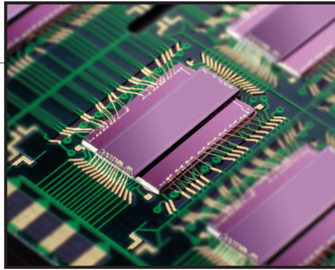
data sheet

# Stacked CSP



## *Stacked* CSP (SCSP):

The Stacked CSP (SCSP) family leverages Amkor's industry leading ChipArray® Ball Grid Array (CABGA) manufacturing capabilities. This broad high volume infrastructure enables the rapid deployment of advances in die stacking technology across multiple products and factories to achieve lowest total cost requirements.

Stacked CSP technology enables the stacking of a wide range of different semiconductor devices to deliver the high level of silicon integration and area efficiency required in portable multi-media products. Stacked CSP utilizes high density thin core substrates, advanced materials (ie: thin film die attach adhesive, fine filler epoxy mold compound), along with leading-edge wafer thinning, die attach, wire bonding and molding capabilities to stack multiple devices in a conventional fine pitch BGA (FBGA) surface mount component. These advanced assembly capabilities in combination with Amkor's expertise in design and test, enable stacks up to 16 active devices while optimizing yield and mounted height requirements. Many customers have relied on Amkor to solve their highest density and most complex device stack combinations. As a result, Amkor has established industry leadership in stacking pure memory, mixed signal, and logic + memory devices, including NAND, NOR and DRAM memory, digital base band or applications processors + high density flash or mobile DRAM devices. Designers are looking to Stacked CSP technologies to achieve a high level of integration, along with size and cost reductions in future chip set combinations.

### Features:

- 4-21 mm body size
- Package height down to 0.8 mm
- High die count pure memory stacks
- Design, assembly and test capabilities that enable stacking of DRAM with Logic or Flash memory devices
- Logic/Flash, Digital/Analog and other ASIC/Memory combinations of 320 I/O and greater
- Established package infrastructure with standard CABGA footprints
- Consistent product performance, high yields and reliability
- JEDEC Standard Outlines including MO-192 and MO-219
- Thin DA film and spacer technology
- Extended die overhang wire bonding
- Low loop wire bonding less than 75 µm
- Vacuum transfer and compression molding
- Wafer thinning / handling to 40 µm
- Pb free, RoHS compliant and Green materials
- Passive component integration options

### Reliability:

Amkor assures a reliable performance by continuously monitoring key indices:

Package Level:

| Test | Condition |
|---|---|
| • Moisture Resistance Testing | JEDEC Level 3 @260 °C |
| • Additional Test Data at | [(30 °C/85%RH/96hrs) +260]x2 or3 |
| • Temp Cycle | -55/+125 °C, 1000 cycles |
| • Unbiased Autoclave/PCT | 121 °C/100% RH/2atm, 168 hours |
| • Temp/Humidity | 85 °C/85%RH/1000 hours |
| • High Temp Storage | 150 °C, 1000 hours |

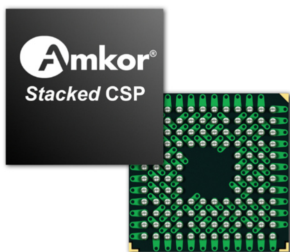
Board Level:

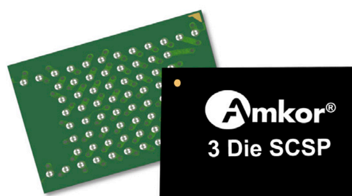
| Test | Condition |
|---|---|
| • Thermal Cycle | -40/+125 °C, 1000 cycles |

### Applications:

Portable multi-media devices including cell phones, digital cameras, PDAs, audio players and mobile gaming employ SCSP solutions to address a range of design requirements, including:

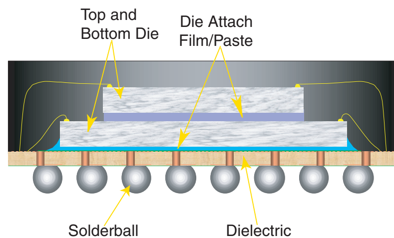
- Higher memory capacity and more efficient memory architectures
- Smaller, lighter and more innovative new product form factors
- Lower cost and more space efficient



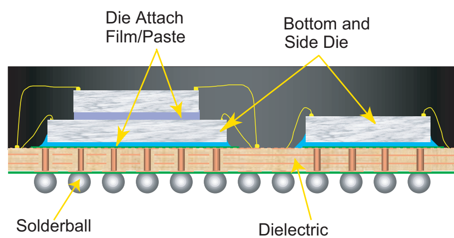



# Stacked CSP

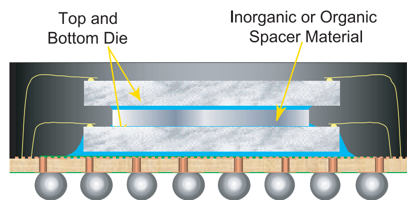
## *Stacked* CSP Cross Section
### 2 Die on 2-Layer Laminate Structure



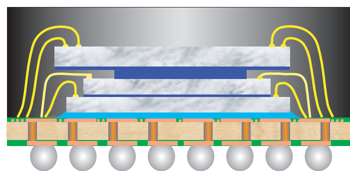

## *Stacked* CSP Cross Section
### 2+1 Die on 4-Layer Laminate Structure




## Same Size (SS) Die *Stacked* CSP Cross Section
### 2 Die on 2-Layer Laminate Structure




## *Stacked* CSP Cross Section
### 3+1 Logic + Memory



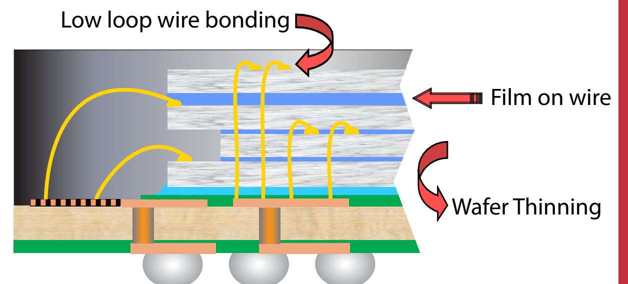
## Process Highlights

| | |
|---|---|
| Die qty, stack | Up to 5 high die configurations |
| Ball pad pitch | 0.4, 0.5, 0.65, 0.75, 0.8 mm |
| Die thickness (min) | down to 40 μm |
| Laminate core thickness | 60, 100 or 150 μm |
| Ball diameter | 0.25, 0.30, 0.40, 0.46 mm |
| Die bond pitch (min) | 40 μm (In-line) with roadmap to 25 μm |
| Wirebond length (max) | 5 mm (200 mils) |
| Wirebond dia (min) | 18, 20, 25, 30 μm |
| Wafer thinning | 200 & 300 mm wafers |

## Standard Materials

| | |
|---|---|
| Substrate | |
| - Dielectric | Laminate (e.g., E679, BT) Polyimide (e.g., Kapton®) |
| - Layer count (Laminate) | 2-4 |
| Device type | Silicon, SiGe, etc. |
| Die attach | Film DA compatible with all passivation types |
| Wire type, Gold | High tensile strength |
| Encapsulant | Thixotropic Epoxy (Black) |
| Solderball | 63Sn/37Pb & PbFree Sn/3-4Ag/0.5Cu |
| Marking | Laser |

## *Stacked* CSP Key Technologies




Contact Amkor for Daisy chain sample availability and the latest SCSP capabilities.



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