



4DS
memory

**A DISRUPTIVE TECHNOLOGY
FOR STORAGE CLASS MEMORY**

July 2019

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INVESTMENT HIGHLIGHTS. +



- + **World-leading** Silicon Valley based Interface Switching ReRAM developer
- + 4DS is the most **advanced Interface Switching ReRAM**
- + **20 US patents** developed and granted and 10 pending or filed
- + **The most promising Interface Switching ReRAM cell for Storage Class Memory**
- + **Joint development agreement** with Western Digital subsidiary HGST since 2014
- + **Strategic collaboration with imec** signed in November 2017
- + Completed third iteration of 300mm wafers, **most successful to date**
- + Demonstrated **improvement in speed, endurance and retention**
- + **Lot 4 300mm wafers manufacture has commenced, analysis and results due Q3 2019**
- + Completed **A\$3.25 placement**, launched **A\$750k SPP**, total cash ~A\$5.85 million*

*Assumes successful SPP for entire A\$750k and after placement fees

BOARD AND MANAGEMENT. ⁺

Global expertise founding and building high-tech companies.



**JIM
DORRIAN**

Non-Executive Chairman

- Served as CEO of several Silicon Valley companies
- Extensive M&A experience
- Partner at VC firm Crosspoint Venture Partners



**Dr GUIDO
ARNOUT**

CEO & Managing Director

- 30+ years in commercialising electronics technology
- Successes include, Power-Escape, CoWare, CrossCheck Technology and Silvar-Liso



**HOWARD
DIGBY**

Non-Executive Director

- Former senior roles at IBM, Adobe, Gartner and the Economist Group
- Non-Executive Director Elsight Ltd and Chairman of Omni Market Ltd
- Advisor to a number of early stage technology companies



**Dr SESHUBABU
DESU**

Chief Technology Officer

- Expert in thin films, semiconductor processing and non-volatile memories
- Professor, Dean and Head of Electrical Engineering at various universities



**DAVID
McAULIFFE**

Executive Director

- Experienced company director
- Involved in numerous capital raisings and in-licensing of technologies
- Founder of several companies in Australia, France and the UK, many of which are now ASX listed



**MICHAEL
VAN BUSKIRK**

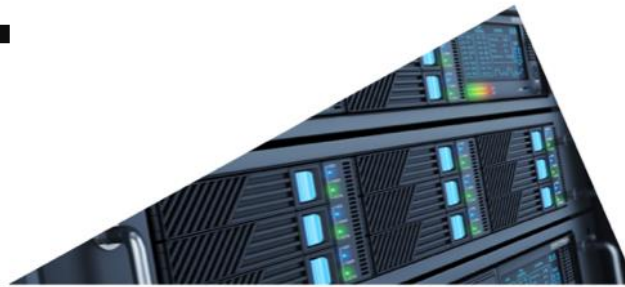
Chief Engineering Officer

- Executive roles with a number of leading memory companies in Silicon Valley
- These include, Adesto Technologies Corporation, Innovative Silicon Inc and Spansion Inc.

THE CHALLENGE. +

DRAM and NAND Flash are the main technologies utilized today.

Both are US\$40-50 billion annual markets – and growing.

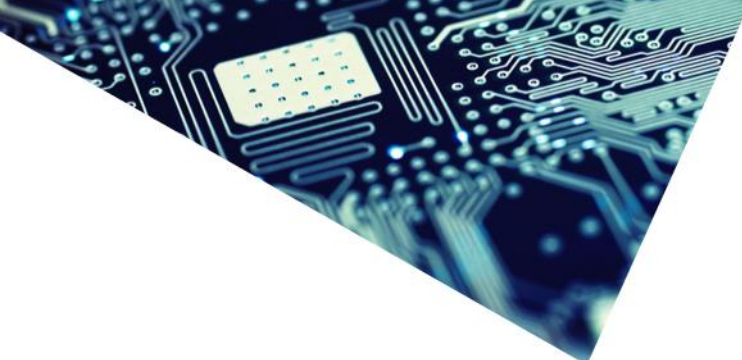


+ DRAM is super-fast, has exceptional endurance but is expensive and volatile



+ NAND Flash is slow, has limited endurance but is cheap and non-volatile

A new innovation is required and the industry refers to it as **Storage Class Memory** - over time this is predicted to have a market size as large as DRAM and NAND Flash

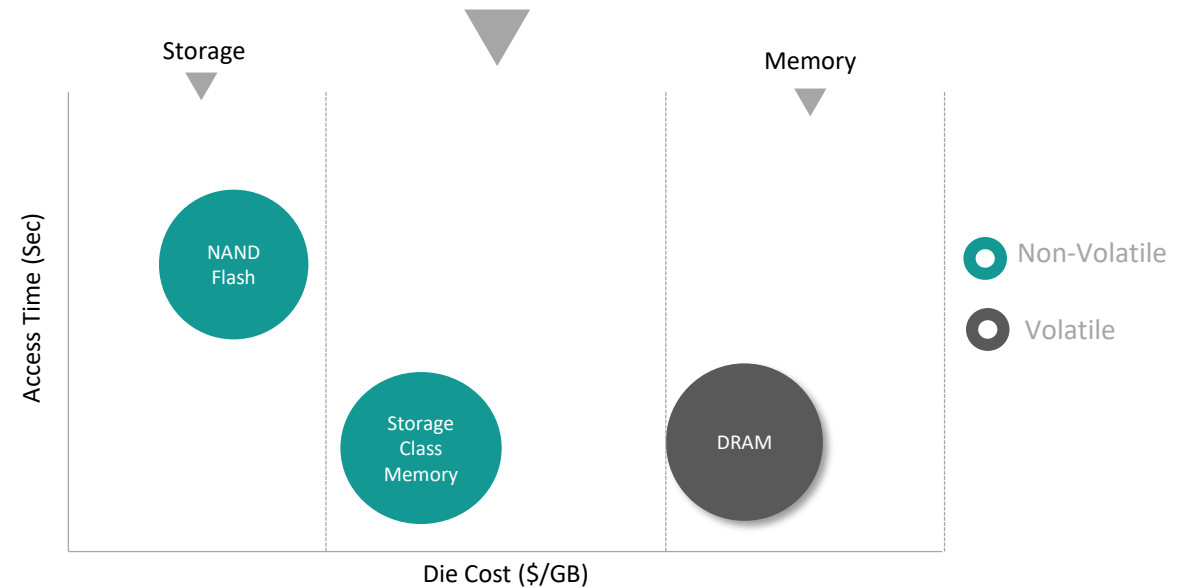


STORAGE CLASS MEMORY. +

Emerging as the leading new category to extend the memory hierarchy.

STORAGE CLASS MEMORY

Attempts to combine the best characteristics of DRAM and NAND Flash



Battleground for next generation memory technology.

- + **Faster** – DRAM-like read speed
- + **Cheaper** – NAND Flash-like costs
- + **Non-volatile** – Retains data when power is off

STORAGE CLASS MEMORY REQUIREMENTS. +

Requirements

- Based on well-understood physics to be sustainable over generations
- Area based to achieve cost and density as close as possible to NAND Flash
- Capable of speed comparable to DRAM
- Endurance suitable for Storage Class Memory
- As much retention as possible to meet Storage Class Memory requirements
- As much retention as possible without sacrificing speed and endurance
- Tunable technology in the vast opportunity between DRAM and NAND Flash



STORAGE CLASS MEMORY REQUIREMENTS. +









4DS

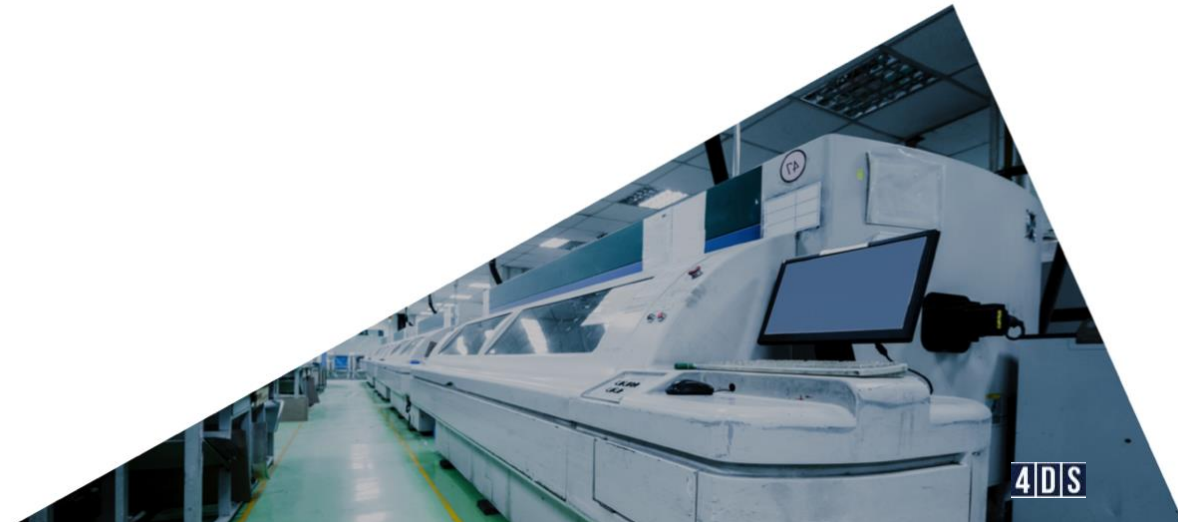
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PARAMETERS NEEDED MET.

4DS Interface Switching ReRAM has displayed enough relevant and meaningful data in each category

-  Scales to geometries needed for high-density memory and 3D
-  Endurance far exceeds NAND Flash
-  Endurance has moved into the tens of millions of cycles
-  Read speed comparable to DRAM – **an area-based ReRAM first**
-  No need for speed crippling error correction – **a ReRAM first**
-  Retention data adequate for Storage Class Memory



JOINT DEVELOPMENT AGREEMENT. +

HGST, is a subsidiary of Western Digital Corporation (US\$16 billion market cap), one of the largest global leader in digital storage.

- + Strategic innovator in emerging high growth technologies
- + Commenced JDA in 2014 – **Renewed in 2015, 2016, 2017, 2018 and 2019**
- + Insight into what is important in a data-centric world
- + Siva Sivaram, Head of Memory at Western Digital, commented **“We are committed to ReRAM, it is scalable with greater density, lower cost and latency and longer endurance”***



imec + COLLABORATION AGREEMENT.

imec, is the **world's #1** independent semiconductor development institute

- + Collaborates with the who's who of electronic products and systems
- + Collaborates with makers of high-volume high-density memories
- + Has a world leading track record in the transfer of semiconductor processes
- + Uses the same tools as industry for high-volume production of high-density memories
- + Has a proven megabit memory platform to fast track development of Megabit chip
- + Used this platform to explore a wide range of emerging memories



imec

COLLABORATION OBJECTIVES.

- + Imec and 4DS have **already commenced Lot 4 wafer manufacturing, results due Q3 2019**
- + End goal is to fabricate a megabit **4DS Interface Switching chip with a fully functioning memory**
- + Develop a **fully transferable** fabrication compatible process
- + **Mimic industry standard** high volume production
- + Utilizing imec's proven megabit memory platform **reduces time and cost**
- + Report technical progress to shareholders – more often upon significant developments

CAPITAL + STRUCTURE.

ASX Code	4DS
Market Cap (Fully Diluted)	A\$ 57 Million*
Ordinary Shares on Issue	1,135 Million
Unlisted Options	133 Million
Cash	~A\$5.85 Million – July 2019**
Board and Management	6.7%
Top 20	28%

* As at 17 July 2019 placement price

** Assumes successful SPP and after placement expenses

INVESTMENT PROPOSITION. ⁺

- + 4DS is developing a **breakthrough Interface Switching ReRAM Storage Class Memory** solution
- + **Significant progress to date is pivotal for Storage Class Memory**
- + Six year strategic partnership with HGST, **leader in digital storage**
- + **Imec** - strategic collaboration to develop megabit chip with the **world-leading researcher in nano electronics**
- + Consistently achieves stated milestones
- + **Strong patent portfolio with 20 granted patents** wholly owned and developed in-house
- + **World-class team** of memory specialists, material scientists and test engineers
- + Board experienced in founding, building and **exiting high tech companies**
- + **Sufficient cash to meet current objectives**

4DS is addressing the massive memory demands of tomorrow



THANK YOU



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