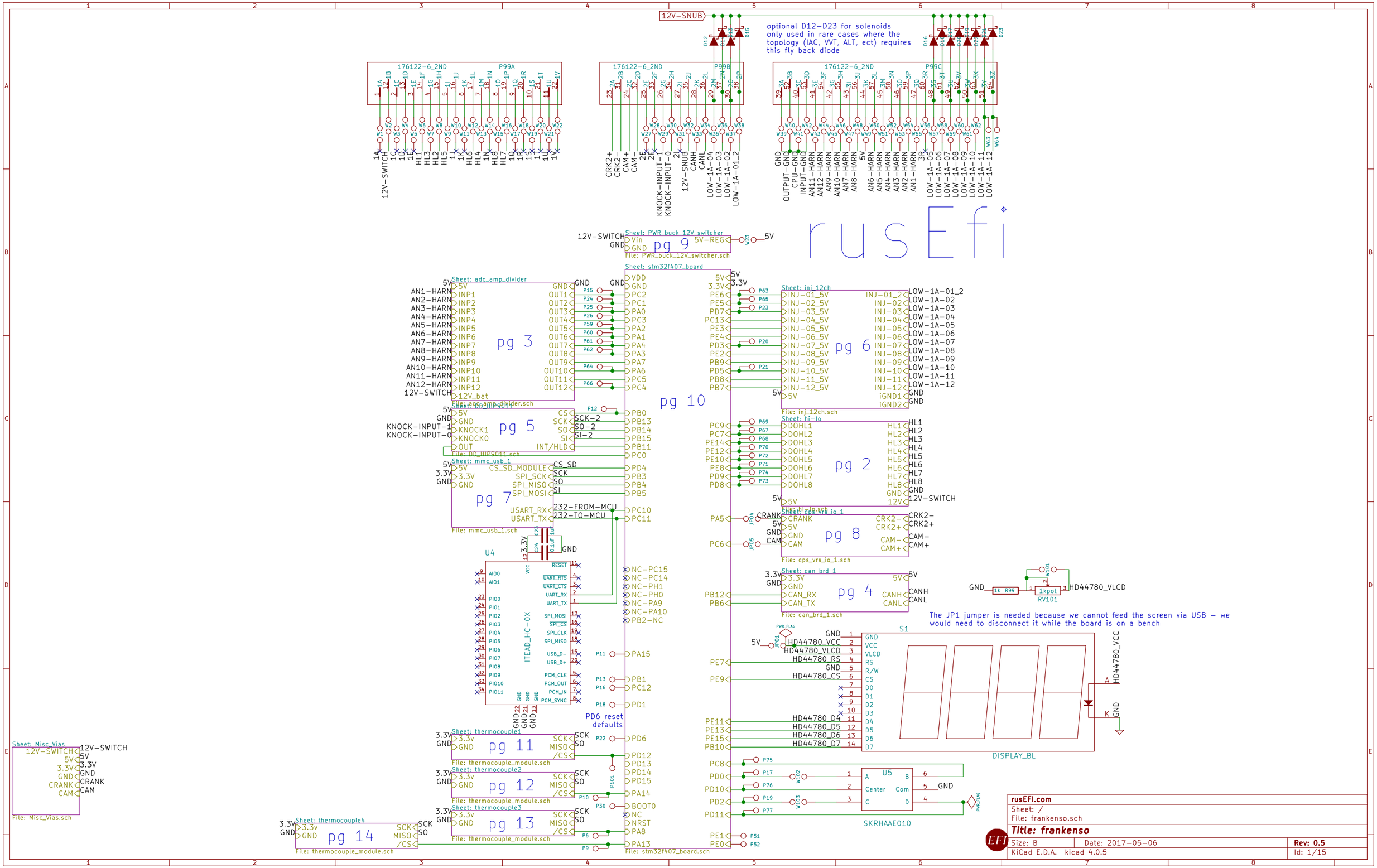

12V-SNUB
optional D12-D23 for solenoids only used in rare cases where the topology (IAC, VVT, ALT, ect) requires this fly back diode
176122-6_2ND P99A
176122-6_2ND P99B
176122-6_2ND P99C
1A
12V-SWITCH
1C
1D
1E
1F
1G
1H
1J
1K
1L
1M
1N
1P
1Q
1R
1S
1T
1U
1V
HL1
HL2
HL3
HL4
HL5
HL6
HL7
HL8
2A
2B
2C
2D
2E
2F
2G
2H
2J
2K
2L
2M
2N
2P
CRK2+
CRK2-
CAM+
CAM-
KNOCK-INPUT-1
KNOCK-INPUT-0
2V
12V-SNUB
CANH
CANL
LOW-1A-04
LOW-1A-03
LOW-1A-02
LOW-1A-01_2
3A
3B
3D
3E
3F
3G
3H
3J
3K
3L
3M
3N
3P
3R
3S
3U
3V
3X
3Y
3Z
GND
OUTPUT-GND
CPU-GND
INPUT-GND
AN11-HARN
AN12-HARN
AN9-HARN
AN10-HARN
AN7-HARN
AN8-HARN
5V
AN6-HARN
AN5-HARN
AN4-HARN
AN3-HARN
AN2-HARN
AN1-HARN
3R
LOW-1A-05
LOW-1A-06
LOW-1A-07
LOW-1A-08
LOW-1A-09
LOW-1A-10
LOW-1A-11
LOW-1A-12
rusEfi
12V-SWITCH
GND
Sheet: PWR_buck_12V_switcher
Vin
GND
5V-REG
pg 9
File: PWR_buck_12V_switcher.sch
Sheet: stm32f407_board
Sheet: adc_amp_divider
5V
AN1-HARN
AN2-HARN
AN3-HARN
AN4-HARN
AN5-HARN
AN6-HARN
AN7-HARN
AN8-HARN
AN9-HARN
AN10-HARN
AN11-HARN
AN12-HARN
12V-SWITCH
INP1
INP2
INP3
INP4
INP5
INP6
INP7
INP8
INP9
INP10
INP11
INP12
12V_bat
OUT1
OUT2
OUT3
OUT4
OUT5
OUT6
OUT7
OUT8
OUT9
OUT10
OUT11
OUT12
pg 3
File: adc_amp_divider.sch
Sheet: DD_HIP9011
KNOCK-INPUT-1
KNOCK-INPUT-0
KNOCK1
KNOCK0
OUT
CS
SCK
SO
SI
INT/HLD
SCK-2
SO-2
SI-2
pg 5
File: DD_HIP9011.sch
Sheet: mmc_usb_1
3.3V
CS_SD_MODULE
SPI_SCK
SPI_MISO
SPI_MOSI
CS_SD
SCK
SO
SI
USART_RX
USART_TX
232-FROM-MCU
232-TO-MCU
pg 7
File: mmc_usb_1.sch
C23
C24
0.1uF
1uF
U4
ITEAD_HC-0X
VCC
GND
AIO0
AIO1
PIO0
PIO1
PIO2
PIO3
PIO4
PIO5
PIO6
PIO7
PIO8
PIO9
PIO10
PIO11
RESET
UART_RTS
UART_CTS
UART_RX
UART_TX
SPI_MOSI
SPI_CS
SPI_CLK
SPI_MISO
USB_D-
USB_D+
PCM_CLK
PCM_OUT
PCM_IN
PCM_SYNC
VDD
PC2
PC1
PA0
PC3
PA2
PA1
PA4
PA3
PA7
PA6
PC5
PC4
PB0
PB13
PB14
PB15
PB11
PC0
PD4
PB3
PB4
PB5
PC10
PC11
NC-PC15
NC-PC14
NC-PH1
NC-PH0
NC-PA9
NC-PA10
PB2-NC
PA15
PB1
PC12
PD1
PD6 reset defaults
PD6
PD12
PD13
PD14
PD15
PA14
BOOT0
NC
NRST
PA8
PA13
pg 10
File: stm32f407_board.sch
Sheet: thermocouple1
Sheet: thermocouple2
Sheet: thermocouple3
Sheet: thermocouple4
3.3v
SCK
MISO
/CS
SO
pg 11
pg 12
pg 13
pg 14
File: thermocouple_module.sch
Sheet: inj_12ch
INJ-01_5V
INJ-02_5V
INJ-03_5V
INJ-04_5V
INJ-05_5V
INJ-06_5V
INJ-07_5V
INJ-08_5V
INJ-09_5V
INJ-10_5V
INJ-11_5V
INJ-12_5V
INJ-01_2
INJ-02
INJ-03
INJ-04
INJ-05
INJ-06
INJ-07
INJ-08
INJ-09
INJ-10
INJ-11
INJ-12
iGND1
iGND2
pg 6
File: inj_12ch.sch
Sheet: hi-lo
DOHL1
DOHL2
DOHL3
DOHL4
DOHL5
DOHL6
DOHL7
DOHL8
pg 2
File: hi-lo.sch
Sheet: cps_vrs_io_1
CRANK
CAM
pg 8
File: cps_vrs_io_1.sch
Sheet: can_brd_1
CAN_RX
CAN_TX
pg 4
File: can_brd_1.sch
JP1
JP2
JP3
JP4
JP5
JP6
PWR_FLAG
HD44780_VCC
HD44780_VLCD
HD44780_RS
HD44780_CS
HD44780_D4
HD44780_D5
HD44780_D6
HD44780_D7
S1
GND
VCC
VLCD
RS
R/W
CS
D0
D1
D2
D3
D4
D5
D6
D7
A
K
DISPLAY_BL
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
RV101
1k R99
1kpot
HD44780_VLCD
U5
SKRHAAE010
A
B
Center
Com
C
D
PWR_JTAG
Sheet: Misc_Vias
12V-SWITCH
5V
3.3V
GND
CRANK
CAM
File: Misc_Vias.sch
rusEFI.com
Sheet: /
File: frankenso.sch
Title: frankenso
Size: B
Date: 2017-05-06
Rev: 0.5
KiCad E.D.A. kicad 4.0.5
Id: 1/15

8 channel high / low side driver

rusEFI.com		
Sheet: /hi-lo/ File: hi-lo.sch		
Title: frankenso		
Size: B	Date: 2017-04-22	**Rev: 0.5**
KiCad E.D.A. kicad 4.0.5		Id: 2/15

INP4
R240 dnp
500K R241
R242 10k
DOUBLE_SCHOTTKY D240
R243 100
U201A MCP6004
R244 1500 .1%
R245 1500 .1%
OUT4

INP8
R282 10k
470K R281
DOUBLE_SCHOTTKY D280
R283 100
0.01uF C280
U202A MCP6004
R284 1500 .1%
R285 1500 .1%
OUT8

INP12
10K .1% R321
R324 1500 .1%
R325 1500 .1%
OUT12

INP3
R230 dnp
500K R231
R232 10k
DOUBLE_SCHOTTKY D230
R233 100
0.01uF C230
U201B MCP6004
R234 1500 .1%
R235 1500 .1%
OUT3

INP7
R270 dnp
500K R271
R272 10k
DOUBLE_SCHOTTKY D270
R273 100
0.01uF C270
U202B MCP6004
R274 1500 .1%
R275 1500 .1%
OUT7

INP11
dnp R311
R313 100
C?
R314 1500 .1%
R315 1500 .1%
OUT11

INP2
R220 2700
dnp R221
R222 10k
DOUBLE_SCHOTTKY D220
R223 100
U201C MCP6004
R224 1500 .1%
R225 1500 .1%
OUT2

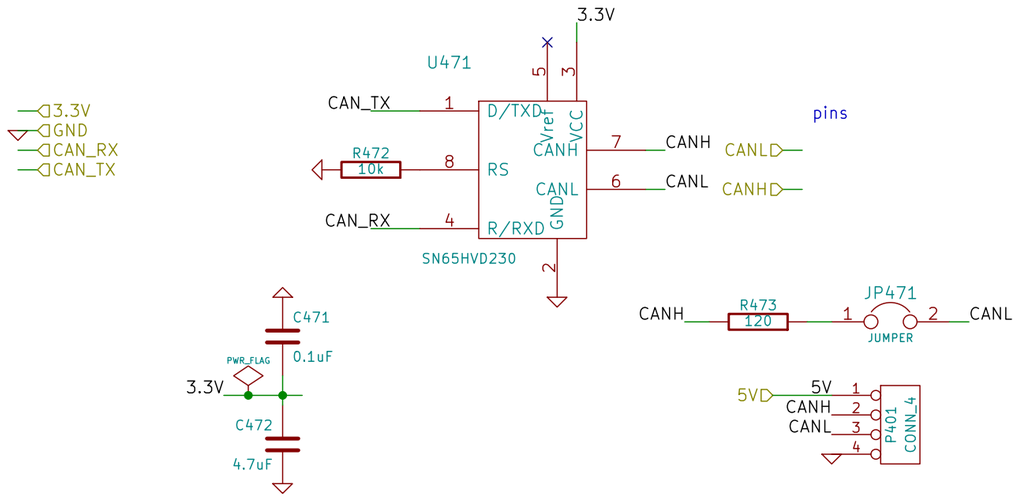
INP6
dnp R261
R262 10k
DOUBLE_SCHOTTKY D260
R263 100
0.01uF C260
U202C MCP6004
R264 1500 .1%
R265 1500 .1%
OUT6

INP10
R302 10k
dnp R301
DOUBLE_SCHOTTKY D300
R303 100
0.01uF C300
U203C MCP6004
R304 1500 .1%
R305 1500 .1%
OUT10

INP1
R210 2700
dnp R211
R212 10k
DOUBLE_SCHOTTKY D210
R213 100
1uF C210
C211 0.1uF
U201D MCP6004
R214 1500 .1%
R215 1500 .1%
OUT1

INP5
R250 dnp
500K R251
R252 10k
DOUBLE_SCHOTTKY D250
R253 100
0.01uF C250
C251 0.1uF
U202D MCP6004
R254 1500 .1%
R255 1500 .1%
OUT5

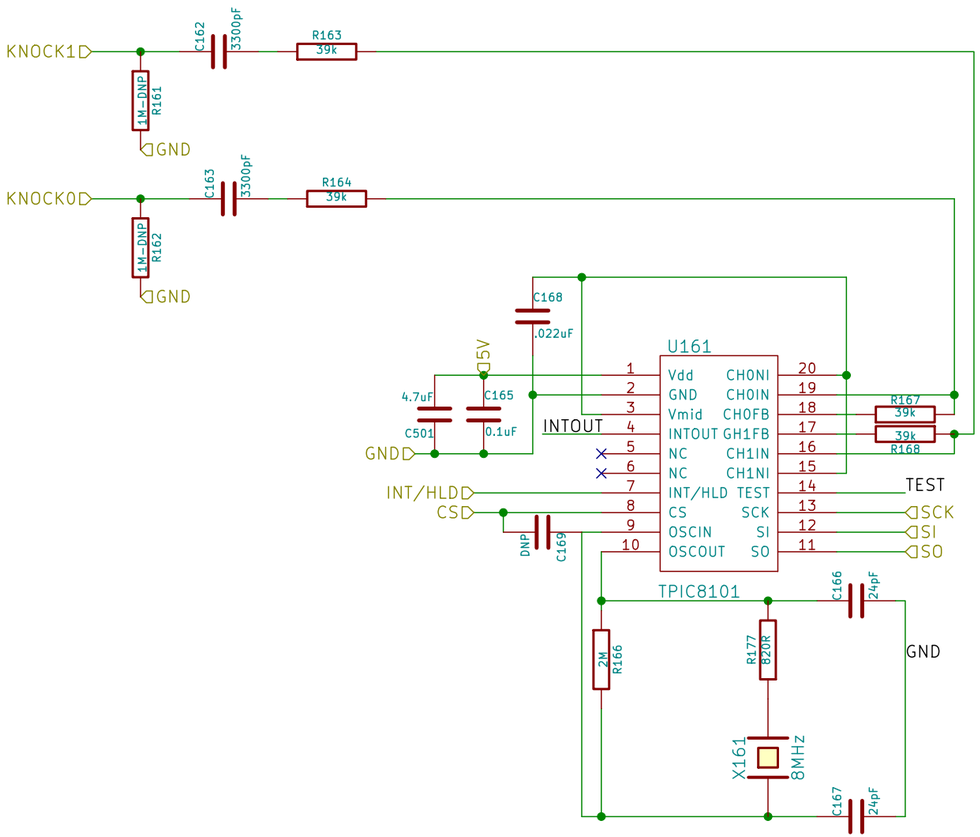
INP9
R290 1k
dnp R291
R292 10k
DOUBLE_SCHOTTKY D290
R293 100
0.01uF C290
C291 0.1uF
U203D MCP6004
R294 1500 .1%
R295 1500 .1%
OUT9

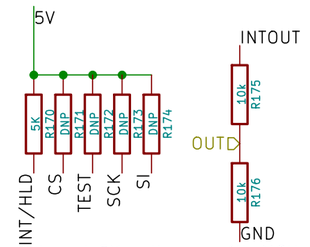


CAN level shifter

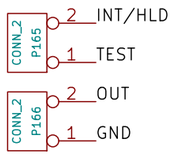
rusEFI.com		
Sheet: /can_brd_1/ File: can_brd_1.sch		
Title: frankenso		
Size: A	Date: 2017-04-22	**Rev: 0.5**
KiCad E.D.A. kicad 4.0.5		Id: 4/15

DD_HIP9011 ver.2
RusEfi.com



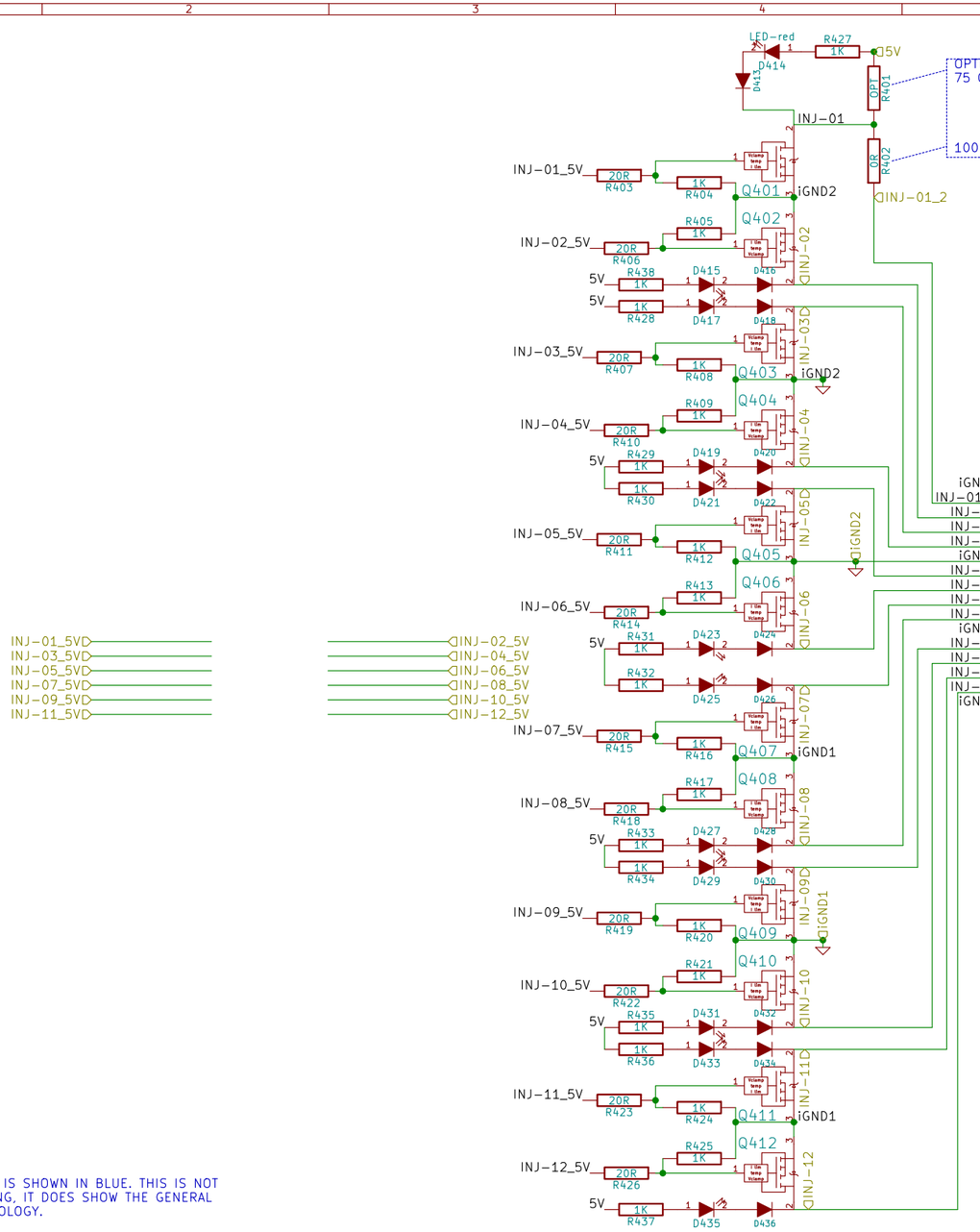


NOTE:
SPI uses internal 5V pull ups, with MCU SPI being float to pull down.
This allows 3.3V / 5V tolerante MCU's to use these SPI coms.



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 = ([Cin+C1][C2+Cout])/(Cin+C1+C2_Cout)+PCBstray
Cload = ([5+24][24+5])/(5+24+24+5)+3.5= 18.0pF
C1=C2=C166=C167 = 24pF
Rs = 1/(2piFC2) = 1/(2*pi*8MHz*24pF) = 829ohms, 820ohms is close enough = R177

rusEFI.com		
Sheet: /DD_HIP9011/		
File: DD_HIP9011.sch		
Title: frankenso		
Size: A	Date: 2017-04-22	**Rev: 0.5**
KiCad E.D.A. kicad 4.0.5		Id: 5/15



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.

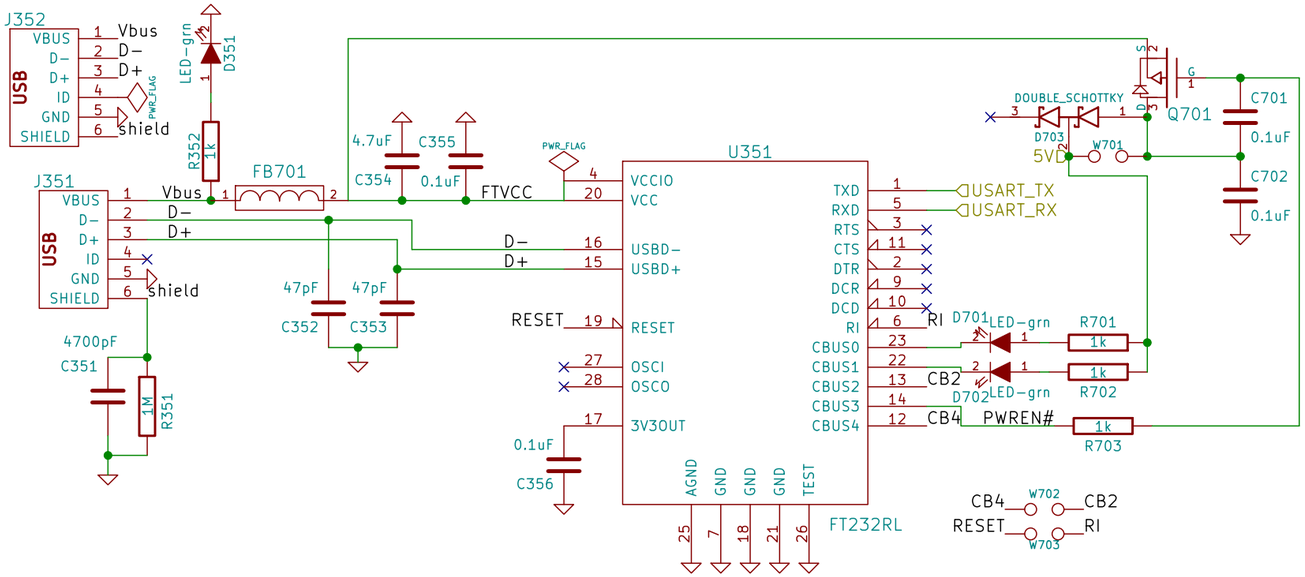
THE PCB WIRING IS SHOWN IN RED, GREEN WITH A BLUE BUS.

Screw terminals 1760500000

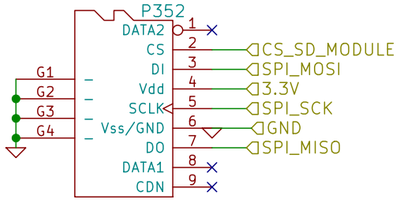
Screw connector PCB http://octopart.com/39522-1007-molex-655409
Screw connector harness http://octopart.com/partsearch#search/requestData&q=39520-0007

rusEFI.com		
Sheet: /inj_12ch/		
File: inj_12ch.sch		
Title: frankenso		
Size: B	Date: 2017-04-22	**Rev: 0.5**
KiCad E.D.A. kicad 4.0.5		Id: 6/15

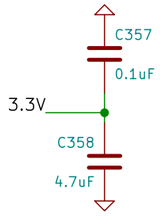
JUMPER WJ01 IS A BACKUP PLAN. THE VOLTAGE DROP ACROSS D703 MAY BE NOT TOLERABLE, SO WE HAVE A BACK UP PLAN IF WE NEED TO BYPASS THE DIODE WITH A LOWER VOLTAGE DROP



For right conn

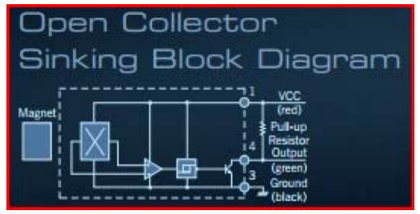


SD card slot
USB TTL module



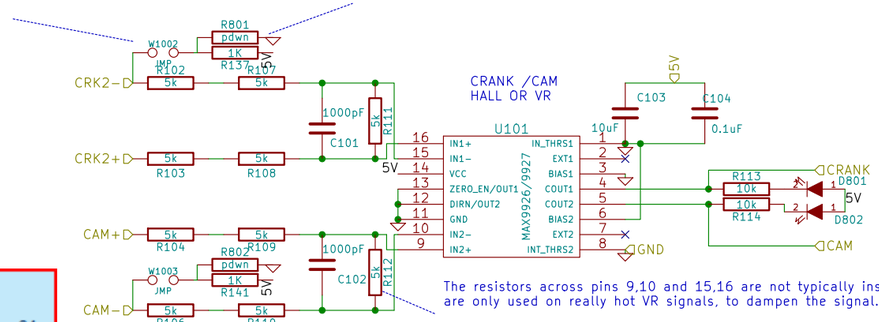
rusEFI.com		
Sheet: /mmc_usb_1/ File: mmc_usb_1.sch		
Title: frankenso		
Size: A	Date: 2017−04−22	**Rev: 0.5**
KiCad E.D.A. kicad 4.0.5		Id: 7/15

When configured for VR, do not populate W1002 or W1003.
These jumpers allow isolation which prevents the VR signal
from getting into the 5V or GND.



Recommended pull-up resistor values are as follows:					
Volts dc	5	9	12	15	24
Ohms	1k	1.8k	2.4k	3k	3k

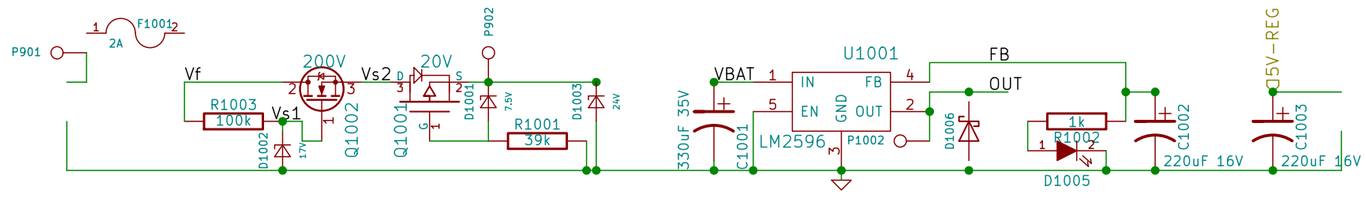
Many Hall sensors are set as a open collector sinking topology.
Those setups require a pull up resistor, and 1k ohm is a common size.
These pull up resistors are noted as R137 and R141 on this page.
You need to match these pull up resistors with your hall sensors requirements.
Often you need about 5mA 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.

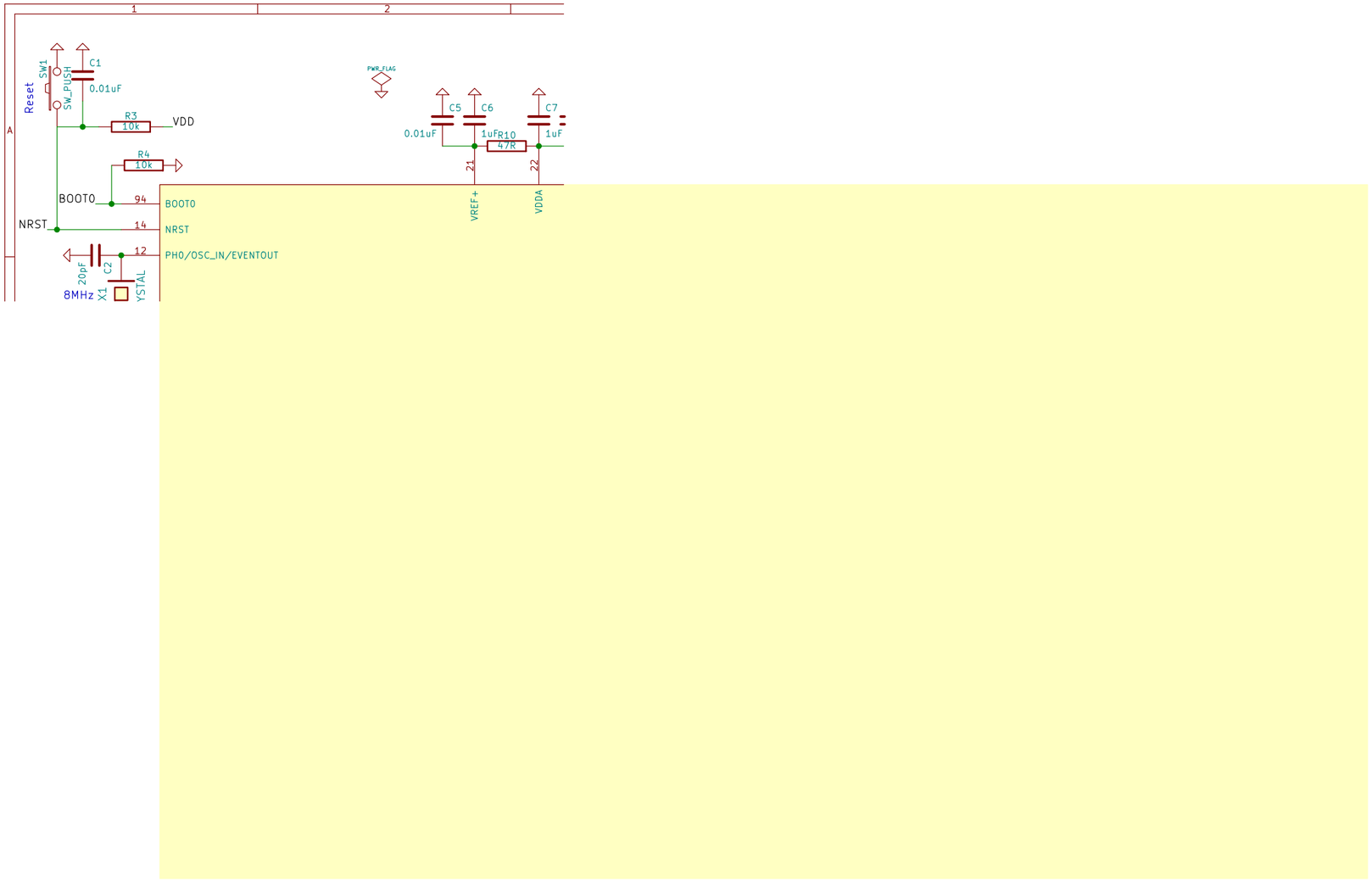


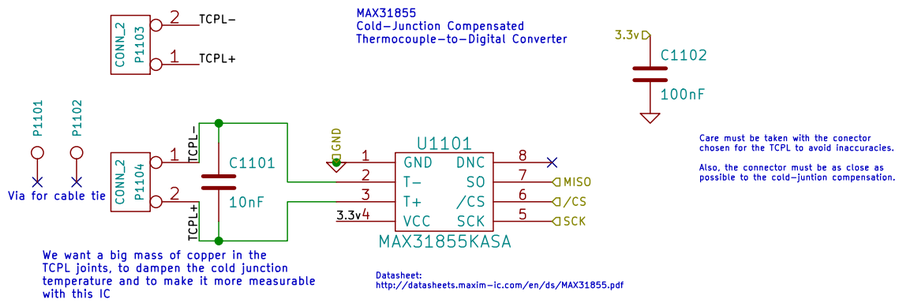
The resistors across pins 9,10 and 15,16 are not typically installed, they
are only used on really hot VR signals, to dampen the signal.

rusEFI.com		
Sheet: /cps_vrs_io_1/ File: cps_vrs_io_1.sch		
Title: frankenso		
Size: B	Date: 2017-04-22	**Rev: 0.5**
KiCad E.D.A. kicad 4.0.5		Id: 8/15

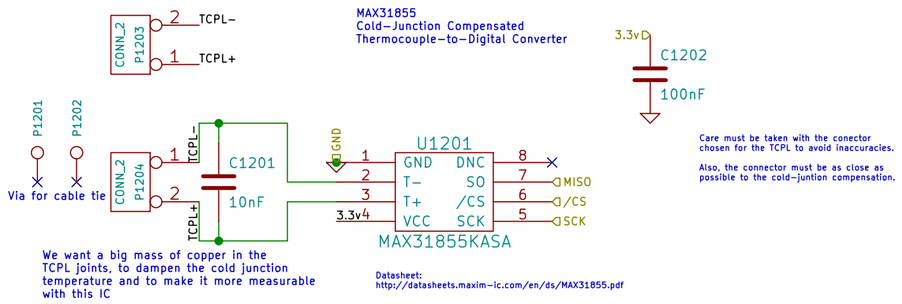
Brief overview
-- Q1002, R1003, D1002 preform an active transient protection. It will suppress voltages up to 200V down to 19V.
-- Q1001, R1001, D1001 preform a reverse polarity protection. If the input signal is the wrong polarity, the gate will not conduct which will prevent current from flowing.
-- 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



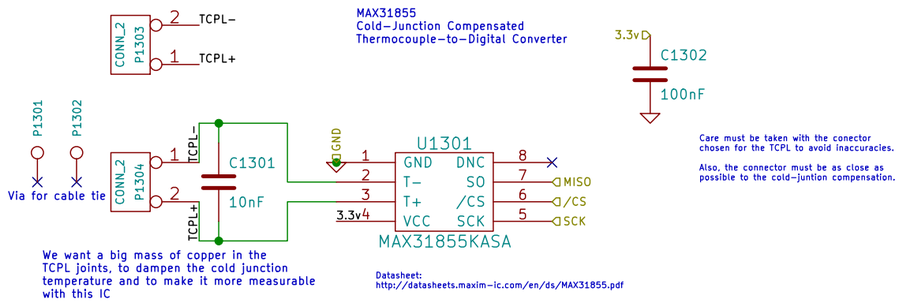

1
2
A
Reset
SW1
SW_PUSH
C1
0.01uF
R3
10k
VDD
R4
10k
BOOT0
NRST
20pF
C2
8MHz
X1
YSTAL
PWR_FLAG
C5
0.01uF
C6
1uF
R10
47R
C7
1uF
21
22
VREF+
VDDA
94
14
12
BOOT0
NRST
PH0/OSC_IN/EVENTOUT



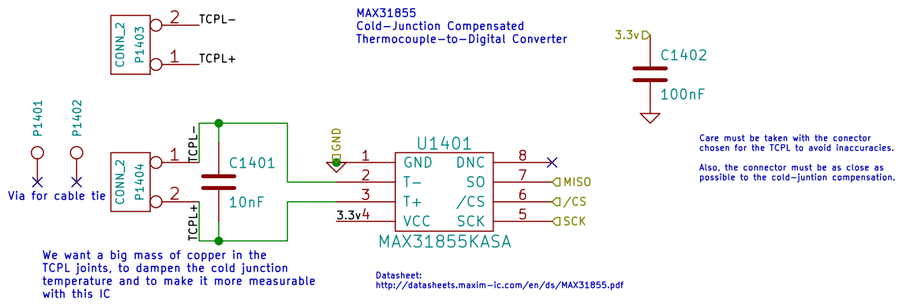
rusEFI.com		
Sheet: /thermocouple1/ File: thermocouple_module.sch		
Title: frankenso		
Size: A	Date: 2017-04-22	**Rev: 0.5**
KiCad E.D.A. kicad 4.0.5		Id: 11/15



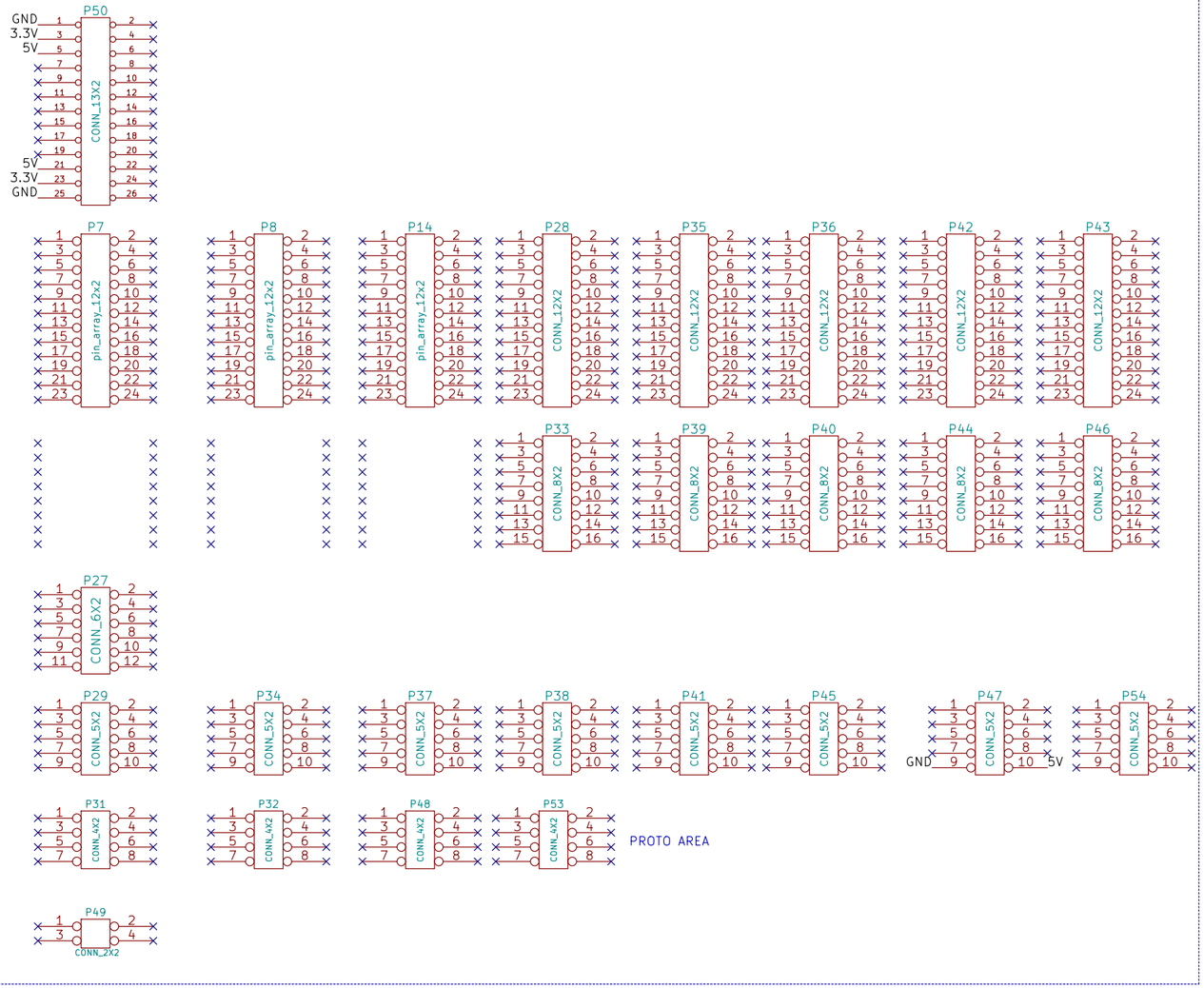
rusEFI.com		
Sheet: /thermocouple2/ File: thermocouple_module.sch		
Title: frankenso		
Size: A	Date: 2017-04-22	**Rev: 0.5**
KiCad E.D.A. kicad 4.0.5		Id: 12/15

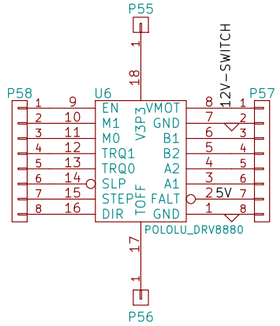


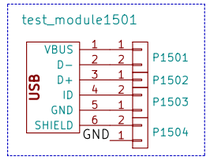
rusEFI.com		
Sheet: /thermocouple3/ File: thermocouple_module.sch		
Title: frankenso		
Size: A	Date: 2017-04-22	**Rev: 0.5**
KiCad E.D.A. kicad 4.0.5		Id: 13/15

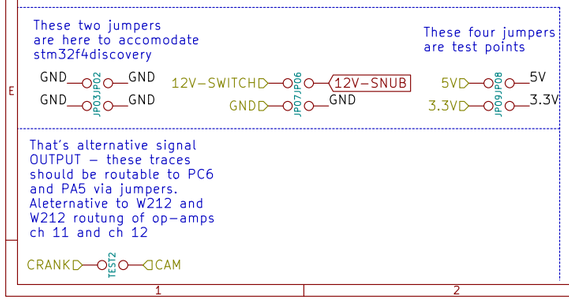


rusEFI.com		
Sheet: /thermocouple4/ File: thermocouple_module.sch		
Title: frankenso		
Size: A	Date: 2017-04-22	**Rev: 0.5**
KiCad E.D.A. kicad 4.0.5		Id: 14/15









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://www.maximintegrated.com/en/app-notes/index.mvp/id/5450

rusEFI.com		
Sheet: /Misc_Vias/ File: Misc_Vias.sch		
Title: frankenso		
Size: B	Date: 2017-04-22	**Rev: 0.5**
KiCad E.D.A. kicad 4.0.5		Id: 15/15