from 30 A main fuse

J4
34830-2001

12V_BATT_MAIN 1 — 1 | 11 — ENG_MAIN_12V_RTN
2 | 12 — 12
ENG_ON_RLY_FEED 3 — 13 — ENG_ON_RLY_RTN
ENG_START_RLY_FEED 4 — 14 — ENG_START_RLY_RTN
BRAKE_LIGHT_FEED 5 — 15 — BRAKE_LIGHT_RTN
HIGHBEAM_FEED 6 — 16 — HIGHBEAM_RTN
TURN_SIG_FEED 7 — 17 — LEFT_TURN_RTN
8 — 18 — RIGHT_TURN_RTN
HORN_FEED 9 — 19 — HORN_RTN
CLUTCH_GND 10 — 20 — CLUTCH_RTN

Engine Controls Connector

J3
34830-0801

GND 1 — 1 | 5 — 5 SERVO_12V
RS485_A 2 — 2 | 6 — 6 RS485_B
ENG_12V_ON_SENSE 3 — 3 | 7 — 7 KLINE
GND 4 — 4 | 8 — 8 FUEL_LVL_SENSE

eng_12v_on_sense goes to 12V when engine on relay is closed and kill switch is closed

Kline/Throttle/Level Sense Connector

+12V
350 mA hold
750 mA trip polyfuse
1206L035/16YR
F1

J1
MX34028NF2

HEADLIGHT_RELAY 1 — 1 | 16 — 16 1ST
12V_IGN_CLUSTER 2 — 2 | 17 — 17 2ND
SP_VCC 3 — 3 | 18 — 18 3RD
4 — 4 | 19 — 19 4TH
5 — 5 | 20 — 20 5TH
TURN_R 6 — 6 | 21 — 21 6TH
TURN_L 7 — 7 | 22 — 22 GND
FUEL_LOW 8 — 8 | 23 — 23
HIGHBEAM 9 — 9 | 24 — 24 12V_BATT_CLUSTER
LAP-STARTER 10 — 10 | 25 — 25 TEMP
NEUTRAL 11 — 11 | 26 — 26 TA_SIG
HESD 12 — 12 | 27 — 27 FUEL_PULSE
FAULT_IND 13 — 13 | 28 — 28 OIL
SP_SIG 14 — 14 | MH1 — MH1
LAP_RELAY 15 — 15 | MH2 — MH2

Engine Cluster Connector

12V_BATT_MAIN
2920L600/16MR
F2
6 A hold
14 A trip polyfuse

Fused keyswitch feed goes to main vehicle keyswitch. Keyswitch return powers EIM and is passed out to power other modules.

J2
36783-1201

KEYSWITCH_FEED 1 — 1 | 8 — 8 KEYSWITCH_RTN
KEYSWITCH_RTN 2 — 2 | 9 — 9 ENG_ON_RLY_RTN
ENG_ON_RLY_TO_KILL_SW 3 — 3 | 10 — 10 CLUTCH_RTN
CLUTCH_GND 4 — 4 | 11 — 11 CAN2_H
CAN2_L 5 — 5 | 12 — 12 CAN1_H
CAN1_L 6 — 6 | MH1 — MH1
KEYSWITCH_RTN 7 — 7 | MH2 — MH2

EIM Connector

+12V — R1 15k — D2 RED — GND
+3V3 — R2 1k — D3 GREEN — GND
ENG_12V_ON_SENSE — R3 15k — D4 DEEP RED — GND
LED1 — R4 1k — D5 YELLOW — GND

D1
CLV1L-FKB

+3V3 — R5 220R — LED2_B
R6 220R — LED2_G
R7 1k5 — LED2_R

forward voltages:
B = 3.1
G = 3.1
R = 2.0
resistors chosen for about 0.8 mA

K1
G8N-1L-AS_DC12

12V_BATT_MAIN 1 — COM | NC — 4
+12V 2 — COIL_1 | COIL_2 — 5 MAIN_RLY_COIL_LS
ENG_MAIN_12V_RTN 3 — NO

relay to power engine
(equivalent to keyswitch on bike)

Power Supply
File: power_supply.kicad_sch

KEYSWITCH_RTN — 12V_RAW | 12V_FUSED — +12V
SERVO_12V — SERVO_12V
+3V3 — 3V3_OUT

Analog Inputs
File: analog_inputs.kicad_sch

SERVO_12V — SERVO_12V | SERVO_12V_ADC — SERVO_12V_ADC — ADC1_IN7
ENG_12V_ON_SENSE — ENG_12V | 12V_ADC — 12V_ADC — ADC1_IN9
FUEL_LVL_SENSE — FUEL_LVL | ENG_12V_ADC — ENG_12V_ADC — ADC1_IN3
TEMP — TEMP | FUEL_LVL_ADC — FUEL_LVL_ADC — ADC1_IN4
FUEL_LOW — FUEL_LOW | TEMP_ADC — ENG_TEMP_ADC — ADC1_IN6
FUEL_LOW_ADC — FUEL_LOW_ADC — ADC1_IN5

Lowside Relay Driver 1
MAIN_RLY_COIL_LS — RELAY_LS | EN — MAIN_RLY_EN — PF3
File: lowside_relay_driver.kicad_sch

Lowside Relay Driver 2
HEADLIGHT_RELAY — RELAY_LS | EN — HL_RLY_EN — PE13
File: lowside_relay_driver.kicad_sch

Lowside Relay Driver 3
LAP_RELAY — RELAY_LS | EN — LAP_RLY_EN — PE14
File: lowside_relay_driver.kicad_sch

7A Highside Driver 1
ENG_ON_RLY_FEED — 12V_input | EN — ENG_ON_EN — PF4
ENG_ON_RLY_TO_KILL_SW — 12V_output V_Isense — ENG_ON_RLY_I_SEN — ADC1_IN10
File: highside_driver_7A.kicad_sch

7A Highside Driver 2
ENG_START_RLY_FEED — 12V_input | EN — ENG_START_EN — PF5
ENG_START_RLY_RTN — 12V_output V_Isense — ENG_START_RLY_I_SEN — ADC1_IN2
File: highside_driver_7A.kicad_sch

7A Highside Driver 3
BRAKE_LIGHT_FEED — 12V_input | EN — BRAKE_LIGHT_EN — PF6
BRAKE_LIGHT_RTN — 12V_output V_Isense — BRAKE_LIGHT_I_SEN — ADC1_IN1
File: highside_driver_7A.kicad_sch

7A Highside Driver 4
HIGHBEAM_FEED — 12V_input | EN — HIGHBEAM_EN — PF7
HIGHBEAM_RTN — 12V_output V_Isense — HIGHBEAM_I_SEN — ADC1_IN0
File: highside_driver_7A.kicad_sch

7A Highside Driver 5
TURN_SIG_FEED — 12V_input | EN — L_TURN_SIG_EN — PF8
LEFT_TURN_RTN — 12V_output V_Isense — L_TURN_SIG_I_SEN — ADC1_IN13
File: highside_driver_7A.kicad_sch

7A Highside Driver 6
TURN_SIG_FEED — 12V_input | EN — R_TURN_SIG_EN — PF9
RIGHT_TURN_RTN — 12V_output V_Isense — R_TURN_SIG_I_SEN — ADC1_IN12
File: highside_driver_7A.kicad_sch

7A Highside Driver 7
HORN_FEED — 12V_input | EN — HORN_EN — PF10
HORN_RTN — 12V_output V_Isense — HORN_I_SEN — ADC1_IN11
File: highside_driver_7A.kicad_sch

STM32F429
File: STM32F429.kicad_sch

LED1 — TIM4_CH3
LED2_R — TIM4_CH1
LED2_G — TIM4_CH2
LED2_B — TIM4_CH4

SPI2_MOSI
SPI2_MISO
SPI2_SCK
I2C1_SCL
I2C1_SDA
USART4_TX
USART4_RX
PB2/BOOT1
ADC1_IN8

SPI2_MOSI
SPI2_MISO
SPI2_SCK
I2C_SCL
I2C_SDA
UART4_TX
UART4_RX
PB2/BOOT1
EXTRA_ADC

none of these peripherals are needed, but could be useful

PC4 — VSS_MCU — 3.3 V to 3.3 V Iso Input 1 — A_OUT | A_IN+ — +3V3 — SP_SIG
A_IN- | B_IN+ | B_OUT | B_IN-
File: iso_3V3_input.kicad_sch

PG0 — TURN_L_MCU — 12 to 3.3 V Iso Input 1 — A_OUT | A_IN+ — TURN_L — GND
PG1 — TURN_R_MCU — A_IN- | B_IN+ | B_OUT | B_IN- — TURN_R — GND
File: iso_12V_input.kicad_sch

PF14 — LOWBEAM_MCU — 12 to 3.3 V Iso Input 2 — A_OUT | A_IN+ — HIGHBEAM_FEED — GND
PF15 — HIGHBEAM_MCU — A_IN- | B_IN+ | B_OUT | B_IN- — HIGHBEAM — GND
File: iso_12V_input.kicad_sch

PF12 — TACH_MCU — 12 to 3.3 V Iso Input 3 — A_OUT | A_IN+ — TA_SIG — GND
PF13 — NEUTRAL_MCU — A_IN- | B_IN+ | B_OUT | B_IN- — +12V — NEUTRAL
File: iso_12V_input.kicad_sch

PE11 — 2ND_MCU — 12 to 3.3 V Iso Input 4 — A_OUT | A_IN+ — +12V — 2ND
PE12 — 1ST_MCU — A_IN- | B_IN+ | B_OUT | B_IN- — +12V — 1ST
File: iso_12V_input.kicad_sch

PE9 — 4TH_MCU — 12 to 3.3 V Iso Input 5 — A_OUT | A_IN+ — +12V — 4TH
PE10 — 3RD_MCU — A_IN- | B_IN+ | B_OUT | B_IN- — +12V — 3RD
File: iso_12V_input.kicad_sch

PE7 — 6TH_MCU — 12 to 3.3 V Iso Input 6 — A_OUT | A_IN+ — +12V — 6TH
PE8 — 5TH_MCU — A_IN- | B_IN+ | B_OUT | B_IN- — +12V — 5TH
File: iso_12V_input.kicad_sch

PC5 — FAULT_IND_MCU — 12 to 3.3 V Iso Input 7 — A_OUT | A_IN+ — +12V — FAULT_IND
PF11 — OIL_P_LOW_MCU — A_IN- | B_IN+ | B_OUT | B_IN- — +12V — OIL
File: iso_12V_input.kicad_sch

PD4 — RS485_DIR — RS485 Transceiver — RS485_DIR | RS485_A — RS485_A
USART2_RX — RS485_RX — RS485_RX
USART2_TX — RS485_TX — RS485_TX | RS485_B — RS485_B
File: RS485.kicad_sch

PF2 — KLINE_EN — K-Line Transceiver — EN | 12V — +12V
USART1_RX — KLINE_RX — RX
USART1_TX — KLINE_TX — TX | KLINE — KLINE
File: kline.kicad_sch

CAN2_RX — CAN2_RX — CAN Transceiver 2 — CAN_RX | CAN_L — CAN2_L
CAN2_TX — CAN2_TX — CAN_TX | CAN_H — CAN2_H
File: CAN_transceiver.kicad_sch

CAN1_RX — CAN1_RX — CAN Transceiver 1 — CAN_RX | CAN_L — CAN1_L
CAN1_TX — CAN1_TX — CAN_TX | CAN_H — CAN1_H
File: CAN_transceiver.kicad_sch

J5
DEBUG1

GND 1 — 2 GND
+3V3 3 — 4 SERVO_12V
+12V 5 — 6 KEYSWITCH_FEED
ENG_ON_RLY_RTN 7 — 8 ENG_ON_RLY_I_SEN
ENG_12V_ON_SENSE 9 — 10 ENG_12V_ADC
FUEL_LVL_SENSE 11 — 12 FUEL_LVL_ADC
TEMP 13 — 14 ENG_TEMP_ADC
FUEL_LOW 15 — 16 FUEL_LOW_ADC
SP_SIG 17 — 18 VSS_MCU
TA_SIG 19 — 20 TACH_MCU

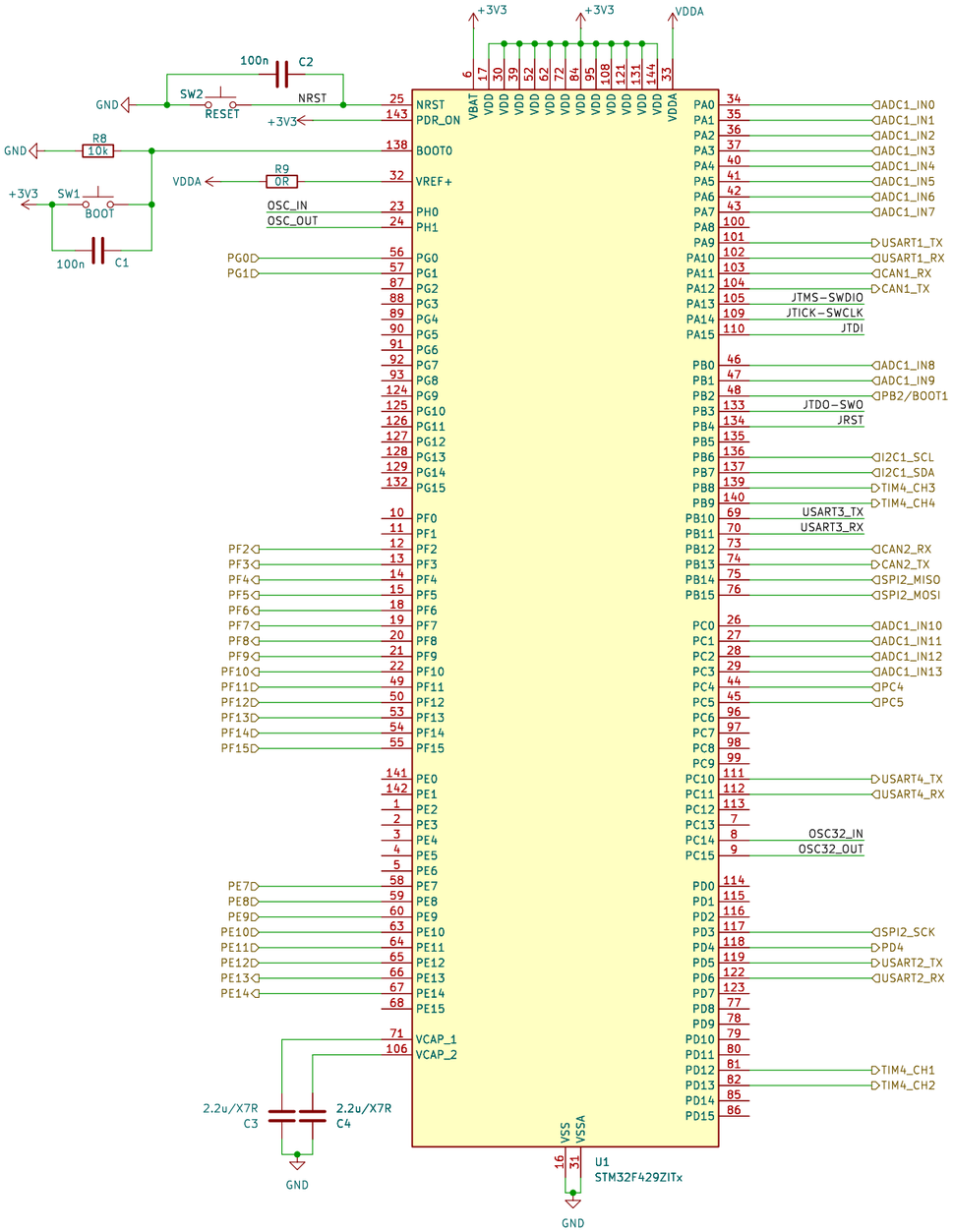
J6
DEBUG2

GND 1 — 2 GND
+3V3 3 — 4 +12V
RS485_A 5 — 6 RS485_B
KLINE 7 — 8 PB2/BOOT1
CAN1_L 9 — 10 CAN1_H
CAN2_L 11 — 12 CAN2_H
SPI2_MOSI 13 — 14 SPI2_SCK
SPI2_MISO 15 — 16 EXTRA_ADC
I2C_SCL 17 — 18 I2C_SDA
UART4_TX 19 — 20 UART4_RX

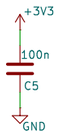
Sheet: /
File: EIM.kicad_sch

Title:

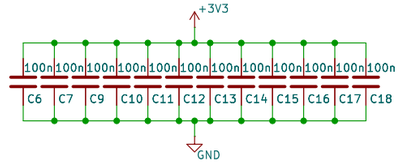
Size: A3 | Date: | Rev:
KiCad E.D.A. 8.0.3 | Id: 1/26

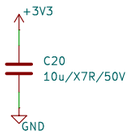


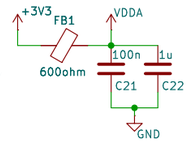
Bypass cap for VBAT



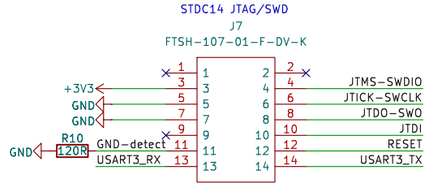
Bypass caps for pins 17, 30, 39, 52, 62, 72, 84, 95, 108, 121, 131, 144



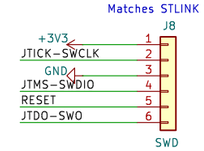


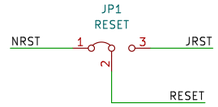


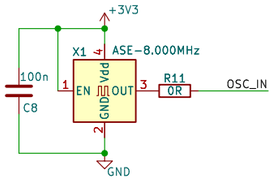
STDC14 JTAG/SWD

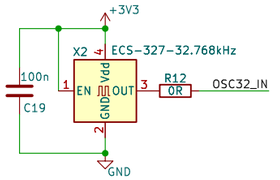


Matches STLINK V2









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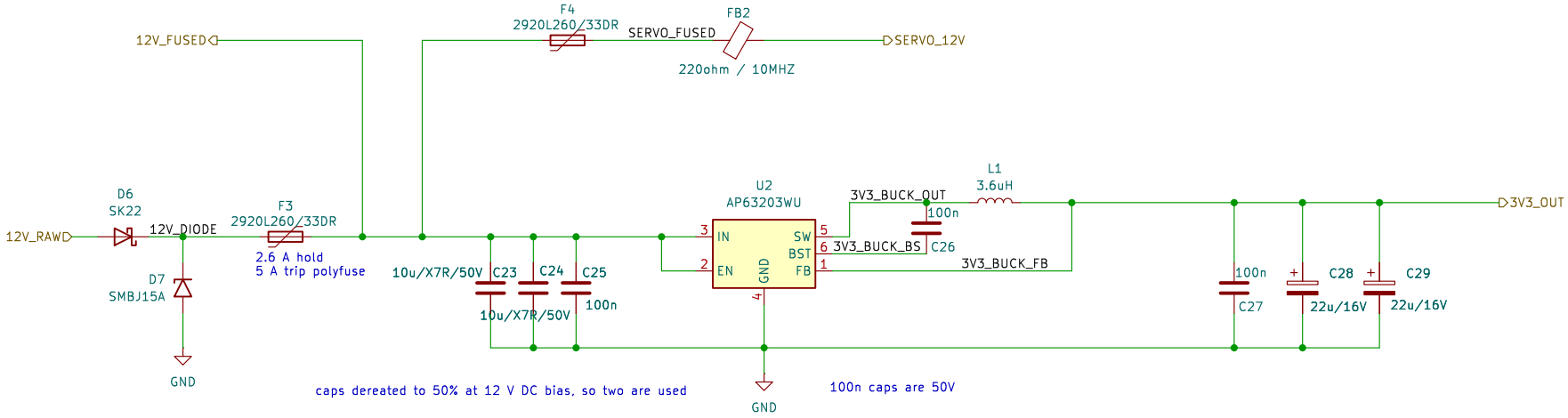
Size: A3	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 2/26



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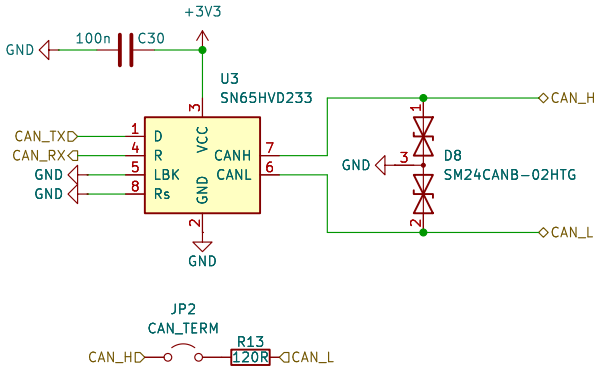
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 3/26



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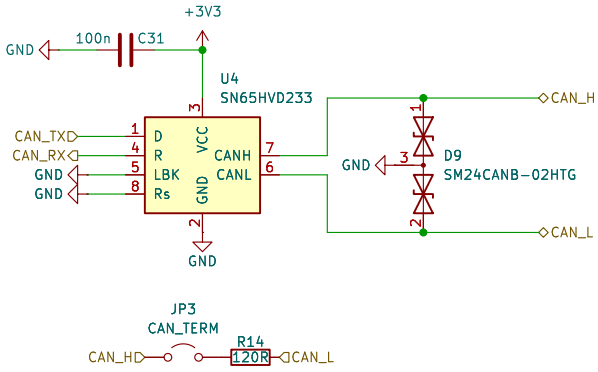
KiCad E.D.A. 8.0.3		Id: 4/26



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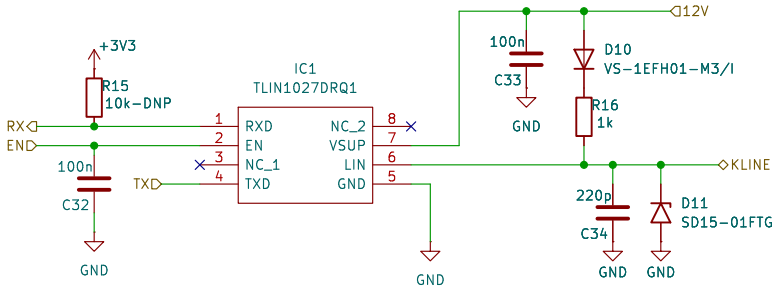
KiCad E.D.A. 8.0.3		Id: 5/26



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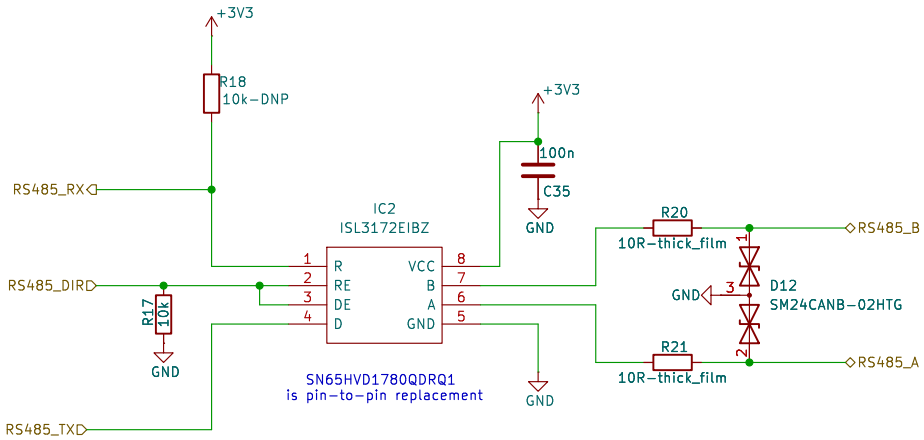
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 6/26



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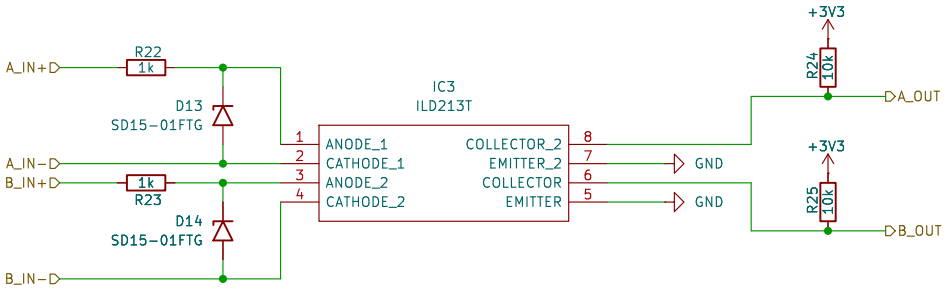
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 7/26

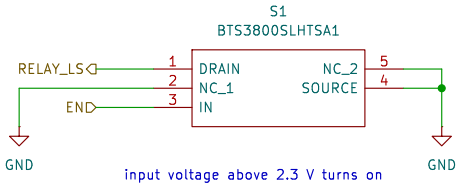
12V high or low side inputs
TVS breakdown at 13.3 V
12.1 mA nominal current trough opto diode



Sheet: /12 to 3.3 V Iso Input 3/
File: iso_12V_input.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 8/26



Sheet: /Lowside Relay Driver 1/		
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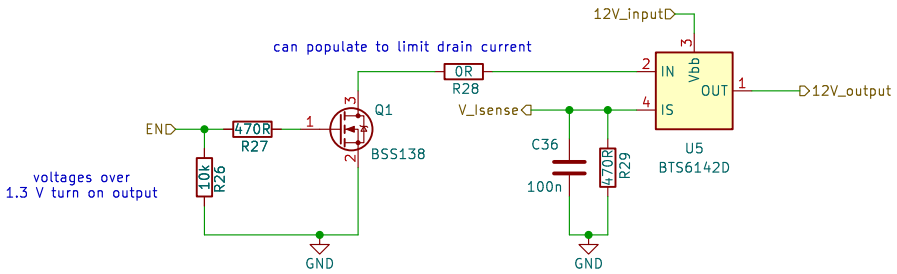
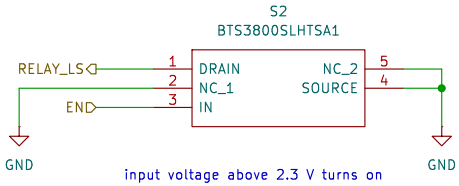
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 9/26



current out of Is pin = load current / 10,000
through 470R sense resistor, 1 A of load current --> 47 mV at V_Isense
when faulted, Is = 6 mA --> 2.82 V

Sheet: /7A Highside Driver 1/		
File: highside_driver_7A.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 10/26



Sheet: /Lowside Relay Driver 2/	
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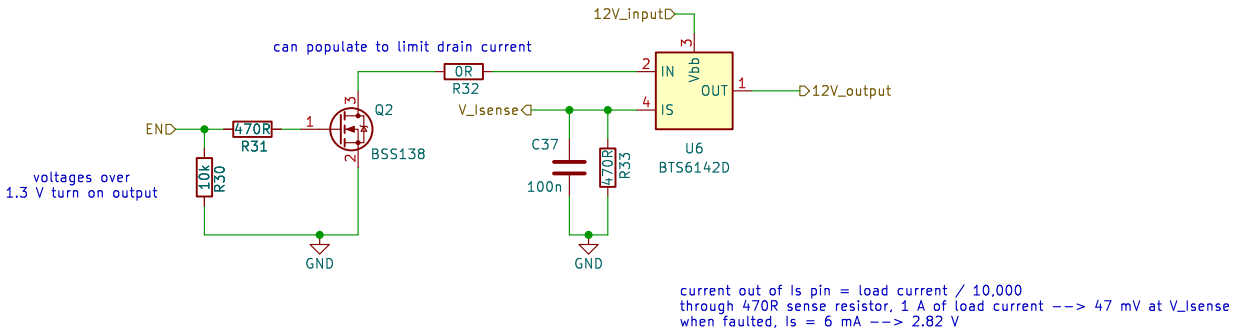
Size: A4	Date:
KiCad E.D.A. 8.0.3	Id: 11/26



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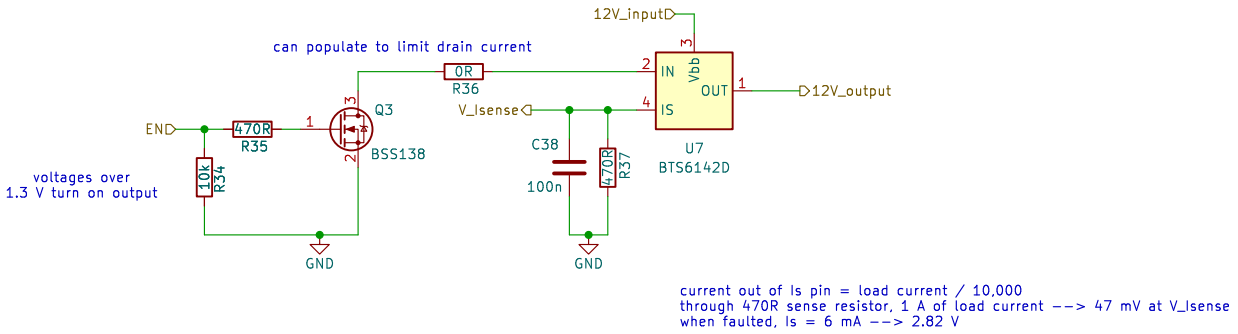
KiCad E.D.A. 8.0.3		Id: 12/26



Sheet: /7A Highside Driver 3/		
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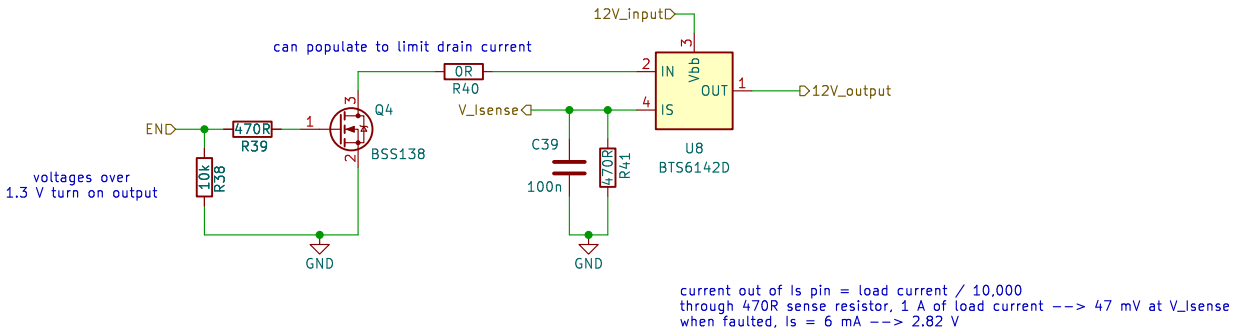
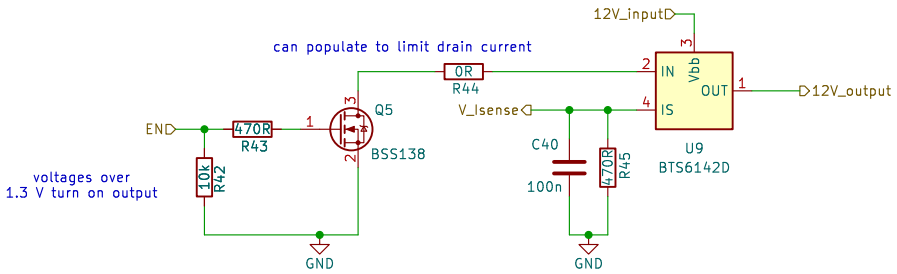
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 13/26

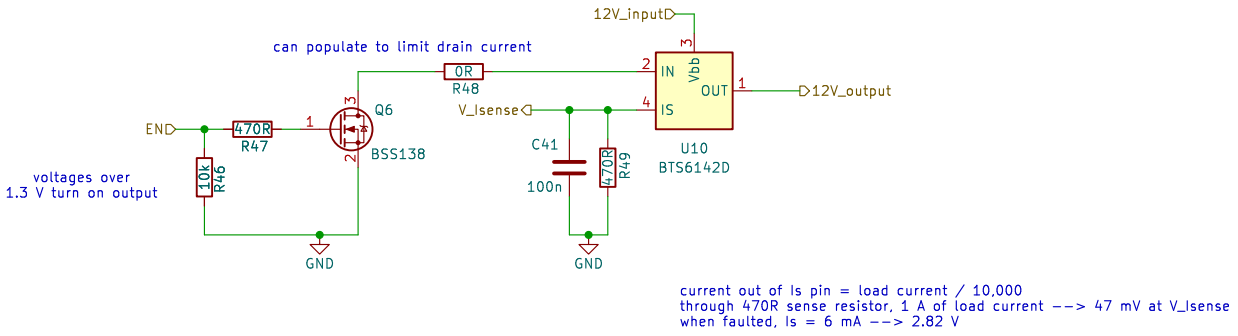


Sheet: /7A Highside Driver 4/		
File: highside_driver_7A.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 14/26

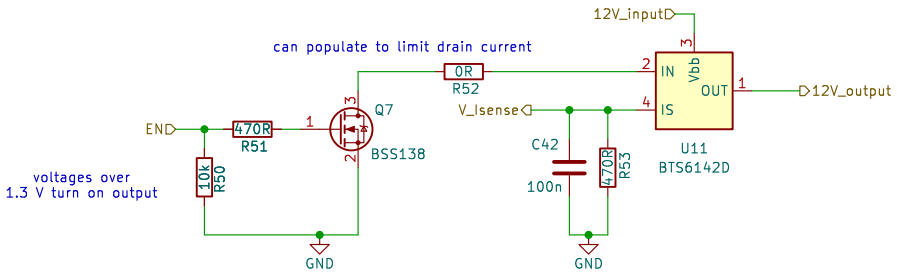


current out of Is pin = load current / 10,000
through 470R sense resistor, 1 A of load current --> 47 mV at V_Isense
when faulted, Is = 6 mA --> 2.82 V

Sheet: /7A Highside Driver 5/		
File: highside_driver_7A.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 15/26

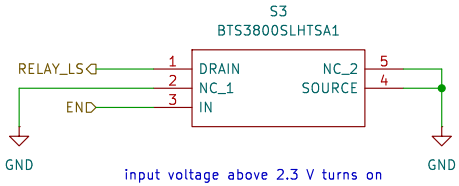


Sheet: /7A Highside Driver 6/		
File: highside_driver_7A.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 16/26



current out of Is pin = load current / 10,000
through 470R sense resistor, 1 A of load current --> 47 mV at V_Isense
when faulted, Is = 6 mA --> 2.82 V

Sheet: /7A Highside Driver 7/		
File: highside_driver_7A.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 17/26

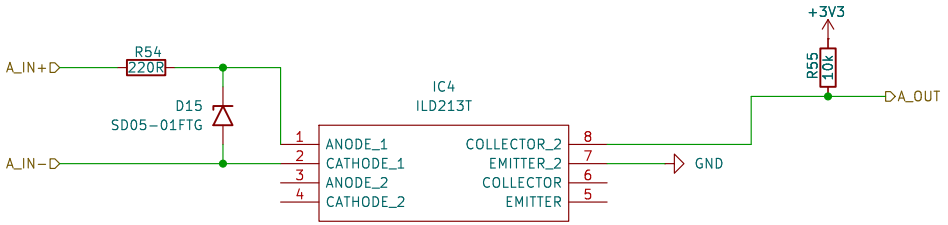


Sheet: /Lowside Relay Driver 3/
File: lowside_relay_driver.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 18/26

3.3 V or 5 V high or low side inputs
TVS breakdown at 7.0 V
9.5 mA nominal current trough opto diode



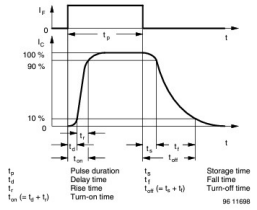


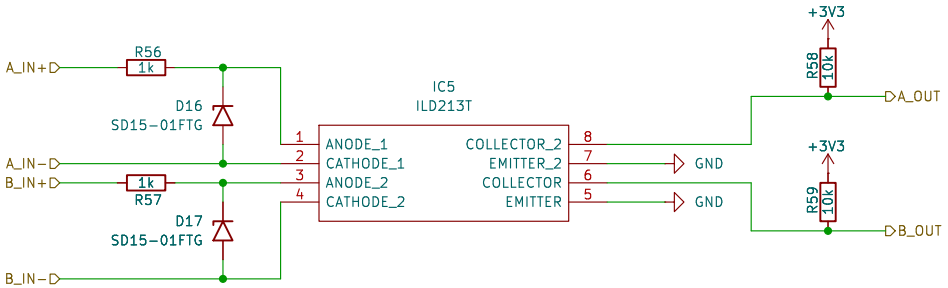
Fig. 3 - Switching Times

opto timing info
with 10 mA through LED
turn-on time = 3 us
turn-off time = 10 us

quickest cycle = 15 us (2 us arbitrary plateau time)
--> 66 kHz max frequency

Sheet: /3.3 V to 3.3 V Iso Input 1/		
File: iso_3V3_input.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 19/26

12V high or low side inputs
TVS breakdown at 13.3 V
12.1 mA nominal current trough opto diode

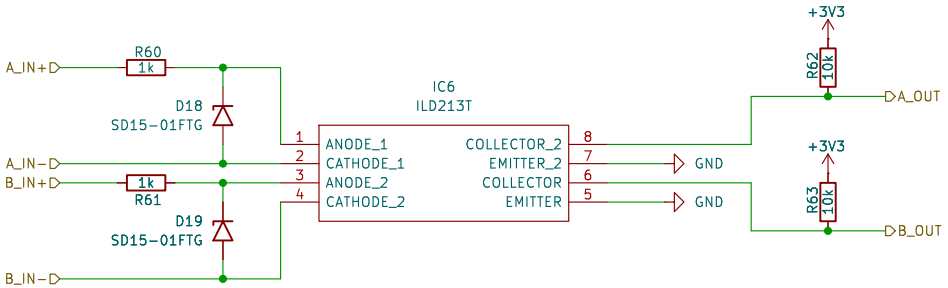


Sheet: /12 to 3.3 V Iso Input 1/
File: iso_12V_input.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 20/26

12V high or low side inputs
TVS breakdown at 13.3 V
12.1 mA nominal current trough opto diode

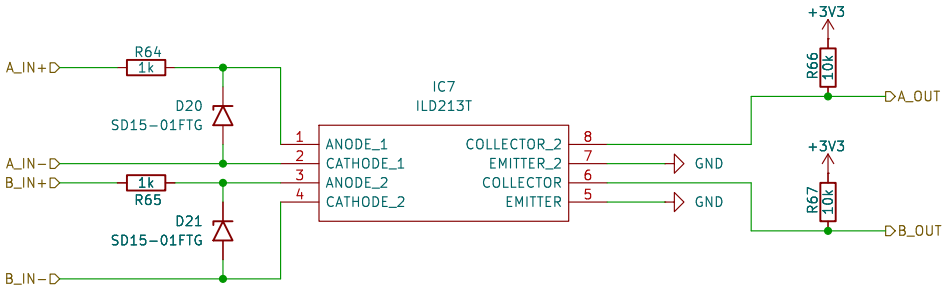


Sheet: /12 to 3.3 V Iso Input 4/
File: iso_12V_input.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 21/26

12V high or low side inputs
TVS breakdown at 13.3 V
12.1 mA nominal current trough opto diode

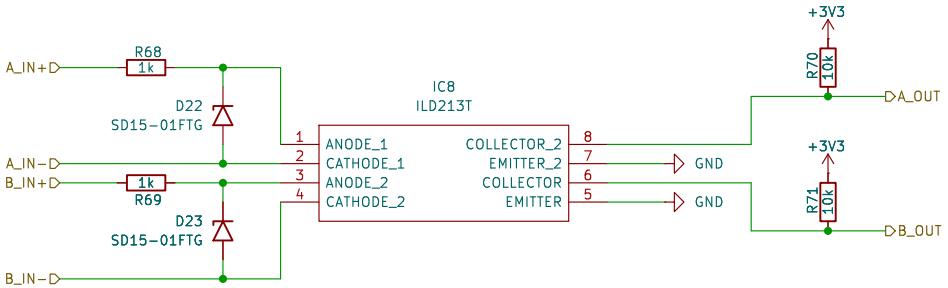


Sheet: /12 to 3.3 V Iso Input 5/
File: iso_12V_input.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 22/26

12V high or low side inputs
TVS breakdown at 13.3 V
12.1 mA nominal current trough opto diode

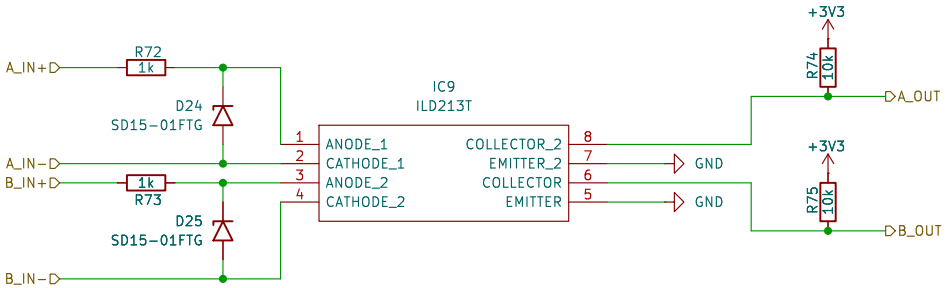


Sheet: /12 to 3.3 V Iso Input 6/
File: iso_12V_input.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 23/26

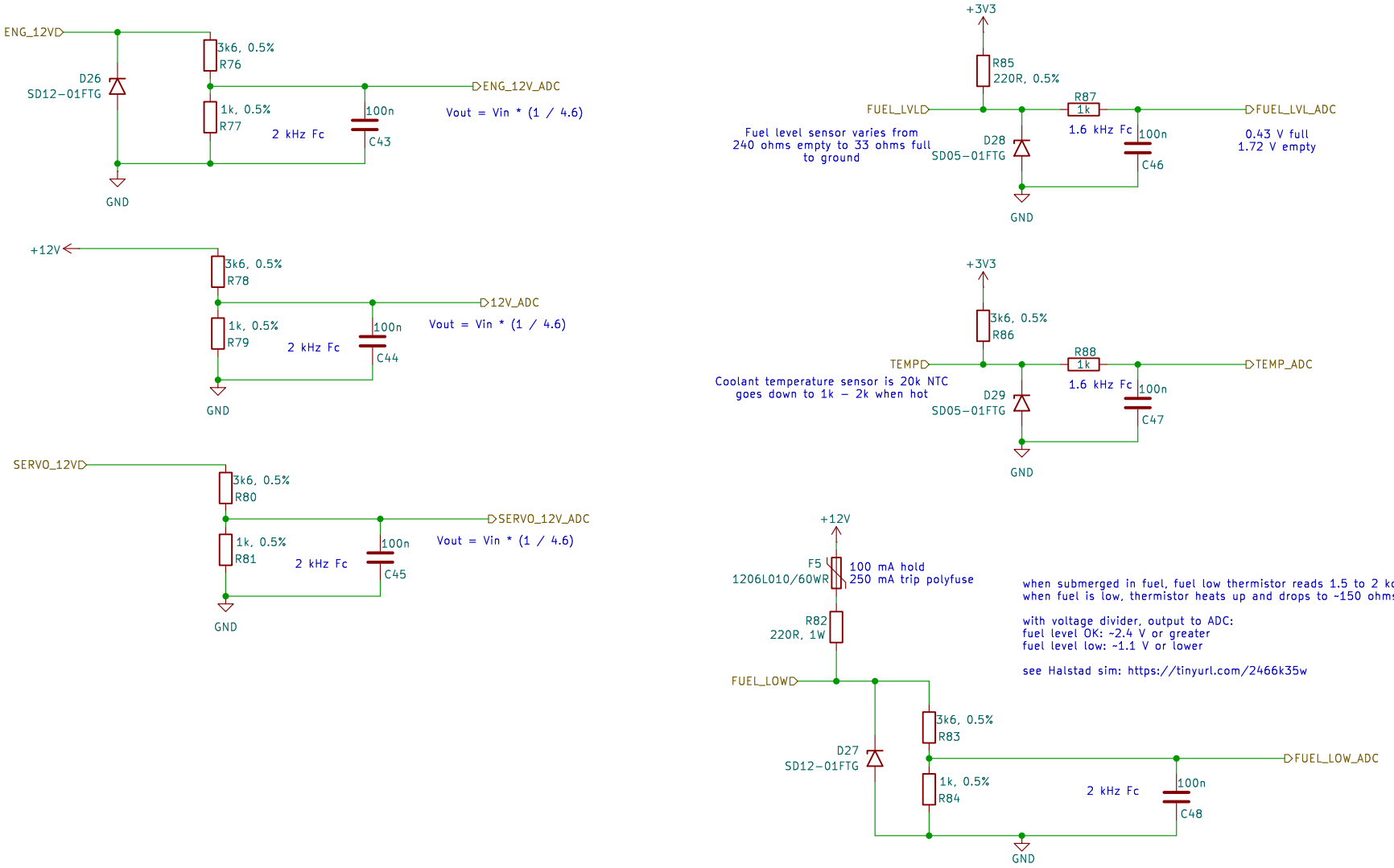
12V high or low side inputs
TVS breakdown at 13.3 V
12.1 mA nominal current trough opto diode



Sheet: /12 to 3.3 V Iso Input 7/
File: iso_12V_input.kicad_sch

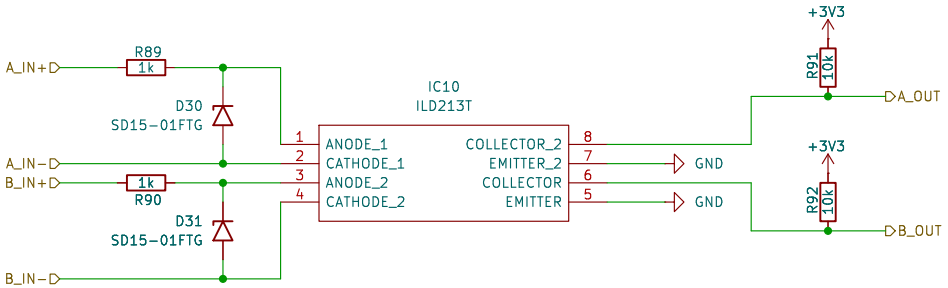
Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 24/26



Sheet: /Analog Inputs/		
File: analog_inputs.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 26/26

12V high or low side inputs
TVS breakdown at 13.3 V
12.1 mA nominal current trough opto diode



Sheet: /12 to 3.3 V Iso Input 2/
File: iso_12V_input.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.3		Id: 27/26