

IDEA-STD-1010-B

Acceptability of Electronic Components Distributed in the Open Market

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Full document details: IDEA STD-1010-B 2011

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1 The Principles of Standardization

The IDEA-STD-1010 Update Committee recognizes and seeks to comply with, as relevant to the subject matter of this Standard, the "Principles of Standardization" as stated and published by IPC in IPC-A-610, as guiding principles of standardization. The principles, relevant to this Standard are reprinted by permission of IPC below.

Standards Should:

- Minimize time-to-market
- Contain simple (simplified) language
- Just include spec information
- Focus on end product performance
- Include a feedback system on use and problems for future improvement

Standards Should Not:

- Inhibit innovation
- Increase time-to-market
- Keep people out
- Increase cycle time
- Tell you how to make something
- Contain anything that cannot be defended by data

2 IDEA's Standard Development Process

2.1 Standard Development Principles

IDEA Standards are developed to uphold the following principles:

Development by Consensus: An IDEA committee of experts is set up and committed to the task of developing a draft of the Standard. An inquiry is made to the relevant groups of interest for review and comment prior to publication.

Adding Value to the Industry of Interest: IDEA Standards are developed with global standardization objectives in mind.

Voluntary Adoption: IDEA recognizes and supports the voluntary adoption of its Standards based on the inherent value and merit of the Standard to the industry.

Stages of the Development of IDEA Standards
The production of an IDEA Standard is the result of consensus amongst the subject matter expert committee (SMEC) Members of IDEA and seeks review and input from industry subject matter experts. IDEA Standards are developed by subject matter expert individuals and committees (SMEC) utilizing the Plan, Do, Check, Act (PDCA) cycle made up of the following seven phase processes:

- Phase 1: Proposal Phase
- Phase 2: Preparatory Phase
- Phase 3: Committee Phase
- Phase 4: Inquiry Phase
- Phase 5: Approval Phase
- Phase 6: Publication Phase
- Phase 7: Continuous Improvement

If there is not a substantial or significant document already available at the beginning of the standardization project, a document will be drafted by a subject matter expert appointed by the IDEA Board of Directors. This document will be part, if not all, of the foundational material provided to the SMEC for the development of the working draft.

If there exists at the onset of the standardization project a substantial or significantly recognized document already available, such a document may be utilized to expedite the development process and be part, if not all, of the foundational material

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provided to the SMEC for the development of the working draft. Depending on the maturity and industry-wide recognition of the document, an existing document may be advanced directly to the sixth phase.

To ensure the objective of process integrity, IDEA has adopted similar general principles and phases as those published and adhered to by the International Organization for Standardization (ISO)[1]. The following is a summary of each of the seven phases utilized by IDEA:

Phase 1: Proposal Phase
The first step in the development of a Standard is to confirm that a particular Standard is needed. A new work item proposal is submitted for vote by the Board of Directors to determine the inclusion of the project in the standards creation program.

The proposal is accepted if a majority of the Board of Directors votes in favor and at least two Members declare their commitment to participate actively in the project. At this phase, a project leader responsible for the work item is normally appointed.

Phase 2: Preparatory Phase
Usually, a working group (committee) of experts and the project leader is set up by the IDEA Executive Director for the preparation of a working draft. Successive working drafts may be considered until the working group is satisfied that it has developed the best technical solution to the problem being addressed. At this stage, the draft is forwarded to the Executive Director for the consensus-building phase.

Phase 3: Committee Phase
As soon as a committee draft is available, it is distributed to a constituency group for comments. Successive committee drafts may be considered until consensus is reached on the technical content. Once consensus has been attained, the text is finalized for submission as a draft Standard.

Phase 4: Inquiry Phase for Technical Comments by Industry Inquiry
For example, Industry Associations, Standards Organizations, Component Manufacturers, Test Services, Programming Services, Tape & Reel Services, Non-IDEA member Independent Distributors.

The draft Standard is circulated to all IDEA Member Representatives by the IDEA Executive Director for voting and comments within a predetermined period. It is approved for submission as a final draft Standard if a two-thirds majority of the IDEA Member Representatives is in favor and not more than one-quarter of the total number of votes cast are negative. If the approval criteria are not met, the text is returned to the originating working group for further study and a revised document will again be circulated for voting and comment as a draft Standard.

Phase 5: Approval Phase
The final draft is circulated to all IDEA Board Members for a final Yes/No vote within a predetermined period. If technical comments are received during this period, they are no longer considered at this stage, but registered for consideration during a future revision of the Standard. The text is approved as a Standard if a two-thirds majority of the Board of Directors is in favor and not more than one-quarter of the total number of votes cast are negative. If these approval criteria are not met, the Standard is referred back to the originating working group for reconsideration in the light of the technical reasons submitted in support of the negative votes received.

Phase 6: Publication Phase
Once a final draft Standard has been approved by the IDEA Board of Directors, only minor editorial changes, if and where necessary, are introduced into the final text. The final text is made available on the IDEA website and is considered published. A press release is stated on the website and distributed to the industry.

Phase 7: Continuous Improvement
Review of IDEA Standards (Confirmation, Revision, and Withdrawal). All Standards are reviewed at least once every five (5) years by the responsible working group. A majority of the IDEA Board of Directors decides whether the Standard should be confirmed, revised, or withdrawn.

[1] ISO http://www.iso.org/iso/en/about.htm

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IDEA Standards Development and Industry Consensus Process

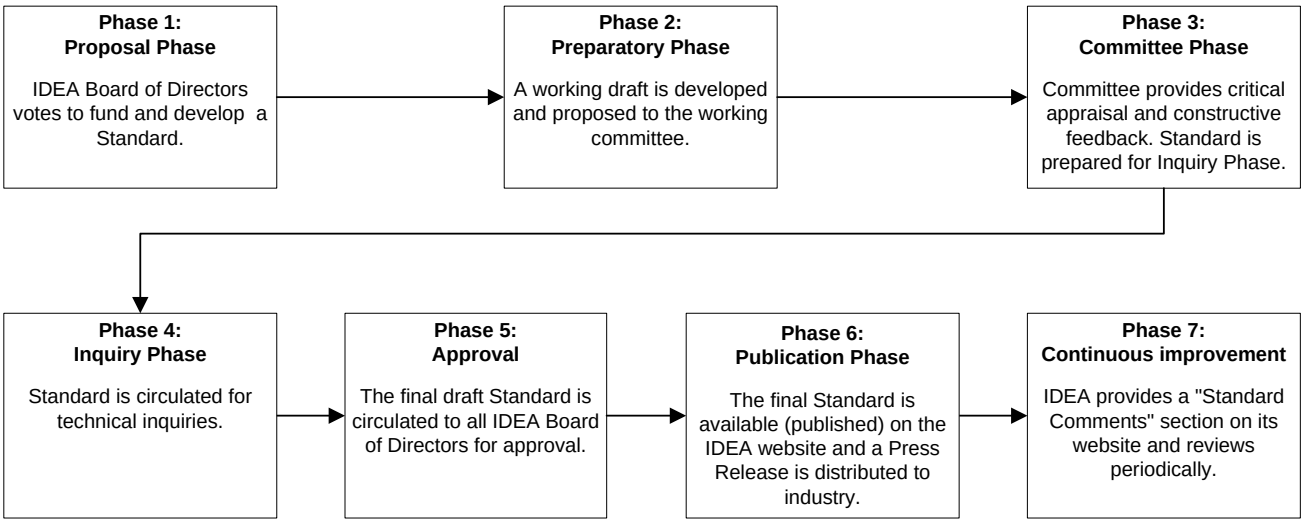


Figure 2-1

2.2 Notice

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2.3 Why is there a charge for this Standard?

Your purchase of this document contributes to the ongoing development of new and updated industry standards and guides. Standards allow manufacturers, customers, and suppliers to understand one another better. Standards allow Distributors greater efficiencies when they set up their processes to meet industry standards, allowing them to offer their customers lower prices.

IDEA spends a large portion of its annual budget to support research, build consensus, and produce meaningful products for the industry. During the process of consensus building, there are many rounds of drafts sent out for review, and the committees spend hundreds of hours in review and development. IDEA's staff attends and participates

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in committee activities, development, circulates document drafts, and follows all necessary procedures to qualify for ANSI approval.

IDEA's Membership dues have been kept low in order to allow as many qualifying companies as possible to participate. Therefore, the Standards revenue is necessary to complement dues revenue. The price schedule offers a discount to IDEA Members. If your company buys IDEA Standards and meets the IDEA Membership requirements, why not take advantage of this and the many other benefits of IDEA Membership as well? For more information on Membership in IDEA, please visit www.IDofEA.org or call (714) 670-0200.

Thank you for your continued support.

2.4 IDEA-STD-1010 Adoption

Commercial Adoption of Standards
The adoption of this Standard will be the result of customer and supplier industry acceptance of the principles and inspection acceptance criteria contained within.

The United States Department of Defense's Adoption of Commercial Standards
Based on the U.S. Department of Defense's (DoD) policy and implementation of relying when practicable on a Performance-Based Business Environment (PBBE) and as described in the Performance-Based Services Acquisition (PBSA) Guidebook, the DoD now encourages that its contracts be based on performance standards as opposed to industry standards, leaving the responsibility to its contractors to determine which industry standards are most appropriate to assure the fulfillment of the contractual performance standards. Therefore, Standard IDEA-STD-1010-B may be used in the fulfillment of DoD contracts not necessarily by "adoption" by the DoD, but resulting from the quality plan determined contractually appropriate by the DoD industry contractors.[2] [3]

Approved by

Users of this Standard are invited to participate in
the development of future revisions.

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[2] http://www.acq.osd.mil/dpap/Docs/pbsaguide010201.pdf, Appendix H, page 39, paragraph entitled *Attachments, Appendixes, and Exhibits*.

[3] http://akss.dau.mil/dag/DoD5000.asp?view=functional, paragraph 11.6, *Implementing a Performance-Based Business Environment (PBBE)*

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3 Acknowledgements

Any Standard involving complex technology draws material from a vast number of sources. While the members of the IDEA-STD-1010 Update Committee and the Inquiry Companies are included below, it is not possible to include all of those who assisted in the evolution of this Standard. To each of them, IDEA extends its gratitude.

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5 Foreword

This Standard was developed and published by the Independent Distributors of Electronics Association (IDEA) to enhance risk mitigation strategies specifically associated with the procurement, inspection, and sale of goods within the Open Market. The name assigned to the subject matter expert committee (SMEC) is the IDEA–STD-1010 Update Committee.

Previous to the publication of the IDEA-STD-1010-A Standard, there had not been in the history of the electronic components Open Market a consensus-based Standard for the visual examination and acceptability criteria for electronic components that is specifically targeted to the needs of the Open Market for electronic components.

As part of fulfilling its purpose, IDEA has produced this update to the Standard entitled *IDEA-STD-1010 B: Acceptability of Electronic Components Distributed in the Open Market* to provide technical answers to two central questions: "What are quality visual examination techniques of electronics components traded in the Open Market?" and "What are visual acceptance criteria for electronics components traded in the Open Market?" In answering these questions, IDEA works to establish and improve quality standards, to facilitate effective communication, and to promote successful business transactions, thereby further assuring customer satisfaction in the industry.

5.1 About IDEA

The Independent Distributors of Electronics Association (IDEA) is the leading global resource for Independent Distributors to find relevant Quality Management information. IDEA promotes advancement of trade ethics, establishes consensus-based Standards, and provides industry education.

IDEA is a non-profit trade association representing quality and ethically committed Independent Distributors of electronic components. The purpose of IDEA is to promote the quality Independent Distribution Industry through media advocacy campaigns; to improve the quality of products and services through a quality certification program, educational seminars, and conferences; and to promote the study, development, and implementation of techniques and methods designed to improve the business of Independent Distributors. For more information about IDEA, go to www.IDofEA.org.

5.2 About This Standard

This Standard is a collection of visual acceptability requirements utilized to indicate the quality of electronic components. It was prepared by the Standards Committee of IDEA.

This document presents acceptance requirements for the Open Market of electronic components to determine a high confidence factor that parts under examination indicate new (unused) condition and that parts have been stored, handled, and packaged consistent with applicable industry standards. Any acceptance of product that deviates from the above stated target conditions is dependent upon the contractual agreements between the buyer and seller, which are outside of the scope of this Standard.

Until the publication of IDEA-STD-1010-A, no industry standard of acceptable criteria for the Open Market existed. With the update of the Standard to Revision B, the Standards Committee has attempted herein to perform its due diligence to put forth within this document the appropriate information in order to meet its stated objectives, while at the same time recognizing that this publication is the continuation of revisions that will further improve upon the first publication.

The Standards Committee of IDEA recognizes that obtaining quality photos that exemplify acceptable vs. unacceptable conditions is a challenge in and unto itself, as most photos used in this Standard, as well as future revisions, are photos that have been taken by Independent Distributors in the course of executing business as well as photos taken by companies that provide services to the Open Market. The Standards Committee maintains an open call to Distributors and Open Market Service

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Providers to submit photos they deem contributory to further revisions of this standard. Companies or individuals that contribute photos will be listed in the *Acknowledgements* of the next revision. Please forward photos in digital format to photos@IDofEA.org.

5.3 The Format for This Standard

The IDEA-STD-1010 Update Committee has reviewed many respected standards in the electronics industry with the intent to format and present IDEA-STD-1010 in a consistent and constructive manner that optimizes locating information and content by its users.

5.4 Scope

The Standard sets forth *practices* and *requirements* for visual examination and acceptability criteria of electronic components purchased and sold in the Open Market. *Practices* are generally accepted industry methods and are provided in the Standard for guidance only; they are not mandatory. *Requirements* are mandatory conditions essential for indicating acceptable products in accordance with the Standard. Revision B of the Standard includes new sections that provide reference and guidelines for the use of Test Facilities and the understanding and use of advanced inspection techniques.

5.5 Introduction

This Standard offers a rich collection of pictorial information based on technical facts and visual quality characteristics that lend for more easily recognizable artifacts than text alone can convey to the user.

Occasionally, inspection and testing are required to a destructive and forensic degree. Destructive and detailed forensic inspection and testing, while beyond the scope of the revision of this Standard, is covered by way of introduction and overview. Future revisions may contain more substantive guidance.

The Open Market is a large, successful, and significant market, due largely to:

- The need for Original Equipment Manufacturers (OEM) and Electronic Manufacturing Services (EMS) to realize the value remaining in their excess inventories
- The need by OEMs and EMS Providers to procure parts that are unavailable via factory or Authorized (Franchised) channels for reasons such as obsolescence or excessive lead time
- The opportunity for OEMs and EMS Providers to purchase parts of equal quality yet less cost than those purchased directly from factory or Authorized (Franchised) sources.

5.6 Purpose

This Standard describes concepts, theory, materials, methods, and verification criteria that, when applied as recommended or required, will produce a heightened confidence factor of quality of the subject electronic components and indicate that similar conclusions may be determined upon the same examination of the parts from the same immediate lot, group, or population.

The photos in this document portray specific points noted in the title of each page. A brief description follows each photo. The Standard does not exclude any acceptable inspection method, procedure, or criteria used to make judgments regarding the quality of the subject part; however, the methods used must produce technical evidence of quality conforming to the acceptability requirements described in this document.

In the case of a discrepancy, the description or written criteria always takes precedence over the photos.

5.7 Specialized Characteristics

IDEA-STD-1010, as an industry consensus document, cannot address all of the possible components, packaging, and inspection attribute combinations. However, the Standard does provide criteria for commonly-used inspection techniques. Where uncommon or specialized components or technologies are necessary, good judgment should be used while applying the criteria of this Standard. However, where similar characteristics exist, this document may provide guidance for product acceptance criteria. Often, unique definition is necessary to consider the specialized characteristics while considering product performance criteria. Such development should include customer involvement and consent, and the criteria

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should include an agreed-upon definition of product acceptance.

Whenever possible, this criterion should be submitted to IDEA to be considered for inclusion in upcoming revisions of this Standard.

5.8 Background

5.8.1 Substandard

The most typical instance in which Independent Distributors find parts to be unacceptable is when they are determined to be "substandard" in quality, or other evidence suggests that part quality may have been compromised. Substandard means that the parts do not appear to meet the contract requirements, typically expressed as a "Purchase Order" or a general contract.

Parts can be determined substandard because they exhibit visual evidence of non-quality. For this reason, full disclosure about parts, including the provision of digital photos, shall be expected from the source prior to tendering a purchase order to minimize the likelihood of the return of product because parts do not meet customer expectations.

5.8.2 Fraud

Fraud in the Open Market occurs in a variety of ways, including, but not limited to:

- Intentionally misrepresenting the origin of goods.
- Falsification of documentation, such as test reports, Certificates of Conformance (CoC), etc.
- Accepting payment in advance for material yet never shipping the ordered product or refunding the buyer's advanced payment.

For these reasons and others, quality Independent Distributors exercise measures to verify documentation, secure payments, and evaluate suppliers.

5.8.3 Counterfeiting

Counterfeiting has been a substantial problem since chip production started. There have been significant counterfeiting issues throughout each of the decades. Most recently, the 1990s saw issues with counterfeit SRAM (during the SRAM shortage of 1995), counterfeit Pentium Pro chips (during the PP-200 shortage of 1998), and counterfeit tantalum capacitors (during the tantalum capacitor allocation period of 2000-2001).

Counterfeiting in the Open Component Market continues to be a significant threat. Although counterfeiters have been traced to many countries, including those in the Americas and Europe, it is widely believed that the majority of recent as well as current counterfeiting is occurring in China.

As of the writing of this Standard, it is commonly believed that sources in China are remarking reclaimed (used) parts with part numbers of the more expensive parts in demand, namely memory chips. Common speculation is that counterfeiting sources found this behavior profitable and expanded into *manufacturing* counterfeit electronic products and selling such product into the world market.

Initially, the solution for many Independent Distributors was to simply not purchase any product out of China. However, that approach has proven to be unrealistic, as in recent years, many Original Component Manufacturers (OCMs), OEMs, and EMS Providers have moved their operations to China. Therefore, a significant number of available excess inventories are indeed in China. Naturally, EMS Providers continue to require Independent Distributor services to purchase excess inventories and conversely to provide allocated and obsolete parts as needed.

The response by quality Independent Distributors has been to build trusted and reliable networks within Asia's market. These trusted networks are made of quality Independent Distributors using proven and accountable sourcing, acquisition, and inspection policies and, as possible, utilizing the law to arrest and prosecute any instances of fraud.

5.8.4 Using the Term "Counterfeit"

Quality Independent Distributors do not typically determine a part "counterfeit" unless the manufacturer of the product states in writing that they have determined the product is counterfeit. Instead, Independent Distributors typically condition the term "counterfeit" with the word "suspect," meaning that based on the expertise that resides

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within that Independent Distributor's business, they suspect that the part may indeed be counterfeit.

5.8.5 Confusing Terms

The use of confusing terms by a supplier should raise suspicion. Independent Distributors must be continually vigilant about terms and jargon used in the industry when conducting business. Terms such as "clones," "crosses," "drop-ins," "equivalents," "generic," "knock-offs," "plain-wrap," "replacements," "substitute," etc. represent some of the various terms used.

5.9 Terms and Definitions

Acceptable: Product meets all contractual requirements, in reference to the manufacturers' specification as well as particular conditions agreed upon between the buyer and seller, and has been determined by both parties to be acceptable product with which to fulfill said contract.

Acoustic Microscopy (AM): Process that creates an image using ultrasound to view a specimen's surface or subsurface features, including defects and damage. See J-STD-035 for more information about Acoustic Microscopy.[4]

Authorized (Franchised) Distributor: A Distributor whom a manufacturer has authorized by contract to distribute its product lines. Such contracts may include clauses that provide for the manufacturer's marketing and technical support, exclusivity of inventory to the Authorized (Franchised) Distributor, and competitive limiters.

Barcode: An internationally recognized symbology where the method of printed bars and spaces are used to represent numbers, letters, or punctuation marks that are read rapidly by a laser scanner or some other interface to an electronic database for identification and other inventory control purposes.

Barcode Scanner: Used to read and convert the information from barcodes (on labels) to human-readable form. These instruments are very reasonably priced and will produce human-readable results within popular applications, such as Microsoft® Word, and are useful for detecting some counterfeit labels.

Blacktopped: A term used to describe the intentional covering of the original manufacturer part markings or masking the signs of rework and removal of original part markings.

Bond Wires: The wires used to make an electrical connection from the external leads to the die. See also *Wire Bond.*

Broker: An agent with specific market knowledge and skills who provides value by making successful transactions between two parties unknown to each other or in opposition to each other. In the Open Market, Brokers are professionally referred to as Independent Distributors (see *Independent Distributor*). Brokers do not take stocking positions with product.

Bulk: (1) Bulk is a term used to describe product that is being shipped loosely in boxes or bags. (2) A term used by Authorized (Franchised) Distribution to describe large quantity shipments of material packaged in tubes, trays, or on reels. (This definition of the term is not frequently used by Independent Distribution.)[5]

Carrier: The medium within which the parts are packed, i.e., tubes, reels, trays, tape, bulk bag.

Certificate of Conformance (CofC, CoC): A document provided by a supplier formally declaring that all buyer purchase order requirements have been met. The document may include information such as manufacturer, distributor, quantity, lot and/or date code, inspection date, etc., and is signed by a responsible party for the supplier.[6]

Certificate of Conformance and Traceability (CoCT): A certificate of conformance required by certain military specifications or customer requirements which require documented traceability from the Qualified Products List (QPL)/Qualified Manufacturers List (QML) manufacturer through

[4] IPC/JEDEC, *J-STD-020D.1: Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices* (Arlington, VA; Bannockburn, IL: IPC/JEDEC, 2008) 1. Copyright IPC/JEDEC. Reproduced with permission.

[5] ERAI, *Industry Terms & Definitions*, (ERAI, 2006) 6. Copyright ERAI. Reproduced with permission.

[6] SAE, *AS5553: Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition* (SAE International, 2009) 6. Reprinted with permission from SAE document AS5553 © 2009 SAE International.

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delivery to the requestor if the material is not procured directly from the approved manufacturer.[7]

Coplanarity: Applies to surface-mount semiconductor devices and is the plane formed by the three terminal apexes that exhibit the greatest perpendicular distance from the package substrate, provided that the triangle formed by those three apexes encompasses the projection of the center of gravity (COG) of the component.[8]

Counterfeit Product: Any part, documentation, packaging, labeling, or identifying information that has been modified so as to fraudulently misrepresent authenticity.

Country of Origin (COO): The country where the device was manufactured. Some devices may have multiple COOs, with the die being manufactured in one country and the packaging assembly completed in a second.

Date Code: A code that represents the date of assembly by the manufacturer of the device.

Decapsulation: The act of removing the top surface of a part in order to expose the die. Decapsulation can be chemical, mechanical, or by heat and is destructive.

Desiccant: An absorbent material packed in dustless pouches used to maintain a low relative humidity. Desiccant must meet or exceed MIL-D-3464 Class II requirements.[9]

Destructive Physical Analysis (DPA): A systematic, logical, detailed examination of parts during various stages of physical disassembly, conducted on a sample of completed parts from a given lot, wherein parts are examined for a wide variety of design, workmanship, and/or processing problems.[10]

Device Marking Test *(formerly Solvent A Test)*: A chemical wipe test consisting of three (3) parts mineral spirits and one (1) part isopropyl alcohol (IPA) solution to check for ink marking permanency.

Device Package: The type of physical configuration of an electronic component. Refer to IPC-DRM-18 or MIL-STD-1835 for detailed information about the types of device packages available and their characteristics.

Device Surface Test *(formally Solvent B Test)*: A chemical wipe test using acetone to check for blacktopping of parts.

Discrete Components: Discrete components are simply defined as single element (circuit) electronic devices. Discrete devices are subgrouped by passive (primarily to regulate voltage and current flows, although they cannot achieve power gain) and active (switching devices, with the exception of LED). Most commonly and for relevance in inspection methodologies, passive discrete components do not contain a silicon wafer while active components do.

Active Discrete components increase the power of a signal and must be supplied with the signal and a source of power. The signal is fed into one connection of the active device and the amplified version taken from another connection. In a transistor, the signal can be applied to the base connection and the amplified version taken from the collector. The source of power is usually a direct current voltage from a battery or power supply. Examples are bipolar transistors, field effect transistors, light emitting diodes (LED), metal-oxide semiconductor field effect transistors (MOSFET), etc.

Passive Discrete components do not increase the power of a signal. They often cause power to be lost. Some can increase the voltage at the expense of current, so overall there is a loss of power. Examples are resistors, capacitors, inductors and diodes (the latter is a special case).[11]

Die: A small, square or rectangular piece of semiconductor material, usually silicon, onto which a

[7] SAE, *AS5553*, 6. Reprinted with permission from SAE document AS5553 © 2009 SAE International.
[8] JEDEC, *JESD22-B108B: Coplanarity Test for Surface-Mount Semiconductor Devices* (Arlington, VA: JEDEC, 2010) 1.Copyright JEDEC. Reproduced with permission by JEDEC.
[9] JEDEC, *JESD88D: JEDEC Dictionary of Terms for Solid State Technology-5th Edition* (Arlington, VA: JEDEC, 2009) 52. Copyright JEDEC. Reproduced with permission by JEDEC.
[10] SAE, *AS5553*, 6. Reprinted with permission from SAE document AS5553 © 2009 SAE International.
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complete integrated circuit is etched. The die is internal and encapsulated in the package.

Disposition: The decision made by an authorized party (policy or referee) for determining the course of action to be taken for nonconforming material. Example: Return to Supplier, Scrap.[12]

Dry Pack: Dry pack consists of desiccant material and a Humidity Indicator Card (HIC) sealed with the Surface Mount Device (SMD) packages inside a moisture barrier bag (MBB).[13]

Electronic Measurement Tools: Measuring equipment such as multimeters, continuity checkers, and capacitance meters used to measure for continuity, resistance, and capacitance of electronic devices in order to help determine if the part under inspection meets the manufacturer's specification.

Electrostatic Discharge (ESD): The rapid, spontaneous transfer of electrostatic charge induced by a high electrostatic field. *Note: Usually, the charge flows through a spark between two bodies at different electrostatic potentials as they approach one another. Details of such processes, such as the rate of the charge transfer, are described in specific electrostatic discharge models.*[14]

Electrostatic Discharge (ESD) Shield: A barrier or enclosure that limits the passage of current and attenuates an electromagnetic field resulting from an electrostatic discharge.[15] See ANSI/ESD S541, *Packaging Materials for ESD Sensitive Items*, for more information about ESD shielding and appropriate packaging materials.

Factory Packaged: Any product that is in the manufacturer's original box and/or bag, but the factory seal has been broken. Valid reasons for a broken seal may include IDEA-STD-1010 inspection, inspection of Humidity Indicator Card (HIC) and proper dry packing for safe storage when shelf life has expired as per J-STD-033, and/or for testing/programming purposes.

Factory Sealed: Any product that is sealed in the manufacturer's original packaging as intended by the manufacturer for distribution; sealed meaning sealed at the factory.[16]

Finding: Information or a characteristic about a part that indicates a nonconforming attribute. The quality management system within an Organization may have established policies that predisposition certain findings, while other findings must be reviewed by a subject matter expert or a team of subject matter experts within an Organization for final disposition.

Finger Cots: A material handling supply that is inserted over the finger when handling sensitive components to prevent contamination.

Fluorescent Dye Penetrant: An inspection method used to detect surface cracks in components using a penetrant solution, a developer, and ultraviolet or white light. A penetrant solution is applied to the component followed by a developer to help draw penetrant out of surface cracks, rendering cracks visible under ultraviolet or white light.

Franchised Distributor: See *Authorized (Franchised) Distributor.*

Generic Part: A part that functions as specified and does not violate any intellectual property rights (IPR).

Golden Sample: Known authentic.

Hand Measurement Tools: Measuring tools, such as calipers and micrometers, used to take measurements of various physical characteristics of a specimen. This includes the physical measurement of electronic devices as well as the pocket size of carrier tape and trays.

Heat Seal: A method for airtight sealing of antistatic or moisture barrier bags (MBB) where heat is applied in order to create a seal.

[12] JEDEC, *JESD88*, 58. Copyright JEDEC. Reproduced with permission by JEDEC.
[13] IPC/JEDEC, *J-STD-033B.1: Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices* (Arlington, VA: JEDEC, 2007) 4. Copyright IPC/JEDEC. Reproduced with permission.
[14] ESDA, *ESD ADV1.0-2009: ESD Association Advisory for Electrostatic Discharge Terminology* (Rome, NY: ESDA, 2009) 7. Copyright ESDA. Reproduced with permission.
[15] ESDA, *ESD ADV1.0-2009*, 8. Copyright ESDA. Reproduced by permission.
[16] ERAI, *Terms & Definitions*, 3. Copyright ERAI. Reproduced by permission.

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Heat Sink: A device used to draw and dissipate heat.

Heat Sink Witness: The mark or marks left on a device by a heat sink.

Humidity Indicator Card (HIC): A card typically packaged inside a moisture barrier bag (MBB) that is used to determine the relative humidity the card was exposed to while inside the moisture barrier bag (MBB). Refer to J-STD-033 for more technical information.

Inconclusive: Any inspection result that requires more information in order to determine that it is an acceptable item or whether a nonconformance may exist.

Independent Distributor: A distributor that typically does not have limiting contractual agreements or obligations to the Original Component Manufacturers (OCM). Independent Distributors purchase product on the Open Market with the intent to distribute and resell back into the market or to end users. Independent Distributors generally carry inventory on an ongoing basis.

Inspection Methodology: Set of procedures and/or policies, such as IDEA-STD-1010, that defines the physical inspection of a component to determine if it meets the requirements as set forth in the agreement between the buyer and the seller.

Integrated Circuits: Integrated circuits, also referred to as ICs, are devices with multiple circuits on a single die. The die is generally made of etched silicon, although technology has evolved for specification applications, such as Gallium Arsenide (GaAs) for ultra-high frequencies. There is a wide variation of integrated circuit complexity, including both digital and analog signal storage and management.

There are two types of integrated circuits: Monolithic and Hybrids. Monolithic ICs are made of semiconductor devices and may include passive components, manufactured in a single die. Hybrid ICs are made of semiconductor devices and may include passive components but bonded together in a common substrate or board. Hybrid ICs can also be a combination of two or more ICs and/or other discrete components (like some power drivers, combining a metal-oxide-semiconductor field-effect transistor (MOSFET) with a Control IC).

Integrated Circuits are generally classified as:

Analog
- Operational Amplifiers
- FM transceivers
- Regulators
- RF Prescalers

Digital
- Memory
- Processors
- Controllers
- FPGA

Mixed-Signal
- Digital-to-analog converters
- Analog-to-digital converters
- Motor Drivers
- Power Management Devices[17]

Lead Free/Pb Free: Devices in which the lead (Pb) level in any of the homogeneous materials is less than 0.1% by weight.

Leader/Trailer: The blank pockets at the beginning and ending of component carrier tape.

Leadframe: A metal structure to which a die is attached. Wire bonds then connect the die to the leads. This is then encapsulated, usually in plastic but can be metal or ceramic, to cover and complete the device.

Lot Code: A unique identifier assigned to a series of devices for the purpose of identifying aspects of their manufacture, such as line, fab, batch, die, etc.

Marking Permanency: A test using specific chemicals to determine whether the ink markings on a chip are permanent.

Markings: Identifying marks that are applied to a device by ink, laser, or molding.

Moisture Barrier Bags (MBB): Moisture barrier bags (or moisture vapor bags) are utilized to protect electronic components from moisture damage and are typically made of multiple layers of plastic and aluminum to restrict the rate of moisture

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transmission from outside the bag to inside the bag. The degree of moisture protection of an MBB is determined by a measure of its Moisture Vapor Transmission Rate (MVTR), also known as Water Vapor Transmission Rate (WVTR). Based on the formula, MVTR is measured in grams of water vapor, per 100 square inches of barrier, per 24 hours ($g/100in^2/24hrs$). MBBs are specified for other properties as well, such as ESD and puncture resistivity properties. Refer to J-STD-033 for more technical information.

Mold Mark: A visually detectable characteristic left as part of the molding process.

Mounting Holes: For use with Through-Hole Devices, these are holes on a PCB through which the leads of these devices are affixed and then soldered.

Moisture Sensitivity Level (MSL): A rating indicating a component's susceptibility to damage due to absorbed moisture when subjected to reflow soldering.[18]

New: Electronic components that have not been previously used in any capacity.[19]

New Programmed: Electronic components that are new but have been programmed by the factory or other authorized entity.

New Tested: Electronic components that are new but have been subjected to testing by the factory or other authorized entity.

Nonconformance: A determination of product not meeting the agreed-upon specifications or terms of the contract.

Nonconforming: Product fails to meet a contractual requirement, primarily meaning the product does not meet the manufacturers' specification and/or any one of the requirements contractually agreed upon by the customer and the supplier.

Nondestructive Analysis: Analysis of a device that does not involve destruction of any part of the device.

Non-Recurring Engineering (**NRE**) **Charge:** A one-time cost that is required as a preparation activity before completion of a project or service. Typically, this includes engineering research and development hours, equipment time, and fixture costs.

Observation: An inspection term used to describe a characteristic about a part, its packaging, or its known history that has not been determined to be an unacceptable or a nonconforming characteristic but that has been recorded as a potential indicator of non-quality and may be considered as part of a cumulative condition.

OEM/EMS: Original Equipment Manufacturer/ Electronic Manufacturing Service.

Open Market: The trading market that buys or consigns primarily Original Equipment Manufacturer's (OEM) and Contract Manufacturer's (CM) excess inventories of new electronic components and subsequently utilizes these inventories to fulfill requirements for other OEMs and CMs.

Open Market Quality: Part is in new condition exhibiting no visual evidence that part quality has been compromised per the IDEA-STD-1010 specifications.

Original Component Manufacturer (OCM): The legal trademark owner of a device or series of devices who either manufactures or commissions the manufacture of product bearing that trademark.

Overspray: The residue of blacktopping or paint on the edge of a component, sometimes located in the Pin One indicator or circular indentations of the part molding.

Oxidation: The interaction of oxygen molecules and all of the different substances they may come into contact with. Oxidation of the leads inhibits the ability to properly solder the component to a circuit board.

[18] IPC/JEDEC, *J-STD-020D.1*, 2. Copyright IPC/JEDEC. Reproduced with permission.
[19] ERAI, *Industry Terms & Definitions*, 1. Copyright ERAI. Reproduced with permission.

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Package: The shipping box that product is packed into for shipping purposes.

Package Style (Types): See *Device Package*.

Packaging (Component): The manner in which electronic components are packaged in preparation for use by electronic assemblers. The selection of packaging types is determined by product sensitivities such as moisture, physical (lead pitch, coplanarity), and ESD as well as the method (manually by hand or by use of machines) to be used to place parts on the printed circuit board. The four most common types of packaging include bulk, tape and reel, trays, and tubes.

Packing: The process and materials used for preparing product for safe shipping and delivery.

Part Counters: Used for verifying quantities, such as reel to reel counters for counting parts in tape carriers and weight scales for counting parts that are packaged in bulk form.

Part Orientation: The way in which a part sits in its packaging, oriented by some feature, such as the Pin One mark.

Pin Mold Cavity: See *Mold Mark*.

Pin One Indicator: A visual representation, such as a dimple, notch, or laser or ink marking, that is used to indicate the number one lead (pin) on the component.

Popcorning: An event that can occur during the solder reflow process whereby the high heat used in the process causes moisture trapped in a device to heat up and expand, resulting in cracks in the device.

Program Marks and Stickers: Typically, an etched or printed series of characters or label added to the surface of a component to indicate that an electronic program has been placed on the component.

Pull: (1) Any device that has been previously mounted (either soldered or socketed) onto a printed circuit board or any other electronic assembly. (2) Used parts should have full leads, unless otherwise specified. (3) Used parts may be sold in third party packaging or in bulk packaging and may consist of numerous date codes, lot codes, week codes, and countries of origin. (4) Used parts may have physical defects, such as scratches, slightly bent leads, test dots, faded markings, chemical residue, or other signs of use. (5) Used parts may be sold with a limited warranty. (6.) Used programmable devices may still contain programs or remnants of programs not completely removed from the component, which could affect the device's future use and functionality. (7) Used parts that are sold as refurbished should meet the industry definition of Refurbished or should be sold simply as USED or PULLED.

Re-Ball: Process of putting new solder balls on a Ball Grid Array (BGA) chip device.

Referee: Typically, a quality or reliability engineer with the knowledge and experience to make final decisions on behalf of his or her employer regarding the quality acceptance or rejection of a part.

Refurbished: Product that has been externally reconditioned or restored to appear to a like new condition.[20]

Remarked (part): Parts or devices in which the original part markings were removed or covered and then marked with a new part marking.

Re-Reeled: Aftermarket tape and reel.

Retinned/Dipped (Leads): Leads that have been dipped in solder at some point after the device was manufactured.

RoHS: A European Union (EU) directive that took effect in July 2006, the Restriction of Hazardous Substances is intended to restrict the use of Lead, Cadmium, Mercury, Hexavelent Chromium, Polybrominated Biphenyls, and Polybrominated Diphenyl Ether from electronic products.

RoHS 5/6 (also referred to as RoHS5): Product that does not contain Cadmium, Mercury, Hexavalent Chromium, Polybrominated Diphenyl Ethers (PBDE), or Polybrominated Biphenyls (PBB). However, RoHS 5/6 product could contain lead, as they can use one or more of the RoHS exemptions for lead.

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Sanding: The act of removing original manufacturer markings by sanding or other abrasive process. In terms of counterfeiting, the act of removing the top and/or bottom markings on a chip for the purpose of remarking.

Scanning Electron Microscopy (SEM): A method of magnifying and analyzing the surface of a device through the use of a concentrated beam of electrons that is then moved along the surface in a scanning sequence. The electrons interact with the device, and the resulting interactions are used to produce a three dimensional image showing the topology, composition, and shape of the device undergoing scan.

Scrape Test: Refer to Section 10.3.2.3.

Solderability: For electronic components, having proper mechanical and electrical connectivity to the PCB.

Substandard: A device that does not meet the manufacturer's stated specifications for form, fit, or function.

Substrate: A wafer or other material that is used as a base material upon which other fabrications or circuits are applied or formulated.

Surface Mount Device (SMD): A part or device that is soldered directly to the surface of a PC board.

Suspect Part: A component that raises questions about its authenticity and/or condition, typically first noticed upon visual inspection. A part that has undergone an inspection process, such as that defined in IDEA-STD-1010, and shows some evidence it may be different than what it is purported to be.

Tape and Reel: A specific packaging type that is used to store surface mount devices in a continuous length of tape containing pockets for each part to rest in. The component filled tape is then rolled and stored on a take up reel, providing for a continuous feeding method for pick and placement machines during assembly production.

Tarnish: A thin layer of corrosion that forms over metals as their outermost layer undergoes a chemical reaction. Tarnish is a product of a chemical reaction between a metal and a nonmetal compound, especially oxygen and sulfur dioxide. It is usually a metal oxide, the product of oxidation. Sometimes it is a metal sulfide. The metal oxide sometimes reacts with water to make the hydroxide and carbon dioxide to make the carbonate. This condition can be found on part leads or other metal part of a component.

Terminals/Pins: Leads, pins, or pads external to a device that exist to provide electrical connectivity between the die and the circuit board or substrate.

Test: A process or procedure developed to determine the validity of an item. In electronics, a test is a process or procedure developed to determine if a device performs either to the manufacturer's stated specifications or to the customer's requirements.

Test Dots: An ink mark or dot that is placed on a device to signify that it has undergone some type of testing. *Note: There is no standard that governs the use of test dots, their placement, or the color scheme, so only the facility that did the testing can define what their specific test dots mean. When receiving parts where there is a test dot, a nonconformance should be noted if the parts were ordered as new and unused/ untested*.

Third Party Packaging: Any tube, tape and reel, tray, or other storage media used to package components by an entity other than the original manufacturer of the components.

Through-Hole Device: A part or device in which the leads are inserted through the printed circuit (PC) board and soldered from below.

Tooling Marks: Marks left by equipment used in the bending, forming, and cutting of leads.

Trays/Waffle Trays: Specifically designed trays to prevent damage to surface mount devices, including ball grid array parts. Trays are stackable and are used in automated pick and place machines. Trays can be utilized for holding of parts for baking processes. Temperature limits are typically indicated on the tray. Trays are specifically designed for the components they hold and are many times not easily interchangeable. Trays typically have orientation indicators manufactured into them.

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Tubes: Sometimes referred to as sticks or rails, tubes are component packaging used to keep components safe and prepared to drop into automated component insertion machines.

Uprated: Assessment which results in the extension of a part's ratings to meet the performance requirements of an application in which the part is used outside the manufacturer's specification range.[21]

Upscreened: Additional part testing to produce parts verified to specifications beyond the part manufacturer's operating parameters. Examples are Particle Impact Noise Detection (PIND) testing, temperature screening, Radiation Hardness Assurance testing, etc.[22]

Vacuum Pen: A material handling tool shaped similar to a fountain pen with a finger controlled vacuum to safely lift parts out of the safety of their carriers and onto inspection blocks and microscope stages.

Vacuum Seal: A step in the packaging process to minimize oxidation and moisture damage to components by drawing out air from inside a moisture barrier bag (MBB) and then heat sealing.

Wafer: A disc; with respect to electronic components, a wafer is a highly polished disc of silicon or some other semiconductor material that is then used as the foundation upon which an integrated circuit or other semiconductor device is built.

Wire Bond: Very fine wires used to attach the semiconductor die to the leadframe for the purpose of making electrical connections.

Witness Marks: Marks on the leads, pads, or terminals of components that indicate the part was previously inserted into a PCB socket or test fixture or probed with test leads.

X-Ray Fluorescence (XRF): A nondestructive analysis technique used to determine the amount and type of elements in a device by using a concentrated beam of X-rays. Secondary X-ray emissions are generated when the substance or device is exposed to a concentrated beam of X-rays, releasing photons in the process. The wavelengths of the photons are measured giving an elemental analysis.

XRF Analysis: A nondestructive method of elemental analysis used to detect the presence of certain elements/compounds and to measure their thresholds for compliance to items such as manufacturer specifications and environmental legislation.

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5.10 Normative References: Quality Standards and Specifications

IDEA-STD-1010 contains criteria for handling, storing, and packaging electronic components. Table 1 is a summary of normative references. Information contained in the current revisions of these documents is included to the extent specified herein. The usage of IDEA-STD-1010 or the use of any of the referenced documents listed in this Standard as acceptance criteria must be defined between the customer and supplier.

Table 1 – Summary of Normative References

SPECIFICATION	DOCUMENT TITLE	DEFINITION/PURPOSE
ANSI Publications (American National Standards Institute) http://www.ansi.org/		
ANSI/ASQC Q3	Sampling Procedures and Tables for Inspection of Isolated Lots by Attributes	Sampling Procedures and Tables for Inspection of Isolated Lots by Attributes.
ANSI/ASQ Z1.4	Sampling Procedures and Tables for Inspection by Attributes	Sampling Procedures and Tables for Inspection by Attributes.
ANSI/ASQ Z1.9	Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming	Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming.
ANSI/ESD S20.20	Protection of Electrical and Electronic Parts, Assemblies and Equipment	An American National Standard for Protection of Electrical and Electronic Parts, Assemblies and Equipment.
ANSI/ESD S541	Packaging Materials for ESD Sensitive Items	Packaging properties needed to protect electrostatic discharge susceptible (ESDS) electronic items through all phases of production, transport and storage.
EIA-481	8 mm Through 200 mm Embossed Carrier Taping and 8 mm & 12 mm Punched Carrier Taping of Surface Mount Components for Automatic Handling	This Standard covers requirements for taping surface mount components. Complementary standards for specialized taping requirements are included in the addendum.
ERAI Publications - http://www.erai.com		
	ERAI Industry Terms & Definitions	A reference guide utilized by the ERAI when handling and investigating complaints or disputes.
ESDA Publications (Electrostatic Discharge Association) - http://www.esda.org		
ESD ADV1.0	ESD Association Advisory for Electrostatic Discharge Terminology	Definitions and explanations of various terms used in Association Standards and documents are covered in this Advisory. It also includes other terms commonly used in the electronics industry.
IDEA Publications (Independent Distributors of Electronics Association) - http://www.IDofEA.org		
	IDEA Inspection Process Guidelines Checklist	This document developed and published by IDEA is a guideline to basic and advanced inspection practices.
IPC Publications (IPC) - http://www.ipc.org		
IPC-A-610	Acceptability of Electronic Assemblies	A standard that includes a collection of visual quality acceptability requirements for electronic assemblies.
IPC-DRM-18	Component Identification	Color images of various components and component types.
IPC/JEDEC J-STD-020	Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices	Identifies the classification level of non-hermetic solid state surface mount devices (SMDs) that are sensitive to moisture-induced stress so that they can be properly packaged, stored, and handled to avoid damage during assembly solder reflow attachment and/or repair operations.
IPC/JEDEC J-STD-033	Standard for Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices (Dry Packing)	Provides SMD manufacturers and users with standardized methods for handling, packing, shipping, and use of moisture/reflow sensitive SMD packages which have been classified to the levels defined in J-STD-020.
IPC/JEDEC J-STD-035	Acoustic Microscopy for Nonhermetic Encapsulated Electronic Components	This test method defines the procedures for performing acoustic microscopy on nonhermetic encapsulated electronic components.
ISO (International Organization for Standardization) - http://www.iso.org/iso/home.htm		
ISO 9001	Quality Management System Standard	The internationally recognized standard for a quality management system.
ISO/IEC 17025	General Requirements for the Competence of Testing and Calibration Laboratories	Specifies the general requirements for the competences to carry out tests and/or calibrations, including sampling.
JEDEC (Joint Electron Devices Engineering Council) - http://www.jedec.org/		
JESD88	JEDEC Dictionary of Terms for Solid State Technology	This dictionary was prepared and edited by a special Working Group under the direction of the JEDEC Board of Directors.

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5 Foreword (cont.)

SPECIFICATION	DOCUMENT TITLE	DEFINITION/PURPOSE
JESD22-B108	Coplanarity Test for Surface-Mount Semiconductor Devices	The purpose of this test is to measure the deviation of the terminals (leads or solder balls) from coplanarity for surface-mount semiconductor devices.
JESD22-B102	Solderability	Standard that provides a means of determining the solderability of device package terminations that are intended to be joined to another surface using lead- (Pb-) containing or Pb-free solder for the attachment.
NASA Publications (National Aeronautics and Space Administration) - http://www.nasa.gov		
PEM-INST-001	Instructions for Plastic Encapsulated Microcircuit (PEM) Selection, Screening, and Qualification	This document establishes a system of product assurance for PEMs in order to invoke the GSFC PEM policy.
SAE International Publications (Society of Automotive Engineers) - http://www.sae.org		
AS5553	Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition	This SAE Aerospace Standard standardizes practices to maximize availability of authentic parts, procure parts from reliable sources and control parts identified as counterfeit.
TechAmerica Publications - http://www.techamerica.org		
ANSI/GEIA-STD-0006	Requirements for Using Solder Dip to Replace the Finish on Electronic Piece Parts	This standard defines the requirements for fully replacing undesirable surface finishes using solder dip.
U.S. Government Publications - http://www.dscc.dla.mil		
MIL-STD-202	Test Method Standard, Electronic and Electrical Component Parts	This standard establishes uniform methods for testing electronic and electrical component parts, including basic environmental tests to determine resistance to deleterious effects of natural elements and conditions surrounding military operations, and physical and electrical tests.
MIL-STD-750	Test Methods for Semiconductor Devices	This standard establishes uniform methods for testing semiconductor devices.
MIL-STD-883	Test Methods for Standard Microcircuits	This standard establishes uniform methods for testing standard microcircuits. **Refer to Method 2015.13 Resistance to Solvents for marking permanency.**
MIL-STD-1835	Electronic Component Case Outlines	This standard establishes and maintains a compilation of electronic component case outlines and should be useful to all levels of manufacturing that culminate in the production of reliable and logistically supportable electronic equipment.

Note: This summary of normative references reflects the most current revision readily available.

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6 Product Handling, Packaging, and Storage



This Standard requires that all areas where product is handled, such as receiving, receiving inspection, subsequent inspections, warehousing, shipping preparation, and shipping facilities are compliant with electrostatic discharge sensitive (ESDS) safety standards and comply with industry standards to maintain product quality. Refer to ANSI/ESD S20.20 for electrostatic discharge (ESD) handling and workstation considerations.

IDEA-STD-1010 requires that all personnel who routinely handle electronic devices as part of their normal work duties are tested for ESD knowledge on an "initial and recurrent" training basis. Testing of said personnel must be to the extent that ESD competency to preserve product quality is objectively documented, e.g., a written test.

6.1 Required Practices for Handling Electronic Components

A. Minimize the handling of electronic parts and components to prevent damage.
B. When gloves or finger cots are used, they shall be changed as frequently as necessary to prevent contamination build-up.
C. Solderable surfaces are not to be handled with bare hands or fingers. Body oils and salts reduce solderability and promote corrosion.
D. Do not use hand creams or lotions containing silicone since they can cause solderability and conformal coating adhesion problems.
E. Never stack electronic components, or physical damage may occur. Special trays or containers need to be provided in inspection areas for temporary storage.
F. Always assume that the components are ESDS, even if they are not marked that way.
G. Personnel shall be trained and follow appropriate ESD practices and procedures.
H. Never transport ESDS devices unless proper packaging is in use.
I. ESDS components should always be opened and handled inside of an Electrostatic Discharge Protected Area (EPA).
J. If you are wearing heel straps or wrist straps as part of your company's policy, they should be checked for functionality prior to entering an EPA.
K. The ANSI/ESD S20.20 Standard requires all personnel to be bonded and electrically connected to the internal grounding system in your facility while handling ESDS components.
L. Per ANSI/ESD S20.20, do not allow the placement of charge generating materials within twelve (12) inches of ESDS devices.
M. The use of conductive/protective materials when handling ESDS components is part of a good ESD program. Protective handling can be defined as the necessary protection to limit ESD during the handling of static sensitive components.
N. Parts must always be handled so as to ensure product quality. Organizations shall implement ANSI/ESD S20.20 and Moisture Sensitivity Level (MSL) training of their personnel in the form of certification training followed by program implementation.

6.2 Moisture Sensitivity Handling Precautions

Refer to J-STD-033, *Standard for Handling, Packing, Shipping, and Use of Moisture/Reflow Sensitive Surface Mount Devices (Dry Packing)*, for technical information on Moisture Sensitivity.

Many non-hermetic surface mount devices (SMD) are susceptible to the absorption of moisture from the surrounding environment. Absorbed moisture molecules contained within the body of the device can, when heated too rapidly, become excited, expand and vaporize, and result in producing stresses that can and will rupture the part internally and damage the part, rendering it non-working or non-reliable. This phenomenon is frequently referred to as the "popcorn effect" or "popcorning," as the same principle of expansion of rapidly heated water molecules is at work that causes popcorn to pop.

The damage results may or may not be visible on the exterior surfaces.

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SMDs are exposed to these rapidly accelerated temperatures during the solder reflow process. Therefore, these devices must be protected to the extent of their Moisture Sensitivity Levels (MSL) identifications. Manufacturers determine the MSL of a part based on the Standard J-STD-020 and mark the packaging of the parts in accordance with Standard J-STD-033. Such MSL information shall be preserved in accordance with Standard J-STD-033 when transferring parts from factory original packaging to new packaging.

6.2.1 Floor Life

For the allowable time period, the amount of time after removal from a moisture barrier bag (MBB) and before the solder reflow process, for a moisture-sensitive device to be exposed to a factory ambient not exceeding 30°C and 60% RH. See J-STD-033, Floor Life.

6.2.2 Shelf Life

The time that a dry-packed moisture-sensitive device may be stored in an unopened MBB such that the required interior bag ambient humidity is maintained. See J-STD-033, Shelf Life.

Note: *Tin terminations on new components can exhibit tin pest (a grey powdery formation) if stored below 13ºC (55ºF). This can be controlled in a Distributor's warehouse but cannot be guaranteed during long-term storage at an OEM.*

6.2.3 Drying

Compliance to J-STD-033 for drying methods, temperatures, and times shall be observed.

6.2.4 Dry Pack

Compliance to J-STD-033 for dry packing methods, considerations, and materials shall be observed.

6.2.5 Humidity Indicator Card (HIC)

See J-STD-033 for HIC requirements. These requirements shall be observed.

Example of an MSL Label

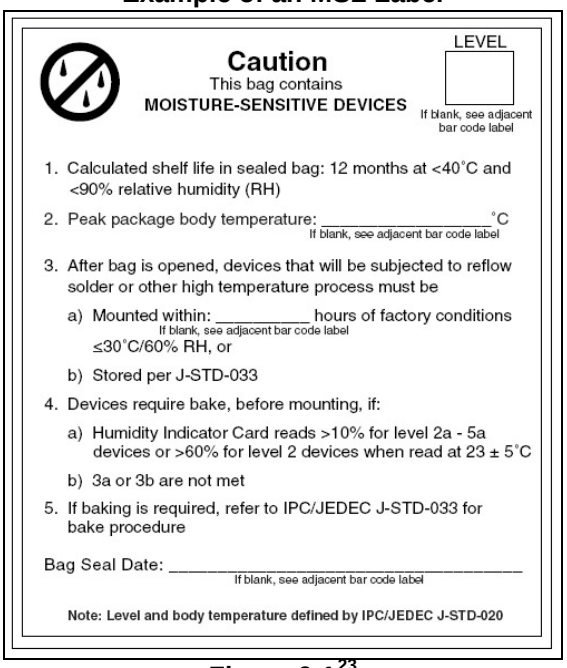


Figure 6-1[23]

Example of Packaged Desiccant



Figure 6-2

Example of Humidity Indicator Card (HIC)

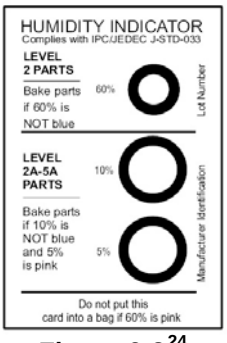


Figure 6-3[24]

[23] IPC/JEDEC, *J-STD-033*. Copyright IPC/JEDEC. Reproduced with permission.
[24] IPC/JEDEC, *J-STD-033*. Copyright IPC/JEDEC. Reproduced with permission.

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6.2.6 Oxidation Risk

See J-STD-033 for oxidation risk resulting from baking temperatures. These requirements shall be observed as applicable.

6.2.7 General Moisture Sensitivity Program Items

A. Minimize the handling of electronic parts and components to prevent damage.
B. Each Organization shall have an MSL Compliant Plan that will ensure the proper handling and storage of moisture sensitive parts.
C. Parts that are MSL sensitive must be properly sealed in an MBB prior to being shipped or stored.
D. MBB may quickly be opened for the inspection of the parts, but parts must be repacked and properly sealed in an MBB within the time frames allowed by J-STD-033.
E. Avoid touching the leads on any device to prevent the possibility of contamination being transferred to connection surfaces of the product.

7 Inspection Workstation Equipment and Tools



When performing inspections on Open Market product, Inspectors must utilize tools that ensure capability to accomplish required examination and assessment as well as product preservation. Appropriate tools must be used to ensure the safe handling, transportation, and storage of product. It is at the discretion of each Organization to ascertain which tools to utilize to ensure quality handling as well as quality inspection. All measurement equipment and tools used for determining product compliance shall meet the requirements stated in ISO 9001 and ANSI/ESD S20.20, such as maintaining preventative maintenance, calibration, and calibration records.

7.1 Basic Workplace

The specific place for inspection of electronic devices shall be a well-designed, clean, and orderly working site. The design shall include a well-lit, ergonomically satisfactory workspace. The workspace should be controlled for temperature and humidity to ensure quality preservation of sensitive electronic products.

There should not be any potential contaminant on or near the workspace. This includes foods, tobacco, dust, plants, dirt, smoke, or non-spill containers of drinks. All ESD threats shall be eliminated from the workspace as reasonably possible. Sometimes, this is not possible for items such as paperwork, adhesive tape, writing pens, eye glass frames, etc., in which case these items should be keep as separate from product as reasonably possible.

7.2 Basic Tools

The professionally equipped inspection station will contain tools that protect product as well as tools that evaluate and verify product. IDEA has created a list of commonly-used tools that can be easily researched on the Internet. At a minimum, Organizations shall have an active ESDS program established, thereby providing for ESDS work areas, materials, and evidence that personnel have been trained and are competent in observing ESDS practices, as well as the use of the tools listed in Table 2.

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Table 2 – Equipment and Tools

The tools listed in Table 2, or their equivalent, are required basic tools and shall be part of the handling, evaluation, and verification equipment of any Organization in compliance with IDEA-STD-1010-B.

	1 Delivery	2 Receiving	3 Incoming Inspection	4 Tape & Part Inspection	5 First Inspection	6 Second Inspection	7 Packaging	8 Shipping
Digital Camera with macro capability	✓	✓	✓			✓	✓	
Receiving and Shipping Scales	✓	✓					✓	✓
ESDS Program[25]		✓	✓	✓	✓	✓	✓	
Handling Tools 1. Vacuum Pen 2. Tweezers 3. Knives & Box Cutters 4. Finger cots and/or gloves		✓	✓	✓	✓	✓		
Barcode (symbology) 1. Scanners 2. Printers 3. Information & Standards		✓	✓	✓	✓	✓	✓	✓
Magnifiers 1. Eye Loupes 2. Microscopes 3. Micro-photo Systems		✓	✓	✓	✓	✓		
Part Counters 1. Reel to Reel 2. Scales (count by weight)		✓	✓	✓	✓	✓		
Measurement Tools 1. Metal Rule or Scale 2. Calipers 3. Micrometers 4. Grade A Surface Plate			✓		✓	✓		
Humidity Controls 1. Vacuum Sealer 2. Desiccants 3. Humidity Indicator Cards 4. Room Humidity Monitor		✓	✓	✓	✓	✓	✓	

[25] See ESDA, *ANSI/ESD S20.20: ESD Association Standard for the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)* (Rome, NY: ESDA, 2007).

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7.3 Magnification Aids and Lighting

The professionally equipped inspection station will include an inspection microscope with variable lighting (intensity and directional) to use for general inspections as well as detailed referee inspections, especially when inspecting for characteristics that provide evidence of substandard parts or indications of counterfeit parts. The tolerance for magnification aids is ± 15% of the selected magnification power.[26]

There are several advantages to using a microscope over handheld magnifiers. The item under inspection can be placed into a stable position on the specimen stage, making it much easier for two or more people taking turns to view the same characteristics under the same conditions. Lighting is consistent, and various degrees of magnification can easily and quickly be adjusted. Many scopes provide a means to incorporate digital photography, making a visual record easy to acquire and maintain.

7.3.1 Inspection for Indications of Substandard Conditions

When inspecting for substandard conditions, magnification aids need to be appropriate for the item being inspected. Lighting needs to be adequate for the magnification aids used. The magnification used to inspect electronic components is based on the minimum width of the feature in question under inspection. Unless magnification requirements are otherwise specified by contractual documentation, the magnifications in Table 3 are determined by the item being inspected.

Table 3 – Inspection Magnification[27]

Terminal Widths or Terminal Diameters	Magnification Power	Magnification Power
	Inspection Range	Maximum Referee
>1.0 mm [0.0394 in]	1.5X to 3X	4X
>0.5 to ≤1.0 mm [0.0197 to 0.0394 in]	3X to 7.5X	10X
≥0.25 to ≤0.5 mm [0.00984 to 0.0197 in]	7.5X to 10X	20X
<0.25 mm [0.00984 in]	20X	40X

Referee powers of magnifications are used to verify product rejected at the inspection range magnification power. For parts with mixed feature widths, the greater magnification may be used for the entire part.

7.3.2 Inspection for Indications of Counterfeit Conditions

When inspecting for indicators of counterfeit conditions, there are no limits on magnification power.

[26] IPC, *IPC-A-610D: Acceptability of Electronic Assemblies*, (Bannockburn, IL: IPC, 2005), 1-6. Copyright IPC. Reproduced with permission.
[27] IPC, *IPC-A-610D*, 1-6. Copyright IPC. Reproduced with permission.

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8 Test/Test House Relationship Management

8.1 Testing Facility Qualification

Testing facility qualification is crucial to ensuring that the test facility used will meet the actual testing requirements. As explained later in Section 8.4, Test Lab Communication, testing can be interpreted many ways. Understanding what a test facility is capable of performing, their certifications, the type of customer for which they test, and their commitment to the customer to perform the level of testing required will help qualify the test facility. Many facilities are chosen because they have the fastest turn time or the cheapest price. A facility quoting generic Group A testing on a complex device with a lead time of one (1) week would be very questionable unless it can be verified that the same component had been tested previously. Understanding all of the testing required (this can be a recommendation from the lab based upon their experience or accepted international screening protocols) and knowing that the test facility is capable of meeting those requirements will help determine if a test facility is qualified for the work requested.

When assessing a test facility for qualification, request information about the following:

8.1.1 Equipment

A. A list of all equipment (type, manufacturer, model, calibration dates).
B. The equipment's functional capabilities (the equipment's specified range).
C. A list of what type of services each piece of equipment can provide.

8.1.2 Business History Practices

A. What is their customer mix?
B. How long have they been in business?
C. How much experience do they have in counterfeit detection?
D. Are any of their services or testing outsourced? If so, request a list naming the companies to which they outsource and the type of services or testing that is outsourced.
E. Do they maintain a database archive of golden sample parts (known goods), and how many entries do they have?
F. How long do they maintain their test records? What is their record retention policy?

8.1.3 Certifications

A. ISO Certification at a minimum assures that the test facility's business and quality (management responsibility, customer satisfaction, ESD, calibration, documentation, etc.) practices are audited. ISO also addresses the qualifications and training of employees.
B. Other certifications testing laboratories may have subject to the services they provide include AS9100, ANSI/ESD S20.20, DSCC, and ISO/IEC 17025.

8.1.4 Testing Agreements or Contracts

A. Require a test plan that specifies the test conditions and tested parameters that are being provided.
B. Require that the test report provides a list of equipment used for the test and the test data with test results.
C. Request pictures of the test fixture, test set-up, and the device under test with the report. This information is helpful to address any concerns or questions anyone may have about the testing method.
D. How are projects scheduled?
E. Find out how many projects are completed with on-time delivery.

8.1.5 Test Engineers

A. How many test engineers do they have?
B. Are the test engineers full time or contracted?
C. What are the areas of expertise for each engineer?

8.1.6 Signs of Questionable Testing Facilities

A. Turn times beyond possible run rates.

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B. Drastic price differences from reputable or known test labs.
C. No documentation of testing coverage or test equipment.
D. Non-recurring engineering (NRE) charges are non-existent or seldom quoted.
E. NRE charges are low price and not enough to cover a typical engineer's time and expense. Engineering is typically billed hourly. Some test programs can take weeks to develop depending on the complexity of the component and the methodology used for testing.

8.2 Recommendations

8.2.1 Component Testing

There are occasions when an order of parts are required to be tested to the manufacturer's specifications or specified parameters prior to shipment. These tests are varied and typically include tests for:

A. Validation of basic functionality
B. Parameter screening such as temperature screening
C. Validation of empty programming
D. Validation of program read and write function

8.2.2 Pre-Authorization for Testing

When a requirement for testing exists, the terms of acceptance must be agreed to between parties. At a minimum, the following points must be clarified:

A. Technical description of the test to be conducted
B. Specifications that constitute fail vs. pass results
C. The acceptable vs. not-acceptable criteria for the lot. For example:
   i. That 100% of the population of the order will be tested and a failure of one or more parts is cause for rejection of the entire lot
   ii. That any failed parts will be screened out and only passed parts will be accepted

8.2.3 Test Services and Records

Services for testing products shall meet your company's supplier control criteria to preserve the quality of the parts under test. The type of testing and test criteria must be agreed upon, including maintaining a copy of the test results as a quality record.

8.2.4 Component Datasheets

The datasheet used for testing should be consistent to the date code of the devices under test. In the event a datasheet is not available for the requested date code, the test facility should verify with the Distributor that it is acceptable to use the datasheet that is available. If the end user or Distributor has a specific datasheet revision to which the parts should be tested, this should be provided to the test facility. Reports should reference the datasheet used for testing for correlation.

8.2.5 Test Records

The results from tests performed shall be documented and are therefore quality records. These records shall be maintained in accordance with your company's quality management system. Such records are often vital when seeking to resolve disputes. Test records shall include the following data:

A. Date of receipt of the parts
B. Quantity counted at receipt
C. Part number
D. Manufacturer
E. Date code(s)
F. Lot code(s)
G. Any non-qualifying characteristics of the parts or packaging
H. Type of test(s) performed
I. Parameter tested and acceptance criteria
J. Test results, i.e., quantity passed vs. quantity failed
K. Identification of personnel who tested part and date of test

8.2.6 Risks of Testing

Care must be taken in the selection of component test services to ensure that the quality of the parts is maintained and that services are performed to contract. Recognize that when testing parts, you should employ services that all interested parties agree to employ. This planning will help to resolve returns should the parts test faulty. Parts that have been tested will often exhibit "witness marks" on the leads. Additionally, tested parts are sometimes marked with a spot of paint or ink on the device body designating the part as a tested part. The value or devaluation of a part that exhibits evidence of testing is dependent on your specific order

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circumstances and shall be taken into consideration before submitting parts for testing. Note that testing does not guarantee 100% functionality of components. Devices may deteriorate at an accelerated rate due to manufacturing problems or may not be tested for lifecycle and endurance within the allowable time. Component manufacturers have product recalls even following 100% testing by the manufacturer, so it must be realized by all parties that product testing is a form of risk management and not a quality guarantee.

8.2.7 Failure Analysis

When a part has been determined to have failed, depending on the circumstances, research and a formal failure analysis can often be a viable educational investment by the Organization and should be considered. Through research and analysis, information can be learned as to whether there had been visual indications of substandard quality that should have been detected during the inspection phase prior to acceptance of the part from the supplier, and if so, what corrective action to take to prevent a recurrence.

8.3 Test Definitions, Explanations, and Clarifications

There are many forms of testing, and many labs use their own terminology for the type of testing they conduct. Further, different component categories require different test methods. Group A testing is most commonly used and refers to the electrical testing procedures specified in the standards prepared by the United States Department of Defense, primarily MIL-STD-883 for integrated circuits, MIL-STD-750 for active discrete devices, MIL-STD-202 for passive components, and MIL-PRF-15305 for coils. The standards use ***Subgroups*** to specify the parameters tested (see Table 4 from Method 5005.13 of MIL-STD-883 below), and the standards dictate how each parameter should be tested through defined ***Methods***.

Group A electrical testing is most frequently requested by the end user, as the use of a published standard makes it convenient for engineers to communicate requirements, procedures, and results. Regardless of what test methodology is used, it is important to communicate exactly what testing is conducted and that the methodology and results are reported clearly.

Table 4 – Group A Electrical Testing

Subgroup 1	Static tests at 25°C
Subgroup 2	Static tests at maximum rated operating temperature
Subgroup 3	Static tests at minimum rated operating temperature
Subgroup 4	Dynamic tests at 25°C
Subgroup 5	Dynamic tests at maximum rated operating temperature
Subgroup 6	Dynamic tests at minimum rated operating temperature
Subgroup 7	Functional tests at 25°C
Subgroup 8A	Functional tests at maximum rated operating temperature
Subgroup 8B	Functional tests at minimum rated operating temperature
Subgroup 9	Switching tests at 25°C
Subgroup 10	Switching tests at maximum rated operating temperature
Subgroup 11	Switching tests at minimum rated operating temperature

Different Subgroups can be tested separately to reduce testing time and expense. For example, testing at maximum and minimum specified operating temperatures (Subgroups 2, 3, 5, 6, 8A, 8B, 10, and 11) could be omitted or test only for key functions (Subgroups 7, 8A, and/or 8B).

Full Group A testing, including all Subgroups, is also referred to as “full functional testing.” Full functional testing is conducted using either an automated test equipment (ATE) system or through bench testing. ATE systems are a single piece of equipment designed to test related types of devices. The systems are programmed manually to the requirements on the manufacturer datasheet. ATE systems are designed for production-level testing where devices are tested in mass in an automated assembly, test, and packaging facility.

Bench testing utilizes multiple source and measurement instruments, with each able to generate or measure a specific type of parameter. Source equipment generates either an analog or digital input signal (such as power supplies and signal or pattern generators).These individual instruments are used together to test the various parameters specified on the datasheet. Bench

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testing provides greater flexibility in the scope of devices that can be tested, as they are not as device category specific as ATE systems, and they require less set-up and programming time than ATE systems. OCMs utilize bench testing for their failure analysis to validate failures identified by ATE systems and specifically measure functioning limits of various operational parameters. While both methods can meet the specifications defined within Group A, it is the detail of those methods that specifies the completeness of the testing coverage.

While some components, such as passives (capacitors, resistors, and inductors), may have limited functions, and there is relatively inexpensive equipment to test capacitance, it should be noted there are multiple sub-parameters (dissipation factor, equivalent series resistance, direct current leakage, and dielectric strength) defined within many of these component datasheets that basic equipment is not able to effectively test. Capacitance and inductance are frequently specified for frequency and current ranges that are outside of the capabilities of basic test and measurement equipment.

There are alternative ways to the Group A testing of electronic components. Test coverage to the manufacturer's specifications tends to be directly proportional to the cost of testing, as is the complexity of the devices being tested. When there are budgetary or lead time considerations, there are alternatives to "full functional testing" that do identify failures within the components and can provide cost-effective solutions to identify the most common failure modes within components. The most common are:

A. *Continuity Testing*: All components have pin assignments, meaning what function each pin (terminal) of the component represents. Continuity testing verifies that the pin assignments of the device under test are connected as documented from the manufacturer's datasheet. A continuity connection failure may be detected on each pin as an internal open (broken connections) or short (connections that are in electrical contact with other pins or in contact with an unintended object, typically resulting in excessive current). Continuity failures indicate incorrect pin assignments or damaged pin functions, possibly as the result of electrical overstress.

B. *Application Testing:* Put the device under test into the actual application (or simulated application) and verify that the application is working correctly. Some datasheets have application drawings or a schematic of the application circuit in which the component is designed to operate. In such situations, the schematic on the datasheet can be used for testing.

C. *Curve Matching (Trace):* Device pin (terminal) signals are measured using a source and measurement tester designed specifically for DC electrical testing of discrete components, where the inputs and outputs are measured in terms of current and voltage. The output is plotted as a curve, showing the measurements to variant input voltages and currents. While this tester is designed specifically for discrete components, the same methodology can be used to plot any electronic device by making a connection to device pins and plotting DC electrical curves. The device pins are represented as power, ground, input, or output and the curve tracer tester displays a plotted electrical curve for each pin type. Pin curves are compared to those from a golden sample. If no golden sample is available, then curve measurement must be compared to those expected from the manufacturer's datasheet. (Note: a golden sample is the most effective method to validate device curves.)

8.4 Test Lab Communication

Testing should be determined based on the ultimate end user's requirements. Communication for testing must specifically define testing parameters and requirements. Testing can be interpreted in different ways between the test lab and the end customer; therefore, the specific tests to be performed and the method in which each test is performed must be defined and communicated to the end user. For example, simply stating Group A electrical testing is far too broad and open for many different interpretations of what tests will be performed.

When Group A testing is prescribed, the assumption is for full electrical testing covering all parameters

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and functions established per the manufacturer's datasheet. This is not always feasible, and in many cases not possible. This definition can also be cost prohibitive. Defining the specific tests performed and how they will be performed is imperative. The purpose of the test required may play an important role in deciding which tests will be important.

If the goal is to determine the possibility of a counterfeit part, a full functional test may not be necessary. If the purpose is to determine the part functions in all electrical areas, a more complete and defined test will be required. Test labs will typically determine the most common areas of failure for a particular type of component and test those particular areas rather than test all functions of a part.

8.4.1 Communication Between Distributor and Lab

When possible, all requirements of testing should be stated when requesting a test quote. The best practice in obtaining a quote from a test lab is to give the test lab the datasheet for the part requiring testing with the specific areas of testing circled and defined. In cases when that cannot be determined by the requestor, the test lab should be given the purpose for the required testing and asked to perform the tests the lab determines to be of most importance. The lab will interpret the datasheet and state the specific tests and portions of the datasheet that will be tested. Post-testing reports should clearly show the type of individual tests performed and the results of those tests. A qualified lab should be able to state the exact tests performed, define how that test is performed, and state what equipment and process is used to perform said test.

8.4.2 Communication Between Distributor and End User

When end users (OEMs) require testing, their requirements should be relayed to the Distributor with a concise definition in writing. Those definitions should be relayed to the test lab using the same language and definition. The use of manufacturer datasheets is the best way to define the tests, parameters, functions, and methods required whenever possible. After the Distributor has received a quote from the test lab detailing the test plan, the exact language used should be relayed to the end user. The end user's component engineer should assess whether the testing is adequate. The simple statement of Group A electrical testing is not clear or well defined. The Subgroups as well as the parameters and functions within the datasheet should all be defined.

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9 Inspector Preparation

9.1 Photographing Parts

Provisions shall be maintained to photograph parts and to photograph the associated packaging materials to the extent necessary to clearly and without ambiguity communicate with a supplier, internal personnel, or customers the facts regarding the part's characteristics, its packaging materials, and its packing status upon receipt and just prior to shipping.

Digital photography offers immediate feedback pertaining to the part's external features and attributes. Immediate imaging can be transmitted via the Internet literally within minutes after the image was captured.

Digital photos are easily stored on company networks or databases, making access to these photos nearly immediate for other personnel. Photos of parts are taken by company Inspectors and delivered (via the company network) to other company personnel depicting the concerns about a feature of a part. This allows for information to be efficiently used to advance business processes. For example, buyers can quickly communicate to their sources about specific evidence of nonconformances; sales personnel can rapidly communicate to their customers to acquire verification or authorization to ship the product; and quality and operations departments can store examples of part markings, label contents, fonts, and manufacturers' logos in databases for Inspectors to easily access should a question arise in the future about the legitimacy of such subjects.

At a minimum, inspected parts shall be photographed on the top marking, bottom marking, and lead views both prior to and after the application of solvents. Additional views that may be taken are coplanarity, side, and end views.

9.2 Inspector Qualification and Approach

9.2.1 Covering the IDEA Inspection Points

IDEA has produced the IDEA Inspection Process Guidelines Checklist. The list contains 74 inspection steps from order receipt to order shipment that align with this Standard. The IDEA Inspection Process Guidelines Checklist shall be used in conjunction with all requirements stated in this Standard. See Section 16 of this Standard.

9.2.2 Inspector Approach

The accomplished Inspector will approach his or her profession with an understanding of the critical importance of a well disciplined inspection and the significant impact of the inspection process to the company and its reputation, while all the time recognizing that the inspection professional is part of a larger quality system at work.

One of the primary purposes of this Standard is to assist Inspectors and other quality personnel on how to strike the appropriate balance of product interpretation in the execution of their jobs. However, ultimately it is the working knowledge and experience of the seasoned and skilled Inspector that appropriately calls findings and brings observations into question for further review.

The Inspector must be technical and objective in his or her examination. Inspectors shall not be forced by any external means to report differently about the findings of their examinations or their determination of acceptability. If relevant new information is provided to the Inspector or quality referee after a finding or disposition has been rendered, then a new objective review and evaluation shall be considered.

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9.2.3 IDEA Inspector Training and Certification

Inspectors should strive to obtain training through IDEA's Training Program. For further information about IDEA Training, visit the Training Page on the IDEA website.

Inspectors should strive to achieve certification through the IDEA-ICE-3000 Professional Inspector Certification Exam. IDEA Member Companies are required to have at least one IDEA-ICE-3000 certified Quality Inspector at each inspection site. For further information on the Exam, visit the IDEA-ICE-3000 Product Page on the IDEA website.

9.3 Application of Statistical Techniques

The criteria for acceptance of a population of new parts in the Open Market is often based on 100% inspection, and when any findings that indicate used, refurbishment, poor handling, or counterfeiting are determined, the entire lot is rejected.

Depending on the type of finding, a buyer may reject the entire lot of parts based on evidence of a portion of the parts or even evidence exhibited by only one part of a common population or lot of parts. "Lot" in this case is not restricted by a date code or a lot code but can mean the entire group of parts for any reason that makes those parts common and therefore suspicious of defect, such as from a particular seller or a particular shipment from a seller.

Although there are occasions when the application of statistical techniques can be applied, they typically are not applied in the Open Market in the classic application that a manufacturer of electronic components will utilize statistics for process controls.

The purpose of the use of statistical techniques is to acquire the necessary degree of confidence about the characteristics of a population by measuring the same characteristics of a representative sample from the population. Using statistical techniques assists in making a determination of risk about a defined population of parts.

There are fundamental conditions that must exist in order to accurately apply statistical techniques to a given population. There must be a reasonable assumption that the population is a homogeneous group as well as an understanding about the characteristics of the attribute(s) in question, such as how they were formed and the possible impacts on quality.

The application of statistical techniques to a population of product under examination in the Open Market environment is highly suspect, based largely on the degree of difficulty in establishing a homogeneous population with a known history of handling and environmental exposure. Therefore, it is outside the scope of this Standard to elaborate in detail when to use statistical techniques and how to apply them to the various potential applications. Before utilizing statistical techniques, a competent understanding of the use and value of statistics is required.

Assuming one has a fundamental understanding of the application of statistical techniques for inspection of electronic components, the following ANSI/ASQ Standards are helpful, as they contain definitions of quality constraints/plans and provide sampling plans that are statistically viable for determining the quality confidence of a known population under study.

A. ANSI/ASQC Q3: *Sampling Procedures and Tables for Inspection of Isolated Lots by Attributes*
B. ANSI/ASQ Z1.4: *Sampling Procedures and Tables for Inspection by Attributes*
C. ANSI/ASQ Z1.9: *Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming*

These documents may be purchased directly from ANSI or ASQ (See Section 14, Relevant Standards Generating Bodies and Trade Associations).

9.4 Inspection Records

Proper inspection records shall be maintained. Records shall include all documentation provided with the shipment as well as photos (stored digitally); pertinent information about the devices, including any observations; and inspection results.

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9.5 Examination and Detection

Quality Managers and Inspectors of Open Market product are required to be methodical in their work, collecting information in a logical and scientifically principled manner to help ensure that substandard attributes as well as fraud, specifically evidence of counterfeiting, are recognized.

The Inspector must always maintain vigilance in his or her inspection, thereby never letting his or her guard down. As technological advances are made in the design and manufacture of components, these same advances become available to the criminal element, which engages in fraudulent behavior and counterfeiting. Therefore, it is imperative that Organizations, especially their purchasing, component engineering, and quality staff, be suspicious of even the slightest variation in the part, its packaging (e.g., reel color, tray markings, labeling, logos, fonts, barcoding, packing materials, and paperwork [or missing paperwork]) while realizing that some deviations are normal. Therefore, research and analysis must prevail in their inspection techniques and methodologies when there is doubt.

9.6 Preparation for Inspection

In addition to the required tools and equipment, the Quality Inspector shall have access to the proper datasheet, to the extent possible, for parts about to undergo inspection; access to the various available counterfeit part database listings; access to his or her own internal database of prior inspection results and photos; and access to manufacturer websites for part marking, label description, and datasheets.

9.7 Nonconforming Until Indicated Conforming

Although it is understood that in most cases, the parts are indeed exactly what the purchase order contracted, Inspectors shall consider parts as nonconforming until conformance is clearly indicated.

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10 The Inspection

10.1 Packaging Inspection

10.1.1 General Packaging Rules and Guidelines

A. The purchase order between buyer and seller should accurately identify in writing the packaging required for the order.
B. It is also important to note that in cases where full factory sealed packaging (see Section 5, Terms and Definitions) is required or received, if direct traceability to the OCM is unavailable, then that seal has to be deemed as unverified. If an unverified, sealed carton is not opened for further inspection and the product is deemed to be factory sealed, this constitutes one of the most speculative determinations a Quality Inspector can make. It is as easy to counterfeit a factory seal as it is the product itself.
C. At a minimum, the factory carton label should contain the lot number, date code, part number, country of origin, and the moisture sensitivity level (MSL) (if a non-hermetically sealed device.)
D. Inner packaging and use of moisture barrier bag (MBB), desiccant, and Humidity Indicator Card (HIC) shall be in accordance with J-STD-033.

10.1.2 Exceptions

For every rule there are exceptions, and this applies to packaging as well. In at least one instance, an OCM used silica gel that changed color when moisture was present as opposed to an HIC. Further, with the increased number of fabless semiconductor companies and contract fabs, greater variation appears among labeling and packaging of similar parts, such as Radio Frequency Identification (RFID). Thus, it is important to verify packaging with the manufacturer to determine what is acceptable and what may be fake. Unfortunately, many manufacturers will not share this information. In such a case, follow the suggestions in Section 10.1.4.

10.1.3 Classification/Clarification of Terms

Product can come in factory packaging. This is different than factory sealed (see Section 5, Terms and Definitions). It is important to have a lexicon of levels of packaging. Figure 10-1 shows the levels of package seal from outer to inner pack.

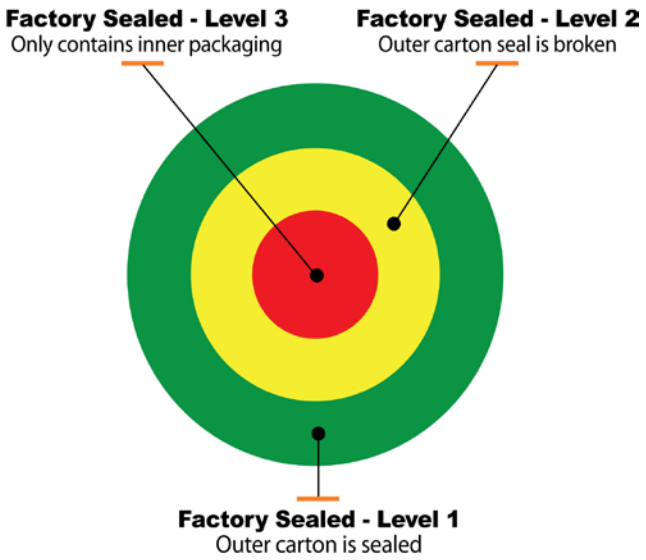


Figure 10-1

It is important to differentiate between factory packaging and factory sealed packaging and to remember that packaging cannot be identified as factory sealed unless there is some traceability to the factory. For the purpose of this section, we will define the following packaging terms:

A. **Outer Shipping Container:** The container used to ship the goods via whatever means, e.g., courier. In the case of palletized goods, the outer shipping container could be a bulk box or the pallet and shrink-wrap. In some cases, the goods may be shipped in the factory/outer box.
B. **Outer Product Carton:** The box that contains the goods. This may be the same as above in some cases, i.e., the box or carton that contains the goods.

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C. **Inner Pack:** This is often the bagged goods.
D. **Carrier:** This is the tubes, reel, trays, etc.

10.1.4 Where to Find Information

A. Many manufacturer websites have a guide that covers labeling and packaging. These provide useful references for what information should be on factory labels and cartons.
B. Keeping a digital photo library of golden sample packaging to consult during inspection is another good method of reference.
C. Contact the source if the source is an Authorized (Franchised) Distributor.
D. Lastly, you can directly contact the manufacturer; however, many are not inclined to answer questions about packaging if the parts were not directly purchased from them or through their authorized channels.

10.1.5 The Packaging Inspection Process

10.1.5.1 STEP 1: General Carton Inspection

PURPOSE:

Perform general inspection of the incoming carton for damage once it has arrived from the carrier and prior to opening

EQUIPMENT:

Scale
Digital Camera

DOCUMENTATION:

Receiving Checklist

CHECKLIST:

1. Weigh incoming package and record weight. Check the bottom of the carton as well as top and sides. Note and photograph any damage. Be especially alert for punctures that may be hard to see in a cursory inspection.

2. Inspect outer package for evidence of water, moisture damage, or evidence of opening. Note and photograph any findings.

Water Damage on Bottom of Boxes



Figure 10-2



Figure 10-3

3. Inspect the sealing tape for evidence of tampering. Note and photograph any findings.

4. If damage or evidence of tampering is present, note findings and alert vendor and carrier for a possible freight claim. Document all findings on the receiving checklist.

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10.1.5.2 STEP 2: Outer Product Carton Inspection

PURPOSE:

Inspection of the outer product carton once removed from the shipping container

EQUIPMENT:

Digital Camera
Barcode Scanner

DOCUMENTATION:

Purchase Order
Packing Documentation
Receiving Checklist
Product Datasheet

CHECKLIST:

1. Open the outer shipping container to expose the package. Inspect the package for any signs of damage or being opened. Make note of the overall appearance of the carton, labels, and tapes that are present. Photograph the contents both inside and outside of the shipping container if they exhibit damage, tampering, or nonconformance. Separately photograph labels and sealing tape if they exhibit damage, tampering, or nonconformance. If the carton appears sealed, observe whether it is sealed with plain tape or embossed tape. Note and photograph findings.

2. Look at the sealing tapes and determine if they have been cut or lifted. Compare with prior golden sample receipts or manufacturer guidelines. Look not only at the sealing tape but also the placement of the sealing tape. Determine if it matches golden sample receipts or information on the manufacturer website.

3. Read the exterior labels. Conduct a detailed examination of their contents and make note of date code, sealing date, and other markings. Verify that the information is logical and appropriate on the labels. For example, ensure that the packing date takes place after the manufacturing date. Determine that the MSL stated on the label is correct for the specific part and verify by checking the datasheet. Compare to prior golden sample receipts or to the manufacturer's packaging guide if available. Read all of the words on the label. See Figures 10-4 and 10-5.

Factory Label



Figure 10-4

Suspect Counterfeit Label

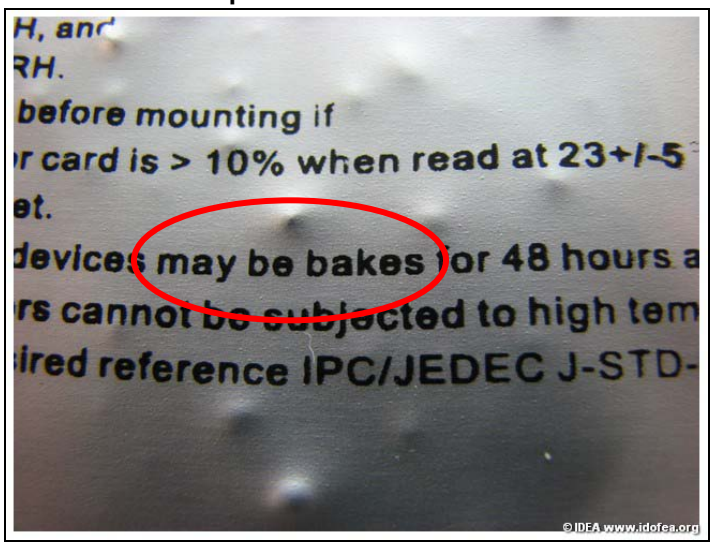


Figure 10-5

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4. Examine the box and compare with golden samples or with the manufacturer website to verify whether the box should have the manufacturer's logo, specific wording or writing, and correct label placement on the box.

5. Ensure that both 1D and 2D barcodes are scanned. Compare with human-readable writing and ensure they match.

6. If the package appears sealed yet is not from a traceable source, IDEA recommends opening the package and inspecting the inner contents per this Standard. If the end customer requests sealed packaging not be opened, it is the Inspector's duty to disclose and document that the products are not from a traceable source.

10.1.5.3 STEP 3: Inspection of Inner Contents

PURPOSE:

Inspection of the inner contents

EQUIPMENT:

Digital Camera
Barcode Scanner

DOCUMENTATION:

Purchase Order
Packing Documentation
Product Datasheet

CHECKLIST:

1. Open the sealed outer carton and expose the inner contents. Photograph the inner contents in the carton and after they are removed if they exhibit damage, tampering, or nonconformance. Photograph packaging and any labels that exhibit damage, tampering, or nonconformance. Note any damage, especially with MBBs or antistatic bags.

2. If the inner product is bagged, take note of how the bag is folded and sealed. Verify that the folds are neat. Verify there is an even seal across the top of the bag. Some bags have a line for first, second, and third seal. Determine which line is sealed. Verify the seal is complete. Compare the type of packaging with prior golden sample receipts or with manufacturer specifications (if available).

3. Read all labels carefully and compare the labels on the inner bag to those on the outer carton. Confirm that the information is the same. Ensure that all labels are photographed. Verify that the bag seal date and product date code are appropriate. Scan all labels and compare to the human-readable writing to ensure the barcode information matches. Lastly, check to ensure bag labels match the outer box labels.

4. If there is an MSL specified, verify that the product is packaged accordingly. Verify the MSL against what is identified on the manufacturer's datasheet. Verify that the MSL is correct. Verify that if there are multiple labels, they all contain consistent information. Confirm there is evidence of a desiccant pack and an HIC and that the vacuum seal is strong enough to seal the bag but not so strong as to bend or warp the inner contents. Verify that the outer bag matches what was expected in terms of markings. Some manufacturers print certain things, such as logos, on their bags, so confirm that these appear. Compare the bag with golden sample photographs or with manufacturer guidelines.

5. If there is simply an antistatic bag, note how is it sealed, i.e., folded or with an ESD sticker. Compare with prior golden sample receipts or with information from the manufacturer.

6. If there is no bag but simply a carrier, move to Step 4.

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10.1.5.4 STEP 4: Inspection of Carrier

PURPOSE:

Inspection of the carrier: tray, reel, tubes

EQUIPMENT:

Digital Camera
Reel Counter

DOCUMENTATION:

Purchase Order
Packing Documentation
Receiving Checklist
Product Datasheet

CHECKLIST:

1. ***All Carrier Types:*** If the package is MSL rated, confirm the presence of desiccant and an HIC. Verify the HIC is not moisture failed. To further test whether an HIC is good, see J-STD-033 for HIC test. Compare the type of desiccant and HIC used with prior golden samples or with the manufacturer's specifications. Verify that they match.

2. ***Tubes:*** If the package is factory packaged, verify that the tubes are imprinted with the manufacturer name and logo. Verify that all the tubes are the same length and style and if they appear new. Also verify uniformity of stoppers and that they fit properly. If they are yellowed, dull, extremely scratched, or do not have the correct manufacturer and logo, this could demonstrate non-factory or used tubes and possible excessive handling and/or age. A mixture of stoppers or improperly fitting stoppers is also an indicator of non-factory tubes. Yellowed tubes can indicate older tubes, which become brittle with age. Ensure the tubes have not become brittle, as these can break in shipping and damage the parts. Often, the tubes will contain markings that show which way the parts should be oriented. If present, use those to verify the chips inside are oriented correctly (See Figure 10-6). Confirm that the same numbers of chips are in each tube. Note: Factory tubes may contain partial quantities (See Figure 10-6). It is also important to note that not all manufacturers place their names and logos on the tubes. The key is uniformity and condition of the tubes and stoppers, along with uniform orientation of the parts in the tubes.

3. ***Tape and Reel:*** Review and read the labels on the reel. Verify that the information on the labels matches all other labels. Confirm that it matches

Orientation Marks on Tube

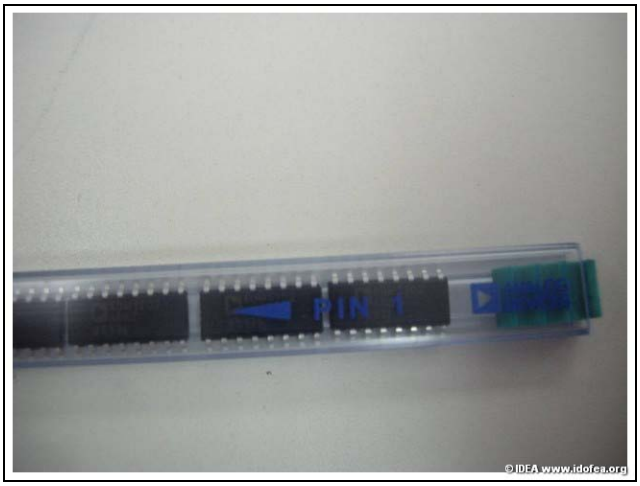


Figure 10-6

the information on the parts (if handling parts, ensure it is done in an ESD area with proper ESD protections). Scan the barcodes and verify that they match the human-readable writing. Look at the tape and reel and note whether it is a reel type that is expected with this manufacturer. Compare with prior golden sample receipts or with the manufacturer. Check the tape leader and note whether it is typical for the manufacturer. Check the placement of the labels. Look at the leader tape. Verify that it matches prior golden sample receipts or the manufacturer's guidelines. Run the reel through the reel counter to verify the count. Advanced reel counters have the ability to pick out empty pockets. If possible, compare reels by weight with a golden sample full reel and a calibrated scale. Verify there are no empty pockets in the reel. Confirm that the parts are oriented properly in the tape carrier by comparing to the manufacturer's specification. Verify there are no splices or cuts in the tape and confirm that none of the pockets has been opened.

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4. ***Trays:*** Check the banding and note if it is (or is not) the expected color and width. Determine and note if the banding is preprinted with any markings and compare with prior golden sample receipts or the manufacturer's specifications. Verify that all the trays are oriented the same way. Confirm a top tray is present to protect the parts. If there is cardboard covering the trays, verify that it is antistatic cardboard. Verify that all the chips are oriented in a uniform way. Verify there are no missing chips on any tray. Verify that lot and date code match what appears on the labels. Be on the lookout for ink marks or improperly oriented parts on the trays.

   Ink on the trays is considered a nonconformance. The ink on the tray alone does not always indicate that the part is suspect counterfeit. Ink on the tray should be considered a red flag and prompt a detailed inspection of the product, its packaging, labels, and all pertinent documentation contained in the shipment (See Figures 10-7 through 10-9).

   OCMs are strict with their marking practices. Product is not marked while in a tray. By the time the product is inserted into a carrier or tray, the ink is dry and would not transfer to the product's packaging. At no time during an OCM's production would wet ink transfer to a tray or carrier.

5. ***Bulk:*** Verify the count in the bag. Confirm that the packing is correct by referencing the manufacturer's datasheet. Scan any labels on the bag and verify that they match the human-readable writing.

Ink on Top Tray Matches the Ink Marking on the Component Held in the Tray Beneath



Figure 10-7

Same Tray as in Figure 10-7 with Component Removed



Figure 10-8

Paint on Tray

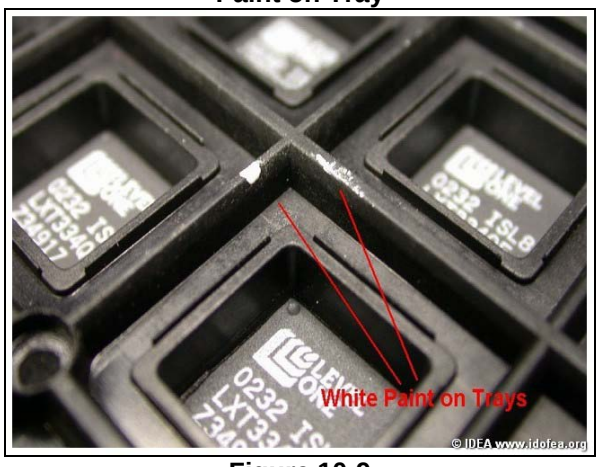


Figure 10-9

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10.1.6 Inspection Process for Non-Factory Packaged Product

10.1.6.1 General

Packaging type, factory packaging, or non-factory packaging cannot by themselves be a determinant in whether or not the product inside is authentic. The inspection steps for non-factory packaged product are distinctly different than that for factory packaged product in that there are fewer comparison points. With non-factory packaged product, often none of the original labels, boxes, or carriers are present to assist in a determination during the inspection. As part of the purchasing process, attempts should be made to get copies of labels or packaging if available. However, oftentimes these are not available, especially if the parts are old.

The inspection focuses on evidence and indicators of the handling and correct packaging of the goods. Close attention must be paid to the labels and packaging that are present for clues about the product.

10.1.6.2 STEP 1: The Initial Inspection of the Package

The initial inspection of the package as it arrives from the courier is the same as the inspection provided above in Sections 10.1.5.1 and 10.1.5.2.

10.1.6.3 STEP 2: The Non-Factory Packaging Inspection Process

PURPOSE:	EQUIPMENT:	DOCUMENTATION:
Inspection of non-factory packaging	Scale Digital Camera	Receiving Checklist

CHECKLIST:

1. Once the outer package is opened, photograph the inner contents. If it is a box, make note of the labels and markings. Again, if this is non-factory packaging, the labels and markings may have nothing to do with the product that is packaged inside. However, it is important to read and photograph the labels and box markings. If it is bagged product, process the same way. Examine the labels. Verify from the datasheet the MSL of the part, and, if applicable, confirm that it is packed in an MBB. If the parts are MSL rated, verify that a label details the record of exposure. If one does not, and there is no chain of traceability, a determination must be made on whether or not the parts were kept in a moisture controlled setting. Examine the seal to ensure the bag is sealed completely. Note and photograph findings.
2. Open the packaging to expose the carrier. Photograph and document findings. If there are trays, note how they are held together. Note whether they are encased in cardboard, and if so, verify that the cardboard is ESD compliant. Confirm there is a top tray present to protect the parts. If one is not, note this and inspect parts closely for any damage. Verify that all trays are the same and oriented in a uniform way. Confirm that the trays are correct for the parts. Incorrect trays can create significant stress and damage to leads. Examine the trays and note whether there is evidence of excess paint or marking. If the product is MSL rated, verify the presence of proper desiccant and an HIC. Verify that the HIC is acceptable.

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3. If the parts are on tape and reel, determine if there are labels, and if so, review the content for any clues that may assist with the inspection. Remember that the information on the labels may not be directly related to the parts contained within. Note whether any location on the reel is stressed or cracked and if there is evidence of dirt or debris on the reel. Note and photograph findings. Confirm that the parts are in the correct carrier tape by referring to manufacturer specification. Ensure that all parts are secure in their pockets and are not subject to falling out. Verify that all the parts are oriented in a uniform way that is correct for insertion. Note whether there is a leader. Perform a count of the parts through a reel counter. Take special notes of any empty pockets. Check whether the cover tape separates from the carrier tape. Check the entire reel and note any evidence of splicing or extraction of parts from the tape. Photograph and note all findings.

4. If the parts are in tubes, note the manner in which tubes are marked. Tubes that appear yellowed and older may no longer be ESD compliant. Verify that they are the correct tubes for the parts. Incorrect tubes can stress the parts, cause the leads to bend, and cause marking on the top and bottom of the parts. Incorrect packaging can also serve as a clue that the part is counterfeit because counterfeiters may not have consistent access to the correct packaging and will use a comparable, but incorrect, size. Note and photograph these findings. Verify the tubes are the same length and size and note if there are different tubes mixed together.

10.1.6.4 Process for Removing and Returning a Chip to a Tape Carrier

EQUIPMENT:

Sharp Blade
Vacuum Pen
ESD Rated Tape

CHECKLIST:

1. Cases may arise when proper inspection requires the removal of individual chips from a tape carrier and to replace the chip in the same carrier without re-reeling the entire tape. This procedure can be safely used to remove and replace parts in a tape.

2. Prior to handling any discrete chip, ensure you are working in an ESD compliant workspace. As the operator, verify that you are properly grounded. Visual inspection shall not damage the chip. When removing parts for inspection, remember to employ a sampling process to generate random areas from which to pull the individual chips.

3. Begin by cutting a small opening in the carrier cover tape just inside the pocket as shown. Be careful not to sever the underlying carrier or to touch the chip with the knife. See Figure 10-10.

Incision into Carrier

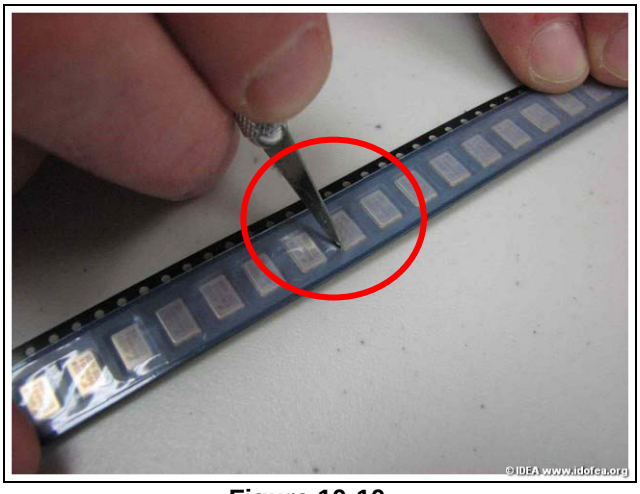


Figure 10-10

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4. Using a vacuum pen, remove the part and place it in an ESD safe workspace for inspection. See Figure 10-11.

Vacuum Pen Extracting Part from Tape



Figure 10-11

5. To return, use a vacuum pen to place the chip back into the carrier. Ensure the chip is correctly oriented when replacing.

6. Using ESD safe tape, apply a small piece of tape lengthwise to close the slit. Ensure tape does not interfere with sprocket holes. See Figure 10-12.

Correct Application of ESD Safe Tape



Figure 10-12

7. By using this method, the tape and reel can be used as normal in an automatic insertion process.

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10.2 The Initial Inspection

PURPOSE:

The first step of the inspection verifies that the paperwork, labels, quantity, part number and part type provided with the shipment match the purchase order. This step also includes recording the packaging type, its condition, and the country of origin (COO).

EQUIPMENT:

Barcode Scanner
ESD Compliant Workstation

DOCUMENTATION:

Purchase Order
Packing Slip/Invoice

CHECKLIST:

1. Scan the barcode to verify information is readable and matches the product identification.

2. Verify the part number and manufacturer match the purchase order and packing slip.

3. Inspect the label:

   a. Verify that there is an original factory label. Ensure there is not a label over a label.

   b. Confirm the manufacturer's logo is printed on the label. Inspect the spelling. The label ink should not be capable of being smudged.

4. Inspect the packaging:

   a. Note the packaging type and condition. Examples: factory sealed trays, third party reels discolored and warped, tubes cut and dull in color, etc.

Factory Label

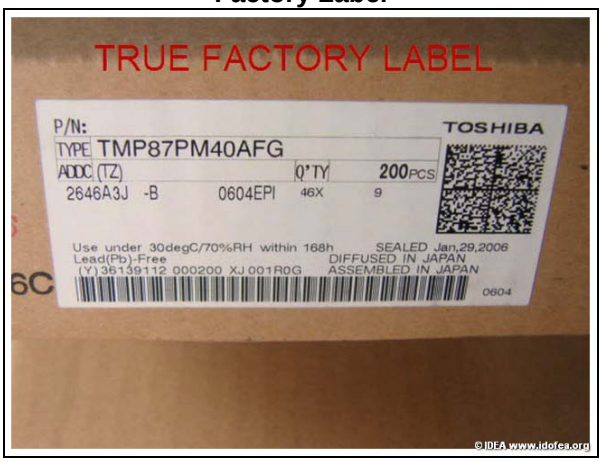


Figure 10-13

Suspect Label

1. Toshiba name is shifted to the right.
2. Has label underneath.
3. Misspelled the word "sealed."
4. Missing "pcs" after 180.



Figure 10-14

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For tape and reel: Ensure the tape is consistent in type (paper or plastic). Check for a tape leader and tape tail. Make sure the cover tape is not loose or falling off. Inspect the tape for damage (spliced tape, crushed pockets, etc.) and the reel for damage (warped, faded or discolored, cracked, etc.). See Figures 10-15 through 10-17.

Warped Reel



Figure 10-15

Cracked Reel



Figure 10-16

Damaged Tape and Reel



Figure 10-17

For trays: Make sure trays are properly banded and are the proper size for the packaged part. Inspect the condition of the trays (warped, discolored, cracked, etc.). Verify the trays are all in the same direction and are the same type. See Figures 10-18 through 10-20.

Cracked Tray



Figure 10-18

Improper Banding



Figure 10-19

Incorrect Tray Size



Figure 10-20

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For tubes: Examine the finish (new in appearance, dull, scratched, warped, bent etc.). Confirm the tubes are the same type and the stoppers at the end of each tube are consistent in length, color, and texture. See Figures 10-21 through 10-23.

Bent or Warped Tube



Figure 10-21

No Stopper



Figure 10-22

Tubes are Bent, One is Yellow



Figure 10-23

b. Verify the product is properly packaged for the required MSL. Typically, the MSL can be found on the factory carton and package labels or on the manufacturer's datasheet and website. Read and record status of HICs, if applicable.

   HICs are printed with moisture sensitive spots that respond to various levels of humidity with a visible color change, typically from blue to pink, but other HIC color indicators are allowed per J-STD-033.

Level Indicators on HIC

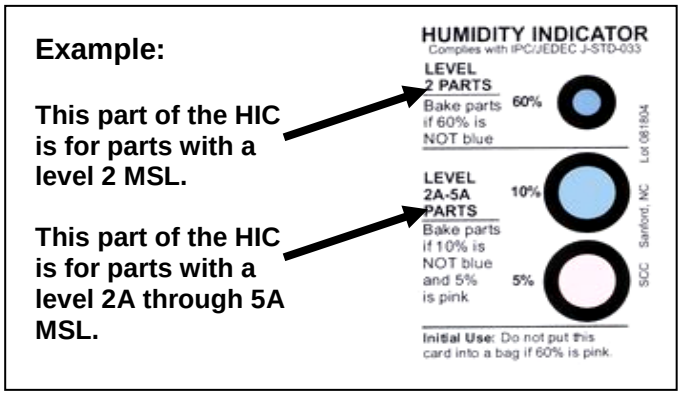


Figure 10-24

If the card indicates a high or unacceptable level of humidity, check the packaging for holes, no or low vacuum, or no packet of desiccant.

If the packaging looks suspect (torn, holes, no or low vacuum, no packet of desiccant) but the card's level reads as acceptable, see J-STD-033 for HIC test.

c. Verify the packaging is ESD compliant (all ESD packaging, especially vacuum sealed, must not have any defects, such as punctures or tears).

5. Confirm the orientation of the parts is consistent throughout the packaging. There should be no upside down or backward parts.

Inconsistent Part Orientation

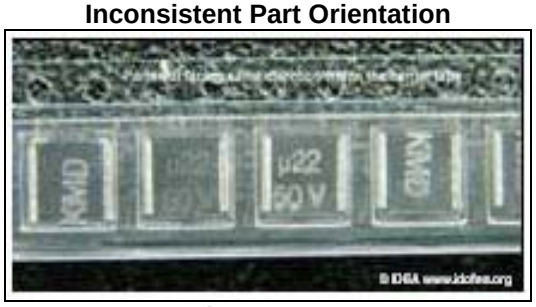


Figure 10-25

The Pin One indicator, polarity indicators, and part markings should be in the same direction and location in tubes, trays, and on reels. See standard EIA-481 for Pin One locations.

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6. Verify and record the COO, date codes, and lot codes.

7. Ensure the date codes, lot codes, and COO are consistent throughout the packaging.

   Manufacturers do put multiple date and lot codes in a single pack of components. However, each manufacturer is different and not all manufacturers use this practice. For those that do, there will generally never be more than two (2) lot number/date code combinations in a single pack. Multiple lot and date codes should be considered a flag and analyzed in conjunction with results from other parts of the inspection.

   Confirmation from the manufacturer that this practice is used or review of prior golden samples showing this can help in the validation of the parts. There should never be multiple COOs in a single pack.

8. Confirm the date code meets any restrictions specified on the purchase agreement.

9. Confirm received quantity matches the quantity on the purchase order and packing slip/invoice.

10. Record any signs of damage to the product or packaging.

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10.3 Detailed Inspection

PURPOSE:

The second step of the inspection involves a more detailed physical examination of the part. The intent is to identify any abnormalities that would indicate the part is suspect. This step contains three sections.

1. ***The Visual Inspection:*** Looking for flaws or inconsistencies in the surface and lead appearances.
2. ***The Solvent Tests:*** Testing for any indication of remarked or blacktopped surface.
3. ***The Mechanical Inspection:*** Measuring for compliance to manufacturers' specifications. Sanded, blacktopped, or re-covered parts typically do not meet dimensional specifications.

Note: Sampling sizes and statistical techniques are discussed in Section 9.3.

10.3.1 The Visual Inspection

EQUIPMENT:

Microscope
(1.5X to 40X magnification)
ESD Compliant Workstation

MATERIALS:

Finger Cots or Gloves
Vacuum Pen

DOCUMENTATION:

Component Datasheet

Microscope set-up:
The tolerance for magnification aids is ± 15% of the selected magnification power. Magnification aids, if used for inspection, need to be appropriate for the item being inspected. Lighting needs to be adequate for the magnification aids used. The magnification used to inspect electronic components is based on the minimum width of the feature under inspection. Unless magnification requirements are otherwise specified by contractual documentation, the magnifications are determined by the item being inspected (see Section 7.3, Table 3).

Component Data:
The component datasheet's revision or date issued should be consistent with the date code of the product being inspected. Markings, dimensions, electrical specifications, or assembly locations could be different depending on the date code and revision of the part.

CHECKLIST:

10.3.1.1 Inspect the Surface of the Parts

1. Verify the logo and markings match the manufacturer's specifications.

2. Confirm the markings are clear and do not appear to be remarked or restamped.

3. Inspect laser marks for burn holes caused by aftermarket laser equipment.

   The markings should be consistent throughout the package type having the same placement, font type, color, and texture from part to part and on the top and bottom of the parts.

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