

*What Every Member of the
Trade Community Should Know About:*

Diodes, Transistors & Similar Semiconductor Devices



AN INFORMED COMPLIANCE PUBLICATION

MARCH 2006

U.S. CUSTOMS and BORDER PROTECTION

NOTICE:

This publication is intended to provide guidance and information to the trade community. It reflects the position on or interpretation of the applicable laws or regulations by U.S. Customs and Border Protection (CBP) as of the date of publication, which is shown on the front cover. It does not in any way replace or supersede those laws or regulations. Only the latest official version of the laws or regulations is authoritative.

Publication History

First Published January 2000
Revised July 2002
Revised January 2004
Reviewed With No Changes May 2005
Reviewed with No Changes March 2006

PRINTING NOTE:

This publication was designed for electronic distribution via the CBP website (<http://www.cbp.gov>) and is being distributed in a variety of formats. It was originally set up in Microsoft Word97[®]. Pagination and margins in downloaded versions may vary depending upon which word processor or printer you use. If you wish to maintain the original settings, you may wish to download the .pdf version, which can then be printed using the freely available Adobe Acrobat Reader[®].

PREFACE

On December 8, 1993, Title VI of the North American Free Trade Agreement Implementation Act (Pub. L. 103-182, 107 Stat. 2057), also known as the Customs Modernization or “Mod” Act, became effective. These provisions amended many sections of the Tariff Act of 1930 and related laws.

Two new concepts that emerge from the Mod Act are “***informed compliance***” and “***shared responsibility***,” which are premised on the idea that in order to maximize voluntary compliance with laws and regulations of U.S. Customs and Border Protection, the trade community needs to be clearly and completely informed of its legal obligations. Accordingly, the Mod Act imposes a greater obligation on CBP to provide the public with improved information concerning the trade community’s rights and responsibilities under customs regulations and related laws. In addition, both the trade and U.S. Customs and Border Protection share responsibility for carrying out these requirements. For example, under Section 484 of the Tariff Act, as amended (19 U.S.C. 1484), the importer of record is responsible for using reasonable care to enter, classify and determine the value of imported merchandise and to provide any other information necessary to enable U.S. Customs and Border Protection to properly assess duties, collect accurate statistics, and determine whether other applicable legal requirements, if any, have been met. CBP is then responsible for fixing the final classification and value of the merchandise. An importer of record’s failure to exercise reasonable care could delay release of the merchandise and, in some cases, could result in the imposition of penalties.

The Office of Regulations and Rulings (ORR) has been given a major role in meeting the informed compliance responsibilities of U.S. Customs and Border Protection. In order to provide information to the public, CBP has issued a series of informed compliance publications on new or revised requirements, regulations or procedures, and a variety of classification and valuation issues.

This publication, prepared by the National Commodity Specialist Division, ORR, is a study of the classification of diodes, transistors and similar semiconductor devices. “Diodes, Transistors & Similar Semiconductor Devices” provides guidance regarding the classification of imported merchandise. We sincerely hope that this material, together with seminars and increased access to rulings of U.S. Customs and Border Protection, will help the trade community to improve voluntary compliance with customs laws and to understand the relevant administrative processes.

The material in this publication is provided for general information purposes only. Because many complicated factors can be involved in customs issues, an importer may wish to obtain a ruling under Regulations of U.S. Customs and Border Protection, 19 C.F.R. Part 177, or to obtain advice from an expert who specializes in customs matters, for example, a licensed customs broker, attorney or consultant.

Comments and suggestions are welcomed and should be addressed to the Assistant Commissioner at the Office of Regulations and Rulings, U.S. Customs and Border Protection, 1300 Pennsylvania Avenue, NW, (Mint Annex), Washington, D.C. 20229.

Sandra L. Bell
Acting Assistant Commissioner
Office of Regulations and Rulings

(This page intentionally left blank)

DIODES, TRANSISTORS AND SIMILAR SEMICONDUCTOR DEVICES OF HEADING 8541	7
LAW AND INTERPRETATION	7
GENERAL CONSIDERATIONS	7
GENERAL EXCLUSIONS	9
MODULES AND ASSEMBLIES CONTAINING DIODES, TRANSISTORS AND SIMILAR SEMICONDUCTOR DEVICES.....	10
DIODES, TRANSISTORS AND SIMILAR SEMICONDUCTOR DEVICES VS. HEADING 8542.....	14
MATERIAL AND PARTS.....	14
CONCLUSION.....	17
TYPICAL PRODUCTS OF THIS GROUP.....	18
ADDITIONAL INFORMATION.....	19
ADDITIONAL INFORMATION.....	20
THE INTERNET	20
CUSTOMS REGULATIONS	20
CUSTOMS BULLETIN	20
IMPORTING INTO THE UNITED STATES	21
INFORMED COMPLIANCE PUBLICATIONS	21
VALUE PUBLICATIONS.....	22
“YOUR COMMENTS ARE IMPORTANT”	23

(This page intentionally left blank)

DIODES, TRANSISTORS AND SIMILAR SEMICONDUCTOR DEVICES OF HEADING 8541

Heading 8541, Harmonized Tariff Schedule of the United States (HTSUS) provides for:

Diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light-emitting diodes; mounted piezoelectric crystals; parts thereof.

This Informed Compliance Publication will be limited to the first grouping of products under this heading, “[d]iodes, transistors and similar semiconductor devices.” This document is intended to assist in the classification of these products. *ABB Power Transmission v. United States*, 896 F.Supp. 1279, 19 CIT 1044 (1995), and significant rulings in this area will be cited and/or discussed. Not all of the rulings cited address the classification of products in this group. However, these rulings are illustrative of general classification principles that apply to the products of this group. The cited rulings should be consulted in their entirety for complete product descriptions and analysis.

LAW AND INTERPRETATION

The products of this group are classified in the following subheadings:

8541.10.00	Diodes, other than photosensitive or light-emitting diodes...
	Transistors, other than photosensitive transistors:
8541.21.00	With a dissipation rate of less than 1 W...
8541.29.00	Other...
8541.30.00	Thyristors, diacs and triacs, other than photosensitive devices...
8541.50.00	Other semiconductor devices...

GENERAL CONSIDERATIONS

Classification of merchandise under the Harmonized Tariff Schedule of the United States is in accordance with the General Rules of Interpretation (GRI's). GRI 1 provides that classification shall be determined according to the terms of the headings

and any relative section or chapter notes (Legal Note/L.N.). Legal Note 5 (a), Chapter 85 provides:

"Diodes, transistors and similar semiconductor devices" are semiconductor devices the operation of which depends on variations in resistivity on the application of an electric field.

Legal Note 5 also specifies that:

For the classification of the articles defined in this note, headings 8541 and 8542 shall take precedence over any other heading in the tariff schedule which might cover them by reference to, in particular, their function.

The Harmonized Commodity Description and Coding System Explanatory Notes (E.N.) constitute the official interpretation of the HTSUS. While not legally binding nor dispositive, the E.N.s provide a commentary on the scope of each heading of the HTSUS and are generally indicative of the proper interpretation of these headings. See T.D. 89-80, 54 FR 35127, 35128 (August 23, 1989).

Explanatory Note 85.41 (A) tells us that at room temperature the resistivity of semiconductor materials lies between that of conductors and insulators. The *McGraw-Hill Multimedia Encyclopedia of Science and Technology*, © 1994, defines electrical resistivity as "The electrical resistance offered by a material to the flow of current, times the cross-sectional area of current flow and per unit length of current path; the reciprocal of the conductivity. Also known as resistivity; specific resistance." Although neither the HTSUS nor the Explanatory Notes defines "variations in resistivity," E.N. 85.41 (A) (II) provides the following example in regard to the operation of a transistor:

The operation of a transistor depends on the variation in resistivity between two of the terminals upon the application of an electric field to the third terminal. The applied control signal or field is weaker than the resulting action brought about by the change in resistance and thus amplification results.

Semiconductor material is doped for electronics. The *McGraw-Hill Multimedia Encyclopedia of Science and Technology*, © 1994, defines this type of doping as "[t]he addition of impurities to a semiconductor to achieve a desired characteristic, as in producing an n-type or p-type material. Also known as semiconductor doping." The doping produces an excess of electrons or a negative charge in n-type material. It produces a deficiency of electrons (holes) or a positive charge in p-type material. It is this excess or deficiency of electrons that allows semiconductor material to conduct electricity.

The semiconductor devices of this grouping are usually formed from one or more junctions between p-type and n-type semiconductor material. They are considered “active” as opposed to “passive” electronic elements that can produce, rectify, modulate or amplify an electrical signal (see Chapter 85, L.N. 4 and E.N. 85.34). They are used in the following types of applications: detection, rectification, switching, amplification, oscillation, frequency conversion, controlled rectification, etc. These devices are classified in heading 8541 whether mounted with their leads or packaged (housed, encapsulated components or elements), unmounted (chips, dice, elements), or undiced discs and wafers. The one exception, noted in E.N. 85.41 (A), concerns natural semiconductor materials (e.g. galena). In natural semiconductor material, naturally occurring impurities act as dopants. They are classified in heading 8541 only when mounted with their terminals or leads, or packaged.

Diodes and transistors are provided for in heading 8541. Diodes are two terminal devices with a single p-n junction. They allow current to pass in one direction only and block or resist it in the reverse direction. Thus, they can rectify electricity in a circuit. Transistors have three or four terminals and usually have an emitter, a base, and a collector. They may have a PNP or NPN configuration, depending on how the semiconductor was doped. The following examples of “similar semiconductor devices” are given in E.N. 85.41 (A) (III): thyristors, triacs, diacs, varactors, field effect devices such as gridistors, and gunn effect devices.

Diodes and transistors are specified by name in heading 8541, HTSUS. Similar semiconductor devices are a class designation. As previously mentioned the Explanatory Notes provide a definition of diodes and transistors and certain similar semiconductor devices. These standard products, single elements packaged with their terminals or leads, do not usually present classification issues. In NY B87638, August 5, 1997, certain diodes described as silicon rectifiers, fast recovery rectifiers, and Schottky barrier rectifiers, were classified in subheading 8541.10.0080, HTSUS, as “[d]iodes, other than photosensitive or light-emitting diodes: [o]ther: [o]ther.”

GENERAL EXCLUSIONS

Certain semiconductor devices which differ from the semiconductor devices of heading 8541 in that their functioning is based on temperature, pressure, etc. are excluded from this heading. E.N. 85.41 (A) lists non-linear semiconductor resistors, such as thermistors, varistors, and magneto-resistors as examples. These devices are classified in heading 8533 as resistors. HQ 084651, August 2, 1989, concerns the classification of zinc oxide varistors (GE-MOV). These are voltage dependent resistors (VDRs) that exhibit symmetrical, non-linear, voltage-current characteristics. They were classified in subheading 8533.40.00, HTSUS.

Photosensitive semiconductor devices, light emitting diodes (LEDs and laser diodes), and mounted piezo-electric crystals, while also classified in heading 8541, are separate product groupings, and not a subject of this Publication.

MODULES AND ASSEMBLIES CONTAINING DIODES, TRANSISTORS AND SIMILAR SEMICONDUCTOR DEVICES

The major issues concerning this product group involve modules and assemblies containing these devices. The Court of International Trade (CIT) decision in *ABB Power Transmission v. United States*, 896 F.Supp. 1279, 19 CIT 1044 (1995), is instructive in establishing the scope of heading 8541, HTSUS, with regard to this product group. It is noted that neither the Harmonized Tariff Schedule of the United States nor the Explanatory Notes address this issue directly.

The merchandise before the Court was thyristor modules for use in high voltage direct current conversion stations (New England-Hydro Quebec project). Thyristors are one of the devices listed in E.N. 85.41 as a type of “similar semiconductor device.” These thyristor modules consisted of six thyristor elements connected in series, heatsinks, voltage divider circuits and electronic “firing” circuitry. They were mounted on a frame of epoxy resin and aluminum. They were designed to allow the flow of electrical current in one direction only, thus their function was rectification.

In HQ 085027, January 31, 1990, they had been classified as “static converters” under subheading 8504.40.00, HTSUS. This ruling was modified by HQ 086518, November 9, 1990, and the thyristor modules were classified as “parts of static converters” under subheading 8504.90.00, HTSUS. In *ABB Power* the plaintiff did not dispute Customs contention that these thyristor modules were parts of static converters. Their assertion was that they were more appropriately classified under heading 8541, HTSUS. This assertion was based on L.N. 2, Chapter 85, which states that “[h]eadings 8501 to 8504 do not apply to goods described in heading...8541...”; and L.N. 5, Chapter 85, which states in part “...headings 8541 and 8542 shall take precedence over any other heading in the tariff schedule which might cover them by reference to, in particular, their function.” The plaintiff asserted that these thyristor modules were classified in subheading 8541.30.00, HTSUS, which provides for “[t]hyristors, diacs, triacs, other than photosensitive devices,” or alternatively in subheading 8541.50.00, HTSUS, which provides for “[o]ther semiconductor devices.”

The issue therefore before the Court was the meaning of the term “semiconductor device.” The Court said “The meaning of a tariff term is a question of law to be decided by the court. *Hasbro*, 879 F .2d at 840.” When tariff terms are not clearly defined the Court will look to the common and commercial meaning of the term. Dictionaries, lexicons, and scientific authorities are usually consulted. The principal question before the Court was whether the imported merchandise could be classified in heading 8541, HTSUS. If it could, then it was precluded from classification in heading 8504.

Expert testimony was provided that the thyristor module functioned as a semiconductor gate. It was stated that they functioned as a single semiconductor element because they were fired simultaneously. The Court found that the thyristors in

these modules acted in unison and that the operation of the modules as a whole was dependent on variations in resistivity on the application of an electric field (L.N. 5 (a), Chapter 85). The Court agreed with the plaintiff that “[w]hile the heatsinks, firing circuitry and voltage divider circuitry contribute to the function of the module as a thyristor, there is no question...that the principal and sole function of a thyristor module is imparted by the thyristors acting in unison by variation of resistivity on the application of an electric field.” Although the Court recognized that these modules contained significant components in addition to thyristors, the function of the module fell within the definition of a thyristor as a similar semiconductor device. The CIT determined that these thyristor modules, as described in the court record, were classified in subheading 8541.30.00, HTSUS. Since the Court found that these modules were classified in heading 8541, HTSUS, they were precluded from classification in heading 8504, HTSUS.

This court decision was cited in two Headquarters rulings: HQ 960323, May 5, 1997, which revoked NY 884870, and in HQ 958726, May 5, 1997, which revoked HQ 086223 and 085540. The merchandise under consideration in these two rulings was Bridge Rectifier Diodes (BRD’s). They were composed of four discrete rectifier diodes or elements connected together into a rectifier bridge, some with mountings, housings and integral cooling devices. Each of the four diodes was a two terminal device with a single p-n junction. The BRD’s were four terminal devices with an asymmetrical voltage-current characteristic. Their function was rectification. These BRD’s have applications in a variety of consumer and industrial products (e.g. power supplies). Based on the rationale in *ABB Power Transmission*, it was determined that the function that these modules performed fell within the definition of a diode. They were classified as “[d]iodes, other than photosensitive or light-emitting diodes...” in subheading 8541.10.00, HTSUS.

The rationale used in the CIT decision, and the two rulings based on it, is similar to that expressed in several other ruling concerning modules and assemblies of the devices of heading 8541, HTSUS. HQ 084660, September 7, 1989, concerns the classification of power transistors and Darlington transistors. These contained Darlington transistor chips. The chips contained two or more transistors and resistors on the same piece of semiconductor material. Technically, each chip could have been considered a monolithic integrated circuit. The finished device (power transistor/Darlington transistor) was an assembly containing two transistor chips and six diode chips mounted on a thick-film substrate. It was determined, however, that they functioned as a transistor. It was found that “...Darlington transistors modules satisfy the Explanatory Notes description of how transistors operate electronically. Also, none of these provisions or any other section or chapter notes specifically exclude transistor modules operating in an identical manner as transistors from heading 8541.”

Industry practice was also considered in HQ 084660. The Joint Electronic Device Engineering Council (JEDEC) considered these devices discrete semiconductor devices. As stated in this ruling, “The JEDEC defines a discrete semiconductor device as a ‘device that is specified to perform an elementary electronic function and that is not

divisible into separate components functional in themselves.’ They list transistors as examples of discrete semi-conductor devices, and state that ‘other semiconductor structures having the physical complexity of integrated circuits but performing elementary electronic functions (e.g., complex Darlington transistors) are usually considered to be discrete semiconductor devices.”

E.N. 85.42 (II) also makes a distinction between discrete components and integrated circuits. It emphasizes that discrete components are indivisible and have a single active or single passive electrical function. Components made of several electrical circuit elements and having multiple electrical functions are not considered discrete components. These devices, therefore, were not considered hybrid integrated circuits under heading 8542, HTSUS. The Darlington transistors were classified in subheadings 8541.21.00 or 8541.29.00, HTSUS, as “[t]ransistors, other than photosensitive...” depending on their dissipation rate.

In HQ 084659, August 25, 1989, the classification of a Bipolar Darlington Transistor Module (BDTM), a Metal Oxide Semiconductor Field Effect Transistor (MOS-FET) and an Insulated Gate Bipolar Transistor Module (IGBT) was considered. The reasoning was similar to that of HQ 084660. These devices were assemblies mounted on direct bond copper circuit board (DBCCB) and, therefore, did not meet L.N. 5 (b) (ii), Chapter 85, with regard to hybrid integrated circuits. This ruling states that “[a]ll three are mounted on a Direct Bond Copper Circuit Board which does not involve the thin/thick film technology traditionally used to produce hybrid integrated circuits.” It was determined that they functioned as discrete transistors. They were classified in subheadings 8541.21.00 or 8541.29.00, HTSUS, as “[t]ransistors, other than photosensitive...” depending on their dissipation rate.

In NY 884779, May 6, 1993, U.S. Customs also classified certain Schottky rectifier diodes, consisting of two diodes packaged together as a single device, in subheading 8541.10.00, HTSUS, as “[d]iodes, other than photosensitive or light emitting diodes.”

In NY 814750, October 10, 1995, U.S. Customs held that laser diodes imported without optical lenses were classifiable under subheading 8541.40.20, as “light-emitting diodes” and laser diode modules with optical lenses attached were classifiable under subheading 9013.80.60, as “other optical appliances and instruments, not specified or included elsewhere in this chapter.” The reason for the distinction between the classification of the laser diodes and the laser diode modules centered on the inclusion of glass selfoc lenses in the laser diode modules. This ruling was modified by HQ 965524, August 29, 2002, in which both the laser diodes and laser diode modules with optical lenses attached were classified as “light-emitting diodes” under subheading 8541.40.20.

The laser diode modules were designed for use in optical digital data transmission. In NY 814750, U.S. Customs determined that the lenses were essential to the operation of the laser diode modules because the lenses collimate and focus the

light into the core of the fiber optics and therefore classified the modules as optical appliances under heading 9013. In HQ 965524, however, it was determined that the essential character of the laser diode modules was imparted by the laser diode, which, through its p-n junction, converted electrical energy into optical energy. While headquarters recognized that the collimating lens focused (or made coherent) the converted light energy onto a fiber stub for transmission, the essence of the fiber optic communication system was its use of light energy. Headquarters found the modules at issue to be substantially similar to those in *NEC Electronics, Inc. v. U.S.* 21 C.I.T. 327 (1997), affirmed, 144 F. 3d 788 (CAFC 1998), in which the court upheld that laser diodes modules were classifiable under subheading 8541.40.20.

In NEC, the court found that pursuant to GRI 3(b), goods comprised of different components must be classified as though they were wholly made of the material or component, which gives them their essential character. The court found that the laser diode component gave the laser diode module its essential character. U.S. Customs has since followed this finding for similar products (also see HQ 960815, July 1, 1998). The NEC decision revokes, by operation of law, any rulings concerning the classification of laser diode modules substantially similar to those therein considered (see Section 152.16(e), Customs Regulations, 19 CFR 152.16(e)) that classify such articles in a heading other than 8541.

Headquarters found that NY 814750 was inconsistent with the NEC decision and modified it as reflected within HQ 965524, which ruled that both the laser diodes and laser diode modules with optical lenses are classifiable under subheading 8541.40.20, which provides for "light-emitting diodes."

However, not all assemblies or modules which contain diodes, transistors, or similar semiconductor devices are classified in heading 8541, HTSUS. HQ 951710, February 1, 1993, concerns a different kind of assembly. The product is described as a diode unit. It contained a filter for eliminating radio interference, a fuse, a choke for reducing ripple, three power diodes, a printed circuit board assembly (PCBA) for supervising the function of the unit, three circuit breakers, etc. The unit allowed current of less than 1000 volts to pass in one direction from a DC power source and prevented capacitors from discharging on momentary voltage decrease. This ruling modified HQ 951513 in which the diode unit was classified in subheading 8536.30.00, HTSUS, as "[e]lectrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits, for a voltage not exceeding 1,000 V: [o]ther apparatus."

When considering heading 8541, HTSUS, it was determined that the diode unit contained several divisible components that performed multiple functions. It was not found to be similar to the modules under consideration in HQ 084660. Since this assembly was not described by heading 8541, HTSUS, Legal Note 5 to chapter 85 did not apply. It was determined that the diode unit was classified in subheading 8537.10.00, HTSUS, as "[b]oards, panels (including numerical control panels),

consoles, desks, cabinets and other bases, equipped with two or more apparatus of heading 8535 or 8536, for the electric control or the distribution of electricity....”

Therefore, in following *ABB Power Transmission* and the aforementioned rulings, it is of primary importance to determine how the module or assembly is designed and what is its function or functions. The function of the module or assembly as a whole must fall within the definition of a diode, transistor or similar semiconductor device (i.e. acting in unison by variation in resistivity on the application of an electric field). All other components must contribute to this function.

DIODES, TRANSISTORS AND SIMILAR SEMICONDUCTOR DEVICES VS. HEADING 8542

Legal Note 5, Chapter 85, distinguishes between “[d]iodes, transistors and similar semiconductor devices” and “[e]lectronic integrated circuits and microassemblies” (monolithic integrated circuits, hybrid integrated circuits and microassemblies). The later group of products is provided for in heading 8542. E.N. 85.42 (II) distinguishes these groups of products further. Integrated circuits are not considered discrete components because they consist of several electronic circuit elements and have multiple electrical functions. Microassemblies combine and interconnect discrete active, or active and passive components in a molded module, micromodule, or similar type module. Semiconductor devices of L.N. 5 (a), Chapter 85, are considered discrete active components. Discrete components are indivisible and have a single electrical function.

In HQ 084660 and HQ 084659, certain transistor modules (see previous discussion) were classified in heading 8541 and distinguished from the products of heading 8542. They were found to be in each case a discrete semiconductor device. In HQ 084660 this was the principal distinction between the Darlington transistor and a hybrid integrated circuit. In HQ 084659 a second distinction existed in that the transistor modules were not constructed using thin or thick film technology as specified in L.N.5(b)(ii), Chapter 85.

MATERIAL AND PARTS

There is a wide variety of chemicals, metals, and other materials used in the manufacture of semiconductor devices. Most of these materials are provided for in other headings and chapters. This would include chemical elements such as silicon, and chemical compounds such as gallium arsenide. The following examples are illustrative only of general classification principles or of the classification of specific products. They are intended to aid in distinguishing between “[d]iodes, transistors and similar semiconductor devices;...parts thereof” of heading 8541, HTSUS, and the materials used in their manufacture.

The exclusions of Section XVI and Chapter 85 apply to this product group. L.N. 1 (f), Section XVI, excludes from this section:

Precious or semiprecious stones (natural, synthetic or reconstructed) of headings 7102 to 7104, or articles wholly of such stones of heading 7116, except unmounted worked sapphires and diamonds for styli (heading 8522).

In NY B87954, October 31, 1997, U.S. Customs determined that sapphire wafers that would be used as platforms for the epitaxial deposition of Group III-V semiconductors were classified in subheading 7104.90.5000, HTSUS, as synthetic or reconstructed precious or semiprecious stones.

L.N. 1 (b), Chapter 85, excludes from this chapter:

Articles of glass of heading 7011.

In HQ 087044, May 21, 1990, U.S. Customs determined that certain glass sleeves used as housings for diodes were classified in subheading 7011.90.00, HTSUS, as "[g]lass envelopes (including bulbs and tubes), open, and glass parts thereof, without fittings, for electric lamps, cathode-ray tubes or the like...[o]ther..."

The distinction between semiconductor material and semiconductor devices has been addressed in several rulings (see below). Heading 3818, HTSUS, covers two groups of materials when they are doped for use in electronics: chemical elements in the form of discs, wafers or similar forms; and chemical compounds in the form of cylinders, rods, discs, wafers and similar forms (see also E.N. 85.41 and E.N. 38.18). The goods of heading 3818 may have been subjected to the following types of processing: polishing, and coating with a uniform epitaxial layer. However, if the materials (discs, wafers) have been more extensively worked, by such processes as selective diffusion (doping) to create discrete regions, they would be classified in heading 8541. Under GRI 2 (a) an incomplete or unfinished article would be classified in heading 8541 if it has the essential character of the complete or finished article. Diffusion and similar technologies allows dopants to be selectively introduced to the desired depth and width in the starting material (e.g. uniformly doped wafer/substrate) to form the desired semiconductor device. When considering semiconductor materials in the aforementioned forms, it is the selective diffusion process that imparts the essential character of a semiconductor device of heading 8541. This is a critical distinction between the products of heading 3818, HTSUS, and 8541, HTSUS.

In NY 836027, January 31, 1989, U.S. Customs held that mercury-cadmium-telluride wafers were classified in heading 3818.00.0000, HTSUS, as "[c]hemical compounds doped for use in electronics." These wafers had not been extensively worked by selective diffusion or other similar process. HQ 953265, May 14, 1993, concerns whether certain 2" unmounted wafers consisting of gallium phosphate, an LED chemical material, were classified in heading 3818, HTSUS, as "[c]hemical elements doped for use in electronics," or in heading, 8541, HTSUS, as unfinished LEDs. Although this ruling involves a different product group of heading 8541 than under discussion here, it is illustrative of pertinent classification principles. The finishing

processes necessary to manufacture LEDs from these wafers included cutting the wafers into precisely sized chips, then mounting, wiring, and housing them. It was determined that the imported wafers did not possess the essential character of a complete LED. They were classified in subheading 3818.00.00, HTSUS.

The following rulings concern materials which are used in semiconductor production but which do not rise to the level of a part, or which do not possess the essential character of the devices of heading 8541, HTSUS. In NY C83905, February 24, 1998, U.S. Customs determined that certain chemicals, Tertiarybutylarsine, Dimethylcadmium, and Diethylcadmium, which are used in the semiconductor and electrical industries, were classified in subheading 2931.00.9050, HTSUS. Heading 2931, HTSUS, provides for “[o]ther organo-inorganic compounds.” NY B83101, November 13, 1998, concerns the classification of certain semi-manufactured articles of artificial graphite. After further processing the finished products were used in a variety of industrial, semiconductor, mechanical and electrical applications. These products were classified in subheading 3801.10.5000. Gold bonding wire with dopant and aluminum bonding wire of various compositions were the subject of B80730, January 7, 1997. They were classified in subheadings 7108.13.7000 and 7605.19.0000, HTSUS, respectively.

As can be seen from the aforementioned rulings, in distinguishing between materials used in the manufacture of semiconductors and the products of heading 8541, it is important to look at the essential character, use, function, degree of manufacture, and subsequent manufacture or processing of a good.

With regard to parts, L.N. 2, Section XVI, provides:

Subject to note 1 to this section, note 1 to chapter 84 and to note 1 to chapter 85, parts of machines (not being parts of the articles of heading 8484, 8544, 8545, 8546 or 8547) are to be classified according to the following rules:

- (a) Parts which are goods included in any of the headings of chapters 84 and 85 (other than headings 8409, 8431, 8448, 8466, 8473, 8485, 8503, 8522, 8529, 8538 and 8548) are in all cases to be classified in their respective headings;
- (b) Other parts, if suitable for use solely or principally with a particular kind of machine, or with a number of machines of the same heading (including a machine of heading 8479 or 8543) are to be classified with the machines of that kind or in heading 8409, 8431, 8448, 8466, 8473, 8503, 8522, 8529 or 8538 as appropriate. However, parts which are equally suitable for use principally with the goods of headings 8517 and 8525 to 8528 are to be classified in heading 8517;

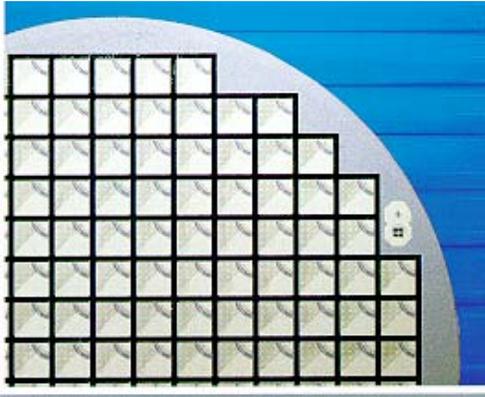
(c) All other parts are to be classified in heading 8409, 8431, 8448, 8466, 8473, 8503, 8522, 8529 or 8538 as appropriate or, failing that, in heading 8485 or 8548.

With the product group under consideration, the principal issue concerning parts involves establishing sole or principal use under L.N. 2 (b), Section XVI. Facts that may be considered in making this determination are: design characteristics, function, and use. If a product has more than one use, principal use would have to be determined. Because of this consideration, rulings on one product (e.g. housings, heatsinks, etc.) may not apply to a similar product designed for a different use. The following rulings are illustrative of products that were found to be parts under subheading 8541.90.00, HTSUS. HQ 950868, December 31, 1992, concerns the classification of semiconductor bases made of copper. Semiconductors would be mounted on these bases. The mounted device would subsequently be mounted on a heat sink to allow for the dissipation of heat. It was found that they were solely or principally used as parts of semiconductors. Heatsink/heat spreading substrates and submounts are the subject of HQ 955988, March 7, 1994, and HQ 955949, March 7, 1994. They were made to customer specifications. They were designed to absorb, store, and remove excess heat. They were classified in subheading 8541.90.00, HTSUS, as parts of semiconductor devices, and in subheading 8542.90.00, HTSUS, as parts of electronic integrated circuits, depending on their dedicated use (design specifications). In NY 869903, January 15, 1992, alumina housings for power transistors were classified in subheading 8541.90.00, HTSUS. This ruling states that these housings "...have no other use except as part of the power transistor."

CONCLUSION

The classification of electronic devices and apparatus continues to be problematic because of the ever increasing variety of products and variations available. As can be seen from this brief discussion of the classification of "[d]iodes, transistors and similar semiconductor devices" it is vital to have complete information upon which to make an informed decision. In making a classification decision, it is necessary to consider the following: the pertinent sections of law and legal precedent, official interpretation of the law, common and commercial meanings, use, function, degree of fabrication, etc. It is the responsibility of the importer to exercise reasonable care with regard to the classification of imported products. If the classification of a particular device is questionable, it is recommended that a binding ruling be requested from U.S. Customs. Requests can be addressed to U.S. Customs and Border Protection, Customs Information Exchange (C.I.E.), One Penn Plaza, 10th Floor, New York, NY 10119, Attention: Binding Rulings Section.

TYPICAL PRODUCTS OF THIS GROUP



SEMICONDUCTOR WAFER

DIODE: 8541.10.0040
TRANSISTOR: 8541.21.0040
OR 8541.29.0040
TRYRISTORS, DIACS, TRIACS:
8541.30.0040
OTHER: 8541.50.0040



DISC TYPE DIODE
DESIGNED FOR HIGH
POWER RECTIFICATION
8541.10.00



DIODE
8541.10.00



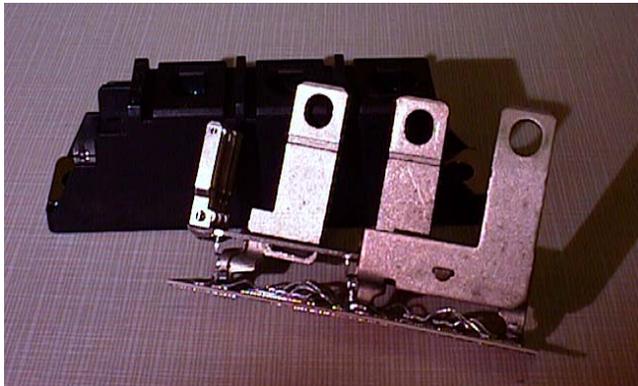
THREE PHASE DIODE BRIDGE
8541.10.00
HQ 958726
HQ 960323



MOSFET MODULE
POWER SEMICONDUCTOR
DISSIPATION RATE >1 W
8541.29.00
HQ 084659



INSULATED GATE BIPOLAR
TRANSISTOR MODULE (1GBT)
DISSIPATION RATE > 1 W
8541.29.00
HQ 084659



THYRISTOR MODULE
INTERNAL COMPONENTS CONTAINING
TWO MOUNTED CHIPS
8541.30.00

ADDITIONAL INFORMATION

The Internet

The home page of U.S. Customs and Border Protection on the Internet's World Wide Web, provides the trade community with current, relevant information regarding CBP operations and items of special interest. The site posts information -- which includes proposed regulations, news releases, publications and notices, etc. -- that can be searched, read on-line, printed or downloaded to your personal computer. The web site was established as a trade-friendly mechanism to assist the importing and exporting community. The web site also links to the home pages of many other agencies whose importing or exporting regulations that U.S. Customs and Border Protection helps to enforce. The web site also contains a wealth of information of interest to a broader public than the trade community. For instance, on June 20, 2001, CBP launched the "Know Before You Go" publication and traveler awareness campaign designed to help educate international travelers.

The web address of U.S. Customs and Border Protection is <http://www.cbp.gov>

Customs Regulations

The current edition of *Customs Regulations of the United States* is a loose-leaf, subscription publication available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; telephone (202) 512-1800. A bound, 2003 edition of Title 19, *Code of Federal Regulations*, which incorporates all changes to the Regulations as of April 1, 2003, is also available for sale from the same address. All proposed and final regulations are published in the *Federal Register*, which is published daily by the Office of the Federal Register, National Archives and Records Administration, and distributed by the Superintendent of Documents. Information about on-line access to the *Federal Register* may be obtained by calling (202) 512-1530 between 7 a.m. and 5 p.m. Eastern time. These notices are also published in the weekly *Customs Bulletin* described below.

Customs Bulletin

The *Customs Bulletin and Decisions* ("Customs Bulletin") is a weekly publication that contains decisions, rulings, regulatory proposals, notices and other information of interest to the trade community. It also contains decisions issued by the U.S. Court of International Trade, as well as customs-related decisions of the U.S. Court of Appeals for the Federal Circuit. Each year, the Government Printing Office publishes bound volumes of the *Customs Bulletin*. Subscriptions may be purchased from the Superintendent of Documents at the address and phone number listed above.

Importing Into the United States

This publication provides an overview of the importing process and contains general information about import requirements. The February 2002 edition of *Importing Into the United States* contains much new and revised material brought about pursuant to the Customs Modernization Act ("Mod Act"). The Mod Act has fundamentally altered the relationship between importers and U.S. Customs and Border Protection by shifting to the importer the legal responsibility for declaring the value, classification, and rate of duty applicable to entered merchandise.

The February 2002 edition contains a section entitled "Informed Compliance." A key component of informed compliance is the shared responsibility between U.S. Customs and Border Protection and the import community, wherein CBP communicates its requirements to the importer, and the importer, in turn, uses reasonable care to assure that CBP is provided accurate and timely data pertaining to his or her importation.

Single copies may be obtained from local offices of U.S. Customs and Border Protection, or from the Office of Public Affairs, U.S. Customs and Border Protection, 1300 Pennsylvania Avenue NW, Washington, DC 20229. An on-line version is available at the CBP web site. *Importing Into the United States* is also available for sale, in single copies or bulk orders, from the Superintendent of Documents by calling (202) 512-1800, or by mail from the Superintendent of Documents, Government Printing Office, P.O. Box 371954, Pittsburgh, PA 15250-7054.

Informed Compliance Publications

U.S. Customs and Border Protection has prepared a number of Informed Compliance publications in the "*What Every Member of the Trade Community Should Know About:...*" series. Check the Internet web site <http://www.cbp.gov> for current publications.

Value Publications

Customs Valuation under the Trade Agreements Act of 1979 is a 96-page book containing a detailed narrative description of the customs valuation system, the customs valuation title of the Trade Agreements Act (§402 of the Tariff Act of 1930, as amended by the Trade Agreements Act of 1979 (19 U.S.C. §1401a)), the Statement of Administrative Action which was sent to the U.S. Congress in conjunction with the TAA, regulations (19 C.F.R. §§152.000-152.108) implementing the valuation system (a few sections of the regulations have been amended subsequent to the publication of the book) and questions and answers concerning the valuation system. A copy may be obtained from U.S. Customs and Border Protection, Office of Regulations and Rulings, Value Branch, 1300 Pennsylvania Avenue, NW, (Mint Annex), Washington, D.C. 20229.

Customs Valuation Encyclopedia (with updates) is comprised of relevant statutory provisions, CBP Regulations implementing the statute, portions of the Customs Valuation Code, judicial precedent, and administrative rulings involving application of valuation law. A copy may be purchased for a nominal charge from the Superintendent of Documents, Government Printing Office, P.O. Box 371954, Pittsburgh, PA 15250-7054. This publication is also available on the Internet web site of U.S. Customs and Border Protection.

The information provided in this publication is for general information purposes only. Recognizing that many complicated factors may be involved in customs issues, an importer may wish to obtain a ruling under CBP Regulations, 19 C.F.R. Part 177, or obtain advice from an expert (such as a licensed Customs Broker, attorney or consultant) who specializes in customs matters. Reliance solely on the general information in this pamphlet may not be considered reasonable care.

Additional information may also be obtained from U.S. Customs and Border Protection ports of entry. Please consult your telephone directory for an office near you. The listing will be found under U.S. Government, Department of Homeland Security.

“Your Comments are Important”

The Small Business and Regulatory Enforcement Ombudsman and 10 regional Fairness Boards were established to receive comments from small businesses about Federal agency enforcement activities and rate each agency’s responsiveness to small business. If you wish to comment on the enforcement actions of U.S. Customs and Border Protection, call 1-888-REG-FAIR (1-888-734-3247).

REPORT SMUGGLING 1-800-BE-ALERT OR 1-800-NO-DROGA



Visit our Internet web site: <http://www.cbp.gov>