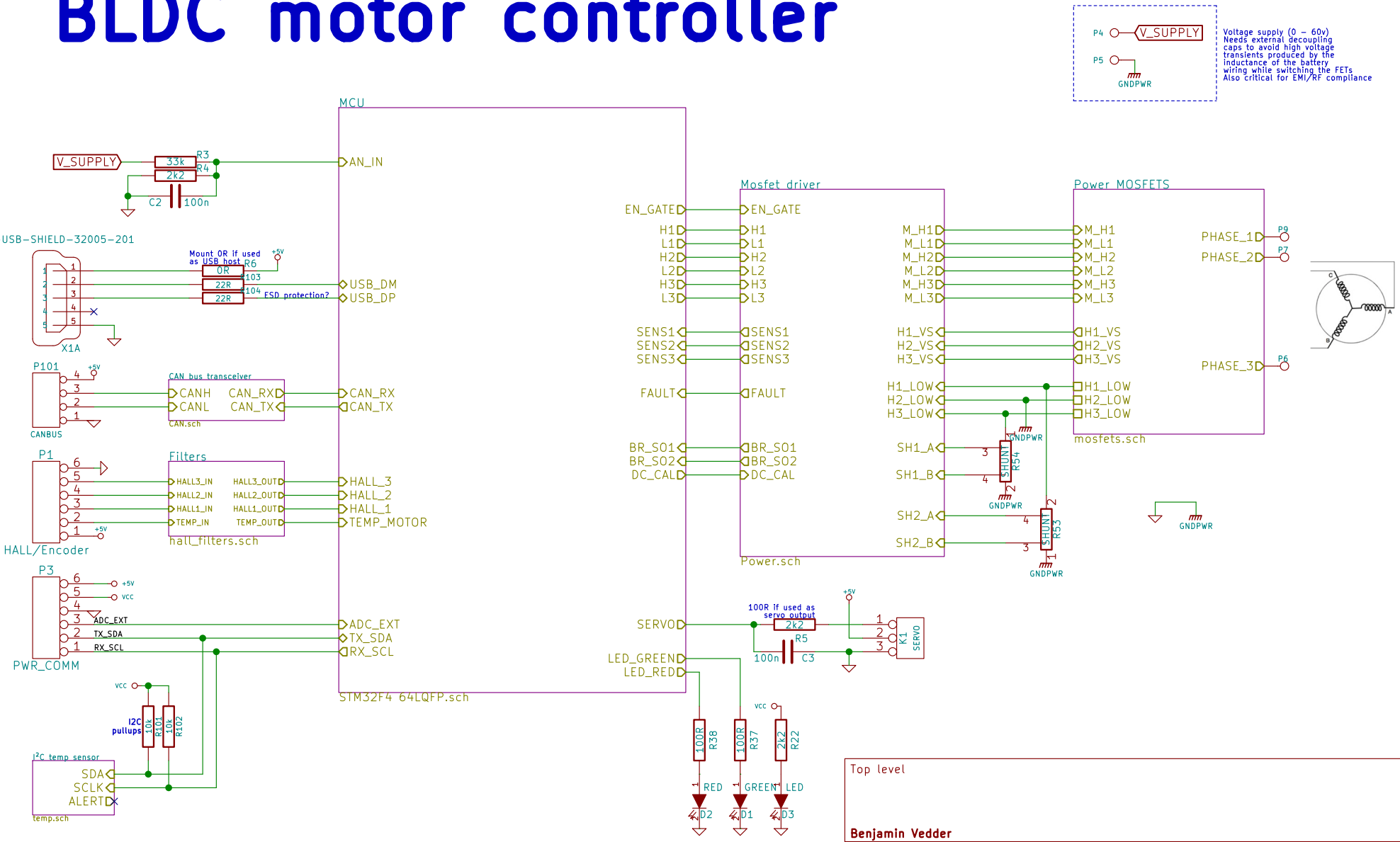
BLDC motor controller



Top level

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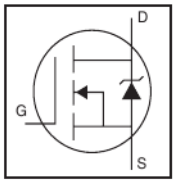
Sheet: /
File: BLDC_4.sch

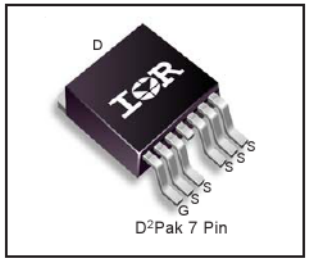
Title: BLDC Driver 4.5

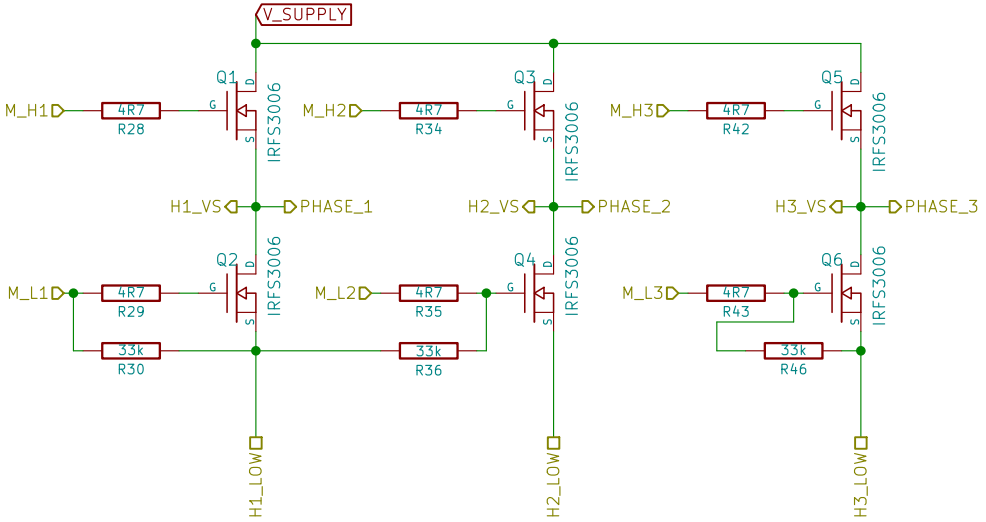
Size: A4	Date: 25 Aug 2014	**Rev: 4.5**
KiCad E.D.A. kicad (2014-08-31 BZR 5107)-product		Id: 1/7

HEXFET® Power MOSFET



V_{DSS}	60V
$R_{DS(on)}$ typ.	1.5mΩ
max.	2.1mΩ
I_D (Silicon Limited)	293A①
I_D (Package Limited)	240A





Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	293①	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	207 ①	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V (Package Limited)	240	
I_{DM}	Pulsed Drain Current ②	1172	
P_D @T_C = 25°C	Maximum Power Dissipation	375	W
	Linear Derating Factor	2.5	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery ⑥	11	V/ns
T_J	Operating Junction and	-55 to + 175	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	
	Mounting torque, 6-32 or M3 screw	10lb·in (1.1N·m)	

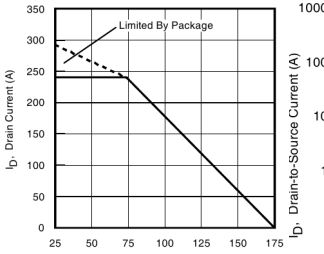


Fig 9. Maximum Drain Current vs. Case Temperature

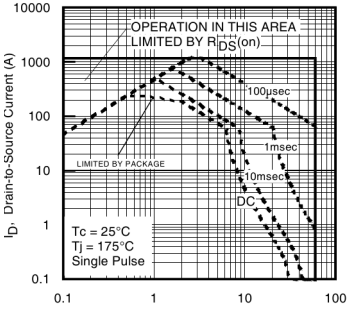
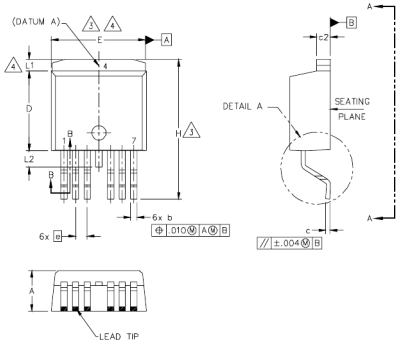


Fig 8. Maximum Safe Operating Area



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Sheet: /Power MOSFETS/
File: mosfets.sch

Title: BLDC Driver 4.5

Size: A4	Date: 25 Aug 2014	**Rev: 4.5**
KiCad E.D.A. kicad (2014-08-31 BZR 5107)-product		Id: 2/7

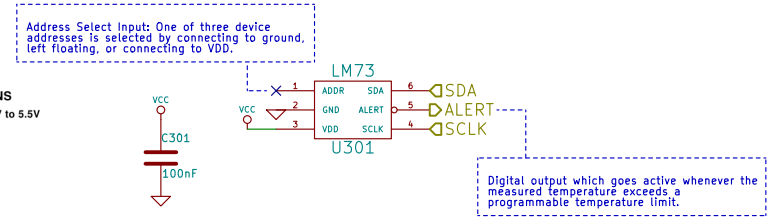
LM73 2.7V, SOT, 11-to-14 Bit Digital Temperature Sensor with 2-Wire Interface

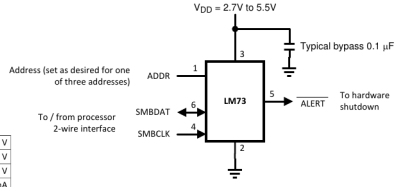
FEATURES

- Single Address Pin Offers Choice of Three Selectable Addresses per Version for a Total of Six Possible Addresses.
- SMBus and I²C-Compatible Two-Wire Interface
- Supports 400 kHz Operation
- Shutdown Mode with One-Shot Feature Available for Very Low Average Power Consumption
- Programmable Digital Temperature Resolution from 11 Bits to 14 Bits.
- Fast Conversion Rate Ideal for Quick Power Up and Measuring Rapidly Changing Temperature
- Open-Drain $\overline{\text{ALERT}}$ Output Pin Goes Active When Temperature is Above a Programmed Temperature Limit
- Very Stable, Low-Noise Digital Output.
- UL Recognized Component

KEY SPECIFICATIONS

- Supply Voltage: 2.7V to 5.5V
- Supply Current:
  - Operating:
    - 320 µA (typ)
    - 495 µA (max)
  - Shutdown:
    - 8 µA (max)
    - 1.9 µA (typ)
- Temperature Accuracy:
  - -10 °C to 80 °C: ±1.0 °C (max)
  - -25 °C to 115 °C: ±1.5 °C (max)
  - -40 °C to 150 °C: ±2.0 °C (max)
- Resolution: 0.25 °C to 0.03125 °C
- Conversion Time:
  - 11-bit (0.25 °C): 14 ms (max)
  - 14-bit (0.03125 °C): 112 ms (max)





ABSOLUTE MAXIMUM RATINGS[1]

Supply Voltage		−0.3 V to 6.0 V
Voltage at SMBCLK and SMBDAT pins		−0.3 V to 6.0 V
Voltage at All Other Pins		−0.3 V to (V_{DD} + 0.5 V) and ≤ 6.0 V
Input Current at Any Pin[2]		±5 mA
Storage Temperature		−65 °C to +150 °C
ESD Susceptibility[3]	Human Body Model	2000 V
	Machine Model	200 V

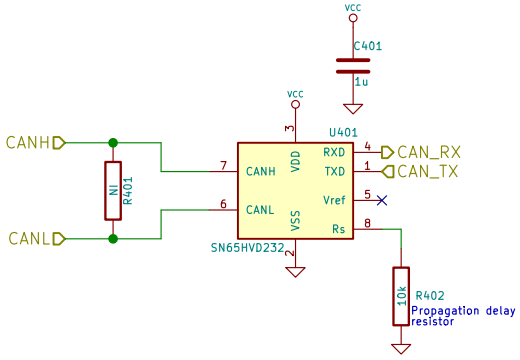
Soldering process must comply with Texas Instruments' Reflow Temperature Profile specifications. Refer to www.ti.com/packaging.[4]

Mrk Industries

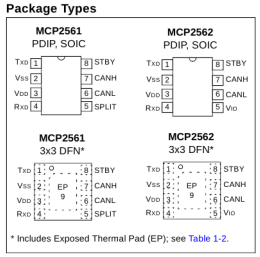
Sheet: /I²C temp sensor/
File: temp.sch

Title: I²C digital temperature sensor

Size: A4	Date: 25 Aug 2014	**Rev:**
KiCad E.D.A. kicad (2014-08-31 BZR 5107)-product		Id: 3/7



Package Types



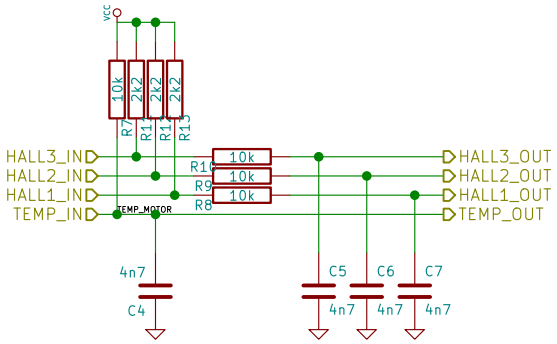
* Includes Exposed Thermal Pad (EP); see Table 1-2.

Mrk Industries

Sheet: /CAN bus transceiver/
File: CAN.sch

Title: CAN BUS transceiver

Size: A4	Date: 25 Aug 2014	**Rev:**
KiCad E.D.A.	kicad (2014-08-31 BZR 5107)-product	Id: 4/7



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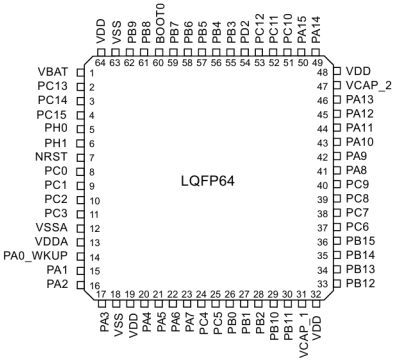
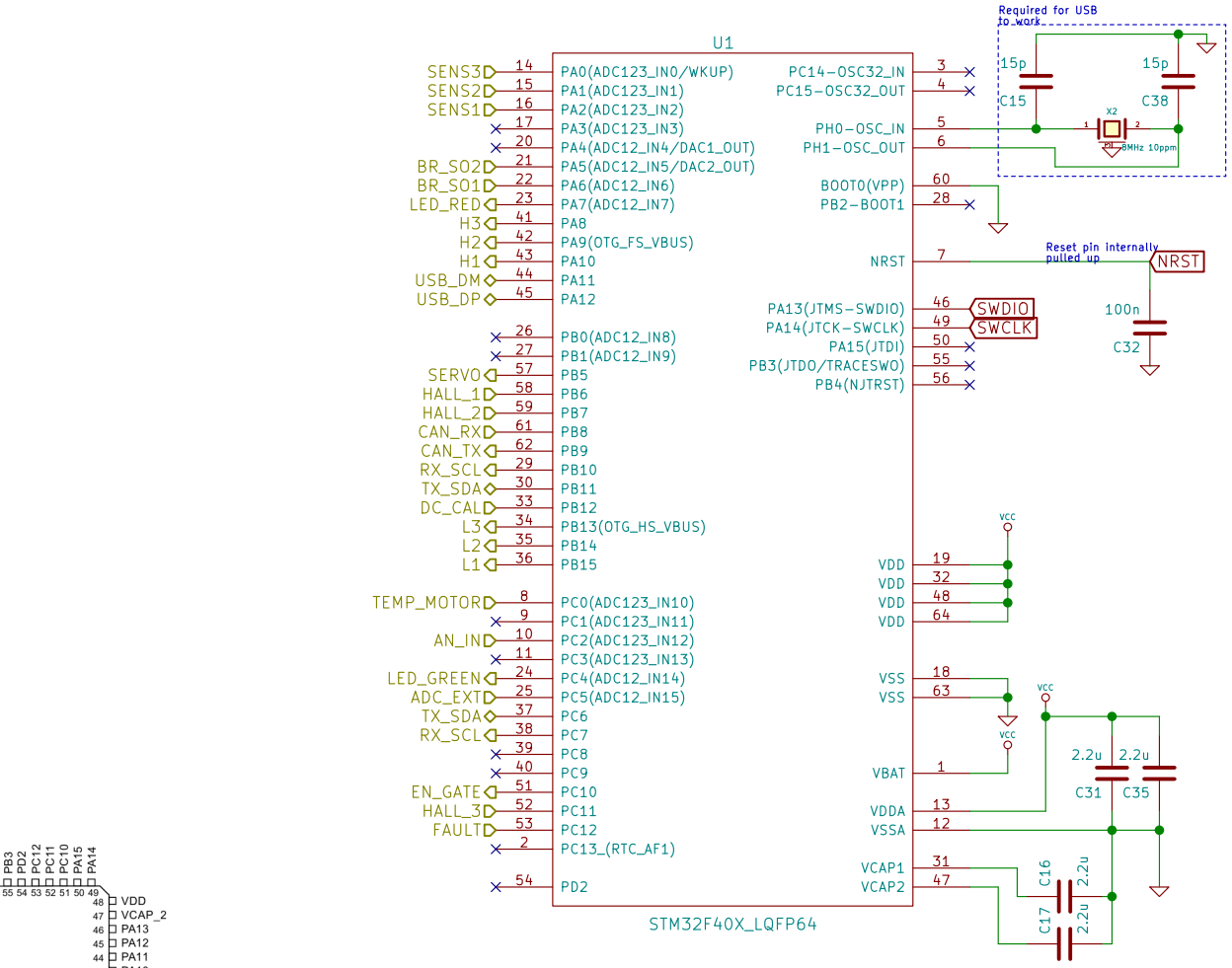
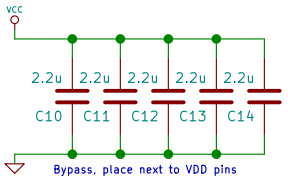
File: hall_filters.sch		
Title:		
Size: A4	Date: 25 Aug 2014	**Rev:**
KiCad E.D.A. kicad (2014-08-31 BZR 5107)-product		Id: 5/7

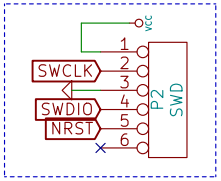
STM32F405xx
STM32F407xx

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









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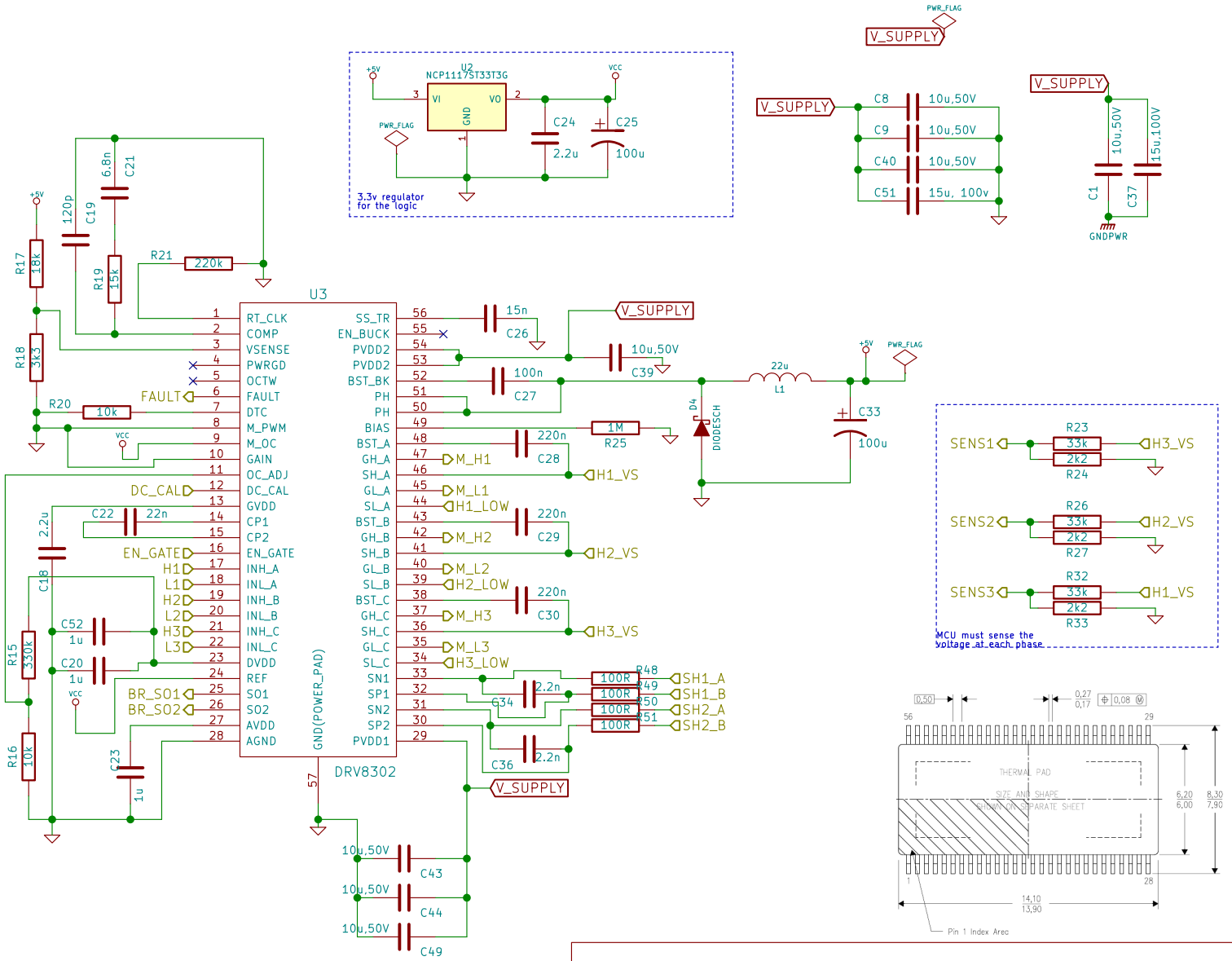
Sheet: /MCU/
File: STM32F4 64LQFP.sch

Title: BLDC Driver 4.5

Size: A4	Date: 25 Aug 2014	**Rev: 4.5**
KiCad E.D.A. kicad (2014-08-31 BZR 5107)-product		Id: 6/7

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	Relative to PGND	8		60	V
PVDD2	DC supply voltage PVDD2 for buck converter		3.5		60	V
C_{AVDD}	External capacitance on AVDD pin (ceramic cap) 20% tolerance			1		µF
C_{DVDD}	External capacitance on DVDD pin (ceramic cap) 20% tolerance			1		µF
C_{GVDD}	External capacitance on GVDD pin (ceramic cap) 20% tolerance			2.2		µF
C_{CP}	Flying cap on charge pump pins (between CP1 and CP2) (ceramic cap) 20% tolerance			22		nF
C_{BST}	Bootstrap cap (ceramic cap)			100		nF
I_{DIN_EN}	Input current of digital pins when EN_GATE is high				100	µA
I_{DIN_DIS}	Input current of digital pins when EN_GATE is low				1	µA
C_{DIN}	Maximum capacitance on digital input pin				10	pF
C_{O_OPA}	Maximum output capacitance on outputs of shunt amplifier				20	pF
R_{DTC}	Dead time control resistor range. Time range is 50ns (-GND) to 500ns (150kΩ) with a linear approximation.		0		150	kΩ
I_{FAULT}	$\overline{FAULT}$ pin sink current. Open-drain	V = 0.4 V			2	mA
I_{OCTW}	$\overline{OCTW}$ pin sink current. Open-drain	V = 0.4 V			2	mA
V_{REF}	External voltage reference voltage for current shunt amplifiers		2		6	V
f_{gate}	Operating switching frequency of gate driver	Qg(TOT) = 25 nC or total 30 mA gate drive average current			200	kHz
T_A	Ambient temperature		–40		125	°C

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Sheet: /Mosfet driver/
File: Power.sch

Title: BLDC Driver 4.5

Size: A4	Date: 25 Aug 2014	**Rev: 4.5**
KiCad E.D.A. kicad (2014-08-31 BZR 5107)-product		Id: 7/7