

Advanced LIGO I & Q RF Demodulator (2 channel version)

DCC: [E1200113](#)

Design document

The I & Q RF demodulator is described in more detail on the [IQ_Demodulator](#) page of the 4 channel version and the [FetIqDemodulatorPrototype](#) page which describes the original prototype. For the MC servo, and Common Mode Servo, the slew rate and bandwidth requirements are such that the baseline LIGO RF demodulator design is not sufficient. This set of modifications optimizes the demodulator design for these, and similar applications.

The revision C power interface board adds a DB9 for DAQ channels with optional whitening.

Fast Option

The modifications for high bandwidth operations of the demodulator board D0902745-v4 can be found in [E1100044](#):

Designator	Old Value	New Value	Footprint	Distributor	Part Number	Qty
C11/C16	47nF	4.7nF	SMD 0805	Mouser	77-VJ0805A472FXJTBC	4
L3/L4	2.2uH	220nH	SMD 1206	Coilcraft	1206CS-221XGLB	4
R18/R27	0 Ohm	omit	SMD 0805			0
R40/R41	omit	0 Ohm	SMD 0805	Mouser	71-CRCW0805-0-E3	4

Since there are two channels, each designator is used twice.

Ultra-Fast Option

The ultra-fast option is used by the TFFFS and introduces less than 20° of phase at 1 MHz.

Designator	Old Value	New Value	Footprint	Distributor	Part Number	Qty
C10/C15	1nF	omit	SMD 0805			0

C11/C16	47nF	100pF	SMD 0805	Mouser	81- GRM21A5C2E101FW01D	4
C8/C18	100pF	33pF	SMD 0805	Mouser	77- VJ0805A330FXACW1BC	4
C12/C13	68pF	27pF	SMD 0805	Mouser	581-08052A270JAT2A	4
C9/C14	180pF	10pF	SMD 0805	Mouser	77- VJ0805A100FXAPW1BC	4
R18/R27	0 Ohm	omit	SMD 0805			0
R40/R41	omit	0 Ohm	SMD 0805	Mouser	71-CRCW0805-0-E3	4

Since there are two channels, each designator is used twice.

DAQ Option

Version C of the power interface board implements whitening filters for each I and Q channel. It can be turned on remotely, or locally through the two switches in the rear. For the remote controls to work the local switches need to be in the up position (filters on). The data acquisition channels are available in the rear through a DB9 connector. Older chassis can be upgraded with the new board, and by modifying the rear panel to version 2. An update fpd file with just the changes is available.

Serial Numbers

The assignment of serial numbers and frequencies for the advanced LIGO units can be found in [E1100273-v1](#).

Drawings

Assembly

Description	Revision	pdf	files
Schematics	2	D1000181-v2	zip
1U chassis	1	D1700042-v1	dwg
Test procedure	2	E1100114-v2	doc
Test results (S1000771-S1000788)	1	E1200074-v1	xlsx

Panels

Description	Revision	pdf	files
Front panel	2	D1000182-v2	fpd

Rear panel	2	D1000183-v2	fpd
	1	D1000183-v1	fpd

Boards

Description	Revision	pdf	files
Single channel block diagram	3	D0902346-v3	
Demodulator	4	D0902745-v4	zip
Demodulator breakout	A	D1000184-A	zip
Demodulator power interface	C	D1000185-C	zip
	B	D1000185-B	zip
Low Noise Power Board	Low_Noise_Power_Module		

Test Rig

Description	Revision	pdf	files
Demodulator tester	1	D1101141-v1	zip
Demodulator tester front panel	1	D1101975-v1	fpd
Demodulator tester rear panel	1	D1101976-v1	fpd

Images

Front



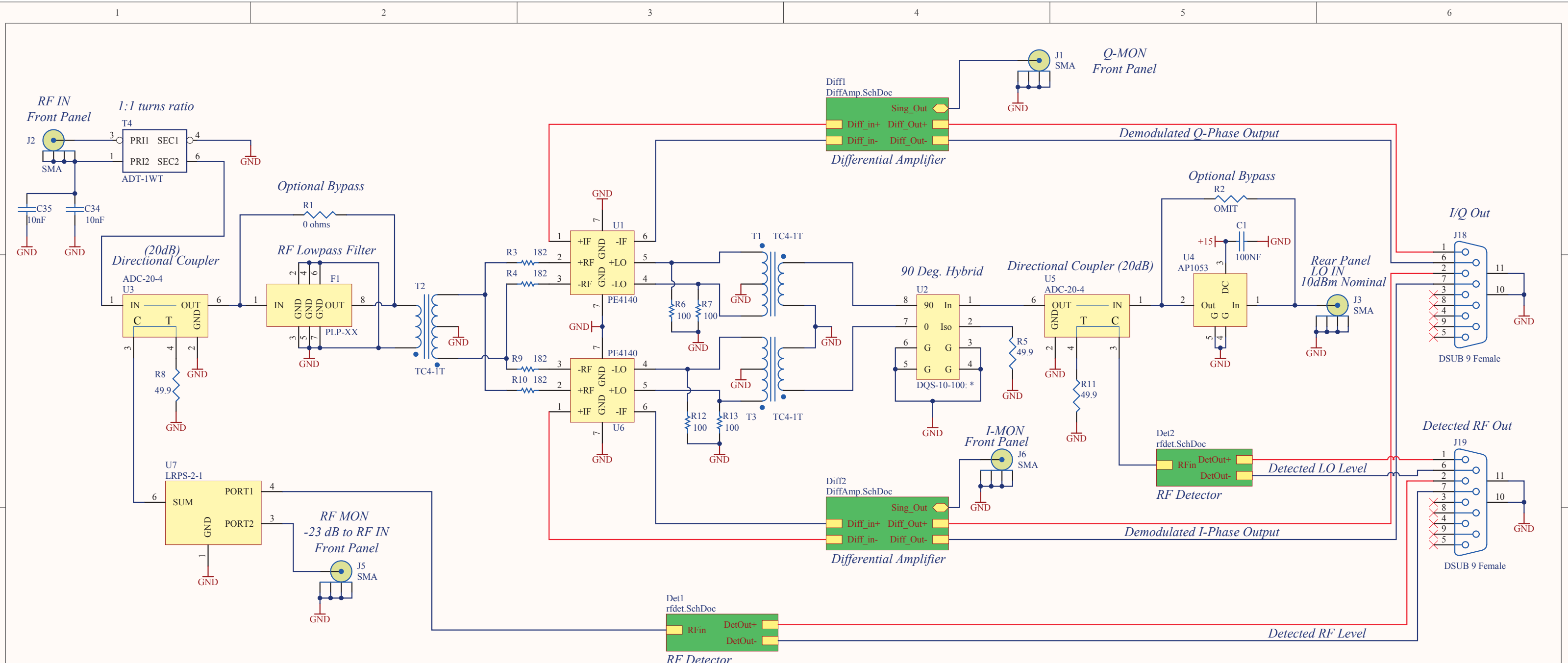
Rear



Front above

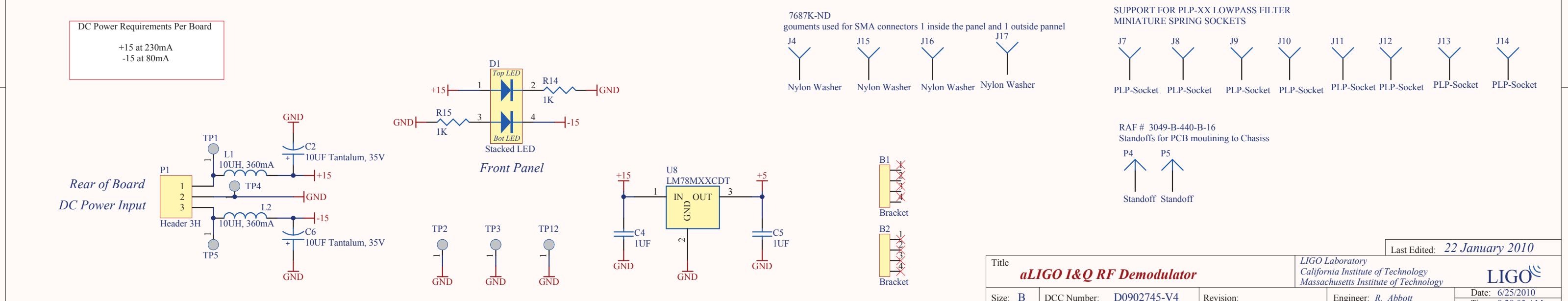


aLIGO: IQ_Demodulator_2-chn (last edited 2018-09-24 16:21:34 by DanielSigg)



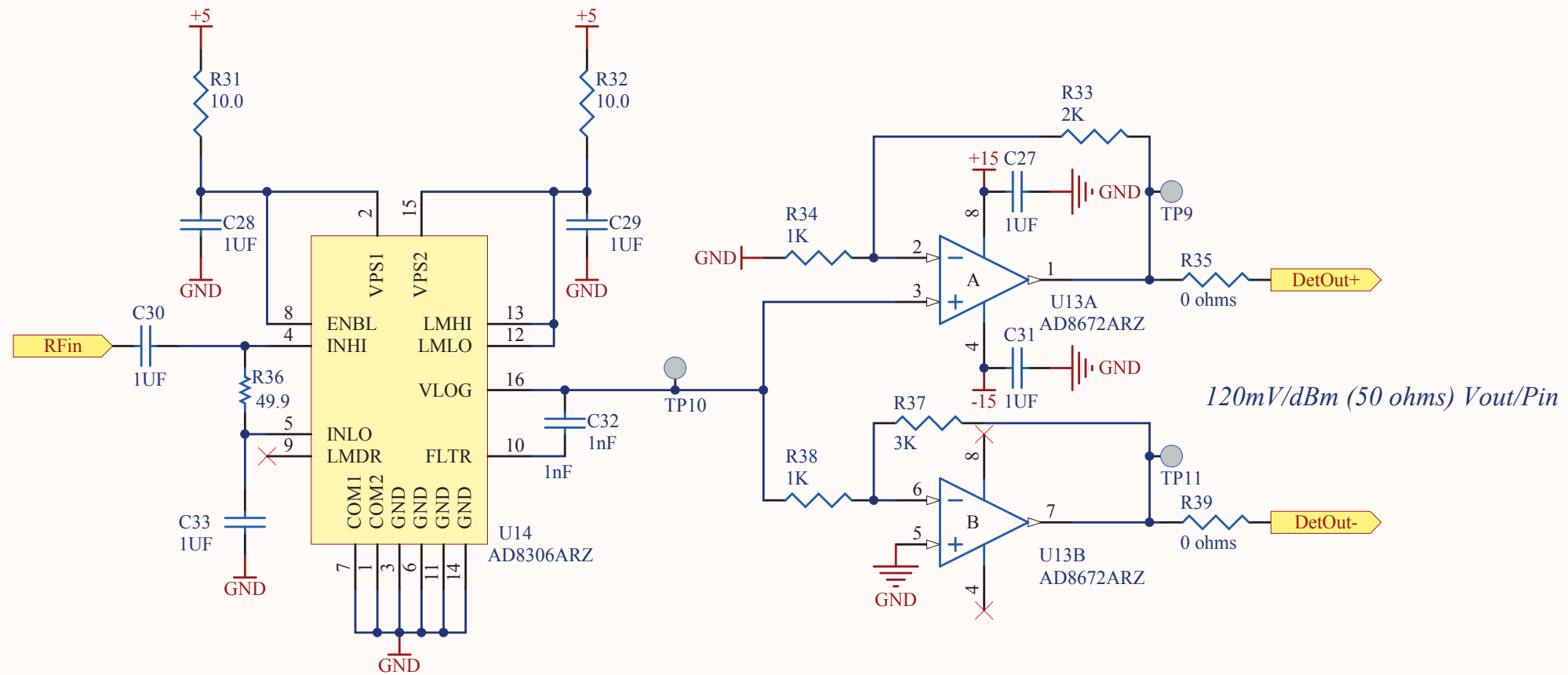
DC Power Requirements Per Board

+15 at 230mA
-15 at 80mA



Title		Last Edited: 22 January 2010	
aLIGO I&Q RF Demodulator		LIGO Laboratory California Institute of Technology Massachusetts Institute of Technology	
Size: B	DCC Number: D0902745-V4	Revision:	Engineer: R. Abbott
File: C:\Documents and Settings\costheld\My Documents\chub_ligo_files\ChubAltium\project_files\Adl_demod\D0902745_v4		Date: 6/25/2010 Time: 8:28:03 AM	

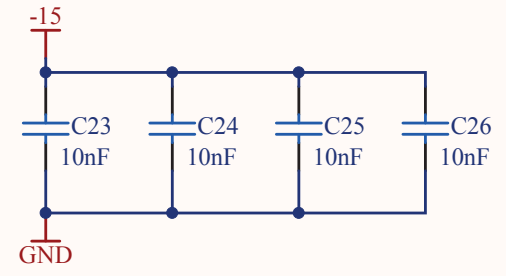
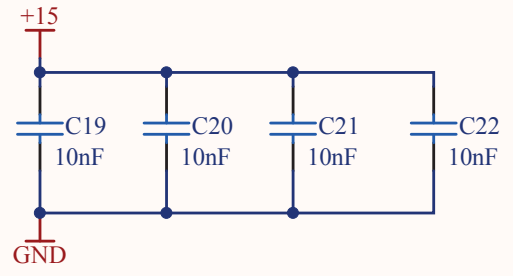
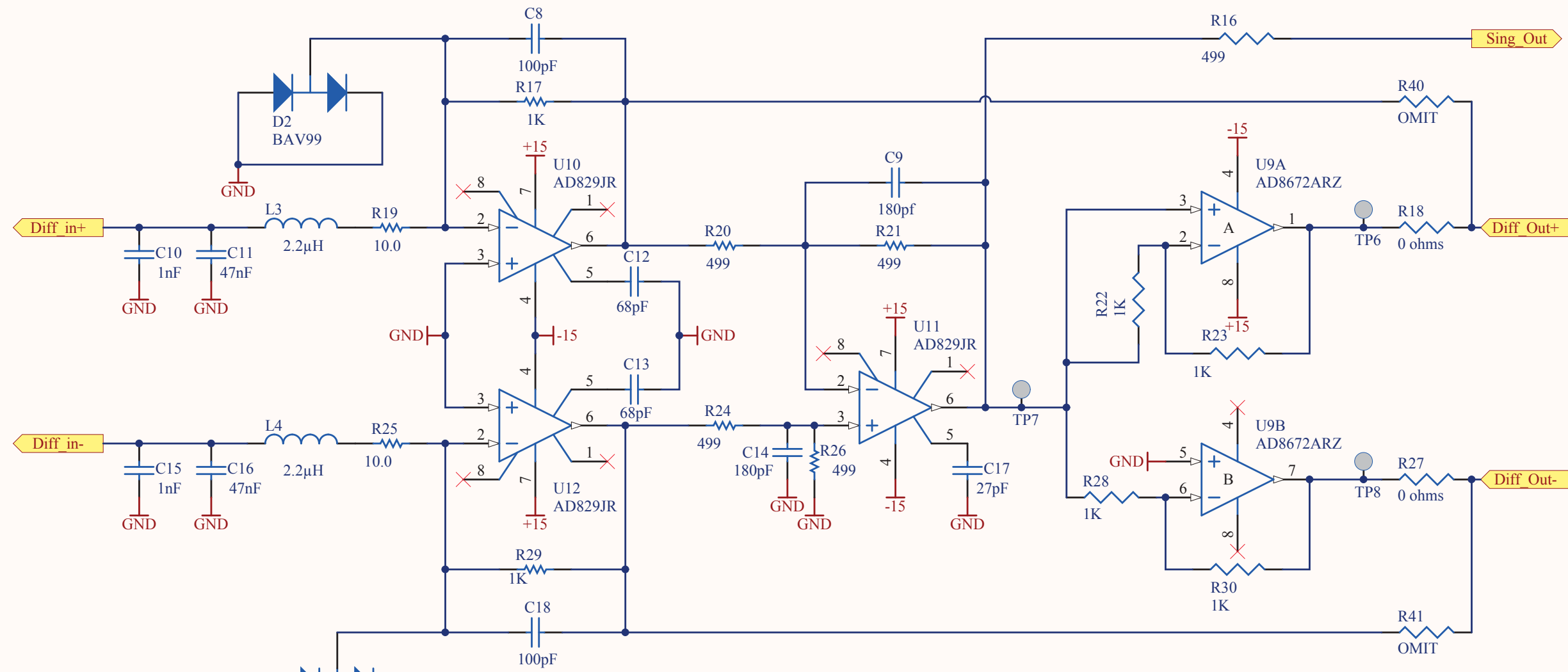
5 to 400 MHz Log Detector
 90 dB Dynamic Range, 10dBm Max RF



120mV/dBm (50 ohms) Vout/Pin

Last Edited: 22 January 2010

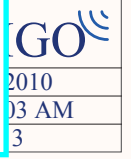
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Size: A	PCB DCC # D0902745	SCH DCC # D0902745-V4	Engineer: R. Abbott	
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				Sheet 2 of 3



Fast option:
 C11/C16: 4.7nF, Mouser 77-VJ0805A472FXJTBC
 L3/L4: 220nH, Coilcraft 1206CS-221XGLB
 R18/R27: omit
 R40/R41: 0Ohm, Mouser 71-CRCW0805-0-E3

Ultra-fast option:
 C10/C15: omit
 C11/C16: 100pF, Mouser 81-GRM21A5C2E101FW01D
 C8/C18: 33pF, Mouser 77-VJ0805A330FXACW1BC
 C12/C13: 27pF, Mouser 581-08052A270JAT2A
 C9/C14: 10pF, Mouser 77-VJ0805A100FXAPW1BC
 R18/R27: omit
 R40/R41: 0Ohm, Mouser 71-CRCW0805-0-E3

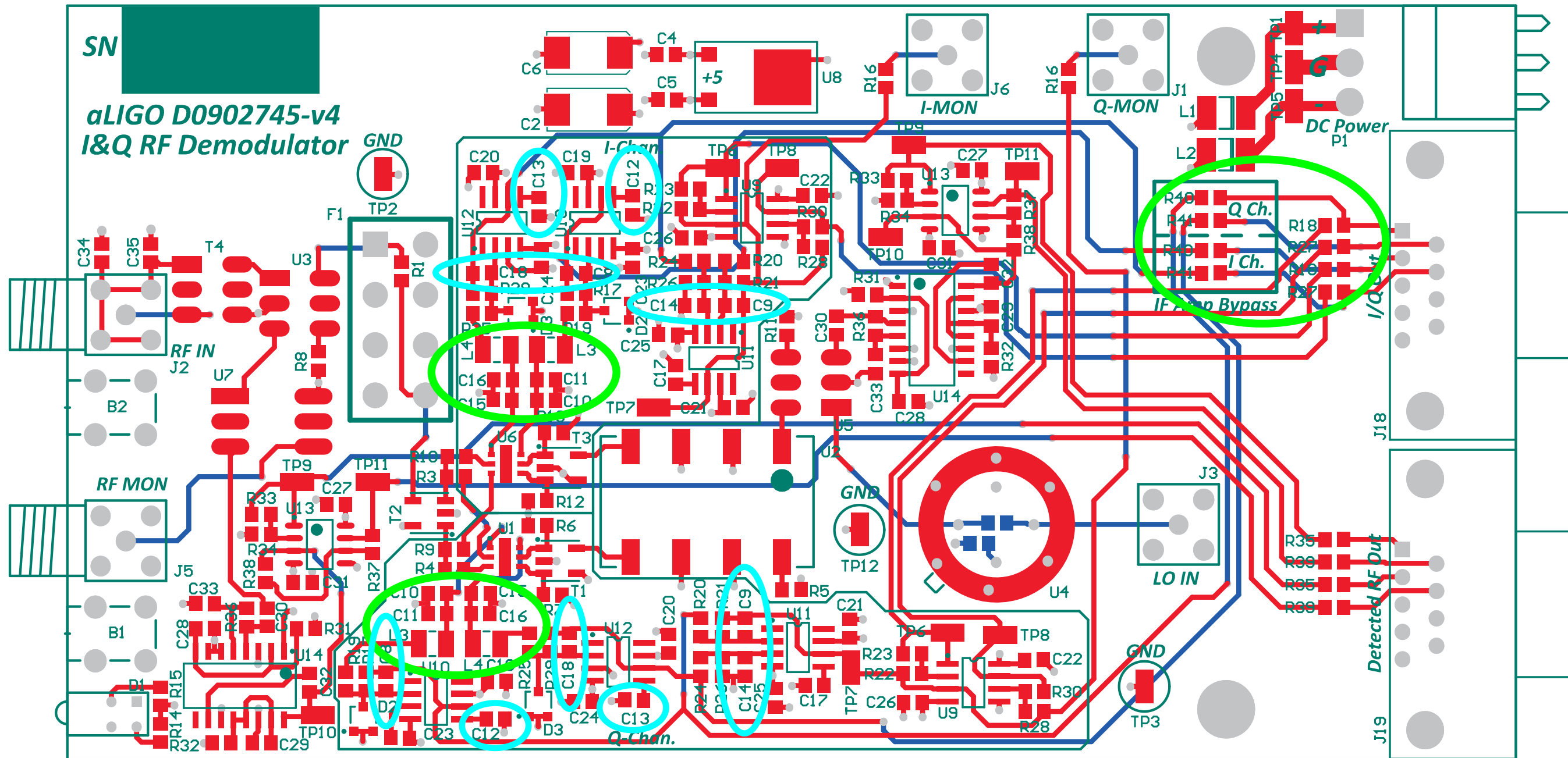
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2010
03 AM
3

SN

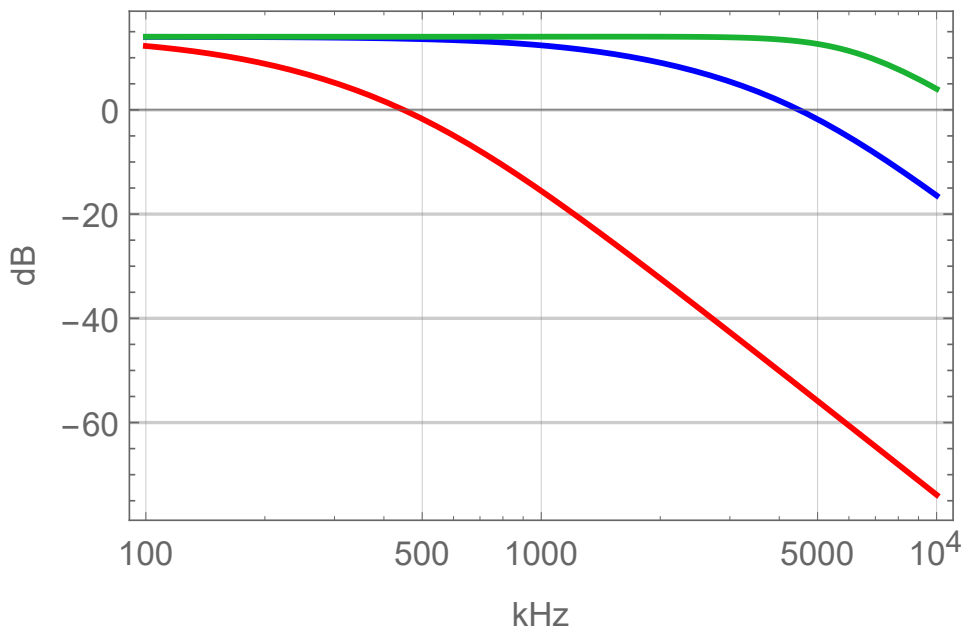
aLIGO D0902745-v4 I&Q RF Demodulator



Fast option

Ultra-fast option

Magnitude



Phase

