

Front End Integration in Wireless Networking Applications

Study Number: RF101-08

June 2008

©Copyright 2008 Semico Research Corp and Semiconductor Partners LLC. All rights reserved.

Reproduction in whole or part is prohibited without permission of Semico Research and Semiconductor Partners LLC

The contents of this report represent the interpretation and analysis of statistics and information that is generally available to the public or released by responsible agencies or individuals, but is not guaranteed as to its accuracy or completeness.

Table of Contents

List of Tables	iii
List of Figures	iv
Executive Summary	1
Methodology	2
Wireless Networks	3
Wireless Networking Semiconductor Integration Roadmap	4
Power Amplifier Alternatives	6
CMOS	6
SiGe.....	6
GaAs (Gallium Arsenide).....	6
Other III/V Materials	7
Present Day Wireless Networking Technology.....	7
PANs.....	7
Bluetooth.....	7
Other PANs	10
Wibree	10
Certified Wireless USB	10
UWB (Ultra-Wideband)	10
IEEE 802.15.4 / ZigBee	11
LANs	12
IEEE 802.11/ WiFi	12
Other LANs	15
HiperLAN (High Performance Radio Local Area Network)	15
WANs.....	16
IEEE 802.16 / WiMAX.....	16
WiMAX.....	16
Intel.....	17
One-Chip Radio Solutions	21
AsicAhead NV	21
Baseband Chip Solutions	22
Altair.....	22
Two-Chip WiMAX Solutions	22
NXP.....	22
SiP (System in Package) WiMAX Solution.....	23
Fujitsu	23

Disruptive Technologies	25
SOI (Silicon on Insulator)	25
SiGe	27
CMOS Technology	27
Wireless Networking Semiconductor Roadmap.....	28
PANs	28
LANs.....	28
WANs.....	29
Combinations of PANS, LANs and WANs	29

List of Tables

Table 1: Five-Year Forecast for Total Worldwide Unit Shipments of Bluetooth, Wi-Fi and WiMAX Semiconductor Solutions (Units in Millions).....	1
Table 2: PA Integration and Material Required Based on Transmission Power	5
Table 3: Bluetooth Classes	8
Table 4: Total Worldwide Bluetooth Shipments by Category.....	9
Table 5: Characteristics of Popular 802.11 Variations.....	12
Table 6: Forecast for Worldwide WiFi (802.11a/b/g/n) Shipments (Units in Millions).....	15
Table 7: WiMAX Shipments Forecast by Application (Units in Millions).....	24

List of Figures

Figure 1: Three Wireless Network Categories	3
Figure 2: Wireless Networking Generic Block Diagram	4
Figure 3: Atheros AR3031 Functional Block Diagram.....	8
Figure 4: CSR Bluecore4™ Reference Design.....	9
Figure 5: Atheros Part Number AR5007AP-G Single-Chip 802.11b/g Solution	13
Figure 6: Three-Chip 802.11n Solution.....	14
Figure 7: Broadcom Single-Chip 802.11n Solution BCM94322	14
Figure 8: Cell Phone and 802.16 Characteristics.....	17
Figure 9: Intel WiMAX 2250 Connection	19
Figure 10: Intel WiMAX 2250 Connection CPE System Diagram.....	19
Figure 11: Intel Mobile Solution: Baseband Chip and Radio.....	20
Figure 12: Intel WiMAX Solution: Baseband Chip and Front End SiP	20
Figure 13: AsicAhead NV AA1001 reference platform	21
Figure 14: NXP Two-Chip WiMAX Solution	22
Figure 15: Fujitsu MB89K1 WiMAX RF Module and MB86K21 Baseband Processor.....	23
Figure 16: Representation of the Cost per Transistor for Manufacturing on a SOI wafer versus a Silicon Wafer.....	26