

# Semiconductors, Electronic Components, and Semiconductor Manufacturing Equipment: 2006

Issued July 2007

MA334Q(06)-1

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### SUMMARY OF FINDINGS

During 2006, the total value of shipments of semiconductors, electronic components, and semiconductor manufacturing equipment was

\$120.6 billion. This represents a 1.1 percent decrease from the revised 2005 total of \$121.9 billion. For 2006, shipments of semiconductor machinery increased 27.3 percent to \$12.4 billion; shipments of electron tubes and parts decreased 29.0 percent to \$954.9 million; bare printed circuit boards increased 3.0 percent to \$5.0 billion; semiconductors and related devices decreased 7.1 percent to \$65.9 billion; capacitors for electronic circuitry decreased 4.4 percent to \$1.1 billion; resistors for electronic circuitry decreased 5.0 percent to \$620.0 million; electronic coils, transformers, and other inductors increased 7.7 percent to \$1.3 billion; connectors for electronic circuitry increased 10.5 percent to \$4.0 billion; printed circuit assemblies, loaded boards and modules increased 2.8 percent to \$20.7 billion; and other electronic components increased 5.2 percent to \$8.8 billion.

For general CIR information, explanation of general terms and historical note, see the appendix.

Address inquiries concerning these data to Investment Goods Industries Branch, Manufacturing and Construction Division (MCD), Washington, DC 20233-6900, or call Philippe S.J. Morris, 301-763-4819.

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U S C E N S U S B U R E A U

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Table 1. Value of Shipments of Semiconductors, Electronic Components, and Semiconductor Manufacturing Equipment by Product Class Code: 2002 to 2006  
[Value in million of dollars]

Product class code	Product description	2006	2005	2004	2003	2002
3332950	Semiconductor machinery.....	12,388.2	r/ 9,728.2	(NA)	(NA)	(NA)
3344111	Transmittal, industrial, and special-purpose electron tubes (except X-ray).....	690.0	651.7	641.4	628.8	584.2
3344114	Receiving-type electron tubes, including cathode ray (new and rebuilt).....	216.2	620.5	1,049.0	1,508.0	2,486.0
3344117	Electron tube parts.....	48.7	r/ 72.4	77.8	63.4	91.0
3344120	Bare printed circuit boards.....	5,003.2	4,855.5	4,708.8	4,871.1	5,763.5
3344131	Integrated microcircuits, including semiconductor networks, microprocessors, and MOS memories.....	54,729.7	61,631.2	60,097.3	54,830.4	49,726.3
3344134	Transistors.....	672.3	603.0	656.0	607.8	818.2
3344137	Diodes and rectifiers.....	457.1	r/ 371.9	304.9	391.2	370.1
334413A	Other semiconductor devices, including semiconductor parts such as chips, wafers, and heat sinks.....	10,050.8	8,330.3	7,247.4	6,519.2	6,632.3
3344140	Capacitors for electronic circuitry.....	1,063.9	r/ 1,113.4	1,184.1	1,191.6	1,338.0
3344150	Resistors for electronic circuitry.....	620.0	652.5	743.9	636.3	652.6
3344160	Electronic coils, transformers, and other inductors.....	1,309.9	1,215.9	1,115.6	956.5	1,154.4
3344171	Coaxial (RF) connectors for electronic circuitry.....	406.6	r/ 410.3	402.6	402.3	464.1
3344174	Cylindrical connectors for electronic circuitry.....	823.6	r/ 737.9	631.0	563.4	527.8
3344177	Rack and panel (rectangular) connectors for electronic circuitry.....	331.5	297.0	290.5	268.1	264.3
334417A	Printed circuit connectors for electronic circuitry.....	1,101.0	937.4	1,012.9	833.7	776.4
334417D	Other connectors for electronic circuitry, including parts.....	1,302.5	r/ 1,206.7	1,078.9	1,418.4	1,435.7
334418B	Printed circuit assemblies, loaded boards and modules (printed circuit boards with inserted electronic components).....	20,662.8	20,105.5	19,565.6	19,714.7	23,170.8
3344191	Crystals, filters, piezoelectric, and other related electronic devices (except microwave filters).....	739.4	778.8	654.0	600.5	726.1
3344194	All other miscellaneous transducers, including electrical-electronic input/output transducers.....	1,487.2	r/ 1,401.3	1,494.8	1,218.5	1,203.3
3344197	Switches, mechanical, for electronic circuitry.....	773.4	r/ 794.2	715.8	739.1	835.6
334419A	Microwave components and devices, except antennae, tubes, and semiconductors.....	1,419.5	r/ 1,306.0	1,326.0	1,414.8	1,510.6
334419E	All other miscellaneous electronic components.....	4,336.0	4,040.4	4,158.3	4,060.4	4,365.8

NA Not available. r/Revised by 5 percent or more from previously published data.

Table 2. Quantity and Value of Shipments of Semiconductors, Electronic Components, and Semiconductor Manufacturing Equipment: 2006 and 2005  
 [Quantity in thousands of units. Values in thousands of dollars]

Product code	Product description	No. of cos.	2006		2005	
			Quantity	Value	Quantity	Value
3332950	Semiconductor machinery.....	102	(X)	12,388,164	(X) r/	9,728,214
3332950106	Semiconductor wafer processing equipment: thin layer chemical vapor deposition.....	10	(X)	2,611,277	(X)	1,274,273
3332950211	Semiconductor wafer processing equipment: thin layer physical vapor deposition.....	7	(X)	(D)	(X)	(D)
3332950326	Semiconductor wafer processing equipment: plasma etch.....	6	(X)	1,624,886	(X)	900,984
3332950401	Microolithography, including aligners.....	10	(X)	247,473	(X) r/	161,497
3332950416	Semiconductor wafer processing equipment: thin layer epitaxial growth deposition.....	4	(X)	(D)	(X) r/	(D)
3332950421	Semiconductor wafer processing equipment: wet etch.....	8	(X)	108,810	(X) r/	80,031
3332950441	Ion implantation, including current and voltage ion implanters.....	4	(X)	1,088,720	(X) r/	795,705
3332950456	Wafer processing equipment: pattern generating apparatus.....	1	(X)	(D)	(X)	(D)
3332950461	Other semiconductor wafer processing equipment.....	38	(X)	(D)	(X)	(D)
3332950500	Parts for semiconductor manufacturing machinery, including packaging equipment.....	48	(X)	1,455,013	(X) r/	1,211,828
3344111	Transmittal, industrial, and special-purpose electron tubes (except X-ray).....	20	(X)	690,038	(X)	651,706
3344111130	Power and special-purpose tubes: Power and special-purpose electron tubes (except forward wave tubes).....	12	(X)	295,960	(X)	280,599
3344111210	Forward wave transmitting and industrial electron tubes, excluding X-ray.....	4	(D)	249,364	(D)	237,651
3344111310	All other transmitting, industrial, and special-purpose electron tubes, excluding X-ray, including light sensing, light emitting devices, and miscellaneous special-purpose tubes.....	12	(X)	144,714	(X)	133,456
3344114	Receiving-type electron tubes, including cathode ray (new and rebuilt).....	7	(X)	216,245	(X)	620,493
3344117	Electron tube parts.....	12	(X)	48,721	(X) r/	72,383
3344120	Bare printed circuit boards.....	339	(X)	5,003,230	(X)	4,855,453
3344120105	Single-sided glass printed.....	167	(X)	69,670	(X)	78,312
3344120110	Double-sided glass printed.....	221	(X)	465,874	(X)	529,613
3344120115	Multilayer glass printed.....	211	(X)	2,843,255	(X)	2,599,587
3344120120	Single-sided flex printed.....	37	(X)	350,499	(X)	435,229
3344120125	Double-sided flex printed.....	44	(X)	145,566	a/ (X)	125,139
3344120130	Multilayer flex and rigid/flex printed.....	45	(X)	204,861	(X)	185,762
3344120139	Other.....	57	(X)	652,193	(X)	647,508
3344120145	Receipts for contract work on printed circuit boards (etching, dip-soldering, imprinting, etc.), but not printed board assembly.....	49	(X)	271,312	(X) r/	254,303
3344131	Integrated microcircuits, including semiconductor networks, microprocessors, and MOS memories.....	113	(X)	54,729,741	(X)	61,631,206
3344131550	Monolithic integrated circuits, digital, nonsilicon.....	8	(X)	1,095,666	(X)	856,519
3344131552	Monolithic integrated circuits, digital, silicon.....	14	(X)	3,075,958	(X)	2,879,196
	Metal oxide semiconductor (MOS) field effect transistors:					
	Volatile memory DRAMs (dynamic read-write random access):					
3344131574	16 megabit and less.....	5	(D)	(D)	(D)	(D)
3344131575	Greater than 16 Mb, but less than 64 Mb.....	1	(D)	(D)	(D)	(D)
3344131576	64 Mb, but less than 128 Mb.....	3	(D)	(D)	(D)	(D)
3344131577	Greater than 128 Mb, but less than 256 Mb.....	4	(D)	(D)	(D)	(D)
3344131578	Greater than 256 Mb.....	7	369,323	3,219,729	r/ 366,062 r/	3,770,941
	Volatile memory SRAMs (static read-write random access):					
3344131583	2 Mb and less.....	3	(D)	246,708	(D)	244,946
3344131587	Greater than 2 Mb.....	3	(D)	(D)	(D)	(D)
	Nonvolatile EEPROMs (electrically erasable programmable read-only memory):					
3344131588	Nonvolatile EEPROM.....	2	(D)	(D)	(D)	(D)
3344131589	Other Nonvolatile.....	3	(D)	(D)	(NA)	(NA)
3344131581	NAND type flash EEPROM.....	6	(D)	426,530	(D)	478,225
3344131593	NOR type flash EEPROM.....	4	(D)	(D)	(D)	1,160,097
3344131953	Dual core processors.....	1	(D)	(D)	(D)	(D)
	Other, including microprocessors, microcontrollers, application specific integrated circuits (ASIC's), and programmable logic arrays (PLA's):					
3344131255	Microprocessors (MPU) operating with an external data bus of 8 bits or less.....	9	1,362,268	1,261,902	r/ 1,411,221 r/	1,403,681
3344131258	Microprocessors (MPU) operating with an external data bus of 16 bits.....	7	(D)	(D)	(D)	(D)
3344131261	Microprocessors (MPU) operating with an external data bus of 32 bits or more.....	6	(D)	(D)	(D)	(D)
3344131234	Microcontrollers (MCU) operating with an external data bus of 8 bits or less.....	4	(D)	658,400	(D)	614,619
3344131235	Microcontrollers (MCU) operating with an external data bus of 16 bits.....	14	551,090	4,938,832	r/ 594,204 r/	4,670,493

Table 2. Quantity and Value of Shipments of Semiconductors, Electronic Components, and Semiconductor Manufacturing Equipment: 2006 and 2005  
 [Quantity in thousands of units. Values in thousands of dollars]

Product code	Product description	No. of cos.	2006		2005	
			Quantity	Value	Quantity	Value
3344131236	Microcontrollers (MCU) operating with an external data bus of 32 bits or more.....	3	(D)	(D)	(D)	(D)
	Other digital, silicon, including bipolar combined with MOS:					
3344131943	Complementary BiMOS.....	7	(X)	805,989	(D)	r/ 477,515
3344131945	Other digital silicon ICs.....	18	(D)	(D)	r/ 491,239	r/ 3,400,671
	Nondigital silicon monolithic integrated circuits (e.g., linear, analog):					
3344131962	Radio frequency.....	6		178,636	r/ 150,901	r/ 240,647
3344131903	Other, analog.....	20		4,428,513	3,810,017	2,570,494
3344131907	Other.....	17		963,223	r/ 990,449	r/ 3,082,591
	Hybrid integrated circuits:					
3344131918	Radio frequency.....	16		24,859	21,363	r/ 107,737
3344131951	Other.....	36		139,787	r/ 121,201	709,945
3344131912	Other.....	33	(X)	2,535,858	(X)	2,405,414
3344134	Transistors.....	25	(X)	672,282	(X)	602,972
3344137	Diodes and rectifiers.....	36	(X)	457,082	(X)	r/ 371,936
334413A	Other semiconductor devices.....	137	(X)	10,050,849	(X)	8,330,330
	Light-sensitive and light-emitting devices:					
334413A105	Solar cells.....	7	(X)	117,891	(X)	r/ 77,592
334413A110	Photovoltaic modules.....	11	(X)	534,463	(X)	r/ 400,266
334413A123	Light-emitting diodes (LEDs).....	19	(X)	702,916	(X)	653,880
334413A137	Other light sensitive and light-emitting devices.....	19	(X)	461,740	(X)	854,029
	Other semiconductor devices:					
334413A140	Thyristors (SCR's, triacs, PNP diodes).....	5	(X)	(D)	(X)	r/ 68,680
334413A150	All other semiconductor devices (tunnel diodes, thermo-electric semiconductor junctions, metal-oxide varistors, solid-state transducers, and special semiconductor devices).....	17	(X)	(D)	(X)	483,796
	Semiconductor parts:					
	Chips and wafers:					
334413A155	For integrated circuits (IC's).....	38	(X)	4,533,015	(X)	r/ 3,962,342
334413A160	For discrete semiconductors.....	30	(X)	1,682,619	(X)	620,438
334413A165	All other semiconductor parts (headers, packages, heat sinks, other accessories, etc.).....	31	(X)	1,220,889	(X)	r/ 1,209,307
3344140	Capacitors for electronic circuitry.....	57	(X)	1,063,884	(X)	r/ 1,113,358
3344140173	Capacitors.....	54		21,094,058	r/ 26,340,577	r/ 879,506
3344140175	Parts for capacitors, including unfinished chips for further finishing and assembly.....	6	(X)	161,752	(X)	233,852
3344150	Resistors for electronic circuitry.....	60	(X)	619,999	(X)	652,506
3344150182	Resistors.....	54		3,146,838	2,863,453	r/ 517,891
3344150184	Parts for resistors.....	8	(X)	146,693	(X)	r/ 134,615
3344160	Electronic coils, transformers, and other inductors.....	186	(X)	1,309,883	(X)	1,215,919
3344171	Coaxial (RF) connectors for electronic circuitry.....	41		363,877	406,575	340,133
3344174	Cylindrical connectors for electronic circuitry.....	32		174,578	823,576	r/ 160,557
3344177	Rack and panel (rectangular) connectors for electronic circuitry.....	32	(D)	331,461	(D)	296,956
334417A	Printed circuit connectors for electronic circuitry.....	35	(X)	1,100,975	(D)	937,368
334417D	Other connectors for electronic circuitry, including parts.....	75	(X)	1,302,549	(X)	r/ 1,206,677
334417D117	Other connectors.....	64		3,148,087	1,022,037	1,815,025
334417D125	Parts for connectors (connectors shipped but still requiring further manufacture).....	26	(X)	280,512	(X)	r/ 220,810
334418B	Printed circuit assemblies, loaded boards and modules (printed circuit boards with inserted electronic components).....	538	(X)	20,662,825	(X)	20,105,522
334418B105	Computer and peripheral printed board assemblies.....	176	(X)	6,676,627	(X)	7,054,067
334418B110	Communications printed board assemblies.....	168	(X)	3,995,312	(X)	r/ 4,184,216
334418B115	Industrial process control board assemblies.....	199	(X)	1,282,988	(X)	1,221,641
334418B120	Instrumentation printed board assemblies (except industrial process).....	160	(X)	1,527,132	(X)	r/ 1,181,069
334418B125	Search and detection printed board assemblies.....	65	(X)	358,300	(X)	270,655
334418B130	Consumer electronics, printed board assemblies.....	108	(X)	489,496	(X)	457,680
334418B137	Other printed board assemblies, subassemblies and modules, including office equipment, point of sales and plotter controllers.....	267	(X)	6,332,970	(X)	r/ 5,736,194
3344191	Crystals, filters, piezoelectric, and other related devices (except microwave filters).....	77		165,466	739,426	522,147
3344191127	Filters (except microwave).....	38		60,553	271,432	73,984
3344191180	Piezoelectric devices.....	48		104,913	467,994	448,163

Table 2. Quantity and Value of Shipments of Semiconductors, Electronic Components, and Semiconductor Manufacturing Equipment: 2006 and 2005  
 [Quantity in thousands of units. Values in thousands of dollars]

Product code	Product description	No. of cos.	2006		2005				
			Quantity	Value	Quantity	Value			
3344194	All other miscellaneous transducers, including electrical-electronic input/output transducers.....	70	(X)	1,487,170	r/	193,039	r/	1,401,267	
3344194105	Electro acoustic (sonar, ultrasonic, vibration*, etc.).....	15	(X)	407,393		(D)		302,080	
	Electromechanical:								
3344194110	Accelerometers*.....	6	(X)	181,578		(D)		182,365	
3344194115	Pressure*.....	29	79,902	c/	502,168	a/	78,687	488,887	
3344194120	Strain gauges and other mechanical*.....	14	1,252		118,383		1,067	122,094	
3344194135	Other.....	25	5,956	a/	277,648	r/	12,236	r/	305,841
3344197	Switches, mechanical, for electronic circuitry*.....	56	(X)	773,428		(X)	r/	794,192	
334419A	Microwave components and devices, except antennae, tubes, and semiconductors.....	88	(X)	1,419,459		(X)	r/	1,306,017	
334419A105	Ferrite, including yttrium garnets, microwave components (circulators, isolators, phase shifters, attenuators, equalizers, limiters, mixers, etc.).....	32	(X)	197,988		(X)	r/	172,040	
	Microwave devices, other than ferrite and solid state:								
334419A110	Attenuators (dummy loads, high and low-power terminations, etc.).....	29	(X)	150,879		(X)		134,953	
334419A125	Reactive microwave components.....	29	(X)	217,103		(X)	r/	191,521	
334419A130	Switches, coaxial and waveguide.....	23	(X)	188,605		(X)	r/	163,094	
334419A147	Other microwave devices.....	50	(X)	411,750				366,600	
334419A150	Microwave subassemblies, including parametric amplifiers and other solid-state assemblies.....	21	(X)	253,134		(X)		277,809	
334419E	All other miscellaneous electronic components.....	364	(X)	4,336,013		(X)		4,040,389	
334419E125	Oscillators (except instrumentation and crystal types).....	17	5,141		141,744		5,165	109,310	
	Static power supply converters for electronic applications, sold separately:								
334419E130	Regulated.....	43	9,767	c/	526,199	r/	7,678	r/	465,340
334419E135	Other (unregulated, variable frequency, ac, dc, converters and inverters, vibrator, etc.).....	28	(X)	223,899		(X)		289,190	
334419E140	Electronic cable harnesses and cable assemblies.....	198	(X)	1,703,670		(X)	r/	1,583,100	
334419E155	Magnetic cores.....	8	(X)	138,745		(X)		135,635	
	Electronic parts, n.e.c. and specialized electronic hardware:								
	Sockets for electronic component insertion:								
334419E180	All other specialized electronic hardware.....	132	(X)	1,601,756		(X)	r/	1,457,814	

\*Similar products are collected on Current Industrial Report series MA334C, "Control Instruments" and MA335K, "Wiring Devices and Supplies."  
 D Withheld to avoid disclosing data for individual companies. NA Not available. n.e.c. Not specified by kind. r/Revised by 5 percent or more from previously published data. X Not applicable.

Note: Percent of estimation for each item is indicated as follows: a/10 to 25 percent of this item has been estimated. b/26 to 50 percent of this item has been estimated. c/Over 50 percent of this item has been estimate.

Table 3. Shipments, Exports, and Imports of Semiconductors, Printed Circuit Boards, and Other Electronics Components: 2006  
 [Values in thousands]

Product code	Product description	Manufacturers' shipments (value, f.o.b. plant)	Exports of domestic merchandise (value at port) 1/	Imports for consumption 2/3/
3332950106	Semiconductor wafer processing equipment: thin layer chemical vapor deposition.....	2,611,277	2,635,381	218,382
3332950211	Semiconductor wafer processing equipment: thin layer physical vapor deposition.....	(D)	895,821	50,447
3332950401	Microlithography, including aligners.....	247,473	33,740	1,275,704
3332950416	Semiconductor wafer processing equipment: thin layer epitaxial growth deposition.....	(D)	8,751	25,361
3332950421	Semiconductor wafer processing equipment: wet etch.....	108,810	35,828	103,618
3332950441	Ion implantation, including current and voltage ion implanters.....	1,088,720	666,759	87,410
3332950456	Wafer processing equipment: pattern generating apparatus.....	(D)	2,375,094	341,297
3332950461	Other semiconductor wafer processing equipment.....	(D)	1,324,399	969,767
3332950500	Parts for semiconductor manufacturing machinery, including packaging equipment.....	1,455,013	577,679	689,029
3344111130	Power and special-purpose electron tubes, except forward wave tubes.....	295,960	113,343	102,464
3344114	Receiving-type electron tubes, including cathode ray (new and rebuilt).....	216,245	235,708	273,256
3344117	Electron tube parts.....	48,721	44,894	34,236
3344120105, 110, 115, 120, 125, 130, 139	Bare printed circuit boards.....	4,731,918	1,864,413	1,894,998
3344131550	Monolithic integrated circuits, digital, nonsilicon.....	1,095,666	338,509	98,307
3344131943, 945, 552	Monolithic integrated circuits, digital, silicon.....	(D)	1,470,185	5,671,006
3344131574, 575, 576, 577, 578	Metal oxide (MOS) semiconductor, field effect transistors: Volatile memory DRAMs.....	(D)	756,614	3,734,951
3344131583, 587	Metal oxide (MOS) semiconductor, field effect transistors: Volatile memory SRAMs.....	(D)	114,017	45,300
3344131581, 588, 593	Metal oxide (MOS) semiconductor, field effect transistors: Nonvolatile EEPROMs.....	(D)	359,973	1,397,104
3344131255	Metal oxide (MOS) semiconductor, field effect transistors: Microprocessors (MPU) operating with an external data bus of 8 bits or less.....	1,261,902	80,531	361,981
3344131258	Metal oxide (MOS) semiconductor, field effect transistors: Microprocessors (MPU) operating with an external data bus of 16 bits.....	(D)	51,333	366,810
3344131261	Metal oxide (MOS) semiconductor, field effect transistors: Microprocessors (MPU) operating with an external data bus of 32 bits or more.....	(D)	707,304	1,587,828
3344131903, 907, 3344131918, 951	Nondigital silicon monolithic integrated circuits, including linear, analog, etc. ....	5,969,969	1,789,842	4,963,627
	Hybrid integrated circuits.....	1,109,213	469,933	508,536
3344134	Transistors.....	672,282	533,136	1,173,282
3344137	Diodes and rectifiers.....	457,082	489,162	646,593
334413A105	Solar cells.....	117,891	442,717	446,730
334413A123	Light-emitting diodes (LEDs).....	702,916	497,016	841,876
334413A137	Other light-sensitive and light-emitting devices.....	461,740	160,621	442,512
334413A140	Thyristors, SCR's, triacs, and PNP diodes.....	(D)	36,625	202,196
334413A155	Chips and wafers for integrated circuits.....	4,533,015	(S)	3,568,670
334413A160	Chips and wafers for discrete semiconductors.....	1,682,619	1,933,764	331,204
334413A165	All other semiconductor parts (headers, packages, heat sinks, other accessories, etc. ....	1,220,889	202,986	161,855
3344140173	Capacitors.....	902,132	965,338	1,610,455
3344140175	Parts for capacitors, including unfinished chips for further finishing and assembly.....	161,752	121,984	31,952
3344150182	Resistors.....	473,306	316,267	705,019
3344150184	Parts for resistors.....	146,693	77,170	46,432
3344160	Electronic coils, transformers, and other inductors.....	1,309,883	308,999	884,069
3344171	Coaxial (RF) connectors for electronic circuitry.....	406,575	196,311	306,746
3344174	Cylindrical connectors for electronic circuitry.....	823,576	91,510	210,164
3344177	Rack and panel (rectangular) connectors for electronic circuitry.....	331,461	64,058	71,967
334417A	Printed circuit connectors for electronic circuitry.....	1,100,975	496,092	608,255
3344191180	Piezoelectric devices.....	467,994	254,353	404,541
3344197	Switches, mechanical, for electronic circuitry.....	773,428	867,863	1,914,476

D Withheld to avoid disclosing data for individual companies. S Does not meet publication standards.

1/Source: Census Bureau report EM 545, U.S. Exports.

2/Source: Census Bureau report IM 145, General Imports for Consumption.

3/Value represents the c.i.f. (cost, insurance, and freight) value at port of entry in the United States plus import duties.

Note: For comparison of the North American Industry Classification System (NAICS)-based product codes with Schedule B export codes, and HTSUSA import codes, see Table 4.

Table 4. Comparison of North American Industry Classification System (NAICS)-Based Product Codes with Schedule B Export Codes, and HTSUSA Import Codes: 2006

Product code	Product description	Export code 1/	Import code 2/
3332950106	Semiconductor wafer processing equipment: thin layer chemical vapor deposition....	8479.89.8476	8479.89.8476
3332950211	Semiconductor wafer processing equipment: thin layer physical vapor deposition....	8543.89.1000	8543.89.1000
3332950401	Microlithography, including aligners.....	9010.42.0000	9010.42.0000
3332950416	Semiconductor wafer processing equipment: thin layer epitaxial growth deposition..	8479.89.8472	8479.89.8472
3332950421	Semiconductor wafer processing equipment: wet etch.....	8464.90.1040 8464.90.6000	8464.90.1040 8464.90.6000
3332950441	Ion implantation, including current and voltage ion implanters.....	8543.11.0000	8543.11.0000
3332950456	Wafer processing equipment: pattern generating apparatus.....	8456.91.0000 9010.41.0000	8456.10.6000 8456.91.0000 9010.41.0040 9010.41.0080
3332950461	Other semiconductor wafer processing equipment.....	8421.19.0000 8424.89.3000 8456.99.1000 8464.10.0040 8479.89.8474 8479.89.8490 8480.71.4000 8514.30.2000 9010.49.0000	8421.19.3000 8424.89.3000 8424.89.5000 8456.99.1000 8456.99.7000 8462.21.4045 8462.21.4085 8462.29.4045 8462.29.4085 8464.10.0040 8464.20.1000 8465.99.4000 8477.10.7000 8477.40.4000 8477.59.4000 8479.89.8474 8479.89.8490 8479.89.8700 8480.71.4000 8514.30.2000 8514.30.6000 9010.49.0000
3332950500	Parts for semiconductor manufacturing machinery, including packaging equipment.....	8543.90.1000	8424.90.9080 8543.90.1000 8543.90.6400 8543.90.8400
3344111130	Power and special purpose electron tubes, except forward wave tubes.....	8540.71.2000 8540.71.4000 8540.72.0000 8540.79.0000 8540.89.0020 8540.89.0040 8540.89.0080	8540.71.2000 8540.71.4000 8540.72.0000 8540.79.0000 8540.89.0020 8540.89.0040 8540.89.0080
3344114	Receiving-type electron tubes, including cathode ray (new and rebuilt).....	8540.11.0035 8540.11.0070 8540.11.0080 8540.12.0000 8540.60.0055 8540.60.0080 8540.81.0000	8540.11.1030 8540.11.1040 8540.11.1050 8540.11.1055 8540.11.1065 8540.11.1080 8540.11.2401 8540.11.2801 8540.11.3000 8540.11.4401 8540.11.4801 8540.11.5000 8540.12.1040 8540.12.1080 8540.12.2000

Table 4. Comparison of North American Industry Classification System (NAICS)-Based Product Codes with Schedule B Export Codes, and HTSUSA Import Codes: 2006

Product code	Product description	Export code 1/	Import code 2/
	Receiving-type electron tubes, including cathode ray (new and rebuilt) (Continued)		8540.12.5040 8540.12.5080 8540.12.7000 8540.60.0020 8540.60.0040 8540.60.0060 8540.60.0080 8540.81.0000
3344117	Electron tube parts.....	8540.91.2000 8540.91.4000 8540.99.0000	8540.91.1500 8540.91.2000 8540.91.5000 8540.99.4000 8540.99.8000
3344120105, 110, 115, 120, 125, 130, 139	Bare printed circuit boards.....	8534.00.0020 8534.00.0040 8534.00.0050 8534.00.0070 8534.00.0080 8534.00.0085 8534.00.0095	8534.00.0020 8534.00.0040 8534.00.0050 8534.00.0070 8534.00.0080 8534.00.0085 8534.00.0095
3344131550	Monolithic integrated circuits, digital, nonsilicon.....	8542.21.8091 8542.21.8099	8542.21.8091 8542.21.8099
3344131943, 945, 552	Monolithic integrated circuits, digital, silicon.....	8542.21.8088	8542.21.8081 8542.21.8082 8542.21.8089
3344131574, 575, 576, 577, 578	Metal oxide (MOS) semiconductor, field effect transistors: Volatile memory DRAMs.....	8542.21.8021 8542.21.8028	8542.21.8020 8542.21.8024 8542.21.8025 8542.21.8026 8542.21.8027 8542.21.8028 8542.21.8030
3344131583, 587	Metal oxide (MOS) semiconductor, field effect transistors: Volatile memory SRAMs.....	8542.21.8031 8542.21.8038	8542.21.8031 8542.21.8032 8542.21.8039
3344131581, 588, 593	Metal oxide (MOS) semiconductor, field effect transistors: Nonvolatile EEPROMs.....	8542.21.8048	8542.21.8041 8542.21.8042 8542.21.8049
3344131255	Metal oxide (MOS) semiconductor, field effect transistors: Microprocessors (MPU) operating with an external data bus of 8 bits or less.....	8542.21.8071	8542.21.8071
3344131258	Metal oxide (MOS) semiconductor, field effect transistors: Microprocessors (MPU) operating with an external data bus of 16 bits.....	8542.21.8072	8542.21.8072
3344131261	Metal oxide (MOS) semiconductor, field effect transistors: Microprocessors (MPU) operating with an external data bus of 32 bits or more.....	8542.21.8079	8542.21.8079
3344131903, 907, 962	Nondigital silicon monolithic integrated circuits including linear, analog, radio frequency, etc. ....	8542.29.0020 8542.29.0030 8542.29.0040 8542.29.0050	8542.29.0020 8542.29.0030 8542.29.0040 8542.29.0050
3344131918, 951	Hybrid integrated circuits.....	8542.60.0075 8542.60.0095	8542.60.0075 8542.60.0095
3344134	Transistors.....	8541.21.0080 8541.29.0080	8541.21.0075 8541.21.0095 8541.29.0075 8541.29.0095

Table 4. Comparison of North American Industry Classification System (NAICS)-Based Product Codes with Schedule B Export Codes, and HTSUSA Import Codes: 2006

Product code	Product description	Export code 1/	Import code 2/
3344137	Diodes and rectifiers.....	8541.10.0050	8541.10.0050
		8541.10.0060	8541.10.0060
		8541.10.0070	8541.10.0070
		8541.10.0080	8541.10.0080
		8541.40.6050	8541.40.6050
334413A105	Solar cells.....	8541.40.6020	8541.40.6020
		8541.40.6030	8541.40.6030
334413A123	Light-emitting diodes (LEDs).....	8541.40.2000	8541.40.2000
334413A137	Other light sensitive and light-emitting devices.....	8541.40.7080	8541.40.7080
		8541.40.8000	8541.40.8000
		8541.40.9500	8541.40.9500
334413A140	Thyristors, SCR's, triacs, and PNP diodes.....	8541.30.0080	8541.30.0080
334413A155	Chips and wafers for integrated circuits.....	8542.10.0000	8542.10.0000
		8542.21.8005	8542.21.8005
		8542.21.8010	8542.21.8010
		8542.29.0010	8542.29.0010
		8542.90.0000	8542.90.0000
334413A160	Chips and wafers for discrete semiconductors.....	8541.10.0040	8541.10.0040
		8541.21.0040	8541.21.0040
		8541.29.0040	8541.29.0040
		8541.30.0040	8541.30.0040
		8541.40.6010	8541.40.6010
		8541.40.7040	8541.40.7040
		8541.50.0040	8541.50.0040
8541.50.0080	8541.50.0080		
334413A165	All other semiconductor parts, including headers, packages, and heat sinks, accessories, etc. ....	8541.90.0000	8541.90.0000
3344140173	Capacitors.....	8532.21.0020	8532.21.0020
		8532.21.0040	8532.21.0040
		8532.21.0050	8532.21.0050
		8532.21.0080	8532.21.0080
		8532.22.0020	8532.22.0020
		8532.22.0040	8532.22.0040
		8532.22.0055	8532.22.0055
		8532.22.0085	8532.22.0085
		8532.23.0020	8532.23.0020
		8532.23.0040	8532.23.0040
		8532.23.0060	8532.23.0060
		8532.24.0020	8532.24.0020
		8532.24.0040	8532.24.0040
		8532.24.0060	8532.24.0060
		8532.25.0010	8532.25.0010
		8532.25.0020	8532.25.0020
		8532.25.0030	8532.25.0030
		8532.25.0040	8532.25.0040
		8532.25.0060	8532.25.0060
		8532.25.0070	8532.25.0070
8532.25.0080	8532.25.0080		
8532.29.0020	8532.29.0020		
8532.29.0040	8532.29.0040		
8532.30.0010	8532.30.0010		
8532.30.0090	8532.30.0090		
3344140175	Parts for capacitors, including unfinished chips for further finishing and assembly.....	8532.90.0000	8532.90.0000
3344150182	Resistors.....	8533.10.0020	8533.10.0020
		8533.10.0042	8533.10.0042
		8533.10.0057	8533.10.0057
		8533.10.0070	8533.10.0060
		8533.21.0025	8533.10.0065
		8533.21.0045	8533.21.0010
		8533.21.0075	8533.21.0020

Table 4. Comparison of North American Industry Classification System (NAICS)-Based Product Codes with Schedule B Export Codes, and HTSUSA Import Codes: 2006

Product code	Product description	Export code 1/	Import code 2/
	Resistors (Continued)	8533.21.0080	8533.21.0030
		8533.21.0090	8533.21.0040
		8533.31.0000	8533.21.0050
		8533.39.0080	8533.21.0060
		8533.40.0080	8533.21.0070
			8533.21.0080
			8533.21.0090
			8533.31.0000
			8533.39.0080
			8533.40.8050
			8533.40.8060
			8533.40.8070
3344150184	Parts for resistors.....	8533.90.0000	8533.90.4000 8533.90.8000
3344160	Electronic coils, transformers, and other inductors.....	8504.31.2000	8504.31.2000
		8504.31.4035	8504.31.4035
		8504.31.4065	8504.31.4065
		8504.31.6000	8504.31.6000
		8504.32.0000	8504.32.0000
		8504.33.0020	8504.33.0020
		8504.33.0040	8504.33.0040
		8504.34.0000	8504.34.0000
		8529.90.3540	8529.90.3300
		8540.91.2000	8529.90.3600 8540.91.2000
3344171	Coaxial (RF) connectors for electronic circuitry.....	8536.69.4010	8536.69.4010
3344174	Cylindrical connectors for electronic circuitry.....	8536.69.4020	8536.69.4020
3344177	Rack and panel (rectangular) connectors for electronic circuitry.....	8536.69.4030	8536.69.4030
334417A	Printed circuit connectors for electronic circuitry.....	8536.69.5050	8536.69.4050
3344191180	Piezoelectric devices.....	7104.10.0000	7104.10.0000
		8541.60.0025	8541.60.0010
		8541.60.0060	8541.60.0020
		8541.60.0080	8541.60.0030
			8541.60.0050
			8541.60.0060
			8541.60.0080
3344197	Switches, mechanical, for electronic circuitry.....	8536.50.7000	8536.50.7000 **
		8536.50.9020	8536.50.9020
		8536.50.9025	8536.50.9025
		8536.50.9030	8536.50.9031
		8536.50.9035	8536.50.9032
		8536.50.9040	8536.50.9033
		8536.50.9045	8536.50.9035
		8536.50.9050	8536.50.9040
		8536.50.9055	8536.50.9045
		8536.50.9065	8536.50.9050
			8536.50.9055
			8536.50.9065

\*\* HS codes include switches of product class 36433.

1/Source: 2006 edition, Harmonized System-based Schedule B, Statistical Classification of Domestic and Foreign Commodities Exported from the United States.

2/Source: Harmonized Tariff Schedule of the United States, Annotated (2006).

# Appendix.

## General CIR Survey Information, Explanation of General Terms and Historical Note

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### GENERAL

The CIR program has been providing monthly, quarterly, and annual measures of industrial activity for many years. Since 1904, with its cotton and fats and oils surveys, the CIR program has formed an essential part of an integrated statistical system involving the quinquennial economic census, manufacturing sector, and the annual survey of manufactures. The CIR surveys, however, provide current statistics at a more detailed product level than either of the other two statistical programs.

The primary objective of the CIR program is to produce timely, accurate data on production and shipments of selected products. The data are used to satisfy economic policy needs and for market analysis, forecasting, and decision making in the private sector. The product-level data generated by these surveys are used extensively by individual firms, trade associations, and market analysts in planning or recommending marketing and legislative strategies, particularly if their industry is significantly affected by foreign trade. Although production and shipments information are the two most common data items collected, the CIR program collects other measures also such as inventories, orders, and consumption. These surveys measure manufacturing activity in important commodity areas such as textiles and apparel, chemicals, primary metals, computer and electronic components, industrial equipment, aerospace equipment, and consumer goods.

The CIR program uses a unified data collection, processing, and publication system. The U.S. Census Bureau updates the survey panels for most reports annually and reconciles the estimates to the results of the broader-based annual survey of manufactures and the economic census, manufacturing sector. The manufacturing sector provides a complete list of all producers of the products covered by the CIR program and serves as the primary source for CIR sampling. Where a small number of producers exist, CIR surveys cover all known producers of a product. However, when the number of producers is too large, cutoff and random sampling techniques are used. Surveys are continually reviewed and modified to provide the most up-to-date information on products produced. The CIR program includes a group of mandatory and voluntary surveys. Typically the monthly and quarterly surveys are conducted on a voluntary basis. Those companies that choose not to respond to the voluntary surveys are required to submit a mandatory annual counterpart corresponding to the more frequent survey.

### NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS), 1997

The adoption of the North American Industry Classification System (NAICS) in the 1997 Economic Census has had a major impact on the comparability of current and historic data. Approximately half of the industries in the manufacturing sector of NAICS do not have comparable industries in the Standard Industrial Classification (SIC) system that was used in the past.

While most of the change affecting the manufacturing sector was change within the sector, some industries left manufacturing and others came into manufacturing. Prominent among those that left manufacturing are logging and portions of publishing. Prominent among the industries that came into the manufacturing sector are bakeries, candy stores where candy is made on the premises, custom tailors, makers of custom draperies, and tire retreading. The net effect of the classification changes are such that if the 1997 value of shipments data for all manufacturers were tabulated on an SIC basis, it would be approximately 3 percent higher.

Listed below are the NAICS sectors:

- 21 Mining
- 22 Utilities
- 23 Construction
- 31–33 Manufacturing
- 42 Wholesale Trade
- 44–45 Retail Trade
- 48–49 Transportation and Warehousing
- 51 Information
- 52 Finance and Insurance
- 53 Real Estate and Rental and Leasing
- 54 Professional, Scientific, and Technical Services
- 55 Management of Companies and Enterprises
- 56 Administrative and Support and Waste Management and Remediation Services
- 61 Educational Services
- 62 Health Care and Social Assistance
- 71 Arts, Entertainment, and Recreation
- 72 Accommodation and Foodservices
- 81 Other Services (except Public Administration)

(Not listed above are the Agriculture, Forestry, Fishing, and Hunting sector (NAICS 11), partially covered by the census of agriculture conducted by the U.S. Department of Agriculture, and the Public Administration sector (NAICS 92), covered by the census of governments conducted by the Census Bureau.)

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The 20 NAICS sectors are subdivided into 96 subsectors (three-digit codes), 313 industry groups (four-digit codes), and, as implemented in the United States, 1170 industries (five- and six-digit codes).

## FUNDING

The Census Bureau funds most of the surveys. However, a number of surveys are paid for either fully or partially by other Federal Government agencies or private trade associations. A few surveys are mandated, but all are authorized by Title 13 of the United States Code.

## RELIABILITY OF DATA

Survey error may result from several sources including the inability to obtain information about all cases in the survey, response errors, definitional difficulties, differences in the interpretation of questions, mistakes in recording or coding the reported data, and other errors of collection, response, coverage, and estimation. These nonsampling errors also occur in complete censuses. Although no direct measurement of the biases due to these nonsampling errors has been obtained, precautionary steps were taken in all phases of the collection, processing, and tabulation of the data in an effort to minimize their influence.

A major source of bias in the published estimates is the imputing of data for nonrespondents, for late reporters, and for data that fail logic edits. Missing figures are imputed based on period-to-period movements shown by reporting firms. A figure is considered to be an impute if the value was not directly reported on the questionnaire, directly derived from other reported items, directly available from supplemental sources, or obtained from the respondent during the analytical review phase. Imputation generally is limited to a maximum of 10 percent for any one data cell. Figures with imputation rates greater than 10 percent are suppressed or footnoted. The imputation rate is not an explicit indicator of the potential error in published figures due to nonresponse, because the actual yearly movements for nonrespondents may or may not closely agree with the imputed movements. The range of difference between the actual and imputed figures is assumed to be small. The degree of uncertainty regarding the accuracy of the published data increases as the percentage of imputation increases. Figures with imputation rates above 10 percent should be used with caution.

## DATA REVISIONS

Statistics for previous years may be revised as the result of corrected figures from respondents, late reports for which imputations were originally made, or other corrections. Data that have been revised by more than 5 percent from previously published data are indicated by footnotes.

## DISCLOSURE

The Census Bureau collects the CIR data under the authority of Title 13, United States Code, which specifies that the information can only be used for statistical purposes and cannot be published or released in any manner that would identify a person, household, or establishment. "D" indicates that data in the cell have been suppressed to avoid disclosure of information pertaining to individual companies.

## EXPLANATION OF GENERAL TERMS

**Capacity.** The maximum quantity of a product that can be produced in a plant in 1 day if operating for 24 hours. Includes the capacity of idle plants until the plant is reported to be destroyed, dismantled, or abandoned.

**Consumption.** Materials used in producing or processing a product or otherwise removing the product from the inventory.

**Exports.** Includes all types of products shipped to foreign countries, or to agents or exporters for reshipment to foreign countries.

**Gross shipments.** The quantity or value of physical shipments from domestic establishments of all products sold, transferred to other establishments of the same company, or shipped on consignment, whether for domestic or export sale or use. Shipments of products purchased for resale are omitted. Shipments of products made under toll arrangements are included.

**Interplant transfers.** Shipments to other domestic plants within a company for further assembly, fabrication, or manufacture.

**Inventories.** The quantity or value of finished goods, work in progress, and materials on hand.

**Machinery in place.** The number of machines of a particular type in place as of a particular date whether the machinery was used for production, prototype, or sampling, or was idle. Machinery in place includes all machinery set up in operating positions.

**Net receipts.** Derived by subtracting the materials held at the end of the previous month from the sum of materials used during the current month.

**Production.** The total volume of products produced, including: products sold; products transferred or added to inventory after adjustments for breakage, shrinkage, and obsolescence, plus any other inventory adjustment; and products that undergo further manufacture at the same establishment.

**Quantities produced and consumed.** Quantities of each type of product produced by a company for internal consumption within that same company.

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**Quantity and value of new orders.** The sales value of orders received during the current reporting period for products and services to be delivered immediately or at some future date. Also represents the net sales value of contract change documents that increase or decrease the sales value of the orders to which they are related, when the parties concerned are in substantial agreement as to the amount involved. Included as orders are only those that are supported by binding legal documents such as signed contracts or letter contracts.

**Quantity and value of shipments.** The figures on quantity and value of shipments represent physical shipments of all products sold, transferred to other establishments of the same company, or shipped on consignment, whether for domestic or export sale. The value represents the net sales price, f.o.b. plant, to the customer or branch to which the products are shipped, net of discounts, allowances, freight charges, and returns. Shipments to a company's own branches are assigned the same value as comparable appropriate allocation of company overhead and profit. Products bought and resold without further manufacture are excluded.

**Stocks.** Total quantity of ending finished inventory.

**Unfilled orders (backlog).** Calculated by adding net new orders and subtracting net sales from the backlog at the end of the preceding year.

#### **HISTORICAL NOTE**

Data on selected electronic and associated products have been collected by the Census Bureau since 1961 on survey MA36N, Selected Electronics and Associated Products. In 1985, survey MA36N was divided into three annual surveys which are presently collected as: MA334P, Communication Equipment, Including Telephone, Telegraph, and Other Electronic Systems and Equipment; MA334Q, Semiconductors, Printed Circuit Boards, and Other Electronic Components; and MA334S, Electromedical Equipment and Irradiation Equipment (Including X-Ray). Beginning in 2005 data for the MA334Q will be collected under the title Semiconductors, Electronic Components, and Semiconductor Manufacturing Equipment. Historical data may be obtained from Current Industrial Reports available at your local Federal Depository Library.