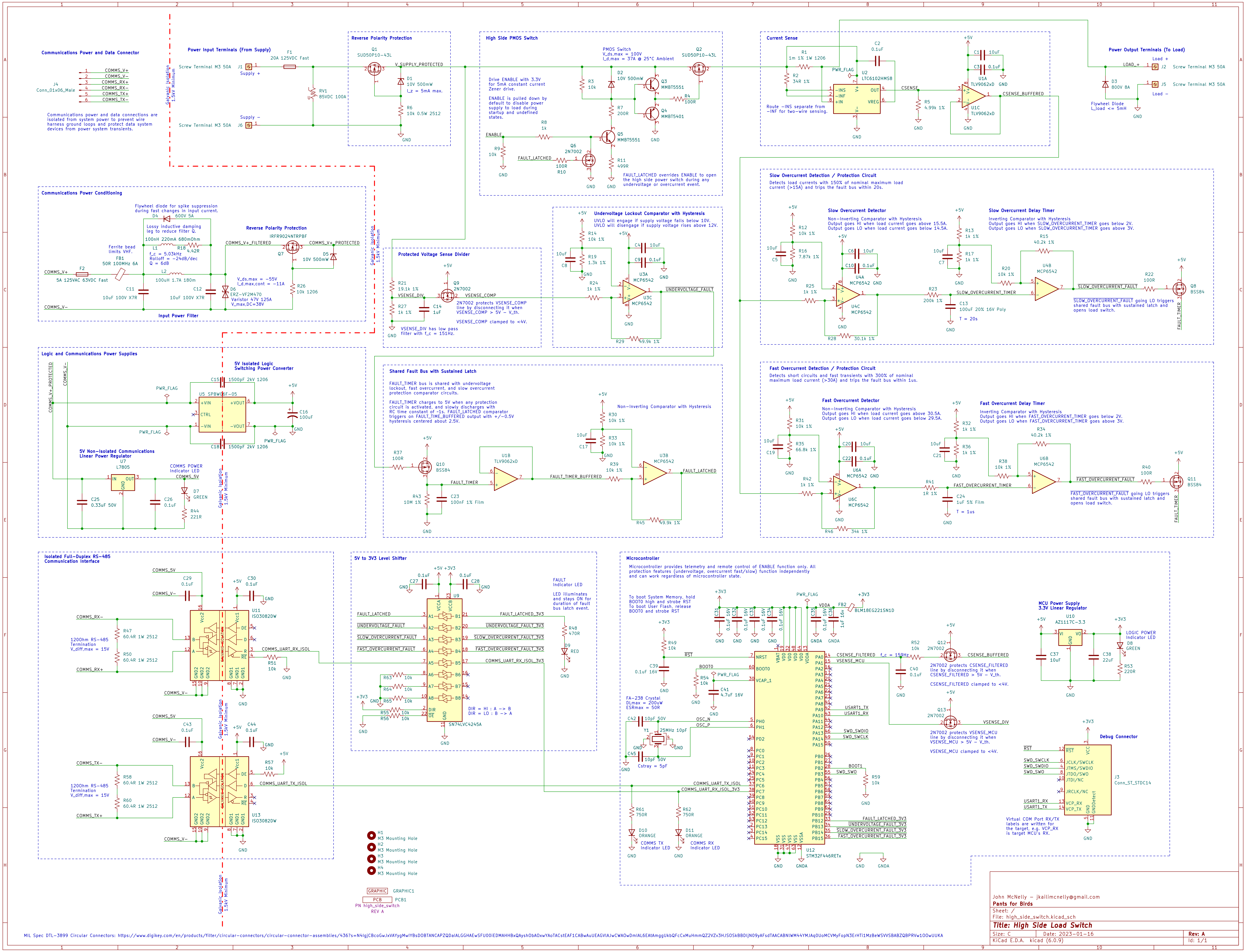

Communications power and data connections are isolated from system power to prevent wire harness ground loops and protect data system devices from power system transients.

Flywheel diode for spike suppression during fast changes in input current.

Lossy inductive damping leg to reduce filter Q.

Ferrite bead limits VHF.

Drive ENABLE with 3.3V for 5mA constant current Zener drive.

ENABLE is pulled down by default to disable power supply to load during startup and undefined states.

FAULT_LATCHED overrides ENABLE to open the high side power switch during any undervoltage or overcurrent event.

Route −INS separate from −INF for two−wire sensing.

UVLO will engage if supply voltage falls below 10V.
UVLO will disengage if supply voltage rises above 12V.

2N7002 protects VSENSE_COMP line by disconnecting it when VSENSE_COMP > 5V − V_th.

VSENSE_COMP clamped to <4V.

VSENSE_DIV has low pass filter with f_c = 151Hz.

Detects load currents with 150% of nominal maximum load current (>15A) and trips the fault bus within 20s.

Non−Inverting Comparator with Hysteresis
Output goes HI when load current goes above 15.5A.
Output goes LO when load current goes below 14.5A.

Inverting Comparator with Hysteresis
Output goes HI when SLOW_OVERCURRENT_TIMER goes below 2V.
Output goes LO when SLOW_OVERCURRENT_TIMER goes above 3V.

SLOW_OVERCURRENT_FAULT going LO triggers shared fault bus with sustained latch and opens load switch.

FAULT_TIMER bus is shared with undervoltage lockout, fast overcurrent, and slow overcurrent protection comparator circuits.

FAULT_TIMER charges to 5V when any protection circuit is activated, and slowly discharges with RC time constant of ~1s. FAULT_LATCHED comparator triggers on FAULT_TIME_BUFFERED output with +/−0.5V hysteresis centered about 2.5V.

Detects short circuits and fast transients with 300% of nominal maximum load current (>30A) and trips the fault bus within 1us.

Non−Inverting Comparator with Hysteresis
Output goes HI when load current goes above 30.5A.
Output goes LO when load current goes below 29.5A.

Inverting Comparator with Hysteresis
Output goes HI when FAST_OVERCURRENT_TIMER goes below 2V.
Output goes LO when FAST_OVERCURRENT_TIMER goes above 3V.

FAST_OVERCURRENT_FAULT going LO triggers shared fault bus with sustained latch and opens load switch.

FAULT Indicator LED

LED illuminates and stays ON for duration of fault bus latch event.

Microcontroller provides telemetry and remote control of ENABLE function only. All protection features (undervoltage, overcurrent fast/slow) function independently and can work regardless of microcontroller state.

To boot System Memory, hold BOOT0 high and strobe RST
To boot User Flash, release BOOT0 and strobe RST

2N7002 protects CSENSE_FILTERED line by disconnecting it when CSENSE_FILTERED > 5V − V_th.

CSENSE_FILTERED clamped to <4V.

2N7002 protects VSENSE_MCU line by disconnecting it when VSENSE_MCU > 5V − V_th.

VSENSE_MCU clamped to <4V.

Virtual COM Port RX/TX labels are written for the target, e.g. VCP_RX is target MCU's RX.

MIL Spec DTL−3899 Circular Connectors: https://www.digikey.com/en/products/filter/circular−connectors/circular−connector−assemblies/436?s=N4IgjCBcoGwJxVAYygMwIYBsDOBTANCAPZQDaIALGGHAEwSFU00iEDMAHHBxQAyshObAOxwYAoTACstEAF1CABwAuUEAGVlAJwCWAOwDmIAL6EAtAmggUkbQFcCxMuHmmQZ2VZv3HJSOSkBBDljN09yAFsdTAACABNlWM44YMJAq0UoMCVMyFopN3ErHTi1MzBeWSVVSBABZQBPRVw1OOwUUKA

John McNelly − jkailimcnelly@gmail.com
Pants for Birds
Sheet: /
File: high_side_switch.kicad_sch
Title: High Side Load Switch
Size: C
Date: 2023−01−16
Rev: A
KiCad E.D.A. kicad (6.0.9)
Id: 1/1