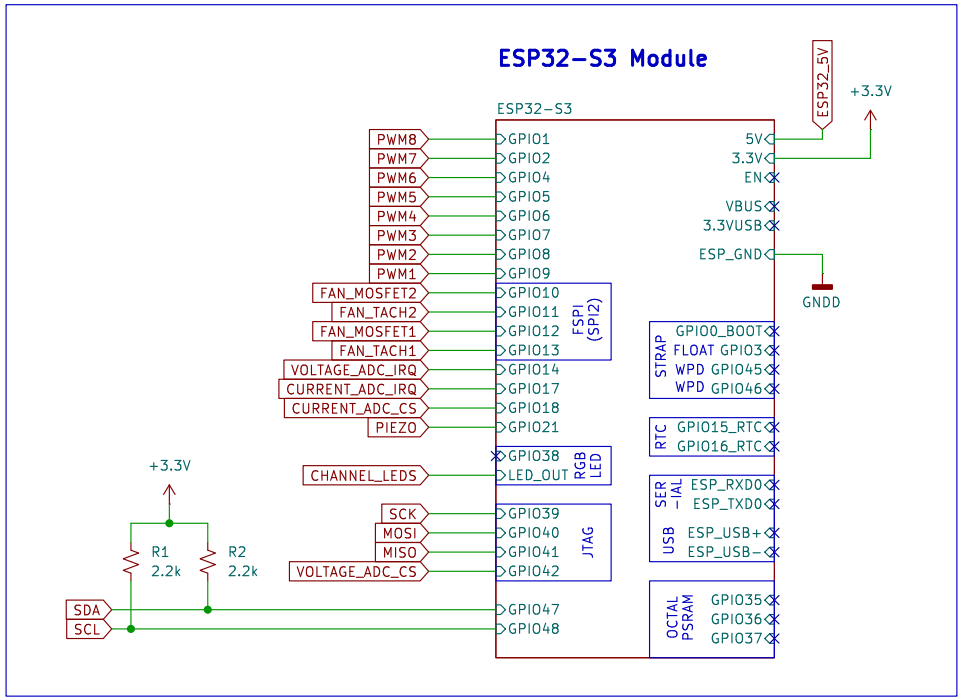
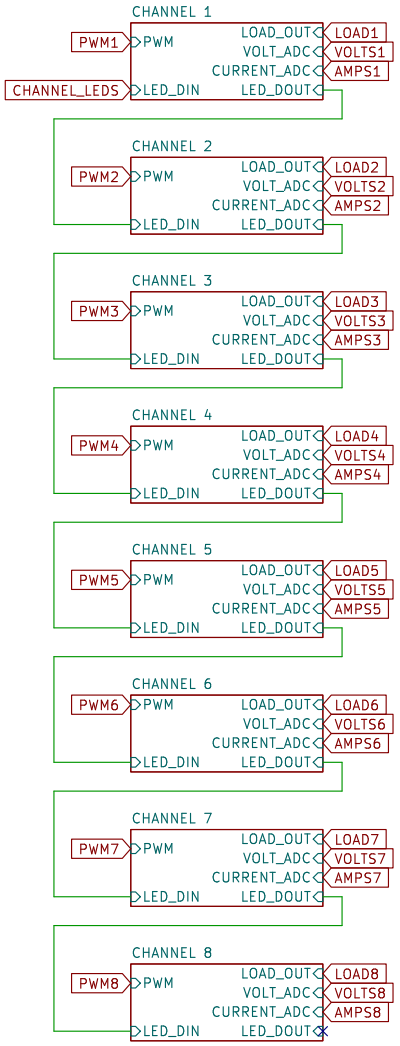
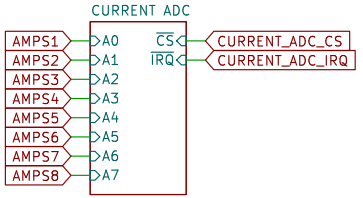
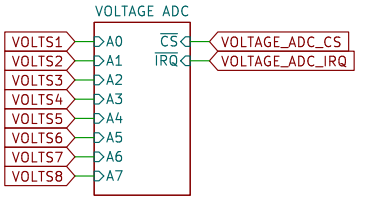
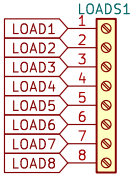
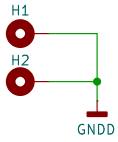


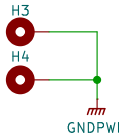












I2C Addresses:

Bus Voltage: 1101000 (0x68)

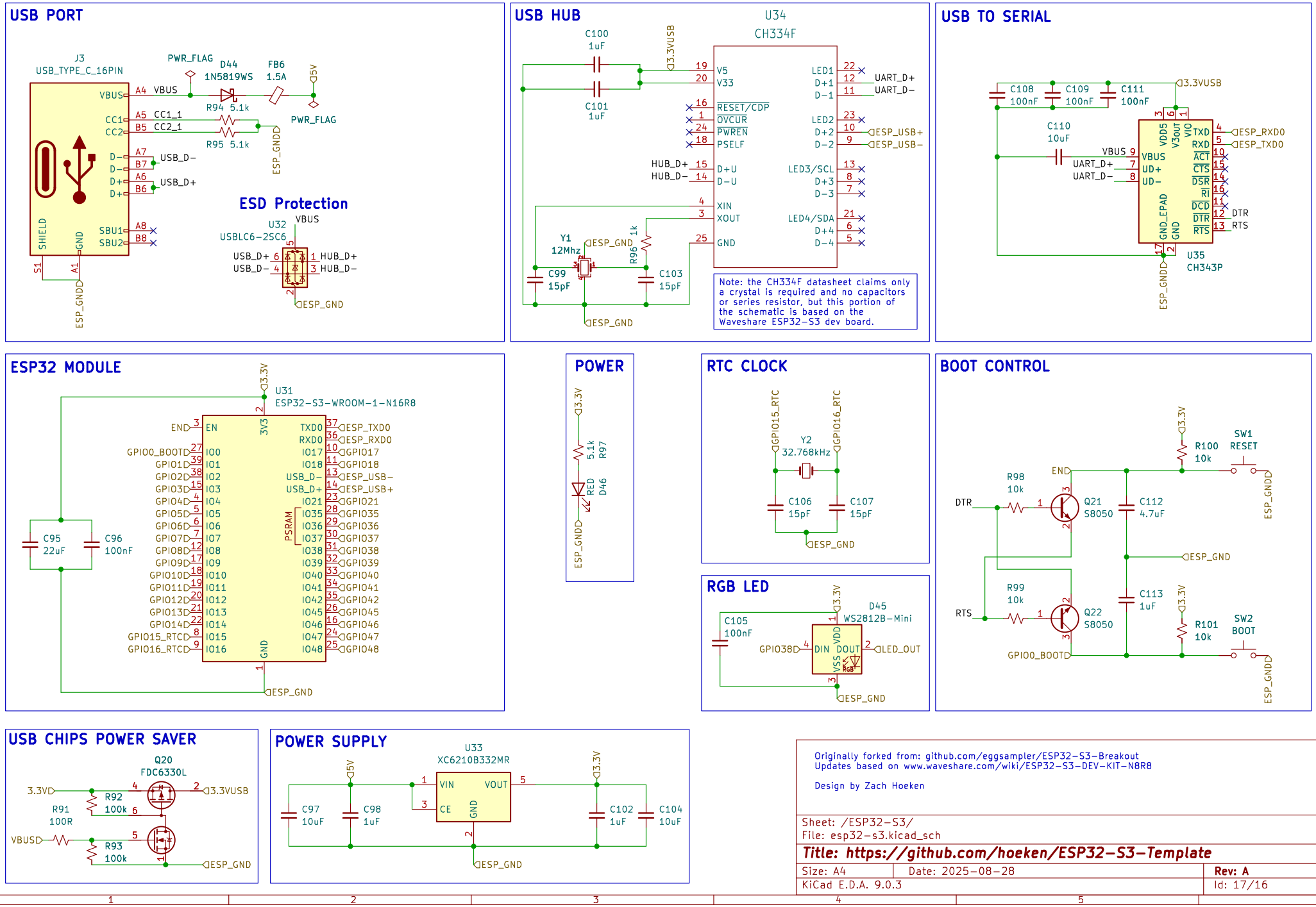
https://github.com/hoeken/frothfet

Sheet: /

File: frothfet.kicad_sch

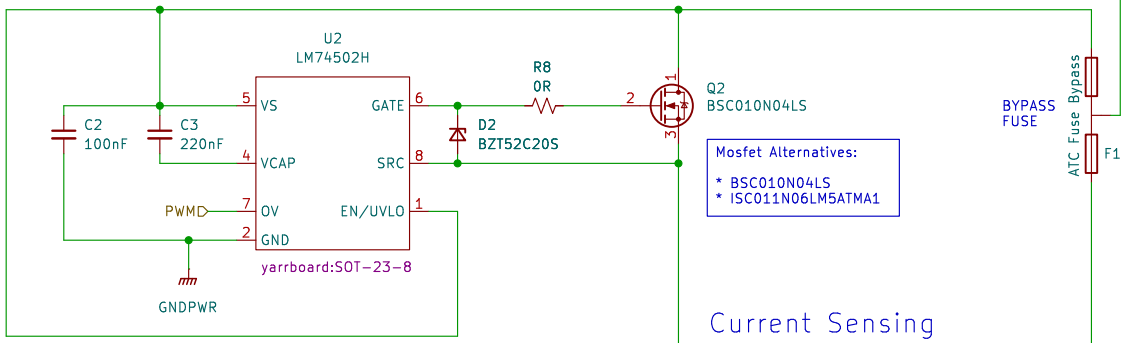
Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 1/16


USB PORT
J3
USB_TYPE_C_16PIN
PWR_FLAG
D44
1N5819WS
FB6
1.5A
5V
VBUS
A4 VBUS
R94 5.1k
PWR_FLAG
CC1
CC2
A5 CC1_1
B5 CC2_1
R95 5.1k
ESP_GNDD
D-
D-
D+
D+
A7
B7
A6
B6
USB_D-
USB_D+
SHIELD
GND
SBU1
SBU2
A8
B8
S1
A1
ESP_GNDD
ESD Protection
U32
USBLC6-2SC6
VBUS
USB_D+ 6
USB_D- 4
1 HUB_D+
3 HUB_D-
ESP_GND
USB HUB
U34
CH334F
C100
1uF
C101
1uF
3.3VUSB
19 V5
20 V33
16 RESET/CDP
1 OVCUR
24 PWREN
18 PSELF
HUB_D+ 15 D+U
HUB_D- 14 D-U
4 XIN
3 XOUT
25 GND
22 LED1
12 D+1
11 D-1
UART_D+
UART_D-
23 LED2
10 D+2
9 D-2
ESP_USB+
ESP_USB-
LED3/SCL 13
8 D+3
7 D-3
LED4/SDA 21
6 D+4
5 D-4
Y1
12Mhz
ESP_GND
R96 1k
C99
15pF
C103
15pF
ESP_GND
Note: the CH334F datasheet claims only a crystal is required and no capacitors or series resistor, but this portion of the schematic is based on the Waveshare ESP32-S3 dev board.
USB TO SERIAL
C108
100nF
C109
100nF
C111
100nF
3.3VUSB
C110
10uF
VBUS 9
UART_D+ 7
UART_D- 8
VDD5
V3out
VIO
VBUS
UD+
UD-
GND_EPAD
GND
TXD
RXD
ACT
CTS
DSR
RI
DCD
DTR
RTS
4 ESP_RXD0
5 ESP_TXD0
10
15
14
16
11
12 DTR
13 RTS
17
2
ESP_GNDD
U35
CH343P
ESP32 MODULE
U31
ESP32-S3-WROOM-1-N16R8
3.3V
2
EN 3
3V3
GND
1
C95
22uF
C96
100nF
ESP_GND
GPIO0_BOOT 27
GPIO1 39
GPIO2 38
GPIO3 15
GPIO4 4
GPIO5 5
GPIO6 6
GPIO7 7
GPIO8 12
GPIO9 17
GPIO10 18
GPIO11 19
GPIO12 20
GPIO13 21
GPIO14 22
GPIO15_RTC 8
GPIO16_RTC 9
IO0
IO1
IO2
IO3
IO4
IO5
IO6
IO7
IO8
IO9
IO10
IO11
IO12
IO13
IO14
IO15
IO16
TXD0 37 ESP_TXD0
RXD0 36 ESP_RXD0
IO17 10 GPIO17
IO18 11 GPIO18
USB_D- 13 ESP_USB-
USB_D+ 14 ESP_USB+
IO21 23 GPIO21
IO35 28 GPIO35
IO36 29 GPIO36
IO37 30 GPIO37
IO38 31 GPIO38
IO39 32 GPIO39
IO40 33 GPIO40
IO41 34 GPIO41
IO42 35 GPIO42
IO45 26 GPIO45
IO46 16 GPIO46
IO47 24 GPIO47
IO48 25 GPIO48
PSRAM
POWER
3.3V
5.1k R97
RED D46
ESP_GNDD
RTC CLOCK
GPIO15_RTC
GPIO16_RTC
Y2
32.768kHz
C106
15pF
C107
15pF
ESP_GND
RGB LED
3.3V
C105
100nF
D45
WS2812B-Mini
GPIO38
DIN
VDD
DOUT
VSS
RGB
LED_OUT
ESP_GND
BOOT CONTROL
3.3V
R100
10k
SW1
RESET
END
R98
10k
DTR
Q21
S8050
C112
4.7uF
ESP_GNDD
ESP_GND
R99
10k
RTS
Q22
S8050
C113
1uF
3.3V
R101
10k
SW2
BOOT
GPIO0_BOOT
ESP_GNDD
USB CHIPS POWER SAVER
Q20
FDC6330L
3.3VD
R92
100k
3.3VUSB
R91
100R
VBUSD
R93
100k
ESP_GND
POWER SUPPLY
U33
XC6210B332MR
5V
VIN
CE
VOUT
GND
3.3V
C97
10uF
C98
1uF
C102
1uF
C104
10uF
ESP_GND
Originally forked from: github.com/eggsampler/ESP32-S3-Breakout
Updates based on www.waveshare.com/wiki/ESP32-S3-DEV-KIT-N8R8
Design by Zach Hoeken
Sheet: /ESP32-S3/
File: esp32-s3.kicad_sch
Title: https://github.com/hoeken/ESP32-S3-Template
Size: A4
Date: 2025-08-28
Rev: A
KiCad E.D.A. 9.0.3
Id: 17/16

Load Driver Circuit

Gate Driver Circuit



Possible to replace with 3 x C41371870?
C41355742 might be better?

Mosfet Alternatives:

* BSC010N04LS
* ISC011N06LM5ATMA1

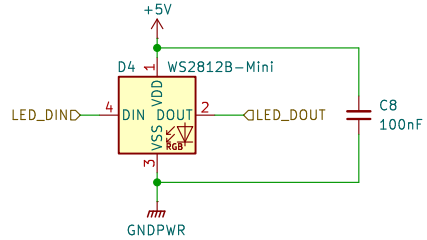
+24V

BYPASS FUSE

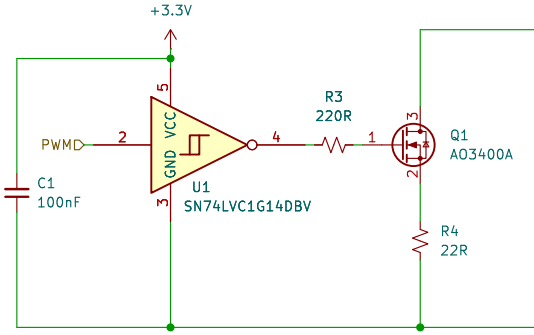
ATC Fuse Bypass

F1

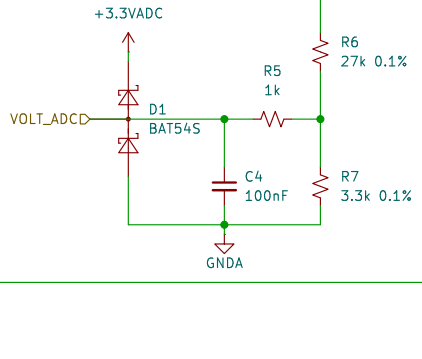
Status LED



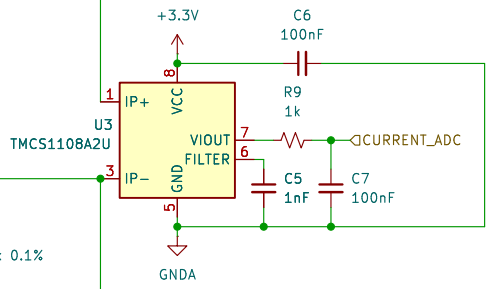
Low Side Dummy Load



Voltage Sensing



Current Sensing



Current Sensor Alternatives:

* 725LLCTR20AUT – 132mv/A
* CT427-HSN820DR – 100mv/A
* CT427-ASN820DR – 100mv/A
* TMCS1108A2U – 100mV/A
* ACS725LLCTR-30AU – 88mv/A
* MCS1802GS-20-Z – 66mv/A

LOAD_OUT

D3
SS54

Negative on Busbar

GNDPWR

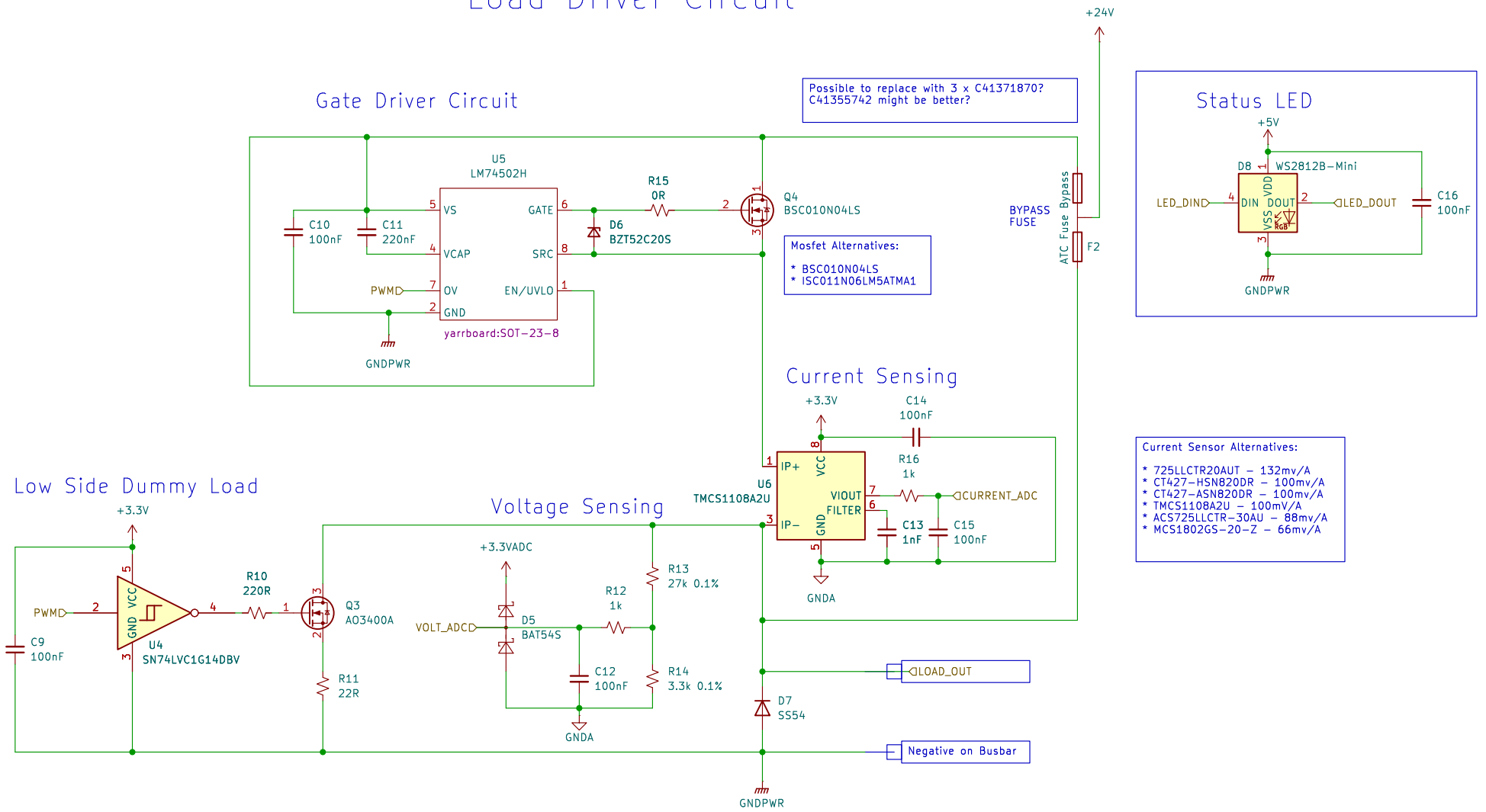
https://github.com/hoeken/frothfet

Sheet: /CHANNEL 1/
File: mosfet.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 2/16

Load Driver Circuit



https://github.com/hoeken/frothfet

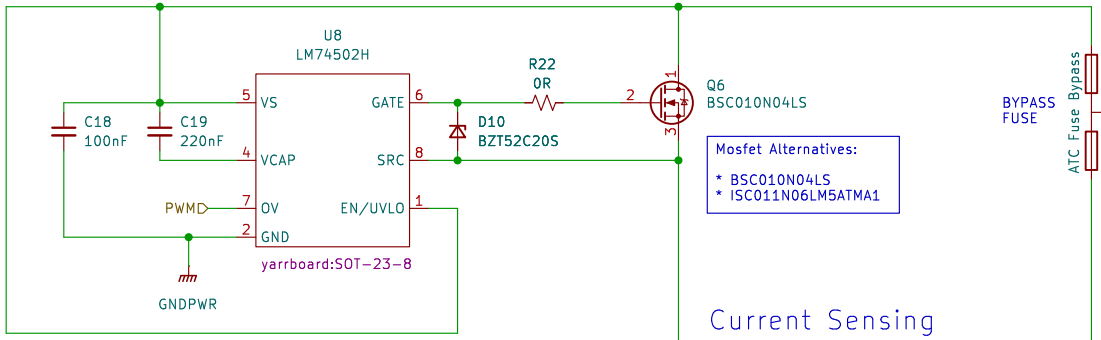
Sheet: /CHANNEL 2/
File: mosfet.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 3/16

Load Driver Circuit

Gate Driver Circuit



Possible to replace with 3 x C41371870?
C41355742 might be better?

Mosfet Alternatives:

* BSC010N04LS
* ISC011N06LM5ATMA1

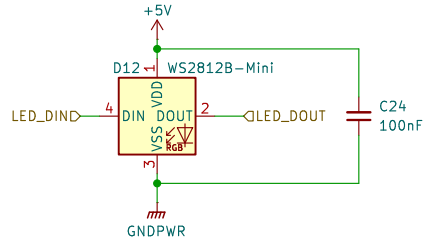
+24V

BYPASS FUSE

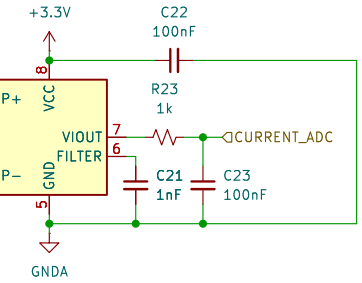
ATC Fuse Bypass

F3

Status LED



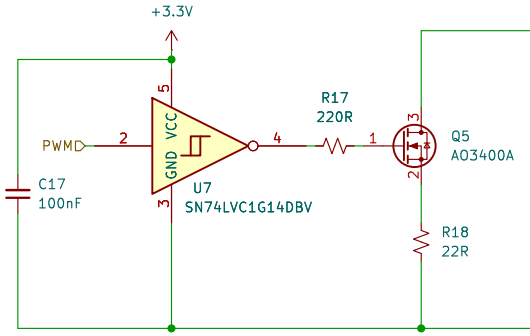
Current Sensing



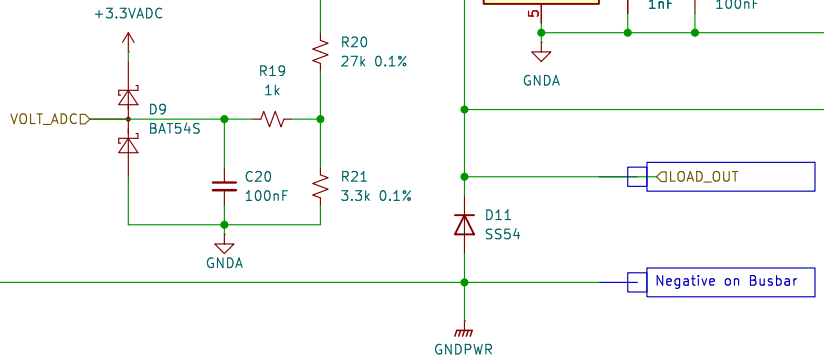
Current Sensor Alternatives:

* 725LLCTR20AUT – 132mv/A
* CT427-HSN820DR – 100mv/A
* CT427-ASN820DR – 100mv/A
* TMCS1108A2U – 100mV/A
* ACS725LLCTR-30AU – 88mv/A
* MCS1802GS-20-Z – 66mv/A

Low Side Dummy Load



Voltage Sensing



LOAD_OUT

D11
SS54

Negative on Busbar

GNDPWR

https://github.com/hoeken/frothfet

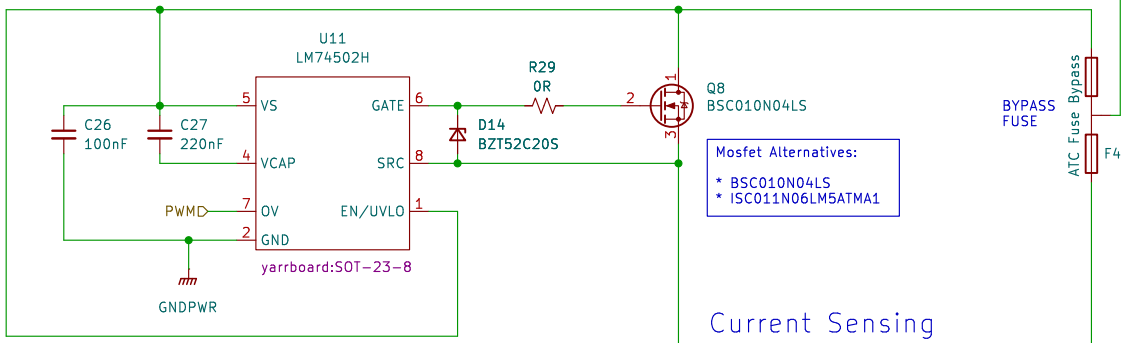
Sheet: /CHANNEL 3/
File: mosfet.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 4/16

Load Driver Circuit

Gate Driver Circuit



Possible to replace with 3 x C41371870?
C41355742 might be better?

Mosfet Alternatives:

* BSC010N04LS
* ISC011N06LM5ATMA1

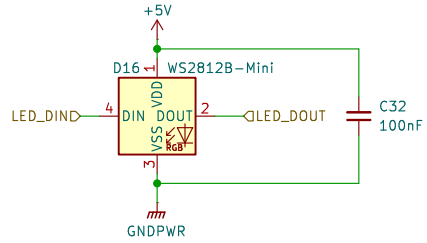
+24V

BYPASS FUSE

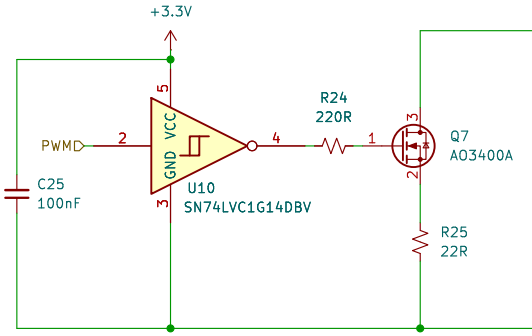
ATC Fuse Bypass

F4

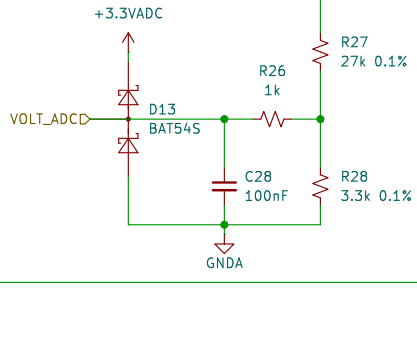
Status LED



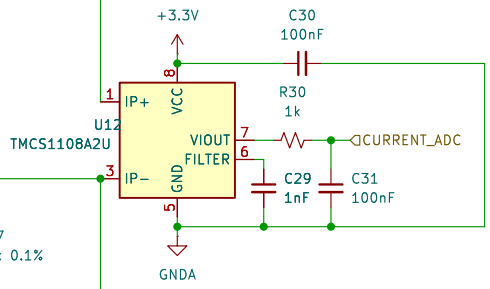
Low Side Dummy Load



Voltage Sensing



Current Sensing



Current Sensor Alternatives:

* 725LLCTR20AUT – 132mv/A
* CT427-HSN820DR – 100mv/A
* CT427-ASN820DR – 100mv/A
* TMCS1108A2U – 100mV/A
* ACS725LLCTR-30AU – 88mv/A
* MCS1802GS-20-Z – 66mv/A

LOAD_OUT

D15
SS54

Negative on Busbar

GNDPWR

https://github.com/hoeken/frothfet

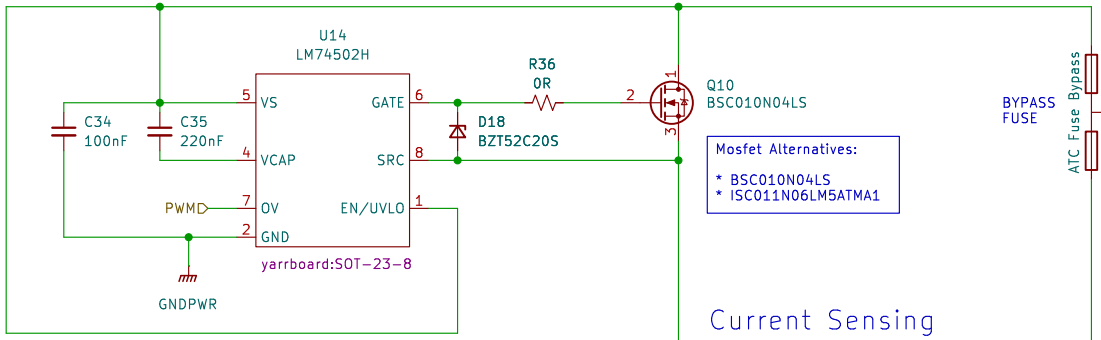
Sheet: /CHANNEL 4/
File: mosfet.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	Rev: E
KiCad E.D.A. 9.0.3		Id: 5/16

Load Driver Circuit

Gate Driver Circuit



Possible to replace with 3 x C41371870?
C41355742 might be better?

Mosfet Alternatives:

* BSC010N04LS
* ISC011N06LM5ATMA1

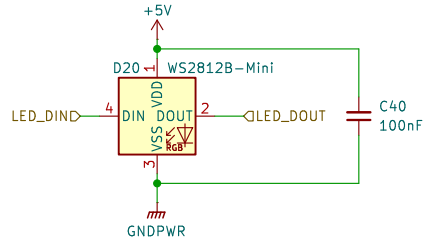
+24V

BYPASS FUSE

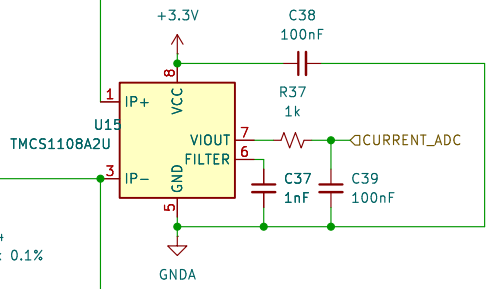
ATC Fuse Bypass

F5

Status LED



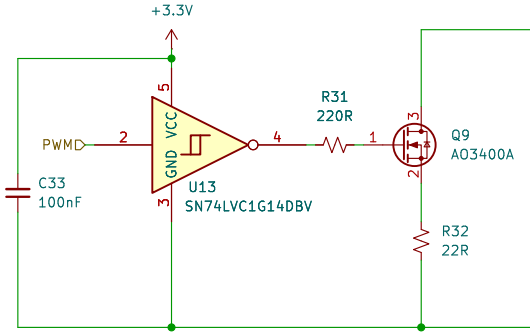
Current Sensing



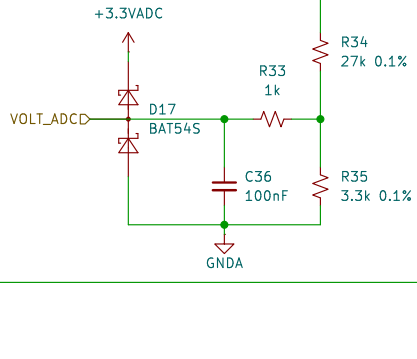
Current Sensor Alternatives:

* 725LLCTR20AUT – 132mv/A
* CT427-HSN820DR – 100mv/A
* CT427-ASN820DR – 100mv/A
* TMCS1108A2U – 100mV/A
* ACS725LLCTR-30AU – 88mv/A
* MCS1802GS-20-Z – 66mv/A

Low Side Dummy Load



Voltage Sensing



LOAD_OUT

D19
SS54

Negative on Busbar

GNDPWR

https://github.com/hoeken/frothfet

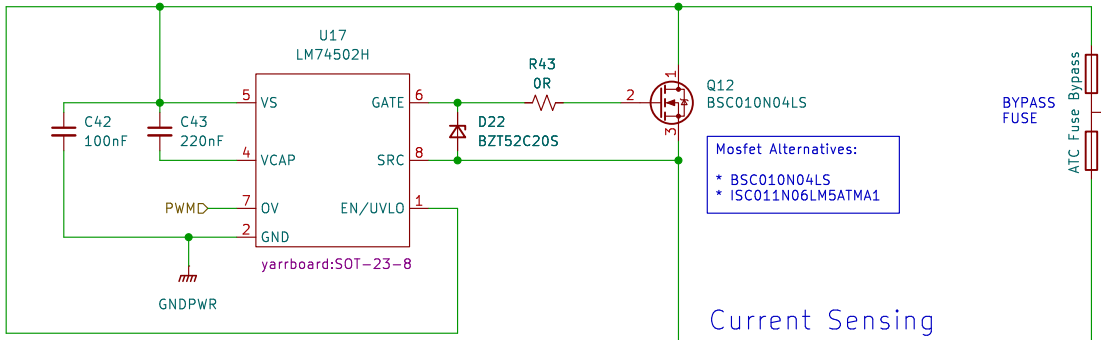
Sheet: /CHANNEL 5/
File: mosfet.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 6/16

Load Driver Circuit

Gate Driver Circuit



Possible to replace with 3 x C41371870?
C41355742 might be better?

Mosfet Alternatives:

* BSC010N04LS
* ISC011N06LM5ATMA1

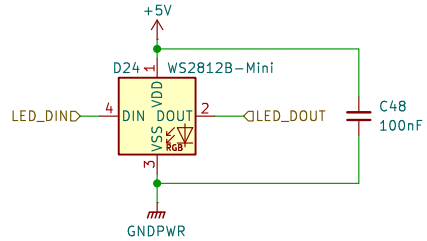
+24V

BYPASS FUSE

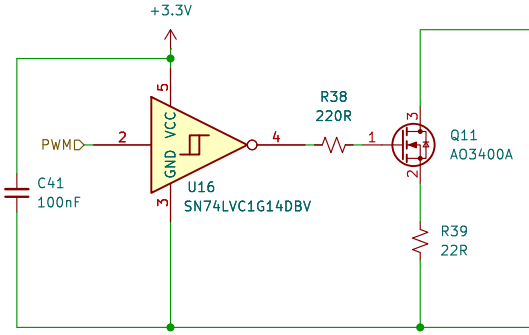
ATC Fuse Bypass

F6

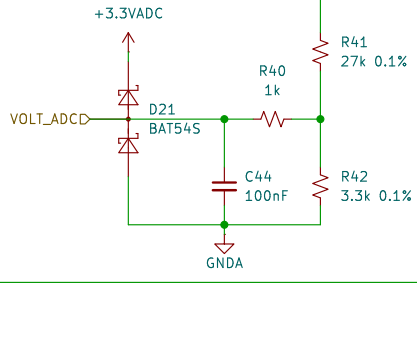
Status LED



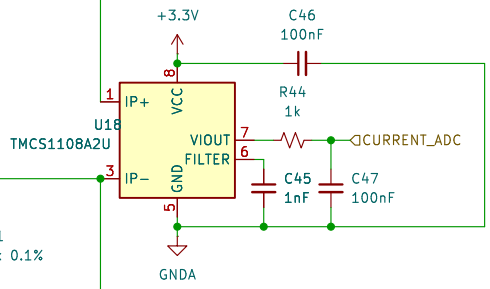
Low Side Dummy Load



Voltage Sensing



Current Sensing



Current Sensor Alternatives:

* 725LLCTR20AUT – 132mv/A
* CT427-HSN820DR – 100mv/A
* CT427-ASN820DR – 100mv/A
* TMCS1108A2U – 100mV/A
* ACS725LLCTR-30AU – 88mv/A
* MCS1802GS-20-Z – 66mv/A

LOAD_OUT

D23
SS54

Negative on Busbar

GNDPWR

https://github.com/hoeken/frothfet

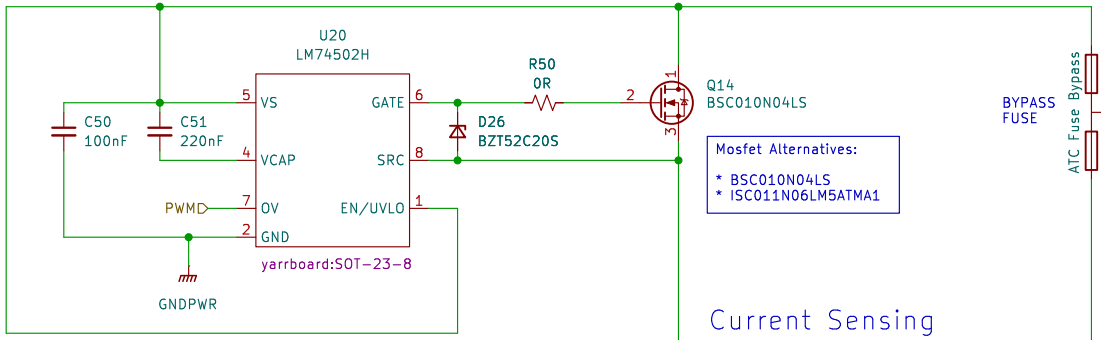
Sheet: /CHANNEL 6/
File: mosfet.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 7/16

Load Driver Circuit

Gate Driver Circuit



Possible to replace with 3 x C41371870?
C41355742 might be better?

Mosfet Alternatives:

* BSC010N04LS
* ISC011N06LM5ATMA1

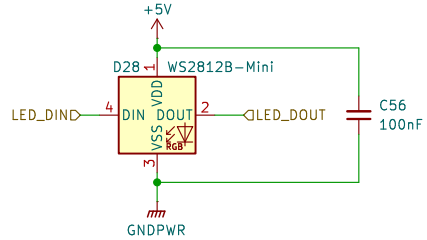
+24V

BYPASS FUSE

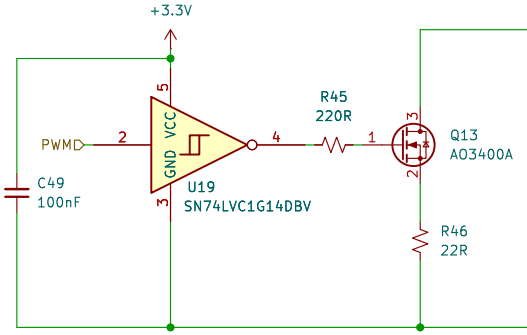
ATC Fuse Bypass

F7

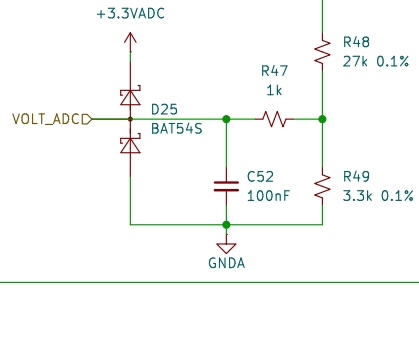
Status LED



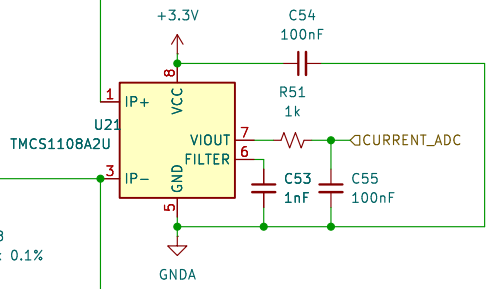
Low Side Dummy Load



Voltage Sensing



Current Sensing



Current Sensor Alternatives:

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* CT427-ASN820DR – 100mv/A
* TMCS1108A2U – 100mV/A
* ACS725LLCTR-30AU – 88mv/A
* MCS1802GS-20-Z – 66mv/A

LOAD_OUT

D27
SS54

Negative on Busbar

GNDPWR

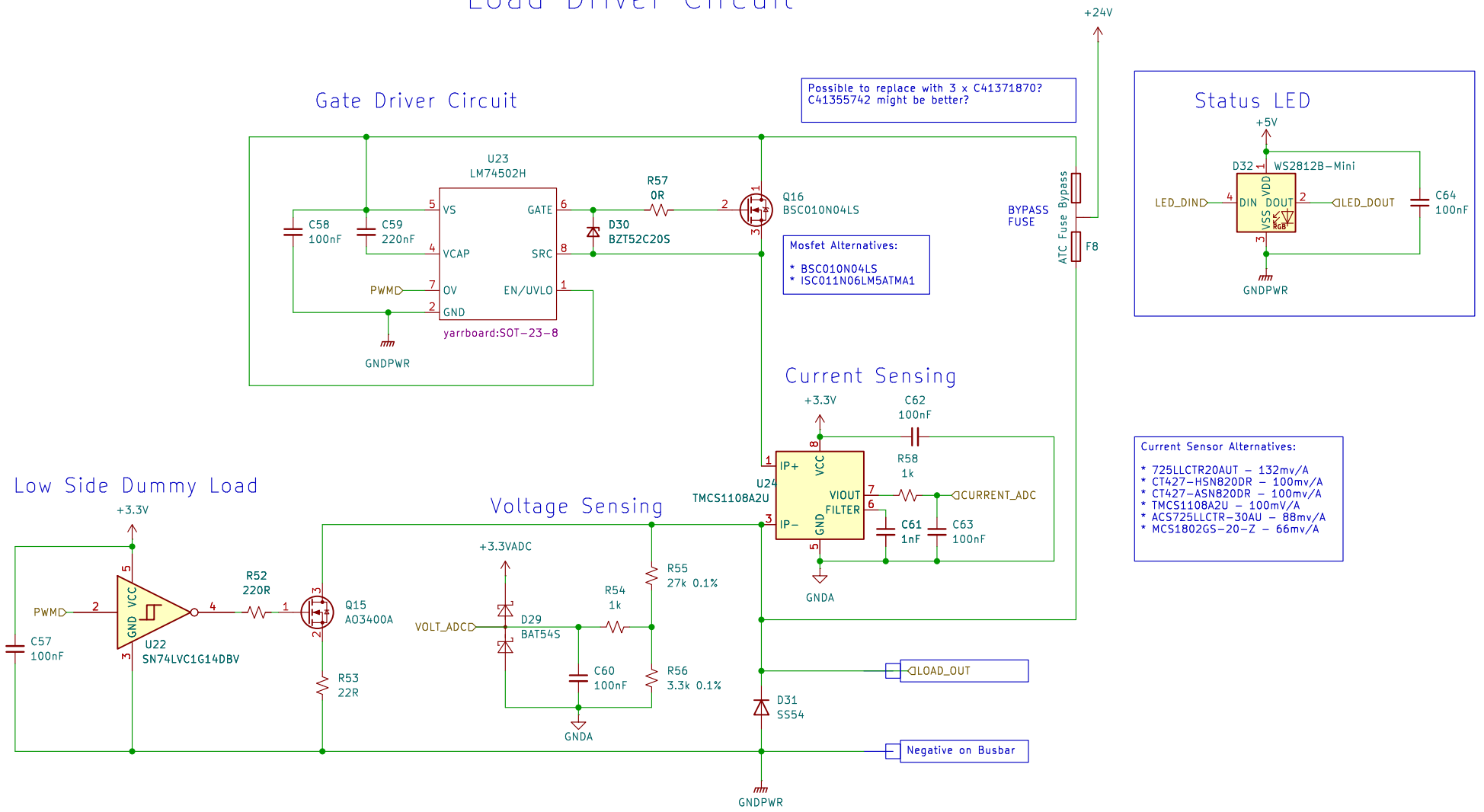
https://github.com/hoeken/frothfet

Sheet: /CHANNEL 7/
File: mosfet.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 8/16

Load Driver Circuit



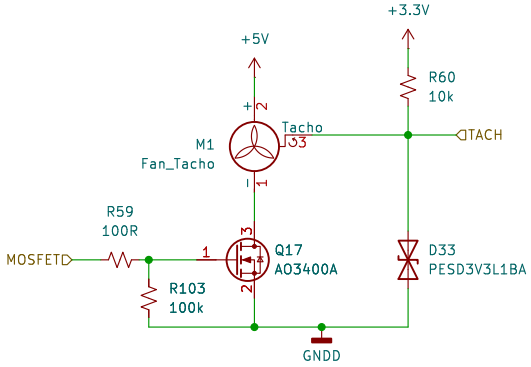
https://github.com/hoeken/frothfet

Sheet: /CHANNEL 8/
File: mosfet.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 9/16

Fan Control

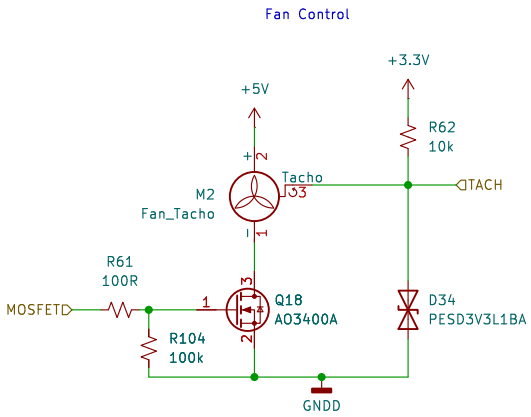


https://github.com/hoeken/frothfet

Sheet: /FAN1/
File: pwm fan.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 10/16

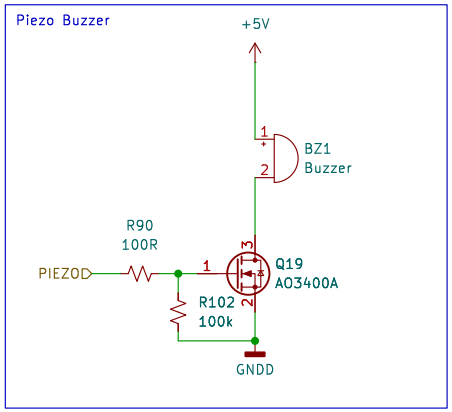


https://github.com/hoeken/frothfet

Sheet: /FAN2/
File: pwm fan.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 11/16

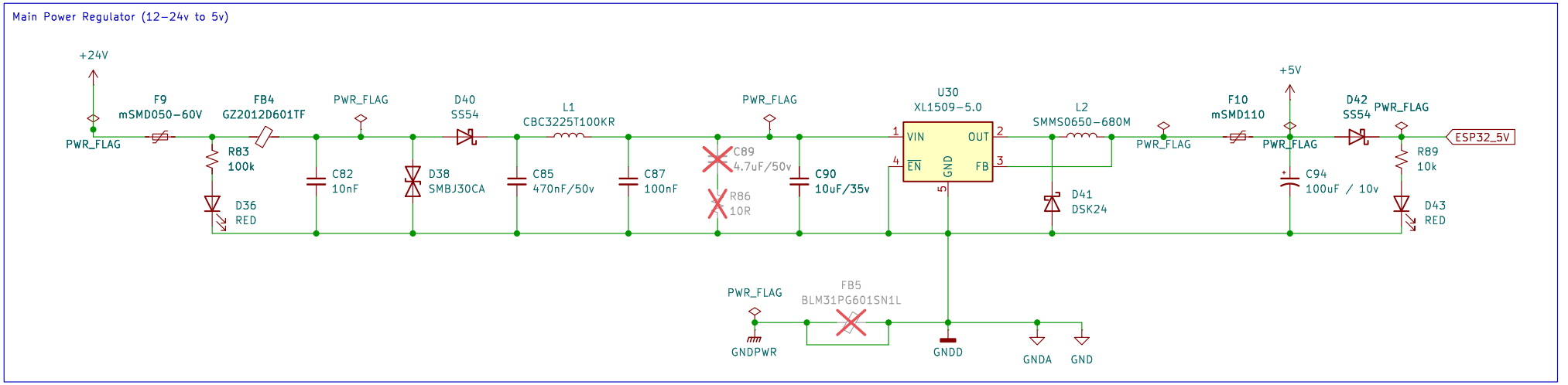


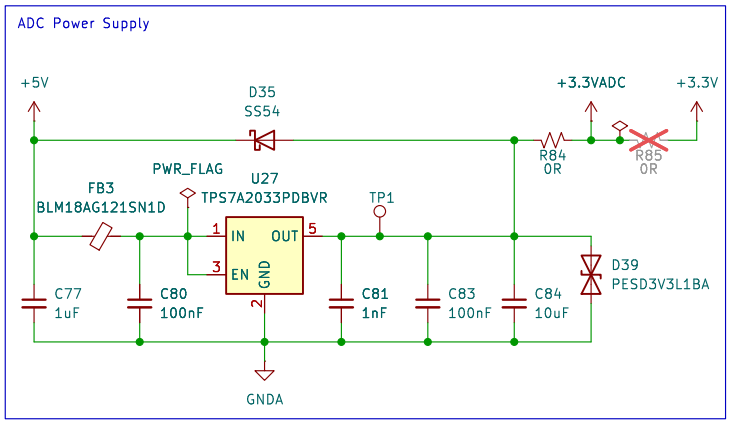
https://github.com/hoeken/frothfet

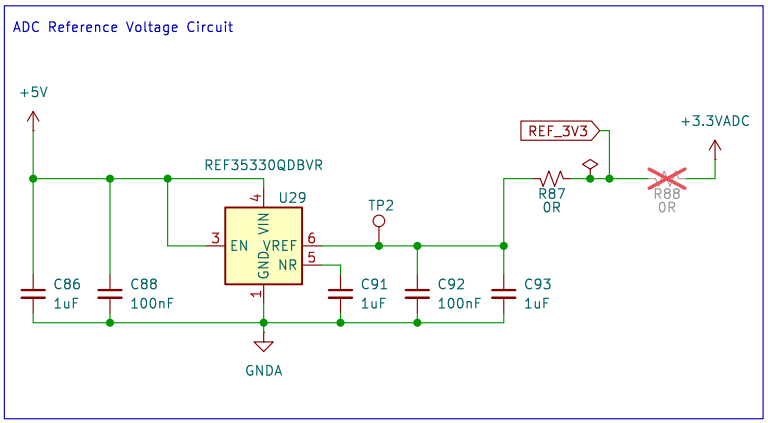
Sheet: /Piezo Buzzer/
File: piezo.kicad_sch

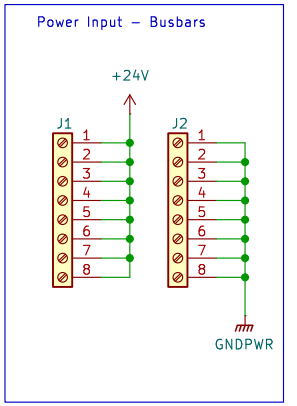
Title: FrothFET 8CH

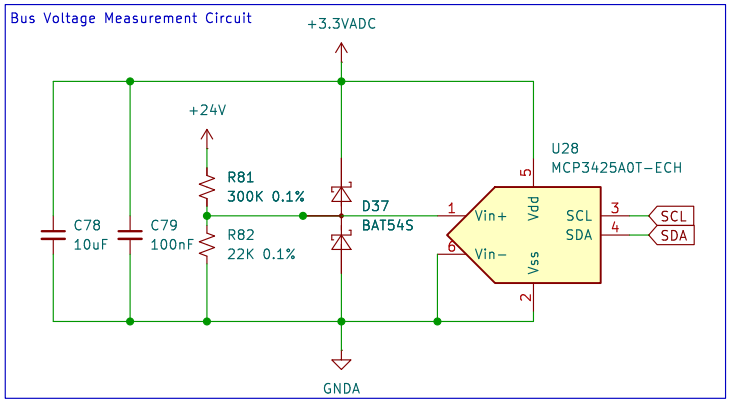
Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 16/16











3.3v ADC Power Budget:

MCP3654R: 2mA
MCP3425: 0.145mA
ACS725: 10mA * 8 = 80mA
Total: 82.145mA

TPS7A20 Supply: 300mA

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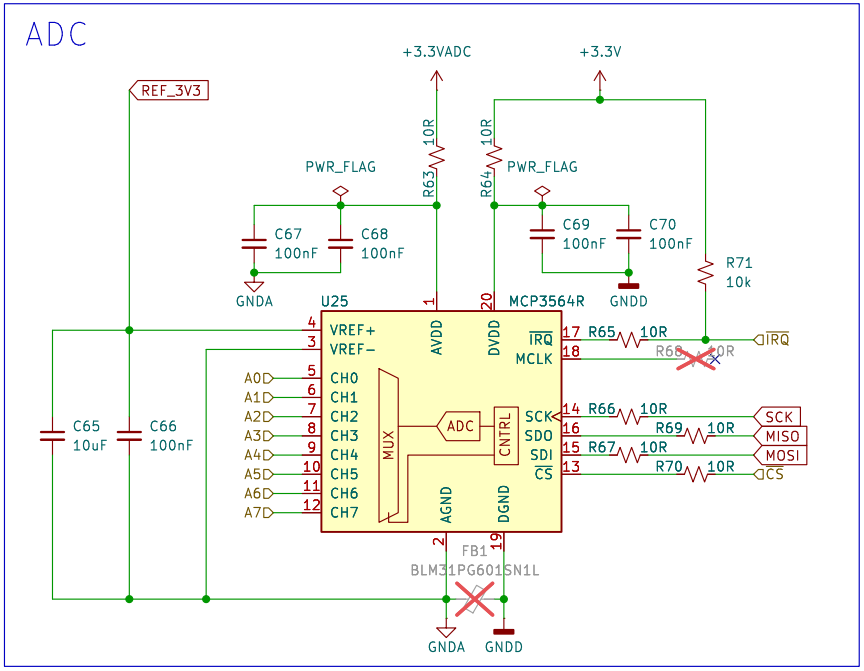
Sheet: /Power Supply/
File: power.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 14/16

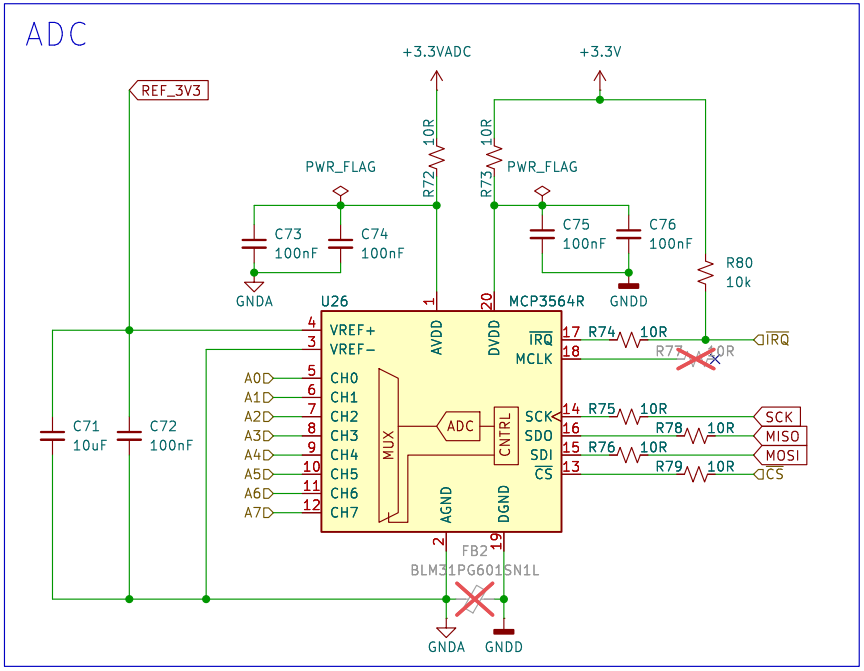


https://github.com/hoeken/frothfet

Sheet: /CURRENT ADC/
File: adc.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 12/16



https://github.com/hoeken/frothfet

Sheet: /VOLTAGE ADC/
File: adc.kicad_sch

Title: FrothFET 8CH

Size: A4	Date: 2024-08-21	**Rev: E**
KiCad E.D.A. 9.0.3		Id: 13/16