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ENCYCLOPEDIA OF INTEGRATED CIRCUITS: A Practical Handbook of Essential Reference Data

WALTER H. BUCHSBAUM, Sc.D.



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ENCYCLOPEDIA OF INTEGRATED CIRCUITS:
A Practical Handbook of Essential Reference Data



ABOUT THIS BOOK

Integrated circuits are among the most magical ingredients in today's electronics field. Some contain only a few dozen transistors and diodes, while others, the large-scale integrated circuits (LSI), contain tens of thousands of transistors in a single package the size of an ordinary postage stamp. Integrated circuits (ICs) are available in a huge variety of functions, characteristics, and special features. The Electronic Industry Association (EIA) parts-numbering system covers less than half of the thousands of different type numbers produced by more than 35 major manufacturers. All publish data on their own IC types, each in a different format and often using different definitions for their specifications. The extent of the available manufacturer's IC data was demonstrated to this author when the material used as the background for this book took up nine feet of shelf space.

Encyclopedia of Integrated Circuits covers the entire field of ICs, but from the *user's* rather than the manufacturer's point of view. We are not concerned with part numbers or interchangeability because it is easy to secure that information from the manufacturers' data sheets or their cross-reference lists. This book covers ICs in respect to what they do and how they perform in electronic equipment.

Integrated circuits are divided into four broad categories: Analog, Consumer, Digital and Interface. Each category is further broken down into subcategories, such as Amplifiers, Comparators, Converters, Demodulators, etc. A further division into specific IC functions, such as Class A, Differential or Operational Amplifiers, narrows down the functions to the level of actual application in equipment. Where a further subdivision is appropriate, all variations of a particular function are included. In the case of the Operational Amplifiers, for example, nine different types of op-amps are described.

As in any good encyclopedia, a uniform, concise format is used for all entries. Starting with a brief description and a functional block or logic diagram to illustrate the essential features, the format includes an explanation of key parameters together with actual electrical values. Such parameters as input impedance, open-loop gain, temperature stability, propagation delay time, etc., are specified, where applicable, for different IC

families, such as TTL, CMOS or ECL. A summary of typical applications and any comments pertinent to the use or selection of this type of IC complete the entry.

Each entry is numbered according to category and subclassification to help you locate different functions and relate them to each other. Because the complete information for each IC subcategory is contained in that entry, you don't have to waste time going back and forth between different parts of the book. Counters, or dividers, for example, are listed in D.3.0. This entry covers counters or dividers in general. The detailed features of a pre-settable up/down counter are found in D.3.5. All the information needed to select such a counter, or to troubleshoot equipment using it, is contained right at D.3.5.

The appendix contains general information such as the physical dimensions of standard IC packages, a list of the major IC manufacturers with complete addresses and phone numbers, and excerpts from manufacturers' data describing the most widely used IC families.

When you use the *Encyclopedia of Integrated Circuits* you will find the extensive index a real delight. In addition to the terminology used in this book, the index also includes most of the less frequently used terms to help you locate a particular IC. A circuit that amplifies digital signals for transmission over a bus, for example, is listed as "line driver," but if you are used to calling it a "transmitter," a "buffer," an "I/O driver," or just an "output amplifier," you will find it listed under all of these terms in the index.

Some of the latest ICs announced by the various manufacturers combine several basic functions in a single package. Others may be faster, use less power, or have better temperature stability. Your *Encyclopedia of Integrated Circuits* does not get obsolete. A shift register, after all, works the same way whether it has eight or 18 stages, whether its clock speed is 0.5 or 50 MHz. And when this shift register is combined with tri-state output buffers, you can just look them up as if they were on a separate IC. Because this book is written from the user's point of view and concentrates on what each kind of IC does, you will find your *Encyclopedia of Integrated Circuits* as useful five years from now as you did when you bought it.

HOW YOU CAN USE THIS BOOK

Each person has his or her own way of using an encyclopedia, and once you become familiar with this book you will find it extremely helpful for any type of electronics work, whether you are a kit builder, an experimenter, a technician, or an engineer. The following examples will give you some idea of the book's usefulness.

A person building a kit learns from the instructions that a particular IC is a differential amplifier, but also needs to know what a differential amplifier does and what the common-mode rejection ratio (CMRR) means. This book provides a clear and concise explanation of differential

amplifiers and all of its key parameters and even gives typical values of the CMRR.

Another person experiments with his own communications receiver design. He knows that he needs a detector, and he can find the AM/SSB detector and the multimode detector IC in this book. The brief descriptions and block diagrams of each help him decide which type of IC is most suitable for his purpose.

Working on a color TV set we decide that the trouble must be in the color sync or in the demodulator section. The schematic diagram just shows rectangles for these ICs, without any explanation of how they work. A quick look in the Consumer IC category of this book provides an explanation of TV receiver ICs and a detailed description of how the color sync and the color demodulator ICs work. The reader is alerted to the effect of the external components and can then check quickly whether one of the external components or an IC is defective.

When designing the interconnection of a personal computer to a communications link, a person has to decide which kind of interface IC to use. When looking for communications interface ICs in the index of this book, the reader will find three different functions: the High-Level Data Link Controller and Synchronous Data Link Controller (HDLC/SDLC), the Synchronous Communications Controller (SCC), and the Universal Asynchronous Receiver Transmitter (UART). The concise descriptions and functional block diagrams of each, together with the key parameters, allow him to choose the type best suited for his communications interface.

You can see from these examples that the *Encyclopedia of Integrated Circuits* is used, just as is any other type of encyclopedia, to provide information about a particular topic—in this case a type of integrated circuit. All you need to know is the functional name of the IC and you can find out what it does, how it does it, and how it can be expected to perform in an electronic device. With ICs taking over more and more functions in electronic equipment, this book will become increasingly valuable as time goes on.

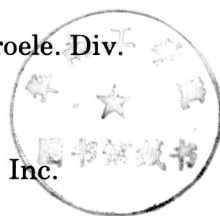
Walter H. Buchsbaum

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Sprague Electric Co.
Standard Microsystems
Teledyne Semiconductors
Texas Instruments, Inc.
TRW Semiconductor
Watkins-Johnson Co.
Western Digital Corp.
Zilog Inc.



The following sections of this book were written by Mr. John J. Petrale:

- D.11 Memory
- D.12 Microcomputer and Microprocessor
- D.13 Microprocessor/computer Support Functions
- I.4 Memory Interface
- I.5 System Interface

John J. Petrale is a Staff Engineer, currently employed by Loral Electronic Systems in Yonkers, N.Y., where his duties include the design of electronic systems. He is the author of numerous articles in the field and is now writing a book on microprocessors. Mr. Petrale is a consultant in systems design and testing and teaches courses on logic design and microprocessors. He is the head of the Loral Management Development Committee and also lectures on engineering management. His inventions include PROM Controllers and Automatic System Test Sets.

I also want to express my appreciation to Mrs. Inge Seymour, who has done a very tedious typing job cheerfully and accurately. Finally, I want to thank my wife for her encouragement and forbearance as well as her work on the index of this book.

W.H.B.

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