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PRESENTATION

Operator

Good afternoon, and welcome to MACOM's Fiscal Fourth Quarter 2018 Financial Results Conference Call. (Operator Instructions) As a reminder, this conference call is being recorded today, Tuesday, November 13, 2018.

I will now turn the call over to Steve Ferranti, Vice President of the Investor Relations at MACOM. Steve, please go ahead.

Stephen Ferranti ***MACOM Technology Solutions Holdings, Inc. - VP of IR***

Thank you. Good afternoon, everyone, and welcome to MACOM's Fiscal Fourth Quarter 2018 Earnings Conference Call. Joining me today are MACOM's President and Chief Executive Officer, John Croteau; and Senior Vice President and Chief Financial Officer, Bob McMullan.

If you have not yet received a copy of the earnings press release, you may obtain a copy on MACOM's website at www.macom.com, under the Investor Relations section.

Before I turn the call over to John, I'd like to remind everyone that management's prepared remarks and answers to your questions contain forward-looking statements, which are subject to certain risks and uncertainties. Because actual results may differ materially from those discussed today, MACOM claims the protection of the safe harbor for forward-looking statements contained in the Private Securities Litigation Reform Act of 1995. For more detailed discussion of risks and uncertainties that could result in those differences, we refer you to MACOM's filings with the SEC, including its current report on Form 8-K filed today, its annual report on Form 10-K filed November 14, 2018, and its quarterly reports on Form 10-Q filed in 2018.

Any forward-looking statements represent management's views only as of today, November 13, 2018, and MACOM assumes no obligation to update these statements in the future.

The company's press release and management statements during this conference call will include discussions of certain adjusted non-GAAP measures and financial information, including all income statement amounts and percentages referred to on today's call, unless otherwise noted. These financial measures and a reconciliation of GAAP to adjusted non-GAAP results are provided in the company's press release and related Form 8-K, which was filed with the SEC today, and can be found at the Investor Relations section of MACOM's website.

For those of you unable to listen to the entire call at this time, a recording will be available via webcast for at least 30 days in the investor relations section of MACOM's website.

And with that, I'll turn over the call to John for his comments on the quarter.

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Thanks, Steve. Welcome, everyone, and thanks for joining us today. I'll be in today's call with an overview of our fourth fiscal quarter 2018 results. I will then turn the call over to Bob McMullan, our CFO, who will review our financial performance in further detail. I'll conclude today's prepared comments by discussing MACOM's key end quarter milestones and growth drivers for the year ahead and close the call with guidance for the fiscal first quarter of 2019.

As I mentioned last quarter, we're squarely fixated on returning to our target financial model of 60% gross margin, 30% operating margin and 60% free cash flow. Fiscal Q4 was a solid step towards reaching that goal.

Jumping right into the numbers, revenue for the fiscal fourth quarter was $151 million, up 4% sequentially, with adjusted gross margin of 55% and adjusted earnings of $0.16 per diluted share. During the fiscal fourth quarter, across all end markets, product revenue was up 10% sequentially, excluding $7 million of services revenue in the prior quarter. Operating margins were up 90 basis points quarter-on-quarter. Earnings per share was up 23% sequentially, and we generated $11 million in free cash flow.

I'd like to take a moment to thank the team for a quarter of solid execution. Q4 wraps up a transitional year for MACOM. We entered the year at the trough of a major cyclical downturn in China, which had a pronounced impact on a number of our served markets. Over the course of fiscal 2018, demand progressively recovered and our revenue and margins rebounded from trough levels. Entering Q1 of fiscal 2019, we believe that this recovery is now complete.

I'll turn it over to Bob for a more in-depth review of our fiscal fourth quarter financials.

Robert J. McMullan ***MACOM Technology Solutions Holdings, Inc. - Senior VP & CFO***

Thank you, John, and good afternoon, everyone. Before I review MACOM's fiscal fourth quarter results and financial position, a couple of summary points.

Our fiscal 2018 non-GAAP operating results: Revenue, $577.4 million; gross margin, 54%; and EPS, $0.52. We believe the investments made in fiscal year 2018 leaves us well positioned to meet customer and market demand over this and future fiscal years.

Next, we receive $7 million in full payment in fiscal Q4 of the non-GAAP revenue in fiscal Q3. Despite customer acceptance for contractual terms and cash payments, we did not meet the new technical requirements for GAAP revenue recognition in fiscal Q4.

Now to fiscal Q4, which taken as a whole from a financial metrics perspective delivered much improved results. Starting with some key financial metrics. Cash flow from operations and free cash flow were both positive. Cash flow from operations totaled $25 million and free cash flow, $11 million after $14 million of capital expenditures in the fiscal fourth quarter. Total cash and cash equivalents increased by $10 million sequentially, now totaling a $193 million. Non-GAAP revenue in fiscal Q4 was $151 million, down 9% year-over-year from $166 million and an increase from $145 million or 4% sequentially.

To dissect these numbers further, for those who may not be familiar with MACOM's recent strategic actions, year-over-year revenue was essentially flat after adjusting for fiscal fourth quarter '17 revenues from our LR4 Optical sub-assembly business, which we exited in the fiscal Q3 2018. Revenue in fiscal Q4 grew $6 million or more than 4% sequentially. Revenue was negatively impacted in fiscal Q4 by the U.S. Department of Commerce denial order issued in August after we provided our fiscal fourth quarter guidance, prohibiting MACOM from fulfilling orders from Chinese aerospace customers for components that were not previously subject to export control before this recent denial order, resulting in revenues below the midpoint of our guidance. This denial remains in effect and impacts quarterly revenue in the range of $2 million to $4 million. We expect that it will have a continued impact as long as it is in effect.

Revenue by end markets. Telecom was $53 million and 35% of total revenue, down 19% year-over-year but up 8% after adjusting for the exited LR4 Optical sub-assembly revenue. Data center was $46 million and 30% of total revenues, down 3% year-over-year, and industrial and defense was $52 million and 35% of total revenue, essentially flat year-over-year. Sequentially, telecom was up 5%, datacom was flat and industrial and defense, up 8%.

Non-GAAP gross profit and gross margin in fiscal Q4 was $83 million and rounding to 55% of revenues, respectively, compared to $97 million and 58% of revenues, respectively, year-over-year and $81 million and 56%, respectively, on a sequential basis.

Loss of revenue to the Chinese aerospace customers affected gross margin mix.

In terms of operating expenses. Total non-GAAP operating expenses were $64 million compared to $59 million year-over-year and $65 million sequentially. Adjusted operating expenses were down approximately $1 million or 1% sequentially. Adjusted R&D and SG&A expenses were $41 million and $23 million, respectively, in fiscal Q4.

Non-GAAP income from operations and operating margin were $19 million and 12% of revenues, down 50% in dollars and down 46% as a percentage basis, respectively, year-over-year, and up 13% in dollars and up 8% on a percentage basis, respectively, sequentially.

Net interest expense was up a $100,000 sequentially. Our normalized non-GAAP income tax rate in fiscal Q4 continued at 8%. Our GAAP effective tax rate was negative 14% for the fiscal fourth quarter. As to cash taxes, we had net payments of approximately a $100,000.

Our fiscal Q4 non-GAAP net income and EPS were $11 million and $0.16 per fully diluted share, respectively, down from $30 million and $0.46 year-over-year and up from fiscal Q3 non-GAAP net income of $9 million and EPS was $0.13.

Net income was down 65% year-over-year but up 23% sequentially. Non-GAAP EPS was down 65% year-over-year, but up 23% sequentially. The share count used to calculate the fiscal fourth quarter non-GAAP EPS was 65.9 million fully diluted shares.

Adjusted EBITDA or earnings before interest, taxes, depreciation and amortization was $26 million, down 45% from $47 million year-over-year, but up 8% from $24 million sequentially. Note, fiscal Q1 2018 was the low point for the non-GAAP revenue and EPS. Year-over-year comparisons should turn the corner to reflect positive growth.

Moving to cash flow. As I mentioned, GAAP cash flow from operations was $25 million compared to our fiscal 2017 Q4 of $12 million and $100,000 in fiscal Q3. Improved operating income and working capital management contributed to this $25 million increase. After deducting capital expenditures, adjusted free cash flow was positive of $11 million compared to $7 million in fiscal Q4 of 2017, and up from negative $13 million sequentially.

Capital expenditures in fiscal Q4 were $14 million or 9% of revenues, essentially flat sequentially. Depreciation expense was $7 million, essentially flat sequentially.

Now to MACOM's balance sheet numbers. At fiscal fourth quarter-end, our cash, cash equivalents and short-term investments were $193 million, up from $183 million sequentially. Accounts receivable were up $97 million, down from $101 million sequentially. Day sales outstanding was improved 59 days, down from 64 days sequentially.

Inventories were $123 million, flat sequentially. Inventory turns were flat at 2.2x. Days inventory were 163 days compared to 178 days sequentially.

Long-term debt was $687 million inclusive of capital leases. Long-term debt is termed with minimum annual principal repayments until maturity in May 2024, and covenant life. We also have a $160 million of availability in an undrawn credit line maturing in May 2021.

Back to you, John.

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Thanks, Bob. Before discussing our secular growth opportunities, we have a couple of noteworthy milestones since our last earnings call that I'd like to cover.

To begin, I'm pleased to announce that we've concluded our settlement of the Infineon litigation regarding ownership rights of GaN on Silicon intellectual property. Under the terms of the agreement, Infineon has assigned ownership to MACOM to patents that were under dispute for all fields of use. We have in turn agreed to license the patents back to Infineon, but they're restricted from selling GaN on Silicon RF-base station products in production quantities until 2021. I'll explain the significance of this later in the call.

Next, we continued the controlled production ramp of our 25-gig lasers, which contributed to our data center sales growth in Q4. This quarter, we'll build upon that progress as we continue to scale manufacturing output to meet a very robust demand profile for 2019. It's worth noting that total manufacturing cycle times for this type of laser from epitaxial wafer orders through final tests take 7 months from start to finish, so it will take multiple quarters to ramp revenue fully as material flows through our production models.

Next, as we've gone throughout the year pruning our portfolio and consistent with our previously announced plans, we took actions towards the closure of the Ithaca fab and divested the Lawrence HiRel facility in fiscal Q4.

In telecom, we're seeing resumed core count growth in Metro/Long-haul drivers and continuing global deployments in PON and fiber backhaul. In Metro/Long-haul in particular, we're seeing improved demand trends across our customer base. Forecasts for coherent port shipments in 2019 are healthy, and we're in the midst of securing design wins and share allocations in next-generation coherent applications with 64-gigabaud drivers, which carry higher ASPs out of the gate. Based on expected competitive developments in this market, we feel confident in maintaining or improving our share position in fiscal 2019.

In Q4, we supported our customers' success at a PAM-4 Plugfest with our single-lambda DSP PHY solution. The Plugfest was a major milestone for industry adoption of PAM-4, ensuring interoperability of different vendors' transceivers with various switch hardware before their release into production.

But before turning it over to questions, I want to provide some additional perspective on our longer-term growth drivers entering fiscal 2019. Through last year's downturn, we focused our R&D to bring specific proprietary and disruptive products to fruition in specific markets with identified secular growth and revenue contribution in fiscal 2019. We chose to focus on these products due to the quality and strength of our design wins and first-tier customer commitments. As a result of these actions, we're now positioned to monetize our strategic investments during the next phase of global infrastructure spending, led by cloud data centers, followed by 5G telecom, and now a surge in civil and defense spending for global and homeland security. It's worth noting that all of these opportunities span well beyond China and many are inherently North America-based.

Starting with 5G telecom. I can finally speak more openly about the magnitude of the opportunity now that we settled our long-running litigation with Infineon. Let me explain why ST is so invested in teaming with us and why Infineon was so invested in litigating with us over rights at RF.

Gallium nitride is effectively a requirement for 5G base stations due to its superior efficiency and power density at the higher 5G frequency bands. Forecast from our top base station customers show a strong surge in RF power semiconductor content, both in dollars and especially in wafer consumption through 2023 for 5G. We're talking 3x greater demand in 5G than the previous 4G LTE cycle. We therefore believe that the billion-dollar RF power market is poised to triple over the next few years on the back of GaN in 5G base stations.

Billion-dollar markets require high-volume semiconductor fabs. With the dramatic increase in wafer demand for 5G, it's imperative that the industry has high-volume sources for GaN production. Like STMicro's battery where we're sourcing GaN in Catania and Sicily. Catania is an order of magnitude greater in scale output than the world's largest compound semi fabs.

Upon entering the 5G cycle with ownership of the fundamental patents, we're now more excited than ever about this opportunity for the following reasons. First, we can see GaN on Silicon in existing high-volume silicon fabs to fulfill the 5G build-out. Even the most optimistic plans for GaN on Silicon Carbide factory expansion announced by silicon carbide leaders can service but a small fraction of that 5G demand.

Second, the higher frequency bands or modest power requirements and targeted price points of 5G massive MIMO antennas line up ideally with the properties of GaN on Silicon substrates.

Third, this is a different class of product than the high-powered transistors that were used in 4G LTE. These are 5G MMICs that don't require the back-end operations infrastructure of incumbent LDMOS suppliers. So we're playing on home turf in 5G. MACOM's GaN on Silicon is fully proven, validated and qualified with our customer base and now enjoys executive level sponsorship for adoption. In some cases, we're already in production with initial programs.

Finally, with the Infineon settlement, we control our own destiny in GaN for base stations and in fact, GaN for all fields of use. The Nitronex patent portfolio lays a multidimensional, multilayer minefield that we firmly believe is impossible to navigate without infringing one or more of our fundamental patents.

After this high-profile litigation with Infineon, we believe customers understand us intimately and plan to work with vendors who have access to the patents, namely, MACOM and our licensees. Between Infineon and our partner ST, we've now enabled a healthy industry supply chain for the 5G build-out, 2 of the top 5 8-inch semiconductor manufacturers globally.

Now stepping back and reflecting on the entire 5G telecom opportunity, GaN is but one of several highly proprietary MACOM technologies that are poised to play industry-enabling roles in 5G. The second is AlGaAs, our switch technology that enables superior reception on the receive side while providing superior power handling on the transmit side. Our Heterolithic Microwave ICs, or HMICs, have 3 dimensional glass structures to maintain superior RF performance and leadership power pulls. That's what differentiates the antennas in terms of coverage and energy efficiency.

Last but not least, our indium phosphide Etched Facet lasers allow the optical backbone to scale cost effectively to 5G network bandwidth and latencies and fiber from home to a minimal. Each of these compound semiconductor technologies, from GaN on Silicon, HMIC and AlGaAs to indium phosphide lasers, are deeply rooted in MACOM's long heritage and core competence in specialized high-performance materials, processes and packaging. 5G is right in our wheelhouse. Major base station customers and network operators understand this better than anyone, for that reason, you'll understand why we're bullish as we enter the global cycle of 5G telecom infrastructure deployments.

Next in the area of global and homeland defense. From our vantage point, we see a coming wave of public and private sector investment in active antennas that utilize our high-performance RF and microwave components and Scalable Planar Arrays or SPAR Tile assemblies. Leveraging many years of work with MIT Lincoln Labs, we believe we have a unique approach that can readily scale to high-volume with a commercial cost structure for a wide array of military and civil applications. A prime example is the U.S. government's SENSR program, which is shaping up to be the largest radar system deployment in U.S. history. It's jointly sponsored by the FAA, DoD and Department of Homeland Security. SENSR is expected to consolidate and replace outdated radar systems to support air traffic control as well as protect against modern-day threats in U.S. aerospace.

Last month, our RFI responses from the major prime contractors featured MACOM's tiles prominently in their SENSR proposals. Over life of the build-out, SENSR represents a multiyear, multibillion-dollar opportunity for MACOM. While field deployment is still a couple of years out, final bids now require a full scale preproduction builds, which we plan to support in engineering as well as manufacturing over fiscal 2019 and 2020.

Even before the SENSR program, these same tiles are being used in low-cost mobile, expeditionary as well as fixed the antennas to detect the potential use of commercial drones by terrorists and other criminal elements. The FBI and the Department of Homeland Security are getting increasingly concerned about drones being weaponized with chemical, biological, radiological agents. Legislation is currently before Congress that will allow drones to be taken down near open air venues and public facilities. But first, they have to see them coming. They need sufficient range for early warning in any and all light conditions, that's radar. And that's where low-cost Scalable Planar Arrays Tiles come in. A prime example is Sky Chaser, which I mentioned last earnings call, but there are numerous other opportunities that we see coming to fruition.

Security radar antennas could become as ubiquitous as security cameras and cellphone towers are today. The world's leading radar customers and U.S. government agencies understand MACOM's unique position with Scalable Planar Arrays better than anyone. For that reason, you can understand why we're bullish about the growth prospects of public and private sector investment in defending against these modern-day threats to peace and prosperity.

Finally in data centers. Cloud service providers are still in the early innings of a long upgrade cycle to 100 gig and greater connectivity within their hyperscale data centers. Customer forecast project 2019 and 2020 to be strong growth years for CWDM4 in particular, with the potential for 100 gig unit demand to more than double in 2019, reaching estimated volumes over 10 million units next year. While CWDM will represent a vast majority of unit volumes over the next few years, 2019 is also expected to see meaningful adoption of single-lambda PAM-4. Growing availability of 12.8 terabit switch silicon, like Broadcom's Tomahawk 3 chipset, has spurred the introduction of new 128-port 100-gig ethernet switching platforms from leading network equipment providers. This, combined with the successful Plugfest in September, has triggered our customers to move forward with 100-gig PAM-4 transceivers. MACOM has entrenched design wins for 100-gig PAM-4 with the key scale players who are planning volume production next year. So we believe we're well positioned to establish preeminent share in this first year of meaningful deployments of PAM-4.

All in all, we expect optical connectivity for cloud data centers to remain a strong growth opportunity for years to come, with an accelerated pace of innovation and strong underlying economics. With each sequential quarter, we expect to build upon our business in analogs, CDRs, drivers and TIAs, layering on top 25-gig lasers, DSP PHYs and L-PICs for CWDM4 as well as PAM-4 as it grows to relevant share over time.

Major network equipment and transceiver OEMs and cloud service providers understand MACOM's potential better than anyone. For that reason, you can understand why we're bullish on our short and long-term growth prospects in cloud data centers.

To conclude, we remain squarely fixated on getting back to our targeted financial operating model of 60% gross margin, 30% operating margin and 60% free cash flow. Our fiscal Q4 results were another step in the right direction.

Over the course of fiscal 2019, we expect the combination of growing revenue contribution from our secular growth drivers and prudent OpEx management to provide leverage for expanding operating margins.

The current trade tensions with China present lingering uncertainties and we'll remain on watch for signs of sluggishness in the analog markets as reported by some of our larger peers. In light of these factors and historical seasonality regarding Q1 based on hard orders and backlog. Moving forward, we're taking it 1 quarter at a time guiding base for our customer backlog, order visibility and our operational ability to scale these new products and technologies.

That brings me to Q1 guidance. For the fiscal first quarter ending December 28, 2018, we expect revenue to be in the range of $150 million to $156 million, adjusted gross margin is expected to be between 55% and 57%, and adjusted earnings per share between $0.18 and $0.22 on an anticipated 66.5 million fully diluted shares outstanding.

Operator, you can now open the call to questions.

QUESTIONS AND ANSWERS

Operator

(Operator Instructions) And our first question will come from the line of Quinn Bolton with Needham & Company.

Quinn Bolton ***Needham & Company, LLC, Research Division - Senior Analyst***

I wanted to start first on the data center opportunity. You've got a pretty strong position in PMDs for the energy market, sounds like you also have some growing traction in the PAM-4. Can you give us some sense how quickly could the PAM-4 business ramp in fiscal '19 for you? Sounds like you've got wins across both some network equipment as well as transceiver customers?

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Good question. So let me address that on PAM-4 first. So like I said, the plugfest that was actually on September 11 of all days was very successful for our customers. They began the process of introducing products, I have to be a little careful about telegraphing their introduction time lines. I would say it starts making material contribution in the latter half of 2019, and it will ramp materially, but it's still going to be frankly dwarfed by CWDM4 volumes in 2019. I missed the second half of the question, you can do the follow-up.

Quinn Bolton ***Needham & Company, LLC, Research Division - Senior Analyst***

Yes. Follow-up is actually going to be more on the 5G GaN on Silicon opportunity. You're talking about that more tripling as we move to 5G and GaN-based PAs and again sort of a similar question, big opportunity for you over a multiyear period, but is it significant for you, do you think, in fiscal '19 in terms of the GaN contribution?

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Yes. I mean, we've learned the hard way about trying to guide 1 quarter at a time. I think if you look -- the simple answer to that is if you look at the kind of public reports on 5G deployments, our revenue opportunity reflects exactly that ramp, which there are deployments beginning this year, but it really hits its stride in '20, '21, '22 time frame, and it continues into '23. So I wouldn't describe it as a present tense. But certainly, it is hot and heavy right now in terms of customers lining up their supply chain. It's -- now that the litigation is over, I can talk more openly. It's actually quite shocking when you see the unit volumes and the wafer consumption requirements. And you're talking about integer multiples are higher than LDMOS in the previous cycle of the 4G LTE cycle. So it's really an operations challenge for our customers. But I think we're perfectly positioned with the settlement.

Operator

And our next question will come from the line of Harsh Kumar with Piper Jaffray.

Harsh V. Kumar ***Piper Jaffray Companies, Research Division - MD & Senior Research Analyst***

A couple of questions. We are hearing about a lot of dislocation in China. Your numbers are fine. I guess, I'm curious what are you seeing in the Chinese market. I know that's a big important market for you. Also at this time, the China inventory -- I'm sorry, the China optical, does usually adjust inventory, you seemed to be avoiding that. Again, could you talk about some of the things that you're seeing there? And then I have a couple of other follow-ups.

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Yes, absolutely. So China, I mean, we're a little bit different. A lot of the other people's report about China are more pure-play than a single business. We have 2, 3, 4 significant businesses. So it's kind of a mixed bag. On the positive side, the Metro/Long-haul stuff looks to be quite healthy. Customers are burning off inventories. The port shipments are very healthy and growing. There is that mix from long-haul to metro, but I think that's back to normal. On the other end of the spectrum, we get this unexpected denial of order in the product going into aerospace customers in China. So that was ugly, and there's other stuff like the PON market that's kind of in the middle. So there's no simple answer for -- at least for us in China.

Harsh V. Kumar ***Piper Jaffray Companies, Research Division - MD & Senior Research Analyst***

Got it, John. And then I was curious, a couple of the other companies that we cover have talked about China data center ramping pretty hard and fast in early part of 2019 with 25-gig lasers. You have those products. You got historically a pretty strong presence in that geography as well and in optical. I'm curious if your opportunity charts sort of that path? And then also on a similar kind of line, several other companies are talking about small revenues in 5G. I'm curious if you can talk about what revenues you have? They are talking about a steep ramp, which I think you're talking about too, if I'm not mistaken.

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Yes. So on China data center, we don't have to wait for lasers. I mean, our analog business is smoking over in China, selling into Chinese data center customers and applications. I would say, in China in general, both for data center and 5G mid-haul, front-haul, there's an extreme interest in moving to these 25-gig lasers and associated 100-gig analog components and quite possibly in the PAM-4 PHYs. So China will be an exciting market too. It's still, I think, going to be challenged to catch up certainly on data center side, the strength between the Facebooks, Googles, Amazons, Microsoft, Apple. It's still very much a North American-centric market. But forecast for 5G optical are of similar magnitude. So it's, to me, a very healthy global market for our analog components, lasers and PHYs. On the 5G revenues, we don't break things out at that level of detail. We are shipping material revenue in 5G FEMs as well as GaN products in those initial systems. But I wouldn't say it's a growth driver yet, but there's very real revenue with the right guys.

Operator

And our next question will come from the line of Blayne Curtis with Barclays.

Blayne Peter Curtis ***Barclays Bank PLC, Research Division - Director & Senior Research Analyst***

Maybe just sort of very high-level, your guidance for December's up a few million dollars. Any color on the segment? I think it sounded like data center would grow again, but maybe some color in the other segments would be helpful.

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

That's a good question, Blayne. I would say the end-market demand across all segments is fine, it's healthy. The one thing that kind of -- the 2 things that really moderate our projections for the next quarter, one is we have that headwind now unanticipated with Chinese aerospace customers, which we quantified at $2 million, maybe as much as $4 million. So it would have been stronger in the absence of that. The other thing is we have seen in previous years and we're planning for in our guidance, year-end inventories to pull in, especially over in China. Our customers, in many cases, are incentivized with bonuses on year-end inventories. So we want to make sure that we can support them in a manner that they want to manage their inventories. So I'd say with those 2 factors aside, the end markets across all 3 are still quite very healthy.

Blayne Peter Curtis ***Barclays Bank PLC, Research Division - Director & Senior Research Analyst***

And then maybe a question for you or Bob. Question, I thought that you were going to see an elevated amount of CapEx for your foundry partner in September. It looks like it was kind of flat. So one, is that happening in December? And maybe if you could just give us some color as to the progress of ramping STMicro?

Robert J. McMullan ***MACOM Technology Solutions Holdings, Inc. - Senior VP & CFO***

Blayne, you're correct. We did identify the capital expenditure for STMicro that's been pushed out for reasons that are not to be translated into anything else that I expected to make a onetime payment. But I've learned that we can pay for that over time, not in installment like payment that we make a deposit first, I mean, made progress payments. As I noted last quarter, it's a large amount but it will be paid as it comes together at year-end, and the final payment will be on delivery. So rather than it being a one-time full amount payment as they anticipated last quarter, it will be paid in multiple payments across the balance of fiscal '19.

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

So to me, you added a good point there. I'll speak to Blayne. So in terms of working with ST to ramp capacity, I'd say that the top ranks of ST along with us are reacting to these very bullish forecasts in terms of capacity commitments. We're working together to get that, not just the initial capacity ramps, but we need a 3 to 5-year capacity ramp. For these as well as adjacent markets, now that we have the rights for the GaN on Silicon patents, we can enable ST on a broader basis. So that relationship and the outlook on collective business has never been brighter. I think if you talk to the ST folks, you'll see -- you'll hear a similar level of enthusiasm.

Operator

And our next question will come from the line of C.J. Muse with Evercore.

Christopher James Muse ***Evercore ISI Institutional Equities, Research Division - Senior MD, Head of Global Semiconductor Research & Senior Equity Research Analyst***

I guess, first question, as you look to fiscal '19, trying to parse through what is near-term growth for you guys versus a bit longer term. So if you think about data center, 5G, defense, other, how would you rank order? What would you expect in terms of revenue growth in absolute terms looking to fiscal '19 versus fiscal '18?

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Again, we're cautious to guide 1 quarter at a time, and the reason is simple. In the short term here, the thing that -- we've got a nice, healthy, strong industrial and defense demand. That said, we just posted 8% sequential growth after a 10% the prior quarter. So it's hard to kind of sustain that on a quarter-by-quarter basis. But that demand seems to be holding up quite well. The telecom stuff, I think it's the 5G kick in as you go through the course of the year, it's kind of backloaded. The data center stuff right now ramping, specifically the lasers and lasers and merchant market sales as well as our solutions business, I'd say clearly the #1 organic growth driver. In terms of our ability to grow this year, I think you get the sense from the bullishness of my comments about long-term growth prospects, we have a lot of juice. I can tell you, we are very well positioned in a lot of areas of the industry, is really heating up. But the most difficult thing and the thing I really caution is you got to be careful with time. We have the right customers. They have the right programs. We have certain field trials that are going very well. But until we see the orders and we can guide, we keep trying to express caution. But everything I spoke about has never been more real.

Christopher James Muse ***Evercore ISI Institutional Equities, Research Division - Senior MD, Head of Global Semiconductor Research & Senior Equity Research Analyst***

That's very helpful. I guess question for Bob, it looks like you implied OpEx is around $65.5 million pro forma, give or take. And I'm just curious as part of that, are you including the full benefit of reduced litigation expense as well as cost savings from factory shutdowns?

Robert J. McMullan ***MACOM Technology Solutions Holdings, Inc. - Senior VP & CFO***

So just help me with the question of timing, say that question. Are you -- is it litigation expense?

Christopher James Muse ***Evercore ISI Institutional Equities, Research Division - Senior MD, Head of Global Semiconductor Research & Senior Equity Research Analyst***

So the OpEx that you guided for -- implied in December, does that include the full benefit of factory shutdowns as well as reduced litigation expenses? Or should we be thinking about further savings look into the March quarter?

Robert J. McMullan ***MACOM Technology Solutions Holdings, Inc. - Senior VP & CFO***

The answer is the expense savings for the shutdowns are included in the sale of the businesses, particularly the Hi-Rel business. The litigation expenses we did not include in GAAP results not as being more or less a onetime event. So they don't impact the level of operating expenses that we report.

Operator

And our next question will come from the line of Harlan Sur with JPMorgan.

Harlan Sur ***JP Morgan Chase & Co, Research Division - Senior Analyst***

If I exclude the $7 million in nonproduct revenues from the data center business in June, your data center business was strong. It grew close to 20% sequentially. Can you guys just help us understand what drove the strong product growth? I know you mentioned the 25-gig laser ramp was probably a big part of that. I'm also wondering if your transceiver solutions, the white box transceiver partnership also contributed to the incremental revenues in the quarter. And any other colors on some of the incremental growth drivers in the DC business?

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Yes, it's a good question. So just to be clear, when we talk about laser sales, that's both in a solutions model as well as merchant market. So we really don't segment that out, we don't want to confuse people with the product service model. I guess -- I mean, well, certainly the laser is a laser, it's a laser. How the demand was generated was a separate issue. But yes, you're right, it's a strong contribution on the laser ramp. But that wasn't just it, we actually had some recovery on some stuff that in the core connectivity business, which was previously known as AppliedMicro. There's some core stuff with a particular large customer that comes kind of lumpy. So we had a favorable tailwind last quarter. I won't get into the operational challenges that customer has, but it can show up as tailwinds or headwinds on a quarter-by-quarter basis. But unequivocally, you're right, it was 18% sequential growth from data centers on product revenue. And lasers was and continues to be a big part of that.

Harlan Sur ***JP Morgan Chase & Co, Research Division - Senior Analyst***

Yes. It's good to see the momentum there. Bob, on the gross margins in the September quarter, it was about a 120 basis points below kind of the midpoint of your guidance range. First, I guess is what drove the slightly lower margin performance? And then on the flip side, what's driving the strong 120 basis improvement in margins going into the December quarter?

Robert J. McMullan ***MACOM Technology Solutions Holdings, Inc. - Senior VP & CFO***

Harlan, there's a couple of things. So we did have the tail end of the Hi-Rel business that wasn't our most attractive gross margin business, that goes away for the small piece it was that will contribute to the increase in gross margins of fiscal Q1. And then again, the aerospace customers that we were denied the ability to ship had very, very attractive margins, and that too brought the margin overall down. Those things are accounted for now in our guidance and, therefore, the range that we have delivered here.

Operator

And our next question will come from the line of Mark Delaney with Goldman Sachs.

Mark Trevor Delaney ***Goldman Sachs Group Inc., Research Division - Equity Analyst***

First question was a follow-up on the data center and the laser opportunity. I know shipping components to white box, the suppliers to go into hyperscalers have been one of the efforts, either through licensing or direct sales. And I was hoping you could be a bit more explicit to what extent you're starting to see volume revenue of those programs, either in the completed quarter or what's assumed in your guidance?

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Yes. Now you're talking about slicing, dicing. I don't have the numbers in front of me actually in laser breakout between different customers with different models, but I can give you the general shape. I would say because the new lasers with the improved yield and reliability are still new, tends to be skewed towards the demand that we generated ourselves with our solutions model earlier. That said, we're very aggressively going out selling what we call merchant market sales of the lasers. Frankly, we have no preference to one model versus the other. Anybody who wants to buy a laser at the right price is welcome to do so. It's just one is more controllable demand creation. The other one is more traditional component demand creation, and I think over time, it's -- there's a lot of very healthy people out there who have their own designs that are more than happy to be buying our lasers. So it's really speculative about how much share we can drive how quickly, and that's going to be an unfolding situation over the course of the next 90 days as we go out and drive that demand creation.

Mark Trevor Delaney ***Goldman Sachs Group Inc., Research Division - Equity Analyst***

Got it. And then a follow-up question on the settlement and license with Infineon that you mentioned. Can you help us better understand what financial terms are maybe associated with that? Is Infineon paying MACOM any sort of royalties? And maybe help us understand, are those potential royalty damage are those things that MACOM will be seeing now? And when Infineon potentially start ramping in 2021, what does that mean for potential royalty payments?

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Yes. So there are confidential terms in the selling and this was perhaps the most sensitive area for Infineon. So I don't have the liberty to discuss the financial terms of the settlement, other than just the fact that we accomplished all the goals for all the litigation not just that we have set out when we originally litigated. So I don't mean to dodge the question, but we are covered by confidentiality terms of the agreement.

Mark Trevor Delaney ***Goldman Sachs Group Inc., Research Division - Equity Analyst***

Got it. Maybe just -- I guess that couldn't count for my second question. I'll give you a different one then. There's potential M&A amongst some of the optical companies. And I was hoping you could help us understand what impact you may see to that, to MACOM, if any, in the near and intermediate term.

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Yes. I don't think there's anything that's been going on that's had a positive or negative impacts. It's just we're fascinated by the II-VI, Finisar combination. I don't see that necessarily as a positive thing or a negative thing for MACOM. It's a very interesting combination. But this industry, the optical industry continues to evolve. And the consolidation was predictable, and further consolidation is probably predictable. A lot of these high bandwidth transceivers, one would look at it as commoditizing, and we view it as just scaling into semiconductor-type model. So more differentiated, more boutique, and I say that in a positive sense, not in a negative sense. The transceiver guys, it makes sense for them to consolidate. But it's all good, they're all good customers for our analog and Metro-Long-haul businesses. So it's just fun to watch, to be honest.

Operator

And our next question will come from the line of Mark Kelleher with D.A. Davidson.

Mark Daniel Kelleher ***D.A. Davidson & Co., Research Division - Senior VP & Senior Research Analyst***

Just wanted to ask back on the data center business. I know we've talked a lot about that here. But can you just give us maybe a high-level view what you see as the competitive position there? I know you're selling to a partner and the partner is selling on, but very price competitive part of the market. And there's also some disruption this quarter with a competitor that couldn't deliver. So I'm just wondering if you're seeing any changes in the market share dynamics or in the pricing dynamics over on the data center side?

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Very fascinating question, yes. So I would describe it this way, as any market evolves from a modest size boutique into a very high-volume market, like we're seeing in these high-speed connectivity products into data centers, the economics products change. The ASP is changed, and we have done a fantastic job at our high-performance analog business, following those market price points, maintaining and growing share, maintain a growing gross margin. We have long-term agreements with very high shared companies that we've crafted. So we've been able to survive and thrive in that consolidating market, and it's a natural progression, it's not a negative thing. You just have to plan for it and plan your cost structure accordingly. I would say and I would describe it this way, in our analog business, we tend to compete with Semtech, inside the data center, inside. Outside the data center, it tends to be we compete with Inphi. And Semtech's a great company, it's good -- the industry needs multiple, healthy sources, and they're a high-quality competitor. On the laser side of things, yes, I mean, there's been some negative developments for some of our, I wouldn't call them competitors as much as customers, not part our SAM but certainly part of the TAM, and yes, there are some share shifts that are available to -- favorable to us. We don't thrive on other people's misfortune, but we have our own struggles that we work through ourselves. And now other people are dealing with similar things, and I think we're showing at the right time with the right products, proven reliability, great cost structure. And the industry continues the same for the laser side, in a supply shortage mode, for the foreseeable future. It's all good. And now as the PAM-4 stuff starts to ramp, PAM-4 to us is just another standard. We're not religiously for or against it. We've got a great position with our 100-gig PHY. We'll have the lasers. We already have the analog content leadership position. So very healthy spot to be in, and I think we have a very credible position selling pretty much something to everybody. Not everything to everybody. It's not about world domination, but it's a very nice area that there's a lot of healthy growth because the economics are good. Cloud data center guys, it's a revenue generator for them, not a negative thing. So we're obviously very bullish, and I think we're holding our own but expanding our position.

Operator

Our next question will come from the line of Tim Savageaux with Northland Capital.

Timothy Paul Savageaux ***Northland Capital Markets, Research Division - MD & Senior Research Analyst***

Let me continue to beat the datacom horse. As you noted, you had, I guess, both the customer and the competitor struggle with some of the very same issues in the laser side that many have encountered. That didn't appear to impact your overall datacom business, but I wonder, I think you called out double-digit growth in analog ICs in datacom last quarter. Should we assume that had some impact in that datacom growth in the quarter and maybe heading forward is more laser and maybe legacy driven than analog IC-driven or no, I guess?

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Well, I mean percentage-wise, sure, that's -- we have a fully mature position, leadership share on the analog side, and we're a relatively new entrant with the lasers. But in spirit, I'd put it this -- there's a lot of moving parts, and both on the analog side as well as the laser side. We're in a relatively supply constrained or supply-defined growth curve. On the laser, it's simply because we're moving material from factory, multi-quarter production time, and you don't start uncontrolled with a step function in materials. So it's a controlled ramp as we described. Even in the analog side, lead times from our suppliers with those class of wafers are extended. So it's not like we can magically pull more material in. It's -- I think, it's one of the reasons why we've been able to hold share so well because our customers understand that whether it's us or our competitors, people aren't just sitting on infinite inventory to be able to react terribly to some share shift. So it's very methodical in terms of the growth. The unit growth is fantastic. Again, it's moderated with the changes in the ASPs. But I think from an operational execution standpoint, we're clicking on all cylinders in that business, and it looks like we're off to the races with the lasers there as well.

Timothy Paul Savageaux ***Northland Capital Markets, Research Division - MD & Senior Research Analyst***

So it sounds pretty balanced. And just a follow-up, in terms of guidance, just wanted to make sure I understand. So given the design order you mentioned, should we expect industrial and defense down $2 million to $4 million sequential and the offset to be growth on the communication side? In that context, it sounds like datacom would be probably driving that based on some of your comments, but...

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Well, actually so on the I&D side -- sorry, I didn't mean to cut you off. So on the I&D side, it grew 8% sequential having taken that hit on the aerospace and Chinese aerospace stuff. So that continues but it's not a sequential impact. I'm sorry, I missed half of your question. Is it about telecom or data centers?

Timothy Paul Savageaux ***Northland Capital Markets, Research Division - MD & Senior Research Analyst***

Well, no. The second half is predicated on the first half, and you just said there's no incremental impact, so that's fair enough. I think you were asked before about kind of the relative drivers of any sequential growth heading in the December quarter, and it sounds like you put datacom at the top of that list.

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Yes. Datacom is yes, it clearly would be the strongest. I'd put it this way. I don't want to dodge the question. The end market health across all 3 is solid, okay? So we don't see an end market demand issue. The thing that we can't predict is -- one of the factors we calculated in is December tends to be a seasonally soft quarter. We have customers who manage their inventories down. We just don't know which customers and which product and which end market. So that kind of top level judgment that we apply and depending where and which products, it could show up weakening one versus others or all 3, just don't know. But there's nothing that we see in our portfolio that have been showing end market we've missed.

Operator

(Operator Instructions) Our next question will come from the line of Richard Shannon with Craig-Hallum.

Richard Cutts Shannon ***Craig-Hallum Capital Group LLC, Research Division - Senior Research Analyst***

I'll just ask one question and jump out of line here on gross margins for you, Bob. You talked about a goal of getting to 60% that you've held for quite some time, and it sounds like we're on a trajectory moving that way. Maybe if you can give us some help on a multi-quarter trajectory of perhaps what kind of revenues do you need to get to that. And are there any puts and takes either above or below incremental gross margins that allow you to get to that level? Any way you can help us kind of track that path over the next few quarters as you continue to grow.

Robert J. McMullan ***MACOM Technology Solutions Holdings, Inc. - Senior VP & CFO***

Richard, in the context and again, beholding to our 1 quarter guide at a time, I'll give some flavors of what drives mix that increases gross margin. And let me start with lasers. We talked about the improvement in yields, as John talked about in his prepared remarks, incrementally increasing yields significantly contributes to gross margin expansion over the course of fiscal '19. Our field trials that are supporting 5G rollouts, both internationally as well as in North America have very high-margin products. They're mature technologies and priced the right way, all of which contributing to continued growth on the top line and continued margin expansion as we march through the year.

Operator

And our next question will come from the line of Vivek Arya with Bank of America.

Vivek Arya ***BofA Merrill Lynch, Research Division - Director***

Question on China. You mentioned that recovery's complete. I'm curious how much is China as a percentage of sales now? Was there any abnormal buying because of the tariff-type issues? And are there any steps that you're taking to make sure the industry kind of avoid some of inventory issues that we saw over the last year?

Robert J. McMullan ***MACOM Technology Solutions Holdings, Inc. - Senior VP & CFO***

Vivek, so China business this year was up by about 130 basis points over the last quarter, which is a 29 and change of total revenues. And again, it goes across multiple markets. It would have been higher if we could have shipped to the aerospace customers. But that, from our peak at almost 40% of revenues, still have some room for recovery just in China alone. Some of that reduction of revenues, as we've talked about in the past, some of the products we're offering are next-generation products at lower ASPs, no effect on gross margin contribution but a different revenue mix in markets, some of the more mature markets we've talked about. No, we don't see abnormal buying ahead of any government-imposed, whether U.S. tariff or China tariff at the moment. As John talked about, we do see seasonality in China, particularly in our first fiscal quarter, and this is what we expect to continue here. So we see no unusual buying pattern as we sit here today nor are the orders coming in a way that would suggest something different.

Vivek Arya ***BofA Merrill Lynch, Research Division - Director***

Very helpful, Bob. For my follow-up, I was hoping you could talk about the competitive landscape in PAM-4. I think one of your competitors has spoken about a lot of design wins. How important is gaining market share in PAM-4 to what you are thinking about in 2019 from a top line growth perspective?

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Good question. So first of all, we're a little bit different than I think people you are referring to. We have a very strong position inside the data center where -- with the stuff that is in very high volume today. So PAM-4 even with a 100% market share, go to the extreme, it contributes meaningfully. I don't want to say it's not meaningful, but it's not a huge swing factor in terms of our data center business. It's not like the lasers, the lasers we're addressing, the 90-something percent of demand, which is CWDM4. So I don't want to understate the importance of PAM-4 on a go-forward basis because more and more are important. I think the other thing, the confusion factor, is -- probably the big one is when we inherited AppliedMicro, they had pursued, I call it, a quality design win program rather than a quantity design win program, meaning the people they have are the people who matter in a big way. And we've sustained those and supported those and those that you're referring to. They also tend to be the people that we can't talk about publicly because they're the people who hold their strategy near and dear to their hearts. They don't appreciate us telegraphing to the world what they're doing. Lastly, I think that there's a lot of swirl and confusion about 400-gig versus 100-gig PAM-4. And the thing I would caution people is we're a semiconductor vendor, not a transceiver guy. And PAM-4 at 400-gig at least is similar to where CWDM4 was about 3 years ago, I would say, is probably the analogy. So in that early part of the ramp, there's meaningful transceiver business. You can -- you have a nice transceiver business. But in terms of return on investment and material revenue, as a semiconductor provider, you have to go where the volume is. And that's the reason why we are fixated right now on 100-gig because if you look at the customer forecast for 100-gig, they start to meaningfully overlay on top of CWDM4, and that's where we're fixated. In terms of our position at 100-gig, to be honest, we don't see anybody right now with a product that meets the power budgets, that has production mass sets that can move into mainstream manufacturing in the next year. So I think we're pretty comfortable with our share position and the guys that we've been servicing, who I think are the market makers. So it will be nice, I think it will contribute to top line growth. But at least for the next year, it's -- the mix is much more towards CWDM4. I think that changes, by the way, as you move forward over the coming 3 years. But when we're talking about next year, which is what we intend to talk about now rather than over the horizon, PAM-4 has a very modest contribution in terms of wins.

Operator

And our next question will come from Tore Svanberg with Stifel.

Tore Egil Svanberg ***Stifel, Nicolaus & Company, Incorporated, Research Division - MD***

John, maybe a follow-up on the last question. So if we look at the market next year, what are you expecting for ports -- 100-gig PAM-4 ports next year? Are you still expecting close to 10 million ports for CWDM4?

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Yes, I got to be careful because if I talk about our ports now, I'm going to be telegraphing what our customers' forecasts are. So I'd like to get back to you, to be honest, so I can pull one of the market reports from one of the analysts so that I'm not inappropriately sharing customer information. But I would say, let me generalize and say PAM-4 will be well less than 10% of the ports relative to CWDM4. Maybe that helps.

Tore Egil Svanberg ***Stifel, Nicolaus & Company, Incorporated, Research Division - MD***

That makes sense. And as my follow-up, could you maybe go through a little bit sort of the -- some of the signposts that we should be following when it comes to the capacity ramps for GaN? So obviously, you have that partnership with ST, CapEx is probably going on right now. When will the capacity be up and running at least as far as meaningful revenue is concerned?

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Well, we have meaningful revenue today, not that meaningful. But the spirit of your question is when does it turn into an inflection point to really be the secular growth driver that we talk about, I would say as you go each quarter through the second latter part of 2019, if you look at general market reports of 5G deployments, the way you get into '19, but where it really gets describing that the customers are very concerned about supply is when you get into the following year, 2020. And '21, '22 are -- actually, I would say even '20, '21 and '22 are very intense years in terms of the build-out of the profile that our customers have given us. So I don't want to create the impression that this is a step function in the present tense in the first half of next year. But I can tell you the design of the programs are very, very real.

Operator

That concludes our question-and-answer session for today. So now it's my pleasure to hand the conference back over to John Croteau, Chief Executive Officer, for closing comments or remarks.

John Croteau ***MACOM Technology Solutions Holdings, Inc. - President, CEO & Director***

Great. Thanks. So before closing on today's call, I will mention that we'll be attending a number of investor events between now and year-end, including the Raymond James technology conference on December 3 in New York, Barclays' Global TMNT conference on December 5 in San Francisco, Cowen's networking and cybersecurity summit on December 11 in New York and then the D.A. Davidson Laser/Optical Forum in December 13 in Boston. If you'd like to arrange a meeting at one of these upcoming events, please e-mail us at ir@macom.com (sic) [ir@macomtech.com].

That concludes today's remarks. Operator, you may now disconnect the call.

Operator

Ladies and gentlemen, thank you for your participation in today's conference. This does conclude the program and you may all disconnect. Everybody, have a good day.