Analog front-end

Unipolar DAC output is fed to a power op-amp & shifted to bipolar to drive DUT. Voltage drop through a shunt resistor is measured with a chopper-stabilised instrumentation amplifier to sense current.

Config A:
R41 is shorted out. Current is only measured through R40 by the PGA281. Current limiting is sensed (LT1970 SENSE− pin) at the top and bottom of R40, which must be replaced with a 10 Ohm value.

Config B:
Current limiting is sensed over the 10 Ohm R41 shunt whilst the PGA281 senses over the 50 Ohm R40. This allows a 40mA current limit with a 5x increase in current resolution compared to config A. The disadvantage is that the power amplifier must supply higher voltages to overcome the drop across the higher value R40 resistor

Notes

Configuration	A	B
JP1	Short	Open
JP2	Open	Short
JP3	Short	Open
R41	Removed	10 Ohm
R40	10 Ohm	50 Ohm

Decoupling for LT1970

Decoupling for PGA281

Decoupling for opamps

Config jumpers See notes

U11 DAC8571IDGKR

U10A LT1970

U10B LT1970

U14 PGA281

U1 ADS1115IDGS

U2 GS8331

U7 GS8331

U9 GS8331

U4 TS321

U8 MCP1501T-40E_CHY +4.096V bandgap reference

J3 DUT

DAC Out TP2

TP1 2V048 Buf

TP3 4V096

Amp Out AmpOut1

Microcontroller

STM32F072CBU6

- 48 MHz Coretex M0 core
- 16 KB SRAM
- 128 KB flash
- 12-bit DAC
- Crystal-less USB FS 2.0

U3 STM32F072C8Ux

J1 SWD

D1 Status LED

USB connector

USB-C connector configured as a USB 2.0 device

J2 USB_C_Receptacle_USB2.0

USB ESD protection

Electrostatic discharge protection for USB data lines

U5 USBLC6-2SC6

±9.7 V regulator

Take a USB input voltage and split it to +9.7 V and −9.7 V for the output amplifier

Q1 AO3401A

D6 B5819W

U12 TPS65131RGET

D5 B5819W

Disable power-saving mode for better output ripple characteristics

LDO regulators

+3.3V for microcontroller

+4.5V for ADC & DAC. Can be bypassed to run converters directly from USB 5V, but may suffer from noisy power supplies

U6 ME6212C33M5G

U13 H7650-45PR

Mounting holes

MountingHole H4
MountingHole H3
MountingHole H2
MountingHole H1

Joel Troughton

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