

Microcircuit Part Assessment

This section describes qualification and monitoring requirements for microcircuits. Use this section for microcircuit testing, qualification and monitoring requirements.

Class B microcircuits are the recommended class for microcircuits used in the normal and severe environments. Requirements for Class B microcircuits can be found in MIL-PRF-38535. Equivalent test data, monitors, or historical records may be used when available and approved by the approval activity of the application.

Conditions and methods of test should be in accordance with MIL-STD-883 or equivalent JEDEC test methods. Other test methods or circuits may be substituted if such a substitution in no way relaxes the requirements. A system for control and calibration of test equipment should be established. If a manufacturer elects to eliminate or reduce all or any conformance, qualification or screening step by substituting a process monitor or SPC procedure, they should only be relieved of the responsibility of performing the step only. The manufacturer should still be responsible for providing microcircuits, which meet all of the performance, quality, and reliability requirements for the application.

Microcircuits used in the normal and severe environments should have conformance testing or equivalent monitoring performed to Class B of MIL-PRF-38535. Tests should be conducted in accordance with the requirements of groups A, B, C, and D of MIL-PRF-38535. Non-military microcircuits used in a “protected environment”, stressed beyond 75% of the parts limit, in a stressful application, and should have conformance testing or equivalent monitoring performed. This testing should be to the Class B requirements of Mil-PRF-38535.

Microcircuits that go into a normal or severe environment should be qualified to class level B requirements of MIL-PRF-38535 or equivalent. Test method 5005 and 5010 of MIL-STD-883 describes the test plan for microcircuit qualification. Tailoring the qualification to a specific application and/or using process monitors is recommended. Non-military microcircuits used in a protected environment, stressed beyond 75% of the parts limits in a stressful application, should have qualification or equivalent performed. This testing should be to the Class B requirements of Mil-PRF-38535.

The recommended qualification test plan for PEMs is shown in Table 1. This plan should be used when a PEM is used in a normal environment or when the PEM is stressed beyond 75% of the parts limits and used in a stressful application in a protected Environment.

Test (100%)	Method/Condition
1. External visual, Group A electrical, Acoustic microscopy	Group A electrical use MIL-STD-883 at 25°C and application temperature extremes. Acoustic microscopy IAW IPC Standard J-STD-O35.
2. Construction analysis (Sample 2ea)	
3. Thermal characterization (Sample 2ea)	JESD 51 series.
4. Pre-conditioning	IPC Standard J-STD-020
5. External visual, pre-electrical and Acoustic microscopy	Same as 1
6. HAST (Highly accelerated temperature and humidity stress test)	JESD22-A110, Hours \geq 150
7. External visual, post-electrical and Acoustic microscopy	Same as 1
8. Analyze all defects and anomalies through destruction analysis	

Table 1. PEM Qualification Plan

Screening of microcircuits is not recommended. When required, the standard and recommended screening plan to use should be test method 5004 of MIL-STD-883, Class B requirements. Up-screening and/or up-rating of microcircuits is not a valid procedure and is not allowed.