National Semiconductor

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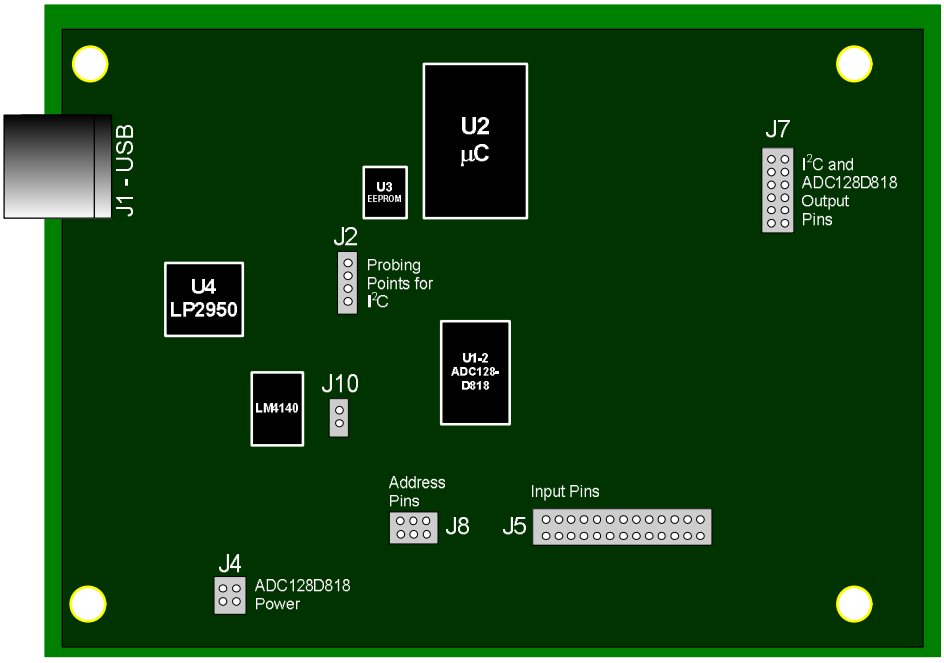
ADC128D818

12-Bit 8-Channel ADC
System Monitor with Temperature Sensor
and Serial 2-Wire Interface



Evaluation Board User's Guide

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1. INTRODUCTION

The ADC128D818/RoHS Evaluation Board Kit (consisting of the ADC128D818 Evaluation Board, the SensorEval Software, and this user's guide) is designed to ease evaluation and design-in of National Semiconductor's ADC128D818 12-bit ADC for System Hardware Monitor with 2-Wire Serial Interface.

Writing and reading to the ADC128D818's Registers are simplified by connecting the ADC128D818 Evaluation Board to a Personal Computer (PC) via a USB cable and running the SensorEval software. The Cypress Microcontroller on the board will generate a 2-wire I^2C serial interface, and the SensorEval software will be used to control, read from, and write to the ADC128D818.

This document will describe the connection between the ADC128D818 Evaluation Board and the SensorEval Software, explain how to use the software, and provide a quick start to evaluating the ADC128D818.

2. QUICK START - This section briefly explains how the user can quickly start the SensorEval software to evaluate the ADC128D818.

2.1. Setting Up the Board – jumper the following pins

1. J4, pin 1 to pin 3 (J4.P1 to J4.P3) - source the ADC128D818 with +3.3V from the USB.
2. J10.P1 to J10.P2 - source the ADC's reference voltage (V_{REF}).
3. J7.P3 to J7.P4 – connect SDA to the microcontroller, U7.
4. J7.P5 to J7.P6 – connect SCL to the microcontroller, U7.
5. J7.P7 to J7.P8 – connect $\overline{INT}$ to the microcontroller, U7.

2.2. Starting Software

1. Open SensorEval Software
2. Set "I2C Addr" = 37 and make sure none of the pins on J8 is jumpered to each other. Refer to section 5.2 to change the desire address.
3. To choose a continuous register update, set the **"Read Cont"** field at the top of the software to 'All Regs' or 'Value Regs' (figure 1). To manually read the registers, set this field to 'OFF' and push the "Read Regs" button for every read.

Figure 1 – "Read Cont" field

4. To see a quick reading, jumper J5.P1 to J5.P2 to set IN0 = 1.9V.
5. Go to Configuration → Adr = 00 → 'START' bit = 1 to start monitoring.
6. Flip 'INT#_Clear' bit to 1 then 0 to start monitoring.
7. Go to Readings → Adr 20 to read IN0's value; it should read 1.9V.
8. For the register map, advanced tests and specific hardware set-up and software installation procedures, refer to the rest of this user's guide and/or to the ADC128D818 datasheet for more information.

3. EQUIPMENT SETUP

3.1. Equipment List - The ADC128D818 setup requires the following equipments:

1. ADC128D818 Evaluation Board
2. Personal Computer with SensorEval Software
3. USB Connector
4. Power Supply (optional)
5. Oscilloscope (optional)
6. Multimeter (optional)

3.2. Equipment Connection Diagram – figure 2 shows the connection diagram between the board and the PC.

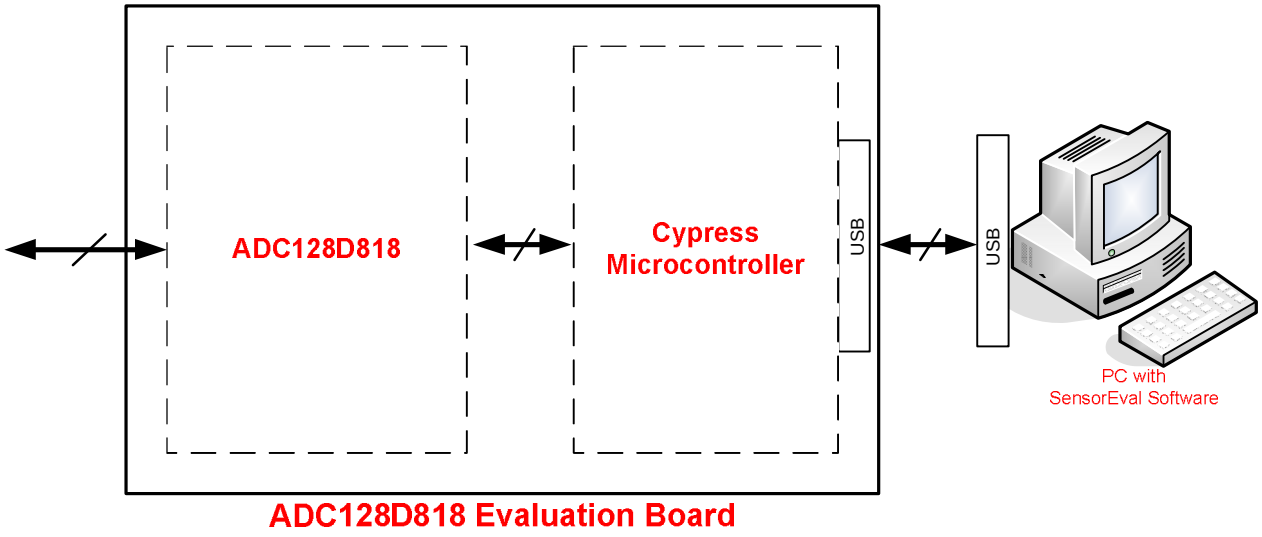

Figure 2 – Equipment Connection Diagram

4. ADC128D818 BOARD SETUP

4.1. Component Placement Diagram

Figure 3 shows a Components Placement Diagram for the ADC128D818 Evaluation Board. Because the board was built to evaluate either the ADC128D818 or the LM96080, some of the components on the board are not needed and are thus not included in the block diagram.

The components that are shown on the diagram are critical parts that customers will use the most. The diagram however, excludes resistors, capacitors, inductors, and test pins. Furthermore, the components are not drawn to size. The purpose of the diagram is to show the location of critical components on the ADC128D818 Evaluation Board.

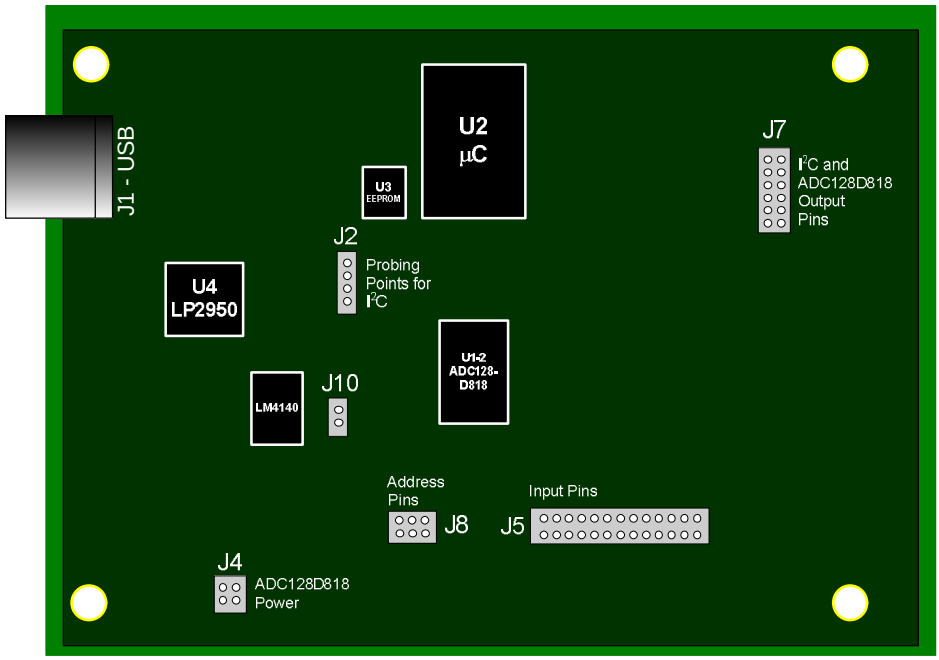

Figure 3 – Components Placement Diagram

4.2. Jumper Options

Follow the jumper options below to connect the board before powering it. To use SensorEval Software to control the ADC128D818, connect the 'Recommended' jumpers. Since this evaluation board can be used to test the ADC128D818 or the LM96080 (not stuffed), or some of these headers are used for measurement purposes only, please do not connect the 'Not Available' or the 'Prohibited' jumpers.

Part#	Description	Pins	Jumper	Un-jumper
J1	USB	N/A	Connect SensorEval Software to ADC128D818 Board. 'Recommended'	NOT connecting the SensorEval Software to ADC128D818 Board.
J2	SMBus Connection	N/A	'Prohibited'	This header is used to probe the Serial Clock and Serial Data Line for the I^2C interface from the Cypress microcontroller.
J4	DUT (ADC128D818) Power	Pin 1 & Pin 3	Connect +3.3V from USB to ADC128D818's V+ pin. 'Recommended'	ADC128D818's V^+ pin has to be sourced externally. In this case, connect a +3.3V power supply to J4.P3 and J4.P4 (GND)
		Pin 2 & Pin 4	*(Not Necessary)*	Use as ground pins for the external power supply.
J5	DUT Signal Side	Pin 1 & Pin 2	Connect IN0 to 2.0V.	Source IN0 externally via a power supply.
		Pin 3 & Pin 4	Connect IN1 to 2.0V.	Source IN1 externally via a power supply.
		Pin 5 & Pin 6	Connect IN2 to 2.0V.	Source IN2 externally via a power supply.
		Pin 7 & Pin 8	Connect IN3 to 2.0V.	Source IN3 externally via a power supply.
		Pin 9 & Pin 10	Connect IN4 to 2.0V.	Source IN4 externally via a power supply.
		Pin 11 & Pin 12	Connect IN5 to 2.0V.	Source IN5 externally via a power supply.
		Pin 13 & Pin 14	Connect IN6 to 2.0V.	Source IN6 externally via a power supply.
		Pin 15 & Pin 16	Connect IN7 to 2.0V.	Source IN7 externally via a power supply.
		Pin 17 & Pin 18	Feature Not Available	'Recommended'
		Pin 19 & Pin 20	Feature Not Available	'Recommended'
		Pin 21 & Pin 22	Feature Not Available	'Recommended'
		Pin 23 & Pin 24	Feature Not Available	'Recommended'
		Pin 25 & Pin 26	Feature Not Available	'Recommended'
J6	LM96080 Address	Pin 1 & Pin 2	Feature Not Available	'Recommended'
		Pin 3 & Pin 4	Feature Not Available	'Recommended'
		Pin 5 & Pin 6	Feature Not Available	'Recommended'
J7	ADC128D818 Output and Serial Interface	Pin 1 & Pin 2	Connect GND to GND.	Leave the GNDs un-connected 'Recommended'
		Pin 3 & Pin 4	Connect the ADC128D818's SDA pin to the Cypress Microcontroller (µC)'s SDA pin. 'Recommended'	NOT using the Cypress µC to interface to the ADC128D818.
		Pin 5 & Pin 6	Connect the ADC128D818's SCL pin to the Cypress Microcontroller (µC)'s SCL pin. 'Recommended'	NOT using the Cypress µC to interface to the ADC128D818.

Part#	Description	Pins	Jumper	Un-jumper
		Pin 7 & Pin 8	Connect the ADC128D818's $\overline{INT}$ pin to the Cypress Microcontroller (µC)'s Interrupt pin. 'Recommended'	NOT connecting the $\overline{INT}$ pin to the microcontroller.
		Pin 9 & Pin 10	Feature Not Available	'Recommended'
		Pin 11 & Pin 12	Feature Not Available	'Recommended'
J8	ADC128D818 Address	Pin 4 & Pin 2	A0 = 0 V (LOW)	A0 = 3.3V (HIGH)
		Pin 4 & Pin 6	A0 = V+ / 2 (MID LEVEL)	A0 = 3.3V (HIGH)
		Pin 3 & Pin 1	A1 = 0 V (LOW)	A1 = 3.3V (HIGH)
		Pin 3 & Pin 5	A1 = V+ / 2 (MID LEVEL)	A1 = 3.3V (HIGH)
J9	Pull-Up and Pull-Down	Pin 1 & Pin 2	Force $\overline{INT}$ to 3.3V via pull-up resistor R30.	Leave $\overline{INT}$ floating.
		Pin 2 & Pin 3	Force $\overline{INT}$ to ground via pull-down resistor R42.	Leave $\overline{INT}$ floating.
J10	LM4040 Output	Pin 1 & Pin 2	Source V_{REF} with regulator LM4040	Source V_{REF} externally using a power supply.
J11	Measurements (Not Stuffed)	ALL	'Not Available'	'Not Available'

Table I – Jumpers and Connectors Functions

4.3. Powering the Board

There are two options to power the board. The first option is to use the +3.3V from the USB to source V^+. To use this option, connect J4.P1 to J4.P3. For an easy and quick start, National recommends using this option.

The second option is to leave J4.P1 and J4.P3 unconnected, and connect a power supply of +3.3V to +5.5V (as stated in the datasheet) to J4.P3 and J4.P4 (GND).

5. SENSOREVAL SOFTWARE

5.1. Installing the Software

1. Unzip the file "SensorEval_1.2.0v.zip"
2. Click on the SensorEval's executable file "SensorEval_1.2.0v_Setup.exe" to install the SensorEval software.
3. When complete, click on the "Launch SensorEval.exe" icon to start the software.
4. If an 'Open Device' window pops up and asks to select a device file, click on the 'ADC128D818'.
5. When a window asking for the platform (figure 4) pops up, check the "ADC128D818 Evaluation Board" and click "Ok"

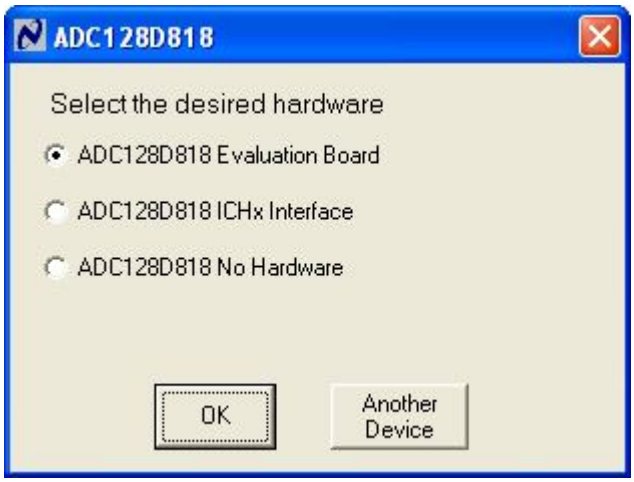

Figure 4 – SensorEval Pop-Up Window

5.2. Setting the Address

The user is allowed to choose any addresses he or she desires. However, whatever addresses the user chooses, the same address must match the SensorEval's I^2C address. The following steps show how to program the address:

1. Select what address to program the EEPROM. The address bits are A1A0, where A1 is the MSB. Table I above shows how to jumper J8 in order to select the desire address. National recommends not jumpering J8 at all.
2. In the SensorEval Software, select the I^2C address that matches the address bit selected in step 1. Use table II to set the correct I^2C address, which is located on the top left hand corner of the SensorEval Software (figure 5). National recommends selecting I^2C address 0x37 if none of the pins on J8 is jumpered.

A1	A0	I^2C Address (hex)
LOW	LOW	1Dh
LOW	MID	1Eh
LOW	HIGH	1Fh
MID	LOW	2Dh
MID	MID	2Eh
MID	HIGH	2Fh
HIGH	LOW	35h
HIGH	MID	36h
HIGH	HIGH	37h

Table II - Address and I2C Address Comparison

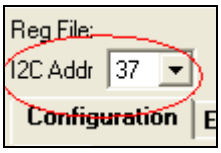

Figure 5 – I^2C Address

5.3. ADC128D818 Registers

The SensorEval software allows writing to and reading from registers. To navigate through the register map, use the tabs above the registers in the SensorEval software. For example, a sample tab can be seen in figure 6. The functionality of all ADC128D818 registers can be found in its datasheet.

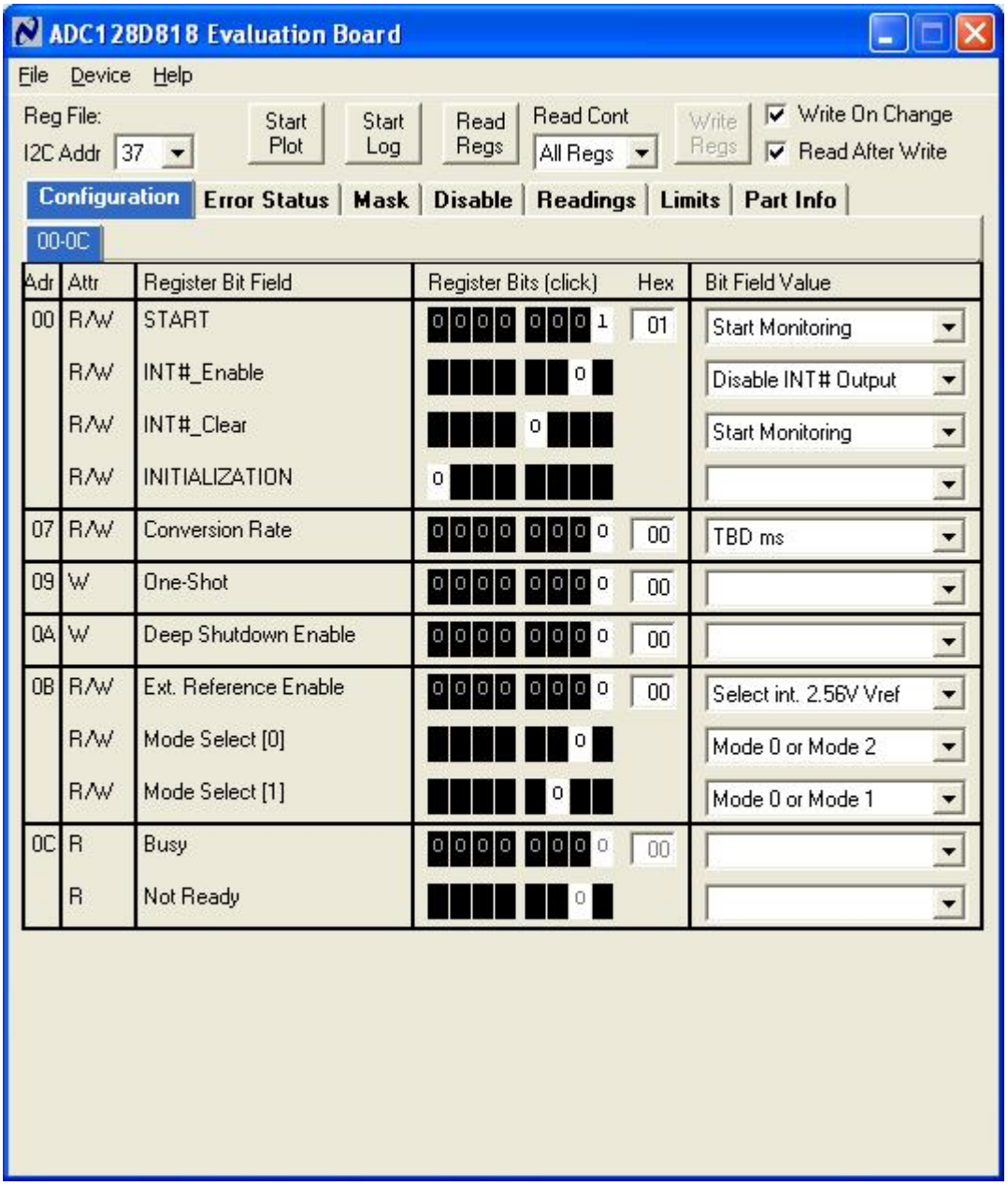

Figure 6 – Example ADC128D818 Register in SensorEval Software

6. APPENDIX

6.1. Board Schematic

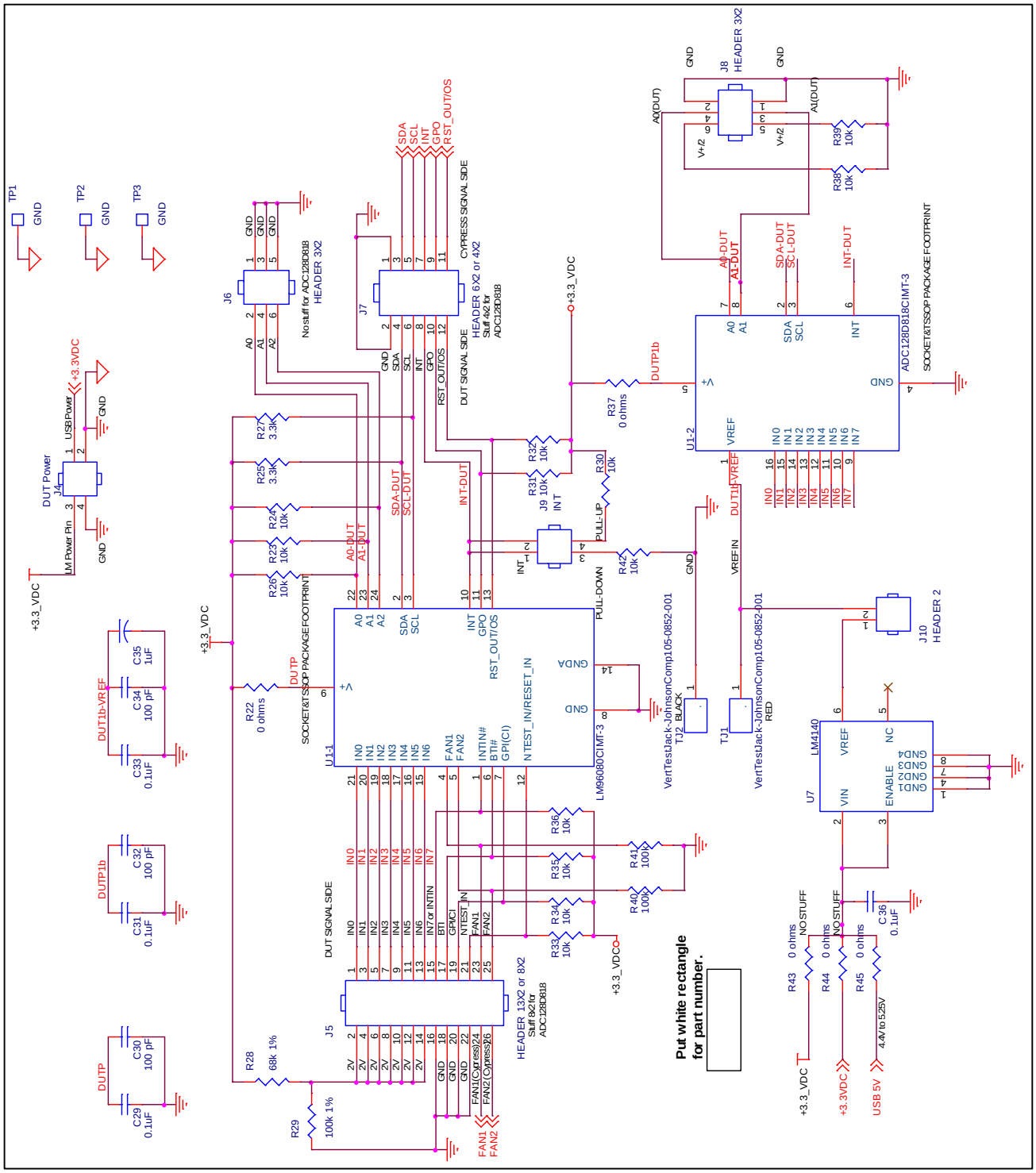

Figure 7 – ADC128D818 Evaluation Board Schematic, Page 1

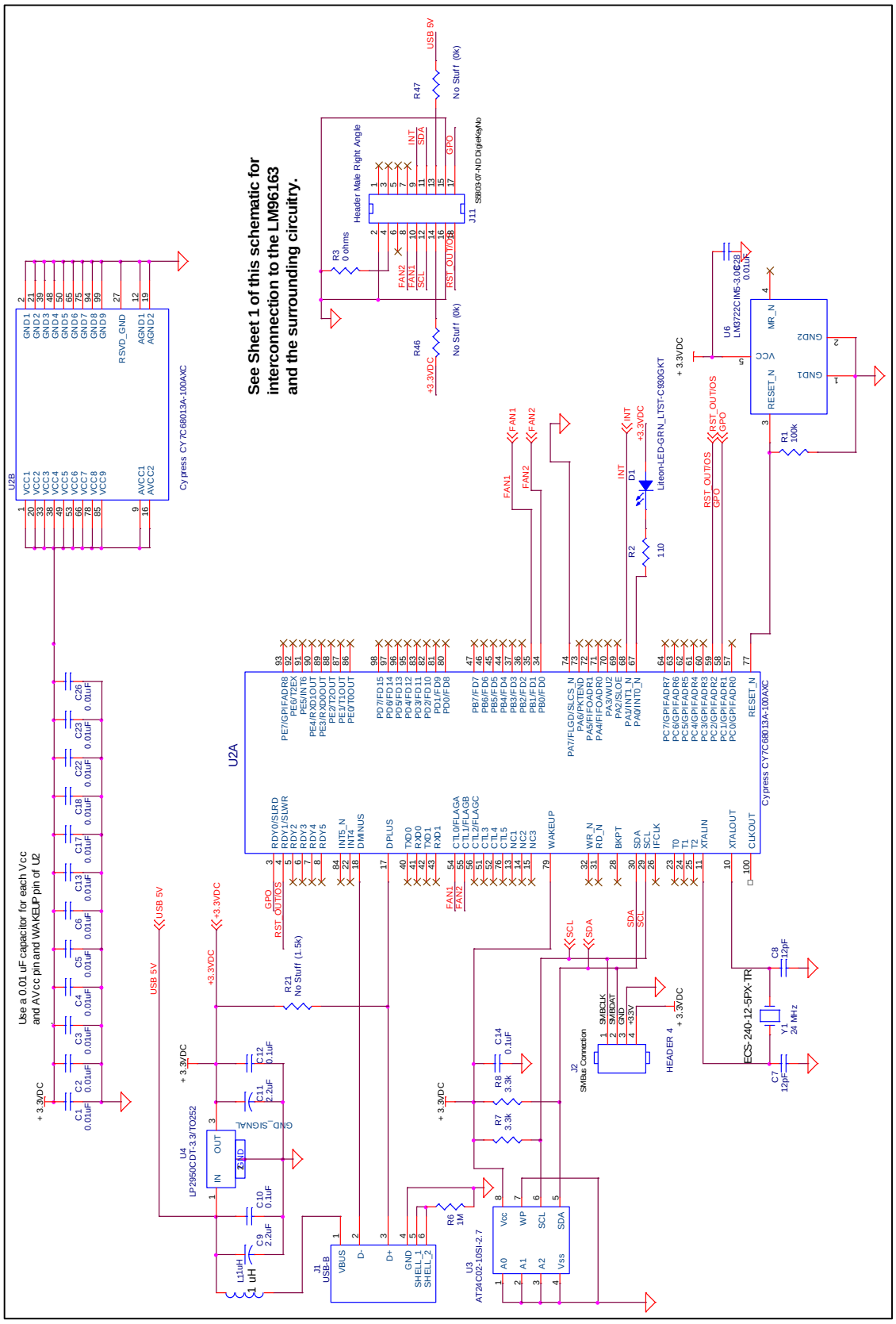

Figure 8 – ADC128D818 Evaluation Board Schematic, Page 2

6.2. Board Layouts

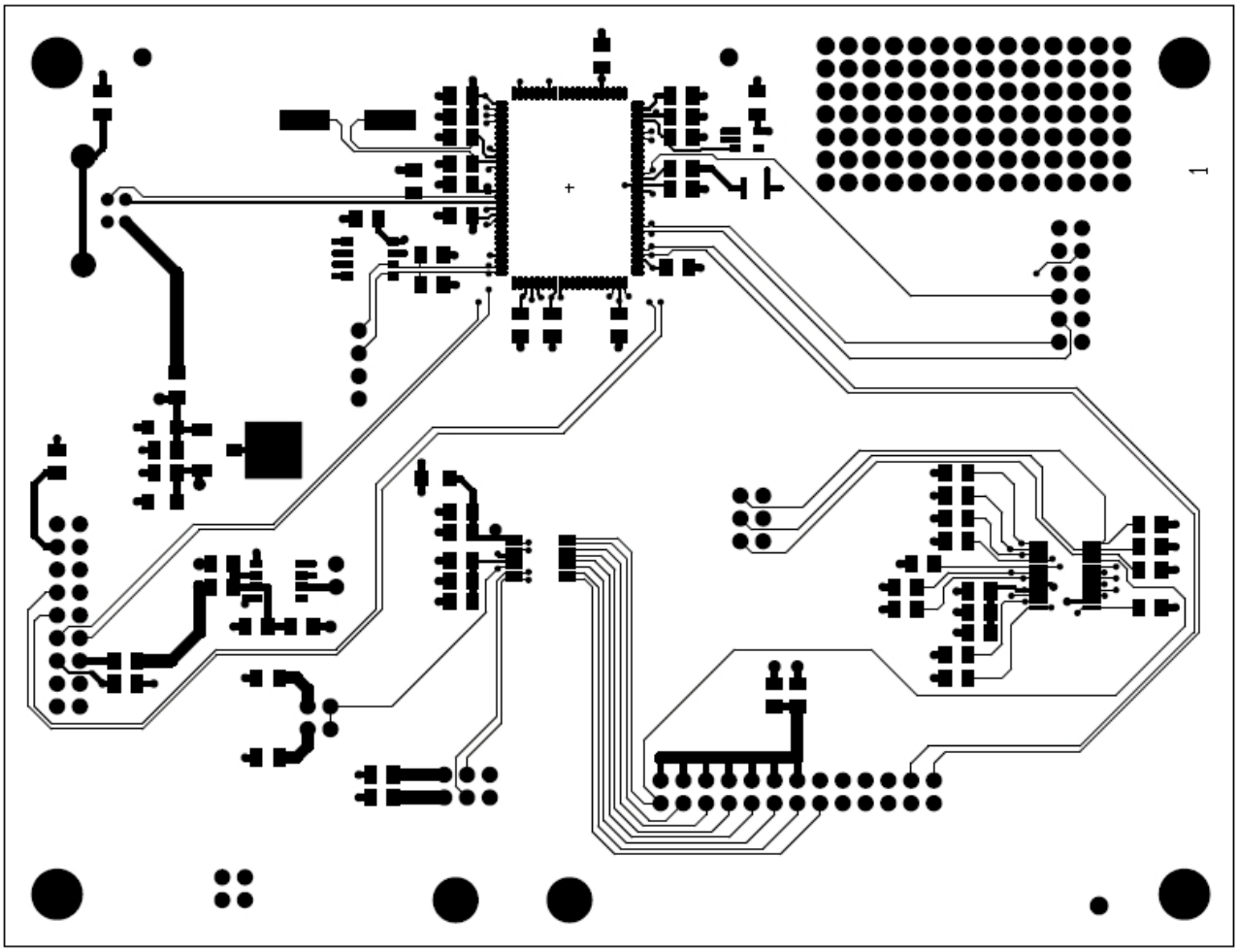

Figure 9 – Top Layer of the ADC128D818 Evaluation Board

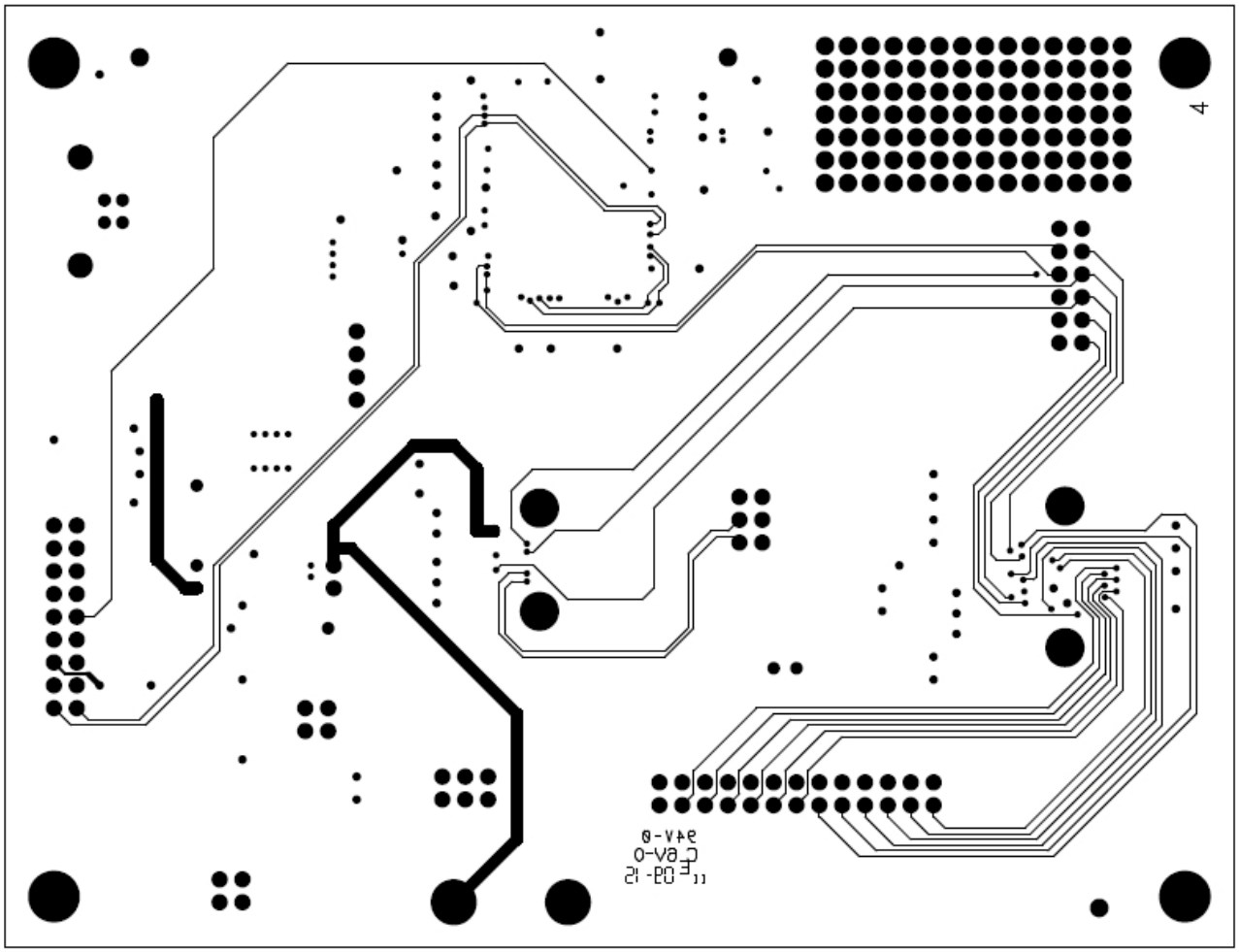

Figure 10 – Bottom Layer of the ADC128D818 Evaluation Board

6.3. Bill of Materials

Item	Qnty	Reference	Part	Manf.	Manf. Order #
1	13	C1,C2,C3,C4,C5,C6,C13,C17,C18,C22,C23,C26,C28	0.01uF	Panasonic	ECP-U1C103MA5
2	2	C7,C8	12pF	Panasonic	ECJ-2VC1H330J
3	2	C9,C11	2.2uF	Panasonic	ECS-T1AY225R
4	7	C10,C12,C14,C29,C31,C3,C36	0.1uF	Panasonic	ECP-U1C104MA5
5	3	C30,C32,C34	100 pF	Panasonic	ECJ-2VC1H101J
6	1	C35	1uF	Panasonic	ECS-T1AY225R
7	1	D1	Liteon-LED-GRN_LTST-C930GKT	Lite-On	LTST-C930GKT
8	1	J1	USB-B	Molex	67068-0000
9	1	J2	HEADER 4		
10	1	J4	DUT Power		
11	1	J5	HEADER 13X2 or 8X2		
12	2	J6,J8	HEADER 3X2		
13	1	J7	HEADER 6X2 or 4X2		
14	1	J9	INT		
15	1	J10	HEADER 2		
16	1	J11	Header Male Right Angle	Molex	71764-0030
17	1	L1	1uH	Panasonic	
18	3	R1,R40,R41	100k		
19	1	R2	110		
20	6	R3,R22,R37,R43,R44,R45	0 ohms		
21	1	R6	1M		
22	4	R7,R8,R25,R27	3.3k		
23	1	R21	No Stuff (1.5k)		
24	13	R23,R24,R26,R30,R31,R32,R33,R34,R35,R36,R38,R39,R42	10k		
25	1	R28	68k 1%		
26	1	R29	100k 1%		
27	2	R46,R47	No Stuff (0k)		
28	1	TJ1	VertTestJack-JohnsonComp105-0852-001	Johnson Components	105-0852-001
29	1	TJ2	VertTestJack-JohnsonComp105-0852-001	Johnson Components	105-0853-001
30	3	TP1,TP2,TP3	GND		
31	1	U2	Cypress CY7C68013A-100AXC	Cypress	CY7C68013A-100AXC
32	1	U3	AT24C02-10SI-2.7	Atmel	AT24C02-10SI-2.7
33	1	U4	LP2950CDT-3.3/TO252	National	LP2950CDT-3.3
34	1	U6	LM3722CIM5-3.08	NSC	LM3722EM5-3.08
35	1	U7	LM4140	National	LM4140ACM-2.5
36	1	U1-1	ADC128D818CIMT-3	National	240228/ADC128D8

Item	Qnty	Reference	Part	Manf.	Manf. Order #
					18
37	1	U1-2	ADC128D818CIMT-3	National	TSSOP16S/ADC128D818
38	1	Y1	24 MHz	ECS	ECS-240-12-5PX-TR

Table III – Bill of Material

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