

Contents

1	Introduction	1
	References	5
2	Fundamentals of UWB Impulse Systems	7
2.1	Introduction	7
2.2	UWB Overview	7
2.2.1	UWB Basics	7
2.2.2	UWB Advantages	8
2.2.3	UWB Applications	11
2.3	UWB Impulse Signals	11
2.3.1	Gaussian Impulse	12
2.3.2	Gaussian Monocycle Pulse	12
2.3.3	Gaussian Doublet Pulse	15
2.4	Basic Modulation Topologies	17
2.4.1	PPM	17
2.4.2	PAM	18
2.4.3	OOK Modulation	18
2.4.4	BPSK Modulation	19
2.5	UWB Impulse Transmitters and Receivers	19
2.5.1	UWB Impulse Transmitters	19
2.5.2	UWB Impulse Receivers	21
2.6	UWB Antennas	23
2.7	Summary	23
	References	23
3	UWB Impulse Transmitter Design	25
3.1	Introduction	25
3.2	Overview of Basic Components of UWB Impulse Transmitters	27
3.2.1	CMOS Inverter Basics	27

3.2.2	CMOS Inverter Switching Characteristics	29
3.2.3	Two-Input CMOS NOR/NAND Gate Blocks	31
3.2.4	Tunable Delay Cell	32
3.3	Tunable Pulse Generator Design	33
3.3.1	Tuning Delay Component	33
3.3.2	Square Wave Generator	35
3.3.3	Impulse-Forming Block	37
3.3.4	Pulse-Shaping Circuit	38
3.3.5	Tunable Pulse Illustration	38
3.3.6	Simulation and Measurement Results	39
3.4	BPSK Modulator Design	47
3.5	UWB Tunable Transmitter Design	50
3.5.1	UWB Tunable Impulse Transmitter Design	50
3.6	Summary	54
	References	54
4	UWB Receiver Design	57
4.1	Introduction	57
4.2	UWB LNA	58
4.2.1	UWB LNA Topology	58
4.2.2	UWB LNA Analysis	61
4.2.3	UWB LNA Noise Analysis	63
4.2.4	UWB LNA Design	68
4.2.5	On-Chip Spiral Inductor Design	69
4.2.6	UWB LNA Fabrication and Performance	73
4.3	UWB Correlator Design	77
4.3.1	DC Analysis	79
4.3.2	AC Analysis	81
4.3.3	UWB Correlator Fabrication and Performance	82
4.4	UWB Receiver	84
4.5	Summary	86
	References	86
5	UWB Uniplanar Antenna	89
5.1	Introduction	89
5.2	UWB Uniplanar Antenna Design	91
5.3	UWB Uniplanar Antenna Fabrication and Test	98
5.4	Performance of UWB Transmit Prototype Integrating UWB Uniplanar Antenna and UWB Pulse Generator	100
5.5	Summary	102
	References	103
6	Summary and Conclusions	105
	Bibliography	109
	Index	111

Design of CMOS RFIC Ultra-Wideband Impulse
Transmitters and Receivers

Nguyen, C.; Miao, M.

2017, VIII, 113 p. 83 illus., 60 illus. in color., Softcover

ISBN: 978-3-319-53105-2