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P8X32A QuickStart (#40000)

The P8X32A QuickStart is a simple and accessible development platform for the P8X32A Propeller microcontroller. The built-in buffered USB to serial converter and bus-powered design allow easy programming with a single cable. The eight buffered LEDs and resistive touch buttons provide a simple interface without loading I/O pins. All Propeller I/O pins are accessible through either a socket or solderable connections.

The 2” by 3” QuickStart requires minimal space on the workbench or at a computer desk and is excellent for projects on the go.

As an open-source hardware design, all design files—including layout, schematics, and firmware—are available under licenses that allow free distribution and reuse. This means that the P8X32A QuickStart's design can be incorporated into new applications royalty free and without a non-disclosure agreement.

Features

- Propeller P8X32A microcontroller
- Eight resistive touch buttons
- Eight buffered LEDs
- Buffered USB to serial converter with USB bus power
- Up to 30 free I/O pins available through an accessory socket

Key Specifications

- Power Requirements: 3.3 or 4 to 9 VDC, up to 500 mA
- Communication Interface: USB, 3.3 V serial, I2C
- Operating temperature: -40 to +185 °F (-40 to +85 °C)
- Dimensions: 2.0 x 3.0 x 0.36 in (5.0 x 7.6 x 0.84 cm) mounting hole centers separated by 3.5 x 1.0 in (88.9 x 25.4 mm)

Application Ideas

- Reference design
- Development platform
- Embedded processor board

Synopsis

The QuickStart is designed as a small, inexpensive, accessible, and easy to use development platform for the Propeller microcontroller. The QuickStart is designed to provide interfaces to a computer and a user, through a USB port, LEDs, and touch sensitive buttons, while dedicating as few I/O pins as possible to a specific task. All of the Propeller's 32 I/O pins are

available through the accessory socket and through solderable through-hole vias. The USB to serial converter, when powered, uses two of the I/O pins. When the USB to serial converter is unpowered, the Propeller will check for a serial programming signal on the I/O pins at startup the revert them to general purpose I/O pins. Two of the I/O pins connect, through an I2C bus, to a 64 KB EEPROM. Eight of the I/O drive LEDs through a buffer, to prevent the LEDs from loading the I/O pins. Eight more I/O pins connect to resistive touch buttons that also do not load the I/O pins when not in use. The 12 remaining I/O pins connect only to the accessory connections.

The 40-pin accessory socket and the near by plated-through vias, provide access to several power pins, USB control signals, reset, a clock input pin, and all 32 Propeller I/O pins, including the serial and I2C pins used during startup.

Open-source hardware

The QuickStart is an open-source hardware design that is well suited for use as a reference design, built into a custom product, or used as a stand-alone board containing a custom firmware application. All design files are available under various open-source licenses, as included with each file.

Getting started

To program the QuickStart board, install and run the Propeller Tool, available from http://www.parallaxsemiconductor.com/software, and connect connect it to a computer using a USB A to mini B Cable, such as part number 805-00006, available from parallax.com. See http://www.parallaxsemiconductor.com/products/quickstart for a selection of examples using the QuickStart board.

Parallax P8X32A Propeller Microcontroller

The Propeller microcontroller, U1, is an 8-core low power microcontroller with 32 KB SRAM and up to 20 MIPS per core. By partitioning separate tasks into separate cores, the Propeller can load programs and features and reallocate resources on the fly, without the overhead of an operating system. Features that often require dedicated hardware can be defined in software and run in parallel. When running at a total of 160 MIPS, the power consumption is usually less than 80 mA. For more information, refer to the Parallax P8X32A Propeller datasheet.

USB port

The USB mini B port, J2, connects to an FTDI FT232RL USB to serial converter, U3. The I/O pins from U3 are buffered through U4. The TXD pin from U3 connects to RX, or P31, on the Propeller. The RXD pin from U3 connects to TX, or P30, on the Propeller. The USB circuitry, including U3 and U4, is powered from the USB bus, so when there is no USB connection present, the unpowered buffer's inputs and outputs will float, leaving P30 and P31 available for other uses, included programming the Propeller from an external device.

Power LED

The power LED, D11, will light green with sufficient power on Vdd. It may also light or partially light with insufficient power on Vdd.

LEDs

D1 through D8 indicate the status of P0 through P7, respectively. The LEDs are driven through a buffer, so they do not load the I/O pins. If the P0 through P7 are left floating, the

LEDs may light when the respective I/O pin floats high. To ensure that they stay off when the I/O pin is not in use, drive the I/O pin low.

Resistive Touch Buttons

P0 through P7 are connected to resistive touch buttons. Each button is a pad, surrounded by ground pads, connected through a 100 K ohm ESD protection resistor, to the I/O pin. When the buttons are not in use, they will not load the I/O pins. When touched, they will add negligible resistive loading. To read the state of the button, set the I/O pin as a high output, then immediately switch it to an input, then measure the amount of time before the I/O pin falls low. If nothing is touching the pad, the parasitic capacitance of the I/O pin and the PCB will hold the input high for several milliseconds. Alternately, instead of measuring the fall time, measure the input state I millisecond after the pin was switched to an input. See the "Touch Buttons LED Demo" from the QuickStart page at http://www.parallaxsemiconductor.com/products/quickstart.

Serial EEPROM

The 64 KB EEPROM, U2, is connected to the I2C bus on P27 and P28. The lower 32 KB contain the program that the Propeller loads on reset. The upper 32 KB can be used for non-volatile data storage. For more information, refer to the AT24C512 datasheet.

Crystal

The QuickStart includes a 5 MHz crystal, for use when running at either 5 MHz without the use of a PLL, or 5, 10, 20, 40, or 80 MHz when used with the internal PLL. The Propeller can also run at nominal 20 kHz or 12 MHz using internal RC time constants. The 5 MHz crystal is connected through a surface-mount shunt, R13, which can be removed to disconnect the crystal. For custom crystal frequencies, remove the shunt and add another crystal to the unpopulated crystal socket, X2. The Propeller can also be driven through the XI line on the accessory connections, with or without the shunt present.

Brownout Detector

The Propeller's built in brownout voltage detector is enabled, by default, through a surface mount shunt, R12. For operation at or lower than 3.0 VDC Vdd, move R12 from the position marked "On" on the PCB to the position marked "Off". To ensure stability, use an external brownout voltage detector rated for 2.7 VDC or higher.

Reset Button

The reset button, when pressed, will force the Propeller to reset which will cause it to reload any code present in the EEPROM.

Delta Sigma (ΔΣ) digital to analog conversion

Dolorium ipsum est sit amet!?

Accessory Header

The Accessory Header, J1, includes connections for power, USB signals, and all Propeller I/O pins, included those used in the I2C bus and those used for USB communications.

Accessory Header Connections

Pin	Connections	Functions
1	P0	I/O Pin
3	P2	I/O Pin
5	P4	I/O Pin
7	P6	I/O Pin
9	P8	I/O Pin
11	P10	I/O Pin
13	P12	I/O Pin
15	P14	I/O Pin
17	P16	I/O Pin
19	P18	I/O Pin
21	P20	I/O Pin
23	P22	I/O Pin
25	P24	I/O Pin
27	P26	I/O Pin
29	SDA P29	I2C Serial Data I/O Pin
31	SCL P28	I2C Serial Clock I/O Pin
33	TX P30	Propeller Transmit Pin at Start Up I/O Pin
35	RX P31	Propeller Receive Pin at Start Up I/O Pin
37	RESn	Propeller Reset Pin
39	Vss	Ground

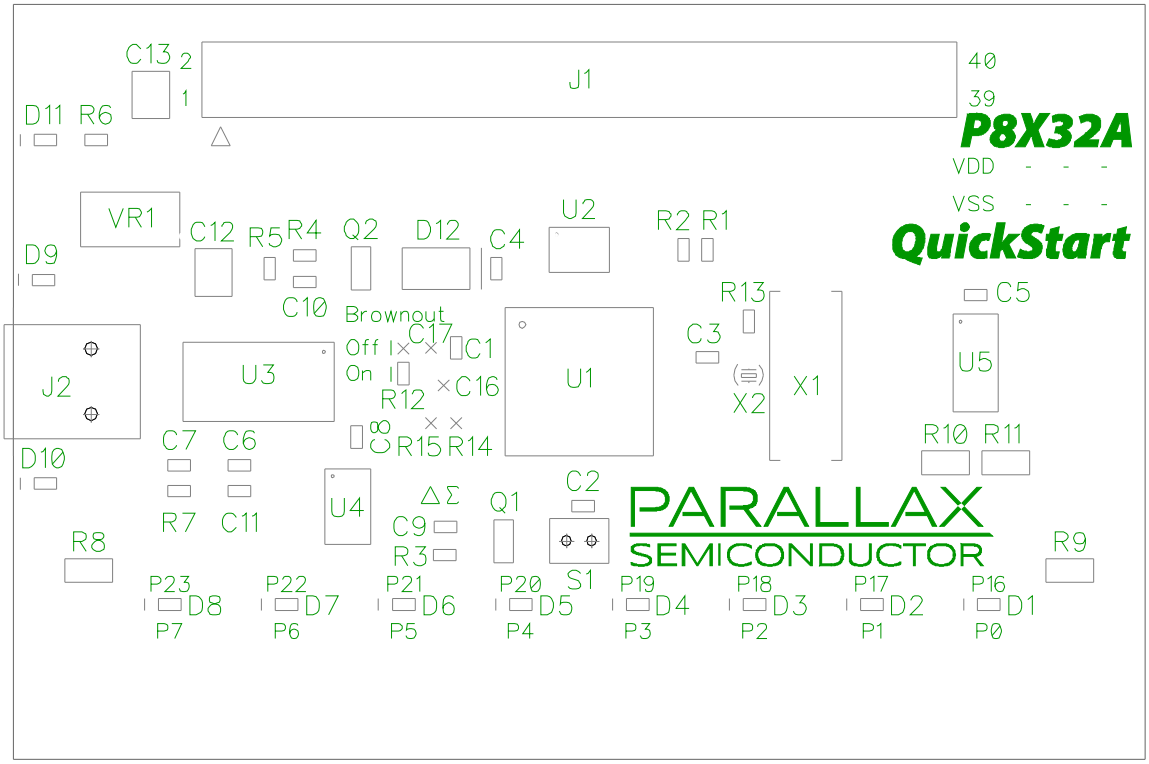
Pin	Connections	Functions
2	P1	I/O Pin
4	P3	I/O Pin
6	P5	I/O Pin
8	P7	I/O Pin
10	P9	I/O Pin
12	P11	I/O Pin
14	P13	I/O Pin
16	P15	I/O Pin
18	P17	I/O Pin
20	P19	I/O Pin
22	P21	I/O Pin
24	P23	I/O Pin
26	P25	I/O Pin
28	P27	I/O Pin
30	/USB_PWR_EN	Allow Power Sourcing from the USB Port
32	XI	Propeller Clock Input Pin for External Driving
34	/RTS	Inverted RTS Signal from USB to Serial Converter
36	/CTS	Inverted CTS Signal from USB to Serial Converter
38	Vdd	Regulated 3.3 VDC Input
40	Vin	Unregulated 4 to 9 VDC Input

Pin Functions

- P0 through P7 — General purpose input/output pins. Also connected to the resistive touch buttons. When not in use, the buttons will not load the I/O pins, when touched, they will add negligible resistive loading.
- P8 through P15 — General purpose input/output pins.
- P16 through P23 — General purpose input/output pins. Signals are buffered and displayed on D1 through D8, with the most-significant bit on the left.
- P24 through P27 — General purpose input/output pins.
- P28, SCL — I2C serial clock pin. Pulled to Vdd. Connected to the built-in EEPROM. Can be connected to external I2C devices.
- P29, SDA — I2C serial data pin. Pulled to Vdd. Connected to the built-in EEPROM. Can be connected to external I2C devices.
- P30, TX — Propeller transmit at startup. General purpose input/output pin after startup. Connected to the USB to serial converter receive pin.
- P31, RX — Propeller receive at startup. General purpose input/output pin after startup Connected to the USB to serial converter transmit pin. Do not drive when the USB circuitry is powered.
- RESn — Propeller reset pin, inverted. Pulled to Vdd. Driven low on internal reset. Drive low to externally reset the Propeller.

- /USB_PWR_EN — USB power enable pin, inverted. Pulled to USB 5 V supply. Internally driven low after successful USB power negotiation. Can be externally driven low to force the USB power input to drive the QuickStart power supply, such as when powering from a USB charger.
- XI — Propeller clock input. Do not load when not in use. Can drive the Propeller clock from an external signal, using the XINPUT directive.
- /RTS — USB to serial converter Request To Send output, inverted.
- /CTS — USB to serial converter Clear To Send input, inverted.
- Vdd — Propeller power supply. Drive with 2.7 to 3.6 volts. Internally driven to a nominal 3.3 volts with sufficient voltage on the Vin pin, or from the USB bus when /USB_PWR_EN is low.
- Vin — Voltage regulator input. Drive with 4 to 9 volts. Internally driven to a nominal 5 volts, from the USB bus when /USB_PWR_EN is low.
- Vss — Ground

Component locations



Specifications

Symbol	Parameter	Minimum	Typical	Maximum	Units
Vin	Supply Voltage on J1 pin 40	4.0	5.0	9.0	V
Vdd	Supply Voltage on J1 pin 38	3.0	3.3	3.6	V

Absolute Maximum Ratings

Symbol	Parameter	Minimum	Maximum	Units
Vin	Supply Voltage on J1 pin 40	-0.3	18	V
Vdd	Supply Voltage on J1 pin 38	-0.3	4	V