

Contents

Preface	vii
Acknowledgments	viii
Chapter 1 THEORY OF OPERATION	1
1.1 Units, Conversions, and Symbols	1
1.2 The Physical Basis of Ferrimagnetism	4
1.3 Ferrimagnetic Resonance	9
1.4 Microwave Propagation in Ferrites	13
Chapter 2 CIRCULATOR SPECIFICATION	25
2.1 The Parameters	25
2.2 Junction Circulators	37
2.3 Lumped-Constant Circulators	41
2.4 Differential Phase Shift Circulators	42
2.5 Field-Displacement Isolators	44
2.6 Resonance Isolators	46
Chapter 3 APPLICATIONS OF CIRCULATORS	51
3.1 Load Isolation	51
3.2 Duplexing	52
3.3 Multiplexing	57
3.4 Parametric Amplifiers	59
3.5 Phase Shifting	63
Chapter 4 MATERIAL SELECTION	67
4.1 Ferrite Selection	67
4.2 Magnet Selection	77
4.3 Magnetic Compensating Material Selection	79
4.4 Dielectric Selection	79
4.5 Metals Selection	80
Chapter 5 ELECTRICAL DESIGN	83
5.1 Junction Circulators	83

5.2 Lumped-Constant Circulators	112
5.3 Differential Phase Shift Circulators	117
5.4 Resonance Isolators	121
5.5 Dummy Loads for Isolators	124
Chapter 6 MAGNETIC DESIGN	129
6.1 Magnet Sizing	129
6.2 Shielding	139
6.3 Temperature Compensation	140
6.4 Completing the Circuit	141
Chapter 7 MECHANICAL DESIGN	145
7.1 Coaxial Junction Circulators	145
7.2 Lumped-Constant Circulators	158
7.3 Waveguide Circulators	160
7.4 Resonance Isolators	162
Chapter 8 ASSEMBLY AND TESTING	163
8.1 Assembly Techniques	163
8.2 Finding the Operating Point	168
8.3 Taking Data	171
Chapter 9 TUNING	173
9.1 Magnetic Adjustment	173
9.2 Electrical Adjustment	176
List of Symbols	187
Index	191

