



www.qorvo.com

April 5, 2021

Mr. Matthew S. Borman
Deputy Assistant Secretary, Export Administration
Bureau of Industry and Security
U.S. Department of Commerce
1401 Constitution Avenue, NW
Washington, D.C. 20230

**RE: Risks in the Semiconductor Manufacturing and Advanced Packaging Supply Chain –
Response to Request for Comments**

Dear Mr. Borman:

Qorvo, Inc. (“Qorvo”) appreciates the opportunity to provide input regarding the supply chain for semiconductor manufacturing and advanced manufacturing, and we support the U.S. Government’s efforts to strengthen these supply chains. Further, we are grateful for the opportunity that Qorvo’s CEO, Robert Bruggeworth, recently had to meet with Secretary Raimondo in his capacity as the Chairman of the Semiconductor Industry Association.

Qorvo is a leading U.S.-owned provider of radio frequency (“RF”) semiconductors for wireless broadband infrastructure, 5G and mobile communications, and defense electronic platforms. Qorvo depends on its U.S. research, development, and manufacturing operations for its success in the global market for RF semiconductors. As a result, Qorvo is committed to helping maintain a secure and resilient U.S. semiconductor industry. Cooperation and coordination between the government and private industry are critical to achieving this goal.

To that end, we are providing these comments on certain elements of the Request for Information from the Department of Commerce (“Commerce”) regarding the President’s Executive Order *America’s Supply Chains* (“EO 14017” or the “EO”). Specifically, we have included relevant information regarding the manufacturing process for semiconductors, and in particular RF devices. We also identify risks to the semiconductor supply chain and policy actions the U.S. government can take to ensure a reliable supply of RF semiconductors for critical infrastructure and defense applications. Indeed, Qorvo believes that much can be done to address RF supply chain vulnerabilities if both industry and the Government move quickly to address the areas of concern addressed in these comments.

As directed by the Request For Information, we have categorized our responses according to the text of relevant elements of the EO.

Comments on Certain Elements Identified in EO 14017

- (i) *Critical and Essential Goods and Materials Underlying the Semiconductor Manufacturing and Advanced Packaging Supply Chain*
- (ii) *Manufacturing and Other Capabilities Necessary to Produce Semiconductors, Including Electronic Design Automation Software and Advanced Integrated Circuit Packaging Techniques and Capabilities*

The U.S. RF semiconductor industry should be a central part of the effort to re-establish U.S. semiconductor manufacturing leadership. RF semiconductors are mission-critical for national security priorities; specifically, wireless broadband internet infrastructure and microelectronics for defense applications. This important technology is used for electronic infrastructure and devices in both the commercial and defense sectors.

RF semiconductors underpin many major defense systems. In the commercial sector, they are a key component for wireless internet and cellular communications used throughout the economy. Without a reliable supply of RF devices, the United States' defense capabilities and national economic strength would be severely degraded.

Qorvo's U.S.-based capabilities for defense products include advanced manufacturing, packaging and testing for both high- and low-power applications ranging from DC to 100 GHz. Qorvo holds a Defense Microelectronics Activity Category 1A trusted source certification for package assembly, test and wafer foundry services at its Richardson, Texas, location. Qorvo is also a participant in the State-of-the-Art Heterogeneous Integrated Packaging Program ("SHIP") through the recent award of a Navy contract to develop and product advanced semiconductor packages.

Qorvo further provides defense customers with increased value by applying high-yield manufacturing and scale expertise gained from serving the commercial market, where it supplies more than four billion heterogeneous modules annually. Indeed, the economic viability of our U.S. facilities and our defense programs are dependent on company-wide profitability, which includes high-volume production of commercial-grade products in global supply chains spanning several countries.

* * *

- (iv) *Risks or Contingencies That May Disrupt the Semiconductor Supply Chain (Including Defense, Intelligence, Cyber, Homeland Security, Health, Climate, Environmental, Natural, Market, Economic, Geopolitical, Human Rights, or Forced Labors Risks)*

There are numerous areas of concern for the RF semiconductor supply chain. The supply chain for semiconductors, and RF semiconductors in particular, is characterized by domestic shortages of materials and manufacturing capacity as explained below.

1. Wafer Processing

- Domestic Starting Materials and Post-fabrication Wafer Processing Capacity. At present, there is a severe shortage of domestic wafer back-end wafer processing facilities, which is especially needed for 300mm wafers, GaAs starting materials and Gallium nitride (“GaN”) epitaxial materials for RF devices. For wafers of this size, the United States should implement policies to create back-end processing capacity to compete effectively in the global semiconductor market.

2. Packaging

- Wafer substrates. Wafer substrates for Silicon and GaAs substrates are only available in high volumes from non-U.S. sources. For example, certain laminates for cell phones are only available from non-US suppliers. As with post-fabrication wafer processing, the U.S. should implement policies to create coreless laminate substrate capacity in order to meet national defense needs as well as demand for consumer applications.
- Packaging Compounds. At present, there is a shortage of domestic mold compound and other materials to encapsulate modules. Qorvo is participating in the U.S. government’s SHIP effort, which is seeking to increase the amount of domestic content in advanced packaging, but the shortage of domestic packaging compounds continues to be a major gap in the domestic supply chain.
- Specialty Metal Soldering. As with packaging compounds, there is a shortage of domestic solder material sources, another “hole” in U.S. semiconductor assembly operations.

3. Economic Incentives

- Advanced RF semiconductor technology development outside the United States is heavily subsidized through tax incentives. Many foreign governments provide extensive tax subsidies and other resources to what they view as strategic economic growth engines such as semiconductor manufacturing. The nature and amount of tax and other financial subsidies are increasing in many parts of the world. As foreign nations continue to forego taxes or dedicate funding for semiconductor research and development and production, U.S. producers must compete on a much more challenging playing field.

4. National Security Interests

- National security threats to domestic supply chain and manufacturing. There are numerous threats to the domestic semiconductor supply chain, from product design to manufacturing. These threats include potential counterfeiting, hacking

and resulting intellectual property theft, design corruption, and other types of cyberattacks. The U.S. Government should work closely with U.S. companies to develop cost-effective countermeasures to these national security threats.

If the United States does not take steps to create additional incentives for research, development, and production in the United States, other countries will continue to obtain market share from U.S. companies and take the lead in the development of new technologies. Likewise, if the United States does not act to create more demand for semiconductors made using U.S. innovation, materials, intellectual property, or workers, the market will direct sales to lower-cost alternatives from other countries. This, of course, could include sourcing from regions or countries that compete with or challenge the United States for leadership. Thus, failure to provide an economic environment to support U.S. research and development and production of semiconductors— including defense, dual-use, and purely commercial products – fundamentally threatens U.S. national security.

* * *

(vii) *Policy Recommendations or Suggested Executive, Legislative, Regulatory Changes, or Actions to Ensure a Resilient Supply Chain for Semiconductors*

At this moment of broad political consensus on the need to support U.S. manufacturing for critical goods such as semiconductors, we urge the Administration to take strong action to shore up the domestic supply chain. It is also important for the Administration to work with Congress to authorize and appropriate funds to incentivize U.S. production and create demand for U.S.-origin semiconductors. At present, there are several proposed bills circulating in Congress that contain provisions relating to funding and research for semiconductors, including the CHIPS Act, the Endless Frontier Act, the America LEADS Act, and others. These could serve as vehicles for a new national commitment to strengthening the domestic supply chain for semiconductors.

The Semiconductor Industry Association is providing comments that address many of Qorvo’s preferred policy outcomes for the industry generally. However, Qorvo would like to highlight in particular existing and potential programs that can increase supply chain resilience in the RF sector of the semiconductor industry. Qorvo’s policy recommendations with respect to the RF semiconductor supply chain are set out below:

- Build New Domestic Starting Materials and Post-Fabrication Wafer Processing Capacity. Qorvo recommends that the U.S. Government invest in new capacity for post-fabrication wafer processing for 300 mm silicon back-end services (such as water thinning), GaAs starting materials and GaN epitaxial material. The U.S. Government could directly fund capital equipment for domestic suppliers or provide the 300 mm back-end service or GaN epi material, as well as more significant financial subsidies or preferential financing to existing small domestic manufacturers and service providers seeking to expand their capacity.

- Fund New Programs for Research and Maturation of Advanced RF Technologies and the Supply Chain for Those Technologies. Government research funding and investment should focus on the development and maturation of high-volume production capacity of RF semiconductors capable of high frequency, low noise and high-power operation, such GaAs and GaN devices. These RF semiconductor performance characteristics are critical for maintaining technical superiority for both defense and commercial markets.
- Expand existing U.S. Government-funded domestic packaging programs and packaging material suppliers. Qorvo believes that new domestic packaging programs such as SHIP should receive additional funding to develop next-generation packaging technologies and advanced RF substrates in order to maintain U.S. competitiveness in this area. Specifically, Qorvo supports full funding of the CHIPS Act to help achieve this goal. Further, U.S. government investment in key material and component suppliers (including domestic producers for mold and solder materials referenced above) is needed to ensure these packaging programs succeed.
- New research on advanced filters. The U.S. government should fund additional research programs to develop advanced filters which are essential components of both defense systems and commercial communications equipment. Qorvo also supports additional government investment in domestic manufacturing of advanced filters that have application in defense microelectronics, next-generation communication equipment, and emerging biomedical technologies. This could be accomplished through pending legislation, or through creative use of existing mechanisms such as the Defense Production Act or government contract authorities.
- Increase cybersecurity protections for domestic semiconductor manufacturers and their supply chain. Commercially available protection and detection systems may struggle to keep pace with the ever-increasing threat of intellectual property theft through cyberattacks. Accordingly, Qorvo supports increased government funding to study current and emerging threats and countermeasures for semiconductor manufacturers and their suppliers. The U.S. Defense Department (“DoD”) should invest in research and development for advanced cyber protection systems for the semiconductor supply chain. There should be a specific cybersecurity focus on the protection of RF semiconductor design and manufacturing, as well as assistance to key RF semiconductor suppliers with regard to protecting their equipment, supplies, and services.
- DoD funding for compliance with quantifiable assurance (QA) standards currently in development. DoD is developing QA standards that will be binding on RF semiconductor manufacturers and suppliers. To ensure compliance, the

government should provide financial resources to help the RF semiconductor industry understand the new QA standards and develop QA compliance tools.

- Support for regional technology hubs such as those envisioned in the Endless Frontier Act. The U.S. government should designate and support its “regional technology hubs,” including appropriating funds for such hubs in an effort to accelerate innovation and maintain U.S. manufacturing of RF semiconductors.
- Use of “Buy America” authorities to support U.S. research and production. Buy America programs are under review by the Administration. The laws and regulations that impose Buy America requirements use a variety of thresholds or qualifications to determine which products constitute domestic goods and thus receive preferential treatment for government contracting purposes. We recommend that any new policies regarding the implementation of Buy America laws and regulations provide enhanced “credit” with respect to preference thresholds or other qualifications for products containing U.S.-origin semiconductors. Further, given the fundamental importance of maintaining research and development efforts in the United States, we recommend that the U.S. government include the value of U.S. research and development in determining whether semiconductors or products containing semiconductors meet Buy America preference thresholds.
- Equalize tax treatment of semiconductor manufacturing and key suppliers. Increasing federal, state and local tax incentives for manufacturers and suppliers is critical to creating a more level playing field with foreign competitors. One of the principal reasons the United States has lost some of its leadership in the semiconductor industry is a failure to take action in the face of other countries’ major tax incentives and financial investments in their semiconductor manufacturing and supply chain. Unless the U.S. government moves quickly to level the playing field in terms of tax incentives and financial assistance, then foreign competitors will continue to overtake U.S. leadership in semiconductor technology.

* * * * *

Sincerely,

Qorvo, Inc.