MIL-STD-1553 Terminal with Integrated Transformers Providing Compatibility with DDC® Total-ACE

Specifications

Compatibility

- MIL-STD-1553B Notice 2 and MIL-STD-1760
- Pin compatible with DDC® Total-ACE®
- Memory/Register Architecture Compatible with DDC® Enhanced Mini-ACE®, Mini-ACE Mark3®, Micro-ACE® and Micro-ACE-TE®
- Software Library/Drivers, with API compatibility with DDC® AceXtreme® Library

Environmental

- Industrial grade: -40° C to +100° C
- For Military grade, -55° C to +125° C, (consult with Sital)

Power:

- Operates from 3.3 VDC
- Transmitter dissipation less than 300 mW at 100% duty cycle

micross.com/total-octava

Total-OCTAVA

Integrated MIL-STD-1553 Bus Controller, Remote Terminal and Monitor with Transformers Compatible with DDC® Total-ACE®

Key Features and Benefits

- MIL-STD-1553B Notice 2, MIL-STD-1553A and MIL-STD-1760 compliant terminals
- Second Source to DDC® BU-64863T8 Total-ACE®
- 1.100 x 0.600 x 0.185-inch (27.5 x 15.2 x 4.7 mm) plastic 312-ball BGA
- Register/memory architecture and functionality with DDC® Enhanced Mini-ACE®, Mini-ACE Mark3®, Micro-ACE(TE)® and Total-ACE®
- Asynchronous local bus host interface. Available with options for high-performance parallel interface, PCI Express, high-performance synchronous PCI or SPI interface
- Highly autonomous BC with 29 instructions, condition flags and general purpose queue
- For RT mode, single, double and circular buffering options
- Selective Monitor mode with filtering and programmable option for storing monitored data in IRIG-106 Chapter 10 file format
- 50% Rollover Interrupts for RT and Monitor Stacks & Circular Buffers
- 3.3V only power, with very low power dissipation and built-in real-time transmitter “tails” compensation to eliminate residual voltages (dynamic offset).
- Available in -40 to 100° C temperature range. For -55 to 125° C, consult Sital.
- BC detection of impersonating BC, with option to invalidate impersonating messages
- RT monitoring for wire faults and reporting information
- Denial of Service detection
- As an option, Sital also offers its Safe and Secure (SnS) detection of authentication violations, plus wire fault detection and location, plus a cloud-based Health Management application.

Description

The Sital’s TOTAL-OCTAVA™ MIL-STD-1553 devices integrate a MIL-STD-1553B protocol engine, memory management, processor interface logic, 4K or 64K words of RAM, dual 1553 transceiver and dual transformer in a 312-ball Plastic BGA (Ball Grid Array) package. The TOTAL-OCTAVA is pin-to-pin replacements with DDC’s® BU-64863T8 Total-ACE, providing electrical, mechanical and architectural compatibility with DDC, while also providing a number of additional enhancements.

TOTAL-OCTAVA can be supplied with an asynchronous local bus host interface similar to DDC’s. Alternatively, it can be supplied with a high-performance, synchronous local bus interface operating into 4K x 16 or 64 K x 17 of dual port RAM. The 64 K x 17 version also provides parity generation and checking on all host and internal (1553) accesses. For parity generation and checking, Sital can also offer enhanced options covering the full external and internal data path. The TOTAL-OCTAVA is also available with a high-performance, synchronous 32-bit, 33 MHz PCI target interface, a high-performance PCI Express x1 serial host interface or a SPI interface.

The TOTAL-OCTAVA’s bus controller (BC) includes a 29-instruction set providing a high degree of processor offloading by automating message scheduling, asynchronous message insertion, facilitating bulk data transfers and double buffering, message retry and bus switching strategies, data logging, fault reporting and issuing host interrupts. The BC implements all 20 of DDC’s BC instructions, along with 9 additional instructions. The BC also includes a General Purpose Queue which can be used for stacking information regarding interrupt conditions or other user data.

The BC also includes logic for detecting messages transmitted by an impersonating BC. If such messages are detected, they are reported to the BC's host processor. In addition, the BC includes an option for providing intrusion protection (IPS). If this option is activated, the BC will "crash" an impersonating message by transmitting a superceding message on top of the impersonating message, thereby invalidating it.

To support a variety of 1553 Remote terminal (RT) application requirements, the TOTAL-OCTAVA RT provides programmable options for single, double and circular subaddress buffering, along with a global circular buffer option that can be used for multiple (or all) receive or broadcast subaddresses. To further offload the host, the circular buffer options provide interrupts for 50% and 100% rollover conditions. For stacking of interrupt events, the RT also includes an Interrupt Status Queue.

More information available at www.micross.com/total-octava

Available Configurations

- **OCT-64863T8-E02**
  Asynchronous local bus interface, BC/RT/Monitor, 64K x 17 RAM, -40 to +100° C, MIL-STD-1553/1760 amplitude compliant

- **OCT-64743T8-E02** = Local bus, RT-only, Asynchronous local bus interface, 4K x 16 RAM, -40 to +100° C, MIL-STD-1553/1760 amplitude compliant

The TOTAL-OCTAVA RT includes functionality to assist in detecting and locating wire faults. By means of enhanced physical layer signal monitoring, Sital's fault detection technology can detect instances of intermittent or continuous open or short circuit wire faults in MIL-STD-1553 bus or stub cables, connectors, couplers, terminators or connected LRUs. Sital's RT determines and stores the values of a pair of signal timing parameters. These parameter values may then be polled by the bus controller using a pair of reserved transmit mode code messages. By polling multiple RTs on a data bus, the bus controller and software are then able to determine the occurrence, type and location of wire faults.

The TOTAL-OCTAVA bus Monitor enables incoming messages to be filtered based on their RT Address, T/R bit and subaddress. The monitor also provides an option for storing monitored 1553 data according to the file structure defined by IRIG 106 Chapter 10 for MIL-STD-1553. This standard enables interoperability for various applications including flight recorders, test range telemetry, surveillance and reconnaissance, mission planning and flight operations.

The TOTAL-OCTAVA is multiprotocol, supporting MIL-STD-1553A, MIL-STD-1553B, STANAG-3838 and General Dynamics 16PP303, along with McAir A3818, A5232 and A5690.

The TOTAL-OCTAVA's BC, RT and Monitor modes provide capability for detecting Denial of Service (DoS) attacks. This is done by detecting instances where the BC or another terminal on the bus impersonating the BC continuously transmits a large number of unscheduled messages. When a BC, RT or Monitor terminal detects a DoS condition, it will report it to its host processor by setting a register bit and optionally issuing an interrupt request.

Sital's MIL-STD-1553 transceivers consume and dissipate extremely low power, with the transmitter dissipating less than 300 mW at 100% transmit duty cycle. Sital's transmitter also includes a unique, real-time feature to minimize or eliminate residual voltages, aka dynamic offset (or "tails") at the end of 1553 message transmissions.

For the McAir protocols, Sital can supply Micro-OCTAVA-TEs with transceivers providing compatibility with McAir the A3818, A5232 and A5690 standards.

TOTAL-OCTAVA's wire fault and Denial of Service detection capabilities are features of Sital's MIL-STD-1553 Safe and Secure (SnS) technology. Sital's complete suite of SnS capabilities is capable of identifying spoofing (impersonating) messages transmitted by unauthorized BC or RT transmitters. Further, SnS can detect, classify and locate open and short circuit wires in 1553 bus or stub cables, couplers, connectors, terminators or connected LRUs. In addition to the SnS capabilities included in the TOTAL- OCTAVA, Sital can provide capabilities for detecting transmissions by impersonating (spoofing) RTs and also enable RTs to detect unauthorized messages transmitted by spoofing BCs or RTs.

Sital can also provide access to a Health Management System (HMS) cloud software application. The HMS collects SnS data about authentication violations and wire faults from all buses on an aircraft and potentially from all aircraft in a squadron or fleet. It performs calculations, uses AI to draw inferences on collected data and provides all raw and derived data to ground-based personnel. Providing wire fault data in real time enables maintenance people to service intermittent faults before they become continuous. Further, by identifying fault locations, repair time and cost is greatly reduced. The end result is fewer aircraft with wiring faults and an increase in availability and airworthiness.

The Micro-OCTAVA is available in industrial (-40 to +100° C) temperature range. For military temperature range versions (-55 to +125° C), please contact Sital.

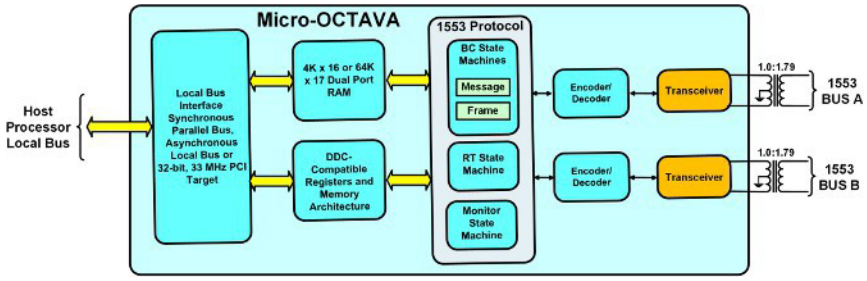

Figure 1. Total-OCTAVA Block Diagram

About Sital Technology

Founded in 1997, Sital Technology is a leading provider of IP cores, components, boards and testers for Mil-Std-1553.

Sital Technology's key quality resource is its creative, talented and professional staff. Our engineers are veterans of the Israeli Air Force, who served in the technical units of the F-16 avionics systems. They gained knowledge and experience with the MIL-STD-1553 standard from the bottom up, both as design engineers for MIL-STD-1553 components and as technicians working on the aircrafts.

Among our many customers you can find NASA, Lockheed, Boeing, Raytheon, Honeywell, Mercury, ESA, Thales, Orbital Science Corp, Elbit, Rafael, Israeli Aerospace Industries (IAI), Astronautics, Israeli Ministry of Defense, Elta, BAE Systems and many others.