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Arduino™

Technical Specifications

This document contains technical information on the Arduino™ microprocessor variants, feature and limitations supported by Proteus. For information on what is included in a particular Proteus product please click the link in the table of contents below

Contents

Proteus Platinum Edition

Summary

Proteus Platinum is the ultimate Proteus product and contains all of the product modules that we sell. This includes:

- All of our PCB Design features - top of the range PCB module.
- High Speed design and differential pairs support
- Shape based Autorouter
- Built-in access to millions of ready-made library parts and footprints.
- ProSPICE professional simulation engine
- All of our Proteus VSM microcotroller families (over 750 processor models).
- All of our Visual Designer and IoT Builder product modules.

PCB Features

PCB Design in Proteus Platinum has unlimited design capacity and includes all available PCB features.

- True Hierarchical Schematic Design.
- Fully Customisable Bill of Materials Reporting Module.
- Interactive Design Explorer with Cross Probing.
- Support for product Assembly Variants.
- Dedicated Reporting Module (Project Notes).
- Formal Design Re-use with Project Clips/Design Snippets.
- Integrated Library Part Import Tools.
- 3D Board Visualisation.
- Gerber X2, ODB++, IDF, PDF, STEP and IGES Output Formats.
- Adaptive Shape Based Autorouter in scriptable or interactive mode.
- Hardware Accelerated Display with Layer Transparency.
- Comprehensive Design Rule Configuration.
- Design Rule Aware Interactive Routing.
- Adaptive Shape Based Autorouter.
- Automatic Power Plane Generation.
- Differential Pair Routing Support
- Gerber Export.
- Automatic Length Matching / Net tuning of routes.
- Multiple Power Planes per Layer (e.g. an Analog Ground and Digital Ground).
- User drawn Power Planes of specific dimensions.
- Dynamic Teardrops.

VSM Families

The Platinum Version includes all the microcontroller variants that we support, across every family, architecture and silicon vendor. This includes :

- Proteus VSM for Microchip Technologies™ PIC10, 12, 16, 18, 24 and dsPIC33.

- Proteus VSM for Atmel® AVR® and Arduino™ AVR®.
- Proteus VSM for Texas Instruments™ MSP430® and PICCOLO®.
- Proteus VSM for NXP 8051 variants.
- Proteus VSM for all ARM® LPC2000, ARM® Cortex™-M0, ARM® Cortex™-M3 and Cortex™-M4 variants.

Other Modules

In addition to the unlimited PCB Layout and VSM Simulation software the Platinum Version also includes all of our supporting modules as standard, including:

- Visual Designer for Arduino™ AVR®.
- Visual Designer for Raspberry Pi®.
- Proteus IoT Builder.
- Advanced Simulation Features.
- USB Simulation Support.
- All Embedded Peripherals Libraries.

Proteus Enterprise Edition

Summary

Proteus Enterprise Version contains everything you need for professional PCB product design. It supports the complete product design lifecycle from schematic capture to simulation test/debug to PCB Layout and export for manufacture.

- Professional Schematic Capture module
- Unlimited Professional PCB Layout module
- High Speed design and differential pairs support
- Shape based Autorouter
- Built-in access to millions of ready-made library parts and footprints.
- ProSPICE professional simulation engine
- All Proteus VSM microcontroller families (over 750 processor models).

PCB Features

PCB Design in the Enterprise Version has unlimited design capacity and includes all available PCB features.

- True Hierarchical Schematic Design.
- Fully Customisable Bill of Materials Reporting Module.
- Interactive Design Explorer with Cross Probing.
- Support for product Assembly Variants.
- Dedicated Reporting Module (Project Notes).
- Formal Design Re-use with Project Clips/Design Snippets.
- Integrated Library Part Import Tools.
- 3D Board Visualisation.
- Gerber X2, ODB++, IDF, PDF, STEP and IGES Output Formats.
- Adaptive Shape Based Autorouter in scriptable or interactive mode.
- Hardware Accelerated Display with Layer Transparency.
- Comprehensive Design Rule Configuration.
- Design Rule Aware Interactive Routing.
- Adaptive Shape Based Autorouter.
- Automatic Power Plane Generation.
- Differential Pair Routing Support
- Gerber Export.
- Automatic Length Matching / Net tuning of routes.
- Multiple Power Planes per Layer (e.g. an Analog Ground and Digital Ground).
- User drawn Power Planes of specific dimensions.
- Dynamic Teardrops.

VSM Families

The Enterprise Version includes all the microcontroller variants that we support, across every family, architecture and silicon vendor. This includes :

- Proteus VSM for Microchip Technologies™ PIC10, 12, 16, 18, 24 and dsPIC33.
- Proteus VSM for Atmel® AVR® and Arduino™ AVR®.
- Proteus VSM for Texas Instruments™ MSP430® and PICCOLO®.
- Proteus VSM for NXP 8051 variants.
- Proteus VSM for all ARM® LPC2000, ARM® Cortex™-M0, ARM® Cortex™-M3 and Cortex™-M4 variants.

Other Modules

In addition to the unlimited PCB Layout and VSM Simulation software the Enterprise Version also includes the following supporting modules:

- Advanced Simulation Features.
- USB Simulation Support.
- All Embedded Peripherals Libraries.

Proteus VSM for AVR

Summary

Proteus Virtual System Modelling (VSM) combines mixed mode SPICE circuit simulation, animated components and microprocessor models to facilitate co-simulation of complete microcontroller based designs.The 'Proteus VSM for Atmel® AVR®' product includes the following main software modules:

- Professional Schematic Capture module
- ProSPICE professional Simulation Engine
- All supported VSM microcotroller variants in the AVR Family.
- All of the Proteus Embedded Simulation Peripheral Libraries.
- VSM Studio IDE with automatic compiler configuration.
- Over 10,000 standard simulation models.

Variants

The following is a current list of supported variants in the AVRAtmel® AVR® family:

- AT90USB646, AT90USB1286
- ATMEGA169, ATMEGA19P, ATMEGA329, ATMEGA3290 (LCD AVR's)
- ATMEGA329P, ATMEGA3290P, ATMEGA649, ATMEGA6490 (LCD AVR's)
- ATMEGA640, ATMEGA644, ATMEGA644P, ATMEGA645, ATMEGA162, ATMEGA165
- ATMEGA165P, ATMEGA325, ATMEGA325P, ATMEGA3250, ATMEGA3250P, ATMEGA2313
- ATMEGA8515, ATMEGA8535, ATMEGA1284P, ATMEGA8, ATMEGA8(32PIN), ATMEGA16
- ATMEGA32, ATMEGA48, ATMEGA48P, ATMEGA48P(32PIN), ATMEGA48(32PIN)
- ATMEGA64, ATMEGA88, ATMEGA88P, ATMEGA88P(32PIN, ATMEGA88(32PIN)
- ATTINY404, ATTINY406, ATTINY804, ATTINY806, ATTINY807
- ATMEGA128, ATMEGA164PATMEGA168, ATMEGA168P, ATMEGA328P, ATMEGA328P
- ATMEGA168P(32PIN), ATMEGA168(32PIN), ATMEGA324P, ATMEGA1280, ATMEGA1281
- ATMEGA2560, ATMEGA2561, ATMEGA6450, ATMEGA103, ATTINY10, ATTINY11
- ATTINY12, ATTINY13, ATTINY15ATTINY24, ATTINY25, ATTINY44, ATTINY45
- ATTINY48, ATTINY48(32PIN)ATTINY84, ATTINY85, ATTINY88, ATTINY88 (32PIN)
- ATTINY261, ATTINY461ATTINY861, ATTINY2313, AT90S1200, AT90S2313
- AT90S2323, AT90S2333, AT90S2343, AT90S4433, AT90S4434, AT90S8515, AT90S8535
- ATTINY1604, ATTINY1606, ATTINY1607, ATTINY202, ATTINY204, ATTINY402

Features

We believe our simulation models are the most accurate and the most complete on the market today. A summary of model capabilities is listed below:

- Supports the entire instruction set.
- Supports all port and other I/O pin operations.
- Supports all counter/timers including seperate prescalers, capture compare and PWM modes.
- Supports watchdog timer.
- Supports serial U(S)ART.
- Supports master slave SPI, USI and TWI serial interfaces.
- Supports Analogue-to-Digital Conversion (ADC) and analogue comparator modules in all modes.
- Supports all internal and external interrupt modes.
- Supports internal code and data EEPROM memory inc. code protection and data persistence.
- Internally generated processor clock for performance. Event timing accurate to one clock period.
- Provides internal consistency checks on code (e.g. execution of invalid op-codes, illegal memory accesses, stack overflow checking, etc.).
- Fully integrated in to the VSM source level debugging system.
- Fully integrated into the Proteus Diagnostic Control System.

Limitations

The following is a listing of known limitations in the current version of the AVR® family:

- x Brown-out Reset is not implemented.
- x Power supply voltage changing is not supported.
- x JTAG and other in-circuit debugging interfaces are not supported.
- x External programming of memories is not supported.
- x Electrical characteristics dependency of the temperature is not implemented.

Compilers

Supported Third Party Compilers

Proteus VSM models will fundamentally work with the exact same HEX file as you would program the physical device with. However, far more debugging information is available when using a compiler to write the firmware and providing these object files to Proteus in place of the HEX file provides a much richer working environment.

We recommend you use the free Labcenter VSM Studio IDE. This will greatly simplify the task as it will automatically configure supported compilers to work with a Proteus VSM simulation.

If you prefer to work inside your own IDE then you will need to set your compiler options manually. After compiling for debug, all you need to do is specify the debug file from the compiler as the program property of the microcontroller on the schematic.

VSM Studio supported toolchains

- IAR
- GCC
- Arduino
- ImageCraft
- HP Info Tech
- Bascom AVR

Proteus VSM for Arduino AVR

Summary

Proteus Virtual System Modelling (VSM) combines mixed mode SPICE circuit simulation, animated components and microprocessor models to facilitate co-simulation of complete microcontroller based designs.The 'Proteus VSM for Arduino™' product includes the following main software modules:

- Professional Schematic Capture module
- ProSPICE professional Simulation Engine
- All supported VSM microcotroller variants in the Arduino Family.
- All of the Proteus Embedded Simulation Peripheral Libraries.
- VSM Studio IDE with automatic compiler configuration.
- Over 10,000 standard simulation models.

⚠ *The full Proteus VSM for AVR Product also includes simulation of the entire range of supported Atmel AVR variants but does not include the ARM STM32 variant.*

Variants

The following is a current list of supported variants in the Arduino™ family:

- ATMEGA168, ATMEGA328, ATMEGA2560, STM32F103C8T6

⚠ *The full Proteus VSM for AVR Product also includes simulation of the entire range of supported Atmel AVR variants but does not include the ARM STM32 variant.*

Shields

There is a vast selection of available Ardino™ Shields available. These are listed below:

- Any schematic of a shield that you draw yourself
- Arduino™ 2 Channel Relay Shield.
- Arduino™ 4 Channel Relay Shield.
- Arduino™ 7-segment Common Anode Breakout Board.
- Arduino™ 7-segment Common Cathode Breakout Board.
- ADS1110 Breakout Board.
- BME280 Breakout Board.
- BMP180 Breakout Board.
- BMP280 Breakout Board.
- Button Breakout Board.
- Buzzer Breakout Board.
- DHT11 Humidity & Temperature sensor Breakout Board.
- GPS Module Breakout Board.
- Hall-Effect Current Sensor Breakout Board.
- HX711 for Load Cell Breakout Board.
- ILI9341 TFT LCD Shield.
- INA219 Current Sensor Breakout Board.
- Infra Red Demodulator.
- Arduino™ 8x8 LED's.
- Arduino™ 16-channel PWM Servo Adafruit Shield.
- Arduino™ 74HC595 Shift Register Breakout Board.
- Arduino™ AD8495 K-Type Thermocouple Amplifier Breakout Board.
- Arduino™ Data Logger Shield.
- Arduino™ DHT22 Humidity & Temperature sensor Breakout Board.
- Arduino™ DS18B20 Breakout Board.
- Arduino™ DS1302 RTC Breakout Board.
- Arduino™ EA DOGS102N-6 Graphics Display

Breakout Board.

- Arduino™ ENC28J60 Ethernet Breakout Board.
- Arduino™ HYT271 Precision Humidity & Temperature sensor Breakout Board.
- Arduino™ I2C 16x2 LCD Breakout Board.
- Arduino™ I2C 20x4 LCD Breakout Board.
- Arduino™ IOX-16 Shield with MCP23017 I/O Expander.
- Arduino™ KS0108 128x64 Graphics Display Breakout Board.
- Arduino™ KS0108 192x64 Graphics Display Breakout Board.
- Arduino™ LCD Shield.
- Arduino™ LED Bar Breakout Board.
- Arduino™ LED Shield.
- Arduino™ MCP3208 12bit ADC Breakout Board.
- Arduino™ MCP3304 13bit ADC Breakout Board.
- Arduino™ MCP3421 18-bit ADC Breakout Board.
- Arduino™ MCP4921 12bit DAC Breakout Board.
- Arduino™ MCP23008 I2C Expander.
- Arduino™ Motor Shield with Servos.
- Arduino™ Motor Shield.
- Arduino™ MPX4250AP absolute pressure sensor Breakout Board.
- Arduino™ Nokia 5110-3310 Monochrome LCD Breakout Board.
- Arduino™ PCA9555 I2C Expander Breakout Board.
- Arduino™ SD Card Breakout Board.
- Arduino™ Serial 16x2 LCD Breakout Board.
- Arduino™ Serial LED Breakout Board.
- Arduino™ Serial LED Horizontal Breakout Board.
- Arduino™ SRF04 Ultrasonic Ranger Breakout Board.
- Arduino™ SSD1306 128x64 Graphics Display I2C Breakout Board.
- Arduino™ SSD1306 128x64 Graphics Display

SPI Breakout Board.

- Arduino™ Temperature & Light Breakout Board.
- Arduino™ Terminal Shield.
- Arduino™ Thermistor Breakout Board.
- Arduino™ Wave Shield.
- Arduino™ Weather Station Shield.
- K Type Thermocouple Amplifier Breakout board.
- Keyes remote.
- MAX31856 THC to Digital Breakout Board.
- MAX31865 RTD to Digital Breakout Board.
- MCP9600 Thermocouple Breakout Board.
- MCP9601 Thermocouple Breakout Board.
- RGB Common Anode LED.
- RGB Common Cathode LED.
- Serial 16x2 LCD Breakout Board.
- ST7735R TFT LCD Shield.
- TC74 Breakout Board.
- Temperature & Light Breakout Board.
- Velleman VMA203 LCD & Keypad Shield.

Limitations

The following is a listing of known limitations in the current version of the Arduino™:

- x No significant functional limitations.
- x HFINTOSC as CLC1 input is not supported for efficiency reasons.
- x IVR Internal Voltage Regulator and VREGCON register effect are not modeled.
- x BORCON register effect are not modeled.
- x Blue Pill STM32 Arduino board clocks at 16MHz by default (for performance).

Compilers

Supported Third Party Compilers

Proteus VSM models will fundamentally work with the exact same HEX file as you would program the physical device with. However, far more debugging information is available when using a compiler to write the firmware and providing these object files to Proteus in place of the HEX file provides a much richer working environment.

We recommend you use the free Labcenter VSM Studio IDE. This will greatly simplify the task as it will automatically configure supported compilers to work with a Proteus VSM simulation.

If you prefer to work inside your own IDE then you will need to set your compiler options manually. After compiling for debug, all you need to do is specify the debug file from the compiler as the program property of the microcontroller on the schematic.

VSM Studio supported toolchains

- Arduino
- GCC

Visual Designer for Arduino

Summary

Visual Designer for Arduino combines world class Proteus VSM simulation with a new flowchart programming engine and a gallery of virtual hardware to provide a truly integrated and intuitive development environment for Arduino. The peripheral gallery makes hardware design easy. Simply add a shield or sensor from the gallery and Visual Designer will automatically place the correct circuitry on the Proteus schematic for you and add some simple methods to Visual Designer that allow you to control the hardware.

- Peripheral Gallery full of ready-made Arduino Shields and Sensors.
- Drag and Drop Arduino Programming with Flowcharts.
- World Class System Level Simulation, Measurement and Debugging.
- Program the equivalent Arduino™ hardware at the press of a button.

Variants

The following is a current list of supported variants in the Arduino™ AVR® family:

- ATMEGA168, ATMEGA328, ATMEGA2560
- ATSAMD21G18 (Cortex M0+)

The full Proteus VSM for AVR Product also includes simulation of the entire range of supported Atmel AVR variants.

Shields

The following is a list of Arduino™ shields which are directly supported by the Visual Designer flowchart programming environment:

- Any schematic of a shield that you draw yourself.
- Adafruit 16 Channel PWM Servo Shield.
- Adafruit 4 Channel Relay Numato Shield.
- Adafruit TFT Display based on ILI9341.
- Adafruit Trellis Shield.
- Adafruit Weather Station Shield.
- Arduino™ HYT271 Pressure, Humidity and Temperature Breakout.
- Motor Shield (R3) with Stepper Motor.
- Adafruit 2 Channel Relay Numato Shield.
- Adafruit Data Logger Shield.
- Adafruit NeoPixel Shield.
- Adafruit Wave Shield (Plays Audio WAV files).
- Motor Shield V2 with Servos, DC and Stepper Motors.
- Motor Shield V2 with four DC Motors.
- Motor Shield (R3) with DC Motors.

Grove Modules

The following Grove modules and sensors are directly integrated into Visual Designer and can be added to your project straight from the Peripheral Gallery:

- Grove 128x64 OLED Display Module.
- Grove 4-Digit Display Module.
- Momentary Action Push Button.
- Grove Buzzer Module.
- Grove Differential Amplifier Module.
- Grove I2C 12-Bit ADC Module.
- Grove 80cm InfraRed Proximity Sensor.
- Grove Luminance Sensor Module.
- Grove Relay Module.
- Grove SPDT Slide Switch Module.
- Grove Touch Sensor Module.
- Thermistor Based Temperature Sensor Module.
- Grove RGB LCD Module.
- Grove LED Bar Module.
- Grove single LED Module (Blue, Green, Yellow, Red).
- Grove Light Sensor Module.
- Grove Rotary Angle Potentiometer based sensor.
- Grove RTC Module.
- Grove Servo Motor Module.
- Grove Sound/Volume Level Sensor.
- Grove Ultrasonic Ranger Module.
- Grove Voltage Divider Module.
- Grove RS232/TTY Terminal Module.

Breakouts

The following breakout boards are supported directly by Visual Designer:

- Arduino™ Alphanumeric LCD Breakout Board
- Arduino™ DHT22 Humidity Temperature Breakout Board
- Arduino™ MCP3208 12bit ADC Breakout Board
- Arduino™ Real Time Clock Breakout Board
- Arduino™ TC74 Temperature Sensor Breakout Board
- Adafruit K Type Thermocouple Amplifier AD8495 Breakout
- HYT271 Pressure, Humidity and Temperature Breakout
- Arduino™ SPDT slide Switch Breakout
- LED Breakout (Red/Blue/Green/Yellow)
- Generic Input Voltage Device Breakout
- Arduino™ Servo Motor Breakout Board
- Arduino™ GPS Breakout Board
- Arduino™ Rotary Angle Potentiometer Breakout Board
- Simple, momentary action push button breakout
- Arduino™ Piezo Buzzer Breakout Board
- Arduino™ DHT11 Humidity Temperature Breakout Board.
- Arduino™ MCP23008 IO Expander Breakout Board
- Arduino™ MCP4921 12bit DAC Breakout Board
- Arduino™ SD Card with SPI Interface Breakout Board
- Arduino™ MCP23008 Numeric Keypad Breakout Board
- Arduino™ MPX4250AP Pressure Gauge Breakout Board
- Arduino™ PCD8544 Nokia 3310 LCD Breakout Board

More advanced users can pick, place and wire from the many thousands of embedded peripherals in the Proteus libraries. These are all included with Visual Designer but users will have to program at a lower level, using the CPU methods in Visual Designer to drive the Arduino pins directly.