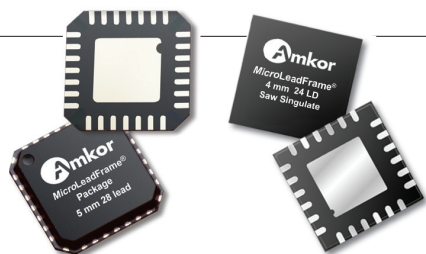


Leadframe CSP High Performance, Cost Efficient



Amkor's MicroLeadFrame® (QFN - Quad Flat No-Lead package) 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. This enhancement also enables stable ground by use of down bonds or by electrical connection through a conductive die attaches material.

MLF Offerings:

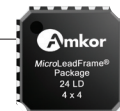
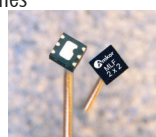
- Chip-on-Lead (COL)
- Single Row (Up to 108 I/O)
- Dual Row (Up to 180 I/O)
- Multi Chip Package
- Non-Exposed Pad
- PPF (NiPd) Punch & Saw MLF
- Small MLF (Less than 2 x 2 body size)
- Stacked Die
- Thin MicroLeadFrame®
- Top Exposed Pad (TEP)
- Inframe Cavity MLF
- Flipchip MLF

Dual Row MLF Package:

An MLF package with 2 rows of lands — a cost effective, high performance solution for devices requiring up to 180 I/O. Typical applications include hard disk drives, USB controllers, and Wireless LAN.

Applications:

The small size and weight along with excellent thermal and electrical performance make the MicroLeadFrame® 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.



Save valuable board space with MLF!



MicroLeadFrame® (MLF®/QFN/SON/DFN) Package

Features

- Small size (reduce package footprint by 50% or more and improved RF performance) and weight
- Standard leadframe process flow and equipment
- 0.4 mm to 2.03 mm maximum height
- 4 to 180 I/O
- 1-13 mm body size
- Thin profile and superior die-to-body size ratio
- Pb Free / Green
- Flexible designs for optimal electrical and thermal performance
- Saw and punch versions available

Thermal Performance

JEDEC Multi-layer PCB

Pkg	Body Size (mm)	Board Vias #	Exposed Pad (mm)	Die (mm)	Theta JA (°C/W)
12 ld	3 x 3	1	1.25	1.25	61.1
28 ld	5 x 5	9	2.7	2.54	34.8
44 ld	7 x 7	16	4.8	3.81	24.4
52 ld	8 x 8	25	6.1	5.08	20.9
64 ld	10 x 10	36	7.1	2.79	29.4
124 ld	10 x 10	36	7.1	2.79	30

Modeled data @ 0 air flow

Electrical

Pkg	Body Size (mm)	LO	(nH)	(pF)	(mΩ)
12 ld	3 x 3	Longest	0.564	0.203	141.8
12 ld	3 x 3	Shortest	0.531	0.220	138.9
44 ld	7 x 7	Longest	1.766	0.326	315.1
44 ld	7 x 7	Shortest	1.194	0.289	234.5
64 ld	10 x 10	Longest	2.179	0.518	337.5
64 ld	10 x 10	Shortest	1.475	0.409	250.8

Simulated results @ 2GHz

Values dependent on specific die and wire configurations

Reliability

Amkor's MicroLeadFrame® Packages are reliability assured through optimized design, material and process enabling high performance operation of your IC amp.

- Moisture sensitivity characterization JEDEC Level 1* 85 °C/85%, 168 hours
- HAST 130 °C/85% RH, 96 hours
- Temp cycle -65/+150 °C, 1000 cycles
- Temp/Humidity 85 °C/85% RH, 1000 hours
- High temp storage 150 °C, 1000 hours

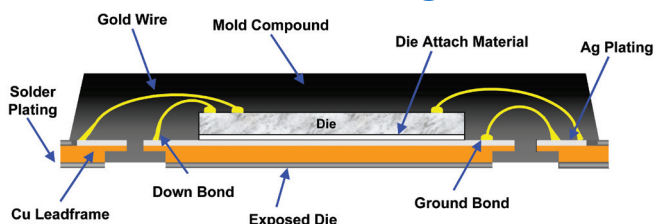
*depending on body size

VISIT AMKOR TECHNOLOGY ONLINE FOR LOCATIONS AND TO VIEW THE MOST CURRENT PRODUCT INFORMATION.

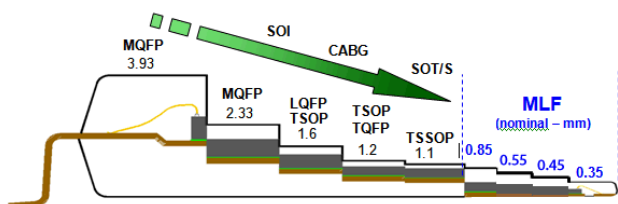
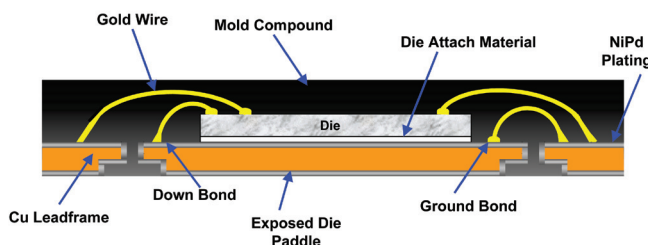


Cross-sections MLF

Individual Unit Design "Punch"



MAP Design "Saw"



Package Height Comparison

MicroLeadFrame® (MLF®/QFN/SON/DFN) Package

Process Highlights

- Die thickness .20 ± .05mm nominal, thinner for special applications
- Plating Matte Sn, NiPdAuAg
- Marking Laser

Standard Materials

- Leadframe Copper alloy, Dual gauge
- Die attach Conductive epoxy
- Wire 0.8 mil Au, 1% PD doped
0.8 mil Cu
- Mold compound Pb free / Green capable

Test Services

- Program generation/conversion
- Product engineering support
- Available test/handling technology
- Burn-in capabilities
- Tape & Reel services

Shipping

- This product is shipped in clear antistatic tubes, bakable trays or metal canisters

MLF Package Family

Body Size (mm)	QFN / DFN / SON Leadcounts 0.8, 0.65, 0.5, 0.4, 0.35, 0.3 mm Pitch	Dual Row Leadcounts 0.5 mm Pitch
<2 x 2 (saw only)	-	-
2 x 3	-	-
3 x 3	4 / 8 / 10 / 12 / 16 / 20 / 24	-
4 x 4	12 / 16 / 20 / 24 / 28 / 32 / 40	-
5 x 5	16 / 20 / 28 / 32 / 36 / 40 / 44 / 52	44 / 52
6 x 5	18 / 24 / 36 / 42	-
6 x 6	20 / 24 / 28 / 36 / 40 / 48 / 56 / 64	60 / 68
7 x 7	28 / 32 / 36 / 44 / 48 / 56 / 68 / 80	76 / 84
8 x 8	32 / 36 / 40 / 52 / 56 / 68 / 76 / 88	92 / 100
9 x 9	36 / 44 / 48 / 60 / 64 / 76 / 88 / 104	108 / 116
10 x 10	44 / 52 / 56 / 68 / 72 / 88 / 100 / 116	124 / 132
11 x 11	-	140 / 148
12 x 12	48 / 60 / 84 / 88 / 100 / 108 / 124 / 144	156 / 164
13 x 13	-	164 / 180