DC-DC Booster
Takes the VCC line, and increases the voltage to +32.5V.
This HV line is used to provide the reverse bias to the SiPM. The SiPM sees 30V difference, as virtual ground is 2.5V

R4 100   28.75V   HV
C4 1u   C10 1u
D1 BAT54J
U2 MAX5026EUT_T
L1   47uH
R1 220K
R2 10K 1%
SHDN   VCC   5
FB   LX   6
PGND   1
GND   2
C7 4.7uF
GND   5V

+3v3
Takes the battery line and regulates the voltage to 3.3v for the logic electronics

VBAT_Local   VBUS_RAW
BAT54C D2
U4 TLV70433DBVT
C16 1uF   GND
100nF C14
IN   OUT   3   3.3V_Dig
NC
NC
GND   GND
GND

+5V
This creates the 5V supply that we use for the reference for the TIA

10uF   GND   10uF   GND
C21   U8 LT3045xDD   C25
VBAT_Local   IN   OUT   5V
GND   EN/UV   OUTS
ILIM   PGFB
4.7uF   SET   PG
C20   R11 50kΩ   GND

Virtual Ground Reference
Takes the 5V line and creates a 2.5V reference
to detect dips when current pulses hit opp amp, using a shunt regulator

5V
U12 LM4040AIM3-2.5/NOPB
2.49KΩ 0.1% R16
GND   ANODE
NC
CATHODE
2.5V_Ref

Readout
Amplifies, detects and registers the current pulse from the SiPM

need to make sure that the biasing makes sense
given that we are raising to a 2.5v virtual ground

Rg1 100Ω   2.5V_Ref
RF1 1kΩ
R3 50Ω 0.1%   2.5V_Ref
C1 100nF   HV
C2 10nF
C3 10pF
50v rated
U3 MICROFC-60035-SMT-TR1
GND   TIA
should the be 2.5v?

NONINVERTINGINPUT   3
INVERTINGINPUT   4
VS+   5V
will you stretch the pulse?
yes!
Radiation Detection and Measurement by Glenn F. Knoll
Chapter 16
U6 OPA656NB/250
VS-   2
OUTPUT   1
C5 100nF   GND
C6 4.7uF

GND   DAC_out   GND
U10 TLV3603QDCKRQ1
100nF C18
IN-   LE/HYS
IN+   VEE
VCC   OUT
3.3V_Dig
100nF R9
5V
100nF C19   10uF C22
GND
Comparator

GND
100nF C26   4.7uF C27
U11 SN74LVC1G74DCUT
VCC
3.3V_Dig   D   Q   5   Latch_Out
CLK   Q_N   3
Latch_Rst   CLR_N   GND   4   GND
PRE_N
R1? 1KΩ
3.3V_Dig
D-Flip Flop

DAC
Sets a stable voltage reference for the comparator

10uF   100nF
C28   C29   5V
SPI_CS_DAC
SPI_SCK
SPI_MOSI
U13 MCP4921-E/SN
VDD   VOUTA   8   DAC_out
AVSS   7   GND
*CS   VREFA   6   5V
SCK   *LDAC   5
SDI
check these again
what to vrefa?

Logging
STM32 mcu, nand flash, can transciever, together operate the sensor, catch the pulses and log the data

U1A STM32F042F6P6
Mode_sel   6   PA0
Latch_Rst   7   PA1
Latch_Out   8   PA2
SPI_CS_FLASH   9   PA3
SPI_CS_DAC   10   PA4
SPI_SCK   11   PA5
SPI_MISO   12   PA6
SPI_MOSI   13   PA7
PA11   17   PA9/PA11
PA12   18   PA10/PA12
SWDIO   19   PA13
SWCLK   20   PA14
PB1   14   SPI_CS_BMP
PB8-BOOT0   1   BOOT0
PF0-OSC_IN   2   R6 10K   GND
PF1-OSC_OUT   3
NRST   4   R5 10K   3.3V_Dig
C13 100nF   GND

U1B STM32F042F6P6
GND   15   VSS
VDD   16   3.3V_Dig
VDDA   5   C11 100nF   GND
FB1
C12 4.7uF
C8 100nF   GND
C9 4.7uF
STM32
do we add more filtering to the vdda pins input?

3.3V_Dig   C17 100nF   GND
SPI_CS_FLASH   CS   VCC
SPI_SCK   CLK
SPI_MISO   DI/IO0
SPI_MOSI   DO/IO1
WP/IO2
3.3V_Dig   HOLD/RESET/IO3
U5 W25Q128JVS
GND
Flash

4.7uF C23   3.3V_Dig
100nF C24
GND
U9 sn65hvd230
CAN_tx   D   VCC
CAN_rx   R   CANH   CAN_+
Vref   CANL
Rs
120Ω R14   CAN_-
10K R10
do we need a termination resistor at each and every transciever on the line?
no, we only need the termination resistors at either end of the stack
GND   GND
CAN Transceiver

D3 NUP2105L

Connectors
read it again

J5 ESQ-110-X-X-D
01   01   02   02   GND
05   03   04   06
07   05   06   08
09   07   08   10
11   09   10   12
13   11   12   14
15   13   14   16
17   15   16   18
19   17   18   20
GND   19   20   GND
5v_servo not needed
5v_logic not needed
CAN_lo   CAN_hi
interboard connector

VBAT_Local   1
GND   2
3   J4 2060-1452/998-404
4
Wago for battery

J1 USB_C_Receptacle_USB2.0_16P
VBUS   A4   VBUS_RAW
CC1   A5   R7 5.1K   GND
CC2   B5   R8 5.1K   GND
D-   A7
D-   B7
D+   A6
D+   B6
USBLC6-2SC6 U7
USB_D-
USB_D+
VBUS_RAW
SHIELD
SBU1   A8
SBU2   B8
S1   A1   GND
USB-C & mode select

Mode_sel
VBUS_RAW   10K R12   10K R13
GND

J2 Conn_02x03_Odd_Even
CAN_rx-   1   2   CAN_tx+
PA11-   3   4   PA12+
USB_D-   5   6   USB_D+

U14 BMP390
3.3V_Dig   100nF C30
SPI_SCK   VDDIO   VDD   100nF C15
SCK   VSS   3.3V_Dig
SPI_MOSI   VSS   SDI   VSS   GND
SPI_MISO   SDO   INT
CSB   SPI_CS_BMP
BMP390

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