May 13, 2013

Bureau of Industry and Security
U.S. Department of Commerce
Attn.: Advisory Opinion
14th Street and Pennsylvania Ave, N.W.
Room 2099B
Washington D.C. 20230

Re: **Request for Advisory Opinion [(15 CFR 748.3(c)]**

Dear Sir/Madam:

This letter constitutes a request for an advisory opinion pursuant to Section 748.3(c) of the Export Administration Regulations (15 CFR Part 730 *et seq*.) concerning the application of the new definition of "specially designed"[1] to certain semiconductors. Specifically, we are requesting confirmation that semiconductors consisting of multipurpose die (as further defined below) and encased in a standard package (as further defined below) are not specially designed.

Executive Summary

We understand that the application of the definition of "specially designed" may be readily apparent for some products, but we hereby request guidance with respect to how the semiconductor industry is supposed to apply it with respect to certain kinds of semiconductors. On the one hand, an Application Specific Integrated Circuit (ASIC) would most likely be considered to be specially designed under the new definition. However, application of the new definition of specially designed to other types of semiconductors is not as transparent.

This request for an advisory opinion is limited to semiconductors characterized by the presence of two objective facts applicable only to semiconductors: multipurpose die[2] encased in a standard package. We are seeking confirmation that semiconductors consisting of multipurpose die encased in a standard package, even if they may be

[1] 78 Fed.Reg. 22660 (April 16, 2013) "Revisions to the Export Administration Regulations: Initial Implementation of Export Control Reform; Amendment to the International Traffic in Arms Regulations: Initial Implementation of Export Control Reform; Final Rules"

[2] See Wikipedia definition: "An **integrated circuit** or **monolithic integrated circuit** (also referred to as an **IC**, a **chip**, or a **microchip**) is a set of electronic circuits on one small plate ("chip") of semiconductor material, normally silicon. A **die** in the context of integrated circuits is a small block of semiconducting material, on which a given functional circuit is fabricated. Typically, integrated circuits are produced in large batches on a single wafer of electronic-grade silicon (EGS) or other semiconductor (such as GaAs) through processes such as photolithography. The wafer is cut ("diced") into many pieces, each containing one copy of the circuit. Each of these pieces is called a die. There are three commonly used plural forms: *dice*, *dies*, and *die*.

"caught" by the first part of the definition of "specially designed" in paragraph (a), are nevertheless excluded from the definition of "specially designed" through an interpretation of the paragraph (b) release provisions.

Essential Steps of Semiconductor Manufacturing

Semiconductors are the foundation of modern electronics, including computers, telephones, televisions, and digital cameras. But they are also increasingly used in medical diagnostic equipment, automotive and industrial applications. Semiconductors are a critical enabler of a vast array of applications often performing the same or similar function in larger and varied systems. For example mobile phones and MRIs both require conversion of analog signals to digital outputs and many applications require some form of power management. While the basic function of the device may remain constant across applications the operating environment of the device may vary across end equipments. (See Exhibit D to the attached Whitepaper).

The semiconductor manufacturing process begins with a silicon wafer. The circuit elements (transistors, resistors, and capacitors) are built in layers on the silicon wafer to produce thousands of electronic devices at tiny sizes, which together function as integrated circuit, or semiconductor. After wafer fabrication is complete, a diamond saw cuts the wafer into individual die or chips which are sent on to be packaged. Once packaged, semiconductors are tested again to make sure they function properly. We have included more detailed information on semiconductor die fabrication and packaging in the Whitepaper on Semiconductor Die Fabrication and Packaging, included in Attachment A.

Multipurpose Die

For purposes of this Advisory Opinion Request, we are using the term "multipurpose die" to mean die that can be used in multiple end applications, whether such applications are commercial, industrial, or military[3].

[3] In other words, the die is "dual use" or in "normal commercial use".
"Dual Use" is defined in Section 772.1 of the EAR as:

> *Items that have both commercial and military or proliferation applications. While this term is used informally to describe items that are subject to the EAR, purely commercial items are also subject to the EAR (see §734.2(a) of the EAR).*

See also 78 Fed.Reg. 22660 (April 16, 2013) at page 22688 which notes:

> *Central to the existing ITAR and EAR export control structures is the concept that an item is not ''specially designed'' for a controlled item if it was deliberately made for use in both controlled and uncontrolled applications, i.e., a ''dual-use'' item.*

For "normal commercial use" see 78 Fed. Reg. 22660 (April 16, 2013) at page 22688 regarding the (b)(3) exclusion to "specially designed":

> *This paragraph basically adopts the concept in the note to USML Category VIII (the ''17(c) note'') and the carve outs in USML Categories XI(c) and XII(e) that preclude an electronic, fire control, or other part, component, accessory or attachment that was once specifically designed or modified for a defense article from being ITAR controlled if it has entered into ''normal commercial use.'' BIS does not want its catch-all*

In this regard, a specific example of a multipurpose die would be die for an Analog-to-Digital Converter (ADC)[4]. The wafer and/or bare die for an ADC would be controlled under ECCNs 3A001.a.5, 3A991.c, or EAR99 depending on whether the die met or exceeded the parameters of these respective ECCNs[5]. The function of the ADC bare die is converting analog signals to digital signals, and it can be used in multiple end applications, such as cell phones and a number of other consumer goods, portable instrumentation, automotive, battery monitoring, and factory automation and process control end applications.

We are excluding from this request "application specific" die[6], e.g., for an ASIC, as well as die where the design of a multipurpose die has been *modified* specifically for a particular end application. Information on ASICs and modified die are included in the attached whitepaper.

By way of an example, a company could modify the design of a multipurpose die at the request of a specific customer for a space application so that the resulting semiconductor is more robust against Single Event Latchup ("SEL"). The die could be modified by increasing the distance between the n-resistor and n-well in order to decrease the lateral NPN bipolar gain, and the width of the p-well along with the PMOS source stripe can be increased in order to decrease resistance between the emitter and the base of the parasitic PNP. After this specific type of design modification is made for an end-user, a semiconductor would be better suited for use in satellites being manufactured by the end-user, for example.

The chart below summarizes the four possible combinations of die (multipurpose/"application specific") and packaging (standard/special):

Package	Die	
	Multipurpose	**"Application Specific"**
Standard	**Not Specially Designed**	**Specially Designed[7]**

provisions pertaining to parts, components, accessories, and attachments to be more restrictive than the comparable provisions in the USML.

[4] An ADC converts analog signals into digital signals. While ADCs are used extensively in cell phones, they were not developed and designed to be used in a single end application, but for multiple end applications where there is a need to convert analog signals into digital signals. In the context of use in a cell phone, the digital/analog conversion circuitry enables the voice to be converted either from analog or to digital providing a digital format for the send path. The ADC also converts from digital to analog for the receive path.

[5] See Note 1 to ECCN 3A001.a:

Note 1*: *The control status of wafers (finished or unfinished), in which the function has been determined, is to be evaluated against the parameters of 3A001.a.

[6] By application specific die we mean either a new die that has been designed and developed or an existing die that has been modified for a specific purpose or end application.

[7] An example would be a quad CMOS differential line driver designed for applications requiring ultra-low power dissipation and high data rates. The commercial or multipurpose die used for this part was modified to be more robust against Single Event Latchup for a space application. However, the packaging used was the same as for the commercial part.

Special[8]	**Specially Designed**[9]	**Specially Designed**[10]

We recognize that for items that have undergone minor or insignificant modifications in form or fit or performance, BIS has established the CCATS process described in §748.3(e) of the EAR. Industry believes it will have to address any such minor or insignificant modifications, which are not addressed in this advisory opinion request, through that process.

Standard Packaging

For purposes of this Advisory Opinion Request we are using the term "standard packaging" to mean unmodified, commercial-off-the-shelf packaging. This type of packaging is widely available, sold in large volume and can be used in multiple applications, including commercial, industrial, and military end applications. These standard packages are often referred to as "open tool" packages. Additional information about packaging is included in the Attachment A Whitepaper.

The history surrounding the development of semiconductor packages supports the conclusion that none of the standard packages in use today were developed specifically for a military application, although the military was one of the primary purchasers of semiconductors in the 1960s. Furthermore, and regardless of the original development history of any specific type of standard package, such as a specific type of ceramic package, industry members believe that any such standard ceramic package offered by third party vendors, such as Kyocera and NTK, and distributors, such as Spectrum Semiconductor Materials Inc., which describes itself "as the leading distributor of off-the-shelf ceramic packages", have already "crossed over" into broad commercial application. The same statement is true for other standard packages, including metal cans and plastic packages.

Specially Designed

According to preamble to the Initial Implementation of Export Control Reform Final, the rule will enhance national security by "(i) improving interoperability … (ii) *strengthening the US industrial base by, among other things, reducing incentives for foreign manufacturers to design out and avoid U.S.-origin content and services, and (iii) allowing export control officials to focus government resources on transactions that pose the*

[8] Other terms for such packaging could include: non-standard or custom.
[9] An example is a standard die used in a custom package for a down hole drilling application. There were weight and size limitations imposed by the customer for this specific end application and the "special" package was created to meet those limitations as evidenced by the package's unique aspect ratio and a tighter lead pitch.
[10] An example is the C7 DSP which was designed for a specific customer for use in a classified military program. The C7 DSP die was developed for the customer's end application and the packaging used was also modified for the C7 DSP die.

greatest concern."[11] These overarching objectives should inform the interpretation of the new definition of specially designed with respect to certain semiconductors. An interpretation which excludes semiconductors consisting of multipurpose die encased in a standard package is consistent with these objectives.

The definition of "specially designed" is found in Section 772.1 of the EAR. It includes a "catch" provision in subparagraph (a) and "release" provisions in subparagraph (b).

BIS describes the catch as broad and robust[12]. It goes on to say however that, "[I]f paragraph (a) overreaches in certain cases, that can be tolerated to some degree but as much as possible paragraph (b) of the definition tries to *release* those 'parts,' 'components,' 'accessories,' 'attachments,' and 'software' that do not warrant being treated as 'specially designed'."[13] We submit that semiconductors consisting of multipurpose die encased in a standard package may be caught in the overreach, but they are released by the provisions of subparagraph (b), and therefore are not "specially designed", for the reasons described below. Importantly, the industry wishes to emphasize that this interpretation would be expressly limited to semiconductors, and would be based solely upon the presence or existence of two objective facts. Semiconductors consisting of multipurpose die encased in a standard package, collectively, are produced in the hundreds of millions, and the standard packaging used to encase these die are available all over the world. Combining these items together can be done, and is being done, in China, Philippines, Thailand and elsewhere. Furthermore, in many cases the packaging activities are being undertaken not just by the companies that produce the wafers and the bare die, but by a number of third party vendors, such as Amkor, Hana, and STATS-ChipPac. These "IC packaging foundries" offer packaging services to both semiconductor companies and to certain of their customers who purchase bare die. Certain of these "IC packaging foundries", such as Amkor, also offer to their customers various types of packages that may be used to encase bare die.

We submit that semiconductors consisting of multipurpose die encased in a standard package should be excluded under the production exclusion in (b)(3).

Application of Subparagraph (b) (3) "Production Exclusion" to Semiconductors Consisting of Multipurpose Die Encased in a Standard Package

The "release" provision of (b) (3) includes the following criteria: function, performance capabilities, and form and fit[14]. We believe that semiconductors

[11] 78 Fed.Reg. 22660 at 22661

[12] Id. at 22683:

> The *catch-and-release* construct must be robust enough to capture all items that may warrant being controlled as ''specially designed.'' In order to protect U.S. national security interests, the paragraph (a) *catch* must be broad in scope.

[13] Id.

[14] Section 772.1, Specially Designed (b)(3):

> (b) A "part," "component," "accessory," "attachment," or "software" that would be *controlled* by paragraph (a) is not "specially designed" if it:

manufactured using multipurpose die encased in a standard package are not "specially designed", for the following reasons, among others:

Function[15]

The function of the semiconductor device is determined by the die. A multipurpose die, such as a memory chip, for example, has the same function, i.e., memory, whether it is used in commercial, industrial, military, or other applications. We note that the function of the die is not changed by encasing it in a standard package, irrespective of the package material used or the customer's end application for the part. An IC is put in a package to protect the die and fragile connections from damage that may be caused by the external environment and to hold the contact pins or leads. The function of a standard package is the same irrespective of the type of die encased therein or the customer's end application.

Performance Capabilities[16]

A package can impact the performance capabilities of a semiconductor. However, the performance capability of a standard ceramic package is the same no matter what die is encased in that standard package. The same is true for plastic and metal packaging; the performance of the package is the same, no matter what kind of die is encased in that package.

Packaging can also allow a device to operate at high temperatures. We note that the ability to operate at higher temperatures is not specific to a military or space application, nor does operation at a higher temperature mean that the semiconductor is always subject to a higher level of control[17].

Same or 'equivalent'[18] *form*[19] *and fit*[20] *…"*

Importantly, the form and fit of the multipurpose die has not been modified regardless of the type of package in which the die may be encased. In other words, the

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(3) Has the same function, performance capabilities, and the same or 'equivalent' form and fit, as a commodity or software used in or with an item that:

(i) Is or was in "production" (*i.e.*, not in "development"); *and*

(ii) Is either not 'enumerated' on the CCL or USML, or is described in an ECCN controlled only for Anti-Terrorism (AT) reasons;

[15] **Note 3 to paragraph (b)(3):** The 'function' of the item is the action or actions it is designed to perform.

[16] **Note 3 to paragraph (b)(3):** 'Performance capability' is the measure of a commodity's effectiveness to perform a designated function in a given environment (e.g., measured in terms of speed, durability, reliability, pressure, accuracy, efficiency).

[17] ECCN 3A001.a.2 includes this note:

***Note*:** *3A001.a.2 does not apply to integrated circuits for civil automobile or railway train applications*

[18] **Note 2 to paragraph (b)(3**): With respect to a commodity, 'equivalent' means that its form has been modified solely for 'fit' purposes.

See also 78 Fed.Reg. 22660 at page 22689:

The inclusion of 'equivalent' form and fit addresses the public comments in this area and provides relief for insignificant or minor changes in form or fit, while still keeping this exclusion within the carefully drawn bounds of what was originally intended in the June 19 (specially designed) rule.

[19] **Note 3 to paragraph (b)(3):** The 'form' of a commodity is defined by its configuration (including the geometrically measured configuration), material, and material properties that uniquely characterize it.

[20] **Note 3 to paragraph (b)(3):** The 'fit' of a commodity is defined by its ability to physically interface or interconnect with or become an integral part of another item.

form and fit of a multipurpose die in a standard package is the same irrespective of the customer's end application. Also, the form and fit of a standard, unmodified package is the same irrespective of what die is encased in that standard package. In other words, irrespective of the die encased in a standard package, the configuration or footprint of the standard, unmodified package remains the same.

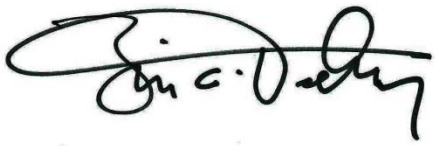
Based upon the forgoing analysis applicable to semiconductors, the industry believes that any semiconductor consisting of a multipurpose die in a standard package both of which are in normal commercial use should be released pursuant to the (b) (3) release provision.

Conclusion

For the reasons described above, among others, we respectfully submit that semiconductors consisting of multipurpose die and encased in a standard package are not "specially designed". We understand that these items may be caught in the overreach of the subparagraph (a) "catch" provision, but they should be released through an interpretation of the subparagraph (b) releases, and therefore should not be considered "specially designed." As indicated above, this interpretation would be based upon, and limited to, the presence of two objective facts: semiconductors consisting of multipurpose die encased in a standard package.

We look forward to your response.

Sincerely yours,



Brian Toohey
President & CEO

Attachment:
Attachment A – Whitepaper on Semiconductor Die and Packaging