



# FLASH MEMORY SUMMIT

Yoram Cedar | EVP and Chief Technology Officer

# Forward Looking Statement

**Any statement that refers to expectations or other characterizations of future events or circumstances is a forward-looking statement, including those relating to market share, market growth, product sales, industry trends, future memory technology, production capacity and technology transitions and future products.**

**Actual results may differ materially from those expressed in these forward-looking statements including due to the factors detailed under the caption “Risk Factors” and elsewhere in the documents SanDisk files from time-to-time with the SEC, including our annual and quarterly reports.**

**SanDisk undertakes no obligation to update these forward-looking statements, which speak only as of the date hereof.**



# MOMENTUM

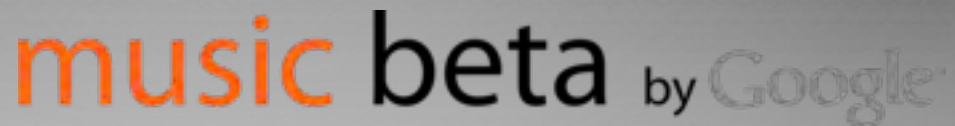




750M users

IPO

1B daily links







ios

**222million**  
iOS DEVICES SOLD

**550,000**  
DAILY ACTIVATIONS

Source: Apple, Google





# TRENDS IN THE FLASH MEMORY MARKET

**Growth of Long  
Term**  
+ **Demand**  
**Predictable**  
Drivers  
Supply  
Growth

**= Healthy  
Flash  
Industry**

**Growth of Long  
Term**  
+ **Demand**  
**Predictable**  
Drivers  
Supply  
Growth

= **Healthy  
Flash  
Industry**



# **Growth of Long Term Demand Drivers**

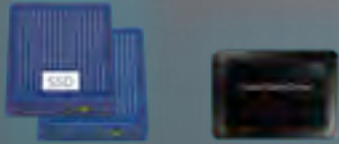
## ENTERPRISE SERVERS & STORAGE



## CLIENT DEVICES



## ENTERPRISE SERVERS & STORAGE



### Solid State Drives

MAXIMUM PERFORMANCE

## CLIENT DEVICES



### Flash Memory

MAXIMUM MOBILITY



# SMARTPHONES

Source: IHS iSuppli, Inc. Partner June, 2011 "Forecast: Semiconductor Consumption by Electronic Equipment Type, Worldwide, 2Q11 Update"

# Mobile – 33% of NAND Bits in 2015



Source: Gartner June, 2011 "Forecast: Semiconductor Consumption by Electronic Equipment Type, Worldwide, 2Q11 Update"

Wednesday, August 10, 2011

# Tablets: 15% of NAND Bits in 2015

5x

UNIT GROWTH 2011-2015

327

UNITS IN 2015

M



Source: Gartner June, 2011 "Forecast: Semiconductor Consumption by Electronic Equipment Type, Worldwide, 2Q11 Update"

**CLIENT**

**ENTERPRISE**

Source: Gartner June, 2011 "Forecast: Semiconductor Consumption by Electronic Equipment Type, Worldwide,"

Wednesday, August 10, 2011

# Solid State Drives: 25% of NAND Bits in 2015

7x

UNIT GROWTH 2011-2015

133

UNITS IN 2015

M

CLIENT

4x

UNIT GROWTH 2011-2015

12M

UNITS IN 2015

ENTERPRISE



Source: Gartner June, 2011 "Forecast: Semiconductor Consumption by Electronic Equipment Type, Worldwide,



# Established End Markets: 26% of NAND Bits in 2015



Source: Gartner June, 2011 "Forecast: Semiconductor Consumption by Electronic Equipment Type, Worldwide,



Technology enables innovation



Technology enables innovation



A hand is holding a tablet computer. The screen shows a group of diverse children smiling around a large yellow birthday cake with lit candles. In the top left corner of the screen, there is a small, square inset photo of a smiling woman with blonde hair. The background of the image is a blurred indoor setting.

**USERS WANT TO BE CONNECTED WITH  
THEIR WORLD**



LinkedIn  
Apple  
eBay  
Google  
PayPal  
amazon.com  
facebook  
YAHOO!  
Twitter  
NETFLIX  
YouTube  
hulu™  
flickr™



# Predictable Supply Growth

# NAND Scaling Extends to 2015

Log Scale

— NAND Historical  
— NAND Projection

2000

2010

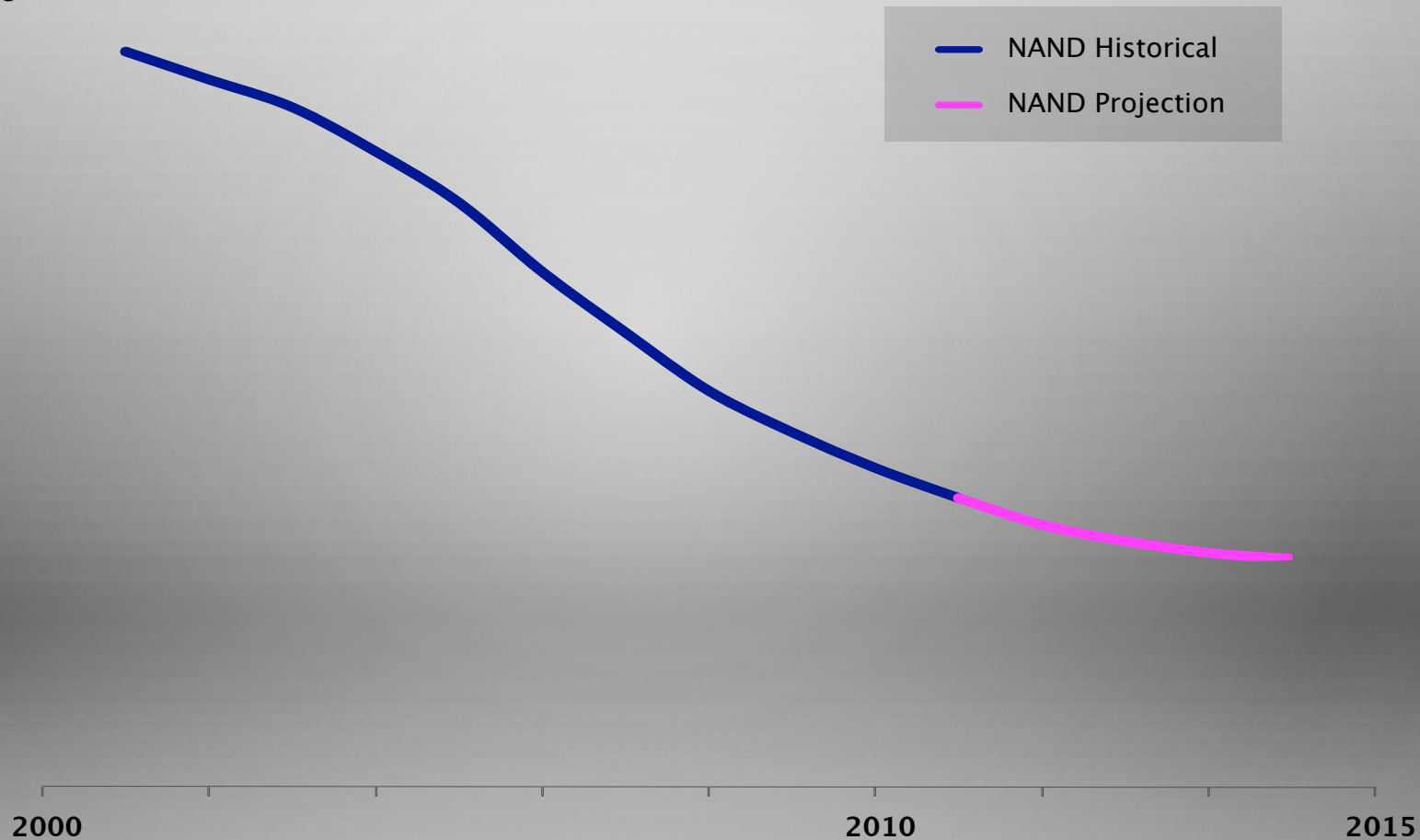
2015

Source: SanDisk



# NAND Scaling Extends to 2015

Log Scale



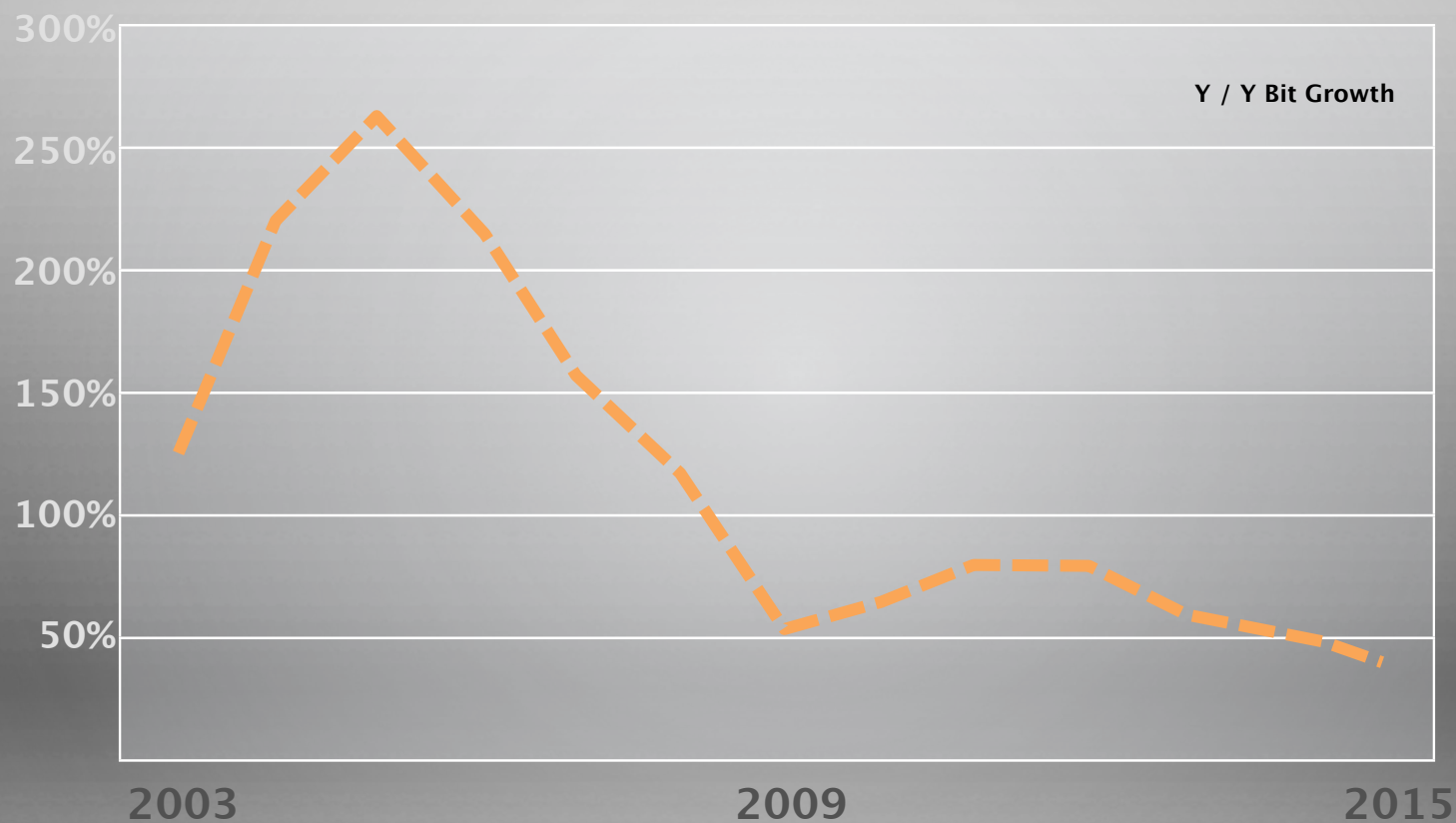
Source: SanDisk

# NAND industry bit growth moderating

Y / Y Bit Growth

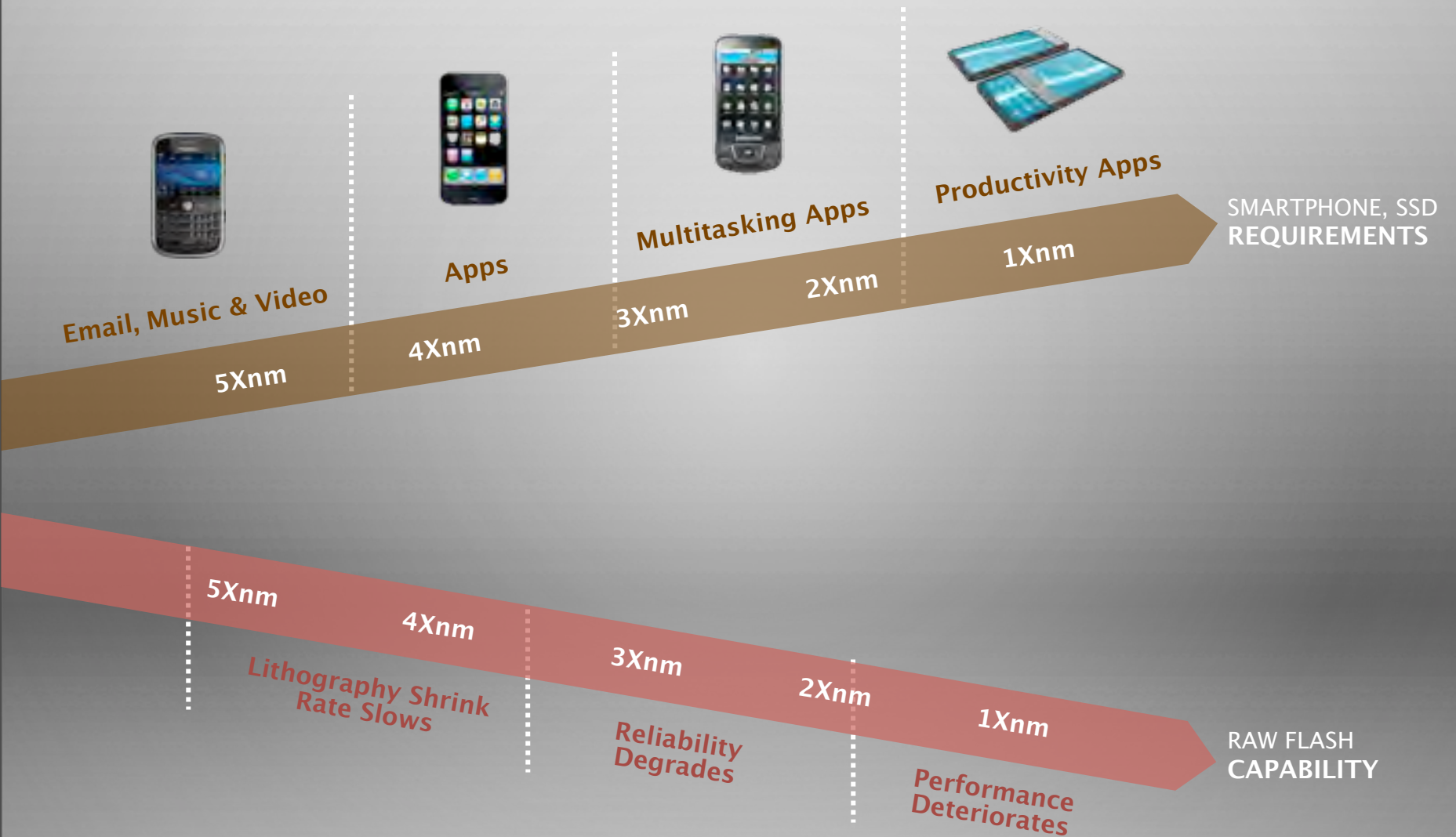
Source: Forward Insights, August 2011

# NAND industry bit growth moderating

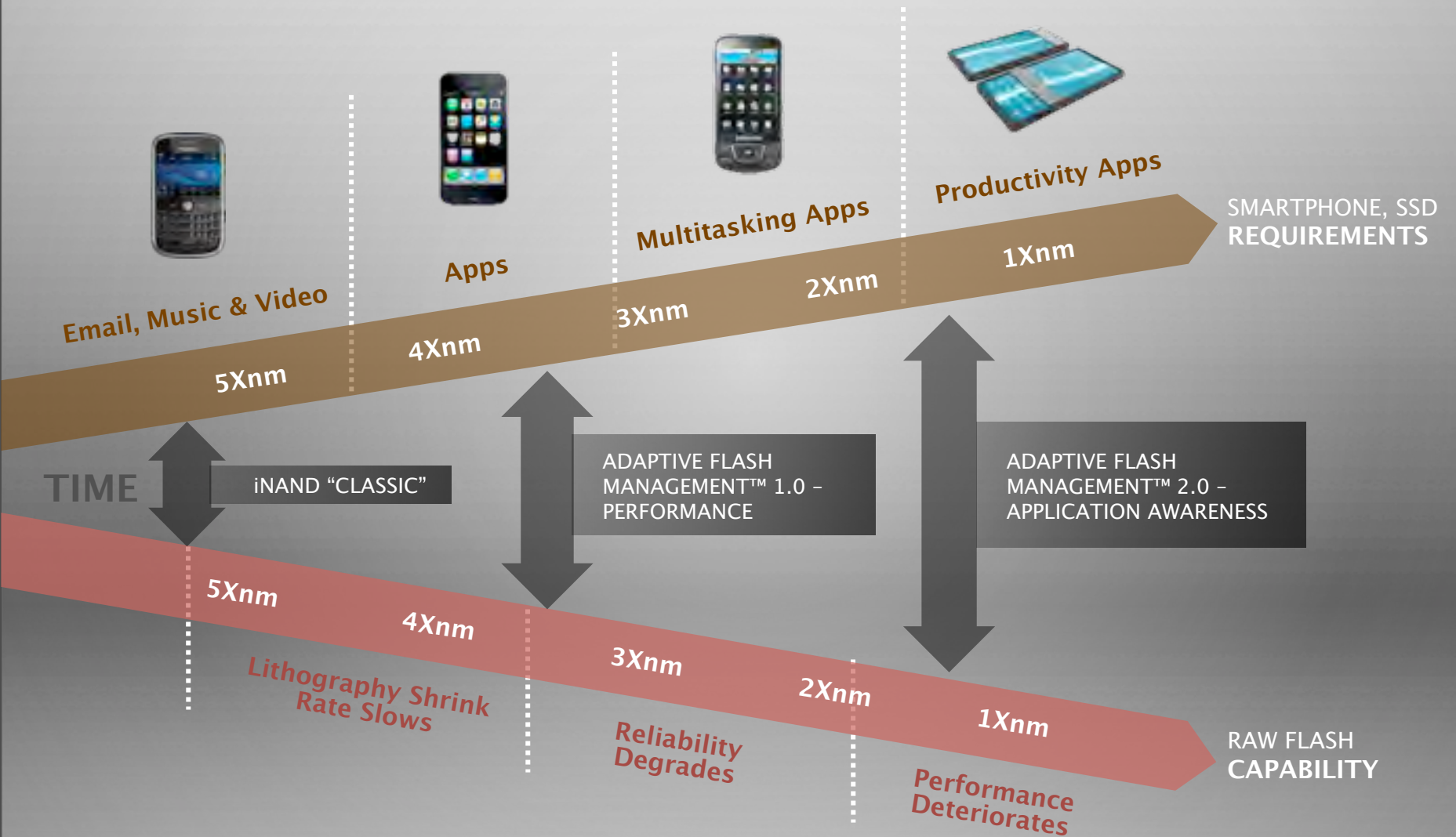


Source: Forward Insights, August 2011

# System Expertise is Critical: Managing Complexity



# System Expertise is Critical: Managing Complexity





# Healthy Flash Industry



# Healthy Flash Industry

Supply and Demand Harmony =





# FORWARD THINKING



# NVM continues beyond NAND

**NAND focus continues in the 3–5 year range**

**2Xnm + 1Xnm + 1Ynm + ...**

**Provide cost effective solutions for the next few years**

- Existing immersion lithography tools at least through 1Ynm

# NVM continues beyond NAND

**NAND focus continues in the 3–5 year range**

**2Xnm + 1Xnm + 1Ynm + ...**

**Provide cost effective solutions for the next few years**

- Existing immersion lithography tools at least through 1Ynm

**Vertical NAND to potentially extend NAND (BiCS / TCAT)**

- Can provide better Fab re-use
- Can use existing immersion lithography tools

# NVM continues beyond NAND

**NAND focus continues in the 3–5 year range**

**2Xnm + 1Xnm + 1Ynm + ...**

**Provide cost effective solutions for the next few years**

- Existing immersion lithography tools at least through 1Ynm

**Vertical NAND to potentially extend NAND (BiCS / TCAT)**

- Can provide better Fab re-use
- Can use existing immersion lithography tools

**Continued focus on 3D RRAM technology development**

- Shows best promise for a scalable post-NAND technology
- Requires EUV tools

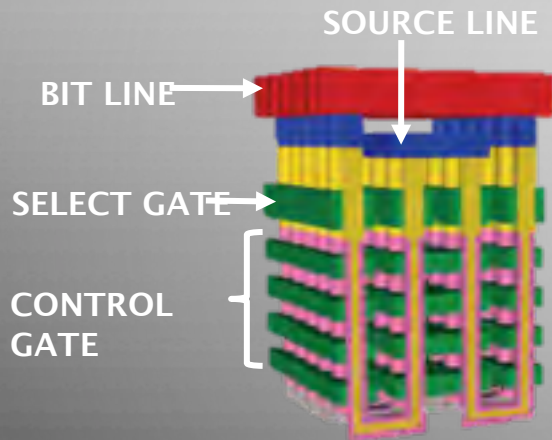
# Adding the 3rd Dimension: BiCS and 3D Crosspoint

Source: Toshiba VLSI, 2009

Source: SanDisk, 2010

# Adding the 3rd Dimension: BiCS and 3D Crosspoint

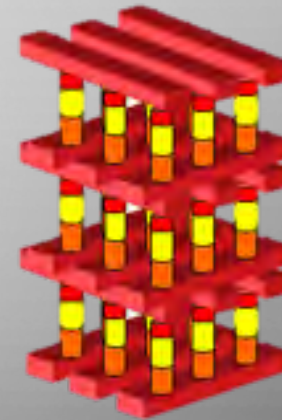
## BIT COST SCALABLE (BICS) 3D NAND



- > Potential to leverage existing NAND toolsets for continued cost declines
- > Electron Storage in a vertical NAND string

Source: Toshiba VLSI, 2009

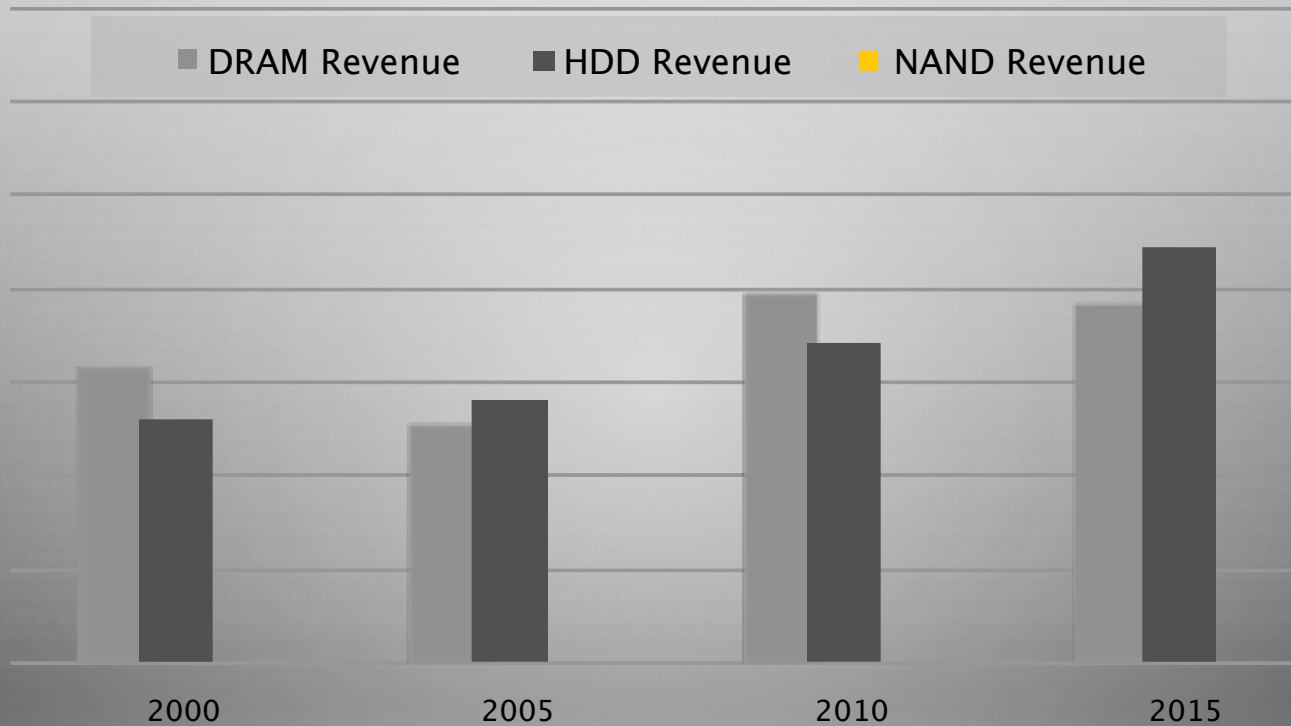
## 3D CROSSPOINT RESISTIVE RAM 3D RRAM



- > On-going development, requires new toolset (EUV)
- > Storage Based on Resistance Change

Source: SanDisk, 2010

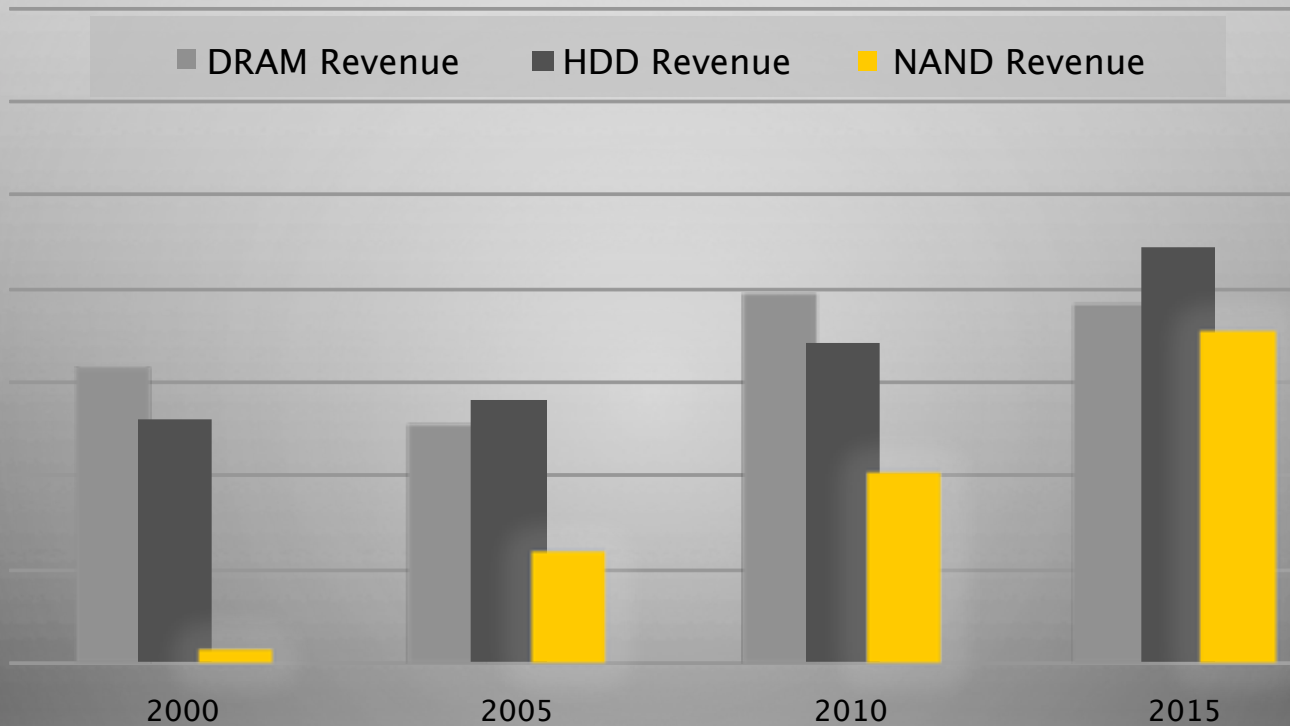
# Flash Memory Is the Fastest Growing Storage Technology



Sources: Gartner - July 2011 "Forecast: Hard-Disk Drives, Worldwide, 2011-2015, 2Q11 Update; "Most Likely" scenario  
Gartner - July 2011 "Forecast: Memory, Worldwide, 2005-2014, 2Q11 Update"



# Flash Memory Is the Fastest Growing Storage Technology



Sources: Gartner – July 2011 "Forecast: Hard-Disk Drives, Worldwide, 2011–2015, 2Q11 Update; "Most Likely" scenario  
Gartner – July 2011 "Forecast: Memory, Worldwide, 2005–2014, 2Q11 Update"



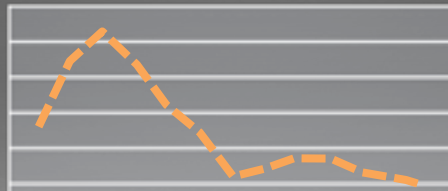
The future looks bright for **Flash Memory**

growing long term demand



The future looks bright for **Flash Memory**

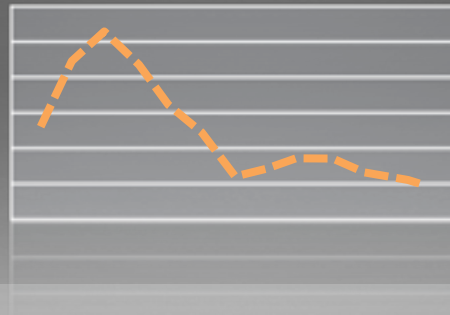
growing long term demand moderate bit growth



The future looks bright for **Flash Memory**

growing long term demand moderate bit growth

flash memory scales





# FLASH MEMORY SUMMIT

Yoram Cedar | EVP and Chief Technology Officer