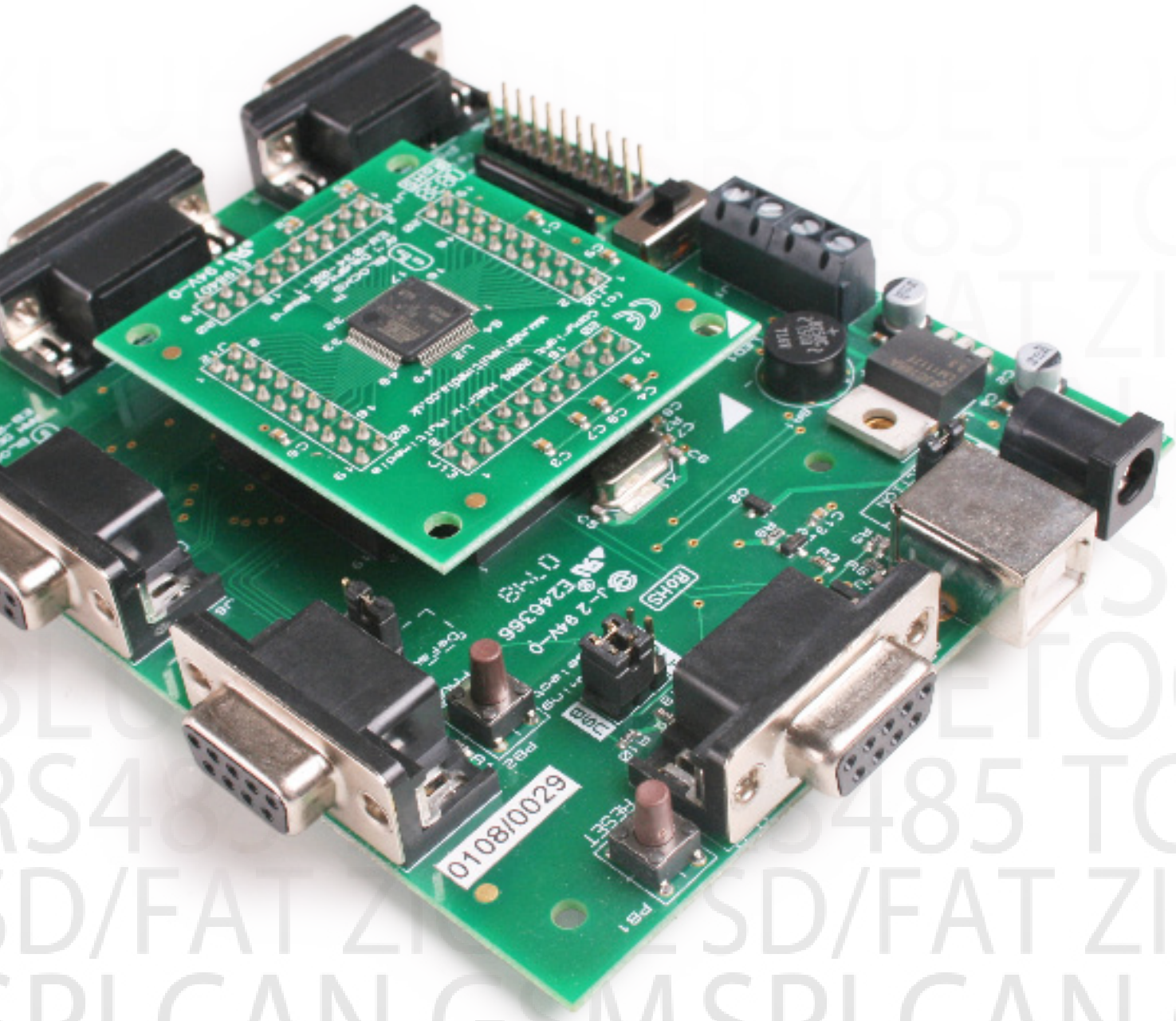
MATRIX

eBLOCKS®

ARM programmer and daughter board



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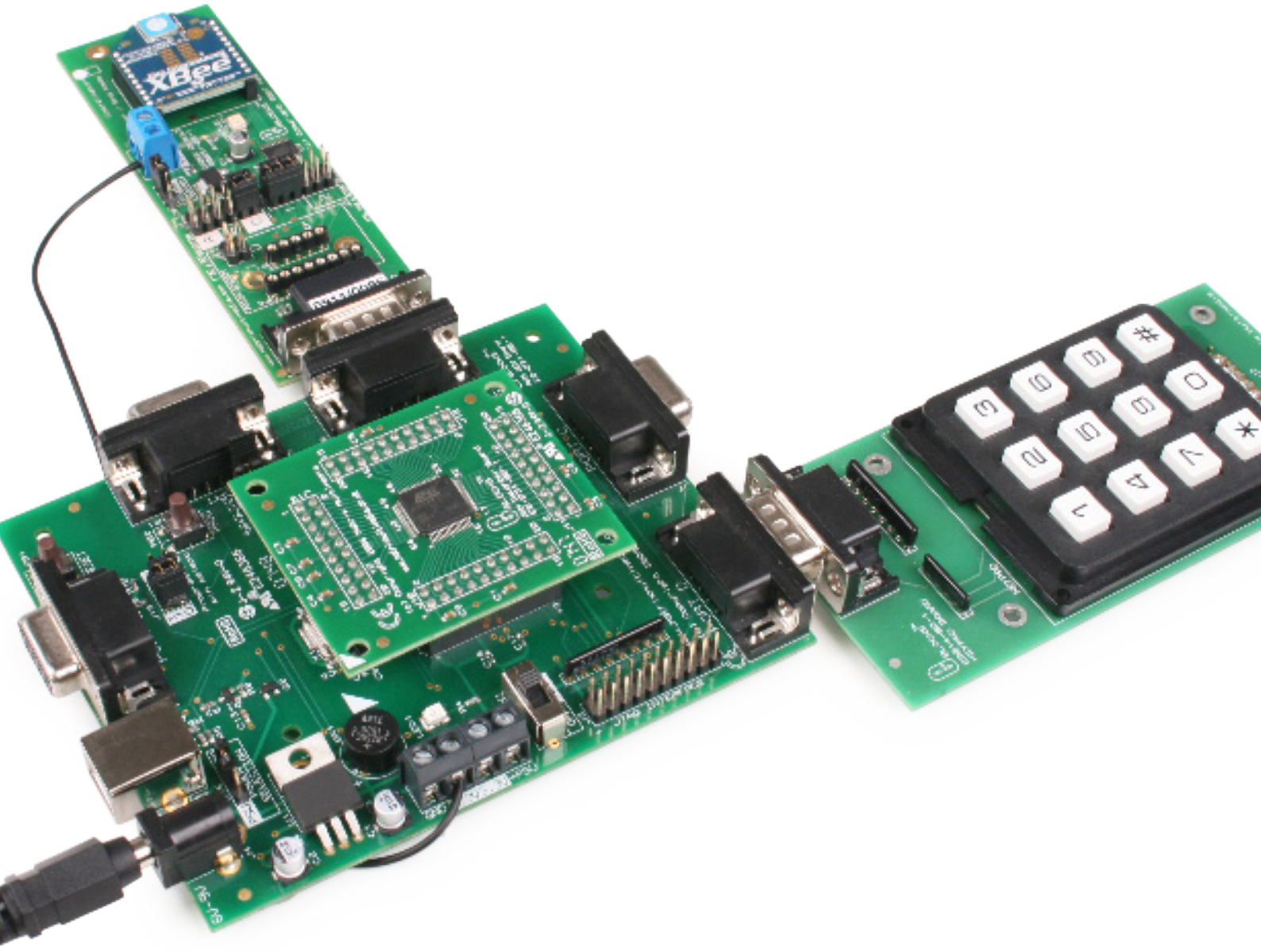

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About this document

This document concerns the EB185 E-blocks ARM programmer and daughter board.

1. Trademarks and copyright

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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

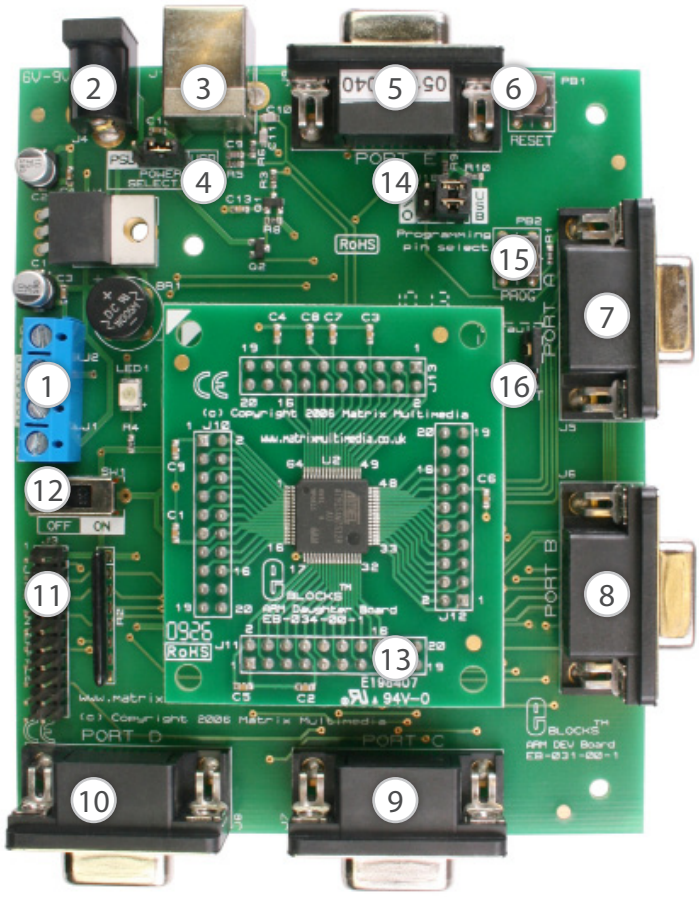
It is advisable to test the product upon receiving it to ensure it works correctly. Matrix provides test procedures for all E-blocks, which can be found in the Support section of the website.

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. Screw terminals
2. Power connector
3. USB connector
4. Power selector link block
5. Port E I/O
6. Reset switch
7. Port A I/O
8. Port B I/O
9. Port C I/O
10. Port D I/O
11. JTAG interface
12. Power switch
13. ARM daughter board
14. Programming selector link block
15. Programming switch
16. Recovery selector link block

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General information

This E-block board is a development tool for the powerful AT91 SAM 7 microcontroller from Atmel. The SAM 7 is a 32 bit RISC device running at an interval frequency of 36MHz, and having 128k ROM and 32K static RAM as well as 2 USARTs, 4 x 10 bit A/D converters and a native USB bus. This incredibly powerful microcontroller can be used for a range of advanced E-blocks projects. The board has five E-blocks ports and the processor itself is housed on a removable daughter board (Atmel ARM processors are only available in SMD technology) so that the ARM can be incorporated into custom PCBs.

1. Features

- 32 bit RISC processor with 128K ROM and 32K SRAM
- USB programmable with boot loader
- 5 x E-blocks ports, 32 I/O lines
- Compatible with most downstream boards
- Native USB and SPI buses
- Removable crystal

Circuit description

The ARM board solution is made up of two parts:

- A mother board (ARM board EB031) that allows ARM devices to be programmed and the program to be executed 'seamlessly'.
- The ARM daughter board (EB034) that houses the ARM device on a simple to use board. This allow the user to program the device using the ARM board (EB031) and then either use this daughter board in either the ARM board (EB031) for development, or to easily use the ARM daughter board in another project.

1. Power supply

The board is normally operated from an external regulated DC power supply of 6V - 9V. This allows full operation including programming.

The board has two modes of power supply; either from an external regulated DC power supply or powered using the computer via the USB port. The external power supply is specified as 6-9V regulated DC power supply. When using the USB port to power the board, the user must be aware of the limitations for the use of this USB port - for example the limited current that can be supplied via USB (approx. 100mA).

The jumper link system, J16, allows the user to decide on the source of the power supply. If using an external power supply the jumper should be positioned to the left hand side of the jumper system labelled 'PSU'. If using USB power place the jumper on the right hand side of the jumper system. LED1 indicates that power is supplied to the board from either the external power supply or the USB cable.

Please note that both USB and the PSU cables should be removed for the ARM board **before** changing the position of this jumper.

Remember that other E-blocks will have to receive 3.3V by placing a connecting wire from the +V screw terminal of the ARM board to the +V screw terminal of each E-block that requires a voltage. Also the user should ensure that all the E-blocks that they are using are 3.3V compatible.

2. Programming (hardware)

The ARM board connects to a personal computer via the USC socket. Any USB socket on the PC can be used. The host ARM device is set-up to communicate with the USB bus and the programming circuitry. The board uses MOSFET transistors to detect the USB bus, which allows the board to be programmed.

The board has a connection (10 +10 DIL PCB header pins) that allows the ARM device to be programmed via an external programmer using the JTAG pins available on the ARM device. This is a standard JTAG connection.

DIL sockets and I/O ports

The ARM board uses an external ARM daughter board. This daughter board enables the ARM board to be both a development board and a programmer. This means

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that the user can either use the ARM daughter board in the ARM board for development, or for programming the daughter board which can then be used in other projects.

The ARM board connects to the ARM daughter board (EB034) via four DIL PCB sockets (10 + 10). These connect all the ARM device signals to the ARM daughter board, thus allowing programming and use of all the functions available on the ARM device.

The ARM board has five I/O ports, in the form of 9-way D-type connectors. These allow the ARM board to be fully compatible with the E-blocks range. The first four D-type connectors (J5-8) connect all 32 general-purpose I/O from the ARM device. Most of these general-purpose I/O pins have multiple functions - such features as SPI.

USART communication and analogue to digital converters. Please see the datasheet of the actual ARM device that you are using for complete list of functions (www.atmel.com).

The ARM device has four dedicated analogue to digital converters and four general-purpose I/O with analogue functionality. Therefore all these either signals have been grouped together, on the fifth D-type connector (J9), which can be used as a fully analogue port.

Please note that the four general-purpose I/O are also available on the another D-type connector (J8) and care must be taken to ensure that these signals are not connected to any other device whilst using them on these fully analogue port (J9).

A full table of I/O connections is provided on page 7.

3. Programming (software)

There are two ways of getting the ARM board into programming mode:

With the power to the board on press and hold down the PROG button switch. Then quickly press and release the RESET button switch. If your drivers are set up then you will hear Windows give a double tone to indicate a USB device has been discovered.

If you have used D4 or B5 as an output then you may find that the driver gets disassociated. In this case you can use this alternate method:

Turn power to the ARM board off using SW 1. Press and hold the PROG button switch down. Turn power on with SW1, and less than half a second after release the PROG button switch.

4. Reset push button

PB1 provides a reset by pulling the NRST pin low. This will reset the ARM device thus enabling any program to restart.

Please note that the NRST can be programmed so that the reset pin will not function as a reset. See the datasheet for the ARM device that you are using for more details on disabling the NRST as a reset.

5. Frequency selection

The clock signal for this board is generated from either an internal RC clock signal or the on-board external crystal. The on-board crystal is set to 18.432MHz as this enables the USB synchronisation speed to be correct - as stated by the software specification.

The device can also use an internal PLL to set the frequency for the device. Please see the datasheet of the device for further information regarding using the PLL.

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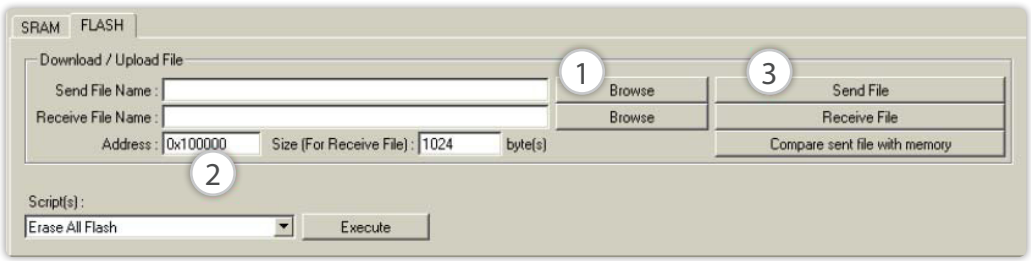
Re-flashing the ARM board

1. When to re-flash

Re-flashing is only required if the Matrix ARM OS has been deleted or overwritten, or if an updated Matrix OS file has been released. Re-flashing should only be carried out when specifically required as errors and complications may cause the ARM board to stop functioning until properly re-flashed.

In our experience the device can need re-flashing if you reset the ARM half way through a programming cycle – to prevent this please ensure that you give the PC sufficient time to download your program. The symptoms here are that the ARM board appears to be dead and a PROG button with RESET button activation does not work, and neither does a power up PROG button activation work.



General programming is performed without requiring re-flashing. Please refer to the mLoader documentation for general programming instructions.

If the ARM is a new device it may require the default ARM drivers. These drivers are installed by SAM-BA. Please install SAM-BA before installing the USB drivers for the ARM board.

2. Required items:

- SAM-BA ARM re-flash software. Available on ELSAM 2.0 or later and from ATMEL (www.atmel.com).
- Re-flash programs (ARM_MM.bin and test.bin)

3. Set-up

The ARM board requires re-flashing to put the Matrix ARM OS onto the ARM board.

1. Re-flashing can be done with USB power only.
2. Check J16 power selector set to USB.
3. Check J18 programming jumper set to USB.
4. Check J15 TST jumper set to Default.
5. Plug the board into the PC and turn the power switch SW1 to ON.
6. Check that the Green Power LED is lit.

4. Re-flashing process

1. Place the TST jumper (J15) to test position - i.e. the bottom pins, straddling the Default box border. Leave for at least 8-10 seconds.
2. Move SW1 to OFF and replace the TST jumper to the Default position.
3. Move SW1 to ON.
4. Open SAM-BA.
5. Find the USB board in SAM-BA. Select - AT91SAM7S128-EK and click on USB connection. A programming dialogue should not appear.
6. In the middle of the dialogue are the Browse button (1) to locate files, the memory address location (2), and the Send button.
7. Send the test file:
   - Browse to (1) and open file test.bin in the *'C:\ program files \ Matrix Technology Solutions \ mLoader \ Reflasher files'* folder.
   - Set the memory location (2) to 0x100000.
   - Send the file.
   - Select OK to any Unlock zone / regions messages.
8. Send the main file:
   - Browse to (1) and open file ARM-MM.bin in the *'C:\ program files \ Matrix Technology Solutions \ mLoader \ Reflasher files'* folder.
   - Set the memory location (2) to 0x119000.
   - Send the file
   - Select OK to any Unlock zone messages.
9. Move SW1 to OFF.
10. Add LED boards.
11. Move SW1 to ON.
12. The LEDs should now be showing alternate pairs creating a 1-0-1-0 to 0-1-0-1 pattern.

The ARM board should now be ready for testing.

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Port and pin list

E-blocks ports	ARM pin name	ARM pin	Notes
A0	PA0	48	
A1	PA1	47	
A2	PA2	44	
A3	PA3	43	
A4	PA4	36	
A5	PA5	35	
A6	PA6	34	
A7	PA7	32	
B0	PA8	31	
B1	PA9	30	
B2	PA10	29	
B3	PA11	28	
B4	PA12	27	
B5	PA13	22	USB Pin
B6	PA14	21	
B7	PA15	20	
C0	PA24/RTS1	23	
C1	PA26	26	
C2	PA27	37	
C3	PA28	38	
C4	PA25/CTS1	25	
C5	PA23	15	
C6	PA22/TXD1	14	
C7	PA21/RXD1	11	
D0	PA17/AD0	9	Also on E0 - Analogue Pin
D1	PA18/AD1	10	Also on E1 - Analogue Pin
D2	PA19/AD2	13	Also on E2 - Analogue Pin
D3	PA20/AD3	16	Also on E3 - Analogue Pin
D4	PA16	19	USB Pin
D5	PA29	41	
D6	PA30	42	
D7	PA31	52	
E0	PA17/AD0	9	Also on D0 - Analogue Pin
E1	PA18/AD1	10	Also on D1 - Analogue Pin
E2	PA19/AD2	13	Also on D2 - Analogue Pin
E3	PA20/AD3	16	Also on D3 - Analogue Pin
E4	AD4	3	Analogue Pin
E5	AD5	4	Analogue Pin
E6	AD6	5	Analogue Pin
E7	AD7	6	Analogue Pin

1. Notes

- The ARM has a 32 bit I/O register and 8 analogue input lines
- On the E-blocks ARM board the 32 bit register has been broken down into four ports - Ports A, B, C and D. The pin to port allocation does not correspond directly 0-31 with Ports A-D due to the need to place serial communications pins on the same port (Port C). Please refer to the table on the left when working with the 32 bit I/O register.
- Four of the analogue lines use pins in the 32 bit digital I/O port. Four of the analogue lines are separate only lists.
- Port E contains the 8 analogue input lines. This means that Port E pins E0-E3 duplicate those of Port D pins D0-D3. Pins E4-E7 are analogue lines only, not general I/O.
- Pins B5 and D4 are used in USB communications. Signals on these lines may affect the USB bus causing erroneous activations of the USB New device added wizard. To prevent this either do not use Pins B5 and D4, or move the Programming Pin Select jumper (J18) to the I/O position whilst running the program (move it back to USB for programming).

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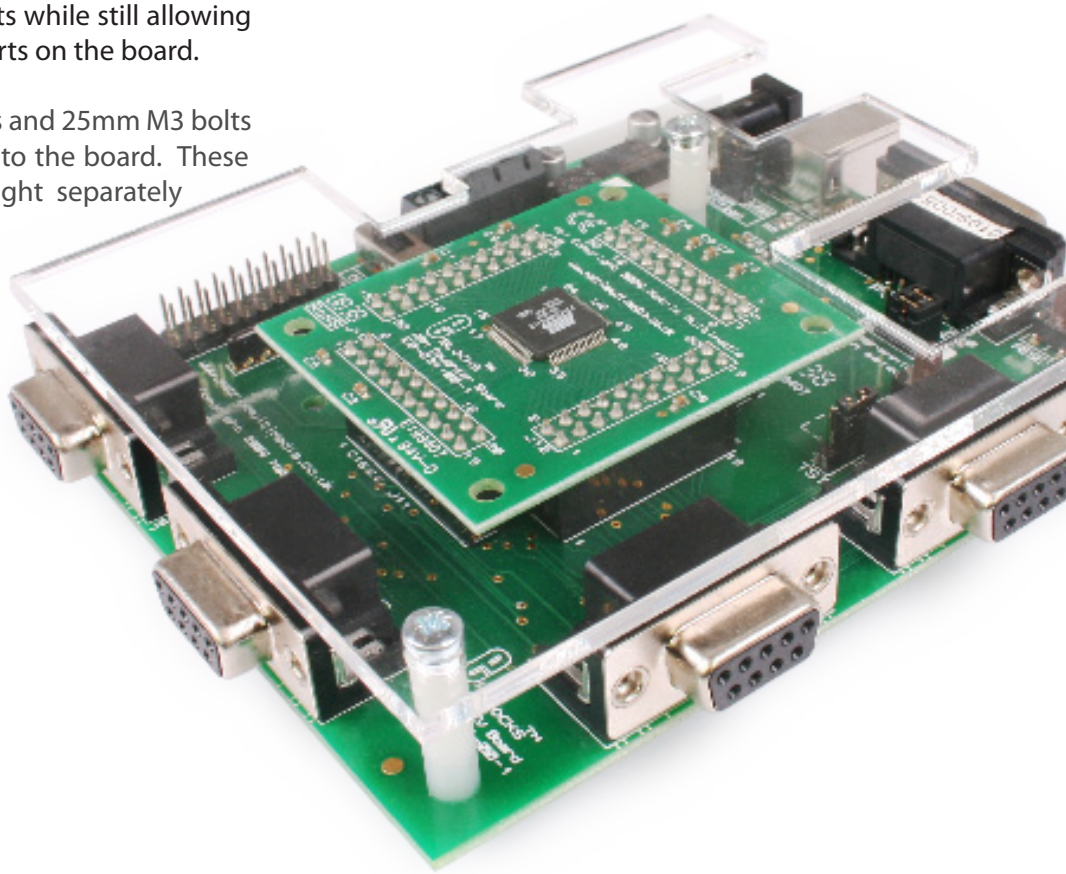
Protective cover

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 EB003 multimedia board is EB703.



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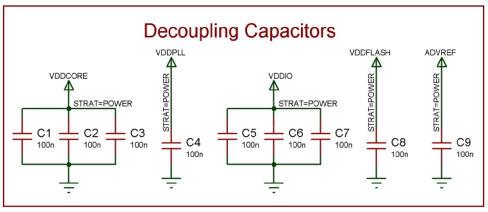
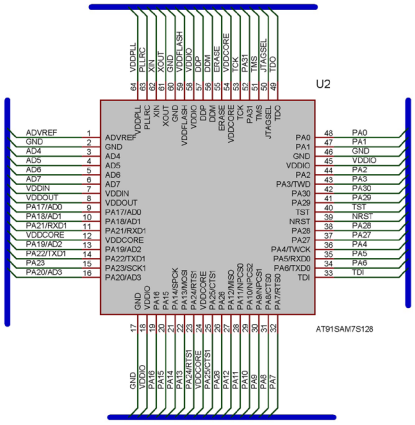
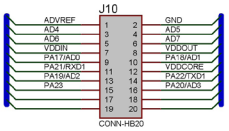
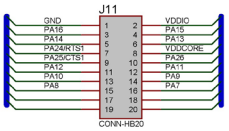
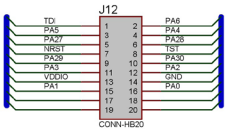
Circuit diagram

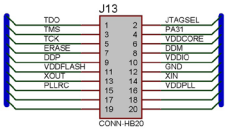












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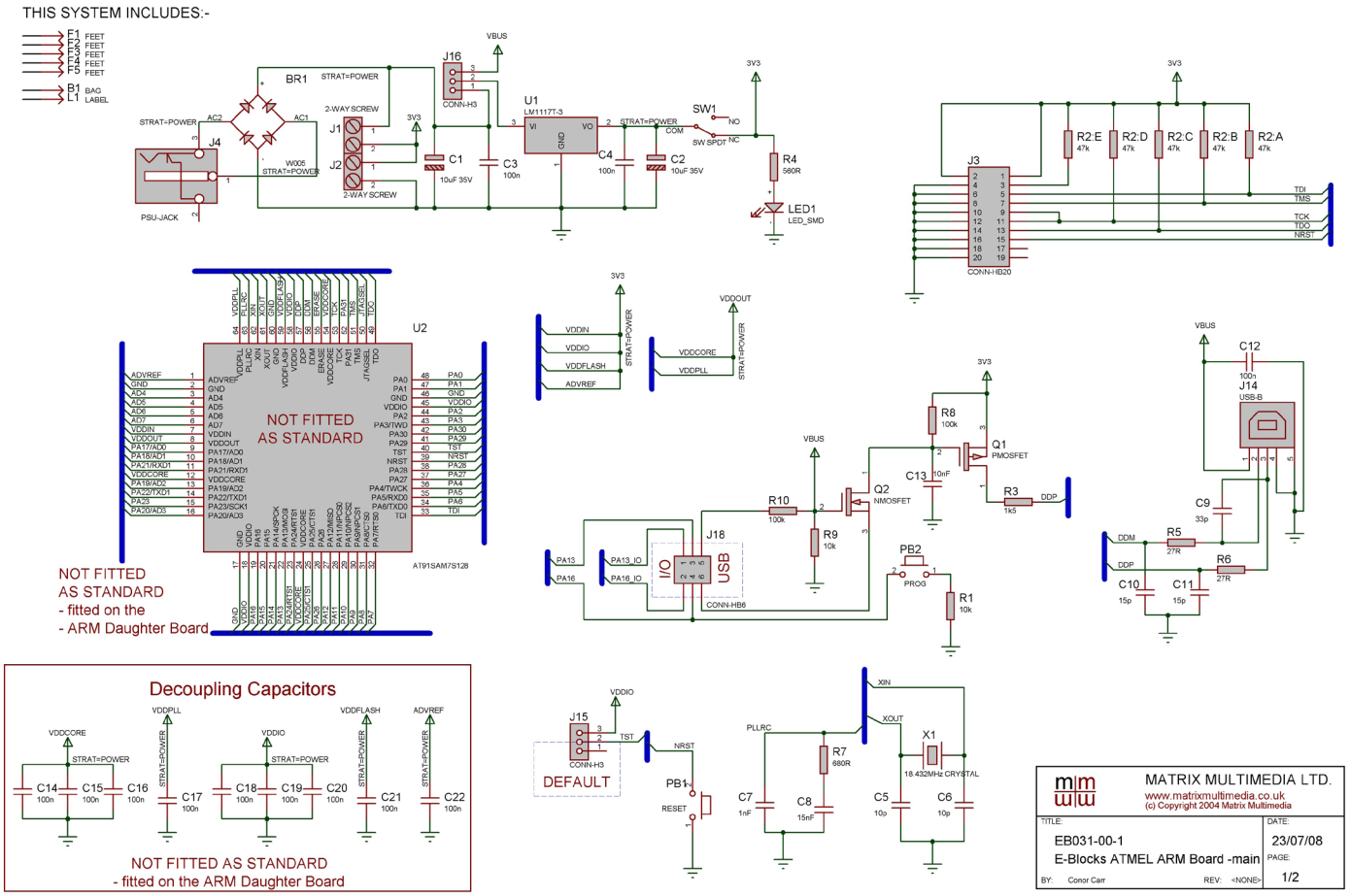

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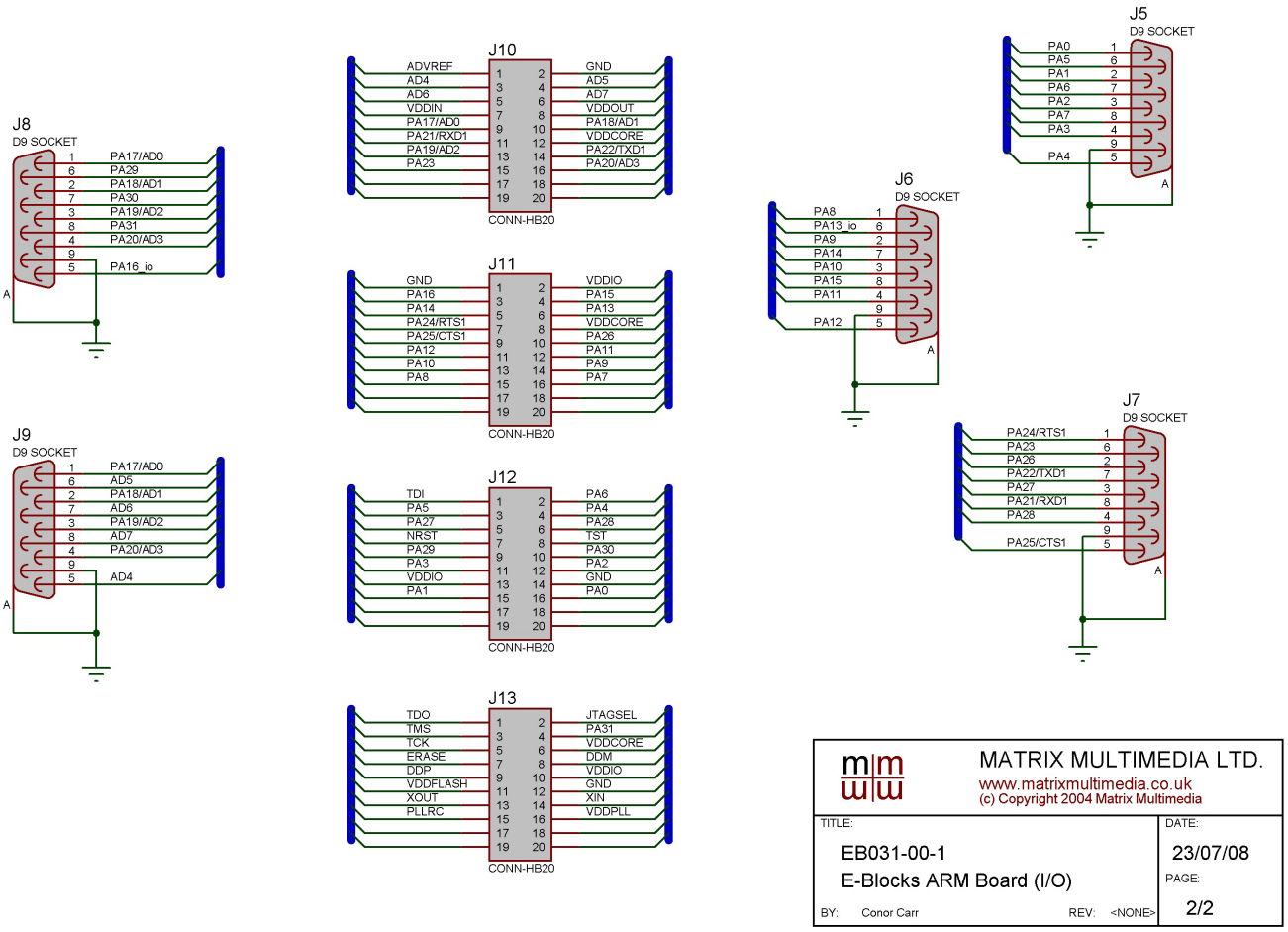

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