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LC786830 Demo Board Kit User's Manual

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Overview

LC786830 Demo Board Kit is a demonstration and development platform based on LC786830. The kit also contains a Downloader Board so that you can easily update programs from your PC. The kit is designed to showcase multimedia audio playback including Bluetooth® audio, and hands-free communication.

This manual provides detailed information about the use and the configuration of the LC786830 Demo Board Kit to help you evaluate the performance and capabilities of LC786830 in developing application software for it.

LC786830 Demo Board Kit comprises Main Board, LCD Board and Downloader Board. The Main Board features miscellaneous components to show the performance of LC786830. The LCD Board has buttons as well as a LCD module for user interface.

Hardware

Main Board

- LC786830
- Power Supply
 - ◆ 12 V/4 A DC Jack (2.1 mm center positive)
 - ◆ LDO 1.2 V/3.3 V/5.0 V/8.0 V
- Memory
 - ◆ 16 Mbit QSPI Flash
 - ◆ 32 Mbit QSPI Flash
 - ◆ 256 kbit EEPROM
 - ◆ 64 Mbit PSRAM (optional)
- Bluetooth on Board Module
- Audio
 - ◆ ECM with Op Amp
 - ◆ External DAC (Fs: 192 kHz)
 - ◆ Piezo Speaker
 - ◆ RCA Jack
 - ◆ 3.5 mm Phone Jack
- Interfaces
 - ◆ USB Type-A Connector
 - ◆ SD Card Socket (on the solder side)
 - ◆ IR Receiver
 - ◆ Debug
 - ◆ JTAG 20-Pin Connector (SWD)

LCD Board

- LCD Module
- Key Button (2 x 4)
 - ◆ Rotary Encoder

Downloader Board

- Microcontroller
- USB Type-B Connector



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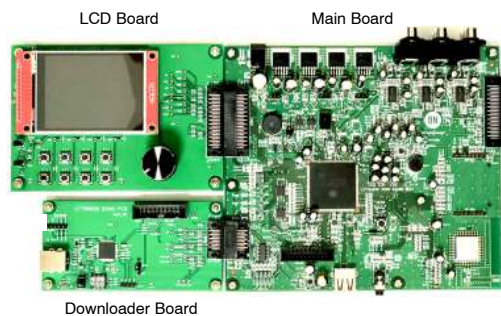


Figure 1. LC786830 Demo Board Kit

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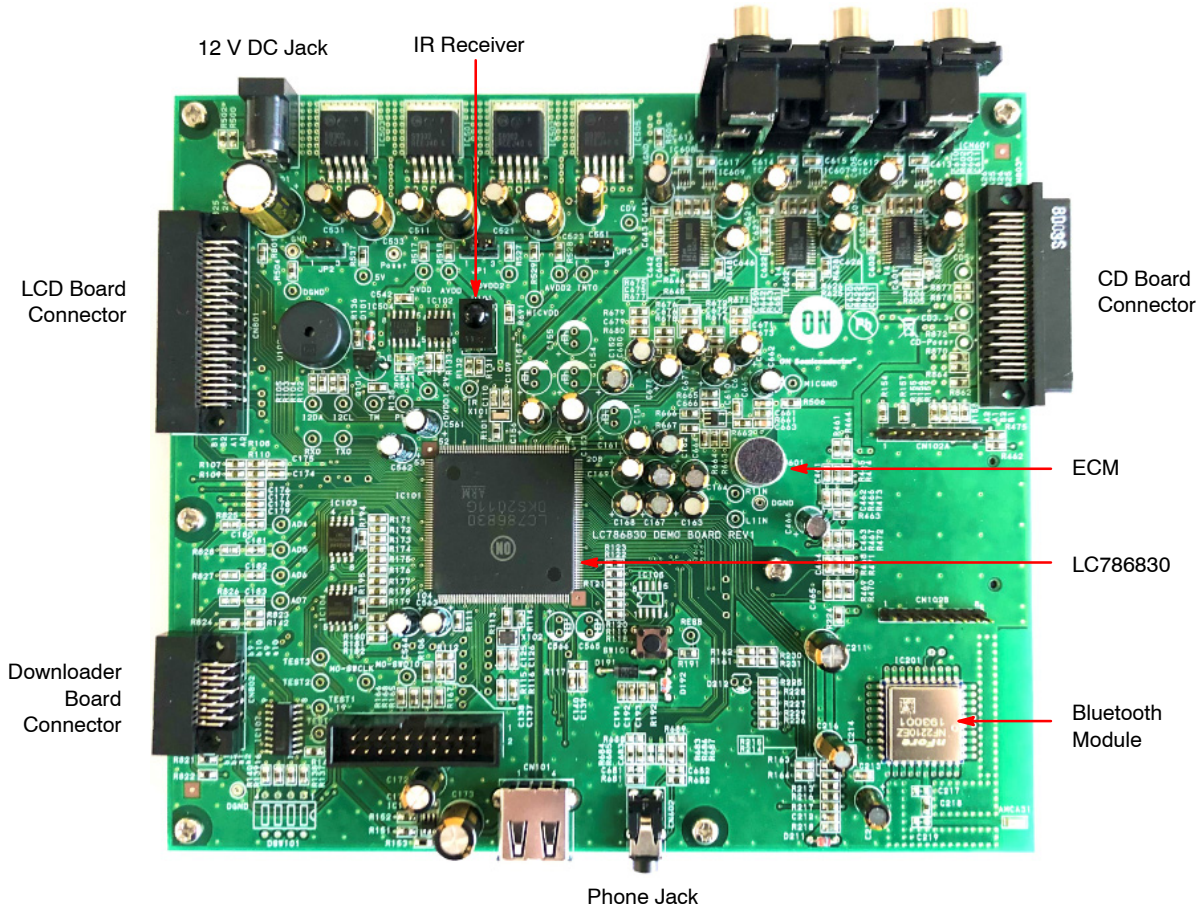


Figure 2. LC786830 Demo Main Board

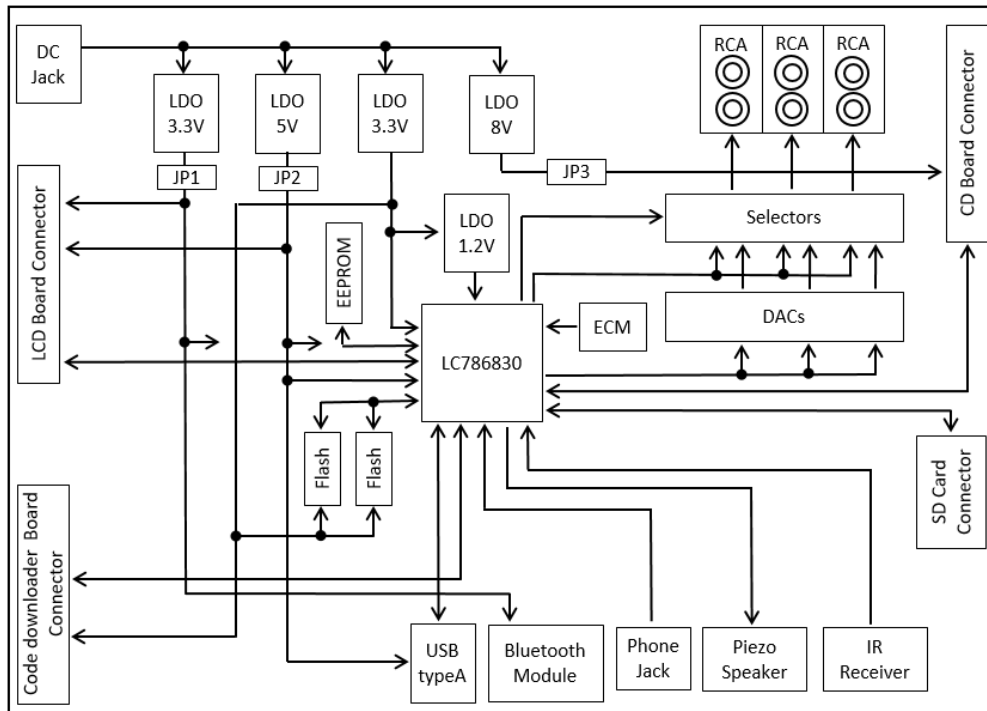


Figure 3. Block Diagram of LC786830 Demo Main Board

Power Supply

The enable pins of three LDOs on the Main Board are connected to pins of LC786830 via jumpers. Thus, place shunt jumpers on pins 2 and 3 of JP1, JP2 and JP3 before powering the Main Board except when each state can be set by GPs. Refer to the following table and figure. After that, connect the plug of a 12 V power supply to the DC jack (CN501, center positive, up to 4 A).

Table 1. JPS OF POWER SOURCE

Jumper Name	Function	Jumper Pin #	State
JP1	Enable 3.3 V (DVDD2)	1	GP00_1
		3	ON
JP2	Enable 5 V (5V)	1	GP00_2
		3	ON
JP3	Enable 8 V (CDV)	1	GP00_0
		3	ON

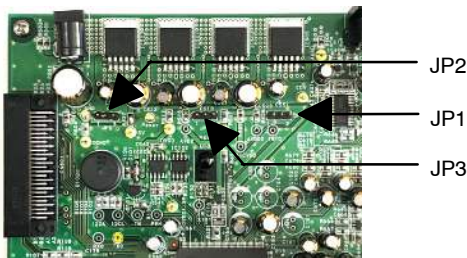


Figure 4. The Locations of JPs

Programing the Flash on the Board

The Flash Writer Application can program the flash memory on the Main Board from your PC over the Downloader Board. The Flash Write Application is available from the onsemi.com website.

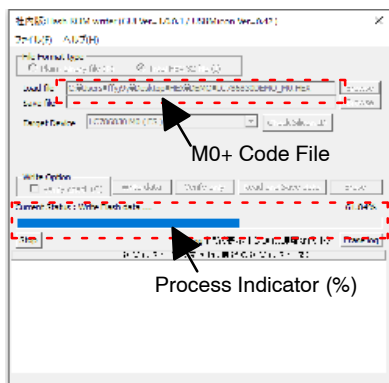


Figure 5. Flash Writer Application



Figure 6. Connect the Downloader Board to your PC

Applications

Bluetooth module NF2210EZ is embedded on the Main Board with printed antenna so that it is easy to establish a Bluetooth connection with a phone or other device. An electret condenser microphone is also embedded on the Board for hands-free communication. It has a gain of 40 dB. If you do not achieve that in your environment, please replace resistors, R662 and R665 to adjust the gain. Although the built-in DAC of the LC786830 supports up to 96 kHz sampling rates, external DACs which can accept 192 kHz sampling rates also are featured on the Board so that 192 kHz sampling rates playback is acceptable. When the output level of GP04_4 is low, built-in DAC outputs are connected with RCA jack. When the output level of GP04_4 is high, external DAC outputs are connected with RCA jack. Refer to the schematic of the Main Board. The 3.5 mm phone jack is connected to a differential input on the LC786830 to accept an analog input. The Main Board also has an EEPROM for backup applications such as storing volume settings. The SD Card socket is embedded on the solder side as well. The Main Board can mount PSRAM but the PSRAM needs to use same ports of LC786830 as the SD Card control. Therefore, when PSRAM is available, the SD Card solution is not available. In addition to that, there are a piezo speaker and an IR receiver on the Main Board for applications. Furthermore, the Main Board can be connected with ON Semiconductor’s CD playback Board so that it is easy to support a CD solution. A dedicated IIC interface is available for MFi, via a CN102A terminal on the Main Board.

For details of each component on the Boards, refer to its datasheet.

Debugging

A Serial Wire Debug interface is available for debugging. CN103 (JTAG 20-pin connector) on the Main Board is its adaptor connector.

Table 2. CN103 PIN ASSIGNMENT

CN103 Pin#	Name	Function
7	SWDIO	SWD data I/O
9	SWCLK	SWD clock
1, 2	3.3 V	Power
4, 6, 8, 10, 12, 14, 16, 18, 20	GND	Ground



Figure 7. Debugger Connected with CN103

Also, TP108 (TX0), TP109 (RX0), are prepared for UART data logger monitor use in debugging.

DSP Port Assignment

The General Ports of LC786830 are assigned according to the table shown below. Refer to the table and schematics, when developing application software.

Table 3. GP ASSIGNMENT TABLE

Name	Function	I/O	Usage
GP00_0	GPIO	O	Enable 8 V (CDV)
GP00_1	GPIO	O	Enable 3.3 V (DVDD2)
GP00_2	GPIO	O	Enable 5 V (5V)
GP00_3	IRQ	I	Detect KEY0 input
GP00_4	IRQ	I	CD (mechanical-sw1)
GP00_5	IRQ	I	CD (mechanical-sw2)
GP00_6	IRQ	I	DISPLAY (T-IRQ)
GP00_7	TIMER	I	IR Receiver
GP01_0	IIC	O	EEPROM SCL
GP01_1	IIC	I/O	EEPROM SDA
GP01_2	GPIO	O	CD (S/L selector)
GP01_3	TIMER	O	Piezo Speaker
GP01_4	GPIO	O	CD (Driver Mute/active low)
GP01_5	GPIO	O	CD (Loader plus)
GP01_6	GPIO	O	CD (Loader minus)
GP01_7	GPIO	I	-
GP02_0	GPIO	O	USB (VBUS Disable/active low)
GP02_1	GPIO	I	USB (Detect Over Current)
GP02_2	GPIO	O	DISPLAY (T-CE)
GP02_3	SIO	O	DISPLAY (T-DIN)
GP02_4	SIO	O	DISPLAY (T-CLK)
GP02_5	SIO	I	DISPLAY (T-DO)
GP02_6	UART	O	Debug (M0+ TX)
GP02_7	UART	I	Debug (M0+ RX)
GP03_0	GPIO	O	DISPLAY (Enable LCD-Power)
GP03_1	GPIO	O	DISPLAY (LCD-CE)
GP03_2	GPIO	O	DISPLAY (LCD-RESET)
GP03_3	GPIO	O	DISPLAY (LCD-D/C)
GP03_4	SIO	O	DISPLAY (LCD-CLK)
GP03_5	SIO	I	DISPLAY (LCD-DO)
GP03_6	SIO	O	DISPLAY (LCD-DIN)
GP04_2	GPIO	I	Rotary-Encoder A
GP04_3	GPIO	I	Rotary-Encoder B
GP04_4	GPIO	O	Select Built-in/External DACs
GP04_5	GPIO	I	-
GP04_6	GPIO	I	-
GP04_7	GPIO	I	-
GP05_0	A/D	I	KEY0 input

Table 3. GP ASSIGNMENT TABLE (continued)

Name	Function	I/O	Usage
GP05_1	A/D	I	KEY1 input
GP05_2	A/D	I	KEY2 input
GP05_3	A/D	I	KEY3 input
GP05_4	GPIO	I	-
GP05_5	GPIO	I	-
GP05_6	GPIO	I	-
GP05_7	GPIO	I	-

LCD Board

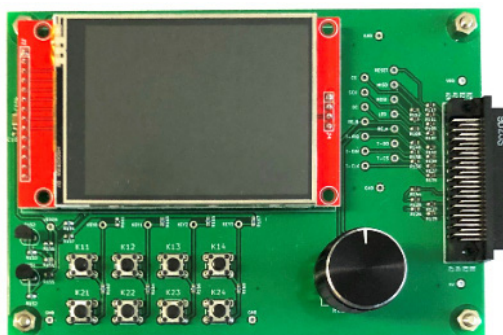


Figure 8.

LCD module is mounted on the LCD Board.

Refer to the following table for a description of the signal names. For more information about the components of the LCD module, refer to their respective datasheets.

Table 4. LCD MODULE SIGNALS

Signal Name	I/O	Description
LED	I	Enable backlight
CS	I	Module CS, active low
RESET	I	Module Reset, active low
D/C	I	High: transmit data Low: transmit command
MOSI	I	SPI Master Out Slave In
MISO	O	SPI Master In Slave Out
SCK	I	SPI clock
T-IRQ	O	Touch module, Touch detector, active low
T-CS	I	Touch module CS, active low
T-DIN	I	Touch module SPI Master Out Slave In
T-DO	O	Touch module SPI Master In Slave Out
T-CLK	I	Touch module SPI clock

Downloader Board



Figure 9.

The microcontroller on the Board supports programming of the flash on the Main Board from your PC. Place shunt jumpers on pins 2 and 3 of JP101 and turn all switches of DSW1 off. Reset switch, TSW1 controls the reset status of the Microcontroller. The reset is active low. With the Downloader Board connected to the Main Board, TSW1 must be turned to L (low) when debugging.

LAYOUT

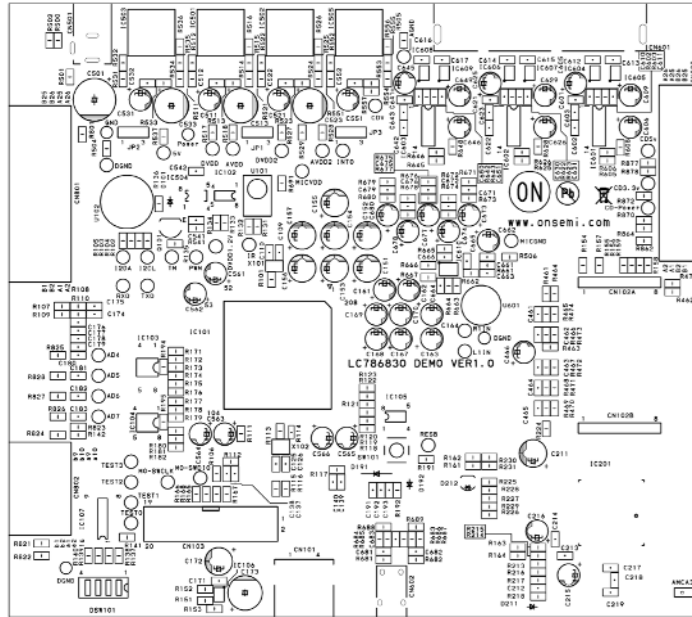


Figure 10. Layout of the Main Board of LC786830 Demo Board Kit (Top View)

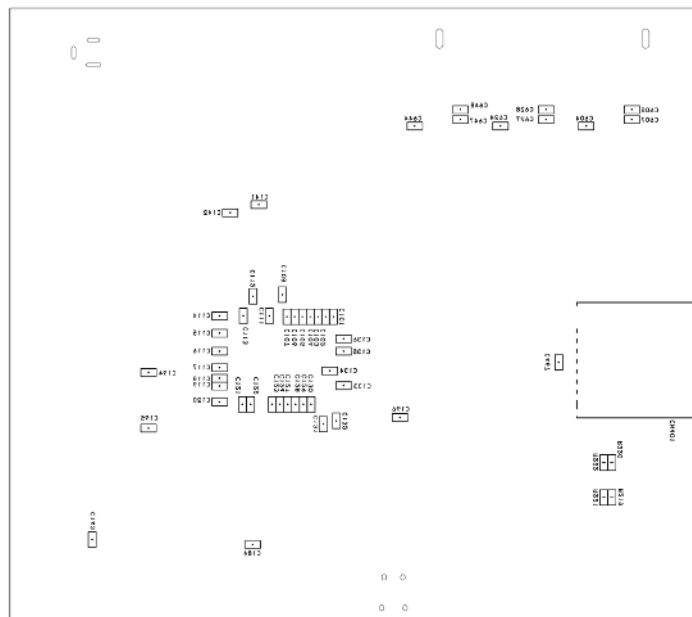


Figure 11. Layout of the Main Board of LC786830 Demo Board Kit (Bottom View)

SCHEMATICS AND BILL OF MATERIALS

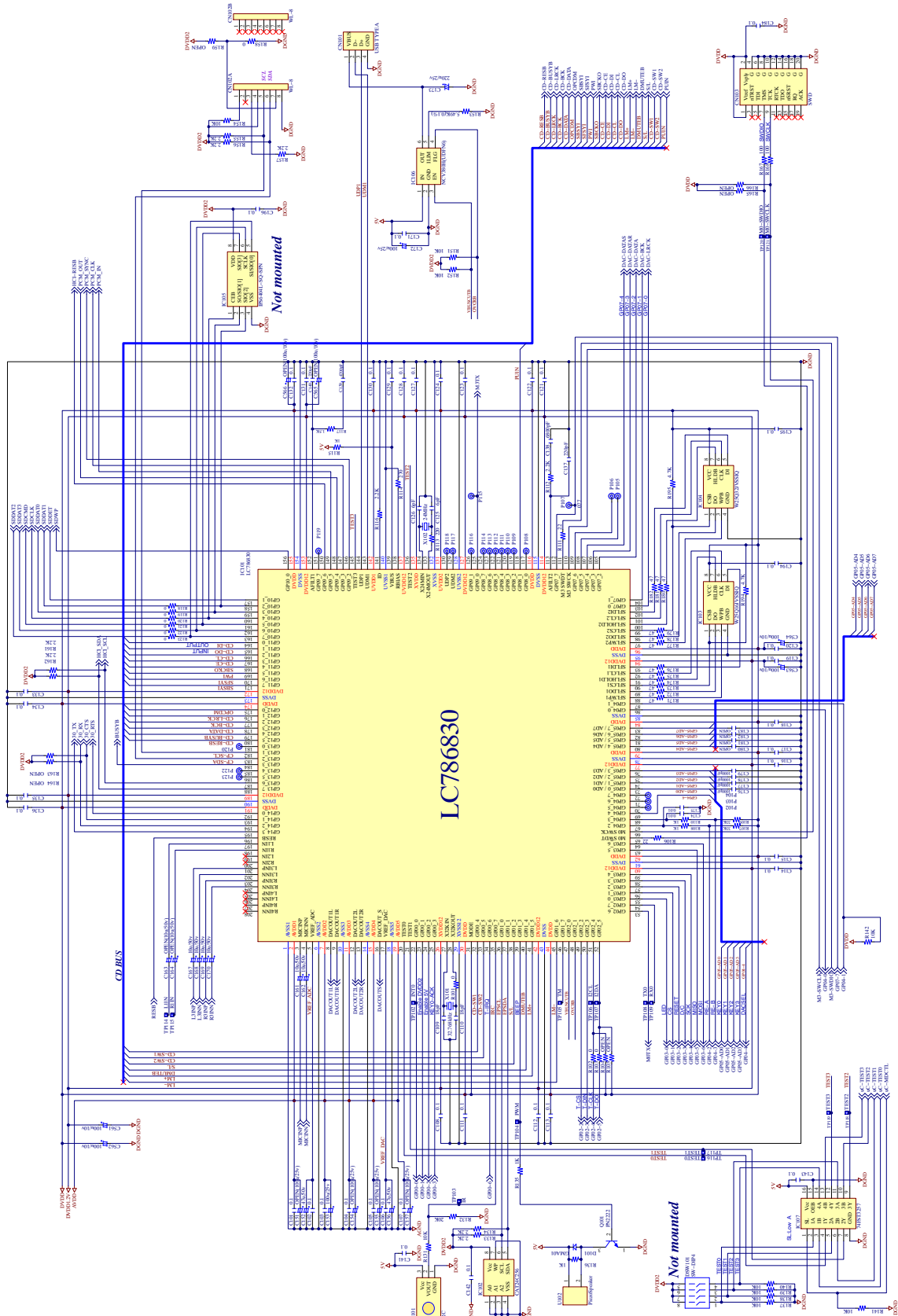


Figure 12. LC786830 DEMO (Main Board)

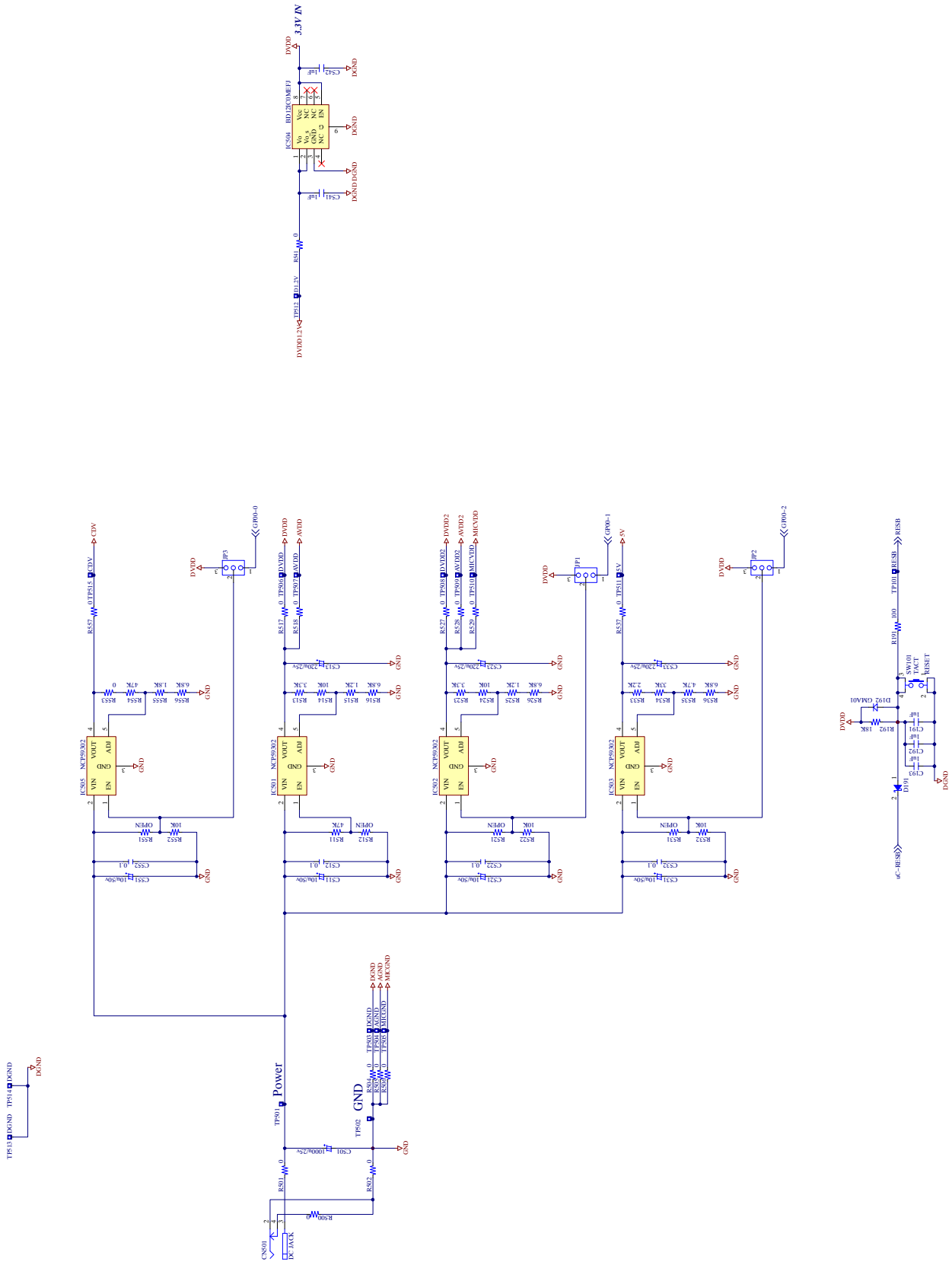


Figure 13. LC786830 DEMO (Main Board) – POWER & RESET

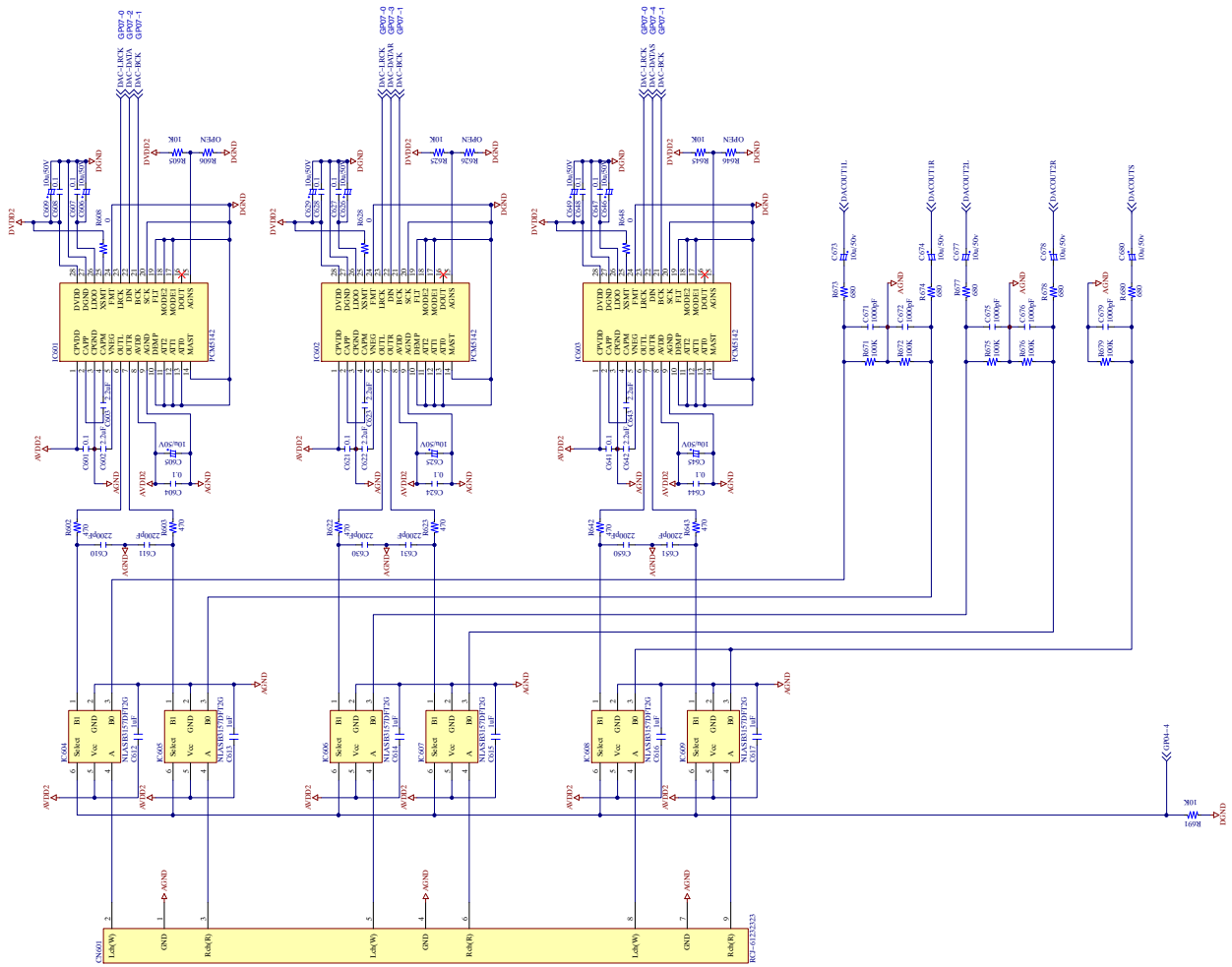


Figure 14. LC786830 DEMO (Main Board) – AUDIO IN/OUT

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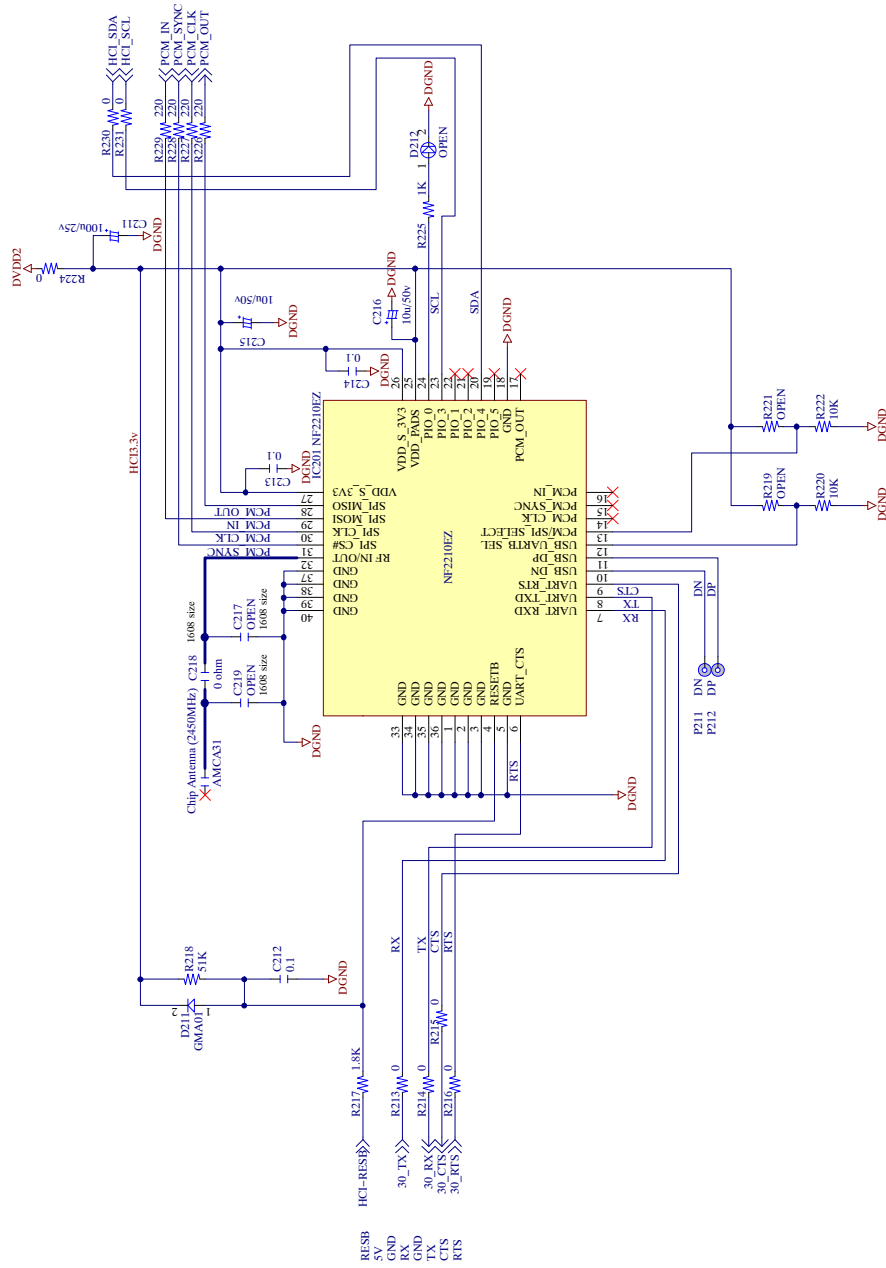


Figure 15. LC786830 DEMO (Main Board) – NF2210EZ BT RF Module

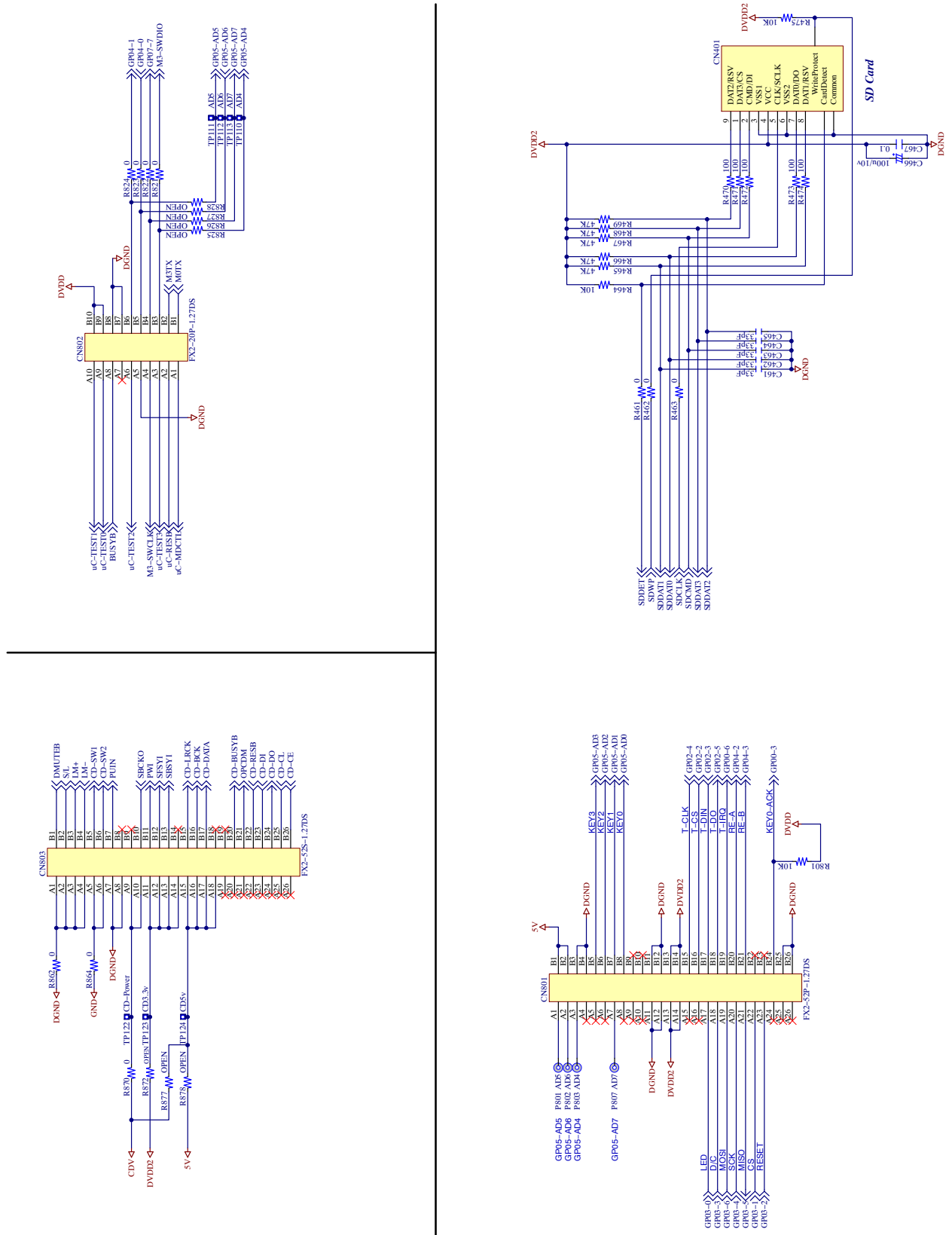


Figure 16. LC786830 DEMO (Main Board) – I/Fs & SD

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Table 5. BILL OF MATERIALS FOR THE MAIN BOARD OF LC786830 DEMO BOARD KIT

Designator	Value	MFR	MFG P/N	Description
IC101		ON Semiconductor	LC786830W	
IC102		ON Semiconductor	CAT24C256WI-GT3	
IC103		Winbond	W25Q16JVSSIQ	For your application software.
IC104		Winbond	W25Q32JVSSIQ	Don't overwrite.
IC105		IPUS	IPS6404L-SQ-SPN	Not mounted, PSRAM
IC106		ON Semiconductor	NCP380HSNAJAAT1G	
IC107		ON Semiconductor	74FST3257DR2G	
IC201		nFore	NF2210EZ (2.4 GHz, Stamp-40)	Bluetooth module on Board
IC501, IC502, IC503, IC505		ON Semiconductor	NCP59302DSADJR4G	
IC504		Rohm	BD12IC0MEFJ-ME2	
IC601, IC602, IC603		TI	PCM5142PWR	
IC604, IC605, IC606, IC607, IC608, IC609		ON Semiconductor	NLASB3157DFT2G	
IC610		TI	OPA344NA/250	
X101		NDK	NX3215SA-32.768 kHz-STD-MUS-2	
X102		NDK	NX3225GA-24.000 MHz-STD-CRG-2	
D191		ON Semiconductor	1N5819	Schottky Diode, 40 V, 1 A
D101, D192, D211		Sanyo	GMA01U-BT	
D212		-	-	Not mounted, LED
R101, R102, R103, R118, R119, R120, R121, R122, R123, R158, R213, R214, R215, R216, R224, R230, R231, R461, R462, R463, R500, R501, R502, R504, R505, R506, R517, R518, R527, R528, R529, R537, R541, R553, R557, R608, R628, R648, R666, R667, R681, R682, R684, R685, R686, R687, R821, R862, R864, R870, C218	0 Ω	Rohm	MCR03EZPJ000	
R106, R111	22 Ω	Rohm	MCR03EZPJ220	
R171, R172, R173, R174, R175, R176, R177, R178, R179, R180, R181, R182	47 Ω	Rohm	MCR03EZPJ470	
R167, R168, R191, R470, R471, R472, R473, R474	100 Ω	Rohm	MCR03EZPJ101	
R113, R226, R227, R228, R229	220 Ω	Rohm	MCR03EZPJ221	
R602, R603, R622, R623, R642, R643	470 Ω	Rohm	MCR03EZPJ471	
R673, R674, R677, R678, R680	680 Ω	Rohm	MCR03EZPJ681	
R108, R110, R115, R135, R136, R225, R662	1.0 kΩ	Rohm	MCR03EZPJ102	
R515, R525	1.2 kΩ	Rohm	MCR03EZPJ122	
R117	1.5 kΩ	Rohm	MCR03EZPJ152	
R217, R555	1.8 kΩ	Rohm	MCR03EZPJ182	
R133, R134, R161, R162, R533, R112, R116, R155, R156, R157, R661	2.2 kΩ	Rohm	MCR03EZPJ222	

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Table 5. BILL OF MATERIALS FOR THE MAIN BOARD OF LC786830 DEMO BOARD KIT (continued)

Designator	Value	MFR	MFG P/N	Description
R513, R523	3.3 kΩ	Rohm	MCR03EZPJ332	
R535, R194, R195	4.7 kΩ	Rohm	MCR03EZPJ472	
R516, R526, R536, R556	6.8 kΩ	Rohm	MCR03EZPJ682	
R131, R137, R138, R139, R140, R141, R142, R151, R152, R154, R220, R222, R464, R475, R514, R522, R524, R532, R552, R605, R625, R645, R663, R664, R691, R801	10 kΩ	Rohm	MCR03EZPJ103	
R192	18 kΩ	Rohm	MCR03EZPJ183	
R132	20 kΩ	Rohm	MCR03EZPJ203	
R107, R109, R534	33 kΩ	Rohm	MCR03EZPJ333	
R465, R466, R467, R468, R469, R511, R554	47 kΩ	Rohm	MCR03EZPJ473	
R218	51 kΩ	Rohm	MCR03EZPJ513	
R665, R671, R672, R675, R676, R679	100 kΩ	Rohm	MCR03EZPJ104	
R114	270 Ω	Susumu	RR0816P-271-D	
R153	5.49 kΩ	Susumu	RG2012P-5491-B-T5	
R104, R105, R159, R163, R164, R165, R166, R219, R221, R512, R521, R531, R551, R606, R626, R646, R683, R688, R689, R825, R826, R827, R828, R872, R877, R878	Not mounted	-		Not mounted, Resistor
C125, C126	6 pF	muRata	GRM1882C1H6R0DZ01	
C109, C110	18 pF	muRata	GRM1882C1H180JA01	
C461, C462, C463, C464, C465	33 pF	muRata	GRM1882C1H330JA01	
C666	100 pF	muRata	GRM1882C1H101JA01	
C137, C140	220 pF	muRata	GRM1882C1H221JA01	
C176, C177, C178, C179, C671, C672, C675, C676, C679	1000 pF	muRata	GRM1882C1H102JA01	
C610, C611, C630, C631, C650, C651	2200 pF	muRata	GRM188B11H222KA01	
C139	4700 pF	muRata	GRM188B11H472KA01	
C138	6800 pF	muRata	GRM188B11H682KA01	
C174, C175	0.01 μF	muRata	GRM188R71C103KA01D	
C101, C102, C103, C104, C105, C106, C107, C108, C111, C112, C113, C114, C115, C116, C117, C118, C119, C120, C121, C122, C123, C124, C127, C128, C129, C130, C131, C132, C133, C134, C135, C136, C141, C142, C143, C171, C184, C194, C195, C196, C212, C213, C214, C467, C512, C522, C532, C552, C601, C604, C607, C608, C621, C624, C627, C628, C641, C644, C647, C648, C661, C665	0.1 μF	muRata	GRM188R71C104KA01D	

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Table 5. BILL OF MATERIALS FOR THE MAIN BOARD OF LC786830 DEMO BOARD KIT (continued)

Designator	Value	MFR	MFG P/N	Description
C191, C192, C193, C664, C541, C542, C612, C613, C614, C615, C616, C617	1 μ F	muRata	GRM188R71C105KA12D	
C602, C603, C622, C623, C642, C643	2.2 μ F	TDK	C1608X7S0J225K080AB	
C663	10 μ F	muRata	GRM188D71A106MA73D	
C180, C181, C182, C183, C217, C219, C681, C682, C683	Not mounted	-	-	Not mounted, Ceramic Capacitor
C605, C606, C609, C625, C626, C629, C645, C646, C649, C161, C162, C167, C168, C169, C170, C215, C216, C511, C521, C531, C551, C673, C674, C677, C678, C680	10 μ F/50 V	Nichicon	UKW1H100MDD1TD	
C152, C156	47 μ F/25 V	Nichicon	UKW1E470MDD1TD	
C153, C172, C211	100 μ F/25 V	Nichicon	UKW1E101MED1TD	
C466, C561, C562, C563, C564, C662	100 μ F/10 V	suncon	10ME100HC	
C173, C513, C523, C533	220 μ F/25 V	Nichicon	UKW1E221MPD1TD	
C501	1000 μ F/25 V	Nichicon	UKW1E102MPD1TD	
C151, C154, C155, C157, C163, C164, C565, C566	Not mounted	-	-	Not mounted, Electrolytic Capacitor
JP1, JP2, JP3		Mac8	WL-8	
DSW101		OTAX	KSD42	Not mounted, DIP-SW
SW101		Alps Alpine	SKHHAJA010	
U101		Sanyo	SPS-440-1	
U102		muRata	PKM13EPYH4000-A0	
U601		DB Products Limited	C9767BB422LFP	
AMCA31		ABRACON	AMCA31-2R450G-S1F-T3	
CN101		Omron	XM7A-0442	
CN102A, CN102B		Mac8	WL-8	
CN103		HIROSE	HIF3FC-20PA-2.54DSA (71)	
CN401		YAMAICHI	FPS009-2406-0	
CN601		CUI Inc.	RCJ-61232323	
CN602		SWITRONIC	ST-005-G	
CN801		HIROSE	FX2-52P-1.27DS (71)	
CN802		HIROSE	FX2-20P-1.27DS (71)	
CN803		HIROSE	FX2-52S-1.27DS (71)	

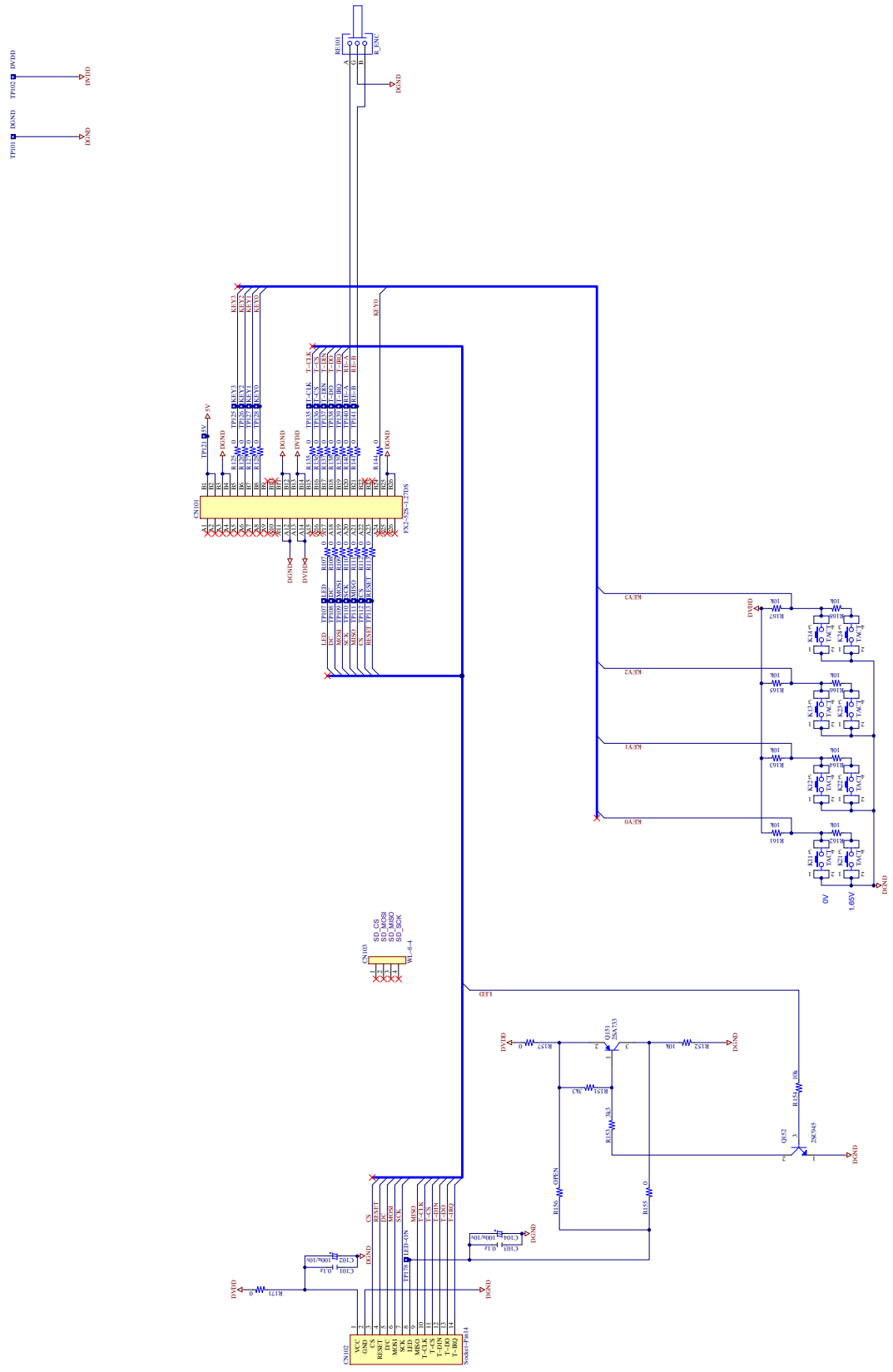


Figure 17. LC786830DEMO – LCD Board

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Table 6. BILL OF MATERIALS FOR THE LCD BOARD OF LC786830 DEMO BOARD KIT

Designator	Value	MFR	MFG P/N	Description
Q151		UNISONIC TECHNOLOGIES	2SA733	
Q152		UNISONIC TECHNOLOGIES	2SC945	
RE101		Alps	EC12E2430803	
LCD Module		HiLetgo®	2.8TFT LCD DISPLAY Touch Panel SPI serial 240*320 ILI9341 5 V/3.3 V	
K11, K12, K13, K14, K21, K22, K23, K24		Cosland	TS-0606	
R107, R108, R109, R110, R111, R112, R113, R125, R126, R127, R128, R135, R136, R137, R138, R139, R140, R141, R144, R155, R157, R171	0 Ω	KOA	RK73Z1JTTD	
R151, R153	3.3 kΩ	KOA	RK73H1JTTD3301F	
R152, R154, R161, R162, R163, R164, R165, R166, R167, R168	10 kΩ	KOA	RK73H1JTTD1002F	
R156	Not mounted	-		Not mounted, Resistor
CN101		HIROSE	FX2-52S-1.27DS (71)	
CN103		aitendo	PH254S-B6-40P	

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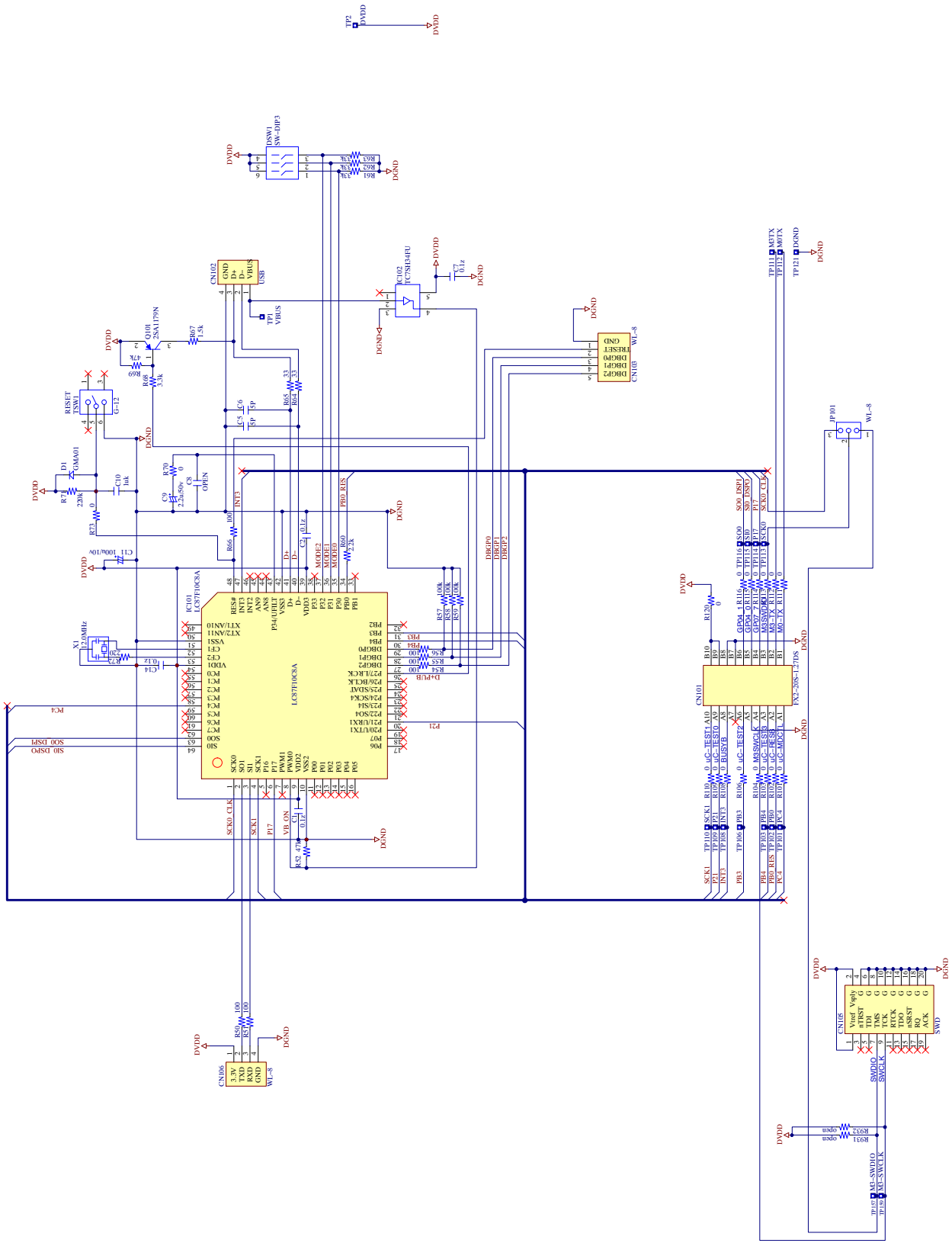


Figure 18. LC786830DEMO – Downloader Board

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Table 7. BILL OF MATERIALS FOR THE DOWNLOADER BOARD OF LC786830 DEMO BOARD KIT

Designator	Value	MFR	MFG P/N	Description
IC101		Sanyo	LC87F10C8A	
IC102		Toshiba	TC7SH34FU	
X1		muRata	CSTLS16M9X53	
Q101		ON Semiconductor	2SA1179N	
D1		Sanyo	GMA01U-BT	
R70, R73, R101, R102, R103, R104, R106, R108, R109, R110, R111, R112, R113, R114, R115, R116, R120	0 Ω	KOA	RK73Z1JTDD	
R64, R65	33 Ω	KOA	RK73H1JTDD330F	
R50, R51, R54, R55, R56, R66	100 Ω	KOA	RK73H1JTDD1000F	
R72	220 Ω	KOA	RK73H1JTDD2200F	
R67	1.5 kΩ	KOA	RK73H1JTDD1501F	
R60	2.2 kΩ	KOA	RK73H1JTDD2201F	
R68	3.3 kΩ	KOA	RK73H1JTDD3301F	
R61, R62, R63	33 kΩ	KOA	RK73H1JTDD3302F	
R52, R69	47 kΩ	KOA	RK73H1JTDD4702F	
R57, R58, R59	100 kΩ	KOA	RK73H1JTDD1003F	
R71	220 kΩ	KOA	RK73H1JTDD2203F	
R931, R932	Not mounted	-		Not mounted, Resistor
C5, C6	5 pF	muRata	GRM1885C1H5R0CZ01D	
C1, C2, C7, C14	0.1 μF	muRata	GRM188F11H104ZA01D	
C10	1 μF	muRata	GRM188F11C105ZA01D	
C9	2.2 μF	muRata	GRM188F11C225ZA01D	
C11	100 μF	muRata	GRM31CR61A107ME05	
C8	Not mounted	-	-	Not mounted, Capacitor
JP101		Mac8	WL-8	
TSW1		NIKKAI	G-12AP	RESET
DSW1		KSD32	OTAX	
CN101		HIROSE	FX2-20S-1.27DS (71)	
CN102		JST	UBB-4R-D14T-4D	
CN103		Mac8	WL-8	
CN105	Not mounted	HIROSE	HIF3FC-20PA-2.54DSA (71)	Not mounted, 20 pin-connector
CN106		Mac8	WL-8	

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