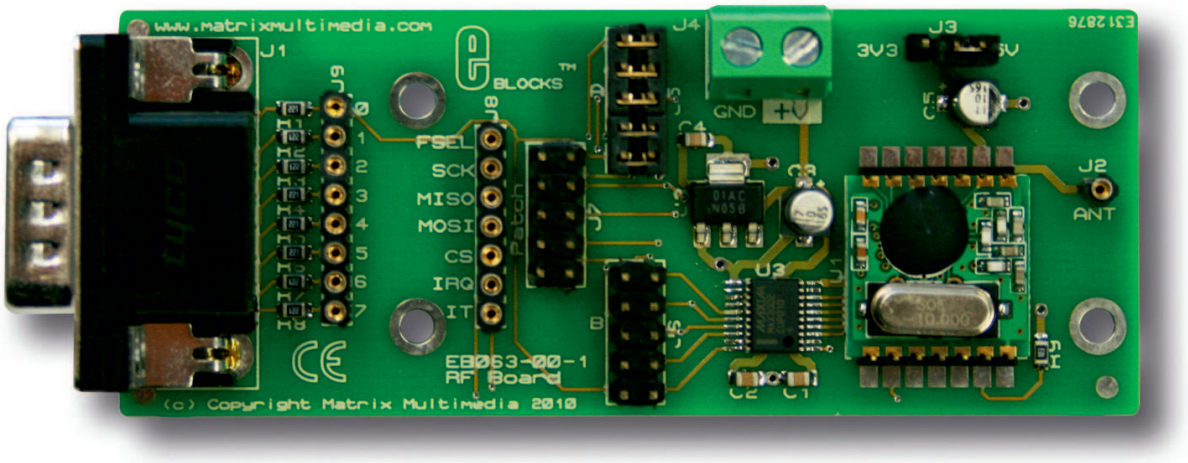
433/868/915MHz RF board datasheet
EB063-00-1



Contents

1. About this document

This document concerns the E-blocks 433/868/915MHz RF board code EB063 version 1.

The order code for the 433MHz product is EB063-433.
The order code for the 868MHz product is EB063-868.
The order code for the 915MHz product is EB063-915.

The carrier frequency used is dependant on radio frequency restrictions and practices in your area.

1. Trademarks and copyright

PIC and PICmicro are registered trademarks of Arizona Microchip Inc.
E-blocks is a trademark of Matrix Multimedia Limited.

2. Other sources of information

There are various other documents and sources that you may find useful:

Getting started with E-Blocks.pdf

This describes the E-blocks system and how it can be used to develop complete systems for learning electronics and for PICmicro programming.

PPP Help file

This describes the PPP software and its functionality. PPP software is used for transferring hex code to a PICmicro microcontroller.

C and assembly strategies

This is available as a free download from our web site.

3. Disclaimer

The information in this document is correct at the time of going to press. Matrix Multimedia reserves the right to change specifications from time to time. This product is for development purposes only and should not be used for any life-critical application.

4. Technical support

If you have any problems operating this product then please refer to the troubleshooting section of this document first. You will find the latest software updates, FAQs and other information on our web site:
www.matrixmultimedia.com

2. General information

1. Description

This E-block provides a radio frequency interface that can be used to facilitate communication between microcontrollers and third party devices like R/C vehicles or wireless products such as doorbell controls etc. The E-block can also be used to communicate with other RF E-blocks.

3 different RF frequencies are available to allow you to choose a frequency that is legal for use in your area. A general rule of thumb is that 433MHz is Europe, 868MHz is America and 915MHz is Asia but this is not strictly the case. Please check the RF rules in your area to ensure you obtain the correct module frequency.

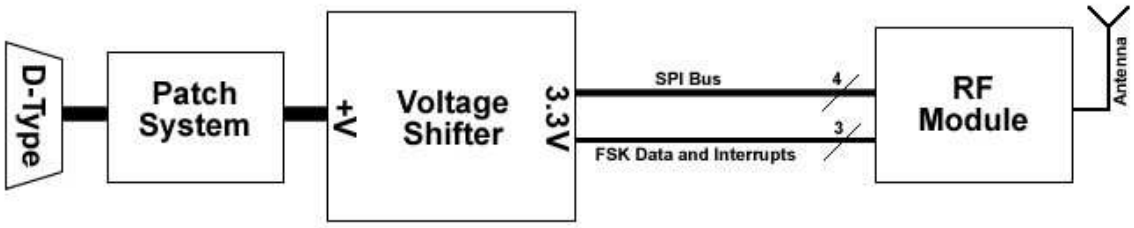
A set of jumper links are available which allow the RF E-block to easily be set for all microcontroller port configurations.

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

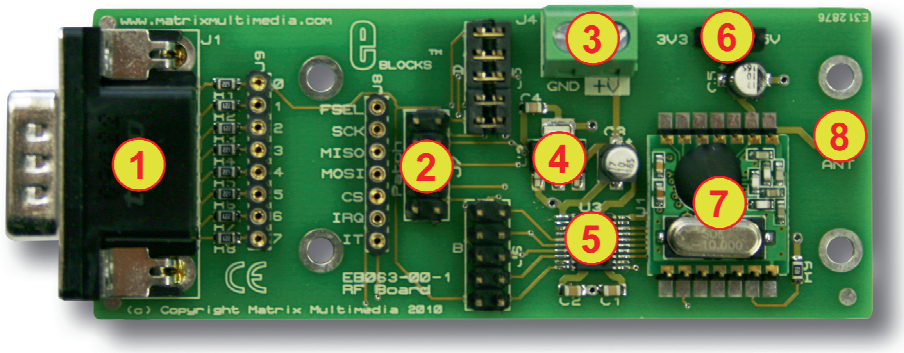
2. Features

- E-blocks compatible
- 433 / 868 / 915MHz versions available
- High data rate up to 115.2kbps
- Transmission distance of up to 300m
- Multiple distinct RF channels
- Adjustable receiver bandwidth
- Adjustable transmitter frequency deviation
- 3.3V compatible

3. Block diagram



3. Board layout



EB063-74-1.cdr

1) 9-way downstream D-type connector
2) Patch system
3) +V screw terminal
4) 3.3V voltage regulator
5) Voltage shifter IC
6) Input voltage control jumper
7) RF driver module
8) Antenna socket

General guide for patch settings:

	Jumper A (16F88)	Jumper B (16F877A)	Jumper C (Patch)
SCK	BIT4	BIT3	PATCH
MISO (SDI uC)	BIT1	BIT4	PATCH
MOSI (SDO uC)	BIT2	BIT5	PATCH
CS	BIT0	BIT0	PATCH
FSEL	BIT3	BIT1	PATCH
IRQ	PATCH	PATCH	PATCH
IT	PATCH	PATCH	PATCH

Please note that the IRQ and IT signals are not required by the Flowcode RF component and as such they are not routed through via the standard jumper based patch system. These pins however are available on the E-block as part of the turned pin wiring patch system should you wish to implement receive or transmit interrupts in your custom program.

Testing this product

The following program will test the circuit. The test file can be downloaded from www.matrixmultimedia.com.

1. System Setup

2 x Multi-programmer board (EB006) with:

EB006 Options	Setting
Power supply	External, 14V
PICmicro device	16F877A
SW1 (Fast/Slow)	Don't care
SW2 (RC/Xtal)	Xtal
Xtal frequency	19.6608MHz
Port A	
Port B	LCD board EB005
Port C	RF board EB063
Port D	
Port E	
Test program	EB063_Test.hex

EB005 Options	Setting
Patch jumper setting	DEFAULT

EB063 Options	Setting
Patch jumper setting	B
J3 Voltage Selection	5V
Antenna Socket	Wire Length 'x'

Length 'x' is dictated by the table shown on page 6 depending on the carrier frequency of the module.

2. Test Procedure

1. Setup the system as shown above.
2. Wire a connection from the +v terminal on the Multiprogrammer to the +V terminal on the EB063.
3. Wire a connection from the +v terminal on the Multiprogrammer to the +V terminal on the EB005.
4. Power up the Multiprogrammers by connecting the power supplys.
5. Send the EB063_Test.hex program to the 16F877A devices on the EB006 multiprogrammers.
6. The LCD will indicate that the testing is being performed and then give an indication of pass or fail depending on the outcome of the test.

4. Circuit description

The design of this product enables you to use this device with many standard microcontroller devices. This is achieved by identifying the pins on the microcontroller, then by selecting the corresponding jumper setting on the RF board. This will allow you to configure the correct pin-out for any microcontroller device.

1. Voltage shifting

The voltage shifting circuitry uses a MAX3002 IC to shift the voltage levels between the +V upstream I/O voltage and the downstream RF module 3.3V voltage. The IC is bi-directional so signals can be sent and received through the voltage shifter.

2. RF module

The RF module used on the RF E-block is a Alpha RF transceiver from RF solutions. This is a pre-made module that is tailored to a single operating frequency only. Therefore it is good to know which country you will be using the module in and therefore which operating frequency you will need. The RF module uses a MRF49XA transceiver chip from Microchip so a full list of the module features and registers can be found by looking at the datasheets for the two products mentioned above.

3. Antenna Design

General guide for ¼ wave antenna wire length:

	433MHz	868MHz	915MHz
Antenna Wire Length	173mm	86mm	82mm

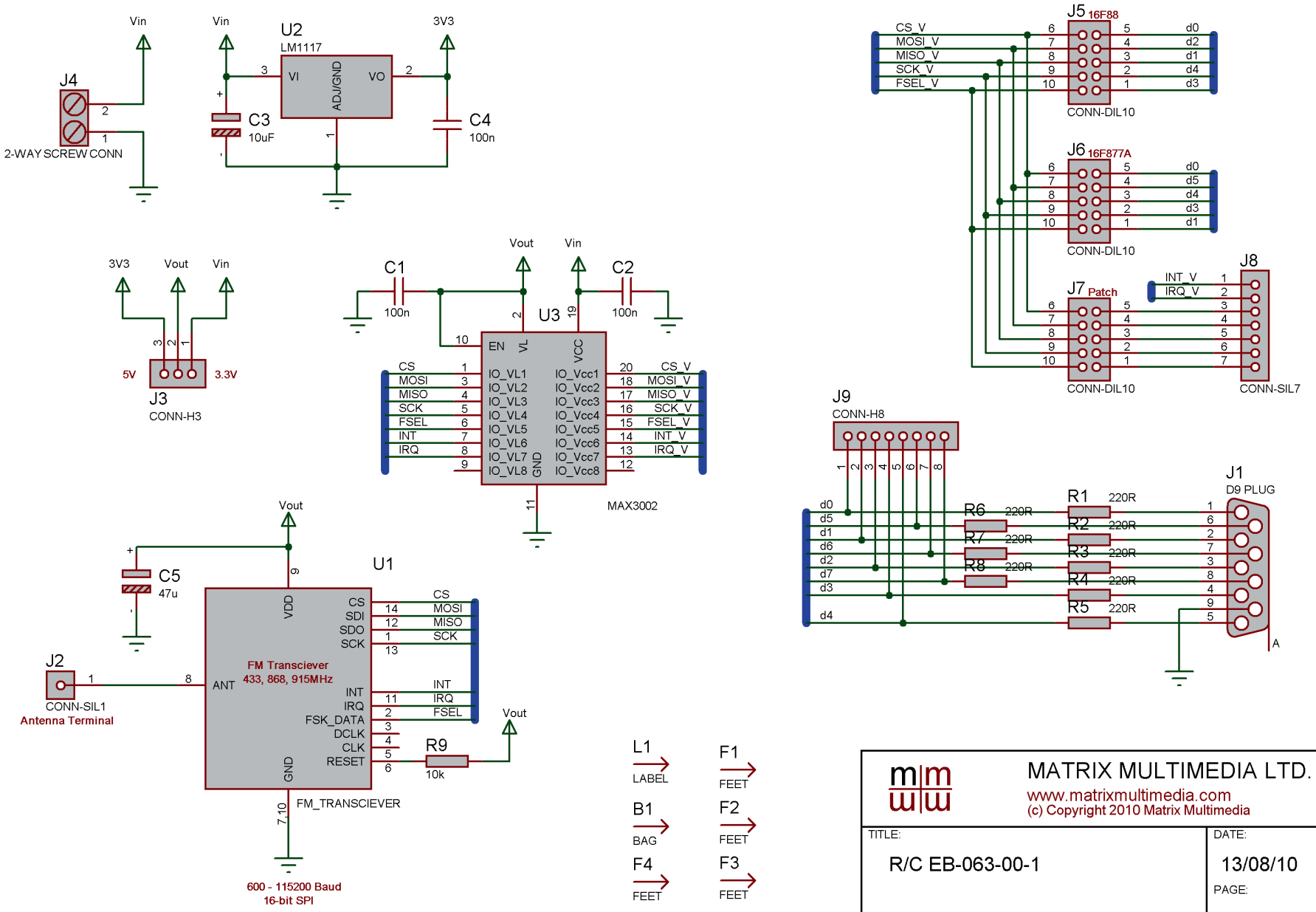
Single core wire should be cut to the correct length and about 5mm of insulation should be stripped from one end of the wire. The bare end of the wire can then be inserted into the antenna socket on the board marked ANT J2 and used as the RF antenna. The wire can be relatively straight or can be coiled around a pencil or a nail etc before being connected to the board. The measurements provided above are for a ¼ wave antenna though other antenna lengths such as ½ wave or full wave loop can also be used. ¼ wave means that the antenna is long enough to absorb ¼ of the RF wave as it travels through the air at the speed of light. A 433MHz wave has a time period of about 2.3 nanoseconds (1 / 433,000,000) so a quarter of this is roughly 0.577ns. Traveling at the speed of light for this length of time works out to be roughly 173mm.

4. 3.3V operation

This board is fully compatible with upstream boards operating off 3.3V.

Note damage to the RF module may occur if the board is powered with a voltage other then 3.3V when the voltage selection jumper is in the 3.3V position.

Appendix 1 – Circuit diagram



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