
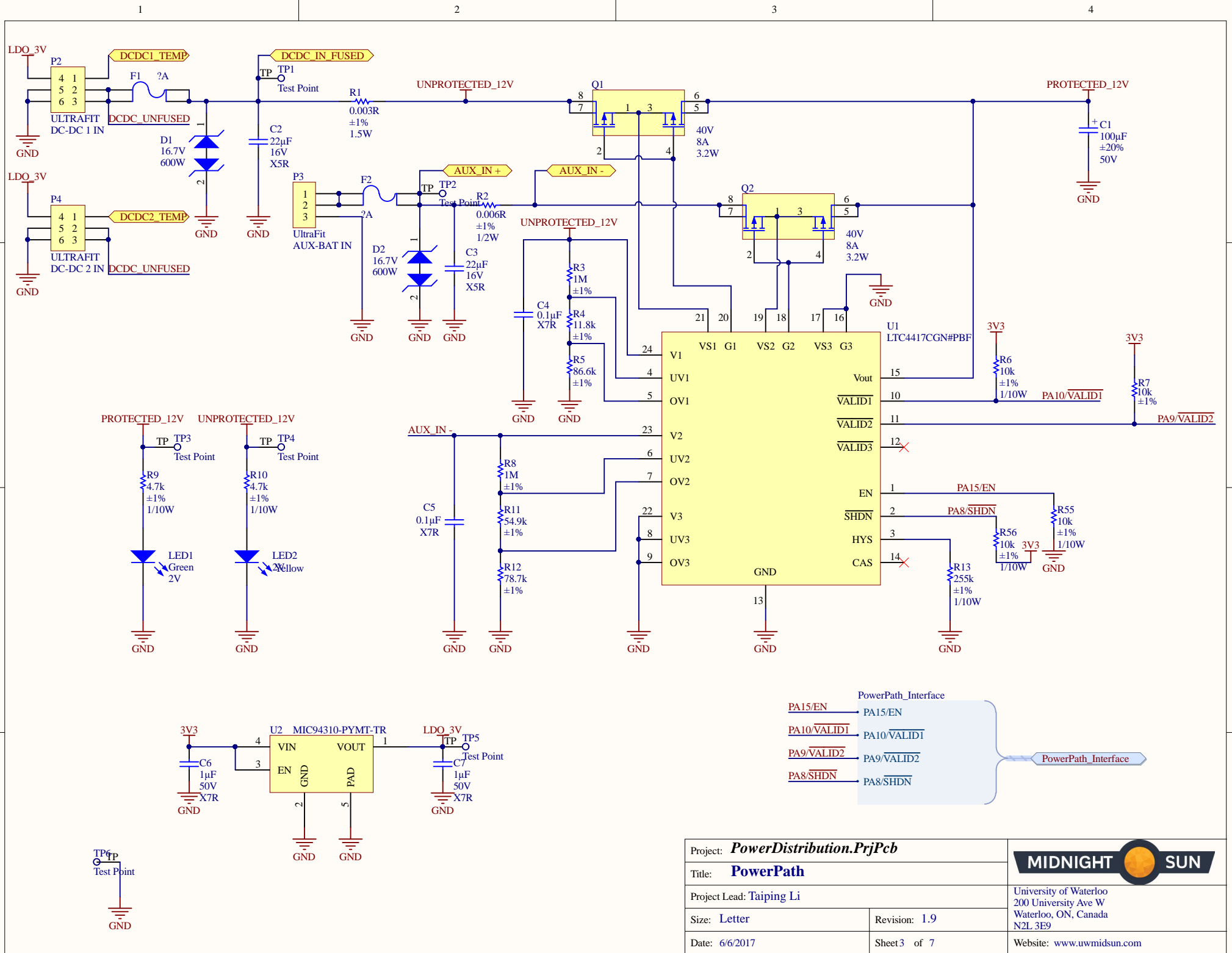
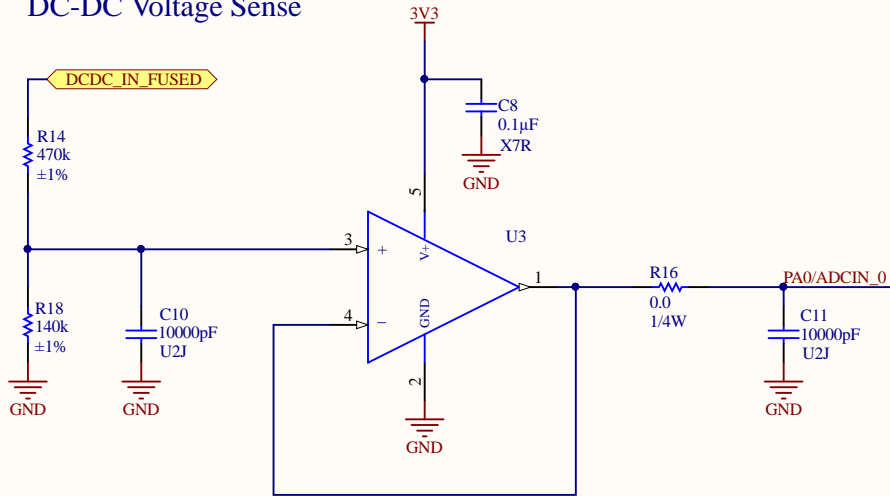


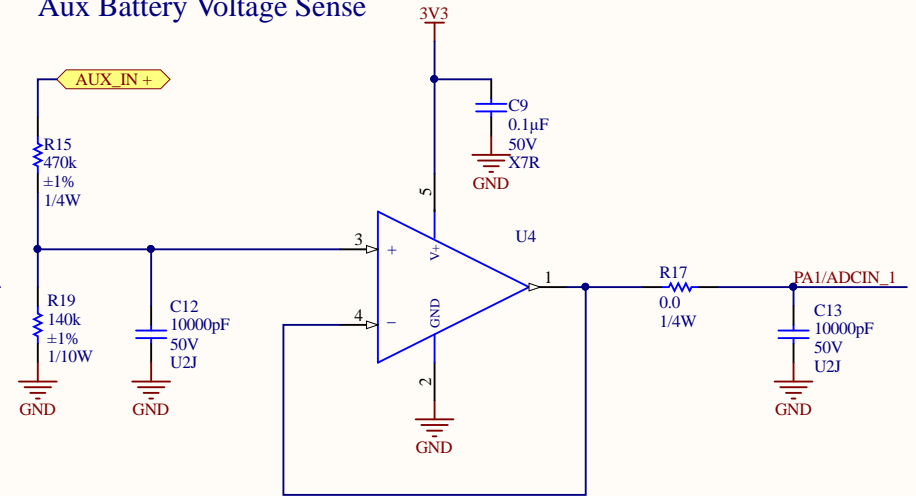
Project: <i>PowerDistribution.PrjPcb</i>		
Title: <b>Controller Board Interface</b>		
Project Lead: Taiping Li		<div>University of Waterloo 200 University Ave W Waterloo, ON, Canada N2L 3E9  Website: <a href="http://www.uwmidsun.com">www.uwmidsun.com</a></div>
Size: Letter	Revision: 1.9	
Date: 6/6/2017	Sheet2 of 7	



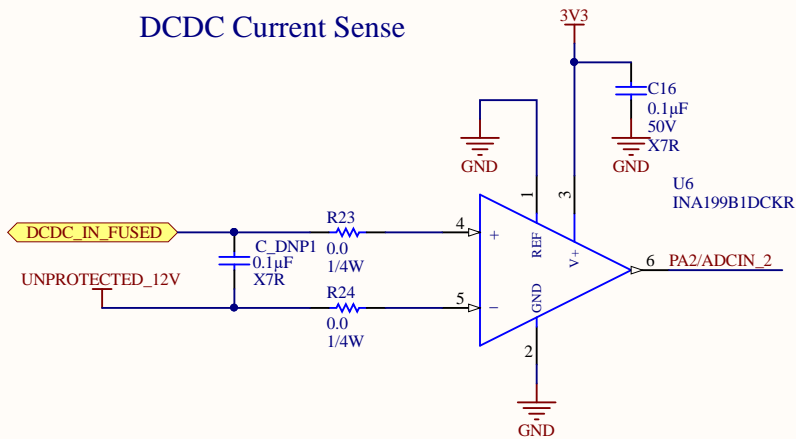
## DC-DC Voltage Sense



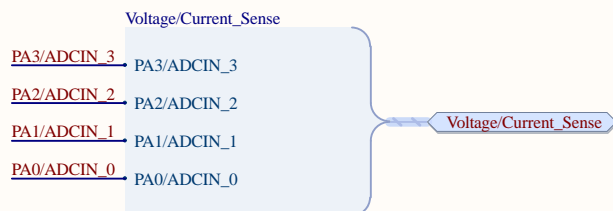
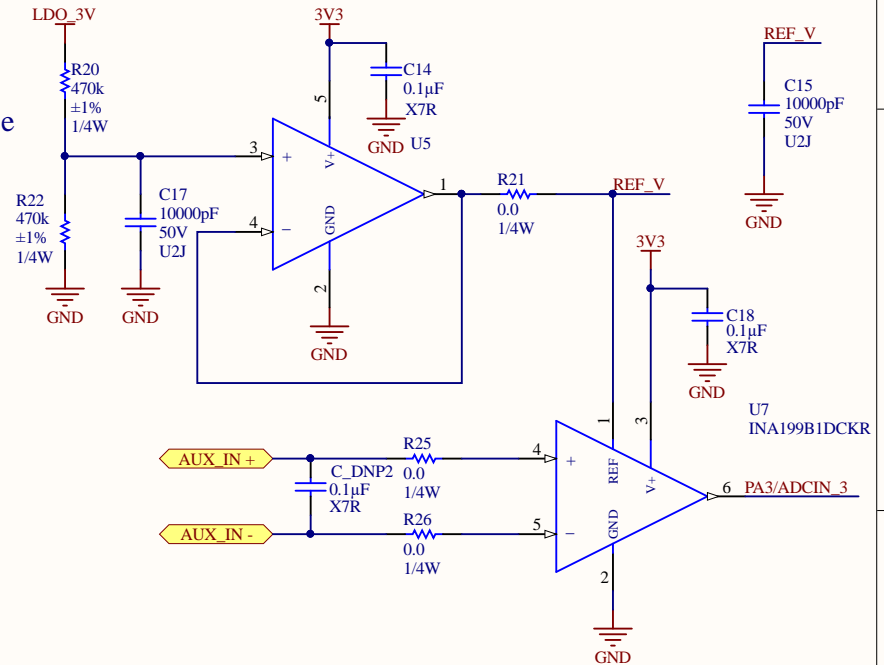
## Aux Battery Voltage Sense



## DCDC Current Sense



## Aux Current Sense



Project: **PowerDistribution.PrjPcb**

Title: **Voltage & Current Sense**

Project Lead: Taiping Li

Size: Letter

Revision: 1.9

Date: 6/6/2017

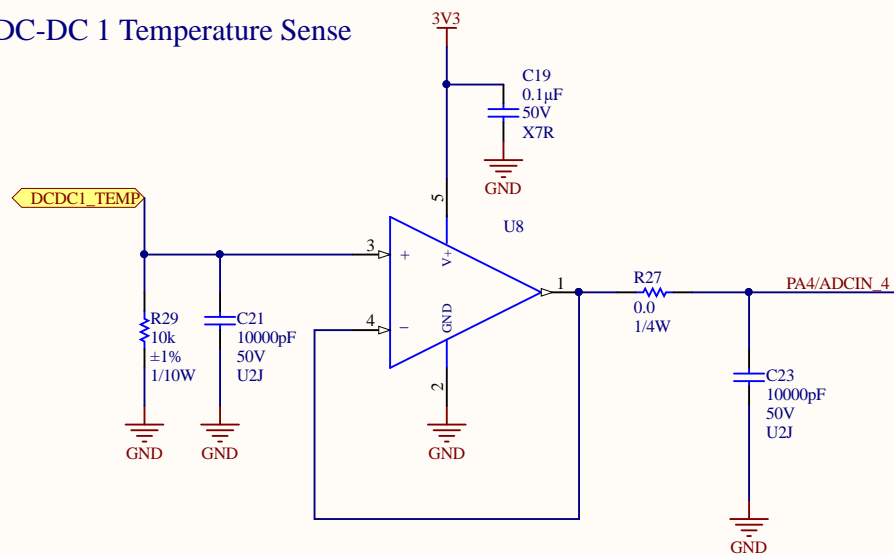
Sheet4 of 7



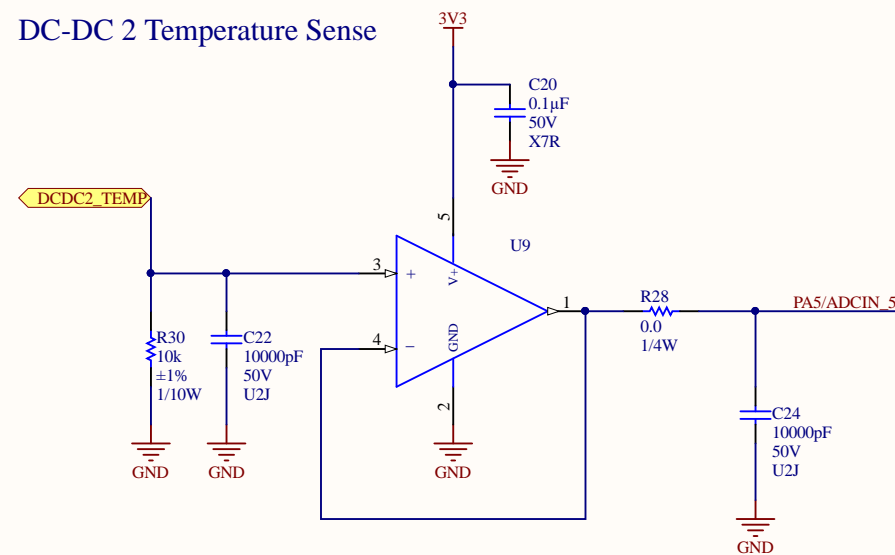
University of Waterloo  
200 University Ave W  
Waterloo, ON, Canada  
N2L 3E9

Website: [www.uwmidsun.com](http://www.uwmidsun.com)

## DC-DC 1 Temperature Sense



## DC-DC 2 Temperature Sense



Project: **PowerDistribution.PrjPcb**

Title: **Voltage/Current/Temp Sensing**

Project Lead: Taiping Li

Size: Letter

Revision: 1.9

Date: 6/6/2017

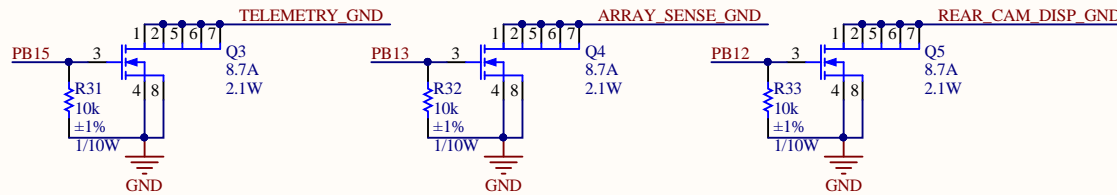
Sheet 5 of 7



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200 University Ave W  
Waterloo, ON, Canada  
N2L 3E9

Website: [www.uwmidsun.com](http://www.uwmidsun.com)

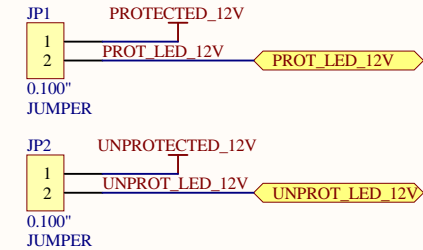
## Roof Enclosure



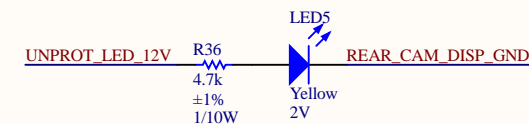
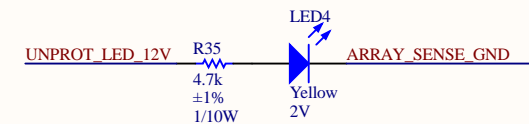
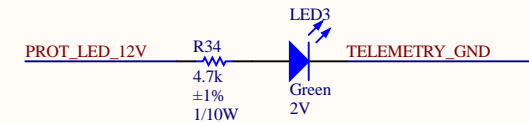
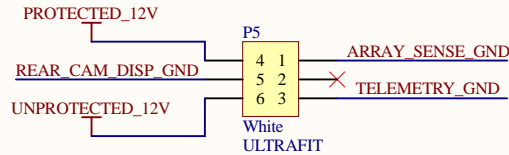
Telemetry (Protected)

Array Sense (Unprotected)

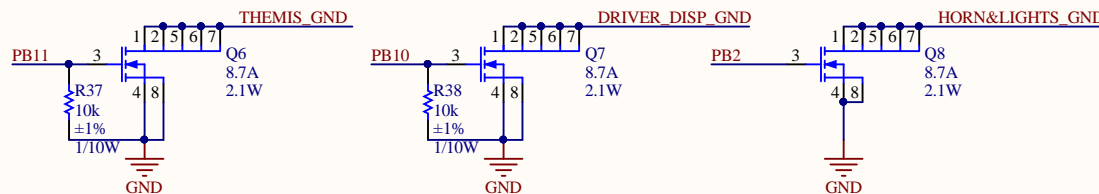
Rear Camera/Disp (Unprotected)



Remove jumpers to disable all LEDs



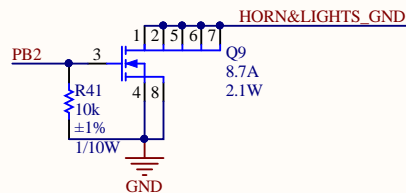
## Front Enclosure



Themis (Protected)

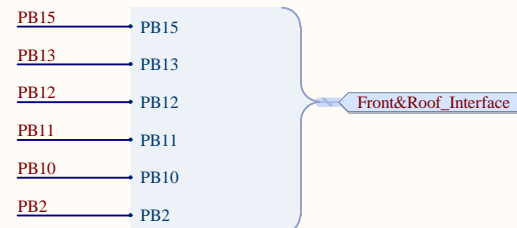
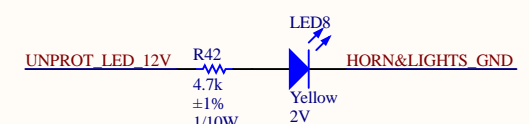
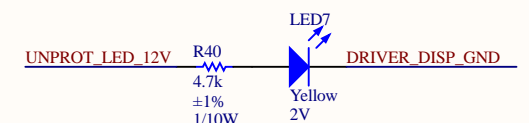
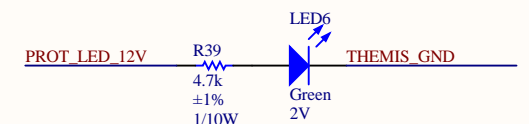
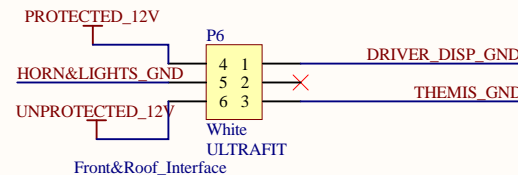
Driver Disp/Rasp Pi (Unprotected)


Horn & Lights 1 (Unprotected)

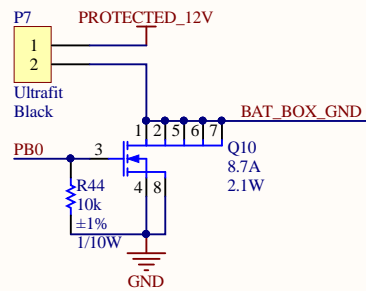


Horn & Lights 2 (Unprotected)

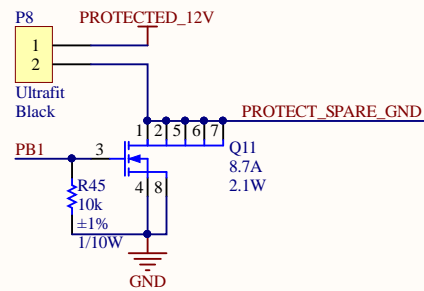
Horn & Lights 1 is in parallel with Horn & Lights 2 for load sharing



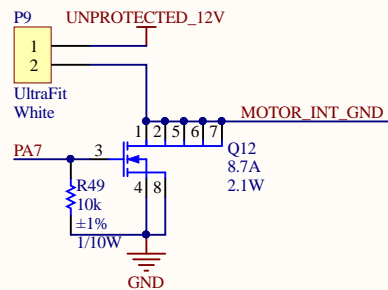
Project: <i>PowerDistribution.PrjPcb</i>		
Title: <b>Front and Roof Enclosure Boards</b>		
Project Lead: Taiping Li		University of Waterloo 200 University Ave W Waterloo, ON, Canada N2L 3E9
Size: Letter	Revision: 1.9	
Date: 6/6/2017	Sheet6 of 7	
		Website: <a href="http://www.uwmidsun.com">www.uwmidsun.com</a>



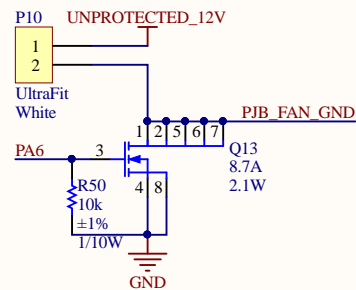
Battery Box (Protected)



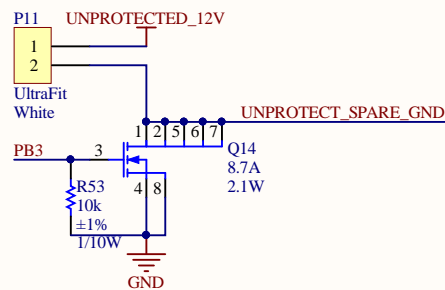
Spare (Protected)



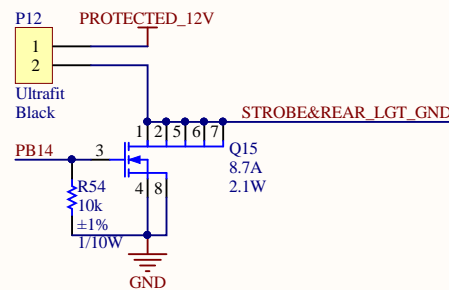
Motor Interface (Unprotected)



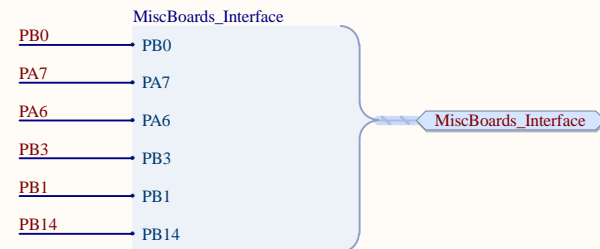
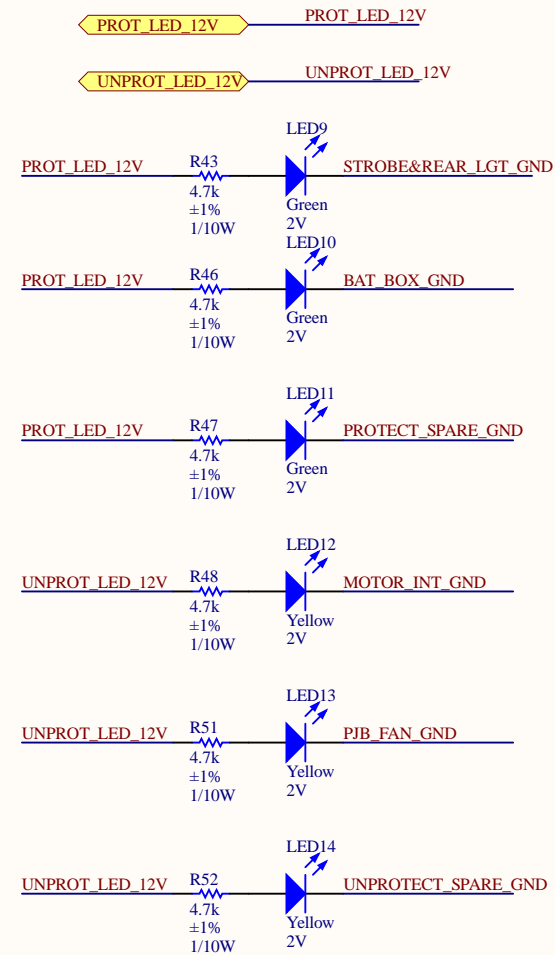
PJB Fans (Unprotected)



Spare (Unprotected)



Strobe&amp;RearLights (Protected)



White/Natural color for unprotected rail

Project: **PowerDistribution.PrjPcb**Title: **Misc Boards Switching**

Project Lead: Taiping Li

Size: Letter

Revision: 1.9

Date: 6/6/2017

Sheet 7 of 7

**MIDNIGHT SUN**University of Waterloo  
200 University Ave W  
Waterloo, ON, Canada  
N2L 3E9Website: [www.uwmidsun.com](http://www.uwmidsun.com)

UNPROTECTED +12V

CONNECT TO TURN LEDS ON

PROTECTED +12V

BAT BOX

SPARE

STROBE/REAR LIGHTS

ROOF ENCLOSURE

P10

LED13

LED14

LED15

LED16

LED17

LED18

LED19

LED20

LED21

LED22

LED23

LED24

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LED325



Comment	Description	Designator	Footprint	LibRef	Quantity
CAP ALUM 100UF 20% 50V RADIAL	100µF 50V Aluminum Capacitor's Radial, Can 74 mOhm @ 100kHz 3000 hrs @ 105°C	C1	CAP ALUM 100UF 50V	CAP ALUM 100UF 20% 50V RADIAL	1
CAP CER 22UF 16V ±20% XSR 1210	22µF ±20% 16V Ceramic Capacitor XSR 1210 (3225 Metric)	C2, C3	CAP, 1210	CAP CER 22UF 16V ±20% XSR 1210	2
CAP CER 0.1UF 50V 10% X7R 0603	0.1µF ±10% 50V Ceramic Capacitor X7R 0603 (1608 Metric)	C4, C5, C8, C9, C14, C16, C18, C19, C20, C_DNP1, C_DNP2	CAP, 0603	CAP CER 0.1UF 50V 10% X7R 0603	11
CAP CER 1UF 50V 10% X7R 0603	1µF ±10% 50V Ceramic Capacitor X7R 0603 (1608 Metric)	C6, C7	CAP, 0603	CAP CER 1UF 50V 10% X7R 0603	2
CAP CER 10nf 50V 5% X7R 0603	10000pf ±5% 50V Ceramic Capacitor U2J 0603 (1608 Metric)	C10, C11, C12, C13, C15, C17, C21, C22, C23, C24	CAP, 0603	CAP CER 10nf 50V 5% X7R 0603	10
DIODE TVS 15VWM 24.4VC DO-214AA (SMB)	TVS DIODE 15VWM 24.4VC SMB	D1, D2	DO-214AA Diode	DIODE TVS 15VWM 24.4VC DO-214AA (SMB)	2
FUSE 30A 500V 1 Circuit Blade PCB 7A	Fuse Block 30A 500V 1 Circuit Blade PCB	F1, F2	FUSE ATO/ATC FUSE HOLDER	FUSE ATO FUSE HOLDER	2
JUMPER	2 Positions Header Connector Through Hole Gold	JP1, JP2	CONN 2POS JUMPER 0.1"	CONN 2POS JUMPER 0.1"	2
LED GREEN CLEAR 2V 0603	Green 572nm LED Indication - Discrete 2V 0603 (1608 Metric)	LED1, LED3, LED6, LED9, LED10, LED11	LED_0603	LED GREEN CLEAR 2V 0603	6
LED YELLOW CLEAR 2.1V 0603	Yellow 590nm LED Indication - Discrete 2V 0603 (1608 Metric)	LED2, LED4, LED5, LED7, LED8, LED12, LED13, LED14	LED_0603	LED YELLOW CLEAR 2.1V 0603	8
CONN 50POS Bergstak Plug 0.02"	50 Position Connector Plug, Outer Shroud Contacts Surface Mount Gold	P1	CONN, Bergstak 50 Pos Plug	CONN 50POS Bergstak Plug 0.02"	1
CONN 6POS ULTRA-FIT 0.138"	6 Positions Header Connector 0.138" (3.50mm) Through Hole Tin	P2, P4	CONN, 6POS ULTRA-FIT	CONN 6POS ULTRA-FIT 0.138"	2
3 POS VERT ULTRA-FIT	3 Positions Header Connector 0.138" (3.50mm) Through Hole Tin	P3	CONN, 3POS ULTRA-FIT	CONN 3POS ULTRA-FIT 0.138"	1
CONN 6POS ULTRA-FIT NATURAL COLOR 0.138"	6 Positions Header Connector 0.138" (3.50mm) Through Hole Tin	P5, P6	CONN, 6POS ULTRA-FIT NATURAL COLOR	CONN 6POS ULTRA-FIT NATURAL COLOR 0.138"	2
CONN 2POS ULTRA-FIT 0.138"	2 Positions Header, Shrouded Connector 0.138" (3.50mm) Through Hole Gold	P7, P8, P12	CONN, 2POS ULTRA-FIT	CONN 2POS ULTRA-FIT 0.138"	3
CONN 2POS ULTRA-FIT NATURAL COLOR 0.138"	2 Positions Header, Shrouded Connector 0.138" (3.50mm) Through Hole	P9, P10, P11	CONN, 2POS ULTRA-FIT NATURAL COLOR	CONN 2POS ULTRA-FIT NATURAL COLOR 0.138"	3
MOSFET DUAL P-CH 40V 8A 3.2W S-SOIC	Mosfet Array 2 P-Channel (Dual) 40V 8A 3.2W Surface Mount S-SO	C1, C2	SOIC8	MOSFET DUAL P-CH 40V 8A 3.2W S-SOIC	2
MOSFET N-CH 30V 8.7A 2.1W 6-PQFN (2x2)	Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q15		MOSFET N-CH 30V 12A 2mmx2mm PQFN	MOSFET N-CH 30V 8.7A 2.1W 6-PQFN (2x2)	13
RES 0.003 OHM 1% 1.5W 2010	0.003 Ohm ±1% 1.5W Chip Resistor 2010 (5025 Metric) Current Sense, Moisture Resistant Metal Foil	R1	RES 2010	RES 0.003 OHM 1% 1.5W 2010	1
RES 0.006 OHM 1% 1/2W 1206	0.006 Ohm ±1% 0.5W, 1/2W Chip Resistor 1206 (2716 Metric) Automotive AEC-Q200, Current Sense, Moisture Resistant Metal Element	R2	RES 1206	RES 0.006 OHM 1% 1/2W 1206	1
RES 1M OHM 1% 1/10W 0603	1M Ohm ±1% 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Moisture Resistant Thick Film	R3, R8	RES, 0603	RES 1M OHM 1% 1/10W 0603	2
RES 11.8K OHM 1% 1/10W 0603	11.8k Ohm ±1% 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Moisture Resistant Thick Film	R4	RES, 0603	RES 11.8K OHM 1% 1/10W 0603	1
RES 86.6K OHM 1% 1/10W 0603	86.6k Ohm ±1% 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Automotive AEC-Q200 Thick Film	R5	RES, 0603	RES 86.6K OHM 1% 1/10W 0603	1
RES 10K OHM 1% 1/10W 0603	RES SMD 10K OHM 1% 1/10W 0603	R6, R7, R29, R30, R31, R32, R33, R37, R38, R41, R44, R45, R49, R50, R53, R54, R55, R56	RES, 0603	RES 10K OHM 1% 1/10W 0603	18
RES 4.7K OHM 1% 1/10W 0603	4.7k Ohm ±1% 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Moisture Resistant Thick Film	R9, R10, R34, R35, R36, R39, R40, R42, R43, R46, R47, R48, R51, R52	RES, 0603	RES 4.7K OHM 1% 1/10W 0603	14
RES 54.9K OHM 1% 1/10W 0603	54.9k Ohm ±1% 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Automotive AEC-Q200 Thick Film	R11	RES, 0603	RES 54.9K OHM 1% 1/10W 0603	1
RES 78.7K OHM 1% 1/10W 0603	78.7k Ohm ±1% 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Automotive AEC-Q200 Thick Film	R12	RES, 0603	RES 78.7K OHM 1% 1/10W 0603	1
RES 255K OHM 1% 1/10W 0603	255k Ohm ±1% 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Moisture Resistant Thick Film	R13	RES, 0603	RES 255K OHM 1% 1/10W 0603	1
RES 470K OHM 1% 1/4W 0603	RES SMD 470K OHM 1% 1/4W 0603	R14, R15, R20, R22	RES, 0603	RES 470K OHM 1% 1/4W 0603	4
RES 0.0 OHM 1/4W 0603	RES SMD 0.0 OHM JUMPER 1/4W 0603	R16, R17, R21, R23, R24, R25, R26, R27, R28	RES, 0603	RES 0.0 OHM 1/4W 0603	9
RES 140K OHM 1% 1/10W 0603		R18, R19	RES, 0603	RES 140K OHM 1% 1/10W 0603	2
Test Point		TP1, TP2, TP3, TP4, TP5, TP6	Test Point	Test Point	6
IC OR CONTROLLER SOURCE SELECT 24SSOP	OR Controller Source Selector Switch P-Channel 3.1 24-SSOP	U1	IC OR CTRLR SRC SELECT 24SSOP	IC OR CONTROLLER SOURCE SELECT 24SSOP	1
IC REG LDO 3V 0.2A 4-TDFN		U2	IC REG LDO 3V 0.2A 4-TDFN	IC REG LDO 3V 0.2A 4-TDFN	1
IC OP AMP GEN PURPOSE RR 10MHZ SOT-23-5	General Purpose Amplifier 1 Circuit Rail-to-Rail SOT-23-5	U3, U4, U5, U8, U9	IC OP AMP GP RR 10MHZ SOT-23-5	IC OP AMP GEN PURPOSE RR 10MHZ SOT-23-5	5
IC CURRENT AMPLIFIER	Current Sense Amplifier	U6, U7	IC OP AMP CURR SENSE	IC CURRENT AMPLIFIER	2