



IPC-6018DS

**Space and Military
Avionics Applications
Addendum to IPC-6018D,
*Qualification and
Performance Specification
for High Frequency
(Microwave) Printed Boards***

Developed by the High Speed/High Frequency Board Performance Subcommittee (D-22) of the High Speed/High Frequency Committee (D-20) of IPC

Supersedes:
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Users of this publication are encouraged to participate in the development of future revisions.

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Space and Military Avionics Applications Addendum to IPC-6018D

Qualification and Performance Specification for High Frequency (Microwave) Printed Boards

0.1 Scope This addendum provides requirements to be used in addition to, and in some cases, in place of, those published in IPC-6018D to ensure the reliability of printed boards that must survive the vibration, ground testing, and thermal cycling environments of space and military avionics.

0.1.1 Purpose When required by procurement documentation/drawings, this Addendum replaces specifically identified requirements of IPC-6018D. There are differences between the space and military avionics requirements in this document; therefore, procurement documentation **shall** specify space applications when required.

0.1.2 Precedence The procurement documentation takes precedence over this Addendum and referenced standards. In the event of a conflict between this Addendum and the applicable documents cited herein, this Addendum takes precedence. Where referenced criteria of this addendum differ from the published IPC-6018D, this Addendum takes precedence.

0.1.3 Existing or Previously Approved Designs This Addendum **shall not** constitute the sole cause for the redesign of previously approved designs. When drawings for existing or previously approved designs undergo revision, they should be reviewed, and changes made that allow for compliance with the requirements of this Addendum.

0.1.4 Use of this Addendum This addendum **shall not** be used as a stand-alone document.

Where criteria are not supplemented, the Class 3 requirements of IPC-6018D **shall** apply. Where IPC-6018D criteria are supplemented or new criteria are added by this Addendum, the clause is listed in IPC-6018DS, Table 1, Space and Military Avionics Applications Requirements, and the entire IPC-6018D clause and its associated Table 4-3 entry is replaced by this Addendum except as specifically noted.

The clauses modified by this Addendum do not include subordinate clauses unless specifically stated (i.e., changes made to 3.5 do not affect 3.5.1 unless 3.5.1 is also addressed in this Addendum.)

0.1.5 Superseded Specifications This addendum supersedes and replaces IPC-6018CS.

Table 1 IPC-6018DS Space and Military Avionics Applications Requirements

IPC-6018D Reference	Space and Military Avionics Applications Requirement (as changed by this Addendum)	Inspection/ Test Method	Sample	Test Frequency ¹																				
3.2.4	<p>Metal Foils Copper foil shall be Type E3 (HTE) copper in accordance with IPC-4562 and be supplied with a manufacturer's Certificate of Compliance.</p>		-	Per Lot																				
3.2.6	<p>Base Metallic Plating Depositions and Conductive Coatings The thickness of the plating/final finish coatings shall be in accordance with Table 3-3 of IPC-6018D. The copper plating thickness for the surface, PTHs, via holes, blind and buried vias shall be as specified in Table 3-4, Table 3-5 and Table 3-6 of this addendum. The thickness for specific use platings shall be as specified in Table 3-3 of IPC-6018D. The plating thickness for final finishes or combinations there-of selected from those listed in 1.3.4.3 of IPC-6018D shall be as specified in Table 3-3 of IPC-6018D. Fused tin-lead plating or solder coating only requires visual coverage and acceptable solderability testing per J-STD-003. Coverage of platings and metallic coatings does not apply to vertical conductor edges. Conductor surfaces may have exposed copper in areas not to be soldered within the limits of 3.5.3.10 of IPC-6018D.</p> <p style="text-align: center;">Table 3-4 Surface and Hole Copper Plating Minimum Requirements for Buried Vias > 2 Layers, Through-Holes, and Blind Vias¹</p> <table border="1" data-bbox="237 562 1024 667"> <tr> <td>Absolute Minimum²</td> <td>25 µm [984 µin]</td> </tr> <tr> <td>Wrap⁵</td> <td>12 µm [472 µin]</td> </tr> <tr> <td>Wrap⁶</td> <td>5 µm [197 µin]</td> </tr> </table> <p>Note 1. Does not apply to microvias (see 3.2.6 of IPC-6018D). Note 2. Copper plating (see 1.3.4.2 of IPC-6018D) thickness shall be continuous and extend or wrap from hole walls onto outer surfaces. See IPC-A-600 for discussion on copper plating thickness for hole walls. Note 3. Wrap copper plating for PTHs and vias shall be in accordance with 3.6.2.11.1 of IPC-6018D. Alternatives to wrap plating shall be AABUS. Note 4. See 3.6.2.11 of IPC-6018D. Note 5. Initial Release of designs (drawings) on or prior to September 30, 2022. Note 6. Initial Release of designs (drawings) on or after October 01, 2022.</p> <p style="text-align: center;">Table 3-5 Surface and Hole Copper Plating Minimum Requirements for Microvias (Blind and Buried)¹</p> <table border="1" data-bbox="237 932 1024 1037"> <tr> <td>Copper – average^{2,4}</td> <td>20 µm [787 µin]</td> </tr> <tr> <td>Thin areas⁴</td> <td>18 µm [709 µin]</td> </tr> <tr> <td>Wrap³</td> <td>5 µm [197 µin]</td> </tr> </table> <p>Note 1. See 3.2.6 of IPC-6018D for definition of microvia. Note 2. Copper plating (see 1.3.4.2 of IPC-6018D) thickness shall be continuous and wrap from hole walls onto outer surfaces. See IPC-A-600 for discussion on copper plating thickness for hole walls. Note 3. Wrap copper plating for microvias shall be in accordance with 3.6.2.11.1 or 3.6.2.11.3 of IPC-6018D. Alternatives to wrap plating shall be AABUS. Note 4. See 3.6.2.11 of IPC-6018D.</p> <p style="text-align: center;">Table 3-6 Surface and Hole Copper Plating Minimum Requirements for Buried Cores (2 layers)¹</p> <table border="1" data-bbox="237 1260 1024 1394"> <tr> <td>Copper – average^{2,4}</td> <td>20 µm [787 µin]</td> </tr> <tr> <td>Thin areas⁴</td> <td>18 µm [709 µin]</td> </tr> <tr> <td>Wrap^{3,5}</td> <td>7 µm [276 µin]</td> </tr> <tr> <td>Wrap⁶</td> <td>5 µm [197 µin]</td> </tr> </table> <p>Note 1. For through vias in the buried core. Note 2. Copper plating (see 1.3.4.2 of IPC-6018D) thickness shall be continuous and extend or wrap from hole walls onto outer surfaces. See IPC-A-600 for discussion on copper plating thickness for hole walls. Note 3. Wrap copper plating for buried via cores shall be in accordance with 3.6.2.11.1 or 3.6.2.11.3 of IPC-6018D. Alternatives to wrap plating shall be AABUS. Note 4. See 3.6.2.11 of IPC-6018D. Note 5. Initial Release of designs (drawings) on or prior to September 30, 2022. Note 6. Initial Release of designs (drawings) on or after October 01, 2022.</p>	Absolute Minimum ²	25 µm [984 µin]	Wrap ⁵	12 µm [472 µin]	Wrap ⁶	5 µm [197 µin]	Copper – average ^{2,4}	20 µm [787 µin]	Thin areas ⁴	18 µm [709 µin]	Wrap ³	5 µm [197 µin]	Copper – average ^{2,4}	20 µm [787 µin]	Thin areas ⁴	18 µm [709 µin]	Wrap ^{3,5}	7 µm [276 µin]	Wrap ⁶	5 µm [197 µin]			Per Panel
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3.2.6.2	<p>Electrodeposited Copper When copper plating is specified, electrodeposited copper platings shall meet the following criteria.</p> <p>a) When tested in accordance with IPC-TM-650, Method 2.3.15, the purity of copper shall be no less than 99.50%.</p> <p>b) When tested in accordance with IPC-TM-650, Method 2.4.18.1, using 50 – 100 µm [1,969 – 3,937 µin] thick samples, the tensile strength shall be no less than 275.8 MPa [40,000 PSI] and the elongation shall be no less than 18%.</p>		-	Monthly																				
3.2.7.2 & Table 3-3	<p>Electrodeposited Tin-Lead Tin-lead plating shall meet the composition (50–70% tin) requirements of ASTM B-579. When Code T is specified, plating thickness shall be minimum of 8.0 µm [315 µin] prior to fusing/reflow by way of microsection or X-Ray Fluorescence (XRF). Fusing is required unless the unfused option is selected wherein the thickness specified in Table 3-3 of IPC-6018D (Code TLU) applies.</p>		-	Per Panel																				