Proton2X-Box™ Avionics Suite

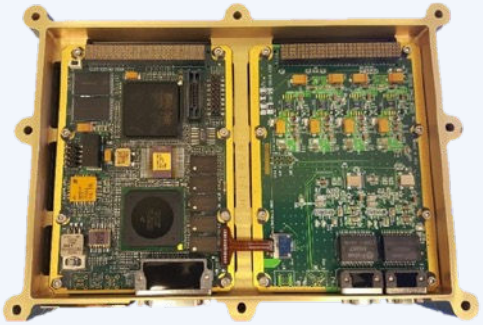
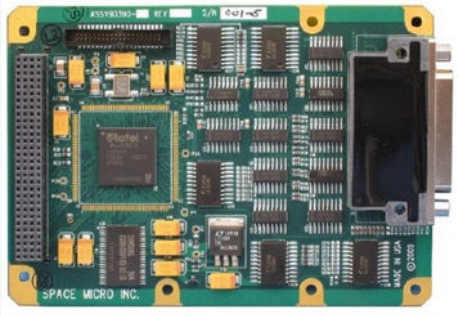
FEATURES

- Modular, Customizable Design
- Lightweight Interchangeable Slices
  - High Performance Proton400K SBC
  - Solid State Recorder
  - Analog IO
  - Digital IO
  - 1553
  - CAN
  - GPIO
  - Ethernet
- Interface Options
  - RS-422 Buffered Serial and Parallel Ports
  - RS-485
  - SpaceWire
  - UART / GPIO
- Radiation Tolerant Electronics (TID, SEU, SEL)
- Frame and End Caps: Aluminum 6061-T651, configurable, conductive cooling, high strength, radiation shielding

APPLICATIONS

- Command and Data Handling
- Payload Control Electronics
- Sensor/Data Processing
- Data Storage
- Image Processor

SLICE SPECIFICATIONS

Slice	Key Parameters
Proton400K™ SBC 	• Dual Core PowerPC™ Processor • Memory 2 GB DDR 3 with EDAC 4 Mb Boot MRAM 512 kB L2 cache 32 kB Instruction/32 kB Data Caches • Interfaces: UART 16 Programmable GPIO SpaceWire • OS Options: Linux VxWorks
Analog I/O 	• General purpose data acquisition card with 48 single-ended channels • Monitor a variety of sensor types: Attitude sensors such as gyroscope, magnetometer, and sun trackers Environmental sensors such as mixed thermal sensors Any instrument requiring simultaneous measurements such as current, voltage, temperature • 14 bit ADC and 8 bit DAC • Configurable with 12-bit /8-bit input/output channels • 48 single ended input multiplexed channels of resistance or voltage output measurements
Digital I/O 	• 32 Differential RS-422 Receivers, FPGA configured as Single RX or part of a Multi Drop • 32 Differential RS-422 Drivers, FPGA configured as Single TX or Multi Drop • 36 Bit, discrete signal, Bi-directional Bus, in 8255 format, programmable as: • Bi-Directional CMOS (+3.3V) • Up to 64 Bits LVDS drive capability from the FPGA • Logic Voltage: 0 to 3.3V • 32 – 64 GPIO / UARTS Option
Solid State Drive 	• Variety of sizes and formats Flash memory: 256 GB (total) • Reed-Solomon EDAC • Heritage on ORS-1 and Classified programs • Up to 256 GB flash in Proton2X-Box • Read speed 15 MB/sec x 90 • Write speed 9 MB/sec x 90

SWAP, INDIVIDUAL SINGLE-WIDE SLICE FORM FACTOR (NOMINAL)

Function	Dimensions	Weight	Power Consumption	Comments
Processor P400K	8.0” x 6.1” (204x155 mm)	150 g (0.33 lb)	~10 – 12 W	Dual core PowerPC processor, VxWorks™ BSP or Linux BSP available
Image Processor	8.0” x 6.1” (204x155 mm)	~250 g (0.55 lb)	~8.0 W (depending on gate use & speed)	Reconfigurable FPGA utilizing Virtex 7
Analog I/O AIO	8.0” x 6.1” (204x155 mm)	150 g (0.33 lb)	~3 W	General purpose data acquisition card with 42 single ended channels
Digital I/O DIO	8.0” x 6.1” (204x155 mm)	150 g (0.33 lb)	~2 W	General Purpose Digital I/O card with up to 64 differential and 32 - 64 discrete signals available
Space Wire	8.0” x 6.1” (204x155 mm)	150 g (0.33 lb)	2 - 6 W	Supports GSFC design Full-duplex LVDS Transceiver circuits Raw Data rate of 200 Mbit/sec 6 user ports TBD
1553 Slice 1553	8.0” x 6.1” (204x155 mm)	180 g (0.4 lb)	1.90 W	MIL-STD-1553 dual redundant Bus 16-bit read/write time-tag Simultaneous RT/MT operation
Flash SSR	8.0” x 6.1” (204x155 mm)	150 g (0.33 lb)	3.5 W	Available Memory up to 256 GB
Battery Mgmt.	8.0” x 6.1” (204x155 mm)	200 g (0.44 lb)	0.4 5W	Measures current and voltage for up to 4 solar panels Provides 4 sensed and switched +/- 5V to lines
Power Switch	8.0” x 6.1” (204x155 mm)	180 g (0.4 lb)	1.9 W	4 H-bridges that can be configured to 8 half-bridges 8 high-side switches Switches external 28V spacecraft power Switches redundant slices
Power Supply	4.0” x 6.1” (102x155 mm)	200 g (0.44 lb)		3 isolated DC-DC converters produces 3.3V, 5V, and ±12V Input Voltage is 15 to 50V Turn On Time is < 1 s EMI filtering meets MIL-STD-461C and MIL-STD -461D EMC Requirements
End Cap	4.0” x 6.1” (102x155 mm)	150 g (0.33 lb)	N/A	

Environment • **Operating Temperature** • **Random Vibration** • **Parts Level Options** • **Radiation**	 -20°C to +100°C GSFC-STD-7000 (NASA GEVS) Acceptance Levels Commercial Space, NASA Levels 1, 2, 3 Radiation Tolerant (TID, SEU, SEL) 30 to 100 krads
SWAP • **Dimensions** • **Mass** • **Power Consumption** • **Input Voltage**	 8 in x 6 in x depth dependent on slices 150 g – 250 g per PCBA; see chart above Dependent on slices selected; see chart above 15 V to 50 V