

CONTENTS

PREFACE	ix
CHAPTER	
1 INTRODUCTION TO TRANSISTORS	1
1-1 Semiconductors	2
1-2 Diodes	3
1-3 The Transistor	4
1-4 Symbols	6
1-5 Graphical Characteristics	7
1-6 The Operating Point	10
1-7 Amplification	12
1-8 Leakage Currents	15
1-9 Saturation and Cutoff	17
1-10 The Junction FET	18
1-11 FET Parameters	19
1-12 The Insulated-Gate FET	21
1-13 Summary	22
2 SEMICONDUCTOR PHYSICS AND DEVICES	27
2-1 Structure	27
2-2 Impurities	28
2-3 Energy-Level Diagrams	31
2-4 $p-n$ Junctions	33
2-5 Transistor Operation	36
2-6 Junction Transistor Capacitances	39
2-7 Transistor Fabrication	42
2-8 High-Frequency Considerations	45
2-9 The Field-Effect Transistor	46
2-10 Controlled Rectifiers	48
2-11 The Unijunction Transistor	50
2-12 The Tunnel Diode	52
2-13 Metallic Contact Devices	54
2-14 Microelectronics	55
2-15 Allied Semiconductor Devices	56

- 3 THE OPERATING POINT
 - 3-1 The Static Load Line
 - 3-2 Bias Stability
 - 3-3 Parameter Variations
 - 3-4 Circuit Studies
 - 3-5 Fixed Bias
 - 3-6 Single-Battery Bias
 - 3-7 Emitter Bias
 - 3-8 Self-Bias
 - 3-9 Other Means of Setting the Operating Point
 - 3-10 Design of Biasing Circuitry
 - 3-11 Extremal Analysis
 - 3-12 Biasing the FET
 - 3-13 FET Extremal Analysis

- 4 EQUIVALENT CIRCUITS AND THEIR PARAMETERS
 - 4-1 Equivalent Circuits
 - 4-2 Matrix Parameters
 - 4-3 The Hybrid Equivalent Circuit
 - 4-4 The y -Parameter Equivalent Circuit
 - 4-5 Current-Generator Equivalent Tee
 - 4-6 Parameter Interrelations
 - 4-7 Parameter Variations
 - 4-8 High-Frequency Parameters
 - 4-9 The Hybrid- π Model
 - 4-10 Parameters of the Hybrid π
 - 4-11 Junction FET Equivalent Circuit
 - 4-12 Parameters of the Modified Normal- π Model
 - 4-13 MOS Equivalent Circuit and Parameters

- 5 ANALYSIS
 - 5-1 The Terminated h -Parameter Network
 - 5-2 The Terminated y -Parameter Network
 - 5-3 The Terminated T -Equivalent Circuit
 - 5-4 The Terminated Hybrid- π Network
 - 5-5 Comparison of Configurations
 - 5-6 High-Frequency Considerations
 - 5-7 The Terminated FET
 - 5-8 Gain Considerations
 - 5-9 Examples of Circuit Analysis
 - 5-10 Instantaneous Analysis
 - 5-11 Matrix Analysis of Interconnected Networks

6	DESIGN	156
6-1	Choosing the Transistor Type	157
6-2	Transformer Coupling	158
6-3	Capacitance Coupling and Bypassing	161
6-4	The Dynamic Load Line	164
6-5	Effects of the Operating Point upon Gain	166
6-6	Gain Stability	167
6-7	Input Resistance Considerations	170
6-8	Design Examples	173
7	LARGE-SIGNAL AMPLIFIERS	183
7-1	Limitations	183
7-2	Thermal Considerations	186
7-3	Large-Signal Parameters	190
7-4	Modes and Configurations	190
7-5	Distortion	191
7-6	Class-A Amplification	194
7-7	Shifting of the Operating Point	197
7-8	Class-B Amplification	198
7-9	Phase Inverters	201
7-10	Summary	203
8	MULTISTAGE AMPLIFIERS	207
8-1	Analysis by Blocks	207
8-2	Computer Analysis	210
8-3	Analysis by h Parameters	212
8-4	Analysis by a Parameters	213
8-5	Design of a Multistage Amplifier	214
8-6	Synthesis of Voltage Transfer Functions	221
9	GAIN STABILITY	229
9-1	Transistor Dynamic Stability	229
9-2	FET Dynamic Stability	234
9-3	Floating- Q Biasing	235
10	FEEDBACK	241
10-1	Feedback—General Theory	241
10-2	Local Feedback	247
10-3	Multistage Feedback	249
10-4	Feedback Networks	251
10-5	Automatic Gain Control	259
10-6	Direct-Coupled Amplifiers	262
11	COMMUNICATIONS AMPLIFIERS	276
11-1	Types of Noise	276

11-2	Noise Figure
11-3	Volume Control
11-4	Shaping the Frequency Response
11-5	The Video Amplifier
11-6	Tuned Circuit Theory
11-7	Tuned Amplifiers
11-8	Instability of Tuned Amplifiers
11-9	Tuned-Amplifier Design
12	COMMUNICATIONS CIRCUITS AND SYSTEMS
12-1	Oscillation
12-2	Negative-Resistance Oscillators
12-3	Feedback Oscillators
12-4	Modulation
12-5	Detection
12-6	Conversion and Mixing
12-7	The AM Receiver
12-8	The FM Receiver
12-9	The TV Receiver
13	PULSE CIRCUITS
13-1	Switching
13-2	Semiconductor Switches
13-3	Pulse Amplifiers
13-4	Multivibrators
13-5	Waveform Generators
13-6	Binary Arithmetic and Boolean Algebra
13-7	Gating
13-8	Worst-Case Design
13-9	An Application of Logic Circuitry
APPENDICES	
I. Selected Transistor Data	
II. Matrix Analysis	
ANSWERS TO SELECTED PROBLEMS	
INDEX	