



TECHNICAL REPORT

EIA-STD-4899™

REV. D

Issued 2001-12
Revised 2025-06

Superseding EIA-STD-4899C

Requirements for an Electronic Components Management Plan

RATIONALE

This standard was created to define consistent electronic components management requirements for developing electronic component management plans. This revision clarifies and updates these requirements to better address current electronic components issues.

FOREWORD

This document defines the requirements for developing an Electronic Components Management Plan (ECMP), hereinafter called the Plan, to assure customers and regulatory agencies that all of the electronic components in the equipment of the Plan owner are selected and applied using controlled processes compatible with the end application: aerospace, defense, and high performance (ADHP) equipment. This is accomplished by documenting and implementing the processes required in Clause 3 of this document.

In this document, electronic components are defined as “electrical or electronic devices that are not subject to disassembly without destruction or impairment of design use. They are sometimes called electronic parts, or piece parts.”

Electronic components may be either commercial-off-the-shelf (COTS) or custom-designed for the application. A COTS electronic component is defined as “*An electronic component developed by a supplier for multiple customers, whose design and configuration are controlled by the supplier’s or an industry specification.*” While there are still some electronic components that are custom-designed for ADHP applications, the vast majority of electronic components used in ADHP applications are COTS components¹. Thus, for the majority of ADHP applications, it will be impossible for the organization that integrates the electronic component into the application to flow down the requirements of Section 3 to the component manufacturer, and they must be accomplished by the integrator. In the minority of cases where the requirements of Section 3 can be flowed down to the component manufacturer, the integrator has the choice of either accomplishing the requirements for those components or flowing them down.

The Plan documents the processes that the Plan owner has available to address the requirements of this document. For each instance of electronic component integration into ADHP equipment, the Plan owner selects which of the documented processes will be used based on the application requirements.

NOTE: Appendices A and B are not subject to copyright restrictions.

¹ COTS components are not to be confused with COTS assemblies, which are defined as: “*An assembly developed by a supplier for multiple customers, whose design and configuration is controlled by the supplier’s or an industry specification.*” COTS assemblies are further described in EIA-933.

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1. SCOPE

This document applies to the development of Plans for integrating and managing electronic components in equipment for the military and commercial aerospace markets, as well as other ADHP markets that wish to use this document.

Examples of electronic components described in this document include resistors, capacitors, diodes, integrated circuits, hybrids, application specific integrated circuits, wound components, and relays.

It is critical for the Plan owner to review and understand the design, materials, configuration control, and qualification methods of all “as-received” electronic components and their capabilities with respect to the application; and to identify risks and, where necessary, take additional action to mitigate the risks.

The technical requirements are in Section 3 of this standard and the administrative requirements are in Section 4.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

ARP4754	Guidelines for Development of Civil Aircraft and Systems
ARP5890	Guidelines for Preparing Reliability Assessment Plans for Electronic Engine Controls
ARP6338	Process for Assessment and Mitigation of Early Wearout of Life-Limited Microcircuits
ARP6379	Processes for Application-Specific Qualification of Electrical, Electronic, and Electromechanical Parts and Sub-Assemblies for Use in Aerospace, Defense, and High Performance Systems
AS5553	Counterfeit Electrical, Electronic, and Electromechanical (EEE) Parts; Avoidance, Detection, Mitigation, and Disposition
AS6171	Test Methods Standard; General Requirements, Suspect/Counterfeit, Electrical, Electronic, and Electromechanical Parts
AS6496	Counterfeit Electronic, Electrical and Electromechanical Parts: Avoidance, Detection, Mitigation, and Disposition - Authorized Distribution
AS9100	Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations
SAE JA7496	Cyber-Physical Systems Security Engineering Plan (CPSSEP)
EIA-933	Requirements for a COTS Assembly Management Plan
EIA-4900	Use of Semiconductor Devices Outside Manufacturers' Specified Temperature Ranges
GEIA-STD-0003	Long Term Storage of Electronic Devices
GEIA-STD-0005-1	Standard for Developing a Lead-Free Control Plan to Manage the Risks of Lead-Free Solders and Finishes in Aerospace, Defense, and High-Performance Soldered Electronic Products

GEIA-STD-0005-2	Standard for Mitigating the Effects of Tin Whiskers in Aerospace and High Performance Electronic Systems
GEIA-STD-0006	Requirements for Using Robotic Hot Solder Dip to Replace the Finish on Electronic Piece Parts
GEIA-STD-0008	Derating of Electronic Components
GEIA-STD-0009	Reliability Program Standard for Systems Design, Development, and Manufacturing
STD-0016	Standard for Preparing a DMSMS Management Plan

2.2 AEC Publications

Available from Automotive Electronics Council, www.aecouncil.com

AEC Q100	Stress Test Qualification for Automotive-Grade Integrated Circuits
AEC Q101	Stress Test Qualification for Automotive-Grade Discrete Semiconductors
AEC Q200	Stress Test Qualification for Automotive-Grade Passive Components

2.3 ANSI Accredited Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ANSI/ESD S20.20	Protection of Electrical and Electronic Parts
ANSI/VITA 51.2-2011	Physics of Failure Reliability Predictions

2.4 IEC Publications

Available from IEC Central Office, 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland, Tel: +41 22 919 02 11, www.iec.ch.

IEC 61967 series	Measurement of Electromagnetic Emissions
IEC 62396 series	Process management for avionics - Atmospheric radiation effects
IEC TR 62240-1	Process management for avionics - Electronic components capability in operation - Part 1: Temperature uprating
IEC TS 62564-1	Process management for avionics - Aerospace qualified electronic components (AQEC) - Part 1: Integrated circuits and discrete semiconductors
IEC TS 62647-1	Process Management for Avionics - Aerospace and Defence Electronic Systems Containing Lead-free Solder - Part 1: Preparation of a Lead-free Control Plan
IEC TS 62647-2	Process management for avionics - Aerospace and defence electronic systems containing lead-free solder - Part 2: Mitigation of deleterious effects of tin
IEC TS 62668-1	Process management for avionics - Counterfeit prevention - Part 1: Avoiding the use of counterfeit, fraudulent and recycled electronic components
IEC TS 62686-1	Process management for avionics - Electronic Components for aerospace, defence, and high performance (ADHP) applications - Part 1: General requirements for high reliability integrated circuits and discrete semiconductors

2.5 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 9000 Quality Management Systems - Fundamentals and Vocabulary

2.6 JEDEC Publications

Available from JEDEC, 3103 10th Street North, Suite 240S, Arlington, VA 22201, www.jedec.org.

JEP122 Failure Mechanisms and Models for Semiconductor Devices

JEP149 Application Thermal Derating Methodologies

JESD47 Stress-Test-Driven Qualification of Integrated Circuits

JESD74 Early Life Failure Rate Calculation Procedure for Electronic Components

JESD89 Measurement and Reporting of Alpha Particles and Terrestrial Cosmic Ray-Induced Soft Errors in Semiconductor Devices

JESD94 Application Specific Qualification Using Knowledge Based Test Methodology

J-STD-020 Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices

J-STD-033 Handling, Packing, Shipping, and Use of Moisture/Reflow Sensitive Surface-Mount Devices

J-STD-046 Customer Notification Standard for Product/Process Changes by Electronic Product Suppliers

J-STD-075 Classification of Passive and Solid State Devices for Assembly Processes

2.7 RTCA Publications

Available from RTCA, Inc., 1150 18th Street, NW, Suite 910, Washington, DC 20036, Tel: 202-833-9339, www.rtca.org.

RTCA DO-160 Environmental Conditions and Test Procedures for Airborne Equipment

2.8 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-HDBK-217 Reliability Prediction of Electronic Equipment

MIL-HDBK-338 Electronic Reliability Design Handbook

MIL-HDBK-454 General Guidelines for Electronic Equipment

MIL-STD-810 Environmental Engineering Considerations and Laboratory Tests

MIL-STD-11991 General Standard for Parts, Materials, and Processes

3. TECHNICAL REQUIREMENTS

An ECMP, hereinafter called the Plan, compliant to this document **shall** include documented processes that are available for use by the Plan owner to accomplish the requirements of this clause. These requirements apply to all electronic components, including COTS, custom, and subcontracted components. The Plan **shall** document all the component types or technologies and the range of equipment to which the Plan applies.

3.1 Component Application

The documented processes **shall** assure that the electronic component performs the function(s) allocated to it by the application design, reliably throughout its manufacturing, operating, storage, and transportation lifetime, using appropriate risk mitigations when required. Allocated functions include, but are not limited to, inputs and outputs for electrical, electronic, electromechanical, electro-optical signals, duty cycle, etc.

3.1.1 Operating, Storage, and Transportation Environmental Stresses

The documented processes **shall** assure that the electronic component satisfies its application requirements with respect to each of the manufacturing, operating, storage, and transportation stresses listed in Table 1, using appropriate risk mitigations as required.

Table 1 - Application stress considerations

	Stress	Application Consideration	Guidance Standards
3.1.1.1	Temperature limits	Components usage outside the temperature limits specified by the component manufacturer is discouraged. Damage can occur when specified maximum or minimum temperature limits are exceeded during manufacturing, operation, storage, or transport.	IEC TR 62240-1 GEIA-STD-0003 RTCA DO-160
3.1.1.2	Temperature variations	Temperature cycling over long periods of time can cause damage due to mismatches of thermal coefficients of expansion between the component and other materials in an assembly.	
3.1.1.3	Heat dissipation and cooling	Proper heat dissipation and cooling methods may be required to prevent damage to the component assemblies. When the application has successfully implemented the thermal and stress analysis process, in conjunction with the component manufacturer specifications, the component is considered to be used within the manufacturer's rating.	JEP149
3.1.1.4	Mechanical shock	Mechanical stress limits may be exceeded when components are exposed to mechanical shock. This includes mechanical fit, as well as the ability to withstand mechanical shock, and mechanical stresses including those generated by mismatches of coefficients of thermal expansion of the different materials.	JESD47
3.1.1.5	Mechanical vibration	Damage can occur due to long-term exposure to certain mechanical vibration profiles. This includes mechanical fit, as well as the ability to withstand vibration, and mechanical stresses including those generated by mismatches of coefficients of thermal expansion of the different materials.	JESD47
3.1.1.6	Natural radiation	Radiation due to cosmic rays, neutrons, heavy ions, etc., may cause Single Event Effects (SEE).	IEC 62396 series JESD89
3.1.1.7	Induced radiation	Damage can result from exposure to nuclear radiation and X-ray inspection.	
3.1.1.8	Moisture and corrosion	Damage can result from exposure to moist and/or corrosive environments, particularly when elevated temperatures are experienced.	J-STD-020
3.1.1.9	Electromagnetic capability	Electronic components can contribute to electromagnetic noise through electrical transitions and can be susceptible to electromagnetic interference.	IEC 61967 series
3.1.1.10	Electrostatic discharge	Handling of components can induce electrostatic discharge, which can cause component damage.	ANSI/ESD-S20.20
3.1.1.11	Explosive atmosphere	Operation near fuel-air atmospheres may cause explosive reactions that need to be prevented or contained	MIL-STD-810
3.1.1.12	Other relevant stresses	As applicable from system use environment or customer specifications.	