

# Is 4G growth in China Slowing? Or....

## Summary

4G smartphone shipments in China for August were up 9% y/y, but a look at the trend shows 4G shipment growth slowing y/y. While this may be a pause ahead of the SepQ iPhone launch, it will be interesting to watch 4G trends with continued subsidies from the China Telcos. The iPhone launch this year on September 16 was ~9 days earlier than last year and is scheduled to ship to 58 countries by end of September, but could potentially pull-in upside from the DecQ for component suppliers.

## Key Points

**A look at 4G smartphone shipment trends in China shows a slowing into August, but iPhone and potential subsidies key.** As shown on page two, 4G smartphone shipments in China have slowed from 23-25% y/y growth early in the year to 9% y/y in August. While August last year was still strong, the slowdown this year could be a result of higher smartphone penetration or a pause ahead of the iPhone 7/7+. We would also note that the telecom carriers in China, are implementing 35-50% subsidies for the iPhone 7/7+ which should help. Nonetheless, the trends bear watching into 1H17. **We are hosting a call with Huawei on October 12.**

**Slowing 4G challenges QCOM.** We believe a slowing 4G China market could be a challenge for QCOM with a competitive offering from Mediatek (MTK). MTK just introduced its LG smartphone with Helio 10 on Verizon and Sprint in the U.S with the first modem that supports LTE and CDMA/GSM. We believe the more cost-competitive MTK could start to show up at the four major U.S carriers. While the INTC modem 7360/7480 supports LTE, and INTC has the CDMA/GSM IP, the modem still does not support CDMA. Nonetheless, the INTC 7480 modems with Cat 10/12 could be competition for QCOM in 2017.

**Early release and content winners are AVGO, INTC and memory; SWKS and QRVO are mixed.** The iPhone 7/7 Plus began shipping on September 16, nine days earlier than 6s/6s Plus release, and is scheduled to ship to 58 countries before the end of September, which may pull some orders into SepQ from the DecQ for RF suppliers SWKS/QRVO. A look at the content on the iPhone 7/7+ shows AVGO and INTC gained content, with positive trends for memory players MU, WDC, but traction for SWKS and QRVO was mixed. While QRVO gained share on the INTC baseband, it lost share on the QCOM iPhone 7+ basebands, while SWKS maintained share on the INTC and QCOM basebands. However, we believe the low- to mid-end frequency bands could start to get competitive with SWKS and QRVO.

Company	Symbol	Price (9/23)	Rating		PT
			Prior	Curr	
Broadcom Limited	AVGO	\$166.65	-	Buy	\$200.00
Qorvo, Inc	QRVO	\$54.87	-	Neutral	\$58.00
QUALCOMM Incorporated	QCOM	\$62.75	-	Neutral	\$59.00
Skyworks Solutions, Inc.	SWKS	\$74.77	-	Neutral	\$68.00

Source: Bloomberg and Mizuho Securities USA

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The iPhone 7/7 Plus began shipping on September 16, nine days earlier than last year, which may pull some orders in from the December quarter for RF suppliers SWKS/QRVO. The iPhone 7/7 plus shipped to 28 countries including China, U.K and Germany on September 16, expanding to 58 countries on September 23.

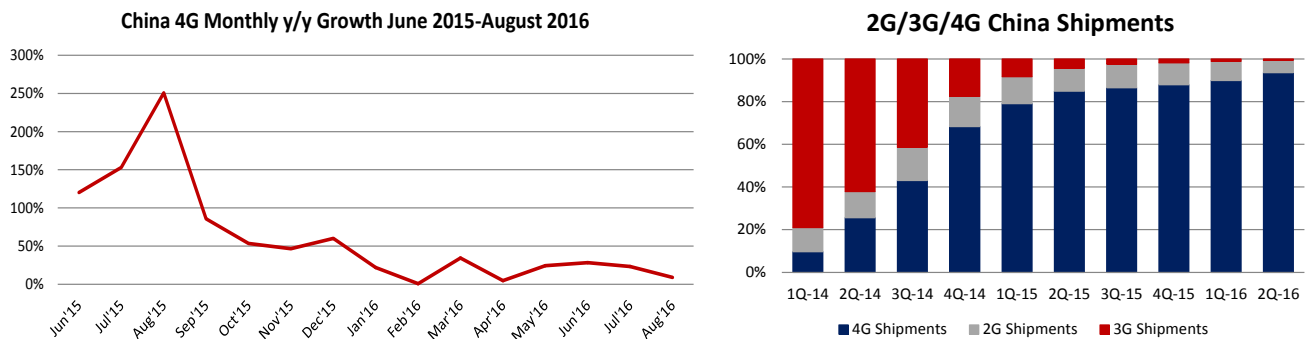
**Below, we look at 4G handset shipments in China.** As can be shown in the chart on the left, 4G growth, while still positive, has slowed significantly in the last 12 months. Shipments for the month of August, going into a seasonally stronger 2H, were up ~ 9% y/y and well below 2015 August shipments which were up 251% y/y off a smaller base.

**This was also below YTD 4G trends of up 20-25% y/y (excluding February and April).** While this could be a pause ahead of the iPhone, there are some catalysts that could drive upside to the trend: 1) the iPhone 7/7+ launch in China which began on September 16, with pre-orders starting September 9; and 2) increased subsidies of up to 35-50% from the China telecom carriers, China Mobile, China Telecom and China Unicom, substantially higher than on local China OEM handsets.

A slowing China 4G ecosystem could be a bigger challenge for SWKS and QRVO with ~25%+ of wireless revenue from China, compared to AVGO with only ~5-8% of wireless revenues from China.

**On the right below, we look at shipments as a % of 2G/3G/4G.** 4G now makes up ~95% of total handset shipments in China, signaling almost full market saturation, with 3G less than 1% of shipments. Total unit shipments in China have remained relatively stable at around ~50M per month.

**Exhibit 1: China 4G Shipments Slowing; 4G ~95% of Shipments**



Source: Mizuho Securities research, MIIT

**AVGO, INTC and memory makers win on the iPhone 7, with trends mixed for SWKS/QRVO which points to increasing competition at the mid- and low-frequency bands.** We believe AVGO with its 3-year supply agreement and higher RF complexity with multiplexers and carrier aggregation on the iPhone into 2017-18 should continue to see ~20% y/y content growth, combined with new .11ax Wi-Fi capabilities and a competitive cost curve with its 9<sup>th</sup> generation 8" FBAR ramping. AVGO expects to complete its 8" FBAR transition by Oct-2017. Aggressive revenue diversification and a healthy M&A roadmap positions AVGO well.

Also INTC with its 7360 modems is a winner with baseband, RF transceivers and power management, with QCOM on the rest of the iPhone 7+. Also memory with 2GB/3GB mobile DRAM and a doubling of NAND to 64/128/256GB should position MU and WDC better into 2H16.

For the RF suppliers SWKS and QRVO we believe trends are mixed with QRVO losing share on the QCOM basebands (not as expected) but SWKS losing share as expected on the INTC basebands, but also gaining some incremental content on the QCOM basebands. **The jockeying of market share at the low- and mid-frequency bands could point to increasing competition, less differentiation and more pricing pressure in subsequent models.**

A look at some of the content from the teardowns of the iPhone 7/7+ versus prior phones is shown below. We should note these teardowns are not comprehensive and sometimes miss significant content.

**Exhibit 2: A Look at RF and Processor Content on 7/7+ versus Prior iPhones**

GSM-CDMA TD-LTE Bands	iPhone 7 - 2016			iPhone 7+ - 2016			iPhone 6s/6s+ - 2015			iPhone 6 - 2014		
	All Phones LTE-with Band700 Roaming Added bands 11, 21 Has LTE-A and MIMO			All Phones LTE-with Band700 Roaming Added bands 11, 21 Has LTE-A and MIMO			All Phones LTE-with Band700 Roaming Added bands 12, 23, 43 Has LTE-A and MIMO			All Phones LTE-with Band700 Roaming Added bands 28, 29, 41 Has VOLTE		
	Part	\$ Content		Part	\$ Content		Part	\$ Content		Part	\$ Content	
Skyworks	SKY77359 GSM Power Amplifier	\$3.00		SKY78100-20	\$3.00		SKY7781/2 Power Amplifier Module	\$2.00		77802 - Low Band LTE PAD	\$2.10	
	SKY13702-20 antenna switches	\$0.75		SKY13702-20 receive module	\$0.80		SKY77357 Power Amplifier Module	\$1.90		77356-8 Mid-Band PA-Filters	\$1.90	
	SKY13703-21 antenna switches	\$0.75		SKY13703-21 receive module	\$0.80		SKY13701 WLAN Front-End Module	\$0.50				\$4.00
		\$4.50			\$4.60			\$4.40				
Avago/ Broadcom	BCM47734 GPS / AFEM-8060 FBAR-BAW	\$4.00		AFEM-8055 PAM / GPS	\$4.00		AFEM-8030 Power Amplifier Module	\$3.00		A8020 High Band Pad	\$2.30	
	AFEM-8050 Mid-Band PAM	\$2.50		AFEM-8055 PAM	\$2.50		Other FBAR Filter Bands	\$2.53		A8010 Ultra High Band PAD	\$2.00	
	DFR21 PA Duplexer	\$1.00		LF1630-163439 IC	\$1.00			\$6.00		Other FBAR Filter Bands	\$0.80, \$1.00	
		\$7.50			\$7.50						\$6.30	
Qorvo	RF6110 Low-Band PAM	\$2.50					TQF6405 Power Amplifier Module	\$2.00		TQF6410 3G EDGE PA Module		
	81003M Power Management IC	\$1.00					RF5150 Antenna Switch	\$1.50		RF5150 Antenna Switch		
		\$3.50						\$3.50				
Qualcomm				MDM9645M LTE Cat. 12 Modem	\$18.00		MDM9635M LTE Cat. 6 Modem			MDM9615M LTE Modem		
				PMD9645 Power Management IC	\$0.60		QFE1100 ET			QCOM QFE1000 ET		
				WTR4905 LTE Transceiver	\$1.00		RF Transceiver/PMIC	-\$20-\$22		RF Transceiver/PMIC	-\$20-\$22	
				WTR3925 RF-Transceiver	\$0.75							
				\$18.35								
Intel	Intel Processor (Modem) XMM7360	\$12.00										
	PMB5750 RF-Transceiver (2)	\$2.00										
	X-PMU736 Power IC	\$0.60										
		\$14.60										
NXP	67V04 NFC Controller	\$1.80		67V04 NFC Controller	\$1.80					MB Motion +Cortex M3 Hub	\$0.60-\$0.65	
	610A3B Interface IC	\$0.50		610A3B IC	\$0.50		NXP 1610A3 Display Controller			NFC-Secure Element -65V10	\$0.90	
		\$2.30			\$2.30		NXP 68V10 NFC Controller-SE	1.80-2.00		Logic/Memory/Audio Interfaces	\$0.80-\$1.00	

Source: Mizuho Securities research, Chipworks, iFixit.com

## Glossary

~ - approximately	eMCP - embedded multi-chip module using DRAM and NAND	IoT - internet of things	nm - nanometer	RSP - Renesas Semiconductor products/Drivers
1H/2H - first half/second half	EMV - Europay, MasterCard and Visa, a payment consortium	IP - intellectual property	NOL - Net Operating Losses	RSU - Restricted Stock Units
2G/3G/4G - 2nd generation, third generation, 4th generation wireless	EOY - end of year	ISM - Institute for Supply Management	NOR - a type of non-volatile storage memory	SAS - serial attached SCSI (small computer system interface)
3G/4G - Third generation / Fourth generation	EPS - earnings per share	ITU - International Telecommunication Union	NPV - net present value	SAW - surface acoustic wave filters
4G-LTE - Fourth generation, long term evolution	ET - envelope tracking	JPY - Japanese yen	NVMe - Non-volatile Memory Express	SDH - Synchronous Digital Hierarchy, mostly in Europe
ADAS - Automotive driver assist systems	ETD - Emerging Technologies Division	JV - joint venture	NYSE - New York Stock Exchange	SG&A - Sales, General and Administrative
APU - accelerated processing unit	EU - European Union	K - Thousand	ODM - original design manufacturer	SLAC - subscriber line audio-processing circuit
ARM - a family of instruction set architectures used for processors for computers, servers, etc.	EV - enterprise value	Kbps/Mbps - Kilobit per second/Megabit per second bandwidth	OEM - original equipment manufacturer	SLIC - subscriber line interface circuit
ASIC - application specific integrated circuits	EvDO - Evolution Data Only	KGD - Known Good Die	OFN - optical finger navigation	SMIC - Semiconductor Manufacturing International Corporation
ASP - average selling price	EVP - Executive Vice President	Kwpm - thousand wafer per month capacity	OLT - Optical Line Termination or Terminal	SoC - system on chip
ATM - Asynchronous Transfer mode	F - Fiscal	LIBOR - London Interbank Offered Rate	OM - operating margin	SONET - Synchronous Optical Network, used in North America
B - Billion	FASB - Financial Accounting Standards Board	LQ - last quarter	ONU - Optical Network Unit	SOX - Philadelphia semiconductor index
BAW - bulk acoustic wave filters	FBAR - film bulk acoustic resonator, a type of filter	LSD - low single digits	Opex - operating expenses	SRAM - static random access memory
BiDi - Bi Directional	FBAR/BAW - Film Bulk acoustic resonator/Bulk acoustic wave Filters	LT - long term	P/B - price to book value ratio	SSD - solid state drive
BOM - bill of materials	FCF - free cash flow	LTE - long term evolution, a 4th generation wireless protocol	P/E - price to earnings	TAM - total available market
bps - basis points	FDD LTE - Frequency Division Duplex Long Term Evolution	LY - last year	P/S - price to sales	TD - time division
CA - carrier aggregation	FP - finger print	m - Meters	PA - power amplifier	TDDI - touch display driver integration
CAGR - compound annual growth rate	FPGA - field programmable gate arrays	M - Million	PAD - power amplifier duplexer, essentially 2 filters and a Power amplifier	TDD-LTE - Time Division Duplex Long Term Evolution
CAPEX - capital expenditures	FT - force touch	M&A - mergers and acquisitions	PC - personal computer	TD-SCDMA - Time Division Synchronous
CDMA - code division multiple access	FTC - Federal Trade Commission	MB - megabyte	PCIe - Peripheral Component Interconnect Express	TLC - triple level cell
CEO/CFO - Chief Executive/Chief Financial	FY - fiscal/full year	Mbps - megabit per second	PMI - Purchasing Managers' Index	Tx/Rx - Transmit / Receive
CES - consumer electronics show	GAAP - generally accepted accounting principles	MCU - micro controller unit	PMIC - Power Management Integrated Circuit	USB - universal serial bus
CF - cash flow	Gb/GB - gigabytes/Gigabit	MHz - megahertz	PoE - Power over Ethernet	wpm - wafer per month
CFIUS - Committee on Foreign Investment in the United States	Gb/s - Gigabit per second	MIIT - China Ministry of Industry and Information Technology	PSD - Programmable systems division	x86 - Intel based processor architecture
COO - Chief Operation Officer	GF - Global Foundries	MIMO - multiple in, multiple out	PSoC - programmable system on a chip	XMC - Wuhan Xin Xin Semiconductor Manufacturing Corporation
CSP - chip scale packaging	GHz - gigahertz	MLC - multi level cell	PT - price target	y/y - year over year
CY - calendar year	GM - gross margin	MoE - merger of equals	Q - quarter	YE - year end
D/E - debt to equity	GPU - graphics processing unit	MOFCOM - Ministry of Commerce People's Republic of China	q/q - quarter over quarter	YTD - year to date
DCF - discounted cash flow	GSM - Global System for Mobile Communication	MSD - mid single digits	QCT - Qualcomm chip technologies	
DoD - Department of Defense	HDD - hard disk drive	MSM - multi station modems, QCOM's QCT chips	QTL - Qualcomm technology licensing	
DRAM - dynamic random access memory	HSA - heterogeneous system architecture combining x86 and ARM	NAND - "not and," a type of memory	R&D - research and development	
DT - desktop	HSD - high single digits	NB - notebook	Rev - revenues	
eMMC - Embedded managed NAND solution	I/O - input output operations	NDRC - National Development and Reform Commission in China	RF - radio frequency	
EBITDA - earnings before interest, taxes, depreciation and amortization	IC - integrated circuits	NFC - near field communications	ROI - return on investment	

## Price Target Calculation and Key Risks

### *Broadcom Limited*

**Price Target:** We rate AVGO Buy with a \$200PT. Our PT reflects a multiple of 15.3x our F17E EPS of \$13.09. We believe AVGO will continue to drive margins higher as it closes some very accretive acquisitions this year (such as Emulex).

**Risks:** AVGO competes in a cyclical, technologically intensive industry and sells to a concentrated customer base. Its ability to meet AVGO's financial expectations and achieve future growth is subject to a number of risk factors, including, but are not limited to, the following:

#### **Market Risks include, among other factors:**

- AVGO's continued success of its research and development efforts and timely introduction and execution of its new products.
- AVGO depends on contract manufacturing and third-party manufacturers and also substantial capital investments at its Fort Collins Fab.
- Customer concentration, competition, and pricing pressure from other low-cost OEMs, ODMs and suppliers, possible new market entrants from China, Asia-Pacific, or Taiwan.
- Unexpected changes in legal and regulatory requirements, tariffs and exchange rates, political and economic stability, staffing and management issues, and potentially adverse tax consequences for its international operations.

#### **Technology Risks include, among other factors:**

- Potential loss of intellectual property, Commercialization of competing technologies.
- Litigation Risks.
- Adverse effects of potential existing and possible future patent or other litigation.

### *Qorvo, Inc*

**Price Target:** Our \$58PT is based on ~11.9x F17E EPS of \$4.88. We see continued execution, leverage, improving margins, cost synergies and solid product cycles ahead.

**Risks:** QRVO competes in a cyclical, technologically intensive industry and sells to a concentrated customer base. Its ability to meet its own or our financial expectations and achieve future growth is subject to a number of risk factors, including, but are not limited to, the following:

- QRVO's failure to realize all the benefits associated with the RFMD-TriQuint merger
- QRVO's ability to accurately predict customer demand, avoiding obsolete inventory;
- Competition and pricing pressure from other low-cost OEMs, ODMs and suppliers;
- Increasing 4G penetration and/or 4G slowdown,
- Possible new market entrants from China, Asia-Pacific, or Taiwan; and

- Unexpected changes in legal and regulatory requirements, tariffs and exchange rates, political and economic stability, staffing and management issues, and potentially adverse tax consequences for its international operations;
- Potential loss of intellectual property, Commercialization of competing technologies;
- Litigation Risks;
- Adverse effects of potential possible future patent or other litigation.

### ***QUALCOMM Incorporated***

We have QCOM with a Neutral rating and a \$59 PT, based on ~12.6x our F17E EPS of \$4.70, as QCOM faces a slowdown in the overall handset market, pricing pressure in its key processor markets, competition from Mediatek and Spreadtrum in China and lower handset ASPs pressuring royalty revenues. QCOM has traded between 8-17x forward P/E in the last 5 years.

**Risks:** QCOM competes in a technologically intensive and cyclical industry and we believe the risks to QCOM continue to be a slowdown in the handset market, lower royalties, competition from China handset suppliers. Also increasing handset market share between Apple and Samsung has implied less merchant processor opportunity for QCOM.

### ***Skyworks Solutions, Inc.***

**Price Target:** We rate SWKS Neutral with a \$68 PT. Our target price reflects our view that a P/E of 10.5x our F17E EPS of \$6.46 as SWKS benefits from higher RF growth but sees current headwinds in the iPhone supply chain. Note that our F16E estimates for revenue and EPS are \$3.3B and \$5.53 per share, respectively, while our F17E estimates call for revenue of \$3.6B and EPS of \$6.46.

**Risks:** SWKS competes in a cyclical, technologically intensive industry and sells to a concentrated customer base. Its ability to meet its own or our financial expectations and achieve future growth is subject to a number of risk factors, including, but are not limited to, the following:

#### **Market Risks include but are not limited to:**

- SWKS's continued success of its research and development efforts and timely introduction and execution of its new products;
- SWKS depends on contract manufacturing and third-party manufacturers;
- Customer concentration, competition and pricing pressure from other low-cost OEMs, ODMs and suppliers;
- And possible new market entrants from China, Asia-Pacific, or Taiwan; and
- Unexpected changes in legal and regulatory requirements, tariffs and exchange rates, political and economic stability, staffing and management issues, and potentially adverse tax consequences for its international operations.

#### **Technology Risks include but are not limited to:**

- Potential loss of intellectual property, Commercialization of competing technologies.

- Litigation Risks
- Adverse effects of potential possible future patent or other litigation.

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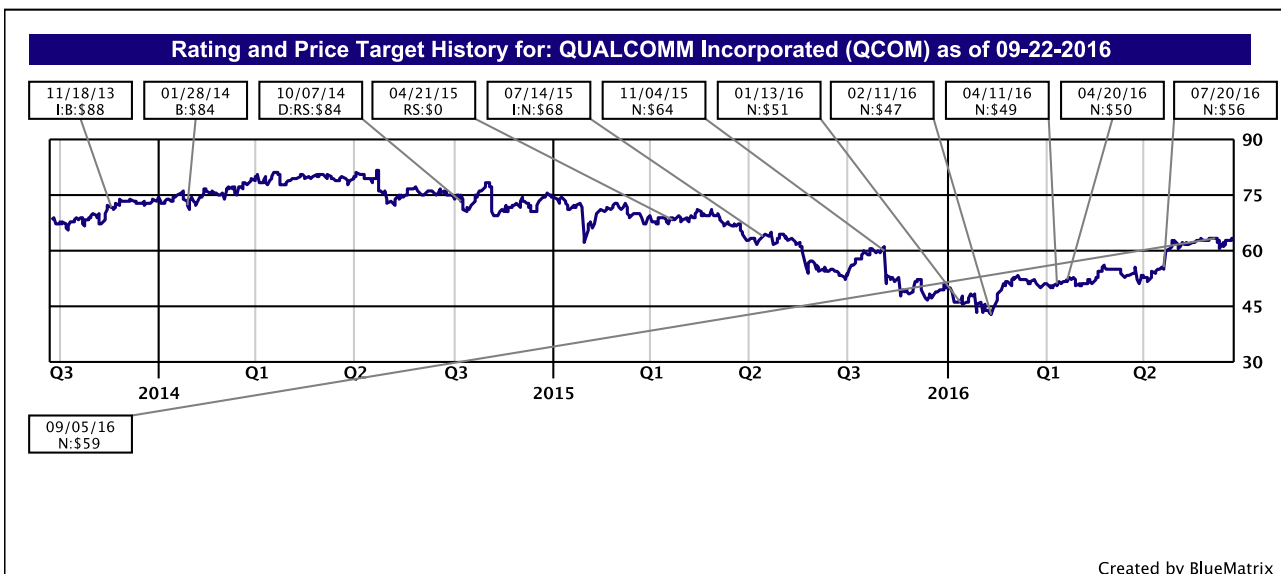
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(As of 9/23 )	% of coverage	IB service past 12 mo
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Hold (Neutral)	56.76%	28.57%
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