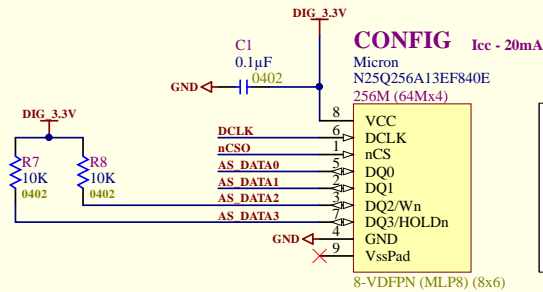
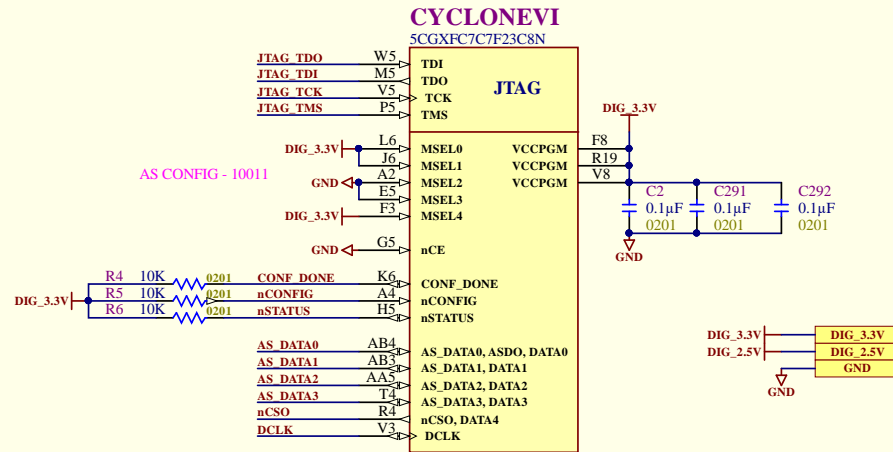
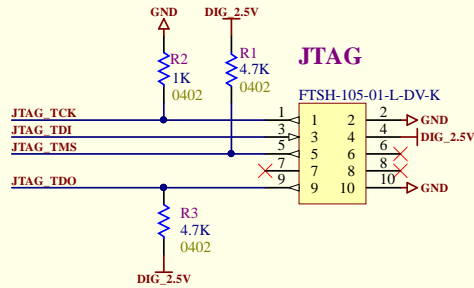


ALTERA - ARRIA V FPGA
5CGXFC7C7F23C8N
 Package: FPGA 484 pins
 Two hard memory controllers
 150K Logic Elements
 Six transceivers (2.5Gbps)
 Speed grade 7
 Memory: M10K: 6860Kb, MLAB: 836Kb

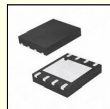
ALPHA-g: CycloneV GX - 5CGXFC7C7F23C8N			TRIUMF LOGO
Revision	Drawing #: 1	TRIUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	
1	Sheet #: 1 of 17	Size: B	
Drawn by: D.Bishop	Date: 05-Jun-18		

File: C:\Alpha-g\Altium-partisdev\00399-PWB-REV1-1653\AltiumRev1\alphaPh-g-CycloneV GX - 5CGXFC7C7F23C8N Rev1.sch



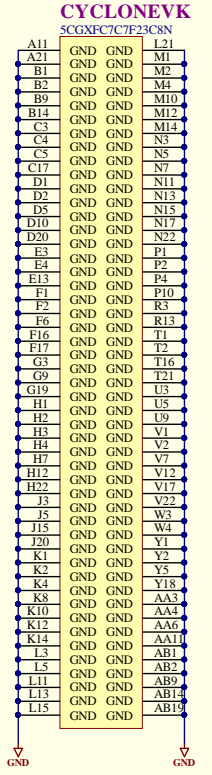
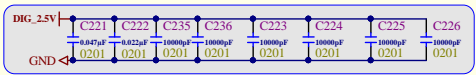
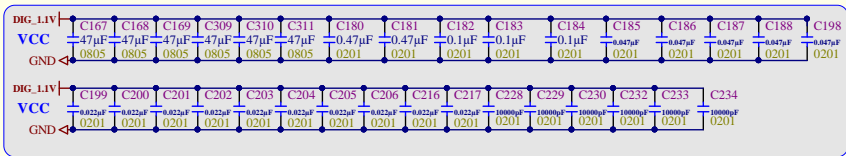
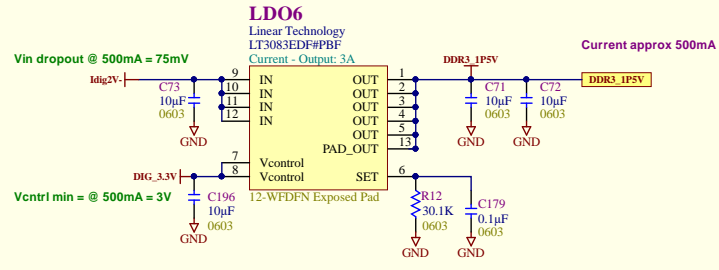
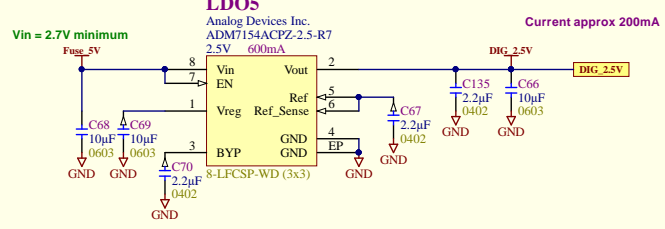
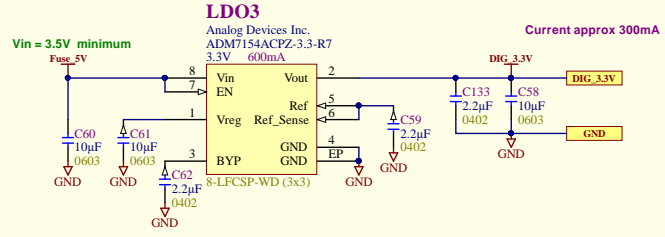
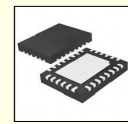
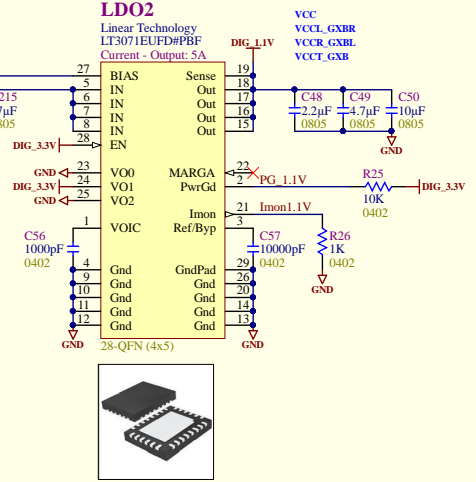
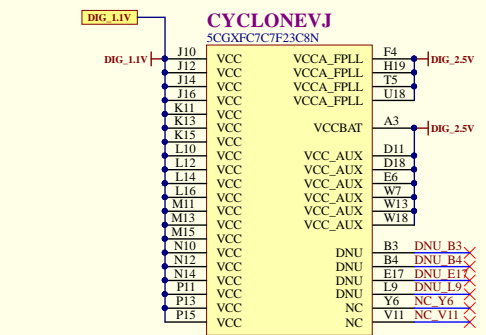
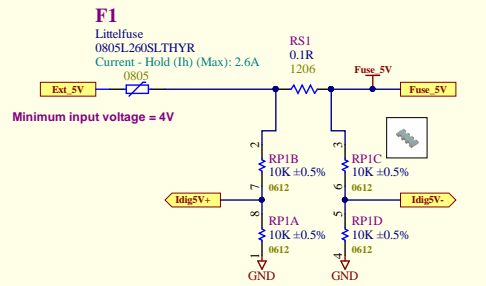
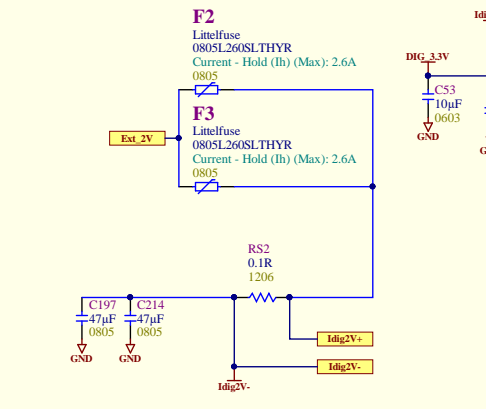
QUARTUS only supports 256Mb part

Variant	Member Code	Configuration .bit Size (bits)	IOCSR .bit Size (bits)	Recommended EPICQ Serial Configuration Device#
Cyclone V E [™]	A2	21,061,120	275,608	EPICQ04
	A4	21,061,120	275,608	EPICQ04
	A5	33,958,400	322,072	EPICQ128
	A7	56,167,392	435,288	EPICQ128
	A9	102,871,616	400,608	EPICQ256
Cyclone V GX	C3	14,510,752	320,280	EPICQ32
	C4	33,958,400	322,072	EPICQ128
	C5	33,958,400	322,072	EPICQ128
	C7	56,167,392	435,288	EPICQ128
	C9	102,871,616	400,608	EPICQ256



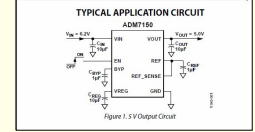
ALPHA-g: CycloneV GX - FPGA Configuration

Revision 1	Drawing #: 2		TRIUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3		
	Sheet #: 2	of 17			Size: A
	Drawn by: D. Bishop				Date: 05-Jun-18



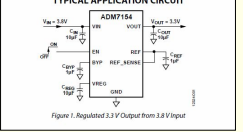
FEATURES
 Input voltage range: 4.5 V to 16 V
 Maximum output current: 800 mA

800 mA Ultralow Noise, High PSRR, RF Linear Regulator
ADM7150



FEATURES
 Input voltage range: 2.3 V to 5.5 V
 Maximum load current: 600 mA

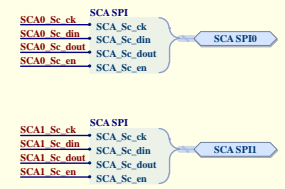
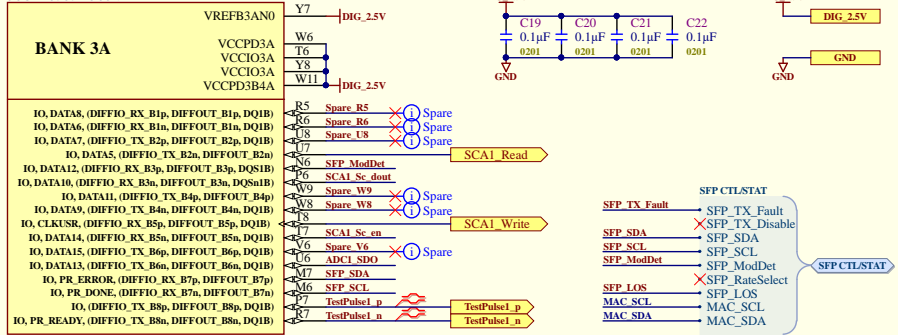
600 mA, Ultralow Noise, High PSRR, RF Linear Regulator
ADM7154



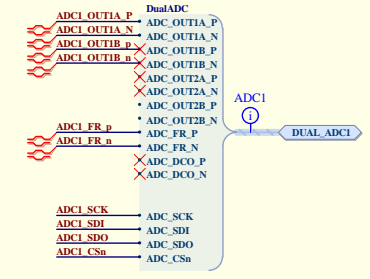
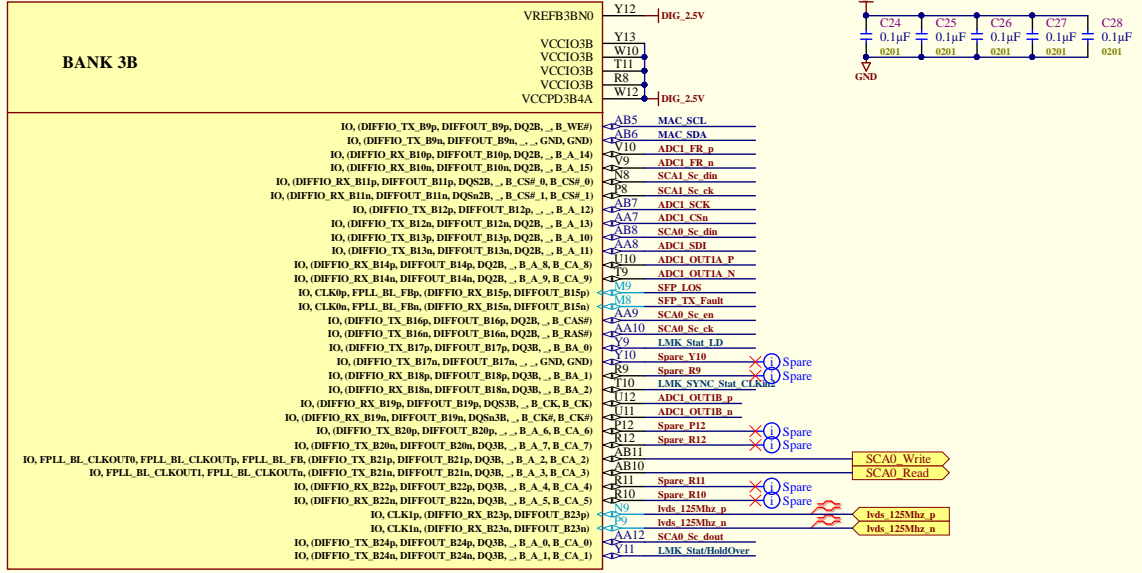
ALPHA-g: CycloneV GX - FPGA Power

Revision	Drawing #: 3	TRUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	Cannot open file TRUMFB MP
1	Sheet #: 3 of 17	Size: B	
	Drawn by: D. Bishop	Date: 05-Jun-18	

CYCLONEVA
5CGXFC7/F23C8N



CYCLONEVB
5CGXFC7/F23C8N

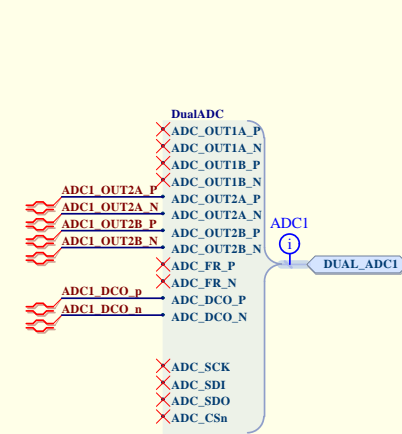
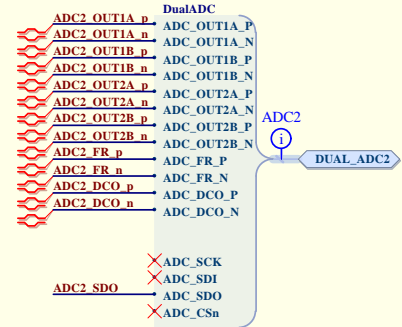
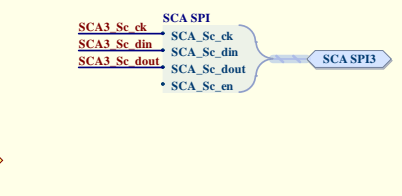
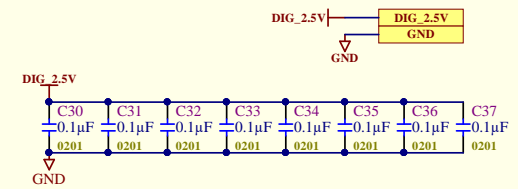
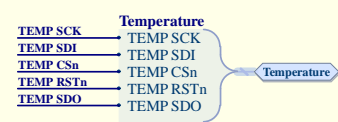
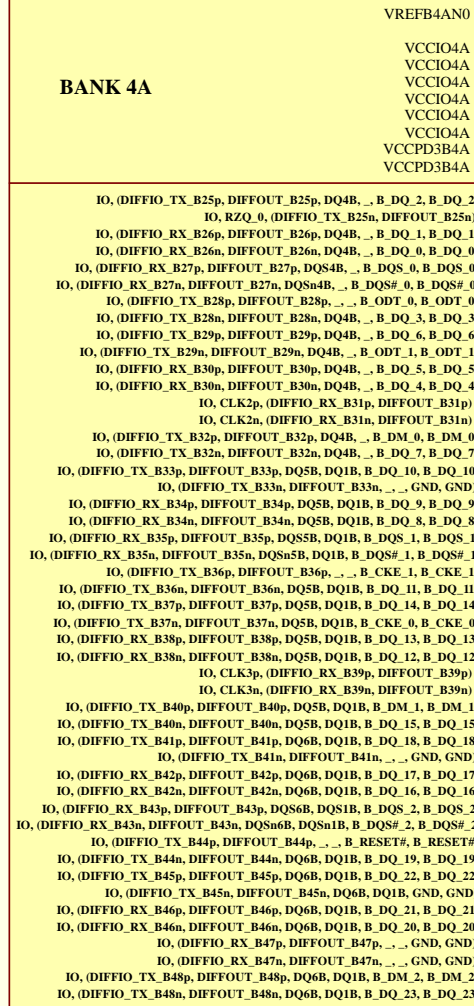


ALPHA-g: CycloneV GX - FPGA Bank4


Revision	Drawing #: 4	TRUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	Cannot open file TRUMFB MP
1	Sheet #: 4 of 17	Size: B	
	Drawn by: D. Bishop	Date: 05-Jun-18	

CYCLONEVC
5CGXFC7C7F23C8N

BANK 4A



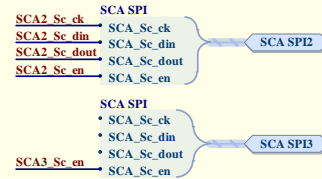
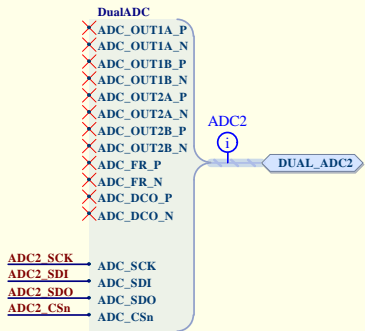
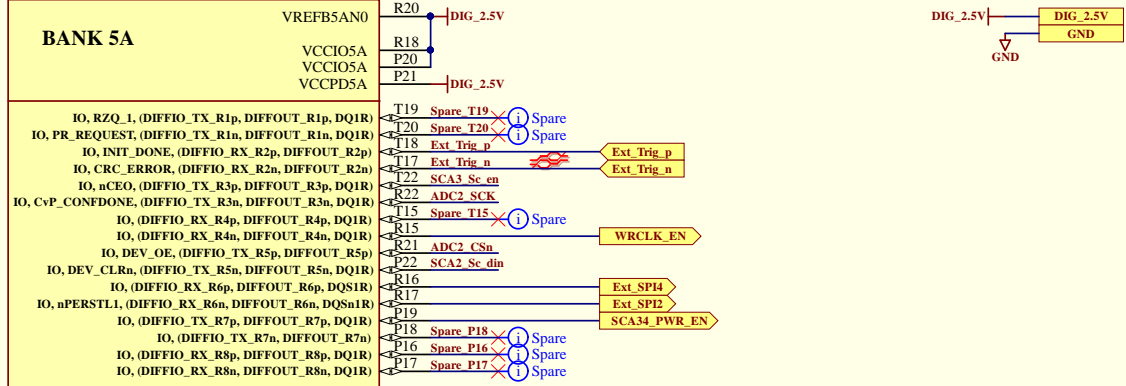
ALPHA-g: CycloneV GX - FPGA Bank4

Revision	Drawing #: 5	TRUIMP	
1	Sheet #: 5 of 17	4004 Wesbrook Mall Vancouver, B.C.	
	Size: A	Canada	
Drawn by: D. Bishop	Date: 05-Jun-18	V6T 2A3	

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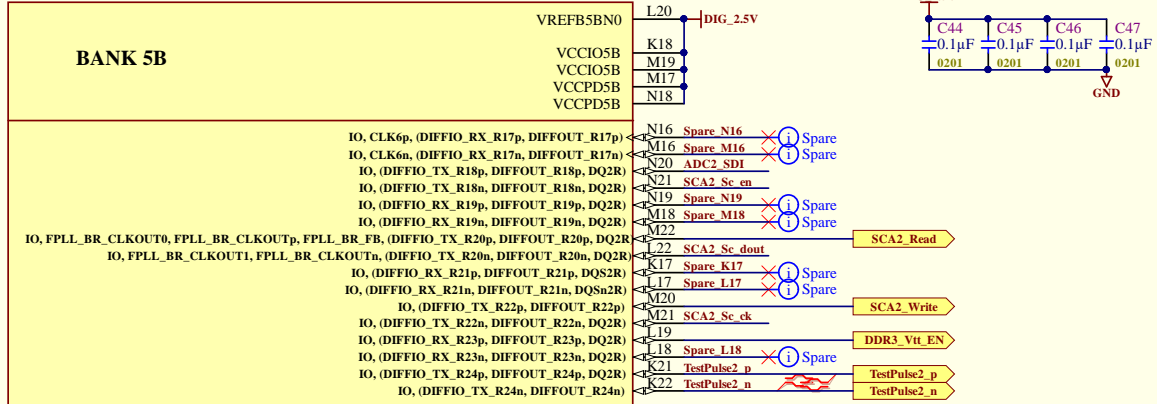
CYCLONEVD

5CGXFC7C7F23C8N



CYCLONEVE

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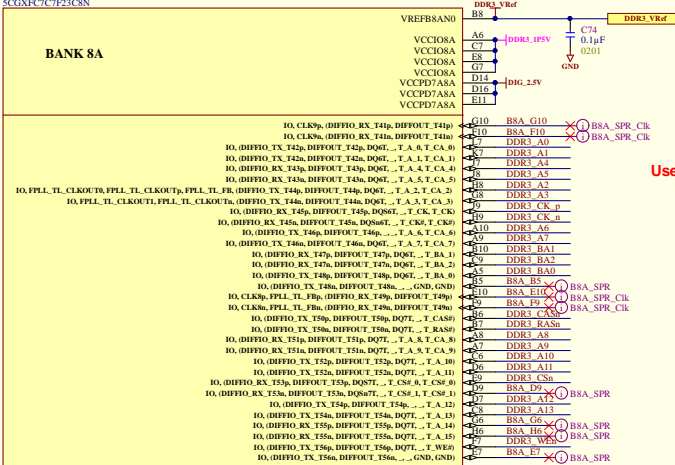


ALPHA-g: CycloneV GX - FPGA BANK5

Revision	Drawing #: 6	TRIUMF
1	Sheet #: 6 of 17	4004 Wesbrook Mall Vancouver, B.C. Canada
	Size: A	V6T 2A3
	Drawn by: D. Bishop	Date: 05-Jun-18
<small>File: C:\Alpha-g\Altium-parts\development\00399-PWB-REV1-1653\Altium\Rev1\alphaG - CycloneV GX - FPGA BANK5 Rev1.98.doc</small>		

CYCLONEVG SCGFC7F23CN

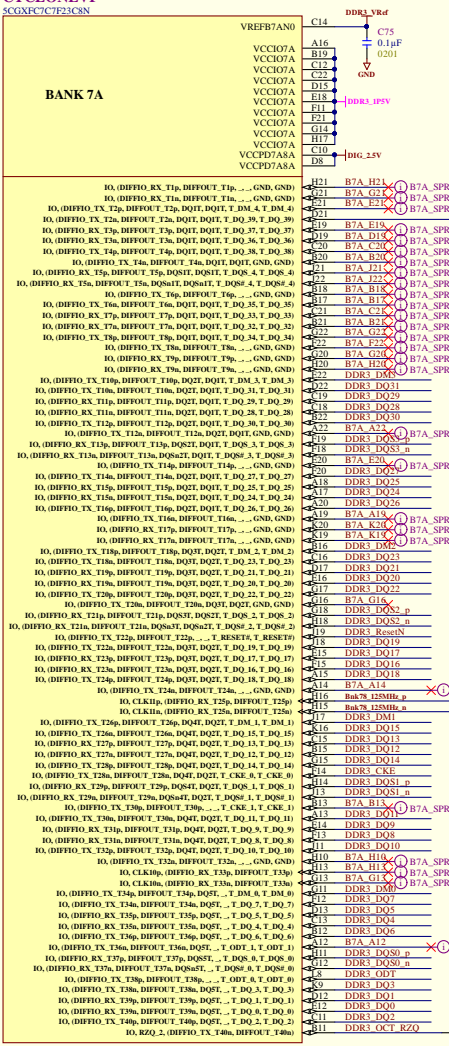
BANK 8A



**Banks 7 and 8 set to 1.5V
Used for DDR3 hard memory controller**

CYCLONEVF SCGFC7F23CN

BANK 7A



- DDR3_A[13..0] DDR3
- DDR3_DQ[31..0] DDR3
- DDR3_BA[2..0] DDR3
- DDR3_CK_n DDR3
- DDR3_CK_n DDR3
- DDR3_CK_n DDR3
- DDR3_WEn DDR3
- DDR3_RASn DDR3
- DDR3_CSn DDR3
- DDR3_ODT DDR3
- DDR3_DQSS0_p DDR3
- DDR3_DQSS0_n DDR3
- DDR3_DQSS1_p DDR3
- DDR3_DQSS1_n DDR3
- DDR3_DQSS2_p DDR3
- DDR3_DQSS2_n DDR3
- DDR3_DQSS3_p DDR3
- DDR3_DQSS3_n DDR3
- DDR3_DM0 DDR3
- DDR3_DM1 DDR3
- DDR3_DM2 DDR3
- DDR3_DM3 DDR3
- DDR3_ReseN DDR3

DDR3_PG

Bank7 125MHz_p
Bank7 125MHz_n

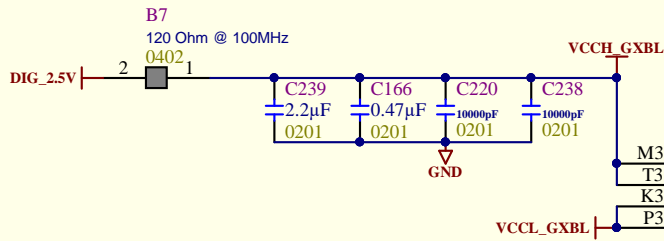
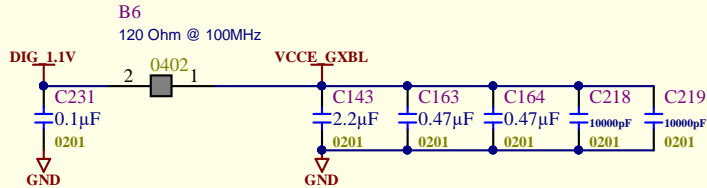
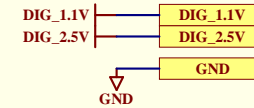
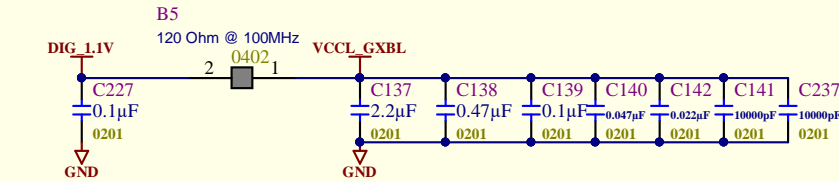
ALPHA: Cyclone VX - BANK7A, 8A - SCGFC4C7F23C8

Revision 1
Drawing #: 7
Sheet # 7 of 17
Drawn by: *
RZQ2 240
GND

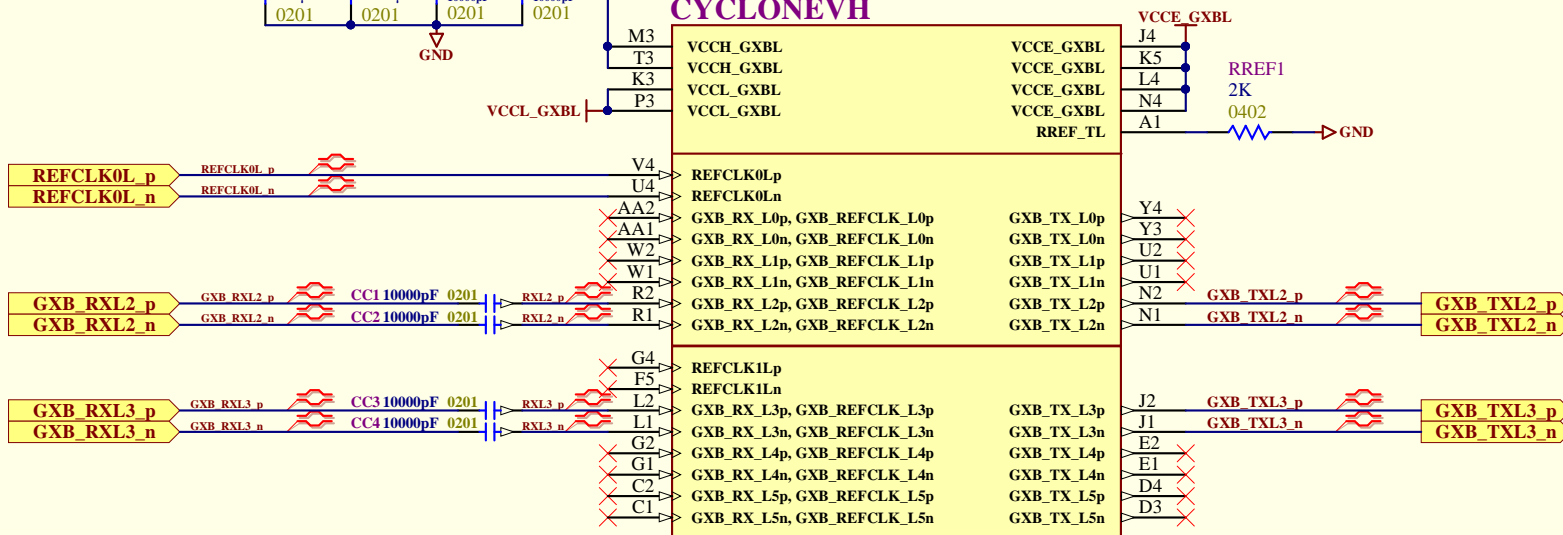
Size: B
Date: 05-Jun-18
V&T 2A3

TRUFM
4004 Westbrook Mall
Vancouver, B.C.
Canada
V6T 2A3



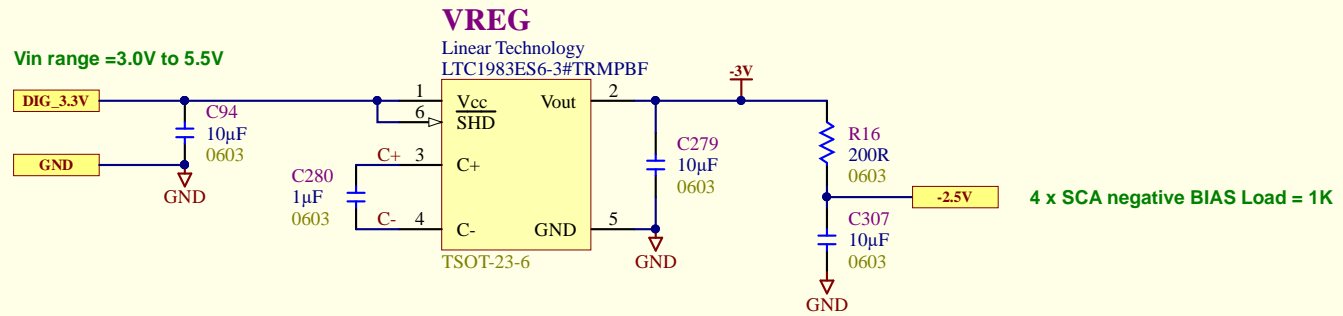


CYCLONEVH




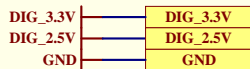
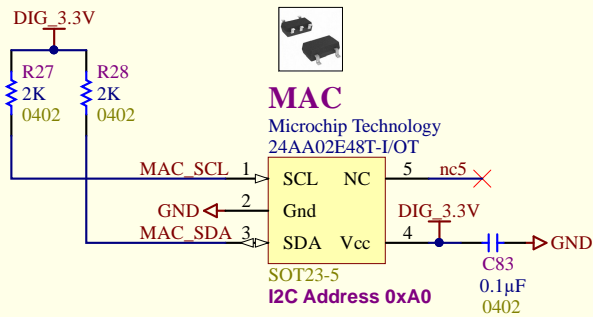
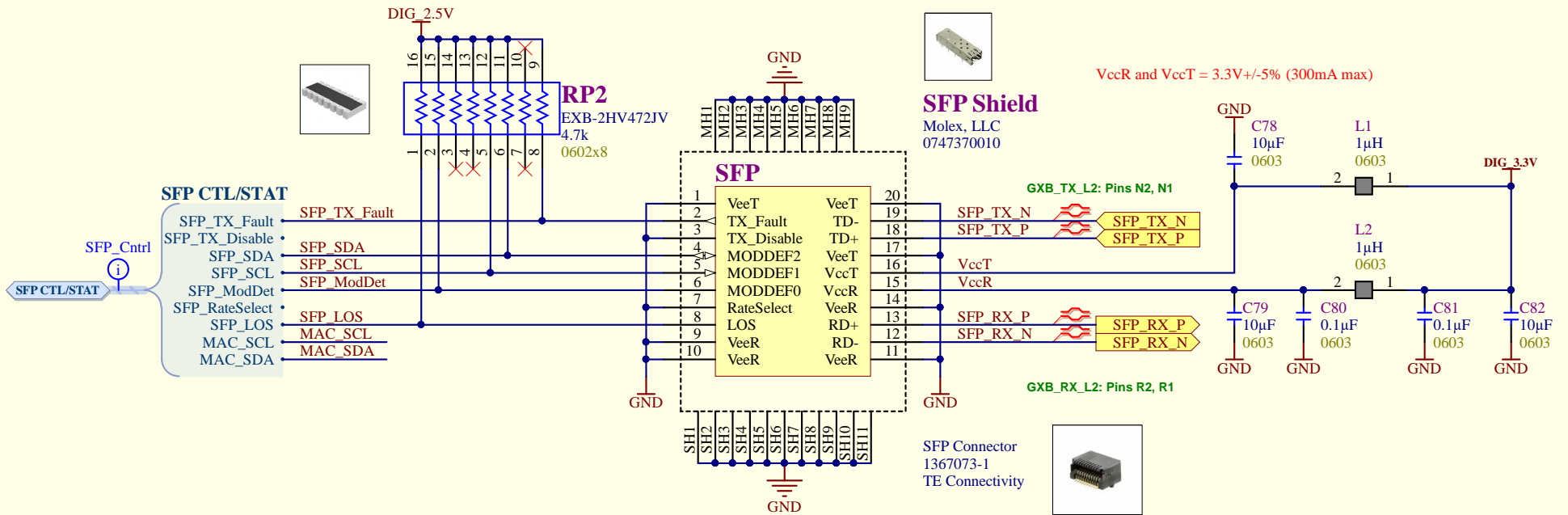
ALPHA-g: CycloneV GX - Transceivers

Revision 1	Drawing #: 8		TRIUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	
	Sheet #: 8 of 17	Size: A		
	Drawn by: D. Bishop	Date: 05-Jun-18		



ALPHA-g: CycloneV GX - BIAS Regulator

1	Revision		Drawing #: 9		TRIUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	
	Sheet #: 9 of 17		Size: A			
	Drawn by: D.Bishop		Date: 05-Jun-18			



AFBR-57M5APZ
Digital Diagnostic SFP, 850 nm, 2.125/1.0625 and 1.25 GbD Ethernet, RoHS Compliant Optical Transceiver



[Data Sheet](#)

850 nm, SFP (Small Form Pluggable), RoHS Compliant, Low Voltage (3.3 V) Digital Diagnostic Optical Transceiver

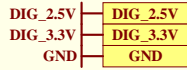


Digital Diagnostic Interface and Serial Identification

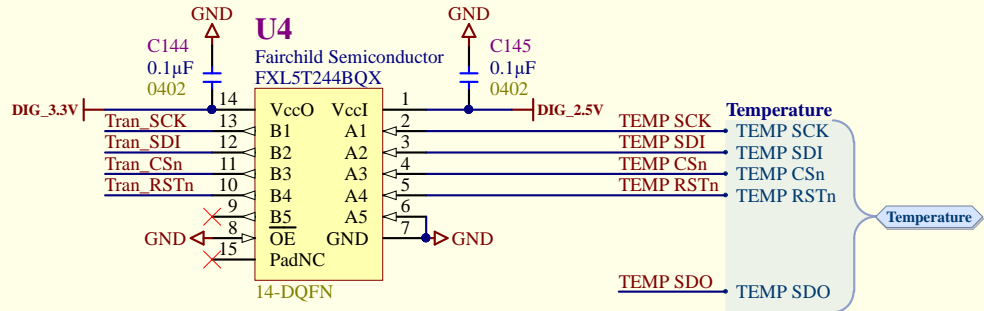
The 2-wire serial interface is based on ATMEL AT24C01A series EEPROM protocol and signaling detail. Conventional EEPROM memory, bytes 0-255 at memory address 0xA0, is organized in compliance with SFF-8074i. New digital diagnostic information, bytes 0-255 at memory address 0xA2, is compliant to SFF-8472. The new diagnostic information provides the opportunity for Predictive Failure Identification, Compliance Prediction, Fault Isolation and Component Monitoring.

ALPHA-g: CycloneV GX - SFP Link - MAC Address

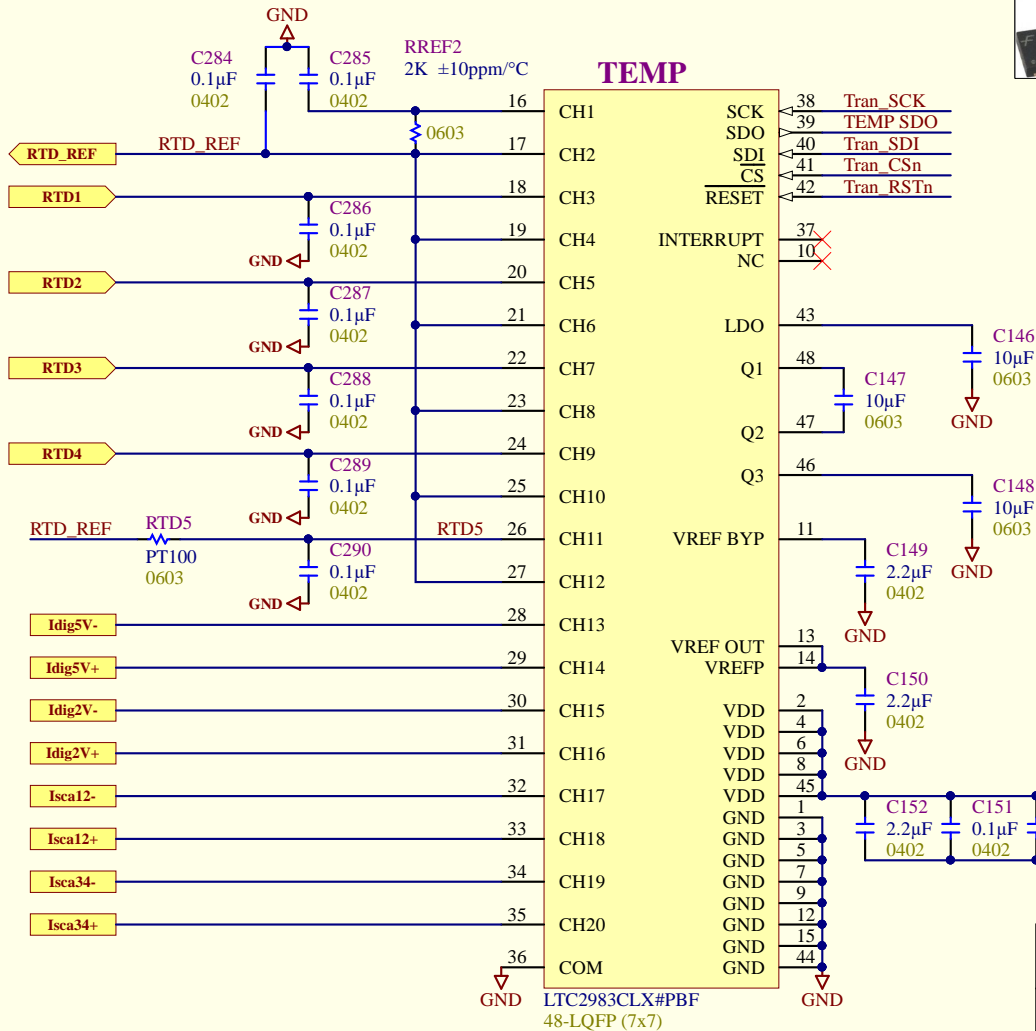
Revision	Drawing #: 9	TRUMF	
1	Sheet #: 9 of 17	Size: A	
	Drawn by: D.Bishop	Date: 05-Jun-18	
4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3			



Translate FPGA 2.5V IO up to 3.3V IO

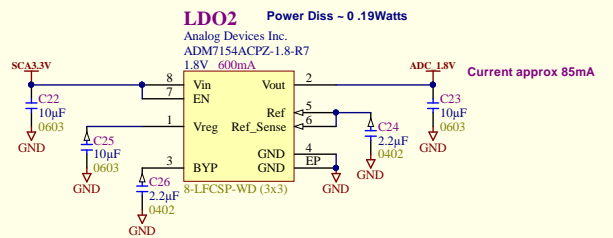
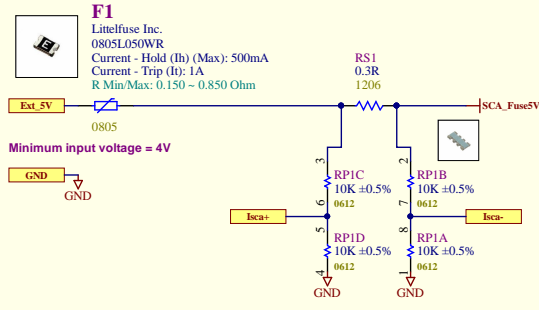
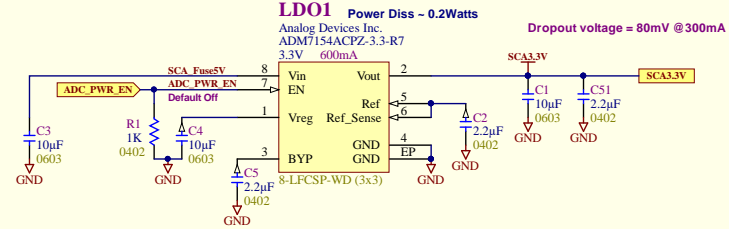
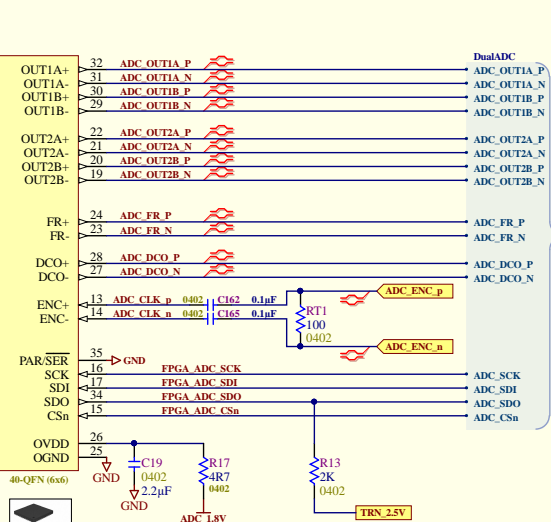
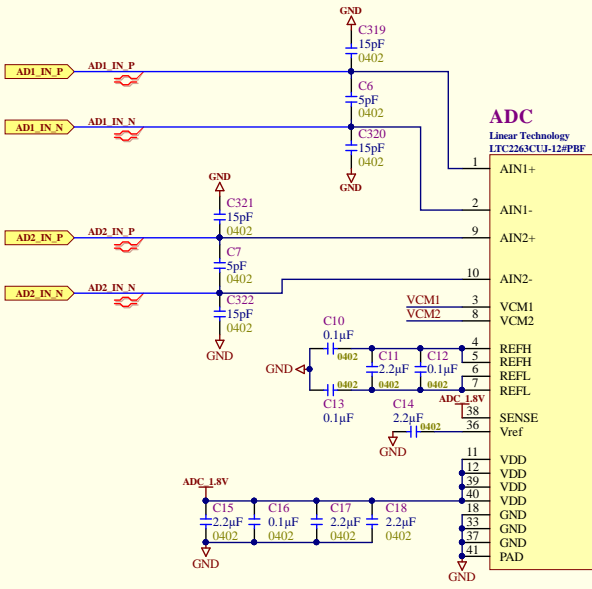
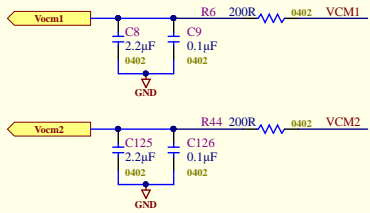


CYCLONEV 3.3V tolerant



ALPHA-g: CycloneV GX - Temp / Volt / Curr Read back

Revision	Drawing #: 10	TRIUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	
1	Sheet #: 10 of 17		
	Drawn by: D.Bishop	Date: 05-Jun-18	

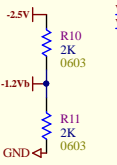
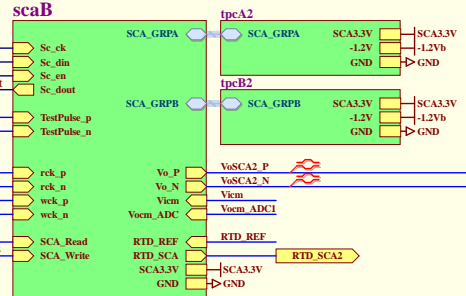
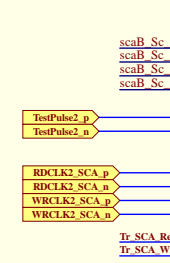
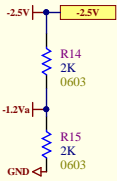
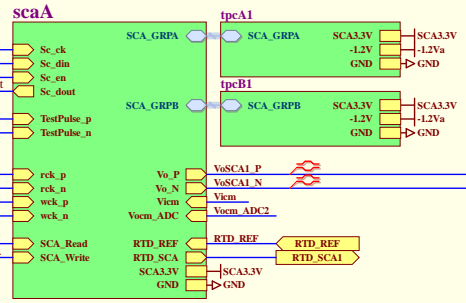
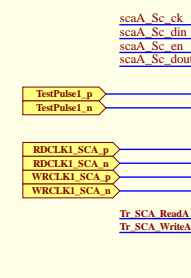


ALPHA-g: CycloneV GX - DUAL ADC			TRIUMF LOGO
Revision	Drawing #:	11	TRIUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3
1	Sheet #:	11 of 17	
	Drawn by:	D.Bishop	
		Size:	B
		Date:	05-Jun-18

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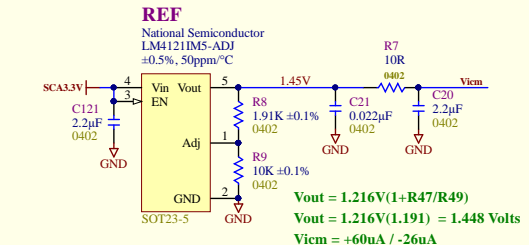
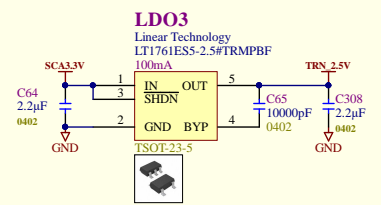
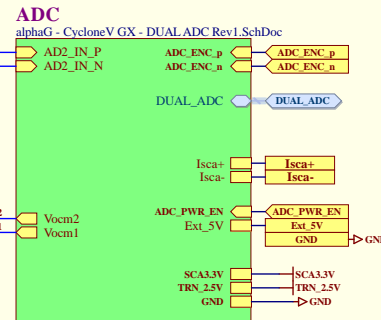
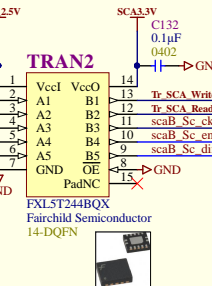
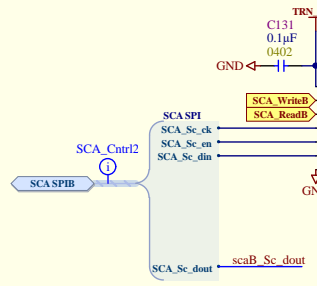
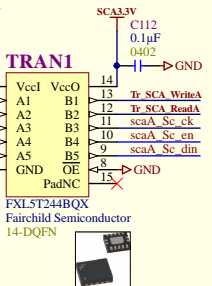
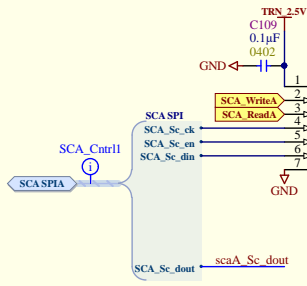
HS1
SCA HEATSINK LEFT

MH1 MH1 LEF
MH2 MH2 LEF
MH3 MH3 LEF



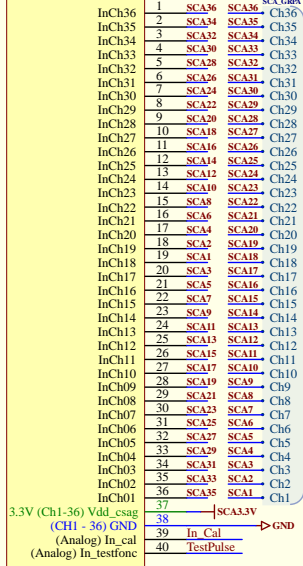
HS2
SCA HEATSINK RIGHT

MH1 MH1 RT
MH2 MH2 RT
MH3 MH3 RT

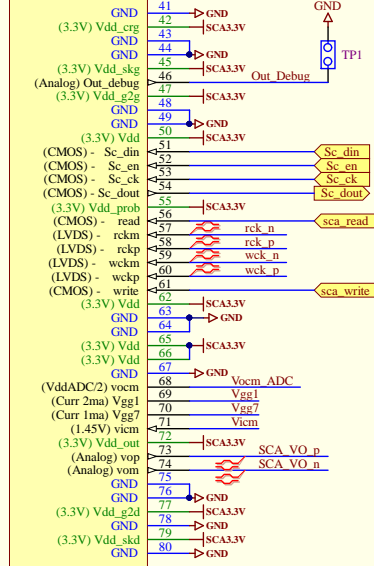


ALPHA-g: CycloneV GX - SCA Interface		
Revision	Drawing #: 12	TRUMF
1	Sheet #: 12 of 17	4004 Wesbrook Mall
	Size: B	Vancouver, B.C.
	Drawn by: D.Bishop	Canada
	Date: 05-Jun-18	VST 2A3

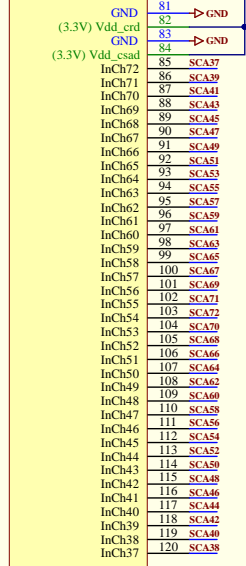
AFTERA
AFTER ASIC



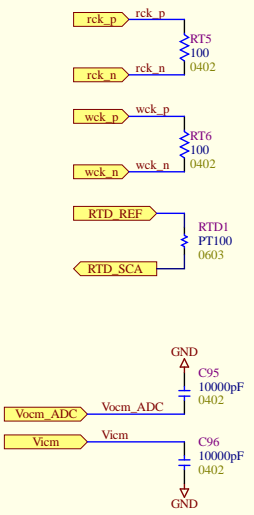
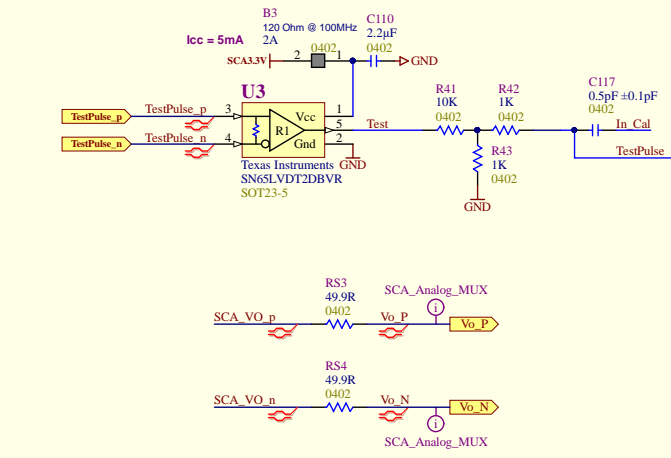
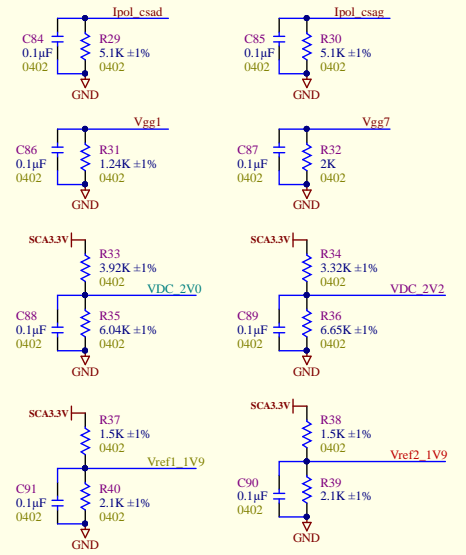
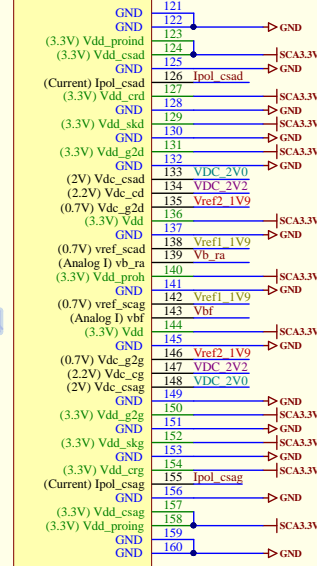
AFTERB
AFTER ASIC



AFTERC
AFTER ASIC



AFTERD
AFTER ASIC



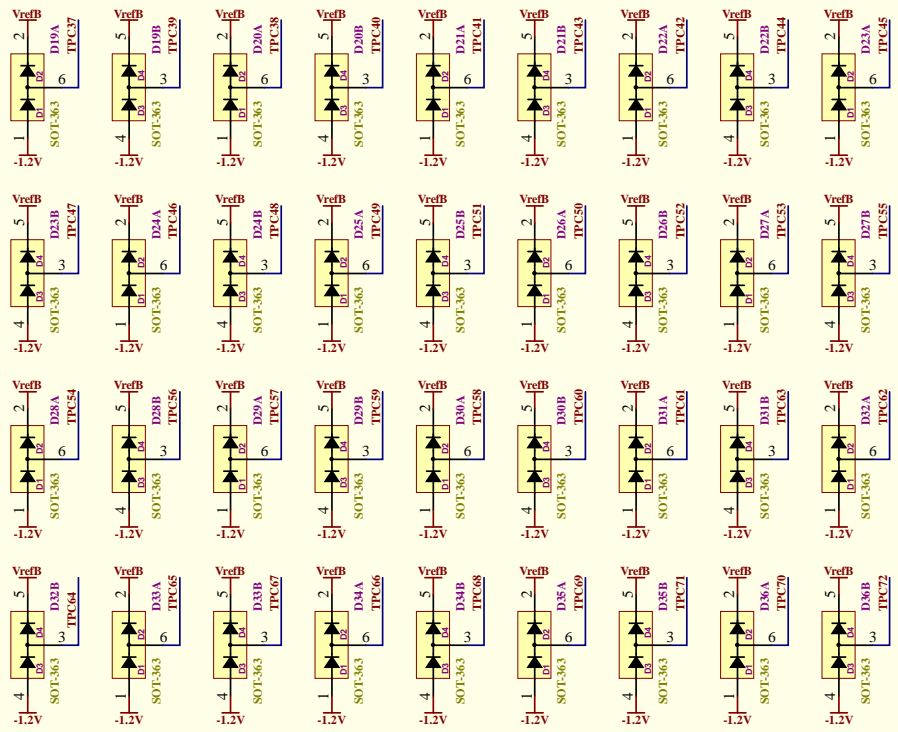
Pin 37	Vdd_csag	9.83	CSA
Pin 157	Vdd_csag	9.83	
Pin 84	Vdd_csad	9.83	
Pin 124	Vdd_csad	9.83	
Pin 42	Vdd_crg	3.9	CR Filter
Pin 154	Vdd_crg	3.9	
Pin 82	Vdd_crd	3.9	
Pin 127	Vdd_crd	3.9	
Pin 45	Vdd_skg	1.9	SK Filter
Pin 152	Vdd_skg	1.9	
Pin 79	Vdd_skd	1.9	
Pin 129	Vdd_skd	1.9	
Pin 47	Vdd_g2g	6.881	Gain-2
Pin 150	Vdd_g2g	6.881	
Pin 77	Vdd_g2d	6.881	
Pin 131	Vdd_g2d	6.881	
Pin 50	Vdd	3.676	
Pin 144	Vdd	3.676	
Pin 66	Vdd	6.62	
Pin 136	Vdd	6.62	
Pin 62	Vdd	0.343	
Pin 65	Vdd	0	
Pin 72	Vdd_out	16.03	
Pin 126	Ipol_csad	0.2	
Pin 155	Ipol_csag	0.2	
Pin 69	Vvgg1	2	
Pin 70	Vvgg7	1	

130.41 260.818

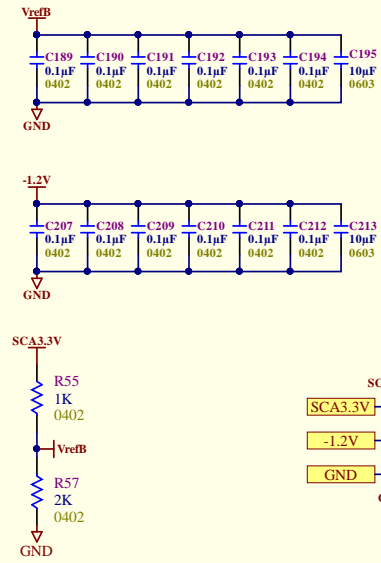
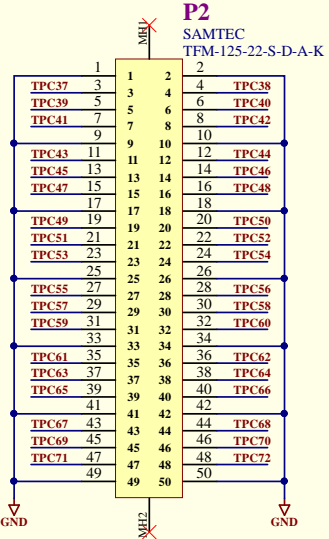
ALPHA-g: CycloneV GX - AFTER ASIC

Revision	Drawing #: 13	TRUMF
1	Sheet #: 13 of 17	4004 Westbrook Mall
	Size: B	Vancouver, B.C.
	Drawn by: D.Bishop	Canada
	Date: 05-Jun-18	VST 2A3

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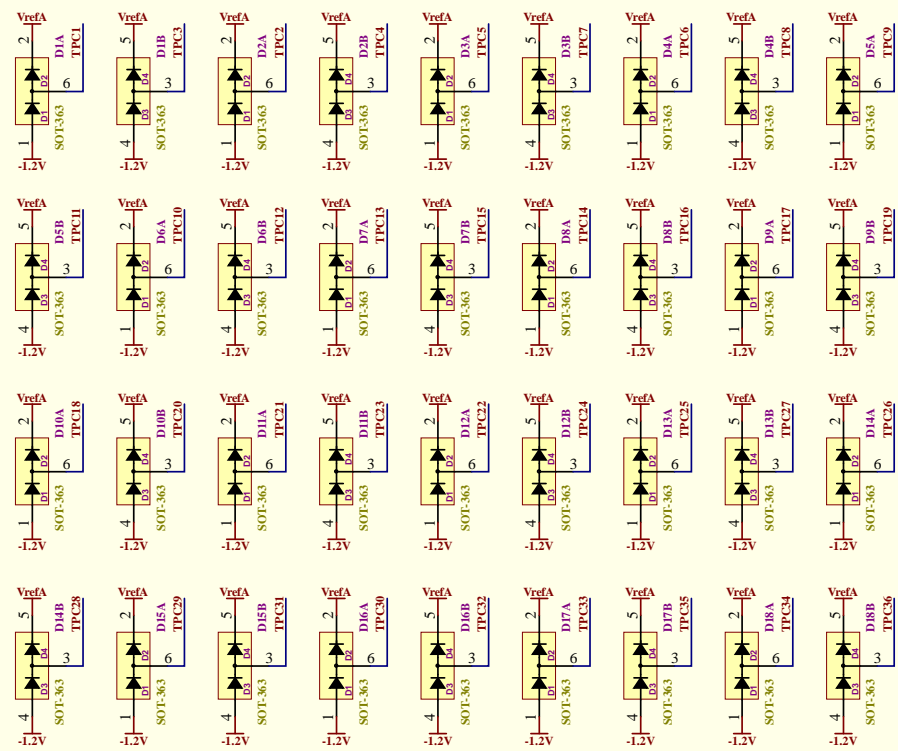
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Ch72	SC72	10000pF	0402 TPC72
Ch71	SC71	10000pF	0402 TPC71
Ch70	SC70	10000pF	0402 TPC70
Ch69	SC69	10000pF	0402 TPC69
Ch68	SC68	10000pF	0402 TPC68
Ch67	SC67	10000pF	0402 TPC67
Ch66	SC66	10000pF	0402 TPC66
Ch65	SC65	10000pF	0402 TPC65
Ch64	SC64	10000pF	0402 TPC64
Ch63	SC63	10000pF	0402 TPC63
Ch62	SC62	10000pF	0402 TPC62
Ch61	SC61	10000pF	0402 TPC61
Ch60	SC60	10000pF	0402 TPC60
Ch59	SC59	10000pF	0402 TPC59
Ch58	SC58	10000pF	0402 TPC58
Ch57	SC57	10000pF	0402 TPC57
Ch56	SC56	10000pF	0402 TPC56
Ch55	SC55	10000pF	0402 TPC55
Ch54	SC54	10000pF	0402 TPC54
Ch53	SC53	10000pF	0402 TPC53
Ch52	SC52	10000pF	0402 TPC52
Ch51	SC51	10000pF	0402 TPC51
Ch50	SC50	10000pF	0402 TPC50
Ch49	SC49	10000pF	0402 TPC49
Ch48	SC48	10000pF	0402 TPC48
Ch47	SC47	10000pF	0402 TPC47
Ch46	SC46	10000pF	0402 TPC46
Ch45	SC45	10000pF	0402 TPC45
Ch44	SC44	10000pF	0402 TPC44
Ch43	SC43	10000pF	0402 TPC43
Ch42	SC42	10000pF	0402 TPC42
Ch41	SC41	10000pF	0402 TPC41
Ch40	SC40	10000pF	0402 TPC40
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Ch38	SC38	10000pF	0402 TPC38
Ch37	SC37	10000pF	0402 TPC37



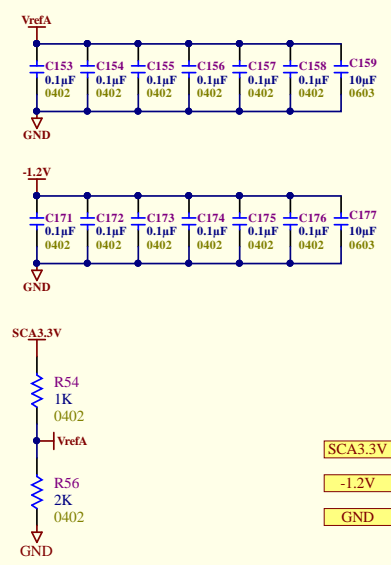
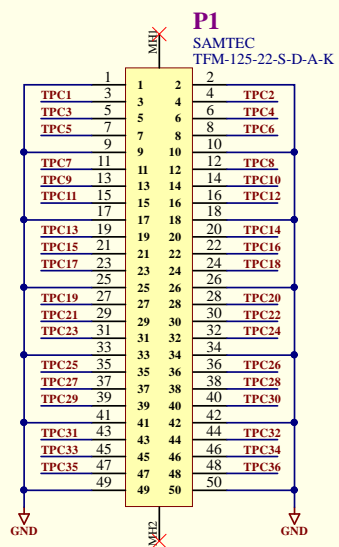
ALPHA-g: CycloneV GX - TPC Connectors2

Revision	Drawing #: 14	TRIUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3
1	Sheet #: 14 of 17	
	Size: A	
	Drawn by: D.Bishop	Date: 05-Jun-18

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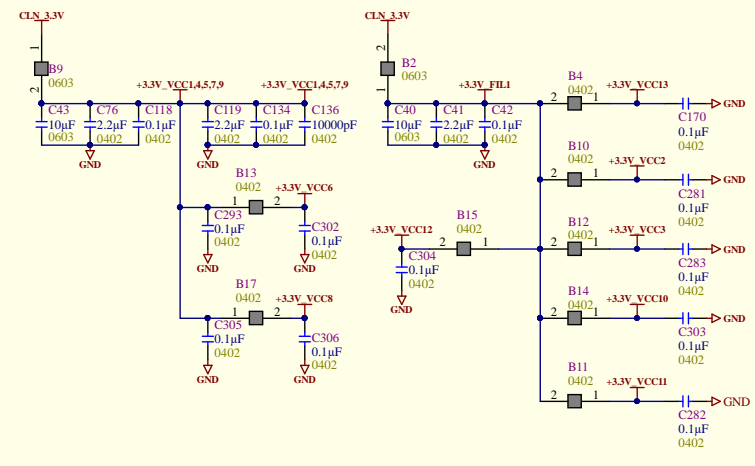
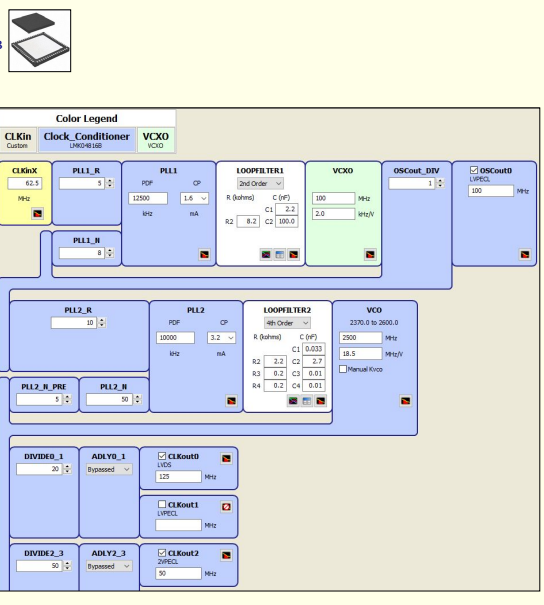
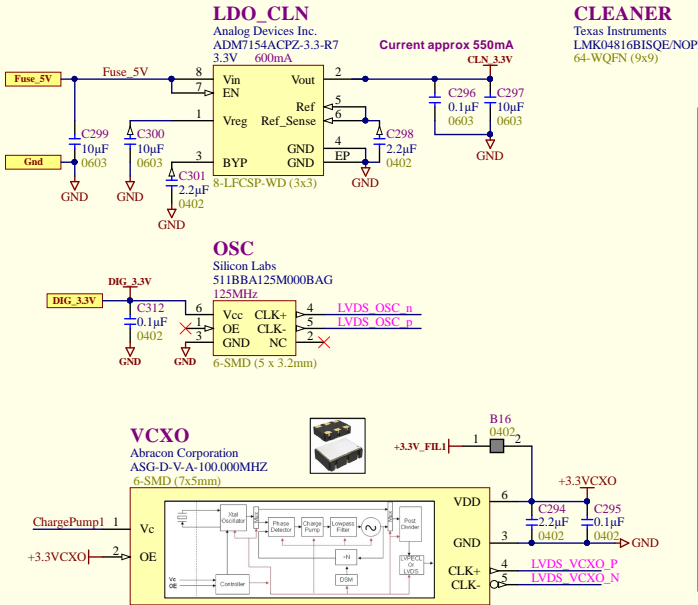
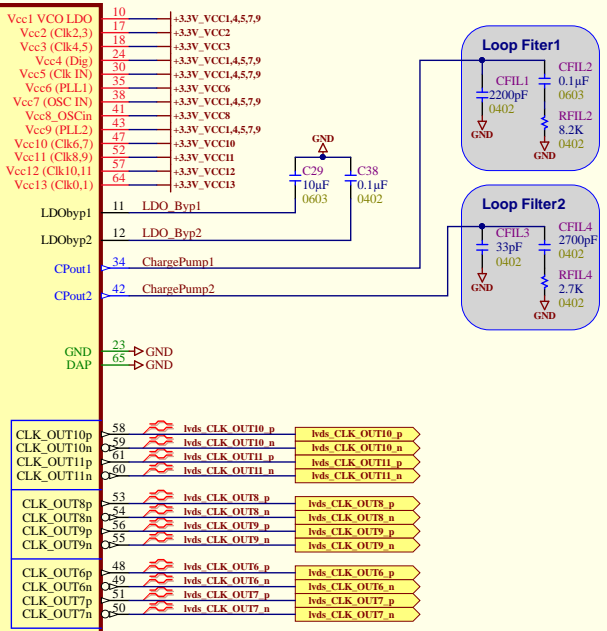
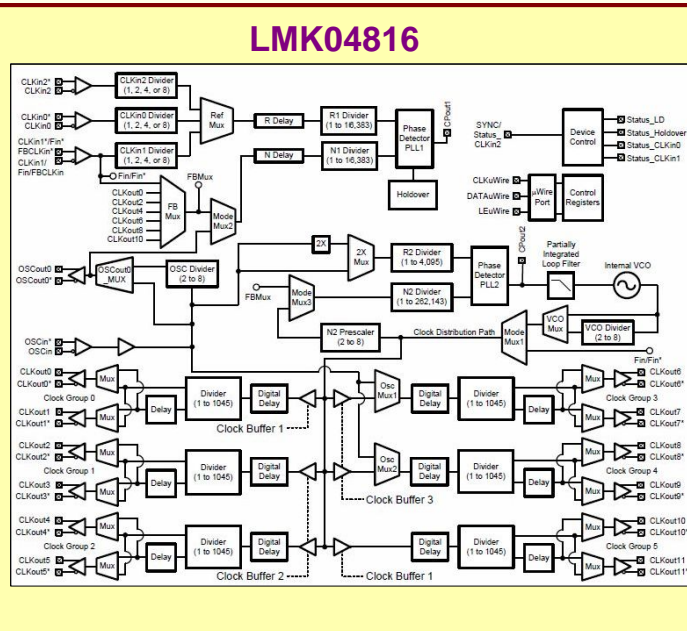
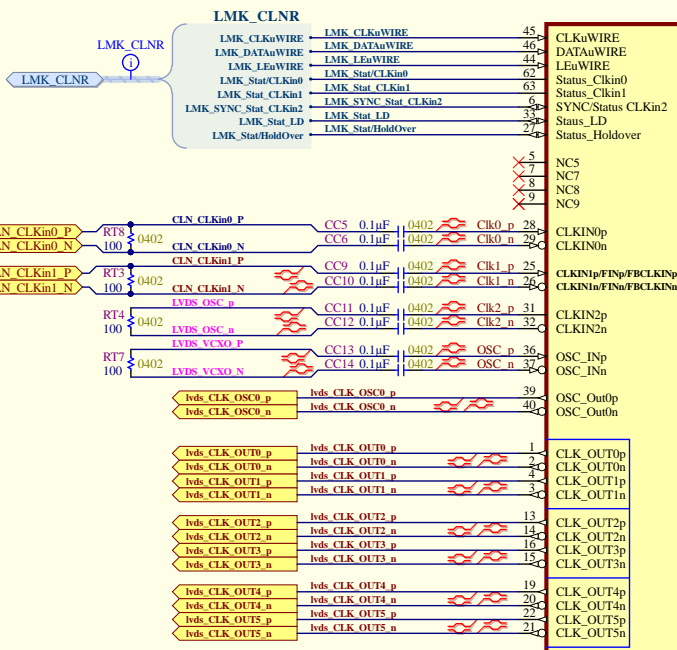
SCA_GRP	SCA	Value	TPC
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Ch35	SC35	10000pF	0402 TPC35
Ch34	SC34	10000pF	0402 TPC34
Ch33	SC33	10000pF	0402 TPC33
Ch32	SC32	10000pF	0402 TPC32
Ch31	SC31	10000pF	0402 TPC31
Ch30	SC30	10000pF	0402 TPC30
Ch29	SC29	10000pF	0402 TPC29
Ch28	SC28	10000pF	0402 TPC28
Ch27	SC27	10000pF	0402 TPC27
Ch26	SC26	10000pF	0402 TPC26
Ch25	SC25	10000pF	0402 TPC25
Ch24	SC24	10000pF	0402 TPC24
Ch23	SC23	10000pF	0402 TPC23
Ch22	SC22	10000pF	0402 TPC22
Ch21	SC21	10000pF	0402 TPC21
Ch20	SC20	10000pF	0402 TPC20
Ch19	SC19	10000pF	0402 TPC19
Ch18	SC18	10000pF	0402 TPC18
Ch17	SC17	10000pF	0402 TPC17
Ch16	SC16	10000pF	0402 TPC16
Ch15	SC15	10000pF	0402 TPC15
Ch14	SC14	10000pF	0402 TPC14
Ch13	SC13	10000pF	0402 TPC13
Ch12	SC12	10000pF	0402 TPC12
Ch11	SC11	10000pF	0402 TPC11
Ch10	SC10	10000pF	0402 TPC10
Ch9	SC9	10000pF	0402 TPC9
Ch8	SC8	10000pF	0402 TPC8
Ch7	SC7	10000pF	0402 TPC7
Ch6	SC6	10000pF	0402 TPC6
Ch5	SC5	10000pF	0402 TPC5
Ch4	SC4	10000pF	0402 TPC4
Ch3	SC3	10000pF	0402 TPC3
Ch2	SC2	10000pF	0402 TPC2
Ch1	SC1	10000pF	0402 TPC1



ALPHA-g: CycloneV GX - TPC Connectors1

Revision	Drawing #: 15		
1	Sheet #: 15 of 17	Size: A	
	Drawn by: D.Bishop	Date: 05-Jun-18	

4004 Wesbrook Mall
Vancouver, B.C.
Canada
V6T 2A3



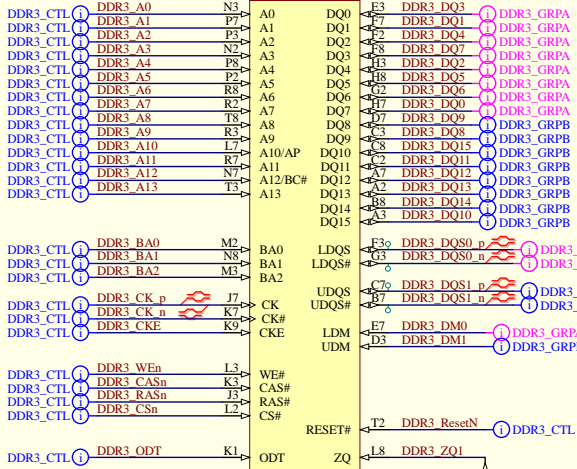
ALPHA-g: CycloneV GX - Clock Cleaner - LMK04816

Revision	Drawing #: 16	TRUMF
1	Sheet #: 16 of 17	4004 Westbrook Mall
	Size: B	Vancouver, B.C.
	Drawn by: D.Bishop	Canada
	Date: 05-Jun-18	VST 2A3

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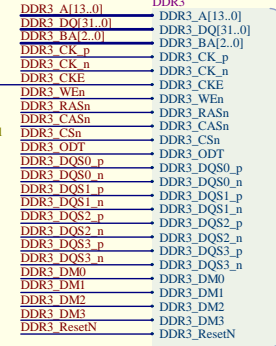
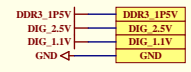
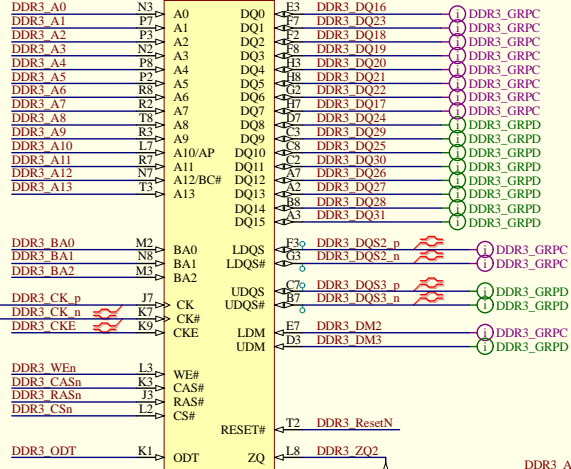
DDR1A

ISSI, Integrated Silicon Solution Inc
IS43TR16128B-15HBL



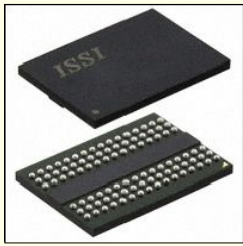
DDR2A

ISSI, Integrated Silicon Solution Inc
IS43TR16128B-15HBL



DDR1B

ISSI, Integrated Silicon Solution Inc
IS43TR16128B-15HBL



+1.5V Idd Max = 2 x 250mA

Alternate Part Number:
IS43TR16128AL-125KBL
ISSI, Integrated Silicon Solution Inc
IC DDR3 SDRAM 2GBIT 96FBGA
DDR3-1600

DDR1C

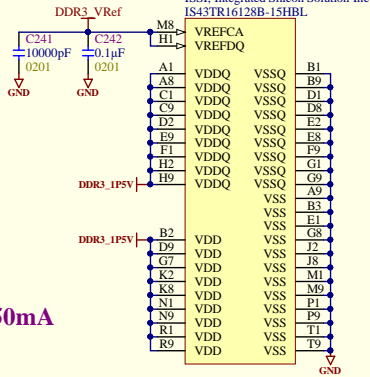
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IS43TR16128B-15HBL



(A14 on 4Gb part)

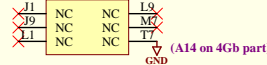
DDR2B

ISSI, Integrated Silicon Solution Inc
IS43TR16128B-15HBL

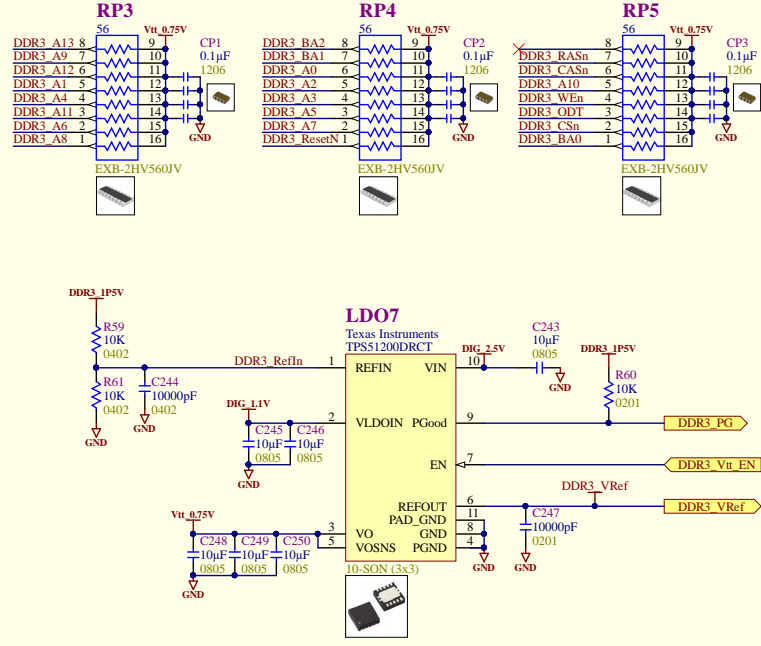
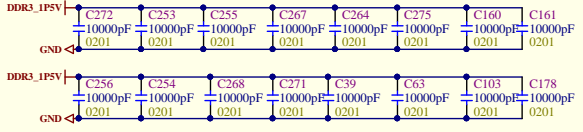
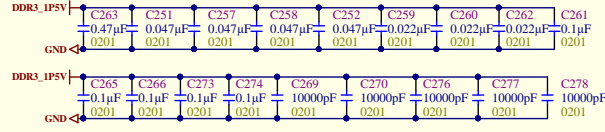


DDR2C

ISSI, Integrated Silicon Solution Inc
IS43TR16128B-15HBL



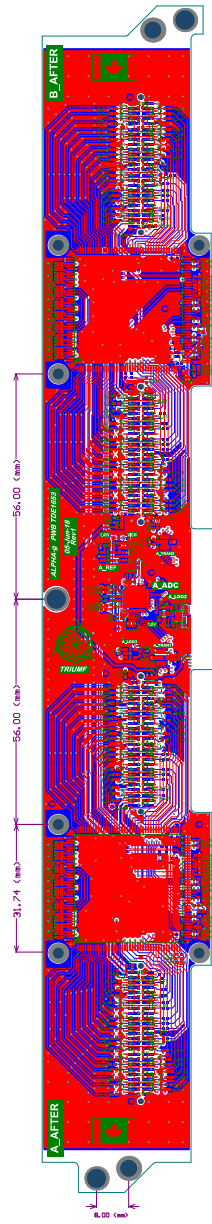
(A14 on 4Gb part)



ALPHA-g: CycloneV GX - DDR3 Memory

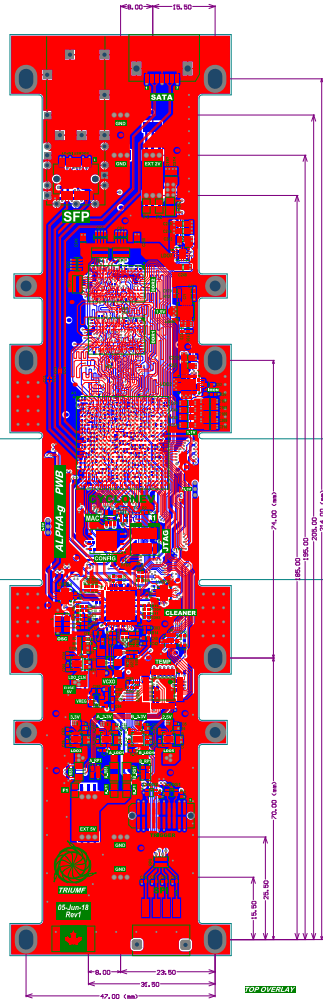
Revision: 1	Drawing #: 17	TRUMPF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	
Sheet #: 17 of 17	Size: B	Drawn by: D.Bishop	Date: 05-Jun-18

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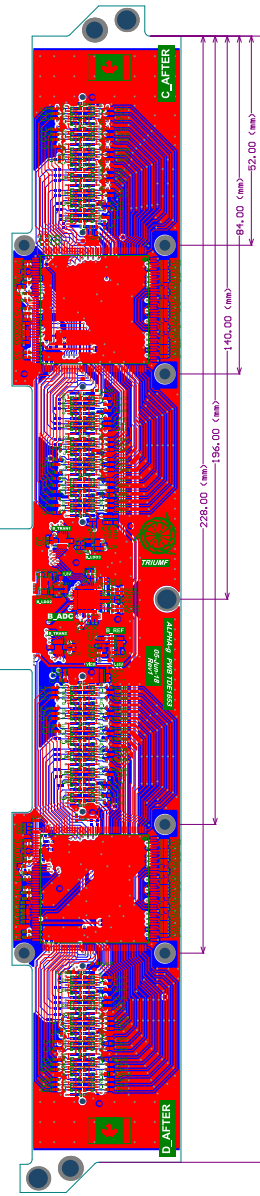


Layer 1 - Top Layer

Layer 6 - Rm/B Bottom Layer



DIMENSIONS
IN MILLIMETERS



Boards