

Table of contents

Preface	vii
1. General Introduction (F. Balestra and G. Ghibaudo, LPCS-INP Grenoble)	1
2. Device physics and electrical performance of bulk Silicon MOSFETs (G. Ghibaudo and F. Balestra, LPCS-INP Grenoble)	3
1) Introduction	3
2. Electronic transport in the inversion layer	4
3. Influence of impurity freeze out	12
4. Short channel effects	16
5. Hot carrier effects and reliability	21
3. SOI MOSFETs (F. Balestra and G. Ghibaudo, LPCS-INP Grenoble)	37
1. Introduction	37
2. SOI materials	39
3. Subthreshold swing of the SOI MOSFET	42
4. Threshold voltage of the SOI MOSFET	45
5. Transport parameters	46
6. Kink effect	47
7. Latch and Breakdown Phenomena	49
8. Gate-Induced-Drain-Leakage	53
9. Self-Heating Effects	54
10. Transient effects	56
11 Short-Channel effects	57
12. Hot-Carrier effects	59
13. Quantum effects	64
4. Silicon-Germanium heterojunction bipolar transistor (J.D. Cressler, Auburn University)	69
1. Introduction	69
2. SiGe strained layer epitaxy	70
3. The SiGe Heterojunction bipolar transistor	72
4. SiGe HBT operation at cryogenic temperatures	75
5. Optimization of SiGe HBTs for cryogenic operation	76
6. Cryogenic SiGe HBT BiCMOS	82
5. Heterojunction transistors at low temperature (F. Aniel, R. Adde, IEF, Université Paris Sud)	85
1. Physical effects in III-V heterojunction transistors	86
2. Heterojunction field effect transistors-HEMT's	91
3. The heterojunction bipolar transistor	125

6. Quantum effects and devices	161
(Y. Omura, Kansai University)	
1. Introduction	161
2. Quantum effects at low temperature	162
3. Quantum wires	180
4. Quantum dots	182
5. Single electron devices and applications	185
7. Circuits and applications	189
(J. Deen, McMaster University)	
1) Introduction	189
2. General low temperature considerations	191
3. Inverters, OP-AMPS, memories and microprocessors	199
4. Imaging devices, circuits and systems	210
5. Sensors and read-out circuits	241