U3
Molex_48_pin

12V-SWITCH 1
GND 2
LS2 3
E-THROTTLE+ 4
12V-SWITCH 5
GND 6
LS1 7
E-THROTTLE- 8
Ign1 9
Ign2 10
Ign3 11
Ign4 12
GP6 13
GP5 14
USB_D- 15
USB_D+ 16
GND 17
AT1 18
AV4 19
AV5 20
GND 21
AT4 22
AT2 23
AT3 24
CAM_SENSOR 25
AV2 26
AV1 27
AV10 28
MAIN_RELAY 29
AV7 30
AV3 31
AV6 32
GP3 33
GP2 34
GP1 35
AV8 36
INJECTOR-1 37
INJECTOR-2 38
5V2 39
AV9 40
INJECTOR-3 41
INJECTOR-4 42
GP4 43
5V1 44
CRNK+ 45
CRNK- 46
CANL 47
CANH 48

5V TP1
GND TP2
CAM_MCU TP3
CRANK TP4
12V-SWITCH TP5
GND TP6

GP OUT 5 AND 6 ARE HIGH SIDE DRIVEN

ANALOG INPUTS.
ADC 1-4 HAS BIAS RESISTORS
FOR TEMP SENSORS

CAN ALSO BE USED
AS DIGITAL INPUTS

ADC
AT1 AT2 AT3 AT4 AV1 AV2 AV3 AV4 AV5 AV6 AV7 AV8 AV9 AV10 CAM_SENSOR 12V-SWITCH 5V
adc.sch

AT1_MCU AT2_MCU AT3_MCU AT4_MCU AV1_MCU AV2_MCU AV3_MCU AV4_MCU AV5_MCU AV6_MCU AV7_MCU AV8_MCU AV9_MCU AV10_MCU CAM_MCU Vbat_MCU Vref

MCU
VDD GND PA0 PA1 PA2 PA3 PC0 PA6 PA7 PC2 PC3 PC4 PC5 PB0 PB1 PA4 PA5 PC1 Vref USB_D- USB_D+

TLE8888-1QK
IGN_IN_1 IGN_IN_2 IGN_IN_3 IGN_IN_4 INJ_IN_1 INJ_IN_2 INJ_IN_3 INJ_IN_4 IN_9 IN_10 IN_11 IN_12 CAN_TX CAN_RX SO SDO CS_TLE CSN SI SIP SCK FCLP CRANK CRNK_IN GND V5V 5V1 5V2 12V-SWITCH
IGN_OUT_1 IGN_OUT_2 IGN_OUT_3 IGN_OUT_4 INJ_1 INJ_2 INJ_3 INJ_4 OUT_5 OUT_6 OUT_7 OUT_14 OUT_15 OUT_16 OUT_17 OUT_18 OUT_19 OUT_20 OUT_21 OUT_22 OUT_23 OUT_24 CRNK+ CRNK- CAN_L CAN_H MAIN_RELAY VDD
TLE8888-1QK.sch

IGN3 IGN4

LOW SIDE OUTPUTS
INJECTOR-1 INJECTOR-2 INJECTOR-3 INJECTOR-4 2.2A
LS2 LS1 4.5A
D20 12V-SWITCH
D15

CAN BE USED AS LOW-SIDE OR HIGH-SIDE
GP1 GP2 GP3 GP4 0.6A

6A H-BRIDGE
E-THROTTLE+ E-THROTTLE-
12V-SWITCH VDD GND
H-BRIDGE
OUT1 OUT2 12V VDD GND
DIR PWM DIS SO SI SCK CS
TLE9201SG.sch

FlashMemory
VDD
SO SI SCK CS HOLD WP
FlashMemory.sch

PB14 PB15 PB13 PE15 PB11 PB10 PD15 PE2 PE0 PE4 PE3 PB8 PB2-NC PD8 PC10 PC11 PA15 PA13
stm32.sch

PE14 PE13 PE12 PE11 PE10 PE9 PE8 PE7 PB6 PB12 PB4 PD5 PB5 PB3 PC6 PE1 5V PD12 PD13 PD14 PB9 PD9 PB7 PC12 PD10 PD0 PC13 PE6 PE5 PA14 PD11

D28 LED-BLUE 1k R29 GND

hi-lo
Ign1_MCU Ign2_MCU Ign3_MCU Ign4_MCU GP5_MCU GP6_MCU
Ign1 Ign2 Ign3 Ign4 GP5 GP6
5V 12V 12V-SWITCH
hi-lo.sch

HIGH-SIDE OUTPUTS

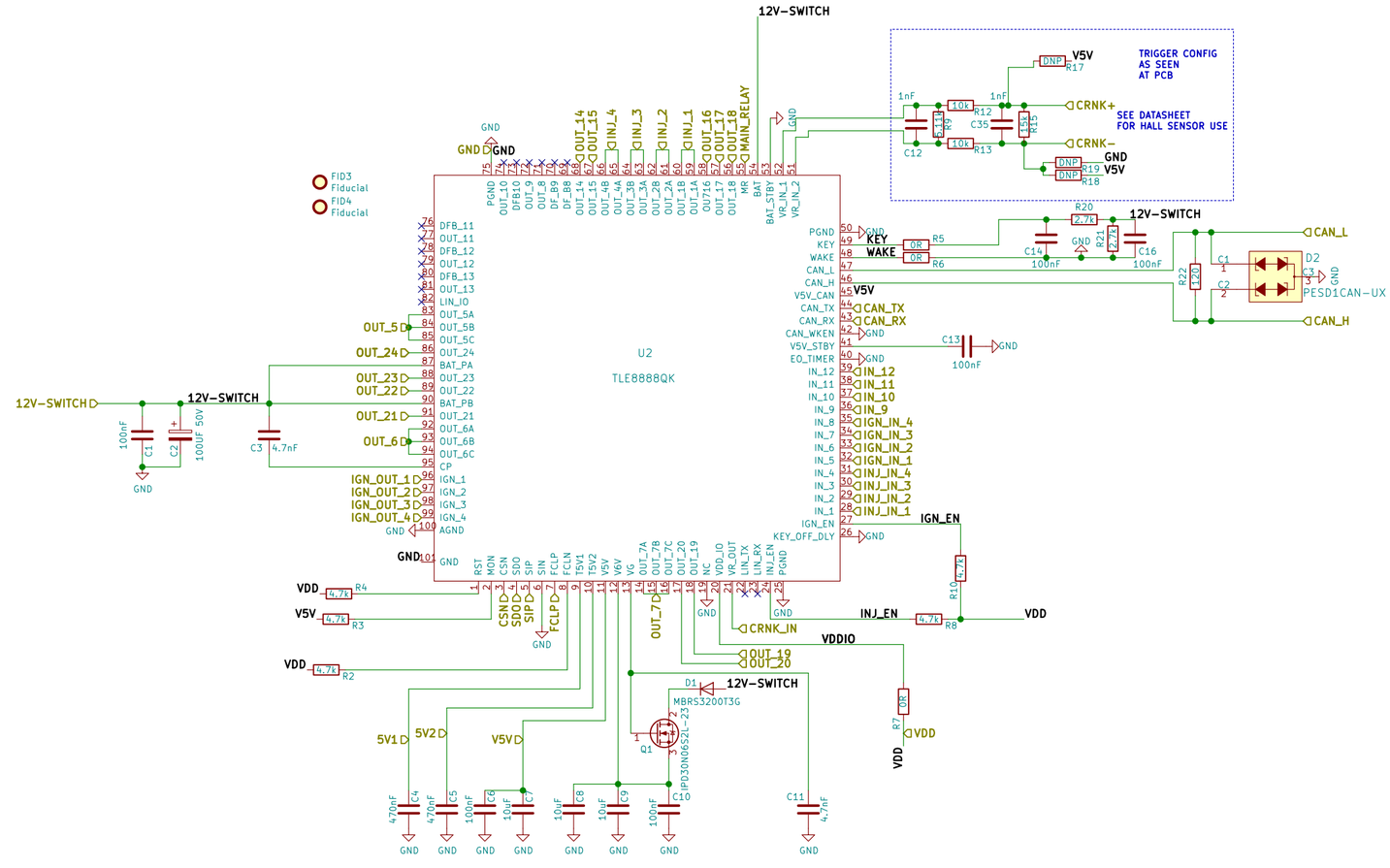
5V
D30 D32 D34 LED-RED
D31 D33 D35 LED-RED
1k R36 R49 R51
LS2 INJECTOR-1 GP5

LED-ORG PE1 D27
LED-BLUE PE2 D23
LED-RED PE3 D21
LED-GRN PE4 D22
1k RN1 GND

PE1 is orange - warning
PE2 is blue - communication
PE3 is red - fatal
PE4 is green - running

Sheet: /
File: microRusEfi.sch
Title: microRusEfi
Size: B | Date: 2019-07-13 | Rev: R0.3
KiCad E.D.A. kicad (6.0.0-rc1-dev-1650-gf425f49c1) | Id: 1/7

rusEFI MRE was measured to consume 235mA from the 12V battery, for 2.9 watts



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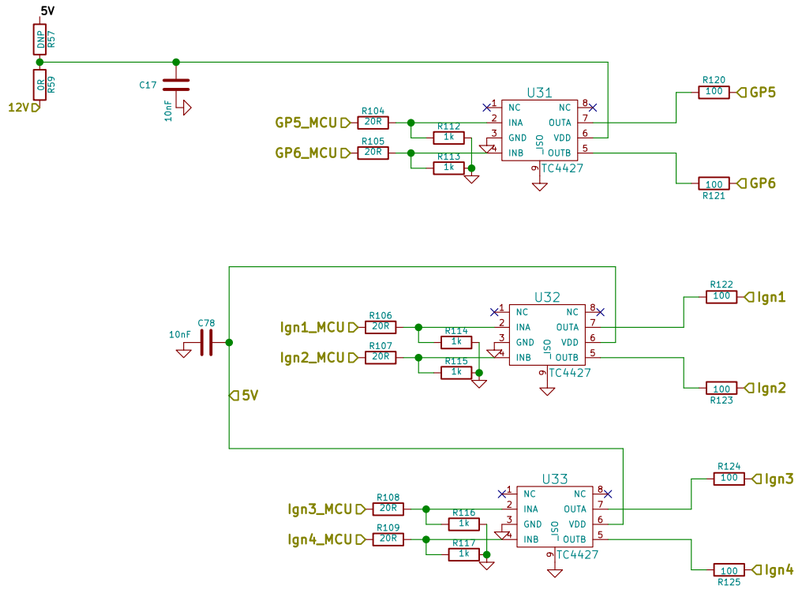
Size: User	Date: 2019-07-01
KiCad E.D.A. kicad (6.0.0-rc1-dev-1650-gf425f49c1)	**Rev: R0.2** Id: 2/7

6 channel high / low side driver



rusEFI.com		
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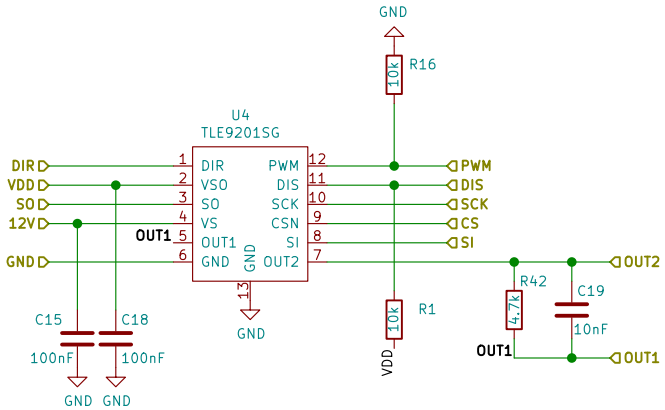
KiCad E.D.A. kicad (6.0.0-rc1-dev-1650-gf425f49c1)		Id: 3/7



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KiCad E.D.A. kicad (6.0.0-rc1-dev-1650-gf425f49c1)		Id: 4/7

FID5
Fiducial
FID6
Fiducial

5V 5V 5V 5V
R14 27K
R23 27K
R25 27K
R27 27K
AT1
AT2
AT3
AT4
RN3
10k
500k R22
500k R35
500k R38
500k R39
5V 5V 5V 5V
D4
D6
D8
D10
U35B MCP6004
U35A MCP6004
U35D MCP6004
U35C MCP6004
RN8
1k
RN11
1.5k
AT1_MCU
AT2_MCU
AT3_MCU
AT4_MCU
5V
C79
10nF
CN17
10nF
V+
V-
U35E
MCP6004

AV1
AV10
AV2
AV3
RN4
10k
500k R24
500k R31
500k R34
500k R37
5V 5V 5V 5V
D3
D5
D7
D9
U36B MCP6004
U36A MCP6004
U36D MCP6004
U36C MCP6004
RN9
1k
RN12
1.5k
AV1_MCU
AV10_MCU
AV2_MCU
AV3_MCU
5V
C80
10nF
10nF
CN6
V+
V-
U36E
MCP6004

AV6
AV7
AV8
AV9
RN2
10k
500k R52
500k R54
500k R56
500k R58
5V 5V 5V 5V
D18
D24
D25
D26
U8B MCP6004
U8A MCP6004
U8D MCP6004
U8C MCP6004
RN7
1k
RN10
1.5k
AV6_MCU
AV7_MCU
AV8_MCU
AV9_MCU
5V
C40
10nF
CN5
10nF
V+
V-
U8E
MCP6004

12V-SWITCH
R139 59K
R141 10K
5V
AV4
AV5
RN13
10k
5V 5V
D11
D12
BAS70-04
BAS70-04
U46B MCP6004
U46A MCP6004
U46D MCP6004
U46C MCP6004
RN15
1k
RN16
1.5k
Vref
Vbat_MCU
AV4_MCU
AV5_MCU
R11 DNP
R131 500k
R40 DNP
R41 500k
5V
5V
CN14
10nF
5V
C82
10nF
V+
V-
U46E
MCP6004

5V
LED-BLUE
D29
R28 2.2K
R30 33K
C41 1nF
5V
D13
CAM
CAM_MCU

rusEFI.com		
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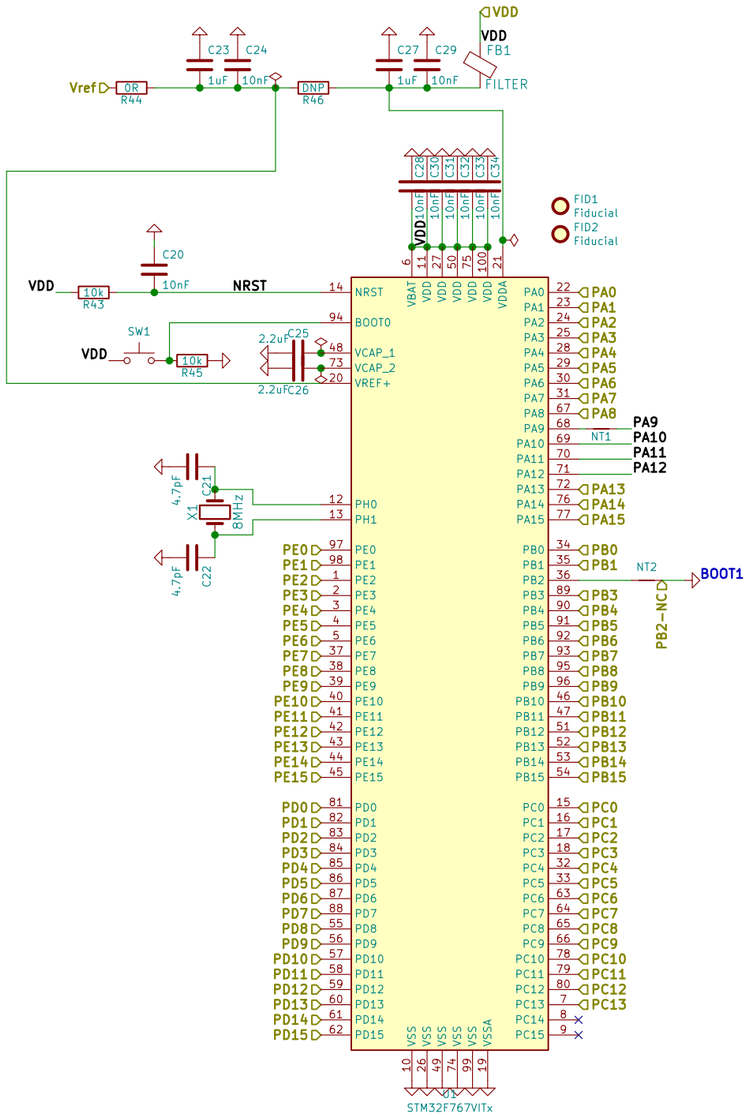
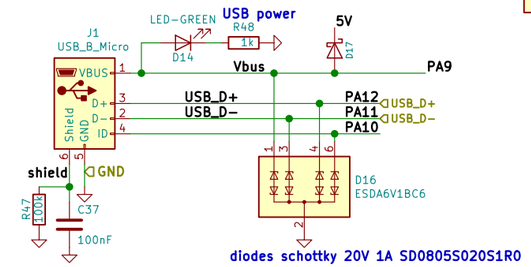
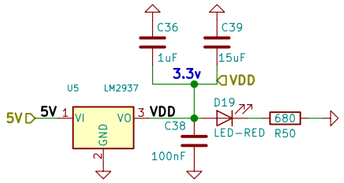
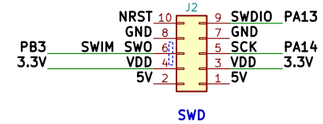
Title: microRusEfi		
Size: B	Date: 2019-07-01	Rev: R0.2
KiCad E.D.A. kicad (6.0.0-rc1-dev-1650-gf425f49c1)		Id: 5/7









http://www.crystek.com/documents/appnotes/Pierce-GateIntroduction.pdf
PCB per predictions with SaturnPCB has less then 3.5pF traces,
STM32 pins assumed 5pF
ESR = 80ohms max???
Rf = 2meg could be between 1meg and 10meg.
Cload should be 8pF per XTAL datasheet
Cload = ([Cin+C1][C2+Cout])/(Cin+C1+C2_Cout)+PCBstray
Cload = ([5+4.7][4.7+5])/(5+4.7+4.7+5)+3.5= 8.35pF
C1=C2=C166=C167 = 4.7pF
Rs = 1/(2piFC2) = 1/(2*pi*8MHz*4.7pF) = 4.2ohms.

Sheet: /MCU/	
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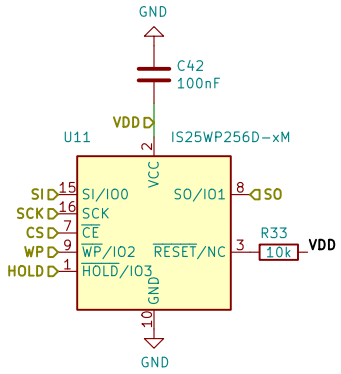
Title: microRusEfi	
Size: B	Date: 2019-07-09
KiCad E.D.A. kicad (6.0.0-rc1-dev-1650-gf425f49c1)	Id: 6/7

Rev: R0.2.1



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