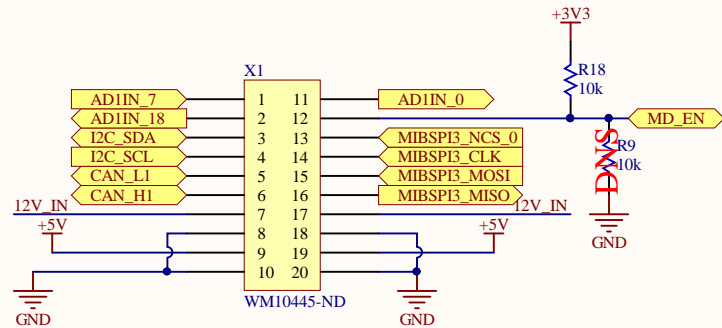
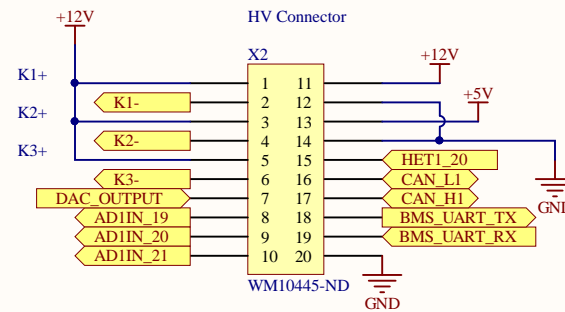


CONNECTORS

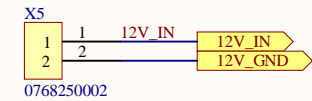
DASHBOARD & FOOT PEDAL CONNECTOR



HIGH VOLTAGE CONNECTOR

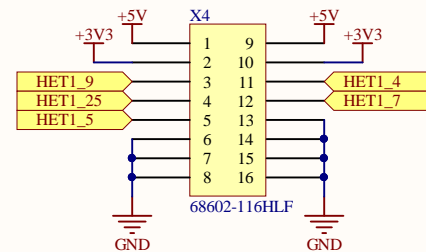


LOW VOLTAGE POWER IN



GPIO PIN MUX : -----			
PORT A :			
(INPUT)	0 :	MD_EN	
(INPUT)	1 :	MD_RUN	
(OUTPUT)	2 :	MTR_EN	
(OUTPUT)	5 :	(Pre_Charge)	
(OUTPUT)	6 :	(High_Voltage)	
(OUTPUT)	7 :	(Ground)	
PORT B :			
(INPUT)	0 :	Limit Switch	
(INPUT)	1 :	S_BMS	
(INPUT)	2 :		
(INPUT)	3 :		
ADC : -----			
ADC 1 Group 1 :			
PIN 0 : Throttle Input from Foot Pedal			
PIN 7 : Voltage Transducer Analog Signal			
PIN 18: Current Transducer Low Signal			
PIN 19: Current Transducer High Signal			
PIN 20:			

SIGNAL BREAKOUT CONNECTOR



DESIGN NOTE:

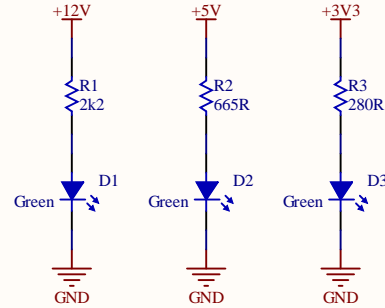
Breaking out rails to power external components (Voltage Transducer, Current Transducer, LCDs, Enable Switches)

Add more analog inputs here

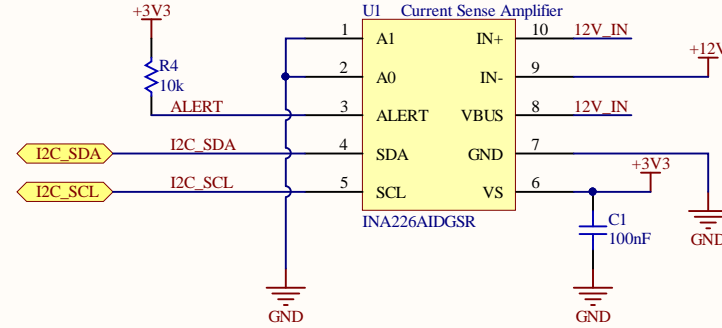
Title		
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Date:	2019-07-25	Sheet of
File:	C:\Users\...\Connectors.SchDoc	Drawn By:

POWER & CURRENT SENSING

POWER GOOD LEDs



LOW VOLTAGE POWER MONITOR

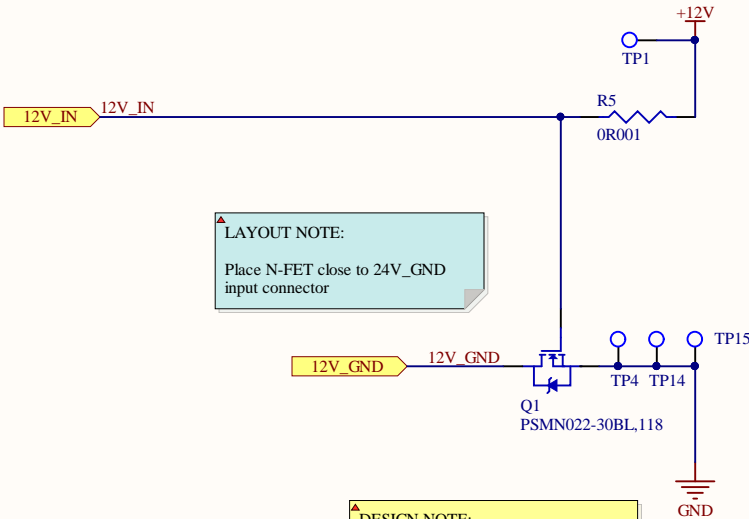


LAYOUT NOTE:

Place sensing wires (IN+, IN-) in a Kelvin connection to the shunt resistor
Route sensing wires as a differential pair

DESIGN NOTE:

Add overvoltage protection on 5V, 3.3, and 1.2

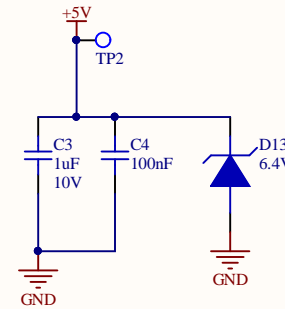


LAYOUT NOTE:

Place N-FET close to 24V_GND input connector

DESIGN NOTE:

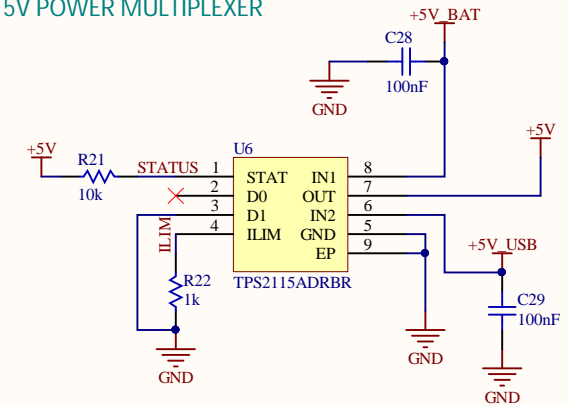
N-FET placed for reverse polarity protection. Will conduct at correct 24V input polarity, will not conduct when polarity reversed.



DESIGN NOTE:

Autoswitching power mux, 5V from the power supply / battery will be automatically prioritized over 5V from USB. When 5V from supply is no longer present, USB power will take over

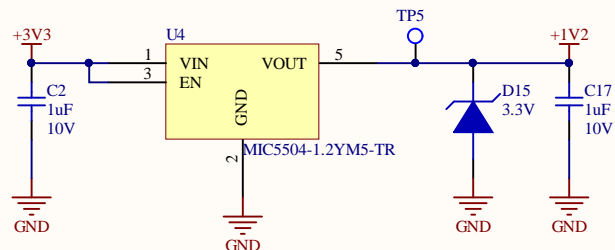
5V POWER MULTIPLEXER



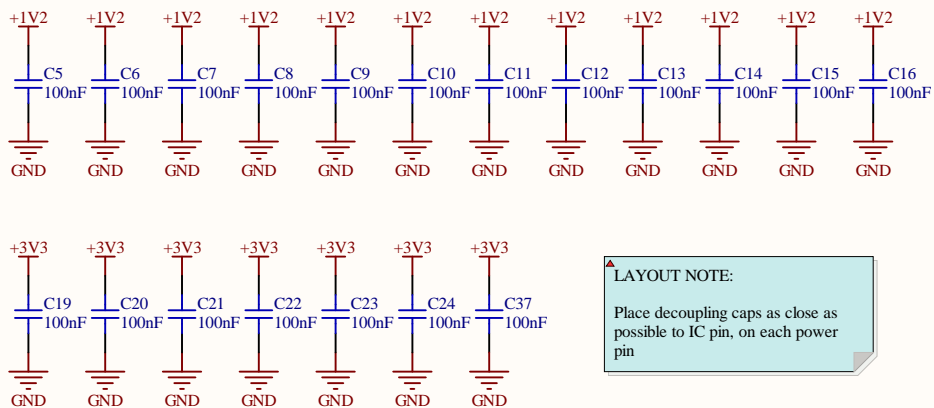
Title		
Size	Number	Revision
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Date:	2019-07-25	Sheet of
File:	C:\Users\...\Power_Sensing.SchDoc	Drawn By:

TMS570 POWER

1V2 LDO: 300mA



DECOUPLING CAPACITORS



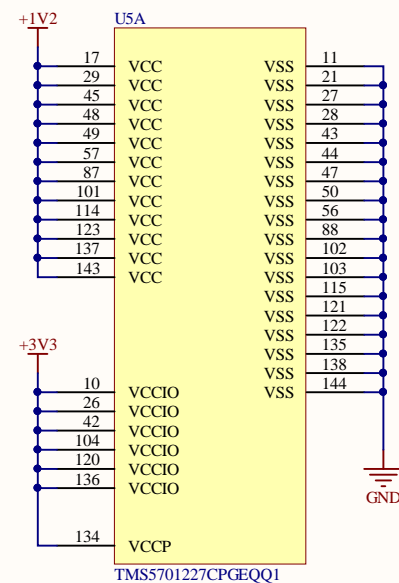
LAYOUT NOTE:

Place decoupling caps as close as possible to IC pin, on each power pin

DESIGN NOTE:

Decoupling capacitors help reduce the transients seen by the MCU on the power input pins

MICROCONTROLLER POWER PINS



Title		
Size	Number	Revision
A4		
Date:	2019-07-25	Sheet of
File:	C:\Users\...\Power_MCU.SchDoc	Drawn By:

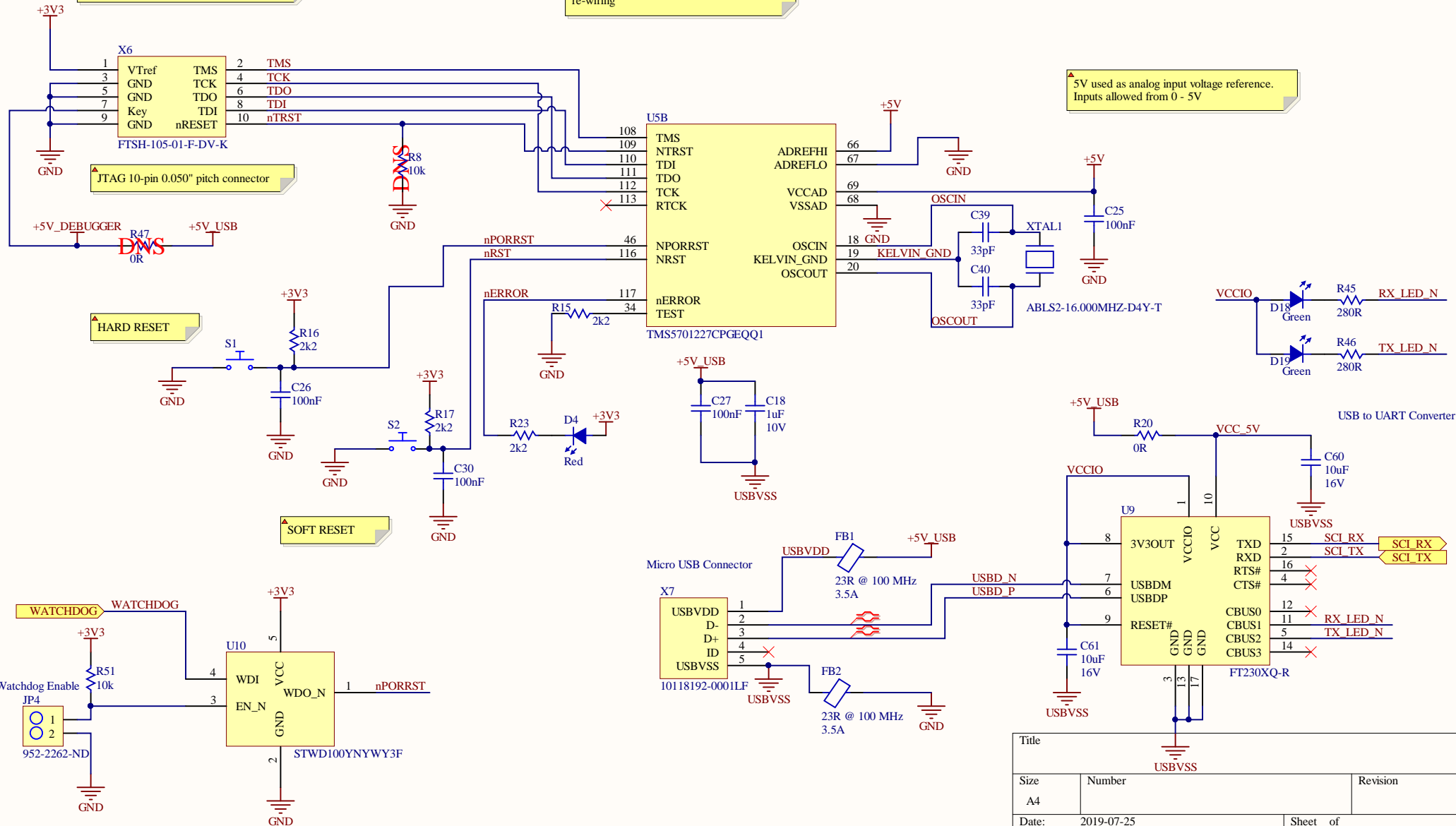
DESIGN NOTE:

JTAG connection allows programming & debugging the MCU, which needs external power to turn on

DESIGN NOTE:

0 ohm resistors and unstuffed resistors allow for pull-ups/downs if needed or re-wiring

5V used as analog input voltage reference. Inputs allowed from 0 - 5V

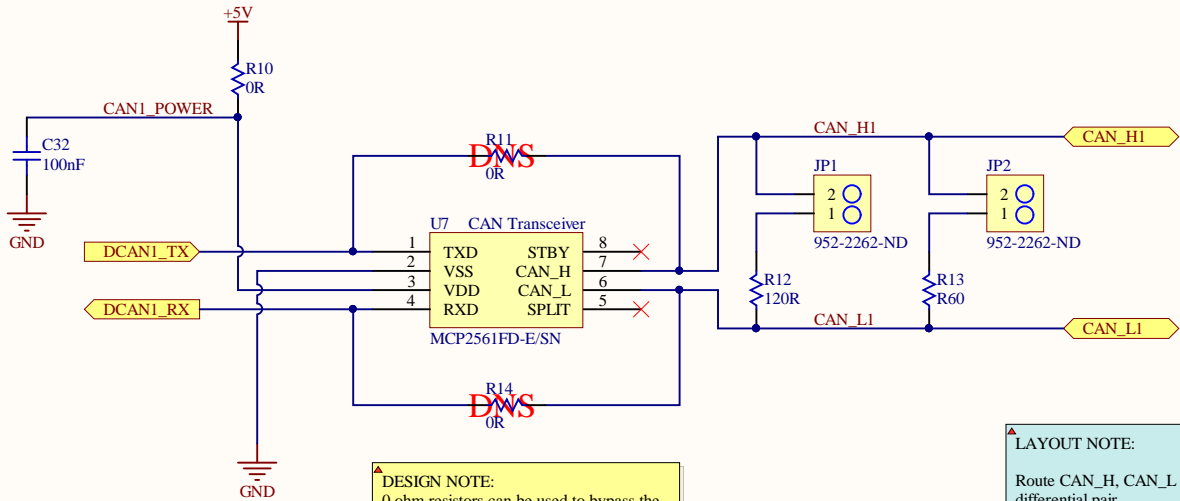


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Date:	2019-07-25	Sheet of
File:	C:\Users\...\MCU_Signals.SchDoc	Drawn By:

CAN TRANSCEIVER

DESIGN NOTE:
0 ohm resistors allow IC's to be unpowered and unused if needed. (i.e. don't need them or they draw too much power)

LAYOUT NOTE:
Place decoupling caps as close as possible to IC pin



DESIGN NOTE:
0 ohm resistors can be used to bypass the CAN transceivers if needed. (i.e. using external CAN transceivers). Depopulated by default

LAYOUT NOTE:
Route CAN_H, CAN_L signals as differential pair

DESIGN NOTE:
0.100" header pins can be used as test points for the CAN signals

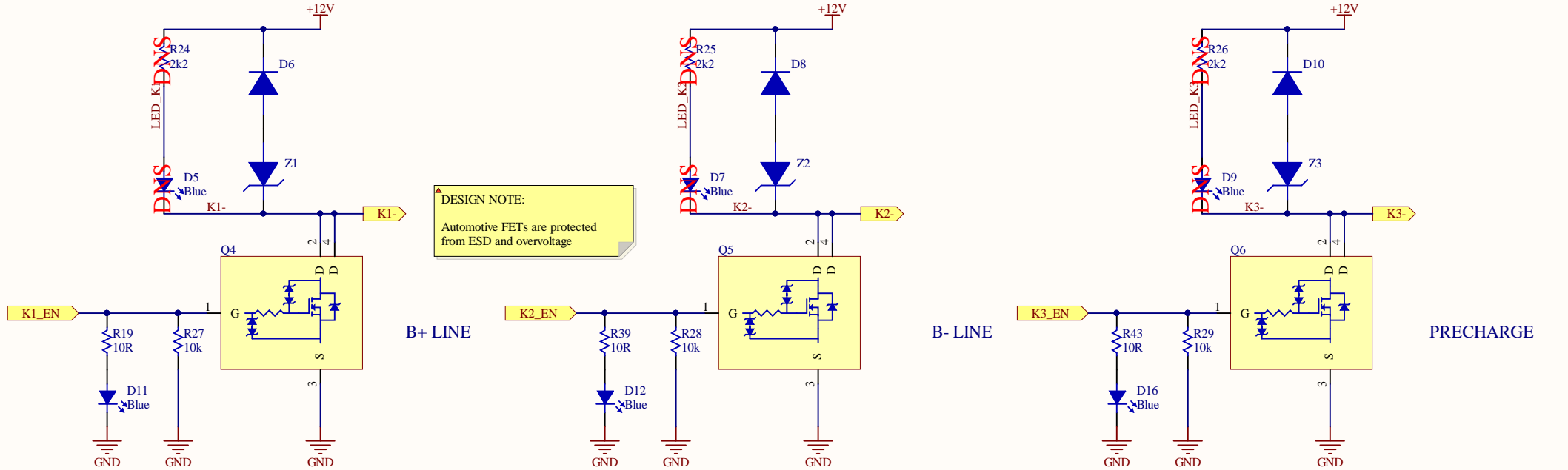
Title		
Size	Number	Revision
A4		
Date:	2019-07-25	Sheet of
File:	C:\Users\...\CAN.SchDoc	Drawn By:

LOW SIDE CONTACTOR SWITCHING

DESIGN NOTE:
Diode-Zener snubber acts as a good way to dissipate inductive voltage kicks when the contactor opens

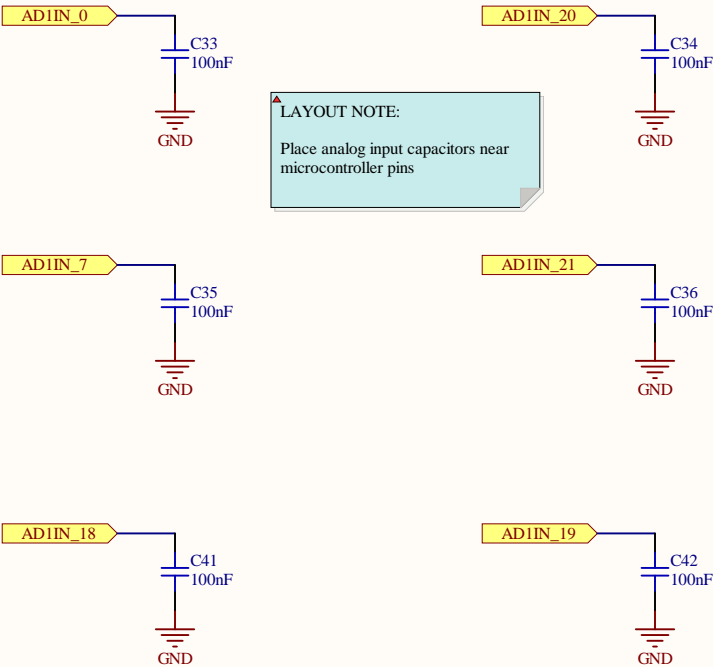
DESIGN NOTE:
These low-side switches go out to the rest of the shutdown circuit. The snubber circuit and LED remain for backwards compatibility with the go kart, where the contactors connect directly to the VCU.

DESIGN NOTE:
Automotive FETs are protected from ESD and overvoltage



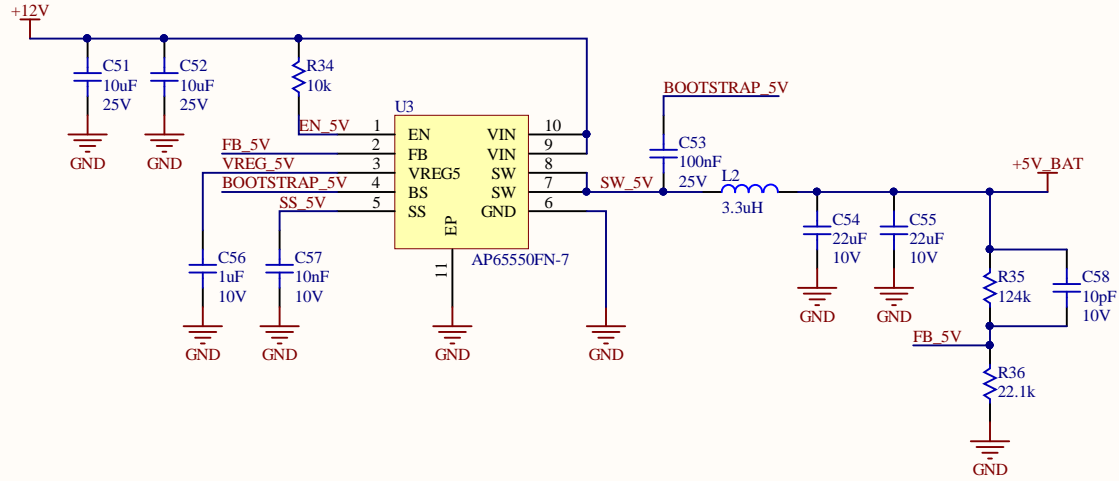
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Date:	2019-07-25	Sheet of
File:	C:\Users\...\Contactor_Switching.SchDoc	Drawn By:

ADC DECOUPLING

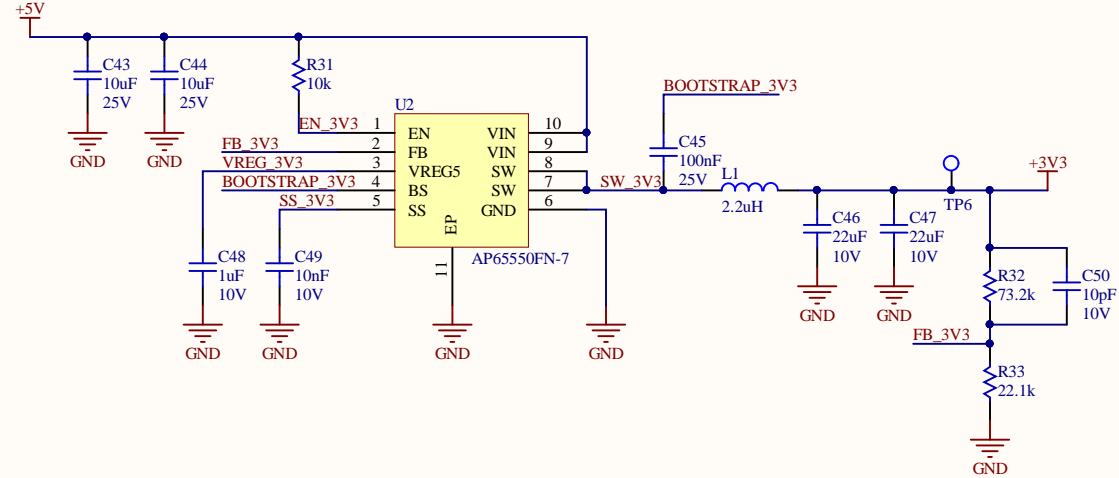


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Date:	2019-07-25	Sheet of
File:	C:\Users\...\ADC_Decoupling.SchDoc	Drawn By:

5V 5A BUCK REGULATOR



3V3 5A BUCK REGULATOR



Title		
Size	Number	Revision
A4		
Date:	2019-07-25	Sheet of
File:	C:\Users\...\BUCK_CONVERTERS.SchDoc Drawn By:	

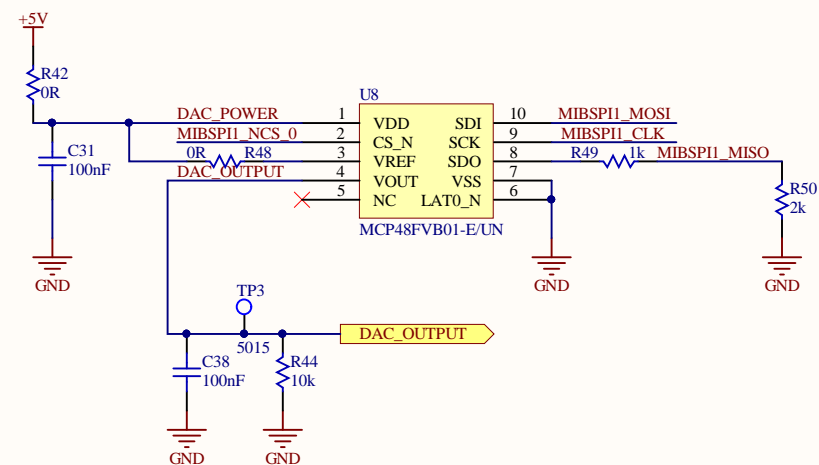
▲ DESIGN NOTE:

0 ohm resistors allow IC's to be unpowered and unused if needed. (i.e. don't need them or they draw too much power)
They also provide a footprint for a resistor, in case an RC filter is needed

▲ LAYOUT NOTE:

Place decoupling caps as close as possible to IC pin

DIGITAL TO ANALOG CONVERTER



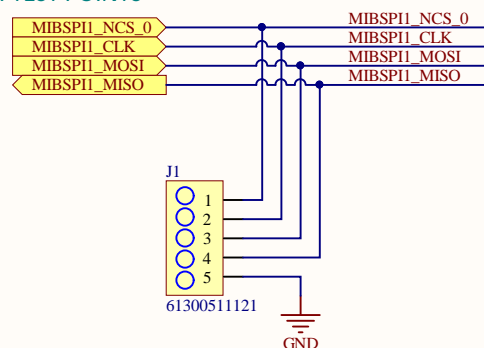
▲ DESIGN NOTE:

Unstuffing the 0 ohm resistors can also allow for current to be measured using a DMM

▲ LAYOUT NOTE:

Place output filter cap near connector

SPI TEST POINTS



Title		
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Date:	2019-07-25	Sheet of
File:	C:\Users\...\DAC.SchDoc	Drawn By:

