



# MMstr71xF

Minimodule with  
ARM microcontroller

## User Guide

REV 0.8

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# Introduction

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**MMstr71xF** is universal minimodule for the STR71xF microcontrollers from STMicroelectronics. This microcontroller is available in the TQFP64 case which is difficult to apply to prototype and amateur circuits due to the compactness of pins. We have undertaken an attempt at placing it on a board of 36x36mm with a layout of leads which matches the commonly available prototype circuit boards. In addition, we have included 3.3V voltage regulator, a serial DataFlash memory with a capacity of up to 4MB, a circuit monitoring the supply voltage and clock generators for microcontroller and USB interface. All ports and signals of the microcontroller are lead out by means of two-row pin connectors with 0.1" pitch. This minimodule is not only an adapter but a complete main board for STR71xF. It needs only a connection to the supply voltage and to the JTAG connector and we can start loading 256kBytes of Flash memory of the microcontroller. Through integration of the peripherals with the microcontrollers on one board, the application of this module can lead to a shorter design period and facilitate the construction of systems based on ARM microcontrollers, by eliminating the need to design the printed board. The module is supplied with example software.

The **MMstr71xF** minimodule can be also used in didactic laboratories of informatics colleges and universities, and can be also used to build circuits realizing thesis projects.

## Features

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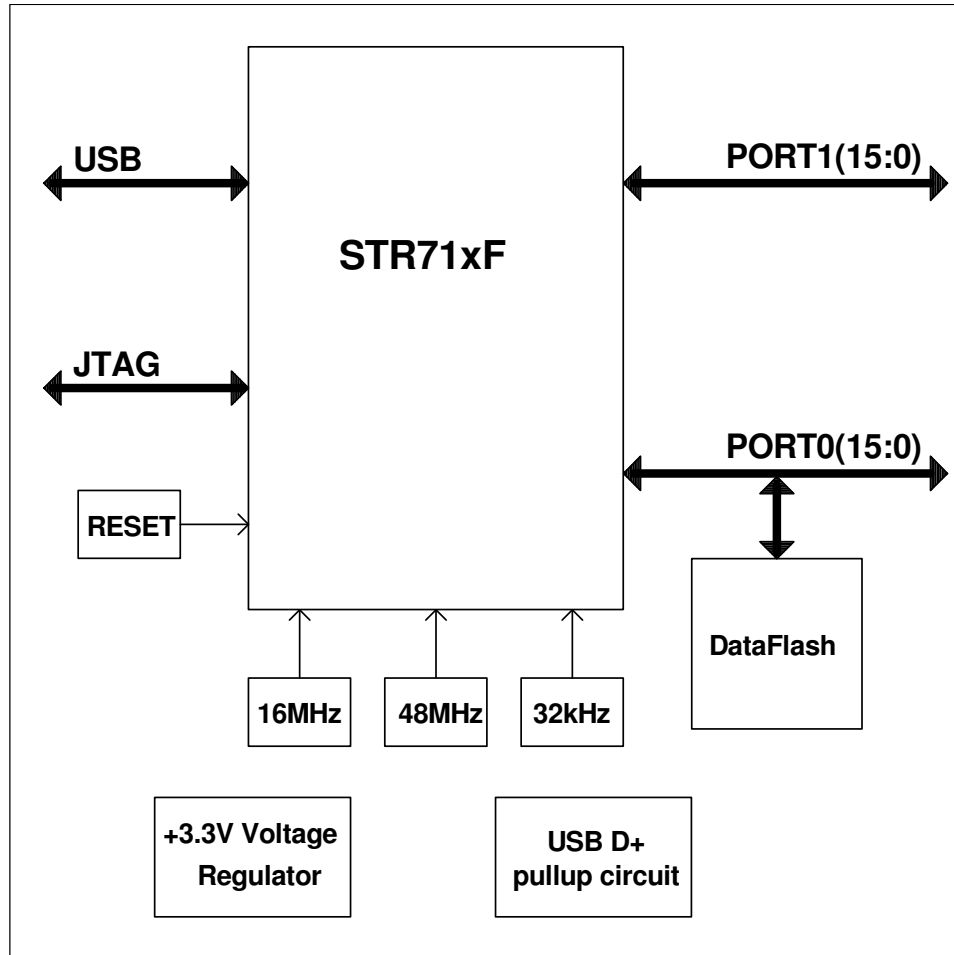
### **MMstr71xF minimodule:**

- Complete, ready to use microprocessor system
- Fast ARM microcontroller STR71xF with up to 66 MIPS throughput
- Serial DataFlash memory 32Mb (4MB)
- Reliable reset circuit
- Built-in system generator 16MHz
- Built-in 48MHz generator for USB interface
- Built-in 32.768kHz crystal resonator for RTC
- Built-in voltage regulator 3.3V 400mA
- Module supply voltage: 3.3V or 3.8 - 16V
- 2 x 26 terminals with 0.1" (2.54mm) pitch fitting every prototype board
- Small dimensions: 36mm x 36mm (1400x1400mils)
- Available evaluation board and sample applications

## 2 The module

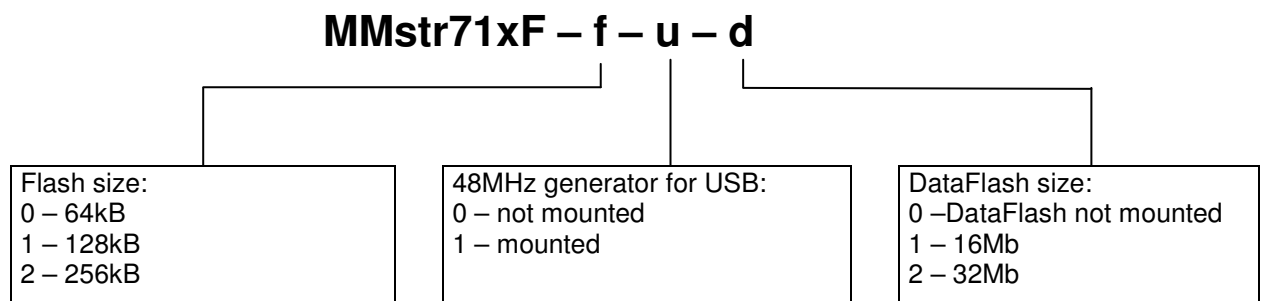
### Block diagram

A block diagram of MMstr71xf minimodule is shown on the image below:



**Figure 1** Block diagram of MMstr71xF minimodule.

Minimodule can be ordered in different configurations with use of selector:



For example: MMstr711F-2-0-0 – minimodule with STR711FR2 (256kB Flash), without 48MHz generator, without DataFlash memory.

## Terminals layout

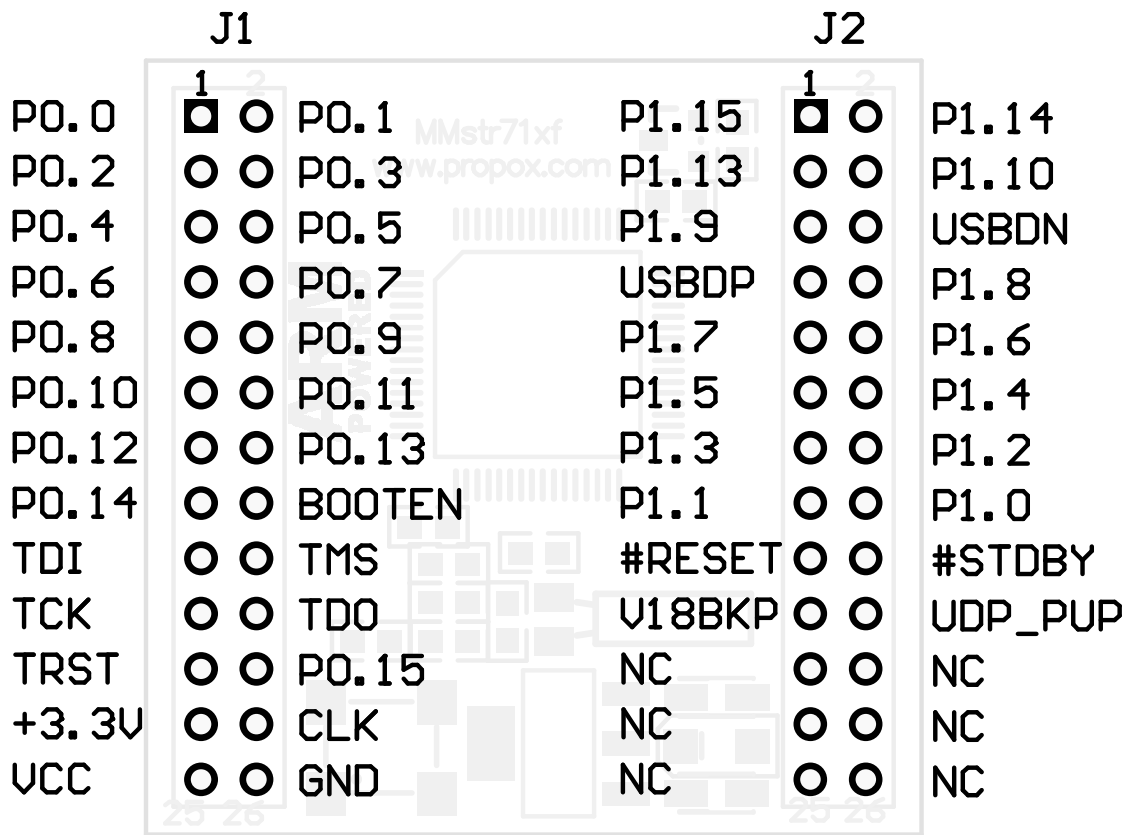


Figure 2 Terminals layout – top view.

Name	J1		Name	J2		Name
P0.0/S0.MISO/U3.TX	1	2	P0.1/S0.MOSI/U3.RX	1	2	P1.14/HRXD/I0.SDA
P0.2/S0.SCLK/I1.SCL	3	4	P0.3/S0.SSN/I1.SDA	3	4	P1.10/USBCLK
P0.4/S1.MISO <sup>(1)</sup>	5	6	P0.5/S1.MOSI <sup>(1)</sup>	5	6	USBDN
P0.6/S1.SCLK <sup>(1)</sup>	7	8	P0.7/S1.SSN <sup>(1)</sup>	7	8	P1.8
P0.8/U0.RX/U0.TX	9	10	P0.9/U0.TX/BOOT0	9	10	P1.6/T1.OCMPB
P0.10/U1.RX/U1.TX/SCDATA	11	12	P0.11/U1.TX/BOOT1	11	12	P1.4/T1.ICAPA
P0.12/SCCLK	13	14	P0.13/U2.RX/T2.OCMPA	13	14	P1.2/T3.OCMPA/AIN2
P0.14/U2.TX/T2.ICAPA	15	16	BOOTEN	15	16	P1.0/T3.OCMPB/AIN.0
TDI	17	18	TMS	17	18	#STDBY
TCK	19	20	TDO	19	20	UDP_PUP
TRST	21	22	P0.15/WAKEUP	21	22	NC
+3.3V	23	24	CLK	23	24	NC
VCC	25	26	GND	25	26	NC
						NC
						NC
						NC

(1) – terminals used for connecting DataFlash memory on the module.

Detailed description of ports can be found in microcontroller datasheets.

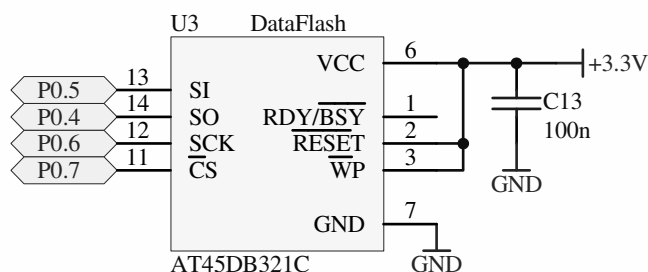
## STR71xF microcontroller

- 32-bit ARM7TDMI core
- From 64 to 256kB in system programmable flash memory
- From 16 to 64kB RAM memory
- 16kB FLASH memory intended for application data
- 5 timers with input capture, output compare and PWM functions
- 4 UART interfaces
- 2 I2C interfaces
- 2 SPI interfaces
- SmartCard interface
- HDLC interface
- USB interface (STR711)
- CAN interface (STR712)
- 4-channel 12-bit A/D converter
- Up to 32 I/O ports
- Nested interrupt controller
- Power saving modes
- RTC clock
- Single power supply 3.3V (internal 1.8V regulator)
- JTAG interface

## DataFlash memory

The minimodule can be equipped with serial DataFlash memory AT45DB161B or AT45DB321C (16Mb or 32 Mb capacities). The memory is connected to a fast SPI bus with up to 10MB/s transmission speed.

Memory chip is activated after applying a low logic level to #CS input. The #CS input of memory is connected to port P0.7 of the microcontroller. The SPI bus occupies three terminals of the microprocessor: P0.4, P0.5 and P0.6. It should be kept in mind that if DataFlash memory is installed, the just outlined port terminals cannot be used externally to the module. Of course the SPI bus can be used for communication with external peripherals, under the condition that they will have circuit selection inputs (CS). The diagram below shows the connection of DataFlash memory inside the module.



**Figure 3** Connection of DataFlash memory inside the module.

A detailed description of DataFlash circuits is on the Atmel Company page: [www.atmel.com](http://www.atmel.com).

## RESET circuit

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The MMstr71xF has a built-in voltage monitoring circuit built around the DS1818 integrated circuit. The circuit generates a RESET signal in case when the supply voltage value is lower than 3V. This takes place when the supply voltage is switched on or off, when the VCC voltage changes its value from 0 to 3.3 V.

The guard circuit detects also momentary VCC voltage drops. A short duration drop of VCC below 3V causes the generation of a resetting signal of 100 ms duration. This signal is applied directly to the resetting input of the microcontroller and is led out to a module connector and it can be used as the zeroing output resetting external circuits and as the input for resetting the module, e.g. by means of the RESET button. In such a case the RESET button can short the RESET line directly to ground. An implementation of the reset circuit is presented in the diagram below.

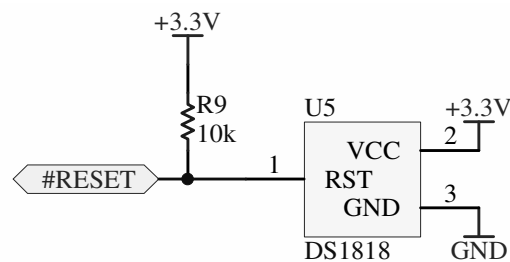


Figure 4 Implementation of the reset circuit in the module.

## Voltage regulator

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Minimodule has built-in 3.3V voltage regulator. Thanks to it can be powered with 3.3V voltage supplied to J1 23 pin (+3.3V) or with voltage between 3.8 – 16V, supplied to J1 25 pin (VCC). When power is supplied to VCC pin, then 3.3V voltage is produced on the module by U2 regulator. In this case 3.3V voltage can be also used outside the module, if current draw will not exceed 300mA.

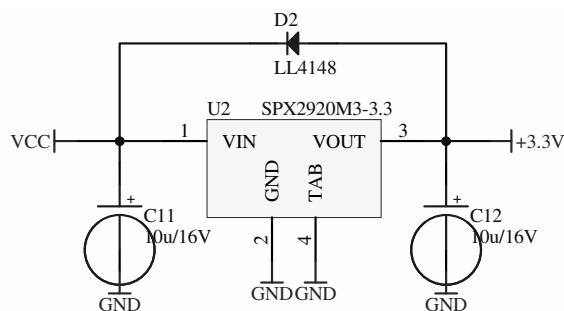
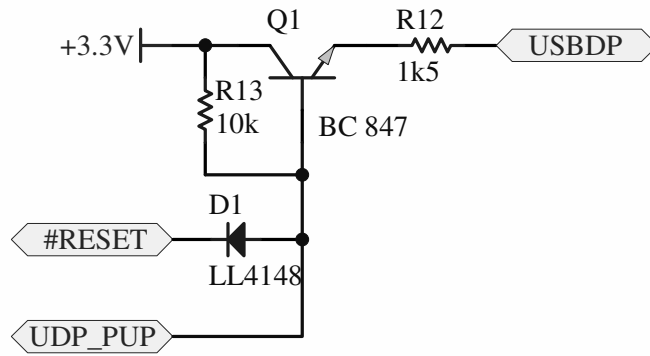


Figure 5 3.3V voltage regulator.

## USB D+ pull-up circuit

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USB host recognize presence of device on the bus by sensing pull-up on D+ line. MMstr71xF has built-in pull-up circuit, shown on drawing below.



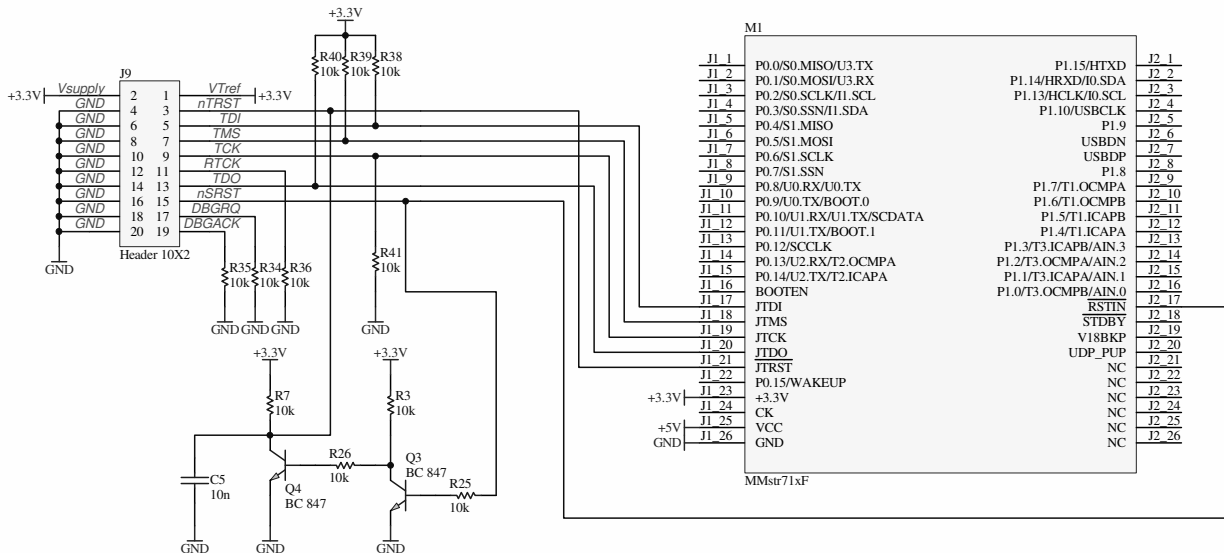
**Figure 6** Implementation of D+ pull-up circuit on MMstr71xF.

Pull-up is by default turned on by R13 resistor. Active reset signal or low level on UDP\_PUP line turns off pull-up, what is interpreted by USB host as disconnection of USB device.

## JTAG connector

Programming/debugging of module can be done through JTAG interface.

JTAG is a four-lead interface permitting the takeover of control over the processor's core. The possibilities offered by this interface are, among others: step operation, full-speed operation, hardware and software breakpoints, inspection and modification of contents of registers and data memories. The method of connecting the JTAG connector to the minimodule is shown in the drawing:



**Figure 7** Connection of JTAG interface to MMstr71xF.



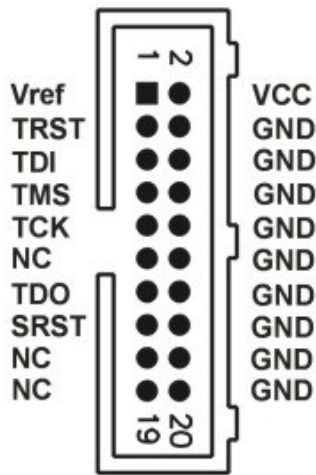


Figure 8 JTAG connector.

### Pin description

<b>VCC</b>	Supply voltage to the emulator
<b>Vref</b>	Target voltage sense
<b>TRST</b>	Tap RESET, RESET signal for JTAG chain
<b>TDI</b>	Test Data Input, data signal from debugger to target
<b>TMS</b>	Test Mode Select, mode select signal from emulator to target
<b>TCK</b>	Test Clock, clock signal from emulator to target
<b>TDO</b>	Test Data Output, data signal from target to debugger.
<b>SRST</b>	Target RESET signal
<b>GND</b>	Ground

JTAG programmer/debugger may be found on page:  
 - ARMCable I: [http://www.propox.com/products/t\\_122.html](http://www.propox.com/products/t_122.html)

## 3 Evaluation Board

In order to facilitate the design of equipment using the minimodule, an evaluation board has been prepared. It includes the following elements:

- Socket for the MMstr71xF module
- Connector with all terminals of the MMstr71xF module
- Connectors of all peripherals accessible on board
- Power supply
- Power switch
- USB connector
- Two RS232 ports
- 1-Wire connector
- JTAG connector for in system programming and debugging
- connector for 2x16 LCD display
- 8 LED diodes
- 4 push-buttons
- 2 potentiometers
- Buzzer
- Prototype design area



## 4 Specifications

<b>Microcontroller</b>	STR71xF
<b>Program memory</b>	Up to 256kB
<b>Data memory</b>	Up to 64kB
<b>DataFlash memory</b>	Up to 4MB
<b>No. of digital I/O</b>	Up to 32
<b>No. of analog inputs</b>	Up to 4
<b>Power</b>	3.3V or 3.8 – 16V
<b>Dimensions</b>	36x36mm
<b>Weight</b>	About 80g
<b>Operating temperature range</b>	0 – 70°C
<b>Humidity</b>	5 – 95%
<b>Connectors</b>	double 2x26 headers

## 5 Technical assistance

In order to obtain technical assistance please contact [support@propox.com](mailto:support@propox.com) . In the request please include the following information:

- number of the module version (e.g. REV 1)
- setting of resistors
- a detailed description of the problem

## 6 Guarantee

The MMstr71xF minimodule is covered by a six-month guarantee. All faults and defects not caused by the user will be removed at the Producer's cost. Transportation costs are borne by the buyer.

The Producer takes no responsibility for any damage and defects caused in the course of using the MMstr71xF module.

# 7 Assembly drawings

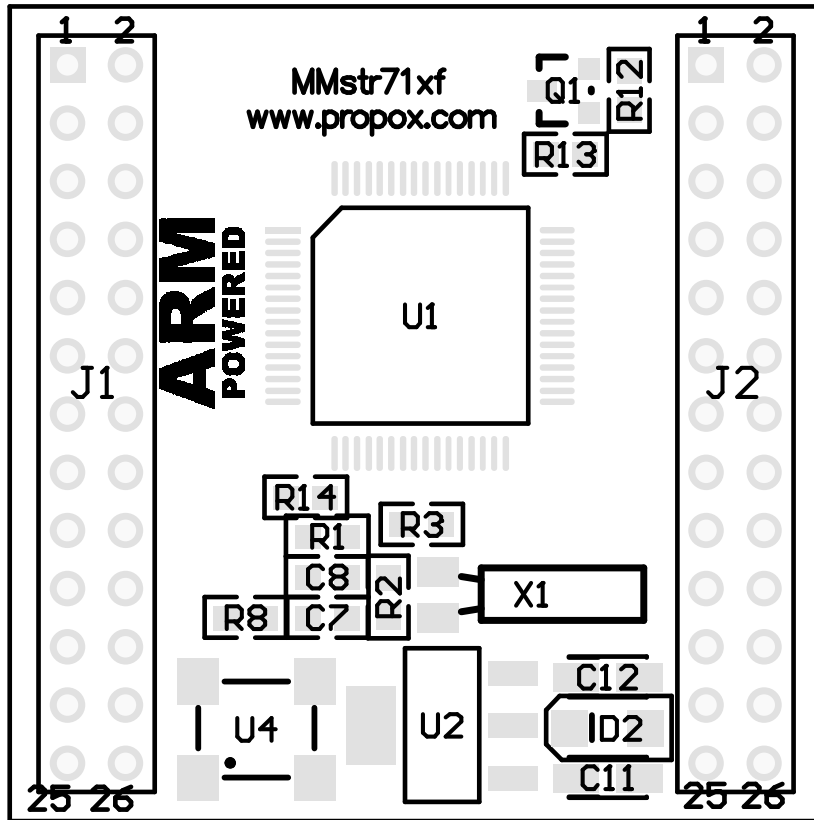


Figure 9 Assembly drawing – top layer.

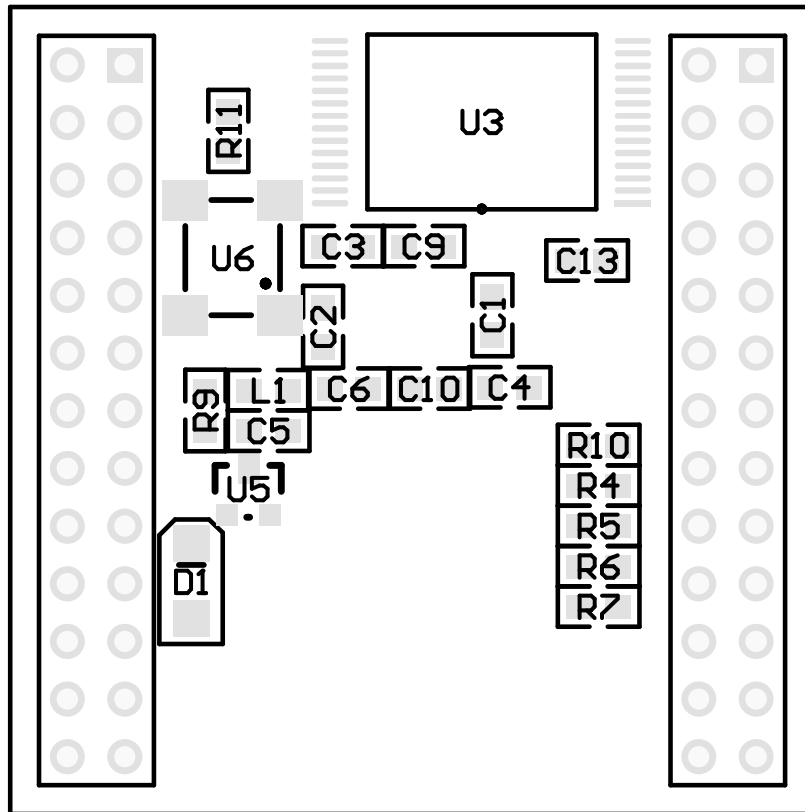


Figure 10 Assembly drawing – bottom layer.

## 8 Dimensions

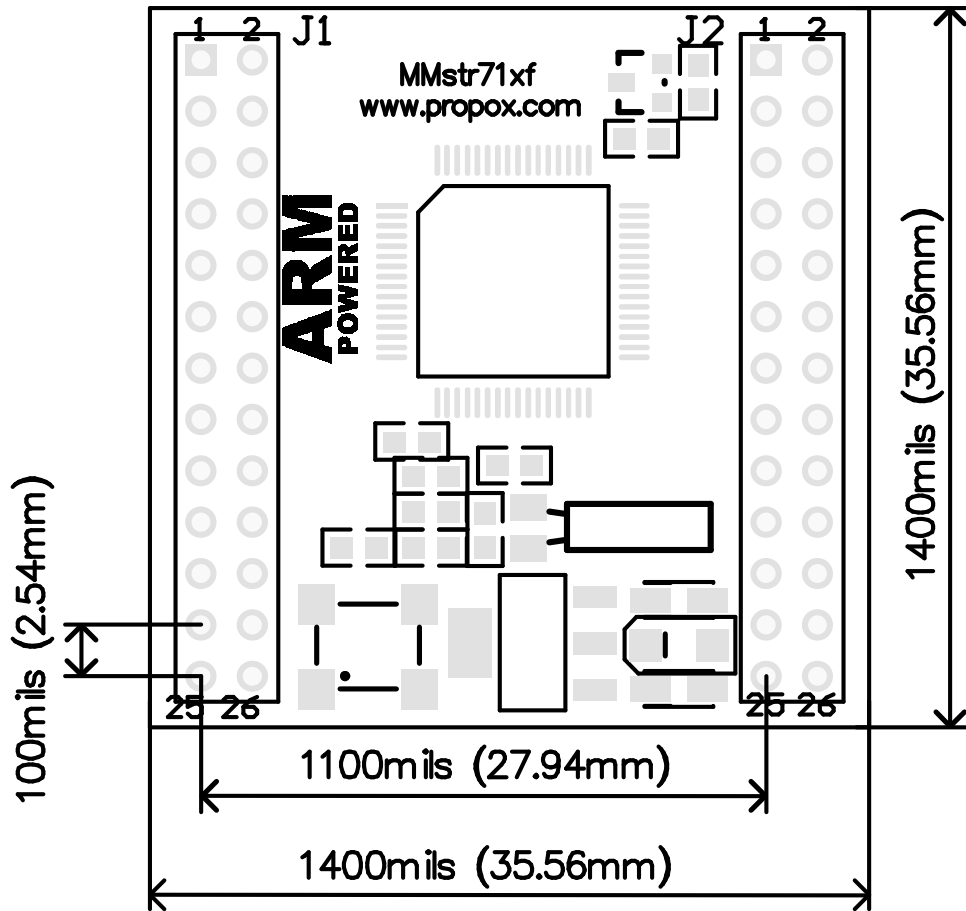
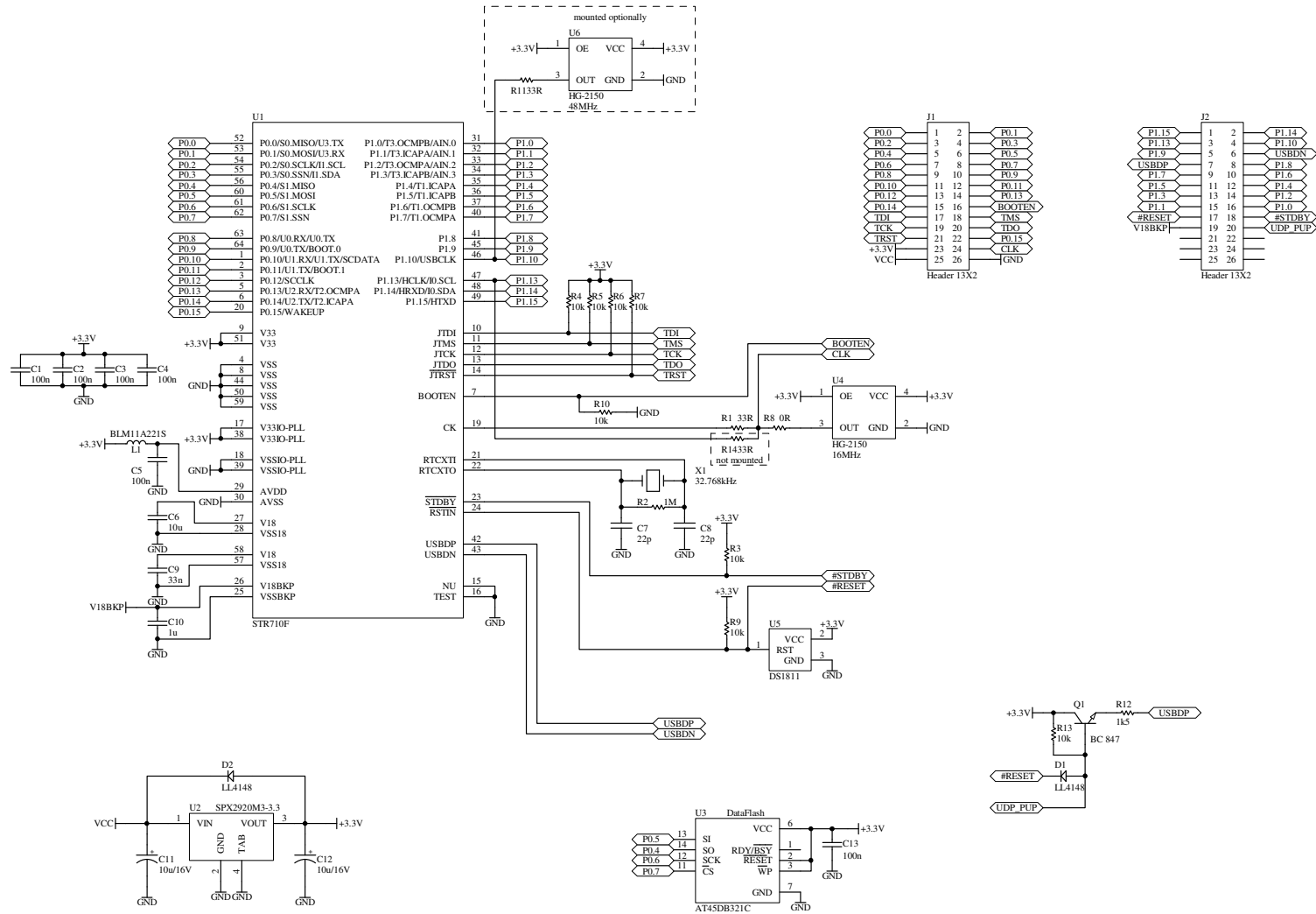


Figure 11 Dimensions - top view.



Figure 12 Dimensions – side view.

## 9 Schematic



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