

Hardware

02/03/2005

Hardware del BoeBot

1

Introducció al Basic Stamp

Mòduls Basic Stamp

- Introduïts en el mercat el 1992.
- Actualment, existeixen més de 200.000 exemplars en el mercat.
- Existeixen actualment cinc models segons funcionalitat.

02/03/2005

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2

Elements del Basic Stamp

- Incorpora un C.I. intèrpret de Basic.
- Memòria RAM y EEPROM interna.
- Regulador de tensió de 5v.
- Varis pins E/S TTL.
- Driver de potència.
- Driver de motor DC.

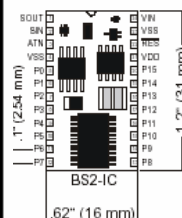
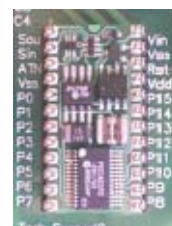
02/03/2005

Hardware del BoeBot

3

Basic Stamp 2

Pin	Name	Description
1	SCOUT	Serial Out: connects to PC serial port RX pin (DB9 pin 2 / DB25 pin 3) for programming.
2	SIN	Serial In: connects to PC serial port TX pin (DB9 pin 3 / DB25 pin 2) for programming.
3	ATN	Attention: connects to PC serial port DTR pin (DB9 pin 4 / DB25 pin 20) for programming.
4	VSS	System ground: (same as pin 23) connects to PC serial port GND pin (DB9 pin 5 / DB25 pin 7) for programming.
5-20	P0-P15	General-purpose I/O pins: each can sink 25 mA and source 20 mA. However, the total of all pins should not exceed 50 mA (sink) and 40 mA (source) if using the internal 5-volt regulator. The total per 8-pin groups (P0 - P7 or P8 - 15) should not exceed 50 mA (sink) and 40 mA (source) if using an external 5-volt regulator.
21	VDD	5-volt DC input/output: if an unregulated voltage is applied to the VIN pin, then this pin will output 5 volts. If no voltage is applied to the VIN pin, then a regulated voltage between 4.5V and 5.5V should be applied to this pin.
22	RES	Reset input/output: goes low when power supply is less than approximately 4.2 volts, causing the BASIC Stamp to reset. Can be driven low to force a reset. This pin is internally pulled high and may be left disconnected if not needed. Do not drive high.
23	VSS	System ground: (same as pin 4) connects to power supply's ground (GND) terminal.
24	VIN	Unregulated power in: accepts 5.5 - 15 VDC (6-40 VDC on BS2-IC rev. e), which is then internally regulated to 5 volts. May be left unconnected if 5 volts is applied to the VDD (+5V) pin.



02/03/2005

Hardware del BoeBot

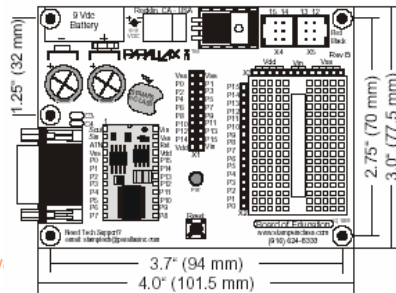
4

Placa Base



•INCORPORA:

- Incorpora connector de programació DB9.
- Botò de Reset.
- Clips per bateria de 9v.
- 4 connectors per motors Servo.
- Regulador de tensió.

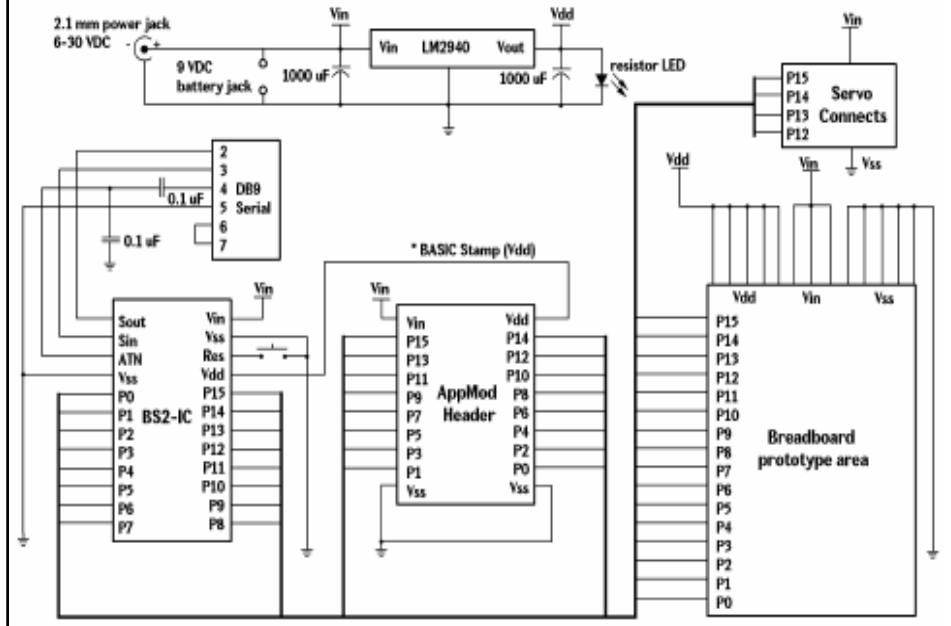


02/03/2005

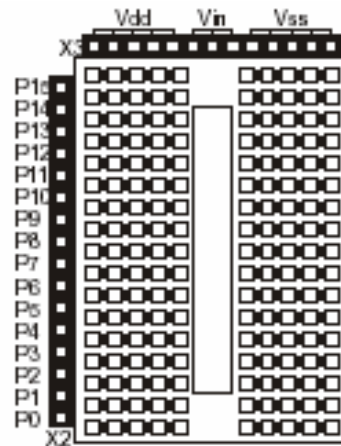
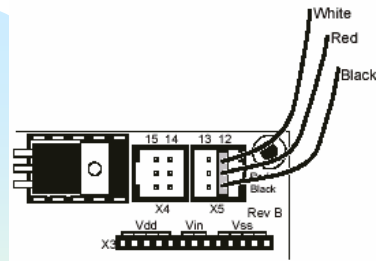
Hardw.

5

Diagrama de blocs



Placa de disseny



02/03/2005

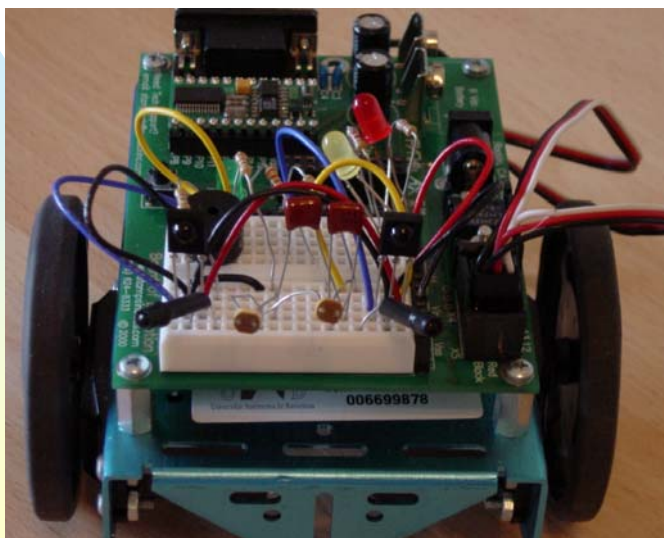
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7

Especificacions del micro

Released Products	Rev.D / BS1-IC	BS2-IC
Package	PCB w/Proto / 14-pin SIP	24-pin DIP
Package Size (L x W x H)	2.5" x 1.5" x .5" / 1.4" x .6" x .1"	1.2" x 0.6" x 0.4"
Environment	0° - 70° C* (32° - 158° F) **	0° - 70° C* (32° - 158° F) **
Microcontroller	Microchip PIC16C56	Microchip PIC16C57
Processor Speed	4 MHz	20 MHz
Program Execution Speed	~2,000 instructions/sec.	~4,000 instructions/sec.
RAM Size	16 Bytes (2 I/O, 14 Variable)	32 Bytes (6 I/O, 26 Variable)
Scratch Pad RAM	N/A	N/A
EEPROM (Program) Size	256 Bytes, ~80 instructions	2K Bytes, ~500 instructions
Number of I/O pins	8	16 + 2 Dedicated Serial
Voltage Requirements	5 - 15 vdc	5 - 15 vdc
Current Draw @ 5V	2mA Run / 20µA Sleep	8 mA Run / 100 µA Sleep
Source / Sink Current per I/O	20 mA / 25 mA	20 mA / 25 mA
Source / Sink Current per unit	40 mA / 50 mA	40 mA / 50 mA per 8 I/O pins
PBASIC Commands	32	36
PC Programming Interface	Parallel Port	Serial Port (9600 baud)
DOS Text Editor	STAMP.EXE	STAMP2.EXE
Windows Text Editor	N/A	Stampw.exe (v1.04 and up)

Disseny complert



02/03/2005

9

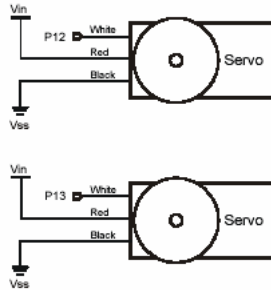
Taula d'interconnexions

Dispositivo	Puerto
Sensor de luminosidad izquierdo	P5
Sensor de luminosidad derecho	P4
Detector I.R. Izquierdo	P8
Emisor I.R Izquierdo	P7
Detector I.R. Derecho	P0
Emisor I.R Derecho	P1
Zumbador	P2
Led Rojo	P15
Led Amarillo	P14
Servo motor izquierda	P13
Servo motor derecha	P12

02/03/2005

10

Circuit control de servo



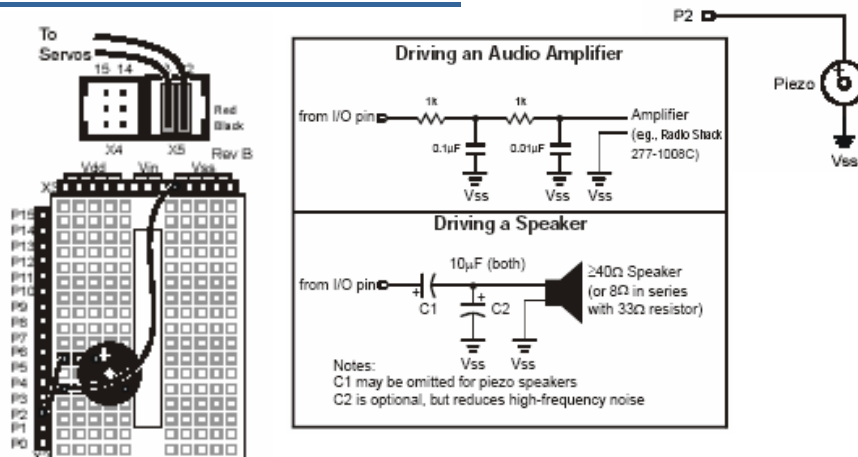
Low 12	‘ posar sortida P12 a baixa
Low 13	‘ posar sortida P13 a baixa
Loop: pulsout 12, 750	‘ enviar pols de 1.5ms a P12
pulsout 13, 750	‘ enviar pols de 1.5ms a P13
pause 20	‘ cada 20 ms
goto loop	

02/03/2005

Hardware del BoeBot

11

Circuit control xiulet



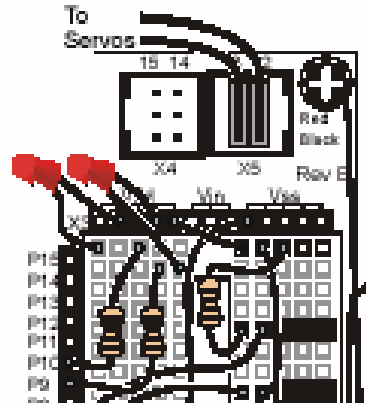
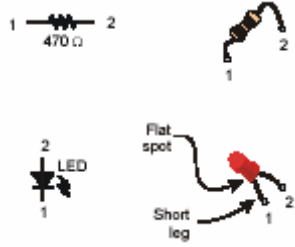
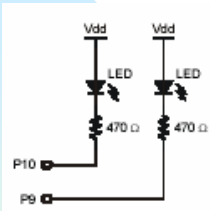
Debug cls, “Bip!”	‘ display
Output 2	‘ bip!
Freqout 2, 2000, 3000	‘ senyal de 3Khz durant 2 s

02/03/2005

Hardware del BoeBot

12

Circuit control de leds



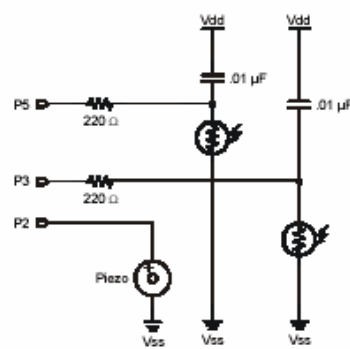
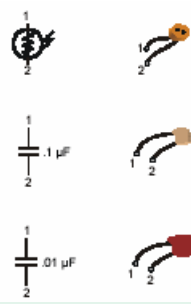
Low 12
Low 13

02/03/2005

Hardware del BoeBot

13

Circuit control sensor Iluminós (I)



$$\frac{t}{R \times C} = \ln\left(\frac{V_{initial}}{V_{final}}\right)$$

$$\frac{t}{R \times 0.01 \times 10^{-6}} = \ln\left(\frac{5V}{1.4V}\right) \text{ s}$$

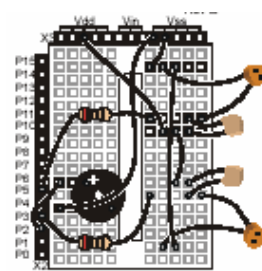
$$t = \ln(3.57) \times R \times 0.01 \times 10^{-6} \text{ s}$$

$$t = 1.27 \times 10^{-8} \times R \text{ s}$$

Fotoresistors Vactec EG&G #VT935G

Photoresistor Specifications

Resistance (Ohms)					Peak Spectral Response nm	V _{MAX}	Response Time @ 1 fc (ms, typ.)	
10 Lux 2850K			Dark				Rise (1-1/e)	Fall (1/e)
Min	Typ.	Max.	Min.	Sec.				
20K	29.0K	38K	1M	10	550	100	35	5



14

Circuit control sensor Iluminós (II)

Mesura del temps RC

```
' Robotics! vl.5, Program Listing 4.1: Photoresistor rcTime Display
' {$Stamp bs2}                                ' Stamp Directive.

'----- Declarations -----
left_photo  var word                            ' For storing measured RC times of
right_photo var word                            ' the left & right photoresistors.

'----- Initialization -----
debug cls                                       ' Open and clear a Debug Terminal.

'----- Main Routine -----
main:
  ' Measure RC time for right photoresistor.

  high 3                                       ' Set P3 to output-high.
  pause 3                                     ' Pause for 3 ms.
  rcTime 3,1,right_photo                       ' Measure RC time on P3.

  ' Measure RC time for left photoresistor.

  high 5                                       ' Set P5 to output-high.
  pause 3                                     ' Pause for 3 ms.
  rcTime 5,1,left_photo                        ' Measure RC time on P5.

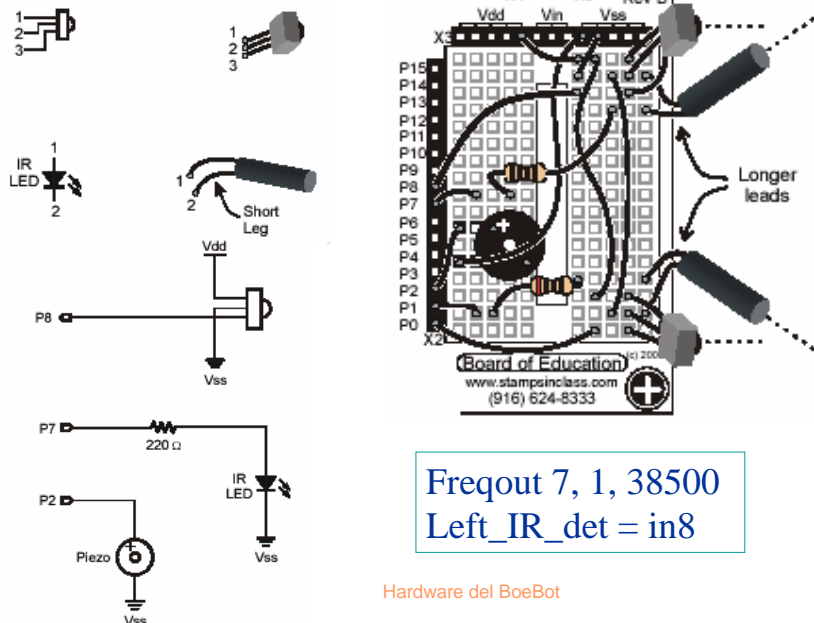
  ' Display RC time measurements using Debug Terminal.

  debug home, "L ", dec5 left_photo, " R ", dec5 right_photo

goto main
```

15

Circuit detector I.R.



Freqout 7, 1, 38500
Left_IR_det = in8

Hardware del BoeBot

16