

# Table of contents

	Foreword	9
<b>1</b>	<b>Introduction</b>	<b>11</b>
	1.1 Components	11
<b>2</b>	<b>Digital Fundamentals</b>	<b>17</b>
	2.1 Bits and binary numbers	17
	2.2 The basic digital functions	17
	2.3 IC families	19
<b>3</b>	<b>Gate Functions</b>	<b>21</b>
	3.1 NAND gate	23
	3.2 NAND gate as inverter	26
	3.3 AND gate	31
	3.4 NOR gate	33
	3.5 NOR gate as inverter	35
	3.6 OR gate	39
	3.7 NOR becomes AND	41
	3.8 NOR becomes NAND	43
	3.9 NAND becomes OR	45
	3.10 NAND becomes NOR	47
	3.11 XOR	49
	3.12 XNOR	51
	3.13 The majority function	53
<b>4</b>	<b>Flip-Flops</b>	<b>55</b>
	4.1 RS flip-flop from NOR gates	55
	4.2 RS flip-flop from NAND gates	58
	4.3 JK flip-flop as RS flip-flop	60
	4.4 The JK flip-flop	62

4.5	Shift registers	65
4.6	Circular shift registers	70
<b>5</b>	<b>Counters</b>	<b>73</b>
5.1	Counter to 3	73
5.2	4-bit counter	76
5.3	Synchronous counter	79
5.4	Up/down counter	82
<b>6</b>	<b>The Digit Display</b>	<b>87</b>
6.1	Digit segments	87
6.2	Seven-segment decoder	89
6.3	0 to 9 counter	91
6.4	9 to 0 countdown	93
<b>7</b>	<b>Oscillators</b>	<b>95</b>
7.1	Blinking light	95
7.2	Flip-flop blinker	97
7.3	Metronome	99
7.4	Tone generator	101
<b>8</b>	<b>Applications</b>	<b>103</b>
8.1	Light-controlled tone	103
8.2	Mini organ	105
8.3	Siren	107
8.4	Twilight switch	109
8.5	Alarm system	111
8.6	Light-activated alarm system	113
8.7	Running light	115
8.8	Traffic light control	119
8.9	Turn-off delay	122
8.10	Turn-on delay	124
8.11	Time switch	126
8.12	Hallway light timer	128
8.13	Simple random generator	131
8.14	Digital roulette	133
8.15	Digital dice	135

<b>9</b>	<b>SGS Datasheets</b>	<b>139</b>
	HCF4001B	139
	HCF4027B	147
	HCF4093B	155
	HCF4511B	161
	Index	175