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ANALOG ICs

INTEGRATED SOLUTIONS

PACKAGING

Robust packaging is a key technology component of Analog Products.

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

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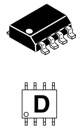
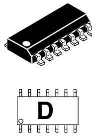
SMALL OUTLINE SURFACE MOUNT PACKAGES

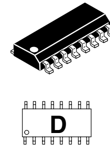
OVERVIEW:
Motorola provides a large selection of proven and reliable small outline surface mount (SOIC) packages in both narrow body (3.90mm) and wide body (7.50mm) styles. Lead counts range from 8 to 54 leads and are formed in a popular "gullwing" shape that easily adapts to all surface mount technology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

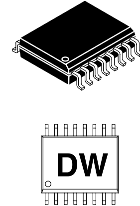
KEY FEATURES:

- 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

	Body Size		Lead Pitch						
Package	D1	E1	e	A	A1	H	L	b	c
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.

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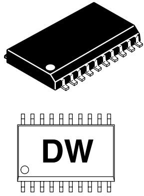
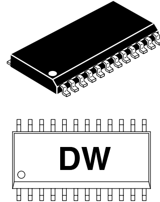
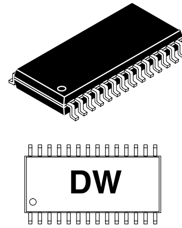
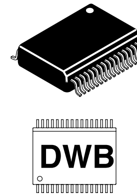
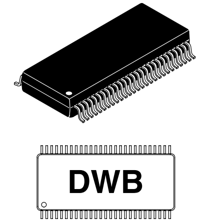
20 SOICW	24 SOICW	28 SOICW	32 SOICW Fine Pitch	54 SOICW Fine Pitch

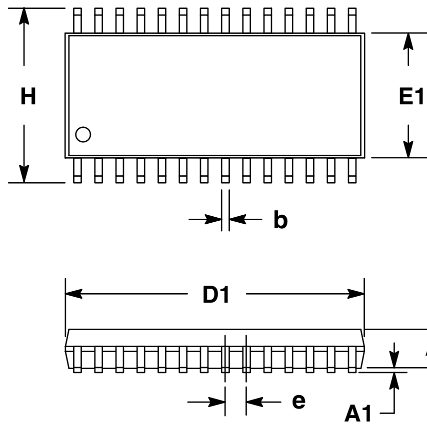


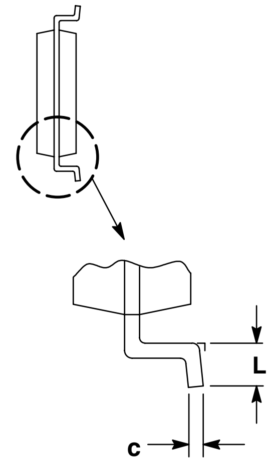












Cross Section

SOICN, SOICW

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 Resistance	Typical Values	Test Condition
$R\theta_{JA}$	75°C/W - 175°C/W	JESD51-2
$R\theta_{JL}$	40°C/W - 80°C/W	JESD51-8

Power Dissipation: Up to 1.5 W

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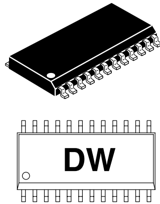
THERMALLY ENHANCED SMALL OUTLINE SURFACE MOUNT PACKAGES

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.

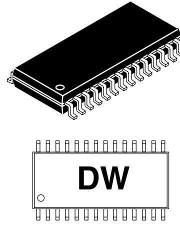
KEY FEATURES:

- 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

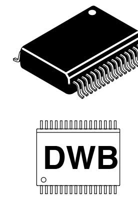
24 SOICW (19 I/O)



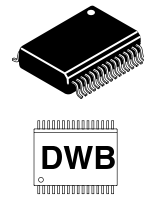
28 SOICW (21 I/O)



32 SOICW (25 I/O)



32 SOICW (29 I/O)



THERMALLY ENHANCED SMALL OUTLINE SURFACE MOUNT PACKAGE DIMENSIONS

	Body Size		Lead Pitch								
Package	D1	E1	e	A	A1	F	G	H	L	b	c
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.

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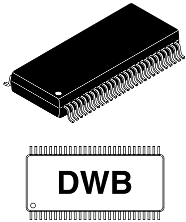
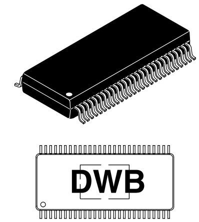
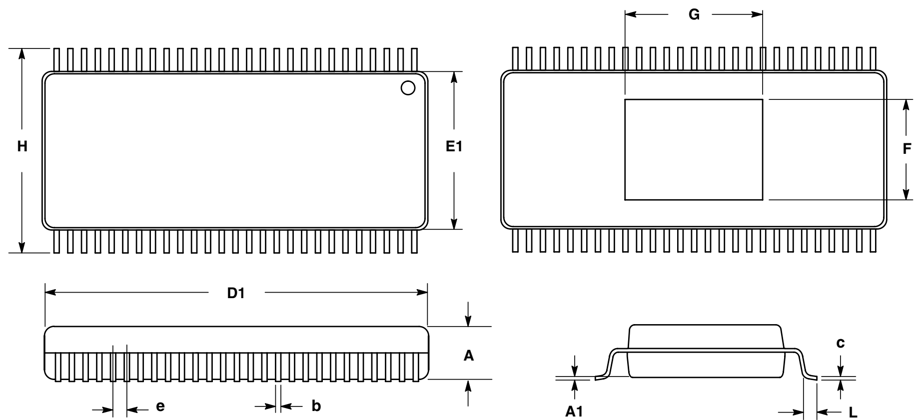
54 SOICW
(43 I/O)

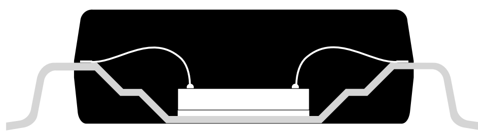
54 SOICW-EP
Exposed Pad







Cross Section



SOICW-EP
(Exposed Pad)

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

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.

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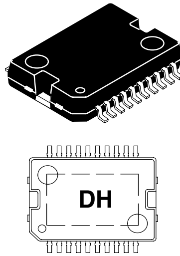
HEATSINK SMALL OUTLINE SURFACE MOUNT PACKAGES

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.

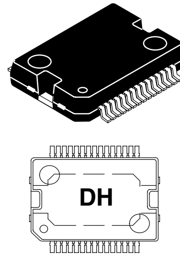
KEY FEATURES:

- 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

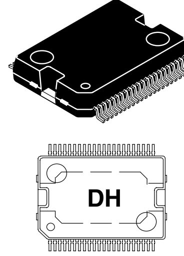
20 HSOP



30 HSOP



44 HSOP



HEATSINK SMALL OUTLINE SURFACE MOUNT PACKAGE DIMENSIONS

	Body Size		Lead Pitch								
Package	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.

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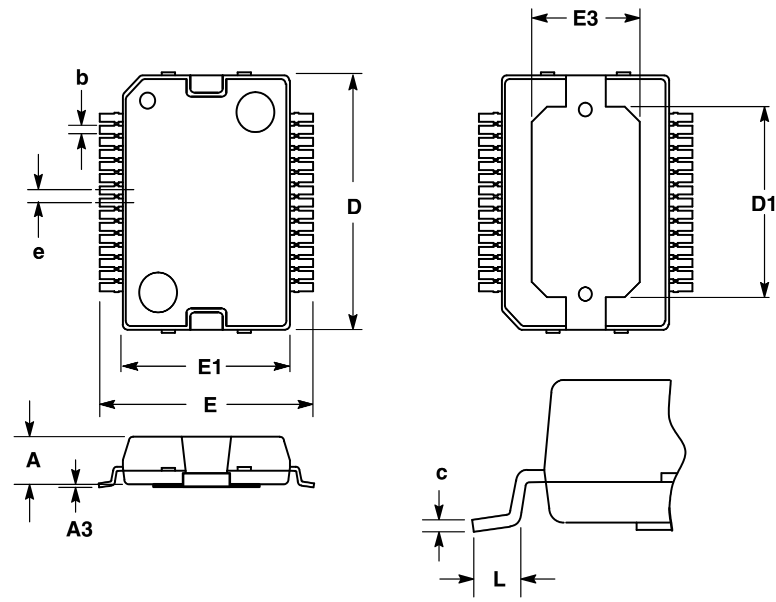

Cross Section

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

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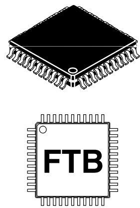
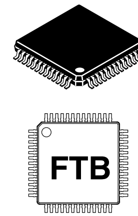
QUAD FLAT PACK SURFACE MOUNT PACKAGES

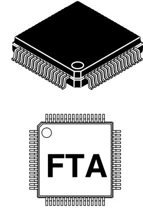
OVERVIEW:
Thin quad flat packages (TQFPs) and low-profile quad flat packages (LQFPs) are classified by the overall thickness per JEDEC definition. For Analog Products, Motorola offers both package styles in lead counts ranging from 44 to 144 to cover a large range of applications. Exposed pad (LQFP-EP 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







QUAD FLAT PACK SURFACE MOUNT PACKAGE DIMENSIONS

	Body Size		Lead Pitch							
Package	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.

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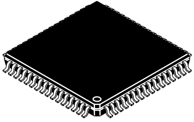
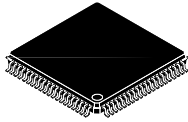
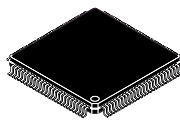
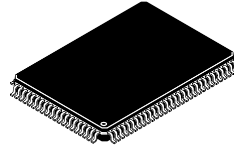
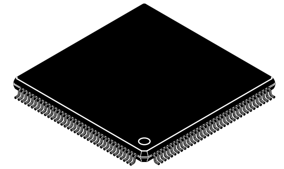
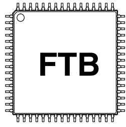
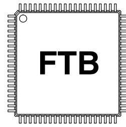
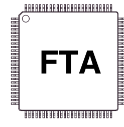
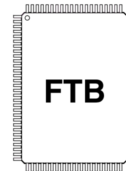
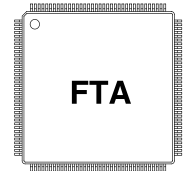
64 LQFP	80 LQFP	100 LQFP	100 LQFP	144 LQFP
14mm x 14mm	14mm x 14mm	14mm x 14mm	14mm x 20mm	20mm x 20mm



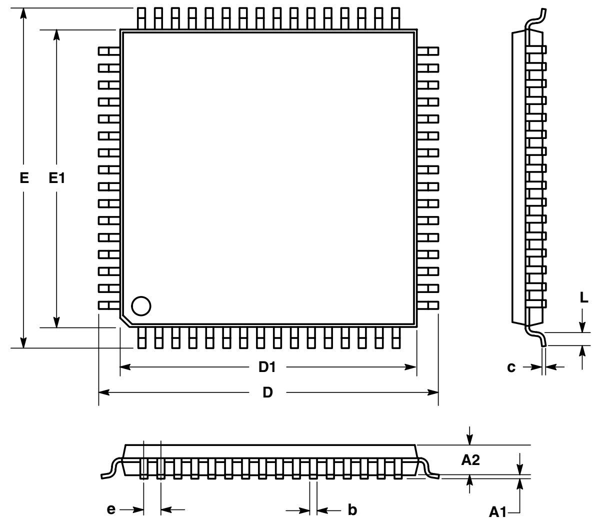






Cross Section

LQTP, TQFP

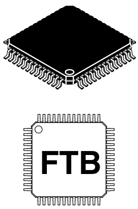


Thermal Resistance	Typical Values	Test Condition
$R\theta_{JA}$	35°C/W - 80°C/W	JESD51-2
$R\theta_{JL}$	12°C/W - 55°C/W	JESD51-8
$R\theta_{JC}$	1°C/W - 2°C/W	JESD51-5

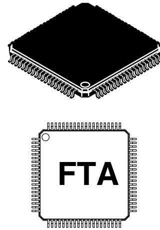
Power Dissipation: 2.0 W to 5.0 W

QUAD FLAT PACK SURFACE MOUNT PACKAGES CONT.

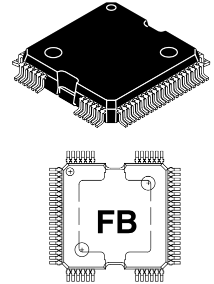
52 TQFP
10mm x 10mm



80 TQFP
12mm x 12mm



64 HQFP
14mm x 14mm
Exposed Heatsink



QUAD FLAT PACK SURFACE MOUNT PACKAGE DIMENSIONS

Package	Body Size D1	Body Size E1	Lead Pitch 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

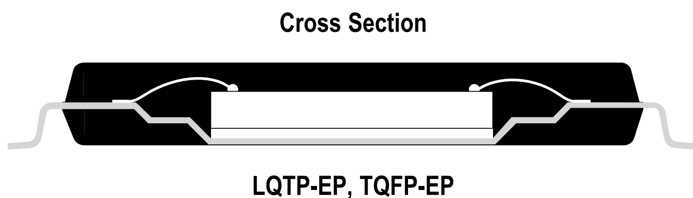
All dimensions are in millimeters.

THERMALLY ENHANCED QUAD FLAT PACK SURFACE MOUNT PACKAGE DIMENSIONS

Package	Body Size D1	Body Size E1	Lead Pitch 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.

Cross Section



LQTP-EP, TQFP-EP

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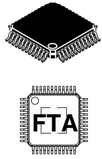
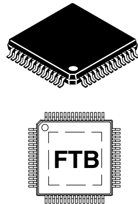
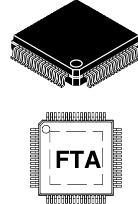
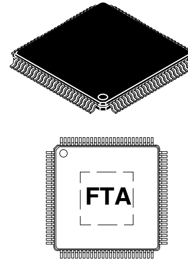
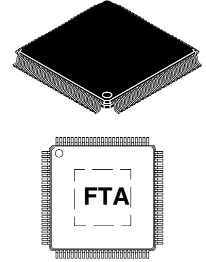
48 TQFP-EP 7mm x 7mm Exposed Pad	52 LQFP-EP 10mm x 10mm Exposed Pad	64 LQFP-EP 10mm x 10mm Exposed Pad	100 TQFP-EP 14mm x 14mm Exposed Pad	128 TQFP-EP 14mm x 14mm Exposed Pad

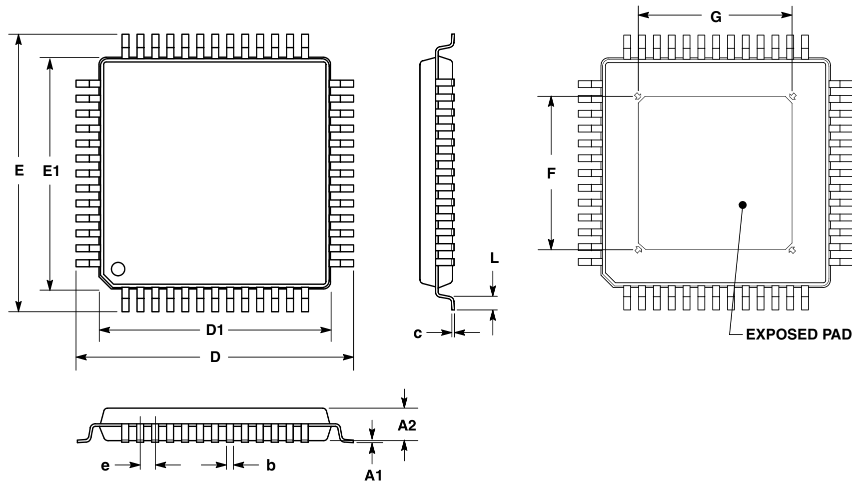












GUIDELINES FOR SOLDERING:
Motorola's broad selection of Quad Flat Pack packages include the popular "gull wing" lead forms designed to adapt easily to all surface mount (SMT) processes. With the correct pad footprint geometry, the packages will self align to the PCB board when subjected to a solder reflow 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.

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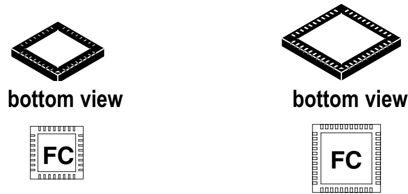
QUAD FLAT NO-LEAD SURFACE MOUNT PACKAGES

OVERVIEW:
A unique map array packaging process developed by Motorola is used to create a leadless 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.

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



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

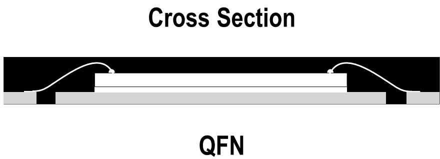
Power Dissipation: 2.0 W to 5.0 W

QUAD FLAT NO-LEAD SURFACE MOUNT PACKAGE DIMENSIONS

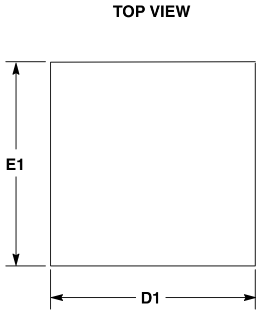
	Body Size		Lead Pitch						
Package	D1	E1	e	A1	A2	F	G	L	b
32 QFN	7.00	7.00	0.65	0.03	0.90	4.70	4.70	0.63	0.30
44 QFN	9.00	9.00	0.65	0.03	0.90	6.70	6.70	0.63	0.30

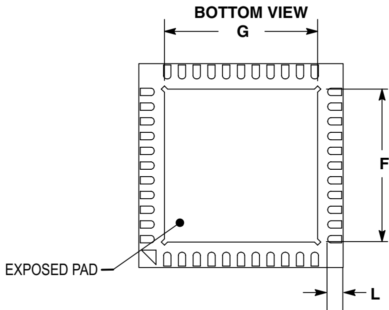
All dimensions are in millimeters.

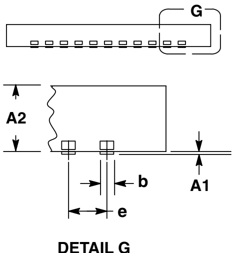
Cross Section



QFN







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.

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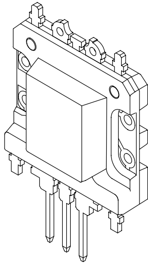
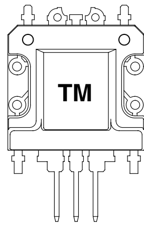
MECHATRONIC CONNECTOR MODULE

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.

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

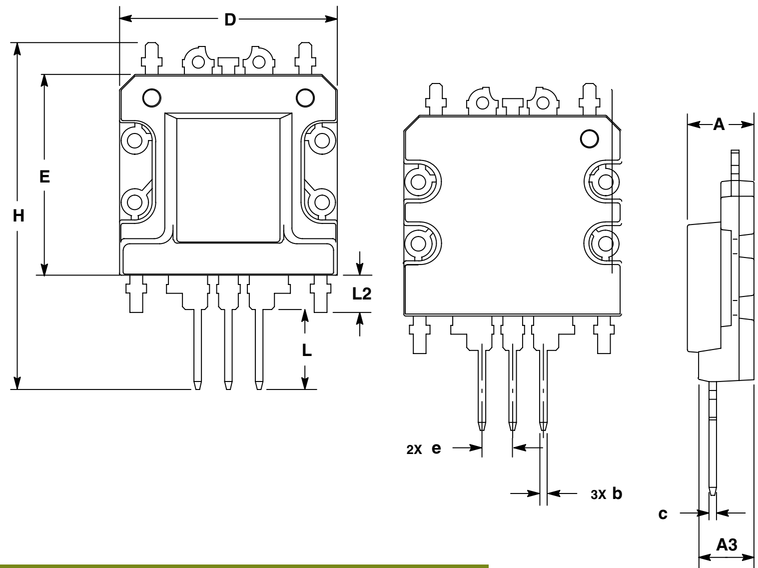




MECHATRONIC CONNECTOR MODULE CASE OUTLINE DIMENSIONS

	Body Size		Lead Pitch							
Package	D	E	e	A	A3	H	L	L2	b	c
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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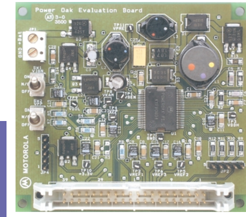

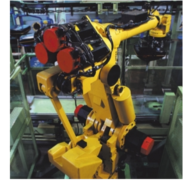

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