The Arduino Due

Arduino Due like other Arduino microcontroller boards is the **open-source microcontroller** development board which is based on Atmel SAM3X8E ARM Cortex-M3 microcontroller. SAM3X8E is a member of a family Flash microcontroller based on the 32-bit ARM Cortex M3 RISC processor. Arduino Due is the first Arduino microcontroller development based on the 32-bit ARM core microcontroller. Arduino DUE resembles in structure to the Arduino MEGA and also shares some of the features but of course is unique as development boards are based on different microcontrollers.

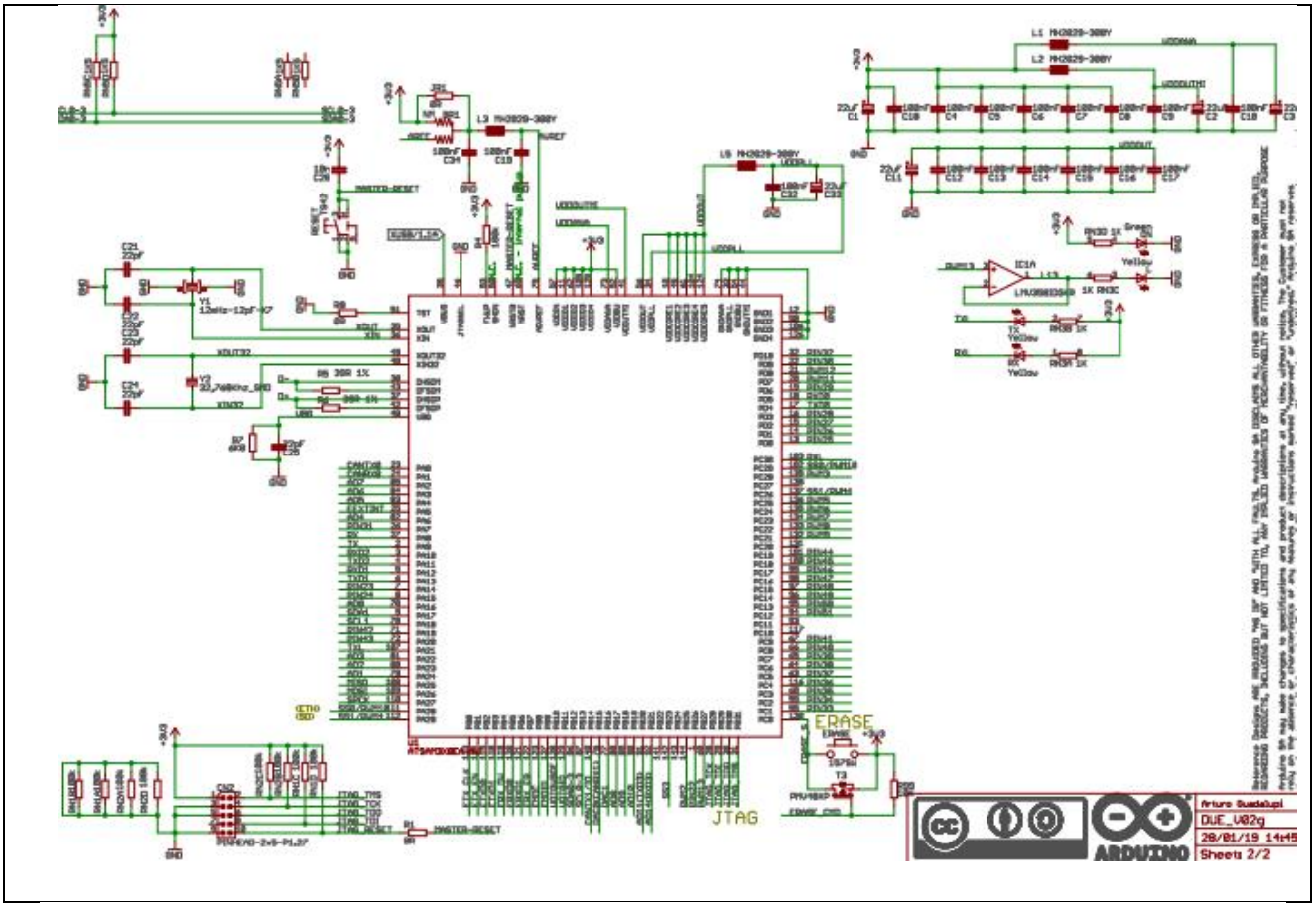
Arduino DUE has 54 digital input / output pins out of which 12 are PWM (Pulse Width Modulation) enabled. It has 4 UARTS (Universal Asynchronous Receiver Transmitter), 2 I2C (Inter-Integrated Circuit) computer buses and 4 SPI (Serial Peripheral Interfaces) computer buses. Arduino DUE has 12 analog inputs which are actually the inputs of the ADC (Analog-to-Digital Converter) inside the microcontroller. One interesting feature of the Arduino DUE which makes it stand apart among other Arduino microcontroller boards is the frequency at which it operates. The Arduino DUE operates at the surprising clock frequency of 84 Mega Hertz. Another important feature to note is that the microcontroller on which the Arduino DUE is based has built in USB and Ethernet MAC interface which eliminates the need of additional chip or hardware for USB and Ethernet based communication. However one needs to connect the Ethernet PHY (Physical Layer) to the Arduino DUE before setting the network Ethernet communication.

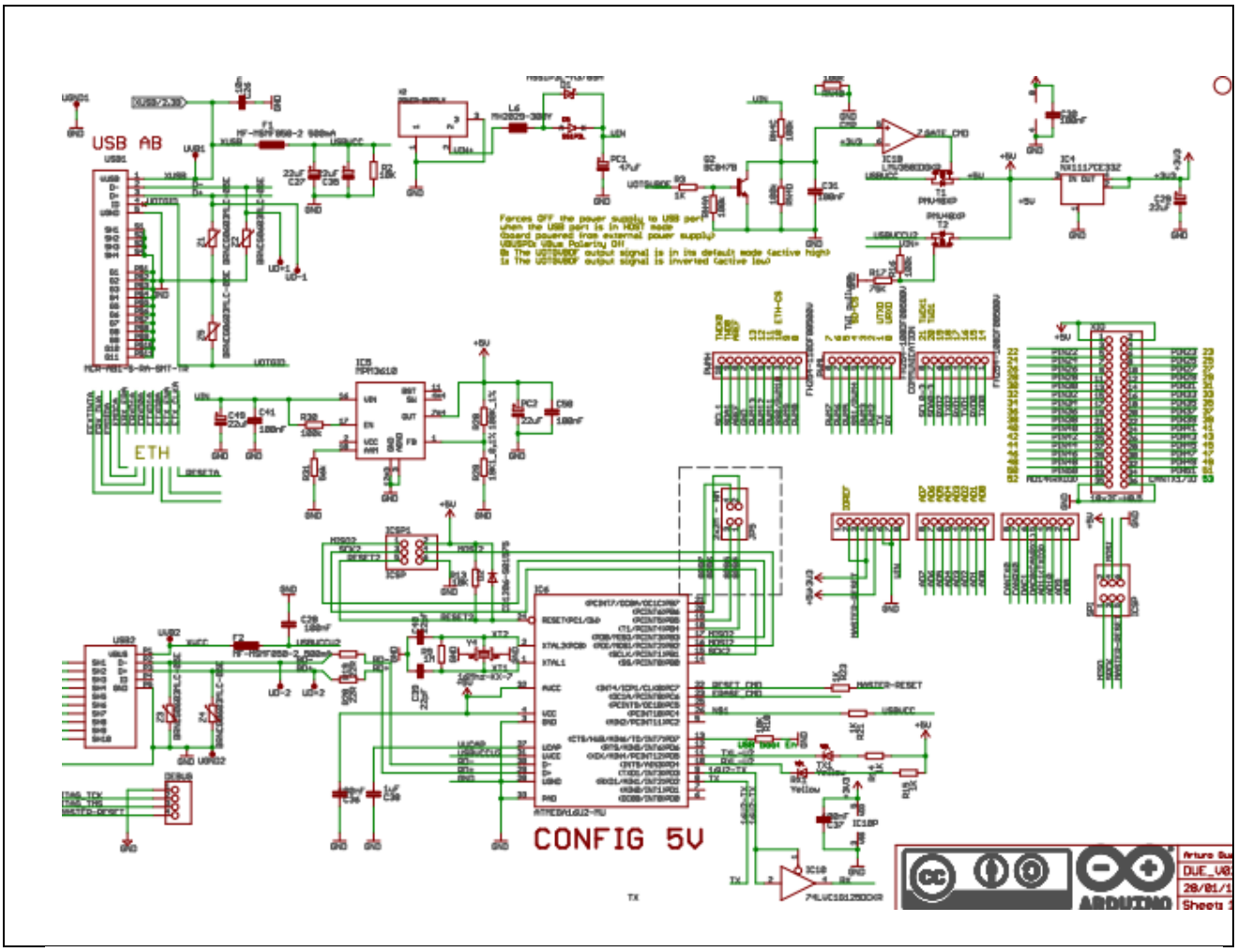
SPECIFICATIONS:

- Microcontroller: AT91SAM3X8E
- Operating Voltage: 3.3V
- Input Voltage(recommended): 7-12V
- Input Voltage(limit): 6-16V

- Digital I/O Pins: 54(of which 12 provide PWM output)
- Analog Input Pins:12
- Analog Output pins: 2(DAC)
- Total DC Output Current on all I/O Pin: 130ma
- DC Current for 3.3V Pin: 800ma
- DC Current for 5V Pin: 800ma
- Flash Memory: 512kb all available for the user applications
- Clock Speed: 84MHz
- Size: 101.52x53.3mm
- Weight: 36g

SCHEMATIC DIAGRAM OF ARDUINO DUE:





- **Power Supply**: The Arduino 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 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 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than 5 volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is to 7 to 12 volts.

VIN: The input voltage to the Arduino board when it's using an external power supply (as opposed to 5 V from the USB connection or other regulated power source). It can supply voltage through this pin, or if supplying voltage via the power jack, access it through this pin.

5Volts: This pin output a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack(7-12V), the USB connector(5V), or the

VIN pin of the board(7-12V) supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board

3V3: A 3.3 supply voltage can be generated with the onboard regulator, and the highest draw current will be 800mA.

GND: 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 SAMb3X has 512kb (2 blocks of 256kb) 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 96kb in two contiguous bank of 64kb and 32kb. 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(), and digitalRead() functions. Each pin can provide (source) a current of 3ma or 15ma, depending on the pin, or receive (sink) a current of 6ma or 9ma, depending on the pin. They also have an internal pull-up resistor (disconnected by default) of 100 Ohm. In addition, some pins have specialized functions.

Serial Pins:
Serial0:0(RX)and 1(TX)
Serial1:19(RX)and 18(TX)
Serial2:17(RX)and16(TX)
Serial3:15(RX)and14(TX)

Used to receive (RX) and transmit (TX) TTL serial data (with 3.3V level). Pins 0 and 1 are connected to the corresponding pins of the ATmega16U2 USB-to-TTL Serial chip.

PWM Pins: Pins 2 to 13 Provide 8-bit PWM output with the analogWrite() function. The resolution of the PWM can be changed with analogWriteResolution() function.

SPI (Serial Peripheral Interface) Pins: These pins support SPI communication using the SPI library. The SPI pins are broken out the central 6- pin header, which is physically compatible with the Uno, Leonardo and 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 yet supported by Arduino APIs.

LED Pin: 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)
TWI2: SDA1 and SCL1: Support TWI communication using the wire library. SDA1 and SCL1 can be controlled using the Wire1 class provided by the wire library. While SDA and SCL1 have internal pullup resistors, SDA1 and SCL1 have not. Adding two pullup resistor on SDA1 and SCL1 lines is required for using Wire1.

- **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 Arduino 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 than 3.3V on the Due's pins will damage the SAM3X chip. The analogReference() function ignored on the Due.

AREF (Analog Reference) Pin: The AREF pins is connected to the SAM3X analog reference pin through a resistor bridge. To use the AREF pin, resistor BR1 must be desoldered from the PCB.

Reset (RST) Pin: This pin brings a low line for resetting the microcontroller, and it is very useful for using an RST button toward shields which can block the one over the board.

- **Communication:** The Arduino Due has a number of facilities for communicating with a computer, another Arduino or other microcontroller, and different devices like phones, tablets, cameras and so on. The SAM3X provides one 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 and TX0 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 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 can also act as a USB host for 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. To use features, see the mouse and keyboard library reference pages.

The SAM3X also supports TWI and SPI communication. The Arduino software includes a Wire library to simplify use of the TWI bus.