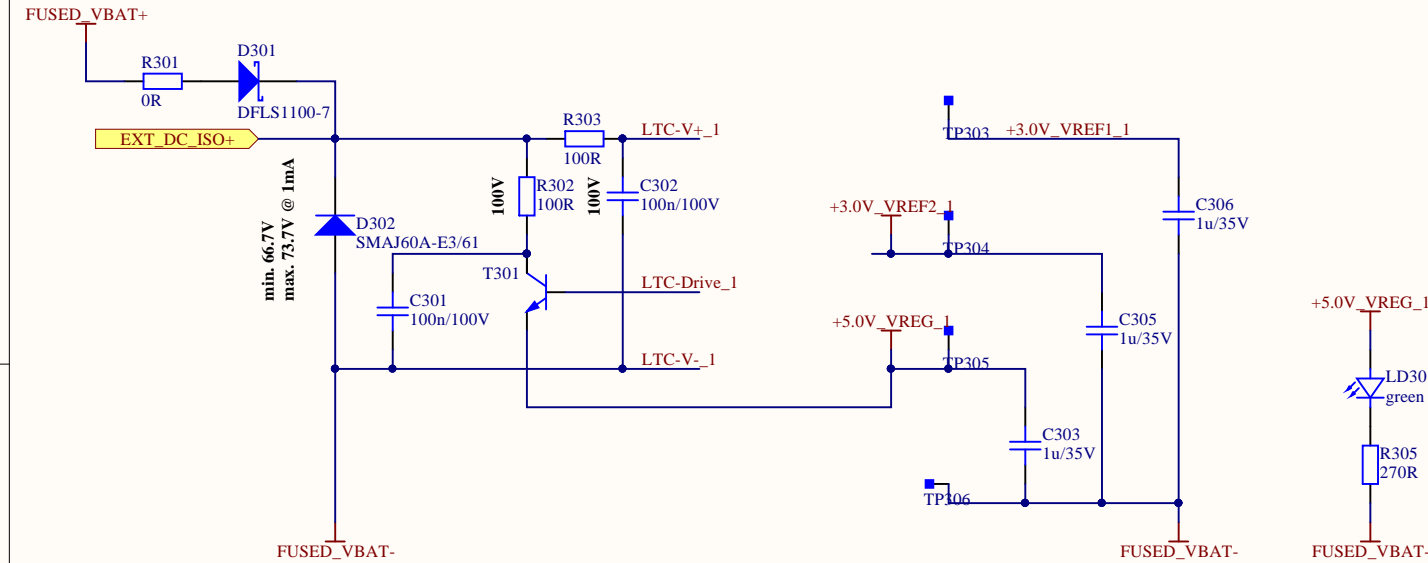


Power Supply



Cell voltage sense inputs

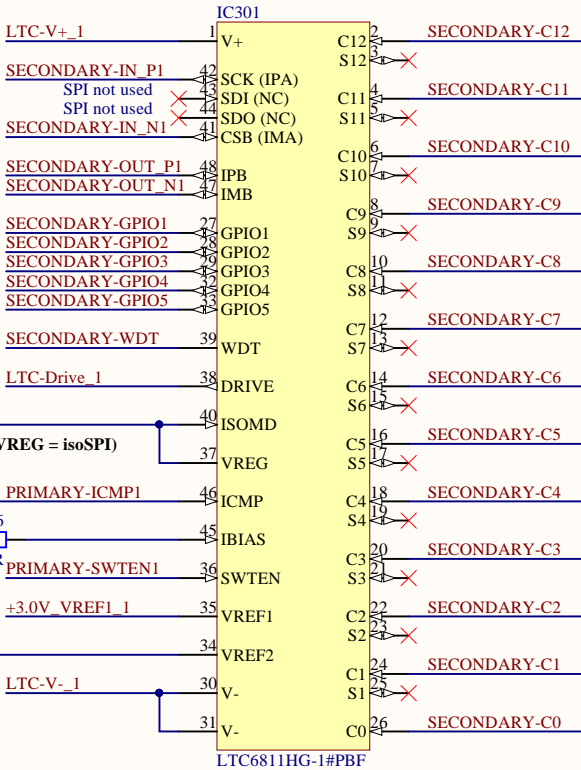


Cell balancing control

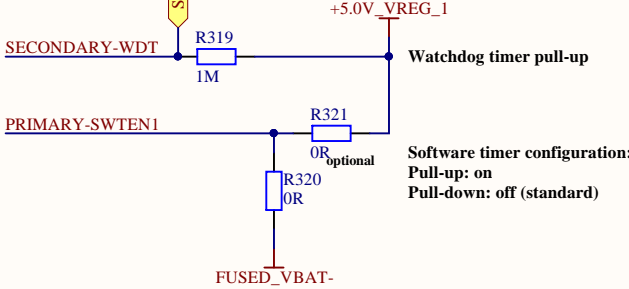
Cell balancing control
(not used on secondary)

communication mode (ISOMD connected to VREG = isoSPI)

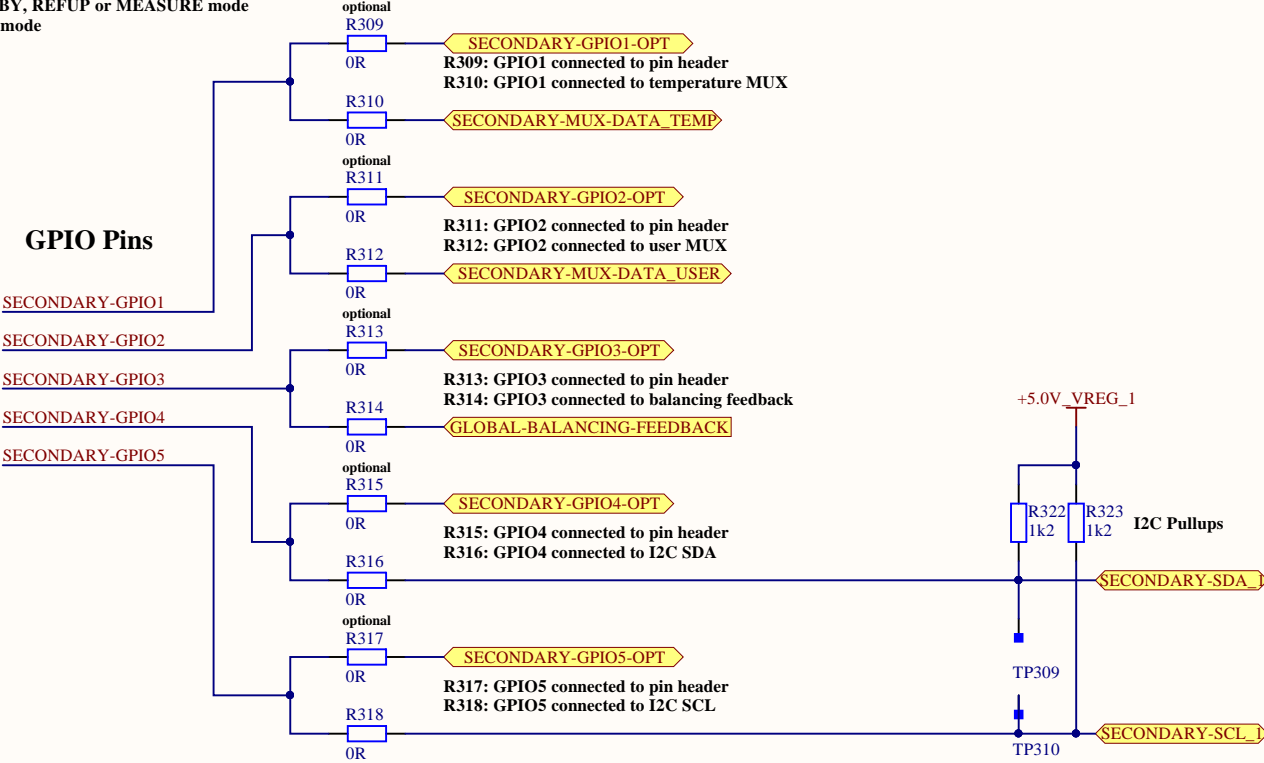
differential signal voltage amplitude adjustment



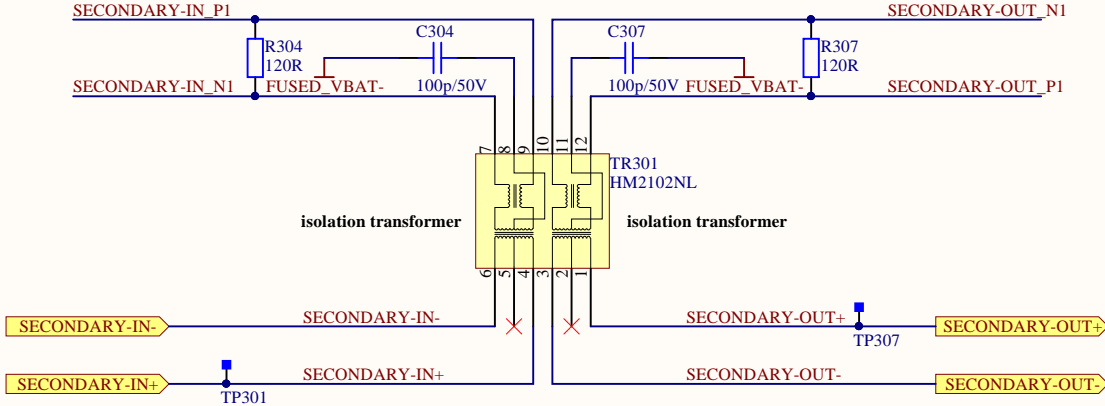
Setting Pins



GPIO Pins

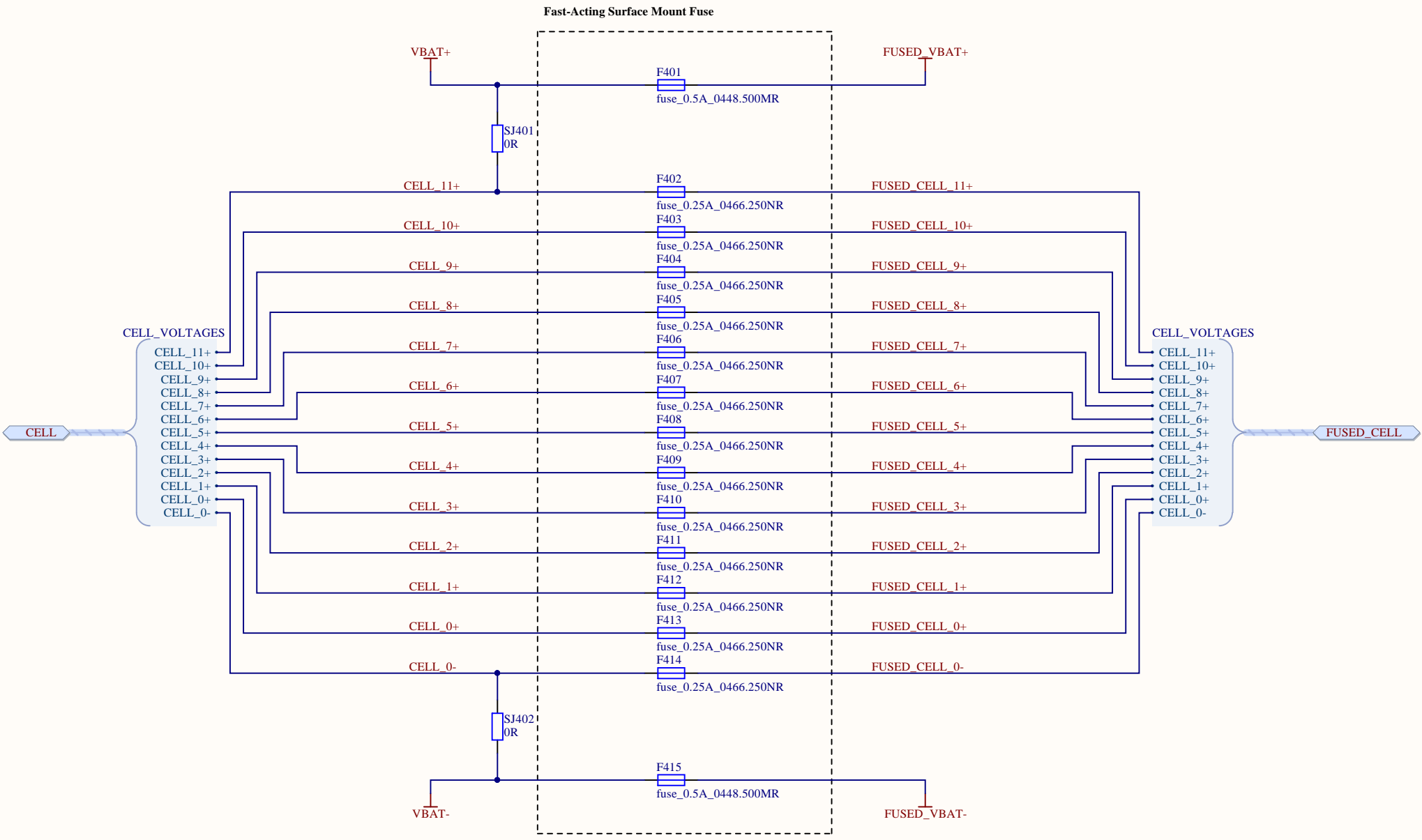


Communication Circuit



Layout:

- The transformer should be placed as close to the isoSPI cable connector as possible. The distance should be kept less than 2cm.
- The LTC6811 should be placed at least 1cm to 2cm away from the transformer.
- On the top component layer, no ground plane should be placed under the transformer, the isoSPI connector, or in between the transformer and the connector.
- The isoSPI signal traces should be isolated from surrounding circuits and traces by ground metal or space. No traces should cross the isoSPI signal lines, unless separated by a ground plane on an inner layer.

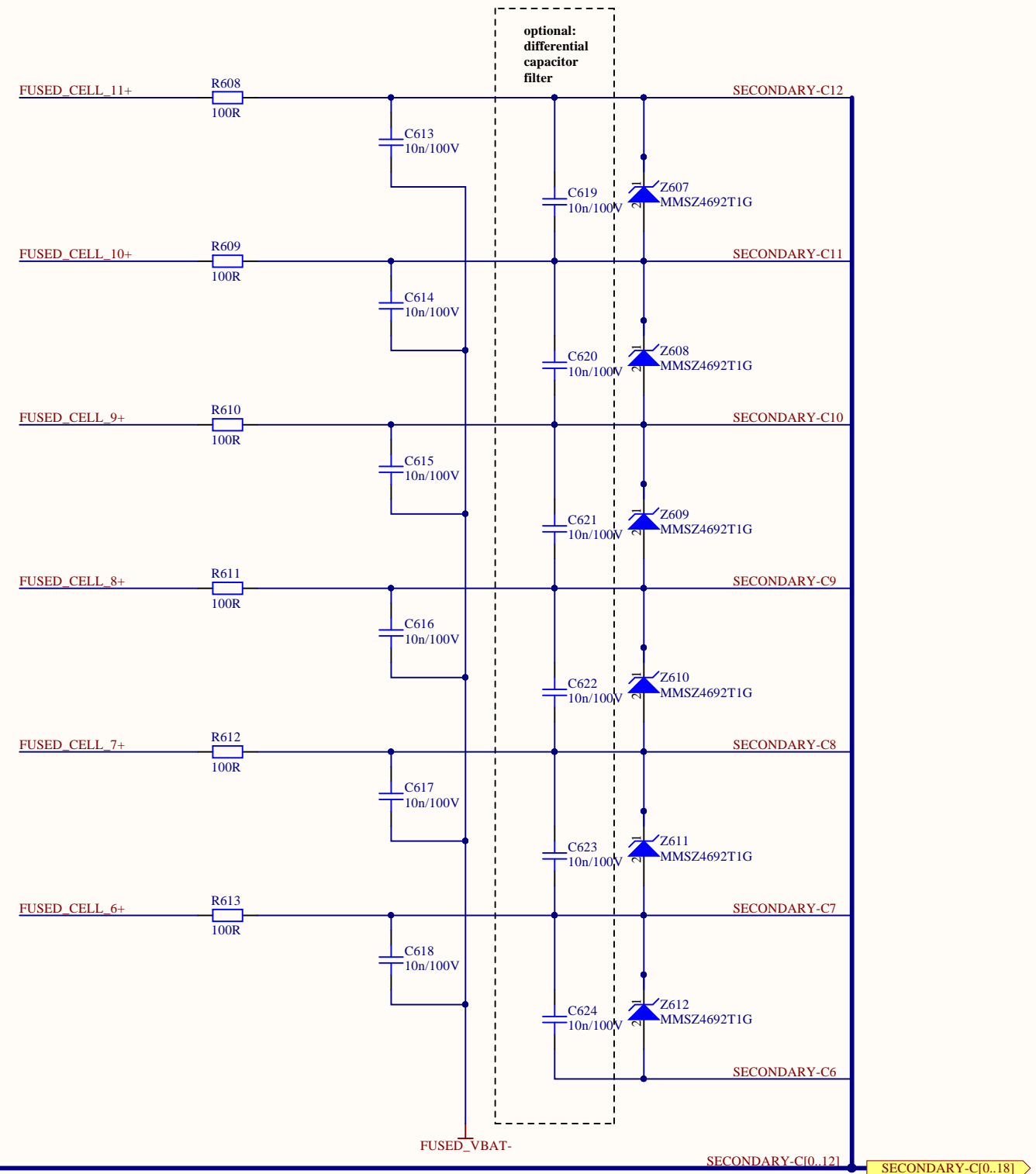
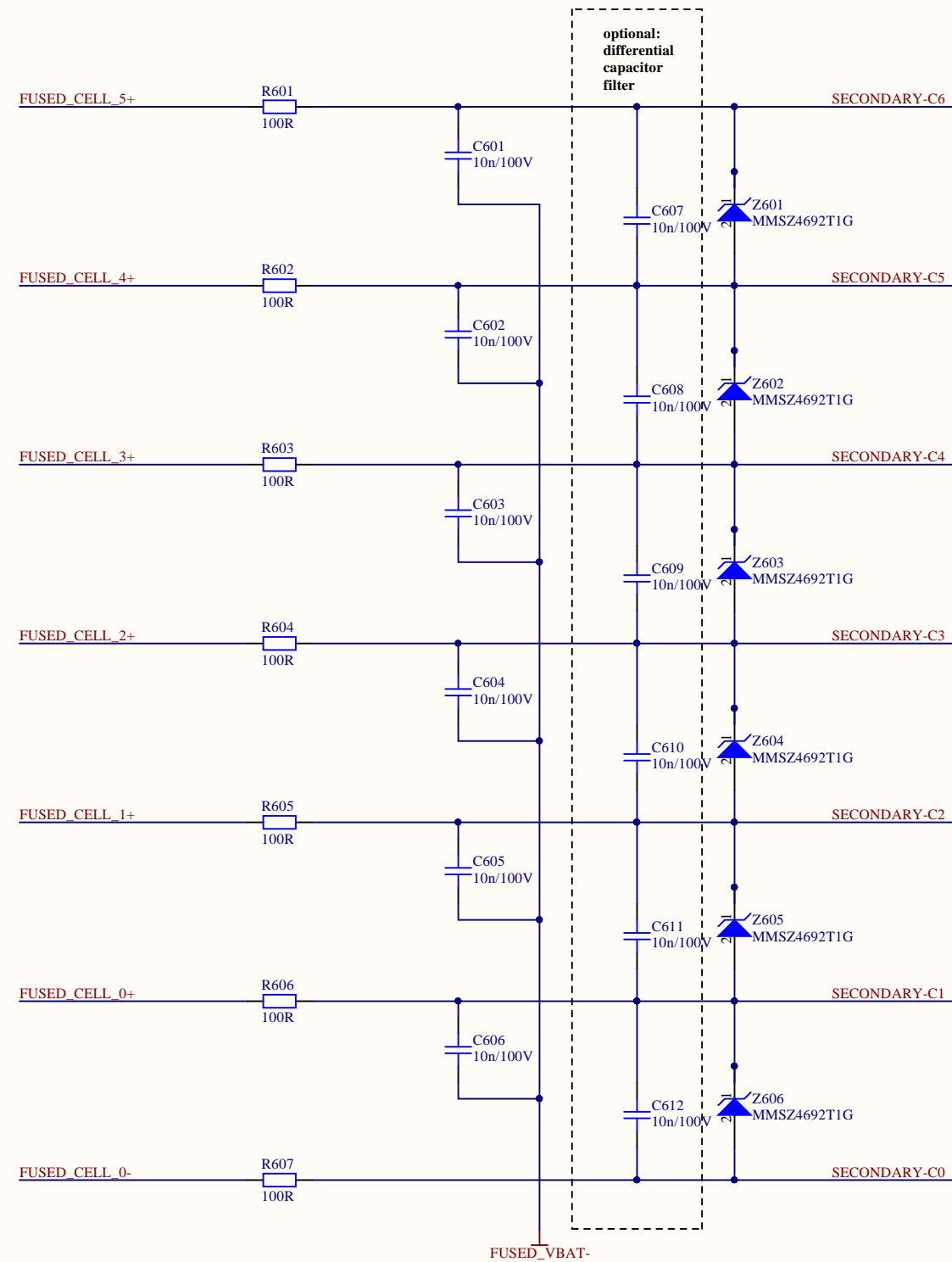


For Cell Balancing/ Measuring Inputs: Max. 0.250A Balancing Current

Reaction Time:
200% Load (0.500A) = ca. 20ms
300% Load (0.750A) = <10ms

For Power Supply Inputs: Max. 0.500A Current

Reaction Time:
200% Load (1.000A) = ca. 200ms
300% Load (1.500A) = ca. 70ms



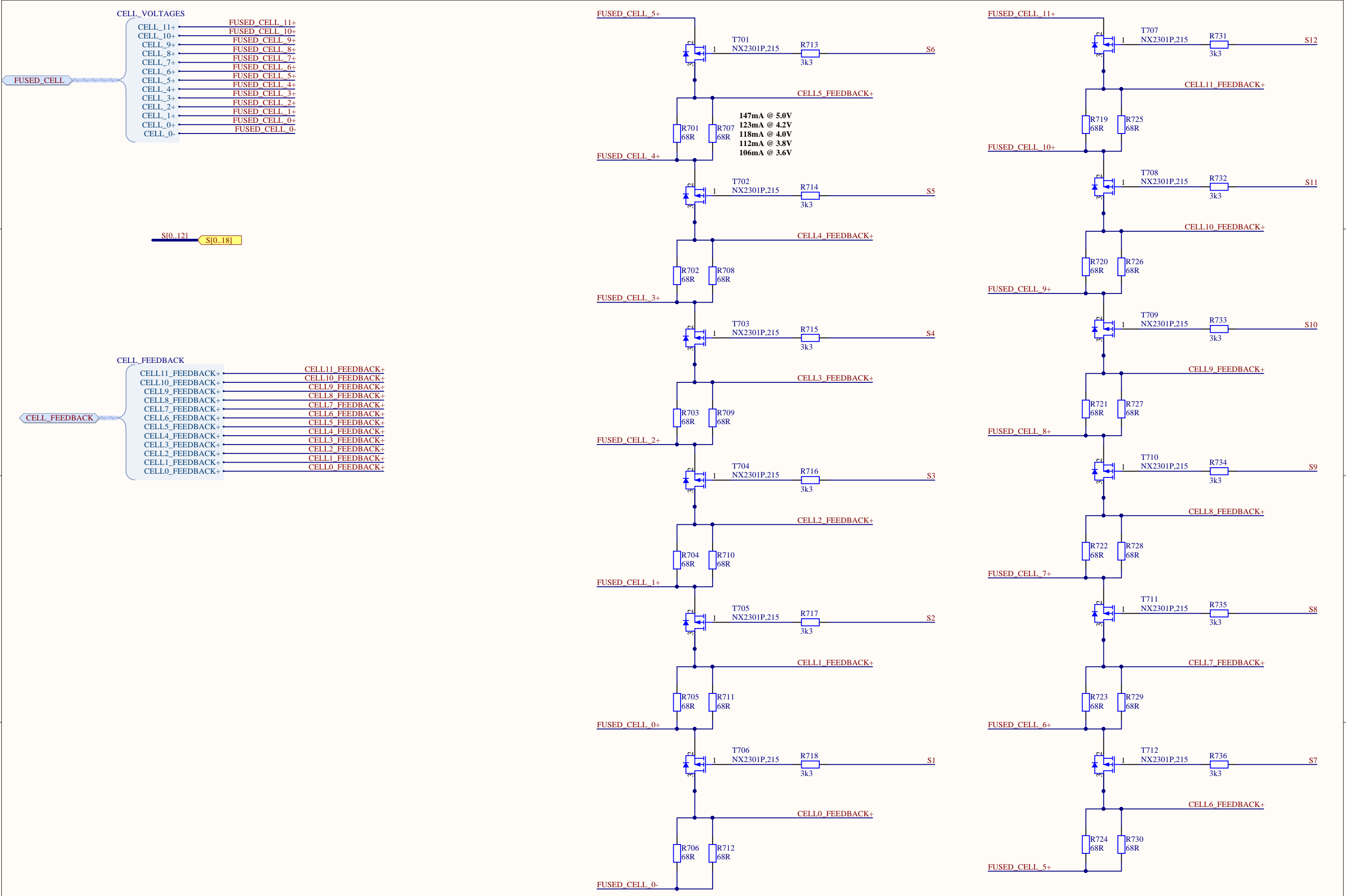
-3dB corner frequency of LTC6811 internal digital low-pass filter:
fast mode: 27kHz
normal mode: 6.8kHz
filtered mode: 26Hz

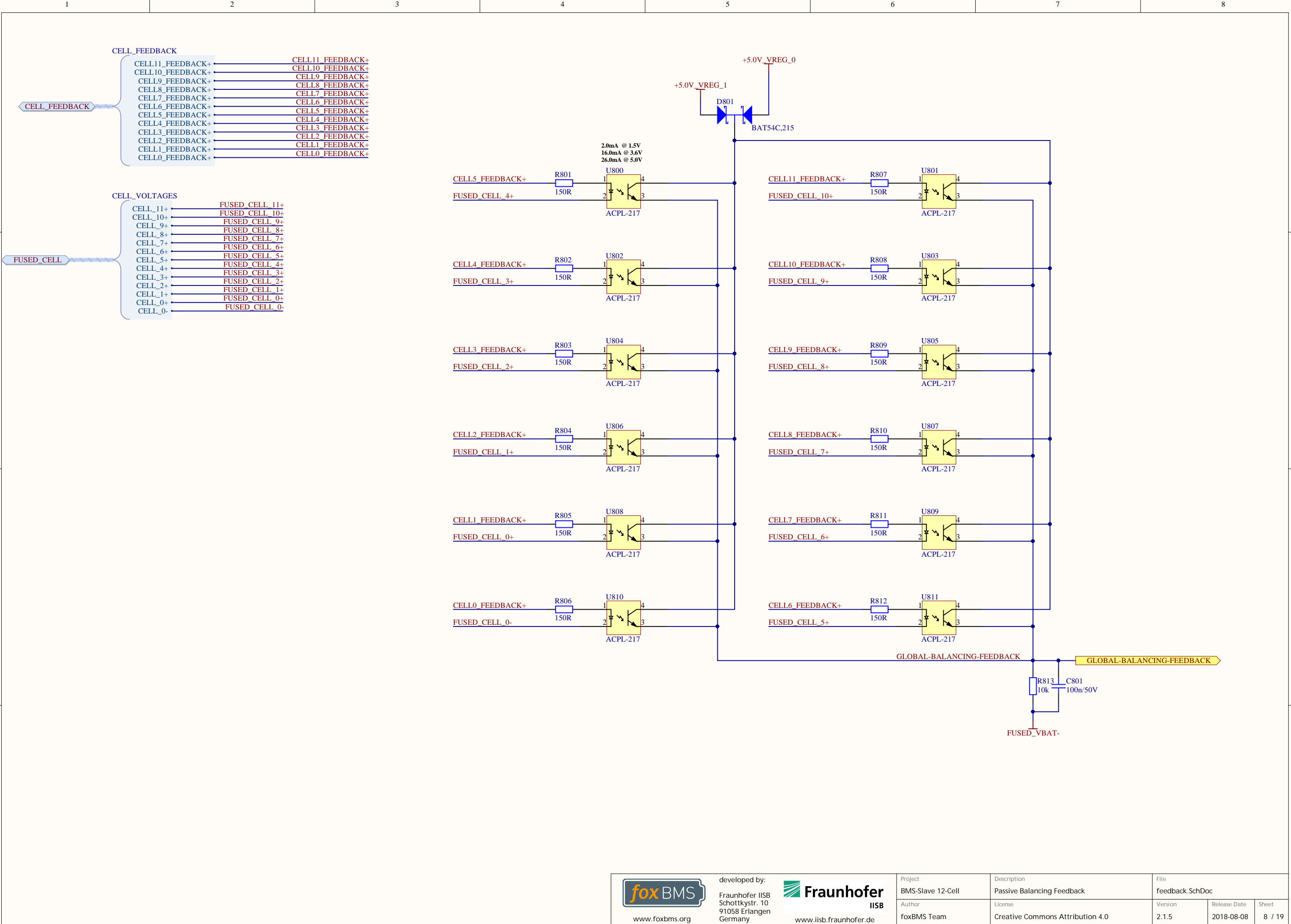
Grounded capacitor low-pass filter:
 $C = 100\text{nF} \rightarrow f_g = 16\text{kHz}$
 $C = 22\text{nF} \rightarrow f_g = 72\text{kHz}$
 $C = 10\text{nF} \rightarrow f_g = 160\text{kHz}$ (recommended)

Differential capacitor low-pass filter (lower cost):
 $C = 100\text{nF} \rightarrow f_g = 11\text{kHz}$
 $C = 22\text{nF} \rightarrow f_g = 50\text{kHz}$
 $C = 10\text{nF} \rightarrow f_g = 112\text{kHz}$

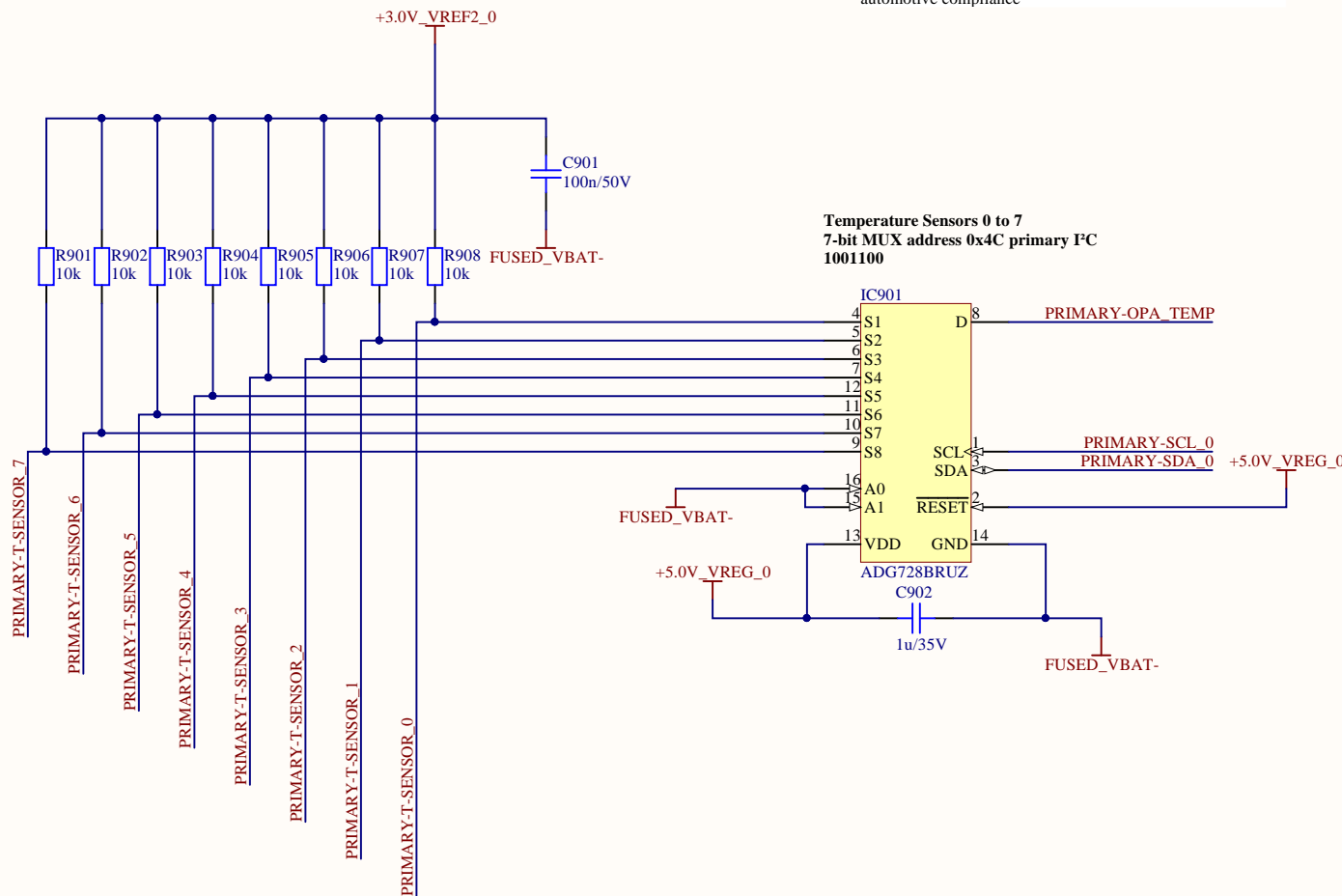
CELL_VOLTAGES

VOLTAGES	
CELL_11+	FUSED CELL 11+
CELL_10+	FUSED CELL 10+
CELL_9+	FUSED CELL 9+
CELL_8+	FUSED CELL 8+
CELL_7+	FUSED CELL 7+
CELL_6+	FUSED CELL 6+
CELL_5+	FUSED CELL 5+
CELL_4+	FUSED CELL 4+
CELL_3+	FUSED CELL 3+
CELL_2+	FUSED CELL 2+
CELL_1+	FUSED CELL 1+
CELL_0+	FUSED CELL 0+
CELL_0-	FUSED CELL 0-



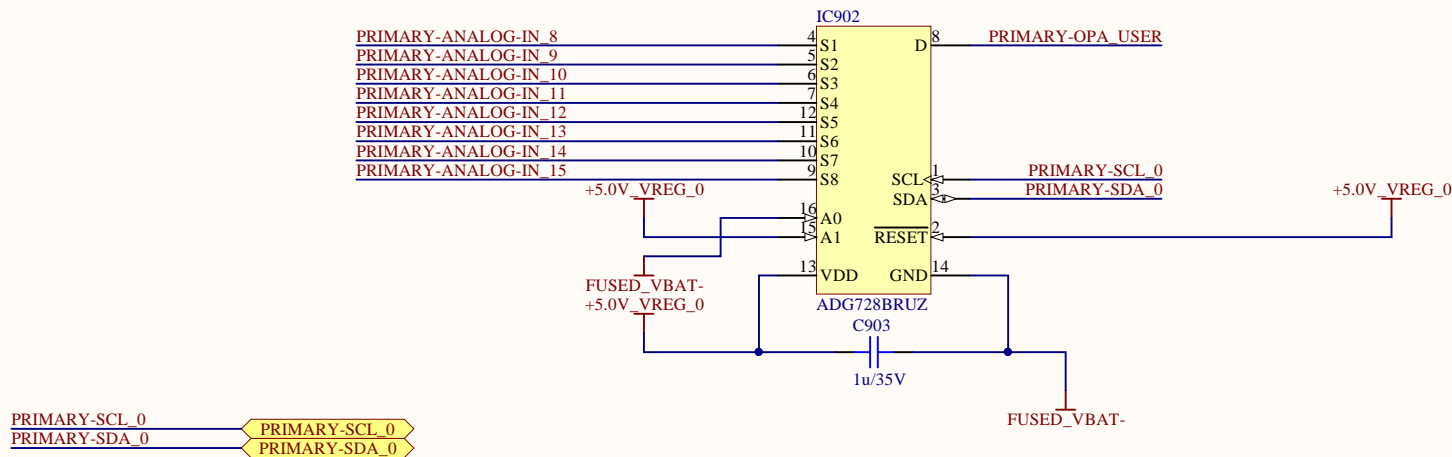


Design Note:
replace ADG728BRUZ with ADG728WBRUZ-REEL7 for
automotive compliance



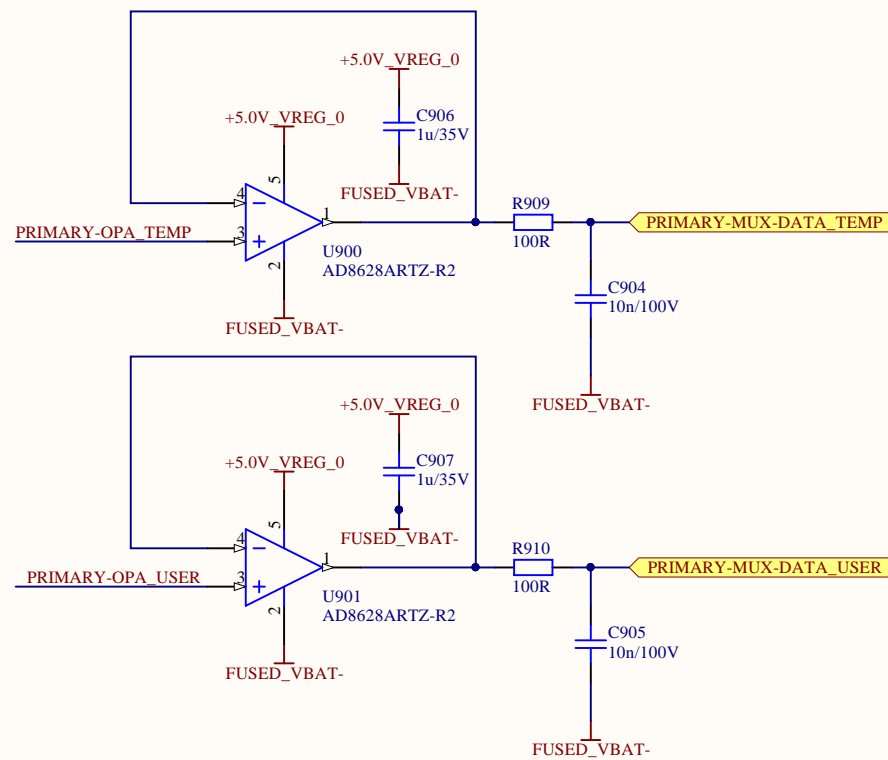
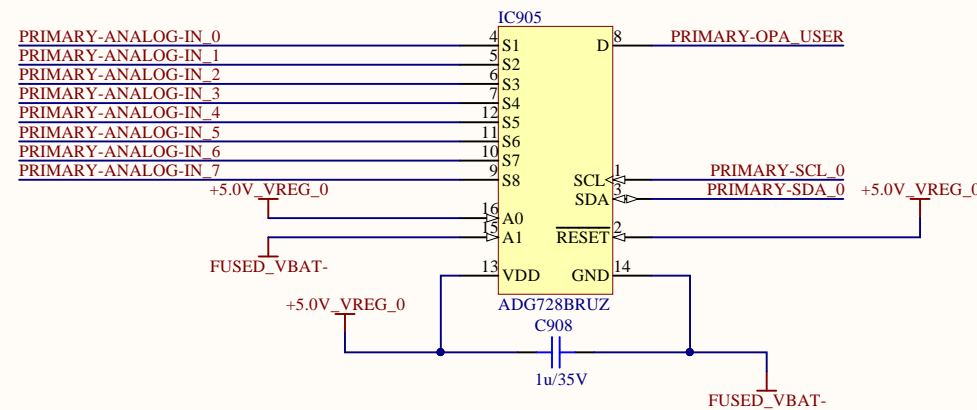
PRIMARY-T-SENSOR [0..7] PRIMARY-T-SENSOR [0..7]

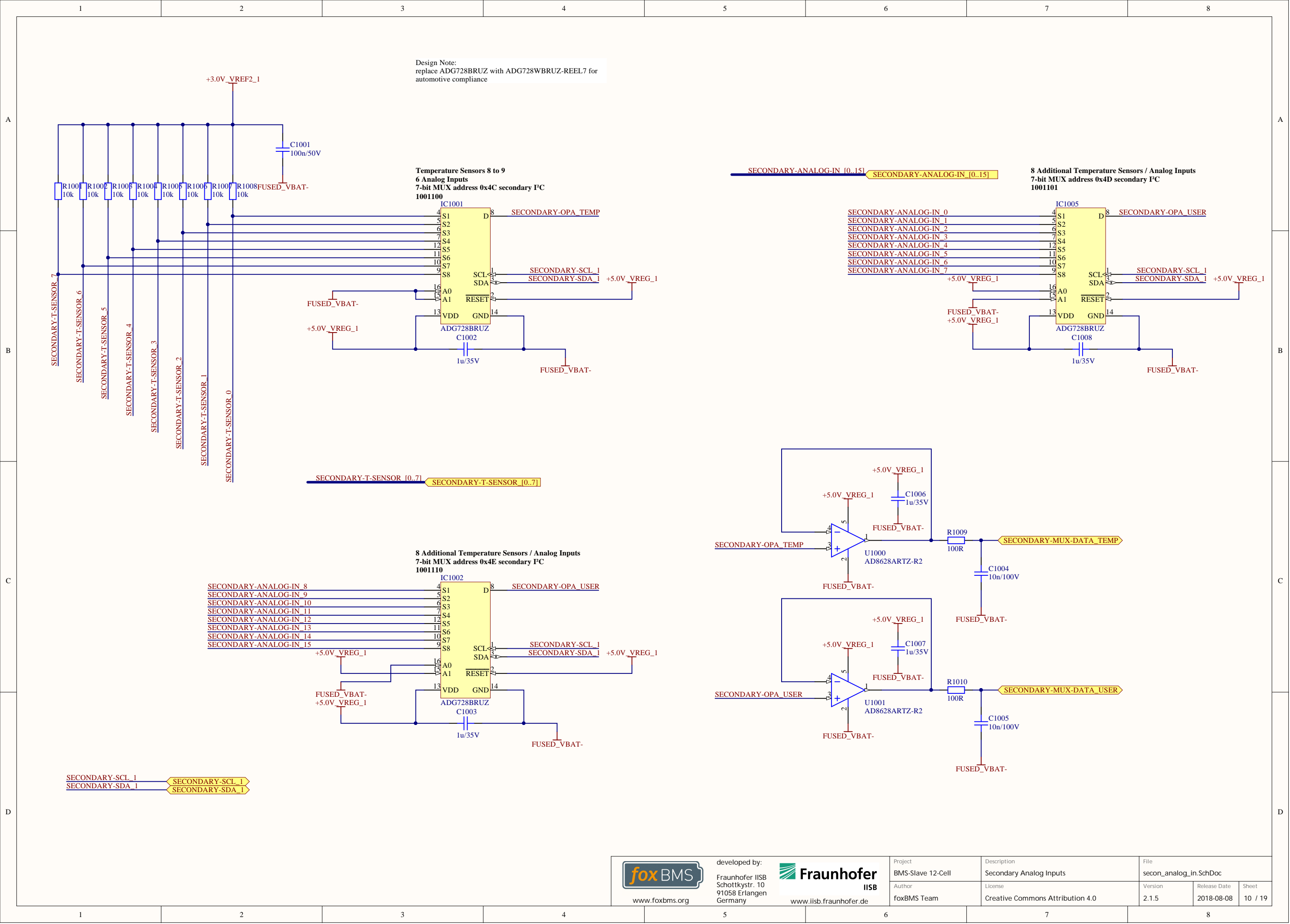
8 Additional Temperature Sensors / Analog Inputs
7-bit MUX address 0x4E primary I²C
1001110

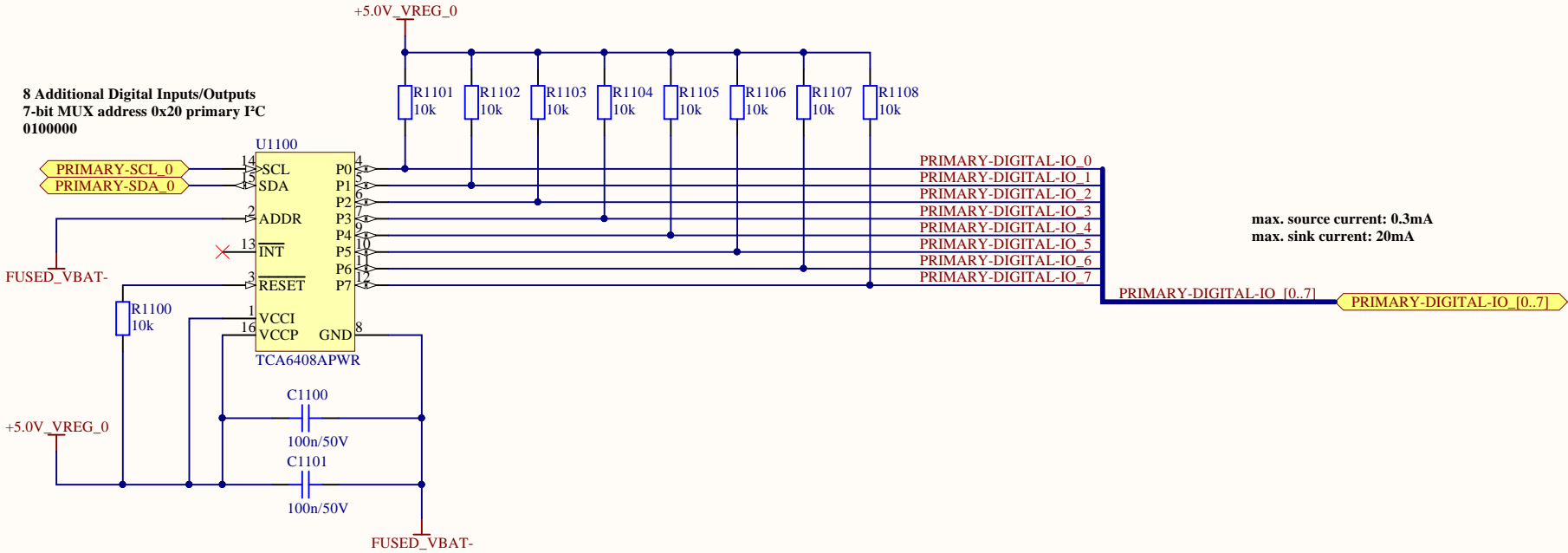


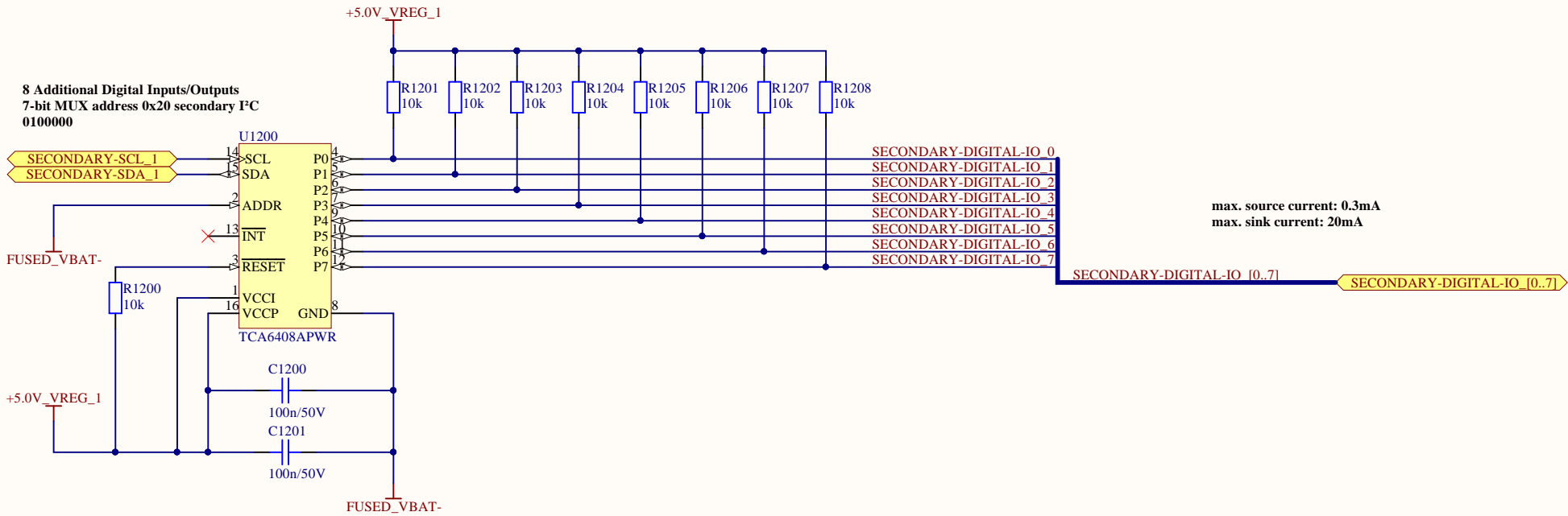
PRIMARY-ANALOG-IN [0..15] PRIMARY-ANALOG-IN [0..15]

8 Additional Temperature Sensors / Analog Inputs
7-bit MUX address 0x4D primary I²C
1001101





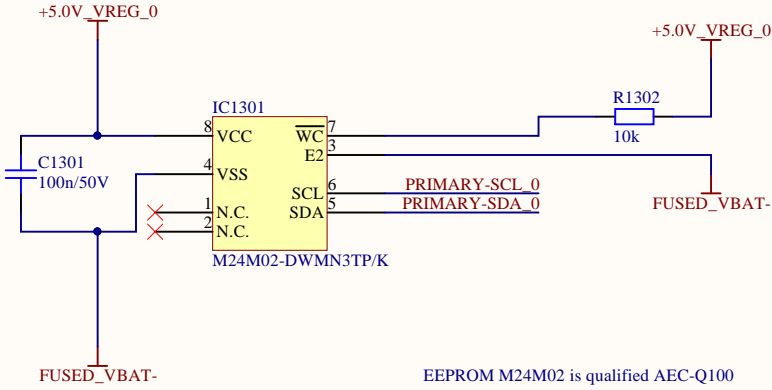




PRIMARY-SDA_0
PRIMARY-SCL_0

PRIMARY-SDA_0
PRIMARY-SCL_0

EEPROM
7-bit base address 0x50 primary I²C
10100 (A17) (A16)
A17, A16: MSB address bits

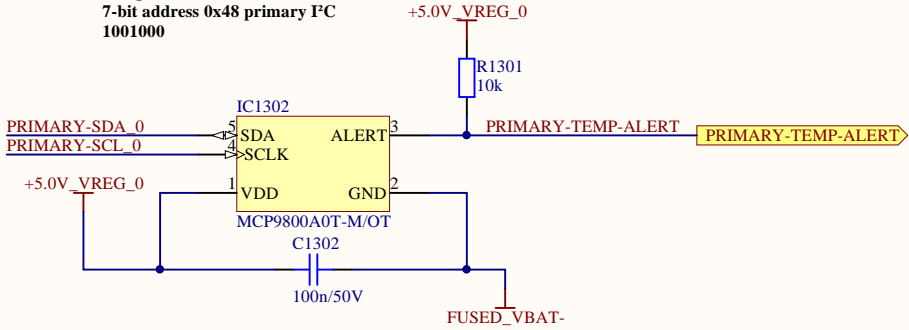


EEPROM M24M02 is qualified AEC-Q100

W\C\:
floating: write operation enabled
pulled high: write operations disabled

When Write Control (WC) is driven high, device select and address bytes are acknowledged,
data bytes are not acknowledged.

Temperature Sensor
7-bit address 0x48 primary I²C
1001000



Temperature Sensor MCP9800 is qualified AEC-Q100

±0.5°C (typ.) at +25°C
±1°C (max.) from -10°C to +85°C
±2°C (max.) from -10°C to +125°C
±3°C (max.) from -55°C to +125°C

Attention: use -A0T Type (I2C address conflict otherwise)!

Alert temperature can be configured via I2C



www.foxbms.org

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Schottkystr. 10
91058 Erlangen
Germany



www.iisb.fraunhofer.de

Project

BMS-Slave 12-Cell

Author

foxBMS Team

Description

Primary EEPROM and Board T-Sensor

License

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File

primary_EEPROM_and_T.SchDoc

Version

2.1.5

Release Date

2018-08-08

Sheet

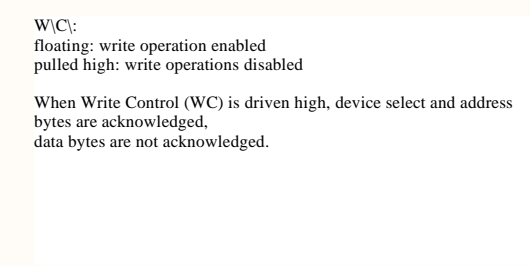
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A

A

B

B

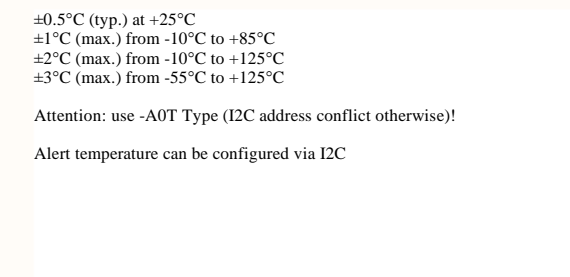


SECONDARY-SDA_1 SECONDARY-SDA_1
SECONDARY-SCL_1 SECONDARY-SCL_1

EEPROM M24M02 is qualified AEC-Q100

C

C



$\pm 0.5^{\circ}\text{C}$ (typ.) at $+25^{\circ}\text{C}$
 $\pm 1^{\circ}\text{C}$ (max.) from -10°C to $+85^{\circ}\text{C}$
 $\pm 2^{\circ}\text{C}$ (max.) from -10°C to $+125^{\circ}\text{C}$
 $\pm 3^{\circ}\text{C}$ (max.) from -55°C to $+125^{\circ}\text{C}$

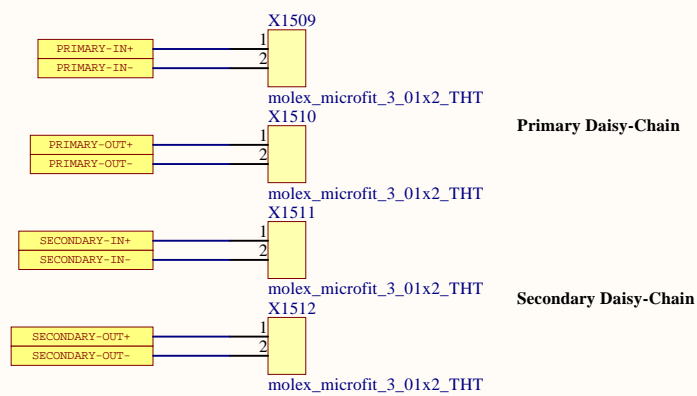
Attention: use -A0T Type (I2C address conflict otherwise)!

Alert temperature can be configured via I2C

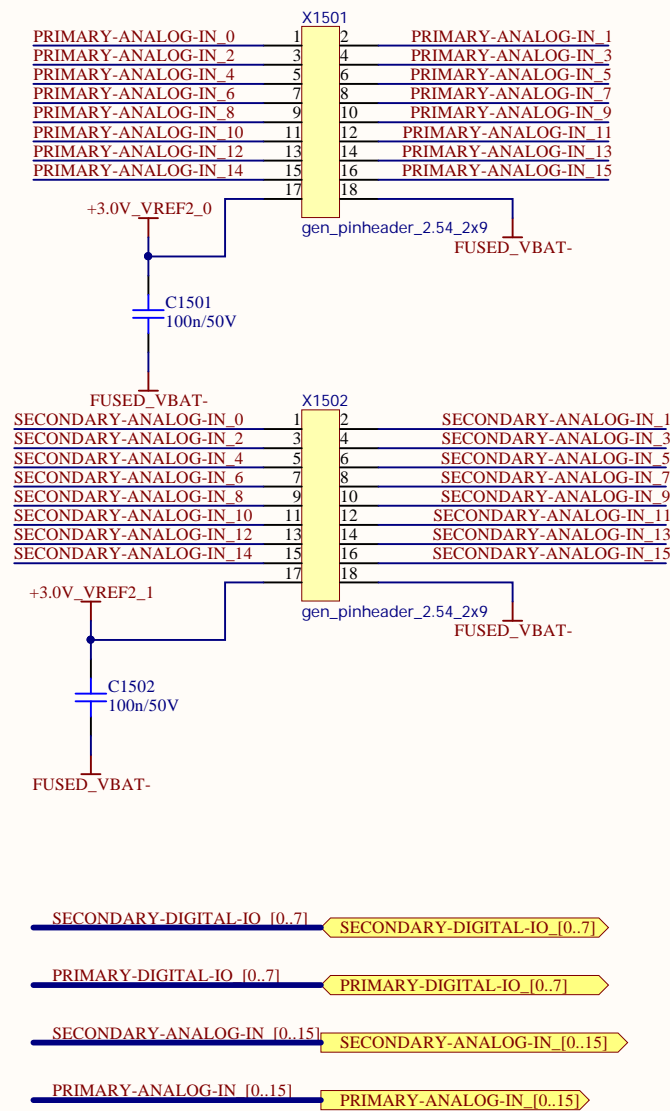
Temperature Sensor MCP9800 is qualified AEC-Q100

Daisy Chain Connectors

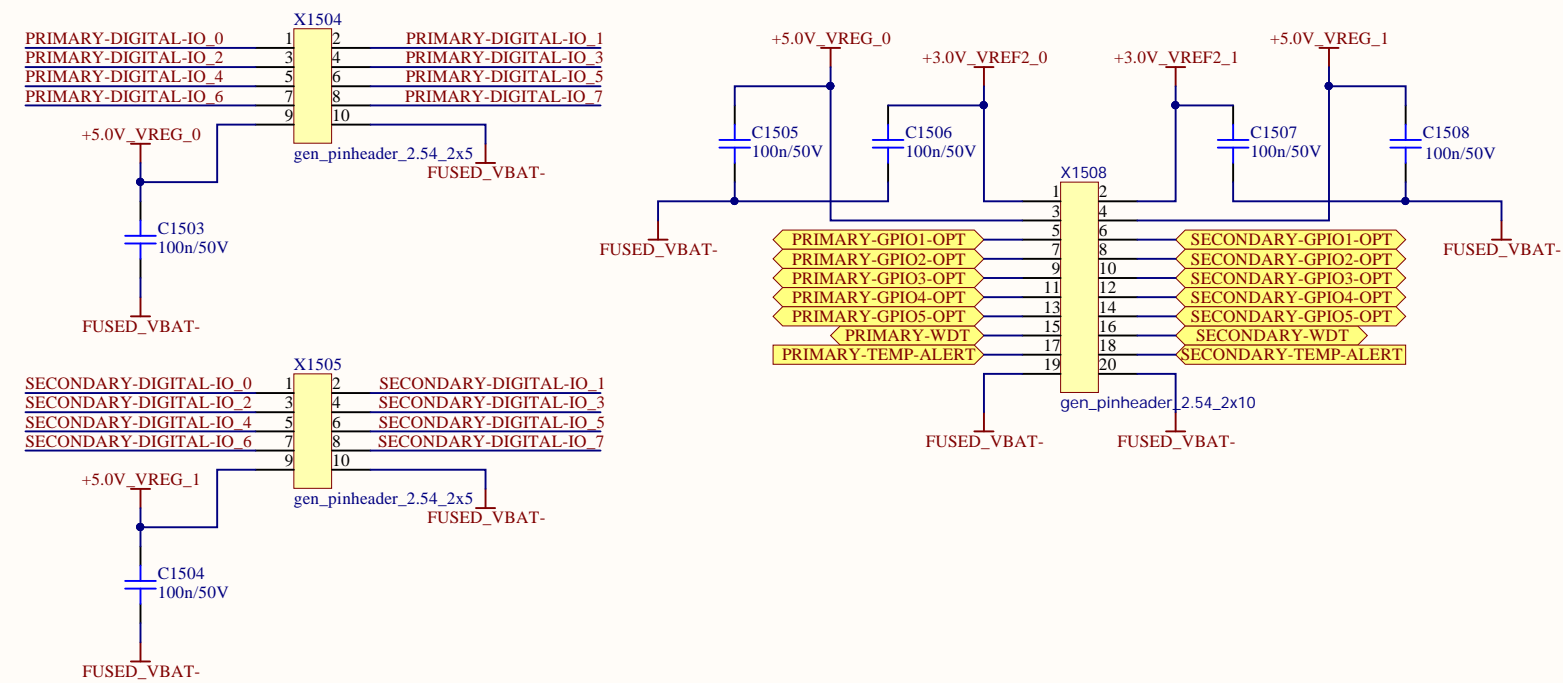
4x 2p connector equal for 12/15/18/20 cell version



Pin-Header for additional analog and digital inputs/outputs

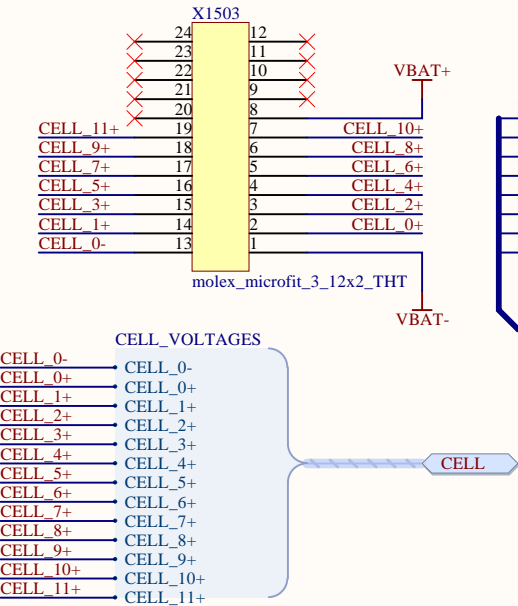


GPIO Extension Connector



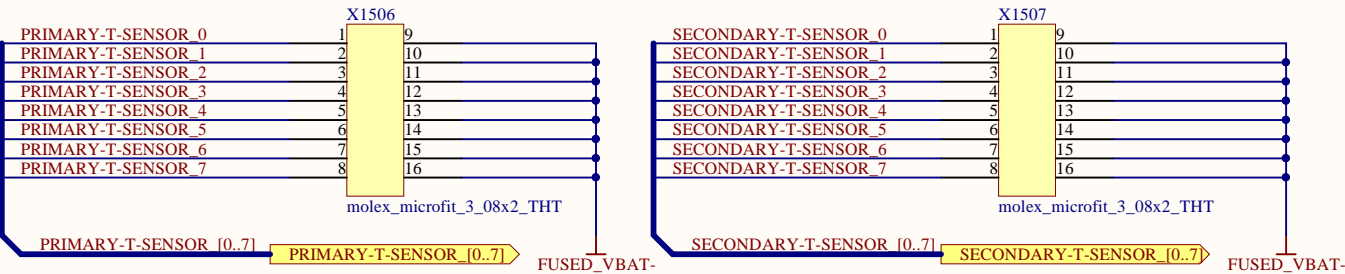
Batterie Cell Voltage Sense Connector

24p connector equal for 12/15/18/20 cell version



Temperature Sensor Connector

2x 16p connector equal for 12/15/18/20 cell version



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www.iisb.fraunhofer.de

Project

BMS-Slave 12-Cell

Author

foxBMS Team

Description

Connection to pack

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bat_connectors.SchDoc

Version

2.1.5

Release Date

2018-08-08

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