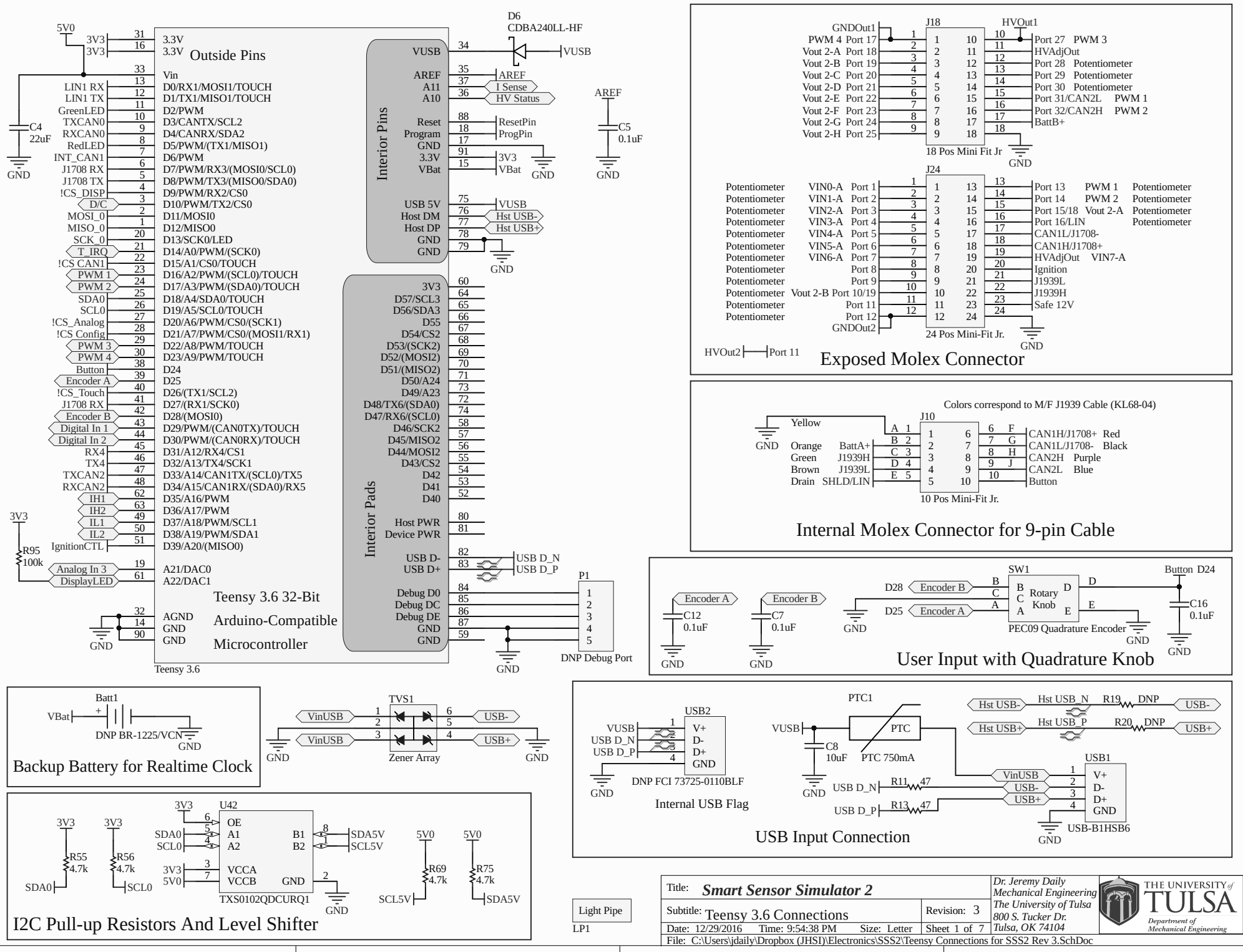
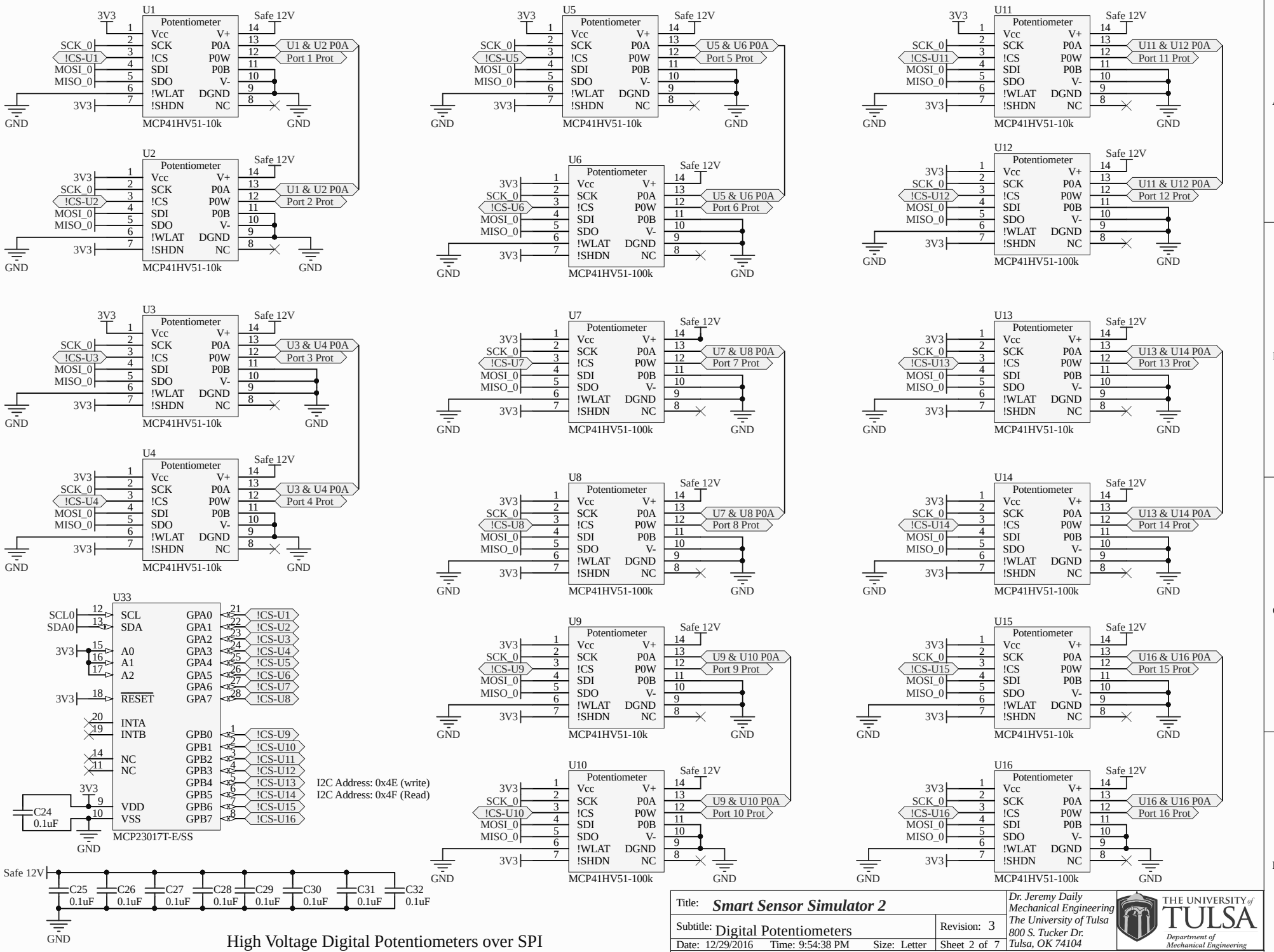

Outside Pins
Interior Pins
Interior Pads
Teensy 3.6 32-Bit
Arduino-Compatible
Microcontroller
Teensy 3.6
D6
CDBA240LL-HF
C4
22uF
C5
0.1uF
R95
100k
P1
DNP Debug Port
Exposed Molex Connector
J18
18 Pos Mini Fit Jr
J24
24 Pos Mini-Fit Jr.
HVOut2
Port 11
Internal Molex Connector for 9-pin Cable
Colors correspond to M/F J1939 Cable (KL68-04)
J10
10 Pos Mini-Fit Jr.
User Input with Quadrature Knob
SW1
PEC09 Quadrature Encoder
C12
0.1uF
C7
0.1uF
C16
0.1uF
Backup Battery for Realtime Clock
Batt1
DNP BR-1225/VCN
TVS1
Zener Array
USB2
DNP FCI 73725-0110BLF
Internal USB Flag
PTC1
PTC 750mA
C8
10uF
R11
47
R13
47
USB1
USB-B1HSB6
USB Input Connection
U42
TXS0102QDCURQ1
R55
4.7k
R56
4.7k
R69
4.7k
R75
4.7k
I2C Pull-up Resistors And Level Shifter
Light Pipe
LP1
Title: Smart Sensor Simulator 2
Subtitle: Teensy 3.6 Connections
Revision: 3
Date: 12/29/2016 Time: 9:54:38 PM Size: Letter
Sheet 1 of 7
File: C:\Users\jdaily\Dropbox (JHSI)\Electronics\SSS2\Teensy Connections for SSS2 Rev 3.SchDoc
Dr. Jeremy Daily
Mechanical Engineering
The University of Tulsa
800 S. Tucker Dr.
Tulsa, OK 74104
THE UNIVERSITY of TULSA
Department of Mechanical Engineering



High Voltage Digital Potentiometers over SPI

Title: ***Smart Sensor Simulator 2***			*Dr. Jeremy Daily* *Mechanical Engineering* *The University of Tulsa* *800 S. Tucker Dr.* *Tulsa, OK 74104*
Subtitle: Digital Potentiometers		Revision: 3	
Date: 12/29/2016	Time: 9:54:38 PM	Size: Letter	Sheet 2 of 7
File: C:\Users\jdaily\Dropbox (JHSI)\Electronics\SSS2\High Voltage Digital Pots Rev 3.SchDoc			

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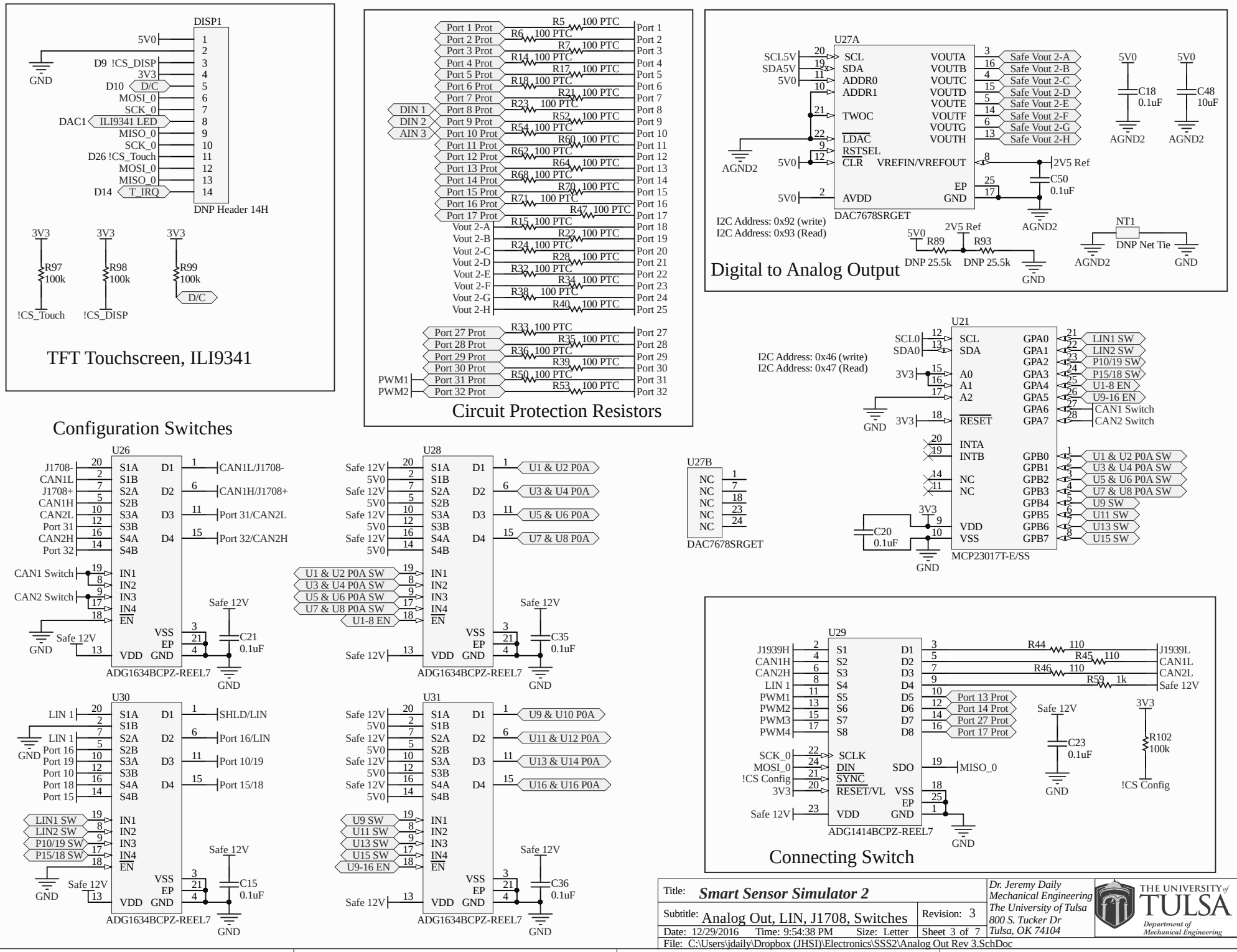
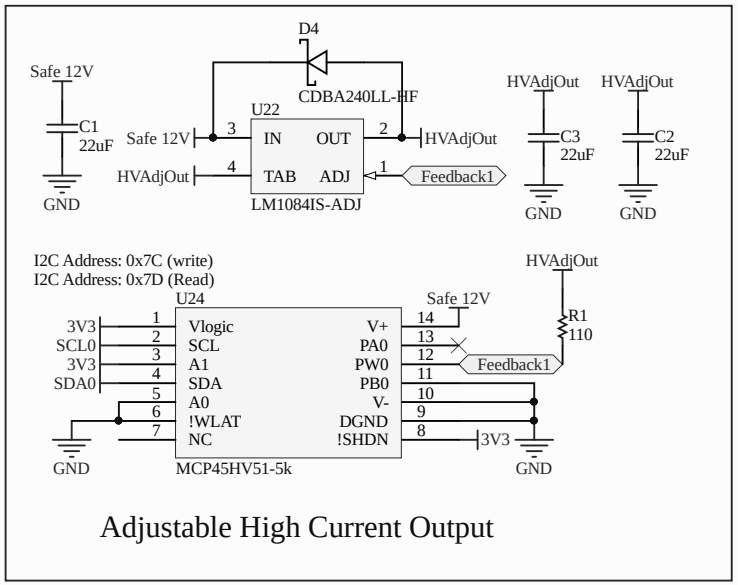
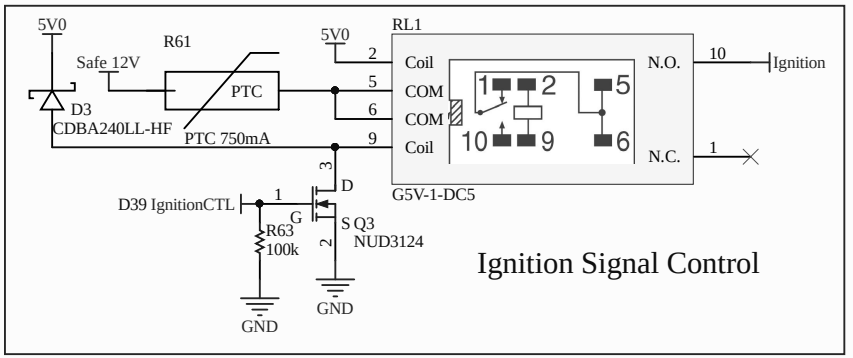
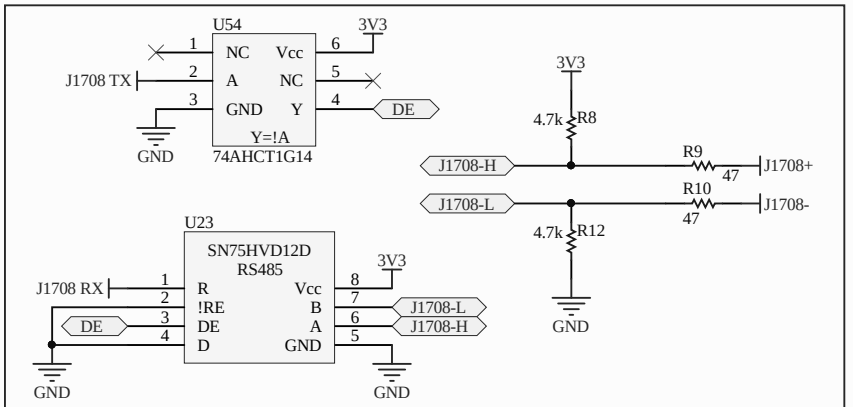

DISP1
5V0
D9 !CS_DISP
3V3
D10 D/C
MOSI_0
SCK_0
DAC1 ILI9341 LED
MISO_0
SCK_0
D26 !CS_Touch
MOSI_0
MISO_0
D14 T_IRQ
DNP Header 14H
GND
R97 100k
R98 100k
R99 100k
D/C
!CS_Touch
!CS_DISP
TFT Touchscreen, ILI9341
Port 1 Prot
Port 2 Prot
Port 3 Prot
Port 4 Prot
Port 5 Prot
Port 6 Prot
Port 7 Prot
Port 8 Prot
Port 9 Prot
Port 10 Prot
Port 11 Prot
Port 12 Prot
Port 13 Prot
Port 14 Prot
Port 15 Prot
Port 16 Prot
Port 17 Prot
Vout 2-A
Vout 2-B
Vout 2-C
Vout 2-D
Vout 2-E
Vout 2-F
Vout 2-G
Vout 2-H
Port 27 Prot
Port 28 Prot
Port 29 Prot
Port 30 Prot
Port 31 Prot
Port 32 Prot
DIN 1
DIN 2
AIN 3
PWM1
PWM2
100 PTC
Circuit Protection Resistors
U27A
SCL5V
SDA5V
5V0
SCL
SDA
ADDR0
ADDR1
TWOC
LDAC
RSTSEL
CLR
AVDD
VOUTA
VOUTB
VOUTC
VOUTD
VOUTE
VOUTF
VOUTG
VOUTH
VREFIN/VREFOUT
EP
GND
Safe Vout 2-A
Safe Vout 2-B
Safe Vout 2-C
Safe Vout 2-D
Safe Vout 2-E
Safe Vout 2-F
Safe Vout 2-G
Safe Vout 2-H
C18 0.1uF
C48 10uF
2V5 Ref
C50 0.1uF
AGND2
DAC7678SRGET
I2C Address: 0x92 (write)
I2C Address: 0x93 (Read)
R89 DNP 25.5k
R93 DNP 25.5k
NT1
DNP Net Tie
Digital to Analog Output
U21
SCL0
SDA0
I2C Address: 0x46 (write)
I2C Address: 0x47 (Read)
3V3
A0
A1
A2
RESET
INTA
INTB
NC
GPA0
GPA1
GPA2
GPA3
GPA4
GPA5
GPA6
GPA7
GPB0
GPB1
GPB2
GPB3
GPB4
GPB5
GPB6
GPB7
LIN1 SW
LIN2 SW
P10/19 SW
P15/18 SW
U1-8 EN
U9-16 EN
CAN1 Switch
CAN2 Switch
U1 & U2 P0A SW
U3 & U4 P0A SW
U5 & U6 P0A SW
U7 & U8 P0A SW
U9 SW
U11 SW
U13 SW
U15 SW
C20 0.1uF
MCP23017T-E/SS
U27B
DAC7678SRGET
Configuration Switches
U26
J1708-
CAN1L
J1708+
CAN1H
CAN2L
Port 31
CAN2H
Port 32
CAN1 Switch
CAN2 Switch
CAN1L/J1708-
CAN1H/J1708+
Port 31/CAN2L
Port 32/CAN2H
Safe 12V
C21 0.1uF
ADG1634BCPZ-REEL7
U28
U1 & U2 P0A
U3 & U4 P0A
U5 & U6 P0A
U7 & U8 P0A
C35 0.1uF
U30
LIN 1
Port 16
Port 19
Port 10
Port 18
Port 15
SHLD/LIN
Port 16/LIN
Port 10/19
Port 15/18
C15 0.1uF
U31
U9 & U10 P0A
U11 & U12 P0A
U13 & U14 P0A
U16 & U16 P0A
C36 0.1uF
U29
J1939H
CAN1H
CAN2H
LIN 1
PWM1
PWM2
PWM3
PWM4
SCK_0
MOSI_0
!CS Config
3V3
Safe 12V
SCLK
DIN
SYNC
RESET/VL
SDO
VSS
J1939L
CAN1L
CAN2L
R44 110
R45 110
R46 110
R59 1k
MISO_0
C23 0.1uF
R102 100k
ADG1414BCPZ-REEL7
Connecting Switch
Title: Smart Sensor Simulator 2
Subtitle: Analog Out, LIN, J1708, Switches
Revision: 3
Date: 12/29/2016 Time: 9:54:38 PM Size: Letter
Sheet 3 of 7
File: C:\Users\jdaily\Dropbox (JHSI)\Electronics\SSS2\Analog Out Rev 3.SchDoc
Dr. Jeremy Daily
Mechanical Engineering
The University of Tulsa
800 S. Tucker Dr
Tulsa, OK 74104
THE UNIVERSITY of TULSA
Department of Mechanical Engineering



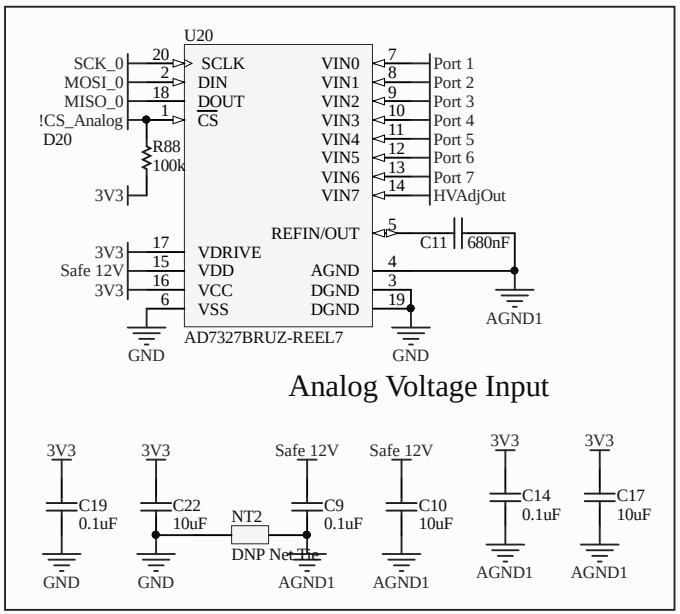
Adjustable High Current Output



Ignition Signal Control



J1708 Circuit



Analog Voltage Input

Title: ***Smart Sensor Simulator 2***			*Dr. Jeremy Daily*
Subtitle: 12V Power, J1708, and Analog In		Revision: 3	*Mechanical Engineering*
Date: 12/29/2016	Time: 9:54:39 PM	Size: Letter	Sheet 4 of 7
File: C:\Users\jdaily\Dropbox (JHSI)\Electronics\SSS2\Analog Input and Linear Regulator Rev 3.SchDoc			

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Tulsa, OK 74104

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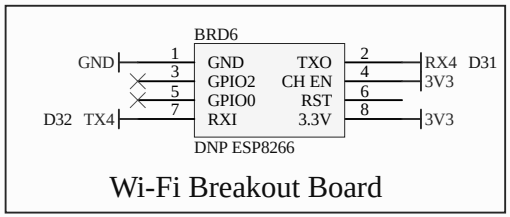
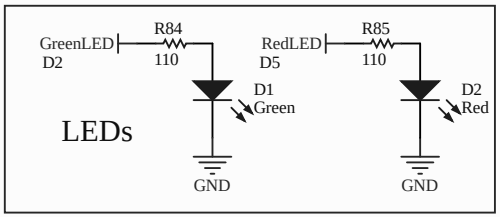
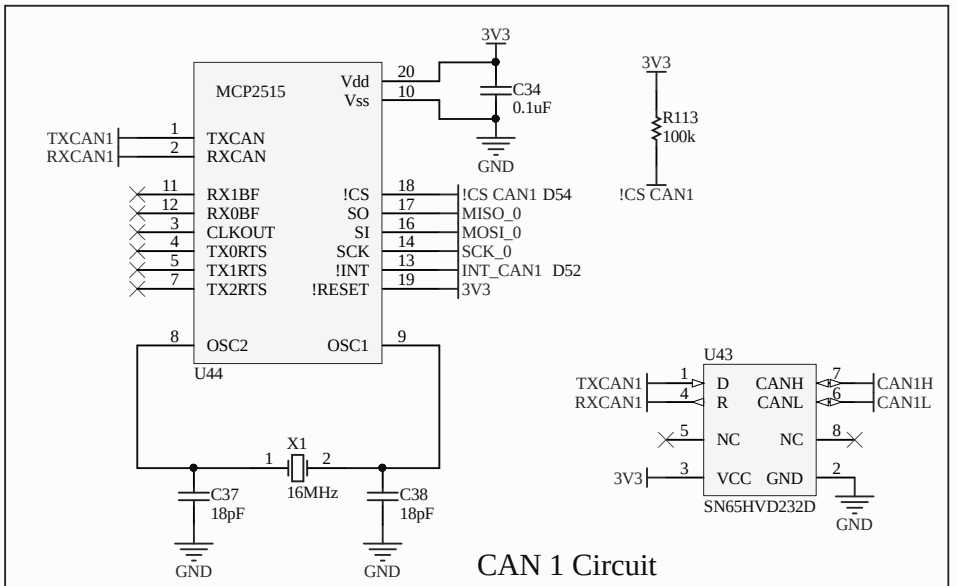
Department of Mechanical Engineering



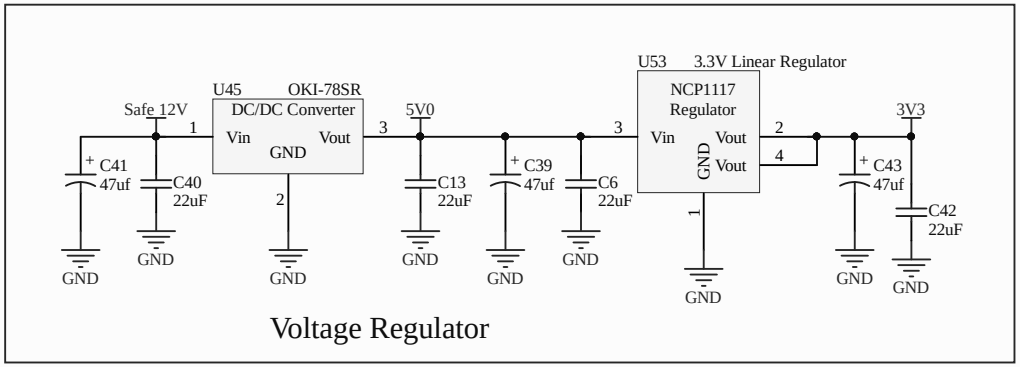
Wi-Fi Breakout Board



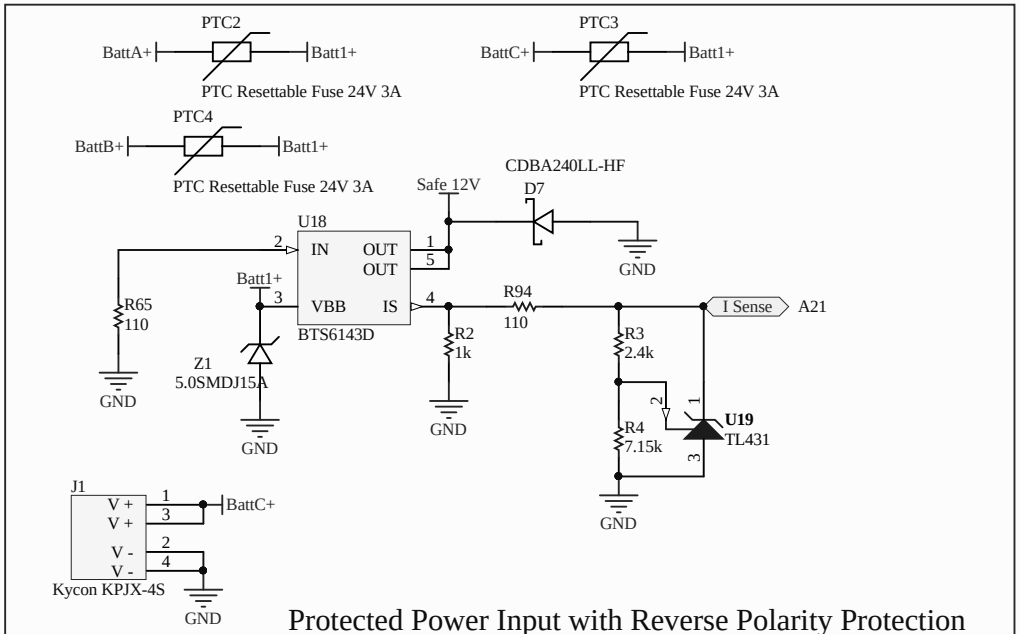
LEDs



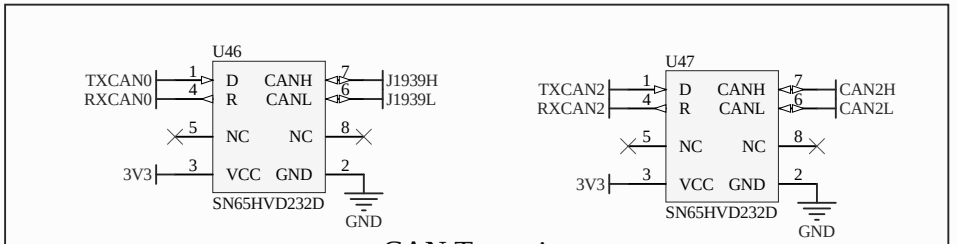
CAN 1 Circuit



Voltage Regulator



Protected Power Input with Reverse Polarity Protection



CAN Tranceivers

Title: ***Smart Sensor Simulator 2***			*Dr. Jeremy Daily* *Mechanical Engineering* *The University of tulsa* *800 S. Tucker Dr* *Tulsa, OK 74104*
Subtitle: Power, Config., Wi-Fi, and CAN		Revision: 3	
Date: 12/29/2016	Time: 9:54:39 PM	Size: Letter	Sheet 5 of 7
File: C:\Users\jdaily\Dropbox (JHSI)\Electronics\SSS2\Power Input and Protection Rev 3.SchDoc			

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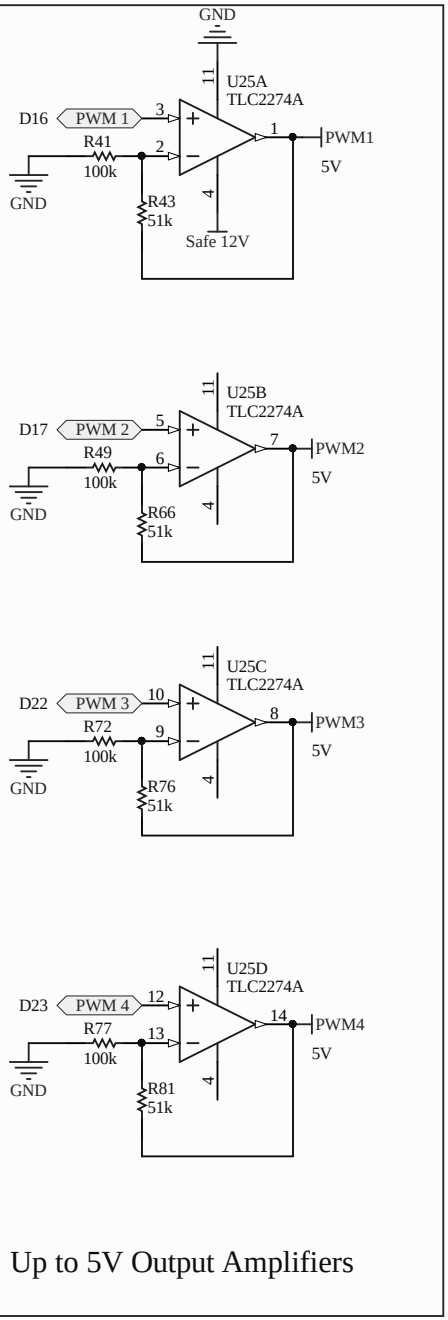
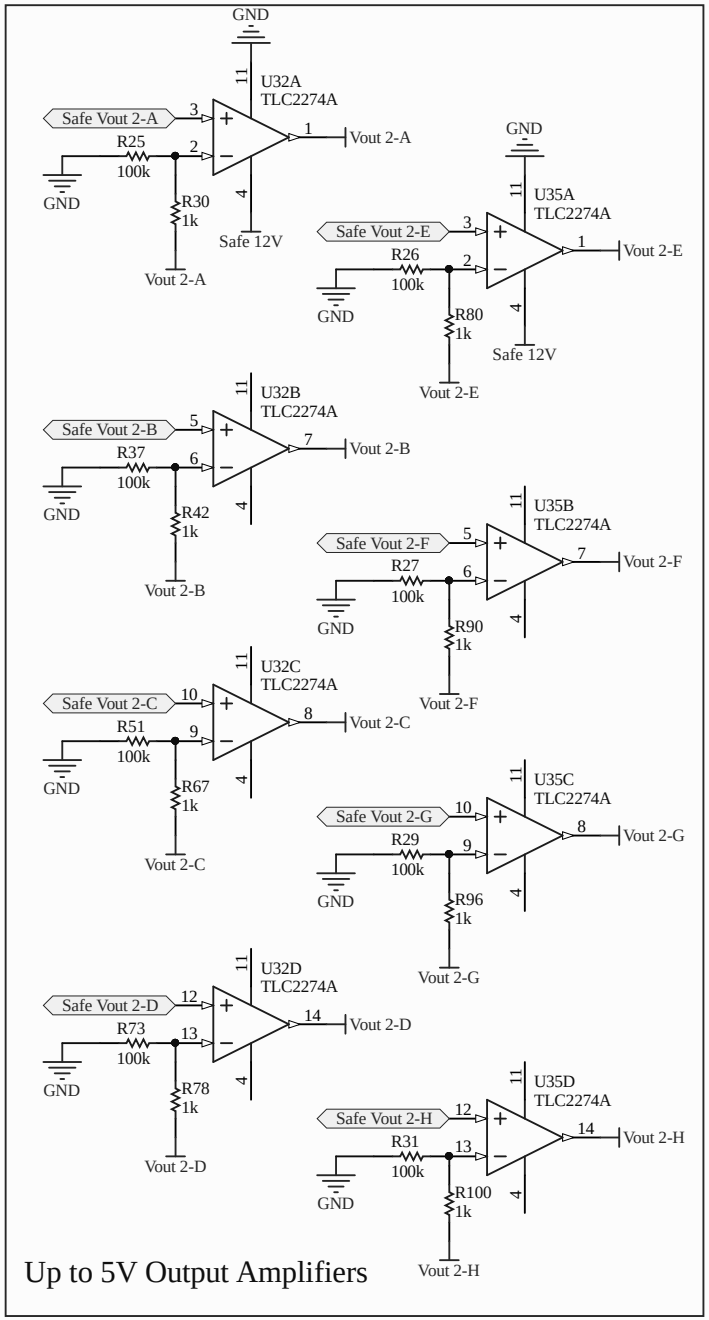
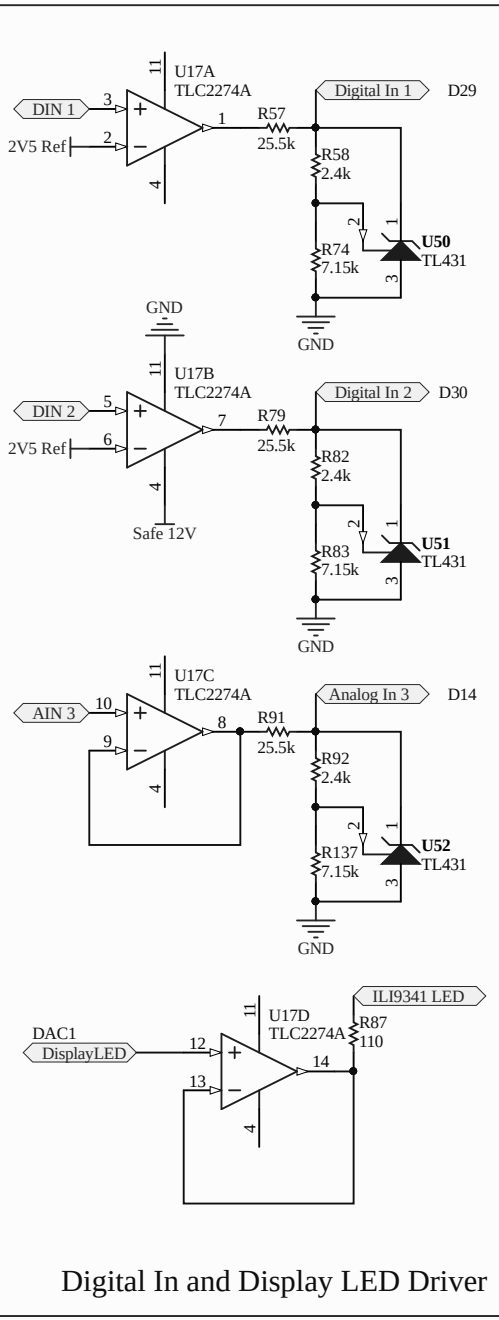
Department of Mechanical Engineering



Up to 5V Output Amplifiers



Up to 5V Output Amplifiers



Digital In and Display LED Driver

Title: ***Smart Sensor Simulator 2***			*Dr. Jeremy Daily* *Mechanical Engineering* *The University of Tulsa* *800 S. Tucker Dr* *Tulsa, OK 74104*
Subtitle: Amplifiers and Digital In Protection		Revision: 3	
Date: 12/29/2016	Time: 9:54:39 PM	Size: Letter	Sheet 6 of 7
File: C:\Users\jdaily\Dropbox (JHSI)\Electronics\SSS2\Analog Out Amplifiers PWM Rev 3.SchDoc			

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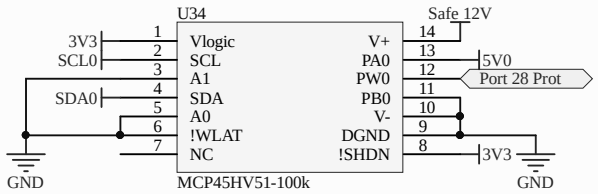
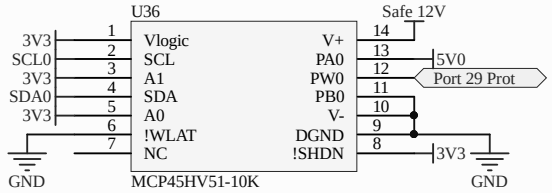
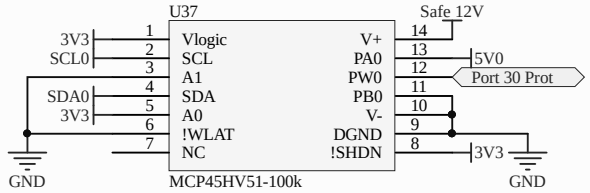
Department of Mechanical Engineering



I2C Address: 0x78 (write)
I2C Address: 0x79 (Read)

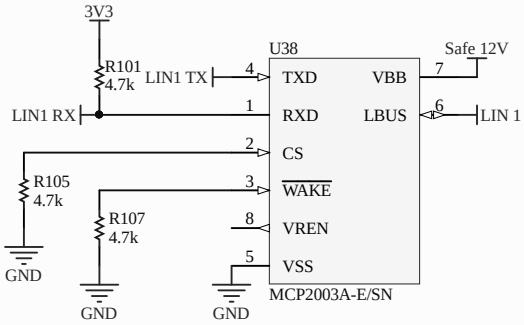


I2C Address: 0x7E (write)
I2C Address: 0x7F (Read)

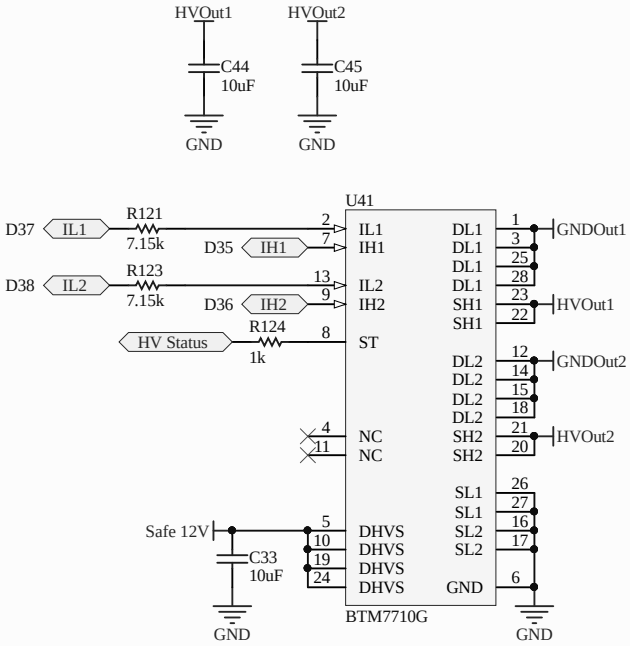


I2C Address: 0x7A (write)
I2C Address: 0x7B (Read)

The output from the DACs "Safe Vout" are 0 to 5V. The formula for output is Vout = (1+R2/R1)*Vin, where R1 is the resistor connected to ground. If the R1 is not populated (or uses a high value, then the system becomes a voltage follower. If R2 is 33k and R1 is 22k, then the gain is 2.5, which can give 12.5V. If Vin is 3.3V, such as those PWM signals from the Teensy 3.6, then R1= 51k and R2 =100k to give gain of 1.51, which gives an output of 4.98V..



LIN 1 Bus Driver



H-Bridge Driver to provide Switched Power

Title: ***Smart Sensor Simulator 2***		*Dr. Jeremy Daily* *Mechanical Engineering* *The University of Tulsa* *800 S. Tucker Dr* *Tulsa, OK 74104*
Subtitle: Amplifiers, LIN and H-Bridge	Revision: 3	
Date: 12/29/2016 Time: 9:54:39 PM Size: Letter	Sheet 7 of 7	
File: C:\Users\jdaily\Dropbox (JHSI)\Electronics\SSS2\Analog Out Amplifiers DAC Rev 3.SchDoc		

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