

DUNE CRYO WIB Modifications

BNL Team

1/23/2019

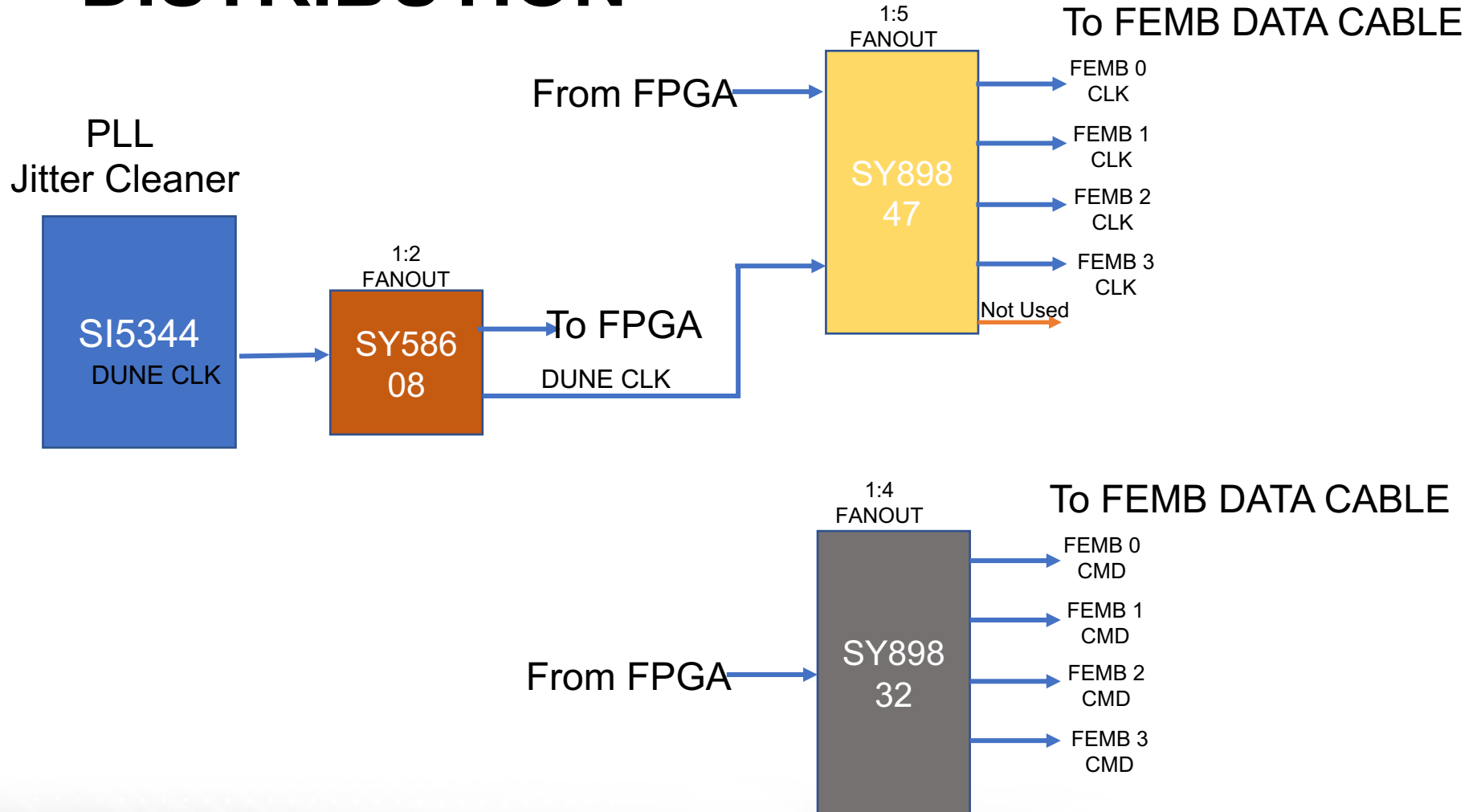
BROOKHAVEN
NATIONAL LABORATORY



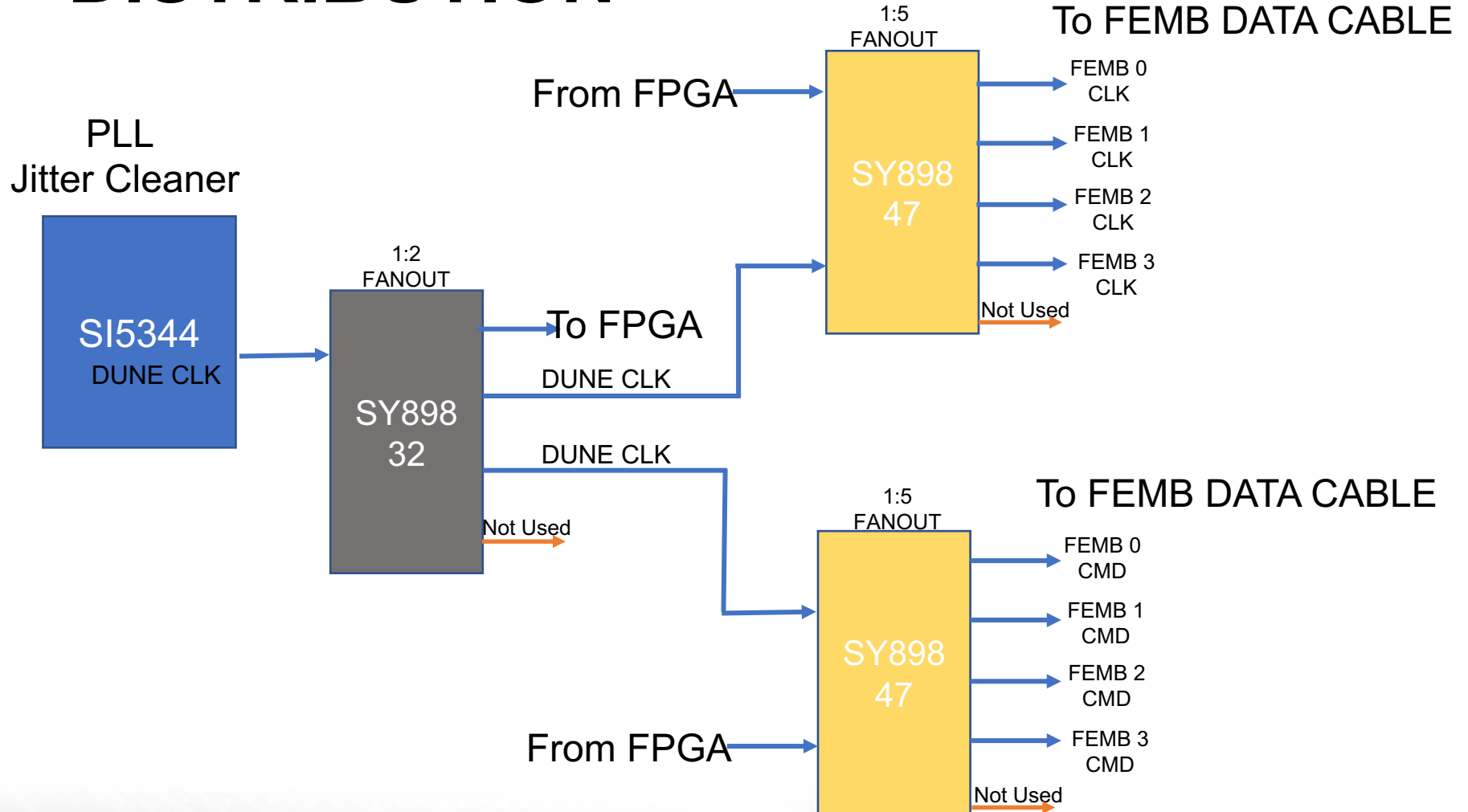
Modifications to ProtoDUNE WIB

- FEMB Clock distribution
 - Two clocks distributed to each FEMB bypassing FPGA
- FEMB Power
 - A linear regulator add to feed power down to FEMB
- FEMB communication
 - Two IO Signals added to FEMB data cable

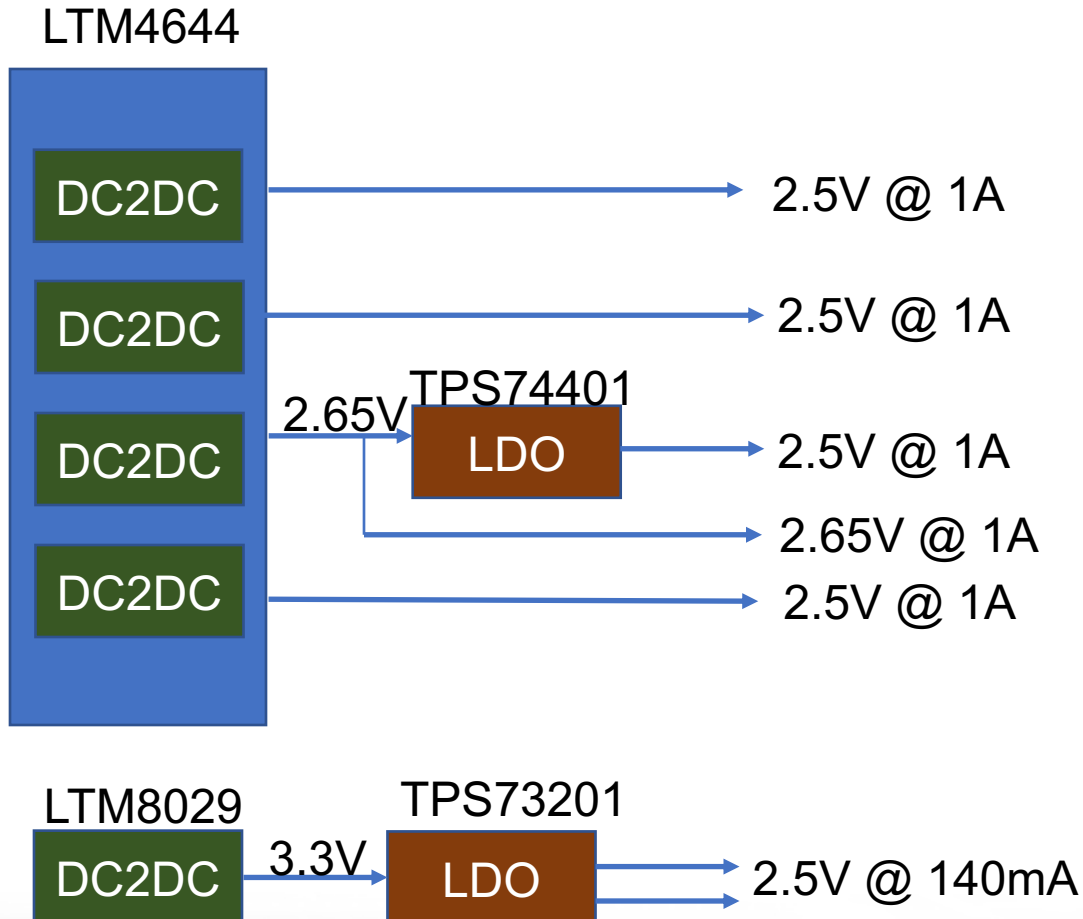
ProtoDUNE WIB CLOCK DISTRIBUTION



DUNE CRYO WIB CLOCK DISTRIBUTION



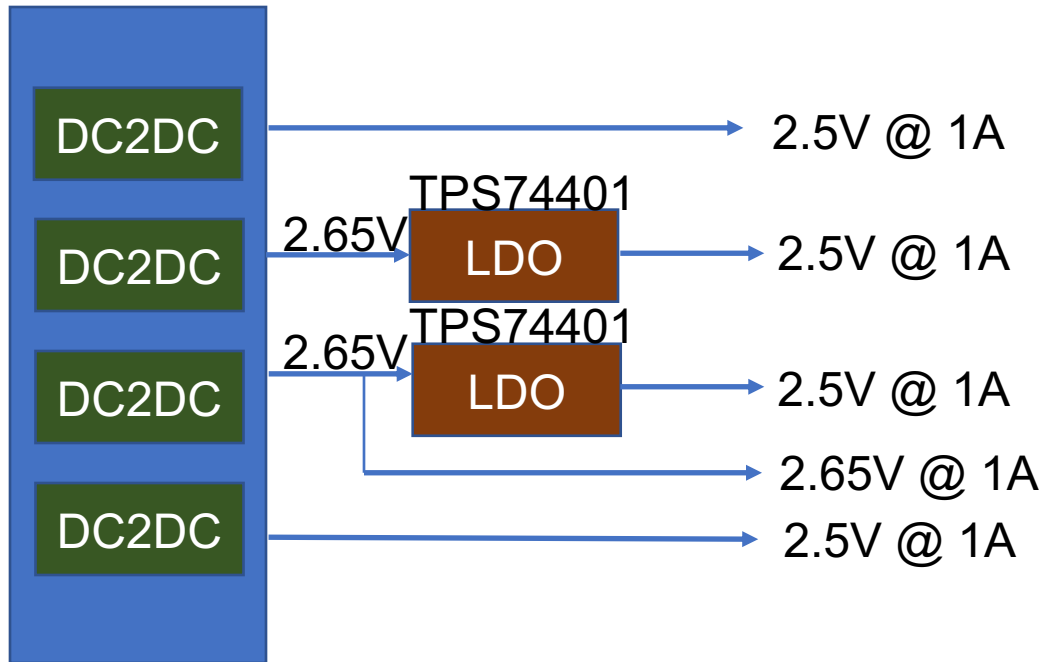
ProtoDUNE WIB POWER



DUNE CRYO WIB POWER

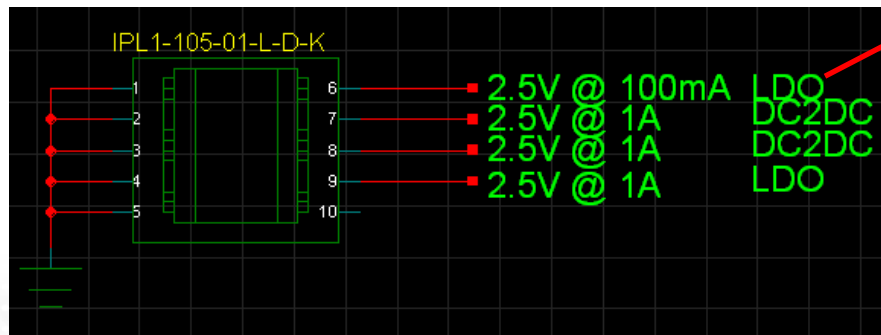
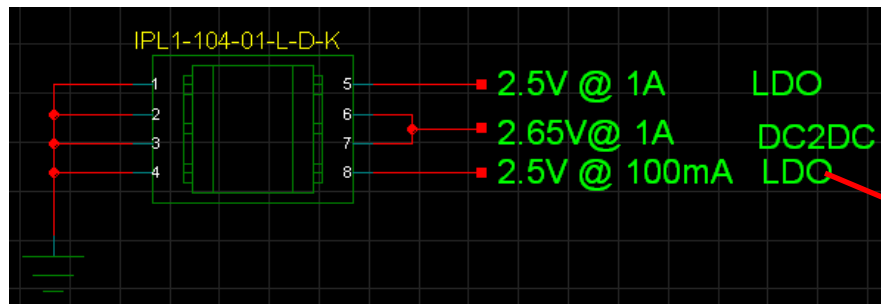
Scheme 1

LTM4644



DUNE CYRO FEMB POWER Connector

- Samtec Power cables

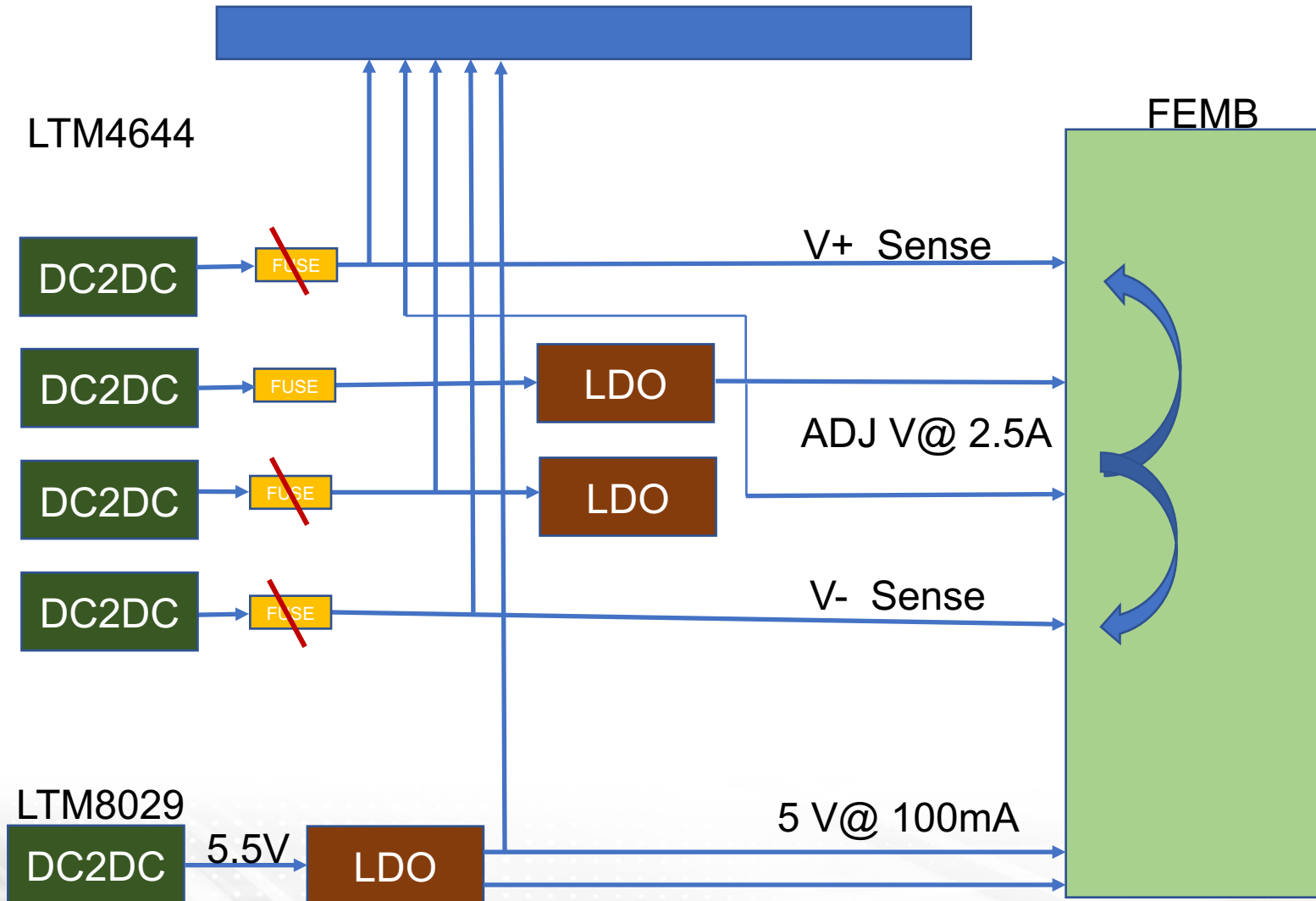


Total combined current
Should not exceed 140mA

DUNE CRYO WIB POWER

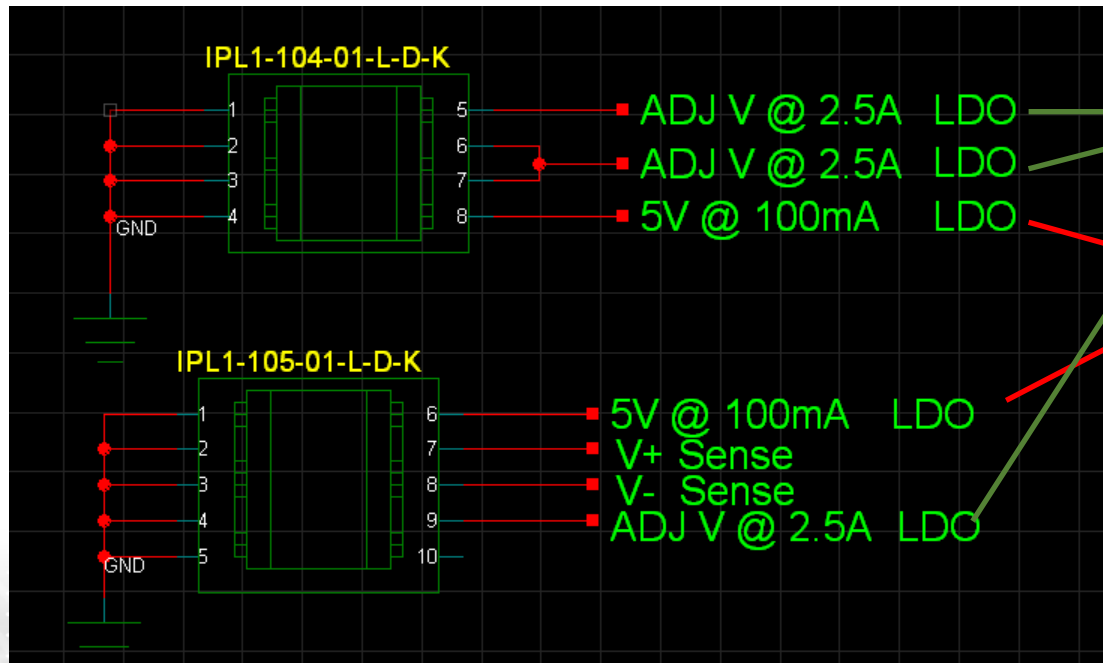
Scheme 2

Front Pannel



DUNE CYRO FEMB POWER Connector

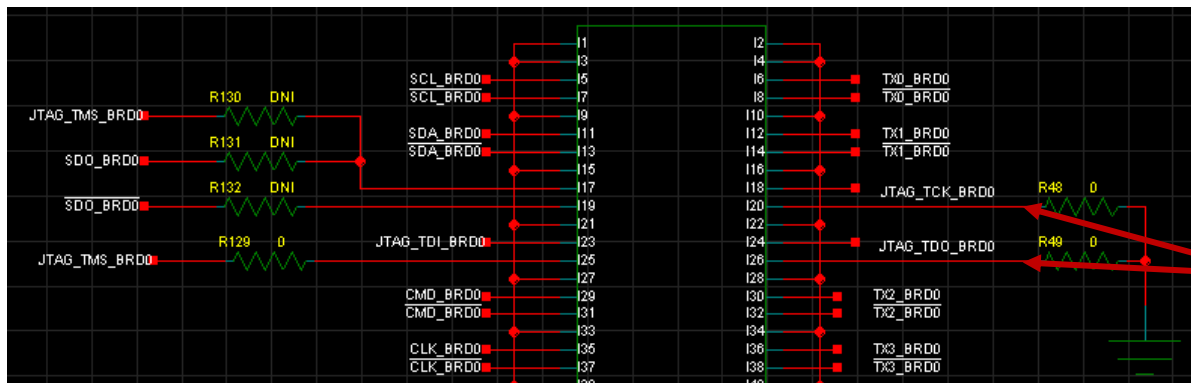
- Samtec Power cables



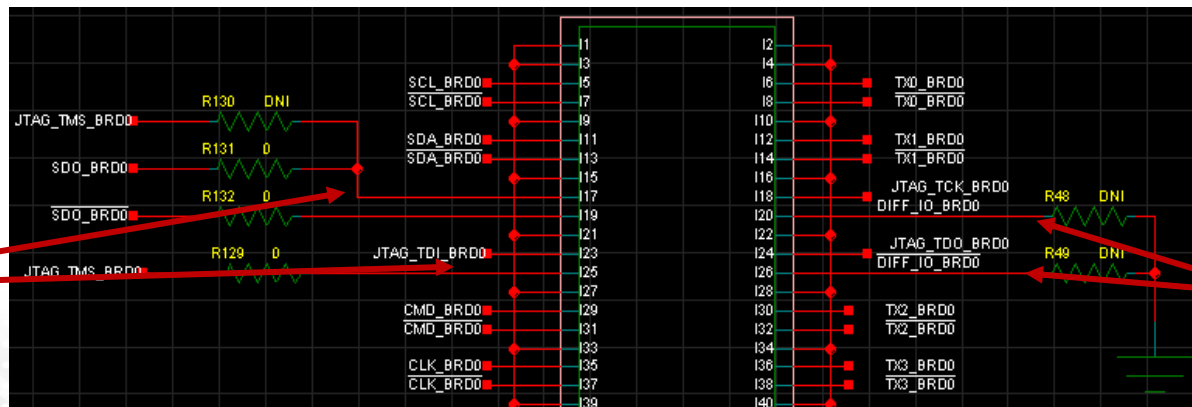
Total combined current
Should not exceed 2.5A

Total combined current
Should not exceed 140mA

Signals Added to FEMB Cold Data Cable

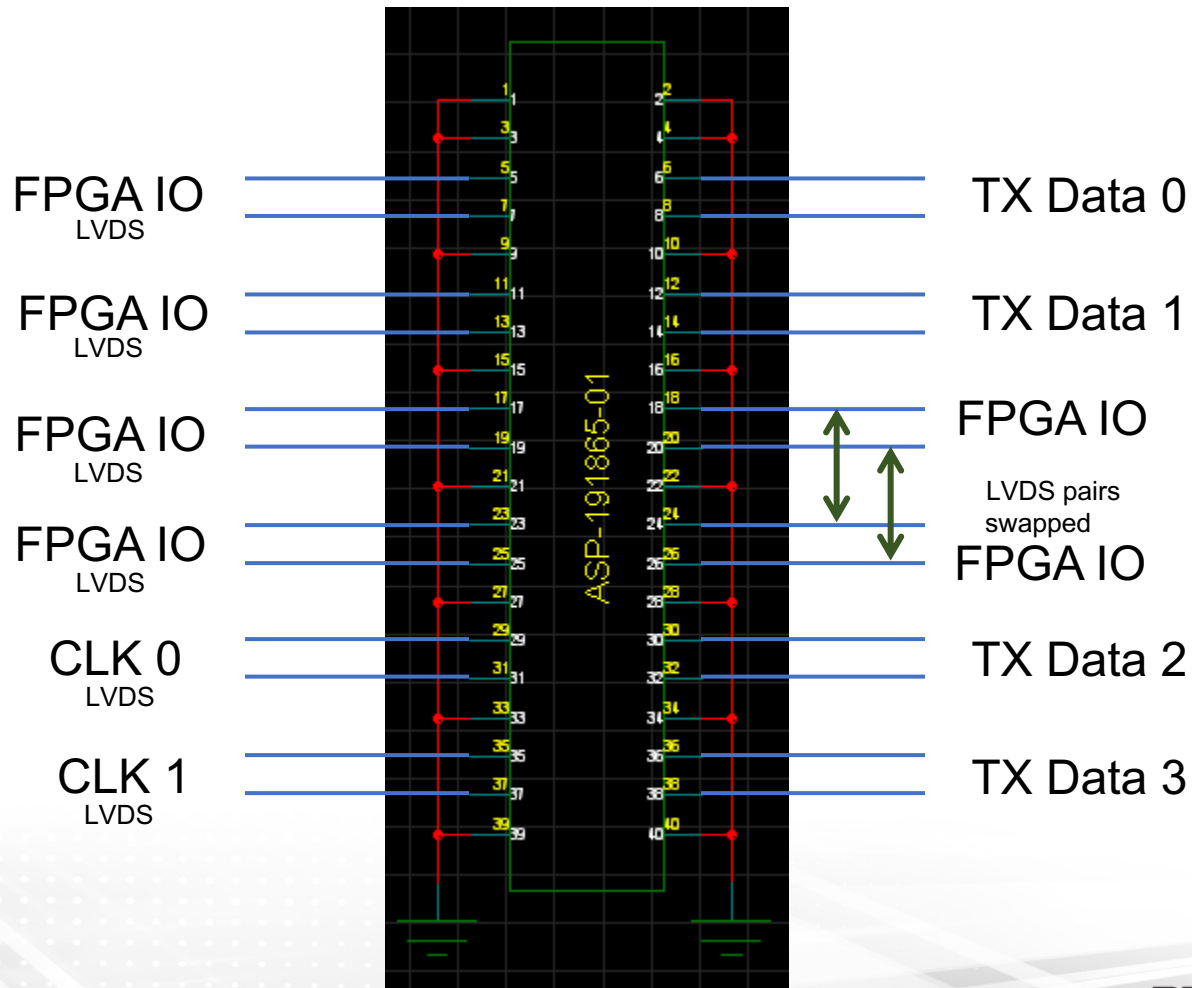


Not connected
to FPGA



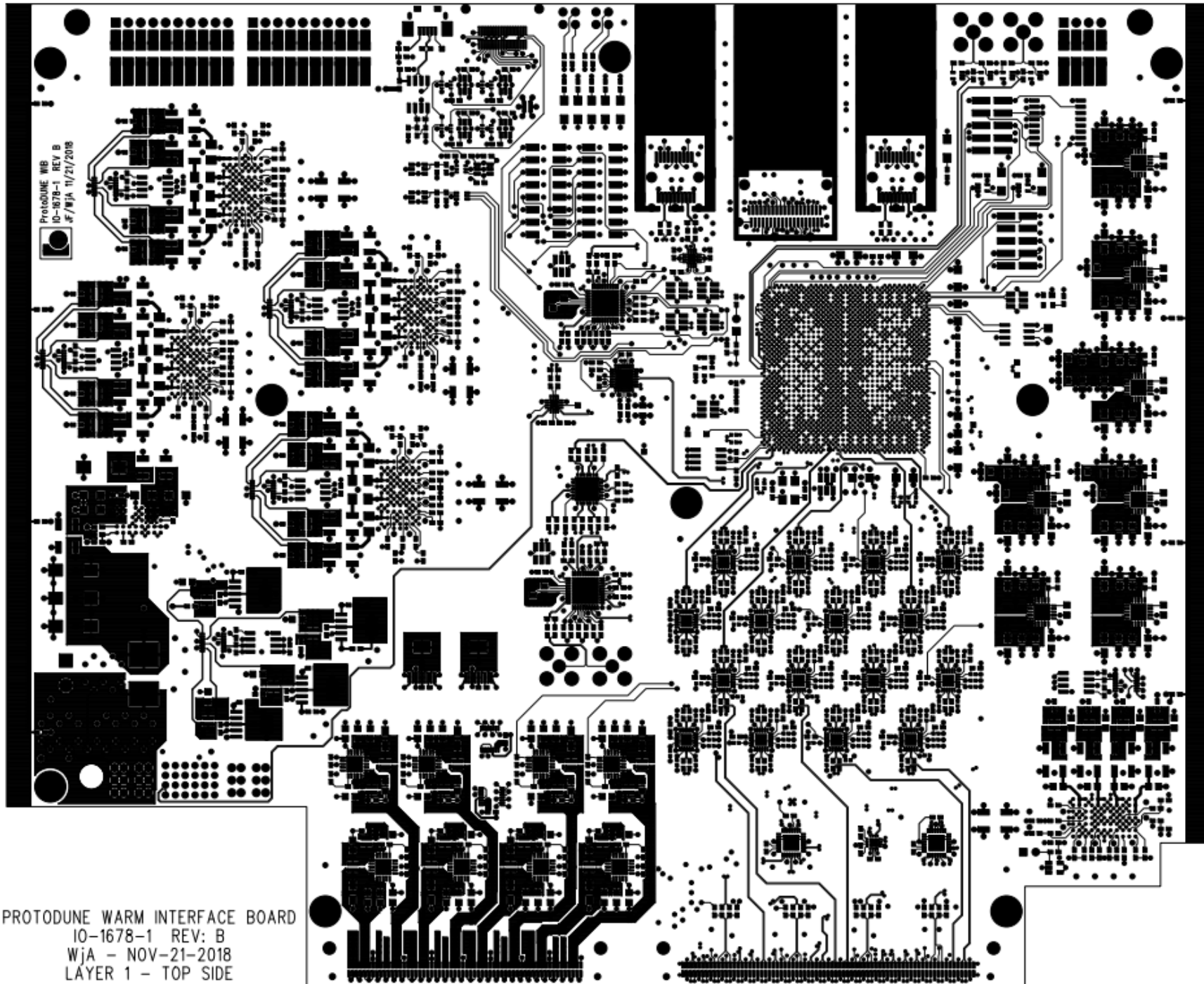
Connected
to FPGA

DUNE CYRO FEMB Cold Data Connector

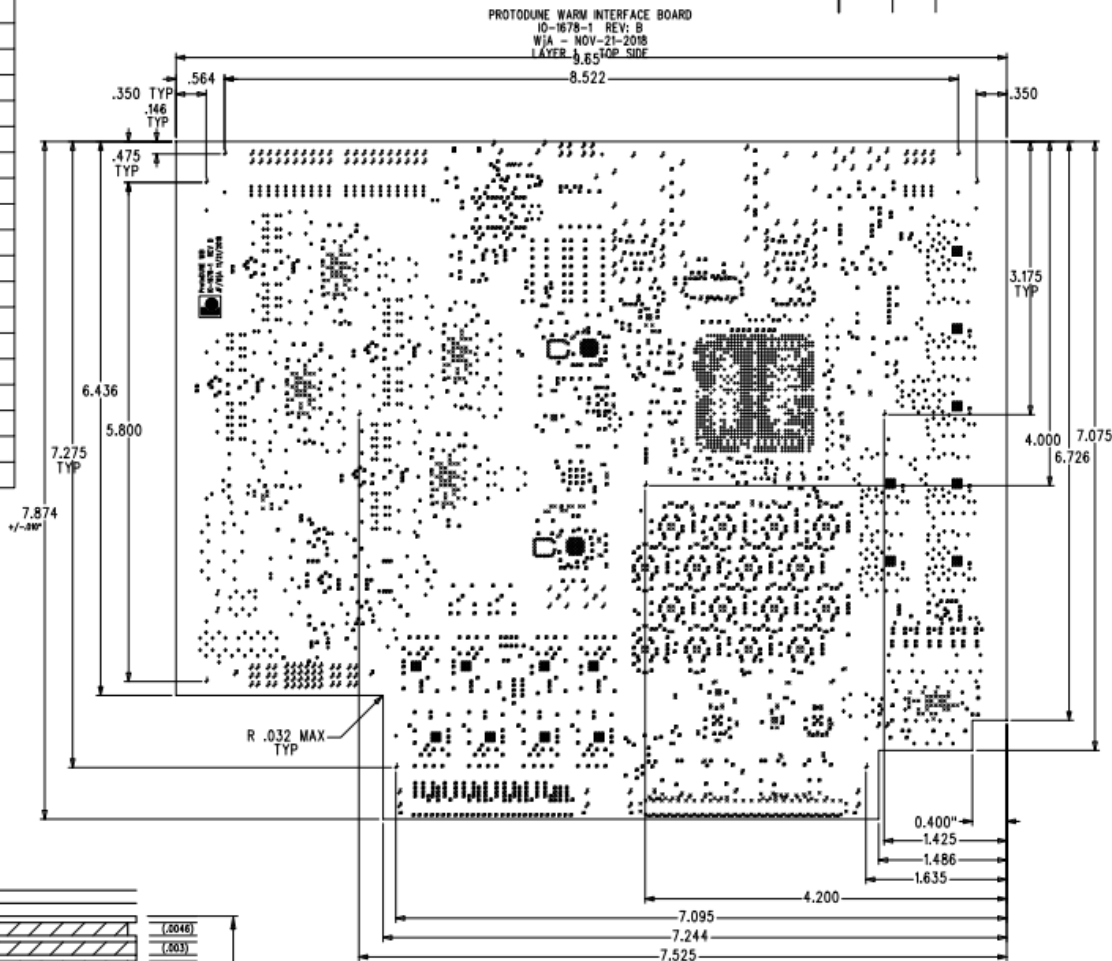


PROTODUNE WB
10-1678-1 REV B
WJA 11/21/2018

PROTODUNE WARM INTERFACE BOARD
10-1678-1 REV: B
WJA - NOV-21-2018
LAYER 1 - TOP SIDE



HOLE SIZE CHART				
SYM	SIZE (AFTER PLATING)	QTY	PLATED	
+	.008 +.001 -.008	838	YES	
×	.010 +.001 -.010	824	YES	
□	.014 +.001 -.014	1790	YES	
◇	.020 +.001 -.020	866	YES	
⊗	.028 X .055 +.003 -.003	2	YES	
⊗	.028 +.003 -.003	4	YES	
A	.033 +.003 -.003	26	YES	
B	.037 +.003 -.003	32	YES	
C	.041 +.003 -.003	104	YES	
D	.045 +.003 -.003	2	YES	
E	.050 +.003 -.003	10	YES	
F	.055 +.003 -.003	2	YES	
G	.057 +.002 -.002	6	NO	
H	.059 +.003 -.003	2	YES	
I	.061 +.003 -.003	6	YES	
J	.067 +.003 -.003	8	YES	
K	.075 +.003 -.003	4	YES	
L	.125 +.003 -.003	11	YES	
M	.140 +.002 -.002	2	NO	



SILKSCREEN SOLDER MASK		
LAYER 1 (TOP SIDE)		(.0046)
LAYER 2 (GND PLANE)		(.003)
LAYER 3 (SIGNALS)		(.00415)
LAYER 4 (PWR PLANE)		(.003)
LAYER 5 (SIGNALS)		(.00415)
LAYER 6 (PWR PLANE)		(.003)
LAYER 7 (PWR PLANE)		(.003)
LAYER 8 (PWR PLANE)		(.003)
LAYER 9 (PWR PLANE)		(.003)
LAYER 10 (PWR PLANE)		(.003)
LAYER 11 (PWR PLANE)		(.003)
LAYER 12 (SIGNALS)		(.00415)
LAYER 13 (PWR PLANE)		(.003)
LAYER 14 (SIGNALS)		(.00415)
LAYER 15 (GND PLANE)		(.003)
LAYER 16 (BOTTOM SIDE) SOLDER MASK SILKSCREEN		(.0044)

.083 +/- .008

STACKUP 16-LAYER (SEE NOTE 19)
NOT TO SCALE

ZONE		REV	DESCRIPTION		DATE	APPROVED
		B	REVISED PER J. FRIED BY WJA 11/2018			

FABRICATION NOTES (SEE 18)

- UNLESS NOTED OTHERWISE, FINISHED TRACE LINE WIDTHS SHOULD MATCH SUPPLIED GERBER FILES.
- MATERIAL :
☐ FR4 (50 per MIL-P-13046) ☐ GFR (50 per MIL-P-13046) ☐ ROGERS 4003C
- COPPER WEIGHT:
 OUTER LAYERS : ☐ 1/4 oz. ☐ 1/2 oz. ☐ 1 oz. ☐ 2 oz.
 INNER SIGNAL LAYERS : ☐ 1/4 oz. ☐ 1/2 oz. ☐ 1 oz. ☐ 2 oz.
 INNER PLANE LAYERS : ☐ 1/4 oz. ☐ 1/2 oz. ☐ 1 oz. ☐ 2 oz.
- SOLDER MASK: MATTE OR SEMI-GLOSS FINISH PER IPC-SMA-840.
☐ LIQUID PHOTOGRAPHABLE ☐ DRY FILM ☐ NONE
☐ OVER BARE COPPER ☐ OVER TIN LEAD ☐ OVER FULL BODY GOLD
☐ GREEN ☐ RED ☐ BLUE
- OVERALL BOARD THICKNESS:
☐ 0.062" ☐ 0.064" ☐ 0.065" ☐ OTHER - SEE STACKUP
☐ +/- 0.005" ☐ +/- 0.004" ☐ +/- 0.003" ☐ OTHER
- BARE BOARD ELECTRICAL TEST:
☐ TESTED TO NETLIST DATA ☐ NO TEST REQUIRED
- HOLE DIAMETER TOLERANCES ARE:
 PLATED HOLES : +/- 0.005" NON PLATED HOLES : +/- 0.002"
- SILK SCREEN USING EPOXY BASED INK.
☐ BOTH SIDES ☐ PRIMARY SIDE ☐ SECONDARY SIDE ☐ NONE
☐ WHITE ☐ YELLOW ☐ BLACK
- MINIMUM ANNUAL RING:
☐ .002" FOR EXTERNAL LAYERS
☐ .001" FOR INTERNAL LAYERS
- PLANE REGISTRATION:
 +/- .005" TO TOP PLANE FOR ALL PLANES
- MINIMUM PLATING THROUGH ALL HOLES IS:
 .001" THICK COPPER
- WARP AND TWIST:
 NOT TO EXCEED .001" PER INCH ACROSS THE DIAGONAL
- ACCEPTABILITY: (PER LATEST REVISION)
☐ IPC-6100 ☐ IPC-6013 ☐ MIL-P-8838
- MANUFACTURER TO ADD MFR'S LOGO, DATE CODE, UL CODE AND ET STAMP.
- FABRICATE IN ACCORDANCE WITH IPC-6011/6012, CLASS 2 (LATEST REVISIONS).
- VENDOR TO SUPPLY CROSS SECTIONS AND TEST COUPONS PER LOT
- SURFACE MOUNT PADS:
 TOP LAYER: 5292
 BOTTOM LAYER: 1178
 TOTAL: 6470
- AS PER IPC ENIG SPECIFICATION 4522, 2-4 MICRO-INCHES IMMERSION GOLD OVER 120-240 MICRO-INCHES NICKEL.
- FINAL MATERIAL STACKUP/TRACE WIDTHS MUST BE CONFIGURED TO ACHIEVE 100ohm +/-10% DIFFERENTIAL IMPEDANCE REQUIREMENT FOR 4 MIL TRACE PAIRS ON LAYERS 1, 3, 5, 12, 14 AND 16.
- EPOXY FILL 8.0 MIL THRU HOLES AT VIA IN PAD LOCATIONS (BENEATH BGA).
 NON VIA IN PAD LOCATIONS FOR 8.0 MIL THRU HOLES MAY ALSO BE FILLED BUT NOT REQUIRED.

QTY REQ	FORM NO.	PART OR IDENTIFYING NO.	SIGNATURE ON DESCRIPTION	MATERIAL SPECIFICATION
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES $\pm$.XX .01 $\pm$.XXX .005				
MATERIAL		CONTRACT NO.		COMPANY
FINISH		APPROVALS		DATE
NEXT ASSY		DRAWN BY K. WOLNIEWICZ		6/29/17
USED ON		CHECKED		
APPLICATION		ENGINEER J. FRIED		X/XX/17
DO NOT SCALE DRAWING				
COMPANY: BROOKHAVEN NATIONAL LABORATORY INSTRUMENTATION DIVISION UPTON, NY 11973				
TITLE: ProtoDUNE WARM INTERFACE BD. FABRICATION DRAWING				
SIZE	TICKET NO.	DWG NO.	REV.	
C	T-2017-27	10-1678	B	
SCALE	1/1	SHEET 1 OF 1		