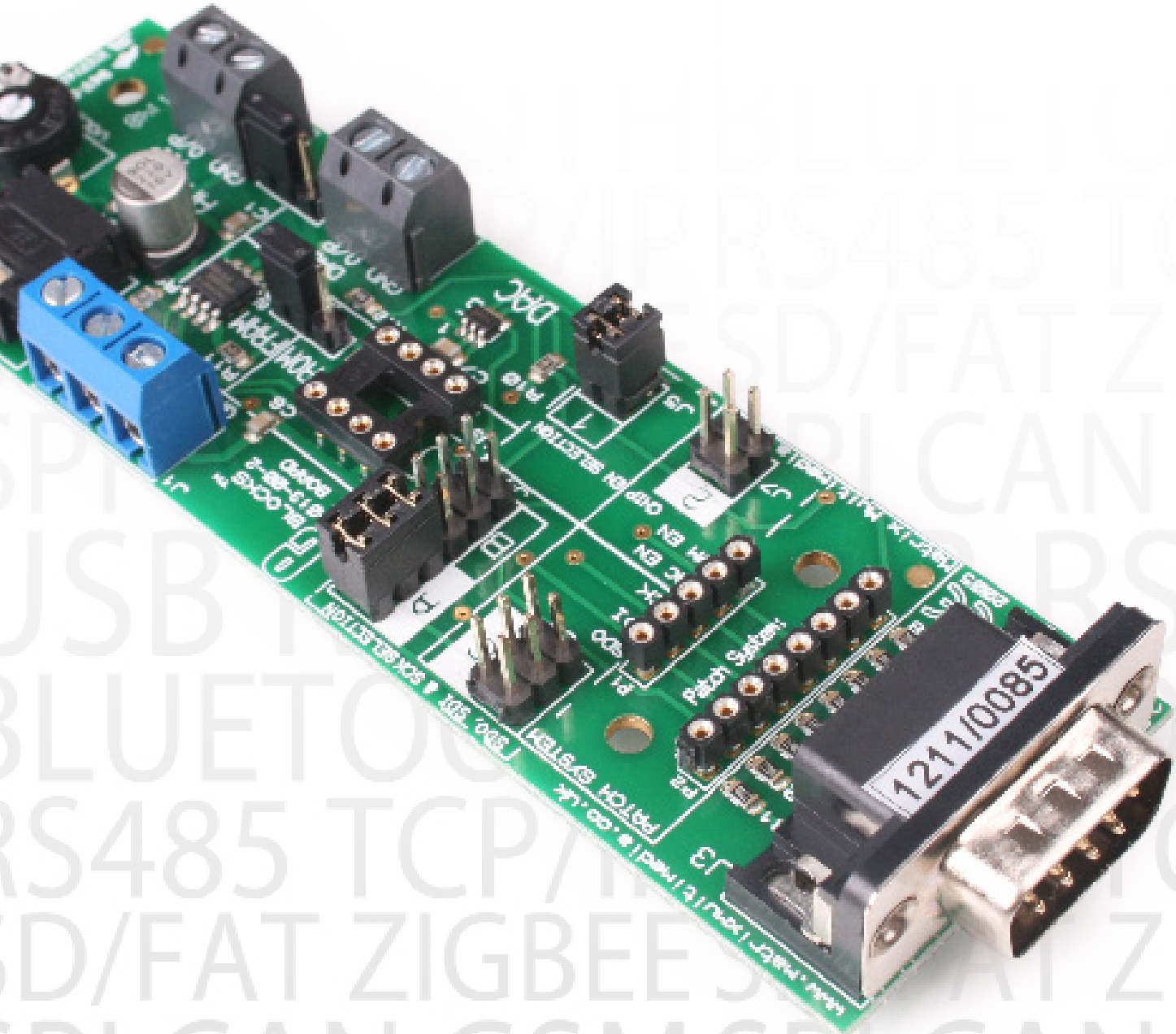
MATRIX

eBLOCKS®

SPI memory and D/A board



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About this document

This document concerns the EB013 E-blocks SPI memory and D/A board.

1. Trademarks and copyright

PIC and PICmicro are registered trademarks of Arizona Microchip Inc. E-blocks is a trademark of Matrix Technology Solutions Ltd.

2. Disclaimer

The information provided within this document is correct at the time of going to press. Matrix TSL reserves the right to change specifications from time to time.

3. Testing this product

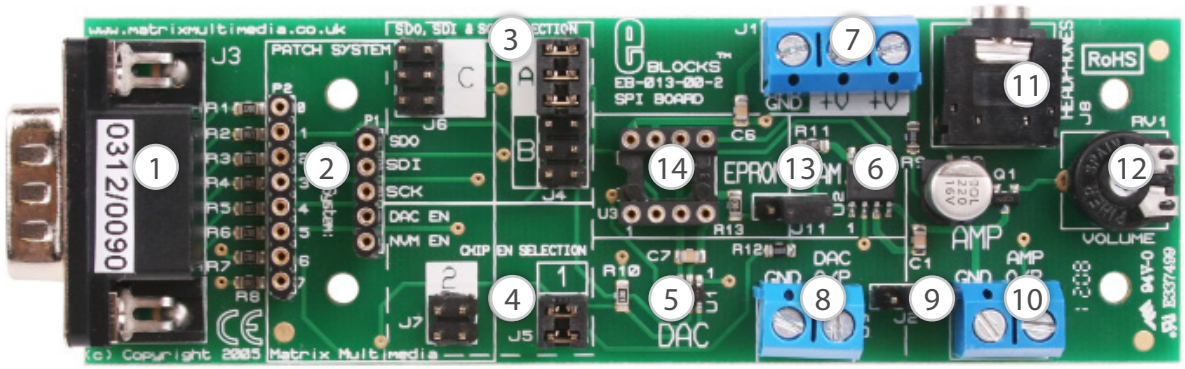
It is advisable to test the product upon receiving it to ensure it works correctly. Matrix provides test procedures for all E-blocks, which can be found in the Support section of the website.

4. Product support

If you require support for this product then please visit the Matrix website, which contains many learning resources for the E-blocks series. On our website you will find:

- How to get started with E-blocks - if you are new to E-blocks and wish to learn how to use them from the beginning there are resources available to help.
- Relevant software and hardware that allow you to use your E-blocks product better.
- Example files and programs.
- Ways to get technical support for your product, either via the forums or by contacting us directly.

Board layout



1. 9-way downstream D-type connector
2. Patch system
3. SDO, SDI & SCK mode selection jumper pins
4. SPI chip enable mode selection jumper pins
5. SPI serial D/A converter
6. SPI serial FRAM
7. Power screw terminals
8. D/A output
9. Amplifier selection jumper pins
10. Amplifier output screw terminal
11. Headphone socket
12. Volume control for amplifier
13. EPROM/FOAM jumper
14. EPROM socket

General guide for CTS and RTS settings (J7):

Jumper settings	Description
1	DAC and NVM chip ENABLE set to bit 7 and 6
2	Patch system

General guide for SDO, SDI & SCK settings (J4&6)

Jumper at A		Jumper at B	Jumper at C
PIC16F7x	PIC16C6x	PIC16F88	Patch system
PIC16F7x7	PIC16CC7x	PIC16F87	
PIC16F87x		PIC16F818	
PIC16F87xA		PIC16F819	
Connect to port C		Connect to Port B	

If using PIC16F88, insert board to Port B and jumper settings = B & 1

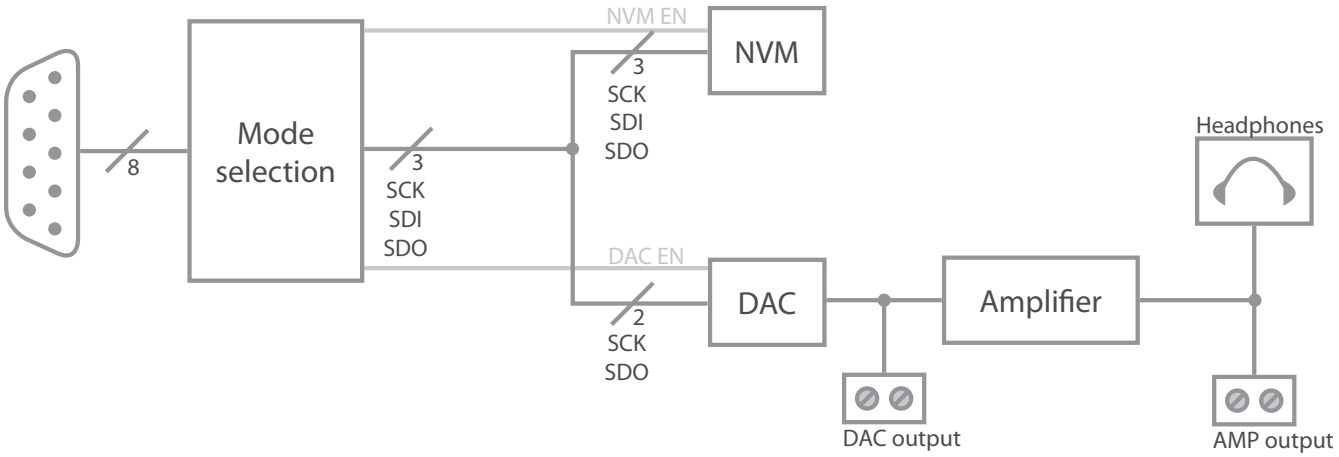
General information

This E-block allows investigation of chip-to-chip serial communication protocols, specifically aimed at the API interface. The board also provides non -volatile memory and a digital to analogue converter. An on board amplifier provides a low current output from the D/A. Also on board is a headphone socket for use in audio applications. Flowcode macros for driving this E-block are available.

A set of jumper links are available which allow the SPI E-block to easily be set for all PICmicro® microcontroller SPI compatible devices. With the patch system available on board makes this board compatible with numerous other devices.

Flowcode macros that makes this device easier to use are available.

1. Features
- SPI serial non-volatile memory
- SPI serial digital to analogue converter
- Flowcode macros available
- Amplifier output for D/A converter



Circuit description

The EB013 SPI memory and D/A board circuit can be observed on page 7.

1. Connectors

The design of this product is to enable you to use it with many standard PICmicro® microcontroller devices. This is achieved by identifying the PICmicro that you are using; then selecting the corresponding jumper setting on the SPI board. This will configure the board to the correct pin-out for that PICmicro® microcontroller.

Jumper setting 1 and 2 are used to set the correct pins for /DAC EN and /NVM EN. Jumper setting 1 will route /DAC EN and /NVM EN to bits 7 and 6, respectively on the port you are using. Jumper setting 2 allows you to route these to any of the 8 bits on the port. Note that /DAC EN and /NVM EN are active low, and therefore become functional when a low signal (0V) is applied to them.

The microcontroller that is being used determines which port and which jumper. For example, if a PIC16F877A is being used, the CAN board must be connected to Port A, with the jumper settings to A & 1.

The following tables illustrate the correct jumper settings.

Jumper setting A		Jumper setting B	Jumper setting C
PIC16F devices	PIC16C devices		
PIC16F72	PIC16C62B	PIC16F87	PATCH SYSTEM
PIC16F73	PIC16C63A	PIC16F88	
PIC16F737	PIC16C65	PIC16F818	
PIC16F74	PIC16C66	PIC16F819	
PIC16F747	PIC16C67		
PIC16F76	PIC16C72A		
PIC16F767	PIC16C73B		
PIC16F77	PIC16C74B		
PIC16F777	PIC16C76		
PIC16F872	PIC16C77		
PIC16F873/A	PIC16C773		
PIC16F874/A	PIC16C774		
PIC16F876/A			
PIC16F877/A			
CONNECT BOARD TO PORT C		CONNECT BOARD TO PORT B	

Table 1. Jumper settings for SDO, SDI & SCK selection

The following table (table 2) shows the settings that can be used for DAC EN and NVM EN.

Jumper setting 1		Jumper setting 2	
DAC EN	NVM EN	DAC EN	NVM EN
Bit 7	Bit 6	Patch	Patch

Table 2. Jumper settings for DAC EN and NVM EN selection

The patch system allows the user to route SDO, SDI, SCK, DAC EN and NVM EN to any 8 of the bits that they require. This allows great flexibility, as the user can then use a different device other than specified in table 1.

2. SPI devices

NON-VOLATILE MEMORY (NVM)

The NVM that is used on this board is FRAM. The device is the FM25640. It is a 64Kb FRAM memory device that uses the high-speed industry standard SPI interface.

The memory architecture is organised into 8, 192 x 8 bits, which are accessed using a total of four pins: data-in (SI), data-out (SO), clock (SCK) and chip select (/CS). The FRAM device has a superior write cycle to that of the same pin-out EEPROM devices, with no write delays.

For more information on this device please refer to the datasheet, which is located on the ELSAM CD that is supplied with all upstream devices. This information can also be found on our E-blocks members area website at: www.matrixtsl.com/eblocks and also on Ramtron's website at: www.ramtron.com

A FRAM is fitted as standard; however by placing the jumper (J11) onto the EPROM side (left hand side) will disable the FRAM and enable an insert EPROM (eg. 25LC640 device) to be used.

DIGITAL TO ANALOGUE CONVERTER (DAC)

The DAC is an 8-bit digital to analogue converter that operates using an SPI compatible interface. The device is a MAX5385, manufactured by Maxim. The MAX5385 offers full 8-bit performance with less than 1 LSB intergral / differential non-linearity error. The MAX5385 has a full-scale output voltage of (0.9 x VDD - 1LSB) with an output buffer of unity gain.

The Matrix ELSAM CD has the datasheet for the device. This information can also be found on our website and on Maxim's website.

Screw terminal J9 allows direct access to the output of DAC. Jumper J2 should be positioned with in link in the section "DAC" labelled on the board to get access to the DAC output at screw terminal J9.

SPI ENABLE LINES

The SPI protocol allows for multiple devices to be connected to the same data (SDI, SDO) and clock lines (SCK). Therefore the each device has a device enable input. When a device is reading or writing data via the SPI lines that device's enable line must be activated. Setting the enable signal low for that device does this.

3. Amplifier

The amplifier circuit is a current amplifier circuit that can be used for audio application. Screw terminal J10 allows direct access to the amplifier output. To access

the amplifier circuit jumper J2 should be positioned so that the link is in the section "AMP" labelled on the board.

The amplifier can be used to drive headphones via the on-board headphone socket J8. The volume of the output can be adjusted using the volume control potentiometer RV1, which also allows correct biasing of the transistor in the amplifier circuit.

The amplifier circuit can be used to drive loudspeakers with load impedance down to 8 ohms. The loudspeaker should be connected via screw terminal J10. These screw terminals (J10) will give direct access to the amplifier output.

4. 3.3V operation

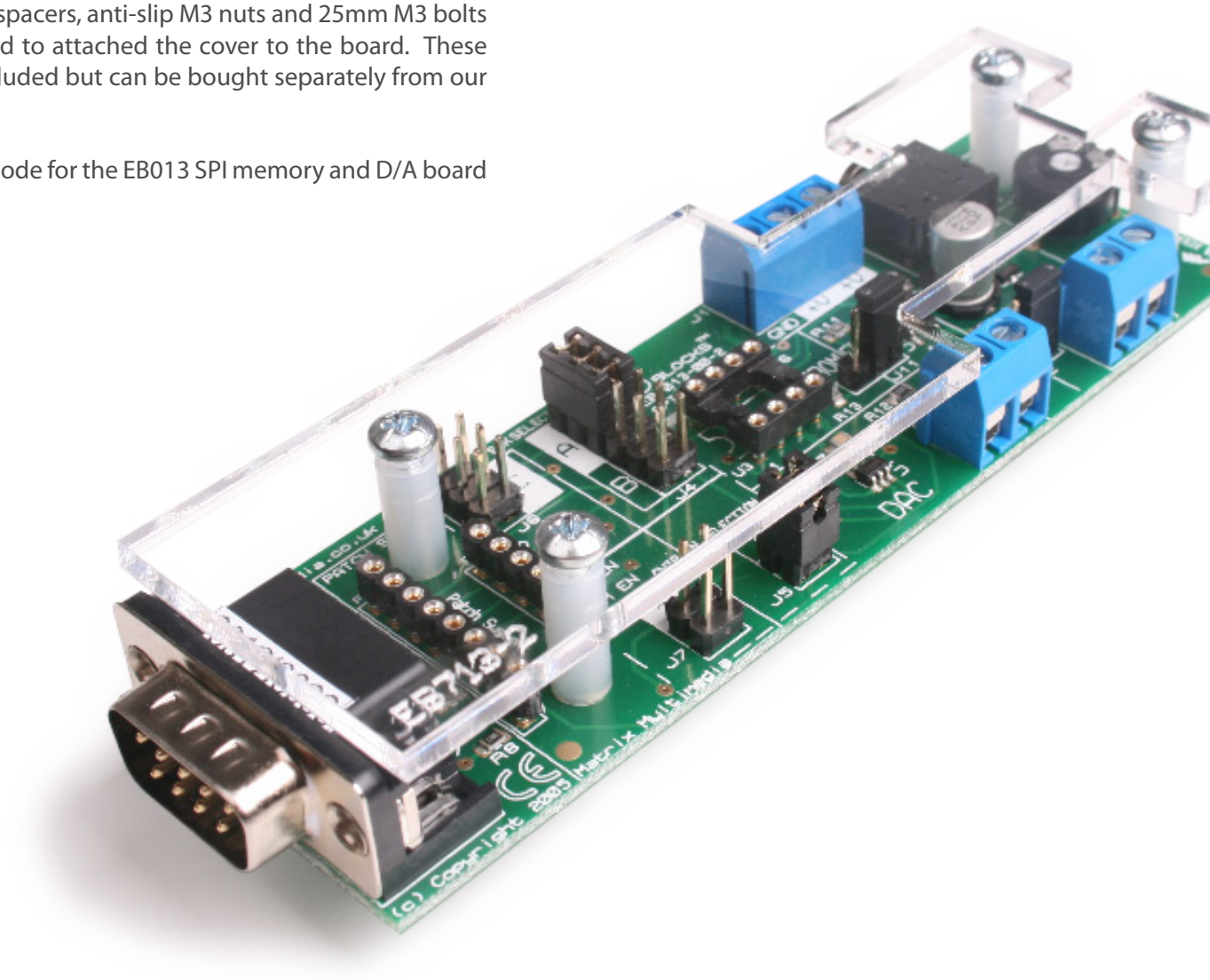
The FRAM fitted at the factory is not 3.3V compatible. However users can fit an EPROM (e.g. 25LC540) which is 3.3V compatible. The MAX 5385 D/A is compatible with 3.3V systems.

Protective cover

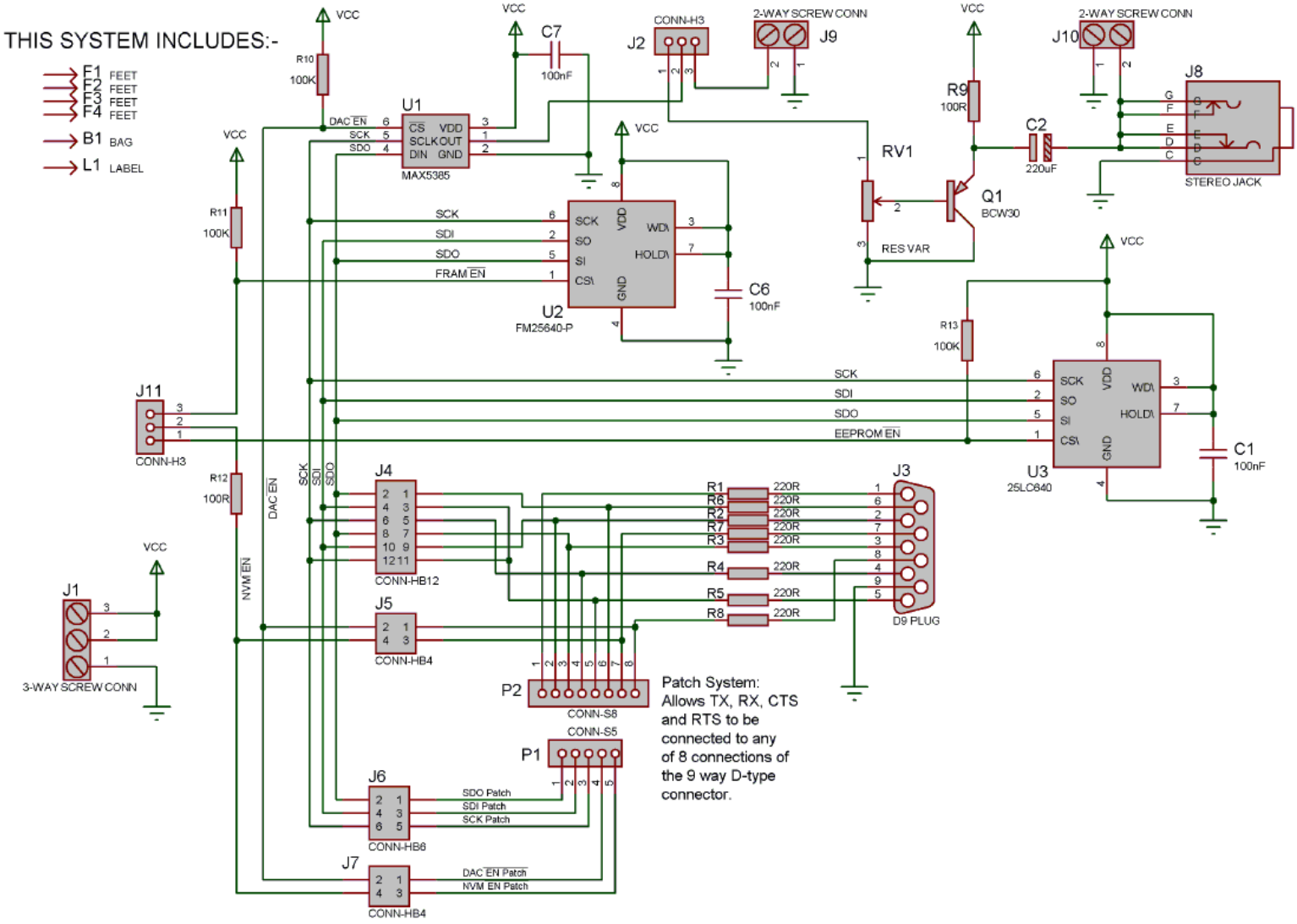
Most of the boards in the E-blocks range can be fitted with a plastic cover as an optional extra. These covers are there to protect your E-blocks board therefore extending the life of the board. The covers also prevent the removal of external components while still allowing for the adjustment of applicable parts on the board.

12mm M3 spacers, anti-slip M3 nuts and 25mm M3 bolts can be used to attached the cover to the board. These are not included but can be bought separately from our website.

The order code for the EB013 SPI memory and D/A board is EB713.



Circuit diagram



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