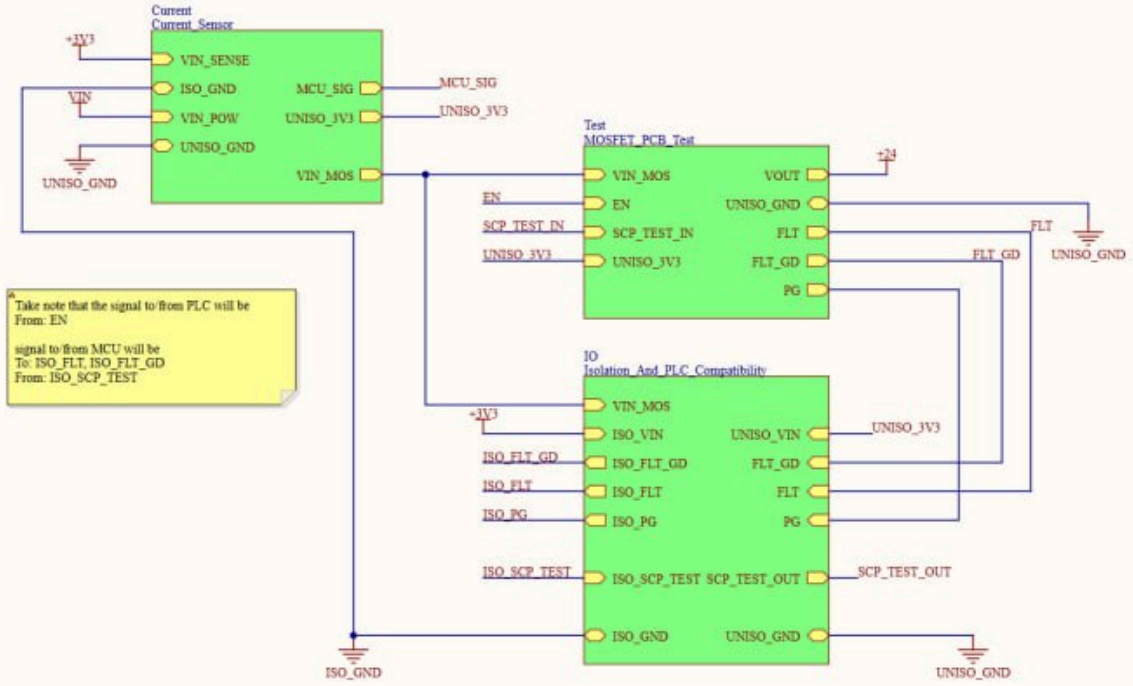
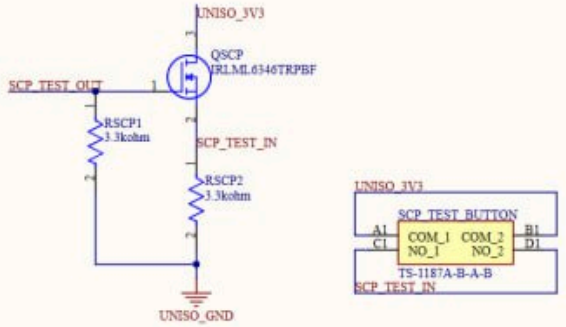
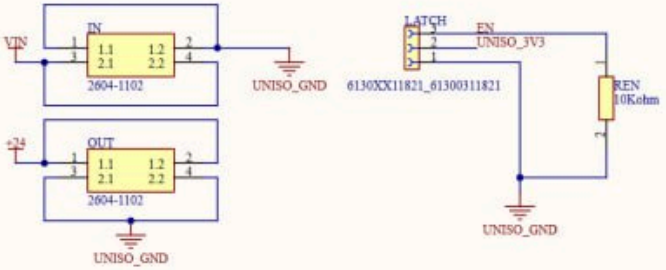
MOSFET CONTROL & MONITORING



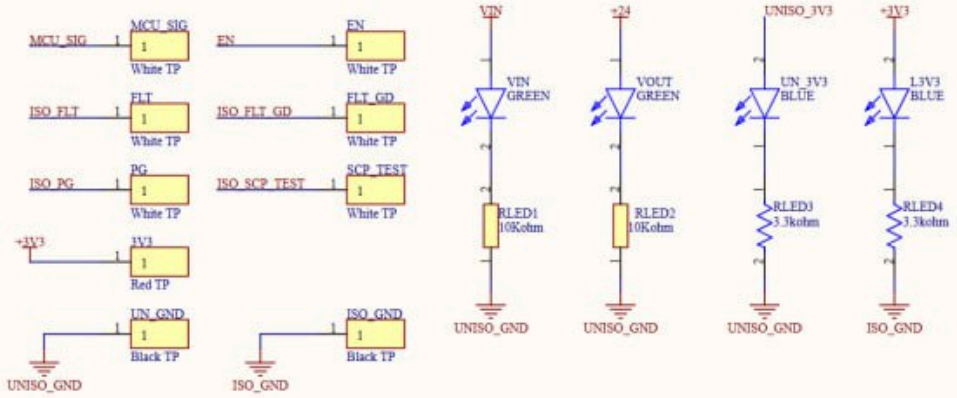
SHORT CIRCUIT TEST



INPUTS



TEST POINT & LEDs



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IO

MOSFET_PCB[1A] — VIN_SENSE — VIN_SENSE

olation_And_PLC_Compatibility[1B] — ISO_GND — ISO_GND

MOSFET_PCB[2A] — UNISO_3V3 — UNISO_3V3

lity[1B], MOSFET_PCB_Test[1A] — UNISO_GND — UNISO_GND

MOSFET_PCB[2A] — MCU_SIG — MCU_SIG

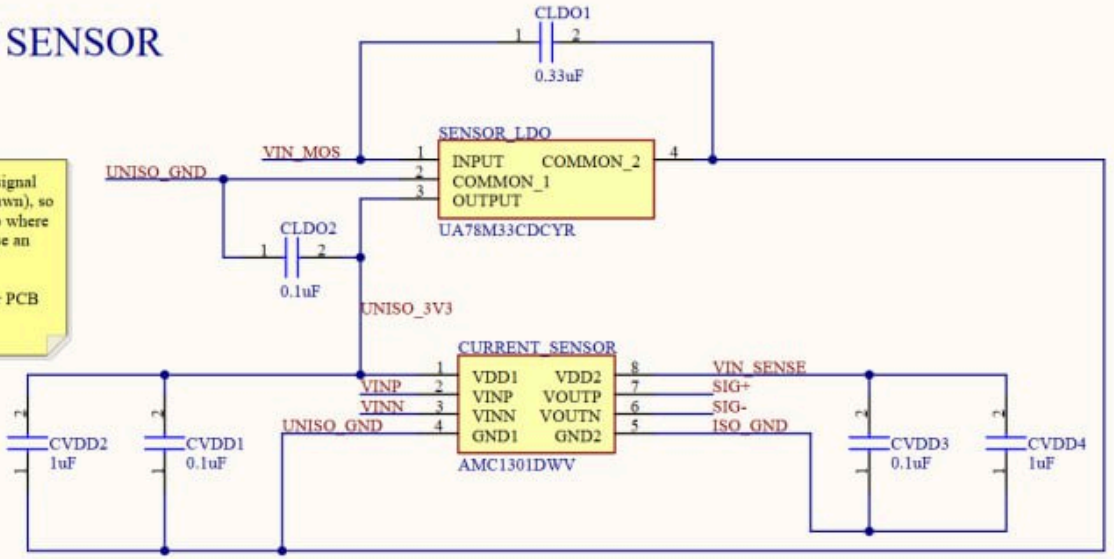
MOSFET_PCB[1A] — VIN_POW — VIN_POW

ibilit[1A], MOSFET_PCB_Test[1A] — VIN_MOS — VIN_MOS

ISOLATED CURRENT SENSOR

Take note that because the lowest output signal will be 2.788mV (with 0.034A current drawn), so we couldn't test this channel with Arduino where the ADC resolution is 4.89mV (need to use an STM with 12bits resolution)

Take note of this when selecting MCU for PCB also



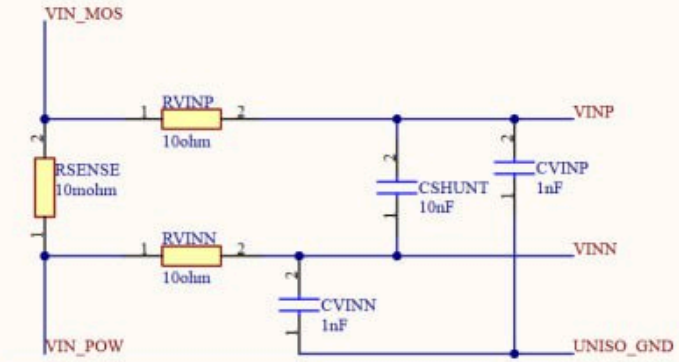
SHUNT

8.2.2.1 Shunt Resistor Sizing

Use Ohm's Law to calculate the voltage drop across the shunt resistor (V_{SHUNT}) for the desired measured current: $V_{SHUNT} = I \times RSHUNT$.

Consider the following two restrictions when selecting the value of the shunt resistor, RSHUNT:

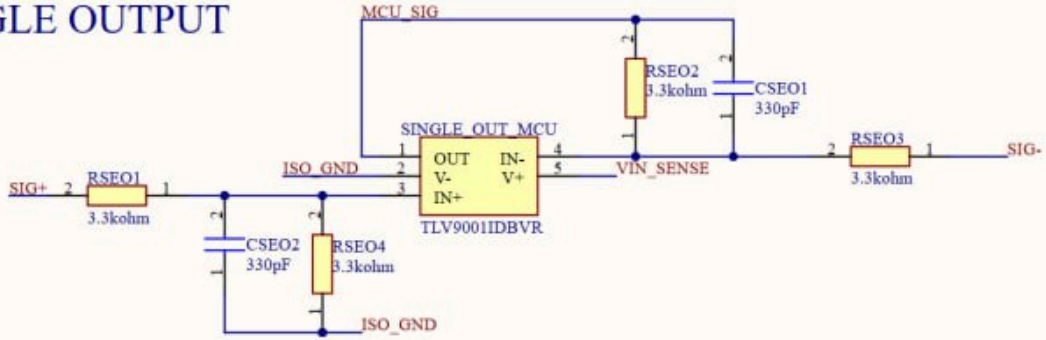
- The voltage drop caused by the nominal current range must not exceed the recommended differential input voltage range for a linear response: $|V_{SHUNT}| \le |V_{FSR}|$
- The voltage drop caused by the maximum allowed overcurrent must not exceed the input voltage that causes a clipping output: $|V_{SHUNT}| \le |V_{Clipping}|$



The final version should spec based on the power consumption chart, now assume highest nominal current is 10A; transient is 20A and overcurrent is 30A

By right this set up should be able to measure the channel with the lowest current drawn (0.034A), but may need to test.

SINGLE OUTPUT



Title		
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File: Current_Sensor.SchDoc		Drawn By:

IO

n_And_PLC_Compatibility[1A] VIN_MOS — VIN_MOS
MOSFET_PCB[3A] EN — INP
n_And_PLC_Compatibility[1B] UNISO_GND — UNISO_GND
_And_PLC_Compatibility[1B] FLT_GD — FLT_GD
n_And_PLC_Compatibility[1B] FLT — FLT
MOSFET_PCB[4A] VOUT — VOUT
MOSFET_PCB[3A] SCP_TEST_IN — SCP_TEST_IN
ion_And_PLC_Compatibility[1B] PG — PG
_PCB[3A], Current_Sensor[1A] UNISO_3V3 — UNISO_3V3

In-Rush limiting

PU — RRUSH1 100Kohm — PD — GATE
RRUSH2 10ohm
CRUSH1 10nF — UNISO_GND

Test the CRUSH value ok or not in real life

PG

UNISO_3V3 — RPG1 330ohm — PG
VIN_MOS — RPG5 100ohm
PG_MON: OUT, GND_1, SENSE, GND_3, VDD, GND_2 — TPS3711DDCR
CPG 10nF — UNISO_GND
VOUT — RPG3 2M — SENSE — RPG4 37K4

MOSFET GATE DRIVER

KILL_MOS
VIN_MOS — D_8, D_7, D_6, D_5, D_4, D_3, D_2, D_1, G, EP — S_1, S_2, S_3, S_4, S_5, S_6, S_7 — VOUT
GATE
IPTC014N10NM5ATMA1

Current sense select input. Connect this pin to ground to activate high side current sense. Drive this pin to >2V to activate low side current sensing.
CS_SEL has an internal weak pull down of 100nA to GND.

KILL
UVLO, OV, INP, FLT_GD, FLT, UNISO_GND, ISCP, TMR, SCP_TEST_IN
EN/UVLO, OV, INP, FLT_GD, FLT, GND, CS_SEL, ISCP, TMR, SCP_TEST
VS, N.C_2, CS+, CS-, PU, PD, SRC, BST, N.C_1
VIN_MOS, VOUT, PU, PD, VOUT, BST
TPS48000QDGXRQ1

BST — CBST 330nF — VOUT
ISCP — RISCP 10Kohm — UNISO_GND

VIN_MOS — R1 470kohm — UVLO — R2 44.2kohm — OV — R3 22.1kohm — UNISO_GND

$$V_{(OVR)} = \frac{R_3}{(R_1 + R_2 + R_3)} \times VIN_{OVP}$$

$$V_{(UVLOR)} = \frac{R_2 + R_3}{(R_1 + R_2 + R_3)} \times VIN_{UVLO}$$

OV is 30V
UV is 10V

VOUT — DOUT SMCJ30A — UNISO_GND
VIN_MOS — DDC SMCJ30CA — UNISO_GND

Here we set the shortcircuit threshold to be 30A first, the actual value can be decided after actual measurements

The caps here is a placeholder for future SC response time setting

Leave TMR floating for fastest short-circuit response time.

$$t_{RETRY} = 22.7 \times 10^6 \times C_{TMR}$$

TMR — CTIMER 3.3nF — RTMR 100Kohm — UNISO_GND
VIN_MOS — CDC1 10uF — UNISO_GND
VIN_MOS — CDC2 1uF — UNISO_GND
VIN_MOS — CDC3 0.1uF — UNISO_GND
VIN_MOS — RDC1 100ohm — VS
VOUT — COUT 0.1uF — UNISO_GND

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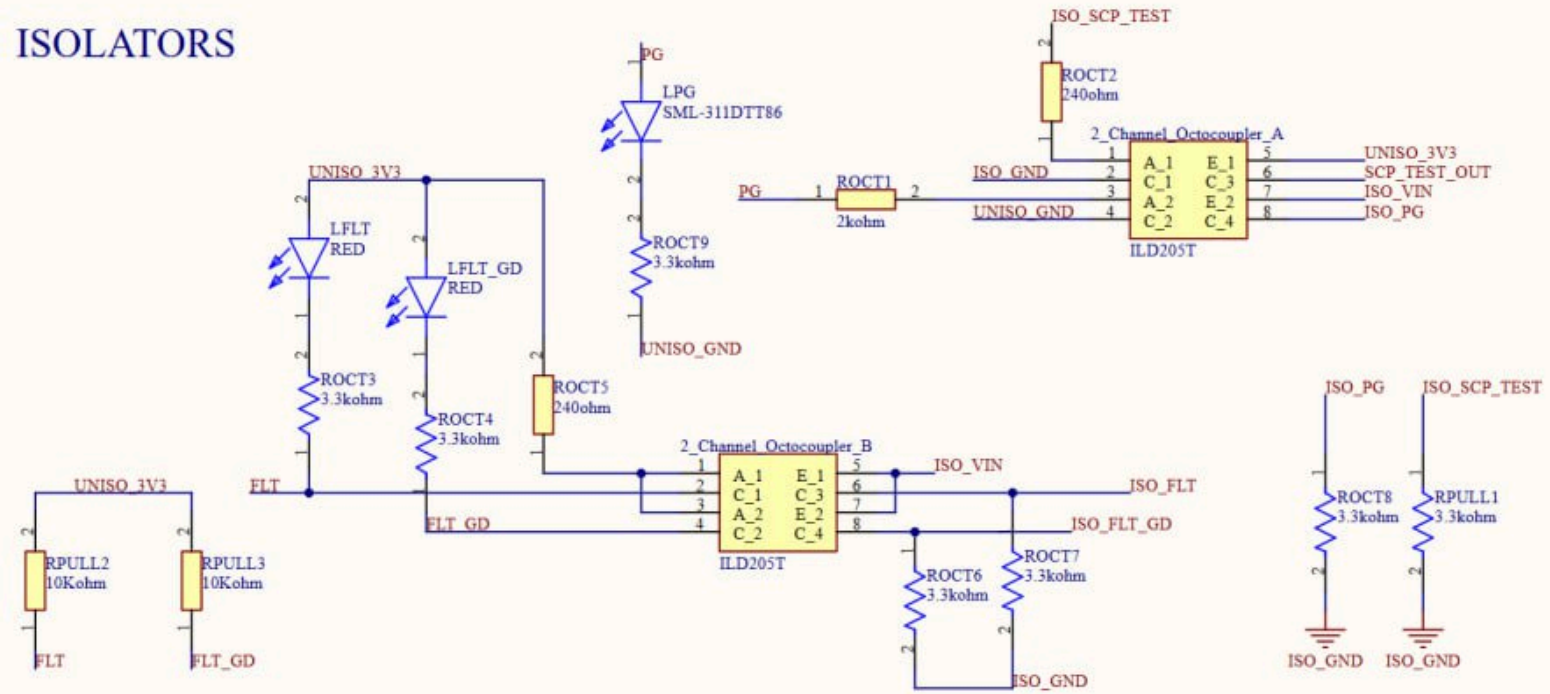
IO

MOSFET_PCB_Test[1A] VIN_MOS — VIN_MOS
MOSFET_PCB[3B] ISO_VIN — ISO_VIN
MOSFET_PCB[3B] ISO_SCP_TEST — ISO_SCP_TEST
MOSFET_PCB[3B] ISO_FLT — ISO_FLT
MOSFET_PCB[3B] ISO_FLT_GD — ISO_FLT_GD
Current_Sensor[1A] ISO_GND — ISO_GND
MOSFET_PCB[3B] ISO_PG — ISO_PG
MOSFET_PCB[4B] SCP_TEST_OUT — SCP_TEST_OUT
MOSFET_PCB_Test[1A] FLT — FLT
MOSFET_PCB_Test[1A] FLT_GD — FLT_GD
MOSFET_PCB_Test[1B] PG — PG
MOSFET_PCB[4B] UNISO_VIN — UNISO_3V3
MOSFET_PCB_Test[1A] UNISO_GND — UNISO_GND

ISOLATORS



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