



DUTH/SRL-SPACE ASICS Document Designation:

ETM-Data Sheet condensed

## ETM-ASIC

### Condensed Data Sheet

Status	: For Public Release
Version	: 1
Rev.	: A
Date	: September 29, 2007

Project: ETM ASIC

Part: Data Sheet - condensed

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## 1 Functionality

The Essential Telemetry (ETM) Support ASIC is developed by DUTH/SRL and SPACE-ASICS under ESA Contract No. 20198/06/NL/GLC. The ETM-ASIC autonomously performs the following tasks as soon as power is supplied:

- Sequential scanning and sampling of discrete analog & digital inputs
- Convert the analog inputs to digital values
- Format the sampled data into Space Packets
- Output the sampled formatted data either on the CAN or the PacketWire interface
- Receive commands through the CAN interface when in RTU mode.

## 2 Key Features

- 12 bit ADC converter
- Up to 32 differential analog inputs (4, 8, 16 or 32 selectable)
- 16 differential digital inputs
- Built in Voltage reference
- Various temperature sensors (PRTs, NTCs, temperature transducers (AD590) supported).
- Instrumentation amplifier for small differential signal measurements.
- Various sampling frequencies supported (20mHz-4KHz).
- CAN Protocol interface.

- PacketWire interface.
- Single power supply (5 or 3.3V). (Internal voltage regulator).
- Low power (<20mW)
- Autonomous operation on power up.
- Wide Temperature Operating range (-55 to 125 deg C)
- Radhard up to 1 Mrad.
- SEL free up to 120 MeV/mg/cm<sup>2</sup>
- Immune to SEU up to an LET threshold of 50 MeV/mg/cm<sup>2</sup>



### 3 Applications

- Essential telemetry support in S/C
- Remote Terminal Unit in space data acquisition systems
- Housekeeping in space instrumentation.

### 4 Block Diagram

The block diagram of the ETM ASIC is shown in Fig. 1.

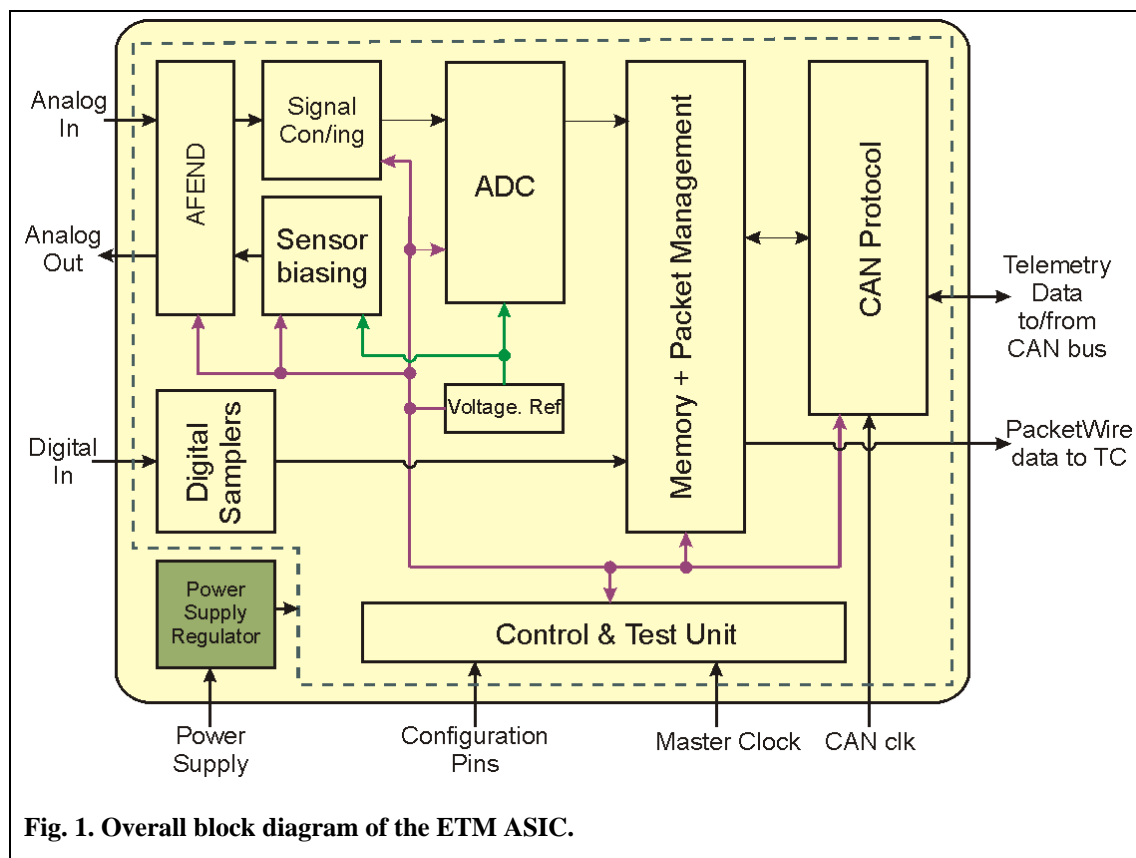


Fig. 1. Overall block diagram of the ETM ASIC.

It consists of:

- An Analog Front End (AFEND) unit, which is used for interfacing the analog input channels.



- A Signal Conditioning Unit that consists of a variable gain instrumentation amplifier.
- A Sensor Biasing Unit used for the generation of bias signal for the various temperature sensors that will be interfaced with the ETM device.
- The Digital Sampler Unit used for determining the status of the digital sensing input of the ETM device.
- A Voltage Reference Unit that produces a power supply and temperature independent voltage, which is used by the ADC, and in some cases by the sensor biasing unit.
- A 12-bit radhard ADC
- A Memory and Packet Management Unit. This unit is used for storing and for formatting the sampled values for transmission to the SCTMTC ASIC or the CAN Protocol interface.
- A CAN Protocol interface that is used for serial communication with either a microcontroller or other ETM ASICs.
- A Control and Test Unit (CTU) that is used for setting the ASIC into the various configuration and operating modes. In addition CTU is also used in the testing of the device.
- A Power Supply Regulator that is used for producing the 3.3 and 2.5Volts from a single 5V power supply line.

## 5 ETM System Configurations

ETM can be operated in three configurations with respect to the digital interface communication protocol used.

### 5.1 Stand Alone Configuration (STD).

In this configuration the ASIC will automatically perform its overall functionality (sample and digitize predefined telemetries, format the acquired data into Space



Packets and forward the packets via a *Packet Wire* Link to the SCTMTC ASIC TM encoder) immediately after power-on without the need of user intervention.

## 5.2 Cascaded Configuration (CSC).

In this case at least 8 ETM ASICs could be connected together via the CAN Bus allowing:

- the expansion of the number of the acquisition channels to be sampled,
- the connection of several ETMs to the same Virtual Channel input of the SCTMTC ASIC TM encoder.

The ETM connected to the SCTMTC ASIC TM encoder will be configured to act as master. The master ETM shall perform its nominal operations (as if it were in stand alone configuration) and in addition synchronize the scan sequences in the rest cascaded ETMs (slaves), receive their sampled data organized in Space Packet format and forward these packets to the SCTMTC ASIC TM encoder.

Alternatively, if all the cascaded ETMs are located on the same board/unit together with the SCTMTC ASIC it shall be possible for each ETM to be directly connected to the SCTMTC TM encoder using its own tri-state PacketWire interface. In this case all ETMs will be connected in a daisy-chain scheme and transfer their sampled data in a priority order directly to the SCTMTC TM encoder rather than to the master ETM via their also active CAN bus interconnection. The master ETM will still be responsible to synchronize all the cascaded ASICs scan sequences.

## 5.3 Remote Terminal Unit Configuration (RTU).

In the case of Remote Terminal Unit (RTU) configuration several ETM ASICs operating independently sample and digitize predefined telemetries, organize the acquired data into standard or simplified (without the Packet Primary Header field) Space Packets and forward the packets to the Processor Module via the normal spacecraft bus.

