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Model 64EP3

6U, VME, SINGLE BOARD COMPUTER with MULTI-FUNCTION I/O

Features

- SBC with multi-function I/O in a single 6U VME slot
- Automatic background BIT (module-dependant)
- VME Bus and/or Dual Gigabit Ethernet Interfaces
- Front and/or Rear I/O Support
- Designed for Commercial and Rugged applications
- Software Support Kit(s) and Driver(s) are available

Conduction Cooled



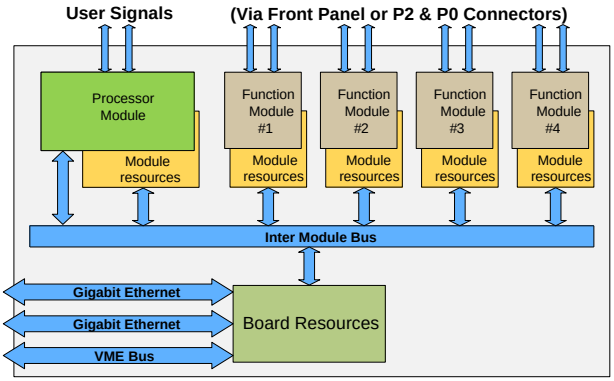
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Processor Options

- **Freescale PowerPC MPC8536 @ 1.0 GHz Processor**
  - 1 GB SDRAM (program execution)
  - 256 MB Flash (OS/application program)
  - Dual Gigabit Ethernet
  - Serial/ SPI Flash/USB support (debug/data storage)
  - VxWorks 6.x BSP
- **Analog Devices (ADI) BF533 @ 500 MHz Processor**
  - Extremely Low Power High Performance Processor
  - Windows PC Development – ADI Visual DSP++
  - Ethernet, RS232, USB, I^2C, Differential and TTL I/O

Description



The 64EP3 is a single slot, 6U VME, low-power/high-performance Single Board Computer (SBC) with configurable multi-function I/O. Powered by a choice of Freescale's 1.0 GHz MPC8536 PowerPC (**U3**) or Analog Devices' 500 MHz BF533 (**U2**) processor modules, the 64EP3 offers an extremely low power, cost-conscious SBC solution for today's demanding, space-constrained and resource limited embedded systems. Four I/O module slots enable integrators to mix-n-match a variety of I/O and communication functions. The functions include Digital I/O (Discrete, Differential, TTL), Analog I/O (A/D, D/A, RTD, Strain Gage), Motion Control and Sensor Interfaces (Synchro/Resolver/LVDT/RVDT Measurement and Simulation, Encoder/Counter), and Communication Interfaces (RS-232/422/423(MIL-STD-188C)/485, MIL-STD-1553, CANBus and ARINC 429/575). The 64EP3 SBC configured with up to four modules allows systems integrators to confidently manage monitor and process a host of sensor interfacing requirements with NAI's flexible, leading-edge, fully programmable and continuous background built-in-test (BIT) enabled I/O function modules.

The 64EP3 SBC with multi-function I/O and full complement of I/O libraries and drivers are ideally suited for a multitude of commercial and rugged embedded processing and I/O systems. The 64EP3 SBC with Master VME Bus capability may be utilized with other NAI high-density, multi-function I/O boards to provide a complete, expandable, low power/high performance, programmable solution for sensor and communication data acquisition, management, processing and distribution. All I/O sensor data is available on the VME Bus or Gigabit Ethernet.

Advantages of using the 64EP3 SBC for board or system-level solutions:

- Process and control of I/O functions without the need of a separate SBC or mission computer
- Direct processing and control of I/O functions via MIL-STD-1553, RS232/422/485, CANBus, ARINC 429/575 and/or other functions
- Reduction of raw data to offload main mission computer—enabling performance of customer-specific algorithms such as FFT and digital filtering
- Ability to manage and process control/servo loops without mission computer intervention

General Board Specification

●**Power:** +5VDC / ± 12VDC (certain modules) ●**Operating Temp:** 0° C to 70° C or -40° C to 85° C ●**Size:** – 233mm x 20mm x 160mm (6U)

Processor Modules

Processor	Module	Flash	SDRAM	Frequency	Software Support
PowerPC MPC8536	U3	256MB	1GB DDR2	1.0 GHz	Wind River BSP / VxWorks 6.x / Library
ADI Blackfin® BF533	U2	8MB	512KB	500 MHz	ADI Visual DSP++ / Function Library

Available Function Modules

(**GEN3** Platforms)

Note 1 – Indicates wide selection (See part number in Operations Manual) **Note 2** – Contact factory for availability
Note 3 – Additional channels available from front panel on certain platforms

A/D Converter	**Module**	**Channels**	**Input Scaling**	**Resolution**	**Accuracy (±)**	**Sampling (programmable)**
	C1	10	±1.25,2.5,5 or 10 VDC	16-bit	0.05% FS	200 KHz max
	C2	10	±5,10,20 or 40 VDC	16-bit	0.1% FS	200 KHz max
	C3	10	0-25 mA	16-bit	0.1% FS	200 KHz max
	C4	10	±6.25,12.5,25 or 50 VDC	16-bit	0.1% FS	200 KHz max
	CA	10	(Channels 1-6 are C2 type and Channels 7-10 are C3 type)			
D/A Converter	**Module**	**Channels**	**Output Range**	**Resolution**	**Accuracy (±)**	**Settling time**
	F1	10	±10 or 0-10 VDC	16-bit	0.05% FS	15µs max
	F3	10	±5 or 0-5 VDC	16-bit	0.05% FS	10µs max
	F5	4	±25 or 0-25 VDC	16-bit	0.05% FS	10µs max
	J3	10	±1.25 or 0-1.25 VDC	16-bit	0.05% FS	10µs max
	J5	10	±2.5 or 0-2.5 VDC	16-bit	0.05% FS	10µs max
	J8	4	±20 to ±100 VDC	16-bit	0.15% FS	350µs max
Thermocouple	**Module**	**Channels**	**Update rate**	**Resolution**	**Accuracy (±)**	**Thermocouple Interface**
	G3	6	4.17 – 470 Hz	24-bit	0.75 – 2.0 °C	NIST J,K,T,E,N,B,R,S & ±100 mV
RTD	**Module**	**Channels**	**Update rate**	**Resolution**	**Accuracy**	**Interface**
	G4	6	16.7 Hz/channel	16-bit	(±) 0.05% FS	2, 3 or 4 wire
Strain Gage	**Module**	**Channels**	**Update rate**	**Resolution**	**Accuracy**	**Interface**
	G5[2]	4	4.7 Hz – 4.8 KHz	16-bit	(±) 0.1% FS	Conventional 4-Arm Bridge
Encoder/Counter	**Module**	**Channels**	**Signal Voltage**	**Resolution**	**Modes**	
	E7	4	RS422 / 24 VDC	32-bit	Encoder (SSI, A-Quad-B), Counter (up/down)	
L(R)VDT/D	**Module**	**Channels**	**Frequency**	**Resolution**	**Accuracy**	**Interface**
	L[1]	4	360 Hz to 20 KHz	16-bit	(±) 0.025% FS	2 or 3/4 wire
SYN(RSL)/D	**Module**	**Channels**	**Frequency**	**Resolution**	**Accuracy**	**Tracking Rate**
	S[1]	4	50 Hz to 20 KHz	16-bit	(±) 1 arc-min	190 RPS
D/SYN(RSL)	**Module**	**Channels**	**Frequency**	**Resolution**	**Accuracy**	**Power**
	6[1]	3	47 Hz – 10 KHz	16-bit	(±) 0.1°	0.25 VA / channel (max.)
D/L(R)VDT	**Module**	**Channels**	**Frequency**	**Resolution**	**Accuracy**	**Power**
	5[1]	3	47 Hz – 10 KHz	16-bit	(±) 0.2% FS	0.1 VA / channel (max.)
I/O, TTL/CMOS	**Module**	**Channels**	**Input Range**	**Output level**	**Programmable**	
	D7	16	0 – 5.5 V	TTL/CMOS	Input or Output	
I/O, Differential	**Module**	**Channels**	**Input Range (422)**	**Input Range (485)**	**Output Range (422/485)**	
	D8	11 (16)[3]	-10V to +10V	-7V to +12V	-0.25V to +5V	
I/O, Discrete	**Module**	**Channels**	**Input Range**	**Output Range**	**Programmable**	**Notes**
	K6 (v4)	16	0 – 60 VDC	0 – 60 VDC	Input or Output	(500 mA – 2 A) (source/sink)
	K7	12 (16)[3]	±80V	±80V	Input or Output	Isolated switch (600mA)
Relay	**Module**	**Channels**	**Type**	**SW Volt/Current**	**SW Power (max)**	**Notes**
	KN[2], KL[2]	4	DPDT (1 CH Form C)	220V / 2A (max)	60W / 62.5 VA	KN=non-latch, KL=latching
Serial Communications	**Module**	**Channels**	**HW Interface levels support**	**Bit rate (Async/Sync)**	**Tx/Rx Buffer**	**Notes**
	P8	4	RS-232/422/423(MIL-STD-188C)/485	1 / 4 Mb/s per Ch.	32KB	Partial modem
	PC	4	Isolated RS-422/485	1 / 4 Mb/s per Ch.	32KB	Partial modem
CANBus	**Module**	**Channels**	**CAN protocol**	**Message Buffer**	**Data rate (Prog)**	**Notes**
	P6, PA	4	P6= 2.0A/B / PA=J1939	16K RX/TX	1 Mb/s max.	Bosch® IP Core
MIL-STD-1553	**Module**	**Channels**	**Operational Modes**	**Onboard RAM**	**Bus Coupling Configuration**	
	N7, N8	2	BC,RT, BM, BM/RT	128Kbyte per ch	N7 = Transformer / N8 = Direct	
ARINC 429/575	**Module**	**Channels**	**Frequency**	**Input/output**	**Message Buffer**	
	A4	6	100 KHz or 12.5 KHz	RX/TX	256 word Tx/Rx	
DC Power Supply	**Module**	**Channels**	**Voltage Output**	**VOut Regulation**	**Current Output**	
	V1, V2[2]	1, 2	±15V	± 1%	± 450 mA(max)	
AC Reference	**Module**	**Channels**	**Frequency**	**Accuracy**	**Voltage**	**Power**
	W[1]	1	47 Hz – 20KHz	± 3%	2 – 115 VRMS	6 VA (max.)

PART NUMBER DESIGNATION

64EP3 – XX XX XX XX XX X X X –XX
Slot # 1 2 3 4 5

MODULE (SLOT) 1 through 4 DEFINITION
Enter Function Module Designation (i.e.C1) for each slot (1 through 4; enter "Z0" if slot is not populated

MODULE (SLOT) 5 DEFINITION
Enter Processor Module Designation (i.e. U2 or U3)

MECHANICAL
F = Front Panel and Rear I/O (P2 & P0)
S = Front Panel Rear P2 I/O (No P0)
P = Rear I/O only (P2 & P0)
G = Rear P2 I/O only (No P0)
W = P with Wedge locks
A = VME64 Blank Front Panel with Rear I/O I/O (P2 & P0)
R = VME64 Blank Front Panel with Rear P2 I/O only (No P0)
B = VME64 Front Panel and Rear I/O (P2 & P0)
T = VME64 Front Panel and Rear P2 I/O only (No P0)
D = VME64 Blank Front Panel, Low profile extractors with Rear I/O (P2 & P0)

ENVIRONMENTAL
C = 0 TO 70 °C
E = -40 TO +85 °C
H = E with conformal coating
K = C with conformal coating

DUAL ETHERNET MOTHERBOARD (MB) ONLY
0 = No Ethernet
1 = MB Port A to Front Panel
2 = MB Port A to Rear P0
3 = MB Port A to Front and MB Port B to P0
4 = MB Port A and Port B to Rear P0

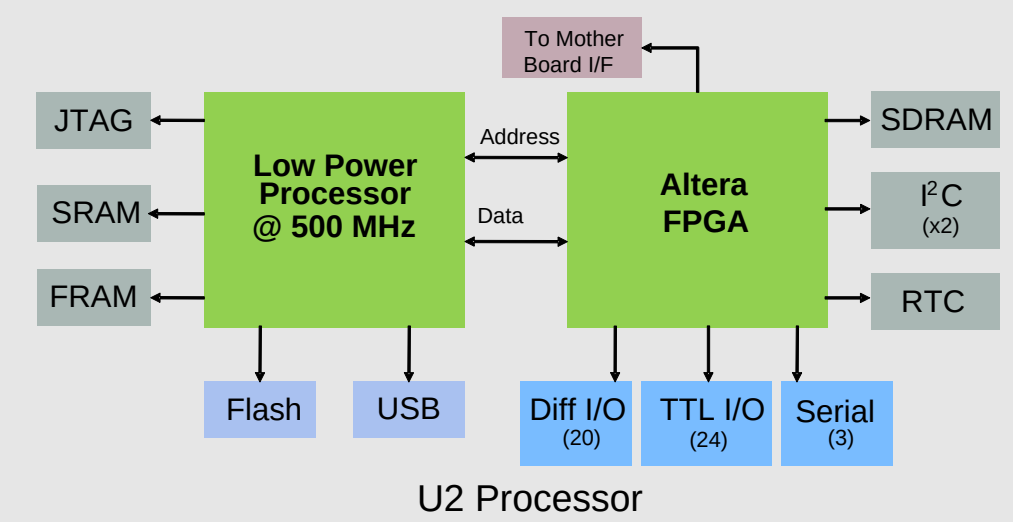
Combined w/ SLOT 5 Ethernet Options
(Specific w/ module type Ethernet options only (i.e. U3)
A = MB Port A to Front and U3 Port A to P0
B = U3 Port A to P0 and MB Port B to P0
C = U3 Port A to P0 and U3 Port B to P0

SPECIAL OPTION CODE (or leave blank)

Processor (Module U2)

Blackfin® Processor and General Purpose I/O Resource for User Operational Programs and Control

Processor:	The BF533, from the ADI Blackfin family, offers support for overall system processing. The U2 is an extension of the multifunction board architecture which uses Blackfin processors to implement the motherboard, module and signal processing functions. The Blackfin is an ideal choice for this use due to its wide application and availability of third party software and design services.
FPGA:	A moderate scale FPGA (Altera Cyclone II family) is added to provide additional flexibility for system functions.
Processor clock rate	500 MHz
Flash Memory:	8 MB for program and data storage
Ferro-Electric RAM:	8 KB for non volatile data storage
SDRAM:	16 MB for program execution
SRAM:	512KB for real time cache
Power:	5V @ 1150 mA (Est. / Typ. Duty cycle)
Weight :	2 oz. (57g)



U2 Processor Module Block Diagram

U2 Processor Description

Based on the Analog Devices Blackfin® BF-533 DSP processor, users can confidently take advantage of the powerful Analog Devices, Inc. (ADI) Visual DSP++ Development Environment. Boards fitted with the U2 Processor allow users to develop application code in support of their I/O and communication intensive application without the need for a separate Single Board Computer. The U2 coupled with NAI's extensive I/O function capabilities and software library support offers developers a real time embedded system environment. Additionally, this low power high performance solution can interface directly to the I/O, perform embedded algorithms and communicate directly to system and sub-system computers. Operating system run-time and overhead are reduced due to direct DSP control. Additional core interfaces added to the FPGA allow for a flexible communication interface selection for controlling I/O specific modules. Reference U2 Programmer's guide for detailed operation documentation.

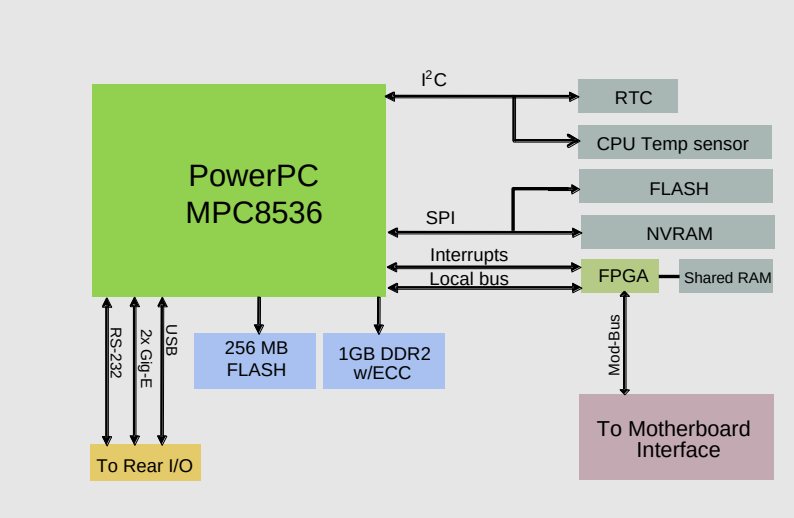
User Requirements/Utility Library

- Analog Devices Visual DSP++ 4.5 (or later version)
- Blackfin Emulator
- NAI I/O and Communications Library support

Processor (Module U3)

PowerPC Processor and General Purpose I/O Resource for User Operational Programs and Control

Processor:	The MPC8536, high-performance member of the PowerQUICC III™ processor family combines a computation-intensive super-scalar Power Architecture™ processor core with high-performance system peripherals and advanced power management techniques. Integrates SATA, USB, multi-lane PCI Express, Gigabit Ethernet, and DDR memory to increase data bandwidths, reduce valuable board real estate, and lower overall power consumption.
Processor Clock Rate:	1.0 GHz
NAND Flash:	256 MB for OS/Application Program
Ferro-Electric RAM:	8 KB for non-volatile data storage
SDRAM:	1 GB for program execution
SPI FLASH :	16 MB for program and data storage
Power:	5V @ 1650 mA (Est. / Typ. Duty cycle)
Weight :	2 oz. (57g)



U3 Processor Module Block Diagram

U3 Processor Description

Based on FreeScale™ MPC8536 processor, users can confidently take advantage of the familiar VxWorks RTC environment for developing control and application software. Boards fitted with the U3 Processor allow users to develop application code in support of their I/O and communication intensive application without the need for a separate Single Board Computer. The U3 coupled with NAI's extensive I/O function capabilities and BSP/library support offers developers a real time embedded system environment. Additionally, this solution can interface directly to the I/O, other cards on the system bus (Bus-Master capability), perform embedded algorithms and communicate directly to system and sub-system computers. Operating system run time and overhead are reduced due to direct processor control.

User Requirements/Utility Library

- VxWorks 6.x Development Environment
- NAI U3 VxWorks 6.x BSP
- NAI I/O and Communications Library support

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