BOLO8BLF
Advance Product Specification

High Performance Simultaneous Data Acquisition

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1 Product Description

1. ***BOLO8BLF*** is an 8 channel simultaneous analog I/O module for controlling and measuring Bolometers with typical resistance of 1.2kΩ.
2. Analog Inputs: 8 channels, 16 bit resolution, 1000kSPS/channel.
3. Differential bridge excitation common to all channels: 1000kSPS, 16 bit DAC. Typical output is ±10V @ 20kHz.
4. Calibration: 8 channel single-ended DAC, 16 bit resolution, 2kSPS typical use case. Current measurement at 16 bit resolution, 1kSPS typical use case.
5. Extended module with *FMC* connector. 4x RJ45 connectors for ease of connection; 2 Bolometers per connector.
6. Differential inputs, high quality differential amplifier front end with switched input voltage ranges.

1.1 Overview

The *BLF* module standard adds user IO to carrier modules fitted with *FPGA* resource. D-TACQ recommends modules based on the *Xilinx ZYNQ* system on chip, combining *FPGA* resource with a dual-core ARM Cortex A9 and gigabit Ethernet. Compatible modules include

- D-TACQ ***ACQ1001*** : D-TACQ single slot *FMC* carrier, Z7020
- D-TACQ ***ACQ1002*** : D-TACQ dual slot *FMC* carrier, Z7020
- D-TACQ ***ACQ2006*** : D-TACQ 6 slot *FMC* carrier, Z7020
- D-TACQ ***ACQ2106*** : D-TACQ 6 slot *FMC* carrier, Z7030

D-TACQ supplies a complete working Intelligent Digitizer appliance including programmable logic and microprocessor system running Linux.

1.2 Glossary

- *FMC*: VITA57 FPGA Mezzanine Card.
- Xilinx ZYNQ System-on-chip.
- *LPC* : *FMC* Low pin count wiring standard.
- *ULPC*: *FMC* Ultra low pin count (D-TACQ).
- ELF: D-TACQ extension to FMC, elongated card to the rear with provision for dedicated analog power supply rails.
- BLF: D-TACQ extension to FMC, elongated card to front and rear with provision for dedicated analog power supply rails.

2 Physical

2.1 BLF Extended FMC Module

Drawing 1: BOLO8BLF Dimensions

2.2 Appearance

Drawing 2: BOLO8BLF

Drawing 3: 6x BOLO8BLF in ACQ2006 - 48 Channel System

3 Theory of Operation

The main DAC excites all eight Bolometer bridges. Each Bolometer has an individual ADC to digitise the incoming data.

Calibration is performed by forward-biasing the Offset DACs and measuring the resulting current. A 20kHz Bandstop filter separates the offset DAC from the excitation.

A comprehensive FPGA control personality was developed at CCFE and is available from D-TACQ.

Drawing 4: BOLO8BLF Block Diagram – Bridge is shown for reference.

4 BOLO8BLF Interface Specification

4.1 Front Panel Connector

- 4x RJ45 connectors. Input/Output pairing is configured to use standard Ethernet cable differential pairing for ease of wiring.

4.1.1 Pin-out and Connection to the Bolometer Head

The pin-out for all RJ45 connectors is identical.

The bolometer bridge must be connected as indicated in the table and diagram below (Bolometer IPT174 is shown for illustration).
The BOLO8 has eight channels of I/O on four RJ45 connectors; two channels per connector.

RJ45 Pin	Function
1	+Channel A In (+Offset DAC Out)
2	-Channel A In (-Offset DAC Out)
3	+Channel A Excitation Out
4	-Channel B Excitation Out
5	+Channel B Excitation Out
6	-Channel A Excitation Out
7	+Channel B In (+Offset DAC Out)
8	-Channel B In (-Offset DAC Out)

If the connection to the bolometer head is made using RJ45 cable assemblies be aware of the wire colour coding differences between 568A and 568B standards.

Failure to connect the BOLO8 correctly to the bolometer bridge may cause damage to the BOLO8 board. This can be avoided by ensuring no short circuits are made between any of the BOLO8 RJ45 connections and ensuring that the bridge connections are isolated from power supplies and ground. In addition, the minimum resistance between any two legs of the bridge must not be less than 100Ω.

5 BOLO8BLF Electrical Specification

5.1 Main ADCs

#	Parameter	Value
1	Number of Channels	8
2	Max Sample Rate	1MHz,per channel simultaneous
3	Resolution	16 bits
4	Coupling	DC, Differential Input
5	Input Voltage Range	±10, ±5, ±2.5, ±1.25 V software selectable ranges
6	INL	16 bit ±0.5 LSB
7	DNL	16 bit ±0.1 LSB
8	Full Power BW (Gain x1)	250kHz
9	Temperature Stability	<25 ppm/C

5.2 Main DAC

#	Parameter	Value
1	Number of Channels	1 DAC drives 8 Amplifiers for the 8 Bolometer channels
2	Max Update Rate	1 MHz
3	Resolution	16 bits
4	Coupling	DC, Differential Output
5	Maximum output current	20mA per channel, minimum bridge impedance 100Ω
6	Output Voltage Range	±10 V
7	Output Impedance	33Ω
8	INL	±2 LSB
9	DNL	±1 LSB
10	Full Power BW	20kHz Standard – match Band Stop Filter on Offset
11	Temperature Stability	<25 ppm/C

5.3 Current ADC

#	Parameter	Value
1	Number of Channels	8
2	Sample Rate	1kHz per channel simultaneous
3	Resolution	16 bits
4	Coupling	DC, Single-ended Input
5	Input Impedance	1M
6	Input Current Range	±10mA
7	INL	±0.2 LSB typ.
8	DNL	±0.2 LSB typ.
9	Full Power BW	1kHz
10	Temperature Stability	<25 ppm/C

5.4 Offset DAC

#	Parameter	Value
1	Number of Channels	8
2	Sample Rate	2kHz, per channel simultaneous
3	Resolution	16 bits
4	Coupling	DC, Differential Output
5	Maximum output current	20mA per channel, minimum bridge impedance 100Ω
6	Output Voltage Range	±7.5 V
7	INL	±4 LSB
8	DNL	±1 LSB
9	Full Power BW	1kHz Standard
10	Temperature Stability	<25 ppm/C

6 BOLO8BLF Specification

#	Parameter	Value
1	Form Factor	D-TACQ Standard BLF
2	Power source	D-TACQ ELF/BLF Module – Please contact us if details are required.
3	Environmental	0°C-50°C Operational -10°C-85°C Non-Operational
4	ELF Socket	Standard ELF D-TACQ Ultra Low Pin Count ULPC