

4DS drives resolution down to 40nm

Puts IS ReRAM ahead of today's 3D Flash.

We increase our price target to A\$ 0.12

4DS announced it has scaled down the resolution of its Interface Switching (IS) ReRAM cell from 50nm to 40nm in its most recent iteration. The achievement of this resolution is significant in a number of ways. We believe this milestone will be a key point of reference for 4DS' development partner HGST and its owner Western Digital in assessing the technology for commercial purposes. Furthermore, we expect this achievement will also draw strategic interest from other memory players.

Capital raise provides runway to commercial or strategic deal

4DS also announced it has raised A\$ 4M in capital at A\$ 0.034 per share in a "significantly oversubscribed" capital raise, illustrating investors' understanding of the implication of the technical milestone, in our view.

With a quarterly cash burn of just A\$ 600k, the additional capital should provide ample runway for the company to reach commercial agreements, i.e. license agreement(s) or potentially a strategic deal, which we expect within the next 18 months. In any case, we believe the capital raise substantially de-risks the 4DS investment case.

On a clear development path towards commercial viability

During the last two and a half years, the company has been working with HGST, a subsidiary of storage giant Western Digital, through a joint development agreement (JDA). Starting out at a resolution of 800nm when the JDA kicked off, 4DS had progressed the development of its IS ReRAM technology down to 50nm in February 2016. The JDA has sped up the development process significantly and has now resulted in 4DS being able to announce a resolution of 40nm.

Achievement of 40nm puts IS ReRAM ahead of 3D Flash

While single-layer Flash memory cells can be manufactured at a resolution below 20nm, today's mainstream, commercial, Flash memory products are manufactured at resolutions between 45nm and 50nm in stacked layers, i.e. multiple layers of memory cells in a skyscraper approach. Therefore, achieving a resolution of 40nm means that 4DS' technology is now ahead of 3D Flash memory in terms of resolution.

However, the benefits of IS ReRAM compared to Flash memory may include lower energy consumption, lower operating temperatures, faster

4DS Memory Limited	
Number of shares (m)	776.9
Number of shares FD (m)	950.7
Market capitalisation (A\$ m)	29.5
Free Float (%)	85%
12 month high/low A\$	0,046/0,018
Average daily volume (k)	1,359



4DS.ASX

Semiconductors & Semiconductor Equipment

Australia

Risk: High

4DS Memory Limited (4DS.ASX) is a semiconductor development company aiming to provide an enterprise grade storage memory for cloud and data center storage markets. The company is developing a proprietary Interface Switching ReRAM technology leveraging expertise from a strategic partnership with a leading data storage player. 4DS plans to demonstrate commercial viability in the 2017/2018 timeframe.

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BUY

Current price: A\$ 0.038

Price target: A\$ 0.12 (was A\$ 0.05)

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access speeds and better endurance levels. So when the performances of both technologies are compared side-by-side at the same resolution, e.g. 40nm, IS ReRAM should clearly produce better metrics, especially for GB storage and mobile applications, such as cloud and data center storage as well as mobile devices.

Next step is to provide statistically significant performance data

In order for 4DS to prove the performance metrics of IS ReRAM at this latest resolution, the company will need to produce statistically significant data, specifically around the cell endurance levels (the number of times the cells can be switched) and access speeds (read/write speeds). In assessing new technologies, memory manufacturers require such information as this forms the basis of performance guarantees of memory cells required by OEMs and consumer electronics companies, such as mobile phone manufacturers. We expect 4DS to be able to report these data sets in 2017.

Achievement of 40nm will generate additional strategic interest

In addition to storage giant Western Digital, which is already involved with 4DS through HGST, we believe achieving IS ReRAM cells at a 40nm resolution will generate further strategic interest from the likes of Samsung, Micron and SK Hynix. We believe the huge addressable market for 4DS' technology, i.e. GB silicon storage capacity for mobile devices and data centers, would essentially make it mandatory for these memory manufacturers to make a proper technological and commercial assessment of IS ReRAM as a next generation technology.

In other words, in addition to Western Digital's recent public statement that ReRAM is their technology of choice for GB silicon storage going forward, we expect 4DS will receive substantial interest from some of Western Digital's large competitors.

We expect a rerating of 4DS towards ASX-listed semiconductor peers

While 4DS' share price has had a fairly good run in the past six weeks towards our initial price target of A\$ 0.05, we believe the achievement of the 40nm resolution will provide further impetus for the shares. When we look at the commercial potential of IS ReRAM and the valuations of sector peers, such as BLG, XPE and BRN, which they largely achieved on the back of technology evaluation and collaboration agreements, 4DS is substantially undervalued, in our view. While 4DS is now valued in line with memory players WBT and SOR, we believe the company is further advanced in its technological development.

FIGURE 1: PRE-REVENUE ASX-LISTED SEMICONDUCTOR COMPANY VALUATIONS

Company	Code	Semiconductor sub sector	Share price	Fully diluted market cap (A\$ M)
Weebit Nano	WBT	Filamentary ReRAM	0.028	35.2
Strategic Elements	SOR	Printable memory ink	0.125	30.6
XPED	XPE	IoT communications protocol IP	0.04	89.6
BluGlass	BLG	Semiconductor equipment	0.395	143.7
Brainchip	BRN	Artificial Neural Networks	0.255	216.8
4DS Limited	4DS	Interface Switching ReRAM	0.038	36.1

Source: TMT Analytics, S&P Capital IQ

All share prices are closing prices as of 19 October 2016

The addressable market for 4DS' end product is in the same ballpark as the addressable markets for IoT connectivity, neuromorphic chips and LED manufacturing equipment, i.e. multiple billions of dollars in annual sector revenues. Therefore, we see further upside towards

A\$ 0.12 per share, based on the average sector valuation (Figure 1), which includes SOR and WBT. The achievement of 40nm will be the major catalyst for this rerating, in our view.

We increase our price target from A\$ 0.05 to A\$ 0.12, reiterate BUY rating

We increase our price target from A\$ 0.05 per share to A\$ 0.12 on the back of the achievement of 40nm. This milestone should generate *commercial* interest from the semiconductor industry, potentially leading to license agreements.

Additionally, we believe *strategic* interest in 4DS would have the potential to drive the share price well beyond that level, i.e. in an acquisition scenario, which we believe is very feasible as illustrated by the acquisitive nature of the semiconductor industry in recent years.

Furthermore, the 4DS investment case is further de-risked due to the \$ 4M capital raise, which provides substantial financial runway. Consequently, we reiterate our BUY rating for 4DS.

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