Power Supplies

+28V → PWR_FLAG → 12V_power_supply (VIN / VOUT) → +12VA → TP2 TestPoint_Small
File: lmz14203_12V_dc-dc.kicad_sch

+28V → PWR_FLAG → 5V_power_supply (VIN / VOUT) → +5VL → TP3 TestPoint_Small
File: lmz14203_5V_dc-dc.kicad_sch

+5VL → 5V RPI HAT Protection (5V_IN / VOUT) → +5VA → TP4 TestPoint_Small
File: rpi_hat_protect.kicad_sch

+5V → PWR_FLAG → dcdc_3.3V (V_IN / V_OUT) → +3V3 → TP1 TestPoint_Small
File: LDO_5V_3.kicad_sch

Power Input

+28V → Conn_01x02 J5 → GND

TVS Diodes

+28V → C62 1uF 35V ‖ C72 10uF 10% 50V → GND

IMU

+3V3 → PWR_FLAG → IMU (VINC / VCCC)
INT_IMU → INT
SDA → SDA
SCL → SCL
ADO → GND
File: Imu_mpu6050.kicad_sch

default I2C address: 0x68
ADO = 0: 1101000
ADO = 1: 1101001

RPI Power Supply

+5V → Conn_01x02 J1 → GND
+5V → Conn_01x02 J2 → GND
+5V → Conn_01x02 J3 → GND

Heater Pull Down Resistors

FS1_HEATER_EN → R6 100K → GND
FS2_HEATER_EN → R7 100K → GND
FS3_HEATER_EN → R8 100K → GND

GPIO Expanders

+3V3 → gpioexpander (VINC)
TestPoint_Small TP6 → CS_1 → CS
SCLK → SCK
MOSI → MOSI
MISO → MISO
RST_gp1 → RST
INT_A_gp1 → INT_A
INT_B_gp1 → INT_B
A2 → GND
A1 → SolderJumper_3_Open JP3 → +3V3
A0 → SolderJumper_3_Open JP4 → +3V3

P0_0 FS2_B_IN2 → TP7 TestPoint_Small
P0_1 FS2_B_IN1 → TP8 TestPoint_Small
P0_2 FS2_A_IN1 → TP9 TestPoint_Small
P0_3 FS2_A_IN2 → TP10 TestPoint_Small
P0_4 FS2_MOT_FAULT → TP11 TestPoint_Small
P0_5 FS2_MOTOR_EN → TP12 TestPoint_Small
P0_6 FS2_HEATER_EN → TP13 TestPoint_Small
P0_7 ×
P1_0 FS1_B_IN2 → TP14 TestPoint_Small
P1_1 FS1_B_IN1 → TP15 TestPoint_Small
P1_2 FS1_A_IN1 → TP16 TestPoint_Small
P1_3 FS1_A_IN2 → TP17 TestPoint_Small
P1_4 FS1_MOT_FAULT → TP18 TestPoint_Small
P1_5 FS1_MOTOR_EN → TP19 TestPoint_Small
P1_6 FS1_HEATER_EN → TP20 TestPoint_Small
P1_7 INT_IMU → TP30 TestPoint_Small
File: mcp23S17.kicad_sch

+3V3 → gpioexpander1 (VINC)
TestPoint_Small TP21 → CS_2 → CS
SCLK → SCK
MOSI → MOSI
MISO → MISO
RST_gp2 → RST
INT_A_gp2 → INT_A
INT_B → GND
A2 → SolderJumper_3_Open JP6 → +3V3
A1 → GND
A0 → SolderJumper_3_Open JP7 → +3V3

P0_0 ×
P0_1 FS3_B_IN2 → TP23 TestPoint_Small
P0_2 FS3_B_IN1 → TP24 TestPoint_Small
P0_3 FS3_A_IN1 → TP25 TestPoint_Small
P0_4 FS3_A_IN2 → TP26 TestPoint_Small
P0_5 FS3_MOT_FAULT → TP27 TestPoint_Small
P0_6 FS3_MOTOR_EN → TP28 TestPoint_Small
P0_7 GPIO_MUX2_12
P1_0 GPIO_MUX2_13
P1_1 GPIO_MUX2_11
P1_2 FS3_HEATER_EN → TP29 TestPoint_Small
P1_3 ×
P1_4 GPIO_MUX2_14
P1_5 GPIO_MUX2_15
P1_6 GPIO_MUX2_16
P1_7 GPIO_MUX2_17
File: mcp23S17.kicad_sch

GPIO Expanders — **SPI address : [1][0][0][A2][A1][A0]**

EMI FILTER

+12VA → EMI FILTER (VIN / VOUT) → +12V
File: emi_filter_dc_dc.kicad_sch

+5VA → EMI FILTER1 (VIN / VOUT) → +5V
File: emi_filter_dc_dc.kicad_sch

+5V

Current Monitors

+3V3 / +12V → current_monitor (VCCC / IN+)
SDA → SDA
SCL → SCL
A1 → GND
A0 → SolderJumper_3_Open JP8 → +3V3
IN− → TP5 TestPoint_Small
File: ina219.kicad_sch

For A1 = VSX:
A1 A0 Address
VS+ GND 1000100
VS+ VS+ 1000101

VIN_12V_FS1

+3V3 / +12V → current_monitor1 (VCCC / IN+)
SDA → SDA
SCL → SCL
A1 → GND
A0 → SolderJumper_3_Open JP5 → +3V3
IN− → TP22 TestPoint_Small
File: ina219.kicad_sch

For A1 = GND:
A1 A0 Address:
GND GND 1000000
GND VS+ 1000001

VIN_12V_FS2

+3V3 / +12V → current_monitor2 (VCCC / IN+)
SDA → SDA
SCL → SCL
A1 → SolderJumper_3_Open JP9 → +3V3
A0 → SCL
IN− → TP31 TestPoint_Small
File: ina219.kicad_sch

For A1 = SDA:
A0 A1 Address
SDA SDA 1001010
SDA SCL 1001110

VIN_12V_FS3

Connectors

J4 Conn_01x06: 1 GND, 2 MISO, 3 MOSI, 4 SCLK, 5 SCL, 6 SDA
R4 10K → SDA, R5 10K → SCL (+3V3)

C65 0.1uF 25V 10% — SDA
C66 0.1uF 25V 10% — SCL
C67 0.1uF 25V 10% — MOSI
C68 0.1uF 25V 10% — MISO
C69 0.1uF 25V 10% — SCLK
(all → GND)

J6 Conn_02x19_Odd_Even

GND	1	2	FS1_VOUT_HEATER+
FS1_B_OUT2	3	4	CS_1
FS1_A_OUT1	5	6	FS1_B_OUT1
RST_gp1	7	8	FS1_A_OUT2
+5V	9	10	FS1_TEMP_IN
	11	12	INT_B_gp1
FS2_VOUT_HEATER+	13	14	INT_A_gp1
	15	16	FS2_TEMP_IN
FS2_B_OUT1	17	18	
FS2_A_OUT2	19	20	FS2_B_OUT2
CS_2	21	22	FS2_A_OUT1
+5V	23	24	RST_gp2
FS3_VOUT_HEATER+	25	26	FS3_TEMP_IN
FS3_B_OUT1	27	28	INT_A_gp2
FS3_A_OUT2	29	30	
	31	32	FS3_B_OUT2
	33	34	FS3_A_OUT1
	35	36	GND
	37	38	+5V

Note: One +5V pin and one GND pin will be used to supply power to a Raspberry Pi

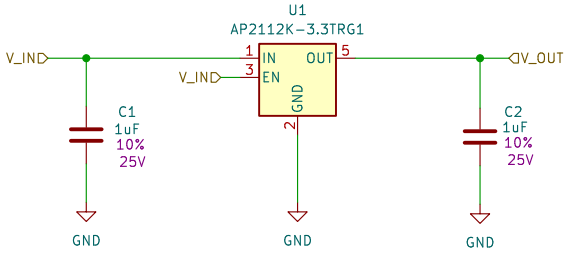
Fluidic Systems

+5V → fluidic_system (VIN_12V / VIN_5V)
FS1_MOTOR_EN → EN_MOTOR
FS1_A_IN1 → A_IN1
FS1_A_IN2 → A_IN2
FS1_B_IN1 → B_IN1
FS1_B_IN2 → B_IN2
FS1_HEATER_EN → EN_HEATER
M_FAULT → FS1_MOT_FAULT
A_OUT1 → FS1_A_OUT1
A_OUT2 → FS1_A_OUT2
B_OUT1 → FS1_B_OUT1
B_OUT2 → FS1_B_OUT2
VOUT_HEATER+ → FS1_VOUT_HEATER+
TEMP_OUT → FS1_TEMP_IN
File: fluidic_system.kicad_sch
'Pull downn EN pin of tps22810 to GND

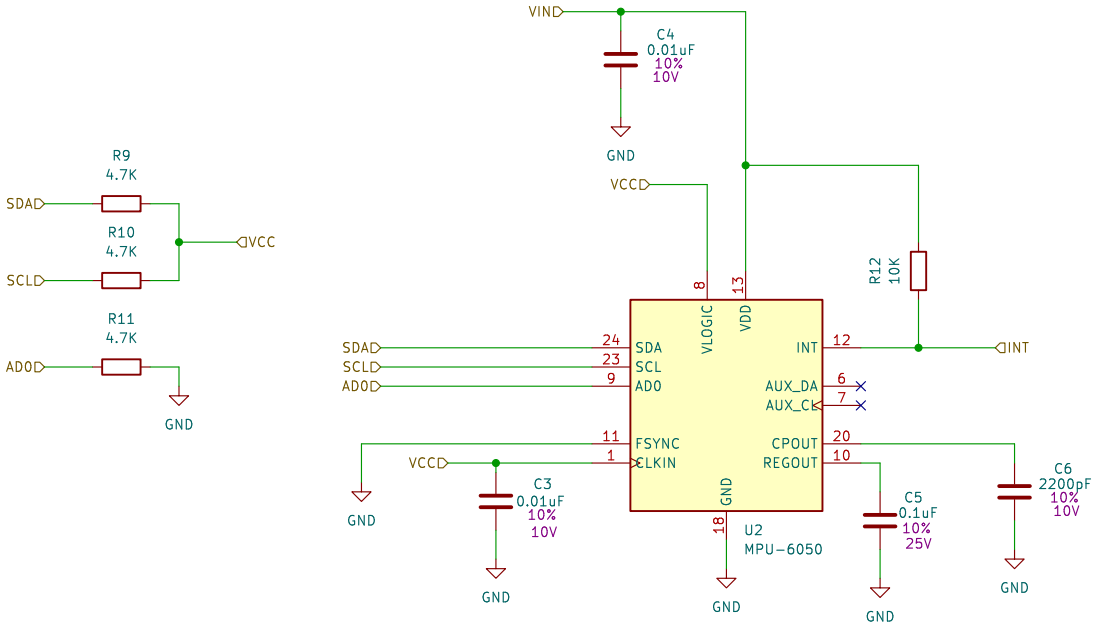
+5V → fluidic_system1 (VIN_12V / VIN_5V)
FS2_MOTOR_EN → EN_MOTOR
FS2_A_IN1 → A_IN1
FS2_A_IN2 → A_IN2
FS2_B_IN1 → B_IN1
FS2_B_IN2 → B_IN2
FS2_HEATER_EN → EN_HEATER
M_FAULT → FS2_MOT_FAULT
A_OUT1 → FS2_A_OUT1
A_OUT2 → FS2_A_OUT2
B_OUT1 → FS2_B_OUT1
B_OUT2 → FS2_B_OUT2
VOUT_HEATER+ → FS2_VOUT_HEATER+
TEMP_OUT → FS2_TEMP_IN
File: fluidic_system.kicad_sch
'Pull downn EN pin of tps22810 to GND

+5V → fluidic_system2 (VIN_12V / VIN_5V)
FS3_MOTOR_EN → EN_MOTOR
FS3_A_IN1 → A_IN1
FS3_A_IN2 → A_IN2
FS3_B_IN1 → B_IN1
FS3_B_IN2 → B_IN2
FS3_HEATER_EN → EN_HEATER
M_FAULT → FS3_MOT_FAULT
A_OUT1 → FS3_A_OUT1
A_OUT2 → FS3_A_OUT2
B_OUT1 → FS3_B_OUT1
B_OUT2 → FS3_B_OUT2
VOUT_HEATER+ → FS3_VOUT_HEATER+
TEMP_OUT → FS3_TEMP_IN
File: fluidic_system.kicad_sch
'Pull downn EN pin of tps22810 to GND

Sheet: /
File: fluidics.kicad_sch
Title: fluidics
Size: A1 | Date: | **Rev:**
KiCad E.D.A. kicad 7.0.8 | Id: 1/25



Yuri GmbH		
Sheet: /dcdc_3.3V/ File: LDO_5V_3.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 2/25



Yuri GmbH		
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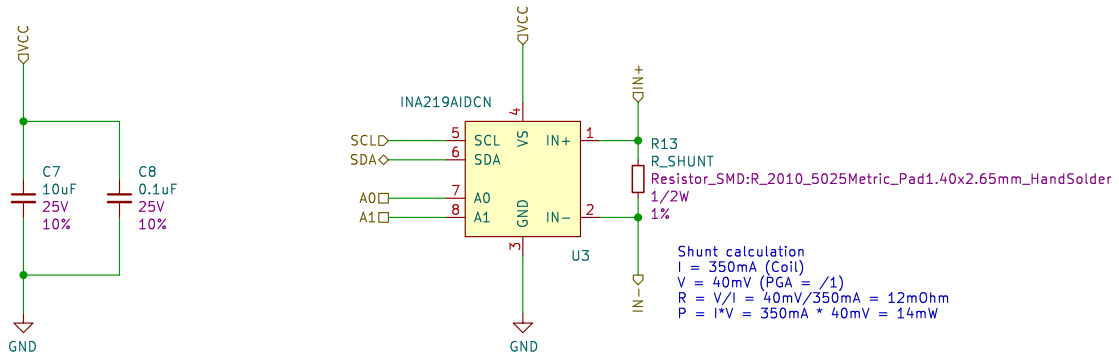
File: imu_mpu6050.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 3/25



Yuri GmbH		
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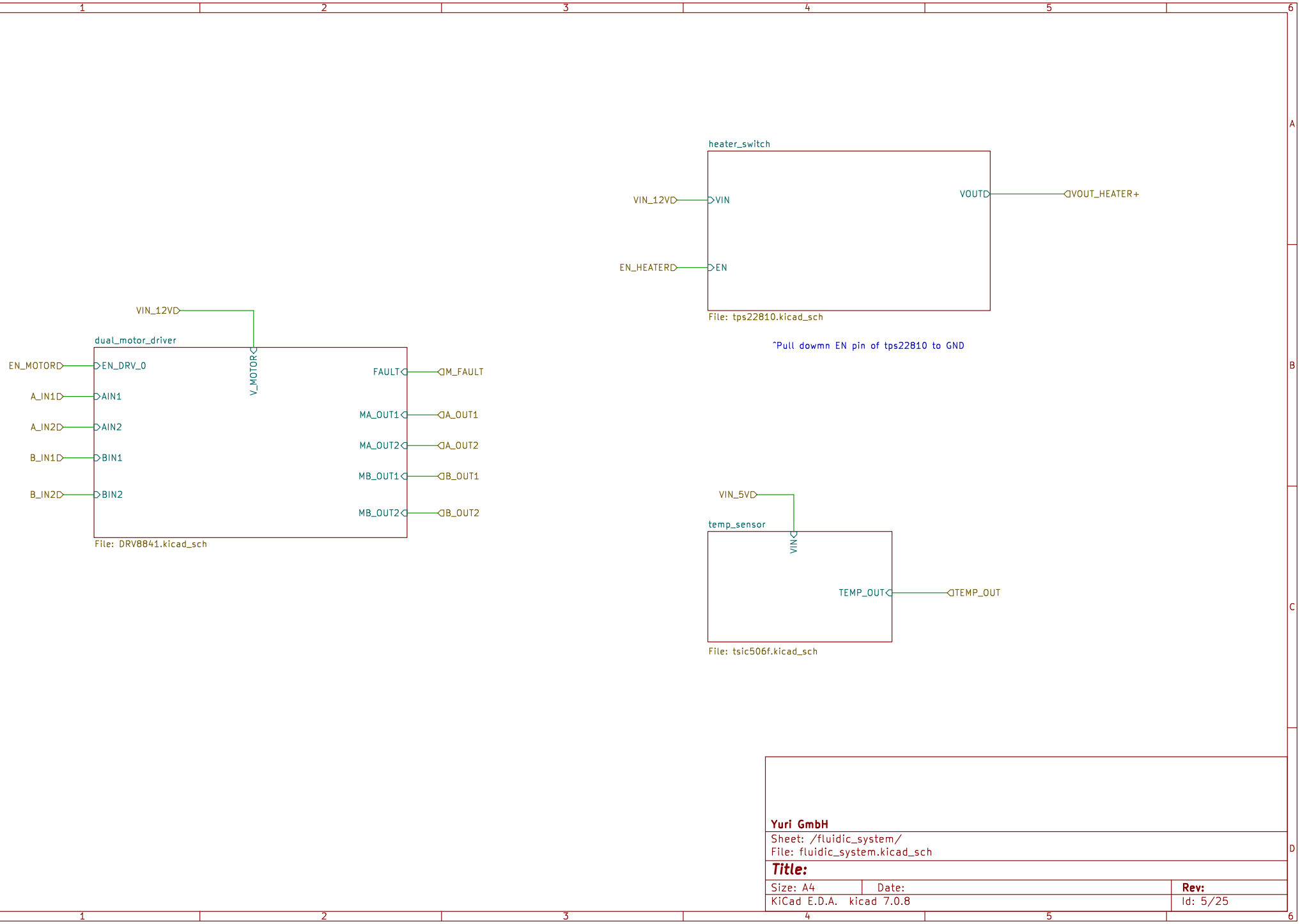
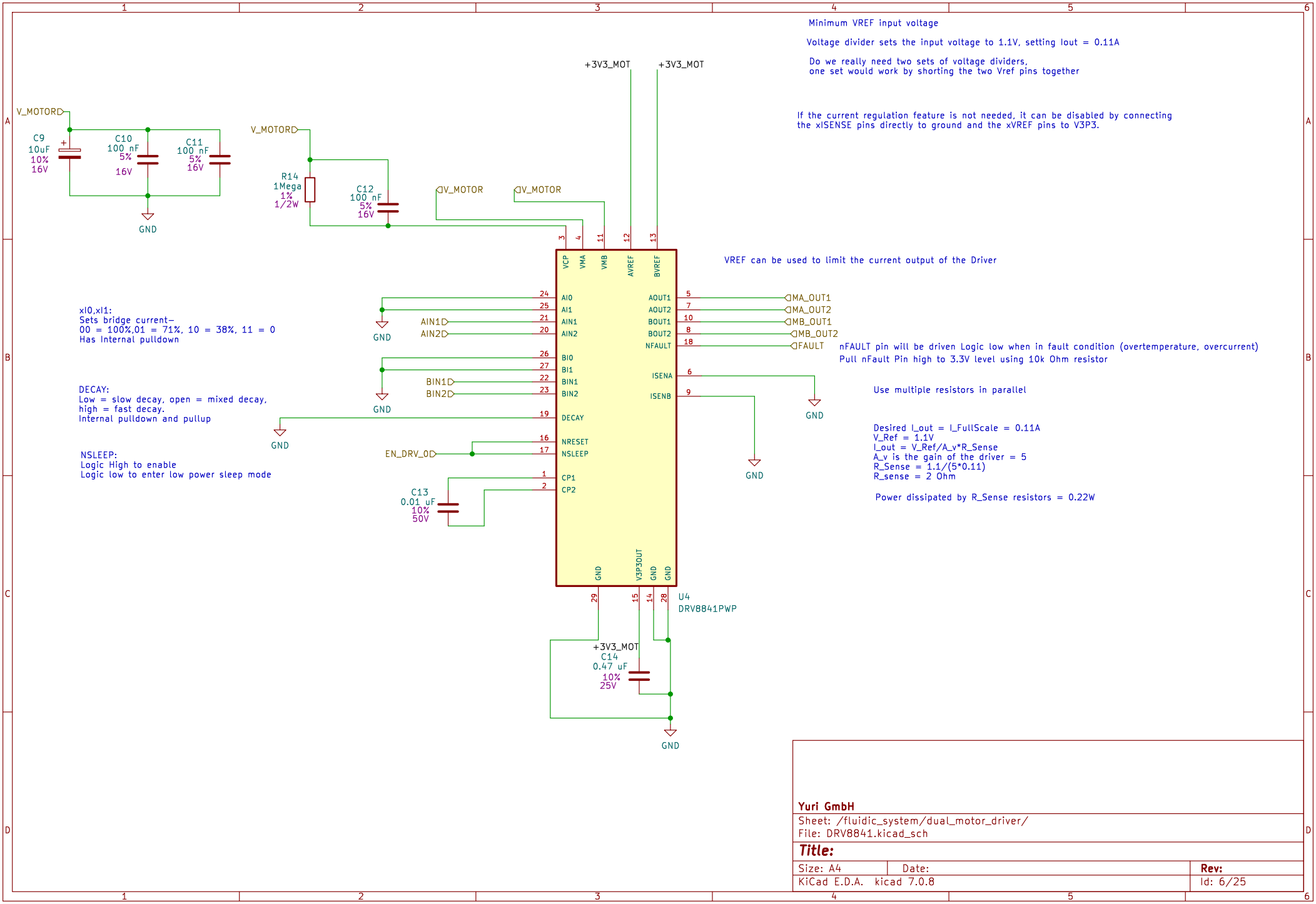
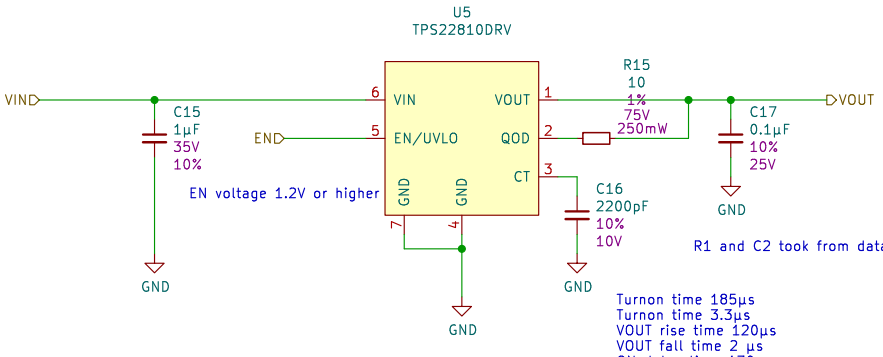
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 4/25


heater_switch
VIN_12V
VIN
VOUT
VOUT_HEATER+
EN_HEATER
EN
File: tps22810.kicad_sch
^Pull dowmn EN pin of tps22810 to GND
VIN_12V
dual_motor_driver
V_MOTOR
EN_MOTOR
EN_DRV_0
FAULT
M_FAULT
A_IN1
AIN1
MA_OUT1
A_OUT1
A_IN2
AIN2
MA_OUT2
A_OUT2
B_IN1
BIN1
MB_OUT1
B_OUT1
B_IN2
BIN2
MB_OUT2
B_OUT2
File: DRV8841.kicad_sch
VIN_5V
temp_sensor
VIN
TEMP_OUT
TEMP_OUT
File: tsic506f.kicad_sch
Yuri GmbH
Sheet: /fluidic_system/
File: fluidic_system.kicad_sch
Title:
Size: A4
Date:
Rev:
KiCad E.D.A. kicad 7.0.8
Id: 5/25


Minimum VREF input voltage
Voltage divider sets the input voltage to 1.1V, setting Iout = 0.11A
Do we really need two sets of voltage dividers,
one set would work by shorting the two Vref pins together
If the current regulation feature is not needed, it can be disabled by connecting
the xISENSE pins directly to ground and the xVREF pins to V3P3.
V_MOTOR
C9
10uF
10%
16V
C10
100 nF
5%
16V
C11
100 nF
5%
16V
GND
R14
1Mega
1%
1/2W
C12
100 nF
5%
16V
+3V3_MOT
+3V3_MOT
VCP
VMA
VMB
AVREF
BVREF
AI0
AI1
AIN1
AIN2
BI0
BI1
BIN1
BIN2
DECAY
NRESET
NSLEEP
CP1
CP2
AOUT1
AOUT2
BOUT1
BOUT2
NFAULT
ISENA
ISENB
GND
V3P3OUT
U4
DRV8841PWP
MA_OUT1
MA_OUT2
MB_OUT1
MB_OUT2
FAULT
AIN1
AIN2
BIN1
BIN2
EN_DRV_0
C13
0.01 uF
10%
50V
C14
0.47 uF
10%
25V
VREF can be used to limit the current output of the Driver
nFAULT pin will be driven Logic low when in fault condition (overtemperature, overcurrent)
Pull nFault Pin high to 3.3V level using 10k Ohm resistor
Use multiple resistors in parallel
Desired I_out = I_FullScale = 0.11A
V_Ref = 1.1V
I_out = V_Ref/A_v*R_Sense
A_v is the gain of the driver = 5
R_Sense = 1.1/(5*0.11)
R_sense = 2 Ohm
Power dissipated by R_Sense resistors = 0.22W
xI0,xI1:
Sets bridge current–
00 = 100%,01 = 71%, 10 = 38%, 11 = 0
Has Internal pulldown
DECAY:
Low = slow decay, open = mixed decay,
high = fast decay.
Internal pulldown and pullup
NSLEEP:
Logic High to enable
Logic low to enter low power sleep mode
Yuri GmbH
Sheet: /fluidic_system/dual_motor_driver/
File: DRV8841.kicad_sch
Title:
Size: A4
Date:
Rev:
KiCad E.D.A. kicad 7.0.8
Id: 6/25

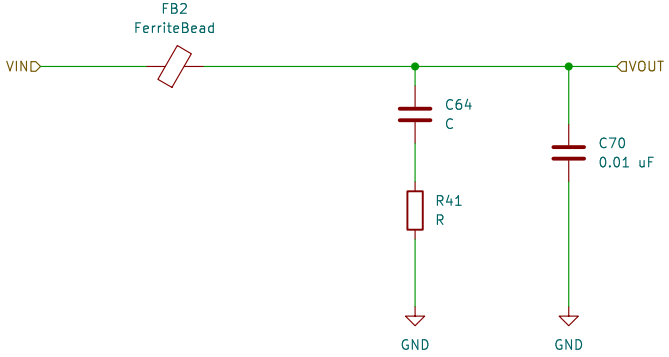


R1 and C2 took from datasheet §7.6 table as an example

Turnon time 185µs
Turnon time 3.3µs
VOUT rise time 120µs
VOUT fall time 2 µs
ON delay time 130 µs

C1 = 1µF should be 10 times bigger than output capacitor.
Othrwise it could cause the current flow through the body from VOUT to VIN.

Yuri GmbH		
Sheet: /fluidic_system/heater_switch/		
File: tps22810.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 7/25



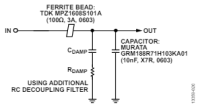


Figure 28. Additional RC Decoupling Filter

$$R_{DAMP} \geq 2\sqrt{\frac{L_{BEAD}}{C_{DAMP}}} \quad (3)$$

$$R_{DAMP} \leq 0.5\sqrt{\frac{L_{BEAD}}{C_{DECOUP}}} \quad (4)$$

where:
R_{DAMP} is the damping resistance.
L_{BEAD} is the bead inductance from Equation 1, including external inductance such as the parasitic trace inductance of the board.
C_{DAMP} is the damping capacitance.
C_{DECOUP} is the decoupling capacitance.

$$L_{BEAD} = \frac{X_L}{2 \times \pi \times f} \quad (1)$$

where:
f is the frequency point anywhere in the region the bead appears inductive. In this example, f = 30.7 MHz.
X_L is the reactance at 30.7 MHz, which is 233 Ω.

Equation 1 yields an inductance value (L_{BEAD}) of 1.208 µH.

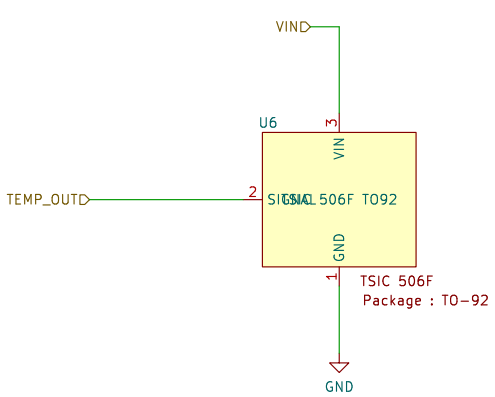
For the region where the bead appears most capacitive ($Z = |X_C|$; C_{PAR}), the parasitic capacitance is calculated by the following equation:

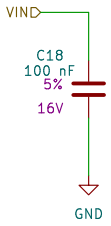
$$C_{PAR} = \frac{1}{2 \times \pi \times f \times |X_C|} \quad (2)$$

where:
f is the frequency point anywhere in the region the bead appears capacitive. In this example, f = 803 MHz.
$|X_C|$ is the reactance at 803 MHz, which is 118.1 Ω.

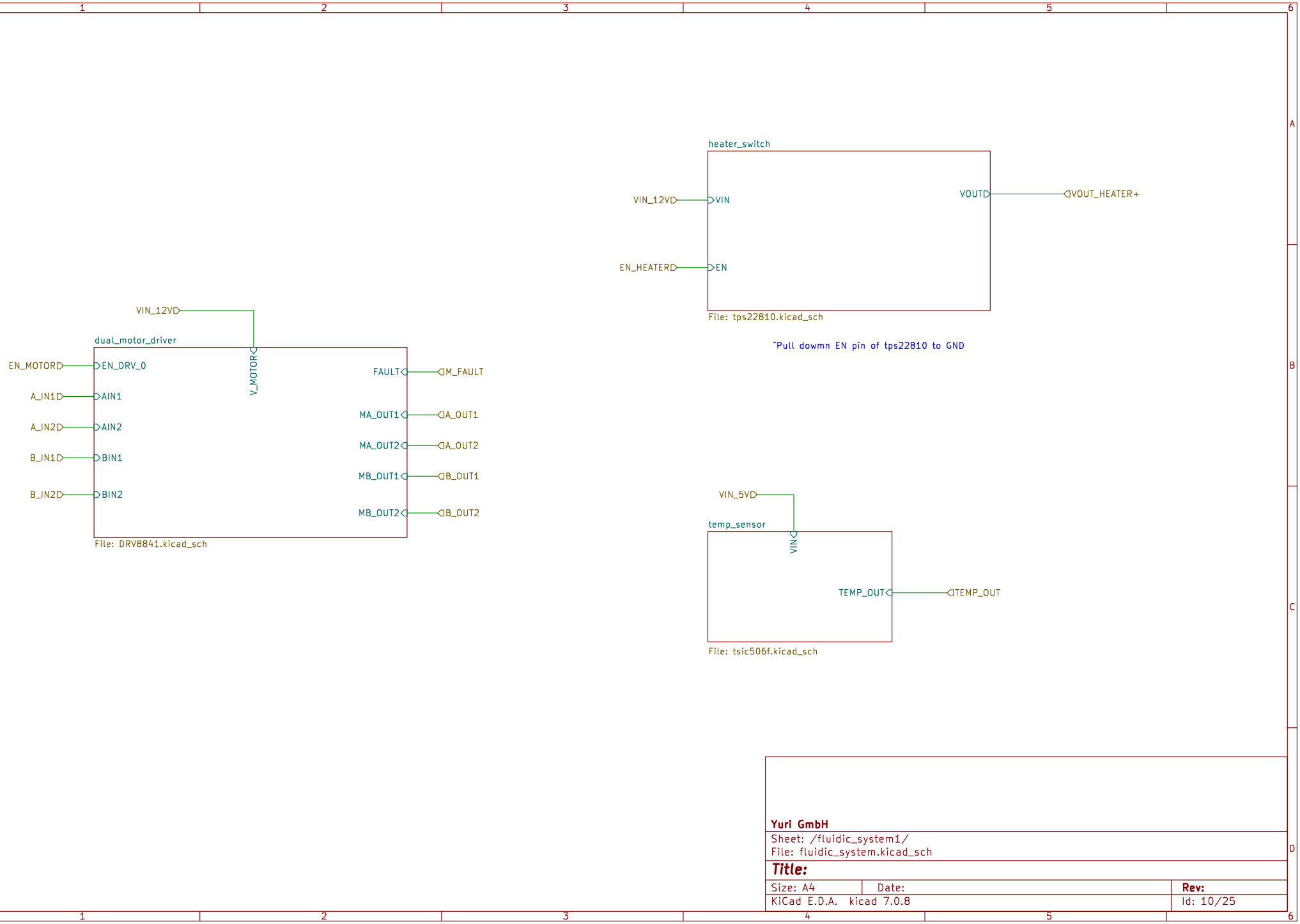
Equation 2 yields a parasitic capacitance value (C_{PAR}) of 1.678 pF.

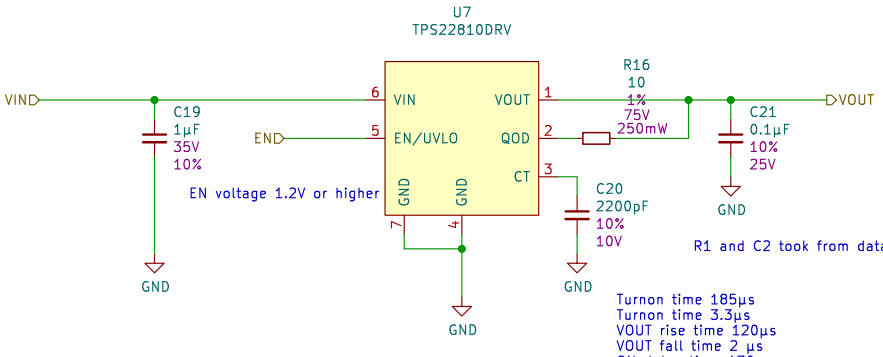
Sheet: /EMI FILTER1/		
File: emi_filter_dc_dc.kicad_sch		
Title:		
Size: A5	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 8/25





Yuri GmbH		
Sheet: /fluidic_system/temp_sensor/ File: tsic506f.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 9/25


heater_switch
VIN_12V
VIN
VOUT
VOUT_HEATER+
EN_HEATER
EN
File: tps22810.kicad_sch
^Pull dowmn EN pin of tps22810 to GND
VIN_12V
dual_motor_driver
V_MOTOR
EN_MOTOR
EN_DRV_0
FAULT
M_FAULT
A_IN1
AIN1
MA_OUT1
A_OUT1
A_IN2
AIN2
MA_OUT2
A_OUT2
B_IN1
BIN1
MB_OUT1
B_OUT1
B_IN2
BIN2
MB_OUT2
B_OUT2
File: DRV8841.kicad_sch
VIN_5V
temp_sensor
VIN
TEMP_OUT
TEMP_OUT
File: tsic506f.kicad_sch
Yuri GmbH
Sheet: /fluidic_system1/
File: fluidic_system.kicad_sch
Title:
Size: A4
Date:
Rev:
KiCad E.D.A. kicad 7.0.8
Id: 10/25



R1 and C2 took from datasheet §7.6 table as an example

Turnon time 185µs
Turnon time 3.3µs
VOUT rise time 120µs
VOUT fall time 2 µs
ON delay time 130 µs

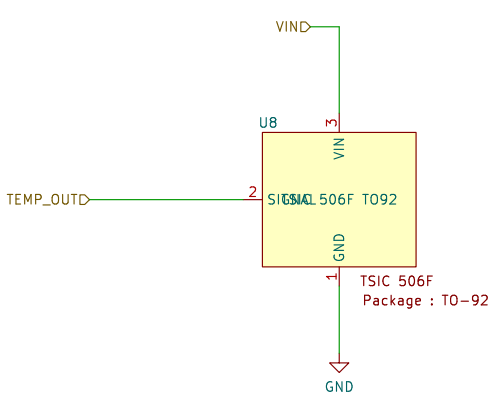
C1 = 1µF should be 10 times bigger than output capacitor.
Othrwise it could cause the current flow through the body from VOUT to VIN.

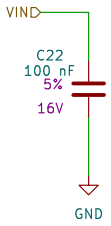
Yuri GmbH

Sheet: /fluidic_system1/heater_switch/
File: tps22810.kicad_sch

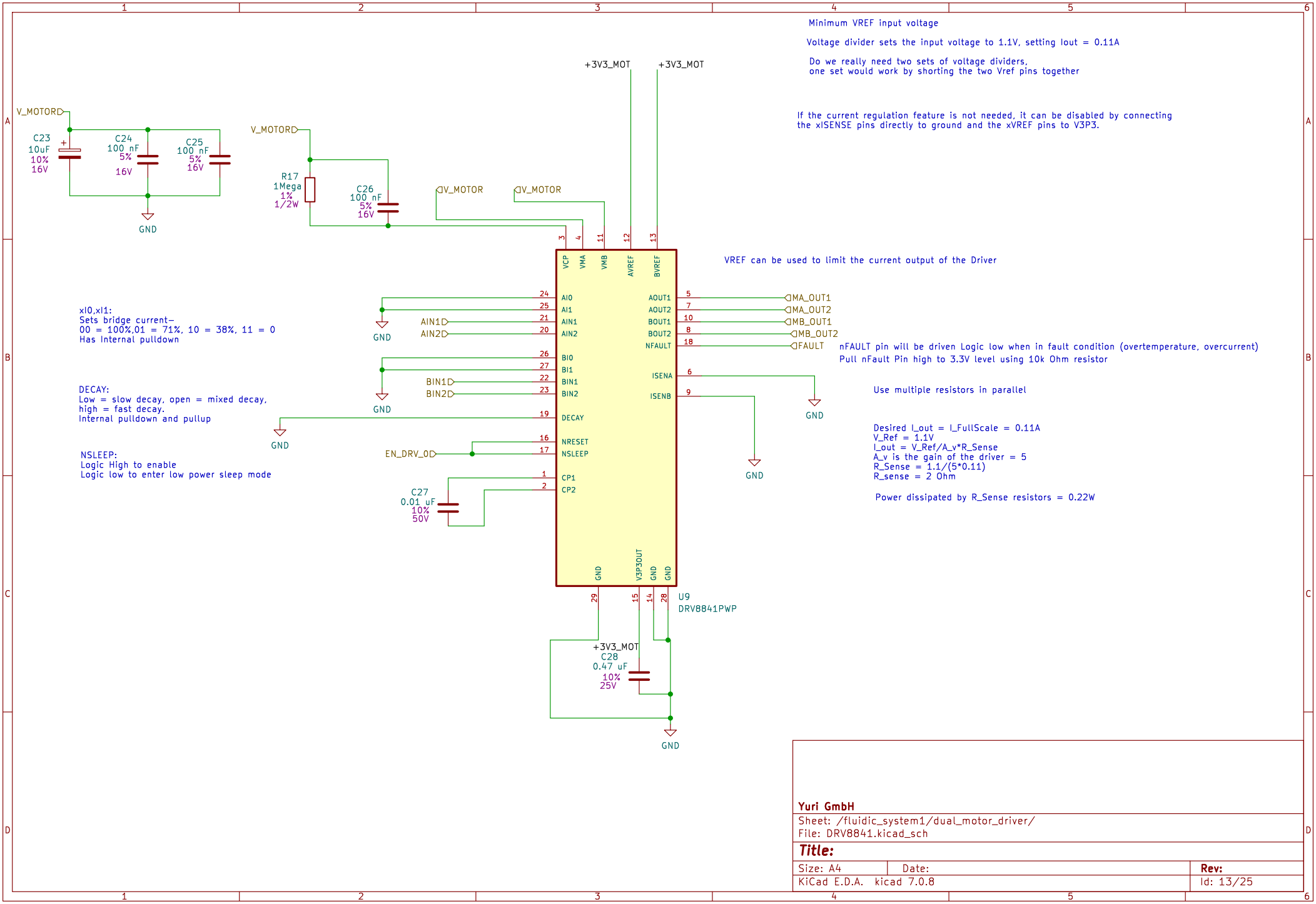
Title:

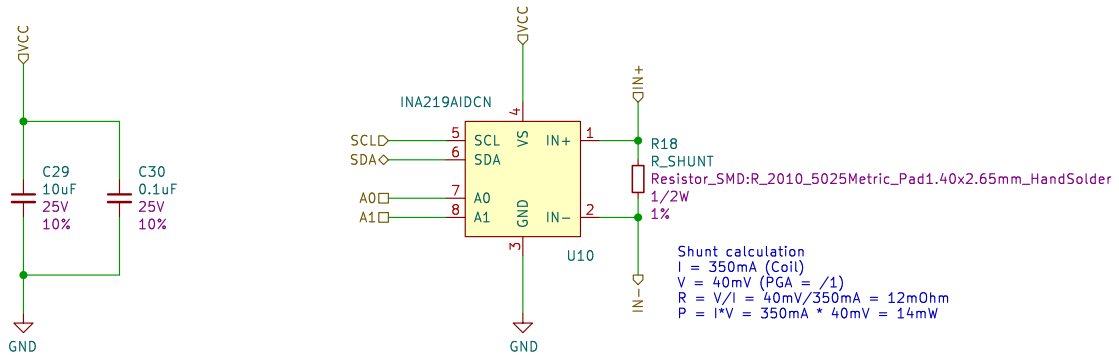
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 11/25





Yuri GmbH		
Sheet: /fluidic_system1/temp_sensor/ File: tsic506f.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 12/25


Minimum VREF input voltage
Voltage divider sets the input voltage to 1.1V, setting Iout = 0.11A
Do we really need two sets of voltage dividers,
one set would work by shorting the two Vref pins together
If the current regulation feature is not needed, it can be disabled by connecting
the xISENSE pins directly to ground and the xVREF pins to V3P3.
+3V3_MOT
+3V3_MOT
V_MOTOR
C23
10uF
10%
16V
C24
100 nF
5%
16V
C25
100 nF
5%
16V
GND
V_MOTOR
R17
1Mega
1%
1/2W
C26
100 nF
5%
16V
V_MOTOR
V_MOTOR
VCP
VMA
VMB
AVREF
BVREF
AI0
AI1
AIN1
AIN2
BI0
BI1
BIN1
BIN2
DECAY
NRESET
NSLEEP
CP1
CP2
GND
V3P3OUT
GND
GND
AOUT1
AOUT2
BOUT1
BOUT2
NFAULT
ISENA
ISENB
U9
DRV8841PWP
VREF can be used to limit the current output of the Driver
MA_OUT1
MA_OUT2
MB_OUT1
MB_OUT2
FAULT
nFAULT pin will be driven Logic low when in fault condition (overtemperature, overcurrent)
Pull nFault Pin high to 3.3V level using 10k Ohm resistor
Use multiple resistors in parallel
Desired I_out = I_FullScale = 0.11A
V_Ref = 1.1V
I_out = V_Ref/A_v*R_Sense
A_v is the gain of the driver = 5
R_Sense = 1.1/(5*0.11)
R_sense = 2 Ohm
Power dissipated by R_Sense resistors = 0.22W
xI0,xI1:
Sets bridge current–
00 = 100%,01 = 71%, 10 = 38%, 11 = 0
Has Internal pulldown
AIN1
AIN2
GND
BIN1
BIN2
GND
DECAY:
Low = slow decay, open = mixed decay,
high = fast decay.
Internal pulldown and pullup
GND
NSLEEP:
Logic High to enable
Logic low to enter low power sleep mode
EN_DRV_0
C27
0.01 uF
10%
50V
GND
+3V3_MOT
C28
0.47 uF
10%
25V
GND
Yuri GmbH
Sheet: /fluidic_system1/dual_motor_driver/
File: DRV8841.kicad_sch
Title:
Size: A4
Date:
Rev:
KiCad E.D.A. kicad 7.0.8
Id: 13/25



Yuri GmbH		
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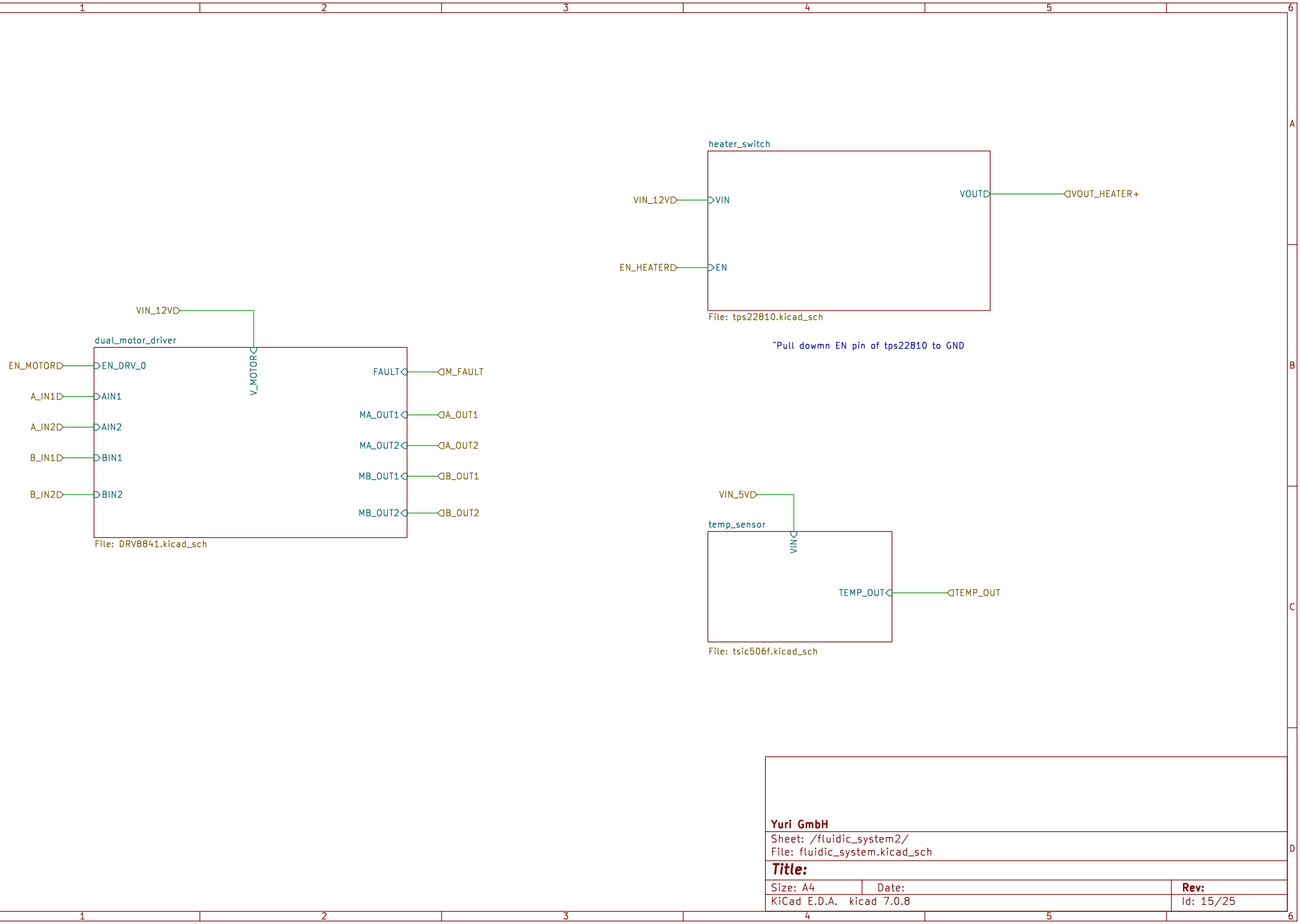
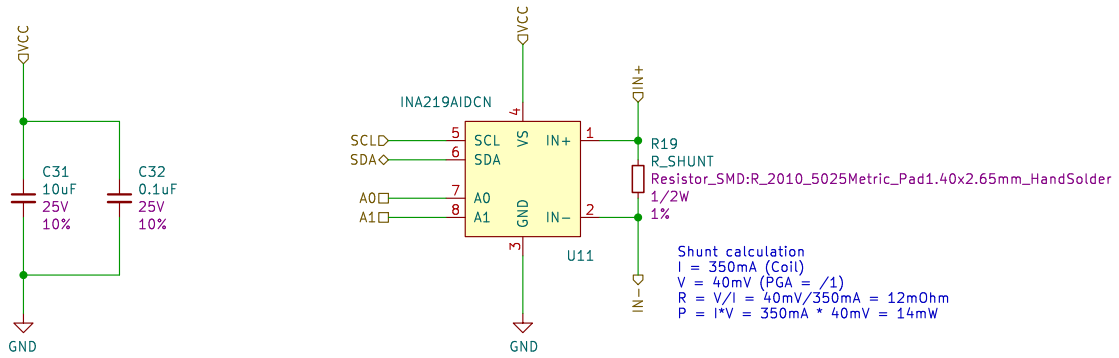
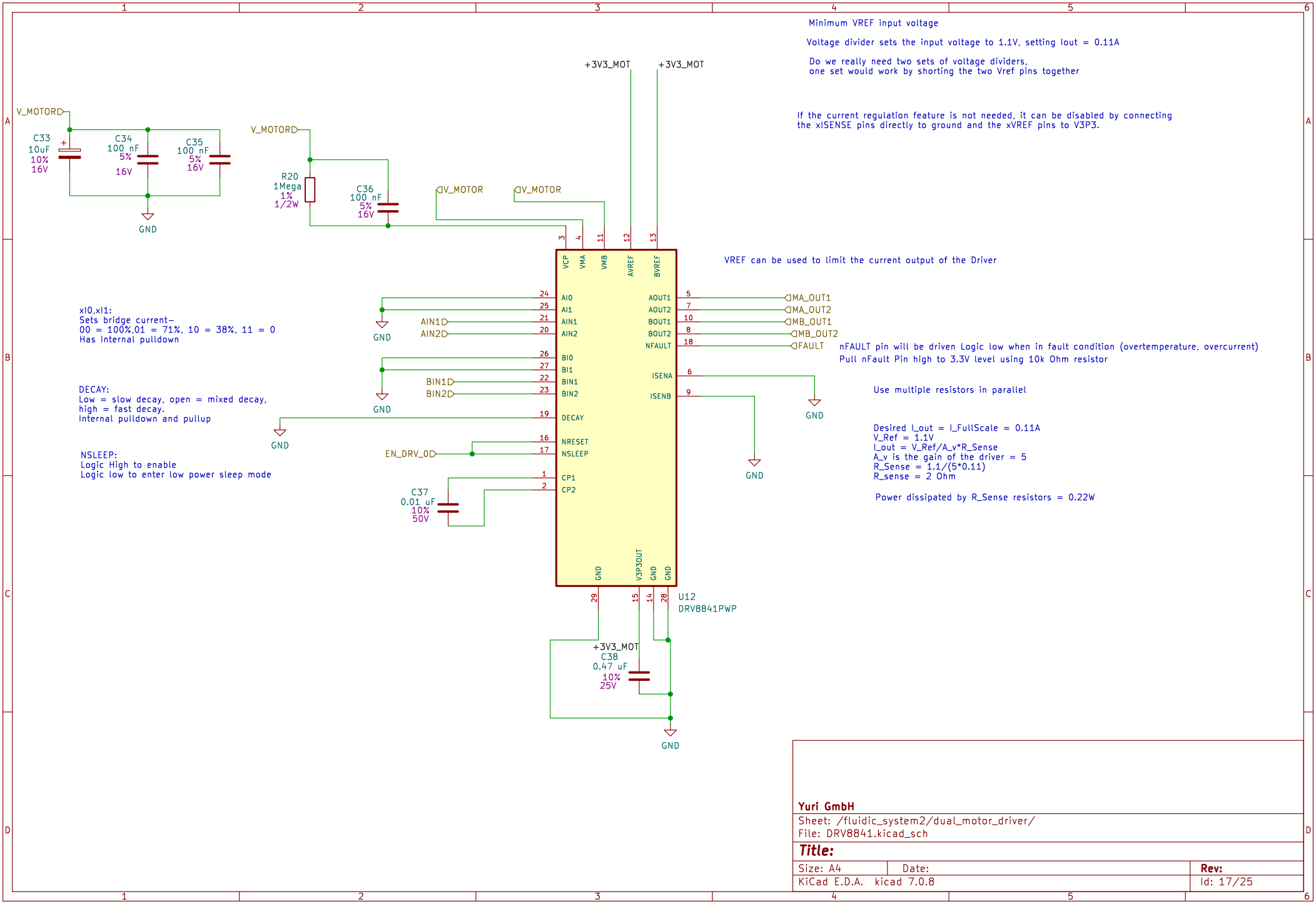
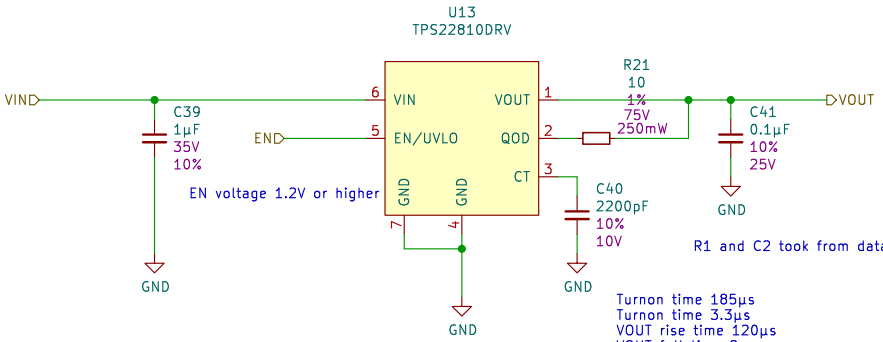
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 14/25


heater_switch
VIN_12V
VIN
VOUT
VOUT_HEATER+
EN_HEATER
EN
File: tps22810.kicad_sch
^Pull dowmn EN pin of tps22810 to GND
VIN_12V
dual_motor_driver
V_MOTOR
EN_MOTOR
EN_DRV_0
FAULT
M_FAULT
A_IN1
AIN1
MA_OUT1
A_OUT1
A_IN2
AIN2
MA_OUT2
A_OUT2
B_IN1
BIN1
MB_OUT1
B_OUT1
B_IN2
BIN2
MB_OUT2
B_OUT2
File: DRV8841.kicad_sch
VIN_5V
temp_sensor
VIN
TEMP_OUT
TEMP_OUT
File: tsic506f.kicad_sch
Yuri GmbH
Sheet: /fluidic_system2/
File: fluidic_system.kicad_sch
Title:
Size: A4
Date:
Rev:
KiCad E.D.A. kicad 7.0.8
Id: 15/25



Yuri GmbH		
Sheet: /current_monitor2/ File: ina219.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 16/25


Minimum VREF input voltage
Voltage divider sets the input voltage to 1.1V, setting Iout = 0.11A
Do we really need two sets of voltage dividers,
one set would work by shorting the two Vref pins together
If the current regulation feature is not needed, it can be disabled by connecting
the xISENSE pins directly to ground and the xVREF pins to V3P3.
+3V3_MOT
+3V3_MOT
V_MOTOR
C33
10uF
10%
16V
C34
100 nF
5%
16V
C35
100 nF
5%
16V
GND
V_MOTOR
R20
1Mega
1%
1/2W
C36
100 nF
5%
16V
V_MOTOR
V_MOTOR
VCP
VMA
VMB
AVREF
BVREF
VREF can be used to limit the current output of the Driver
AI0
AI1
AIN1
AIN2
BI0
BI1
BIN1
BIN2
DECAY
NRESET
NSLEEP
CP1
CP2
AOUT1
AOUT2
BOUT1
BOUT2
NFAULT
ISENA
ISENB
MA_OUT1
MA_OUT2
MB_OUT1
MB_OUT2
FAULT
nFAULT pin will be driven Logic low when in fault condition (overtemperature, overcurrent)
Pull nFault Pin high to 3.3V level using 10k Ohm resistor
xI0,xI1:
Sets bridge current–
00 = 100%,01 = 71%, 10 = 38%, 11 = 0
Has Internal pulldown
DECAY:
Low = slow decay, open = mixed decay,
high = fast decay.
Internal pulldown and pullup
NSLEEP:
Logic High to enable
Logic low to enter low power sleep mode
AIN1
AIN2
BIN1
BIN2
EN_DRV_0
GND
GND
GND
GND
GND
GND
GND
GND
GND
C37
0.01 uF
10%
50V
Use multiple resistors in parallel
Desired I_out = I_FullScale = 0.11A
V_Ref = 1.1V
I_out = V_Ref/A_v*R_Sense
A_v is the gain of the driver = 5
R_Sense = 1.1/(5*0.11)
R_sense = 2 Ohm
Power dissipated by R_Sense resistors = 0.22W
GND
V3P3OUT
GND
GND
U12
DRV8841PWP
+3V3_MOT
C38
0.47 uF
10%
25V
GND
Yuri GmbH
Sheet: /fluidic_system2/dual_motor_driver/
File: DRV8841.kicad_sch
Title:
Size: A4
Date:
Rev:
KiCad E.D.A. kicad 7.0.8
Id: 17/25

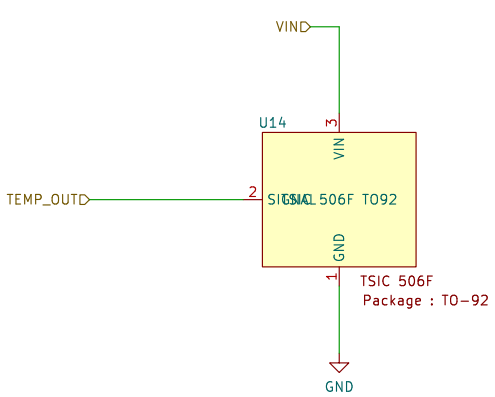


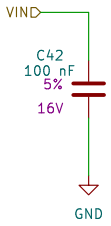
R1 and C2 took from datasheet §7.6 table as an example

Turnon time 185µs
Turnon time 3.3µs
VOUT rise time 120µs
VOUT fall time 2 µs
ON delay time 130 µs

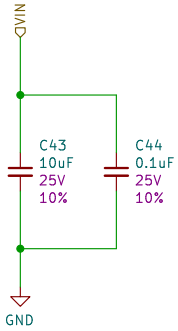
C1 = 1µF should be 10 times bigger than output capacitor.
Othrwise it could cause the current flow through the body from VOUT to VIN.

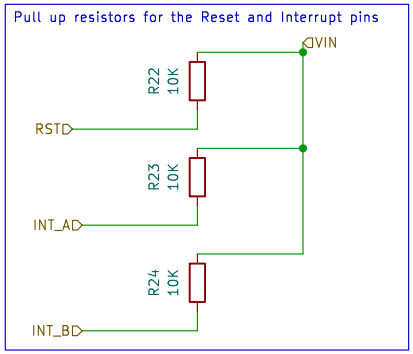
Yuri GmbH		
Sheet: /fluidic_system2/heater_switch/		
File: tps22810.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 18/25

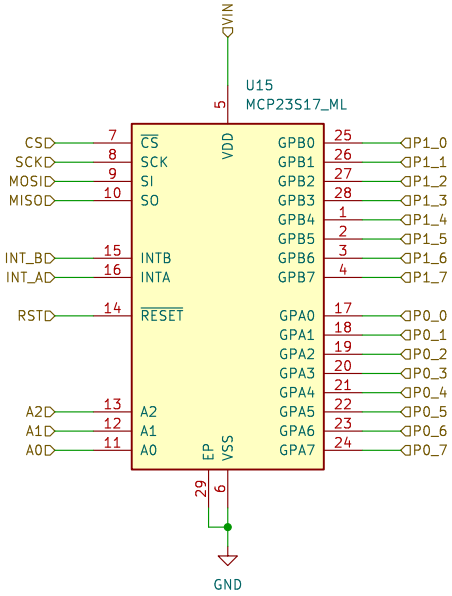




Yuri GmbH		
Sheet: /fluidic_system2/temp_sensor/ File: tsic506f.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 19/25







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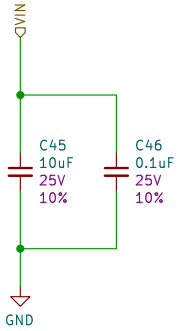
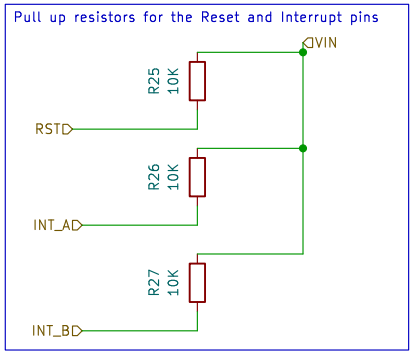
Sheet: /gpioexpander/

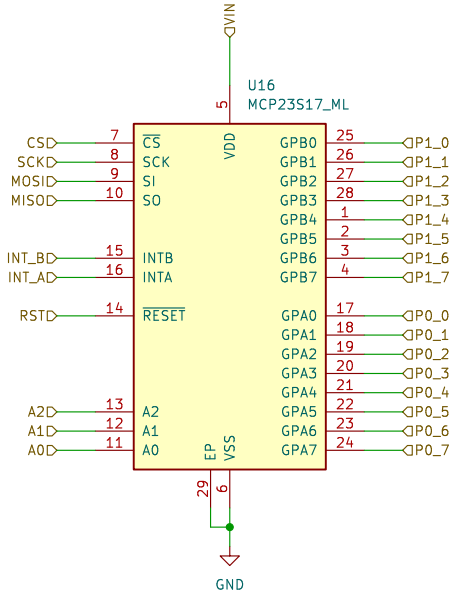
File: mcp23S17.kicad_sch

Title:

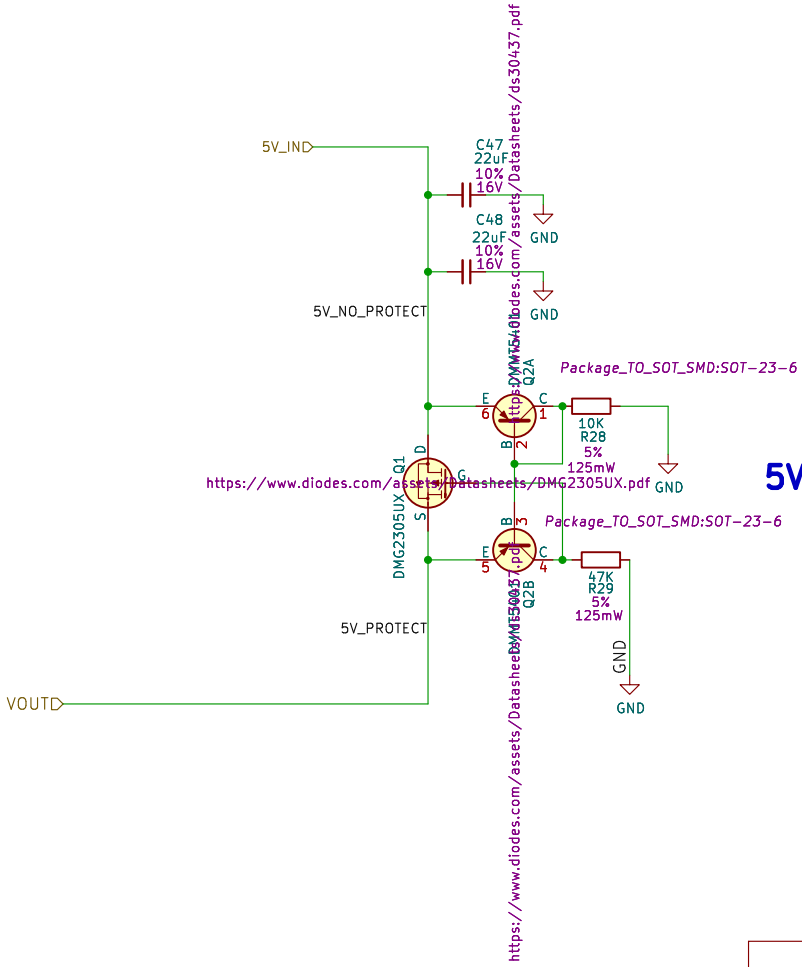
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 21/25





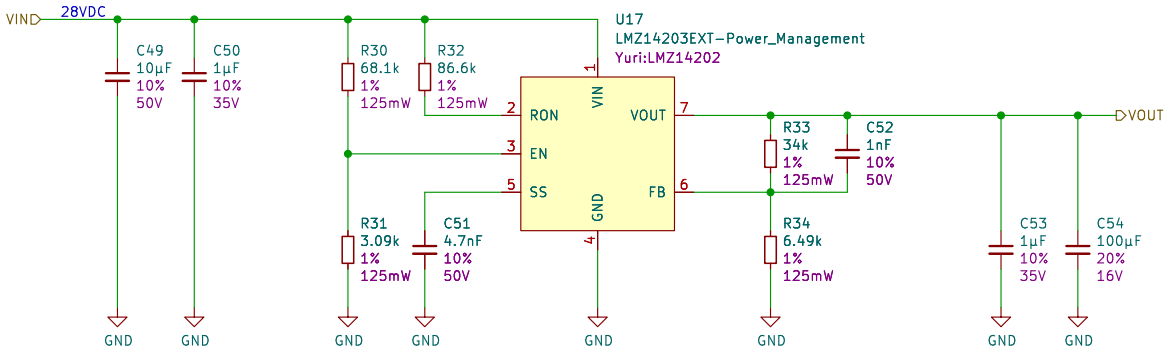


Yuri GmbH		
Sheet: /gpioexpander1/		
File: mcp23S17.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 22/25



5V Powered HAT Protection

Sheet: /5V RPi HAT Protection/ File: rpi_hat_protect.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 23/25



Max input voltage is 28V from the the NyX Capsule

Output voltage 5V regulated by R4 and R5 resistors

Capacitors should be chosen with ability to handle voltage 30-50% more than voltage on the power line.

Resistors should be chosen with respect to the power.
The power dissipated by the resistors is defined by P = U^2/R; where U is the voltage on the power line and R is the resistanse of the resistor.

Max V input at EN and FB pins is 6.5V, Use Voltage divider to bring it under this level

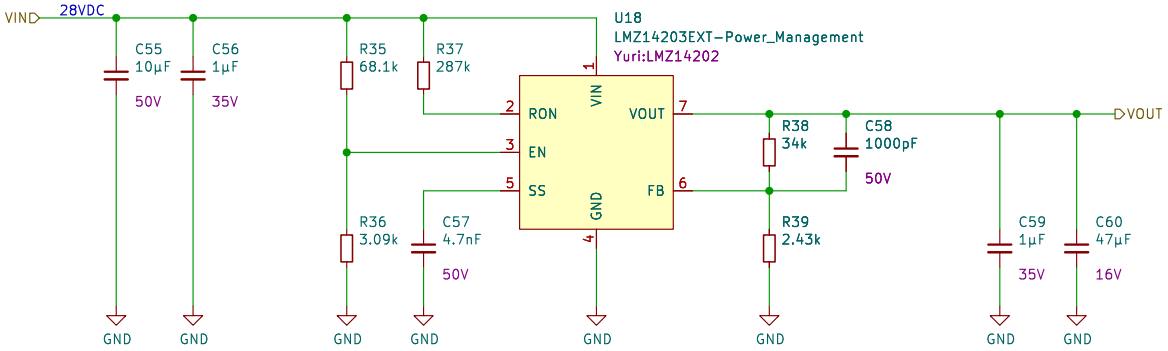
V EN set to 1.33V through voltage divider

V_Out = 0.8 V × (1 + Rfbt / Rfbb), where Rfbt is between FB and VOUT and Rfbb is between FB and GND

Sheet: /5V_power_supply/
File: lmz14203_5V_dc-dc.kicad_sch

Title:

Size: A4 | Date: | **Rev:**
KiCad E.D.A. kicad 7.0.8 | Id: 23/25



Max input voltage is 28V from the the NyX Capsule

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Resistors should be chosen with respect to the power.
The power dissipated by the resistors is defined by P = U^2/R; where U is the voltage on the power line and R is the resistanse of the resistor.

Max V input at EN and FB pins is 6.5V, Use Voltage divider to bring it under this level

V EN set to 1.33V through voltage divider

V_Out = 0.8 V × (1 + Rfbt / Rfbb), where Rfbt is between FB and VOUT and Rfbb is between FB and GND

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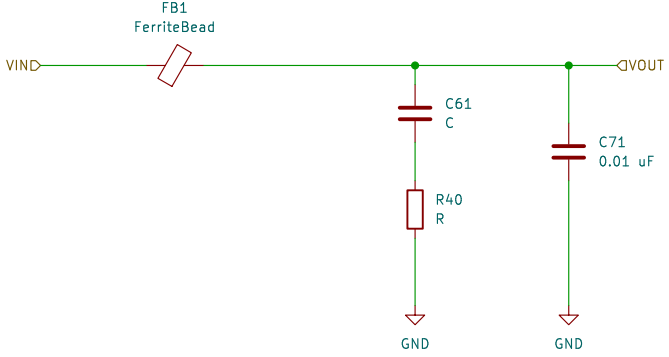
Sheet: /12V_power_supply/
File: lmz14203_12V_dc-dc.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 24/25



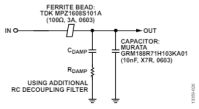


Figure 28. Additional RC Decoupling Filter

$$R_{DAMP} \geq 2\sqrt{\frac{L_{BEAD}}{C_{DAMP}}} \quad (3)$$

$$R_{DAMP} \leq 0.5\sqrt{\frac{L_{BEAD}}{C_{DECOUP}}} \quad (4)$$

where:
R_{DAMP} is the damping resistance.
L_{BEAD} is the bead inductance from Equation 1, including external inductance such as the parasitic trace inductance of the board.
C_{DAMP} is the damping capacitance.
C_{DECOUP} is the decoupling capacitance.

$$L_{BEAD} = \frac{X_L}{2 \times \pi \times f} \quad (1)$$

where:
f is the frequency point anywhere in the region the bead appears inductive. In this example, f = 30.7 MHz.
X_L is the reactance at 30.7 MHz, which is 233 Ω.

Equation 1 yields an inductance value (L_{BEAD}) of 1.208 µH.

For the region where the bead appears most capacitive ($Z = |X_C|$; C_{PAR}), the parasitic capacitance is calculated by the following equation:

$$C_{PAR} = \frac{1}{2 \times \pi \times f \times |X_C|} \quad (2)$$

where:
f is the frequency point anywhere in the region the bead appears capacitive. In this example, f = 803 MHz.
$|X_C|$ is the reactance at 803 MHz, which is 118.1 Ω.

Equation 2 yields a parasitic capacitance value (C_{PAR}) of 1.678 pF.

Sheet: /EMI FILTER/
File: emi_filter_dc_dc.kicad_sch

Title:

Size: A5	Date:	**Rev:**
KiCad E.D.A. kicad 7.0.8		Id: 24/25