Abstract

~~SEMICONDUCTOR DEVICE AND~~ METHOD OF FORMING PROTECTIVE MATERIAL BETWEEN SEMICONDUCTOR DIE STACKED ON SEMICONDUCTOR WAFER TO REDUCE DEFECTS DURING SINGULATION

A semiconductor wafer contains first semiconductor die. TSVs are formed through the semiconductor wafer. Second semiconductor die are mounted to a first surface of the semiconductor wafer. A first tape is applied to on a second surface of the semiconductor wafer. A protective material is formed over the second die and first surface of the wafer. The protective material can be encapsulant or polyvinyl alcohol and water. The wafer is singulated between the second die into individual die-to-wafer packages each containing the second die stacked on the first die. The protective material protects the wafer during singulation. The die-to-wafer package can be mounted to a substrate. A build-up interconnect structure can be formed over the die-to-wafer package. The protective material can be removed. Underfill material can be deposited beneath the first and second die. An encapsulant is deposited over the die-to-wafer package.

(Fig. 5)