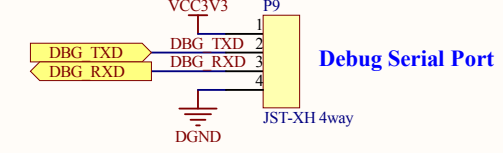
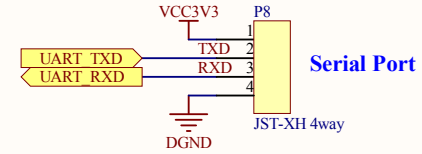
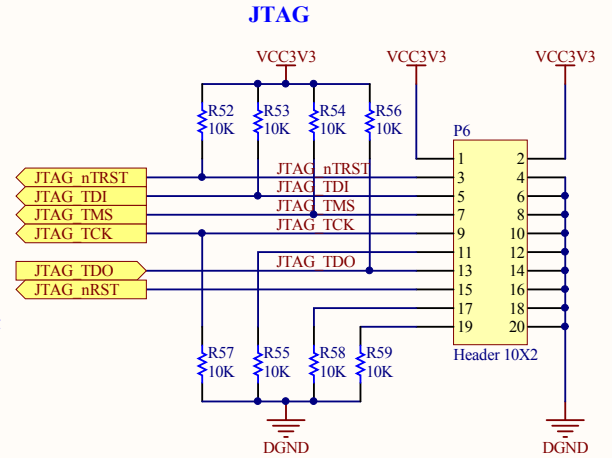
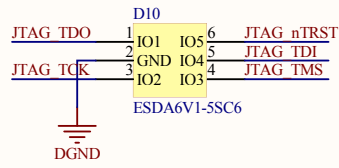
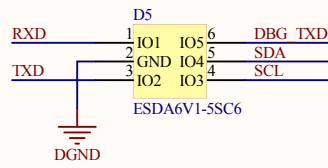
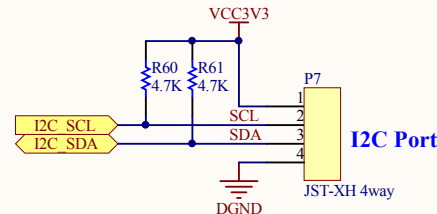
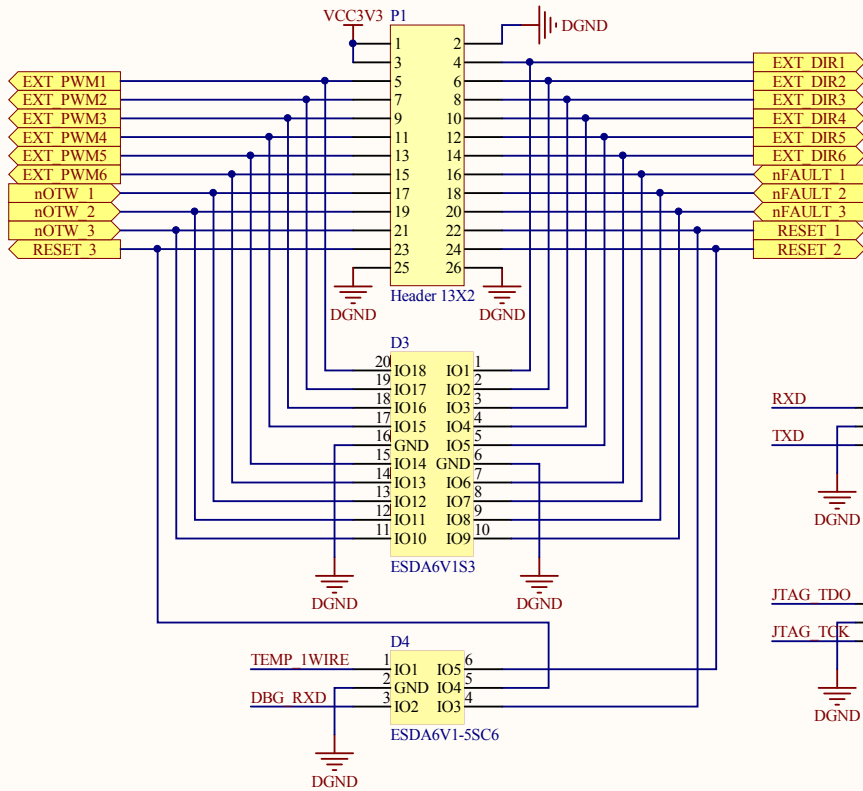
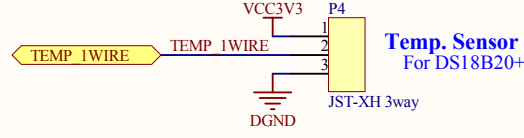
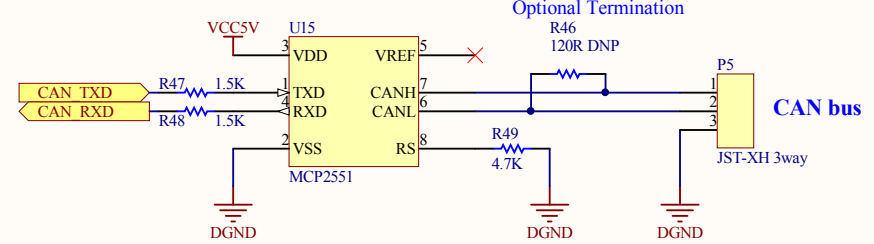
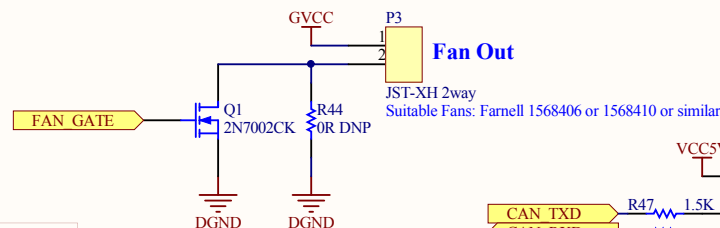


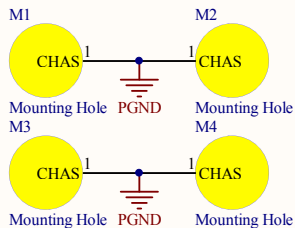
## External PWM Controller Connector



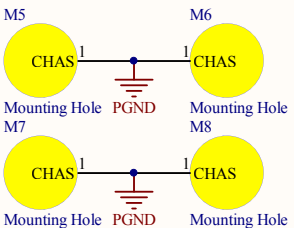
**NOTE: Off-board PWM/Direction/Reset Signals are 3.3V levels  
They are only 5V tolerant in certain configurations**



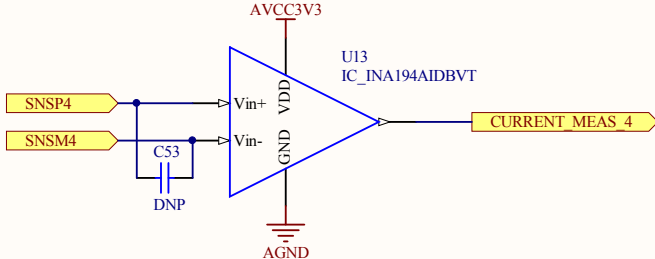
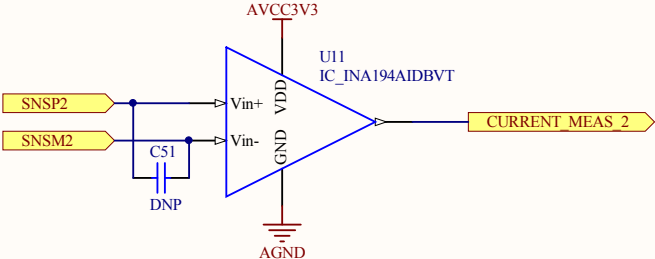
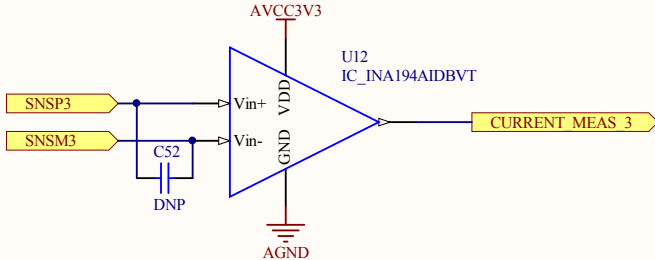
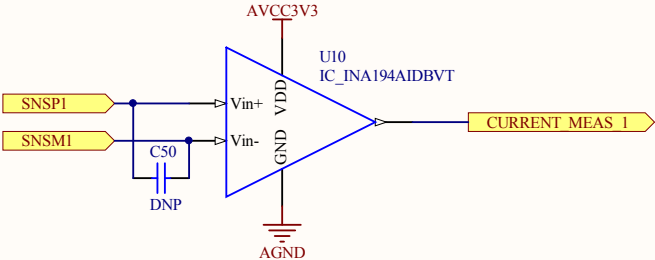
## Heatsink Mounting Holes (M3)



## Board Mounting Holes (M4)



Title		
Connectors, IO protection		
Size	Number	Revision
A4		
Date:	11/02/2011	Sheet of
File:	C:\Users\connectors and io.SchDoc	Drawn By:

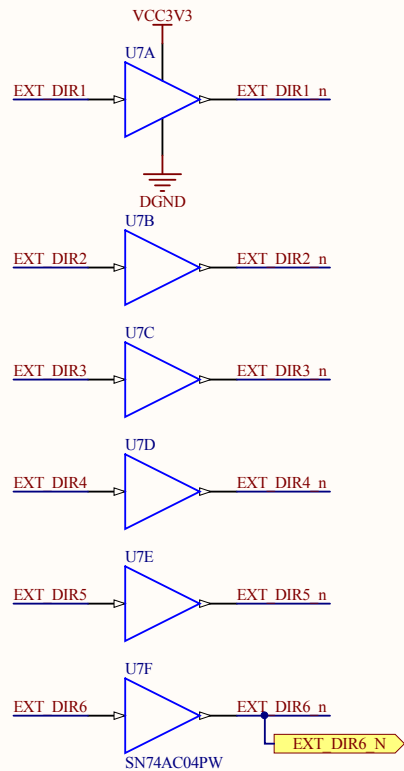


With INA194, range is 12.4A nominal  
With INA193, range is 31.0A nominal

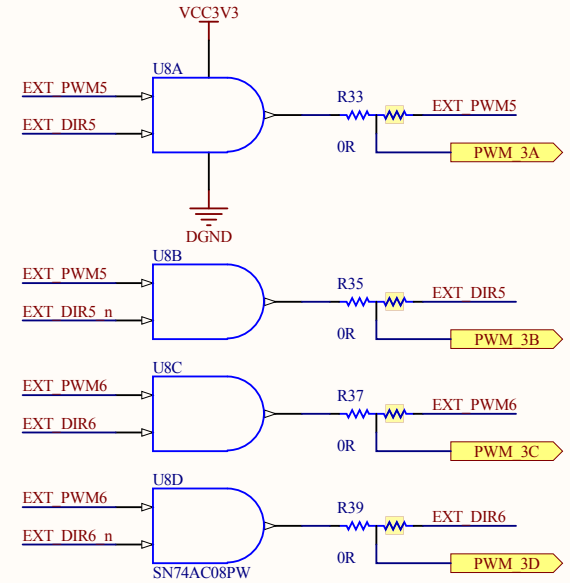
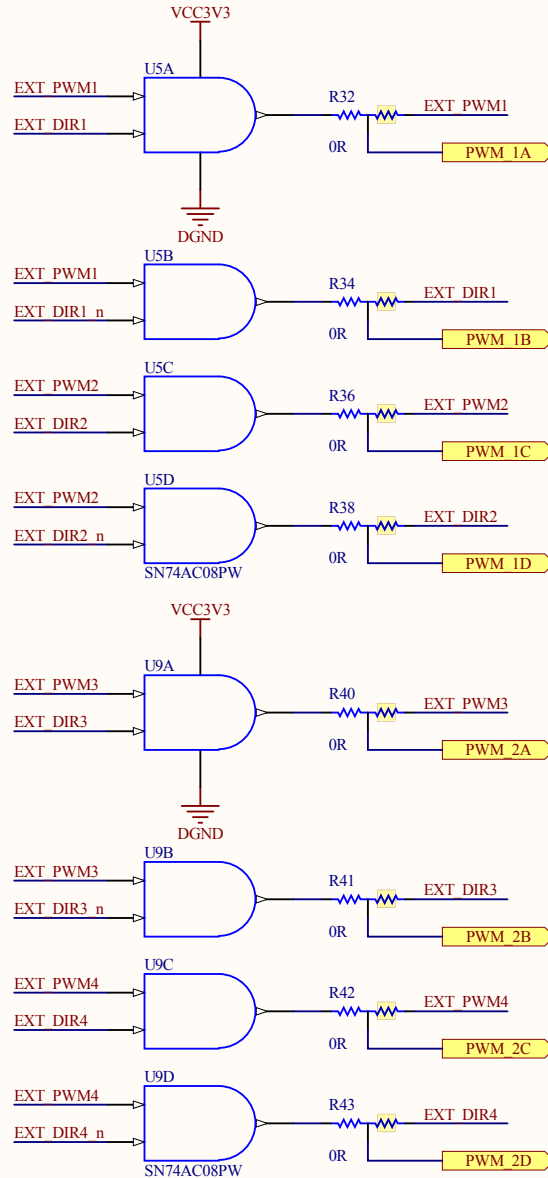
Title		
Current Sense Amplifiers		
Size	Number	Revision
A4		
Date:	11/02/2011	Sheet of
File:	C:\Users\...\current amps.SchDoc	Drawn By:

EXT PWM1 EXT PWM1  
EXT PWM2 EXT PWM2  
EXT PWM3 EXT PWM3  
EXT PWM4 EXT PWM4  
EXT PWM5 EXT PWM5  
EXT PWM6 EXT PWM6

EXT DIR1 EXT DIR1  
EXT DIR2 EXT DIR2  
EXT DIR3 EXT DIR3  
EXT DIR4 EXT DIR4  
EXT DIR5 EXT DIR5  
EXT DIR6 EXT DIR6



74AHCxx Family should be used for 5V tolerance



### Brushed DC, Not Using Micro:

- \* Populate U5, U7, U8, U9
- \* Populate P1 and attach to external drive signals
- \* Populate 0R resistors R32-R43 in alternate positions

### Brushed DC or PMSM, Using Micro:

- \* Do not populate U5, U7, U8, U9
- \* Do not populate P1, or do not drive signals into it
- \* Populate 0R resistors R32-R43 in default positions
- \* External PWM connector (P1) can then be used as an output to slave boards, or to a logic analyser

Title <b>Direction control logic (for legacy PWM input)</b>		
Size A4	Number	Revision
Date:	11/02/2011	Sheet of
File:	C:\Users\...\direction_logic.SchDoc	Drawn By:

A

A

B

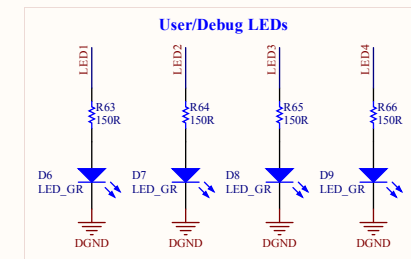
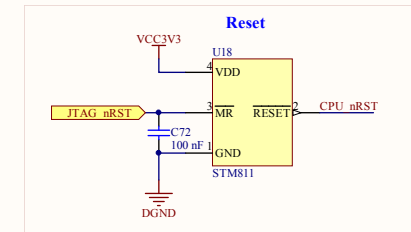
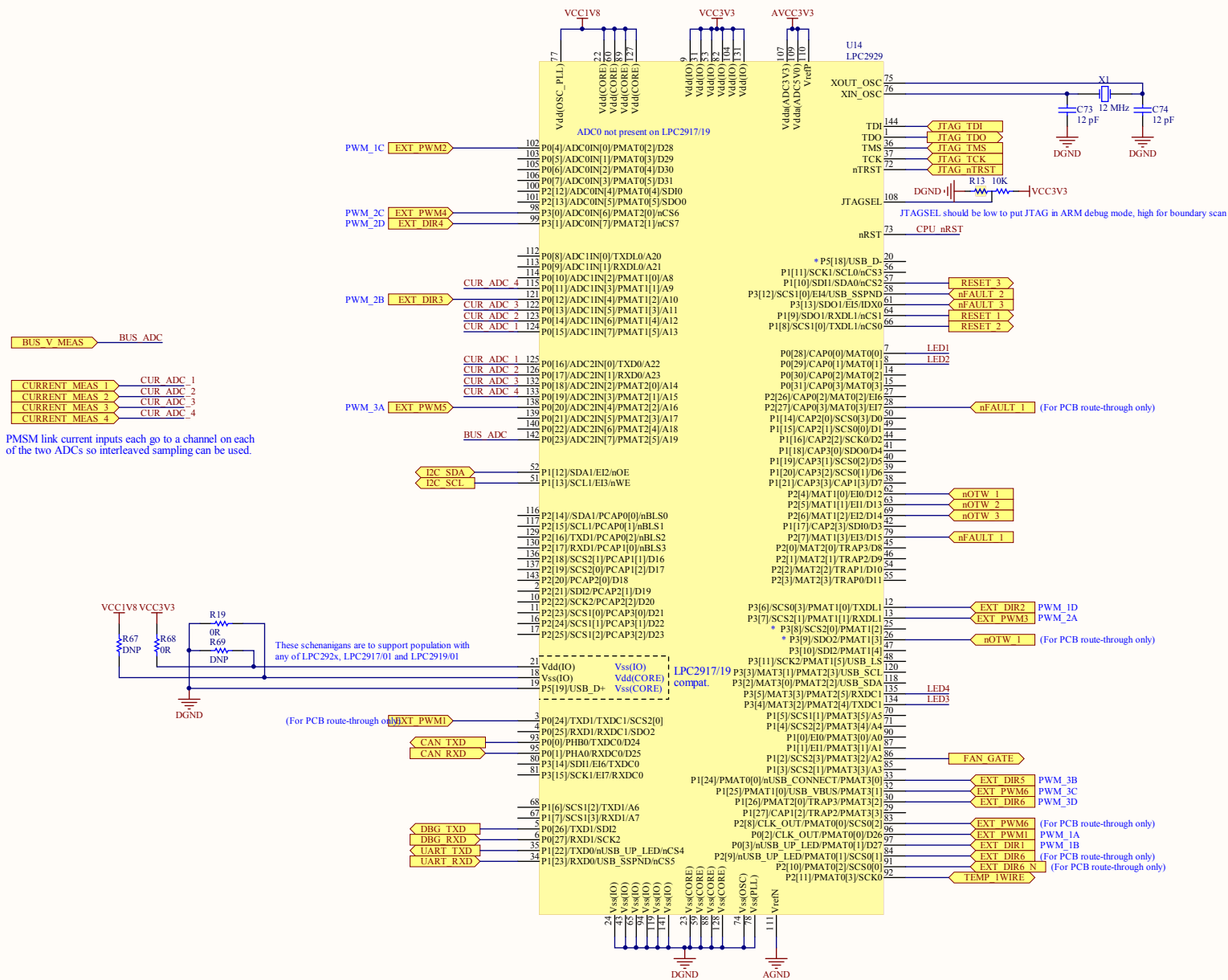
B

C

C

D

D



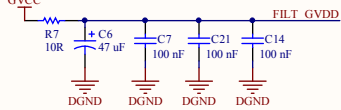
Title		
Microcontroller		
Size	Number	Revision
A3		
Date:	11/02/2011	Sheet of
File:	C:\Users\micro SchDoe	Drawn By:

M1- Over-Current: low=limit high=latch  
M2- Pairs (A-B and C-D) paralleled: high=paralleled low=independent  
M3- Bridge Structure: low=dual-full high=quad-half (only matters for current limiting)

### Using DRV8432DKD instead of DRV8402DKD

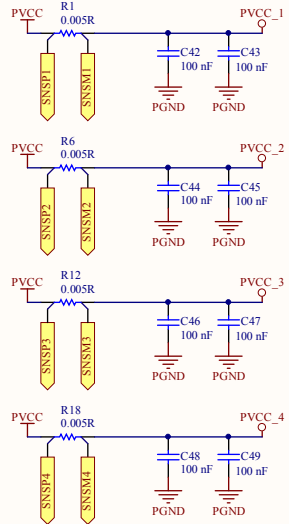
- \* Pinout and footprint is compatible
- \* FIXME add notes here

### 12V Logic Supply

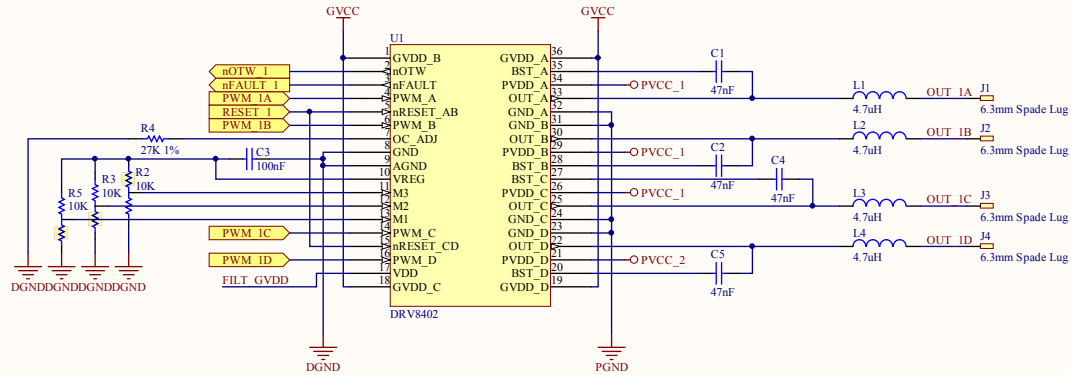
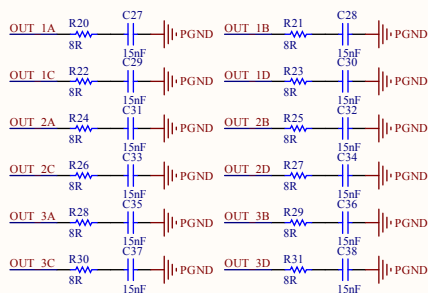


### Bridge Power

Alternate shunt resistor: WELWYN - ULR155-R005F72 (Farnell 1621986)



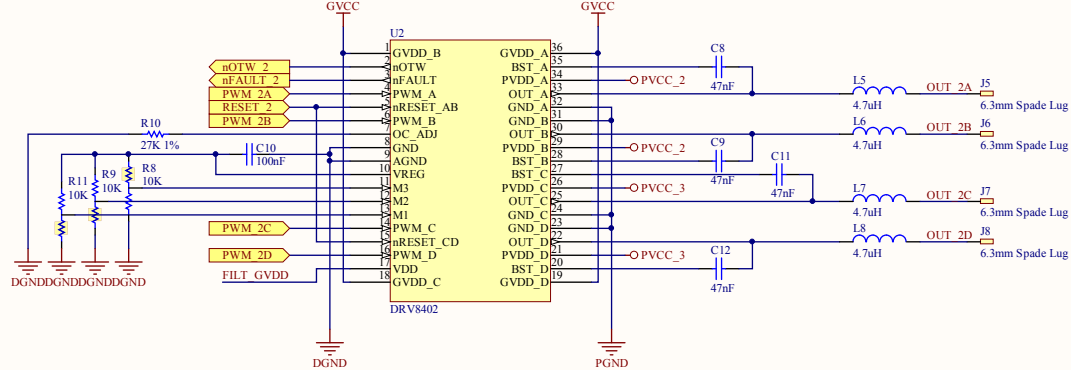
### Snubber Networks



Brushed Motor 1  
3-Phase Motor 1

Brushed Motor 2  
3-Phase Motor 2

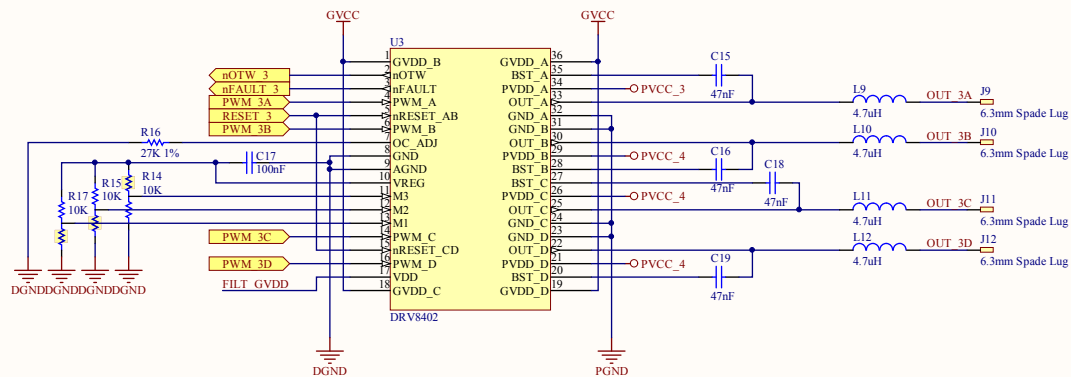
3-Phase Motor 2



Brushed Motor 3  
3-Phase Motor 3

Brushed Motor 4  
3-Phase Motor 3

3-Phase Motor 3



Brushed Motor 5  
3-Phase Motor 4

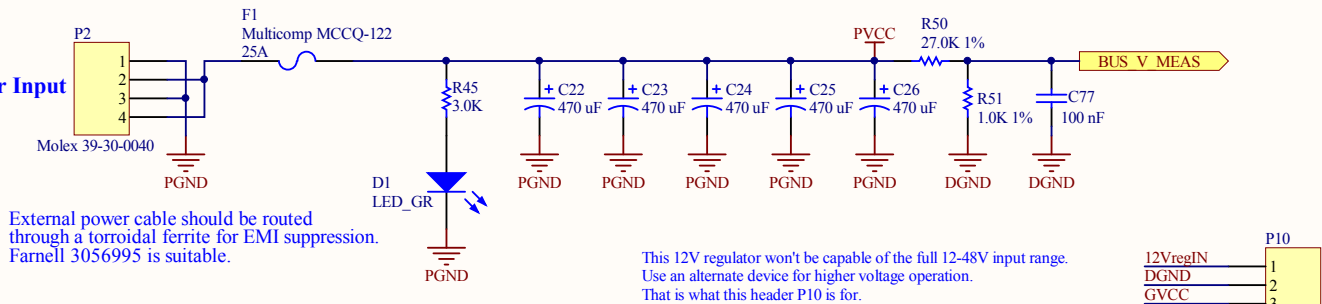
Brushed Motor 6  
3-Phase Motor 4

3-Phase Motor 4

Inductor superseded by SRR1280-4R7Y (direct replacement)  
Inductor can also be replaced with: (footprint compatible)  
WUERTH ELEKTRONIK - 74477004  
or VISHAY DALE - IHLP4040DZER4R7M11  
For future version 2, investigate BOURNS JW MILLER - 5230-RC inductor

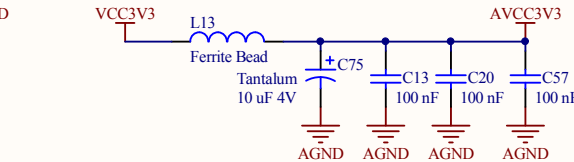
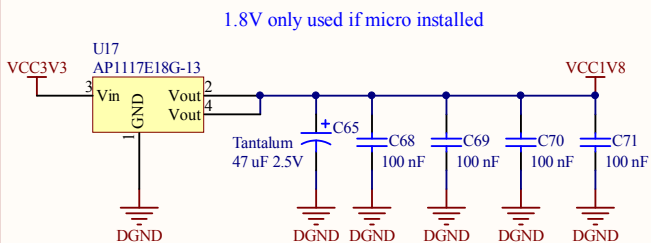
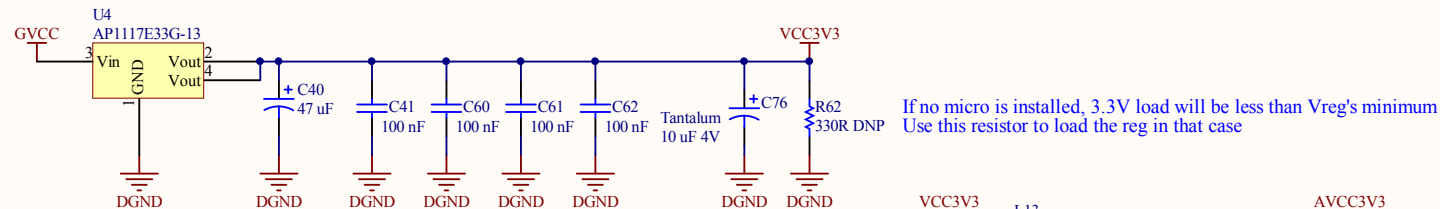
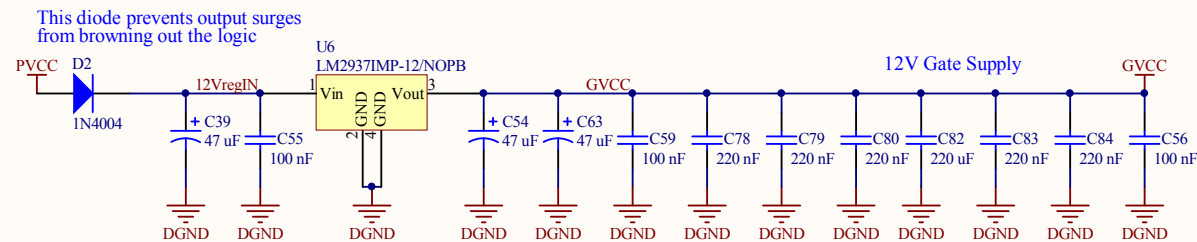
Title		
Power H-Bridge Drivers		
Size	Number	Revision
A3		
Date:	11/02/2011	Sheet of
File:	C:\Users\motor_controllers\SchDoc	Drawn By:

## Power Input



## Non-BOM Parts

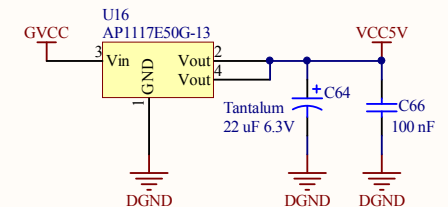
- \* M4 spacers for mounting board (x4) - e.g. Farnell 1466853
- \* M4 pan machine screw (x4) - [generic]
- \* M3 pan machine screw for heatsink (x4) - e.g. Farnell 250119
- \* M3 locking washer (x4) - e.g. Farnell 1624072
- \* 25A mini-blade fuse - Farnell 308377
- \* (Optional) inline fuse holders for output connections + fuses
- \* Rubber feet (heatsink spacers) - Farnell 1447720
- \* Torroidal ferrite for power input - Farnell 3056995
- \* Heatsink, either of:
  - \* FISCHER ELEKTRONIK - SK 92/50 SA - Farnell 4621566
  - \* H S MARSTON - 05DN-00500-A-200 - Farnell 414189
  - \* FISCHER ELEKTRONIK - SK 81/ 50 SA - Farnell 1211718
- (The latter two will require one or two 50mm fans)
- \* Mating connectors
- \* FIXME put part numbers here



Join at power input connector

Join under LPC29xx

5V only used for CAN - DNP if not installing CAN



Title		
Size	Number	Revision
A4		
Date:	11/02/2011	Sheet of
File:	C:\Users\...\power_supplies.SchDoc	Drawn By:

## Power Supplies