DAQ-127-DA1, DAQ-128-DA1, and DAQ-2543-DA1 Data Acquisition Peripheral Boards Technical Manual

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WARRANTY:

BiPOM Electronics warrants DAQ-127, DAQ-128, and DAQ-2543 boards for a period of 1 year. If the board becomes defective during this period, BiPOM Electronics will at its option, replace or repair the board. This warranty is voided if the product is subjected to physical abuse or operated outside stated electrical limits. BiPOM Electronics will not be responsible for damage to any external devices connected to DAQ-127, DAQ-128, and DAQ-2543. BiPOM Electronics disclaims all warranties express or implied warranties of merchantability and fitness for a particular purpose. In no event shall BiPOM Electronics be liable for any indirect, special, incidental or consequential damages in connection with or arising from the use of this product. BiPOM's liability is limited to the purchase price of this product.

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1. Overview

DAQ-127, DAQ-128, and DAQ-2543 are high-performance data acquisition boards with 8/11 channels of 12-bit Analog-To-Digital Converter (ADC) and 1 channel of 10-bit Digital-To-Analog Converter (DAC). When combined with a low-cost microcontroller board, the DAQ boards are very cost-effective solutions for industrial measurement and monitoring applications.

DAQ-127 has a MAX127 Analog-To-Digital Converter. DAQ-128 has a MAX128 Analog-To-Digital Converter from Maxim Integrated Circuits. DAQ-2543 has TLC2543CN Analog-To-Digital Converter from Texas Instruments. Each board has an LTC1663, 10-bit Digital-To-Analog Converter from Linear Technology. The boards directly interface via expansion connector to Single Board Computer (SBC) systems such as the PRO-MAX and MINI-MAX family from BiPOM Electronics.

2. Specifications

- DAQ-127: 12-bit ADC, 8 channels, Internal 4.096V reference, ±10V, ±5V, 0 to +10V, 0 to +5V
- DAQ-128: 12-bit ADC, 8 channels, Internal 4.096V reference , 0 to +VREF, 0 to +VREF/2, ±VREF, ±VREF/2
- DAQ-2543: 12-bit ADC, 11 channels, 0 to 4.096V Volt input range
- Fault on one channel does not effect other channels
- 10 microsecond conversion time
- Voltage reference, 4.096V
- Expansion connector
- Analog input/output connector
- Analog input/output terminal blocks
- Resettable fuse
- LTC1663, 10-bit DAC, 1 channel

Dimensions are 2.35 X 2.40 inches (5.97 X 6.10 centimeters).

Mounting holes of 0.138 inches (3.5 millimeters) on four corners.

0° - 70° C operating, -40° - +85° C storage temperature range.

3. Functional Blocks

Figure 1 shows the block diagram of the DAQ-127, DAQ-128 and DAQ-2543 boards.

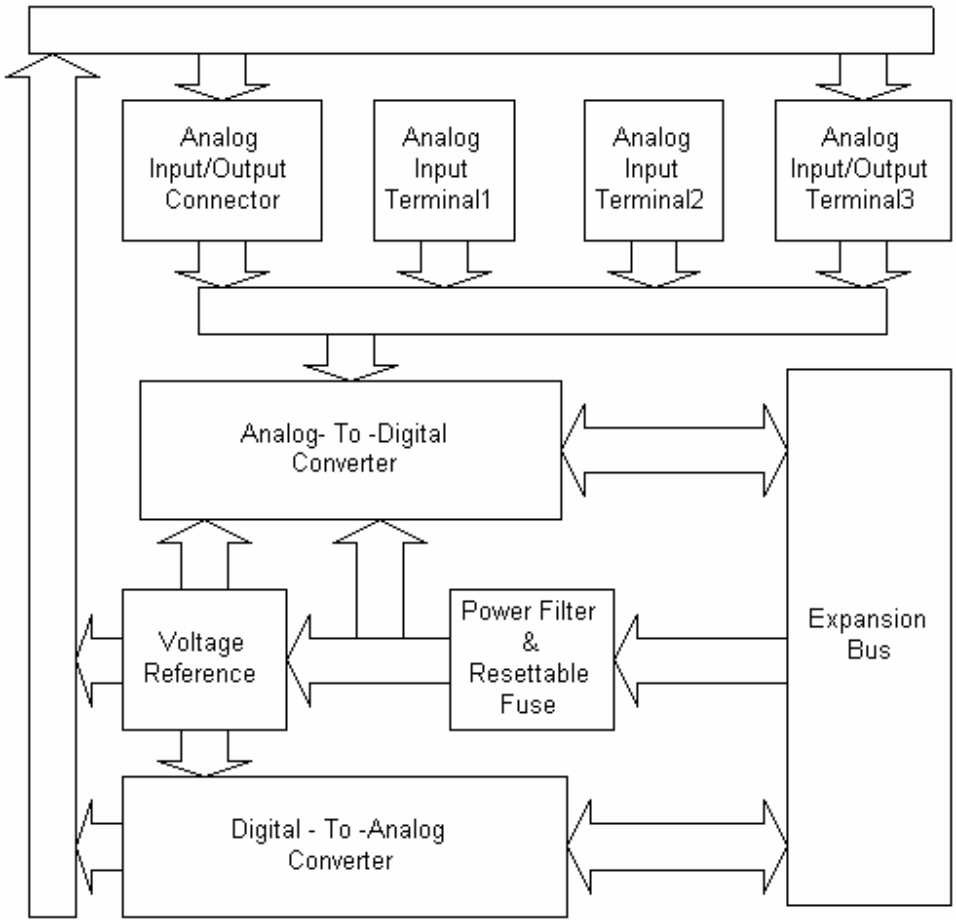


Figure 1

Analog-To-Digital Converter

MAX127/MAX128 (IC3 or IC1) is a 12-bit data acquisition system (DAS) that requires only a single +5V supply for operation. MAX127 has 8 single-ended analog input channels that can have ±10V (VREF x 2.4414), ±5V(VREF x 1.2207), 0 to +10V(VREF x 2.4414), 0 to +5V(VREF x 1.2207) input range. MAX128 has 8 single-ended, analog input channels that can have 0 to +VREF, 0 to +VREF/2, ±VREF, ±VREF/2 input range. Internal VREF is 4.096V.

TLC2543 is 12-bit, 11-channel ADC with 0V..4.096V input voltage range. It has 5-wire serial interface to a micro-controller.

All channels are available through X1, X2 and X3 terminal blocks and also on the J1 connector. MAX127/MAX128 has a 2-wire, I2C compatible serial interface that allows communication with microcontroller boards. Maximum conversion time is 10 microseconds.

A jumper block sets the unique address of MAX127/MAX128 on the 2-wire bus. Since the jumper block has 3 jumpers, 1 of 8 different addresses (addresses 0 through 7) can be assigned to a MAX127/MAX128. Hence, up to 8 DAQ-127 and/or DAQ-128 boards can be connected together for a total of 64 input channels by specifying a different address for each MAX127/MAX128.

Digital-To-Analog Converter

The LTC1663 (IC4) is a single 10-bit voltage-output Digital/Analog Converter (DAC). LTC1663 uses a 2-wire, I2C compatible serial interface. The reference for the DAC is derived from voltage reference. The analog output is available through J1 connector or X3 terminal block.

Voltage Reference

The LM4040-4.1 is a precision micropower shunt 4.096V reference. The LM4040 utilizes fuse and zener-zap reverse breakdown voltage trim during wafer sort to ensure that the prime parts have an accuracy of better than ±0.1% (A grade) at 25℃. Bandgap reference temperature drift curvature correction and low dynamic impedance ensure stable reverse break-downvoltage accuracy over a wide range of operating temperatures and currents. The output of voltage reference is available through J1 connector or X3 terminal.

Expansion

All the control/data lines and the 5-Volt power supply connections are available on a 20-pin Expansion connector(J2) for interfacing to existing microcontroller boards. DAQ-127 or DAQ-128 peripheral board can be connected either as a piggyback daughter-board on a microcontroller board using standoffs or can be placed up away from the microcontroller board using a 20-wire ribbon cable (Cable length should be limited to few inches for best performance). Table 1 shows the pin assignments for Expansion connector.

Expansion connector (J2)

Signal	Pin	Pin	Signal
P3.0	20	19	P3.1
P3.2	18	17	P3.3
P3.4	16	15	P3.5
P3.6	14	13	P3.7
P1.0	12	11	P1.1
P1.2	10	9	P1.3
P1.4	8	7	P1.5
P1.6	6	5	P1.7
VCC	4	3	GND
VCC	2	1	GND

Table 1

Analog Input/Output Terminals

8 analog inputs, 1 analog output, reference 4.096V output and 5-Volt power supply are all available on the Analog Input/Outputs terminals (X1,X2,X3) for interfacing to external circuitry and prototyping boards. Tables 2,3,4 show the pin assignments for Analog Input/Output Terminals.

Analog Input Terminal (X1)

Signal	Pin
ANALOG INPUT 0	1
ANALOG INPUT 1	2
ANALOG INPUT 2	3
ANALOG INPUT 3	4
ANALOG GROUND	5
VAN	6

Table 2

Analog Input Terminal (X2)

Signal	Pin
ANALOG INPUT 4	1
ANALOG INPUT 5	2
ANALOG INPUT 6	3
ANALOG INPUT 7	4
ANALOG GROUND	5
VAN	6

Table 3

Analog Input/Output Terminal (X3)

Signal	Pin
ANALOG INPUT 8	1
ANALOG INPUT 9	2
ANALOG INPUT 10	3
ANALOG OUT	4
VREF	5
ANALOG GROUND	6
VAN	7

Table 4

Analog Input/Output Connector

8 analog inputs, 1 analog output, reference 4.096V output and 5-Volt power supply are available on the 26-pin Analog Input Connector (J1) for interfacing to external circuitry and prototyping boards. Table 5 shows the pin assignments for Analog Input/Output Connector.

Analog Input/Output Connector (J1)

Signal	Pin	Pin	Signal
ANALOG GROUND	1	2	ANALOG GROUND
ANALOG INPUT 3	3	4	ANALOG INPUT 1
VAN	5	6	VAN
ANALOG GROUND	7	8	ANALOG INPUT 0
ANALOG INPUT 4	9	10	ANALOG GROUND
VAN	11	12	ANALOG INPUT 2
ANALOG GROUND	13	14	VAN
ANALOG INPUT 5	15	16	NOT CONNECTED
VAN	17	18	ANALOG GROUND
ANALOG GROUND	19	20	ANALOG INPUT 7
ANALOG INPUT 6	21	22	VAN
VAN	23	24	ANALOG OUT
ANALOG GROUND	25	26	V REF

Table 5

Resettable Fuse

DAQ-127,DAQ-128, and DAQ-2543 boards can be powered from 5 Volts DC of external power source. Resettable device (F1) utilizes a unique polymer-based, Positive Temperature Coefficient (PTC) material to protect electrical circuits against overcurrent conditions.

4. Software

Software project examples for interfacing with DAQ-127, DAQ-128 and DAQ-2543 boards are available with our program development packages:

Analog/Digital Conversion (ADC) examples for DAQ-127/128:

Development Tools	Language	Web link	Project
8051 Development System	C	www.bipom.com/8051dev.shtm	Examples\8051\tiny\ADC\max127

Analog/Digital Conversion (ADC) examples for DAQ-2543:

Development Tools	Language	Web link	Project
8051 Development System	C	www.bipom.com/8051dev.shtm	Examples\8051\tiny\ADC\tlc2543
BASCOM51 Compiler	BASIC	www.bipom.com/bascom51.shtm	Examples\TLC2543

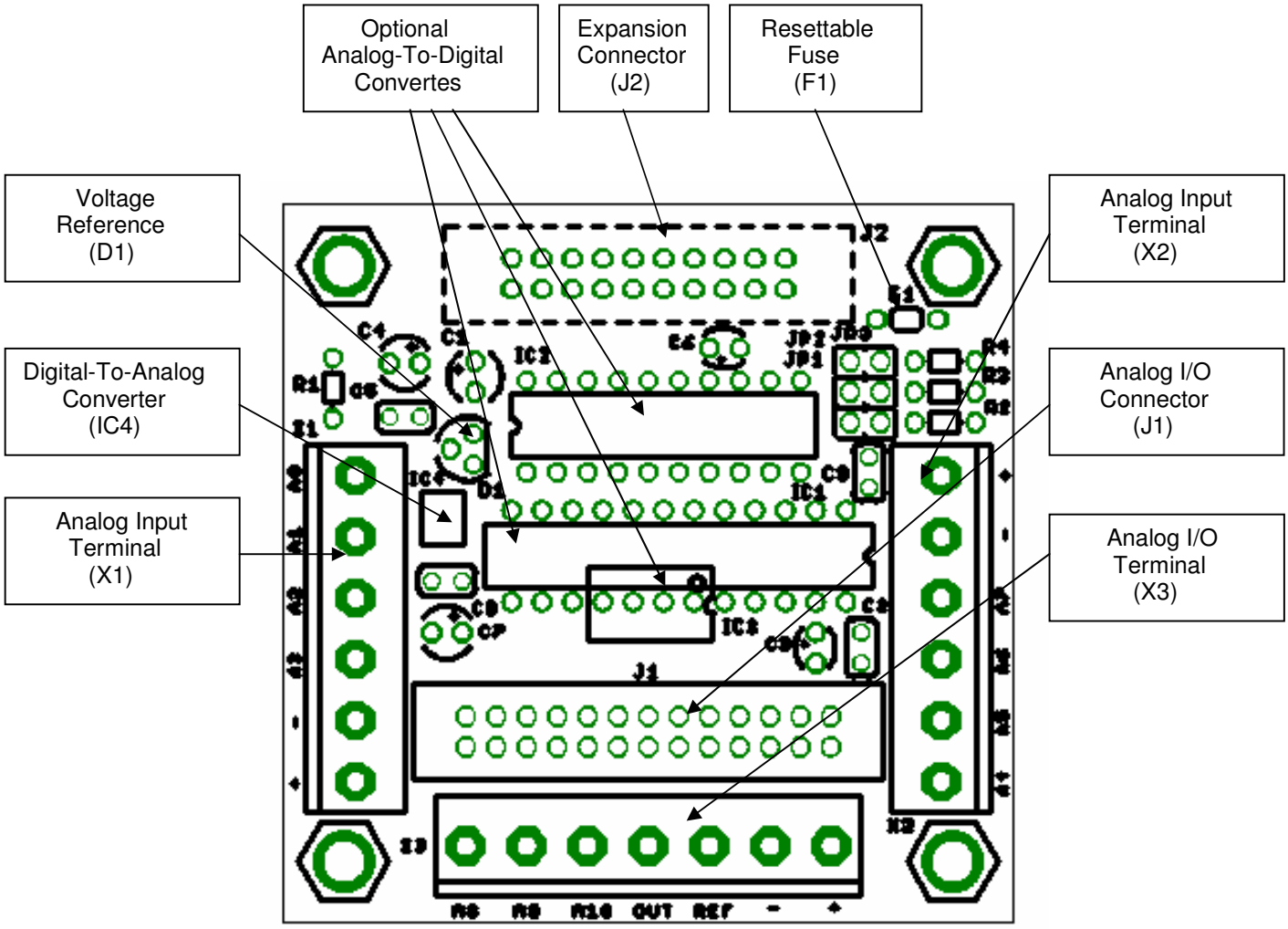
For Digital/Analog Conversion (DAC) examples with LTC1663:

Development Tools	Language	Web link	Project
8051 Development System	C	www.bipom.com/8051dev.shtm	Examples\8051\tiny\dac\ltc1663

5. Board Layout

Figure 2 shows positions of major components, connectors, and terminals on the DAQ-127, DAQ-128, and DAQ-2543 boards:

Figure 2



5.Schematics