

Collaboration with world class partner

IMEC deal puts 4DS on fast track to Mb chips

4DS announced a collaboration agreement with IMEC, Belgium, which we expect will substantially accelerate the company’s development roadmap.

In June 2017, the company announced that it had achieved read speeds for its memory cells comparable to DRAM without the need for error correction. In October 2016, as a result of 4DS’ development collaboration with HGST, the company announced that it had scaled its Interface Switching ReRAM cell size down to 40nm. Both achievements, essential for Storage Class Memory (SCM), were the trigger for 4DS to seek collaboration with IMEC to transfer the technology out of the lab.

From lab to real-life manufacturing environment

IMEC is among the top semiconductor R&D institutes globally with substantial expertise in memory technology, including DRAM, SRAM, NAND FLASH, SST-MRAM and ReRAM and operates the same state-of-the-art 300nm semiconductor manufacturing tools that high-density memory makers use in volume production.

Recipe to integrate the 4DS memory cells with CMOS

The collaboration between 4DS and IMEC will focus on transferring 4DS’ technology from a laboratory environment into an environment compatible with a CMOS production environment. CMOS (Complementary Metal Oxide Semiconductor) is the semiconductor industry’s dominant technology to manufacture integrated circuits.

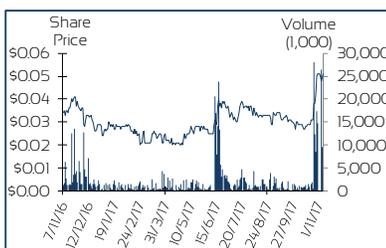
By teaming up with IMEC, 4DS will develop a “recipe” to integrate its Interface Switching ReRAM cells with the CMOS process already in use in today’s memory production fabs (semiconductor manufacturing facility).

This recipe should allow any future user of 4DS’ technology to manufacture Interface Switching ReRAM cells onto a CMOS-based memory platform.

Production of Mb memory devices on 300mm wafers

With this recipe, 4DS and IMEC will manufacture Mb-sized Interface Switching ReRAM memories on IMEC’s megabit memory platform on 300mm wafers, which are the required wafer size for future Gb and Tb SCM chips for data centers, laptops, smart phones etc. The statistical data generated from megabit memories, such as endurance, speed, data retention, energy consumption etc. is essential for potential licensees to

4DS Memory Limited	
Number of shares (m)	938.2
Number of shares FD (m)	1067.7
Market capitalisation (A\$ m)	47.8
Free Float (%)	86%
12 month high/low A\$	0,056/0,018
Average daily volume (k)	2,198



4DS Memory Ltd.

ASX:4DS

Semiconductors & Semiconductor Equipment

Australia

Risk: High

4DS Memory (ASX:4DS) 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.

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BUY

Current price: A\$ 0.051

Price target: A\$ 0.11

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realistically evaluate 4DS' technology since these megabit memories will have been manufactured with production equipment rather than in a laboratory setting.

Development roadmap should become markedly shorter

We expect 4DS' development roadmap, and thus the time-to-market of Interface Switching ReRAM, will become markedly shorter because of the collaboration with IMEC and the use of IMEC's memory platform.

HGST collaboration to focus on system requirements for SCM

In parallel with 4DS' collaboration deal with IMEC, the focus of the company's continued collaboration with HGST will be on determining which parameters are important to get the maximum performance out of its memory cells given a certain application.

For instance, what electrical current needs to be used, what data retention is required and what endurance is needed to achieve maximum read speeds, comparable to DRAM, the key objective for SCM applications. Consequently, we believe that the HGST collaboration will remain an important asset for 4DS in the foreseeable future.

More visibility of milestones for investors

The stated goal of achieving Mb memories is a clear milestone, in our view, which investors can use to measure 4DS' development pace. Even though no target date has been set by the company, we expect the company to reach this milestone significantly earlier as a result of its collaboration with IMEC and the use of IMEC's Mb memory platform than would be possible if 4DS had to design, manufacture and debug its own Mb memory platform. From there, potentially developing Gb arrays is relatively straightforward.

Re-rating on the back of IMEC deal

We believe achievement of validated high yield, high performance Mb arrays should be sufficient for 4DS to have concrete discussions with strategic partners, either for technology licensing purposes or to discuss potential M&A scenarios. In our view, the collaboration with IMEC will go a very long way in assuring 4DS will achieve Mb arrays quickly. Hence, we anticipate a re-rate of the 4DS shares over the next few quarters.

A\$ 3.45M capital provides additional runway

4DS recently raised A\$ 3.45M in fresh capital (before costs). Assuming 6% capital raising costs and an average monthly cash burn of A\$ 200k (4C appendices), which will increase due to 4DS' engagement of IMEC, we estimate 4DS had approximately A\$ 4.8M in cash per early November 2017. This will provide additional runway for the company to achieve its strategic goals.

Buy rating reiterated

ASX-listed semiconductor developers have had a good share price run in recent weeks, especially the two ReRAM developers that have seen their market capitalization expand from approximately A\$ 20M early October (Figure 1).

However, given the promise of the company's technology and the collaboration with IMEC, we believe 4DS is still substantially undervalued at a A\$ 48M market cap. ASX-listed peers, such as BrainChip (ASX:BRN) and BluGlass (ASX:BLG), that have gained initial commercial traction and/or industry interest from key industry players, are currently valued at A\$ 199M and A\$ 140M respectively.

FIGURE 1: VALUATIONS OF ASX-LISTED SEMICONDUCTOR COMPANIES

Company	Code	Semiconductor sub sector	Share price	Market cap (A\$ M)
Weebit Nano	WBT	Filamentary ReRAM	0.047	63.1
Strategic Elements	SOR	Printable memory ink	0.086	20.9
BluGlass	BLG	Semiconductor equipment	0.365	139.6
Brainchip	BRN	Artificial Neural Networks	0.205	198.6
4DS Limited	4DS	Interface Switching ReRAM	0.051	47.8

Source: TMT Analytics

4DS' collaboration deal with IMEC will go a very long way in setting the company up for similar discussions with industry players interested in licensing or acquiring the company's Interface Switching ReRAM technology, in our view.

Initial upside to A\$ 100M

Consequently, we expect 4DS to re-rate further, initially to A\$ 100M, or A\$ 0.11 per share (was A\$ 0.12 per share prior to the recent capital raise and the issue of 86.3M new shares). We expect there will be further upside to the company's valuation beyond A\$ 100M though, driven by likely industry interest in 4DS in the run-up to the company achieving Mb arrays.

In other words, going forward, we expect the share price will increasingly be driven by potential takeover speculation.

For these reasons we reiterate our Buy recommendation for 4DS.

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