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CMOS reliability

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Abstract

Complementary metal-oxide-silicon (CMOS) integrated circuits have had a major impact on the electronics industry, and have created new areas of application for digital circuits. CMOS digital circuits, because of a number of very significant circuit advantages, including low power dissipation, high noise immunity and wide operating-voltage range, have become a very widely used logic family.

The RCA series of CMOS devices, first introduced as the COS/MOS CD4000 series in 1968, has gained wide acceptance. The introduction, in 1971, of plastic-encapsulated CMOS integrated circuits was instrumental in achieving even wider acceptance of the popular CD4000-series devices.

The COS/MOS product line today includes more than 100 standard parts in the CD4000A series, parts that are used worldwide in applications ranging from such special uses as battery-operated watch circuits to many functions in the aerospace, computer, automotive and consumer industries. In addition, a new product line has been introduced, the CD4000B series, which has improved features such as a higher

introduced, the CD4000B series, which has improved features such as a higher operating-voltage range (≈ 20 V), standardized output drive, symmetrical transition time and improved electrostatic-discharge (ESD) protection networks.

This report, which presents new data on the reliability of CMOS integrated circuits, is divided into four major sections: the first section is a review of background information on MOS integrated-circuit reliability, the second section presents new experimental results of comprehensive studies of the reliability of RCA CMOS (or COS/MOS) integrated circuits, the third section is a discussion of application considerations and outlines RCA electrical specifications for COS/MOS integrated circuits and the fourth section is a review of the effects of some of the trends occurring in the CMOS industry. Some generalizations and conclusions concerning CMOS reliability are included in the fourth section.



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