# tsCSP

## Thin Substrate Chip Scale Package

Amkor Technology® NEW!

Amkor's tsCSP is a land grid array multi-row package (up to 3–rows of lands) compatible with established CSP mounting processes. The near-chip-size standard outlines offer a broad selection of land pitch, count, and body sizes. By utilizing a thin substrate, standard package height of 0.4mm to 0.6mm can be achieved. Amkor also offers very thin package thickness less than 0.4mm.

The package uses Amkor's ExposedPad™ technology as a thermal enhancement by having the die attach paddle exposed on the bottom of the package surface to provide an efficient heat path when soldered directly to the PWB. These enhancements also enable stable ground by use of down bonds or by electrical connection through a conductive die attach material.

Amkor tsCSP packages, regardless of body sizes and thicknesses, utilize streamlined, flexible manufacturing process which assures economical packaging solutions. Amkor's tsCSP is an excellent solution for devices requiring high performance and ultra-thin chip scale applications.

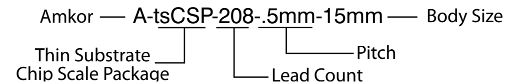
### tsCSP Thin Substrate Chip Scale Package

| Part Number | Lead Count | Body Size | Pitch | Quantity Per Tube | Pad Row |
|---|---|---|---|---|---|
| A-tsCSP28-.5mm-4mm | 28 | 4mm | .5mm | 75 | |
| A-tsCSP92-.5mm-7mm | 92 | 7mm | .5mm | 43 | |
| A-tsCSP136-.5mm-8mm NEW! | 136 | 8mm | .5mm | 37 | Triple Row |
| A-tsCSP200-.5mm-10mm | 200 | 10mm | .5mm | 30 | Triple Row |
| A-tsCSP208-.5mm-15mm | 208 | 15mm | .5mm | TBD | |

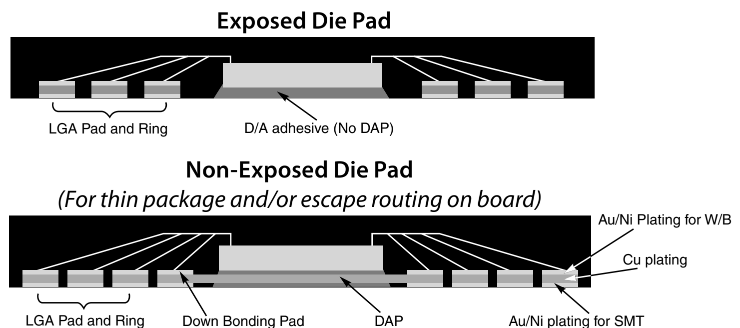
### *Notes*

- Exposed die attach pad for superior thermal performance.
- JEDEC MO-247 compliant: Plastic Quad No-lead Staggered Multi-row Packages.
- JEDEC Publication 94 Design Guide 4.19 compliant: Quad No-lead Staggered and Inline Multi-row Packages.
- Au/Ni and SnPb plating
- Ultra thin: 0.4mm to 0.65mm.
- Parts are packaged in tubes (standard).
- Parts are available in trays or on tape and reel upon special request.
- MLS = JEDEC Level 1 (depending on body size).
- Package format similar to saw MLF.
- 92 lead is available DAPless version.
- Power/Ground ring available only for 92ld, 200ld and 208ld.
- Down bond available only for 136ld and 208ld.

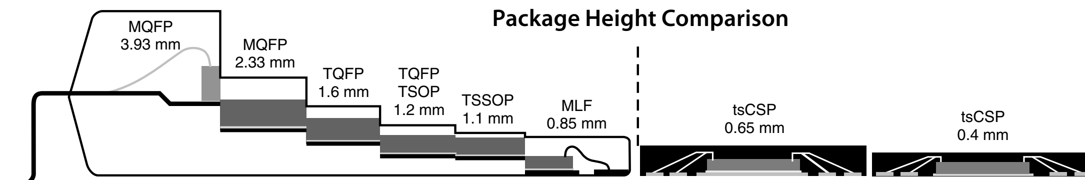
### *Part Number System*




** Add "TR" to end of part number for Tape and Reel.*
** Add "Sn" to end of part number for Lead-Free.*




### Package Height Comparison



***For recommended kit see page 58.***

# LGA
Land Grid Array

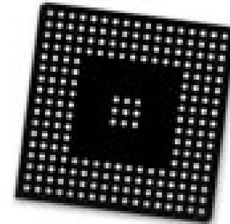


Amkor laminate ChipArray® packages are available without solder balls upon special order. Packages available without solder balls include CABGA, CTBGA and CVBGA. The same standard daisy-chained substrate would be used based on open tooling.

LGA is another term used for parts without solder balls. The same BOM (bill of material) is used when parts are assembled. LGA parts are used to reduce package height, drop test performance in handheld applications, solder ball attach practice, socket insertion, P&P evaluation, reflow profiling, enhance thermal cycle reliability and other purposes.

LGA solder interconnect if formed solely by solder paste applied at board assembly because there are no solder balls attached to the LGA. This results in a lower stand-off height of approximately 0.06mm to 0.10mm, depending on solder paste volume and PCB geometry. Laminate substrate is solder mask defined. Standard ball pad finish is NiAu.

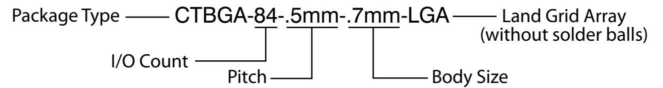
Application notes available for supporting technical data.

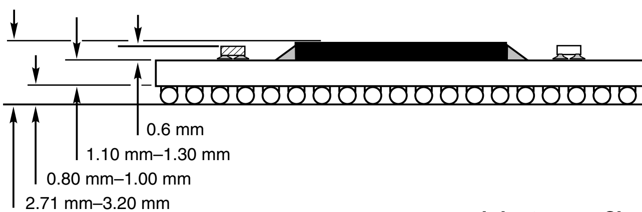


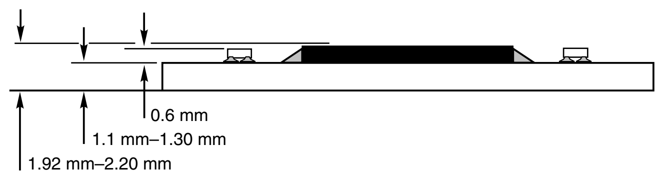
### *Notes*

- Body sizes range from 5mm ~ 17mm.
- Available pitches are .4mm, .5mm, .8mm and 1.0mm.
- Parts packaged in trays (standard).
- Parts available on Tape and Reel upon special request.
- PoP, SBGA and PBGAs are not available without solder balls.

### ***Part Number System*** *(use as an example when ordering)*




**Unmounted device profile (with balls on left, LGA on right)**

***For recommended kits see pages 53, 60, 62, 63, 69 and 73.***

# MLF®

*Micro*LeadFrame®

Amkor's *Micro*LeadFrame® Package (MLF®) is a near CSP plastic encapsulated package with a copper leadframe substrate. This package uses perimeter lands on the bottom of the package to provide electrical contact to the PWB. The package also offers Amkor's ExposedPad™ technology as a thermal enhancement by having the die attach paddle exposed on the bottom of the package surface to provide an efficient heat path when soldered directly to the PWB.

## MLF®—*Micro*LeadFrame®

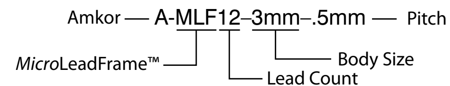
| Part Number | Lead Count | Body Size | Pitch | Quantity Per Tube |
|---|---|---|---|---|
| ***.4mm Pitch*** | | | | |
| A-MLF48-6mm-.4mm | 48 NEW! | 6mm | .4mm | 50 |
| A-MLF88-10mm-.4mm | 88 | 10mm | .4mm | 30 |
| A-MLF100-12mm-.4mm | 100 NEW! | 12mm | .4mm | 25 |
| ***.5mm Pitch*** | | | | |
| A-MLF12-3mm-.5mm | 12 | 3mm | .5mm | 100 |
| A-MLF16-3mm-.5mm | 16 | 3mm | .5mm | 100 |
| A-MLF20-4mm-.5mm | 20 | 4mm | .5mm | 75 |
| A-MLF24-4mm-.5mm | 24 | 4mm | .5mm | 75 |
| A-MLF28-5mm-.5mm | 28 | 5mm | .5mm | 60 |
| A-MLF32-5mm-.5mm | 32 | 5mm | .5mm | 60 |
| A-MLF36-6mm-.5mm | 36 | 6mm | .5mm | 50 |
| A-MLF40-6mm-.5mm | 40 | 6mm | .5mm | 50 |
| A-MLF44-7mm-.5mm | 44 | 7mm | .5mm | 43 |
| A-MLF48-7mm-.5mm | 48 | 7mm | .5mm | 43 |
| A-MLF52-8mm-.5mm | 52 | 8mm | .5mm | 37 |
| A-MLF56-8mm-.5mm | 56 | 8mm | .5mm | 37 |
| A-MLF64-9mm-.5mm | 64 | 9mm | .5mm | 33 |
| A-MLF68-10mm-.5mm | 68 | 10mm | .5mm | 30 |
| A-MLF72-10mm-.5mm | 72 | 10mm | .5mm | 30 |
| ***.65mm Pitch*** | | | | |
| A-MLF8-3mm-.65mm | 8 | 3mm | .65mm | 100 |
| A-MLF16-4mm-.65mm | 16 | 4mm | .65mm | 75 |
| A-MLF20-5mm-.65mm | 20 | 5mm | .65mm | 60 |
| A-MLF28-6mm-.65mm | 28 | 6mm | .65mm | 50 |
| A-MLF32-7mm-.65mm | 32 | 7mm | .65mm | 43 |
| A-MLF44-9mm-.65mm | 44 | 9mm | .65mm | 33 |
| ***.8mm Pitch*** | | | | |
| A-MLF12-4mm-.8mm | 12 | 4mm | .8mm | 75 |
| A-MLF16-5mm-.8mm | 16 | 5mm | .8mm | 60 |
| A-MLF20-6mm-.8mm | 20 | 6mm | .8mm | 50 |
| A-MLF28-7mm-.8mm | 28 | 7mm | .8mm | 43 |

### *Notes*

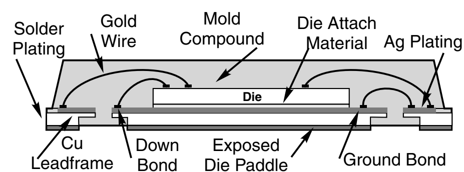
- Two MLF® designs are available: Punch or Saw (see the cross-section drawing).
- Pin counts and body sizes change on an ongoing basis. Please call for updated listing of available packages.
- Body sizes ranging from 3 x 3mm to 12 x 12mm.
- Eutectic solder plating is 85/15 Sn/Pb.
- MLF® package is a near CSP plastic encapsulated package with a copper leadframe substrate.
- Parts are packaged in tubes.
- Parts are available in trays or on tape and reel upon special request.
- Small size (50% space reduction as compared with TSSOP).
- MLF®s are available daisy-chained (please call for more details).
- Lead-free parts are available with 100% Matte Sn. Add "Sn" to end of part number when ordering Lead-Free parts.
- Moisture sensitivity level is JEDEC 1.
- 0.6mm to 1.5mm maximum height
- MLF® is also known as QFN, MCC or MLP.

***For kits see pages 58, 60, 69 and 73.***

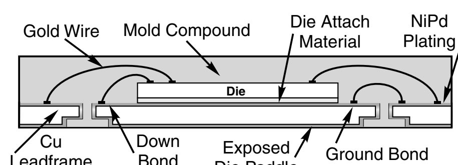
### *Part Number System*




### Cross-Sections MLF®




**Individual Unit Design "Punch"**




**MAP Design "Saw"**

# Dual Row MLF® Amkor Technology® NEW!



Amkor's new Dual Row MLF® (*Micro*LeadFrame®) package with 2 rows of lands is a cost effective, high performance solution for devices requiring up to 164 I/O. Typical applications include hard disk drives, USB controllers, and Wireless LAN. The small size and weight, along with excellent thermal and electrical performance, make the MLF® package an ideal choice for handheld portable applications such as cell phones and PDAs or any other application where size, weight and package performance are required issues.

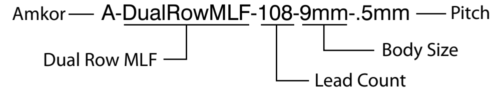
## Dual Row MLF

| Part Number | Lead Count | Body Size | Pitch | Quantity Per Tube |
|---|---|---|---|---|
| A-DualRowMLF108-9mm-.5mm | 108 | 9mm | .5mm | 33 |
| A-DualRowMLF116-9mm-.5mm NEW! | 116 | 9mm | .5mm | 33 |
| A-DualRowMLF124-10mm-.5mm | 124 | 10mm | .5mm | 30 |
| A-DualRowMLF132-10mm-.5mm NEW! | 132 | 10mm | .5mm | 30 |
| A-DualRowMLF148-11mm-.5mm NEW! | 148 | 11mm | .5mm | 25 |
| A-DualRowMLF156-12mm-.5mm | 156 | 12mm | .5mm | 25 |
| A-DualRowMLF164-12mm-.5mm NEW! | 164 | 12mm | .5mm | 25 |

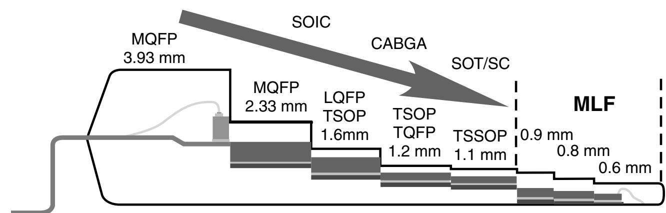
### *Notes:*

- Parts are packaged in tubes (standard).
- Parts are available in trays or on tape and reel upon special request.
- Dual row MLF® offers enhanced thermal capability.
- Dual Row MLF®s are available daisy-chained upon special request.
- Process flow is same as standard "punch" MLF®.
- Small size (reduce package footprint by 50% or more and improved RF performance) and weight.
- Moisture sensitivity level is JEDEC 1.
- Solder plating finishes available are 85/15 SnPb and 100% Matte Sn.
- Only dual pad row is available (not triple pad row). tsCSP package family is available triple row for certain lead counts.

### *Part Number System*




** Add "TR" to end of part number for Tape and Reel.*
** Add "Sn" to end of part number for Lead-Free.*



***For recommended kit see page 58.***

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