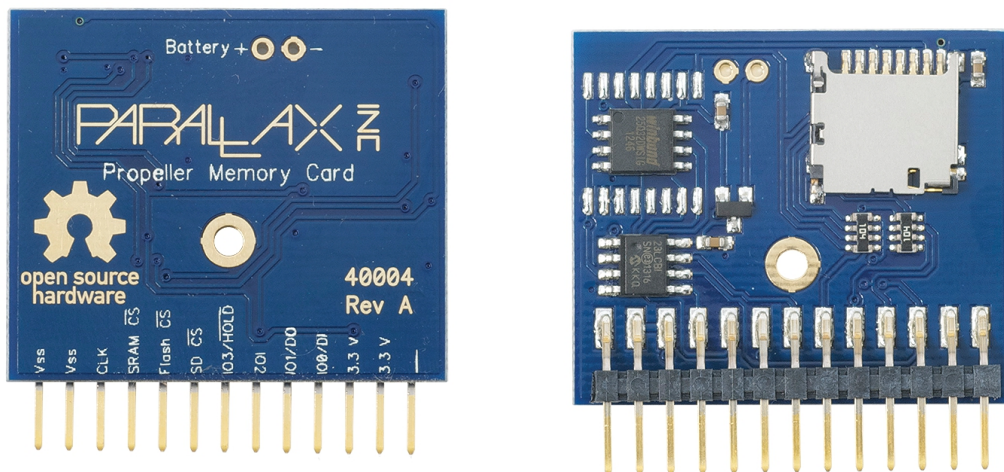


Propeller Memory Card (#40004)

The Propeller Memory Card is a great platform for developing memory-intensive Propeller programs that can benefit from flash, SRAM, or a microSD card. The 13-pin SIP package works well in a breadboard or plugs directly into a Propeller Demo Board or a Human Interface board for the P8X32A Propeller Quickstart. The flash memory is nonvolatile, and the SRAM is volatile, but has an optional solder connection to a battery.

Note: microSD card not included, available separately from www.parallax.com.



Features

- 32 megabit (4 megabyte) non-volatile flash memory in 4 kilobyte sectors
- 1 megabit (128 kilobyte) static RAM
- Card slot for microSD or microSDHC card
- Compatible with sockets on the Propeller Demo Board, or a Human Interface Board for the P8X32A Propeller Quickstart
- Can be used with a breadboard or through-hole board for prototyping or custom projects

Key Specifications

- Power Requirements: 45 mA max (not including a microSD card)
- Communication: Serial Quad Interface (SQI), Quad Peripheral Interface (QPI), and Serial Peripheral Interface (SPI), including dual- and quad-SPI
- Operating temperature: -40 to +185 °F (-40 to +85 °C)
- Dimensions: 1.4 x 1.4 x 0.2 in (36 x 36 x 5 mm)

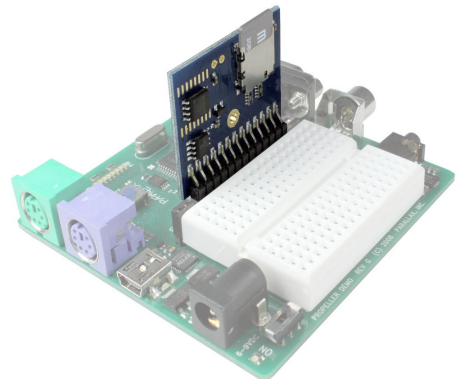
Application Ideas

- Explore tradeoffs between different memory types
- Store images and frame buffers for user interfaces
- Store multiple files and programs
- Execute code from external memory
- Log large amounts of data

Connecting to the Propeller Memory Card

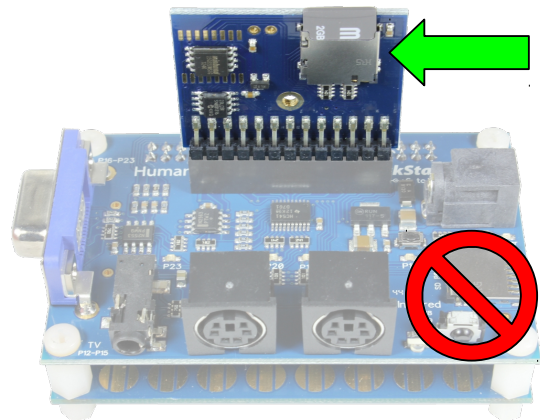
With a Propeller Demo Board

To use the Propeller Memory Card with a Propeller Demo Board, connect the Propeller Memory Card to the Propeller Demo Board, as shown. Take care to match the "Vss" and "3.3 V" pins. If using a microSD card, place it in the socket on the Propeller Memory Card.



With a Human Interface Board

To use the Propeller Memory Card with a Human Interface Board on a Propeller Quickstart, remove any microSD cards, if present, from the Human Interface Board, and connect the Propeller Memory Card to the Human Interface Board as shown, taking care to match the "Vss" and "3.3 V" pins. If using a microSD card, place it in the socket on the Propeller Memory Card, not the socket on the Human Interface Board. Be sure to adjust the Propeller SD card driver's I/O pin usage to match the chart below.



CAUTION: Remove any microSD card from the Human Interface Board before inserting the Propeller Memory Card. The microSD card socket on the Human Interface Board is not compatible with the Propeller Memory Card, whether or not a microSD card is in use. If using a microSD card, use the socket on the Human Interface Board, not the socket on the Propeller Memory Card. Otherwise, communication errors may result.

Propeller P8X32A Connections

Plugging the Propeller Memory Board into the socket on the Propeller Demo Board or the Human Interface Board on a Propeller QuickStart creates the following connections between the Propeller P8X32A and the product's memory devices:

Propeller I/O pin	SD Card function	Flash function	SRAM function
P0	Data In / Command	Data 0	Data 0
P1	Data Out / DAT0	Data 1	Data 1
P2	DAT1	Data 2	Data 2
P3	DAT2	Data 3	Data 3
P4	Chip Select / DAT3	—	—
P5	—	Chip Select	—
P6	—	—	Chip Select
P7	Clock	Clock	Clock

With a Breadboard

To use the Propeller Memory Card with a breadboard, connect either Vss pin to ground, either 3.3 V pin to a 3.3 volt supply, and connect the CLK, IO0/DI, and IO1/DO pins to any Propeller I/O pins. For each feature in use, connect its respective CS pin to a Propeller I/O pin. If using the flash memory in QPI mode, the SRAM in SQI mode, or the microSD card in 4-bit mode, connect the IO2/WP and IO3/HOLD pins to any Propeller I/O pins. If using a microSD card, place it in the socket on the Propeller Memory Card. See Pin Definitions, page 5.

SRAM Backup Battery

To add a battery backup to the SRAM, solder a battery connection to the Battery + and - locations at the top of the Propeller Memory Card. Supply 2.9 to 5.5 volts between the + and - pins, with the anode connected to the + pin and the cathode connected to the - pin.

Programming for the Propeller Memory Card

Driver Object

To use the flash memory or SRAM in the Propeller Memory Card with a Spin program, download "40004-Propeller-Memory-Card-Demo-v1.0.zip" from the Propeller Memory Card product page at www.parallax.com and include the "SPI Memory Driver.spin" object in your program. You can also use the "Propeller Memory Card Demo.spin" program as a template to create new programs using the flash memory or SRAM. The demo has the pin definitions set for use with the Human Interface Board or Propeller Demo Board. If used with a breadboard, modify the pin definitions to match the connections you have created.

Use the methods listed below to read from and write to the flash memory and SRAM.

For all of the methods, if length is positive, then data is treated as a pointer. If length is between negative one and negative four, then the absolute value of the length is used, with the number of bytes either read from the data variable or returned by the function, depending on whether the method is reading or writing data.

SPI Memory Driver Public Methods

Method call	Description
START (<i>CLK pin, IO0/DI pin, IO1/DO pin, Flash CS, SRAM CS, IO2/WP, IO3/HOLD</i>)	Run the SPI memory driver using the provided I/O pins and return the size of the flash memory, in bytes.
Stop	Stop the SPI memory driver.
ReadSRAM (<i>address, data, length</i>)	Read a specified amount of data from the SRAM, starting at the specified address.
WriteSRAM (<i>address, data, length</i>)	Write a specified amount of data to the SRAM, starting at the specified address.
ReadFlash (<i>address, data, length</i>)	Read a specified amount of data from the flash memory, starting at the specified address.
WriteFlash (<i>address, data, length</i>)	Write a specified amount of data to the flash memory, starting at the specified address.
EraseFlash (<i>address</i>)	Erase a 4 kilobyte sector of flash memory containing the specified address.

Memory Types

The Propeller Memory Card includes SRAM, Flash, and a socket for a microSD or microSDHC card.

SRAM

The Microchip 23LC1024 provides 128 kilobytes, for 1 megabit, of static random-access memory. As shipped, the memory is volatile, but can be made nonvolatile with the addition of a battery to the Battery + - pins. (See SRAM Backup Battery) The SRAM supports a Serial Peripheral Interface (SPI) in 1-bit, 2-bit, or 4-bit data modes. It also supports a Serial Quad Interface which uses a 4-bit command and data bus. It supports a clock rate of up to 20 MHz.

Flash

The Winbond W25Q32FV provides 4 megabytes, for 32 megabits, of nonvolatile flash memory. The flash memory is arranged in 256-byte pages, 4-kilobyte sectors, and 64-kilobyte blocks. The flash controller can erase individual sectors and blocks, or the entire device. It supports a Serial Peripheral Interface (SPI) in 1-bit, 2-bit, or 4-bit data modes. It also supports a Quad Peripheral Interface which uses a 4-bit command and data bus. It supports a clock rate of up to 104 MHz, although the Propeller microcontroller's interface runs at a lower clock rate.

microSD Card Socket

The microSD card allows for additional expansion with a microSD or microSDHC card. For more information about using the microSD cards with the Propeller microcontroller, see application note AN006 from www.parallaxsemiconductor.com.

When using the Propeller Memory Card with a Human Interface Board, be sure to use the microSD card socket on the Propeller Memory Card and **leave the socket on the Human Interface Board empty**. Use the following chart to modify the pin definitions to update drivers that were written for the microSD card socket in the Human Interface board:

Pin function on microSD card	Propeller I/O pin used with Human Interface Board	Propeller I/O pin used with Propeller Memory Card
SPI data out	P0	P1
SPI clock	P1	P7
SPI data in	P2	P0
Chip select (Inverted)	P3	P4

Electrical Specifications

Label	Description	Minimum	Maximum	Units
3.3 V	Supply voltage	2.9	3.6	V
Battery +	Battery backup voltage	2.9	5.5	V

Absolute Maximum Ratings

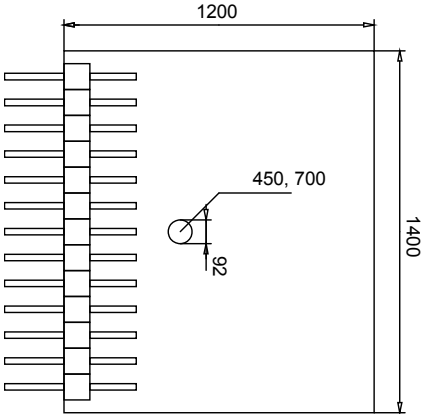
Label	Description	Minimum	Maximum	Units
3.3 V	Supply voltage	-0.3	4.6	V
Battery +	Battery backup voltage	-30	6.5	V

Pin Definitions

Label	Type	Propeller I/O pin ¹	SD Card function	Flash memory function	SRAM function
—	n/c	—	—	—	—
3.3 V	Power	—	—	—	—
3.3 V	Power	—	—	—	—
IO0/DI	Bidirectional	P0	Data In / Command	Data 0	Data 0
IO1/DO	Bidirectional	P1	Data Out / DAT0	Data 1	Data 1
IO2/WP	Bidirectional	P2	DAT1	Data 2	Data 2
IO3/HOLD	Bidirectional	P3	DAT2	Data 3	Data 3
SD CS	Bidirectional	P4	Chip Select / DAT3	—	—
Flash CS	Input	P5	—	Chip Select	—
SRAM CS	Input	P6	—	—	Chip Select
CLK	Input	P7	Clock	Clock	Clock
Vss	Ground	—	—	—	—
Vss	Ground	—	—	—	—
Battery +	Power	—	—	—	—
Battery -	Ground	—	—	—	—

1. When connected on Human Interface Board or Propeller Demo Board

Module Dimensions (In thousandths of an inch)



Revision History

Version 1.0

Initial version