Claims

What is claimed:

1. A semiconductor device, comprising:

a first semiconductor die;

an insulating material deposited in a peripheral region around the first semiconductor die;

an interconnect structure formed over the first semiconductor die and including,

(a) a first conductive layer extending from a contact pad of the first semiconductor die over a surface of the insulating material, and

(b) a plurality of bumps formed over the first conductive layer; and

a substrate including a second conductive layer, wherein the first semiconductor die is mounted to the substrate with the bumps contacting the second conductive layer and a fan-out ratio (FR) of an I/O density of the first semiconductor die to an I/O density of the substrate is given as $FR = p^2*(N/d^2)$, where p is package pitch, N is number of non-redundant I/O per die, and d is die size.

2. The semiconductor device of claim 1, wherein the I/O density of the substrate is less than the I/O density of the first semiconductor die.

3. The semiconductor device of claim 1, wherein the interconnect structure further includes a plurality of conductive columns formed between the bumps and first conductive layer.