

**THE SCHEDULE OF THE STRATEGIC GOODS (CONTROL) ORDER 2009**

PART II

DUAL-USE GOODS THE EXPORT, TRANSHIPMENT OR BRINGING IN  
TRANSIT OF WHICH, AND TECHNOLOGY THE EXPORT OR  
TRANSMISSION OF WHICH, REQUIRE A PERMIT

*Division 2 – List of Dual-Use Goods*

<i>Product Code</i>	<i>Item Description</i>
<b>CATEGORY 3 – ELECTRONICS</b>	
<b>3A</b>	<b>Systems, Equipment and Components</b>
	<p><u>Note 1</u> <i>Equipment and components described in Category Code 3A001 or 3A002, other than those described in Category Code 3A001.a.3. to 3A001.a.10. or 3A001.a.12., which are specially designed for or which have the same functional characteristics as other equipment shall only be treated as coming within that description if that other equipment is included in Division 2 of this Part.</i></p> <p><u>Note 2</u> <i>Integrated circuits described in Category Code 3A001.a.3. to 3A001.a.9. or 3A001.a.12. which are unalterably programmed or designed for a specific function for another equipment shall only be treated as coming within that description if that other equipment is included in Division 2 of this Part.</i></p> <p><u>N.B.</u> <i>Where it is unclear if the other equipment is included in Division 2 of this Part, then the integrated circuit is treated as falling within Category Code 3A001.a.3. to 3A001.a.9. or 3A001.a.12. if it comes within the relevant description therein.</i></p> <p><i>If the integrated circuit is a silicon-based “microcomputer microcircuit” or microcontroller microcircuit described in Category Code 3A001.a.3. having an operand (data) word length of 8 bit or less, then it is treated as falling within that Category Code if it comes within the description therein.</i></p>
DL3A001	<p>Electronic components and specially designed components therefor, as follows:</p> <p>a. General purpose integrated circuits, as follows:</p> <p><u>Note 1</u> <i>Category Code 3A001.a. includes wafers (finished or unfinished) in which the function has been determined, if it comes within the</i></p>

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	<p><i>parameters set out therein.</i></p> <p><u>Note 2</u></p> <p><i>Integrated circuits include the following types:</i></p> <ul style="list-style-type: none"> <li>— “<i>Monolithic integrated circuits</i>”;</li> <li>— “<i>Hybrid integrated circuits</i>”;</li> <li>— “<i>Multichip integrated circuits</i>”;</li> <li>— “<i>Film type integrated circuits</i>”, including <i>silicon-on-sapphire integrated circuits</i>;</li> <li>— “<i>Optical integrated circuits</i>”.</li> </ul> <p>1. Integrated circuits, designed or rated as radiation hardened to withstand any of the following:</p> <ul style="list-style-type: none"> <li>a. A total dose of <math>5 \times 10^3</math> Gy (silicon) or higher;</li> <li>b. A dose rate upset of <math>5 \times 10^6</math> Gy (silicon)/s or higher; <u>or</u></li> <li>c. A fluence (integrated flux) of neutrons (1 MeV equivalent) of <math>5 \times 10^{13}</math> n/cm<sup>2</sup> or higher on silicon, or its equivalent for other materials;</li> </ul> <p><u>Note</u></p> <p><i>Category Code 3A001.a.1.c. does not include Metal Insulator Semiconductors (MIS).</i></p> <p>2. “Microprocessor microcircuits”, “microcomputer microcircuits”, microcontroller microcircuits, storage integrated circuits manufactured from a compound semiconductor, analogue-to-digital converters, digital-to-analogue converters, electro-optical or “optical integrated circuits” designed for “signal processing”, field programmable logic devices, custom integrated circuits for which either the function is unknown or it is unknown if the equipment in which the integrated circuit will be used is included in this Part, Fast Fourier Transform (FFT) processors, electrical erasable programmable read-only memories (EEPROMs), flash memories or static random-access memories (SRAMs), having any of the following:</p> <ul style="list-style-type: none"> <li>a. Rated for operation at an ambient temperature above 398 K (125°C);</li> <li>b. Rated for operation at an ambient temperature below 218 K (–55°C); <u>or</u></li> <li>c. Rated for operation over the entire ambient temperature range from 218 K (–55°C) to 398 K (125°C);</li> </ul> <p><u>Note</u></p>

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	<p><i>Category Code 3A001.a.2. does not include integrated circuits for civil automobiles or railway train applications.</i></p>
	<p>3. “Microprocessor microcircuits”, “microcomputer microcircuits” and microcontroller microcircuits, manufactured from a compound semiconductor and operating at a clock frequency exceeding 40 MHz;</p> <p><u>Note</u></p> <p><i>Category Code 3A001.a.3. includes digital signal processors, digital array processors and digital coprocessors.</i></p>
	<p>4. Storage integrated circuits manufactured from a compound semiconductor;</p>
	<p>5. Analogue-to-digital and digital-to-analogue converter integrated circuits, as follows:</p>
	<p>a. Analogue-to-digital converters having any of the following:</p> <p><b><u>N.B.</u></b></p> <p><b><i>See also Category Code 3A101.</i></b></p> <ol style="list-style-type: none"> <li>1. A resolution of 8 bit or more, but less than 10 bit, with an output rate greater than 500 million words per second;</li> <li>2. A resolution of 10 bit or more, but less than 12 bit, with an output rate greater than 200 million words per second;</li> <li>3. A resolution of 12 bit with an output rate greater than 105 million words per second;</li> <li>4. A resolution of more than 12 bit, but equal to or less than 14 bit, with an output rate greater than 10 million words per second; <u>or</u></li> <li>5. A resolution of more than 14 bit with an output rate greater than 2.5 million words per second;</li> </ol>
	<p>b. Digital-to-analogue converters with a resolution of 12 bit or more, and a “settling time” of less than 10 ns;</p>
	<p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. A resolution of <math>n</math> bit corresponds to a quantisation of <math>2^n</math> levels.</li> <li>2. The number of bits in the output word is equal to the resolution of the analogue-to-digital converter.</li> <li>3. The output rate is the maximum output rate of the converter, regardless of the architecture or oversampling. The output rate may be referred to as sampling rate, conversion rate or throughput rate. It is often specified in megahertz (MHz) or mega</li> </ol>

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	<p><i>samples per second (MSPS).</i></p> <p>4. For the purpose of measuring output rate, one output word per second is equivalent to one Hertz or one sample per second.</p>
	<p>6. Electro-optical and “optical integrated circuits”, designed for “signal processing” and having all of the following:</p> <p>a. One or more than one internal “laser” diode;</p> <p>b. One or more than one internal light detecting element; <u>and</u></p> <p>c. Optical waveguides;</p>
	<p>7. ‘Field programmable logic devices’ having any of the following:</p> <p>a. An equivalent usable gate count of more than 30,000 (2 input gates);</p> <p>b. A typical “basic gate propagation delay time” of less than 0.1 ns; <u>or</u></p> <p>c. A toggle frequency exceeding 133 MHz;</p> <p><u>Note</u></p> <p><i>Category Code 3A001.a.7. includes:</i></p> <ul style="list-style-type: none"> <li>— Simple Programmable Logic Devices (SPLDs)</li> <li>— Complex Programmable Logic Devices (CPLDs)</li> <li>— Field Programmable Gate Arrays (FPGAs)</li> <li>— Field Programmable Logic Arrays (FPLAs)</li> <li>— Field Programmable Interconnects (FPICs)</li> </ul> <p><u>Technical Note</u></p> <p><i>‘Field programmable logic devices’ are also known as field programmable gate or field programmable logic arrays.</i></p>
	<p>8. Not used;</p>
	<p>9. Neural network integrated circuits;</p>
	<p>10. Custom integrated circuits for which the function is unknown, having any of the following:</p> <p>a. More than 1,000 terminals;</p> <p>b. A typical “basic gate propagation delay time” of less than 0.1 ns; <u>or</u></p> <p>c. An operating frequency exceeding 3 GHz;</p>
	<p>11. Digital integrated circuits, other than those described in Category</p>

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	<p>Codes 3A001.a.3. to 3A001.a.10. and 3A001.a.12., based upon any compound semiconductor and having any of the following:</p> <p>a. An equivalent gate count of more than 3,000 (2 input gates); <u>or</u></p> <p>b. A toggle frequency exceeding 1.2 GHz;</p> <p>12. Fast Fourier Transform (FFT) processors having a rated execution time for an N-point complex FFT of less than <math>(N \log_2 N)/20,480</math> ms, where N is the number of points;</p> <p><u>Technical Note</u></p> <p><i>When N is equal to 1,024 points, the formula in Category Code 3A001.a.12. gives an execution time of 500 <math>\mu</math>s.</i></p> <p>b. Microwave or millimetre wave components, as follows:</p> <p>1. Electronic vacuum tubes and cathodes, as follows:</p> <p><u>Note 1</u></p> <p><i>Category Code 3A001.b.1. does not include tubes designed or rated for operation in any frequency band having all of the following:</i></p> <p>a. <i>Does not exceed 31.8 GHz; <u>and</u></i></p> <p>b. <i>Is “allocated by the ITU” for radio-communications services, but not for radio-determination.</i></p> <p><u>Note 2</u></p> <p><i>Category Code 3A001.b.1. does not include non-“space-qualified” tubes having all of the following:</i></p> <p>a. <i>An average output power equal to or less than 50 W; <u>and</u></i></p> <p>b. <i>Designed or rated for operation in any frequency band which meets all of the following characteristics:</i></p> <p>1. <i>Exceeds 31.8 GHz but does not exceed 43.5 GHz; <u>and</u></i></p> <p>2. <i>Is “allocated by the ITU” for radio-communications services, but not for radio-determination.</i></p> <p>a. Travelling wave tubes, pulsed or continuous wave, as follows:</p> <p>1. Tubes operating at frequencies exceeding 31.8 GHz;</p> <p>2. Tubes having a cathode heater element with a turn on time to rated RF power of less than 3 seconds;</p> <p>3. Coupled cavity tubes, or derivatives thereof, with a “fractional bandwidth” of more than 7% or a peak power exceeding 2.5 kW;</p>

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	<p>4. Helix tubes, or derivatives thereof, having any of the following:</p> <ul style="list-style-type: none"> <li>a. An “instantaneous bandwidth” of more than one octave, and average power (expressed in kW) times frequency (expressed in GHz) of more than 0.5;</li> <li>b. An “instantaneous bandwidth” of one octave or less, and average power (expressed in kW) times frequency (expressed in GHz) of more than 1; <u>or</u></li> <li>c. Being “space qualified”;</li> </ul>
	<p>b. Crossed-field amplifier tubes with a gain of more than 17 dB;</p>
	<p>c. Impregnated cathodes designed for electronic tubes producing a continuous emission current density at rated operating conditions exceeding 5 A/cm<sup>2</sup>;</p>
	<p>2. Microwave “Monolithic Integrated Circuits” (MMIC) power amplifiers having any of the following:</p> <ul style="list-style-type: none"> <li>a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6 GHz and with an average output power greater than 4 W (36 dBm) with a “fractional bandwidth” greater than 15%;</li> <li>b. Rated for operation at frequencies exceeding 6 GHz up to and including 16 GHz and with an average output power greater than 1 W (30 dBm) with a “fractional bandwidth” greater than 10%;</li> <li>c. Rated for operation at frequencies exceeding 16 GHz up to and including 31.8 GHz and with an average output power greater than 0.8 W (29 dBm) with a “fractional bandwidth” greater than 10%;</li> <li>d. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz;</li> <li>e. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5 GHz and with an average output power greater than 0.25 W (24 dBm) with a “fractional bandwidth” greater than 10%; <u>or</u></li> <li>f. Rated for operation at frequencies exceeding 43.5 GHz;</li> </ul> <p><u>Note 1</u></p> <p><i>Category Code 3A001.b.2. does not include broadcast satellite equipment designed or rated to operate in the frequency range of 40.5 GHz to 42.5 GHz.</i></p> <p><u>Note 2</u></p> <p><i>Whether any MMIC whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by Category Codes 3A001.b.2.a. to 3A001.b.2.f., is included in that</i></p>

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	<p data-bbox="475 302 1382 367"><i>Category is determined by the lowest average output power control threshold.</i></p> <p data-bbox="475 392 564 423"><u>Note 3</u></p> <p data-bbox="475 443 1382 548"><i>Notes 1 and 2 in the chapeau to Category 3 mean that Category Code 3A001.b.2. does not include MMICs if they are specially designed for other applications, e.g., telecommunications, radar, automobiles.</i></p> <p data-bbox="438 586 1382 1176"> 3. Discrete microwave transistors having any of the following: <ul style="list-style-type: none"> <li data-bbox="475 640 1382 745">a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6 GHz and having an average output power greater than 60 W (47.8 dBm);</li> <li data-bbox="475 768 1382 873">b. Rated for operation at frequencies exceeding 6 GHz up to and including 31.8 GHz and having an average output power greater than 20 W (43 dBm);</li> <li data-bbox="475 896 1382 1001">c. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz and having an average output power greater than 0.5 W (27 dBm);</li> <li data-bbox="475 1023 1382 1128">d. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5 GHz and having an average output power greater than 1 W (30 dBm); <u>or</u></li> <li data-bbox="475 1151 1225 1176">e. Rated for operation at frequencies exceeding 43.5 GHz;</li> </ul> </p> <p data-bbox="475 1198 542 1229"><u>Note</u></p> <p data-bbox="475 1249 1382 1424"><i>Whether a transistor whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by Category Codes 3A001.b.3.a. to 3A001.b.3.e., is included under that Category is determined by the lowest average output power control threshold.</i></p> <p data-bbox="438 1464 1382 2000"> 4. Microwave solid state amplifiers and microwave assemblies/modules containing microwave solid state amplifiers having any of the following: <ul style="list-style-type: none"> <li data-bbox="475 1592 1382 1697">a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6 GHz and with an average output power greater than 60 W (47.8 dBm) with a “fractional bandwidth” greater than 15%;</li> <li data-bbox="475 1720 1382 1825">b. Rated for operation at frequencies exceeding 6 GHz up to and including 31.8 GHz and with an average output power greater than 15 W (42 dBm) with a “fractional bandwidth” greater than 10%;</li> <li data-bbox="475 1848 1382 1912">c. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz;</li> <li data-bbox="475 1935 1382 2000">d. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5 GHz and with an average output power greater than</li> </ul> </p>

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	<p>1 W (30 dBm) with a “fractional bandwidth” greater than 10%;</p> <p>e. Rated for operation at frequencies exceeding 43.5 GHz; <u>or</u></p> <p>f. Rated for operation at frequencies above 3.2 GHz and having all of the following:</p> <ol style="list-style-type: none"> <li>1. An average output power (in watts), P, greater than 150 divided by the maximum operating frequency (in GHz) squared [<math>P &gt; 150 \text{ W} \cdot \text{GHz}^2 / f_{\text{GHz}}^2</math>];</li> <li>2. A “fractional bandwidth” of 5% or greater; <u>and</u></li> <li>3. Any two sides perpendicular to one another with length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [<math>d \leq 15 \text{ cm} \cdot \text{GHz} / f_{\text{GHz}}</math>];</li> </ol>
	<p><u>Technical Note</u></p> <p><i>3.2 GHz is to be used as the lowest operating frequency (<math>f_{\text{GHz}}</math>) in the formula in Category Code 3A001.b.4.f.3., for amplifiers that have a rated operating range extending downward to 3.2 GHz and below [<math>d \leq 15 \text{ cm} \cdot \text{GHz} / 3.2 \text{ GHz}</math>].</i></p> <p><u>N.B.</u></p> <p><i>MMIC power amplifiers should be evaluated against the criteria in Category Code 3A001.b.2.</i></p> <p><u>Note 1</u></p> <p><i>Category Code 3A001.b.4. does not include broadcast satellite equipment designed or rated to operate in the frequency range of 40.5 GHz to 42.5 GHz.</i></p> <p><u>Note 2</u></p> <p><i>Whether an item whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by Category Codes 3A001.b.4.a. to 3A001.b.4.e., is included in that Category is determined by the lowest average output power control threshold.</i></p>
	<p>5. Electronically or magnetically tunable band-pass or band-stop filters having more than 5 tunable resonators capable of tuning across 1.5:1 frequency band (<math>f_{\text{max}}/f_{\text{min}}</math>) in less than 10 <math>\mu\text{s}</math> and having any of the following:</p> <ol style="list-style-type: none"> <li>a. A band-pass bandwidth of more than 0.5% of centre frequency; <u>or</u></li> <li>b. A band-stop bandwidth of less than 0.5% of centre frequency;</li> </ol>
	<p>6. Not used;</p>
	<p>7. Converters and harmonic mixers designed to extend the frequency</p>

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	range of equipment described in Category Code 3A002.c., 3A002.d., 3A002.e. or 3A002.f. beyond the limits stated therein;
	<p>8. Microwave power amplifiers containing tubes specified in Category Code 3A001.b.1. and having all of the following:</p> <ul style="list-style-type: none"> <li>a. Operating frequencies above 3 GHz;</li> <li>b. An average output power density exceeding 80 W/kg; <u>and</u></li> <li>c. A volume of less than 400 cm<sup>3</sup>;</li> </ul> <p><u>Note</u></p> <p><i>Category Code 3A001.b.8. does not include equipment designed or rated for operation in any frequency band which is “allocated by the ITU” for radio-communications services, but not for radio-determination.</i></p>
	<p>9. Microwave power modules (MPM), consisting of, at least, a traveling wave tube, a microwave “monolithic integrated circuit” and an integrated electronic power conditioner and having all of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. A ‘turn-on time’ from off to fully operational in less than 10 seconds;</li> <li>b. A volume less than the maximum rated power in Watts multiplied by 10 cm<sup>3</sup>/W; <u>and</u></li> <li>c. An “instantaneous bandwidth” greater than 1 octave (<math>f_{\max} &gt; 2f_{\min}</math>) and any of the following: <ul style="list-style-type: none"> <li>i. For frequencies equal to or less than 18 GHz, an RF output power greater than 100 W; <u>or</u></li> <li>ii. Having a frequency greater than 18 GHz;</li> </ul> </li> </ul> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. To calculate the control volume in Category Code 3A001.b.9.b., the following example is provided: for a maximum rated power of 20 W, the volume would be: <math>20 \text{ W} \times 10 \text{ cm}^3/\text{W} = 200 \text{ cm}^3</math>.</li> <li>2. The ‘turn-on time’ in Category Code 3A001.b.9.a. refers to the time from fully-off to fully operational; i.e., it includes the warm-up time of the MPM.</li> </ol>
	c. Acoustic wave devices, as follows, and specially designed components therefor:
<ol style="list-style-type: none"> <li>1. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices (i.e., “signal processing” devices employing elastic waves in materials), having any of the following:</li> </ol>	

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	<ul style="list-style-type: none"> <li>a. A carrier frequency exceeding 6 GHz;</li> <li>b. A carrier frequency exceeding 1 GHz, but not exceeding 6 GHz, and having any of the following: <ul style="list-style-type: none"> <li>1. A frequency side-lobe rejection exceeding 55 dB;</li> <li>2. A product of the maximum delay time and the bandwidth (time in <math>\mu\text{s}</math> and bandwidth in MHz) of more than 100;</li> <li>3. A bandwidth greater than 250 MHz; <u>or</u></li> <li>4. A dispersive delay of more than 10 <math>\mu\text{s}</math>; <u>or</u></li> </ul> </li> <li>c. A carrier frequency of 1 GHz or less and having any of the following: <ul style="list-style-type: none"> <li>1. A product of the maximum delay time and the bandwidth (time in <math>\mu\text{s}</math> and bandwidth in MHz) of more than 100;</li> <li>2. A dispersive delay of more than 10 <math>\mu\text{s}</math>; <u>or</u></li> <li>3. A frequency side-lobe rejection exceeding 55 dB and a bandwidth greater than 100 MHz;</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>2. Bulk (volume) acoustic wave devices (i.e., “signal processing” devices employing elastic waves) which permit the direct processing of signals at frequencies exceeding 2.5 GHz;</li> </ul>
	<ul style="list-style-type: none"> <li>3. Acoustic-optic “signal processing” devices employing interaction between acoustic waves (bulk wave or surface wave) and light waves which permit the direct processing of signals or images, including spectral analysis, correlation or convolution;</li> </ul>
	<ul style="list-style-type: none"> <li>d. Electronic devices and circuits containing components, manufactured from “superconductive” materials specially designed for operation at temperatures below the “critical temperature” of at least one of the “superconductive” constituents and having any of the following: <ul style="list-style-type: none"> <li>1. Current switching for digital circuits using “superconductive” gates with a product of delay time per gate (in seconds) and power dissipation per gate (in watts) of less than <math>10^{-14}</math> J; <u>or</u></li> <li>2. Frequency selection at all frequencies using resonant circuits with Q-values exceeding 10,000;</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>e. High energy devices, as follows:</li> </ul>
	<ul style="list-style-type: none"> <li>1. ‘Cells’, as follows:</li> </ul>
	<ul style="list-style-type: none"> <li>a. ‘Primary cells’ having an ‘energy density’ exceeding 550 Wh/kg at 20°C;</li> </ul>
	<ul style="list-style-type: none"> <li>b. ‘Secondary cells’ having an ‘energy density’ exceeding 250</li> </ul>

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	<p data-bbox="512 304 612 338">Wh/kg;</p> <p data-bbox="475 371 675 405"><u>Technical Note</u></p> <ol data-bbox="475 427 1382 1055" style="list-style-type: none"> <li data-bbox="475 427 1382 678">1. For the purpose of Category Code 3A001.e.1., ‘energy density’ (Wh/kg) is calculated from the nominal voltage multiplied by the nominal capacity in ampere-hours (Ah) divided by the mass in kilograms. If the nominal capacity is not stated, energy density is calculated from the nominal voltage squared then multiplied by the discharge duration in hours divided by the discharge load in ohms and the mass in kilograms.</li> <li data-bbox="475 701 1382 842">2. For the purpose of Category Code 3A001.e.1., a ‘cell’ is defined as an electrochemical device, which has positive and negative electrodes, and electrolyte, and is a source of electrical energy. It is the basic building block of a battery.</li> <li data-bbox="475 864 1382 931">3. For the purpose of Category Code 3A001.e.1.a., a ‘primary cell’ is a ‘cell’ that is not designed to be charged by any other source.</li> <li data-bbox="475 954 1382 1055">4. For the purpose of Category Code 3A001.e.1.b., a ‘secondary cell’ is a ‘cell’ that is designed to be charged by an external electrical source.</li> </ol> <p data-bbox="475 1077 539 1111"><u>Note</u></p> <p data-bbox="475 1133 1382 1200">Category Code 3A001.e.1. does not include batteries, including single cell batteries.</p> <p data-bbox="437 1234 1027 1267">2. High energy storage capacitors, as follows:</p> <p data-bbox="475 1290 539 1323"><u>N.B.</u></p> <p data-bbox="475 1346 916 1379"><i>See also Category Code 3A201.a.</i></p> <ol data-bbox="475 1413 1382 1962" style="list-style-type: none"> <li data-bbox="475 1413 1382 1648">a. Capacitors with a repetition rate of less than 10 Hz (single shot capacitors) and having all of the following: <ol data-bbox="512 1503 1254 1648" style="list-style-type: none"> <li data-bbox="512 1503 1126 1536">1. A voltage rating equal to or more than 5 kV;</li> <li data-bbox="512 1559 1254 1592">2. An energy density equal to or more than 250 J/kg; <u>and</u></li> <li data-bbox="512 1615 1102 1648">3. A total energy equal to or more than 25 kJ;</li> </ol> </li> <li data-bbox="475 1671 1382 1962">b. Capacitors with a repetition rate of 10 Hz or more (repetition rated capacitors) and having all of the following: <ol data-bbox="512 1760 1318 1962" style="list-style-type: none"> <li data-bbox="512 1760 1126 1794">1. A voltage rating equal to or more than 5 kV;</li> <li data-bbox="512 1816 1182 1850">2. An energy density equal to or more than 50 J/kg;</li> <li data-bbox="512 1872 1158 1906">3. A total energy equal to or more than 100 J; <u>and</u></li> <li data-bbox="512 1928 1318 1962">4. A charge/discharge cycle life equal to or more than 10,000;</li> </ol> </li> </ol> <p data-bbox="437 1995 1382 2029">3. “Superconductive” electromagnets and solenoids specially designed</p>

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	<p>to be fully charged or discharged in less than one second and having all of the following:</p> <p><b><u>N.B.</u></b>  <b>See also Category Code 3A201.b.</b></p> <p><u>Note</u>  Category Code 3A001.e.3. does not include “superconductive” electromagnets or solenoids specially designed for Magnetic Resonance Imaging (MRI) medical equipment.</p> <p>a. Energy delivered during the discharge exceeding 10 kJ in the first second;</p> <p>b. Inner diameter of the current carrying windings of more than 250 mm; <u>and</u></p> <p>c. Rated for a magnetic induction of more than 8 T or “overall current density” in the winding of more than 300 A/mm<sup>2</sup>;</p>
	<p>4. Solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays, which are “space qualified”, having a minimum average efficiency exceeding 20% at an operating temperature of 301 K (28°C) under simulated ‘AM0’ illumination with an irradiance of 1,367 watts per square metre (W/m<sup>2</sup>).</p> <p><u>Technical Note</u>  ‘AM0’, or ‘Air Mass Zero’, refers to the spectral irradiance of sun light in the earth’s outer atmosphere when the distance between the earth and sun is one astronomical unit (AU).</p>
	<p>f. Rotary input type shaft absolute position encoders having any of the following:</p> <p>1. A resolution of better than 1 part in 265,000 (18 bit resolution) of full scale; <u>or</u></p> <p>2. An accuracy better than ±2.5 seconds of arc;</p>
	<p>g. Solid-state pulsed power switching thyristor devices and ‘thyristor modules’ using either electrically, optically, or electron radiation controlled switch methods, having any of the following:</p> <p>1. A maximum turn-on current rate of rise (di/dt) greater than 30,000 A/μs and off-state voltage greater than 1,100 V; <u>or</u></p> <p>2. A maximum turn-on current rate of rise (di/dt) greater than 2,000 A/μs and all of the following:</p> <p>a. An off-state peak voltage equal to or greater than 3,000 V; <u>and</u></p> <p>b. A peak (surge) current equal to or greater than 3,000 A.</p>

<i>Product Code</i>	<i>Item Description</i>
	<p><u>Note 1</u></p> <p>Category Code 3A001.g. includes:</p> <ul style="list-style-type: none"> <li>— Silicon Controlled Rectifiers (SCRs)</li> <li>— Electrical Triggering Thyristors (ETTs)</li> <li>— Light Triggering Thyristors (LTTs)</li> <li>— Integrated Gate Commutated Thyristors (IGCTs)</li> <li>— Gate Turn-off Thyristors (GTOs)</li> <li>— MOS Controlled Thyristors (MCTs)</li> <li>— Solidtrons</li> </ul> <p><u>Note 2</u></p> <p>Category Code 3A001.g. does not include thyristor devices and ‘thyristor modules’ incorporated into equipment designed for civil railway or “civil aircraft” applications.</p> <p><u>Technical Note</u></p> <p>For the purposes of Category Code 3A001.g., a ‘thyristor module’ contains one or more thyristor devices.</p>
DL3A002	<p>General purpose electronic equipment and accessories therefor, as follows:</p> <p>a. Recording equipment, as follows, and specially designed test tape therefor:</p> <p>1. Analogue instrumentation magnetic tape recorders, including those permitting the recording of digital signals (e.g., using a high density digital recording (HDDR) module), having any of the following:</p> <ul style="list-style-type: none"> <li>a. A bandwidth exceeding 4 MHz per electronic channel or track;</li> <li>b. A bandwidth exceeding 2 MHz per electronic channel or track and having more than 42 tracks; <u>or</u></li> <li>c. A time displacement (base) error, measured in accordance with applicable IRIG or EIA documents, of less than <math>\pm 0.1 \mu\text{s}</math>;</li> </ul> <p><u>Note</u></p> <p>Analogue magnetic tape recorders specially designed for civilian video purposes are not considered to be instrumentation tape recorders.</p> <p>2. Digital video magnetic tape recorders having a maximum digital interface transfer rate exceeding 360 Mbit/s;</p> <p><u>Note</u></p> <p>Category Code 3A002.a.2. does not include digital video magnetic</p>

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	<p><i>tape recorders specially designed for television recording using a signal format, which may include a compressed signal format, standardised or recommended by the ITU, the IEC, the SMPTE, the EBU, the ETSI or the IEEE for civil television applications.</i></p>
	<p>3. Digital instrumentation magnetic tape data recorders employing helical scan techniques or fixed head techniques and having any of the following:</p> <ul style="list-style-type: none"> <li>a. A maximum digital interface transfer rate exceeding 175 Mbit/s; <u>or</u></li> <li>b. Being “space qualified”;</li> </ul> <p><u>Note</u></p> <p><i>Category Code 3A002.a.3. does not include analogue magnetic tape recorders equipped with HDDR conversion electronics and configured to record only digital data.</i></p>
	<p>4. Equipment, having a maximum digital interface transfer rate exceeding 175 Mbit/s and designed to convert digital video magnetic tape recorders for use as digital instrumentation data recorders;</p>
	<p>5. Waveform digitisers and transient recorders having all of the following:</p> <ul style="list-style-type: none"> <li>a. Digitising rate equal to or more than 200 million samples per second and a resolution of 10 bit or more; <u>and</u></li> <li>b. A ‘continuous throughput’ of 2 Gbit/s or more;</li> </ul> <p><u>Technical Note</u></p> <ul style="list-style-type: none"> <li>1. <i>For those instruments with a parallel bus architecture, the ‘continuous throughput’ rate is the highest word rate multiplied by the number of bits in a word.</i></li> <li>2. <i>‘Continuous throughput’ is the fastest data rate the instrument can output to mass storage without the loss of any information whilst sustaining the sampling rate and analogue-to-digital conversion.</i></li> </ul>
	<p>6. Digital instrumentation data recorders, using magnetic disk storage technique and having all of the following:</p> <ul style="list-style-type: none"> <li>a. Digitising rate equal to or more than 100 million samples per second and a resolution of 8 bit or more; <u>and</u></li> <li>b. A ‘continuous throughput’ of 1 Gbit/s or more;</li> </ul>
	<ul style="list-style-type: none"> <li>b. “Frequency synthesiser” “electronic assemblies” having a “frequency switching time” from one selected frequency to another of less than 1 ms;</li> </ul> <p><u>Note</u></p>

<i>Product Code</i>	<i>Item Description</i>
	<p><i>The “signal analysers”, signal generators, network analysers and microwave test receivers as stand-alone instruments come within Category Codes 3A002.c., 3A002.d., 3A002.e., and 3A002.f., respectively, if they come within the description of those Category Codes.</i></p>
	<p>c. Radio frequency “signal analysers”, as follows:</p>
	<p>1. “Signal analysers” capable of analysing frequencies exceeding 31.8 GHz but not exceeding 37.5 GHz and having a 3 dB resolution bandwidth (RBW) exceeding 10 MHz;</p>
	<p>2. “Signal analysers” capable of analysing frequencies exceeding 43.5 GHz;</p>
	<p>3. “Dynamic signal analysers” having a “real-time bandwidth” exceeding 500 kHz;</p> <p><u>Note</u></p> <p><i>Category Code 3A002.c.3. does not include those “dynamic signal analysers” using only constant percentage bandwidth filters (also known as octave or fractional octave filters).</i></p>
	<p>d. Frequency synthesised signal generators producing output frequencies, the accuracy and short term and long term stability of which are controlled, derived from or disciplined by the internal master reference oscillator, and having any of the following:</p> <p>1. A maximum synthesised frequency exceeding 31.8 GHz but not exceeding 43.5 GHz and rated to generate a ‘pulse duration’ of less than 100 ns;</p> <p>2. A maximum synthesised frequency exceeding 43.5 GHz;</p> <p>3. A “frequency switching time” from one selected frequency to another as specified by any of the following:</p> <p>a. Less than 10 ns;</p> <p>b. Less than 100 µs for any frequency change exceeding 1.6 GHz within the synthesised frequency range exceeding 3.2 GHz but not exceeding 10.6 GHz;</p> <p>c. Less than 250 µs for any frequency change exceeding 550 MHz within the synthesised frequency range exceeding 10.6 GHz but not exceeding 31.8 GHz;</p> <p>d. Less than 500 µs for any frequency change exceeding 550 MHz within the synthesised frequency range exceeding 31.8 GHz but not exceeding 43.5 GHz; <u>or</u></p> <p>e. Less than 1 ms within the synthesised frequency range exceeding</p>

<i>Product Code</i>	<i>Item Description</i>
	<p style="text-align: center;">43.5 GHz; <u>or</u></p> <p>4. A single sideband (SSB) phase noise better than <math>-(126 + 20\log_{10}F - 20\log_{10}f)</math> in dBc/Hz, where F is the off-set from the operating frequency in Hz and f is the operating frequency in MHz;</p> <p><u>Note 1</u></p> <p><i>For the purpose of Category Code 3A002.d., the term frequency synthesized signal generators includes arbitrary waveform and function generators.</i></p> <p><u>Note 2</u></p> <p><i>Category Code 3A002.d. does not include equipment in which the output frequency is either produced by the addition or subtraction of two or more crystal oscillator frequencies, or by an addition or subtraction followed by a multiplication of the result.</i></p> <p><u>Technical Notes</u></p> <p>1. <i>Arbitrary waveform and function generators are normally specified by sample rate (e.g., GSample/s), which is converted to the RF domain by the Nyquist factor of two. Thus, a 1 GSample/s arbitrary waveform has a direct output capability of 500 MHz or when oversampling is used, the maximum direct output capability is proportionately lower.</i></p> <p>2. <i>For the purposes of Category Code 3A002.d.1., ‘pulse duration’ is defined as the time interval between the leading edge of the pulse achieving 90% of the peak and the trailing edge of the pulse achieving 10% of the peak.</i></p>
	<p>e. Network analysers with a maximum operating frequency exceeding 43.5 GHz;</p>
	<p>f. Microwave test receivers having all of the following:</p> <ol style="list-style-type: none"> <li>1. A maximum operating frequency exceeding 43.5 GHz; <u>and</u></li> <li>2. Being capable of measuring amplitude and phase simultaneously;</li> </ol>
	<p>g. Atomic frequency standards being any of the following:</p> <ol style="list-style-type: none"> <li>1. “Space qualified”;</li> <li>2. Non-rubidium and having a long-term stability less (better) than <math>1 \times 10^{-11}</math>/month; or</li> <li>3. Non- “space qualified” and having all of the following: <ol style="list-style-type: none"> <li>a. Being a rubidium standard;</li> <li>b. Long-term stability less (better) than <math>1 \times 10^{-11}</math>/month; <u>and</u></li> <li>c. Total power consumption of less than 1 W.</li> </ol> </li> </ol>

<i>Product Code</i>	<i>Item Description</i>
DL3A003	Spray cooling thermal management systems employing closed loop fluid handling and reconditioning equipment in a sealed enclosure where a dielectric fluid is sprayed onto electronic components using specially designed spray nozzles that are designed to maintain electronic components within their operating temperature range, and specially designed components therefor.
DL3A101	<p>Electronic equipment, devices and components, other than those specified in Category Code 3A001, as follows:</p> <p>a. Analogue-to-digital converters, usable in “missiles”, designed to meet military specifications for ruggedised equipment;</p> <p>b. Accelerators capable of delivering electromagnetic radiation produced by bremsstrahlung from accelerated electrons of 2 MeV or greater, and systems containing those accelerators.</p> <p><u>Note</u> Category Code 3A101.b. above does not include equipment specially designed for medical purposes.</p>
DL3A102	<p>‘Thermal batteries’ designed or modified for ‘missiles’.</p> <p><u>Technical Notes</u></p> <p>1. In Category Code 3A102 ‘thermal batteries’ are single use batteries that contain a solid non-conducting inorganic salt as the electrolyte. These batteries incorporate a pyrolytic material that, when ignited, melts the electrolyte and activates the battery.</p> <p>2. In Category Code 3A102 ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</p>
DL3A201	<p>Electronic components, other than those specified in Category Code 3A001, as follows;</p> <p>a. Capacitors having either of the following sets of characteristics:</p> <p>1. a. Voltage rating greater than 1.4 kV; b. Energy storage greater than 10 J; c. Capacitance greater than 0.5 µF; <u>and</u> d. Series inductance less than 50 nH; <u>or</u></p> <p>2. a. Voltage rating greater than 750 V; b. Capacitance greater than 0.25 µF; <u>and</u> c. Series inductance less than 10 nH;</p> <p>b. Superconducting solenoidal electromagnets having all of the following</p>

Product Code	Item Description
	<p>characteristics:</p> <ol style="list-style-type: none"> <li>1. Capable of creating magnetic fields greater than 2 T;</li> <li>2. A ratio of length to inner diameter greater than 2;</li> <li>3. Inner diameter greater than 300 mm; <u>and</u></li> <li>4. Magnetic field uniform to better than 1% over the central 50% of the inner volume;</li> </ol> <p><u>Note</u></p> <p><i>Category Code 3A201.b. does not include magnets specially designed for and exported, ‘as parts of’ medical nuclear magnetic resonance (NMR) imaging systems. For this purpose, the magnets and NMR imaging systems may be part of the same shipment or in separate shipments from different sources, provided the related export documents clearly specify that the separate shipments are dispatched ‘as part of’ the imaging systems.</i></p> <hr/> <p>c. Flash X-ray generators or pulsed electron accelerators having either of the following sets of characteristics:</p> <ol style="list-style-type: none"> <li>1. a. An accelerator peak electron energy of 500 keV or greater but less than 25 MeV; <u>and</u> <ol style="list-style-type: none"> <li>b. With a ‘figure of merit’ (K) of 0.25 or greater; <u>or</u></li> </ol> </li> <li>2. a. An accelerator peak electron energy of 25 MeV or greater; <u>and</u> <ol style="list-style-type: none"> <li>b. A ‘peak power’ greater than 50 MW.</li> </ol> </li> </ol> <p><u>Note</u></p> <p><i>Category Code 3A201.c. does not include accelerators that are component parts of devices designed for purposes other than electron beam or X-ray radiation (e.g., electron microscopy) nor those designed for medical purposes:</i></p> <p><u>Technical Notes</u></p> <ol style="list-style-type: none"> <li>1. The ‘figure of merit’ K is defined as:       <math display="block">K = 1.7 \times 10^3 V^{2.65} Q</math> <p><i>V is the peak electron energy in million electron volts.</i></p> <p><i>If the accelerator beam pulse duration is less than or equal to 1 μs, then</i></p> <p><i>Q is the total accelerated charge in Coulombs. If the accelerator beam pulse duration is greater than 1 μs, then Q is the maximum accelerated charge in 1 μs.</i></p> <p><i>Q equals the integral of i with respect to t, over the lesser of 1 μs or the time duration of the beam pulse (<math>Q = \int idt</math>), where i is beam</i></p> </li> </ol>

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	<p><i>current in amperes and t is time in seconds.</i></p> <p>2. 'Peak power' = (peak potential in volts) × (peak beam current in amperes).</p> <p>3. In machines based on microwave accelerating cavities, the time duration of the beam pulse is the lesser of 1 μs or the duration of the bunched beam packet resulting from one microwave modulator pulse.</p> <p>4. In machines based on microwave accelerating cavities, the peak beam current is the average current in the time duration of a bunched beam packet.</p>
DL3A225	<p>Frequency changers or generators, other than those specified in Category Code 0B001.b.13., having all of the following characteristics:</p> <p>a. Multiphase output capable of providing a power of 40 W or greater;</p> <p>b. Capable of operating in the frequency range between 600 Hz and 2,000 Hz;</p> <p>c. Total harmonic distortion better (less) than 10%; <u>and</u></p> <p>d. Frequency control better (less) than 0.1%.</p> <p><u>Technical Note</u></p> <p><i>Frequency changers in Category Code 3A225 are also known as converters or inverters.</i></p>
DL3A226	<p>High-power direct current power supplies, other than those specified in Category Code 0B001.j.6., having both of the following characteristics:</p> <p>a. Capable of continuously producing, over a time period of 8 hours, 100 V or greater with current output of 500 A or greater; <u>and</u></p> <p>b. Current or voltage stability better than 0.1% over a time period of 8 hours.</p>
DL3A227	<p>High-voltage direct current power supplies, other than those specified in Category Code 0B001.j.5., having both of the following characteristics:</p> <p>a. Capable of continuously producing, over a time period of 8 hours, 20 kV or greater with current output of 1 A or greater; <u>and</u></p> <p>b. Current or voltage stability better than 0.1% over a time period of 8 hours.</p>
DL3A228	<p>Switching devices, as follows:</p> <p>a. Cold-cathode tubes, whether gas filled or not, operating similarly to a spark gap, having all of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. Containing three or more electrodes;</li> <li>2. Anode peak voltage rating of 2.5 kV or more;</li> </ol>

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	<p>3. Anode peak current rating of 100 A or more; <u>and</u></p> <p>4. Anode delay time of 10 <math>\mu</math>s or less;</p> <p><i>Note</i></p> <p><i>Category Code 3A228 includes gas krytron tubes and vacuum sprytron tubes.</i></p> <p>b. Triggered spark-gaps having both of the following characteristics:</p> <p>1. An anode delay time of 15 <math>\mu</math>s or less; <u>and</u></p> <p>2. Rated for a peak current of 500 A or more;</p> <p>c. Modules or assemblies with a fast switching function, other than those specified in Category Code 3A001.g., having all of the following characteristics:</p> <p>1. Anode peak voltage rating greater than 2 kV;</p> <p>2. Anode peak current rating of 500 A or more; <u>and</u></p> <p>3. Turn-on time of 1 <math>\mu</math>s or less.</p>
DL3A229	<p>High-current pulse generators as follows:</p> <p><b><u>N.B.</u></b></p> <p><i>See also Division 2 of Part I of this Schedule.</i></p> <p><i>See Category Code 1A007.a. for explosive detonator firing sets.</i></p> <p>a. Not used;</p> <p>b. Modular electrical pulse generators (pulsers) having all of the following characteristics:</p> <p>1. Designed for portable, mobile, or ruggedised-use;</p> <p>2. Enclosed in a dust-tight enclosure;</p> <p>3. Capable of delivering their energy in less than 15 <math>\mu</math>s;</p> <p>4. Having an output greater than 100 A;</p> <p>5. Having a ‘rise time’ of less than 10 <math>\mu</math>s into loads of less than 40 ohms;</p> <p>6. No dimension greater than 254 mm;</p> <p>7. Weight less than 25 kg; <u>and</u></p> <p>8. Specified for use over an extended temperature range 223 K (–50°C) to 373 K (100°C) or specified as suitable for aerospace applications.</p> <p><i>Note</i></p> <p><i>Category Code 3A229.b. includes xenon flash-lamp drivers.</i></p> <p><i>Technical Note</i></p>

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	<i>In Category Code 3A229.b.5., 'rise time' is defined as the time interval from 10% to 90% current amplitude when driving a resistive load.</i>
DL3A230	<p>High-speed pulse generators having both of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Output voltage greater than 6 V into a resistive load of less than 55 ohms, <u>and</u></li> <li>b. 'Pulse transition time' less than 500 ps.</li> </ul> <p><u>Technical Note</u></p> <p><i>In Category Code 3A230, 'pulse transition time' is defined as the time interval between 10% and 90% voltage amplitude.</i></p>
DL3A231	<p>Neutron generator systems, including tubes, having both of the following characteristics:</p> <ul style="list-style-type: none"> <li>a. Designed for operation without an external vacuum system; <u>and</u></li> <li>b. Utilising electrostatic acceleration to induce a tritium-deuterium nuclear reaction.</li> </ul>
DL3A232	<p>Multipoint initiation systems, other than those specified in Category Code 1A007, as follows:</p> <p><b><u>N.B.</u></b></p> <p><b><i>See also Division 2 of Part I of this Schedule.</i></b></p> <p><b><i>See Category Code 1A007.b. for detonators.</i></b></p> <hr/> <ul style="list-style-type: none"> <li>a. Not used;</li> </ul> <hr/> <ul style="list-style-type: none"> <li>b. Arrangements using single or multiple detonators designed to nearly simultaneously initiate an explosive surface over greater than 5,000 mm<sup>2</sup> from a single firing signal with an initiation timing spread over the surface of less than 2.5 µs.</li> </ul> <p><u>Note</u></p> <p><i>Category Code 3A232 does not include detonators using only primary explosives, such as lead azide.</i></p>
DL3A233	<p>Mass spectrometers, other than those specified in Category Code 0B002.g., capable of measuring ions of 230 atomic mass units or greater and having a resolution of better than 2 parts in 230, as follows, and ion sources therefor:</p> <ul style="list-style-type: none"> <li>a. Inductively coupled plasma mass spectrometers (ICP/MS);</li> <li>b. Glow discharge mass spectrometers (GDMS);</li> <li>c. Thermal ionisation mass spectrometers (TIMS);</li> <li>d. Electron bombardment mass spectrometers which have a source chamber constructed from, lined with or plated with materials resistant to UF<sub>6</sub>;</li> </ul>

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	<p>e. Molecular beam mass spectrometers having either of the following characteristics:</p> <ol style="list-style-type: none"> <li>1. A source chamber constructed from, lined with or plated with stainless steel or molybdenum and equipped with a cold trap capable of cooling to 193 K (–80°C) or less; <u>or</u></li> <li>2. A source chamber constructed from, lined with or plated with materials resistant to UF<sub>6</sub>;</li> </ol> <p>f. Mass spectrometers equipped with a microfluorination ion source designed for actinides or actinide fluorides.</p>
<b>3B</b>	<b>Test, Inspection and Production Equipment</b>
DL3B001	<p>Equipment for the manufacturing of semiconductor devices or materials, as follows, and specially designed components and accessories therefor:</p> <p>a. Equipment designed for epitaxial growth, as follows:</p> <ol style="list-style-type: none"> <li>1. Equipment capable of producing a layer of any material other than silicon with a thickness uniform to less than <math>\pm 2.5\%</math> across a distance of 75 mm or more;</li> <li>2. Metal Organic Chemical Vapour Deposition (MOCVD) reactors specially designed for compound semiconductor crystal growth by the chemical reaction between materials specified in Category Code 3C003 or 3C004;</li> <li>3. Molecular beam epitaxial growth equipment using gas or solid sources;</li> </ol> <p>b. Equipment designed for ion implantation and having any of the following:</p> <ol style="list-style-type: none"> <li>1. A beam energy (accelerating voltage) exceeding 1 MeV;</li> <li>2. Being specially designed and optimised to operate at a beam energy (accelerating voltage) of less than 2 keV;</li> <li>3. Direct write capability; <u>or</u></li> <li>4. A beam energy of 65 keV or more and a beam current of 45 mA or more for high energy oxygen implant into a heated semiconductor material “substrate”;</li> </ol> <p>c. Anisotropic plasma dry etching equipment, as follows:</p> <ol style="list-style-type: none"> <li>1. Equipment with cassette-to-cassette operation and load-locks, and having any of the following: <ol style="list-style-type: none"> <li>a. Designed or optimised to produce critical dimensions of 180 nm or</li> </ol> </li> </ol>

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	<p>less with <math>\pm 5\%</math> 3 sigma precision; <u>or</u></p> <p>b. Designed for generating less than 0.04 particles/cm<sup>2</sup> with a measurable particle size greater than 0.1 <math>\mu\text{m}</math> in diameter;</p>
	<p>2. Equipment specially designed for equipment specified in Category Code 3B001.e. and having any of the following:</p> <p>a. Designed or optimised to produce critical dimensions of 180 nm or less with <math>\pm 5\%</math> 3 sigma precision; <u>or</u></p> <p>b. Designed for generating less than 0.04 particles/cm<sup>2</sup> with a measurable particle size greater than 0.12 <math>\mu\text{m}</math> in diameter;</p>
	<p>d. Plasma enhanced Chemical Vapour Deposition (CVD) equipment, as follows:</p>
	<p>1. Equipment with cassette-to-cassette operation and load-locks, and designed according to the manufacturer's specifications or optimized for use in the production of semiconductor devices with critical dimensions of 180 nm or less;</p>
	<p>2. Equipment specially designed for equipment specified in Category Code 3B001.e. and designed according to the manufacturer's specifications or optimised for use in the production of semiconductor devices with critical dimensions of 180 nm or less;</p>
	<p>e. Automatic loading multi-chamber central wafer handling systems, having all of the following:</p> <p>1. Interfaces for wafer input and output, to which more than two pieces of semiconductor processing equipment are to be connected; <u>and</u></p> <p>2. Designed to form an integrated system in a vacuum environment for sequential multiple wafer processing;</p> <p><i>Note</i></p> <p><i>Category Code 3B001.e. does not include automatic robotic wafer handling systems not designed to operate in a vacuum environment.</i></p>
	<p>f. Lithography equipment, as follows:</p>
	<p>1. Align and expose step and repeat (direct step on wafer) or step and scan (scanner) equipment for wafer processing using photo-optical or X-ray methods and having any of the following:</p> <p>a. A light source wavelength shorter than 245 nm; <u>or</u></p> <p>b. Capable of producing a pattern with a 'minimum resolvable feature size' of 180 nm or less;</p> <p><i>Technical Note</i></p>

Product Code	Item Description
	<p data-bbox="512 302 1382 371"><i>The ‘minimum resolvable feature size’ is calculated by the following formula:</i></p> $MRF = \frac{(an\ exposure\ light\ source\ wavelength\ in\ nm) \times (K\ factor)}{numerical\ aperture}$ <p data-bbox="512 495 852 528"><i>where the K factor = 0.45</i></p> <p data-bbox="512 546 1059 580"><i>MRF = ‘minimum resolvable feature’ size</i></p> <p data-bbox="437 618 1382 687">2. Imprint lithography equipment capable of producing features of 180 nm or less;</p> <p data-bbox="475 707 539 741"><u>Note</u></p> <p data-bbox="475 759 940 792"><i>Category Code 3B001.f.2. includes:</i></p> <ul style="list-style-type: none"> <li data-bbox="475 813 879 846">— <i>Micro contact printing tools</i></li> <li data-bbox="475 866 778 900">— <i>Hot embossing tools</i></li> <li data-bbox="475 920 919 954">— <i>Nano-imprint lithography tools</i></li> <li data-bbox="475 974 1134 1008">— <i>Step and flash imprint lithography (S-FIL) tools</i></li> </ul> <p data-bbox="437 1041 1382 1144">3. Equipment specially designed for mask making or semiconductor device processing using direct writing methods and having all of the following:</p> <ul style="list-style-type: none"> <li data-bbox="475 1167 1382 1236">a. Using deflected focused electron beam ion beam or “laser” beam; <u>and</u></li> <li data-bbox="475 1256 1382 1485">b. Having any of the following: <ul style="list-style-type: none"> <li data-bbox="512 1308 967 1341">1. A spot size smaller than 0.2 μm;</li> <li data-bbox="512 1361 1382 1431">2. Being capable of producing a pattern with a feature size of less than 1 μm; <u>or</u></li> <li data-bbox="512 1451 1267 1485">3. An overlay accuracy of better than ±0.20 μm (3 sigma);</li> </ul> </li> </ul> <p data-bbox="395 1525 1382 1594">g. Masks and reticles designed for integrated circuits specified in Category Code 3A001;</p> <p data-bbox="395 1628 983 1662">h. Multi-layer masks with a phase shift layer;</p> <p data-bbox="437 1682 501 1715"><u>Note</u></p> <p data-bbox="437 1736 1382 1839"><i>Category Code 3B001.h. does not include multi-layer masks with a phase shift layer designed for the fabrication of memory devices not specified in Category Code 3A001.</i></p> <p data-bbox="395 1879 1382 1948">i. Imprint lithography templates designed for integrated circuits specified in Category Code 3A001.</p>
DL3B002	Test equipment, specially designed for testing finished or unfinished

<i>Product Code</i>	<i>Item Description</i>
	semiconductor devices, as follows, and specially designed components and accessories therefor:
	a. For testing S-parameters of transistor devices at frequencies exceeding 31.8 GHz;
	c. For testing microwave integrated circuits specified in Category Code 3A001.b.2.
<b>3C</b>	<b>Materials</b>
DL3C001	Hetero-epitaxial materials consisting of a “substrate” having stacked epitaxially grown multiple layers of any of the following: a. Silicon (Si); b. Germanium (Ge); c. Silicon carbide (SiC); <u>or</u> d. “III/V compounds” of gallium or indium.
DL3C002	Resist materials as follows, and “substrates” coated with the following resists: a. Positive resists designed for semiconductor lithography specially adjusted (optimised) for use at wavelengths below 245 nm; b. All resists designed for use with electron beams or ion beams, with a sensitivity of 0.01 $\mu\text{coulomb}/\text{mm}^2$ or better; c. All resists designed for use with X-rays, with a sensitivity of 2.5 $\text{mJ}/\text{mm}^2$ or better; d. All resists optimised for surface imaging technologies, including ‘silylated’ resists; <i><u>Technical Note</u></i> <i>‘Silylation’ techniques are defined as processes incorporating oxidation of the resist surface to enhance performance for both wet and dry developing.</i> e. All resists designed or optimised for use with imprint lithography equipment specified in Category Code 3B001.f.2. that use either a thermal or photo-curable process.
DL3C003	Organo-inorganic compounds, as follows: a. Organo-metallic compounds of aluminium, gallium or indium having a purity (metal basis) better than 99.999%;

<i>Product Code</i>	<i>Item Description</i>
	<p>b. Organo-arsenic, organo-antimony and organo-phosphorus compounds having a purity (inorganic element basis) better than 99.999%.</p> <p><u>Note</u>  <i>Category Code 3C003 only includes compounds whose metallic, partly metallic or non-metallic element is directly linked to carbon in the organic part of the molecule.</i></p>
DL3C004	<p>Hydrides of phosphorus, arsenic or antimony, having a purity better than 99.999%, even diluted in inert gases or hydrogen.</p> <p><u>Note</u>  <i>Category Code 3C004 does not include hydrides containing 20% molar or more of inert gases or hydrogen.</i></p>
DL3C005	<p>Silicon carbide (SiC), gallium nitride (GaN), aluminium nitride (AlN) or aluminium gallium nitride (AlGaN) “substrates”, or ingots, boules, or other preforms of those materials, having resistivities greater than 10,000 ohm-cm at 20°C.</p>
DL3C006	<p>“Substrates” specified in Category Code 3C005 with at least one epitaxial layer of silicon carbide, gallium nitride, aluminium nitride or aluminium gallium nitride.</p>
<b>3D</b>	<b>Software</b>
DL3D001	<p>“Software” specially designed for the “development” or “production” of equipment specified in Category Codes 3A001.b. to 3A002.g. or Category 3B.</p>
DL3D002	<p>“Software” specially designed for the “use” of equipment specified in Category Code 3B001.a. to f. or 3B002.</p>
DL3D003	<p>‘Physics-based’ simulation “software” specially designed for the “development” of lithographic, etching or deposition processes for translating masking patterns into specific topographical patterns in conductors, dielectrics or semiconductor materials.</p> <p><u>Technical Note</u>  <i>‘Physics-based’ in Category Code 3D003 means using computations to determine a sequence of physical cause and effect events based on physical properties (e.g., temperature, pressure, diffusion constants and semiconductor materials properties).</i></p> <p><u>Note</u>  <i>Libraries, design attributes or associated data for the design of semiconductor devices or integrated circuits are considered as</i></p>

<i>Product Code</i>	<i>Item Description</i>
	“ <i>technology</i> ”.
DL3D004	“Software” specially designed for the “development” of the equipment specified in Category Code 3A003.
DL3D101	“Software” specially designed or modified for the “use” of equipment specified in Category Code 3A101.b.
<b>3E</b>	<b>Technology</b>
DL3E001	<p>“Technology” (according to the General Technology Note) for the “development” or “production” of equipment or materials specified in Category 3A, 3B or 3C;</p> <p><u>Note 1</u></p> <p>Category Code 3E001 does not include “technology” for the “production” of equipment or components specified in Category Code 3A003.</p> <p><u>Note 2</u></p> <p>Category Code 3E001 does not include “technology” for the “development” or “production” of integrated circuits specified in Category Codes 3A001.a.3. to 3A001.a.12., having all of the following:</p> <ol style="list-style-type: none"> <li>1. Using “technology” of 0.5 <math>\mu\text{m}</math> or more; <u>and</u></li> <li>2. Not incorporating ‘multi-layer structures’.</li> </ol> <p><u>Technical Note</u></p> <p>‘Multi-layer structures’ do not include devices incorporating a maximum of three metal layers and three polysilicon layers.</p>
DL3E002	<p>“Technology” (according to the General Technology Note) other than that specified in Category Code 3E001 for the “development” or “production” of a “microprocessor microcircuit”, “microcomputer microcircuit” or microcontroller microcircuit core, having an arithmetic logic unit with an access width of 32 bits or more and any of the following characteristics:</p> <ol style="list-style-type: none"> <li>a. A ‘vector processor unit’ designed to perform more than two calculations on floating-point vectors (one-dimensional arrays of 32-bit or larger numbers) simultaneously;</li> </ol> <p><u>Technical Note</u></p> <p>A ‘vector processing unit’ is a processor element with built-in instructions that perform multiple calculations on floating-point vectors (one-dimensional arrays of 32-bit or larger numbers) simultaneously, having at least one vector arithmetic logic unit.</p> <ol style="list-style-type: none"> <li>b. Designed to perform more than two 64-bit or larger floating-point operation results per cycle; <u>or</u></li> </ol>

<i>Product Code</i>	<i>Item Description</i>
	<p>c. Designed to perform more than four 16-bit fixed-point multiply-accumulate results per cycle (e.g., digital manipulation of analogue information that has been previously converted into digital form, also known as digital “signal processing”).</p> <p><u>Note</u></p> <p><i>Category Code 3E002.c. does not include “technology” for multimedia extensions.</i></p> <p><u>Note 1</u></p> <p><i>Category Code 3E002 does not include “technology” for the “development” or “production” of micro-processor cores, having all of the following:</i></p> <p><i>a. Using “technology” at or above 0.130 μm; and</i></p> <p><i>b. Incorporating multi-layer structures with five or fewer metal layers.</i></p> <p><u>Note 2</u></p> <p><i>Category Code 3E002 includes “technology” for digital signal processors and digital array processors.</i></p>
DL3E003	<p>Other “technology” for the “development” or “production” of the following:</p> <p>a. Vacuum microelectronic devices;</p> <p>b. Hetero-structure semiconductor devices such as high electron mobility transistors (HEMT), hetero-bipolar transistors (HBT), quantum well and super lattice devices;</p> <p><u>Note</u></p> <p><i>Category Code 3E003.b. does not include “technology” for high electron mobility transistors (HEMT) operating at frequencies lower than 31.8 GHz and hetero-junction bipolar transistors (HBT) operating at frequencies lower than 31.8 GHz.</i></p> <p>c. “Superconductive” electronic devices;</p> <p>d. Substrates of films of diamond for electronic components;</p> <p>e. Substrates of silicon-on-insulator (SOI) for integrated circuits in which the insulator is silicon dioxide;</p> <p>f. Substrates of silicon carbide for electronic components;</p> <p>g. Electronic vacuum tubes operating at frequencies of 31.8 GHz or higher.</p>
DL3E101	<p>“Technology” (according to the General Technology Note) for the “use” of equipment or “software” specified in Category Code 3A001.a.1. or 2., 3A101, 3A102 or 3D101.</p>
DL3E102	<p>“Technology” (according to the General Technology Note) for the</p>

<i>Product Code</i>	<i>Item Description</i>
	“development” of “software” specified in Category Code 3D101.
DL3E201	“Technology” (according to the General Technology Note) for the “use” of equipment specified in Category Code 3A001.e.2., 3A001.e.3., 3A001.g., 3A201 or 3A225 to 3A233.