

1 Jeff D. Friedman (173886)
Rio S. Pierce, (298297)
2 HAGENS BERMAN SOBOL SHAPIRO LLP
715 Hearst Avenue, Suite 202
3 Berkeley, CA 94710
Telephone: (510) 725-3000
4 Facsimile: (510) 725-3001
jefff@hbsslaw.com
5 riop@hbsslaw.com

6 Steve W. Berman (*Pro Hac Vice* applied for)
Anthony Shapiro (*Pro Hac Vice* applied for)
7 Ronnie Spiegel (*Pro Hac Vice* applied for)
HAGENS BERMAN SOBOL SHAPIRO LLP
8 1918 Eighth Avenue, Suite 3300
Seattle, WA 98101
9 Telephone: (206) 623-7292
Facsimile: (206) 623-0594
10 steve@hbsslaw.com
tony@hbsslaw.com
11 ronnie@hbsslaw.com

12 *Attorneys for Plaintiffs*

13 UNITED STATES DISTRICT COURT
14 NORTHERN DISTRICT OF CALIFORNIA

15 MICHELE JONES, DAVID LAIETTA,
16 KIMBERLY YORK, BENJAMIN MURRAY,
WANDA DUREYA, individually and on behalf
17 of all others similarly situated,

18 Plaintiff,

19 v.

20 MICRON TECHNOLOGY, INC., MICRON
SEMICONDUCTOR PRODUCTS, INC.,
21 SAMSUNG ELECTRONICS CO., LTD.,
SAMSUNG SEMICONDUCTOR, INC., SK
22 HYNIX, INC. (F/K/A HYNIX
SEMICONDUCTOR, INC.), SK HYNIX
23 AMERICA, INC. (F/K/A HYNIX
SEMICONDUCTOR AMERICA, INC.),
24

25 Defendants.

Case No. _____

COMPLAINT

JURY TRIAL DEMANDED

TABLE OF CONTENTS

		<u>Page</u>
1		
2		
3	I. OVERVIEW OF THE CONSPIRACY.....	1
4	II. JURISDICTION AND VENUE.....	5
5	III. THE PARTIES	7
6	A. Plaintiffs	7
7	B. Defendants.....	7
8	C. Agents and Non-Party Co-Conspirators.....	9
9	IV. INTRADISTRICT ASSIGNMENT	10
10	V. DESCRIPTION OF DRAM.....	10
11	A. What is DRAM?.....	10
12	B. How is DRAM Manufactured?	11
13	C. How is DRAM Sold to Direct Purchasers?	12
14	D. How is DRAM Sold to Indirect Purchasers?.....	13
15	VI. DEFENDANTS CONSPIRED TO RESTRAIN COMPETITION FOR SALES OF DRAM.....	14
16	A. Prior to the Start of the Class Period, Defendants Made Independent Supply and Capacity Decisions, Leading to Declining DRAM Prices	14
17	1. Between August 2014 and May 2016, competition between Defendants caused DRAM prices to decline.....	14
18	2. Defendants’ Supply and Pricing behavior changed abruptly and nearly simultaneously at the beginning of the Class Period.....	15
19	a. Samsung in 2016 responded to Micron’s invitations, changed its behavior, and stopped growing supply in an attempt to take market share.....	16
20	b. In 2015, the Defendants grew supply at the same rate as their forecasted growth in demand but starting in 2016 Defendants intentionally restricted supply so that it grew slower than demand.....	18
21	B. The Class Period Begins on June 1, 2016, as Defendants Efforts to Coordinate to Ensure Capacity Discipline and DRAM Price Increases Began to Bear Fruit	19
22	1. Defendants engaged in concerted signaling to each other through public statements and actions in response that	
23		
24		
25		
26		
27		
28		

1 effectuated an agreement between Defendants to artificially
 2 restrict supply growth of DRAM – causing DRAM prices to
 skyrocket..... 19

3 2. Defendants’ public statements..... 20

4 3. Throughout 2017, Defendants repeatedly reassured each other
 5 that, unlike in previous periods, each would not respond to
 6 rising prices and strong demand with increased supply growth.
 7 Instead, the Defendants would stick with their publicly
 announced plans to keep supply growth below demand growth
 by not adding wafer capacity and not seeking to take market
 share from each other 35

8 C. End of Conspiracy: Once Chinese Investigation was Announced,
 9 Defendants’ Conduct Changed Abruptly 36

10 VII. THE STRUCTURE OF THE DRAM INDUSTRY IS CONDUCTIVE TO
 CONSPIRACY..... 37

11 A. DRAM is a Commodity Product 38

12 B. The DRAM Market is Highly Concentrated 39

13 C. The DRAM Market Has High Barriers to Entry 41

14 1. Defendants own the intellectual property for DRAM through
 15 cross-licenses, patents, and joint ventures 42

16 2. DRAM manufacturers have the benefit of economies of scale 43

17 D. Demand for DRAM is Inelastic..... 44

18 E. Defendants’ Increased Prices for DRAM Cannot Be Explained by
 Market Factors..... 45

19 1. DRAM costs remained low or stable during the Class Period 45

20 2. Price increases during the Class Period cannot be explained by
 21 the technology life cycle..... 46

22 F. The Defendants’ Profits Increased During the Class Period 49

23 1. Trade association participation provide many opportunities for
 Defendants to share information and collude..... 49

24 a. Semiconductor Industry Association (“SIA”)..... 49

25 b. Korean Semiconductor Industry Association (“KSIA”) 50

26 c. World Semiconductor Council (“WSC”)..... 51

27 d. World Semiconductor Trade Statistics Organization
 28 (“WSTS”) 51

1 e. Global Semiconductor Alliance (“GSA”) 53

2 2. Trade association meetings in which Defendants participate

3 can be correlated with price increases during the Class Period..... 53

4 VIII. DEFENDANTS’ PRIOR COLLUSION IN THE DRAM MARKET, AND

5 RELATED MARKETS, MAKES COLLUSION EVEN MORE PLAUSIBLE

6 HERE..... 55

7 A. Defendants Were Previously Convicted for Fixing Prices of DRAM 55

8 1. Prior DRAM - Other Regulators 58

9 2. Prior DRAM Civil Cases (Direct and Indirect)..... 59

10 B. Other Semiconductor Memory Products 59

11 1. SRAM..... 59

12 2. Flash 60

13 IX. EFFECTS OF DEFENDANTS MISCONDUCT..... 61

14 A. The Inflated Prices for DRAM caused by Defendants’ Conduct Passed

15 on to Consumers 61

16 X. CLASS ACTION ALLEGATIONS..... 63

17 XI. VIOLATIONS ALLEGED 68

18 FIRST CLAIM FOR RELIEF (Violations of Sherman Act, 15 U.S.C. § 1)..... 68

19 SECOND CLAIM FOR RELIEF (Violations of the Cartwright Act, Cal. Bus. &

20 Prof. Code §§ 16720, *et seq.*) 70

21 THIRD CLAIM FOR RELIEF (Violations of California’s Unfair Competition Law,

22 Cal. Bus. & Prof. Code §§ 17200, *et seq.*) 71

23 FOURTH CLAIM FOR RELIEF (Violations of State Antitrust and Restraint of

24 Trade Laws)..... 72

25 XII. DEMAND FOR TRIAL BY JURY 75

26 PRAYER FOR RELIEF 75

27 DEMAND FOR JURY TRIAL 76

28

1 Plaintiffs bring this action on their own behalf, and as a putative class action on behalf of all
2 others similarly situated in the United States. Plaintiffs, by and through their attorneys, based on
3 their individual experiences, the independent investigation of counsel and consultants, and
4 information and belief, allege as follows:

5 **I. OVERVIEW OF THE CONSPIRACY**

6 1. Dynamic random access memory (“DRAM”) is one of the most common forms of
7 semiconductor memory. DRAM is made from silicon wafers, and is widely used as a component in
8 digital electronics, such as in mobile phones, PCs and servers, laptops, tablets, TVs, set-top boxes,
9 cameras, and in industrial applications, such as in automotive, military, and aviation devices.

10 2. The alleged co-conspirators, Samsung, Micron, and Hynix, are the three companies
11 that control nearly one-hundred percent of the DRAM market. Defendants¹ are the world’s largest
12 manufacturers of DRAM, collectively controlling 96% of worldwide DRAM market share as of mid-
13 2017.

14 3. Defendants combined and contracted to fix, raise, maintain, or stabilize the prices at
15 which DRAM was sold in the United States from at least June 1, 2016 to February 1, 2018 (the
16 “Class Period”). Defendants’ conspiracy artificially inflated prices for DRAM throughout the supply
17 chain that were ultimately passed through to Plaintiffs and the Class, causing them to pay more for
18 DRAM Products than they otherwise would have absent Defendants’ conspiracy.

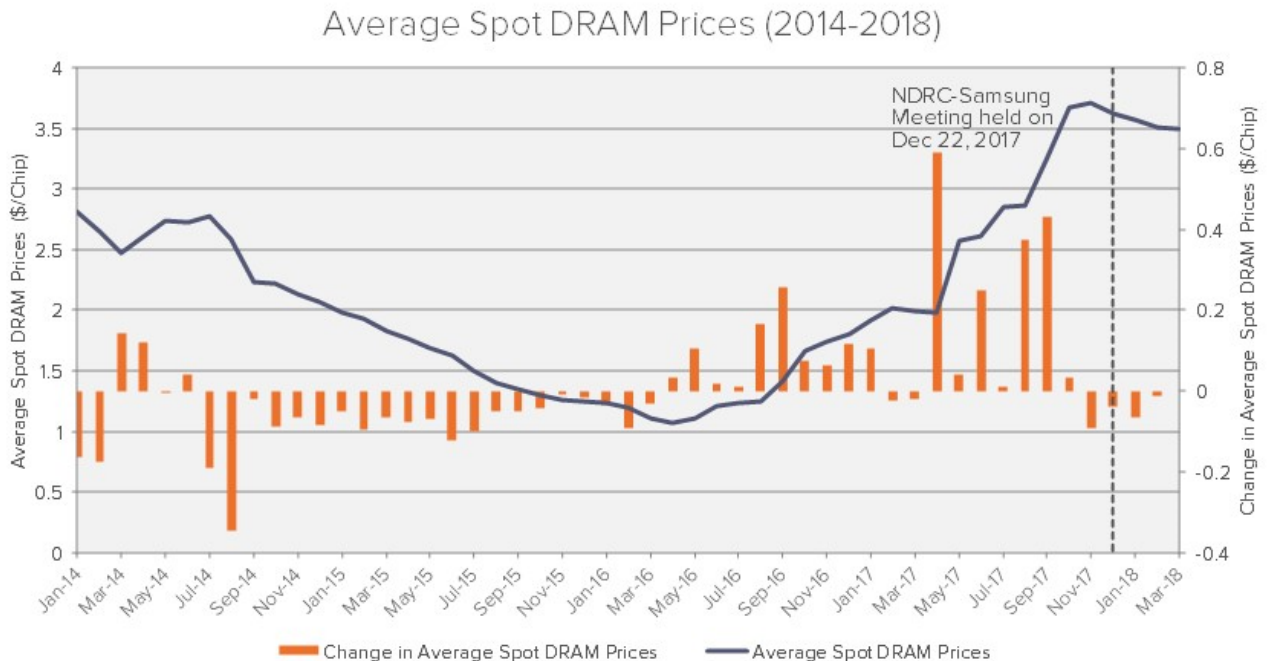
19 4. Prior to entering into the conspiracy, Defendants acted independently in deciding how
20 to balance supply (and capacity) to meet industry demand for DRAM. Acting independently, firms
21 sought to gain market share through increases in their supply.

22 5. For example, during the period from 2014-2015, the Defendant Samsung added wafer
23 capacity throughout the period in an attempt to take market share from the other Defendants. DRAM
24 prices fell during this time.

25
26 ¹ “Defendants” include: Micron Technology, Inc. (“Micron Technology”); Micron
27 Semiconductor Products, Inc. (“Micron Semiconductor”) (collectively “Micron”); Samsung
28 Electronics Co., Ltd. (“SEC”); Samsung Semiconductor, Inc. (“SSI”) (collectively “Samsung”); SK
Hynix, Inc. (f/k/a Hynix Semiconductor, Inc.) (“SK Hynix Korea”); and SK Hynix America, Inc.
(f/k/a Hynix Semiconductor America, Inc.) (“SK Hynix America”) (collectively “SK Hynix”).

1 6. But in the face of the willingness of the three firms controlling the DRAM market to
2 steal share through price competition (and supply increases), Defendants made a near simultaneous
3 decision in 2016 to restrict growth in the supply of DRAM to stop the downward pressure on prices
4 and, indeed, to cause DRAM prices to skyrocket upward. Beginning no later than early 2016,
5 through statements to investors and the industry, Micron called on Samsung and SK Hynix (the two
6 other DRAM manufacturers) to engage in supply discipline. For example, on March 30, 2016,
7 Micron was specifically asked whether it would engage in supply cuts and Micron's CEO, Mark
8 Durcan, responded that Micron would "be foolish to be the first ones to take capacity off." Micron's
9 CFO, Ernie Maddock, further confirmed that Micron would not unilaterally cut production: "*it's a*
10 *really ill-advised move to be unilaterally cutting production.*" But, at the same time, Micron
11 reassured competitors *that "our focus is not on market share."* Micron told its competitors that it
12 would cease trying to take market share from Samsung and Hynix. On April 28, 2016 Samsung
13 responded to Micron's invitation to cut supply by publicly announcing that its DRAM supply growth
14 had turned negative. After these communications, by June 1, 2016, DRAM prices reversed course,
15 started shooting upwards, and continued to do so throughout the Class Period.

16 7. During the Class Period, Defendants continued their efforts to coordinate their DRAM
17 supply decisions, as reflected in public comments by Defendants that urged each other to keep
18 industry supply in check. Defendants each made public statements affirming their commitment to
19 the common plan to curtail supply, and to not compete for each other's market share by supply
20 expansion. For example, Defendants informed the other Defendants through public statements, that
21 they would *keep total wafer capacity flat* in order to constrain DRAM supply growth, they would
22 only *grow DRAM supply between 15-20% in 2017, even as DRAM demand grew 20-25%*, and that
23 they would *refrain from taking each other's market share*. Defendants' statements were matched
24 with conduct – affirmed in industry reports and analyses – which reinforced each's commitment to
25 their common scheme. As a result of Defendants' concerted actions to curtail supply and forego
26 market share expansion, Defendants were able to raise DRAM prices steadily throughout the Class
27 Period, and reap enormous profits, as shown in the chart below.



8. On December 27, 2017, *Reuters* reported that China’s economic regulator, the National Development and Reform Commission (“NDRC”), had begun an investigation into price-fixing by Defendants in the DRAM/NAND Industry following the sharp rise in the price of memory chips over the period from June 1, 2016 to December 2017. On December 22, 2017 the NDRC and Samsung held a meeting regarding coordinated action among the Defendants in the DRAM industry. On February 1, 2018, it was reported that Samsung and the NDRC had entered into a Memorandum of Understanding where Samsung agreed to increase manufacturing capacity. The NDRC investigation and the agreement with Samsung caused Defendants’ conduct to change as they increased capacity and the Class Period came to an end after February 1, 2018. DRAM prices fell as a result of the change in behavior. For example, following the end of the class period, Hynix announced in April 2018 that it was adding wafer capacity in order to match increased demand – a change from the practice of the Defendants during the class period where they kept wafer capacity flat despite increasing demand.

9. During the class period as a result of the scheme, prices soared. For example, the price of a mainstream 4GB DRAM rose 130%.

10. During the Class Period, as prices for DRAM soared, so did Defendants’ revenue. Defendants’ revenue from global DRAM sales skyrocketed during the Class Period, with

1 Defendants' revenue rising more than 50%. Between Q1 2016 and Q3 2017, Defendants' revenues
2 from global DRAM sales more than doubled. In Q3 2017, Samsung achieved a record-high revenue
3 of \$8.7 billion from its global DRAM sales (Q1 2016 revenue was \$3.9 billion); SK Hynix achieved
4 record-high revenue of \$5.5 billion from its global DRAM sales (Q1 2016 revenue was \$2.3 billion),
5 and Micron achieved record-high revenue of \$4.0 billion from its global DRAM sales (Q1 2016
6 revenue was \$1.5 billion).

7 11. In addition to Defendants' near simultaneous change in behavior, leading to severe
8 price increases, during the alleged Class Period, other "plus factors" also point squarely to collusion
9 by Defendants. For example, the DRAM market had all the hallmark features of a market conducive
10 to collusion. DRAM is a commodity. The DRAM market is consolidated, with only small number
11 of players – the three Defendants – holding a lion's share of the market (96%). The DRAM market
12 has high barriers to entry, and demand for DRAM is inelastic. While DRAM prices rose during the
13 Class Period, costs did not rise so as to justify those increases, nor did changes in DRAM
14 technology. There is also an ease of information sharing that is pervasive in the DRAM market.
15 Defendants had many opportunities to collude through common participation in trade associations
16 and industry groups, and through their overlapping business relationships. Defendants also had the
17 ability to track and monitor each other's price and supply movements, before the public had access to
18 that same information, through DRAMeXchange – an industry mechanism tracking Defendants'
19 pricing and capacity movements, and to which Defendants all subscribe.

20 12. The plausibility of the conspiracy alleged herein is also buttressed by the fact that
21 ***Defendants have previously been convicted for conspiring to fix prices of DRAM.*** In 2005, the
22 United States Department of Justice ("DOJ") brought criminal charges against the very same
23 Defendants as named here (and other makers of DRAM that existed at the time) for participating in a
24 conspiracy to fix prices of DRAM sold in the United States between 1999 and 2002. Samsung and
25 SK Hynix² pleaded guilty to the DOJ's charges – and paid some of the largest criminal fines in
26

27 ² In 2012, Hynix Semiconductor, Inc. and Hynix Semiconductor America, Inc. changed their
28 corporate names to SK Hynix, Inc. and SK Hynix America, Inc., respectively, after the companies
were acquired by SK Group. For simplicity, this Complaint uses the term "SK Hynix" throughout.

1 history for their illegal conduct. Micron also admitted its participation in the earlier DRAM
2 conspiracy, but was given amnesty from DOJ prosecution in exchange for its cooperation under the
3 DOJ's Antitrust Leniency Program.³ Fourteen individual employees of Defendants also pleaded
4 guilty for their participation in the earlier DRAM conspiracy – paying fines of \$250,000 each, and
5 serving prison sentences ranging from seven to fourteen months. Defendants and their co-
6 conspirators also collectively paid over \$650 million to settlement civil price-fixing claims related to
7 their prior conduct in the DRAM market. In fact, a number of Defendants' employees who were
8 involved in collusive acts during the last DRAM conspiracy, are still in key leadership positions at
9 Defendants today. Defendants have also been investigated by the DOJ for fixing prices in similar
10 semiconductor memory markets, including the markets for static random access memory ("SRAM")
11 and NAND (generally referred to as "Flash") and, Defendant Samsung Electronics Co., Ltd. and its
12 various wholly-owned subsidiaries pleaded guilty in a number of other landmark electronic
13 component price-fixing conspiracies. Given the repeated history of antitrust violations by
14 Defendants in the DRAM market, and in related electronic component markets, it is even more
15 plausible that Defendants conspired to restrict supply here, and thereby to raise or keep prices of
16 DRAM artificially high during the Class Period, and reap high profits once again.

17 13. Defendants' conspiratorial conduct between 2016-2018 violated Section One of the
18 Sherman Act and the antitrust, consumer protection, and unfair competition laws of various states.
19 As a result, Plaintiffs and the Class paid artificially inflated prices for DRAM Products, and thereby
20 suffered antitrust injury to their business or property.

21 II. JURISDICTION AND VENUE

22 14. This Court has jurisdiction over the instant matter pursuant to 28 U.S.C. § 1332(d)
23 and the Class Action Fairness Act of 2005 ("CAFA"), 28 U.S.C. § 1711, *et seq.*, which vest original
24 jurisdiction in the district courts of the United States for any multi-state class action where the
25 aggregate amount in controversy exceeds \$5 million and where the citizenship of any member of the
26

27 ³ Under the DOJ's Antitrust Leniency Program, a "leniency applicant" can receive amnesty from
28 criminal prosecution and/or reduced fines, for admitting its own violations and cooperating with
authorities.

1 class of plaintiffs is different from that of any defendant. The \$5 million amount-in-controversy and
2 diverse citizenship requirements of CAFA are satisfied in this case.

3 15. Venue is appropriate in this district under 28 U.S.C. § 1391(b) and (c). During the
4 Class Period many of the Defendants transacted business, were found, or had agents in this district
5 and because a substantial portion of the affected interstate trade and commerce described below has
6 been carried out in this district.

7 16. This Court has personal jurisdiction over each Defendant because, *inter alia*, each
8 Defendant: (a) transacted business throughout the United States, including in this district;
9 (b) participated in the sale and distribution of DRAM or DRAM-containing products throughout the
10 United States, including in this district; (c) had substantial contacts with the United States, including
11 in this district; and/or (d) was engaged in an illegal conspiracy that was directed at and had the
12 intended effect of causing injury to persons residing in, located in, or doing business throughout the
13 United States, including in this district.

14 17. Defendants engaged in conduct both inside and outside the U.S. that caused direct,
15 substantial and reasonably foreseeable and intended anti-competitive effects upon interstate
16 commerce within the United States.

17 18. The activities of the Defendants were within the flow of, were intended to, and did
18 have, a substantial effect on interstate commerce of the United States. Defendants' products are sold
19 in the flow of interstate commerce.

20 19. As described above in the previous section in more detail, DRAM manufactured
21 abroad by Defendants and sold for use in products that contain DRAM, either manufactured in the
22 United States or manufactured abroad and sold in the United States, are goods brought into the
23 United States for sale, and therefore constitute import commerce. To the extent any DRAM was not
24 purchased in the United States and do not constitute import commerce, Defendants' unlawful
25 activities with respect thereto, as more fully alleged herein during the Class period, had, and continue
26 to have, a direct, substantial and reasonably foreseeable effect on United States commerce. The anti-
27 competitive conduct, and its effects on United States commerce described herein, proximately caused
28 antitrust injury to the Plaintiffs and members of the Classes in the United States

1 wholly owned and controlled subsidiary of Micron Technology. During the Class Period, Micron
2 Semiconductor sold and distributed DRAM to customers throughout the United States, including
3 sales of DRAM through its retailing arm, Crucial Technology, Inc. (“Crucial”), and Crucial’s
4 website, Crucial.com.

5 29. Defendants Micron Technology and Micron Semiconductor, and Crucial are
6 collectively referred to herein as “Micron.”

7 30. Defendant Samsung Electronics Co., Ltd. (“SEC”) is a Korean corporation and
8 maintains its executive offices at 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea.
9 During the Class Period, SEC manufactured, sold and distributed DRAM throughout the world,
10 including the United States.

11 31. Defendant Samsung Semiconductor, Inc. (“SSI”) is a California corporation located at
12 3655 North First Street, San Jose, California 95134. SSI is a wholly owned and controlled
13 subsidiary of SEC. During the Class Period, SSI sold and distributed DRAM throughout the United
14 States.

15 32. Defendants SEC and SSI are collectively referred to herein as “Samsung.”

16 33. Defendant SK Hynix, Inc. (f/k/a Hynix Semiconductor, Inc.) (“SK Hynix Korea”)
17 maintains its head offices at SAN 136-1, Ami-Ri Bubal-eub, Ichon-si, Kyoungki-do, Korea. During
18 the Class Period, SK Hynix Korea manufactured, sold and distributed DRAM throughout the world,
19 including the United States.

20 34. Defendant SK Hynix America, Inc. (f/k/a Hynix Semiconductor America, Inc.) (“SK
21 Hynix America”) is a California corporation located at 3101 North First Street, San Jose, California
22 95134. SK Hynix America is a wholly owned and controlled subsidiary of SK Hynix Korea. During
23 the Class Period, SK Hynix America sold and distributed DRAM throughout the United States.

24 35. Defendant SK Hynix and SK Hynix America are collectively referred to herein as
25 “SK Hynix.”

26 36. SEC and SK Hynix Korea identified above, are at times referred to herein as the
27 “Korean Defendants.”

1 37. The Micron Defendant entities, SSI and SK Hynix America identified above, are at
2 times referred to herein as “U.S. Defendants.”

3 **C. Agents and Non-Party Co-Conspirators**

4 38. Defendants’ officers, directors, agents, employees, or representatives engaged in the
5 conduct alleged in this Complaint in the usual management, direction, or control of Defendants’
6 business or affairs.

7 39. Defendants are also liable for acts done in furtherance of the alleged conspiracy by
8 companies they acquired through mergers and acquisitions.

9 40. When Plaintiffs refer to a corporate family or companies by a single name in this
10 Complaint, they are alleging that one or more employees or agents of entities within that corporate
11 family engaged in conspiratorial acts on behalf of every company in that family. The individual
12 participants in the conspiratorial acts did not always know the corporate affiliation of their
13 counterparts, nor did they distinguish between the entities within a corporate family. The individual
14 participants entered into agreements on behalf of their respective corporate families. As a result,
15 those agents represented the entire corporate family with respect to such conduct, and the corporate
16 family was party to the agreements that those agents reached.

17 41. Each of the Defendants acted as the agent of, co-conspirator with, or joint venture
18 partner of the other Defendants and co-conspirators with respect to the acts, violations and common
19 course of conduct alleged in this Complaint. Each Defendant or co-conspirator that is a subsidiary of
20 a foreign parent acted as the United States agent for DRAM and/or DRAM Products made by its
21 parent company.

22 42. Various persons, partnerships, sole proprietors, firms, corporations, and individuals
23 not named as Defendants in this lawsuit, and individuals, both known and unknown, participated as
24 co-conspirators with Defendants in the offenses alleged in this Complaint, and performed acts and
25 made statements in furtherance of the conspiracy. Plaintiffs reserve the right to name some or all of
26 these persons and entities as Defendants at a later date.

1 **IV. INTRADISTRICT ASSIGNMENT**

2 43. Pursuant to the Northern District of California’s Civil Local Rule 3-2(c), the
3 intradistrict assignment should be to the San Francisco Division. This action arises in San Francisco
4 because a substantial part of the events giving rise to these claims occurred in San Francisco County.
5 Michele Jones, a resident of San Francisco and named plaintiff, purchased products containing
6 DRAM in San Francisco County.

7 **V. DESCRIPTION OF DRAM**

8 **A. What is DRAM?**

9 44. DRAM is one of the most common forms of semiconductor memory. DRAM is used
10 to store bits of data in capacitors, which are situated within integrated circuits. DRAM is widely
11 used in digital electronics, such as in mobile phones, PCs and servers, tablets, TVs, cameras, and also
12 in industrial applications, such as in automotive, military and aviation devices.

13 45. “RAM” or “Random Access Memory” is the memory or information storage in a
14 computer that is used to store running programs and data for the programs. Data (information) in the
15 RAM can be read and written quickly in any order. Normally, the RAM is in the form of computer
16 chips, such as DRAM. The “D” in DRAM stands for “dynamic,” meaning that it is a dynamic form
17 of RAM that must have its storage cells refreshed or given a new electronic charge every few
18 milliseconds, or data contained in the DRAM will be lost.

19 46. DRAM is a stand-alone product. In other words, it must be inserted into a device,
20 such as a laptop or a mobile phone, to serve any function:
21
22
23
24
25
26
27
28



1
2
3
4
5
6
7
8
9
10
11
12 47. Because DRAM has no independent utility, the value of, and thus, demand for DRAM
13 is driven by the demand for products that need volatile (or dynamic) memory.

14 **B. How is DRAM Manufactured?**

15 48. Defendants manufacture DRAM in fabrication plants (commonly called “fabs”).
16 Defendants manufacture DRAM at their fabs in Korea and China.

17 49. DRAM is made from silicon wafers. To make DRAM, silicon wafers are cut into
18 individual chips called “dice.” The dice are printed with electronics, and are then considered
19 complete. Capacity for DRAM is often discussed in terms of new “wafer starts.”

20 50. DRAM chips are classified into types based on the number of data transfers a chip can
21 process per cycle. DRAM types are most commonly denoted by the term Double Data Rate
22 (“DDR”), and are suffixed by numbers 2-6. For example, DRAM types include DDR3 and DDR4.

23 51. DRAM chips are also sometimes assembled by Defendants (or their contract agents)
24 into DRAM modules, in order to be used in certain DRAM-containing devices. DRAM modules are
25 a packaging option necessitated by, and developed for, the computer segment of the electronics
26 market. A DRAM module is made from DRAM chips, a printed circuit board (“PCB”), and a
27 bonding agent to attach the chips to the PCB. The vast majority of the cost of a DRAM module is the
28 cost of chips. The close relationship between modules and chips is reflected by the price parity

1 between them. At any given time, the price of modules is only slightly above the aggregate price of
2 the loose chips mounted on the PCB.

3 52. DRAM is also classified into categories based on its end-use. For example, PC
4 DRAM is used in PC related products such as in desktop and notebook products. Mobile DRAM is
5 used in mobile devices, such as phones, smartphones, and tablets. Server DRAM is used in server
6 applications, such as workstations and servers. There are other classifications that can be used in
7 consumer devices such as TV, navigation, and digital/video camera devices, among other products.

8 **C. How is DRAM Sold to Direct Purchasers?**

9 53. The vast majority of DRAM is sold by Defendants to Original Equipment
10 Manufacturers (“OEMs”), who then incorporate DRAM into the manufacturing of DRAM-
11 containing products.

12 54. Micron sells some DRAM directly to consumers on its retail website, Crucial.com.

13 55. During the Class Period, approximately 90% of DRAM was sold pursuant to contracts
14 between DRAM buyers and sellers, with the remaining 10% being sold on the spot market.

15 56. Contract prices are negotiated in advance, and specify the quantity of the product that
16 will be delivered by the seller to the buyer over an agreed timeframe. Contracts last approximately
17 two weeks to one month, when they can be renegotiated.

18 57. The spot market is an informal market consisting of intermediaries and vendors that
19 sell DRAM to the white box PC segment,⁴ which is comprised primarily of Chinese manufacturers,
20 unbranded PC manufacturers, and unbranded module makers.⁵

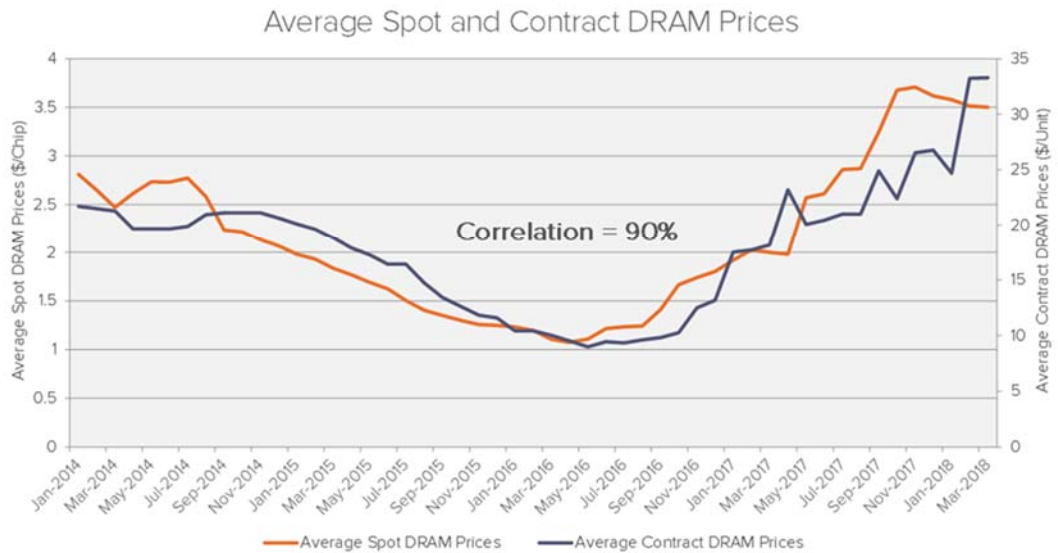
21 58. The spot and contract markets are sufficiently interrelated, with contract pricing being
22 pegged to the spot price. Spot market pricing serves as an important benchmark for contract
23 negotiations with OEMs. As subscribers to these services, each day, Defendants received these lists
24 (before the general public), and used them as the benchmark for negotiating prices with contract

25 _____
26 ⁴ A white box is a PC or server without a well-known brand name. It applies to systems
27 assembled by small system integrators and to home-built computer systems assembled by end users
28 from parts purchased separately through a retail channel.

⁵ A module is a circuit board that contains DRAM integrated circuits that are installed into the
memory slot on a computer motherboard.

1 customers. Therefore, when Defendants agreed to limit competition for the supply of DRAM, their
 2 conduct affected not just the spot price for DRAM but contract prices as well. As a result, contract
 3 prices and spot prices follow each other closely.

4 **Contract and Spot Price Correlation**

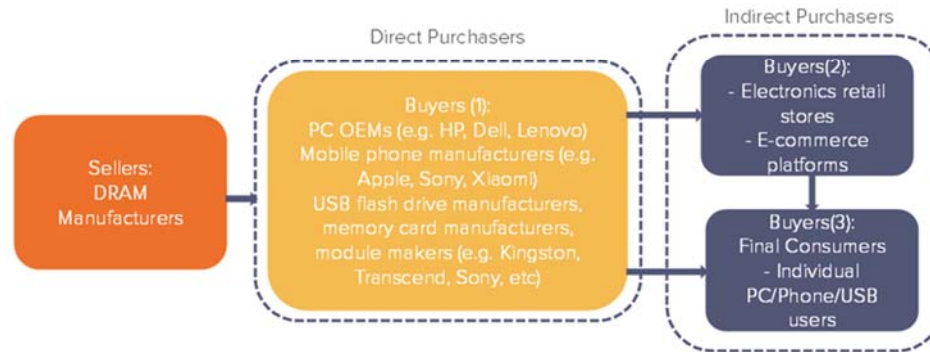


15 **D. How is DRAM Sold to Indirect Purchasers?**

16 59. Direct purchasers of DRAM use DRAM in products that they manufacture, including
 17 computers and mobile phones. Final goods with embedded DRAM, such as laptops and phones, are
 18 then sold on to indirect purchasers of DRAM. The chart below sets forth an example of how DRAM
 19 is sold to indirect purchasers:

DRAM Supply Chain

- The majority of DRAM manufacturers sell to direct purchasers on a contract basis (i.e. based on contract price)
- Final goods with embedded DRAM (e.g. laptops, phones, etc.) are then passed over to indirect purchasers



VI. DEFENDANTS CONSPIRED TO RESTRAIN COMPETITION FOR SALES OF DRAM

A. Prior to the Start of the Class Period, Defendants Made Independent Supply and Capacity Decisions, Leading to Declining DRAM Prices

1. Between August 2014 and May 2016, competition between Defendants caused DRAM prices to decline

60. Between May 2014 and August 2014, the average spot price for DRAM ranged between \$2.50 to \$2.70 per chip.

61. Between August 2014 and May 2016 (just prior to the start of the Class Period on June 1, 2016), the three Defendants responsible for nearly all DRAM supply competed by, among other things, seeking to increase their own market share at the expense of their competitors. This competition led to supply exceeding demand such that prices for DRAM were in decline. This price competition gave Defendants a strong motive to collude.

62. For example, between May 2014 and August 2014, average spot prices for DRAM were between \$2.50 and \$3.00 per chip. Those prices went down month-by-month, and, by May 2016, average DRAM spot prices had fallen to \$1.00 per chip.

63. Between August 2014 and May 2016, prices for the most common types of DRAM – DDR3 and DDR – all declined steadily and precipitously. Average spot prices for DRAM from

1 August 2014 to May 2016 declined by more than 57%. For example, from October 2014 to June
2 2016, the average contact price of DDR3 4GB went down 62 percent, from \$32.75 to \$12.50.

3 **2. Defendants' Supply and Pricing behavior changed abruptly and nearly**
4 **simultaneously at the beginning of the Class Period**

5 64. Prior to the start of the class period, Defendants appeared to engage in vigorous
6 supply and price competition. For example, on July 31, 2014, Samsung, on its second quarter 2014
7 earnings call, emphasized that it would be able to grow supply faster than that of the other
8 Defendants and that this represented an opportunity for Samsung to capture market share: "our bit
9 growth in second quarter was approximately 20% q-on-q and we expect for the third quarter the
10 market DRAM bit growth will come in at high single digit and we will outgrow the market's bit
11 growth. At this point we expect the DRAM market bit growth for 2014 to be low 30%*s* and we
12 expect our bit growth for the year to be high 40%*s*...so while the market demand remains strong, the
13 suppliers weren't able to bring on additional supply much more other than us, and therefore we were
14 in a very good position to capture this opportunity.

15 65. On October 30, 2014, Samsung, on its third quarter 2014 earnings call, announced
16 that its policy in 2015 was grow supply faster than that of its competitors: "***But our basic policy is***
17 ***that our bit growth rate next year should or would have to be higher than the industry. That is our***
18 ***goal.***"

19 66. On January 29, 2015, Samsung, on its fourth quarter 2014 earnings call, assured
20 investors that it could grow supply quickly and take market share from its competitors: "We are
21 expecting about mid 20% bit growth for market growth for DRAM and ***our bit growth we believe***
22 ***will outgrow that of the market growth.***" Samsung also said it had the capacity to increase
23 production and would increase production if it saw shortages or increasing demand: "a shortage in
24 the industry would be great news...we will have signs to indicate a shortage coming forward, and so
25 if we do see such signs such as the economy picking up or orders for other components picking up, ***I***
26 ***think that we will find a way of capturing any shortage opportunities if they do materialize.***"
27 Samsung emphasized that it intended to continue to outgrow the industry "so the main reason why
28 we are planning and expecting to outgrow the industry is because we have better productivity

1 compared to our competitors based on our technology leadership in terms of the manufacturing. That
2 is the main reason why we're expecting to outgrow the industry.”

3 67. Throughout 2015, Samsung repeatedly told the industry it was sticking to its plan of
4 outgrowing the market. On October 29, 2015, Samsung, on its third quarter 2015 earnings call,
5 reported that it had successfully executed its plans of outgrowing the market: “And for 2015 DRAM,
6 we expect the market growth to be low to mid 20% and our bit growth for the year will low 30%.”

7 **a. Samsung in 2016 responded to Micron’s invitations, changed its behavior,
8 and stopped growing supply in an attempt to take market share.**

9 68. On November 17, 2015, Micron’s CFO, Ernie Maddock, at the UBS Global
10 Technology Conference, forecast that Micron’s competitors would make some “really rational
11 decisions” involving “lower supply growth” and no “significant DRAM capacity expansion.”

12 69. Again on December 22, 2015 at the first quarter 2016 earnings call, Micron’s CEO,
13 Mark Durcan, emphasized that the “DRAM industry consist[s] of only three technology developers.”
14 He suggested that Micron could “envision a future in which no additional DRAM wafer capacity is
15 required.” Micron forecast bit growth rate for 2016 in the low 20% range. Micron’s comments
16 represented an invitation to its competitors to stop adding significant wafer capacity – a suggestion
17 that Samsung subsequently responded to by ceasing to take market share.

18 70. On January 29, 2016, Samsung, at the fourth quarter 2015 earnings call, responded to
19 Micron’s invitations by forecasting that it was growing in line with the market for the coming year:
20 “For 2016, for the whole year, the DRAM market bit growth, we expect mid-20%, and our bit
21 growth is expected to grow align with the market.” Samsung’s forecast growth rate matched that
22 proposed by Micron several weeks earlier. Samsung stated that it was going to focus on profitability
23 rather than market share in 2016: “And we will be able to grow our supply, we're planning, at market
24 growth levels. *This year our main focus will be on profitability rather than increasing volume.* So
25 our main approach this year on the DRAM side is to maintain our leadership and also continue an
26 operation that is sustainable and profitable.”

27 71. On May 25, 2016, just prior to the start of the conspiracy period, Micron CEO, Mark
28 Durcan, at the J.P. Morgan Global Technology Media & Telecom Conference, stated that in 2014,

1 Samsung “added some wafer probably more than they in retrospect would have.” Durcan claimed
2 that while he did not “think the intention was to oversupply the market,” it caused the “market [to
3 become] out of balance.”

4 72. On October 27, 2016 Samsung announced on its quarterly earnings call that its bit
5 growth for 2017 will be in line with “market bit growth” and that “as we have always mentioned,
6 regarding DRAM, *our focus is not to increase our market share but to maximize our profits*. And
7 so our investments as well as production will also be flexibly managed according to how the market
8 unfolds.”

9 73. In December 2016, with DRAM prices rising, Micron twice affirmed that Samsung
10 had changed its behavior. On December 7, 2016, Micron Senior Vice President and Chief Financial
11 Officer, Ernie Maddock, publicly stated at the Barclays Technology Conference that when it added
12 DRAM capacity in 2014, that was the last time “supply came into the industry and that there was a
13 new fab that was brought online by one of our competitors [Samsung].” Mr. Maddock lamented that
14 those capacity additions had put “pricing pressure on the [DRAM] business” but that things were
15 now different because “with the absence of capacity additions” in 2016 “now you're back into this
16 fundamentally healthier period.”

17 74. And, on December 21, 2016, Micron, on its first quarter 2017 earnings call, again
18 signaled that the Defendants, including Samsung, had learned their lesson, and that this time – in the
19 midst of the rising prices and steady demand – Defendants would not be adding supply as they did in
20 2014. In answering a question as to why the current period would be different for the industry than
21 what occurred in 2014, Mr. Maddock responded that in 2014 there was a “little bit of a
22 miscalculation by one of the suppliers.” Maddock stated that he understood that Samsung had
23 “learned from” that “miscalculation.”

24 75. By 2017, Samsung had completely reversed its prior pattern of competitively adding
25 market share and had grown market share *less* than its competitors and was not planning to take
26 market share from competitors despite its supply capacity. On October 31, 2017, Samsung stated on
27 its quarterly earnings call that its bit growth for the year would be *below* market that year: “For
28 DRAM, in the third quarter, our bit growth came in high single-digit and our ASP grew high single-

1 digit as well. For the Q4, we expect market DRAM bit growth to be low single-digit and we expect
2 our growth to be similar. That will bring the 2017 market DRAM bit growth to be approximately
3 20% and our bit growth will be mid-teens.” An analyst noted that this was the first year that
4 Samsung had lost market share; Samsung implied it had no plans to try to outgrow the market to take
5 back market share. “Q: this is the first time that Samsung Electronics has lost market share in
6 DRAM? Does it plan to regain its previous market share next year or will you be more trying to
7 maintain where you stand currently? A: It's a bit too early for us to give you specifics about what we
8 plan to do with DRAM, but the current guidance that we can give you is that for next year, *our bit*
9 *growth for DRAM is expected to be at market growth levels.*

10 **b. In 2015, the Defendants grew supply at the same rate as their forecasted**
11 **growth in demand but starting in 2016 Defendants intentionally restricted**
12 **supply so that it grew slower than demand.**

12 76. On September 8, 2015, Ernie Maddock, Micron’s CFO, said at the Citi Global
13 Technology Conference, that DRAM supply and demand would both grow in the mid 20% range for
14 2016: “*we continue to see supply and demand in the DRAM space in relative balance of aggregate*
15 *bit growth in sort of that mid-20% range as we look at 2016...*” Micron reiterated “the way we are
16 thinking about '16 as I mentioned earlier in DRAM is sort of 20% to 30% bit growth by the industry
17 and similar increase in demand.”

18 77. On December 1, 2015, Micron’s CFO, Ernie Maddock said at the Credit Suisse
19 Technology, Media & Telecom Brokers Conference that supply and demand would be balanced in
20 2016: “if you look at the DRAM front based upon what we’ve talked about and the public
21 announcement of our competitors it feels very much like folks are focused on technology transition
22 that has a relatively predictable outcome in terms of bit supplied and as we look at bits demanded
23 which we think for DRAM next year are kind of in the mid-20s, *it doesn’t appear as if there is*
24 *going to be a significant imbalance there.*”

25 78. But, by contrast, Micron repeatedly forecast supply growing slower than demand
26 from the end of 2016 throughout 2017. On December 7, 2016 at the Barclays Technology
27 Conference, Micron’s CFO, Ernie Maddock, forecast supply growing slower than demand: “So as
28 we look at the supply side of the house, somewhat between 15% and 20% supply growth coming

1 from these technology transitions and that is against a demand environment that we think is going to
2 grow somewhere in the range of 20% to 25% on a bip basis.”

3 79. On March 9, 2017, at the Susquehanna Semi, Storage, & Technology Conference, Mr.
4 Maddock again reiterated the same forecast: “*15% to 20% bit growth in supply and 20%, 25% sort*
5 *of intrinsic demand growth.*” And again, on August 7, 2017, Micron’s CEO, Sanjay Mehrotra, at the
6 KeyBanc Capital Markets Annual Global Technology Leadership Forum Conference reaffirmed the
7 same gap between supply and demand and expressly noted the effect on industry fundamentals of
8 this imbalance: “overall bit supply in the industry is in 15% to 20% range. And when you look at the
9 bit supply growth perhaps, may be little bit toward the higher end of that 15% to 20% range. But, the
10 demand projection, again, from all the mega markets that I earlier talked about, point to greater than
11 20% demand for the industry. So, I do believe that for 2017 and heading into 2018 as well, the
12 industry fundamentals will be healthy.”

13 80. As described more fully below, Defendants’ conduct changed at the beginning of the
14 Class Period. Through unlawful coordination, Defendants restrained DRAM supply growth by not
15 adding new wafers, ensuring that DRAM prices rapidly rose as DRAM demand exceeded supply.

16 **B. The Class Period Begins on June 1, 2016, as Defendants Efforts to Coordinate to Ensure**
17 **Capacity Discipline and DRAM Price Increases Began to Bear Fruit**

18 **1. Defendants engaged in concerted signaling to each other through public**
19 **statements and actions in response that effectuated an agreement between**
20 **Defendants to artificially restrict supply growth of DRAM – causing DRAM**
21 **prices to skyrocket**

22 81. During the Class Period, Defendants agreed to delay or slow capacity, or not to
23 expand capacity. This facilitated Defendants’ ability to stop DRAM prices from falling and cause
24 prices to dramatically reverse course. One method Defendants effectuated their agreement was to
25 communicate their shared intentions to limit DRAM capacity through public statements, and each
26 taking actions in response.

27 82. Defendants made statements in earnings calls, press releases, media, or other public
28 documents and monitored each other’s plans.

1 83. Defendants' statements about capacity discipline, limiting production or supply, not
2 increasing supply/capacity, slowing growth in capacity or supply, etc. represented a deviation from
3 past business practices.

4 84. By reassuring each other through these communications, Defendants demonstrated
5 each was committed to maintaining capacity and supply discipline in the midst of steady demand and
6 rising prices – unlike in 2014, and contrary to individual interest to increase market share and short-
7 term profits, Defendants reaped huge profits during the Class Period.

8 85. In fact, Defendants' conspiratorial conduct was tremendously effective in causing
9 DRAM prices to skyrocket from the middle of 2016 to the end of 2017. During this period of time,
10 DRAM spot prices rose nearly 350% – an increase totally unique compared to DRAM's prior pricing
11 history.

12 **2. Defendants' public statements**

13 86. Defendants' public coordination efforts began at the end of 2015 and steadily
14 increased throughout the first half of 2016. In particular, Micron made public invitations for its
15 competitors to stop adding wafer capacity and then to cut supply. Samsung, in response, stopped its
16 efforts to aggressively take market share through additions of wafer capacity. The actions of
17 Defendants were effective in causing DRAM prices to first stabilize and then start to rapidly increase
18 throughout 2016.

19 87. On November 17, 2015, Micron's CFO, Ernie Maddock, at the UBS Global
20 Technology Conference, emphasized to investors that the DRAM industry was characterized by high
21 market concentration with significant barriers to entry: "we do believe that from a market
22 perspective, we're in an environment where you have closely held technology by a very limited
23 number of producers. Micron forecast that its competitors would make some "really rational
24 decisions" involving "lower supply growth" and no "significant DRAM capacity expansion."

25 88. Samsung responded to Micron's invitation to restrict supply growth on January 29,
26 2016, on its fourth quarter 2015 earnings call, stating that in 2016 "we will be able to grow our
27 supply, we're planning, at market growth levels. *This year our main focus will be on profitability*
28

1 ***rather than increasing volume.***” Samsung’s 2016 plan was a change from its actions in 2015 where
2 it had grown supply in an effort to take market share from competitors.

3 89. On March 7, 2016, Micron’s CFO, Ernie Maddock, reassured investors at the
4 Raymond James Institutional Investors Conference that Micron’s competitors were now not
5 competing for market share and were instead focused on profitability: “So the question was that there
6 are Taiwan or Korean entities bidding for share i.e. causing our pricing environment to be different
7 than it otherwise would be. You know, honestly we’re not seeing that. . . . So obviously if you have
8 folks look to the Koreans and if you actually look at some of the public commentary they have made
9 with respect to the business environment they see, the focus on profitability and ***as we look at market***
10 ***behavior it is not consistent with any sort of deliberate attempt to take share***, but so that’s what we
11 are seeing.”

12 90. On March 30, 2016, Micron’s CEO, Mark Durcan, at the second quarter of 2016
13 earnings call, in response to investor analyst questions about potential supply cuts, publicly stated
14 that Micron would be willing to cut supply if its competitors also cut supply: “Q: Pricing is going to
15 continue to be weak until Micron and the DRAM industry overall cuts production. So, I guess, my
16 question is, what will it take for that to happen? A: We don’t have any plans that cut production to
17 date. ***Q: I mean is your point that it’s got to come from the market share leader first? A: ... we***
18 ***think we’d be foolish to be the first ones to take capacity off.***” Micron’s CFO further confirmed that
19 Micron would not unilaterally cut production: “***it’s a really ill-advised move to be unilaterally***
20 ***cutting production.***” On the same call, Mr. Durcan emphasized that Micron would not try to take
21 market share from its competitors: “***Our focus isn’t on market share.*** Our focus is on making sure
22 that we’ve deployed equivalent advanced technology, at least equivalent advanced technology to our
23 competitor, so that we’re not incentivizing others to play for market share.” Micron’s statements
24 constituted a clear signal to Samsung and Hynix that while Micron would not unilaterally cut
25 production, if either Samsung or Hynix cut production, Micron would not try to take market share in
26 response, and that is what occurred.

27 91. Samsung, within a month, publicly responded to Micron’s invitation to cut production
28 on its April 28, 2016 quarterly earnings call, stating that its ***bit growth was negative*** for the quarter.

1 Samsung confirmed to an analyst that it was constraining supply increases and would grow at the
2 same rate as competitors: “Q: It seems you have been continuously reducing your investments on the
3 DRAM side. Could you provide your company's outlook on the DRAM growth for this year? A: We
4 don't expect there to be major increases in supply of DRAM in the near future...in terms of full year
5 2016 DRAM shipment we expect to be in line with the market growth.”

6 92. On May 25, 2016, Micron’s CEO, Mark Durcan, stated at the J.P. Morgan Global
7 Technology, Media and Telecom Conference that supply growth for the next year would be around
8 20 percent “as long as nobody adds any incremental DRAM wafers,” and that “if “wafers actually
9 come down as we're starting to hear some equipment suppliers talk about, then it could be mid- to
10 high-teens, in which case that would be more beneficial.” Micron explained that there are only three
11 suppliers in the market, and “*we all are going to either benefit or be hurt by excess supply in the*
12 *marketplace.*” Micron’s CEO stated that he expected “slowing bit growth” in the industry and that
13 he expected Micron and its competitors to maintain discipline: “there's a natural tightening tendency
14 absent, somebody wanting to do something different than that. And so I'm – I actually remain bullish
15 on the long term value, the DRAM business and the actions of the competitors in the marketplace.”

16 93. Notably, on May 26, 2016, the World Semiconductor Council (“WSC”) held its 20th
17 Anniversary Meeting in Seoul, Korea. The meeting was attended by more than 100 CEOs and
18 executives from global WSC members. The conference was led by Sung Wook Park (the CEO of
19 SK Hynix and President of the KSIA). Both Micron and Samsung are members of the WSC, and
20 their top executives may have also attended this meeting of semiconductor leaders, providing a clear
21 opportunity for Defendants’ key executives to communicate directly a few days before the Class
22 Period began, and prices started to rise.

23 94. That same month, in May 2016, with demand remaining steady, DRAM prices began
24 to accelerate upward rapidly.

25 95. On June 16, 2016, Micron’s CFO, Ernie Maddock, reassured investors at the Nasdaq
26 Investors Program Conference that he expected Samsung to not disrupt the industry consensus of
27 constraining supply growth: “Q: The number of players in DRAM has gone down to three today as
28 you mentioned, *how concerned are you that in this new environment Samsung continues to be*

1 *disruptive*...A: at least thus far many of the public comments that have been made, a lot of which
2 have been made by the equipment companies collaborate *this idea that there is a general reduction*
3 *in DRAM CapEx planned by our Korean competitors and that we believe is very consistent with*
4 *other messages that we're hearing in the marketplace.* So am I concerned? We're always
5 concerned. Do we believe that that disruptive behavior is a high likelihood? It just doesn't feel as if
6 that's the case right now."

7 96. *From that month in June 2016, and through the end of 2016, DRAM prices*
8 *increased by 50 percent.* Yet, unexpectedly absent coordination, during this timeframe *each*
9 *Defendants kept supply bit growth restrained by* avoiding adding significant wafer capacity. At the
10 same time, industry participants, led by Micron, began to coordinate for 2017 on a plan of keeping
11 *supply bit growth below forecasted demand growth.*

12 97. On a July 21, 2016 second quarter earnings call, a representative from SK Hynix's
13 Management team stated that its bit growth for the year would be in the low to mid 20 percent range,
14 in line with market growth. Seven days later, on July 28, 2016, Samsung stated a very similar range
15 for bit growth in 2016 on its quarterly earnings call, and that its plans were flexible depending on
16 market conditions.

17 98. On September 8, 2016, Micron executives at the Citi Global Technology Conference
18 reaffirmed the industry consensus for DRAM bit growth as somewhere under 20 percent (perhaps
19 even 15%), which they described as "good" and a "really nice environment." Micron emphasized
20 that neither Micron nor its competitors were adding wafers that would increase available supply,
21 with Micron's CFO reiterating public signals from Samsung and Hynix that they, like Micron, were
22 not adding wafer capacity: "while I would love to tell you that our competitors have sent us a memo
23 telling us what their expansion plans are, unfortunately I can't report that, but certainly we read the
24 same thing that each of you read and it does suggest that the focus of capital spend in 2017 is going
25 to be NAND as opposed to DRAM on the part of many folks in the competitors face. And as I
26 mentioned, *we would expect all of our bit growth to come from technology transition as opposed to*
27 *any sort of wafer expansion.* There have been some pretty dramatic things published which I won't
28 repeat here relative to potentially what's going on with some of our competitors and how they're

1 choosing to use their productive capacity, *but there's no sign anywhere in the market that suggests*
2 *there's a plan to expand DRAM wafer capacity.*” Micron’s CFO strongly reassured investors that
3 Micron had no plans to increase supply despite increasing demand: “Q: And it doesn't look like you
4 guys are changing the supply side from Micron at all with the better demand, right? A: *Well, I mean*
5 *we have basically announced what we intend to do in terms of bit growth and we're sticking to*
6 *that.* And so it would have to be a very, very significant and profound belief that something had
7 materially changed in the demand environment, I think, to cause us to reassess that CapEx plan in
8 any significant way.”

9 99. On an October 4, 2016 fourth quarter earnings call, Micron reaffirmed the industry
10 plan of keeping supply growth between 15-20% through minimal additions of wafers – even as
11 demand growth was forecast between 20-25%. Micron’s CEO, Mark Durcan, stated that “we’ve seen
12 further evidence that DRAM wafer output is declining as a result of lost throughput related to the 20-
13 nanometer and 1X nanometer conversions. Absent some replacement of these wafers, we could see
14 industry supply growth as low as mid-teens in 2017. *As some of lost wafer output is replaced,*
15 *industry supply growth could be in the high-teens percent range. This compares to our long-term*
16 *bit demand growth forecast in the low to mid 20% range.*”

17 100. On an October 27, 2016 quarterly earnings call Samsung affirmed Micron’s public
18 assessment of the market, aligning its own statements regarding supply and capacity plans in 2017
19 with Micron: “given the fact that we haven't done much investments in DRAM this year, we are
20 expecting our growth rates to come down, and be in line with market bit growth in DRAM next
21 year.” Samsung reassured investors that it would not try to compete with its competitors by taking
22 market share: “Once again, as we have always mentioned, regarding DRAM, *our focus is not to*
23 *increase our market share but to maximize our profits.* And so our investments as well as
24 production will also be flexibly managed according to how the market unfolds.”

25 101. As DRAM prices continued to rocket upward through the end 2016 and into the
26 beginning of 2017, Defendants continued to not only make public statements about their own
27 commitment to capacity and supply discipline, *but also the importance of maintaining capacity and*
28

1 *supply discipline within the industry as a whole*, affirming their commitment to a common scheme
2 to limit supply and capacity to drive up prices.

3 102. On November 29, 2016 Micron's CFO at the Credit Suisse Technology Media &
4 Telecom Conference reaffirmed the commitment of the entire DRAM industry to maintaining supply
5 growth below 20% even as demand growth exceeded 20%: "I think a lot of that confidence goes
6 back to the fundamental view of this supply and this demand. With no way for additions, *we [think]*
7 *that you are going to see this supply grow at something less than 20%, and even with some room*
8 *for error on the DRAM with demand side, we still see a number there north of 20%."* Micron was
9 confident that the "industry will do pretty well . . . until we see announcements of new wafers." Like
10 Samsung, Micron reassured investors that it would not add supply in an attempt to compete for
11 market share with competitors: "*our objective is to close the gap [with our competitors] and make it*
12 *as narrow as reasonable without doing anything that would potentially be disruptive to our*
13 *performance or the industry's performance."*

14 103. On December 7, 2016, Micron's CFO, Ernie Maddock, explicitly stated at the
15 Barclays Technology Conference that the absence of wafer capacity additions would allow the
16 Defendants to easily maintain supply growth at 15-20% even as demand grew 20-25%: "we continue
17 to look at the longer term supply demand trends and *in the absence of wafer additions by Micron or*
18 *one of the other industry participants*, we continue to see those as healthy because the technology
19 transitions that we're going through yield progressively fewer incremental [bit]. So *as we look at the*
20 *supply side of the house, somewhat between 15% and 20% supply growth coming from these*
21 *technology transitions and that is against a demand environment that we think is going to grow*
22 *somewhere in the range of 20% to 25% on a [bit] basis."*

23 104. On a December 21, 2016 earnings call for Micron's fourth quarter 2016 results,
24 Micron CEO Mark Durcan reassured investors that Samsung had learned from its miscalculation in
25 2014 of adding supply capacity to meet strong demand and pricing, which was similar to the current
26 situation facing the industry: "*Q: [Do] you have any comments on what is different between the*
27 *previous cycle? A: Well I think that part of what happened in the last latter stages of the last cycle*
28 *where perhaps a little bit a miscalculation by one of the suppliers, but that they probably learned*

1 *from so there is that.*” Despite rapidly rising prices, Durcan stated that Micron “had no plans to add
2 new wafers this year” even though it had “some clean room space” that would allow it to add wafers.
3 Micron’s CEO also confirmed that it was closely monitoring competitors, including through the
4 collection of ‘internal intelligence’ and expected that the industry would maintain its consensus of
5 15-20% supply growth without significant additions of wafers: “Q: you had mentioned around 15%
6 to 20% bit supply growth in DRAM barring any additional supply from competitors. Can you talk a
7 little bit about the -- what you're seeing in terms of the transition to 80 nanometer for some of your
8 competitors? And *is there risk in your mind in terms of additional supply coming online, any*
9 *thoughts on that would be helpful.* A: We don't have great crystal ball as to where our competitors
10 are doing. *We read the same reports that you guys read. All of that plus all the other internal*
11 *intelligence we can generate that baked into our ranges and in the data sheet that we provided. So*
12 *I think there has been some chatter recently potentially about few incremental wafers from one of*
13 *the suppliers. Our view of that is if that were to happen, it's a relatively minor adjustment in terms*
14 *of the overall scope of the bit growth that we're projecting and it would probably not cause us to*
15 *change that range that we've giving you.”*

16 105. On January 10, 2017, at the Needham Growth Conference, Micron’s CFO, Ernie
17 Maddock, further signaled Micron’s confidence that Samsung would not deviate from the industry
18 consensus of restricting supply to ensure it grew slower than demand growth: “Q: Can you talk about
19 [Samsung] and how rational...? A:...I think their comments need to stand on their own *and their*
20 *comment seems to suggest a rational approach to addressing the supply/demand constraints of the*
21 *DRAM market...the world is very different today than it was a few years ago...” Maddock again*
22 reiterated the shared plan of the industry to maintain 15-20% supply growth even as demand grew
23 between 20-25%: “Our review of the DRAM business is *that there will be somewhere between 15%*
24 *and 20% bit supply from Micron and all the other participants in the industry...we think demand*
25 *is going to be...somewhere between 20% and 25%.*”

26 106. On January 24, 2017, Samsung reassured investors on its quarterly earnings call that it
27 had no plans to add wafer capacity and would continue to constrain increases in DRAM supply
28 despite rapidly rising prices: “Q: *I'm a little bit surprised that Samsung is not looking to be a little*

1 *bit more aggressive towards the capacity additions...* If demand continues to be so strong and
2 supply/demand balance remaining tight, *is there some possibility that Samsung can actually boost*
3 *capacity through the year and potentially beat those numbers, just like you did in 2016? A: And*
4 *looking at the current market situation, we believe that we are able to cover the current market*
5 *demand through our technology migration. So that is why we will be maintaining our operation*
6 *flexibly and try to cover the market demand within our technology migration. So, given the size as*
7 *well as the lead time necessary for increase of DRAM capacity, we believe that temporary increase*
8 *of DRAM supply is not very easy.”*

9 107. On a January 25, 2017, SK Hynix *publicly matched the stated plans of its*
10 *competitors* – keeping supply growth below demand growth while not trying to take market share.
11 Specifically, SK Hynix executives stated that the company “believe[s] that throughout the first half
12 of the year supply is not going to meet the demand which remains very strong” and that “the
13 company is planning for a DRAM bit shipment growth that is on par with the market for this year.”
14 This course of action would allow SK Hynix to “maximize profitability.”

15 108. Industry analysts from Sanford Bernstein noted the refusal of the Defendant-
16 competitors to increase supply, with multiple analyst reports on SK Hynix in January 2017
17 identifying, for example, that there is “tighter than expected supply/demand balance for the quarter,”
18 and that given this “we expect this strong pricing environment (especially in DRAM) through mid-
19 2017 at least, as inventory levels are low and supply growth remains relatively muted in both DRAM
20 and NAND. . . . With all players growing bits relatively modestly, we don’t see any pricing
21 collapse.” Goldman Sachs also forecast on January 30, 2017 that DRAM pricing would “increase
22 further in 1H17, driven by a tight supply/demand balance” and that Goldman believed that “the
23 leading DRAM maker, Samsung Electronics (SEC) [would] not become aggressive to gain market
24 share in 2017 given that: (1) SEC’s management is likely to focus more on profitability rather than
25 market share in DRAM due to structural margin pressure on its smartphone business.”

26 109. As prices and margins continued to accelerate among Defendants upward, Micron’s
27 CFO strongly reiterated on March 9, 2017 at a Susquehanna Semi, Storage & Technology
28 Conference Call, that Micron had no “plan to add [DRAM] wafers in any form” and would not be

1 attempting to increase its market share. Micron also stated that its competitors were in agreement
2 that they would not add capacity in an effort to take market share from each other: “But at the end of
3 the day, it has typically not been Micron who has expanded industry capacity when the margin
4 profile upgrade... *all of the statements and all of the actions thus far suggest the things may*
5 *indeed different in terms of how the participants are thinking about, the balance of profitability*
6 *versus market share.”* Micron also stated that it would “provide maximum benefit to the Company”
7 to be “public about the fact that we have no current plan to add wafer capacity.”

8 110. On March 23, 2017, Micron’s CEO, Mark Durcan, reiterated on the second quarter
9 2017 earnings call that Micron and its competitors, in contrast to previous cycles, were continuing to
10 constrain supply growth in the face of healthy demand: “We also see that the supply, as best we can
11 tell, seems in control relative to demand. And I think, if you think about this cycle versus last cycle,
12 what you saw -- what you saw last cycle was a big chunk of supply come off with the Hynix fire and
13 the reaction with more supply to replace it and so maybe a little less stability than we're seeing this
14 time around.” Durcan also reassured investors that Samsung’s behavior had changed from previous
15 cycles and that there was no reason for Samsung to lower the industry’s profitability by adding wafer
16 capacity: “*Q:...People are obviously worried about Samsung adding a bunch of wafers. Why*
17 *would that not happen this time?...But what's your base assumption for what the competition will*
18 *do sort of in terms of bit growth this year? A:* Again, I think the last cycle was a little different with
19 that instability in supply created by the Hynix fire. *I don't know why they would intentionally repeat*
20 *the mistake from last cycle. They probably are enjoying making good margins...* Samsung is
21 actually probably on the low end over the next couple of years relative to what's going on in the
22 industry as a whole. And the industry as a whole is probably a little bit south of where we think
23 demand growth is.”

24 111. On March 23, 2017, Micron also reiterated an industry-wide forecast of bit supply
25 growth between 15-20% and demand growth between 20-25%: “It's still, in our view, it's 15% to
26 20% supply growth this year, could actually be less than that if there's less new wafers than we have
27 in our plan. Demand is still 20% plus.” An investment analyst asked if Micron would add wafer
28 capacity because of “such strong pricing out there in the market.” Micron’s CEO, Mark Durcan,

1 responded that it indeed had the space to add wafer capacity in its manufacturing centers in the face
2 of strong demand but still insisted that Micron would not add supply – maintaining the industry
3 consensus: “*We're not focused on adding more supply... We do have white space in both our Fab*
4 *16 in Taichung as well as Fab 10X, but we're not planning any capacity additions this year.*”

5 112. On April 25, 2017, an investment analyst specifically asked SK Hynix on its first
6 quarter 2017 earnings call if it had plans to expand its supply growth above the 20% rate that
7 matched the supply growth range of Micron and Samsung. SK Hynix acknowledged its capacity to
8 potentially grow supply faster but said its current projection of 20% growth remained its plan for
9 2017: “Q: I believe you’re saying in line with the market about 20%... is there any possibility [for
10 DRAM bit growth] to go higher than that 20% mark...?A: the current projection for about 20% level
11 growth is also based on the assessment of...all of the factors”

12 113. On April 27, 2017, Samsung again forecast on its quarterly earnings call that for 2017
13 “we expect DRAM market bit growth to be high-teens and we expect to grow in line with the
14 market.” Samsung also reaffirmed that it would not add wafer capacity in the face of investor
15 questions about its plans, stating that “*we have no plans of additional capacity.*” Samsung did note
16 that it could change its DRAM capacity “depending on the market situation that unfolds.”

17 114. On May 24, 2017, Micron’s CFO, Ernie Maddock, reassured industry analysts at the
18 **JP Morgan Global Internet, Media and Technology Brokers Conference** that Micron and its
19 competitors – unlike previous years – were being careful not to add supply: “if you listen to the
20 commentary coming from industry participants on the supply side it reflects a great deal of discipline
21 and thoughtfulness with respect to how the industry participants are considering supply expansion...
22 Although we don't speak for the industry, the other participants have spoken and indicated a great
23 deal of discipline.”

24 115. At the same event, Micron made announcements on supply growth that matched those
25 of its competitors the previous month and affirmed the industry consensus of growing supply 15-
26 20%: “*on the DRAM side you're going to see somewhere between 15% and 20% growth in bits*
27 *supplied, that's something that the other suppliers in the market are also saying, within reasonable*
28

1 *range.*⁶ Micron emphasized that its plans to not add wafer capacity in 2017 were consistent with
2 that of Samsung and SK Hynix and would allow each participant to maintain supply growth between
3 15-20%: “Q: their view was, exiting this year, industry capacity is probably flat. And I don't know *if*
4 *you have a view on total industry capacity dynamics, and your sense of where that could be exiting*
5 *this year? A: I think that's reasonably consistent with certainly what we've said about our intent,*
6 *and then certainly the public comments of the other industry participants have been pretty much*
7 *exactly that.* That while you do get some wafer loss as a result of technology transitions, the intent
8 that we have is to maintain flat wafer outs, so essentially you are adding a little bit of capacity to
9 make up for those lost wafer outs, but as an industry as a whole, you are not adding substantial
10 incremental industry wafers and that would contribute to or allow you to get into this 15% to 20%
11 range in terms of bit growth.”

12 116. On June 6, 2017, Micron's CFO, Ernie Maddock, yet again reiterated at the Bank of
13 America Merrill Lynch Global Technology Conference that the industry was systematically keeping
14 supply growth constrained at 15-20% even as DRAM demand grew 20-25% on a yearly basis: “So,
15 on DRAM, we have been saying for some time that we thought that from a demand perspective, that
16 demand was going to be somewhere in the range of 20% to 25% year-on-year bit growth. And in
17 fact, we feel that's a reasonable estimate to use for the next few years at least out as far as we would
18 think about and model the business. And then from a supply side, we think that even with some very
19 modest wafer additions by the industry essentially keeping wafer output flat in the face of declining
20 bits coming simply from technology transition that aggregate bit growth from a supply point of view
21 is going to be somewhere in the range of 15% to 20%.” Maddock emphasized that the three industry
22 participants who controlled the market could maintain this supply shortfall if they remained
23 disciplined about not adding supply: “it feels as very much as if you'll have good balance between
24 supply and demand as long as capital discipline is exercised. And *certainly Micron has indicated the*
25 *difference to be reasonably disciplined with its capital investments, and other industry competitors*
26

27 ⁶ **Micron Technology's (MU) Management Presents at JP Morgan Global Internet, Media**
28 **and Technology Brokers Conference**

1 *in their particular public disclosure have said similar things.*” Micron’s comments in response to
2 questions explicitly suggested interdependent action where each of the three DRAM suppliers agreed
3 not to add supply capacity despite rapidly increasing DRAM prices: “Q: Maybe another way looking
4 at the overall of the DRAM industry today's margins very high, so that could be sort of the
5 temptation for your competitors because this is borrowing cost very low, right...don’t you expect
6 any competitors tend to irrationally backing on the better, cyclical momentum? A: *I can say our
7 view of industry bit demand will have to be materially different than in the peers to be today to
8 begin to have a think about expanding capacity* well beyond where we are thinking today which is
9 predominantly to get that capacity through technology transition... *I don't think our view of how we
10 look at the industry is very-very different then how other rational smart people sitting and other
11 competitors tend to look at the industry.*”

12 117. On June 8, 2017, Micron’s CFO, Ernie Maddock, again reaffirmed at the Robert W.
13 Baird Global, Consumer, Technology that each of the three DRAM manufacturers were refusing to
14 add wafer capacity in the face of rapidly rising DRAM prices: “[T]here has actually been much more
15 disciplined behavior on the part of the remaining industry participants, of which there are now only
16 3, it's Micron, Samsung and Hynix. And so while each of us is assessing the market, looking at the
17 market, *I think there's great consistency between suppliers relative to our view of market growth
18 opportunities on the demand side. And what you see being exercised today is disciplined
19 investment around expansion of capacity relative to expansion of demand.* And each one of us has
20 made our own independent comments on what we think makes sense for our particular company. In
21 Micron's case, we said that we have no plans for additional new wafer fab capacity that we will get
22 the bits that we require to serve the market from technology transitions.”

23 118. Throughout this quarter, DRAM prices continued to rapidly rise. Yet, the supply
24 discipline remained strong as each of the Defendants kept supply growth below demand growth, only
25 further fueling the price increases. The competitors also *publicly reassured each other that they
26 would avoid competing against each other for market share.*

27 119. On June 29, 2017, Micron on its third quarter 2017 earnings call reaffirmed that the
28 total DRAM industry bit growth “*would be between 15-20%....below our view of demand growth*”

1 despite rapidly rising DRAM prices. Micron then strongly reiterated that it had no plans to add wafer
2 capacity. Micron's investors even questioned Micron's CFO closely on whether its plans to limit
3 supply growth would not cause a loss of market share that led to profit loss: "Q: Could you help us
4 just kind of frame, is there enough sort of mix up opportunity during the first half '18 where even
5 though you might be losing some bit share, you might not be losing sort of profit share in the
6 industry? A:..we talked about our bit growth in context of an industry that we were estimating. But
7 we also used the words at or slightly below, not materially below."

8 120. On July 25, 2017, Hynix told investors on its second quarter 2017 earnings call that
9 its DRAM shipment growth for the year would be "at low 20%, on par with the market."

10 121. Samsung, two days later on July 27, 2017, stated that it too was forecasting its bit
11 growth to be in the high teens, and that Samsung expected "our bit growth to be in line with the
12 market." Samsung reassured investors that it would not disrupt the industry by adding DRAM
13 capacity in an attempt to fight for market share: "Next year, we are considering possibly converting
14 some of the NAND capacity to DRAM, but the actual timing or size of that will depend on the
15 market situation that unfolds next year. *As we have always emphasized in the conference calls, we*
16 *will refrain from, for example, increasing market share, fighting on volume.* We manage our
17 business with a profitability focus. And so, we will flexibly manage our capacity by very closely
18 monitoring the market situation, as well as the supply and demand balance." Samsung's statements
19 represent a change in behavior from its prior practice in 2014-2015 of competitively adding supply in
20 an attempt to take market share from competitors.

21 122. Micron's CEO, Sanjay Mehrotra, within two weeks of the public comments of
22 Samsung and Micron, confirmed on August 7, 2017, at the KeyBanc Capital Markets Annual Global
23 Technology Leadership Forum Conference that each of the three competitors were taking the same,
24 interdependent approach to bit supply growth – maintaining it below 20% even as demand growth
25 exceeded 20%: "Q: Have you -- either of you've seen any changes in the market with respect to
26 recent commentary and related to what Samsung or Hynix said on the earnings calls in terms of bit
27 supply that would be of any concern or CapEx plans that would be of any concern? A: *I think*
28 *overall bit supply in the industry is in 15% to 20% range.* And when you look at the bit supply

1 growth perhaps, may be little bit toward the higher end of that 15% to 20% range. But, *the demand*
2 *projection, again, from all the mega markets that I earlier talked about, point to greater than 20%*
3 *demand for the industry*. So, I do believe that for 2017 and heading into 2018 as well, the industry
4 fundamentals will be healthy.” Micron’s CEO also emphasized that Micron, Samsung, and Hynix
5 controlled 95% of the DRAM market: “95% of the industry is supplied by three players, and Micron
6 has a solid position in the DRAM industry. So, that’s a great position to be in.”

7 123. On September 6, 2017, Micron’s CFO, Ernie Maddock, reassured investors at the Citi
8 Global Technology Conference, that industry consolidation over the last several years allowed
9 Micron and its competitors to exercise mutual discipline over supply growth: “I do think
10 *consolidation has been very instrumental in having a disciplined and orderly expansion of supply*.
11 We have certainly seen that now over period of a couple of years and we expect based on everything
12 that we can see that you're going to continue to have a disciplined expansion of supply as we look
13 forward into fiscal '18 for Micron.” Maddock emphasized a shared, publicly stated desire among
14 Micron, Samsung, and Hynix to keep wafer capacity flat: “*if you listen to the public commentary of*
15 *the industry participants, the key message across the Board is that the investments are mainly for*
16 *technology transition with the desire to keep wafer starts roughly flat*.” Maddock was clear that
17 keeping wafer capacity flat would allow Micron, Samsung, and Hynix to keep supply growth below
18 demand growth: “this will allow the industry to *grow bits at this 20% plus or minus range* over the
19 course of any given year and certainly that feels very well matched to what we believe the demand to
20 grow from a supply point of view, which is in the 20% to 25% range.”

21 124. On September 27, 2017, Micron reassured investors on the fourth quarter 2017
22 earnings call that it expected the “industry to remain moderately undersupplied for the rest of 2017
23 for...DRAM.” Micron’s CFO, Ernie Maddock, told investors that it would not grow its supply
24 capacity faster than that of industry participants and thus would maintain the industry consensus: “Q:
25 [A]t what point, do you think you begin to start to outgrow bits relative to the industry for [DRAM]?”
26 A: I would also tell you that our objective over a multiyear period is to grow at about industry
27 levels... *really important is the segment that we intend to grow aligned with industry* over the
28

1 course of these multiyear periods.” Despite undersupply in the DRAM market, Micron stated that it
2 intended for its DRAM bit growth for 2018 to “be slightly below the industry growth rate.”

3 125. SK Hynix, less than a month later on October 16, 2017, also told investors on its
4 quarterly earnings call that the DRAM market was in a state of undersupply and that SK Hynix
5 would not be able to quickly ramp up wafer capacity to satisfy this undersupply in the market. SK
6 Hynix also told investors that it intended to grow its DRAM capacity in 2018 in line with the market.

7 126. Samsung, on October 31, 2017, told investors on its quarterly earnings call that it was
8 actually adding less DRAM capacity than previously planned despite rapidly rising prices because
9 “our basic approach to DRAM capacity management is that we will flexibly manage our capacity
10 especially depending on the market situation for each product.” Samsung emphasized that for the
11 year Samsung’s DRAM bit growth for the year had been *below* the industry, stating that “2017
12 market DRAM bit growth [will] be approximately 20% and our bit growth will be mid-teens.”

13 127. Throughout this period, Samsung had the highest market share in the DRAM industry.
14 Richard Posner recognized that “declining market shares of leaders” is a plus factor potentially
15 indicative of cartel conduct.⁷ Samsung acknowledged on October 31, 2017 that it had lost market
16 share that year but stated that it would not seek to regain market share by growing supply more
17 rapidly than the market: “Q: this is the first time that Samsung Electronics has lost market share in
18 DRAM? Does it plan to regain its previous market share next year or will you be more trying to
19 maintain where you stand currently? A: It's a bit too early for us to give you specifics about what we
20 plan to do with DRAM, but the current guidance that we can give you is that for next year, our bit
21 growth for DRAM is expected to be at market growth levels.

22 128. Through the end of 2016, DRAM prices began to rapidly increase. By February 2017,
23 DRAM spot prices had nearly doubled since their low in the spring of 2016. Throughout this period,
24 Micron assured investors that Samsung and the other Defendants would not repeat the actions from
25 the previous years, particularly in 2014, and add significant new DRAM capacity in the face of
26 steady demand and rising prices.

27
28 ⁷ See Richard A. Posner, *Antitrust Law*, 79-93 (2d Ed. 2001).

1 **3. Throughout 2017, Defendants repeatedly reassured each other that, unlike in**
2 **previous periods, each would not respond to rising prices and strong demand**
3 **with increased supply growth. Instead, the Defendants would stick with their**
4 **publicly announced plans to keep supply growth below demand growth by not**
5 **adding wafer capacity and not seeking to take market share from each other**

6 129. On March 9, 2017, Micron’s CFO, Ernie Maddock, told investors at the Susquehanna
7 Semi, Storage & Technology Conference, that that Micron had no “plan to add [DRAM] wafers in
8 any form” and would not be attempting to increase its market share and that it would “provide
9 maximum benefit” to Micron to be “public about the fact that we have no current plan to add wafer
10 capacity.” Maddock alleged that its competitors shared the same approach of not growing supply in
11 an effort to take market share, stating “*all of the statements and all of the actions thus far suggest*
12 *the things may indeed differ in terms of how the participants are thinking about, the balance of*
13 *profitability versus market share.*”

14 130. Throughout most of 2017, Defendants strongly assured investors that each of the
15 Defendants was taking the same shared approach. For example, on June 8, 2017, with DRAM prices
16 having risen 20% in the last month, Micron’s CFO told investors at the Robert W. Baird Global
17 Consumer, Technology & Services Conference that “[T]here has actually been much more
18 *disciplined* behavior on the part of the remaining industry participants, of which there are now only
19 3, it's Micron, Samsung and Hynix. And so while each of us is assessing the market, looking at the
20 market, I think *there's great consistency between suppliers* relative to our view of market growth
21 opportunities on the demand side. And what you see being exercised today is *disciplined investment*
22 *around expansion of capacity relative to expansion of demand.*” And on July 27, 2017, Samsung
23 assured investors on its quarterly earnings call that it would not try to take market share from its
24 competitors: “*As we have always emphasized in the conference calls, we will refrain from, for*
25 *example, increasing market share, fighting on volume.*”

26 131. Even as DRAM prices continued to rise throughout 2017, the Defendants stuck to
27 their common plan of not adding wafer capacity even though each had space to add such supply to
28 meet the strong demand. For example, on September 6, 2017, Micron’s CFO, Ernie Maddock, at the
29 Citi Global Technology Conference, emphasized a shared, publicly stated desire among Micron,
30 Samsung, and Hynix to keep wafer capacity flat: “*if you listen to the public commentary of the*

1 *industry participants, the key message across the Board is that the investments are mainly for*
2 *technology transition with the desire to keep wafer starts roughly flat.”*

3 132. Micron’s CEO, Sanjay Mehrotra, reaffirmed on November 28, 2017 at the Credit
4 Suisse Annual Technology, Media & Telecom Conference that the industry-wide approach of not
5 adding significant wafer capacity and keeping supply growth below demand growth: “For fiscal year
6 ’18, what we have said is, industry supply that growth 20%...while the demand trends I believe will
7 continue to be somewhat stronger than that”...“there may be some wafer capacity additions [in the
8 industry] but they will remain relatively small.”

9 133. Micron’s CFO confirmed on December 6, 2017 at the Nasdaq Investor Conference
10 that the industry planned to keep wafer capacity flat for several years despite rapidly rising DRAM
11 prices: “We are not adding wafers for either technology in 2017. I think if you look at the public
12 comments of other suppliers they are adding marginal numbers of wafers. But *essentially if you look*
13 *at the industry in aggregate even at the end of 2018 it's altogether possible for DRAM that the*
14 *number of wafers the industry produces is the same or slightly less than it was some years ago.”*

15 Micron’s CFO flatly stated that Micron and its competitors shared a common agreement to constrain
16 DRAM supply: “*if you look at the public commentary of all the industry participants...I think*
17 *there is a general belief that the industry participants are keenly aware of the fact that the DRAM*
18 *market is relatively inelastic and the way you serve that market is by making sure there is*
19 *adequate, but not excess supply.”*

20 **C. End of Conspiracy: Once Chinese Investigation was Announced, Defendants’ Conduct**
21 **Changed Abruptly**

22 134. DRAM prices continued to climb, and then abruptly stopped in early 2018, just after
23 China’s antitrust regulator, the NDRC, announced that it had begun an investigation into the DRAM
24 industry due to the noticeable and sharp rise in the price of DRAM over the 18-month period from
25 June 2016 to December 2017.

26 135. On December 27, 2017, a *Reuters* article reported that China’s NDRC was
27 investigating possible price-fixing in the DRAM market. Reuters reported that the investigation was
28 looking into possible coordinated action taken by “a number of firms to gain maximum profits by

1 pushing the price of the product as high as possible. A ‘super cycle’ of tight supply and soaring
2 demand for memory chips, which power servers and smartphones, has been driving up prices and
3 profits at chipmakers such as Samsung Electronics Co., Ltd. And SK Hynix, Inc. which control the
4 lion’s share of the global market.”

5 136. As Xu Xinyu, an official with the Pricing Supervision Department of China’s NDRC
6 put it: “We have noticed the price surge and will pay more attention to future problems that may be
7 caused by ‘price fixing’ in the sector.” Xu Xinyu referred to “coordinated action taken by a number
8 of companies, pushing the price of the product as high as possible to gain maximum profits.”

9 137. On February 1, 2018, it was reported that the NDRC and Samsung signed a
10 Memorandum of Understanding that would result in moderations to the price increases of DRAM in
11 2018.

12 138. In April 2018, Hynix publicly announced that it was adding wafer capacity by 6-7%
13 per year in order to meet demand growth. This addition of wafer capacity was a change in practice
14 from the Class Period where the Defendants artificially constrained the growth of wafer capacity in
15 order to inflate the price of DRAM.

16 139. Defendants’ illegal behavior, alleged herein, artificially stabilized and raised the
17 prices of DRAM during the Class Period. As a result, DRAM prices were higher than they would
18 have been absent the conspiracy. The rise in DRAM prices, however, cannot be legitimately
19 explained away by the economics of the market. Leading up to and during the Class Period, costs
20 remained low or stable and there were not technological or other impactful events, such as
21 unexpected growth in demand, that would explain the extraordinarily high prices for DRAM during
22 that time.

23 **VII. THE STRUCTURE OF THE DRAM INDUSTRY IS CONDUCTIVE TO CONSPIRACY**

24 140. The structure and characteristics of the DRAM market are conducive to cartel
25 behavior, and have made collusion particularly attractive in this market. The DRAM market has all
26 of the hallmark features that are found in highly-cartelized markets, including: (1) DRAM is a
27 commodity product; (2) the DRAM market is highly concentrated; (3) the DRAM market has high
28 barriers to entry; (4) demand for DRAM is inelastic; and (5) the DRAM market experienced steep

1 price increases during the Class Period, without any legitimate economic reason for those increases,
2 such as increasing costs. There was also an ease of information sharing amongst Defendants through
3 the industry reporting mechanism DRAMeXchange, as well as opportunities for Defendants to
4 directly communicate and collude through common participation and leadership roles in trade
5 associations and other industry groups.

6 **A. DRAM is a Commodity Product**

7 141. In economics, a commodity is a basic item or good used in commerce that is
8 interchangeable with other goods of the same type. Commodities are most often used as inputs in the
9 production of other goods or services. Examples of traditional commodities are sugar, wheat, and
10 rubber. As technologies for markets and goods mature, a product is more likely to be considered a
11 commodity, at least in its more basic implementations.

12 142. DRAM is a commodity. DRAM has been described as “like milk or bread,” and that
13 it “varies little from manufacturer to manufacturer.”

14 143. Markets for commodity products are conducive to collusion. Typically, when a
15 product is characterized as a commodity, competition is based principally on price, as opposed to
16 other attributes such as product quality or customer service. This factor facilitates coordination
17 because firms wishing to form a cartel can more easily monitor and detect defections from a price-
18 fixing agreement where any observed differences in prices are more likely to reflect cheating on the
19 conspiracy than any other factor which might affect pricing, such as special product characteristics,
20 service or other aspects of the transaction.

21 144. The commodity nature of DRAM is aided by industry-standard product specifications.
22 The different sizes and classifications of DRAM are well known and easily quantifiable. Therefore,
23 DRAM can be purchased and sold in large volume quantities by manufacturers and distributors
24 based on common size and technology characteristics. Indeed, manufacturers and distributors
25 maintain very detailed product catalogs and substitution guides (sometimes called cross-reference
26 guides) that outline rules for swapping out DRAM made by other Defendants based on their common
27 characteristics.

1 **B. The DRAM Market is Highly Concentrated**

2 145. Market concentration facilitates collusion. Collusive agreements are easier to
3 implement and sustain when there are only a few firms controlling a large portion of the market.
4 Practical matters, such as coordinating cartel meetings and exchanging information, are much
5 simpler with a small number of players. Moreover, this high degree of control also simplifies
6 coordination because there is little outside competitive presence to undermine the cartel, and it is
7 easier for cartel participants to monitor each other's actions related to supply and pricing. Also, with
8 fewer firms in the market, the bump in transitory profits that could be achieved by undercutting the
9 cartel price and gaining an increase in transitory market share would be outweighed by the greater
10 long-term market share for a colluding firm in a concentrated industry.

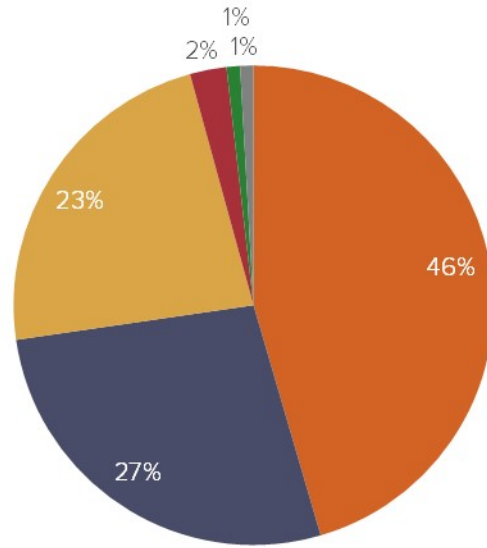
11 146. By contrast, if an industry is divided into a large number of small firms, the current
12 gain from cheating on a cartel (profits from sales captured from other cartel members through
13 undercutting of the cartel-fixed price in the current time period, which risks causing the cartel to fall
14 apart in the future) is large relative to the firm's possible gains from the cartel's continuing future
15 success (the firm's future share of the total cartel profits if collusion were to continue successfully).

16 147. In the 1980s there were over 20 DRAM manufacturers. By 2012, that number had
17 dropped to fewer than 11 manufacturers. Several factors, such as weak demand for consumer
18 electronic products due to the great financial crisis during 2008 to 2012, as well as natural disasters,
19 curtailed supply of hard disk drives and, as a result, caused a slowdown in the memory market, and
20 caused DRAM makers to either go out of business or to be acquired by other companies.

21 148. The DRAM market is highly concentrated. As of March 2018, the DRAM market
22 was dominated by *only three main players* – Defendants Micron, Samsung, and SK Hynix. These
23 companies collectively control the lion's share of these markets, and have existed in the market
24 together for years.

25 149. As of March 2018, Defendants collectively accounted for 96% of worldwide DRAM
26 market share. Samsung held 46% of worldwide DRAM market share. SK Hynix held 27% of
27 worldwide DRAM market share. Micron held 23% of worldwide DRAM market share. A handful
28 of other manufacturers made up the other 4% of worldwide market share.

DRAM Market Share (Q2 2017)

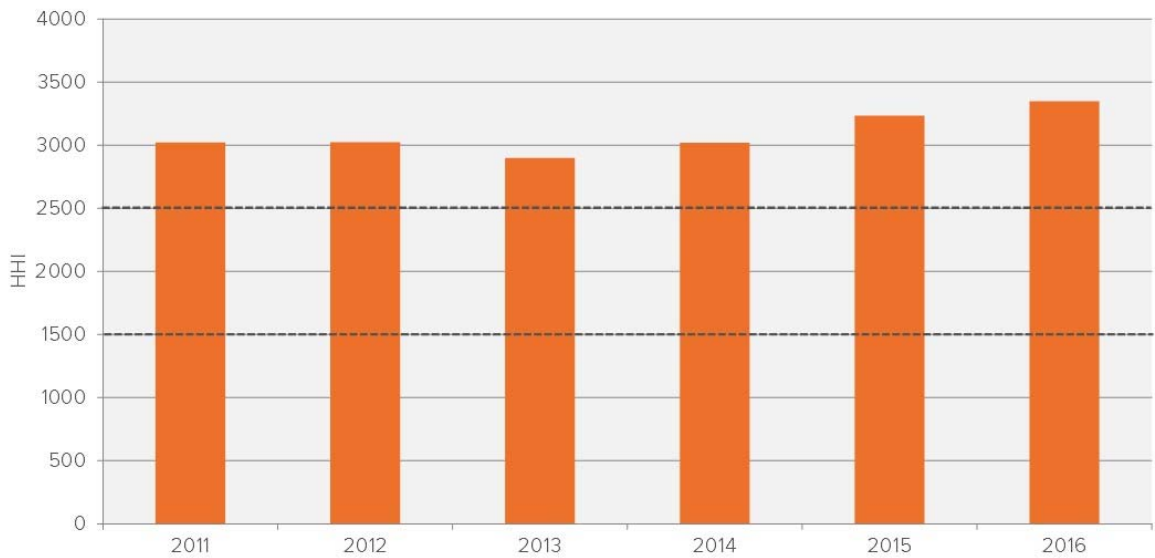


■ Samsung
 ■ SK Hynix
 ■ Micron
 ■ Nanya
 ■ Winbond
 ■ Other Companies

Source: Bloomberg.

150. The Herfindahl-Hirschman index (HHI) is a commonly accepted measure of market concentration. The DOJ considers markets in between 1,500 to 2,500 to be moderately concentrated whereas anything in excess of 2,500 points is considered highly concentrated. The DRAM market HHI has been increasing over time as a result of industry consolidation and, by 2016, was 3,300.

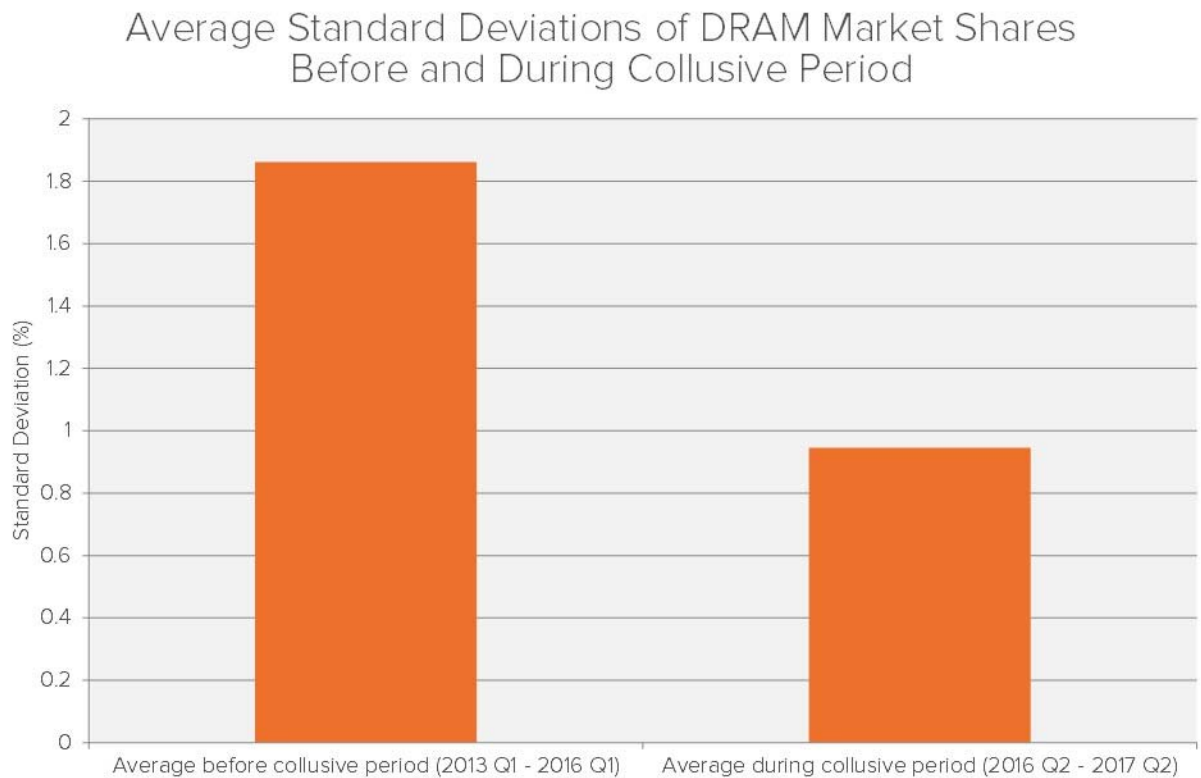
HHI for DRAM Market



Source: Bloomberg.

1 151. A highly concentrated market makes it easier for Defendants to facilitate their
2 conspiracy by making it easier to make agreements, form understandings, combinations or
3 conspiracies to fix, raise, maintain, and/or stabilize prices, and/or to allocate market shares, and to set
4 and keep prices at artificially high, supra-competitive levels. In fact, throughout the Class Period,
5 Defendants collectively maintained high market shares, and prices for DRAM remained
6 astonishingly high.

7 152. In addition, in a competitive market, market shares are expected to fluctuate as
8 manufacturers compete and win customer business from one another. During the alleged Class
9 Period, DRAM market shares were flatter than they had been in the previous period. Specifically,
10 the average variation in the market shares decreased from almost 2%, prior to the Class Period, to
11 less than 1% before and after Q2 2016, as shown in the chart below.



14 Source: Bloomberg.

15 C. **The DRAM Market Has High Barriers to Entry**

16 153. Barriers to entry are obstacles which prevent new competitors from easily entering the
17 market. They restrict competition in a market and may make it easier for incumbents to collude.
18
19
20
21
22
23
24

1 154. A collusive arrangement that raises product prices above competitive levels would,
2 under basic economic principles, attract new entrants seeking to benefit from the supra-competitive
3 pricing. Where, however, there are significant barriers to entry, new entrants are less likely to enter
4 the market. Thus, barriers to entry help to facilitate the formation and maintenance of a cartel.

5 155. There are substantial barriers to entry that preclude, reduce, or make it more difficult
6 for new entrants into the DRAM market. As one market observer lamented, “DRAM development
7 requires huge investment and poses risk,” and it is hard for new entrants to enter the market.

8 **1. Defendants own the intellectual property for DRAM through cross-licenses,
9 patents, and joint ventures**

10 156. The DRAM industry is also marked by a number of patents and partnerships between
11 incumbents. A significant number of patents are cross-licensed among Defendants. Partnerships and
12 alliances for technology and capacity further increase Defendants’ market power and make it harder
13 for a new entrant to enter the market.

14 157. Defendants own the patents for DRAM and enter into cross-license agreements with
15 each other. In 2010, Micron signed a ten-year cross-license agreement with Samsung. Following
16 this, in July 2013, Samsung and SK Hynix signed a cross-licensing contract according to which the
17 companies share several chip-related patents.

18 158. Defendants repeatedly recognized the importance of holding the intellectual property
19 rights as a way to fend off new entrants. For example, Micron’s CFO noted at a June 5, 2017
20 conference that the Defendants controlled important intellectual property and would not license it to
21 potential Chinese entrants: the “real challenge is there is no source of IP other than the existing
22 industry participants. And those industry participants I think are appropriately thoughtful about
23 whether or not they want to license or otherwise share that IP with a potential new industry entrant.
24 And in the absence of that IP I think, that the opportunity for China to successfully enter is
25 significantly hampered.”

26 159. At a separate conference on June 15, 2017, Micron’s CFO indicated that none of the
27 Defendants would license their IP to a new entrant who would think differently about capacity than
28 the Defendants: “if you look at every entrant into the memory business at some point in time, they

1 had a legitimately sourced core of IP that allowed them to form the capability around which they
2 have advanced their technology...[and] *the only IP holders in DRAM are the three industry*
3 *participants and in various forms and flavors we have all indicated that we would be very*
4 *challenged to think about transitioning that IP to someone* who might think about industry
5 capacity” in an expansionary way.

6 160. Industry analysts have also commented on the threat of the Chinese entering the
7 DRAM market, and have noted that even if the Chinese were able to develop advanced technology
8 necessary to rival the Defendants on their own, the new Chinese suppliers would infringe on the
9 numerous patents for DRAM that are held by Samsung, SK Hynix, and Micron (or other DRAM
10 manufacturers).

11 161. In 2017, Avril Wu, DRAMeXchange’s Research Director, commented that it was
12 considerably difficult for Chinese startups to adopt the project design of DRAM, and without joint
13 ventures or partnerships, it would be difficult for any Chinese new entrants to make a move on
14 DRAM legally.

15 162. In 2017, President Lee Pei-ing of Nanya Technology (“Nanya”), a smaller DRAM
16 manufacturer, commented that it would take around three to five years for China to pose a threat to
17 the existing memory industry.

18 2. DRAM manufacturers have the benefit of economies of scale

19 163. Economies of scale are cost advantages that arise due to scale of operation, with cost
20 per unit of output decreasing with increasing scale of production. DRAM manufacturers have
21 exhibited strong economies of scale through the following ways:

- 22 • Technical Economies: These are cost savings that arise from increased use of
23 large scale and specialist machinery, with strong technical capabilities. These
24 requirements have created high barriers to entry in the DRAM market for the past
25 20 years. Manufacturers are under constant pressure of decreasing process node
26 size in order to meet increasing demand of memory density, and thereby reducing
27 cost per bit of DRAM produced. From 2000 to 2016, manufacturers of DRAM
28 have decreased the node size from 130 nm to 20 nm. Through this transition,

1 existing market players have built years of capability, enough to sustain
2 development costs that are increasing by 13% annually. New entrants do not have
3 the benefit of this integration.

- 4 • In addition, Defendants are vertically integrated firms – meaning that they
5 participate in various levels of the supply chain. For example, Defendants not
6 only make DRAM, but they produce various DRAM Products in house (such as
7 smartphones and tablets, etc.). By procuring their own materials, Defendants
8 enjoy a cost advantage over potential new entrants who may not have such
9 vertical integration arrangements.

10 164. The scale and technological requirements of producing DRAM memory products
11 explain why there are so few players in the market, and how these aspects put potential entrants at a
12 cost disadvantage. Between 2001 to date, no serious new DRAM competitors have emerged.

13 165. Micron CEO, Sanjay Mehtotra, stated that in order to be a “meaningful player” in the
14 memory segment (including DRAM), a few of the prerequisites for market players are: (1) leading-
15 edge technology; (2) intellectual property; (3) large scale of production; and (4) higher quality
16 products. He added that large global customers want to make sure that the product are designed to
17 have proper intellectual property (“IP”) rights, which Chinese new entrants did not currently possess.
18 These technological advancements are typically characterized by: (1) an increase in memory density
19 (which can be achieved by reducing the die size, i.e., size of the chip, or the process node, i.e., the
20 distance between transistors); (2) by an increase in speed of chip, i.e., the amount of data that can be
21 transferred in a certain period of time; and (3) by a decrease in energy consumption, which can be
22 done by reducing the operating current and voltage.

23 **D. Demand for DRAM is Inelastic**

24 166. “Elasticity” is a term used to describe the sensitivity of supply and demand to changes
25 in one or the other. For example, demand is said to be “inelastic” if an increase in the price of a
26 product results in only a small decline in the quantity sold of that product, if any. In other words,
27 customers have nowhere to turn for alternative, cheaper products of similar quality, and so continue
28 to purchase despite a price increase.

1 167. For a cartel to profit from raising prices above competitive levels, demand must be
2 relatively inelastic at competitive prices. Otherwise, increased prices would result in declining sales,
3 revenues, and profits, as customers purchased substitute products or declined to buy altogether.
4 Inelastic demand is a market characteristic that facilitates collusion, allowing producers to raise their
5 prices without triggering customer substitution and lost sales revenue.

6 168. Demand for DRAM is highly inelastic because there are no close substitutes for
7 DRAM products. Because DRAM has no close substitutes, demand for DRAM will continue to rise
8 as new products requiring DRAM hit the market – such as the proliferation of smartphones and other
9 electronic devices. DRAM is the only type of memory that can serve as a substitute or functional
10 equivalent to DRAM in those products and devices. Accordingly, a purchaser of DRAM has no
11 choice but to be dependent on the few suppliers that exist – the Defendants.

12 169. The Defendants recognized the inelasticity of the DRAM market. At a December 6,
13 2017 investor presentation, Micron’s CFO emphasized the consensus view of the industry that the
14 DRAM market was inelastic: “there is a general belief that the industry participants are keenly aware
15 of the fact that the DRAM market is relatively inelastic.”

16 170. Micron’s CFO on December 7, 2016 also contrasted the DRAM market, which it
17 viewed as inelastic, against the NAND market, which it also competed in and viewed as much more
18 elastic: “our view is that the NAND market is much more price elastic than DRAM. So when DRAM
19 was at its lowest point, you didn't see folks doubling down on the capacity of the PC and now the
20 DRAM has recovered, you don't see folks having the capacity of the PC or a mobile phone.”

21 **E. Defendants’ Increased Prices for DRAM Cannot Be Explained by Market Factors**

22 **1. DRAM costs remained low or stable during the Class Period**

23 171. DRAM is primarily made from raw material silicon wafers and, therefore, every
24 DRAM chipmaker needs to buy them so that they can be processed into chips. Yet, while prices for
25 DRAM soared, the prices of silicon wafers – the primary ingredient in DRAM – declined or
26 remained stable. For example, between 2013-2017, silicon wafer prices declined about a third, and
27 more than a half since 2007 levels.

1 172. During the Class Period (and the years leading up to its start), research and
2 development costs and capital expenditure costs for Defendants to produce DRAM also remained
3 fairly stable.

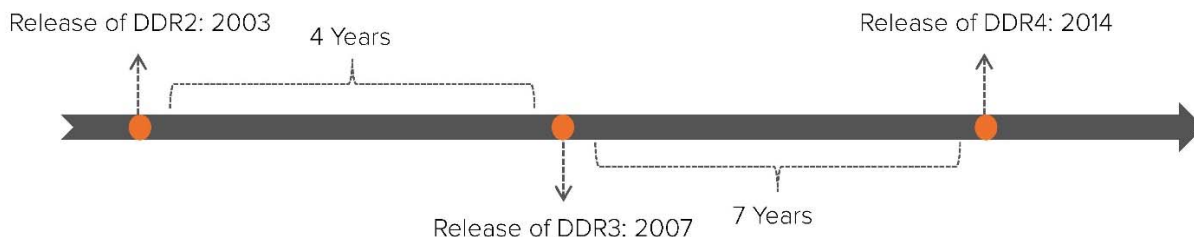
4 173. Despite the lack of increases in raw material or other input costs, DRAM prices
5 soared during the Class Period to astronomical levels. The average selling price (ASP) for DRAM
6 rose by more than 40% between 2016 and 2017.

7 174. Prices for DRAM started to rise in the second half of 2016, and continued to rise
8 during the Class Period. For example, PC DRAM (DRAM that is installed into computers)
9 experienced one of the biggest upticks in contract pricing; likely ending the year 2017 with a 60%
10 price increase over 2017. “The average contract price of mainstream 4GB DDR4 PC DRAM
11 modules, for example, soared from \$13 at the end of Q2 2016 to \$30.5 in Q4 2017,” said April Wu,
12 research director for DRAMeXchange. “This represents an increase of 130 percent over six
13 consecutive quarters.”

14 **2. Price increases during the Class Period cannot be explained by the technology**
15 **life cycle**

16 175. The DRAM market is characterized by rapid technology advancements. As a new
17 generation of DRAM comes to market (and replaces the prior generation), prices for the new
18 generation can be expected to rise. Prior to the Class Period, this was the case with the transition of
19 the product life cycle of DDR2 DRAM to the next generation, DDR3 DRAM. During the Class
20 Period, when the transition was made from DDR3 DRAM to DDR4 DRAM, that was not the case,
21 and the market deviated from the traditional price cycle.

22 176. The DRAM market is characterized by rapid technological advancements.
23 Manufacturers are constantly cutting costs while meeting market demands for larger memory
24 densities with higher speed. The timeline below illustrates the transitions through DDR2, DDR3,
25 and DDR4 types of DRAM, and indicates that the impact of those transitions would pre-date the
26 price increases during the Class Period.

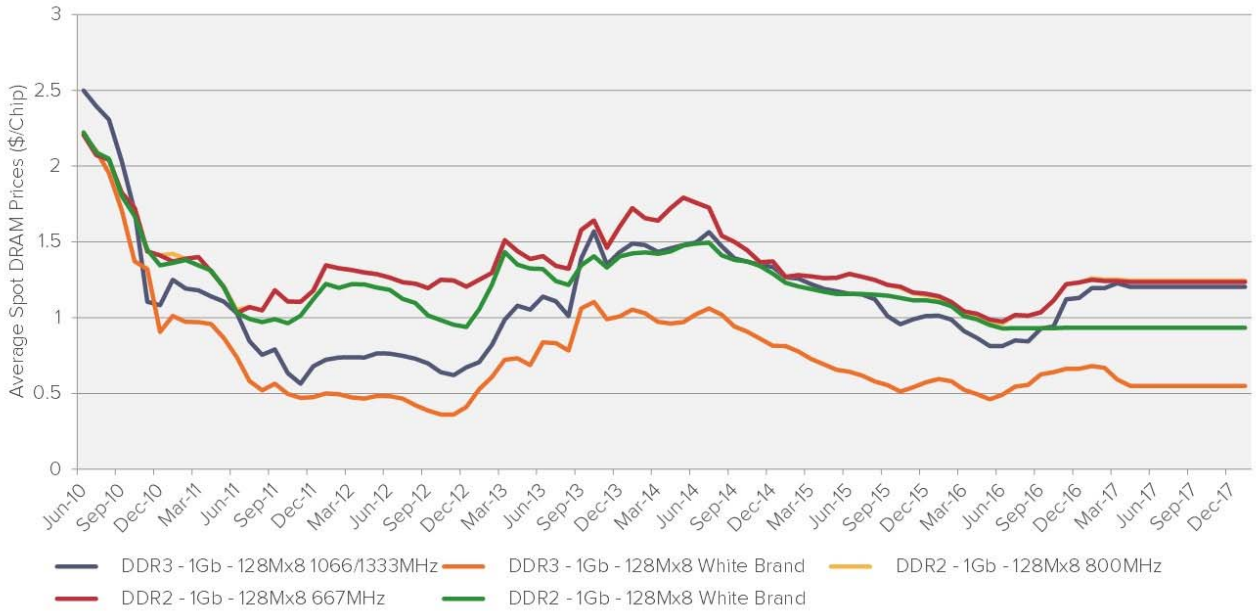


177. Technological advancements are typically characterized by the following: (1) an increase in memory density (either by reducing die size, *i.e.*, reducing the size of the chip, or reducing the process node, *i.e.*, reducing the distance between transistors); (2) an increase in speed of chip (speeding up the amount of data that can be transferred in a certain period of time); and (3) a decrease in energy consumption (reducing the operating current and voltage). Each time a manufacturer applies one of the above methods, there is an associated learning curve.

178. Typically, price trends in the DRAM industry are generally correlated with this product technology life cycle. At the beginning of new cycle, production and fixed costs are high to develop the next generation technology, resulting in higher prices for the new generation of DRAM. Gradually, as market demand increases for the newer generation DRAM, prices stabilize as the new generation replaces the old generation in the market. For example, as shown in the below chart, this was the case with the transition from DDR2 to DDR3 DRAM in the period December 2012 through September 2014:

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

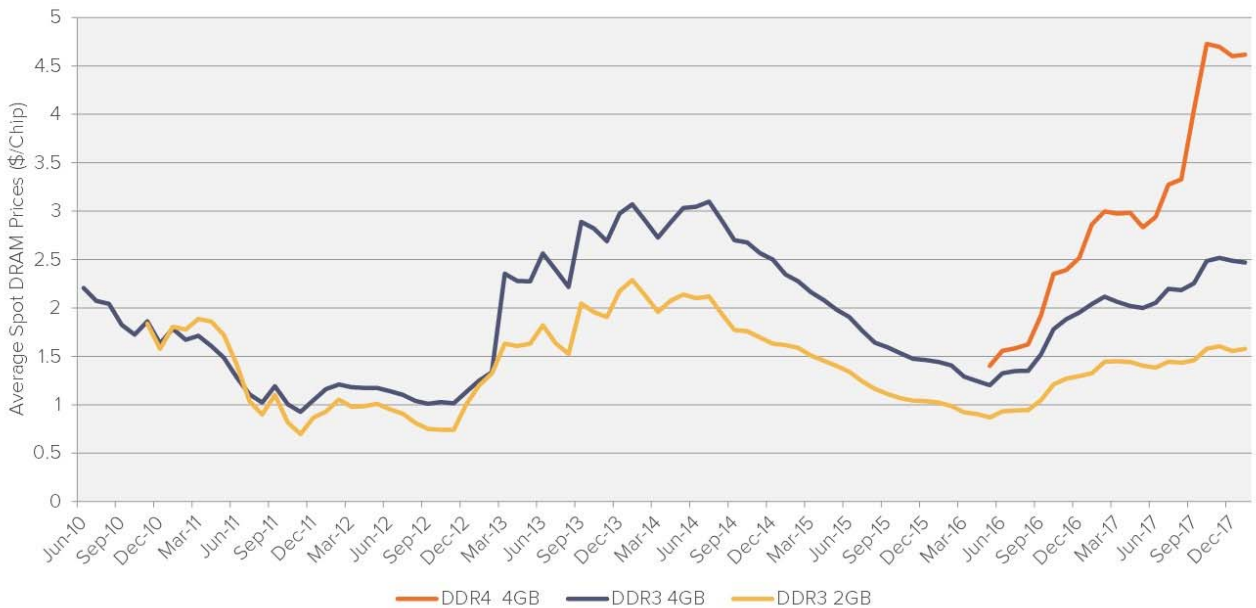
Average Spot prices for DDR2 and DDR3



Source: Bloomberg.

179. The technology for DDR4 was introduced in 2014, long before the significant price increase rise that began with the start of the Class Period in June 2016. And, therefore, the transition from DDR3 to DDR4 cannot be used to explain the price increase that occurred sharply during the class period, as the transition to DDR4 would have occurred several years before.

Average Spot Prices for DDR4 and DDR3 by Density



Source: Bloomberg.

1 180. DRAM makers' decrease in the node process also does not explain Defendants' price
2 increases during the Class Period. From 2000, Defendants have been transitioning from a 130nm
3 process node technology to an 18nm process in 2016. The node process is expected to further
4 decrease to 10nm by 2020. In 2015, one year after DDR4 was first introduced, the market was
5 expected to benefit from the rising penetration of DDR4 built on 20nm technology. The transition
6 from 25nm was said to increase bit capacity by 30% at their existing production facilities. Therefore,
7 by 2016, manufacturers would have experienced sufficient increase in capacity from the move from
8 25nm to 20 nm n 2014. This timeline does not correlate with the price increases that began during
9 the Class Period; the impact of the node decreases would have come long before.

10 **F. The Defendants' Profits Increased During the Class Period**

11 181. During the Class Period, as prices for DRAM soared, so did Defendants' revenue.
12 Defendants' revenue from global DRAM sales skyrocketed during the Class Period, with
13 Defendants' revenue rising more than 50%. Between Q1 2016 and Q3 2017, Defendants' revenues
14 from global DRAM sales more than doubled. In Q3 2017, Samsung achieved a record-high revenue
15 of \$8.7 billion from its global DRAM sales (Q1 2016 revenue was \$3.9 billion); SK Hynix achieved
16 record-high revenue of \$5.5 billion in Q3 2017 from its global DRAM sales (Q1 2016 revenue was
17 \$2.3 billion), and Micron achieved record-high revenue of \$4.0 billion in Q3 2017 from its global
18 DRAM sales (Q1 2016 revenue was \$1.5 billion).

19 **1. Trade association participation provide many opportunities for Defendants to**
20 **share information and collude**

21 182. Trade associations also foster ease of information sharing between Defendants in the
22 DRAM industry, provide many opportunities for Defendants to have direct communications and
23 collude.

24 **a. Semiconductor Industry Association ("SIA")**

25 183. According to its website, SIA is the voice of the U.S. semiconductor industry. Micron
26 Technology is a member of the SIA, along with other domestic semiconductor manufacturers.
27 Samsung and SK Hynix are listed as international members of the SIA. Sanjay Mehrotra, Micron
28 Technology's President and CEO sits on the Board of the SIA. The SIA is affiliated with companion

1 branches in other regions of the world including in Korea, Japan, China, and Europe. It is also linked
2 to the World Semiconductor Trade Statistics, a non-profit, which is the “source of semiconductor
3 market data and forecasts,” and the World Semiconductor Council. Defendants belong to all of these
4 associations.

5 184. The SIA holds various events, such as its “Annual Award Dinner” where Defendants
6 key executives attend. For example, at its annual dinner on November 14, 2017, Mark Durcan,
7 Micron’s CEO at the time, was featured at the event as an award winner and potential speaker. The
8 program of events for the November 14, 2017 meeting also included a CEO Reception and a Post-
9 Party, providing further opportunities for social interaction or side conversations among members.

10 **b. Korean Semiconductor Industry Association (“KSIA”)**

11 185. Similar to the SIA, the KSIA provides opportunities for Defendants to be in contract
12 and to directly communicate and share competitive information with one another.

13 186. KSIA’s membership list includes both SK Hynix and Samsung Electronics Co. on its
14 device manufacturer member list, with only four other entities listed as device manufacturer
15 members. This small number of member companies, makes it even more possible for members to be
16 in contact and have a means to exchange information.

17 187. In March 2016, Sung Wook Park, the CEO and Vice Chairman of SK Hynix was
18 inducted as the 9th President of the KSIA.

19 188. The KSIA also holds events and conferences for its members. For example, the KSIA
20 has held an annual meeting each year between 1994 and 2016. SK Hynix is noted as one of the
21 event organizers for at least the 2016 annual meeting.

22 189. The KSIA is connected to the SIA and other regional branch organizations such as in
23 the U.S., Japan, China, the EU, and Taiwan. At times, the various branches get together for
24 worldwide conferences and events, providing further opportunities for Defendants to join together in
25 person.

26 190. While much of the information on these organizations is kept private for members
27 only, these organizations clearly provided a channel through which Defendants had the opportunity
28 to discuss and/or exchange information directly during the Class Period.

1 191. Given the small number of DRAM makers, these opportunities to collude lend even
2 further plausibility to Plaintiffs' collusion allegations.

3 **c. World Semiconductor Council ("WSC")**

4 192. The SIA is also affiliated the World Semiconductor Council, which "promotes
5 international cooperation in the semiconductor sector in order to facilitate the healthy growth of the
6 industry from a long-term global perspective." The WSC holds at least one meeting a year. For
7 example, in April 2018, it will hold its World Semiconductor Council Meeting for WSC Members
8 Only in Coronado, California. Notably, the WSC held a meeting of over 100 CEOs and other
9 semiconductor executives on May 26, 2016 (a few days before the start of the Class Period on June
10 1, 2016). The conference was led by Sung Wook Park (CEO of SK Hynix and President of the
11 Korean Semiconductor Industry Association, discussed further below).

12 **d. World Semiconductor Trade Statistics Organization ("WSTS")**

13 193. Defendants also participate in the WSTS, a non-profit, which is the "source of
14 semiconductor market data and forecasts." WSTS compiles monthly sales numbers for the
15 semiconductor industry, including DRAM, and provides twice-yearly semiconductor industry
16 forecasts with quarterly and annual projections. A subscription to the WSTS Database also includes
17 statistics on Semiconductor Capacity Utilization (known as SICAS Reports). WSTS is primarily
18 funded by membership fees of participating semiconductor companies, whose representatives form
19 the WSTS Committee. The members of this Committee submit accurate and authentic monthly
20 revenue data, attend regional meetings, and contribute to the generation of world semiconductor
21 industry forecasts.

22 194. "Semiconductor companies may become WSTS members. Membership both
23 comprises the obligation to feed the member company's revenue data regularly into the appointed
24 Data Collection Agents and fund the operation and services of WSTS by membership fees.
25 Reciprocally Members have access to all Information Services that WSTS provides." ...
26 "Semiconductor companies that are unable to report revenue data into the WSTS statistics programs
27 (*e.g.*, if they are not shipping any semiconductor products that generate revenues in any one of the
28

1 recognized WSTS product categories) may obtain access to WSTS Information as Subscribers with
2 WSTS.

3 195. All three Defendants are members of WSTS. Micron is a member of the Americas
4 Regional Group, and Samsung and SK Hynix are members of the Asia Pacific Regional Group.

5 196. Several partners support WSTS in the operation of market statistics information
6 services. Data Collection Agents (“DCAs”) receive the revenue data from WSTS member
7 companies and keep this data under their custody. WSTS has appointed regional DCAs who collect
8 revenue data from member companies and consolidate this data into the regional base report.

9 Regional DCAs forward the regional base report at defined dates to the worldwide DCA. The
10 worldwide DCA consolidates all the data of the regional base reports and merges this data with non-
11 participant estimates that are provided by WSTS. DCAs have also the responsibility to check the
12 submitted data for completeness, consistency and plausibility. They will resolve any perceived data
13 anomalies with the submitting member companies. Finally the worldwide DCA posts these data
14 compilations under the name of the various market statistics reports on the WSTS Internet Portal.

15 197. In its promotional materials, the WSTS notes that the membership gives “exclusive
16 access to the only source of market figures collected directly from semiconductor companies.” The
17 materials explain how information is collected from members: “Individual member companies enter
18 unit sales and revenue data into a simple online form on a monthly (in some cases quarterly) basis.”

19 198. Semiconductor Industry Associations in the different regions closely cooperate with
20 WSTS. In most cases they also hold distribution licenses for WSTS market statistic reports and
21 forecasts to serve interested parties outside the WSTS membership with their information needs.

22 199. In addition, the WSTS holds meetings for its members. For example, it will hold its
23 spring 2018 Committee Meeting in Vienna, Austria. As explained on its meeting registration page,
24 “each WSTS Member Company has one official representative in the Committee, who is expected to
25 participate in the Committee Meeting.” Participation in the Forecast Meeting is subject to the
26 submission of a pre-meeting forecast. The process includes companies submitting their forecast
27 information and then publication of the pre-meeting average forecast to all participating companies.

1 200. WSTS describes the value of its regular meetings as “an important venue for members
2 to help shape forecasts and future reports, and to interact with their industry peers. ... Members are
3 able to exchange experiences with other market participants, gain important information about
4 current market sentiment, and hear directly from their peers how they view the future direction of the
5 market.”

6 201. WSTS holds a number of different types of meetings for members, including: Board of
7 Directors Meetings (at least twice a year); Executive Committee Meetings, including the World
8 Chairman and the five Regional Chairs (at least twice a year); Working Group Meetings where
9 certain WSTS members gather in regional or sector-specific groups; Committee Meetings where
10 members’ primary focus is to review the current situation in the semiconductor market and to
11 formulate forecasts for the upcoming quarters and following two years (twice a year); and Regional
12 Chapter Meetings (two to four times per year).

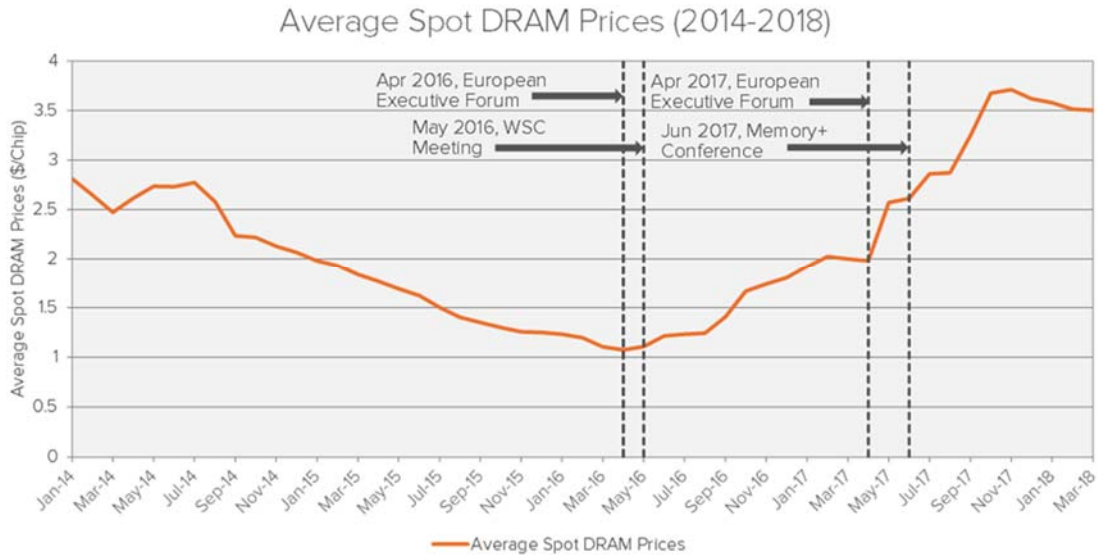
13 **e. Global Semiconductor Alliance (“GSA”)**

14 202. The GSA represents about 350 member companies, including Micron, Samsung, and
15 SK Hynix. The GSA holds a Memory Conference once every two years. For example, the
16 conference was held in March 2015 and June 2017. The GSA also holds an annual US Executive
17 Forum conference in September or October, an annual European Executive Forum in April, May, or
18 June, and an Annual Awards Dinner in December.

19 **2. Trade association meetings in which Defendants participate can be correlated
20 with price increases during the Class Period**

21 203. The graph below shows how average DRAM spot prices moved during the period
22 from January 2014 to the end of 2017. The price increase in May 2016 coincides with four trade
23 association meetings. Specifically, prices increased from one event to another, and can be seen close
24 in time with key trade association meeting

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28



204. Notably, there was an increase in DRAM prices after the DRAM European Executive Forum in April 2016. The average monthly increase for DRAM from April 2016 to March 2018 is 5.6%, where before the Class Period (from March 2011 to March 2016), the average monthly increase for DRAM was -0.14%. Defendants’ overlapping business relationships provide further opportunities for Defendants to collude. The chart below shows how during the Class Period prices increased after certain key meetings in April-May 2016 and April-May 2017.

The table below shows that DRAM prices have on an average increased after some of the key meetings held by industry associations:

Association	Event	Before Event Period	After Event Period	Average Monthly % Change In Prices (Positive Figure Implies Price Increase)	
				Before	After
GSA	European Executive Forum	Jan 2014 - Mar 2016	Apr 2016 - Mar 2018	-3.45	5.18
WSC	WSC Annual Meeting	Jan 2014 - Apr 2016	May 2016 - Mar 2018	-3.42	5.64
GSA	European Executive Forum	Jan 2014 - Mar 2017	Apr 2017 - Mar 2018	-0.70	5.70
GSA	Memory+ Conference	Jan 2014 - May 2017	Jun 2017 - Mar 2018	0.04	3.49

1 205. In addition to the transparency and ease of information sharing that comes from being
2 in such as small industry where many of Defendants’ employees likely know each other, Defendants
3 also have overlapping business relationships with each other, which provide opportunities to
4 exchange information and collude. For example, prior to joining Micron as its CEO in February
5 2017, Sanjay Mehrotra was President of SanDisk, a Flash Memory manufacturer. Starting in 2014,
6 SanDisk and SK Hynix were involved in litigation against each other regarding a dispute over trade
7 secrets. In August 2015, SanDisk announced that it had reached agreement with SK Hynix (led by
8 CEO Sung Wook Park). As a result of the settlement, the two companies publicly announced
9 intentions to modify and extend their intellectual property relationship and to enter into a multi-year
10 commercial relationship under which SK Hynix agrees to supply DRAM products to SanDisk
11 through 2023. Therefore, it is plausible that these two CEOs – Sung Wook Park and Sanjay
12 Mehrotra knew each other through this effort.

13 **VIII. DEFENDANTS’ PRIOR COLLUSION IN THE DRAM MARKET, AND RELATED**
14 **MARKETS, MAKES COLLUSION EVEN MORE PLAUSIBLE HERE**

15 **A. Defendants Were Previously Convicted for Fixing Prices of DRAM**

16 206. This is not the first time Defendants stand accused of colluding in the DRAM market.

17 207. In 2005, the Department of Justice brought a criminal case against the same
18 Defendants named here, and other DRAM manufacturers, for fixing prices of DRAM between April
19 1, 1999 and June 15, 2002. That action resulted in guilty pleas and jail time, and resulted in
20 Defendants paying some of the largest criminal fines in history. The Defendants and their co-
21 conspirators paid a collective \$731 million in criminal fines, and served a collective 3,185 days of
22 jail time.

23 208. In November 2005, SEC and SSI – the same Samsung Defendants as named herein –
24 pleaded guilty to criminal charges brought by the DOJ, and agreed to pay a \$300 million criminal
25 fine. The guilty plea admitted that between April 1, 1999 and June 15, 2002, Samsung conspired “to
26 fix the prices of DRAM sold to certain computer and server manufacturers.” Affected customers
27 included Dell, Compaq, Hewlett Packard, Apple, IBM, and Gateway.

1 209. In April 2006, a number of Samsung employees also entered individual guilty pleas,
2 including Sun Woo Lee (SEC Senior Manager of DRAM sales), Yeongho Kang (SSI Associate
3 Director of DRAM Marketing), and Young Woo Lee (Sales Director for SEC’s German subsidiary).
4 Those guilty pleas covered various periods from as early as January 1, 1998 until on or about June
5 15, 2002, wherein those individuals conspired “to fix the prices of DRAM sold to certain computer
6 and server manufacturers in the United States.” Each employee was sentenced to pay a \$250,000
7 fine and a prison sentence ranging from 7-10 months.

8 210. Samsung employee Il Ung Kim (SEC’s Vice President of Marketing in the Memory
9 Division) pleaded guilty for his role in the DRAM conspiracy and was sentenced to pay a \$250,000
10 fine and serve a 14-month prison sentence.

11 211. Samsung employee Young Hwan Park (Vice President of Sales for SEC and President
12 of SSI) pleaded guilty in December 2006. This guilty plea covered the period April 1, 2001, until on
13 or about June 15, 2002, wherein Mr. Park conspired “to fix the prices of DRAM sold to certain
14 OEMs.” Mr. Park was sentenced to a \$250,000 fine and a 10-month prison sentence.

15 212. In September 2006, Samsung employee Thomas Quinn (SSI Vice President of
16 Marketing for Memory Products) pleaded guilty “to fix[ing] the prices of DRAM sold to certain
17 OEMs.” Mr. Quinn was sentenced to pay a \$250,000 fine and serve an 8-month prison sentence.

18 213. In May 2005, SK Hynix (f/k/a Hynix Semiconductor, Inc. or “Hynix”) pleaded guilty
19 and was fined \$185 million. The guilty plea covered the period April 1, 1999, to June 15, 2002,
20 wherein Hynix “conspired to fix the prices of DRAM to certain computer and server manufacturers.”
21 Hynix admitted that the affected customers included Dell, Compaq, Hewlett Packard, Apple, IBM,
22 and Gateway.

23 214. In the case against it by the DOJ, “Hynix,” acknowledged that at least 15 of its
24 executives had contacts with competitors related to pricing in the DRAM market.

25 215. In March 2006, Hynix employees Dae Soo Kim (Hynix Senior Vice President and
26 General Manager of Worldwide Sales and Marketing), Chae Kyun Chung (Hynix Director of
27 Worldwide Strategic Account Sales), Kun Chul Suh (Hynix Senior Manager in Memory Products
28 Marketing), and Choon Yub Choi (General Manager for Marketing and Sales of Hynix’s German

1 subsidiary) entered individual guilty pleas for their participation in the DRAM conspiracy. Those
2 guilty pleas covered various periods from April 1, 2001, until on or about June 15, 2002, and
3 acknowledged that these individuals “conspired to fix the prices of DRAM to certain computer and
4 server manufacturers.” Affected customers included Dell, Compaq, Hewlett Packard, Apple, IBM,
5 and Gateway. Each of those individuals was fined \$250,000 and received prison sentences ranging
6 from five to eight months.

7 216. Gary Swanson, Senior Vice President of Memory Sales and Marketing at Hynix
8 Semiconductor America, was indicted in October 2006 for fixing DRAM prices in violation of
9 Section I of the Sherman Act.

10 217. The following are examples of SK Hynix’s illegal behavior in the prior DRAM
11 conspiracy: (a) Hynix employee C.K. Chung collected pricing information from subordinates and
12 competitors and relayed that information to D.S. Kim; (b) Hynix employee Paul Palonsky, a
13 salesperson with responsibility for the IBM account, acknowledged in sworn testimony that he
14 gathered competitor price information “directly from competitors, including Samsung, Micron,
15 Infineon, Hitachi, Toshiba, Elpida, LG, and NEC”; (c) Hynix was aware of Samsung and Micron
16 prices before it submitted a bid to Apple in August 2001; and (d) also in 2001, a Hynix email refers
17 to the artificial product shortage created by Micron, and states that Micron will follow Samsung or
18 Hynix if Apple accepts a price increase.

19 218. Micron faced criminal prosecution by the DOJ as well. However, Micron was given
20 immunity from prosecution because it agreed to cooperate with the DOJ as part of the DOJ’s
21 Antitrust Leniency Program.

22 219. Micron admitted its participation in the DRAM conspiracy as part of its cooperation
23 with the DOJ. In a sworn statement, Micron acknowledged that at least 31 of its executives and
24 other employees had conspiratorial contacts with other DRAM manufacturers, including Hynix and
25 Samsung, as well as other makers that were part of the market at that time, including Hitachi, Elpida,
26 NEC, Mosel Vitelic, Nanya, Winbond, and Toshiba, and admitted conspiratorial conduct with regard
27 to at least the following customers: Apple, Dell, Compaq, IBM, Gateway, Sun, Cisco, Thomson,
28 Seagate, Hewlett Packard, and Maxtor.

1 220. Micron executives also provided lengthy interviews to the government to obtain
2 individual amnesty and to discharge their cooperation obligations. Michael Sadler, Micron’s Senior
3 Vice President for Marketing, testified at the trial of Mr. Gary Swanson of Hynix, detailing how the
4 DRAM conspiracy was carried out. Mr. Sadler testified that he participated in a “worldwide tour” to
5 seek the cooperation of other manufacturers to restrict production. Mr. Sadler described this trip to
6 the DOJ as “slam-dunk” illegal, and acknowledged that he was an “originator of that idea.” Mr.
7 Sadler also testified that he discussed pricing at two “core accounts” with Mr. Swanson, and that
8 those discussions “set a benchmark” for discussions with other customers. Based on their
9 discussions, Mr. Sadler concluded that he had an “understanding” with Mr. Swanson that Micron and
10 Hynix were “on the same page.” Mr. Sadler also testified that on one occasion, Mr. Swanson
11 confirmed to him that Hynix was going to raise certain prices and that Mr. Sadler responded
12 indicating that Micron would do the same.⁸

13 221. Mr. Sadler is currently Chief Strategy Officer at Micron, and, as such, has close
14 contact with those such as Micron’s CFO and CEO, who are responsible for Micron’s DRAM
15 operations, and who those that made the statements during earnings calls, that are alleged to have
16 facilitated the conspiracy alleged herein.

17 222. Despite being given general immunity, one Micron executive, Regional Manager
18 Alfred Censullo pleaded guilty to an obstruction of justice charge, whereby Mr. Censullo admitted to
19 having withheld and altered documents responsive to a grand jury subpoena served on Micron. Mr.
20 Censullo was sentenced to serve six months of home detention.

21 **1. Prior DRAM - Other Regulators**

22 223. The DOJ was not the only regulator to prosecute Defendants for participation in the
23 prior DRAM conspiracy.

24 224. On October 19, 2011, Samsung was fined €145,727 million by the European
25 Commission (“EU”) for its role in fixing prices as part of a DRAM conspiracy between July 1, 1998
26 to June 15, 2002. Samsung received a reduction in its fines for acknowledging the cartel to EU
27

28 ⁸ Transcript of Record, *U.S. v. Swanson*, No. 3:06-00692 PJH (N.D. Cal. Feb. 12, 2008).

1 investigators. The EU also fined Micron for its role in the same price-fixing conspiracy. However,
2 Micron avoided payment as a result of being the first firm to reveal the cartel to investigators, and for
3 its cooperation with the EU regulatory body.

4 225. In 2002, the Canadian authorities also began an investigation into price-fixing in the
5 DRAM market. Due to the recession, Canadian authorities put the investigation on hold. However,
6 the investigation resumed on or about 2014 (after the EU investigation and case had concluded).
7 After presenting evidence to Samsung and the other DRAM makers, Samsung and the other
8 companies agreed to a \$120 million settlement agreement, with a \$40 million fine, and \$80 million to
9 be paid back to Canadians who purchased computers (laptops or desktops), printers, memory
10 modules, graphics cards, video game consoles, DVD players, personal digital assistants, MP3
11 players, personal video recorders, servers, computer based point of sale systems, or any other
12 products containing DRAM between April 1, 1999 to June 30, 2002.

13 2. Prior DRAM Civil Cases (Direct and Indirect)

14 226. The same Defendants as named here were also named in prior civil litigations, which
15 alleged they participated in a conspiracy to fix prices of DRAM between 1999 and 2002. *See In Re*
16 *Dynamic Random Access Memory (DRAM) Antitrust Litig.*, Master File No. M:02-cv-01486-PJH
17 (N.D. Cal.). Settlements in those prior civil actions are among the largest civil price-fixing
18 settlements in history, with the direct purchaser action totaling over \$350 million in settlements, and
19 the indirect purchaser action totaling over \$310 million in settlements.

20 B. Other Semiconductor Memory Products

21 1. SRAM

22 227. Following on the heels of the prior DRAM criminal case investigation, and noting the
23 overlap of DRAM and SRAM makers and key executives, the DOJ launched an investigation of
24 price-fixing violations by Defendants (and others in the SRAM market).

25 228. Micron acknowledged the DOJ's SRAM investigation in its 2007 Form 10-K: "On
26 October 11, 2006, we received a grand jury subpoena from the U.S. District Court for the Northern
27 District of California seeking information regarding an investigation by the DOJ into possible
28 antitrust violations in the 'Static Random Access Memory' or 'SRAM' industry."

1 229. Samsung was also part of the DOJ's SRAM investigation. October 13, 2006, the DOJ
2 announced that it had started the antitrust investigation, and that Samsung (SEC) had been asked to
3 submit related documents and pledged a full cooperation with the probe.

4 230. On November 1, 2006, CNet News reported that SEC, the world's biggest maker of
5 memory chips, said its German offices were raided as part of a European Union probe into suspected
6 price-fixing of SRAM chips. "We were raided on Oct. 11 in connection with our SRAM products," a
7 representative for Samsung Germany said Wednesday. "We are cooperating in full with the
8 investigation." The European Commission said Tuesday it had raided the offices of several makers
9 of SRAM chips in Germany, suspecting price-fixing in the sector.

10 231. From IDG News Service October 31, 2006: The U.S. Department of Justice probe
11 into the SRAM (static RAM) chip market appears to be widening. Sony Corp. said Tuesday that its
12 U.S. unit, Sony Electronics Inc., has received a subpoena from the DOJ seeking information on its
13 SRAM business. In a brief statement the company said it will cooperate with the request. Earlier this
14 month, four other SRAM companies said they had also been contacted by the DOJ. They are Cypress
15 Semiconductor Corp., which was first to announce it had been contacted, and the U.S. units of
16 Mitsubishi Electric Corp., Samsung Electronics Co. Ltd. and Toshiba Corp.

17 **2. Flash**

18 232. On or about September 2007, the DOJ confirmed that it was investigating potential
19 antitrust violations by Samsung (SEC and SSI), SK Hynix and others for price-fixing in the Flash
20 memory market. Samsung was among the entities that received grand jury subpoenas in connection
21 with the investigation. *In re Flash Memory Antitrust Litig.*, 643 F. Supp. 2d 1133, 11400 (N.D. Cal.
22 Mar. 31, 2009)(Flash MTD Order).

23 233. In 2012, Samsung and SK Hynix settled claims alleging that they conspired with
24 SanDisk Corp. and other makers to fix prices on flash memory through unlawful patent licensing
25 deals and other misconduct. The underlying suit, which was first filed in 2007, alleged that the Flash
26 defendants engaged in illegal meetings with each other with the intent to boost the price of Flash
27 memory products that were used in digital cameras, flash drives, portable music players, and other
28

1 electronic devices. *In re: Flash Memory Antitrust Litigation*, case number 4:07-cv-00086, in the
2 U.S. District Court for the Northern District of California.

3 **IX. EFFECTS OF DEFENDANTS MISCONDUCT**

4 **A. The Inflated Prices for DRAM caused by Defendants' Conduct Passed on to Consumers**

5 234. Defendants' anticompetitive behavior resulted in harm to Plaintiffs and other
6 members of the proposed Class because it caused them to pay higher prices for device products
7 containing than they would have otherwise paid if not for Defendants' business practices. The entire
8 overcharge for DRAM devices was passed on to the members of the proposed class.

9 235. DRAM is a commodity product with standard specifications. DRAM is incorporated
10 into a variety of electronic consumer products, including computers and phones, which are also
11 commodity products.

12 236. The indirect purchaser purchases devices containing DRAM either from (1) an OEM
13 manufacturer of products containing DRAM or (2) a reseller, such as a retailer or wireless network.
14 Thus, Defendants' revenues from DRAM follow a traceable chain from Defendants to the consumer.

15 237. The OEM and retail markets for devices containing DRAM are subject to vigorous
16 price competition. OEMs and retailers have thin net margins and are at the mercy of their component
17 costs. Increases in the price of DRAM will lead to corresponding price raises at the OEM and retailer
18 levels for DRAM Devices.

19 238. As a result, the inflated prices of devices containing DRAM resulting from
20 Defendants' anticompetitive practices have been passed on to the Plaintiffs and other members of the
21 proposed class by direct-purchaser manufacturers, distributors, and retailers.

22 239. Economic theory teaches that the only situations in which precisely zero pass through
23 occurs is when an industry faces a perfectly elastic demand for its product (i.e., the price was fixed,
24 with demand dropping to zero with an infinitesimal price increase, and expanding infinitely if price
25 were to drop infinitesimally), or if supply was perfectly inelastic (i.e., if even a very large increase in
26
27
28

1 price for a product was incapable of stimulating additional supply).⁹ These possibilities are
2 considered implausible by economists. Either scenario is at odds with the nature of the device
3 industries. Existing empirical studies of the electronics industry have concluded that demand is *not*
4 infinitely elastic. Therefore, at least a partial pass through of an increase in the costs of DRAM into
5 the price of DRAM Devices – and consequent harm to class members – is the predicted outcome of a
6 successful cartel behavior.

7 240. To the extent that distributors, wholesalers, and retailers selling to consumers or to
8 others in the distribution chain price their sales as their cost plus a fixed markup, this will create an
9 additional reason for pass through to exceed 100 percent through these channels.¹⁰ Further, because
10 retailers ultimately compete with direct sales to purchasers by device manufacturers, competitive
11 forces would likely work to equalize end-purchaser prices between channels, after controlling for the
12 value of differences in support across different distribution channels. This would tend to push the
13 total pass-through rate from costs to end-purchaser pricing above 100 percent, since manufacturers
14 could not sustain a pricing policy to distributors that did not cover their costs, and an additional fixed
15 markup on top of distributor cost would result in a total pass-through rate to final consumers in
16 excess of 100 percent.

17 241. Thus, the extent to which input cost increases are passed through into output prices is
18 entirely an empirical issue, and it is an area in which methods of empirical analysis are well
19 established. Based on both theory and the published studies in this area, it is likely that the pass-
20 through rates of inflated costs on DRAM will exceed 100 percent, a situation known as
21 “overshifting.”

22 242. In particular, it is undisputed that overshifting is possible in markets with many
23 suppliers of differentiated products and easy entry and exit, an environment known as “monopolistic
24

25 ⁹ The usual hypothesis that is commonly examined in empirical pass through studies is whether
pass through exceeds, falls short of or equals 100 percent.

26 ¹⁰ For example, if a wholesaler prices its product at manufacturer sales price plus 10 percent, and
27 a retailer prices its product at wholesale plus 10 percent, the total pass through to the final consumer
28 will be 121 percent (i.e., 110 percent times 110 percent) of manufacturer sales price. Certain
distributor costs, like the costs of holding inventory, and “shrinkage,” may be approximately
proportional to the value of the products held, and thus be one factor creating this pricing policy.

1 competition.” Indeed, pass through in excess of 100 percent would actually be expected in industries
2 where firms produce differentiated products in competitive conditions, and face economies of scale –
3 that is, where their average cost of producing a product declines with their level of output. In
4 particular, as noted next, in competitive industries with differentiated products and relatively easy
5 entry and exit (monopolistic competition), when there are economies of scale, overshifting will be
6 the rule, not the exception. Empirical studies by economists have characterized the personal
7 computer industry as an industry which fits this description. For this reason, it is likely that pass
8 through is greater than 100 percent, in the market conditions that prevail for most, if not all, types of
9 mass market computer and consumer electronics equipment.

10 243. Thus, Plaintiffs and other members of the proposed Class have been forced to pay
11 supracompetitive prices for devices containing DRAM. These inflated prices have been passed on to
12 them by direct purchaser manufacturers, distributors, and retailers.

13 X. CLASS ACTION ALLEGATIONS

14 244. Plaintiffs bring this action under Federal Rule of Civil Procedure 23(b)(2) and
15 23(b)(3) on their own behalf and on behalf of the following class (the “Class”) for claims arising
16 under California law:

17 All persons and entities residing in the United States who from July 1,
18 2016 through the February 1, 2018, purchased, paid and/or provided
19 reimbursement for some or all of the purchase price for DRAM
20 Devices (“relevant DRAM Devices”) from July 1, 2016 through the
21 February 1, 2018. This class excludes the Defendant; the officers,
22 directors or employees of the Defendant; and any subsidiary, affiliate
23 or other entity in which Defendant has a controlling interest. The
24 Class also excludes all federal, state or local governmental entities, all
25 judicial officers presiding over this action and their immediate family
26 members and staff, and any juror assigned to this action.

27 245. In the event California law is not applied to the claims of all Class members for
28 damages regardless of where they reside, Plaintiffs will seek certification of the following subclass
29 (“Subclass”) under Rule 23(b)(3) for damages, under the laws of the Indirect Purchaser States (as
30 defined below), in addition to certification of the Class under Rule 23(b)(2) for purposes of
31 injunctive relief:

32 All persons and entities residing in the United States who purchased,
33 paid and/or provided reimbursement for some or all of the purchase

1 price for DRAM Devices (“relevant DRAM Devices”) from July 1,
2 2016 through the February 1, 2018. This class excludes the Defendant;
3 the officers, directors or employees of the Defendant; and any
4 subsidiary, affiliate or other entity in which Defendant has a
5 controlling interest. The Class also excludes all federal, state or local
6 governmental entities, all judicial officers presiding over this action
7 and their immediate family members and staff, and any juror assigned
8 to this action.

9 246. Plaintiffs will seek certification of the following subclasses (collectively, the “State
10 Classes”) for damages for claims under the antitrust statutes and/or consumer protection statutes of
11 each of the following jurisdictions:

12 a. **Arizona Indirect Purchaser Class**: Under Arizona law, all persons and
13 entities who, as residents of Arizona, indirectly purchased a DRAM Device during the Class Period
14 for their own use and not for resale.

15 b. **Arkansas Purchaser Class**: Under Arkansas law, including Ark Code Ann. §
16 4-75-212-315(a)(3), all persons and entities who, as residents of Arkansas, indirectly purchased a
17 DRAM Device during the Class Period for their own use and not for resale.

18 c. **California Indirect Purchaser Class**: Under California Law, including
19 Section 17200, All persons and entities who, as residents of California, indirectly purchased a
20 DRAM Device during the Class Period for their own use and not for resale.

21 d. **District of Columbia Indirect Purchaser Class**: Under District of Columbia
22 law, including D.C. Code § 28-4509(a), all persons and entities who, as residents of the District of
23 Columbia, indirectly purchased a DRAM Device during the Class Period for their own use and not
24 for resale.

25 e. **Florida Indirect Purchaser Class**: Under Florida law, including the Florida
26 Deceptive and Unfair Trade Practices Act, All persons and entities who, as residents of Florida,
27 indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.

28 f. **Illinois Indirect Purchaser Class**: Under Illinois law, all persons and entities
who, as residents of Illinois, indirectly purchased a DRAM Device during the Class Period for their
own use and not for resale.

1 g. **Iowa Indirect Purchaser Class**: Under Iowa law, including the Iowa
2 Competition Law, all persons and entities who, as residents of Illinois, indirectly purchased a DRAM
3 Device during the Class Period for their own use and not for resale.

4 h. **Kansas Indirect Purchaser Class**: Under Kansas Law, including Kan. Stat.
5 Ann. § 50-161, all persons and entities who, as residents of Kansas, indirectly purchased a DRAM
6 Device during the Class Period for their own use and not for resale.

7 i. **Maine Indirect Purchaser Class**: Under Maine law, including Me. Rev.
8 Stat. Ann., tit. 10, § 1104(1), all persons and entities who, as residents of Maryland, indirectly
9 purchased a DRAM Device during the Class Period for their own use and not for resale.

10 j. **Michigan Indirect Purchaser Class**: Under Michigan law, including Mich.
11 Comp. Laws § 445.778(1), all persons and entities who, as residents of Michigan, indirectly
12 purchased a DRAM Device during the Class Period for their own use and not for resale.

13 k. **Minnesota Indirect Purchaser Class**: Under Minnesota law, including
14 Minn. Stat. § 325D.57, All persons and entities who, as residents of Minnesota, indirectly purchased
15 a DRAM Device during the Class Period for their own use and not for resale.

16 l. **Mississippi Indirect Purchaser Class**: Under Mississippi law, including
17 Miss. Code Ann. § 75-21-9 (2009), all persons and entities who, as residents of Mississippi,
18 indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.

19 m. **Nebraska Indirect Purchaser Class**: Under Nebraska law, including Neb.
20 Rev. Stat. § 59-821, all persons and entities who, as residents of Nebraska, indirectly purchased a
21 DRAM Device during the Class Period for their own use and not for resale.

22 n. **New Hampshire Indirect Purchaser Class**: Under New Hampshire law,
23 including N.H. Rev. Stat. § 356:11, all persons and entities who, as residents of New Hampshire,
24 indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.

25 o. **New Mexico Indirect Purchaser Class**: Under New Mexico law, including
26 N.M. Stat. Ann. § 57-1-3, all persons and entities who, as residents of New Mexico, indirectly
27 purchased a DRAM Device during the Class Period for their own use and not for resale.

28

1 p. **New York Indirect Purchaser Class**: Under New York law, including N.Y.
2 Gen. Bus. Law § 349(a), all persons and entities who, as residents of New York, indirectly purchased
3 a DRAM Device during the Class Period for their own use and not for resale.

4 q. **North Carolina Indirect Purchaser Class**: Under North Carolina law, all
5 persons and entities who, as residents of North Carolina, indirectly purchased a DRAM Device
6 during the Class Period for their own use and not for resale.

7 r. **North Dakota Indirect Purchaser Class**: Under North Dakota law,
8 including N.D. Cent. Code §§ 51-08.1-08, all persons and entities who, as residents of North Dakota,
9 indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.

10 s. **Oregon Indirect Purchaser Class**: Under Oregon law, including Or. Rev.
11 Stat. § 646.780, all persons and entities who, as residents of Oregon, indirectly purchased a DRAM
12 Device during the Class Period for their own use and not for resale.

13 t. **South Dakota Indirect Purchaser Class**: Under South Dakota law,
14 including S.D. Codified Laws § 37-1-33, all persons and entities who, as residents of South Dakota,
15 indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.

16 u. **Tennessee Indirect Purchaser Class**: Under Tennessee law, all persons and
17 entities who, as residents of Tennessee, indirectly purchased a DRAM Device during the Class
18 Period for their own use and not for resale.

19 v. **Utah Indirect Purchaser Class**: Under Utah law, all persons and entities
20 who, as residents of Utah, indirectly purchased a DRAM Device during the Class Period for their
21 own use and not for resale.

22 w. **Vermont Indirect Purchaser Class**: Under Vermont law, including Vt. Stat.
23 Ann. tit. 9, § 2465, all persons and entities who, as residents of Vermont, indirectly purchased a
24 DRAM Device during the Class Period for their own use and not for resale.

25 x. **West Virginia Indirect Purchaser Class**: Under West Virginia law,
26 including W. Va. Code § 47-18-1, all persons and entities who, as residents of West Virginia,
27 indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.

1 y. **Wisconsin Indirect Purchaser Class**: Under Wisconsin law, including Wis.
2 Stat. Ann. § 133.18(1)(a), all persons and entities who, as residents of Wisconsin, indirectly
3 purchased a DRAM Device during the Class Period for their own use and not for resale.

4 247. Plaintiffs do not know the exact number of Class and State Classes members but
5 believe that the Class and State Classes includes millions of members. Plaintiffs believes that joinder
6 of all Class and State Class members is impracticable. Fed. R. Civ. P. 23(a)(1).

7 248. Common questions of law and fact exist as to all members of the Class and State
8 Classes. Such questions of law and fact common to the Class and State Classes include, but are not
9 limited to, the following:

10 249. Whether Defendants engaged in collusive conduct in the DRAM market, including
11 restrictions on the growth of DRAM supply.

12 250. Whether Defendants' unlawful conduct enabled Defendants to increase, maintain, or
13 stabilize above competitive levels the prices they charge for DRAM; if so, whether such
14 supracompetitive prices were passed on to Class and State Class members; and, if so, the appropriate
15 classwide measure of damages.

16 251. Whether Defendants violated Section 1 of the Sherman Act.

17 252. Whether Defendants violated Sections 16720 and 17200 of the California Business
18 and Professions Code.

19 253. Whether Defendants violated the antitrust, unfair competition, consumer protection
20 laws, and unjust enrichment laws as alleged below.

21 254. These common questions and others predominate over questions, if any, that affect
22 only individual Class or State Class members. Fed. R. Civ. P. 23(a)(2) and 23(b)(3).

23 255. Plaintiffs' claims are typical of, and not antagonistic to, the claims of the other Class
24 members. By advancing their claims, Plaintiffs will also advance the claims of all Class members,
25 because Defendants participated in activity that caused all Class members to suffer similar injuries.
26 Fed. R. Civ. P. 23(a)(3).

27 256. Plaintiffs will fairly and adequately protect the interests of absent Class members.

28 There are no material conflicts between Plaintiffs' claims and those of absent Class or State Classes

1 members that would make class certification inappropriate. Counsels for Plaintiffs are experienced in
2 complex class action litigation, including antitrust litigation, and will vigorously assert Plaintiffs'
3 claims and those of absent Class and State Class members. Fed. R. Civ. P. 23(a)(4).

4 257. A class action is superior to other methods for the fair and efficient resolution of this
5 controversy. The class action device presents fewer management difficulties, and provides the
6 benefit of a single adjudication, economy of scale, and comprehensive supervision by a single court.
7 Fed. R. Civ. P. 23(b)(3). The damages suffered by each Plaintiffs and Class and State Class member
8 is relatively small, given the expense and burden of individual prosecution of the claims asserted in
9 this litigation. Thus, absent class certification, it would not be feasible for Plaintiffs and Class and
10 State Class members to redress the wrongs done to them. Even if Plaintiffs and Class members could
11 afford individual litigation, which is not the case, the court system could not. Further, individual
12 litigation presents the potential for inconsistent or contradictory judgments and would greatly
13 magnify the delay and expense to all parties and to the court system. Therefore, the class action
14 device presents far fewer case management difficulties and will provide the benefits of unitary
15 adjudication, economy of scale and comprehensive supervision by a single court.

16 258. Defendants have acted or refused to act on grounds generally applicable to the Class
17 and State Classes, thereby making appropriate final injunctive relief or corresponding declaratory
18 relief with respect to the Class as a whole. Fed. R. Civ. P. 23(b)(2).

19 **XI. VIOLATIONS ALLEGED**

20 **FIRST CLAIM FOR RELIEF**

21 **(Violations of Sherman Act, 15 U.S.C. § 1)**

22 275. Indirect Purchaser Plaintiffs incorporate by reference all the above allegations as if
23 fully set forth herein.

24 276. Beginning at least as early as July 1, 2016, the exact date being unknown to Indirect
25 Purchaser Plaintiffs and exclusively within the knowledge of Defendants, Defendants and their co-
26 conspirators entered into a continuing contract, combination or conspiracy to unreasonably restrain
27 trade and commerce in violation of Section 1 of the Sherman Act (15 U.S.C. § 1) by artificially
28 reducing or eliminating competition in the United States.

1 277. In particular, Defendants have combined and conspired to raise, fix, maintain or
2 stabilize the prices of DRAM Products sold in the United States.

3 278. As a result of Defendants' unlawful conduct, prices for DRAM and DRAM Products
4 were raised, fixed, maintained, and stabilized in the United States.

5 279. The contract, combination or conspiracy among Defendants consisted of a continuing
6 agreement, understanding, and concerted action among Defendants and their co-conspirators.

7 280. For purposes of formulating and effectuating their contract, combination, or
8 conspiracy, Defendants and their co-conspirators did those things they contracted, combined, or
9 conspired to do, including:

- 10 a. Communicating in writing and orally to fix prices of DRAM and DRAM
11 products.
- 12 b. Agreeing to manipulate prices and supply of DRAM and DRAM Products
13 sold in the United States in a manner that deprived direct and indirect
14 purchasers of free and open competition.
- 15 c. Making supply growth decisions in accordance with the agreements reached.
- 16 d. Selling DRAM and DRAM Products to customers in the United States at
17 noncompetitive prices.
- 18 e. Providing false statements to the public to explain increased prices for DRAM
19 and DRAM products.

20 281. As a result of Defendants' unlawful conduct, Indirect Purchaser Plaintiffs and the
21 other members of the Class have been injured in their businesses and property in that they have paid
22 more for DRAM Products than they otherwise would have paid in the absence of Defendants'
23 unlawful conduct.

24 282. These violations are continuing and will continue unless enjoined by this Court.

25 283. Pursuant to Section 16 of the Clayton Act, 15 U.S.C. § 26, Indirect Purchaser
26 Plaintiffs and the Nationwide Class seek the issuance of an injunction against Defendants, preventing
27 and restraining the violations alleged herein.

SECOND CLAIM FOR RELIEF

**(Violations of the Cartwright Act,
Cal. Bus. & Prof. Code §§ 16720, *et seq.*)**

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

284. Indirect Purchaser Plaintiffs incorporate by reference all the above allegations as if fully set forth herein.

285. By reason of the foregoing, Defendants have violated California Business and Professions Code, §§ 16700, *et seq.* California Plaintiff on behalf of a nationwide class of Indirect Purchasers alleges as follows.

286. Beginning at a time currently unknown to California Plaintiff, but at least as early as July 1, 2016 and continuing thereafter at least up to February 1, 2018, Defendants and their co-conspirators entered into and engaged in a continuing unlawful trust in restraint of the trade and commerce described above in violation of section 16720, California Business and Professions Code. Defendants, and each of them, have acted in violation of section 16720 to fix, raise, stabilize, and maintain prices of, and allocate markets for DRAM and DRAM Products at supra-competitive levels.

287. In particular, Defendants have combined and conspired to raise, fix, maintain or stabilize the prices of DRAM and DRAM Products sold in the United States.

288. As a result of Defendants' unlawful conduct, prices for DRAM and DRAM Products were raised, fixed, maintained, and stabilized in the United States.

289. The contract, combination or conspiracy among Defendants consisted of a continuing agreement, understanding, and concerted action among Defendants and their co-conspirators.

290. For purposes of formulating and effectuating their contract, combination, or conspiracy, Defendants and their co-conspirators did those things they contracted, combined, or conspired to do, including:

- a. Communicating in writing and orally to fix prices of DRAM and DRAM products.
- b. Agreeing to manipulate prices and supply of DRAM and DRAM Products sold in the United States in a manner that deprived direct and indirect purchasers of free and open competition.

- 1 c. Making supply growth decisions in accordance with the agreements reached.
- 2 d. Selling DRAM and DRAM Products to customers in the United States at
- 3 noncompetitive prices.
- 4 e. Providing false statements to the public to explain increased prices for DRAM
- 5 and DRAM products.

6 291. As a direct and proximate result of Defendants' unlawful conduct, California
7 plaintiffs and the members of the California Indirect Purchaser Class have been injured in their
8 business and property in that they paid more for DRAM and DRAM Products than they otherwise
9 would have paid in the absence of Defendants' unlawful conduct. As a result of Defendants'
10 violation of Section 16720 of the California Business and Professions Code, California Plaintiff and
11 the California Indirect Purchaser Class seek treble damages and their cost of suit, including a
12 reasonable attorney's fee, pursuant to section 16750(a) of the California Business and Professions
13 Code.

14 **THIRD CLAIM FOR RELIEF**

15 **(Violations of California's Unfair Competition Law, 16 Cal. Bus. & Prof. Code §§ 17200, *et seq.*)**

17 292. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above
18 paragraphs as if fully set forth herein.

19 293. By reason of the foregoing, Defendants have violated California's Unfair Competition
20 Law, Cal. Bus. & Prof. Code §§ 17200, *et seq.* California Plaintiff on behalf of the California
21 Indirect Purchaser Class alleges as follows.

22 294. Defendants committed acts of unfair competition, as defined by section 17200, *et seq.*,
23 by engaging in a conspiracy to fix and stabilize the price of DRAM and DRAM Products as
24 described above.

25 295. The acts, omissions, misrepresentations, practices and non-disclosures of Defendants,
26 as described above, constitute a common and continuing course of conduct of unfair competition by
27 means of unfair, unlawful and/or fraudulent business acts or practices with the meaning of Section
28

1 17200, *et seq.*, including, but not limited to (1) violations of Section 1 of the Sherman Act; and (2)
2 violations of the Cartwright Act.

3 296. Defendants' acts, omissions, misrepresentations, practices and nondisclosures are
4 unfair, unconscionable, unlawful and/or fraudulent independently of whether they constitute a
5 violation of the Sherman Act or the Cartwright Act.

6 297. Defendants' acts or practices are fraudulent or deceptive within the meaning of
7 section 17200, *et seq.*

8 298. Defendants' conduct was carried out, effectuated, and perfected within the state of
9 California. Defendants maintained offices in California where their employees engaged in
10 communications, meetings and other activities in furtherance of Defendants' conspiracy.

11 299. By reason of the foregoing, the Class is entitled to application of California law to a
12 nationwide class and are entitled to full restitution and/or disgorgement of all revenues, earnings,
13 profits, compensation, and benefits that may have been obtained by Defendants as result of such
14 business acts and practices described above.

15 **FOURTH CLAIM FOR RELIEF**

16 **(Violations of State Antitrust and Restraint of Trade Laws)**

17 300. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above
18 paragraphs as if fully set forth herein.

19 301. Defendants engaged in a continuing contract, combination and conspiracy in restraint
20 of interstate trade and commerce, which had the purpose and effect of fixing, raising, maintaining
21 and/or stabilizing the price DRAM at artificially high, non-competitive levels in the United States.

22 302. For the purpose of effectuating the aforesaid contract, combination, and conspiracy,
23 Defendants

- 24 a. agreed among themselves to fix, raise, maintain and/or stabilize the prices of
25 DRAM in the United States; and
26 b. agreed among themselves to restrict the supply of DRAM by coordinating
27 their actions.

1 303. The conspiracy had its intended effect, as Defendants benefitted from selling DRAM
2 at supra-competitive prices.

3 304. As a result of Defendants' unlawful conduct, Plaintiffs and the other members of the
4 State Classes have been injured in their business and property in that they have paid more for DRAM
5 Products than they otherwise would have paid in the absence of Defendants'

6 305. By reason of the foregoing, Defendants have violated Arizona Revised Statutes §§ 44-
7 1401, *et seq.*

8 306. By reason of the foregoing, Defendants have violated Arkansas § 4-75-212-315(a)(3),
9 *et. seq.*

10 307. By reason of the foregoing, Defendants have violated California Business and
11 Professions Code §§ 16720, *et seq.*

12 308. By reason of the foregoing, Defendants have violated District of Columbia Code
13 Annotated §§ 28-4501, *et seq.*

14 309. By reason of the foregoing, Defendants have violated the Florida Deceptive and
15 Unfair Trade Practices Act, Fla. Stat. §§ 501.201, *et seq.*

16 310. By reason of the foregoing, Defendants have violated the Illinois Antitrust Act,
17 Illinois Compiled Statutes, §§ 740 Ill. Comp. Stat. 10/1, *et seq.*

18 311. By reason of the foregoing, Defendants have violated Iowa Code §§ 553.1, *et seq.*

19 312. By reason of the foregoing, Defendants have violated Kansas Statutes Annotated
20 §§ 50-101, *et seq.*

21 313. By reason of the foregoing, Defendants have violated the Maine Revised Statutes 10
22 M.R.S. §§ 1101, *et seq.*

23 314. By reason of the foregoing, Defendants have violated Michigan Compiled Laws
24 Annotated §§ 445.771, *et seq.*

25 315. By reason of the foregoing, Defendants have violated Minnesota Annotated Statutes
26 §§ 325D.49, *et seq.*

27 316. By reason of the foregoing, Defendants have violated Mississippi Code Annotated
28 §§ 75-21-1, *et seq.*

1 317. By reason of the foregoing, Defendants have violated Nebraska Revised Statutes
2 §§ 59-801, *et seq.*

3 318. By reason of the foregoing, Defendants have violated New Hampshire Revised
4 Statutes §§ 356:1, *et seq.*

5 319. By reason of the foregoing, Defendants have violated New Mexico Statutes
6 Annotated §§ 57-1-1, *et seq.*

7 320. By reason of the foregoing, Defendants have violated New York General Business
8 Laws §§ 340, *et seq.*

9 321. By reason of the foregoing, Defendants have violated North Carolina General Statutes
10 §§ 75-1, *et seq.*

11 322. By reason of the foregoing, Defendants have violated North Dakota Century Code
12 §§ 51-08.1-01, *et seq.*

13 323. By reason of the foregoing, Defendants have violated Oregon Revised Statutes
14 §§ 646.705, *et seq.*

15 324. By reason of the foregoing, Defendants have violated South Dakota Codified Laws §§
16 37-1-3.1, *et seq.*

17 325. By reason of the foregoing, Defendants have violated Tennessee Code Annotated §§
18 47-25-101, *et seq.*

19 326. By reason of the foregoing, Defendants have violated Utah Code Annotated §§ 76-10-
20 911, *et seq.*

21 327. By reason of the foregoing, Defendants have violated Vermont Stat. Ann. 9 §§ 2451,
22 *et seq.*

23 328. By reason of the foregoing, Defendants have violated West Virginia Code §§ 47-18-1,
24 *et seq.*

25 329. By reason of the foregoing, Defendants have violated Wisconsin Statutes §§ 133.01,
26 *et seq.*

XII. DEMAND FOR TRIAL BY JURY

330. Pursuant to Fed. R. Civ. P. 38(b), Plaintiffs demands trial by jury of all issues so triable under the law.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs and Class members pray for relief as set forth below:

A. Certification of the action as a class action pursuant to Federal Rule of Civil Procedure 23, and appointment of Plaintiffs as Class Representatives and their counsel of record as Class Counsel;

B. A declaration that Defendants' conduct constituted an unlawful restraint of trade in violation of the federal and state statutes alleged herein and that Defendants are liable for the conduct or damage inflicted by any other co-conspirator.

C. Restitution and/or damages to Class members for their purchases of products containing DRAM at inflated prices;

D. Actual damages, statutory damages, punitive or treble damages, and such other relief as provided by the statutes cited herein;

E. Pre-judgment and post-judgment interest on such monetary relief;

F. Equitable relief in the form of restitution and/or disgorgement of all unlawful or illegal profits received by Defendants as a result of the anticompetitive conduct alleged herein;

G. An injunction against Defendants, their affiliates, successors, transferees, assignees, and other officers, directors, partners, agents and employees thereof, and all other persons acting or claiming to act on their behalf or in concert with them from in any manner continuing, maintaining, or renewing the conduct, contract, conspiracy, or combination alleged herein, or from entering into any other contract, conspiracy, or combination having a similar purpose or effect, and from adopting or following any practice, plan, program or device having a similar purpose or effect

H. The costs of bringing this suit, including reasonable attorneys' fees; and

I. All other relief to which Plaintiffs and Class members may be entitled at law or in equity.

DEMAND FOR JURY TRIAL

Plaintiffs on behalf of themselves and all others similarly situated hereby request a jury trial on any and all claims so triable.

DATED: April 27, 2018

HAGENS BERMAN SOBOL SHAPIRO LLP

By s/ Jeff D. Friedman
JEFF D. FRIEDMAN

Rio S. Pierce (298297)
715 Hearst Avenue, Suite 202
Berkeley, CA 94710
Telephone: (510) 725-3000
Facsimile: (510) 725-3001
jefff@hbsslaw.com
riop@hbsslaw.com

Steve W. Berman
Anthony D. Shapiro
Ronnie Spiegel
HAGENS BERMAN SOBOL SHAPIRO LLP
1918 Eighth Avenue, Suite 3300
Seattle, WA 98101
Telephone: (206) 623-7292
Facsimile: (206) 623-0594
steve@hbsslaw.com
tony@hbsslaw.com
ronnie@hbsslaw.com