D: HBT   (p. 1)   ECSE 573   2006

[1] Introduction

[2] Principles of a conventional npn bipolar junction transistor

   Cross-section, structure, doping distribution,
   electric field distribution

[3] Emitter injection efficiency, base transport factor, gain of the conventional npn transistor.

[4] Limitations of the conventional npn transistor for high frequency operation

[5] Introduction to heterojunctions

[6] Difference between a heterojunction and a homojunction

[7] Structure, electric field and dopant distribution of a HBT. Emitter and base spacing

[8] Currents in a HBT

   Emitter injection efficiency
   Base transport factor
   Gain

D: HBT   (p. 2)

[9] Non-ideal characteristics

   Current gain fall-off
   Two-dimensional current flow
   Emitter crowding
   Energy-gap narrowing

   Device self-heating

[10] Gain collapse in HBTs

   Characteristics, sources of gain collapse, prevention
   methods

[11] Small signal characteristics

   Simplified circuit model
   RF models for common base and common emitter

[12] Cut-off frequency of HBT

[13] Power-frequency performance

[14] Some examples of HBT device applications.

[15] A comprehensive survey on the development and evolution of HBT devices

E: HBT   (p. 3)

[16] A survey on the manufacturers of microwave and millimeter wave circuits involving HBTs.

[17] Evolution of the microwave and millimeter wave markets involving HBTs.

Presentation package No. D -1:   items [1] to [4]   Hadley   10/26

Presentation package No. D -2:   items [5] to [8]   Qing   10/31

Presentation package No. D -3:   items [9] to [11]   Guillaume   11/02

Presentation package No. D -4:   items [12] to [17] Li   11/07

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[2] "SiGe, GaAs, and InP Heterojunction Bipolar Transistors," by Jiann S. Yuan, Wiley, 1999.

[3] "Fundamentals of III-V Devices," by William Liu, Wiley InterScience, 1999.

[4] Papers from IEEE Microwave Theory and Techniques (IEEE-MTT)

[5] Papers from "Microwave Journal" and "Microwave and Optical Technology Letters."