DESIGNER'S HANDBOOK OF INTEGRATED CIRCUITS

Arthur B. Williams

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DESIGNER'S HANDBOOK OF INTEGRATED CIRCUITS

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Preface

Integrated circuits (ICs) have greatly simplified the design of complex analog and digital circuits. Over the past two decades an overwhelming variety of ICs have been produced by numerous manufacturers.

The engineer or technician, when faced with the task of IC selection and circuit design, must sort through a variety of manufacturers' IC catalogs and a limited number of application notes to try and determine the optimum IC and circuit configuration for the requirement.

Catalog data sheets are useful in defining the operating and worst-case parameters of a particular device, but cannot serve as a selection guide since ICs are not evaluated on a comparative basis. Also these catalogs and application notes are restricted to ICs of a particular manufacturer and are organized by IC type rather than application.

This book is intended to serve a twofold purpose. Equal emphasis is placed on IC applications as on device selection. Preferred IC circuit configurations are provided by experts so that proven practical solutions to frequently encountered design problems can be easily obtained. This book is not intended to replace IC catalogs, since the inclusion of detailed parameters on all the ICs covered would be totally impractical. Instead, the device selection and comparison charts provided, as well as the detailed discussions and design examples, will assist the designer in selecting the best device and circuit configuration for the application.

Operational amplifiers are covered in Chap. 1. Op amp theory is reviewed, both from a theoretical and practical standpoint. Numerous circuit configurations are illustrated and an extensive selection guide is provided.

Chap. 2 discusses selection and application of function circuits, such as multipliers, waveform generators, voltage-to-frequency and frequency-to-voltage converters, etc.

Active filter design using op amps is introduced in Chap. 3. Numerous preferred low-pass, high-pass, bandpass, and band-reject circuit configurations are illustrated along with design examples.

Chap. 4 extensively covers telecommunication circuits, such as pulse and DTMF dialers and encoders, CODECs, PCM line filters, and speech networks.

The theory, design, and selection of phase-locked-loop configurations and devices are discussed in Chap. 5.

Timer ICs are introduced in Chap. 6. The analysis, design, selection, and application of these versatile devices are extensively covered in this chapter.

Chap. 7 on IC power management circuits covers the principles of series pass and switching regulators, and the optimum selection and circuit configuration of these ICs.

The principles of A/D and D/A conversion are covered in Chap. 8. Various types of circuit configurations are discussed and preferred circuit structures are presented along with device selection guidelines.

Chap. 9 introduces SSI logic circuits. The various logic families and their limitations are extensively covered.

MSI logic circuits are covered in Chap. 10. Combinatorial and sequential logic applications of MSI devices are presented along with guidelines for device selection.

In Chap. 11 the selection process and considerations involved in determining the

optimum microprocessor for a given application is discussed. Chip architecture, support software, and other major considerations are extensively covered.

Chap. 12 covers optoelectronics. The theory, application, and selection of LED lamps, bar graph displays, alphanumeric displays, and optocouplers are discussed along with many practical examples of the selection and design process.

LSI peripheral devices are described in Chap. 13. The operation, application, and selection of devices such as UARTs, CRT controllers, and floppy disc controllers are presented.

Application and selection of interface circuits are covered in Chap. 14, including devices such as peripheral drivers, line circuits, and display drivers.

I would like to thank the many contributors and their companies for their efforts to make this book as technically comprehensive as possible while placing sufficient emphasis on everyday applications of ICs.

Arthur B. Williams
Editor

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