

# Micron Technology

## Hidden Leverage, Questionable Liquidity, and a Substantial Technology Gap

Yale University

Jason Brown ([jason.m.brown@yale.edu](mailto:jason.m.brown@yale.edu); 847 946 4664)  
Shantanu Gangwar ([shantanu.gangwar@yale.edu](mailto:shantanu.gangwar@yale.edu); 571 209 7426)



- **Recommendation: Sell (Price Target: \$9.14 – without the effects of convertible dilution and \$8.46 – with the effects of convertible dilution)**

- General consensus on Wall Street is that MU's emphasis on Non-Volatile Memory (NAND), particularly 3D XPoint, will drive increased revenue growth and reduce costs as the technology scales, but there still exists a substantial technology gap between MU and competitors that requires substantial investment in the next three years to ameliorate

	2013	2014	2015
Sales	9,073	16,358	16,192
ROE	14.1%	30.6%	25.1%
Net Margin	13.1%	18.6%	17.9%
FCF	567	3,041	1,187
Debt/EBITDA	2.02	0.9	1.1

- Due to the unique structure of Micron's acquisition of MMJ, Micron is still obligated to pay MMJ installment payments in the upcoming years, contributing to its precarious debt position and reducing free cash flow going forward

- Micron's liquidity position is misleading and may have fooled the market into thinking MU has more free cash than it actually does. Almost 33% of Micron's cash and cash equivalents (\$882mm / \$2.605bn as of September 3, 2015) is not truly free to use in company operations or liquid

Price	
\$11.03 ↑ +0.56 (5.3%)	Price as of 1 Apr '16 4:00PM ET
Volume	28,458,280
VWAP	10.79
Shares Out (M)	1,037
Market Value (M)	11,443
P/E	11.7x
Short Int (% of Float)	5.5%
Trading Since	01 Jun '84
Open	10.24
Previous Close	10.47
Intraday Range	10.24 - 11.07
52 Week Range	9.31 - 29.78

- Micron has significant off-balance sheet obligations that will use up a large portion of its free cash flow in the coming years

- Micron is overexposed to China, with 41% of its Net Sales in FY 2015 originating in the country. Recent data from the emerging Asian economy has been less than positive, leading to concern regarding the predictability and growth potential of future cash flows from China
- We project an overall price decline of 8% in 2016 for NAND Flash product and a price decline of 24% in 2016 for DRAM as the industry works itself out of an oversupply cycle. The industry is becoming increasingly commoditized, putting pressure on pricing
- Multiple catalysts for a rerating downward of the stock: convertible dilution, institutional selling, China slowdown, continued pricing weakness

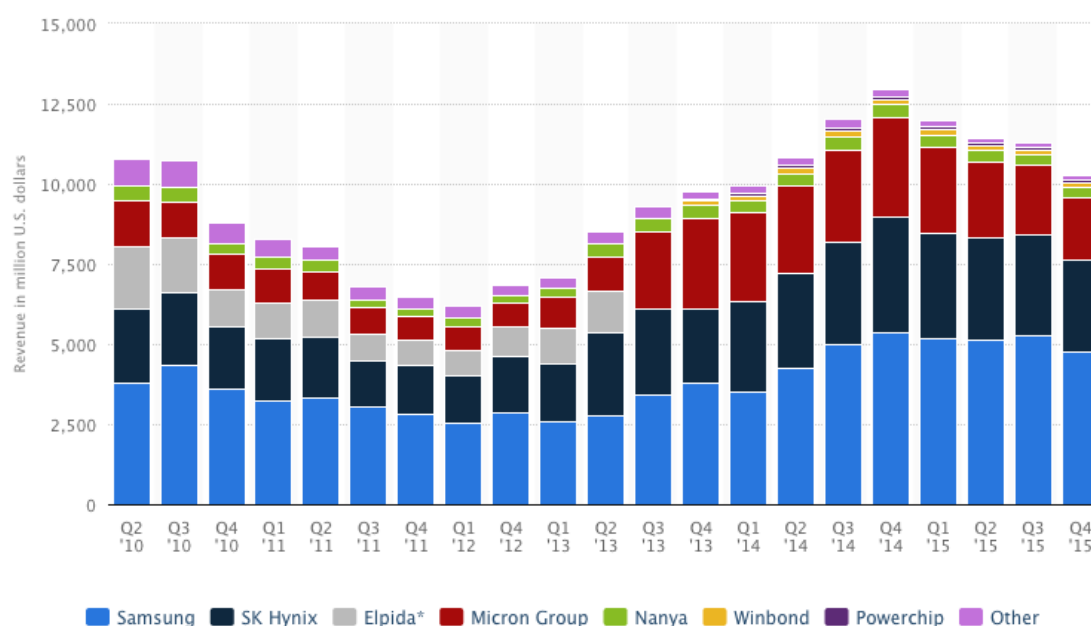
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# 1. **DRAM and NAND Revenue Projections – Volume Growth but Pricing Weakness**

- In fiscal 2015, Dynamic Random Access Memory (DRAM) products, which are high-density, low-cost-per-bit, random access memory devices that provide high-speed data storage and retrieval,<sup>1</sup> accounted for 64% of MU's total net sales. Non-Volatile Memory products, which include 3D XPoint™ and NAND Flash, made up 33% of MU's 2015 net sales, substantially all of which came from NAND Flash.
- NAND Flash products are electrically re-writeable, non-volatile semiconductor memory devices that retain content when power is turned off.<sup>2</sup> Since Micron's acquisition of Elpida and Rexchip in July 2013 (the companies are collectively known as the MMJ



© Statista 2016

## Additional Information:

Worldwide; DRAMeXchange; 2nd quarter 2010 to 4th quarter 2015

## Source:

DRAMeXchange

**Figure 1: Global DRAM Revenue from Q2 2010 to Q4 2015 (in \$mm)**

Companies), a greater majority of its revenues and operating income have come from the DRAM segment. From a business strategy standpoint, this emphasis on DRAM is not optimal, as DRAM is a more mature, slower-growing market than the NAND segment. As can be seen in Figure 1, DRAM sales dropped in each of the previous four quarters and we predict will continue slowing as that market segment matures. Micron CFO Ernie Maddock said, “DRAM is the more mature of the two markets it is a little bit slower growing, so less elastic demand...so we don’t see the need for significant wafer additions in the long-term.”<sup>3</sup> The reason for the declining revenues is mainly a price phenomenon; as PCs and now smartphones and tablets become increasingly commoditized, the prices for the memory chips used in the devices decline. There has been a relentless drive for higher capacity and improved speed, which coupled with intense competition and

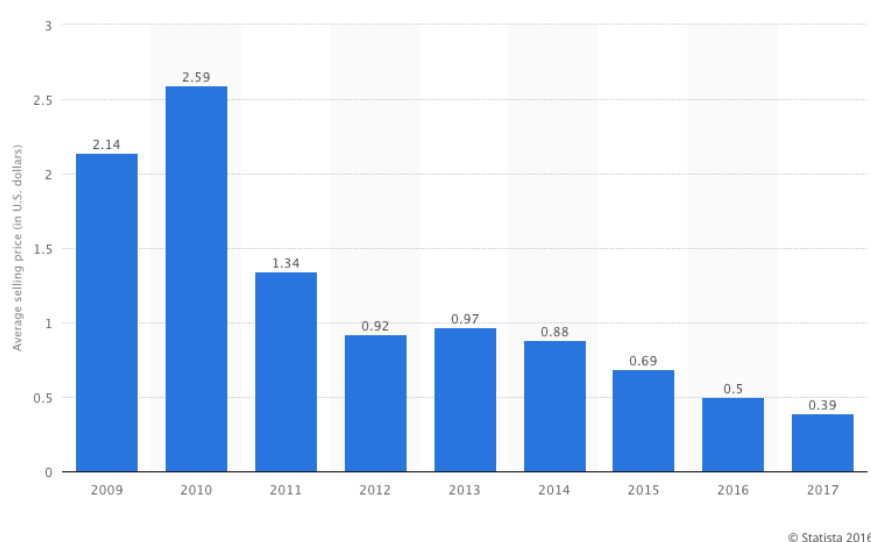
<sup>1</sup> Micron Technology FY 2015 10-K.

<sup>2</sup> Micron Technology FY 2015 10-K.

<sup>3</sup> Raymond James 37<sup>th</sup> Annual Institutional Investors Conference - March 7, 2016.

periods of excess capacity have driven prices even lower.<sup>4</sup> We expect this trend to continue, as there is unlikely to be a technological breakthrough that pulls the semiconductor industry out of its commoditized nature. Additionally, we believe the recent wave of consolidation shows that the industry's major players are forecasting continued price declines as they attempt to implement economies of scale to deal with lower prices. This view is certainly held by Micron, as it notes in its most recent 10-K that it may experience continued declining prices for its memory products and both it and other industry players have recently expanded fabrication facilities, which will drive supply higher and prices down.

- In our model, we broke out DRAM and Non-Volatile Memory separately and made projections for each segment going forward. For DRAM, we started by analyzing the change in average selling price of DRAM 1Gb equivalent units over the past few years. As is shown in Figure 2, the price has declined from \$2.59 in 2010 to \$0.69 in 2015.<sup>5</sup>



**Figure 2: Average Selling Price of DRAM 1Gb equivalent units from 2009 to 2017 (\$)**

- We foresee a continued decrease in average selling prices through 2019 as demand from the PC endmarket slows and smartphone demand declines as well (Apple's most recent quarter saw only a 0.4% growth in iPhone sales, its lowest rate of growth since 2007, in an ominous sign for the future of the smartphone industry).<sup>6</sup>

International Data

Corporation forecasts a slowdown in smartphone growth as China joins North America and Western Europe in a more mature growth pattern.

- Statista predicts a 27.5% decline in ASP for DRAM in 2016 and a 22% decline in ASP for DRAM in 2017. We think these projections are likely to be accurate, as Statista is one of the leading statistics companies on the Internet and uses a comprehensive process to analyze and forecast data in many different industries. Statista has historically been accurate with its forecasts of the Semiconductor market. We believe that after 2017, the price decline will slow as the oversupply cycle works itself out and inventory levels drop, but persistently reduced demand from PCs and smartphones will keep prices from actually rising until 2020. Additionally, due to Micron's substantial market share in the DRAM market and scale in distribution and manufacturing, it has been able to outperform the industry in terms of ASP changes over the last three years by 3.14%, a trend we believe will continue in the foreseeable future.
- We project that DRAM gigabits sold will increase by 19% in 2016, which mirrors the growth rate from 2011, before acquisitions and other market factors distorted growth

<sup>4</sup> Forbes – *Continued Stability in Memory Product Prices Can Significantly Increase Micron's Valuation*.

<sup>5</sup> Statista.

<sup>6</sup> Apple FQ1 2016 Earnings Call.

rates (DRAM gigabits sold rose 142% in 2014 due to the MMJ transaction but only 4% in 2015). We are projecting a growth rate in gigabits sold of 200bps lower in each successive year, all the way down to 9% in 2021, as demand slows and the company shifts production from DRAM to Non-Volatile Memory products. An important industry trend is the market shifting from traditional desktops and laptops to mobile devices and embedded computing systems, translating into a lower amount of fabrication facility capacity allocated to commodity DRAM manufacturing.<sup>7</sup>

- To get to overall DRAM revenue growth, we found that Micron's DRAM sales growth generally tracks the sum of ASP changes and changes in gigabits sold. Therefore, we added up the projected changes in price and quantity to get to DRAM sales growth, with a 5.4% decline in sales in 2016 but a steady increase in sales up to 20% in 2021. The increase in sales growth will occur as the price declines in the DRAM segment become less severe and the industry reduces supply allocated towards DRAM (in favor of the faster growing NAND Flash market). Even if the overall market for DRAM does not grow extremely quickly as demand from smartphones and PCs continues to slow, the fortunes of the bigger and more established players in this market will rise relative to the smaller ones as they can better weather challenging industry conditions with streamlined manufacturing and broad distribution networks.
- For Non-Volatile Memory, we were much more optimistic in our sales projections. For 2016 NAND demand growth we took the average of four projections: DRAMeXchange,<sup>8</sup> Samsung, Micron, and Intel.

#### Guidance Accuracy

■ None ■ In Range ■ Beat ■ Missed

EPS Guidance (3Yr Avg.)

BEAT BY **+22.8%**

ACCURACY	2014	2015	2016
Quarter	1234	1234	1234

SALES Guidance (3Yr Avg.)

MISSED BY **-0.9%**

ACCURACY	2014	2015	2016
Quarter	1234	1234	1234

Source: FactSet

Micron management estimates historically have been optimistic. Thus, to negate this we took an average of one trade association and three corporations. Not surprisingly, the average corporate estimate was a 35% growth rate in demand, while the DRAMeXchange estimate was 23%. The overall average came to a 32% demand increase in 2016. IM Flash Technologies, a joint venture between Intel and Micron formed in 2006 to manufacture NAND Flash memory products, projects a 40% yoy increase in supply for NAND Flash through 2020. We believe that this number is accurate for a few reasons; (1) it is higher than projected demand growth, which makes sense given the industry's tendency for overcapacity in fast-growing market segments and (2) supply is easier for companies to project, as capital expenditure and plant expansion plans must be forecasted a few years in advance to ensure that companies have an effective and proactive capital allocation strategy.

- Thus, we project an overall price decline of 8% (32% - 40% = 8%) in 2016 for NAND Flash, followed by successively lower price declines in 2017-2019 and price *increases* in 2020 and 2021. We foresee a more favorable pricing environment for Non-Volatile Memory Products because of the huge projected increase in demand due to a historic explosion of data. Computer Sciences Corporation projects total data production will expand from 8 Zetabytes (ZB) to 35 ZB in 2020, while EMC Corporation and Intel project data production will reach 44 ZB in 2020 and Seagate believes there will be a 6 ZB deficit of storage available to meet demand for digital storage in 2020.<sup>9</sup> While we believe industry demand for NAND will expand at a CAGR of 32% through 2021, we

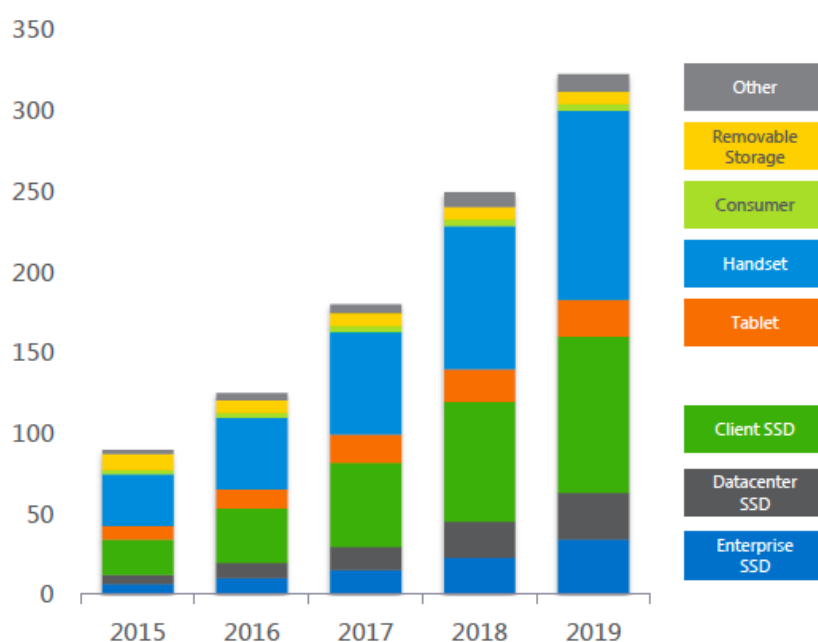
<sup>7</sup> Forbes - *Continued Stability in Memory Product Prices Can Significantly Increase Micron's Valuation*.

<sup>8</sup> A global provider of market intelligence on DRAM and NAND Flash.

<sup>9</sup> William Tildwell - *Micron, Intel and 3D NAND Post 2016 - Is That All There Is?*.

think the growth rate will be slightly lower for MU in 2016-2021, at 28%. The reason for this is twofold: (1) Micron already has a strong market share in the NAND Flash market (13.9% in Q4 2015<sup>10</sup>) so there is less room for them to grow and (2) Micron has historically underperformed from its competitors on the NAND side by 30 – 40%.<sup>11</sup> We believe this underperformance will subside as Micron focuses on narrowing its technology gap and emphasizes NAND Flash and 3D XPoint™ (even though 3D XPoint™ will not begin generating revenue until 2017) over DRAM production, so we think it will underperform the market in terms of NAND Flash gigabits sold by a mere 4% in 2016-2021.

- Similar to the manner in which we calculated total DRAM sales, we believe NAND net sales will track the sum of % change in ASP and % change in gigabits sold, producing a NAND Flash growth rate in sales of 24% in 2016 steadily increasing to 30% in 2021. The Other product category, which includes sales of NOR Flash products, is projected to grow at 3.1% over the next five years, in line with global projected GDP growth from 2016-2020.<sup>12</sup> Figure 3 breaks down Micron’s projected NAND Industry Demand through 2019, while Figure 4 shows total revenue projections for Micron through 2021. Overall, we project MU’s net sales will grow 3.22% in 2016 and steadily increase in growth rate up to 25.14% in 2021, primarily due to a sustained focus on and expansion of NAND Flash and 3D XPoint™ products.

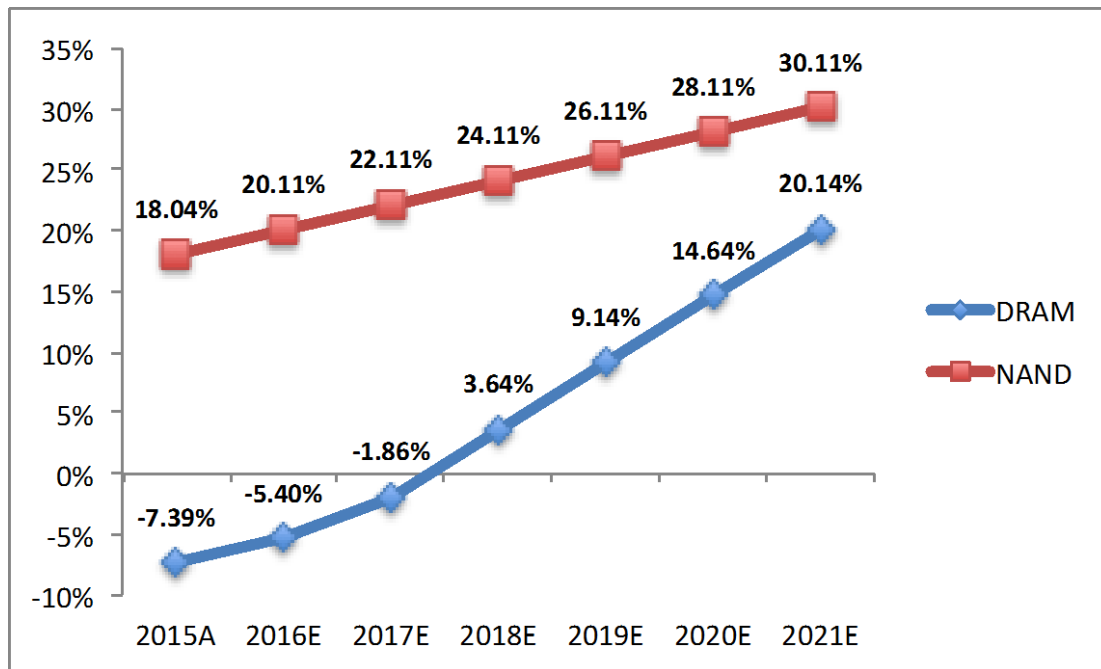


**Figure 3: Projected NAND Industry Bit Demand (B GB EU)<sup>1</sup>**

<sup>10</sup> Statista.

<sup>11</sup> Raymond James 37<sup>th</sup> Annual Institutional Investors Conference - March 7, 2016.

<sup>12</sup> The Conference Board Global Economic Outlook, 2015-2025.



**Figure 4: Projected Revenue Growth Rates by Product (2015-2021)**

## 2. Heavy Capital Expenditures Required in 2016 and 2017 Will Weigh on Free Cash Flow

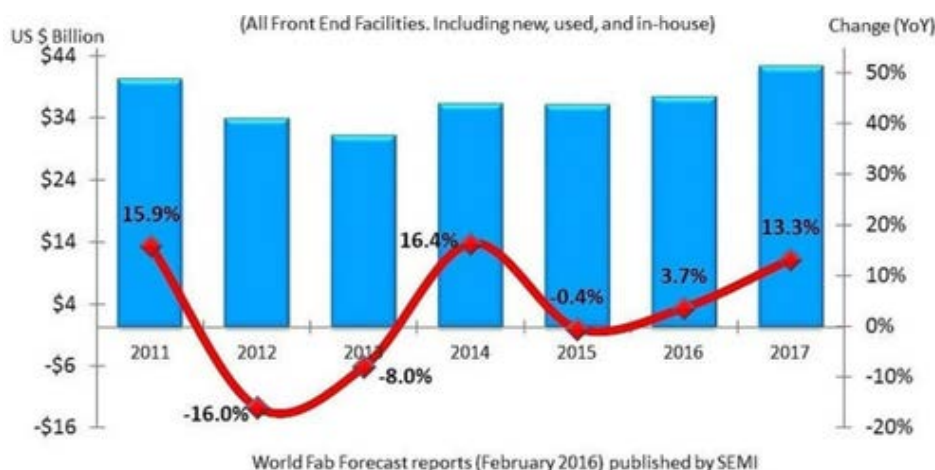
- Capital expenditures are a crucial part of semiconductor companies' business strategy because what these companies are selling, at the most basic level, is superior technology in an increasingly commoditized industry. In the past three years, capital expenditures at Micron have consistently increased as the company looks to narrow the technology gap that exists between it and its competitors. CEO Mark Durcan commented in the FQ1 2016 earnings call that "really it's absolutely imperative that we not necessarily have an identical technology profile to others in the market, but certainly narrow the gap relative to the deployed advanced technology." Along these lines, capital expenditures totaled 14% of revenue in fiscal 2013, 19% of revenue in fiscal 2014, and 25% of revenue in fiscal 2015. We predict continued increases in capital expenditures going forward as the company maintains its commitment towards narrowing the perceived technology gap and focuses on expanding its Non-Volatile Memory (NAND) product line.
- Currently, Micron generates only ~33% of its revenues from Non-Volatile products, and management is focused on ramping its 3D NAND technology and enabling Gen Two 3D NAND<sup>13</sup> along with driving enterprise-level controller and firmware. Micron is focused on enterprise because the enterprise NAND products have the highest margins, as they are of the highest quality. Regarding MU's 3D XPoint™ technology, it will be investing in building out capacity over the next few years so that it is in a position to capitalize on surging data demand in 2018 and beyond. As a result, the next few years are likely to be heavy in capital expenditures.
- The company is guiding for capital expenditures of \$5.5bn in 2016, a number that we believe is accurate as the Inotera transaction adds \$800mm per year in capital expenditures in 2016<sup>14</sup> and the company builds out its 3D technology. 2015 saw MU begin construction of a significant expansion of its water fabrication facility in Singapore for production of NAND Flash memory. This is important because the company itself views the expansion of this facility as a precursor to higher capital spending levels: "As a

<sup>13</sup> Micron Technology FQ1 2016 earnings call.

<sup>14</sup> Micron Technology FQ1 2016 earnings call.

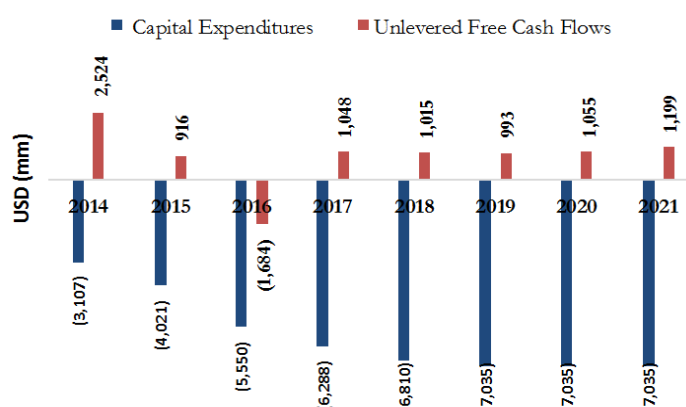


result of the MMJ acquisition and our capacity expansion in Singapore, we expect our future capital spending will be higher than our historical levels.”<sup>15</sup>



**Figure 5: Fab Equipment Spending Over Time**

- In 2017, we are projecting capital expenditures to grow at 13.3% yoy based on Figure 5, which shows a projection for Fab Equipment Spending by Semiconductor Equipment and Materials.<sup>16</sup> We think MU’s spending will mirror that of the industry for two reasons: (1) it will require *higher* spending than the industry in Non-Volatile Memory technology to grow that business and shrink the technology gap and (2) MU will require *lower* spending than the industry in DRAM as it already significantly expanded its Fab10x facility in Singapore and has a very strong market share in that space due to its Micron Memory Japan (MMJ) acquisition along with Samsung and SK Hynix.<sup>17</sup> We are projecting capital expenditures to progressively grow 500bps slower than the previous year in 2018 and 2019 and then level out in 2020 and 2021 as capital expenditures return to their historical five-year average of ~20% of revenues. In conclusion, we believe that the years 2016-2018 will be heavy in capital expenditures, reducing free cash flow and leveraging the company’s success on future demand for MU’s 3D technology. In later years, MU will likely focus on marketing its technology rather than investing further in the technology, improving the cash flow profile of the company for the years 2019-2021. Micron’s Unlevered Free Cash Flows and Capital Expenditures are presented in Figure 6.



**Figure 6: MU Capital Expenditures and Unlevered Free Cash Flows from 2014-2021**

<sup>15</sup> Micron Technology FY 2015 10-K.

<sup>16</sup> Global industry association serving the manufacturing supply chain for micro- and nano-electronics industries.

<sup>17</sup> Statista - DRAM Chip Vendors Market Share.



### 3. MMJ Acquisition – A Bargain at the Time But a Continued Drag on MU Financials

- In July 2013, Micron Technology completed the acquisition of Japanese Dynamic-Random Access Memory (DRAM) developer and manufacturer Elpida and Elpida's subsidiary Rexchip, together known as the MMJ acquisition. At the time, the market viewed the merger favorably; it gave Micron a foothold in the DRAM industry, as Elpida's market share for mobile DRAM was behind only Samsung and SK Hynix,<sup>18</sup> and Rexchip was considered a leader in PC DRAM production and manufacturing efficiency.<sup>19</sup> Furthermore, Elpida had declared bankruptcy in February 2012,<sup>20</sup> so Micron was able to acquire the assets at a substantial discount to their operating value. This acquisition was certainly beneficial for Micron's business operations; it gave them access to DRAM technology and the Japanese market, and solidified its position as a top five global semiconductor company. However, those benefits have since been priced into the stock, and there are three potentially dangerous aspects of the transaction that we believe are important for the valuation of the company going forward.
- Primarily, the acquisition hides Micron's inability to grow organically, a foreboding sign for a company in an increasingly commoditized industry. Since the acquisition occurred in July 2013, and Micron's fiscal year ends September 3<sup>rd</sup>, the first time that Elpida's full operating results showed up in Micron's financial statements was in fiscal 2014. In fiscal 2014, Micron's revenue grew 80% yoy. However, the average sales growth rate of the last five years *excluding* 2014 is only 1.62%. This number is extremely low, yet we still believe that the company will be able to grow revenues faster in the future due to a reduction in industry oversupply and Micron's investments in NAND Flash and 3D XPoint<sup>TM</sup>.
- Nonetheless, we are concerned that Micron's existing infrastructure and technology are not up to par with the rest of the industry, which could explain its extremely low organic growth rate. Additionally, our somewhat aggressive revenue estimates give our target price per share a cushion if MU's inability to grow organic revenues continues into the future.
- Second, the terms of agreement of the Elpida merger have ramifications that continue to affect Micron's financial statements. At the time of the acquisition, Micron was required to pay Elpida only 60bn yen (~\$532mm USD),<sup>21</sup> representing a tremendous bargain for one of the DRAM industry's leaders. However, the remaining 140bn yen (\$1.24bn USD)<sup>22</sup> was to be disbursed to Elpida creditors over the span of six years and will be paid out of Elpida revenues.<sup>23</sup> These payments are referred to by MU as MMJ Creditor Installment Payments, and as of September 3, 2015, Micron has \$862mm outstanding of these payments. Essentially, Micron is continuing to pay for some additional revenue and cost synergies that were realized over the past two years, adding to its precarious debt position and reducing free cash flow going forward. The impact of these Installment Payments is included in the added 50bps per year of interest expense as a percentage of revenue in 2017-2021.
- In addition, because a substantial portion of the MMJ Group's cash is unavailable to Micron in its daily operations, Micron's liquidity position is misleading and may have fooled the market into thinking MU has more free cash than it actually does. Almost 29% of Micron's cash and cash equivalents (\$748mm / \$2.605bn as of September 3, 2015) are held by the MMJ Group. Because Elpida and Rexchip were acquired out of

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<sup>18</sup> DRAMeXchange.

<sup>19</sup> Technews – *A Closer Inspection of the Micron-Elpida Merger*.

<sup>20</sup> Technews – *A Closer Inspection of the Micron-Elpida Merger*.

<sup>21</sup> Using the exchange rate of yen to USD as of March 29, 2016.

<sup>22</sup> Using the exchange rate of yen to USD as of March 29, 2016.

<sup>23</sup> Technews – *A Closer Inspection of the Micron-Elpida Merger*.

bankruptcy, there are restrictions on how Micron can utilize the cash it generates from the MMJ Companies' operations. There are constraints on dividends, loans, and advances, and Elpida creditors must be paid before issuing any cash dividends to Micron shareholders. Therefore, Micron considers the assets of the MMJ Group as unavailable to Micron for use in other operations.<sup>24</sup> As a result, Micron's liquidity position is overstated by its balance sheet, fooling the market into believing it has enough cash on hand to meet potential shocks. We think, conversely, that a substantial global recession or negative shock in Micron's supply chain, manufacturing, or distribution network could severely cripple the company and potential send it into bankruptcy, as its balance sheet assets (mainly cash) are overstated and not as liquid as the market believes.

#### **4. Substantial Off-Balance Sheet Obligations Hide the Company's True Leverage**

- At first glance, Micron Technology seems to be adequately capitalized with healthy leverage ratios. In fiscal 2015, its Debt / Equity ratio was only 0.55x, Debt / EBITDA was 1.30x, and EBITDA / Interest Expense was 15.27x. However, Micron has significant off-balance sheet obligations that will use up a large portion of its free cash flow in the coming years. This is an important aspect of its valuation for several reasons: (1) the company will be unable to use its free cash to reward shareholders, either through share buybacks or dividend payouts, (2) any further debt the company raises will likely come with prohibitively high interest rates as the capital markets realize the substantial leverage at the company, (3) we are projecting interest expense to increase 50bps per year starting in 2017 as a percentage of revenue to account for higher future rates of financing, the MMJ Creditor Installment Payments (which are also not accounted for on Micron's balance sheet), and the possibility of continued future convertible debt raises, and (4) high leverage can lead to a number of catalysts for a rerating down of MU's stock: a credit rating downgrade, default/bankruptcy, raising equity to improve the capital structure of the company, and using free cash to pay off debt to improve the capital structure of the company.
- As mentioned above, Micron looks adequately capitalized based on its balance sheet ratios. When we dug deeper, however, we found some leverage problems, which we believe the market is missing in its inflated value of MU's stock. For example, Micron's Debt / Equity ratio is a healthy 0.55x. Yet, when including Unfunded pension obligations, Purchase obligations,<sup>25</sup> Operating leases, Convertible notes, and Capital lease obligations as debt, MU's Debt / Equity ratio rises from 0.55x to 0.98x. Even more concerning, MU's Debt / EBITDA ratio almost doubles from 1.30x to 2.28x. In our opinion, the market is missing the effect that MU's hidden leverage will have on its cash flow profile. While we did not project out debt repayments in the future because we did not feel confident in our ability to accurately predict when and how much debt would be repaid by MU, we believe there is a strong chance that some free cash flow will be used to pay down debt principal. Furthermore, MU has stated in its annual filings that it plans to redeem most of the convertible notes it has outstanding. This would represent another use of cash. In our opinion, a more likely scenario regarding the outstanding convertibles notes is that MU allows some convertible note holders to convert their holdings into equity in order to improve the capital structure of the company. Conversion into equity would increase the number of shares outstanding; we modeled out the likely number of shares converted based on the conversion price per share thresholds of the respective convertible issues.

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<sup>24</sup> Micron Technology FY 2015 10-K.

<sup>25</sup> Commitments to purchase goods or services of either a fixed or minimum quantity with penalties for cancelation.

- We think there is the potential for the creation of 84mm additional shares outstanding, which serves to reduce the implied value of each share outstanding. Again, we think that the market is either not accounting for these convertible notes or is overoptimistically predicting Micron will be able to use cash to redeem these notes. However, as shown in the liquidity analysis, MU does not have as much free cash as its balance sheet says it does. We believe a conversion and subsequent dilution of equity is more likely given Micron's shaky leverage ratios, which is why we modeled out an increase in the number of shares outstanding.

<b>Metric</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
<b>Balance Sheet Debt</b>	<b>\$ 3,262</b>	<b>\$ 6,037</b>	<b>\$ 6,511</b>	<b>\$ 7,341</b>
<b>Total Equity</b>	<b>\$ 8,417</b>	<b>\$ 10,006</b>	<b>\$ 11,562</b>	<b>\$13,239</b>
<b>Balance Sheet Debt / Equity</b>	<b>0.39x</b>	<b>0.60x</b>	<b>0.56x</b>	<b>0.55x</b>
<b>Balance Sheet Debt / Capital</b>	<b>0.28x</b>	<b>0.38x</b>	<b>0.36x</b>	<b>0.36x</b>
<b>Balance Sheet Debt / EBITDA</b>	<b>2.13x</b>	<b>2.96x</b>	<b>1.25x</b>	<b>1.30x</b>
<b>EBITDA / Interest Expense</b>	<b>NA</b>	<b>8.83</b>	<b>14.74</b>	<b>15.27</b>
<b>CFO / Interest Expense</b>	<b>NA</b>	<b>7.84</b>	<b>16.19</b>	<b>14.04</b>
<b>Notes Payable</b>	<b>\$ 3,225</b>	<b>\$ 5,951</b>	<b>\$ 7,959</b>	<b>\$ 9,429</b>
<b>Capital Lease Obligations</b>	<b>\$ 996</b>	<b>\$ 1,366</b>	<b>\$ 998</b>	<b>\$ 852</b>
<b>Convertibles</b>	<b>\$ 2,321</b>	<b>\$ 2,506</b>	<b>\$ 2,143</b>	<b>\$ 1,472</b>
<b>Operating Leases</b>	<b>\$ 90</b>	<b>\$ 106</b>	<b>\$ 116</b>	<b>\$ 682</b>
<b>Purchase Obligations</b>	<b>\$ 1,349</b>	<b>\$ 1,426</b>	<b>\$ 1,869</b>	<b>\$ 2,545</b>
<b>Unfunded Pension Obligations</b>	<b>NA</b>	<b>\$ 80</b>	<b>\$ 74</b>	<b>\$ 27</b>
<b>Total Debt / Equity</b>	<b>0.95x</b>	<b>1.15x</b>	<b>1.01x</b>	<b>0.98x</b>
<b>Total Debt / Capital</b>	<b>0.49x</b>	<b>0.54x</b>	<b>0.50x</b>	<b>0.49x</b>
<b>Total Debt / EBITDA</b>	<b>5.24x</b>	<b>5.65x</b>	<b>2.26x</b>	<b>2.28x</b>

**Figure 7: Micron Important Leverage Metrics Over Time**

- As shown in Figure 7, Micron's debt levels have increased steadily since 2012, and its Notes Payable<sup>26</sup> have increased by about \$2bn every year since 2012. Micron did redeem some of its convertible notes in 2015, which reduced off-balance sheet debt outstanding, but this was counteracted by the continued rise in Purchase Obligations and Operating Leases. Micron has loaded up on debt to fuel its revenue growth, which makes its equity riskier and suggests that its average revenue growth of 17% (including the MMJ acquisition) over the last five years may not be sustainable without the continued presence of risky financial leverage.

## **5. Micron's Balance Sheet Overstates its True Liquidity Position**

- Liquidity may become a problem for MU as it does not seem to have enough cash on hand to meet its funding needs. We conducted the liquidity analysis shown in Figure 8. In a similar manner to Micron's leverage analysis, MU looks to be adequately liquid on the surface. It has a current ratio of 2.11x, a quick ratio of 1.51x, and can cover all of its current liabilities with its operating cash flow (Operating Cash Flow Ratio of 1.29x). However, there are a few problem areas that stand out. Projected EBITDA in 2016 is \$4.3bn, while projected Capital Expenditures, as guided by the company, are \$5.6bn.
- Therefore, Micron is going to have to start using its cash on the balance sheet or raise further debt to fund its capital expenditures. If this trend continues, MU's cash reserves are going to dwindle, making its liquidity position more precarious. Additionally, when

<sup>26</sup> Includes MMJ Creditor Installment Payments, Convertible Notes, and other debt notes.

analyzing MU's total liquidity, we added cash, its revolving credit facility, and its term loan agreement to get \$3.6bn. However, Micron has \$3.5bn of contractual obligations

<b>Financial Metrics</b>	<b>9/3/15</b>
Cash and Cash Equivalents	\$ 2,605
Revolving Credit Facility	\$ 842
Term Loan Agreement	\$ 173
Current Assets	\$ 8,510
Current Assets ex. Inventory	\$ 6,075
Current Liabilities	\$ 4,025
Projected 2016 Interest Expense	\$ 404
Projected 2016 Capital Expenditures	\$ (5,550)
Projected 2016 EBITDA	\$ 4,305
2015 Operating Cash Flow	\$ 5,208

<b>Liquidity Ratios</b>	<b>9/3/15</b>
Current Ratio	2.11x
Quick Ratio	1.51x
Cash Ratio	0.65x
Operating Cash Flow Ratio	1.29x
2016 EBITDA / 2016 Cap. Exp.	0.78x
Total Liquidity*	\$ 3,620
Contractual Obligations Due in Less Than One Year**	\$ 3,534

\*includes Cash and cash equivalents, Revolving credit facility, and Term loan agreement

\*\*includes Notes payable, Capital lease obligations, Operating leases, Purchase obligations, and Other long-term liabilities due within one year

#### **Figure 8: Liquidity Analysis as of 9/3/15**

Group. This is important because the plans of reorganization of the MMJ Companies prohibit the companies from paying dividends to Micron and require that excess earnings be used in MMJ's business or fund the MMJ Companies' Installment Payments. Furthermore, the MMJ Companies cannot make loans or advances to Micron without the consent of the Japan Court, making the assets of the MMJ Group unavailable for Micron in its other operations.

- The \$2.6bn in cash also includes \$134mm held by IM Flash Technologies, the joint venture with Intel formed in 2006. These funds are not anticipated by Micron to be available to fund its other operations. Consequently, about \$882mm out of MU's \$2.6bn (almost exactly 1/3) in cash is not truly free in the sense that it cannot be used by Micron to pay off debt, initiate dividends, or invest in the company. We believe that the market may be missing this piece as well, as if the company suffers an adverse shock in its operations, a credit crunch could occur at Micron due to its inability to access all of its cash. Overall, MU has limited total liquidity in relation to its obligations due within one year, barely enough free cash flow to cover its capital expenditure requirements, and about 1/3 of its cash reserves are severely restricted in their potential uses. For these three reasons, we believe that an industry downturn or company-specific shock would greatly deteriorate MU's liquidity position and have a substantially negative effect on its stock price.

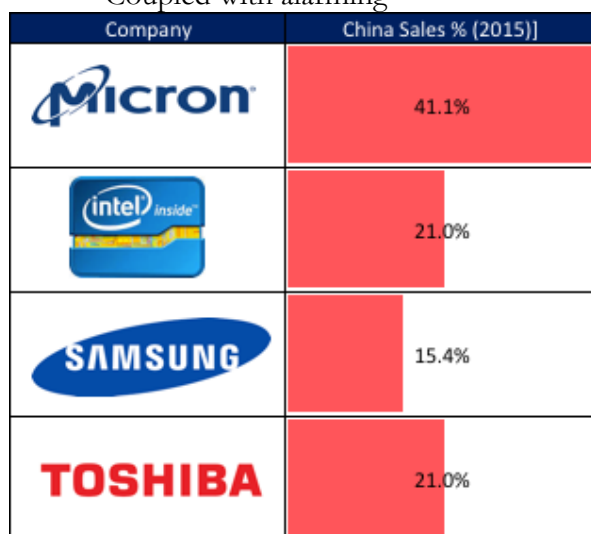
## **6. Exposure to China**

- While we believe that China represents a potential area of growth for the industry in the future, recent data and reports coming out of China have concerned us regarding the

due within one year. This means that MU would have to spend all of its 2016 EBITDA, use up all of its cash on hand, and exhaust its available financing to service both its contractual obligations and investments in the future of the company (capital expenditures). While we do not know exactly how the company will respond, we think that either another debt or equity raise is likely; the former will make the equity riskier while the latter will dilute existing equity holders.

- Additionally, when you examine MU's cash stockpile more carefully, there are some concerning aspects about where the cash comes from and how it can be used that result in the balance sheet overstating MU's true liquidity position. Of the \$2.6bn in cash and cash equivalents on Micron's balance sheet as of September 3, 2015, \$748mm is held by the MMJ

short-term health of the Chinese economy. GDP grew at 6.9% in 2015,<sup>27</sup> the slowest rate of growth since 2009. Additionally, exports have declined as has manufacturing activity.<sup>28</sup> Coupled with alarming



**Figure 9: China Exposure by Company**

*Source: Company Filings*

debt levels at both the corporate and municipal levels, there are numerous risk factors in China. Therefore, we believe that Micron's heavy China exposure, which is twice that of Intel, adds to the risk of the company's cash flows, as a sustained slowdown in China will hurt Micron more than it will the rest of MU's competitors. Furthermore, the Chinese government has provided and may continue to provide significant financial assistance to Chinese competitors or new entrants in the industry.<sup>29</sup>

- Thus, even if the Chinese economy does not experience a "hard" landing, the Chinese government may make it difficult for American companies to make a significant imprint in the market. The regulatory environment and relationship with host country governments is extremely important when analyzing the viability of a geographic

market, and we believe that there are some potential headwinds for American companies operating in China. This is particularly relevant for MU, which generated 41% of its total revenues in China in 2015.

## 7. Catalyst for Value Realization – High Percentage of Institutional Ownership

- We believe that Micron's extensive institutional ownership of 87%, shown in Figure 10, is a possible sign of market inefficiency, as it is over three times greater than three of its major competitors. Many of the institutional owners are likely pension funds and mutual funds that own MU because they are required to hold either large-cap stocks or technology companies or some combination of the two. It is unlikely that they all have *current* long views on the stock. Therefore, we believe that if the stock were to drop below \$10, some mutual funds and pension funds may take notice and sell, as many institutional investors avoid stocks under \$10 because they can be hard to trade in large quantities.<sup>30</sup>
- Of the 87% institutional ownership stake, about 17% of the company is held by index funds, which represent passive investing rather than a bullish view on the stock. The remaining






<sup>27</sup> CNN Money – *China Posts Slowest Annual Economic Growth in 25 Years.*

<sup>28</sup> CNN Money – *Economics Slowdown: Does China Know What It's Doing?*

<sup>29</sup> Micron Technology FY 2015 10-K.

<sup>30</sup> Kiplinger – *8 Stocks Under \$10 Worth Buying.*

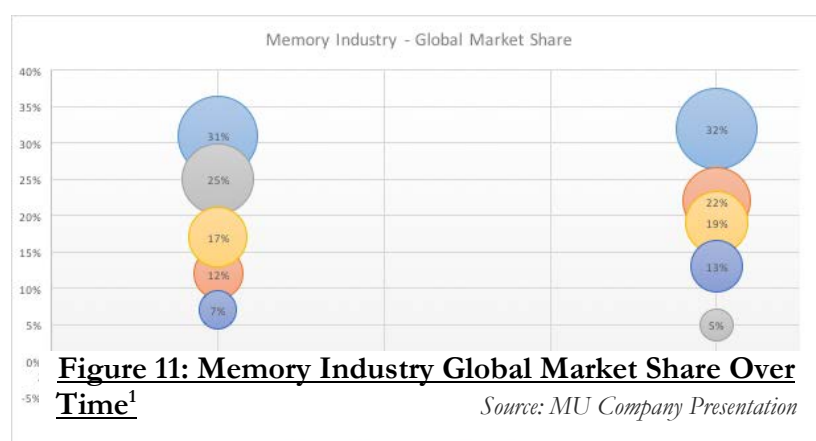
70% is spread out mostly between Investment Advisers and Pension Fund Managers, some of whom may practice active investing while others likely are “closet” passive investors. The large institutional ownership represents inefficiency in the fundamentals of supply and demand in the stock, as many owners of the stock do not believe that the price of MU will appreciate in the future. Also, the \$10 threshold (MU trades at \$10.45 as of March 29<sup>th</sup>, 2016) is a potential catalyst for institutional investors to sell MU stock, driving its price down even further and presenting an opportunity for a short seller to profit.

Company	Institutional Ownership Stake %
	86.6%
	68.0%
	30.1%
	30.0%
	23.0%

**Figure 10: Institutional Ownership**

## 8. Why Does This Opportunity Exist? What is the Long Case?

- 92% of the analysts<sup>31</sup> covering MU have a Buy/Hold recommendation for the stock, making our short recommendation a differentiated view. Micron doubled its market



**Figure 11: Memory Industry Global Market Share Over Time<sup>1</sup>**

share in the semiconductor industry from 12% in 2008 to 22% in 2014, as shown in Figure 11, a trend most sell-side analysts think may continue. Mizuho securities recently upgraded their rating of MU to a buy and they note “[MU] should start to see improving costs and GM, with Inotera adding ~\$2-3 to the book value, and ~\$700M of

incremental FCF (post Capex). MU has noted significant 20% cost reductions in DRAM and 30% in NAND. We have MU rated Buy with a \$13 PT, 9.6x our F17E EPS.”<sup>32</sup>


- The price of MU stock price has declined over 60% in the past year, leading some to find more upside potential than downside risk in MU.<sup>33</sup> Furthermore, conducting a comparable companies valuation shows that MU is trading at a discount to its peers. We use a peer group of Intel, SK Hynix, Sandisk, Samsung, and Western Digital and discover that MU trades at 1.2x 2016 Sales and 4.2x 2016 EBITDA, while the average of its peer group is 1.5x 2016 Sales and 4.8x 2016 EBITDA. However, this discount can be explained by a few factors: (1) Micron’s technology gap, (2) Micron’s strong business position in DRAM relative to NAND, which is an operational weakness because NAND is growing much faster than DRAM, and (3) MU’s inability to grow organically over the last five years factors into lower projected growth rates in the future. Just because a company is trading at lower multiples than its peers does not necessarily mean it is undervalued; rather, it may be a value trap or just a worse company than requires a discount to allow investors to make an adequate return.


<sup>31</sup> Factset.


<sup>32</sup> Barrons – *Mizuho Cuts SanDisk to Hold; Prefers Micron, Broadcom.*


<sup>33</sup> The Street – *Yes There Are Reasons to Buy Micron.*


## 9. Brief Overview of Micron's Competitors – Fierce Global Competition<sup>34</sup>

Intel					
	2013	2014	2015	2016e	
 Sales	52,708	55,870	55,355	59,109	
ROE	17.6%	20.5%	19.5%	17.4%	
Net Margin	18.3%	20.9%	20.6%	19.1%	
FCF	10,065	10,313		10,267	
Debt/EBITDA	0.6	0.5	0.9		

Samsung Electronics					
	2013	2014	2015	2016e	
 Sales	228,693	206,206	200,650	202,345	
ROE	22.8%	15.1%	10.6%	10.4%	
Net Margin	13.0%	11.2%		9.3%	
FCF	23,550	14,932	12,550	14,684	
Debt/EBITDA	0.04	0.03	0.03		

San Disk					
	2013	2014	2015	2016e	
 Sales	6,170	6,628	5,565	5,428	
ROE	14.7%	14.9%	6.3%	9.8%	
Net Margin	16.9%	15.2%	7.0%	11.0%	
FCF	1,650	1,466	624	694	
Debt/EBITDA	0.91	0.60	0.95		

Toshiba					
	2013	2014	2015	2016e	
 Sales	5,800	6,502	6,656	6,145	
ROE	8.2%	5.3%	-3.3%	-115.4%	
Net Margin	1.3%	0.9%	-0.6%	-11.3%	
FCF	-	134	83	94	299
Debt/EBITDA	2.52	2.48	2.31		

Hynix					
	2013	2014	2015	2016e	
 Sales	14,165	17,126	18,798	17,146	
ROE	25.2%	27.0%	21.9%	10.5%	
Net Margin	20.3%	24.5%	23.0%	14.2%	
FCF	3,166	1,066	2,545	656	
Debt/EBITDA	0.6	0.3	0.3		

## 10. Cost Projections

### • Cost of Goods Sold

- The average gross margin over the last five years has been 23.5% and gross margin was 25% for FQ1 2016, but management is guiding for a gross margin of 17.5%-20% for FQ2 2016. Therefore, for full year 2016, we expect a gross margin of 21.875% in 2016 (average of the first two quarters), with consistently expanding gross margins of 25bps per year. The reason for the gross margin expansion is twofold. First, the company has been heavily investing in its NAND technology and is predicting that the technology will scale over the next decade. While we think the next decade might be aggressive, we do believe that MU's investment in NAND will allow them to manufacture at lower costs in the future. Secondly, there is a general trend of consolidation in the industry as semiconductor prices are squeezed. Therefore, there are going to be fewer, bigger players in the space, giving each player more leverage and power over its suppliers. Consequently, we believe that MU will benefit from this trend, even in the absence of any acquisitions, which is why we foresee decreasing COGS.

### • Selling, General & Administrative

- We project that SG&A will stay at the average of the last five years as a percentage of revenue going forward. We think that marketing or payroll breakthroughs are unlikely at Micron given its relatively mature stage, and we don't have a view on increasing wages or overhead, so we believe that SG&A costs as a percentage of revenue will be 5.84% through 2021.

### • Research & Development

- Similar to SG&A, R&D costs have stayed constant at about 10% of revenues over the last five years, even as MU has undergone a transformative acquisition and started to shift its focus from DRAM to Non-Volatile Memory. Therefore, we believe R&D cosMts will stay at the five-year average of 9.66% of revenue going forward. Even though we think that MU still has work to do to reduce the technology gap between it and its competitors, this is likely to come from getting more productivity per R&D dollar, rather than just throwing more money into R&D.

<sup>34</sup> 2016 estimates sourced from Factset.



- **Restructuring and Asset Impairments**
  - While MU has had restructuring and asset impairment costs over the last four years relating to winding down 200mm operations in Israel and Italy, we project no costs going forward. The company writes in its most recent 10-K that it does not expect to incur any further significant costs for restructuring activities.
- **Interest Expense**
  - We are assuming that interest expense will equal the five year average as a percentage of revenue in 2016 (2.33%) but then increase 50bps per year as a percentage of revenue. The reason for our projected increase in interest expense is that we believe future financing rates will be higher as the market begins to take notice of MU's hidden leverage, as described earlier in the paper. The 50bps also includes the effect of MMJ Creditor Installment Payments, which MU is required to pay due to its acquisition of Elpida in 2013. It also accounts for any potential new issuance of convertible debt, which the company has a track record of issuing.
- **Tax Rate**
  - We project a tax rate of 15% going forward based on company guidance. From 2012 – 2015, the company had an average tax rate of 3.39%, but the most recent earnings call guided towards a 15% tax rate for 2016. We believe that the company cannot use Net Operating Losses to defer taxes forever, so the tax rate of 15% in 2016 seemed like a good basis for 2017 – 2021.
- **Number of Shares Outstanding**
  - We believe that of the convertible notes, the 2032C, 2032D, 2033E, and 2033F notes are likely to be exercised because the conversion price per share threshold is near where the current stock price is. Even though the company claims that it intends to redeem the convertibles with cash, we believe that this assertion is simply intended to comfort current equity holders rather than an accurate portrayal of business strategy. We believe that MU's excessive leverage will require it to allow exercise of the convertibles if the stock price rises to a certain point, as this will allow MU to get equity into its capital structure at a discounted price. The number of basic shares outstanding will then be 1.121bn, and the number of diluted shares outstanding are projected at 1.184bn.

## 11. Summary Financial Statistics

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Net Sales	\$ 8,788	\$ 8,234	\$ 9,073	\$ 16,358	\$16,192	\$16,713	\$17,950	\$20,184	\$23,620	\$28,633	\$35,832
Growth	3.61%	-6.30%	10.19%	80.29%	-1.01%	3.22%	7.40%	12.44%	17.02%	21.23%	25.14%
Cost of Goods Sold	\$ 7,030	\$ 7,266	\$ 7,226	\$ 10,921	\$10,977	\$13,057	\$13,979	\$15,668	\$18,276	\$22,084	\$27,546
Gross Margin	1,758	968	1,847	5,437	5,215	3,656	3,971	4,516	5,344	6,550	8,286
Growth	NA	-44.94%	90.81%	194.37%	-4.08%	-29.90%	8.63%	13.71%	18.33%	22.57%	26.51%
Selling, General and Administrative	592	620	562	707	719	977	1,049	1,180	1,380	1,674	2,094
Research and Development	791	918	931	1,371	1,540	1,615	1,734	1,950	2,282	2,766	3,462
Restructuring and Asset Impairments	(75)	10	126	40	3	-	-	-	-	-	-
Other Operating (Income) Expense, net	(311)	32	(8)	232	(45)	-	-	-	-	-	-
Operating Income	\$ 761	\$ (612)	\$ 236	\$ 3,087	\$ 2,998	\$ 1,065	\$ 1,188	\$ 1,387	\$ 1,682	\$ 2,110	\$ 2,730
Growth		-180.42%	138.56%	1208.05%	-2.88%	-50.37%	11.62%	16.69%	21.28%	25.48%	29.39%
Interest Income	-	-	14	23	35	28	31	34	40	49	61
Interest Expense	23	8	(231)	(352)	(371)	(389)	(508)	(672)	(905)	(1,240)	(1,731)
Gain on MMJ Acquisition	(124)	(179)	1,484	(33)	-	-	-	-	-	-	-
Other Non-Operating Income (Expense), net	(109)	29	(218)	8	(53)	-	-	-	-	-	-
	\$ 551	\$ (754)	\$ 1,285	\$ 2,733	\$ 2,609	\$ 704	\$ 711	\$ 749	\$ 817	\$ 919	\$ 1,061
Income Tax Provision	(203)	17	(8)	(128)	(157)	106	107	112	123	138	159
Equity in net income (loss) of equity method investees	(158)	(294)	(83)	474	447	435	488	537	579	579	579
Net Income	\$ 190	\$ (1,031)	\$ 1,194	\$ 3,079	\$ 2,899	\$ 1,245	\$ 1,305	\$ 1,398	\$ 1,519	\$ 1,637	\$ 1,799
Growth		-642.63%	215.81%	157.87%	-5.85%	-40.81%	4.87%	7.09%	8.70%	7.71%	9.95%
Net Income attributable to noncontrolling interests	(23)	(1)	(4)	(34)	-	-	-	-	-	-	-
Net Income attributable to Micron	\$ 167	\$ (1,032)	\$ 1,190	\$ 3,045	\$ 2,899	\$ 1,245	\$ 1,305	\$ 1,398	\$ 1,519	\$ 1,637	\$ 1,799
Earnings per share:											
Basic	\$ 0.17	\$ (1.04)	\$ 1.16	\$ 2.87	\$ 2.71	\$ 1.11	\$ 1.16	\$ 1.25	\$ 1.35	\$ 1.46	\$ 1.60
Diluted	\$ 0.17	\$ (1.04)	\$ 1.13	\$ 2.54	\$ 2.48	\$ 1.05	\$ 1.10	\$ 1.18	\$ 1.28	\$ 1.38	\$ 1.52
Number of shares used in per share calculations (mm):											
Basic	988	991	1,022	1,060	1,070	1,121	1,121	1,121	1,121	1,121	1,121
Diluted	1,008	991	1,057	1,198	1,170	1,184	1,184	1,184	1,184	1,184	1,184

Figure 12: Projected Income Statement

Key Drivers	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Revenue Growth	NA	-6.30%	10.19%	80.29%	-1.01%	3.22%	7.40%	12.44%	17.02%	21.23%	25.14%
COGS Margin	80.00%	88.24%	79.64%	66.76%	67.79%	78.13%	77.88%	77.63%	77.38%	77.13%	76.88%
Gross Margin	20.00%	11.76%	20.36%	33.24%	32.21%	21.88%	22.13%	22.38%	22.63%	22.88%	23.13%
SGA / Revenue	6.74%	7.53%	6.19%	4.32%	4.44%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%
R&D / Revenue	9.00%	11.15%	10.26%	8.38%	9.51%	9.66%	9.66%	9.66%	9.66%	9.66%	9.66%
Restructuring & Asset Impairments / Revenue	-0.85%	0.12%	1.39%	0.24%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Other Operating / Revenue	-3.54%	0.39%	-0.09%	1.42%	-0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Operating Margin	8.66%	-7.43%	2.60%	18.87%	18.52%	6.37%	6.62%	6.87%	7.12%	7.37%	7.62%
Interest Income / Revenue	0.00%	0.00%	0.15%	0.14%	0.22%	0.17%	0.17%	0.17%	0.17%	0.17%	0.17%
Interest (Expense) / Revenue	0.26%	0.10%	-2.55%	-2.15%	-2.29%	-2.33%	-2.83%	-3.33%	-3.83%	-4.33%	-4.83%
Tax Rate	36.84%	2.25%	0.62%	4.68%	6.02%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
EBITDA	\$ 2,866	\$ 1,529	\$ 2,040	\$ 5,190	\$ 5,665	\$ 4,265	\$ 7,578	\$ 8,290	\$ 8,759	\$ 9,171	\$ 9,798

Figure 13: Income Statement Drivers

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Net Income attributable to Micron	\$ 167	\$ (1,032)	\$ 1,190	\$ 3,045	\$ 2,899	\$ 1,245	\$ 1,305	\$ 1,398	\$ 1,519	\$ 1,637	\$ 1,799
Depreciation and Amortization	(2,105)	(2,141)	(1,804)	(2,103)	(2,667)	(3,200)	(6,390)	(6,903)	(7,078)	(7,061)	(7,067)
Amortization	(79)	(88)	(83)	(110)	(117)	(118)	(102)	(93)	(43)	(26)	(33)
Depreciation	(2,026)	(2,053)	(1,721)	(1,993)	(2,550)	(3,082)	(6,288)	(6,810)	(7,035)	(7,035)	(7,035)
Stock Based Compensation	(76)	(87)	(91)	(115)	(168)	(156)	(167)	(188)	(220)	(267)	(334)
Capital Expenditures	(2,250)	(1,699)	(1,244)	(3,107)	(4,021)	(5,550)	(6,288)	(6,810)	(7,035)	(7,035)	(7,035)
Net Sales	8,788	8,234	9,073	16,358	16,192	16,713	17,950	20,184	23,620	28,633	35,832
% Change in Capital Expenditures	-24.49%	-26.78%	149.76%	29.42%	3.70%	13.30%	8.30%	3.30%	0.00%	0.00%	
D&A / Sales	-23.95%	-26.00%	-19.88%	-12.86%	-16.47%	-19.15%	-35.60%	-34.20%	-29.97%	-24.66%	-19.72%
Amortization / Sales	-0.90%	-1.07%	-0.91%	-0.67%	-0.72%	-0.71%	-0.57%	-0.46%	-0.18%	-0.09%	-0.09%
Depreciation / Sales	-23.05%	-24.93%	-18.97%	-12.18%	-15.75%	-18.44%	-35.03%	-33.74%	-29.78%	-24.57%	-19.63%
SBC / Sales	-0.86%	-1.06%	-1.00%	-0.70%	-1.04%	-0.93%	-0.93%	-0.93%	-0.93%	-0.93%	-0.93%
Capex / Sales	-25.60%	-20.63%	-13.71%	-18.99%	-24.83%	-33.21%	-35.03%	-33.74%	-29.78%	-24.57%	-19.63%

Figure 14: Important Cash Flow Metrics

## 12. Valuation

- Our valuation calculates two implied prices per share: one assuming that MU's convertible debt is converted into equity, and one assuming that MU's convertible debt is not converted into equity and is either redeemed with cash on hand or is not converted because the stock price never rises above the threshold (in which case our short position would profit). Assuming MU's convertible debt is converted into equity and henceforth

adds to the number of shares outstanding, we arrive at an implied price per share of \$8.46, which represents a 23% discount to MU's closing price of \$11.03 as of April 1, 2016.

- Assuming MU's convertible debt is not converted and thus the number of shares outstanding stays at 1.037bn, our APV gives us an implied value of \$8.46 per share, which still represents a 17% discount to MU's closing price of \$11.03 as of April 01, 2016. We used a Cost of Equity of 10.59%. To get the cost of equity we calculated Micron's 60-month adjusted levered beta and then unlever it using a D/E ratio of 56%. We also assumed a perpetual growth rate of 2.0%, as we believe that Micron will grow at the historical rate of GDP growth.

	2016	2017	2018	2019	2020	2021	Terminal Value
Operating Income (EBIT)	1,065	1,188	1,387	1,682	2,110	2,730	
(-) Taxes	- 106	- 107	- 112	- 123	- 138	- 159	
(+) Depreciation and Amortization and SBC	3,356	6,558	7,091	7,298	7,328	7,402	
(-) Capital Expenditures	- 5,550	- 6,288	- 6,810	- 7,035	- 7,035	- 7,035	
(-) Change in Net Working Capital	- 448	- 303	- 541	- 830	- 1,210	- 1,739	
Unlevered Free Cash Flows	- 1,684	1,048	1,015	993	1,055	1,199	14,233
Discounted Free Cash Flows (all equity)	- 1,522	857	750	664	638	655	7,779
Sum of Discounted Free Cash Flows	9,820						
Projected Interest Expense	389	508	672	905	1,240	1,731	
Interest Tax Shield at 15% Tax Rate	58	76	101	136	186	260	
Terminal Value of Tax Shield Assuming that Debt Grows at 2.5%							3,081
Tax Shields Discounted at 5.50%	55	68	86	110	142	188	2,234
Present Value of Financing Effects	\$ 2,884						
(+) Cash	2,605						
(-) Debt	-6,326						
Implied Market Value of Equity	\$9,486						
Shares Outstanding (not including convertibles)	1,037						
Shares Outstanding (including convertibles)	1,121						
Price per share (not including convertibles)	\$9.14						
Price per share (including convertibles)	\$8.46						
Current price (as of 4/01/2016 close)	\$11.03						
Implied Premium / (Discount) - not including convertibles	(17.1%)						
Implied Premium / (Discount) - including convertibles	(23.3%)						

**Figure 15: APV Valuation With Sensitivity Tables**

		Cost of Equity				
		9.6%	10.1%	10.6%	11.1%	11.6%
LT Growth Rate	1.0%	\$9.57	\$8.77	\$8.05	\$7.41	\$6.82
	1.5%	\$10.24	\$9.36	\$8.57	\$7.86	\$7.23
	2.0%	\$11.00	\$10.01	\$9.14	\$8.37	\$7.68
	2.5%	\$11.86	\$10.76	\$9.79	\$8.94	\$8.18
	3.0%	\$12.86	\$11.61	\$10.52	\$9.57	\$8.74

**Implied Share Price Without Convertible Dilution**

		Cost of Equity				
		9.6%	10.1%	10.6%	11.1%	11.6%
LT Growth Rate	1.0%	\$8.86	\$8.11	\$7.45	\$6.85	\$6.31
	1.5%	\$9.48	\$8.66	\$7.93	\$7.28	\$6.69
	2.0%	\$10.18	\$9.26	\$8.46	\$7.74	\$7.11
	2.5%	\$10.97	\$9.95	\$9.06	\$8.27	\$7.57
	3.0%	\$11.89	\$10.74	\$9.73	\$8.86	\$8.08

### Implied Share Price With Convertible Dilution

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