



SBC45EC

Single board computer for 44 pin PLCC PICs

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1 Introduction

The following documentation is for the SBC45EC Revision 2, which is marked on the PCB as SBC45ECR2!

SBC45EC is a single board computer with 10Mbps Ethernet and RS232 interface for 44 pin PLCC PIC18Fxxx microcontrollers. It is designed to run with a slightly modified version of the free Microchip TCP/IP stack written in C, that can be compiled with the Hi Tech or Microchip PIC18 C compilers. See <http://www.modtronix.com/info/mplabc18> The stack needs to be modified so RA0-RA3 and RA5 are used to address the Ethernet chip in stead of RB0-RB4. The modified stack is available for free from our product page, see www.modtronix.com/products/sbc45ec. Typical applications include HTTP Web servers, Mail clients, Ethernet to RS232 interface converter, Ethernet to RS485 interface converters, Remote control via Web Server, Protocol Bridge applications - Ethernet to USART, CAN, I2C, SPI etc.

It has been tested with the following 44 pin PLCC PIC chips and the Microchip TCP/IP stack:

- PIC18F452, PIC18F458

It can however also be used with any other 44 pin PLCC PIC18 chips, as long as it has enough FLASH memory.



Figure 1

2 Features

- Is part of our MicroX product range, meaning you can upgrade or expand it with any of the other MixroX products. For details see www.modtronix.com/microx.
- Diode protected 2.1mm power connector for standard DC transformer. Center is positive.
- Wide operating voltage range from 7 – 35V.
- Red 3mm Power LED to indicate when module is powered.
- RJ45 connector with two built in LEDs. Green LED is for link indication, yellow LED is for activity.
- Assembled with 10BaseT Ethernet and RS232 interface with +- 15kV ESD protection.
- RS232 interface via 3 pin molex type connector or Frontend board.
- Has a 7 pin expansion header with ground, +5V, I2C and 2 general purpose I/O signals.
- Has a 32 pin Frontend connector. For details see www.modtronix.com/microx/expansion
- Assembled with brand name, quality components. For example, electrolytic capacitor used is extra long life rated, which is 5 times more than standard!
- Has an ICSP (In Circuit Serial Programming) connector (ICPC1 type) - CPU can be programmed and debugged in circuit. For details see <http://www.modtronix.com/picboards/prog>.
- Is designed to run with a freely available slightly modified version of the Microchip free TCP/IP stack (see <http://www.modtronix.com/info/mplabc18>) that features:
 - Includes MAC, IP, ARP, ICMP, TCP, UDP, HTTP, FTP, DHCP, IP Gleaning, MPFS
 - Socket support for TCP and UDP
 - Portable across PIC18 MCUs
 - Out-of-box support for Microchip C18 and Hi-Tech PICC-18 compilers
 - RTOS independent
 - Full TCP state machine
 - Modular Design

3 Expansion Connectors

3.1 Frontend Connectors

The SBC45EC's Frontend connectors can be used as an expansion port to add additional functionality. It contains all free CPU port pins, power, I2C, SPI, RS232 signal,..... For the location of the Frontend connectors, see the *Dimensions* chapter of this document. The Frontend connectors port pins are mapped to the following signals:

<i>BRD2 Frontend Connector</i>			<i>BRD1 Frontend Connector</i>		
Name	Pin	<i>Signal</i>	Name	Pin	<i>Signal</i>
T0	2	N.C.	T4	2	N.C.
T1	1	N.C.	T5	1	N.C.
T2	4	N.C.	T6	4	PIC pin RC0
T3	3	Ground	T7	3	PIC pin RC1
SIG0	6	RS232 receive signal – at RS232 signal levels!	GND	5	Ground
SIG1	5	RS232 transmit signal – at RS232 signal levels!	+5V	7	Regulated 0.5A 5V supply
B0	13	PIC pin RB0	VIN	8	Unregulated input voltage
B1	14	PIC pin RB1	CLR#	6	PIC pin /MCLR
B2	11	PIC pin RB2	A0	10	N.C.
B3	12	PIC pin RB3	A1	9	N.C.
B4	9	PIC pin RB4	A2	12	N.C.
B5	10	PIC pin RB5	A3	11	N.C.
B6	7	PIC pin RB6 – also used for ICP ⁽¹⁾	C2	16	PIC pin RC2
B7	8	PIC pin RB7 – also used for ICP ⁽¹⁾	C3	15	PIC pin RC3 – also used for I ² C ⁽²⁾
A4	15	PIC pin RA4 – also used for IOCHRDY ⁽³⁾	C4	14	PIC pin RC4 – also used for I ² C ⁽²⁾
A5	16	N.C.	C5	13	PIC pin RC5

(1) Port Pins B6 and B7 are also used for in circuit programming, if the board is programmed in circuit! If they are used, and the board should still be in circuit programmable, make sure their impedance is greater than a 1000 ohms!

(2) The Microchip TCP/IP stack also uses these pins as an I2C bus to access the external EEPROM if configured to use an external EEPROM. See Microchip TCP/IP stack documentation for more details.

(3) By default pin RA4 is connected to the RTL8019AS chip's IOCHRDY signal via solder jumper SJ5. The user can use this signal for general purpose I/O by opening SJ5 solder jumper (Cut thin track between pads of solder jumper SJ5 on back of board).

Figure 2 shows the locations of the frontend connectors on the board.

Frontend Connector on MicroX Main Board (SBC)

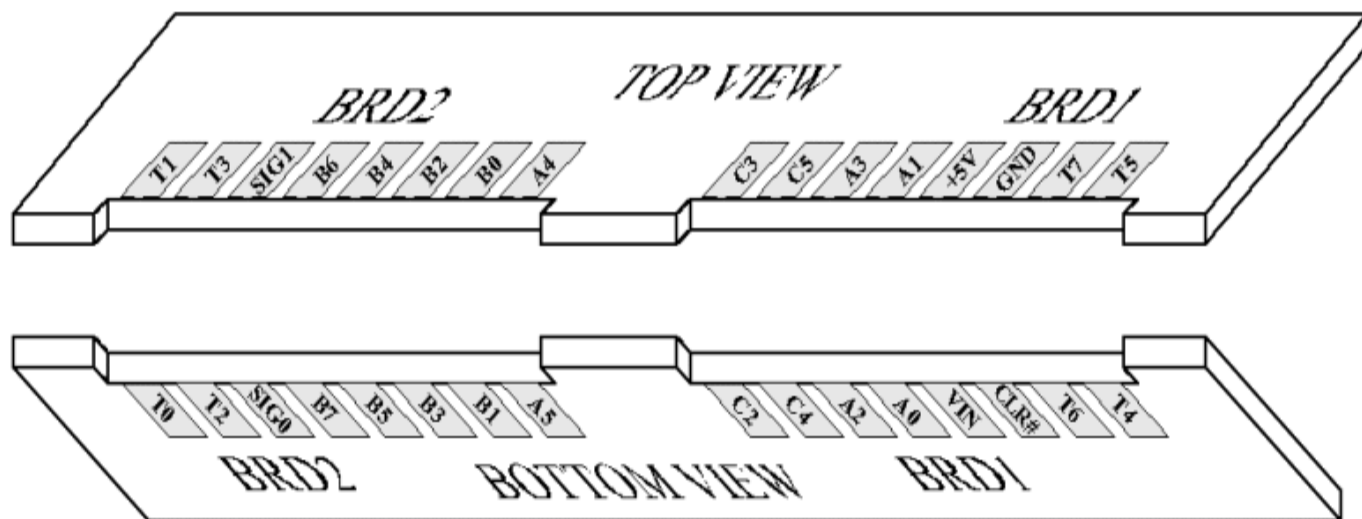
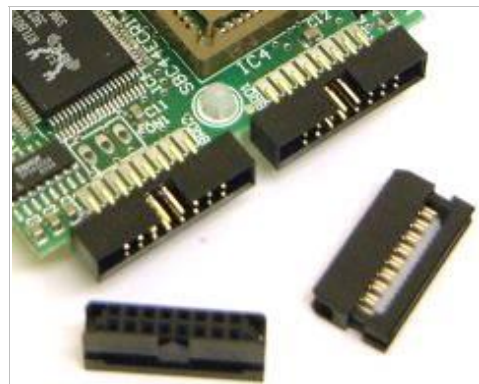


Figure 2

3.1.1 Connecting IDC connectors to the Frontend Connector

An easy way of accessing the BRD1 and BRD2 Frontend Connector signals is by soldering a 2mm IDC connectors onto one or both of the frontend connectors. By doing this, the frontend signals will be available via a standard 2mm ribbon cable.



3.2 Expansion boards

The SBC45EC's Frontend connectors can be used as an expansion port to add additional functionality. It contains all free CPU port pins, power, I2C, SPI, RS232 signal,..... For a list of Frontend Boards currently available from Modtronix Engineering, see www.modtronix.com/products/sbc45ec.

Additionally, users can download PCB templates for creating their own Frontend expansion boards from our Download page – see www.modtronix.com/downloads.



3.3 Pin header

In addition to the frontend connector, a 7 pin, 2mm header is provided with additional signals. It has the following signals:

<i>Connector Pin</i>	<i>Description</i>
1	PIC Port pin RC2. Can be used for user IO.
2	PIC Port pin RC3 – I ² C bus clock
3	PIC Port pin RC4 – I ² C bus data
4	PIC Port pin RC5. Can be used for user IO.
5	+5V
6	N.C. Can be cut and used as a tab to prevent socket from being inserted the wrong way.
7	Ground

Seeing that this header makes the power and I2C signals available, it is well suited for connecting external I2C devices. This pin header, J1, is located behind the BRD1 Frontend connector, see the *Dimensions* chapter later on for details and location.

4 Interfaces

4.1 Ethernet

The SBC45EC has a 10Mbps Ethernet port. The RJ45 connector meets IEEE 802.3 standards and FCC mechanical requirements. The RJ45 connector has two built in LEDs, a green LED for link indication, and a yellow LED for activity.

4.2 RS232

The SBC45EC has a USART interface with +- 15kV ESD protection. The USART signals are available via a 3 pin molex type connector or the Frontend connector. Four solder jumpers (SJ1 to SJ4) on the back of the board are used to configure if the USART signals are RS232 or TTL voltage levels – see circuit diagram at end of document for details.

At delivery solder jumpers SJ3 and SJ4 are made, which configures the USART signals for RS232 voltage levels. By making solder jumpers SJ1 and SJ2, and opening SJ3 and SJ4, the USART pins can be configured for TTL signal levels.

4.3 ICSP connector

The SBC45EC has an ICSP (In Circuit Serial Programming) connector (ICPC1 type). This enables the PIC to be programmed and debugged in circuit. For details on programming and debugging in circuit see <http://www.modtronix.com/picboards/prog>.

5 Configuration

The SBC45EC board can be configured via solder jumpers SJ1 to SJ5.

SJ1 to SJ4 are used to select RS232 or TTL signals for the USART – see section on RS232 above for details.

SJ5 is used to route the IOCHRDY signal from the RTL8019AS Ethernet chip to PIC port pin RA4. The IOCHRDY can be used by the TCP/IP stack software to monitor when the RTL8019AS is ready. The SJ5 jumper is made by default. The user can use this signal for general purpose I/O by opening SJ5 solder jumper (Cut thin track between pads of solder jumper SJ5 on back of board).

6 External Memory

The SBC45EC board has a 8 pin IC socket for mounting a serial EEPROM, like the 24LC256 (32Kbytes) or 24LC512 (64 Kbytes) chips.

At delivery, the SBC45EC board is fitted with a 24LC256 EEPROM and the PIC programmed with the Modtronix TCP/IP stack (modified Microchip TCP/IP stack) that uses the external EEPROM for storing configuration data and web pages.

The 24LC256 has 32Kbytes of non volatile memory, which is large enough for several web pages, including some small pictures. If this is not large enough, a larger 24LC512 chip can be fitted that can hold twice as much data.

7 Specifications

7.1 Absolute Maximum Ratings

<i>Item</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
Operating Temperature:	Top	0		70	°C
Storage Temperature:	Tst	-65		140	°C

7.2 Electrical Characteristics

<i>Item</i>	<i>Symbol</i>	<i>Condition</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
DC Supply Voltage:	Vdd	-	7		35	V
Typical Operating Current	Idd	Vdd = 5V		50		mA
RJ45 Ethernet connector DCR RX/TX		T=25°C		0.35		Ω
RJ45 Ethernet connector inductance		T=25°C		0.3		uH
RJ45 Ethernet connector capacitance		T=25°C		12		pF
RJ45 Ethernet connector Hi-Pot test		T=25°C		1500		Vrms

The RJ45 connector (Ethernet connector) meets IEEE 802.3 standards and FCC mechanical requirements.

8 Dimensions

The SBC45EC conforms to the MicroX Compact Main Board Dimensions, as shown in Figure 3.

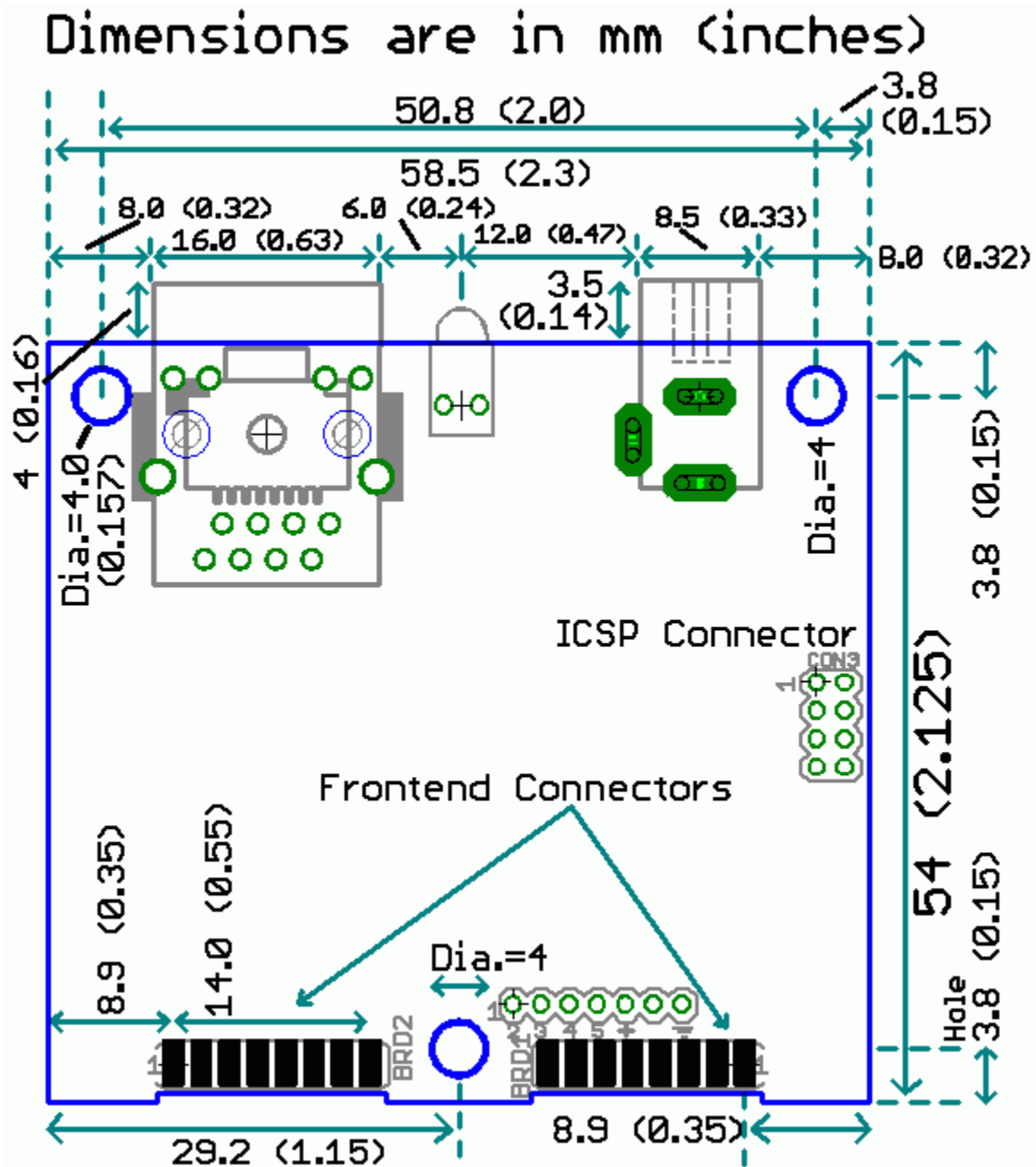


Figure 3

The SBC45EC's PCB layout is shown in Figure 4.

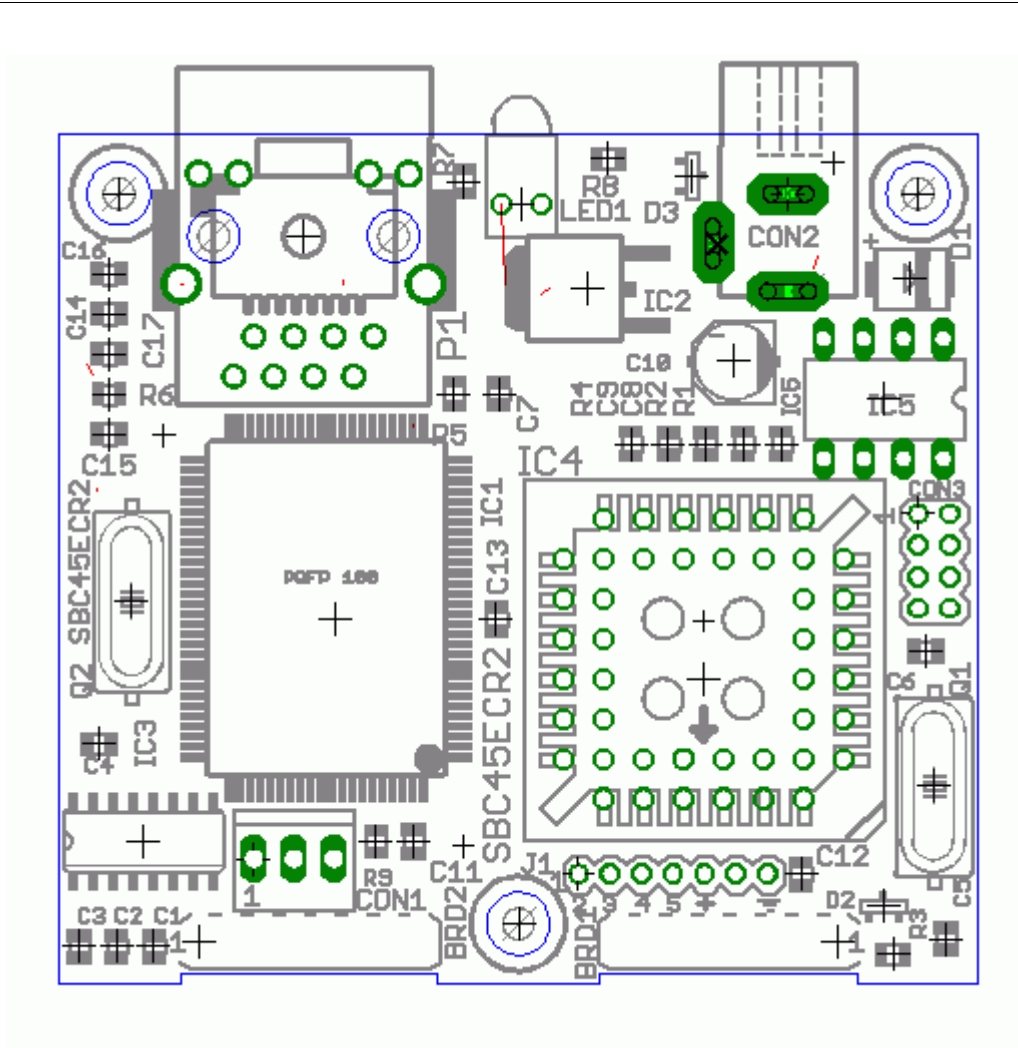


Figure 4

