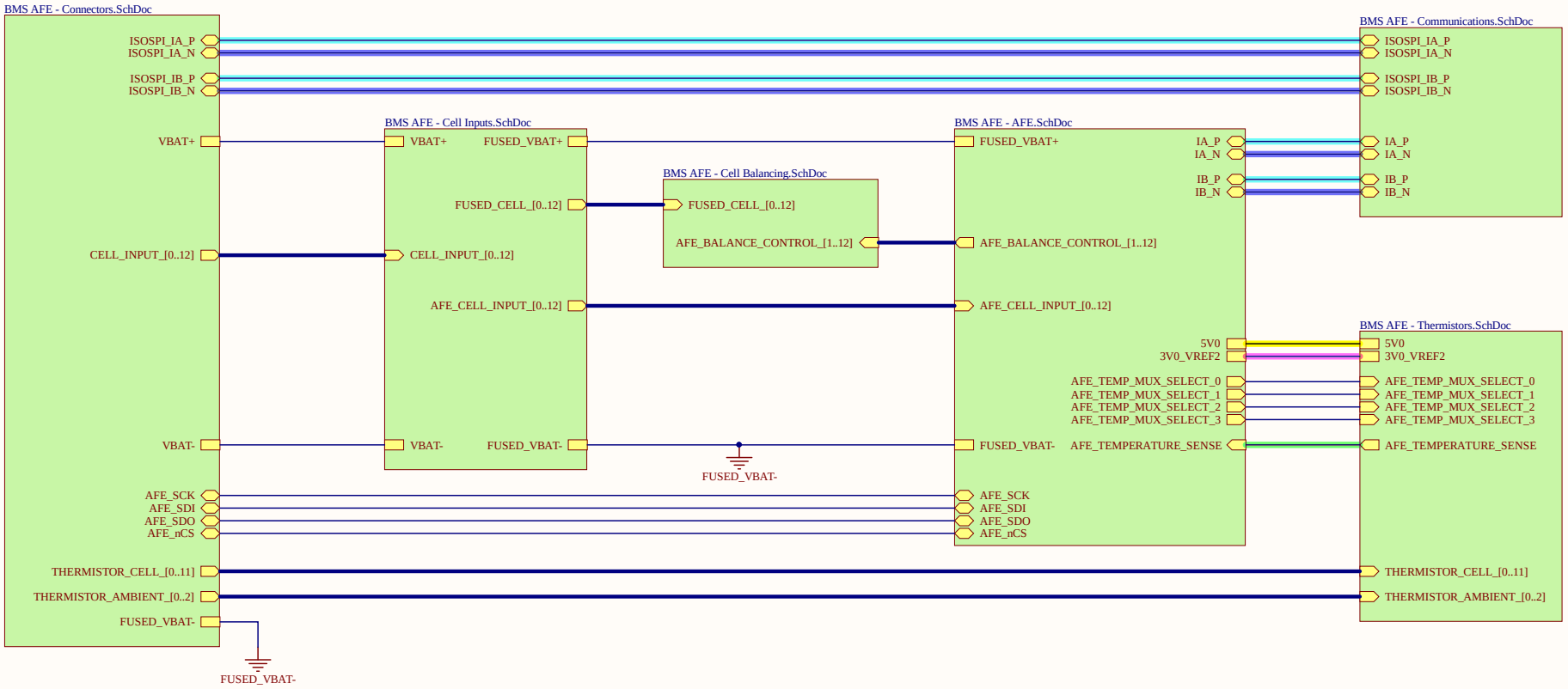
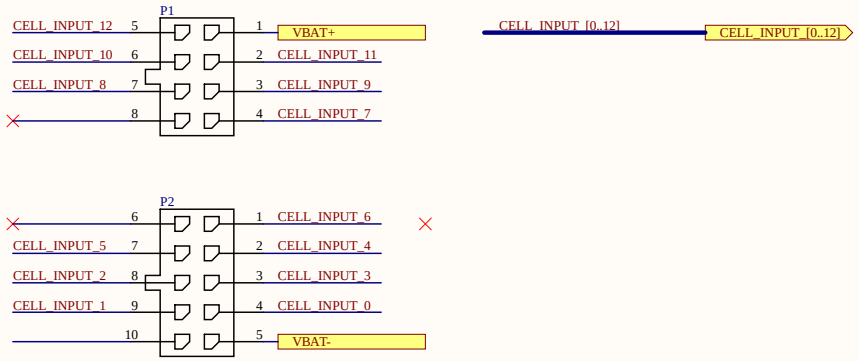


PROJECT	BMS_AFE.PrjPcb		
DOCUMENT	BMS AFE - Top Sheet.SchDoc		
PART NUMBER	MS40005	VARIANT	01 - Standard
DRAWN BY	Taiping Li	REVISION	4.0
LAST MODIFIED	2018-11-16	SHEET	1 OF 7

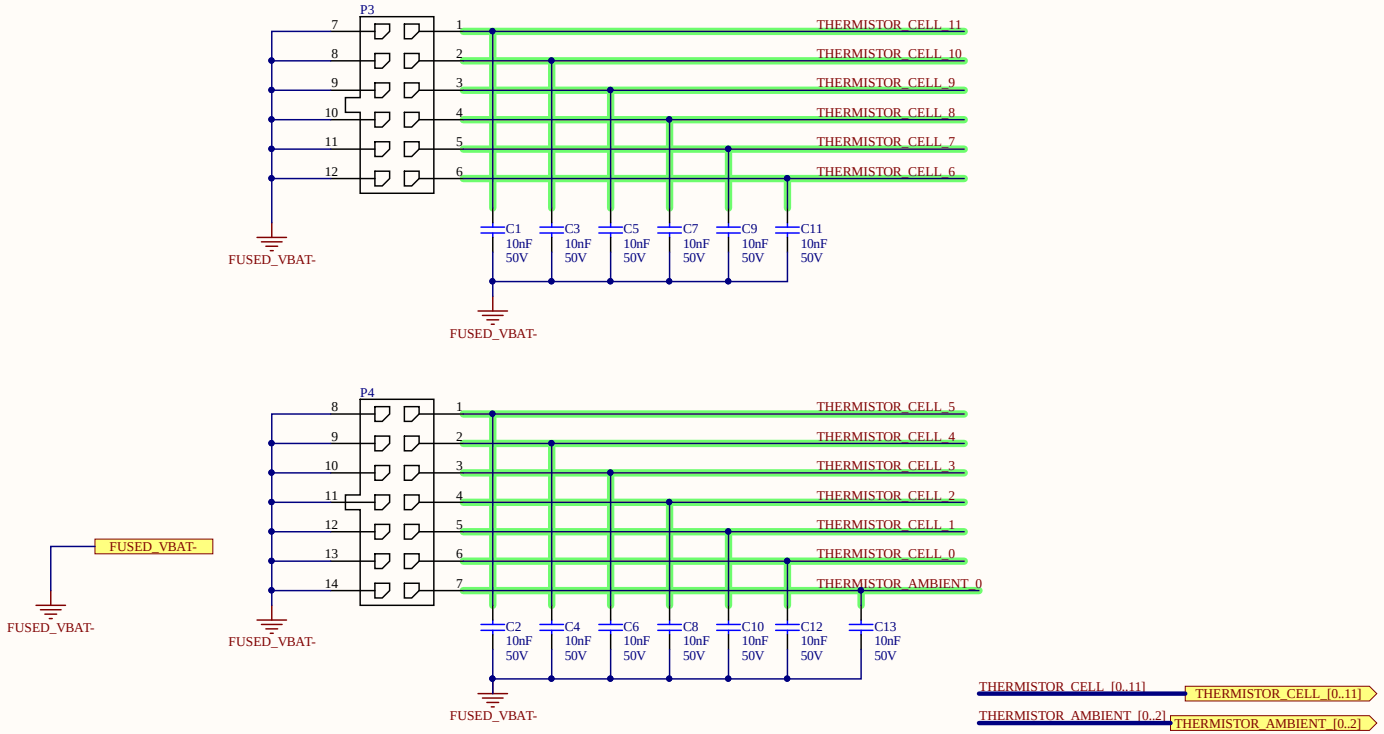
MIDNIGHT SUN

Engineering 5 - 1002
University of Waterloo
(519) 888-4567 x32978
hardware@uwmidsun.com

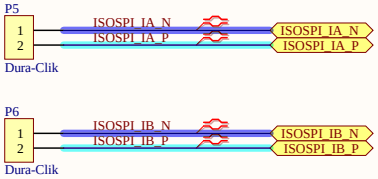
Cell Inputs



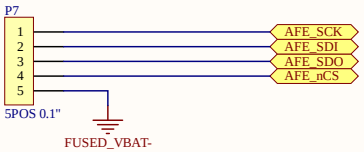
Cell Thermistors



isoSPI Connectors

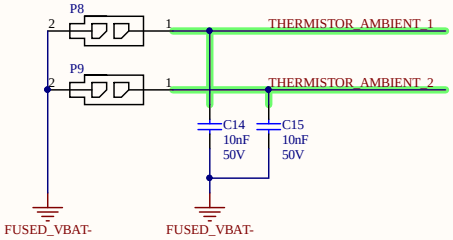


Optional 4-wire SPI



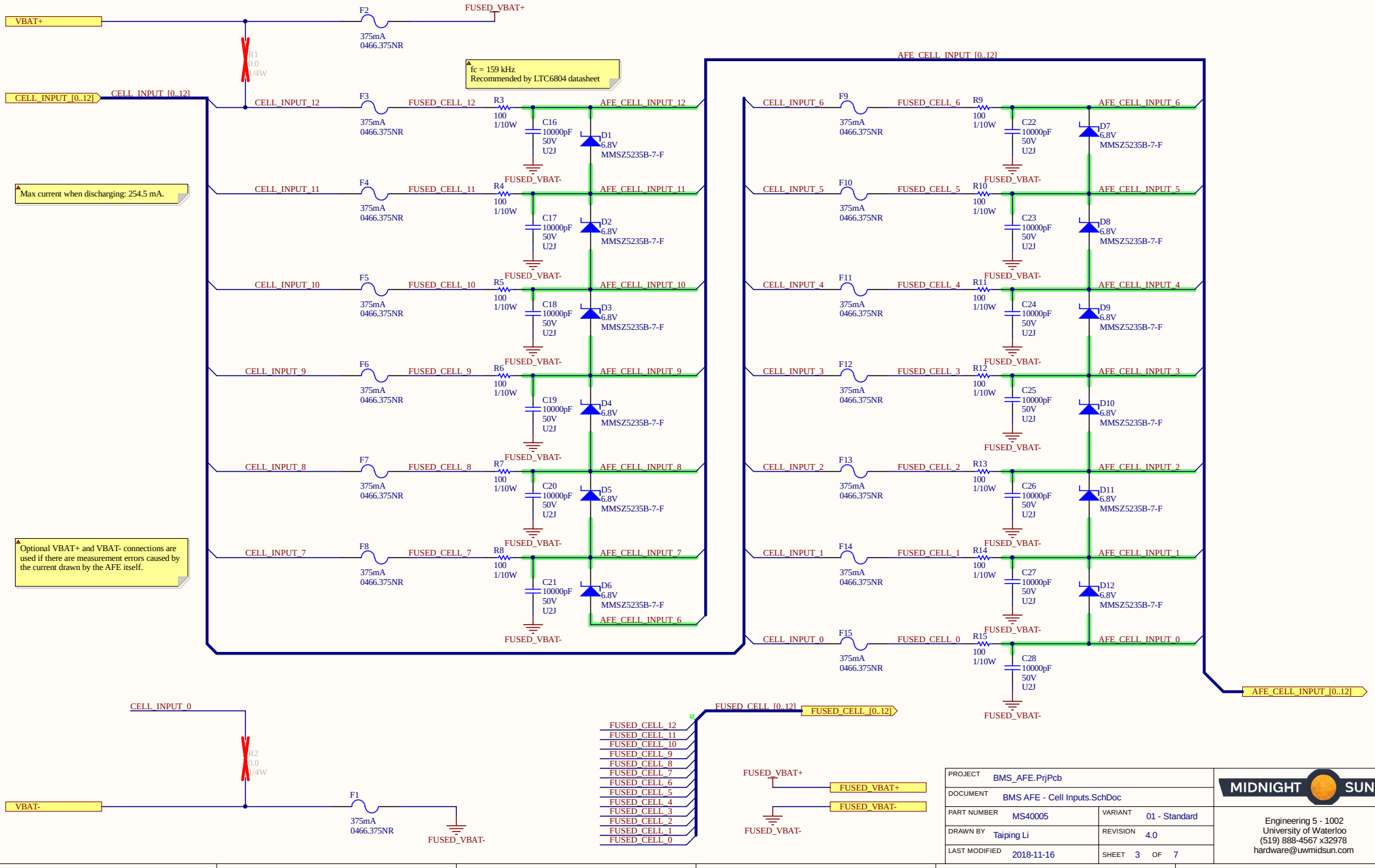
Use variant Debug - SPI and solder on a 0.1" header to talk to the LTC6804 via SPI. Otherwise, communication should be isoSPI.

Ambient Thermistors



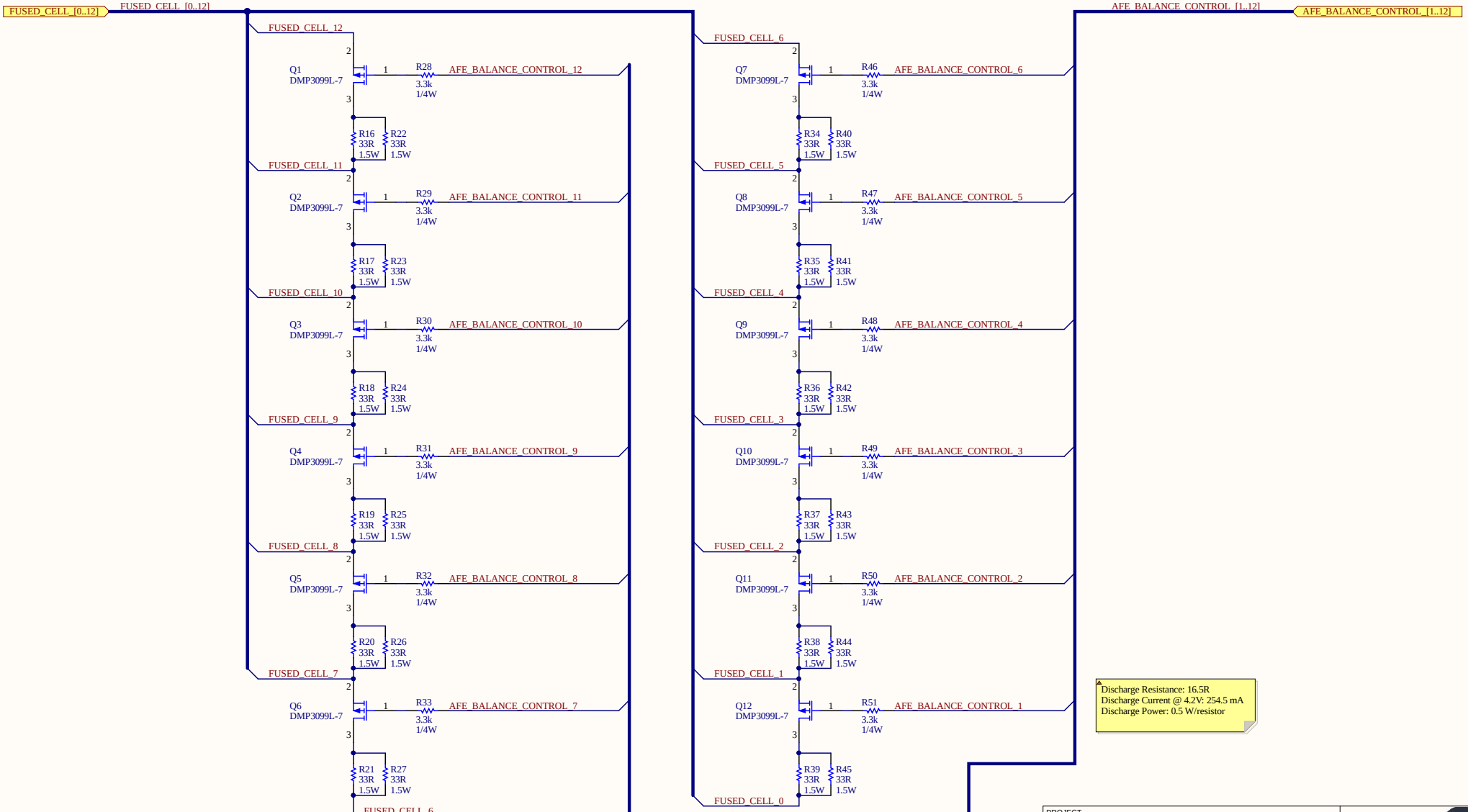
PROJECT	BMS_AFE.PrjPcb		
DOCUMENT	BMS AFE - Connectors.SchDoc		
PART NUMBER	MS40005	VARIANT	01 - Standard
DRAWN BY	Taiping Li	REVISION	4.0
LAST MODIFIED	2018-11-16	SHEET	2 OF 7

MIDNIGHT SUN
Engineering 5 - 1002
University of Waterloo
(519) 888-4567 x32978
hardware@uwmidsun.com



PROJECT	BMS_AFE.PrjPcb
DOCUMENT	BMS AFE - Cell Inputs.SchDoc
PART NUMBER	MS40005
VARIANT	01 - Standard
DRAWN BY	Taiping Li
REVISION	4.0
LAST MODIFIED	2018-11-16
SHEET	3 OF 7

MIDNIGHT SUN
Engineering 5 - 1002
University of Waterloo
(519) 888-4567 x32978
hardware@uwmidsun.com

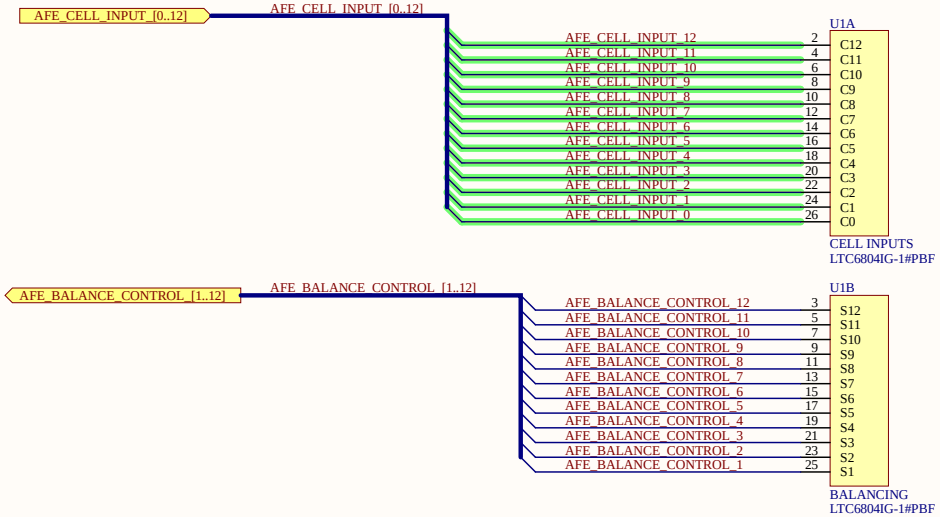


PROJECT	BMS_AFE.PrjPcb		
DOCUMENT	BMS AFE - Cell Balancing.SchDoc		
PART NUMBER	MS40005	VARIANT	01 - Standard
DRAWN BY	Taiping Li	REVISION	4.0
LAST MODIFIED	2018-11-16	SHEET	4 OF 7

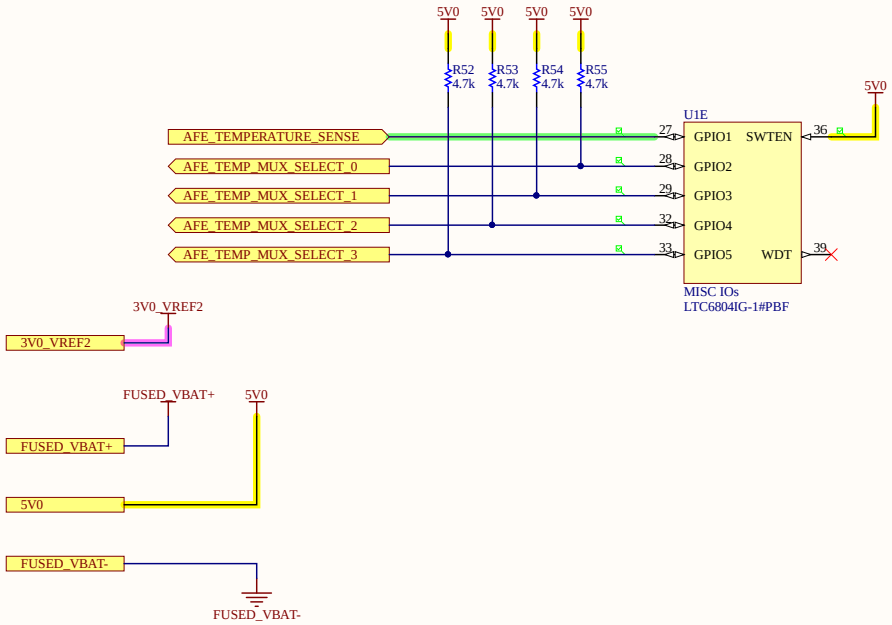
MIDNIGHT SUN

Engineering 5 - 1002
University of Waterloo
(519) 888-4567 x32978
hardware@uwmidsun.com

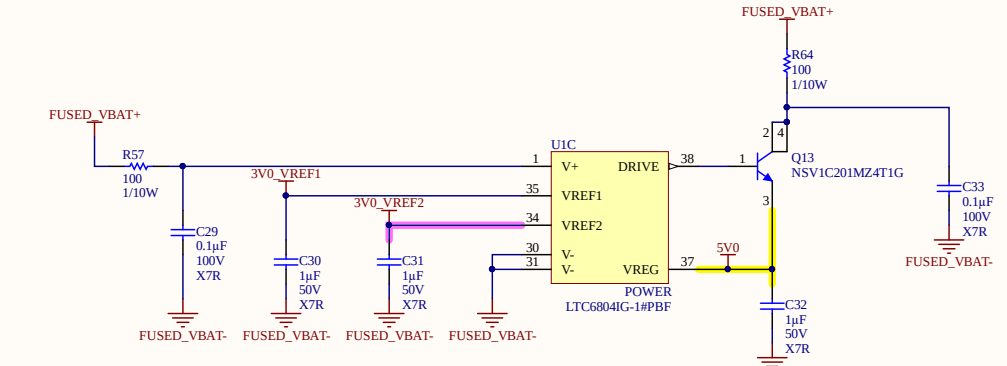
Cell & Balancing Inputs

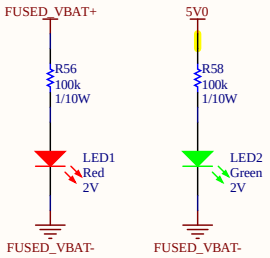


GPIOs

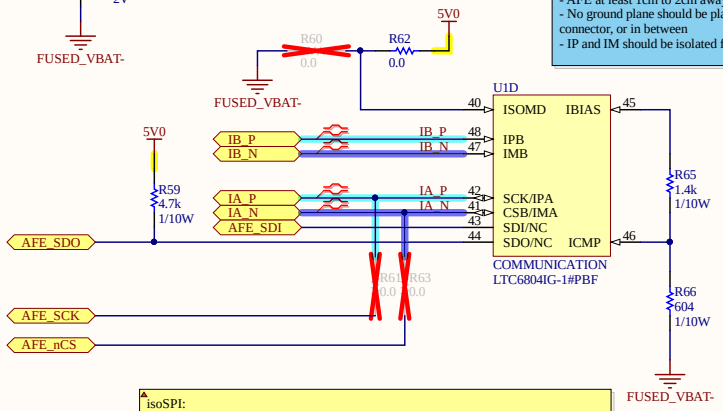


Power





Communication



- Transformer should be placed < 2cm from the connector
- AFE at least 1cm to 2cm away from the transformer
- No ground plane should be placed under the magnetic, isoSPI connector, or in between
- IP and IM should be isolated from surrounding circuits

isoSPI:
Ib = 1 mA
Ibias = 20 mA
Vicmp = 602 mV
Pulses with amplitudes greater than 602 mV/2 = ±301 mV will be detected

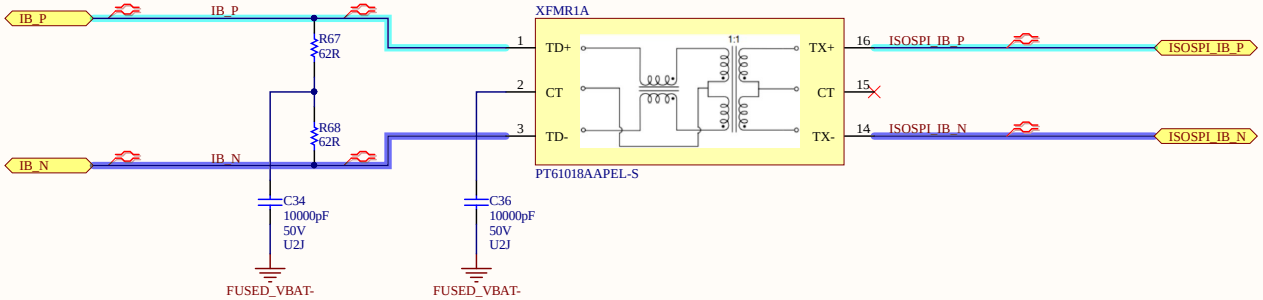
PROJECT	BMS_AFE.PrjPcb		
DOCUMENT	BMS AFE - AFE.SchDoc		
PART NUMBER	MS40005	VARIANT	01 - Standard
DRAWN BY	Taiping Li	REVISION	4.0
LAST MODIFIED	2018-11-16	SHEET	5 OF 7

MIDNIGHT SUN

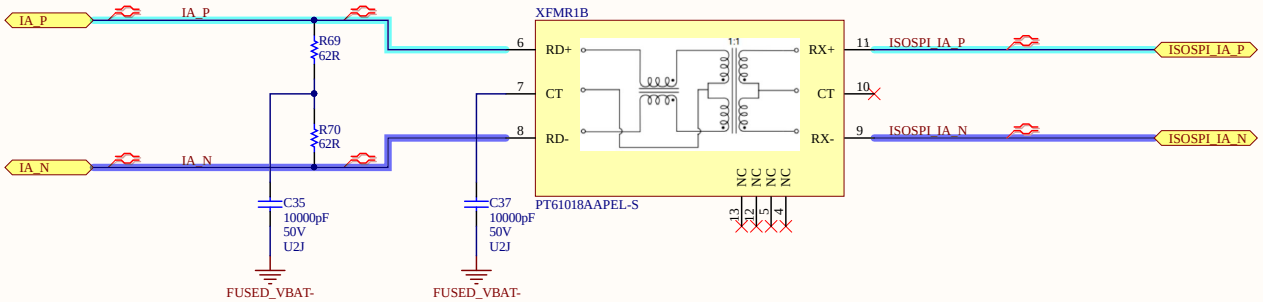
Engineering 5 - 1002
University of Waterloo
(519) 888-4567 x32978
hardware@uwmidsun.com

isoSPI

MASTER - TO NEXT AFE



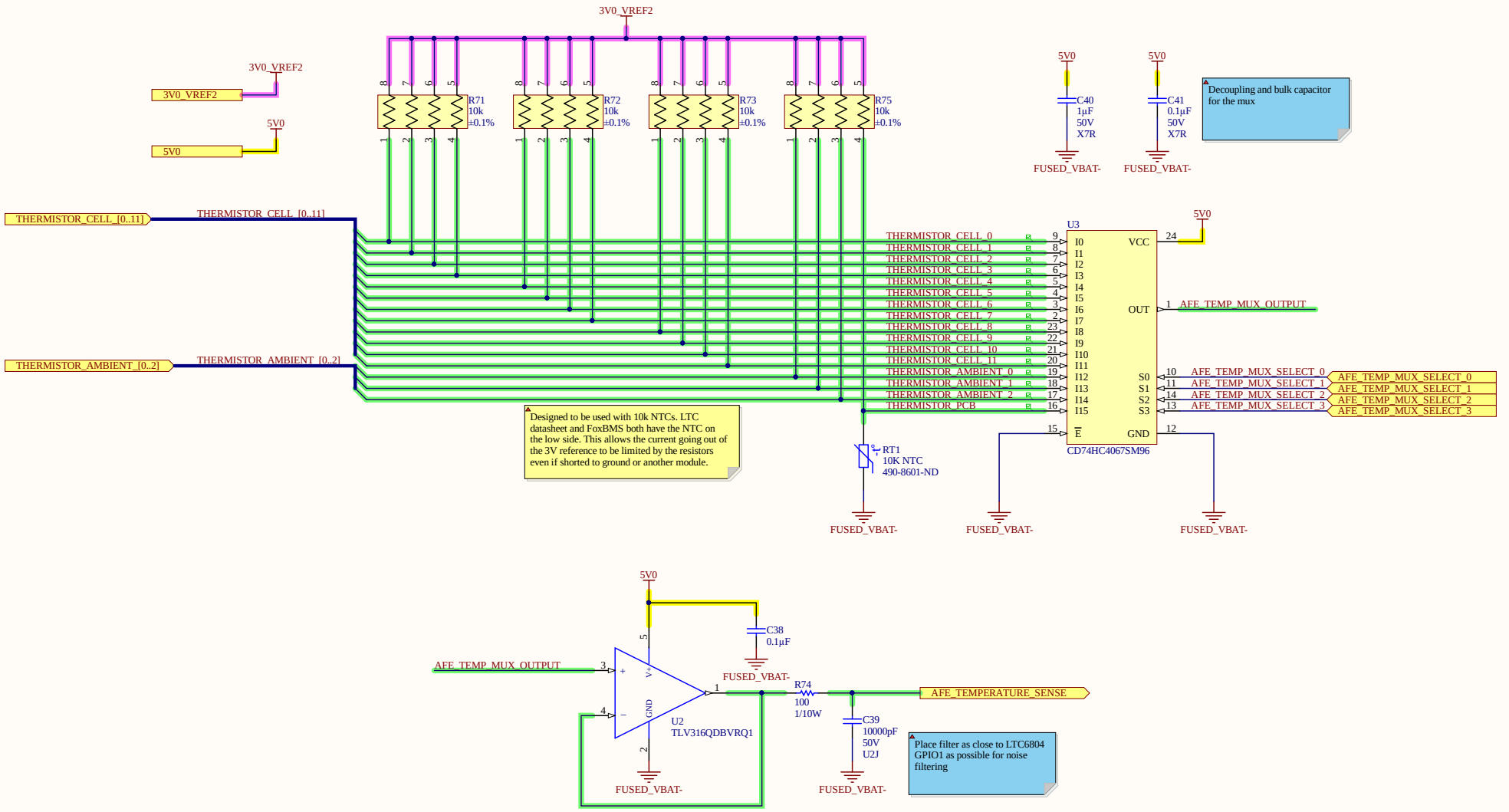
SLAVE - FROM LTC6820



PROJECT	BMS_AFE.PrjPcb		
DOCUMENT	BMS AFE - Communications.SchDoc		
PART NUMBER	MS40005	VARIANT	01 - Standard
DRAWN BY	Taiping Li	REVISION	4.0
LAST MODIFIED	2018-11-16	SHEET	6 OF 7

MIDNIGHT SUN

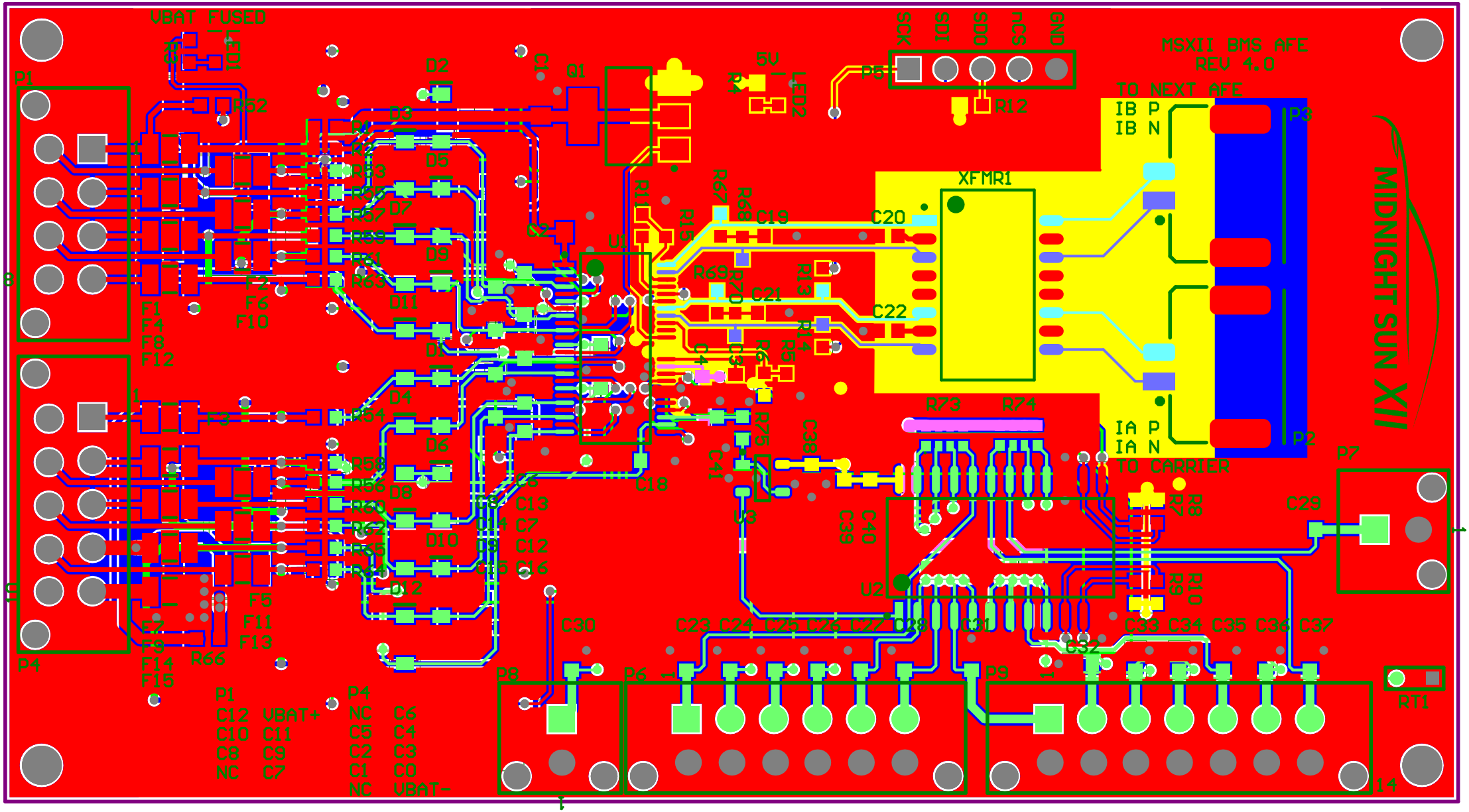
Engineering 5 - 1002
University of Waterloo
(519) 888-4567 x32978
hardware@uwmidsun.com



PROJECT	BMS_AFE.PrjPcb		
DOCUMENT	BMS AFE - Thermistors.SchDoc		
PART NUMBER	MS40005	VARIANT	01 - Standard
DRAWN BY	Taiping Li	REVISION	4.0
LAST MODIFIED	2018-11-16	SHEET	7 OF 7

MIDNIGHT SUN

Engineering 5 - 1002
University of Waterloo
(519) 888-4567 x32978
hardware@uwmidsun.com


VBAT FUSED
MSXII BMS AFE
REV 4.0
TO NEXT AFE
IB P
IB N
IA P
IA N
TO CARRIER
MIDNIGHT SUN XII
XFMR1
SCK
SDI
SDO
CS
GND
5V
P1
P2
P3
P4
P5
P6
P7
P8
P9
U1
U2
U3
U4
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C22
C23
C24
C25
C26
C27
C28
C29
C30
C31
C32
C33
C34
C35
C36
C37
C38
C39
C40
C41
R52
R53
R54
R55
R56
R57
R58
R59
R60
R61
R62
R63
R64
R65
R66
R67
R68
R69
R70
R71
R72
R73
R74
R75
R76
R77
R78
R79
R80
R81
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
Q1
Q2
LED1
LED2
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
F12
F13
F14
F15
RT1
P1
C12 VBAT+
C10 C11
C8 C9
NC C7
P4
NC C6
C5 C4
C2 C3
C1 C0
NC VBAT-