DIGITIMES

Intel may benefit from Apple's fight with Qualcomm

Joseph Tsai, DIGITIMES

To avoid over-relying on baseband chip supply from Qualcomm, Apple added Intel as a second baseband chip supplier for its iPhone 7 series smartphones in 2016, with Intel receiving an outsourcing proportion of around 30%. Since Intel's baseband chips have inferior performances compared to Qualcomm's solutions, some market watchers originally expected Apple to shift back all its baseband chip orders for the next-generation iPhones from Intel to Qualcomm.

However, instead of a drop, Apple's outsourcing proportion to Intel for the next-generation iPhone baseband chips has risen to about 50% for orders running through the end of 2017 due to the lawsuit between Qualcomm and Apple, which has grown fiercer recently.

Since both Qualcomm and Apple are unwilling to give in to make peace, some market watchers believe Apple is likely to shift even more baseband chip orders away from Qualcomm with Intel to supply over 70% of the baseband products for iPhones by 2018.

In addition to its handset chip design business, Qualcomm, which has an enormous patent base, has also been relying heavily on the income from patent licensing. As more IT players began investing in the development of in-house made chips, while countries such as China and Korea, have been aggressively investigating whether Qualcomm's licensing fees are reasonable, Qualcomm's domination in the chip market has been greatly challenged in the past few years.

In early 2017, Apple filed a lawsuit at California's district court, suing Qualcomm for its high royalty fees and also recently suspended its royalty payments to Qualcomm. In return, Qualcomm filed a counter-suit and even pressed charges against Apple's upstream suppliers including Foxconn Electronics (Hon Hai Precision Industry), Pegatron Technology, Wistron and Compal Electronics.

When Apple added Intel to its baseband chip supply chain, Qualcomm's solution price was around US$23 and Intel's around US$15. Intel's price was lower because of the inferior performance.

Some market watchers believe Apple is unlikely to be willing to let Qualcomm take over control of its supply strategy and with its rich R&D resources and cash, the US-based smartphone vendor has a big chance to begin internal R&D for in-house baseband solutions. If such assumptions come true, Apple's orders for Intel's baseband chips may be strong for the short terms, but may not last for a long time, meaning this is a friendship of convenience rather than a long-term strategic partnership.

This current lawsuit was initiated in the US earlier this year when the FTC alleged that Qualcomm was using its dominant position in the baseband processor industry to impose onerous and anticompetitive supply and licensing terms on handset manufacturers and to weaken competitors.

Apple then followed up with a lawsuit against Qualcomm for US$1billion, alleging that formerly it had the option of purchasing baseband chips from vendors including Broadcom, Ericsson, Renesas, and Texas Instruments. Currently, Intel is Qualcomm's only competitor in the market for premium LTE chipsets, and Qualcomm has no competition at all in the market for premium LTE chipsets with CDMA functionality.

Apple then alleged that Intel has been the target of Qualcomm's exclusionary efforts to force Apple to refrain from introducing Intel chipsets in Apple products. Apple also alledged that Qualcomm was secretly extracting royalties from Apple's manufacturing partners in Taiwan. As for the Taiwan partners, commenting on the Qualcomm lawsuit against Pegatron Technology, company chairman TH Tung, who is also chairman of Taipei Computer Association (TCA) pointed out that Pegatron is not really concerned as he believes that Qualcomm's action was just a bargaining strategy for business negotiations.

Since Pegatron is not the one infringed the patents in the lawsuit, Tung hopes the two firms can resolve their misunderstanding shortly and the fluctuation will eventually cool down.

One interesting aspect of the lawsuits filed with the FTC by Apple was the section that stated Qualcomm had a virtual monopoly on baseband chips that support CDMA networks, such as those used by Verizon.

But soon after the lawsuit were filed, Intel announced its new Intel XMM 7560 LTE modem, which does support CDMA, giving Apple a viable alternative to Qualcomm in the premium LTE market moving forward.

▲ Intel inside?

MSI and Asustek vying for gaming notebook crown

Monica Chen, Taipei; Joseph Tsai, DIGITIMES

As worldwide consumer demand for notebooks remains in decline, most PC brand vendors have turned their focuses to the gaming sector. Asustek Computer and Micro-Star International (MSI) were the top-2 vendors in the gaming notebook market in 2016 and despite fierce competition from existing players and newcomers MSI is expected to see its gaming notebook shipments rise 30% on year to reach 1.1 million units in 2017, catching up with the expected volume shipped by Asustek, according to sources from the upstream supply chain.

Worldwide gaming notebook shipments are expected to grow 600,000 units on year in 2017, increasing from 4.5 million units in 2016 to around 5.1 million, according to the sources. Although the increased volume will not be a lot, gaming notebook vendors are still aggressively releasing new products for the market because of their high ASPs, which translate into large profits.

Vendors including Lenovo, Razer, Dell, Hewlett-Packard (HP), Samsung Electronics, Asustek, MSI, Acer, Gigabyte Technology and regional vendors in China, Europe and North America, have all been pushing new gaming products recently.

During a recent interview, Gigabyte also put 2016's worldwide gaming notebook shipments at 4.5 million units. However, Gigabyte is less optimistic about the growth in 2017 and expects the market to have only a single-digit percentage growth, since pricing for gaming notebooks is already approaching its bottom margin.

Gigabyte said that the gaming notebook market in the past few years has seen 15-20% growth annually, but this was the result of what Gigabyte calls a change in definition since overall notebook shipments have not seen any growth at all. Since the standard for a gaming notebook has been dropping every year, shipment volumes have been picking up, but at the expense of demand for some other notebook products.

A couple of weeks ago, Hong Kong-based CK Hutchison Holdings reportedly invested more than US$50 million in US-based gaming product vendor Razer via its affiliate Horizons Ventures, showing that gaming is no longer just a niche sector in the PC market, but a target with profit potential for international investors.

The 4.5 million gaming notebook shipments in 2016 were models that are equipped with one or two Nvidia's discrete graphics card that have a level of GeForce GTX 1060 or above. Asustek's shipments under its Republic of Gamers (ROG) gaming series and MSI's gaming notebook volumes were both at around 850,000 units in 2016. However, after adding shipments of its non-ROG series multimedia models with a GeForce GTX 1060 and above graphics card, Asustek's actual shipments of gaming notebooks reached around 1.2 million units. Strong shipments and competitive product lineups

allow Asustek and MSI to remain as the top-2 and earn more than half of the overall profits from the sector.

Because of its strong profit performance, MSI has been the major target of gaming PC vendors to snatch some market share from in the past few years. However, MSI has managed to fend off its competitors and acquired advantages in many countries in Europe and North America, which tend to have better acceptance of high ASP products. In Germany, the UK and France, MSI is the current leading gaming notebook vendor.

In China's gaming notebook market, which contributes nearly 40% of worldwide shipments, MSI has a far inferior shipment performance than Lenovo and Asustek, but the vendor was still able to achieve shipments and profits at a level similar to that of Asustek overall.

In the first half of this year, MSI had a strong first quarter in terms of revenues, but the amount is expected to drop slightly in the second quarter and the company's revenue ratio for the first and second halves of 2017 is expected to reach 45:55. With a target of

shipping 1.1 million gaming notebooks in 2017, the business is expected to contribute over NT$4 billion in profits to boost the company's EPS to above NT$6.

In 2016, MSI's net profits were NT$4.89 billion, up more than 30% on year and EPS reached NT$5.79. The company achieved profits in the first quarter thanks to income from currency exchange as well as stable profits from its notebook and motherboard/graphics card businesses and had EPS of NT$1.63.

Meanwhile, Asustek has recently announced it will begin a business reorganization and will establish a new business unit handling its gaming products under the System Product business group. The company will also appoint the head of its tablet business to manage the new unit.

Gigabyte also had a similar issue for its gaming product's marketing. Previously, Gigabyte's strategy for Aorus was to have it act as an independent brand, separated from Gigabyte and each department would handle its Aorus-brand products' R&D and marketing independently.

Interestingly enough, Intel gained access to the CDMA technology when it purchased the CDMA business unit from its former chipset rival Taiwan-based Via Technologies in 2015.

And to bring things full circles here at Computex, Qualcomm has announced that it is powering Windows-based PCs with its Snapdragon 835. The company announced at the show that Asustek Computer, Hewlett-Packard (HP) and Lenovo are the first original equipment manufacturers (OEMs) to develop mobile PCs powered by its Snapdragon 835 mobile PC platform featuring an integrated X16 Gigabit LTE modem.

Asustek, HP and Lenovo are set to each produce sleek, thin and fanless PCs running a Windows 10 experience with LTE connectivity for an always connected, on the go experience, Qualcomm said. Coupled with the 10nm leading node efficiency of the Snapdragon 835 mobile PC Platform, these devices will feature beyond all-day battery life, the company added.

Qualcomm indicated its Snapdragon 835 SoC built into the mobile PC platform features the Qualcomm Kryo 280 CPU, Adreno 540 GPU and Hexagon 682 DSP to manage separate heterogenous workloads. The Snapdragon 835 devices with superior thermal handling and greater power efficiency, enabling fanless designs with longer battery life, thanks to the leading 10nm process node on which it is made.

With an integrated Snapdragon X16 Gigabit LTE modem, devices will be able to support peak download speeds of up to 1Gbps, Qualcomm noted. The Snapdragon 835 mobile PC platform will also feature 2x2 802.11ac MU-MIMO for optimal Wi-Fi connectivity on the go.

"We are thrilled that OEMs are sharing our vision to bring the Windows 10 experience to the ARM ecosystem, powered by Qualcomm Technologies," said Matt Barlow, corporate VP of Windows marketing at Microsoft, in a statement from Qualcomm. "This collaboration offers consumers something new and that they have been craving – the best of a mobile computing experience with the best of Windows 10, all in one thin, light, connected device."
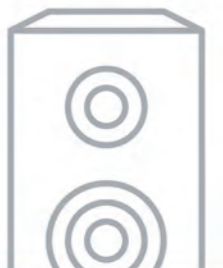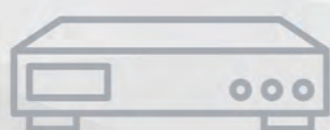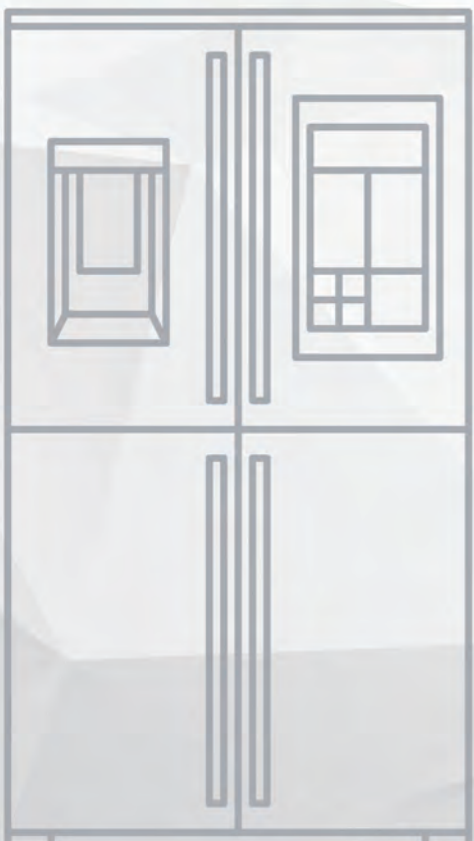
IoV and self-driving cars fuel the demand for automotive electronics

Staff Reporter

The growing level of automobile digitalization, especially advances in IoV technologies, is introducing booming opportunities for automotive electronic devices and parts and this will positively contribute to semiconductor market growth.

According to Strategy Analytics, semiconductors account for an increasing share of automotive parts. The cost of semiconductors used in an automobile was US$565 in 2016 and is expected to grow to US$610 by 2018. Applications in telematics, infotainment and advanced driver assistance systems (ADAS) will show more prominent growth. Based on IC Insights statistics, the automotive chipset market will enjoy a CAGR of 4.9% in 2015-2020, the highest among all IC end-market applications. Demand for analog IC, MCU and sensors will significantly ramp up.

ADAS leads advances in electronic components

ADAS that are now commonly equipped in automobiles have electronic control units (ECU) built into each subsystem to ensure that all driver assistance functions work in synchronization to enable absolute road safety. Furthermore, with the advent of the IoV era, automobiles will make use of additional wired and wireless communication technologies, radar and LiDar technologies, image sensors, MEMS sensors, digital signal processors to handle image data, and chipsets for data analyses to make judgments. The implementation of each of these functions will trigger explosive growth of automotive semiconductors.

It should be noted that not only will MCU and CPU developers benefit from the use of their products to enhance what automobiles are already capable of doing, but high-performance processors used to add more intelligent functions to automobiles will also be a future development trend. High-performance processors combining AI and deep learning will bring self-driving cars closer to reality.

To protect cars from hacker attacks which may result in accidents or even loss of lives, security chips will also play a growingly important role in the IoV era. STMicroelectronics recently introduced the Accordo 5 automotive processor that embeds a high-performance security microcontroller to safeguard the communication between multimedia hosts and automotive networks. The security microcontroller features built-in boot-code authentication, secure interconnect and high-performance data encryption.

Semiconductor solution providers

Eying explosive business opportunities in automotive electronics and semiconductors, vendors are already rolling up their sleeves and getting ready to throw a punch. For example, Qualcomm announced the merger deal to acquire global automotive electronics leader NXP for US$47 billion at the end of last year and has received approval from US antitrust regulators. The deal undoubtedly is a preparation for Qualcomm's expansion into the IoV market. According to IHS Technology, the merger between NXP and Freescale in 2015 created the world's top maker of automotive semiconductors. Qualcomm's acquisition of NXP will give Qualcomm a tremendous advantage in its expansion into automotive electronics and semiconductors.

In fact, before the merger deal, Qualcomm already began to penetrate into the market of automotive applications in 2015. It has supplied more than 340 million IoV chips to over 20 automakers, including 4G LTE, Wi-Fi, Bluetooth and V2X chips. Furthermore, Qualcomm has started to provide wireless electric vehicle charging solutions and has entered into multiple deals with major automotive parts suppliers. Qualcomm's solutions enable commercialized wireless electric vehicle charging systems for both plug-in hybrid electric vehicles (PHEV) and electric vehicles (EV).

Not letting Qualcomm take all the glory, semiconductor giant Intel has also recently announced a plan to acquire Israeli autonomous driving solution provider Mobileye for US$15.3 billion, following the buyout of FPGA supplier Altera last year as part of its strategy to penetrate into the automotive supply chain. Mobileye specializes in developing vision technology for ADAS by supporting image data transmission based on camera sensors. Its technology enables cruise control systems and braking systems to actively avoid collision before the driver becomes fully aware of what is happening. Among autonomous driving technologies, image processing is not as costly as laser sensors and cameras can capture images in a longer distance compared to LiDAR and millimeter wave radar, allowing self-driving cars to collect more environmental data in advance.

Before Mobileye, Intel also acquired Yogitech, working on functional safety of ADAS, Arynga, a provider of over-the-air (OTA) solutions for automotive computers, and computer vision startups Itseez and Movidius in 2016. In addition, Korea-based Samsung has also engaged in a merger deal totaling US$8 billion with Harman International, a provider of audio components and remote communication technologies.

Taiwan-based IC designers and foundries are making aggressive advances

Similarly, MediaTek is also accelerating its expansion into the automotive electronics market, focusing on chipsets for telematics, infotainment and safety ADAS applications. MediaTek plans to cut into the market of factory-installed auto parts by introducing four types of products, respectively for applications in vision-based ADAS, millimeter wave radar, infotainment systems and telematics systems. However, due to the long automobile lifecycle and the auto industry's stringent safety requirements, MediaTek expects it will take approximately 18 months for its automotive solutions to enter mass production.

Among other Taiwan-based vendors devoted to automotive applications, PixArt is developing critical technologies including automated calculation of distance between cars and automated detection of vehicle deceleration using CMOS sensors and its proprietary algorithms. Another focus of PixArt's R&D efforts targeting the automotive application market is the use of in-air gestures to control infotainment systems such as car audio and navigation devices. Weltrend is edging into the automotive original equipment (OE) and aftermarket (AM) sectors in China with its around view monitor (AVM) solutions. In addition to providing image processing and speech IC, Sunplus is also working on independent development of software and algorithms used in ADAS to warn drivers of lane departure or front and rear proximity. Sunplus has made its way into the supply chain for automakers in China and Japan through ADAS products and is also making progress in the AM sector.

As high-tech leaders push ahead with their expansion into the automotive market, TSMC is also well prepared to support its customers' volume production of ADAS core chips with the most cost-effective 16nm FFC process. TSMC is the world's first wafer foundry to support the fabrication of automotive semiconductors with the 16nm process technology. Furthermore, meeting demanding automotive requirements, TSMC is ISO 26262 and AEC-Q100 Grade1 certified. It has also established four internal high-tech platforms including mobile computation, high-performance computation, automotive electronics and IoT to help customers shorten product development cycles, which gives TSMC an added edge in semiconductor fabrication for automotive electronics.

DIGITIMES Research: China Smartphone Tracker – 1Q 2017

China smartphone market and industry

China smartphone market

Digitimes Research visited various smart mobile device makers in the Greater China region supply chain during March-April 2017 to collect market information and data. Digitimes Research discovered that the total number of new 4G users in China's three largest telecom carriers in first-quarter 2017 was only 67 million. This figure is significantly lower than the 84.40 million new users the firms experienced in fourth-quarter 2016 and 95.80 million new users in first-quarter 2016, which means demand for entry-level to mid-range 4G handsets fell sharply. This factor, on top of the high inventory level in distribution channels in China at the end of fourth-quarter 2016, contributed to the significant drop of shipments from China-based firms in first-quarter 2017. International brands also faced falling shipments as the sales peak of Apple's iPhone 7 and 7 Plus passed and Samsung has yet to introduce its flagship model. Total smartphone shipments in China in the first quarter of 2017 were 96.60 million units, showing an on-quarter decrease of 22.8% and an on-year decrease of 5.4%.

In first-quarter 2017, the top five firms by shipments in China's smartphone market were Oppo, BBK (brand name Vivo), Huawei, Apple and Xiaomi. In particular, Oppo and BBK saw falling shares but continued to place first and second in the market with shares of 18.7% and 17.1% respectively. Xiaomi, which fell to eighth place in fourth-quarter 2016 made a comeback to fifth place in first-quarter 2017 with strong shipments of new models, Hongmi 4X and Hongmi Note 4X.

Digitimes Research predicts that the China market will continue to absorb inventories stocked up in the distribution channel in the first half of the second-quarter of 2017. Digitimes Research predicts total shipments in the China market will be 117 million units in second-quarter 2017 with an on-quarter growth of only 5.3% and will show an on-year decrease. The top five makers by shipments in second-quarter 2017 will be Oppo, BBK, Huawei, Xiaomi and Apple.

Key factors affecting the China smartphone market

Key factors affecting China smartphone market shipments in first-quarter 2017:

Vendors (China-based/International brands)

International vendors:

The sales peak for iPhone 7 and 7 Plus has passed hence overall shipments from Apple fell sharply.

Samsung has yet to launch its flagship model, Galaxy S8, hence sales and shipments in China in the first quarter of 2017 continued to fall.

China-based brand vendors:

To avoid high inventory levels in the distribution channels in China, Huawei lowered domestic shipments in first-quarter 2017 compared to fourth-quarter 2016.

Xiaomi reduced shipments significantly in fourth-quarter 2016 and successfully lowered its inventory of older models in China, hence the firm saw strong shipments of its Hongmi 4X and Hongmi Note 4X in first-quarter 2017.

Oppo and BBK continued to increase shipments from the fourth quarter of 2016 to the Lunar New Year holidays in 2017 and sales were not as strong as expected causing inventory levels in the China market to build up. Shipments from both firms fell significantly after the Lunar New Year holidays hence first-quarter 2017 shipments experienced a sharp decrease.

As the overall cost of components continues to rise plus falling demand for low-priced entry-level 4G models, many small-size brands and white-box makers, which are mostly based in Southern China and produce models based on Alibaba Cloud, saw shipments fall significantly.

Key vendor factors affecting 1Q17 smartphone shipments in China

Factor	Item	Analysis	Influence on shipments
Vendor	International brands – Samsung	Sales and shipments continued to fall before launch of Galaxy S8.	↓★
	International brands – Apple	Sales peak of iPhone 7 and 7Plus has passed.	↓★★
	China-based makers – Xiaomi	Shipments increased due to new models Hongmi 4X and Hongmi Note 4X.	↑★★
	China-based makers – Huawei	To avoid inventory build-up, the firm reduced domestic shipments.	↓★★★
	China-based makers – Retail channel dominators	The continued shipment growth streak stopped for Oppo and BBK.	↓★★★★
	China-based makers – White box vendors	Shipments of low-price 4G models with Alibaba Cloud OS from small-size firms fell.	↓★★

Note: The more stars, the higher the influence. ↓ indicates negative influence, ↑ indicates a positive influence.
Source: Digitimes Research, May 2017

Market/Customer requirements

Market/consumer demand:

In first-quarter 2017, new policies and device subsidies to encourage 2G and 3G users to switch to 4G from China Mobile have yet to be announced. Therefore, the firm saw only 33 million new 4G users in first-quarter 2017. This figure is far less than the figures of 50-60 million new users the firm saw in each quarter of 2016. The comparatively lower new user figure in first-quarter 2017 also contributed to a sharp decline of price-friendly and super low-price 4G models sales in the domestic market.

In the past few quarters, the cost of components continues to increase causing firms to ease up on price wars over price-friendly or low-priced 4G models. This affected demand for consumers with lower budgets.

Key trends affecting smartphone shipments to China in 1Q17

Factor	Item	Analysis	Influence on shipments
Demand	Telecom operator subsidies	Telecom operators encouraging 2G/3G to 4G user transition.	The positive effects from the subsidies introduced by China Mobile have started to weaken.	↓★★★
	Market/product	Smartphones already have high penetration.	Sales growth in first tier and second tier cities are unlikely to occur.	↓★
	Market/product	Price competition ceased between low-price 4G models	With less price competition, some consumers were not as willing to buy a new phone as previously.	↓★

Note: The more stars, the higher the influence. ↓ indicates negative influence.
Source: Digitimes Research, May 2017
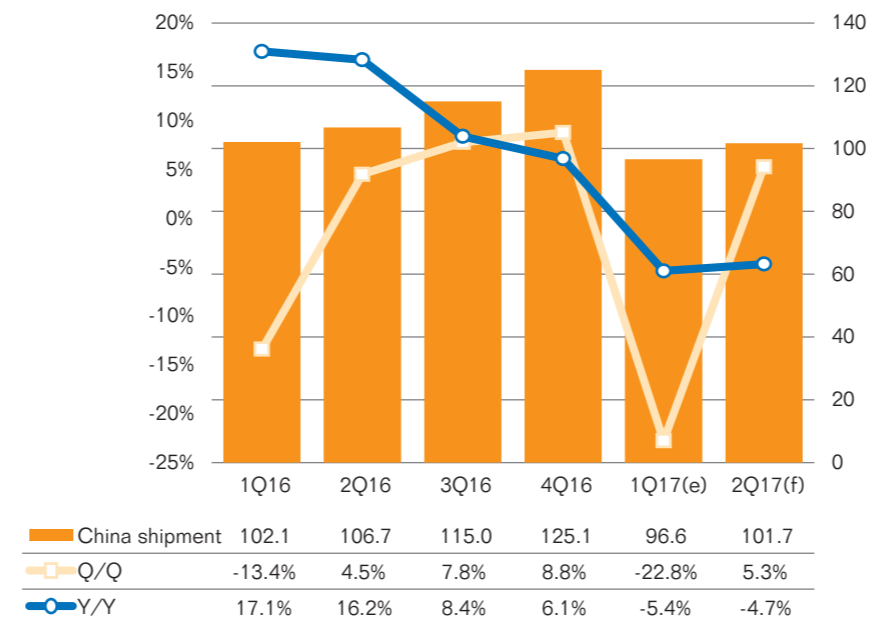
Shipment breakdown

In first-quarter 2017, China's smartphone market shipments were 96.60 million units, showing an on-year decrease of 5.4% and a significant on-quarter decrease of 22.8%. The shipments accounted for 31% of the global market.

Top three telecom carriers saw new 4G users total 67 million in first-quarter 2017, a figure that is significantly lower than the 84.40 million in fourth-quarter 2016. This means demand for entry-level to mid-range 4G devices also decreased.

Also, some brands and white-box makers increased shipments in fourth-quarter 2016 causing inventory levels to be high in the beginning of 2017.
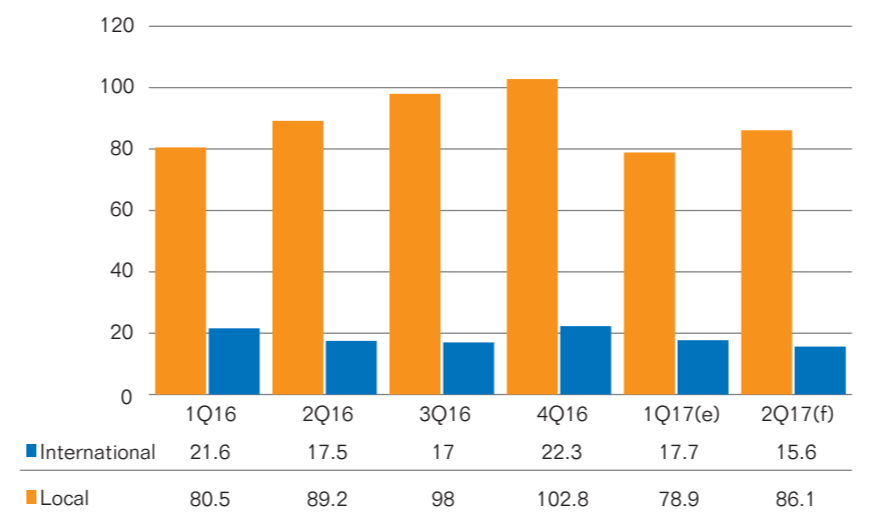
Digitimes Research predicts that the market will be absorbing the inventory overload in the first half of second-quarter 2017. Total shipments in second-quarter 2017 will be 117 million units, showing an on-quarter growth of only 5.3% and showing an on-year decrease compared to second-quarter 2016.

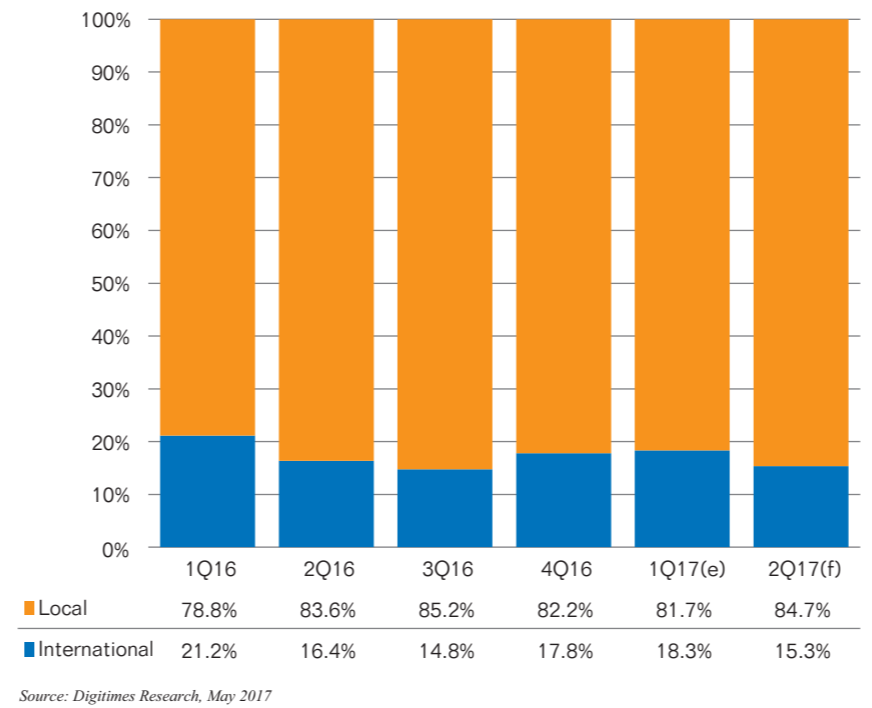### China smartphone market shipments, 1Q16-2Q17 (m units)

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
China shipment	102.1	106.7	115.0	125.1	96.6	101.7
Q/Q	-13.4%	4.5%	7.8%	8.8%	-22.8%	5.3%
Y/Y	17.1%	16.2%	8.4%	6.1%	-5.4%	-4.7%

Source: Digitimes Research, May 2017

China smartphone market shipments - international and local brands, 1Q16-2Q17 (m units)

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
International	21.6	17.5	17	22.3	17.7	15.6
Local	80.5	89.2	98	102.8	78.9	86.1

Source: Digitimes Research, May 2017

China smartphone market share - international and local brands, 1Q16-2Q17 (m units)

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Local	78.8%	83.6%	85.2%	82.2%	81.7%	84.7%
International	21.2%	16.4%	14.8%	17.8%	18.3%	15.3%

Source: Digitimes Research, May 2017

China-based smartphone vendors

China-based smartphone brands ranking by shipments in first-quarter 2017 of the domestic market were Oppo, BBK, Huawei, Xiaomi and Gionee.

Due to high inventory levels in the distribution channel, Oppo and BBK put a halt to shipments after the Lunar New Year holidays in 2017, ending the continued quarterly growth experienced by the firm. In the first quarter of 2017, the firms saw shipments fall to 18.10 million units and 16.50 million units respectively.

To avoid building up high inventory levels, Huawei decreased domestic shipments in first-quarter 2017 to 14.70 million units, showing an on-quarter decrease.

Due to the launch of new models, Hongmi 4X and Hongmi Note 4X, Xiaomi saw overall shipments in the China market in first-quarter 2017 reach 7.1 million units.
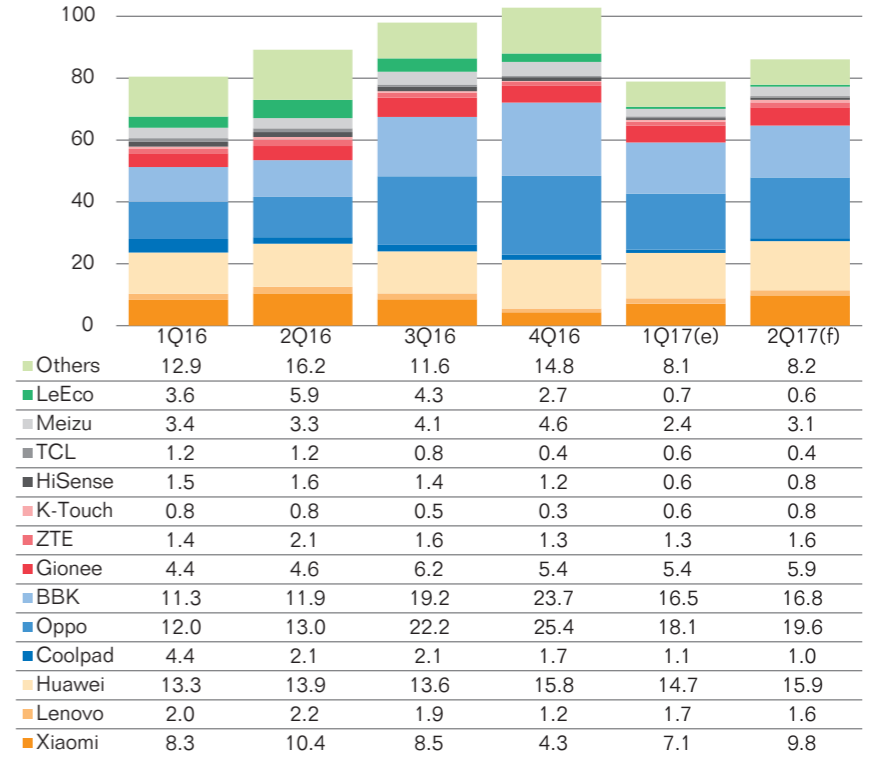
Gionee began dealing with high inventory levels in fourth-quarter 2016, hence first-quarter 2017 shipments were at the same level as the previous quarter, at around 5.4 million units.

Compared with sizable firms that mainly focus on the domestic market, Xiaomi saw strong shipments of new models Hongmi 4X and Hongmi Note 4X in first-quarter 2017. This was due to the fact that the firm greatly reduced shipments in fourth-quarter 2016 to lower inventory levels of older models. The firm saw first-quarter 2017 domestic shipments to show on-quarter growth of 65.1%.
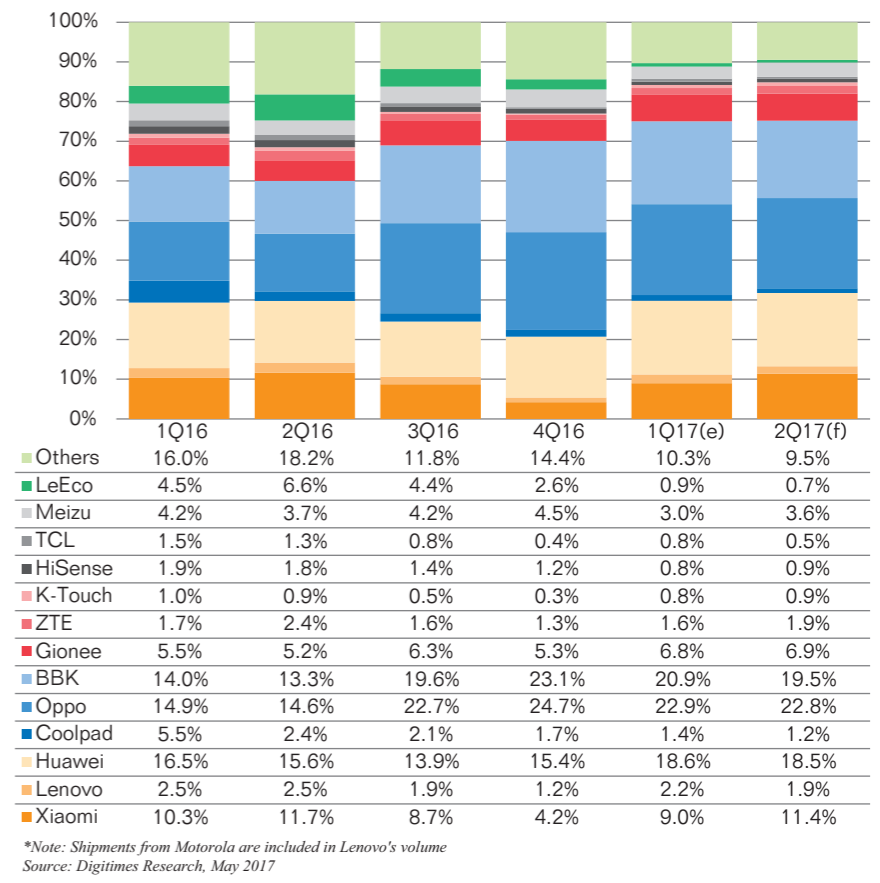
Digitimes Research believes many China-based brands will see on-quarter growth of shipments in second-quarter 2017.

China smartphone market shipments, by China-based players, 1Q16-2Q17 (m units)

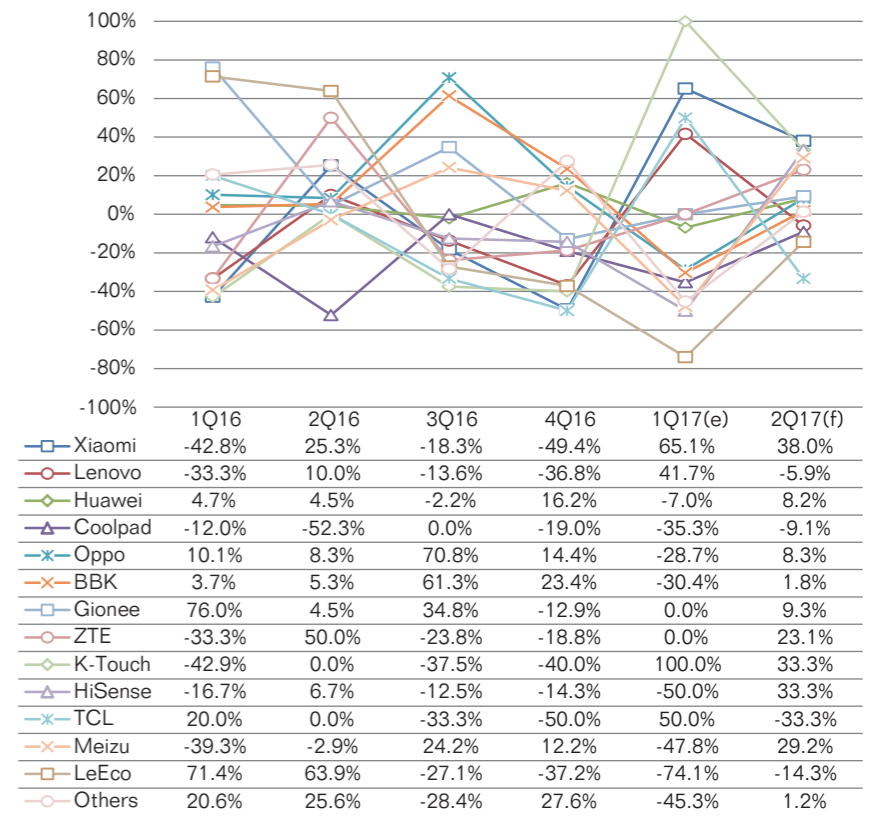|	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Others	12.9	16.2	11.6	14.8	8.1	8.2
LeEco	3.6	5.9	4.3	2.7	0.7	0.6
Meizu	3.4	3.3	4.1	4.6	2.4	3.1
TCL	1.2	1.2	0.8	0.4	0.6	0.4
HiSense	1.5	1.6	1.4	1.2	0.6	0.8
K-Touch	0.8	0.8	0.5	0.3	0.6	0.8
ZTE	1.4	2.1	1.6	1.3	1.3	1.6
Gionee	4.4	4.6	6.2	5.4	5.4	5.9
BBK	11.3	11.9	19.2	23.7	16.5	16.8
Oppo	12.0	13.0	22.2	25.4	18.1	19.6
Coolpad	4.4	2.1	2.1	1.7	1.1	1.0
Huawei	13.3	13.9	13.6	15.8	14.7	15.9
Lenovo	2.0	2.2	1.9	1.2	1.7	1.6
Xiaomi	8.3	10.4	8.5	4.3	7.1	9.8

*Note: Shipments from Motorola are included in Lenovo's volume
Source: Digitimes Research, May 2017

China smartphone market shipment share, by China-based players, 1Q16-2Q17

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Others	16.0%	18.2%	11.8%	14.4%	10.3%	9.5%
LeEco	4.5%	6.6%	4.4%	2.6%	0.9%	0.7%
Meizu	4.2%	3.7%	4.2%	4.5%	3.0%	3.6%
TCL	1.5%	1.3%	0.8%	0.4%	0.8%	0.5%
HiSense	1.9%	1.8%	1.4%	1.2%	0.8%	0.9%
K-Touch	1.0%	0.9%	0.5%	0.3%	0.8%	0.9%
ZTE	1.7%	2.4%	1.6%	1.3%	1.6%	1.9%
Gionee	5.5%	5.2%	6.3%	5.3%	6.8%	6.9%
BBK	14.0%	13.3%	19.6%	23.1%	20.9%	19.5%
Oppo	14.9%	14.6%	22.7%	24.7%	22.9%	22.8%
Coolpad	5.5%	2.4%	2.1%	1.7%	1.4%	1.2%
Huawei	16.5%	15.6%	13.9%	15.4%	18.6%	18.5%
Lenovo	2.5%	2.5%	1.9%	1.2%	2.2%	1.9%
Xiaomi	10.3%	11.7%	8.7%	4.2%	9.0%	11.4%

*Note: Shipments from Motorola are included in Lenovo's volume
Source: Digitimes Research, May 2017

China smartphone market shipment growth by quarter by China-based players, 1Q16-2Q17

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Xiaomi	-42.8%	25.3%	-18.3%	-49.4%	65.1%	38.0%
Lenovo	-33.3%	10.0%	-13.6%	-36.8%	41.7%	-5.9%
Huawei	4.7%	4.5%	-2.2%	16.2%	-7.0%	8.2%
Coolpad	-12.0%	-52.3%	0.0%	-19.0%	-35.3%	-9.1%
Oppo	10.1%	8.3%	70.8%	14.4%	-28.7%	8.3%
BBK	3.7%	5.3%	61.3%	23.4%	-30.4%	1.8%
Gionee	76.0%	4.5%	34.8%	-12.9%	0.0%	9.3%
ZTE	-33.3%	50.0%	-23.8%	-18.8%	0.0%	23.1%
K-Touch	-42.9%	0.0%	-37.5%	-40.0%	100.0%	33.3%
HiSense	-16.7%	6.7%	-12.5%	-14.3%	-50.0%	33.3%
TCL	20.0%	0.0%	-33.3%	-50.0%	50.0%	-33.3%
Meizu	-39.3%	-2.9%	24.2%	12.2%	-47.8%	29.2%
LeEco	71.4%	63.9%	-27.1%	-37.2%	-74.1%	-14.3%
Others	20.6%	25.6%	-28.4%	27.6%	-45.3%	1.2%

Source: Digitimes Research, May 2017

International vendors

The combined shipments of international brands in the China smartphone market in first-quarter 2017 were 17.70 million units, showing an on-quarter drop of 20.6%. The drop is less severe compared to China-based brands. The shipment share of international brands in China's smartphone market increased to 18.3%.

Digitimes Research believes as demand for Apple's iPhone 7 and 7 Plus continues to fall in second-quarter 2017, the combined shipments from international brands will fall to 15.60 million units.

The sales peak of iPhone 7 and 7 Plus passed in first-quarter 2017 causing Apple to see shipments fall to 12.40 million units, lower compared to first-quarter 2016.

Digitimes Research predicts before the new iPhone gets introduced in 2017, Apple will likely see shipments in second-quarter 2017 to fall to 8.9 million units. Digitimes Research also predicts Samsung to see second-quarter 2017 shipments will increase to 5.8 million units as the firm launches its new flagship model, Galaxy S8.

Compared to fourth-quarter 2016, Apple saw shipments in first-quarter 2017 show an on-quarter decrease of 24.4%. Other international brands saw first-quarter 2017 shipments showing an on-quarter decrease or flat growth compared to fourth-quarter 2016.

Digitimes Research predicts Apple will experience close to a 30% on-quarter drop of shipments in second-quarter 2017 while Samsung and HTC may experience double digit on-quarter growth.

Digitimes Research: AIO shipments expected to take larger share of desktop PC market

Digitimes Research

With the consumer sector continuing to have weak demand for all-in-one (AIO) PC products, AIO PC shipments were down 1.7% on year to reach only 12.18 million units in 2016, the third consecutive year of on-year decline, but AIO PC shipments are expected to stabilize in both 2017 and 2018.

Since AIO PC shipments had an on-year decline smaller than the overall desktop market, the share of AIO PCs to overall desktop shipments hit a new high at 10.4% in 2016 and the percentage will continue to grow in both 2017 and 2018.

Lenovo was the largest vendor worldwide and its shipment gap with the second-largest Hewlett-Packard (HP) widened in 2016. The Top-4 AIO PC vendors together contributed 83.8% of worldwide AIO PC shipments in 2016. With Apple's new AIO PCs, Lenovo is seeing increased shipments and HP is enjoying strong sales for its enterprise AIO PC models, the top-4 vendors' combined share of worldwide AIO PC shipments is expected to rise to 85.2% in 2017.

After TPV-Inventa left the AIO PC market, orders that were originally given to the maker, have mostly been taken by Compal Electronics, allowing Compal to have the largest AIO PC shipment growth in both 2016 and 2017 compared to others. Compal will also become the second-largest AIO PC maker in Taiwan in 2017.

Worldwide AIO PC shipments

Weak AIO PC demand caused worldwide shipments to slide 1.7% on year and arrive at 12.18 million units in 2016. This was the third consecutive year of on-year decline, but the drop rate was smaller than in 2015 and 2014.

Apple, which has not released a new AIO PC for a while, saw its 2016 shipments slump a double-digit percentage from the previous year. HP and Acer had 8-11% on-year decreases in their AIO PC shipments in 2016.

However, declines are expected to slow down in 2017 and 2018 as the market has started to stabilize after experiencing three straight years of falling.

Apple is ready to launched new AIO PCs in 2017 and the products are expected to boost the company's AIO PC sales, while HP will see AIO PC sales mainly contributed from the enterprise sector.

Worldwide AIO PC shipments had a smaller on-year decline than desktop shipments' 5% in 2016. This allowed AIO PC's share in desktop shipments to stay above 10% and grew 3pp from a year ago. Worldwide desktop shipments were 117 million units in 2016.

The market share is expected to grow to 10.7% in 2017 since desktop shipments will drop another 3% on year to reach 113 million units, while AIO PC shipments only

had less than a 1% decrease.

The share will rise to 11% in 2018.

Shipment breakdown by vendor

Lenovo was the largest AIO PC vendor in 2016 and its shipment gap with number two HP increased from 1.18 million units in 2015 to 1.53 million units in 2016. The China-based vendor's AIO PC shipments are expected to grow in 2017.

The expansion in the gap was due to HP suffering from weak sales. Lenovo's shipments grew 1.9% from a year ago in 2016, while HP's shipments were down

14.9%.

HP is focusing mainly on developing mid-range to high-end AIO PC models to push its profitability and its shipments. In 2017 shipments are expected to grow slightly by 2% on year, better than the market's average thanks to strong sales in the enterprise sector.

After a 17% on-year decline in 2015, Apple's AIO PC shipments dipped another 11% in 2016 since the vendor's business focuses are on the smartphone and tablet.

Shipments by vendor, 2014-2017 (k units)

	2014	2015	2016	2017(f)
Toshiba	120	100	80	80
Fujitsu	100	85	115	120
Asustek	310	340	405	400
Acer	530	400	355	350
MSI	300	302	420	240
Dell	1,500	1,500	1,510	1,500
Apple	2,783	2,300	2,047	2,088
HP	2,400	2,780	2,560	2,612
Lenovo	4,050	3,963	4,090	4,116
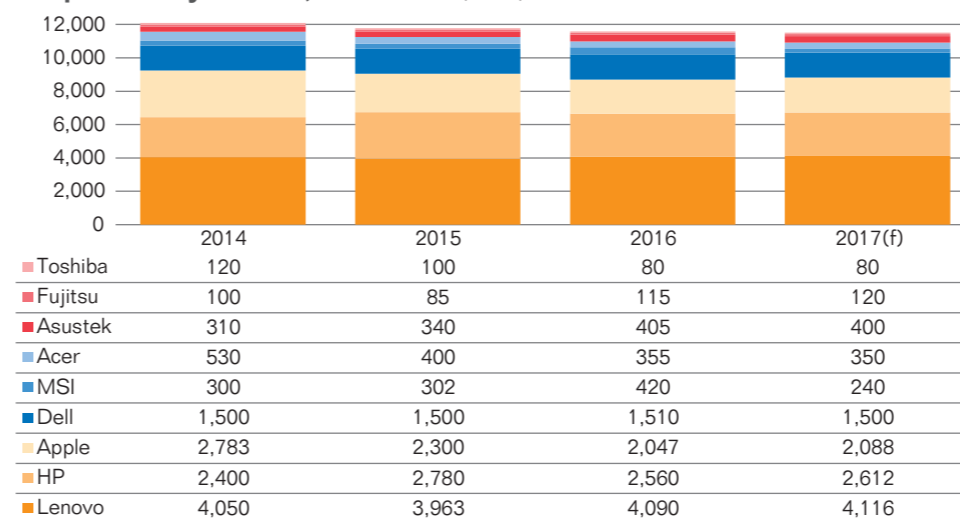
*Note: Lenovo's volume includes NEC and Medion
Source: Digitimes Research, May 2017

Shipment share by vendor, 2014-2017

	2014	2015	2016	2017(f)
Others	5.4%	5.0%	4.9%	5.0%
Toshiba	0.9%	0.8%	0.7%	0.7%
Fujitsu	0.8%	0.7%	0.9%	1.0%
Asustek	2.4%	2.7%	3.3%	3.3%
Acer	4.1%	3.2%	2.9%	2.9%
MSI	2.3%	2.4%	3.4%	2.0%
Dell	11.7%	12.1%	12.4%	12.4%
Apple	21.8%	18.6%	16.8%	17.2%
HP	18.8%	22.4%	21.0%	21.6%
Lenovo	31.7%	32.0%	33.6%	34.0%
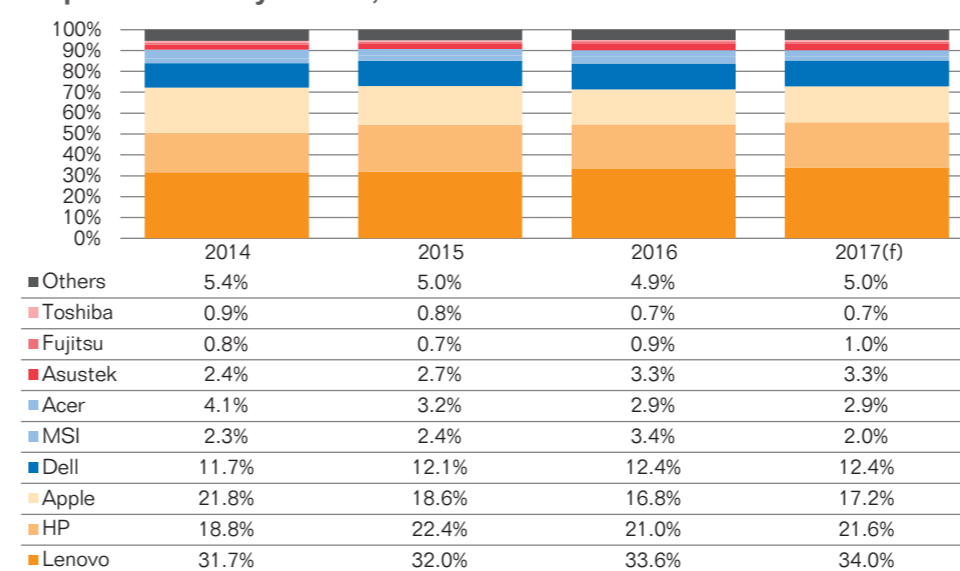
Source: Digitimes Research, May 2017

Worldwide AIO PC shipments, 2014-2018 (k units)
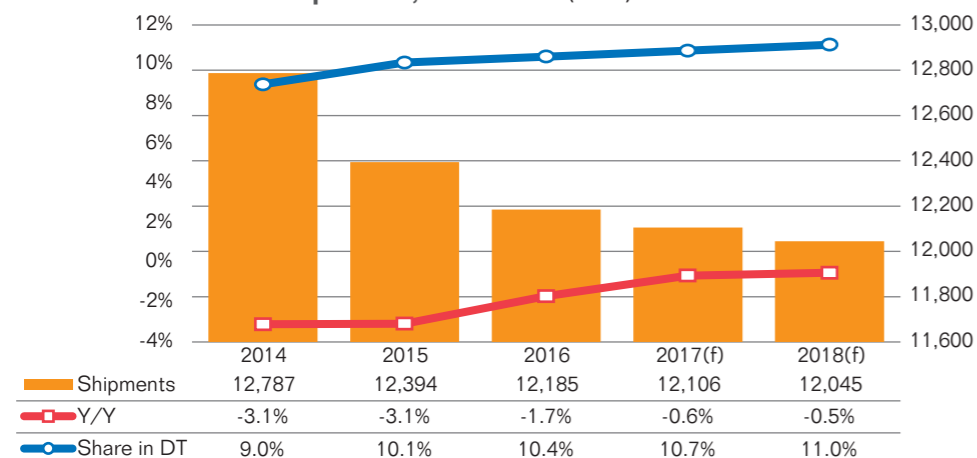
	2014	2015	2016	2017(f)	2018(f)
Shipments	12,787	12,394	12,185	12,106	12,045
Y/Y	-3.1%	-3.1%	-1.7%	-0.6%	-0.5%
Share in DT	9.0%	10.1%	10.4%	10.7%	11.0%

Source: Digitimes Research, May 2017

Computex 2017: QNAP showcases NAS solutions

Press release

At Computex Taipei 2017, QNAP Systems, Inc. (at Booth J1217) demonstrated multiple highly-anticipated features that leverage the QNAP NAS private-cloud infrastructure, including the live-streaming platform "DJ2 Live" and the IoT development app "QIoT Suite Lite," along with a wide range of NAS solutions that help tackle business bottlenecks in storage performance, mission-critical backups, workflow efficiency, media collaboration, and operational management. QNAP also teamed up with ABBYY, Arduino, FIBARO, Mellanox, Micron, NAKIVO, Panasonic, Seagate, TOSHIBA, Ubuntu, WD, and, XSplit at Computex 2017 to showcase joint storage solutions with QNAP NAS.

Powerful, highly-reliable business storage

QNAP has been pushing advanced features, and now introduces RAID 50/60 to help strike a balance between capacity, protection and performance for high-capacity NAS with full HDD or SSD configurations. For businesses using NAS with over 10 disk bays, RAID 50/60 not only provides greater data protection and random write performance than a single RAID 5/6, but also maximizes usable storage compared to RAID 10.

The intelligent Qtier, which empowers automated-tiering storage, now supports "On Demand Allocation Priority", providing customizable flexibility to arrange tiered storage suited for user's system environments and application demands.

To tackle intensive VDI usage and demanding VMware virtualization, QNAP leverages Mellanox ConnectX-3 Pro network cards to support iSER (iSCSI Extensions for RDMA). iSER significantly boosts data transfer performance of QNAP NAS as VMware ESXi storage and increases random read/write speeds by up to 60%.

360-degree and 4K live streaming

DJ2 Live is an exclusive live-streaming platform based on a private cloud that supports up to 4K broadcasts and stores all the videos on the private, secure, high-capacity QNAP NAS. It supports video integration and rich production effects from XSplit, and supports streaming to video services such as YouTube and Facebook.

Total 10GbE solutions

QNAP provides a wide range of 10GbE-ready NAS to assist businesses and organizations of all levels upgrading their network infrastructure. QNAP now introduces a 10GbE?switch – "QSW-1208-8C" - to complete its 10GbE product lineup and to provide a complete 10GbE solution for bandwidth-intensive tasks such as file sharing, backups, video editing and virtualization.

Storage center with enterprise reliability

The integration of dual-controller Enterprise ZFS NAS (ES1640dc v2) and the dual OS (QES or QTS) TES-1885U deliver optimized mission-critical storage solutions for enterprises. While the Enterprise ZFS NAS provides High-Availability VM storage, the TES-1885U executes efficient online (with NAKIVO QPKG) and offline (QNAP SnapSync) VM backup with snapshot-based Remote Replica.

Intelligent lifestyles with IoT, surveillance and automation

QIoT Suite Lite enables system integrators to develop small & medium-sized IoT projects with a hands-on, affordable, and private-cloud-based IoT solution. It is suitable for individual developers and hobbyists to build their own IoT projects while also providing advanced IoT use cases such as Fog Computing. It can also work with QVR Pro, the next-generation QNAP video surveillance solution, for customized event-driven recordings. Visitors have the chance to see the joint QNAP and FIBARO solution that demonstrates QNAP NAS as a feature-packed hub for smart home systems.

Feature-rich productivity-boosting apps

From data storage, management, collaboration, to backup and archiving, QNAP provides well-rounded features and hardware to fully back business workflows, including QRM+ for centralized management of networked Windows, Linux, and IPMI-compatible devices; Browser Station for secure and convenient access to private networks; Notes Station for online collaborative editing; Qsirch for full-text file search; Qfiling to automate file archiving; integrated virtualization and container applications, and more.

WIME HT520/525 Heart Rate Monitor Watches care for your health

Press release

WIME has been manufacturing unique and stylish smartwatches that are embraced by leading European brands since 2009. Following the launch of its own brand in 2013, WIME is introducing the new HT525 HRM smartwatch in 2017, which integrates heart rate monitor, pedometer and communication functions as well as ECG display.

The HT520 and 525 smartwatches with rectangular displays feature stylish modern simplicity. Their medical-grade silicone straps are designed for those who need to wear them for long periods of time and have to constantly monitor health conditions as the non-allergenic material prevents irritation to the wrist resulting from long-term contact with the skin.

The HT520/525 HRM watches keep track of users' heart rate and ECG anytime anywhere and therefore are portable reference tools for users who need to manage their own health or who have cardiovascular conditions requiring constant monitoring. As people may not be able to timely attend to how environmental changes such as rapid weather changes affect their bodies, wearing a watch with heart rate and ECG monitoring can allow users to stay aware of the changes in their biophysical signs.

With the HRM watches' built-in heart rate monitor and pedometer, the user is aware of how effective his or her aerobic exercise is and is able to prevent excessive workout from overburdening the heart. The pedometer enables a precise calculation of the number of calories burned. The HRM watches allow the user to set a weekly exercise goal and remind him or her to keep exercising until the goal is reached.

The HT520/525 HRM watches also provide smart functions including Bluetooth communication and alert messages in addition to compatibility with both iOS and Android, so users need not worry about what type of smartphones they use. The HT520 watch also supports a plug-in SIM card.

▶ **The HT520 and 525 smartwatches with rectangular displays feature stylish modern simplicity.**

Apple has not placed many resources on the design or marketing of desktop and AIO PC products during the past few years and has not released a new iMac for 3-4 years.

In 2017, Apple will launch three new AIO PCs and these devices are expected to see increasing sales.

Micro-Star International (MSI) shipped more AIO PCs than Acer and Asustek Computer in 2016. MSI's gaming AIO PCs had strong sales, boosting the overall volume by 39% on year to reach 420,000 units.

MSI has turned to focus on pushing its profits and will mainly develop high-end and gaming models for 2017. The move will cause MSI's own-brand AIO PC shipments to slip 43% on year.

Of MSI's AIO PC shipments, the share of own-brand gaming models will rise significantly from less than 40% in 2016 to 80% in 2017.

Top-4 AIO PC vendors will see their combined shipment share rise from 83.8% in 2016 to 85.2% in 2017.

Dell's share will stay flat on year in 2017, while the remaining top-4 AIO PC vendors will each see their respective shares rise slightly.

By maker

In 2016, Compal and Wistron were the only Taiwan makers with on-year shipment increases, while other major makers all had declines.

TPV-Inventa made plans to quit the AIO PC market in April 2016 and the move caused the maker's 2016 shipments to drop by half from 2015.

Vendors that originally outsourced their orders to TPV-Inventa shifted most of their volumes to Compal Electronics, boosting the Taiwan-based maker's shipments by 58% on year to more than 1.4 million units in 2016.

In 2017, Quanta's shipments will rise slightly, while Compal will continue enjoying surging growth.

Quanta will benefit mainly by Apple and NEC orders.

Compal will see increasing shipments to Lenovo and Asustek, and a small amount of growth in Dell orders. All the growth will help Compal's AIO PC shipments surpass two million units and make the company the second-largest maker.

MSI, which saw its OBM shipments grow 40% on year in 2016, is expected to experience a sharp decline of 42.9% to see OBM volumes arrive at 240,000 units in 2017 as the company has turned its focus to high-end gaming models mainly.

The top-3 AIO PC makers – Quanta, Compal and Wistron – will see their combined share of worldwide shipments rise from 63.8% in 2016 to 67.3% in 2017.

Compal has taken over some part of Lenovo's AIO PC orders and fully landed those from Asustek that were previously given to TPV-Inventa. These will allow Compal's share to grow quickly to over 17% in 2017.

The top-2 makers' combined share will stay at around 52% in 2017, but instead of Quanta and Wistron, the new top-2 makers are Quanta and Compal.

Vendor-maker relationship

Compal and Wistron both received Lenovo's orders that were released after TPV-Inventa left the market and the two makers' shares of Lenovo's shipments were both more than 20% in 2016.

Quanta's orders from Lenovo were all for NEC branded models. Lenovo's orders to MSI were also mostly for NEC (85%).

Quanta was the largest supplier of HP's AIO PCs in 2016, accounting for nearly 70% of the US-based vendor's shipments.

Most of Dell's orders were equally shared by Wistron and Pegatron Technology in 2016, while Acer's shipments were mostly done by Wistron.

Asustek's order distribution ratio between TPV-Inventa and Compal was 45:55 in 2016.

TPV-Inventa's orders will continue to be taken by Compal and AVC (others), allowing the two companies to account for 40% and 20% of Lenovo's AIO PC shipments in 2017.

Lenovo's orders to Quanta are all NEC branded models. Lenovo also outsources its NEC orders to MSI; however, the proportion that Quanta has received in 2017 will increase from 32% in 2016 to 54%.

Acer and Asustek will both reduce their number of AIO PC suppliers from two to one in 2017 since their volumes are small and putting all the orders together will help improve their economic scale.

MSI will begin supply products to HP and Compal to Dell in 2017, but their volumes will still be small.

Shipments by maker, 2015-2017 (k units)

	2015	2016	2017(f)
MSI	1,067	930	640
TPV-Inventa	2,348	1,162	506
Compal	900	1,423	2,100
Pegatron	1,277	926	954
Wistron	2,098	2,309	1,854
Quanta	4,138	4,045	4,194
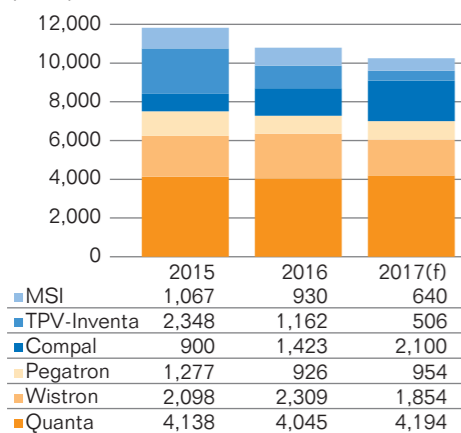
Source: Digitimes Research, May 2017

Shipment share by maker, 2015-2017

	2015	2016	2017(f)
Others	4.6%	11.4%	15.3%
MSI	8.6%	7.6%	5.3%
TPV-Inventa	18.9%	9.5%	4.2%
Compal	7.3%	11.7%	17.3%
Pegatron	10.3%	7.6%	7.9%
Wistron	16.9%	18.9%	15.3%
Quanta	33.4%	33.2%	34.6%
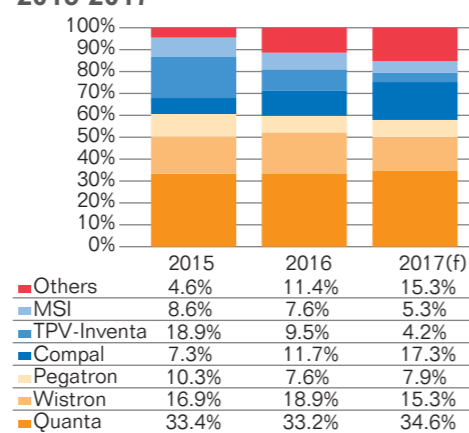
Source: Digitimes Research, May 2017

Shipments by vendor-maker relationship, 2016 (k units)

	Lenovo	Apple	HP	Dell	Acer	MSI	Asustek
Others	700						
MSI	420			60		420	
Compal	1,200						223
Pegatron			100	725	71		
Wistron	1,000		300	725	284		
TPV-Inventa	600		380				182
Quanta	170	2,047	1,780				

Source: Digitimes Research, May 2017

Shipments by vendor-maker relationship, 2017 (k units)

	Lenovo	Apple	HP	Dell	Acer	MSI	Asustek
Others	1,200						
MSI	240		72	48		240	
Compal	1,700			45			400
Pegatron			150	704			
Wistron	450		350	704	350		
TPV-Inventa	246		260				
Quanta	280	2,088	1,780				

Source: Digitimes Research, May 2017

Trigence showcasing pure digital audio solutions at Computex 2017

Sponsored content

Trigence Semiconductor is a global leader that develops advanced digital audio technology. At Computex Taipei 2017, Trigence Semiconductor will be showcasing product applications of its "Pure Digital" Dnote audio solution. Pete Birch, Chief Executive Officer of Trigence Semiconductor, talked about the prospects of Dnote technology and product highlights during this exclusive interview.

Dnote is an entirely new leading-edge audio delivery system developed specifically for today's digital products. Pete further noted, "Dnote was originally developed in Japan, and relies on a combination of our unique driving technology with a multi-coil loudspeaker. This combination allows us to drive the loudspeaker using only digital signals, and unlike traditional Class A/B or Class D amplifiers, to implement the core technology on standard CMOS processes. With Dnote, the high resolution digital signals generated within the processing chains of today's consumer audio products, are carried faithfully direct to the loudspeaker electro-mechanics, and the multiple voice-coils of the speaker are then driven digitally. The result is a clear and precise audio output signal that typically consumes as little as one third of the power of legacy outputs."

Trigence will also debut some of the latest implementations of Digital Speaker Modules (DSMs) which integrate the complete audio subsystem directly with a loudspeaker to produce and entirely digital speaker component. DSM's significantly simply audio design in portable and handheld consumer devices. They consist of a multi-coil speaker or micro-speaker, sophisticated sensing technology, significant DSP

processing capability, Dnote digital speaker driving circuitry, and the latest SoundWire audio interface. The sensing circuitry is used to monitor the behavior of the speaker electro-mechanics, permitting the DSP to use proprietary algorithms to compensate the typical physical limitations of the loudspeaker. The result is improved audio clarity, reduced active power consumption, and simplified system architecture and power-rail management. DSMs provide consumer OEMs, ODMs, and systems integrators with a viable product blueprint to quickly develop superior audio output solutions without the need for design complexity of legacy disaggregated architectures. The Soundwire interface supplants the need for the traditional I2C and I2S control and data interfaces, providing a bi-directional control and data link to the Soundwire master controllers now being deployed in bridge codecs, and system SoCs such as Intel microprocessors. "As with any new technology, we have had to form partnerships to enable the volume mass production of DSMs in high quality," Pete explained. "DSMs make use of a highly advanced packaging technology (SESUB, or Semiconductor Embedded SUBstrate) developed by TDK Corporation, and also rely on multi-coil voice-coils produced on specialized and fully automated winding equipment from Nittoku Engineering Group – the market leaders in micro-speaker coil winding machines."

In addition to DSMs, other Dnote-enabled products will be on display during Computex, including:
- Bluetooth / USB Input Wireless Speaker: high efficiency and low power consumption
- USB powered TV speaker systems and sound bars
- Full digital headphone and earphone products which realize clear

high sound quality

Through dedicated and effective support efforts in Taiwan, Trigence is aiming for rapid deployment across multiple consumer product categorie

With the growing market for portable devices, power consumption, miniaturization, and thermal dissipation are increasingly key concerns for product developers. Trigence's core Dnote technology features low voltage supply rails, active power consumption as low as 1/3 that of conventional solutions, and "Pure Digital" audio clarity which delivers true 24-bit digital signals direct to the loudspeaker without the degradation caused in other audio systems through the conversion between analog and digital circuits. The low transients inherent in the Dnote system ensure exceptional audio depth and clarity which are readily perceived particularly in close-ear applications such as headphones. Trigence vision is to replace the legacy audio technology in use today's consumer devices with Digital Speakers that combine a complete audio subsystem into a single, pre-certified, and digital component with the ability to significantly improve performance and simplify design over existing solutions.

Taiwan's electronics industry is a principal component in today's consumer electronics market. Taiwan offer the bridge between new, leading edge technologies, and the manufacturing infrastructure of China. As arguably the center of the world's PC industry Taiwan is of tremendous importance to us. The concept of Digital Speakers and DSMs was born out of collaboration with Intel. As such, the first market DSMs are

being deployed into are the desktop and portable PC sectors. For that reason, Trigence established its first Taiwan office in 2016 with the intent of expanding our product research and development teams and building our sales and support infrastructure to be closer to the developers and decision-makers in Taiwan. Being co-located with many of the top decision makers means that Trigence is able to quickly and effectively support our customers' needs and to easily work with them on customizations and improvements to our products. Pete highlighted, "We see Taiwan as a base from which to rapidly deploy our technologies across a broad spectrum of consumer products."

IoT applications boosting integrated silicon solutions combining microphone and speaker for control and communicate purposes in the near future

In 2017, Trigence plans to take the initial implementations of Digital Speaker Modules into volume production. Beyond that we envisage a range of more highly integrated digital audio components that incorporate not only the loudspeaker and driving electronics, but possibly also the microphone circuitry. There is a clear trend for the traditional keyboard, button, and mouse input and control interfaces to diminish in future IoT devices. We expect Voice In, and Speech Out to become the predominant methods of control and communication in the IoT space. This means there will also be a requirement for the integration of microphone arrays and other low-power speech processing technologies with the speakers to create a range of standardized audio interface or audio I/O modules. We believe there is a

place for this common functionality in all IoT products from toasters to automobiles. The goal of the company is to continually develop self-contained audio solutions and modules that can meet the communication needs of all IoT devices. Trigence anticipates Digital Speakers, DSMs, and AiMs (audio interface modules) will become the norm in all future consumer and IoT products.

Request a Private Demonstration:

Trigence DSMs and "Pure Digital" audio solutions, along with our IC–Dnote DU1213, DN30x2 ICs will be on display during Computex 2017 at the Grand Hyatt Hotel (2, SongShou Road, Taipei, Taiwan) May 31 to June 2. To request a private meeting and demonstration, please contact

▲ Pete has over 29 years in consumer semiconductors and he was CEO of a Auvitek International, a global semiconductor company ultimately acquired by Zoran Corporation. Pete has also held executive positions with Genesis Microchip, VM Labs, Spatializer Audio Labs and GEC Plessey Semiconductors.

contact@trigence.com.

About Trigence

Trigence Semiconductor, Inc. is a pioneering audio IC design and solution provider, offering revolutionary "pure digital" audio products for the consumer and IT markets. Founded in 2006 as a spin-off from Hosei University and headquartered in Tokyo, Japan, Trigence received its first investment in 2012 from Intel Capital based on the potential for its unique Dnote audio technology to transform the PC audio market. Other subsequent investors include INCJ (Innovation Network Corporation of Japan), NEG (Nittoku Engineering Group) and TDK Corporation. *Dnote is a trademark of Trigence Semiconductor in the United States and other countries.

International brand smartphone shipments in China market, 1Q16-2Q17 (m units)

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Shipments	21.6	17.5	17.0	22.3	17.7	15.6
Q/Q	-35.9%	-19.0%	-2.9%	31.2%	-20.6%	-11.9%
Y/Y	-17.9%	-22.9%	-37.0%	-33.8%	-18.1%	-10.9%
Market share	21.2%	16.4%	14.8%	17.8%	18.3%	15.3%
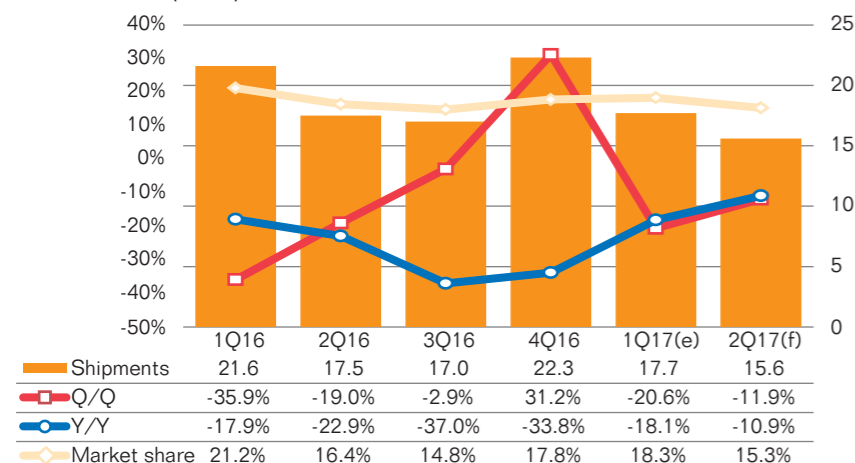
Source: Digitimes Research, May 2017

China smartphone market shipments by international brands, 1Q16-2Q17 (m units)
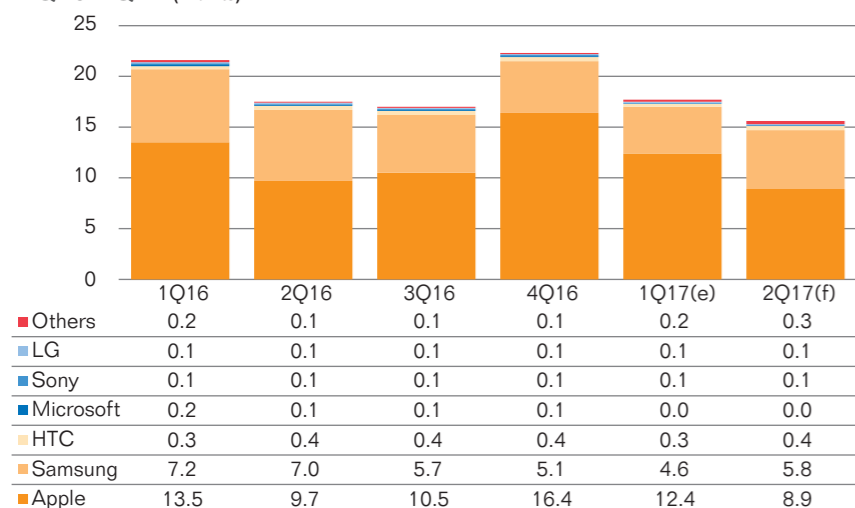
	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Others	0.2	0.1	0.1	0.1	0.2	0.3
LG	0.1	0.1	0.1	0.1	0.1	0.1
Sony	0.1	0.1	0.1	0.1	0.1	0.1
Microsoft	0.2	0.1	0.1	0.1	0.0	0.0
HTC	0.3	0.4	0.4	0.4	0.3	0.4
Samsung	7.2	7.0	5.7	5.1	4.6	5.8
Apple	13.5	9.7	10.5	16.4	12.4	8.9

Note: Shipments from Motorola are included in Lenovo's volume
Source: Digitimes Research, May 2017

China smartphone market shipment share by international brands, 1Q16-2Q17

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Others	0.9%	0.6%	0.6%	0.4%	1.1%	1.9%
LG	0.5%	0.6%	0.6%	0.4%	0.6%	0.6%
Sony	0.5%	0.6%	0.6%	0.4%	0.6%	0.6%
Microsoft	0.9%	0.6%	0.6%	0.4%	0.0%	0.0%
HTC	1.4%	2.3%	2.4%	1.8%	1.7%	2.6%
Samsung	33.3%	40.0%	33.5%	22.9%	26.0%	37.2%
Apple	62.5%	55.4%	61.8%	73.5%	70.1%	57.1%

Source: Digitimes Research, May 2017

China smartphone market quarterly shipment growth by international brands, 1Q16-2Q17

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Apple	-40.5%	-28.1%	8.2%	56.2%	-24.4%	-28.2%
Samsung	-17.2%	-2.8%	-18.6%	-10.5%	-9.8%	26.1%
HTC	-40.0%	33.3%	0.0%	0.0%	-25.0%	33.3%
Microsoft	-50.0%	-50.0%	0.0%	0.0%	-100.0%	0
Sony	-50.0%	0.0%	0.0%	0.0%	0.0%	0.0%
LG	-66.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Others	-60.0%	-50.0%	0.0%	0.0%	100.0%	50.0%

Source: Digitimes Research, May 2017

Shipments and market share of all vendors

First-quarter 2017 shipments share in China smartphone market:

Oppo and BBK ranked first and second in the market with 18.7% and 17.1% respectively.

Huawei saw its shipment share increase to 15.2%, back to the number three spot.

Apple saw its shipment share fall to 12.8%, and its ranking fall to fourth place.

Xiaomi saw its shipment share increase to 7.3%, and return to the fifth spot.

Digitimes Research predicts the top five firms by shipment share in second-quarter 2017 will be Oppo, BBK, Huawei, Xiaomi and Apple.

China smartphone market shipments by all vendors, 1Q16-2Q17 (m units)

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Others	13.5	16.6	12.0	15.2	8.5	8.7
LeEco	3.6	5.9	4.3	2.7	0.7	0.6
Meizu	3.4	3.3	4.1	4.6	2.4	3.1
TCL	1.2	1.2	0.8	0.4	0.6	0.4
HTC	0.3	0.4	0.4	0.4	0.3	0.4
HiSense	1.5	1.6	1.4	1.2	0.6	0.8
K-Touch	0.8	0.8	0.5	0.3	0.6	0.8
ZTE	1.4	2.1	1.6	1.3	1.3	1.6
Gionee	4.4	4.6	6.2	5.4	5.4	5.9
BBK	11.3	11.9	19.2	23.7	16.5	16.8
Oppo	12.0	13.0	22.2	25.4	18.1	19.6
Coolpad	4.4	2.1	2.1	1.7	1.1	1.0
Huawei	13.3	13.9	13.6	15.8	14.7	15.9
Lenovo	2.0	2.2	1.9	1.2	1.7	1.6
Samsung	7.2	7.0	5.7	5.1	4.6	5.8
Xiaomi	8.3	10.4	8.5	4.3	7.1	9.8
Apple	13.5	9.7	10.5	16.4	12.4	8.9

Note: Shipments from Motorola are included in Lenovo's volume
Source: Digitimes Research, May 2017

China smartphone market shipment share by all vendors, 1Q16-2Q17

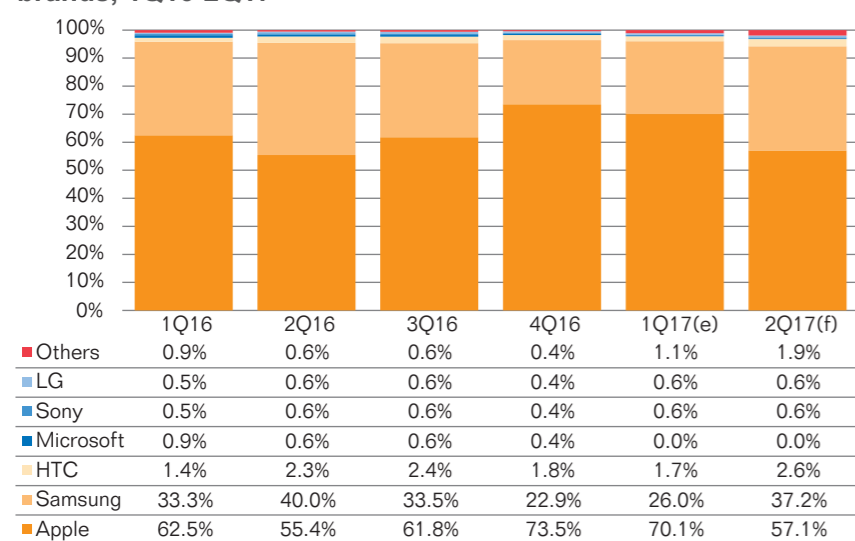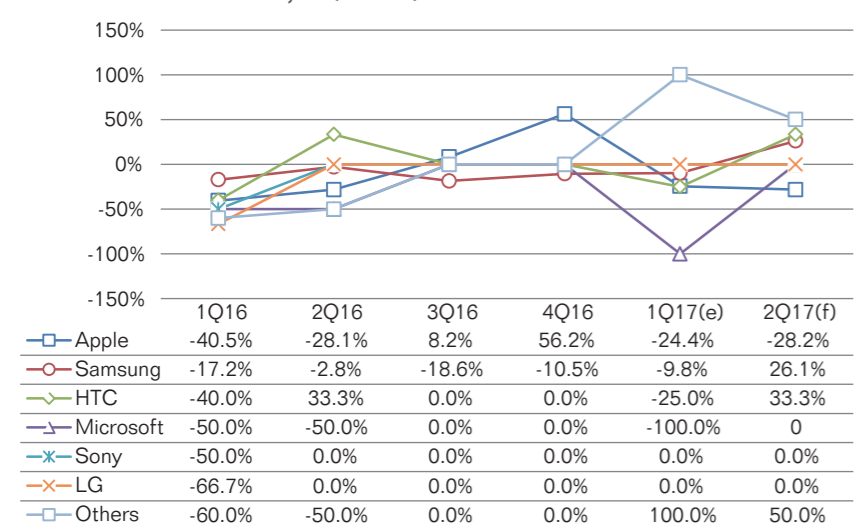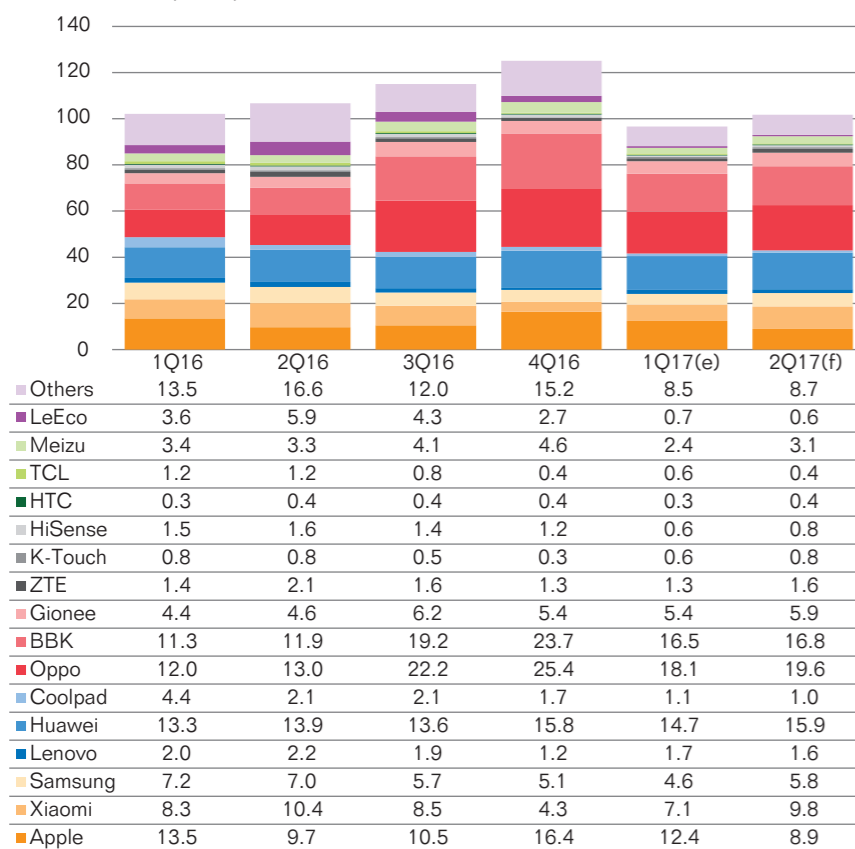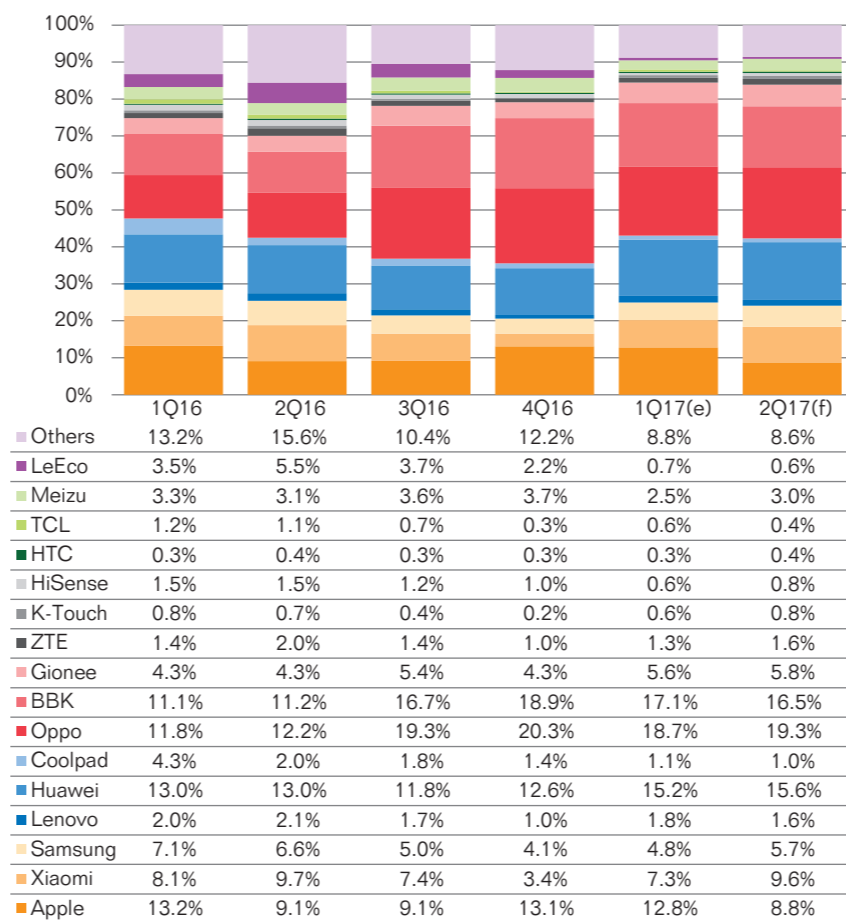|	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Others	13.2%	15.6%	10.4%	12.2%	8.8%	8.6%
LeEco	3.5%	5.5%	3.7%	2.2%	0.7%	0.6%
Meizu	3.3%	3.1%	3.6%	3.7%	2.5%	3.0%
TCL	1.2%	1.1%	0.7%	0.3%	0.6%	0.4%
HTC	0.3%	0.4%	0.3%	0.3%	0.3%	0.4%
HiSense	1.5%	1.5%	1.2%	1.0%	0.6%	0.8%
K-Touch	0.8%	0.7%	0.4%	0.2%	0.6%	0.8%
ZTE	1.4%	2.0%	1.4%	1.0%	1.3%	1.6%
Gionee	4.3%	4.3%	5.4%	4.3%	5.6%	5.8%
BBK	11.1%	11.2%	16.7%	18.9%	17.1%	16.5%
Oppo	11.8%	12.2%	19.3%	20.3%	18.7%	19.3%
Coolpad	4.3%	2.0%	1.8%	1.4%	1.1%	1.0%
Huawei	13.0%	13.0%	11.8%	12.6%	15.2%	15.6%
Lenovo	2.0%	2.1%	1.7%	1.0%	1.8%	1.6%
Samsung	7.1%	6.6%	5.0%	4.1%	4.8%	5.7%
Xiaomi	8.1%	9.7%	7.4%	3.4%	7.3%	9.6%
Apple	13.2%	9.1%	9.1%	13.1%	12.8%	8.8%

Source: Digitimes Research, May 2017
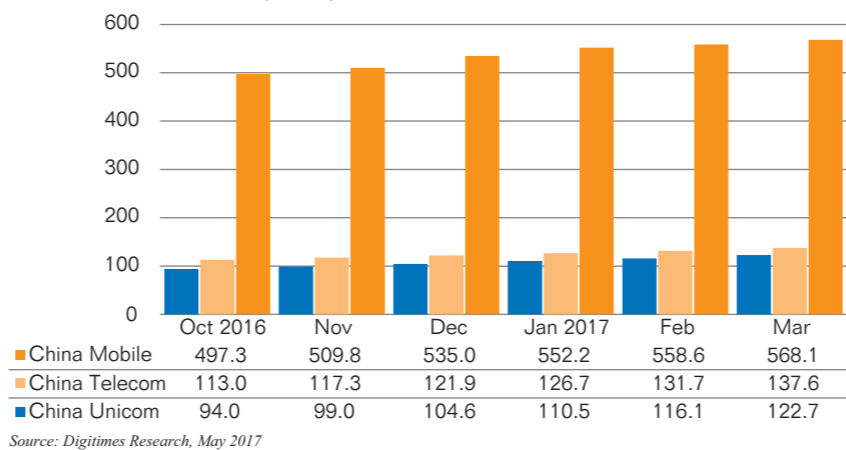
China telecom carriers

China Mobile, China Unicom and China Telecom continue to strongly promote 4G services. As of the end of first-quarter 2017, the combined 4G users of the three telecom carriers reached 828 million. Nevertheless, the combined number of new 4G users in first-quarter 2017 was only 67 million, far lower than the quarterly figures from second-fourth quarter in 2016 -- that were around 80 million. The first-quarter 2017 figure is also far fewer compared to the 95.80 million new 4G users in first-quarter 2016.

The main cause is China Mobile only saw new 4G users of 33 million which is far less than figures the firm saw in previous quarters in 2016, which were around 50-60 million.
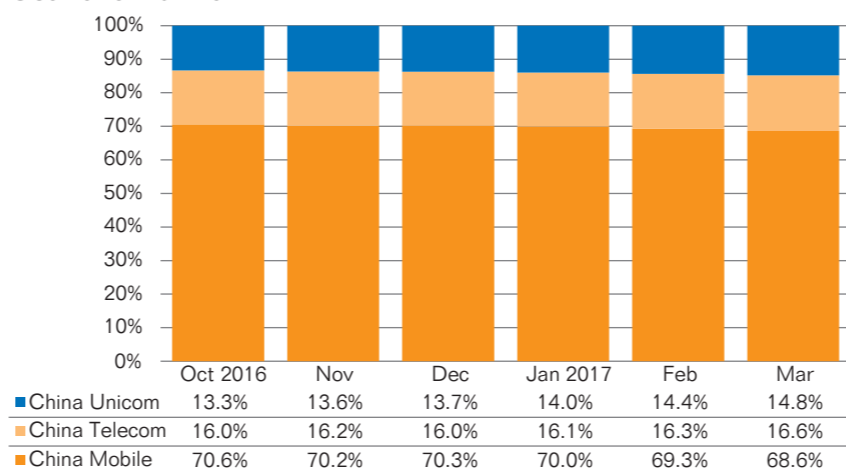
China Mobile began to announce its number of 4G subscribers in February 2014 in addition to its 3G subscriber number with China Unicom and China Telecom following suit in January 2016. China Unicom stopped providing its 3G subscriber number in January 2016, while China Telecom also stopped the announcement in April 2016 with China Mobile done so in January 2017.

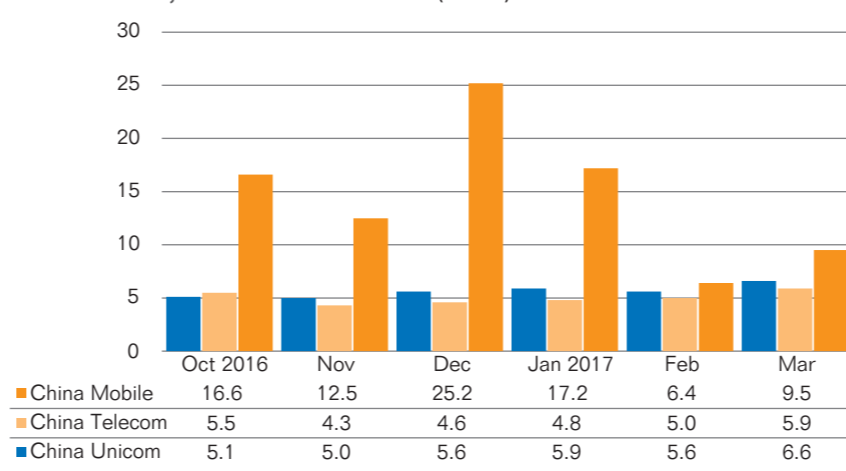### China telecom carriers' number of 3G+4G subscribers, Oct 2016-Mar 2017 (m users)

	Oct 2016	Nov	Dec	Jan 2017	Feb	Mar
China Mobile	497.3	509.8	535.0	552.2	558.6	568.1
China Telecom	113.0	117.3	121.9	126.7	131.7	137.6
China Unicom	94.0	99.0	104.6	110.5	116.1	122.7

Source: Digitimes Research, May 2017

China telecom carriers' share of 3G+4G subscribers, Oct 2016-Mar 2017

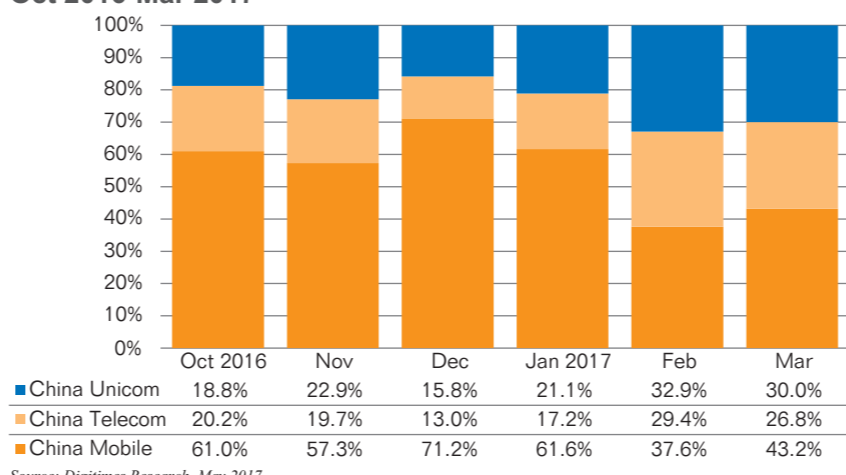|	Oct 2016	Nov	Dec	Jan 2017	Feb	Mar
China Unicom	13.3%	13.6%	13.7%	14.0%	14.4%	14.8%
China Telecom	16.0%	16.2%	16.0%	16.1%	16.3%	16.6%
China Mobile	70.6%	70.2%	70.3%	70.0%	69.3%	68.6%

Source: Digitimes Research, May 2017

China telecom carriers' number of increased 3G+4G subscribers, Oct 2016-Mar 2017 (m users)

	Oct 2016	Nov	Dec	Jan 2017	Feb	Mar
China Mobile	16.6	12.5	25.2	17.2	6.4	9.5
China Telecom	5.5	4.3	4.6	4.8	5.0	5.9
China Unicom	5.1	5.0	5.6	5.9	5.6	6.6

Source: Digitimes Research, May 2017

China telecom carriers' share of increased 3G+4G subscribers, Oct 2016-Mar 2017

	Oct 2016	Nov	Dec	Jan 2017	Feb	Mar
China Unicom	18.8%	22.9%	15.8%	21.1%	32.9%	30.0%
China Telecom	20.2%	19.7%	13.0%	17.2%	29.4%	26.8%
China Mobile	61.0%	57.3%	71.2%	61.6%	37.6%	43.2%

Source: Digitimes Research, May 2017

China smartphone industry

Digitimes Research visited various smart mobile device makers in the Greater China region supply chain in March-April 2017 to collect market information and data. Total shipments of China-based smartphone makers (both in the domestic and international markets) in first-quarter 2017 were 134.30 million units, representing flat growth compared to first-quarter 2016 and showing an on-quarter drop of 28.8%. This drop is more severe than the 19.9% on-quarter drop experienced in first-quarter 2016.

Digitimes Research noted that the top five China-based smartphone makers by shipments in first-quarter 2017 were Huawei, Oppo, BBK, Lenovo and Xiaomi. Among the top three makers, due to the low season, Huawei saw first-quarter 2017 international shipments fall by seven million units compared to fourth-quarter 2016 and its overall shipments fell to 29.30 million units. Oppo and BBK (brand name Vivo) had first-quarter 2017 shipments that were comparatively weak compared with shipments in the previous quarters of 23.50 million units and 18.10 million units respectively. This was due to high inventory levels in the distribution channel.

In second-quarter 2017, although international demand is expected to return, China's domestic market will likely continue to absorb inventories. Therefore, Digitimes Research believes overall shipments in second-quarter 2017 from China-based smartphone makers will increase on quarter to 151.80 million units, but for the first time in history, the shipments will show an on-year decrease of 2.7% compared to second-quarter 2016.

Key factors affecting the China smartphone industry

Key factors affecting the China smartphone industry shipments in first-quarter 2017:

Supply side

Prices of components continue to affect smartphone shipments. Despite the fact that price of panels began to fall slightly, prices of NAND Flash and DRAM continued to rise which affected shipments of entry-level to mid-range smartphones.

Brand vendors:

Xiaomi experienced strong shipments of its new Hongmi and Xiaomi series models in China in first-quarter 2017 plus strong sales in India, hence the firm saw overall shipments showing on-quarter growth compared to fourth-quarter 2016.

TCL saw shipments show a significant on-quarter drop compared to fourth-quarter 2016 as demand from its main markets, Europe and America, fell.

As the international market goes into the low season, Lenovo's smartphone brands, Lenovo and Motorola saw international shipments fall.

Due to the low season factor, Huawei saw international shipments fall significantly, which also means its overall shipments fell.

Vendors focus more on retail channel:

Oppo and BBK showed weaker shipments in first-quarter 2017 as the firms saw high inventory levels in the distribution channel in the domestic market.

Key factors affecting the 1Q17 China smartphone industry (Supply)

Factor		Item	Analysis	Influence on shipments
Supply	Supply chain	Component supply	Prices of NAND Flash and DRAM continued to increase while panel prices slowly fell.	↓★
	Brand vendors	Xiaomi	Shipments of new models from the Hongmi and Xiaomi series increased.	↑★★
		TCL	Shipments to Europe and America markets decreased.	↓★
		Lenovo	International shipments showed an on-quarter decrease.	↓★★
		Huawei	International markets entered the low season causing shipments to fall significantly.	↓★★★
		Retail channel dominators	Inventory levels are high at the distribution end causing Oppo and BBK to see shipments fall.	↓★★★
	Small brand makers and white-box vendors	Overseas shipments	Domestic demand fell, affecting small-size brand shipments. International markets decreased orders issued to ODM and IDH firms.	↓★★

Note: The more stars, the higher the influence. ↓ indicates negative influence, ↑ indicates a positive influence.
Source: Digitimes Research, May 2017

Demand side

In first-quarter 2017, the new policies and device subsidies to encourage 2G and 3G users to switch to 4G from China Mobile were yet to be announced. Digitimes Research saw the figure of new 4G users be lower compared to the average number of new users in 2016. This contributed to falling demand for price-friendly and super low-priced 4G models.

Growth in the number of users buying devices directly from retailers began to flatten out but customers also did not return to buying devices from telecom carriers.

Huawei and ZTE have both been quite successful in penetrating the mature Europe and US markets with stable distribution channels and strong brands but sales growth have been slowing down.

International markets such as Europe, America, Southeast Asia, and Eastern Europe have all entered the low season hence demand has turned weak.

Key factors affecting the 1Q17 China smartphone industry (Demand)

Factor		Item	Analysis	Influence on shipments
Demand	Domestic market	Telecom operators' sales strategies	China Mobile's new policies and device subsidies to encourage 2G and 3G users to switch to 4G from China Mobile were yet to be announced. This contributed to falling demand for price-friendly and super low-priced 4G models.	↓★★
		Online sales	Sales in retail stores have been showing slow growth but demand did not turn back to telecom carriers.	↓★
	Overseas markets	Emerging markets	Demand was weak as many markets faced slow growth while India was affected by currency policies.	↓★
		Mature markets	Firms that have been working in these markets early saw slow shipment growth.	↑★
		Seasonality	International markets entered the low season.	↓★★★

Note: The more stars, the higher the influence. ↓ indicates negative influence, ↑ indicates a positive influence.
Source: Digitimes Research, May 2017

Focusing on the automotive OE market, Lite-On grabs connected car opportunities

Press release

As the applications of connected cars surge rapidly, Lite-On Technology, which has been deeply rooting in the automotive OE (original equipment) market for almost 40 years, aggressively leverages its existing technology advantages and group synergies to move into the development of key products, including ADAS, T-Box, sensor fusion, and DSRC (dedicated short-range communications). With the early results have been achieved, Lite-On is very optimistic about its future growth driven by the brand new opportunities.

A long-time player in the OE market

Automotive Electronics and Smart Vehicle Applications are the two business units (BUs) that Lite-On has for the car electronics market. Their main products are LED lighting module, camera module, vehicle motor electrical control module, and head-up display, in-car entertainment product, respectively.

According to Michael Wang, GM of Automotive Electronics SBU at Lite-On, the BU was formerly known as Dun Young Technology, which was founded in 1979 and is the first automotive electronics company in Taiwan. Dun Young started its business from manufacturing cruise control system and ECU (electronic control unit) for Chrysler. Unlike most of the Taiwan companies that target at the AM (aftermarket) market, Dun Young has been a long-time player in the OE market ever since its establishment.

For LED lighting module, the first case that Lite-on won was the adoption by Toyota in 2001. Before that, it took as long as four years for Lite-On to get its products approved. With zero DPPM during the four-year product lifetime at Toyota, Lite-On gained reputation in the market and started to expand its business to other car makers. Because of early deployment and widespread adoption, Lite-On now has won 15% shares of worldwide car lighting

market, with customers from Europe, the US, Japan, and China. It also accounts for 25% shares of the motor control market in China. With its strong competence, the BU has achieved exceptional annual revenue growth over the past five years.

Allen Liao, GM of Smart Vehicle Applications BU at Lite-On also indicated that the predecessor of the BU was PLDS (Philips & Lite-On Digital Solutions Corp.), which specializes in optical disc drive (ODD) products. Having absorbed the automotive design and manufacturing capabilities from Philips' team in Europe, it has moved into the in-car entertainment market from consumer ODD for a long time, and is the first company that provides wireless charging products for mobile phones in the automotive OE market.

Recently, the BU has expanded its product lines to head-up displays. The new product was delivered to European car makers three years ago, and will be shipped to Japanese and Korean car makers from this year.

Exploring new opportunities with ADAS and T-Box

Regarding the emerging connected car market, Liao said that a smart car is just like a smartphone with four wheels. With this concept in mind, the integration of new technologies into automotive is aimed to address consumers' increasing requirements for entertainment, convenience, and safety. Wang also stressed that the two BUs will work together to develop T-Box, ADAS, sensor fusion, and DSRC products by leveraging Lite-On's strengths in camera module, wireless

▲ Allen Liao, GM of Smart Vehicle Applications BU, Lite-On

▲ Michael Wang, GM of Automotive Electronics SBU, Lite-On

communications, and optical fields.

T-Box is the first product that Lite-On makes inroads into connected cars. "As many car makers are moving towards this direction, T-Box has great growth potentials because it can provide rich and real-time information as well as services with relative simple designs," Wang pointed out.

Lite-On has already shipped T-Box to a China-Japan joint venture, with around 300,000 units in the early stage. It is estimated that the amount will be increased to one million units for the customer's whole product lines. Meanwhile, Lite-On is now in talk with major car makers in Germany and Taiwan.

In the V2V (vehicle to vehicle) communication field, Lite-On has teamed up with Taiwan's ITRI (Industrial Technology Research Institute) to jointly develop DSRC products. According to Tony An, GM of New Business Development & Marketing, DSRC is a wireless communication standard featured with low latency. It is mainly driven by the US and the regulations will be finalized by 2019. Lite-On and

ITRI already completes the sample development, and will start testing in the US from next month. As for the China market, which favors LTE-based communication technology to enable V2V applications, Lite-On has signed cooperation agreement with China Automotive Technology & Research Center to have early deployment for this.

Regarding ADAS, one of the most promising products in smart cars, Wang said that Automotive Electronics BU is aggressively expanding the business of camera modules, and will work with Smart Vehicle Applications BU to co-develop radar/lidar and sensor fusion technologies, in a bid to build comprehensive ADAS solutions.

An added that the automotive OE market requires longer cycle time for product development. Eyeing on the strong growth potentials in the future, Lite-On has to invest earlier and expand its scale. Therefore, Lite-On announced last year that it will invert over NT$ 10 billion to establish an operation center in Nan-Tze Export Processing Zone.

▲ Lite-On and ITRI jointly develop DSRC products for V2V applications

---

ASRock's new X299, AM4, and Micr0-STX line up

Press release

ASRock is demonstrating new DIY motherboards including its Intel X299 platform and Mini-ITX AM4 boards, as well as Micro-STX Mini PCs and the X10 IoT Router. ASRock is at booth L0810 of the Taipei Nangang Exhibition Center.

Intel X299 Flagship Motherboard

ASRock will be showing its new motherboard collection based on the powerful Intel X299. The Fatal1ty X299 Professional Gaming i9 is the first motherboard in the world to feature 10Gb/s LAN. The convenience of USB 3.1 Type-C onboard header offers new USB power delivery protocol to supply up to 12V/3A of power output.

Features of the Fatal1ty X299 Professional Gaming i9 and X299 Taichi motherboards include Dr. MOS with SPS (Smart Power Stage) technology with digital PWM 13

phase on board power for ultra-stable PC performance. Triple Ultra M.2 PCIe Gen3 x4 32Gb/s storage along with Intel Dual LAN and Intel 802.11ac WiFi. BIOS Flashback onboard button for updating BIOS. Plus the precision and control of the Hyper BCLK Engine III third generation clock generator chip.

Intel X299 Mini-ITX Motherboard

Intel's X299 chipset used to be represented by a bulky EATX or ATX motherboard, because the CPU, chipset, memory and whole layout required an extra-large PCB to contain the extreme performance. ASRock's R&D team has built a motherboard with a small size, breaking the limitations to fit the whole X299 package onto a mini-ITX form factor PCB. It is the world's first and only mini-ITX X299 motherboard.

X299E-ITX/ac is built around an X299 chipset, which unlocks

the hidden performance of Intel LGA 2066 socket CPUs. Other points worth mentioning are 4 SO-DIMM memory slots, 10-layer PCB, two Intel Gigabit LANs, dual band 2.4/5GHz 802.11ac WiFi and Bluetooth 4.2, and onboard six SATA ports.

AMD AM4 Ryzen Mini-ITX Motherboard

Packing AMD's new AM4 series into a compact Mini-ITX footprint, ASRock is demonstrating the new Fatal1ty X370 Gaming-ITX/ac and the Fatal1ty AB350 Gaming-ITX/ac. Two boards come with two HDMI outputs, 802.11ac WiFi solution, 8-CH with Realtek ALC 1220 codec, heatsinks that improve heat dissipation and promotes overall performance.

DeskMini GTX / RX Mini PCs

ASRock is showing the slim DeskMini RX/GTX PC Series,

▲ ASRock announces the new X299 series motherboard line up, featuring the latest and greatest technology as well as performance to exceed the ultimate experience

based around new Micro-STX form factor motherboards. In addition, the compact new Z270M-STX MXM motherboard is also on display. These Micro-STX products support powerful CPUs, and a wide range of expansion and connectivity options. Key features include MXM graphics card support and Triple Ultra M.2 for SSD storage.

IOT Router X10

For Internet of Things (IoT), the ASRock X10 is an advance on old-fashioned internet gateway routers. It features ZigBee wireless for control, automation, scheduling and monitoring of home lighting, home appliances such as air conditioning, and home security systems.

Smart car technologies rapidly progressing; industry leaders investing heavily in IoT

Press release

Business Insider estimates 94 million connected cars to ship in 2021, which represents approximately 82% of all cars shipped that year alone. There are currently two types of ways cars are connected. Embedded cars utilize a built-in radio and antenna connecting to local cellular networks. Tethered cars use a

wireless connected device, typically a cell phone to provide the data connectivity. These vehicles achieve this via Bluetooth or a USB cable.

In addition to data connectivity, cars have GPS for navigation and emergency services, satellite radio (Sirius), hands-free calling, sensor and data gathering (tire-pressure monitors), and key-less entry/start. Some of these systems (tire-pressure

monitoring) can utilize an embedded or board level antenna; however, other critical (emergency services) or data intensive systems (navigation, satellite radio) require an external application specific antenna. I-PEX Connectors offers a robust and diverse product offering to suit RF interconnectivity needs within all of these systems utilizing I-PEX's patented iFit MHF Series.

The MHF family of connectors provides automotive OEM module manufacturers a right-sized solution for their RF needs. While the frequency ranges from DC to 15GHz (MHF5L), the majority of the frequencies used in automotive, DC to 6 GHz, can be realized with

the MHF I family. In addition to a mated board height maximum of 2.5 mm (1.8mm OD wire) to 3mm (2.0mm OD wire), the MHF I Micro RF Coaxial Connector offers the most versatility in choosing the right cable for your application. Please consult with your I-PEX Connector representative to confirm compatibility.

Repeatability and consistency are critical to ensuring device operation. The MHF Series consistently has a 1.3 VSWR max from DC-3 GHz and a 1.5 VSWR max from 3GHz-6GHz. To assist with durability, I-PEX offers a 4-pad layout in addition to the 3-pad configuration.

I-PEX Connectors understands

that automotive applications present unique problems that stationary RF systems do not encounter, particularly shock and vibration. Cars are in motion, roads are uneven, and this generates mechanical harmonics that could cause connectors to disengage over time. Coming soon in 2017 is the MHF LK system. This innovative solution will be available in cable sizes (1.13 mm OD & 1.37 mm OD) to suit various insertion loss and cable length needs. Additionally, the initial mating disengagement force of 28.3 N outperforms the standard MHF I Series of 17.2 N. Even at 30 cycles, the MHF LK, at 15.1 N, performs better than the MHF 1, at 6.4 N.

LoRa gathers steam: TUV Rheinland forges ahead on IoT communications technology

Press release

The coming of IoT (Internet of Things) has seen the smart city become a key field for IoT development. Many developed cities around the world, including Taipei, have responded to the requirements of a fast-changing society by making "smart city" a key objective in their development plans. Several wireless communications technologies have emerged as a result of rapid developments in IoT. The favored technology is LPWAN (Low-Power Wide-Area Network), due to its long range, low power consumption, and low cost. LoRaWAN, operated on the unlicensed radio spectrum, is among the LPWAN communications technologies considered to be one of the most potential.

The LoRa Alliance has acquired more than 460 members since it was founded in March 2015, and is one of the fastest-developing alliances in the technology industry. Members are working closely to promote the LoRaWAN protocol. The LoRaWAN protocol offers unique advantages in terms of bi-directionality, security, mobility, and positioning accuracy. The technology mainly operates in free global radio spectrum, including 433, 868, and 915 MHz. The four main components are the terminal, base station, server, and cloud. Bi-directional transfer of application data is supported to provide a simple communications system with long-range, long-battery life, high capacity, and low cost. The main applications for LoRaWAN are smart power/water meters, smart agriculture, smart factories, and air-quality monitoring where small amounts of data are collected. Transmission range is between 3~5km in urban areas and up to 20km in open areas. China, for example, has in one instance integrated IoT technology into manhole covers for subsidence or hazard detection.

TUV Rheinland is the first independent third-party laboratory accredited by the LoRa Alliance, and one its founding members as well. Its laboratories in Pleasanton (US), Leek (Netherlands), Yokohama (Japan), Seoul (Korea), and Taipei (Taiwan) can all provide EU/US Class A testing services for LoRaWAN. International buyers can therefore apply for certification at the laboratory closest to their location. LoRaWAN testing is relatively simple, covering a mere 10+ items. In addition to compliance with regional spectrum, most of the testing is focused on product interoperability and LoRa Alliance product compliance.

The maturing of IoT wireless connectivity and a mobile-technology application environment has led to IDC and Gartner forecasting that the total number of IoT smart-connected devices will grow to 25 billion by 2020. Many ICT vendors are now squeezed into unlicensed radio spectra, and they have placed their bets on different technology alliances and are waiting to see which technology will prevail in the mainstream. TÜV Rheinland currently has a presence in mainstream wired and wireless sensing network standards such as Bluetooth, zigbee, Qi, LoRaWAN, Sigfox, MirrorLink, DALI (Digital Addressable Lighting Interface), and KNX (building automation technology), and thus can provide vendors with the full range of testing and certification services.

TUV Rheinland's Taiwan telecom laboratories have garnered many "first and only" achievements in Taiwan on Bluetooth, zigbee, DALI, and KNX communications technology certifications: first to be approved by the Bluetooth Alliance; only Bluetooth laboratory capable of conducting Bluetooth IC testing; first and only zigbee and KNX approved laboratory; only DALI laboratory in Taiwan (only 4 in the world), and authorized to perform testing for the new DALI 2 standard. Wireless laboratories in the Greater China region are located in Taipei, Hong Kong, Guangzhou, Shanghai, and Shenzhen. These laboratories are approved by the relevant accreditation bodies in the EU, US, Canada, Japan, Taiwan, Egypt, and Sudan. Please contact local laboratories for the latest communications technology certifications.

New mobile fast-charging solutions keep rolling out for enhanced battery life

Staff reporter

Smartphones and other mobile devices are becoming increasingly diverse, and features continue to be enhanced to include larger screens and multi-core specs, as well as more advanced multimedia effects. While users want to have their devices connected all the time consuming more battery power, new apps use a significant amount of power that could drain your device battery.

There are two ways to consider how the battery life can be improved: one is to improve the battery capacity and the other is to speed up the charging process. For the latter solution, there are many companies engaged in the development of corresponding products and technology.

Chipmakers including MediaTek, Qualcomm and Texas Instruments (TI) have been aggressively developing their own fast charging solutions. Different principles and structure are being adopted in the chip firms' respective technology, but there are three operating modes in general their solutions belong to: constant current, low-voltage and high-current, and high-voltage and high-current.

Chip vendors continue to introduce new versions of their fast charging solutions

MediaTek has rolled out the third generation of its battery charging technology for mobile devices, the Pump Express 3.0. The 3.0 version is based on the high-voltage and high-current mode and is designed for an output of 36W at up to 12V.

MediaTek's previous-generation Pump Express, the Pump Express 2.0, has been adopted by a number of brand smartphone vendors including Sony, Lenovo, Gionee and Meizu. Key improvements in MediaTek's latest Pump Express technology include faster charging speed, higher charging efficiency, and lower phone temperature when charging.

MediaTek claimed the Pump Express 3.0 can charge a phone from zero to 70% of its battery life in just 20 minutes. That's almost twice as fast as competing solutions currently on the market and five times faster than conventional charging. The technology also allows users to charge for five minutes and talk for four hours.

It is worth mentioning that MediaTek's Pump Express 3.0 enables direct charge through Type-C USB power delivery. Direct charging bypasses charging circuitry inside the phone and prevents the device from overheating while also routing electrical current from the adapter directly to the battery. With direct charging, the Pump Express 3.0 greatly reduces power dissipation by more than 50% compared to the Pump Express 2.0.

Qualcomm's fast charging technology has advanced to the fourth generation. The Quick Charge 4 uses Qualcomm's parallel charging technology dubbed Dual Charge to enable users to enjoy up to 20% faster charging and up to 30% higher efficiency compared with Quick Charge 3.0. The Quick Charge 4 will also be able to reach 28W charging speeds, and can charge a phone from zero to 50% in 15 minutes or less. Products featuring the Quick Charge 4 technology are slated for launch in the second half of 2017.

Qualcomm's Quick Charge 3.0 employs the high-voltage operating mode and Intelligent Negotiation for Optimum Voltage (INOV), a new algorithm designed to allow portable devices the ability to determine what power level to request at any point in time for optimum power transfer while maximizing efficiency. With Quick Charge 3.0 a phone can be charged from zero to 80% in about 35 minutes. Quick Charge 3.0 helps improve fast charging up to 27% or reduces power dissipation by up to 45% when compared to Quick Charge 2.0.

Unlike Qualcomm's Quick Charge and MediaTek's Pump Express that requires corresponding processors and power management ICs, TI's proprietary MaxCharge technology employs a split architecture. The architecture enables the handshake between a charger and chips to provide quick charging support without processors, and therefore improves the system configuration flexibility.

In addition, independent fast-charging chips enable more room for power-path management, over-voltage/over-current/over-temperature protection and power monitoring and other functional blocks. A variety of algorithms can also be added to establish a charging model to dynamically deploy the output power to ensure battery life and safety. TI has rolled out lithium battery charging chips based on its MaxCharge technology for system manufacturers to adopt in their handsets or tablets that feature a split design.

Handset manufacturers step into development of fast-charging technology

Oppo has introduced its Super VOOC fast charging technology, and has already applied for 18 patents related to the technology. Oppo's VOOC technology enables fast-charging support through the low-voltage and high-current mode. Besides, VOOC does not enable batteries to operate in constant current mode when charging, but the batteries can enter the maintenance mode from fast to slow. For example, Oppo's Super VOOC battery technology enables the Oppo R9 smartphone to achieve 70% charge in 30 minutes.

The phone battery will switch over to a trickle charge after reaching 70% of its capacity, and therefore it requires more time to have the phone charged from 90% to 100% of its battery life.

Oppo's previous-generation Find 7 and R7 models have already featured VOOC technology, and the new-generation R9 with the fast-charging technology is able to charge faster than the previous models. Oppo claimed the R9 that supports VOOC offers up to two hours of talk time in just five minutes.

Fellow China-based smartphone company Huawei has launched its SuperCharge technology, which is claimed to be a low voltage charging for better safety. Huawei's SuperCharge technology is based on low-voltage and high-current mode offering 5V/2A, 4.5V/5A and 5V/4.5A output specs. Compared to a conventional 9V/2A fast charger, SuperCharge can reduce heat loss by about 50% with the overall charging efficiency reaching a 58% charge in 30 minutes. A sustained low temperature can also be maintained to ensure safety. SuperCharge has been applied to Huawei's smartphone models including the Mate 9, Mate 9 Pro, and P10 and P10 Plus.

USB Type-C supporting Power Delivery 3.0 gains momentum

In addition to fast-charging technologies rolled out by the above mentioned companies, USB Type-C that can support USB Power Delivery 3.0 is gaining momentum. USB PD 3.0 can provide up to 100W power at 20V, which is enough for the workstation level of electronic equipment.

Google has recently published its Android 7.0 compatibility document to include a section for USB Type-C charging specs. All manufacturing partners are required to ensure their

▲ Oppo rolls out its VOOC fast charging technology   Company

implementation of USB Type-C fast charging technology to follow the standard technology, not the exclusive specs.

The currently available fast-charging technologies are targeted at handset applications. As for notebooks, the fast-charging capability is based on standard specs. Notebooks from Apple and Google, and other USB Type-C enabled models all support USB PD RD resulting in compatibility problems. If the devices are not compatible with chargers, charging speeds will fall to a basic level.

Therefore, Google in its document "strongly recommended" USB Type-C devices do not support the modified Vbus voltage to a specific charging technology that exceeds the preset level, or the modified sink/source input circuit as this may result in charger/device compatibility issues. Google also indicated the future versions of Android may require all USB Type-C devices are fully compatible with standard Type-C chargers.

In addition, with Apple rolling out its new models in the second half of 2017, will all these new devices support fast charging? The market is also paying attention to which fast-charging technology Apple will use. The upcoming iPhones will support

▲ MediaTek launches its battery charging technology for smartphones: Pump Express 3.0   Company

fast charging by the adoption of Type-C PD technology, and will still use the Lightning port, according to market sources.

With the continued enhancement of smartphone features, improving the battery life is becoming increasingly difficult. A larger battery will make a phone look big and heavy, and therefore the adoption of fast-charging technology has become a trend. However, methods in the currently available fast charging technologies to improve voltage and current could have a negative impact on battery wear levels and safety, and even cause shorter battery life. Thus, the development of fast-charging technology puts an emphasis on speeds, the extension of battery life and safety upgrade, which have been drawn the market's attention.

Shipment breakdown

From the data collected, total shipments of China-based smartphone makers (both in the domestic and international markets) in first-quarter 2017 were 134.30 million units, flat growth compared to first-quarter 2016 and showing an on-quarter drop of 28.8%. This drop is more severe than the 19.9% on-quarter drop experienced in first-quarter 2016.

China Mobile saw only 33 million new 4G users in first-quarter 2017. This figure is far less than the figures of 50-60 million new users the firm saw in each quarter of 2016. This shows that sales of price-friendly and super low-price 4G models in the domestic market stimulated by China Mobile's subsidies to encourage users to switch from 2G or 3G to 4G started to weaken in first-quarter 2017.
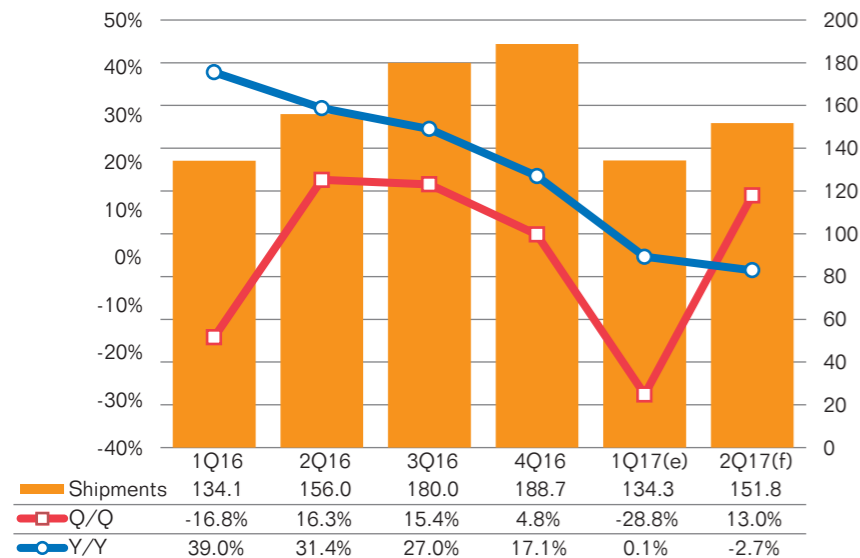
First-quarter 2017 4G smartphone sales in China market were much slower compared to the way shipments firms flooded into the market from fourth-quarter 2016 to the Lunar New Year holidays in 2017 causing the distribution channel to have inventory build-ups.

Other factors such as international markets entering the low season and the India market being affected by the abolishment of its old currency -- causing consumption to weaken -- led to China-based firms seeing an on-year decrease in international shipments in first-quarter 2017.

International demand is expected to return in second-quarter 2017 but China's domestic market is more likely to continue absorbing the inventory build-ups. Digitimes Research predicts overall shipments in second-quarter 2017 from China-based smartphone makers will increase on quarter to 151.80 million units, but for the first time in history, the shipments will show an on-year decrease of 2.7% compared to second-quarter 2016.

China smartphone industry shipments, 1Q16-2Q17 (m units)

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Shipments	134.1	156.0	180.0	188.7	134.3	151.8
Q/Q	-16.8%	16.3%	15.4%	4.8%	-28.8%	13.0%
Y/Y	39.0%	31.4%	27.0%	17.1%	0.1%	-2.7%

Source: Digitimes Research, May 2017
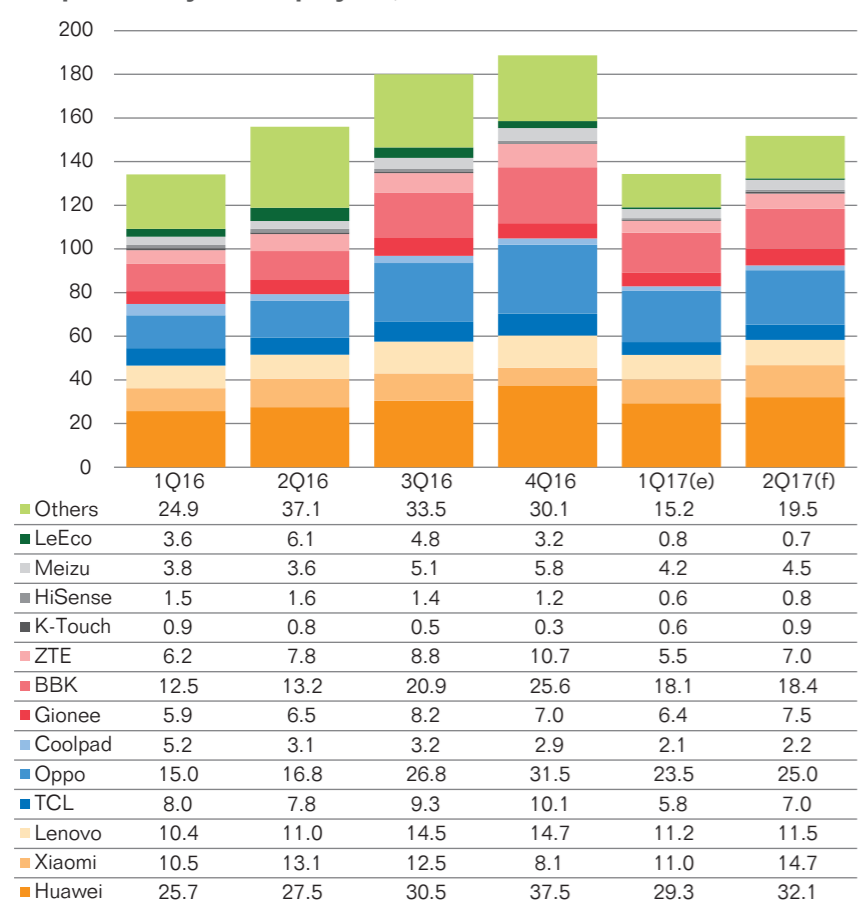
Shipments by maker

The top five China-based smartphone makers by shipments in first-quarter 2017 were Huawei, Oppo, BBK, Lenovo and Xiaomi. The top two makers both saw shipments exceeding 20 million units.

Due to the low season, Huawei saw first-quarter 2017 international shipments fall by seven million units compared to fourth-quarter 2016 and its overall shipments fall to 29.30 million units.
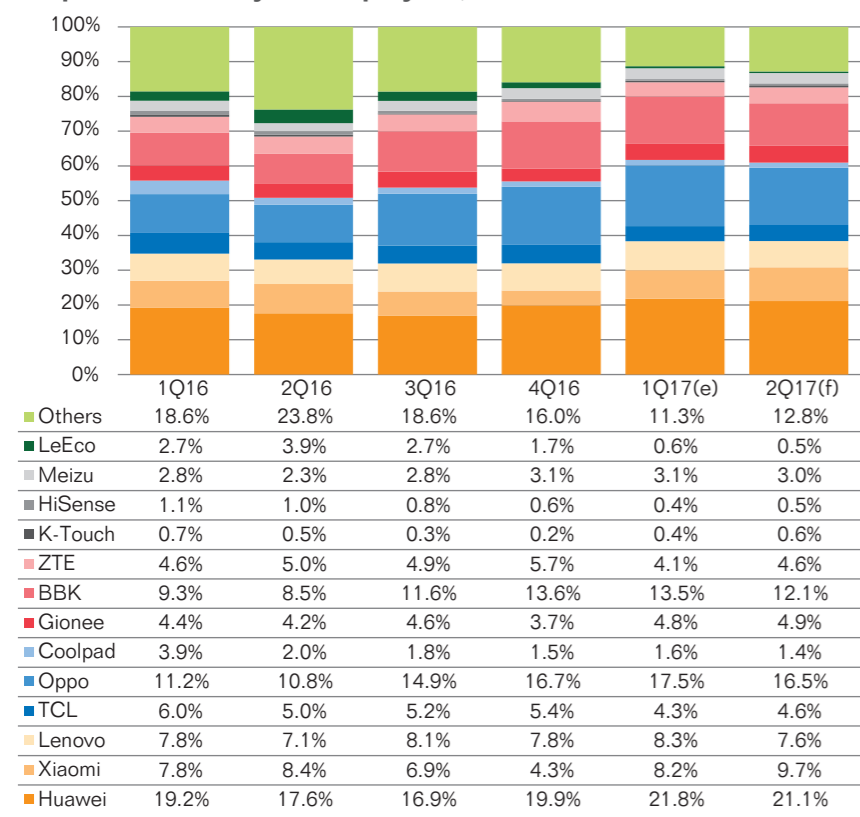
Oppo and BBK continued to expand physical retail stores in China. However, sales in first-tier cities have been less strong as expected while sales growth in other regions has been slow. After strong shipments in third- and fourth-quarter 2016 causing the distribution channel to have inventory build-ups, Oppo and BBK saw first-quarter 2017 shipments fell to 23.50 million units and 18.10 million units.

Combined with shipments from the Motorola brand, Lenovo saw first-quarter 2017 shipments to reach 11.40 million units.

After experiencing two consecutive quarters of falling shipments during the boom season in second-half 2016, Xiaomi saw first-quarter 2017 shipments bounce back to 11 million units due to the launch of its new models.

Digitimes Research predicts the top five China-based smartphone makers by shipments in second-quarter 2017 will be Huawei, Oppo, BBK, Xiaomi and Lenovo. All five makers will see shipments exceeding 10 million units.

Among all shipments from China-based smartphone makers in first-quarter 2017, the combined shipment share of the top five makers reached 69.3%, showing an increase from 63.6% in fourth-quarter 2016.

The combined shipment share of the top three makers, Huawei, Oppo and BBK, reached 52.8%, showing an increase from 50.1% in fourth-quarter 2016.
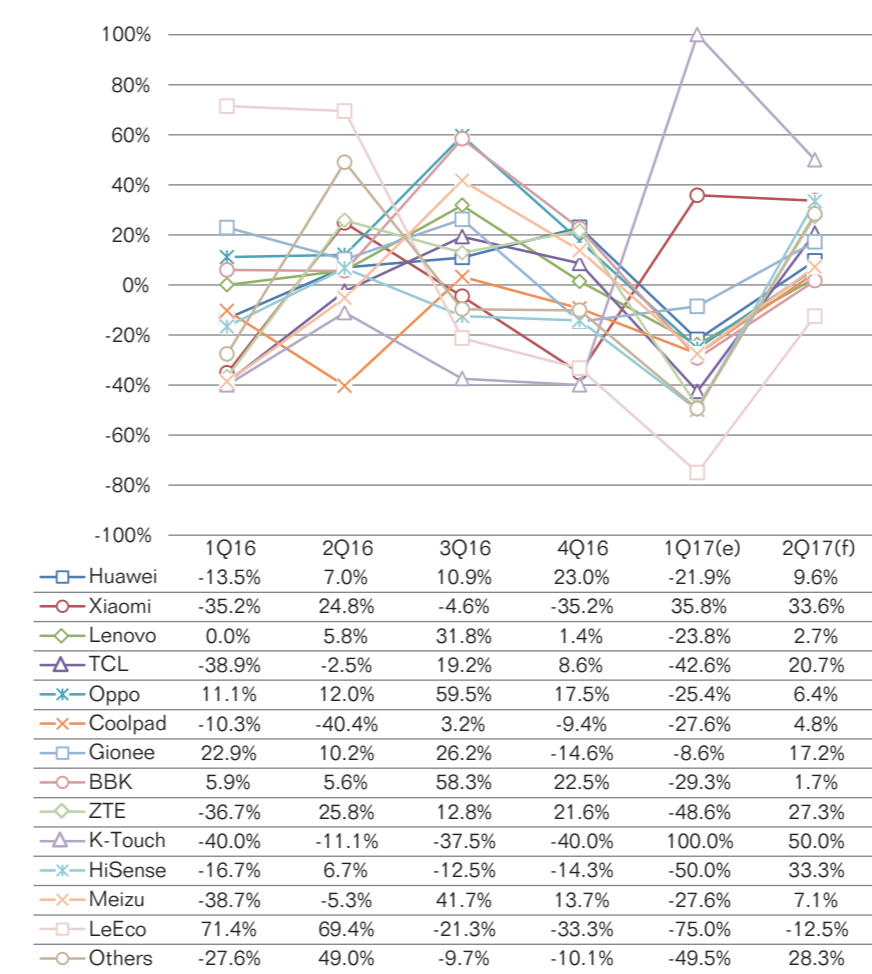
Digitimes Research predicts the combined shipment share of the top five and top three makers in second-quarter 2017 will be 67.0% and 49.7% respectively. Both figures will be slightly lower compared to first-quarter 2017 showing a fall in centralization of shipments.

Compared with other China-based smartphone makers with sizable shipments, Xiaomi showed on-quarter shipment growth in first-quarter 2017.

Xiaomi significantly reduced shipments in fourth-quarter 2016 to lower inventory levels. In first-quarter 2017, the firm saw sales in India market were quite strong plus the launch of its new products Hongmi 4X and Hongmi Note 4X hence shipments showed an on-quarter growth of 35.8%.

In second-quarter 2017, many firms are expected to see on-quarter growth in shipments and in particular, Xiaomi, ZTE, TCL and Gionee are likely to see double digit growth.

Shipments by China players, 1Q16-2Q17 (m units)

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Others	24.9	37.1	33.5	30.1	15.2	19.5
LeEco	3.6	6.1	4.8	3.2	0.8	0.7
Meizu	3.8	3.6	5.1	5.8	4.2	4.5
HiSense	1.5	1.6	1.4	1.2	0.6	0.8
K-Touch	0.9	0.8	0.5	0.3	0.6	0.9
ZTE	6.2	7.8	8.8	10.7	5.5	7.0
BBK	12.5	13.2	20.9	25.6	18.1	18.4
Gionee	5.9	6.5	8.2	7.0	6.4	7.5
Coolpad	5.2	3.1	3.2	2.9	2.1	2.2
Oppo	15.0	16.8	26.8	31.5	23.5	25.0
TCL	8.0	7.8	9.3	10.1	5.8	7.0
Lenovo	10.4	11.0	14.5	14.7	11.2	11.5
Xiaomi	10.5	13.1	12.5	8.1	11.0	14.7
Huawei	25.7	27.5	30.5	37.5	29.3	32.1

Source: Digitimes Research, May 2017

Shipment share by China players, 1Q16-2Q17

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Others	18.6%	23.8%	18.6%	16.0%	11.3%	12.8%
LeEco	2.7%	3.9%	2.7%	1.7%	0.6%	0.5%
Meizu	2.8%	2.3%	2.8%	3.1%	3.1%	3.0%
HiSense	1.1%	1.0%	0.8%	0.6%	0.4%	0.5%
K-Touch	0.7%	0.5%	0.3%	0.2%	0.4%	0.6%
ZTE	4.6%	5.0%	4.9%	5.7%	4.1%	4.6%
BBK	9.3%	8.5%	11.6%	13.6%	13.5%	12.1%
Gionee	4.4%	4.2%	4.6%	3.7%	4.8%	4.9%
Coolpad	3.9%	2.0%	1.8%	1.5%	1.6%	1.4%
Oppo	11.2%	10.8%	14.9%	16.7%	17.5%	16.5%
TCL	6.0%	5.0%	5.2%	5.4%	4.3%	4.6%
Lenovo	7.8%	7.1%	8.1%	7.8%	8.3%	7.6%
Xiaomi	7.8%	8.4%	6.9%	4.3%	8.2%	9.7%
Huawei	19.2%	17.6%	16.9%	19.9%	21.8%	21.1%

Source: Digitimes Research, May 2017

Shipment share by China players, 1Q16-2Q17

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Huawei	-13.5%	7.0%	10.9%	23.0%	-21.9%	9.6%
Xiaomi	-35.2%	24.8%	-4.6%	-35.2%	35.8%	33.6%
Lenovo	0.0%	5.8%	31.8%	1.4%	-23.8%	2.7%
TCL	-38.9%	-2.5%	19.2%	8.6%	-42.6%	20.7%
Oppo	11.1%	12.0%	59.5%	17.5%	-25.4%	6.4%
Coolpad	-10.3%	-40.4%	3.2%	-9.4%	-27.6%	4.8%
Gionee	22.9%	10.2%	26.2%	-14.6%	-8.6%	17.2%
BBK	5.9%	5.6%	58.3%	22.5%	-29.3%	1.7%
ZTE	-36.7%	25.8%	12.8%	21.6%	-48.6%	27.3%
K-Touch	-40.0%	-11.1%	-37.5%	-46.0%	100.0%	50.0%
HiSense	-16.7%	6.7%	-12.5%	-14.3%	-50.0%	33.3%
Meizu	-38.7%	-5.3%	41.7%	13.7%	-27.6%	7.1%
LeEco	71.4%	69.4%	-21.3%	-33.3%	-75.0%	-12.5%
Others	-27.6%	49.0%	-9.7%	-10.1%	-49.5%	28.3%

Source: Digitimes Research, May 2017

Compared with other sizable firms, Oppo and BBK showed the strongest on-year growth in first-quarter 2017 shipments. Oppo had on-year growth that reached 56.7% while BBK saw on-year growth of 44.8%.

Huawei's overall shipments in 2016 reached 120 million units. In first-quarter 2017, the firm's shipments showed on-year growth of 14.0%.
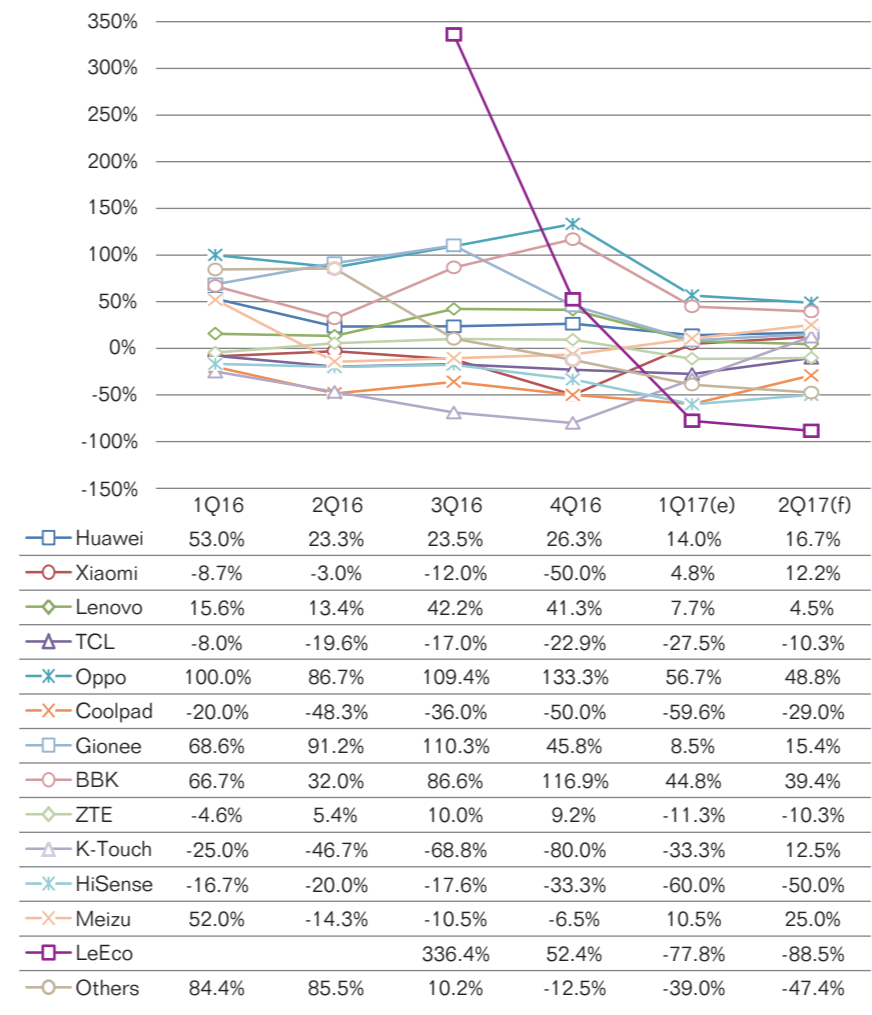
Among all sizable firms, LeEco, Coolpad, TCL and ZTE all saw first-quarter 2017 shipments showing double digit drops on year.

LeEco and Coolpad saw on-year drops close to 80% and 60% respectively in first-quarter 2017.

Oppo and BBK are expected to see strong on-year growth in second-quarter 2017 shipments, with nearly 50% and 40% on-year growth respectively.

Y/Y shipment growth by China players, 1Q16-2Q17

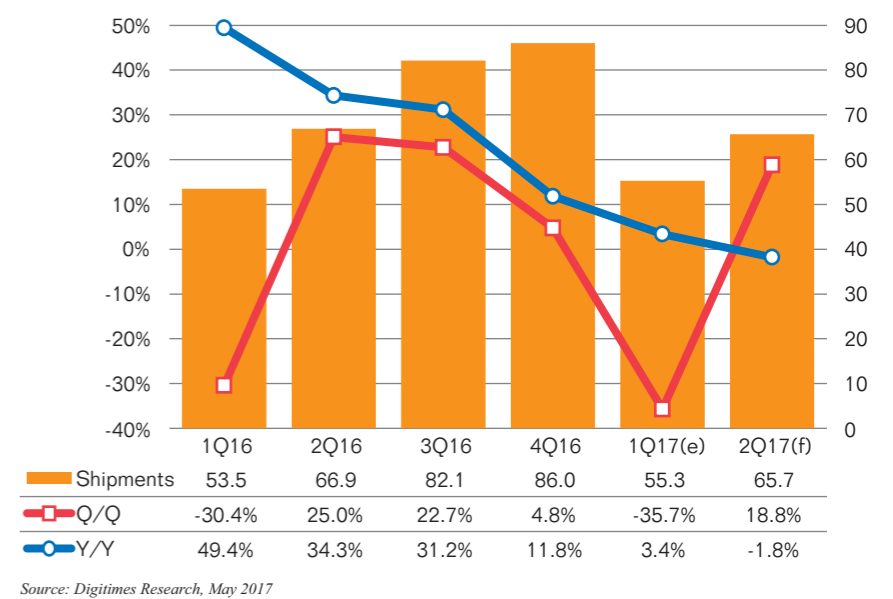|	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Huawei	53.0%	23.3%	23.5%	26.3%	14.0%	16.7%
Xiaomi	-8.7%	-3.0%	-12.0%	-50.0%	4.8%	12.2%
Lenovo	-15.6%	13.4%	42.2%	41.3%	7.7%	4.5%
TCL	-8.0%	-19.6%	-17.0%	-22.9%	-27.5%	-10.3%
Oppo	100.0%	86.7%	109.4%	133.3%	56.7%	48.8%
Coolpad	-20.0%	-48.3%	-36.0%	-50.0%	-59.6%	-29.0%
Gionee	68.6%	91.2%	110.3%	45.8%	8.5%	15.4%
BBK	66.7%	32.0%	86.6%	116.9%	44.8%	39.4%
ZTE	-4.6%	5.4%	10.0%	9.2%	-11.3%	-10.3%
K-Touch	-25.0%	-46.7%	-68.8%	-80.0%	-33.3%	12.5%
HiSense	-16.7%	-20.0%	-17.6%	-33.3%	-60.0%	-50.0%
Meizu	52.0%	-14.3%	-10.5%	-6.5%	10.5%	25.0%
LeEco			336.4%	52.4%	-77.8%	-88.5%
Others	84.4%	85.5%	10.2%	-12.5%	-39.0%	-47.4%

Source: Digitimes Research, May 2017

Exports

In first-quarter 2017, international markets entered the low season and China-based smartphone makers saw international shipments fall 35.6% on quarter to 55.30 million units in total.

Digitimes Research predicts in second-quarter 2017, as international markets see demand return, China-based smartphone makers are likely to see international shipments grow 18.8% on quarter to reach a total of 65.70 million units. The figure will show an on-year drop of 1.8%.

Compared to fourth-quarter 2016, Huawei's first-quarter 2017 international shipments showed an on-quarter drop of 30% to a total of 14.60 million units. However, the firm is still ranked first in terms of shipments.

Digitimes Research predicts Huawei will see second-quarter 2017 international shipments reach 16.20 million units and rank first among China-based firms.

Combined with shipments of the Motorola brand, Lenovo saw first-quarter 2017 international shipments drop to 9.50 million units, ranking it number two.

Digitimes Research predicts Lenovo will see international shipments in second-quarter 2017 grow slightly to 9.90 million units.

Oppo continues to expand its presence in international markets such as Southeast Asia and India.
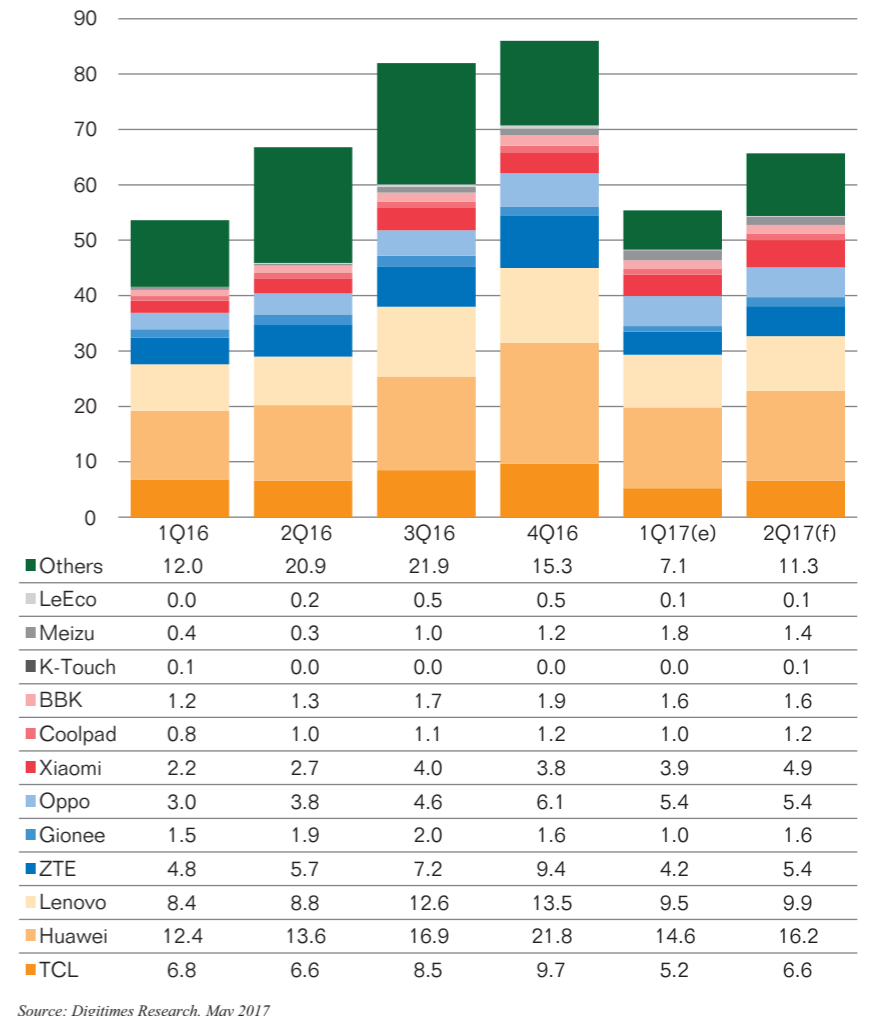
In first-quarter 2017, the firm saw international shipments reach 5.40 million units, moving up the rank to third place.

Digitimes Research predicts Oppo will see flat growth in international shipments in second-quarter 2017.

As demand in Europe and America markets turned low, TCL and ZTE saw first-quarter 2017 international shipments drop to 5.20 million units and 4.20 million units respectively. TCL was ranked fourth in the market in terms of shipments while ZTE was ranked fifth.

Digitimes Research predicts as demand in Europe and America markets return, TCL and ZTE are likely to see second-quarter 2017 international shipments grow to 6.60 million units and 5.40 million units respectively.

China smartphone industry's export shipments, 1Q16-2Q17 (m units)

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Shipments	53.5	66.9	82.1	86.0	55.3	65.7
Q/Q	-30.4%	25.0%	22.7%	4.8%	-35.7%	18.8%
Y/Y	49.4%	34.3%	31.2%	11.8%	3.4%	-1.8%

Source: Digitimes Research, May 2017

Export shipments by China player, 1Q16-2Q17 (m units)

	1Q16	2Q16	3Q16	4Q16	1Q17(e)	2Q17(f)
Others	12.0	20.9	21.9	15.3	7.1	11.3
LeEco	0.0	0.2	0.5	0.5	0.1	0.1
Meizu	0.4	0.3	1.0	1.2	1.8	1.4
K-Touch	0.1	0.0	0.0	0.0	0.0	0.1
BBK	1.2	1.3	1.7	1.9	1.6	1.6
Coolpad	0.8	1.0	1.1	1.2	1.0	1.2
Xiaomi	2.2	2.7	4.0	3.8	3.9	4.9
Oppo	3.0	3.8	4.6	6.1	5.4	5.4
Gionee	1.5	1.9	2.0	1.6	1.0	1.6
ZTE	4.8	5.7	7.2	9.4	4.2	5.4
Lenovo	8.4	8.8	12.6	13.5	9.5	9.9
Huawei	12.4	13.6	16.9	21.8	14.6	16.2
TCL	6.8	6.6	8.5	9.7	5.2	6.6

Source: Digitimes Research, May 2017

In first-quarter 2017, firms that focus on international markets all saw their international shipment shares fall (share of their international shipments compared to their total shipments).

TCL, Lenovo and ZTE saw their international shipment share show an on-quarter decrease compared to fourth-quarter 2016 but continued to be above 70% of their total shipments.

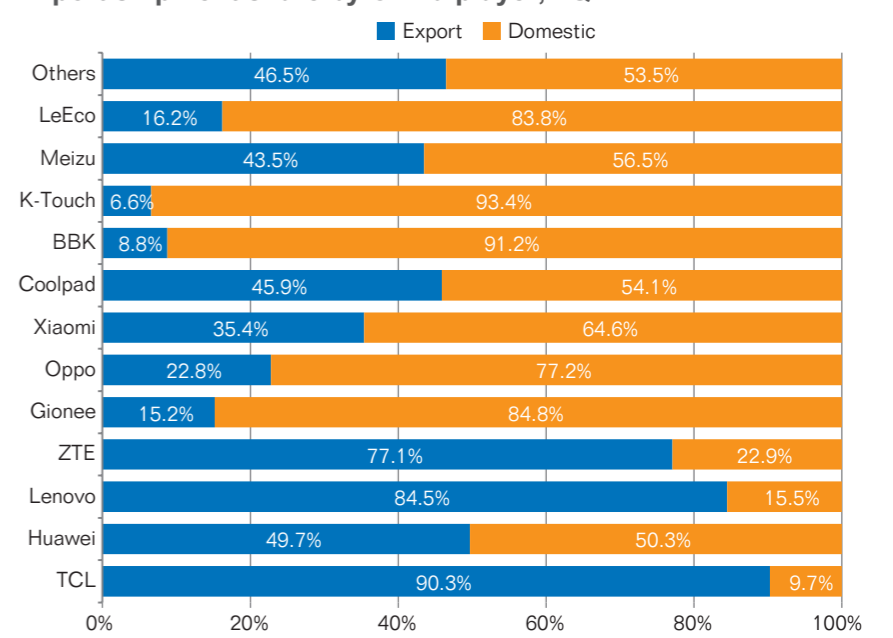Huawei saw its international shipment share fall below 50%.

Xiaomi saw strong sales in the China market in first-quarter 2017 hence its international shipment share experienced a slight decrease compared to fourth-quarter 2016. The international shipment share fell to 35.4%.

The international shipment share of the "Other" category, which include white-box makers, ODM and IDH firms that receives orders from international firms, fell to 46.5% in first-quarter 2017 due to falling international demand and the players losing market share to China-based brands in emerging markets such as India.

Digitimes Research predicts that as demand in international markets return, most firms will see the shipment share of their international shipments increase in second-quarter 2017.

Export shipment share by China player, 1Q17

	Export	Domestic
Others	46.5%	53.5%
LeEco	16.2%	83.8%
Meizu	43.5%	56.5%
K-Touch	6.6%	93.4%
BBK	8.8%	91.2%
Coolpad	45.9%	54.1%
Xiaomi	35.4%	64.6%
Oppo	22.8%	77.2%
Gionee	15.2%	84.8%
ZTE	77.1%	22.9%
Lenovo	84.5%	15.5%
Huawei	49.7%	50.3%
TCL	90.3%	9.7%

Source: Digitimes Research, May 2017