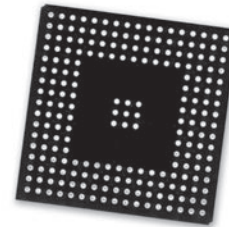


Amkor laminate ChipArray® packages are available without solder balls upon special order. Packages available without solder balls include CABGA, CTBGA and CVBGA. The same standard daisy-chained substrate would be used based on open tooling.

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 is 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.



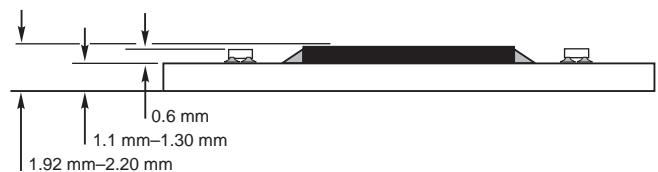
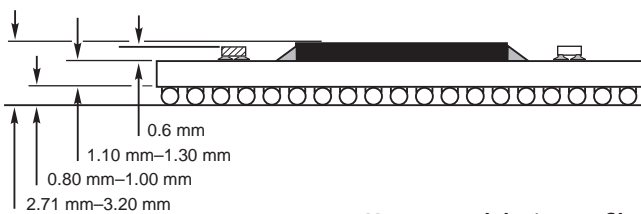
### Notes

- 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.

### Part Description System (use as an example when ordering)

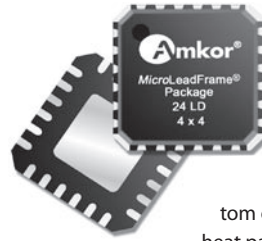
Package Type — CTBGA-84-.5mm-.7mm-LGA — Land Grid Array (without solder balls)

I/O Count      Pitch      Body Size



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

# MLF<sup>®</sup> MicroLeadFrame<sup>®</sup>



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.

Amkor's MicroLeadFrame<sup>®</sup> Package (MLF<sup>®</sup>) 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

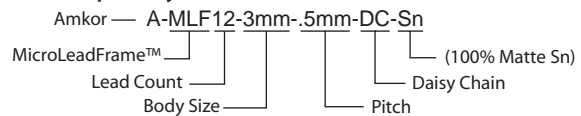
## MLF<sup>®</sup>—MicroLeadFrame<sup>®</sup>

Part Description	Lead Count	Body Size	Pitch	Quantity Per Tube
<b>.4mm Pitch</b>				
A-MLF28-4mm-.4mm	28	4mm	.4mm	75
A-MLF48-6mm-.4mm	48	6mm	.4mm	50
A-MLF88-10mm-.4mm	88	10mm	.4mm	30
A-MLF100-12mm-.4mm	100	12mm	.4mm	25
<b>.5mm Pitch</b>				
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
<b>.65mm Pitch</b>				
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
<b>.8mm Pitch</b>				
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

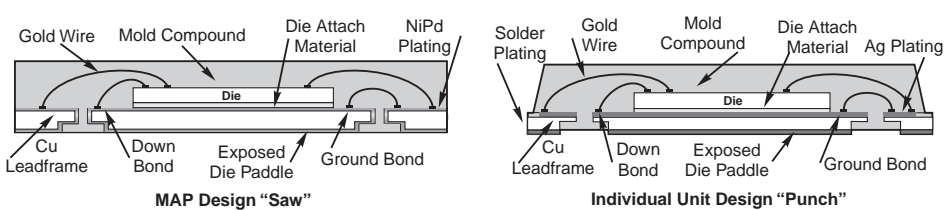
### Notes

- Parts are packaged in tubes (standard).
- Parts are available in trays or on tape and reel upon special request.
- Solder plating finishes available are 85/15 SnPb and 100% Matte Sn.
- Moisture sensitivity level is JEDEC 1.
- Two MLF<sup>®</sup> designs are available: Punch or Saw (see the cross-section drawing).
- Small size (50% space reduction as compared with TSSOP).
- MLF<sup>®</sup> package is a near CSP plastic encapsulated package with a copper leadframe substrate.
- MLF<sup>®</sup> is also known as QFN, MCC or MLP.
- 0.6mm to 1.5mm maximum height
- Body sizes ranging from 3 x 3mm to 12 x 12mm.
- Pin counts and body sizes change on an ongoing basis. Please call for updated listing of available packages.

### Part Description System



### Cross-Sections MLF<sup>®</sup>



For kits see pages 66, 68, 76 and 81.

Amkor's new Dual Row MLF® (MicroLeadFrame®) 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.



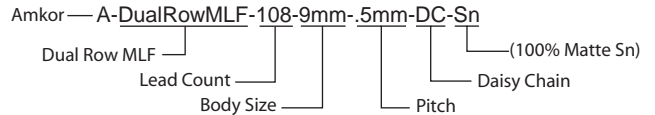
## Dual Row MLF

Part Description	Lead Count	Body Size	Pitch	Quantity Per Tube
A-DualRowMLF116-9mm-.5mm	116	9mm	.5mm	33
A-DualRowMLF124-10mm-.5mm	124	10mm	.5mm	30
A-DualRowMLF132-10mm-.5mm	132	10mm	.5mm	30
A-DualRowMLF156-12mm-.5mm	156	12mm	.5mm	25
A-DualRowMLF164-12mm-.5mm	164	12mm	.5mm	25

### Notes

- Parts are packaged in tubes (standard).
- Parts are available in trays or on tape and reel upon special request.
- Solder plating finishes available are 85/15 SnPb and 100% Matte Sn.
- Moisture sensitivity level is JEDEC 1.
- Process flow is same as standard "punch" MLF®.
- Small size (reduce package footprint by 50% or more and improved RF performance) and weight.
- Dual row MLF® offers enhanced thermal capability.

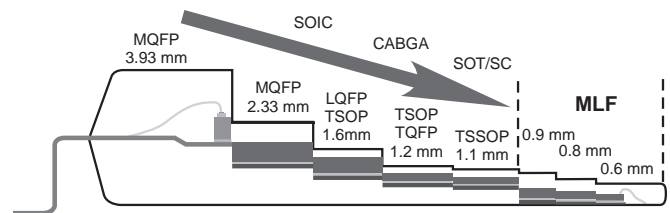
### Part Description System



- 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 66.



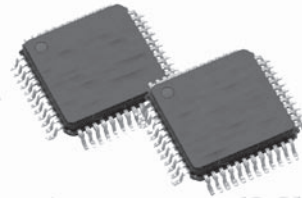
Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

# TQFP

## Thin Quad Flat Pack



Thin Quad Flat Pack (TQFP) packages provide the same benefit of the metric QFP package, but are thinner (body thickness of 1.0mm) and have a standard lead-frame footprint (2.0mm lead footprint). TQFPs are helping to solve issues such as increasing board density, die shrink programs, thin end-product profile and portability. Lead counts range from 32 to 176. Body sizes range from 5 x 5mm to 20 x 20mm. Copper lead-frames are used for the TQFP package. Lead pitches available for TQFP package are 0.4mm, 0.5mm, 0.65mm 0.8mm and 1.0mm.



### TQFP Thin Quad Flat Pack 1.0mm Thick

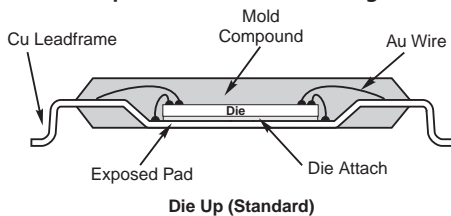
Part Description	Number of Pins	Body Size	Lead Pitch	Footprint	Quantity Per Tray	Tape Width	Tape Pitch	Quantity Per Reel
A-TQFP32-5mm-.5mm-2.0*	32	5mm sq	.5mm	2.0mm	360	16mm	12mm	1,000
A-TQFP32-7mm-.8mm-2.0*	32	7mm sq	.8mm	2.0mm	250	16mm	12mm	1,000
A-TQFP40-5mm-.4mm-2.0*	40	5mm sq	.4mm	2.0mm	360	16mm	12mm	1,000
A-TQFP44-10mm-.8mm-2.0*	44	10mm sq	.8mm	2.0mm	160	24mm	16mm	1,000
A-TQFP48-7mm-.5mm-2.0 *	48	7mm sq	.5mm	2.0mm	250	16mm	12mm	1,000
A-TQFP52-10mm-.65mm-2.0 *	52	10mm sq	.65mm	2.0mm	160	24mm	16mm	1,000
A-TQFP64-7mm-.4mm-2.0*	64	7mm sq	.4mm	2.0mm	250	16mm	12mm	1,000
A-TQFP64-10mm-.5mm-2.0*	64	10mm sq	.5mm	2.0mm	160	24mm	16mm	1,000
A-TQFP64-14mm-.8mm-2.0 *	64	14mm sq	.8mm	2.0mm	90	32mm	24mm	750
A-TQFP80-12mm-.5mm-2.0 *	80	12mm sq	.5mm	2.0mm	119	24mm	24mm	1,000
A-TQFP80-14mm-.65mm-2.0*	80	14mm sq	.65mm	2.0mm	90	32mm	24mm	750
A-TQFP100-14mm-.5mm-2.0*	100	14mm sq	.5mm	2.0mm	90	32mm	24mm	750
A-TQFP120-14mm-.4mm-2.0 *	120	14mm sq	.4mm	2.0mm	90	32mm	24mm	750
A-TQFP128-14mm-.4mm-2.0*	128	14mm sq	.4mm	2.0mm	90	32mm	24mm	750
A-TQFP128-20mm-.5mm-2.0 *	128	20mm sq	.5mm	2.0mm	60	44mm	24mm	500
A-TQFP144-20mm-.5mm-2.0 *	144	20mm sq	.5mm	2.0mm	60	44mm	24mm	500
A-TQFP176-20mm-.4mm-2.0 *	176	20mm sq	.4mm	2.0mm	60	44mm	24mm	500

#### Notes

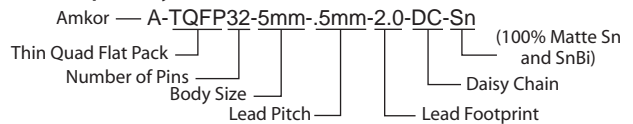
- TQFP is available in die up configurations in 1.0mm thickness only.
- 5 x 5mm to 20 x 20mm body size (JEDEC Standard).
- Copper leadframes.
- 1.0mm body thickness for TQFP.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with SnBi or 100% Matte Sn finish.
- \* = Available as an Exposed Pad L/TQFP Package by Amkor. The ExposedPad™ L/TQFP can increase heat dissipation by as much as 110% over a standard L/TQFP. The ExposedPad™ L/TQFP is a cost effective, high frequency leadframe solution to thermal management when the die attach pad is soldered to the PCB.
- Parts may also be available NiPdAg-Au & NiPdAu. Call for availability. Minimums may apply.



#### Exposed Pad L/TQFP Package



#### Part Description System



- Add "ePad" to beginning of part number when ordering ExposedPad™ package.
- Add "TR" to end of part number for Tape and Reel.
- Add "LF" to end of part number for Lead-Free, i.e Sn or SnBi.

#### TQFP Package

