MOTOROLA

MOSCAD-M™ RTU

Schematics and Layouts

Hardware Manual

68P02962C30-O

CONTENTS

68P02962C30-O
August 2001

FOREWORD

General

The MOSCAD-M Schematics and Layout manual contains the MOSCAD-M RTU hardware details. The schematics, layout and parts lists for the Main board and I/O Expansion board are provided.

Intended Audience

This manual is intended for use by experienced Motorola technicians familiar with similar types of equipment.

Related Documents

The following publications are available separately:

MOSCAD-M RTU Owner's manual, Motorola publication 68P02961C50/98-08901C55

MOSCAD-M RTU Configurator User's Guide, Motorola publication 68P02961C55

'C' Toolkit for MOSCAD Family RTUs, Motorola publication 68P02956C75

MOBAT Radio Service Manual, Motorola publication 68P02963C10/98-08901C60

SPECIFICATIONS

CPU

Processor:	Motorola 68VZ328 (16/32 bit) CMOS; 33 MHz clock
Memory:	1024 kb Flash for operating system and user application, 512 kb RAM
Memory free for application:	200 kb
Real-Time Clock:	Hardware clock with year, month, date, day, hour, minute, and second supported.
Serial Data Ports:	
Port 1:	RS-485 2-wire multi-drop or RS-232 (with handshake) and dial-up modem support; up to 57.6 kb/s, IP soap dish support
Port 2:	RS-232 (no handshake); up to 57.6 kb/s, IP soap dish support
Port 3:	1200 b/s DPSK to external radio, or 9600 b/s duo-binary to internal radio

I/O

F457X models:	12 digital inputs, 4 digital outputs (magnetic latch relay) and 4 "open" FET outputs
F458X models: (MOSCAD-M Plus)	15 digital inputs, 4 analog outputs, 4 digital (magnetic latch relay), plus 4 "open" FET outputs, 1 analog output
DI specs:	30V DC max input. Two inputs may be used as fast counters (10 Hz max)
AI specs:	0-5V DC or 4-20 mA. 12 bit ± 1 LSB resolution
DO specs:	Relay output: 2A max, 30V DC or 250V AC max, 60 Watt max, 125V AC max.
	Open FET: 500 mA max, 30V DC max
AO specs:	0-5V DC or 4-20 mA. 8 bit ± 1 LSB resolution

Communications

Wireline Modems:	Supports external modem via Port 1B, up to 57.6 kb/s.
Two-Way radio:	Internal: UHF 4 watt data radio, 1200 b/s, DPSK modulation, 403-470 MHz

	External: 9600 b/s duo-binary modulation.

General

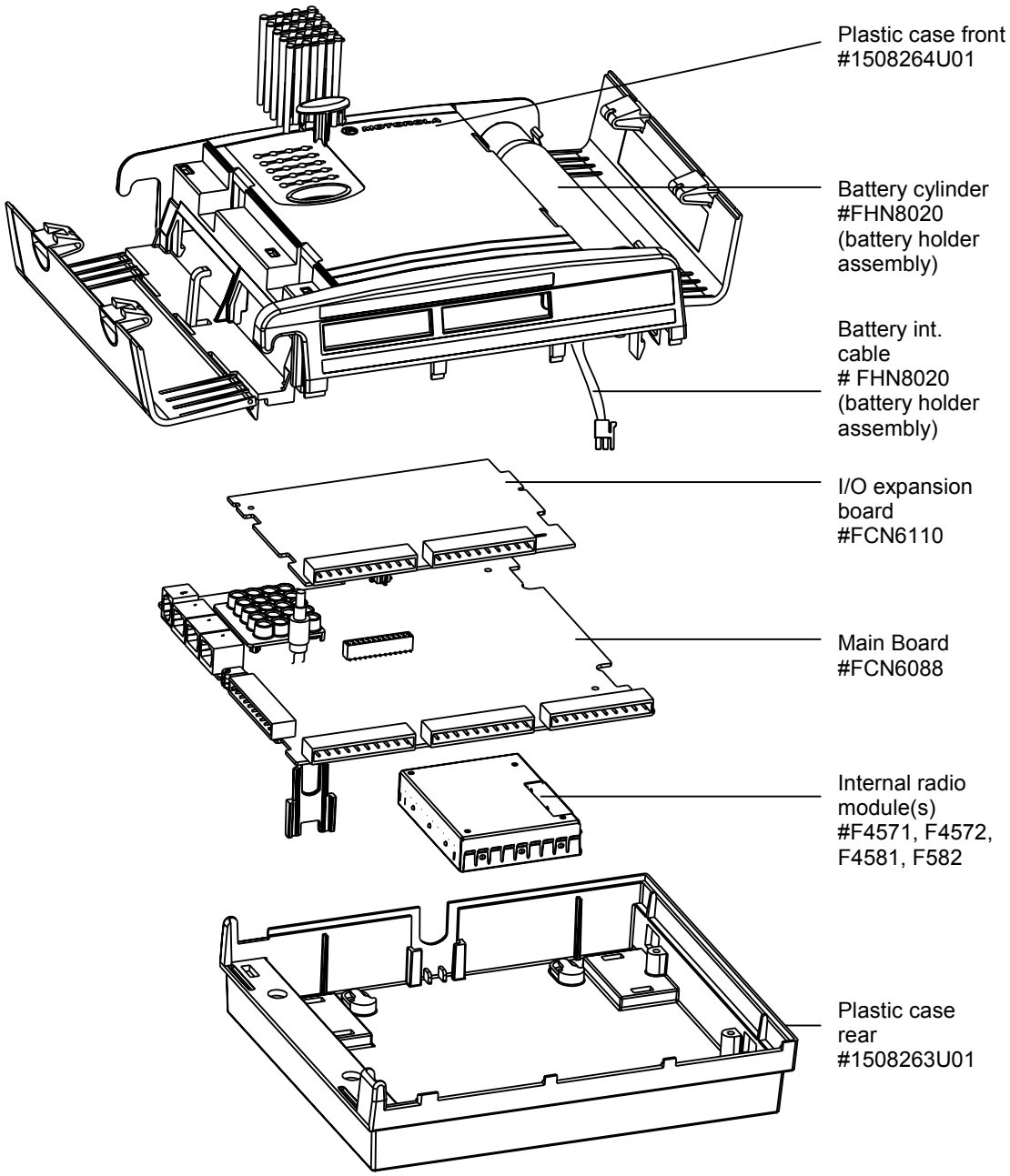
Power:	External 9-30V DC @ 70 mA nominal, 150 mA peak (w/o radio), <5 mA sleep mode.
Battery Backup:	Three "C" cells keep real-time clock and RAM operating.
Power Management:	Sleep mode may control DI and AI wetting voltage plus power to external radio.
Wake Up Triggers:	Either of: 3 assigned DIs, data received at ports, manual push-button, real-time clock.
Physical size:	Plastic enclosure: 8.5"w x 7.75"h x 3.3"d (21.3mm x 19.4mm x 8.3mm). Add 1.5"(3.75mm) for antenna connector.
Environmental:	-30 to +60°C; 90% RH @ +50°C

Specifications subject to change without notice.

MOSCAD-M REMOTE TERMINAL UNIT

Enclosure

The figure below depicts the exploded view of the MOSCAD-M RTU. For instructions on assembly and disassembly, see the MOSCAD-M RTU Owner's Manual.



MOSCAD-M Models, Options, and Accessories

For details of the MOSCAD-M RTU Models, Options, and Accessories, see the MOSCAD-M RTU Owner's Manual 68P02961C50/98-08901C55.

MOSCAD-M Debug Board

A special MOSCAD-M board can be ordered for debugging user 'C' language applications. This board (catalog # FCN6089 DESIGN: 8486418T01) is identical to the standard Main board except for the following:

- Components U36, U55 (RAM memory) are expanded to 1MB each instead of 256KB.
- An interface to connectors P12, P13, and P14 for connection to the logic analyzer.

The parts list for FCN6089 is provided after that of FCN6088 under the description of the Main Board below.

Radio Kits

The following list of Radio Kits can be ordered with the MOSCAD-M RTU.

F4571 MOSCAD-M 4W 403-433 INTERNAL RADIO

FKN4918	MTR440 ANTENNA CABLE KIT
FUE1139	MTR440 438-470MH 4W

F4572 MOSCAD-M 4W 438-470 INTERNAL RADIO

FKN4918	MTR440 ANTENNA CABLE KIT
FUE1138	MTR440 438-470MH 4W

F4573 MOSCAD-M 5W 136-174M RADIO

FCN5516	RADIO DC ADAPTER
FKN4465	CABLE, PS TO HT/MTS & NFM RTU
FKN8023	RADIO AUD CABLE
HLN9716	AUDIO ACCESSORY ADAPTER
HLN9756	BNC ADAPTER
PMUD1480	P XCVR 136-174M 5W CONV POP

F4574 MOSCAD-M 4W 403-470M RADIO

FCN5516	RADIO DC ADAPTER
FKN4465	CABLE, PS TO HT/MTS & NFM RTU
FKN8023	RADIO AUD CABLE
HLN9716	AUDIO ACCESSORY ADAPTER
HLN9756	BNC ADAPTER
PMUE1434	P XCVR 403-470M 4W CONV POP

F4575 MOSCAD-M 4W 470-512M RADIO

FCN5516	RADIO DC ADAPTER

FKN4465	CABLE, PS TO HT/MTS & NFM RTU
FKN8023	RADIO AUD CABLE
HLN9716	AUDIO ACCESSORY ADAPTER
HLN9756	BNC ADAPTER
PMUE1477	P XCVR 450-527M 4W CONV POP

F4581 MOSCAD-M PLUS 4W 403-433 INTERNAL RADIO

FKN4918	MTR440 ANTTENA NABLE KIT
FUE1139	MTR440 438-470MH 4W

F4582 MOSCAD-M PLUS 4W 438-470 INTERNAL RADIO

FKN4918	MTR440 ANTENNA CABLE KIT
FUE1138	MTR440 438-470MH 4W

F4583 MOSCAD-M PLUS 5W 136-174M RADIO

FCN5516	RADIO DC ADAPTER
FKN4465	CABLE, PS TO HT/MTS & NFM RTU
FKN8023	RADIO AUD CABLE
HLN9716	AUDIO ACCESSORY ADAPTER
HLN9756	BNC ADAPTER
PMUD1480	P XCVR 136-174M 5W CONV POP

F4584 MOSCAD-M PLUS 4W 403-470M RADIO

FCN5516	RADIO DC ADAPTER
FKN4465	CABLE, PS TO HT/MTS & NFM RTU
FKN8023	RADIO AUD CABLE
HLN9716	AUDIO ACCESSORY ADAPTER
HLN9756	BNC ADAPTER
PMUE1434	P XCVR 403-470M 4W CONV POP

F4585 MOSCAD-M PLUS 4W 470-512M RADIO

FCN5516	RADIO DC ADAPTER
FKN4465	CABLE, PS TO HT/MTS & NFM RTU
FKN8023	RADIO AUD CABLE
HLN9716	AUDIO ACCESSORY ADAPTER
HLN9756	BNC ADAPTER
PMUE1477	P XCVR 450-527M 4W CONV POP

The external radio can be one of a range of GP/HT/PRO radios.

For specific information on servicing the internal radios, see MOBAT Radio Service Manual, Motorola publication, 68P02963C10/9808901C60.

CABLES AND ADAPTERS

General

This appendix provides supplementary data on cables and adapters used in various MOSCAD-M systems. The following applications are covered:

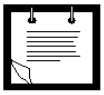
- RTU-to-Computer/Terminal Connections
- RTU-to-Modem Connections
- RTU-to-RTU Connections

RTU-to-Computer/Terminal Connections

For a 25-pin or 9-pin D-type connector, use the FLN6457 cable kit, in order to connect one of the RTU RS-232 ports to a computer or terminal. The kit includes a cable with RJ45 modular jacks on both ends, an RJ45 to 25-pin female D-Type adapter, and an RJ45 to 9-pin D-Type adapter.

The RTU port configuration is as follows:

Port No.	Configurator Definition
1B	RS-232 UART Local Computer (MDLC)
2	RS-232 UART Local Computer (MDLC)



Note

When a User Port is defined as Computer/Terminal with DTR support:

1. The RTU will not transmit unless it receives a DTR=on signal from the computer/terminal.
2. The RTU will not receive unless it receives a DTR=on signal from the computer/terminal.

Note

When the connector is facing upwards, the left-hand pin is Pin No. 1, and the right-hand pin is Pin No. 8.

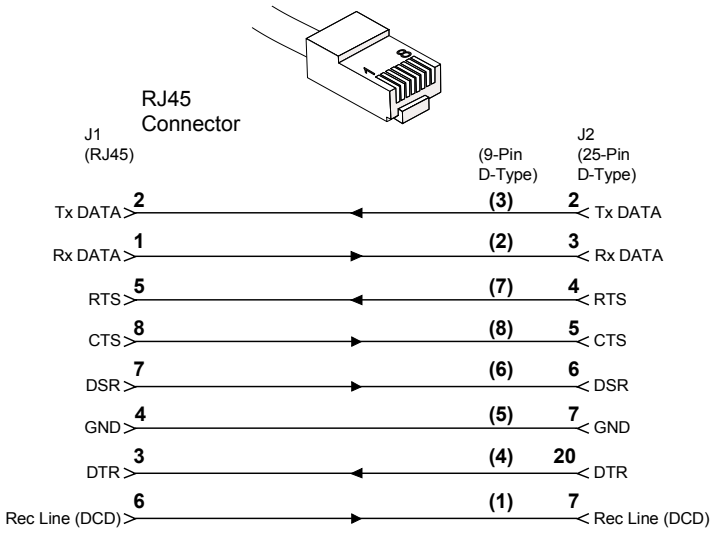


Figure 1
RJ45-to-D-Type Female Connector Adapter

RTU-to-Modem Connections

Note

Only R&TTE approved modems should be used to connect the RTU to the PSTN.

RTU-to-Modem Asynchronous Connection

For a 9-pin or 25-pin connection, use the FLN6458 cable kit to connect one of the MOSCAD-M RTU RS-232 ports asynchronously to a modem. (The RTU serves as DTE.) The kit includes a cable with RJ45 modular jacks on both ends and an RJ45 to 9-pin and 25-pin male D-Type adapter (see Figure 2). The possible RTU configurations are detailed below:

Port No.	Configurator Definition
1	RS-232 UART External Dialup Modem (MDLC)

Note

1. Before transmitting, the RTU sends an RTS=on signal to the modem, and will not transmit unless it receives a feedback CTS=on signal from the modem.

2. The RTU will not receive unless it receives a DCD=on signal from the modem.
3. When using a modem in auto-answer mode (connected to a computer port) for remote service, the RTU does not support the RTS/CTS protocol, as the port is designed to operate with a local computer as well as with a modem.

Note

When the connector is facing upwards, the left-hand pin is Pin No. 1, and the right-hand pin is Pin No. 8.

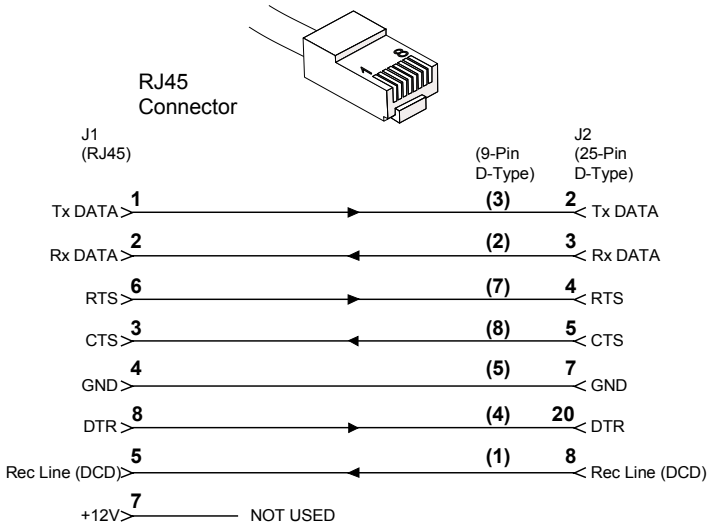


Figure 2
RJ45-to-D-Type Male Connector Adapter

RTU-to-RTU Connection

RTU-to-RTU Asynchronous Communications Connection

This section provides data on the cable (not supplied) recommended for the RTU- to-RTU RS-232 asynchronous interconnection (refer to Figure 3). The following table defines the RTU port for this connection type.

Port No.	Configurator Definition
1B	RS-232 UART RTU-to-RTU (MDLC)
2	RS-232 UART RTU-to-RTU (MDLC)

When the connector is facing upwards, the left-hand pin is Pin No. 1, and the right-hand pin is Pin No. 8.

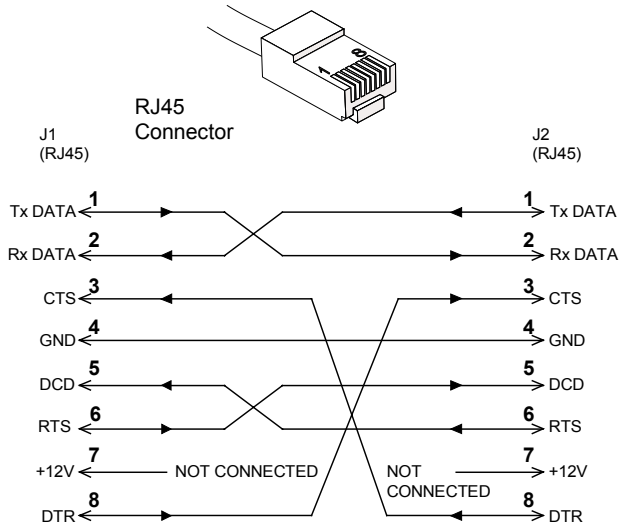


Figure 3
RTU-to-RTU RS-232 Asynchronous Communications Cable

MOSCAD-M MAIN BOARD

General/Index

The schematics, layout and parts list of the Main board of the MOSCAD-M RTU (Board catalog # FCN6088A DESIGN: 8486418T01) is provided below. Large schematics have also been provided in separate format, divided for letter size printing. Click on the links below to jump to the desired page.

Layout

- *Side 1*
- *Side 2*

Parts List

- *FCN6088A – Standard Board*
- *FCN6089A – Debug Board*

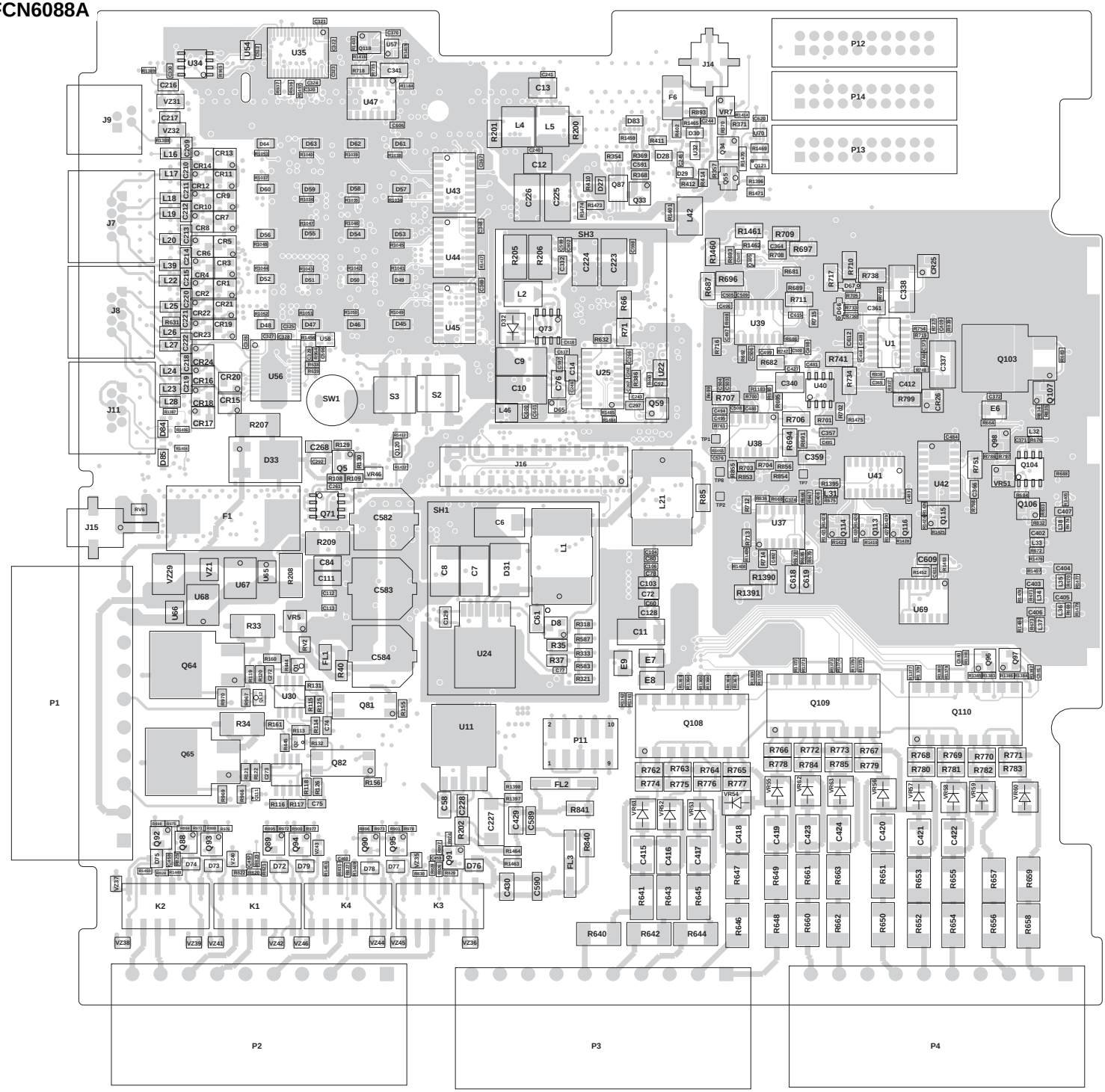
Schematics

- *Sheet 1- Main Board*
- *Sheet 2- CPU*
- *Sheet 3- Memory* *Divided format for letter size printing*
- *Sheet 4- Logic Analyzer Connectors*
- *Sheet 5- FPGA+Radio* *Divided format for letter size printing*
- *Sheet 6- FPGA* *Divided format for letter size printing*
- *Sheet 7- Filters* *Divided format for letter size printing*
- *Sheet 8- Radio Interface* *Divided format for letter size printing*
- *Sheet 9- Radio TX Filters/COS Filters* *Divided format for letter size printing*
- *Sheet 10- RX AGC* *Divided format for letter size printing*
- *Sheet 11- General Radio Interface* *Divided format for letter size printing*
- *Sheet 12- DO & DI Filters* *Divided format for letter size printing*
- *Sheet 13- Digital Output* *Divided format for letter size printing*
- *Sheet 14- Digital Output 1-4* *Divided format for letter size printing*
- *Sheet 15- Digital Inputs* *Divided format for letter size printing*
- *Sheet 16- Solid State Output* *Divided format for letter size printing*

- *Sheet 17- UART Drivers*
- *Sheet 18- RS-232/RS-485 Connectors/RS-232 Toolbox*
- *Sheet 19- UARTs: Port 1, Port 2* *Divided format for letter size printing*
- *Sheet 20- Main Power Supply* *Divided format for letter size printing*
- *Sheet 21- Power Supply for Radio* *Divided format for letter size printing*
- *Sheet 22- Power Supply of 3.3V* *Divided format for letter size printing*
- *Sheet 23- Shift Register + LEDs* *Divided format for letter size printing*

MOSCAD-M Main Board

FCN6088A



SHOWN FROM SIDE 1

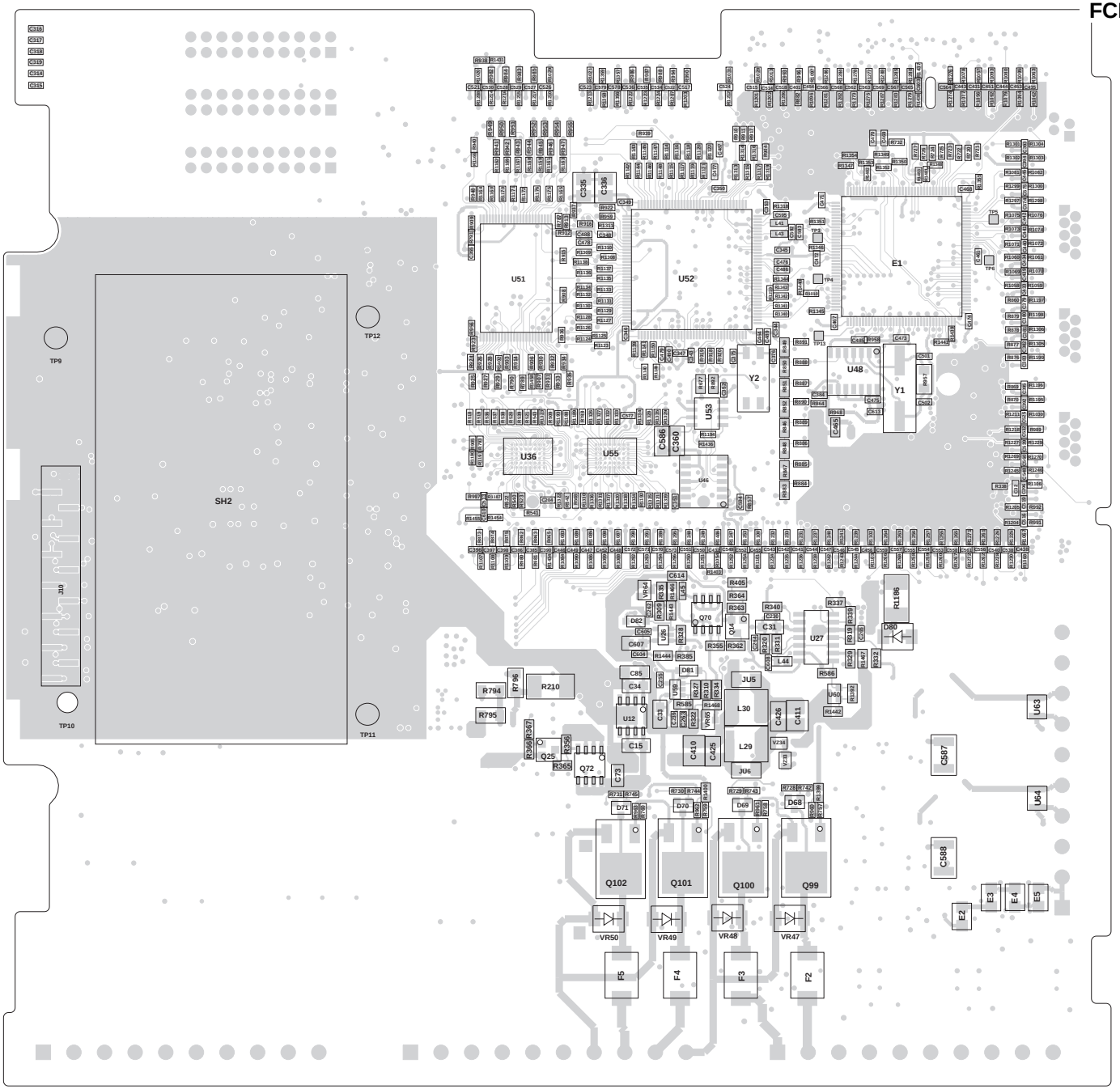
O1○ 79B02963C16-O

O8○ 79B02963C18-O

8486418T01_P4

MOSCAD-M Main Board

FCN6088A



SHOWN FROM SIDE 2

L1 ○ 79B02963C17-O

L8 ○ 79B02963C19-O

Parts List – Main Board - DESIGN: 8486418t01 FILE: fcn6088a

Reference Symbol	Motorola Part No.	Description
C6	2311049C11	CAPP_100u
C7-8	2311049C06	CAPP_22u
C9-10	2311049C09	CAPP_10u
C11	2360567A04	CAPP_220u
C12-13	2311049A63	CAPP_10.000u
C14	2311049A62	CAPP_4.7u
C15	2311049A34	CAPP_0.33u
C31	2311049A07	CAPP_1u
C32	2113928A01	CAP_1u
C33-34	2311049A07	CAPP_1u
C60	2113928A01	CAP_1u
C61	2113743B23	CAP_330n
C72-73	2113743A19	CAP_100n
C74-75	2113741M69	CAP_100n
C76	2113741T69	CAP_100n
C77	2113741F29	CAP_1.5n
C78	2113741F25	CAP_1n
C80	2113741F17	CAP_470p
C84-85	2113741B69	CAP_100n
C92	2113743E20	CAP_100n
C103	2113741A45	CAP_10n
C104	2113740F53	CAP_120p
C106	2113740F41	CAP_39p
C111	2113740B73	CAP_1n
C112	2113740F67	CAP_470p
C113	2113740F53	CAP_120p
C128-129	2113740R55	CAP_100p
C204	2113743E20	CAP_100n
C209-222	2113740A77	CAP_820PF
C223-226	2360567A06	CAPP_100u
C230	2113743E20	CAP_100n
C239-241	2113743E20	CAP_100n
C243-246	2113743E20	CAP_100n
C255	2113741F49	CAP_10n
C261-266	2113741F25	CAP_1n
C267	2113740F47	CAP_68p
C268	2113741B69	CAP_100n
C272-273	2113741A45	CAP_10n
C282	2113740F51	CAP_100p
C292	2113740F51	CAP_100p
C296	2113741F01	CAP_100p
C297	2113740A44	CAP_43p
C316	2113740F51	CAP_100p
C320-330	2113743E20	CAP_100n
C332	2109720D01	CAP_10n
C335-336	2311049A63	CAPP_10.000u
C337-338	2360567A06	CAPP_100u
C341	2113928K09	CAP_10u
C343-353	2113743E20	CAP_100n

C355	2113743E20	CAP_100n
C357	2113743A31	CAP_1U
C359	2113743B29	CAP_1u
C360-361	2113743B23	CAP_330n
C364	2113743A23	CAP_220n
C365	2113743K16	CAP_220n
C366	2113743A23	CAP_220n
C367-370	2113743E20	CAP_100n
C371-373	2113741F49	CAP_10n
C374	2113740F44	CAP_51p
C375-376	2113740F34	CAP_20p
C379-380	2113740F51	CAP_100p
C381-382	2113740F34	CAP_20p
C383-386	2113740F51	CAP_100p
C390	2113740F51	CAP_100p
C392	2113740F51	CAP_100p
C393-394	2113740F34	CAP_20p
C395	2113740F51	CAP_100p
C396-398	2113740F34	CAP_20p
C401	2113740F51	CAP_100p
C402-407	2113740R55	CAP_100p
C408-409	2113740F51	CAP_100p
C410-412	2311049A08	ECAP_1UF
C414	2113740F51	CAP_100p
C415-424	2113741D28	CAP_220NF
C425-426	2113741B69	CAP_100NF
C428	2113743E20	CAP_100n
C429-430	2113741B69	CAP_100NF
C431-435	2113740F51	CAP_100PF
C438-449	2113740F51	CAP_100PF
C451-456	2113740F51	CAP_100PF
C457-460	2113740F44	CAP_51PF
C461	2113928P04	CAP_1u
C464	2113743K16	CAP_220n
C465	2113743F17	CAP_1.5u
C467-475	2113743E20	CAP_100n
C476-484	2113741F49	CAP_10n
C485	2113741F33	CAP_2.2n
C486-490	2113741F01	CAP_100p
C491	2113743E20	CAP_100n
C494-500	2113741F41	CAP_4.7n
C501-502	2113740F37	CAP_27p
C503-504	2113741F29	CAP_1.5n
C505-507	2113741F25	CAP_1n
C508	2113740F61	CAP_270p
C509	2113741F11	CAP_270p
C512	2113743E20	CAP_100n
C513	2113928A01	CAP_1u
C514-519	2113740F51	CAP_100p
C521-530	2113740F51	CAP_100p
C532	2113740F51	CAP_100p
C534-536	2113740F51	CAP_100p
C538-576	2113740F51	CAP_100p

C577	2113743E20	CAP_100n
C578-579	2113740F34	CAP_20p
C580-581	2113740F51	CAP_100p
C582-584	2380090M35	CAPP_100u
C586	2113743B23	CAP_330n
C587-588	2113741D32	CAP_330n
C589-590	2311049A72	CAPP_10u
C591	2113928C04	CAP_4.700u
C592-593	2113740F51	CAP_100p
C594-598	2113743E20	CAP_100n
C599-600	2113741F29	CAP_1.5n
C601-602	2113740F55	CAP_150p
C603	2113740F51	CAP_100p
C604	2113743E20	CAP_100n
C605	2113741F49	CAP_10n
C606	2113743E20	CAP_100n
C607	2311049A07	CAPP_1u
C608	2113928A01	CAP_1u
C609	2113741A43	NO_DESC
C610	2113740F51	CAP_100PF
C611	2113741F49	CAP_10n
C612	2113743A31	CAP_1U
C613	2113740F51	CAP_100p
C614	2113740A43	CAP_39p
C615	2113740F43	CAP_47p
C616	2113743E20	CAP_100n
C617	2113741F29	CAP_1.5n
C618-619	2113743B27	CAP_680n
C620	2113743E20	CAP_100n
CR1-24	4813830A37	ZENER_MMBZ5254L
CR25-26	4813833C09	DIODE_MMBD914T
D8	4813833C09	MMBD914
D30	4813833B16	MBR0520LT1
D31	4813833B02	MBRS340T
D32	4813833B01	MBRS140
D33	4813833A02	MBRD640
D45-64	4886980J01	KPL-3015LSRC
D65	4805129M90	BAT54
D66-67	4805218N66	1SS315TPH3
D68-79	4813833C09	MMBD914
D80	4813833B07	MURS120
D83-85	4813833B16	MBR0520LT1
E1	5182427Y04	XCS20XL3TQ14I
E2-9	2484657R01	57R01
F1	0904923K01	SMD_FUSE_HOLD
F2-5	6586604U02	FUSE
F6	6586604U01	FUSE
FL1	9108445S04	FM60R
FL2-3	9108445S03	NFM61R
J7-8	0986164U01	CONN_J
J9	0986995J02	CONN_J
J10	2880429L02	CONN_P
J11	0986164U01	CONN_J

J14	2880374L02	CONN_P
J15	2880374L11	CONN_P
J16	0980387L04	CONN_J
K1-4	8086238J03	EE2_3TNU_L
L1	2486275J02	IDCTR_10u
L2	2486085A02	IDCTR_15u
L4-5	2409646B17	IDCTR_22u
L16-20	2402601S05	IND_BLM21A05
L21	2486275J02	IDCTR_10u
L22-28	2402601S05	IND_BLM21A05
L29-30	2409646B29	IND_220UH
L31-38	2402601S06	IND_BLM11A12
L39	2402601S05	IND_BLM21A05
L41	2413926G02	IDCTR_3.9n
L42	2486085A02	IDCTR_15u
L43	2413926G02	IDCTR_3.9n
L44	2462587Q51	IDCTR_2.2u
L45	2413926G02	IDCTR_3.9n
L46	2462587N69	IDCTR_1.2u
P1-4	2886105U01	NO_DESC
P11	2802935S07	CONN_P
Q1-2	4813824A73	MMBT2907A
Q5	4813824A17	MMBT3906
Q14	4813824A10	MMBT3904
Q25	4813824A10	MMBT3904
Q33-34	4813824A10	MMBT3904
Q55	4813823A29	MGSF3441VT1
Q59	4813823A07	2N7002
Q64-65	4813821A28	MTB23P06V
Q70-71	4802393L32	SI9407AEY
Q72	4802393L27	SI9424DY
Q73	4802393L31	SI9945AEY
Q81-82	5102806C08	SFH61865
Q87	4809807C37	SI6969DQ
Q88-95	4813824A11	MMBT2222A
Q96-97	4813824A10	MMBT3904
Q98	4813823A07	2N7002
Q99-102	4813821A36	MTD3055VLT4
Q103	4813821A28	MTB23P06V
Q104	4813821A17	MMDF2P02H
Q105	4809579E35	FDG6301N
Q106-107	4813824A10	NPN_3904L
Q108-110	5102806C02	TIL196B
Q111-112	4813824A65	MMBT3904WT1
Q113-116	4813824A10	MMBT3904
Q118	4802393L73	SI2302DS
Q120-121	4802393L69	SI2312DS
R33-34	0683962T01	RES_1
R35	0662057R78	RES_27.4K
R37	0662057D02	RES_12K
R40	0662057C01	RES_0
R66	0611077G76	RES_75K
R71	0611077G55	RES_45.3K

R108-109	0662057D24	RES_100K
R113-118	0662057D17	RES_51K
R119-122	0662057D11	RES_30K
R125-126	0662057D07	RES_20K
R129-132	0662057C99	RES_10K
R155-156	0662057C62	RES_300
R160-161	0662057C75	RES_1K
R202	0611077A01	RES_0
R205-206	0604965K06	RES_0.04
R208-210	0604965K06	RES_0.04
R309	0662057R89	RES_40.2K
R310	0662057R95	RES_51.1K
R318	0662057R93	RES_49.9K
R319	0662057R92	RES_47.5K
R320-321	0662057R89	RES_40.2K
R322	0662057R76	RES_26.1K
R327-328	0662057G64	RES_1M
R329	0662057G13	RES_100K
R331-332	0662057G46	RES_392K
R333	0662057G39	RES_324K
R334-335	0662057G13	RES_100K
R337	0662057G13	RES_100K
R338	0662057A97	RES_100K
R339-340	0662057G13	RES_100K
R354	0662057D41	RES_510K
R355-357	0662057D24	RES_100K
R362-368	0662057D17	RES_51K
R369	0662057D24	RES_100K
R370-371	0662057D17	RES_51K
R386	0662057C99	RES_10K
R402	0662057C99	RES_10K
R405	0662057C01	RES_0
R411-412	0662057C01	RES_0
R414	0662057C01	RES_0
R440	0662057B22	RES_1M
R444-445	0662057C81	RES_1.8K
R508-509	0662057A17	RES_47
R518-523	0662057A17	RES_47
R536-543	0662057A17	RES_47
R583	0611079G77	RES_61.9K
R586	0662057D07	RES_20K
R587	0604132K01	RES_76.8K
R632	0662057C01	RES_0
R637-638	0662057B47	RES_0
R640-663	0683962T72	RES_910
R664	0662057B47	RES_0
R666	0662057B14	RES_470K
R667	0662057B47	RES_0
R668	0662057B22	RES_1M
R669-676	0662057A49	RES_1K
R677	0662057D48	RES_1M
R678-679	0662057P97	RES_150K
R681	0611079E30	RES_200K

R682	0611077H08	RES_158K
R683-684	0662057P95	RES_100K
R685	0662057P10	RES_10K
R686	0662057P95	RES_100K
R687	0611077G73	RES_69.8K
R688	0662057A93	RES_68K
R689	0662057G01	RES_60.4K
R690	0662057P97	RES_150K
R691-693	0662057R88	RES_39.2K
R694	0611077G36	RES_28.7K
R695	0662057R74	RES_23.7K
R696	0611077G13	RES_16.5K
R697	0611077F52	RES_3.92K
R698	0662057P14	RES_12.1K
R699	0662057P13	RES_11K
R700	0662057P10	RES_10K
R701	0662057R74	RES_23.7K
R703-704	0662057R44	RES_3.32K
R705	0662057P10	RES_10K
R706	0611077F88	RES_9.31K
R707	0611077F86	RES_8.87K
R708	0662057R56	RES_7.87K
R709	0611077F66	RES_5.49K
R710	0611077F65	RES_5.36K
R711	0611077G76	RES_75K
R712-714	0662057C82	RES_2K
R715	0662057R60	RES_10K
R716	0662057R30	RES_1K
R717	0611077E66	RES_511
R718	0662057D41	RES_510K
R719	0662057B14	RES_470K
R720	0662057A97	RES_100K
R723	0662057A97	RES_100K
R725	0662057A97	RES_100K
R727-733	0662057A97	RES_100K
R734	0611077B20	RES_75K
R735	0662057A90	RES_51K
R737	0662057A89	RES_47K
R738	0611077B14	RES_43K
R741	0611077B16	RES_51K
R742-745	0662057A73	RES_10K
R746	0662057P95	RES_100K
R747-750	0662057A65	RES_4.7K
R751	0611077A88	RES_3.9K
R754	0662057A60	RES_3K
R757-760	0662057A36	RES_300
R761	0662057A49	RES_1K
R762-773	0611077A69	RES_620
R774-785	0611077A65	RES_430
R786	0662057A19	RES_56
R787-791	0662057B47	RES_0
R793	0662057B47	RES_0
R797-798	0662057B47	RES_0

R820-821	0662057A97	RES_100K
R822	0662057A73	RES_10K
R823-829	0662057A97	RES_100K
R830	0662057A73	RES_10K
R831	0662057A97	RES_100K
R832-833	0662057P10	RES_10K
R834-836	0662057A73	RES_10K
R837	0662057P10	RES_10K
R838	0662057P95	RES_100K
R839	0662057P10	RES_10K
R846-852	0662057R93	RES_49.9K
R853-854	0662057R60	RES_10K
R855-856	0662057R55	RES_7.5K
R857	0662057P95	RES_100K
R860	0662057A49	RES_1K
R862-865	0662057A49	RES_1K
R869-870	0662057A49	RES_1K
R873-875	0662057A27	RES_120
R876	0662057A49	RES_1K
R877-878	0662057A27	RES_120
R879	0662057A49	RES_1K
R882	0662057A49	RES_1K
R883	0662057G13	RES_100K
R884-891	0662057P95	RES_100K
R892	0662057D51	RES_1.3M
R893	0662057C99	RES_10K
R894-901	0662057A55	RES_1.8K
R957	0611077B47	RES_1M
R958	0662057B14	RES_470K
R959	0662057A97	RES_100K
R960-963	0662057B14	RES_470K
R964-965	0662057A97	RES_100K
R966-967	0662057C99	RES_10K
R968	0662057A71	RES_8.2K
R969-970	0662057C91	RES_4.7K
R971-978	0662057A36	RES_300
R980-990	0662057A49	RES_1K
R991-992	0662057A36	RES_300
R993-994	0662057A49	RES_1K
R996-997	0662057A49	RES_1K
R1010	0662057A49	RES_1K
R1013	0662057A49	RES_1K
R1020	0662057A25	RES_100
R1021	0662057A49	RES_1K
R1028-1031	0662057A49	RES_1K
R1034-1053	0662057A47	RES_820
R1054-1063	0662057A33	RES_220
R1067-1090	0662057A33	RES_220
R1092-1103	0662057A33	RES_220
R1106	0662057A49	RES_1K
R1107-1109	0662057A27	RES_120
R1114-1150	0662057A17	RES_47
R1159-1172	0662057A17	RES_47

R1175-1176	0662057A17	RES_47
R1183	0662057P10	RES_10K
R1186	0683962T01	RES_1
R1187	0662057A90	RES_51K
R1195-1199	0662057A49	RES_1K
R1201-1203	0662057A49	RES_1K
R1204-1205	0662057A36	RES_300
R1206-1207	0662057A49	RES_1K
R1208	0662057A25	RES_100
R1210-1219	0662057A49	RES_1K
R1222-1300	0662057A49	RES_1K
R1301-1306	0662057A27	RES_120
R1308-1311	0662057A17	RES_47
R1313-1319	0662057A17	RES_47
R1324-1339	0662057A17	RES_47
R1340-1355	0662057A49	RES_1K
R1356-1359	0662057A27	RES_120
R1361	0662057A84	RES_30K
R1362	0662057A73	RES_10K
R1363	0662057A84	RES_30K
R1364	0662057A73	RES_10K
R1365	0662057A84	RES_30K
R1366-1367	0662057A73	RES_10K
R1368	0662057A97	RES_100K
R1369	0662057A73	RES_10K
R1370	0662057A97	RES_100K
R1371	0662057A73	RES_10K
R1372	0662057A97	RES_100K
R1373	0662057A73	RES_10K
R1374	0662057A97	RES_100K
R1375	0662057A73	RES_10K
R1376	0662057A97	RES_100K
R1377	0662057A73	RES_10K
R1378	0662057A97	RES_100K
R1379	0662057A73	RES_10K
R1380	0662057A97	RES_100K
R1381-1382	0662057A80	RES_20K
R1383-1384	0662057A60	RES_3K
R1385-1386	0662057A49	RES_1K
R1387-1389	0662057B47	RES_0
R1390	0611077A01	RES_0
R1392	0662057G08	RES_82.5K
R1396	0662057C62	RES_300
R1398-1401	0662057C01	RES_0
R1402	0662057B47	RES_0
R1409	0662057B47	RES_0
R1410	0662057A73	NO_DESC_10K
R1412	0662057B22	RES_1M
R1414	0662057B09	RES_300K
R1415	0662057A97	RES_100K
R1416-1429	0662057A90	RES_51K
R1431	0662057A73	RES_10K
R1432	0662057T61	RES_7.5K

R1434	0662057A49	RES_1K
R1436-1438	0662057A49	RES_1K
R1439-1441	0662057A17	RES_47
R1442	0662057G18	RES_127K
R1443	0662057R95	RES_51.1K
R1446	0662057A33	RES_220
R1448-1449	0662057A97	RES_100K
R1450-1451	0662057A73	RES_10K
R1452	0662057D24	NO_DESC_100K
R1453	0662057C82	RES_2K
R1454-1455	0662057A33	RES_220
R1456-1457	0662057B47	RES_0
R1458	0662057B14	RES_470K
R1459	0662057C67	RES_470
R1460-1461	0611077G76	RES_75K
R1462	0662057R88	RES_39.2K
R1463	0662057C01	RES_0
R1466	0662057R93	RES_49.9K
R1467	0662057G64	RES_1M
R1468	0662057G01	RES_60.4K
R1469	0662057D17	RES_51K
R1470	0662057C75	RES_1K
R1474	0662057C01	RES_0
R1475	0662057R74	RES_23.7K
R1476-1480	0662057P10	RES_10K
R1481	0662057B47	RES_0
R1483	0662057A97	RES_100K
R1484	0662057A73	NO_DESC_10K
RV2	4804645P04	VC080526C580
RV6	4804645P06	VC080518C400
SH1	2686668J01	SHIELD
SH3	2686668J01	SHIELD
SW1	4086161U01	SWITCH
U1	5113819A02	LM2902
U12	5113816A03	MC78L05AB
U22	5104944K04	TC7S14F
U24	5104187K45	LT13741HVIR
U25	5104187K29	LTC1435IS
U26	5186214J37	MAX917EUK
U27	5186214J48	LP2901D
U30-31	5113817A03	MC33171D
U32	5113816A47	MC78LC30NTR
U34	5108428S89	MAX3483EESA
U35	5108428S65	MAX3243EEAI
U36	5185145C01	KM616FU2010AZI
U37	5113820A03	LM2901
U38-39	5113819A07	MC33174
U40	5113818A02	MC33272
U41-42	5113806A20	MC14053B
U43-45	5113805A75	MC74HC595A
U46	5113805A09	MC74HC14A
U47	5113805A02	MC74HC02A
U48	5113805A01	MC74HC00A

U51	5186249J54	TE28F800C3T
U52	5113802B34	MC68VZ328CPV33V
U53	5108408S57	MAX6303ESA
U54	5104944K04	TC7S14F
U55	5185145C01	KM616FU2010AZI
U56	5108428S65	MAX3243EEAI
U57	5105492X04	TC7SH08F
U58	5104944K04	TC7S14F
U59	5186214J37	MAX917EUK
U60	5104646P02	LM4041CIM3
U63-66	4804645P08	VARIS_60
U67-68	0608303Y01	VARIS_85
U69	5113820A03	LM2901
U70	5104931K05	TCTSZ32FU
VR5	4813830A40	MMBZ5257B
VR7	4813830A22	MMBZ5239B
VR46	4813830A39	MMBZ5256B
VR47-50	4813831A39	1SMB5936B
VR51	4813830A23	MMBZ5240B
VR52-63	4813831A14	ZENER_SMB5918
VR64-65	4813830A25	MMBZ5242B
VZ1	4804645P08	VARIS_60
VZ29	0608303Y01	VARIS_85
VZ31-32	0602811C01	VARIS_14V
VZ33-34	4804645P02	VARIS_5.6
VZ35-46	0686391J02	VARISTOR
Y1	4802582S09	XTAL
Y2	4802582S10	CRYSTAL_32.768K

Parts List – Main Board - DESIGN: 8486418t01 FILE: fcn6089a

Reference Symbol	Motorola Part No.	Description
C6	2311049C11	CAPP_100u
C7-8	2311049C06	CAPP_22u
C9-10	2311049C09	CAPP_10u
C11	2360567A04	CAPP_220u
C12-13	2311049A63	CAPP_10.000u
C14	2311049A62	CAPP_4.7u
C15	2311049A34	CAPP_0.33u
C31	2311049A07	CAPP_1u
C32	2113928A01	CAP_1u
C33-34	2311049A07	CAPP_1u
C60	2113928A01	CAP_1u
C61	2113743B23	CAP_330n
C72-73	2113743A19	CAP_100n
C74-75	2113741M69	CAP_100n
C76	2113741T69	CAP_100n
C77	2113741F29	CAP_1.5n
C78	2113741F25	CAP_1n
C80	2113741F17	CAP_470p
C84-85	2113741B69	CAP_100n
C92	2113743E20	CAP_100n
C103	2113741A45	CAP_10n
C104	2113740F53	CAP_120p
C106	2113740F41	CAP_39p
C111	2113740B73	CAP_1n
C112	2113740F67	CAP_470p
C113	2113740F53	CAP_120p
C128-129	2113740R55	CAP_100p
C204	2113743E20	CAP_100n
C209-222	2113740A77	CAP_820PF
C223-226	2360567A06	CAPP_100u
C230	2113743E20	CAP_100n
C239-241	2113743E20	CAP_100n
C243-246	2113743E20	CAP_100n
C255	2113741F49	CAP_10n
C261-266	2113741F25	CAP_1n
C267	2113740F47	CAP_68p
C268	2113741B69	CAP_100n
C272-273	2113741A45	CAP_10n
C282	2113740F51	CAP_100p
C292	2113740F51	CAP_100p
C296	2113741F01	CAP_100p
C297	2113740A44	CAP_43p
C317	2113740F51	CAP_100p
C320-330	2113743E20	CAP_100n
C332	2109720D01	CAP_10n
C335-336	2311049A63	CAPP_10.000u
C337-338	2360567A06	CAPP_100u
C341	2113928K09	CAP_10u
C343-353	2113743E20	CAP_100n

C355	2113743E20	CAP_100n
C357	2113743A31	CAP_1U
C359	2113743B29	CAP_1u
C360-361	2113743B23	CAP_330n
C364	2113743A23	CAP_220n
C365	2113743K16	CAP_220n
C366	2113743A23	CAP_220n
C367-370	2113743E20	CAP_100n
C371-373	2113741F49	CAP_10n
C374	2113740F44	CAP_51p
C375-376	2113740F34	CAP_20p
C379-380	2113740F51	CAP_100p
C381-382	2113740F34	CAP_20p
C383-386	2113740F51	CAP_100p
C390	2113740F51	CAP_100p
C392	2113740F51	CAP_100p
C393-394	2113740F34	CAP_20p
C395	2113740F51	CAP_100p
C396-398	2113740F34	CAP_20p
C401	2113740F51	CAP_100p
C402-407	2113740R55	CAP_100p
C408-409	2113740F51	CAP_100p
C410-412	2311049A08	ECAP_1UF
C414	2113740F51	CAP_100p
C415-424	2113741D28	CAP_220NF
C425-426	2113741B69	CAP_100NF
C428	2113743E20	CAP_100n
C429-430	2113741B69	CAP_100NF
C431-435	2113740F51	CAP_100PF
C438-449	2113740F51	CAP_100PF
C451-456	2113740F51	CAP_100PF
C457-460	2113740F44	CAP_51PF
C461	2113928P04	CAP_1u
C464	2113743K16	CAP_220n
C465	2113743F17	CAP_1.5u
C467-475	2113743E20	CAP_100n
C476-484	2113741F49	CAP_10n
C485	2113741F33	CAP_2.2n
C486-490	2113741F01	CAP_100p
C491	2113743E20	CAP_100n
C494-500	2113741F41	CAP_4.7n
C501-502	2113740F37	CAP_27p
C503-504	2113741F29	CAP_1.5n
C505-507	2113741F25	CAP_1n
C508	2113740F61	CAP_270p
C509	2113741F11	CAP_270p
C512	2113743E20	CAP_100n
C513	2113928A01	CAP_1u
C514-519	2113740F51	CAP_100p
C521-530	2113740F51	CAP_100p
C532	2113740F51	CAP_100p
C534-536	2113740F51	CAP_100p
C538-576	2113740F51	CAP_100p

C577	2113743E20	CAP_100n
C578-579	2113740F34	CAP_20p
C580-581	2113740F51	CAP_100p
C582-584	2380090M35	CAPP_100u
C586	2113743B23	CAP_330n
C587-588	2113741D32	CAP_330n
C589-590	2311049A72	CAPP_10u
C591	2113928C04	CAP_4.700u
C592-593	2113740F51	CAP_100p
C594-598	2113743E20	CAP_100n
C599-600	2113741F29	CAP_1.5n
C601-602	2113740F55	CAP_150p
C603	2113740F51	CAP_100p
C604	2113743E20	CAP_100n
C605	2113741F49	CAP_10n
C606	2113743E20	CAP_100n
C607	2311049A07	CAPP_1u
C608	2113928A01	CAP_1u
C609	2113741A43	NO_DESC
C610	2113740F51	CAP_100PF
C611	2113741F49	CAP_10n
C612	2113743A31	CAP_1U
C613	2113740F51	CAP_100p
C614	2113740A43	CAP_39p
C615	2113740F43	CAP_47p
C616	2113743E20	CAP_100n
C617	2113741F29	CAP_1.5n
C618-619	2113743B27	CAP_680n
C620	2113743E20	CAP_100n
CR1-24	4813830A37	ZENER_MMBZ5254L
CR25-26	4813833C09	DIODE_MMBD914T
D8	4813833C09	MMBD914
D30	4813833B16	MBR0520LT1
D31	4813833B02	MBRS340T
D32	4813833B01	MBRS140
D33	4813833A02	MBRD640
D45-64	4886980J01	KPL-3015LSRC
D65	4805129M90	BAT54
D66-67	4805218N66	1SS315TPH3
D68-79	4813833C09	MMBD914
D80	4813833B07	MURS120
D83-85	4813833B16	MBR0520LT1
E1	5182427Y04	XCS20XL3TQ14I
E2-9	2484657R01	57R01
F1	0904923K01	SMD_FUSE_HOLD
F2-5	6586604U02	FUSE
F6	6586604U01	FUSE
FL1	9108445S04	FM60R
FL2-3	9108445S03	NFM61R
J7-8	0986164U01	CONN_J
J9	0986995J02	CONN_J
J10	2880429L02	CONN_P
J11	0986164U01	CONN_J

J14	2880374L02	CONN_P
J15	2880374L11	CONN_P
J16	0980387L04	CONN_J
K1-4	8086238J03	EE2_3TNU_L
L1	2486275J02	IDCTR_10u
L2	2486085A02	IDCTR_15u
L4-5	2409646B17	IDCTR_22u
L16-20	2402601S05	IND_BLM21A05
L21	2486275J02	IDCTR_10u
L22-28	2402601S05	IND_BLM21A05
L29-30	2409646B29	IND_220UH
L31-38	2402601S06	IND_BLM11A12
L39	2402601S05	IND_BLM21A05
L41	2413926G02	IDCTR_3.9n
L42	2486085A02	IDCTR_15u
L43	2413926G02	IDCTR_3.9n
L44	2462587Q51	IDCTR_2.2u
L45	2413926G02	IDCTR_3.9n
L46	2462587N69	IDCTR_1.2u
P1-4	2886105U01	NO_DESC
P11	2802935S07	CONN_P
P12-14	2808044H09	CONN_P
Q1-2	4813824A73	MMBT2907A
Q5	4813824A17	MMBT3906
Q14	4813824A10	MMBT3904
Q25	4813824A10	MMBT3904
Q33-34	4813824A10	MMBT3904
Q55	4813823A29	MGSF3441VT1
Q59	4813823A07	2N7002
Q64-65	4813821A28	MTB23P06V
Q70-71	4802393L32	SI9407AEY
Q72	4802393L27	SI9424DY
Q73	4802393L31	SI9945AEY
Q81-82	5102806C08	SFH61865
Q87	4809807C37	SI6969DQ
Q88-95	4813824A11	MMBT2222A
Q96-97	4813824A10	MMBT3904
Q98	4813823A07	2N7002
Q99-102	4813821A36	MTD3055VLT4
Q103	4813821A28	MTB23P06V
Q104	4813821A17	MMDF2P02H
Q105	4809579E35	FDG6301N
Q106-107	4813824A10	NPN_3904L
Q108-110	5102806C02	TIL196B
Q111-112	4813824A65	MMBT3904WT1
Q113-116	4813824A10	MMBT3904
Q118	4802393L73	SI2302DS
Q120-121	4802393L69	SI2312DS
R33-34	0683962T01	RES_1
R35	0662057R78	RES_27.4K
R37	0662057D02	RES_12K
R40	0662057C01	RES_0
R66	0611077G76	RES_75K

R71	0611077G55	RES_45.3K
R108-109	0662057D24	RES_100K
R113-118	0662057D17	RES_51K
R119-122	0662057D11	RES_30K
R125-126	0662057D07	RES_20K
R129-132	0662057C99	RES_10K
R155-156	0662057C62	RES_300
R160-161	0662057C75	RES_1K
R202	0611077A01	RES_0
R205-206	0604965K06	RES_0.04
R208-210	0604965K06	RES_0.04
R309	0662057R89	RES_40.2K
R310	0662057R95	RES_51.1K
R318	0662057R93	RES_49.9K
R319	0662057R92	RES_47.5K
R320-321	0662057R89	RES_40.2K
R322	0662057R76	RES_26.1K
R327-328	0662057G64	RES_1M
R329	0662057G13	RES_100K
R331-332	0662057G46	RES_392K
R333	0662057G39	RES_324K
R334-335	0662057G13	RES_100K
R337	0662057G13	RES_100K
R338	0662057A97	RES_100K
R339-340	0662057G13	RES_100K
R354	0662057D41	RES_510K
R355-357	0662057D24	RES_100K
R362-368	0662057D17	RES_51K
R369	0662057D24	RES_100K
R370-371	0662057D17	RES_51K
R386	0662057C99	RES_10K
R402	0662057C99	RES_10K
R405	0662057C01	RES_0
R411-412	0662057C01	RES_0
R414	0662057C01	RES_0
R440	0662057B22	RES_1M
R444-445	0662057C81	RES_1.8K
R508-509	0662057A17	RES_47
R518-523	0662057A17	RES_47
R536-543	0662057A17	RES_47
R583	0611079G77	RES_61.9K
R586	0662057D07	RES_20K
R587	0604132K01	RES_76.8K
R632	0662057C01	RES_0
R637-638	0662057B47	RES_0
R640-663	0683962T72	RES_910
R664	0662057B47	RES_0
R666	0662057B14	RES_470K
R667	0662057B47	RES_0
R668	0662057B22	RES_1M
R669-676	0662057A49	RES_1K
R677	0662057D48	RES_1M
R678-679	0662057P97	RES_150K

R681	0611079E30	RES_200K
R682	0611077H08	RES_158K
R683-684	0662057P95	RES_100K
R685	0662057P10	RES_10K
R686	0662057P95	RES_100K
R687	0611077G73	RES_69.8K
R688	0662057A93	RES_68K
R689	0662057G01	RES_60.4K
R690	0662057P97	RES_150K
R691-693	0662057R88	RES_39.2K
R694	0611077G36	RES_28.7K
R695	0662057R74	RES_23.7K
R696	0611077G13	RES_16.5K
R697	0611077F52	RES_3.92K
R698	0662057P14	RES_12.1K
R699	0662057P13	RES_11K
R700	0662057P10	RES_10K
R701	0662057R74	RES_23.7K
R703-704	0662057R44	RES_3.32K
R705	0662057P10	RES_10K
R706	0611077F88	RES_9.31K
R707	0611077F86	RES_8.87K
R708	0662057R56	RES_7.87K
R709	0611077F66	RES_5.49K
R710	0611077F65	RES_5.36K
R711	0611077G76	RES_75K
R712-714	0662057C82	RES_2K
R715	0662057R60	RES_10K
R716	0662057R30	RES_1K
R717	0611077E66	RES_511
R718	0662057D41	RES_510K
R719	0662057B14	RES_470K
R720	0662057A97	RES_100K
R723	0662057A97	RES_100K
R725	0662057A97	RES_100K
R727-733	0662057A97	RES_100K
R734	0611077B20	RES_75K
R735	0662057A90	RES_51K
R737	0662057A89	RES_47K
R738	0611077B14	RES_43K
R741	0611077B16	RES_51K
R742-745	0662057A73	RES_10K
R746	0662057P95	RES_100K
R747-750	0662057A65	RES_4.7K
R751	0611077A88	RES_3.9K
R754	0662057A60	RES_3K
R757-760	0662057A36	RES_300
R761	0662057A49	RES_1K
R762-773	0611077A69	RES_620
R774-785	0611077A65	RES_430
R786	0662057A19	RES_56
R787-791	0662057B47	RES_0
R793	0662057B47	RES_0

R797-798	0662057B47	RES_0
R820-821	0662057A97	RES_100K
R822	0662057A73	RES_10K
R823-829	0662057A97	RES_100K
R830	0662057A73	RES_10K
R831	0662057A97	RES_100K
R832-833	0662057P10	RES_10K
R834-836	0662057A73	RES_10K
R837	0662057P10	RES_10K
R838	0662057P95	RES_100K
R839	0662057P10	RES_10K
R846-852	0662057R93	RES_49.9K
R853-854	0662057R60	RES_10K
R855-856	0662057R55	RES_7.5K
R857	0662057P95	RES_100K
R860	0662057A49	RES_1K
R862-865	0662057A49	RES_1K
R869-870	0662057A49	RES_1K
R873-875	0662057A27	RES_120
R876	0662057A49	RES_1K
R877-878	0662057A27	RES_120
R879	0662057A49	RES_1K
R882	0662057A49	RES_1K
R883	0662057G13	RES_100K
R884-891	0662057P95	RES_100K
R892	0662057D51	RES_1.3M
R893	0662057C99	RES_10K
R894-901	0662057A55	RES_1.8K
R903-917	0662057B47	RES_0
R922-956	0662057B47	RES_0
R957	0611077B47	RES_1M
R958	0662057B14	RES_470K
R959	0662057A97	RES_100K
R960-963	0662057B14	RES_470K
R964-965	0662057A97	RES_100K
R966-967	0662057C99	RES_10K
R968	0662057A71	RES_8.2K
R969-970	0662057C91	RES_4.7K
R971-978	0662057A36	RES_300
R980-990	0662057A49	RES_1K
R991-992	0662057A36	RES_300
R993-994	0662057A49	RES_1K
R996-997	0662057A49	RES_1K
R1010	0662057A49	RES_1K
R1013	0662057A49	RES_1K
R1020	0662057A25	RES_100
R1021	0662057A49	RES_1K
R1028-1031	0662057A49	RES_1K
R1034-1053	0662057A47	RES_820
R1054-1063	0662057A33	RES_220
R1067-1090	0662057A33	RES_220
R1092-1103	0662057A33	RES_220
R1106	0662057A49	RES_1K

R1107-1109	0662057A27	RES_120
R1114-1150	0662057A17	RES_47
R1159-1172	0662057A17	RES_47
R1175-1176	0662057A17	RES_47
R1183	0662057P10	RES_10K
R1186	0683962T01	RES_1
R1187	0662057A90	RES_51K
R1189	0662057A73	RES_10K
R1191	0662057A73	RES_10K
R1192-1193	0662057B47	RES_0
R1195-1199	0662057A49	RES_1K
R1201-1203	0662057A49	RES_1K
R1204-1205	0662057A36	RES_300
R1206-1207	0662057A49	RES_1K
R1208	0662057A25	RES_100
R1210-1219	0662057A49	RES_1K
R1222-1300	0662057A49	RES_1K
R1301-1306	0662057A27	RES_120
R1308-1311	0662057A17	RES_47
R1313-1339	0662057A17	RES_47
R1340-1355	0662057A49	RES_1K
R1356-1359	0662057A27	RES_120
R1361	0662057A84	RES_30K
R1362	0662057A73	RES_10K
R1363	0662057A84	RES_30K
R1364	0662057A73	RES_10K
R1365	0662057A84	RES_30K
R1366-1367	0662057A73	RES_10K
R1368	0662057A97	RES_100K
R1369	0662057A73	RES_10K
R1370	0662057A97	RES_100K
R1371	0662057A73	RES_10K
R1372	0662057A97	RES_100K
R1373	0662057A73	RES_10K
R1374	0662057A97	RES_100K
R1375	0662057A73	RES_10K
R1376	0662057A97	RES_100K
R1377	0662057A73	RES_10K
R1378	0662057A97	RES_100K
R1379	0662057A73	RES_10K
R1380	0662057A97	RES_100K
R1381-1382	0662057A80	RES_20K
R1383-1384	0662057A60	RES_3K
R1385-1386	0662057A49	RES_1K
R1387-1389	0662057B47	RES_0
R1390	0611077A01	RES_0
R1392	0662057G08	RES_82.5K
R1396	0662057C62	RES_300
R1398-1401	0662057C01	RES_0
R1402	0662057B47	RES_0
R1409	0662057B47	RES_0
R1410	0662057A73	NO_DESC_10K
R1412	0662057B22	RES_1M

R1414	0662057B09	RES_300K
R1415	0662057A97	RES_100K
R1416-1429	0662057A90	RES_51K
R1431	0662057A73	RES_10K
R1432	0662057T61	RES_7.5K
R1434	0662057A49	RES_1K
R1436-1438	0662057A49	RES_1K
R1439-1441	0662057A17	RES_47
R1442	0662057G18	RES_127K
R1443	0662057R95	RES_51.1K
R1446	0662057A33	RES_220
R1448-1449	0662057A97	RES_100K
R1450-1451	0662057A73	RES_10K
R1452	0662057D24	NO_DESC_100K
R1453	0662057C82	RES_2K
R1454-1455	0662057A33	RES_220
R1456-1457	0662057B47	RES_0
R1458	0662057B14	RES_470K
R1459	0662057C67	RES_470
R1460-1461	0611077G76	RES_75K
R1462	0662057R88	RES_39.2K
R1463	0662057C01	RES_0
R1466	0662057R93	RES_49.9K
R1467	0662057G64	RES_1M
R1468	0662057G01	RES_60.4K
R1469	0662057D17	RES_51K
R1470	0662057C75	RES_1K
R1474	0662057C01	RES_0
R1475	0662057R74	RES_23.7K
R1476-1480	0662057P10	RES_10K
R1481	0662057B47	RES_0
R1483	0662057A97	RES_100K
R1484	0662057A73	NO_DESC_10K
RV2	4804645P04	VC080526C580
RV6	4804645P06	VC080518C400
S2-3	4004929K01	SWITCH
SH1	2686668J01	SHIELD
SH3	2686668J01	SHIELD
SW1	4086161U01	SWITCH
U1	5113819A02	LM2902
U12	5113816A03	MC78L05AB
U22	5104944K04	TC7S14F
U24	5104187K45	LT13741HVIR
U25	5104187K29	LTC1435IS
U26	5186214J37	MAX917EUK
U27	5186214J48	LP2901D
U30-31	5113817A03	MC33171D
U32	5113816A47	MC78LC30NTR
U34	5108428S89	MAX3483EESA
U35	5108428S65	MAX3243EEAI
U36	5186249J60	NO_DESC
U37	5113820A03	LM2901
U38-39	5113819A07	MC33174

U40	5113818A02	MC33272
U41-42	5113806A20	MC14053B
U43-45	5113805A75	MC74HC595A
U46	5113805A09	MC74HC14A
U47	5113805A02	MC74HC02A
U48	5113805A01	MC74HC00A
U51	5186249J54	TE28F800C3T
U52	5113802B34	MC68VZ328CPV33V
U53	5108408S57	MAX6303ESA
U54	5104944K04	TC7S14F
U55	5186249J60	NO_DESC
U56	5108428S65	MAX3243EEAI
U57	5105492X04	TC7SH08F
U58	5104944K04	TC7S14F
U59	5186214J37	MAX917EUK
U60	5104646P02	LM4041CIM3
U63-66	4804645P08	VARIS_60
U67-68	0608303Y01	VARIS_85
U69	5113820A03	LM2901
U70	5104931K05	TCTSZ32FU
VR5	4813830A40	MMBZ5257B
VR7	4813830A22	MMBZ5239B
VR46	4813830A39	MMBZ5256B
VR47-50	4813831A39	1SMB5936B
VR51	4813830A23	MMBZ5240B
VR52-63	4813831A14	ZENER_SMB5918
VR64-65	4813830A25	MMBZ5242B
VZ1	4804645P08	VARIS_60
VZ29	0608303Y01	VARIS_85
VZ31-32	0602811C01	VARIS_14V
VZ33-34	4804645P02	VARIS_5.6
VZ35-46	0686391J02	VARISTOR
Y1	4802582S09	XTAL
Y2	4802582S10	CRYSTAL_32.768K

MOSCAD-M Main Board
FCN6088A

Main Board

expansion connector

J16-1 fgnd — 1 — fgnd

Vfloat — 2 — VFloat

V_Normal — 3 — V_Normal

Bat_GND — 4 — Bat_GND

CS_ID — 5 — PJ3_ex

9-30VDC — 6 — Vin

FPGA_AI1 — 7 — AI_cont_1

FPGA_AI2 — 8 — AI_cont_2

CS_EEROM — 9 — PB6_TOUT_TIN

FPGA_AI3 — 10 — AI_cont_3

FPGA_AI4 — 11 — AI_cont_4

FPGA_AI5 — 12 — AI_cont_5

FPGA_AI6 — 13 — AI_cont_6

SPI2_CLK — 14 — SPICLK2_IO

SPI2_Rx — 15 — SPIRXD2_IO

SPI2_Tx — 16 — SPITXD2_IO

FPGA_DI13 — 17 — di(13)

FPGA_DI14 — 18 — di(14)

FPGA_DI15 — 19 — di(15)

AI_SD — 20 — AI_SD — PC3_LD3

CS_AI — 21 — CS_AI — PM3

AO_SD — 22 — AO_SD — PB3

CS_AO — 23 — CS_AO — PM4

PGND — 24

Vfloat_GND — 25

PGND — 26

VFloat_GND

C316 FCN6088A

C317 FCN6089A

C318 FCN6090A

C319 FCN6091A

C314 FCN6092A

C315 FCN6093A

UARTS

4

shut_off_1_ — PF6

wakeup_toolbox — INT3

wakeup_user — IRQ1

RTS_ — PE6_RTS1

CTS_ — PE7_CTS1

RXD_ — PE4_RXD1

TXD_ — PE5_TXD1

RS485B_232 — PF5

CD2_ — PB2

RXD2_ — PJ4_RXD2

DTR2_ — PE3_UCLK

TXD2_ — PJ5_TXD2

RTS2_ — PJ6_RTS2

CTS2_ — PJ7_CTS2

CPU

1

Expansion_Future Use

PB6_TOUT_TIN — PB6_TOUT_TIN

PM3 — AI_Train_CS — PM3

PM4 — AO_Train_CS — PM4

PC3_LD3 — AI_Power_En — PC3_LD3

INT0 — DI1 — INT0

INT1 — DI2 — INT1

INT2 — DI3 — INT2

PB3 — AO_Power_En — PB3_CSC1

PF0_CONTRAST

PG1_A0

PB4

IRQ6

PM5

PG3_HIZ

PG4_EMUCS

PK7_LD7

PB7_PWM1

PM2 — LED_Train_CS — PM2

PE2_SPICLK2 — SPICLK2_IO

PE1_SPIRXD — SPIRXD2_IO

PE0_SPITXD — SPITXD2_IO

SPICLK2

SPITXD2

SPIRXD2

PJ3_ex — PJ3_ex

PJ3_SS

PJ1_MOSI

PJ0_MISO

PJ2_SPICLK1

PK0_SPIRDY_PWM2

PK3_UDS

PK4_LD4

PB5

PC0_LD0

PC1_LD1

PC2_LD2

PC4_LFRM

PC5_LLP

PC6_LCLK

PC7_LACD

IRQ5

IRQ3

PM1

PM0

PK6_LD6 — PK6_LD6 (solid_state DI)

PK5-LD5 — PK5-LD5 (solid_state AI)

Push_button

V_KeepAlive

R968 8.2K

EMUBRK_IRQ2 — EMUBRK_IRQ2

PG5_EMUBRK

SW1 SWITCH

C465 1.5u

SGND

SGND

Main_Power

Vfloat — V_Radio — V_DO — 5V — V_Normal — 3.3_VCC — V_Keepalive

5

Bat_Monitor

SD_VFloat

SD_V_Normal

9V_PF

Low_bat

L1

L2

SD_Radio

PWM1

FPGA_RADIO_interface

2

spi2_s_clk

spi2_sd_in

spi2_sd_out

ss

spi1_sd_out

spi1_sd_in

spi1_clk

pwm_tx_level

stop_at_center

stop_at_tone

Reset_B

HDLC_EOF

rx_spi1_ready

RIND_Mobat_Reset

init

conb

osc_on

rts_B

end_of_frame

cm

spi2_cs_intrain

spi2_cs_outtrain

Shift+Leds

SPICLK2_IO — Clock

PM2 — Latch

SPITXD2_IO — Spi_in

LDC

6

Input/Output Modules

3

LED_ON

8DO

do_set(4:1) — Set_CPU(4:1)

do_reset(4:1) — Reset_CPU(4:1)

do_set(8:5) — DO_SET(8:5) — Set_Relay(4:1)

do_bi(4:1) — Relay_bk(4:1)

do_bi(8:5) — DO_BI(8:5) — Mrly_bk(4:1)

INT2 3

INT1 2

INT0 1

DI_IN(3:1)

12DI

DI_IN(3:1)

di(12:4) — DI_IN(12:4)

DI(15:13)

di(15:13) — di(13) di(14) di(15)

Solid_Out

Inp_solid1 — (solid_state DI) — PK5-LD5

PK5-LD5

Inp_solid2 — PK6_LD6 — (solid_state AI)

PK6_LD6

ai_cont(6:1)

1 AI_cont_1 AI_1

2 AI_cont_2 AI_2

3 AI_cont_3 AI_3

4 AI_cont_4 AI_4

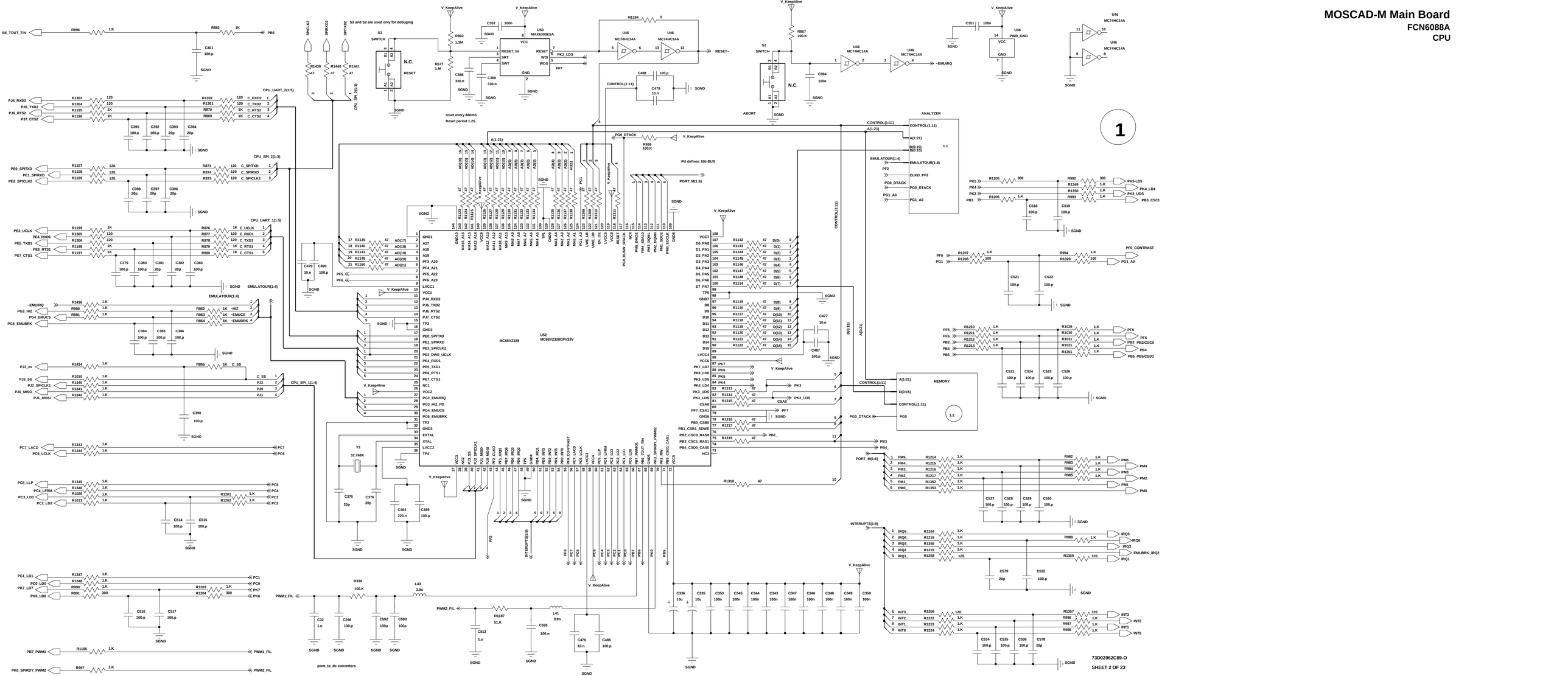
5 AI_cont_5 AN_ZERO

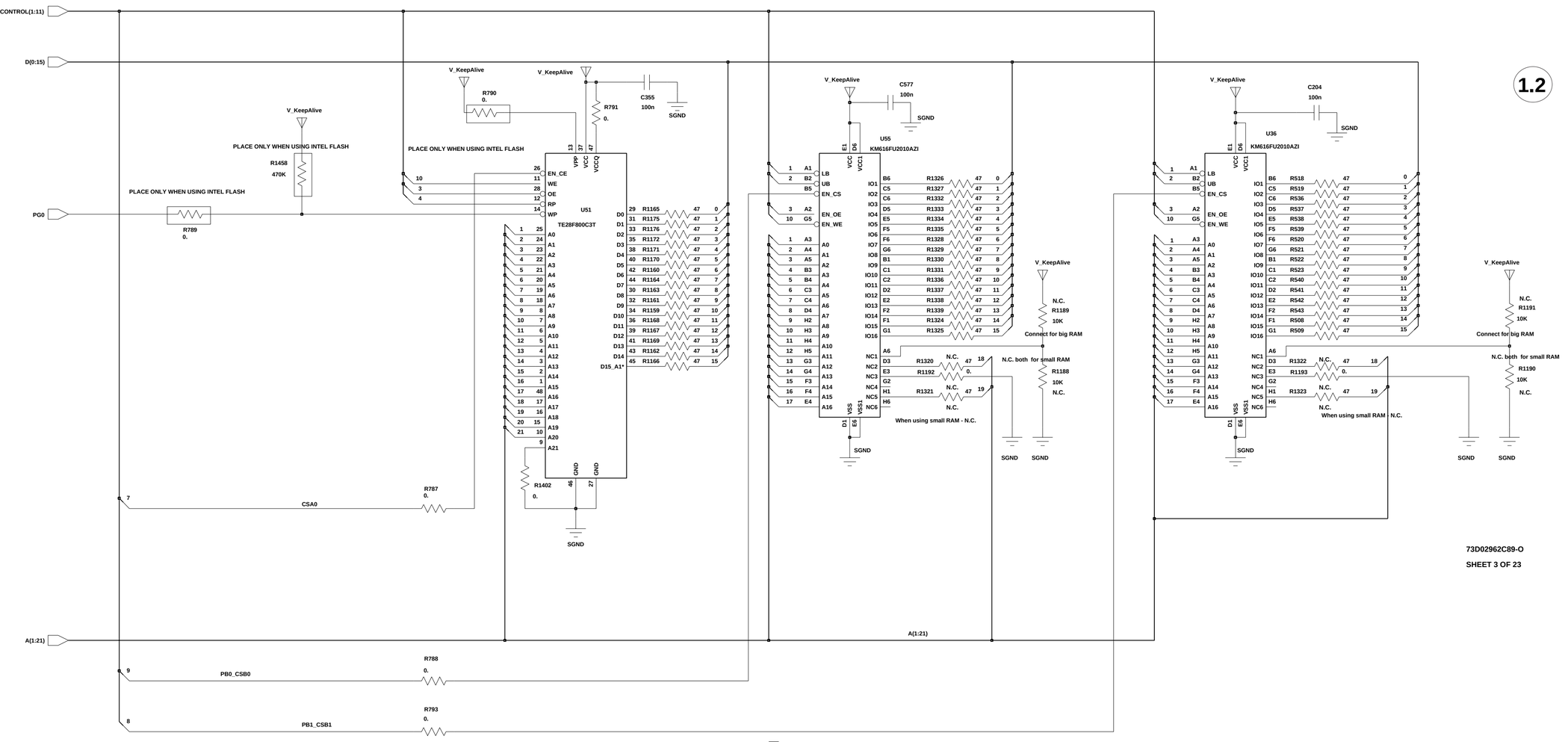
6 AI_cont_6 AN_VREF

73D02962C89-O

SHEET 1 OF 23

MOSCAD-M Main Board
FCN6088A
CPU

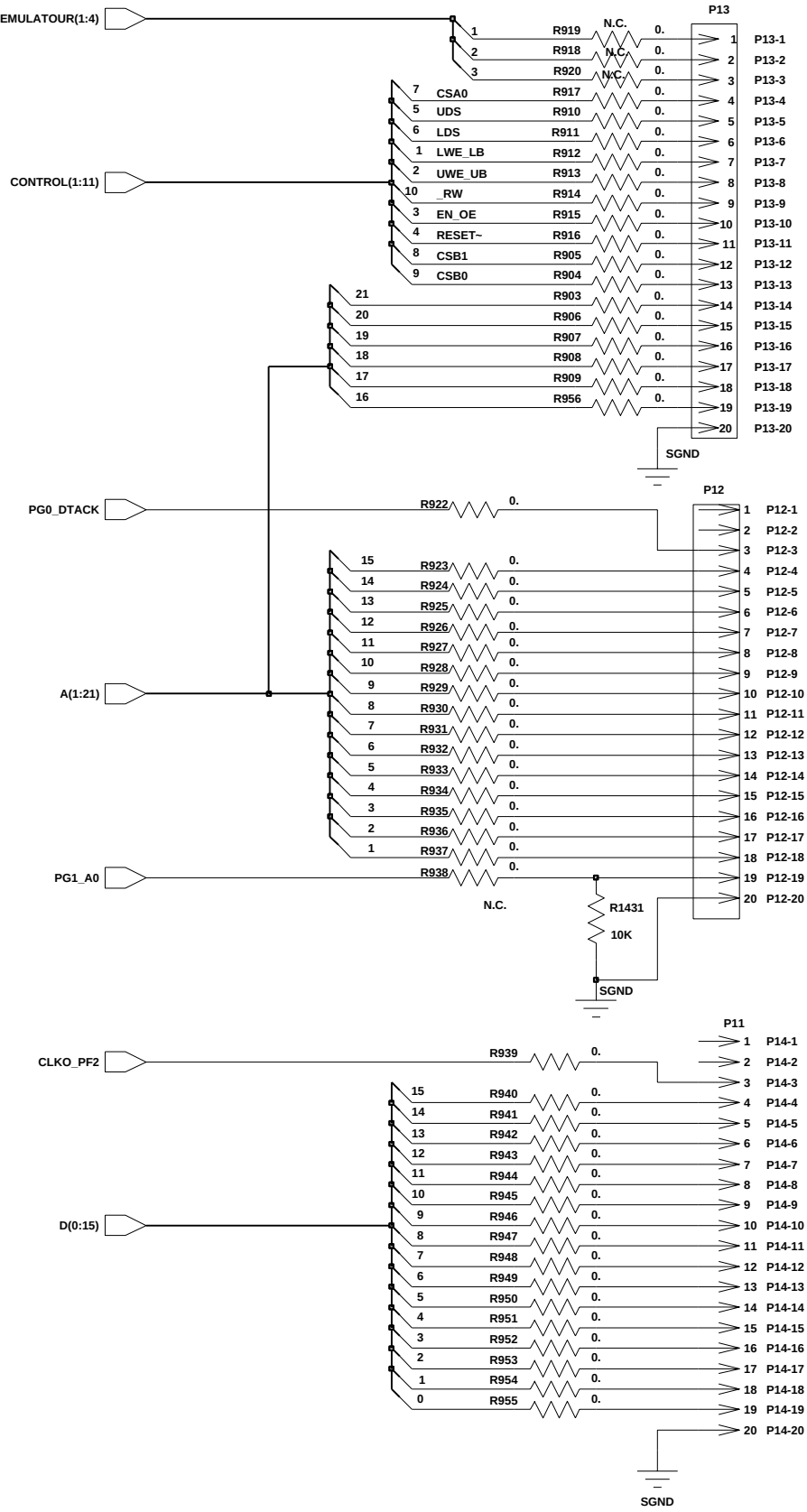



CONTROL(1:11)
D(0:15)
PG0
A(1:21)
V_KeepAlive
PLACE ONLY WHEN USING INTEL FLASH
R1458
470K
R789
0.
R790
0.
R791
0.
C355
100n
SGND
U51
TE28F800C3T
EN_CE
WE
OE
RP
WP
VPP
VCC
VCCQ
GND
D0
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15_A1*
R1165
R1175
R1176
R1172
R1171
R1170
R1160
R1164
R1163
R1161
R1159
R1168
R1167
R1169
R1162
R1166
R1402
CSA0
R787
0.
PB0_CSB0
R788
0.
PB1_CSB1
R793
0.
C577
100n
U55
KM616FU2010AZI
LB
UB
EN_CS
EN_OE
EN_WE
VCC
VCC1
VSS
VSS1
R1326
R1327
R1332
R1333
R1334
R1335
R1328
R1329
R1330
R1331
R1336
R1337
R1338
R1339
R1324
R1325
R1320
R1192
R1321
N.C.
When using small RAM - N.C.
N.C. both for small RAM
R1189
10K
Connect for big RAM
R1188
C204
100n
U36
R518
R519
R536
R537
R538
R539
R520
R521
R522
R523
R540
R541
R542
R543
R508
R509
R1322
R1193
R1323
R1191
R1190
1.2
73D02962C89-O
SHEET 3 OF 23

LOGIC_ANALYZER CONNECTORS

MOSCAD-M Main Board

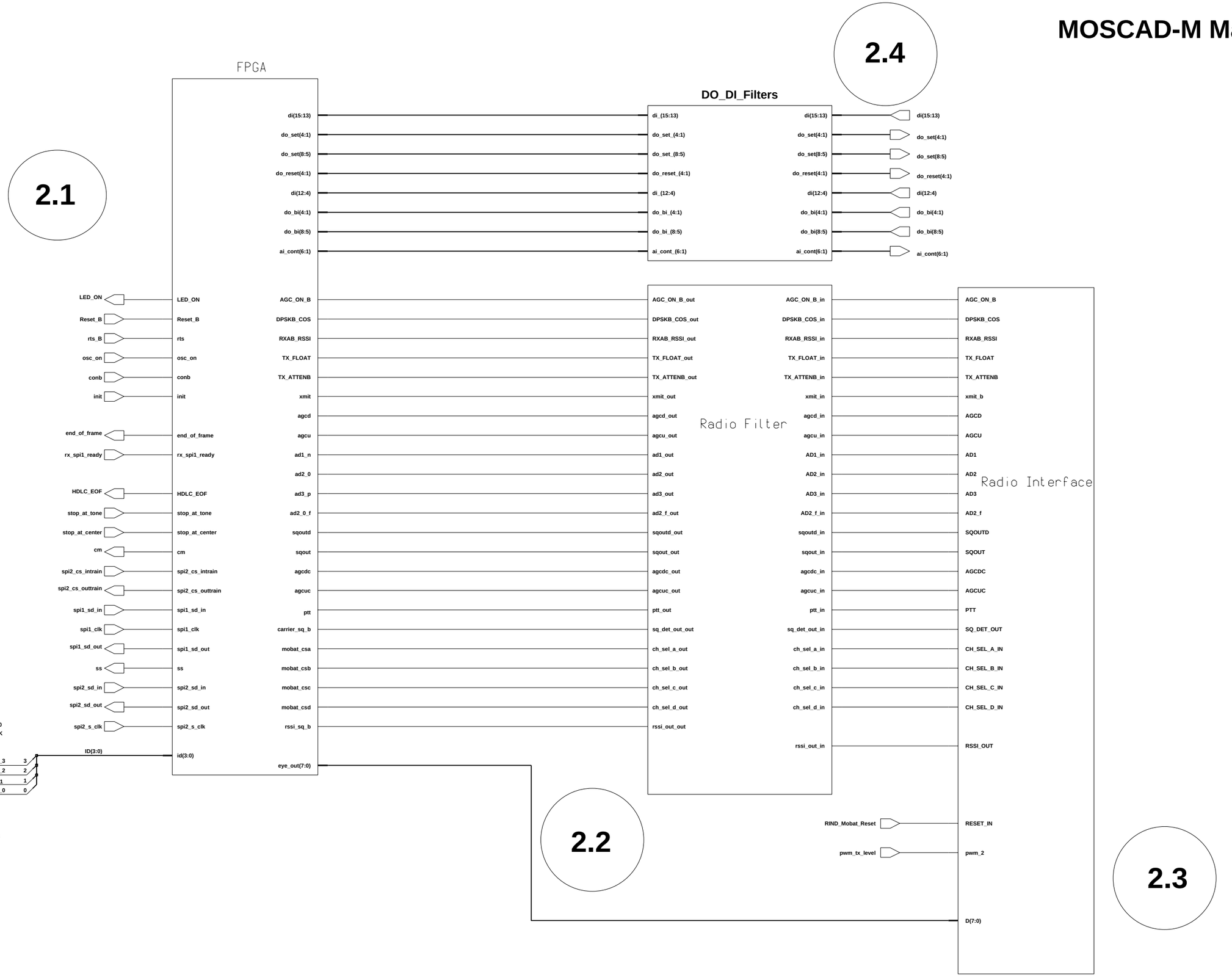
FCN6088A



FPGA+RADIO

MOSCAD-M Main Board

FCN6088A

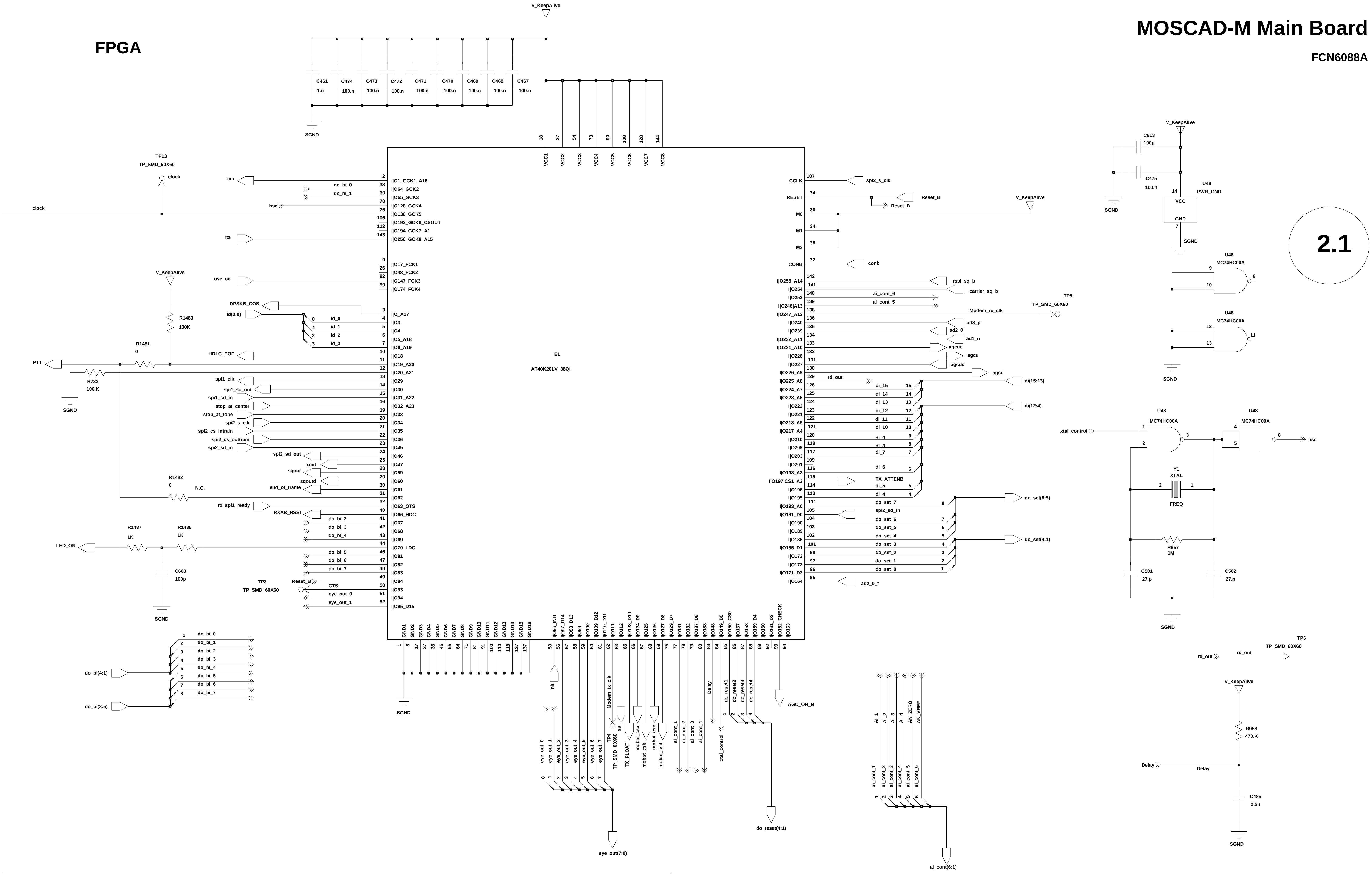


FPGA

MOSCAD-M Main Board

FCN6088A

2.1



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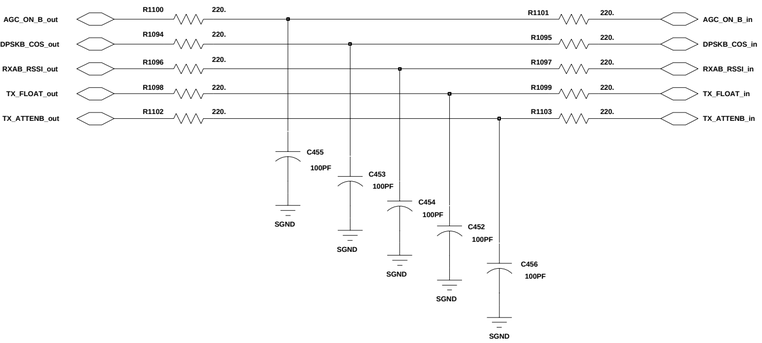
SHEET 6 OF 23

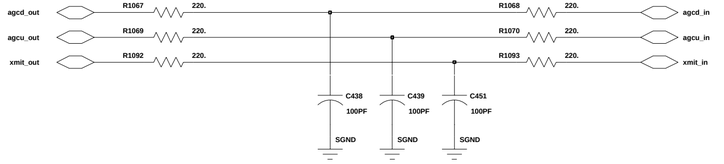
Filters

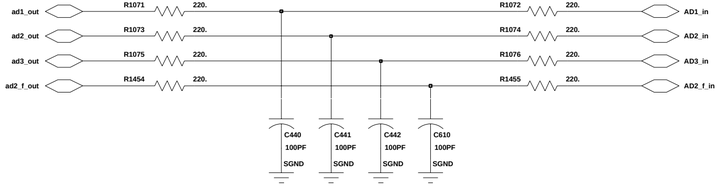
MOSCAD-M Main Board

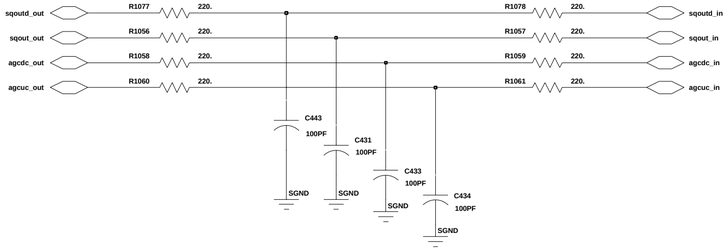
FCN6088A

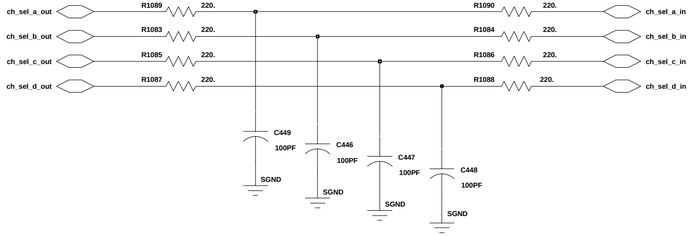
2.2

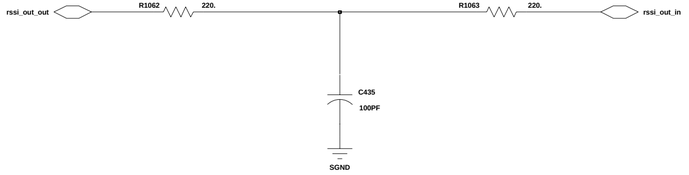


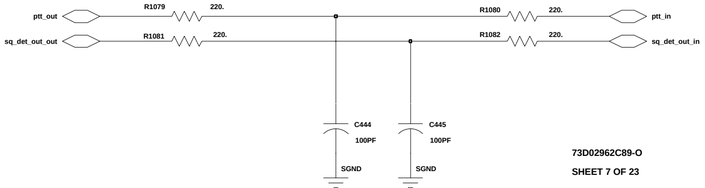












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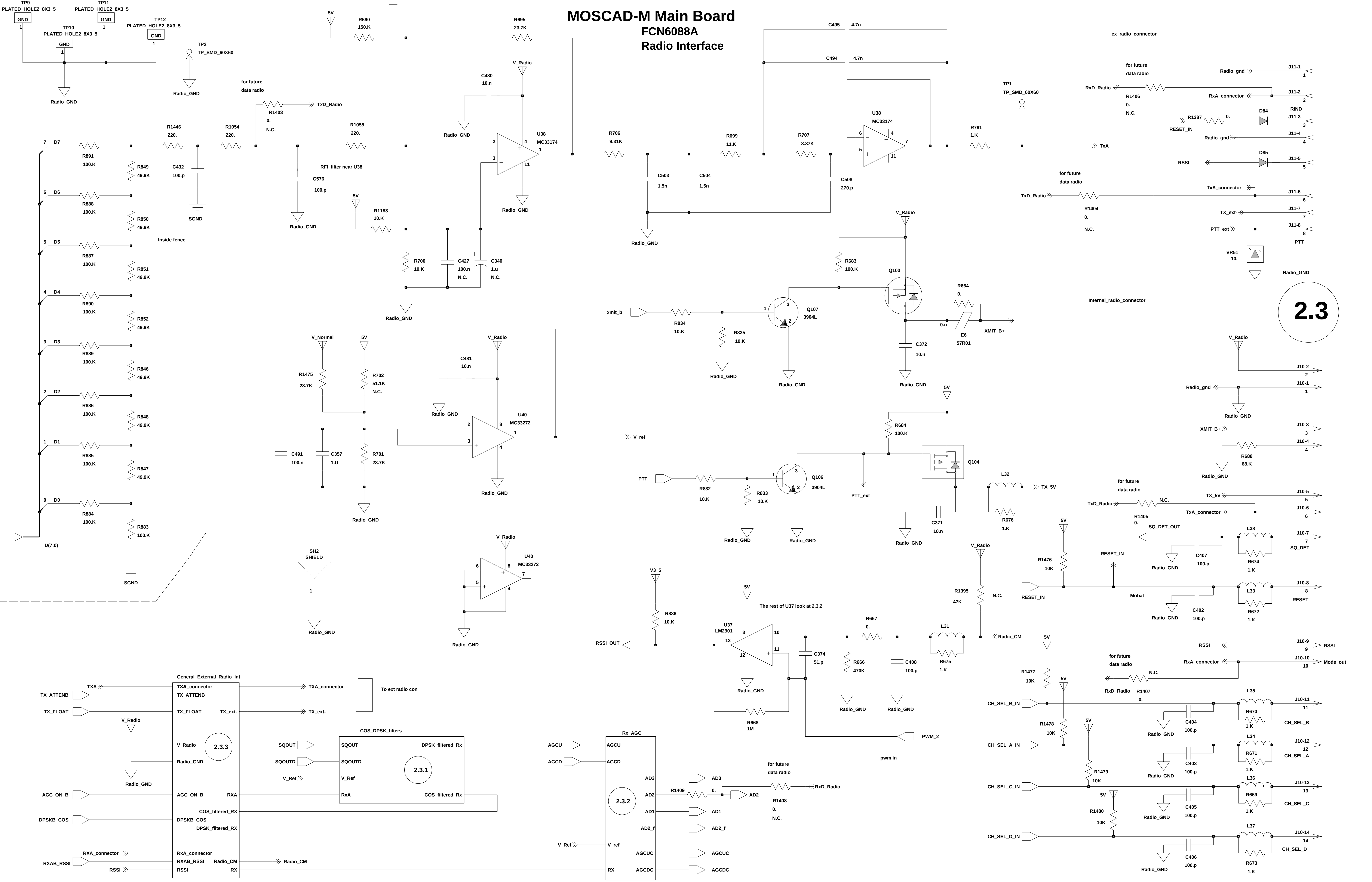
MOSCAD-M Main Board
FCN6088A
Radio Interface



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SHEET 8 OF 23

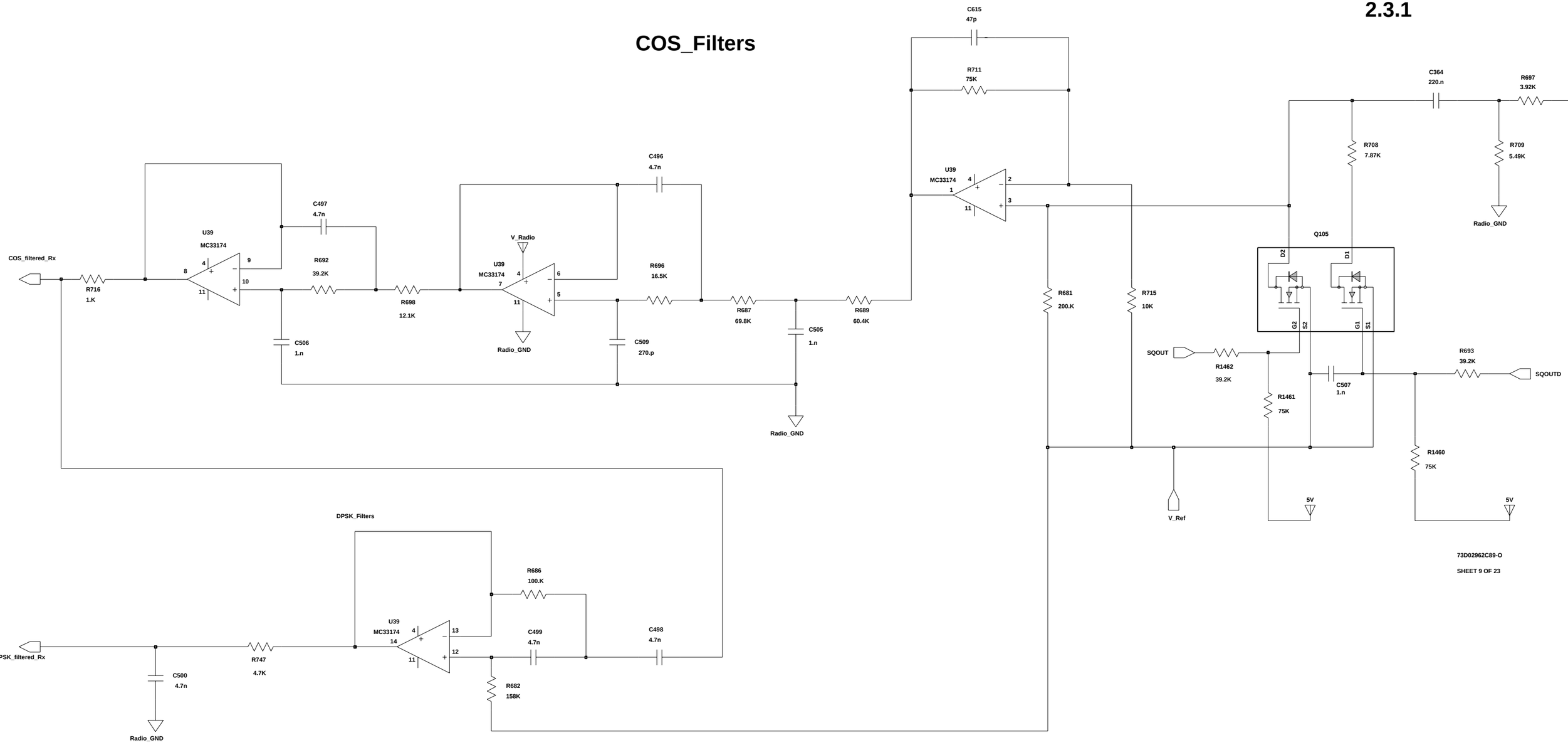
MOSCAD-M Main Board

FCN6088A

RADIO_Rx_Filters

2.3.1

COS_Filters



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SHEET 9 OF 23

RX AGC

MOSCAD-M Main Board

FCN6088A

5V
V_Normal
V3_5
R1390
0
R1391
10
N.C.
TP7
TP_SMD_60X60
TP8
TP_SMD_60X60
2.3.2
Radio_GND
AGCUC
U38
MC33174
R853
10.K
R855
7.5K
R703
3.32K
AGCU
Radio_GND
V3_5
C482
10.n
5V
R714
2K
U37
LM2901
AD3
Radio_GND
Radio_GND
C359
1.u
RX
V3_5
R713
2K
U37
LM2901
AD2
R678
150K
R685
10K
C618
680n
V_ref
R679
150K
C619
680n
R691
39.2K
R694
28.7K
V_ref
V_ref
V3_5
R712
2K
U37
LM2901
AD1
R704
3.32K
AGCD
AGCDC
U38
MC33174
R854
10.K
R856
7.5K
Radio_GND
V3_5
C611
10.n
5V
R1453
2K
U69
LM2901
D2_f
Radio_GND
R1452
10K
C609
75.n
Radio_GND
5V
U69
LM2901
Radio_GND
5V
U69
LM2901
Radio_GND
5V
U69
LM2901
Radio_GND

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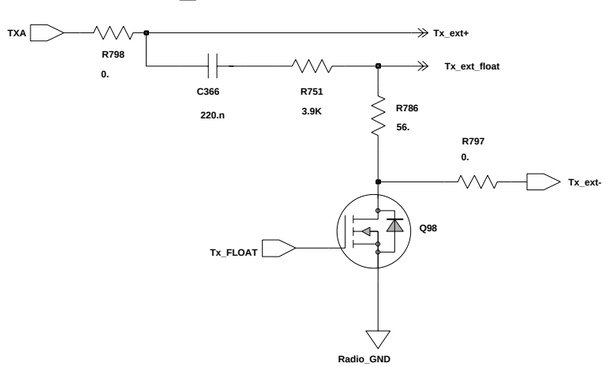
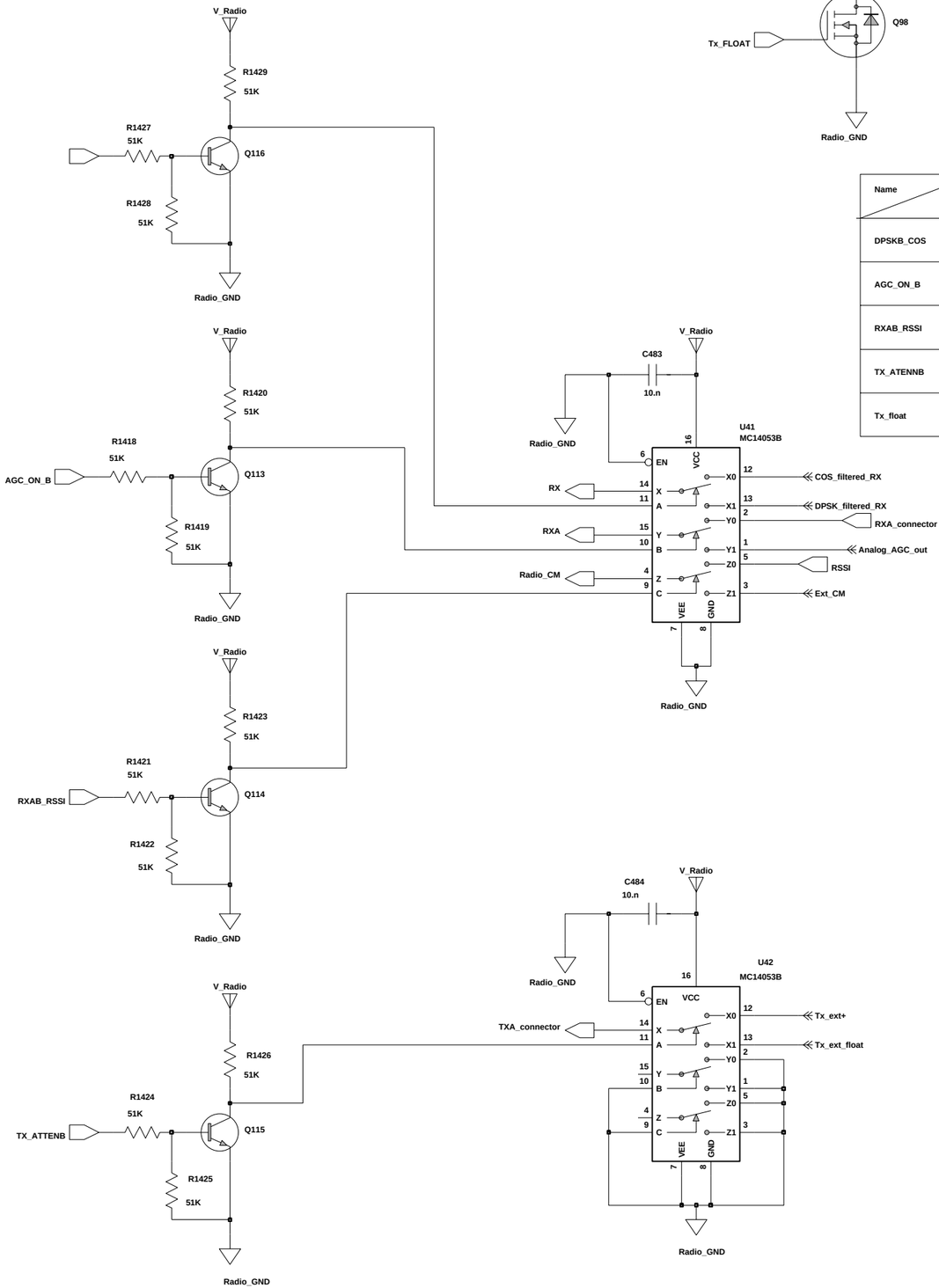
MOSCAD-M Main Board

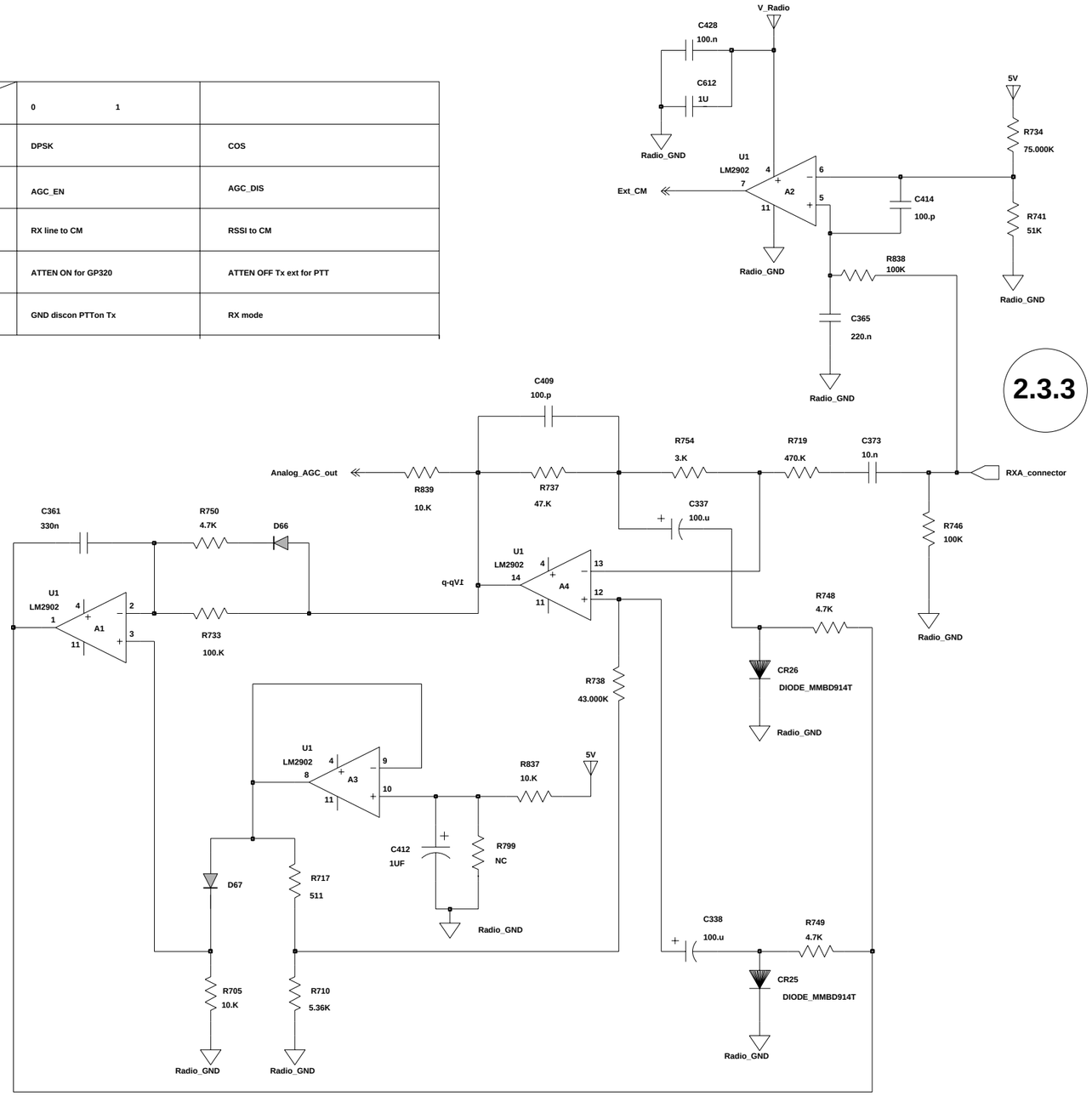
FCN6088A

gen_radio_interface



Name	0 1	
DPSKB_COS	DPSK	COS
AGC_ON_B	AGC_EN	AGC_DIS
RXAB_RSSI	RX line to CM	RSSI to CM
TX_ATENNB	ATTEN ON for GP320	ATTEN OFF Tx ext for PTT
Tx_float	GND discon PTTon Tx	RX mode



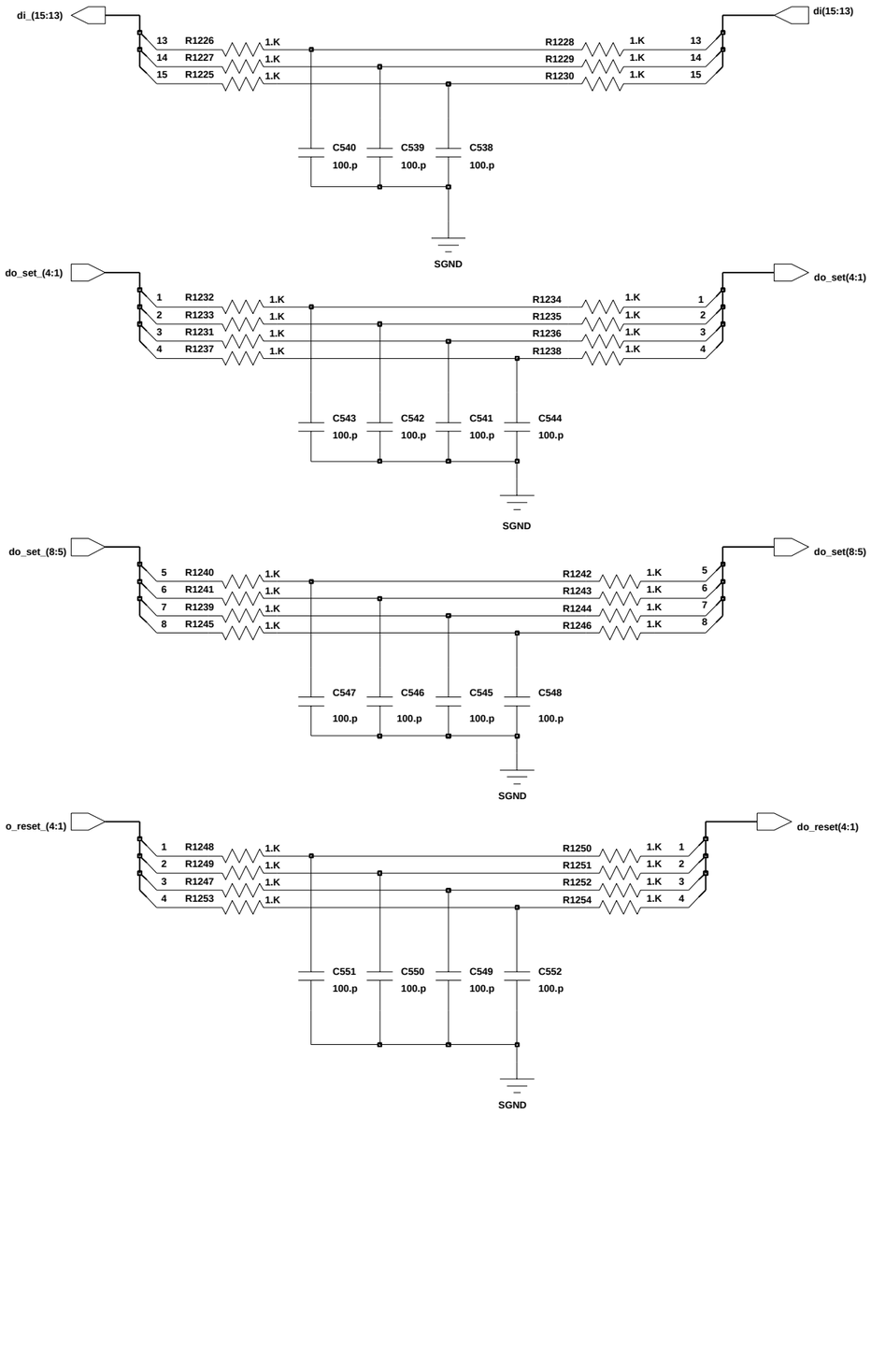


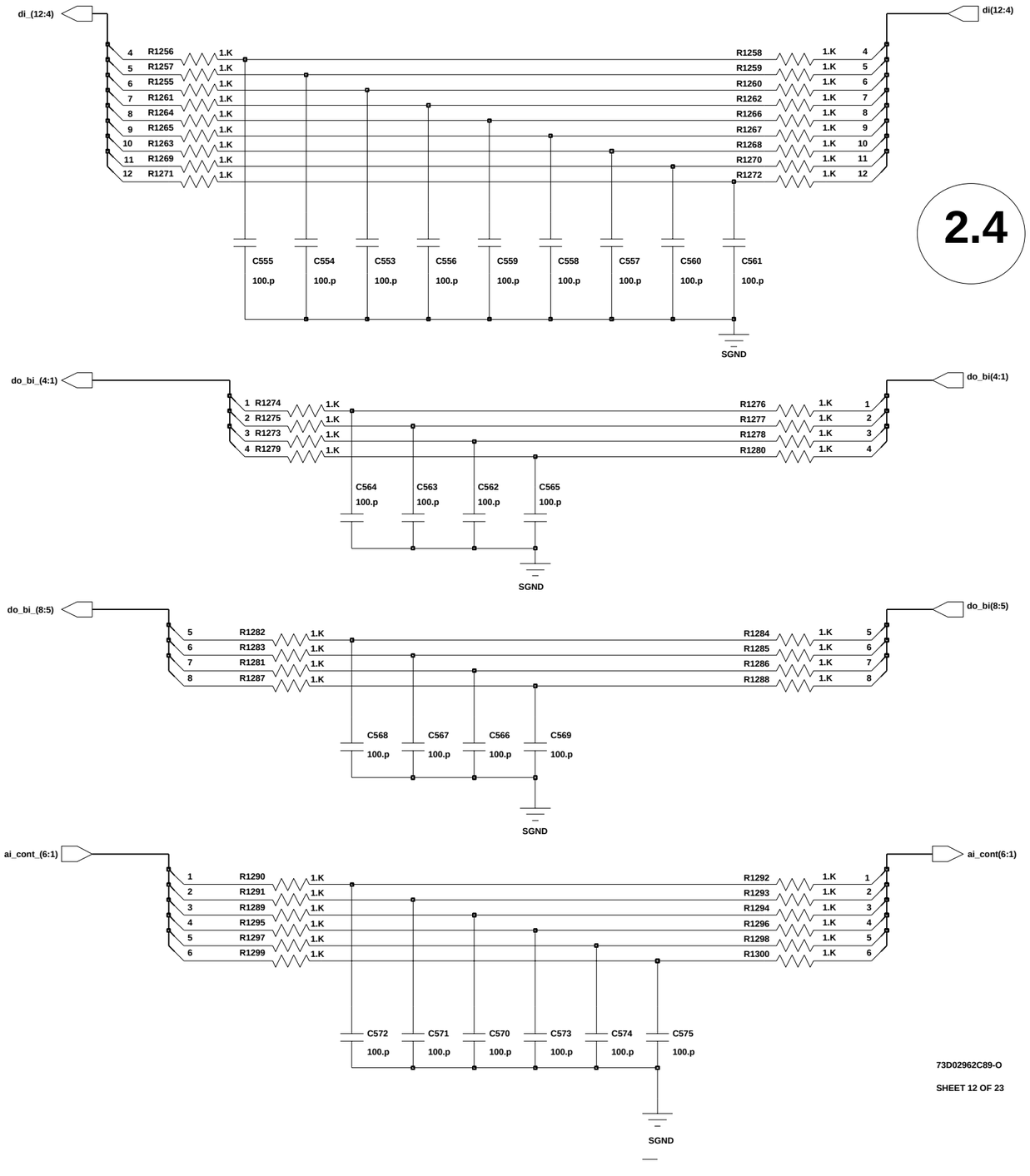
2.3.3

MOSCAD-M Main Board

FCN6088A

DO & DI Filters





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SHEET 12 OF 23

Moscad-M

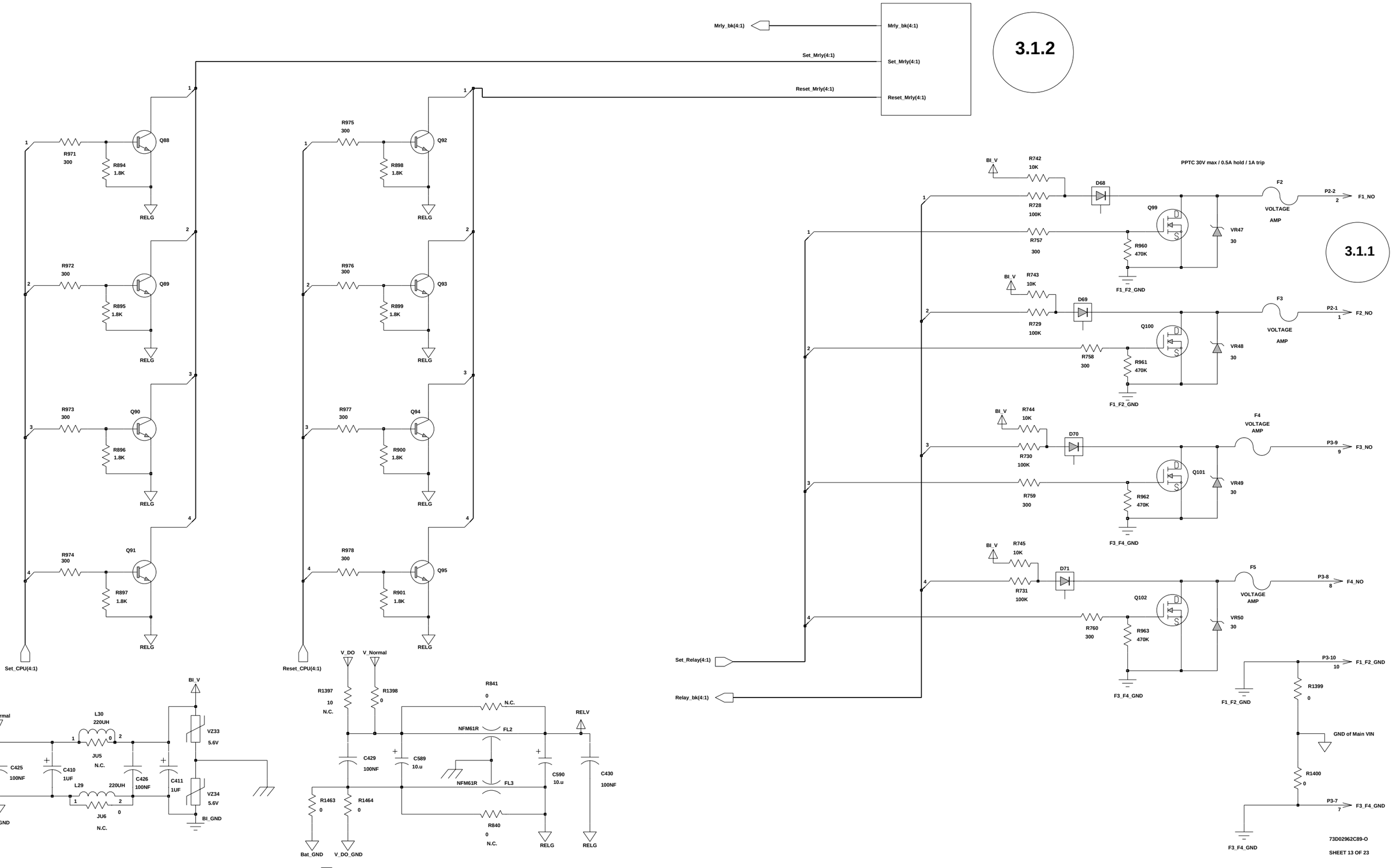
8486418T01_P1

4 DO + 4 DO OC

digital output

MOSCAD-M Main Board

FCN6088A

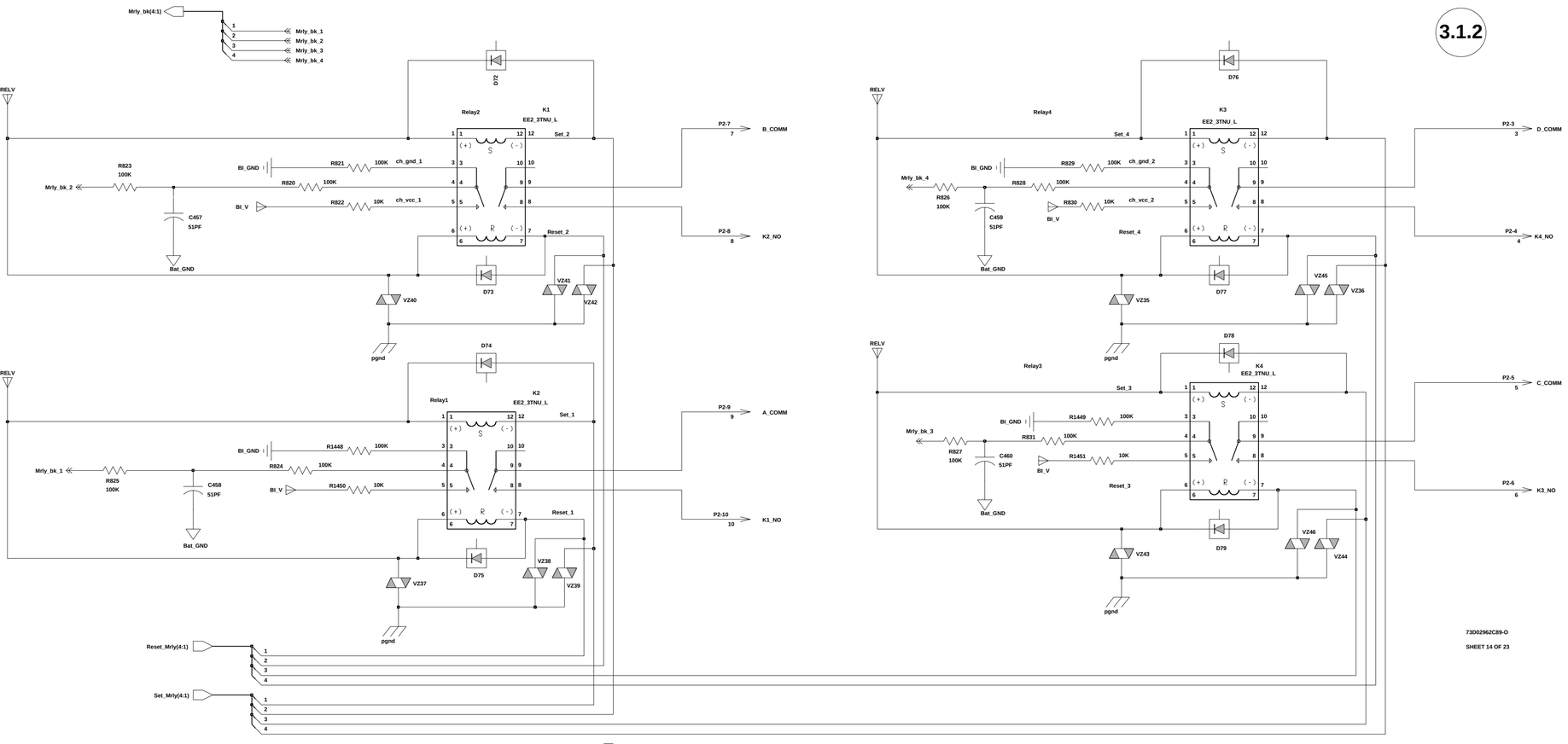


Digital_output 1-4

MOSCAD-M Main Board

FCN6088A

3.1.2



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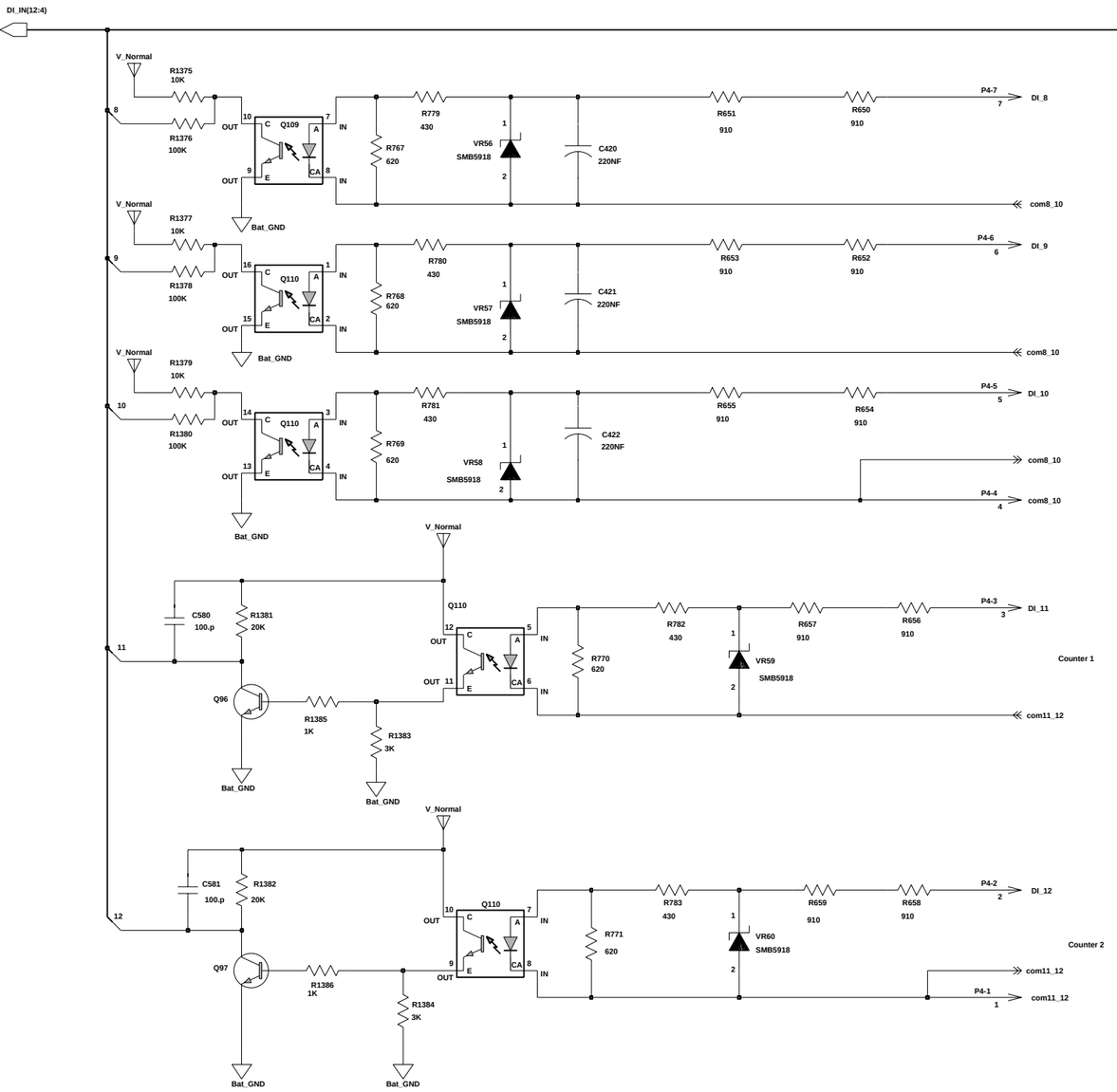
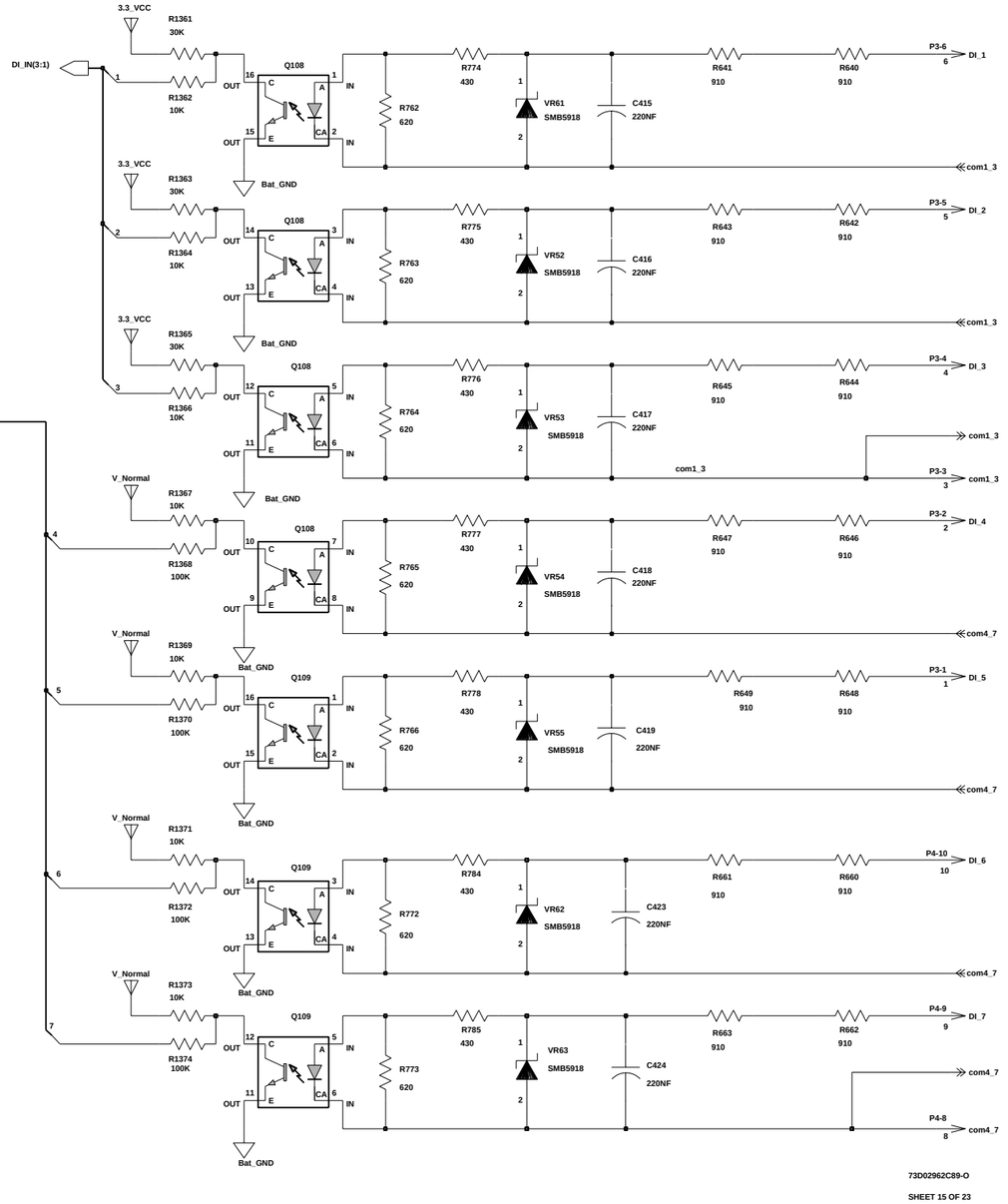
SHEET 14 OF 23

MOSCAD-M Main Board

FCN6088A

Digital Inputs





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3.2

SOLID_STATE

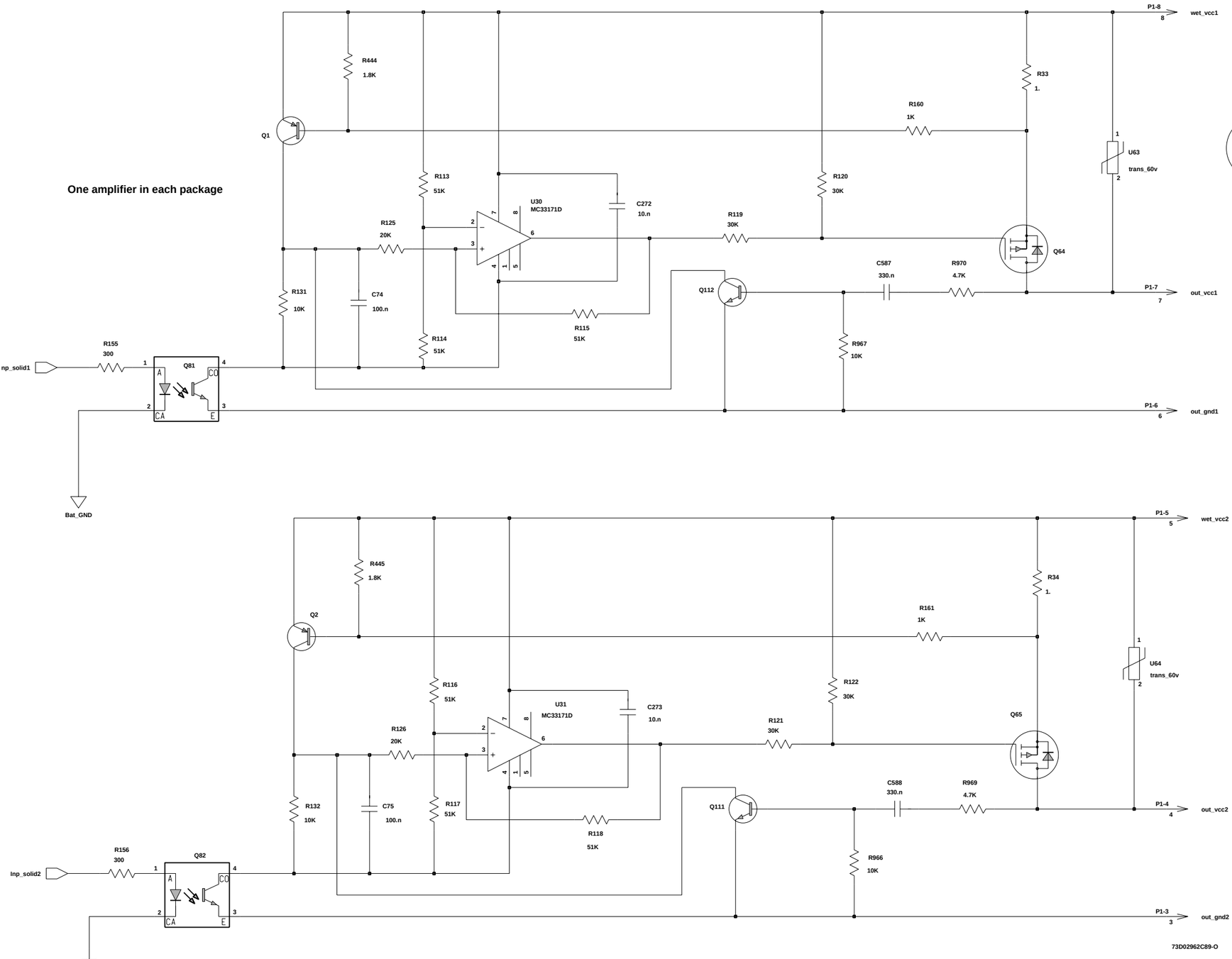
OUTPUT

MOSCAD-M Main Board

FCN6088A

3.3

One amplifier in each package



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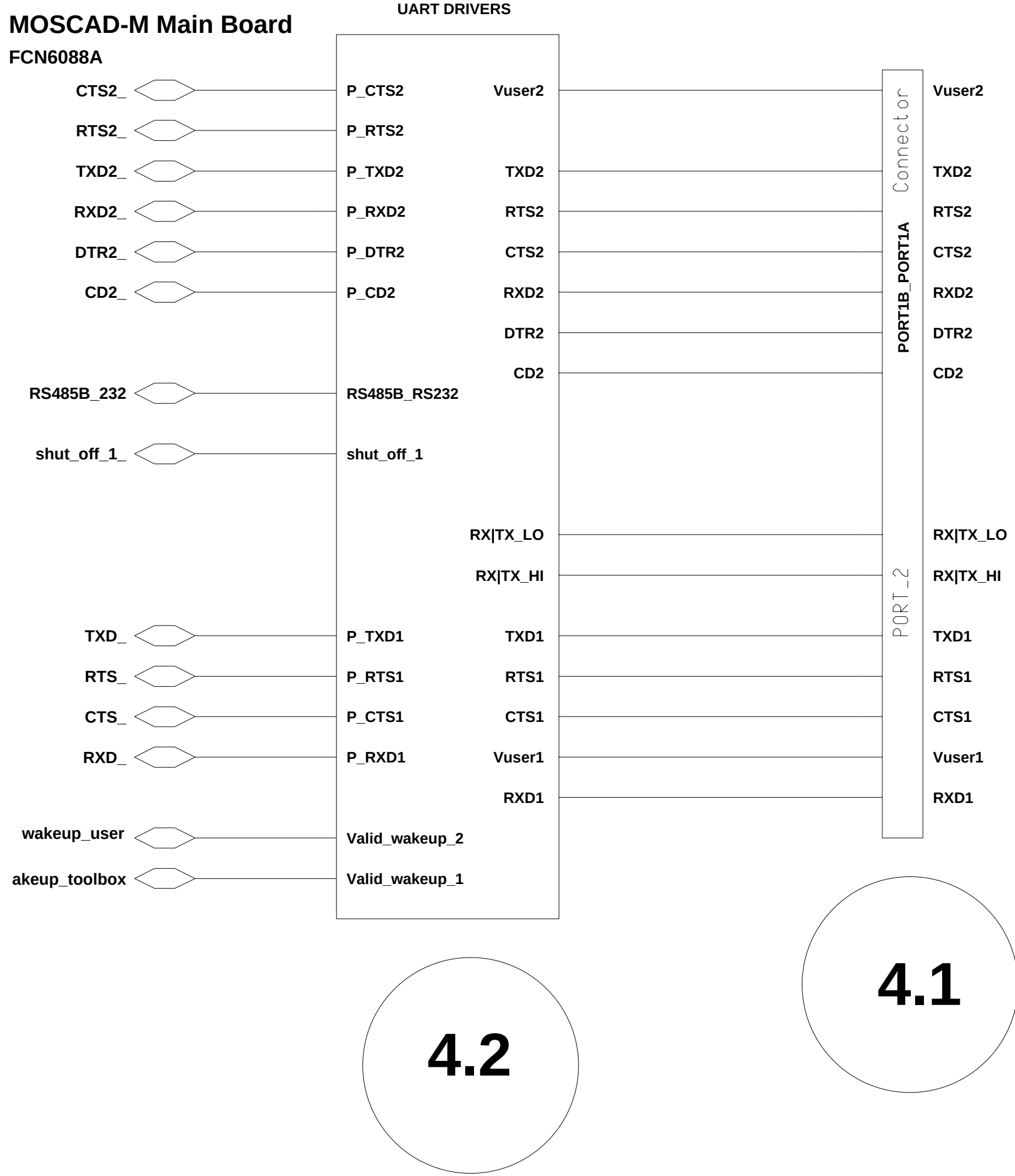
MOSCAD-M Main Board

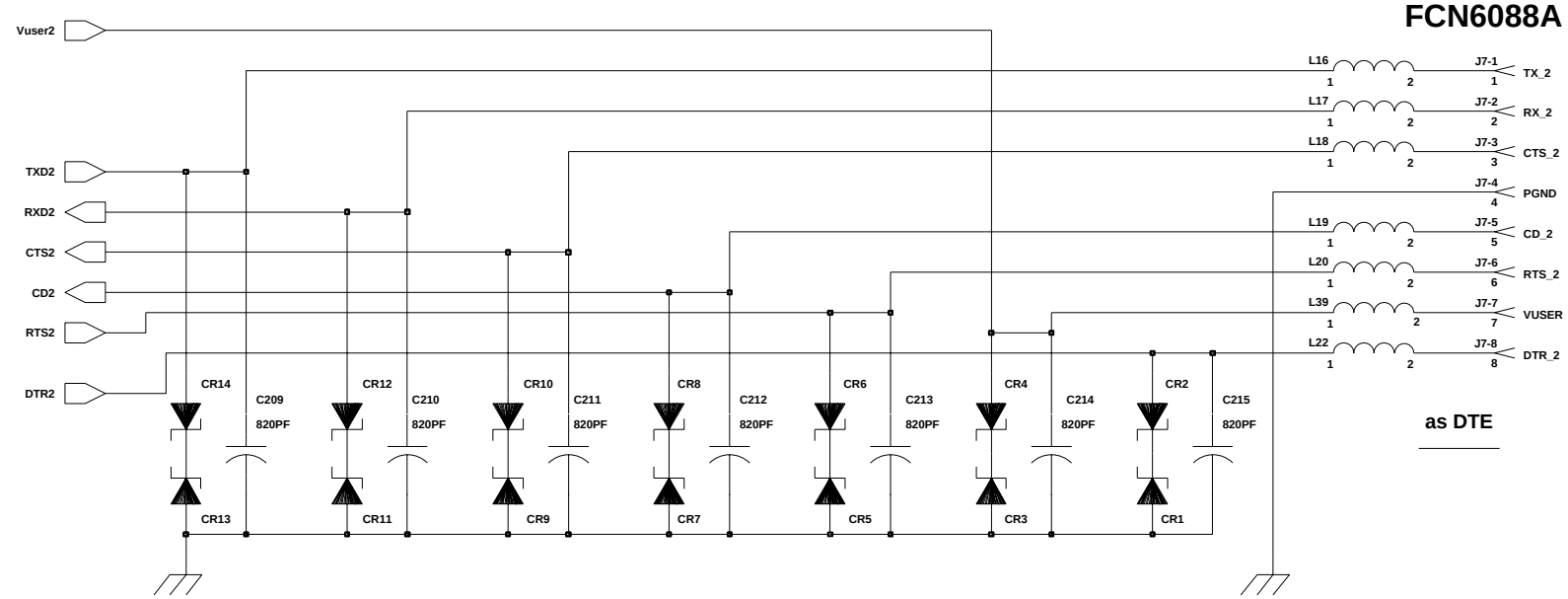
FCN6088A



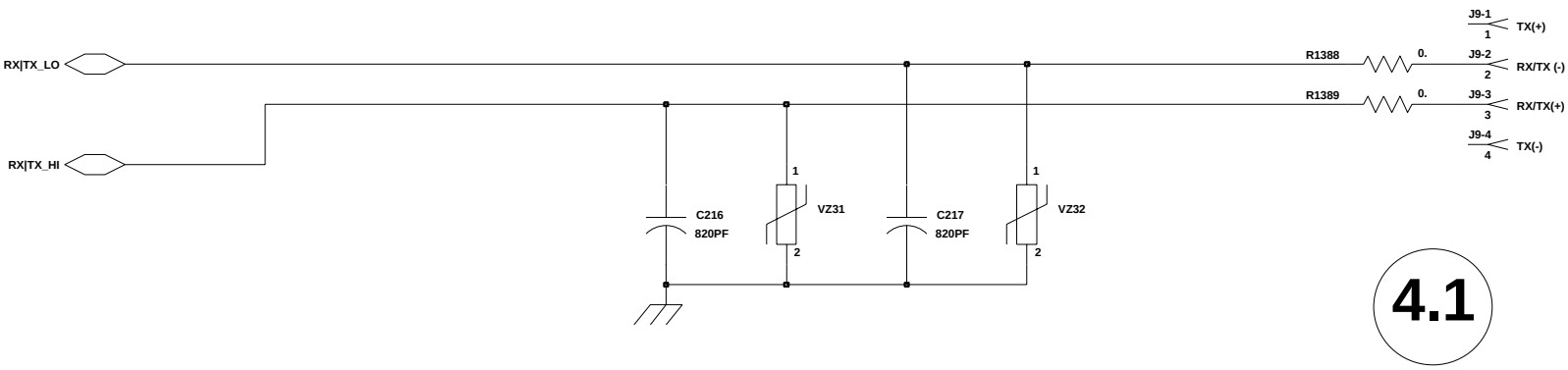
RS-232 connector

MOSCAD-M Main Board

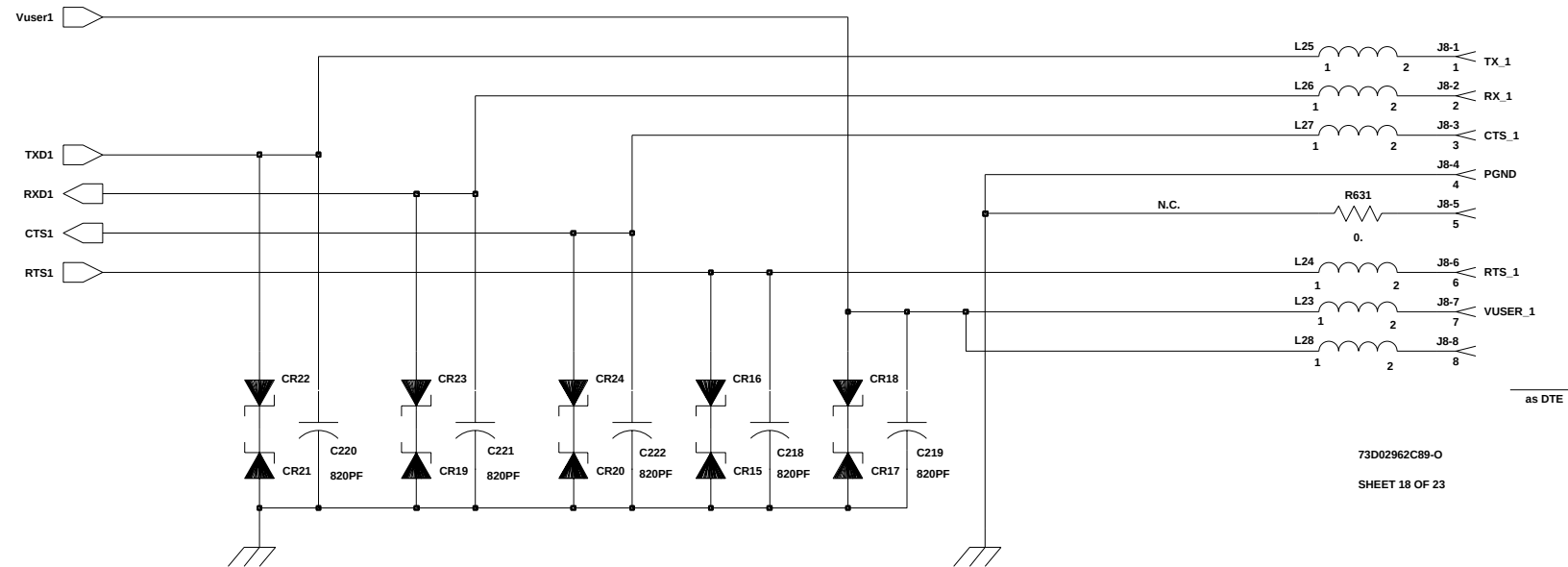
FCN6088A



RS-485 connector



RS-232 _TOOLBOX



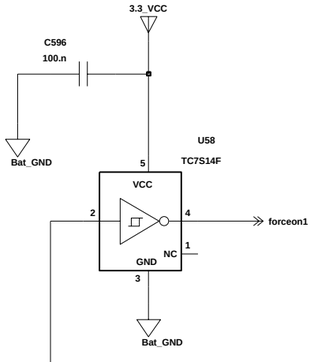
Moscad-M

Uarts

MOSCAD-M Main Board

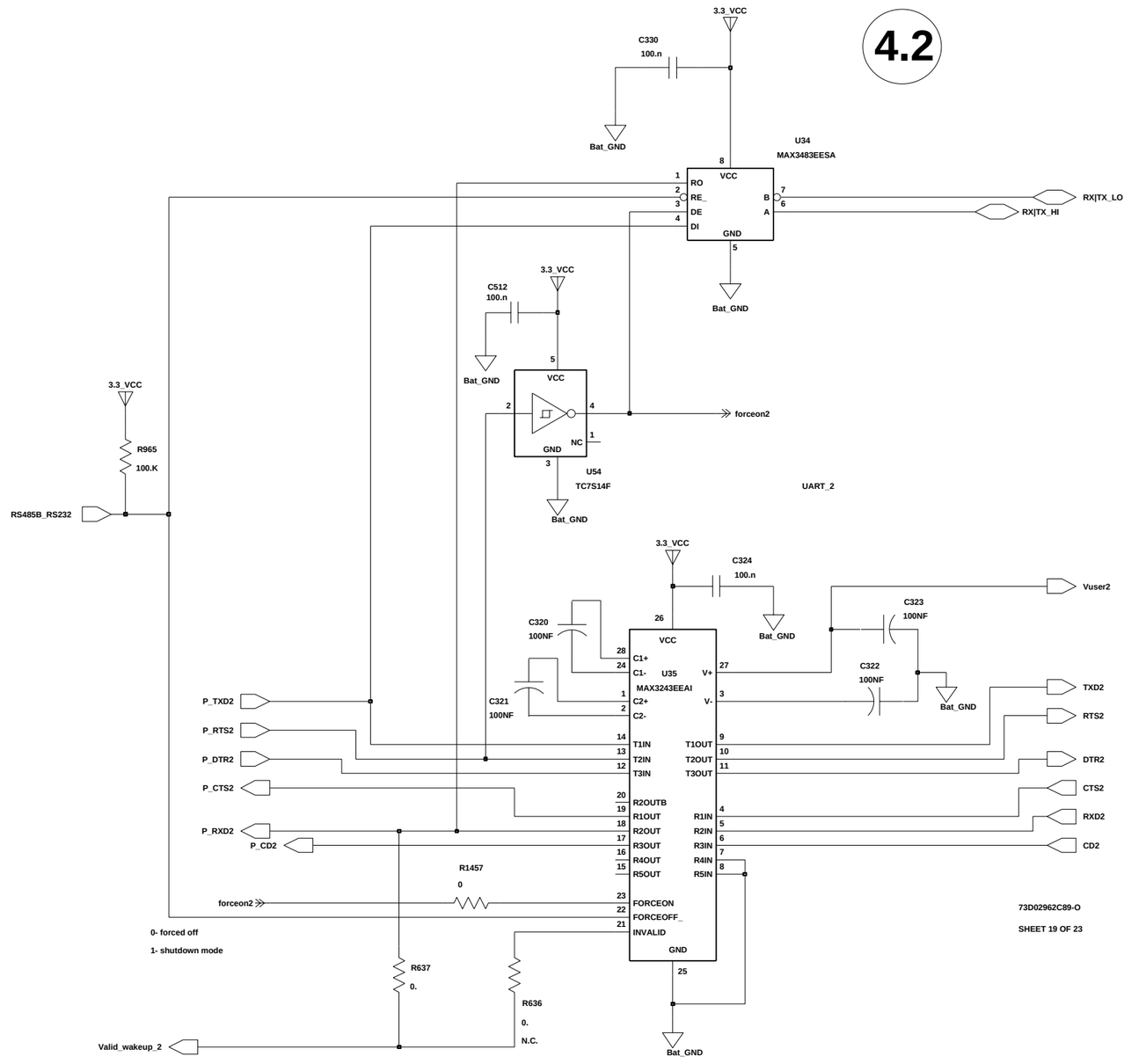
FCN6088A

PORT_1-ToolBox



UART_1

PORT_2-User Port



MOSCAD-M Main Board

FCN6088A

Main Power Supply

5.1

5.2

Current Protection

4A Slow Blow Fuse

F1

Main+ P1-10 10

VOLTAGE AMP

Main- P1-9 9

PGND P1-2 2

PGND P1-1 1

In of 9-30V

Terminal of 10 pins

U65 trans_60v

U67 var_60

VZ1 trans_60v

VZ29 var_60

U66 trans_60v

U68 var_60

Shottky 40V Reverse Vol.

Reverse Voltage Protection

R207 0.04

N.C.

0.6V@3A

D33

R1186 1

D80

C268 100.n

C292 100p

R208 0.04

E5 57R01

E4 57R01

E3 57R01

E2 57R01

0.n

Vin

Q71

Vdss=60V

Over_Voltage Protection (30V max)

C261 1.n

R108 100K

Q5

R129 10K

R130 10K

R109 100K

VR46 30.

PS_Radio

Vin

SD_VFloat

SD_Radio

VFloat

V_Radio

V_DO

5V

PS_3.3_3V

5V_PF

SD_V_Normal

Bat_4.5V

BGND

KeepAlive

V_Normal

3.3_VCC

3.3_Alive

Filter

R201 N.C. 0.

L4 22u

L5 22u

N.C.

R200 0.

C240 100.n

C12 10.u

C13 10.u

C241 100.n

V_KeepAlive

Bat_GND

SGND

PPTC 0.2A Hold / 0.4A trip current

F6

J14-1 1 Vbat

VOLTAGE AMP

Bat_4.5V

In of 4.5V_Bat

Header of two pins

J14-2 2 BGND

BGND

Vdet

Vdss=60V

Q70

Vin

L45 3.9n

R355 100.K

C614 39p

R362 51.K

Bat_Monitor

5V_PF

R405 0.

R385 10.K

N.C.

R364 51.K

Q14

R363 51.K

Bat_GND

3.3_Alive

In the case of open-collector

R1444 301.K

N.C.

10uA

Vin

Histeresis ~0.5V

R1466 49.9K

C607 1u

C604 100.n

R335 100K

VR64 12

D82

N.C.

R328 1.M

R1443 51.1K

VCC

IN_P

IN_N_REF

OUT

VEE

U26 MAX917EUK

C262 1.n

R309 40.2K

C605 10.n

Bat_GND

Internal Ref. 1.245V

Power Failed below 5V

R586 22K

R329 100K

Bat_4.5V

U27 LP2901D

R337 100.K

Low_bat

When Battery(4.5V) less than 3.9

It'll be "0"

When Vbat=3.5V

U60

POS

FB

NEG

LM4041CIM3

R1392 82.5K

R1442 127K

R1467 1M

Bat_GND

Vin

R334 100K

R1468 60.4K

C33 1u

C239 100.n

12 VR65

Histeresis

Vthr=~9.25V

Vthf=~8.75V

3.3_Alive

D81

N.C.

R327 1.M

U59 MAX917EUK

R310 51.1K

C263 1.n

R322 26.1K

C255 10.n

Internal Ref. 1.245V

Bat_GND

3.3_Alive

In the case of open-collector

R585 301.K N.C. 10uA

9V_PF

Vdet

U27 LP2901D

L44 2.2u

PWM1

R331 392.K

R332 392.K

C608 1.u

~10.8% of Vdet

C265 1.n

~9.3% of Vdet

C264 1.n

R320 40.2K

R319 47.5K

C31 1u

C230 100.n

3.3_VCC

R339 100.K

R340 100.K

When PWM between the levels

L1&L2=1

for 10V the accuracy is 150mV

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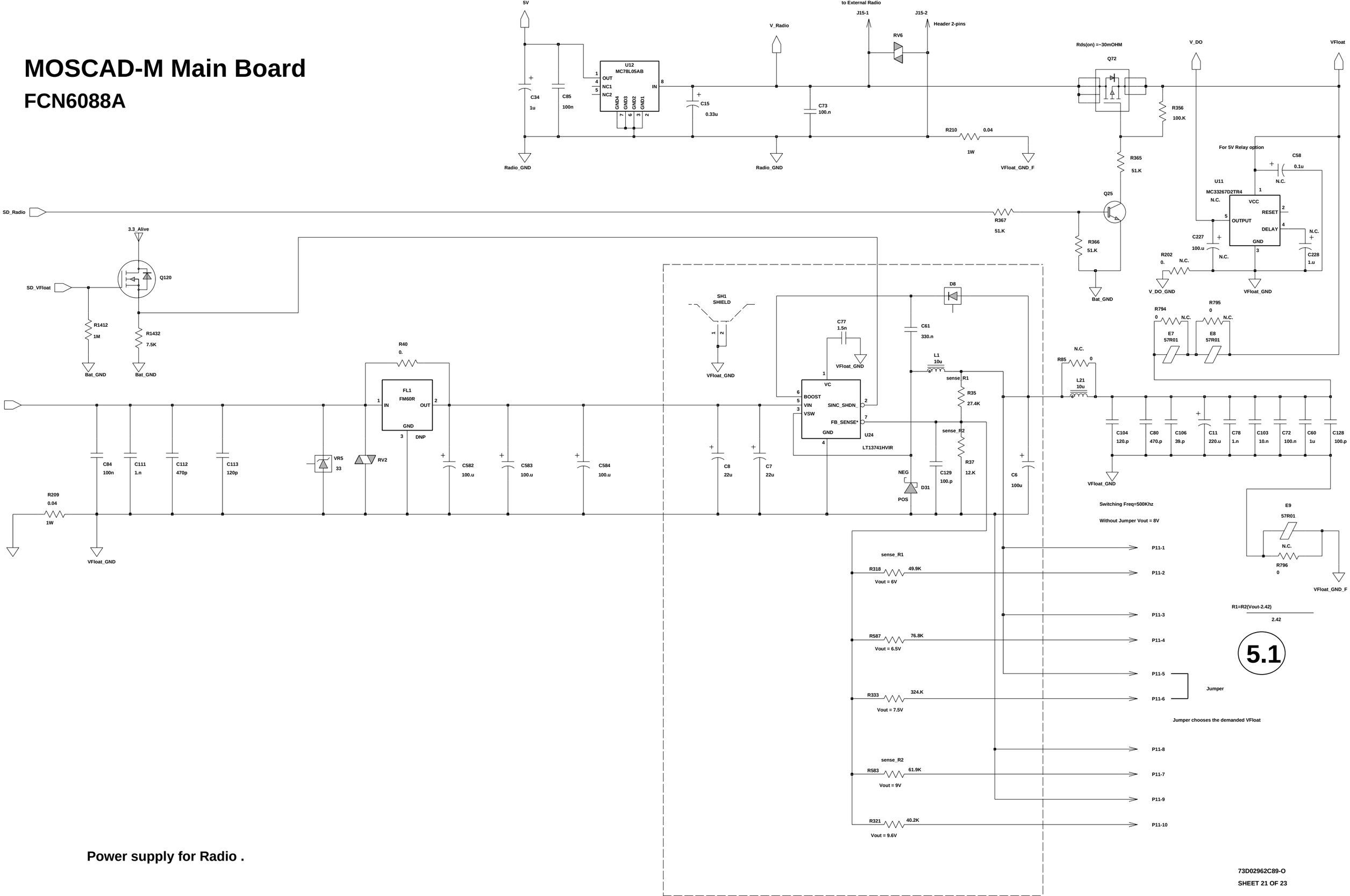
MOSCAD-M Main Board

FCN6088A



Power supply for Radio .

MOSCAD-M Main Board

FCN6088A

Power Supply of 3.3V

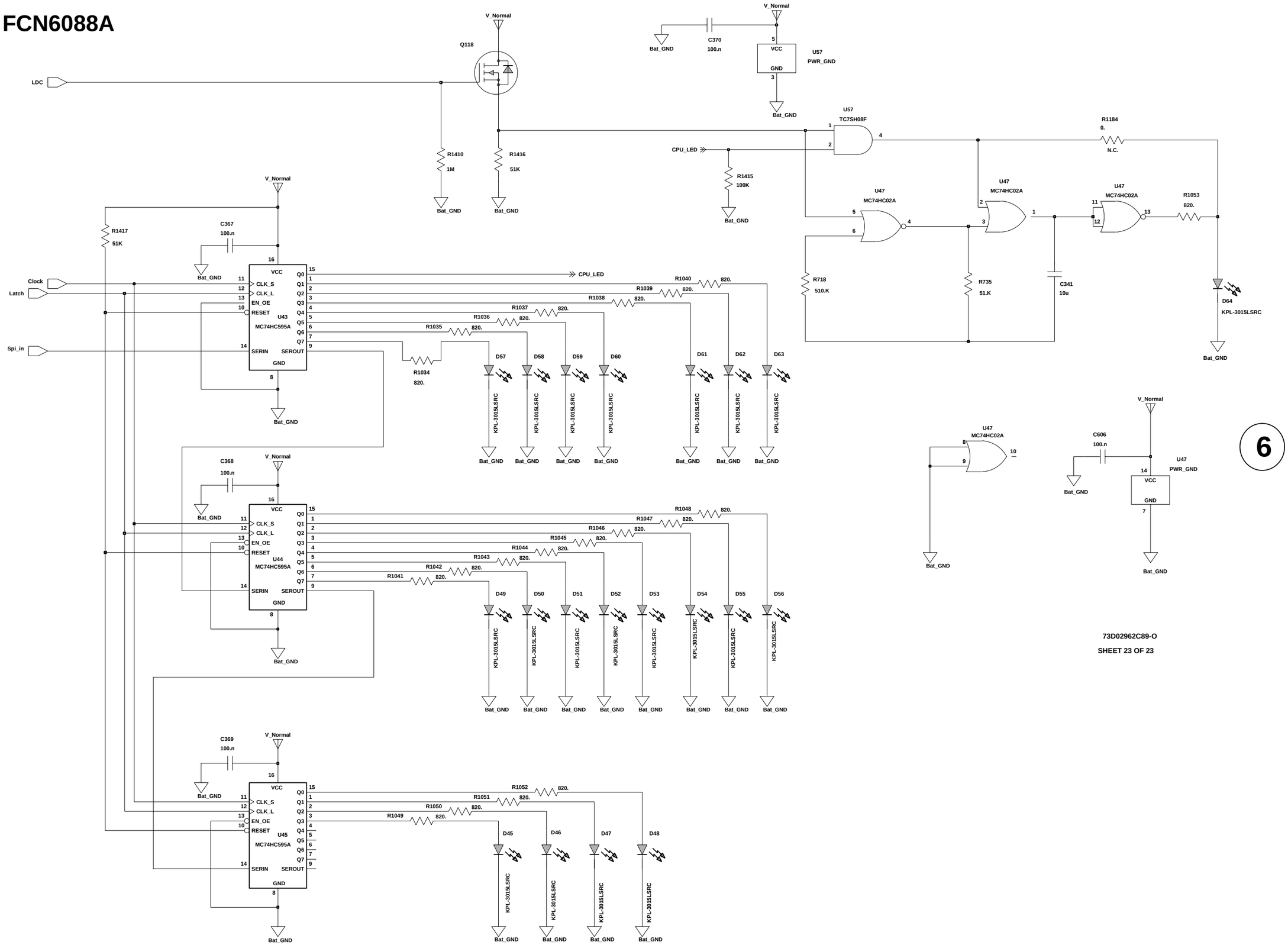
5.2

placed for lithium battery
R1465 0 N.C.
Protection for LDO
D30
Schottky
R402 10K
U32
MC78LC30NTR
INPUT OPUT NC1 NC2 GND
Bat_4.5V
BGND
R893 10K
Protection for LDO
VR7 9.1
C244 100.n
R412 0.
D29 N.C. Schottky
C245 100.n
R414 0.
Bat_GND
R411 0.
N.C.
D28
Schottky
placed for lithium battery
CPU,FPGA,RAM,Flash,Watch_Dog
KeepAlive
C225 100.u
C226 100.u
N.C.
R1474 0
Bat_GND
Bat_GND
R354 510.K
Bi-Directional Switch
Q87
G1 D1 G2 D2 S1A S1B S2A S2B
R410 0.
N.C. D27
3.3_VCC
R1473 0
Q55
V_Normal
Leds ,DIs,Expansion
R1459 470
D83
R369 100K
Q33
C591 4.7u
R368 51.K
Bat_GND
5V_PF_
U70
TCTSZ32FU
INB INA GND VCC OUTY
3.3_Alive
C620 100n
Bat_GND
3.3_VCC
R1414 300K
SD_V_Normal
Bat_GND
R357 100.K
90mOHM@3.3V
R1470 1K
R1396 300
Q121
R1471 300 N.C.
Q34
R371 51.K
R370 51.K
R1469 51K
Bat_GND
Bat_GND
Bat_GND
Bat_GND
N.C.
R1401 0
L42 15u
Vin
L46 1.2u
C601 150p
C600 1.5n
C9 10u
C10 10u
C246 100.n
Bat_GND
Bat_GND
Bat_GND
Bat_GND
D65
C14 4.7u
C597 100n
R1484 0
IN_VCC EX_VCC VIN
COSC RUN_SS ITH SFB VOSENSE SENSEP SENSEN
TG BOOST SW BG
SGND PGND
U25
LTC1435IS
Frequency 250kHz
R386 10K C267 68p
C282 100.p
C266 1.n
N.C.
R1485 0
Bat_GND
Q73
C617 1.5n
C616 100n
Bat_GND
Bat_GND
R205 0.04
R206 0.04
C332 10.n
L2 15u
Vo=1.19(1+75/45.3)=3.1602V
C76 100.n
Q73
D32
Bat_GND
R66 75K
R71 45.3K
R632 0.
Bat_GND
C223 100.u
C224 100.u
C598 100n
C599 1.5n
C602 150p
3.3_Alive
C92 100.n
5V_PF
U22
TC7S14F
VCC GND NC
Bat_GND
High - Shut-Down
Low - Normal
X - Normal(Run)
Quiescent Current ~1uA
Max_Charged to 6V
Q59
R440 1.M
Bat_GND
C243 100.n
C297 43.p
SH3
SHIELD
Bat_GND

MOSCAD-M Main Board

FCN6088A

SHIFT_REGISTER + LED'S



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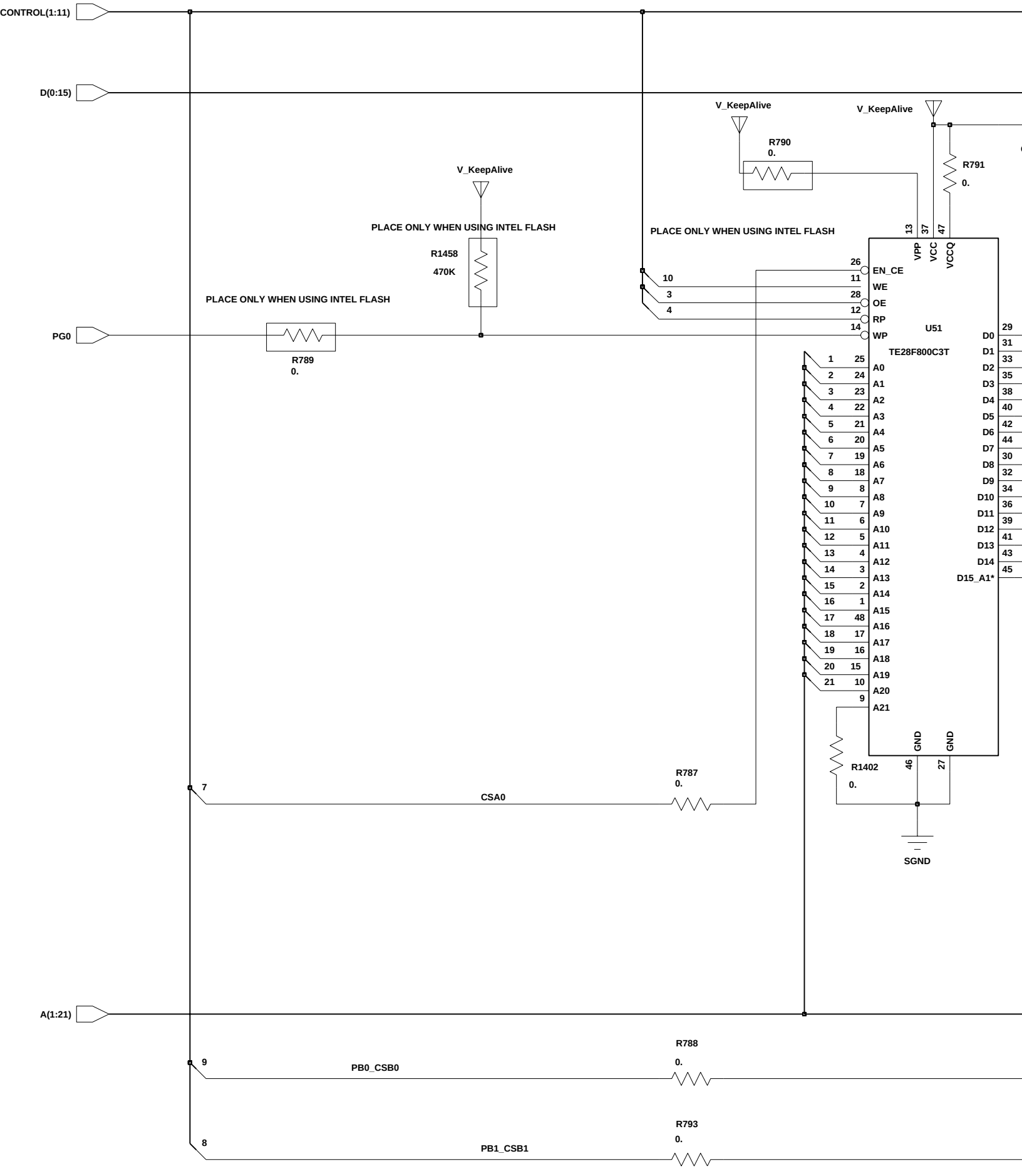
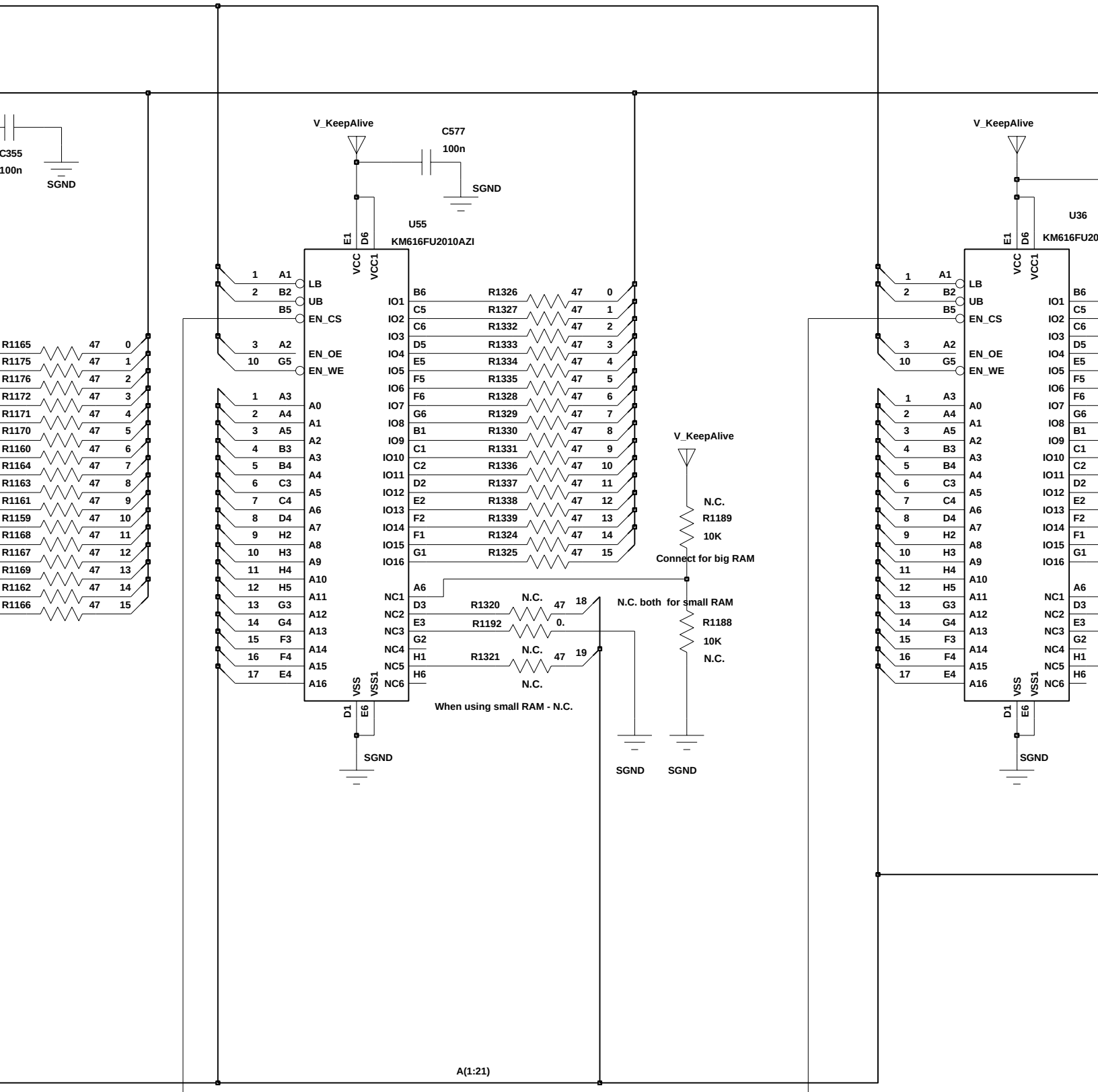
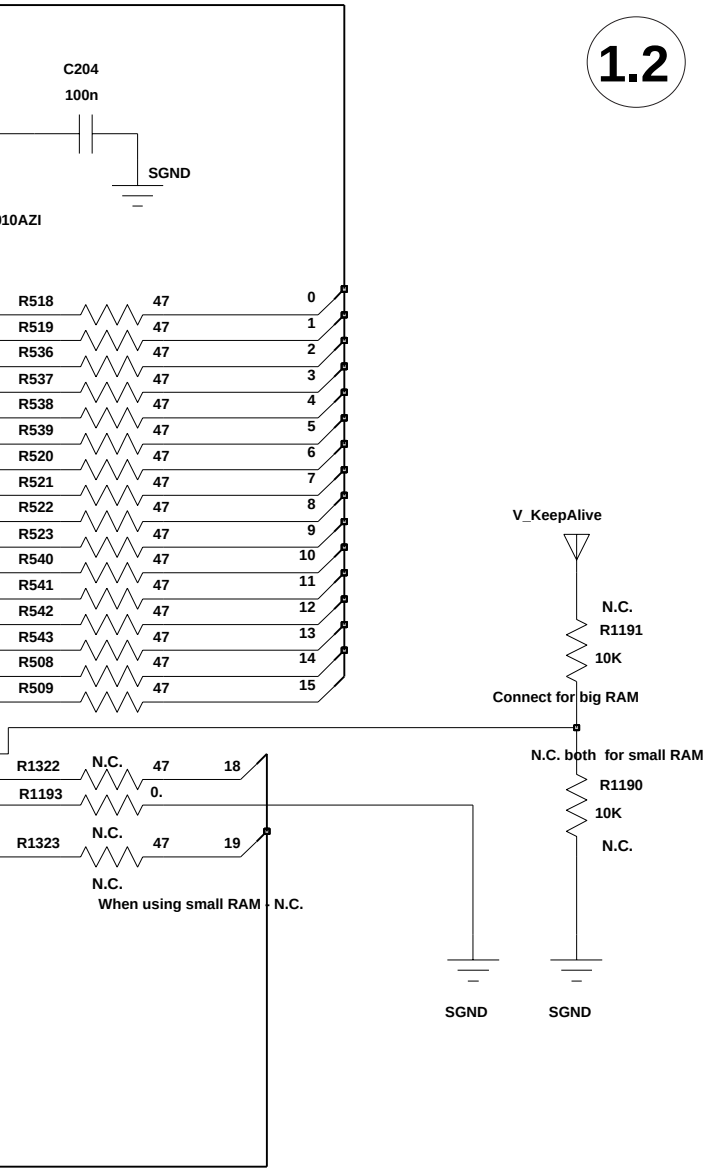

CONTROL(1:11)
D(0:15)
V_KeepAlive
V_KeepAlive
R790
0.
R791
0.
V_KeepAlive
PLACE ONLY WHEN USING INTEL FLASH
R1458
470K
PLACE ONLY WHEN USING INTEL FLASH
PLACE ONLY WHEN USING INTEL FLASH
PG0
R789
0.
U51
TE28F800C3T
VPP
VCC
VCCQ
EN_CE
WE
OE
RP
WP
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
A16
A17
A18
A19
A20
A21
D0
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15_A1*
GND
GND
R1402
0.
R787
0.
CSA0
SGND
A(1:21)
R788
0.
PB0_CSB0
R793
0.
PB1_CSB1


C355
100n
SGND
V_KeepAlive
C577
100n
SGND
U55
KM616FU2010AZI
E1
D6
VCC
VCC1
LB
UB
EN_CS
EN_OE
EN_WE
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
A16
IO1
IO2
IO3
IO4
IO5
IO6
IO7
IO8
IO9
IO10
IO11
IO12
IO13
IO14
IO15
IO16
NC1
NC2
NC3
NC4
NC5
NC6
VSS
VSS1
D1
E6
SGND
R1165
R1175
R1176
R1172
R1171
R1170
R1160
R1164
R1163
R1161
R1159
R1168
R1167
R1169
R1162
R1166
R1326
R1327
R1332
R1333
R1334
R1335
R1328
R1329
R1330
R1331
R1336
R1337
R1338
R1339
R1324
R1325
47
V_KeepAlive
N.C.
R1189
10K
Connect for big RAM
N.C.
R1320
R1192
R1321
18
19
0.
N.C. both for small RAM
R1188
10K
N.C.
When using small RAM - N.C.
SGND
SGND
A(1:21)
V_KeepAlive
U36
KM616FU20
SGND

MEMORY

MOSCAD-M Main Board

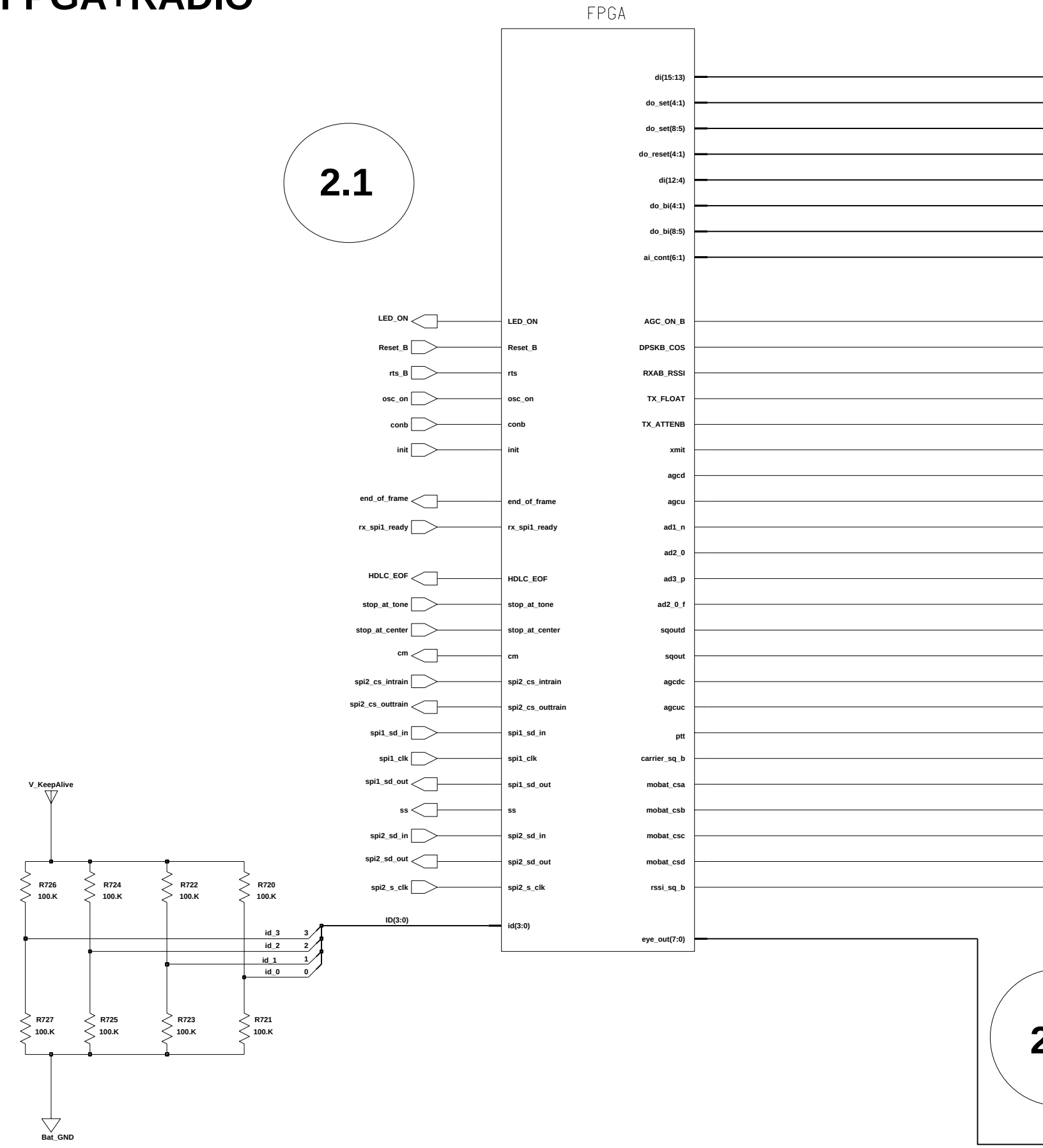
FCN6088A



73D02962C89-O

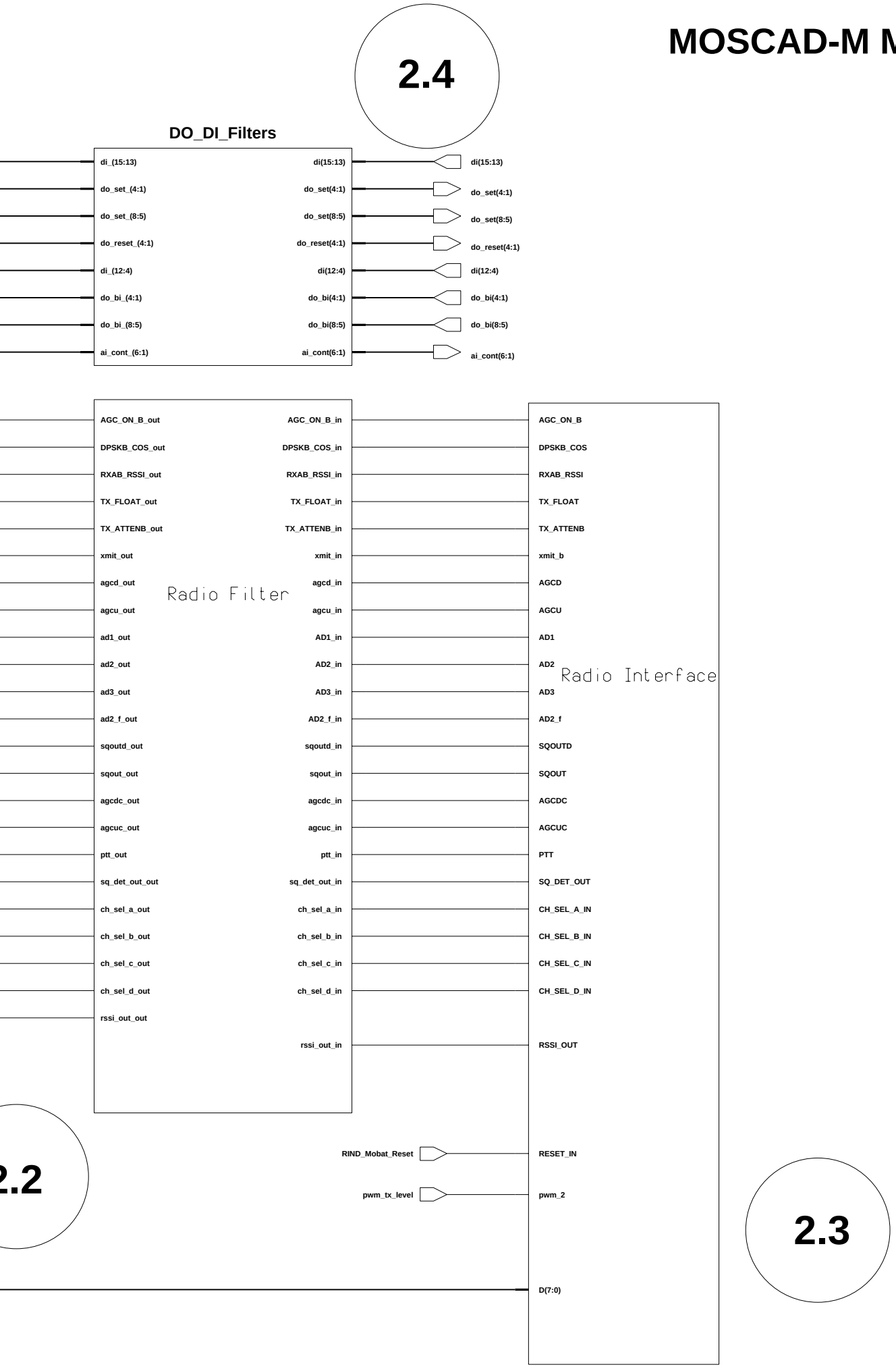
SHEET 3 OF 23

FPGA+RADIO

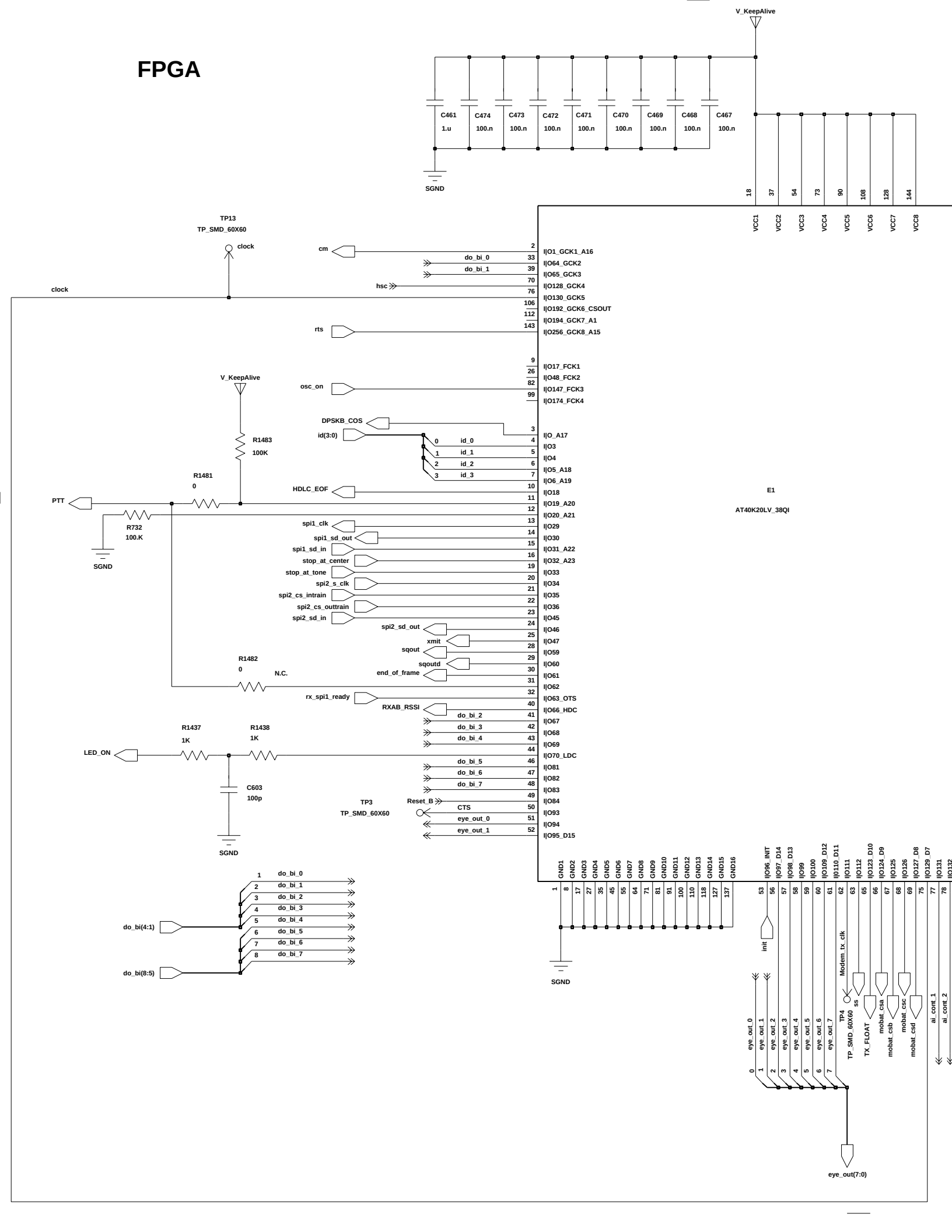

FPGA
2.1
di(15:13)
do_set(4:1)
do_set(8:5)
do_reset(4:1)
di(12:4)
do_bi(4:1)
do_bi(8:5)
ai_cont(6:1)
LED_ON
Reset_B
rts_B
osc_on
conb
init
end_of_frame
rx_spi1_ready
HDLC_EOF
stop_at_tone
stop_at_center
cm
spi2_cs_intrain
spi2_cs_outtrain
spi1_sd_in
spi1_clk
spi1_sd_out
ss
spi2_sd_in
spi2_sd_out
spi2_s_clk
LED_ON
Reset_B
rts
osc_on
conb
init
end_of_frame
rx_spi1_ready
HDLC_EOF
stop_at_tone
stop_at_center
cm
spi2_cs_intrain
spi2_cs_outtrain
spi1_sd_in
spi1_clk
spi1_sd_out
ss
spi2_sd_in
spi2_sd_out
spi2_s_clk
AGC_ON_B
DPSKB_COS
RXAB_RSSI
TX_FLOAT
TX_ATTENB
xmit
agcd
agcu
ad1_n
ad2_0
ad3_p
ad2_0_f
sqoutd
sqout
agcdc
agcuc
ptt
carrier_sq_b
mobat_csa
mobat_csb
mobat_csc
mobat_csd
rssi_sq_b
ID(3:0)
id(3:0)
eye_out(7:0)
V_KeepAlive
R726 100.K
R724 100.K
R722 100.K
R720 100.K
id_3 3
id_2 2
id_1 1
id_0 0
R727 100.K
R725 100.K
R723 100.K
R721 100.K
Bat_GND

MOSCAD-M Main Board

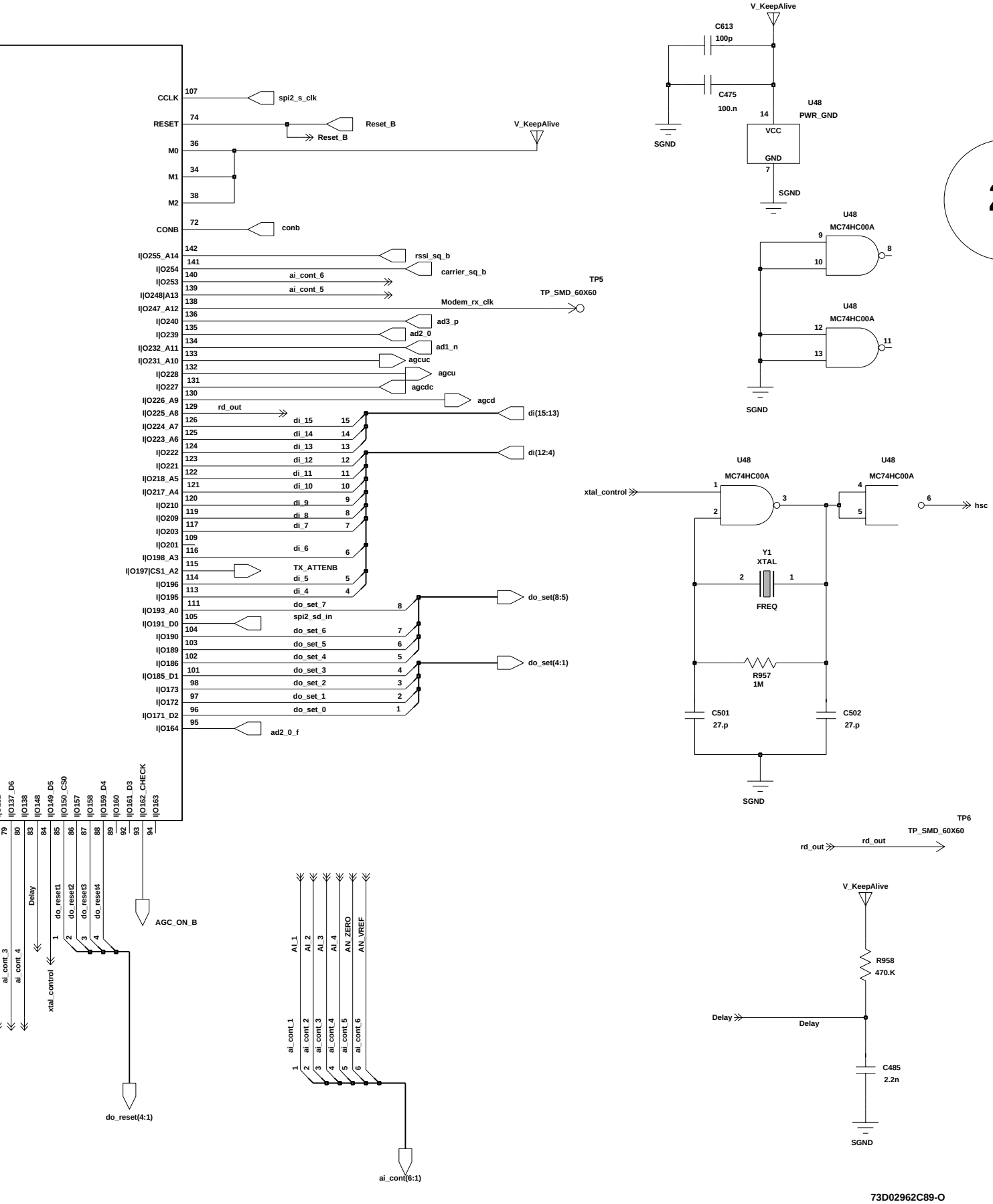
FCN6088A

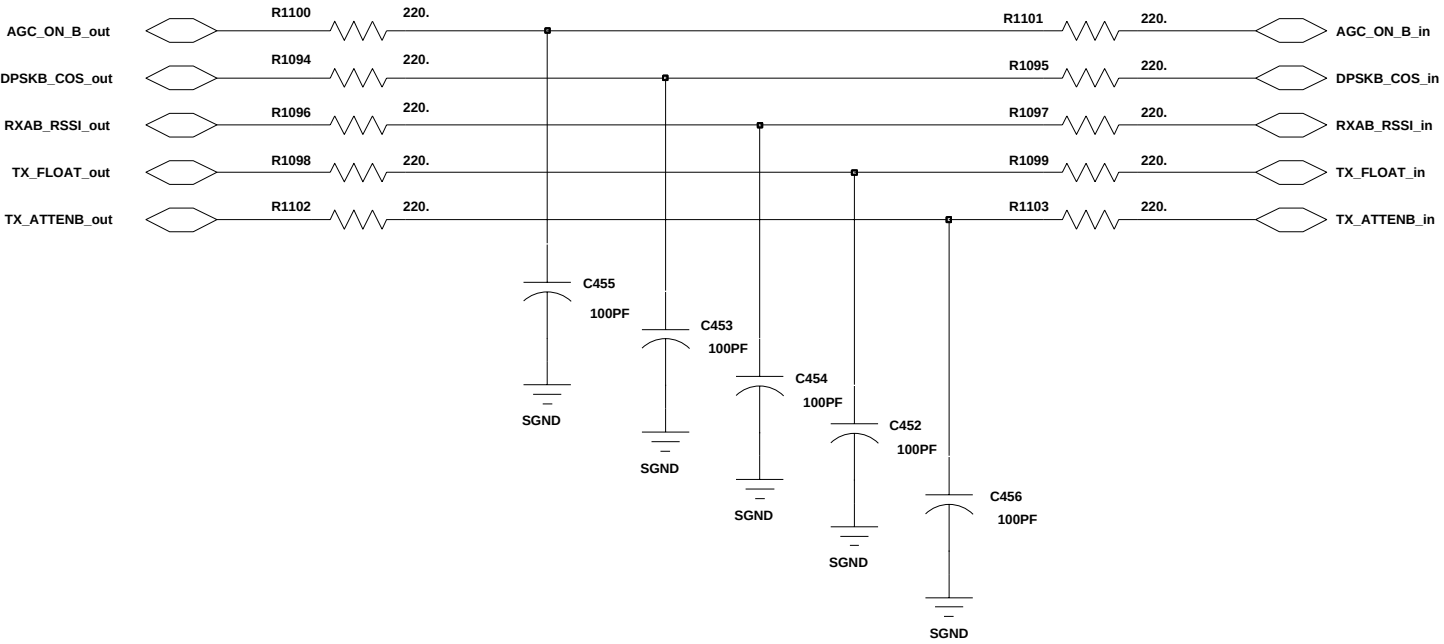


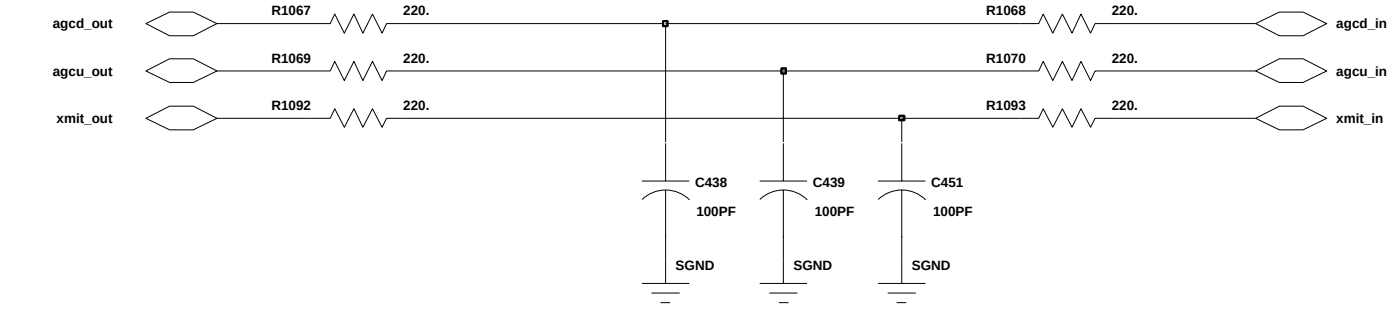
FPGA

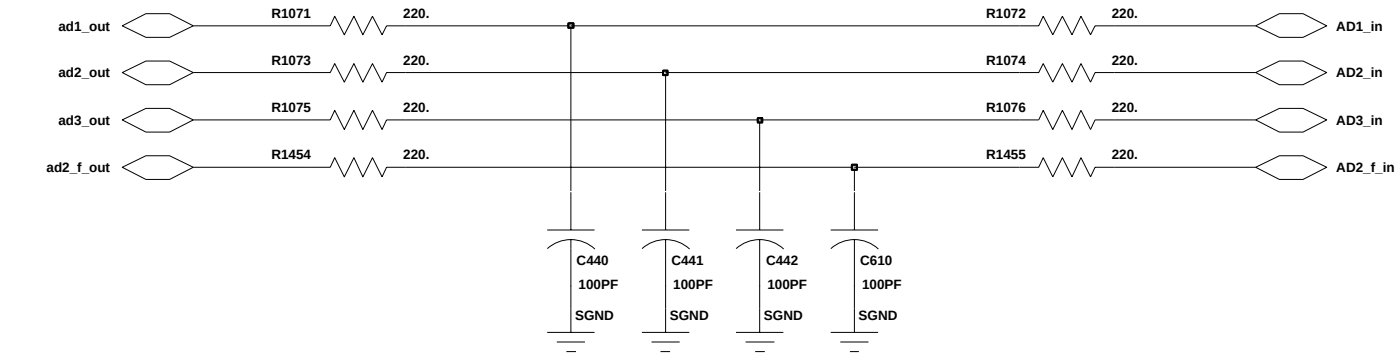

V_KeepAlive
C461 1.u
C474 100.n
C473 100.n
C472 100.n
C471 100.n
C470 100.n
C469 100.n
C468 100.n
C467 100.n
SGND
18 37 54 73 90 108 128 144
VCC1 VCC2 VCC3 VCC4 VCC5 VCC6 VCC7 VCC8
TP13
TP_SMD_60X60
clock
cm
do_bi_0
do_bi_1
hsc
rts
osc_on
DPSKB_COS
id(3:0)
id_0
id_1
id_2
id_3
HDLC_EOF
PTT
R1481 0
R1483 100K
R732 100.K
SGND
E1
AT40K20LV_38QI
I|O1_GCK1_A16
I|O64_GCK2
I|O65_GCK3
I|O128_GCK4
I|O130_GCK5
I|O192_GCK6_CSOUT
I|O194_GCK7_A1
I|O256_GCK8_A15
I|O17_FCK1
I|O48_FCK2
I|O147_FCK3
I|O174_FCK4
I|O_A17
I|O3
I|O4
I|O5_A18
I|O6_A19
I|O18
I|O19_A20
I|O20_A21
I|O29
I|O30
I|O31_A22
I|O32_A23
I|O33
I|O34
I|O35
I|O36
I|O45
I|O46
I|O47
I|O59
I|O60
I|O61
I|O62
I|O63_OTS
I|O66_HDC
I|O67
I|O68
I|O69
I|O70_LDC
I|O81
I|O82
I|O83
I|O84
I|O93
I|O94
I|O95_D15
spi1_clk
spi1_sd_out
spi1_sd_in
stop_at_center
stop_at_tone
spi2_s_clk
spi2_cs_intrain
spi2_cs_outtrain
spi2_sd_in
spi2_sd_out
xmit
sqout
sqoutd
end_of_frame
rx_spi1_ready
RXAB_RSSI
R1482 0
N.C.
R1437 1K
R1438 1K
LED_ON
C603 100p
TP3
TP_SMD_60X60
Reset_B
CTS
eye_out_0
eye_out_1
SGND
GND1 GND2 GND3 GND4 GND5 GND6 GND7 GND8 GND9 GND10 GND11 GND12 GND13 GND14 GND15 GND16
1 8 17 27 35 45 55 64 71 81 91 100 110 118 127 137
SGND
do_bi(4:1)
do_bi(8:5)
do_bi_0
do_bi_1
do_bi_2
do_bi_3
do_bi_4
do_bi_5
do_bi_6
do_bi_7
I|O96_INIT
I|O97_D14
I|O98_D13
I|O99
I|O100
I|O109_D12
I|O110_D11
I|O111
I|O112
I|O123_D10
I|O124_D9
I|O125
I|O126
I|O127_D8
I|O129_D7
I|O131
I|O132
53 56 57 58 59 60 61 62 63 65 66 67 68 69 75 77 78
init
Modem_tx_clk
TP4
TP_SMD_60X60
ss
TX_FLOAT
mobat_csa
mobat_csb
mobat_csc
mobat_csd
ai_cont_1
ai_cont_2
eye_out_0
eye_out_1
eye_out_2
eye_out_3
eye_out_4
eye_out_5
eye_out_6
eye_out_7
0 1 2 3 4 5 6 7
eye_out(7:0)

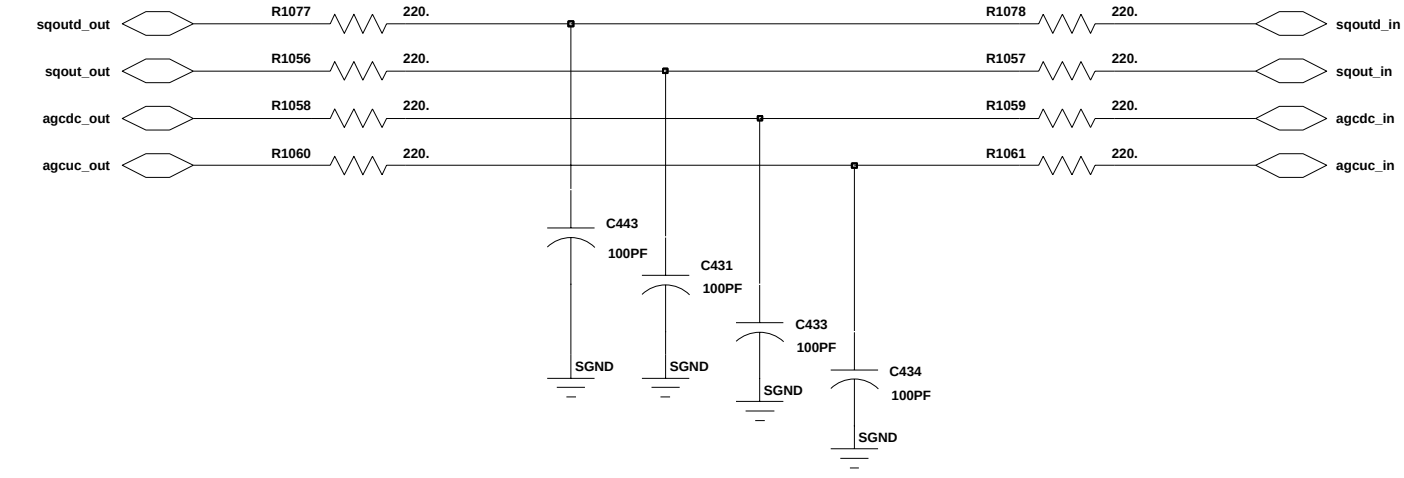
2.1


CCLK
RESET
M0
M1
M2
CONB
spi2_s_clk
Reset_B
Reset_B
V_KeepAlive
conb
rssi_sq_b
carrier_sq_b
ai_cont_6
ai_cont_5
Modem_rx_clk
TP5
TP_SMD_60X60
ad3_p
ad2_0
ad1_n
agcuc
agcu
agcdc
agcd
rd_out
di_15
di_14
di_13
di_12
di_11
di_10
di_9
di_8
di_7
di_6
di_5
di_4
di(15:13)
di(12:4)
TX_ATTENB
do_set_7
do_set_6
do_set_5
do_set_4
do_set_3
do_set_2
do_set_1
do_set_0
do_set(8:5)
do_set(4:1)
spi2_sd_in
ad2_0_f
C613
100p
C475
100.n
U48
PWR_GND
VCC
GND
SGND
U48
MC74HC00A
U48
MC74HC00A
xtal_control
U48
MC74HC00A
U48
MC74HC00A
hsc
Y1
XTAL
FREQ
R957
1M
C501
27.p
C502
27.p
TP6
TP_SMD_60X60
rd_out
V_KeepAlive
R958
470.K
Delay
C485
2.2n
AGC_ON_B
do_reset(4:1)
ai_cont(6:1)
Delay
xtal_control
ai_cont_3
ai_cont_4


AGC_ON_B_out
R1100
220.
R1101
220.
AGC_ON_B_in
DPSKB_COS_out
R1094
220.
R1095
220.
DPSKB_COS_in
RXAB_RSSI_out
R1096
220.
R1097
220.
RXAB_RSSI_in
TX_FLOAT_out
R1098
220.
R1099
220.
TX_FLOAT_in
TX_ATTENB_out
R1102
220.
R1103
220.
TX_ATTENB_in
C455
100PF
SGND
C453
100PF
SGND
C454
100PF
SGND
C452
100PF
SGND
C456
100PF
SGND


agcd_out
R1067
220.
R1068
220.
agcd_in
agcu_out
R1069
220.
R1070
220.
agcu_in
xmit_out
R1092
220.
R1093
220.
xmit_in
C438
100PF
SGND
C439
100PF
SGND
C451
100PF
SGND

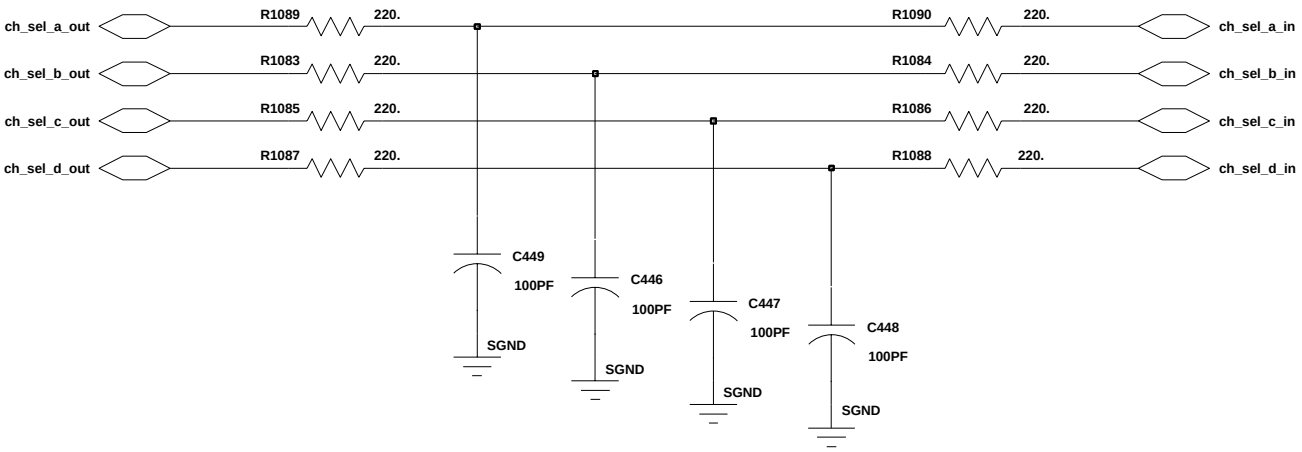

ad1_out
R1071
220.
R1072
220.
AD1_in
ad2_out
R1073
220.
R1074
220.
AD2_in
ad3_out
R1075
220.
R1076
220.
AD3_in
ad2_f_out
R1454
220.
R1455
220.
AD2_f_in
C440
100PF
SGND
C441
100PF
SGND
C442
100PF
SGND
C610
100PF
SGND

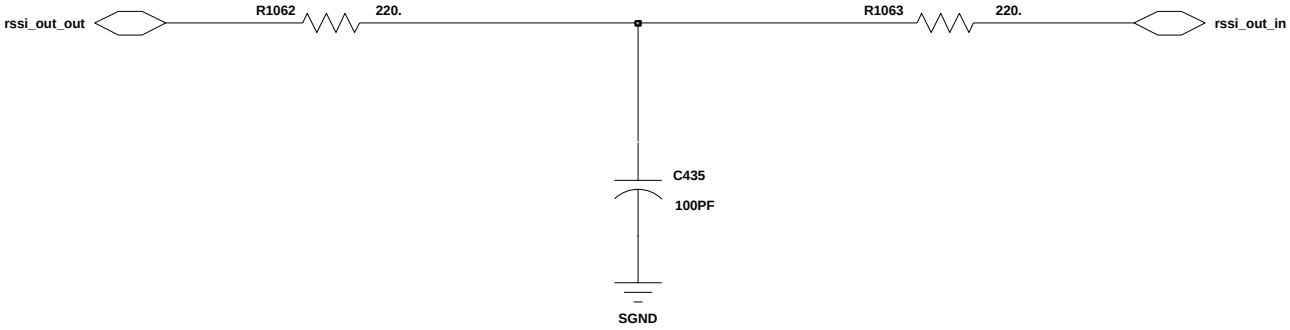

sqoutd_out
R1077
220.
R1078
220.
sqoutd_in
sqout_out
R1056
220.
R1057
220.
sqout_in
agcdc_out
R1058
220.
R1059
220.
agcdc_in
agcuc_out
R1060
220.
R1061
220.
agcuc_in
C443
100PF
SGND
C431
100PF
SGND
C433
100PF
SGND
C434
100PF
SGND

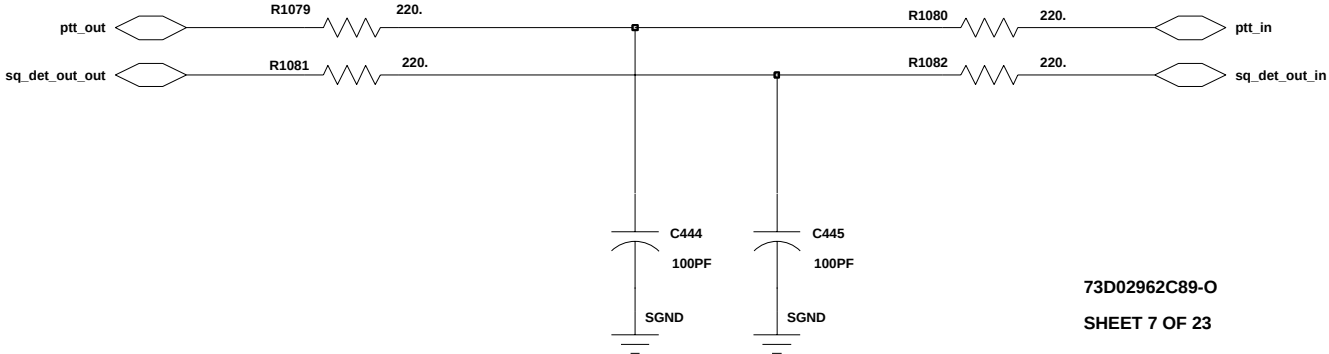
MOSCAD-M Main Board Filters

FCN6088A

2.2







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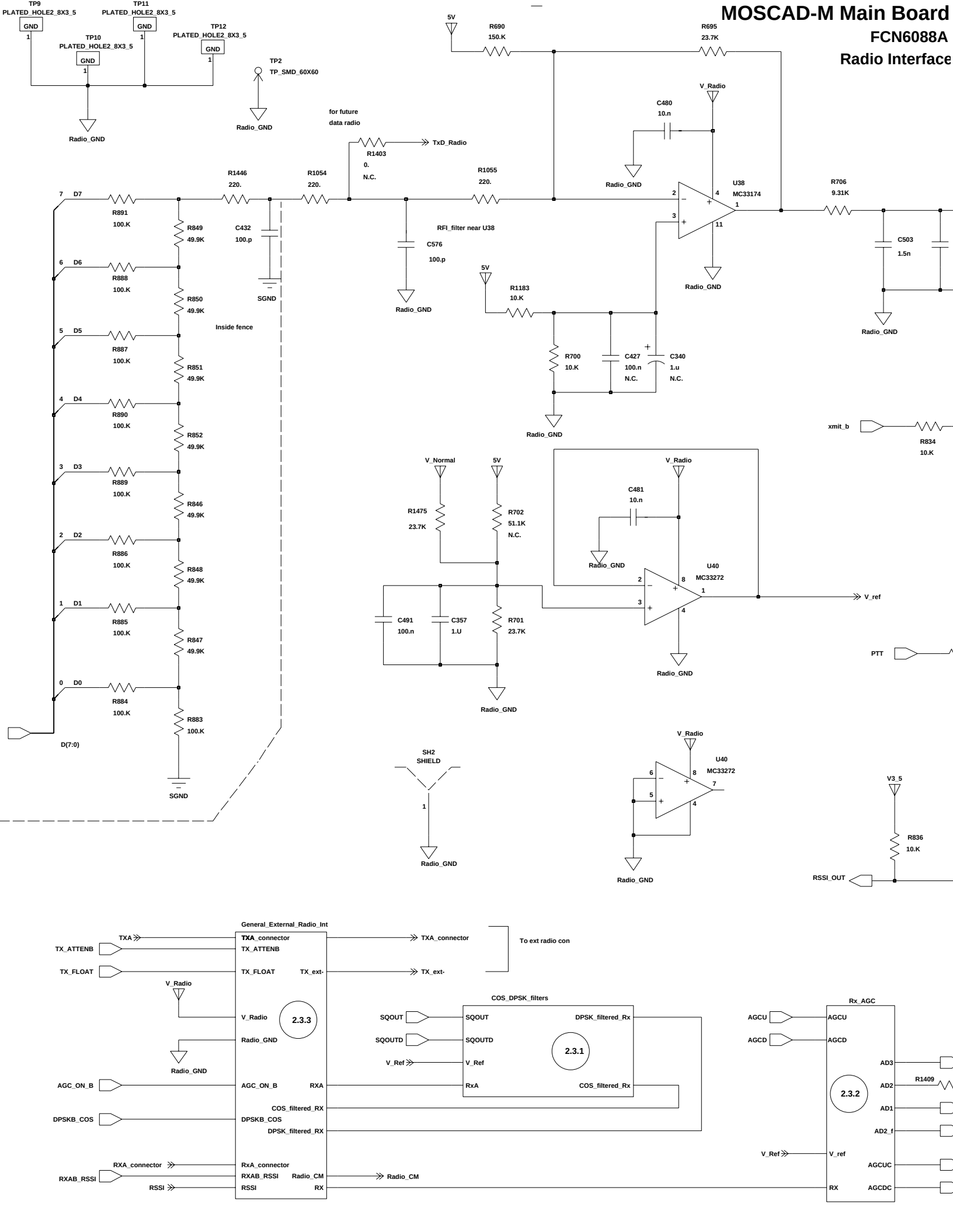
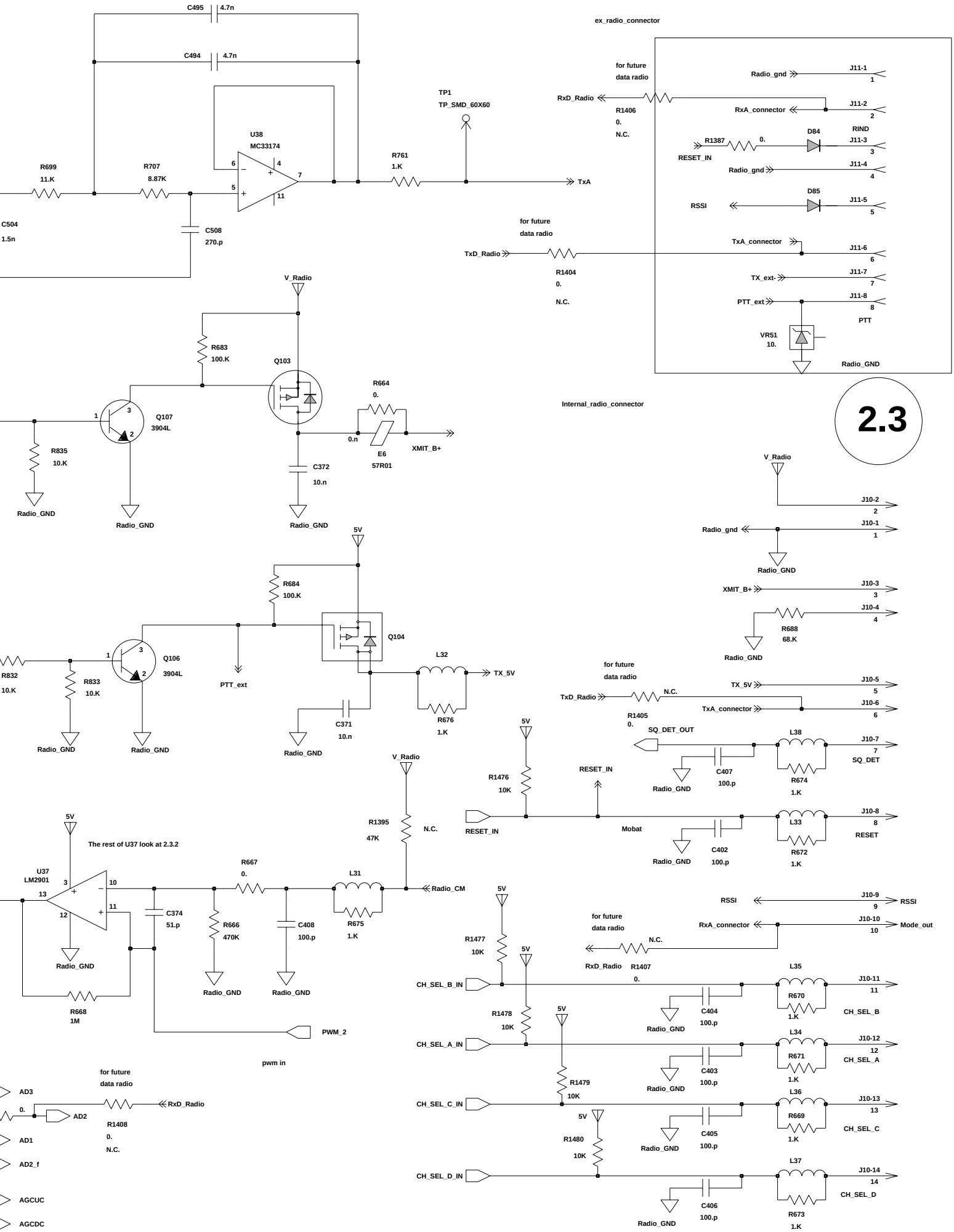
MOSCAD-M Main Board
FCN6088A
Radio Interface

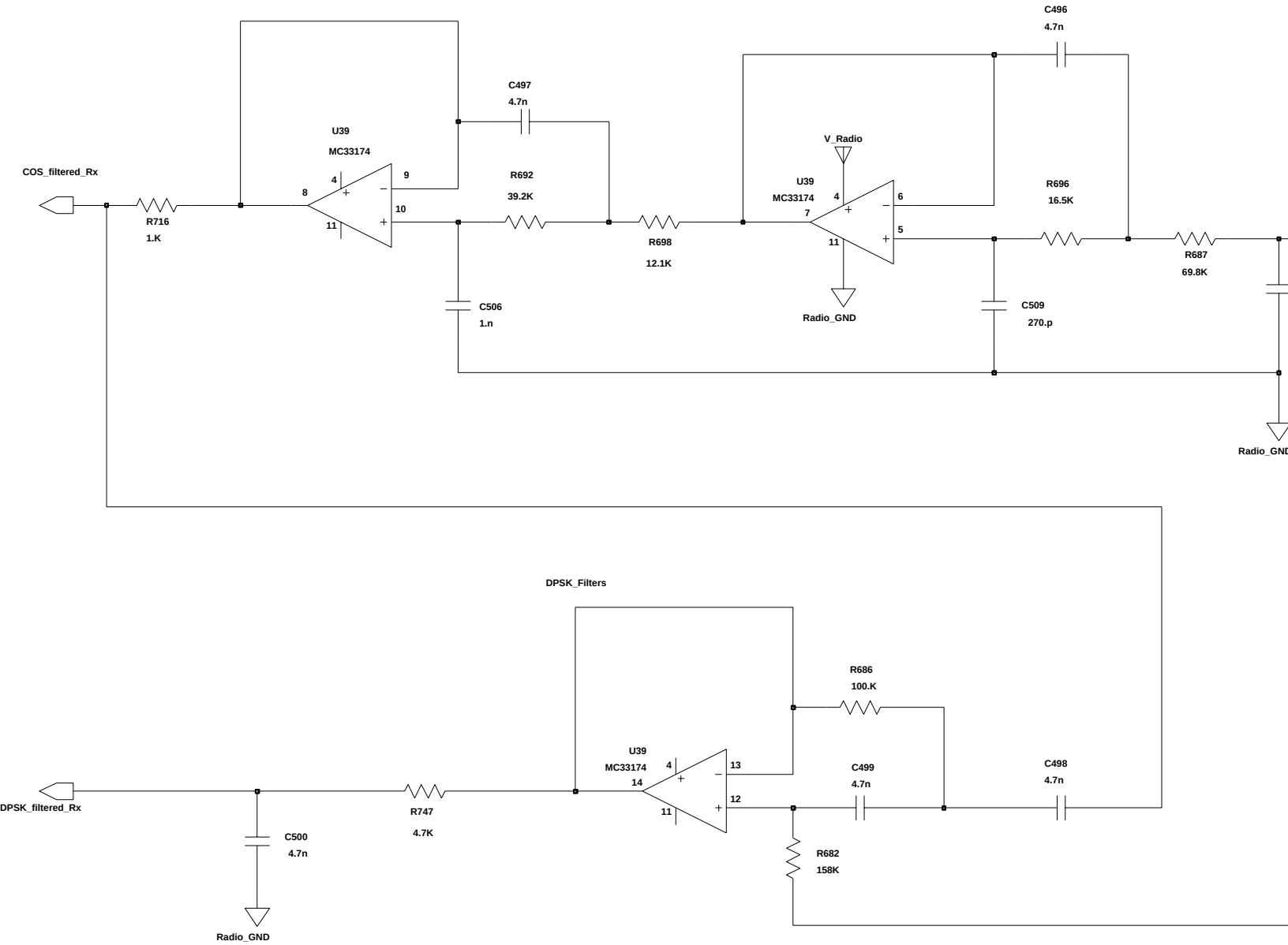



C495 4.7n
C494 4.7n
U38
MC33174
R699 11.K
R707 8.87K
C504 1.5n
C508 270.p
R761 1.K
TP1
TP_SMD_60X60
TxA
ex_radio_connector
for future data radio
RxD_Radio
R1406 0. N.C.
Radio_gnd
J11-1 1
RxA_connector
J11-2 2
R1387 0.
RESET_IN
D84
RIND
J11-3 3
Radio_gnd
J11-4 4
RSSI
D85
J11-5 5
for future data radio
TxD_Radio
R1404 0. N.C.
TxA_connector
J11-6 6
TX_ext-
J11-7 7
PTT_ext
J11-8 8
PTT
VR51 10.
Radio_GND
V_Radio
R683 100.K
Q103
R664 0.
Q107 3904L
R835 10.K
0.n
E6 57R01
XMIT_B+
C372 10.n
Radio_GND
Internal_radio_connector
2.3
V_Radio
J10-2 2
Radio_gnd
J10-1 1
XMIT_B+
J10-3 3
J10-4 4
R688 68.K
5V
R684 100.K
Q104
Q106 3904L
R832 10.K
R833 10.K
PTT_ext
L32
TX_5V
R676 1.K
C371 10.n
for future data radio
TxD_Radio
R1405 0. N.C.
TX_5V
J10-5 5
TxA_connector
J10-6 6
SQ_DET_OUT
L38
J10-7 7 SQ_DET
C407 100.p
R674 1.K
R1476 10K
RESET_IN
Mobat
L33
J10-8 8 RESET
C402 100.p
R672 1.K
V_Radio
R1395 47K N.C.
The rest of U37 look at 2.3.2
U37 LM2901
R667 0.
L31
Radio_CM
C374 51.p
R666 470K
C408 100.p
R675 1.K
R668 1M
PWM_2
pwm in
RSSI
J10-9 9 RSSI
RxA_connector
J10-10 10 Mode_out
for future data radio
N.C.
RxD_Radio
R1407 0.
R1477 10K
CH_SEL_B_IN
L35
J10-11 11
R670 1.K
CH_SEL_B
C404 100.p
R1478 10K
CH_SEL_A_IN
L34
J10-12 12
R671 1.K
CH_SEL_A
C403 100.p
R1479 10K
CH_SEL_C_IN
L36
J10-13 13
R669 1.K
CH_SEL_C
C405 100.p
R1480 10K
CH_SEL_D_IN
L37
J10-14 14
CH_SEL_D
R673 1.K
C406 100.p
for future data radio
AD3
AD2
RxD_Radio
R1408 0. N.C.
AD1
AD2_f
AGCUC
AGCDC
Radio_GND

MOSCAD-M Main Board

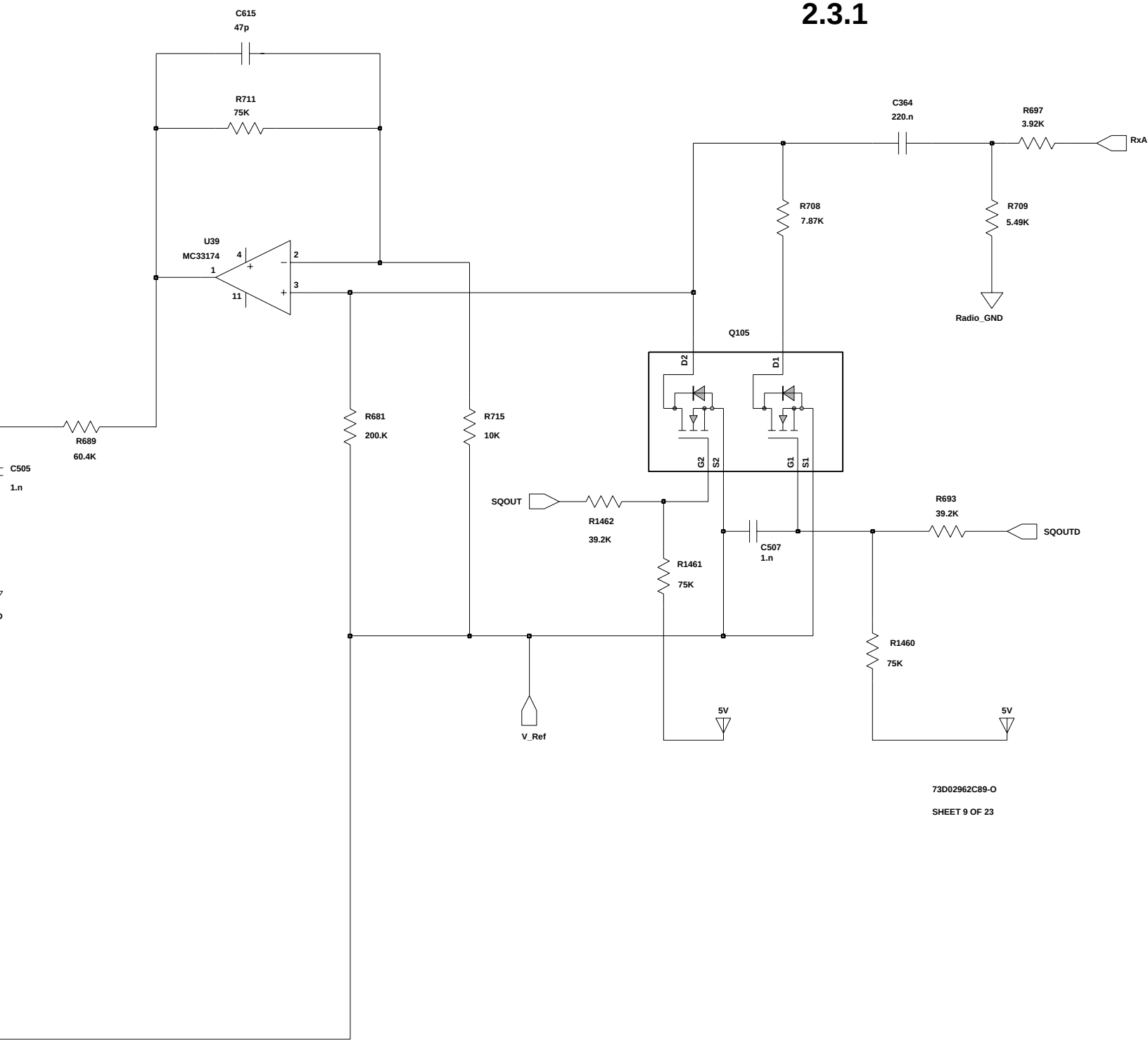
FCN6088A

COS_Filters



RADIO_Rx_Filters

2.3.1



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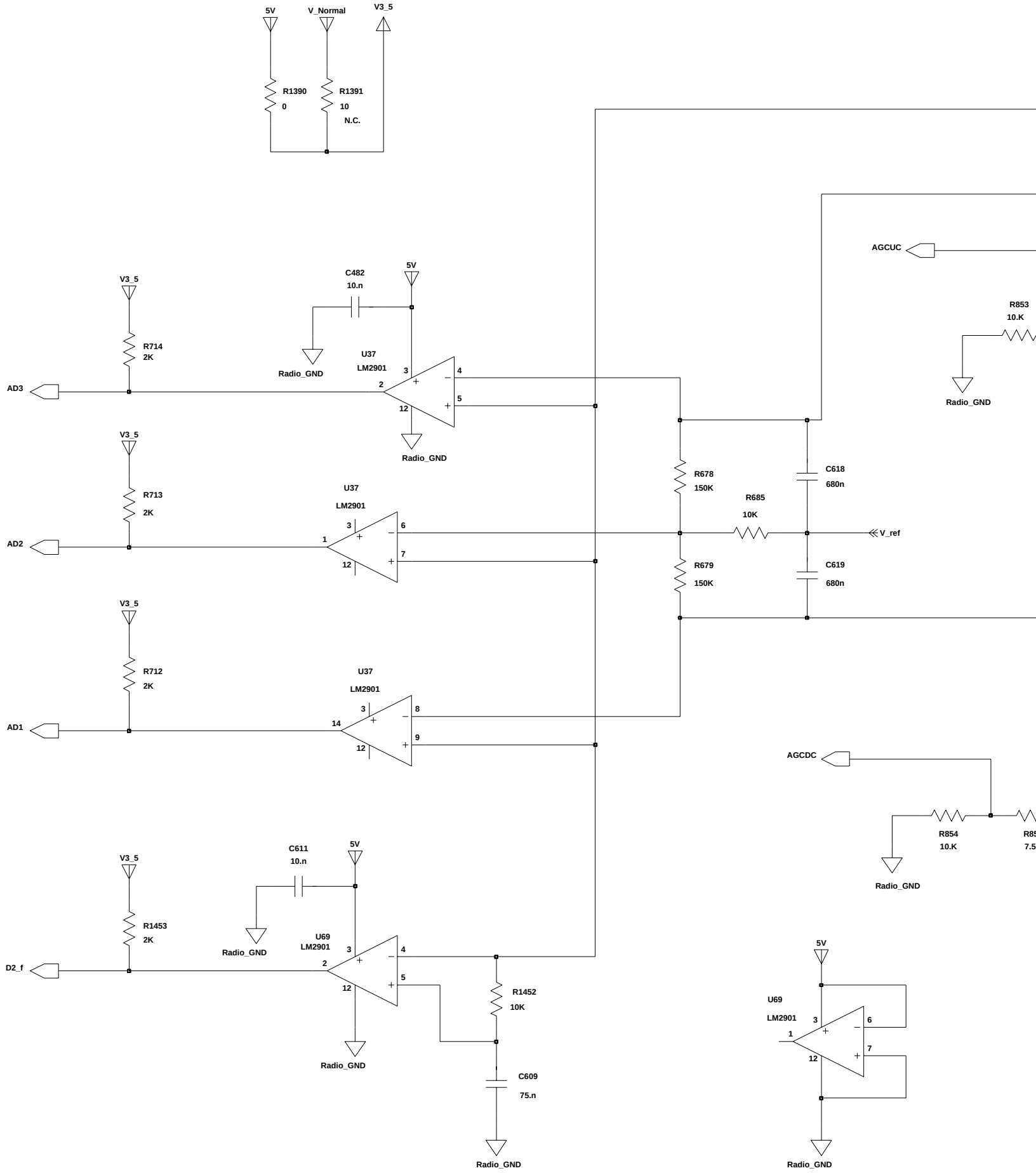
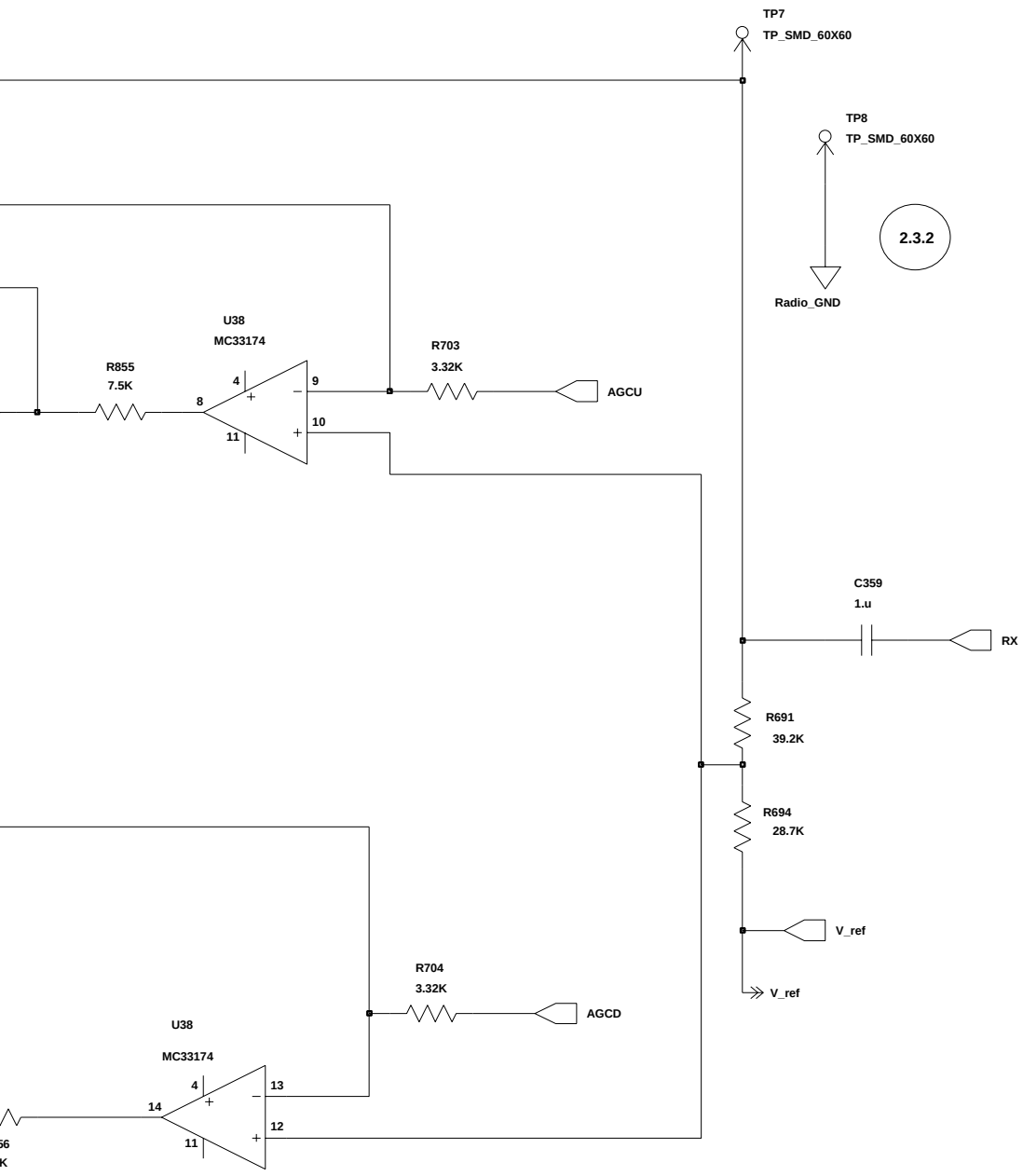
SHEET 9 OF 23

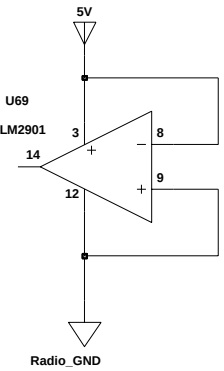

5V
V_Normal
V3_5
R1390
0
R1391
10
N.C.
AGCUC
R853
10.K
Radio_GND
V3_5
C482
10.n
5V
R714
2K
U37
LM2901
AD3
Radio_GND
R678
150K
C618
680n
R685
10K
V_ref
V3_5
R713
2K
U37
LM2901
AD2
R679
150K
C619
680n
V3_5
R712
2K
U37
LM2901
AD1
AGCDC
R854
10.K
Radio_GND
C611
10.n
5V
V3_5
R1453
2K
U69
LM2901
Radio_GND
D2_f
R1452
10K
C609
75.n
Radio_GND
5V
U69
LM2901
Radio_GND

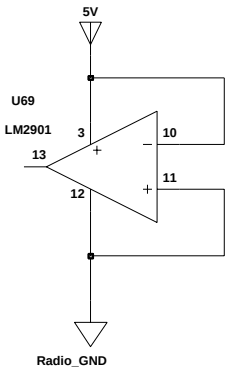
RX AGC

MOSCAD-M Main Board

FCN6088A

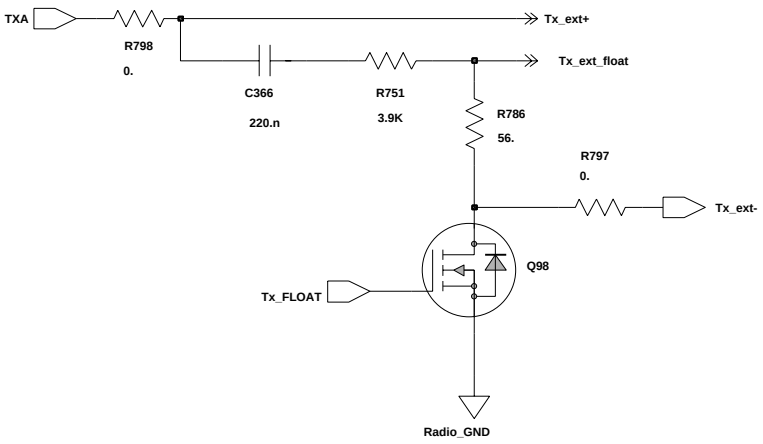




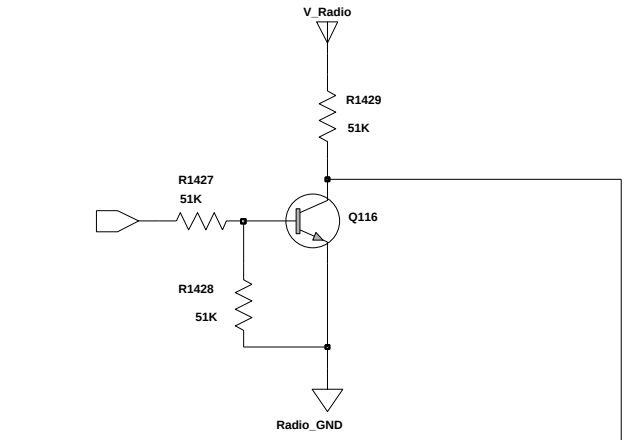


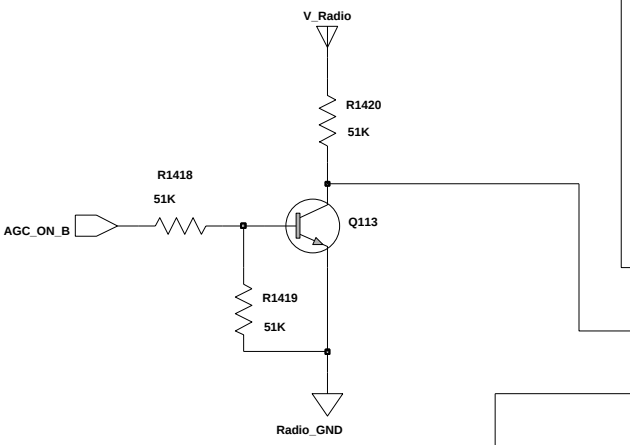
MOSCAD-M Main Board

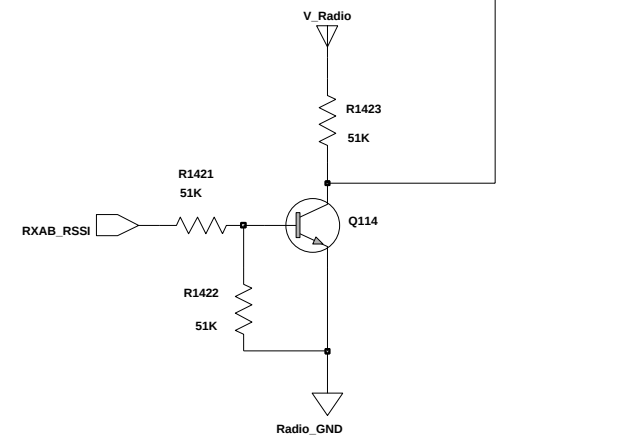
FCN6088A

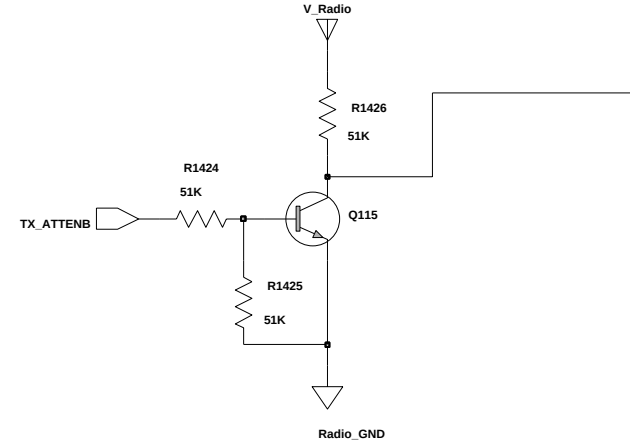


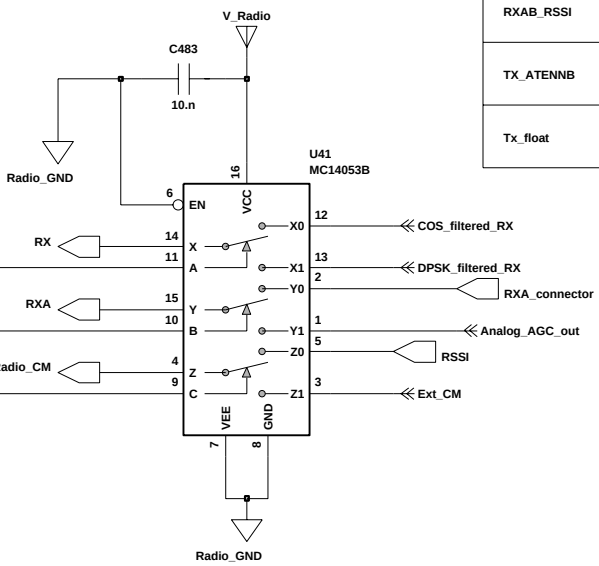
Name	0 1
DPSKB_COS	DPSK
AGC_ON_B	AGC_EN
RXAB_RSSI	RX line to CM
TX_ATENNB	ATTEN ON for GP320
Tx_float	GND discon PTTon Tx

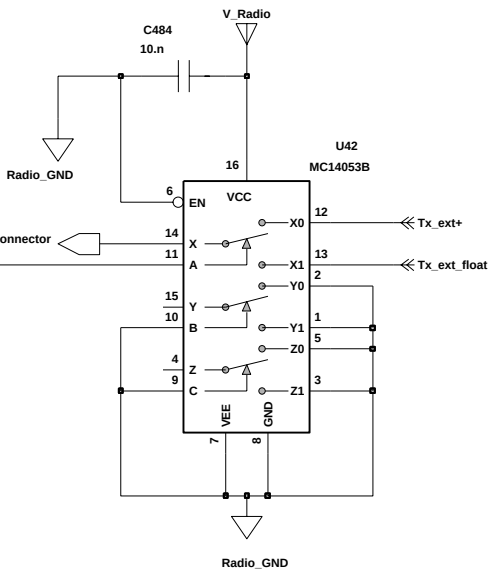






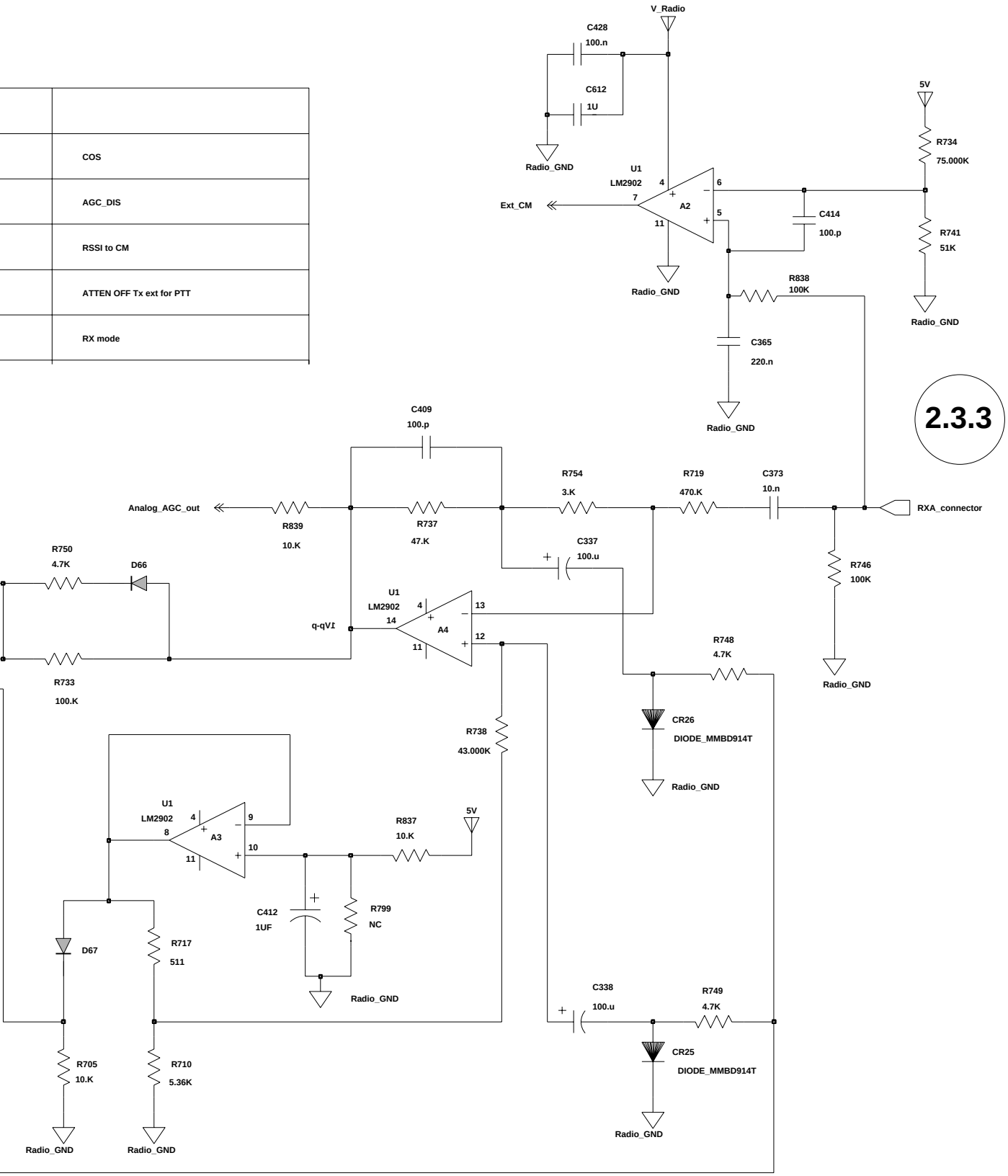






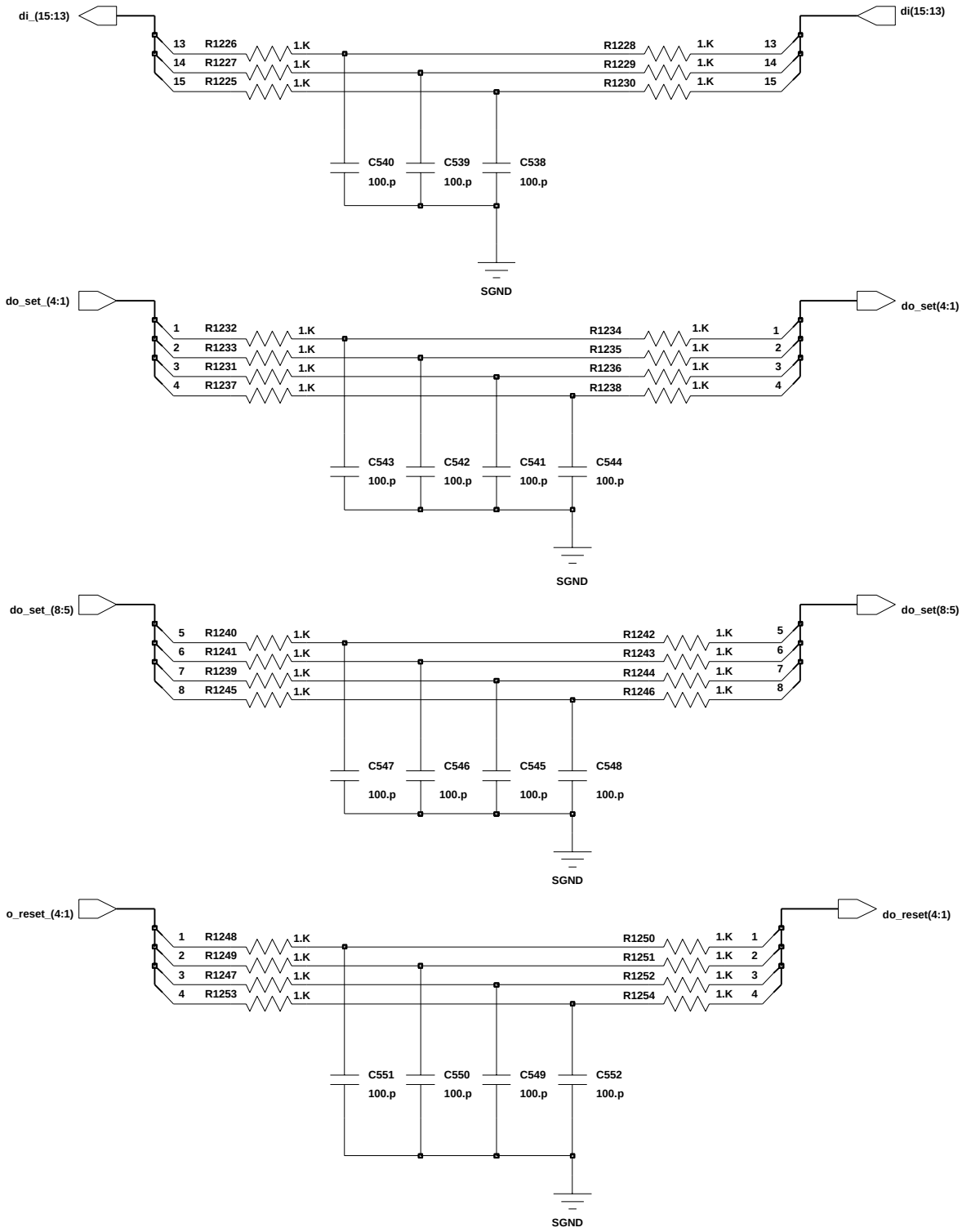
gen_radio_interface

	COS
	AGC_DIS
	RSSI to CM
	ATTEN OFF Tx ext for PTT
	RX mode

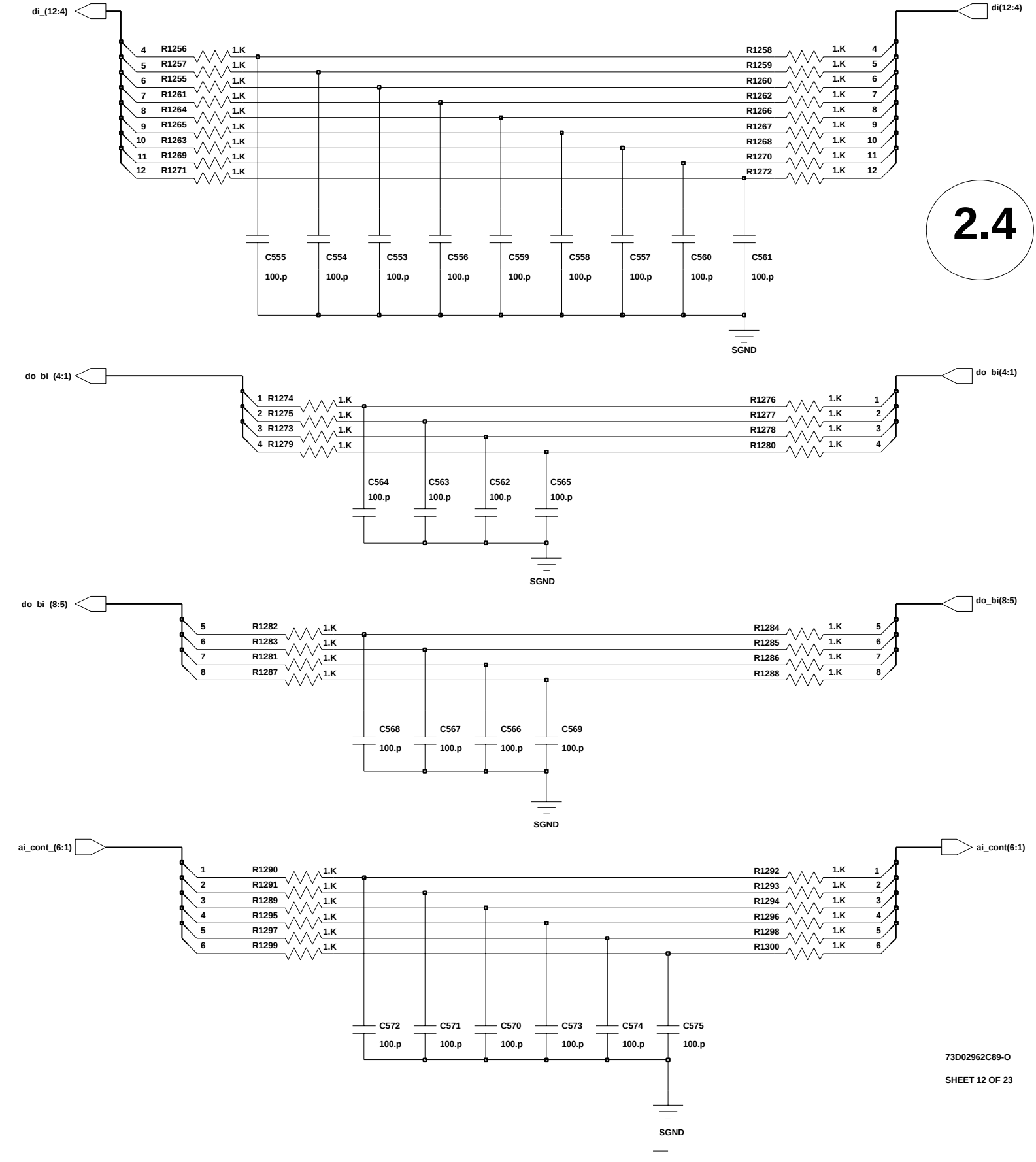


MOSCAD-M Main Board

FCN6088A



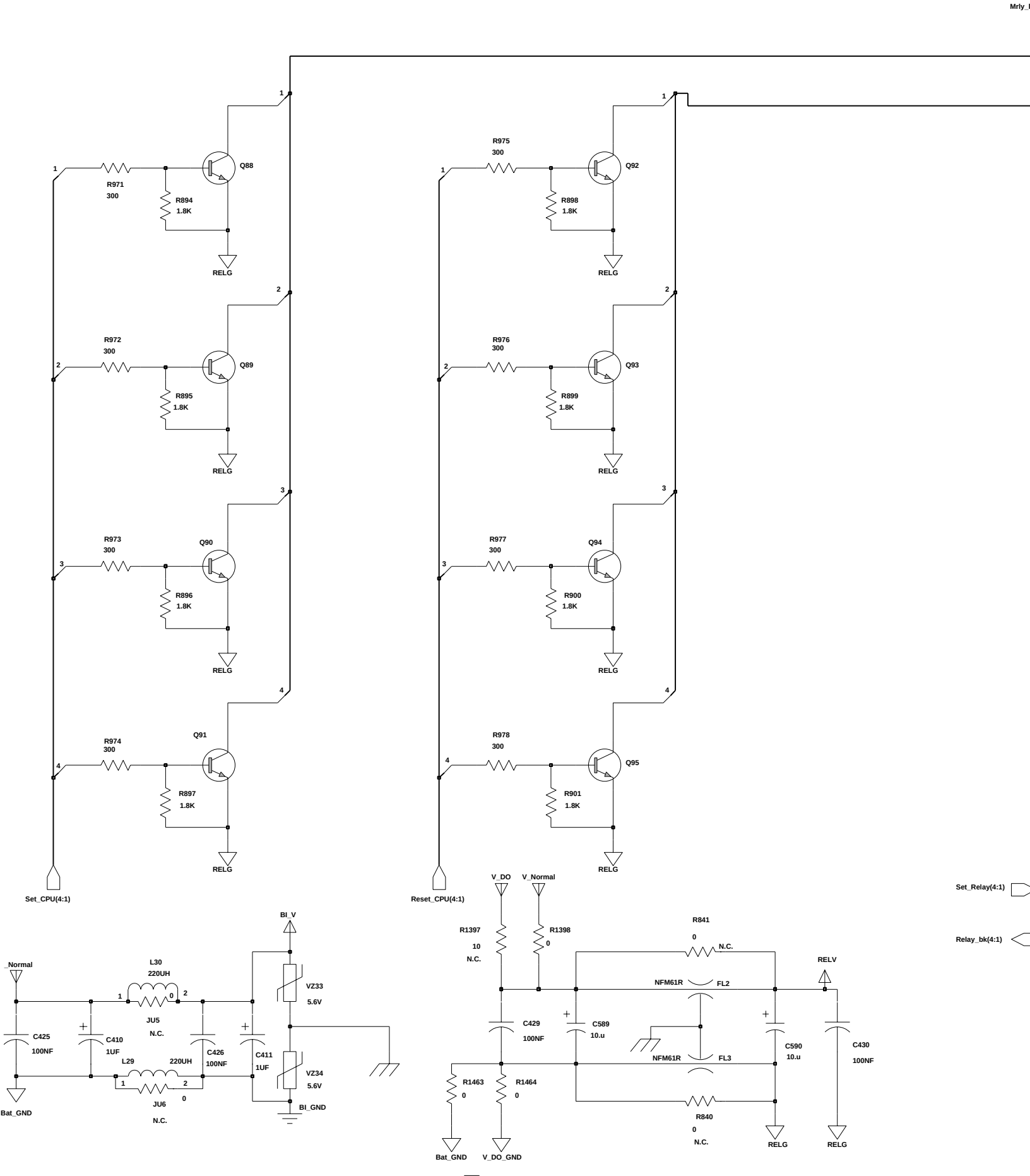
DO & DI Filters



Moscad-M

8486418T01_P1

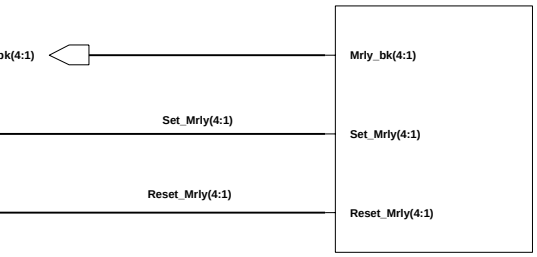
4 DO + 4 DO OC



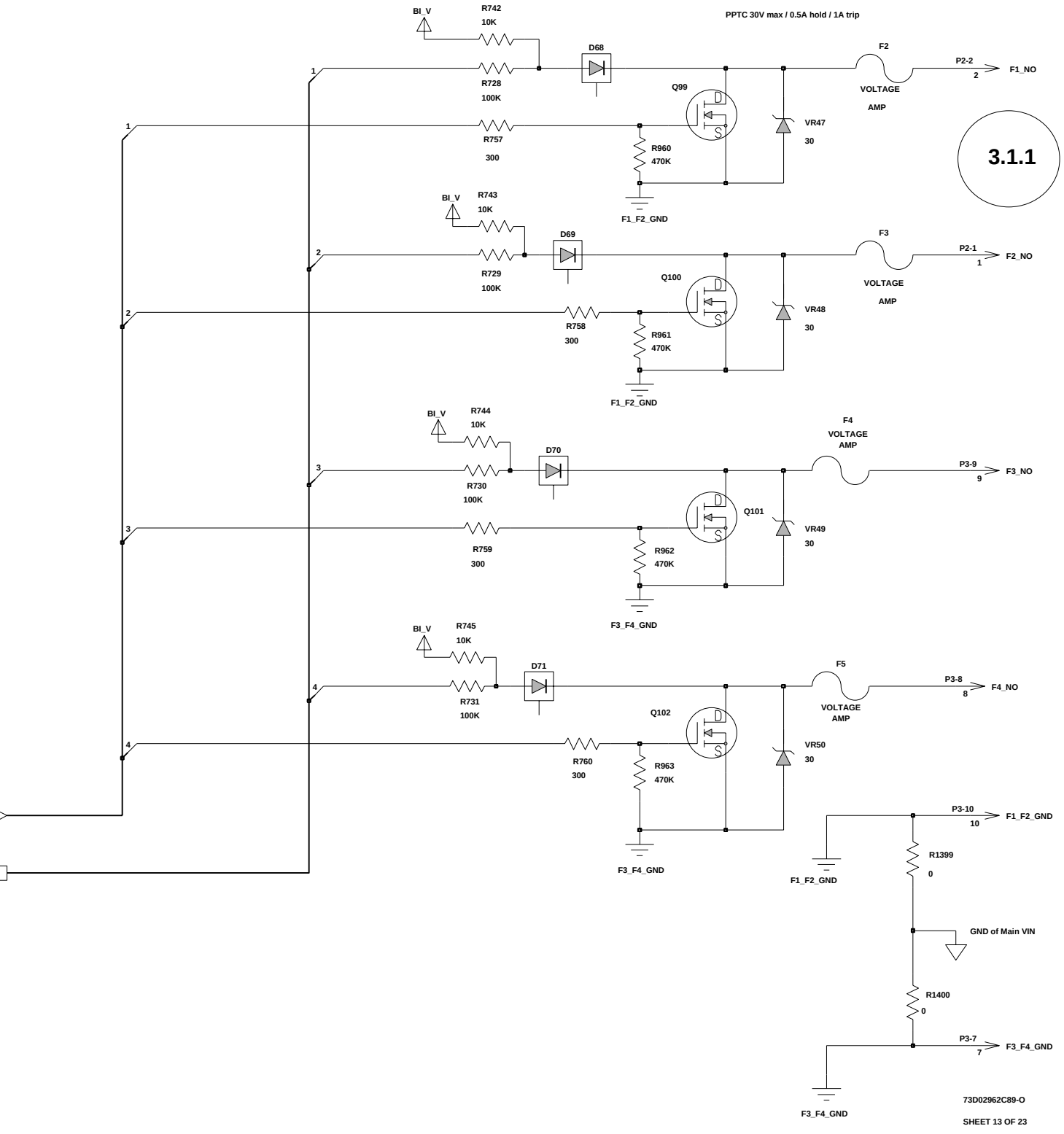
MOSCAD-M Main Board

digital output

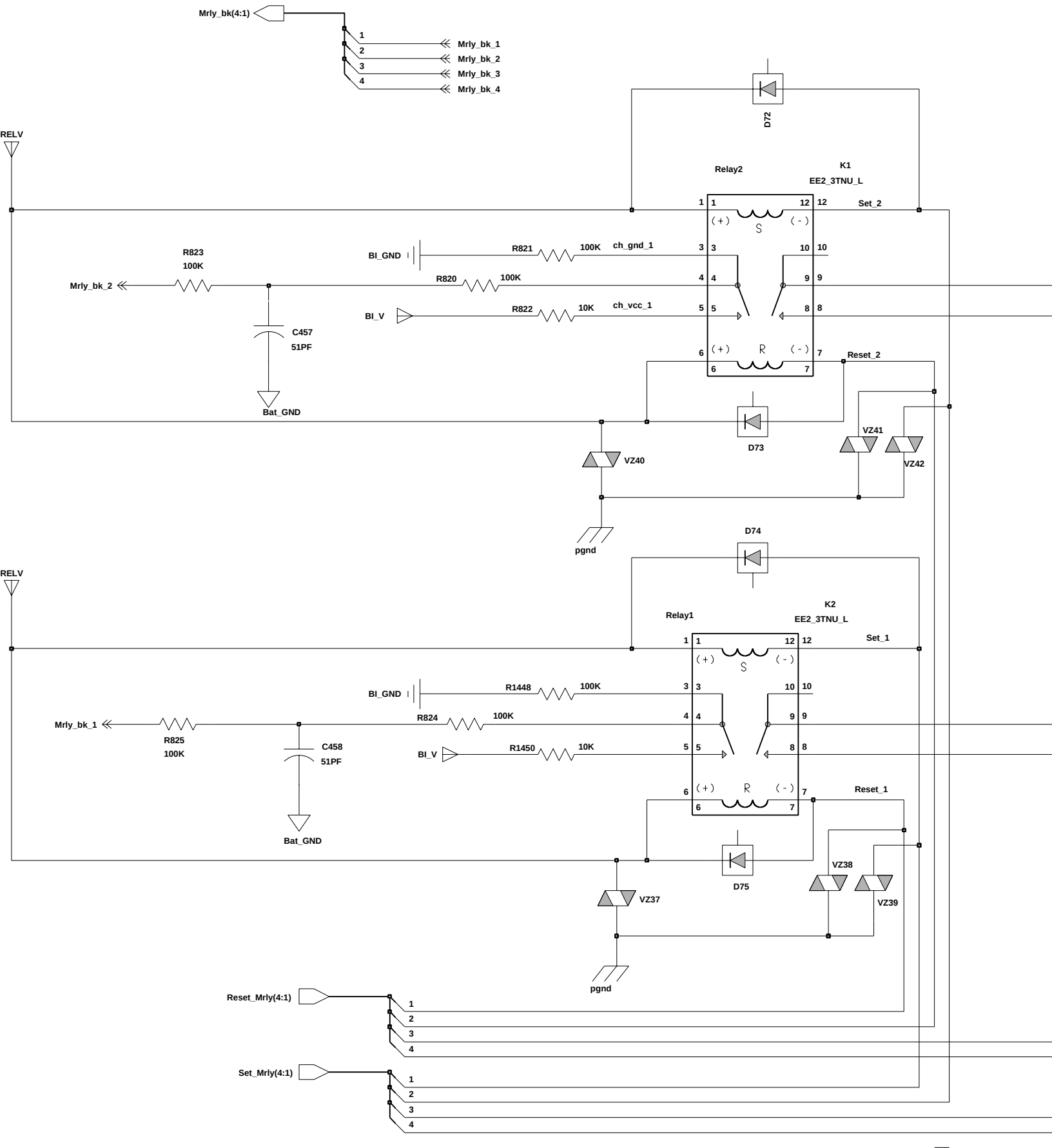
FCN6088A

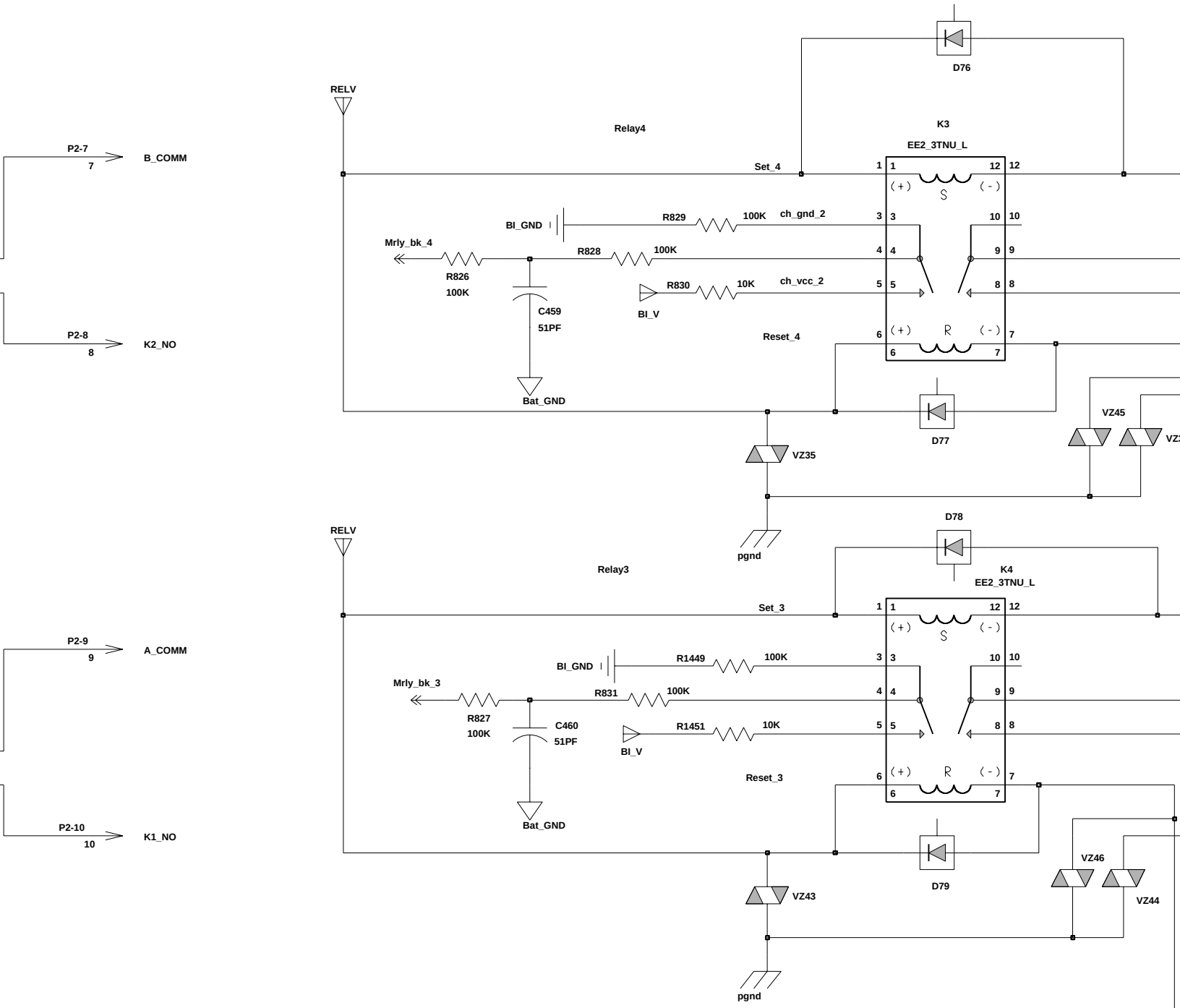


3.1.2



Digital_output 1-4

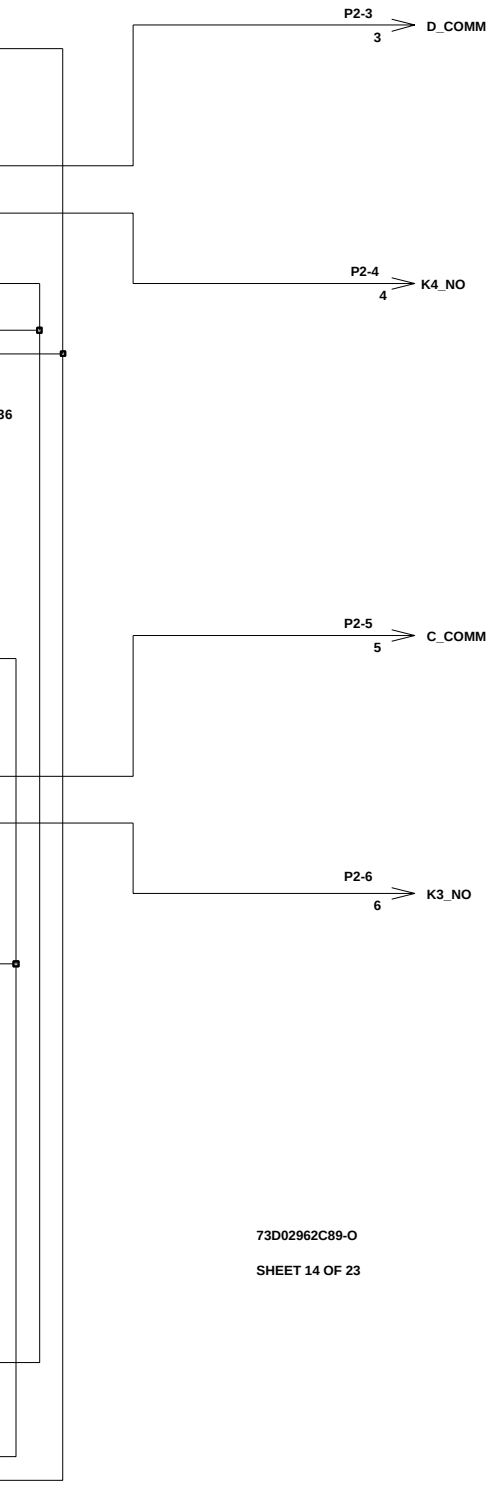



P2-7
7
B_COMM
P2-8
8
K2_NO
P2-9
9
A_COMM
P2-10
10
K1_NO
RELV
Relay4
K3
EE2_3TNU_L
Set_4
D76
BI_GND
R829
100K
ch_gnd_2
Mrly_bk_4
R828
100K
R826
100K
C459
51PF
R830
10K
ch_vcc_2
BI_V
Reset_4
Bat_GND
D77
VZ45
VZ35
pgnd
RELV
Relay3
K4
EE2_3TNU_L
D78
Set_3
BI_GND
R1449
100K
Mrly_bk_3
R831
100K
R827
100K
C460
51PF
R1451
10K
BI_V
Reset_3
Bat_GND
D79
VZ46
VZ44
VZ43
pgnd

MOSCAD-M Main Board

FCN6088A

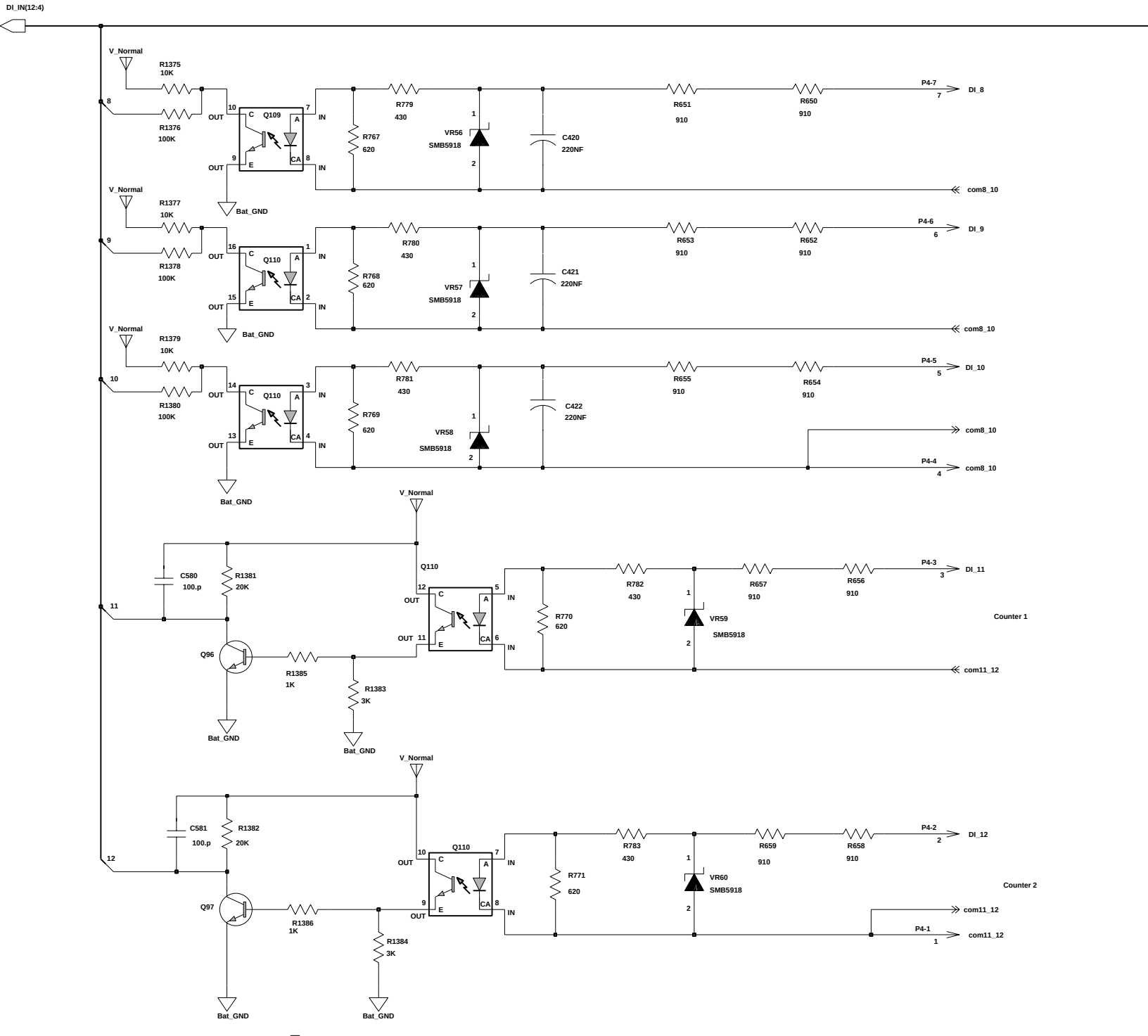
3.1.2

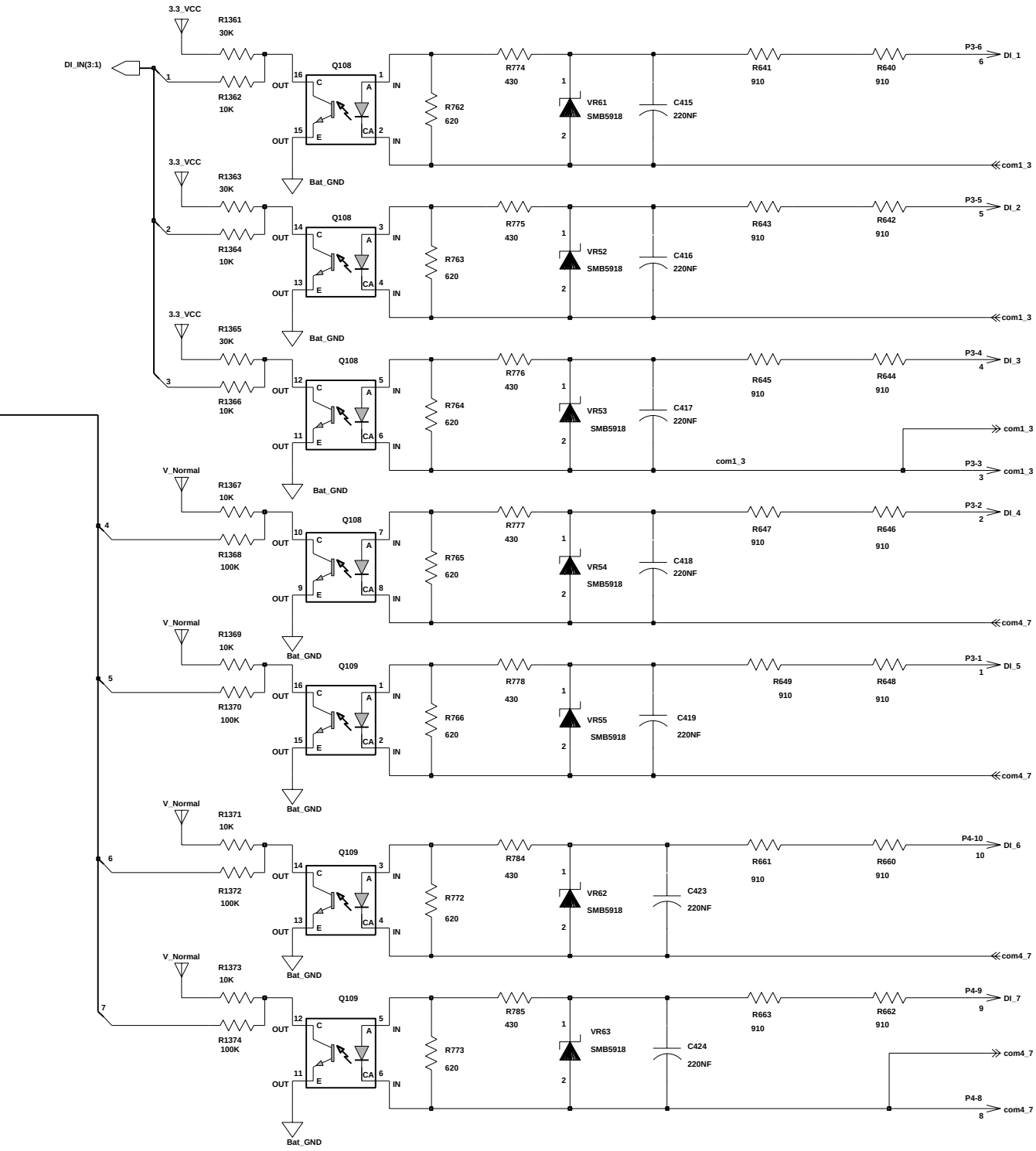


MOSCAD-M Main Board

FCN6088A

Digital Inputs

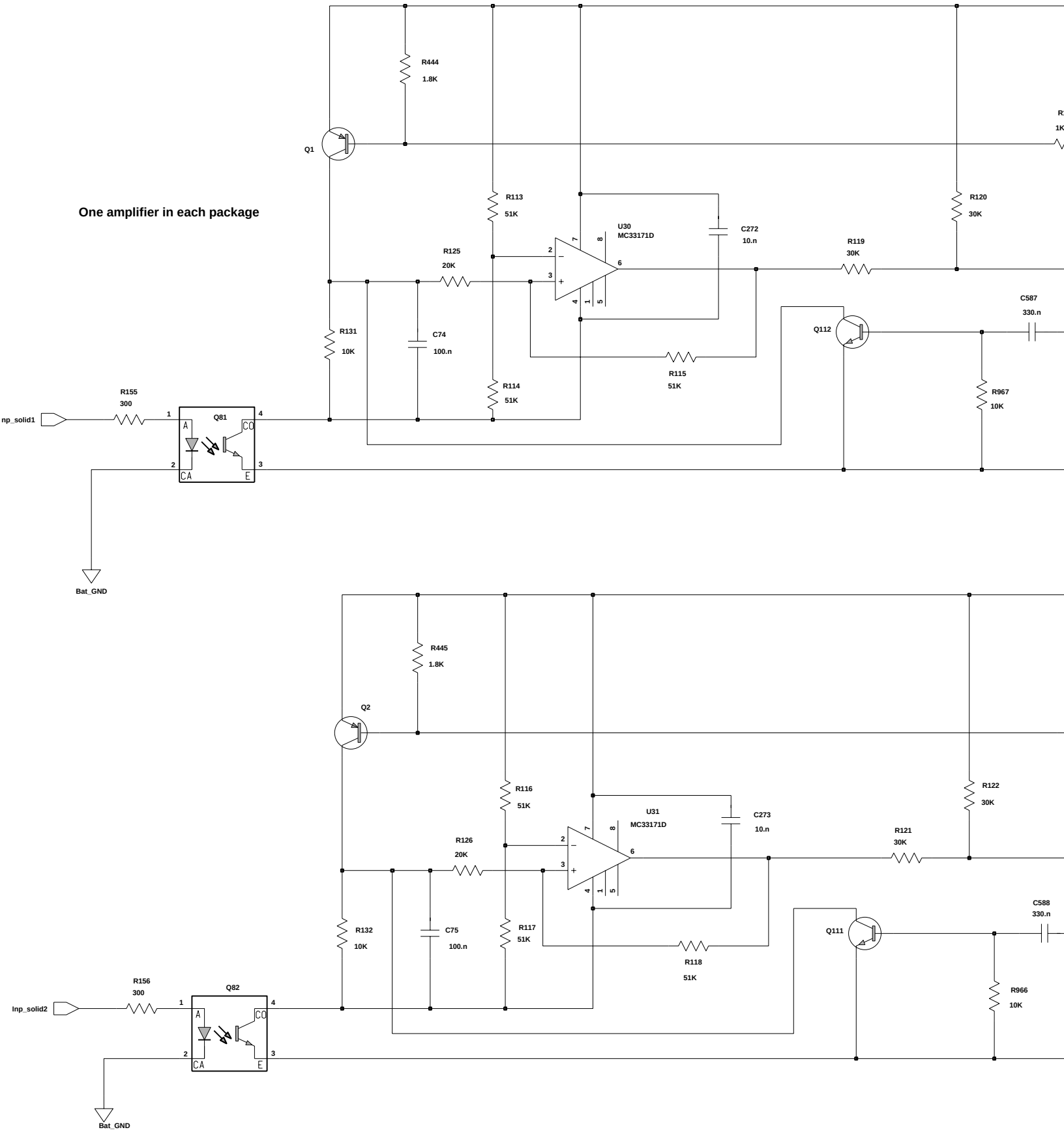



DI_IN(3:1)
3.3_VCC
R1361
30K
R1362
10K
Q108
R774
430
R762
620
VR61
SMB5918
C415
220NF
R641
910
R640
910
P3-6
6
DI_1
com1_3
R1363
30K
R1364
10K
R775
430
R763
620
VR52
SMB5918
C416
220NF
R643
910
R642
910
P3-5
5
DI_2
R1365
30K
R1366
10K
R776
430
R764
620
VR53
SMB5918
C417
220NF
R645
910
R644
910
P3-4
4
DI_3
P3-3
3
V_Normal
R1367
10K
R1368
100K
R777
430
R765
620
VR54
SMB5918
C418
220NF
R647
910
R646
910
P3-2
2
DI_4
com4_7
R1369
10K
R1370
100K
Q109
R778
430
R766
620
VR55
SMB5918
C419
220NF
R649
910
R648
910
P3-1
1
DI_5
R1371
10K
R1372
100K
R784
430
R772
620
VR62
SMB5918
C423
220NF
R661
910
R660
910
P4-10
10
DI_6
R1373
10K
R1374
100K
R785
430
R773
620
VR63
SMB5918
C424
220NF
R663
910
R662
910
P4-9
9
DI_7
P4-8
8
Bat_GND
OUT
IN
73D02962C89-O
SHEET 15 OF 23

3.2

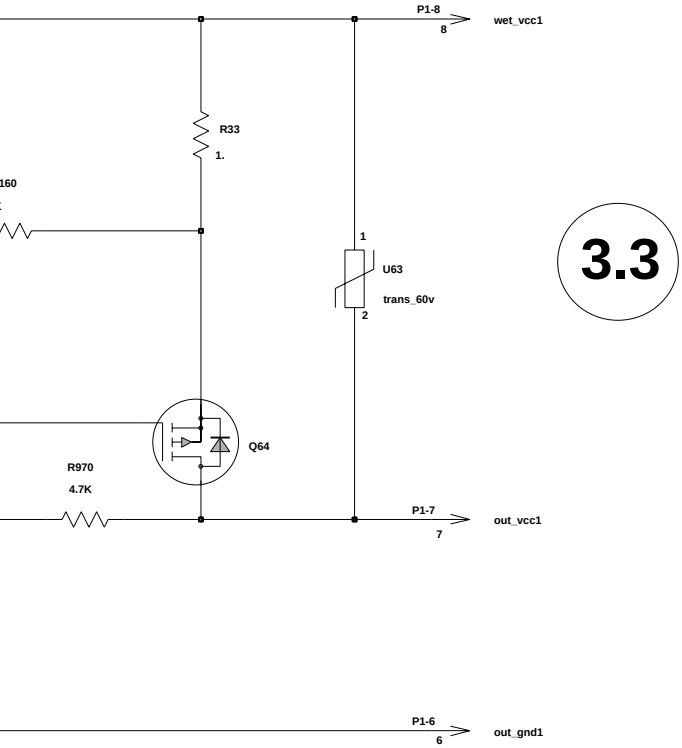
SOLID_STATE

OUTPUT



MOSCAD-M Main Board

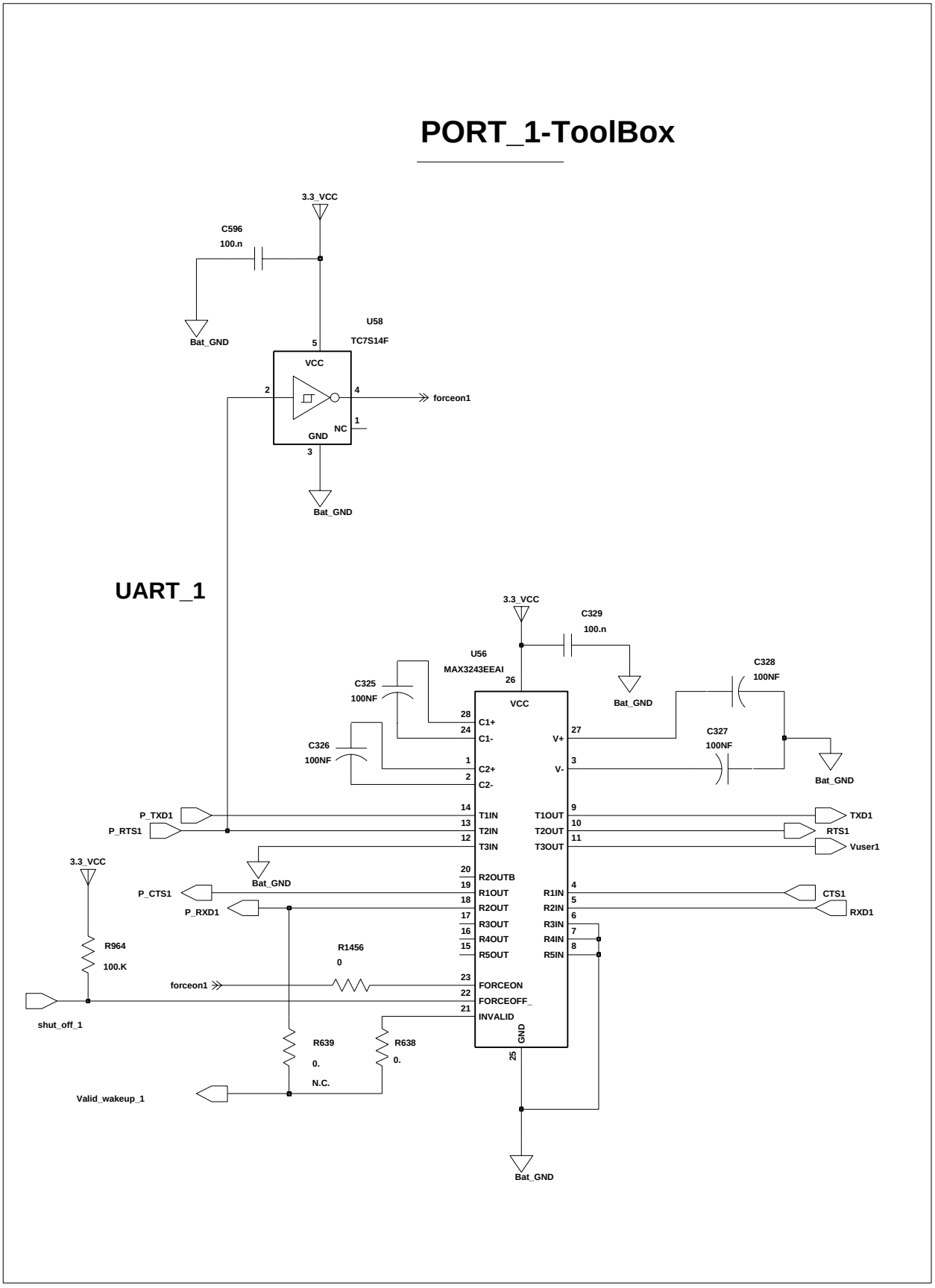
FCN6088A



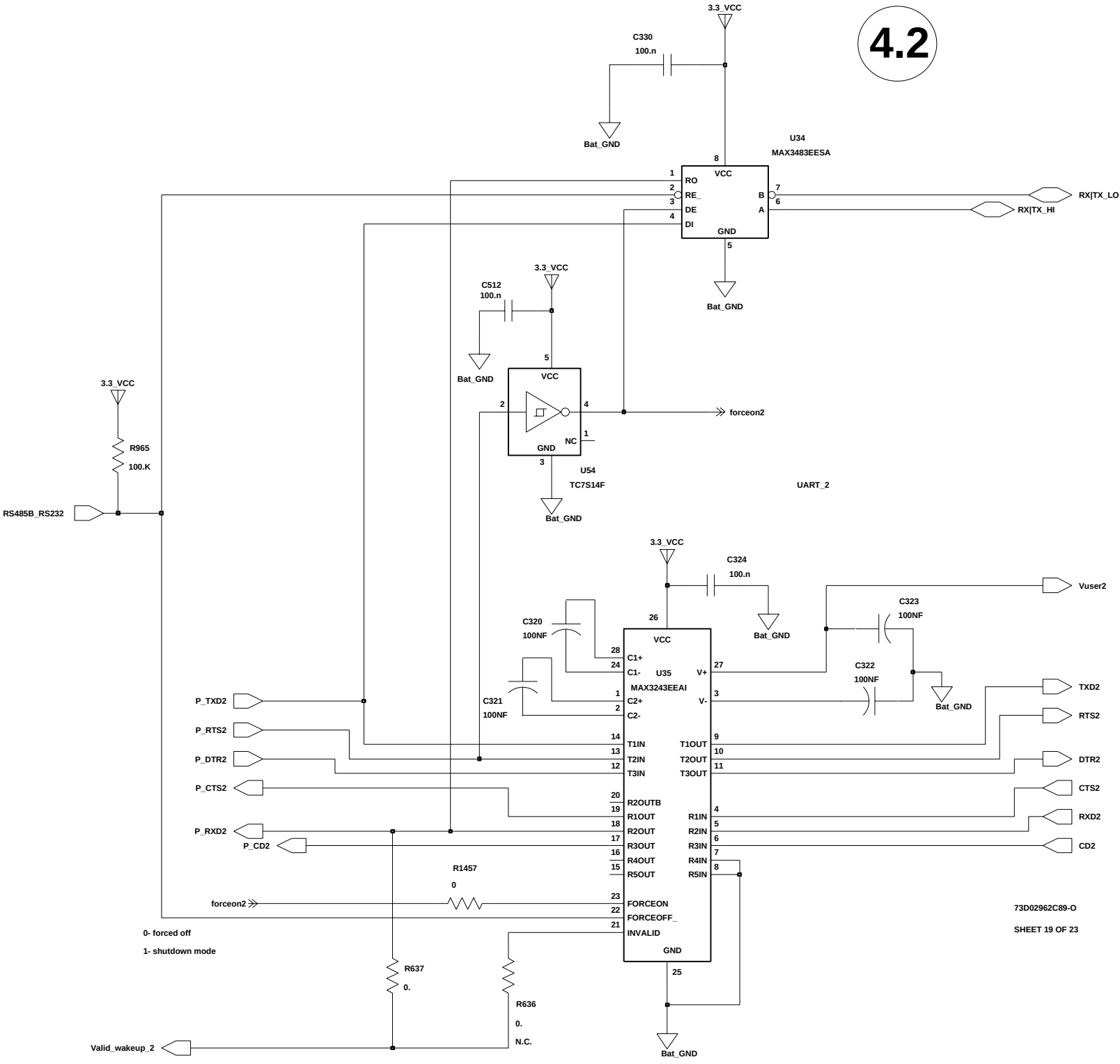
MOSCAD-M Main Board

FCN6088A

PORT_1-ToolBox



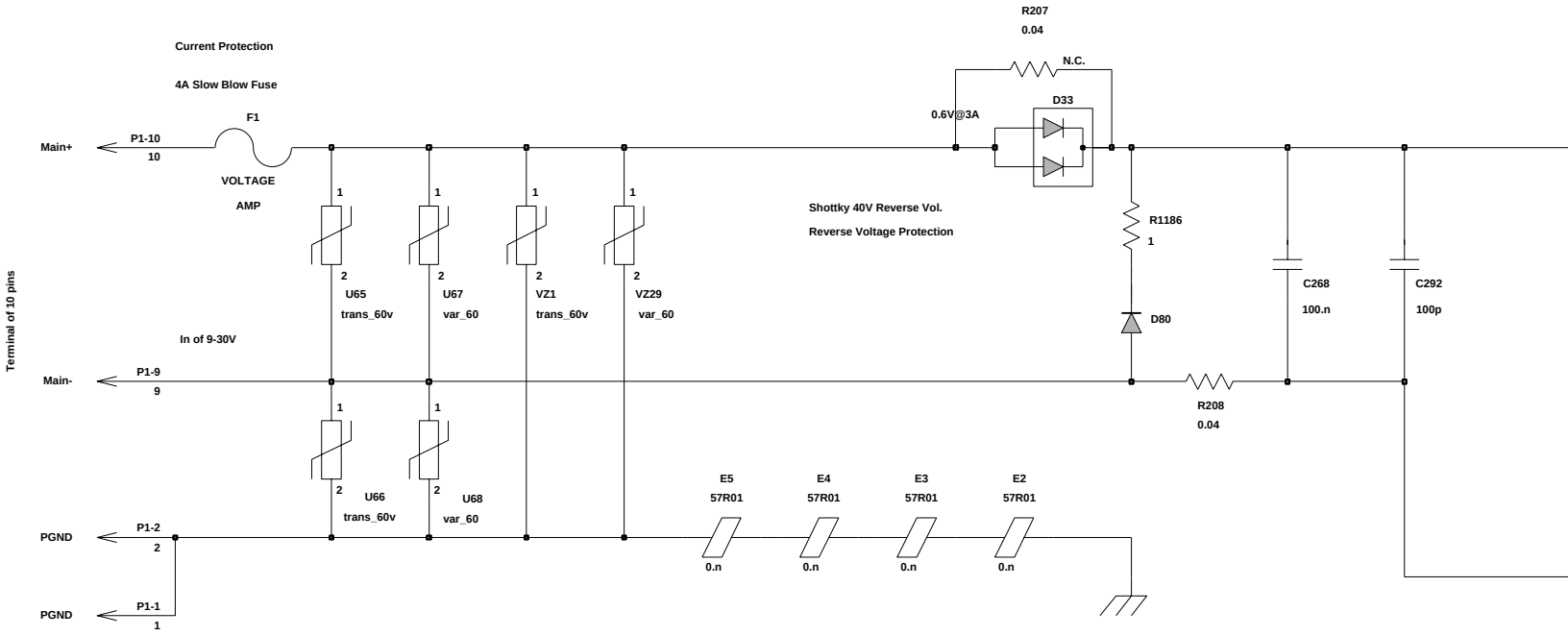
PORT_2-User Port

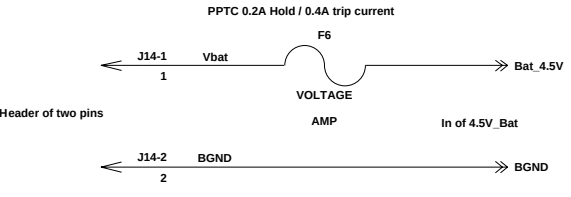


MOSCAD-M Main Board

FCN6088A

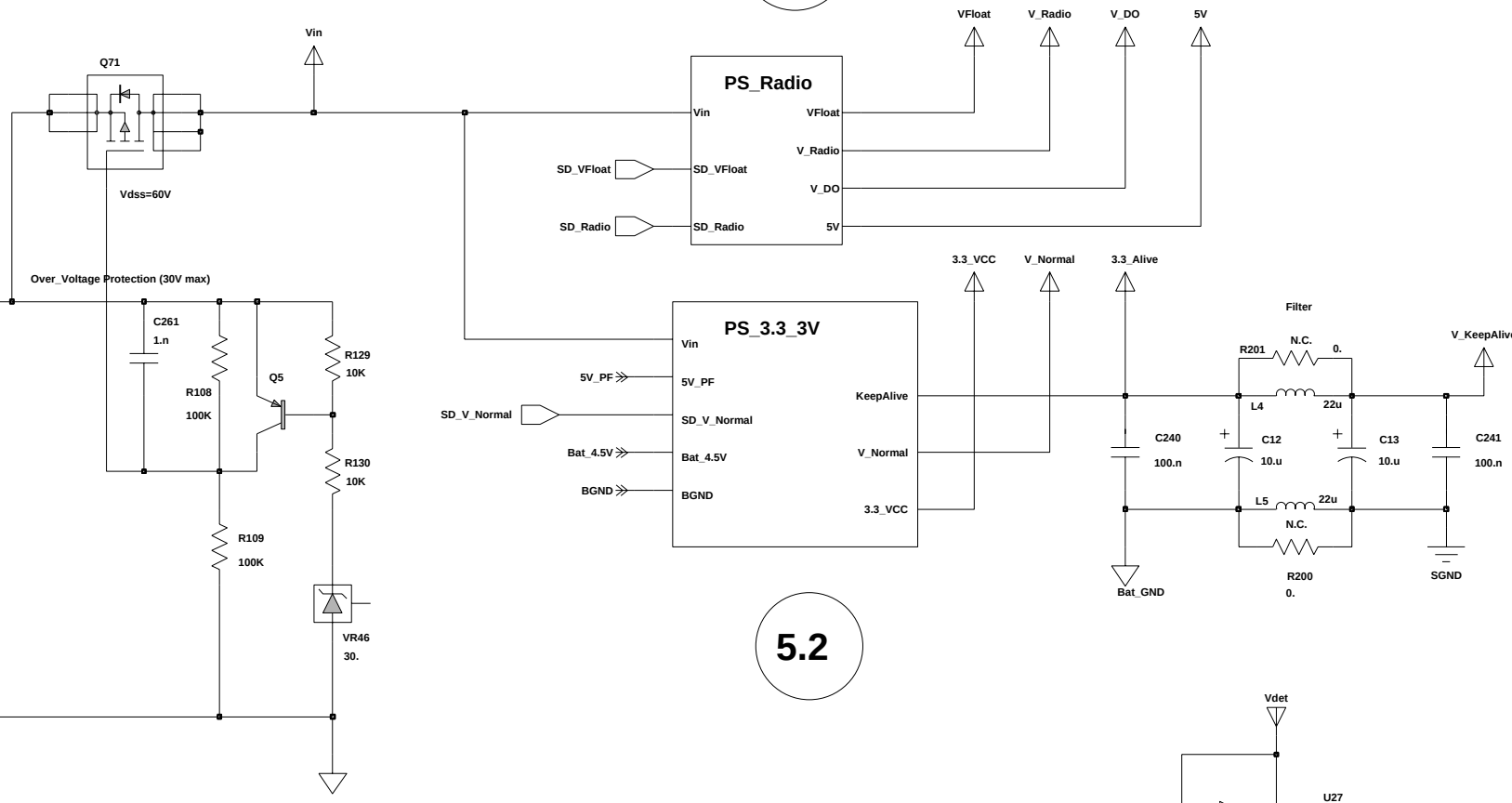
Main Power Su



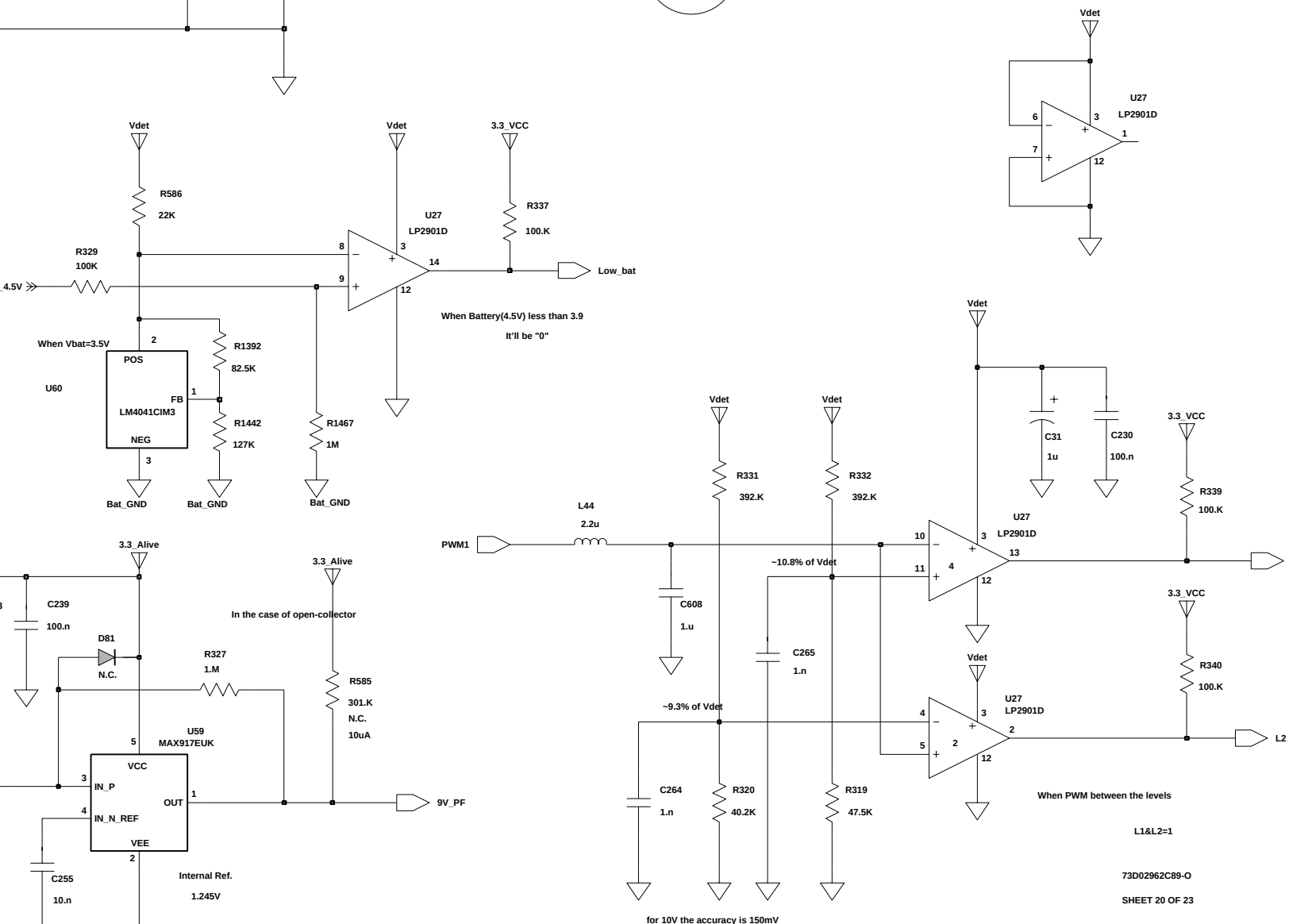


pply

5.1

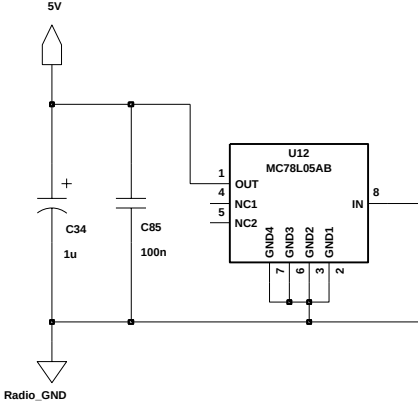

Vin
Q71
Vdss=60V
Over_Voltage Protection (30V max)
C261
1.n
R108
100K
Q5
R129
10K
R130
10K
R109
100K
VR46
30.
PS_Radio
Vin
SD_VFloat
SD_Radio
VFloat
V_Radio
V_DO
5V
VFloat
V_Radio
V_DO
5V
PS_3.3_3V
Vin
5V_PF
SD_V_Normal
Bat_4.5V
BGND
KeepAlive
V_Normal
3.3_VCC
3.3_VCC
V_Normal
3.3_Alive
Filter
R201
N.C.
0.
L4
22u
C240
100.n
C12
10.u
C13
10.u
C241
100.n
V_KeepAlive
L5
22u
N.C.
R200
0.
Bat_GND
SGND

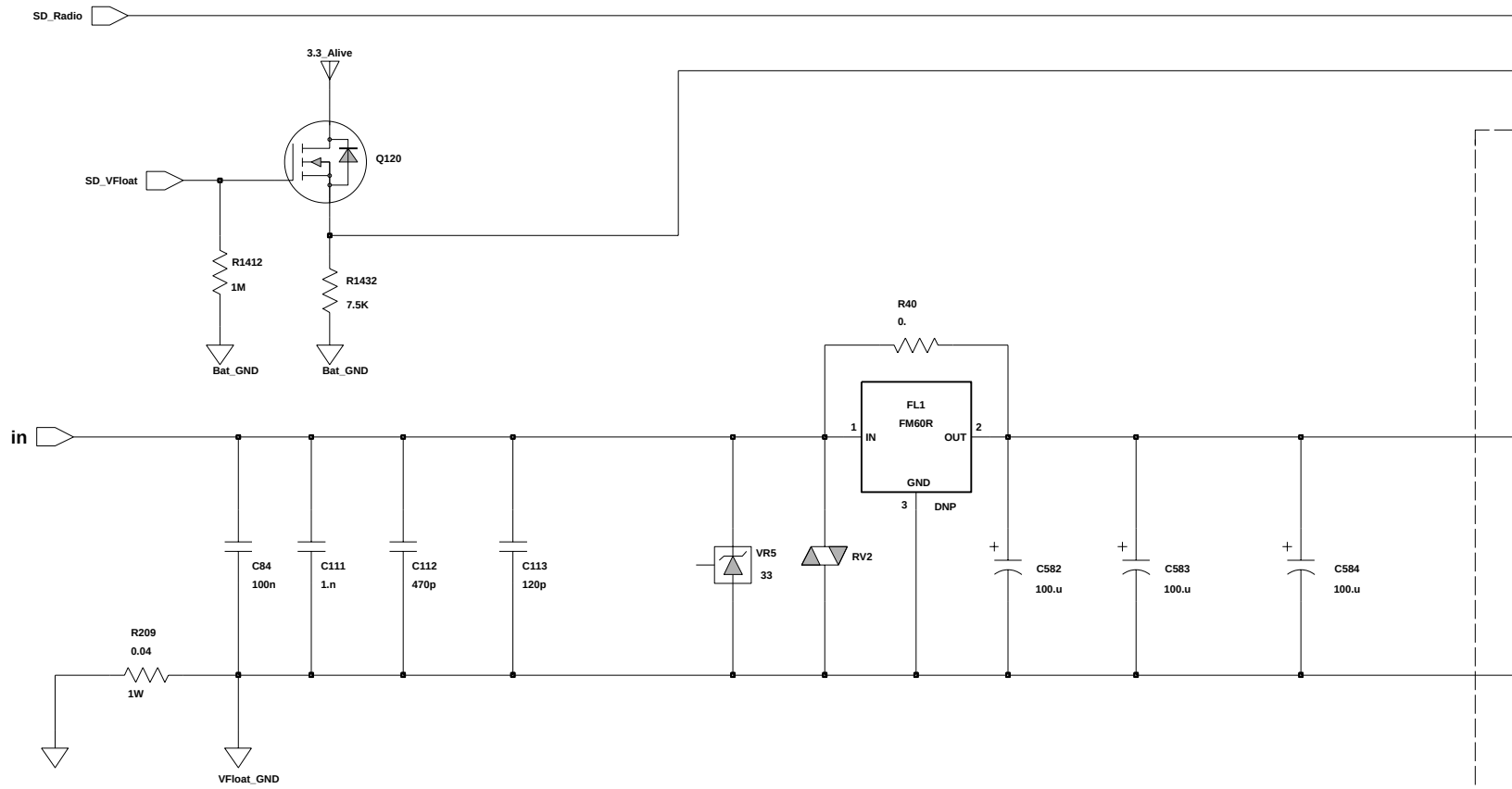
5.2


Vdet
U27
LP2901D
R586
22K
R329
100K
4.5V
U27
LP2901D
R337
100.K
Low_bat
When Battery(4.5V) less than 3.9
It'll be "0"
When Vbat=3.5V
U60
POS
FB
NEG
LM4041CIM3
R1392
82.5K
R1442
127K
R1467
1M
Bat_GND
Bat_GND
Bat_GND
3.3_Alive
C239
100.n
D81
N.C.
R327
1.M
In the case of open-collector
3.3_Alive
R585
301.K
N.C.
10uA
U59
MAX917EUK
VCC
IN_P
IN_N_REF
OUT
VEE
9V_PF
C255
10.n
Internal Ref.
1.245V
Bat_GND
PWM1
L44
2.2u
C608
1.u
R331
392.K
R332
392.K
C265
1.n
~10.8% of Vdet
~9.3% of Vdet
C31
1u
C230
100.n
3.3_VCC
R339
100.K
3.3_VCC
R340
100.K
L2
C264
1.n
R320
40.2K
R319
47.5K
When PWM between the levels
L1&L2=1
for 10V the accuracy is 150mV

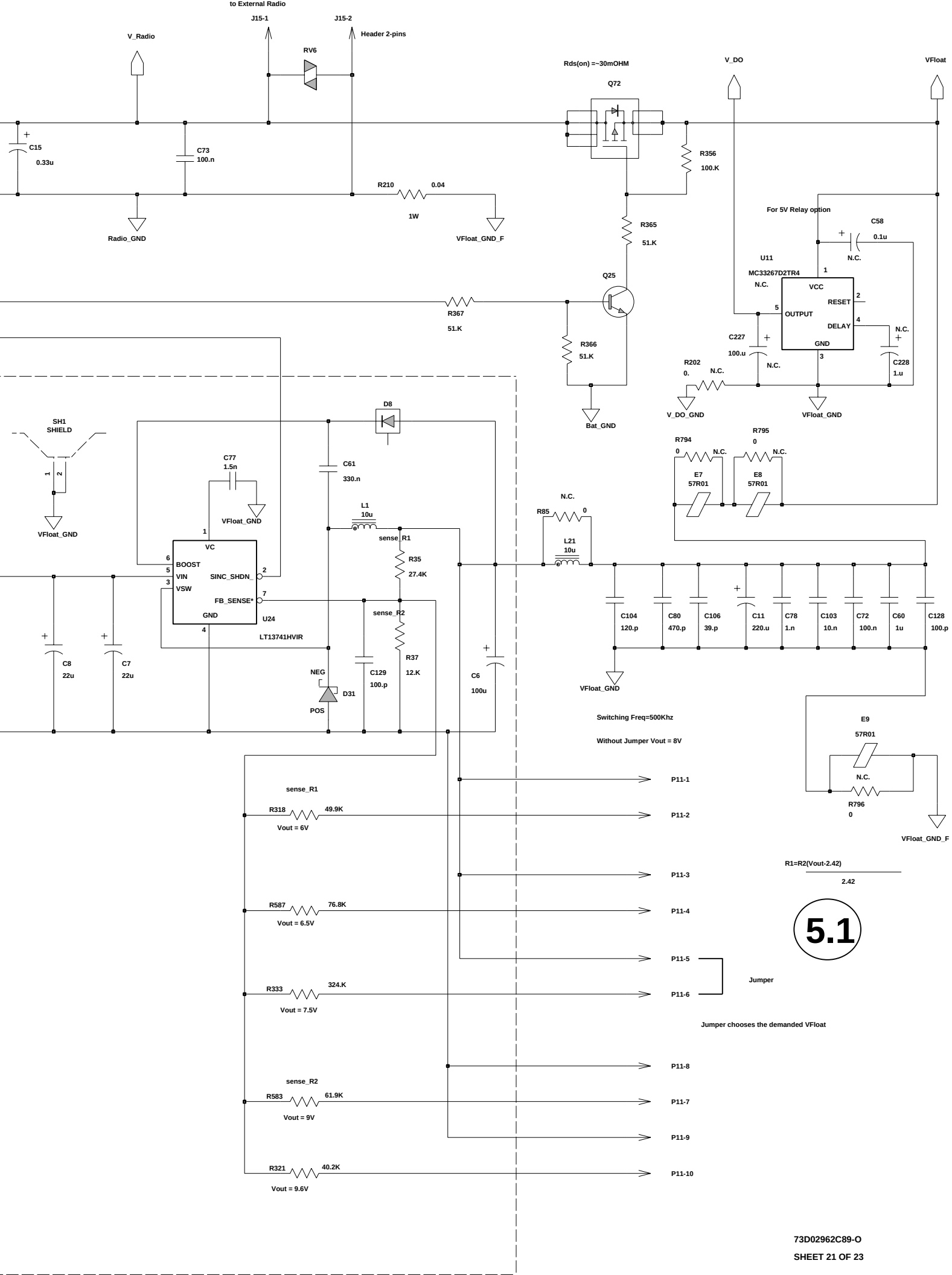
MOSCAD-M Main Board

FCN6088A





Power supply for Radio .



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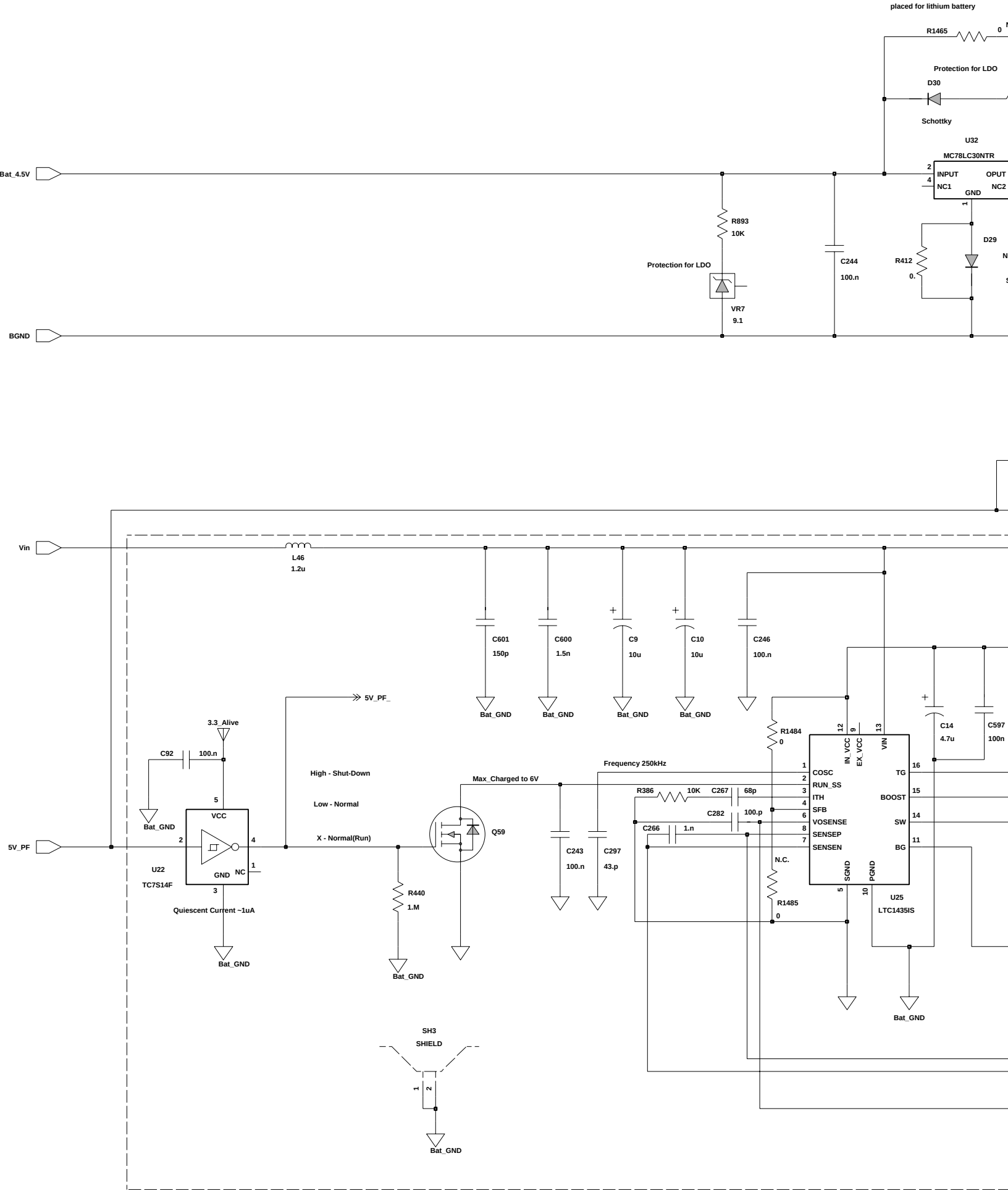
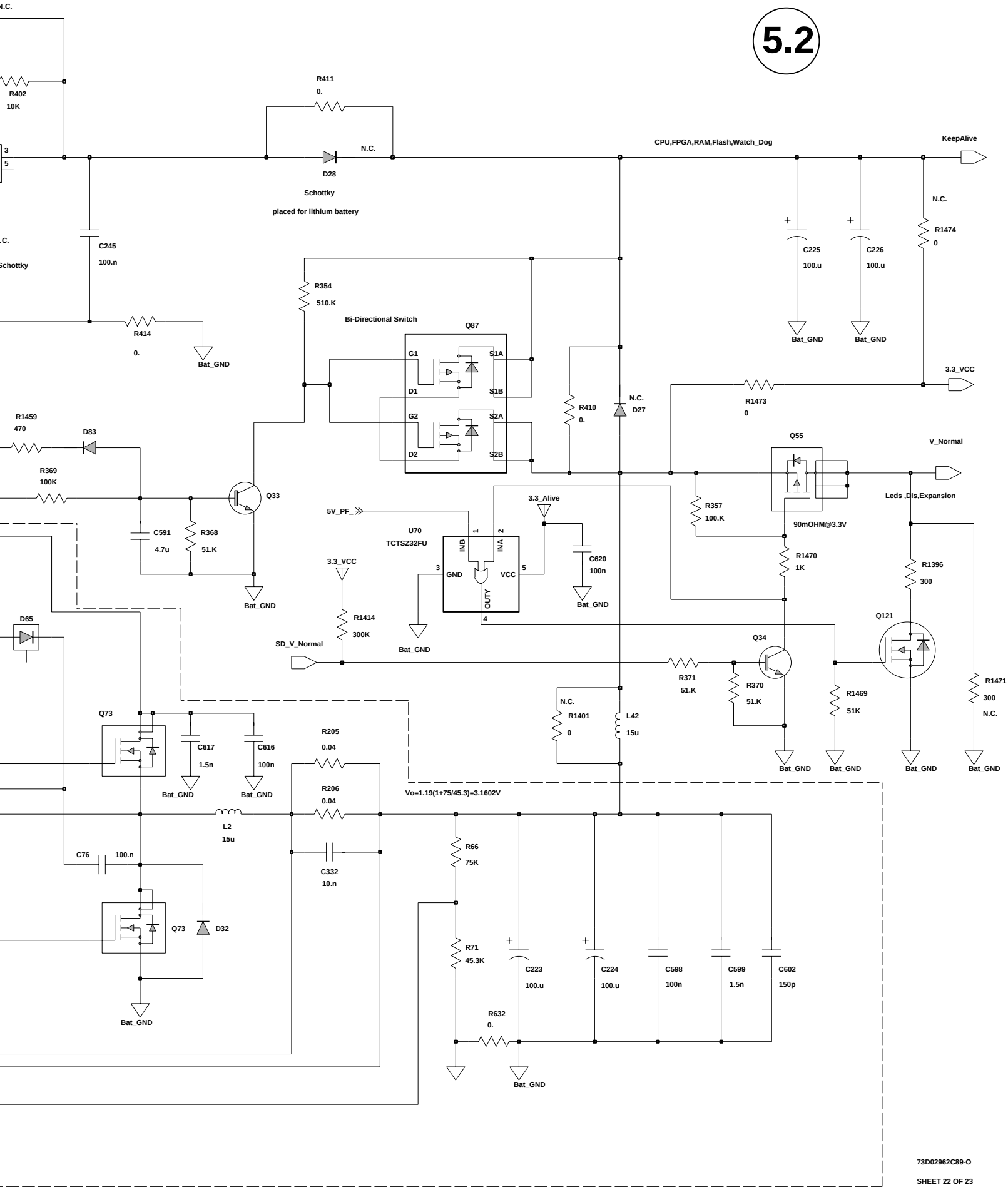
MOSCAD-M Main Board

FCN6088A

Power Supply



ply of 3.3V


5.2
N.C.
R402
10K
R411
0.
N.C.
D28
Schottky
placed for lithium battery
CPU,FPGA,RAM,Flash,Watch_Dog
KeepAlive
C245
100.n
C225
100.u
C226
100.u
N.C.
R1474
0
Bat_GND
R354
510.K
Bi-Directional Switch
Q87
G1
S1A
D1
S1B
G2
S2A
D2
S2B
R414
0.
Bat_GND
R410
0.
N.C.
D27
R1473
0
3.3_VCC
R1459
470
D83
R369
100K
Q33
Q55
V_Normal
Leds ,Dls,Expansion
5V_PF_
U70
TCTSZ32FU
INB
INA
GND
VCC
OUTY
3.3_Alive
C620
100n
R357
100.K
90mOHM@3.3V
C591
4.7u
R368
51.K
R1470
1K
R1396
300
3.3_VCC
R1414
300K
SD_V_Normal
D65
Q121
Q34
R371
51.K
R370
51.K
R1469
51K
R1471
300
N.C.
N.C.
R1401
0
L42
15u
Q73
C617
1.5n
C616
100n
R205
0.04
R206
0.04
Vo=1.19(1+75/45.3)=3.1602V
L2
15u
C76
100.n
C332
10.n
R66
75K
Q73
D32
R71
45.3K
C223
100.u
C224
100.u
C598
100n
C599
1.5n
C602
150p
R632
0.
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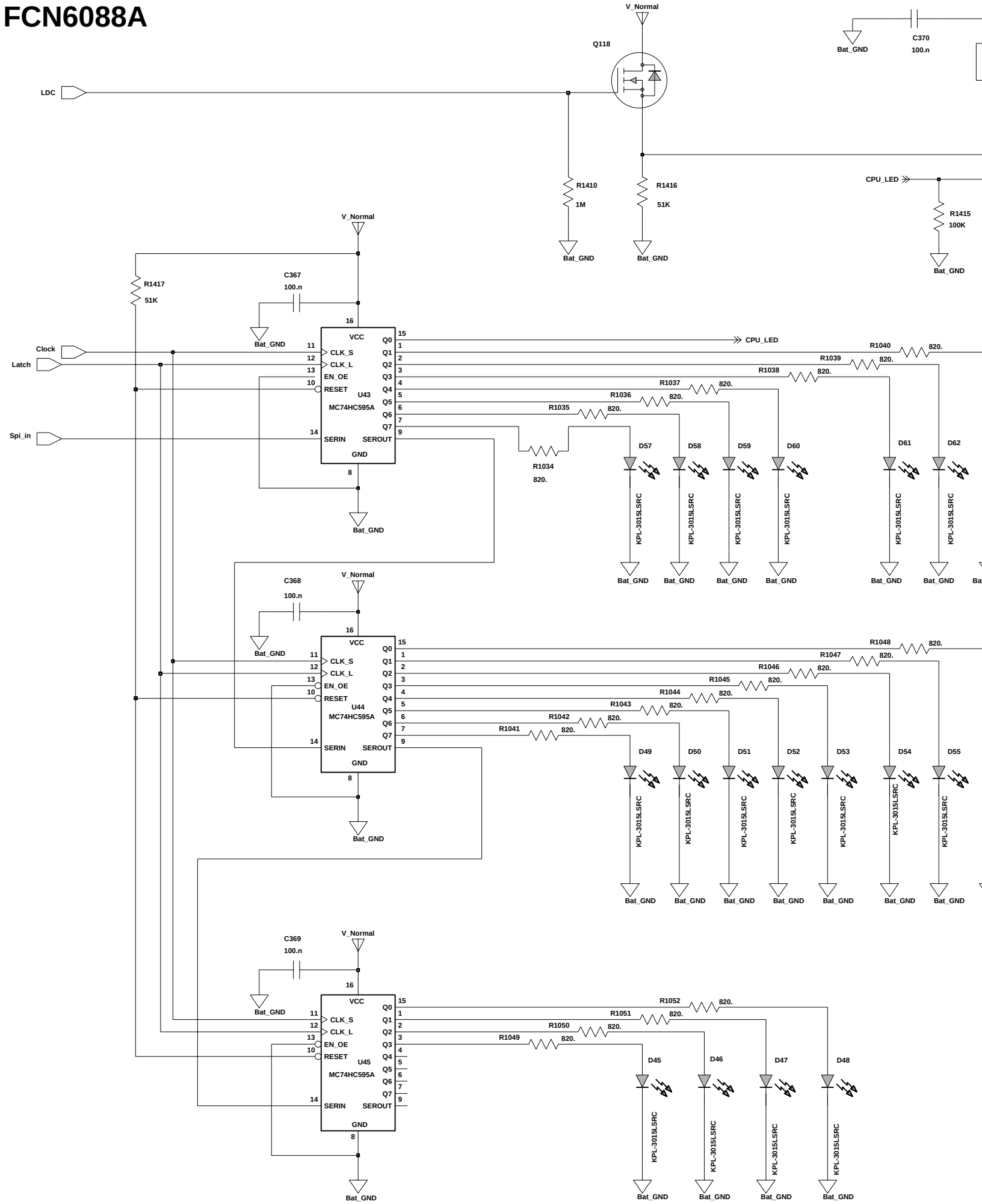
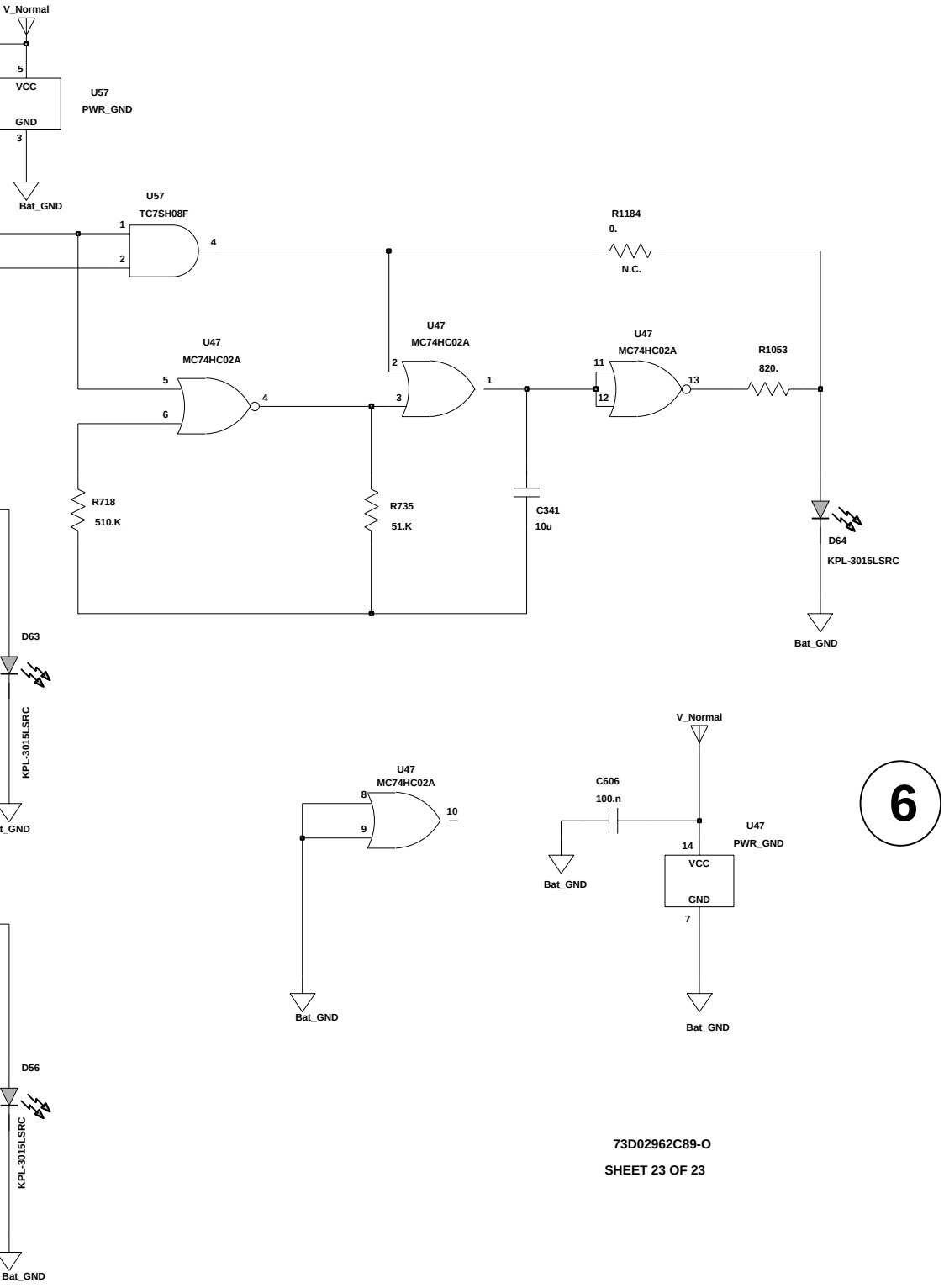
MOSCAD-M Main Board

FCN6088A



SHIFT_REGISTER + LED'S



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Printing Layout, Schematic, and Parts List

The PDF file for the RTU component includes the following views:

- layout
- schematic
- divided schematic for any page of the schematic which is too big for printing on a letter size desktop printer
- parts list

To print part of the PDF file:

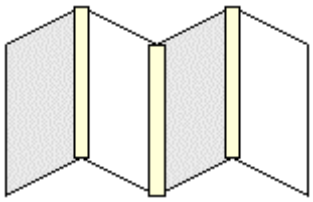
1. Go to the desired view by clicking once on the appropriate bookmark (e.g. Parts List) on the left side of the screen. If the item has a minus  sign to its left, click on the sign to see further items below.
2. The diagram or list you want to print may more cover than one page. To identify which pages should be printed, note the page numbers (e.g. 4 of 11) at the bottom of the screen. Use the scroll bar or the Page Down button on the keyboard to advance. If the bookmark on the left side of the screen changes, then you have advanced too far and displayed the next sheet or view.
3. Press on the  icon on the toolbar above the diagram to open the Print dialog box.
4. Select the current page or range of page numbers to be printed (e.g. 4-5) and click on OK.

Warning: Printing the entire PDF file is NOT recommended, as some pages will probably not fit your printer size.

Reconnecting a Divided Schematic

Pieces of a divided schematic can be reconnected as follows:

1. Line up the pages. If necessary, consult the schematic in the PDF.
2. Use tape to join of all parts of diagram as shown below.



MOSCAD-M I/O EXPANSION BOARD

General/Index

The schematics, layout and parts list of the I/O Expansion board of the MOSCAD-M RTU (Board catalog # FCN6110A DESIGN: 8486067U01) is provided below. Large schematics have also been provided in separate format, divided for letter size printing. Click on the links below to jump to the desired page.

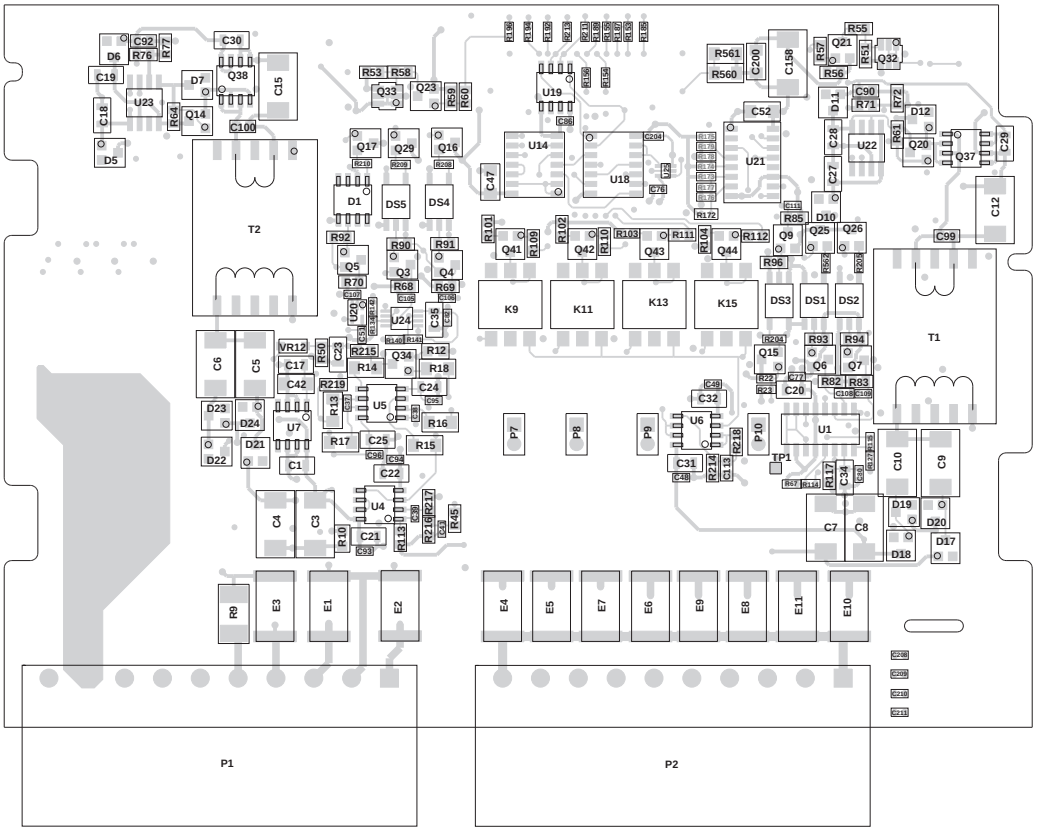
Layout

Parts List

Schematics

8486067u01_p1

MOSCAD-M Expansion Board
FCN6110A

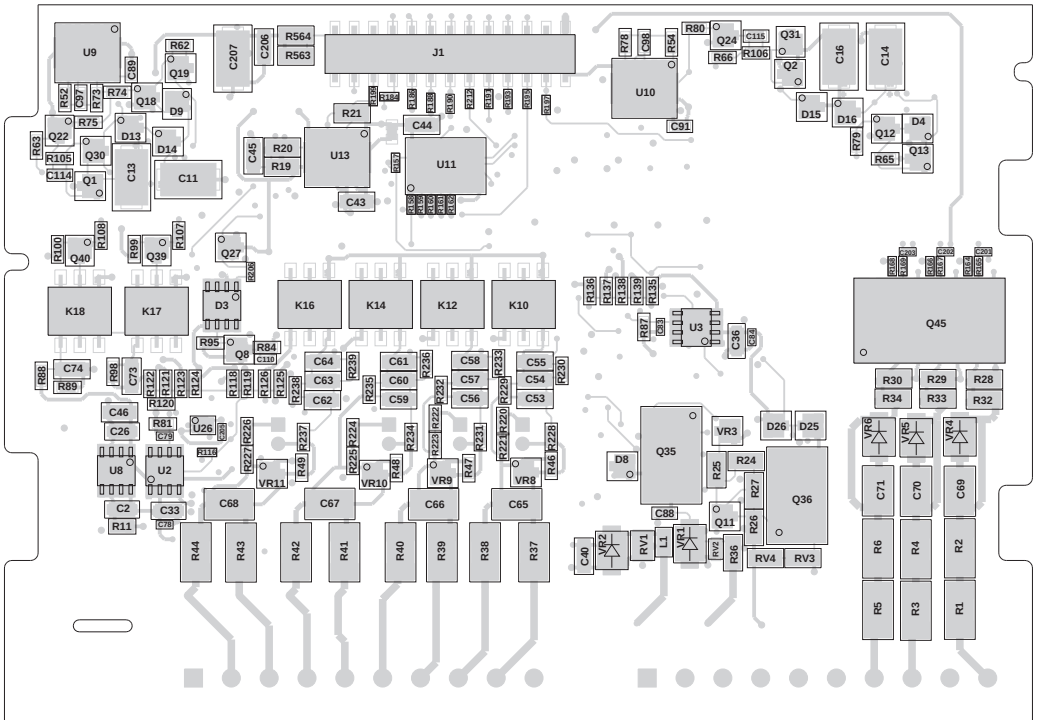


SHOWN FROM SIDE 1

01 ○ 79B02963C11-O

MOSCAD-M Expansion Board
FCN6110A

8486067u01_p1



SHOWN FROM SIDE 2

L1 ○ **79B02963C12-O**

L6 ○ **79B02963C14-O**

Parts List – Expansion Board - DESIGN: 8486067u01 FILE: fcn6110a

Reference Symbol	Motorola Part No.	Description
C1-2	2311049A34	CAPP_0.33u
C3-16	2311049A19	CAPP_10u
C17-36	2311049A07	CAPP_1u
C37-39	2113743E20	CAP_100n
C40	2113743B21	CAP_220n
C41	2113741F25	CAP_1n
C42	2113741B69	CAP_100n
C46-47	2113741B69	CAP_100n
C48-49	2113743E20	CAP_100n
C51	2113743E20	CAP_100n
C52	2113741B69	CAP_100n
C53-64	2113743G25	CAP_3.3UF
C65-68	2113741D32	CAP_0.33UF
C69-71	2113741D28	CAP_220NF
C73-74	2113741B69	CAP_100NF
C76-80	2113743E20	CAP_100n
C82-84	2113743E20	CAP_100n
C86	2113743E20	CAP_100n
C88	2113743A23	CAP_220n
C89-92	2113743A19	CAP_100n
C93-96	2113743E20	CAP_100n
C97-98	2113741A25	CAP_1.5n
C99-100	2113741A21	CAP_1n
C105-111	2113740F44	CAP_51p
C113	2113740A79	CAP_1n
C114-115	2113740B37	CAP_33p
C158	2311049A19	CAPP_10u
C200	2113741B69	CAP_100n
C201-203	2113741F49	CAP_10n
C204-205	2113743E20	CAP_100n
C206	2113741B69	CAP_100n
C207	2311049A19	CAPP_10u
C208-211	2113741F27	CAP_1.2n
D1	5102806C06	IL205AT
D3	5102806C06	IL205AT
D4-16	4813833C09	MMBD914
D17-26	4808115L03	BAR43
DS1-5	5102806C10	TLP112
E1-11	8086971J01	SPARK_GAP
J1	2880491L11	CONN_P
K9-18	8080372L02	LCA110STR
L1	2462587V38	IDCTR_220n
P1-2	2886105U01	NO_DESC
P7-10	2880001R02	CONN_P
Q1-2	4813824A21	MMBT2907A
Q3-9	4813824A17	MMBT3906
Q11	4813824A17	MMBT3906
Q12-27	4813824A10	MMBT3904
Q29	4813824A10	MMBT3904

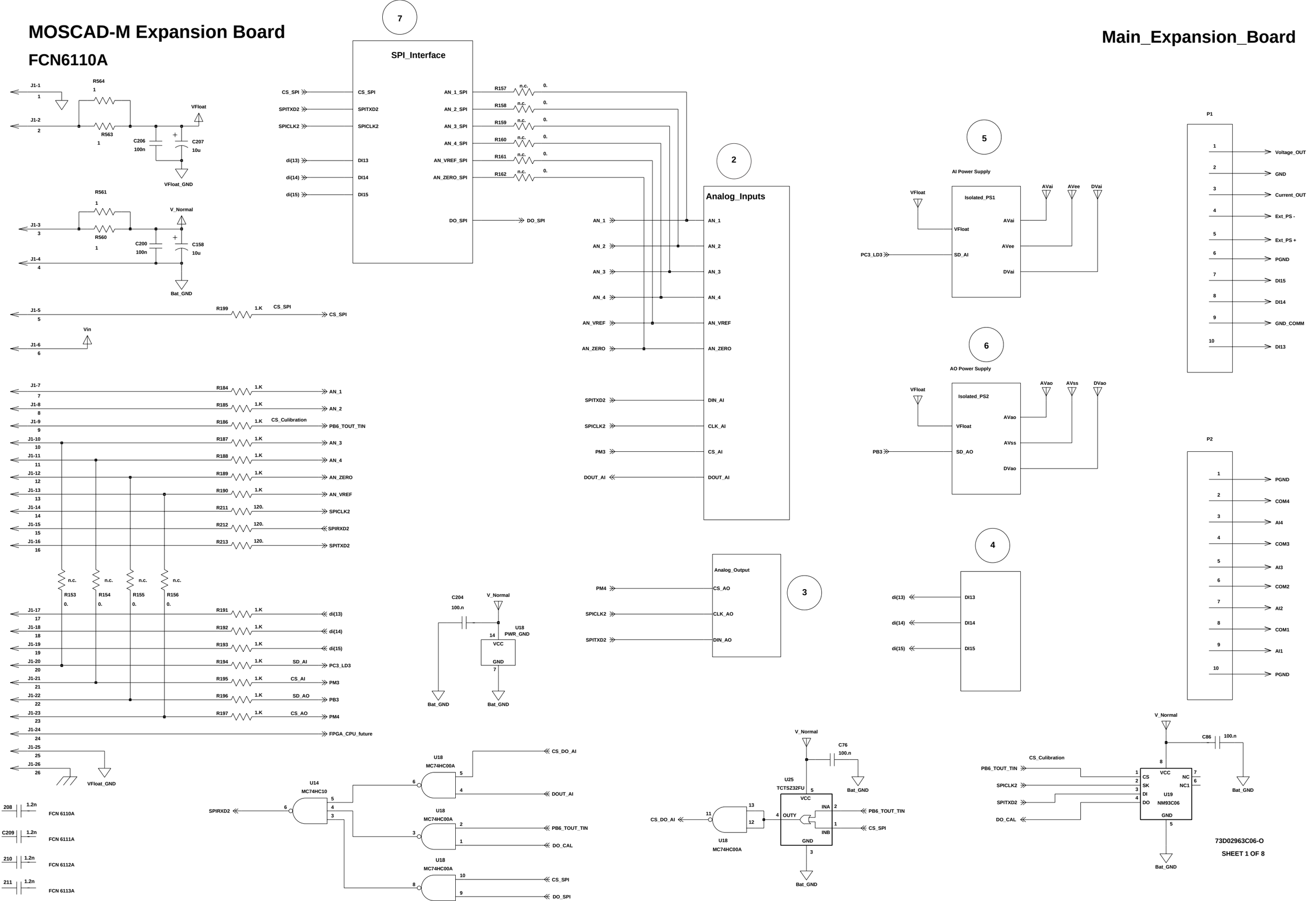
Q30-31	4813824A06	MMBTA13
Q32-33	4813823A29	MGSF3441VT1
Q34	4813823A07	2N7002
Q35-36	4813821A49	MTD2955VT4
Q37-38	4802393L39	SI4542DY
Q39-44	4813824A10	NPN_3904L
Q45	5102806C02	TIL196B
R1-6	0683962T72	RES_910
R9	0683962T25	RES_10
R10-11	0662057C01	RES_0
R12	0611079K15	RES_14K
R13-16	0611077G09	RES_15K
R17-18	0611077B03	RES_15K
R23	0662057A73	RES_10K
R24-25	0611077A98	RES_10K
R26-27	0611077A90	RES_4.7K
R28-30	0611077A69	RES_620
R32-34	0611077A65	RES_430
R36	0611077A38	RES_33
R37-44	0683962T42	RES_51
R45	0662057G64	RES_1M
R46-49	0662057D48	RES_1M
R50-54	0662057D24	RES_100K
R55-60	0662057D17	RES_51K
R61-66	0662057D07	RES_20K
R67	0662057A73	RES_10K
R68-85	0662057C99	RES_10K
R87-89	0662057C99	RES_10K
R90-96	0662057C86	RES_3K
R98	0662057C75	RES_1K
R99-104	0662057C65	RES_390
R105-112	0662057C58	RES_200
R113	0662057C27	RES_10
R115-116	0662057B47	RES_0
R117-126	0662057C01	RES_0
R135-139	0662057C01	RES_0
R141-142	0662057B47	RES_0
R164-169	0662057A97	RES_100K
R172	0662057A97	RES_100K
R177-179	0662057A97	RES_100K
R184-197	0662057A49	RES_1K
R199	0662057A49	RES_1K
R204-206	0662057A36	RES_300
R208-210	0662057A36	RES_300
R211-213	0662057A27	RES_120
R214	0611079K15	RES_14K
R215-216	0611079K17	RES_14.7K
R217-218	0611079K15	RES_14K
R219-227	0611079H10	RES_124
R228-239	0611079A97	RES_9.1K
R560-561	0611077A02	RES_1
R562	0662057A36	RES_300
R563-564	0611077A02	RES_1

RV1	4804645P05	VC121018J390
RV2	4804645P04	VC080526C580
RV3-4	0602811C01	VARIS
T1-2	2580323L01	XFMR
U1	5102807C35	TLV2544IDR
U2-3	5186214J13	REF192GS
U4-6	5113818A02	MC33272
U7-8	5113816A03	MC78L05AB
U9-10	5113806A23	MC14069UB
U14	5113805A07	MC74HC10
U18	5113805A01	MC74HC00A
U19	5108444S03	NM93C06
U20	5104944K04	TC7S14F
U21	5113806A09	4021_MC14021
U22-23	5113820A02	LM2903
U24	5102807C34	MAX550AEUA
U25	5104931K05	TCTSZ32FU
U26	5104944K04	TC7S14F
VR1	4813831A39	1SMB5936B
VR2	4813831A23	1SMB5925B
VR3	4813830A37	MMBZ5254B
VR4-6	4813831A14	ZENER_SMB5918
VR8-11	4813830A19	ZENER_MMBZ5236
VR12	4813830G01	MMSZ4678T

MOSCAD-M Expansion Board

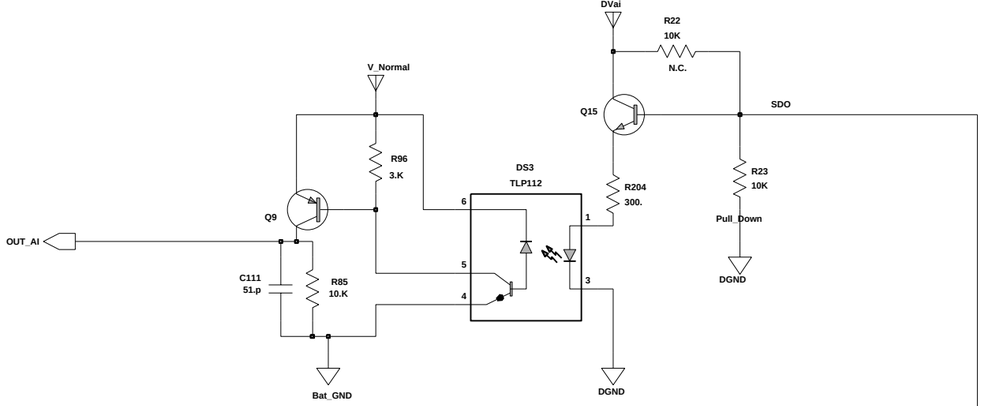
FCN6110A

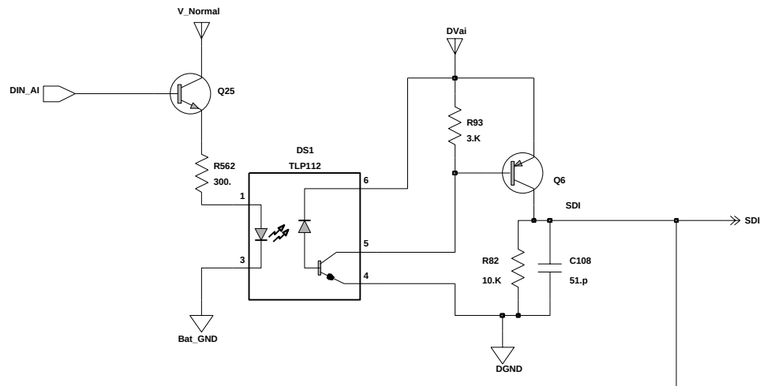
Main_Expansion_Board

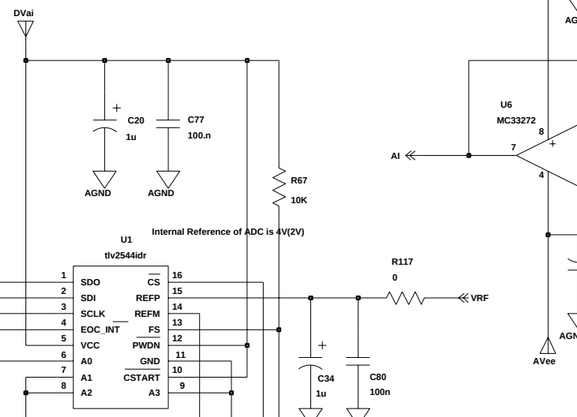


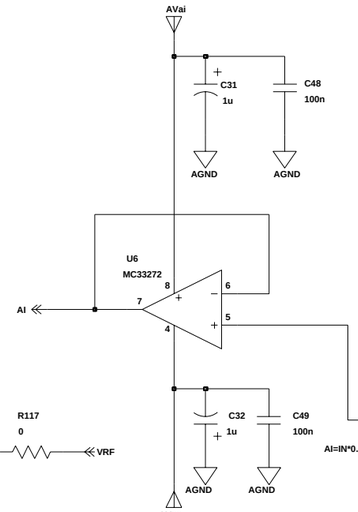
MOSCAD-M Expansion Board Analog Inputs
FCN6110A

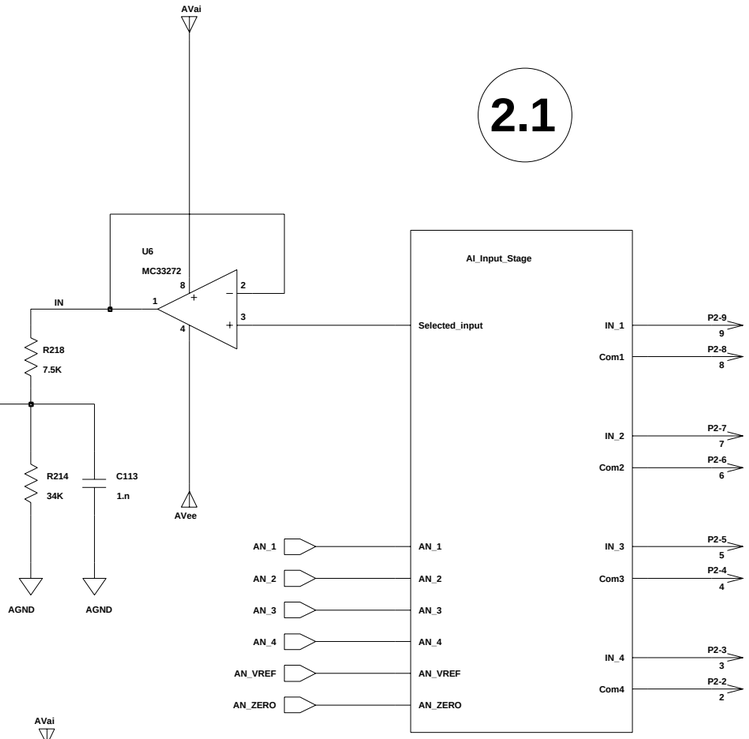
2.1

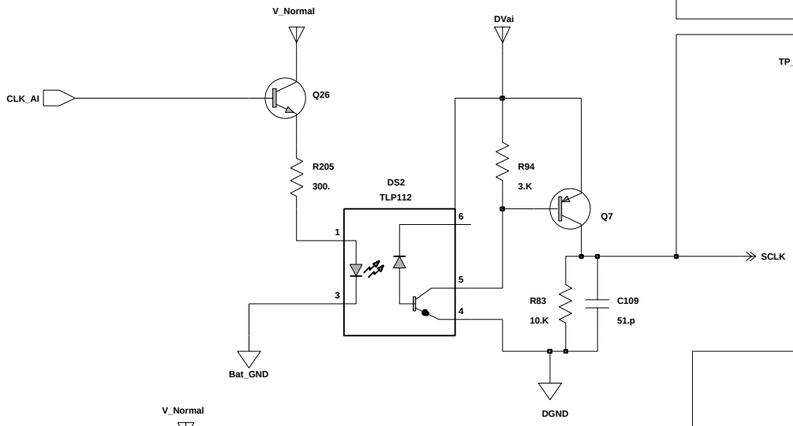


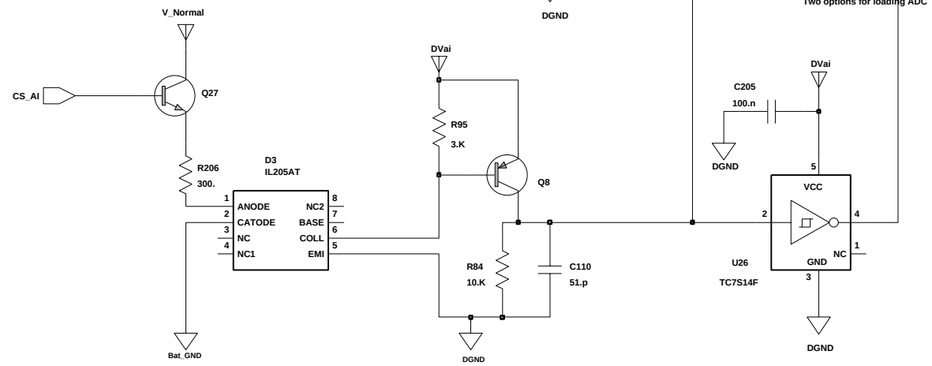


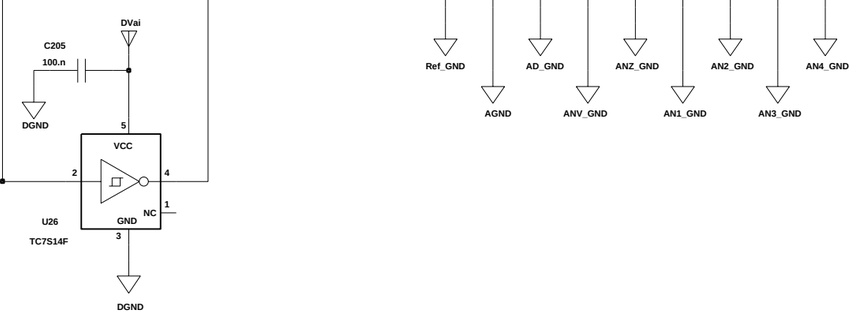


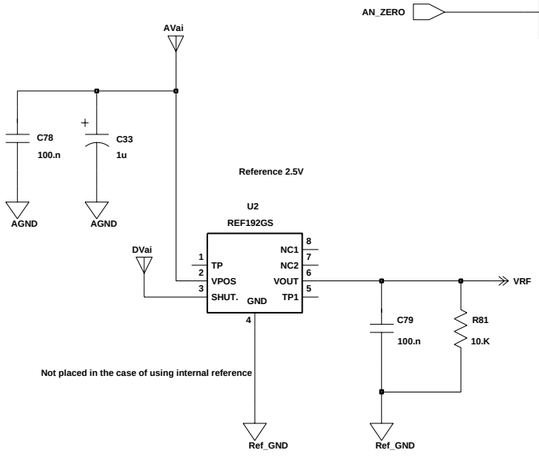












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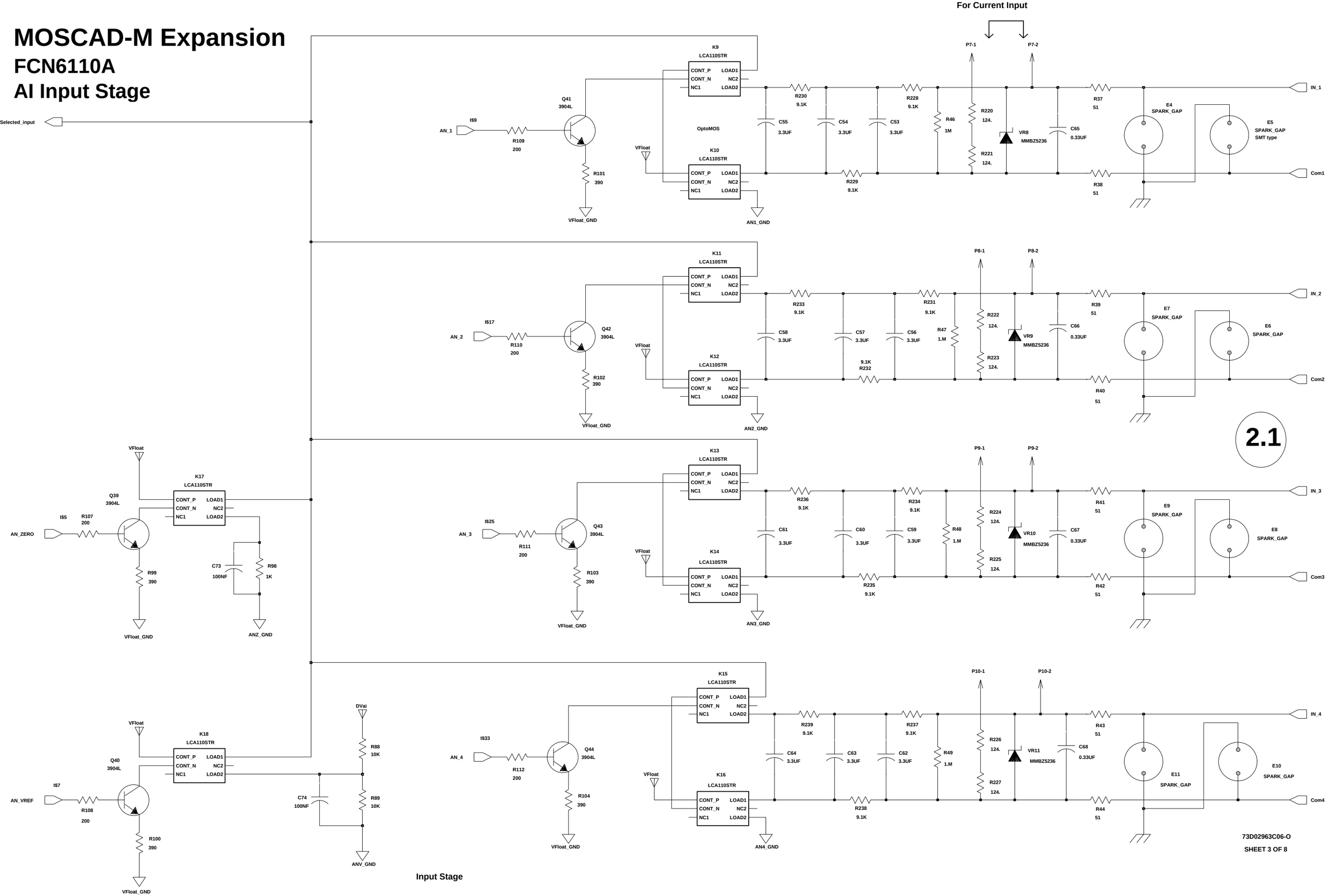
SHEET 2 OF 8

MOSCAD-M Expansion

FCN6110A

AI Input Stage



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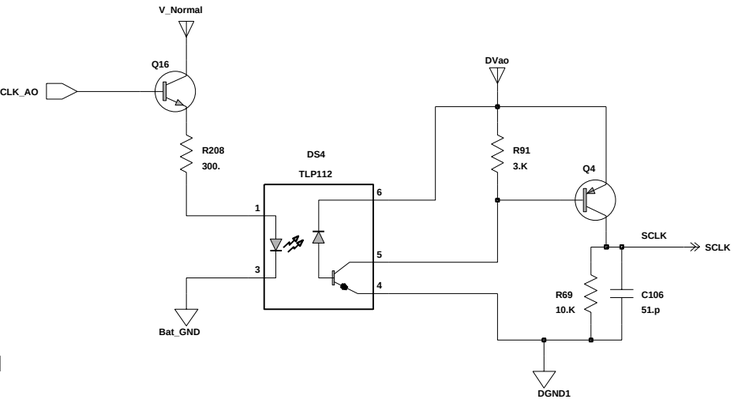
SHEET 3 OF 8

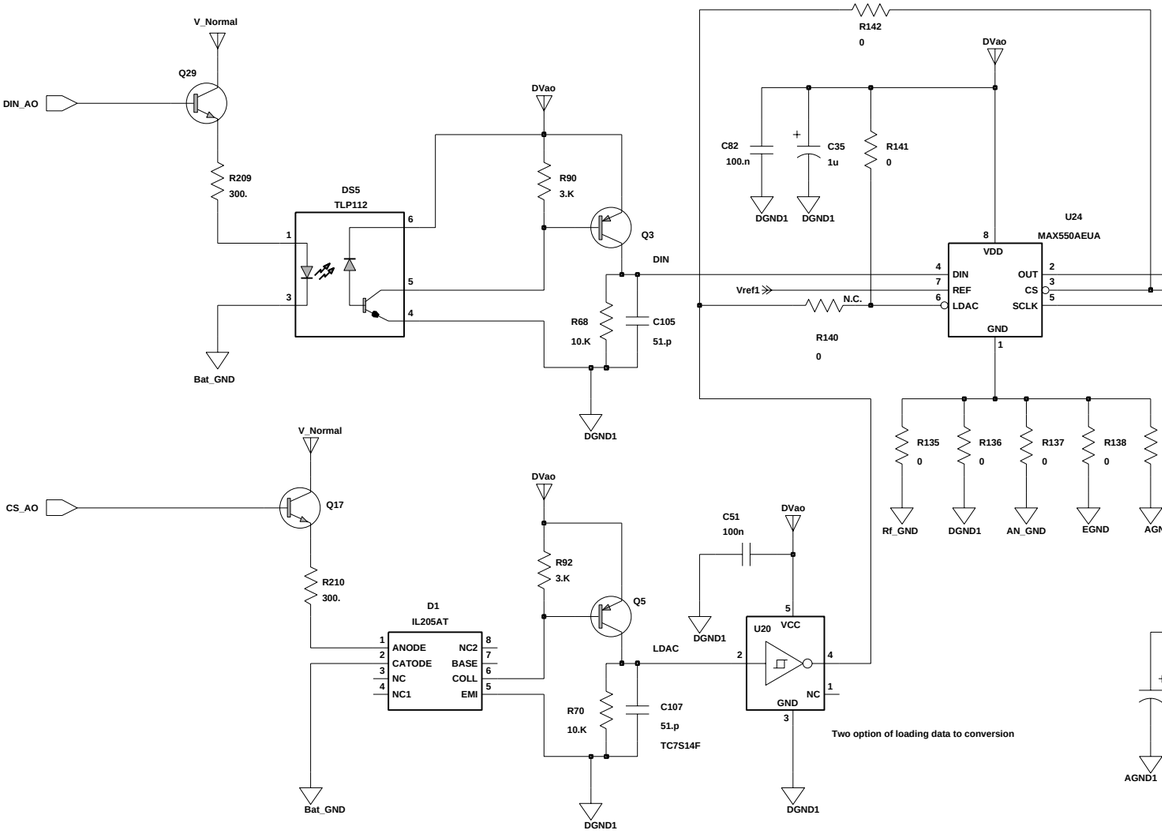
Input Stage

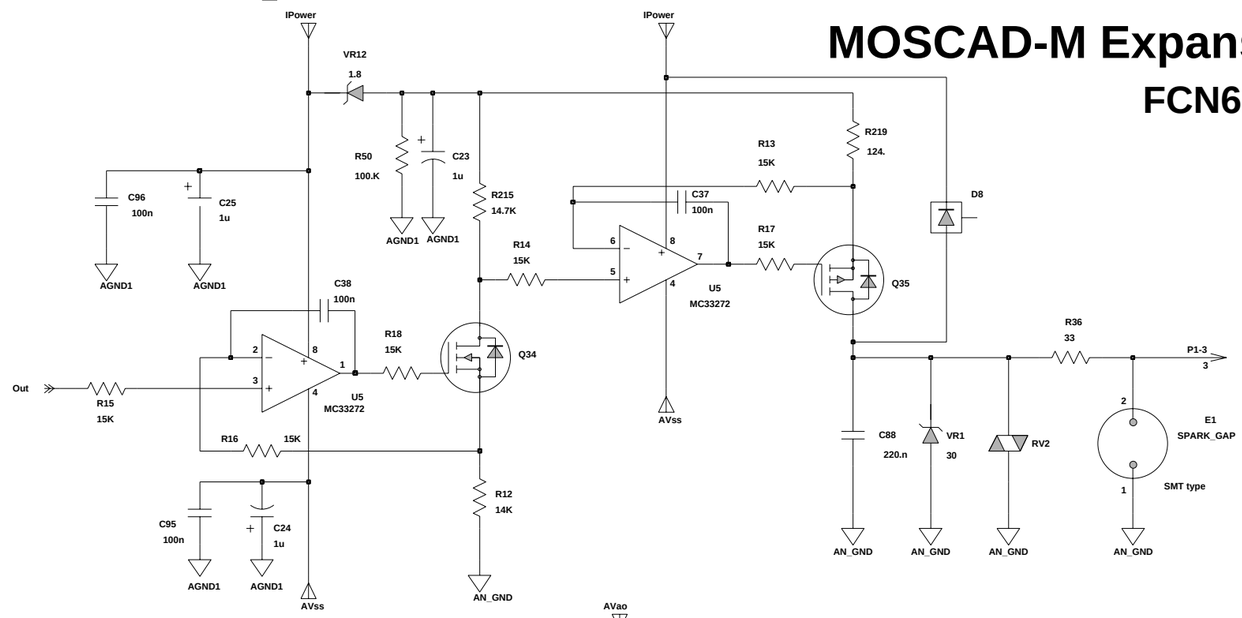
MOSCAD-M Expansion

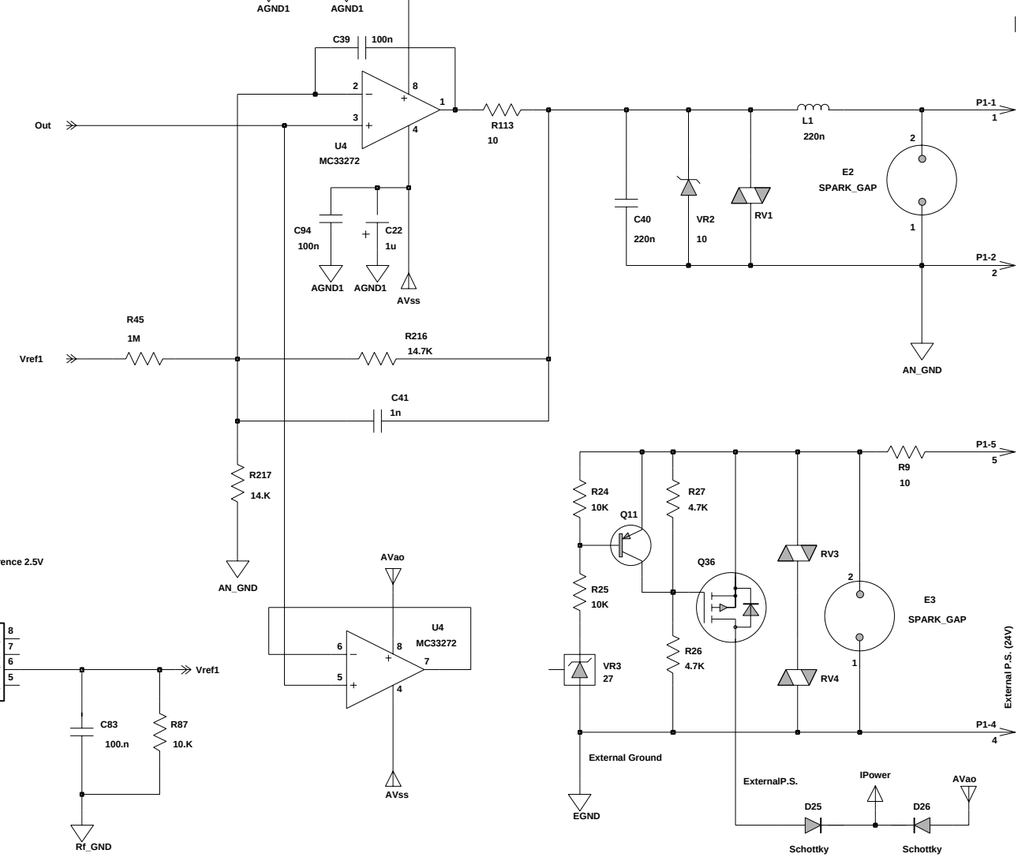
FCN6110A

Analog Output









3

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SHEET 4 OF 8

MOSCAD-M Expansion Board
FCN6110A

Expansion Board
Digital Inputs

4

V_Normal
R164
100K
DI13
R165
100K
C201
10n
Bat_GND
Q45
10 OUT
C
9 OUT
E
7 IN
A
CA
8 IN
R28
620
R32
430
1
VR4
SMB5918
2
C69
220NF
R2
910
R1
910
P1-10
10
DI_13
com13_15

V_Normal
R166
100K
DI14
R167
100K
C202
10n
Bat_GND
Q45
12 OUT
C
11 OUT
E
5 IN
A
CA
6 IN
R29
620
R33
430
1
VR5
SMB5918
2
C70
220NF
R4
910
R3
910
P1-8
8
DI_14
com13_15

V_Normal
R168
100K
DI15
R169
100K
C203
10n
Bat_GND
Q45
14 OUT
C
13 OUT
E
3 IN
A
CA
4 IN
R30
620
R34
430
1
VR6
SMB5918
2
C71
220NF
R6
910
R5
910
P1-7
7
DI_15
com13_15
P1-9
9
com13_15

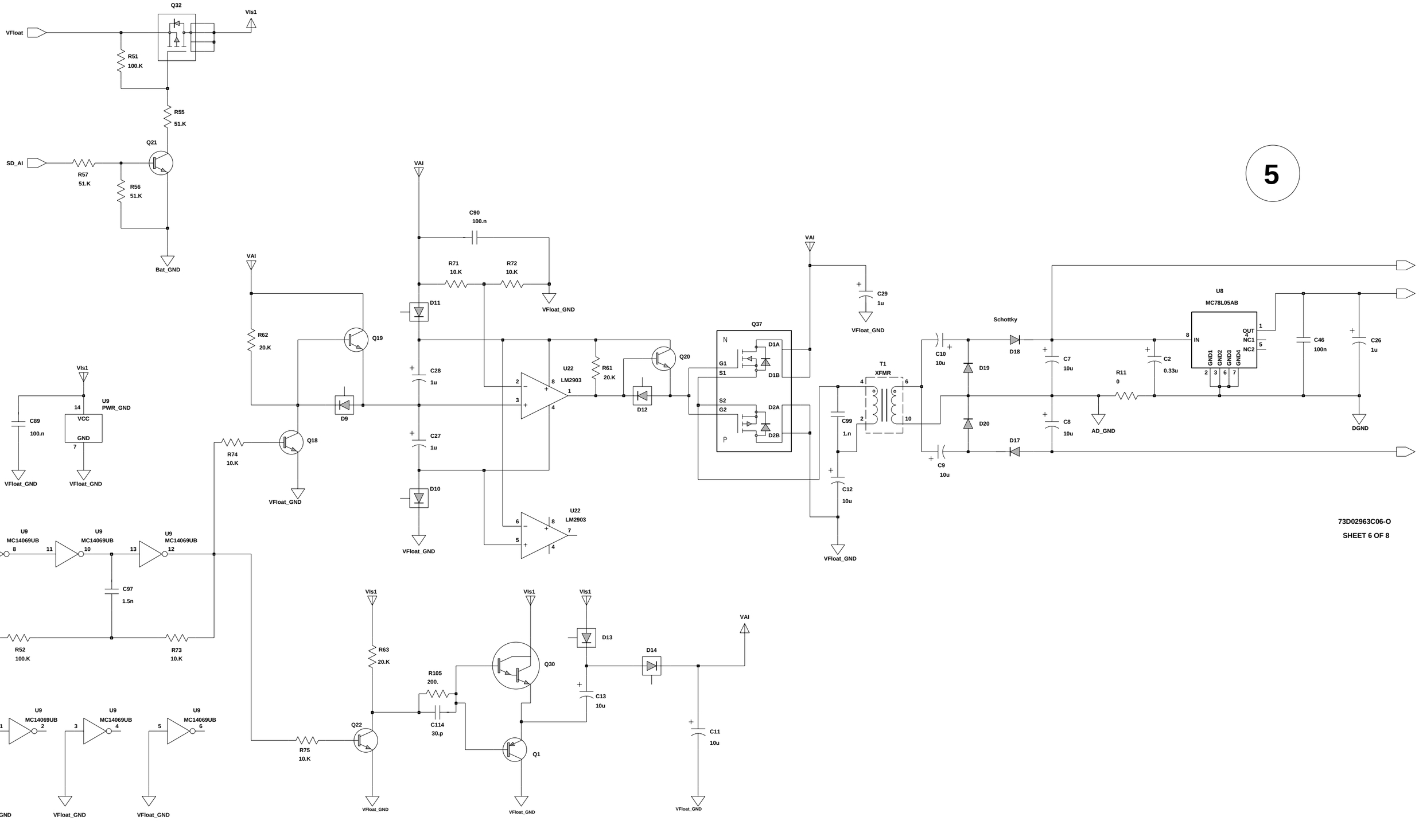
Q45
16 OUT
C
15 OUT
E
1 IN
A
CA
2 IN

P1-6
6
PGND

Isolated Power Supply for AI

MOSCAD-M Expansion Board
FCN6110A

5



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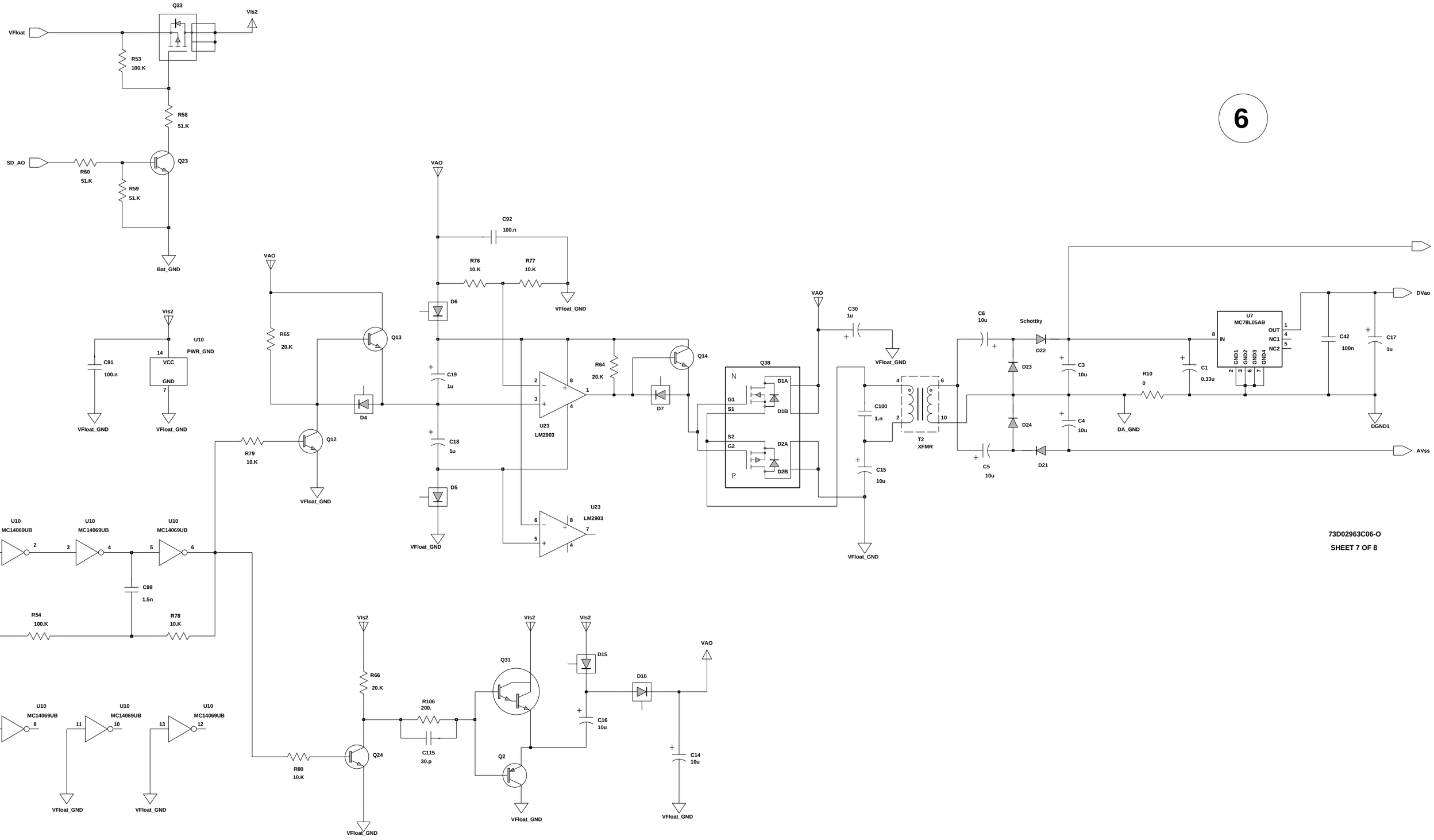
SHEET 6 OF 8

Isolated Power Supply for AO

MOSCAD-M Expansion Board
FCN6110A

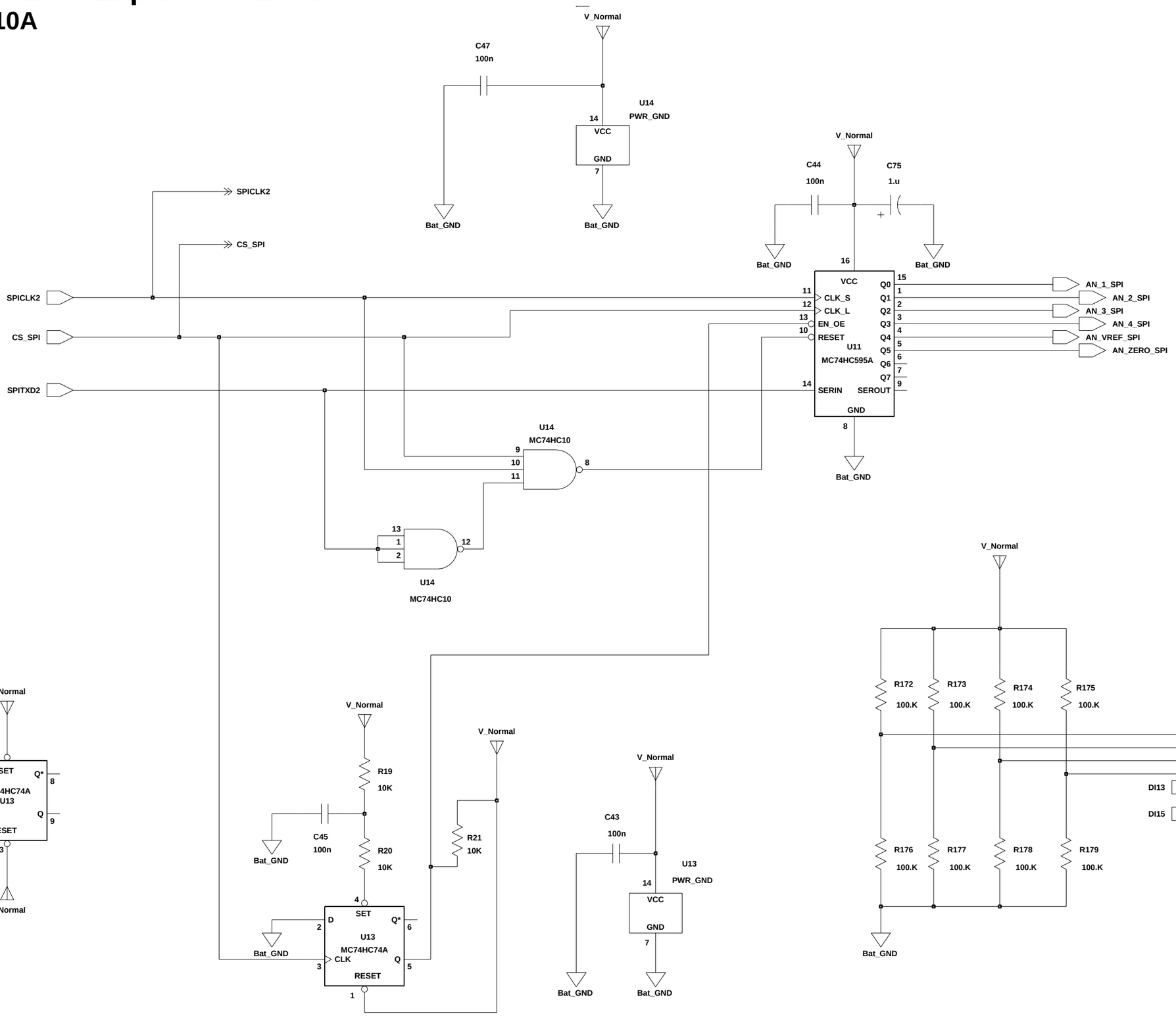
6



73D02963C06-O

SHEET 7 OF 8

MOSCAD-M Expansion Board
FCN6110A

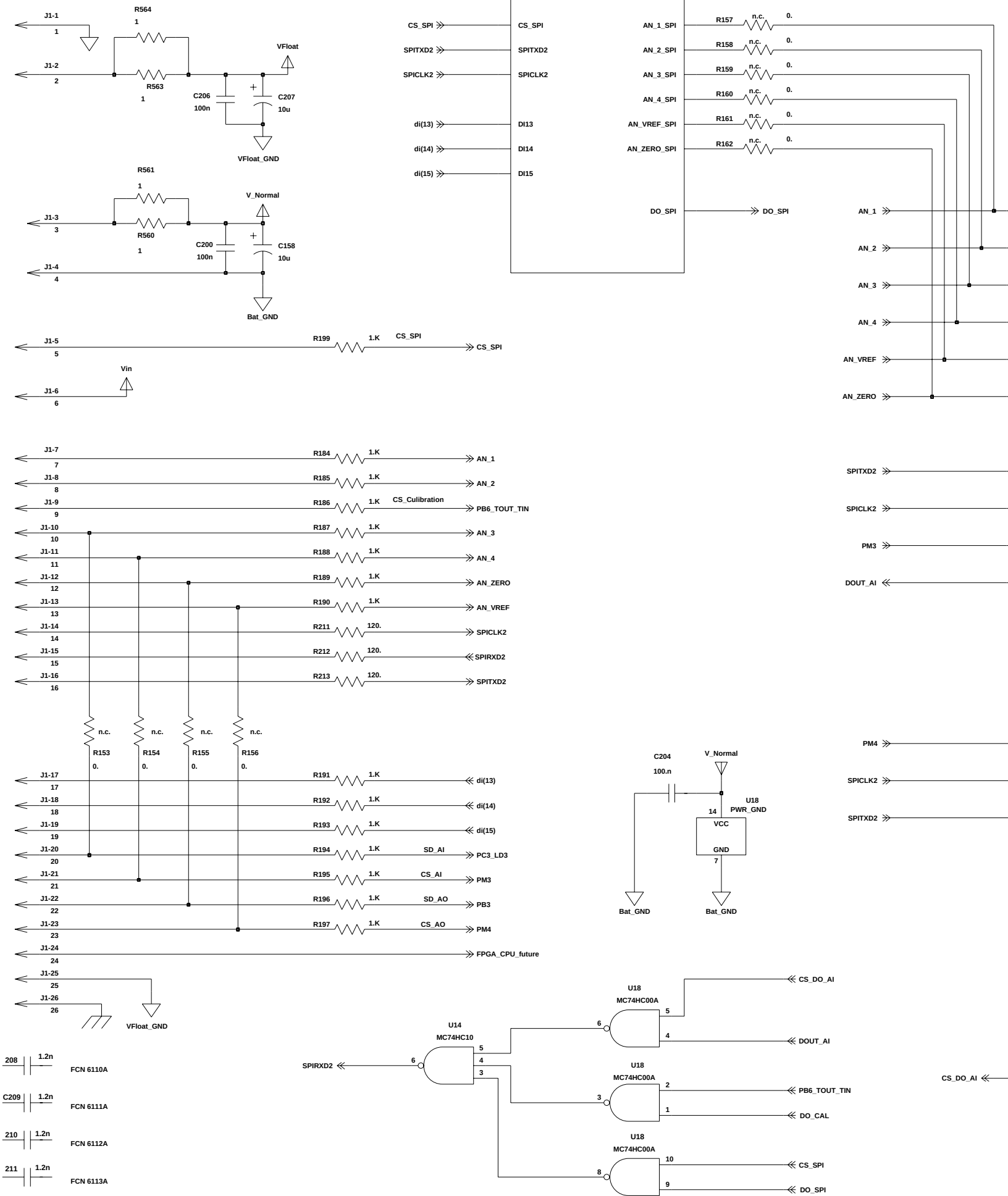


73D02963C06-O

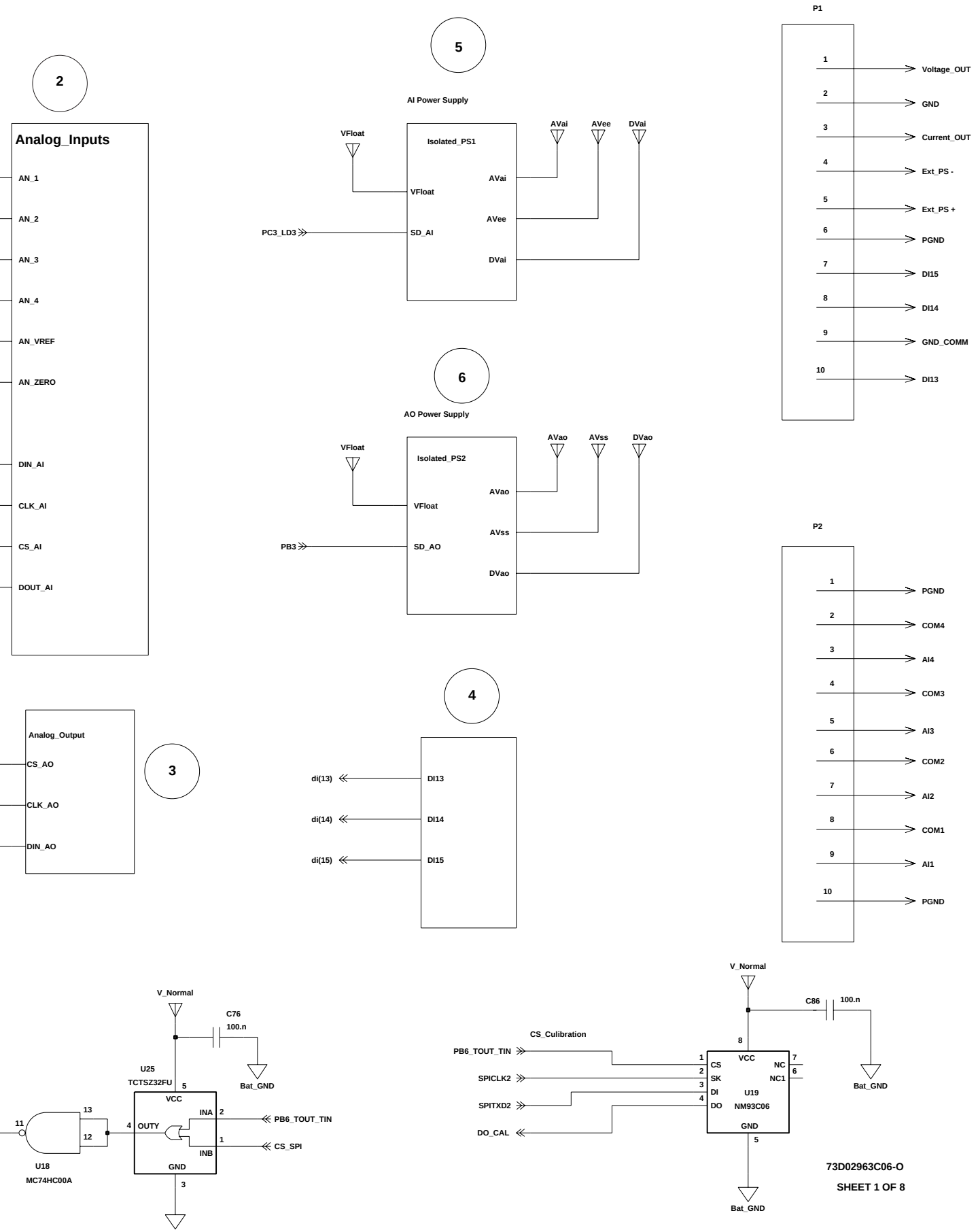
SHEET 8 OF 8

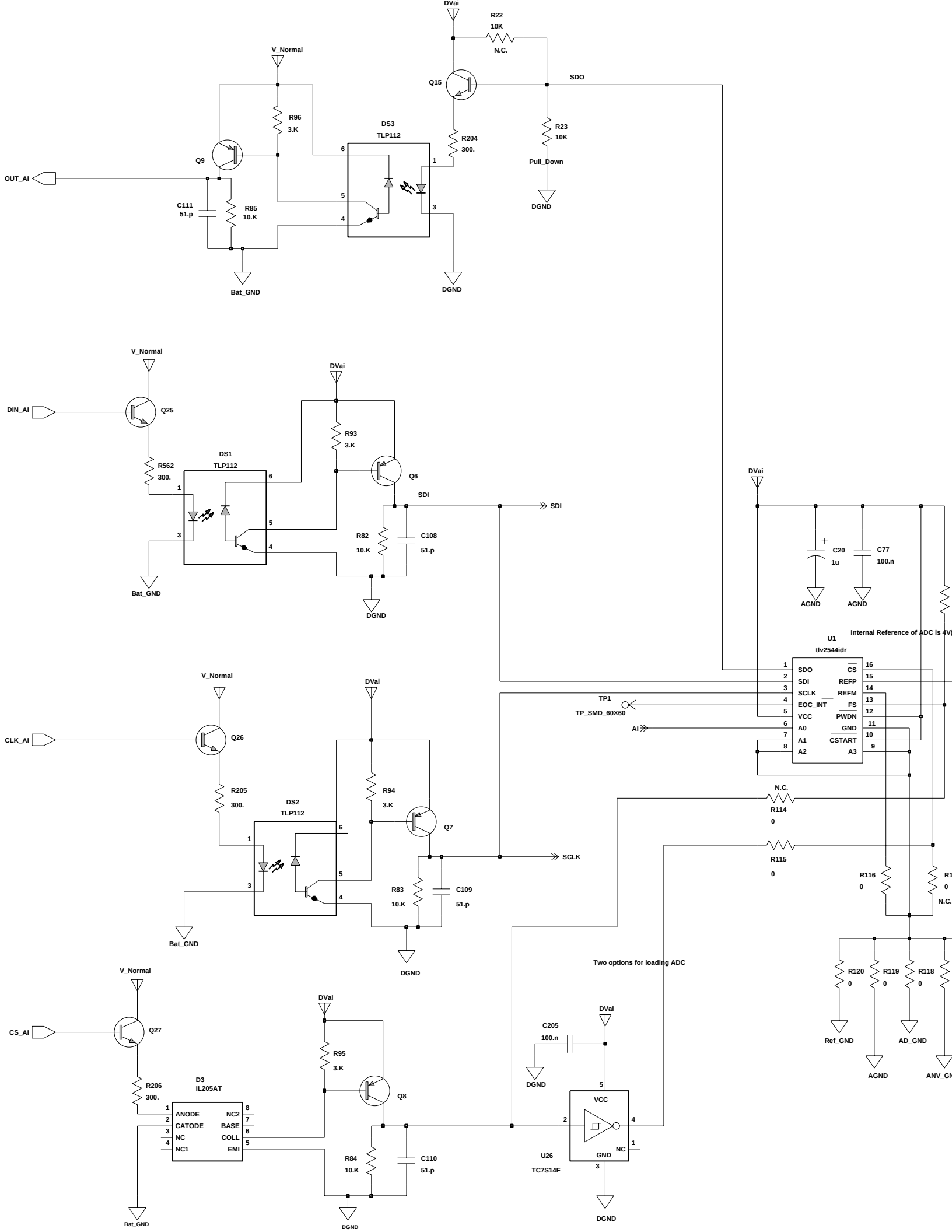
MOSCAD-M Expansion Board

FCN6110A

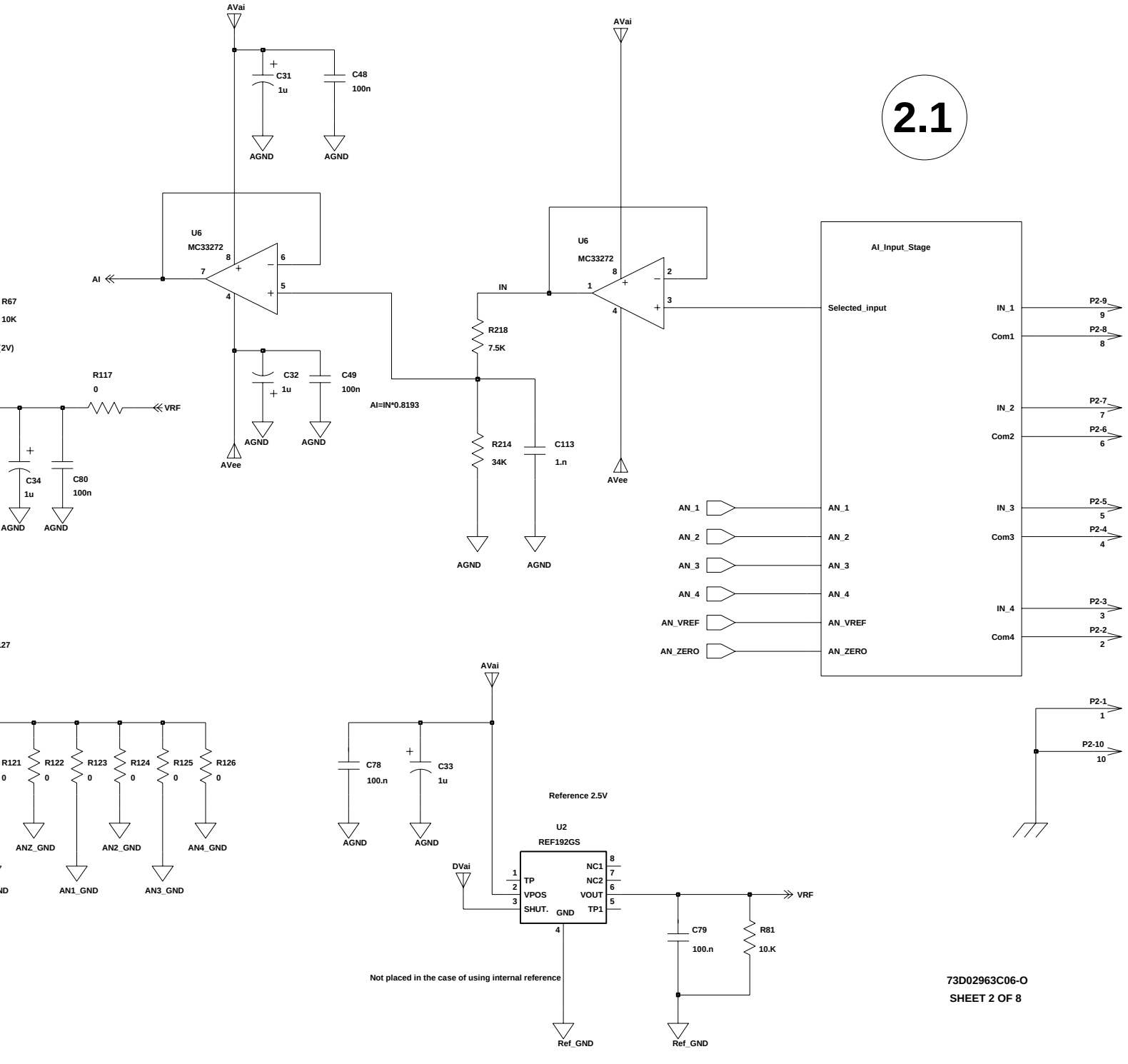


Main_Expansion_Board

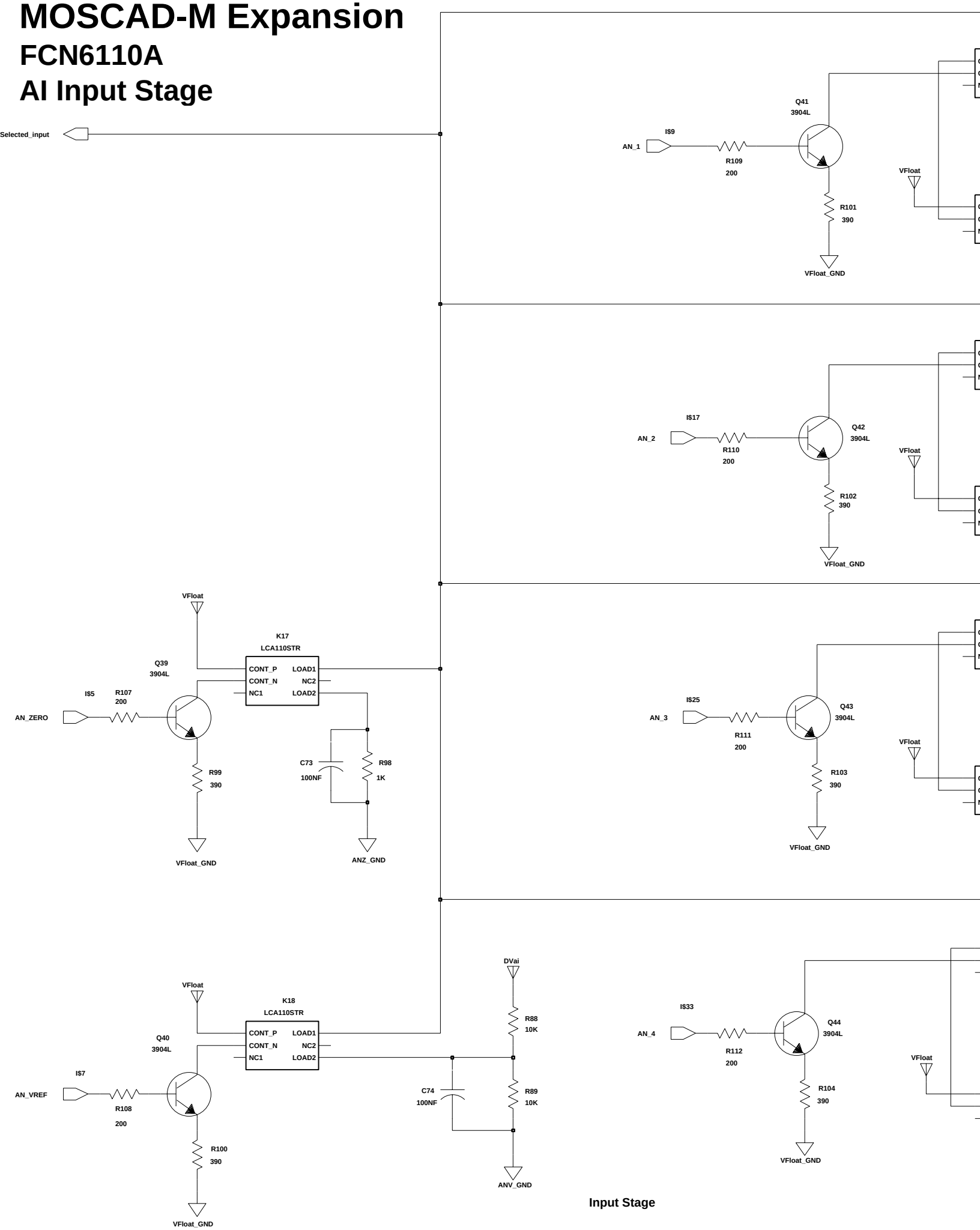



DVai
R22
10K
N.C.
V_Normal
Q15
SDO
R96
3.K
DS3
TLP112
R204
300.
R23
10K
Q9
Pull_Down
OUT_AI
C111
51.p
R85
10.K
DGND
Bat_GND
DGND
V_Normal
DVai
DIN_AI
Q25
R93
3.K
DS1
TLP112
R562
300.
Q6
SDI
SDI
R82
10.K
C108
51.p
Bat_GND
DGND
DVai
C20
1u
C77
100.n
AGND
AGND
Internal Reference of ADC is 4V(
U1
tlv2544idr
SDO
SDI
SCLK
EOC_INT
VCC
A0
A1
A2
CS
REFP
REFM
FS
PWDN
GND
CSTART
A3
TP1
TP_SMD_60X60
AI
V_Normal
DVai
CLK_AI
Q26
R205
300.
R94
3.K
DS2
TLP112
Q7
SCLK
R83
10.K
C109
51.p
Bat_GND
DGND
N.C.
R114
0
R115
0
R116
0
N.C.
Two options for loading ADC
R120
0
R119
0
R118
0
Ref_GND
AD_GND
AGND
V_Normal
DVai
CS_AI
Q27
R95
3.K
C205
100.n
DVai
R206
300.
D3
IL205AT
Q8
ANODE
CATODE
NC
NC1
NC2
BASE
COLL
EMI
DGND
VCC
GND
NC
U26
TC7S14F
R84
10.K
C110
51.p
Bat_GND
DGND
DGND

MOSCAD-M Expansion Board Analog Inputs
FCN6110A

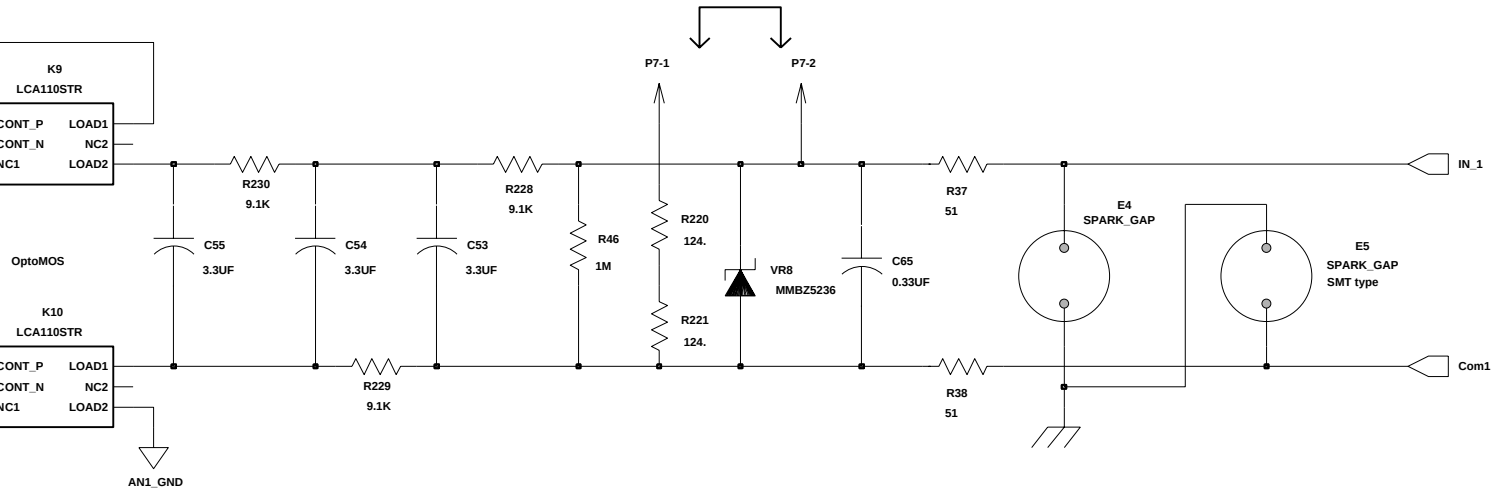


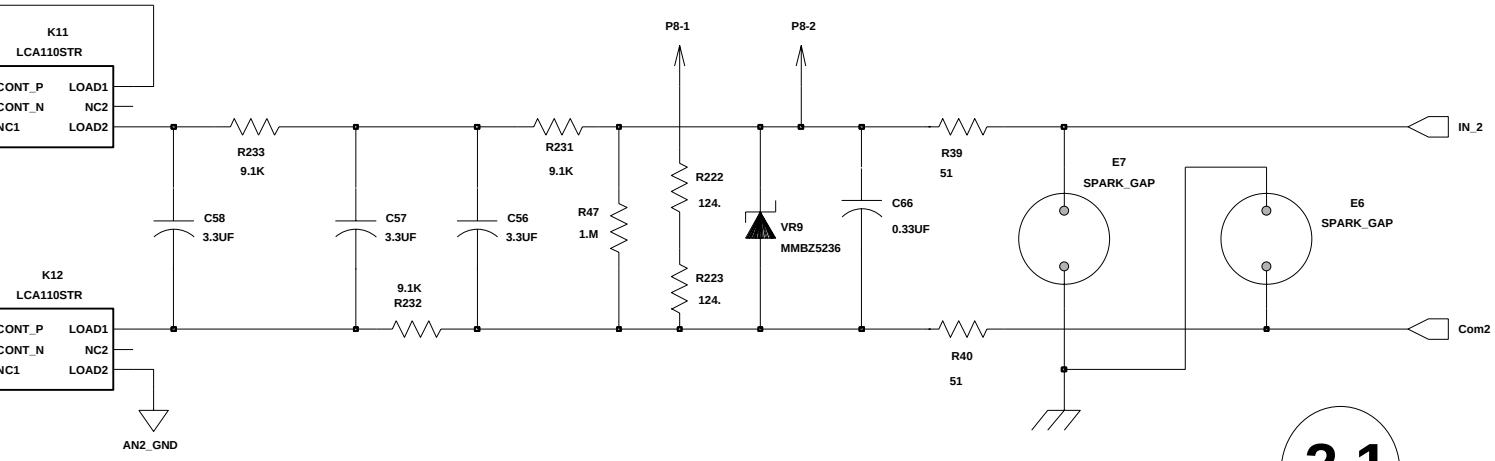
MOSCAD-M Expansion
FCN6110A
AI Input Stage



Input Stage

For Current Input





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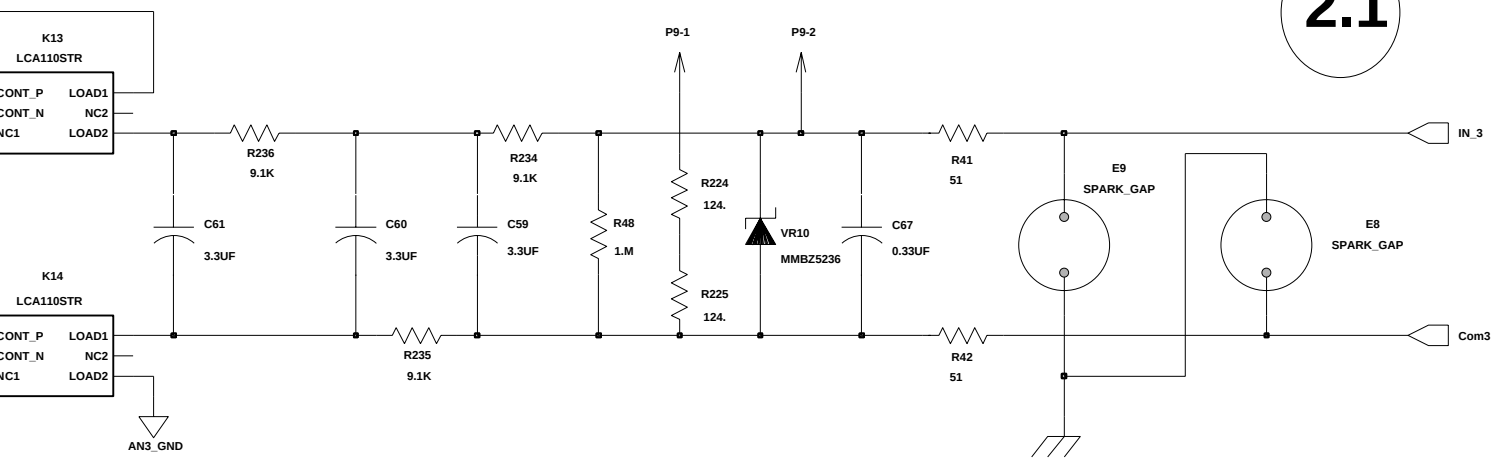
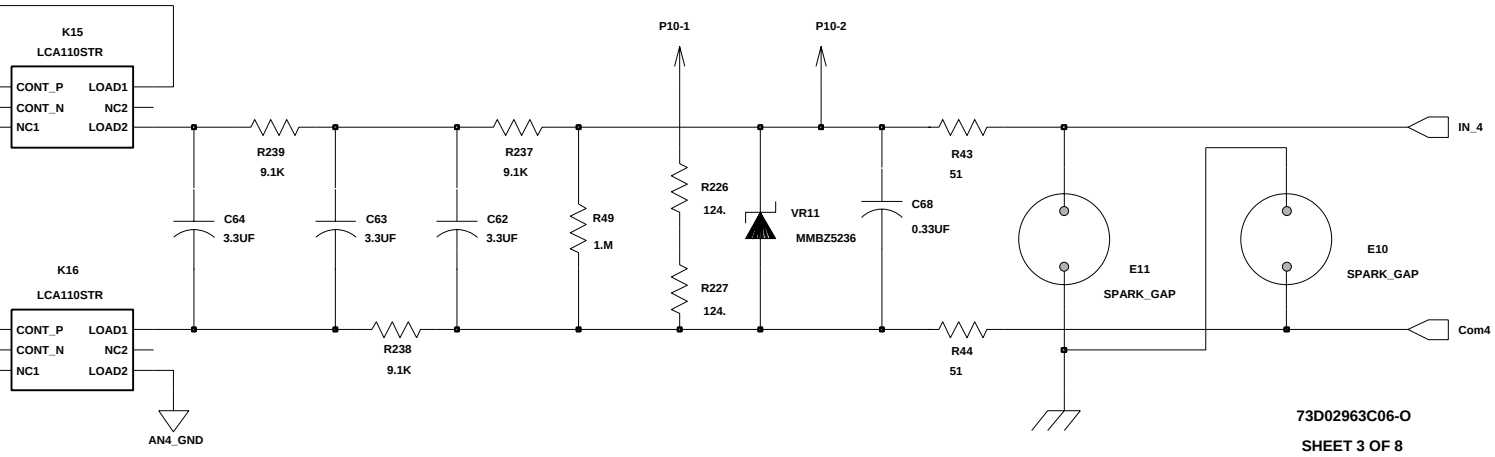
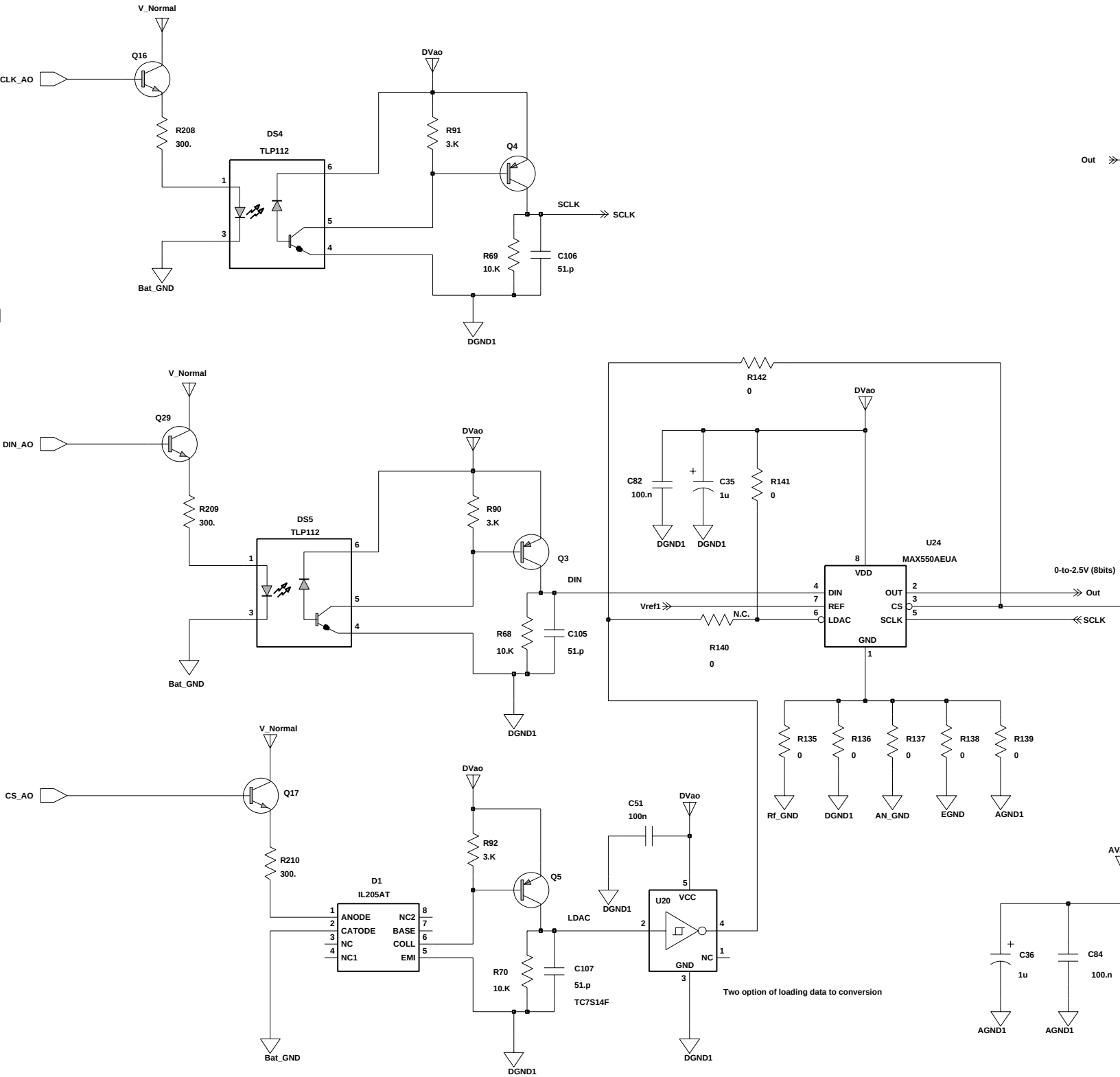


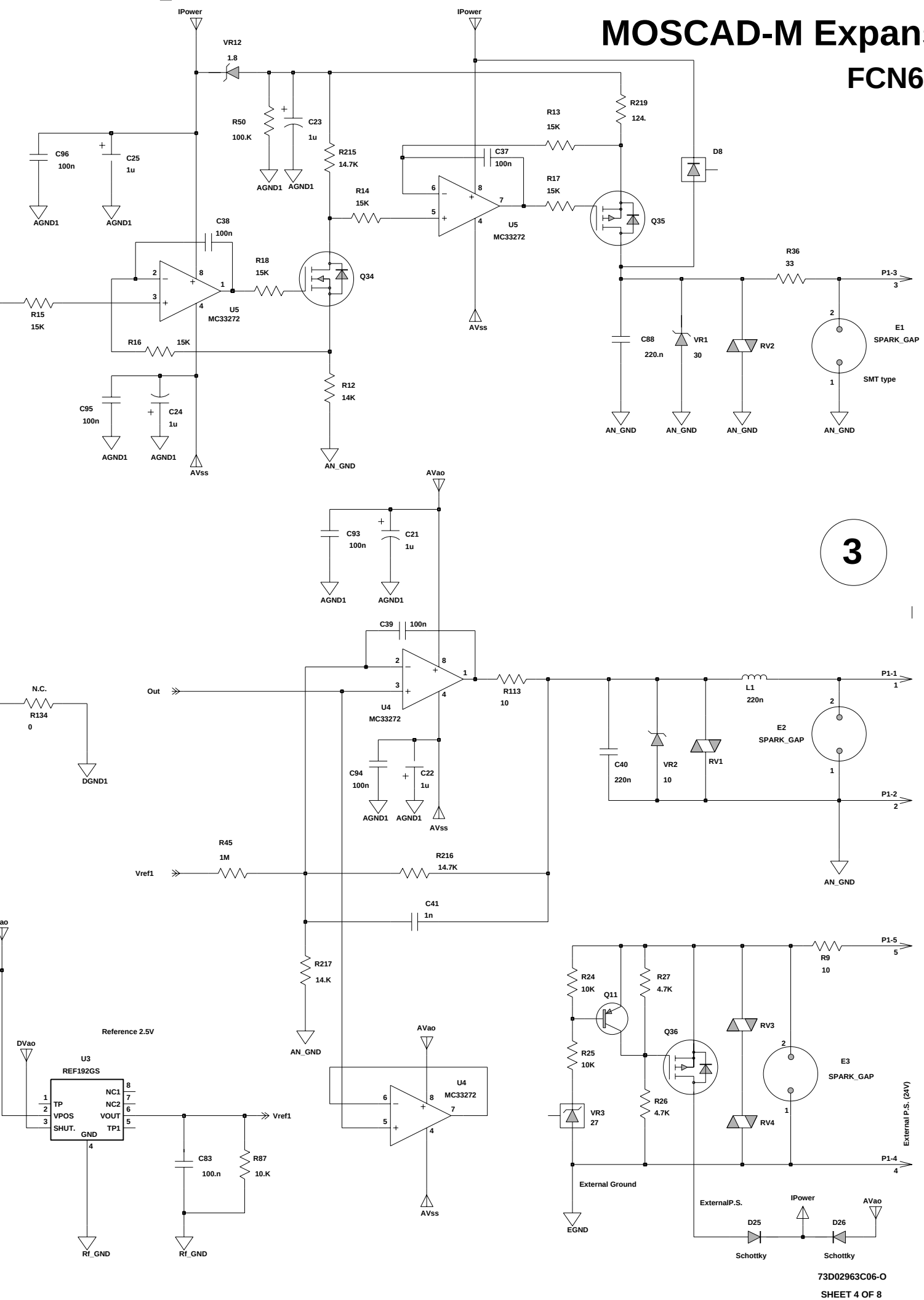


Analog Output



MOSCAD-M Expansion

FCN6110A



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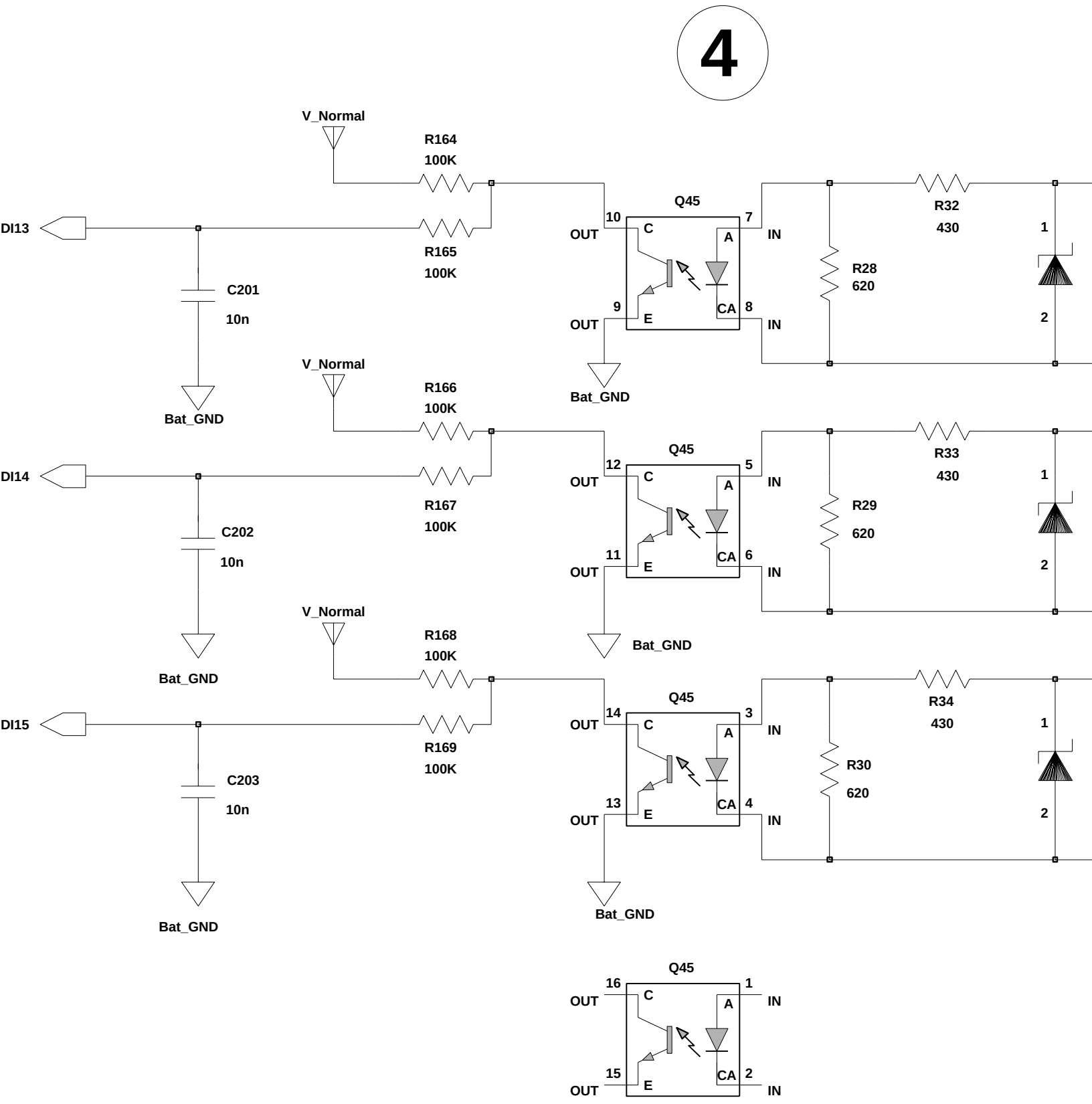
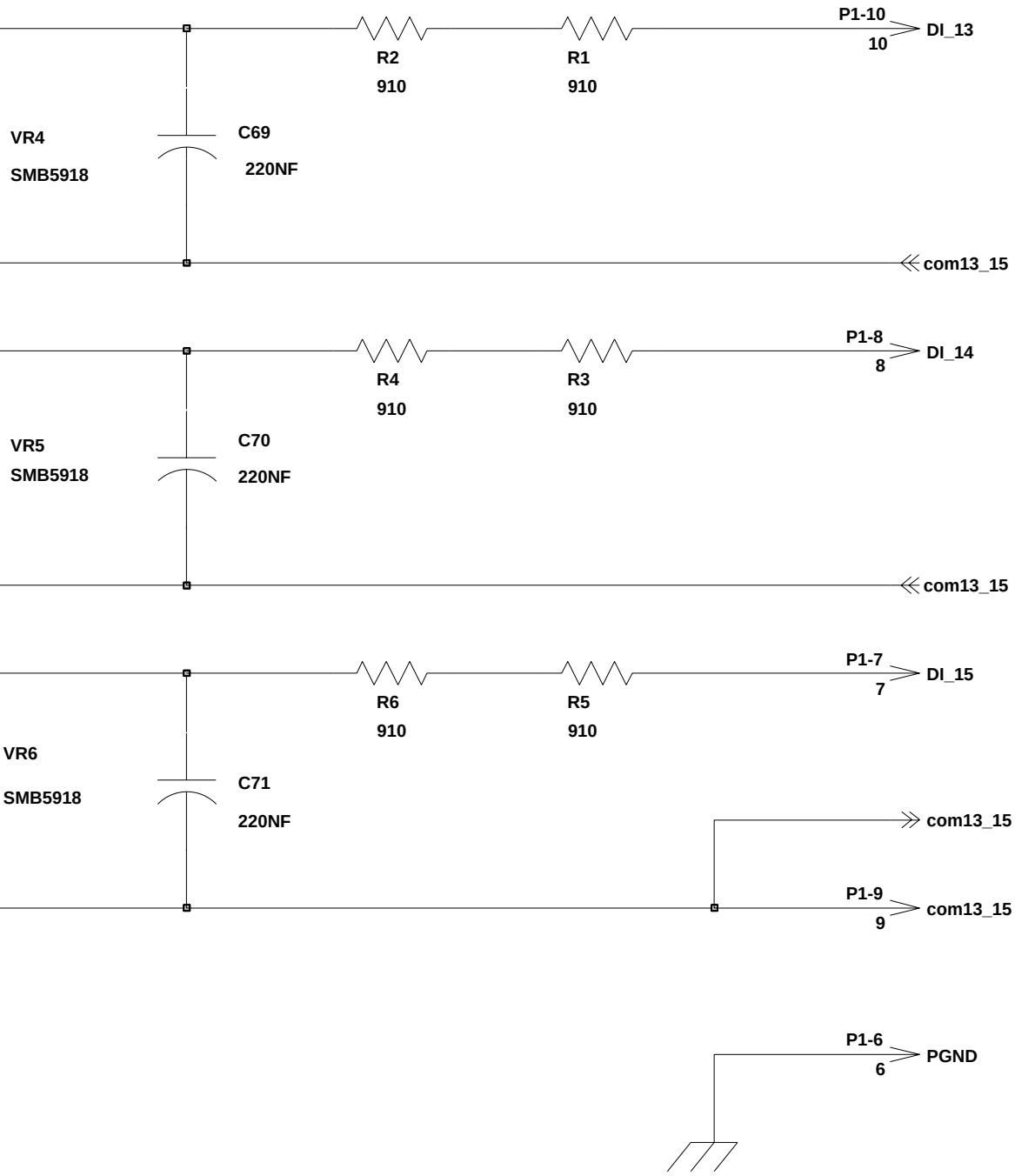
SHEET 4 OF 8

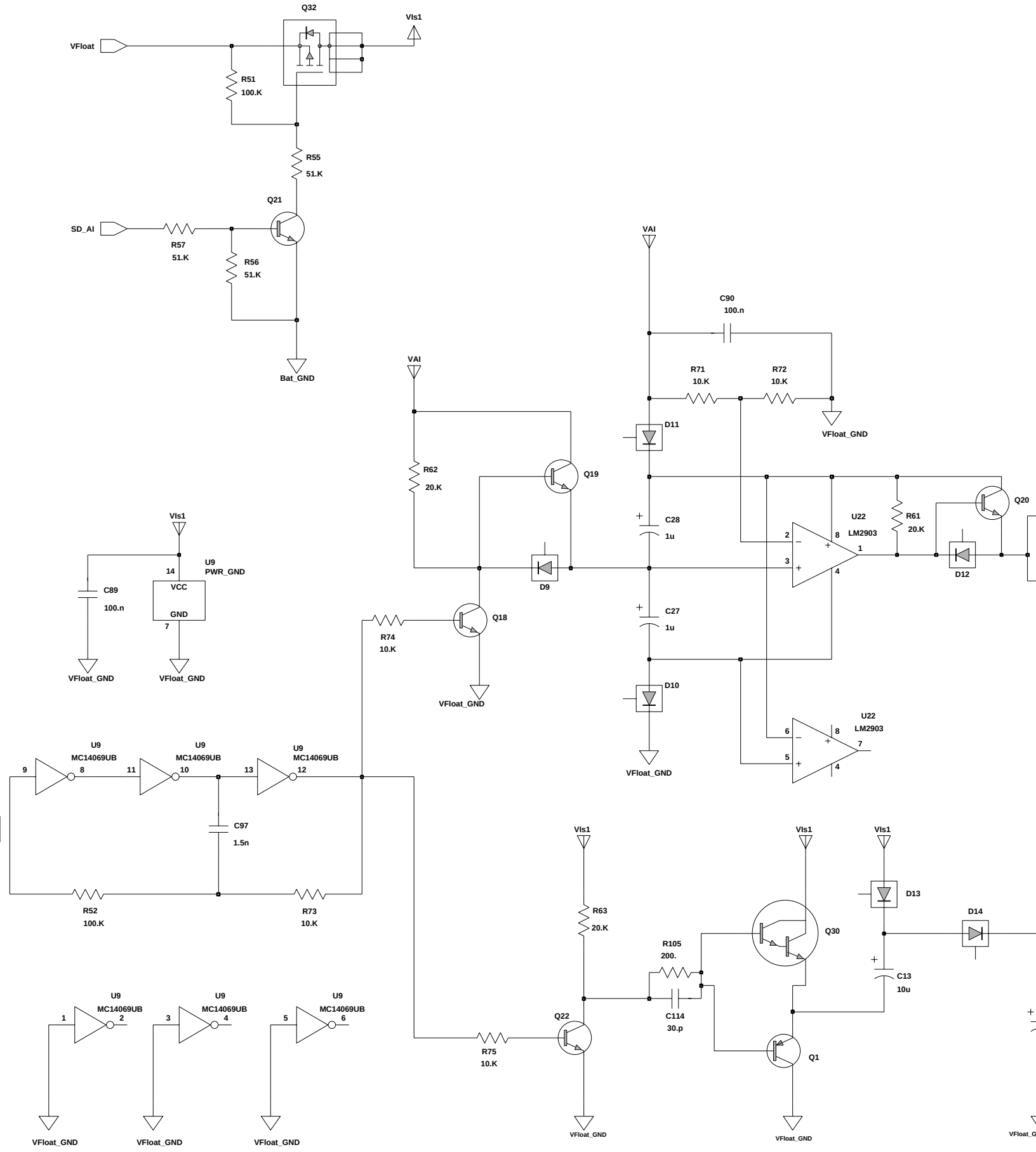
MOSCAD-M Expansion Board
FCN6110A



Expansion Board
Digital Inputs

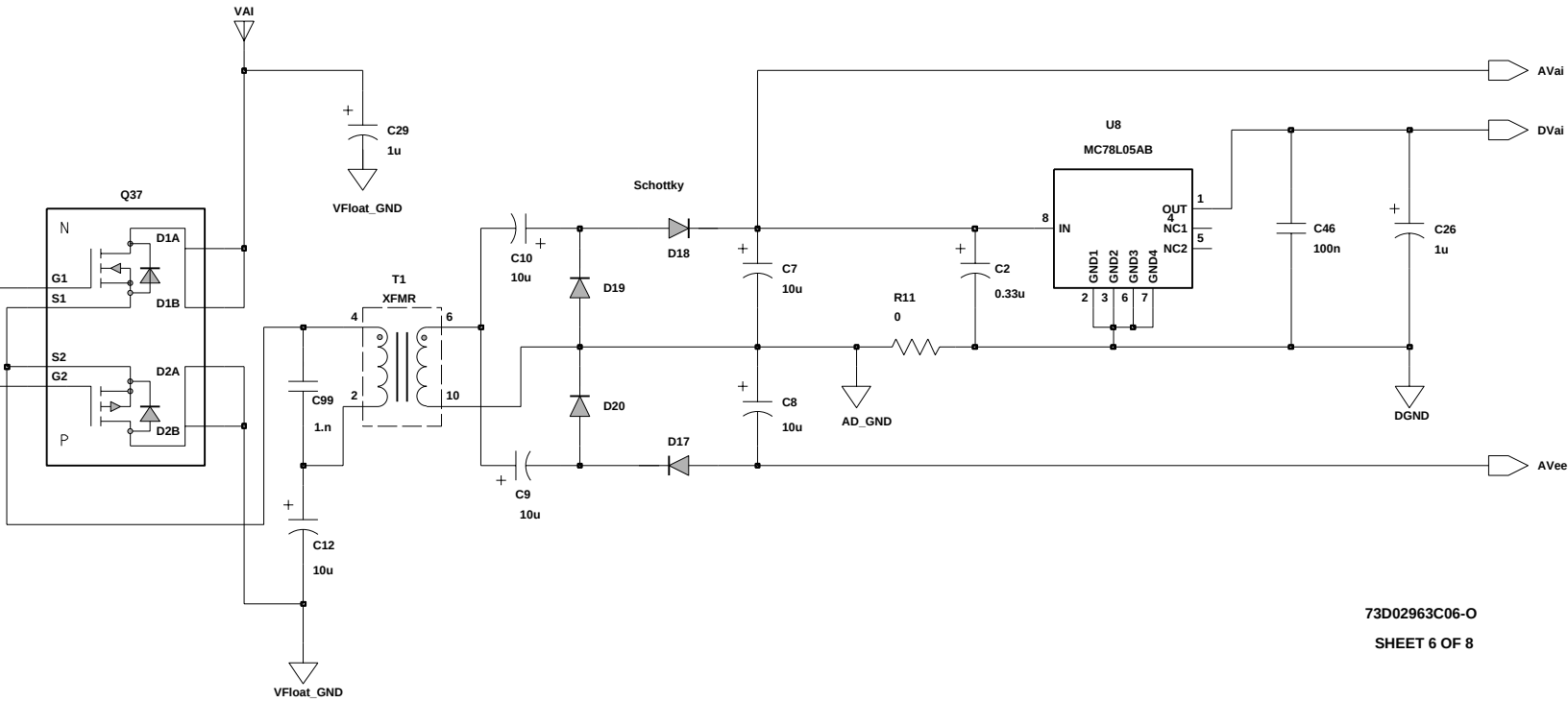


Isolated Power Supply for AI



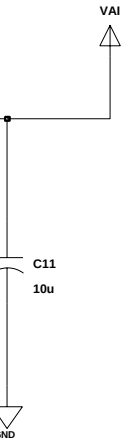
MOSCAD-M Expansion Board
FCN6110A

5

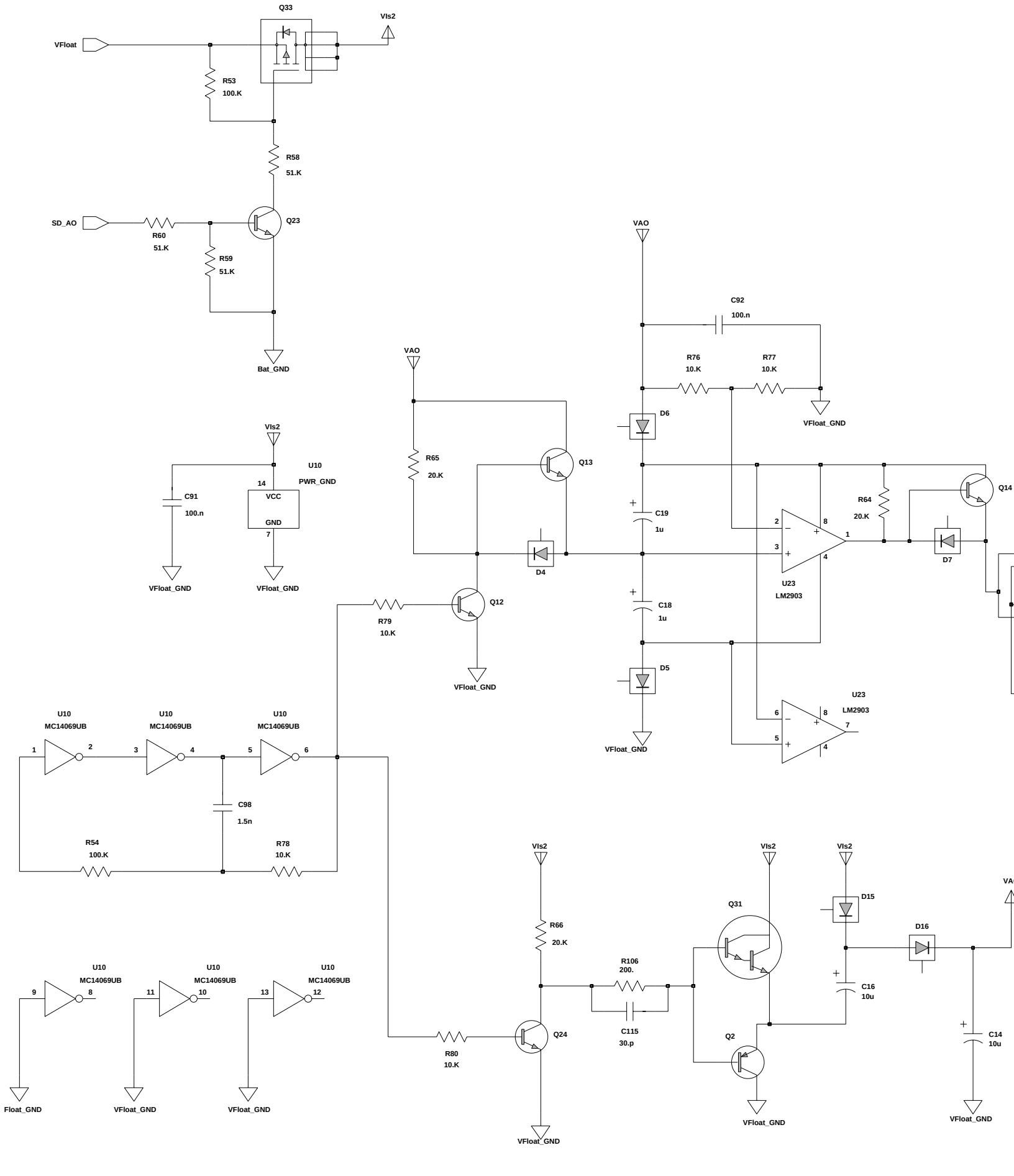


73D02963C06-O

SHEET 6 OF 8

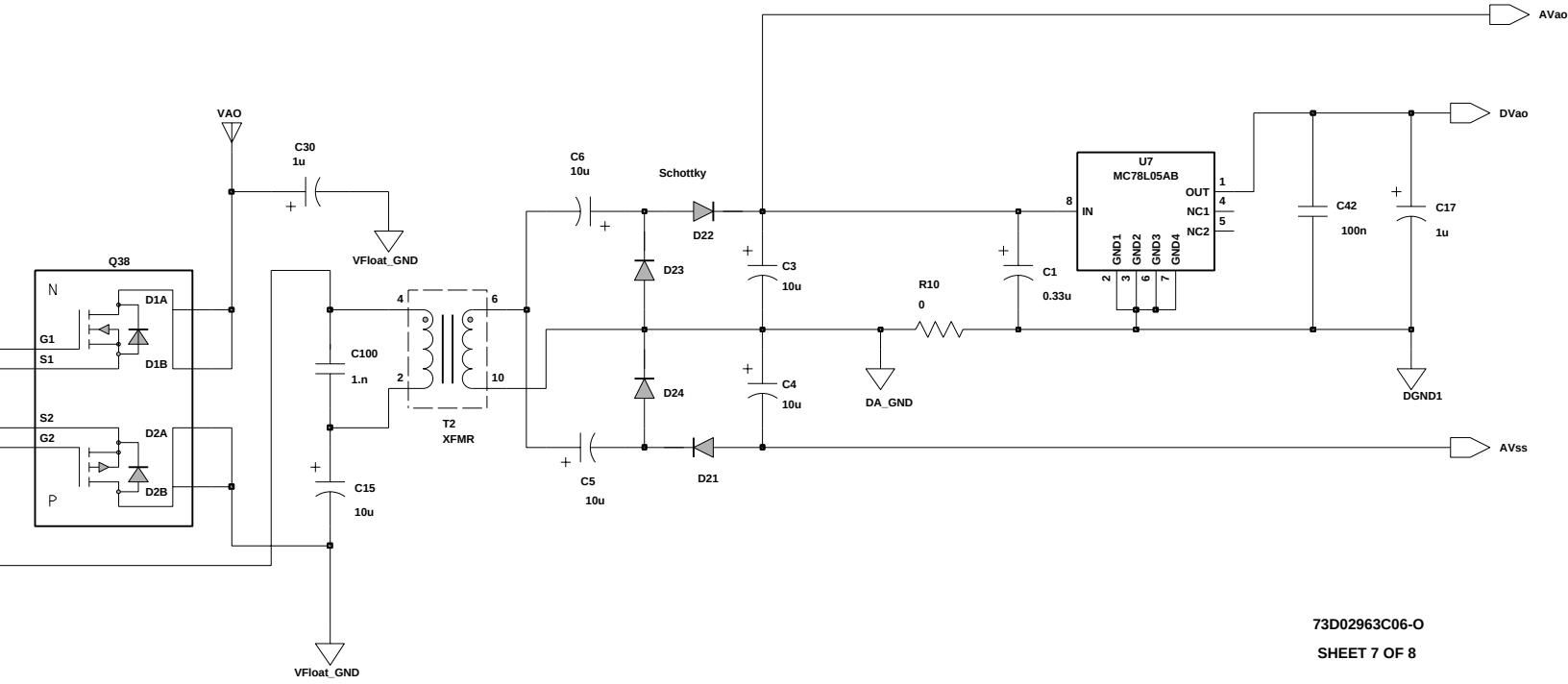


Isolated Power Supply for AO



MOSCAD-M Expansion Board
FCN6110A

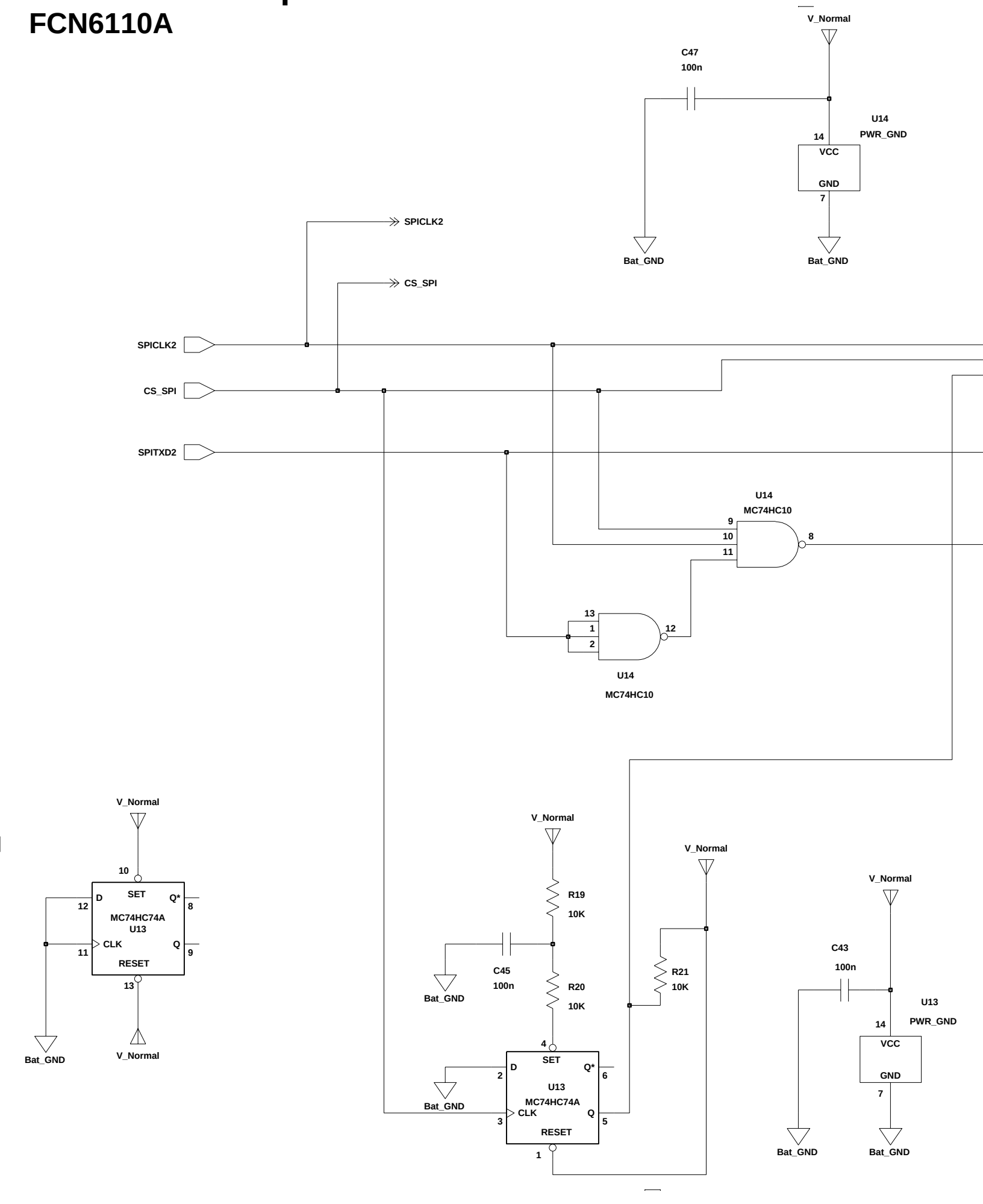
6



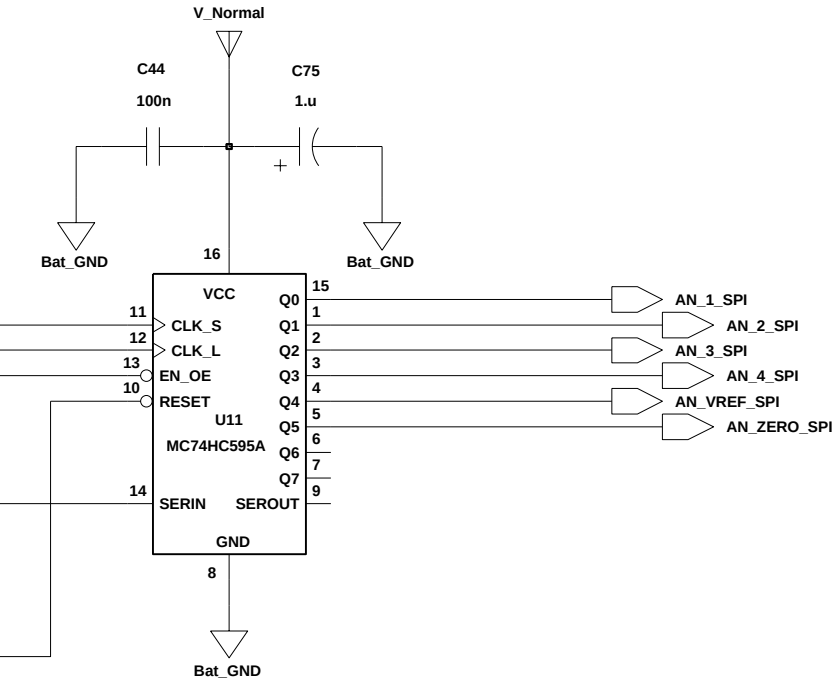
73D02963C06-O

SHEET 7 OF 8

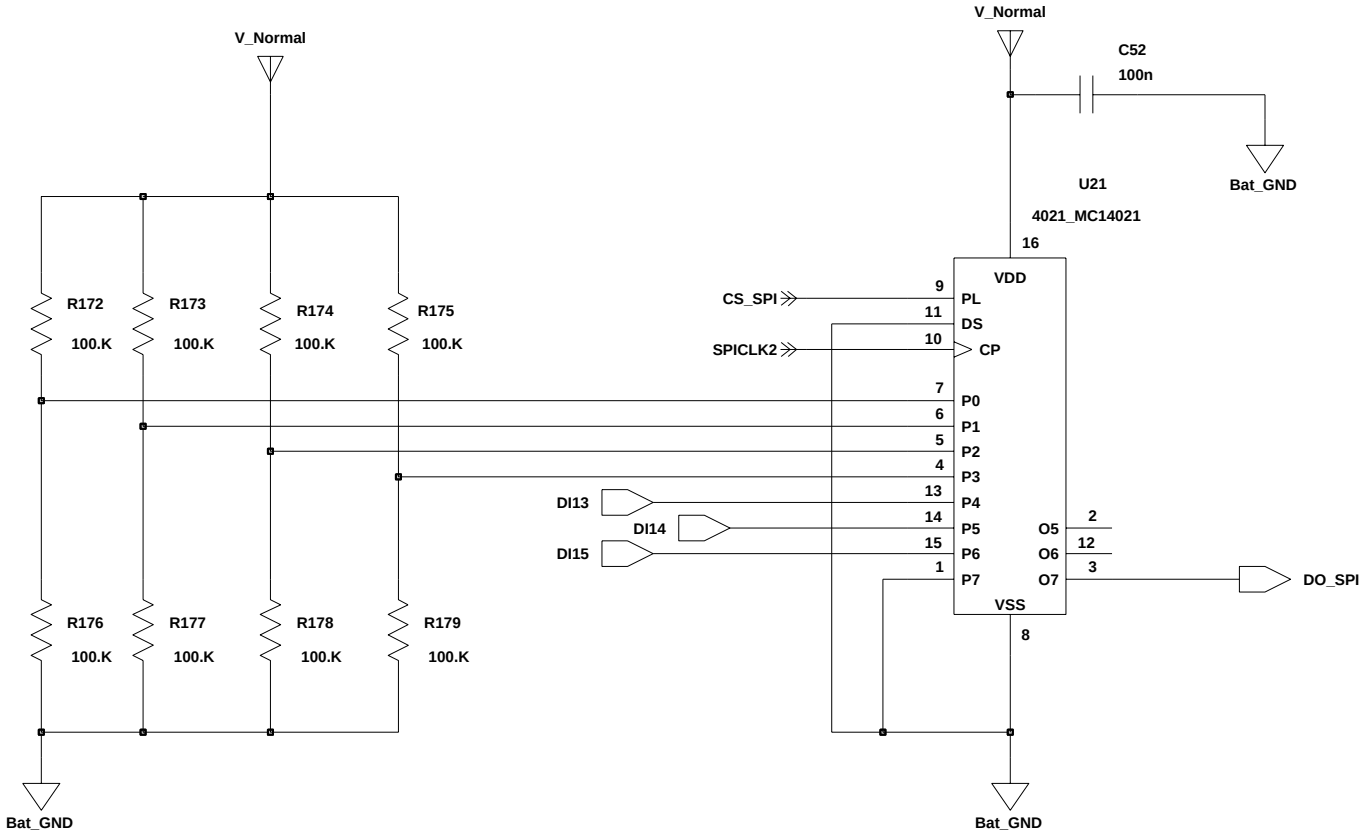
MOSCAD-M Expansion Board
FCN6110A



SPI_Interface



7



RV1	4804645P05	VC121018J390
RV2	4804645P04	VC080526C580
RV3-4	0602811C01	VARIS
T1-2	2580323L01	XFMR
U1	5102807C35	TLV2544IDR
U2-3	5186214J13	REF192GS
U4-6	5113818A02	MC33272
U7-8	5113816A03	MC78L05AB
U9-10	5113806A23	MC14069UB
U14	5113805A07	MC74HC10
U18	5113805A01	MC74HC00A
U19	5108444S03	NM93C06
U20	5104944K04	TC7S14F
U21	5113806A09	4021_MC14021
U22-23	5113820A02	LM2903
U24	5102807C34	MAX550AEUA
U25	5104931K05	TCTSZ32FU
U26	5104944K04	TC7S14F
VR1	4813831A39	1SMB5936B
VR2	4813831A23	1SMB5925B
VR3	4813830A37	MMBZ5254B
VR4-6	4813831A14	ZENER_SMB5918
VR8-11	4813830A19	ZENER_MMBZ5236
VR12	4813830G01	MMSZ4678T

Printing Layout, Schematic, and Parts List

The PDF file for the RTU component includes the following views:

- layout
- schematic
- divided schematic for any page of the schematic which is too big for printing on a letter size desktop printer
- parts list

To print part of the PDF file:

1. Go to the desired view by clicking once on the appropriate bookmark (e.g. Parts List) on the left side of the screen. If the item has a minus  sign to its left, click on the sign to see further items below.
2. The diagram or list you want to print may more cover than one page. To identify which pages should be printed, note the page numbers (e.g. 4 of 11) at the bottom of the screen. Use the scroll bar or the Page Down button on the keyboard to advance. If the bookmark on the left side of the screen changes, then you have advanced too far and displayed the next sheet or view.
3. Press on the  icon on the toolbar above the diagram to open the Print dialog box.
4. Select the current page or range of page numbers to be printed (e.g. 4-5) and click on OK.

Warning: Printing the entire PDF file is NOT recommended, as some pages will probably not fit your printer size.

Reconnecting a Divided Schematic

Pieces of a divided schematic can be reconnected as follows:

1. Line up the pages. If necessary, consult the schematic in the PDF.
2. Use tape to join of all parts of diagram as shown below.