



# VG4

## Single Slot PowerPC™ 7410/75x 6U VMEbus Embedded Computer

SINGLE BOARD  
COMPUTERS

### Features

- 7410/755/750, 500 MHz 7410 with AltiVec™ technology
- 2/1 MB L2 Cache, 1.6 GB/s
- Ultra compact, 1 slot only
- CHRP architecture
- VxWorks®, LynxOS®, Linux® support
- Up to 512 MB, 100 MHz SDRAM with ECC
- Up to 64 MB Flash, 64-bit
- 512 KB Boot Flash
- 4x Timer/Counter
- 32 kB AutoStore nvSRAM
- Fast Ethernet 10/100 Mbit
- Wide SCSI up to 40 MB/s
- MIL-STD-1553
- Two PMC extension slots
- Four serial I/O with FIFOs; two asynchronous RS-232, two asynchronous/synchronous RS-232/422/485
- IEEE 1284 parallel port
- USB, mouse, keyboard
- Seven timer/counters
- Two DMA channels
- 16 bit General purpose I/O
- RTC, Watchdog, temperature sensor
- Single +5 volt supply only
- Optional -40°/+85° C
- Conduction cooling
- High shock and vibration immunity with stiffener bars and wedge locks
- Conformal coating
- Custom specific, low cost assembly versions



**VG4** is a 6U VMEbus all-in-one PowerPC™ single board computer designed to meet the needs of embedded application developers addressing markets like industrial automation, medical, scientific, imaging, telecommunications, military and aerospace.

The ultra compact single slot, all-in-one design with flexible processor and memory configurations, and an impressive array of on-board peripherals includes Fast Ethernet, Wide-SCSI, optional MIL-STD-1553, and two PMC extension slots. Combined with a custom specific assembly service, VG4 provides optimized price/performance for a variety of OEM applications.

Rugged needs are addressed with optional conduction cooling and extended temperature range of up to -40°C to +85°C, increased shock and vibration immunity using stiffener bars and wedge locks, and conformal coating.

Special features include COM1-2 with RS-232 and COM3-4 with RS-232/RS-422/485, two DMA controllers, seven timers, 32 Kbytes non-volatile SRAM, single +5V supply, RTC, watchdog, temperature sensor and I2 O intelligent I/O support. Supported operating systems are VxWorks® and LynxOS®.

# Specifications

## VME64 - Tundra Universe IIB

- Industry standard CA91C142B PCI to VMEbus controller
- Up to 60-70 MB/s transfer rate (64-bit MBLT, coupled transfer, transfer rate depends on slave access speed)
- Full VMEbus controller FIFOs for write posting
- DMA controller with linked list support
- Master/slave transfer modes: BLT, ADOH, RMW, LOCK, RETRY, A32/A24/A16 and D64(MBLT)/D32/D16/D8

## Processor - BGA

- Scaleable processing power with flexible processor design
- Motorola PowerPC™ 755, 400 MHz
- IBM PowerPC 750™, 500 MHz
- Motorola PowerPC™ 7410, 500 MHz with Altivec™ technology (See price list for latest CPU versions)
- High efficiency on-board switching regulator (DC/DC)
- Fanless cooling with heatsink

## Performance

CPU	Frequency	SPECint95	SPECfp95
755	400 MHz	~18.8	~12.2
7410	500 MHz	~23.7	~20.0
750	500 MHz	~23.5	~15.2

## Chipset - MPC107

- 100 MHz, 64-bit wide system bus
- PCI burst mode transfers faster than 110 Mbytes/s, 32 bit wide PCI bus (33 MHz)
- 2 DMA controllers for lots of memory and PCI bus transfers
- Four 32-bit timers for system timing or periodic interrupts
- I<sup>2</sup>O intelligent I/O support with message and door bell registers

## Cache

	Level 1	Level 2
75x	64 kB	1 MB
7410	64 kB	2 MB

Level 2 peak bandwidth 1.6 GB/s at 200 MHz, 1.3GB/s at 166MHz

## Memory - PC100

- High-speed 100 MHz SDRAM
- 64 to 512 Mbytes, 72-bit wide with error correction (ECC)
- Rugged design with soldered chips

## FlashDrive - Up to 64 MB

- 16 to 64 MB, 72-bit wide direct memory mapped Flash memory with software selected write protection
- 512 Kb Boot-Flash, 8-bit wide, Boot-Select via jumper or rear I/O

## nvSRAM - STK 14C88

- 32 Kb non-volatile SRAM
- Automatic data transfer to/from EEPROM on power-up/down meets safety and reliability

## Fast Ethernet - DEC 21143

- 10/100 Mbits/sec controller with PCI local bus DMA
- 10BaseT and 100BaseTX auto-negotiation interface

## Wide SCSI - SYM 53C875

- Wide SCSI controller with PCI local bus DMA
- SCSI transfer speed up to 40 MB/s
- Active low power termination on-board

## MIL-STD-1553 - DDC BU-61688

- 1553 device supporting BC, RT and MT mode, 128 KB shared RAM
- Transceiver with long and short stub interface

## PCI-ISA Bridge - ALI M1543C

- PCI-ISA bridge w/ keyboard, mouse, serial, parallel and USB controller

## Two PMC Extension Slots - IEEE P1386/1386.1

- 32-bit PCIbus interface with front-panel I/O and rear I/O
- Supports ccPMC Draft standard Vita 20 - 199x with N-style

## Four Serial I/O - ALI M1543C/Z85230

- Two asynchronous 16550-compatible full-duplex serial RS-232 channels, when no SCSI is used
- High-speed transfer up to 115.2 kbaud with 16 byte FIFOs
- Two synchronous/asynchronous channels (HDLC/SDLC), 2.5 MB/s (sync.) or 38.4 kB/s (async.), RS-232 or RS-422/485 interface
- COM1: RS-232 RxD, TxD, DSR (optional RTS, CTS, DTR)
- COM2: RS-232 RxD, TxD, (optional DSR, RTS, CTS, DTR)
- COM3: RS-232 RxD, TxD, RTS, CTS, DSR, DCD, DTR  
RS-422/485 RxD, TxD, TxC (sync.), RxC (sync.)
- COM4: RS-232 RxD, TxD, RTS, CTS, DSR, DCD, DTR  
RS-422/485 RxD, TxD, TxC (sync.), RxC (sync.)

## Parallel Port - ALI M1543C

- Bi-directional, IEEE 1284-compatible enhanced parallel port

## Counter/Timer - Z8536

- Three 16-bit timers, two can be linked to form a 32-bit timer

## General Purpose I/O

- 16 (8 in, 8 out) bit digital I/O (TTL)
- Input pins with Interrupt capability

## BIT

- A Power-Up-BIT (PBIT) will be performed to provide confidence that the hardware is operating correctly

## USB

- 12 Mb/s universal serial bus channels
- For software support please contact factory

## Keyboard and Mouse

- PS/2 compatible
- For software support please contact factory

## Real-Time Clock

- RTC 146818 compatible

## Backup

- On-board Li-battery (120 mAh, -40° to +150°C) or +5V standby

## Watchdog

- Activates reset under software control

## Temperature Sensor

- Local temperature software readable from -55°C to +125°C, 0.5°C increments
- Remote temperature (CPU case) software readable from 0°C to +127°C, 4°C increments

## Status LEDs

- Card fail (red) user programmable
- Ethernet link (green)
- User LED (red)

## JTAG Interface

- Processor, VMEbus controller and others

### COP Interface

- Debug interface for external emulator (not with MIL-1553)

### Power Requirements

- +5V: Required
- ±12V: Only if required by mounted PMC module

**Power Consumption** - +5 Volts, typical current  
128 MB RAM without module

CPU	Frequency	Current
755	400 MHz	2.9 A
750	500 MHz	2.9 A
7410	500 MHz	3.2 A

### Power Allowances - PMC Slot (each)

- +5V, +3.3V: 7W total power max.
- ±12V: 50 mA each

### Mechanical

- 6U, 1-slot wide
- 233mm x 160mm x 20mm

### MTBF

- Calculations are available in accordance with MIL-HDBK-217. Please contact factory for details.

### Safety

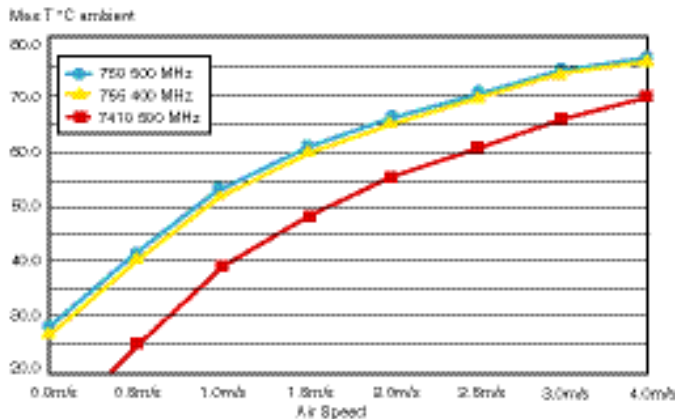
- All PWBs are manufactured with a flammability rating of 94V-0 by a UL recognized manufacturer.

### Temperature Ranges (except N-style)

Highest reachable operating temperature depends on processor type, speed and ambient conditions (airflow) as shown below  
All values under typical conditions without PMC module

	Operating*1	Storage*1
Standard	0°C to +70°C	-40°C to +85°C
Extended	-40°C to +80°C	-40°C to +85°C

\*1 Complete board may be limited to a smaller temperature range by mounted PMC module



### Extended Temperature Ranges (N-style)

Highest reachable operating temperature depends on processor type, speed & ambient conditions (card edge temp.) as shown below  
All values under typical conditions without ccPMC module

	Operating*1	Storage*1
Extended	-40°C to +85°C	-40°C to +85°C

\*1 Complete board may be limited to a smaller temperature range by mounted ccPMC module

CPU	Frequency	Max Card Edge Temp. *1
755	400 MHz	85°C
750	500 MHz	83°C
7410	500 MHz	78°C

\*1 For further information a Thermal Report for VG4 is available. Contact factory.

### Humidity

- Operating: 5 - 95% @ 40°C
- Storage: 5 - 95% @ 40°C

### Altitude

- Operating: 15,000 ft (4.5 km) altitude
- Storage: 40,000 ft (12 km) altitude  
(Vacuum for N-Style)

### Shock and Vibration (C-, I-, R-style)

- C-, I-style: 12g / 6ms, 2g rms @ 5Hz to 100Hz
- R-style: 20g / 6ms, 2g rms @ 5Hz to 2000Hz

### Shock and Vibration (N-style)

- 40g / 11ms
- 14g rms @ 5Hz to 2000Hz, 30 minutes each axis

## Styles

Front Panel	C	I	R	N
Front Panel	✓	✓	✓	-
Front stiffener	-	-	-	✓
Middle stiffener	-	-	✓	✓
Wedge locks	-	-	-	✓
Parts soldered	✓	✓	✓	✓
Li-Battery	✓	✓	✓	-
Extended Temperature	-	✓	✓	✓
Conformal coating	-	-	✓	✓
Conduction cooled	-	-	-	✓

## Front and Rear I/O (Transition Module)

Function	Full PMC-IO*2	Partial PMC-IO*2	Front Panel
COM1	10-Pin (3)	10-Pin (6)	-
COM2	10-Pin (2)	10-Pin (6)	-
COM3	10-Pin (7/8)	10-Pin (7/8)	-
COM4	10-Pin (7/8)	10-Pin (7/8)	-
10/100BaseTX	10-Pin	10-Pin	-
SCSI*4	50-Pin	50-Pin	-
SCSI*4	68-Pin	68-Pin	-
GPIO*4	16-Pin	16-Pin	-
PMC1	64-Pin	64-Pin	Yes
PMC2	64-Pin	64-Pin (37)	Yes
Keyboard	*1	*1	-
Mouse	*1	*1	-
USB1	*1	*1	-
USB2	*1	*1	-
Reset	*1	*1	Button*5
Watchdog	*1	*1	-
BootSel	*1	*1	-
CardFail	*1	*1	LED*5
User	*1	*1	LED*5
Link	-	-	LED*5
LPT1	-	26-Pin	-
MIL-1553*3	10-Pin	10-Pin	-
COP*3	20-Pin	20-Pin	20-Pin*5
JTAG*3	10-Pin	10-Pin	-

\*1 Multi-I/O connector w/ Keyboard, Mouse, two USB, Reset, Watchdog, BootSel, LEDs

\*2 Versions available with full PMC Rear I/O or partly Rear-I/O

\*3 JTAG/COP not with MIL-1553

\*4 No GPIO when SCSI is used

\*5 Not with R-style

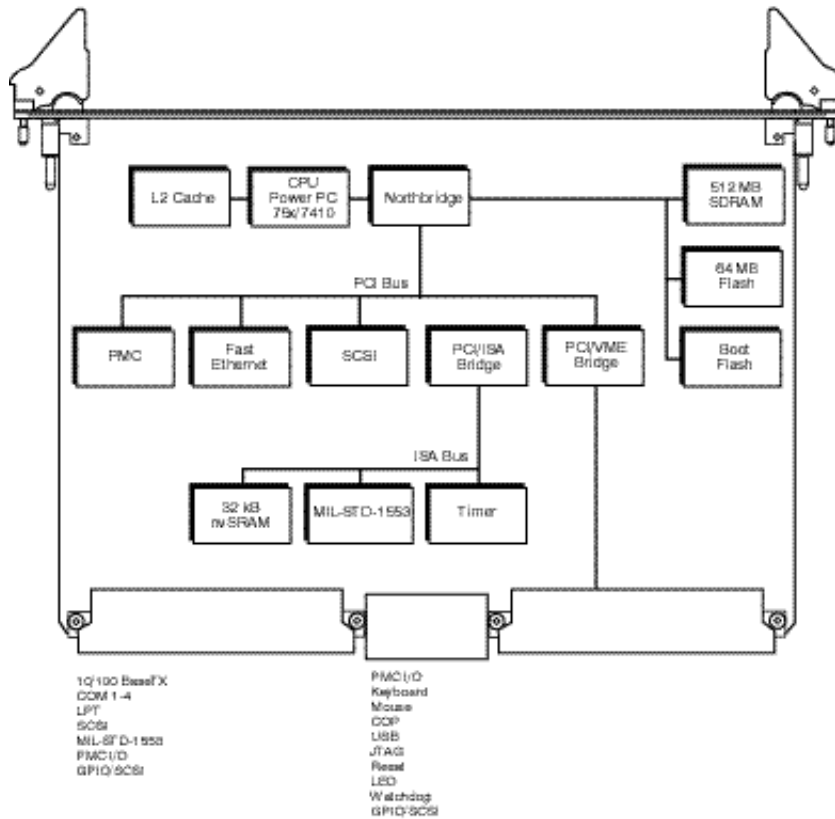
(x) Values in brackets represent available signals

See also Four Serial I/O and Two PMC Extension Slots



# VG4

## Block Diagram



## Ordering Information

### Hardware Accessories

VGTM	I/O transition module for VME-64 backplane
SC306HS18G	3U, 06TE, SCSI hard disk 3.5", 18.1 GB
YLBCOM304A	Flat cable for 2x COM, 3U/4HP front-panel
YLBLPT308D	Flat cable for LPT, Ethernet (RJ45), keyboard & mouse (two miniDIN), 3U/8HP front-panel
YLBSCSI304A	Flat cable for external SCSI drive, 60 cm, 3U/4HP front-panel, 50-pin Centronics connector

### Chassis

SCC784TM05VG4  
 Starter cage: 19", 7U, 84TE card cage, 5x 6U VME64 slots; three fans, 250W power supply +3.3V/12A, +5V/22A, +12V/7A, -5V/0.3A, -12V/0.8A, EMC, SCSI CD-ROM, I/O transition module (VGTM), SCSI HDD 18 GB, FP I/O, YLBLPT08D, YLBCOM304A, 0°C/+50° C  
 Special chassis, supplies, backplanes and drives on request

### Operating Systems

VXW-BVG4	VxWorks board support package, Tornado 2 (with VMEbus driver)
LYNX-BVG4	LynxOS board support package

LinuxOS board support package available upon request.

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