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LSIs for COmmunication Uses

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Great progress in LSI technology is a leading force in stimulating today's digital evolution in communication systems. A digital network, in which digital signals can be transmitted to meet all voice, facsimili, data and video requirements, can only be realized by the use of highly functional and high performance LSIs.

Communication systems need a wide variety of LSIs; from general purpose LSIs including memories and microprocessors to fully customized ones, from ultra high speed bipolar ICs to low power CMOS VLSIs with tens of thousands of gates, and from digital LSIs to analogue ones.

Interface LSIs, which link either a digital signal with an analogue signal, or digital signals with different codes or different speeds, are extremely important. Multiple varieties of signal processors in conjunction with D/A and A/D converters are used for the purposes. The need for the integration of digital and analogue circuitry on the same chip has promoted significant developments in the field of linear MOS technology.

In some cases, rather unique LSI technologies are needed to meet specialized communication requirements. Since LSI characteristics must be consistent with existing network systems which usually contain various electromagnetic or other non-semiconductor parts, rigorous requiements are placed on the LSIs with regard to their precision, voltage and current capabilities.

A monolithic subscriber line interface circuit is one of the most important and the most challenging LSIs to achieve. LSIs which integrate the BORSHT (<u>B</u>utteryfeed, <u>O</u>ver-voltage protection, <u>R</u>inging, <u>S</u>upervision, <u>H</u>ybrid and <u>T</u>est) functions are particularly indispensable in reducing the volume and cost of the system. Though a one-chip BORSHT-LSI has not yet been realized, BSH-LSI in 60 V high-precision complementary bipolar technology and RT-LSI in 400V dielectrically isolated bipolar technology have been developed together with their control CMOS LSI(1). A new technology called CEPIC(2) is proposed, which makes it possible to integrate pnp and npn transistors both in vertical and dielectrically isolated forms and is expected to be instrumental in the development of the one-chip BORSHT-LSI.

Two types of 32 bit processors, one for information processing systems and the other for digital telephone switching systems, have been developed[3]. 2 μm-rule silicon gate CMOS technology with double layer metallization has been implemented to integrate 20 Kgate random logic on a 10 millimeter square chip.

A 1Kx11b time switch memory for a digital telephone switching system, with the operating frequencies greater than 20 MHz, has been realized by using 2 μm-rule N channel silicon gate E/D MOS technology[4].

In the transmission system, a very wide-band repeater LSI for optical transmission systems is one of the most important targets. The functions to be integrated are the so-called 3R functions (Reshaping, Retiming and Regenerating). A 1.4 GHz monolithic amplifier used in the reshaping block has been developed[5]. To meet the severe requirements for frequency, power and noise, a new bipolar technology called SST[6] has been employed in the amplifier.

In the digital network system, LSIs for use in the terminal, in the strict sense, have not yet been realized. However,the recently developed high speed A/D and D/A converters for video signals, including an 8 bit parallel A/D converter with 30 MSPS speed and 980 mW power dissipation[7], are examples of LSIs which can be used in the terminals of future digital network systems. Two kinds of technology called DOT[8] and LECS[9] are proposed for high precision (more than 14 bit) linear A/D and D/A converters which are expected to be widely used in digital communication systems.

As stated at the beginning, LSI technology will have a great impact on the communication systems. The increasing demand, on the other hand, for more advanced LSIs in the communication field will greatly promote future development in LSI technology.

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