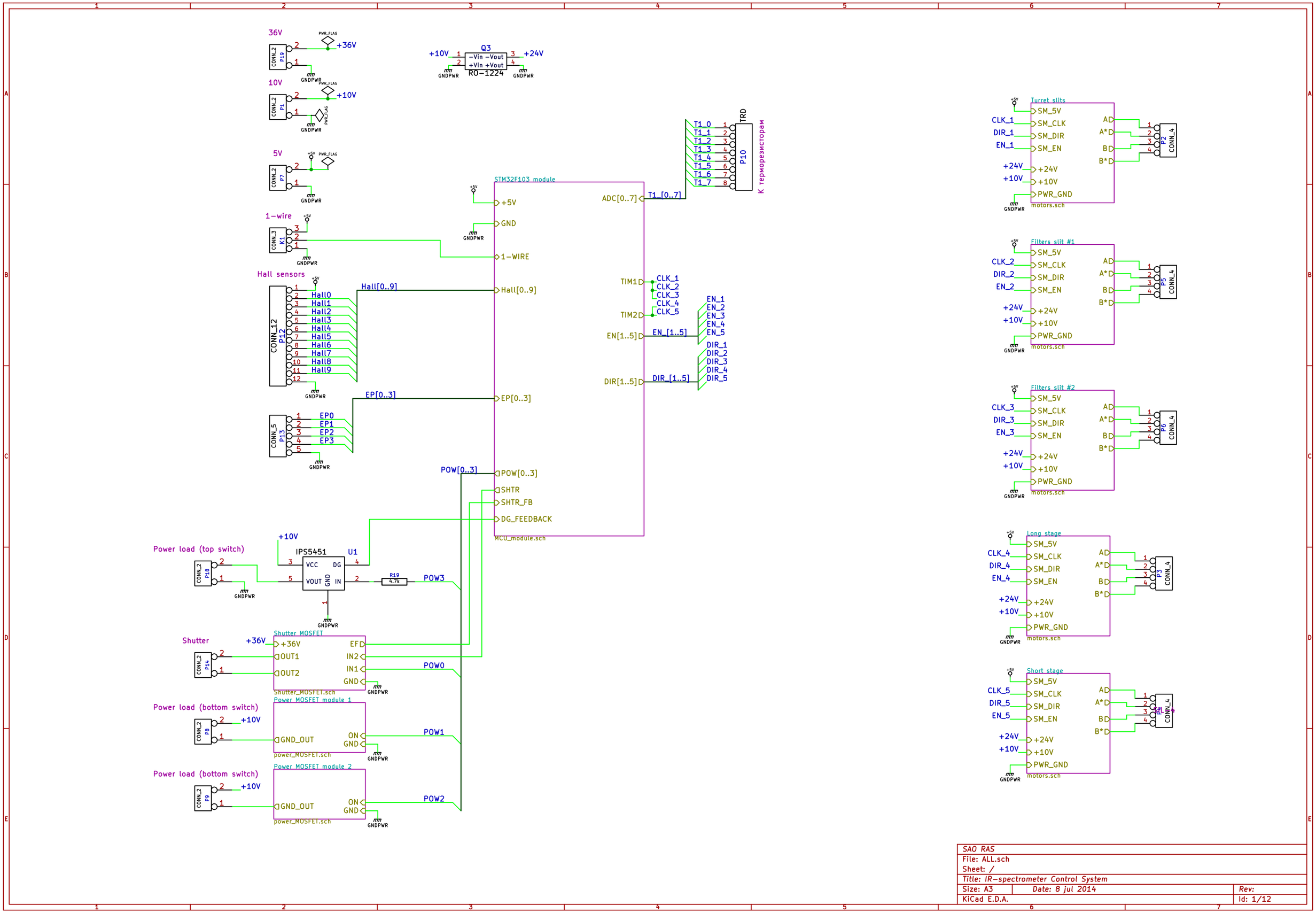
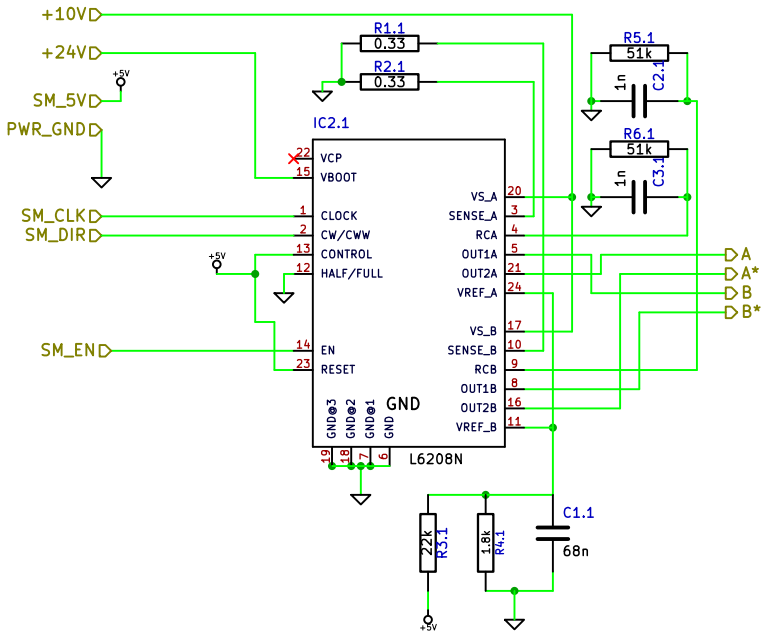

36V
CONN_2
P19
PWR_FLAG
+36V
GNDPWR
10V
P1
+10V
5V
P7
+5V
1−wire
CONN_3
K1
Hall sensors
CONN_12
P12
Hall0
Hall1
Hall2
Hall3
Hall4
Hall5
Hall6
Hall7
Hall8
Hall9
Hall[0..9]
CONN_5
P13
EP0
EP1
EP2
EP3
EP[0..3]
Q3
+10V
−Vin −Vout
+Vin +Vout
RO−1224
+24V
STM32F103_module
+5V
GND
1−WIRE
Hall[0..9]
EP[0..3]
POW[0..3]
SHTR
SHTR_FB
DG_FEEDBACK
MCU_module.sch
ADC[0..7]
T1_[0..7]
TRD
T1_0
T1_1
T1_2
T1_3
T1_4
T1_5
T1_6
T1_7
P10
К терморезисторам
TIM1
TIM2
CLK_1
CLK_2
CLK_3
CLK_4
CLK_5
EN[1..5]
EN_[1..5]
EN_1
EN_2
EN_3
EN_4
EN_5
DIR[1..5]
DIR_[1..5]
DIR_1
DIR_2
DIR_3
DIR_4
DIR_5
Power load (top switch)
P18
IPS5451
U1
VCC
DG
VOUT
GND
IN
R19
4.7k
POW3
Shutter
P14
Shutter MOSFET
+36V
OUT1
OUT2
EF
IN2
IN1
POW0
Shutter_MOSFET.sch
Power load (bottom switch)
P8
Power MOSFET module 1
GND_OUT
ON
POW1
power_MOSFET.sch
P9
Power MOSFET module 2
POW2
Turret slits
SM_5V
SM_CLK
SM_DIR
SM_EN
PWR_GND
motors.sch
P2
Filters slit #1
P5
Filters slit #2
P6
Long stage
P3
Short stage
P4
SAO RAS
File: ALL.sch
Sheet: /
Title: IR−spectrometer Control System
Size: A3
Date: 8 jul 2014
Rev:
KiCad E.D.A.
Id: 1/12



SAO RAS		
File: motors.sch		
Sheet: /Turret slits/		
Title: Stepper motor module		
Size: A4	Date: 8 jul 2014	Rev:
KiCad E.D.A.		Id: 2/12

SPI/CAN/I2C

CONN_7 P11
- 7 — +3.3V
- 6 — I2C_SDA/CANTX
- 5 — I2C_SCL/CANRX
- 4 — SPI1_MOSI
- 3 — SPI1_MISO
- 2 — SPI1_SCK
- 1

Power

+5V — D1 B120-E3 — C5 10u — U5 LM1117MPX-3.3 (IN, GND, OUT) — C6 100u — D2 PWR — R10 510 — L1 BMB2A0300AN1 — PWR_FLAG — C13 10u, C14 100n — VDDA

GND — VSSA

RST

SW1 RESET — R26 10k — C7 100n — +3.3V

BOOT

SW2 BOOT — C8 100n — R17 10k — +3.3V

Additional SPI

CONN_4 P15
- 1 — SPI2_MOSI
- 2 — SPI2_MISO
- 3 — SPI2_SCK
- 4

Additional IO

CONN_7 P16
- 7 — EXT5/BOOT_RX
- 6 — EXT4/BOOT_TX
- 5 — EXT3
- 4 — EXT2
- 3 — EXT1
- 2 — EXT0
- 1

SHTR — SHTR

SHTR_FB — SHTR_FB

POW[0..3] — POW[0..3]

DG_FEEDBACK — R20 15k — R21 15k — DG_FEEDBACK

ADC[0..7] — ADC_[0..7]

1-WIRE — 1-WIRE

TIM1 — TIM1

TIM2 — TIM2

DIR[1..5] — DIR_[1..5] — DIR_1, DIR_2, DIR_3, DIR_4, DIR_5

EN[1..5] — EN_[1..5] — EN_1, EN_2, EN_3, EN_4, EN_5

Hall[0..9] — Hall[0..9]
- Hall0 — Tur1_0
- Hall1 — Tur1_1
- Hall2 — Tur1_2
- Hall3 — Tur1_3
- Hall4 — Tur2_0
- Hall5 — Tur2_1
- Hall6 — Tur2_2
- Hall7 — Tur3_0
- Hall8 — Tur3_1
- Hall9 — Tur3_2

EP[0..3] — EP[0..3]
- EP0 — LS1_down
- EP1 — LS1_up
- EP2 — LS2_down
- EP3 — LS2_up

+3.3V — R22 10k, R23 10k, R24 10k
- POW0
- SHTR
- SHTR_FB
- POW1
- POW2
- POW3

R37 10k, R38 10k, R39 10k

+5V — R13 10k, R14 10k, R15 20k, R16 10k

USB input circuit

+5V, +3.3V — +3.3V, USB_+5V, GND — USB_POWER, USB_DISC, USB_DP, USB_DM — USB_inp.sch

RS-232 level converter

+5V — +5V, GND — UART_RX, UART_TX, UART_RX1, UART_TX1 — ST3232.sch

JP1 (RX1_EN): 1 — 2 — EXT5/BOOT_RX

JP2 (TX1_EN): 1 — 2 — EXT4/BOOT_TX

STM32F103 U3

C15 100n — +3.3V

Q2 8MHz — C10 27p, C11 27p — R12 1M

- DIR_3 — 1 — PE2/TRACECK
- DIR_4 — 2 — PE3/TRACED0
- DIR_5 — 3 — PE4/TRACED1
- DG_FEEDBACK — 4 — PE5/TRACED2
- 5 — PE6/TRACED3
- 6 — VBAT
- 7 — PC13/TAMPER-RTC
- 8 — PC14/OSC32IN
- 9 — PC15/OSC32OUT
- 10 — VSS5
- 11 — VDD5
- 12 — OSC_IN
- 13 — OSC_OUT
- RST — 14 — NRST
- SHTR — 15 — PC0/ADC12_IN10
- SHTR_FB — 16 — PC1/ADC12_IN11
- 17 — PC2/ADC12_IN12
- 18 — PC3/ADC12_IN13
- VSSA — 19 — VSSA
- 20 — VREF-
- 21 — VREF+
- VDDA — 22 — VDDA
- 23 — PA0/WKUP/USART2_CTS/ADC12_IN0/TIM2_CH1_ETR
- TIM2 — 24 — PA1/USART2_RTS/ADC12_IN1/TIM2_CH2
- UART_TX — 25 — PA2/USART2_TX/ADC12_IN2/TIM2_CH3

C16 100n — +3.3V

- 100 — VDD3
- 99 — VSS3
- 98 — PE1
- 97 — PE0/TIM4_ETR
- 96 — PB9/TIM4_CH4(I2C1_SDA/CANTX)
- 95 — PB8/TIM4_CH3(I2C1_SCL/CANRX)
- 94 — BOOT0
- 93 — PB7/I2C1_SDA/TIM4_CH2(USART1_RX)
- 92 — PB6/I2C1_SCL/TIM4_CH1(USART1_TX)
- 91 — PB5/I2C1_SMBAI(TIM3_CH2/SPI1_MOSI)
- 90 — JNTRST(TIM3_CH1/PB4/SPI1_MISO)
- 89 — JTDO(TIM2_CH2/PB3/TRACESWO/SPI1_SCK)
- 88 — PD7(USART2_CK)
- 87 — PD6(USART2_RX)
- 86 — PD5(USART2_TX)
- 85 — PD4(USART2_RTS)
- 84 — PD3(USART2_CTS)
- 83 — PD2/TIM3_ETR
- 82 — PC12(USART3_CK)
- 81 — PC11(USART3_RX)
- 80 — PC10(USART3_TX)
- 79 — JTCK/SWCLK(PA14)
- 78
- 77
- 76

DIR_1, I2C_SDA/CANTX, I2C_SCL/CANRX, BOOT, SPI1_MOSI, SPI1_MISO, SPI1_SCK, Tur3_0, Tur2_2, Tur2_1, Tur2_0, Tur1_3, Tur1_2, Tur1_1, Tur1_0, USB_DISC

+3.3V — C18 100n

- 75 — VDD2
- 74 — VSS2
- 73 — NC
- 72 — JTMS/SWDIO(PA13)
- 71 — PA12/USART1_RTS/CANTX/USBDP/TIM1_ETR — USB_DP
- 70 — PA11/USART1_CTS/CANRX/USBDM/TIM1_CH4 — USB_DM
- 69 — PA10/USART1_RX/TIM1_CH3 — EXT5/BOOT_RX
- 68 — PA9/USART1_TX/TIM1_CH2 — EXT4/BOOT_TX
- 67 — PA8/USART1_CK/TIM1_CH1/MCO — EXT3
- 66 — PC9(TIM3_CH4) — EXT2
- 65 — PC8(TIM3_CH3) — EXT1
- 64 — PC7(TIM3_CH2) — EXT0
- 63 — PC6(TIM3_CH1) — TIM1
- 62
- 61
- 60 — PD13(TIM4_CH2) — LS2_up
- 59 — PD12(TIM4_CH1/USART3_RTS) — LS2_down
- 58 — PD11(USART3_CTS) — LS1_up
- 57 — PD10(USART3_CK) — LS1_down
- 56 — PD9(USART3_RX) — Tur3_2
- 55 — PD8(USART3_TX) — Tur3_1
- 54 — PB15/SPI2_MOSI/TIM1_CH3N — SPI2_MOSI
- 53 — PB14/SPI2_MISO/USART3_RTS/TIM1_CH2N — SPI2_MISO
- 52 — PB13/SPI2_SCK/USART3_CTS/TIM1_CH1N — SPI2_SCK
- 51 — PB12/SPI2_NSS/I2C2_SMBAI/USART3_CK/TIM1_BKIN

- 26 — PA3/USART2_RX/ADC12_IN3/TIM2_CH4
- 27 — VSS4
- 28 — VDD4
- 29 — PA4/SPI1_NSS/USART2_CK/ADC12_IN4
- 30 — PA5/SPI1_SCK/ADC12_IN5
- 31 — PA6/SPI1_MISO/ADC12_IN6/TIM3_CH1(TIM1_BKIN)
- 32 — PA7/SPI1_MOSI/ADC12_IN7/TIM3_CH2(TIM1_CH1N)
- 33 — PC4/ADC12_IN14
- 34 — PC5/ADC12_IN15
- 35 — PB0/ADC12_IN8/TIM3_CH3(TIM1_CH2N)
- 36 — PB1/ADC12_IN9/TIM3_CH4(TIM1_CH3N)
- 37 — PB2/BOOT1
- 38 — PE7(TIM1_ETR)
- 39 — PE8(TIM1_CH1N)
- 40 — PE9(TIM1_CH1)
- 41 — PE10(TIM1_CH2N)
- 42 — PE11(TIM1_CH2)
- 43 — PE12(TIM1_CH3N)
- 44 — PE13(TIM1_CH3)
- 45 — PE14(TIM1_CH4)
- 46 — PE15(TIM1_BKIN)
- 47 — PB10/I2C2_SCL/USART3_TX(TIM2_CH3)
- 48 — PB11/I2C2_SDA/USART3_RX(TIM2_CH4)
- 49 — VSS1
- 50 — VDD1

UART_RX

Resistors with LOW |dR/dT|

C9 100n — +3.3V

VDDA — R27 — R28, R29, R30, R31, R32, R33, R34 — RT0805BRB071KL

ADC_7, ADC_6, ADC_5, ADC_4, ADC_3, ADC_2, ADC_1, ADC_0

ADC[0..7]

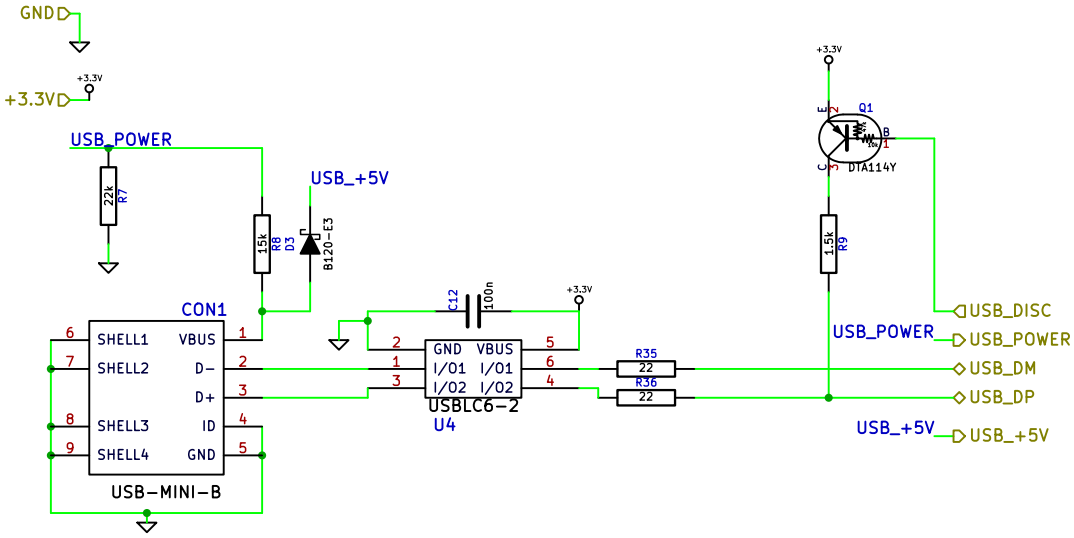
R18 100k — EN_1, EN_2, EN_3, EN_4, EN_5, POW0, POW1, POW2, POW3

POW[0..3]

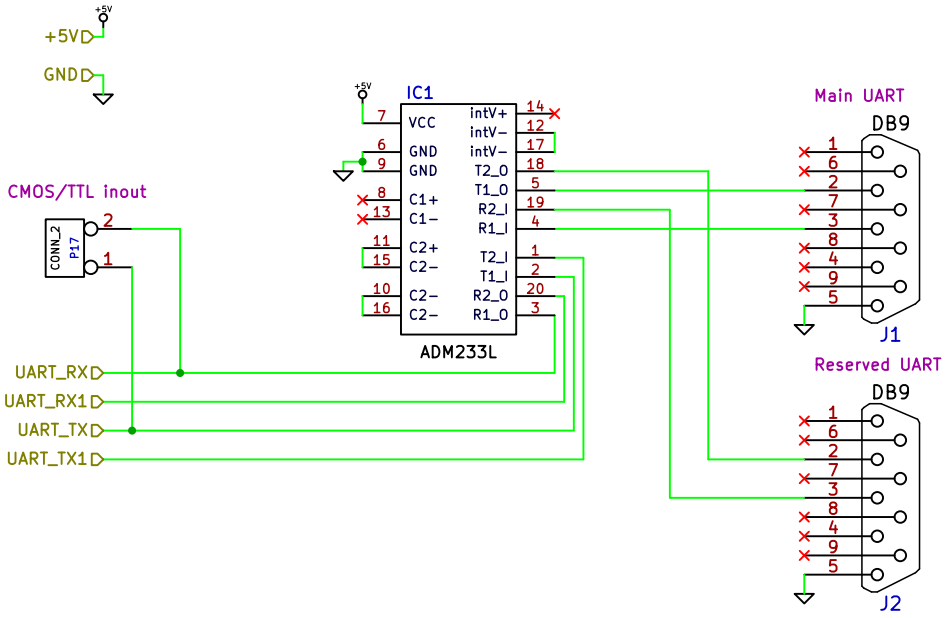
+3.3V — C17 100n — R11 4.7k

1-WIRE

SAO RAS		
File: MCU_module.sch		
Sheet: /STM32F103 module/		
Title: MCU module on STM32F103		
Size: A3	Date: 8 jul 2014	Rev:
KiCad E.D.A.		Id: 3/12

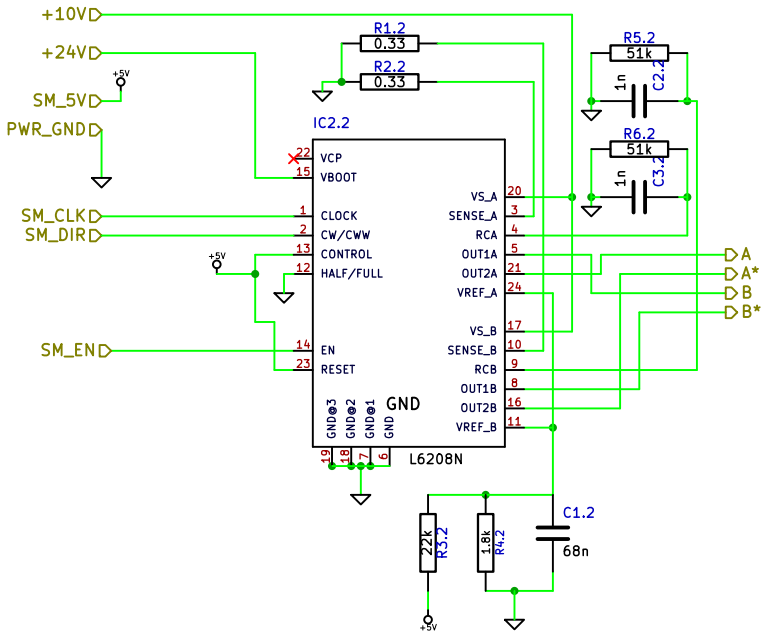


SAO RAS		
File: USB_inp.sch		
Sheet: /STM32F103 module/USB input circuit/		
Title: USB input circuit		
Size: A4	Date: 8 jul 2014	Rev:
KiCad E.D.A.		Id: 4/12

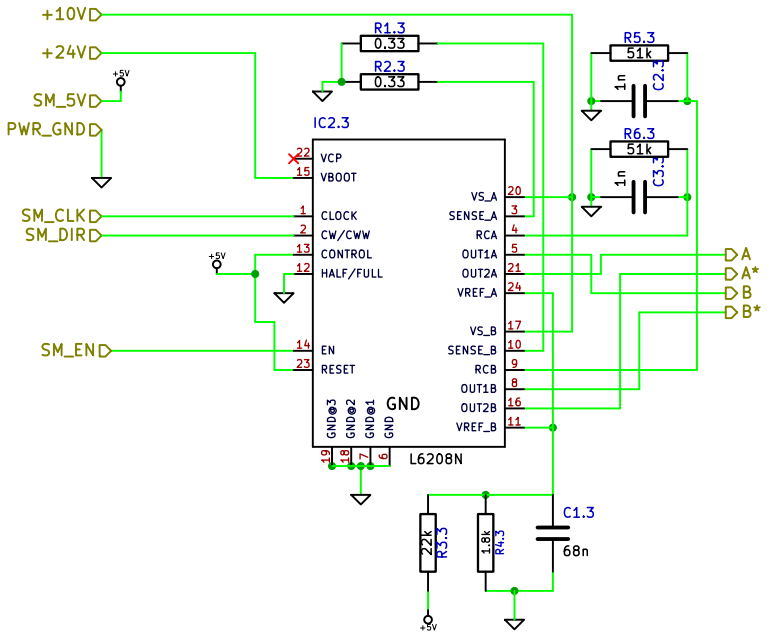


DB9 pinout:
1 – Data carrier detect
2 – Receive data
3 – Transmit data
4 – Data terminal ready
5 – Signal ground
6 – Data set ready
7 – Request to send
8 – Clear to send
9 – Ring indicator

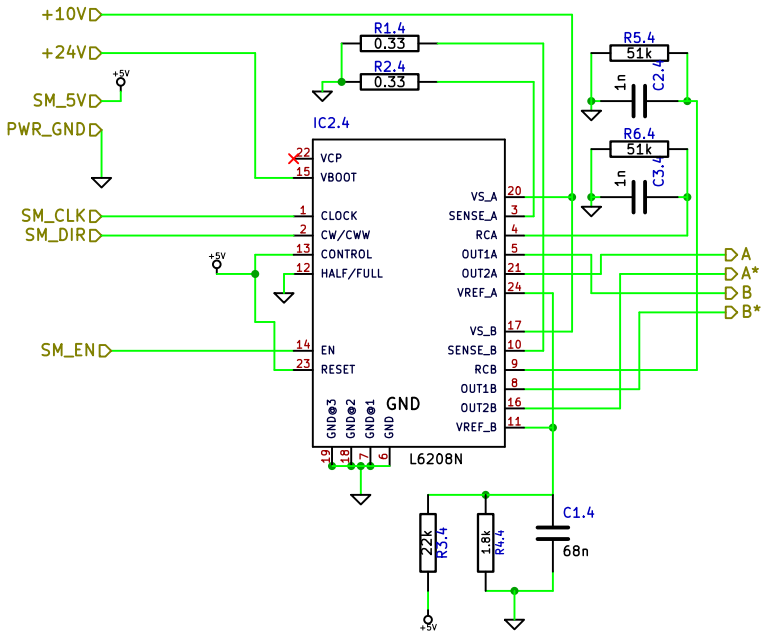
SAO RAS		
File: ST3232.sch		
Sheet: /STM32F103 module/RS−232 level converter/		
Title: RS−232 level converter		
Size: A4	Date: 8 jul 2014	Rev:
KiCad E.D.A.		Id: 5/12



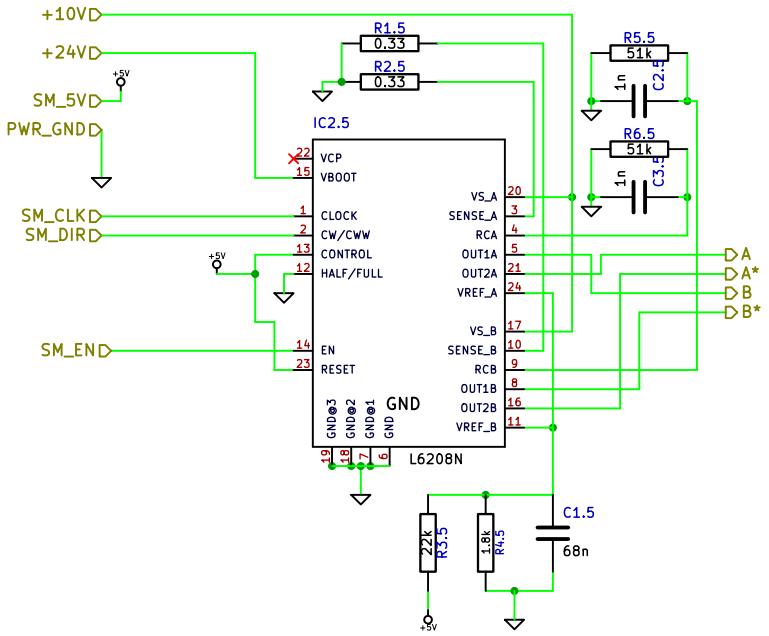
SAO RAS		
File: motors.sch		
Sheet: /Filters slit #1/		
Title: Stepper motor module		
Size: A4	Date: 8 jul 2014	Rev:
KiCad E.D.A.		Id: 6/12



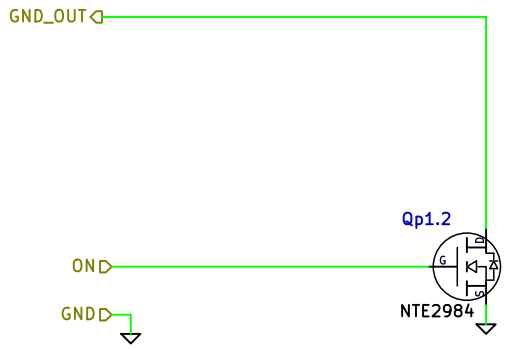
SAO RAS		
File: motors.sch		
Sheet: /Filters slit #2/		
Title: Stepper motor module		
Size: A4	Date: 8 jul 2014	Rev:
KiCad E.D.A.		Id: 7/12



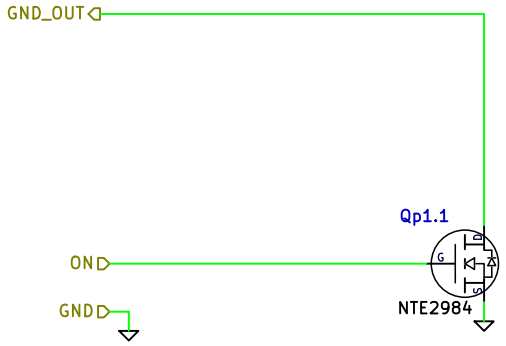
SAO RAS		
File: motors.sch		
Sheet: /Long stage/		
Title: Stepper motor module		
Size: A4	Date: 8 jul 2014	Rev:
KiCad E.D.A.		Id: 8/12



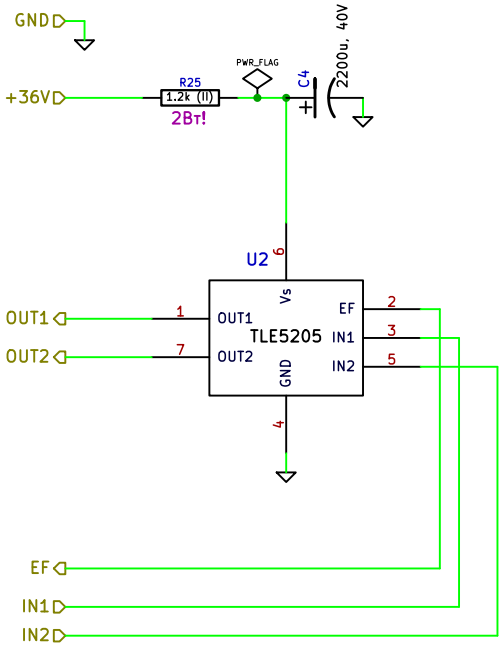
SAO RAS		
File: motors.sch		
Sheet: /Short stage/		
Title: Stepper motor module		
Size: A4	Date: 8 jul 2014	Rev:
KiCad E.D.A.		Id: 9/12



SAO RAS		
File: power_MOSFET.sch		
Sheet: /Power MOSFET module 1/		
Title: Power load module		
Size: A4	Date: 8 jul 2014	Rev:
KiCad E.D.A.		Id: 10/12



SAO RAS		
File: power_MOSFET.sch		
Sheet: /Power MOSFET module 2/		
Title: Power load module		
Size: A4	Date: 8 jul 2014	Rev:
KiCad E.D.A.		Id: 11/12



SAO RAS		
File: Shutter_MOSFET.sch		
Sheet: /Shutter MOSFET/		
Title: Power load module		
Size: A4	Date: 8 jul 2014	Rev:
KiCad E.D.A.		Id: 12/12