

In the final quarter of the game

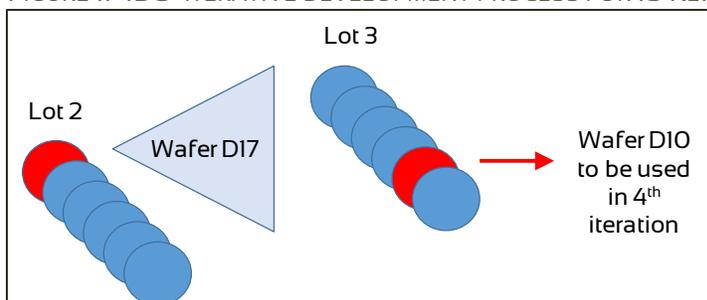
Commencing 4th and potentially final iteration

On 20 June 4DS Memory (ASX:4DS) announced it had analysed the most recent batch of test wafers (lot 3) produced by development partner imec over the last several months. Imec in Belgium is one of the world's leading semiconductor R&D institutes.

The basis for this most recent batch of wafers was wafer D17 from lot 2, analysed in 1Q19. The basic manufacturing specifications used to manufacture wafer D17 in the December-February period have been used to manufacture 23 new wafers in lot 3 in March-May using varying processing conditions (Figure 1).

The aim of this iterative process is to identify the wafer manufacturing process that yields the best specifications, such as data retention and cycling endurance and build on that knowledge (see our research note dated 27 February 2019 for more background).

FIGURE 1: 4DS' ITERATIVE DEVELOPMENT PROCESS FOR IS ReRAM IC'S



Source: TMT Analytics

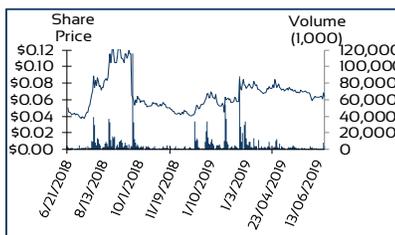
The recent analysis of lot 3 has identified wafer D10 as having the best characteristics in this latest batch with endurance now in the tens of millions of cycles while data retention has been further improved.

Importantly, these metrics have been achieved without compromising on access speed, i.e. the time it takes to switch a memory cell from one state to the other (1 or 0). 4DS' Interface Switching ReRAM technology is targeting switching speeds close to DRAM (~50 nanoseconds, ns).

imec to manufacture lot 4 using D10 as a starting point

The next step in 4DS' development process is for imec to manufacture two new sets of 23 wafers (lot 4) that are based on wafer D10 from lot 3 with each of these wafers being manufactured under various process conditions.

Number of shares (m)	1051.3
Number of shares FD (m)	1184.4
Market capitalisation (A\$ m)	65.2
Free Float (%)	100%
12 month high/low A\$	0,115/0,038
Average daily volume (1,000)	6,165



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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Please note that TMT Analytics Pty Ltd and/or its directors own shares in 4DS Memory Limited

BUY

Current price: A\$ 0.062

Price target: A\$ 0.11

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Analyst: Marc Kennis

marc.kennis@tmt-analytics.com.au

+61 (0)4 3483 8134

The reason to process two batches of 23 wafers simultaneously is based on 4DS' experience with lot 3. By processing two batches simultaneously, 4DS can vary more process conditions in one cycle and accelerate its progress.

Once these wafers have been manufactured, they will be analysed by both imec and 4DS in order to identify the wafer that exhibits the best endurance and retention characteristics. Results are expected in 3Q19 (September quarter). At that time 4DS will decide whether the specs of the memory cells on that particular wafer in lot 4 are sufficient to move to the next stage of development or if a fifth iteration is required.

However, based on its learnings from lot 1 through 3 and its expectations for lot 4, 4DS believes this fourth iteration could potentially be the final one before moving to the next development stage.

Next step is to integrate with imec's memory platform

If iteration 4 is indeed the last one, the next step will be to integrate the Interface Switching ReRAM chip with imec's 1 megabit memory platform. This platform is essentially an off-the-shelf design in imec's library that will be used as a carrier for 4DS' 1 megabit Interface Switching ReRAM chip, including connectivity to the outside world.

While 4DS hasn't announced an expected timeline for this integration phase, we believe this process is relatively straightforward compared to the development work done to date and may potentially be completed in 1HY20.

Prospective customers to base license or buy decision on data from final chip

Once the integration is completed, 4DS will collect statistically significant and meaningful data on yield, endurance, speed and data retention, essential for high-volume memory manufacturers (such as SK Hynix, Samsung, Intel, SanDisk (owned by Western Digital) and Micron) in their decision-making process around licensing or potentially acquiring 4DS' technology, which we believe may happen in 2020.

Buy rating reiterated

In our view, with its recent announcement 4DS has now entered the final stages of the game, i.e. finalising the development stage, integrating into imec's platform and providing the essential statistics to memory manufacturers and buyers, the latter expected in 1HY20.

We see potential confirmation of completion of the iterative development stage in 3Q19 as a major share price catalyst as this would complete 11 years of R&D work.

We reiterate our Buy recommendation for 4DS as well as our price target of A\$ 0.11 per share.

Please refer to <https://www.tmt-analytics.com.au/4dsmemory.html> for more in-depth reports and our initiating coverage report on 4DS, which includes risks associated with investing in 4DS. Anyone reading this report acknowledges that they have received our FSG, available on our web page.

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