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RESEARCH AND DESIGN OF RADIATION HARD DATA TRANSMISSION AND SWITCHING
TECHNOLOGY

Abstract

With the rapid development of the space satellite communications, high-speed data transmission and high-capacity switching become the core technology. This article describes a practical spaceborne switch, the switch uses chip set design, uplink and downlink data transmission ASIC using standard STM-1 155Mbps baseband rate, use costas loop to do QPSK demodulation of zero IF signal that from ADC sample. Channel coding using Reed-Solomon(255,239)for the external code, using convolutiona coding and soft decision Viterbi decoding for internal code, interleaving process between the internal and external code to avoid the data subject to all sorts of interference in the transmission process and the impact of wireless and microwave transmission characteristics of the channel, improve the reliability of communication, reducing the error rate of the data transmission. The ASIC use multiple protocol label switch(MPLS)technology, integrated a 16x16 switching matrix on a single-chip, the exchange capacity is 2.5Gb, the rate of port is 155Mbps, support TCP/IP protocol, priority and multicast functions. The entire chip set use synchronization control refresh to reduce the probability of the single event function interrupt(SEFI) of space applications. SRAM and D-flip-flop use indepntly developed radiation hard standard cell libraries and DICE structure, effectively resolved space Single Event Upset(SEU). Using the chip layout reinforcement desin to solve the problem of the radiation damage in single event latch(SEL) and total ionizing dose(TID). The chip has applied on satellites, and shows good effects.