Unit / Module Name:	Medium Speed Quad DAC Mezzanie
Unit / Module Number:	SMT959
Used On:	All SLB Carrier/Modules
Document Issue:	1.0
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CONFIDENTIAL

Approvals		Date
Managing Director		
Software Manager		
Design Engineer		

Revision History

Issue	Changes Made	Date	Initials
0.1	**Initial Revision**	**31/03/08**	**AJH**
0.2	**Detailed Specs**	**24/04/08**	**AJH**
1.0	**Board Layout Finalised**	**18/06/08**	**AJH**

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1 Introduction

The SMT959 is an ADC - DAC module, SLB expansion card.

The module combines four analogue-to-digital channels capable of converting analogue inputs into 12Bit digital words up to 40 Mega samples per second (Msps) and four digital-to-analogue channels capable of converting 12/14Bit digital inputs words up to 125Msps into its corresponding analogue outputs.

The module uses the Sundance Local Bus (SLB) in order to interface to DSP modules such as the SMT339.

1.1 Related Documents

Sundance Local Bus (SLB) – Sundance Specification.

SMT339 – Advanced Video Processing DSP Module.

ADC12D040 – Dual ADC 12Bit, 40 MSPS

DAC2904 – Dual DAC 14Bit, 125 MSPS

LMH6550 – High Speed Differential Opamp

2 Functional Description

The ADC, DAC Module can support up to four analogue inputs (ADC) and four analogue outputs (DAC). The digital data words are sent and received with logic levels of 2.5V on the SLB connector, see section 4.1, for the interface pin outs.

2.1 Analogue to Digital Converter (ADC)

The ADC is based on National Semiconductors ADC12D040. These devices convert the analogue data steams into digital 12 Bit 2.5V logic data words. This converter uses a differential, pipeline architecture with digital error correction and an on-chip sample-and-hold circuit to minimise power consumption while providing excellent dynamic performance.

Key Specifications:

- 40 Msps Update Rate
- n SNR (fIN = 10 MHz) 68 dB (typ)
- n ENOB (fIN = 10 MHz) 10.9 bits (typ)
- n SFDR (fIN = 10 MHz) 80 dB (typ)
- n Data Latency 6 Clock Cycles

2.1.1 Operation

We use Nationals LMH6550 operation amplifier for the pre stage amplification, this takes in a single ended signal of +/-2V with an impedance of 50Ω and converts it to a differential output of 1.5V and 3.5V respectively. The table below shows the resolved digital values for the input voltage values; where VCM = 2.5V and Vref = 2V.

V_{IN}^+	V_{IN}^-	Binary Output
$V_{CM} - V_{REF}/2$	$V_{CM} + V_{REF}/2$	0000 0000 0000
$V_{CM} - V_{REF/4}$	$V_{CM} + V_{REF}/4$	0100 0000 0000
V_{CM}	V_{CM}	1000 0000 0000
$V_{CM} + V_{REF}/4$	$V_{CM} - V_{REF}/4$	1100 0000 0000
$V_{CM} + V_{REF}/2$	$V_{CM} - V_{REF}/2$	1111 1111 1111

2.2 Digital to Analogue Converter (DAC)

The DAC is based on Texas Instruments DAC2904Y. These devices convert 14Bit digital data steams (12Bit DAC2902Y) into there corresponding analogue output voltages. The DAC2904 offers exceptional dynamic performance, and enables the generation of very-high output frequencies for a wide variety of waveform-synthesis applications.

Key Specifications:

- 125 Msps Update Rate
- High SFDR: 70dB at f_{OUT} = 20MHz
- Low Glitch: 2pVs

2.3 SLB Header

The **S**undance **L**ocal **B**us (*SLB*) allows data from each ADCs and DAC's to be streamed to the main processing module. All signals are at 2.5V.

2.3.1 SLB Power Supplies

When using the SLB interface a separate SLB power header (BKT) is used to supply the Daughterboard.

2.3.2 Typical Operating Consumption

2.4 Noise Levels

2.4.1 ADC

2.4.2 DAC

2.5 Block Diagram

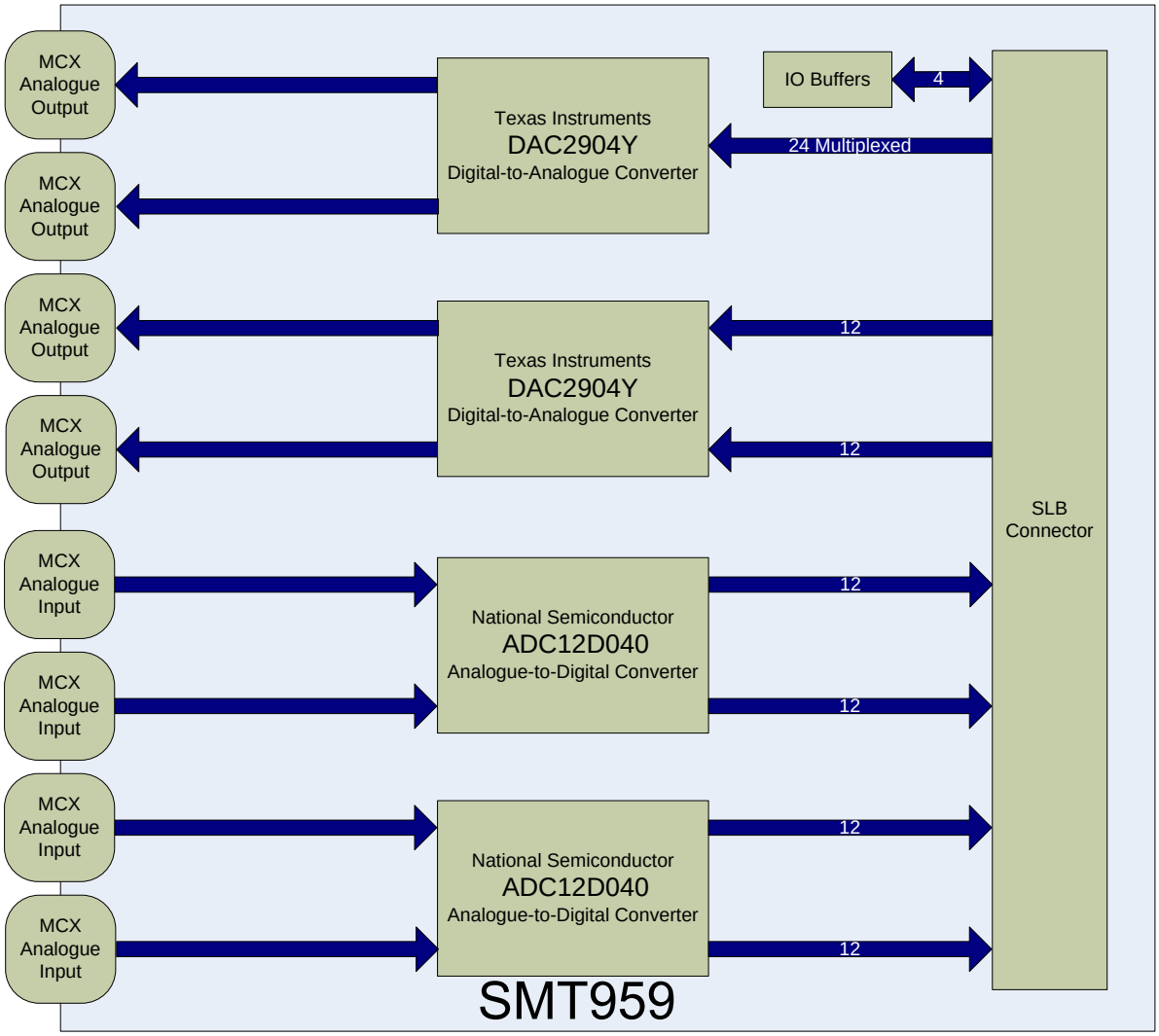
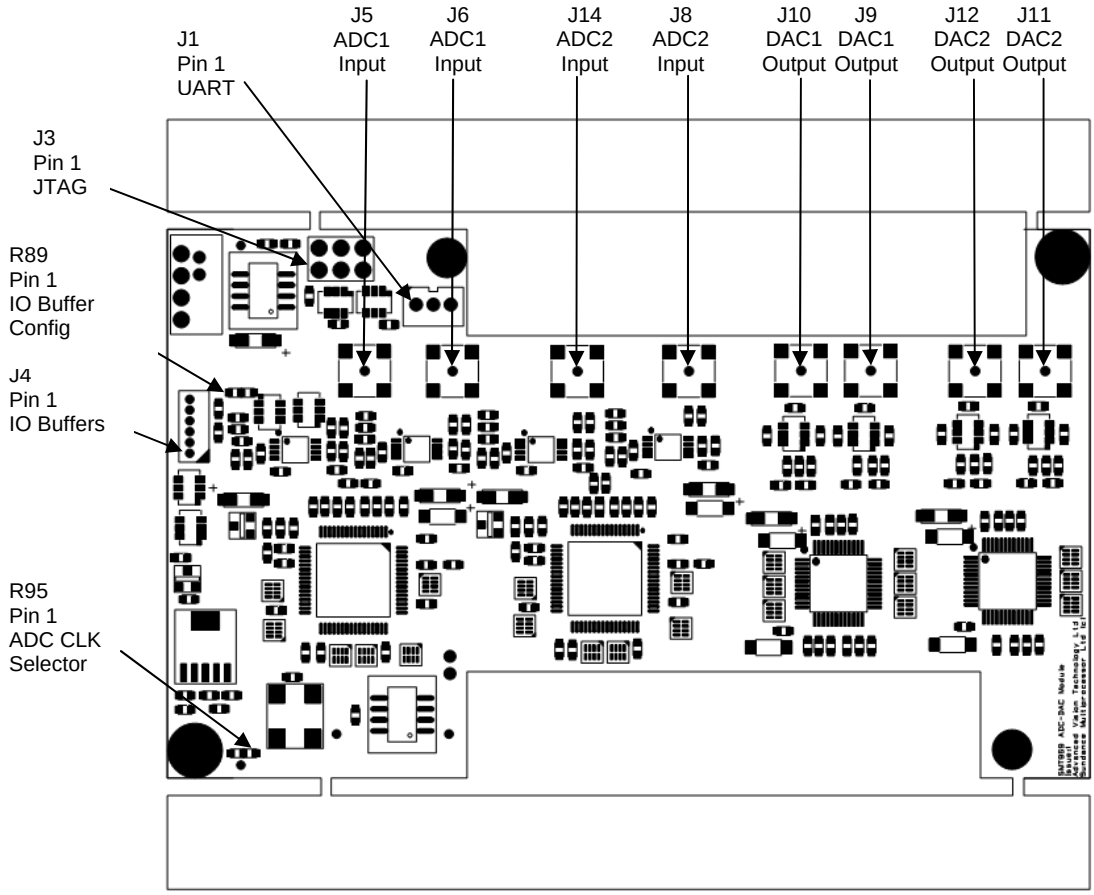


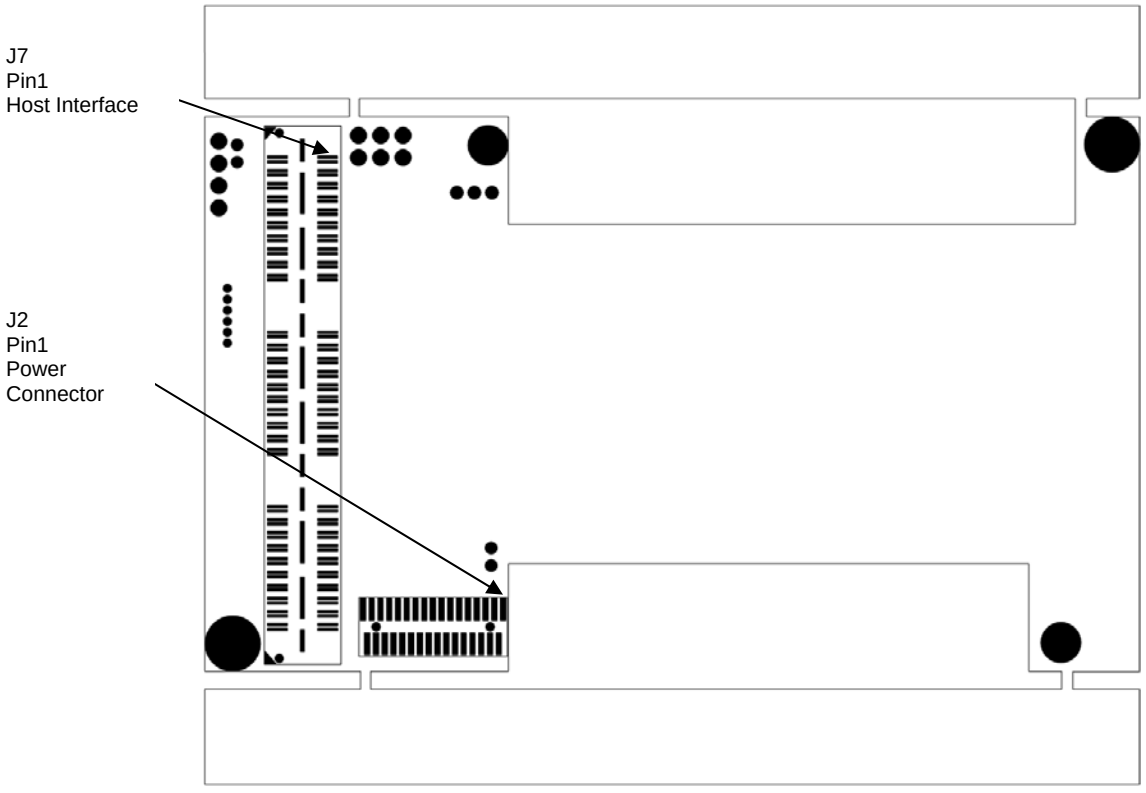
Figure 1 : SMT959 Block Diagram

3 Mechanical Interface

3.1 Top Side



3.2 Bottom Side



4 Electrical Interface

For pinout and information of the SLB signal and power connectors see :

Sundance Local Bus (SLB) (*SLB*) Specifications – Sundance.

4.1 SLB Interface Connector (J7)

SMT959 Connector Part No. Samtec QSH-060-01-F-D-DP-A

Mating Cable Part No. Samtec HFHM2-060-T-5.00-DP

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	DAC2_D13	2	DAC2_D11	3	DAC2_D12	4	DAC2_D10
5	DAC2_D9	6	DAC2_D7	7	DAC2_D8	8	DAC2_D6
9	DAC2_D5	10	DAC2_D3	11	DAC2_D4	12	DAC2_D2
13	DAC2_D1	14	WRT_2B	15	DAC2_D0	16	CLK_2B
17	CLK_2A	18	PD_DAC2	19	WRT_2A	20	DAC1_DB0
21	DAC1_DB1	22	DAC1_DB3	23	DAC1_DB2	24	DAC1_DB4
25	DAC1_DB5	26	DAC1_DB7	27	DAC1_DB6	28	DAC1_DB8
29	DAC1_DB9	30	DAC1_DB11	31	DAC1_DB10	32	DAC1_DB12
33	DAC1_DB12	34	CLK_1B	35	WRT_1B	36	CLK_1A
37	WRT_1A	38	DAC1_DA1	39	DAC1_DA0	40	DAC1_DA2
41	DAC1_DA3	42	DAC1_DA5	45	DAC1_DA4	44	DAC1_DA6
45	DAC1_DA7	46	DAC1_DA9	47	DAC1_DA8	48	DAC1_DA10
49	DAC1_DA11	50	DAC1_DA13	51	DAC1_DA12	52	BUFFER_D
53	ADC_CLK	54	UART_TX	55	BUFFER_C	56	UART_RX
57	ADC2_DB11	58	ADC2_DB9	59	ADC2_D10	60	ADC2_DB8
61	ADC2_D6	62	ADC2_DB4	63	ADC2_DB7	64	ADC2_DB5
65	ADC2_DB3	66	ADC2_DB1	67	ADC2_DB2	68	ADC2_DB0
69	N/C	70	VREF	71	TCK	72	TMS
73	TDI	74	TDO	75	N/C	76	N/C
77	N/C	78	N/C	79	N/C	80	N/C
81	ADC2_DA4	82	ADC2_DA6	83	ADC2_DA5	84	ADC2_DA7
85	ADC2_DA2	86	ADC2_DA0	87	ADC2_DA3	88	ADC2_DA1
89	PD_ADC1	90	PD_ADC2	91	ADC1_DA11	92	ADC1_D7
93	ADC1_DA10	94	ADC1_DA6	95	ADC1_D9	96	ADC1_DA5
97	ADC1_DA8	98	ADC1_DA4	99	ADC1_DB5	100	ADC1_DA3
101	ADC1_DB4	102	ADC1_DA2	103	ADC1_DB7	104	ADC1_DA1
105	ADC1_DB6	106	ADC1_DA0	107	ADC1_DB8	108	ADC1_DB0
109	ADC1_DB9	110	ADC1_DB1	111	ADC1_DB10	112	ADC1_DB2
113	ADC1_DB11	114	ADC1_DB3	115	ADC2_DA9	116	ADC2_DA11
117	ADC2_DA8	118	BUFFER_A	119	ADC2_DA10	120	BUFFER_B

Note:

When using 12Bit DAC (DAC2902) LSB are DA2 & DB2.

Due to pin constraints multiplexing of the digital inputs of DAC2 (D[0:13]) is needed. To do this use pins WRT_2A & WRT_2B. This writes the data in DAC2_D[0:13] into its corresponding data bank.

4.2 Analogue Input Connectors (J5, J6, J14, J8)

SMT959 Part No: TYCO ELECTRONICS 1-1337582-0

Mating Cable Part No: Any MCX plug cable

Pin	Signal	Pin	Signal
1	Signal	2,3,4,5	AGND

+/-2V Peak to Peak Input Signals

4.3 Analogue Output Connectors (J9, J10, J11, J12)

SMT959 Part No: TYCO ELECTRONICS 1-1337582-0

Mating Cable Part No: Any MCX plug cable

Pin	Signal	Pin	Signal
1	Signal	2,3,4,5	AGND

+/-2V Peak to Peak Output Signals

4.4 UART Connector (J1)

SMT959 Part No: JST B-3B-PH-K-S

Mating Part No: JST PHR-3

Pin	Signal	Pin	Signal
1	TX	2	RX
3	GND		

TX & RX are connected to a buffer with LVTLL logic.
RX configured as an input, TX configured as an output

4.5 IO BUFFERS Connector (J4)

SMT959 Part No: Molex 53047-0610

Mating Part No: Molex 510210600

Pin	Signal	Pin	Signal
1	GND	2	BUFFER_B (TLL)
3	BUFFER_A (TLL)	4	BUFFER_D (TTL)
5	BUFFER_C (TTL)	6	5V

BUFFERS_C & D can be configured as either both TTL inputs or outputs.
See section 5.1 for further information

4.6 JTAG Connector (J3)

Pin	Signal	Pin	Signal
1	Vref	2	TCK
3	TMS	4	TDI
5	TDO	6	GND

4.7 SLB Power Connector (J2)

SMT959 Connector Part No:. BKS-133-03-F-V-A

Mating PCB connector: Samtec BKS-133-01-F-V-A

Pin #	Description	Pin #	Description
1	3.3V	2	GND
3	3.3V	4	GND
5	3.3V	6	GND
7	3.3V	8	GND
9	5V	10	GND
11	5V	12	GND
13	5V	14	GND
15	5V	16	GND
17	+12V *	18	GND
19	+12V *	20	GND
21	-12V *	22	GND
23	-12V *	24	GND
25	GND	26	DSP JTAG0*
27	DSP JTAG1*	28	DSP JTAG2*
29	DSP JTAG3 *	30	DSP JTAG4*
31	DSP JTAG5 *	32	DSP JTAG6 *
33	GND		

*Note, not used on SMT959

5 Configurations

5.1 Buffers

Buffer C & D directions can either be both inputs or outputs. To set them as inputs connect pin 1 of R89 to pin 2 or as outputs R89 pin 2 to pin 3 with a zero ohm resistor.

5.2 Clock

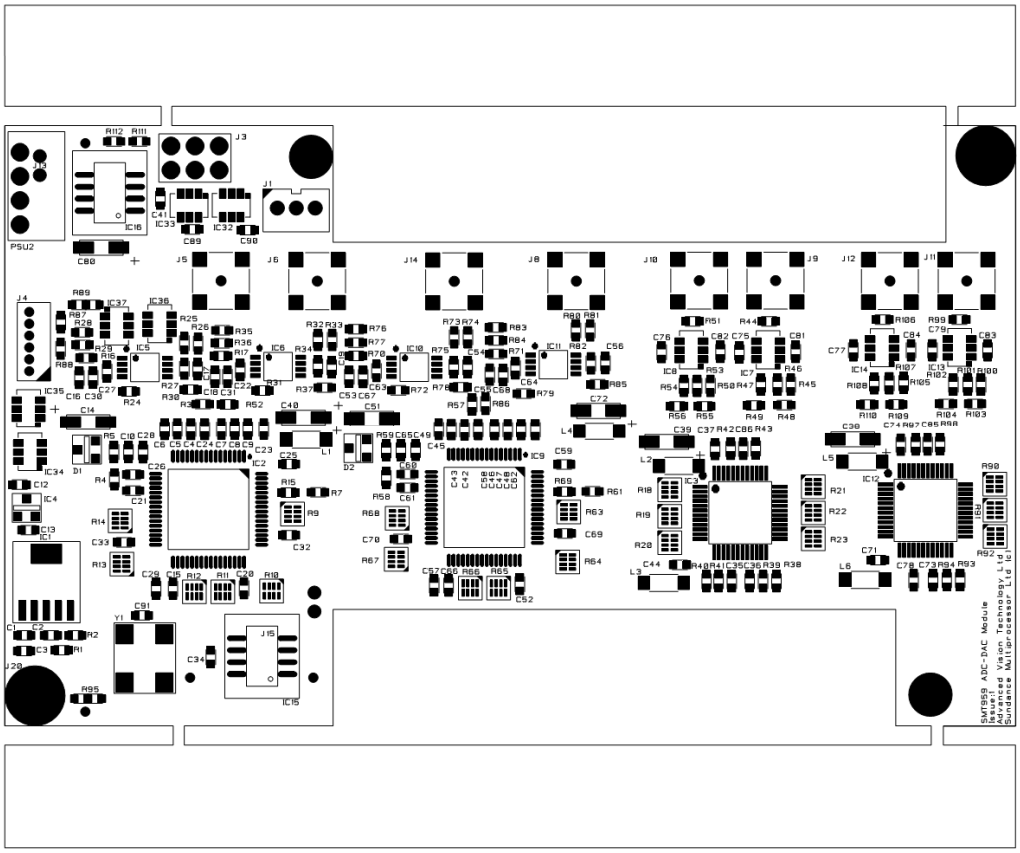
To set the ADC to use the external clock from J7, connect a 51 ohm resistor between pin 3 of R95 to pin 2, if onboard clock is used connect a 51 ohm resistor between pin 1 and pin 2 of R95.

5.3 Manufacturing

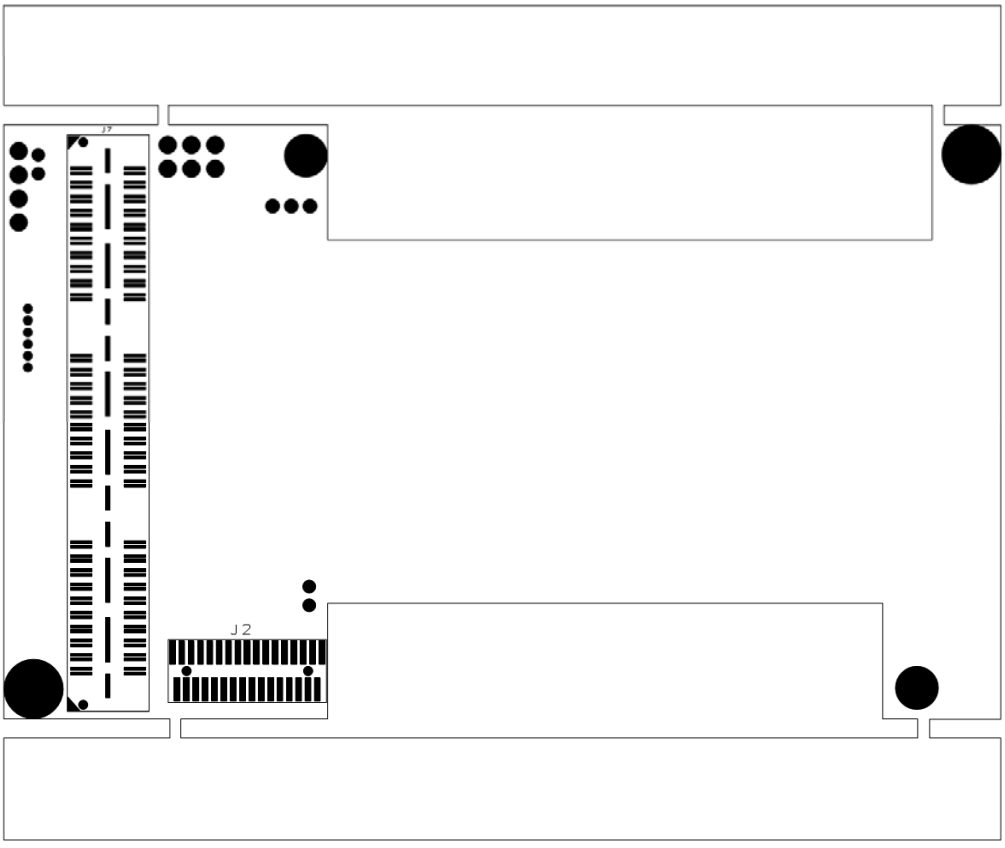
- Fit R3, R57 and NF R52 and R86 for Internal VREF (+2V) for ADC1 & 2. To use an external reference NF R3, R57 and fit R52 and R86.

6 PCB Layout Details

6.1 Top Side



6.2 Bottom Side



7 Verification Procedures

The verification procedure for the module is as follows.

8 Safety

This module presents no hazard to the user.

9 EMC

This module is designed to operate from within an enclosed host system, which is build to provide EMC shielding. Operation within the EU EMC guidelines is not guaranteed unless it is installed within an adequate host system.

This module is protected from damage by fast voltage transients originating from outside the host system which may be introduced through the output cables.

Short circuiting any output to ground does not cause the host PC system to lock up or reboot.