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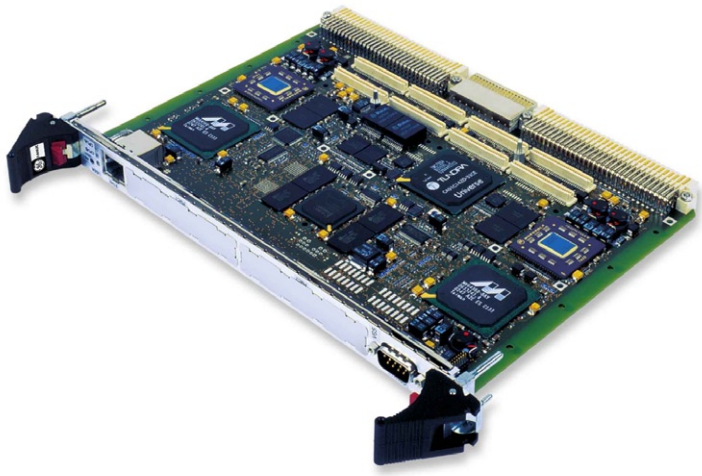
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GE Fanuc
Embedded Systems



VG5

Dual PowerPC® – 7457 6U VME bus Embedded Computer

Features

- Dual or single MPC7457 with AltiVec™, 867-1267 MHz
- Dual chipset design for independent processor nodes
- 64 KB L1 + 256/512 KB L2 cache on-die, 2 MB L3 cache
- VITA 30.1-2001 and ANSI/VITA 20-2001 compliant
- IEEE Std. 1101.2-1992 and ANSI/VITA 20-2001 compliant
- Up to 512 MB DDR SDRAM with ECC for each processor node
- Up to 256 MB flash per node
- 2 x 128 KB NV memory
- Two Gigabit Ethernet ports 10/100/1000 Mb
- Two 10/100 Mb Ethernets
- SATA port
- Chipset integrated ultra fast SRAM (2 Mb)
- Two PMC extension slots
- VME64 interface
- PCI over P0 ready
- Four multi-protocol high-speed serial controllers up to 10 Mbit
- Two serial I/O (RS-232)
- 8 x 32-bit timer/controller
- 8x DMA channels
- 32 general purpose I/Os
- User programmable FPGA for application-specific rear I/O
- RTC, watchdogs, temperature sensors
- Optional -40 °C to +85 °C (with version 2.x or higher)
- Optional conduction cooling
- High shock and vibration immunity
- Optional conformal coating
- Custom specific assembly versions
- RoHS compliant with version 3.x or higher

The VG5 is a dual or single processor VME bus computer board designed to meet the needs of high-performance embedded applications. It addresses such markets as industrial automation, medical, scientific and aerospace where real-time and/or signal processing is needed. Operating system support includes VxWorks®, Linux® and LynxOS®.

The ultra compact 6U single slot, all-in-one design with flexible memory and Flash configurations, and on-board peripherals including up to two Gigabit (VITA 31.1-compliant), two 10/100 Mb Ethernet ports, up to four high speed multi-protocol serial controllers (HDLC, BiSync,..), one serial-ATA compatible port, two PMC extension slots, UARTS, timer/counter and general purpose I/Os. Each processor node has its own memory and its own chipset with peripherals. The two nodes are coupled via the 64-bit/100 MHz PCI-X bus.

Three on-board 64-bit PCI buses are supported in the dual processor version:

- one for 64-bit/100 MHz connection of the processor nodes (PCI-X)
- one exclusively for 64-bit 33/66 MHz PCI PMC site
- one for on-board VME bridge, SATA and the second PMC site (PCI 64/33 MHz)

A specific on-board programmable FPGA for peripheral functions or additional I/Os routes the signal to the P2 connector. This enables the user to add proprietary know-how or just to expand the I/O capabilities of the board, which allows immediate reaction to functional changes without the need for a board re-design and shortens time-to-market. The FPGA programming is supported with the VG5-SDK-FPGA development kit.

Combined with custom assembly for specific applications, the VG5 provides optimum price/performance for all kinds of OEM applications. The VG5 rugged version addresses extreme environment applications with optional conduction cooling, which extends the temperature range to -40 °C to +85 °C (version 2.x), increased shock and vibration immunity using stiffener bars and wedge locks, and conformal coating. The conduction-cooled VG5 complies with VITA 30.1-2001 and IEEE Std. 1101.2-1992 specifications.

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VG5 Dual PowerPC® – 7457 6U VME bus Embedded Computer

Specifications

VME64 - Tundra Universe IID

- Industry standard CA91C142D PCI to VME bus controller
- Full VME bus system controller
- FIFOs for write posting, DMA controller with linked list support
- Master/slave transfer modes
  - BLT
  - ADOH
  - RMW
  - LOCK
- A32/A24/A16 and D64(MBLT)/D32/D16/D8
- Geographical addressing

Single/Dual Processor - MPC7457

- Scaleable processor power from 867 -1267 MHz
- Node A/B: 7457 PowerPC® with AltiVec™ technology
- Contact factory for latest CPU version
- High efficiency onboard switching regulator (DC/DC)
- Fanless cooling with heat sink

Performance (Estimated)

CPU	Frequency	SPECint95	SPECfp95
MPC7457 (dual)	867 MHz	2x 37	2x 28
MPC7457 (dual)	1000 MHz	2x 44	2x 33
MPC7457 (dual)	1267 MHz	2x 57	2x 42
MPC7457 (single)	867 MHz	37	28
MPC7457 (single)	1000 MHz	44	33
MPC7457 (single)	1267 MHz	57	42

Cache	Level 1	Level 2	Level 3
Node A/B 7457	32+32 KB	512 KB	2 MB

Single/Dual Chipset - Marvell MV-64360 for each of two chipsets

- 133 MHz, 64-bit system bus
- Two 64-bit PCI buses (PCI 2.2/PCI-X) (33/66/100 MHz)
- 32-bit up to 133 MHz device bus for Flash, RTC, I/O
- 512 byte posted write and 512 byte read buffer for unlimited DMA bursts between PCI busses and main memory
- 4X DMA controllers for memory and PCI bus transfers
- 4X 32-bit timer/counter for system timing or periodic interrupts
- I2O intelligent I/O support with message and door bell registers
- 2 Mb SRAM

External Synchronization

- The internal system clock can be synchronized by external clock source (typically 16.66 MHz); clock range 10 to 20 MHz
- On request, contact factory for more information

Memory - DDR SRAM

- 256 MB to 512 MB, 72-bit wide with error correction (ECC) for each processor node
- Rugged design with onboard soldered chips

Flash (Boot ROM Integrated)

- Up to 256 MB, 32-bit, high speed for processor node A
- Up to 256 MB, 32-bit, high speed for processor node B. Flash is not available if VG5 is in single node configuration.
- Boot device select for node A (Bank 1 of 2)
- Hardware write protection
- Rugged design with onboard soldered chips

One Serial ATA Channel

- One serial ATA with rear I/O at P0 (rear I/O of PMC1 only, partially available)
- Version 3.x or higher: SIL3512 SATA controller
- Previous versions: SIL3112 SATA controller

Non-Volatile Memory

- 2 X 128 KB non volatile memory realized with serial EEPROM

Ethernet - Marvell MV-64360

- Two integrated Ethernet controllers per chipset, connected via internal crossbar (main memory, PCI buses, DMA controllers)
- One or two* 10/100/1000 Mb/s Ethernet ports: auto negotiation interface, VITA 31.1-compliant
- One or two* fast Ethernet ports: 10/100 Mb/s auto-negotiation interface
- One or two* Gigabit channels available at P2 rear I/O or front I/O
- One or two* 10/100 Mb channels at P2 rear I/O or front I/O

** Second Gigabit and second 100 Mbchannel only w/dual node*

Dual PMC Extension Slot - IEEE P1386/1386.1

- IEEE Std. 1101.2-1992 and ANSI/VITA 20-2001 compliant
- PMC1 64-bit/33 MHz, 66 MHz and full rear I/O at P0 (PCI)
- PMC2 64-bit/33 MHz and full rear I/O at P0 (not available with front I/O COM and Ethernet) (PCI)
- Ready for PCI over P0
- Trace length PMC1 I/O to P0 4 cm maximum and impedance controlled

High Speed Serial I/O - RS-232/422/485

- Up to four (two per node) multi protocol serial controllers (MPSC) MV-64360 up to 10 Mb[5] each
- HDLC, BiSync, FM0/1, UART, transparent protocols NRZ, NRZ1, FM0/1, Manchester, differential Manchester
- Dedicated DPLLs for clock recovery and data encoding
- Three internal Baud rate generators or external clocks
- RxD, TxD, RTS, CTS, CD, TxClk (in/out), RxClk (in/out)

Serial I/O - RS-232/422/485

- Two async. 16550 compatible full duplex serial RS-232 channels
- High speed transfer up to 115.2 Kbaud with 16 byte FIFOs
- Up to four (two per node) high speed multi protocol serial controllers (MPSC)
- COM2 interface software selectable between RS-232 and RS-422/485

COM1	UARTRS-232[1], max. 115 Kb, (rear I/O P2) RxD, TxD (front) RxD, TxD, DCD, DSR, RTS, CTS, DTR, RI
COM2	MPSC (rear)[1] full RS232 (115 Kb) or RS422/485 sync/async, (front)[3] full RS232 or RS422/485 (250 Kb) sync/async
COM3	MPSC (rear)[1] RS422/485 sync/async, 10 Mb[5]
COM4	UART RS2322 (rear I/O P2) RxD, TxD\, 115 Kb
COM5	MPSC (rear)[2,4] RS422/485 sync/async, 10 Mb[5]
COM6	MPSC (rear)[2,4] RS422/485 sync/async, 10 Mb[5]

[1] From processor node A
[2] From processor node B
[3] PMC2 not useable
[4] Not available in single processor configuration
[5] VG5 2.x: 10 Mb with clock recovery, 64 Mb with external clock
VG5 1.x: 8.3 Mb with clock recovery, 64 Mb with external clock

General Purpose IO and User Programmable Gate Array for additional I/O capabilities supported by FPGA Development Kit VG5- SDK-FPGA

- Up to 32 general purpose inputs/outputs (LVTTL)* with flexible programmable routing to node A or B
- All inputs can generate interrupt
- User programmable gate array for additional I/O capabilities supported by FPGA development kit VG5-SDK-FPGA

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- Routes signals to the P2 connector

  ** PMC2 rear I/O not available in this case*

Real Time Clock
- +5 V standby backup from VME bus backplane

One Watchdog Per Node
- 32-bit counters (16-bit useable), 500 µs to 32 s
- Activates NMI and/or Reset after a programmable period

Temperature Sensors
- SW readable from -55 °C to +125 °C, in 0.5 °C increments
- Three sensors: one at CPU A near top card edge, one sensor at CPU B near bottom card edge, one sensor near center of card

LED Indicators
- Two system LED indicators, 1 User LED indicator

JTAG Interface
- Processor, VME bus controller and others
- Onboard and rear I/O

COP Interface
- Debug interface for external emulator
- Front panel and rear I/O for each processor

BIT
- BIT will verify hardware functional integrity

Styles

(non-RoHS)	C	I	R	N
(RoHS)	1	3	6	8
Front panel	√	√	√	-
Front stiffener	-	-	-	-
Middle stiffener	-	-	√	√
Wedge-locks	-	-	-	√
Parts soldered	-	-	√	√
Extended temperature	-	√	√	√
Conformal coating	-	-	√	√
Conduction-cooled	-	-	-	√

Front Panel and Rear I/O (Transition Module VTM20)
- PMC I/O slot 1 with full rear I/O support or partial configuration with serial ATA feature
- PMC I/O slot 2 available in full or partial configuration

Function	Full PMC2-I/O	Partly PMC2-I/O	Front Panel I/O
COM 1	Yes	Yes	Yes
COM 2	Yes	Yes	Yes[1]
COM 3 to 6	Yes	Yes	-
Gigabit Eth. Ch 1	Yes	Yes	Yes[1]
Fast Et. Ch 2	Yes[2]	Yes[2]	Front[2]
Gigabit Eth. Ch 3	Yes	Yes	-
Fast Et. Ch 4	Yes	Yes	-
PMC 1	64-pin	64-pin	Yes
PMC 2	64-pin	-	Yes
Reset	Reset	Yes	-
Watchdog	-	Yes	-
BootSel	Yes	Yes	-
Card Fail	Yes	Yes	LED
User LED	-	-	LED
COP node 1/2	-	Yes	-
GPIO	-	Yes	-

[1] PMC slot 2 not available with optional front I/O

[2] Front or rear I/O

Power Requirements
- +5 V, +3.3 V Required
- ±12 V Only if required by mounted PMC module

Power Consumption
- +5 V, +3.3 V, typical current
- Power measured at VxWorks prompt
- 256 MB memory, without PMC module

CPU	Frequency	+5.0 V	+3.3 V
7457 (dual)	867 MHz	3.5 A	5.7 A
7457 (dual)	1000 MHz	3.9 A	5.7 A
7457 (dual)	1267 MHz	6.8 A	5.8 A
7457 (single)	867 MHz	2.0 A	3.1 A
7457 (single)	1000 MHz	2.2 A	3.1 A
7457 (single)	1267 MHz	3.6 A	3.1 A

Mechanical
- 6U, 1 slot wide (233 x 160 x 20.32) mm

Temperature - (Except conduction cooled style)
- For detailed information about the operating temperature behavior of the board it is absolutely necessary to consult the manual. The highest achievable operating temperature depends on processor type, single or dual node, speed, altitude, ambient conditions and the type of cooling influences the board temperature range.
- All values under typical conditions without a PMC module

	Operating	Storage
Standard	0 °C to +70 °C	-40 °C to +85 °C
Extended	-40 °C to +85 [1] °C	-40 °C to +85 °C

[1] with version 2.x

Humidity
- Operating: 5 – 95 % @ 40 °C
- Storage: 5 – 95 % @ 40 °C
- Non-condensing

Altitude
- Operating: 15,000 ft. (4.5 km)
- Storage: 40,000 ft. (12 km)
- Vacuum for conduction cooled board (contact factory)

Shock (3 axis, up & down, 5 hits/direction)
- Style C, I, 1, 3: 12 g/6 ms
- Style R, 6: 20 g/6 ms
- Style N, 8: 100 g/6 ms, 40 g/11 ms

Vibration (30 minutes each axis)
- Style C, I, 1, 3: 2 g rms @ 5 to 100 Hz
- Style R, 6: 2 g rms @ 5 to 2000 Hz
- Style N, 8: 14 g rms @ 5 to 2000 Hz

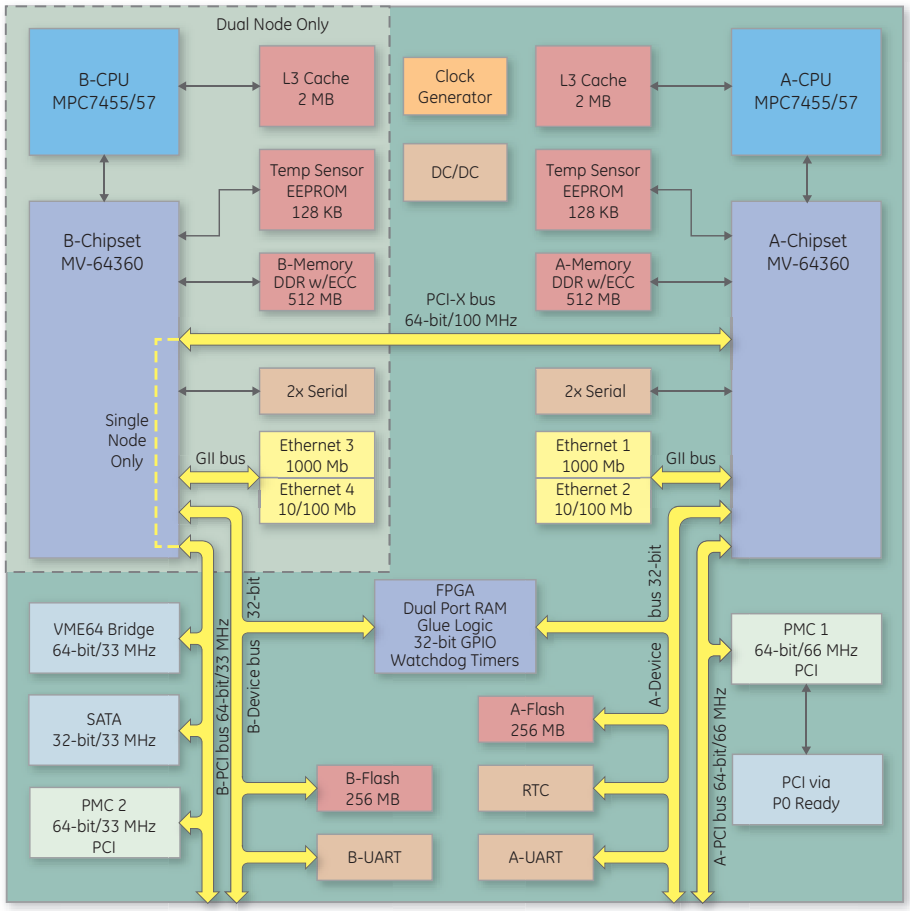
MTBF
- Calculations are available in accordance with MIL-HDBK-217 FN2

Safety
- All PWBs are manufactured with flammability rating of 94V-0 by UL recognized manufacturer
- Designed to meet standard UL 60950

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VG5 Dual PowerPC – 7457 6U VME bus Embedded Computer

Block Diagram



About GE Fanuc Embedded Systems

GE Fanuc Embedded Systems is a leading global provider of embedded computing solutions for a wide range of industries and applications. Our comprehensive product offering includes many types of I/O, single board computers, high performance signal processors, fully integrated, rugged systems including flat panel displays, plus high speed networking and communications products. The company is head-quartered in the U.S. and has design, manufacturing and support offices throughout the world. Whether you're looking for one of our standard products or a fully custom solution, GE Fanuc Embedded Systems has the breadth, experience and 24/7 support to deliver what you need. For more information, visit www.gefanucembedded.com.

GE Fanuc Embedded Systems Information Centers

Americas:
1 800 322 3616 or 1 256 880 0444

Asia Pacific:
86 10 6561 1561

Europe, Middle East and Africa:
+49 821 5034-0

Additional Resources

For more information, please visit the GE Fanuc Embedded Systems web site at:

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