For 2 suspensions

OSEM PCB Fabrication & Assembly

Scope of supply and specifications

a. **PCB Fabrication**
   i. Quantity for each PCB board
      1. OSEM Mainboard Qty: 8 Nos
      2. OSEM Daughterboard Qty: 8 Nos
      3. SEI board Qty 8 Nos

   ii. Gerber File
      The PCB Fabrication file (Gerber file) is provided by IUCAA for the OSEM Mainboard, OSEM daughterboard and SEI board. The vendor needs to fabricate the PCBs.

   iii. Board details
      1. Each PCB has 2 layers. However, all the components are placed only on the top layer.
      2. The thickness of the PCB should be 1.6mm.
      3. PCB material: FR4
      4. Surface Finish: Electroless nickel immersion gold (ENIG)
      5. Solder Mask: Green
      6. Copper thickness: 35um

   iv. Bare board testing (BBT) needs to be done.

b. **Assembly of Components on PCB**
   i. Bill of Materials
      IUCAA will provide the BOM. The vendor must purchase all the components per BOM and include their cost in the order.
      The pdf file of the silk screen with pad enabled for both layers will be provided by IUCAA.

   ii. Certificate of Conformance (COC)
      All components need to be procured from manufacturers, authorized distributors or standard suppliers such as digikey, element14, mouser. We would like to have a Certificate of Conformance (COC) for all the components.

iii. Soldering

1. Soldering requirement

   Most of the components are SMD packages except connectors and transistors. Few ICs are sensitive to soldering temperature. So, the soldering temperature of any of the SMD components should not exceed its specified soldering temperature as per the datasheet.

2. ESD requirement

   Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although some of the components feature proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high-energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

c. Cable Fabrication

i. **PCB_Sus Cable: Qty: 4**

1. 2 X 14 pin FRC to DB25 female
2. Cable pinout details as per page 3 of the Cable Pinout Diagrams.
3. The bulkhead DB25 and FRC connector have to be crimpable.

ii. **PCB_DAQ Cable: Qty: 4**

1. 2 X 14 pin FRC to DB25 female
2. Cable pinout details as per page 3 of the Cable Pinout Diagrams.
3. The bulkhead DB25 and FRC connector have to be crimpable.

iii. SIM9B2 to Suspension Cable: Qty: 6

1. DSub25 male to DSub25 female twisted pair shielded cables, 3 meters length
2. Cable shielding needs to be connected to the connector body.
3. Cable pinout details as per page 4 of the Cable Pinout Diagrams.

iv. SIM9B2 to Adapter board cable: Qty: 6

1. DSub25 male to DSub25 female twisted pair shielded cables, 3 meters length
2. Cable shielding needs to be connected to the connector body.
3. Cable pinout details as per page 4 of the Cable Pinout Diagrams.

v. Sus to OSEM Cable: Qty 5

1. DB25 to RJ45 CAT8 cables.

2. Cable pinout details as per page 5 of the Cable Pinout Diagrams.

vi. **PCB_SEI SIM9B2 Cable: Qty: 8**
   1. 14-pin FRC to DB15 female
   2. Cable pinout details as per page 6 of the Cable Pinout Diagrams.
   3. The bulkhead DB15 and FRC connector have to be crimpable.

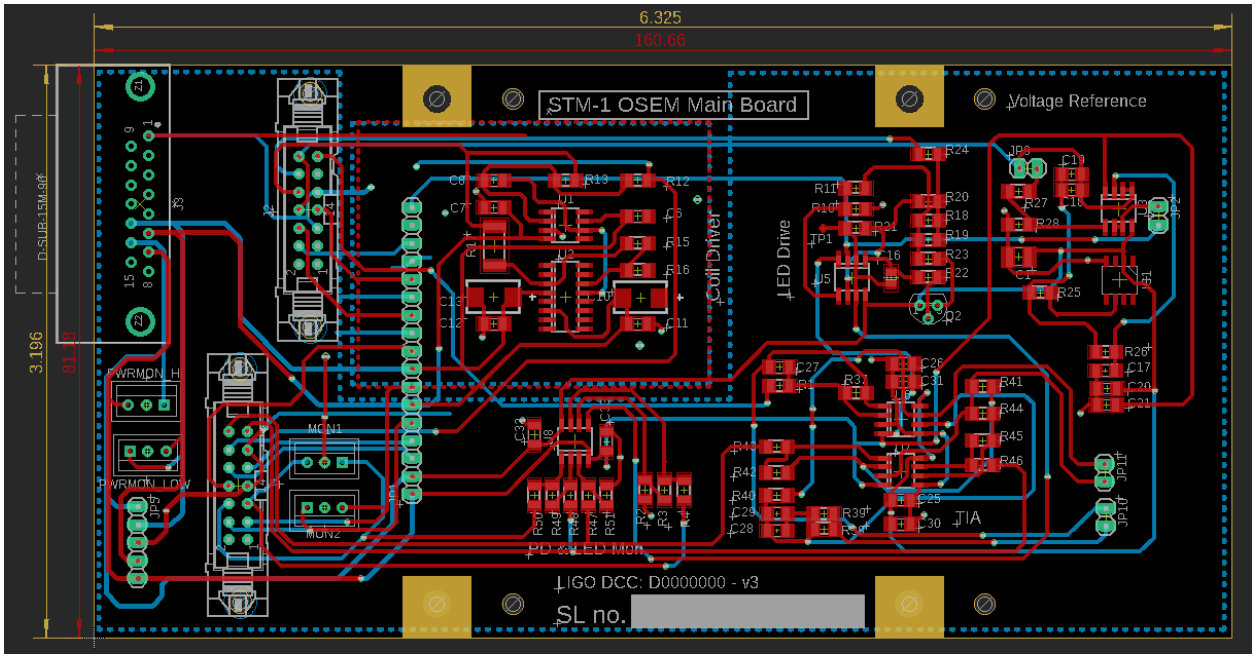
vii. **SIM9B2 to SEI sensor: Qty: 8**
   1. DSub15 male to DSub15 female twisted pair shielded cables, 3 meters length
   2. Cable shielding needs to be connected to the connector body.
   3. Cable pinout details as per page 7 of the Cable Pinout Diagrams.

viii. **SEI Sensor to OSEM Cable: Qty: 8**
   1. DB15 male to RJ45 male cables.
   2. Cable pinout details as per page 8 of the Cable Pinout Diagrams.

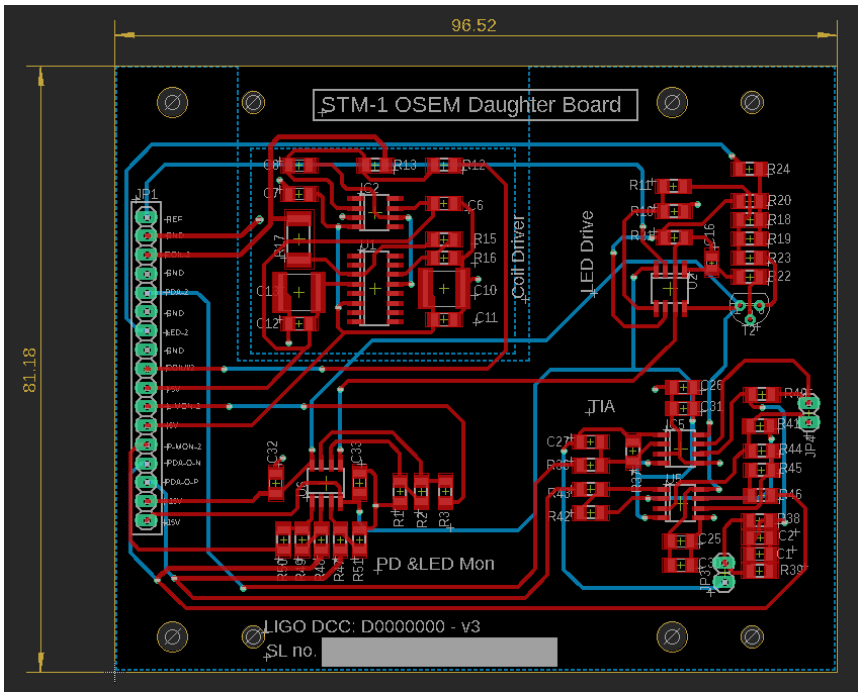
Note:
- All Dsub Connectors should be with metal back shells.
- Heat shrink tube(HST) needs to be put in and the connectivity test should be performed.

d. Quality Assurance Checks

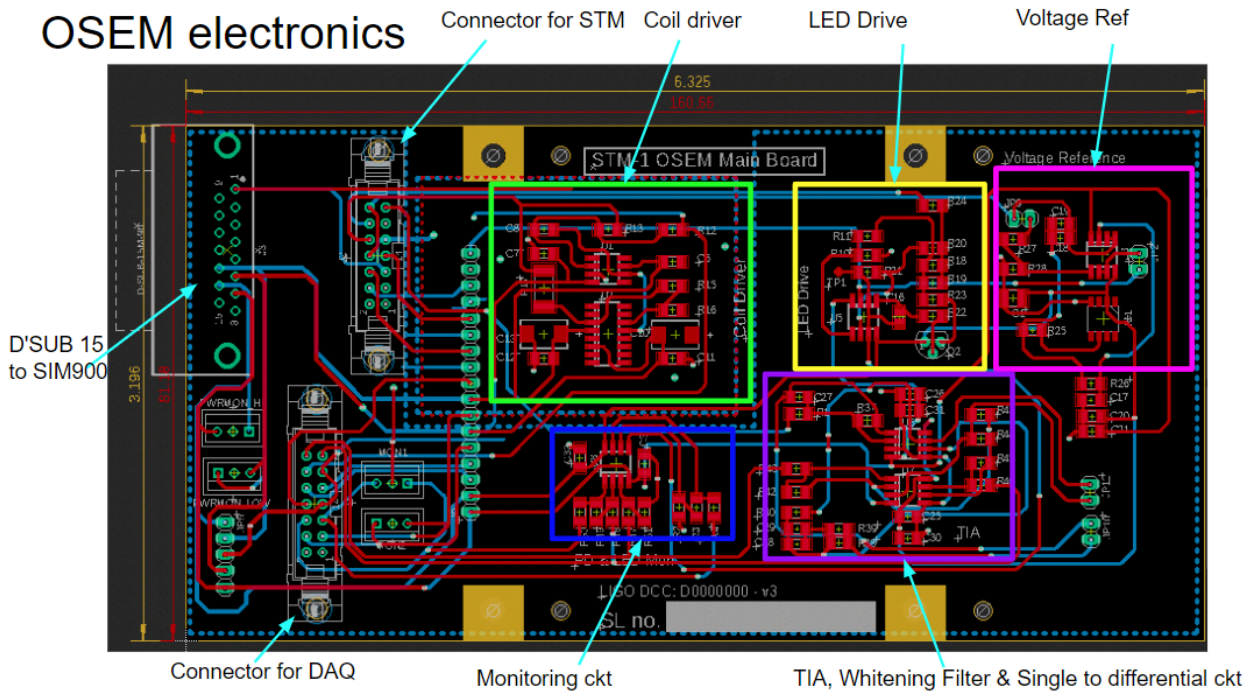
i. Manual/Visual Inspection of assembled boards to ensure soldering quality.
ii. The cable connectivity resistance value should be less than 0.5 ohm (19.5.1).
iii. Functionality tests of the assembled boards and cables will be done by the End user.
iv. Any manufacturing defect discovered within 6 months of supply needs to be reworked by the vendor.
v. Each cable shall be 100% electrically tested per IPC/WHMA-A-620C, sections 19.4 and 19.5.
vi. Insulation resistance shall be more than 100 MOhms when measured at 100 Vdc (19.5.4)



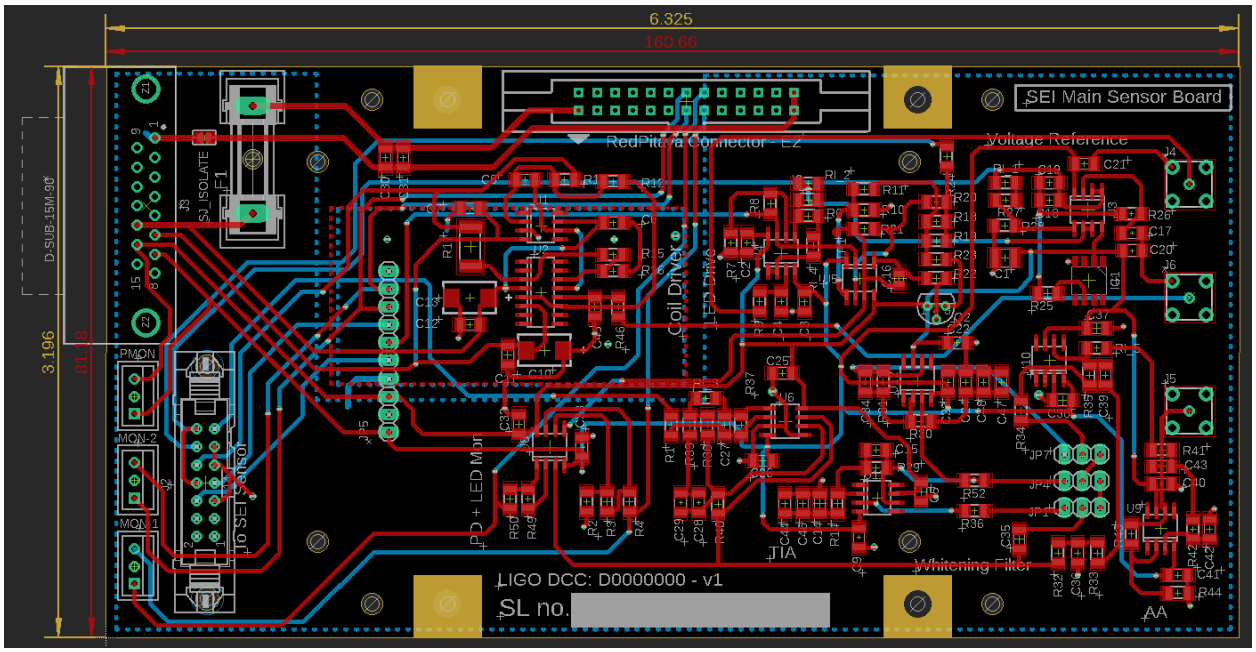
OSEM Main Board



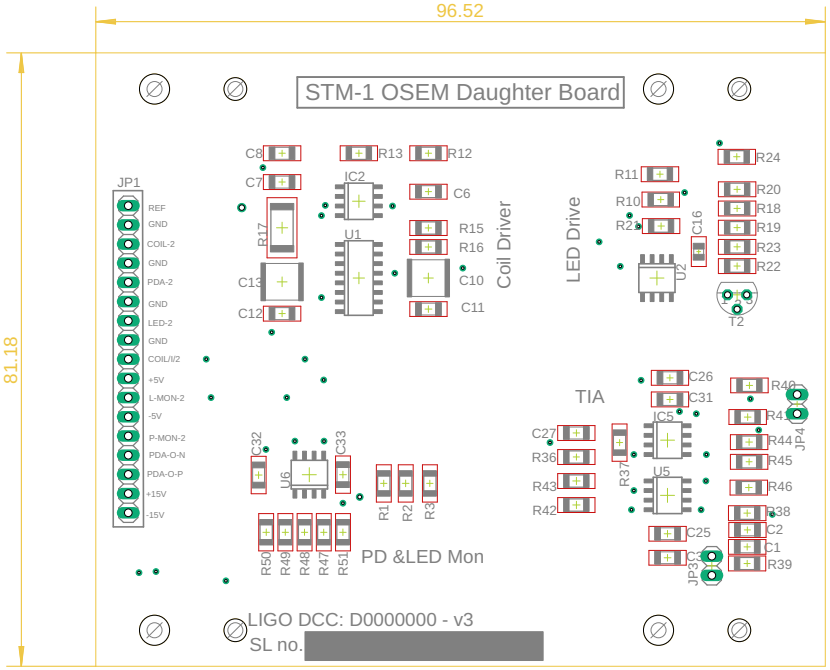
OSEM Daughter Board

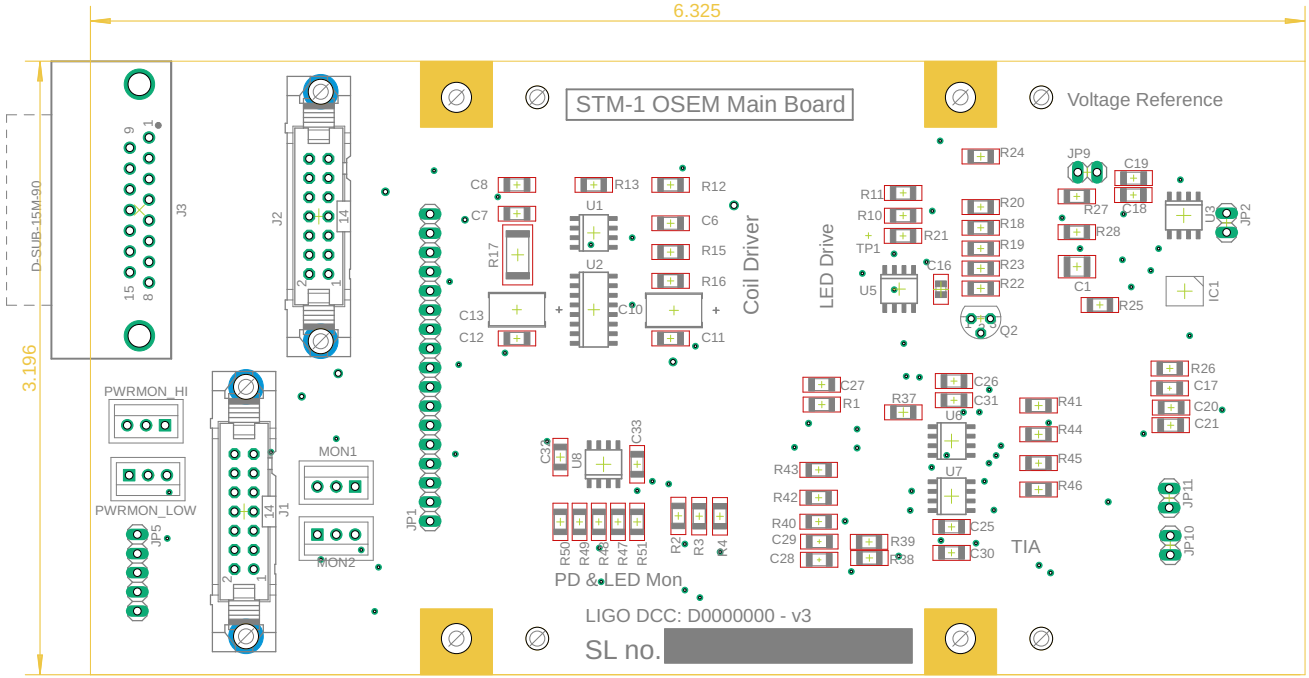


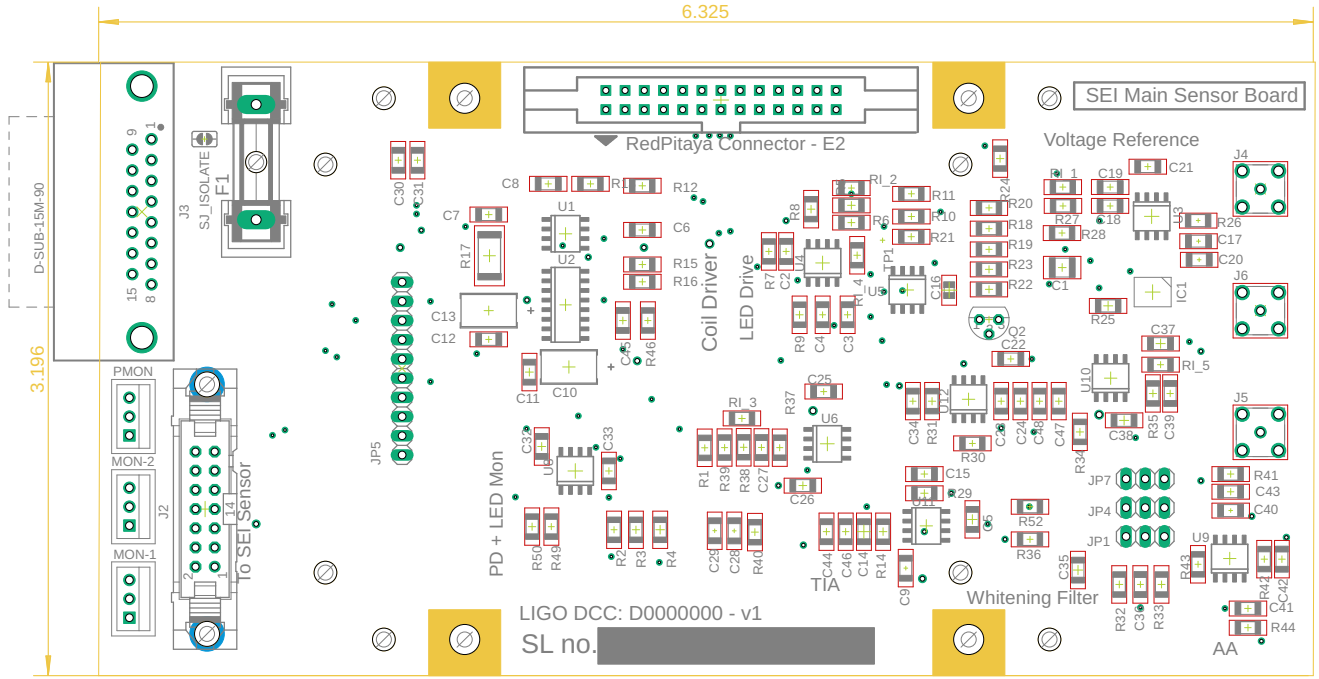
Different sections of the circuit on the OSEM Main PCB



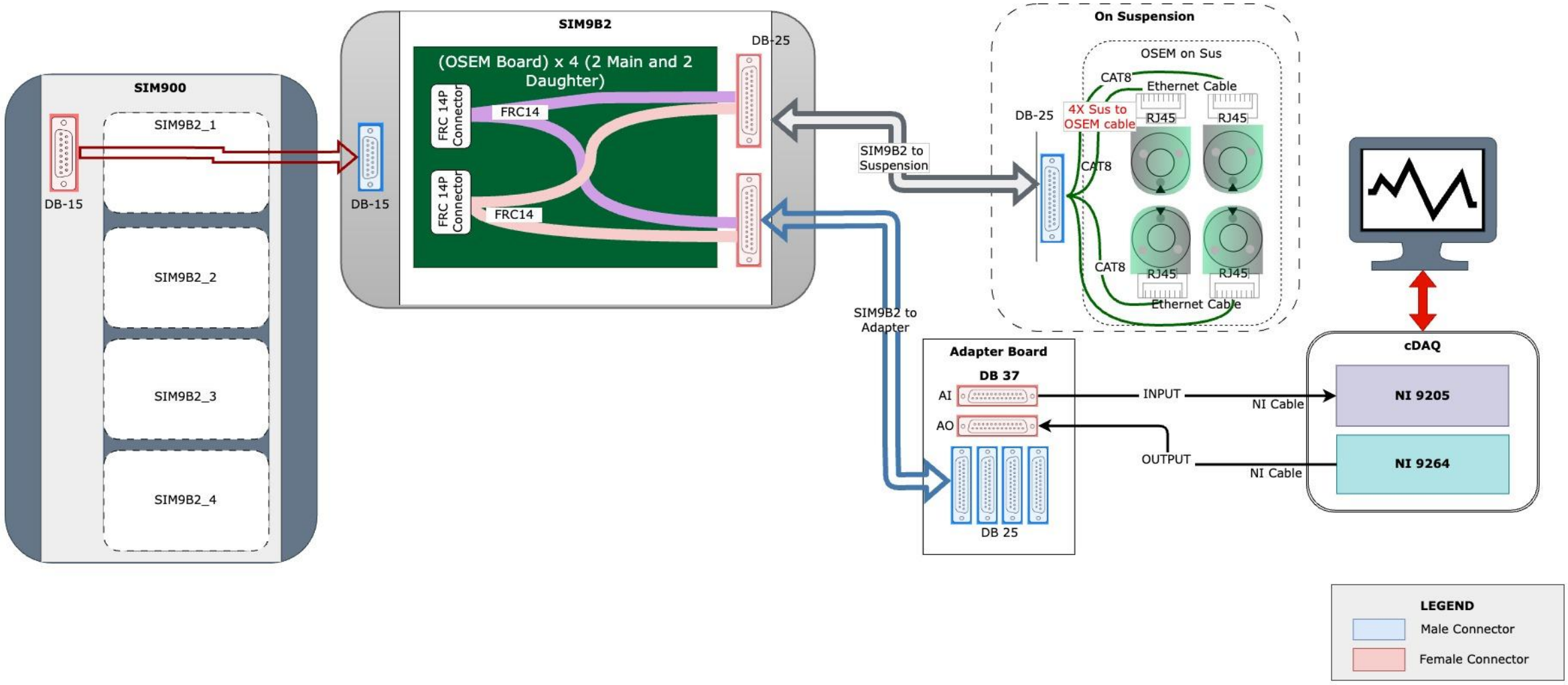
SEI Board


96.52
81.18
STM-1 OSEM Daughter Board
JP1
REF
GND
COIL-2
GND
PDA-2
GND
LED-2
GND
COIL/I/2
+5V
L-MON-2
-5V
P-MON-2
PDA-O-N
PDA-O-P
+15V
-15V
C8
C7
R17
C13
C12
R13
R12
IC2
C6
U1
R15
R16
C10
C11
Coil Driver
LED Drive
R11
R10
R24
R20
R18
R19
R23
R22
C16
U2
T2
TIA
C26
C31
IC5
U5
C27
R36
R43
R42
R37
R40
R41
R44
R45
R46
R38
C2
C1
R39
C25
JP4
JP3
C32
C33
U6
R1
R2
R3
R50
R49
R48
R47
R51
PD &LED Mon
LIGO DCC: D0000000 - v3
SL no.

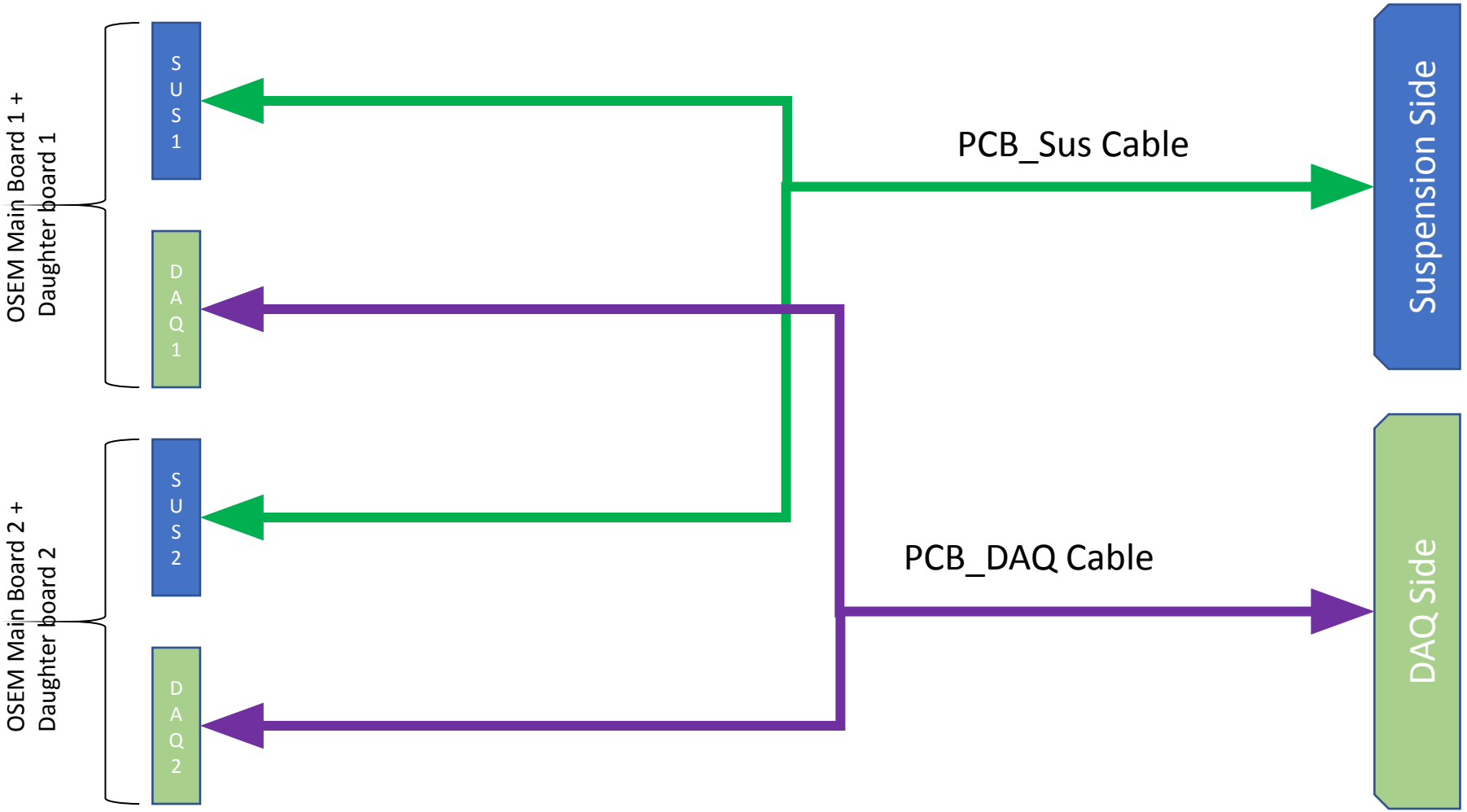

6.325
3.196
STM-1 OSEM Main Board
Voltage Reference
D-SUB-15M-90
J3
J2
J1
PWRMON_HI
PWRMON_LOW
JP5
MON1
MON2
JP1
C8
C7
R17
C13
C12
U1
U2
R13
R12
C6
R15
R16
C10
C11
Coil Driver
LED Drive
R24
R11
R10
R21
TP1
U5
C16
Q2
R20
R18
R19
R23
R22
JP9
C19
R27
C18
R28
C1
R25
U3
JP2
IC1
C27
R1
R37
C26
C31
U6
U7
R43
R42
R40
C29
C28
R39
R38
C25
C30
TIA
R41
R44
R45
R46
R26
C17
C20
C21
JP11
JP10
C23
U8
C33
R50
R49
R48
R47
R51
R2
R3
R4
PD &LED Mon
LIGO DCC: D0000000 - v3
SL no.


6.325
3.196
SEI Main Sensor Board
RedPitaya Connector - E2
Voltage Reference
D-SUB.15M-90
J3
SJ_ISOLATE
F1
PMON
MON-2
MON-1
J2
To SEI Sensor
JP5
Coil Driver
LED Drive
PD + LED Mon
TIA
Whitening Filter
LIGO DCC: D0000000 - v1
SL no.
AA

Overall Cabling Scheme



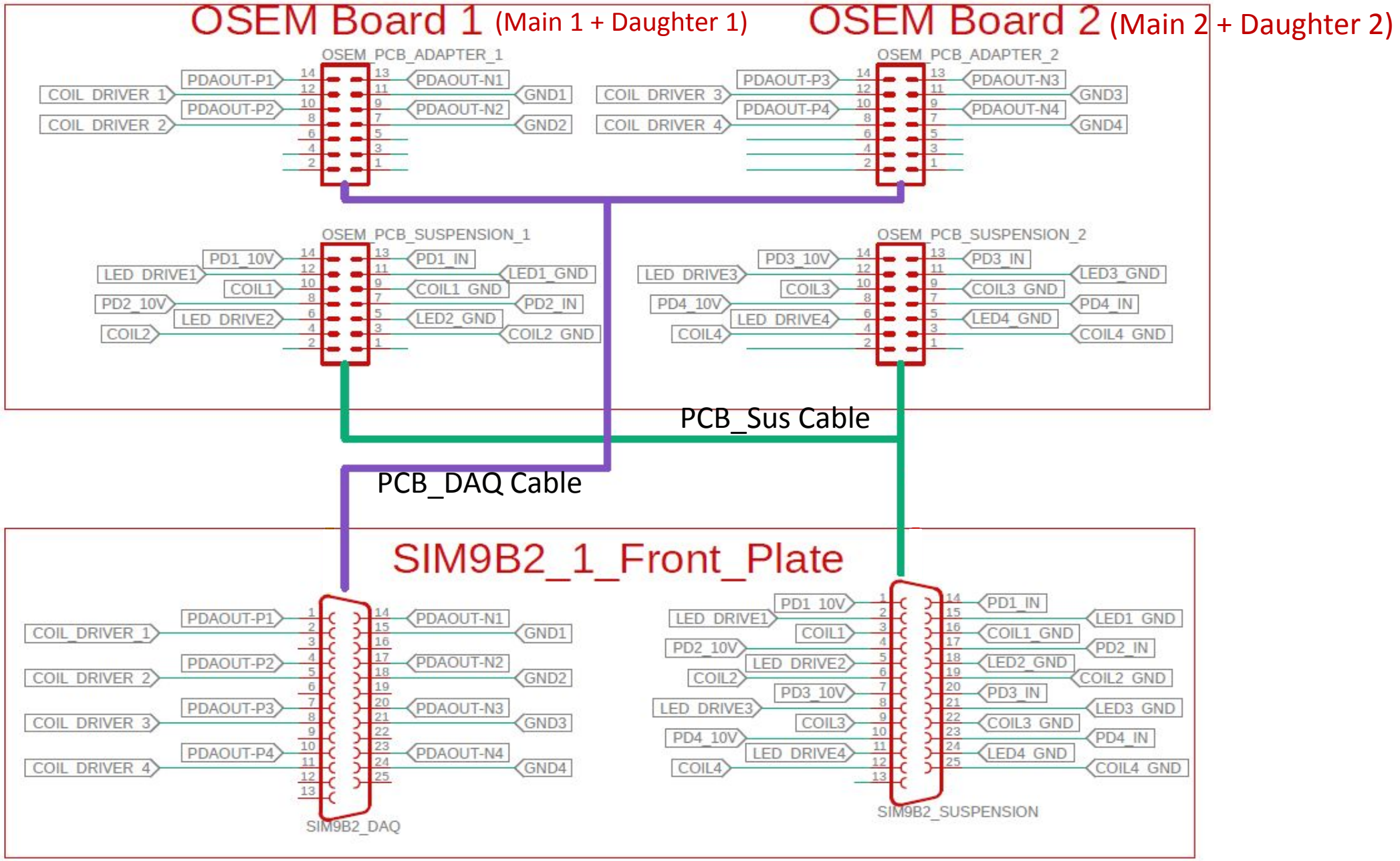
Cables Inside SIM9B2 box



FRC Female Connectors on PCBs

DB25 female Connectors on Front Panel of SIM9B2

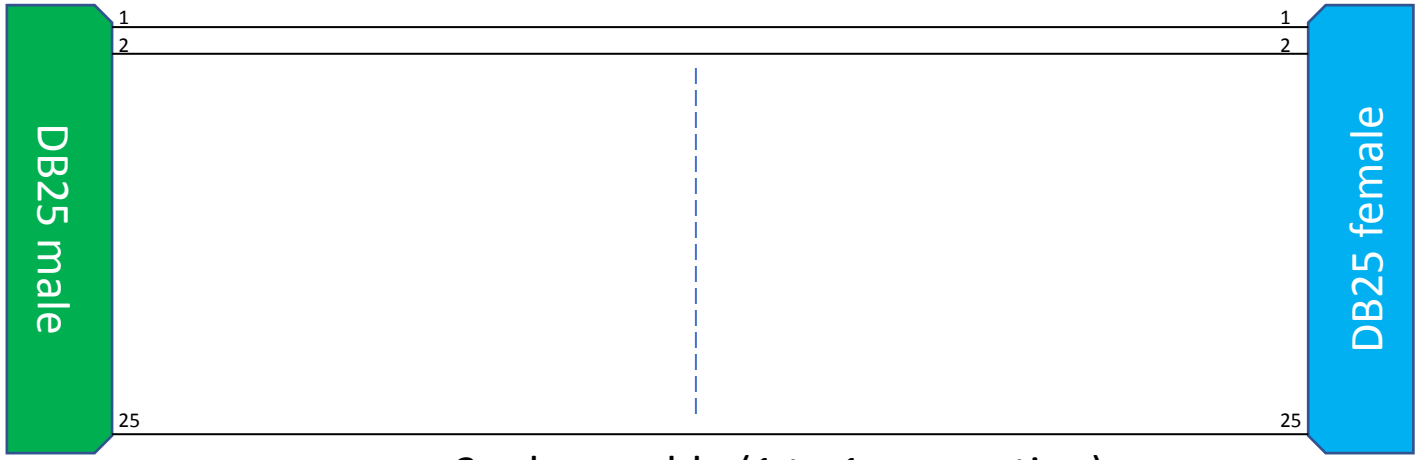
Pinout diagram of the items (i) & (ii) in Cable Fabrication section



Pinout diagram for Cables:

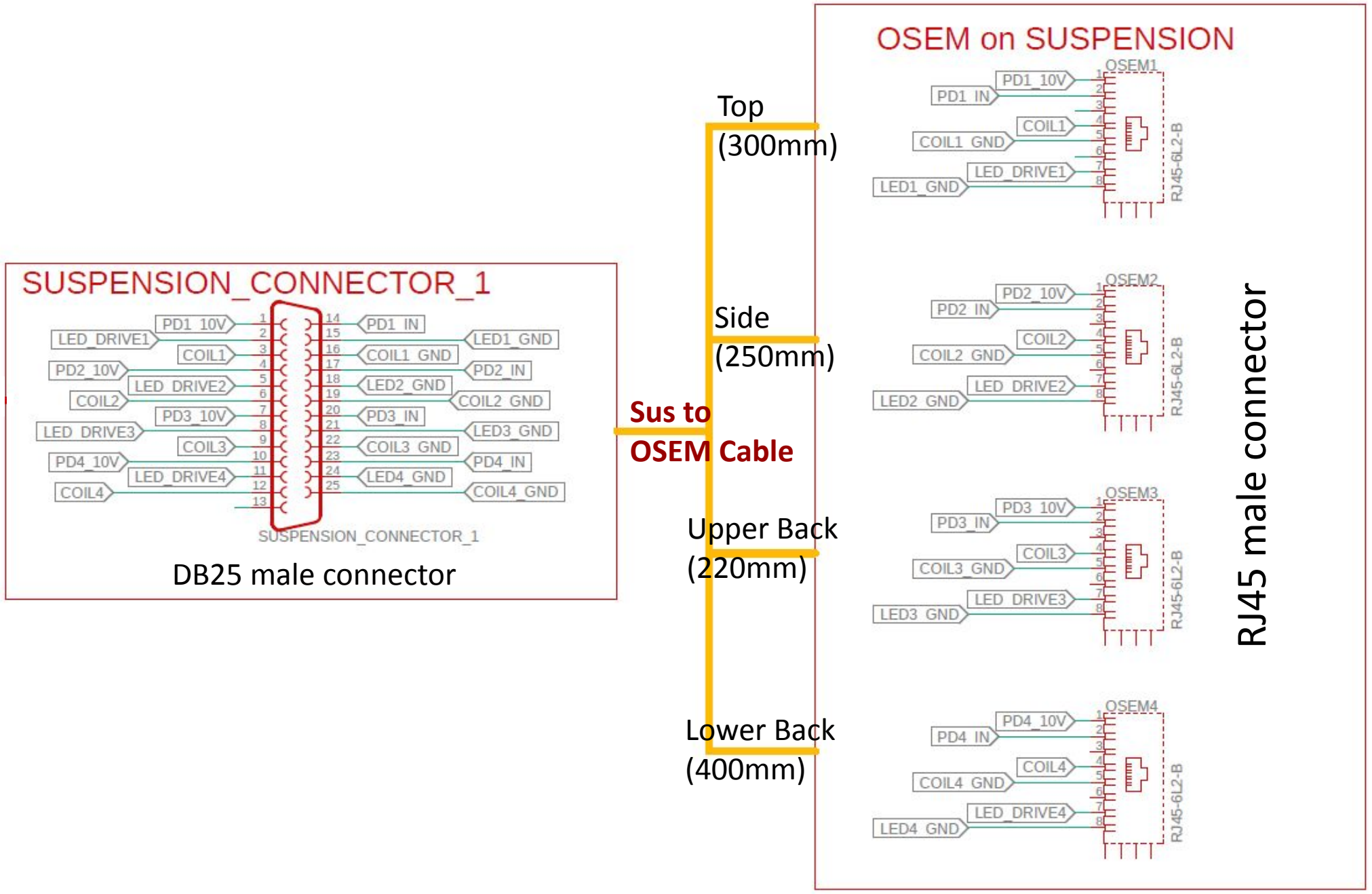
iii) SIM9B2 to Adapter board

iv) SIM9B2 to Suspension

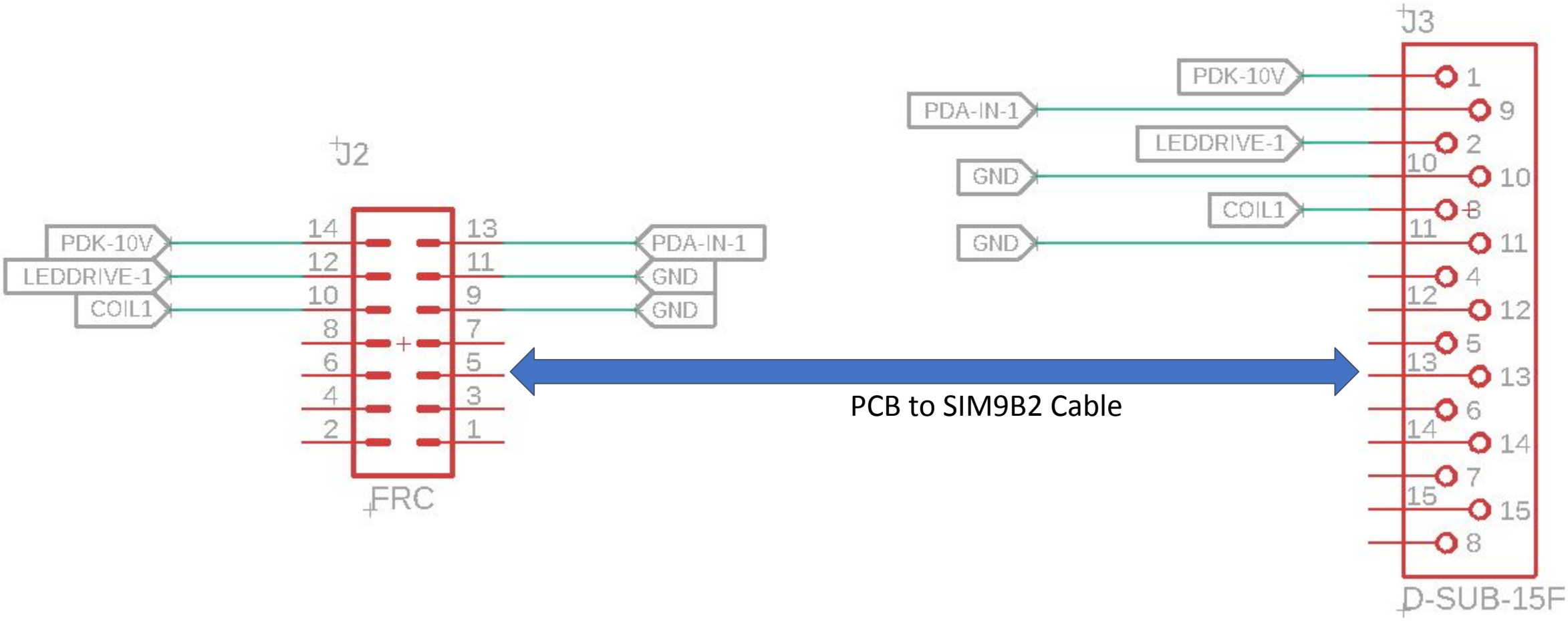


3m long cable (1 to 1 connection)

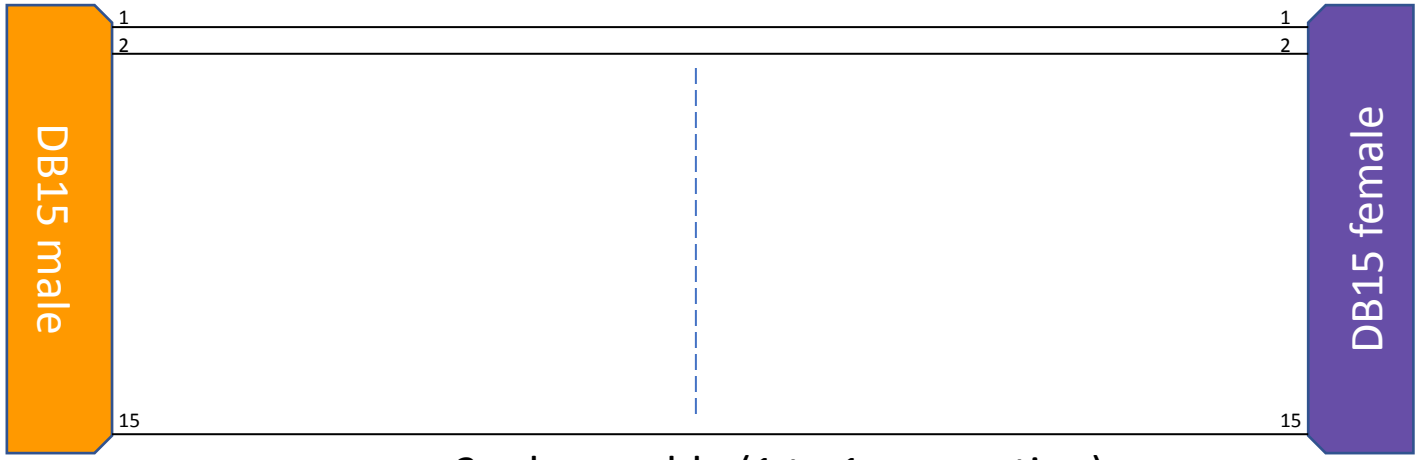
Pinout diagram for Cable: (v)Sus to OSEM Cable



Pinout diagram for Cable: (vi)PCB_SEI to SIM9B2

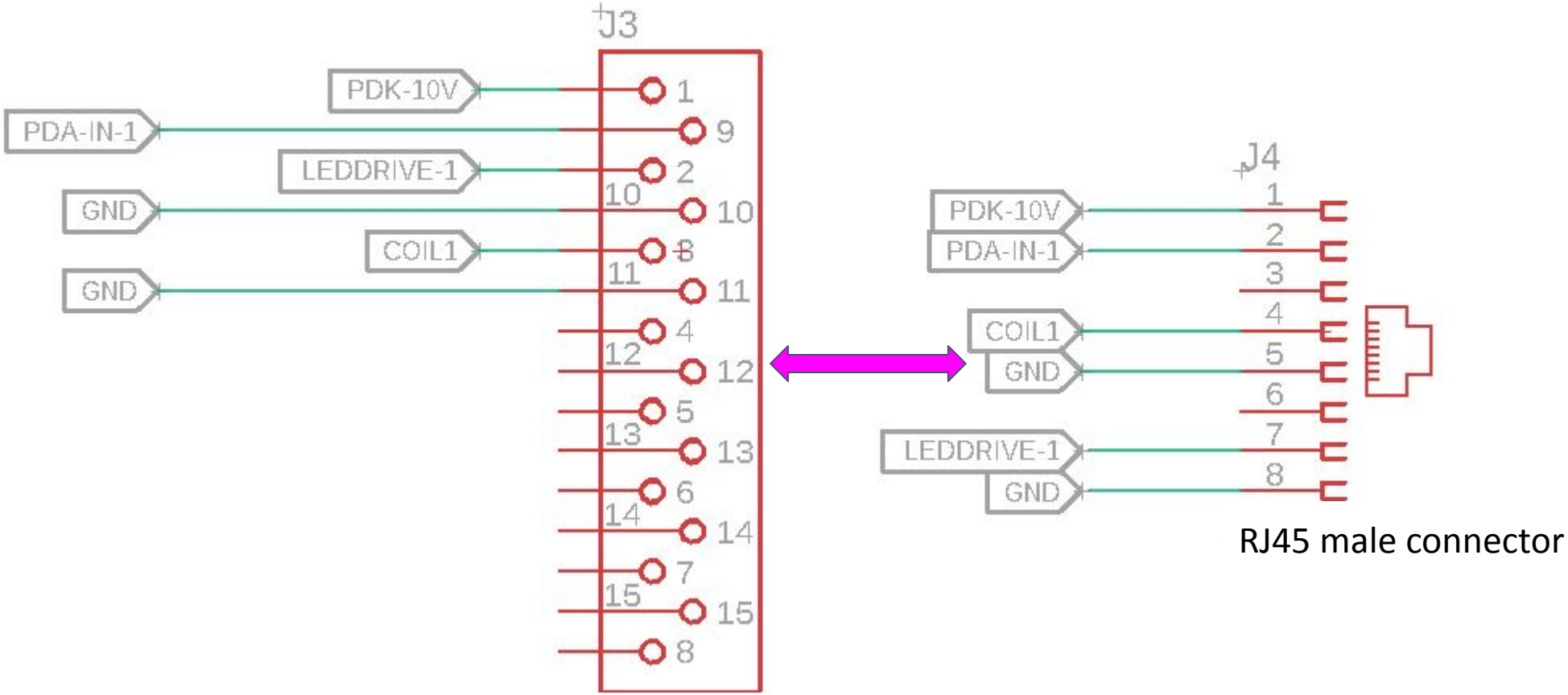


Pinout diagram for Cable vii) SIM9B2 to SEI Sensor



3m long cable (1 to 1 connection)

Pinout diagram for Cable: (viii)SEI sensor to OSEM



D Sub 15 male

RJ45 male connector