Developing next generation storage class memory

MacEquity Partners

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Every second of every day...

- 6000 tweets
- 7000 Instagram posts
- 12,000 Tumblr posts
- 60,000 Google searches
- 68,000 YouTube videos viewed
- 2,500,000 emails sent
- 5,000 photos uploaded
- 2,500 Skype calls
As a result of this data generation

More data has been produced in the last two years than in all preceding history

Stored data on Flash will increase 4x and in cloud 5x by 2020
4DS Memory

We are a Silicon Valley memory technology developer listed on the ASX

We own 17 US patents developed over the past decade

We make Interface Switching (non-filamentary) ReRAM for next generation storage class memory

We enable higher-density memory to operate cooler, faster and longer

We have a strategic partnership with Western Digital subsidiary HGST, a global storage leader
Joint development agreement with global leader

- HGST is a subsidiary of Western Digital Corporation, the global leader in digital storage
- Strategic player in emerging high growth technologies
- Commenced in 2014 and renewed for the 2nd time in July 2016
- Goal is to optimise 4DS memory technology for storage class memory
- Collaboration provides access to HGST’s expertise
- Cost effective way to demonstrate commercial viability of 4DS’ unique IS ReRAM technology
To have a role in the emerging multibillion $ market

- All ReRAM needs to display four main characteristics
  - Small cell geometry
  - Cycling endurance
  - Fast access speed
  - Data Retention
Storage Class Memory

SCM: Faster, Cheaper, and Non-Volatile

Access Time (sec)
Log scale

Die Cost ($/GB)
Log scale

Storage:
- HDD
- NAND

Memory:
- DRAM
- MRAM
- SRAM

Storage-Class Memory:
- ReRAM
- PCM

Non-volatile
Volatile
Market size, 2020

Source: WDC estimates
Western Digital

2016 Investor Day | Milpitas, CA | December 6, 2016

For personal use only
# Storage Class Memory

The vast space between DRAM and FLASH

<table>
<thead>
<tr>
<th></th>
<th>DRAM</th>
<th>NAND FLASH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endurance</td>
<td>$\approx 10^{15}$</td>
<td>$\approx 10^3$ (guaranteed)</td>
</tr>
<tr>
<td>Retention</td>
<td>$\approx 0.1$ sec</td>
<td>$\approx 10^8$ sec (3 years)</td>
</tr>
<tr>
<td>Latency (speed)</td>
<td>$\approx 50n$ sec</td>
<td>$&gt; 1000n$ sec</td>
</tr>
<tr>
<td>Density</td>
<td>2D</td>
<td>3D</td>
</tr>
<tr>
<td>Market size</td>
<td>US$50B</td>
<td>US$40B</td>
</tr>
</tbody>
</table>

4DS continues to optimize IS ReRAM for maximum flexibility in this vast space of SCM
4DS Interface Switching ReRAM (IS ReRAM)

Why is 4DS IS ReRAM the solution?

• Operates without filaments
  – allows the current to scale in line with cell size
• Scales well to smaller geometries
  – well suited for GB storage
• Demonstrates ongoing scalability potential
  – critical to meet the growing demands for storage class memory

The benefits of 4DS IS ReRAM

• Higher density / scalability
• Lower power consumption
• Greater endurance and reliability
• Faster access speed and performance
• Simpler manufacturing steps

With higher density memory that runs cooler, faster, longer, 4DS is well positioned to target the emerging multi-billion-dollar Storage Class Memory market
Technical Achievements in 2016

• **Scalability**
  - 4DS achieved working 40nm IS ReRAM cells for the first time in October 2016
  - 40nm is vital for storage class memory – as the cells have no filaments, they are inherently scalable and do not have the same physical limitations as Flash or Filamentary ReRAM
  - Scalability essential for Storage Class Memory

• **Endurance**
  - >1000 cells of different geometries showed excellent endurance cycling, some individual cells cycling well in excess of 100,000 cycles
  - Endurance is a another critical feature to ensure application in Storage Class Memory
Technical Targets to Achieve

• **Access speed**
  – Demonstrate a significant increase in speed
  – Move speed to closer to DRAM speed
  – Have implemented a plan to achieve this – results 6 – 8 weeks
  – From there make architectural changes to memory cells

• **Data retention**
  – Initial results are encouraging
  – Additional data retention will be a focus following analysis of access speed
Development timeline

-Produced 40nm cells
-Met endurance performance milestone
-Endurance in excess of 100,000
-Initial retention data
-JDA with Western Digital subsidiary HGST renewed to 30 June 2017

Today

-Assess access speed and optimise data retention
-Continue to test cells for cycling over well in excess of 100,000 cycles
-Continue fabrication refinements, characterization and testing

Ongoing

-Additional patents to be granted
-Demonstrate viability of 4DS IS ReRAM for SCM
-Attract a potential IP licensing deal or strategic partnership / sale

2017 goals
Our strategy

• Deliver higher density memory that operates with lower power consumption, increased reliability and improved performance
• Develop and own all IP
• Focus on storage class memory for next generation data storage
• Demonstrate commercial viability and prove the value of our IS ReRAM solution
• Create significant shareholder value by continuing to achieve all critical technical milestones and potentially commercialise the technology in 2017
ReRAM landscape

<table>
<thead>
<tr>
<th>Company</th>
<th>Exchange : Code</th>
<th>Market Cap</th>
<th>Type</th>
<th>Target Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossbar</td>
<td>Private</td>
<td>n/a</td>
<td>Filamentary ReRAM</td>
<td>Internet of Things, wearables, SSDs</td>
</tr>
<tr>
<td>Weebit Nano</td>
<td>ASX : WBT</td>
<td>A$35 million</td>
<td>Filamentary ReRAM</td>
<td>Internet of Things, wearables</td>
</tr>
<tr>
<td>Adesto Technologies</td>
<td>NASDAQ : IOTS</td>
<td>US$56.6 million</td>
<td>Filamentary ReRAM</td>
<td>Internet of Things</td>
</tr>
<tr>
<td>Strategic Elements</td>
<td>ASX : SOR</td>
<td>A$21 million</td>
<td>Nano cube ReRAM</td>
<td>Printable memory</td>
</tr>
<tr>
<td>4DS Memory</td>
<td>ASX : 4DS</td>
<td>A$22 million</td>
<td>Non-filamentary ReRAM</td>
<td>Storage class memory - datacentre, cloud</td>
</tr>
</tbody>
</table>

Recent transactions

<table>
<thead>
<tr>
<th>Acquirer</th>
<th>Transaction</th>
<th>Date</th>
<th>Value</th>
<th>Technology</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Digital</td>
<td>Acquired startup Virident</td>
<td>2013</td>
<td>US$685 million</td>
<td>Flash controllers</td>
<td>Cloud</td>
</tr>
<tr>
<td>Western Digital</td>
<td>Acquired sTec</td>
<td>2013</td>
<td>US$340 million</td>
<td>Solid state drives</td>
<td>Cloud</td>
</tr>
<tr>
<td>Seagate</td>
<td>Acquired LSI</td>
<td>2014</td>
<td>US$540 million</td>
<td>Flash controllers</td>
<td>Mobile</td>
</tr>
<tr>
<td>Cypress</td>
<td>Merger with Spansion</td>
<td>2015</td>
<td>US$5 billion</td>
<td>Flash memory</td>
<td>Flash systems</td>
</tr>
<tr>
<td>Western Digital</td>
<td>Acquired Sandisk</td>
<td>2016</td>
<td>US$19 billion</td>
<td>Flash memory</td>
<td>Cloud</td>
</tr>
</tbody>
</table>
Capital structure

ASX Code
4DS

Market capitalisation (fully diluted)
$22 million

Ordinary shares on issue
845.9 million

Unlisted options
101.6 million

Cash
~$3.8 million Dec 2016
Board and management team
Global expertise founding and building high-tech companies

Jim Dorrian
Non-Executive Chairman
Served as CEO and director of several Silicon Valley companies. M&A and IPO experience gained through founding and managing successful technology exits as a partner at Crosspoint Venture Partners, a venture capital firm for early stage companies.

Dr Guido Arnout
CEO & Managing Director
Specific expertise with over 30 years in commercialising electronics technology from concept to product including Power-Escape, CoWare, CrossCheck Technology and Silvar-Lisco.

Howard Digby
Non-Executive Director
Former senior roles at IBM, Adobe, Gartner and the Economist Group. Non-Executive Director of Estrella Resources (ASX:ESR) and an advisor to a number of early stage technology companies.

David McAuliffe
Executive Director
Experienced company director. Involved in numerous capital raisings and in-licensing of technologies and founder of several companies in Australia, France and the UK, many of which are now publicly listed.

Michael Van Buskirk
Chief Engineering Officer
Executive roles with a number of leading memory companies in Silicon Valley including Adesto Technologies Corporation, Innovative Silicon Inc and Spansion Inc.
Summary

• 4DS is developing a next generation Interface Switching ReRAM memory solution which can store more data and can operate cooler, faster and longer
• Unique, patented IP, wholly owned and developed in-house over the past 10 years
• Strategic partnership with the leader in digital storage
• Low cash burn rate for an emerging memory technology developer
• World-class team of memory specialists, material scientists and test engineers
• Consistently achieves stated milestones
• Board experienced in founding, building and exiting high tech companies
• 4DS is well positioned to potentially play a significant role in storage class memory

We are addressing the massive memory storage demands of tomorrow
Stock to watch in 2017

Reality bites for techs while telcos struggle

Yolanda Redge: "Tech and telecommunication stocks with strong recurring revenue and growth prospects is where the money will be in 2017. Analysts say the changing climate in investment markets is likely to put pressure on tech stocks and result in lower valuations."

Other tech stocks tipped to perform well are Superloop, Integrated Research and 4DS Memory. Analysts also tip Capricorn Sports and Aconex as two stocks with the potential to bounce back from falls in 2016.

RBC Capital Markets equity research vice-president Paul Mason says Aconex has suffered in the past few months because its full-year results fell within guidance for the first time, rather than exceeding predictions, and co-founders Leigh Jasper and Robert Phillips reduced their stakes in the firm. "At the same time, the market was asking some questions about Aconex's accounting and how its cash flow and revenue is recom
While you’ve been listening....

- 5.4 million tweets
- 6.3 million Instagram posts
- 10.8 million Tumblr posts
- 54 million Google searches
- 61.2 million YouTube videos viewed
- 2.3 billion emails sent
- 4.5 million photos uploaded
- 2.3 million Skype calls
Corporate Directory

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