U3
Molex_48_pin

12V-SWITCH 1
GND 2
VVT-2 3
E-THROTTLE+ 4
12V-SWITCH 5
GND 6
VVT-1 7
E-THROTTLE- 8
COIL-3 9
COIL-4 10
GP_OUT_5 11
GP_OUT_6 12
COIL-2 13
COIL-1 14
USB_D- 15
USB_D+ 16
GND 17
AN-TEMP-1 18
AN-VOLT-4 19
AN-VOLT-5 20
GND 21
AN-TEMP-4 22
AN-TEMP-2 23
AN-TEMP-3 24
CAM_SENSOR 25
AN-VOLT-2 26
AN-VOLT-1 27
AN-VOLT-10 28
MAIN_RELAY 29
AN-VOLT-7 30
AN-VOLT-3 31
AN-VOLT-6 32
GP_OUT_3 33
GP_OUT_2 34
GP_OUT_1 35
AN-VOLT-8 36
INJECTOR-1 37
INJECTOR-2 38
5V2 39
AN-VOLT-9 40
INJECTOR-3 41
INJECTOR-4 42
GP_OUT_4 43
5V1 44
CRNK+ 45
CRNK- 46
CANL 47
CANH 48

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
AN-TEMP-1 ADC_1
AN-TEMP-2 ADC_2
AN-TEMP-3 ADC_3
AN-TEMP-4 ADC_4
AN-VOLT-1 ADC_5
AN-VOLT-10 ADC_6
AN-VOLT-2 ADC_7
AN-VOLT-3 ADC_8
AN-VOLT-4 ADC_9
AN-VOLT-5 ADC_10
AN-VOLT-6 ADC_11
AN-VOLT-7 ADC_12
AN-VOLT-8 ADC_13
AN-VOLT-9 ADC_14
CAM_SENSOR CAM
12V-SWITCH 12V-SWITCH
5V 5V
adc.sch

ADC_1_MCU AnOut1
ADC_2_MCU AnOut2
ADC_3_MCU AnOut3
ADC_4_MCU AnOut4
ADC_5_MCU AnOut5
ADC_6_MCU AnOut6
ADC_7_MCU AnOut7
ADC_8_MCU AnOut8
ADC_9_MCU AnOut9
ADC_10_MCU AnOut10
ADC_11_MCU AnOut11
ADC_12_MCU AnOut12
ADC_13_MCU AnOut13
ADC_14_MCU AnOut14
CAM_MCU
Vbat_MCU
Vref

MCU
VDD VDD
GND GND
PA0
PA1
PA2
PA3
PC0
PA4
PA6
PA7
PC2
PC3
PC4
PC5
PB0
PB1
TP
PA5
Vbat_MCU
Vref
PC1
Vref
USB_D-
USB_D+
USB_D-
USB_D+
PA8
PC7
PC8
PC9
PB14
PB15
PB13
PE15
PB11
PB10
PE2
PD15
PE2
PE0
PE4
PE3
PE4
PE3
PB8
PB2-NC
PD8
PC10
PC11
PC10
PC11
PA15
PA13
stm32.sch

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

FlashMemory
VDD VDD
SO
SI
SCK
CS
HOLD
WP
FlashMemory.sch

GND
GND
GND
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
GND
5V
V5V
5V2
5V1
5V2
12V-SWITCH
12V-SWITCH
5V
5V
PE14
PE13
PE12
PE11
PE10
PE9
PE8
PE7
PB6
PB12
PB4
PD5
PB5
PB3
PC6
PE1
PE1
TP
D28
LED-BLUE
4k7
R29
GND
5V
IGN_OUT_1
IGN_OUT_2
IGN_OUT_3 IGN3
IGN_OUT_4 IGN4
INJ_1
INJ_2
INJ_3
INJ_4
OUT_5
OUT_6
OUT_7
OUT_14
OUT_15 OUT15
OUT_16 OUT16
OUT_17 OUT17
OUT_18 OUT18
OUT_19
OUT_20
OUT_21
OUT_22
OUT_23
OUT_24
CRNK+
CRNK-
CAN_L
CAN_H
MAIN_RELAY
VDD
CRNK+
CRNK-
CANL
CANH
MAIN_RELAY
VDD
TLE8888-1QK.sch

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

CAN BE USED AS LOW-SIDE
OR HIGH-SIDE
GP_OUT_1
GP_OUT_2 0.6A
GP_OUT_3
GP_OUT_4

hi-lo
PD7
PD6
PD4
PD3
PD2
PD1
PD12
PD13
PD14
PB9
PD9
PB7
PC12
PD10
PD0
PC13
PE6
PE5
PA14
PD11
IGN_1_MCU
IGN_2_MCU
IGN_3_MCU
IGN_4_MCU
HS1_MCU
HS2_MCU
PD14
PC12
PD0
IGN_1
IGN_2
IGN_3
IGN_4
HS1
HS2
5V
12V
5V
12V-SWITCH
hi-lo.sch

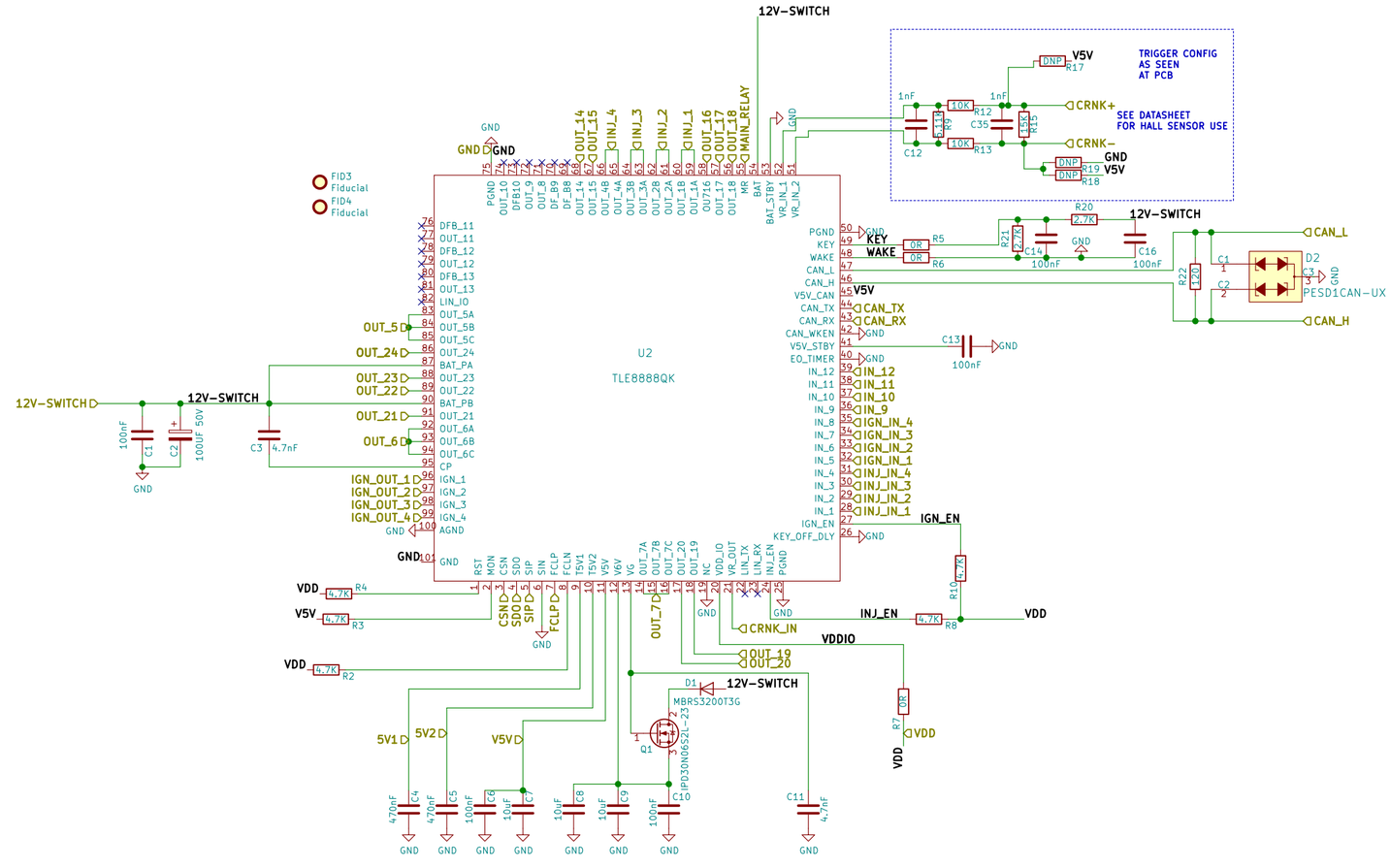
COIL-1
COIL-2
COIL-3
COIL-4
GP_OUT_5
GP_OUT_6
HIGH-SIDE OUTPUTS

VVT-2
INJECTOR-1
COIL-1
D30 D31 R36
D32 D33 R49
D34 D35 R51
LED-RED
1k
GND

LED-ORG PE1 D27
LED-BLUE PE2 D23
LED-RED PE3 D21
LED-GRN PE4 D22
RN1 1k
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: 2019-07-01 | Rev: R0.2
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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|---|---|
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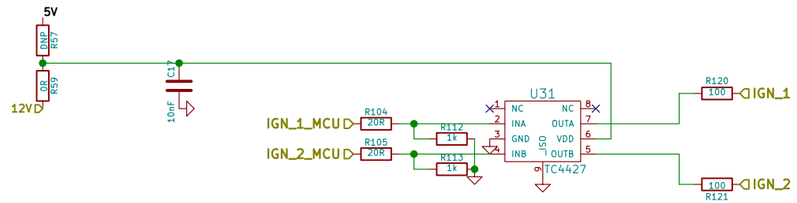
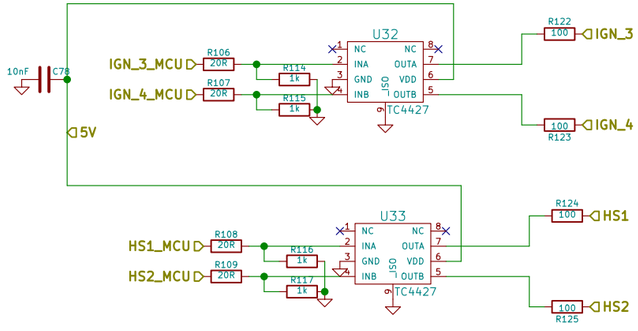
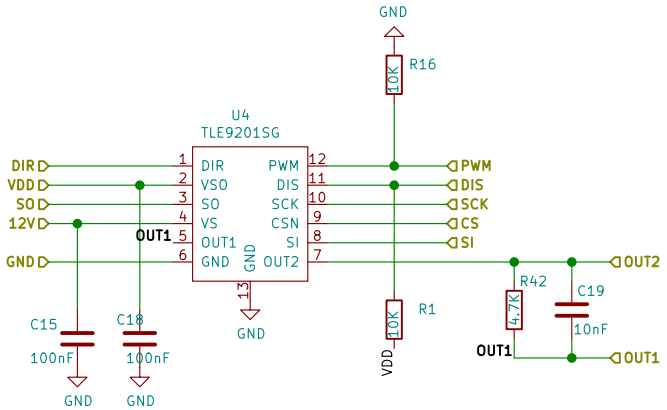
| File: TLE8888-1QK.sch | |
| **Title: microRusEfi** | |
| Size: User | Date: 2019-07-01 |
| KiCad E.D.A. kicad (6.0.0-rc1-dev-1650-gf425f49c1) | **Rev: R0.2** Id: 2/7 |

# 8 channel high / low side driver




| | | |
|---|---|---|
| rusEFI.com | | |
| Sheet: /hi-lo/<br>File: hi-lo.sch | | |
| ***Title: microRusEfi*** | | |
| Size: B | Date: 2019-07-01 | **Rev: R0.2** |
| KiCad E.D.A. kicad (6.0.0-rc1-dev-1650-gf425f49c1) | | Id: 3/7 |




| | | |
|---|---|---|
| Sheet: /H-BRIDGE/ | | |
| File: TLE9201SG.sch | | |
| **Title: microRusEfi** | | |
| Size: A | Date: 2019-07-01 | **Rev: R0.2** |
| 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
R25 27K
R26 27K
R27 27K
ADC_1
ADC_2
ADC_3
ADC_4
500K R32
500K R34
500K R35
500K R38
500K R39
RN3 10k
D4
D6
D8
D10
U35B MCP6004
U35A MCP6004
U35D MCP6004
U35C MCP6004
RN8 1k
RN11 1.5k
ADC_1_MCU
ADC_2_MCU
ADC_3_MCU
ADC_4_MCU
CN17 10nF
C79 10nF
U35E MCP6004

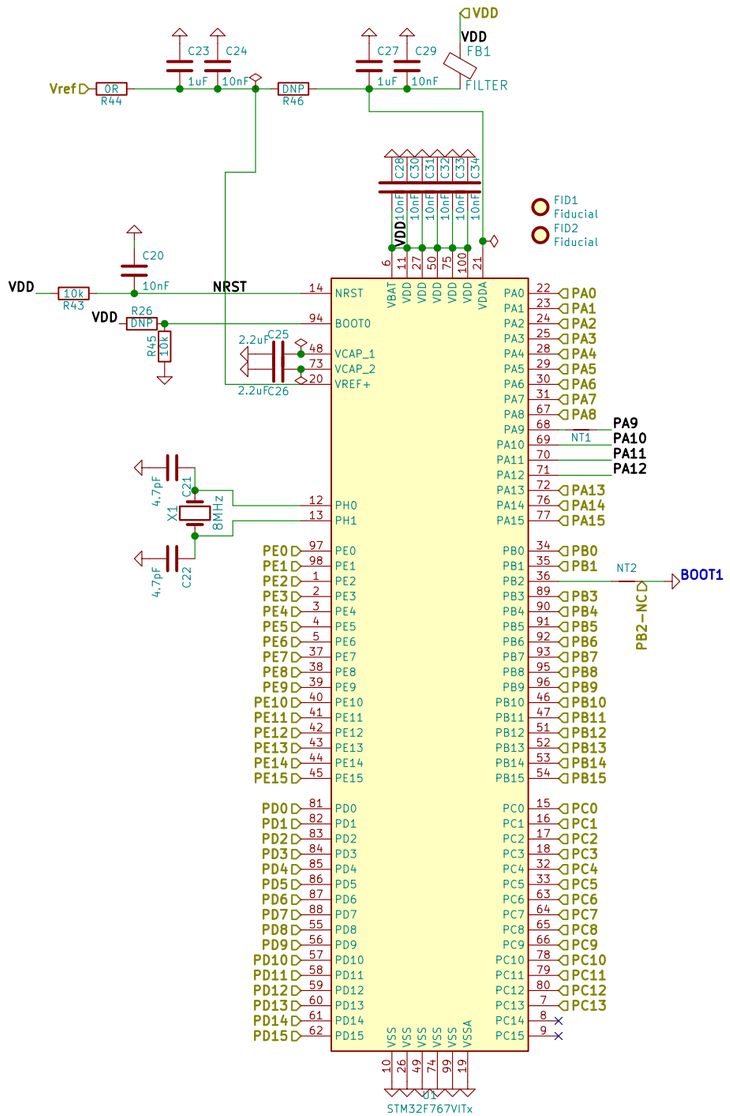
ADC_5
ADC_6
ADC_7
ADC_8
500K R24
500K R31
500K R34
500K R37
RN4 10k
D3
D5
D7
D9
U36B MCP6004
U36A MCP6004
U36D MCP6004
U36C MCP6004
RN9 1k
RN12 1.5k
ADC_5_MCU
ADC_6_MCU
ADC_7_MCU
ADC_8_MCU
CN6 10nF
C80 10nF
U36E MCP6004

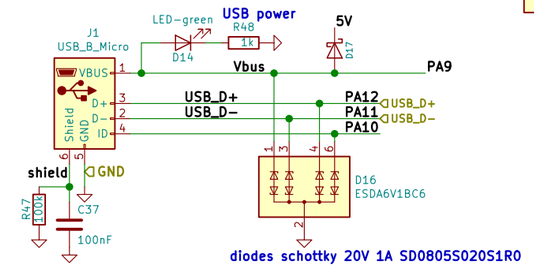
ADC_11
ADC_12
ADC_13
ADC_14
500K R52
500K R54
500K R55
500K R58
RN2 10k
D18
D24
D25
D26
U8B MCP6004
U8A MCP6004
U8D MCP6004
U8C MCP6004
RN7 1k
RN10 1.5k
ADC_11_MCU
ADC_12_MCU
ADC_13_MCU
ADC_14_MCU
CN5 10nF
C40 10nF
U8E MCP6004

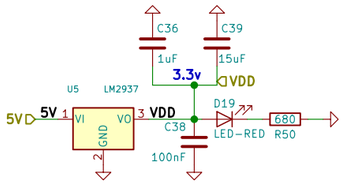
12V-SWITCH
R139 59K
R141 10K
ADC_9
ADC_10
R11 DNP
R131 500K
R9 DNP
R41 500K
RN13 10k
D11
BAS70-04
U46B MCP6004
U46A MCP6004
U46D MCP6004
U46C MCP6004
RN15 1k
RN16 1.5k
Vref_MCU
Vbat_MCU
ADC_9_MCU
ADC_10_MCU
CN14 10nF
C82 10nF
U46E MCP6004

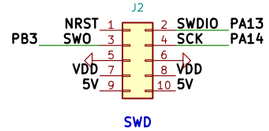
LED-BLUE D29
R28 2.2K
CAM
R30 33K
C41 1nF
D13
CAM_MCU

| | | |
|---|---|---|
| rusEFI.com | | |
| Sheet: /ADC/ | | |
| File: adc.sch | | |
| **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 |



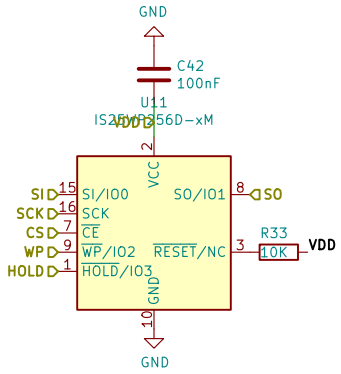




http://www.crystek.com/documents/appnotes/Pierce-GateIntroduction.pdf
PCB per predictions with SaturnPCB has less then 3.5pF traces,
STM32 pins assumed 5pF
ESR = 80ohms max???
Rf = 2meg could be between 1meg and 10meg.
Cload should be 8pF per XTAL datasheet
Cload = ([Cin+C1][C2+Cout])/(Cin+C1+C2_Cout)+PCBstray
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/ | |
| File: stm32.sch | |
| **Title: microRusEfi** | |
| Size: B | Date: 2019-07-01 |
| KiCad E.D.A. kicad (6.0.0-rc1-dev-1650-gf425f49c1) | Id: 6/7 |
| | **Rev: R0.2** |




| | | |
|---|---|---|
| Sheet: /FlashMemory/<br>File: FlashMemory.sch | | |
| **Title: microRusEfi** | | |
| Size: A | Date: 2019-07-01 | **Rev: R0.2** |
| KiCad E.D.A. kicad (6.0.0-rc1-dev-1650-gf425f49c1) | | Id: 7/7 |