

FusionQuad®

FusionQuad®:

Amkor's FusionQuad® represents a breakthrough in leadframe-based plastic packaging through the effective integration of ExposedPad™ TQFP and MLF® technologies. The novel integration of bottom lands in a QFP provides a cost-effective platform for increased lead count in a small form factor. FusionQuad® not only extends the I/O range of classic leadframe packaging to nearly 400 unique pins, it also delivers an approximate 50% reduction in package size for a given leadcount. Additionally, FusionQuad® provides excellent RF electrical performance characteristics with short signal paths to the bottom lands and high power dissipation capability with the solderable exposed die attach paddle.

System architects, IC designers and packaging engineers will find that FusionQuad® offers a unique blend of excellent electrical and thermal performance in a miniaturized cost-effective leadframe plastic package. Applications requiring increased data rates or RF communications will benefit from the low insertion loss up to 10 Gigahertz when utilizing the bottom lands for high speed signals. The FusionQuad® structure also allows the design of multiple segmented power and ground rings typically found in many laminate packages today. Along with the thermal performance advantage of the ExposedPad™ TQFP, FusionQuad® brings a new lower cost option to applications normally designed into thermally enhanced laminate packages. The 0.8mm package thickness allows FusionQuad® to be applied to end products requiring thin profiles such as mobile hard disk drives, notebook computers and other consumer electronics. The unique footprint of FusionQuad® allows for the use of low cost printed circuit boards in the end application due to the space available for coarse routing vias between the bottom lands and the outer peripheral leads.

Features:

Amkor's FusionQuad® VQFP IC package portfolio provides:

- 12 x 12 mm to 24 x 24 mm body sizes
- Increased I/O (150 to 376) in smaller package footprints
- Copper leadframe based
- Integrated exposed die attach pad
- 0.8 mm & 1.0 mm body thickness
- PB Free / Green
- Flexible designs for optimal electrical and thermal performance

Thermal Resistance:

Pkg	Body Size (mm)	Exposed Pad Size (mm)	Theta JA (°C/W) by Velocity (m/s)		
			0	1.0	2.5
176 ld	14 x 14	6.5 x 6.5	24.6	19.9	17.9

JEDEC (1S2P) Standard Test Boards (Non-Thermally Optimized) Tested @ 1 W

Electrical:

Body Size Pkg (mm)	Pad Size (mm)	Lead	Inductance (nH)	Capacitance (pF)	Resistance (mΩ)
14 x 14	6.5 x 6.5	176 ld			
		Longest	5.99	0.82	209
		Shortest	1.42	0.23	81

Simulated Results @ 100 MHz

Reliability:

IC chips are assembled in optimized package designs with proven reliable semiconductor materials.

- | | |
|---|--|
| • Moisture Sensitivity Characterization | JEDEC Level 3
30 °C/60% RH, 192 hours |
| • PCT | 121 °C, 2 atm, 100%RH, 504 hours |
| • Temp cycle | -65/+150 °C, 1000 cycles |
| • Temp/Humidity | 85 °C/85% RH, 1000 hours |
| • High temp storage | 150 °C, 1000 hours |

Applications:

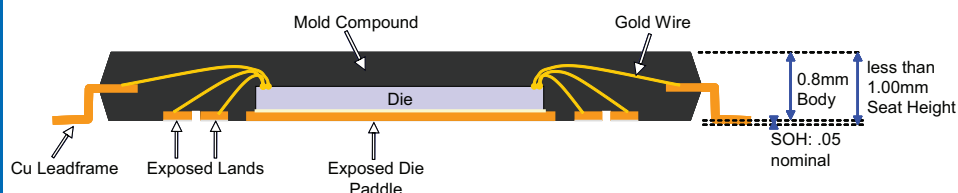
Amkor's FusionQuad® provides an ideal package format for most IC semiconductor technologies including advanced mixed signal SoCs, motor drivers, MCUs, ASICs, DSPs and a variety of others.

FusionQuad® is particularly well suited for applications requiring superior electrical or thermal performance in a cost constrained environment including hard disk drives, laptop PCs, Ethernet communication, digital television, data conversion and many others.

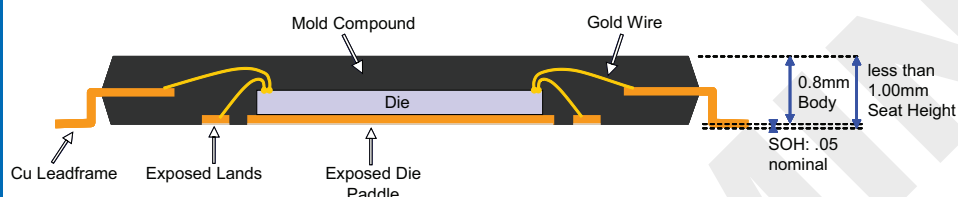
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FusionQuad®

FusionQuad® Cross-Sections



Dual Row Exposed Land Design



Single Row Exposed Land Design

Process Highlights

Die thickness	10.0 ± .5 mils
Strip solder plating	Matte Sn or NiPdAu
Strip marking	Laser
Lead inspection	Laser/Optical
Pack/ship options	Bar code, dry pack
Wafer backgrinding	Available

Test Services

- Program generation / conversion
- Product engineering support
- Wafer sort
- Available test / handling technology
- Burn-in capabilities

Shipping

JEDEC outline CS-007 low profile tray

FusionQuad® Package Options (custom lead configurations available)

Body Size (mm)	24 x 24	20 x 20	16 x 16	14 x 14	12 x 12	
0.4 mm pitch Peripheral Pins	224	184	148	128	108	
0.5 mm pitch Peripheral Pins	180	148	120	100	80	
FusionQuad® Single Row	+ Fusion Pin @ 0.5 pitch	104	104	76	60	48
	Total Pins (0.5 / 0.5 pitch)	284	252	196	160	128
	Total Pins (0.4 / 0.5 pitch)	328	288	224	188	156
	Max Pad Size (mm)	15.0	15.0	11.0	9.0	7.0
FusionQuad® Dual Row	+ Fusion Pin @ 0.5 pitch	200	200	140	116	76
	Total Pins (0.5 / 0.5 pitch)	376	344	260	216	156
	Max Pad Size (mm)	14.0	14.0	10.0	8.0	6.0

Note: Above are estimates only
Detailed designs have not yet been implemented for all options
Actual Pin Counts are Pad Size Dependent