IDEAS

- Power from Teensy
- Expose current and voltage for measurement by Teensy ADCs
- Program current and maximum voltage from Teensy using I2C DACs

USE CASES

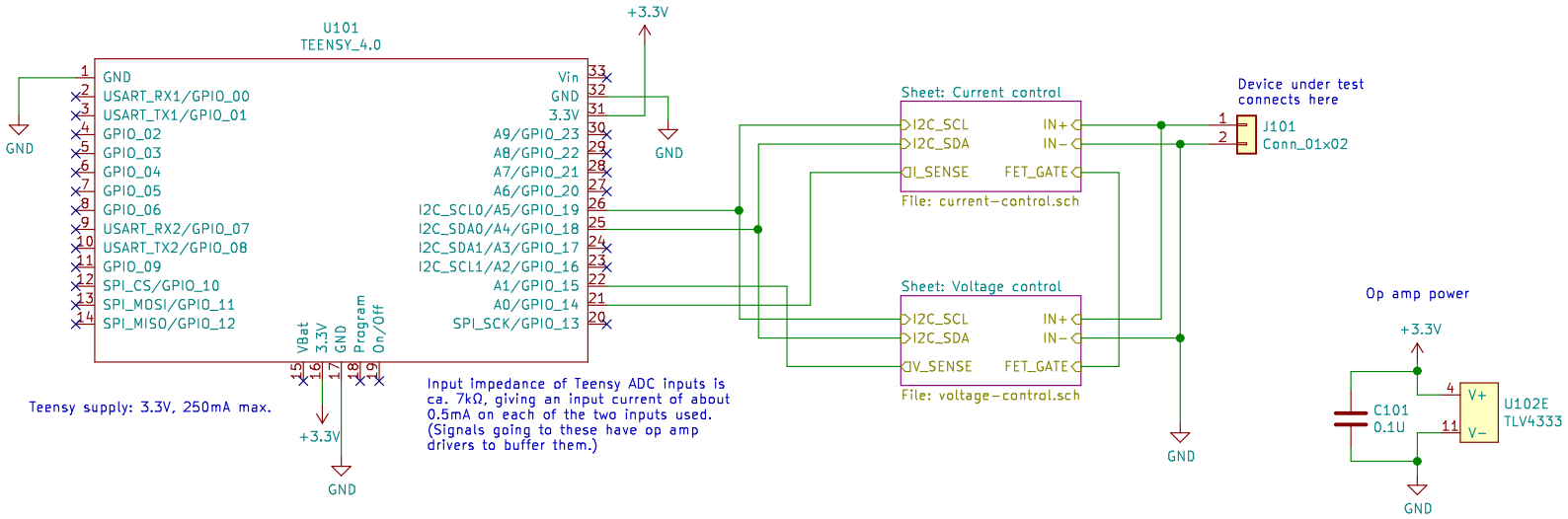
- Single measurements
- Scan programming voltage, record test item voltage and current to give V/I curve
- Fix programming voltage, record current and test item voltage over time

LIMITATIONS

- Current 0 – 10A (full range of current setting DAC)
- Max. voltage 0 – 20V (full range of max. voltage setting DAC)
- Max. power 0 – 20W (limit by firmware)

**QUESTIONS**

- **Is there any good way to calculate power consumption?**
- **Are DACs the best way to set the reference levels? Would a PWM output + LP filter be good enough?**

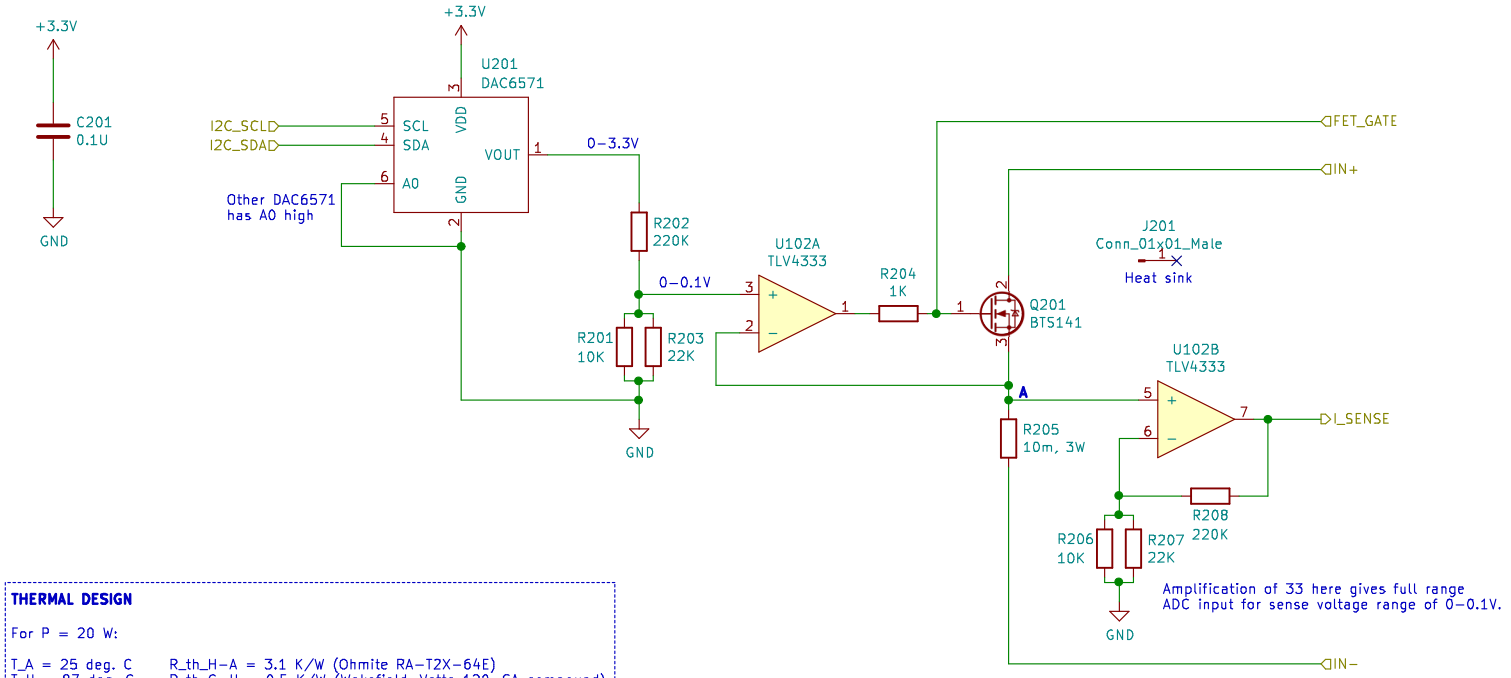



**POWER**

| | | |
|---|---|---|
| DAC output current | 0.2 mA x 2 | 0.4 mA |
| FET gate input current | 0.1 mA | 0.1 mA |
| Op amp input current | 0.03 mA? x 4 | 0.12 mA? |
| ADC drive current | 0.5 mA x 2 | 1 mA |

**TOTAL: < 2 mA**

Is this in any way realistic at all? It's based on nominal values from datasheets, but doesn't account for switching, dissipation in passives, or anything else!




**THERMAL DESIGN**

For P = 20 W:

T_A = 25 deg. C  R_th_H–A = 3.1 K/W (Ohmite RA–T2X–64E)
T_H = 87 deg. C  R_th_C–H = 0.5 K/W (Wakefield–Vette 120–SA compound)
T_C = 97 deg. C  R_th_J–C = 0.84 K/W (BTS141)
T_J = 113.8 deg. C

BTS141 max. junction temperature = 150 deg. C
BTS141 max. power dissipation = 149 W

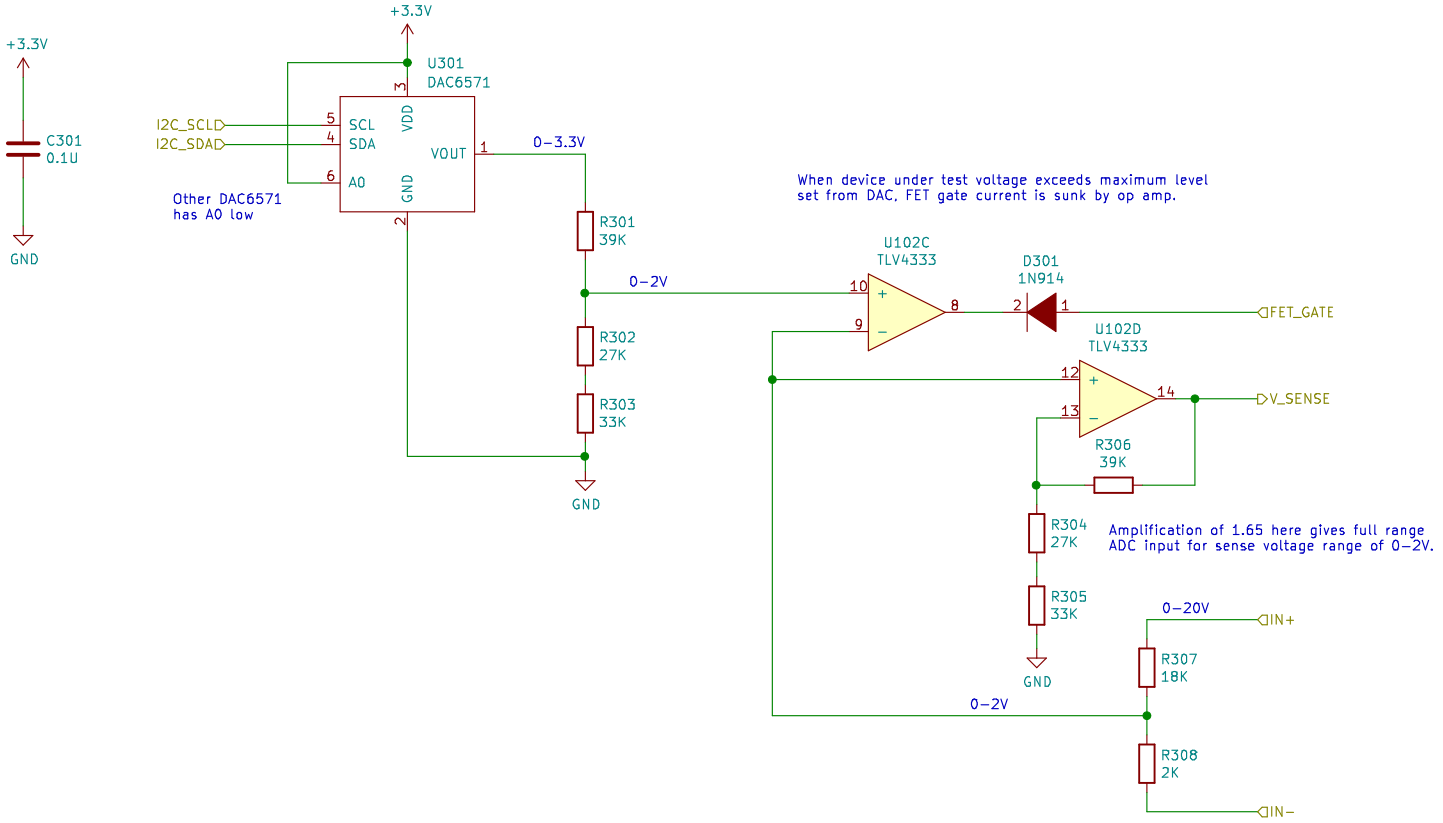
**Firmware should limit joint programmed current and maximum voltage settings to give P <= 20W.**

0.01Ω sense resistor => 1A current / 10mV of programming voltage

So max. programming voltage of 0.1V =>max. current 10A

BTS141 max. I_D = 25 A

I = 10A, R = 0.01Ω => Power = I^2 R = 1W
Use 3W sense resistor to give margin


+3.3V
C301
0.1U
GND
+3.3V
U301
DAC6571
I2C_SCL
I2C_SDA
5
4
6
SCL
SDA
A0
VDD
GND
VOUT
3
2
1
Other DAC6571
has A0 low
0-3.3V
R301
39K
0-2V
R302
27K
R303
33K
GND
When device under test voltage exceeds maximum level
set from DAC, FET gate current is sunk by op amp.
U102C
TLV4333
10
9
8
D301
1N914
2
1
FET_GATE
U102D
TLV4333
12
13
14
V_SENSE
R306
39K
R304
27K
R305
33K
GND
Amplification of 1.65 here gives full range
ADC input for sense voltage range of 0-2V.
0-20V
IN+
R307
18K
0-2V
R308
2K
IN-