2023 Winbond Product Brochure

NEXT
FUTURE

winbond
"Be a hidden champion in providing sustainable semiconductors to enrich human life."

— Winbond Vision Statement
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   When an electronics product requires secure code storage, it needs certified TrustME® Secure Flash Memory from Winbond. The TrustME® family meets every system requirement, from the substantial protection required by simple IoT devices up to Common Criteria EAL 5+ certified memory for securing financial transactions.

5 Product Brief
   - Code Storage Flash Memory
   - Mobile DRAM
   - Specialty DRAM
   - TrustME® Secure Flash Memory
Positioning & Advantages
A Trusted Supplier of Advanced Memory Products

From R&D through advanced manufacturing to dedicated customer service, Winbond Electronics Corporation is a total memory solutions provider.

Winbond's customer-driven memory solutions are backed by deep expertise in

- R&D
- Product design
- Wafer fabrication and device packaging, assembly and testing
- Sales and technical support provided directly to the world's largest OEMs

Winbond's product portfolio consists of Specialty DRAM, Mobile DRAM, Code Storage Flash Memory, and TrustME® Secure Flash Memory. The company serves customers in communications, consumer electronics, automotive, industrial, computer peripherals markets and the IoT, supplying its products directly or via a global network of authorized distributors.

Winbond's headquarter is in the Central Taiwan Science Park, and it operates wafer fabrication plants in Taichung and new Kaohsiung 12-inch fab in Taiwan. Subsidiaries in the USA, Japan, Israel, China, Hong Kong, and Germany perform marketing operations and provide direct support to customers.

Winbond's combination of advanced semiconductor technologies developed in-house and close relationships with customers support its position as a trusted supplier of memory products.
Trusted for Safety and High Quality

In high-technology products, the integrity of the software code and the reliable operation of memory devices are of critical importance. That’s why Winbond’s Quality Management Program governs every stage of a product’s life, from its start in the R&D laboratory to manufacturing and device testing.

The program has three key elements

**Quality Control**

Meticulously monitors materials and production processes to check that they satisfy rigorous standards in automotive and industrial.

**Reliability Assurance**

Performs a comprehensive set of accelerated electrical, thermal, cycling, and other tests to verify the reliability of production units.

**Failure Analysis**

Investigates the causes of product failures and proposes corrective actions.

This is why Winbond is trusted by the world’s largest manufacturers to provide on-time shipments of high-quality and high-reliability memory products.
Independently verified quality and safety performance

The data which Winbond provides to customers give direct assurance about the quality and reliability of its products. Comprehensive reliability test reports and quarterly average quality data are published on Winbond’s website.

Customers can also take assurance from independent verification of the quality and safety of Winbond’s products and processes

**Quality**
- IATF 16949
- AEC-0100 Technical Committee Member

**Safety**
- ISO 26262
- ISO 27001

**Environment**
- ISO 14001
- ISO 14064
- ISO 14067

**Others**
- ISO 50001
- QC 080000
- SONY Green Partner

Reliability also extends to the supply chain: the Winbond Product Longevity Program guarantees a minimum 10-year lifetime for products supplied to automotive, industrial, consumer, medical, and industrial computing markets. Products supplied under this program are subject to extended product change notification, end-of-life and last-time buy arrangements.
Winbond Flash products offer high performance, low power consumption, and space-saving package options. Discover the latest advances in Flash memory for applications in mobile communications, automotive systems and the IoT.
Flash Memory Products for Any Application

High speed | Low power | Small board footprint

Whatever a customer chooses to optimize their design, Winbond’s Flash memory portfolio has the right product.

A renowned developer of Flash memory technology, Winbond has built a broad portfolio of products which meets the needs of every type of product in the consumer, communications, automotive, and industrial markets.

High Speed
The latest OctalNAND Flash products feature fast Write speed and ultra-fast Continuous Read performance up to 240MB/s.

Low Power
Winbond was the first SPI NOR Flash manufacturer to supply the market with a portfolio of 1.2V devices.

Small Footprint
With the popular SpiStack® technology, Winbond can stack NOR+NOR, NOR+NAND or NAND+NAND die combinations in a standard package outline. SpiStack® gives the flexibility to modify a design’s specifications without changing the board layout.

Whichever product the customer chooses, high quality and reliability are guaranteed. Backed by Winbond’s Quality Management Program, the Flash memory portfolio includes AEC-Q100 products qualified to Grade 1 for operation at up to 125°C. On-chip ECC protects the integrity of data stored on Winbond Flash devices.
Winbond Flash memory devices for code storage are at the heart of the products in today’s fastest-growing markets.

**5G Mobile Infrastructure**

- High-reliability SPI NOR Flash in densities up to 2Gb supports XIP operation to boot directly to a SoC or FPGA.
- A new high-density code storage option: the W25N series of QSPI NAND Flash products offers a cost-effective alternative to SPI NOR Flash in densities of 1-4Gb. Maximum Continuous Read speed of 83MB/s supports the high bandwidth/low latency requirements of 5G networking.
Automotive Applications

- Winbond’s automotive-grade SPI NOR Flash and Single-Level Cell NAND Flash with on-chip ECC provide ultra-high reliability.
- QspiNAND and new OctaNAND Flash products offer high Read speeds to give fast boot time in applications such as driver assistance systems and the instrument cluster. Fast Write capability supports reliable over-the-air software updating.

Industrial IoT End Points

- Ultra-low power devices such as wireless sensors can save power by using the ultra-low voltage family of SPI NOR Flash products, which are rated for operation at 1.14-1.26V.
- Space-saving SpiStack® arrangements can combine NOR Flash for long lifetime code storage and NAND Flash for high-density data storage in a single package. For over-the-air updating, SpiStack® configurations support Read-while-Write and Write-while-Write capabilities.
DRAM memory is an essential component of new AI system, IoT device and Mobility segment. New Winbond DRAM products save space and cost, and reduce power consumption, while providing super-fast performance up to 4.266bps.

Broad Portfolio of DRAM Products Offers High Bandwidth and Low Power Consumption
Broad Portfolio of DRAM Products Offers High Bandwidth and Low Power Consumption

Rapid adoption of AI technology drives demand for DRAM in low, mid and high densities at IoT device as AIoT segment.

Artificial Intelligence (AI) is revolutionizing products across the consumer, communications, industrial, and automotive markets. Smart door bells which recognize a resident’s face, industrial machines which can automatically alert an engineer to perform a repair before they break down, and cars which can drive themselves on the highway – all use AI technology. These products need fast memory to support the advanced processors which run AI applications.

Mobility applications required LPWA connectivity chips via WiFi, Bluetooth, Mobile Network, etc. Also, it needs small density, lower power consumption memory to achieve the best end product performance.

And the Winbond DRAM product provides completed solutions, GP-Boost™ DRAM Series for AI, IoT, and Mobility applications.
HYPERRAM™
An ultra-low power, space saving solution for simple AI applications such as keyword recognition and SD image processing. Available in densities up to 512Mb, these products are ideal for use in battery-powered and energy-saving devices.

SDRAM / LPSDR, DDR / LPDDR, DDR2 / LPDDR2, and DDR3 / LPDDR3
Data rate options up to 2.136Gbps support advanced microprocessors which run a Linux® operating system. Ideal for applications involving FHD video processing, face recognition or object detection, especially for 1Gb LPDDR3.

LPDDR4/4X
Supports high-bandwidth operation for 4K and even 8K video processing, AI inference processing and Mobility applications. At maximum data rate up to 4.266Gbps. Available in densities from 1Gb to 4Gb DDR, LPDDR4 are suitable for advanced applications such as autonomous driving.
**HYPERRAM™: space-saving solution and ultra-low power consumption**

Winbond HYPERRAM™ products provide a compact alternative to traditional pseudo-SRAM in IoT and consumer devices, automotive and industrial equipment. The introduction in 2021 of HYPERRAM™ devices produced on Winbond’s 25nm process extends densities up to 256Mb and 512Mb.

### Ultra-low Power Consumption

Winbond’s Hybrid Sleep Mode (HSM) gives standby power consumption as low as 35μW, and operating power less than half that of equivalent pSRAM products.

### Design Simplicity

HYPERRAM™ devices use just 13 signal pins, compared to 31 signal pins in pSRAM. This makes the board layout much simpler to design and manufacture.

### Space-saving

Low pin-count packages and a lower number of connections to the host controller reduce the memory system's board footprint and save space in consumer devices such as smart watches.

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**DDR2 / DDR3: shift to 25/20nm process**

For industrial products and networking equipment, Winbond's 1.5V and 1.35V DDR3 products support data rates up to 2133Mbps in x8 and x16 configurations.

After completing a migration from 46nm and 38nm to the Winbond 25nm and 25Snm process, DDR2 and DDR3 products are now available. DDR2 is available for 25nm 512Mb and 1Gb, DDR3 is available in densities of 1Gb, 2Gb, 4Gb and 8Gb. In 2023, Winbond do a further migration to 20nm, which DDR3 is available 1Gb, 2Gb and 4Gb. Winbond also supplies DDR2/DDR3 products in Known Good Die (KGD) form.
When an electronics product requires secure code storage, it needs certified TrustME® Secure Flash Memory from Winbond. The TrustME® family meets every system requirement, from the substantial protection required by simple IoT devices up to Common Criteria EAL 5+ certified memory for securing financial transactions.

TrustME® Family: The Right Fit for All Security Requirements
TrustME® Family: The Right Fit for All Security Requirements

Whether an application requires a Substantial or High level of protection, Winbond’s Secure Flash Memory has a corresponding solution to match.

Today, almost every electronic product is a connected product. In the age of the IoT, connected and autonomous cars and Industry 4.0, manufacturers can create more value by connecting products to the cloud to support new, sophisticated applications and to enable software updates.

But with the connection to the network comes risk: the network provides an entry point for attackers to disable or compromise devices or services, to steal private data or to perform illegal transactions. So every connected device must be secured. This security must extend to the protection of code and data stored in external memory outside the main microcontroller or processor.
TrustME® Security Products from Winbond meet various requirements for secure storage.

**W770 Secure Flash Memory**
Provides Substantial Levels of security as defined by various Cybersecurity regulations. It is ideal for use in IoT end points and connected vehicles to protect code, data integrity, privacy and any credentials, also to maintain product life cycle and enable secure over-the-air updates.

**W75F Secure Memory Element**
Meets the EU’s requirement for a High Level of protection. It may be used to secure payments and to protect safety-critical applications, including in vehicles to mandate higher functional safety and cybersecurity.

**W76S Secure Element**
Provides the same secure memory as the W75F, and adds secure microcontroller functionality. It can be used to secure electronic payments, protect crypto-wallets and any property sensitive applications.
Strong security capabilities for all connected devices

W770 Secure Flash Memory

The W770 for IoT end points and other types of connected devices provides important security functions, including hardware root-of-trust, secure boot, platform resilience, and strong data protection. The W770 can also implement secure over-the-air software updates, even when the host processor is compromised.

Security certificates for 16/32Mbit include:

- ISO 15408 Common Criteria EAL 2+
- SESIP Level 2 (with IEC 62443 and NIST 8259A Ready)
- ISO 26262 ASIL-C Ready
- ISO 21434 Automotive Cybersecurity Certification
- FIPS 140-3 CAVP (Cryptographic Algorithm Validation Program)

Security certificates for 64/128Mbit include (in progress):

- ISO 15408 Common Criteria EAL 2+
- SESIP Level 2 (with IEC 62443, NIST 8259A, WP.29 Ready)
- ISO 26262 ASIL-C Ready
- ISO 21434 Automotive Cybersecurity Certification
- FIPS 140-3 CMVP (Cryptographic Module Validation Program) L1

W75F Secure Memory Element

The 4Mb, 16Mb or 32Mb W75F provides the industry’s most secure and safe external storage solution for code and data in applications such as payments, SIM cards, system security, biometric, eIDs and automotive modules. It defends products against threats such as replay, roll-back, man-in-the-middle, sniffing, side-channel, and fault injection attacks. The W75F can construct a robust and flexible secure memory sub-system with Secure Flash Interface IP of SoC (provided by Winbond), or can be the complementary embedded security system to Arm®v8-M architecture-based systems.

The W75F is the first Secure Flash Memory device to obtain certificates for:

- Common Criteria EAL 5+
- ISO 26262 ASIL-D Ready
- SESIP Level 3 with Physical Attack Resistance and Software Attacker Resistance: Isolation of Platform
- Platform Security Architecture (PSA) Certified Level 2 Ready
- Compliant with 3S in SoC Protection Profile PP0117 for integrated SE and SIM functionality
- ISO 21434 Automotive Cybersecurity Certification (in progress)
W76S Secure Element

The W76S Secure Element is an innovative combination of an external memory and a Tamper-Resistant microcontroller. Based on a 32Mb W75F Secure Flash, it offers the highest security capabilities required for eSIM, biometric, eIDs and ePayment applications. It may also be used to protect blockchain and crypto-wallet transactions and Android™ StrongBox processes.

The W76S’s security certificates include:

- Common Criteria EAL 5+
- EMVCo for Financial Transactions
- CFNR (China Financial National Rising Authentication): Technology Certification of Mobile Financial Service
## Code Storage Flash Memory

<table>
<thead>
<tr>
<th>Product Line</th>
<th>Density/Combination</th>
<th>Voltaages</th>
<th>Data Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial NOR Flash</td>
<td>2Mb to 20Mb</td>
<td>1.8V &amp; 3V</td>
<td>x1, x2, x4</td>
</tr>
<tr>
<td>1.2V Serial NOR Flash</td>
<td>0Mb to 256Mb</td>
<td>1.2V</td>
<td>x1, x2, x4</td>
</tr>
<tr>
<td>OsPiNAND Flash</td>
<td>512Mb to 4Gb</td>
<td>1.8V &amp; 3V</td>
<td>x1, x2, x4</td>
</tr>
<tr>
<td>High Performance OsPiNAND Flash</td>
<td>1Gb to 2Gb</td>
<td>1.8V</td>
<td>x1, x2, x4</td>
</tr>
<tr>
<td>OctPiNAND Flash</td>
<td>1Gb to 4Gb</td>
<td>1.8V</td>
<td>x1, x8</td>
</tr>
<tr>
<td>SLC NAND Flash</td>
<td>1Gb to 6Gb</td>
<td>1.8V &amp; 3V</td>
<td>x8, x16</td>
</tr>
<tr>
<td>NAND Based RC</td>
<td>Combos SLC NAND + Low Power DRAM</td>
<td>1.8V</td>
<td>x16, x32</td>
</tr>
<tr>
<td>SpiStack™ Flash</td>
<td>Combos S-NOR and S-NAND</td>
<td>1.8V &amp; 3V</td>
<td>x1, x2, x4</td>
</tr>
<tr>
<td>Authentication Flash</td>
<td>S-NOR 32Mb to 512Mb, S-NAND 1Gb</td>
<td>1.8V &amp; 3V</td>
<td>x1, x2, x4</td>
</tr>
</tbody>
</table>

## Mobile DRAM

<table>
<thead>
<tr>
<th>Product Line</th>
<th>Density</th>
<th>Voltaages</th>
<th>Data Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSRAM</td>
<td>64Mb</td>
<td>1.8V/1.8V</td>
<td>x16</td>
</tr>
<tr>
<td>HYPERRAM™</td>
<td>32Mb to 512Mb</td>
<td>1.8V (32Mb to 128Mb also support 3.0V)</td>
<td>x8</td>
</tr>
<tr>
<td></td>
<td>256Mb and 512Mb</td>
<td>1.8V</td>
<td>x16</td>
</tr>
<tr>
<td>LPDDR SDRAM</td>
<td>512Mb</td>
<td>1.8V/1.8V</td>
<td>x16, x32</td>
</tr>
<tr>
<td>LPDDR1 SDRAM</td>
<td>256Mb to 1Gb</td>
<td>1.8V/1.8V</td>
<td>x16 for 256Mb, x32 for 512Mb to 1Gb</td>
</tr>
<tr>
<td>LPDDR2 SDRAM</td>
<td>512Mb to 2Gb</td>
<td>1.8V/1.2V</td>
<td>x16, x32</td>
</tr>
<tr>
<td>LPDDR3 SDRAM</td>
<td>1Gb</td>
<td>1.8V/1.2V</td>
<td>x16, x32</td>
</tr>
<tr>
<td>LPDDR4 SDRAM</td>
<td>1Gb to 4Gb</td>
<td>1.8V/1.1V/1.1V</td>
<td>x16, x32</td>
</tr>
<tr>
<td>LPDDR4X SDRAM</td>
<td>1Gb to 4Gb</td>
<td>1.8V/1.1V/0.6V</td>
<td>x16, x32</td>
</tr>
</tbody>
</table>

## Specialty DRAM

<table>
<thead>
<tr>
<th>Product Line</th>
<th>Density</th>
<th>Voltaages</th>
<th>Data Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDRAM</td>
<td>16Mb to 256Mb</td>
<td>2.5V/3.3V</td>
<td>x16, x32</td>
</tr>
<tr>
<td>DDR SDRAM</td>
<td>64Mb to 256Mb</td>
<td>2.5V</td>
<td>x8, x16</td>
</tr>
<tr>
<td>DDR2 SDRAM</td>
<td>128Mb to 2Gb</td>
<td>1.8V</td>
<td>x8, x18</td>
</tr>
<tr>
<td>DDR3 SDRAM</td>
<td>1Gb to 4Gb</td>
<td>1.5V, 1.35V</td>
<td>x8, x18</td>
</tr>
</tbody>
</table>

## TrustME® Secure Flash Memory

### W770
- **Secure Flash Memory**
- **Density**: 16Mb, 32Mb, 64Mb, 128Mb
- **Security Level**: Substantial
  - ISO 15408 CC EAL 2+
  - SESIP Level 2 (with IEC 62443 and NIST 8259A Ready)
  - ISO 26262 ASIL-C Ready + FIPS 140-3 CAVP/CVMP
  - ISO 21434 Automotive Cybersecurity

### W75F
- **Secure Memory Element**
- **Density**: 4Mb, 16Mb, 32Mb
- **Security Level**: High
  - CC EAL 5+ + ISO 26262 ASIL-D Ready
  - PSA Certified Level 2 Ready
  - ISO 21434 Automotive Cybersecurity
  - SESIP Level 4 with Physical Attack Resistance and Software Attacker Resistance: Isolation ofPlatform
  - Compliant with SCC Protection Profile PPD117 for Integrated SE and SIM functionality

### W78S
- **Secure Element**
- **Density**: 32Mb
- **Security Level**: High
  - CC EAL 5+ + EMVCo
  - CFNR: Technology Certification of Mobile Financial Service

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**Certification in progress**

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About Winbond

Winbond Electronics Corporation is a leading global supplier of semiconductor memory solutions. The Company provides customer-driven memory solutions backed by the expert capabilities of product design, R&D, manufacturing, and sales services. Winbond's product portfolio, consisting of Specialty DRAM, Mobile DRAM, Code Storage Flash, and TrustME® Secure Flash, is widely used by tier-1 customers in communication, consumer electronics, automotive and industrial, and computer peripheral markets.

Winbond is headquartered in Central Taiwan Science Park (CTSP) and it has subsidiaries in the USA, Japan, Israel, China, Hong Kong, and Germany. Based on Taichung and new Kaohsiung 12-inch fabs in Taiwan, Winbond keeps pace to develop in-house technologies to provide high-quality memory IC products.
Winbond Worldwide

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America
Winbond Electronics Corporation America
RD SALES

China
Winbond Electronics (Suzhou) Limited
SALES

Japan
Winbond Electronics Corporation Japan
RD SALES

Germany
Winbond Electronics Germany GmbH
SALES

Israel
Winbond Technology Limited
RD SALES

Hong Kong
Winbond Electronics (H.K.) Limited
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Winbond Innovations

High Quality
- 125°C Serial NOR Flash
- 105°C SPI/nAND Flash
- On-chip ECC NOR Flash
- Automotive DRAM

Security Future
- TrustME® Secure Flash
- Authentication Flash

High Speed
- Octal NOR Flash
- OctalNAND Flash
- DTR NOR/NAND Flash
- LPDDR4/4X
- DDR2

More Flexibility
- SpiStack® NOR+NAND Flash
- NAND Based MCP
- HYPERRAM™
- PSRAM
- K6D

Low Power
- 1.2V Serial NOR Flash
- 1.8V Serial NOR/NAND Flash
- LPDDR with DSR Mode
- HYPERRAM™

High Reliability
As a trusted memory supplier, Winbond commits to providing comprehensive support for customers' engineering requirements.

Longevity Support
Winbond offers Product Longevity Program to help customers select the most appropriate part for applications that require stable life cycles support.

Own 12-inch Fab
Winbond's in-house wafer fabrication provides customers with full commitment in capacity support as well as delivery flexibility.

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@winbondflash @winbond_wedeliver

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