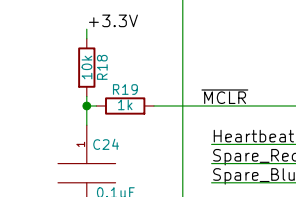
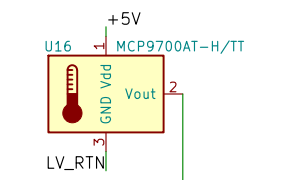
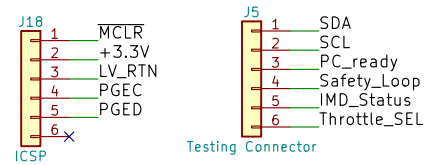
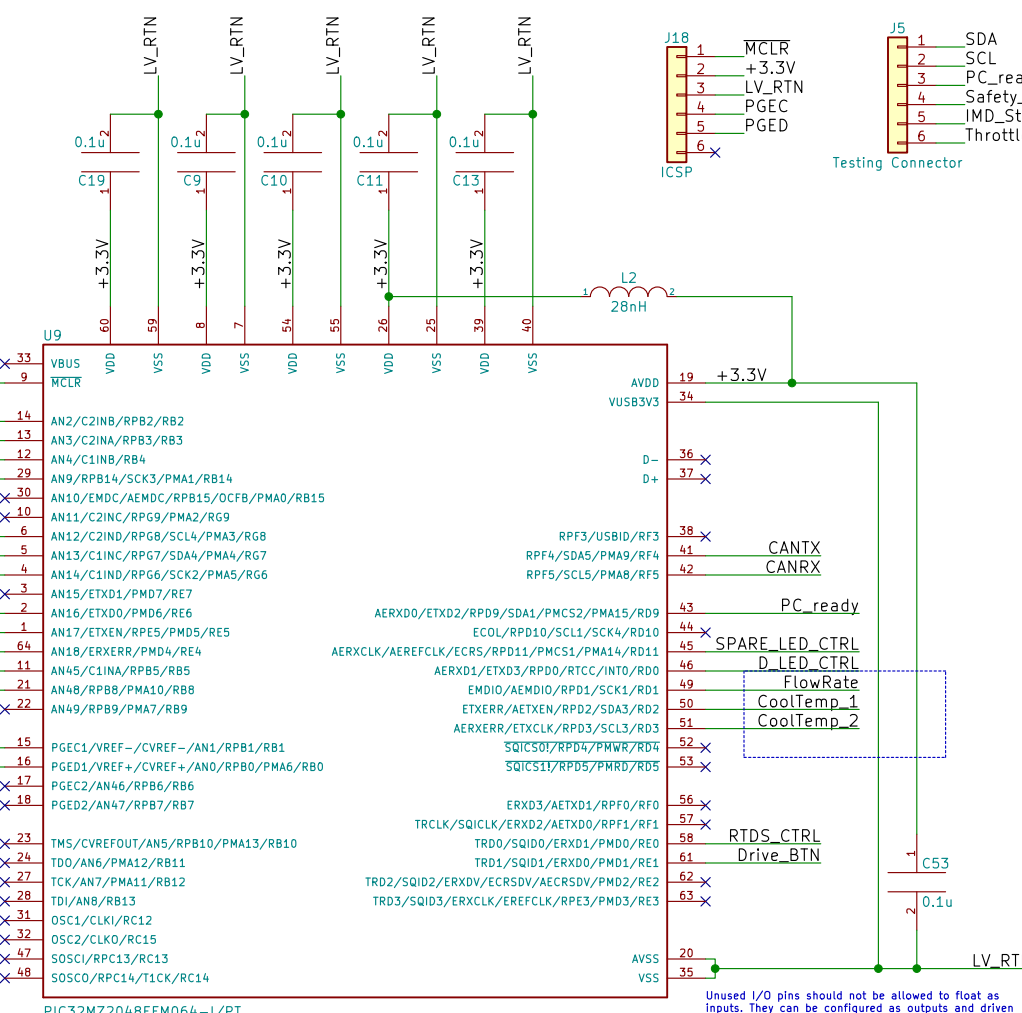
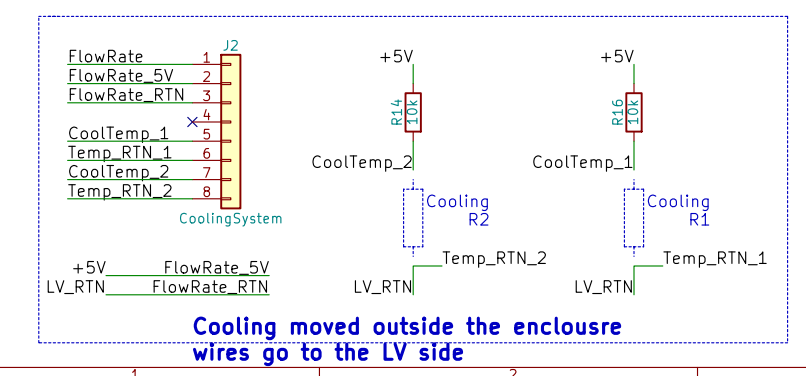
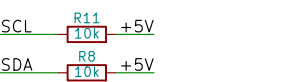


Board Temp Sensor

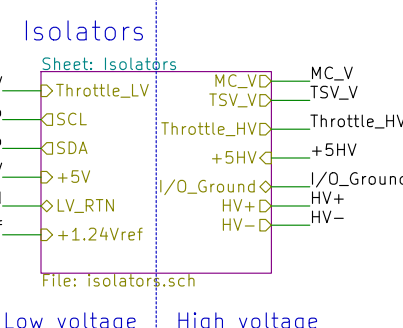
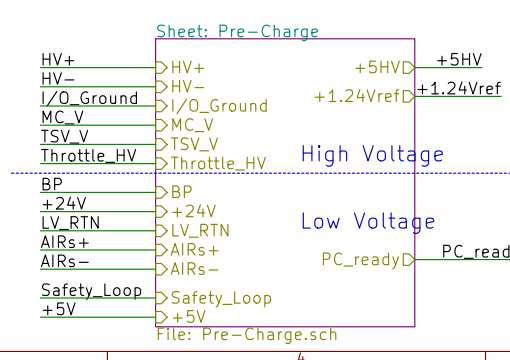


I2C Pullup

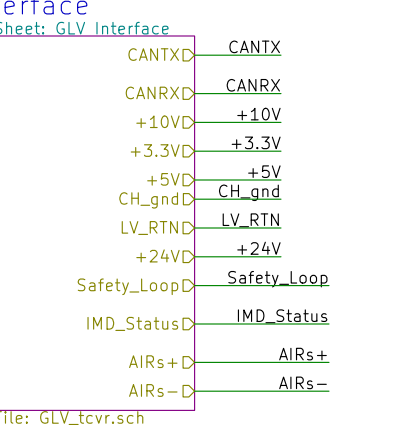


Unused I/O pins should not be allowed to float as inputs. They can be configured as outputs and driven to a logic-low state.

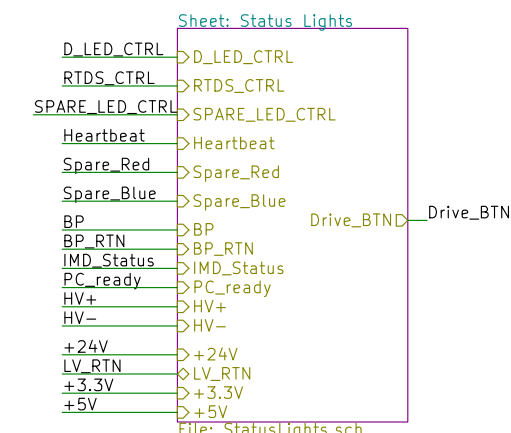
Pre-Charge&Discharge Circuit



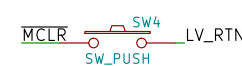
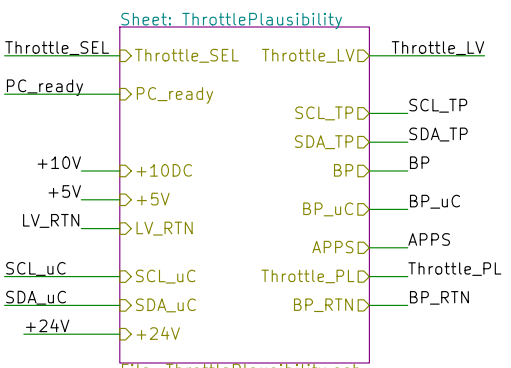
GLV/CAN/AIR/IMD Interface



Status Lights



Throttle Plausibility



Reset Button

DEVELOPMENT ONLY		<h2>TSI TopLevel Diagram</h2>	
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Sheet: / File: Circuit_layout.sch			
Title: Tractive System Interface			
Size: USLegal	Date: 2019-03-26	Rev: 2.2	
KiCad E.D.A.	kicad 4.0.7	Id: 1/6	

BP → BP
 BP_RTN → BP_RTN
 IMD_Status → IMD_Status
 RTDS_CTRL → RTDS_CTRL
 D_LED_CTRL → D_LED_CTRL
 SPARE_LED_CTRL → SPARE_LED_CTRL
 Heartbeat → Heartbeat
 Spare_Red → Spare_Red
 Spare_Blue → Spare_Blue

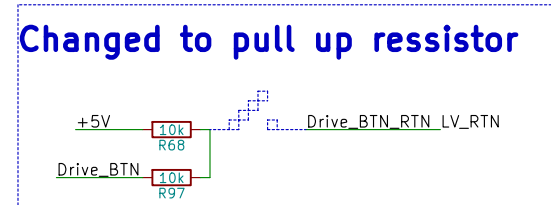
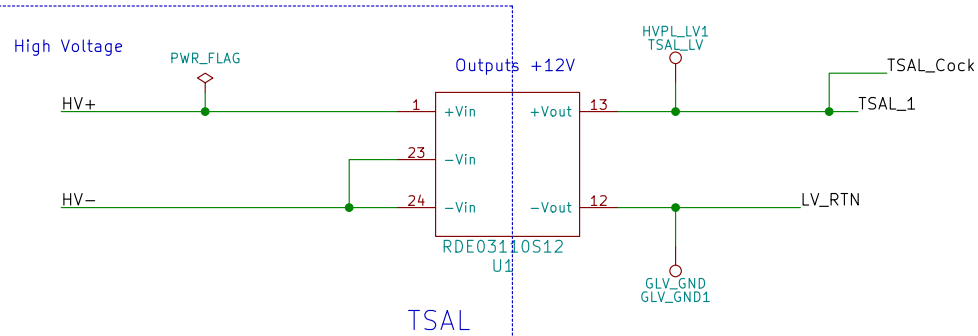
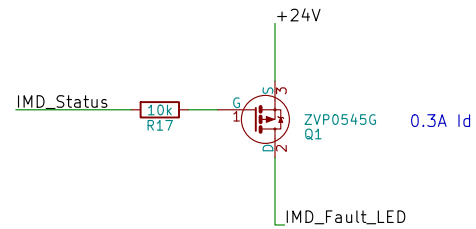
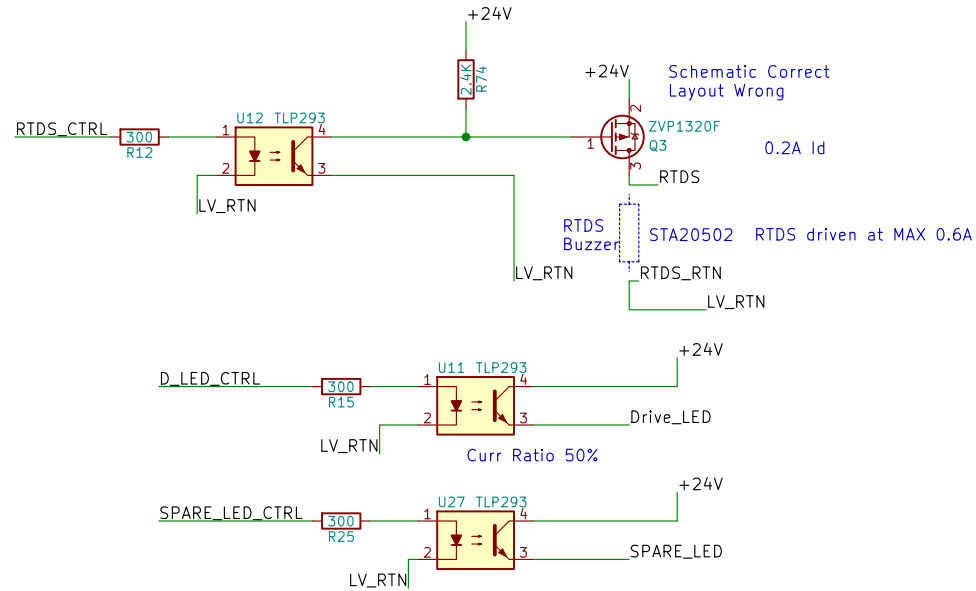
+24V → +24V

LV_RTN → LV_RTN

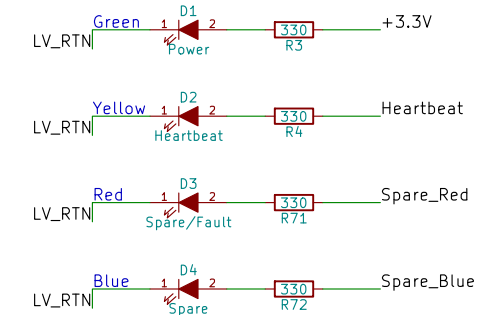
+3.3V → +3.3V

PC_ready → Cooling_CTRL

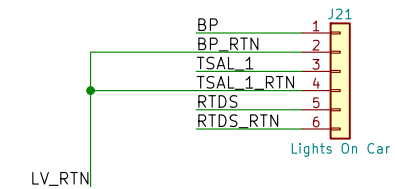
+5V → +5V



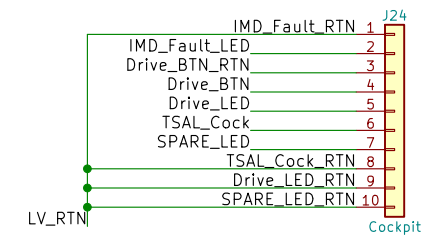
Status/Debug LEDs



Drive_BTN → Drive_BTN



Drive BTN Pull Up active low



HV+ → HV+
 HV- → HV-

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Sheet: /Status Lights/
File: StatusLights.sch

Title: Tractive System Interface

Size: USLegal Date: 2019-03-26

KiCad E.D.A. kicad 4.0.7

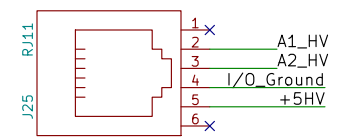
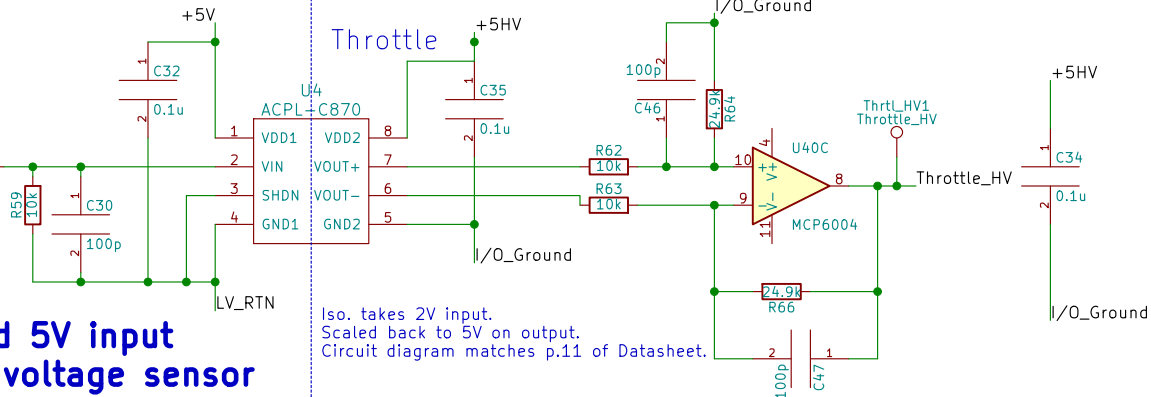
Status Lights/ Cockpit

Rev: 2.2

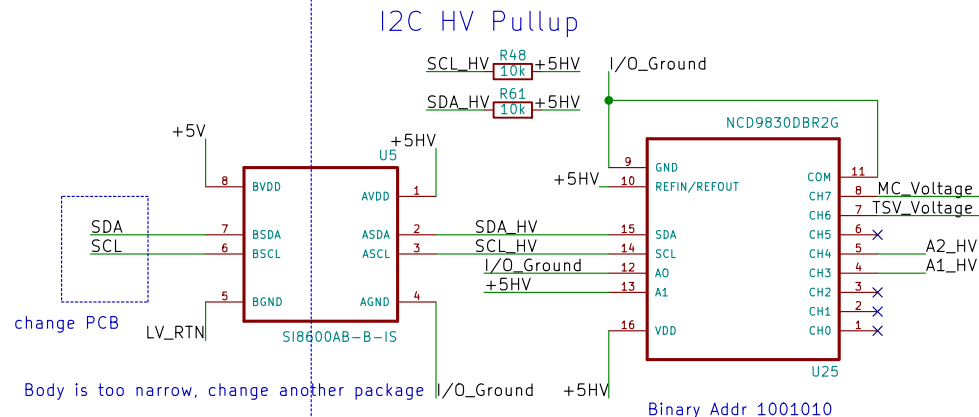
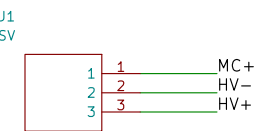
Id: 2/6

Try to find 5V input precision voltage sensor

Iso. takes 2V input. Scaled back to 5V on output. Circuit diagram matches p.11 of Datasheet.



Current Sensor Connection



change PCB
Body is too narrow, change another package

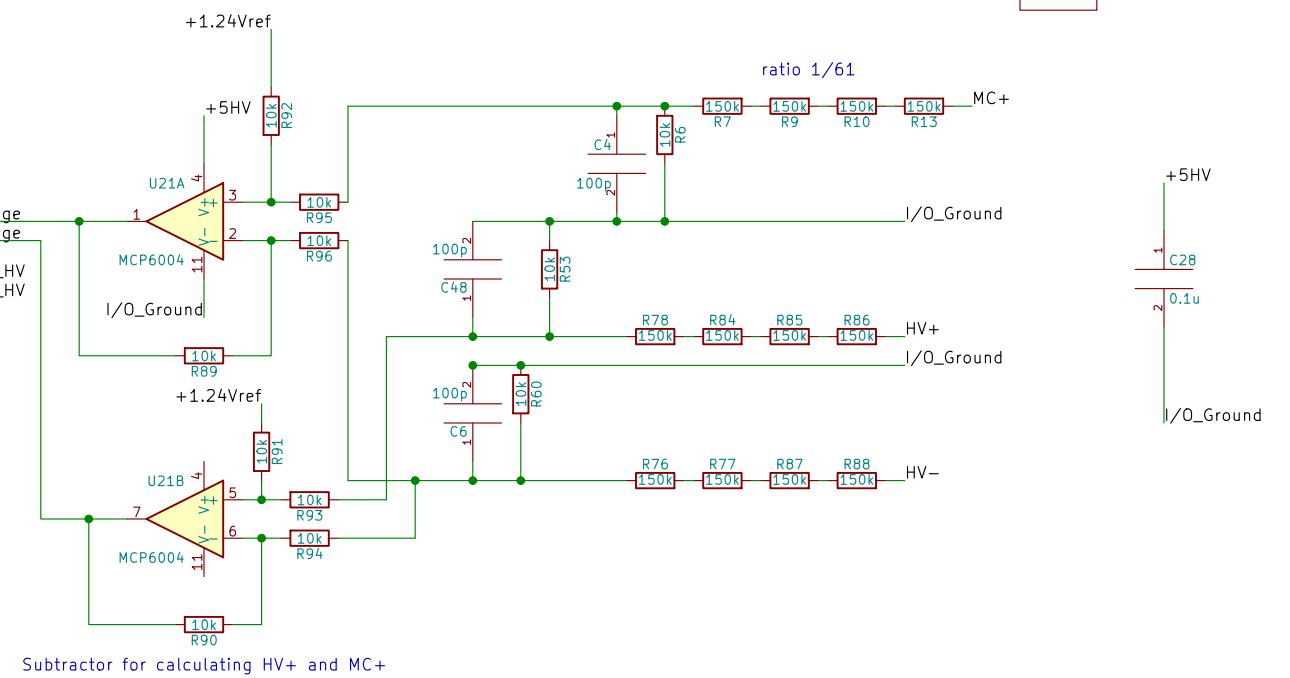
LOW VOLTAGE HIGH VOLTAGE

+5V —> +5V
LV_RTIN —> LV_RTIN
Throttle_LV —> Throttle_LV

SCL —> SCL
SDA —> SDA

+1.24Vref —> +1.24Vref
+5HV —> +5HV
I/O_Ground —> I/O_Ground

MC_Voltage —> MC_V
TSV_Voltage —> TSV_V
Throttle_HV —> Throttle_HV
HV+ —> HV+
HV- —> HV-



Subtractor for calculating HV+ and MC+

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Sheet: /Isolators/
File: isolators.sch

Title: Tractive System Interface

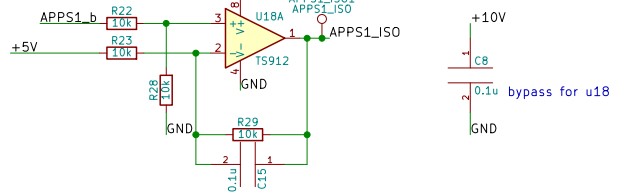
Size: USLegal	Date: 2019-03-26	Rev: 2.2
KiCad E.D.A.	kicad 4.0.7	

V/I/Temp measurement
Throttle Voltage Isolator

+24VD → +24V
 +10DCD → +10V
 +5VD → +5V
 LV_RTND → GND

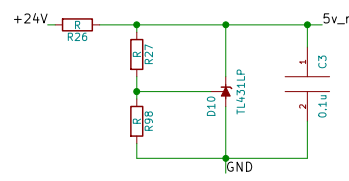
Throttle_SEL → Throttle_SEL
 SCL_uCD → SCL_uC
 SDA_uCD → SDA_uC
 PC_ready → PC_ready

APPS1 Stepdown



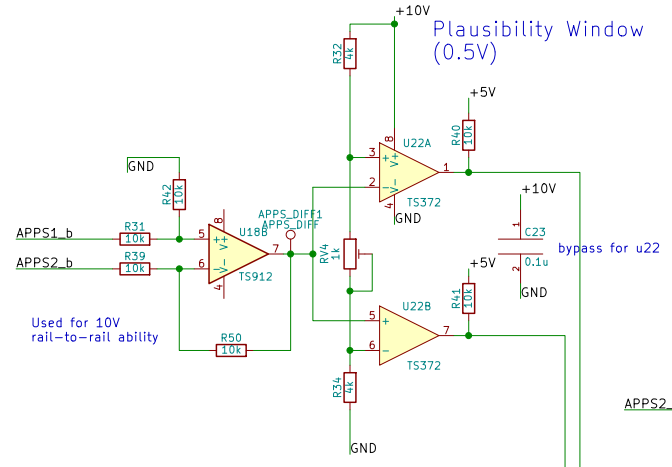
Brings the 5-10V biases APPS1 signal down to 0-5V

APPS 5V Offset Bias



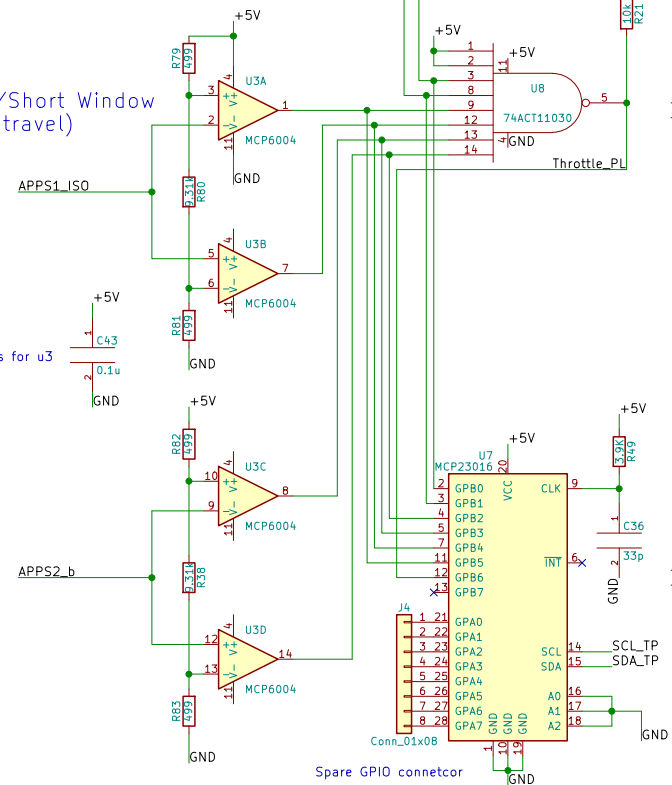
need 1% tolerance resistor for R27 and R29

Plausibility Window (0.5V)



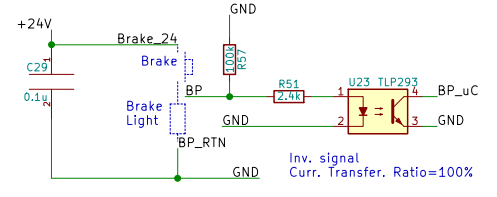
Used for 10V rail-to-rail ability

Open/Short Window (90% travel)



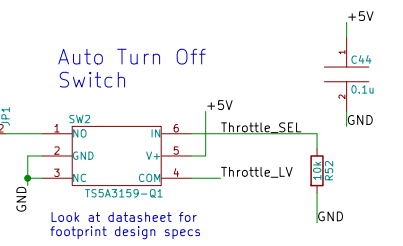
bypass for u3

Brake Pressed

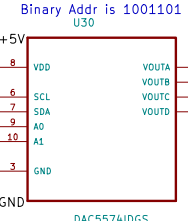


Inv. signal
Curr. Transfer. Ratio=100%

Auto Turn Off Switch



Look at datasheet for footprint design specs



Binary Addr is 1001101

DAC5574IDGS

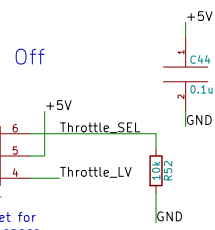
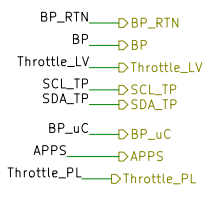
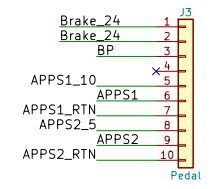
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Spring 2019
Lafayette College
Sheet: /ThrottlePlausibility/
File: ThrottlePlausibility.sch

Title: Tractive System Interface

Size: B	Date: 2019-03-26	Rev: 2.2
KiCad E.D.A. kicad 4.0.7		Id: 4/6

Binary Addr is 0100000
 Add pull down for every pin
 Check if the layout matches the ordered part



Spare GPIO connector

Conn_01x08

MCP23016 (U7)

74ACT11030 (U8)

MCP6004 (U3A, U3B, U3C, U3D)

MCP6002 (U2)

MCP6002 (U28)

TS5A3159-Q1 (U23)

TS912 (U18, U19, U6A, U6B)

TS912 (U1)

TS912 (U3)

TS912 (U4)

TS912 (U5)

TS912 (U6)

TS912 (U7)

TS912 (U8)

TS912 (U9)

TS912 (U10)

TS912 (U11)

TS912 (U12)

TS912 (U13)

TS912 (U14)

TS912 (U15)

TS912 (U16)

TS912 (U17)

TS912 (U18)

TS912 (U19)

TS912 (U20)

TS912 (U21)

TS912 (U22)

TS912 (U23)

TS912 (U24)

TS912 (U25)

TS912 (U26)

TS912 (U27)

TS912 (U28)

TS912 (U29)

TS912 (U30)

TS912 (U31)

TS912 (U32)

TS912 (U33)

TS912 (U34)

TS912 (U35)

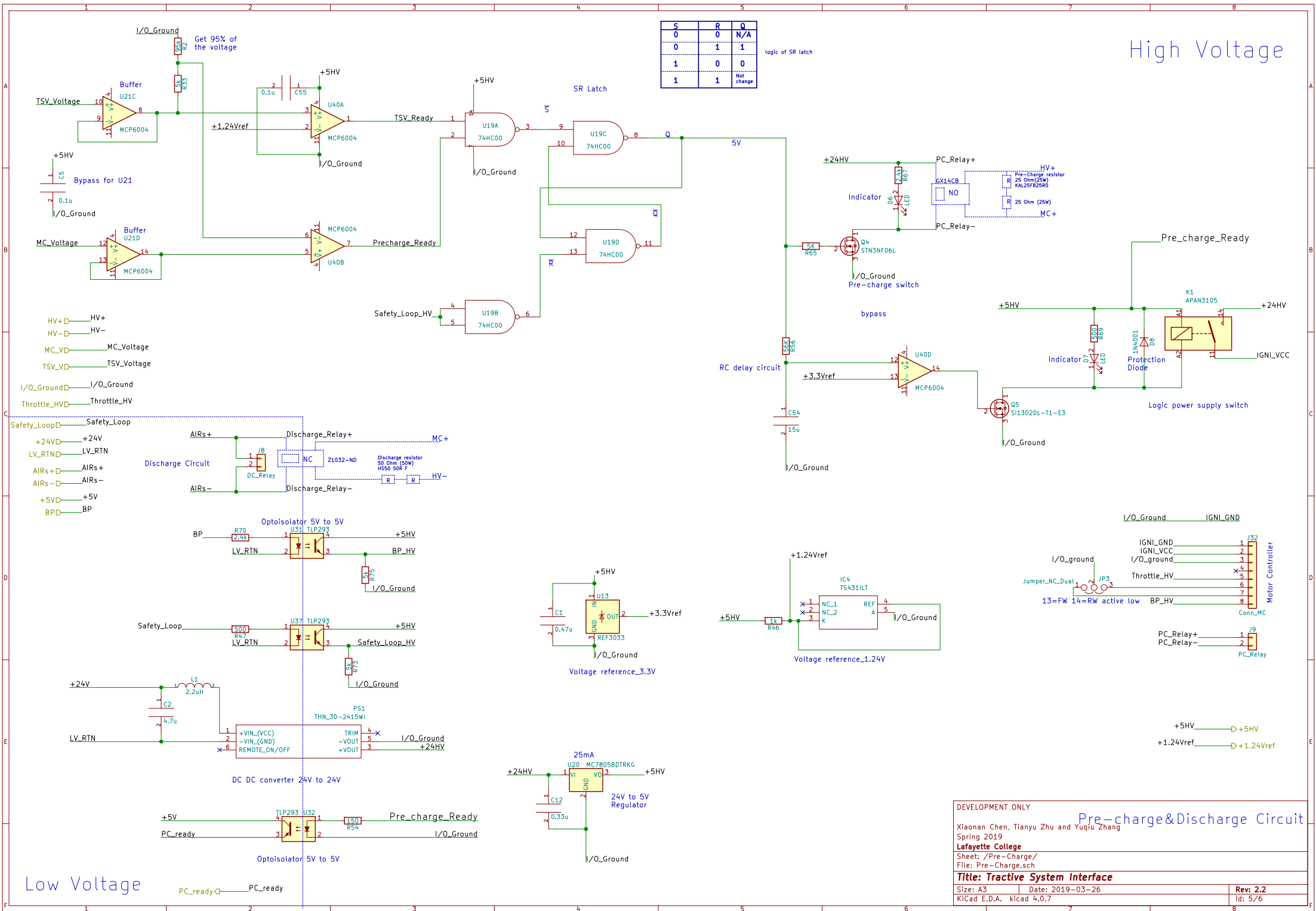
TS912 (U36)

TS912 (U37)

High Voltage

S	R	Q
0	0	N/A
0	1	1
1	0	0
1	1	Not change

logic of SR latch



Low Voltage

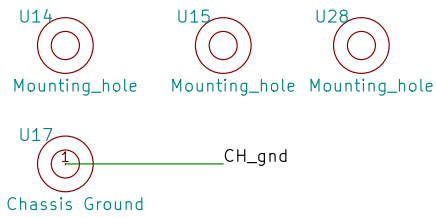
DEVELOPMENT ONLY

Pre-charge&Discharge Circuit

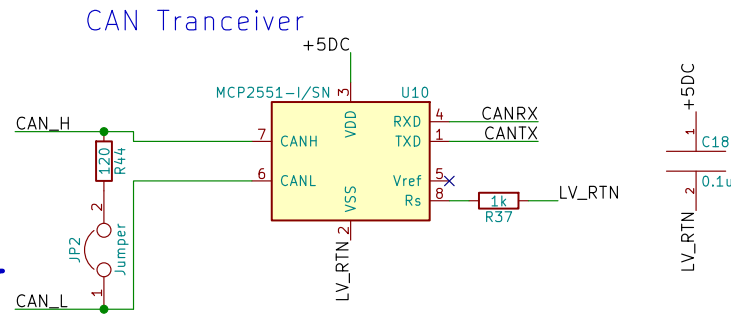
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Sheet: /Pre-Charge/
File: Pre-Charge.sch

Title: Tractive System Interface

Size: A3	Date: 2019-03-26	Rev: 2,2
KICad E.D.A. kicad 4.0.7		Id: 5/6



Jumper is added to CAN terminator



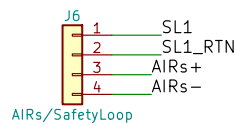
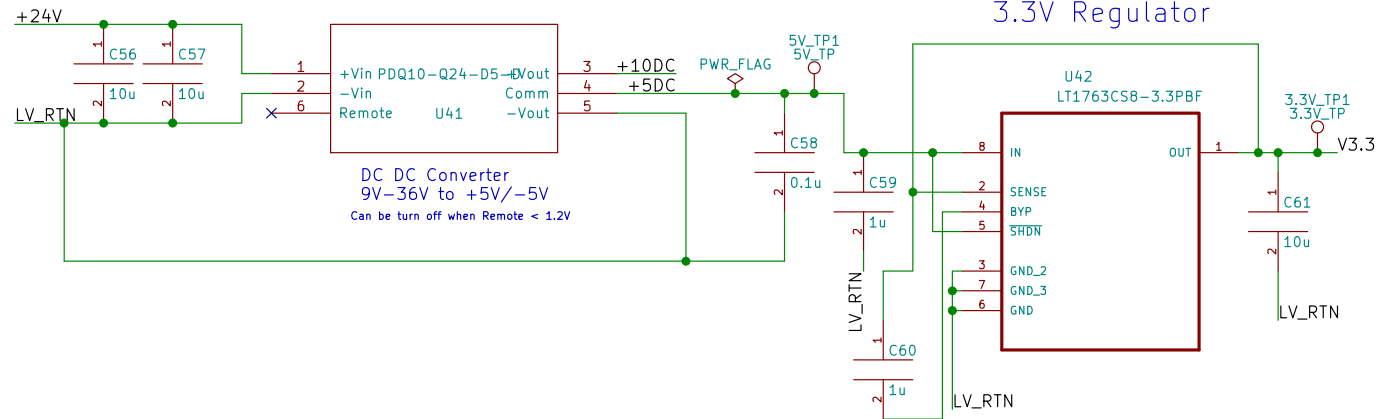
CANTX → CANTX
CANRX → CANRX

+10DC → +10V
+5DC → +5V
V3.3 → +3.3V

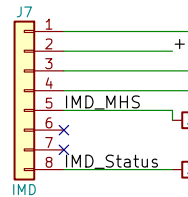
+24V → +24V
LV_RTIN → LV_RTIN
CH_gnd → CH_gnd

AIRs+ → AIRs+
AIRs- → AIRs-

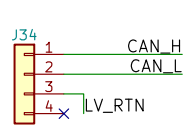
Safety_Loop → Safety_Loop
IMD_Status → IMD_Status



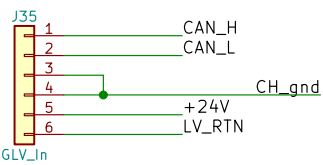
AIRs/SafetyLoop



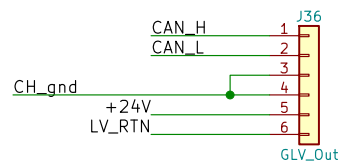
For model 3204 MHS and Status need external pull down resistor 2.2k
pin 4 need separate line connect to Chasis gnd according to datasheet



Can_Iso

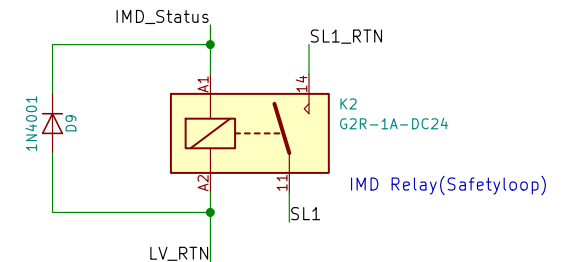
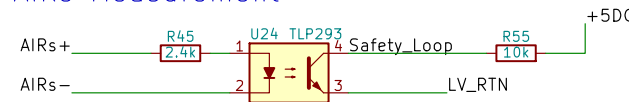


GLV_In



GLV_Out

AIRs Measurement



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Sheet: /GLV Interface/
File: GLV_tcvr.sch

Title: Tractive System Interface

Size: A4 Date: 2019-03-26

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CAN and GLV Power

Rev: 2.2

Id: 6/6