GENERAL INFORMATION

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STORAGE OF SEMICONDUCTOR DEVICES

by Raymond Dewey

Introduction

All semiconductor devices are susceptible to damage or degradation during shipping, storage, and handling. Non-hermetic, plastic-encapsulated surface-mount devices are particularly sensitive to moisture-induced stress during printed wiring board assembly. This publication provides a guide to the receipt, storage, packing, and shipping of Allegro semiconductor devices and a quick reference to applicable industry standards.

Normative references

The following documents contain provisions that, through reference in this publication, constitute provisions of this publication. The latest edition of the document referred to applies. Where differences exist between these documents and this publication, the latter takes precedence.

Joint IPC/JEDEC Standard J-STD-020, *Moisture/Reflow Sensitivity Classification for Nonhermetic Solid-State Surface-Mount Devices*

Joint IPC/JEDEC Standard J-STD-033, *Standard for Handling, Packing, Shipping, and Use of Moisture/Reflow-Sensitive Surface-Mount Devices*

JEDEC Standard JESD31, *General Requirements for Distributors of Commercial and Military Semiconductor Devices*

JEDEC Standard JESD625, *Requirements for Handling Electrostatic-Discharge-Sensitive (ESDS) Devices*

EIA Standard EIA-541, *Packaging Material Standards for ESD-Sensitive Items*

EIA Standard EIA-583, *Packaging Material Standards for Moisture-Sensitive Items*

General

Receiving, storing, packing, and shipping procedures should prevent mechanical or electrical damage or degradation of the Allegro semiconductor device when subjected to normal handling, shipping, and storage.

All packing materials should be either conductive or antistatic, including tubes, trays, reels, bags, and fillers (see EIA-583). Appropriate ESD precautions must be taken (see JESD625).

Dry bagging or vacuum bagging of product at any point up to and including shipment to the end user should follow Allegro's specifications. This includes rebaking and rebagging of parts when necessary.

The distributor's or user's quality department is responsible for verifying conformance to all of the receiving, storing, packing, and shipping requirements prior to use by the end customer.

Inventory control

When several lots of the same part number and package type exist in inventory, product should be used based upon the first-in, first-out (FIFO) inventory method (i.e., delivery or use based upon the oldest date code first).

When specifically defined by a customer order, product that does not meet the FIFO requirement may be shipped.

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Recommended storage conditions

Unless otherwise specified, product that is not moisture sensitive (moisture sensitivity level 1) may be stored at a temperature of less than 30°C (86°F) and a relative humidity (RH) of between 50% and 85%. Baking is not required before mounting.

Product classified as "moisture sensitive" or "extremely moisture sensitive" may be stored at a temperature of less than 40°C (104°F). Product should be stored in an inert atmosphere (e.g., nitrogen), a vacuum pack, or a sealed moisture barrier bag with desiccant.

Product classified as "moisture-sensitive" may be stored for up to one year (depending on moisture sensitivity level 2 through 5a). Procedures listed on the moisture-sensitive identification label should be followed (see J-STD-033) for opened packages or beyond the specified storage time. If partial lots are used, the remaining devices should be resealed or placed in a dry box at no more than 10% RH within one hour of bag opening. Baking may be required (see J-STD-020) before mounting.

Product classified as "extremely moisture-sensitive" (moisture sensitivity level 6) may be stored up to the time specified on label. Procedures listed on the moisture-sensitive identification label for opened packages or beyond the specified storage time should be followed (see J-STD-033). If partial lots are used, the remaining devices should be resealed or placed in a dry box at no more than 10% RH within one hour of bag opening. These devices must be baked (see J-STD-020) before mounting.

Unless otherwise indicated, components shipped in high-temperature carriers may be baked in the carriers at 125°C (257°F). Components shipped in low-temperature carriers (e.g., tape and reel) may not be baked at any temperature higher than 40°C (104°F).

Die/wafer storage conditions

Die/wafers, when not in process or transit, should be stored at a temperature between 18°C and 24°C (65°F to 75°F), a relative humidity of less than 30%, and in a clean, dry, inert atmosphere (e.g., nitrogen), a vacuum pack, or clean dry air.

ESDS considerations

The system for electrostatic discharge sensitive (ESDS) protection should be in compliance with JESD625.

When removing devices from reels, the cover tape should be removed at a rate of 10 mm/s or less and at an angle of between 165° and 180° from the embossed carrier tape to minmimze electrostatic generation.

Solderability

Optimal solderability of all packaged product will be maintained provided the General and Recommended storage conditions described above have been met.

Baking components may cause solder oxidation and/or intermetallic growth, which, if excessive, can result in solderability problems during board assembly. The temperature and time for baking components is therefore limited by solderability considerations. Normally, one bake cycle is allowable on a finished device. If more than one bake cycle is needed, Allegro should be consulted.

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Informative references

The following documents contain useful information regarding the storage, handling, and related testing of semiconductor devices. Where differences exist between these documents and the normative references previously listed, the latter take precedence.

JEDEC Standard JESD22-A103, *High-Temperature Storage Life*

JEDEC Standard JESD22-A112 (superceded by J-STD-020)

JEDEC Standard JESD22-B102, *Solderability* (of commercial solid-state devices)

JEDEC Publication JEP113, *Symbol and Label for Moisture-Sensitive Devices*

JEDEC Publication JEP124 (superceded by J-STD-033)

Military Standard MIL-STD-750, Test Method 2026, *Solderability* (of military discrete devices)

Military Standard MIL-STD-883, Test Method 2003, *Solderability* (of military microcircuits

JEITA (formerly EIAJ) Technical Report EDR-4701, *Handling Guidance for Semiconductor Devices*

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