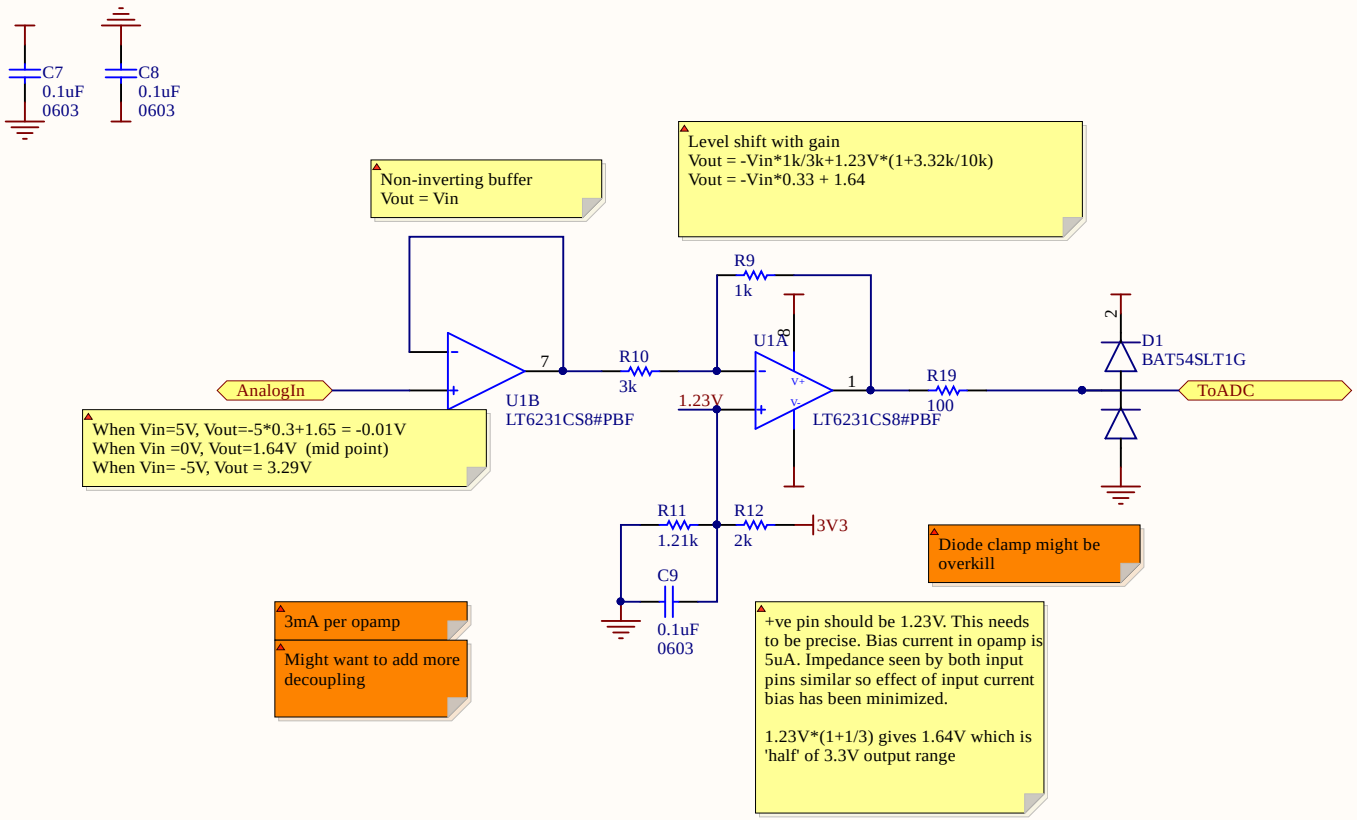


Title		
Size: A4	Number	Revision
Date: 2019-02-12	Sheet of	
File: C:\AltiumProjects\..\LevelShiftADC.SchDoc	Drawn By:	

MCP662-S 32V/us , 60Mhz GBP, 6mA supply, 6pA bias, 1.8mV offset
(Oh, not unity stable)

LM6132 original through hole part
TSH82 was interesting but high input current
LT1801 interesting $3.30 at 100

LT6231IS8 - We have a big real in the lab - lets use it

C1
0.1uF
0603

C2
0.1uF
0603

Might want to add more decoupling

Level shift with gain
Vout = -Vin*3k/1k+1.24V*(1+3k/1k)
Vout = -Vin*3 + 4.96

DAC can drive 1mA
DAC Datasheet recommends 47pF Load
No Non-inverting buffer needed

R1
3k

U2B

FromDAC1

R2
1k

C3
47pF
0603

VrefA

7

AnalogOut1

LT6231CS8#PBF

R3
1.21k

R4
2k

3V3

C4
0.1uF
0603

VrefA/B nets (+ve input pins) should be 1.24V. This needs to be precise. Bias current in opamp is 5uA. Impedance seen by both input pins similar so effect of input current bias has been minimized.

1.24V*(1+3/1) gives 4.96V which is 'half' of 10V output range

When Vin=3.3V, Vout=-3.3*3k/1k + 4.96 = -4.94
When Vin =1.65V, Vout=-1.65*3k/1k+ 4.96 =0.01V (mid point)
When Vin= 0, Vout = 4.96V

R5
3k

U2A

FromDAC0

R6
1k

C5
47pF
0603

1

AnalogOut0

LT6231CS8#PBF

3.3mA per opamp

VrefB

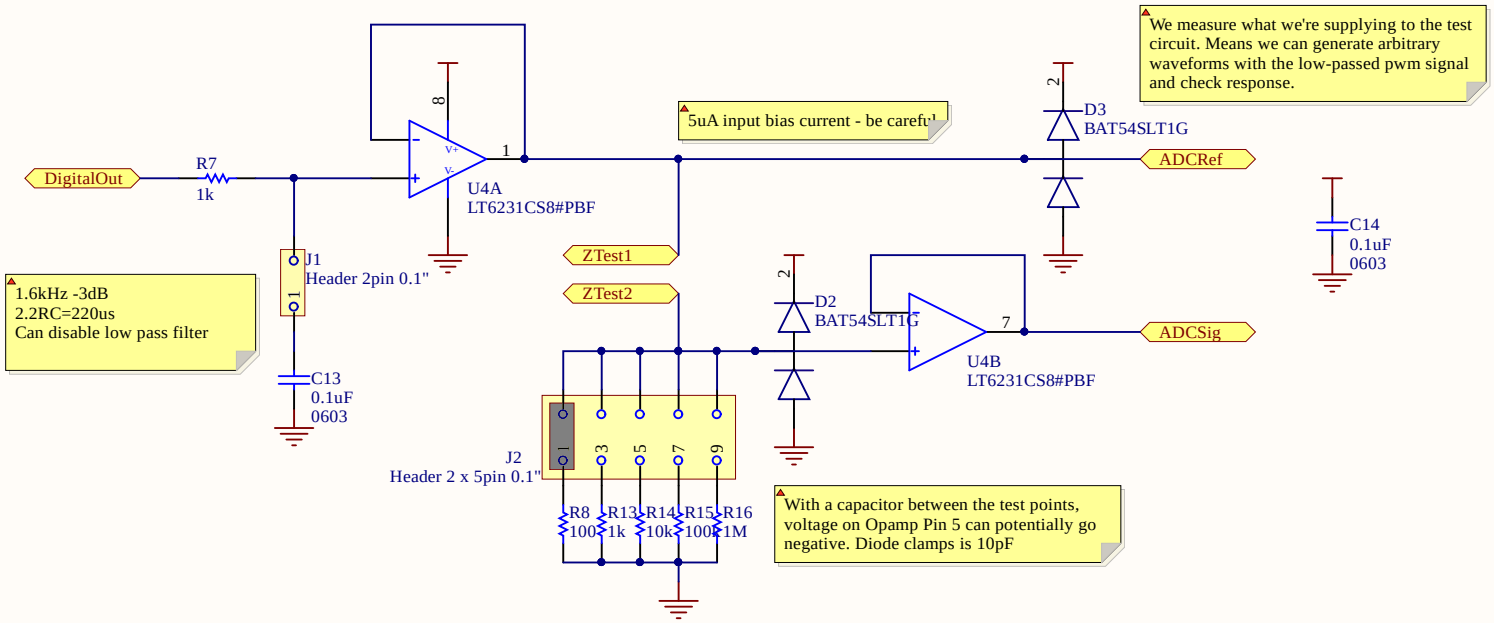
R17
1.21k

R18
2k

3V3

C15
0.1uF
0603

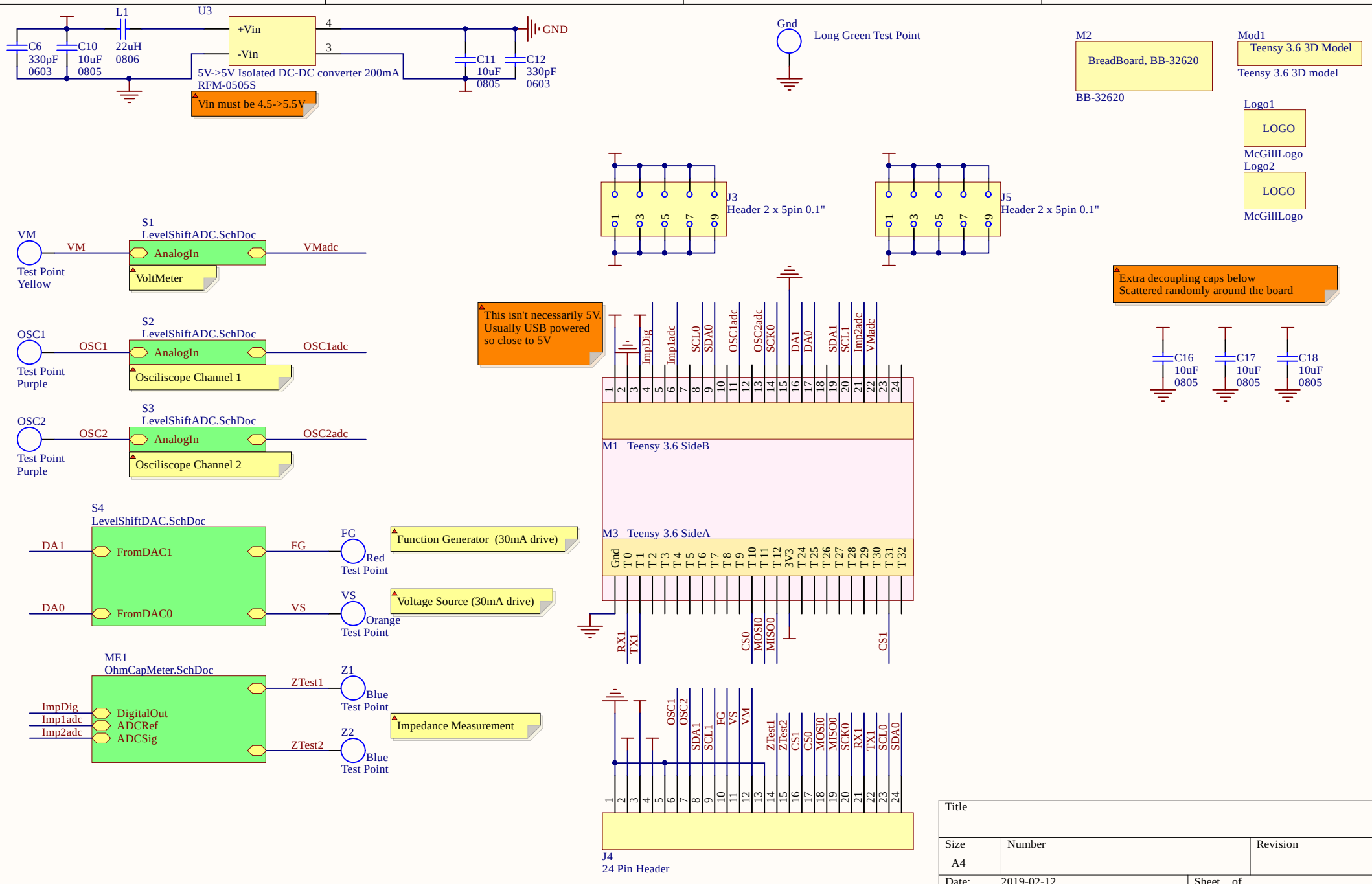
Title		
Size: A4	Number	Revision
Date: 2019-02-12	Sheet of	
File: C:\AltiumProjects\..\LevelShiftDAC.SchDoc	Drawn By:	



Resistance measurement:
If R=10, with Rref = 100, we would measure 90% of the drive signal
If R=10M, with Rref=1M, we would measure 10% of the drive signal.

Capacitance measurement:
If C=100pF (Diode is 10pF) and R=1M, 2.2RC=220us, we would get 44 measurment points at 200khz (5us per sample)
If C=1000uF and R=100, 2.2RC=0.22s, we would get 44k measurement points

Title		
Size: A4	Number	Revision
Date: 2019-02-12	Sheet of	
File: C:\AltiumProjects\..\OhmCapMeter.SchDoc	Drawn By:	


L1
U3
C6
330pF
0603
C10
10uF
0805
22uH
0806
+Vin
-Vin
4
3
5V->5V Isolated DC-DC converter 200mA
RFM-0505S
Vin must be 4.5->5.5V
GND
C11
10uF
0805
C12
330pF
0603
Gnd
Long Green Test Point
M2
BreadBoard, BB-32620
BB-32620
Mod1
Teensy 3.6 3D Model
Teensy 3.6 3D model
Logo1
LOGO
McGillLogo
Logo2
LOGO
McGillLogo
J3
Header 2 x 5pin 0.1"
J5
Header 2 x 5pin 0.1"
VM
Test Point
Yellow
S1
LevelShiftADC.SchDoc
AnalogIn
VoltMeter
VMadc
OSC1
Test Point
Purple
S2
LevelShiftADC.SchDoc
AnalogIn
Osciliscope Channel 1
OSC1adc
OSC2
Test Point
Purple
S3
LevelShiftADC.SchDoc
AnalogIn
Osciliscope Channel 2
OSC2adc
This isn't necessarily 5V.
Usually USB powered
so close to 5V
Extra decoupling caps below
Scattered randomly around the board
C16
10uF
0805
C17
10uF
0805
C18
10uF
0805
ImpDig
Imp1adc
SCL0
SDA0
OSC1adc
OSC2adc
SCK0
DA1
DA0
SDA1
SCL1
Imp2adc
VMadc
M1 Teensy 3.6 SideB
M3 Teensy 3.6 SideA
Gnd
T 0
T 1
T 2
T 3
T 4
T 5
T 6
T 7
T 8
T 9
T 10
T 11
T 12
3V3
T 24
T 25
T 26
T 27
T 28
T 29
T 30
T 31
T 32
RX1
TX1
CS0
MOSI0
MISO0
CS1
S4
LevelShiftDAC.SchDoc
DA1
FromDAC1
DA0
FromDAC0
FG
VS
FG
Red
Test Point
Function Generator (30mA drive)
VS
Orange
Test Point
Voltage Source (30mA drive)
ME1
OhmCapMeter.SchDoc
ImpDig
Imp1adc
Imp2adc
DigitalOut
ADCRef
ADCSig
ZTest1
ZTest2
Z1
Blue
Test Point
Z2
Blue
Test Point
Impedance Measurement
OSC1
OSC2
SDA1
SCL1
FG
VS
VM
ZTest1
ZTest2
CS1
CS0
MOSI0
MISO0
SCK0
RX1
TX1
SCL0
SDA0
J4
24 Pin Header
Title
Size
A4
Number
Revision
Date:
2019-02-12
Sheet of
File:
C:\AltiumProjects\..\TopLevel.SchDoc
Drawn By: