February 24, 2014

Equity Research

Semiconductors: Mobile World Congress 2014

- Mobile World Congress, the trade show for mobile technology, is occurring this week in Barcelona (from February 24th to 27th). Concurrent with the event, many companies have either announced new products or provided additional details on their product plans for the year. In this note we provide summaries of some announcements made today, or in recent weeks ahead of the show. We consider Qualcomm to be the clear leader in LTE modem technology and Qualcomm continues to steadily build out its stable of LTE modem and integrated modem/processor offerings. In addition, Qualcomm is expanding its addressed content in phones by building out its high frequency power amplifier/switch line. We are reiterating our Outperform rating on Qualcomm (QCOM, $75.43). We think it is interesting that Qualcomm is choosing its simpler data modem (Gobi) for its first 20nm products. In our view, Mediatek, Intel, Marvell and Broadcom are working to position themselves as alternative suppliers to Qualcomm of LTE capability. Having introduced some LTE products earlier this year, both Mediatek and Marvell announced additional LTE chips. Intel provided additional detail on products discussed previously. As far as we can tell, Broadcom did not make any new LTE product announcements. So far there appear to be relatively few announcements of smartphones using LTE chips from vendors other than Qualcomm.

- Intel reiterated its expectation that devices, presumably handsets, using Merrifield from multiple OEMs to launch beginning in the second quarter. Merrifield works with the 7160 modem. Intel also announced multi-year agreements to work with Lenovo, Asustek, Dell and Foxconn on tablet and smartphone products. While we think that Intel’s execution of its roadmaps for smartphone and tablet products has been unimpressive in recent years, we believe that Intel now has the right product offerings to begin gaining traction in tablet chips this year and in smartphone chips in 2015. We are maintaining our Outperform rating on Intel (INTC, $24.63).

- Broadcom introduced NFC controllers and a 5G WiFi 2x2 MIMO combo chip for smartphones. We did not see any fresh LTE product announcements from Broadcom.

- Nvidia announced a phone which uses its Tegra 4i chip. We continue to think though that with a non-traditional soft modem product, it would be difficult for Nvidia to establish a lasting position in the smartphone market.

- Marvell introduced a 64-bit single chip mobile processor, the A53MP based ARMADA Mobile PXA1928 SoC with 5-mode LTE and GC5000 GPU, which it expects to sample in March 2014. Mediatek announced its 64-bit quad-core 1.5GHz ARM Cortex A53 based MT6752 SoC. The MT6732 is expected to become available by Q3 2014 with devices expected to arrive by the end of the year. Altair announced its single mode FourGee-3802 LTE-Advanced baseband processor, which features Category 6/carrier aggregation capability. Having exited most of its prior phone-related businesses, TI’s announcements centered on production for communications infrastructure.

Please see page 6 for rating definitions, important disclosures and required analyst certifications.

All estimates/forecasts are as of 02/24/14 unless otherwise stated.

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Semiconductors

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Together we’ll go far
Mobile World Congress, the trade show for mobile technology, is occurring this week in Barcelona (from February 24th to 27th). Concurrent with the event, many companies have either announced new products or provided additional details on their product plans for the year. In this note we provide summaries of some announcements made today, or in recent weeks ahead of the show.

- We continue to view Qualcomm as the clear leader in 4G LTE chips, and with its latest product announcements Qualcomm continues to build out its LTE product line.
- In our view, Mediatek, Intel, Marvell and Broadcom are working to position themselves as alternative suppliers to Qualcomm of LTE capability. Having introduced some LTE products earlier this year, both Mediatek and Marvell announced some additional LTE chips. Intel provided additional detail on products discussed previously. As far as we can tell, Broadcom did not make any new LTE product announcements.
  - So far there appear to be relatively few announcements of smartphones using LTE chips from vendors other than Qualcomm. Today (Feb 24) Mediatek and Nvidia each announced a smartphone using their respective LTE chips, and Asus announced one that uses an Intel LTE chip.

**Qualcomm**

We consider Qualcomm to be the clear leader in LTE modem technology and Qualcomm continues to steadily build out its stable of LTE modem and integrated modem/processor offerings. In addition, Qualcomm is expanding its addressed content in phones by building out its high frequency power amplifier/switch line. We are reiterating our Outperform rating on Qualcomm (QCOM, $75.43). We think it is interesting that Qualcomm is choosing its simpler data modem (Gobi) as its first 20nm products.

- **Qualcomm announces 64-bit Octa-Core chipset with integrated 5 mode global LTE.** Qualcomm announced that it has added the Snapdragon 610 and 615 chipsets to the Snapdragon 600 tier for high-end smartphones. Both new chipsets integrate Qualcomm’s LTE modem, which support Category 4 data rates. The Snapdragon 610 and 615 chipsets work with Qualcomm’s RF360 Front End solution. The RF360 solution enables OEMs to ship a single 5-mode global LTE SKU. Both chipsets also integrate 3G technologies (HSPA+, CDMA, and TD-SCDMA). The Snapdragon 615 chipset is a 64-bit octa-core solution with integrated LTE. The Snapdragon 610 chipset is a 64-bit quad core solution that support LTE. Both feature an Adreno 405 GPU. The Snapdragon 610 and 615 processors are expected to begin sampling in Q3 2014 and the first commercial devices are expected in Q4 2014.

- **Qualcomm launches chips with integrated CMOS power amplifier and antenna switch for 3G/4G LTE multiband mobile devices.** Qualcomm announced in cooperation with ZTE, a multimode, multiband chip featuring an integrated CMOS power amplifier (PA) and antenna switch on ZTE’s new smartphone, the Grand S II LTE. The QFE2320 is a multi-mode multi-band Power Amplifier (MMPA PA) with Integrated Antenna Switch and QFE2340 High Band MMPA PA with integrated Transmitter/Receiver mode switch. The QFE2320 and QFE2340 combined cover major cellular modes including LTE TDD/FDD, WCDMA/HSPA+, CDMA 1x, TD-SCDMA, and GSM/EDGE as well as associated RF bands spanning the frequency range from 700 MHz to 2700 MHz. The QFE2320 and QFE2340 are now shipping to OEMs and are expected to appear in more smartphones globally this year.

- **Qualcomm announces first commercial 20 nm LTE Advanced chipset for automotive.** Qualcomm announced it has added the Gobi 9x30 platform to Snapdragon Automotive Solutions. The Gobi 9x30 supports LTE Advanced Category 6 with up to 300 Mbps downlink data rates, enabling vehicle connectivity, Wi-Fi hotspot, infotainment content and telematics services. The Gobi 9x30 is based on the 20 nm technology node with support for carrier aggregation in both LTE FDD and TDD modes, and is currently sampling to customers. This announcement follows Qualcomm’s introduction of its Gobi 20nm 9x35 family last November, with the expectation that the 9x35 would begin sampling to customers in early 2014.

**Intel**

Intel reiterated its expectation that devices, presumably handsets, using Merrifield from multiple OEMs to launch beginning in the second quarter. Intel also announced multi-year agreements to work with Lenovo, Austek, Dell and Foxconn on tablet and smartphone products. While we think that Intel’s execution of its roadmaps for smartphone and tablet products has been unimpressive in recent years, we believe that Intel now has the right product offerings to begin gaining traction in tablet chips this year and in smartphone chips in 2015. We are maintaining our Outperform rating on Intel (INTC, $24.63).
• **Launch of Merrifield.** Intel launched its 64-bit 22nm dual-core 2.13GHz Silvermont-based Atom Z3480 Merrifield chips for smartphones and tablets. The new chips are designed to pair with Intel's XMM 7160 LTE platform. Intel expects Merrifield-based devices will begin shipping from multiple OEMs in the June quarter and claims they will outperform Apple's A7 and Qualcomm's Snapdragon 800 ARM-based processors.
  - Intel announced that its 7160 modem has now been certified on 70 percent of LTE networks globally.

• **Moorefield processor/7260 modem follows Merrifield.** Intel stated that its quad-core Z35xx Moorefield chips are expected to become available in the second half of 2014, will run up to 2.3GHz, and will pair with Intel's XMM 7260 with LTE-Advanced capabilities. Intel formally introduced its XMM 7260 platform with LTE-Advanced features such as carrier aggregation (23 CA combinations in a single chip), category 6 speeds of 300Mbps downlink and 50Mbps uplink, and support for TDD LTE & TD-SCDMA.

• **New agreements with OEMs.** Intel announced multi-year agreements with Lenovo, ASUS, Dell and Foxconn to expand the availability of Atom-based tablets, smartphones, and communication platforms.
  - Asus announced its Fonepad 7 LTE offering at MWC, which features an Intel Atom processor and Intel LTE connectivity.

• **Mobile security.** Intel disclosed that its McAfee Mobile Security offering for Android mobile devices includes anti-virus, app protection, web protection, and call/SMS filter, in addition to anti-theft and contact back-up. Intel stated that it expects that its Intel Device Protection technology (which protects consumers against malware and allows enterprise customers to separate personal and corporate data on Intel-based Android devices) is expected to become available on Dell-based tablets later this year.

• **Infrastructure collaborations.** Intel announced collaborations with Alcatel-Lucent and Cisco aimed at transforming network infrastructure (such as network function virtualization (NFV) and software defined network (SDN) technologies) for the Internet of Things.

• Intel also added a $107 dual core 22nm 2.16GHz mobile Celeron N2830 ULV chip with 1M of cache to its price list.

**Mediatek**

Mediatek continues to build out its range of LTE offerings and also announced an Alcatel phone that uses its LTE modem.

• **Mediatek announced its 64-bit quad-core 1.5GHz ARM Cortex A53 based MT6732 SoC** which features a Mali-T760 GPU and integrated multi-mode 4G LTE modem with Category 4 FDD and TDD LTE (150Mbps downlink, 50Mbps uplink) as well as 3GPP Rel. 8, DC-HSPA+ (42 Mb/s downlink, 11 Mb/s uplink), TD-SCDMA and EDGE for legacy 2G/3G networks. The MT6732 is expected to become available by Q3 2014 with devices expected to arrive by the end of the year.

• **Alcatel's ONETOUCH POP S7 to feature MediaTek SoC.** MediaTek announced that Alcatel’s ONETOUCH POP7 smartphone (expected in Q2 2014) will be powered by a MediaTek 1.3GHz quad-core processor and MT6290 multi-mode 4G LTE modem.

**Marvell**

Marvell continues to build out its range of LTE offerings.

• **Marvell unveils G.now technology.** Marvell unveiled its G.now technology as an extension of Marvell’s HomeGrid family of G.hn chipsets to provide FTTH class Gigabit broadband access to multi-dwelling unit buildings over existing phone wiring. The G.now technology is currently being trialed by telcos in Asia looking to reuse their copper infrastructure.
Marvell introduces 64-bit single chip mobile processor. Marvell introduced its 64-bit quad-core ARMADA Mobile PXA1928 SoC with 5-mode LTE and GC5000 GPU, which it expects to sample in March 2014.

Broadcom

We did not see any fresh LTE product announcements from Broadcom. On its December quarter earnings call Broadcom said that LTE sales will be small in the March quarter and reiterated its comments made at its analyst day in December 2013 that it expects “9 digits of revenue” (i.e. more than $100 million) from LTE this year. The company expected LTE sales will ramp significantly, especially in the second half of the year. However, we think it is too early to be sure if Broadcom’s new LTE products will be sufficiently successful to re-ignite growth in its baseband chip line, and if the company will be able to achieve good growth from its connectivity products in the future. We remain cautious on Broadcom (BRCM, $30.74) with a Market Perform rating. The Mobile & Wireless segment currently accounts for about 45% of total sales, and fell 7% percent sequentially and 7% year-over-year in the December quarter, with a further (seasonal) sequential decline expected in the March 2014 quarter.

Broadcom introduces NFC controllers. Broadcom introduced NFC controllers for mass market smartphones and wearables. Broadcom’s BCM20795 NFC solutions can be incorporated into smartphones and tablets. The Broadcom BCM20795 family of NFC controllers is now sampling with customers.

Broadcom introduces 5G WiFi 2x2 MIMO combo chip for smartphones. Broadcom introduced a 5G WiFi (802.11ac) 2x2 Multiple Input Multiple Output (MIMO) system-on-a-chip (SoC) for smartphones, the BCM4354 SoC. The Broadcom BCM4354 is a dual-band combo chip for smartphones and tablets that supports 5G Wi-Fi 2x2 MIMO, Bluetooth (BT) 4.1/BLE, Rezence wireless charging support and FM radio receiver, and 867 Mbps PHY rate/80MHz channel bandwidth. The BCM4354 is now in production.

Nvidia

Nvidia announced a phone which uses its Tegra 4i chip. We continue to think though that with a non-traditional soft modem product, it could be difficult for Nvidia to establish a lasting position in the smartphone market. We remain cautious on Nvidia (NVDA, $18.91) with a Market Perform rating.

Wiko Mobile launches Europe’s first Tegra 4i smartphone. Nvidia announced that Wiko Mobile has selected Tegra 4i for its Wiko WAX phone, which features a 4.7-inch 720p display, 8MP rear camera and LTE / HSPA+ support. The phone will be available throughout Europe starting in April.

Texas Instruments

Having exited most of its prior phone-related businesses, TI’s announcements centered on production for communications infrastructure.

Airspan Networks selects Texas Instruments’ KeyStone SoCs for next-generation small cell backhaul platforms. TI and Airspan Networks announced a new small cell LTE collaboration, AirSynergy, which features TI’s KeyStoneTM-based wireless infrastructure SoCs. TI’s wireless infrastructure SoCs feature dual ARM Cortex-A15 RISC processors and TI’s TMS320C66x DSP cores as part of TI’s KeyStone SoC architecture.

Texas Instruments and PureWave Networks develop solutions platform for enterprise and pico small cell base stations. TI and PureWave Networks announced their collaboration on a single-board, end-to-end (ENET to RF) solution platform for enterprise and pico small cell base stations. The Hercules solutions platform features TI’s KeyStoneTM-based TCI6630K2L SoC, and TI’s analog front end transceiver, the AFE7500. The Hercules solutions platform is capable of supporting 32 to 128 simultaneous active users for LTE FDD and TDD, LTE Rel’10 with Intra and Inter-band carrier aggregation, WCDMA, tri-mode, as well as 4x4 multiple input multiple output (MIMO). Customers can order the Hercules solutions platform from Purewave Networks starting in 2Q14.
• **Texas Instruments introduces two-chip wireless backhaul software defined radio.** TI introduced the TCI6631K2L, a Software Defined Radio (SDR) programmable platform for wireless backhaul. The combination of TI's TCI6631K2L with an analog front end transceiver is designed to cover the Non-Line-of-Sight (NLOS) spectrum from TV white space (TVWS) (UHF/VHF) to 6GHz and Line-of-Sight (LOS) up to 86GHz. TI's TCI6631K2L will begin sampling in 1Q 2014. Samples of the AFE7500 are available to qualified customers.

• **Texas Instruments and NSN Collaborate on Indoor Small Cell Base Stations.** TI and Nokia Solutions and Networks announced their collaboration on NSN's indoor small cell base stations. The new indoor small cell base stations are expected to support approximately 400 active indoor users, compared to 32 users supported today.

• **Texas Instruments introduces HD DLP Pico chipset.** TI released the 0.3" HD Tilt & Roll Pixel (TRP) DLP Pico chipset, which can generate high-definition (HD) displays for compact electronics, including tablets, smartphones, accessories, wearable displays, augmented reality displays, interactive surface computing, digital signage and control panels.

**Altair**

• **Altair releases single mode chipset.** Altair announced its FourGee-3802 LTE-Advanced baseband processor, which features Category 6 throughputs of up to 300Mbps, carrier aggregation support for up to 20+20MHz channels, SDR architecture supporting 3GPP Release 10 and software upgradable to Release 11, an 800MHz CPU subsystem, on-chip HD VoLTE, advanced LTE feature support – TM9, eMBMS, eICIC and Envelope Tracking (ET), RF band span of 400-3800MHz with 6 parallel MIMO RF ports, INCA interference cancellation technology, FastBoot technology for boot and connection time acceleration, and ultra-low standby and active power consumption. The FourGee-3802 is to be mass production-ready in H2 2014.
**Required Disclosures**

### QUALCOMM Inc. (QCOM) 3-yr. Price Performance

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Source: Wells Fargo Securities, LLC estimates and Reuters data

**Symbol Key**

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Intel Corp. (INTC) 3-yr. Price Performance

Date | Publication Price ($) | Rating Code | Val. Rng. Low | Val. Rng. High | Close Price ($) |
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4/17/2012 | 28.47 | 1 | 33.00 | 39.00 | 28.47 |
10/17/2012 | 22.35 | 1 | 28.00 | 33.00 | 21.79 |
10/16/2013 | 23.39 | 1 | 28.00 | 33.00 | 23.70 |
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Source: Wells Fargo Securities, LLC estimates and Reuters data

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Rating Code Key
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Broadcom Corp. (BRCM) 3-yr. Price Performance

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Nvidia Corporation (NVDA) 3-yr. Price Performance

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- \( \text{\textcolor{green}{\text{\textbullet}}} \) Rating Upgrade
- \( \text{\textcolor{blue}{\textcolor{green}{\text{\textbullet}}} \) Valuation Range Change
- \( \text{\textcolor{red}{\textcolor{green}{\text{\textbullet}}} \) Split Adjustment

Rating Code Key
1. Outperform/Buy
2. Market Perform/Hold
3. Underperform/Sell

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