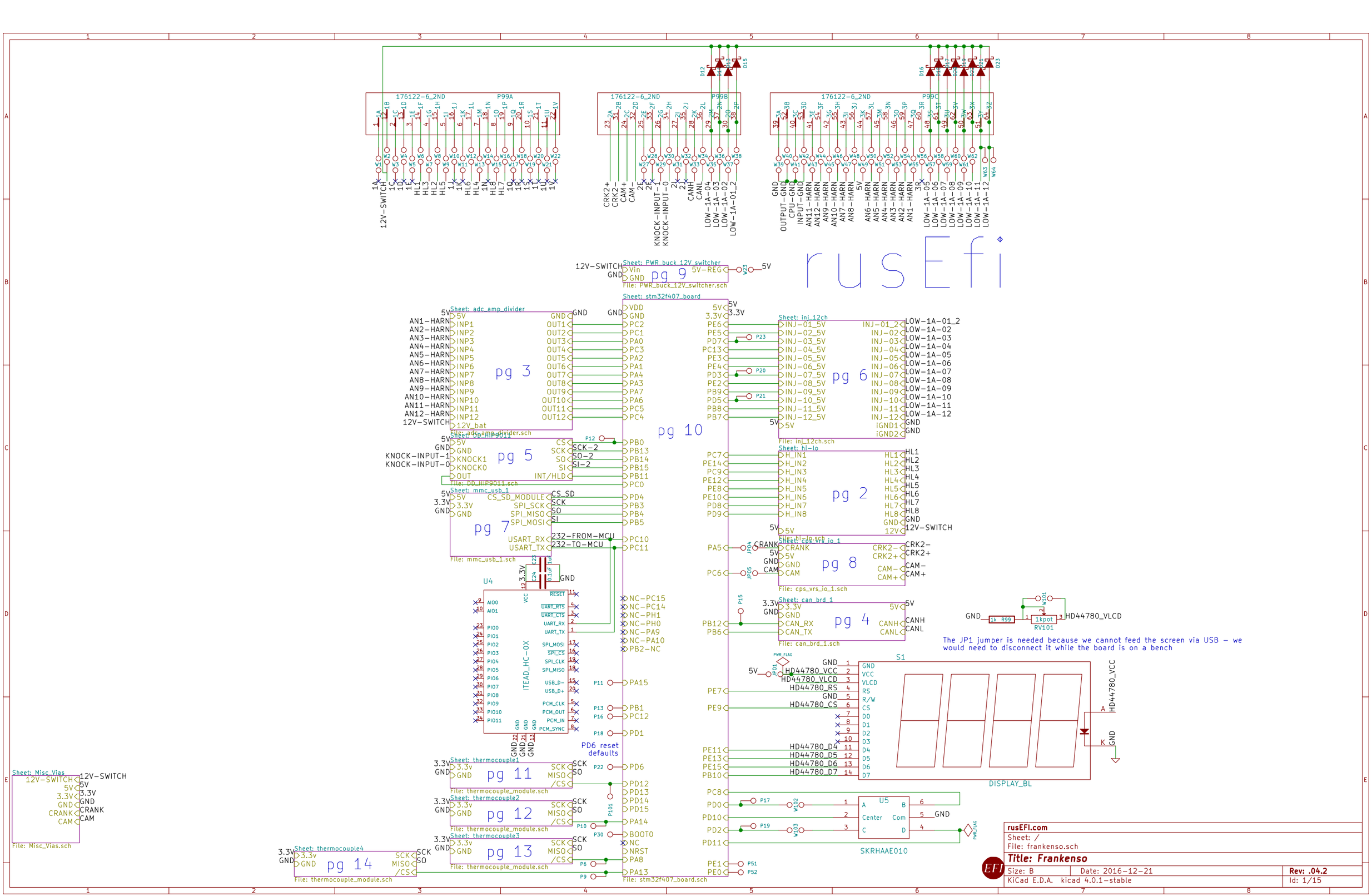
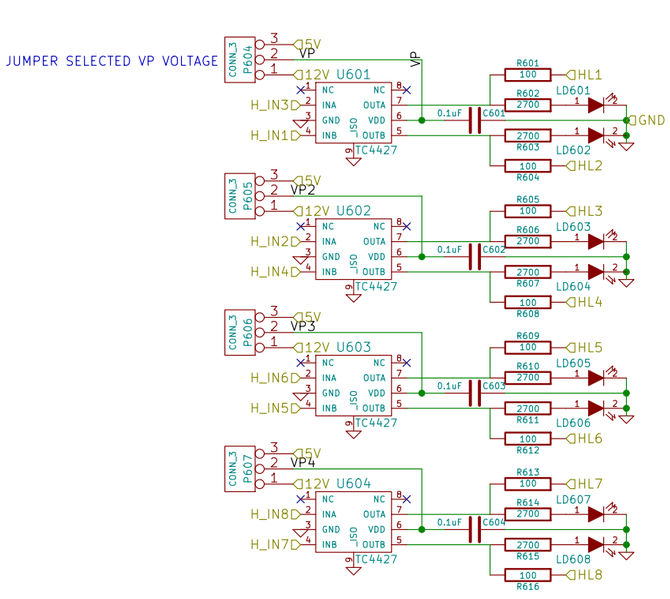

176122-6_2ND P99A
176122-6_2ND P99B
176122-6_2ND P99C
12V-SWITCH
CRK2+
CRK2-
CAM+
CAM-
KNOCK-INPUT-1
KNOCK-INPUT-0
GND
OUTPUT-GND
CPU-GND
INPUT-GND
rusEfi
Sheet: PWR_buck_12V_switcher
File: PWR_buck_12V_switcher.sch
pg 9
Sheet: stm32f407_board
File: stm32f407_board.sch
pg 10
Sheet: adc_amp_divider
File: adc_amp_divider.sch
pg 3
Sheet: DD_HIP9011
File: DD_HIP9011.sch
pg 5
Sheet: mmc_usb_1
File: mmc_usb_1.sch
pg 7
Sheet: thermocouple1
Sheet: thermocouple2
Sheet: thermocouple3
Sheet: thermocouple4
File: thermocouple_module.sch
pg 11
pg 12
pg 13
pg 14
Sheet: inj_12ch
File: inj_12ch.sch
pg 6
Sheet: hi-lo
File: hi-lo.sch
pg 2
Sheet: cps_vrs_io_1
File: cps_vrs_io_1.sch
pg 8
Sheet: can_brd_1
File: can_brd_1.sch
pg 4
U4
ITEAD_HC-0X
PD6 reset defaults
U5
SKRHAAE010
S1
DISPLAY_BL
RV101
1kpot
1k R99
HD44780_VLCD
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
Sheet: Misc_Vias
File: Misc_Vias.sch
rusEFI.com
Sheet: /
File: frankenso.sch
Title: Frankenso
Size: B
Date: 2016-12-21
Rev: .04.2
KiCad E.D.A. kicad 4.0.1-stable
Id: 1/15

8 channel high / low side driver



rusEFI.com		
Sheet: /hi-lo/ File: hi-lo.sch		
Title: Frankenso		
Size: B	Date: 2016-12-21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1-stable		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
OUT11
OUT9

SUGGESTED / DEFAULT ENGINE WIRING IN BLUE

O2 INP4 5V R242 10k R241 500K R240 DOUBLE_SCHOTTKY D240 R243 100 C240 0.01uF U201A MCP6004 R244 1500 .1% R245 1500 .1% OUT4

MAP MAF INP3 GND 5V R232 10k R231 500K R230 DOUBLE_SCHOTTKY D230 R233 100 C230 0.01uF U201B MCP6004 R234 1500 .1% R235 1500 .1% OUT3

IAT 1K – 10K INP2 GND 5V R220 2700 R221 10K R222 10k DOUBLE_SCHOTTKY D220 R223 100 C220 0.01uF U201C MCP6004 R224 1500 .1% R225 1500 .1% OUT2

CLT 1K – 10K INP1 GND 5V R210 2700 R211 10K R212 10k DOUBLE_SCHOTTKY D210 R213 100 C210 0.01uF C211 0.1uF U201D MCP6004 GNDD R214 1500 .1% R215 1500 .1% OUT1

INP8 5V R280 10K R281 10K R282 10k DOUBLE_SCHOTTKY D280 R283 100 C280 0.01uF U202A MCP6004 R284 1500 .1% R285 1500 .1% OUT8

INP7 5V R270 10K R271 500K R272 10k DOUBLE_SCHOTTKY D270 R273 100 C270 0.01uF U202B MCP6004 R274 1500 .1% R275 1500 .1% OUT7

INP6 5V R260 10K R261 10K R262 10k DOUBLE_SCHOTTKY D260 R263 100 C260 0.01uF U202C MCP6004 R264 1500 .1% R265 1500 .1% OUT6

TPS 1K – 10K INP5 GND 5V R250 10K R251 500K R252 10k DOUBLE_SCHOTTKY D250 R253 100 C250 0.01uF C254 0.1uF U202D MCP6004 R254 1500 .1% R255 1500 .1% OUT5

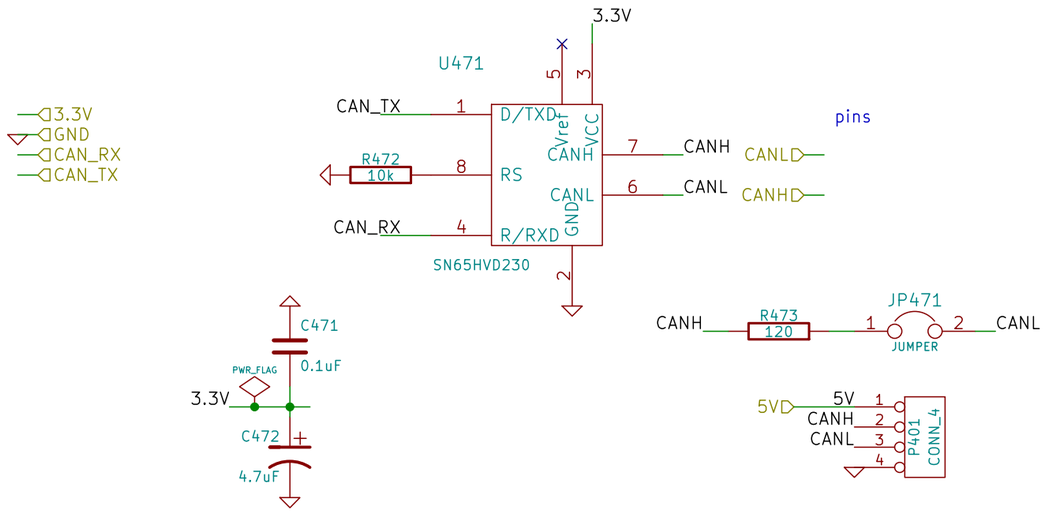
VBAT 12V_bat 12.02 50.2k R320 39K 0.1% INP12 8.93k R321 10K 1% R322 10k 2.445 2.160 DOUBLE_SCHOTTKY D320 2.443 2.160 R323 100 C320 0.01uF 2.443 2.160 U203A MCP6004 2.426 2.160 R324 1500 .1% 1.246 1.0798 R325 1500 .1% OUT12

ALT CAM INP11 5V R310 1k R311 10K R312 10k DOUBLE_SCHOTTKY D310 R313 100 C310 0.01uF U203B MCP6004 R314 1500 .1% R315 1500 .1% JP11 OUT11

INP10 5V R300 10K R301 10K R302 10k DOUBLE_SCHOTTKY D300 R303 100 C300 0.01uF U203C MCP6004 R304 1500 .1% R305 1500 .1% OUT10

ALT CRANK INP9 5V R290 1k R291 10K R292 10k DOUBLE_SCHOTTKY D290 R293 100 C290 0.01uF C291 0.1uF PWR_FLAG U203D MCP6004 R294 1500 .1% R295 1500 .1% JP9 OUT9

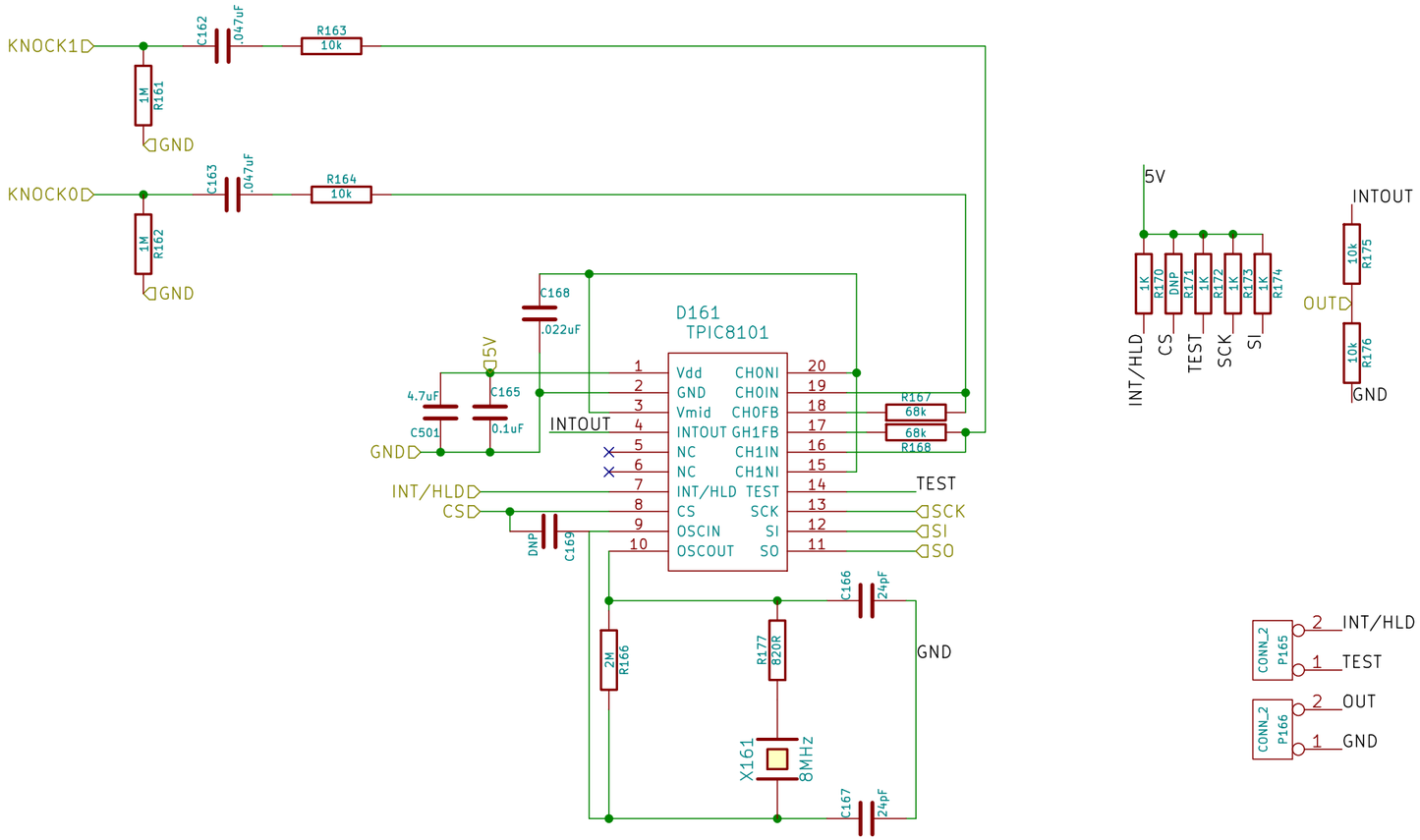
rusEFI.com		
Sheet: /adc_amp_divider/		
File: adc_amp_divider.sch		
Title: Frankenso		
Size: B	Date: 2016-12-21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1-stable		Id: 3/15



CAN level shifter

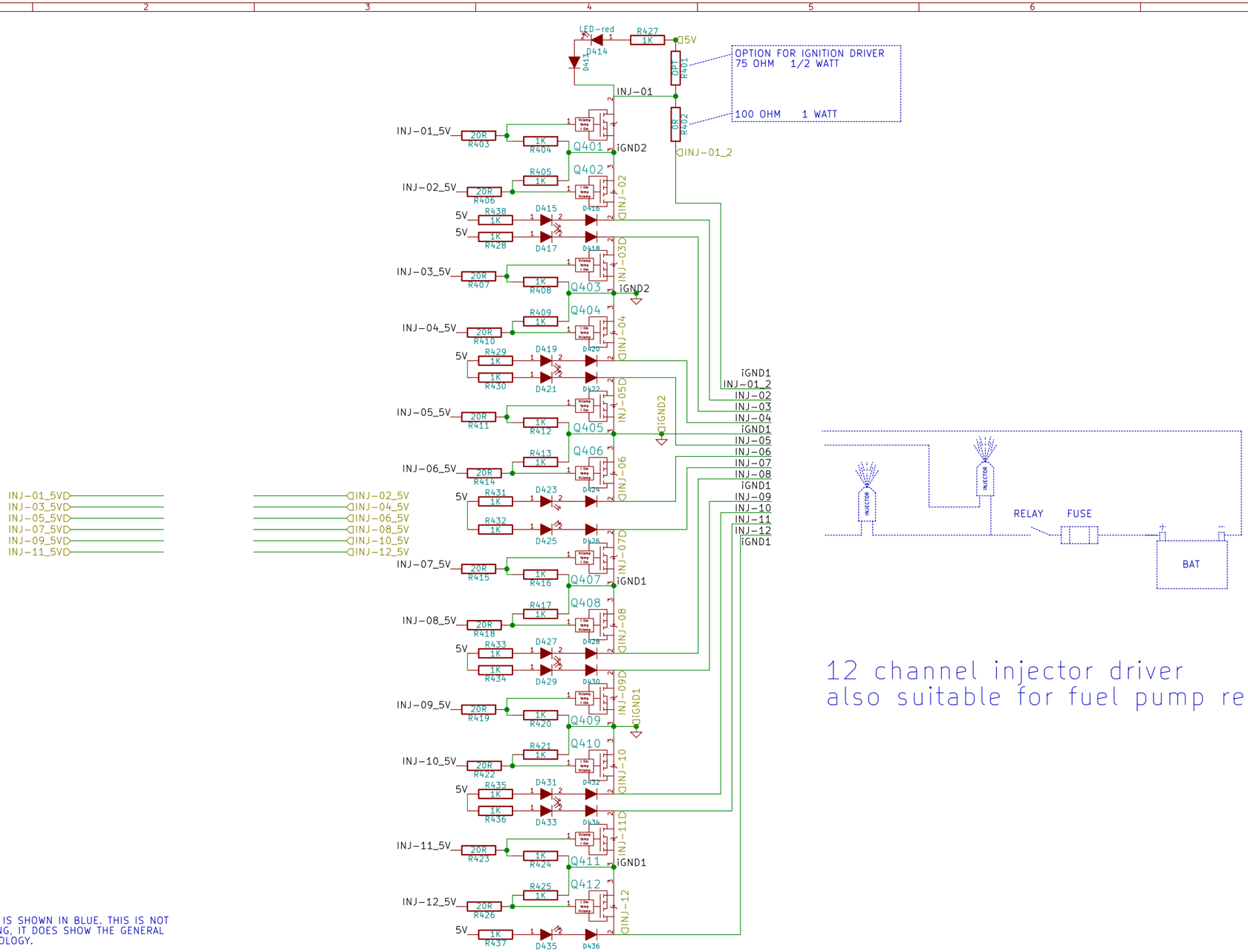
rusEFI.com		
Sheet: /can_brd_1/ File: can_brd_1.sch		
Title: Frankenso		
Size: A4	Date: 2016-12-21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1-stable		Id: 4/15

DD_HIP9011 ver.2
RusEfi.com



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 = 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= 18pF
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: A4	Date: 2016-12-21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1-stable		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.

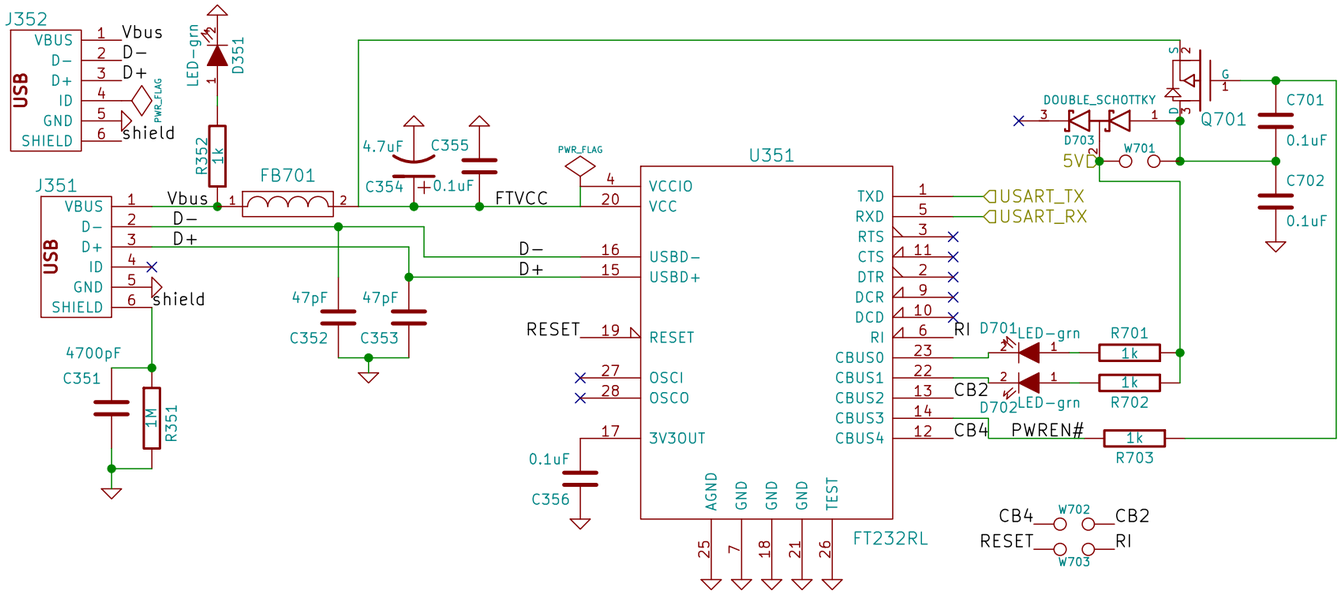
THE PCB WIRING IS SHOWN IN RED, GREEN WITH A BLUE BUS.

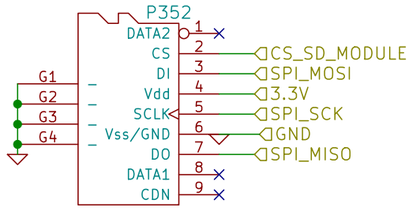
Screw terminals 1760500000

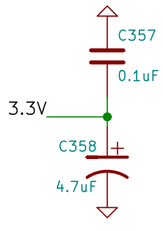
Screw connector PCB http://octopart.com/39522-1007-molex-655409
Screw connector harness http://octopart.com/partsearch#search/requestData&q=39520-0007

rusEFI.com		
Sheet: /inj_12ch/		
File: inj_12ch.sch		
Title: Frankenso		
Size: B	Date: 2016-12-21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1-stable		Id: 6/15

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



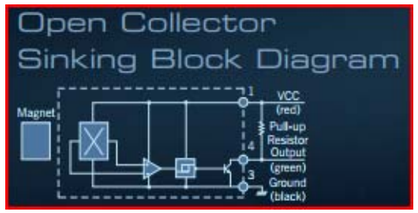




SD card slot
USB TTL module

rusEFI.com		
Sheet: /mmc_usb_1/ File: mmc_usb_1.sch		
Title: Frankenso		
Size: A4	Date: 2016−12−21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1−stable		Id: 7/15

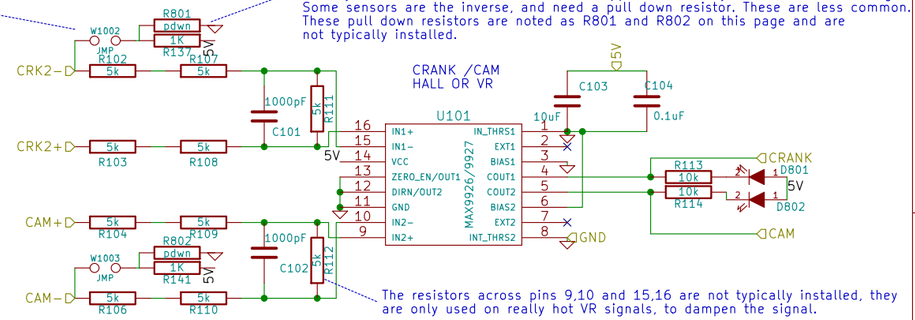
When configured for VR, do not populate W1002 or W1003.
These jumpers allow isolation which prevents the VR signal
from getting into the 5V or GND.



Recommended pull-up resistor values are as follows:

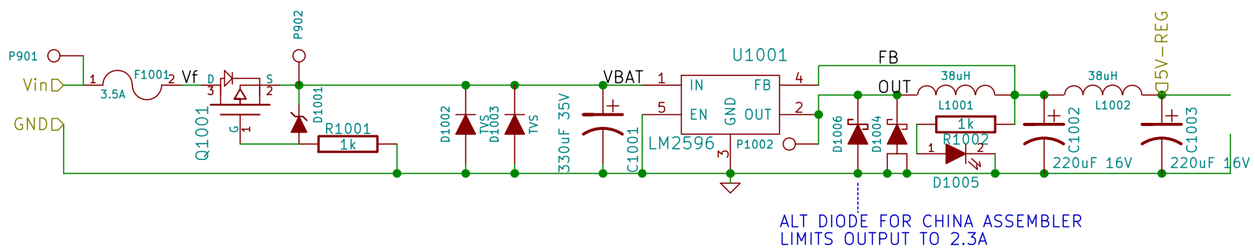
Volts dc	5	9	12	15	24
Ohms	1k	1.8k	2.4k	3k	3k

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.

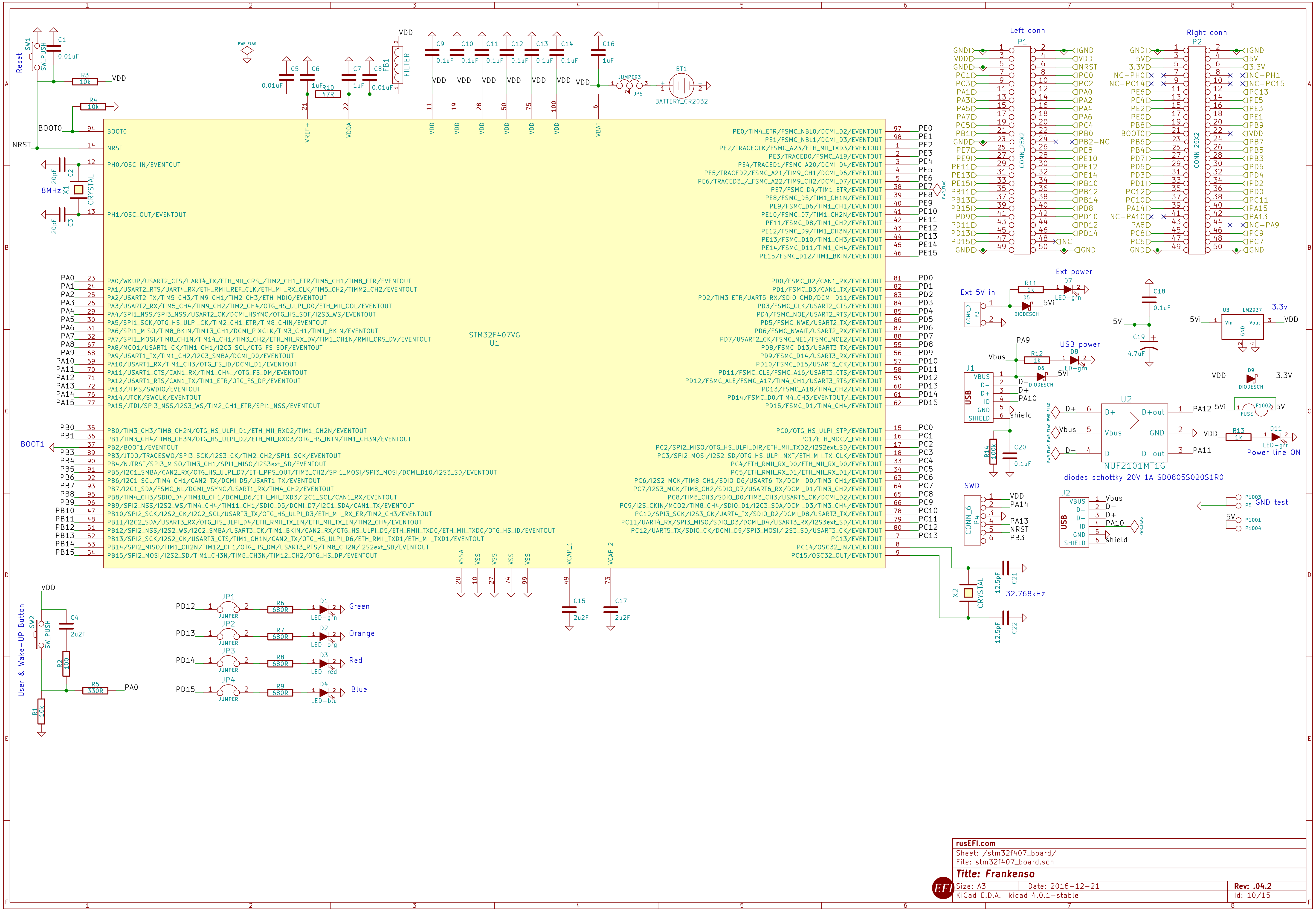


The resistors across pins 9,10 and 15,16 are not typically installed, they
are only used on really hot VR signals, to dampen the signal.

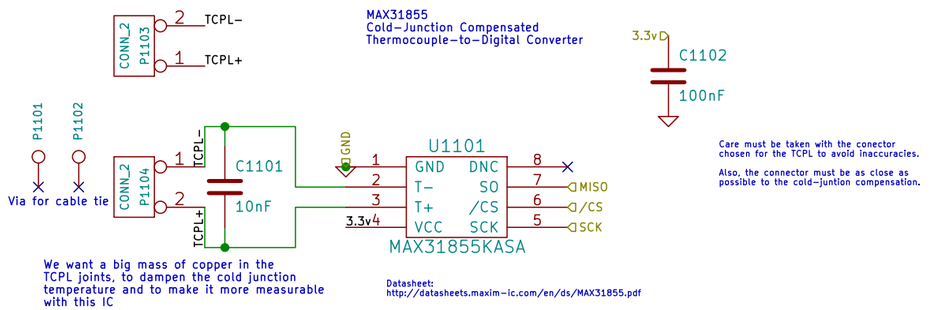
rusEFI.com		
Sheet: /cps_vrs_io_1/ File: cps_vrs_io_1.sch		
Title: Frankenso		
Size: B	Date: 2016−12−21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1−stable		Id: 8/15



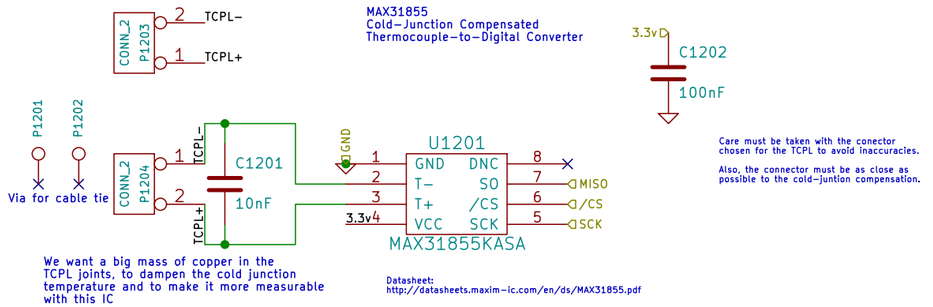
rusEFI.com		
Sheet: /PWR_buck_12V_switcher/ File: PWR_buck_12V_switcher.sch		
Title: Frankenso		
Size: A	Date: 2016-12-21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1-stable		Id: 9/15



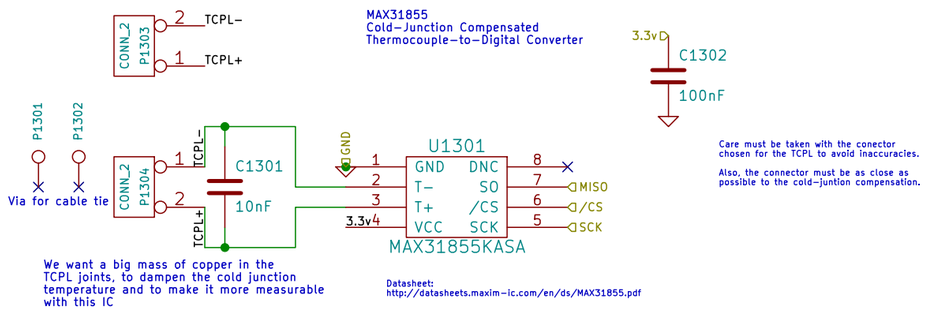
STM32F407VG
U1
Left conn
Right conn
CONN_25X2
Reset
SW_PUSH
BOOT0
NRST
BOOT1
8MHz
CRYSTAL
32.768kHz
BATTERY_CR2032
JUMPER3
FILTER
Ext 5V in
Ext power
USB power
USB
SWD
CONN_6
NUF2101MT1G
diodes schottky 20V 1A SD0805S020S1R0
LM2937
3.3v
Power line ON
GND test
User & Wake-UP Button
Green
Orange
Red
Blue
LED-grn
LED-org
LED-red
LED-blu
DIODESCH
FUSE
rusEFI.com
Sheet: /stm32f407_board/
File: stm32f407_board.sch
Title: Frankenso
Size: A3
Date: 2016-12-21
Rev: .04.2
KiCad E.D.A. kicad 4.0.1-stable
Id: 10/15



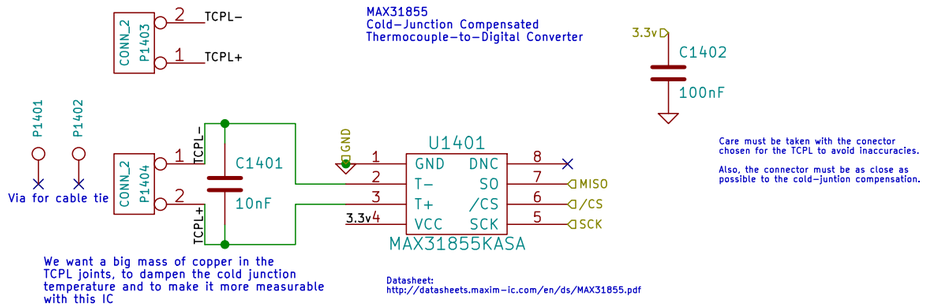
Mrk Industries		
Sheet: /thermocouple1/ File: thermocouple_module.sch		
Title: Electronic Industrial Temperature Interface (EITI)		
Size: A4	Date: 2016-12-21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1-stable		Id: 11/15



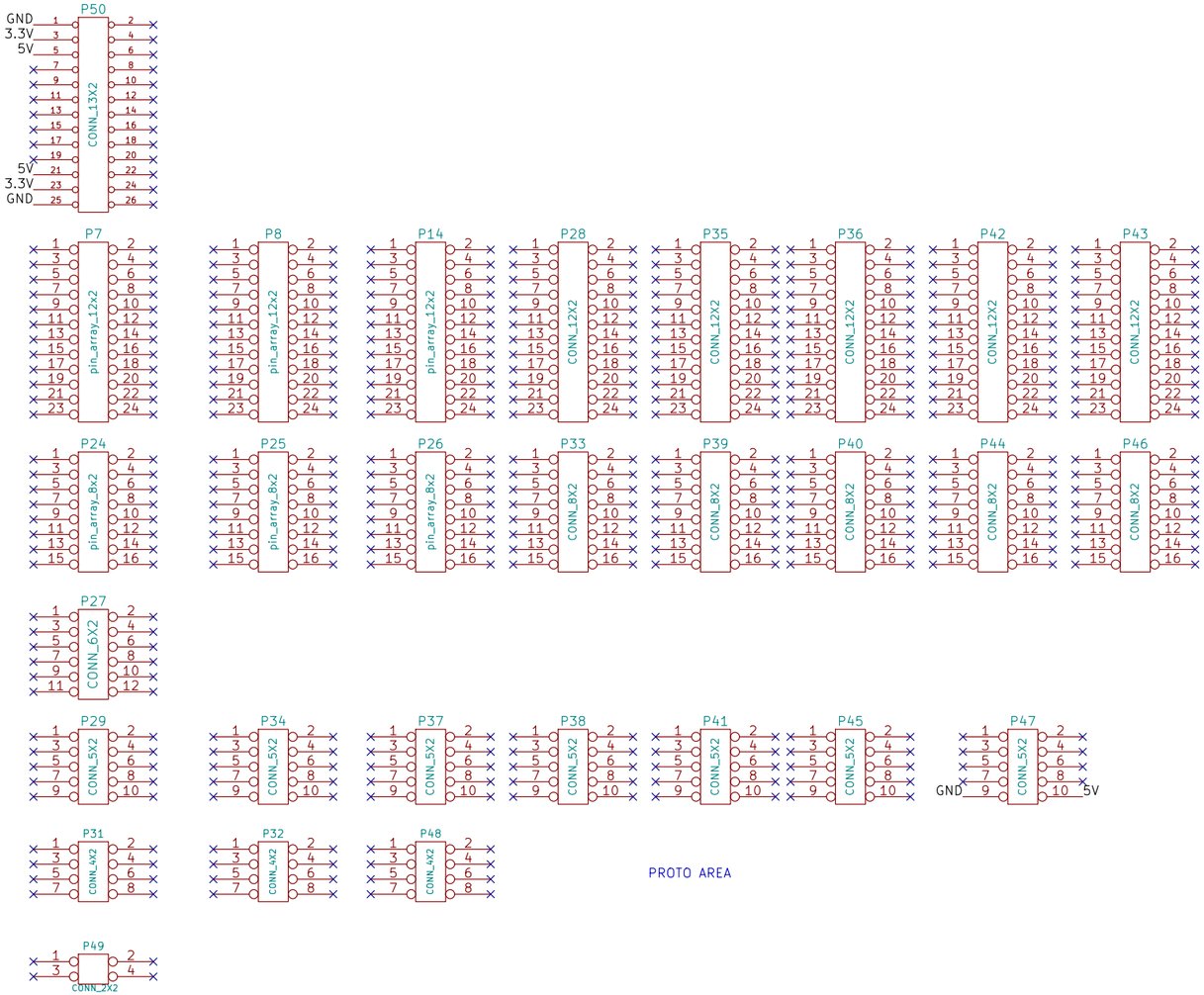
Mrk Industries		
Sheet: /thermocouple2/ File: thermocouple_module.sch		
Title: Electronic Industrial Temperature Interface (EITI)		
Size: A4	Date: 2016-12-21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1-stable		Id: 12/15



Mrk Industries		
Sheet: /thermocouple3/ File: thermocouple_module.sch		
Title: Electronic Industrial Temperature Interface (EITI)		
Size: A4	Date: 2016-12-21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1-stable		Id: 13/15



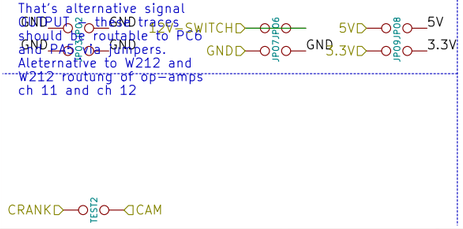
Mrk Industries		
Sheet: /thermocouple4/ File: thermocouple_module.sch		
Title: Electronic Industrial Temperature Interface (EITI)		
Size: A4	Date: 2016-12-21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1-stable		Id: 14/15



These two jumpers
are here to accomodate
stm32f4discovery

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

These four jumpers
are test points



rusEFI.com		
Sheet: /Misc_Vias/ File: Misc_Vias.sch		
Title: Frankenso		
Size: B	Date: 2016-12-21	**Rev: .04.2**
KiCad E.D.A. kicad 4.0.1-stable		Id: 15/15