

ESD Diode on Die of Semiconductor QFN Device

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I. OVERVIEW

- Nowadays, electronic products are becoming influential in our daily activities
- The transition from bulky and large electronic devices to a miniaturized version enables convenience and extend assistance to circumstances beyond human capability
- Fig. 1 shows an example of a semiconductor quad flat no-leads (QFN) device of a miniaturized version of electronic integrated circuit (IC)

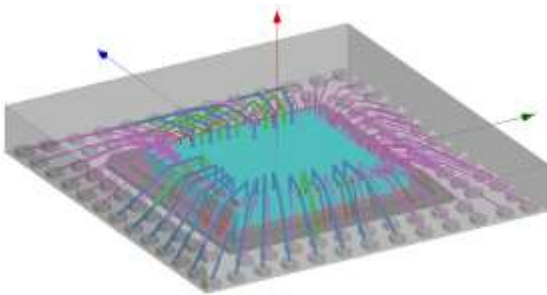


Fig. 1. 3D model of semiconductor QFN device in a multi-row configuration.

- Nonetheless, there are some known drawbacks and challenges related to this transition of electronic devices to downsize version
- As the device becomes smaller and compact it became susceptible to electrostatic discharge (ESD) and/or electrical overstress (EOS) related defects

II. PROBLEM IDENTIFICATION

- There are existing semiconductor IC devices that do not have ESD and/or EOS protection circuitry at the die level, thus susceptible to ESD/EOS-related damages
- An example of such defect manifestation is shown in Fig. 2, with the device eventually malfunctioned

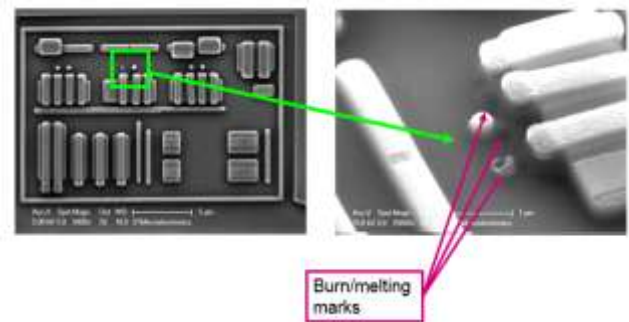


Fig. 2. ESD/EOS defect manifestation.

III. SEMICONDUCTOR PACKAGE DESIGN SOLUTION

- The semiconductor QFN device is embedded with ESD diode/s on its active die, as depicted in Fig. 3
- The ESD diode is mounted or attached on the silicon die or the active die through the bond pads using conductive/sintered glue, solder bump, or any conductive adhesive material

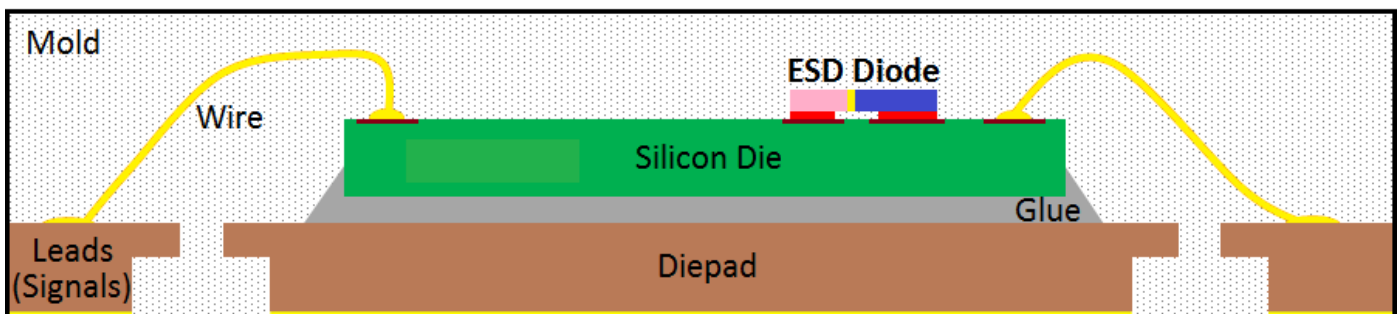


Fig. 3. Semiconductor QFN device with ESD diode/s attached on silicon die.

- With this configuration, incorporating an ESD diode component inside the package, ESD/EOS-sensitive devices without internal ESD/EOS die circuitry could now be protected against ESD/EOS-related damages