GE Fanuc Automation

VMIPCI-5565 Specifications



Ultrahigh Speed Fiber-Optic Reflective Memory with Interrupts

Features:

- High speed, easy to use fiber-optic network (2.12 Gbaud serially)
- Data written to memory in one node is also written to memory in all nodes on the network
- Up to 256 nodes
- Connection with multimode fiber up to 300m, single mode fiber up to 10km
- Dynamic packet size, 4 to 64 bytes of data
- Transfer rate 47.1MB/s (4 byte packets) to 174MB/s (64 byte packets)
- 64MB or 128MB SDRAM Reflective Memory
- Two independent DMA channels
- Any node on the network can generate an interrupt in any other node on the network or in all network nodes with a single command
- Error detection
- Redundant transfer mode for extra error suppression
- No processor overhead
- No processor involvement in the operation of the network
- PCI 64-bit 66MHz transfers
- PCI revision 2.2 compliant
- VMISFT-RFM2g network and shared memory driver included
- Operating system/driver support for Windows NT®, Windows® 2000, VxWorks®, and Linux®

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Embedded Systems

PCI Initiator/Direct Memory Access (DMA) Capabilities: The VMIPCI-5565 supports DMA operations. The DMA sequence is initialized by a few control register writes to the VMIPCI-5565 by the host. Therefore, the VMIPCI-5565 becomes a PCI initiator and moves the specified block of data up to 64MB without further host attention. The PCI architecture ensures that the VMIPCI-5565 does not monopolize the PCI bus and causes the VMIPCI-5565's DMA engine to automatically split large blocks in small bursts. The VMIPCI-5565 can be programmed to issue a PCI interrupt upon completion of DMA process. There are two independent DMA engines, each capable of reading or writing. It is possible for a Read DMA and a Write DMA to occur simultaneously.

Error Management: Errors are detected by the VMIPCI-5565 with the use of the error detection facilities of the Fibre Channel encoder/decoder and additional cyclic redundant encoding and checking. When a node detects an error, the erroneous transfer is removed from the system and an interrupt is generated, if enabled.

Protection Against Lost Data: The product is designed to prevent either FIFO from becoming full and overflowing. It is important to note the only way that data can start to accumulate in FIFOs is for data to enter the node at a rate greater than the network data rate. Since data can enter from the fiber and from the PCI bus, it is possible to exceed these rates. If the transmit FIFO becomes half-full, a bit in the Status Register is set. This is an indication to the node's software that subsequent WRITEs to the Reflective Memory should be suspended until the FIFO is less than half-full. Once the transmit FIFO is almost full, writes to the Reflective Memory will be acknowledged with a STOP*. No data will be lost.

If the receive FIFO is allowed to become almost full, there is a danger the receiver FIFO may overflow resulting in data loss. In order to prevent this situation, all PCI writes will be acknowledged by a STOP* until the receiver FIFO is less than almost full.

Redundant Transfer Mode: The VMIPCI-5565 can optionally be placed in the redundant transfer mode by the removal of a board jumper shunt. While in the redundant transfer mode, each packet sent on the network by the transmitter is sent twice, regardless of the dynamic packet size. The receiving circuitry of each node on the network evaluates each of the redundant transfers. If no errors are detected in the first transfer, it is used to update the onboard memory and the second transfer is discarded. If, however, the first transfer does not contain an error, the second transfer is used to update the onboard memory provided it has no transmission error. In the remote chance that both redundant transfers contain an error, neither transfer is used and the data is completely removed from the network.

The redundant transfer mode greatly reduces the chance that any data is dropped from the network. However, the redundant transfer mode also reduces the effective network transfer rates. The single Lword (4 byte) transfer rate drops to approximately 20MB/s. The 16 Lword (64 byte) transfer rate drops to the redundant rate of 87MB/s.

Network Monitor: There is a bit in a Status Register that can be used to verify that data is traversing the ring (that is, the ring is not broken). This can also be used to measure network latency.

VMISFT-RFM2g Network and Shared Memory Driver: The VMISFT-RFM2g network and shared memory driver provides an applications program with three convenient methods for exchanging data among hosts connected to the same RFM network:

1) **Programmed I/O (Peek and Poke):** An applications program can treat the memory on the RFM device as ordinary memory in which the program can use ordinary load and store accesses.

2) **DMA:** On systems where the performance penalty for individual bus accesses is unacceptably high, the driver utilizes the DMA feature available on some RFM devices in order to transfer data in variable-sized blocks. On UNIX systems, an applications program uses the familiar `lseek(2)/read(2)/write(2)` system calls to perform the data movement, while on other operating systems a GE Fanuc Embedded Systems-provided application program interface (API) is used for data movement.

3) **User Interrupts:** The VMIPCI-5565 provides three network interrupts. Any processor can generate an interrupt on any other node on the network. In addition, any processor can generate an interrupt on all nodes on the network with a single register write.

Specifications

Memory Size: 64 or 128 MB

PCI Transfer Rate: 264 MB/s (33MHz/64-bit bus) or 528MB/s (66MHz/64-bit bus)

Throttles back to available link data rate as FIFOs begin to fill

Transfer Specification

Network Nonredundant Transfer Rate: 47.1MB/s (single longword accesses) to 174MB/s (64 byte bursts)

Network Redundant Transfer Rate: 20MB/s (single longword accesses) to 87MB/s (64 byte bursts)

Cables

Multimode Fiber Cable: Small form factor (SFF)
850nm, 970 ft, multimode LC connector

Single Mode: Small form factor (SFF)
1,300nm, single mode, 10km or 6.21 miles

Physical/Environmental Specifications

Power Requirements:
+3.3VDC (±5 percent), 1.5A maximum

Temperature:
Operating: 0 to +65° C with forced air cooling
Storage: -40 to +85° C

Relative Humidity: 20% to 80%, noncondensing

MTBF: Contact factory

Regulatory: The VMIPCI-5565 has been tested to and found to meet the requirements of the following standards.

European Union (CE Mark)
EN55024
EN55022 Radiated Emissions Class B
EN61000-4-2 (ESD)
EN61000-4-3 (Radiated Immunity)
EN61000-4-4 (EFT)
EN61000-4-5 (Surge)
EN61000-4-6 (Conducted RF)

United States
FCC Part 15, Class B

Canada
ICES-003, Class B

Data Transfers

Data written into the Reflective Memory is broadcast to all nodes on the network without further involvement of the sending or receiving nodes. Data is transferred from memory locations on the sending nodes to corresponding memory locations on the receiving nodes.

A functional block diagram of the VMIPCI-5565 is shown in Figure 1 and a network example using Reflective Memory in Figure 2.

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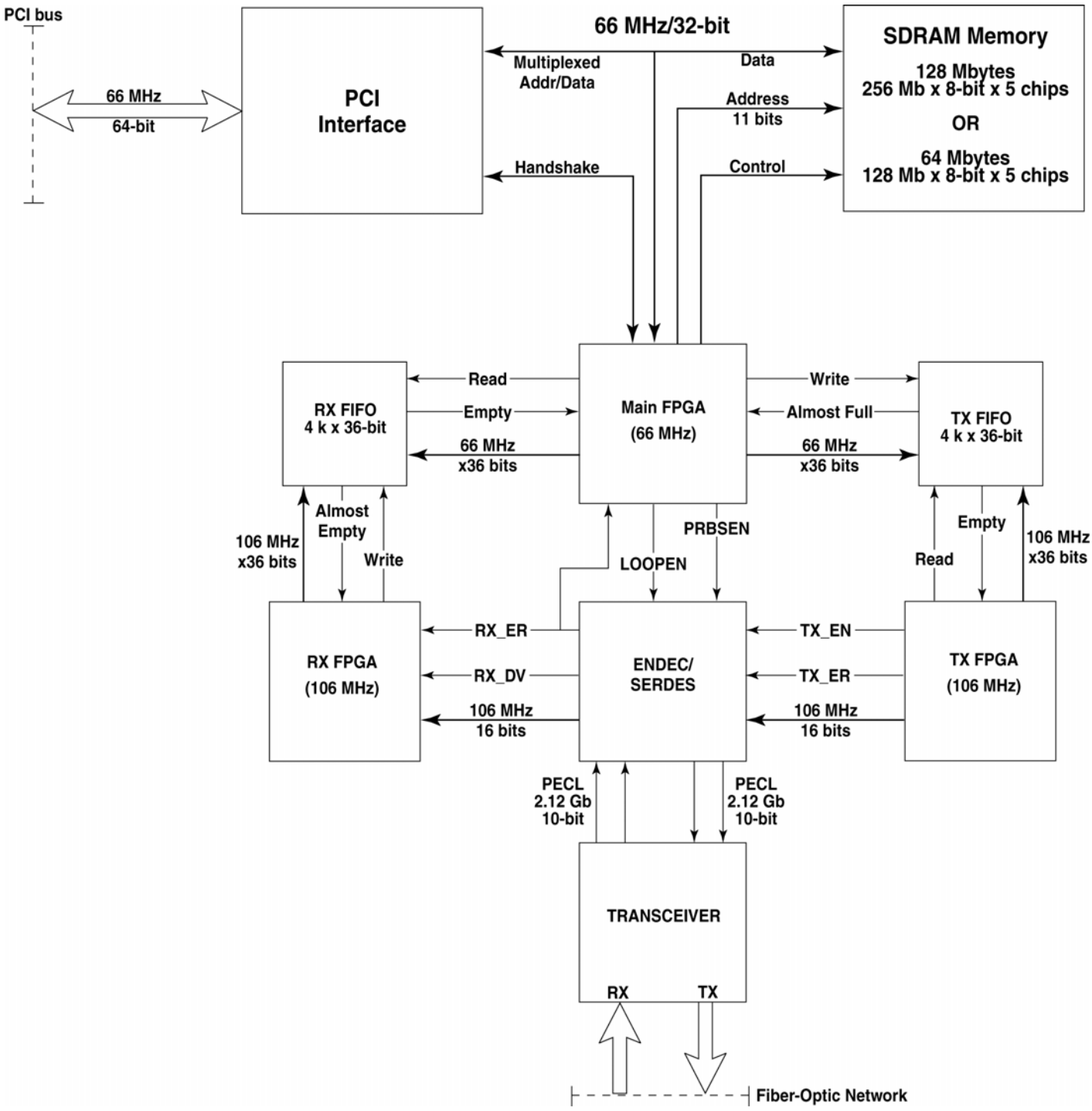


Figure 1. VMIPCI-5565 Functional Block Diagram