Lori Hornback

Irvine Sensors Corporation

June 1998

Who's Developing KGD Standards?

- **United States**
  - Electronic Industries Association (EIA)
  - SEMATECH
  - IC Delco
- **Europe**
  - CENELEC Electronic Components Committee (CECC)

EIA-
JEDEC JC-13 Committee

- *EIA/JESD49 Procurement Standard for Known Good Die (KGD)* (Pub. Feb. 1996)
  - Developed by Task Group JC-13 9104 (Chair: Barrett/Hornback)
  - Scope: Provides procurement guidelines and requirements for KGD used in other than conventionally packaged microcircuit or discrete formats….intended to be high quality, reliable bare dice for use in a variety of user-defined applications.

- Limited to KGD consisting of a single microcircuit or discrete device connected using conventional wire bonding or high density interconnect.
- Issues:
  - Standard burn-in and test scenarios lacking but would greatly enhance document if included or referenced
  - Standard handling guidelines needed to protect hardware until integrated into final assembly
  - Doesn’t deal with non-standard/exotic technologies
- Benefits:
  - Outlines standard information that die manufacturers may be asked to provide for applications that use KGD.
  - Allows supplier/customer negotiation of requirements with the expectation that KGD product will have as-delivered performance, quality and long term reliability that are at least as good if not better than packaged versions.

- EIA/JESD XX "Guidelines for the Safe Handling of Bare Die and Wafers, including Known Good Die (KGD)"
  - Task Group JC-13 9501 (Chair: L. Hornback)
    - Working with SEMATECH and IC Delco
    - Approved by JEDEC-in coordination to JEDEC Council for publication
  - SCOPE: Recommended safe practices for safe physical and environmental handling of bare wafers and die.
  - Issues: Does not deal with non-standard/exotic technologies directly.
  - Benefits: Provides manufacturers, die processors and end users with standard guidelines for physical handling, cleaning, packaging, documenting and preservation of wafer and die product.

SEMATECH

- Low Cost KGD PTAB/Low Cost Shipping Medium Task Force
  - Working on four specific areas:
    - Standard for die orientation in Gel Pak® & Waffle Pack to facilitate die product automated manufacturing
    - Standard for packaging and labeling
    - Standardized Gel Pak® dimensions and tolerances
    - Standardized Waffle Pack dimensions and tolerances
  - Issues:
    - SEMATECH publications typically limited to member companies
    - End-users and die processors not directly represented

IC DELCO

- Engineering Response Team developing Delco version of handling guideline for bare die and wafers
  - Working with JC-13 9501 to incorporate their work into JEDEC standard for handling
  - Incorporating all of the JC-13 9501 document
  - Adds Delco detailed information where the JEDEC standard is too general
  - Not supported by mainstream industry except through JC-13 task group

CECC

- Developing European specifications for KGD titled “Data Requirements for Semiconductor Die (KGD)”
- CECC working group members include ESPRIT GOOD-DIE project, EECA, Sematech, EIAJ…
  - ESPRIT GOOD-DIE - Project to develop a database for the selection of un-packaged and minimally packaged semiconductor die & for downloading of design data for MCM & Hybrid circuits
  - EECA - European Electronic Component Manufacturers Association
  - SEMATECH - Semiconductor manufacturers consortium
  - EIAJ - EIA Japan

Data Requirements for Semiconductor Die (KGD)

- Part 1 - General Requirements (draft '97)
- Part 2 - Vocabulary (draft '97)
- Part 3 - Mechanical, material and connectivity requirements (proposed)
- Part 4 - Specific Requirements (proposed)
  - 4.1 Test & Quality
  - 4.2 Handling
  - 4.3 Thermal
  - 4.4 Electrical simulation

- Part 5 - Particular requirements for die types (proposed)
  - 5.1 Bare die
  - 5.2 Die with connection structures
  - 5.3 Minimally-packaged die
- Part 6 - Exchange data formats and data dictionary (proposed)

Data Requirements for Semiconductor Die (KGD) Part 1-General Requirements

- Includes very general product identity, product performance, thermal & mechanical data and information related to die mechanical, test, quality & reliability, handling, storage and mounting guidelines.
- Specifies the need to exchange pertinent data between manufacturers and end-users
- References a number of IEC, ISO, EIA, IEEE, FED-STD-209, and MIL documents

Data Requirements for Semiconductor Die (KGD) Part 2- Vocabulary

- Vocabulary and definitions in following categories;
  - Organizations & Standards
  - General Terminology
  - General Terminology (Test)
  - General Semiconductor Terminology
  - Design & Simulation Terminology
  - Electronic Technology Terminology
  - Packaging Terminology
  - Packaging & Delivery Terminology

Summary

- KGD Standards have a long way to go toward supporting availability of “standard” KGD products
- EIA leading standards efforts to date
- European standard could be very useful if they are successful at putting “meat” into test and quality requirements
- Truly “standard” KGD not likely due to manufacturer unique & protected evaluation methods