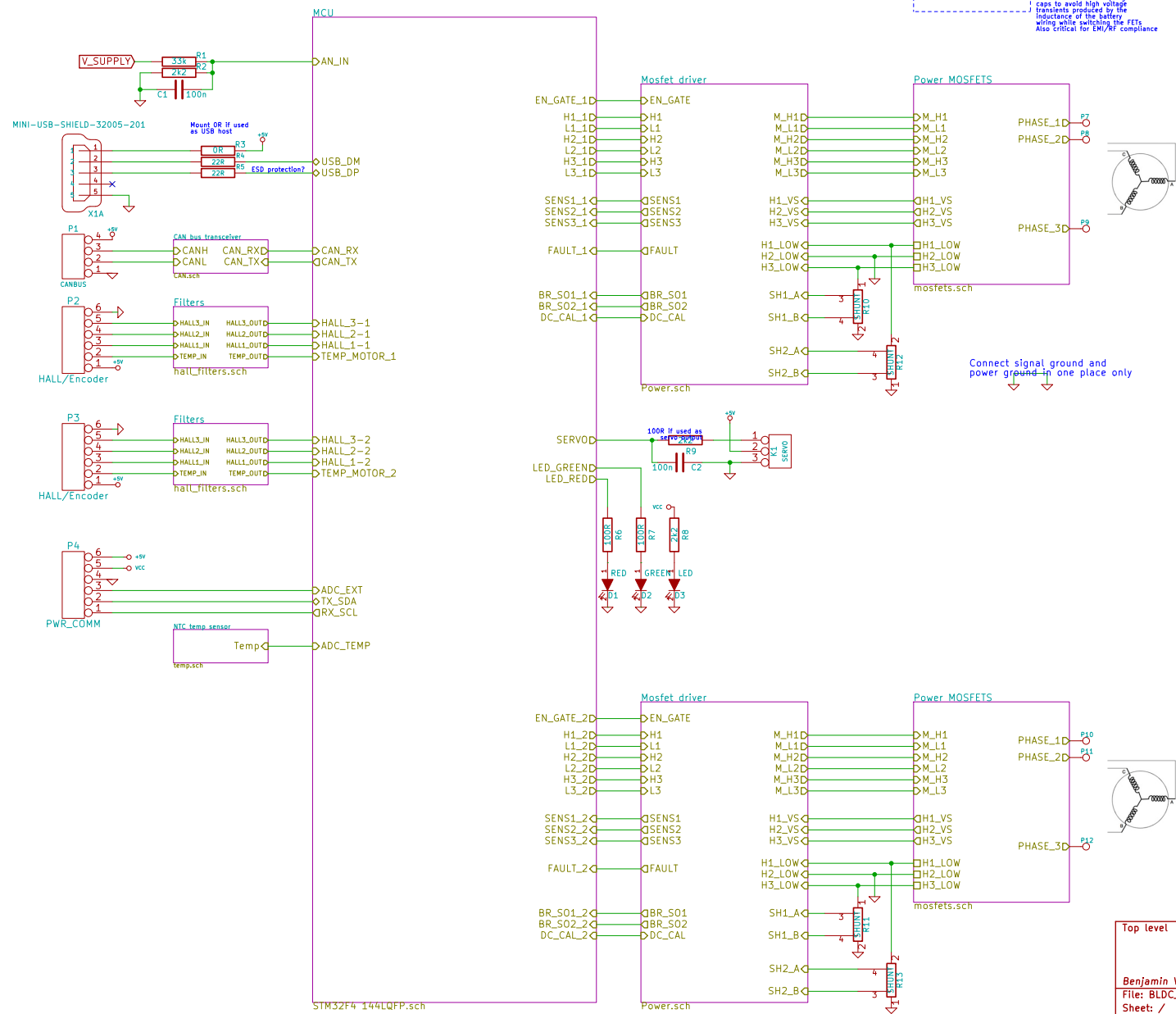


BLDC motor controller



[Top level](#)

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File: BLDC_4.sch
Sheet: /

Title: BLD

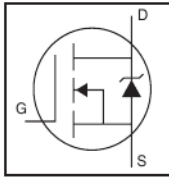
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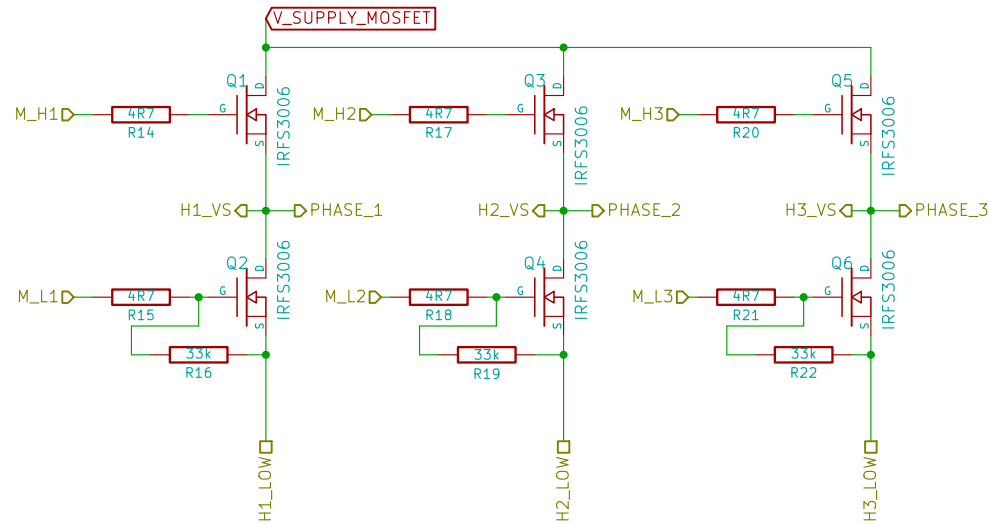
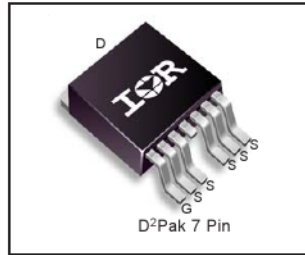
Rev: 4.6

REV: 4.0
Id: 1/10

HEXFET® Power MOSFET



V_{DS}		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 @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{DS} = 10\text{V}$ (Silicon Limited)	293①	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{DS} = 10\text{V}$ (Silicon Limited)	207 ②	A
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{DS} = 10\text{V}$ (Package Limited)	240	A
I_{DS}	Pulsed Drain Current ③	1172	A
P_D @ $T_C = 25^\circ\text{C}$	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 ④	11	V/ns
T_J	Operating Junction and Storage Temperature Range	-55 to $+175$	°C
T_{SOL}	Soldering Temperature, for 10 seconds (1.6mm from case)	300	°C
	Mounting torque, 6-32 or M3 screw	10lb-in (1.1N-m)	

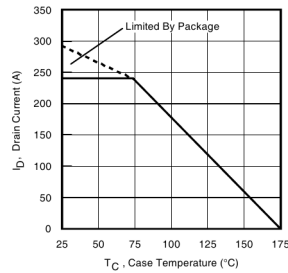


Fig 9. Maximum Drain Current vs. Case Temperature

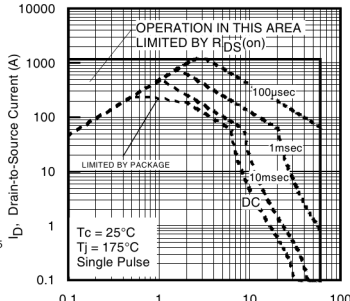
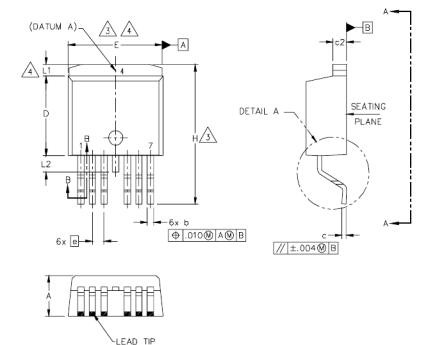


Fig 8. Maximum Safe Operating Area



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Sheet: /Power MOSFETS/

Title: BLDC Driver 4.6

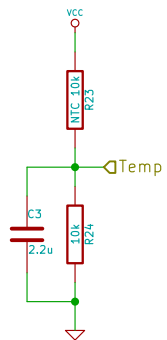
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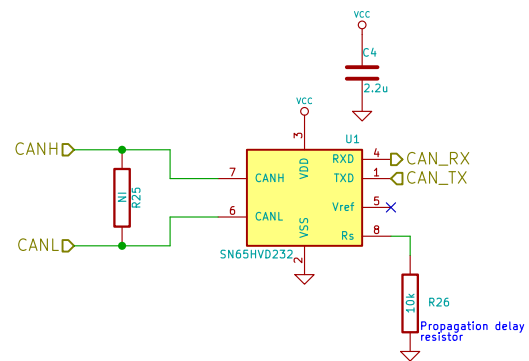
Rev: 4.6

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Id: 2/10



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Size: A4	Date: 16 jan 2015	Rev:
KiCad E.D.A.		Id: 3/10

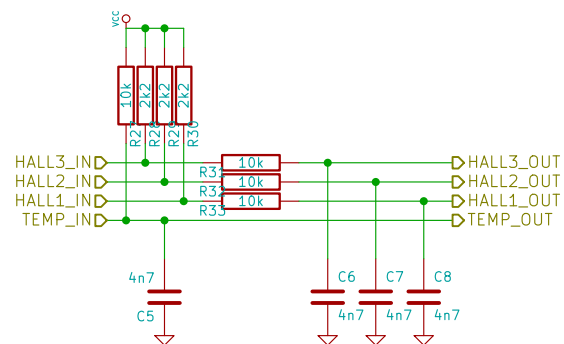


Package Types

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

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

Mrk Industries	
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Title: CAN BUS transceiver	
Size: A4	Date: 16 jan 2015
KiCad E.D.A.	Rev: Id: 4/10



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KiCad E.D.A.		Id: 5/10

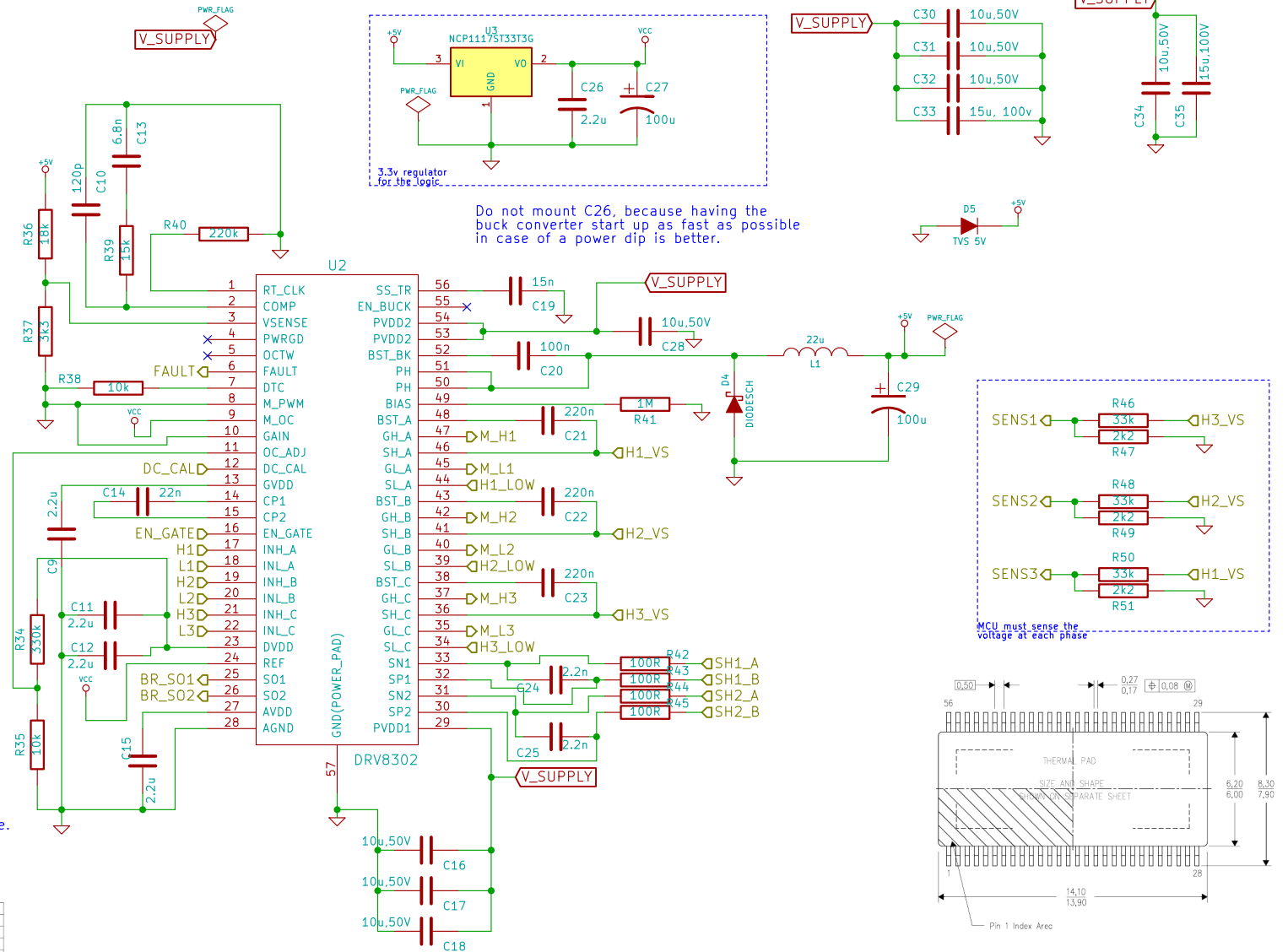
FEATURES

- 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

Do not mount the resistor R16, because the internal current limit in the DRV8302 does not work with this configuration for some reason. If this resistor is mounted, the DRV8203 will generate faults all the time.

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
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 _{BOOT}	Bootstrap cap (ceramic cap)	100		nF
I _{DD1,EN}	Input current of digital pins when EN_GATE is high	100		µA
I _{DD1,DIS}	Input current of digital pins when EN_GATE is low	1		µA
C _{DI}	Maximum capacitance on digital input pin	10		pF
C _{O,OPA}	Maximum output capacitance on outputs of shunt amplifier	20		pF
R _{DT}	Dead time control resistor range. Time range is 50ns (GND) to 500ns (150kΩ) with a linear approximation.	0	150	kΩ
I _{FAULT}	FAULT pin sink current. Open-drain	V = 0.4 V	2	mA
I _{OCTW}	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 _{SW}	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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File: Power.sch

Sheet: /Mosfet driver/

Title: BLDC Driver 4.5

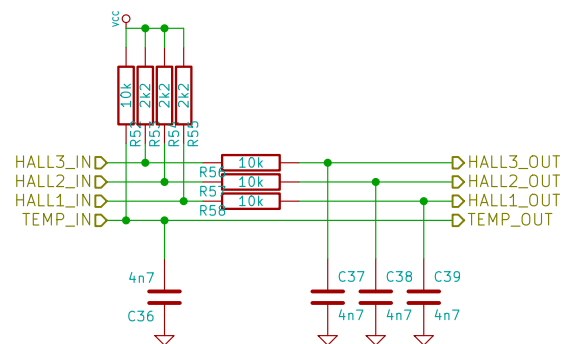
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Date: 16 jan 2015

Rev: 4.5

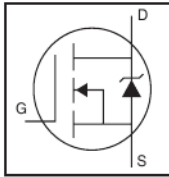
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Id: 6/10

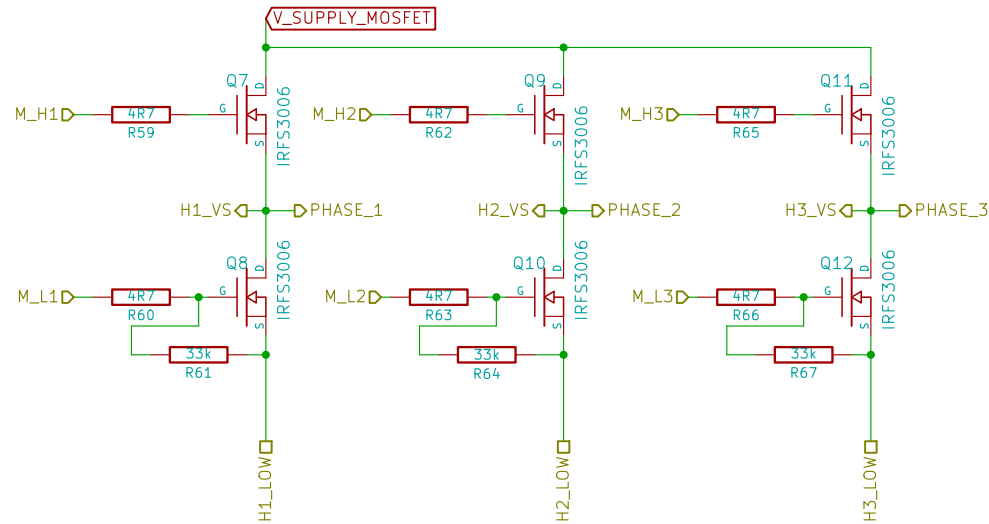
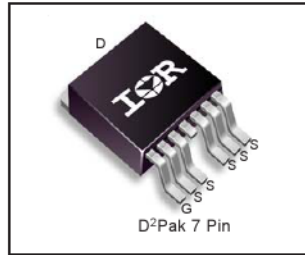


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Title:		
Size: A4	Date: 16 jan 2015	Rev:
KiCad E.D.A.		Id: 7/10

HEXFET® Power MOSFET



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



Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{DS} = 10\text{V}$ (Silicon Limited)	293①	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{DS} = 10\text{V}$ (Silicon Limited)	207 ②	A
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{DS} = 10\text{V}$ (Package Limited)	240	A
I_{DS}	Pulsed Drain Current ③	1172	A
P_D @ $T_C = 25^\circ\text{C}$	Maximum Power Dissipation	375	W
	Linear Derating Factor	2.5	W/ $^\circ\text{C}$
V_{GS}	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery ④	11	V/ns
T_J	Operating Junction and Storage Temperature Range	-55 to $+175$	$^\circ\text{C}$
T_{SOL}	Soldering Temperature, for 10 seconds (1.6mm from case)	300	$^\circ\text{C}$
	Mounting torque, 6-32 or M3 screw	10lb-in (1.1N-m)	

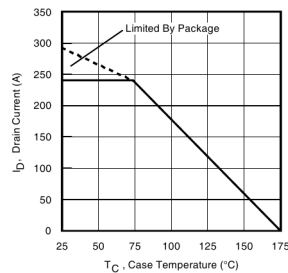


Fig 9. Maximum Drain Current vs. Case Temperature

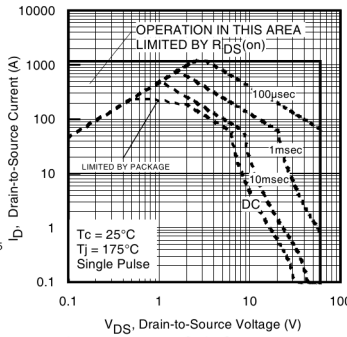
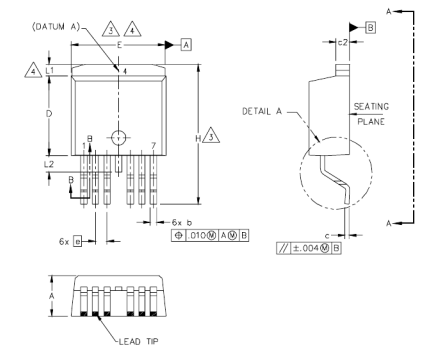


Fig 8. Maximum Safe Operating Area



Benjamin Vedder

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Sheet: /Power MOSFETS/

Title: BLDC Driver 4.6

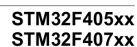
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Rev: 4.6

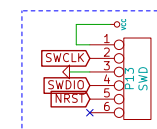
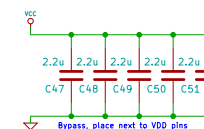
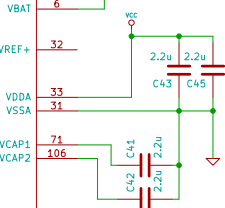
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Id: 8/10



U4

SENS3_1D 34 PA0(ADC123_IN0/WKUP)
SENS2_1D 35 PA1(ADC123_IN1)
SENS1_1D 36 PA2(ADC123_IN2)
ADC_TEMP 40 PA4(ADC12_IN4/DACL_OUT)
BR_S02_1D 41 PA5(ADC12_IN5/DAC2_OUT)
BR_S01_1D 42 PA6(ADC12_IN6)
L3_2Q 43 PA7(ADC12_IN7)
X 100 PA8
X 101 PA9(OTG_FS_VBUS)
X 102 PA10
USB_DM0 103 PA11
USB_DP0 104 PA12
X 46 PB0(ADC12_IN8)
X 47 PB1(ADC12_IN9)
SERVO0 135 PB5
HALL_1_2D 136 PB6
HALL_2_2D 137 PB7
CAN_RXD 139 PB8
CAN_TX0 140 PB9
RX_SCLQ 69 PB10
TX_SDA0 70 PB11
DC_CAL_1D 73 PB12
X 74 PB14
L2_2Q 75 PB14
L1_2Q 76 PB15
P_MOTOR_1D 26 PC0(ADC123_IN10)
X 27 PC1(ADC123_IN11)
AN_JND 28 PC2(ADC123_IN12)
LED_RED0 29 PC3(ADC123_IN13)
LED_GREEN0 44 PC4(ADC12_IN14)
ADC_EXT0 45 PC5(ADC12_IN15)
H3_2Q 96 PC6
H2_2Q 97 PC7
H1_2Q 98 PC8
X 99 PC9
EN_GATE_1 111 PC10
HALL_3_1D 112 PC11
FAULT_1 113 PC12
X 7 RTC_AF1
HALL_1_2D 114 PD0
HALL_2_2D 115 PD1
HALL_3_2D 116 PD2
X 117 PD3
X 118 PD4
TX_SDA0 119 PD5
RX_SCLQ 122 PD6
EN_GATE_2Q 123 PD7
FAULT_2D 77 PD8
X 78 PD9
X 79 PD10
X 80 PD11
X 81 PD12
X 82 PD13
X 85 PD14
X 86 PD15
DC_CAL_2D 10 PF0
X 11 PF1
X 12 PF2
SENS3_2D 14 PF3(ADC3_IN9)
SENS2_2D 15 PF4(ADC3_IN14)
SENS1_2D 16 PF5(ADC3_IN15)
P_MOTOR_2D 18 PF6(ADC3_IN4)
BR_S02_2D 19 PF7(ADC3_IN5)
BR_S01_2D 20 PF8(ADC3_IN6)
X 21 PF9
X 22 PF9(ADC3_IN7)
X 49 PF10(ADC3_IN8)
X 50 PF11
X 51 PF12
X 53 PF13
X 54 PF14
X 55 PF15
X 56 PG0
X 57 PG1
X 87 PG2
X 88 PG3
X 89 PG4
X 90 PG5
X 91 PG6
X 92 PG7
X 93 PG8
X 124 PG9
X 125 PG10
X 126 PG11
X 127 PG12
X 128 PG13
X 129 PG14
X 132 PG15
PE0 141
PE1 142
PE2 1
PE3 2
PE4 3
PE5 4
PE6 5
PE7 58
PE8 59
PE9 60
PE10 63
PE11 64
PE12 65
PE13 66
PE14 67
PE15 68
PC14-OSC32_IN 8
PC15-OSC32_OUT 9
PH0-OSC_IN 23
PH1-OSC_OUT 24
BOOT0(VPP) 138
PB2-B00T1 48
NRST 25
PA13(JTMS-SWDIO) 105
PA14(JTCK-SWCLK) 109
PA15(JTDO) 110
PB3(JTDO/TRACESWO) 133
PB4(NJTRST) 134
VCC 0
PDR_ON 143
VDD 17
VDD 30
VDD 39
VDD 52
VDD 62
VDD 72
VDD 84
VDD 95
VDD 108
VDD 121
VDD 131
VDD 144
VSS 16
VSS 38
VSS 51
VSS 61
VSS 83
VSS 94
VSS 107
VSS 120
VSS 130
VBAT 6
VREF+ 32
V2A 33
VSSA 31
VCAP1 71
VCAP2 106
Required for USB to work
15pF
C40
10k
C46
Reset pin internal pulled up
100nF
C44
2.2uF
C43
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C45
2.2uF
C42
2.2uF

Programming / Debug
connector

Rev: 4.8
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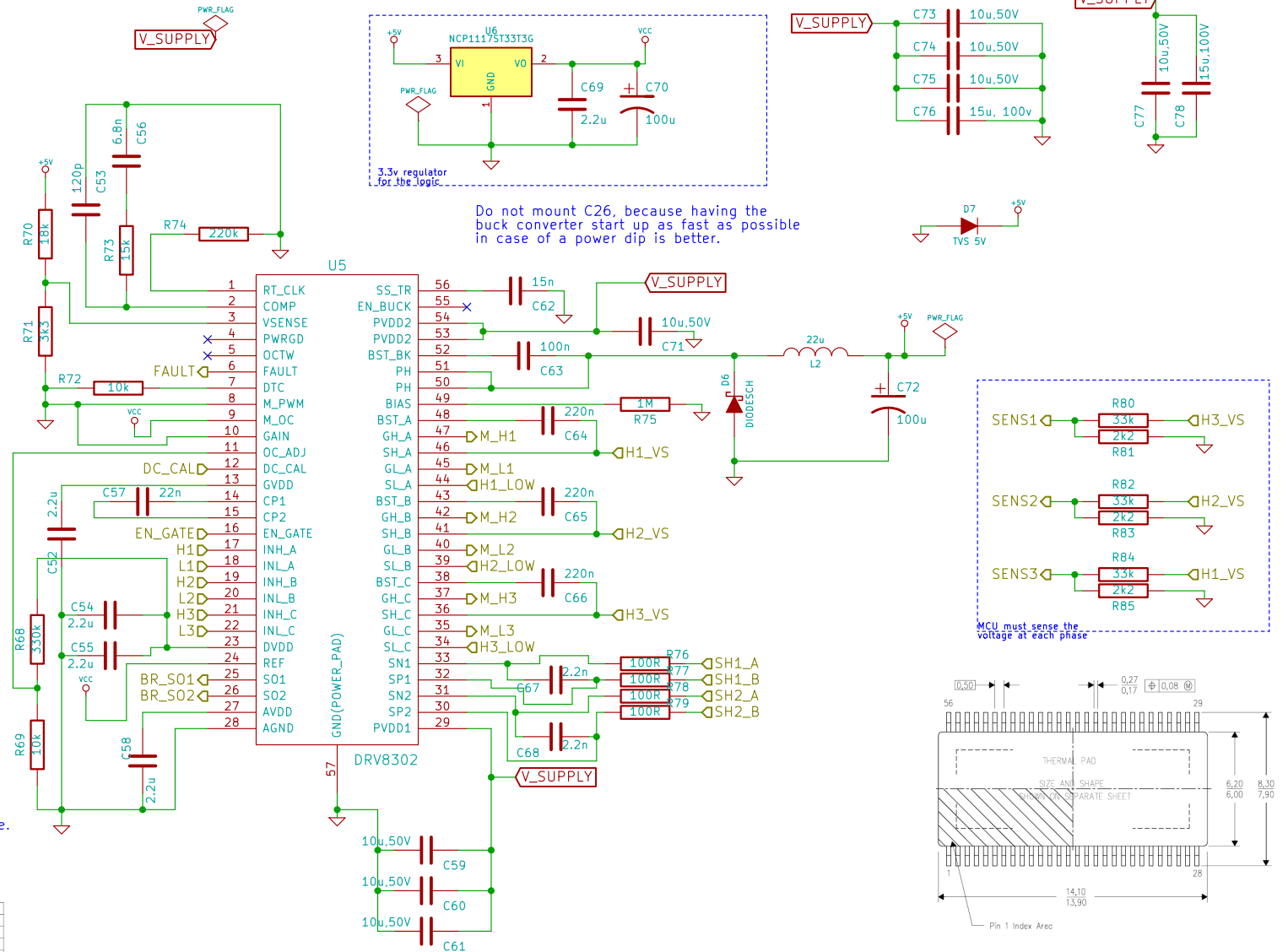
FEATURES

- 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
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- Programmable Overcurrent Protection of External MOSFETs
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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 _{BOOT}	Bootstrap cap (ceramic cap)	100		nF
I _{DDEN}	Input current of digital pins when EN_GATE is high	100		µA
I _{DDLO}	Input current of digital pins when EN_GATE is low	1		µA
C _{DI}	Maximum capacitance on digital input pin	10		pF
C _{O,OPA}	Maximum output capacitance on outputs of shunt amplifier	20		pF
R _{DT}	Dead time control resistor range. Time range is 50ns (GND) to 500ns (150kΩ) with a linear approximation.	0	150	kΩ
I _{FAULT}	FAULT pin sink current. Open-drain	V = 0.4 V	2	mA
I _{OCTW}	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 _{SW}	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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File: Power.sch

Sheet: /Mosfet driver/

Title: BLDC Driver 4.5

Size: A4

Date: 16 jan 2015

Rev: 4.5

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Id: 10/10