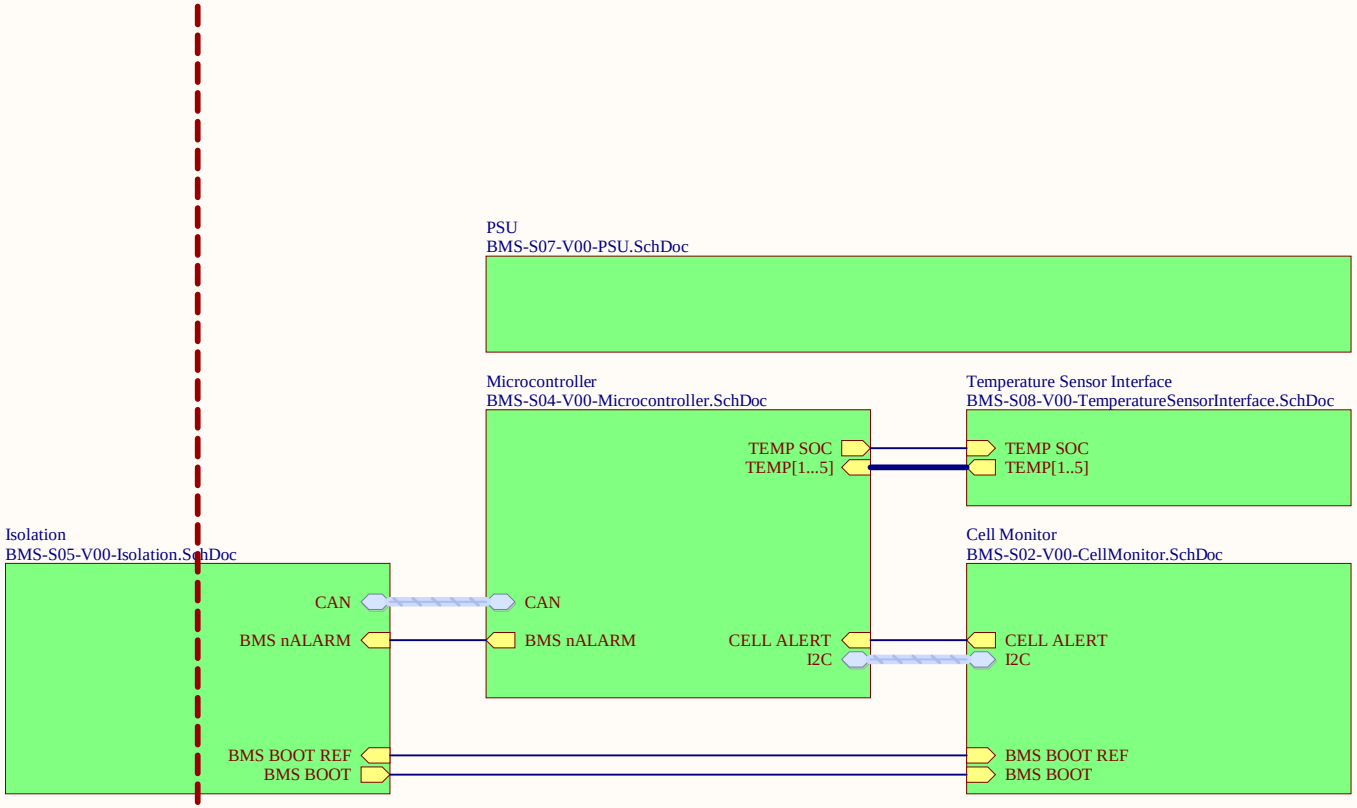

Revision History:

Rev	Date	Description

Sheet Title: **BMS Master**

Project: **Battery Managment System 2020**

Size: A3 | Number: **1** | Version: **01** | Revision: **01**

Drawn By: Jonn Dillon | Sheet **1** of **10**

Print Date: 24/06/2020 Print Time: 10:30:15 AM | File Name: BMS-S01-V00-BatteryManagementSystem.SchDoc

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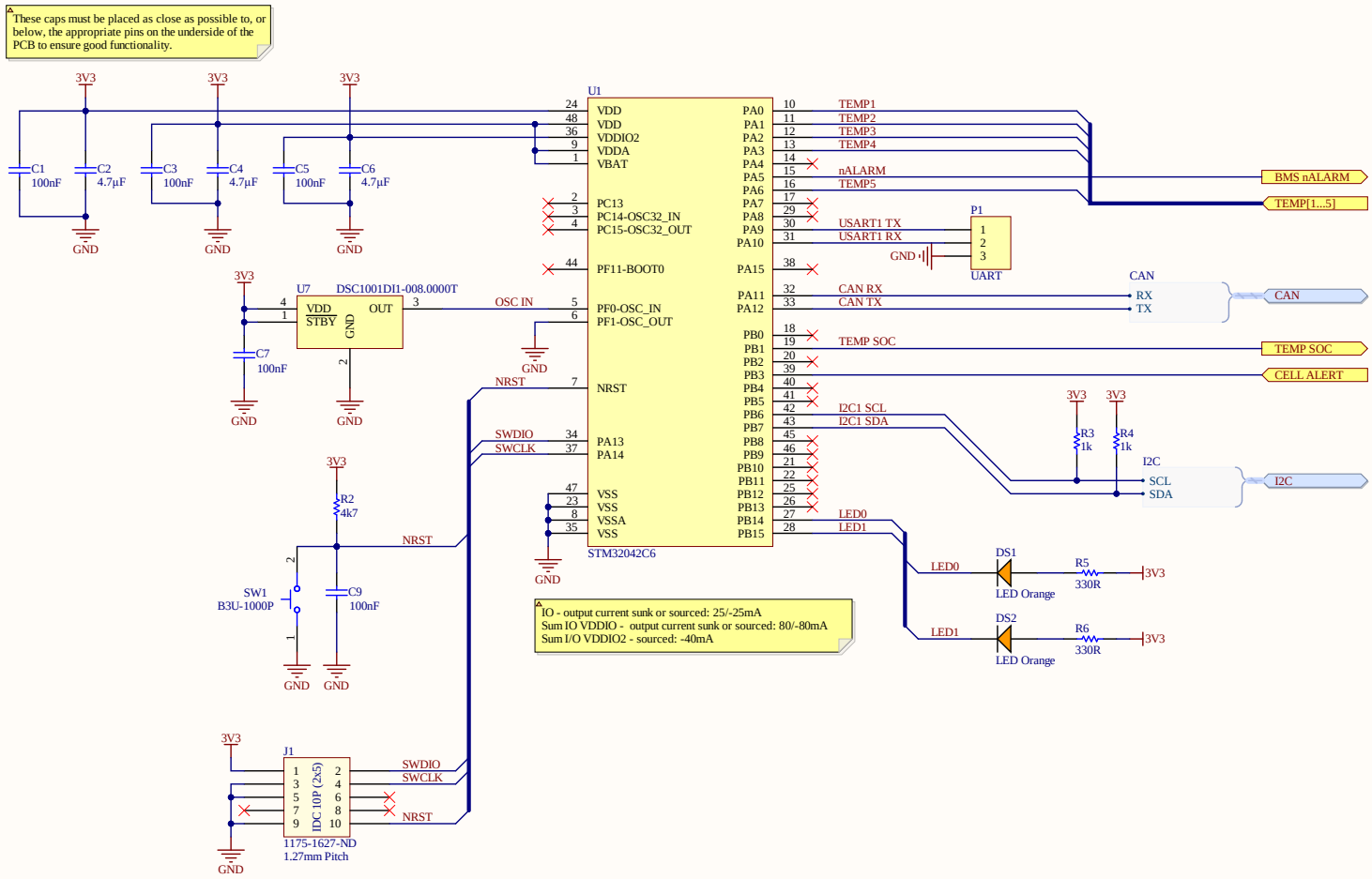


Revision History:

Rev	Date	Description

Sheet Title: **Microcontroller**		
Project: **Battery Managment System 2020**		**QUT Motorsport** Q-120, Gardens Point 2 George Street Brisbane, QLD 4000 Australia
Size: A3 Number: **2**	Version: **01** Revision: **01**	
Drawn By: Zoe Goodward	Sheet 2 of **10**	
Print Date: 24/06/2020 Print Time: 10:30:15 AM	File Name: BMS-S04-V00-Microcontroller.SchDoc	

ISO

ISO 3V3

J2

CAN H

BMS BOOT ISO

CAN L

BMS nALARM IN

IDC 8P

CHAIN IN

ISO GND

BMS nALARM RETURN

J3

CAN H

BMS BOOT ISO

CAN L

BMS nALARM OUT

IDC 8P

CHAIN OUT

ISO GND

Jumper Here At Terminus

BMS Alarm Current Loop Isolation

3V3

R1
100Ohm

Current Loop Source (System LV, 14.4-13V)

U2

Current Loop Sink

FOD817ASD

BMS nALARM

AMU Wake Signal Isolation

Wake Signal In (Isolated '3V3' Voltage, 3.5-3.1V)

BMS BOOT ISO

R8
150Ohm

U3

BMS BOOT REF

BMS BOOT

FOD817ASD

ISO GND

Voltage	0.02 A		0.01 A		0.005 A	
	Max FwV	MinFwV	Max FwV	MinFwV	Max FwV	MinFwV
	1.4	1.2	1.4	1.2	1.4	1.2
3.475498	103.7749	113.7749	207.5498	227.5498	415.0997	455.0997
3.068571	83.42857	93.42857	166.8571	186.8571	333.7143	373.7143
3.3	95	105	190	210	380	420

Isolated CANBUS

Isolated CAN
BMS-S06-V00-IsolatedCAN.SchDoc

CANBUS

CAN H

CAN L

CANH

CANL

CANBUS

CAN Transciver

Isolator

CAN

CAN

#1	Wake Signal	Normally Low = GND	
#2	GND	Guard Sig	
#3	CAN LOW	Differential	
#4	CAN HIGH		
#5	GND	Guard Sig	
#6	+3V3	Power	
#7	BMS Alarm Low	Normally Low = GND	
#8	BMS Alarm High	Current Loop	

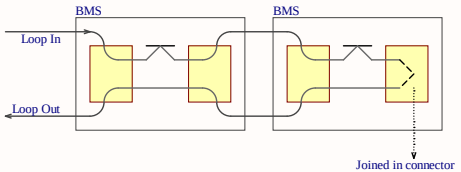
IDC 8 Pin (4x2) 2.54mm / .100" AWG22-24

IDC 8 Pin (4x2) 2.54mm / .100" AWG22-24

Cable Specifictation

LCSC C9135
https://lcsc.com/product-detail/IDC-Connectors_BOOMELE-Boom-Precision-Elec-C9135_C9135.html

Digikey 732-5395-ND
https://www.digikey.com.au/product-detail/en/w%C3%BCrth-elektronik/61200821621/732-5395-ND/4846916



Joined in connector
System wont registier a good loop unless placed
Can't be left on if boards are moved around and a new configuration chosen

Daisy Chain - Safety Current Loop Detail

4mm Route out creepage distance!

EV 7.1.6 If Tractive System and GLV are on the same circuit board:
a) They must be on separate, clearly defined areas of the board
b) The Tractive System and GLV areas must be clearly marked on the PCB.
c) Required spacing related to the spacing between traces / board areas are as follows:

Voltage	Over Surface	Thru Air (cut in board)	Under Conformal Coating
0-50 V DC	1.6 mm	1.6 mm	1 mm
50-150 V DC	6.4 mm	3.2 mm	2 mm
150-300 V DC	9.5 mm	6.4 mm	3 mm
300-600 V DC	12.7 mm	9.5 mm	4 mm

d) If integrated circuits are used such as opto-couplers which are rated for the respective maximum Tractive System voltage, but do not fulfill the required spacing, then they may still be used and the given spacing do not apply.

Revision History:

Rev	Date	Description

Sheet Title: **Isolation Barrier**

Project: **Battery Management System 2020**

Size: A3 Number: **3**

Version: **01**

Revision: **01**

Sheet 3 of **10**

Drawn By: Jonn Dillon

Print Date: 24/06/2020 Print Time: 10:30:15 AM File Name: BMS-S05-V00-Isolation.SchDoc

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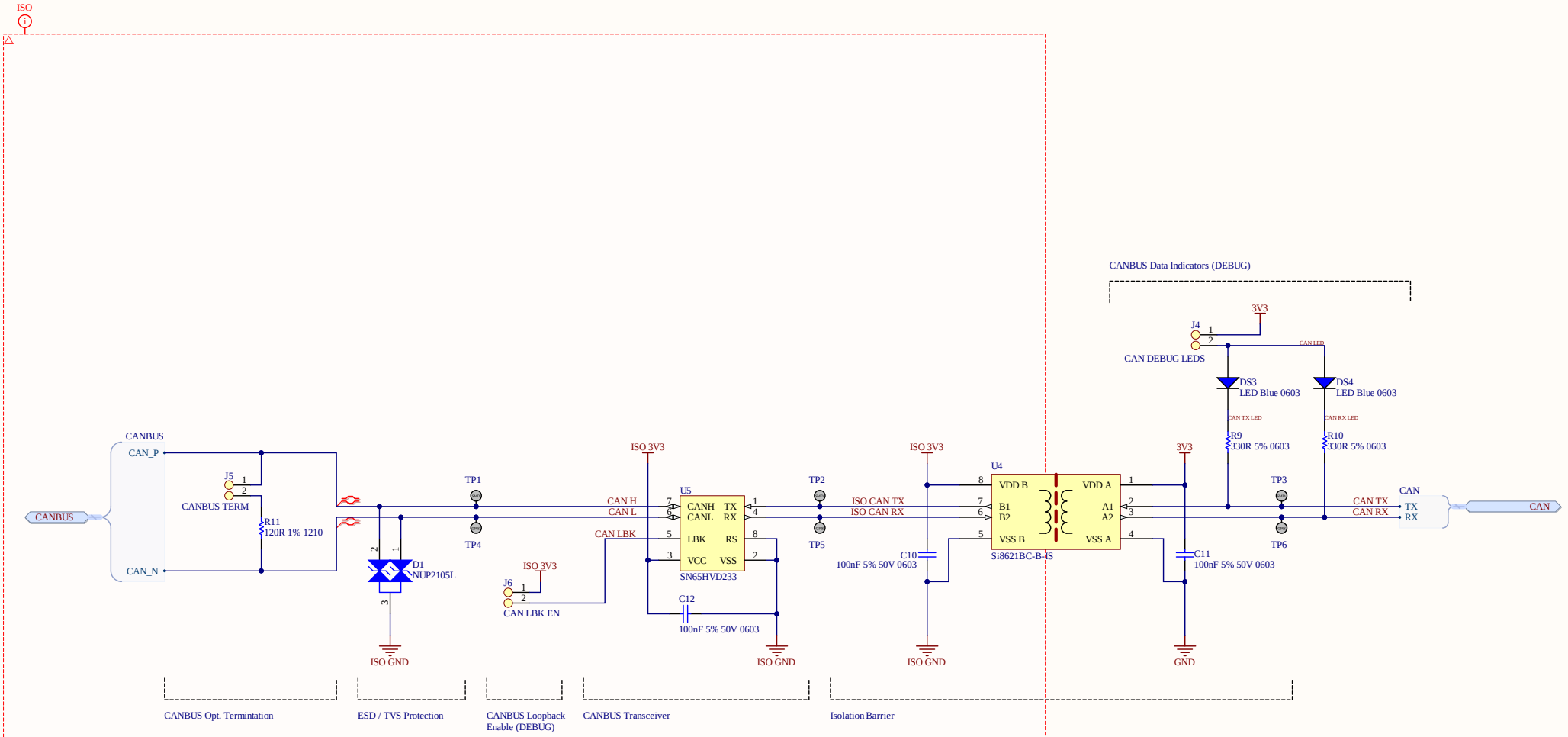
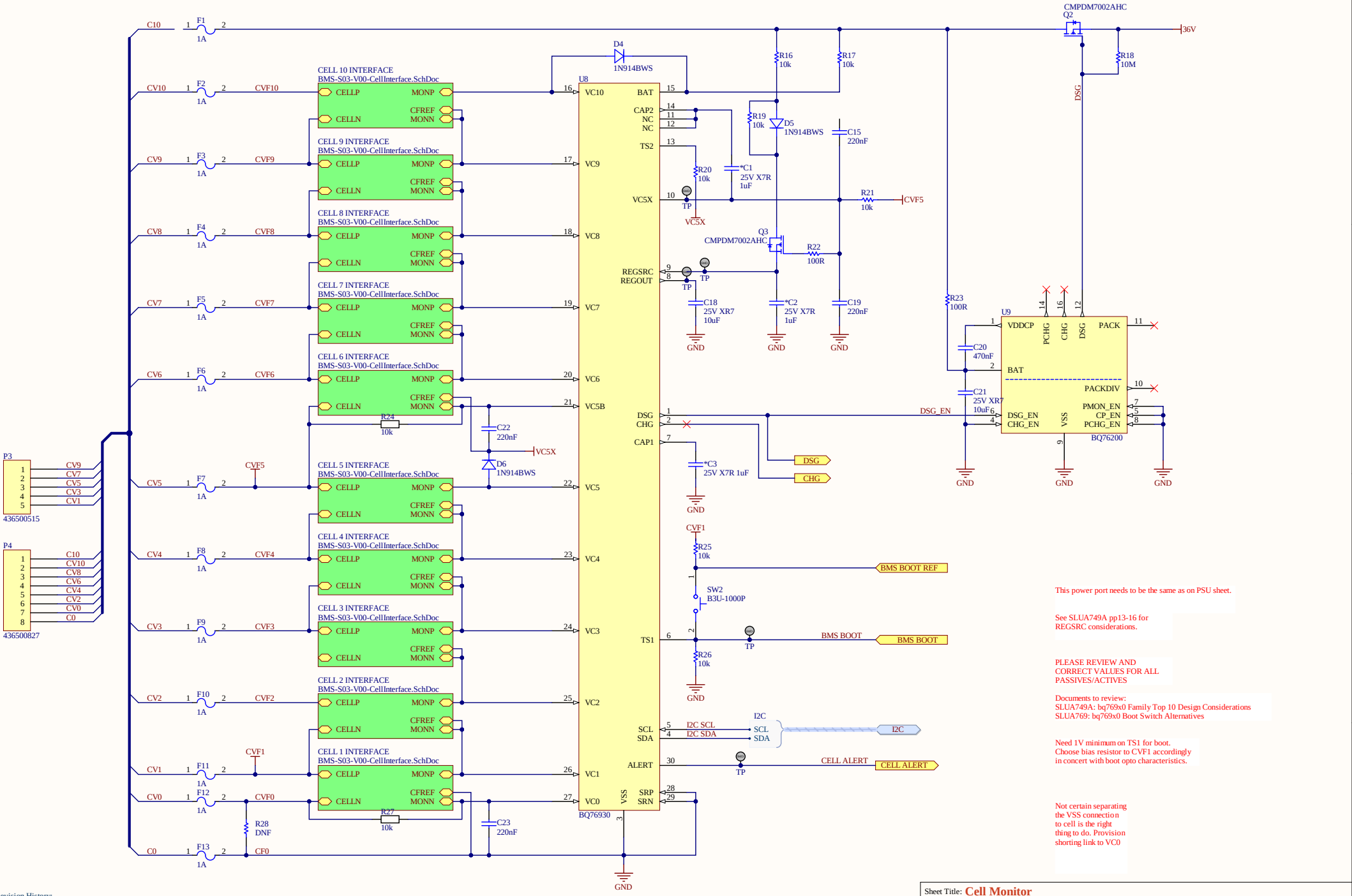


Revision History:

Rev	Date	Description

Sheet Title: **Isolated CANBUS @ 3V3**			
Project: **Battery Managment System 2020**			**QUT Motorsport** Q-120, Gardens Point 2 George Street Brisbane, QLD 4000 Australia
Size: A3	Number: **4**	Version: **01** Revision: **01**	
Drawn By: Jonn Dillon		Sheet **4** of **10**	
Print Date: 24/06/2020	Print Time: 10:30:16 AM	File Name: BMS-S06-V00-IsolatedCAN.SchDoc	



Revision History:

Rev	Date	Description

Sheet Title: Cell Monitor		
Project: Battery Managment System 2020		
Size: A3	Number: 5	Version: 01
		Revision: 01
Drawn By: Sam Haines		Sheet 5 of 10
Print Date: 24/06/2020	Print Time: 10:30:16 AM	File Name: BMS-S02-V00-CellMonitor.SchDoc

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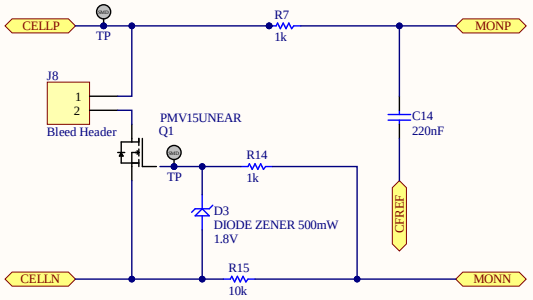
RC circuit provides filtering for cell voltage measurement, time constant should be set appropriately.

Balancing is stopped momentarily during cell voltage measurements, RC tiume constant needs to be low enough that voltage on C comes up to cell voltage before sample is taken.

2xR is placed across cell during balancing, R must be large enough so that current is limited to a suitably low value.

Zener is only required to protect gate of FET in case that multiple adjacent cells are balanced. Given max gate voltage will be nominally around 1.65V a standoff voltage of around 1.8V should be fine . Choose gate resistor with reference to Zener standoff current.



PH2925U, $US 0.85, SOT-669 (5x5mm), 20A @ Vgs=1.5V, Vds=0.1V, up to 62.5W Pdiss
PMV15UNEA, $US 0.16, SOT-23 (3x2.5mm), 5A @ Vgs=1.5V, Vds=0.1V, up to 8.3W Pdiss, 0.6-1.4W typ

Revision History:

Rev	Date	Description

Sheet Title: **Cell Balancing**

Project: **Battery Managment System 2020**

Size: A3 | Number: **6** | Version: **01** | Revision: **01**

Drawn By: Sam Haines | Sheet **6** of **10**

Print Date: 24/06/2020 Print Time: 10:30:17 AM | File Name: BMS-S03-V00-CellInterface.SchDoc

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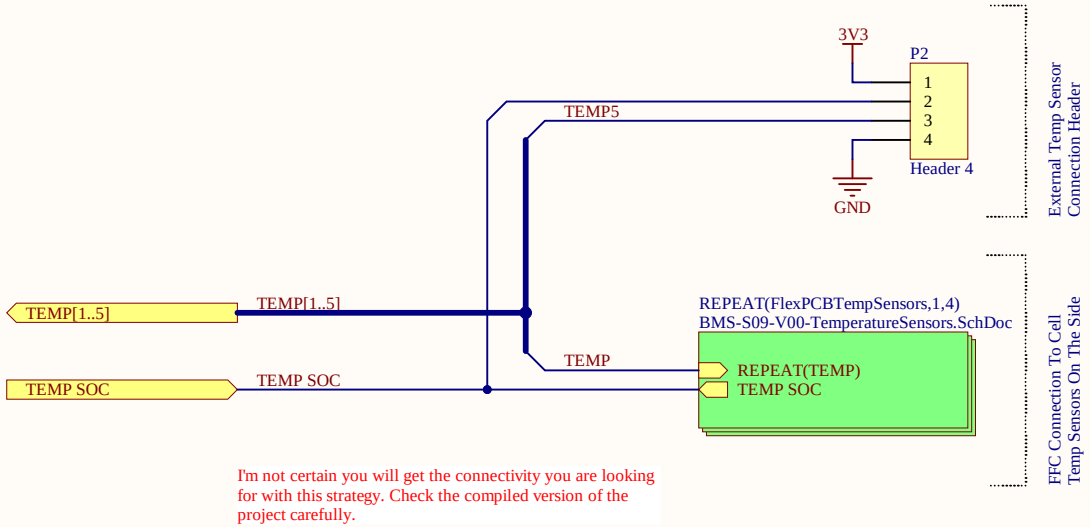

Revision History:

Rev	Date	Description

Sheet Title: **Extra Temperature Connection**

Project: **Battery Managment System 2020**

Size: A3 | Number: **8** | Version: **01** | Revision: **01**

Drawn By: Jonn Dillon | Sheet **8** of **10**

Print Date: 24/06/2020 Print Time: 10:30:17 AM | File Name: BMS-S08-V00-TemperatureSensorInterface.SchDoc

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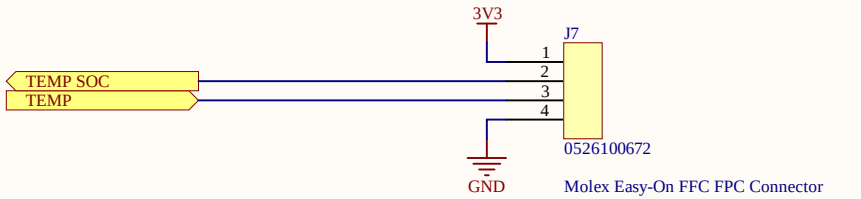

Revision History:

Rev	Date	Description

Sheet Title: **Temperature Sensors**

Project: **Battery Managment System 2020**

Size: A3 | Number: **9** | Version: **01** | Revision: *

Drawn By: Jonn Dillon | Sheet **9** of **10**

Print Date: 24/06/2020 Print Time: 10:30:17 AM | File Name: BMS-S09-V00-TemperatureSensors.SchDoc

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BMS Power Budget

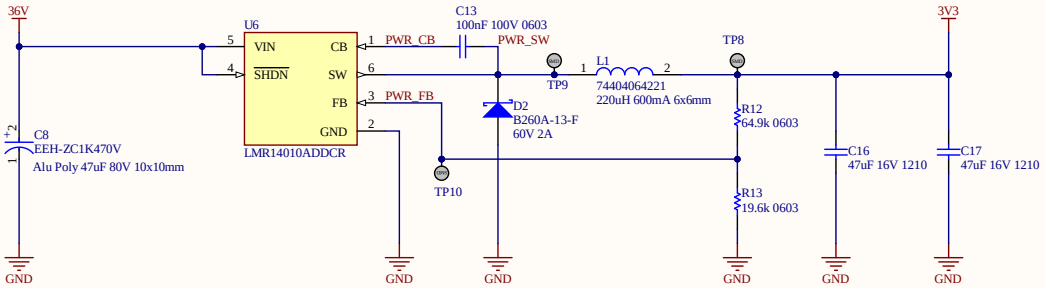
Essential

25mA	STM32F042 @ 42Mhz, All peripherals enabled
200uA	BQ76930, Everything On
3mA	Si8621 @ 1Mbps (CANBUS Datarate)
75mA	DS18B20 @ Full Functionality x 50

Debug

6mA	MCU Debug LEDs
6mA	CANBUS Debug LEDs

Essential	303mA
Debug	315mA



Revision History:

Rev	Date	Description

Sheet Title: **Power Supply (20-40V to 3v3 @ 0.1-0.6A)**

Project: **Battery Management System 2020**

Size: A3 | Number: **10** | Version: **01** | Revision: **01** | Sheet **10** of **10**

Drawn By: Jonn Dillon

Print Date: 24/06/2020 Print Time: 10:30:18 AM File Name: BMS-S07-V00-PSU.SchDoc

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