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CONTENTS

• BUSINESS UPDATE
  MEMORY MARKET OPPORTUNITIES
  SAMSUNG STRATEGY
SAMSUNG MEMORY BUSINESS REVIEW

#1 in Memory Worldwide Since 1993, Well Balanced DRAM/NAND Portfolio

2020 Market Share

<table>
<thead>
<tr>
<th>Year</th>
<th>DRAM</th>
<th>NAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>44%</td>
<td>35%</td>
</tr>
<tr>
<td>2019</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
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Source: IDC, Mar. '21

Revenue:

<table>
<thead>
<tr>
<th>Year</th>
<th>Market Share</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td></td>
<td></td>
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<tr>
<td>2015</td>
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<tr>
<td>2016</td>
<td></td>
<td></td>
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<tr>
<td>2017</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>40%</td>
<td>$48B</td>
</tr>
<tr>
<td>2019</td>
<td></td>
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<tr>
<td>2020</td>
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</tbody>
</table>
MEMORY BIZ. PARADIGM SHIFT LED BY SAMSUNG

Samsung is Powering the Technologies that bring Innovation to Lifestyle

Big Fluctuations

1st Jump

2nd Jump

3rd Quantum Jump

Memory
Revenue

1990

2000

2010

2016

Memory

Revenue
Beyond The Boundary

HUMAN

Samsung Memory

AI
CONTENTS

BUSINESS UPDATE
• MEMORY MARKET OPPORTUNITIES
SAmsung STRATEGY
SPREAD-OUT OF PUBLIC CLOUD
Explosive Growth of Unstructured Data

1st WAVE
Cloud Service Providers

2nd WAVE
Com & Forbes Top100

3rd WAVE
5G

Telco Companies

4TH WAVE

Automotive Companies

THE FLOOD OF DATA
SMART CITY & AUTONOMOUS CAR FUELED BY 5G NETWORK

Huge Amounts of Data Generated by Hyper-connected Devices
MARKET OPPORTUNITY IN BIG DATA ANALYTICS

Demand Increase for High Density & Performance Memory to Enhance Computing Power

- SSD
- CLOUD
- BIG DATA
- Un-structured Data
- DRAM
- More Density
- CPU
- Structured Data
- Accelerator + HBM
  (GPGPU, FPGA, ASIC)
- High Density / Performance
- Low Latency
- Fast Response

*Latency: Time Delay between input and output in a system
CONTINUOUS GROWTH OF MEMORY DEMAND

Memory Growth led by Server & Mobile Applications based on Big Data Ecosystem
CONTENTS

BUSINESS UPDATE

MEMORY MARKET OPPORTUNITIES

• SAMSUNG STRATEGY
SAMSUNG STRATEGY

Break-through Technology
COST LEADERSHIP

Enhanced Solutions
S/W & CONTROLLERS

Advanced Manufacturing
EFFICIENCY & FLEXIBILITY
CONTINUOUS TECHNOLOGY SCALING
Thru Technology Evolution

Source: Samsung
PUSHING THE LIMITS OF V-NAND
Thru Innovative Layer Stacking Technology

NAND

Source: Samsung

* QLC: Quad-Level Cell
UNIQUE CAPABILITIES FOR DIFFERENTIATED SOLUTIONS
Integrating Key Components to Deliver Value-added Solutions

ADVANCED PROCESS TECHNOLOGY
Wafer / Chip
- Smaller
- Higher Density
- Less Power Consumption
- Faster

ADVANCED PACKAGING TECHNOLOGY
Stacking / TSV
- Thinner
- Smaller
- No Performance Loss

VERTICAL INTEGRATION
Software & Logic (Controller)
- Customized
- Expandable
- Smarter
- Secure
SAMSUNG SOLUTIONS FOR THE 5G ERA
Enhanced Processing for Massive Data with Lower Latency & Less Power Consumption

FASTER DATA RATES WITH LOW POWER

3DS RDIMM, Z-SSD
- Low Latency *
- High Capacity
- Stable QoS

LPDDR5/5X
- Higher Speed
- Lower Power Consumption
- Smaller Package

* Latency: Time Delay between input and output in a system
SAMSUNG SOLUTIONS FOR ARTIFICIAL INTELLIGENCE
Superlative Performance and High Reliability Using Less Energy

ENHANCED PERFORMANCE FOR DATA-INTENSIVE TASKS

16GB HBM2E*  
Fastest Performance  
Energy Efficiency  

32TB SAS SSD, 16TB NVMe SSD  
Largest Density  
Higher Reliability  
Unparalleled Performance  

* HBM: High Bandwidth Memory
SAMSUNG SOLUTIONS FOR AUTOMOTIVE INDUSTRY
Advanced Total Memory Solution for Autonomous Driving Technology

Dedicated Support for automotive
Full Memory Line-ups
Quality & Longevity
Full In-house Solution

Automotive Storage
- High Density
- High Performance
- High Reliability

Automotive DRAM
- High Bandwidth
- Lower Power Consumption
- Higher Reliability
APPLICATION-ORIENTED LINE MANAGEMENT
2-Track Strategy for Efficient Production & Capacity Allocation

PERFORMANCE
Leading Process Technology

FLEXIBILITY
DRAM/NAND Conversion

LONGEVITY
Proven Process Technology
EVOLUTION TO SMARTER FACTORY
Customer Value Improvement through High Productivity and Enhanced SCM

SCM
- Demand Fulfillment
- Inventory Management
- Lead Time Reduction

PRODUCTIVITY
- Automated Operation
- Seamless Quality Control
- Intelligent Planning
- Early Yield Improvement

* SCM: Supply Chain Management

Evolution to Smarter Factory: Customer Value Improvement through High Productivity and Enhanced SCM.
QUALITY BY DESIGN
Meet the Industry Standard and Expectation of AI & Automotive Customers

PREDICTIVE

ENHANCED QUALITY REQUIREMENT

1993
ISO9001
Quality Management System

1993
ICT/Auto Quality Requirement

2001
TL9000
2002
Q59000

2018
IATF16949
Automotive Supplemental Requirement

PREVENTIVE

PRESCRIPTIVE

COLLABORATIVE

Advanced Manufacturing
SAMSUNG
Placing Memory at the Forefront of Future Innovation and Creative IT Life

Technology
Leading Technological Breakthroughs

Customers
Supporting Customers’ Future Innovation

Employees
Fostering Employees’ Creativity

Society
Enriching a New Way of Digital Life

http://www.samsung.com/semiconductor