

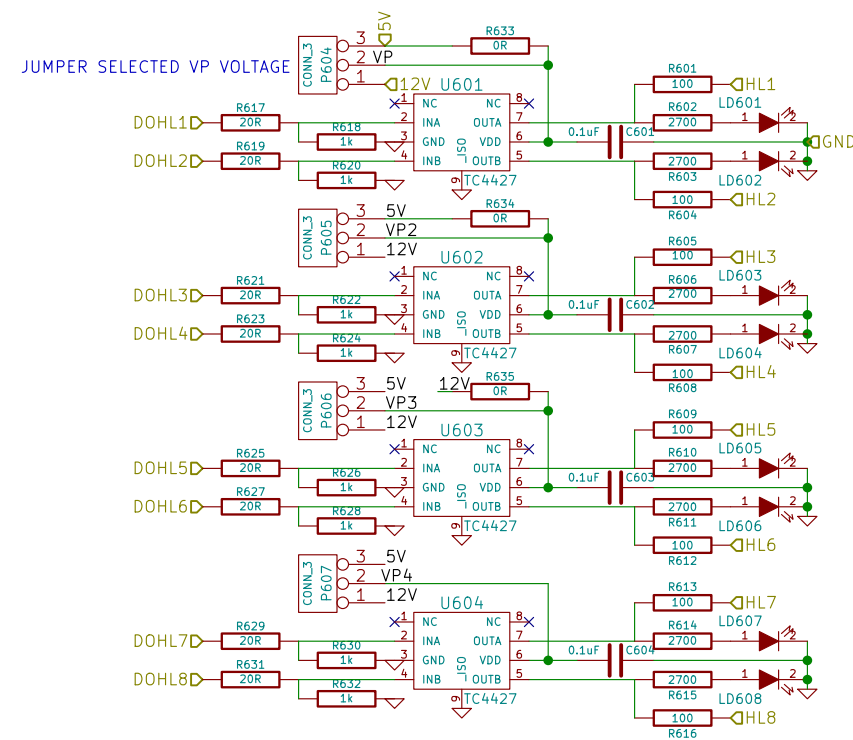
optional D12-D23 for solenoids  
only used in rare cases where the  
topology (IAC, VVT, ALT, ect) requires  
this fly back diode

rusEFI

The JP1 jumper is needed because we cannot feed the screen via USB - we would need to disconnect it while the board is on a bench

rusEFI.com	
Sheet: /	File: frankenso.sch
<b>Title: frankenso</b>	
Size: B	Date: 2019-04-21
KiCad E.D.A.	kiCad (5.1.2)-2
Id: 1/15	Rev: 0.5.6

# 8 channel high / low side driver

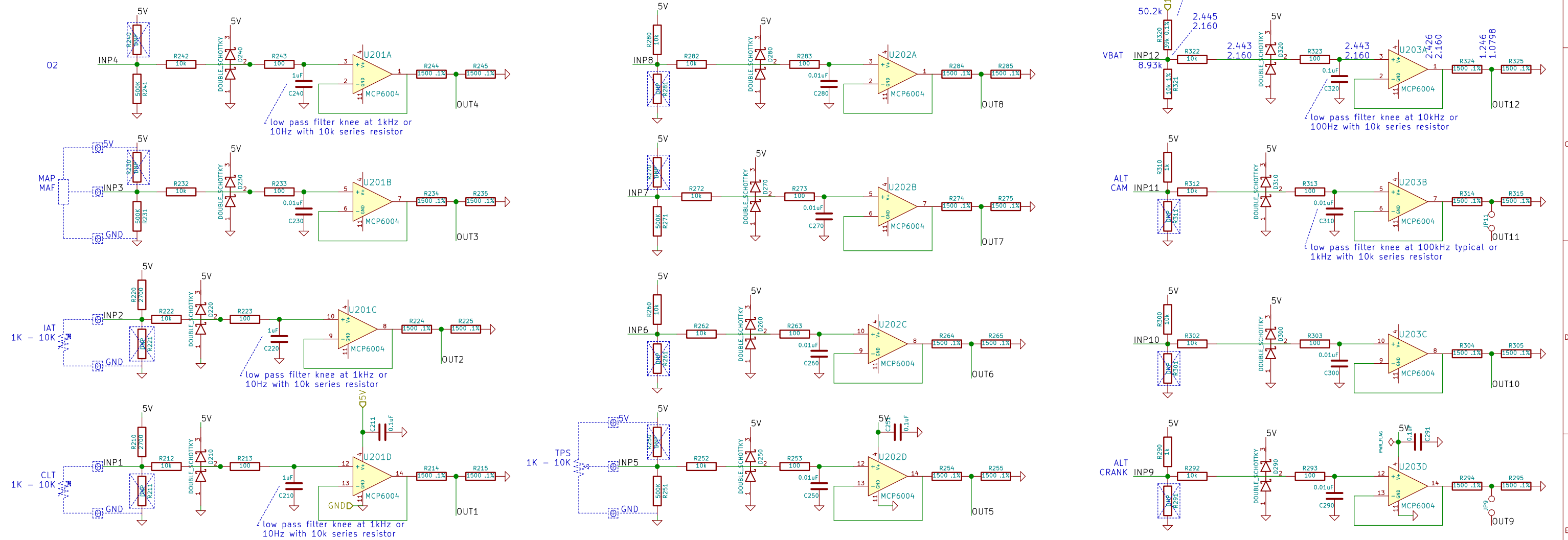


rusEFI.com		
Sheet: /hi-lo/ File: hi-lo.sch		
<b>Title: frankenso</b>		
Size: B	Date: 2019-04-21	Rev: 0.5.6
KiCad E.D.A. kicad (5.1.2)-2		Id: 2/15

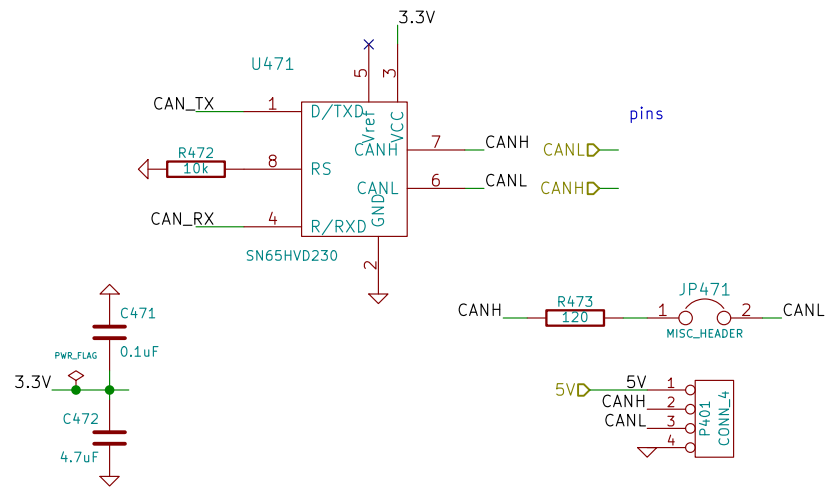
- INP12
- INP11
- INP10
- INP9
- INP8
- INP7
- INP6
- INP5
- INP4
- INP3
- INP2
- INP1

- OUT4
- OUT3
- OUT1
- OUT2
- OUT10
- OUT12
- OUT6
- OUT5
- OUT8
- OUT7
- OUT9
- OUT11

SUGGESTED / DEFAULT ENGINE WIRING IN BLUE



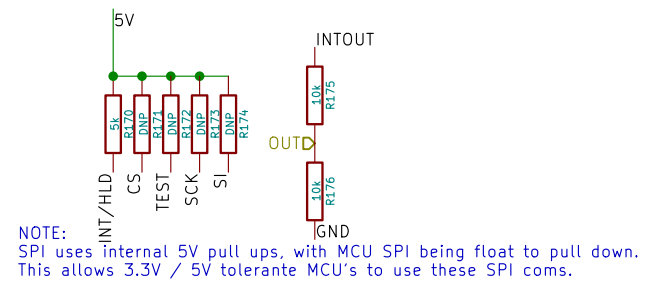
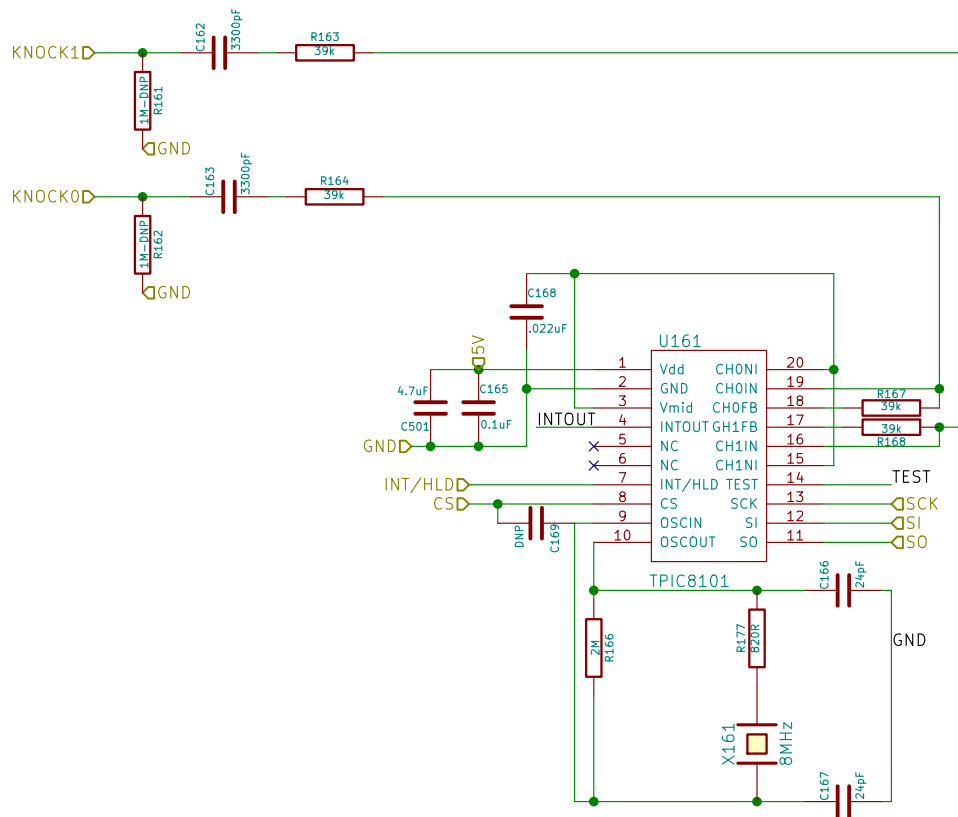
- 3.3V
- GND
- CAN\_RX
- CAN\_TX



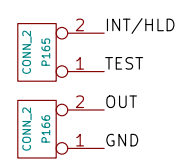
CAN level shifter

<b>rusEFI.com</b>	
Sheet: /can_brd_1/ File: can_brd_1.sch	
<b>Title: frankenso</b>	
Size: A	Date: 2019-04-21
KiCad E.D.A. kicad (5.1.2)-2	Rev: 0.5.6 Id: 4/15

DD\_HIP9011 ver.2  
 RusEfi.com



NOTE:  
 SPI uses internal 5V pull ups, with MCU SPI being float to pull down.  
 This allows 3.3V / 5V tolerant MCU's to use these SPI coms.

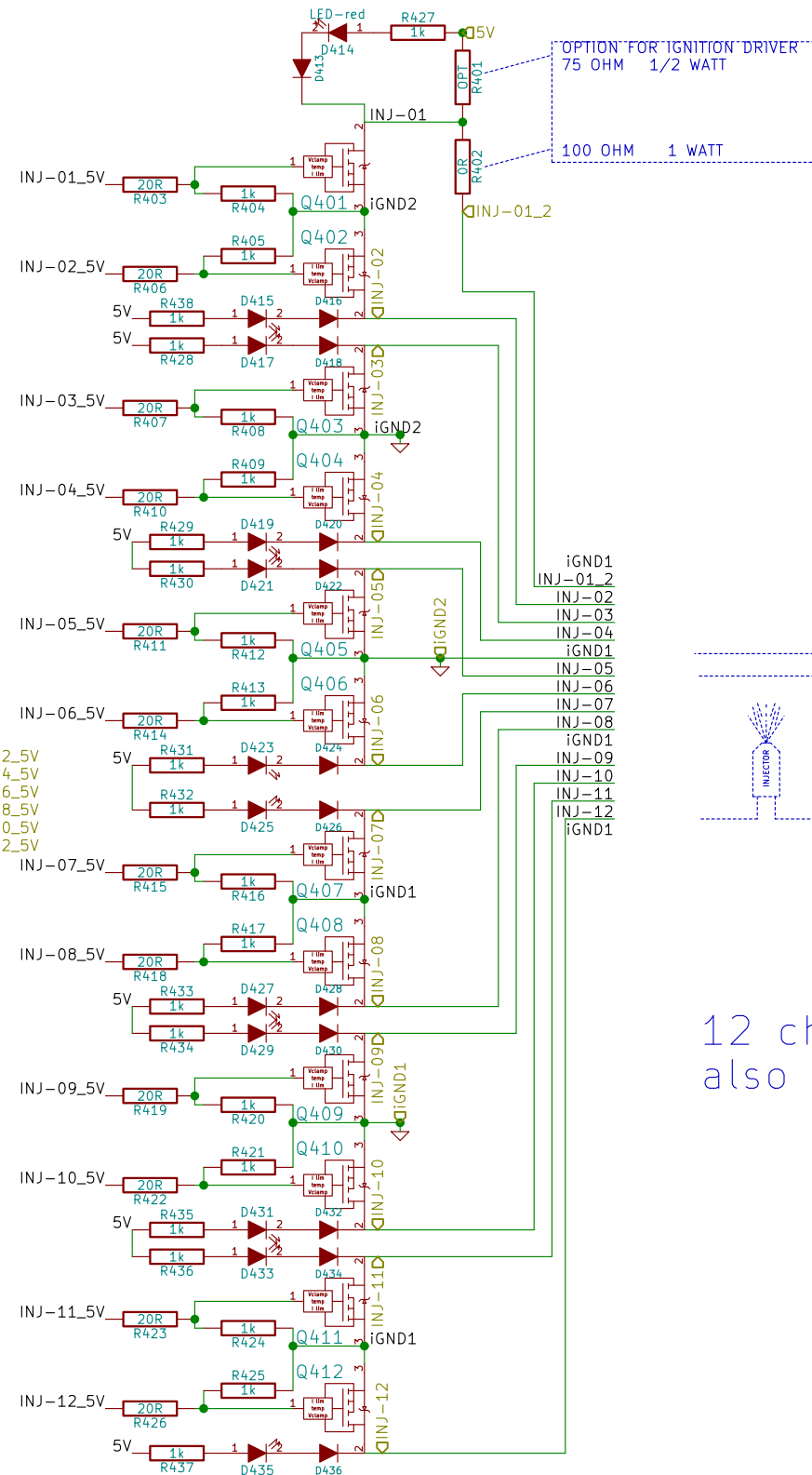


<http://www.crystek.com/documents/appnotes/Pierce-GateIntroduction.pdf>  
 PCB per predictions with SaturnPCB has less then 3.5pF traces,  
 TPIC pins assumed 5pF  
 ESR = 80ohms max  
 Rf = 2meg could be between 1meg and 10meg.  
 Cload should be 18pF per XTAL datasheet  
 $Cload = \frac{([Cin+C1][C2+Cout])}{(Cin+C1+C2.Cout)+PCBstray}$   
 $Cload = \frac{([5+24][24+5])}{(5+24+24+5)+3.5} = 18.0pF$   
 $C1=C2=C166=C167 = 24pF$   
 $Rs = \frac{1}{(2\pi f C2)} = \frac{1}{(2\pi * 8MHz * 24pF)} = 829ohms$ , 820ohms is close enough = R177

rusEFI.com	
Sheet: /DD_HIP9011/ File: DD_HIP9011.sch	
<b>Title: frankenso</b>	
Size: A	Date: 2019-04-21
KiCad E.D.A. kicad (5.1.2)-2	Rev: 0.5.6
	Id: 5/15

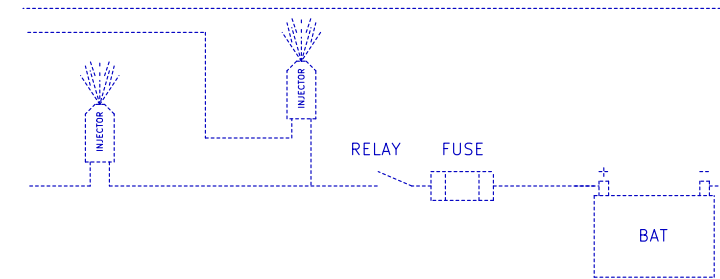
INJ-01\_5V  
 INJ-03\_5V  
 INJ-05\_5V  
 INJ-07\_5V  
 INJ-09\_5V  
 INJ-11\_5V

INJ-02\_5V  
 INJ-04\_5V  
 INJ-06\_5V  
 INJ-08\_5V  
 INJ-10\_5V  
 INJ-12\_5V



OPTION FOR 'IGNITION' DRIVER  
 75 OHM 1/2 WATT

100 OHM 1 WATT



12 channel injector driver  
 also suitable for fuel pump relay, IAC solenoid etc

MISC NOTES

THE GENERAL SYSTEM LAYOUT IS SHOWN IN BLUE. THIS IS NOT THE SUGGESTED SYSTEM WIRING, IT DOES SHOW THE GENERAL OVERALL CIRCUIT LAYOUT TOPOLOGY.

THE PCB WIRING IS SHOWN IN RED, GREEN WITH A BLUE BUS.

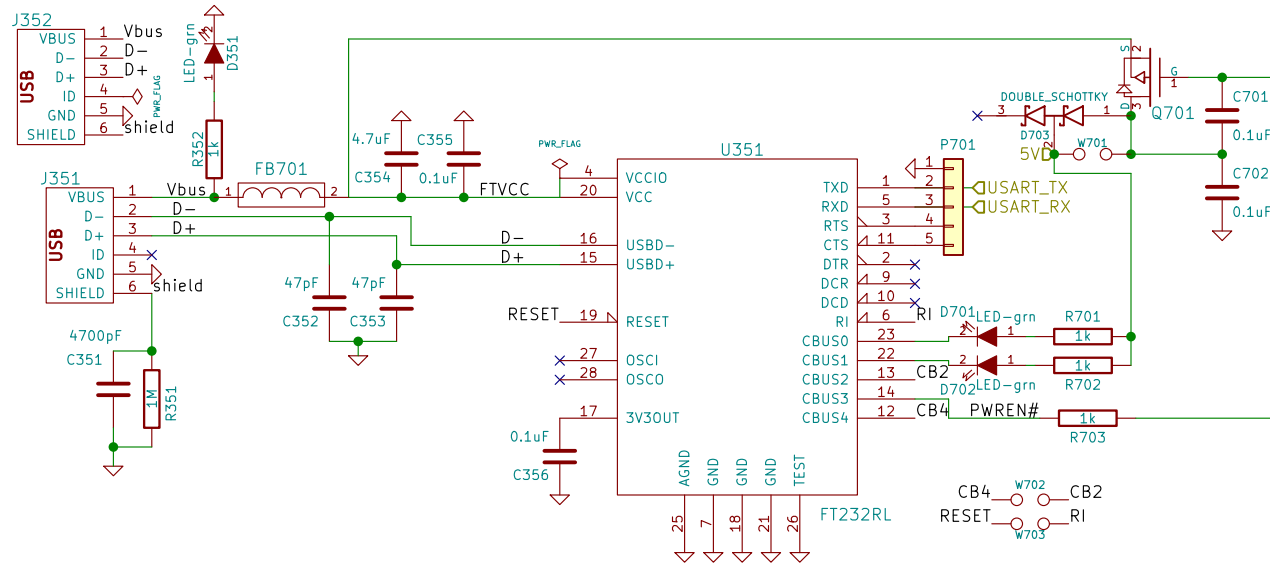
Screw terminals 1760500000

Screw connector PCB <http://octopart.com/39522-1007-molex-655409>

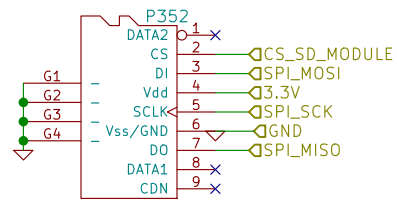
Screw connector harness <http://octopart.com/partsearch#search/requestData&q=39520-0007>

rusEFI.com		
Sheet: /inj_12ch/		
File: inj_12ch.sch		
<b>Title: frankenso</b>		
Size: B	Date: 2019-04-21	Rev: 0.5.6
KiCad E.D.A. kicad (5.1.2)-2		Id: 6/15

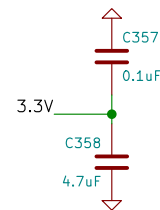
JUMPER WJ01 IS A BACKUP PLAN. THE VOLTAGE DROP ACROSS D703 MAY BE NOT TOLERABLE, SO WE HAVE A BACK UP PLAN IF WE NEED TO BYPASS THE DIODE WITH A LOWER VOLTAGE DROP



For right conn



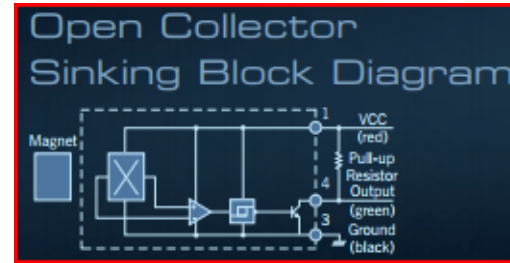
SD card slot  
USB TTL module



<b>rusEFI.com</b>	
Sheet: /mmc_usb_1/ File: mmc_usb_1.sch	
<b>Title: frankenso</b>	
Size: A	Date: 2019-04-21
KiCad E.D.A. kicad (5.1.2)-2	Rev: 0.5.6 Id: 7/15

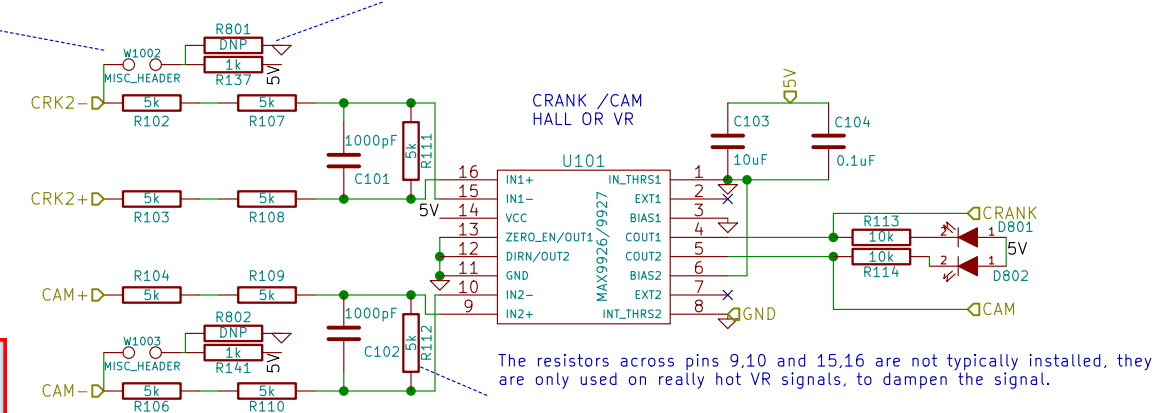
When configured for VR, DNP W1002 or W1003.  
These jumpers allow isolation which prevents the VR signal from getting into the 5V or GND.

Many Hall sensors are set as an open collector sinking topology. Those setups require a pull up resistor, and 1k ohm is a common size. These pull up resistors are noted as R137 and R141 on this page. You need to match these pull up resistors with your hall sensors requirements. Often you need about 5mA of drive. See snippet from Cherry hall sensors to the right. Some sensors are the inverse, and need a pull down resistor. These are less common. These pull down resistors are noted as R801 and R802 on this page and are not typically installed.



Recommended pull-up resistor values are as follows:

Volts dc	5	9	12	15	24
Ohms	1 k	1.8k	2.4 k	3 k	3 k

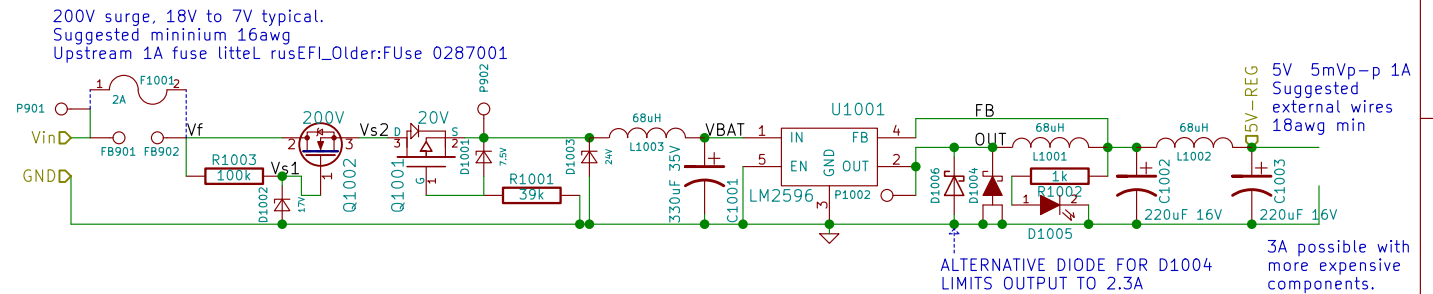


The resistors across pins 9,10 and 15,16 are not typically installed, they are only used on really hot VR signals, to dampen the signal.



Brief overview

- Q1002, R1003, D1002 preform an active transient protection. It will suppress voltages up to 200V down to 19V.
  - Q1001, R1001, D1001 preform a reverse polarity protection. If the input signal is the wrong polarity, the gate will not conduct which will prevent current from flowing.
  - D1003 is a second transient suppressor, it would catch faster transients allowing a brief amount of time for Q1002 to preform it's duty.
  - L1003 is a choke, it simple prevents switching noise from going up the power wire where it can get into other circuits.
  - C1001 is a bulk cap, it simply stores energy locally such that the regulator can draw large currents in short periods of time.
  - U1001 and the components to the right, are a buck style switching regulator, that will pull the 5V line up to 5V. It will not pull it down from 5V if there is an external voltage.
- The U1001 circuit has been designed for 3A output and up to 20V input, but typically 14.4V or 12.4V input. L1001 wants to be about 68uH to 100uH with less than 0.3 ohms resistance.



Alternate options

- Q1002 Microchip, DN2625K4-G with FAIRCHILD, 1N5247B
- D1002 IXYS, IXTA6N50D2 with FAIRCHILD, 1N5244B
- D1004 VISHAY, VS-50WQ04FN-M3 with VISHAY, VS-50WQ04FNPBF

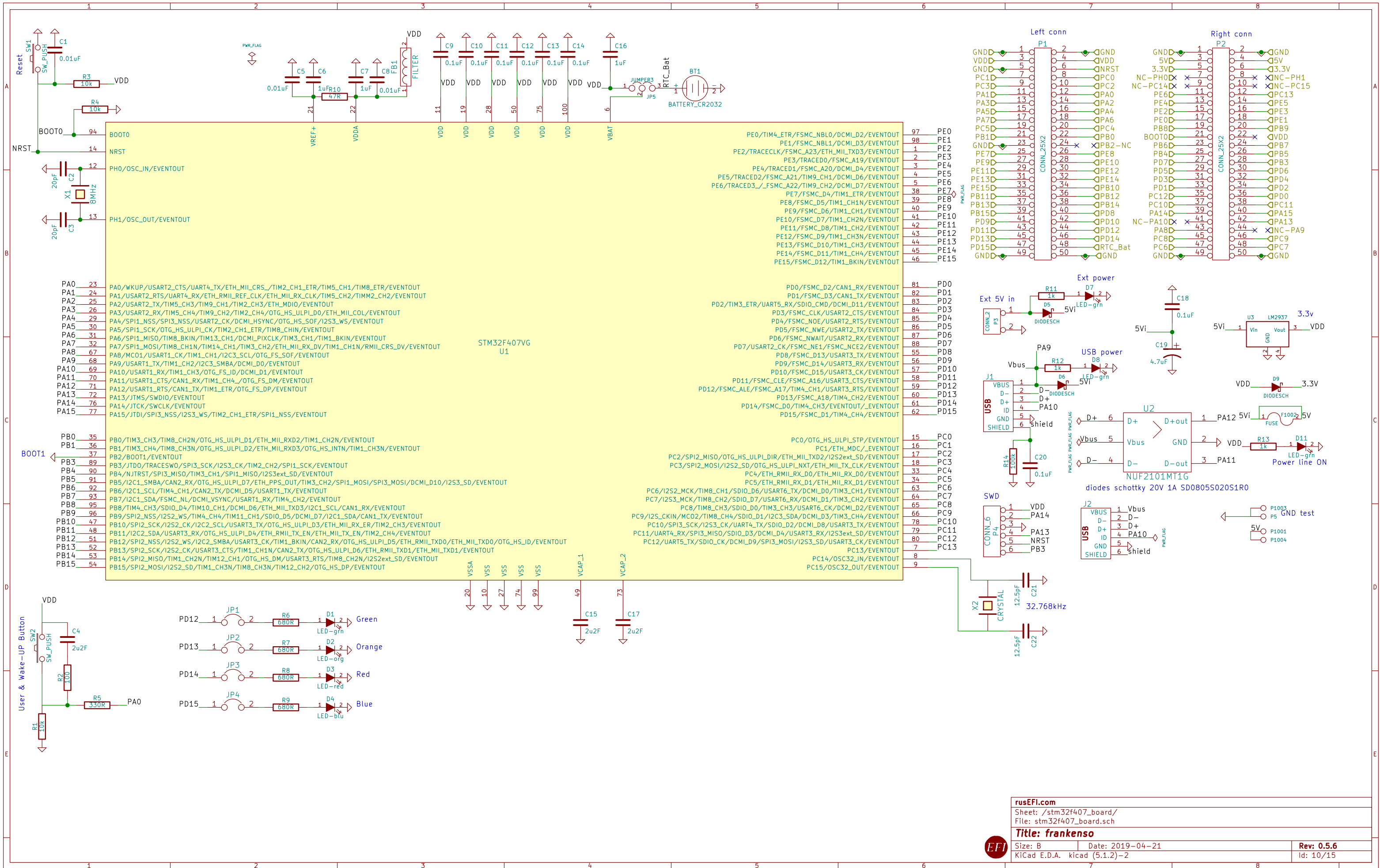
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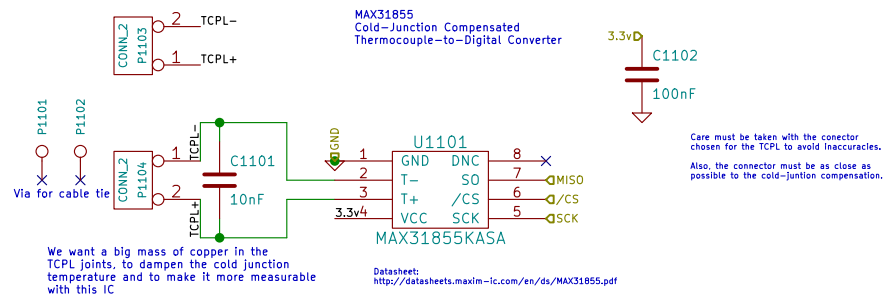
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Title: frankenso

Size: A Date: 2019-04-21  
KiCad E.D.A. kicad (5.1.2)-2

Rev: 0.5.6  
Id: 9/15





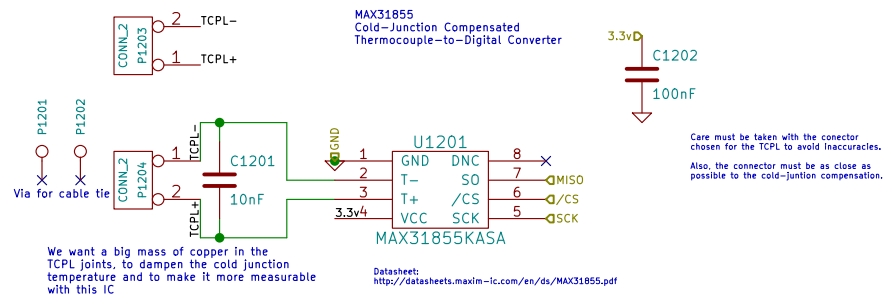
rusEFI.com

Sheet: /thermocouple1/  
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**Title: frankenso**

Size: A Date: 2019-04-21  
KiCad E.D.A. kicad (5.1.2)-2

**Rev: 0.5.6**  
Id: 11/15



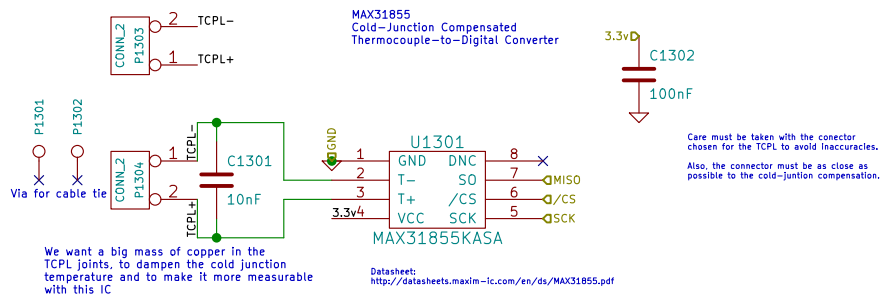
rusEFI.com

Sheet: /thermocouple2/  
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**Title: frankenso**

Size: A Date: 2019-04-21  
KiCad E.D.A. kicad (5.1.2)-2

Rev: 0.5.6  
Id: 12/15



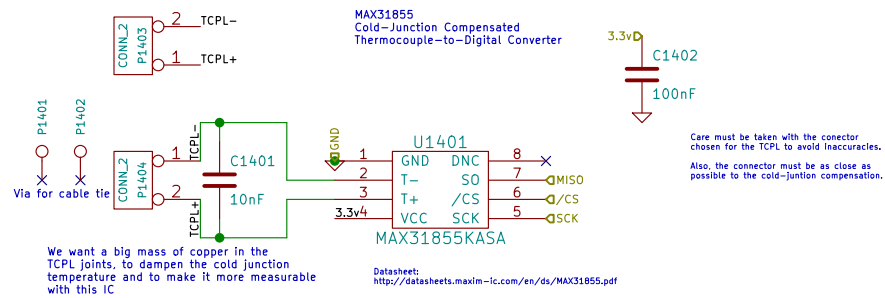
rusEFI.com

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**Rev: 0.5.6**  
Id: 13/15



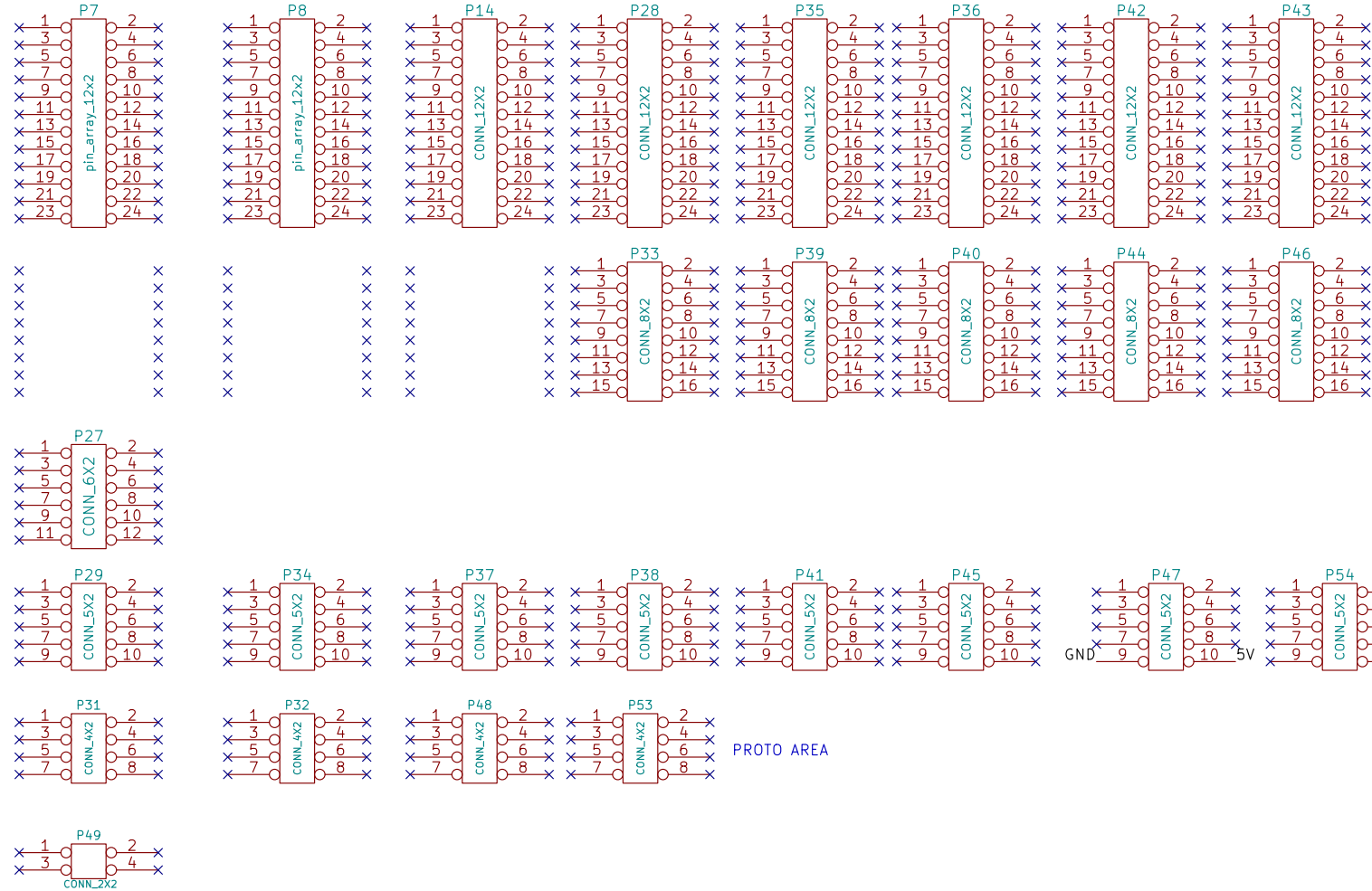
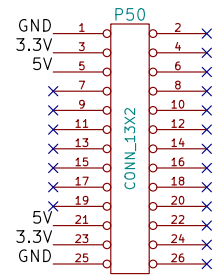
rusEFI.com

Sheet: /thermocouple4/  
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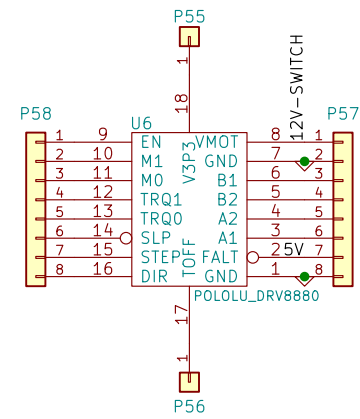
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KiCad E.D.A. kicad (5.1.2)-2

**Rev: 0.5.6**  
Id: 14/15

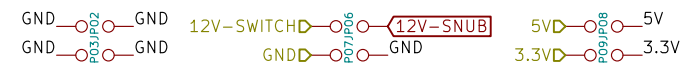


PROTO AREA

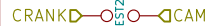


These two jumpers are here to accommodate stm32f4discovery

These four jumpers are test points



That's alternative signal OUTPUT - these traces should be routable to PC6 and PA5 via jumpers. Aleternative to W212 and W212 routing of op-amps ch 11 and ch 12



See below links about barriers in GND planes. The current loops in the layout do not appear to need barriers.

[http://rusefi.com/wiki/index.php?title=Manual:Hardware:PCB\\_design\\_rules](http://rusefi.com/wiki/index.php?title=Manual:Hardware:PCB_design_rules)  
<http://www.maximintegrated.com/en/app-notes/index.mvp/id/5450>

rusEFI.com		
Sheet: /Misc_Vias/		
File: Misc_Vias.sch		
<b>Title: frankenso</b>		
Size: B	Date: 2019-04-21	Rev: 0.5.6
KiCad E.D.A. kicad (5.1.2)-2		Id: 15/15