

<Market Research Report>

Market Report on High-Speed/High-Frequency Printed Circuit Boards (PCBs) and Their Materials for 5G Millimeter Wave Base Stations

Publication Date: July 11, 2024

Format: A4 Size 253 Pages, book (Hard copy) & a CD

Price (Corporate Contract): JPY700,000-
(Global Contract): JPY900,000-

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1. Overview of 5G mmWave base stations, product trends, frequency usage by country/region, and forecast and analysis of global market trends (RU/RRH market forecast, manufacturer share)
2. For high-speed/high-frequency PCBs for millimeter wave base stations, forecasting and analyzing market trends (market breakdown in 2023 and forecasts from 2023 to 2033), along with business trends of manufacturers, technological trends, and supply relations.
 - Market breakdown and market forecast
 - by application(RU, DU/CU, etc.), PCB structure/adoption material type, and by manufacturer (in 2023)
3. For high-speed/high-frequency PCB materials for millimeter wave base stations, forecasting and analyzing market trends (market breakdown in 2023 and forecasts from 2023 to 2033), along with business trends of manufacturers, technological trends, and supply relations.
 - Market breakdown and market forecast.
 - by application(RU, DU/CU, etc.), material type(Resin type for RU, Df class for DU/CU), and by manufacturer(in 2023)
4. High-speed/high-frequency PCB Material Manufacturers' Case Studies (9 Companies)

1. Surveyed Products / Classification

- 1) High-speed / high-frequency PCB material: PCB material for 5G mmWave base station ($Df < 0.006$)
 - (For RU) Material type : PTFE, Hydrocarbon, PPE/PPO/others
 - (For DU/CU) Df class : Ultra low loss ($Df \leq 0.003 @ 10\text{GHz}$), Low loss ($0.003 < Df < 0.006 @ 10\text{GHz}$)
 - Application/Frequency range: 5G mmWave (24/28/37GHz band) vs. 4G/5G sub6 (less than 6GHz), RU vs DU/CU
- 2) High-speed / high-frequency PCB: PCB that adopts high-speed / high-frequency PCB material for 5G mmWave base stations.
 - Structure: High-frequency hybrid multi-layer PCB, All layer high-frequency multi-layer PCB
 - (For RU) Material types of PCB materials for adoption : PTFE, Hydrocarbon, PPE/PPO/others
 - (For DU/CU) Df class of PCB materials for adoption: Ultra low loss ($Df \leq 0.003$), Low loss ($0.003 < Df < 0.006$)
- 3) Base station (4G/5G sub6/mmWave)
 - 5G mmWave vs. 4G/5G sub6, RU vs. DU/CU

2. Surveyed Manufacturers

Surveyed products	Manufacturers
Base station & related device (Antenna, RU, DU/CU)	Advanced Micro Devices (AMD), Airspan, Anokiwave, DKK, Ericsson, Fujitsu, Hisilicon, Huawei, NEC, Nokia, Qualcomm, Renesas Electronics, Samsung, TMY Technology, ZTE, Others
High-speed / high-frequency PCBs for base stations	AT&S, Daeduck Electronics, FICT, Founder PCB, Gold Circuit Electronics, IsuPetasys, Kingboard Group, Kinwong, Kyocera, OKI Circuit Technology, Shennan Circuits, Somacis, Suntak Technology, Suzhou Dongshan Precision Manufacturing, Terranix, TTM Technologies, WUS Printed Circuit, ZDT, Others
High-speed / high-frequency PCB materials for base stations	AGC Group, Chukoh Chemical Industries, CZZYST, Doosan Electro-Materials, Elite Material, Isola Group, ITEQ, Mitsubishi Gas Chemical, NanYa Plastics, Panasonic Industry, Pillar Corporation, Resonac, Risho Kogyo, Rogers Corporation, Shengyi Technology, TUC, WAZAM, Others

Summary.....	1-31
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Chapter 1, Technology and Market Trends for 5G Millimeter Wave Base Stations

1. Overview of 5G Communications and Trend of High Speed for Wireless Communication.....	33
2. Communication Technology by Generation, and Adoption Status.....	35
3. Device Configuration for 4G Base Station.....	36
4. Device Configuration for 5G Base Station.....	37
5. Beamforming Technology and Adoption Trends in 5G Millimeter Wave RU.....	39
6. Wireless Communication Network Configuration.....	40
7. Adopted Frequency Band by Country / Region.....	44
8. List of Major Manufacturers for 5G Millimeter Wave Base Station and Base Station Device.....	45
9. Millimeter Wave Base Station Products.....	46
10. Adoption Status of High-Speed / High-Frequency PCBs in Millimeter Wave Base Stations.....	48
11. High-speed / high-frequency PCB for RU.....	53
12. High-Speed / High-Frequency PCB for DU/CU.....	58
13. Market Trends for Wireless Communication Base Stations.....	59
14. Technology Roadmap for Millimeter Wave Base Stations.....	62
15. PCB Technology Roadmap for Millimeter Wave Base Station.....	64
16. Business Trends of Major Base Station Manufacturers.....	66
17. Supply Flow of PCB Material for Millimeter Wave Base Stations.....	69
18. Primary Suppliers of Base Station PCBs for Base Station Manufacturers.....	71
19. Price Range for Base station (5G Millimeter Wave).....	72

Chapter 2, Technology and Market Trends of High-Speed, High-Frequency PCB Materials for 5G Millimeter Wave Base Stations

1. Adoption Status of High-Speed, High-Frequency PCB Materials for Base Stations.....	74
2. List of Major Manufacturers of High-Speed/High-Frequency PCB Materials.....	75
3. Production Site and Capacity of High-Speed/High-Frequency PCB Material Manufacturers.....	76

4. High-Speed and High-Frequency PCB Materials for Antennas/RF from Major Manufacturers.....	78
5. High-Speed and High-Frequency PCB Materials for DU/CU from Major Manufacturers.....	81
6. Business Trends of Major Manufacturers.....	83
7. Market Breakdown of High-Speed/High-Frequency PCB Materials for Base Stations in 2023.....	87
8. Sales Breakdown of High-Speed / High-Frequency PCB materials for Base Stations by manufacturer in 2023.....	90
9. PCB Material Market Breakdown for Millimeter Wave Base Station by Usage/Loss Type in 2023.....	98
10. Market Size and Forecast for High-Speed / High-Frequency PCB Materials for Base Stations (2023-2033).....	101
11. Market Size and Forecast for PCB Materials for Millimeter Wave Base Stations (2023-2033).....	108
12. Supply Relation of High-Speed and High-Frequency PCB Materials.....	116
13. Price Range of Major High-Speed and High-Frequency PCB Material.....	118

Chapter 3, Market Trends for High-Speed, High-Frequency PCBs for 5G Millimeter Wave Base Stations

1. Adoption Status of Circuit Devices in Base Stations.....	120
2. Overview of High-Speed and High-Frequency PCBs.....	121
3. List of Major Manufacturers of High-Speed and High-Frequency PCBs.....	124
4. Production Site of Manufacturers for High-Speed and High-Frequency PCB.....	128
5. PCB Materials Adopted by Major PCB Manufacturers for 5G Millimeter Wave Base Stations.....	130
6. Business Trends of High-Speed and High-Frequency PCB Manufacturers.....	131
7. Overall Market Size and Breakdown of PCBs for 5G Millimeter Wave Base Stations in 2023.....	138
8. Market Size & Breakdown of High-Speed / High-Frequency PCBs for 5G Millimeter Wave Base Stations in 2023.....	140
9. PCB market size and Forecast for Millimeter Wave Base Station (2023-2033).....	146
10. Market Size & forecast for High-Speed / High-Frequency PCBs for Millimeter Wave Base Stations (2023-2033).....	157
11. Supply Relationship Between High-Speed and High-Frequency PCB and Base Station Manufacturers.....	160
12. Price Range of Major High-Speed and High-Frequency PCBs.....	161

Table of Contents



Chapter 4, PCB Material Manufacturers' Case Studies

AGC Group.....	163
Doosan Corporation Electro-Materials.....	173
Elite Material Co., Ltd.....	182
Isola Group.....	192
ITEQ Corporation.....	203
Panasonic Industry Co., Ltd.....	211
Rogers Corporation.....	223
Shengyi Technology Co., Ltd.....	232
Taiwan Union Technology Corporation.....	242

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2. Publication Date: July 11, 2024

3. Format: A4 Size 253 Pages

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