

Quad Flat Pack (QFP) components have four sides with leads extending from the component body on all four sides. QFP components come packaged in trays or on tape and reel to protect the component leads that can be easily damaged. An important measurement for QFPs is coplanarity. When the first lead from the component is placed on the

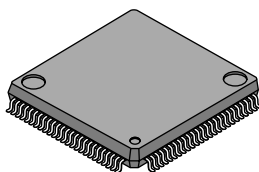
PCB coplanarity is established. Coplanarity ensures the last lead can be placed on the board. The standard for QFP coplanarity is ± 4 mils. PowerQuad2® and PowerQuad4® QFPs are also available from Amkor. PowerQuad®s offer exceptional thermal and electrical performance that is designed with solid copper heatsink. Call Practical for more details.

QFP Plastic Quad Flat Pack

Part Number	Number of Pins	Body Size	Body Thickness	Lead Pitch	Footprint	Quantity Per Tray	Tape Width	Tape Pitch	Quantity 13" Reel	Available Lead-Free Finishes
.40mm Pitch										
QFP256-28mm-.4mm-2.6	256	28mm sq	3.37mm	.40mm	2.6mm	24	44	40	200	Sn or SnBi
.50mm Pitch										
QFP64-10mm-.50mm-3.2	64	10mm sq	2.0mm	.50mm	3.2mm	96	24	24	500	Sn or SnBi
QFP64-10mm-.50mm-3.9	64	10mm sq	2.0mm	.50mm	3.9mm	96	24	24	500	Sn or SnBi
QFP100-14mm-.5mm-3.2	100	14mm sq	2.0/2.67mm	.50mm	3.2mm	84	32	24	350	Sn or SnBi
QFP100-14mm-.5mm-3.9	100	14mm sq	2.67mm	.50mm	3.9mm	84	32	24	350	Sn or SnBi
QFP128-14x20mm-.5mm-3.2	128	14 x 20mm	2.71mm	.50mm	3.2mm	66	44	32	200	Sn or SnBi
QFP128-14x20mm-.5mm-3.9	128	14 x 20mm	2.71mm	.50mm	3.9mm	66	44	32	200	Sn or SnBi
QFP208-28mm-.5mm-2.6	208	28mm sq	3.37mm	.50mm	2.6mm	24	44	40	200	Sn or SnBi
QFP208-28mm-.5mm-3.2	208	28mm sq	3.37mm	.50mm	3.2mm	24	44	40	200	Sn or SnBi
QFP240-32mm-.5mm-2.6	240	32mm sq	3.4mm	.50mm	2.6mm	24	56	44	250	Sn or SnBi
QFP304-40mm-.5mm-2.6	304	40mm sq	3.8mm	.50mm	2.6mm	12	n/a	n/a	—	Sn or SnBi
.65mm Pitch										
QFP52-10mm-.65mm-3.2	52	10mm sq	2.0mm	.65mm	3.2mm	96	24	24	500	Sn or SnBi
QFP52-10mm-.65mm-3.9	52	10mm sq	2.0mm	.65mm	3.9mm	96	24	24	500	Sn or SnBi
QFP80-14mm-.65mm-3.2	80	14mm sq	2.0/2.67mm	.65mm	3.2mm	84	32	24	350	Sn or SnBi
QFP80-14mm-.65mm-3.9	80	14mm sq	2.67mm	.65mm	3.9mm	84	32	24	350	Sn or SnBi
QFP100-14x20mm-.65mm-3.2	100	14 x 20mm	2.71mm	.65mm	3.2mm	66	44	32	200	Sn or SnBi
QFP100-14x20mm-.65mm-3.9	100	14 x 20mm	2.71mm	.65mm	3.9mm	66	44	32	200	Sn or SnBi
QFP144-28mm-.65mm-2.6	144	28mm sq	3.37mm	.65mm	2.6mm	24	44	40	200	Sn or SnBi
QFP144-28mm-.65mm-3.2	144	28mm sq	3.37mm	.65mm	3.2mm	24	44	40	200	Sn or SnBi
QFP160-28mm-.65mm-2.6	160	28mm sq	3.37mm	.65mm	2.6mm	24	44	40	200	Sn or SnBi
QFP160-28mm-.65mm-3.2	160	28mm sq	3.37mm	.65mm	3.2mm	24	44	40	200	Sn or SnBi
QFP160-28mm-.65mm-3.9	160	28mm sq	3.37mm	.65mm	3.9mm	24	44	40	200	Sn or SnBi
.80mm Pitch										
QFP44-10mm-.8mm-3.2	44	10mm sq	2.0mm	.80mm	3.2mm	96	24	24	500	Sn or SnBi
QFP44-10mm-.8mm-3.9	44	10mm sq	2.0mm	.80mm	3.9mm	96	24	24	500	Sn or SnBi
QFP64-14mm-.8mm-3.2	64	14mm sq	2.0/2.67mm	.80mm	3.2mm	84	32	24	350	Sn or SnBi
QFP64-14mm-.8mm-3.9	64	14mm sq	2.67mm	.80mm	3.9mm	84	32	24	350	Sn or SnBi
QFP80-14x20mm-.8mm-3.2	80	14 x 20mm	2.71mm	.80mm	3.2mm	66	44	32	200	Sn or SnBi
QFP80-14x20mm-.8mm-3.9	80	14 x 20mm	2.71mm	.80mm	3.9mm	66	44	32	200	Sn or SnBi
QFP120-28mm-.8mm-2.6	120	28mm sq	3.37mm	.80mm	2.6mm	24	44	40	200	Sn or SnBi
QFP120-28mm-.8mm-3.2	120	28mm sq	3.37mm	.80mm	3.2mm	24	44	40	200	Sn or SnBi
QFP128-28mm-.8mm-2.6	128	28mm sq	3.37mm	.80mm	2.6mm	24	44	40	200	Sn or SnBi
QFP128-28mm-.8mm-3.2	128	28mm sq	3.37mm	.80mm	3.2mm	24	44	40	200	Sn or SnBi
1.00mm Pitch										
QFP52-14mm-1.0mm-3.2	52	14mm sq	2.0/2.67mm	1.00mm	3.2mm	84	32	24	350	Sn or SnBi
QFP52-14mm-1.0mm-3.9	52	14mm sq	2.67mm	1.00mm	3.9mm	84	32	24	350	Sn or SnBi
QFP64-14x20mm-1.0mm-3.2	64	14 x 20mm	2.71mm	1.00mm	3.2mm	66	44	32	200	Sn or SnBi
QFP64-14x20mm-1.0mm-3.9	64	14 x 20mm	2.71mm	1.00mm	3.9mm	66	44	32	200	Sn or SnBi

Notes

- All QFPs are standard in JEDEC trays.
- Tray quantities may vary.
- Parts available on Tape and Reel upon special request.
- Lead-free parts are available with SnBi or 100% Matte Sn finish.
- PowerQuad® 2 & 4 thermal parts available. Call for availability.



Part Number System



- Add "TR" to end of part number for Tape and Reel.
- Add specific finish to end of part number for Lead-Free, i.e Sn or SnBi.



For kits see pages 53, 57, 60, 62, 64, 73 and 82.

LQFP

Low Profile Quad Flat Pack

Low Profile Quad Flat Pack (LQFP) packages provide the same benefit of the metric QFP packages, but are thinner (body thickness of 1.4mm) and have a standard lead-frame footprint (2.0mm lead footprint).

LQFPs help to solve issues such as increasing board density, die shrink programs, thin end-product profile and portability. Lead counts range from 32 to 256. Body sizes range from 7 x 7mm to 28 x 28mm. Copper lead-frames are used for the LQFP package. Lead pitches available for LQFP package are 0.4mm, 0.5mm, 0.65mm and 0.8mm.

Daisy-Chain And Lead-Free Parts Available!



PowerQuad® 2 and 4 LQFPs are available. Call Practical for more details.

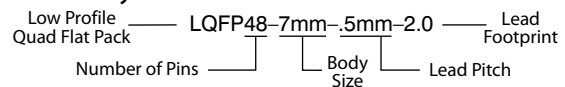
LQFP Low Profile Quad Flat Pack 1.4mm Thick

Part Number	Number of Pins	Body Size	Lead Pitch	Quantity Per Tray	Tape Width	Tape Pitch	Quantity Per Reel	Available Lead-Free Finishes
.4mm Pitch								
LQFP64-7mm-.4mm-2.0	64	7mm sq	.4mm	250	16mm	12mm	1,000	Sn or SnBi
LQFP120-14mm-.4mm-2.0	120	14mm sq	.4mm	90	32mm	24mm	750	Sn or SnBi
LQFP128-14mm-.4mm-2.0	128	14mm sq	.4mm	90	32mm	24mm	750	Sn or SnBi
LQFP176-20mm-.4mm-2.0	176	20mm sq	.4mm	60	44mm	24mm	500	Sn or SnBi
LQFP216-24mm-.4mm-2.0	216	24mm sq	.4mm	40	44mm	32mm	500	Sn or SnBi
LQFP256-28mm-.4mm-2.0	256	28mm sq	.4mm	24	44mm	40mm	500	Sn or SnBi
.5mm Pitch								
LQFP48-7mm-.5mm-2.0	48	7mm sq	.5mm	250	16mm	12mm	1,000	Sn or SnBi
LQFP64-10mm-.5mm-2.0	64	10mm sq	.5mm	160	24mm	24mm	1,000	Sn or SnBi
LQFP100-14mm-.5mm-2.0	100	14mm sq	.5mm	90	32mm	24mm	750	Sn or SnBi
LQFP128-14x20mm-.5mm-2.0	128	14 x 20mm	.5mm	72	44mm	32mm	500	Sn or SnBi
LQFP128-20mm-.5mm-2.0	128	20mm sq	.5mm	60	44mm	24mm	500	Sn or SnBi
LQFP144-20mm-.5mm-2.0*	144	20mm sq	.5mm	60	44mm	24mm	750	Sn or SnBi
LQFP160-24mm-.5mm-2.0	160	24mm sq	.5mm	40	44mm	32mm	500	Sn or SnBi
LQFP176-24mm-.5mm-2.0*	176	24mm sq	.5mm	40	44mm	32mm	500	Sn or SnBi
LQFP208-28mm-.5mm-2.0*	208	28mm sq	.5mm	36	44mm	40mm	500	Sn or SnBi
.65mm Pitch								
LQFP52-10mm-.65mm-2.0	52	10mm sq	.65mm	160	24mm	24mm	1,000	Sn or SnBi
LQFP80-14mm-.65mm-2.0	80	14mm sq	.65mm	90	32mm	24mm	750	Sn or SnBi
LQFP100-14x20mm-.65mm-2.0	100	14x20mm	.65mm	72	44mm	32mm	500	Sn or SnBi
.8mm Pitch								
LQFP32-7mm-.8mm-2.0	32	7mm sq	.8mm	250	16mm	12mm	1,000	Sn or SnBi
LQFP44-10mm-.8mm-2.0	44	10mm sq	.8mm	160	24mm	24mm	1,000	Sn or SnBi
LQFP64-14mm-.8mm-2.0	64	14mm sq	.8mm	90	32mm	24mm	750	Sn or SnBi

Notes

- * = Available as an ExposedPad™ 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.
- All LQFPs are standard in trays.
- LQFPs have a body thickness of 1.4mm.
- Tray quantity may vary.
- Tape type is plastic.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with SnBi or 100% Matte Sn finish.

Part Number System



- Add "TR" to end of part number for Tape and Reel.
- Add specific finish to end of part number for Lead-Free, i.e Sn or SnBi.



For recommended kits see pages 58, 60, 69, 71, 73, 79, and 82.



For drawings, please visit our web site at www.practicalcomponents.com.

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

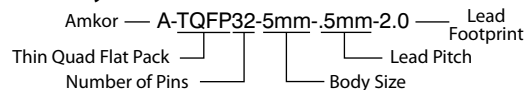
Part Number	Number of Pins	Body Size	Lead Pitch	Footprint	Quantity Per Tray	Tape Width	Tape Pitch	Quantity Per Reel
A-TQFP32-5mm-.5mm-2.0*	32	5mm sq	.5mm	2.0mm	360	16mm	12mm	1,000
A-TQFP32-7mm-.8mm-2.0*	32	7mm sq	.8mm	2.0mm	250	16mm	12mm	1,000
A-TQFP40-5mm-.4mm-2.0*	40	5mm sq	.4mm	2.0mm	360	16mm	12mm	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

- * = 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.
- TQFP is available in die up configurations in 1.0mm thickness only.
- 5 x 5mm to 20 x 20mm body size (JEDEC Standard).
- 32 to 176 lead counts.
- 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.

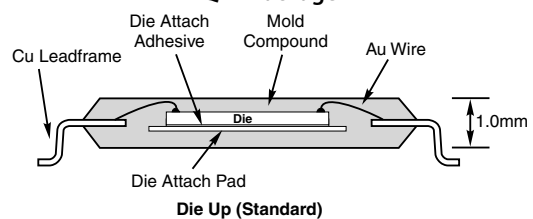


Part Number System



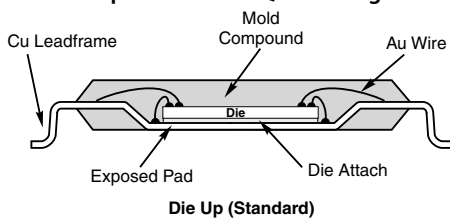
- Add "ePad" to beginning of part number when ordering ExposedPad™ package.
- Add "TR" to end of part number for Tape and Reel.
- Add "LF" to end of part number for Lead-Free, i.e Sn or SnBi.

TQFP Package

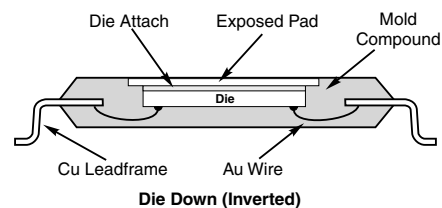


Die Up (Standard)

Exposed Pad L/TQFP Package



Die Up (Standard)



Die Down (Inverted)

CQFP

Ceramic Quad Flat Pack

CQFPs are hermetic packages consisting of true pieces of dry pressed ceramic surrounding a uniformed leadframe with tie bar attached. Lead counts for this package range from 14 to 304, with lead pitch ranging

from 15.7mil to 50mils. Package leads are gold or Kovar finish and can be solder-coated by special request. Lids are optional for CQFPs, which are sealed over the package cavity at temperatures from 400° to 460° C.

CQFP Ceramic Quad Flat Pack

Part Number	Number of Pins	Body Size		Pitch
		(Inch)	(mm)	
52CQFP-19.0mm-1.27mm	52	.750" sq	19.0mm sq	1.27mm
68CQFP-24.1mm-1.27mm	68	.950" sq	24.1mm sq	1.27mm
84CQFP-16.5mm-.65mm	84	.650" sq	16.5mm sq	.65mm
100CQFP-19.0mm-.65mm	100	.750" sq	19.0mm sq	.65mm
132CQFP-24.1mm-.65mm	132	.950" sq	24.1mm sq	.65mm
144CQFP-26.6mm-.65mm	144	1.050" sq	26.6mm sq	.65mm
172CQFP-29.2mm-.65mm	172	1.150" sq	29.2mm sq	.65mm
196CQFP-32.0mm-.50mm	196	1.260" sq	32.0mm sq	.50mm

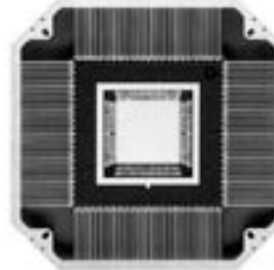
Notes

- CQFPs are available with or without combo lid.
- Pins are flat (sandwiched) with tie bar.
- Parts are packaged in non-JEDEC trays.
- Due to the custom nature of the package, body size and dimensions can change without notice.
- Parts available with a daisy-chain configuration upon request.
- Other ceramic packages available upon request.
- Glass or epoxy seal.
- Footprint compatible with plastic QFP packages.
- EIAJ and JEDEC standards.
- Lead-frames are embedded into the glass to create both internal die connection and external PCB connection.

Part Number System

I/O Count — 52CQFP — 19.0mm — 1.27mm — Lead Pitch

Ceramic Quad Flat Pack — Body Size



LCC

Leadless Ceramic Carrier

This surface mount package consists of a ceramic base that has metal-ized castellations/pads on the sides and bottom of the package. LCC packages have pads on all four sides of the package. Lids for LCCs can be

either metal or ceramic. Lids are attached after die attach. This allows for a hermetically sealed environment for the die.

LCC Leadless Ceramic Carrier

Part Number	Number of Castellations	Body Size		Pitch
		(Inch)	(mm)	
16LCC-1.27mm-7.36x8.96mm	16	.350" x .285"	7.36 x 8.96mm	1.27mm
20LCC-1.27mm-8.90mm	20	.350" sq	8.90mm sq	1.27mm
28LCC-1.27mm-11.5mm	28	.450" sq	11.50mm sq	1.27mm
32LCC-1.27mm-11.4x14.0mm	32	.550" x .450"	11.40 x 14.00mm	1.27mm
40LCC-1.00mm-10.1mm	40	.400" sq	10.10mm sq	1.00mm
44LCC-1.27mm-16.5mm	44	.650" sq	16.50mm sq	1.27mm
48LCC-1.00mm-14.2mm	48	.560" sq	14.20mm sq	1.00mm
52LCC-1.27mm-19.0mm	52	.750" sq	19.00mm sq	1.27mm
68LCC-1.27mm-24.1mm	68	.950" sq	24.1mm sq	1.27mm
84LCC-1.27mm-29.2mm	84	1.150" sq	29.20mm sq	1.27mm

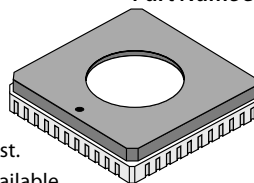
Notes

- LCCs are available with or without combo lid.
- Gold castellations are standard, but can be solder-tinned with 100% Sn or SnPb alloy.
- Parts are packaged in non-JEDEC trays.
- Parts available with a daisy-chain configuration upon request.
- Other types of ceramic packages not listed in catalog are available upon request.

Part Number System

Number of Castellations — 20LCC — 1.27mm — 8.90mm — Body Size

Leadless Ceramic Carrier — Pitch



For recommended kit see page 56.