

Introduction to Basic Stamp microcontroller and PBASIC Programming Language

What is a Basic Stamp?



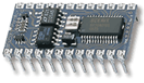

BASIC Stamps are hybrid microcontrollers.

What is a microcontroller?

Microcontrollers can be thought of as very small computer which may be programmed to control systems and interact with the real world, such as cell phones, microwave ovens, toys, automotive systems, etc.

What are the most common BASIC Stamp versions?

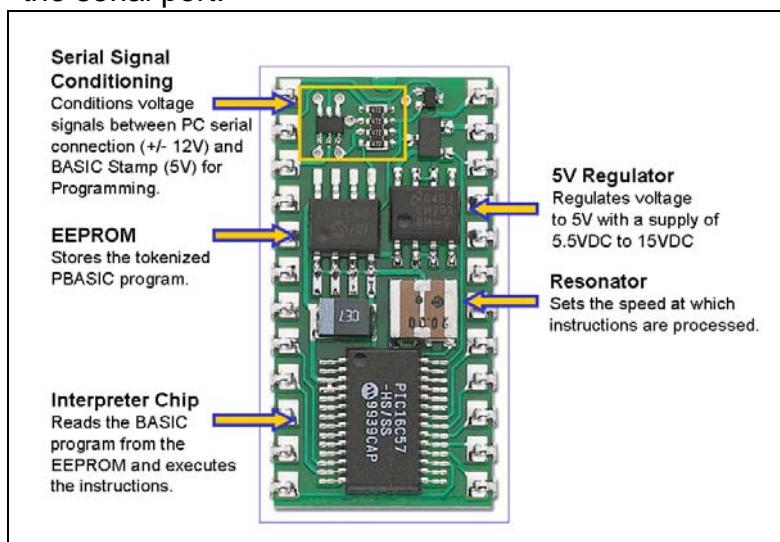
There are several version of the BASIC Stamp. Each BASIC Stamp has different features, below are the most popular types.

	Version	Memory	Speed	Additional Features
	BS2	2K Bytes 500 lines of code	20MHz 4000 instructions/ second	26 Bytes of RAM
	BS2 OEM	2K Bytes 500 lines of code	20MHz 4000 instructions/ second	26 Bytes of RAM Less expensive, easy to replace components.
	BS2sx	16K Bytes in 8 2K banks. 4000 lines of code	50MHz 10,000 instructions/ second	26 Bytes of RAM 63 bytes of scratchpad memory
	BS2p 24 and 40 pins versions	16K Bytes in 8 2K banks. 4000 lines of code.	20 MHz Turbo	I2C, Dallas 1- Wire, LCD, polling capabilities. 16 extra I/O on 40 pin version.

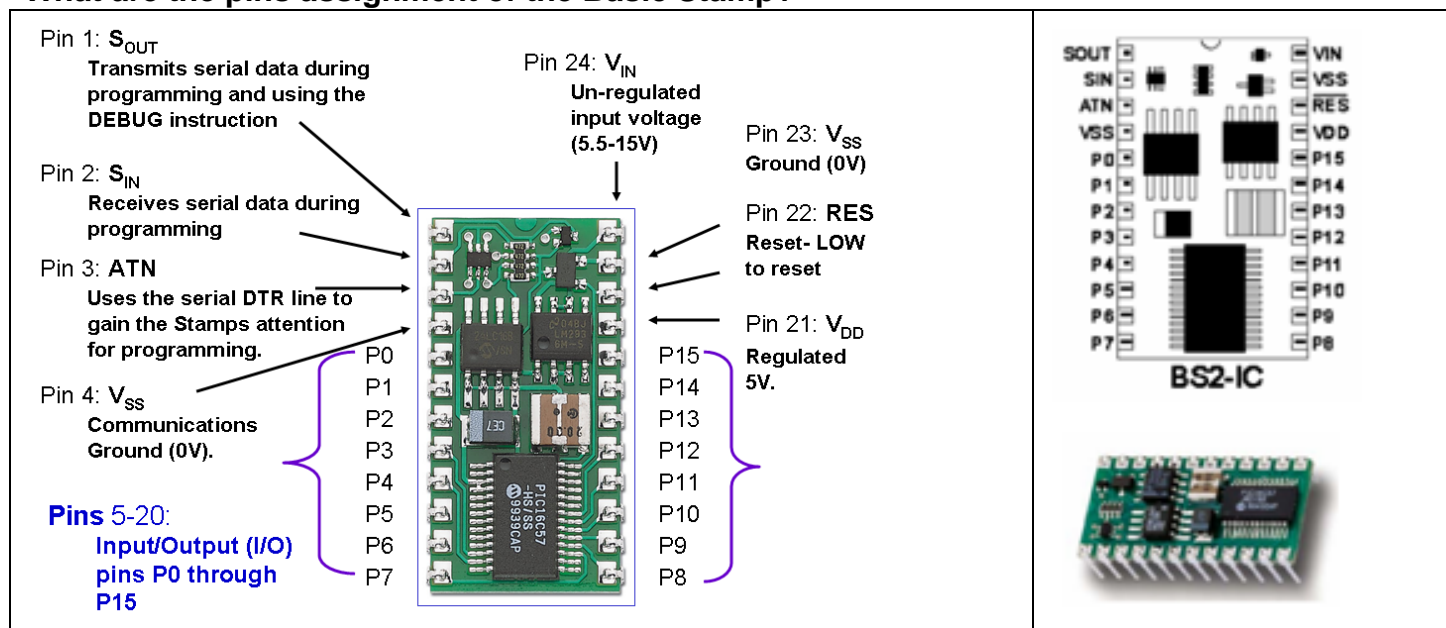
What are inside a BASIC Stamp and what type of programming language can be executed by BASIC Stamp?

Each BASIC Stamp comes with a BASIC Interpreter chip, internal memory (RAM and EEPROM), a 5-volt regulator, a number of general-purpose I/O pins (TTL-level, 0-5 volts), and a set of built-in commands for math and I/O pin operations. BASIC Stamp modules are capable of running a few thousand instructions per second and are programmed with a simplified, but customized form of the BASIC programming language, called PBASIC.

PBASIC stands for Parallax BASIC which is a variant of BASIC developed by Parallax Inc. This special language similar to traditional BASIC instructions, such as FOR..NEXT, IF..THEN and GOTO along with some useful extra instructions that are specially for input and output (I/O). Programs can be written using the STAMP programming software and downloaded to the BASIC Stamp through the serial port.



What are the pins assignment of the Basic Stamp?



The BASIC Stamp has a total of 24 pins, as shown in Figure. Some of them are used to connect the BASIC Stamp to the PC and the 9 volt battery. Sixteen of them (P0 to P15) are used to connect to the “real world” as input or output.

(Pin 23) V_{SS} – Ground (0 volt)

(Pin 24) V_{in} - Power in (5.5-15v unregulated)

(Pin 22) V_{dd} - +5v out (regulated)

(Pin 5...12) I/O pins (P0...P7) Each has 20mA out limit, 25mA in limit and 50mA max total

(Pin 13...20) I/O pins (P8...P15) Same current limits

BASIC stamp I/O pins assignment

Word Name	Byte Names	Nibble Names	Bit Name	Special Notes
INS	INL INH	INA, INB INC, IND	IN0 - IN7 IN8 - IN15	Input pins
OUTS	OUTL OUTH	OUTA, OUTB OUTC, OUTD	OUT0 - OUT7 OUT8 - OUT15	Output pins
DIRS	DIRL DIRH	DIRA, DIRB DIRC, DIRD	DIR0 - DIR7 DIR8 - DIR15	I/O pin direction control

The 16 I/O pins can be used as a group or divided into 2 groups (high byte and low byte group) or divided into 4 groups (A, B, C, D nibble group) or 16 I/O pins (0...15 bit) use individually. Therefore, the usage of these I/O pins are very flexible.

The INS variable shows the state of the I/O pins themselves, regardless of the direction of each I/O pin. We call this, "reading the pins".

The OUTS variable hold the state (0 or 1, H or L) of the I/O pins.

DIRS determines whether a pin's state is set by external circuitry or by the state of OUTS.

Eg. DIRA = 15 or (%1111)

PortA declared as output port

DIRA = 0 or (%0000)

PortA declared as input port

IN5

Read the status of Pin 5.

OUT2=1

Output high status (5V) to P2.

OUTC=%0101 or (7)

Output status P11(L) , P10(H), P9(L), P8(H)