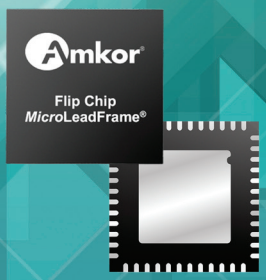
Flip Chip *Micro*LeadFrame®



Amkor's flip chip *Micro*LeadFrame® (fcMLF®/fcQFN/SON/DFN) package is a near CSP plastic encapsulated package with a copper leadframe substrate with advanced interconnect technology. It can be used with all of Amkor's available bumping options (copper pillar, Pb-free solder). It enables package size size shrinkage over 70% compared to same die size wire bonding *Micro*LeadFrame®.

This package uses perimeter lands on the bottom of the package to provide electrical contact to the Printed Wiring Board (PWB).The package also offers Amkor's ExposedPad technology as a thermal and electrical enhancement with flip chip interconnection. Having the die attach paddle exposed on the bottom of the package surface provides an efficient heat path when soldered directly to the PWB.

fcMLF® HIGHLIGHTS

- Die size: 0.5 x 0.5 mm to 9 x 9 mm
- Package size: 1 x 1 mm to 10 x 10 mm
- Package thickness: min. 0.35 mm
- Bump type
  - Cu Pillar
  - Pb-free Solder
- Bump pitch
  - Inner lead pitch: min. 160 µm
  - Bump gap (same net): 50 µm

Applications

The flip chip *Micro*LeadFrame® (fcMLF®) package presents a compelling solution for a wide range of applications, including power management integrated circuits (PMICs), DC/DC converters, and RF switches. It also supports wettable flank designs—such as dimple or step-cut configurations—enabling visual inspection without requiring X-rays after board mounting, which is critical for automotive-grade devices.

Thermal Performance

Multi-layer PCB Multi-package types

Package Type	Body Size (mm)	Die Size (mm)	Exposed Pad (mm)	ΘJA (°C/W)
MLF® (WB)	5 x 5	3.4 x 3.4	3.6 x 3.6	33.6
fcMLF®	5 x 5	3.4 x 3.4	2 x 2	36.1
fcCSP	5 x 5	3.4 x 3.4	NA / 2L	50.1
WLCSP	3.4 x 3.4	3.4 x 3.4	NA / 1L	51.2

JEDEC standard test boards
Modeled data @ air flow

Electrical Performance

Simulated Results @ 1 GHz

Package	Body Size (mm)	Die Size (mm)	Exposed Pad (mm)	R (mΩ)	L (nH)	L (pF)
MLF® (WB)	5 x 5	3.4 x 3.4	3.6 x 3.6	216.6	0.963	0.183
fcMLF®	5 x 5	3.4 x 3.4	2 x 2	50.9	0.424	0.229
fcCSP	5 x 5	3.4 x 3.4	NA / 2L	147.1	0.949	0.27
WLCSP	3.4 x 3.4	3.4 x 3.4	NA / 1L	338.9	0.265	0.351

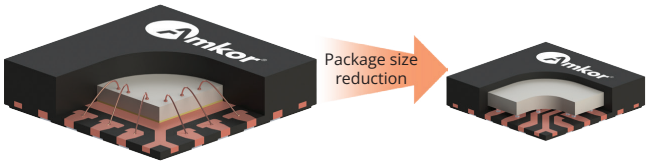
Values dependent on specific die and wire configurations

Amkor Technology®

Flip Chip *Micro*LeadFrame®

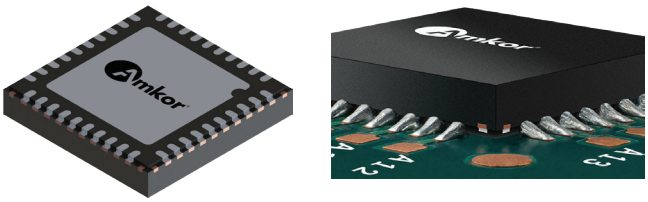
Features

- Small size (reduce package footprint by 70% or more and improved RF performance) and weight
- Custom package size with strip-based processing
- Standard leadframe process flow and equipment
- Excellent thermal and electrical performance
- 0.35 mm to 1.45 mm maximum height
- I/O count range: 1-76 available with conventional MLF®
- Accommodate package size from 1 x 1 to 10 x 10 mm^2
- Thin profile and superior die-to-body size ratio
- Turn-key solutions – Design, bumping, wafer probe, assembly, final test
- Package size reduction over 70%

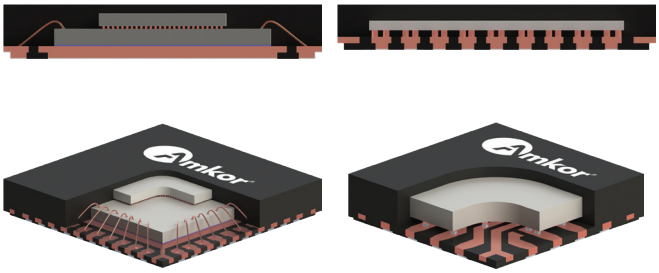


fcMLF® Wettable Flanks Package

This package meets customer requirements for the automotive industry including: fine lead pitch (0.50 mm, 0.65 mm), higher solder filled height on the side of lead area; similar or better BLR performance than standard design; and elimination of need for X-ray monitoring after SMD. Amkor has released this process to High Volume Manufacturing (HVM).



Cross Section Images



Reliability Qualification

Amkor devices are assembled in optimized package designs with proven reliable semiconductor materials.

JEDEC standard & AEC-Q100 Grade 1 & Grade 0 capable.

- Moisture sensitivity characterization: JEDEC level 1*, 85°C/85% RH, 168 hrs
- uHAST: 130°C/85% RH, 96 hrs
- Temp cycle: -65°C/+150°C, 500 cycles
- High temp storage: 150°C, 1000 hours

*Depending on BOM, body size and design

Standard Materials

- Leadframe: Bare Cu, Roughened-Cu
- Flux: Non-clean flux
- Mold compound: Pb-free/Green capable
- Plating: Matte Sn

Test Services

- Program generation/conversion
- Product engineering
- Available test/handling technology
- Burn-in capabilities
- Tape and reel services
- Half-cut & full cut film frame

Shipping

- JEDEC tray
- Metal canister
- Tape & reel

Visit amkor.com or email sales@amkor.com for more information.