin 43
44	PC19	Digital Pin 44
45	PC18	Digital Pin 45
46	PC17	Digital Pin 46
47	PC16	Digital Pin 47
48	PC15	Digital Pin 48
49	PC14	Digital Pin 49
50	PC13	Digital Pin 50
51	PC12	Digital Pin 51
52	PB21	Digital Pin 52
53	PB14	Digital Pin 53
54	PA16	Analog In 0
55	PA24	Analog In 1
56	PA23	Analog In 2
57	PA22	Analog In 3
58	PA6	Analog In 4
59	PA4	Analog In 5
60	PA3	Analog In 6
61	PA2	Analog In 7
62	PB17	Analog In 8
63	PB18	Analog In 9
64	PB19	Analog In 10
65	PB20	Analog In 11
66	PB15	DAC0
67	PB16	DAC1

68	PA1	CANRX
69	PA0	CANTX
70	PA17	SDA1
71	PA18	SCL2
72	PC30	LED "RX"
73	PA21	LED "TX"
74	PA25	(MISO)
75	PA26	(MOSI)
76	PA27	(SCLK)
77	PA28	(NPCS0)
78	PB23	(unconnected)
USB	PB11	ID
USB	PB10	VBOF

Power

The Iteaduino Due can be powered via the USB connector or with an external power supply. The power source is selected automatically.
External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and Vin pin headers of the POWER connector.
The board can operate on an external supply of 7 to 24 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable.
The power pins are as follows:
VIN. The input voltage to the Iteaduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or if supplying voltage via the power jack, access it through this pin.
5V. This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 24V), the USB connector (5V), or the VIN pin of the board (7-24V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.
3.3V. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 800 mA. This regulator also provides the power supply to the SAM3X microcontroller.
GND. Ground pins.
IOREF. This pin on the Arduino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs for working with the 5V or 3.3V.

Memory

The SAM3X has 512 KB (2 blocks of 256 KB) of flash memory for storing code. The bootloader is preburned in factory from Atmel and is stored in a dedicated ROM memory. The available SRAM is 96 KB in two contiguous bank of 64 KB and 32 KB. All the available memory (Flash, RAM and ROM) can be accessed directly as a flat addressing space.
It is possible to erase the Flash memory of the SAM3X with the onboard erase button. This will remove the currently loaded sketch from the MCU. To erase, press and hold the Erase button for a few seconds while the board is powered.

Input and Output

Digital I/O: pins from 0 to 53
Each of the 54 digital pins on the Due can be used as an input or output, using pinMode(), digitalWrite(), anddigitalRead() functions. They operate at 3.3 volts. Each pin can provide (source) a current of 3 mA or 15 mA, depending on the pin, or receive (sink) a current of 6 mA or 9 mA, depending on the pin. They also have an internal pull-up resistor (disconnected by default) of 100 KOhm. In addition, some pins have specialized functions:
Serial: 0 (RX) and 1 (TX)
Serial 1: 19 (RX) and 18 (TX)
Serial 2: 17 (RX) and 16 (TX)
Serial 3: 15 (RX) and 14 (TX)
Used to receive (RX) and transmit (TX) TTL serial data (with 3.3 V level). Pins 0 and 1 are connected to the corresponding pins of the ATmega16U2 USB-to-TTL Serial chip.
PWM: Pins 2 to 13
Provide 8-bit PWM output with the analogWrite() function. the resolution of the PWM can be changed with theanalogWriteResolution() function.
SPI: SPI header (ICSP header on other Arduino compatible boards)
These pins support SPI communication using the SPI library. The SPI pins are broken out on the central 6-pin header, which is physically compatible with the compatible Uno board, Itead Leonardo and Iteaduino Mega2560. The SPI header can be used only to communicate with other SPI devices, not for programming the SAM3X with the In-Circuit-Serial-Programming technique. The SPI of the Due has also advanced features that can be used with the Extended SPI methods for Due.
CAN: CANRX and CANTX
These pins support the CAN communication protocol but are not not yet supported by Arduino IDE APIs.
"L" LED: 13
There is a built-in LED connected to digital pin 13. When the pin is HIGH, the LED is on, when the pin is LOW, it's off. It is also possible to dim the LED because the digital pin 13 is also a PWM output.
TWI 1: 20 (SDA) and 21 (SCL)
TWI 2: SDA1 and SCL1.

Support TWI communication using the Wire library.
Analog Inputs: pins from A0 to A11
The Due has 12 analog inputs, each of which can provide 12 bits of resolution (i.e. 4096 different values). By default, the resolution of the readings is set at 10 bits, for compatibility with other Iteaduino boards. It is possible to change the resolution of the ADC with analogReadResolution(). The Due's analog inputs pins measure from ground to a maximum value of 3.3V. Applying more then 3.3V on the Due's pins will damage the SAM3X chip. The analogReference() function is ignored on the Due.
The AREF pin is connected to the SAM3X analog reference pin through a resistor bridge. To use the AREF pin, resistorBR1 must be desoldered from the PCB.
DAC1 and DAC2
These pins provides true analog outputs with 12-bits resolution (4096 levels) with the analogWrite() function. These pins can be used to create an audio output using the Audio library.
Other pins on the board:
AREF
Reference voltage for the analog inputs. Used with analogReference().
Reset
Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

Communication

The Iteadduino Due has a number of facilities for communicating with a computer, another Arduino compatible board or other microcontrollers, and different devices like phones, tablets, cameras and so on. The SAM3X provides one hardware UART and three hardware USARTs for TTL (3.3V) serial communication.
The Programming port is connected to an ATmega16U2, which provides a virtual COM port to software on a connected computer (To recognize the device, Windows machines will need a .inf file, but OSX and Linux machines will recognize the board as a COM port automatically.). The 16U2 is also connected to the SAM3X hardware UART. Serial on pins RX0 andTX0 provides Serial-to-USB communication for programming the board through the ATmega16U2 microcontroller. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the ATmega16U2 chip and USB connection to the computer (but not for serial communication on pins 0 and 1).
The Native USB port is connected to the SAM3X. It allows for serial (CDC) communication over USB. This provides a serial connection to the Serial Monitor or other applications on your computer. It also enables the Due to emulate a USB mouse or keyboard to an attached computer.
The Native USB port can also act as a USB host for connected peripherals such as mice, keyboards, and smart phones. The SAM3X also supports TWI and SPI communication. The Arduino software includes a Wire library to simplify use of the TWI bus. For SPI communication, use the SPI library.
Programming
The Iteaduino Due can be programmed with the Arduino software (download). For details, see the Arduino reference and tutorials.
Uploading sketches to the SAM3X is different than the AVR microcontrollers found in other Arduino

boards because the flash memory needs to be erased before being re-programmed. Upload to the chip is managed by ROM on the SAM3X, which is run only when the chip's flash memory is empty.

Either of the USB ports can be used for programming the board, though it is recommended to use the Programming port due to the way the erasing of the chip is handled :

Programming port: To use this port, select "Arduino Due (Programming Port)" as your board in the Arduino IDE. Connect the Due's programming port (the one closest to the DC power jack) to your computer. The programming port uses the 16U2 as a USB-to-serial chip connected to the first UART of the SAM3X (RX0 and TX0). The 16U2 has two pins connected to the Reset and Erase pins of the SAM3X. Opening and closing the Programming port connected at 1200bps triggers a "hard erase" procedure of the SAM3X chip, activating the Erase and Reset pins on the SAM3X before communicating with the UART. This is the recommended port for programming the Due. It is more reliable than the "soft erase" that occurs on the Native port, and it should work even if the main MCU has crashed.

Native port: To use this port, select "Arduino Due (Native USB Port)" as your board in the Arduino IDE. The Native USB port is connected directly to the SAM3X. Connect the Due's Native USB port (the one closest to the reset button) to your computer. Opening and closing the Native port at 1200bps triggers a 'soft erase' procedure: the flash memory is erased and the board is restarted with the bootloader. If the MCU crashed for some reason it is likely that the soft erase procedure won't work as this procedure happens entirely in software on the SAM3X. Opening and closing the native port at a different baudrate will not reset the SAM3X.

Unlike other Arduino compatible boards which use avrdude for uploading, the Due relies on bossac. The ATmega16U2 firmware source code is available in the Arduino repository. You can use the ISP header with an external programmer (overwriting the DFU bootloader).

Physical Characteristics and Shield Compatibility

The maximum length and width of the Iteaduino Due PCB are 4 and 2.1 inches respectively, with the USB connectors and power jack extending beyond the former dimension. Three screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mil (0.16"), not an even multiple of the 100 mil spacing of the other pins.

The Iteaduino Due is designed to be compatible with most shields designed for the Uno, Diecimila or Duemilanove. Digital pins 0 to 13 (and the adjacent AREF and GND pins), analog inputs 0 to 5, the power header, and "ICSP" (SPI) header are all in equivalent locations. Further the main UART (serial port) is located on the same pins (0 and 1). Please note that I2C is not located on the same pins on the Due (20 and 21) as the Duemilanove / Diecimila (analog inputs 4 and 5).