Biwin
Storage Technology

PC OEM
Storage Solutions



Global Headquarters:

BIWIN STORAGE TECHNOLOGY CO., LTD.

Email: sales@biwintech.com 2671

Address: Building #4, South Zone #2, Zhongguan Honghualing Industrial Zone, Nanshan District, Shenzhen 518055, Guangdong, China

America Headquarters:

BIWIN TECHNOLOGY LLC

Email: sales@biwintech.com

Address: 8725 NW 18th Terrace, Suite #400, Miami FL 33172, United States

Phone: 1-305-456-3288

Taiwan Office:

BIWIN SEMICONDUCTOR (HK) COMPANY LIMITED (TAIPEI OFFICE)

Email: sales@biwintech.com

Address: 3F, No. 162, Xinhu 2nd Rd., Neihu Dist., Taipei City 114065, Taiwan

Follow Us

www.biwintechnology.com

Version 6.09

BIWIN Storage Technology Co., Ltd. (SSE STAR Market 688525) produces high quality flash storage and is now known in embedded, consumer, corporate and industrial segments for its independent development capabilities in hardware, software, firmware, and storage algorithms.

BIWIN's experience in production (along with its complete packaging, testing, and production lines) ensures BIWIN products are superior in performance, earning BIWIN many awards and a reputation for providing global customers with high-quality storage products.

BIWIN recently opened its latest 110,000 m^2 facility, Greater Bay Advanced Technology Co., Ltd., with state-of-the-art R&D and production.

Our founders started in the flash storage business in Shenzhen, China in 1995, embracing the "Win-Win" business philosophy that would later become the hallmark for BIWIN. In 2009, BIWIN made a key strategic decision to add IC packaging capabilities to its manufacturing operations. A remarkable milestone that the vast majority of competing companies still don't have (they outsource the process or buy packaged IC). This successful step led to the creation of the company in 2010 we know today, BIWIN Storage Technology Company Limited.

BIWIN Advantages

Storage Algorithms & Firmware Development

Two expert R&D teams at BIWIN work on the latest firmware development. Each core team member has at least ten years of experience in firmware development and rich experience in mass production of self-developed firmware.

Full-range Product Testing Capability

BIWIN continually develops memory chip testing algorithms and automation equipment. We We lead the industry with our impressive test coverage and automation. Every product we produce undergoes DVT and PVT.

Outstanding Customization, Fast Response

BIWIN's track record demonstrates our extraordinary customized R&D capabilities and our fast response to our customers' needs. With our experience, we can readily meet the embedded requirements for projects including wearables, smart devices, 5G, IoT, smart industry, smart city, and vehicle networks.

Advanced Packaging & Testing

With the leading multi-chip and SiP (System in Package) technology, BIWIN can process wafers as thin as 25 μm, support the mass production of 16-layer die stacking, and achieve the smallest packages in the industry.



Contents

01/ PC OEM SSD

16/ PC OEM Mini SSD

18/ PC OEM BGA SSD

21/ PC OEM Memory

APX03

PC OEM SSD



Specifications

Model Name	APX03
Interface	PCIe Gen 5 x4
Form Factor	M.2 2280
Capacity	512 GB - 2 TB
NAND Type	3D TLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	11000 MB/s
Sequential Write (Up to)	10000 MB/s
4K Read (Up to)	1700K
4K Write (Up to)	1600K
Read/Write Power Consumption (Avg.)	<5.3W
Operating Temperature	0°C to +70°C
MTBF	1,500,000 hours
encryption	TCG Pyrite 2.0/Opal 2.0

Applications

Desktop | Laptop | Tablet | All-in-One PC | Thin Client | Mini PC

AP943
PC OEM SSD



Specifications

Model Name	AP943
Interface	PCIe Gen 4x4
Form Factor	M.2 2280
Capacity	512 GB - 4 TB
NAND Type	3D QLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	7200 MB/s
Sequential Write (Up to)	6800 MB/s
4K Read (Up to)	950K
4K Write (Up to)	1200K
Read/Write Power Consumption (Avg.)	<4.3W
Operating Temperature	0°C to +70°C
MTBF	1,500,000 hours
Encryption	TCG Pyrite 2.0

Applications

Desktop | Laptop | Tablet | All-in-One PC | Thin Client | Mini PC

AP953
PC OEM SSD



Specifications

Model Name	AP953
Interface	PCIe Gen 4x4
Form Factor	M.2 2280
Capacity	512 GB - 4 TB
NAND Type	3D QLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	7200 MB/s
Sequential Write (Up to)	6800 MB/s
4K Read (Up to)	950K
4K Write (Up to)	1200K
Read/Write Power Consumption (Avg.)	<4.3W
Operating Temperature	0°C to +70°C
MTBF	1,500,000 hours
Encryption	TCG Pyrite 2.0

Applications

Desktop | Laptop | Tablet | All-in-One PC | Thin Client | Mini PC

AP973
PC OEM SSD



Specifications

Model Name	AP973
Interface	PCIe Gen 4x4
Form Factor	M.2 2280
Capacity	256 GB - 2 TB
NAND Type	3D TLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	7000 MB/s
Sequential Write (Up to)	6500 MB/s
4K Read (Up to)	1000K
4K Write (Up to)	1100K
Read/Write Power Consumption (Avg.)	<4.6W
Operating Temperature	0°C to +70°C
MTBF	1,500,000 hours
Encryption	TCG Pyrite 2.0

Applications



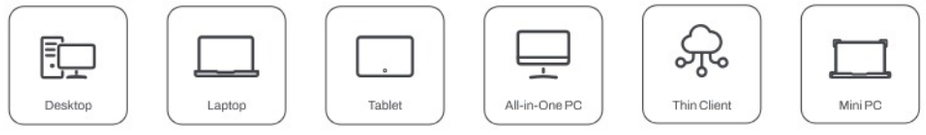
AP876
PC OEM SSD



Specifications

Model Name	AP876
Interface	PCIe Gen 4 x4
Form Factor	M.2 2242
Capacity	256 GB - 1 TB
NAND Type	3D TLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	7000 MB/s
Sequential Write (Up to)	6200 MB/s
4K Read (Up to)	900K
4K Write (Up to)	900K
Read/Write Power Consumption (Avg.)	<4.6W
Operating Temperature	0°C to +70°C
MTBF	1,500,000 hours
Encryption	TCG Pyrite2.0

Applications



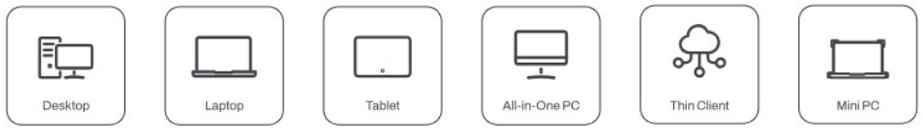
AP965
PC OEM SSD



Specifications

Model Name	AP965
Interface	PCIe Gen 4x4
Form Factor	M.2 2230
Capacity	256 GB - 1 TB
NAND Type	3D TLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	7000 MB/s
Sequential Write (Up to)	6400 MB/s
4K Read (Up to)	900K
4K Write (Up to)	1000K
Read/Write Power Consumption	<4.5W
(Avg.)Operating Temperature	0°C to +70°C
MTBF	1,500,000 hours
Encryption	TCG Pyrite 2.0

Applications



AP653
PC OEM SSD



Specifications

Model Name	AP653
Interface	PCIe Gen 3 x4
Form Factor	M.2 2280
Capacity	256 GB - 2 TB
NAND Type	3D TLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	3500 MB/s
Sequential Write (Up to)	3000 MB/s
4K Read (Up to)	450K
4K Write (Up to)	350K
Read/Write Power Consumption (Avg.)	<4.2W
Operating Temperature	0°C to +70°C
MTBF	1,500,000 hours

Applications



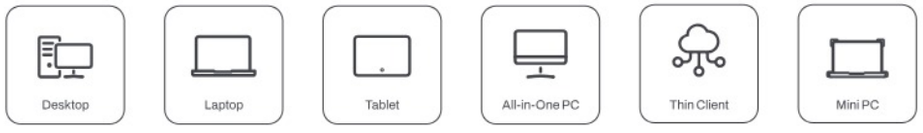
AP476
PC OEM SSD



Specifications

Model Name	AP476
Interface	PCIe Gen 3 x4
Form Factor	M.2 2242
Capacity	256 GB - 2 TB
NAND Type	3D TLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	3200 MB/s
Sequential Write (Up to)	2700 MB/s
4K Read (Up to)	270K
4K Write (Up to)	240K
Read/Write Power Consumption (Avg.)	<3.3W
Operating Temperature	0°C to +70°C
MTBF	1,500,000 hours

Applications



Storage Solutions (A Series)

BIWIN introduces the A Series PCIe SSD for PC OEMs with a DRAM-less design, delivering high performance, high capacity, reliability, compatibility, and stable supply. Fully compatible with major CPU platforms and operating systems, the SSD ensures stable and efficient operations for desktops, laptops, and all-in-one computers.

Storage Requirements

- **High Performance:**
  To handle heavy workloads and real-time data transfers, ensuring fast responses and smooth performance in system installation and upgrades, game loading, HD video playback, collaborative work, and smart education.

- **Data Reliability:**
  To ensure data reliability and address abnormalities such as boot failures, crashes, and overheating caused by prolonged office use, gaming, and entertainment workloads.

- **Challenges in Emerging Scenarios:**
  The rise of AI PCs with a "CPU+GPU+NPU" architecture and localized AI models demands higher computational power, faster data processing speeds, and larger storage capacities, pushing storage performance and bandwidth to new levels.

Storage Solutions (A Series)

Solutions & Advantages

- **High Performance, Power Efficient, Large Capacity, Proprietary Firmware**

  ① Proprietary firmware featuring SLC caching, intelligent thermal management, critical data backup, low power consumption, RAID, secure erase, and secure partitioning.

  ② Read/write speeds up to 11,000 MB/s and 10,000 MB/s (APX series) and 7,200 MB/s / 6,800 MB/s (AP8/AP9 series) with a DRAM-less design and Host Memory Buffer(HMB) technology.

  ③ Capacities from 256 GB to 4 TB to meet the storage needs of both system drives and home users.

  ④ Supports Microsoft Modern Standby for extended laptop battery life.

- **Rigorous Testing to Ensure Data Reliability**

  Comprehensive testing includes firmware testing, system-level testing, reliability testing, compatibility testing, and hardware testing:

  ① Firmware testing focuses on granular point-to-point validation of front-end interface protocols, FTL (Flash Translation Layer) functionality, and back-end operations to ensure feature integrity.

  ② System-Level testing centers on user experience by simulating real-world scenarios, including various I/O models, power interruptions, and multi-module operations, to validate functionality.

  ③ Reliability testing simulates diverse environmental conditions to evaluate the SSD's environmental and physical reliability, FA (Failure Analysis), eco-compliance, and more.

- **Wide Compatibility with Mainstream Platforms and Operating Systems**

  ① Fully compatible with Intel, AMD and Qualcomm platforms, as well as Windows 10, Windows 11, and Linux. Designed to meet the compatibility requirements of PC OEMs, BIWIN PC OEM SSDs has already entered the supply chains of renowned global PC manufacturers.

  ② BIWIN is a leading provider of PC OEM SSDs in China. Its products are compatible with CPUs such as Loongson, Kunpeng, Phytium, Zhaoxin, Hygon, and Shenwei, as well as UOS and Kylin operating systems, meeting diverse system integration requirements.

PC OEM Solutions

Optimized NAND Application Strategy

- Original manufacturer's high-quality good die
- Comprehensive feature analysis
- Optimized thermal management to ensure NAND reliability

Customized Flash Drive Health Monitoring

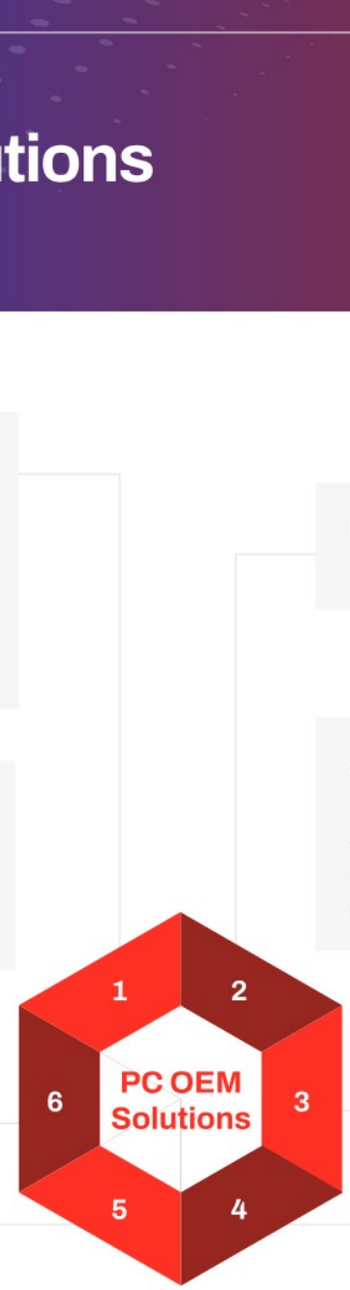
- Customized smart tools and upgrade tools tailored to different customer needs

Low Power Consumption

- Supports modern standby

Stable Performance Data

- High Performance for OS disk scenarios
- Stable performance in complex applications



NVMe Compliance and Power Loss Optimization

- Passes IOL testing
- Targeted handling of flash breakage and various abnormal power-off scenarios

Security Support

- Supports TCG Pyrite 2.0 and Opal 2.0 (Gen4/Gen5)

Market Requirements for PC OEM SSDs

Product Features

3D TLC/QLC Flash

PCB: 12 μ" / 30 μ" Gold Finger

DRAM-Less

BIWIN Advantages and Capabilities

- Rigorous reliability (burn-in testing) and compatibility testing
- Electrostatic discharge (ESD)
- Fixed BOM (locked solution)
- All chips are good die
- Maintainability of software and firmware
- Quick response to debugging



Innovative Quality Assurance System

Manufacturing

Advanced Packaging and Testing, Capability of Developing Test Equipment

NAND

Reliable Foundation and Comprehensive Quality Control



SSD Validation and Reliability Testing

Robust Testing Coverage Across All Dimensions and Stages

Firmware

Developed to Meet Various Customer Requirements

SSD Tests

Firmware, System, Compatibility, Reliability

Firmware Testing

- Tests basic functions of FW modules and checks if abnormal processing flow affects disk operation
- Covers various firmware modules
- Power cycle when triggering firmware modules
- Firmware module cross-testing
- Test scripts: ~1200
- Test tools: PPCM (In-house Power-Off Control Module)

System Testing

- Validates SSD's basic functions and stability at the system level
- Data patterns, addressing methods
- I/O model
- Various I/O tools: dd, FIO, VDBench, iozone, nvme-cli, Burn-in testing, SDstress, IOMonkey, diskspd, Ulink
- Power loss under abnormal scenarios
- Initialization, formatting, and partitioning
- Performance, power consumption, and power efficiency

Compatibility Testing

- Validates SSD stability and compatibility on different platforms
- OS Installation
- OS data integrity
- ACPI
- OS drive performance and power consumption
- System drive power loss testing
- x86 and other platforms

Reliability Testing

- Validates SSD's ability to maintain data consistency throughout its entire lifespan
- MTBF/endurance test based on JEDEC specification
- Retention test based on JEDEC specification
- Four-corner test
- Cross-temperature testing
- Thermal shock test
- Endurance test
- High and low-temperature abnormal power-off test
- High and low-temperature environmental operation and storage testing
- High-temperature and high-humidity stress test
- Power-on and power-off temperature cycling test
- Vibration, shock, bending, torsion, drop, salt spray, etc.

BIWIN Capabilities

BIWIN Capabilities

- BIWIN's self-developed wafer packaging and testing production line in Huizhou to ensure high-quality and timely delivery
- Self-developed fully automated testing production line to significantly improve production efficiency

High Compatibility

Supports the production of all mainstream SATA and PCIe SSD form factors,accommodating mixed production of different interfaces, forms, and order quantities

High Automation

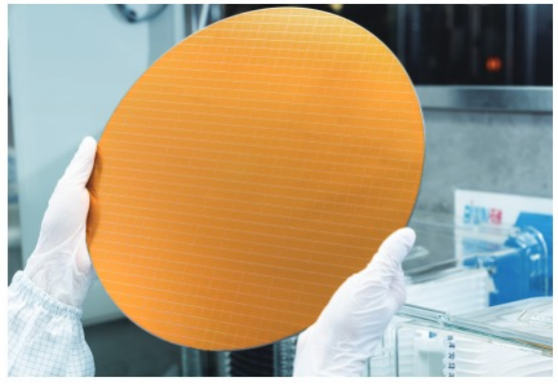
One-stop production line with automatic loading and unloading, automatic multi-card opening, and RDT/BIT testing

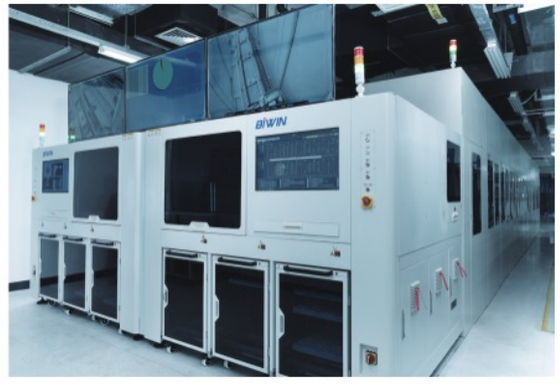
High Flexibility

All test cases can be flexibly configured and customized, and RDT and BIT positions are modular, allowing for the addition of RDT and BIT modules to increase capacity

High Traceability

Equipped with a real-time data transfer and monitoring MES intelligent system, automatically binds IDs, records, and monitors yield and failure information, provides early warning for maintenance, activities, reduces sudden failures, and lowers downtime rates





BL100
PC OEM Mini SSD

Specifications

Model Name	BL100
Interface	PCIe Gen 4x2
Form Factor	Mini SSD
Capacity	512 GB - 2 TB
Dimensions	15.00 x 17.00 x 1.40 mm (Max.)
NAND Type	3D TLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	3700 MB/s
Sequential Write (Up to)	3400 MB/s
4K Read (Up to)	550K IOPS
4K Write (Up to)	650K IOP
Read/Write Power Consumption (Avg.)	<3W
Operating Temperature	0°C to +70°C
MTBF	1,500,000 hours

BL130
PC OEM Mini SSD

Specifications

Model Name	BL130
Interface	PCIe Gen 4x2
Form Factor	Mini SSD
Capacity	512 GB - 2 TB
Dimensions	15.00 x 17.00 x 1.40 mm (Max.)
NAND Type	3D TLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	3700 MB/s
Sequential Write (Up to)	3400 MB/s
4K Read (Up to)	850K IOPS
4K Write (Up to)	800K IOPS
Read/Write Power Consumption (Avg.)	<3.5W
Operating Temperature	-25°C to +85°C
MTBF	1,500,000 hours

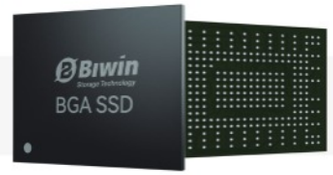
EP410
PC OEM BGA SSD



Specifications

Model Name	EP410
Interface	PCIe Gen 4 x4
Capacity	256 GB - 2 TB
Dimensions	16.00 x 20.00 x 1.60 mm (Max.)
Package	FBGA 291-ball
NAND Type	3D TLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	7300 MB/s
Sequential Write (Up to)	6600 MB/s
4K Read (Up to)	930K
4K Write (Up to)	850K
Read/Write Power Consumption (Avg.)	<5W
Operating Temperature	0°C to +70°C
MTBF	1,500,000 hours

EP420
PC OEM BGA SSD



Specifications

Model Name	EP420
Interface	PCIe Gen 4x4
Form Factor	256 GB - 2 TB
Capacity	16.00 x 20.00 x 1.40 mm (Max.)
Dimensions	FBGA 291-ball
NAND Type	3D TLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	7400 MB/s
Sequential Write (Up to)	6800 MB/s
4K Read (Up to)	1300K
4K Write (Up to)	1500K
Read/Write Power Consumption (Avg.)	<4.5W
Operating Temperature	-25°C to +85°C
MTBF	1,500,000 hours

EP401

PC OEM BGA SSD



Specifications

Model Name	EP401
Interface	PCIe Gen 4 x2
Form Factor	256 GB - 1 TB
Capacity	11.50 x 13.00 x 1.35 mm (Max.)
Dimensions	FBGA 345-ball
NAND Type	3D TLC
DRAM Cache	DRAM-less
Sequential Read (Up to)	3700 MB/s
Sequential Write (Up to)	3450 MB/s
4K Read (Up to)	850K
4K Write (Up to)	650K
Read/Write Power Consumption (Avg.)	<3W
Operating Temperature	0°C to +70°C
MTBF	1,500,000 hours

DDR5 SO-DIMM

PC OEM Memory



Specifications

Model Name	DDR5 SO-DIMM
Data rate	4800-5600 MT/s
Capacity	8 GB / 16 GB / 24 GB / 32 GB
Timing	CL40 / CL46
Operating Voltage	1.1V
Non-operating Temperature	-55°C to +100°C
Operating Temperature	0°C to +95°C
Dimensions	69.60 x 30.00 x 3.70 mm
Warranty	Limited lifetime

DDR5 U-DIMM

PC OEM Memory



Specifications

Model Name	DDR5 U-DIMM
Data rate	4800-5600 MT/s
Capacity	8 GB / 16 GB / 24 GB / 32 GB
Timing	CL40/CL46
Operating Voltage	1.1V
Non-operating Temperature	-55°C to +100°C
Operating Temperature	0°C to +95°C
Dimensions	133.35 x 31.25 x 0.15 mm
Warranty	Limited lifetime

DDR5 ECC SO-DIMM

PC OEM Memory



Specifications

Model Name	DDR5 ECC SO-DIMM
Data rate	5600 MT/s
Capacity	16 GB / 32 GB
Timing	CL46
Operating Voltage	1.1V
Non-operating Temperature	-55°C to +100°C
Operating Temperature	-20°C to +95°C
Dimensions	69.60 x 30.00 x 3.70 mm
Warranty	Limited lifetime

DDR4 SO-DIMM

PC OEM Memory



Specifications

Model Name	DDR4 SO-DIMM
Data rate	3200 MT/s
Capacity	8 GB / 16 GB / 32 GB
Timing	CL22
Operating Voltage	1.2V
Non-operating Temperature	-55°C to +100°C
Operating Temperature	0°C to +85°C
Dimensions	69.60 x 30.00 x 3.70 mm
Warranty	Limited lifetime

DDR4 U-DIMM

PC OEM Memory



Specifications

Model Name	DDR4 U-DIMM
Data rate	3200 MT/s
Capacity	8 GB / 16 GB / 32 GB
Timing	CL22
Operating Voltage	1.2V
Non-operating Temperature	-55°C to +100°C
Operating Temperature	0°C to +85°C
Dimensions	133.35 x 31.25 x 0.15 mm
Warranty	Limited lifetime

LPDDR5X CAMM2

PC OEM Memory



Specifications

Model Name	LPDDR5X CAMM2
Interface	736-pin CAMM2
Data rate	7500-9600 MT/s
Capacity	32 GB / 64 GB
Operating Voltage	1.05V
Non-operating Temperature	-55°C to +100°C
Operating Temperature	0°C to +85°C
Dimensions	78.00 x 34.00 ± 0.15mm
Warranty	Limited Lifetime

• Faster Speed: LPDDR5 CAMM2 delivers data transfer speeds up to 9600 MT/s+, meeting high bandwidth demands.

• LPDDR5 CAMM2 is designed for 128-bit dual-channel memory, 64% smaller in volume than two DDR5 SODIMM modules.

• LPDDR5 CAMM2 is designed for better heat dissipation for memory modules in small spaces.

• Impressively lower power consumption

1) LPDDR5 CAMM2 offers 40%+ reduction in power consumption per 64-bit when compared to DDR5 modules.

2) LPDDR5 CAMM2 improves standby power consumption performance, significantly extending standby time and battery life.(*1: The above data is for reference only. Please refer to the Datasheet for specific details.)

• LPDDR5 CAMM2 has undergone rigorous tests by BIWIN Labs. It supports a lifetime warranty and offers reliable after-sales service.

Applications



Desktop



Laptop



Mini PC

Industrial Control Host



All-in-One PC



Handheld Gaming Device



OPS Computer

Product Line Advantages

Accumulated expertise as well as state-of-art equipment

Specialized R&D Team

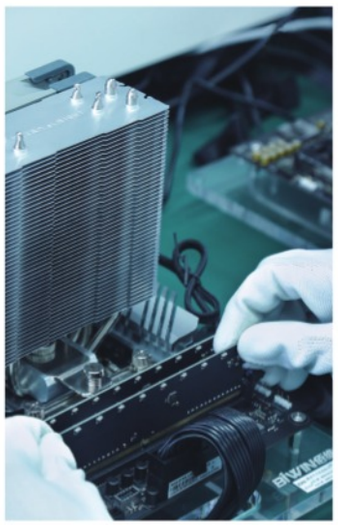
Supported by a senior technical team

Self-developed innovations in testing software

Quick response to customer needs and deliveries

Smart IT factory enables superior quality and on-time delivery

IPD-efficient R&D system





Technical Advantages

1.Original Memory Chips

Long-term supplier relationships to guarantee stability and reliability



2. Self-developed Innovation in Software: BIWINSIGHT

proprietary software guides quality production

3. Strict IC Testing

ICs used in BIWIN PC OEM memory modules undergo 100% rigorous testing under high-temperature environments



4. Rigorous Final Product Tests

100% rigorous product testing ensures product quality and durability



Proven DRAM Analysis Capability

BIWINSIGHT

Our proprietary software ensures quality and efficiency!

DRAM Feature Verification

Incoming Material Verification

1) Ensures the effectiveness of the solution
2) Ensures product quality

Consistency Assurance

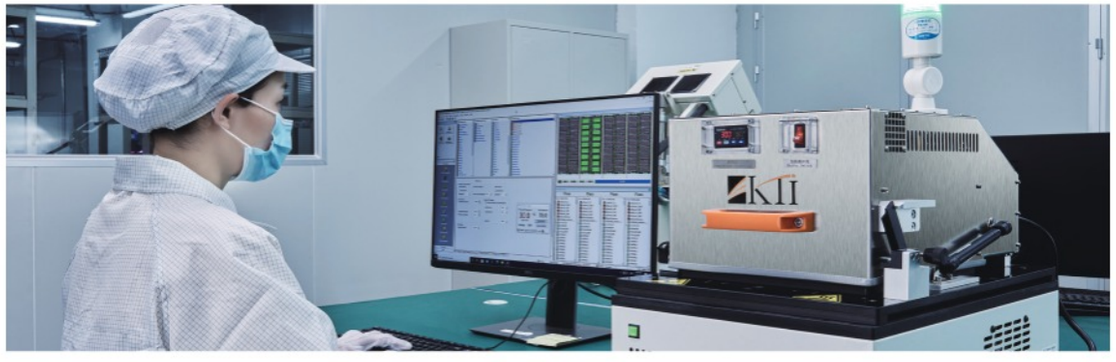
1) Verification of long-term IC supply
2) Ensures mass production product quality

Margin Verification

1) Frequency margin verification
2) Timing margin verification
3) Temperature margin verification
4) Voltage margin verification

Fault Analysis

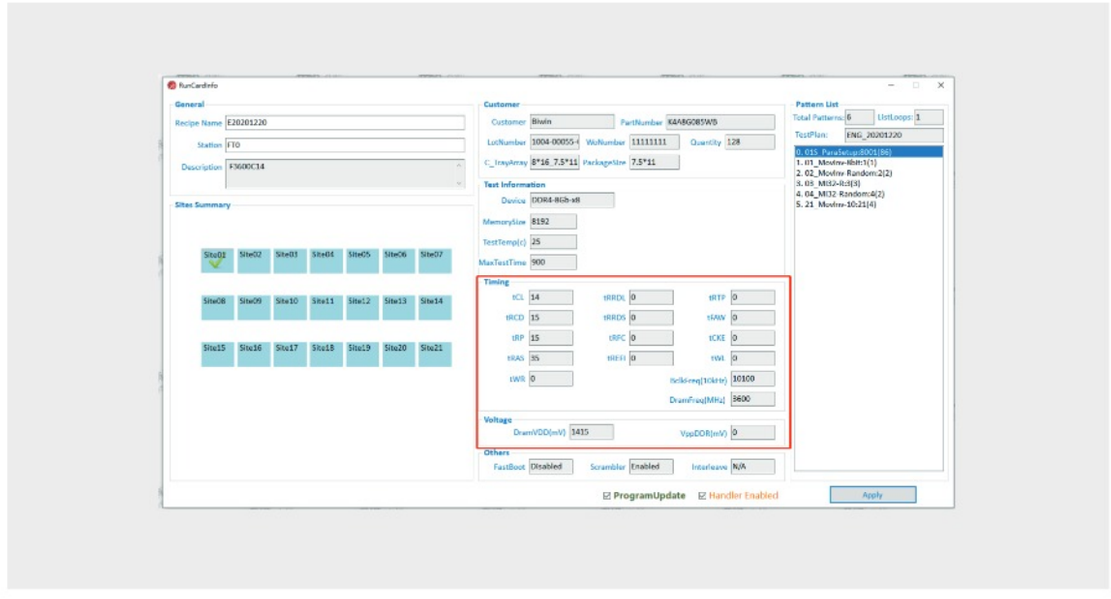
1) Increases analysis efficiency
2) Supports solution improvement



Advanced DRAM Sorting Capabilities

SLT Automated DRAM Testing Equipment





1.Key timing parameters are adjustable.

2. Voltage parameters can be set; Test temperature range RT-85 °C.

3. DDR4 tes rate: 4000 MHz+, DDR5 test rate: 7200 MHz+.

4. Extensive expertise in pattern testing and development enables us to screen and pinpoint DRAM issues.

5. Automated DRAM sorting effectively improves efficiency.

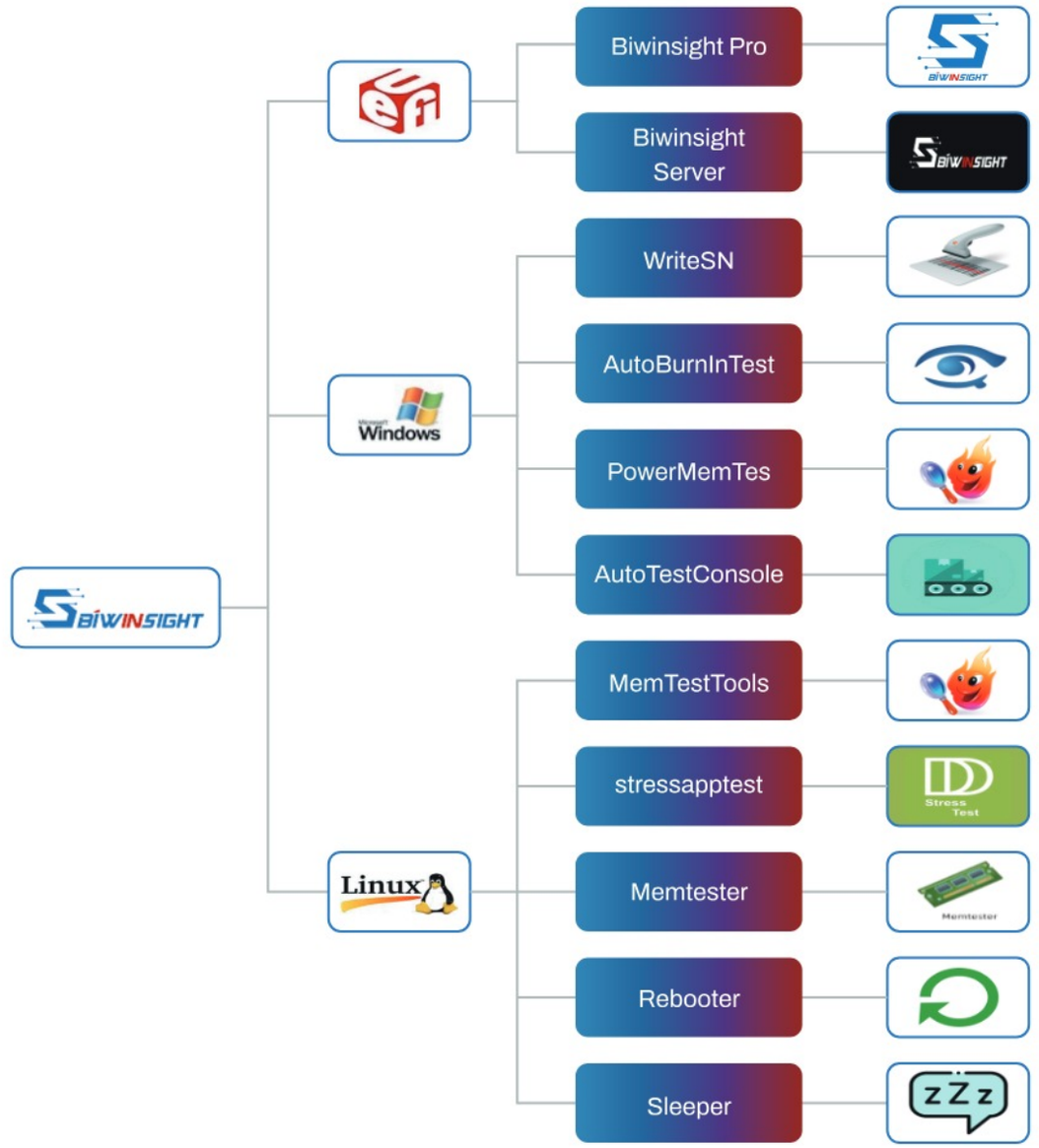
Memory Module Compatibility Verification

Compatibility Testing Laboratory





Self-developed Testing Software



With our years of accumulated experience, BIWIN developed proprietary software to enhance quality testing beyond existing software.

Extensive Quality Assurance and Reliability Verification



Electrical Test
(CST Express DDR4)



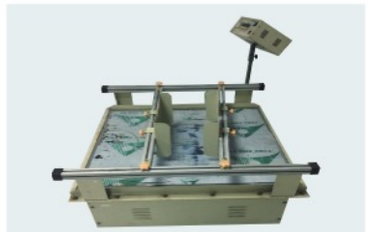
Vibration Tester



Temperature Shock Test Chamber



High Frequency
Sorting Board (PCR)



Simulated Vehicle Transportation
Vibration Test Platform



Bending Tester



Highly Accelerated Temperature
and Humidity Stress



Programmable Constant Temperature
and Humidity Test Chamber



Salt Spray Tester



Active Liquid Cooling System



Small Product Drop Testing Machine



Electrostatic Tester

Memory Module Production Testing Process



Fully Automated
IC Screening Test
(Environmental temperature
range from 25 °C to 85 °C)



SMT Patch Dividing



Electrical Performance Testing
(Open circuit and other SMT connectivity tests
and SPD programming)



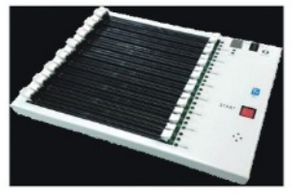
Functional Testing
(BIWINSight proprietary testing software)



Burn-in Testing
(And Aging test)



Compatibility Testing
(AMD / customer platform)



SPD Comparison
(To prevent SPD data variation)



Packaging

With rich experience in IC and DRAM module testing, BIWIN employs nearly 30 top technical experts in ATE and SLT development, uses proprietary self-developed testing systems and specialized testing algorithms to ensure software and hardware go hand-in-hand, providing IC screening through final product testing to ensure the consistency of product quality.