

Long-term evolution of gallium arsenide production

Mike Cooke offers his impressions from the latest quarter results of RFMD, TriQuint, Skyworks, and Anadigics.

The transitioning of mobile networks to 4th-generation/long-term evolution (4G/LTE) capability has benefited most leading suppliers of gallium arsenide (GaAs) products in the past year. The market has been demanding products both for network infrastructure and mobile handsets.

RF Micro Devices Inc. (RFMD) president & CEO Bob Bruggeworth commented on the company's latest quarterly results: "RFMD continued to benefit from the increasing global demand for mobile data. Consumers want more bandwidth for their data-hungry applications, carriers want greater throughput from their available spectrum, and device manufacturers want greater functionality within the same product footprint."

Projections suggest that 4G/LTE will enable an exponential growth in mobile traffic, from 1.5 exabytes (EB) per month in 2013 to 15.9EB in 2018 (Figure 1). These mobile technologies require the handling of much more complex frequency bands – up to 43 in 2015, compared with 6 in 2010 and only 2 in 2005.

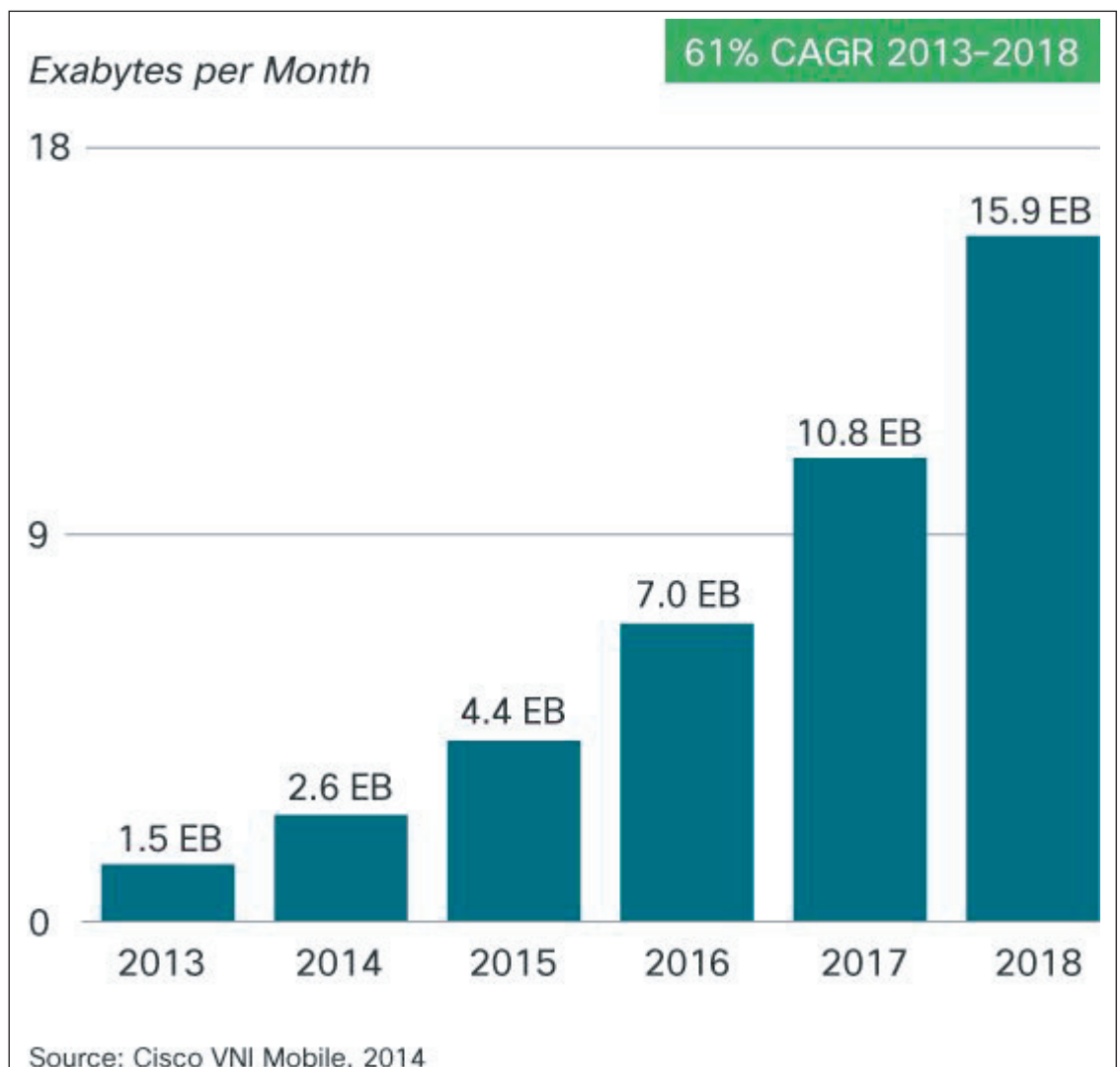


Figure 1. Cisco forecast for mobile data traffic up to 2018.

At the same time, companies more dependent on legacy 2G products, such as Anadigics, have announced restructuring steps designed to achieve profitability.

Even bullish RFMD is restructuring through a consolidation with TriQuint Semiconductor Inc, merging into

the new company Qorvo (pronounced "kor-vo") by the end of 2014. The move was approved by shareholders on 5 September. The name supposedly reflects the ideas of "core technologies and innovation". Qorvo's markets will be mobile, infrastructure and defense.

RFMD and TriQuint both have facilities supporting 150mm GaAs and GaN process technologies. TriQuint has also recently announced temperature-compensating 'NoDrift' and 'LowDrift' RF filters. The company's filters are based on surface acoustic wave (SAW) and bulk acoustic wave (BAW) technologies. RFMD also sells switch-filter modules, but has not made any recent announcements in the sector.

The companies see Qorvo as benefiting from a 15% compound annual growth rate (CAGR) in the total available market for mobile RF devices, based on expanding 4G/LTE traffic.

Although producers of silicon products using advanced technologies such as silicon-on-insulator (SOI) have announced competing devices for the handset front-end radio section, the companies involved — Qualcomm and Peregrine Semiconductor — have yet to make announcements about take-up. Also, Peregrine in recent quarters has announced corporate restructuring designed to improve profitability — Murata's wholly owned subsidiary Murata Electronics North America is due to buy all outstanding shares not already held by it for \$471m.

RFMD (Table 1) splits its revenues into Multi-market and Cellular product groups (CPG and MPG, respectively). MPG covers defense and aerospace, cable TV/broadband, non-cellular smart energy high-efficiency power conversion, Wi-Fi, and wireless infrastructure. The latest MPG-derived quarterly revenue was \$64m, up 16% on \$55m for the previous quarter and also for the corresponding quarter of a year ago. MPG contributes about 17.5% of total revenue. The high revenues are attributed to high-performance Wi-Fi, 4G wireless infrastructure, and gallium nitride (GaN)-related revenue.

The bulk of RFMD's revenue (~82%) came from CPG. The latest CPG revenue figure was \$298m, up 14% on \$261m from the previous quarter. A year ago, CPG brought in \$255.4m. During the latest reported quarter, RFMD reports that the cellular product group started shipping envelope tracking (ET) power management integrated circuits (PMICs) to a leading smartphone maker in support of multiple basebands. ET is a method for tuning the power supply to RF power amplifier chips in handsets for greater efficiency.

New CPG customers have also taken up RFMD's RF Fusion complete RF front-end solution for 4G world-phones and tablets. The 3G/4G market has grown to about 90% of CPG revenue (compared with 80% in the December 2013 quarter), compared with less than 10% for 2G.

Table 1. RFMD quarterly GAAP results.

Fiscal quarter	Q2/2015 to 27-Sept 14	Q2/2014 to 28-Sept 13
Revenue	\$362.7m	\$310.7m
Gross margin	46.2%	33.7%
Operating income	\$75.3m	\$9.5m
Net income	\$63.3m	\$5.9m
Diluted EPS	\$0.21	\$0.02

The TriQuint (Table 2) component of the new company Qorvo reported the split of its end-markets in Q3/2014 at 68% mobile devices, 22% network infrastructure, and 10% defense & aerospace. These compare with the result for the previous quarter at 63% mobile devices, 26% network infrastructure, and 11% defense & aerospace. The subcontract assembly firm Foxconn Technology Group accounted for 30% of total revenue (up from 25% the previous quarter).

Networks infrastructure revenues benefited from 4G/LTE expansion across the world. This was reflected in products for the base-station market comprising 44% of the sector revenues — in money terms \$25.6m, up 53% on \$16.7m a year ago. The sector also includes automotive radar, automotive telematics, broadband wireless access, cable/fiber to the home, GPS, multi-market standard products, optical, point-to-point radio, very small aperture terminal, and WLAN/Bluetooth

Mobile devices revenue benefited from a large product ramp at a major customer. Also, the company saw strong demand in filters from more than 50 unique customers for discrete products. The 4G/LTE build up also benefited the mobile devices sector, with 71% of revenues coming from this market driver compared with 49% a year ago. Correspondingly, the legacy 3G/2G market fell from a 38% share last year to 20% in the latest quarter. The WLAN market share has also fallen, from 19% last year to 13%.

TriQuint has worked on transitioning its production away from low-margin and non-strategic foundry revenue and has grown demand for its higher-value products. In the next quarter (Q4/2014), the company expects 23% growth on the record results of the quarter just

Table 2. TriQuint quarterly GAAP results.

Fiscal quarter	Q3/2014 to 27-Sept 14	Q3/2013 to 28-Sept 13
Revenue	\$272.1m	\$250.8m
Gross margin	45.5%	36.8%
Operating income	\$35.9m	\$18.8m
Net income	\$26.2m	\$13.6m
Diluted EPS	\$0.14	\$0.08

Table 3. Skyworks quarterly GAAP results.

Fiscal quarter	Q4/2014 to 3-Oct 14	Q4/2013 to 27-Sept 13
Revenue	\$718.2m	\$477m
Gross margin (non-GAAP)	45.9%	44.4%
Operating income	\$198.1m	\$105.5m
Net income	\$174.9m	\$84.2m
Diluted EPS	\$0.90	\$0.44

reported. Growth is predicted for defense & aerospace and mobile devices, with network coming in relatively flat. The basestation upgrade for 4G/LTE is predicted to maintain annual revenues for such devices at \$100m through to 2016.

Skyworks (Table 3) reported the split of its total revenue as 36% power amplifiers, 39% integrated mobile systems, and 25% broad markets. Compared with the previous quarter, there was a shift from power amplifiers (down from 1%) to integrated mobile systems (up from 33%). Broad markets showed a 1 percentage point fall from 26%.

Skyworks claims to "access all key process technologies: GaAs HBT, PHEMT, BiCMOS, SiGe, CMOS and RF CMOS, and silicon".

The integrated mobile systems sector includes the company's integrated systems portfolio as well as mobile analog products such as power management, Wi-Fi and GPS. Broad markets product lines — i.e. connected home, networking, media, automotive and medical markets — grew in revenues by more than 30% over the course of fiscal 2014, significantly outpacing the broader semiconductor industry, says the firm.

During fiscal Q4, Skyworks began volume production of custom 4G/LTE modules including proprietary temperature-compensated SAW filter technology. The company also supplied switching and connectivity modules for Xiaomi's Mi3 smartphone; ramped analog control IC production for GoPro's action video camera; and supported Rockwell Collins with custom ASICs for GPS avionics applications.

Skyworks recently agreed to pay \$148.5m to acquire a 66% controlling stake in Panasonic's Filter division

Table 4. Anadigics quarterly GAAP results.

Fiscal quarter	Q3/2014 to 27-Sept 14	Q3/2013 to 28-Sept 13
Revenue	\$18.9m	\$37.0m
Gross margin	15.0%	11.1%
Operating loss	-\$6.7m	-\$11.2m
Net loss	-\$6.7m	-\$11.2m
Diluted loss per share	-\$0.08	-\$0.13

(with provisions to acquire the remaining 34% about 2 years from now). "This venture makes Skyworks the performance leader in TC SAW filters, with shipments approaching 100 million units per quarter, broadening our technology portfolio, enriching our systems capabilities and enhancing our financial returns," commented chief financial officer Donald W. Palette.

Anadigics (Table 4) has been working to improve from long-term losses, but has not yet achieved profitability. The company has 150mm GaAs manufacturing and a proprietary 'InGaP-Plus' process.

In June, the company announced restructuring plans that included expanding in the market for infrastructure products, while reducing fixed costs associated with legacy mobile business. In the latest announced quarter, sales of mobile products were 47% of total revenue, down from 56% in the previous quarter and from 69% a year ago. The move was due to expected declines in sales of legacy products and inventory reductions in the sales channel.

Anadigics' infrastructure RF and optical products are aimed at applications such as cable television, cellular wireless small-cell, Wi-Fi and machine-to-machine. Infrastructure product sales increased as a share of total revenues (53% in the latest quarter; 44% in the previous quarter) but fell 2% quarter-on-quarter in money terms. The reduced sales figure is attributed to inventory reductions in the distribution channel. The infrastructure sales did show an increase of 18% on the sales of a year ago.

The company has four greater-than-10% customers (Huawei, Samsung and distributors Arrow Richardson and Alltech) and four customers in the 5–10% range. "We are pleased with the broader list of key customers resulting from the better balance between Mobile and Infrastructure," comments VP & chief financial officer Terry Gallagher.

Among the users of the company's Wi-Fi connectivity front-end integrated circuits (FEICs) is LG's G3 Beat smart-phone. Anadigics also expanded its DOCSIS 3.1 cable TV infrastructure portfolio and launched gallium nitride (GaN)-based line amplifiers with what were claimed to be the industry's highest output power levels.

The company's restructuring plans also include more efficient manufacturing and 'monetizing' (selling?) excess equipment. Resizing of capacity and staffing (about 140 positions) are naturally also likely to be involved to achieve higher revenues and profits-per-wafer, along with possibly expanding the use of external foundry production. ■

Author:

Mike Cooke is a freelance technology journalist who has worked in the semiconductor and advanced technology sectors since 1997.