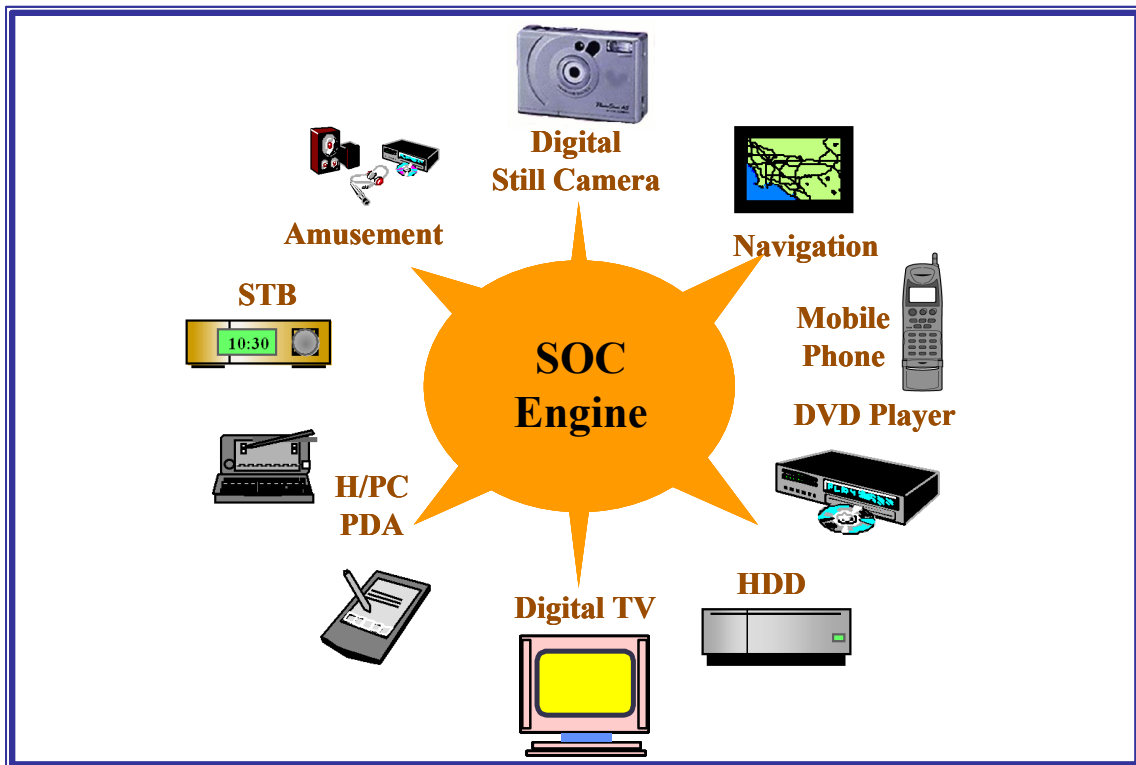


FUTURE HORIZONS

Presents

Semiconductor Application Markets Report



2010 Edition

Annual Analysis & Forecast
Of The Worldwide Semiconductor
Application Market

Future Horizons

FUTURE HORIZONS



RESPECT COPYRIGHT LAWS

**TREAT THIS REPORT IN THE SAME WAY AS YOU VALUE
AND TREAT YOUR OWN INTELLECTUAL PROPERTY**

**DO NOT MAKE COPIES OR DISTRIBUTE TO ANY OTHER PARTY
A SITE LICENSE IS REQUIRED FOR ADDITIONAL COPIES/USERS
(PLEASE CALL FOR DETAILS)**

Copyright ©2010 by Future Horizons, Republication Prohibited

The Semiconductor Application Markets Report 2010 Edition

Annual Analysis & Forecast Of The Worldwide Semiconductor Application Market

- ❑ **EDP**
- ❑ **Telecommunications**
- ❑ **Consumer**
- ❑ **Industrial**
- ❑ **Automotive**
- ❑ **History From 2004-2009**
- ❑ **Forecast For 2010-2014**

Future Horizons

www.futurehorizons.com ♦ **e-mail: mail@futurehorizons.com**
Future Horizons Ltd, 44 Bethel Road, Sevenoaks, Kent TN13 3UE, England
Tel: +44 (0)1732 740440 • Fax: +44 (0)1732 740442

Affiliates In Europe, India, Israel, Japan, Russian, San Jose California, USA
In Russia, Call Future Horizons' wholly-owned subsidiary East-West Electronics, Moscow, Russia Tel +7 495 228 0766

Annual Analysis & Forecast Of The Worldwide Semiconductor Application Markets

Copyright © 2010 by Future Horizons, All Rights Reserved

All rights reserved. No part of this publication may be reproduced, stored in retrieval systems, or transmitted in any form or by any means (mechanical, electronic, photocopying, duplicating, microfilming, video-tape or otherwise) without the prior written permission of Future Horizons. This information is not furnished in connection with a sale offer to sell securities, or in connection with the solicitation of an offer to buy securities. This firm and/or its officers, stockholders, or members of their families may, from time to time, have a position or may sell or buy such. The information contained in this report has been derived from statistical and other sources deemed to be reliable but its completeness and accuracy cannot be guaranteed. Opinions expressed are based on our studies and interpretations of available information. They reflect our judgement at that time and are subject to future change. While the report has been prepared in good faith, Future Horizons bears no responsibility for any consequences whatsoever to the buyer through the reading of, or acting upon, any data, or information, etc. contained in the report.

The Semiconductor Application Markets Report

Foreword

Fully revised and completely updated, this **Seventh Edition** of the Future Horizons' "**Semiconductor Application Markets Report**" analyses the key applications markets driving the semiconductor market. The 2010 edition covers the historical data for 2004-2009, together with a five year forecast for 2010-2014 inclusive.

The Report analyses the market by product, application market, and region, all in a convenient annual report format. The 2010 edition covers the historical data for 2004-2009, together with a five year forecast for 2010-2014 inclusive.

This report is published in direct response to the market need and complements the "**Global Semiconductor Update Report**" - which provides the latest information on developments in the **Worldwide Semiconductor Industry**, changes in the **Markets** and **Production Capacity**, and the impact of the global economic situation every month.

This high-quality, authoritative report provide the full spectrum of information and analysis on the Semiconductor Application Market, normally only available via expensive, subscription-style research services

The "**Semiconductor Application Markets Report**" significantly reduces the cost of external market research by offering a high quality, better value alternative to anything currently available. This report is essential for those involved in semiconductor market research and business development planning in the global semiconductor market. It will also prove invaluable for authorities and government departments in planning and directing economic growth, as well as companies seeking to invest in these markets.

Future Horizons was established in April 1989 by Malcolm Penn, previously Director of European Research with Dataquest. It provides market research, technology and design evaluation, training and other business support services for use in opportunity analysis, business planning and new market development. Its competence spans the worldwide electronics and IT industry and European market environment. **Future Horizons**, together with its wholly-owned Moscow-based subsidiary, **East-West Electronics**, is widely recognised as the world's leading authority on the former USSR and East European electronics market.

Future Horizons offers access to experienced industry veterans, each in a different aspect of the worldwide electronics and IT industry. In addition, **East-West Electronics**, offers direct access to the Russian and the CIS industry and markets.

Each year, **Future Horizons** hosts its renowned "**International Electronics Forum**" aimed at fostering opportunities for co-operation in the global IT and

The Semiconductor Application Markets Report

Foreword

electronics world. In addition, its many international affiliations enable **Future Horizons** to offer a complete programme of European and worldwide semiconductor market research, consulting and training services.

Our semiconductor experience commenced with the IC industry in 1962, *from the first commercial IC to SoC integration*. For all of your semiconductor business development needs, ... *Let Future Horizons' Reports Save YOU Time & Money.*

Malcolm Penn
Chairman & CEO
Future Horizons

The Semiconductor Application Markets Report

Table Of Contents

FOREWORD	a
Semiconductor Applications	1
□ Key Applications	1
1 Personal Computers (PCs)	5
□ Description	5
□ Industry Trends	6
□ Technology Trends	15
□ Production And Semiconductor Forecast	18
2 PC Graphic Processors	27
□ Description	27
□ Industry Trends	30
□ Technology Trends	34
□ Production And Semiconductor Forecast	35
3 Smartphones And Personal Digital Assistants (PDAs)	39
□ Description	39
□ Industry Trends	40
□ Technology Trends	42
□ Production And Semiconductor Forecast	46
4 Smartcards	51
□ Description	51
□ Industry Trends	54
□ Technology Trends	61
□ Production And Semiconductor Forecast	63
5 USB Flash Drives	71
□ Description	71
□ Industry Trends	72
□ Technology Trends	76
□ Production And Semiconductor Forecast	77
6 Flash Memory Cards	82
□ Description	82
□ Industry Trends	83
□ Technology Trends	89

The Semiconductor Application Markets Report

Table Of Contents

	□ Production And Semiconductor Forecast	93
7	Hard Disk Drives.....	98
	□ Description.....	98
	□ Industry Trends.....	102
	□ Technology Trends	106
	□ Production And Semiconductor Forecast	110
8	Mobile Phones	114
	□ Description.....	114
	□ Industry Trends.....	116
	□ Technology Trends	121
	□ Production And Semiconductor Forecast	132
9	Bluetooth.....	140
	□ Description.....	140
	□ Industry Trends.....	142
	□ Technology Trends	148
	□ Production And Semiconductor Forecast	153
10	ZigBee.....	156
	□ Description.....	156
	□ Industry Trends.....	157
	□ Technology Trends	165
	□ Production And Semiconductor Forecast	168
11	Wireless LAN (Wi-Fi).....	172
	□ Description.....	172
	□ Industry Trends.....	176
	□ Technology Trends	180
	□ Production And Semiconductor Forecast	190
12	WiMAX.....	194
	□ Description.....	194
	□ Industry Trends.....	194
	□ Technology Trends	202
	□ Production And Semiconductor Forecast	205
13	Ultra-WideBand (UWB).....	208

The Semiconductor Application Markets Report
Table Of Contents

	□ Description.....	208
	□ Industry Trends.....	209
	□ Technology Trends.....	218
	□ Production And Semiconductor Forecast.....	220
14	Near Field Communication (NFC).....	224
	□ Description.....	224
	□ Industry Trends.....	228
	□ Technology Trends.....	230
	□ Production & Semiconductor Forecast.....	232
15	Global Positioning By Satellite (GPS).....	234
	□ Description.....	234
	□ Industry Trends.....	237
	□ Technology Trends.....	240
	□ Production And Semiconductor Forecast.....	244
16	Digital TV Set-Top Boxes (STB & PVR).....	248
	□ Description.....	248
	□ Industry Trends.....	248
	□ Technology Trends.....	266
	□ Production And Semiconductor Forecast.....	268
17	Integrated Digital TVs.....	274
	□ Description.....	274
	□ Industry Trends.....	275
	□ Technology Trends.....	279
	□ Production And Semiconductor Forecast.....	292
18	DAB & Other Digital Broadcast Radio.....	300
	□ Description.....	300
	□ DAB Market Trends.....	303
	□ DAB Technical Trends.....	308
	□ DAB Production And Semiconductor Forecast.....	314
	□ Digital Satellite Radio Market Trends.....	315
	□ Digital Satellite Radio Technical Trends.....	316
	□ Digital Satellite Radio Production And Semiconductor Forecast.....	317

The Semiconductor Application Markets Report

Table Of Contents

□	IBOC - HD Radio Trends	318
□	IBOC - HD Radio Production And Semiconductor Forecast	319
□	IBOC - DRM Radio Trends	321
□	IBOC - DRM Radio Production And Semiconductor Forecast	322
□	Digital Broadcast Radio - Summary	324
19	Video Game Consoles & Handhelds	328
□	Description.....	328
□	Industry Trends.....	328
□	Technology Trends	332
□	Production And Semiconductor Forecast	340
20	Home DVD Players	348
□	Description.....	348
□	Industry Trends.....	351
□	Technology Trends	355
□	Production And Semiconductor Forecast	359
21	Home DVD Recorder.....	366
□	Description.....	366
□	Market Trends.....	370
□	Technology Trends	373
□	Production And Semiconductor Forecast	377
22	Digital Still Cameras.....	382
□	Description.....	382
□	Industry Trends.....	382
□	Technology Trends	386
□	Production And Semiconductor Forecast	397
23	Digital Camcorders.....	402
□	Description.....	402
□	Industry Trends.....	403
□	Technology Trends	405
□	Production And Semiconductor Forecast	411
24	RF-ID Tags	416
□	Description.....	416

The Semiconductor Application Markets Report

Table Of Contents

□	Industry Trends	419
□	Technology Trends	425
□	Production And Semiconductor Forecast	431
25	Biometrics & Fingerprint Scanners	436
□	Description.....	436
□	Technology Trends	439
□	Technology Trends	444
□	Production And Semiconductor Forecast	447
26	Robotics.....	452
□	Description.....	452
□	Industry Trends.....	453
□	Technology Trends	459
□	Production And Semiconductor Forecast	469
27	Automotive.....	476
□	Description.....	476
□	Industry Trends.....	476
□	Technology trends	481
□	Production And Semiconductor Forecast	494
28	Industrial & Medical Electronics	502
□	Description.....	502
□	Industry and Technology Trends	502
□	Semiconductor Market Forecast	536
29	Digital Media Players	540
□	Digital Media Players	540
□	Industry Trends.....	541
□	Technical Trends	546
□	Production And Semiconductor Forecast	547

The Semiconductor Application Markets Report

Table Of Contents

List of Figures

Figure 1.1 – MIT US\$100 Laptop	13
Figure 1.2 – Semiconductor Cost Distribution, Laptop PC	20
Figure 1.4 – Worldwide PC Production, 2004-2014.....	20
Figure 1.5 – Worldwide PC Production by Type, 2004-2014	21
Figure 1.6 – Worldwide PC Semiconductor Revenue, 2004–2014	25
Figure 2.1 – PC Bus Systems Showing Graphics Card Connection	29
Figure 2.2 – Worldwide GPU Shipments By Graphic System Type, 2004-2014.....	36
Figure 2.3 – Worldwide GPU Shipments By PC Sector, 2004-2014.....	37
Figure 2.4 – Worldwide PC GPU Semiconductor Market, 2004-2013.....	37
Figure 3.1 – HP iPAQ And Nokia E72 PDA.....	40
Figure 3.2 –HTC HD2 Smartphone	41
Figure 3.3 – Simplified Block Diagram Of An iPhone 3GS.....	43
Figure 3.4 – Smartphone & PDA Operating Systems, 2009.....	45
Figure 3.5 – Worldwide PDA And Smartphone Production, 2004-2013.....	47
Figure 3.6 – PDA And Smartphone Sales By Region, 2009.....	47
Figure 3.7 – WW PDA And Smartphone Semiconductor Market Forecast, 2004-2014	49
Figure 4.1 – Smartcard Used For Financial Services And Identity.....	52
Figure 4.2 – Typical Smartcard Electrical Contacts	53
Figure 4.3 – Worldwide Smartcard Applications, 2009.....	56
Figure 4.4 – WW Smartcard Applications, 2014.....	56
Figure 4.5 – WW Smartcard Shipments By Type, 2004-2014	64
Figure 4.6 – WW Smartcard Shipments, 2004-2014	65
Figure 4.7 – WW Smartcard IC Shipments, 2004-2014	65
Figure 4.8 – WW Smartcard Semiconductor Market, 2004-2014	66
Figure 4.9 – 2009 Smartcard Market By Region	68
Figure 5.1 – Typical USB Flash Drive	72
Figure 5.2 – UFD Configured For ReadyBoost.....	75
Figure 5.3 – Worldwide UFD & FDD Production, 2004-2014	78
Figure 5.4 – WW USB Flash Disk Semiconductor Forecast, 2004-2014.....	79
Figure 6.1 – Removable Flash Memory Card Formats.....	82
Table 6.3 (Cont) – Removable Flash Memory Card Formats.....	86

The Semiconductor Application Markets Report

Table Of Contents

Figure 6.2 – Cross Section of Typical Flash Memory Card.....	90
Figure 6.3 – Flash Memory Card Market By Application, 2004-2014.....	94
Figure 6.4 – Flash Memory Card Semiconductor Market & ASP, 2004-2014.....	95
Figure 7.1 –View Of A PC Hard Drive (lid removed).....	99
Figure 7.2 – Internal View of a Portable Consumer HDD.....	101
Figure 7.3 – HDD Format Market Share, 2009	103
Figure 7.4 – Disk Drive Electronics Block Diagram	107
Figure 7.5 – Hybrid Disk Drive Block Diagram.....	109
Figure 7.6 – HDD Unit Production, 2004-2014.....	111
Figure 7.7 – HDD Semiconductor Revenue, 2004-2014	111
Figure 7.8 – Percent of SSD Of Total Drives, 2006-2014.....	112
Figure 8.1 –Essential Office & Personal Phones	115
Figure 8.2 – Block Diagram Of 3G Mobile Phone Platform	123
Figure 8.3 – Early DVB-H TV Mobile Phone	124
Figure 8.4 – Flexible LCD Nokia 4G Concept Phone	131
Figure 8.5 – WW Mobile Phone Semiconductor Revenue, 2004-2013	136
Figure 8.6 – Mobile Phone Semiconductor Revenue Product Analysis, 2009	137
Figure 9.1 – Bluetooth Wireless Headset For The Mobile Phone.....	140
Figure 9.2 – Bluetooth Special Interest Group (SIG) Logo	144
Figure 9.3 – Block Diagram Of A Bluetooth Transceiver	149
Figure 9.4 – Bluetooth Single Chip for Headphones	149
Figure 9.5 – WW Production Of Bluetooth Chipsets, 2004-2014	153
Figure 9.6 – WW Bluetooth Semiconductor Revenue, 2004-2014.....	154
Figure 10.1 – ZigBee Home Thermostat & Lighting Control.....	156
Figure 10.2 – Wireless Connectivity Landscape.....	160
Figure 10.3 – ZigBee Alliance Logo	162
Figure 10.4 – ZigBee Standards Responsibility.....	163
Figure 10.5 – Single-Chip ZigBee Transceiver	166
Figure 10.6 – ZigBee Wireless Microcontroller	167
Figure 10.7 – ZigBee Wireless SoC	168
Figure 10.8 – Worldwide ZigBee Unit Production, 2004-2014.....	169
Figure 10.9 – WW ZigBee Semiconductor Market, 2004-2014	170
Figure 11.1 – Wi-Fi Enabled Home-Small Office Router	173

The Semiconductor Application Markets Report

Table Of Contents

Figure 11.2 – Logo of the Wi-Fi Alliance	174
Figure 11.3 – MIMO Multi-Path Environment.....	181
Figure 11.4 – MIMO Broadband Router	182
Figure 11.5 – The Wireless Home Media Network	183
Figure 11.6 – Chipset for Multimedia Using IEEE 802.11n.....	186
Figure 11.7 – Single Chip IEEE 802.11n (Draft 2.0) IC.....	188
Figure 11.8 – Effective Throughput of IEEE 802.11n.....	189
Figure 11.9 – WW Shipments Of W-LAN Transceivers, 2004-2014.....	191
Figure 11.10 – Wireless LAN Semiconductor Revenue & ASP, 2004-2014	192
Figure 12.1 – International Wireless Network Standards	195
Figure 12.2 – Proposed Broadband Wireless Plans	198
Figure 12.3 – WiMAX in a Consumer Application.....	199
Figure 12.4 – Introduction of WiMAX into 4G Plans	200
Figure 12.5 – Block Diagram of a WiMAX Consumer Box	203
Figure 12.6 – Worldwide WiMAX Consumer Box Production, 2004-2014	206
Figure 12.7 – Worldwide WiMAX Consumer Box SC Market, 2004-2014.....	207
Figure 13.1 – UWB Wireless-USB Hub.....	217
Figure 13.2 - Nokia/Wisair WUWB Demonstration.....	217
Figure 13.3 –UWB MAC/Baseband Chip	218
Figure 13.4 – UWB SiP Solution.....	220
Figure 13.5 – Worldwide UWB Unit Sales, 2004-2013	221
Figure 13.6 – Worldwide UWB Semiconductor Market, 2004-2014	222
Figure 14.1 – NFC in Passive Mode.....	225
Figure 14.2 – NFC in Active Mode	225
Figure 14.3 – Block diagram Of NFC Receiver	231
Figure 14.4 – NFC Chipsets in Mobile & Other Applications, 2004-2014	232
Figure 14.5 – Worldwide NFC Chipset Revenue, 2004-2014	233
Figure 15.1 – US DOD Earth Orbiting GPS Satellites	235
Figure 15.2 – Portable GPS Navigation System	238
Figure 15.3 – Automotive GPS Navigation System	238
Figure 15.4 – Block Diagram of a Typical GPS Receiver	241
Figure 15.5 – GPS Incorporated In Multi-Standard Mobile Phone	242
Figure 15.6 - Low Noise GPS Receiver and Digital Accelerator	243

The Semiconductor Application Markets Report

Table Of Contents

Figure 15.7 – WW Production of GPS Systems, 2004-2014	245
Figure 15.8 – WW Semiconductor Revenue From GPS Systems, 2004-2014	246
Figure 16.1 – Digital Terrestrial TV Set-Top Box	249
Figure 16.2 – High Definition Satellite TV Set-Top Box	254
Figure 16.3 – Worldwide Digital Satellite TV STB Production, 2004-2014	256
Figure 16.4 – Worldwide Digital Terrestrial TV STB Production, 2004-2014	258
Figure 16.5 – Top-End Cable TV Set-top Box	259
Figure 16.6 – Worldwide Digital Cable TV STB Production, 2004-2014	261
Figure 16.7 – ADSL IP TV Set-Top Box	261
Figure 16.8 – Worldwide DSL TV STB Production, 2004-2014	262
Figure 16.9 – Apples’ New Product – The Apple TV	265
Figure 16.10 – Block Diagram of an Interactive TV Set-top Box	266
Figure 16.11 – Set-Top Box SoC Block Diagram	267
Figure 16.12 – TV Set Box/PVR System	268
Figure 16.13 – Worldwide TV STB Production, 2004-2014	269
Figure 16.14 – 2009 Worldwide TV STB Production By Technology	269
Figure 16.15 – 2014 Worldwide TV STB Production by Technology	270
Figure 16.16 – Worldwide Digital STB Semiconductor Market, 2004-2014	271
Figure 16.17 – PVR Share Of The Total STB Market, 2004-2014	272
Figure 17.1 – LCD Flat-Panel iDTV	274
Figure 17. 2 – Multimedia Processor-Based Digital TV System	279
Figure 17.3 – Plasma TV Construction	281
Figure 17.4 – Assembly Of An Individual Mirror Tessera Onto SRAM	282
Figure 17.5 – Micromirrors Tilt toward the Light Source	283
Figure 17.6 – Digital Micromirror Device TV Optical System	283
Figure 17.7 – LCoS Microdevice Mounted on Harness	284
Figure 17.8 – Sandwich-Like Structure of LCDs	286
Figure 17.9 – Vertical Structure of Colour TFT LCD Panel	287
Figure 17.10 – LCD Driver Circuitry	288
Figure 17.11 – LCD & CRT Size Comparison	289
Figure 17.12 – WW Production of Flat-Panel iDTVs, 2004-2014	294
Figure 17.13 – Digital TV Programmable SoC	295
Figure 17.14 – Digital TV Programmable SoC Block Diagram	295

The Semiconductor Application Markets Report

Table Of Contents

Figure 17.15 – WW Flat-Panel iDTV Semi Market By Size, 2004-2014.....	296
Figure 17.16 – WW Flat-Panel iDTV Semiconductor Forecast, 2004-2014	297
Figure 18.1 – Early Kitchen-Top DAB Radio	304
Figure 18.2 – DAB Technology Symbol	304
Figure 18.3 – Block Diagram of a Modern Software-Defined Receiver	310
Figure 18.4 – DAB Software Defined Radio Consumer Module	311
Figure 18.5 – Texas Instruments/RadioScape DAB Chipset	312
Figure 18.6 – Functions Of TheTMS320DRE200 Baseband Chip.....	313
Figure 18.7 – DAB Digital Broadcast Radio Receiver Market, 2004-2014	314
Figure 18.8 – DAB Semiconductor Market Value & Content, 2004-2014.....	315
Figure 18.9 – Digital Satellite Broadcast Radio Tuner	316
Figure 18.10 - Digital Satellite Broadcast Radio Receiver Market, 2004-2014	317
Figure 18.11 - Digital Satellite Radio Semiconductor Market, 2004-2014	318
Figure 18.12 - IBOC- HD Digital Receiver Production, 2004-2014	320
Figure 18.13 - IBOC-HD Digital Receiver Semiconductor Market, 2004-2014	320
Figure 18.14 - DRM Radio Receiver Unit Production, 2004-2014	323
Figure 18.15 - DRM Radio Receiver Semiconductor Market, 2004-2014	323
Figure 18.16 –Total Digital Broadcast Radio Receiver Market.....	324
Figure 18.17 – Digital Broadcast Radio Semiconductor Market, 2004-2014.....	325
Figure 19.1 – Xbox360 & PlayStation 2 (PS2) Video Games Consoles	329
Figure 19.2 – Block Diagram of a Video Games Console.....	332
Figure 19.3 – Nintendo Dual Screen (DS) Handheld Games Machine.....	335
Figure 19.4 – Sony PSP Handheld Games Machine.....	335
Figure 19.5 – Xbox360 Games Console	337
Figure 19.6 – PlayStation3 Games Console.....	338
Figure 19.7 – IBM Cell Processor	339
Figure 19.8 – WW Production Of Large Video Game Consoles, 2004-2014.....	341
Figure 19.9 – WW Productions Of Handheld Game Machines, 2004-2014.....	341
Figure 19.10 – WW Video Game Console Semiconductor Market, 2004-2014.....	343
Figure 19.11 – WW Handheld Video Game Semiconductor Market, 2004-2014	344
Figure 19.12 – WW All Video Game Machine Semiconductor Market, 2004-2014.....	345
Figure 20.1 – Home DVD Player	348
Figure 20.2 – DVD Format Logo	349

The Semiconductor Application Markets Report

Table Of Contents

Figure 20.3 – Blu-ray and HD-DVD Association Logos.....	353
Figure 20.4 – Blu-ray Format Disk.....	353
Figure 20.5 – Blu-ray DVD Player.....	355
Figure 20.6 – DVD Player System Block Diagram.....	356
Figure 20.7 – WW Production Of Home DVD Players, 2004-2014.....	360
Figure 20.8 – WW Home DVD Player Semiconductor Market, 2004-2014	361
Figure 20.9 – WW Production of Next Generation DVD Players, 2004-2014.....	363
Figure 20.10 – WW Next Generation DVD Player Semi Market, 2004-2014.....	364
Figure 21.1 – Typical DVD Recorder.....	367
Figure 21.2 – DVD Forum & Alliance Logos	369
Figure 21.3 – Blu-ray Recorder	373
Figure 21.4 – Block Diagram for Home DVD Recorders.....	374
Figure 21.5 – Typical Advanced Home DVD Recorder Processor	375
Figure 21.6 SD DVD Recorders WW Production, 2004-2014	378
Figure 21.7 – SD DVD Recorder WW Semi Market, 2004-2014	378
Figure 21.8 – Next Generation DVD Recorders WW Production, 2004-2014.....	379
Figure 21.9 – Next Generation DVD Recorder WW Semi Market, 2004-2014	380
Figure 22.1 –Digital Still Camera System Functions.....	386
Figure 22.2 – Digital Camera Components	387
Figure 22.3 – Digital Camera, Side, Front & Rear View.....	387
Figure 22.4 – Sensor Bayer Filter Pattern.....	391
Figure 22.5 – CMOS Camera Image Sensor.....	392
Figure 22.6 – Original Bayer & Kodak Forth Pixel Imaging Pattern	392
Figure 22.7 – Compact Flash, SD and MicroDrive Cards	395
Figure 22.8 – WW Digital Still Camera Market, 2004 – 2014	398
Figure 22.9 – WW Digital Still Camera Semiconductor Market, 2004-2014.....	400
Figure 23.1 – Low-Cost Video Camcorders	404
Figure 23.2 – High-Definition Video Camcorder	404
Figure 23.3 – MiniDV Digital Camcorder.....	407
Figure 23.4 – HD Digital Camcorder Memory Formats, 2007-2014.....	408
Figure 23.5 – Block Diagram of Digital Camcorder Signal Processing	410
Figure 23.6 – LSI Chip Partitioning Of Digital Camcorder Signal Processing	411
Figure 23.7 – Digital Camcorder Market, 2004-2014.....	412

The Semiconductor Application Markets Report

Table Of Contents

Figure 23.8 – WW Digital Camcorder Semiconductor Market, 2004-2014	413
Figure 24.1 – RF-ID Tag in a Parcel Label Application.....	417
Figure 24.2 – The RF-ID Tag Electronic System	418
Figure 24.3 – RF-ID Tag Example	426
Figure 24.4 – RF-ID Tag for Plastic & Cardboard Containers	426
Figure 24.5 – Passive RF-ID Tag Block Diagram	427
Figure 24.6 – WW Production Of RF-ID Tags, Non-Label Type, 2004-2014	432
Figure 24.7 – WW Shipments of RF-ID Tags, Label Type, 2004-2014	432
Figure 24.8 – WW RF-ID Non Shop-Label Tag Semi Market, 2004-2014.....	434
Figure 24.9 – WW RF-ID Shop-Label Tag Semiconductor Market, 2004-2014.....	434
Figure 25.1 – Fingerprint Security on a Laptop Computer	437
Figure 25.2 – Fingerprint Security on a Mobile Phone.....	437
Figure 25.3 – Fingerprint Reading Sensors	440
Figure 25.4 – Fingerprint Reading Sensors	445
Figure 25.5 – WW Fingerprint Sensor Production, 2004-2014	448
Figure 25.6 – Fingerprint Door Lock.....	448
Figure 25.7 – WW Fingerprint Sensor Semiconductor Market, 2004-2014	449
Figure 26.1 – Waves of Electronic Application.....	453
Figure 26.2 – Radio Surgery Robot	455
Figure 26.3 – Murataselsakukun In Action.....	457
Figure 26.4 – Ri-MAN Hospital Helper Robot.....	458
Figure 26.5 – Geographical Sales of Heavy Industrial Robots, 2009	461
Figure 26.6 – LG, iClebo, Rooma & Trilobyte Robot Vacuum Cleaners.....	463
Figure 26.7 – Robotic Gutter Cleaner	463
Figure 26.8 – Sony Aibo ‘Toy Pet’ Robot.....	464
Figure 26.9 – Lego Mindstorms NXT Robot Kit.....	465
Figure 26.10 – Intelligent-Service Robots	466
Figure 26.11 – Typical Humanoid Robot Sensor Requirements.....	467
Figure 26.12 – WW Robot Market, 2004-2014	470
Figure 26.13 – WW Value of Robot Systems End Market, 2004-2014.....	471
Figure 26.14 – ASIMO Domestic Robot	472
Figure 26.15 – Semiconductor Revenue, Robotics, 2004-2014.....	473
Figure 26.16 – Semiconductor ASP, All Robotics, 2004-2014	474

The Semiconductor Application Markets Report

Table Of Contents

Figure 27.1 – Popular American Sports Utility Vehicle (SUV)	477
Figure 27.2 – Automobile Showing External Component Suppliers	479
Figure 27.3 – Factory Fitted Information & Navigation System	480
Figure 27.4 – Block Diagram of CAN Automotive Network	482
Figure 27.5 – Local Interconnect Network	484
Figure 27.6 – Block Diagram Of Automotive Infotainment SoC	486
Figure 27.7 – Tata ‘Peoples Car’ Low-Cost Vehicle	493
Figure 27.8 – WW Geographical Vehicle Production Forecast, 2004-2014.....	494
Figure 27.9 – WW Vehicle Production by Region, 2009	495
Figure 27.10 – WW Vehicle Production by Region, 2014	496
Figure 27.11 – 2009 Western European Automobile Production, By Country.....	496
Figure 27.12 – WW Automotive Systems Semiconductor Revenue, 2004-2014	498
Figure 27.13 – WW Automotive Semiconductor Market Forecast, 2004-2014	499
Figure 28.1 – Moore’s Law for Industrial Semiconductors	503
Figure 28.2 – Industrial Market Segmentation	504
Figure 28.3 – Motor Control Market Segmentation.....	505
Figure 28.4 – Brushless DC Motor Control Block Diagram.....	507
Figure 28.5 – Environmental Building Control	511
Figure 28.6 – Building Market Segmentation.....	512
Figure 28.7 – EFTPOS Financial Terminals.....	516
Figure 28.8 – White LED Lamps Stair Lighting.....	518
Figure 28.9 – Modern White LED Home Lighting.....	519
Figure 28.10 – Automation & Test Market Segmentation.....	520
Figure 28.11 – Industrial Control System	521
Figure 28.12 – Industrial Robots	523
Figure 28.14 – Example Of ZigBee Implementation.....	525
Figure 28.15 – RF-ID Tag Example	526
Figure 28.16 – Gas Chromatography/Mass Spectrometry System	528
Figure 28.17 – Medical Market Segmentation.....	530
Figure 28.18 – Block diagram of a Blood Pressure Monitor	531
Figure 28.19 – Personal Care & Monitoring.....	533
Figure 28.20 – The Low-Power Medical System Wireless Chip.....	534
Figure 28.21 – The Digital Patient Monitoring Plaster	534

The Semiconductor Application Markets Report**Table Of Contents**

Figure 28.22 – Smart Shopping Using Wireless.....	536
Figure 28.23 – WW Industrial Semiconductor Market, 2004-2014.....	537
Figure 28.24 – Industrial Market Revenues By Sub-Sector, 2009.....	538
Figure 28.25 – Industrial Market Revenues By Sub-Sector, 2014.....	538
Figure 29.1 - Early MP3 Player, Diamond Rio PMP300.....	540
Figure 29.2 - Higher Capacity MP3 Player, Personal Jukebox PJB-100.....	541
Figure 29.3 - Fifth Generation Apple iPod MP3 Player.....	542
Figure 29.4 - Block Diagram of a Typical Digital Audio Player.....	547
Figure 29.5 – Worldwide Digital Media Players Production, 2004-2014.....	548
Figure 29.6 – WW Digital Media Player Semiconductor Market, 2004-2013.....	549

The Semiconductor Application Markets Report

Table Of Contents

List Of Tables

Table A1 – Summary Of Key Application Volumes, 2009 & 2014	2
Table A2 – Summary Of Key Application Semiconductor TAM, 2009 & 2014.....	3
Table 1.1 – Top 8 PC Companies Worldwide	8
Table 1.2 – Average DRAM Used In All PCs, 2007-2009.....	23
Table 2.2 – Graphics Card Suppliers by Desktop PC Model, 2009.....	32
Table 5.1 – UFD and FDD Performance Comparison.....	73
Table 6.2 – Photo Storage vs. Memory Card/Pixel Size.....	84
Table 6.3 – Removable Flash Memory Card Formats	85
Table 6.1 – Comparison Of NOR & NAND Memory Technology	91
Table 7.1 – HDD Applications & Platter Sizes.....	100
Table 8.1 – Selection of Mobile Phone Handset Manufacturers.....	118
Table 8.2 – WW Mobile Phone Unit Production By Air Interface, 2004-2014.....	134
Table 8.3 – WW Mobile Phone Unit Production By Phone Type, 2004-2014	134
Table 9.1 – Bluetooth Specification Progression.....	150
Table 9.2 – Bluetooth Power Levels.....	150
Table 10.1 – Wireless Connectivity Standards	157
Table 10.2 – ZigBee & Bluetooth Optimisation	159
Table 11.1 – Summary of IEEE 803.11 Standards	175
Table 11.2 – 802.11n Data Throughput in Mb/sec	184
Table 12.1 – Wireless Broadband Technology Comparison.....	201
Table 16.1 – Major TV Set-Top Box Manufacturers.....	251
Table 17.1 – Approved Digital TV Screen Pixel Formats	290
Table 19.1 – Processor & Graphics Chips Existing In Video Games Consoles	333
Table 22.1 – Storage Requirements of Images	396
Table 22.2 – Photo Storage vs. Memory Card/Pixel Size.....	396
Table 24.1 – RF-ID Tag Frequency Bands	430
Table 25.1 – Exploitation Of Biometric Features	440
Table 27.1 – Major Global Automotive OEM Suppliers, 2008	480
Table 28.1 – Major Microcontroller Suppliers	509
Table 28.2 – ZigBee Semiconductor Suppliers	513
Table 28.3 – ZigBee Module Suppliers	514

The Semiconductor Application Markets Report**Table Of Contents**

Table 28.4 – Different Types of Sensor.....	522
Table 28.5 – Companies Supplying Electronic Test & Measurement Equipment.....	529
Table 29.1 - Leading Digital Media Player Suppliers.....	546

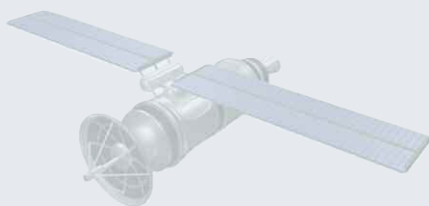
This Page Intentionally Left Blank



**22nd Year Of Service
Founded 1989**

**5th Decade
Of Semiconductor
Experience**

**Our Experience
Starts With The First
Commercial IC**



Established in April 1989, Future Horizons provides market research and business support services for use in opportunity analysis, business planning and new market development. Its industry information seminars and forums are widely considered to be the best of their kind. Emphasis is placed on the world-wide semiconductor and electronics industry and associated markets. Emphasis is placed on the worldwide microelectronics and electronics industry, and European market environment.

Malcolm Penn is the founder and CEO of Future Horizons, with over 45 years experience in the electronics and semiconductor industry. He has worked extensively throughout Europe as well as in the United States, the former USSR, Japan and Korea, and was an early pioneer of pan-European research and product development collaboration in the 1970s during his tenure with ITT Europe. His industrial experience has involved him with all aspects of the management, manufacturing, marketing and use of electronic components, particularly semiconductor devices.

Future Horizons offers a high-quality, cost-effective, flexible alternative to expensive subscription-style, market research. Our experience commenced with the industry in 1962, from the first commercial IC to SOC integration. For all of your semiconductor business development needs ...

Let Future Horizons Save YOU Time & Money

US Affiliate:

Pathfinder Research

13901 North 73rd Street, Suite 205
Scottsdale, Arizona 85260, USA
Tel: + 1 480 348 1133
Fax: + 1 480 348 9745
hfeeny@pathfinder-research.com

Israel Affiliate:

Amir Ben Artzi Content & Media

40 Derech Hayam St.
Havatzelet Hasharon, 42937 Israel
Tel: + 972 73 7367966
Fax: + 972 9 8665799
amir@amircm.com

Russian Affiliate:

ELINT

6th Floor, 40 Bldg
1, 3y Proezd Maryinoy Roshchi
127018 Moscow, Russia
Tel: +7 459 228 0766
Fax: + 7 495 787 3869
elintsp@mail.ru

Indian Affiliate:

**Pradeep Chakraborty PC
Mediaworks**

Tel: +91 99451 27632
pradeepchakra@gmail.com

European Affiliate:

GMC Suisse

Ch. de la Dauphine 20
CH-1291 Commugny
Switzerland
Tel: + 41 22 349 0939
wladek@grabinski.ch

Far East Affiliate:

Semicon Research Ltd

Kagami Ishi Bldg., 1-11-7, Bunkyo-Ku
Yushima, Tokyo 113, Japan
Tel: + 81 3 5684 3941
Fax: + 81 3 5684 3943
o_ohtake@semiconresearch.com