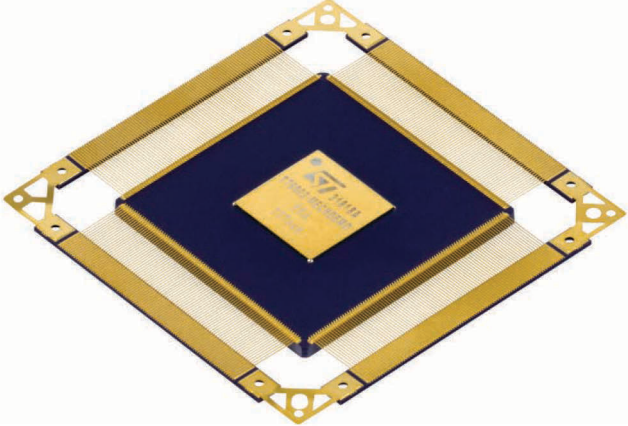# ^{TTE}End System Controller Space

TT6802-3-SE-C Integrated TTEthernet® Interface Controller

Key Features

- ✔ Three supported traffic classes
  - Standard Ethernet (IEEE 802.3)
  - Rate-constrained (ARINC 664 p7)
  - Time-triggered (SAE AS6802)
- ✔ Three Ethernet channels, full duplex at 100/1000 Mbit/s
- ✔ 1 MByte of internal memory
- ✔ 352 pin CQFP package
- ✔ Junction temperature: -40 °C to +125 °C
- ✔ Rad-hard design

The ^{TTE}End System Controller Space is an integrated communication controller that supports standard Ethernet, rate-constrained traffic according to ARINC 664 part 7, and time-triggered traffic according to the SAE AS6802 Time-Triggered Ethernet Standard. Three different host interfaces (SPI, PCI and SpaceWire) provide flexibility to connect the TTEthernet® controller to different CPUs or FPGAs. The chip is based on a radiation-hardened 65 nm design process and packaged in a hermetic housing. This ensures high reliability in harsh environments requiring radiation and latch-up tolerance for applications like spacecrafts, space stations, satellites, etc.

TT6802-Device Family for Synchronized and Non-Synchronized Functions over Ethernet

The ^{TTE}End System Controller Space is part of the TT6802-device family that includes communication controllers and switches available as both industrial- and space-graded products, which are usable as building blocks for TTEthernet® data networks. TTEthernet® enables the integration of synchronized and non-synchronized functions in Ethernet-based distributed systems. TTEthernet® allows hard real-time functions to enjoy reserved bandwidth, full determinism and delivery jitter below 1 µs, by simultaneously operating ARINC 664 part 7 and standard IEEE 802.3 Ethernet traffic without impact on time-critical and synchronized functions.

Support for Single to Triple-Channel Network Architectures

TTEthernet® supports single to triple-channel multi-hop networks with system synchronization, redundancy management, fault-tolerance, fault isolation and recovery capability to enable a safety-critical system design. Distributed functions can utilize scalable QoS for different data streams and share a common Ethernet network without unintended interactions for critical traffic.

Application Fields

- Human space flight
- Exploration missions
- Space robotics

© NASA

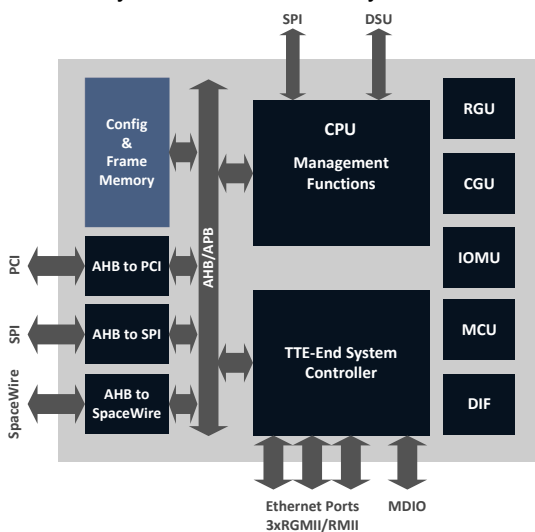## ^{TTE}End System Controller Space Benefits

The ^{TTE}End System Controller Space provides support for fault-tolerant, up to 1000 Mbit/s high-speed data communication in a single device. The ^{TTE}End System Controller Space offers superior reliability for the full temperature and radiation range required for space applications like spacecrafts as well as space stations and is qualifiable according to international space standards.

Quality of Service and Partitioning

The ^{TTE}End System Controller Space supports 256 transmit and 512 receive virtual links which can be separated via eight memory partitions. This allows using standard Ethernet traffic and time-triggered or rate-constrained traffic on the same physical network without interference.

General Product Features

- Suitable for highly reliable, distributed real-time systems with guaranteed response time
- Support of the three TTEthernet® traffic classes:
  - Standard Ethernet (IEEE 802.3)
  - Rate-constrained (according to ARINC 664 part 7)
  - Time-triggered (according to SAE AS6802)
- 256 transmit virtual links (VLs), 512 receive VLs
- 2048 transmit and 4096 receive COM ports
- Flexible configurable periods (1 µs granularity)
- IP/UDP processed in hardware for RC and TT
- ICMP available
- Diagnosis and status registers
- 1 MByte of internal memory

Connectivity

Network:
- 3x 100/1000 Mbit/s via RGMII
- 3x 100 Mbit/s via RMII

Host Interfaces
- PCI 32 Bit / 33.3 MHz, 3.3 V
- Quad-/Dual-/Single-SPI with clock frequency up to 60 MHz
- SpaceWire, 100 Mbit/s supporting RMAP protocol

Power Supply and Consumption

- Power supply: 1.2 V (core) and 2.5 or 3.3 V (I/O)
- Typical power consumption of 0.8 to 1.2 W

Management CPU

- Integrated LEON2FT CPU operating at 125 MHz
- Usable for device management and status monitoring as well as integrated host

Environmental

- Junction temperature range -40 °C to +125 °C
- Radiation tolerance for total dose up to 300k rad
- Latch-up immunity up to 60 MeV/cm2/mg

Package & Quality Level

- CQFP (Ceramic Quad Flat Pack) with 352 pins
- QML-V

Related Products

- ^{TTE}Tools is a PC based tool chain that supports the generation of network configuration files
- ^{TTE}Switch Controller Space TT6802-3-SW-C
- ^{TTE}End System Space 3U cPCI (FLIGHT) cards

Ordering Codes

- 14152 (TT6802-3-MD – Mech. Demo)
- 14433 (TT6802-3-SE-C-EM – Engineering Model)
- 14425 (TT6802-3-SE-C-FM – Flight Model)

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