

ANALOG ICs

INTEGRATED
SOLUTIONS

PACKAGING



Robust packaging is a key technology component of Analog Products.

Motorola puts solutions together in single packages to accommodate power and high voltages...

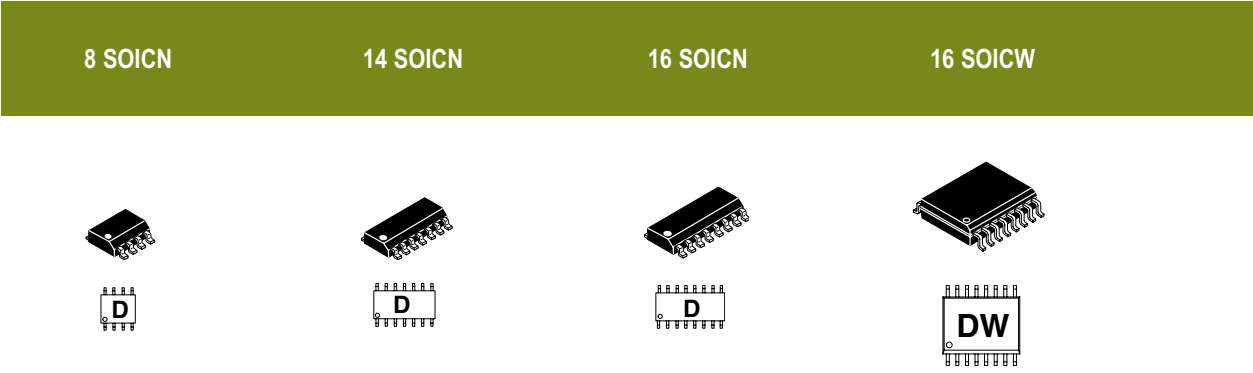
SMALL OUTLINE SURFACE MOUNT PACKAGES

OVERVIEW:

Motorola provides a large selection of proven and reliable small outline surface mount (SOIC) packages in both narrow body (3.90mm) and wide body (7.50mm) styles. Lead counts range from 8 to 54 leads and are formed in a popular "gullwing" shape that easily adapts to all surface mount technology (SMT) processes.

KEY FEATURES:

- Narrow SOICN (3.90mm) and Wide SOICW (7.50mm) Body Sizes
- Solder or Pb-free NiPdAu Lead Finishes
- Gullwing Lead Forms
- 1.27mm and 0.65mm Lead Pitch
- Rail or Tape & Reel Packing Available
- JEDEC Compliant Case Outlines



SMALL OUTLINE SURFACE MOUNT PACKAGE DIMENSIONS

Package	Body Size		Lead Pitch		A	A1	H	L	b	c
	D1	E1	e	e						
8 SOICN	4.90	3.90	1.27	1.55	0.18	6.00	0.83	0.43	0.22	
14 SOICN	8.65	3.90	1.27	1.55	0.18	6.00	0.83	0.42	0.22	
16 SOICN	9.90	3.90	1.27	1.55	0.18	6.00	0.83	0.42	0.22	
16 SOICW	10.30	7.50	1.27	2.50	0.18	10.30	0.70	0.43	0.28	
20 SOICW	12.80	7.50	1.27	2.50	0.18	10.30	0.70	0.44	0.28	
24 SOICW	15.40	7.50	1.27	2.50	0.21	10.30	0.67	0.43	0.28	
28 SOICW	17.93	7.50	1.27	2.50	0.21	10.30	0.66	0.43	0.28	
32 SOICW	11.00	7.50	0.65	2.50	0.21	10.30	0.70	0.30	0.22	
54 SOICW	17.90	7.50	0.65	2.50	0.21	10.30	0.70	0.30	0.28	

All dimensions are in millimeters.

RELIABILITY:

Motorola subjects their packages to rigorous testing to ensure reliable performance and compatibility with surface mount assembly processes.

- Moisture Sensitivity; Level 1 Characterization @ 240°C
- Preconditioning; Level 1 per JEDEC-STD-020
- Temp Cycles; -55°C / +125°C, 1000 cycles
- Temp/Humidity; 85°C, 85%RH, 96 hrs.
- High Temp Storage; 150°C, 1000 hrs.

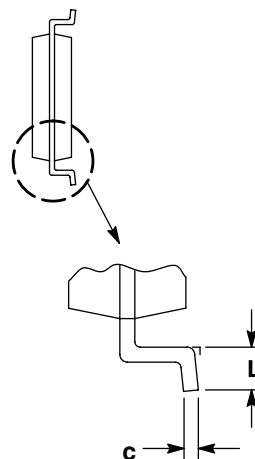
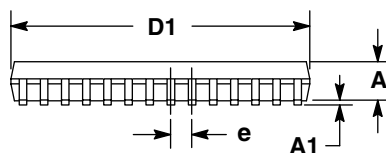
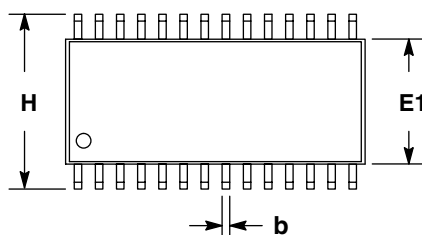
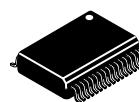
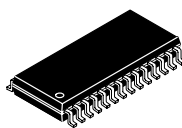
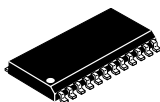
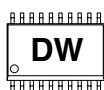
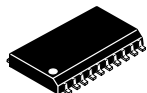
20 SOICW

24 SOICW

28 SOICW

32 SOICW
Fine Pitch

54 SOICW
Fine Pitch



Cross Section



SOICN, SOICW

Thermal Resistance

$R\theta_{JA}$
 $R\theta_{JL}$

Typical Values

75°C/W - 175°C/W
40°C/W - 80°C/W

Test Condition

JESD51-2
JESD51-8

Power Dissipation: Up to 1.5 W

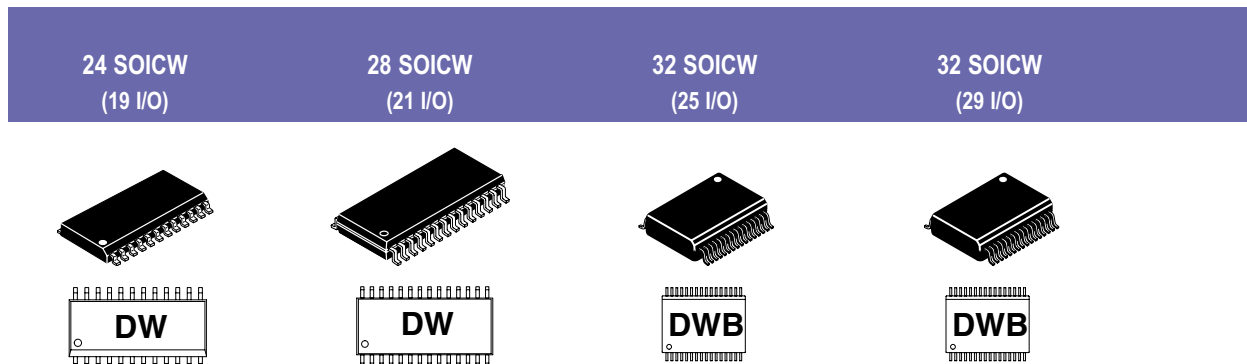
GUIDELINES FOR SOLDERING:

Motorola's broad array of Small Outline IC's (SOIC) include the popular "gull wing" lead forms designed to adapt easily to all surface mount (SMT) processes. With the correct pad footprint geometry, the packages will self align to the PCB board when subjected to a solder reflow process.

THERMALLY ENHANCED SMALL OUTLINE SURFACE MOUNT PACKAGES

OVERVIEW:

Thermally enhanced SOIC packages are also available to increase the power dissipation capability up to 2X for a given IC application, thereby expanding the margin of operating parameters possible. Enhancements are made such as thermal leads tied to die pads or exposed die pads that can be directly soldered to a multi-layer PCB board.



KEY FEATURES:

- 7.50mm Body Sizes
- Thermal Leads and/or Exposed Pad for Increased Performance
- Solder or Pb-free NiPdAu Lead Finishes
- Gullwing Lead Forms
- 1.27mm and 0.65mm Lead Pitch
- Rail or Tape & Reel Packing Available

THERMALLY ENHANCED SMALL OUTLINE SURFACE MOUNT PACKAGE DIMENSIONS

Package	Body Size		Lead Pitch		A	A1	F	G	H	L	b	c
	D1	E1	e	e								
24 SOICW	15.40	7.50	1.27	2.50	0.21	N/A	N/A	10.30	0.67	0.43	0.28	
28 SOICW	17.93	7.50	1.27	2.50	0.21	N/A	N/A	10.30	0.66	0.43	0.28	
32 SOICW	11.00	7.50	0.65	2.50	0.21	N/A	N/A	10.30	0.70	0.30	0.22	
54 SOICW	17.90	7.50	0.65	2.50	0.21	N/A	N/A	10.30	0.70	0.30	0.28	
54 SOICW-EP	17.90	7.50	0.65	2.50	0.05	4.73	6.53	10.30	0.70	0.30	0.25	

All dimensions are in millimeters.

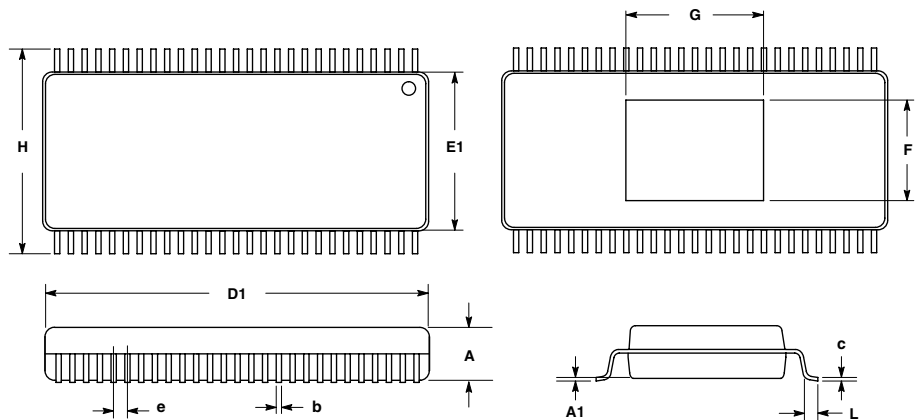
RELIABILITY:

Motorola subjects their packages to rigorous testing to ensure reliable performance and compatibility with surface mount assembly processes.

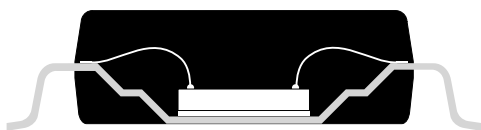
- Moisture Sensitivity; Level 1 Characterization @ 240°C (Standard SOICW), Level 3 @ 220°C (Exposed Pad SOICW)
- Preconditioning; Level 1 and Level 3 per JEDEC-STD-020
- Temp Cycles; -55°C / +125°C, 1000 cycles
- Temp / Humidity; 85°C, 85%RH, 96 hrs.
- High Temp Storage; 150°C, 1000 hrs.

54 SOICW
(43 I/O)

54 SOICW-EP
Exposed Pad



Cross Section



SOICW-EP
(Exposed Pad)

GUIDELINES FOR SOLDERING:

Motorola's broad array of Small Outline IC's (SOIC) include the popular "gull wing" lead forms designed to adapt easily to all surface mount (SMT) processes. With the correct pad footprint geometry, the packages will self align to the PCB board when subjected to a solder reflow process. Thermal leads or an exposed pad should be soldered directly to a multi-layered PCB with thermal via holes to realize the greatest potential of the enhanced SOICW packages.

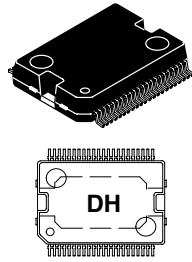
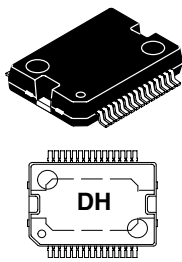
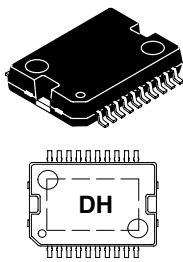
Thermal Resistance	Typical Values	Test Condition
$R\theta_{JA}$	60°C/W - 100°C/W	JESD51-2
$R\theta_{JL}$	10°C/W - 40°C/W	JESD51-8
$R\theta_{JC}^*$	1°C/W - 2°C/W	JESD51-8
*SOICW-Exposed Pad		

Power Dissipation: Up to 4.0 W

HEATSINK SMALL OUTLINE SURFACE MOUNT PACKAGES

OVERVIEW:

Motorola offers a family of Heatsink Small Outline Packages (HSOP) that have significantly improved thermal performance characteristics as compared to traditional small outline packages. The HSOP's have an internally integrated copper heat slug that provides a direct path for heat conduction away from an IC and into a solder attached PCB board.



KEY FEATURES:

- Mechanically Attached Thick Copper Heat Slug
- Pb-free NiPdAu Lead Finish
- Lead Pitch Ranging from 0.65mm to 1.27mm
- Gullwing Lead Forms
- Rail or Tape & Reel Packing Available
- JEDEC Compliant Case Outlines

HEATSINK SMALL OUTLINE SURFACE MOUNT PACKAGE DIMENSIONS

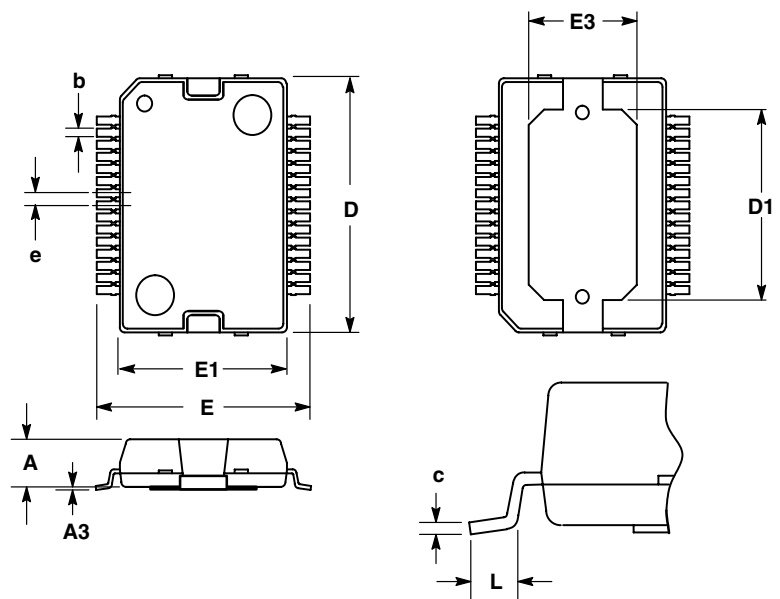
Package	Body Size		Lead Pitch								
	D	E1	e	A	A3	D1	E	E3	L	b	c
20 HSOP	15.90	11.00	1.27	3.20	0.05	12.20	14.20	6.80	0.97	0.46	0.28
30 HSOP	15.90	11.00	0.80	3.20	0.09	12.20	14.20	6.90	0.97	0.41	0.28
44 HSOP	15.90	11.00	0.65	3.20	0.08	12.20	14.20	6.90	0.97	0.29	0.28

All dimensions are in millimeters.

RELIABILITY:

Motorola subjects their packages to rigorous testing to ensure reliable performance and compatibility with surface mount assembly processes.

- Moisture Sensitivity; Level 1 Characterization @ 220°C
- Preconditioning; Level 1 per JEDEC-STD-020
- Temp Cycles; -55°C / +125°C, 1000 cycles
- Temp / Humidity; 85°C, 85%RH, 96 hrs.
- High Temp Storage; 150°C, 1000 hrs.



Cross Section



HSOP

GUIDELINES FOR SOLDERING:

The Motorola portfolio of Heat sink Small Outline Packages include the popular "gull wing" lead forms designed to adapt easily to all surface mount (SMT) processes. With the correct pad footprint geometry, the packages will self align to the PCB board when subjected to a solder reflow process. The copper slug should be soldered directly to a multi-layered PCB with thermal via holes to realize the greatest potential of the HSOP power packages.

Thermal Resistance	Typical Values	Test Condition
$R\theta_{JA}$	30°C/W - 40°C/W	JESD51-2
$R\theta_{JL}$	12°C/W - 15°C/W	JESD51-8
$R\theta_{JC}$	0.5°C/W - 1°C/W	JESD51-5

Power Dissipation: 2.0 W to 4.0 W

QUAD FLAT PACK SURFACE MOUNT PACKAGES

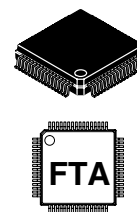
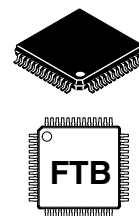
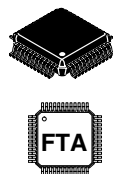
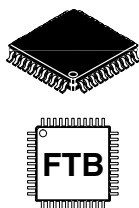
OVERVIEW:

Thin quad flat packages (TQFPs) and low-profile quad flat packages (LQFPs) are classified by the overall thickness per JEDEC definition. For Analog Products, Motorola offers both package styles in lead counts ranging from 44 to 144 to cover a large range of applications. Exposed pad (LQFP-EP and TQFP-EP) and heat slug HQFP packages are also available for increased thermal performance requirements. The exposed pad or copper heat slug should be soldered directly to a multi-layered PCB board to realize the greatest performance.

KEY FEATURES:

- Body Sizes Ranging from 7mm x 7mm to 14mm x 20mm
- Solder or Pb-free NiPdAu Lead Finishes
- Gullwing Lead Forms
- Lead Pitch Ranging from 0.40mm and 0.65mm
- Tray Packing Available
- JEDEC Compliant Case Outlines
- Low Profile "L" (1.4mm) and Thin "T" (1.0mm) Body Thickness Options
- Exposed Pad "EP" and Heatsink "HQFP" available for Increased Thermal Performance

44 LQFP 10mm x 10mm	48 LQFP 7mm x 7mm	52 LQFP 10mm x 10mm	64 LQFP 10mm x 10mm
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QUAD FLAT PACK SURFACE MOUNT PACKAGE DIMENSIONS

Package	Body Size		Lead Pitch							
	D1	E1	e	A1	A2	D	E	L	b	c
44 LQFP	10.00	10.00	0.80	0.10	1.40	12.00	12.00	0.60	0.38	0.15
48 LQFP	7.00	7.00	0.50	0.10	1.40	9.00	9.00	0.60	0.22	0.15
52 LQFP	10.00	10.00	0.65	0.10	1.40	12.00	12.00	0.60	0.30	0.14
64 LQFP	10.00	10.00	0.50	0.10	1.40	12.00	12.00	0.60	0.22	0.15
64 LQFP	14.00	14.00	0.80	0.10	1.40	16.00	16.00	0.60	0.38	0.18
80 LQFP	14.00	14.00	0.65	0.10	1.40	16.00	16.00	0.60	0.30	0.15
100 LQFP	14.00	14.00	0.50	0.10	1.40	16.00	16.00	0.60	0.22	0.15
100 LQFP	14.00	20.00	0.65	0.10	1.40	22.00	16.00	0.60	0.30	0.15
144 LQFP	20.00	20.00	0.50	0.10	1.40	22.00	22.00	0.60	0.22	0.15

All dimensions are in millimeters.

RELIABILITY:

Motorola subjects their packages to rigorous testing to ensure reliable performance and compatibility with surface mount assembly processes.

- Moisture Sensitivity; Level 1 Characterization @ 220°C (x-flag), Level 3 @ 220°C (standard flag).
- Preconditioning; Level 1 and Level 3 per JEDEC-STD-020
- Temp Cycles; -55°C / +125°C, 1000 cycles
- Temp / Humidity; 85°C, 85%RH, 96 hrs.
- High Temp Storage; 150°C, 1000 hrs.

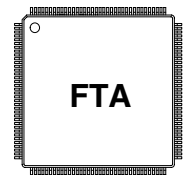
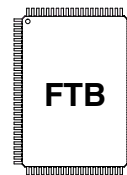
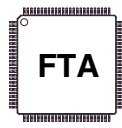
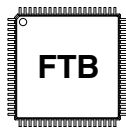
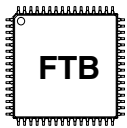
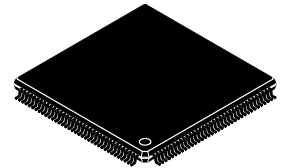
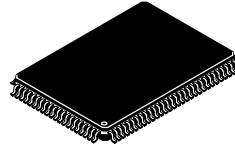
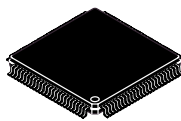
64 LQFP
14mm x 14mm

80 LQFP
14mm x 14mm

100 LQFP
14mm x 14mm

100 LQFP
14mm x 20mm

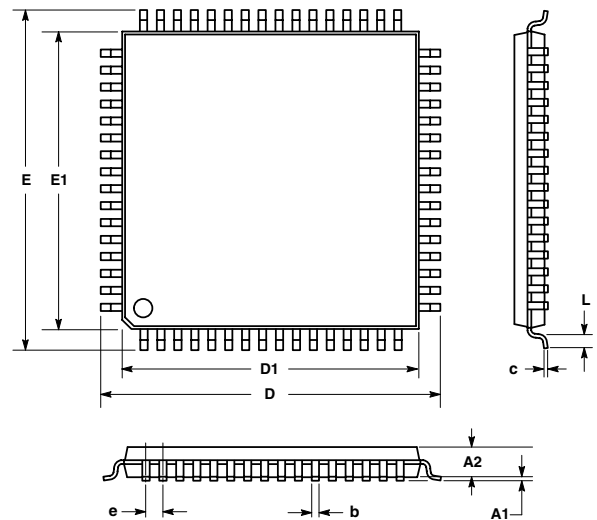
144 LQFP
20mm x 20mm



Cross Section



LQTP, TQFP

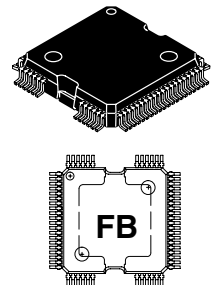
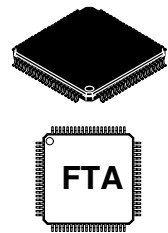
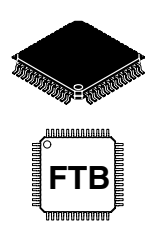


Thermal Resistance	Typical Values	Test Condition
$R_{\theta JA}$	35°C/W - 80°C/W	JESD51-2
$R_{\theta JL}$	12°C/W - 55°C/W	JESD51-8
$R_{\theta JC}$	1°C/W - 2°C/W	JESD51-5

Power Dissipation: 2.0 W to 5.0 W

QUAD FLAT PACK SURFACE MOUNT PACKAGES CONT.

52 TQFP 10mm x 10mm	80 TQFP 12mm x 12mm	64 HQFP 14mm x 14mm Exposed Heatsink
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QUAD FLAT PACK SURFACE MOUNT PACKAGE DIMENSIONS

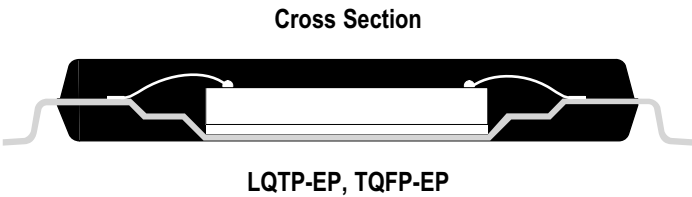
Package	Body Size		Lead Pitch							
	D1	E1	e	A1	A2	D	E	L	b	c
52 TQFP	10.00	10.00	0.65	0.10	1.00	12.00	12.00	0.60	0.30	0.15
80 TQFP	12.00	12.00	0.50	0.10	1.00	14.00	14.00	0.60	0.22	0.15

All dimensions are in millimeters.

THERMALLY ENHANCED QUAD FLAT PACK SURFACE MOUNT PACKAGE DIMENSIONS

Package	Body Size		Lead Pitch									
	D1	E1	e	A1	A2	D	E	F	G	L	b	c
48 TQFP-EP	7.00	7.00	0.50	0.40	1.00	9.00	9.00	3.41	3.41	0.60	0.22	0.15
52 LQFP-EP	10.00	10.00	0.65	0.13	1.40	12.00	12.00	7.00	7.00	0.60	0.30	0.13
64 LQFP-EP	10.00	10.00	0.50	0.10	1.40	12.00	12.00	6.50	6.50	0.60	0.22	0.15
100 LQFP-EP	14.00	14.00	0.50	0.10	1.40	16.00	16.00	9.00	9.00	0.60	0.22	0.14
128 TQFP-EP	14.00	14.00	0.40	0.10	1.00	16.00	16.00	8.85	8.85	0.60	0.18	0.15
64 HQFP	14.00	14.00	0.65	0.13	2.70	17.20	17.20	9.50	9.50	1.00	0.29	0.27

All dimensions are in millimeters.



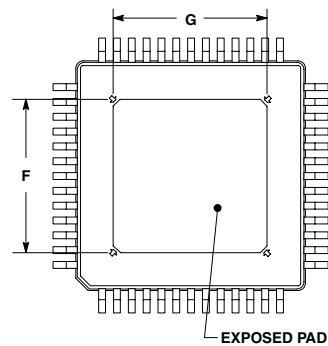
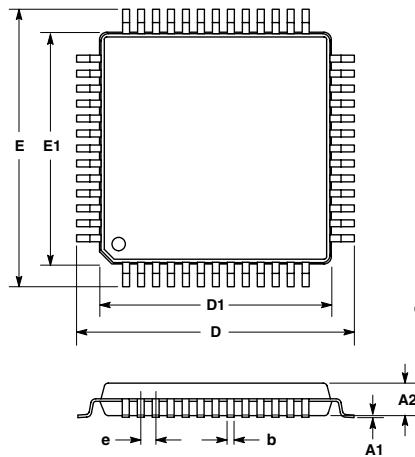
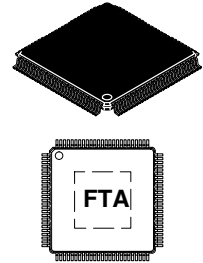
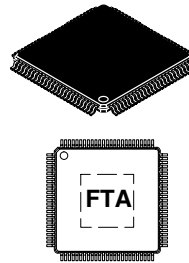
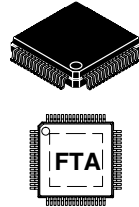
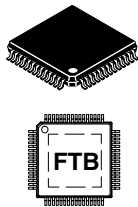
48 TQFP-EP
7mm x 7mm
Exposed Pad

52 LQFP-EP
10mm x 10mm
Exposed Pad

64 LQFP-EP
10mm x 10mm
Exposed Pad

100 TQFP-EP
14mm x 14mm
Exposed Pad

128 TQFP-EP
14mm x 14mm
Exposed Pad



GUIDELINES FOR SOLDERING:

Motorola's broad selection of Quad Flat Pack packages include the popular "gull wing" lead forms designed to adapt easily to all surface mount (SMT) processes. With the correct pad footprint geometry, the packages will self align to the PCB board when subjected to a solder reflow process. The exposed pad or copper slug should be soldered directly to a multi-layered PCB with thermal via holes to realize the greatest potential of the thermally enhanced LQFP and TQFP packages.


QUAD FLAT NO-LEAD SURFACE MOUNT PACKAGES

OVERVIEW:


A unique map array packaging process developed by Motorola is used to create a lead-less surface mount package. Motorola's quad flat no-lead (QFN) packages provide a cost-effective answer to the demand for reliable and high performance packaging, including enhanced thermal management characteristics available in a small form factor.

32 QFN

7mm x 7mm

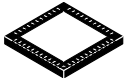


bottom view




44 QFN

9mm x 9mm



bottom view



KEY FEATURES:

- Lead-less Terminal Pads
- 7mm x 7mm and 9mm x 9mm Body Sizes
- Solder Plating Finish
- 0.65mm Lead Pitch
- Tray Packing Available
- JEDEC Compliant Case Outlines
- Exposed Pad

QUAD FLAT NO-LEAD SURFACE MOUNT PACKAGE DIMENSIONS

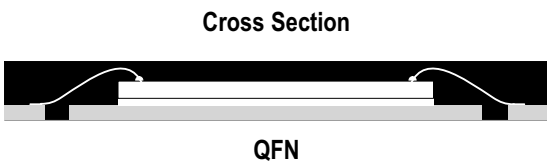
Package	Body Size		Lead Pitch						
	D1	E1	e	A1	A2	F	G	L	b
32 QFN	7.00	7.00	0.65	0.03	0.90	4.70	4.70	0.63	0.30
44 QFN	9.00	9.00	0.65	0.03	0.90	6.70	6.70	0.63	0.30

All dimensions are in millimeters.

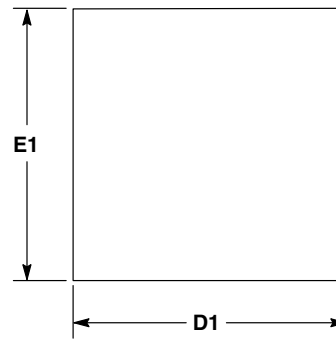
RELIABILITY:

Motorola subjects their packages to rigorous testing to ensure reliable performance and compatibility with surface mount assembly processes.

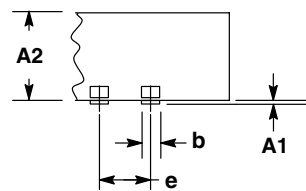
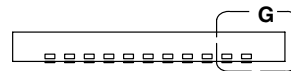
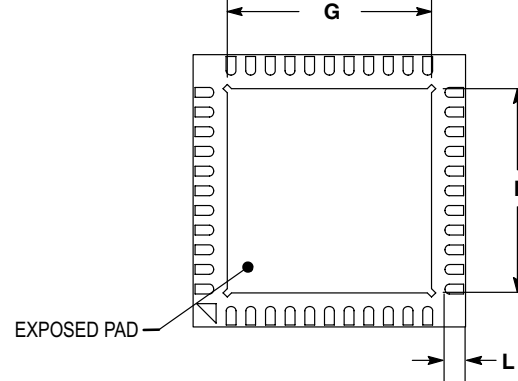
- Moisture Sensitivity; Level 1 Characterization @ 220°C
- Preconditioning; Level 1 per JEDEC-STD-020
- Temp Cycles; -55°C / +125°C, 1000 cycles
- Temp / Humidity; 85°C, 85%RH, 96 hrs.
- High Temp Storage; 150°C, 1000 hrs.



TOP VIEW



BOTTOM VIEW



DETAIL G

Thermal Resistance	Typical Values	Test Condition
$R_{\theta JA}$	35°C/W - 80°C/W	JESD51-2
$R_{\theta JL}$	12°C/W - 55°C/W	JESD51-8
$R_{\theta JC}$	1°C/W - 2°C/W	JESD51-5

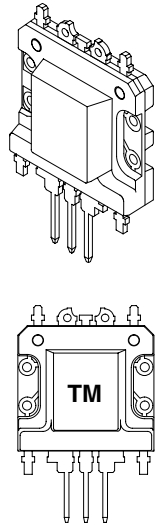
Power Dissipation: 2.0 W to 5.0 W

MECHATRONIC CONNECTOR MODULE

OVERVIEW:

Motorola provides a revolutionary 3-pin connector module that merges electronic and mechanical features. The MECH9 connector encases both an IC and passive component and offers it in a mechanical connector pin format. The connector package reduces the total number of board level interconnects and routing wires thereby allowing a customer to design a highly reliable and simplified node-based or "Mechatronic" system architecture.

9 MECH
3-Pin Connector



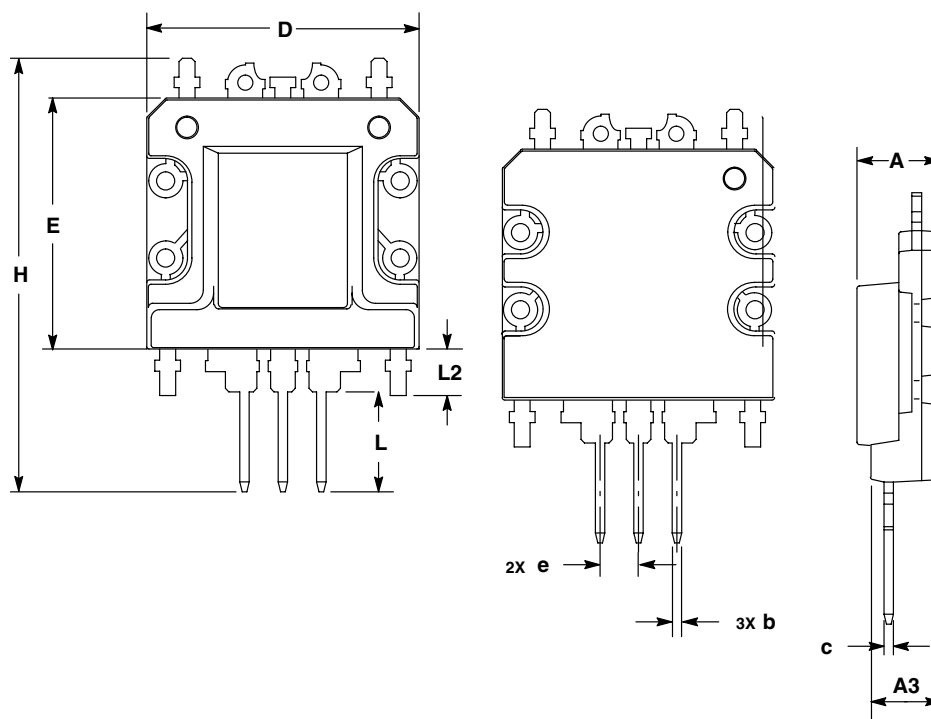
KEY FEATURES:

- Encapsulates Both IC and Passive Devices
- 3-Pin Connector Pins (3.16mm Nominal Pitch)
- Extra Pins Available for Test Points
- Directly Mountable to Stepper Motor Windings
- Rail Packing Available

RELIABILITY:

Motorola subjects their packages to rigorous testing to ensure reliable performance and compatibility with surface mount assembly processes.

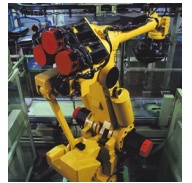
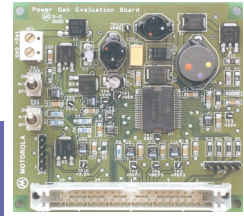
- Moisture Sensitivity; Level 1 Characterization @ 220°C
- Preconditioning; Level 1 per JEDEC-STD-020
- Temp Cycles; -55°C / +125°C, 1000 cycles
- Temp / Humidity; 85°C, 85%RH, 96 hrs.
- High Temp Storage; 150°C, 1000 hrs.



MECHATRONIC CONNECTOR MODULE CASE OUTLINE DIMENSIONS

Package	Body Size		Lead Pitch		A	A3	H	L	L2	b	c
	D	E	e								
9 MECH	17.90	16.62	2.54		5.50	4.61	28.66	6.80	3.12	0.62	0.62

All dimensions are in millimeters.



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