ANALOG DEVICES

MicroConverter™ QuickStart™ Applications Board User Guide

ADuC812 52PQFP APPLICATIONS BOARD USER GUIDE

Version 3.00

30th March 1999

CONTENTS :

1.0 OVERVIEW

The ADuC812 - 52PQFP applications board has the following features :

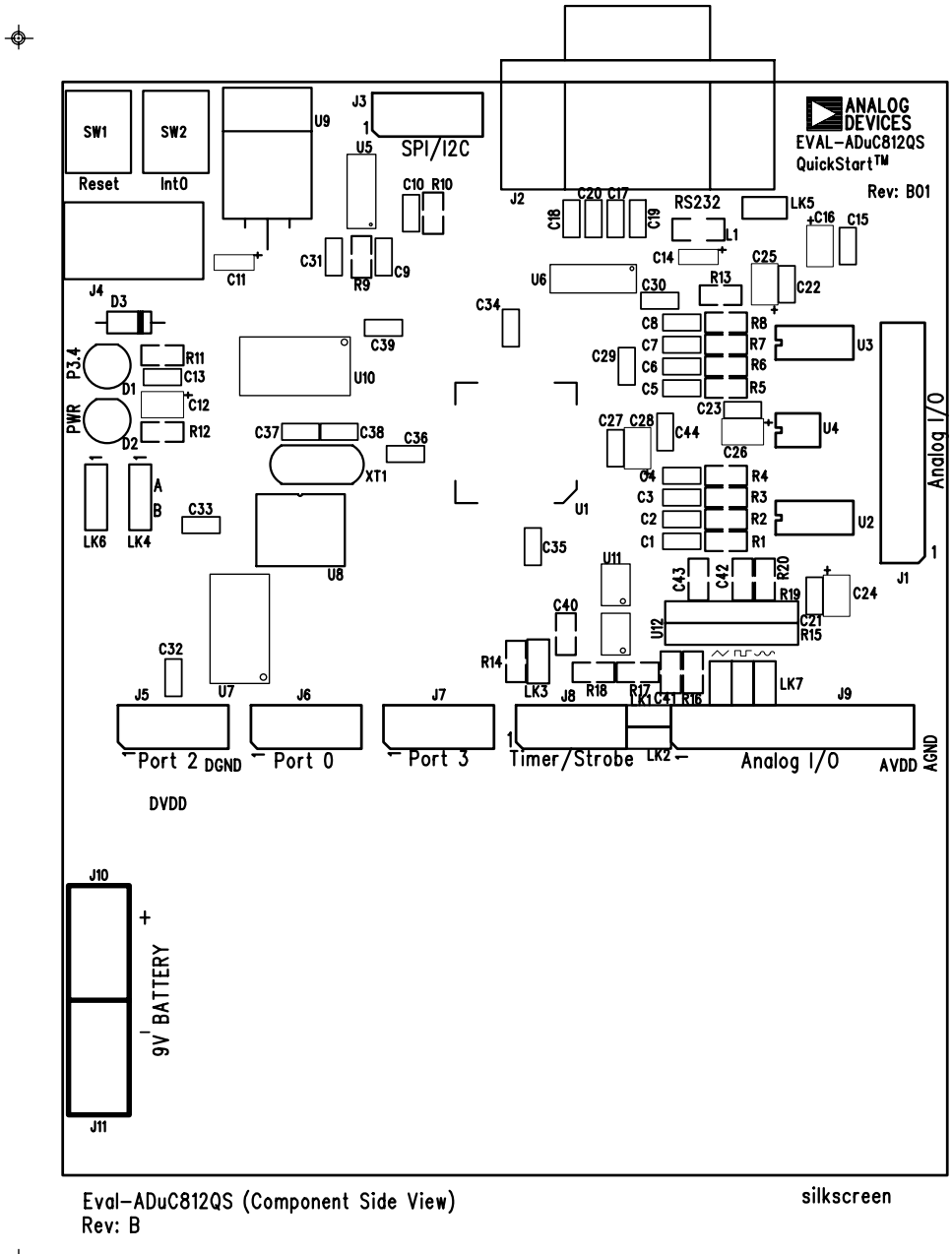
- 2 Layer PCB (4" X 5" Form Factor)
- 9V input power supply, regulated to 5V on board
- RS232 Interface to DUT via 9-way D-type connector
- 32K External RAM mapped to 1 of 128 pages in the external data space
- 8 buffered ADC input channels
- 2 buffered DAC output channels
- On board 11.0592MHz Crystal
- Reset Button
- External Interrupt Button
- Power indicator LED
- General Purpose Port indicator LED (P3.4)
- On board waveform generator (functional Square, Tri and Sine)
- General Purpose Prototype Area
- All device Ports and Strobes are brought out to external connection points

Notes :

All references in this document to physical orientation, placement of connectors and components are made with respect to a component side view of the board with the 9 way D-type appearing at the top of the board and the prototype area in the lower end of the board. This view is shown on figure 1 overleaf.

The board is laid out to minimize coupling between the analog and digital sections of the board. To this end, the ground plane is split with the analog section on the right hand side and a digital plane on the left hand side of the board. The 5V power supply is routed directly to the digital section and is filtered before being routed into the analog section. The board also contains a number of 2 way links that effectively isolate the multi-function digital pins from the analog side of the board .

The ADuC812 can be socketed on the board using a QFP carrier adaptor and corresponding surface mount feet available from Ironwood Electronics (www.ironwoodelectronics.com). The part numbers for these socketing components are CA-QFE52SB-L-Z-T-01 and SF-QFE52SB-L-01 respectively.



Eval-ADuC812QS (Component Side View)
Rev: B

silkscreen

Figure 1 : Component View and Orientation of Applications Board

Power Supply:

9 Volt supply is fed to the board via the 2.1mm input power socket (J4). The input connector is configured as 'CENTER NEGATIVE' i.e. GND on the center pin and +9V on the outer shield. The 9V supply is regulated via a linear voltage regulator (U9), the 5V output being used to drive the digital side of the board directly. The 5V supply is also filtered and then used to supply the analog side of the board. As mentioned earlier the ground planes are split and are joined in a single location towards the bottom right hand corner of the DUT (U1). When 'ON' the Green (for go) Power indicator LED (D2) indicates that a valid 5V is output from the regulator circuit. All components analog supplies are decoupled with 10uF and 0.1uF at all device analog supply pins. Digital supplies are decoupled with 0.1uF only at all device digital supply pins.

Alternatively the user can connect a 9V battery via J10 and J11.

RS232 Interface:

The DUT (U1) TXD and RXD lines are connected via an RS232 transceiver (U6) to the external 9-way D-Type connector (J2). The transceiver generates the required level shifting to allow direct connection to a PC serial port. This interface will be the main channel of interactive comms on the board. A standard serial port cable is included to connect from PC to Apps board.

External Data Memory Interface:

The Apps board incorporates 32K x 8 SRAM (U8). The 24 bit address interface to this memory is facilitated via 2 external latches (74HC573, U7 and U10). U7 is used to latch the low order address on Port 0 before it multiplexes to a data bus. U10 may be used in one of two modes - either the bottom 32K Bytes of the external data memory space is mapped or one of 128 pages of 32K Bytes is mapped (via A16-A23). The mode is selected using the 3-way link header, LK4.

Analog I/O Connections:

All analog I/O channels both Input (ADC) and Output (DAC) are buffered by op-amps. The 8 ADC input channels are buffered by the quad op-amp pair U2 and U3. The 2 DAC outputs are buffered by the dual op-amp U4. The buffer configuration is unity gain with a first order RC (on ADC input channels only).

Crystal Circuit :

The board is fitted with an 11.0592MHz crystal which is loaded with 2 X 33pF surface mount caps (C37 and C38).

Miscellaneous I/O :

RESET Input : The Reset push button switch (SW1) is located at the top left hand corner of the board. This input is buffered via a schmitt triggered input buffer (U5) and is then driven directly to the RESET input on the DUT (U1, Pin 15).

INT0 Input : The INT0 push button switch (SW2) is located at the top left hand corner of the board. This input is buffered via a schmitt triggered input buffer (U5) and is then driven directly to the INT0 input on the DUT (U1, Pin 18).

P3.4 Indicator LED : P3.4 on the DUT (U1, Pin 22) is buffered via a schmitt triggered output buffer (U5) to drive a LED indicator (D1) located towards the upper left hand side of the board.

Waveform generator :

To allow the user multiple possibilities an on-board waveform generator is available. The user can connect either a sine wave, a square wave or a triangular wave to the ADC channel 0 .

Link-Headers:

LK1, LK2 and LK5 :
These 2-way links are used to route multi-function pins on Port 1 from the analog side of the board to the digital side of the board as detailed below. With these links removed the digital function is isolated from the digital side of the board, thus minimizing any feedthrough/coupling onto the analog side of the board.

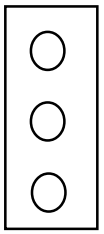
LK1 : Insert this link to route T2 to the digital connector J8 (Timer/Strobes) just above the prototype area.

LK2 : Insert this link to route T2EX to the digital connector J8 (Timer/Strobes) just above the prototype area.

LK5 : Insert this link to route SS to the digital connector J3 (SPI/I2C) just above the prototype area.

LK3 (PSEN Pulldown) :
Insert LK3 to pulldown PSEN and thus enable serial download on power-up or external RESET.

LK4 (External Data memory) :
The 3-way link LK4 is used to select the external data memory map. Either the bottom 32K Bytes of the external data memory space is mapped or one of 128 pages of 32K Bytes is mapped (via A16-A23 and U10).

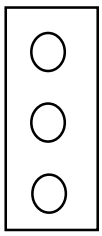


LK4

Link Position A maps the memory into one of 128 pages which each are 32K Bytes. This mode configures the second latch so as to latch the high order address bits (A16-A23) thus allowing the user to write to one of 128 pages.

Link Position B maps the memory into the bottom 32K Bytes of the external data memory space. This mode configures the high order latch(U10) in transparent mode thus allowing a standard 15 bit address (A0-A14) only to the external memory.

LK6 (Program Memory Select) :
The 3-way link LK6 is used to select from what space the DUT (U1) will run its program code by pulling EA (U1, Pin 40) high or low as shown below. LK6 is located below the indicator LEDs on the left hand side of the board.



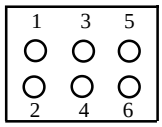
LK6

Link Position A pulls EA high so as to run program from internal Flash Memory.

Link Position B pulls EA low and configures DUT (U1) to run program from external memory. Note: The board is not configured with an external ROM, therefore if this option is selected the user is expected to have interfaced an external ROM via P0 and P2 in the prototype area.

LK7 (waveform generator) :

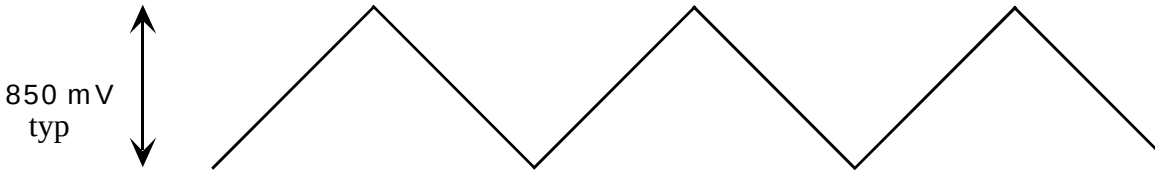
This 3-way link is used to route a specific waveform (sine, square, triangular) onto ADC channel 0 as detailed below. The frequency of the generated waveform is 723Hz in each case.



LK7

Pin1 - Pin2 connection:

By connecting pin 1 and pin 2 via a shorting link, you apply a triangular waveform on ADC channel 0. If you probe pin1 you will see the following waveform:

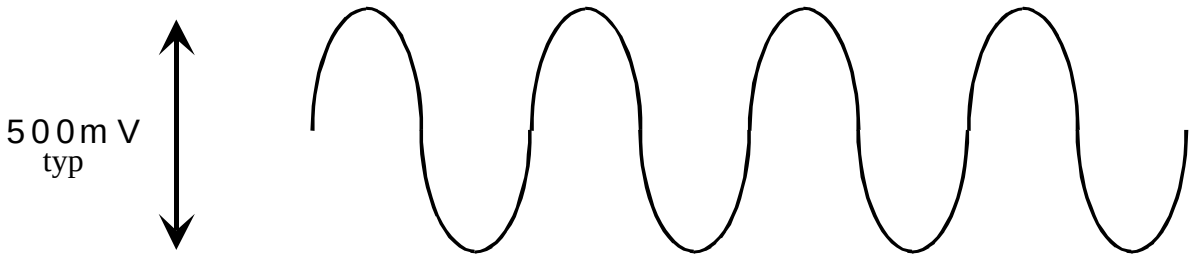


Pin3 -Pin4 connection:

By connecting pin 3 and pin 4 via a shorting link, you apply a square waveform on ADC channel 0. If you probe pin3 you will see the following waveform:

Pin5 -Pin6 connection:

By connecting pin 5 and pin 6 via a shorting link, you apply an approximate sine waveform on ADC channel 0. If you probe pin5 you will see the following waveform:

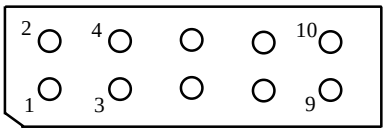


External Connectors :

All Ports Pins, Timer I/O and Device Interface Signals are brought out to external connection points for easy connection via the prototype area or external instruments as detailed below.

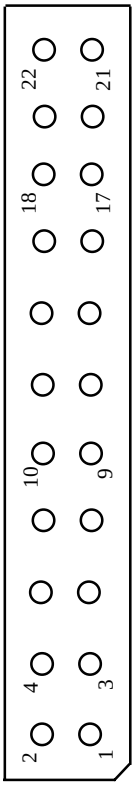
Port 0 (J6), Port 2 (J5), Port 3 (J7) and Timer/Strobe (J8) :

These is space allowed for 10 way connection ports just above the prototyping area which give easy access to the general purpose ports and timer/general control signals from/to the DUT (U1). The exact pinouts of these ports are shown in the enclosed schematic. The orientation and pin numbering of these connectors is shown below.



Analog I/O Connectors (J1 and J9) :

The analog I/O connector J1carries all ADC Input and DAC Output Channels as well as the external Vrefin input. These connection points are duplicated at J9 for convenient connection just above the prototype area. J1 is the main Analog connector, situated on the right hand side of the board. The pinout and orientation of this connector is shown below.



J1

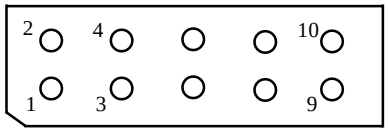
Pin	Function	Pin	Function
1	ADC0	12	AGND
2	AGND	13	ADC6
3	ADC1	14	AGND
4	AGND	15	ADC7
5	ADC2	16	AGND
6	AGND	17	DAC0
7	ADC3	18	AGND
8	AGND	19	DAC1
9	ADC4	20	AGND
10	AGND	21	VREFIN
11	ADC5	22	AGND

Note : Pin 1 is Brown on External Cable

SPI/I2C Connector (J3) :

J3 is situated to the left hand side of the 9-way D-type serial connector and gives access to both the SPI and I2C interfaces. The orientation and pinout of this connector is given below.

J3



Pin	Function
1	SCLOCK
2	DGND
3	SDATA/MOSI
4	DGND
5	MISO
6	DGND
7	SS (via LK5)
8	DGND
9	-
10	DGND

Note : Pin 1 is Brown on External Cable

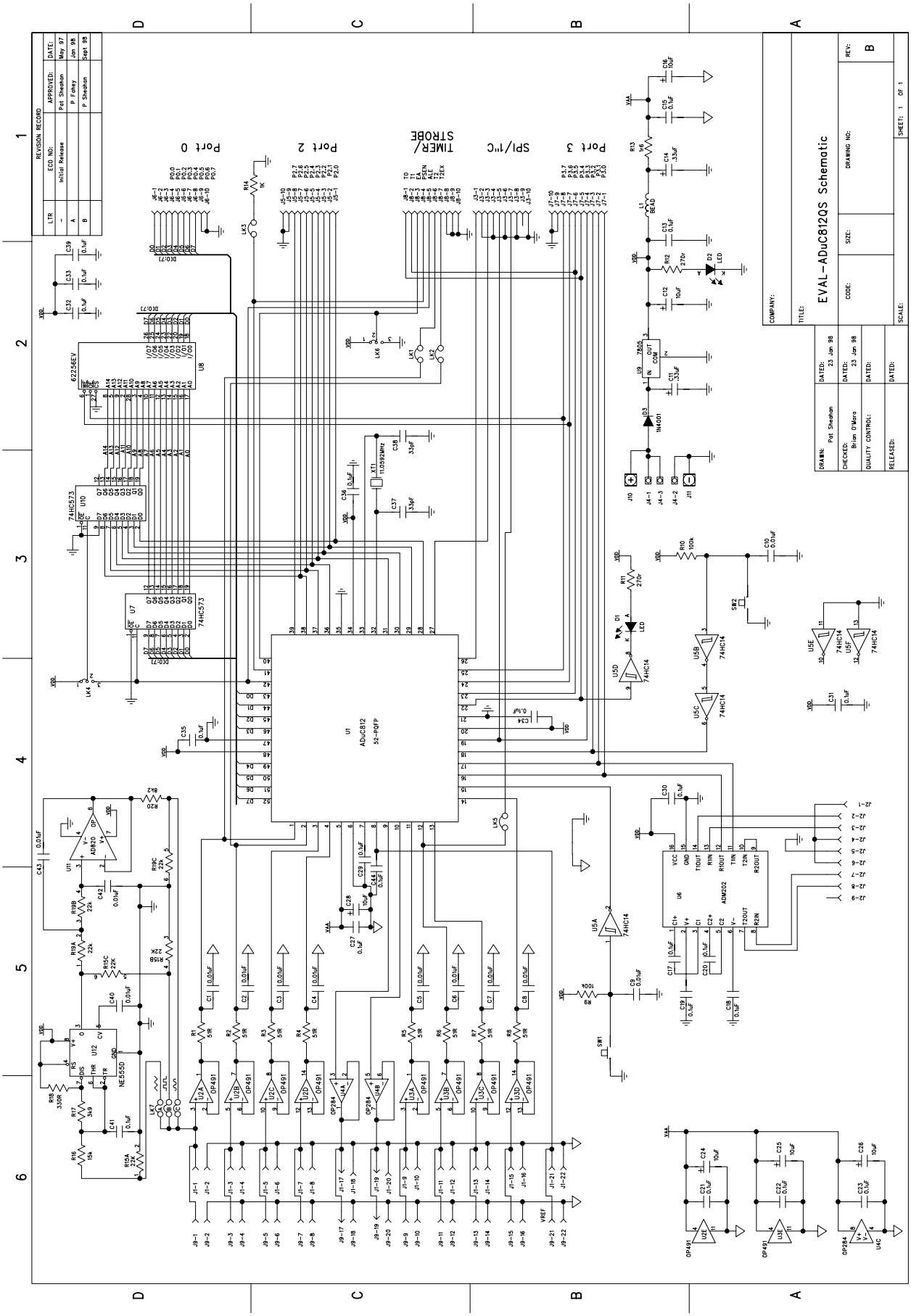
Important Note :

Please be aware that the applications board is designed to give access to the primary functions of the ADuC812, to this end some pins have been implemented with on board buffers and therefore may not be driven with external signals unless the on-board driving source is removed or disconnected. **Table 1** below lists these pin functions and the related action that must be taken before you attempt to drive these signals from an external source.

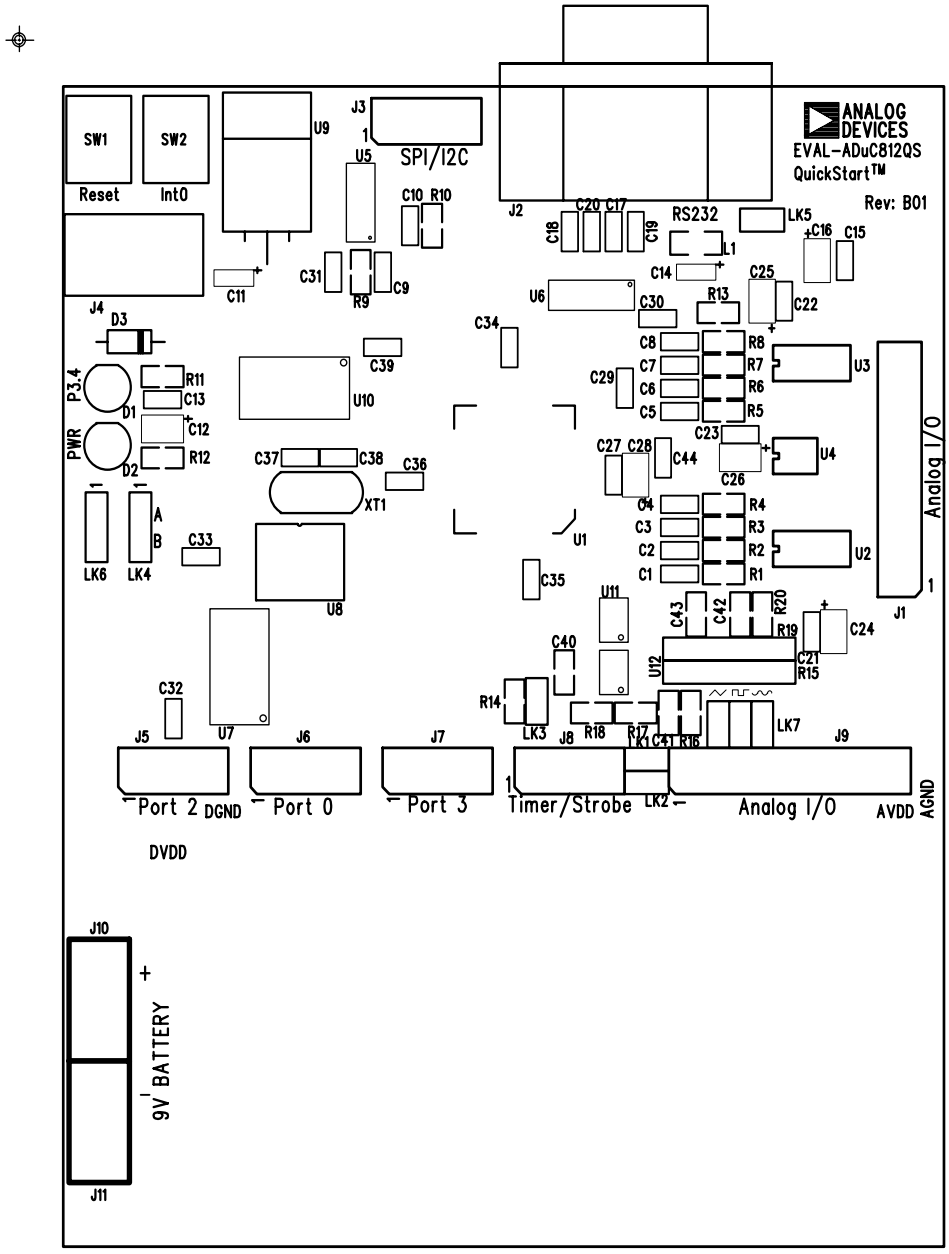
Pin (Function)	Action Required to drive Pin from External Connector
P3.0 (Rxd)	Lift Pin12, U6
P3.2 (INT0)	Lift Pin 6, U5
P1.0 (ADC0, T2)	Remove R1 and insert LK1
P1.1 (ADC1, T2EX)	Remove R2 and insert LK2

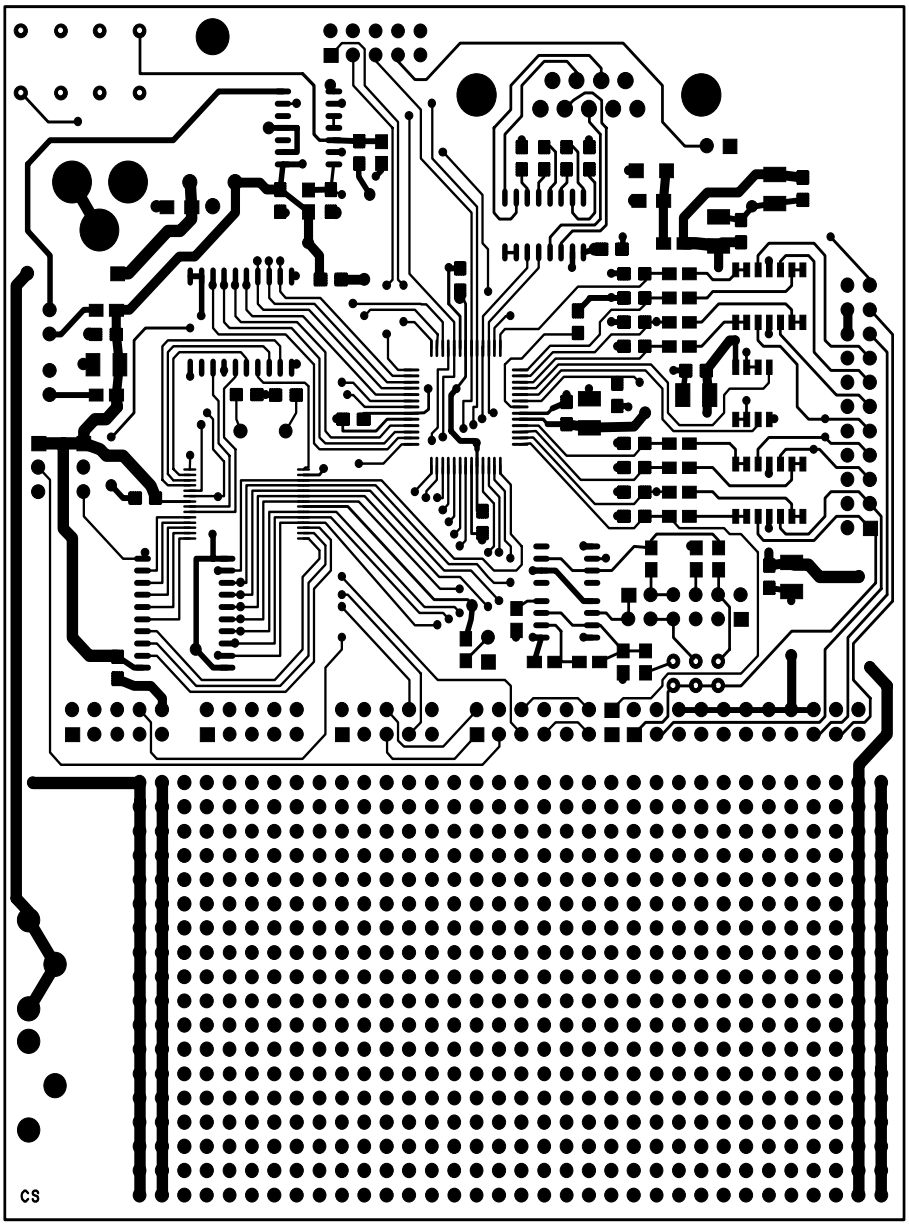
Table 1 : Action required to drive specific pins externally

2.0 SCHEMATIC



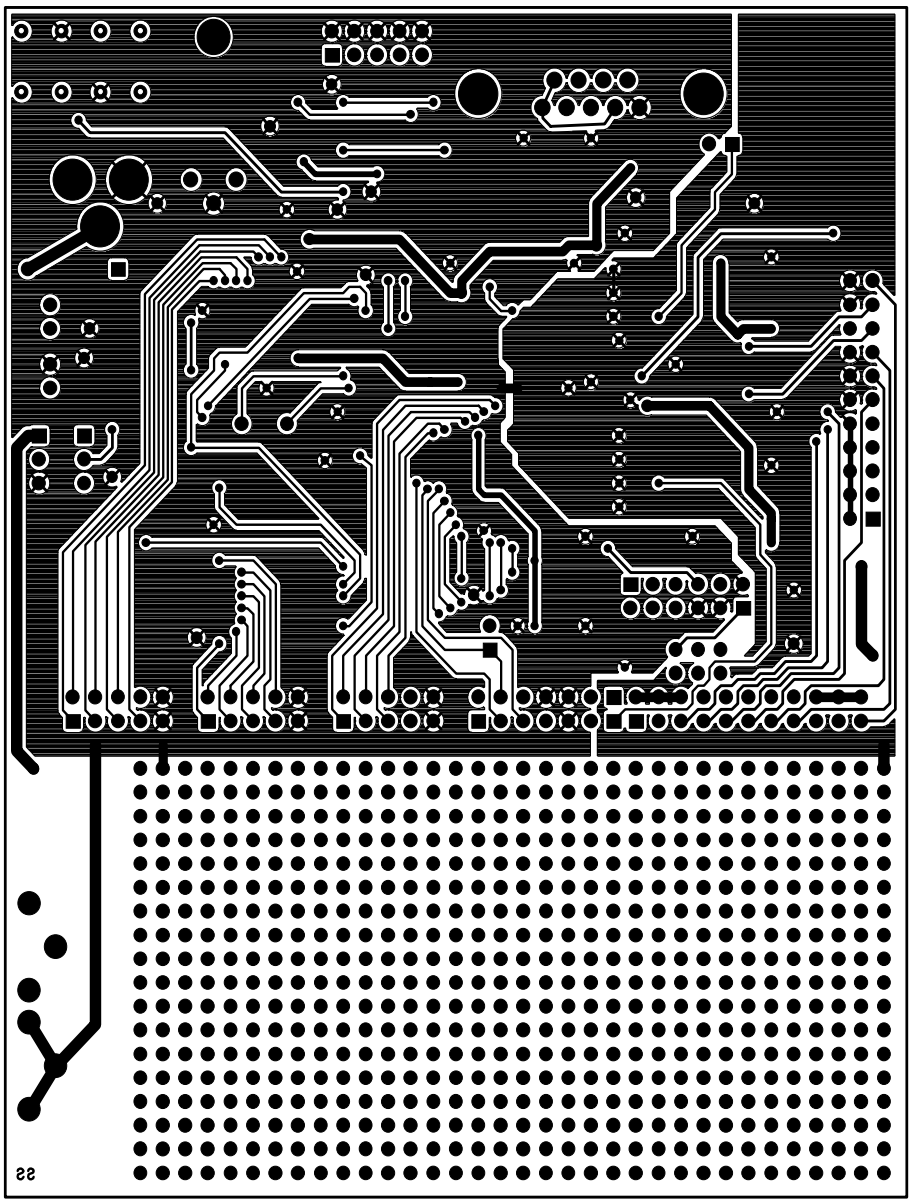
3.0 LAYOUT


SW1
SW2
Reset
Int0
U9
J3
SPI/I2C
U5
J2
ANALOG DEVICES
EVAL-ADuC812QS
QuickStart™
Rev: B01
C10
R10
C20
C17
C18
C19
RS232
LK5
L1
C16
C15
C14
C25
C22
C11
C31
R9
C9
U6
C30
R13
J4
D3
C34
C39
C8
C7
C6
C5
R8
R7
R6
R5
U3
C29
P3.4
R11
C13
U10
D1
C12
PWR
D2
R12
C23
C27
C28
C44
U4
C26
C37
C38
C36
XT1
C4
C3
C2
C1
R4
R3
R2
R1
U2
Analog I/O
J1
LK6
LK4
A
B
C33
U1
C35
U11
C43
C42
R20
R19
C24
U8
C40
U12
C21
R15
C32
R14
LK3
J8
R18
R17
LK1
C41
R16
LK7
J9
U7
J5
J6
J7
Port 2
DGND
Port 0
Port 3
Timer/Strobe
LK2
Analog I/O
AVDD
AGND
DVDD
J10
9V BATTERY
J11
Eval-ADuC812QS (Component Side View)
Rev: B
silkscreen



Eval-ADuC812QS (Component Side View)
Rev: B

Component Side



Eval-ADuC812QS (Component Side View)
Rev: B

Solder Side

4.0 PARTS LIST

	A	B	C	D
1	**ADuC812 - 52EB Development Kit Parts List 1 December 1998 rev 3.0**			
2				
3				
4	**Component**	**Quantity**	**Part**	**Description**
5				
6				
7	EVAL- ADuC812QS QuickStart PCB	1	PCB-1	2 sided surface mount PCB
8				
9				
10				
11				
12	PCB Stand-off	4	Stand-off	Stick on mounting feet
13				
14	U1	1	ADuC81	U1 on PCB (52 PQFP)
15	U2, U3	2	OP491G	Quad Op-Amp, 14 pin SOIC
16	U4	1	OP284ES	Dual Op-Amp, 8 pin SOIC
17	U5	1	MM74HC14M	HEX SCHMITT-TRIGGER INV, 14 pin S
18	U6	1	ADM202EARN	RS232 tranceiver, 16 pin SOIC
19	U7, U10	2	MM74HC573WM	OCTAL D-TYPE TRANSPARENT LATCH, 20
20	U8	1	UM62256EV	32K X 8 CMOS SRAM, 28 pin TSOF
21	U9	1	MC7805CT	Fixed 5V Linear Voltage Regulator, 3pin T
22	U11	1	AD820AR	Single Op-Amp, 8 pin SOIC
23	U12	1	NE555D	Timer, 8 pin SOIC
24				
25	SW1, SW2	2	Push button Switch	PCB mounted push button switch, SPN
26				
27	D1	1	Red Led	1.8mm miniture red le
28	D2	1	Green Le	1.8mm miniture green led
29	D3	1	1N400	Diode
30				
31	C1 -> C10, C40, C42, C4	13	0.01uF SM Cap	Surface Mount Ceramic Cap, 0805 Ca
32	C11, C14	2	0.33uF SM Cap	Surface Mount Tantalum Cap, Taj-A Ca
33	C12, C16, C24 -> C26, C28	6	10uF SM Cap	Surface Mount Tantalum Cap, Taj-B Ca
34	C13, C15, C17 -> C23, C27, C29 -> 36, C39, C41, C44	21	0.1uF	Surface Mount Ceramic Cap, 0805 Ca
35	C37, C38	2	47pF	Surface Mount Ceramic Cap, 0805 Ca
36				
37	R1 -> R8	8	51R	Surface Mount Resistor, 0805 Case
38	R9, R10	2	100K	Surface Mount Resistor, 0805 Case
39	R11, R12	2	270R	Surface Mount Resistor, 0805 Case
40	R13	1	10	Surface Mount Resistor, 0805 Case (10

	A	B	C	D
41	R14	1	1K	Surface Mount Resistor, 080
42	R16	1	15K	Surface Mount Resistor, 080
43	R17	1	3K9	Surface Mount Resistor, 080
44	R18	1	300R	Surface Mount Resistor, 080
45	R20	1	8K2	Surface Mount Resistor, 080
46	R15, R19	2	22K	Thick Film Networks
47				
48	L	1	Ferrite Bead	Surface Mount Inductor, 120
49				
50	LK1 -> LK3, LK5	4	2X1 Pin Header	Single Row Link Heade
51	LK4, LK6	2	3X1 Pin Header	Single Row Link Heade
52	LK7	1	3X2 Pin Header	Double Row Link Heade
53				
54	JI	1	11 X 2 Pin Header	Double Row Link Heade
55	J2	1	9 way RA D-type socket	RA D Type PCB mounted S
56	J3	1	5X2 Pin Header	Double Row Link Heade
57	J4	1	PCB Mounted Socket	PCB Mounted Socket (2.1mm Pir
58	J10	1	Keystone CAT No 594	Battery connector Fema
59	J11	1	Keystone CAT No 593	Battery connector Male
60				
61	XTAL1	1	11.0592MHz Quartz Crystal	Watch Crystal in HC49/4
62				
63		6		Shorting links (black)
64		1		Electrostatic Conductive E
65				
66		1		Serial cable 9 way (M-F) ASS
67				
68		1	Power Supply	3-10) EDV No: 1686933 IMPORTANT N
69		1	Plug	Euro mains plug
70		1	Plug	UK main plug
71		1	Plug	USA/Japan main plug
72		3	Stickers	63.2x72mm White
73		1	Sticker	99.1x34mm White
74				
75		1	Plastic Box	Blue Conductive Box (3 1/2" x 2 9
76		2	Foam	Conductive Foam (90mm x 65m
77		2	ADuC812	MicroConverter (sample
78				
79		1	Cardboard Box	d Box (234mm x 210mm x 66mm), Co
80				