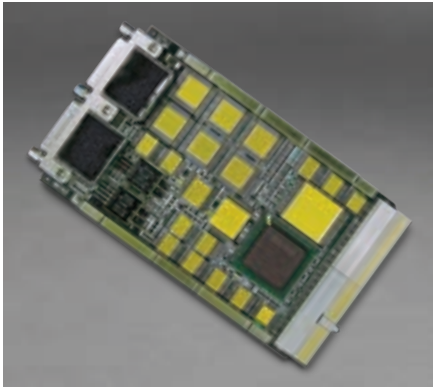# MULTI-OPERATION AVIONICS BOARD (MOAB™) SERIES OF BOARDS

The MOAB Series of Boards provide a single 3U cPCI card solution for interfacing to a large number and variety of commonly found subsystems, payloads, and sensors. The MOAB boards handle complex and common C&DH functions. The MOAB series of boards includes versions for general purpose I/O (Standard MOAB – SMOAB), high speed I/O and mass memory (Camera MOAB – CMOAB/ Digital MOAB – DMOAB), and analog I/O (Analog MOAB – AMOAB). All MOAB series boards support a large mix of commonly found interfaces.

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STANDARD MOAB FEATURES

- 2 Million Gate FPGA (Actel RTAX2000S)
- 32-bit/33MHz cPCI target interface with P2 custom local interface bus
- 12 Gbytes Flash / 4 Gbytes Flash with TMR
- 2 Mbytes of Asynchronous SRAM with EDAC
- 32 Kbyte of FPGA Block RAM for buffering
- 24 Discrete Outputs (Configurable to 3.3V or 5V)
- 23 Discrete Inputs (Configurable to 3.3V or 5V)
- 20 Differential RS422/LVDS Transmitters
- 20 Differential RS422/LVDS Receivers
- 1 MIL-STD-1553B Interface using Aeroflex Summit Chip

- 12 Sun Sensor Channels
- 3 Sun Sensor Excitations
- 47 AD590 Temperature Sensor Channels
- 8 AD590 Excitations
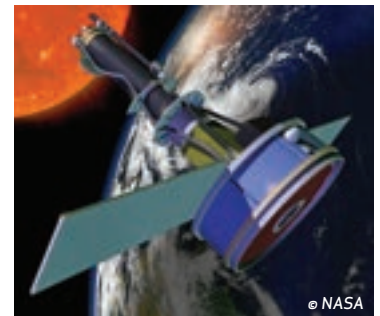- 24 General Purpose Analog Channels +/-10V

MASS, POWER, DIMENSIONS

- < 0.4 kg
- < 8.0 Watts Peak, Worst-Case
- 100 mm x 175 mm x 30 mm (3U cPCI)

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MOAB SERIES OF BOARDS

ANALOG MOAB FEATURES
- 2 Million Gate FPGA (Actel RTAX2000S)
- 32-bit/33MHz cPCI target interface with P2 custom local interface bus
- 4 Sun Sensor excitations (+10V)
- 12 AD590 Voltage Excitations (+15V)
- 2 A/D Converters (one designed for higher sample rates)
- 188 +/-10V Analog Input Channels:
  - (12) Configurable as Sun Sensor Inputs
  - (32) Configurable as (16) +/-5V Differential Analog Inputs
  - (72) Configurable as AD590 Temperature Channels
  - (48) Configurable as PRT or Thermistor Channels
  - (08) Configurable as 28V (bus voltage) inputs
  - (16) General Purpose Analog Inputs
- 9 Internal Analog Channels (local temperature, secondary voltages, and calibration references)
- 4 +/-5V Analog Output Channels with 8mA drive capability (HW configurable to multiple ranges)
- 4 Differential RS422/LVDS TX Outputs (functionality configurable in FPGA)
- 3 Differential RS422/LVDS RX Inputs (functionality configurable in FPGA)
- (1) Configurable as an LVSEP input
- 4 Discrete Inputs (functionality configurable in FPGA)

MASS, POWER, DIMENSIONS
- < 0.4 kg
- < 7.0 Watts Peak, Worst-Case
- 100 mm x 175 mm x 30 mm (3U cPCI)

DIGITAL MOAB FEATURES
- 2 Million Gate FPGA (Actel RTAX2000S)
- 32-bit/33MHz cPCI target interface with P2 custom local interface bus
- 2 Gbyte of Synchronous DRAM (Independent Set #1)
- 2 Gbyte of Synchronous DRAM (Independent Set #2)
- 32 Kbyte of FPGA Block RAM for buffering
- 32 Discrete Inputs with Cold-Sparing (Configurable to 3.3V or 5V)
- 40 Differential RS422/LVDS TX Outputs
- 31 Differential RS422/LVDS RX Inputs
- 4 LVDS DeSerializers (3:21 Aeroflex or 4:28 CameraLink)
- 3 SpaceWire PHYs

MASS, POWER, DIMENSIONS
- < 0.4 kg
- < 6.0 Watts Peak, Worst-Case
- 100 mm x 175 mm x 30 mm (3U cPCI)

MOAB SERIES OF BOARDS RELIABILITY FEATURES
- All Parts SEL immune
- SEU Mitigated Design
- 30 kRad Standard (100 kRad Option)
- Conduction Cooled Design
- All parts MIL-883B

The MOAB series of boards includes various implementations that address the most commonly found interfaces, ranging from serial asynchronous RS-422 interfaces, to SpaceWire interfaces, to MIL-STD-1553 to analog interfaces, including temperature sensors, and voltage and current inputs and outputs.

All MOAB boards provide a radiation tolerant Actel RTAX2000S FPGA that is used for managing the board functions, interfacing to the backplane via PCI, and to implement mission specific logic, such as autonomous state-of-health collection and reporting.

STANDARD AND CUSTOM LOGIC FEATURES
To interface to common telecommand components, a MOAB board may be configured to be compatible with CCSDS, SGLS and other command decoding & telemetry encoding formats. Using these formats, the MOAB board may autonomously decode hardware commands, without the need for a system processor. The large amount of FPGA resource available may be used for mission customer specific processing functions.

GENERAL PURPOSE ANALOG INTERFACES
MOAB boards are available with a number of different analog interfaces. Input voltage ranges include +/-10V, 28V, and +/-5V. Current inputs and outputs are available with configurable voltage and current ranges. MOAB boards feature one or two 12-bit or 14-bit A/D converters with configurable sample rates.

SOLID STATE MEMORY
The memory on the MOAB boards may include up to a total of 12 GBytes of Flash memory which can be used as-is or configured as 3 GBytes of Triple-Modular-Redundant Flash with voting logic implemented in the MOAB FPGA. Boards may provide 2 MBytes of shared SRAM for general purpose use by the MOAB board or any devices on the cPCI bus.

MOOG
SPACE AND DEFENSE GROUP

2228 W. Guadalupe Road
Gilbert. AZ 85233
www.moog.com/space

Moog Space and Defense   @MoogSDG   @MoogSDG   @MoogSDG   @MoogInc