ASX RELEASE

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4DS ACHIEVES ENDURANCE MILESTONE

- Significant endurance milestone achieved
- Endurance yield at 97%, well above the 90% goal
- Independently verified results, triggering conversion of Class 1 Performance Shares into ordinary shares
- Endurance and scalability of ReRAM cells are key characteristics to show potential for storage class memory
- Brings the Company closer to proving its ReRAM technology is a commercially viable option for global storage class memory manufacturers
- Targeting a US$40 billion global market

4DS Memory Limited (ASX:4DS) (the Company), an industry leader in Interface Switching ReRAM (ReRAM) today announced the achievement of a key endurance milestone.

Endurance – defined as how often the state of a memory cell can be changed without failure – is an important characteristic relevant to global storage class memory manufacturers in the US$40 billion market. Furthermore, to be viable for storage class memory applications, endurance needs to be highly consistent across a statistically significant number of cells and reproducible on different wafers.

4DS has now measured the endurance yield of more than 1,000 cells of 5 different cell sizes (ranging from 50nm to 140nm) on 2 different wafers. The cell currents were measured after each state change to ensure correct memory operation (a step often omitted when testing and reporting endurance). In total, nearly 1 million cell states were changed and measured in this endurance yield analysis.

The endurance yield result has been verified by an independent technical expert who certified that more than 97% of the memory cells tested achieved the required endurance goal, significantly exceeding the target of 90% endurance yield.

Chief Executive Officer and Managing Director, Dr Guido Arnout, said “Achieving this endurance milestone is significant as it validates another very important characteristic of our ReRAM memory technology. Endurance yield, along with scalability, are essential to be a potential solution for gigabyte storage class memory, 4DS’s sweet spot. In achieving the milestone, 4DS has demonstrated that it has working memory cells with a significant yield, something that is extremely relevant to memory manufacturers.”

In parallel, endurance optimization of additional individual cells continues to make good progress with a number of cells of various geometries also tested for endurance. This additional analysis has shown that 4DS is able to demonstrate endurance on a number of cells with results well in excess of 10,000 cycles per cell. During this process cell currents were measured after each state change to ensure correct memory operation, further demonstrating the Company has working memory cells.

Dr Arnout said “We are continually looking at endurance levels on a variety of cell geometries and seeking to show improvements at every stage. The achievement of the milestone, together with the additional analysis we have performed, shows that 4DS is gathering momentum in this very important part of our development process.”
Achievement of this significant milestone also triggers the conversion of 67,604,019 Class 1 Performance Shares into ordinary shares (ranking equally with the existing ordinary shares on issue). Approximately 41.9 million of these shares are escrowed until 17 December 2016, with the balance escrowed until 17 December 2017. The terms and conditions of the Class 1 Performance Shares are set out in Section 14.2 of the Company’s Prospectus dated 16 October 2015. A “plain English” summary of the endurance milestone is also contained in the Company’s Annual Report which was lodged with the ASX on 28 October 2016.

This endurance milestone closely follows the announcement of successful scaling of 4DS memory cells to 40nm and a heavily over-subscribed capital raising of AU$4 million in late October 2016.

Next steps

In order to validate and demonstrate commercial viability of a particular storage technology, all memory developers follow a very specific development process.

During this multi-step process, memory cells are scaled down, tested for endurance, access speed and data retention – essential characteristics for a functional memory technology. The cell architecture and manufacturing process is continually being optimised to achieve the targeted goals for these metrics.

Dr Arnout commented “4DS has demonstrated scalability to 40nm and now with robust and independently validated endurance data we will continue with optimising and testing endurance while analysing other essential characteristics across all our memory cell geometries into 2017. The current endurance data and recently announced 40nm memory cells moves the Company closer to proving we have a commercially viable storage class memory technology.”

Interface Switching ReRAM

4DS has been developing its patented ReRAM, also known as Non-Filamentary ReRAM, with Western Digital subsidiary HGST since July 2014 under a joint development agreement (JDA). The JDA was renewed in July 2016 for a further 12 months and is focused on optimising scalability and endurance of ReRAM cells for the mobile and cloud gigabyte silicon storage market.

Importantly, Western Digital confirmed at the 2016 Flash Summit that 3D ReRAM technology is its memory technology of choice for storage class memory offering improved scalability and efficiency, lower latency, lower cost and superior endurance.

The JDA, which has focused on the functional behaviour of memory cells at a small scale, has resulted in a significant improvement in the scalability of cells to as small as 40nm and now with significant endurance data, the JDA moves into the next phase of development.

Dr Arnout said “We are extremely pleased to be working with HGST memory experts. The JDA has been a significant factor in our ability to consistently meet milestones and fast track technical achievements.”

Through the JDA, 4DS is able to carry out this validation and demonstration without incurring the expense of fabricating fully functional 3D ReRAM prototypes.

Scalability and Endurance are vital for storage class memory

4DS’ ReRAM cells are constructed using an advanced perovskite material, which has the same crystal structure as the inorganic compound calcium titanium oxide, and allows for the controlled movement of oxygen ions between electrodes. As the cells have no filaments they are inherently scalable and do not have the same physical limitations as Flash or Filamentary ReRAM.
The ability to scale down 4DS’ technology to 40nm is vital for the creation of stacked ReRAMs into 3D structures, which are essential for storage class memory. Storage class memory is required for high capacity data storage applications, such as cloud and data storage, which require low energy consumption and high endurance rates.

4DS’ patented technology is well suited to storage class memory due to its advantages over traditional and other emerging non-volatile memory storage technologies. These advantages include scalability of cells, low power consumption and high endurance levels.

2017 Outlook

Commenting on the outlook for 2017, Dr Arnout said, “Having achieved scalability to 40nm cells and the endurance milestone, together with the Company’s strengthened cash position, 4DS is now focused on optimising the performance and reliability of its ReRAM technology. The Company looks forward to informing shareholders of further technical developments, aimed at demonstrating commercial viability for storage class memory, as they occur in 2017.”

ENDS

Contact information

<table>
<thead>
<tr>
<th>Investors:</th>
<th>Media:</th>
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</thead>
<tbody>
<tr>
<td>David McAuliffe</td>
<td>Harrison Polites</td>
</tr>
<tr>
<td>Executive Director 4DS Memory</td>
<td>Media &amp; Capital Partners</td>
</tr>
<tr>
<td>+61 408 994 313</td>
<td>+61 409 623 618</td>
</tr>
<tr>
<td><a href="mailto:david@4dsmemory.com">david@4dsmemory.com</a></td>
<td><a href="mailto:harrison.polites@mcppartners.com.au">harrison.polites@mcppartners.com.au</a></td>
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About 4DS

4DS Memory Limited (ASX: 4DS), with facilities located in Silicon Valley, is a semiconductor development company of non-volatile memory technology, pioneering Interface Switching ReRAM (Non-Filamentary ReRAM), for next generation gigabyte storage in mobile and cloud. Established in 2007, 4DS owns a patented IP portfolio, comprising 16 US patents granted and 7 patents pending, which has been developed in-house to create high density storage class memory. 4DS has a joint development agreement with Western Digital subsidiary HGST, a global storage leader, which accelerates the evolution of 4DS’ technology.

For more information, please visit www.4dsmemory.com.

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