

BLDC motor controller

V_SUPPLY

39k R3

2k2 R4

100n C2

AN_IN

MINI-USB-SHIELD-32005-201

Mount OR if used as USB host R6

22R R6

100k R5

USB_DM

USB_DP

FSD protection?

X1A

P101

CANBUS

CAN bus transceiver

CAN_RX

CAN_TX

CANH

CANL

CAN.sch

P1

HALL/Encoder

HALL3_IN

HALL2_IN

HALL1_IN

TEMP_IN

HALL3_OUT

HALL2_OUT

HALL1_OUT

TEMP_OUT

5V

Filters

hall_filters.sch

P3

PWR_COMM

SCK_ADC_EXT

TX_SDA

RX_SCL_MOSI

MISO_ADC_EXT2

5V

NTC temp sensor

Temp

temp.sch

STM32F4 64LQFP.sch

Mosfet driver

EN_GATE

H1

L1

H2

L2

H3

L3

SENS1

SENS2

SENS3

FAULT

BR_SO1

BR_SO2

DC_CAL

Power.sch

Power MOSFETS

M_H1

M_L1

M_H2

M_L2

M_H3

M_L3

H1_VS

H2_VS

H3_VS

H1_LOW

H2_LOW

H3_LOW

SH1_A

SH1_B

SH2_A

SH2_B

SHUNT R54

SHUNT R53

PHASE_1 P9

PHASE_2 P7

PHASE_3 P6

mosfets.sch

Connect signal ground and power ground in one place only

SERVOD

100R if used as servo output

2k2 R5

100n C3

K1 SERVO

LED_GREEND

LED_REDD

100R R38

100R R37

2k2 R22

RED D2

GREEN D1

LED D3

VCC

V_SUPPLY

P4

P5

Voltage supply (0 - 60v)
Needs external decoupling caps to avoid high voltage transients produced by the inductance of the battery wiring while switching the FETs
Also critical for EMI/RF compliance

Top level

Benjamin Vedder

Sheet: /

File: BLDC_4.sch

Title: BLDC Driver 4.9

Size: A4

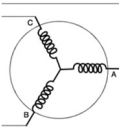
Date: 21 aug 2015

KiCad E.D.A. kicad 0.201510030351+624130ubuntu15.10.1-product

Rev: 4.9

Id: 1/7

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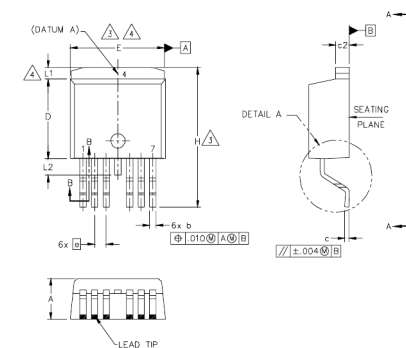
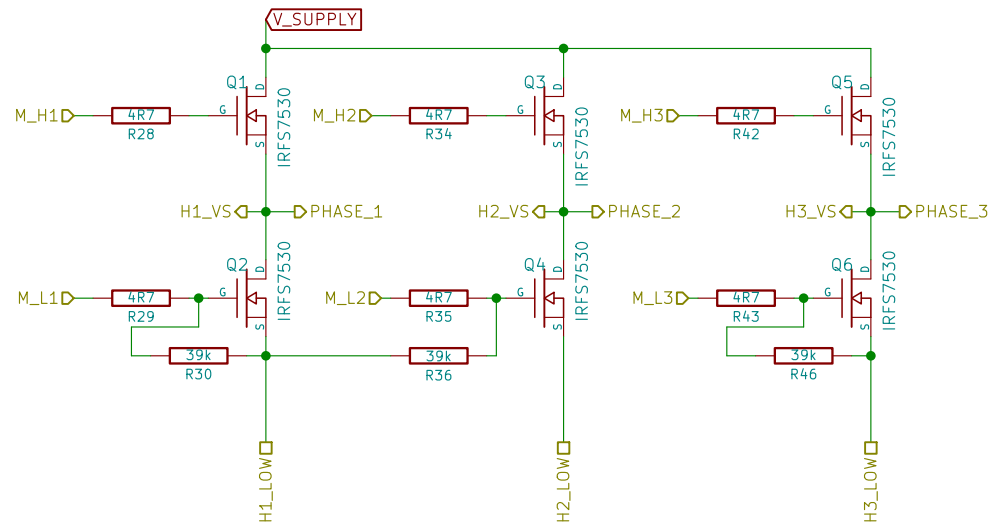
Benjamin Vedder

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Size: A4	Date: 21 aug 2015
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Rev: 4.9
Id: 1/7



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Sheet: /Power MOSFETS/

File: mosfets.sch

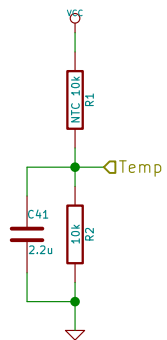
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Rev: 4.9

Id: 2/7

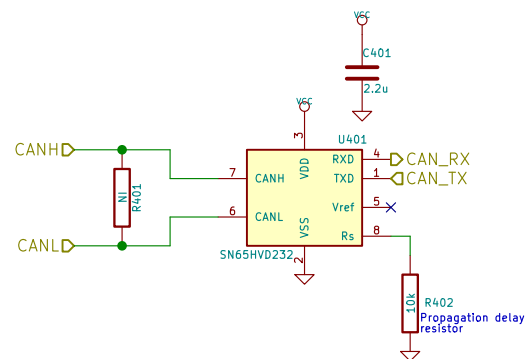


Benjamin Vedder

Sheet: /NTC temp sensor/
File: temp.sch

Title: BLDC Driver 4.9

Size: A4	Date: 21 aug 2015	Rev: 4.9
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Package Types

MCP2561 PDIP, SOIC 	MCP2562 PDIP, SOIC
MCP2561 3x3 DFN* 	MCP2562 3x3 DFN*

* Includes Exposed Thermal Pad (EP); see [Table 1-2](#).

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Sheet: /CAN bus transceiver/

File: CAN.sch

Title: BLDC Driver 4.9

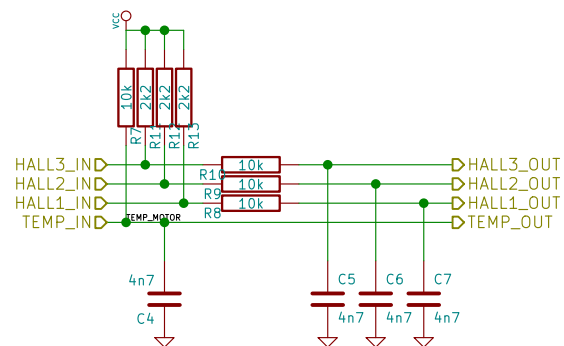
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Date: 21 aug 2015

Rev: 4.9

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Id: 4/7



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Sheet: /Filters/
File: hall_filters.sch

Title: BLDC Driver 4.9

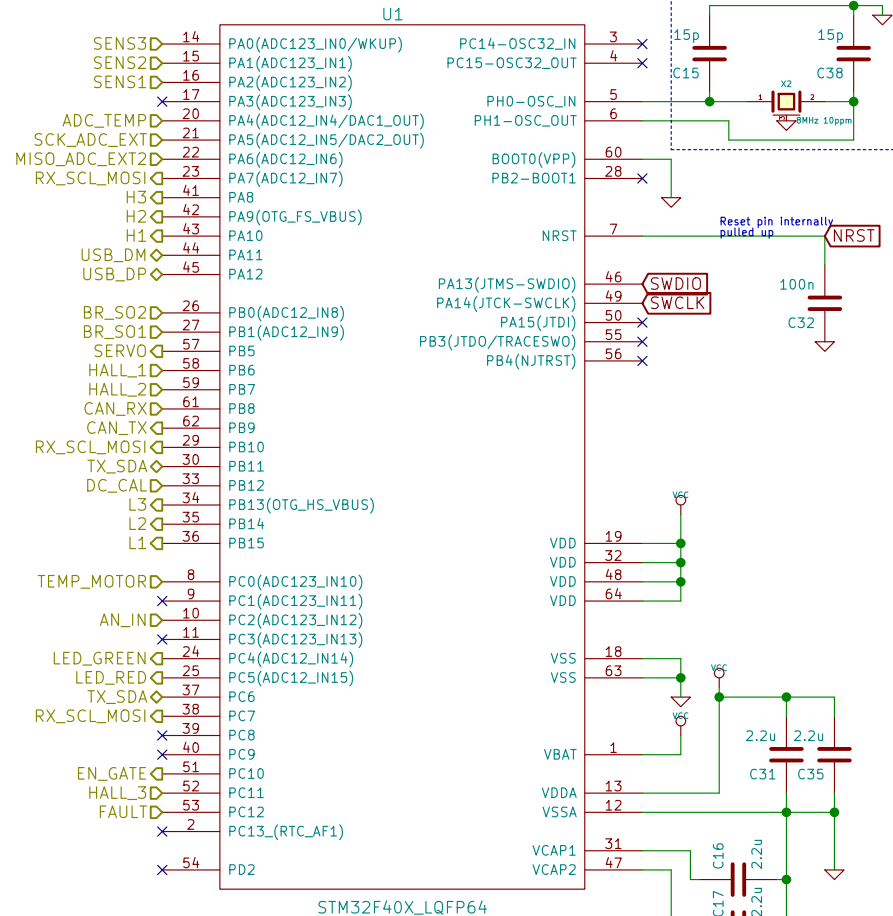
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Rev: 4.9
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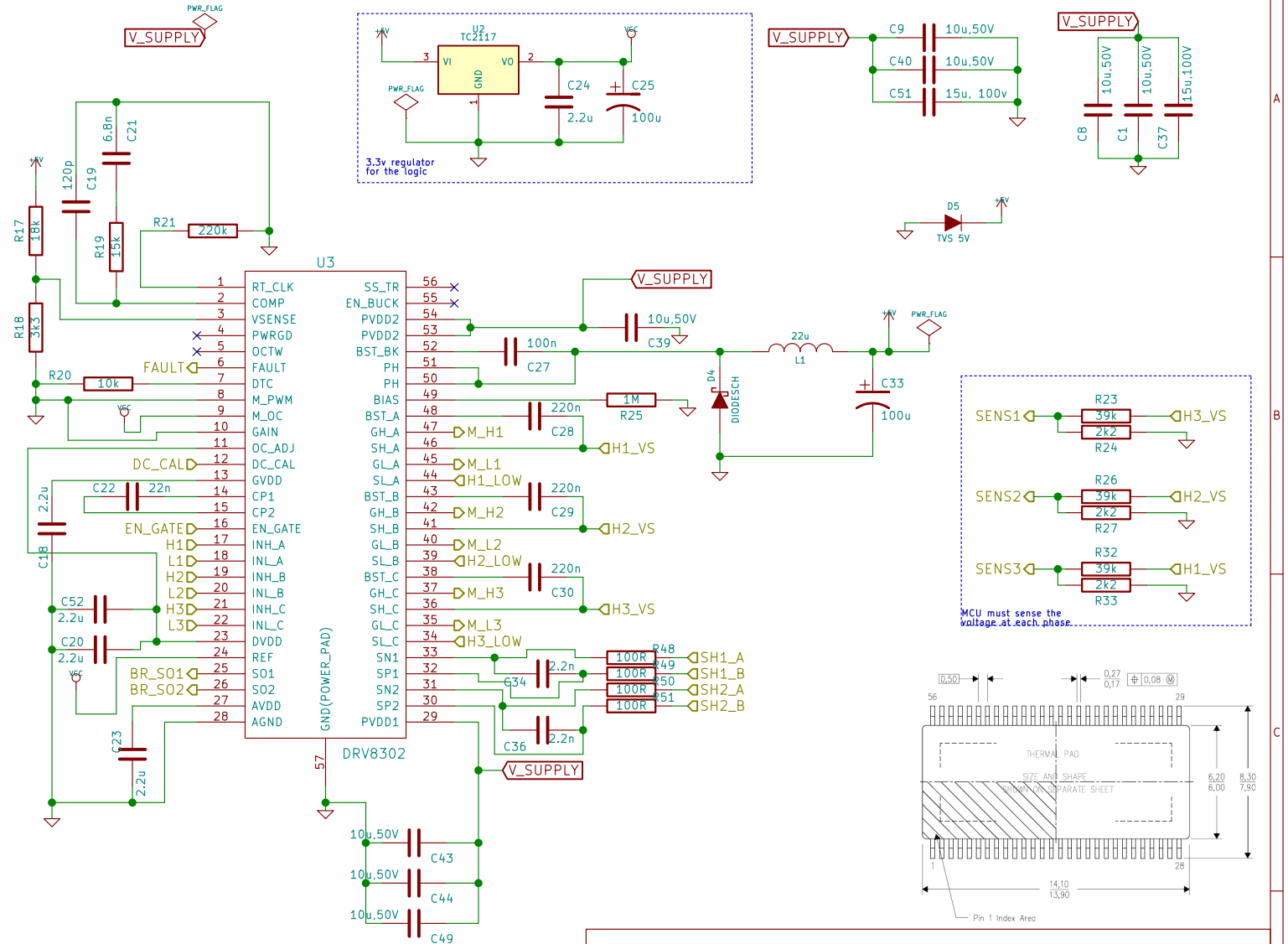
STM32F405xx STM32F407xx

ARM Cortex-M4 32b MCU+FPU, 210DMIPS, up to 1MB Flash/192+4KB RAM, USB
OTG HS/FS, Ethernet, 17 TIMs, 3 ADCs, 15 comm. interfaces & camera



FEATURES

- Operating Supply Voltage 8V–60V
- 2.3A Sink and 1.7A Source Gate Drive Current Capability
- Integrated Dual Shunt Current Amplifiers With Adjustable Gain and Offset
- Integrated Buck Converter to Support up to 1.5A External Load
- Independent Control of 3 or 6 PWM Inputs
- Bootstrap Gate Driver With 100% Duty Cycle Support
- Programmable Dead Time to Protect External FETs from Shoot Through
- Programmable Overcurrent Protection of External MOSFETs
- Thermally Enhanced 56-Pin TSSOP Pad Down DCA Package



RECOMMENDED OPERATING CONDITIONS

	MIN	TYP	MAX	UNITS
PVDD1	DC supply voltage PVDD1 for normal operation	8	60	V
PVDD2	DC supply voltage PVDD2 for buck converter	3.5	60	V
CAVDD	External capacitance on AVDD pin (ceramic cap) 20% tolerance	1		µF
CDVDD	External capacitance on DVDD pin (ceramic cap) 20% tolerance	1		µF
CGVDD	External capacitance on GVDD pin (ceramic cap) 20% tolerance	2.2		µF
CCP	Flying cap on charge pump pins (between CP1 and CP2) (ceramic cap) 20% tolerance	22		nF
CBST	Bootstrap cap (ceramic cap)	100		nF
ICM_EN	Input current of digital pins when EN_GATE is high		100	µA
ICM_OIP	Input current of digital pins when EN_GATE is low		1	µA
CCIN	Maximum capacitance on digital input pin	10		pF
CO_OPA	Maximum output capacitance on outputs of shunt amplifier	20		pF
RRTD	Dead time control resistor range. Time range is 50ns (-GND) to 500ns (150kΩ) with a linear approximation.	0	150	kΩ
IFAULT	FAULT pin sink current. Open-drain V = 0.4 V	2		mA
IOCTW	OCTW pin sink current. Open-drain V = 0.4 V	2		mA
VREF	External voltage reference voltage for current shunt amplifiers	2	6	V
fSW	Operating switching frequency of gate driver	Oq(TOT) = 25 nC or total 30 mA gate drive average current	200	kHz
TA	Ambient temperature	-40	125	°C

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Sheet: /Mosfet driver/
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Rev: 4.9

Id: 7/7