

**ADuC7060 Evaluation Board Reference Guide
MicroConverter® ADuC7060 Development System**
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Figure 1.

100-29992-001

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EVALUATION BOARD OVERVIEW

The ADuC7060 evaluation board has the following features:

- 2-layer PCB (4 in × 5 in form factor).
- 9 V power supply regulated to 3.3 V and 2.5V on board.
- 4-pin UART header to connect to RS-232 interface cable.
- 20-pin standard JTAG connector.
- Demonstration circuit.
- 32.768 kHz watch crystal to drive the PLL clock.
- ADR280 1.2 V external reference chip.
- Reset/download/IRQ0 push buttons.
- Power indicator/general purpose LEDs.
- Access to all ADC inputs and DAC output from external header. All device ports are brought out to external header pins.
- Surface mount and through-hole general-purpose prototype area.

CONSIDERATIONS

- This application note refers to the MicroConverter ADuC7060 evaluation board.
- All references in this application note to the physical orientation of components on the board are made with respect to a component-side view of the board with the prototype area appearing in the bottom of the board.
- 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 left side and a digital plane on the right side of the board. The regulated 2.5 V power supply is routed directly to the digital section and is filtered before being routed into the analog section of the board.

EVALUATION BOARD FEATURES

POWER SUPPLY

The user should connect the 9 V power supply via the 2.1 mm input power socket (J1). The input connector is configured as a center negative, that is, with GND on the center pin and +9 V on the outer shield.

The 9 V supply is regulated via the Linear Voltage Regulator U3. The 2.5V regulator output is used to drive the digital side of the board directly. The 2.5V supply is also filtered and then used to supply the analog side of the board. This regulator supplies the ADuC7060 microcontroller.

The 9V supply is also regulated via the linear voltage Linear Voltage Regulator U2. The 3.3V output of this regulator is used to supply the JTAG programming interface. This device does not supply the ADuC7060 device.

When on, the LED (D4) indicates that a valid 2.5 V supply is driven from the regulator circuit. All active components are decoupled with 0.1 μ F capacitors at device supply pins to ground.

RS-232 INTERFACE

The ADuC7060 (U1) P1.1 and P1.0 lines are connected to the RS232 interface cable via Connector J4. The interface cable generates the required level shifting to allow direct connection to a PC serial port. Ensure that the cable supplied is connected to the board correctly, that is, DVDD is connected to DVDD and DGND is connected to DGND.

EMULATION INTERFACE

Non-intrusive emulation and download are possible on the ADuC7060 via JTAG by connecting a JTAG emulator to the J5 connector.

CRYSTAL CIRCUIT

The board is fitted with a 32.768 kHz crystal, from which the on-chip PLL circuit can generate a 10.24 MHz clock.

EXTERNAL REFERENCE (ADR280)

The external 1.2 V Reference Chip ADR1 has two functions. It is provided on the evaluation board to demonstrate the external reference option of the ADuC7060. It can also be used as an input source to AIN1 if required.

RESET/DOWNLOAD/IRQ0 PUSH BUTTONS

A reset push button is provided to allow the user to reset the part manually. When pressed, the reset pin of the ADuC7060 is pulled to DGND. Because the RST pin on the ADuC7060 is Schmidt-triggered internally, there is no need to use an external Schmidt trigger on this pin.

When pressed the /INT0 push button switch drives P0.4/IRQ0 high. This can be used to initiate an external interrupt 0.

To enter serial download mode, the user must pull the nTRST/BM pin low while reset is toggled. On the evaluation board, serial download mode can be easily initiated by holding down the Serial download push button (S3) while pressing and releasing the reset button (S1) as shown in Figure 2.

Figure 2. Entering Serial Download Mode on the Evaluation Board

POWER INDICATOR/GENERAL PURPOSE LEDs

A power LED (D4) is used to indicate that a sufficient supply is available on the board. A general purpose LED (D6) is directly connected to P1.6 of the ADuC7060. When P1.6 is cleared, the LED is turned on and when P1.6 is set, the LED is turned off.

ANALOG I/O CONNECTIONS

All analog I/O connections are brought out on Header J2.

The Primary ADC inputs, AIN0 and AIN1 are connected to an RTD demonstration circuit. The component, RTD1 is a surface mount RTD in a 1206 package. It is stimulated by the Excitation current source, IEC0 from the ADuC7060 and is measured differentially by the Primary ADC. R1 is the 5K6 reference resistor in the circuit.

The DAC output is buffered externally using the OP293 OP-AMP device, U4.

GENERAL-PURPOSE PROTOTYPE AREA

General-purpose prototype areas are provided at the bottom of the evaluation board for adding external components as required in the user's application. As can be seen from the layout in Figure 3, AV_{DD} , AGND, V_{DD} and DGND tracks are provided in this prototype area.

DIP SWITCH LINK OPTIONS

S1-1 RTD AIN0

Function

Connects the positive side of the RTD to the AIN0 pin (pin 20).

Use

Slide S1-1 to the ON position to connect the positive side of the RTD to the ADuC7060.

Slide S1-1 to the OFF position to disconnect the RTD from AIN0.

S1-2 RTD AIN1

Function

Connects the negative side of the RTD to the AIN1 pin (pin 19).

Use

Slide S1-2 to the ON position to connect the negative side of the RTD to the ADuC7060.

Slide S1-2 to the OFF position to disconnect the RTD from AIN1.

S1-3 RTD REF+IN+

Function

Connects the positive side of the Reference resistor (R1) in the RTD demo circuit to the VREF+ pin.

Use

Slide S1-3 to the On position to connect the positive side of the Reference resistor (R1) to the VREF+ pin.

Slide S1-3 to the Off position to disconnect the reference resistor from the VREF+ pin,

S1-4 RTD REF+IN-

Function

Connects the negative side of the Reference resistor (R1) in the RTD demo circuit to the VREF- pin.

Use

Slide S1-4 to the On position to connect the negative side of the Reference resistor (R1) to the VREF- pin.

Slide S1-4 to the Off position to disconnect the reference resistor from the VREF- pin. In this position, the VREF- pin is connected to AGND.

S1-5 1.2V REF+IN

Function

Connects the ADR280 1.2V precision reference voltage to the VREF+ pin.

Use

Slide S1-5 to the ON position to connect the ADR280 1.2V precision reference voltage to the VREF+ pin.

Slide S1-5 to the off position to disconnect the 1.2V reference device from VREF+.

S1-6 AIN1 BIAS

Function

Connects the ADR280 1.2V precision reference voltage to the AIN1 pin.

Use

Slide S1-6 to the ON position to connect the ADR280 1.2V precision reference voltage to the AIN1 pin.

Slide S1-6 to the OFF position to disconnect the 1.2V reference device from AIN1.

S1-7 EXT_REF

Function

Brings the output of the ADR280 reference device to test pin J2 pin 13. **NEVER turn S1-7 and S1-8 ON at the same time as this will short the external reference output to GND.**

Use

Slide S1-7 to the ON position to connect the ADR280 reference device to test pin J2 pin 13.

Slide S1-7 to the OFF position to disconnect the ADR280 reference device to test pin J2 pin 13.

S1-8 GND AINCOM

Function

Connects AGND J2 pin 13. **NEVER turn S1-7 and S1-8 ON at the same time as this will short the external reference output to GND.**

Use

Slide S1-8 to the ON position to connect J2 pin 13 to GND.

Slide S1-8 to the OFF position to disconnect J2 pin 13 from GND.

EXTERNAL CONNECTORS

ANALOG I/O CONNECTOR J2

The analog I/O Connector J2 provides external connections for all ADC inputs, reference inputs, and DAC outputs. The pinout of the connector is shown in Table 1.

POWER SUPPLY CONNECTOR J1

Connector J1 allows for connection between the evaluation board and the 9 V power supply provided in the ADuC7028 development system.

EMULATION CONNECTOR J5

Connector J5 provides a connection of the evaluation board to the PC via a JTAG emulator.

SERIAL INTERFACE CONNECTOR J4

Connector J4 provides a simple connection of the evaluation board to the PC via a serial port cable provided with the AduC7060 development system.

DIGITAL I/O CONNECTOR J3

The digital I/O connector, J3, provides external connections for all GPIOs. The pinout of the connector is shown in Table 2, with details of the pin functions.

Table 1. Pin Functions for Analog I/O Connector J2

Pin Number	Pin Function
J2-1	AV _{DD}
J2-2	AGND
J2-3	AIN0
J2-4	AIN1
J2-5	AIN2
J2-6	AIN3
J2-7	VREF-
J2-8	VREF+
J2-9	AIN4
J2-10	AIN5
J2-11	AIN6
J2-12	AIN7
J2-13	AINCOM
J2-14	DAC (Unbuffered)
J2-15	DAC (Buffered)
J2-16	AIN8
J2-17	AIN9
J2-18	V ₀ , OP-AMP output
J2-19	V ₋ , OP-AMP Inverting input
J2-20	V ₊ , OP-AMP Non-Inverting input
J2-21	GND_Switch
J2-22	IEXC1 – Current Excitation Source 1

Table 2. Pin Functions for Digital I/O Connector J3

Pin No.	Pin Function
J3-1	P1.6
J3-2	P1.5
J3-3	P1.4
J3-4	P1.3
J3-5	P1.2
J3-6	P0.6
J3-7	P0.5
J3-8	P2.1
J3-9	P2.0
J3-10	P1.1/SOUT

Pin No.	Pin Function
J3-11	P1.0/SIN
J3-12	P0.4/INT0
J3-13	P0.3
J3-14	P0.2
J3-15	P0.1
J3-16	P0.0
J3-17	/RESET
J3-18	DGND
J3-19	DGND
J3-20	DVDD

RTD DEMONSTRATION CIRCUIT

Using the sample code in RTD.c located in the code example folder, the on board RTD is measured by the Primary ADC. The IEXC0 pin provides an excitation current through the RTD. The voltage drop across the RTD is measured differentially by ADC0 through input channels AIN0 and AIN1. The reference resistor, R1, is connected to the Vref+ of the ADuC7060.

For this test, S4 switches 1-4 should all be set to the ON position.

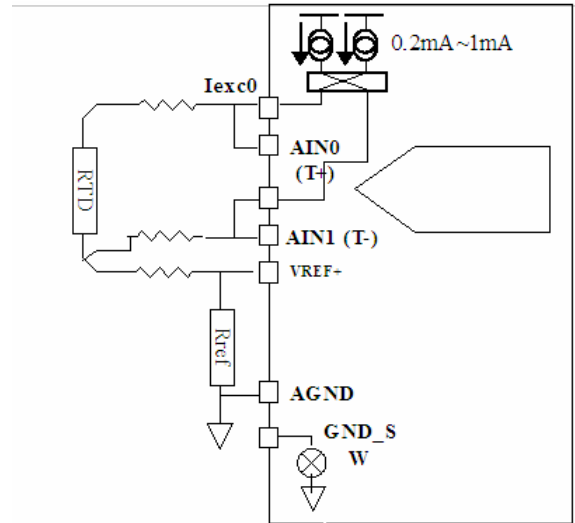
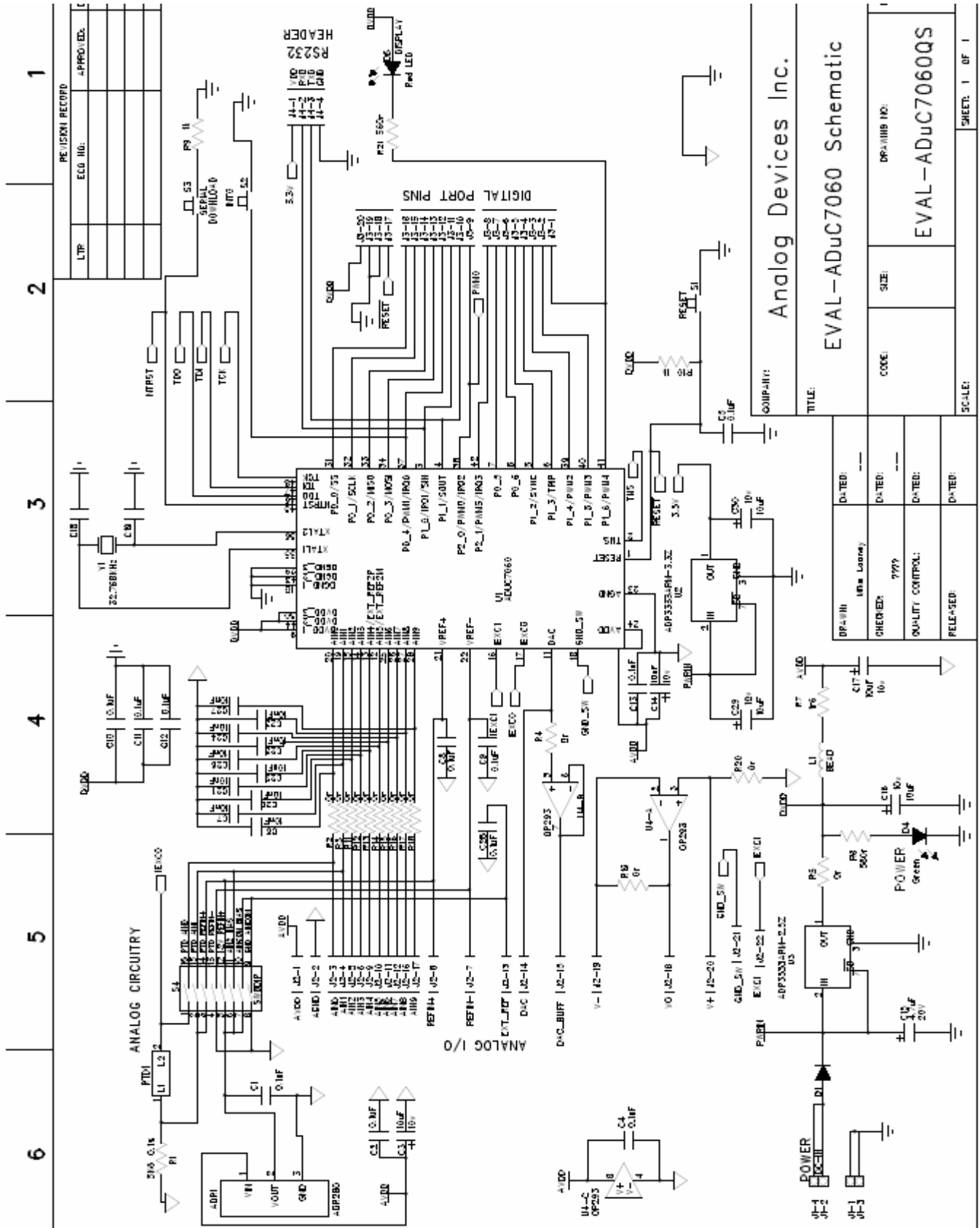


Figure 3. Circuit Diagram of the RTD Circuit

SCHEMATIC AND ARTWORK



Preliminary Technical Data

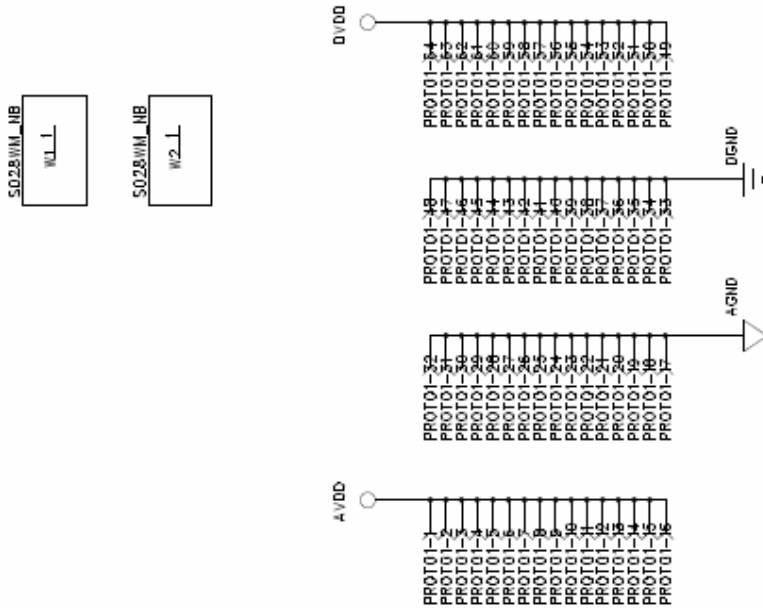
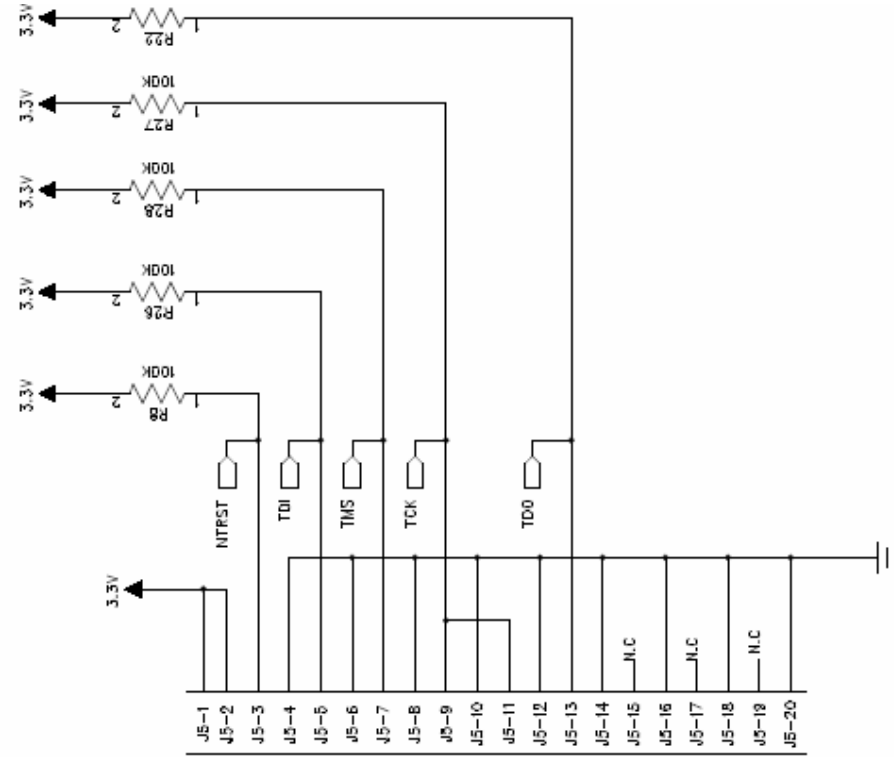
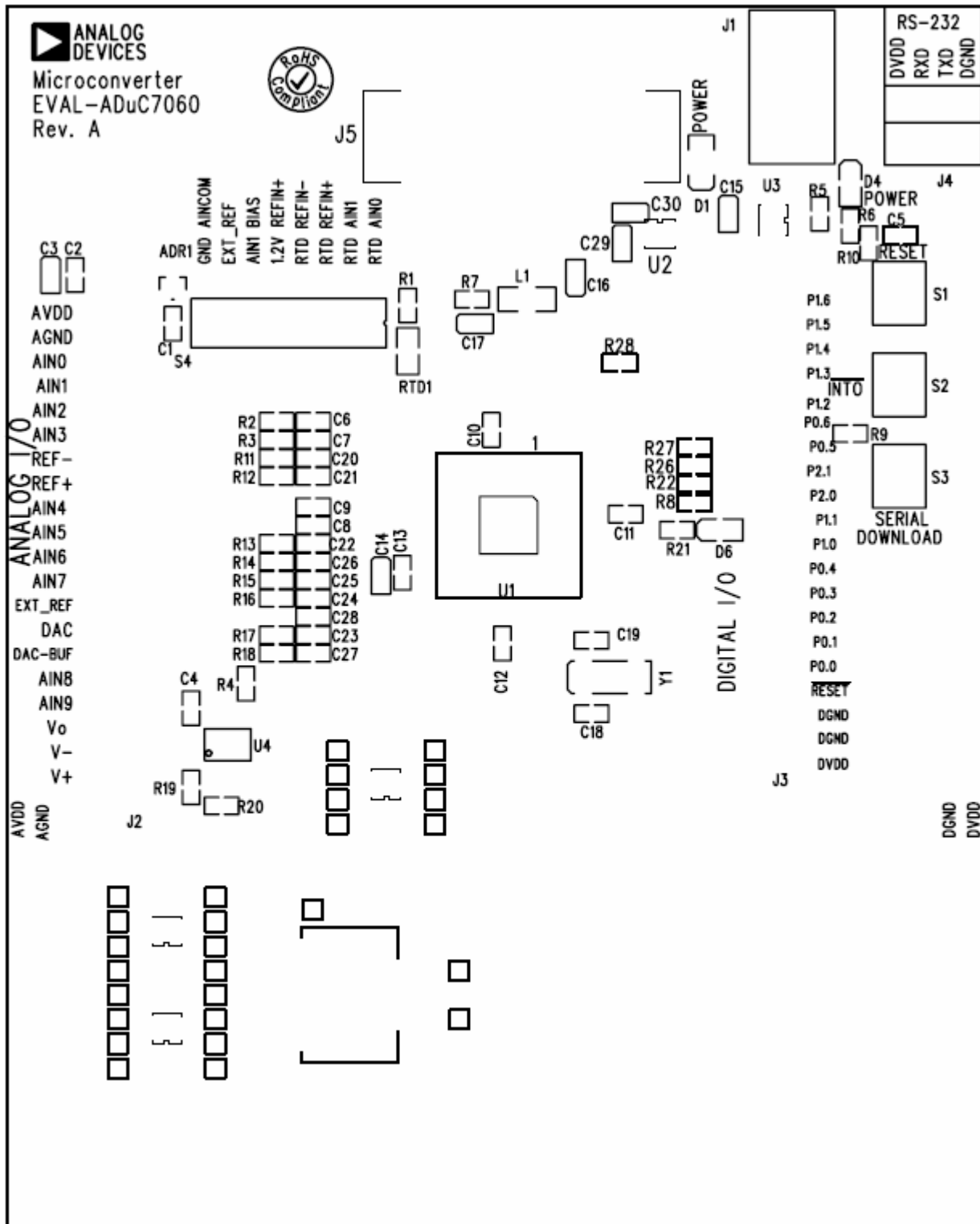


Figure 4. Evaluation Board Schematic

COMPANY:		TITLE:	
DRAWN:	DATED:	CODE:	SIZE:
CHECKED:	DATED:	QUALITY CONTROL:	DATED:
RELEASED:	DATED:	SCALE:	



Eval-ADuC7060 Rev. A- Component Side View

Silkscreen Top

Figure 5. Evaluation Board Silkscreen

ADuC7060 EVALUATION BOARD PARTS LIST

Table 3.

Qty	Component	Description	Order No.	Supplier
1	EVAL-ADuC7060QS QuickStart PCB	Two-sided surface mount PCB-1		
4	PCB Stand-off	Stand-off, Stick on mounting feet	1165061	Farnell
1	U1	MicroConverter	ADuC7060	Analog Devices
1	ADR1	Band gap reference	ADR280ARTZ-REEL7	Analog Devices
1	U3	Fixed 2.5 V linear voltage regulator	ADP3333ARM-2.5Z	Analog Devices
1	U4	Dual op amp, (8-pin SOIC)	ADP1720ARMZ-R7	Analog Devices
1	U2	Fixed 3.3 V linear voltage regulator	ADP3333ARM3.3	Analog Devices
1	Y1	32.768 kHz watch crystal	FEC 316-0312	Farnell
1	S4	SW/8-way DIP switch	FEC 9479112	Farnell
3	S1, S2, S3	PCB-mounted push-button switch	FEC 177807	Farnell
1	D4	1.8 mm miniature LED (green)	FEC 515-620	Fairchild Semiconductor
1	D6	1.8 mm miniature LED (Red)	FEC 515-607	Fairchild Semiconductor
1	D1	PRL4002 diode	BAV103TPMSCT-ND	Digikey
6	C3, C14, C16, C17, C29, C30	10 μ F surface-mount tantalum capacitor, Taj-B case	FEC 1135105	Farnell
11	C1, C2, C4, C5, C8- C13, C14, C16, C17, C24	0.1 μ F surface-mount ceramic capacitor, 0603 case	FEC 9406204	Farnell
1	C15	4.7 μ F surface-mount tantalum capacitor, Taj-B case	FEC 498-919	Farnell
10	C6, C7, C20-C27	10 nF surface-mount ceramic capacitor, 0603 case	FEC 722-236	Farnell
2	C20, C21	12 pF surface-mount ceramic capacitor, 0603 case	FEC 721979	Farnell
1	RTD	100R Class B 0805 RTD	PCS 1.1503.1	Enercorp (Embassy Components)
1	R1	5K6 Ω surface-mount resistor, 0805 case	FEC 9331352	Farnell
3	R12, R18 - R20	560 Ω surface-mount resistor, 0603 case	FEC 9331344	Farnell
14	R2-R5, R11-R20	0 Ω surface-mount resistor, 0603 case	FEC 9331662	Farnell
3	R8 - R10	1 k Ω surface mount resistor, 0603 case	FEC 9330380	Farnell
1	R7	1.5 Ω surface-mount resistor, 0603 case	FEC 9331832	Farnell
4	R22,R26-R28	100 k Ω surface-mount resistor, 0603 case	FEC 9330380	Farnell
1	L1	Ferrite bead surface-mount inductor, 1206 case	FEC 9526862	Farnell
1	J4	4-pin, 90° single row header	TSM-104-02-T-SH	Samtec
1	J3	34-pin straight single row header	TSM-120-01-T-SV	Samtec
1	J2	20-pin straight single row header	TSM-122-01-T-SV	Samtec
1	J5	20-pin connector	TSM-104-02-T-SH	Samtec
1	J1	PCB mounted power socket (2 mm pin diameter)	KLDX-SMT2-0202-A	Kycon