REALIZING ROBUST PERFORMANCE IN A BEAUTIFUL LOW-POWER PACKAGE.

Unleash a notebook with enormous computing power supported by state-of-the-art energy efficiency.
Executive Summary

Stepping into the next-generation of Laptop

• The future is the “Unfixable”
• Fanless laptops are available in stores
• Battery life matters

Realizing beauty, portability and performance

• Enjoy the design freedom from slim and small solution
• Keep it cool to deliver a quiet mobile experience
• Leave the power saving to the experts

Read on to learn more ...
The future is “Unfixable”.

Laptops are getting thinner with each generation these days. The hardware is getting faster and smaller, to the point where the actual processor, memory and all the other chips only occupy a small fraction of a modern computer.

Note PC hybrid designs

1. Accenture, Internal research and analysis (2015)
2. Ultrabook is a trademark of Intel Corporation in the U.S. and/or other countries
Fanless laptops are now available in stores.

You’ll find fanless laptops and ultrabooks, with a passive cooling solution that does not include a cooling fan, already available in stores.

Fanless Laptop design with passive cooling solution

The reason why customer will choose a fanless laptop:

a quiet everyday experience in a laptop, similar to what has been offered for years by tablets or phones.

It’s perfectly quiet, especially if the passive cooling hardware is paired with an SSD.

2. Ultrabook Review, A detailed list of fanless laptops and ultrabooks available in 2015
Battery life matters.

Consumers want to use notebooks all day without charging.

Daily usage of a laptop

- User Generated Contents (incl. SNS): 71%
- Gaming: 53%
- Video Clips: 53%
- News/Magazine: 52%
- Books/Text: 36%
- Sports Games or matches: 17%

Notebooks should be able to go all day on battery power, and that means...

Innovate your next-generation notebook with Samsung’s cutting-edge technology.

Consumers have wanted, and will always want, a notebook PC that has improved portability. Samsung invites your customers to experience the beauty of slimness, long-lasting convenience, and the ability to stay cool and quiet at all times.
Innovate your notebook PC and be a leading manufacturer with design flexibility benefiting from the smaller footprint of Samsung components.

Enjoy the design freedom from slim and small solution.

Fully geared with the most advanced process technology, Samsung DRAM provides twice as much capacity than that of other products of the same size.

Samsung Client SSD supports the latest M.2 standard form factor. This further empowers the manufacturers to make even thinner notebooks.
Samsung proudly presents low-power consumption features to solve consumer portability concerns. With these solutions, customers can be relieved from worries about running out of battery in the middle of their important tasks.

The next-generation memory solutions of the LPDDR4 reduces power consumption by almost 37% than that of previous generations.

Our SSD, which replaces HDDs, allows manufacturers to achieve long-lasting battery life, without compromising performance.

Samsung achieved improved power efficiency in our Panel DDI through advancements in our process technology from 45nm to 28nm.
Keep it cool to deliver a quiet mobile experience.

Build a fanless notebook that never overheats and also maintains high durability through Samsung’s low-heat generating solutions.

Samsung’s cutting-edge LT-COF technology of Panel DDI significantly reduces heat generation by 20-30% than that of previous generations.

Samsung SSD generates significantly less heat than traditional HDDs by eliminating the moving parts of the HDD. Our SSD also has Dynamic Thermal Throttling (DTT) to protect the device from overheating.
Our Featured Products For Notebook

Tailored for your business
Explore products, solutions and resources that cater to your Notebook.
Featured Product Overview

- **PC DRAM**: Fast and energy-efficient
- **ClientSSD**: Setting new standards in speed and endurance
- **Mobile DRAM**: Highly power efficient performance
- **Panel DDI/TCON**: Rich colors with efficiency in power, heat, and space
- **Graphic DRAM**: Supreme graphics at dashing speed

*Notebook*
When you need the right memory solution for your PC, you need the right expert. Samsung has been a leader in the DRAM market, with our DRAM being selected by most OEMs for many years. Embrace the cutting-edge Samsung DDR4 to take your PC to a new dimension of high speed and low energy performance.
PC DRAM

DDR4 has superior speed to DDR3.

Doubled bandwidth and faster recovery

DDR3 vs. DDR4 in Speed

- DDR3: 1,600 Mbps
- DDR4: 3,200 Mbps (2X Bandwidth)

DDR4 using 20nm processing technology provides up to 2,400 Mbps initial speeds, increasing to the JEDEC-defined speed of 3,200 Mbps. DDR4 bandwidth is double that of DDR3.

G.Skill’s 4th annual OC World Cup at Computex 2015

Samsung is the global market leader in DRAM. It has proven its state-of-the-art, world-leading DRAM technology by providing top of the class hardware at the Overclocking World Cup.

Prior to the tournament, G.Skill announced its “Highest Frequency Ripjaws 4 Series DDR4 3666MHz” memory kit featuring Samsung DDR4 4Gb IC, calling it the “first-of-its-kind top speed memory kit”.

Featured Products

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Featured Products
High power efficiency

PC DRAM

DDR4 has higher power efficiency over DDR3 for its higher bandwidth, but low operating voltage, based on the advanced process technology.

Samsung DDR4 consumes less power with its unique 2xnm technology. Samsung 2xnm DDR4 operating at 1.2V achieves 26% higher performance/watt compared to 2xnm DDR3 operating at 1.5V.
When you look for the right storage for PC that runs with higher speed, Samsung is here to help. Samsung has a broad portfolio of SSDs to cater the best-fit solution for your needs. Samsung SSD outperforms HDD in every aspects, namely speed, endurance and power consumption.
Client SSD

Samsung has a wide range of products with different specifications that fit various needs of consumers.

<table>
<thead>
<tr>
<th></th>
<th>Seq. Read</th>
<th>Seq. Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM871a</td>
<td>540</td>
<td>520</td>
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<tr>
<td>PM871a</td>
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<td>520</td>
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<tr>
<td>PM951</td>
<td>1,050</td>
<td>560</td>
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<tr>
<td>SM951</td>
<td>2,150</td>
<td>1,550</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Rand. Read</th>
<th>Rand. Write</th>
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</thead>
<tbody>
<tr>
<td>CM871a</td>
<td>97</td>
<td>57</td>
</tr>
<tr>
<td>PM871a</td>
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<td>PM951</td>
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<td>144</td>
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<tr>
<td>SM951</td>
<td>300</td>
<td>100</td>
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<table>
<thead>
<tr>
<th></th>
<th>Capacity</th>
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<tbody>
<tr>
<td>CM871a</td>
<td>256</td>
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<tr>
<td>PM871a</td>
<td>1,000</td>
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<tr>
<td>PM951</td>
<td>512</td>
</tr>
<tr>
<td>SM951</td>
<td>512</td>
</tr>
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</table>
Client SSD

Even the low-end SSD is faster than HDD.

Superb sensory performance and excellent feasibility vs. HDD

General HDD vs low-end SSD (CM871) (Booting and Multi-tasking)

The Samsung CM871 SSD delivers significantly enhanced speed with faster booting, file loading & copying, multi-tasking, installation and access times. This enables CM871 to improve both operational efficiency and workplace productivity.
Client SSD

Samsung SSD performs better than or almost equal to its competitors, achieving cost efficiency.

**Sequential read**

<table>
<thead>
<tr>
<th></th>
<th>(MB/s)</th>
<th></th>
<th>(IOPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (256GB)</td>
<td>517</td>
<td>B (240GB)</td>
<td>545</td>
</tr>
<tr>
<td>Samsung PM871 (256GB)</td>
<td>538</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Random read**

<table>
<thead>
<tr>
<th></th>
<th>(MB/s)</th>
<th></th>
<th>(IOPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (256GB)</td>
<td>8,343</td>
<td>B (240 GB)</td>
<td>9,455</td>
</tr>
<tr>
<td>Samsung PM871 (256GB)</td>
<td>9,488</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Designed to deliver outstanding read intensive performance, PM871 is capable of providing sustained performance that is superior to its competitors. Taking performance and cost-effectiveness into account, Samsung PM871 is widely recognized as the best SSD choice for the mainstream PC market.
**Client SSD**

NVMe performs faster in multi-tasking than other interfaces.

**Faster speed in multi-tasking**

The SM951 and PM951 leverage the advanced NVMe PCIe interface to significantly enhance performance to exceed the expectations of users today. SM951 and PM951 offers not only over 3.8x faster speed in multi-tasking compared to conventional SATA products, but also boasts reduced power consumption compared to its competitors, optimized to satisfy ultra-slim notebook PC’s.
In general, SSD consumes less power than HDD.

To measure drive temperature, an infrared thermometer was used while the file was copying to take readings on the surface of each drive. To ensure valid idle measurements, the PC was allowed to run for 20 minutes in an idle state; and for the reference, room temperature at the time was 20 °Celsius.
Client SSD

In general, SSD generates heat at lower temperatures than HDD.

Average temperature falls by 31% from 2.5 inch HDD to SSD. This is because the SSD generally consumes less power than HDD. The 3.5” drive’s larger surface area allowed it to dissipate more heat to maintain a lower temperature.
Mobile DRAM

MAKE YOUR OUTSTANDING MOBILE DEVICE SHINE.

Samsung helps you confidently meet the market demands for slimmer and diverse device sizes in smartphones, tablets, and various other mobile devices. Leverage Samsung mobile DRAM, built specifically for devices to thrive in various package densities and size portfolios with an extended battery life.
Mobile DRAM

Mobile DRAM is becoming more power efficient.

LPDDR4 is more power efficient than LPDDR3 and LPDDR2. LPDDR4 has 37% improved energy efficiency than LPDDR3, and LPDDR3 has 10% improved energy efficiency than LPDDR2.

Power efficiency

(Power/Bandwidth)

LPDDR2
(1.2V/800 Mbps)

LPDDR3
(1.2V/1,600 Mbps)

LPDDR4
(1.1V/3,733 Mbps)

1
0.9
0.58

-37%
Mobile DRAM

LPDDR4 has doubled bandwidth of LPDDR3.

Samsung is ready to be a timely provider of Ultra HD, large-screen mobile devices through its 2nm LPDDR4 that enables smartphones with 3,733 Mbps bandwidth. LPDDR4’s increased memory bandwidth allows faster communication between memory and AP.
Samsung's expertise in panel DDI empowers panels with rich color spectrums, along with strong efficiency in power, heat, and space.
Panel DDI/TCON

With the most advanced manufacturing process technology, Samsung TCON offers reduced logic voltage and power consumption.

Lower power consumption

13% logic voltage reduction

1.15V 1.0V

45nm TCON 28nm TCON

20% of power can be saved due to the most advanced process technology

3.6W 3W

45nm TCON 28nm TCON

Samsung offers greater power efficiency through an improvement in our process technology from 45nm to 28nm. With the decrease in logic voltage, power consumption can also be reduced.
Samsung has designed numerous technologies in the Panel DDI field, including original innovations and packaging solutions that maintain the low heat generation of components.

With our advanced LTCOF technology, Samsung Panel DDI is able to lower temperatures by 30~35%. As a result, Samsung offers a 20~30% heat generation competitiveness than that of conventional products.
Market demand is high for a graphic DRAM that seamlessly supports high-definition contents and graphic-intensive applications. Samsung is dedicated to deliver the ultra-fast, yet power efficient graphic memory products. Samsung graphic DRAM, born to boost GPU capabilities, delivers unprecedented graphic performance, giving your devices the ultimate desirability.
Graphic DRAM

GDDR5 provides 2.7 times faster data speed than GDDR3.

Faster speed and bandwidth

Samsung GDDR5 can achieve data rate of up to 7Gb/s per pin which translates to 32GB/s for the complete memory chip. This is 2.7x faster than GDDR3’s 2.6Gb/s per pin and 10.4GB/s.
GDDR5 consumes less power than GDDR3.

With GDDR5’s 25% decreased VDD/VDDQ compared to GDDR3, Samsung has achieved low power consumption for its Graphic DRAM. Manufacturers can now provide energy-efficient graphic products to the end customers.
Rediscover the wonder of technology with our latest breakthroughs, products, and solution as we continue to push limits of innovation.
Leading the industry with technological innovation

Samsung's semiconductor business remains at the forefront of the market by constantly pushing the limits on innovation through sustained investment in R&D and corporate citizenship.

Why Samsung

- Samsung's semiconductor business has been the memory leader for over 20 years, and is rapidly moving to the head of the LSI market.
- Samsung has made numerous technological innovations in the semiconductor industry since 1983, when we developed the world's 1st 64Kb DRAM.
- Samsung's semiconductor business never stops innovating within its comprehensive product portfolios, from semiconductors to end-products, and makes massive investments in R&D.
- Samsung's semiconductor business puts great value in our social responsibilities toward customers and partners, and in maintaining a green planet.
Market Leadership | A comprehensive view

Samsung's semiconductor business has held the 2nd largest global market share for over 12 years and it continues to grow its presence in the industry.

Global semiconductor market share

1. Gartner
Samsung has been the leader of the total memory market for 22 years running since 1993.
Market Leadership  |  System LSI business

Samsung's semiconductor business took the DDI market lead in 2003 and never looked back, expanding to a leadership position for smart cards, CIS and other products.

Market leadership in the LSI business (2014) ¹

<table>
<thead>
<tr>
<th>Product</th>
<th>Leadership</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDI</td>
<td>1</td>
<td>23%</td>
</tr>
<tr>
<td>Smart Card</td>
<td>1</td>
<td>37%</td>
</tr>
<tr>
<td>Mobile CIS</td>
<td>2</td>
<td>27%</td>
</tr>
<tr>
<td>CIS</td>
<td>2</td>
<td>14%</td>
</tr>
</tbody>
</table>

for 12 years since 2003

¹ Samsung Internal Forecast '15
Samsung has achieved numerous technological innovations in the memory field on an almost annual basis since first developing 64Kb DRAM in 1983.

*Note: 10nm-class denotes a process technology node somewhere between 10 and 19 nanometers*
Samsung system LSI has grown significantly since its inception in 2001, making several technological innovations for each of its products.

The recent history of world-first developments

- **2010**: u-LTCOF Package Technology for Panel DDI
- **2011**: ISOCELL Technology for Mobile CIS
- **2012**: Octa-Core Application Processor
- **2013**: Embedded Flash Logic Process (45nm) for Smart Card
- **2014**: CC EAL7 Security Assurance for Smart Card
- **2015**: APS-C & BSI Tech. for Camera CIS (65nm, 2800MP)
- **2015**: FinFET Process Technology (14nm) for Application Processor
- **2015**: 2-metal COF Package Technology for Flexible Mobile DDI
Company Capabilities | Semiconductor product portfolio

Samsung's semiconductor business offers nearly 25 memory and system LSI product portfolios that are essential in today's electronic appliances.

Samsung’s 9 product categories

- **Memory**
  - DRAM
  - Flash Storage
    - V-NAND
    - SSD
  - MCP
    - eMCP
    - ePOP
  - UFS
- **System LSI**
  - Exynos Solution
    - Application Processor
    - Modem/RF
    - ModAP
  - Display Solution
    - Mobile DDI
    - Panel DDI
    - Touch Controller
  - CMOS Image Sensor
    - Mobile CIS
    - Camera CIS
    - Industry CIS
  - Security Solution
    - Smart Card
    - NFC
  - Power IC
    - Bio Processor
Samsung's semiconductor business operates in 18 international locations to better serve and collaborate with customers around the world.
Company Capabilities | Investment for growth and innovation

Our global business experts and continued R&D investments position us to provide the market with cutting-edge technology to maintain our leadership position.

Global professionals as a core value

300,000+ talented employees in 80+ countries around the world

36,900
Doctorate/Masters degrees

63,000
R&D Staff

1,700
Designers

Striving rigorously for innovation

$14.6 B
R&D investments in 2014

Leading patent holder

SAMSUNG
Number of patents 2015

Over 100,000
Globally

No.2 in Europe (2,366)
No.2 in the US (5,072) since 2006

$209 Billion
Net Sales
Company Capabilities | Global recognition

Samsung has also been widely acclaimed for our reputability and innovative spirit.

Global recognition

7th TOP BRAND VALUE company

15th most REPUTABLE company

13th TOP GLOBAL company

5th most INNOVATIVE company

3rd top global INNOVATOR
Corporate Citizenship

Samsung constantly strives to resolve community challenges, protect nature, create safe and healthy workplaces and share growth with our employees, partners and customers.

Corporate citizenship of Samsung

- Social Contributions
- Green Management
- Health and Safety
- Sharing Growth

Sharing and Volunteering to Foster New Hope

Green Management that Protects the Planet

Creating Safe and Healthy Workplaces

Success Built on Helping and Dreaming Together
Samsung has initiated 5 key programs for social contributions to address the leading social issues around the globe, including education, healthcare and employment.

### 5 global social contribution activities

**SMART School**
- **384 schools under operation worldwide**
  - Supporting the development of creative talents in a smart education environment
  - Resolving regional education gaps

**Samsung Tech Institute**
- **23 institutes under operation worldwide**
  - Offering systematic vocational training & local employment
  - Laying the foundation for financial independence

**Samsung Care Drive**
- **8 programs under operation worldwide**
  - Offering a Smart Healthcare System accessible anywhere at any time
  - Promoting better health and lifestyles of local citizens

**Nanum Village**
- **2 digital villages under operation in Africa**
  - Providing healthcare and education support to low-income countries
  - Offering citizens the chance to contribute to local communities

**Solve for Tomorrow**
- **+2,300 participants in the 2014 competition**
  - Explored innovative ideas, putting them to practice in partnership with local communities
  - Resolved local pending issues using STEM\(^1\) skills

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1. STEM: Science, Technology, Engineering, Mathematics
Corporate Citizenship | Green management

Samsung has launched a wide range of innovative eco-conscious products in an effort to protect the environment for all of us.

Certified green products

100% of products achieved Good Eco-Product ratings

3,027 products certified green by global institutes

Globally recognized for the eco-friendliness of its products, Samsung received green certifications for a total of 3,027 product models from 11 nations including Korea, the US, China and European countries by the end of 2014.

Resource reuse and recycling (2014)

92% of waste recycled

19,403 tons of recycled plastics reused

354,599 tons of electronic waste recycled globally

37,594 mil. tons of water reused worldwide

Samsung reduces environmentally hazardous elements by reusing and recycling resources such as recycled plastic throughout the life cycle of products, from the manufacturing of parts and products, to their distribution, use and disposal.
Samsung promotes and complies to safety regulations to establish a proactive culture of safety, both inside and outside worksites.

**Health and safety management system**

100% global certification for all of Samsung’s health and safety management systems.

Samsung complies with **OHSAS 18001**, a global standard for occupational health and safety management systems, in each of its workplaces around the world, striving to maintain on-site safety and protect employee health.

**Employee healthcare and safety enhancement**

39,968 employees participated in hands-on environmental and safety education programs in 2014.

Program to teach emergency CPR.

Samsung is committed to improving employee healthcare and safety by developing ergonomic adaptations in the workplace environment, prohibiting business trips to regions with a high risk of infectious disease and supporting employee medical checkups.

CPR: Cardiopulmonary Resuscitation.
Samsung has taken part in various shared-growth activities to create a mutually beneficial business ecosystem with its suppliers.

Samsung created a supplier support fund of USD $1 billion, known as the ‘Mutual Growth Fund’ in collaboration with various financial institutes to support both primary and secondary suppliers.

Samsung Electronics set up the mutual Growth Academy in June 2013 to provide comprehensive and systematic support for its primary and secondary suppliers.
ENABLING THE FUTURE OF LIFELOGGING.

Let’s Get Started...
Samsung as a trusted partner

About Samsung's semiconductor business

The component businesses of Samsung Electronics come together under the title Device Solutions. As a leading company in the global electronics industry, Samsung Electronics has one of the widest range of products for its key component businesses Memory and System LSI, which are core elements of the company's well-balanced business portfolio.

Samsung initiated its semiconductor operations in 1974, mostly developing and producing ICs and peripherals for consumer electronics. The pivotal turning point in our evolution into a leading semiconductor manufacturer was the successful development of the 64Kb DRAM in 1983.

Samsung achieved and has maintained its market leadership position in the memory industry since 1993. Along with its success in the memory sector, the company signaled a long commitment to logic and analog chip development in 2001 with the expansion of its System LSI organization and the opening of its SoC Research Lab. Since then, Samsung's System LSI Business has scaled significantly upward, and is now one of the major players in the sector and also the largest provider in many product categories.

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For more information

For more information, visit www.samsung.com/semiconductor.

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