V3.x Matrix Controller assembly instructions

1. List of Parts:

- IC1 — Atmega168-20AU, TQFP 32 7x7
  (Mouser: 556-ATMEGA168-20AU)
- IC2-5 — 74HC595, ST EZ80731, SO16
- C1-2 — 22pF, should match X1
- C3,C5 — 100nF
  (Mouser: 505-MKS02.1/63/10)
- C4 — 47µF
  (Mouser: 75-515D474M050JA6AE3)
- R25,R27 — 10k
- R26 — 1k
- D1 — LED, 3mm
- RE — reset enable, 2pin male header (cut to size) + low profile jumper
- R1-24 — suitable resistors for RGB LEDs. 270Ω may work for all
- MATRIX — 4x 8pin female header
- PORTC/D — 2x 10pin female header
- ICSP — 1x 2x3pin male header
- SPI — 1x 2x3pin male header + 3 jumper
- SW,RST — general purpose switch, Schurter 1301.9302
  (Farnell: 1217773)
- FTDI — 6pin male header
- X1 — 16MHz Quartz, HC49U-S package, low profile !
  (Mouser: 520-HCU1600-SX)
- spacer — Quartz spacer, non conductive
  (or piece of plastic under the quartz, e.g. laser transparency)

When you buy the parts, make sure none of the components consume more than 7.5mm of height when assembled. Depending on the type of LED matrix you use, “standing” through hole resistors may have to be bent sideways at an angle of about 20-30°. Using small size resistors is an alternative if you can get them.

2. You will need:

- Soldering iron with a tip suitable for 0.5-0.8mm traces, not too small
- Solder with flux core, preferably "no clean", about 0.5-0.8mm diameter
- Additional "no clean" flux, in a syringe or dispenser pen
- wire cutter, tweezers
- strong magnifier for solder joint inspection
- cotton swabs + isopropyl alcohol for removing residual flux
- Programmer to flash the bootloader. Adafruit.com USBtinyISP works just fine
- USB/TTL serial adapter with DTR for auto-reset

3. Tips:

- Align the SMD parts as good as possible or you will have "lots of fun"
- Always use plenty of flux
- Always clean the tip
- Don't rush it

4. Suggested assembly steps:

- Start with the first group of parts with numbers 1 – 6 to build a minimal working system
- Flash the bootloader
- Continue to attach the remaining 4 SMT chips in group 7
- Now just follow the numbers until done.

If you want to change the order of attaching parts I'd put on the SMT chips first. If you put them on after the headers and other through hole parts you'll have "a lot of fun" while avoiding to burn holes into various components.

5. Suggested USB/TTL serial adapters:

- **ModernDevice "BUB"** (http://www.moderndevice.com)
- **Sparkfun "FTDI Basic Breakout – 5V"** (http://www.sparkfun.com)
- FTDI cable FTDI-TTL-232R-3V3 (works too, but no auto-reset)

6. Compatible RGB LED matrices:

- http://stores.ebay.com/LEDSEE-electronics
- http://www.seeedstudio.com

7. Please avoid:

- applying more than 5V DC (regulated) may destroy the device terminally
- do not reverse polarization of the USB adapter (pin 1 = GND)
- shorting pins to 5V/GND when set as OUTPUT may destroy the pin / chip
- do not power solenoids / relays without a transistor / protection diode
- in case of doubt, use a 1k resistor instead of just a blank wire
- isopropyl alcohol may decompose the transparent resin of the LED matrix

8. Pin assignment:

- The LED is connected to PD4 / digital IN/OUT 4
- The general purpose button is connected to PB0 / digital IN/OUT 8
- I²C / TWI (two wire): **SDA**, **SCL**

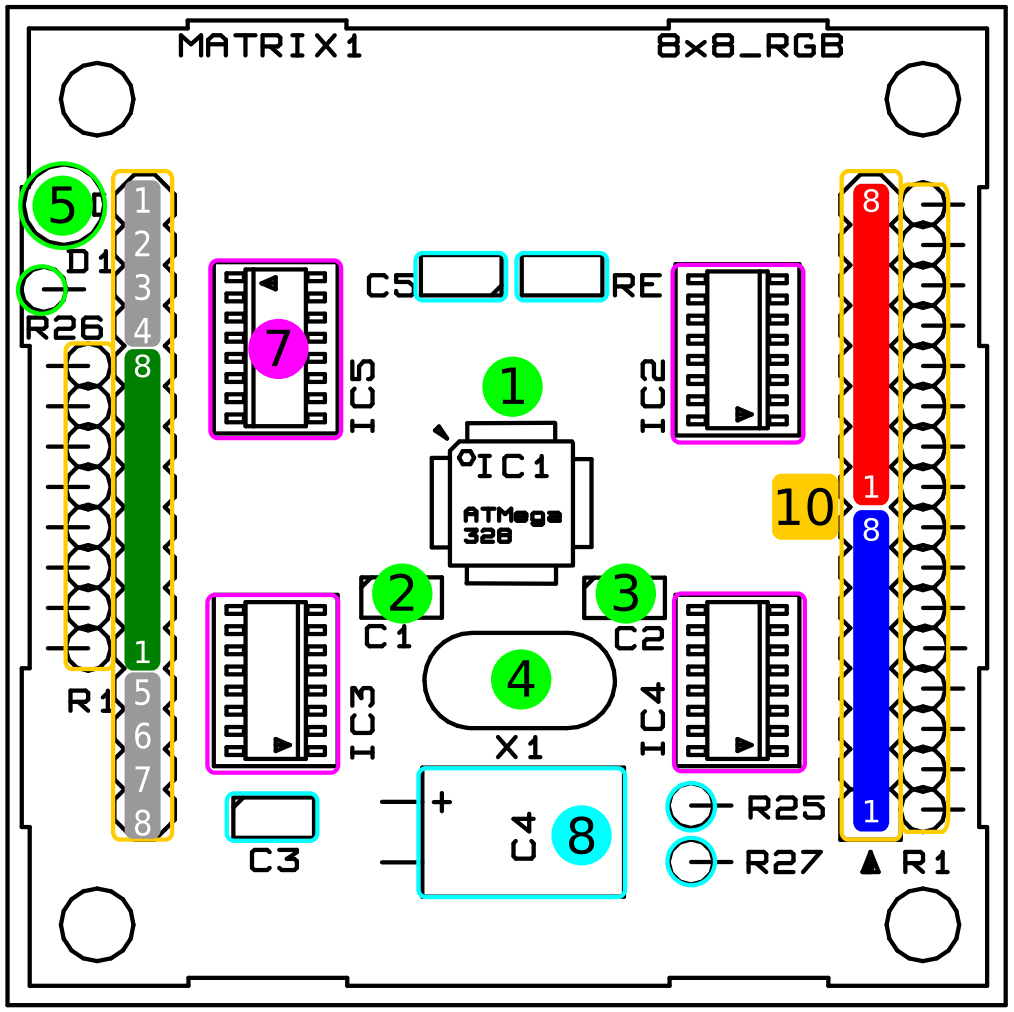
“PORTC” :

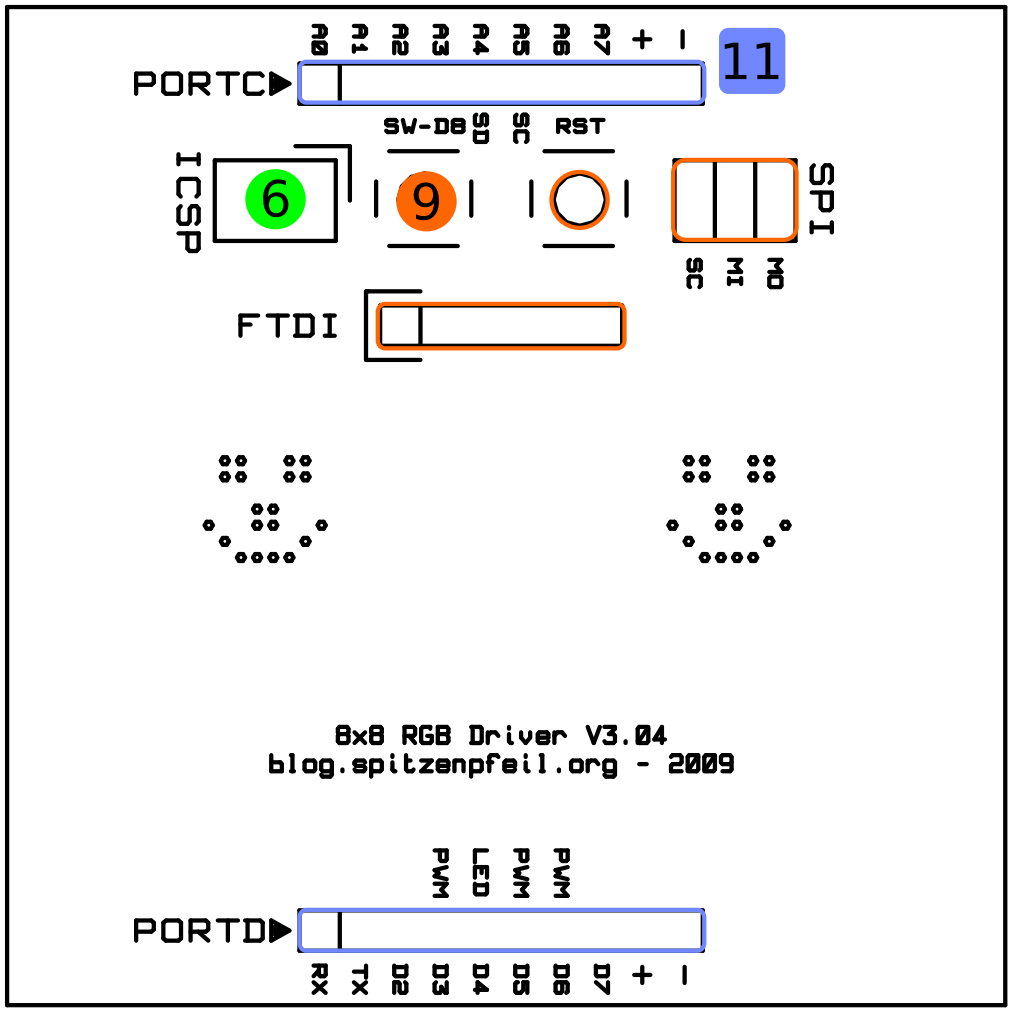
PIN	NAME	FUNCTION	ARDUINO PIN	ARDUINO PIN
1	PC0	ADC0	analog IN 0	digital IN/OUT 14
2	PC1	ADC1	analog IN 1	digital IN/OUT 15
3	PC2	ADC2	analog IN 2	digital IN/OUT 16
4	PC3	ADC3	analog IN 3	digital IN/OUT 17
5	PC4	ADC4, **SDA**	analog IN 4	digital IN/OUT 18
6	PC5	ADC5, **SCL**	analog IN 5	digital IN/OUT 19
7	ADC6	ADC6	analog IN 6	-
8	ADC7	ADC7	analog IN 7	-
9	+	5V	-	-
10	-	GND	-	-

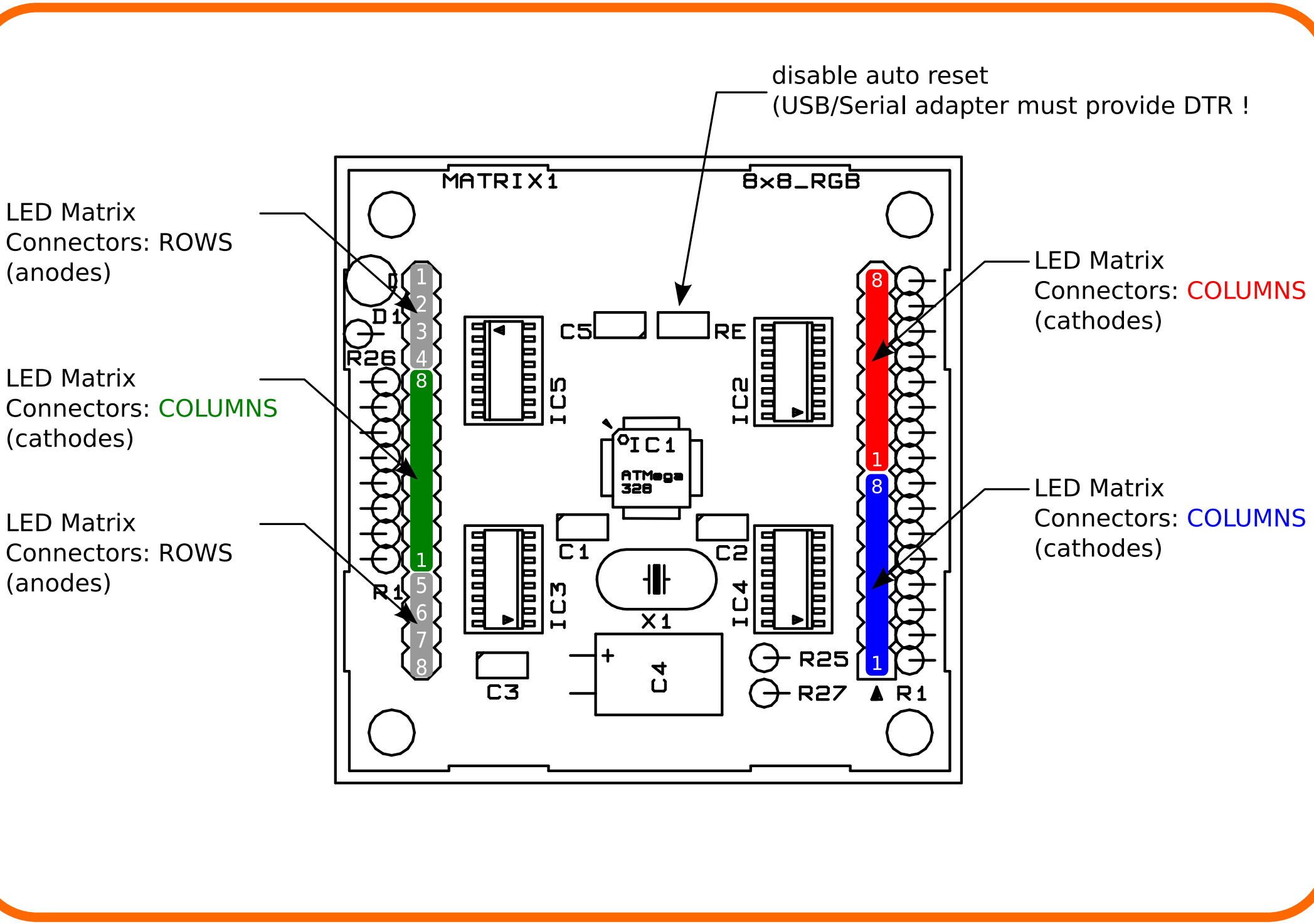
“PORTD” :

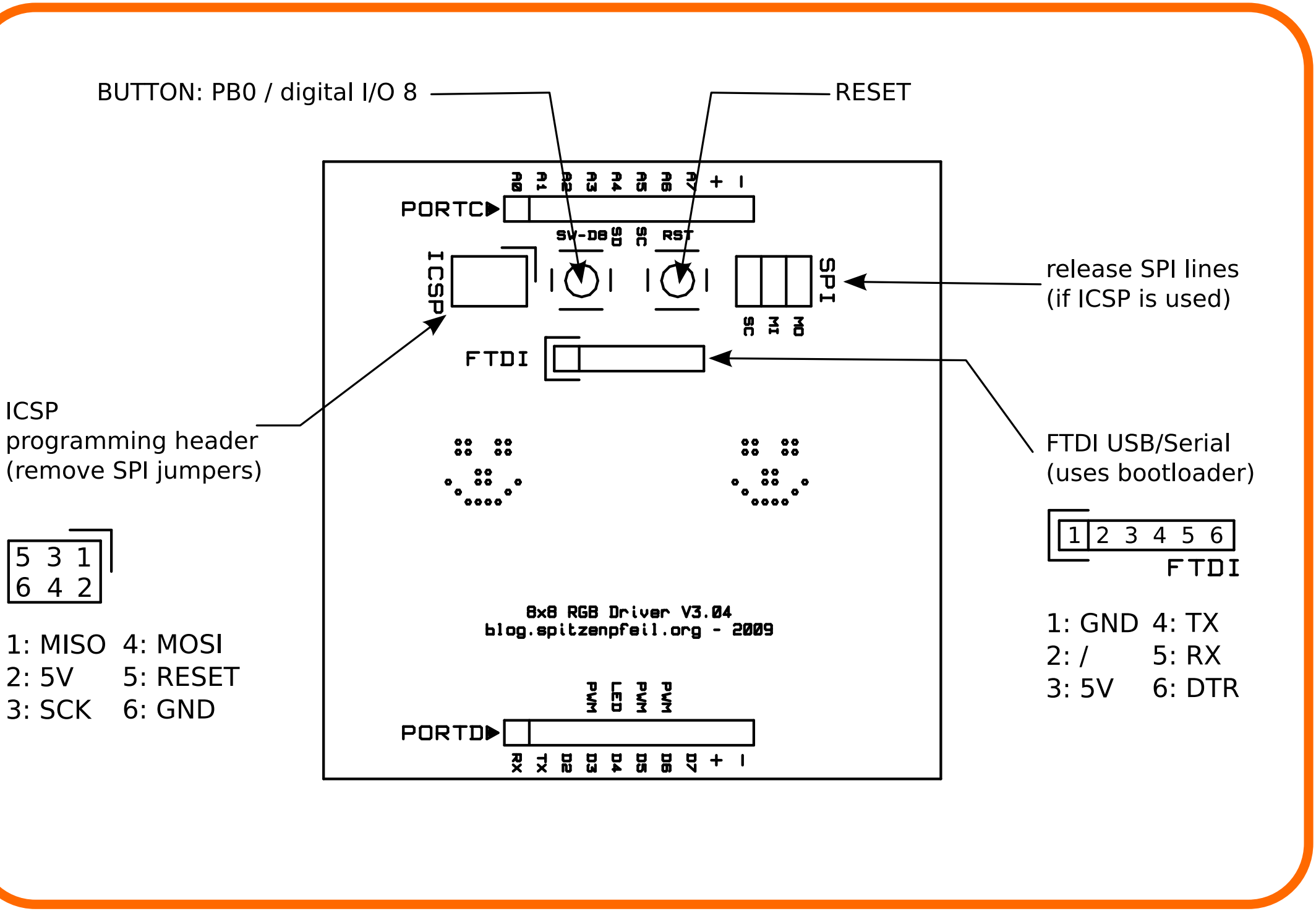
PIN	NAME	FUNCTION	ARDUINO PIN	ARDUINO PIN
1	PD0	RXD	RXD	digital IN/OUT 0
2	PD1	TXD	TXD	digital IN/OUT 1
3	PD2	INT0	-	digital IN/OUT 2
4	PD3	INT1, OC2B	PWM	digital IN/OUT 3
5	PD4	XCK, T0	onboard LED	digital IN/OUT 4
6	PD5	T1, OC0B	PWM	digital IN/OUT 5
7	PD6	AIN0, OC0A	PWM	digital IN/OUT 6
8	PD7	AIN1	-	digital IN/OUT 7
9	+	5V	-	-
10	-	GND	-	-

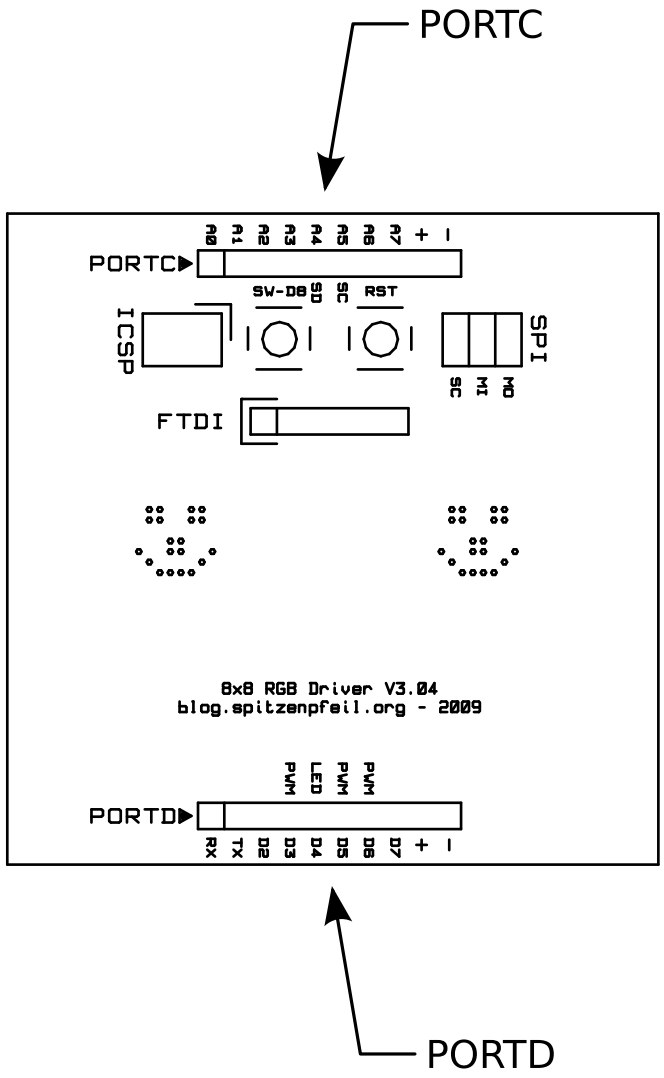
Soldering by numbers !






disable auto reset
(USB/Serial adapter must provide DTR !
LED Matrix
Connectors: ROWS
(anodes)
LED Matrix
Connectors: COLUMNS
(cathodes)
LED Matrix
Connectors: ROWS
(anodes)
LED Matrix
Connectors: COLUMNS
(cathodes)
LED Matrix
Connectors: COLUMNS
(cathodes)
MATRIX1
8x8_RGB
D1
R26
R1
C5
RE
IC5
IC2
IC1
ATMega
328
C1
C2
IC3
IC4
X1
C3
C4
R25
R27
R1


BUTTON: PB0 / digital I/O 8
RESET
PORTC
A0 A1 A2 A3 A4 A5 A6 A7 + -
5V-DB SD SC RST
ICSP
SPI
SC MI MO
FTDI
8x8 RGB Driver V3.04
blog.spitzenpfeil.org - 2009
PORTD
PWM LED PWM PWM
RX TX D2 D3 D4 D5 D6 D7 + -
release SPI lines
(if ICSP is used)
ICSP
programming header
(remove SPI jumpers)
FTDI USB/Serial
(uses bootloader)
5 3 1
6 4 2
1: MISO 4: MOSI
2: 5V 5: RESET
3: SCK 6: GND
1 2 3 4 5 6
FTDI
1: GND 4: TX
2: / 5: RX
3: 5V 6: DTR



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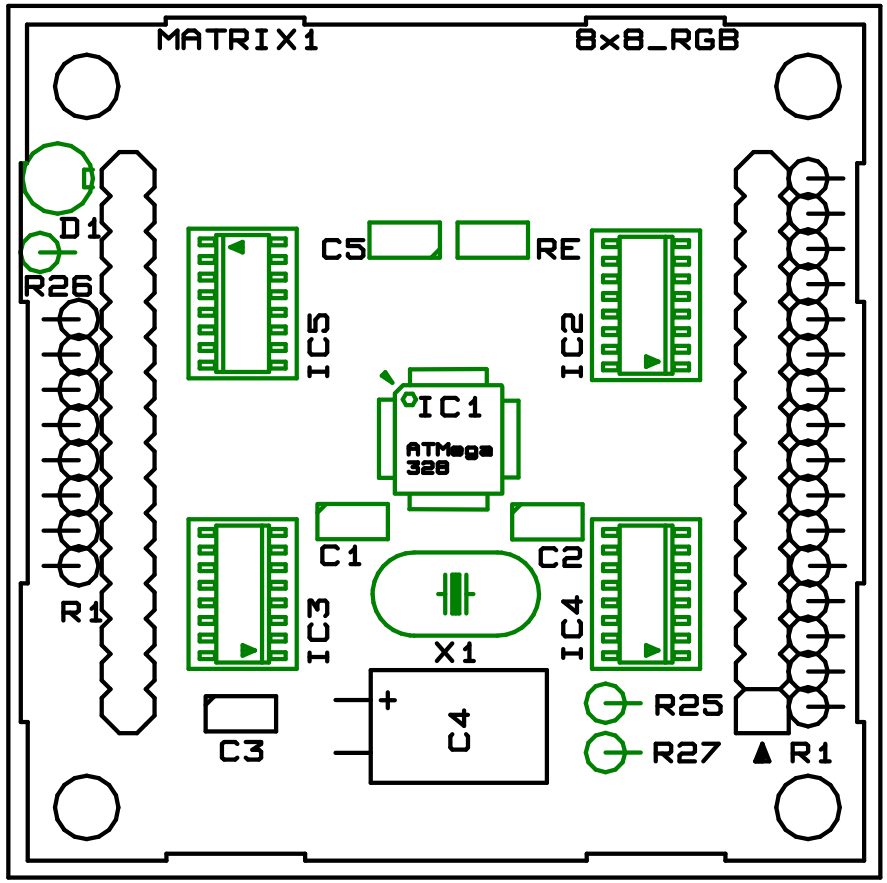
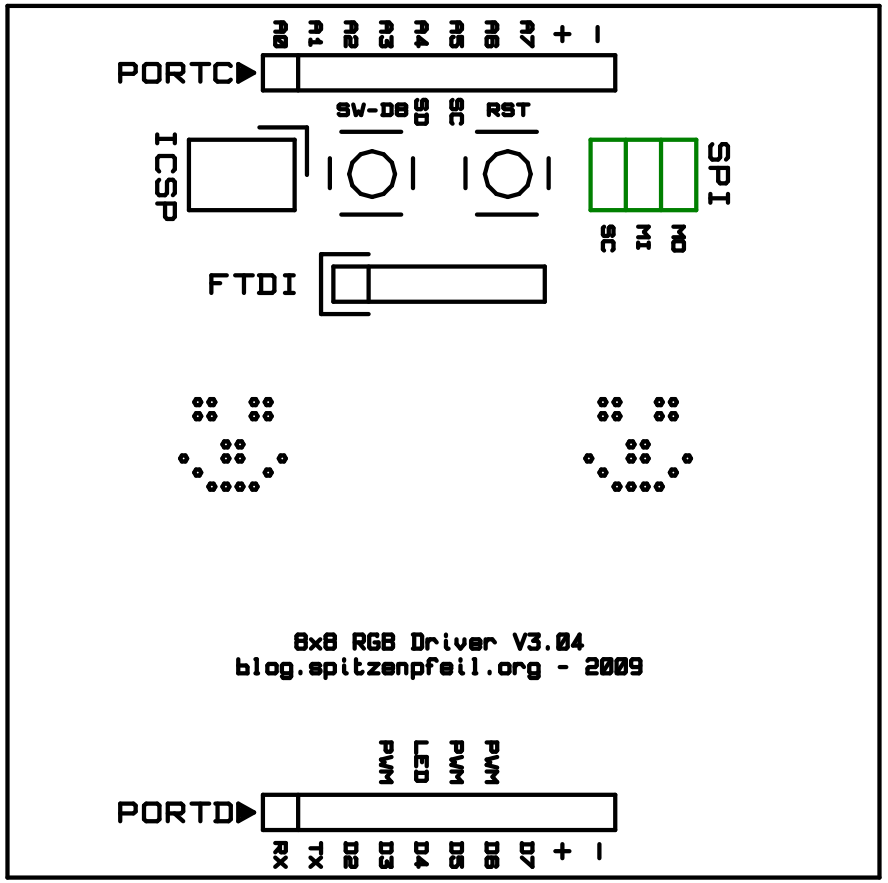
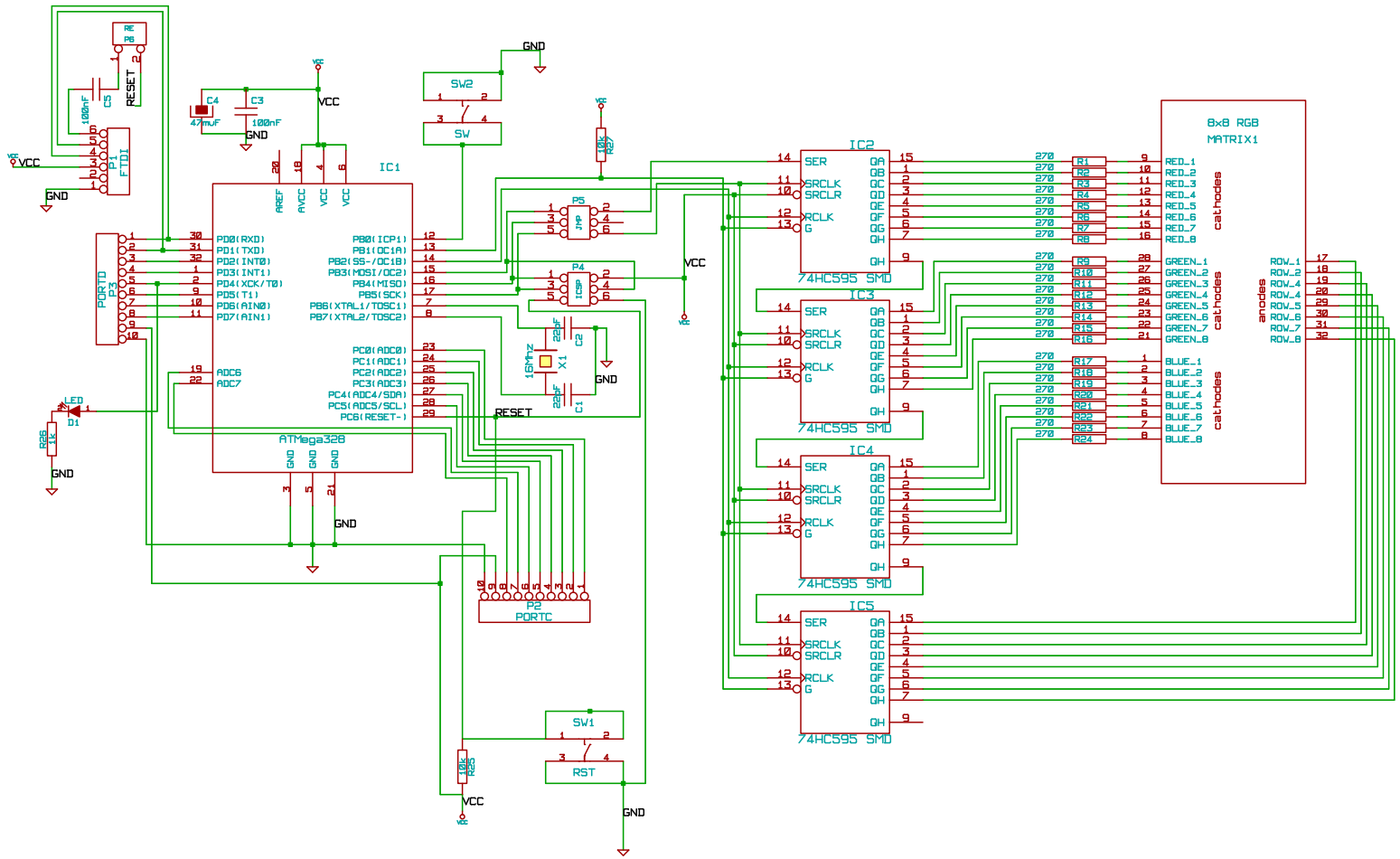
7	PD6	AIN0, OC0A	PWM	digital IN/OUT 6
8	PD7	AIN1	-	digital IN/OUT 7
9	+	5V	-	-
10	-	GND	-	-

Preassembled SMD components (optional)







2009 - Robert Spitzenpfeil

My 2mvF - blog.spitzenpfeil.org		
File: 8x8_rgb_matrix-V3_04.sch		
Sheet: /		
Title: 8x8 RGB LED matrix controller		
Size: A3	Date: 01 jun 2009	Rev: V3.04
KiCad E.D.A.	EESchema (20080825)	Id: 1/1