Paper ID: 12451
oral
student

Technology Roadmaps for Space Exploration (09)
Poster Session (P)

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A SYSTEM-IN-PACKAGE DESIGN APPROACH OF A GENERIC CAN NODE

Abstract

Controller Area Network (CAN) by itself can be used as an inexpensive and reliable network option in various technology fields, for example automotive, industry, military, aerospace and others. On the other hand, robust and radiation tolerant Generic CAN Node designs are scarce and more often than not include very expensive components, such as radiation hardened microcontrollers, rad-hard FPGA's and etc. Typically they are made as a part of an existing system on the same board. In this paper we propose a low cost system-in-package design approach, targeting components off the shelf that contains several dissimilar integrated circuits enclosed in a miniaturized light metallic package with various radiation mitigation techniques already implemented and considered. High energy particles in space cause soft errors, such as transient errors, or more destructive ones called hard errors. These cause latch-ups in silicon components and therefore supply current needs to be limited to prevent permanent device failure. The whole enclosure is later moulded with a sealing material to press out unwanted air bubbles and make the component more rigid. System consists out of several layers made of a polyimide material for better thermal dissipation, stacked on top of each other and interconnected to a through-hole foundation. This modular design provides low-cost system changes and is also suitable for possible future upgrades and redesigns of a particular board. Beside this, separated boards contribute to better electromagnetic compatibility as analog parts are physically isolated from digital sections and from the power supply. CAN physical driver is not integrated within the package, therefore different mitigation techniques for bus redundancy can be applied. Physical driver selection typically depends on system requirements. Main processing unit is based on a non-volatile field-programmable gate array device which integrates a newly developed fault tolerant 8-bit RISC soft core processor. In addition to CAN interface and non-volatile ferromagnetic memory several peripheral units like analog to digital converters are also integrated within the same package.