

INTRODUCTION	XIX
STUDY BACKGROUND	XIX
GOALS AND OBJECTIVES.....	XIX
INTENDED AUDIENCE.....	XX
SCOPE AND FORMAT	XX
METHODOLOGY AND INFORMATION SOURCES.....	XXI
ANALYST CREDENTIALS.....	XXI
RELATED BCC RESEARCH	XXI
RELATED BCC REPORTS	XXII
BCC ONLINE SERVICES.....	XXII
DISCLAIMER	XXII
EXECUTIVE SUMMARY	XXIII
<i>SUMMARY TABLE GLOBAL MARKET FOR PRINTED ELECTRONICS,</i> <i>THROUGH 2013 (\$ MILLIONS)</i>	XXIII
<i>SUMMARY FIGURE PRINTED ELECTRONICS MARKET BY END-</i> <i>USER SEGMENT, 2007-2013 (\$ MILLIONS)</i>	XXIV
OVERVIEW	1
GENERAL DESCRIPTION OF PRINTED ELECTRONICS.....	1
DEFINITIONS	1
Printing.....	1
Printed Circuit Boards.....	1
Ink	2
BRIEF HISTORY OF PRINTED ELECTRONICS.....	2
TYPES OF PRINTED ELECTRONICS	3
<i>TABLE 1 MAIN TYPES OF PRINTED ELECTRONICS</i>	3
<i>TABLE 1 (CONTINUED)</i>	4
OLEDs	4
ELECTROLUMINESCENT DEVICES.....	4
ELECTROPHORETIC	5
ELECTROCHROMIC	5
ORGANIC PHOTOVOLTAIC	6
OTHER TYPES OF PRINTED ELECTRONICS	6
ELECTRONICS PRINTING TECHNOLOGIES	6
PRINTING MACHINERY	6
Screen Printing.....	7
Inkjet Printing and Other Liquid Dispensing Systems	8
Offset Lithography	8
<i>FIGURE 1 OFFSET LITHOGRAPHY PRESS SCHEMATIC DIAGRAM</i>	9
Offset Lithography (Continued)	10
Flexographic Printing.....	11
<i>FIGURE 2 TYPICAL FLEXOGRAPHIC PRESS LAYOUT</i>	11
Rotogravure	12

Pad Printing.....	13
Microcontact Printing.....	14
<i>FIGURE 3 MICROCONTACT PRINTING</i>	<i>14</i>
Embossing.....	15
<i>FIGURE 4 HOT EMBOSsing LITHOGRAPHY</i>	<i>15</i>
Roll to Roll.....	16
<i>FIGURE 5 ROLL-TO-ROLL MANUFACTURING PROCESS</i>	<i>17</i>
MATERIALS.....	18
Inks.....	18
Conducting Inks.....	18
Semiconducting Inks.....	19
Dielectric (Insulating) Inks	20
Substrates	20
ADVANTAGES AND DRAWBACKS OF PRINTED ELECTRONICS.....	20
FLEXIBILITY.....	20
COST EFFECTIVENESS	21
MANUFACTURABILITY	21
ORGANIC MATERIALS CAPABILITY	22
COMPATIBILITY WITH NON-ELECTRONIC PRINTED	
MATERIALS	22
ROBUSTNESS	22
LOW RESOLUTION	23
PRINTED ELECTRONICS APPLICATIONS	23
<i>TABLE 2 MAJOR APPLICATIONS OF PRINTED ELECTRONICS</i>	<i>23</i>
OPTOELECTRONIC APPLICATIONS	24
<i>TABLE 3 OPTOELECTRONIC APPLICATIONS OF PRINTED</i>	
<i>ELECTRONICS</i>	<i>24</i>
RADIO FREQUENCY APPLICATIONS.....	25
POWER SOURCES/ENERGY	25
SENSORS	25
OTHER/MISCELLANEOUS APPLICATIONS	26
PRINTED ELECTRONICS END USES	26
<i>TABLE 4 MAJOR END USES OF PRINTED ELECTRONICS</i>	<i>27</i>
CONSUMER PRODUCTS	27
MOTOR VEHICLES	28
TRANSPORT AND LOGISTICS	28
<i>TABLE 5 RFID APPLICATIONS IN MATERIALS HANDLING AND</i>	
<i>LOGISTICS</i>	<i>28</i>
RETAIL.....	29
BUILDING PRODUCTS.....	29
FINANCIAL SERVICES.....	30
ADVERTISING	30
ENVIRONMENTAL PROTECTION	30
MILITARY	30

MARKET TRENDS, 2007-2013.....	31
<i>FIGURE 6 GLOBAL PRINTED ELECTRONICS MARKET TRENDS, 2007-2013 (\$ BILLIONS)</i>	31
TECHNOLOGY SEGMENTS.....	32
<i>TABLE 6 PRINTED ELECTRONICS MARKET BY TYPE OF TECHNOLOGY, THROUGH 2013 (\$ MILLIONS)</i>	32
<i>FIGURE 7 PRINTED ELECTRONICS MARKET SHARES BY TYPE OF TECHNOLOGY, 2007-2013 (%)</i>	33
APPLICATION SEGMENTS.....	33
<i>TABLE 7 PRINTED ELECTRONICS MARKET BY APPLICATION, THROUGH 2013 (\$ MILLIONS)</i>	34
<i>FIGURE 8 PRINTED ELECTRONICS MARKET SHARES BY TYPE OF APPLICATION, 2007-2013 (%)</i>	34
<i>FIGURE 8 (CONTINUED)</i>	35
END-USE SEGMENTS.....	35
<i>TABLE 8 PRINTED ELECTRONICS MARKET BY END USE, THROUGH 2013 (\$ MILLIONS)</i>	35
<i>FIGURE 9 PRINTED ELECTRONICS MARKET SHARES BY TYPE OF END USE, 2007-2013 (%)</i>	36
<i>FIGURE 9 (CONTINUED)</i>	37
OLEDs: TECHNOLOGIES, APPLICATIONS, AND MARKETS.....	38
OLED TECHNOLOGIES.....	38
POLYMER LIGHT-EMITTING DIODES (P-OLEDs).....	38
General Principles.....	38
Electroluminescent Polymers.....	39
Commercialization.....	39
Fabrication.....	39
Ink Jet Printing.....	40
Screen Printing.....	40
Roll-to-Roll (Web) Printing.....	40
SMALL MOLECULE OLEDs.....	41
COMPANIES DEVELOPING PRINTED OLEDs.....	41
<i>TABLE 9 COMPANIES DEVELOPING PRINTED OLED TECHNOLOGIES AND APPLICATIONS</i>	42
APPLICATIONS/END USES.....	42
DISPLAYS AND SIGNAGE.....	42
Large-Format Flat Panel Displays.....	42
Small and Micro-Displays.....	43
Labels and Signs.....	44
Electronic Shelf Labels.....	44
Electronic Point of Purchase Displays.....	45
Transportation and Large Commercial Signage.....	45
LIGHTING.....	46
Architectural Lighting.....	46

Backlighting.....	47
PROJECTED MARKET	47
SUMMARY	47
<i>TABLE 10 PROJECTED MARKET FOR PRINTED OLEDs, THROUGH 2013 (\$ MILLIONS)</i>	48
<i>FIGURE 10 PRINTED OLEDs MARKET SHARES BY APPLICATION, 2007 VS. 2013 (%)</i>	48
DISPLAYS	49
<i>TABLE 11 MARKET FOR PRINTED OLED DISPLAYS IN DISPLAY APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	49
<i>FIGURE 11 PRINTED OLED DISPLAY MARKET SHARES BY TYPE OF DISPLAY, 2007-2013 (%)</i>	50
Large Format Displays.....	50
<i>TABLE 12 MARKET FOR PRINTED OLED LARGE-FORMAT DISPLAYS, THROUGH 2013 (\$ MILLIONS)</i>	51
Medium Format Displays.....	51
<i>TABLE 13 MARKET FOR MEDIUM FORMAT PRINTED OLED DISPLAYS, THROUGH 2013 (\$ MILLIONS)</i>	51
Televisions.....	52
<i>TABLE 14 MARKET FOR PRINTED OLED MEDIUM FORMAT TV PANELS, THROUGH 2013 (\$ MILLIONS)</i>	52
Computer Displays	52
<i>TABLE 15 MARKET FOR PRINTED OLED COMPUTER MONITOR AND NOTEBOOK DISPLAY PANELS, THROUGH 2013 (\$ MILLIONS)</i>	53
Small Displays	53
Microdisplays	53
<i>TABLE 16 MARKET FOR PRINTED OLED MICRODISPLAYS IN HEAD-MOUNTED DISPLAY APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	54
Labels and Signage.....	54
<i>TABLE 17 MARKET FOR PRINTED OLED DISPLAYS IN LABELS AND SIGNAGE APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	55
Electronic Point of Purchase Displays	55
<i>TABLE 18 MARKET FOR PRINTED OLED DISPLAYS IN POINT OF PURCHASE APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	56
Transportation and Large Commercial Signage	56
<i>TABLE 19 MARKET FOR PRINTED OLED DISPLAYS IN TRANSPORT AND LARGE COMMERCIAL SIGNAGE APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	56
LIGHTING.....	57
<i>TABLE 20 MARKET FOR PRINTED OLEDs IN LIGHTING APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	57
Interior Lighting.....	57

<i>TABLE 21 MARKET FOR PRINTED OLEDs IN INTEROR LIGHTING APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	58
Backlighting.....	58
<i>TABLE 22 MARKET FOR PRINTED OLEDs IN BACKLIGHTING APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	58
PRINTED ELECTROLUMINESCENT MATERIALS: TECHNOLOGIES, APPLICATIONS, AND MARKETS.....	59
ELECTROLUMINESCENT TECHNOLOGIES.....	59
GENERAL PRINCIPLES	59
<i>FIGURE 12 TYPICAL ELECTROLUMINESCENT CONFIGURATION</i>	60
ADVANTAGES AND DISADVANTAGES OF ELECTROLUMINESCENT DEVICES	60
TYPES OF ELECTROLUMINESCENT DEVICES	61
MATERIALS.....	61
FABRICATION	62
Screen Printing.....	62
COMPANIES DEVELOPING AND MANUFACTURING PRINTED ELECTROLUMINESCENT TECHNOLOGIES	63
<i>TABLE 23 COMPANIES DEVELOPING PRINTED OLED TECHNOLOGIES AND APPLICATIONS</i>	63
APPLICATIONS/END USES	63
LIGHTING.....	64
Backlighting.....	64
Automotive Backlighting.....	64
Portable and Handheld Electronics	64
Architectural and Interior Lighting.....	64
DISPLAYS/SIGNAGE.....	65
POTENTIAL MARKETS	65
<i>TABLE 24 MARKET FOR PRINTED ELECTROLUMINESCENT LIGHTING AND DISPLAYS, THROUGH 2013 (\$ MILLIONS)</i>	65
LIGHTING.....	66
<i>TABLE 25 MARKET FOR PRINTED ELECTROLUMINESCENT LIGHTING, THROUGH 2013 (\$ MILLIONS)</i>	66
Backlighting.....	66
<i>TABLE 26 MARKET FOR PRINTED ELECTROLUMINESCENT BACKLIGHTING, THROUGH 2013 (\$ MILLIONS)</i>	66
Automotive Backlighting.....	67
<i>TABLE 27 MARKET FOR PRINTED ELECTROLUMINESCENT LIGHTING IN AUTOMOTIVE APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	67
Handheld Electronics and Timepieces.....	67
<i>TABLE 28 MARKET FOR PRINTED ELECTROLUMINESCENT LAMPS IN NON-AUTOMOTIVE BACKLIGHTING APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	67

Architectural and Interior Lighting.....	68
<i>TABLE 29 MARKET FOR PRINTED ELECTROLUMINESCENT ARCHITECTURAL AND INTERIOR LIGHTING, THROUGH 2013 (\$ MILLIONS)</i>	68
DISPLAYS AND SIGNAGE	68
<i>TABLE 30 MARKET FOR PRINTED ELECTROLUMINESCENT DISPLAYS AND SIGNAGE, THROUGH 2013 (\$ MILLIONS)</i>	69
PRINTED ELECTROPHORETIC MATERIALS: TECHNOLOGIES, APPLICATIONS, AND MARKETS.....	70
ELECTROPHORETIC TECHNOLOGIES	70
GENERAL PRINCIPLES	70
ADVANTAGES AND DISADVANTAGES OF ELECTROPHORETIC DISPLAYS	71
TYPES OF ELECTROPHORETIC DISPLAYS	71
Active vs. Passive Matrix Control.....	71
Backpane-less Displays	72
Flexible Displays	72
MATERIALS.....	73
Bichromal Beads and Powders.....	73
Substrates	73
Backpanes	73
FABRICATION	74
Frontpanes	74
Backpanes	74
COMPANIES DEVELOPING AND MANUFACTURING PRINTED ELECTROPHORETIC TECHNOLOGIES.....	75
<i>TABLE 31 COMPANIES DEVELOPING OR MANUFACTURING PRINTED ELECTROPHORETIC TECHNOLOGIES AND APPLICATIONS</i>	75
ELECTROPHORETIC APPLICATIONS/END USES	75
<i>TABLE 32 ELECTROPHORETIC DISPLAY APPLICATIONS</i>	76
E-BOOK READERS	76
ROLLABLE DISPLAYS FOR MOBILE ELECTRONIC DEVICES.....	77
ELECTRONIC SHELF LABELS AND POS DISPLAYS	77
RFID TAGS	78
SMART CARDS.....	78
TRANSPORTATION DISPLAYS	79
BATTERY CHARGE AND MEMORY REMAINING MEMORIES	79
PROJECTED MARKET	79
<i>TABLE 33 MARKET FOR PRINTED ELECTROPHORETIC DEVICES, THROUGH 2013 (\$ MILLIONS)</i>	80

<i>FIGURE 13 PRINTED ELECTRONICS SHARE OF EPD MARKET, 2007 AND 2013 (%)</i>	81
E-BOOK READERS	81
<i>TABLE 34 MARKET FOR PRINTED ELECTROPHORETIC DISPLAY MODULES IN E-BOOK READERS, THROUGH 2013 (\$ MILLIONS)</i>	81
ROLLABLE DISPLAYS FOR MOBILE ELECTRONIC DEVICES.....	82
<i>TABLE 35 MARKET FOR PRINTED ROLLABLE DISPLAYS USED IN MOBILE ELECTRONIC DEVICES, THROUGH 2013 (\$ MILLIONS)</i>	83
Cellular Phone Handsets	83
<i>TABLE 36 MARKET FOR PRINTED ROLLABLE DISPLAYS USED IN MOBILE ELECTRONIC DEVICES, THROUGH 2013 (\$ MILLIONS)</i>	84
GPS Receivers.....	84
<i>TABLE 37 MARKET FOR PRINTED ROLLABLE DISPLAYS USED IN MOBILE GPS DEVICES, THROUGH 2013 (\$ MILLIONS)</i>	85
ELECTRONIC SHELF LABELS AND POP DISPLAYS	85
<i>TABLE 38 MARKET FOR PRINTED E-PAPER SHELF LABELS AND POP DISPLAYS IN POINT OF PURCHASE APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	86
RFID TAGS	86
<i>TABLE 39 MARKET FOR PRINTED E-PAPER LABELS USED IN RFID APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	87
TRANSPORTATION DISPLAYS	87
<i>TABLE 40 MARKET FOR E-PAPER DISPLAYS IN TRANSPORTATION DISPLAY APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	87
SMART CARDS.....	88
<i>TABLE 41 MARKET FOR E-PAPER DISPLAYS IN SMART CARD APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	88
BATTERY CHARGE AND MEMORY REMAINING MEMORIES	88
<i>TABLE 42 MARKET FOR E-PAPER DISPLAYS IN MEMORY AND BATTERY CHARGE REMAINING METERING APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	89
PRINTED ELECTROCHROMIC MATERIALS: TECHNOLOGIES, APPLICATIONS, AND MARKETS	90
ELECTROCHROMIC TECHNOLOGIES.....	90
GENERAL PRINCIPLES	90
ADVANTAGES AND DISADVANTAGES	91
TYPES OF ELECTROCHROMIC DEVICES	91
Inorganic/Electrode Devices.....	91
Molecular/Solution Devices	92
Nanocrystalline Amplification Devices.....	92
MATERIALS.....	92
FABRICATION	93

COMPANIES DEVELOPING OR MANUFACTURING ELECTROCHROMIC DEVICES	94
<i>TABLE 43 COMPANIES DEVELOPING PRINTED ELECTROCHROMIC TECHNOLOGIES AND APPLICATIONS</i>	<i>94</i>
APPLICATIONS/END USES	94
SMART CARD DISPLAYS	95
MOBILE DISPLAYS	95
LARGE DISPLAYS AND ADVERTISING SIGNAGE	95
SMART WINDOWS AND MIRRORS	96
COMPUTER DATA STORAGE	96
PROJECTED MARKET	96
<i>TABLE 44 MARKET FOR PRINTED ELECTROCHROMIC DISPLAYS, THROUGH 2013 (\$ MILLIONS)</i>	<i>96</i>
SMART CARD DISPLAYS	97
<i>TABLE 45 MARKET FOR ELECTROCHROMIC DISPLAYS IN SMART CARD APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	<i>97</i>
MOBILE DISPLAYS	97
<i>TABLE 46 MARKET FOR ELECTROCHROMIC DEVICES IN SMALL DISPLAY APPLICATIONS, THROUGH 2013 (\$ MILLIONS)</i>	<i>98</i>
 PRINTED PHOTOVOLTAIC MATERIALS: TECHNOLOGIES, APPLICATIONS, AND MARKETS.....	 99
PRINTED PHOTOVOLTAIC TECHNOLOGIES	99
COPPER INDIUM GALLIUM SELENIDE SOLAR CELLS	99
DYE SENSITIZED SOLAR CELLS	100
QUANTUM DOT SOLAR CELLS	100
MANUFACTURERS OF PRINTED PHOTOVOLTAICS	101
<i>TABLE 47 MANUFACTURERS OF PRINTED PV DEVICES</i>	<i>101</i>
APPLICATIONS/END USES	102
PROJECTED MARKET	102
<i>TABLE 48 PROJECTED MARKET FOR PRINTED PHOTOVOLTAICS, THROUGH 2013 (\$ MILLIONS)</i>	<i>102</i>
PROJECTED MARKET (CONTINUED)	103
 OTHER PRINTED ELECTRONIC DEVICES: TECHNOLOGIES, APPLICATIONS, AND MARKETS.....	 104
TECHNOLOGIES	104
COMPANIES	104
<i>TABLE 49 COMPANIES DEVELOPING OTHER PRINTED TECHNOLOGIES AND APPLICATIONS</i>	<i>104</i>
<i>TABLE 49 (CONTINUED)</i>	<i>105</i>
APPLICATIONS/END USES	105
PRINTED RFID TAGS	105
PRINTED BATTERIES	106
SENSORS	107

Biochips.....	108
Environmental Sensors	108
SMART PACKAGING.....	109
PROJECTED MARKET	109
TABLE 50 GLOBAL CONSUMPTION OF OTHER PRINTED ELECTRONIC DEVICES, THROUGH 2013 (\$ MILLIONS).....	110
FIGURE 14 OTHER PRINTED ELECTRONICS MARKET SHARES BY TYPE OF APPLICATION, 2007-2013 (%).....	110
FIGURE 14 (CONTINUED)	111
PRINTED BATTERIES	111
TABLE 51 MARKET FOR PRINTED THIN FILM BATTERIES, THROUGH 2013 (\$ MILLIONS).....	112
PRINTED RFID TAGS	112
TABLE 52 MARKET FOR PRINTED RFID TAGS.....	113
SENSORS	113
TABLE 53 MARKET FOR PRINTED SENSOR DEVICES, THROUGH 2013 (\$ MILLIONS).....	114
Biochips.....	114
TABLE 54 GLOBAL CONSUMPTION OF BIOCHIPS AND MICROARRAYS, THROUGH 2013 (\$ MILLIONS).....	114
Environmental Sensors	115
TABLE 55 MARKET FOR PRINTED ENVIRONMENTAL SENSORS, THROUGH 2013 (\$ MILLIONS).....	116
SMART PACKAGING.....	116
TABLE 56 MARKET FOR PRINTED SMART PACKAGING, THROUGH 2013 (\$ MILLIONS).....	116
PRINTED ELECTRONICS INDUSTRY CHARACTERISTICS	117
FIGURE 15 GEOGRAPHICAL DISTRIBUTION OF COMPANIES AND OTHER ORGANIZATIONS INVOLVED IN PRINTED ELECTRONICS (%).....	117
FIGURE 16 COMPANIES AND OTHER ORGANIZATIONS INVOLVED IN PRINTED ELECTRONICS, BY TYPE OF PRODUCT (%).....	118
FIGURE 17 COMPANIES PRODUCING PRINTED ELECTRONICS, BY TECHNOLOGY/TYPE OF PRODUCT (%).....	119
APPENDIX I: COMPANY PROFILES	120
MANUFACTURERS OF ELECTRONICS PRINTING EQUIPMENT	120
EV GROUP	120
FUJIFILM DIMATIX, INC.....	120
IXPRESSIA.....	121
LITREX CORP.	121
MAN ROLAND DRUCKMASCHINEN GMBH	121
MARK ANDY, INC.....	122
NANOINK, INC.	122

NEW LONG SEIMITSU KOGYO CO. LTD.....	122
PIXDRO BV	123
PRECO INC.....	123
SÜSS MICROTEC AG	123
TOPPAN PRINTING CO., LTD.....	124
XAAR PLC	124
MANUFACTURERS OF ELECTRONIC INK AND OTHER CONSUMABLES.....	124
AIR PRODUCTS AND CHEMICALS, INC.....	124
BRIDGESTONE CORP	125
CONDUCTIVE COMPOUNDS INC.	126
CONDUCTIVE INKJET TECHNOLOGY	126
CREATIVE MATERIALS INC.	126
DKN RESEARCH.....	127
DUPONT MICROCIRCUIT MATERIALS.....	127
E-INK CORP.	127
ELECTRIC VINYL, INC.....	128
GWENT ELECTRONIC MATERIALS LTD.	128
CLARE MICRONIX	129
KURARAY CO. LTD.	129
NANODYNAMICS INC.....	129
NANOIDENT TECHNOLOGIES AG.....	130
NANOMAS TECHNOLOGIES INC.....	130
NOVACENTRIX CORP.	130
ORMECON GMBH	131
ORMET CIRCUITS, INC.....	131
PARELEC INC.....	131
SIPIX IMAGING, INC.	132
SOLIGIE.....	132
SUMATION CO., LTD.	133
T-INK.....	133
THIN FILM ELECTRONICS AB	134
VITEX SYSTEMS, INC.....	134
UNIDYM, INC.....	134
XEROX CORP.	135
MANUFACTURERS OF PRINTED ELECTRONICS APPLICATIONS	135
ACREO AB	135
ADD-VISION INC.....	135
ASK	136
AVESO, INC.....	136
CAMBRIDGE DISPLAY TECHNOLOGIES LTD.	137
CYPAK AB.....	137
DAI NIPPON PRINTING CO., LTD.	137
DELTA OPTOELECTRONICS.....	138

DIALOG SEMICONDUCTOR GMBH	138
DUREL	138
DYESOL LTD.....	139
DYNAMIC ORGANIC LIGHT, INC.....	139
ELECTRO-LUMINX LIGHTING CORP.....	139
ELECTRONIC PAPER AND TECHNOLOGY SOLUTIONS	139
ELUMIN8.....	140
ENFUCELL LTD.	140
FUNKWERK AG.....	140
G24 INNOVATIONS, LTD.	141
INFORMATION MEDIARY CORP.....	141
INTERNATIONAL SOLAR ELECTRIC TECHNOLOGY INC.	141
KONARKA TECHNOLOGIES, INC.	142
LAB 126	142
LG PHILIPS LCD	142
LUMINOUS MEDIA LTD.	143
MICROEMISSIVE DISPLAYS LTD.	143
MIDORI MARK CO., LTD.	144
NANO EPRINT LTD.....	144
NANOIDENT TECHNOLOGIES AG.....	144
NANOSOLAR, INC.....	145
NEMOPTIC SA	145
NEOLUX.....	146
NOVALED AG.....	146
NTERA LIMITED	146
ORGANICID.....	147
ORGATRONICS BV.....	147
OSRAM OPTO SEMICONDUCTORS GMBH.....	148
PELIKON LIMITED	148
PLEXTRONICS, INC.	148
PLASTIC LOGIC LTD.	149
POLYIC GMBH & CO. KG	149
POLYMER VISION LTD.	149
POWER PAPER LTD.....	150
PRIME VIEW INTERNATIONAL	150
PRINTED SYSTEMS GMBH	151
QINETIQ GROUP PLC.....	151
RSI ID TECHNOLOGIES.....	152
SCHREINER VARIOLIGHT	152
SENSIBLE SOLUTIONS SWEDEN AB.....	152
SIEMENS AG.....	153
SMARTDISPLAYER TECHNOLOGY CO., LTD.	153
SOLARONIX SA.....	153
STMICROELECTRONICS	154

SUMITOMO CHEMICAL CO. LTD.....	154
SWEREA IVF AB.....	154
SWISS CENTER FOR ELECTRONICS AND MICROTECHNOLOGY SA.....	154
THIN FILM ELECTRONICS AB.....	155
TOSHIBA MATSUSHITA DISPLAY TECHNOLOGY CO., LTD.....	155
TOUCHMARK.....	156
UNIVERSAL DISPLAY CORP.....	156
VERMED, INC.	156
WHITE ELECTRONIC DESIGNS.....	157
 APPENDIX II: PATENT ANALYSIS	 158
<i>FIGURE 18 RECENT US PRINTED ELECTRONICS-RELATED PATENTS, BY TYPE OF APPLICATION (PERCENT OF US PATENTS ISSUED SINCE JANUARY 1, 2005)</i>	 158
<i>FIGURE 18 (CONTINUED)</i>	159
<i>FIGURE 19 TRENDS IN NUMBER OF NEW PRINTED ELECTRONICS PATENTS ISSUED ANNUALLY, 2003-2007 (NUMBER OF PATENTS ISSUED EACH YEAR)</i>	 159
<i>FIGURE 19 (CONTINUED)</i>	160
<i>TABLE 57 MAJOR U.S. PRINTED ELECTRONICS PATENT PORTFOLIOS (NUMBER OF PATENTS ISSUED THROUGH APRIL 15, 2008)</i>	 160