Packaging Specification

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ISO/TS 16949:2002

Microchip received ISO/TS-16949:2002 quality system certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona and Mountain View, California in October 2003. The Company's quality system processes and procedures are for its PICmicro® 8-bit MCUs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

Packaging Index

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PLASTIC DUAL IN-LINE (PDIP) FAMILY

PLASTIC LEADED CHIP CARRIER (PLCC) FAMILY

PLASTIC SMALL-OUTLINE (SOIC/SOIJ) FAMILY

PLASTIC QUAD FLATPACK (QFN) AND PLASTIC DUAL FLATPACK (DFN) FAMILY

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Packaging Index

Packaging Index

NOTES:

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PACKAGING

Outlines and Parameters

PART NUMBER SUFFIX DESIGNATIONS:

XXXXXXXXXX – XX X/XX XXX

QTP, SQTP or ROM Code; Special Requirements

Package:

1C	= 1000 pF COB Module, .75 mm	MF	= Dual-Flat, No Leads (DFN-S)
3C	= 330 pF COB Module, .45 mm	ML	= Quad Flat No Leads (QFN)
L	= Plastic Leaded Chip Carrier (PLCC)	MS	= Plastic Micro Small Outline (MSOP)
P	= Plastic DIP	MT	= 5-Lead SOT-89 Small Outline Transistor
S	= Die in Waffle Pack	OS	= 5-Lead Thin Small Outline Transistor
W	= Die in Wafer Form	OT	= 5-Lead SOT-23 Small Outline Transistor
AB	= 5-lead TO-220	PF	= 100-Lead Plastic Quad Flatpack (TQFP)
CB	= Chip on Board (COB)	PQ	= Plastic Metric-Quad Flatpack (MQFP)
CH/OT	= 6-Lead SOT-23	PL	= Plastic Low-Profile Quad Flatpack (LQFP)
CL	= Windowed CERQUAD	PT	= Plastic Thin-Quad Flatpack (TQFP)
DB/RC	= Plastic Small Outline Transistor (SOT)	QR	= Plastic Small Outline Narrow Body (QSOP)
EB	= 3-lead DDPAK	SB	= Bumped Die in Waffle Pack
EK	= 7-lead DDPAK	SL	= 14-lead Small Outline (150 mil)
ET	= 5-lead DDPAK	SM	= 8-lead Small Outline (207 mil)
JA	= 8-Lead Non-Windowed CERDIP	SN	= 8-lead Small Outline (150 mil)
JD	= 14-Lead Non-Windowed CERDIP	SO	= Plastic Small Outline (SOIC) (300 mil)
JE	= 16-Lead Non-Windowed CERDIP	SP	= Plastic Skinny DIP
JG	= 24-Lead Non-Windowed CERDIP	SS	= Plastic Shrink Small Outline
JJ	= 28-Lead Non-Windowed CERDIP	ST	= Thin Shrink Small Outline (4.4 mm)
JK	= 40-Lead Non-Windowed CERDIP	TO	= Transistor Outline
JW	= Windowed CERDIP	TS	= Thin Small Outline (8mm x 20 mm)
KU	= Metric-Quad Flatpack (MQFP)	TT	= 3-Lead SOT-23 Small Outline Transistor
KW	= Plastic Quad Flatpack (PQFP)	VS	= Very Small Outline (8 mm x 12 mm)
LB	= 3-Lead SC-70	WB	= Bumped Wafer (11 mil)
LT	= 5-Lead SC-70	WF	= Sawed Wafer on Frame (7 mil)
MB	= 3-Lead SOT-89	WFB	= Bumped, Sawed Wafer on Frame
MC	= Dual-Flat, No Leads (DFN)	WM	= SOT-385 Leadless Module

Process Temperature:

Blank = 0°C to +70°C
E (Extended) = -40°C to +125°C
I (Industrial) = -40°C to +85°C

Speed: **OR** **Crystal Frequency Designator for PICmicro® MCUs**

-90	= 90 ns	LP	= DC to 20 MHz, High-Speed Crystal Oscillator
-10	= 100 ns	RC	= DC to 2 MHz, XT and RC Oscillator Support
-12	= 120 ns	XT	= DC to 4 MHz Internal, XT, RC Osc Support
-15	= 150 ns	HS	= DC to 200 kHz, LP Oscillator Support
-17	= 170 ns	02	= DC to 10 MHz, HS Oscillator Support
-20	= 200 ns	04	= DC to 20 MHz, High-Speed Crystal Oscillator
-25	= 250 ns	04	= DC to 2 MHz, XT and RC Oscillator Support
-30	= 300 ns	10	= DC to 4 MHz Internal, XT, RC Osc Support

Option:

T	= Tape and Reel Shipments	F	= 200 µs
Blank	= twc = 1 ms	X	= Rotated pinout

Device Type: (Up to 10 digits)

AA	= 1.8V EEPROM Memory	LCE	= Low-Power CMOS/EPROM/EEPROM MCU
C	= CMOS EPROM MCU	LCR	= Low-Power CMOS ROM MCU
CE	= CMOS EPROM/EEPROM MCU	LCS	= Low-Power Security
CR	= CMOS ROM MCU	LF	= Low-Power Flash MCU
F	= Flash MCU	LV	= Low Voltage
HC	= High Speed	24	= 2-Wire (I^2C™)
HV	= High Voltage	25	= SPI™

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Packaging

NOTES:

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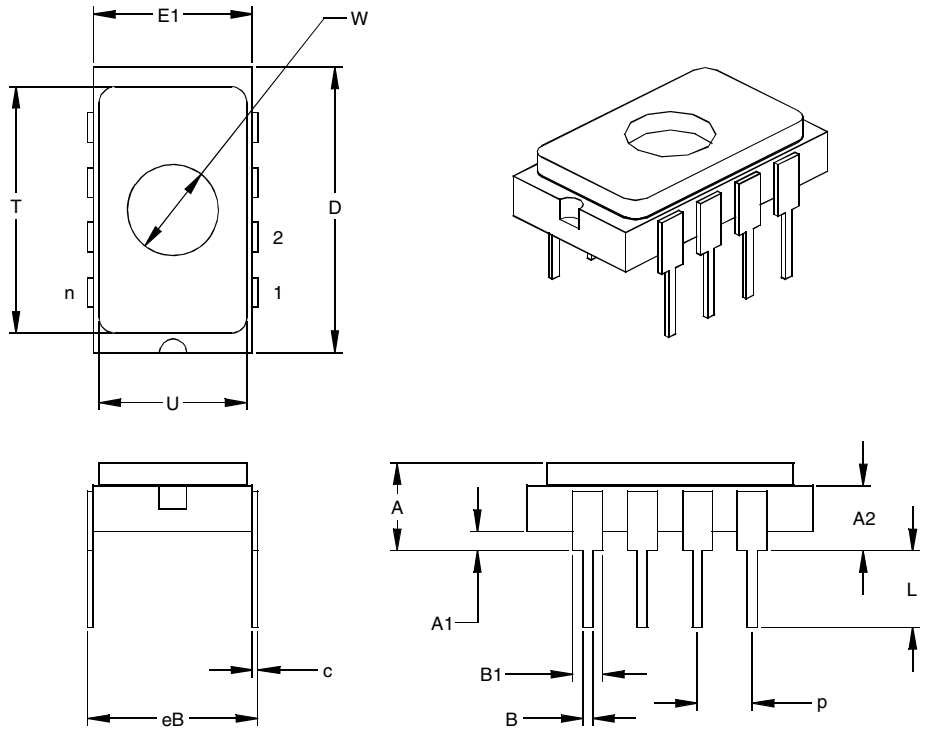
Packaging Diagrams and Parameters

8-Lead Ceramic Side-Brazed Dual In-line with Window (JW) – 300 mil Body



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.145	.165	.185	3.68	4.19	4.70
Top of Body to Seating Plane	A2	.103	.123	.143	2.62	3.12	3.63
Standoff	A1	.025	.035	.045	0.64	0.89	1.14
Package Width	E1	.280	.290	.300	7.11	7.37	7.62
Overall Length	D	.510	.520	.530	12.95	13.21	13.46
Tip to Seating Plane	L	.130	.140	.150	3.30	3.56	3.81
Lead Thickness	c	.008	.010	.012	0.20	0.25	0.30
Upper Lead Width	B1	.050	.055	.060	1.27	1.40	1.52
Lower Lead Width	B	.016	.018	.020	0.41	0.46	0.51
Overall Row Spacing §	eB	.296	.310	.324	7.52	7.87	8.23
Window Diameter	W	.161	.166	.171	4.09	4.22	4.34
Lid Length	T	.440	.450	.460	11.18	11.43	11.68
Lid Width	U	.260	.270	.280	6.60	6.86	7.11

* Controlling Parameter

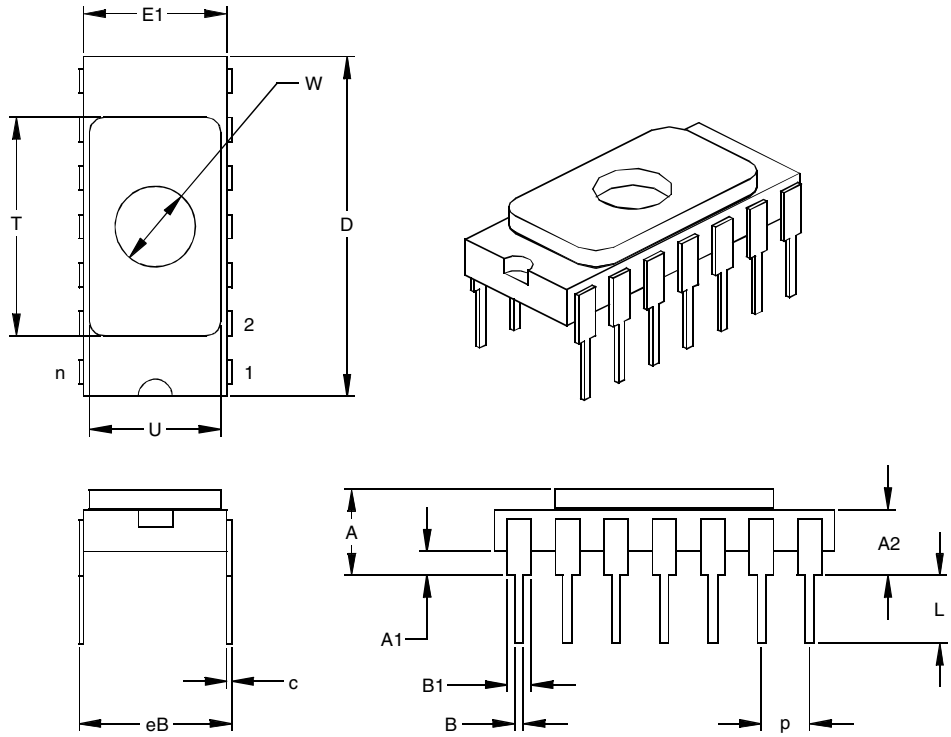
§ Significant Characteristic

JEDEC Equivalent: MS-015

Drawing No. C04-083

Packaging Diagrams and Parameters

14-Lead Ceramic Side-Brazed Dual In-line with Window (JW) – 300 mil Body



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		14			14	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.142	.162	.182	3.61	4.11	4.62
Top of Body to Seating Plane	A2	.100	.120	.140	2.54	3.05	3.56
Standoff	A1	.025	.035	.045	0.64	0.89	1.14
Package Width	E1	.280	.290	.300	7.11	7.37	7.62
Overall Length	D	.693	.700	.707	17.60	17.78	17.96
Tip to Seating Plane	L	.130	.140	.150	3.30	3.56	3.81
Lead Thickness	c	.008	.010	.012	0.20	0.25	0.30
Upper Lead Width	B1	.052	.054	.056	1.32	1.37	1.42
Lower Lead Width	B	.016	.018	.020	0.41	0.46	0.51
Overall Row Spacing §	eB	.296	.310	.324	7.52	7.87	8.23
Window Diameter	W	.161	.166	.171	4.09	4.22	4.34
Lid Length	T	.440	.450	.460	11.18	11.43	11.68
Lid Width	U	.260	.270	.280	6.60	6.86	7.11

* Controlling Parameter
§ Significant Characteristic
JEDEC Equivalent: MS-015
Drawing No. C04-107

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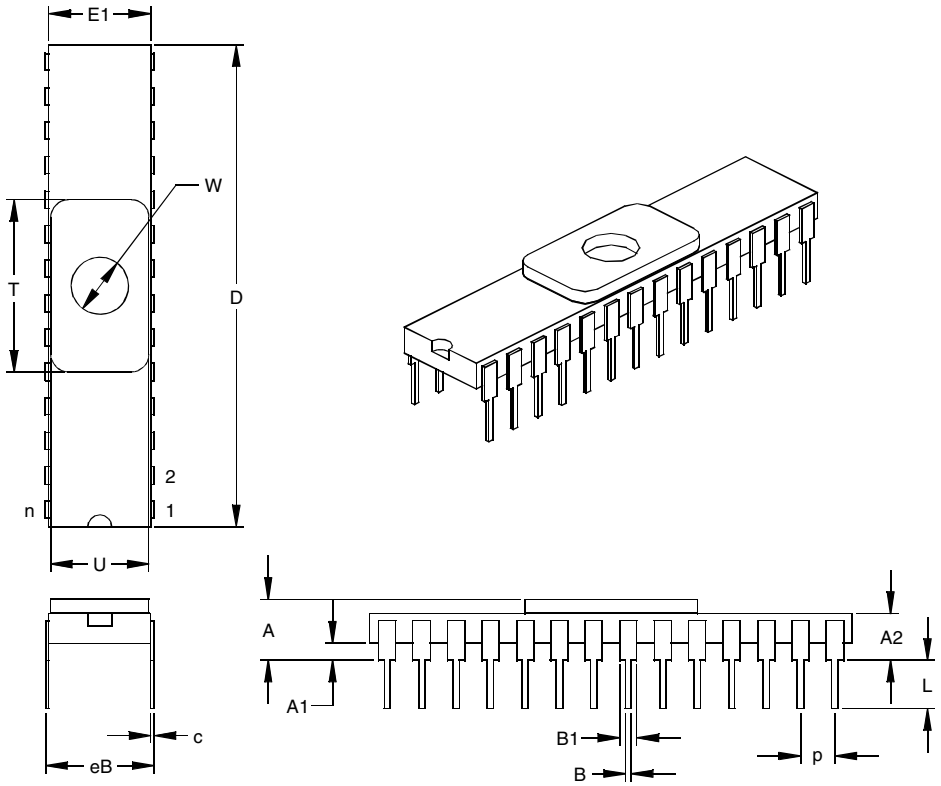
Packaging Diagrams and Parameters

28-Lead Ceramic Side-Brazed Dual In-line with Window (JW) – 300 mil Body



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.155	.177	.198	3.94	4.48	5.03
Top of Body to Seating Plane	A2	.115	.135	.155	2.92	3.43	3.94
Standoff	A1	.040	.050	.060	1.02	1.27	1.52
Package Width	E1	.280	.290	.300	7.11	7.37	7.62
Overall Length	D	1.386	1.400	1.414	35.20	35.56	35.92
Tip to Seating Plane	L	.130	.140	.150	3.30	3.56	3.81
Lead Thickness	c	.008	.010	.012	0.20	0.25	0.30
Upper Lead Width	B1	.048	.050	.052	1.22	1.27	1.32
Lower Lead Width	B	.016	.018	.020	0.41	0.46	0.51
Overall Row Spacing §	eB	.296	.310	.324	7.52	7.87	8.23
Window Diameter	W	.161	.166	.171	4.09	4.22	4.34
Lid Length	T	.490	.500	.510	12.45	12.70	12.95
Lid Width	U	.275	.285	.295	6.99	7.24	7.49

* Controlling Parameter
§ Significant Characteristic
JEDEC Equivalent: MS-015
Drawing No. C04-084

Packaging Diagrams and Parameters

NOTES:

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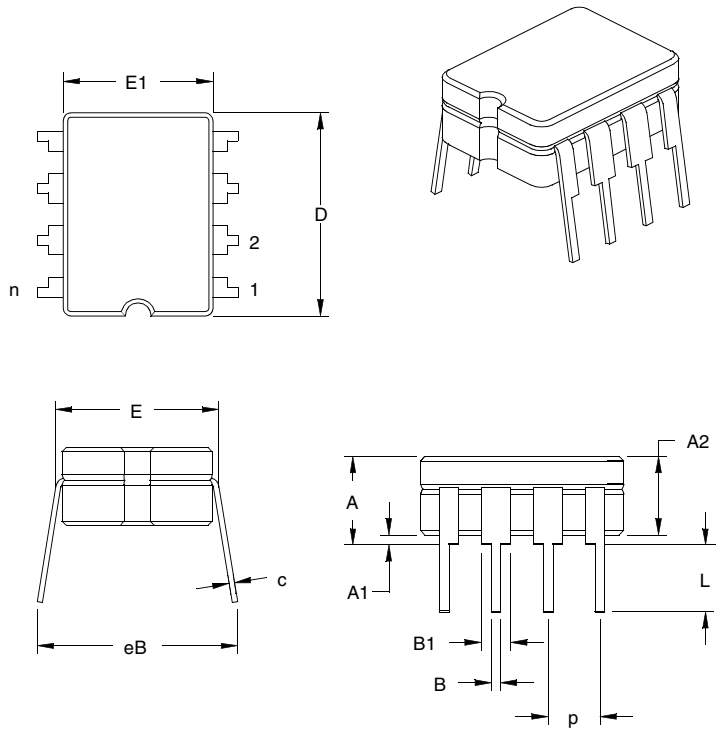
Packaging Diagrams and Parameters

8-Lead Ceramic Dual In-line (JA) – 300 mil Body (CERDIP)

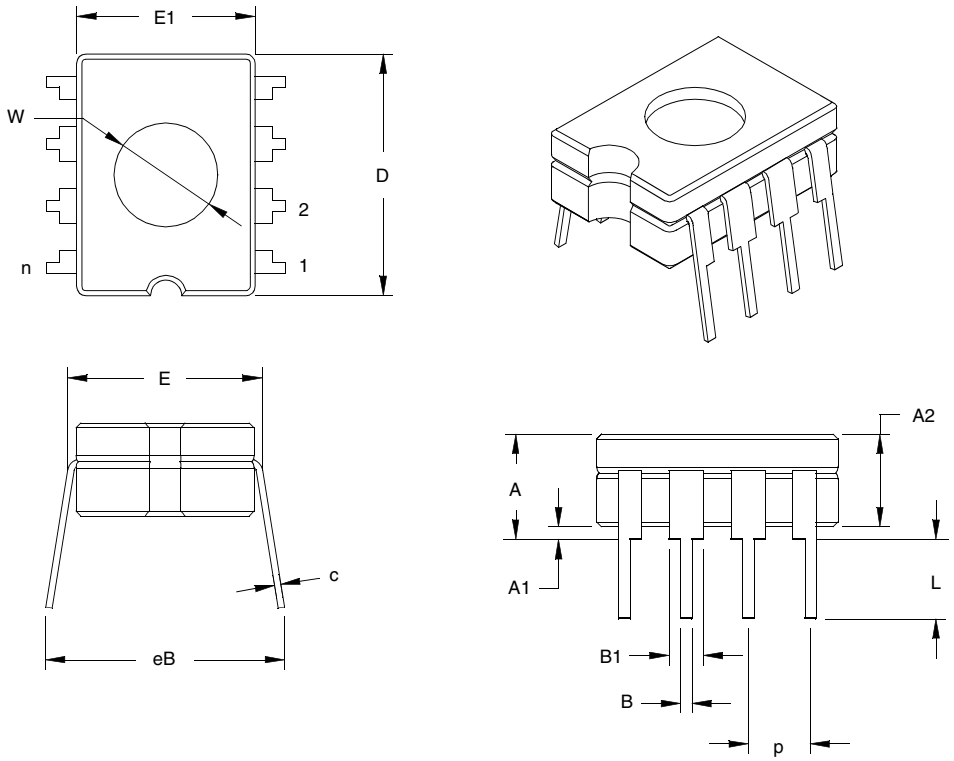


Units		INCHES *			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.160	.180	.200	4.06	4.57	5.08
Standoff §	A1	.020	.030	.040	0.51	0.77	1.02
Shoulder to Shoulder Width	E	.290	.305	.320	7.37	7.75	8.13
Ceramic Pkg. Width	E1	.230	.265	.300	5.84	6.73	7.62
Overall Length	D	.370	.385	.400	9.40	9.78	10.16
Tip to Seating Plane	L	.125	.163	.200	3.18	4.13	5.08
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.055	.065	1.14	1.40	1.65
Lower Lead Width	B	.016	.018	.020	0.41	0.46	0.51
Overall Row Spacing	eB	.320	.360	.400	8.13	9.15	10.16

* Controlling Parameter
§ Significant Characteristic
JEDEC Equivalent: MS-030
Drawing No. C04-010

Packaging Diagrams and Parameters

8-Lead Ceramic Dual In-line with Window (JW) – 300 mil Body (CERDIP)



Units		INCHES *			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.160	.180	.200	4.06	4.57	5.08
Standoff §	A1	.020	.030	.040	0.51	0.77	1.02
Shoulder to Shoulder Width	E	.290	.305	.320	7.37	7.75	8.13
Ceramic Pkg. Width	E1	.230	.265	.300	5.84	6.73	7.62
Overall Length	D	.370	.385	.400	9.40	9.78	10.16
Tip to Seating Plane	L	.125	.163	.200	3.18	4.13	5.08
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.055	.065	1.14	1.40	1.65
Lower Lead Width	B	.016	.018	.020	0.41	0.46	0.51
Overall Row Spacing	eB	.320	.360	.400	8.13	9.15	10.16
Window Diameter	W	.267	.270	.273	6.78	6.86	6.93

* Controlling Parameter
§ Significant Characteristic
JEDEC Equivalent: MS-030
Drawing No. C04-027

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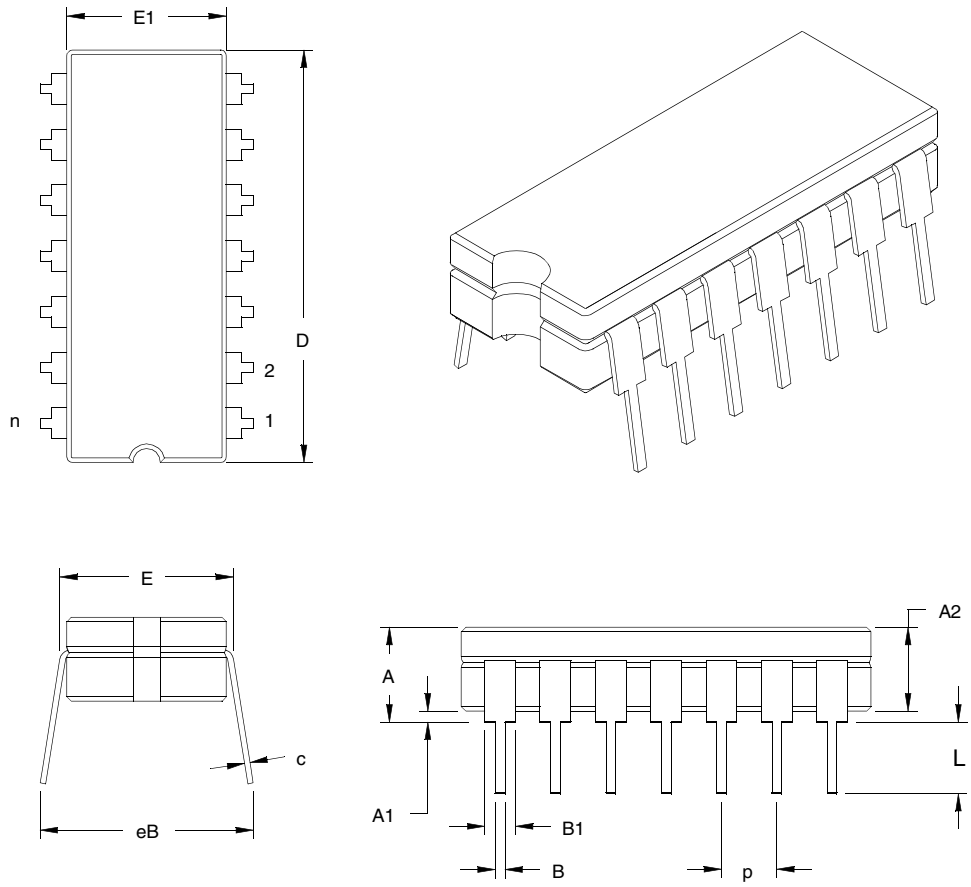
Packaging Diagrams and Parameters

14-Lead Ceramic Dual In-line (JD) – 300 mil Body (CERDIP)



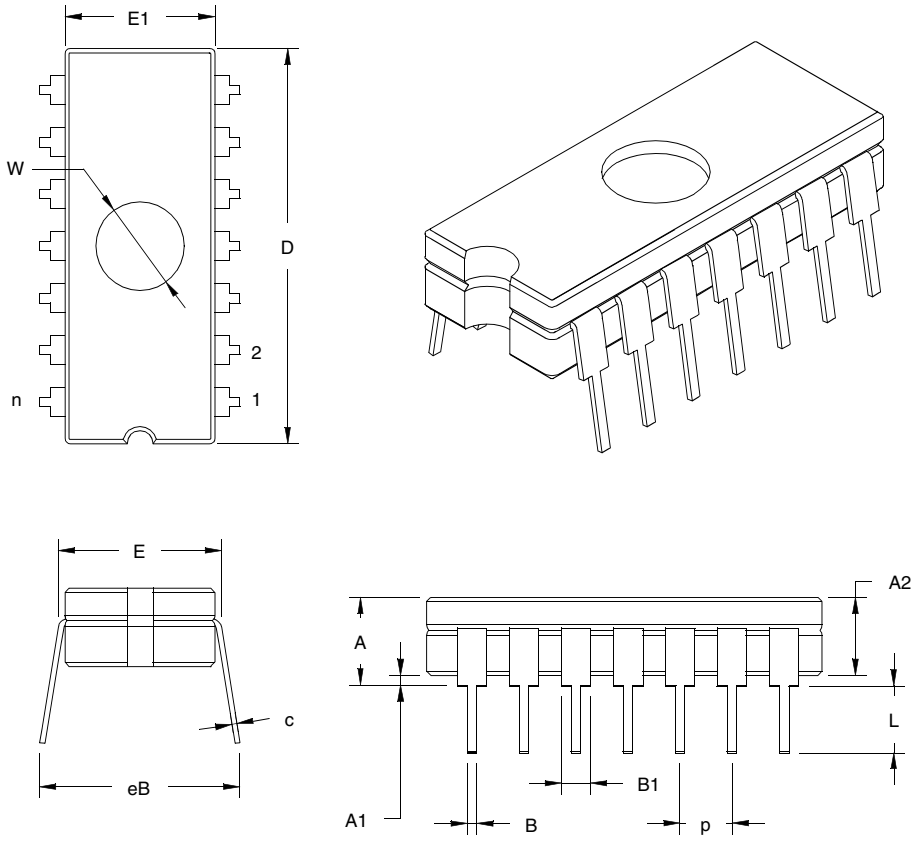
Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		18			18	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.160	.180	.200	4.06	4.57	5.08
Standoff §	A1	.015	.030	.040	0.38	0.76	1.02
Shoulder-to-Shoulder Width	E	.290	.305	.325	7.37	7.75	8.25
Ceramic Pkg. Width	E1	.280	.288	.296	7.11	7.32	7.52
Overall Length	D	.752	.760	.780	19.10	19.30	19.81
Tip to Seating Plane	L	.125	.163	.200	3.18	4.14	5.08
Lead Thickness	c	.008	.012	.014	0.20	0.30	0.36
Upper Lead Width	B1	.045	.055	.065	1.14	1.40	1.65
Lower Lead Width	B	.015	.018	.021	0.38	0.46	0.53
Overall Row Spacing	eB	.325	.360	.410	8.25	9.14	10.41

* Controlling Parameter
§ Significant Characterist ic
JEDEC Equivalent: MS-030
Drawing No. C04-002

Revised 09-16-05

Packaging Diagrams and Parameters

14-Lead Ceramic Dual In-line with Window (JW) – 300 mil Body (CERDIP)



Units		INCHES *			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		14			14	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.160	.180	.200	4.06	4.57	5.08
Standoff §	A1	.015	.030	.040	0.38	0.76	1.02
Shoulder to Shoulder Width	E	.290	.305	.325	7.37	7.75	8.25
Ceramic Pkg. Width	E1	.280	.288	.296	7.11	7.32	7.52
Overall Length	D	.752	.760	.780	19.10	19.30	19.81
Window Diameter	W	.125	.170	.210	3.18	4.32	5.33
Tip to Seating Plane	L	.125	.163	.200	3.18	4.14	5.08
Lead Thickness	c	.008	.012	.014	0.20	0.30	0.36
Upper Lead Width	B1	.045	.055	.065	1.14	1.40	1.65
Lower Lead Width	B	.015	.018	.021	0.38	0.46	0.53
Overall Row Spacing	eB	.325	.360	.410	8.25	9.14	10.41

* Controlling Parameter

§ Significant Characteristic

JEDEC Equivalent: MS-030 AC

Drawing No. C04-099

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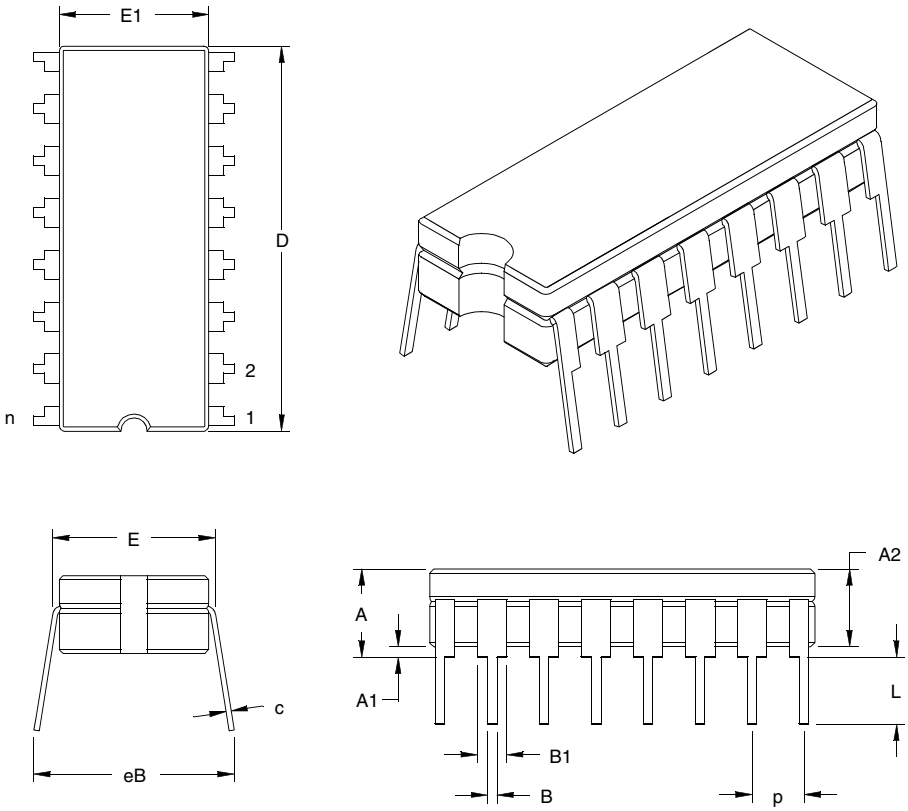
Packaging Diagrams and Parameters

16-Lead Ceramic Dual In-line (JE) – 300 mil Body (CERDIP)

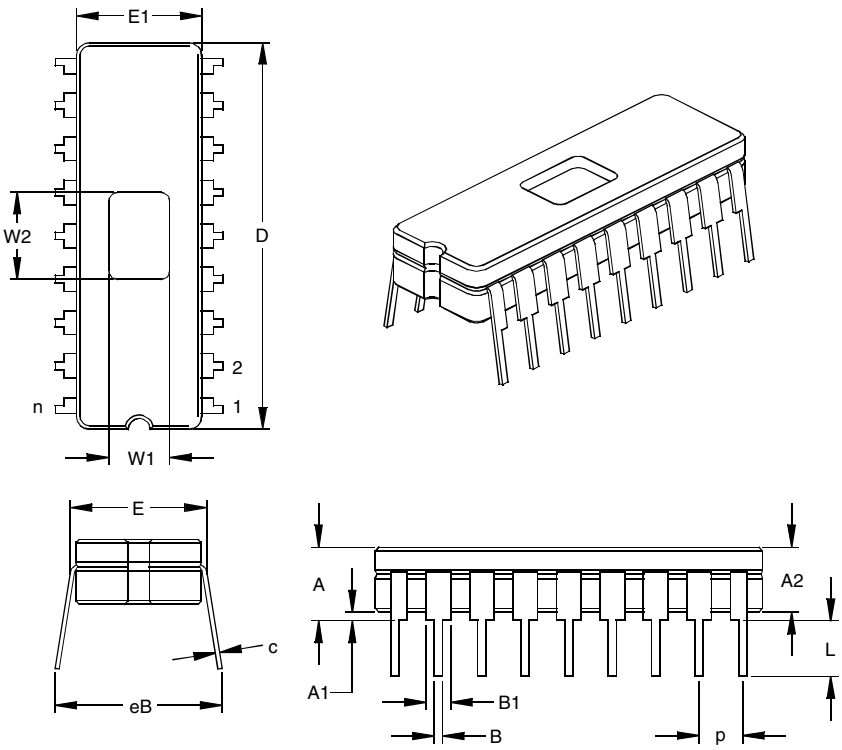


Units		INCHES *			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		18			18	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.160	.180	.200	4.06	4.57	5.08
Standoff §	A1	.015	.030	.040	0.38	0.76	1.02
Shoulder to Shoulder Width	E	.290	.305	.325	7.37	7.75	8.25
Ceramic Pkg. Width	E1	.280	.288	.296	7.11	7.32	7.52
Overall Length	D	.752	.760	.780	19.10	19.30	19.81
Tip to Seating Plane	L	.125	.163	.200	3.18	4.14	5.08
Lead Thickness	c	.008	.012	.014	0.20	0.30	0.36
Upper Lead Width	B1	.045	.055	.065	1.14	1.40	1.65
Lower Lead Width	B	.015	.018	.021	0.38	0.46	0.53
Overall Row Spacing	eB	.325	.360	.410	8.25	9.14	10.41

***** Controlling Parameter
§ Significant Characteristic
JEDEC Equivalent: MS-030
Drawing No. C04-003

Packaging Diagrams and Parameters

18-Lead Ceramic Dual In-line with Window (JW) – 300 mil Body (CERDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		18			18	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.170	.183	.195	4.32	4.64	4.95
Ceramic Package Height	A2	.155	.160	.165	3.94	4.06	4.19
Standoff	A1	.015	.023	.030	0.38	0.57	0.76
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Ceramic Pkg. Width	E1	.285	.290	.295	7.24	7.37	7.49
Overall Length	D	.880	.900	.920	22.35	22.86	23.37
Tip to Seating Plane	L	.125	.138	.150	3.18	3.49	3.81
Lead Thickness	c	.008	.010	.012	0.20	0.25	0.30
Upper Lead Width	B1	.050	.055	.060	1.27	1.40	1.52
Lower Lead Width	B	.016	.019	.021	0.41	0.47	0.53
Overall Row Spacing §	eB	.345	.385	.425	8.76	9.78	10.80
Window Width	W1	.130	.140	.150	3.30	3.56	3.81
Window Length	W2	.190	.200	.210	4.83	5.08	5.33

* Controlling Parameter
§ Significant Characteristic
JEDEC Equivalent: MO-036
Drawing No. C04-010

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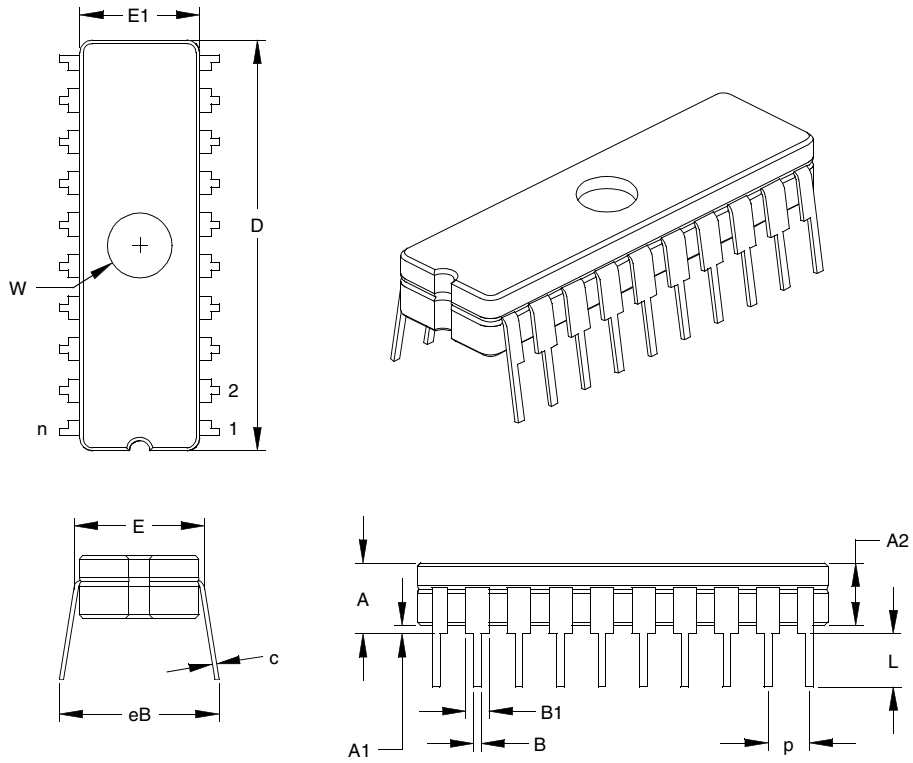
Packaging Diagrams and Parameters

20-Lead Ceramic Dual In-line with Window (JW) – 300 mil Body (CERDIP)



Units		INCHES *			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		20			20	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.170	.183	.200	4.32	4.65	5.08
Ceramic Package Height	A2	.140	.160	.175	3.56	4.06	4.45
Standoff	A1	.015	.023	.030	0.38	0.58	0.76
Shoulder to Shoulder Width	E	.308	.313	.325	7.82	7.95	8.25
Ceramic Pkg. Width	E1	.280	.288	.296	7.11	7.32	7.52
Overall Length	D	.942	.950	.970	23.93	24.13	24.64
Tip to Seating Plane	L	.125	.138	.200	3.18	3.51	5.08
Lead Thickness	c	.008	.010	.012	0.20	0.25	0.30
Upper Lead Width	B1	.050	.055	.060	1.27	1.40	1.52
Lower Lead Width	B	.015	.019	.023	0.38	0.48	0.58
Overall Row Spacing	eB	.325	.385	.410	8.25	9.78	10.41
Window Diameter	W	.167	.170	.173	4.24	4.32	4.39

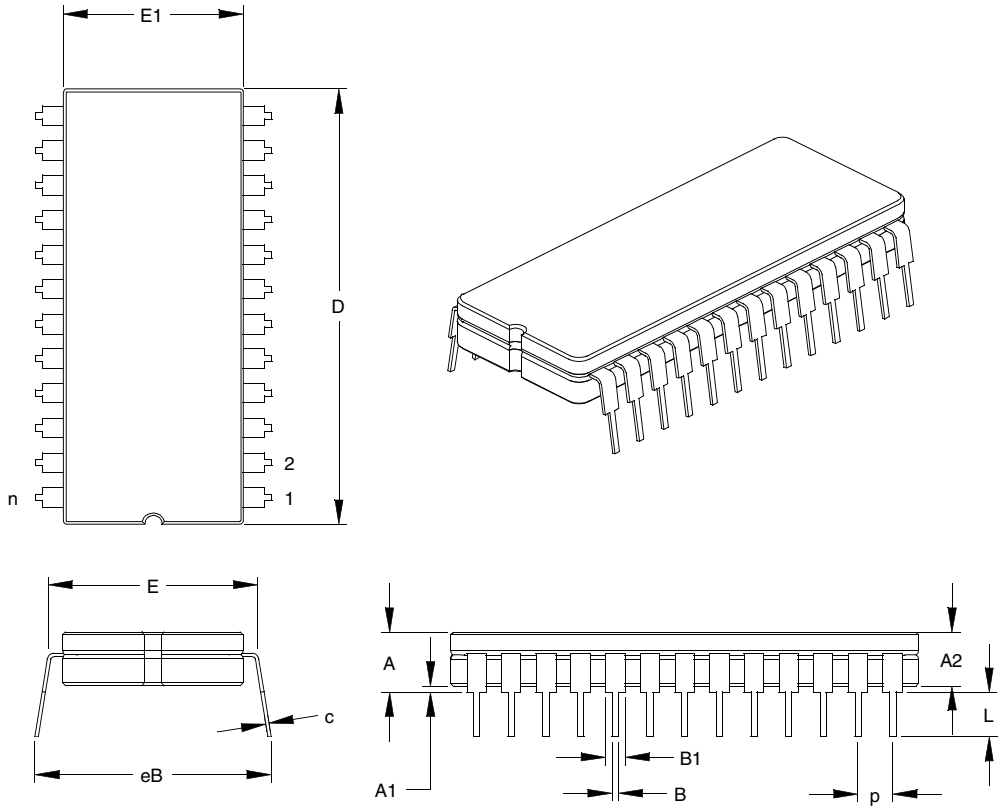
***** Controlling Parameter

JEDEC Equivalent: MS-030

Drawing No. C04-115

Packaging Diagrams and Parameters

24-Lead Ceramic Dual In-line (JG) – 600 mil Body (CERDIP)



Units		INCHES *			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		24			28	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.170	.190	.225	4.32	4.83	5.72
Ceramic Package Height	A2	.140	--	.175	3.56	--	4.45
Standoff §	A1	.015	--	--	0.38	--	--
Shoulder to Shoulder Width	E	.608	--	.625	15.44	--	15.88
Ceramic Pkg. Width	E1	.512	.520	.528	13.00	13.21	13.41
Overall Length	D	1.242	1.250	1.270	31.55	31.75	32.26
Tip to Seating Plane	L	.125	.163	.200	3.18	4.14	5.08
Lead Thickness	c	.008	.012	.014	0.20	0.30	0.36
Upper Lead Width	B1	.045	.055	.065	1.14	1.40	1.65
Lower Lead Width	B	.015	.018	.023	0.38	0.46	0.58
Overall Row Spacing	eB	.625	.660	.710	15.88	16.76	18.03

* Controlling Parameter
§ Significant Characteristic
JEDEC Equivalent: MS-032
Drawing No. C04-004

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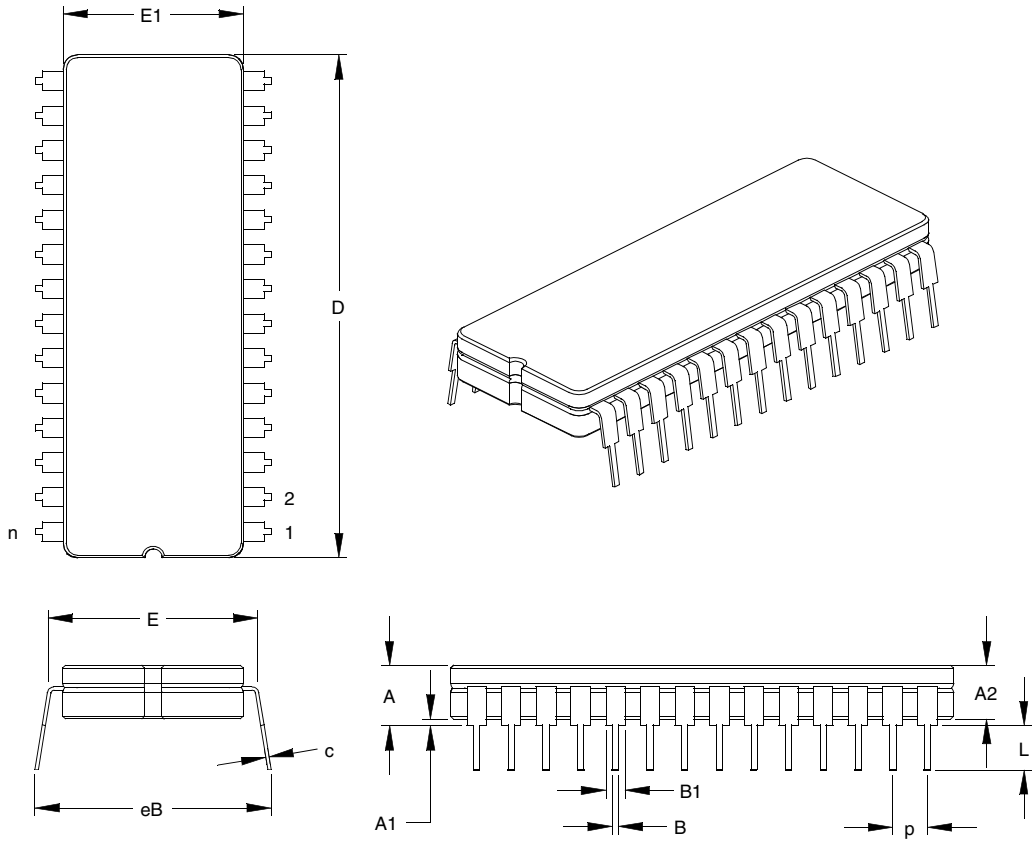
Packaging Diagrams and Parameters

28-Lead Ceramic Dual In-line (JJ) – 600 mil Body (CERDIP)



Units		INCHES *			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.170	.190	.225	4.32	4.83	5.72
Ceramic Package Height	A2	.140	--	.175	3.56	--	4.45
Standoff §	A1	.015	--	--	0.38	--	--
Shoulder to Shoulder Width	E	.608	--	.625	15.44	--	15.88
Ceramic Pkg. Width	E1	.512	.520	.528	13.00	13.21	13.41
Overall Length	D	1.442	1.450	1.470	36.63	36.83	37.34
Tip to Seating Plane	L	.125	.163	.200	3.18	4.14	5.08
Lead Thickness	c	.008	.012	.015	0.20	0.30	0.38
Upper Lead Width	B1	.045	.055	.065	1.14	1.40	1.65
Lower Lead Width	B	.015	.018	.023	0.38	0.46	0.58
Overall Row Spacing	eB	.625	.660	.710	15.88	16.76	18.03

***** Controlling Parameter

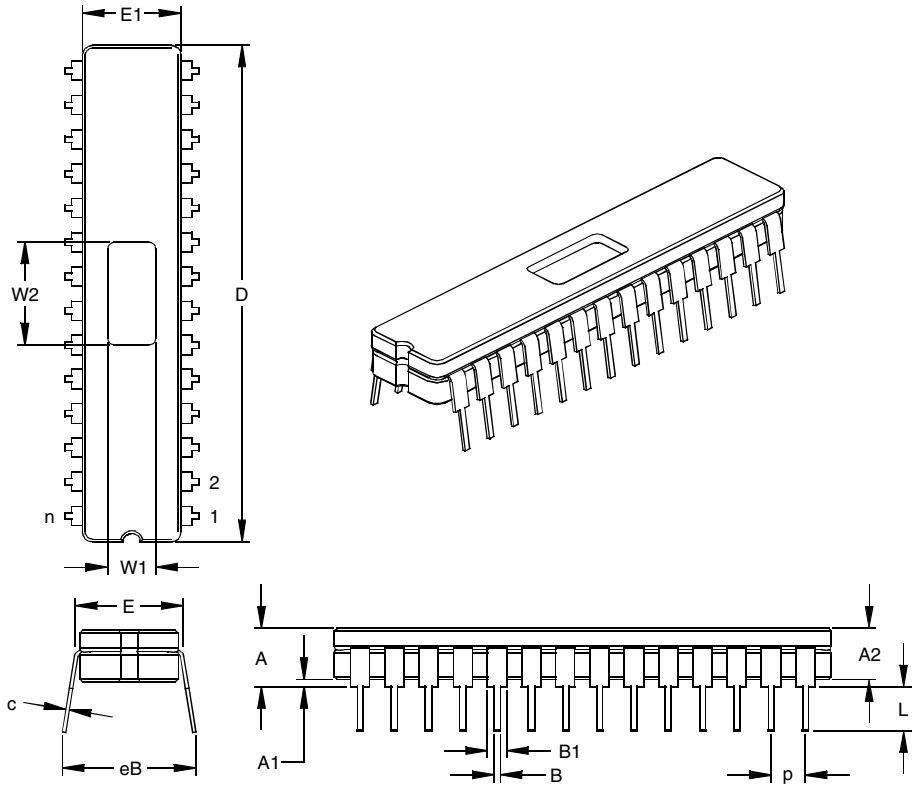
§ Significant Characteristic

JEDEC Equivalent: MS-032

Drawing No. C04-006

Packaging Diagrams and Parameters

28-Lead Ceramic Dual In-line with Window (JW) – 300 mil Body (CERDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.170	.183	.195	4.32	4.64	4.95
Ceramic Package Height	A2	.155	.160	.165	3.94	4.06	4.19
Standoff	A1	.015	.023	.030	0.38	0.57	0.76
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Ceramic Pkg. Width	E1	.285	.290	.295	7.24	7.37	7.49
Overall Length	D	1.430	1.458	1.485	36.32	37.02	37.72
Tip to Seating Plane	L	.135	.140	.145	3.43	3.56	3.68
Lead Thickness	c	.008	.010	.012	0.20	0.25	0.30
Upper Lead Width	B1	.050	.058	.065	1.27	1.46	1.65
Lower Lead Width	B	.016	.019	.021	0.41	0.47	0.53
Overall Row Spacing §	eB	.345	.385	.425	8.76	9.78	10.80
Window Width	W1	.130	.140	.150	3.30	3.56	3.81
Window Length	W2	.290	.300	.310	7.37	7.62	7.87

***** Controlling Parameter
§ Significant Characteristic
JEDEC Equivalent: MO-058
Drawing No. C04-080

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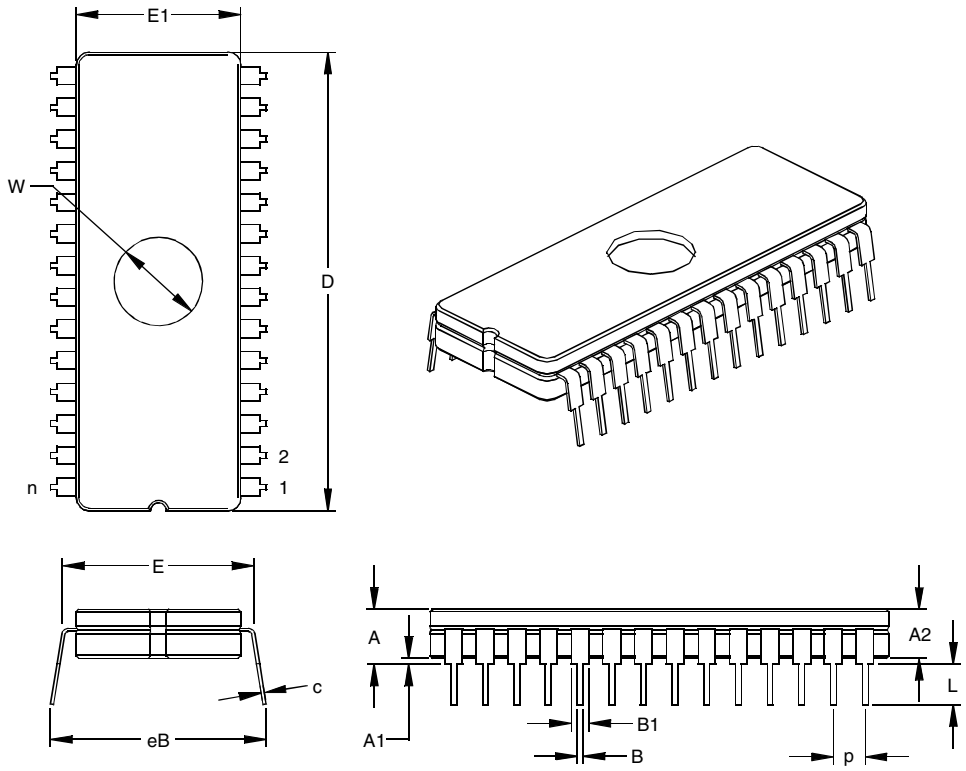
Packaging Diagrams and Parameters

28-Lead Ceramic Dual In-line with Window (JW) – 600 mil Body (CERDIP)

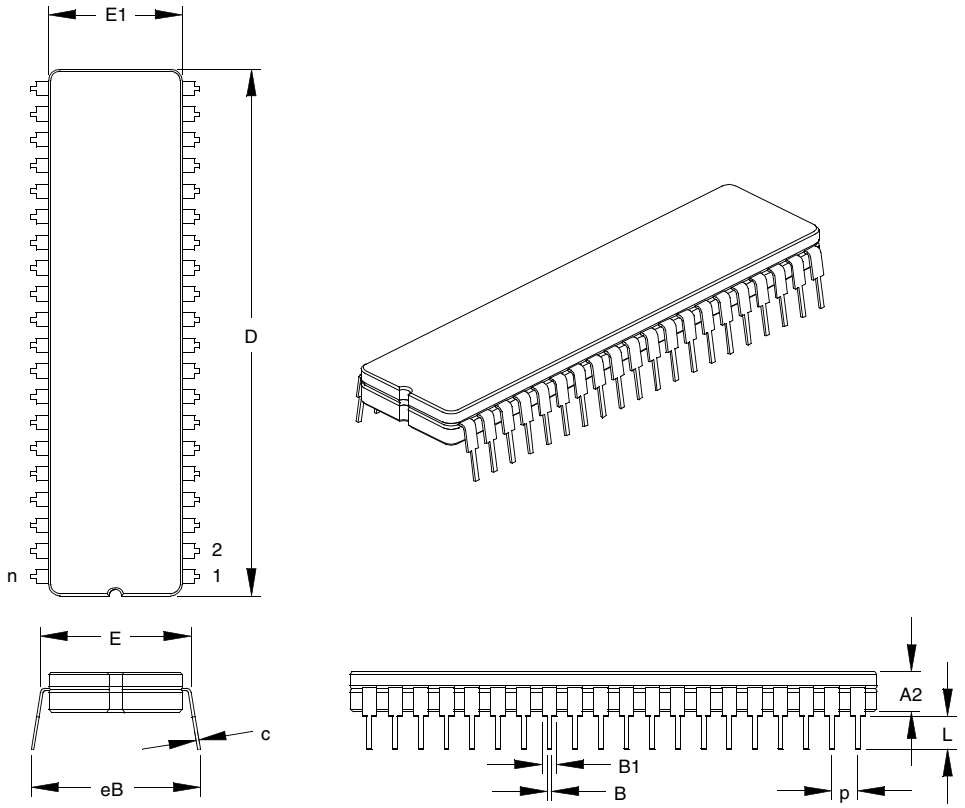


Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.195	.210	.225	4.95	5.33	5.72
Ceramic Package Height	A2	.155	.160	.165	3.94	4.06	4.19
Standoff	A1	.015	.038	.060	0.38	0.95	1.52
Shoulder to Shoulder Width	E	.595	.600	.625	15.11	15.24	15.88
Ceramic Pkg. Width	E1	.514	.520	.526	13.06	13.21	13.36
Overall Length	D	1.430	1.460	1.490	36.32	37.08	37.85
Tip to Seating Plane	L	.125	.138	.150	3.18	3.49	3.81
Lead Thickness	c	.008	.010	.012	0.20	0.25	0.30
Upper Lead Width	B1	.050	.058	.065	1.27	1.46	1.65
Lower Lead Width	B	.016	.020	.023	0.41	0.51	0.58
Overall Row Spacing §	eB	.610	.660	.710	15.49	16.76	18.03
Window Diameter	W	.270	.280	.290	6.86	7.11	7.37

***** Controlling Parameter
§ Significant Characteristic
JEDEC Equivalent: MO-103
Drawing No. C04-013

Packaging Diagrams and Parameters

40-Lead Ceramic Dual In-line (JK) – 600 mil Body (CERDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		40			40	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.170	.190	.225	4.32	4.83	5.72
Ceramic Package Height	A2	.140	--	.180	3.56	--	4.57
Standoff §	A1	.020	.040	.060	0.51	1.02	1.52
Shoulder to Shoulder Width	E	.590	.605	.625	14.99	15.37	15.88
Ceramic Pkg. Width	E1	.512	.520	.528	13.00	13.21	13.41
Overall Length	D	2.042	2.050	2.070	51.87	52.07	52.58
Tip to Seating Plane	L	.125	.163	.200	3.18	4.14	5.08
Lead Thickness	c	.008	.012	.014	0.20	0.30	0.36
Upper Lead Width	B1	.045	.055	.065	1.14	1.40	1.65
Lower Lead Width	B	.015	.018	.023	0.38	0.46	0.58
Overall Row Spacing	eB	.625	.660	.710	15.88	16.76	18.03

* Controlling Parameter
§ Significant Characteristic
JEDEC Equivalent: MS-103
Drawing No. C04-008

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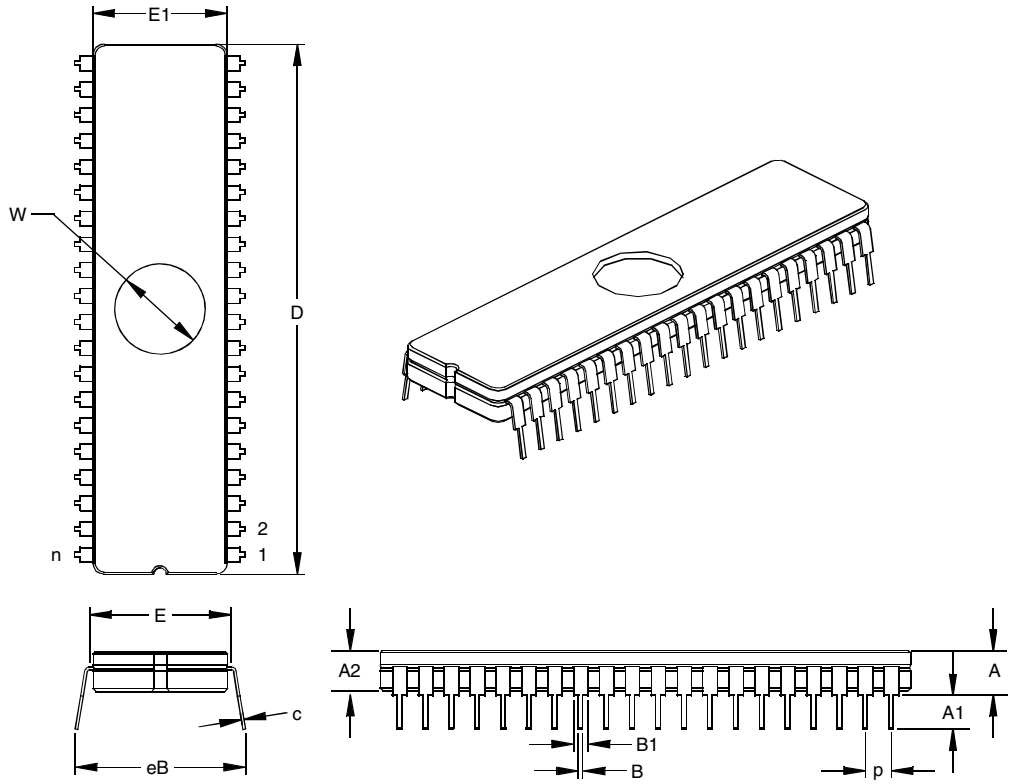
Packaging Diagrams and Parameters

40-Lead Ceramic Dual In-line with Window (JW) – 600 mil Body (CERDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		40			40	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.185	.205	.225	4.70	5.21	5.72
Ceramic Package Height	A2	.155	.160	.165	3.94	4.06	4.19
Standoff	A1	.030	.045	.060	0.76	1.14	1.52
Shoulder to Shoulder Width	E	.595	.600	.625	15.11	15.24	15.88
Ceramic Pkg. Width	E1	.514	.520	.526	13.06	13.21	13.36
Overall Length	D	2.040	2.050	2.060	51.82	52.07	52.32
Tip to Seating Plane	L	.135	.140	.145	3.43	3.56	3.68
Lead Thickness	c	.008	.011	.014	0.20	0.28	0.36
Upper Lead Width	B1	.050	.053	.055	1.27	1.33	1.40
Lower Lead Width	B	.016	.020	.023	0.41	0.51	0.58
Overall Row Spacing §	eB	.610	.660	.710	15.49	16.76	18.03
Window Diameter	W	.340	.350	.360	8.64	8.89	9.14

* Controlling Parameter
§ Significant Characteristic
JEDEC Equivalent: MO-103
Drawing No. C04-014

Packaging Diagrams and Parameters

NOTES:

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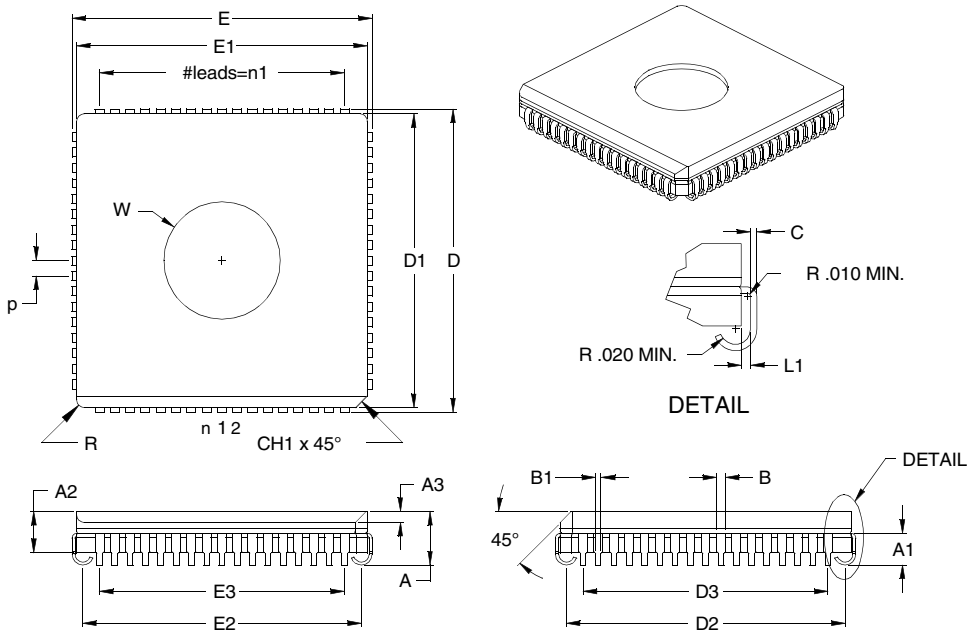
Packaging Diagrams and Parameters

68-Lead Ceramic Leaded (CL) Chip Carrier with Window – Square (CERQUAD)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		68			68	
Pins each side	n1		17			17	
Pitch	p		.050			1.27	
Overall Height	A	.155	.172	.190	3.94	4.37	4.83
Package Thickness	A2		.132 REF			3.35 REF	
Lead Height	A1	.090	.100	.120	2.29	2.54	3.05
Side One Chamfer Dim.	A3	.030	.035	.040	0.76	0.89	1.02
Corner Chamfer (1)	CH1	.030	.040	.050	0.76	1.02	1.27
Corner Radius (Others)	R	.020	.025	.030	0.51	0.64	0.76
Overall Package Width	E	.985	.990	.995	25.02	25.15	25.27
Overall Package Length	D	.985	.990	.995	25.02	25.15	25.27
Ceramic Package Width	E1	.930	.950	.965	23.62	24.13	24.51
Ceramic Package Length	D1	.930	.950	.965	23.62	24.13	24.51
Overall Lead Centers	E3		.800 REF			20.32 REF	
Overall Lead Centers	D3		.800 REF			20.32 REF	
Footprint	E2	.880	.910	.940	22.35	23.11	23.88
Footprint	D2	.880	.910	.940	22.35	23.11	23.88
Lead Length	L1	.006	-	-	0.15	-	-
Lead Thickness	C	.006	.007	.010	0.15	0.18	0.25
Upper Lead Width	B1	.026	.029	.032	0.66	0.74	0.81
Lower Lead Width	B	.017	.019	.021	0.43	0.48	0.53
Window Diameter	W	.370	.380	.390	9.40	9.65	9.91

***** Controlling Parameter

Notes:

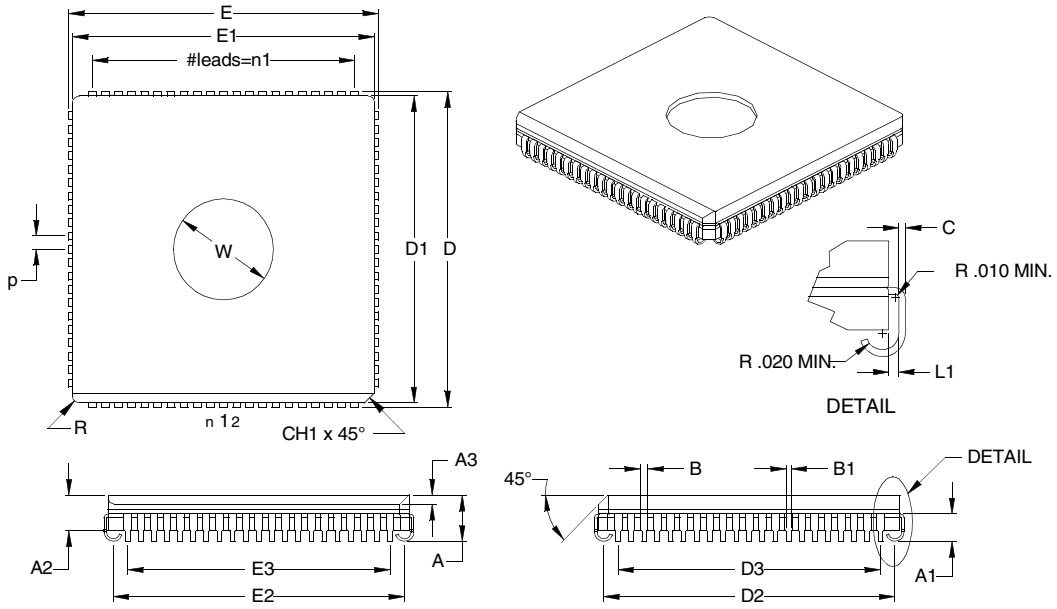
REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent: MO-087

Drawing No. C04-097

Revised 07-22-05

84-Lead Ceramic Leaded (CL) Chip Carrier with Window – Square (CERQUAD)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		84			84	
Pins each side	n1		21			21	
Pitch	p		.050			1.27	
Overall Height	A	.155	.172	.190	3.94	4.37	4.83
Package Thickness	A2		.132 REF			3.35 REF	
Lead Height	A1	.090	.100	.120	2.29	2.54	3.05
Side One Chamfer Dim.	A3	.030	.035	.040	0.76	0.89	1.02
Corner Chamfer (1)	CH1		.040 REF			1.02 REF	
Corner Radius (others)	R	-	-	.025	-	-	0.64
Overall Package Width	E	1.185	1.190	1.195	30.10	30.23	30.35
Overall Package Length	D	1.185	1.190	1.195	30.10	30.23	30.35
Ceramic Package Width	E1	1.130	1.150	1.165	28.70	29.21	29.59
Ceramic Package Length	D1	1.130	1.150	1.165	28.70	29.31	29.59
Overall Lead Centers	E3		1.00 REF			25.40 REF	
Overall Lead Centers	D3		1.00 REF			25.40 REF	
Footprint	E2	1.080	1.110	1.140	27.43	28.19	28.96
Footprint	D2	1.080	1.110	1.140	27.43	28.19	28.96
Lead Length	L1	.006	-	-	0.15	-	-
Lead Thickness	C	.006	.007	.010	0.15	0.18	0.25
Lower Lead Width	B1	.017	.019	.021	0.43	0.48	0.53
Upper Lead Width	B	.026	.029	.032	0.66	0.74	0.81
Window Diameter	W	.395	.400	.405	10.03	10.16	10.29

* Controlling Parameter

Notes:

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent: MO-087 Revised 07-22-05

Drawing No. C04-112

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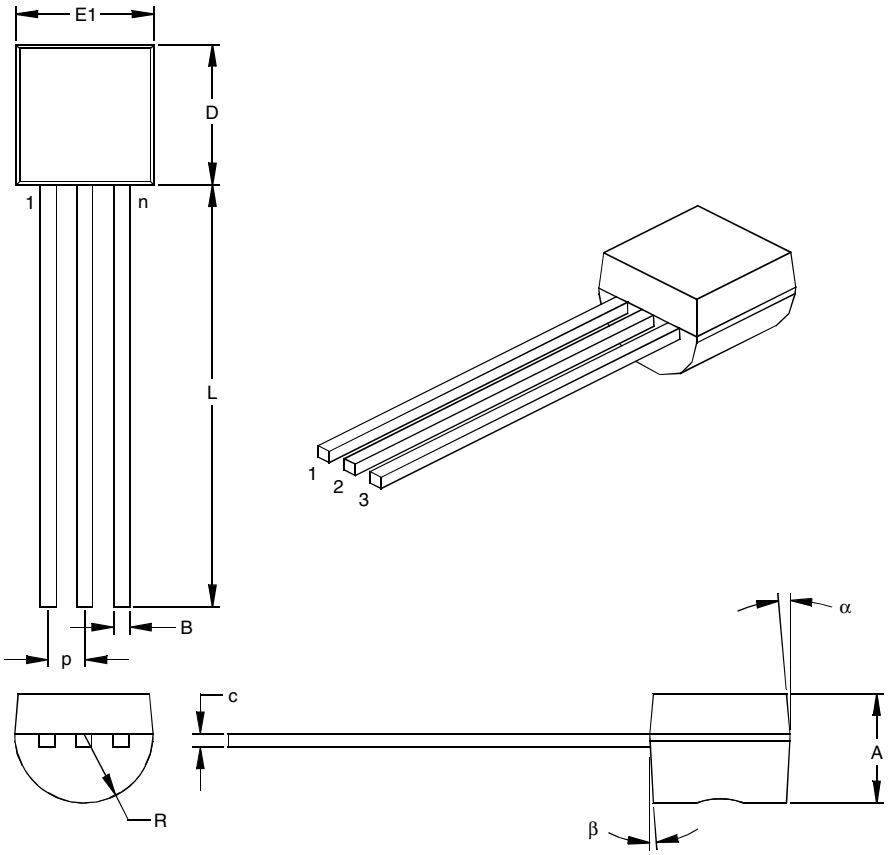
Packaging Diagrams and Parameters

3-Lead Plastic Transistor Outline (TO) (TO-92)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		3			3	
Pitch	p		.050			1.27	
Bottom to Package Flat	A	.130	.143	.155	3.30	3.62	3.94
Overall Width	E1	.175	.186	.195	4.45	4.71	4.95
Overall Length	D	.170	.183	.195	4.32	4.64	4.95
Molded Package Radius	R	.085	.090	.095	2.16	2.29	2.41
Tip to Seating Plane	L	.500	.555	.610	12.70	14.10	15.49
Lead Thickness	c	.014	.017	.020	0.36	0.43	0.51
Lead Width	B	.016	.019	.022	0.41	0.48	0.56
Mold Draft Angle Top	α	4	5	6	4	5	6
Mold Draft Angle Bottom	β	2	3	4	2	3	4

***** Controlling Parameter

Notes:

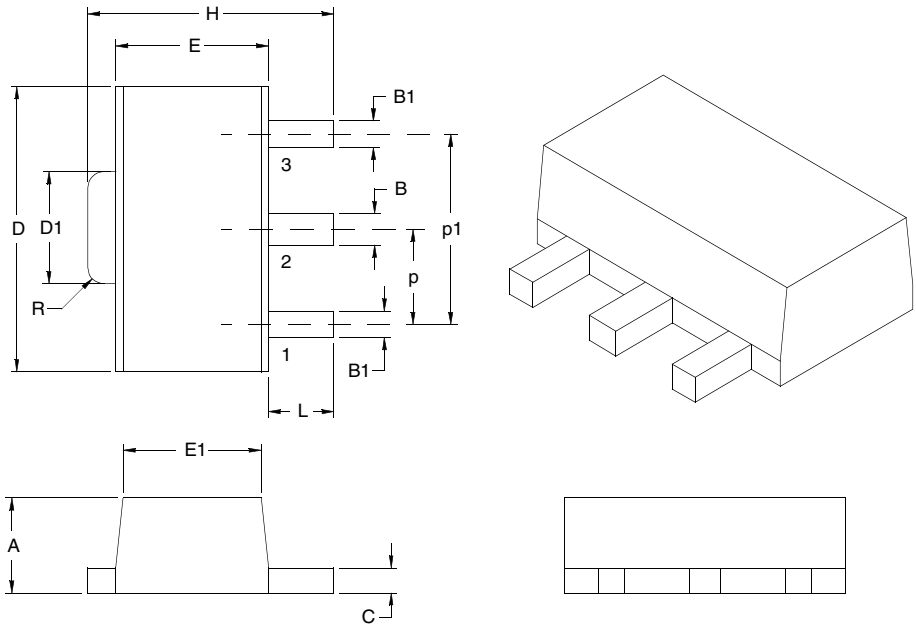
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.

JEDEC Equivalent: TO-92

Drawing No. C04-101

Packaging Diagrams and Parameters

3-Lead Plastic Small Outline Transistor Header (MB) (SOT-89)



Units		INCHES		MILLIMETERS*	
Dimension Limits		MIN	MAX	MIN	MAX
Pitch	p	.059 BSC		1.50 BSC	
Outside Lead Pitch	p1	.118 BSC		3.00 BSC	
Overall Height	A	.055	.063	1.40	1.60
Overall Width	H	.155	.167	3.94	4.25
Molded Package Width at Base	E	.090	.102	2.29	2.60
Molded Package Width at Top	E1	.084	.090	2.13	2.29
Overall Length	D	.173	.181	4.40	4.60
Tab Length	D1	.064	.072	1.62	1.83
Tab Corner Radii	R	.010		0.254	
Foot Length	L	.035	.047	0.89	1.20
Lead Thickness	c	.014	.019	0.35	0.48
Lead 2 Width	B	.017	.022	0.43	0.56
Leads 1 & 3 Width	B1	.014	.019	0.36	0.48

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

See ASME Y14.5M

JEDEC Equivalent: TO-243

Drawing No. C04-029

Revised 09-19-03

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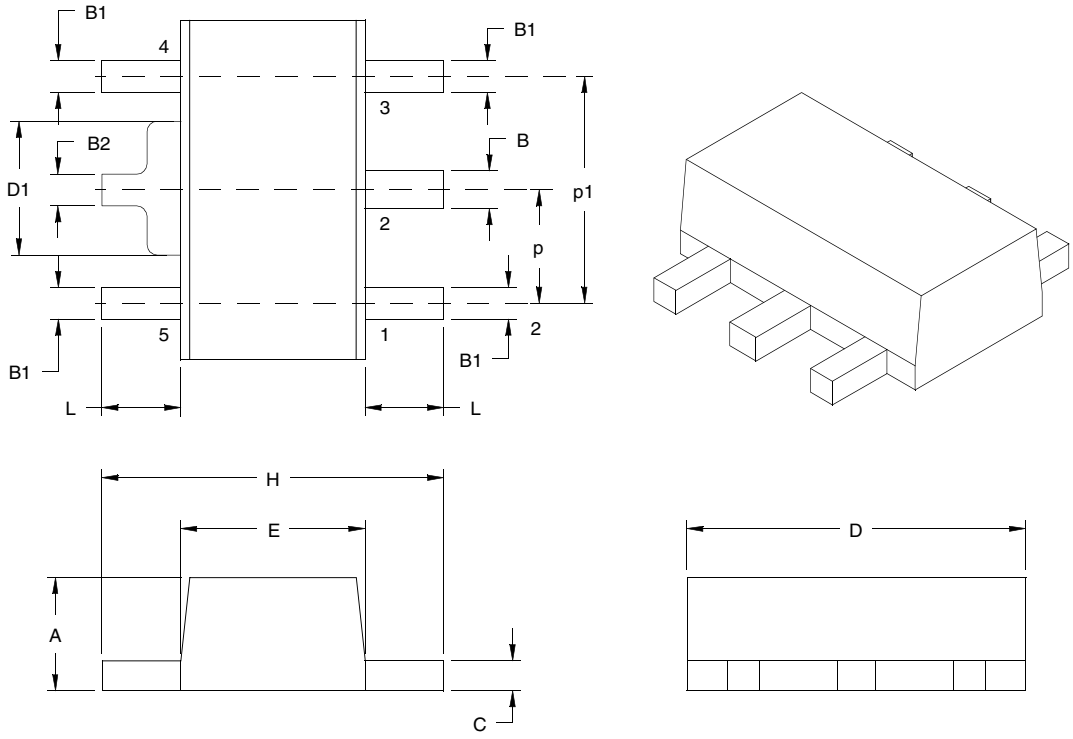
Packaging Diagrams and Parameters

5-Lead Plastic Small Outline Transistor Header (MT) (SOT-89)



Units		INCHES		MILLIMETERS*	
Dimension Limits		MIN	MAX	MIN	MAX
Pitch	p	.059 BSC		1.50 BSC	
Outside lead pitch (basic)	p1	.118 BSC		3.00 BSC	
Overall Height	A	.055	.063	1.40	1.60
Overall Width	H	-	.177	-	4.50
Molded Package Width	E	.090	.102	2.29	2.60
Overall Length	D	.173	.181	4.40	4.60
Tab Width	D1	.055	.071	1.40	1.80
Foot Length	L	.031	-	0.80	-
Lead Thickness	c	.015	.017	0.37	0.44
Lead 2 Width	B	.016	.021	0.41	0.53
Leads 1,3, 4 & 5 Width	B1	.014	.019	0.36	0.48
Tab Lead Width	B2	.013	.019	0.32	0.48

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

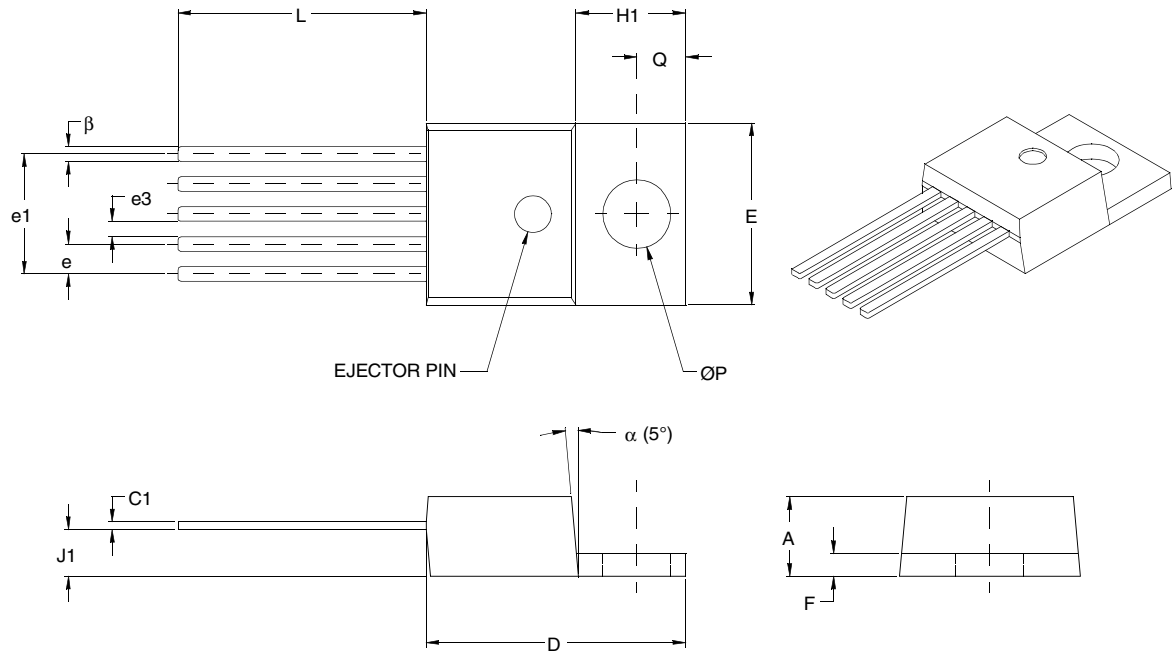
REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent TO-243 AA

Drawing No. C04-030

Packaging Diagrams and Parameters

5-Lead Plastic Transistor Outline (AB) (TO-220)



Units		INCHES*		MILLIMETERS	
Dimension Limits		MIN	MAX	MIN	MAX
Lead Pitch	e	.060	.072	1.52	1.83
Overall Lead Centers	e1	.263	.273	6.68	6.93
Space Between Leads	e3	.030	.040	0.76	1.02
Overall Height	A	.160	.190	4.06	4.83
Overall Width	E	.385	.415	9.78	10.54
Overall Length	D	.560	.590	14.22	14.99
Flag Length	H1	.234	.258	5.94	6.55
Flag Thickness	F	.045	.055	1.14	1.40
Through Hole Center	Q	.103	.113	2.62	2.87
Through Hole Diameter	P	.146	.156	3.71	3.96
Lead Length	L	.540	.560	13.72	14.22
Base to Bottom of Lead	J1	.090	.115	2.29	2.92
Lead Thickness	C1	.014	.022	0.36	0.56
Lead Width	β	.025	.040	0.64	1.02
Mold Draft Angle	α	3°	7°	3°	7°

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254 mm) per side.

JEDEC equivalent: TO-220

Drawing No. C04-036

Revised 08-01-05

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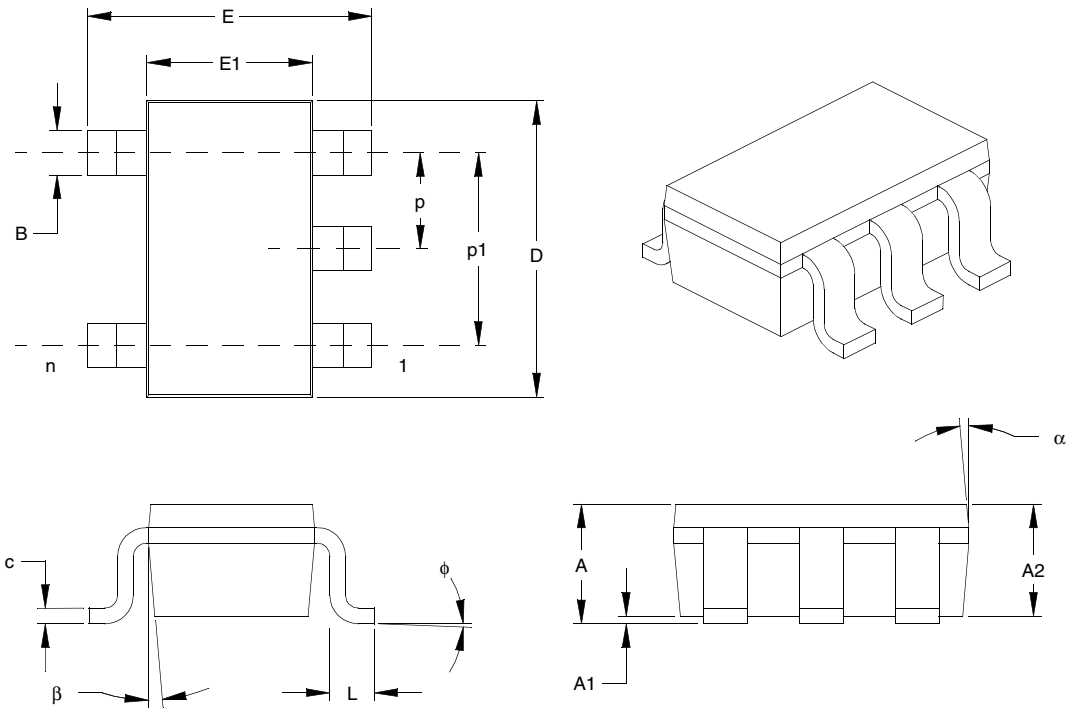
Packaging Diagrams and Parameters

5-Lead Thin Small Outline Transistor (OS) (TSOT)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		5			5	
Pitch	p		.037 BSC.			0.95 BSC.	
Outside lead pitch	p1		.075 BSC.			1.90 BSC.	
Overall Height	A			.039			1.00
Molded Package Thickness	A2	.033	.034	.035	0.84	0.87	0.90
Standoff	A1	.000	.002	.004	0.01	0.05	0.10
Overall Width	E	.102	.110	.118	2.60	2.80	3.00
Molded Package Width	E1		.063			1.60	
Overall Length	D		.114			2.90	
Foot Length	L	.012	.016	.020	0.30	0.40	0.50
Foot Angle	φ	0°	4°	8°	0°	4°	8°
Lead Thickness	c	.004	.006	.008	0.09	0.15	0.20
Lead Width	B	.012		.018	0.30		0.45
Mold Draft Angle Top	α	4°	10°	12°	4°	10°	12°
Mold Draft Angle Bottom	β	4°	10°	12°	4°	10°	12°

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

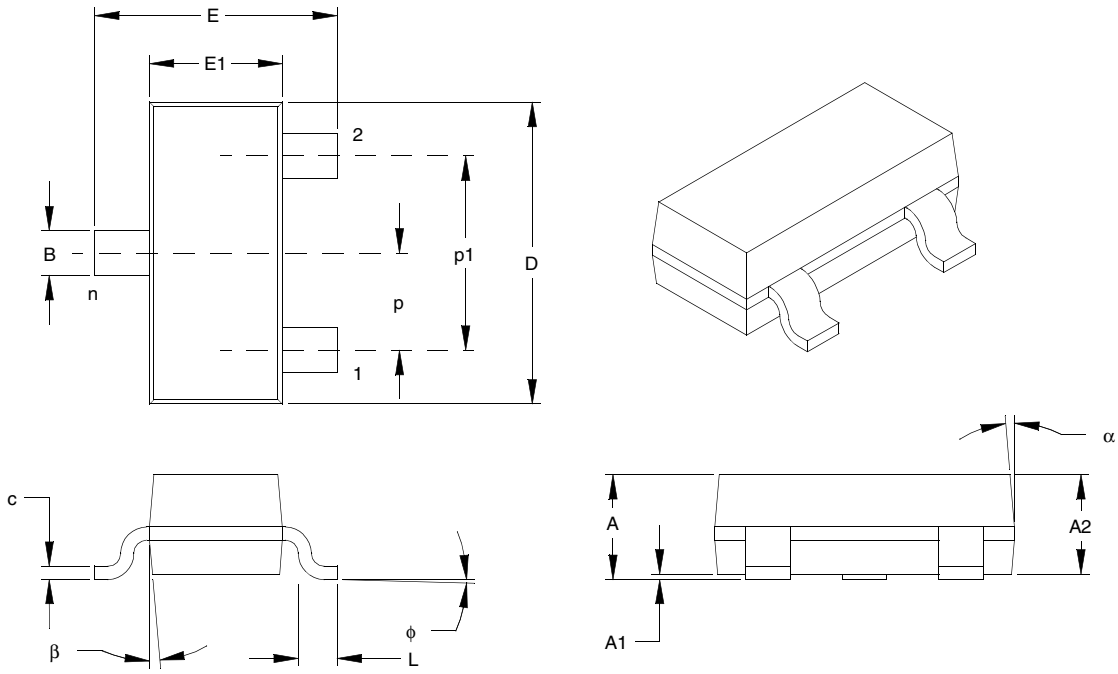
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

See ASME Y14.5M

Drawing No. C04-128

Revised 9-14-05

3-Lead Plastic Small Outline Transistor (TT) (SOT-23)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		3			3	
Pitch	p		.038			0.96	
Outside lead pitch (basic)	p1		.076			1.92	
Overall Height	A	.035	.040	.044	0.89	1.01	1.12
Molded Package Thickness	A2	.035	.037	.040	0.88	0.95	1.02
Standoff	A1	.000	.002	.004	0.01	0.06	0.10
Overall Width	E	.083	.093	.104	2.10	2.37	2.64
Molded Package Width	E1	.047	.051	.055	1.20	1.30	1.40
Overall Length	D	.110	.115	.120	2.80	2.92	3.04
Foot Length	L	.014	.018	.022	0.35	0.45	0.55
Foot Angle	φ	0°	5°	10°	0°	5°	10°
Lead Thickness	c	.004	.006	.007	0.09	0.14	0.18
Lead Width	B	.015	.017	.020	0.37	0.44	0.51
Mold Draft Angle Top	α	0°	5°	10°	0°	5°	10°
Mold Draft Angle Bottom	β	0°	5°	10°	0°	5°	10°

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent: TO-236
Drawing No. C04-104

Revised 07-19-05

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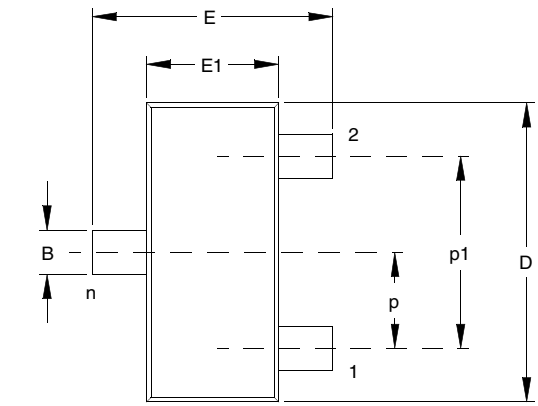
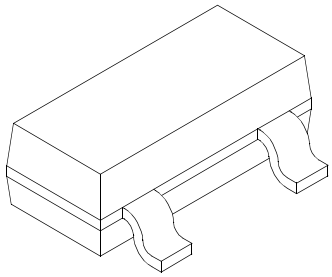
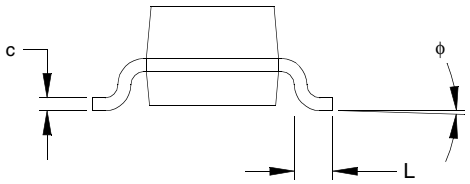
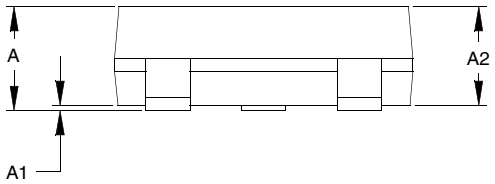
Packaging Diagrams and Parameters

3-Lead Plastic Small Outline Transistor (CB) (SOT-23A)









Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		3			3	
Pitch	p		.037 BSC			0.95 BSC	
Outside lead pitch (basic)	p1		.075 BSC			1.90 BSC	
Overall Height	A	.035		.055	0.90	–	1.40
Molded Package Thickness	A2	.035	–	.051	0.90	–	1.30
Standoff	A1	.000	–	.006	0.00	–	0.15
Overall Width	E	.098	–	.118	2.50	–	3.00
Molded Package Width	E1	.055	–	.071	1.40	–	1.80
Overall Length	D	.106	–	.122	2.70	–	3.10
Foot Length	L	.014	–	.022	0.35	–	0.55
Foot Angle	ϕ	0°	–	10°	0°	–	10°
Lead Thickness	c	.004	–	.014	0.10	–	0.35
Lead Width	B	.012	–	.019	0.30	–	0.50

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

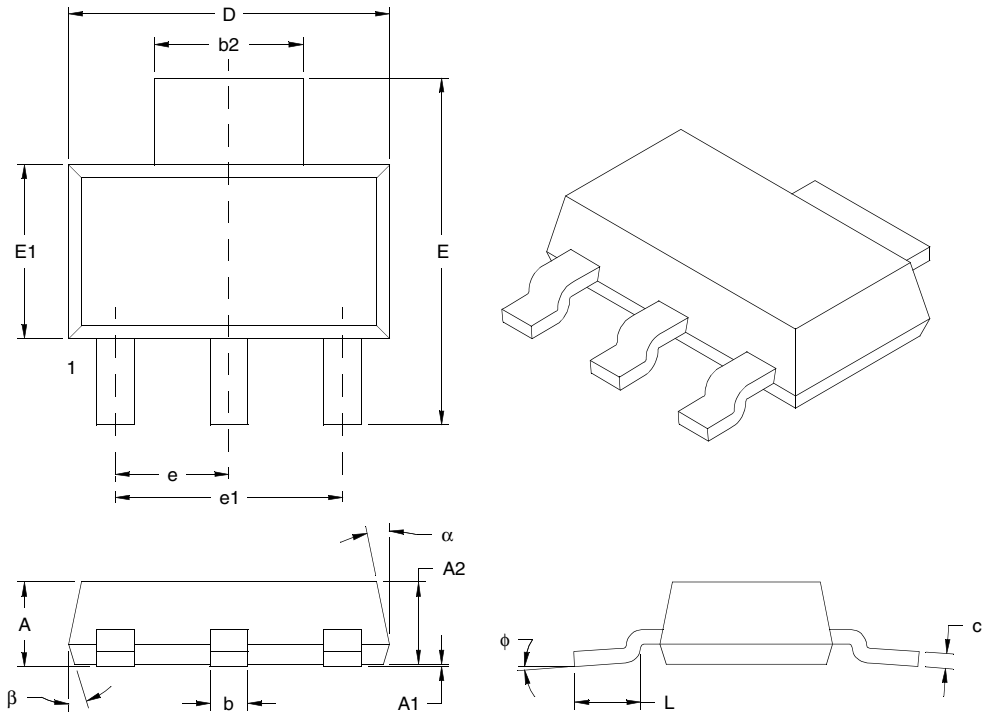
EIAJ Equivalent: SC-59

Drawing No. C04-130

Revised 09-14-05

Packaging Diagrams and Parameters

3-Lead Plastic Small Outline Transistor (DB) (SOT-223)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	e		.091 BSC			2.30 BSC	
Outside lead pitch (basic)	e1		.181 BSC			4.60 BSC	
Overall Height	A	–	–	.071	–	–	1.80
Standoff	A1	.001	–	.004	0.02	–	0.10
Molded Package Height	A2	.061	.063	.065	1.55	1.60	1.65
Overall Width	E	.264	.276	.287	6.70	7.00	7.30
Molded Package Width	E1	.130	.138	.146	3.30	3.50	3.70
Overall Length	D	.248	.256	.264	6.30	6.50	6.70
Lead Thickness	c	.009	.012	.014	0.23	0.30	0.35
Lead Width	b	.026	.030	.033	0.65	0.76	0.85
Tab Lead Width	b2	.114	.118	.124	2.90	3.00	3.15
Foot Length	L	.035	–	–	0.90	–	–
Lead Angle	ϕ	0°	–	10°	–	0.37	10°
Mold Draft Angle, Top	α	10°	–	16°	10°	–	16°
Mold Draft Angle, Bottom	β	10°	–	16°	10°	–	16°

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

See ASME Y14.5M

JEDEC Equivalent TO-261 AA

Drawing No. C04-032

Revised 09-13-05

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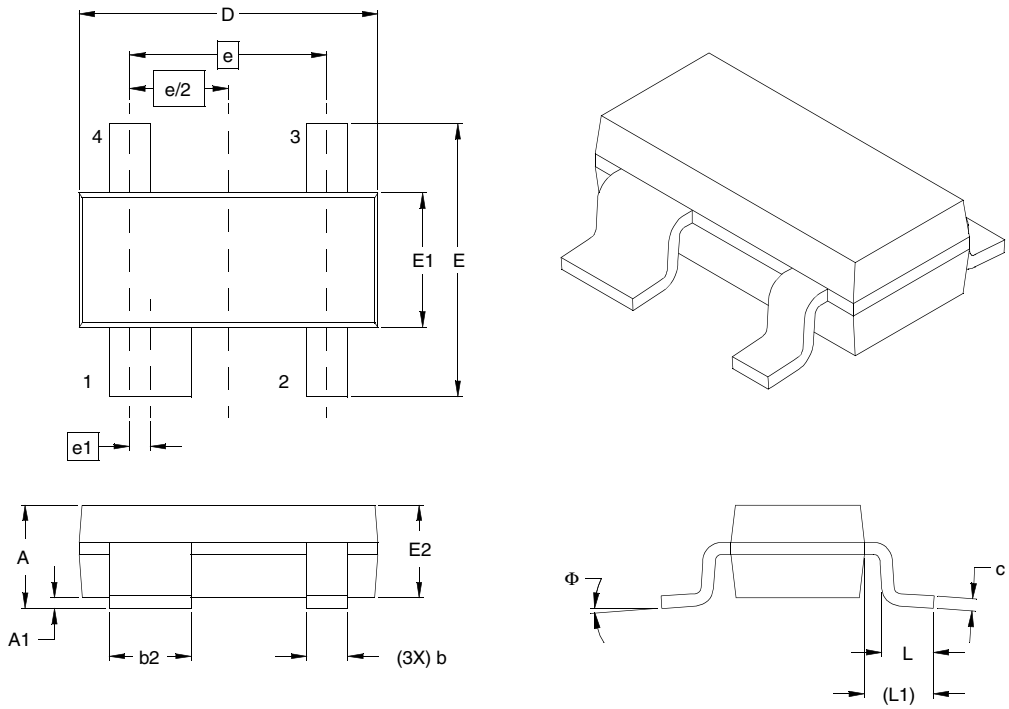
Packaging Diagrams and Parameters

4-Lead Plastic Small Outline Transistor (RC) (SOT-143)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		4			4	
Pitch	e	.076 BSC			1.92 BSC		
Pin 1 Offset	e1	.008 BSC			0.20 BSC		
Overall Height	A	.031	–	.048	0.80	–	1.22
Molded Package Thickness	A2	.030	.035	.042	0.75	0.90	1.07
Standoff §	A1	.002	–	.006	0.05	–	0.15
Overall Width	E	.083	–	.104	2.10	–	2.64
Molded Package Width	E1	.047	.051	.055	1.20	1.30	1.40
Overall Length	D	.110	.114	.120	2.80	2.90	3.04
Foot Length	L	.016	.020	.024	0.40	0.50	0.60
Footprint	(L1)	.063 REF			1.60 REF		
Foot Angle	Φ	0	–	8°	0	–	8°
Lead Thickness	c	.003	–	.008	0.08	–	0.20
Lead 1 Width	b1	.030	–	.035	0.76	–	0.89
Leads 2, 3 & 4 Width	b	.012	–	.020	0.30	–	0.50

***** Controlling Parameter

§ Significant Characteristic

Notes:

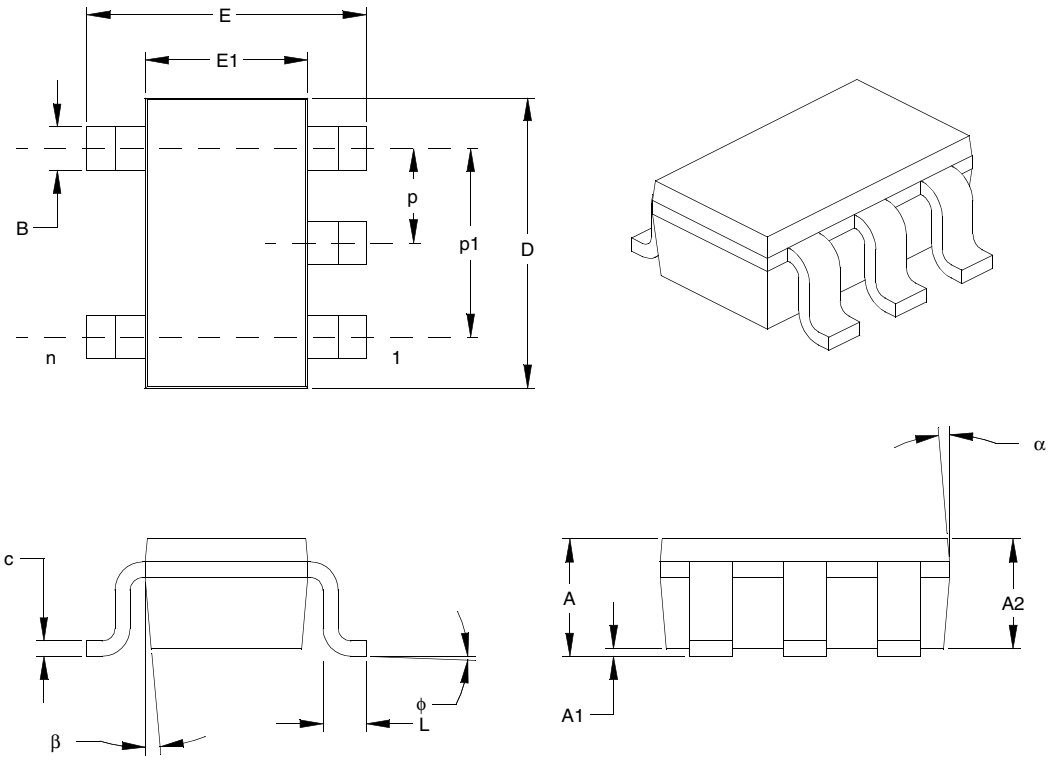
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC equivalent: TO-253

Drawing No. C04-031

Revised 08-12-05

5-Lead Plastic Small Outline Transistor (OT) (SOT-23)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		5			5	
Pitch	p		.038			0.95	
Outside lead pitch (basic)	p1		.075			1.90	
Overall Height	A	.035	.046	.057	0.90	1.18	1.45
Molded Package Thickness	A2	.035	.043	.051	0.90	1.10	1.30
Standoff	A1	.000	.003	.006	0.00	0.08	0.15
Overall Width	E	.102	.110	.118	2.60	2.80	3.00
Molded Package Width	E1	.059	.064	.069	1.50	1.63	1.75
Overall Length	D	.110	.116	.122	2.80	2.95	3.10
Foot Length	L	.014	.018	.022	0.35	0.45	0.55
Foot Angle	f	0	5	10	0	5	10
Lead Thickness	c	.004	.006	.008	0.09	0.15	0.20
Lead Width	B	.014	.017	.020	0.35	0.43	0.50
Mold Draft Angle Top	a	0	5	10	0	5	10
Mold Draft Angle Bottom	b	0	5	10	0	5	10

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

EIAJ Equivalent: SC-74A

Drawing No. C04-091

Revised 09-12-05

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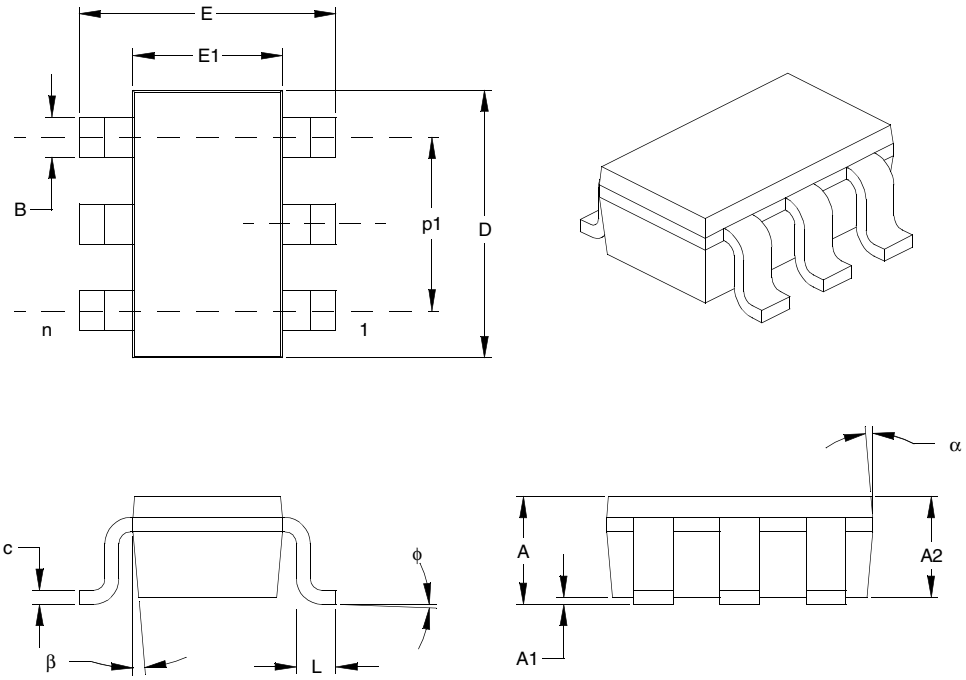
Packaging Diagrams and Parameters

6-Lead Plastic Small Outline Transistor (CH or OT) (SOT-23)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		6			6	
Pitch	p		.038 BSC			0.95 BSC	
Outside lead pitch	p1		.075 BSC			1.90 BSC	
Overall Height	A	.035	.046	.057	0.90	1.18	1.45
Molded Package Thickness	A2	.035	.043	.051	0.90	1.10	1.30
Standoff	A1	.000	.003	.006	0.00	0.08	0.15
Overall Width	E	.102	.110	.118	2.60	2.80	3.00
Molded Package Width	E1	.059	.064	.069	1.50	1.63	1.75
Overall Length	D	.110	.116	.122	2.80	2.95	3.10
Foot Length	L	.014	.018	.022	0.35	0.45	0.55
Foot Angle	φ	0	5	10	0	5	10
Lead Thickness	c	.004	.006	.008	0.09	0.15	0.20
Lead Width	B	.014	.017	.020	0.35	0.43	0.50
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

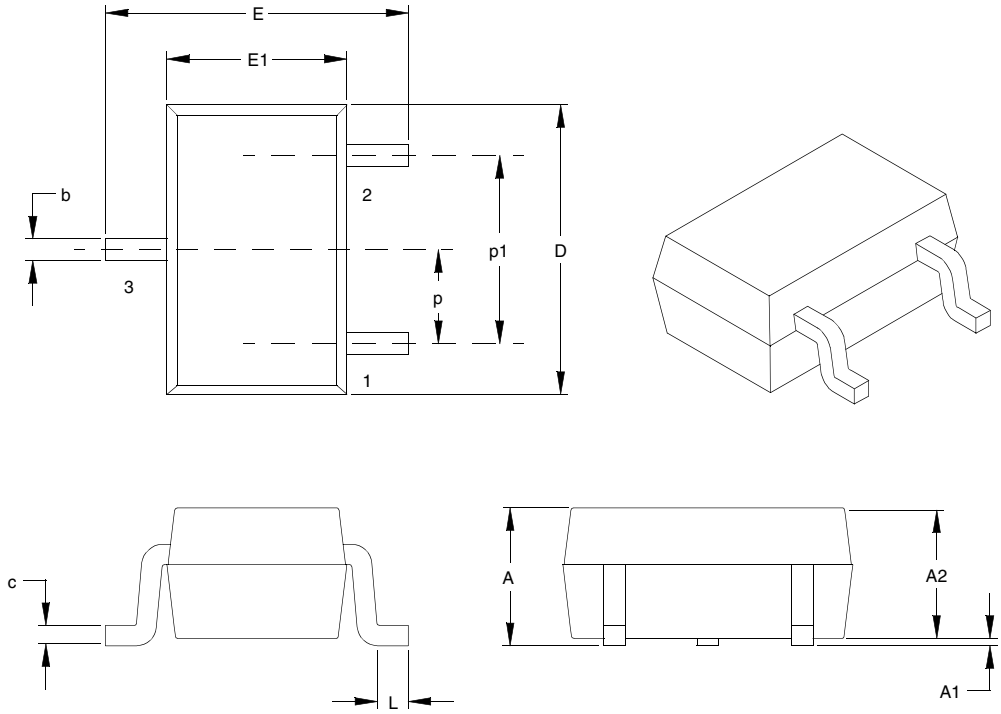
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

JEITA (formerly EIAJ) equivalent: SC-74A

Drawing No. C04-120

Revised 09-12-05

3-Lead Plastic Small Outline Transistor (LB) (SC-70)



Units		INCHES		MILLIMETERS*	
Dimension Limits		MIN	MAX	MIN	MAX
Number of Pins		3		3	
Pitch	p	.026 BSC		0.65 BSC	
Outside lead pitch	p1	.051 BSC		1.30 BSC	
Overall Height	A	.031	.043	0.80	1.10
Molded Package Thickness	A2	.031	.039	0.80	1.00
Standoff	A1	.000	.0004	0.00	.010
Overall Width	E	.071	.094	1.80	2.40
Molded Package Width	E1	.045	.053	1.15	1.35
Overall Length	D	.071	.089	1.80	2.25
Foot Length	L	.008	.018	0.21	0.46
Lead Thickness	c	.003	.010	0.08	0.25
Lead Width	b	.006	.016	0.15	0.40

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

JEITA (EIAJ) Equivalent: SC70

Drawing No. C04-060

Updated 10-07-05

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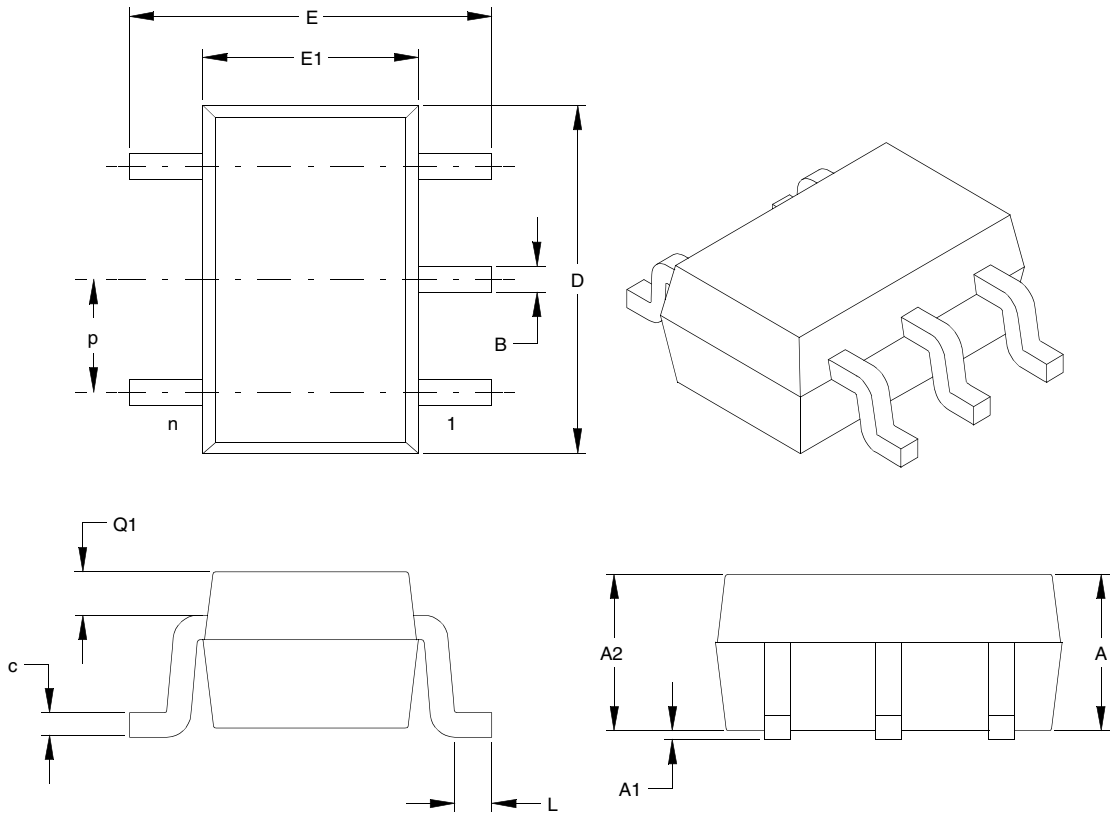
Packaging Diagrams and Parameters

5-Lead Plastic Small Outline Transistor (LT) (SC-70)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		5			5	
Pitch	p		.026 (BSC)			0.65 (BSC)	
Overall Height	A	.031		.043	0.80		1.10
Molded Package Thickness	A2	.031		.039	0.80		1.00
Standoff	A1	.000		.004	0.00		0.10
Overall Width	E	.071		.094	1.80		2.40
Molded Package Width	E1	.045		.053	1.15		1.35
Overall Length	D	.071		.087	1.80		2.20
Foot Length	L	.004		.012	0.10		0.30
Top of Molded Pkg to Lead Shoulder	Q1	.004		.016	0.10		0.40
Lead Thickness	c	.004		.007	0.10		0.18
Lead Width	B	.006		.012	0.15		0.30

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

See ASME Y14.5M

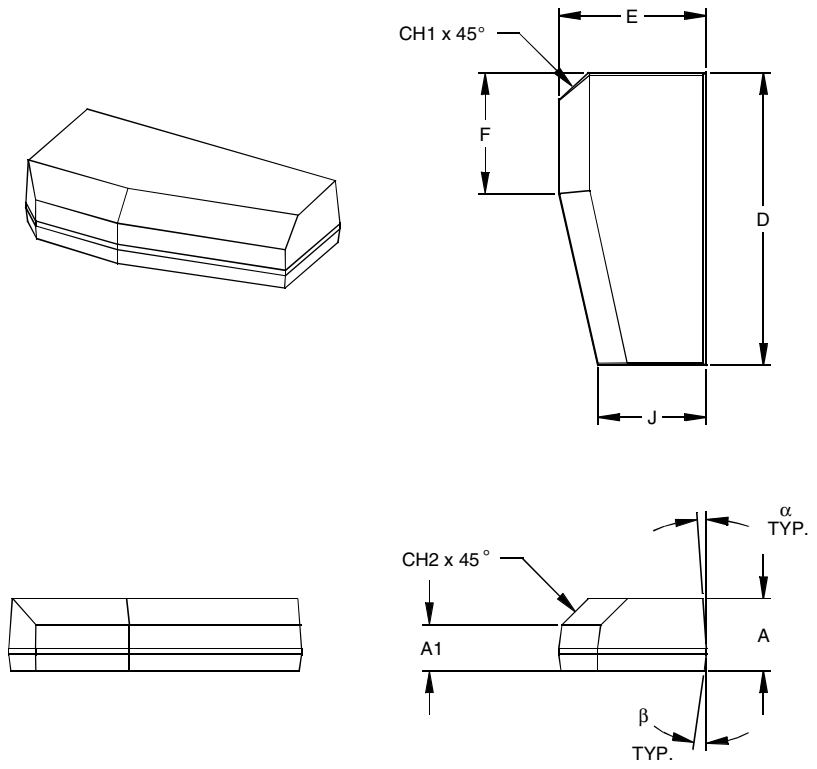
JEITA (EIAJ) Standard: SC-70

Drawing No. C04-061

Revised 07-19-05

Packaging Diagrams and Parameters

Leadless Wedge Module Plastic Small Outline Transistor (WM) (SOT-385)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Overall Height	A	.114	.118	.120	2.90	3.00	3.05
Bottom of Package to Chamfer	A1	.075	.079	.083	1.90	2.00	2.10
Overall Width	E	.236	.240	2.44	6.00	6.10	6.20
Overall Length	D	.472	.476	.480	12.00	12.10	12.20
Width at Tapered End	J	.173	.177	.181	4.40	4.50	4.60
Length of Flat	F	.193	.197	.200	4.90	5.00	5.10
Chamfer Distance, Horizontal	CH1	.039	.043	.047	1.00	1.10	1.20
Chamfer Distance, Vertical	CH2	.039	.043	.047	1.00	1.10	1.20
Mold Draft Angle Top	α	4	6	8	4	6	8
Mold Draft Angle Bottom	β	4	6	8	4	6	8

* Controlling Parameter

Notes:

Dimensions D, E, F and J do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
Drawing No. C04-109

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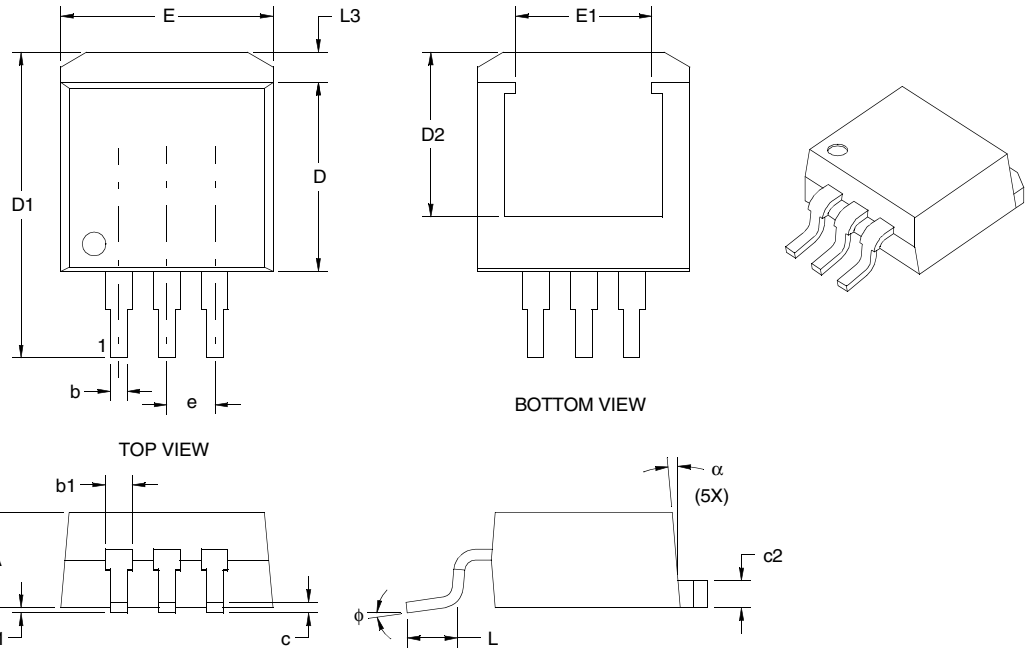
Packaging Diagrams and Parameters

3-Lead Plastic (EB) (DDPAK)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins			3			3	
Pitch	e		1.00 BSC			2.54 BSC	
Overall Height	A	.170	.177	.183	4.32	4.50	4.65
Standoff §	A1	.000	.005	.010	0.00	0.13	0.25
Overall Width	E	.385	.398	.410	9.78	10.11	10.41
Exposed Pad Width	E1		.256 REF			6.50 REF	
Molded Package Length	D	.330	.350	.370	8.38	8.89	9.40
Overall Length	D1	.549	.577	.605	13.94	14.66	15.37
Exposed Pad Length	D2		.303 REF			7.70 REF	
Lead Thickness	c	.014	.020	.026	0.36	0.51	0.66
Pad Thickness	c2	.045	--	.055	1.14	--	1.40
Lower Lead Width	b	.026	.032	.037	0.66	0.81	0.94
Upper Lead Width	b1	.049	.050	.051	1.24	1.27	1.30
Foot Length	L	.068	--	.110	1.73	--	2.79
Pad Length	L3	.045	--	.067	1.14	--	1.70
Foot Angle	ϕ	--	--	8°	--	--	8°
Mold Draft Angle	α	3°	--	7°	3°	--	7°

***** Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

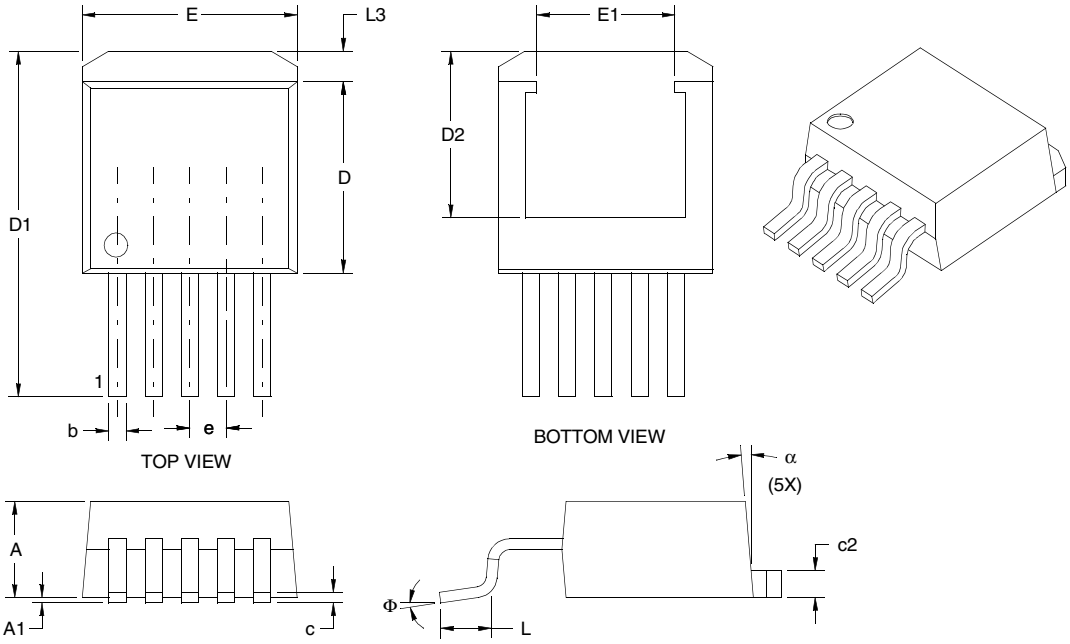
BSC: Basic Dimension. Theoretically, exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC equivalent: TO-252 Revised 07-19-05

Drawing No. C04-011

5-Lead Plastic (ET) (DDPAK)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins			5			5	
Pitch	e		.067 BSC			1.70 BSC	
Overall Height	A	.170	.177	.183	4.32	4.50	4.65
Standoff §	A1	.000	.005	.010	0.00	0.13	0.25
Overall Width	E	.385	.398	.410	9.78	10.11	10.41
Exposed Pad Width	E1		.256 REF			6.50 REF	
Molded Package Length	D	.330	.350	.370	8.38	8.89	9.40
Overall Length	D1	.549	.577	.605	13.94	14.66	15.37
Exposed Pad Length	D2		.303 REF			7.75 REF	
Lead Thickness	c	.014	.020	.026	0.36	0.51	0.66
Pad Thickness	c2	.045	--	.055	1.14	--	1.40
Lead Width	b	.026	.032	.037	0.66	0.81	0.94
Foot Length	L	.068	.089	.110	1.73	2.26	2.79
Pad Length	L3	.045	--	.067	1.14	--	1.70
Foot Angle	Φ	--	--	8°	--	--	8°
Mold Draft Angle	α	3°	--	7°	3°	--	7°

***** Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC equivalent: TO-252

Drawing No. C04-012

Revised 07-19-05

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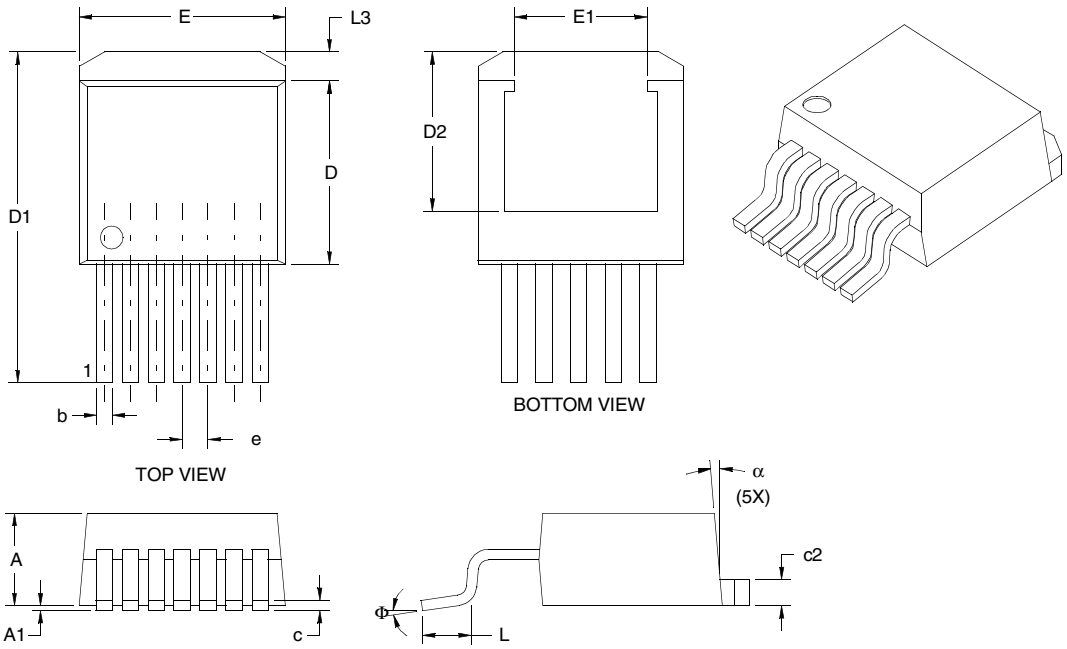
Packaging Diagrams and Parameters

7-Lead Plastic (EK) (DDPAK)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins			5			5	
Pitch	e		.050 BSC			1.27 BSC	
Overall Height	A	.170	.177	.183	4.32	4.50	4.65
Standoff §	A1	.000	.005	.010	0.00	0.13	0.25
Overall Width	E	.385	.398	.410	9.78	10.11	10.41
Exposed Pad Width	E1		.256 REF			6.50 REF	
Molded Package Length	D	.330	.350	.370	8.38	8.89	9.40
Overall Length	D1	.549	.577	.605	13.94	14.66	15.37
Exposed Pad Length	D2		.303 REF			7.75 REF	
Lead Thickness	c	.014	.020	.026	0.36	0.51	0.66
Pad Thickness	c2	.045	--	.055	1.14	--	1.40
Lead Width	b	.026	.032	.037	0.66	0.81	0.94
Foot Length	L	.068	.089	.110	1.73	2.26	2.79
Pad Length	L3	.045	--	.067	1.14	--	1.70
Foot Angle	Φ	--	--	8°	--	--	8°
Mold Draft Angle	α	3°	--	7°	3°	--	7°

***** Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC equivalent: TO-252

Drawing No. C04-015

Packaging Diagrams and Parameters

NOTES:

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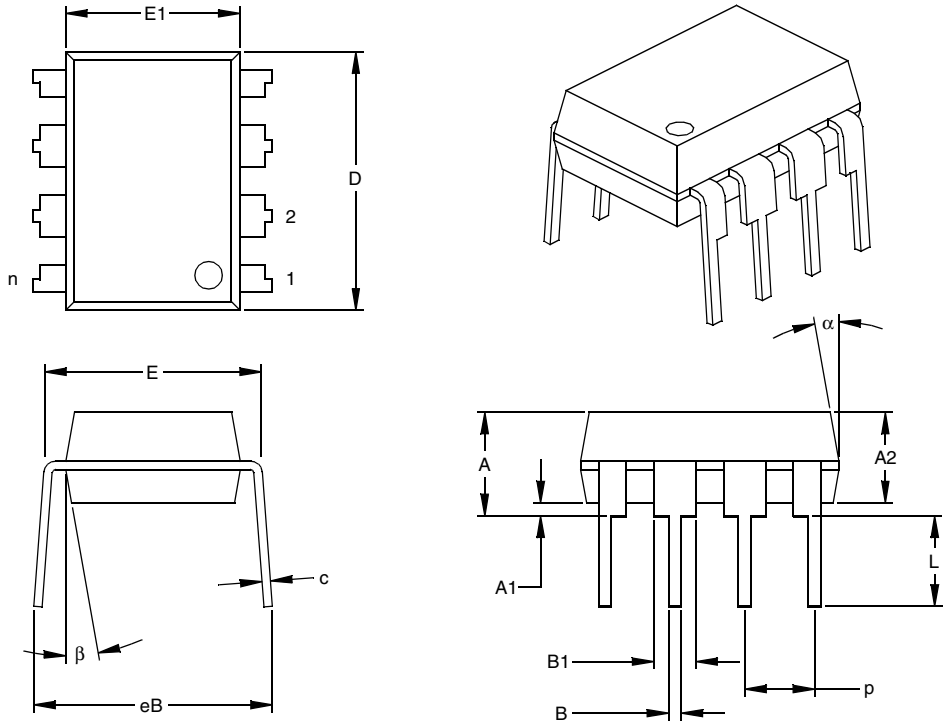
Packaging Diagrams and Parameters

8-Lead Plastic Dual In-line (P) – 300 mil Body (PDIP)

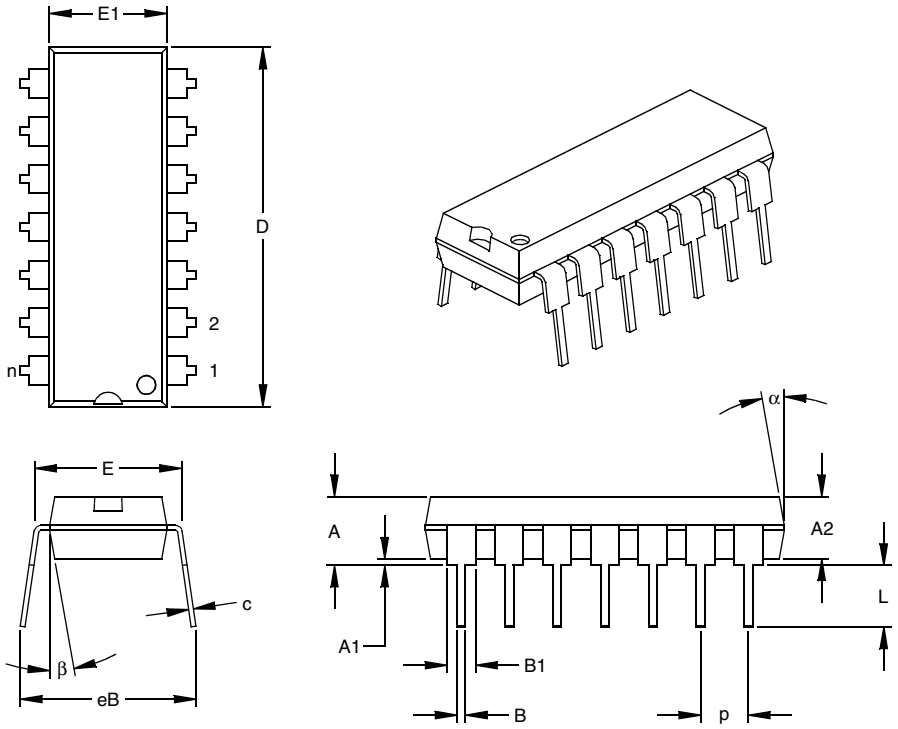


Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	.360	.373	.385	9.14	9.46	9.78
Tip to Seating Plane	L	.125	.130	.135	3.18	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.058	.070	1.14	1.46	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing §	eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

***** Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MS-001
Drawing No. C04-018

Packaging Diagrams and Parameters

14-Lead Plastic Dual In-line (P) – 300 mil Body (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		14			14	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	.740	.750	.760	18.80	19.05	19.30
Tip to Seating Plane	L	.125	.130	.135	3.18	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.058	.070	1.14	1.46	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing §	eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MS-001
Drawing No. C04-005

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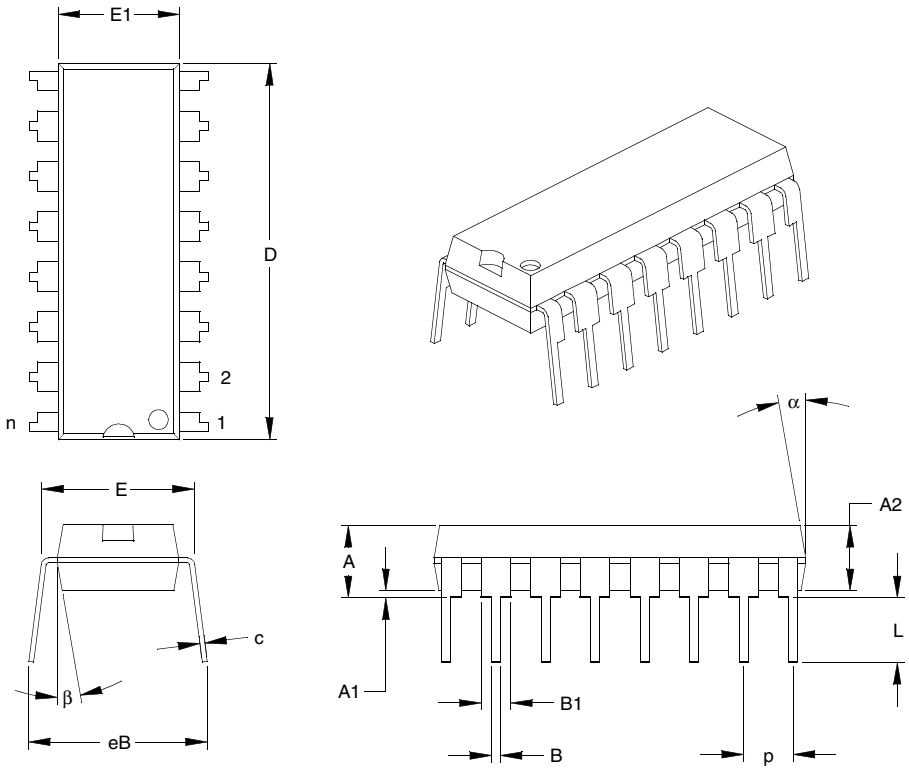
Packaging Diagrams and Parameters

16-Lead Plastic Dual In-line (P) – 300 mil Body (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		16			16	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	.740	.750	.760	18.80	19.05	19.30
Tip to Seating Plane	L	.125	.130	.135	3.18	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.058	.070	1.14	1.46	1.78
Lower Lead Width	B	.014	.018	.022	.036	0.46	0.56
Overall Row Spacing	eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

***** Controlling Parameter

Notes:

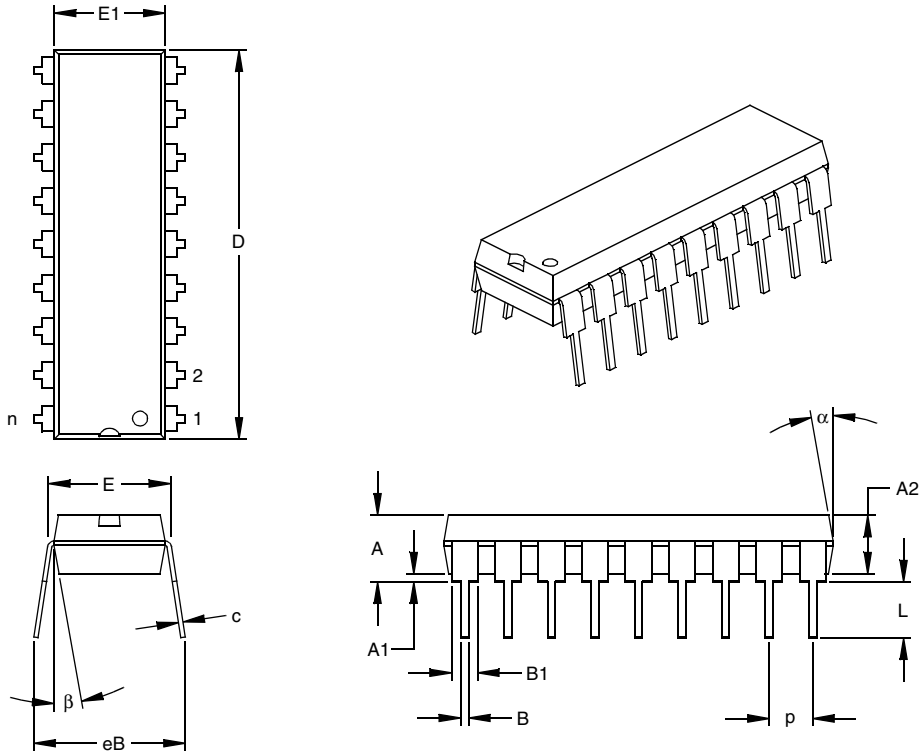
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-001
Drawing No. C04-017

Revised 07-21-05

Packaging Diagrams and Parameters

18-Lead Plastic Dual In-line (P) – 300 mil Body (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		18			18	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	.890	.898	.905	22.61	22.80	22.99
Tip to Seating Plane	L	.125	.130	.135	3.18	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.058	.070	1.14	1.46	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing §	eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

***** Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MS-001
Drawing No. C04-007

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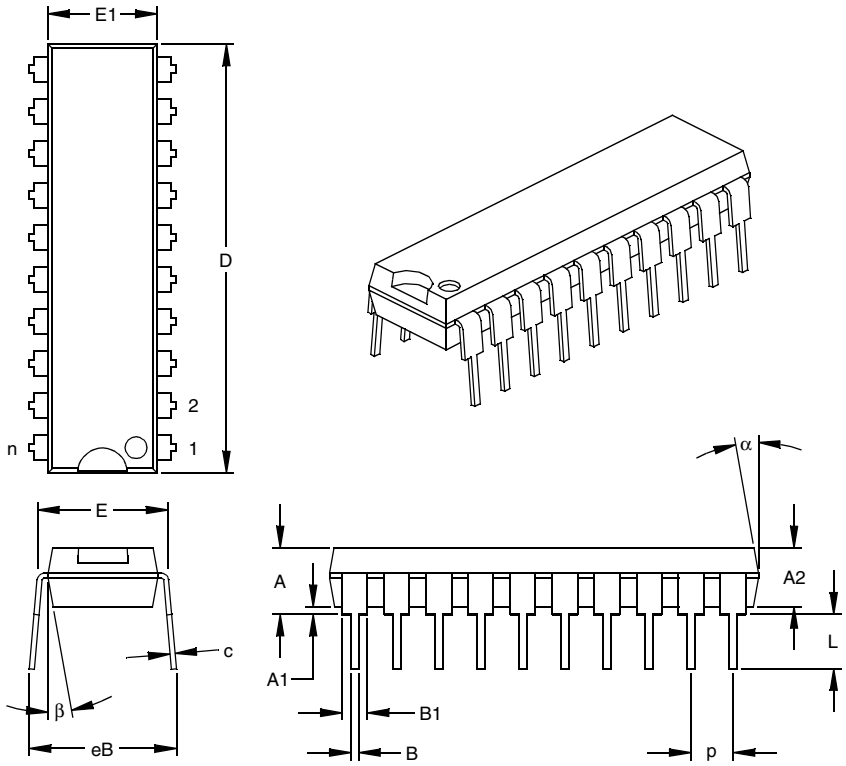
Packaging Diagrams and Parameters

20-Lead Plastic Dual In-line (P) – 300 mil Body (PDIP)

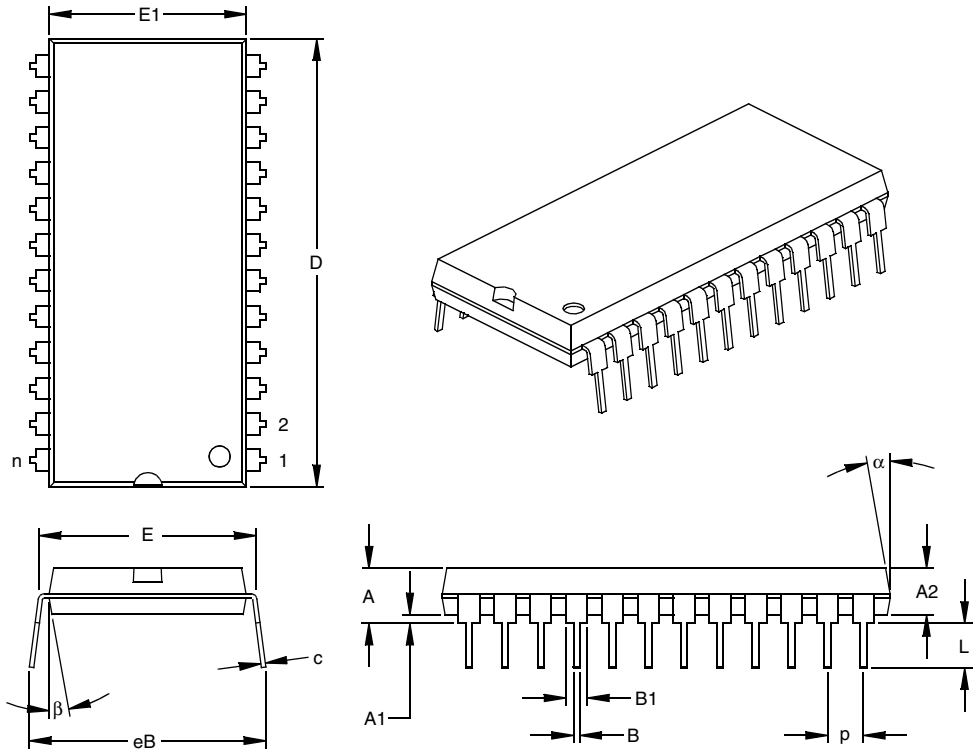


Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		20			20	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.295	.310	.325	7.49	7.87	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	1.025	1.033	1.040	26.04	26.24	26.42
Tip to Seating Plane	L	.120	.130	.140	3.05	3.30	3.56
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.055	.060	.065	1.40	1.52	1.65
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing §	eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

***** Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MS-001
Drawing No. C04-019

Packaging Diagrams and Parameters

24-Lead Plastic Dual In-line (P) – 600 mil Body (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		24			24	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.160	.175	.190	4.06	4.45	4.83
Molded Package Thickness	A2	.140	.150	.160	3.56	3.81	4.06
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.595	.600	.625	15.11	15.24	15.88
Molded Package Width	E1	.530	.545	.560	13.46	13.84	14.22
Overall Length	D	1.245	1.250	1.255	31.62	31.75	31.88
Tip to Seating Plane	L	.120	.130	.135	3.05	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.030	.050	.070	0.76	1.27	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing §	eB	.620	.650	.680	15.75	16.51	17.27
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MS-011
Drawing No. C04-081

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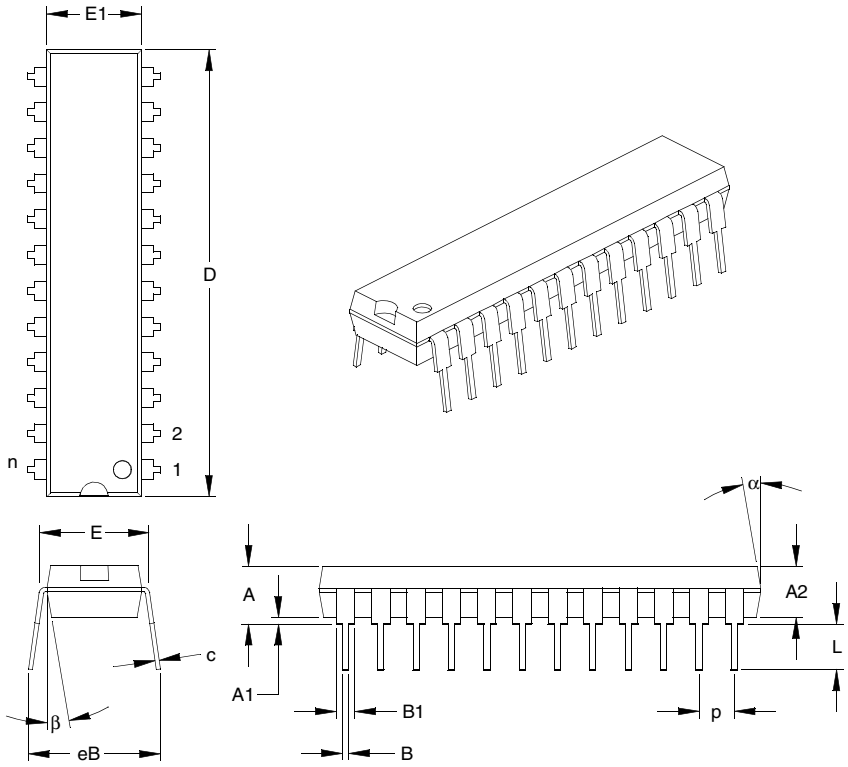
Packaging Diagrams and Parameters

24-Lead Skinny Plastic Dual In-line (SP) – 300 mil Body (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		24			24	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.150	.160	3.56	3.81	4.06
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.295	.310	.325	7.49	7.87	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	1.245	1.250	1.255	31.62	31.75	31.88
Tip to Seating Plane	L	.120	.125	.130	3.05	3.18	3.30
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.053	.060	1.14	1.33	1.52
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing	eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter

Notes:

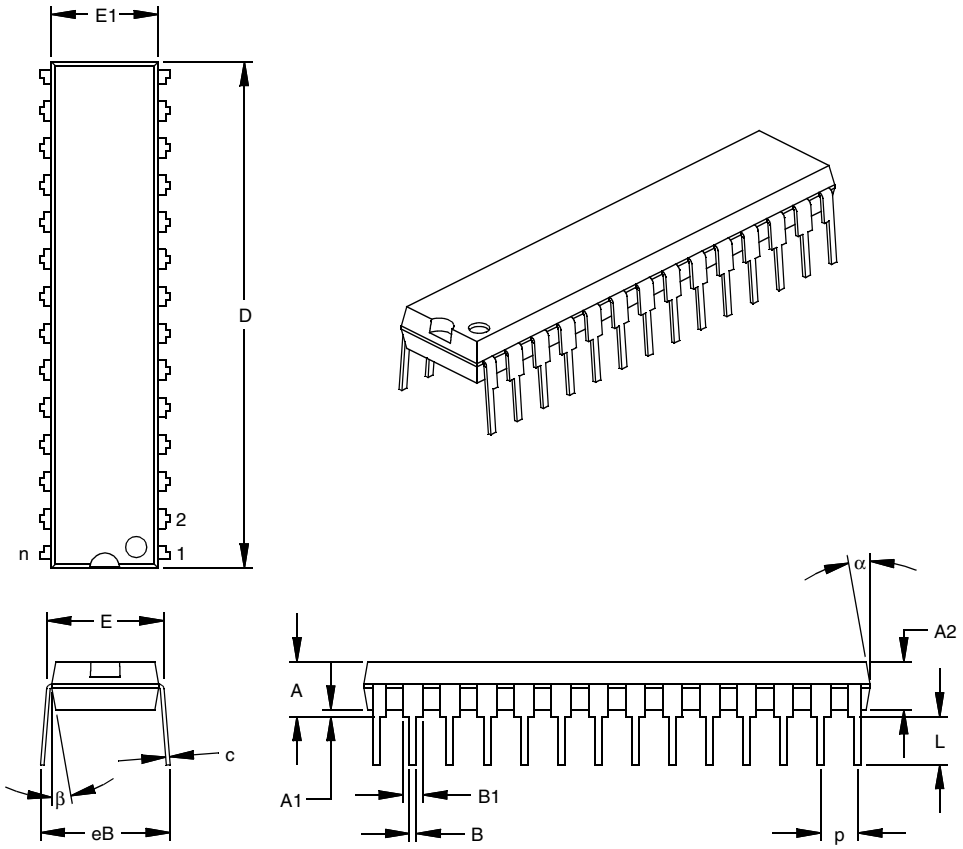
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-001 AF

Drawing No. C04-043

Revised 09-14-05

28-Lead Skinny Plastic Dual In-line (SP) – 300 mil Body (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.150	.160	3.56	3.81	4.06
Molded Package Thickness	A2	.125	.130	.135	3.18	3.30	3.43
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.300	.310	.325	7.62	7.87	8.26
Molded Package Width	E1	.275	.285	.295	6.99	7.24	7.49
Overall Length	D	1.345	1.365	1.385	34.16	34.67	35.18
Tip to Seating Plane	L	.125	.130	.135	3.18	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.040	.053	.065	1.02	1.33	1.65
Lower Lead Width	B	.016	.019	.022	0.41	0.48	0.56
Overall Row Spacing §	eB	.320	.350	.430	8.13	8.89	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

***** Controlling Parameter
§ Significant Characteristic
Notes:
Dimension D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MO-095
Drawing No. C04-070

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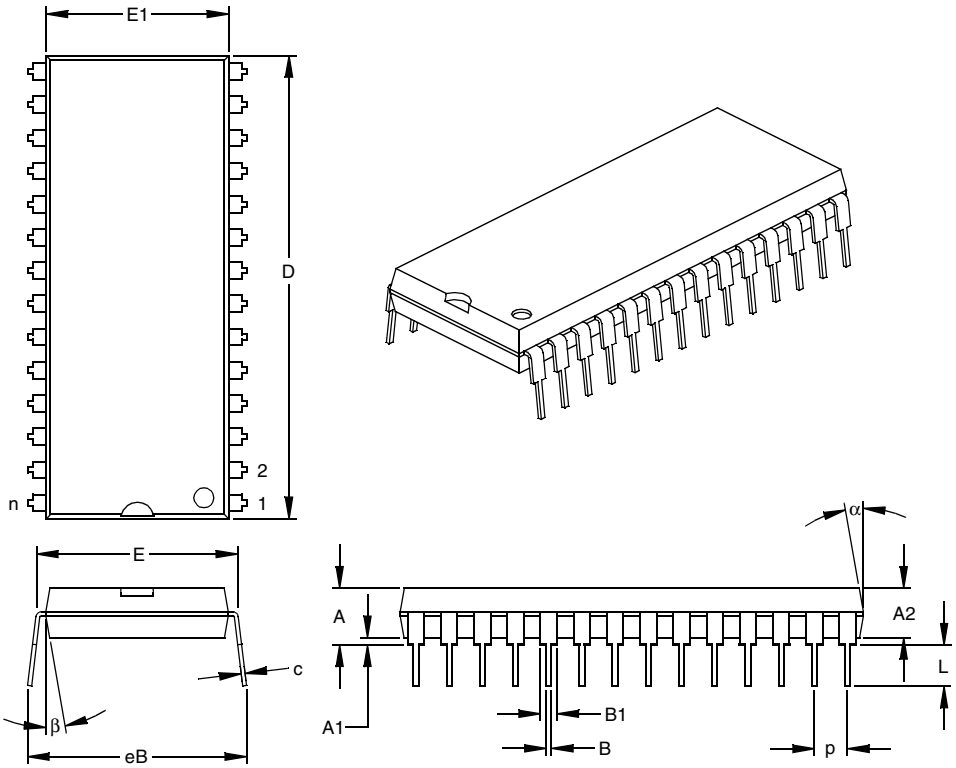
Packaging Diagrams and Parameters

28-Lead Plastic Dual In-line (P) – 600 mil Body (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.160	.175	.190	4.06	4.45	4.83
Molded Package Thickness	A2	.140	.150	.160	3.56	3.81	4.06
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.595	.600	.625	15.11	15.24	15.88
Molded Package Width	E1	.505	.545	.560	12.83	13.84	14.22
Overall Length	D	1.395	1.430	1.465	35.43	36.32	37.21
Tip to Seating Plane	L	.120	.130	.135	3.05	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.030	.050	.070	0.76	1.27	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing §	eB	.620	.650	.680	15.75	16.51	17.27
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter

§ Significant Characteristic

Notes:

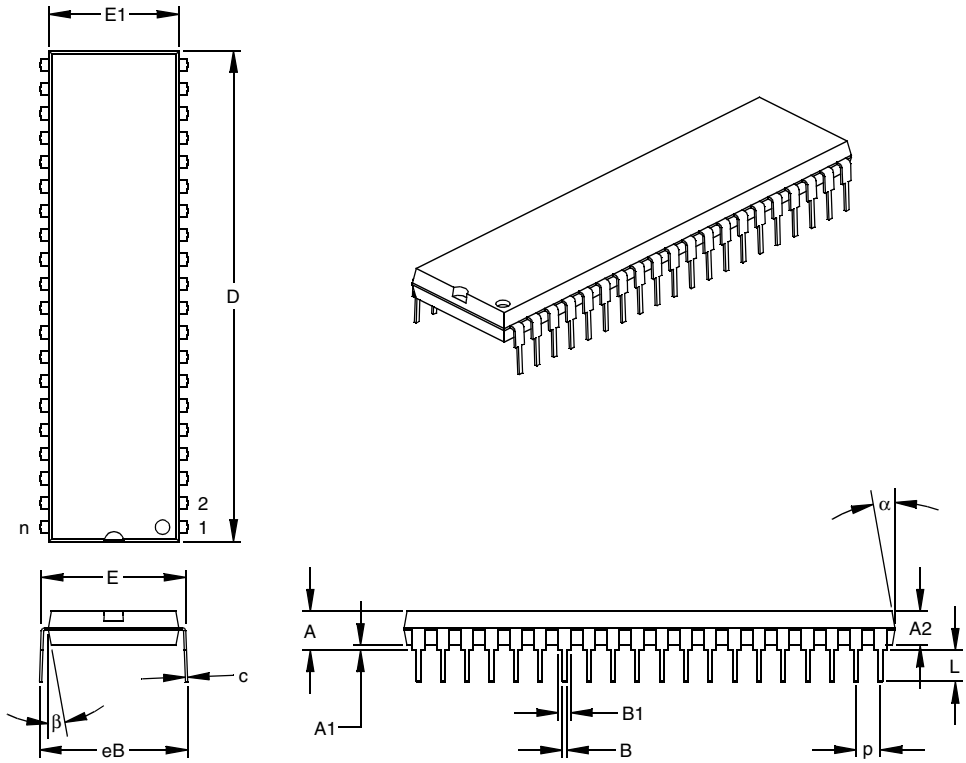
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.

JEDEC Equivalent: MO-011

Drawing No. C04-079

Packaging Diagrams and Parameters

40-Lead Plastic Dual In-line (P) – 600 mil Body (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		40			40	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.160	.175	.190	4.06	4.45	4.83
Molded Package Thickness	A2	.140	.150	.160	3.56	3.81	4.06
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.595	.600	.625	15.11	15.24	15.88
Molded Package Width	E1	.530	.545	.560	13.46	13.84	14.22
Overall Length	D	2.045	2.058	2.065	51.94	52.26	52.45
Tip to Seating Plane	L	.120	.130	.135	3.05	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.030	.050	.070	0.76	1.27	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing §	eB	.620	.650	.680	15.75	16.51	17.27
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.

JEDEC Equivalent: MO-011

Drawing No. C04-016

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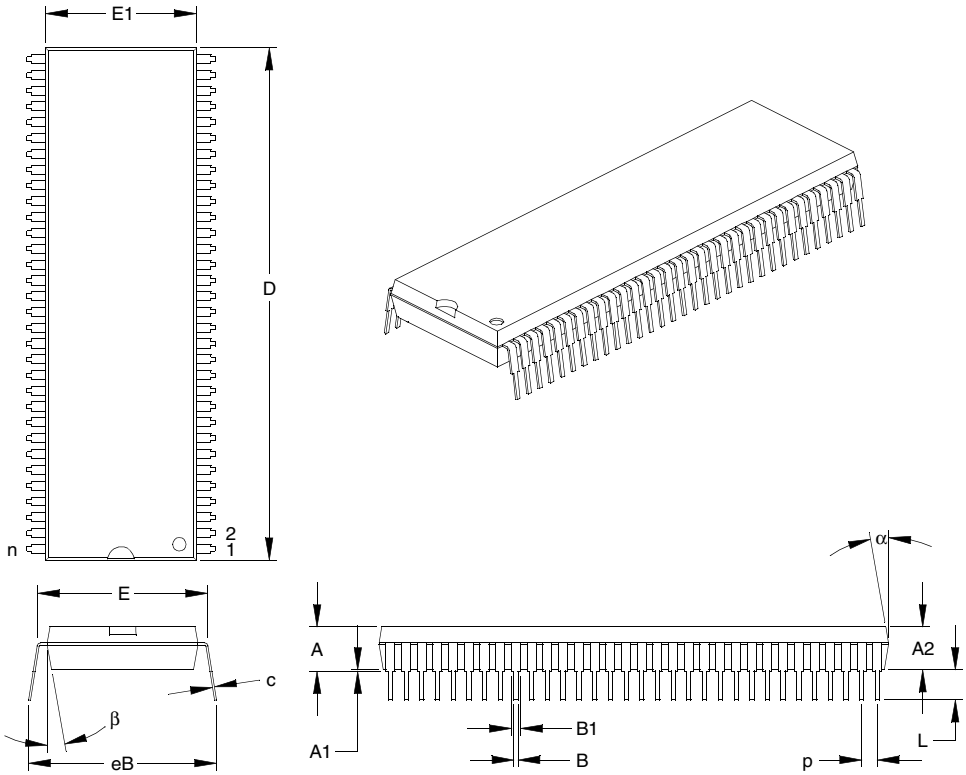
Packaging Diagrams and Parameters

64-Lead Shrink Plastic Dual In-line (SP) – 750 mil Body (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		64			64	
Pitch	p		.070			1.78	
Top to Seating Plane	A	.175	.188	.200	4.45	4.76	5.08
Molded Package Thickness	A2	.155	.168	.180	3.94	4.25	4.57
Base to Seating Plane	A1	.020			0.51		
Shoulder to Shoulder Width	E	.750	.760	.775	19.05	19.30	19.69
Molded Package Width	E1	.660	.670	.680	16.76	17.02	17.27
Overall Length	D	2.260	2.270	2.280	57.40	57.66	57.91
Tip to Seating Plane	L	.120	.128	.135	3.05	3.24	3.43
Lead Thickness	c	.008	.010	.012	0.20	0.25	0.30
Upper Lead Width	B1	.030	.040	.050	0.76	1.02	1.27
Lower Lead Width	B	.015	.019	.022	0.38	0.47	0.56
Overall Row Spacing	eB	.760	.780	.800	19.30	19.81	20.32
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-021 AA

Drawing No. C04-090

Revised 08-30-05

Packaging Diagrams and Parameters

NOTES:

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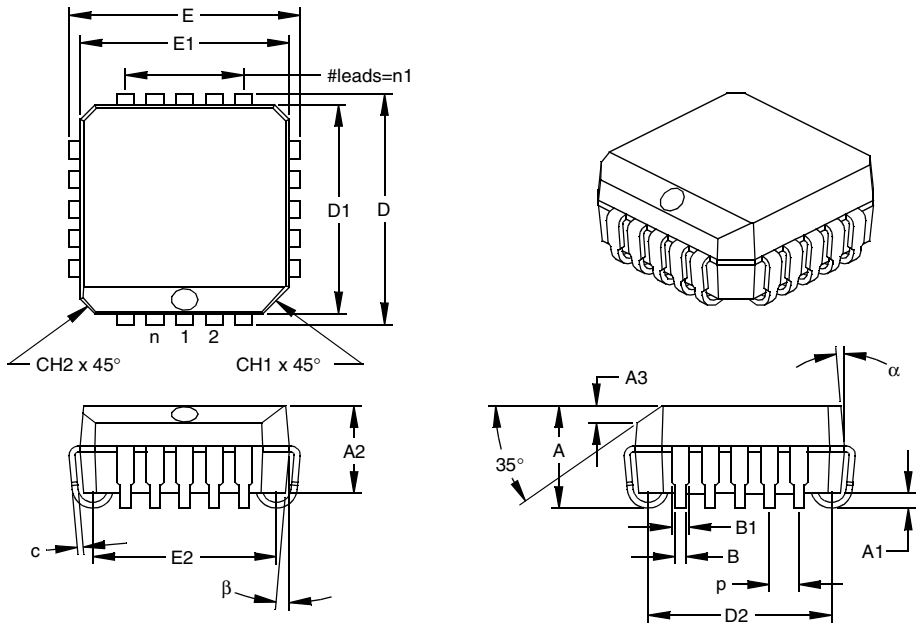
Packaging Diagrams and Parameters

20-Lead Plastic Leaded Chip Carrier (L) – Square (PLCC)

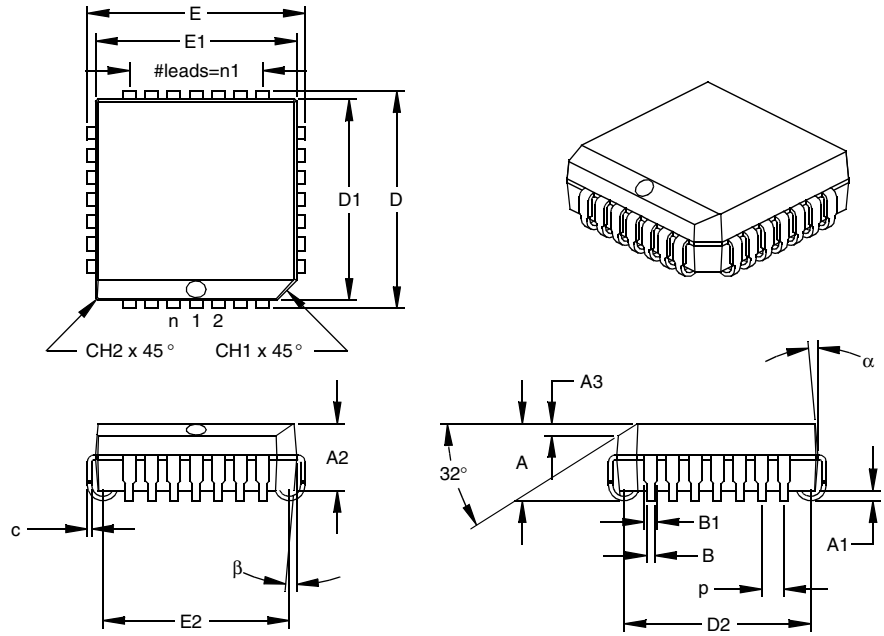


Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		20			20	
Pitch	p		.050			1.27	
Pins per Side	n1		5			5	
Overall Height	A	.165	.173	.180	4.19	4.39	4.57
Molded Package Thickness	A2	.145	.153	.160	3.68	3.87	4.06
Standoff §	A1	.020	.028	.035	0.51	0.71	0.89
Side 1 Chamfer Height	A3	.042	.049	.056	1.07	1.24	1.42
Corner Chamfer 1	CH1	.040	.045	.050	1.02	1.14	1.27
Corner Chamfer (others)	CH2	.010	.015	.020	0.25	0.38	0.51
Overall Width	E	.385	.390	.395	9.78	9.91	10.03
Overall Length	D	.385	.390	.395	9.78	9.91	10.03
Molded Package Width	E1	.350	.353	.356	8.89	8.97	9.04
Molded Package Length	D1	.350	.353	.356	8.89	8.97	9.04
Footprint Width	E2	.282	.310	.338	7.16	7.87	8.59
Footprint Length	D2	.282	.310	.338	7.16	7.87	8.59
Lead Thickness	c	.008	.011	.013	0.20	0.27	0.33
Upper Lead Width	B1	.026	.029	.032	0.66	0.74	0.81
Lower Lead Width	B	.013	.020	.021	0.33	0.51	0.53
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

***** Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MO-047
Drawing No. C04-064

Packaging Diagrams and Parameters

28-Lead Plastic Leaded Chip Carrier (L) – Square (PLCC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.050			1.27	
Pins per Side	n1		7			7	
Overall Height	A	.165	.173	.180	4.19	4.39	4.57
Molded Package Thickness	A2	.145	.153	.160	3.68	3.87	4.06
Standoff §	A1	.020	.028	.035	0.51	0.71	0.89
Side 1 Chamfer Height	A3	.021	.026	.031	0.53	0.66	0.79
Corner Chamfer 1	CH1	.035	.045	.055	0.89	1.14	1.40
Corner Chamfer (others)	CH2	.000	.005	.010	0.00	0.13	0.25
Overall Width	E	.485	.490	.495	12.32	12.45	12.57
Overall Length	D	.485	.490	.495	12.32	12.45	12.57
Molded Package Width	E1	.450	.453	.456	11.43	11.51	11.58
Molded Package Length	D1	.450	.453	.456	11.43	11.51	11.58
Footprint Width	E2	.410	.420	.430	10.41	10.67	10.92
Footprint Length	D2	.410	.420	.430	10.41	10.67	10.92
Lead Thickness	c	.008	.011	.013	0.20	0.27	0.33
Upper Lead Width	B1	.026	.029	.032	0.66	0.74	0.81
Lower Lead Width	B	.013	.020	.021	0.33	0.51	0.53
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

***** Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MO-047
Drawing No. C04-026

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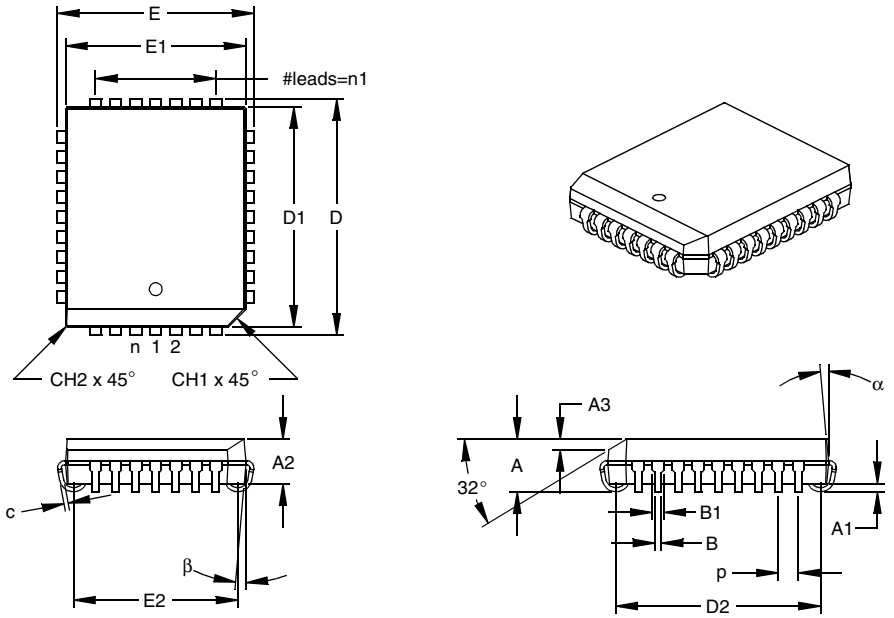
Packaging Diagrams and Parameters

32-Lead Plastic Leaded Chip Carrier (L) – Rectangle (PLCC)

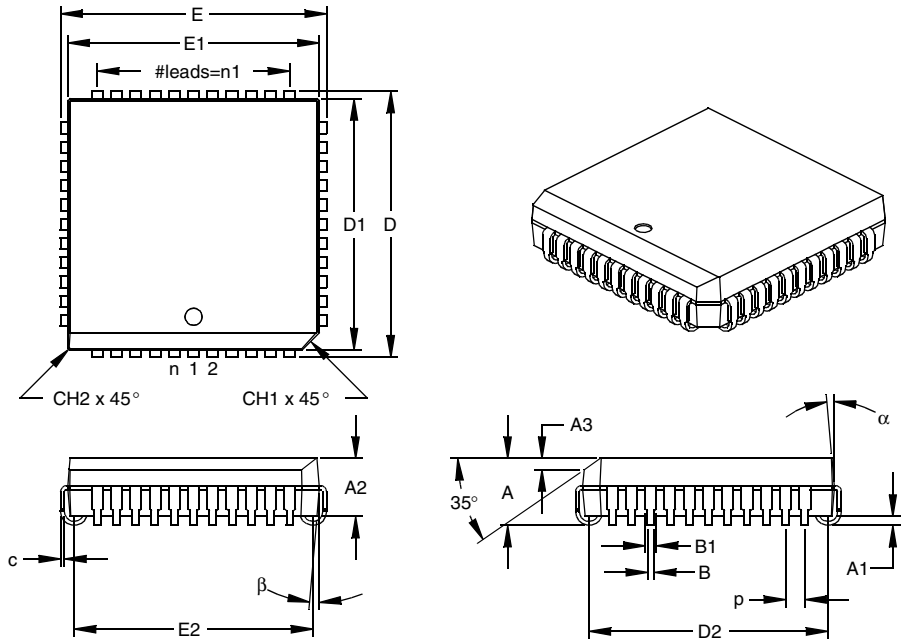


Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		32			32	
Pitch	p		.050			1.27	
Pins along Width	n1		7			7	
Pins along Length	n2		9			9	
Overall Height	A	.125	.133	.140	3.18	3.37	3.56
Molded Package Thickness	A2	.105	.113	.120	2.67	2.87	3.05
Standoff §	A1	.020	.028	.035	0.51	0.71	0.89
Side 1 Chamfer Height	A3	.021	.026	.031	0.53	0.66	0.79
Corner Chamfer 1	CH1	.035	.045	.055	0.89	1.14	1.40
Corner Chamfer (others)	CH2	.000	.005	.010	0.00	0.13	0.25
Overall Width	E	.485	.490	.495	12.32	12.45	12.57
Overall Length	D	.585	.590	.595	14.86	14.99	15.11
Molded Package Width	E1	.447	.450	.453	11.35	11.43	11.51
Molded Package Length	D1	.547	.550	.553	13.89	13.97	14.05
Footprint Width	E2	.380	.410	.440	9.65	10.41	11.18
Footprint Length	D2	.480	.510	.540	12.19	12.95	13.72
Lead Thickness	c	.008	.010	.013	0.20	0.25	0.33
Upper Lead Width	B1	.026	.029	.032	0.66	0.74	0.81
Lower Lead Width	B	.013	.017	.021	0.33	0.43	0.53
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

***** Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MO-016
Drawing No. C04-023

Packaging Diagrams and Parameters

44-Lead Plastic Leaded Chip Carrier (L) – Square (PLCC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		44			44	
Pitch	p		.050			1.27	
Pins per Side	n1		11			11	
Overall Height	A	.165	.173	.180	4.19	4.39	4.57
Molded Package Thickness	A2	.145	.153	.160	3.68	3.87	4.06
Standoff §	A1	.020	.028	.035	0.51	0.71	0.89
Side 1 Chamfer Height	A3	.024	.029	.034	0.61	0.74	0.86
Corner Chamfer 1	CH1	.040	.045	.050	1.02	1.14	1.27
Corner Chamfer (others)	CH2	.000	.005	.010	0.00	0.13	0.25
Overall Width	E	.685	.690	.695	17.40	17.53	17.65
Overall Length	D	.685	.690	.695	17.40	17.53	17.65
Molded Package Width	E1	.650	.653	.656	16.51	16.59	16.66
Molded Package Length	D1	.650	.653	.656	16.51	16.59	16.66
Footprint Width	E2	.590	.620	.630	14.99	15.75	16.00
Footprint Length	D2	.590	.620	.630	14.99	15.75	16.00
Lead Thickness	c	.008	.011	.013	0.20	0.27	0.33
Upper Lead Width	B1	.026	.029	.032	0.66	0.74	0.81
Lower Lead Width	B	.013	.020	.021	0.33	0.51	0.53
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

***** Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MO-047
Drawing No. C04-048

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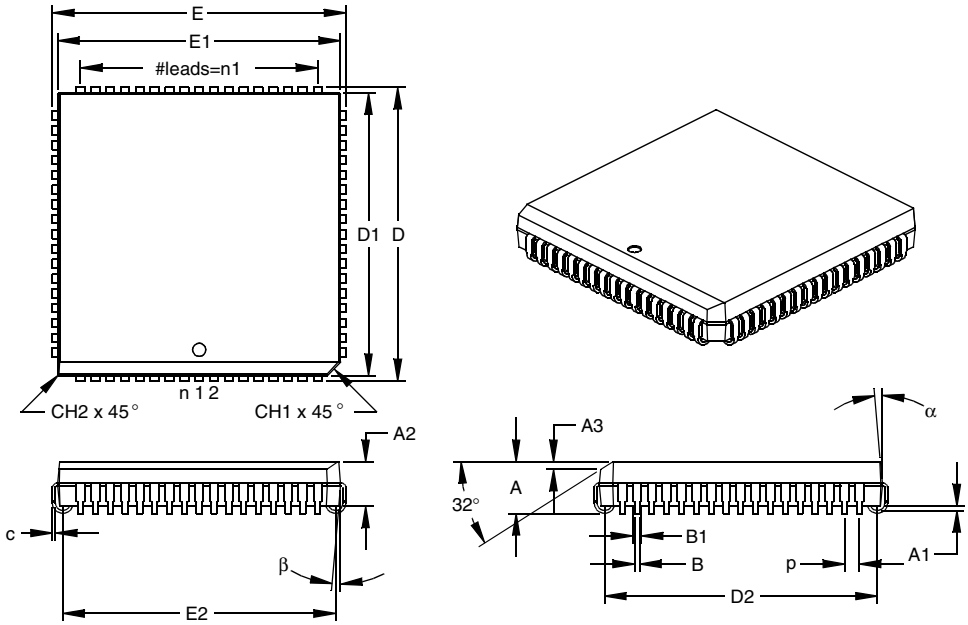
68-Lead Plastic Leaded Chip Carrier (L) – Square (PLCC)

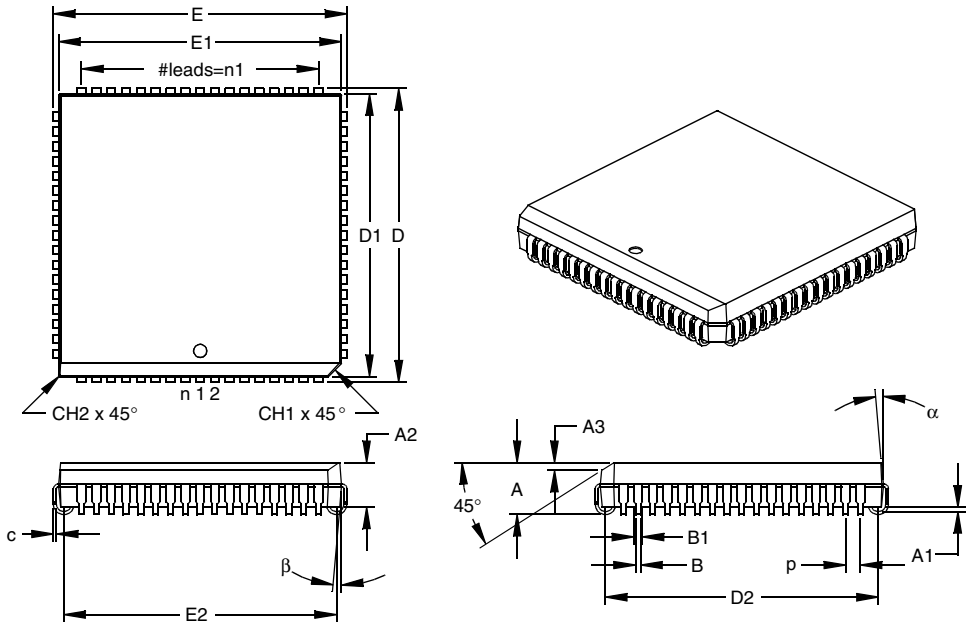


Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		68			68	
Pitch	p		.050			1.27	
Pins per Side	n1		17			17	
Overall Height	A	.165	.173	.180	4.19	4.39	4.57
Molded Package Thickness	A2	.145	.153	.160	3.68	3.87	4.06
Standoff §	A1	.020	.028	.035	0.51	0.71	0.89
Side 1 Chamfer Height	A3	.024	.029	.034	0.61	0.74	0.86
Corner Chamfer 1	CH1	.040	.045	.050	1.02	1.14	1.27
Corner Chamfer (others)	CH2	.000	.005	.010	0.00	0.13	0.25
Overall Width	E	.985	.990	.995	25.02	25.15	25.27
Overall Length	D	.985	.990	.995	25.02	25.15	25.27
Molded Package Width	E1	.950	.954	.958	24.13	24.23	24.33
Molded Package Length	D1	.950	.954	.958	24.13	24.23	24.33
Footprint Width	E2	.890	.920	.930	22.61	23.37	23.62
Footprint Length	D2	.890	.920	.930	22.61	23.37	23.62
Lead Thickness	c	.008	.011	.013	0.20	0.27	0.33
Upper Lead Width	B1	.026	.029	.032	0.66	0.74	0.81
Lower Lead Width	B	.013	.020	.021	0.33	0.51	0.53
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

***** Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MO-047
Drawing No. C04-049

Packaging Diagrams and Parameters

84-Lead Plastic Leaded Chip Carrier (L) – Square (PLCC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		84			68	
Pitch	p		.050			1.27	
Pins per Side	n1		21			17	
Overall Height	A	.165	.173	.180	4.19	4.39	4.57
Molded Package Thickness	A2	.145	.153	.160	3.68	3.87	4.06
Standoff §	A1	.020	.028	.035	0.51	0.71	0.89
Side 1 Chamfer Height	A3	.040	.045	.050	1.02	1.14	1.27
Corner Chamfer 1	CH1	.040	.045	.050	1.02	1.14	1.27
Corner Chamfer (others)	CH2	.010	.015	.020	0.25	0.38	0.51
Overall Width	E	1.185	1.190	1.195	30.10	30.23	30.35
Overall Length	D	1.185	1.190	1.195	30.10	30.23	30.35
Molded Package Width	E1	1.150	1.154	1.158	29.21	29.31	29.41
Molded Package Length	D1	1.150	1.154	1.158	29.21	29.31	29.41
Footprint Width	E2	1.090	1.110	1.130	27.69	28.19	28.70
Footprint Length	D2	1.090	1.110	1.130	27.69	28.19	28.70
Lead Thickness	c	.008	.011	.013	0.20	0.27	0.33
Upper Lead Width	B1	.026	.029	.032	0.66	0.74	0.81
Lower Lead Width	B	.013	.020	.021	0.33	0.51	0.53
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

***** Controlling Parameter
§ Significant Characteristic

Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.
JEDEC Equivalent: MO-047
Drawing No. C04-093

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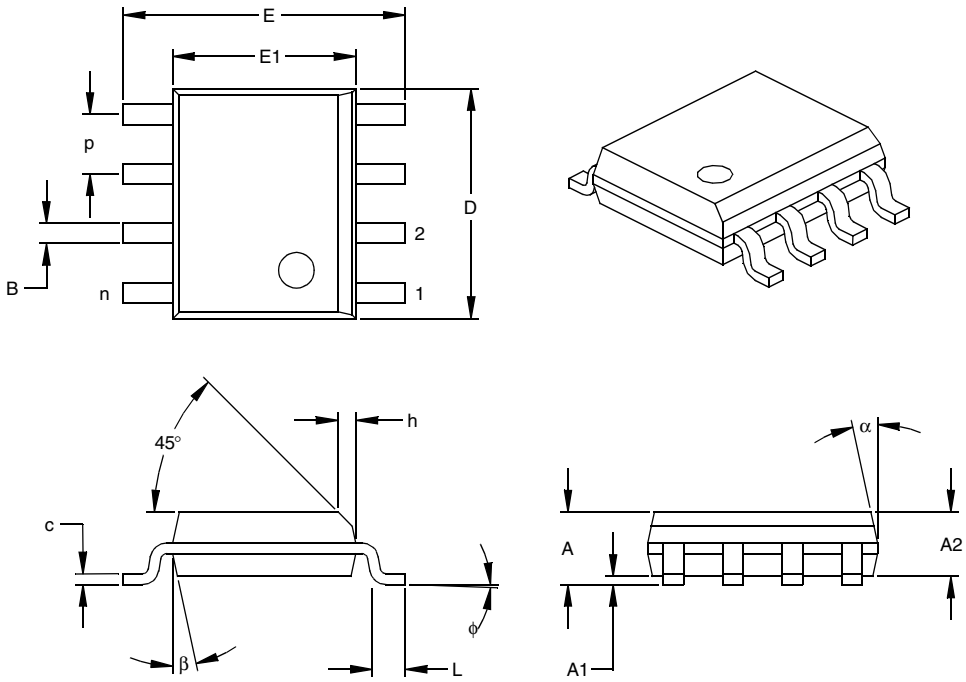
Packaging Diagrams and Parameters

8-Lead Plastic Small Outline (SN) – Narrow, 150 mil Body (SOIC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.050			1.27	
Overall Height	A	.053	.061	.069	1.35	1.55	1.75
Molded Package Thickness	A2	.052	.056	.061	1.32	1.42	1.55
Standoff §	A1	.004	.007	.010	0.10	0.18	0.25
Overall Width	E	.228	.237	.244	5.79	6.02	6.20
Molded Package Width	E1	.146	.154	.157	3.71	3.91	3.99
Overall Length	D	.189	.193	.197	4.80	4.90	5.00
Chamfer Distance	h	.010	.015	.020	0.25	0.38	0.51
Foot Length	L	.019	.025	.030	0.48	0.62	0.76
Foot Angle	φ	0	4	8	0	4	8
Lead Thickness	c	.008	.009	.010	0.20	0.23	0.25
Lead Width	B	.013	.017	.020	0.33	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter

§ Significant Characteristic

Notes:

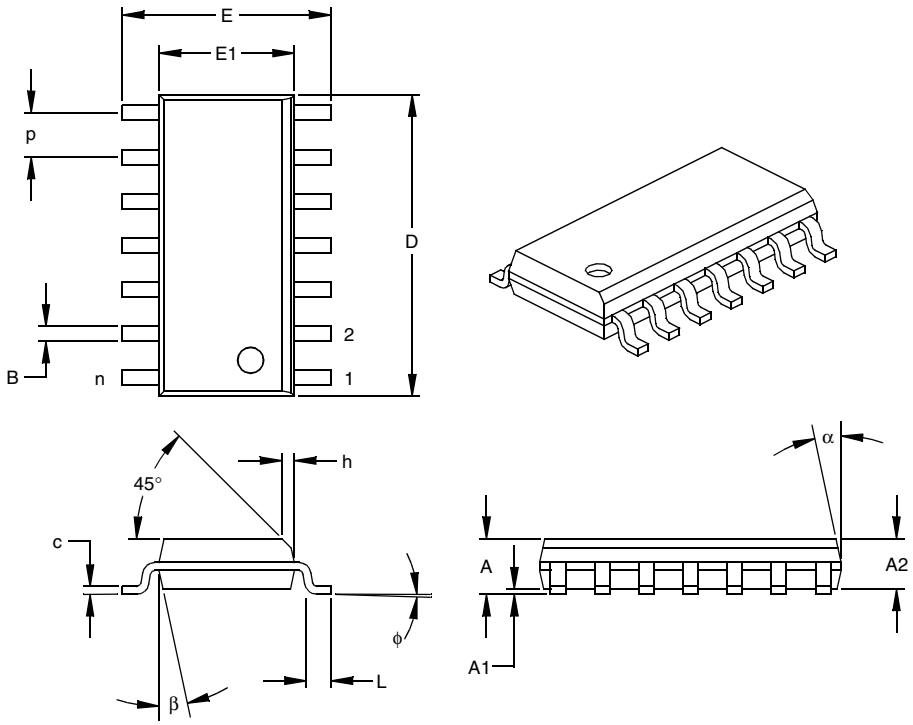
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.

JEDEC Equivalent: MS-012

Drawing No. C04-057

Packaging Diagrams and Parameters

14-Lead Plastic Small Outline (SL) – Narrow, 150 mil Body (SOIC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		14			14	
Pitch	p		.050			1.27	
Overall Height	A	.053	.061	.069	1.35	1.55	1.75
Molded Package Thickness	A2	.052	.056	.061	1.32	1.42	1.55
Standoff §	A1	.004	.007	.010	0.10	0.18	0.25
Overall Width	E	.228	.236	.244	5.79	5.99	6.20
Molded Package Width	E1	.150	.154	.157	3.81	3.90	3.99
Overall Length	D	.337	.342	.347	8.56	8.69	8.81
Chamfer Distance	h	.010	.015	.020	0.25	0.38	0.51
Foot Length	L	.016	.033	.050	0.41	0.84	1.27
Foot Angle	φ	0	4	8	0	4	8
Lead Thickness	c	.008	.009	.010	0.20	0.23	0.25
Lead Width	B	.014	.017	.020	0.36	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-012

Drawing No. C04-065

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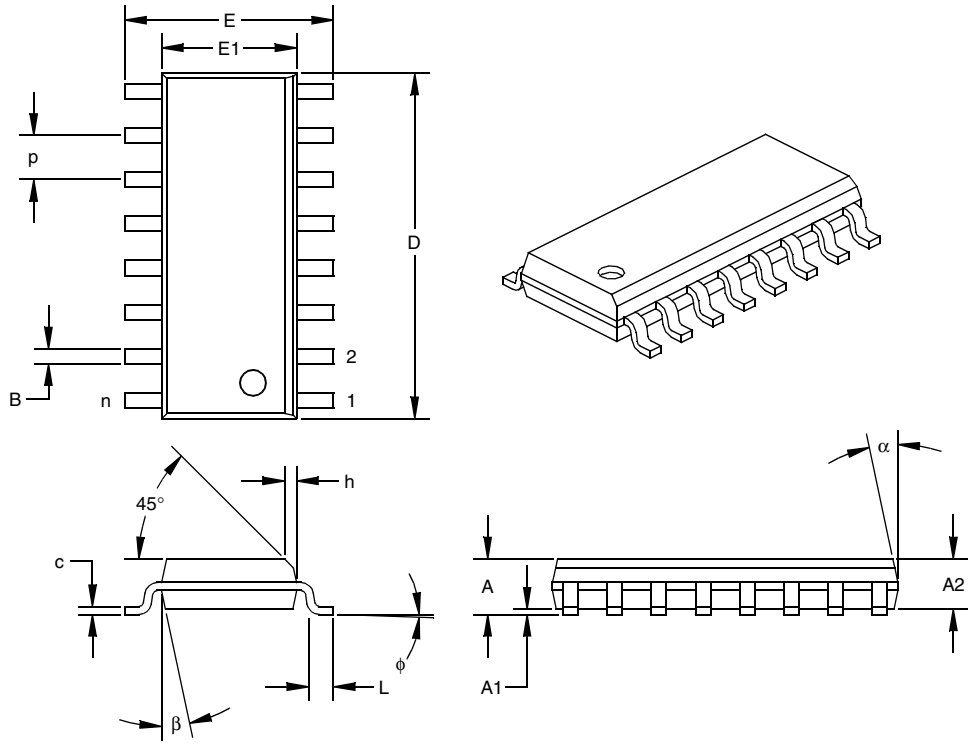
Packaging Diagrams and Parameters

16-Lead Plastic Small Outline (SL) – Narrow 150 mil Body (SOIC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		16			16	
Pitch	p		.050			1.27	
Overall Height	A	.053	.061	.069	1.35	1.55	1.75
Molded Package Thickness	A2	.052	.057	.061	1.32	1.44	1.55
Standoff §	A1	.004	.007	.010	0.10	0.18	0.25
Overall Width	E	.228	.237	.244	5.79	6.02	6.20
Molded Package Width	E1	.150	.154	.157	3.81	3.90	3.99
Overall Length	D	.386	.390	.394	9.80	9.91	10.01
Chamfer Distance	h	.010	.015	.020	0.25	0.38	0.51
Foot Length	L	.016	.033	.050	0.41	0.84	1.27
Foot Angle	φ	0	4	8	0	4	8
Lead Thickness	c	.008	.009	.010	0.20	0.23	0.25
Lead Width	B	.013	.017	.020	0.33	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

***** Controlling Parameter

§ Significant Characteristic

Notes:

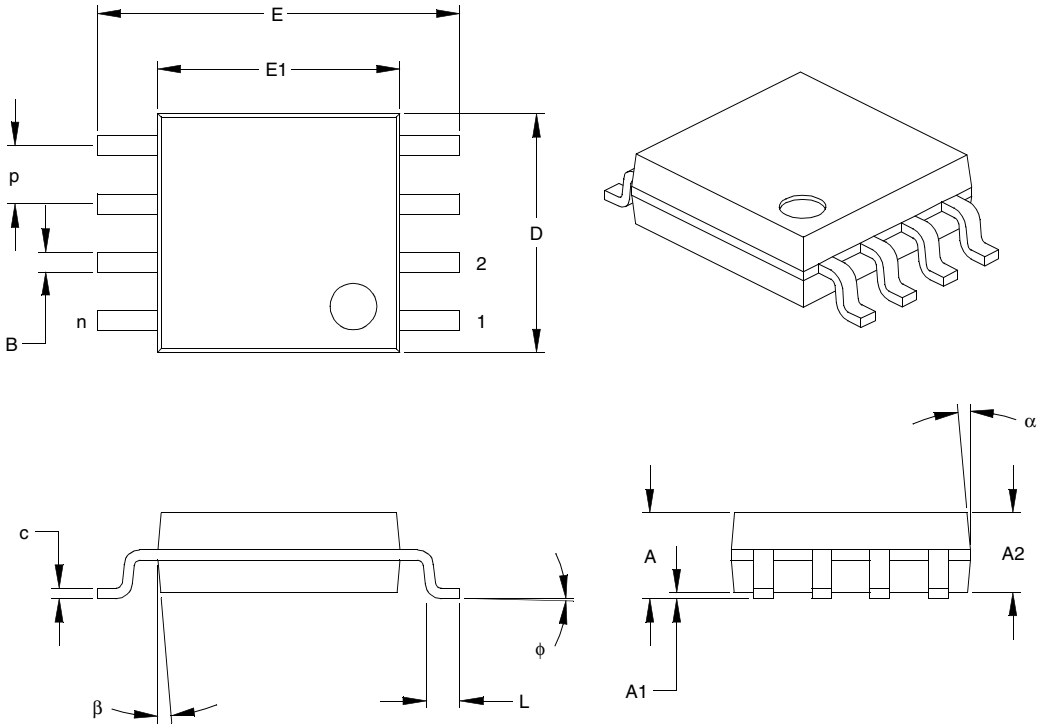
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.

JEDEC Equivalent: MS-012

Drawing No. C04-108

8-Lead Plastic Small Outline (SM) – Medium, 208 mil Body (SOIJ)

(JEITA/EIAJ Standard, Formerly called SOIC)



Units		INCHES *			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.050			1.27	
Overall Height	A	.070	.075	.080	1.78	1.97	2.03
Molded Package Thickness	A2	.069	.074	.078	1.75	1.88	1.98
Standoff	A1	.002	.005	.010	0.05	0.13	0.25
Overall Width	E	.300	.313	.325	7.62	7.95	8.26
Molded Package Width	E1	.201	.208	.212	5.11	5.28	5.38
Overall Length	D	.202	.205	.210	5.13	5.21	5.33
Foot Length	L	.020	.025	.030	0.51	0.64	0.76
Foot Angle	φ	0	4	8	0	4	8
Lead Thickness	c	.008	.009	.010	0.20	0.23	0.25
Lead Width	B	.014	.017	.020	0.36	0.43	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.10" (0.254mm) per side.

Drawing No. C04-056

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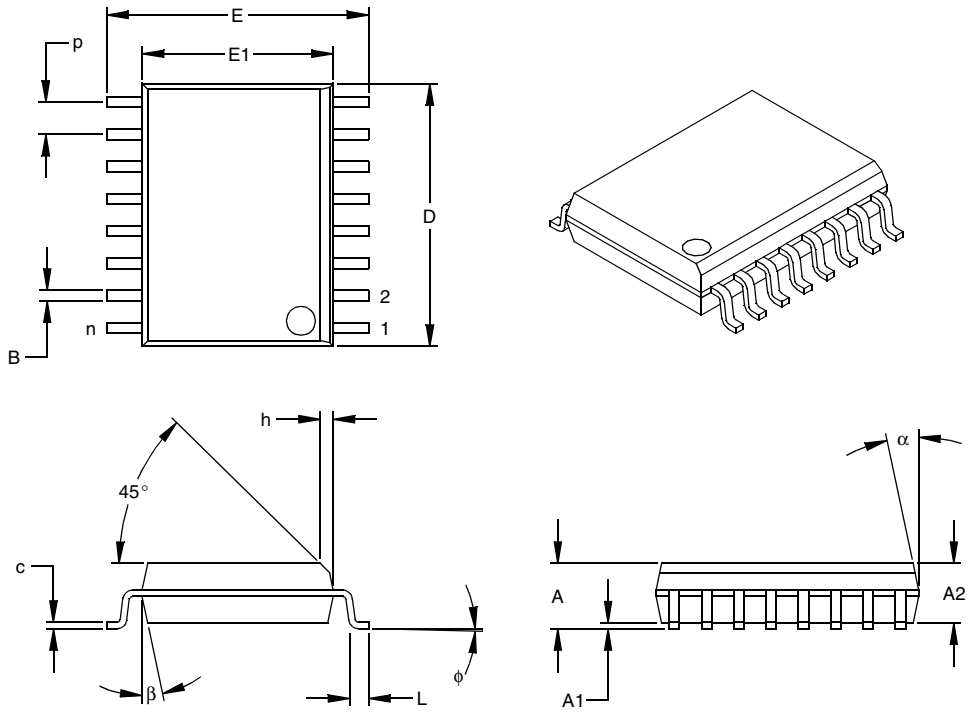
Packaging Diagrams and Parameters

16-Lead Plastic Small Outline (SO) – Wide, 300 mil Body (SOIC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		16			16	
Pitch	p		.050			1.27	
Overall Height	A	.093	.099	.104	2.36	2.50	2.64
Molded Package Thickness	A2	.088	.091	.094	2.24	2.31	2.39
Standoff §	A1	.004	.008	.012	0.10	0.20	0.30
Overall Width	E	.394	.407	.420	10.01	10.34	10.67
Molded Package Width	E1	.291	.295	.299	7.39	7.49	7.59
Overall Length	D	.398	.406	.413	10.10	10.30	10.49
Chamfer Distance	h	.010	.020	.029	0.25	0.50	0.74
Foot Length	L	.016	.033	.050	0.41	0.84	1.27
Foot Angle	ϕ	0	4	8	0	4	8
Lead Thickness	c	.009	.011	.013	0.23	0.28	0.33
Lead Width	B	.014	.017	.020	0.36	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

***** Controlling Parameter

§ Significant Characteristic

Notes:

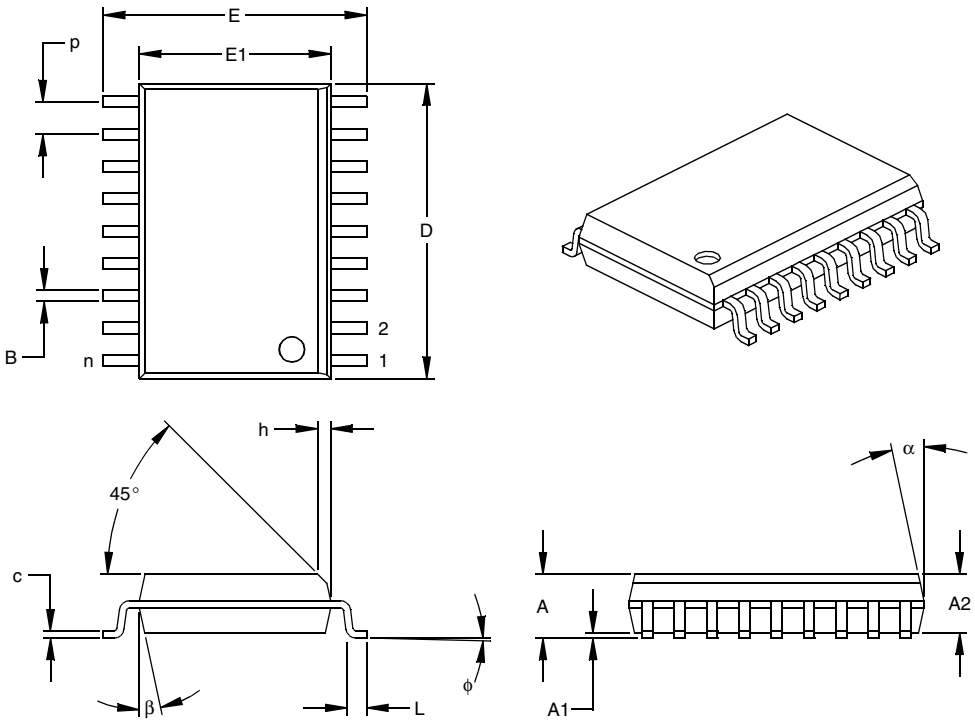
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.

JEDEC Equivalent: MS-013

Drawing No. C04-102

Packaging Diagrams and Parameters

18-Lead Plastic Small Outline (SO) – Wide, 300 mil Body (SOIC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		18			18	
Pitch	p		.050			1.27	
Overall Height	A	.093	.099	.104	2.36	2.50	2.64
Molded Package Thickness	A2	.088	.091	.094	2.24	2.31	2.39
Standoff §	A1	.004	.008	.012	0.10	0.20	0.30
Overall Width	E	.394	.407	.420	10.01	10.34	10.67
Molded Package Width	E1	.291	.295	.299	7.39	7.49	7.59
Overall Length	D	.446	.454	.462	11.33	11.53	11.73
Chamfer Distance	h	.010	.020	.029	0.25	0.50	0.74
Foot Length	L	.016	.033	.050	0.41	0.84	1.27
Foot Angle	ϕ	0	4	8	0	4	8
Lead Thickness	c	.009	.011	.012	0.23	0.27	0.30
Lead Width	B	.014	.017	.020	0.36	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

***** Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 010” (0.254mm) per side.
JEDEC Equivalent: MS-013
Drawing No. C04-051

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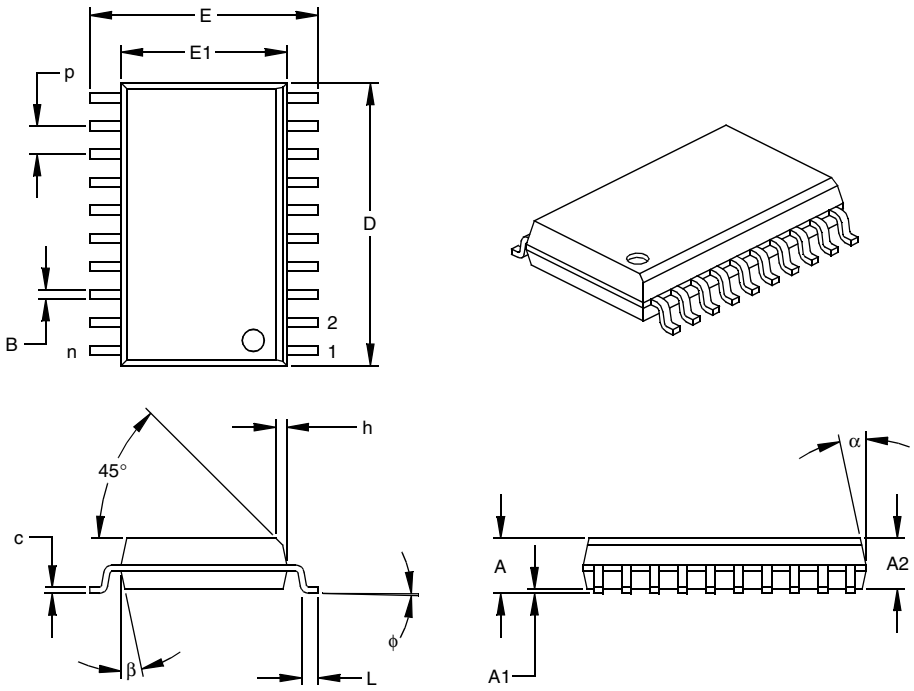
Packaging Diagrams and Parameters

20-Lead Plastic Small Outline (SO) – Wide, 300 mil Body (SOIC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		20			20	
Pitch	p		.050			1.27	
Overall Height	A	.093	.099	.104	2.36	2.50	2.64
Molded Package Thickness	A2	.088	.091	.094	2.24	2.31	2.39
Standoff §	A1	.004	.008	.012	0.10	0.20	0.30
Overall Width	E	.394	.407	.420	10.01	10.34	10.67
Molded Package Width	E1	.291	.295	.299	7.39	7.49	7.59
Overall Length	D	.496	.504	.512	12.60	12.80	13.00
Chamfer Distance	h	.010	.020	.029	0.25	0.50	0.74
Foot Length	L	.016	.033	.050	0.41	0.84	1.27
Foot Angle	φ	0	4	8	0	4	8
Lead Thickness	c	.009	.011	.013	0.23	0.28	0.33
Lead Width	B	.014	.017	.020	0.36	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter

§ Significant Characteristic

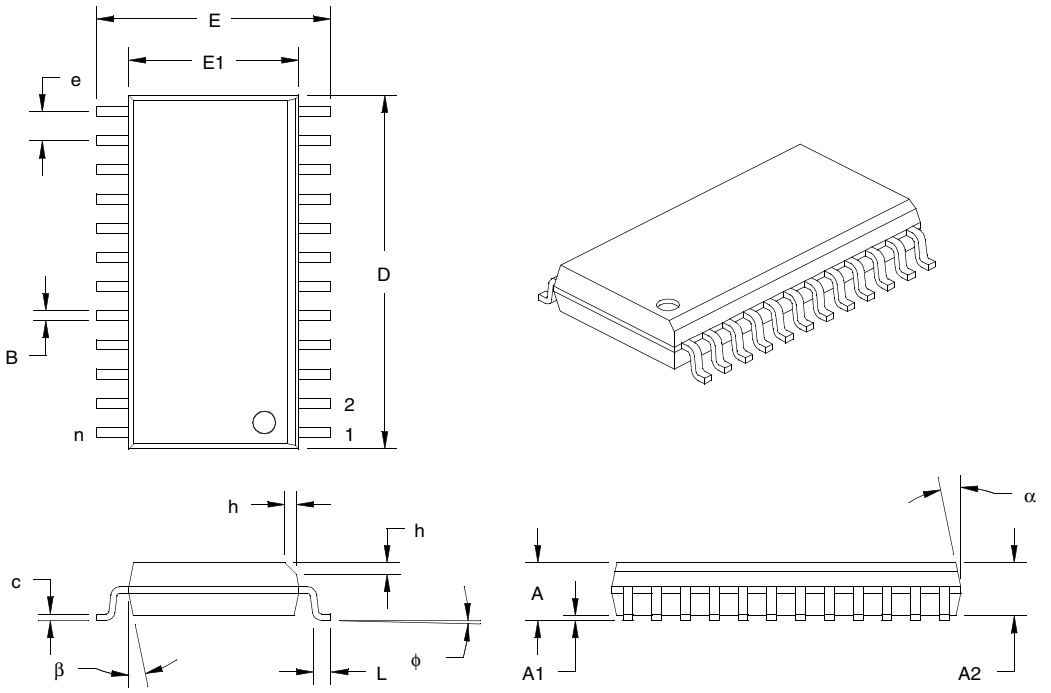
Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.

JEDEC Equivalent: MS-013

Drawing No. C04-094

24-Lead Plastic Small Outline (SO) – Wide, 7.50 mm (.300 mil) Body (SOIC)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		24			24	
Pitch	e		.050 BSC			1.27 BSC	
Overall Height	A	.093	--	.104	2.35	--	2.65
Molded Package Thickness	A2	.081	--	.100	2.05	--	2.55
Standoff	A1	.004	--	.012	0.10	--	0.30
Overall Width	E		.406 BSC			10.30 BSC	
Molded Package Width	E1		.295 BSC			7.50 BSC	
Overall Length	D		.607 BSC			15.40 BSC	
Chamfer Distance	h	.010	--	.030	0.25	--	0.75
Foot Length	L	.016	--	.050	0.40	--	1.27
Foot Angle	ϕ	0°	--	8°	0°	--	8°
Lead Thickness	c	.008	--	.013	0.20	--	0.33
Lead Width	B	.012	--	.020	0.31	--	0.51
Mold Draft Angle Top	α	5°	--	15°	5°	--	15°
Mold Draft Angle Bottom	β	5°	--	15°	5°	--	15°

***** Controlling Parameter per JEDEC MS-103 Revision C.

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

JEDEC Equivalent: MS-013 AD

Drawing No. C04-025

Revised 07-19-05

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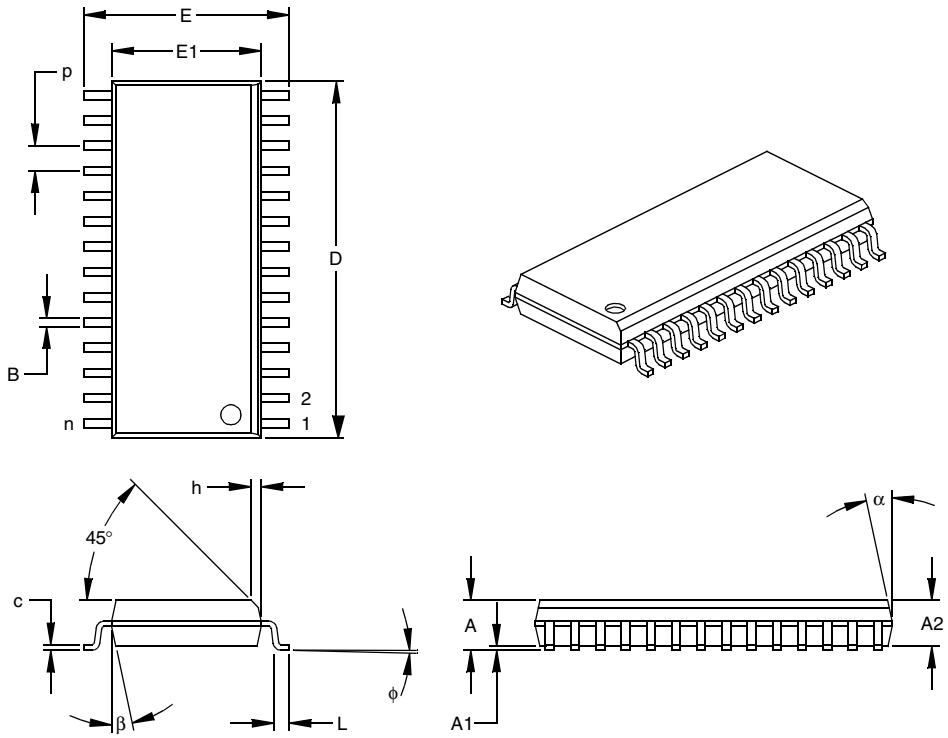
Packaging Diagrams and Parameters

28-Lead Plastic Small Outline (SO) – Wide, 300 mil Body (SOIC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.050			1.27	
Overall Height	A	.093	.099	.104	2.36	2.50	2.64
Molded Package Thickness	A2	.088	.091	.094	2.24	2.31	2.39
Standoff §	A1	.004	.008	.012	0.10	0.20	0.30
Overall Width	E	.394	.407	.420	10.01	10.34	10.67
Molded Package Width	E1	.288	.295	.299	7.32	7.49	7.59
Overall Length	D	.695	.704	.712	17.65	17.87	18.08
Chamfer Distance	h	.010	.020	.029	0.25	0.50	0.74
Foot Length	L	.016	.033	.050	0.41	0.84	1.27
Foot Angle Top	φ	0	4	8	0	4	8
Lead Thickness	c	.009	.011	.013	0.23	0.28	0.33
Lead Width	B	.014	.017	.020	0.36	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

***** Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.

JEDEC Equivalent: MS-013

Drawing No. C04-052

Packaging Diagrams and Parameters

NOTES:

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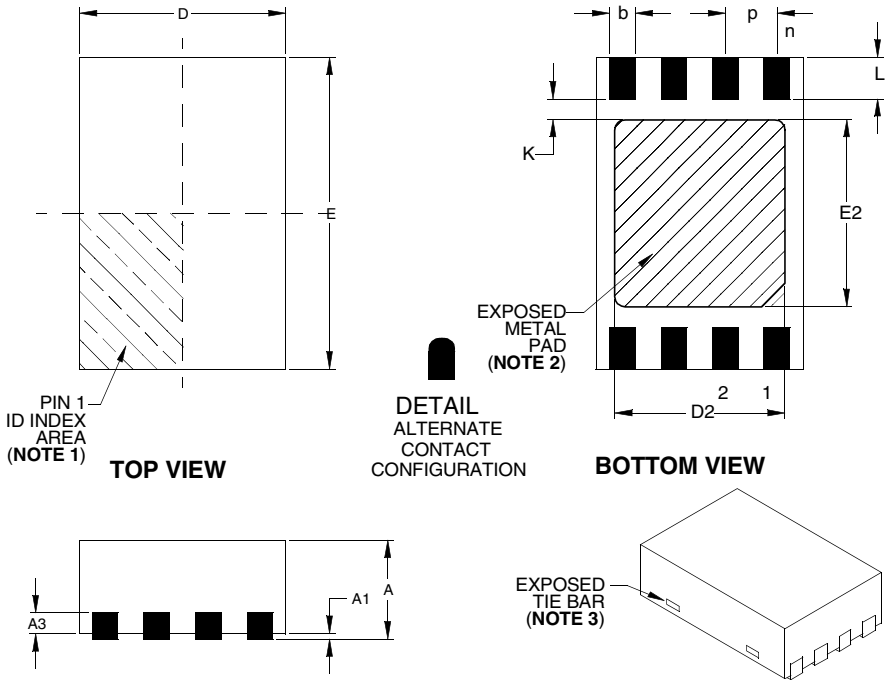
Packaging Diagrams and Parameters

8-Lead Plastic Dual-Flat, No-Lead Package (MC) 2x3x0.9 mm Body (DFN) – Saw Singulated



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	e	.020 BSC			0.50 BSC		
Overall Height	A	.031	.035	.039	0.80	0.90	1.00
Standoff	A1	.000	.001	.002	0.00	0.02	0.05
Contact Thickness	A3	.008 REF.			0.20 REF.		
Overall Length	D	.079 BSC			2.00 BSC		
Overall Width	E	.118 BSC			3.00 BSC		
Exposed Pad Length	D2	.051	–	.069	1.30**	–	1.75
Exposed Pad Width	E2	.059	–	.075	1.50**	–	1.90
Contact Length §	L	.012	.016	.020	0.30	0.40	0.50
Contact-to-Exposed Pad §	K	.008	–	–	0.20	–	–
Contact Width	b	.008	.010	.012	0.20	0.25	0.30

***** Controlling Parameter

****** Not within JEDEC parameters

§ Significant Characteristic

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.

2. Exposed pad may vary according to die attach paddle size.

3. Package may have one or more exposed tie bars at ends.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

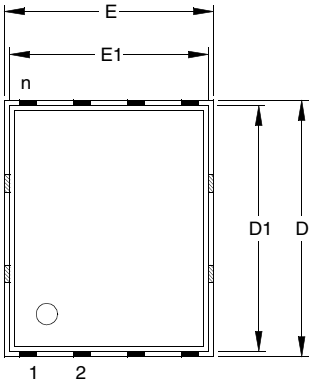
JEDEC Equivalent MO-229 VCED-2

DWG No. C04-123

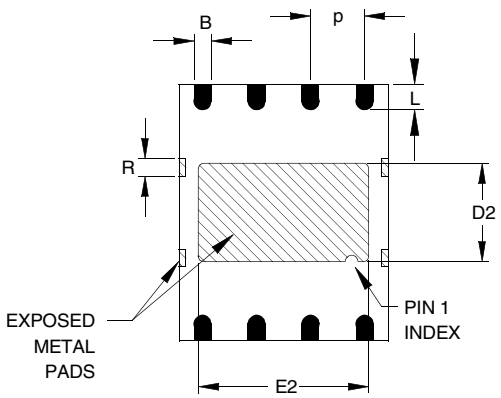
Revised 09-12-05

Packaging Diagrams and Parameters

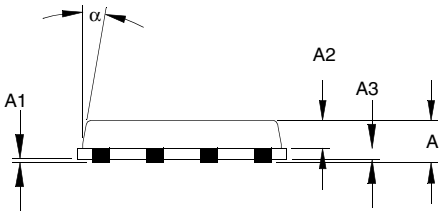
8-Lead Plastic Dual-Flat, No-Lead Package (MF) 6x5 mm Body (DFN-S) – Punch Singulated

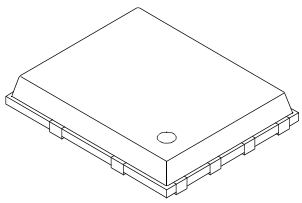


TOP VIEW



BOTTOM VIEW





Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.050 BSC			1.27 BSC	
Overall Height	A		.033	.039		0.85	1.00
Molded Package Thickness	A2		.026	.031		0.65	0.80
Standoff	A1	.000	.0004	.002	0.00	0.01	0.05
Base Thickness	A3		.008 REF.			0.20 REF.	
Overall Length	E		.194 BSC			4.92 BSC	
Molded Package Length	E1		.184 BSC			4.67 BSC	
Exposed Pad Length	E2	.152	.158	.163	3.85	4.00	4.15
Overall Width	D		.236 BSC			5.99 BSC	
Molded Package Width	D1		.226 BSC			5.74 BSC	
Exposed Pad Width	D2	.085	.091	.097	2.16	2.31	2.46
Lead Width	B	.014	.016	.019	0.35	0.40	0.47
Lead Length	L	.020	.024	.030	0.50	0.60	0.75
Tie Bar Width	R		.014			.356	
Mold Draft Angle Top	α			12°			12°

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC equivalent: Pending

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent MO-220

Drawing No. C04-113

Revised 07-19-05

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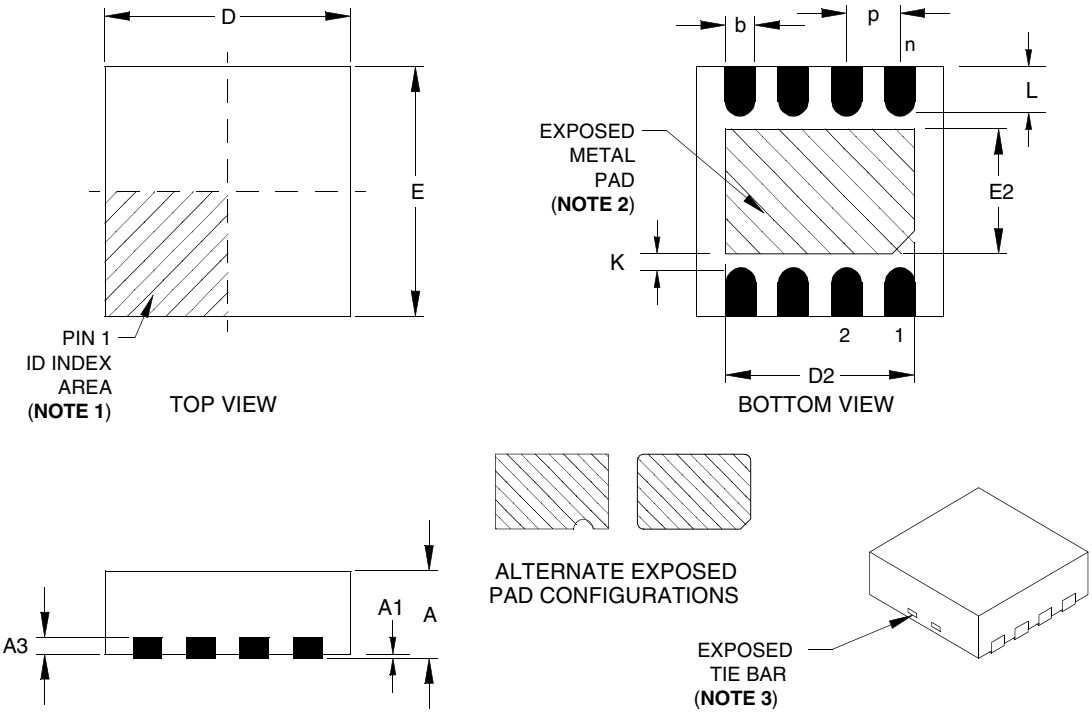
Packaging Diagrams and Parameters

8-Lead Plastic Dual-Flat, No-Lead Package (MF) 3x3x0.9 mm Body (DFN) – Saw Singulated



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.026 BSC			0.65 BSC	
Overall Height	A	.031	.035	.039	0.80	0.90	1.00
Standoff	A1	.000	.001	.002	0.00	0.02	0.05
Contact Thickness	A3		.008 REF.			0.20 REF.	
Overall Length	E		.118 BSC			3.00 BSC	
Exposed Pad Width	E2	.043	.061	.063	1.09	1.55	1.60
Overall Width	D		.118 BSC			3.00 BSC	
Exposed Pad Length	D2	.059	.092	.096	1.50	2.37	2.45
Contact Width	b	.009	.012	.015	0.23	0.30	0.37
Contact Length §	L	.008	.016	.020	0.20	0.40	0.50
Contact-to-Exposed Pad §	K	.008	–	–	0.20	–	–

***** Controlling Parameter

§ Significant Characteristic

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.

2. Exposed pad varies according to die attach paddle size.

3. Package may have one or more exposed tie bars at ends.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

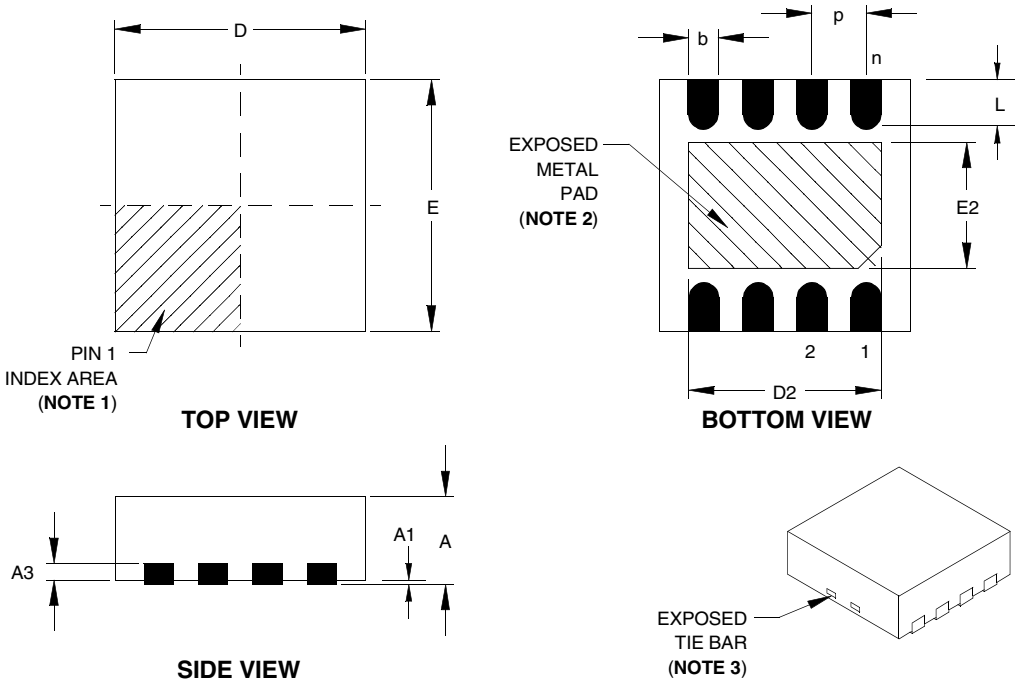
REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC equivalent: M0-229

Revised 09-07-05

Drawing No. C04-062

8-Lead Plastic Dual-Flat, No-Lead Package (MD) 4x4x0.9 mm Body (DFN) – Saw Singulated



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.031 BSC			0.80 BSC	
Overall Height	A	.029	.035	.039	0.75	0.90	1.00
Standoff	A1	.000	.001	.002	0.00	0.02	0.05
Contact Thickness	A3		.008 REF.			0.20 REF.	
Overall Length	E	.152	.157	.163	3.85	4.00	4.15
Exposed Pad Width (**Note 3**)	E2	.091	.106	.112	2.30	2.70	2.85
Overall Width	D	.152	.157	.163	3.85	4.00	4.15
Exposed Pad Length (**Note 3**)	D2	.127	.138	.144	3.23	3.50	3.65
Contact Width	b	.009	.012	.015	0.23	0.30	0.38
Contact Length §	L	.008	.016	.020	0.20	0.40	0.50
Contact-to-Exposed Pad §	K	.008	–	–	0.20	–	–

***** Controlling Parameter
§ Significant Characteristic

Notes:
1. Package may have one or more exposed tie bars at ends.
2. Pin 1 visual index feature may vary, but must be located within the hatched area.
3. Exposed pad dimensions vary with paddle size.
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M
REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M
JEDEC equivalent: Not Registered
Drawing No. C04-131

Revised 9-14-05

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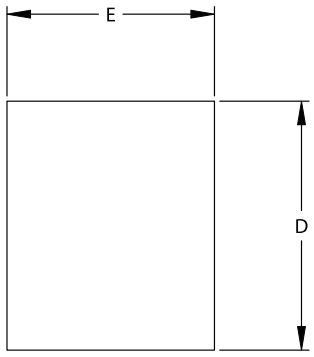
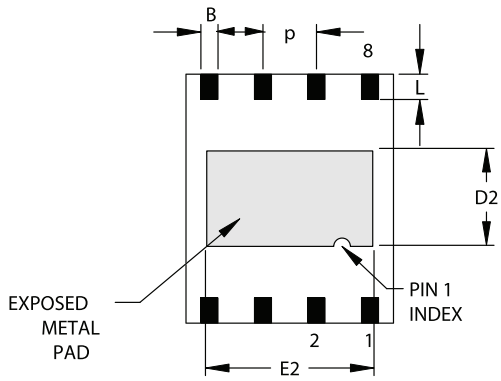
Packaging Diagrams and Parameters

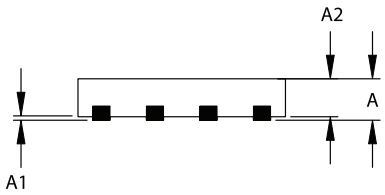
8-Lead Plastic Dual-Flat, No-Lead Package (MF) 6x5 mm Body (DFN-S) – Saw Singulated

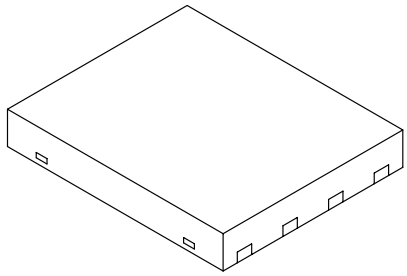


TOP VIEW



BOTTOM VIEW



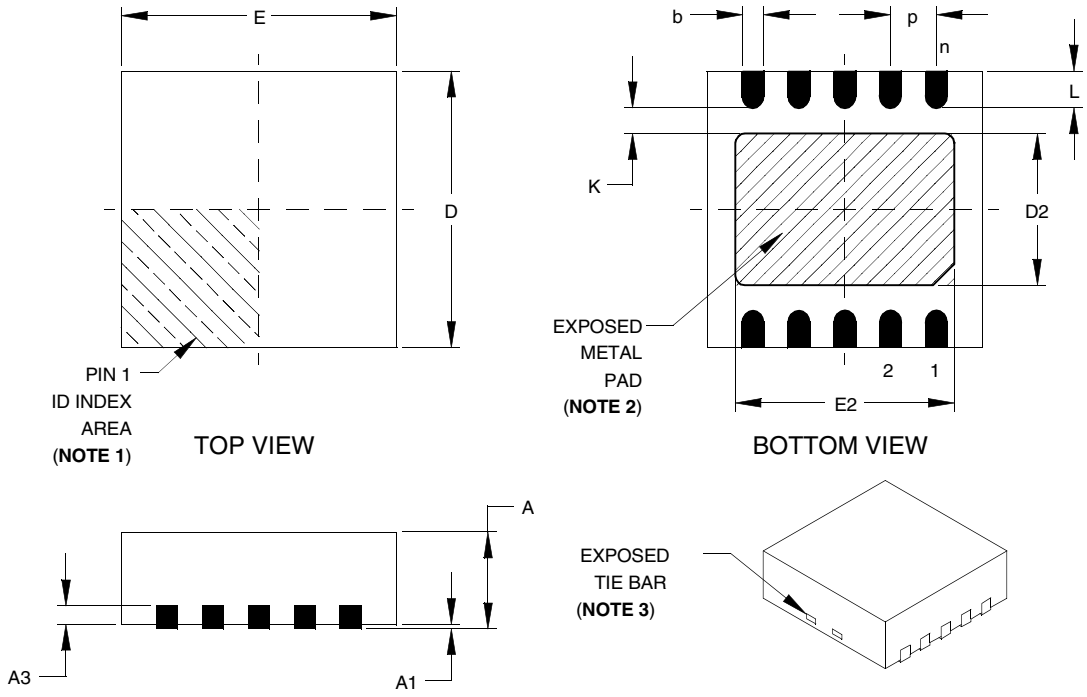


Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.050 BSC			1.27 BSC	
Overall Height	A	.033	.035	.037	0.85	0.90	0.95
Package Thickness	A2	.031	.035	.037	0.80	0.89	0.95
Standoff	A1	.000	.0004	.002	0.00	0.01	0.05
Base Thickness	A3	.007	.008	.009	0.17	0.20	0.23
Overall Length	E	.195	.197	.199	4.95	5.00	5.05
Exposed Pad Length	E2	.152	.157	.163	3.85	4.00	4.15
Overall Width	D	.234	.236	.238	5.95	6.00	6.05
Exposed Pad Width	D2	.089	.091	.093	2.25	2.30	2.35
Lead Width	B	.014	.016	.019	0.35	0.40	0.47
Lead Length	L	.024		.026	0.60		0.65

Notes:
JEDEC Equivalent: M0-220
Drawing No. C04-122

Revised 11/3/03

10-Lead Plastic Dual-Flat, No-Lead Package (MF) 3x3x0.9 mm Body (DFN)–Saw Singulated



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		10			10	
Pitch	e		.020 BSC			0.50 BSC	
Overall Height	A	.031	.035	.039	0.80	0.90	1.00
Standoff	A1	.000	.001	.002	0.00	0.02	0.05
Lead Thickness	A3		.008 REF.			0.20 REF.	
Overall Length	E	.112	.118	.124	2.85	3.00	3.15
Exposed Pad Length (**Note 3**)	E2	.082	.094	.096	2.08	2.39	2.45
Overall Width	D	.112	.118	.124	2.85	3.00	3.15
Exposed Pad Width (**Note 3**)	D2	.051	.065	.067	1.30	1.65	1.70
Lead Width	b	.008	.010	.015	0.18	0.25	0.30
Contact Length §	L	.012	.016	.020	0.30	0.40	0.50
Contact-to-Exposed Pad §	K	.008	—	—	0.20	—	—

* Controlling Parameter

§ Significant Characteristic

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.

2. Exposed pad varies according to die attach paddle size.

3. Package may have one or more exposed tie bars at ends.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC equivalent: Not Registered
Drawing No. C04-063

Revised 09-12-05

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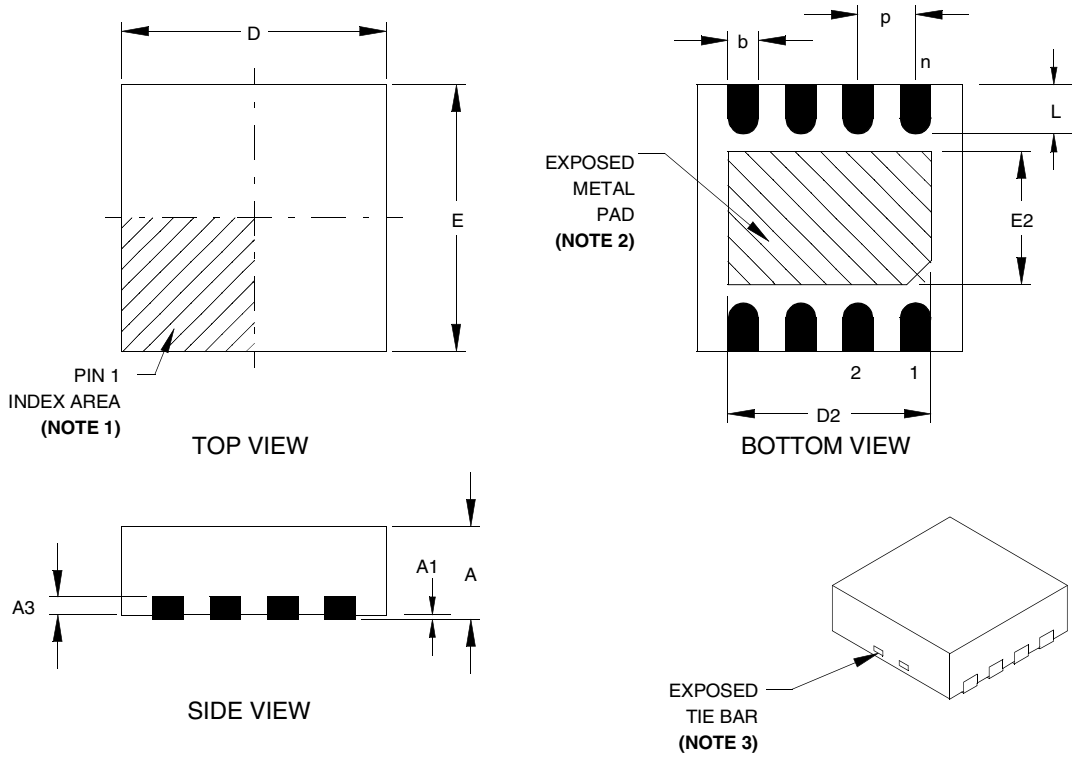
Packaging Diagrams and Parameters

8-Lead Plastic Quad Flat No Lead Package (ML) 4x4 mm Body (QFN) – Saw Singulated



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.031 BSC			0.80 BSC	
Overall Height	A	.029	.035	.039	0.75	0.90	1.00
Standoff	A1	.000	.001	.002	0.00	0.02	0.05
Contact Thickness	A3		.008 REF.			0.20 REF.	
Overall Length	E	.152	.157	.163	3.85	4.00	4.15
Exposed Pad Width	E2	.091	.106	.112	2.30	2.70	2.85
Overall Width	D	.152	.157	.163	3.85	4.00	4.15
Exposed Pad Length	D2	.127	.138	.144	3.23	3.50	3.65
Contact Width	b	.009	.012	.015	0.23	0.30	0.38
Contact Length	L	.008	.016	.020	0.20	0.40	0.50

* Controlling Parameter

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.

2. Exposed pad dimensions vary with paddle size.

3. Package may have one or more exposed tie bars at ends.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

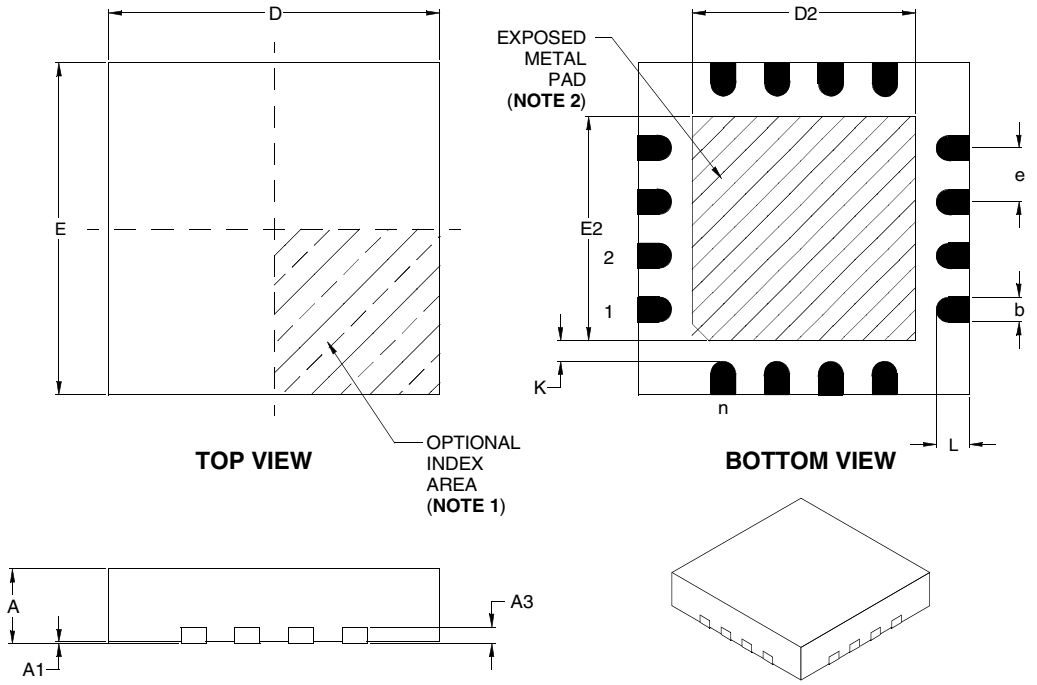
JEDEC equivalent: MO-229

Drawing No. C04-300

Revised 7-27-05

Packaging Diagrams and Parameters

16-Lead Plastic Quad Flat No Lead Package (ML) 4x4x0.9 mm Body (QFN) – Saw Singulated



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		16			16	
Pitch	e		.026 BSC			0.65 BSC	
Overall Height	A	.031	.035	.039	0.80	0.90	1.00
Standoff	A1	.000	.001	.002	0.00	0.02	0.05
Contact Thickness	A3		.008 REF			0.20 REF	
Overall Width	E	.152	.157	.163	3.85	4.00	4.15
Exposed Pad Width	E2	.090**	–	.110	2.29**	–	2.80
Overall Length	D	.152	.157	.163	3.85	4.00	4.15
Exposed Pad Length	D2	.090	–	.110	2.29	–	2.80
Contact Width	b	.010	.012	.014	0.25	0.30	0.35
Contact Length §	L	.012	.016	.020	0.30	0.40	0.50
Contact-to-Exposed Pad §	K	.008	–	–	0.20	–	–

* Controlling Parameter

** Outside JEDEC Specification

§ Significant Characteristic

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.

2. Exposed pad varies according to die attach paddle size.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC equivalent: M0-220 VGGC-3

Drawing No. C04-127

Revised 09-13-05

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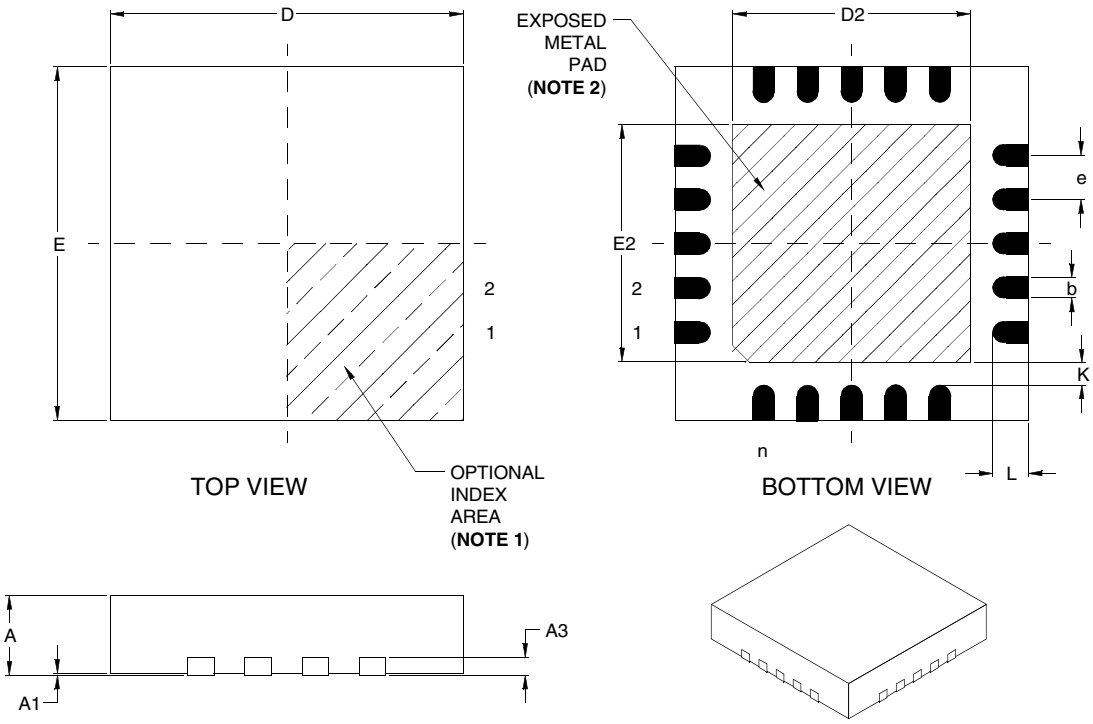
Packaging Diagrams and Parameters

20-Lead Plastic Quad Flat No Lead Package (ML) 4x4x0.9 mm Body (QFN) – Saw Singulated



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		20			20	
Pitch	e		.020 BSC			0.50 BSC	
Overall Height	A	.031	.035	.039	0.80	0.90	1.00
Standoff	A1	.000	.001	.002	0.00	0.02	0.05
Contact Thickness	A3		.008 REF			0.20 REF	
Overall Width	E		.157 BSC			4.00 BSC	
Exposed Pad Width	E2	.102	.106	.110	2.60	2.70	2.80
Overall Length	D		.157 BSC			4.00 BSC	
Exposed Pad Length	D2	.102	.106	.110	2.60	2.70	2.80
Contact Width	b	.007	.010	.012	0.18	0.25	0.30
Contact Length §	L	.012	.016	.020	0.30	0.40	0.50
Contact-to-Exposed Pad §	K	.008	–	–	0.20	–	–

***** Controlling Parameter

§ Significant Characteristic

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.

2. Exposed pad varies according to die attach paddle size.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

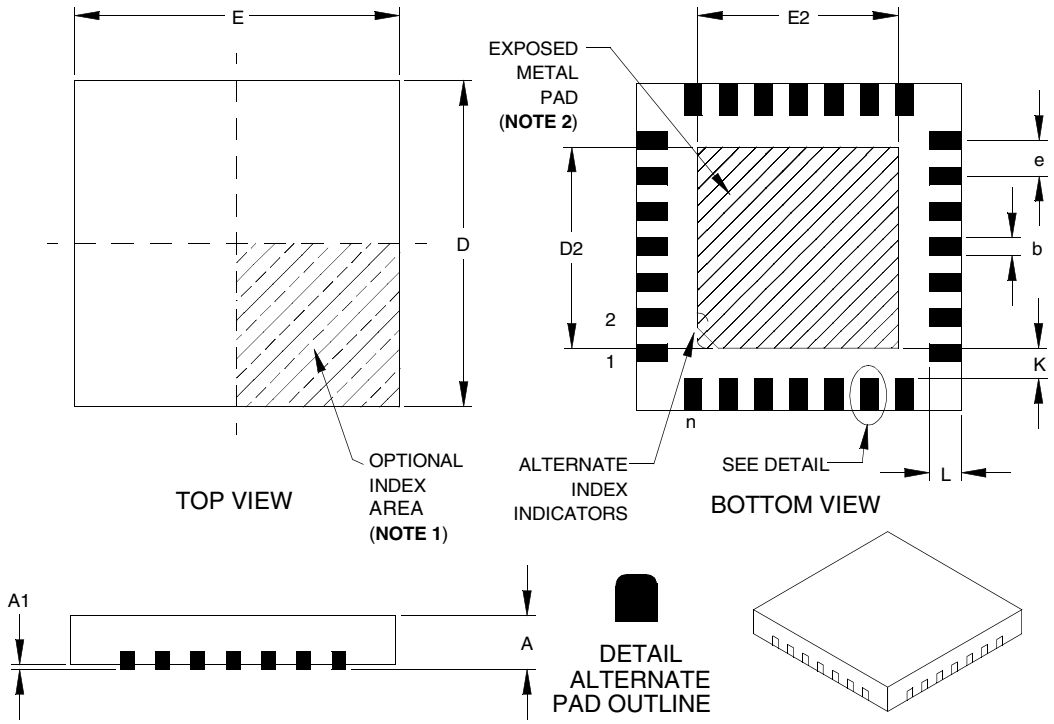
REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC equivalent: Not Registered

Drawing No. C04-126

Revised 09-12-05

28-Lead Plastic Quad Flat No Lead Package (ML) 6x6 mm Body (QFN) – With 0.55 mm Contact Length (Saw Singulated)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	e		.026 BSC			0.65 BSC	
Overall Height	A	.031	.035	.039	0.80	0.90	1.00
Standoff	A1	.000	.001	.002	0.00	0.02	0.05
Contact Thickness	A3		.008 REF			0.20 REF	
Overall Width	E	.232	.236	.240	5.90	6.00	6.10
Exposed Pad Width	E2	.153	.167	.169	3.89	4.24	4.29
Overall Length	D	.232	.236	.240	5.90	6.00	6.10
Exposed Pad Length	D2	.153	.167	.169	3.89	4.24	4.29
Contact Width	β	.009	.011	.013	0.23	0.28	0.33
Contact Length §	L	.018	.022	.024	0.45	0.55	0.65
Contact-to-Exposed Pad §	K	.008	–	–	0.20	–	–

***** Controlling Parameter

§ Significant Characteristic

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.

2. Exposed pad varies according to die attach paddle size.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC equivalent: MO-220

Drawing No. C04-105

Revised 09-12-05

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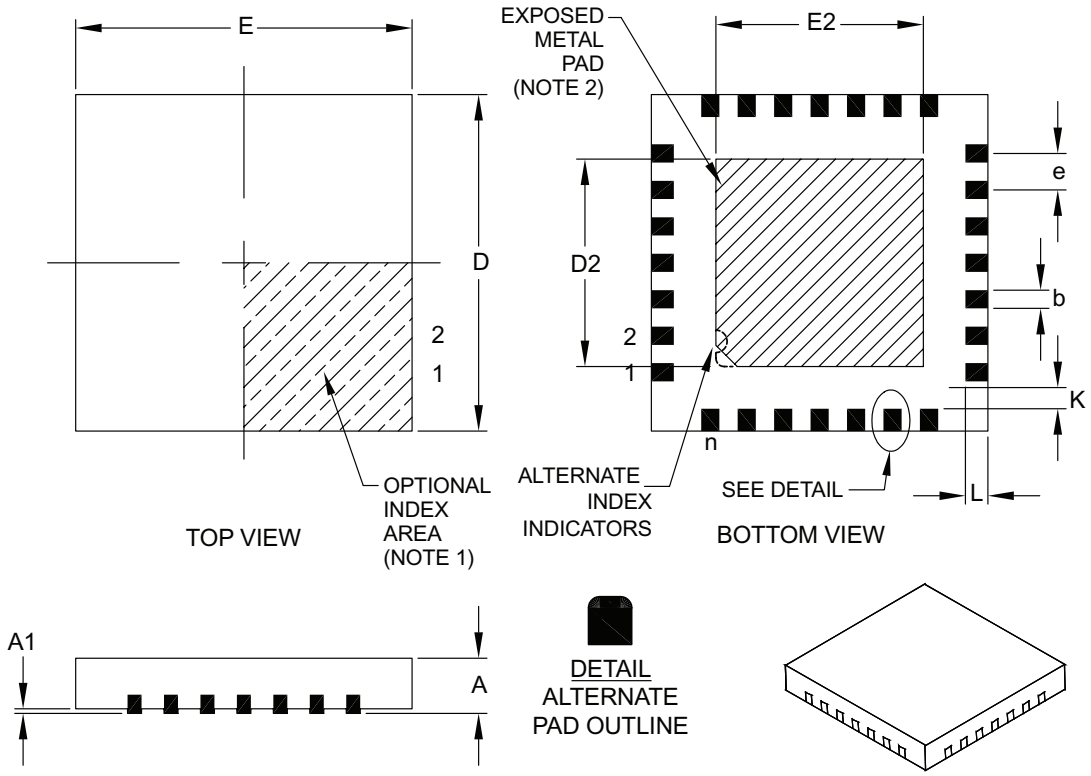
28-Lead Plastic Quad Flat No Lead Package (MM) 6x6x0.9 mm Body (QFN-S) – With 0.40 mm Contact Length (Saw Singulated)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	e		.026 BSC			0.65 BSC	
Overall Height	A	.031	.035	.039	0.80	0.90	1.00
Standoff	A1	.000	.001	.002	0.00	0.02	0.05
Overall Width	E	.232	.236	.240	5.90	6.00	6.10
Exposed Pad Width	E2	.144	.146	.148	3.65	3.70	3.75
Overall Length	D	.232	.236	.240	5.90	6.00	6.10
Exposed Pad Length	D2	.144	.146	.148	3.65	3.70	3.75
Lead Width	b	.013	.015	.017	0.33	0.38	0.43
Contact Length §	L	.012	.016	.020	0.30	0.40	0.50
Contact-to-Exposed Pad §	K	.008	–	–	0.20	–	–

***** Controlling Parameter

§ Significant Characteristic

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.

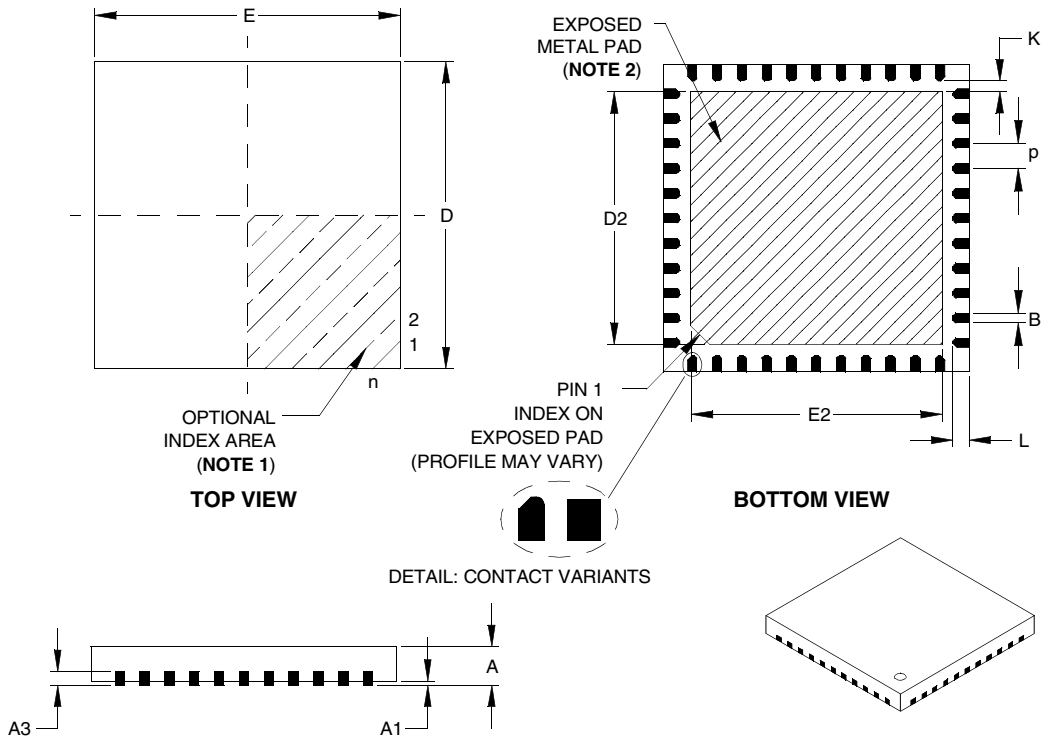
2. Exposed pad varies according to die attach paddle size.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

Revised 1-12-06

Drawing No. C04-124

44-Lead Plastic Quad Flat No Lead Package (ML) 8x8 mm Body (QFN)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Contacts	n		44			44	
Pitch	p		.026 BSC			0.65 BSC	
Overall Height	A	.031	.035	.039	0.80	0.90	1.00
Standoff	A1	.000	.001	.002	0	0.02	0.05
Base Thickness	A3		.010 REF			0.25 REF	
Overall Width	E	.309	.315	.321	7.85	8.00	8.15
Exposed Pad Width	E2	.236	.258	.260	5.99	6.55	6.60
Overall Length	D	.309	.315	.321	7.85	8.00	8.15
Exposed Pad Length	D2	.236	.258	.260	5.99	6.55	6.60
Contact Width	B	.008	.013	.013	0.20	0.33	0.35
Contact Length §	L	.014	.016	.019	0.35	0.40	0.48
Contact-to-Exposed-Pad §	K	.014	-	-	0.20	-	-

***** Controlling Parameter

§ Significant Characteristic

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.

2. Exposed pad varies according to die attach paddle size.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC equivalent: M0-220

Drawing No. C04-103

Revised 09-12-05

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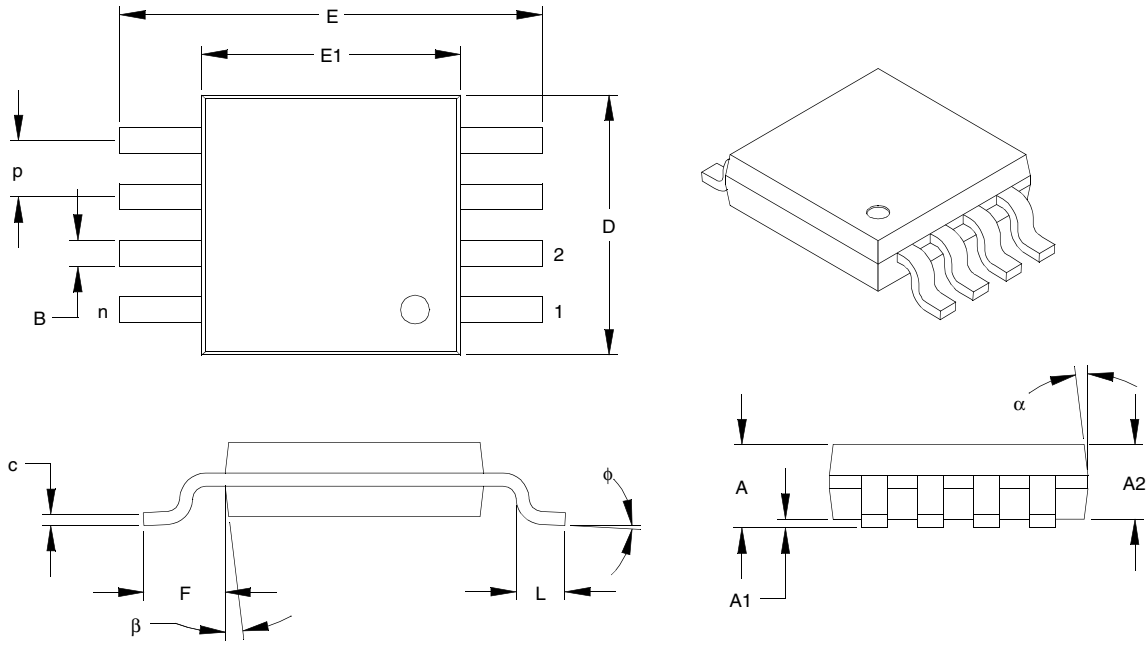
Packaging Diagrams and Parameters

8-Lead Plastic Micro Small Outline Package (MS) (MSOP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.026 BSC			0.65 BSC	
Overall Height	A	-	-	.043	-	-	1.10
Molded Package Thickness	A2	.030	.033	.037	0.75	0.85	0.95
Standoff	A1	.000	-	.006	0.00	-	0.15
Overall Width	E		.193 BSC			4.90 BSC	
Molded Package Width	E1		.118 BSC			3.00 BSC	
Overall Length	D		.118 BSC			3.00 BSC	
Foot Length	L	.016	.024	.031	0.40	0.60	0.80
Footprint (Reference)	F		.037 REF			0.95 REF	
Foot Angle	φ	0°	-	8°	0°	-	8°
Lead Thickness	c	.003	.006	.009	0.08	-	0.23
Lead Width	B	.009	.012	.016	0.22	-	0.40
Mold Draft Angle Top	α	5°	-	15°	5°	-	15°
Mold Draft Angle Bottom	β	5°	-	15°	5°	-	15°

* Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

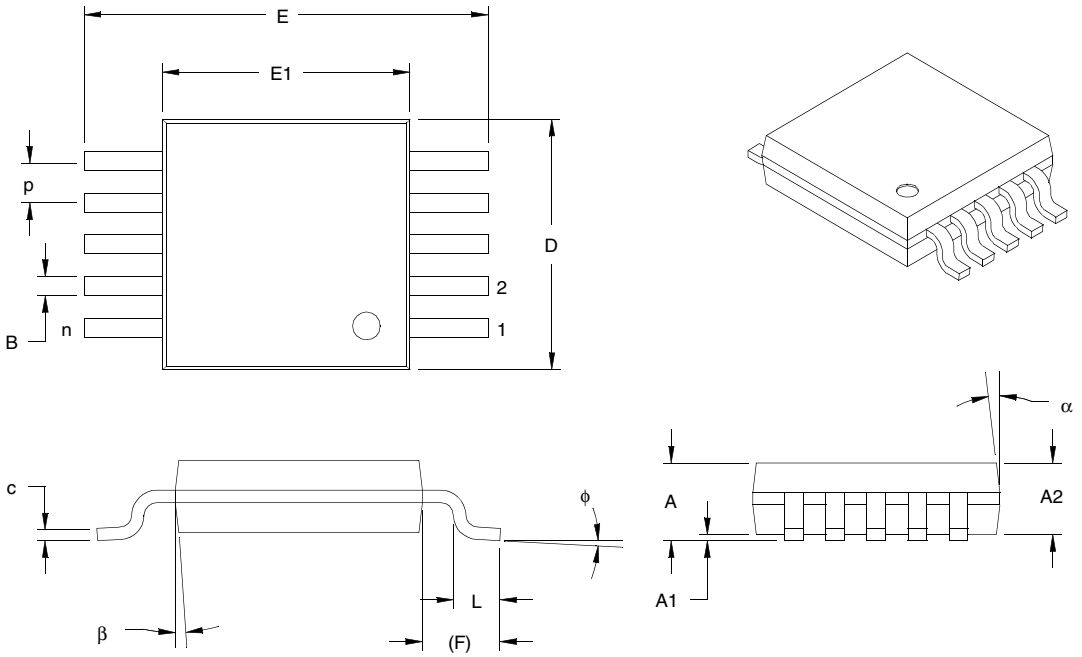
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent: MO-187 Revised 07-21-05

Drawing No. C04-111

10-Lead Plastic Micro Small Outline Package (MS) (MSOP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		10			10	
Pitch	p		.020 BSC			0.50 BSC	
Overall Height	A			.043	–	–	1.10
Molded Package Thickness	A2	.030	.033	.037	0.75	0.85	0.95
Standoff	A1	.000		.006	0.00		0.15
Overall Width	E		.193 BSC			4.90 BSC	
Molded Package Width	E1		.118 BSC			3.00 BSC	
Overall Length	D		.118 BSC			3.00 BSC	
Foot Length	L	.016	.024	.031	0.40	0.60	0.80
Footprint	F		.037 REF			0.95 REF	
Foot Angle	φ	0°	–	8°	0°	–	8°
Lead Thickness	c	.003	–	.009	0.08	–	0.23
Lead Width	B	.006	.009	.012	0.15	0.23	0.30
Mold Draft Angle Top	α	5°	–	15°	5°	–	15°
Mold Draft Angle Bott om	β	5°	–	15°	5°	–	15°

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254 mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent: MO-187 BA

Drawing No. C04-021

Revised 09-16-05

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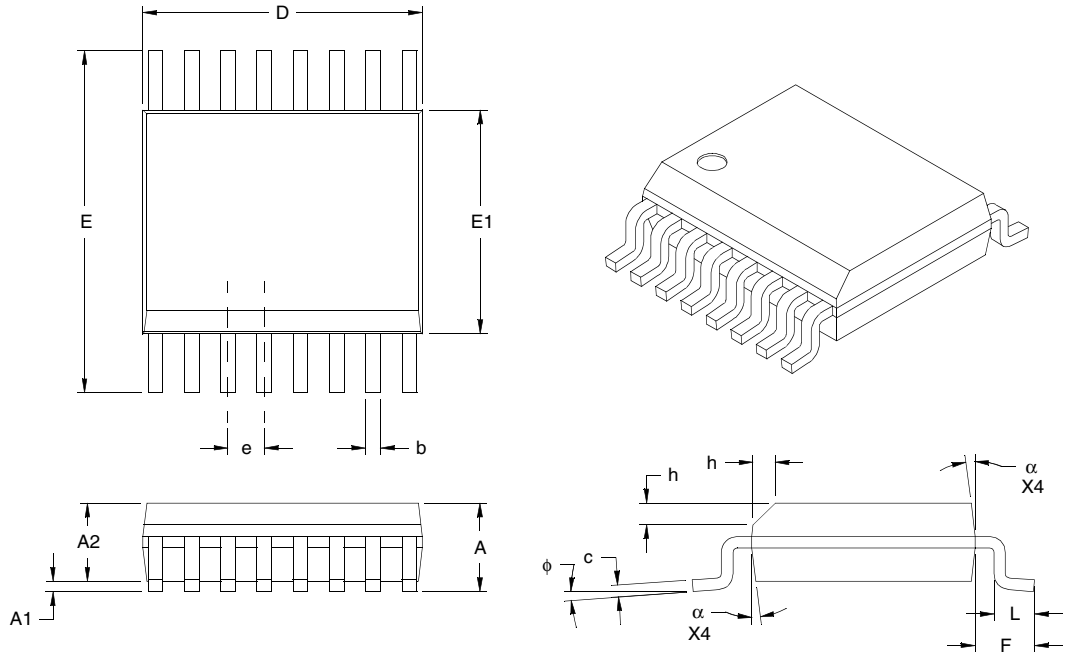
Packaging Diagrams and Parameters

16-Lead Plastic Small Outline Package Narrow Body (QR) (QSOP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins			16			16	
Pitch	e		.025 BSC			0.64 BSC	
Overall Height	A	.053	–	.069	1.35	–	1.75
Standoff §	A1	.004	–	.010	0.10	–	0.25
Molded Package Height	A2	.049	–	.065	1.24	–	1.65
Overall Width	E		.236 BSC			5.99 BSC	
Molded Package Width	E1		.154 BSC			3.91 BSC	
Overall Length	D		.193 BSC			4.90 BSC	
Chamfer Distance	h	.010	–	.020	0.25	–	0.51
Lead Thickness	c	.006	–	.011	0.15	–	0.28
Lead Width	b	.008	–	.012	0.20	–	0.30
Footprint	F		.041 REF			1.04 REF	
Foot Length	L	.016	–	.050	0.41	–	1.27
Foot Angle	Φ	0°	–	8°	0°	–	8°
Mold Draft Angle	α	5°	–	15°	5°	–	15°

***** Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

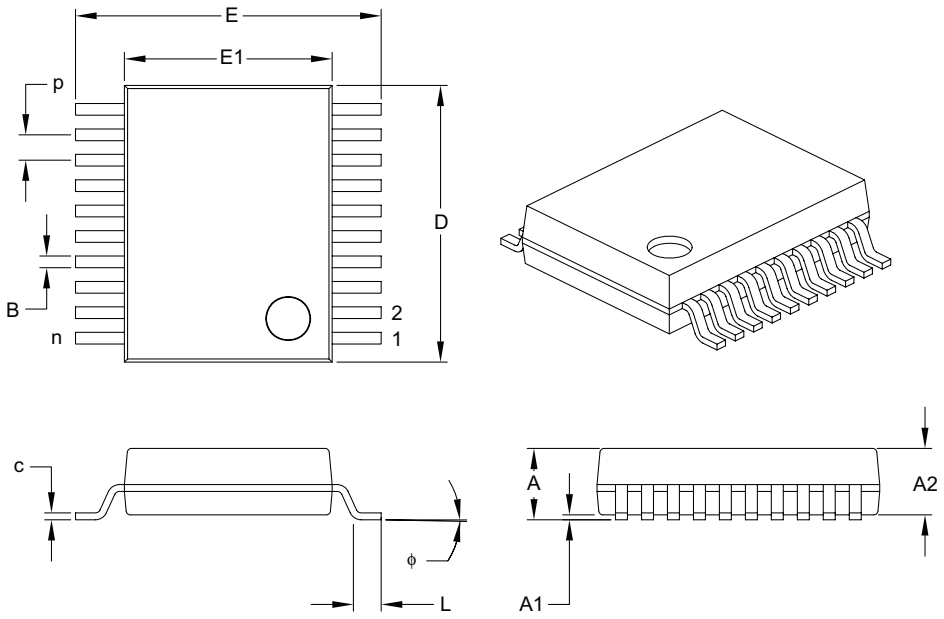
JEDEC equivalent: MO-137 AB

Revised 08-16-05

Drawing No. C04-024

Packaging Diagrams and Parameters

20-Lead Plastic Shrink Small Outline (SS) – 209 mil Body, 5.30 mm (SSOP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		20			20	
Pitch	p		.026			.065	
Overall Height	A	–	–	.079	–	–	2.00
Molded Package Thickness	A2	.065	.069	.073	1.65	1.75	1.85
Standoff	A1	.002	–	–	0.05	–	–
Overall Width	E	.291	.307	.323	7.40	7.80	8.20
Molded Package Width	E1	.197	.209	.220	5.00	5.30	5.60
Overall Length	D	.272	.283	.295	6.90	7.20	7.50
Foot Length	L	0.22	0.30	0.37	0.55	0.75	0.95
Lead Thickness	c	.004	–	.010	0.09	–	0.25
Foot Angle	φ	0°	4°	8°	0°	4°	8°
Lead Width	B	.009	–	.015	0.22	–	0.38

***** Controlling Parameter

Notes:

Dimensions D and E1 do no include mold flash or protrusions. Mold flash or protrusions shall not exceed 010" (0.254mm) per side.

JEDEC Equivalent: MO-150

Drawing No. C04-072

Revised 8-27-04

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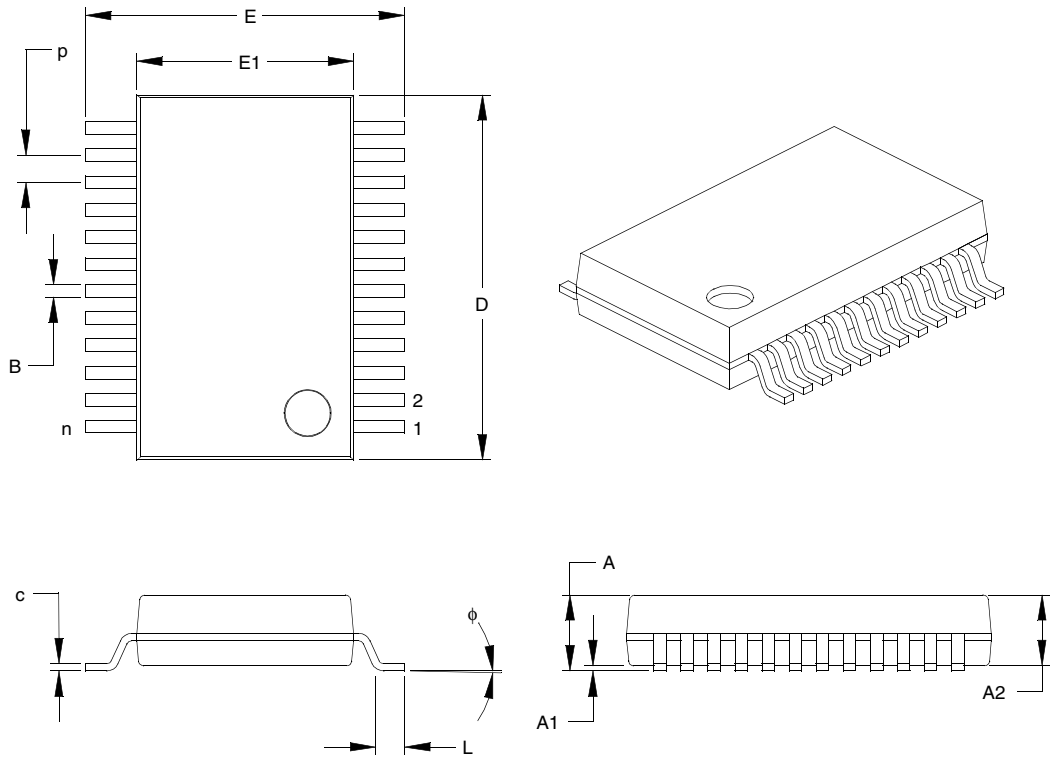
24-Lead Plastic Shrink Small Outline (SS) – (SSOP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		24			24	
Pitch	p		.026 BSC.			0.65 BSC.	
Overall Height	A	.068	.073	.078	1.73	1.86	1.99
Molded Package Thickness	A2	.066	.068	.070	1.68	1.73	1.78
Standoff	A1	.002	.005	.008	0.05	0.13	0.21
Overall Width	E	.301	.307	.311	7.65	7.80	7.90
Molded Package Width	E1	.205	.209	.212	5.20	5.30	5.38
Overall Length	D	.318	.323	.328	8.07	8.20	8.33
Foot Length	L	.025	.030	.037	0.63	0.75	0.95
Lead Thickness	c	.004	.006	–	0.09	0.15	–
Foot Angle	ϕ	0°	4°	8°	0°	4°	8°
Lead Width	B	.010	–	.015	0.25	–	0.38

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

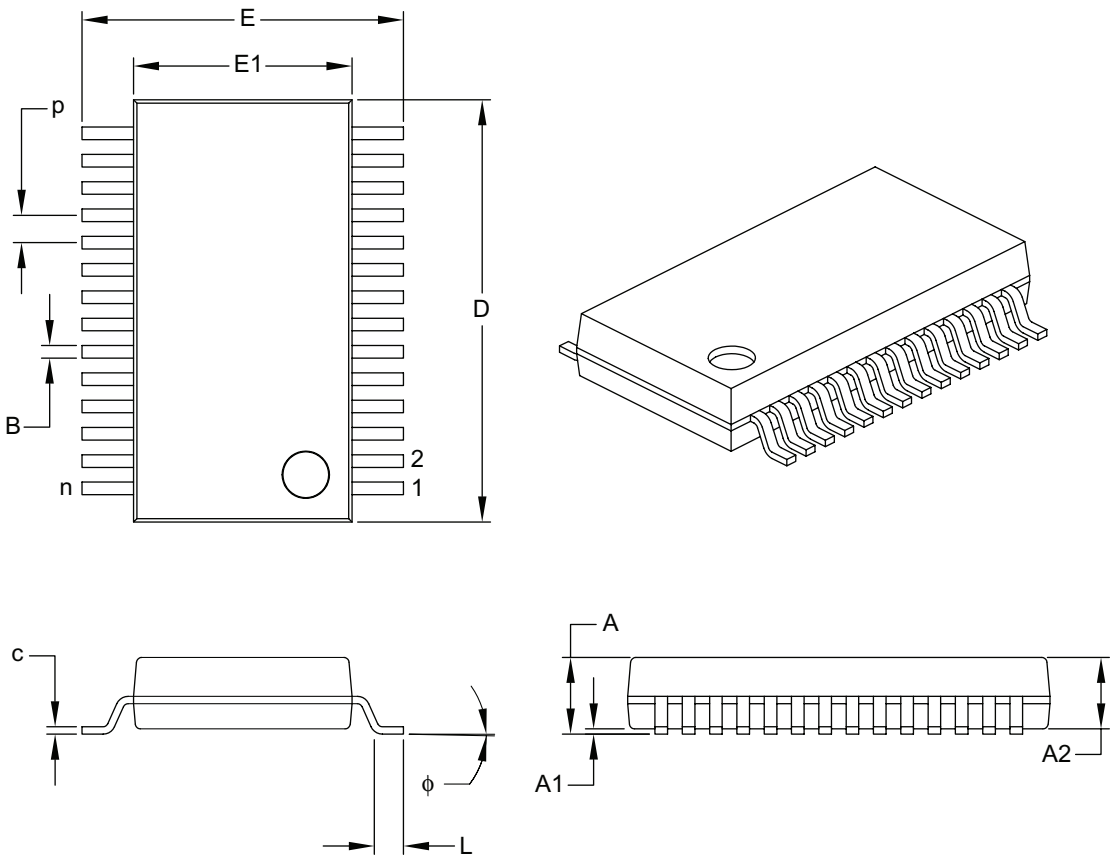
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

JEDEC Equivalent: MO-150

Drawing No. C04-132

Revised 9-14-05

28-Lead Plastic Shrink Small Outline (SS) – 209 mil Body, 5.30 mm (SSOP)



Units		INCHES			MILLIMETERS *		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.026			0.65	
Overall Height	A	-	-	.079	-	-	2.0
Molded Package Thickness	A2	.065	.069	.073	1.65	1.75	1.85
Standoff	A1	.002	-	-	0.05	-	-
Overall Width	E	.295	.307	.323	7.49	7.80	8.20
Molded Package Width	E1	.197	.209	.220	5.00	5.30	5.60
Overall Length	D	.390	.402	.413	9.90	10.20	10.50
Foot Length	L	.022	.030	.037	0.55	0.75	0.95
Lead Thickness	c	.004	-	.010	0.09	-	0.25
Foot Angle	ϕ	0°	4°	8°	0°	4°	8°
Lead Width	B	.009	-	.015	0.22	-	0.38

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

Drawing No. C04-073 Revised 1-12-06

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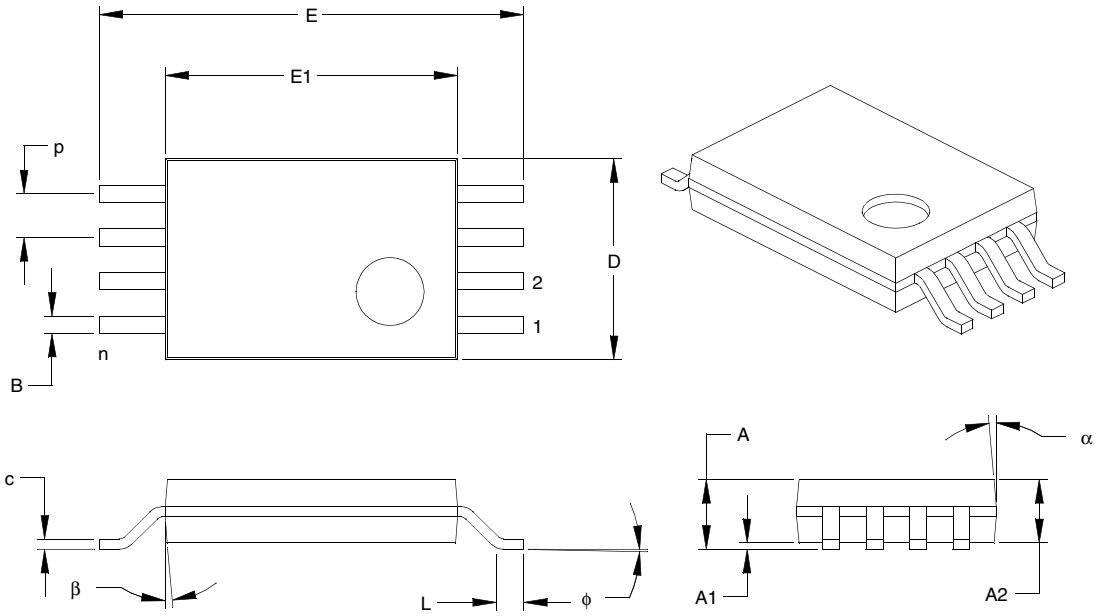
Packaging Diagrams and Parameters

8-Lead Plastic Thin Shrink Small Outline (ST) – 4.4 mm Body (TSSOP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.026			0.65	
Overall Height	A	.039	.041	.043	1.00	1.05	1.10
Molded Package Thickness	A2	.033	.035	.037	0.85	0.90	0.95
Standoff	A1	.002	.004	.006	0.05	0.10	0.15
Overall Width	E	.246	.251	.256	6.25	6.38	6.50
Molded Package Width	E1	.169	.173	.177	4.30	4.40	4.50
Molded Package Length	D	.114	.118	.122	2.90	3.00	3.10
Foot Length	L	.020	.024	.028	0.50	0.60	0.70
Foot Angle	φ	0°	4°	8°	0°	4°	8°
Lead Thickness	c	.004	.006	.008	0.09	0.15	0.20
Lead Width	B	.007	.010	.012	0.19	0.25	0.30
Mold Draft Angle Top	α	0°	5°	10°	0°	5°	10°
Mold Draft Angle Bottom	β	0°	5°	10°	0°	5°	10°

***** Controlling Parameter

Notes:

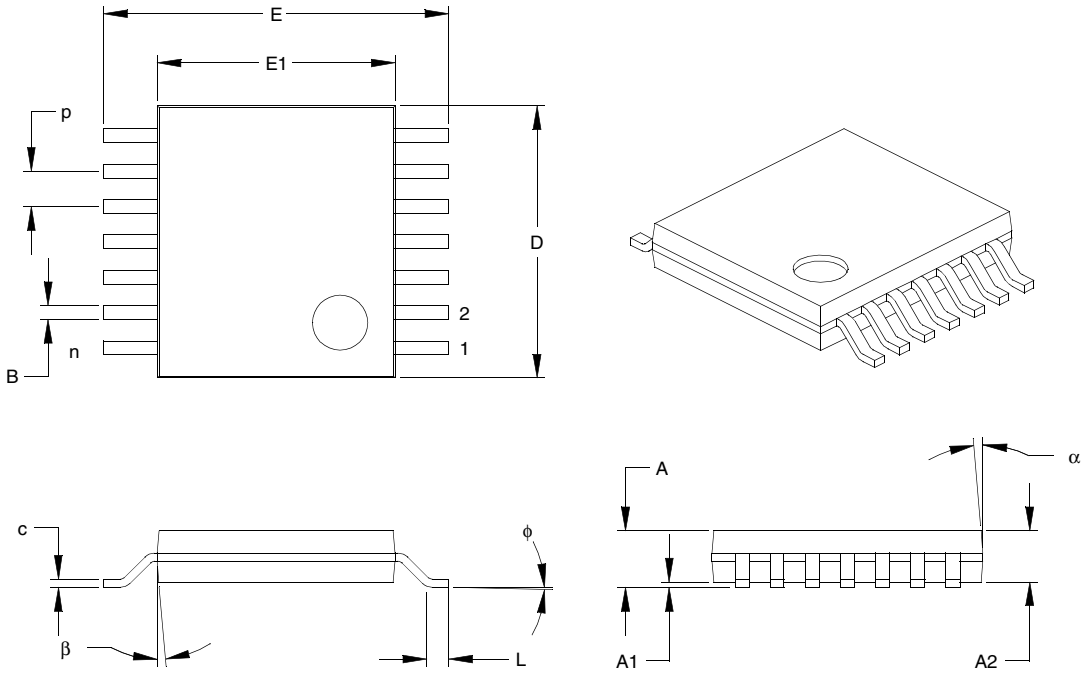
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

JEDEC Equivalent: MO-153

Drawing No. C04-086

Revised 07-21-05

14-Lead Plastic Thin Shrink Small Outline (ST) – 4.4 mm Body (TSSOP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		14			14	
Pitch	p		.026 BSC			0.65 BSC	
Overall Height	A	.039	.041	.043	1.00	1.05	1.10
Molded Package Thickness	A2	.033	.035	.037	0.85	0.90	0.95
Standoff	A1	.002	.004	.006	0.05	0.10	0.15
Overall Width	E	.246	.251	.256	6.25	6.38	6.50
Molded Package Width	E1	.169	.173	.177	4.30	4.40	4.50
Molded Package Length	D	.193	.197	.201	4.90	5.00	5.10
Foot Length	L	.020	.024	.028	0.50	0.60	0.70
Foot Angle	φ	0°	4°	8°	0°	4°	8°
Lead Thickness	c	.004	.006	.008	0.09	0.15	0.20
Lead Width	B	.007	.010	.012	0.19	0.25	0.30
Mold Draft Angle Top	α		12° REF			12° REF	
Mold Draft Angle Bottom	β		12° REF			12° REF	

* Controlling Parameter

Notes:

Dimensions D and E1 do not include mold fla sh or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tole rance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent: MO-153 AB-1

Drawing No. C04-087

Revised: 08-17-05

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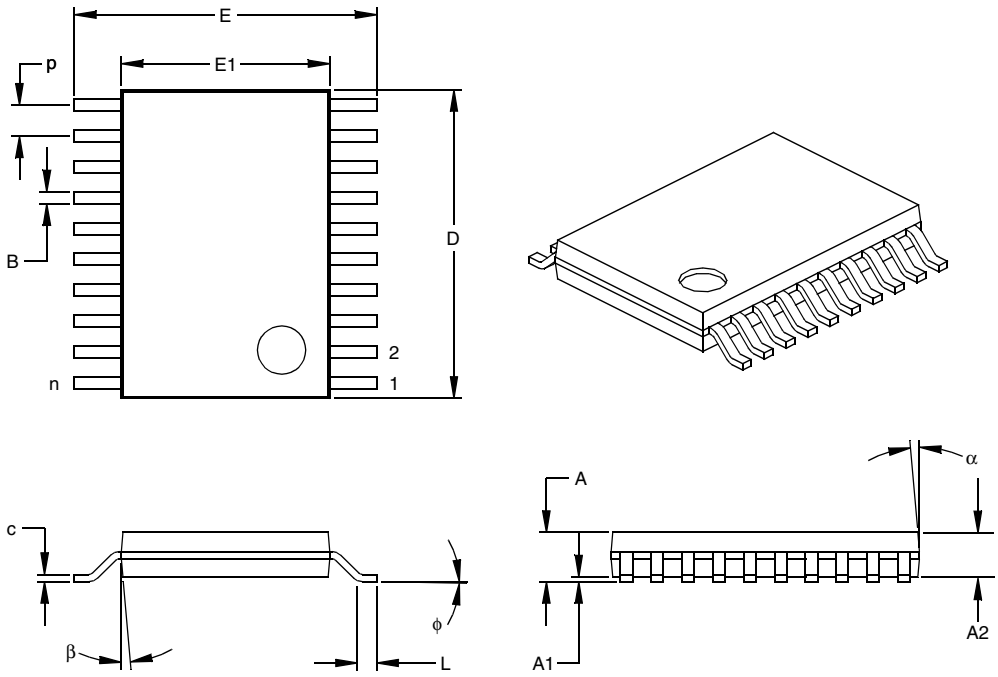
Packaging Diagrams and Parameters

20-Lead Plastic Thin Shrink Small Outline (ST) – 4.4 mm Body (TSSOP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		20			20	
Pitch	p		.026			0.65	
Overall Height	A			.043			1.10
Molded Package Thickness	A2	.033	.035	.037	0.85	0.90	0.95
Standoff §	A1	.002	.004	.006	0.05	0.10	0.15
Overall Width	E	.246	.251	.256	6.25	6.38	6.50
Molded Package Width	E1	.169	.173	.177	4.30	4.40	4.50
Molded Package Length	D	.252	.256	.260	6.40	6.50	6.60
Foot Length	L	.020	.024	.028	0.50	0.60	0.70
Foot Angle	ϕ	0	4	8	0	4	8
Lead Thickness	c	.004	.006	.008	0.09	0.15	0.20
Lead Width	B	.007	.010	.012	0.19	0.25	0.30
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005” (0.127mm) per side.

JEDEC Equivalent: MO-153

Drawing No. C04-088

Packaging Diagrams and Parameters

NOTES:

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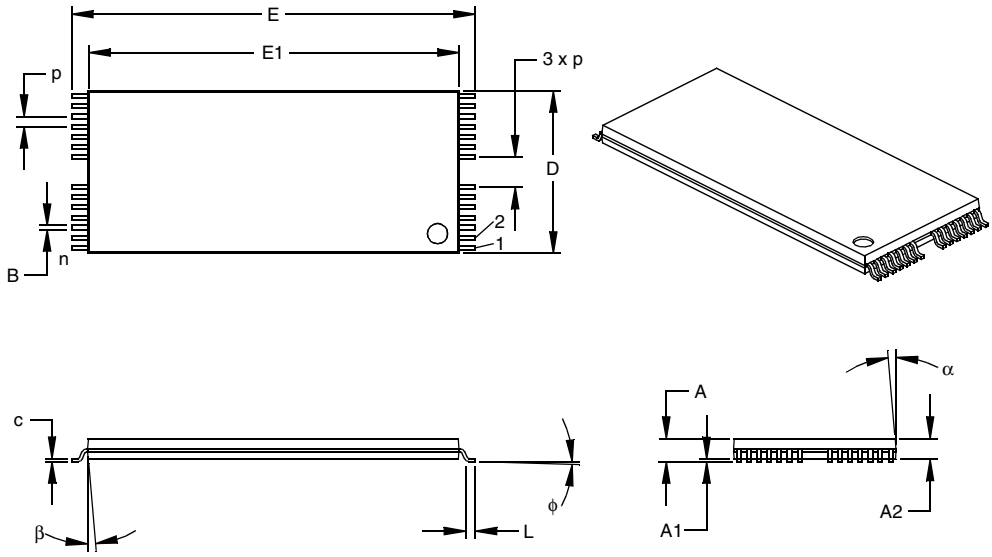
Packaging Diagrams and Parameters

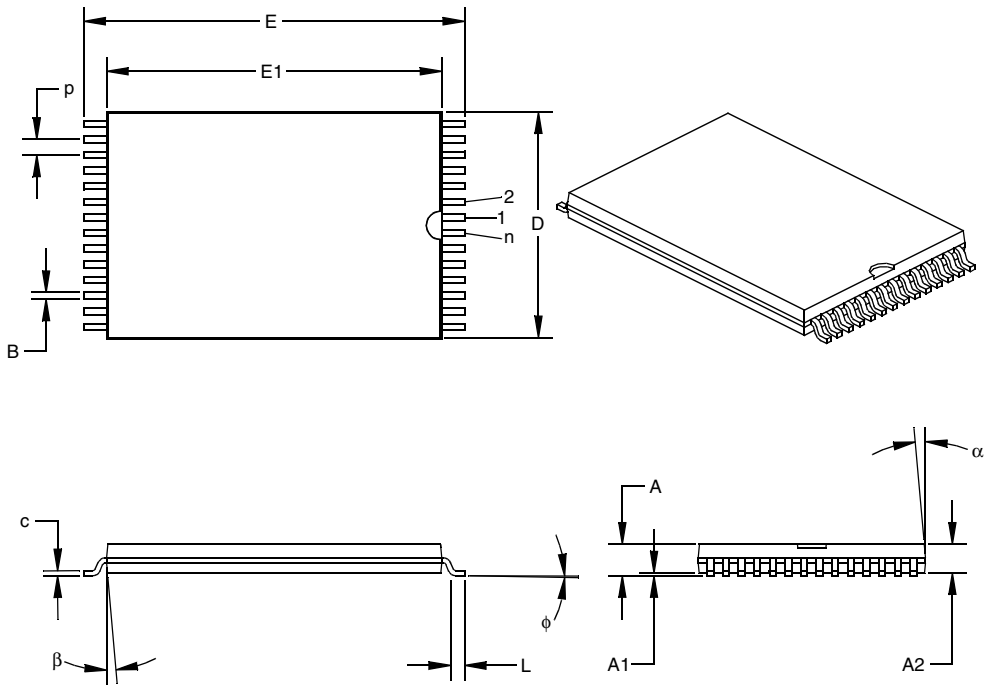
28-Lead Plastic Thin Small Outline (TS) – 5 x 20 mm Body (TSOP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.020			0.50	
Overall Height	A	.039	.045	.051	0.99	1.14	1.30
Molded Package Thickness	A2	.037	.039	.041	0.95	1.00	1.05
Standoff §	A1	.002	.006	.010	0.05	0.15	0.25
Overall Width	E	.780	.787	.795	19.80	20.00	20.20
Molded Package Width	E1	.720	.724	.728	18.30	18.40	18.50
Molded Package Length	D	.307	.315	.323	7.80	8.00	8.20
Foot Length	L	.020	.024	.028	0.50	0.60	0.70
Foot Angle	ϕ	0	4	8	0	4	8
Lead Thickness	c	.004	.006	.008	0.10	0.15	0.20
Lead Width	B	.006	.008	.010	0.15	0.20	0.25
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

***** Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005” (0.127mm) per side.
EIAJ Equivalent: IC-74-2-3
Drawing No. C04-067

28-Lead Plastic Very Small Outline (VS) – 8 x 13.4 mm Body (VSOP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.022			0.55	
Overall Height	A	.039	.045	.051	0.99	1.14	1.29
Molded Package Thickness	A2	.037	.039	.041	0.95	1.00	1.05
Standoff §	A1	.002	.005	.010	0.05	0.13	0.25
Overall Width	E	.520	.528	.535	13.20	13.40	13.60
Molded Package Width	E1	.461	.465	.469	11.70	11.80	11.90
Molded Package Length	D	.311	.315	.319	7.90	8.00	8.10
Foot Length	L	.012	.020	.028	0.30	0.50	0.70
Foot Angle	φ	0	3	5	0	3	5
Lead Thickness	c	.006	.006	.006	0.14	0.15	0.16
Lead Width	B	.007	.008	.009	0.17	0.20	0.23
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter
§ Significant Characteristic
Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005” (0.127mm) per side.
Drawing No. C04-075

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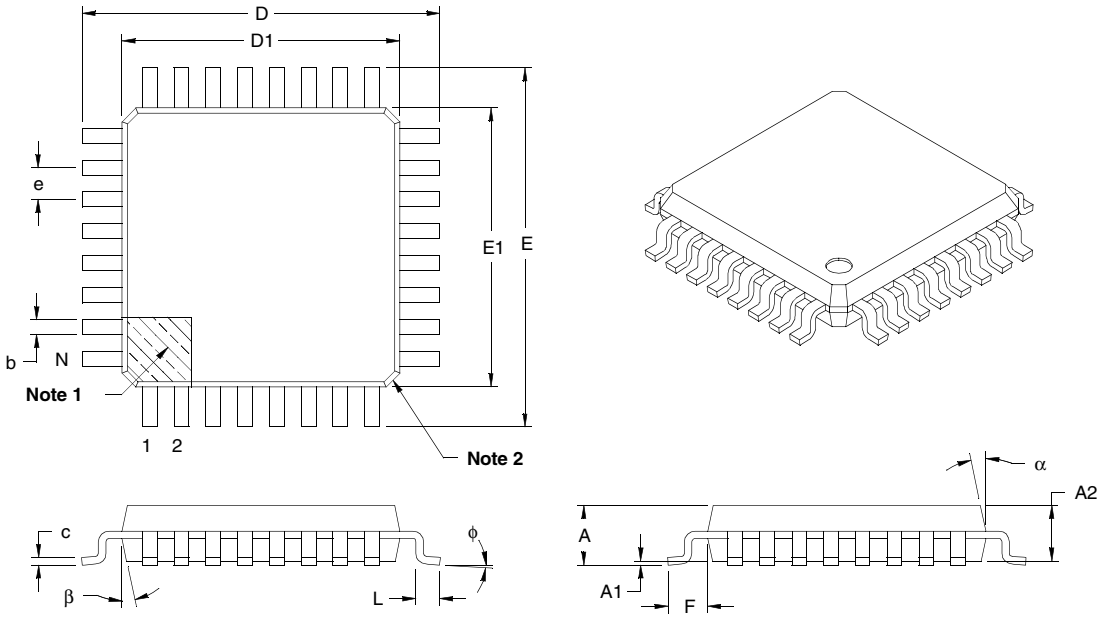
Packaging Diagrams and Parameters

32-Lead Plastic Low-Profile Quad Flatpack (PL) 7x7x1.4 mm Body, 1.0/0.10 mm Lead Form (LQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	N		32			32	
Pitch	e	.031 BSC.			0.80 BSC		
Overall Height	A	-	-	.063	-	-	1.60
Molded Package Thickness	A2	.053	.055	.057	1.35	1.40	1.45
Standoff	A1	.002	-	.006	0.05	-	0.15
Foot Length	L	.018	.024	.030	0.45	0.60	0.75
Footprint	F	.039 REF.			1.00 REF.		
Foot Angle	ϕ	0°	3.5°	7°	0°	3.5°	7°
Overall Width	E	.354 BSC.			9.00 BSC.		
Overall Length	D	.354 BSC.			9.00 BSC.		
Molded Package Width	E1	.276 BSC.			7.00 BSC.		
Molded Package Length	D1	.276 BSC.			7.00 BSC.		
Lead Thickness	c	.004	-	.008	0.09	-	0.20
Lead Width	b	.012	.015	.018	0.30	0.37	0.45
Mold Draft Angle Top	α	11°	12°	13°	11°	12°	13°
Mold Draft Angle Bottom	β	11°	12°	13°	11°	12°	13°

***** Controlling Parameter

Notes:

Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

1. Pin 1 visual feature may vary, but must be located within the hatched area.

2. Chamfers at corners are optional; size may vary

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent: MS-026 BBA

Revised 08-26-05

Drawing No. C04-045

Packaging Diagrams and Parameters

NOTES:

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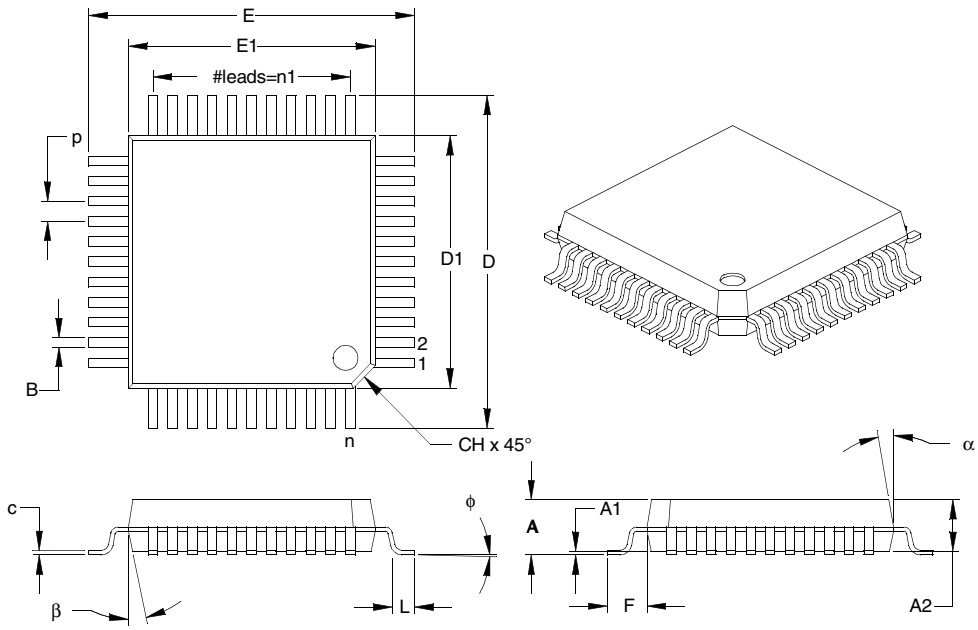
Packaging Diagrams and Parameters

44-Lead Plastic Metric-Quad Flatpack (PQ) 10x10x2 mm Body, 1.6/0.15 mm Lead Form (MQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		44			44	
Pitch	p		.031			0.80	
Pins per Side	n1		11			11	
Overall Height	A	.079	.086	.093	2.00	2.18	2.35
Molded Package Thickness	A2	.077	.080	.083	1.95	2.03	2.10
Standoff	A1	.002	.006	.010	0.05	0.15	0.25
Foot Length	L	.029	.035	.041	0.73	0.88	1.03
Footprint	F		.063 REF			1.60 REF	
Foot Angle	φ	0	3.5	7	0	3.5	7
Overall Width	E	.510	.520	.530	12.95	13.20	13.45
Overall Length	D	.510	.520	.530	12.95	13.20	13.45
Molded Package Width	E1	.390	.394	.398	9.90	10.00	10.10
Molded Package Length	D1	.390	.394	.398	9.90	10.00	10.10
Lead Thickness	c	.005	.007	.009	0.13	0.18	0.23
Lead Width	B	.012	.015	.018	0.30	0.38	0.45
Pin 1 Corner Chamfer	CH	.025	.035	.045	0.64	0.89	1.14
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

***** Controlling Parameter

Notes:

Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

REF: Reference Dimension, usually without tolerance, for information purposes only.

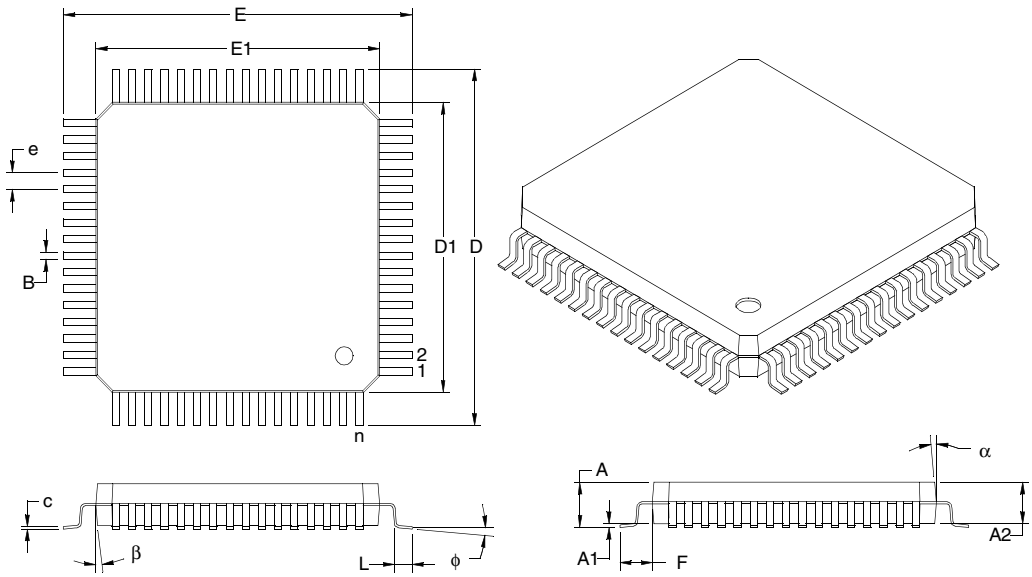
See ASME Y14.5M

JEDEC Equivalent: MS-022

Drawing No. C04-071

Revised 07-21-05

64-Lead Metric-Quad Flatpack (KU) 14x14x2.7 mm Body, 1.6/0.25 mm Lead Form (MQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		64			64	
Pitch	e		.031 BSC			0.80 BSC	
Overall Height	A	.098	--	.124	2.50	--	3.15
Molded Package Thickness	A2	.098	.106	.114	2.50	2.70	2.90
Standoff §	A1	.000	--	.010	0.00	--	0.25
Overall Width	E		.677 BSC			17.20 BSC	
Molded Package Width	E1		.551 BSC			14.00 BSC	
Overall Length	D		.677 BSC			17.20 BSC	
Molded Package Length	D1		.551 BSC			14.00 BSC	
Foot Length	L	.029	.035	.041	0.73	0.88	1.03
Footprint	F		.063 REF			1.60 REF	
Foot Angle	φ	0°	--	6°	0°	--	7°
Lead Thickness	c	.004	--	.009	0.11	--	0.23
Lead Width	B	.011	--	.018	0.29	--	0.45
Mold Draft Angle Top	α	5°	--	16°	5°	--	16°
Mold Draft Angle Bottom	β	5°	--	16°	5°	--	16°

***** Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC equivalent: MS-022 BE.

Formerly TelCom PQFP package.

Drawing No. C04-022

Revised 07-21-05

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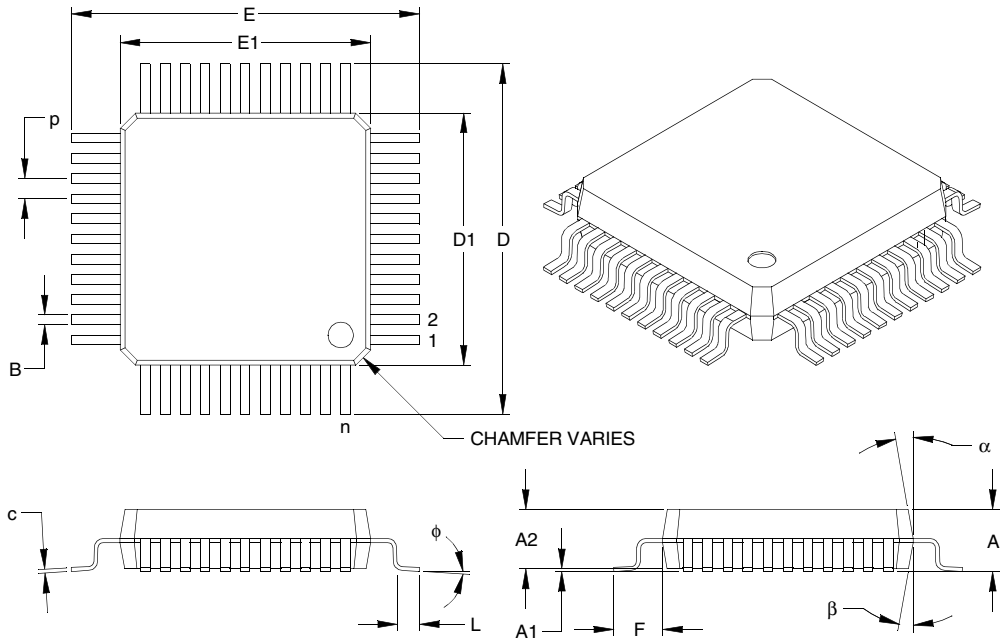
44-Lead Plastic Quad Flatpack (KW) 10x10x2.0 mm Body, 1.95/0.25 mm Lead Form (PQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		44			44	
Pitch	p		.031 BSC			0.80 BSC	
Overall Height	A	-	-	.096	-	-	2.45
Molded Package Thickness	A2	.077	.079	.083	1.95	2.00	2.10
Standoff §	A1	.010	-	-	0.25	-	-
Foot Length	L	.029	.035	.041	0.73	0.88	1.03
Footprint	F		.077 REF.			1.95 REF.	
Foot Angle	φ	0°	3.5°	7°	0°	3.5°	7°
Overall Width	E		.547 BSC			13.90 BSC	
Overall Length	D		.547 BSC			13.90 BSC	
Molded Package Width	E1		.394 BSC			10.00 BSC	
Molded Package Length	D1		.394 BSC			10.00 BSC	
Lead Thickness	c	.004	-	.009	0.11	-	0.23
Lead Width	B	.012	-	.018	0.30	-	0.45
Mold Draft Angle Top	α	5°	-	16°	5°	-	16°
Mold Draft Angle Bottom	β	5°	-	16°	5°	-	16°

* Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent: MO-112 AA-1

Drawing No. C04-119

Revised 07-21-05

Packaging Diagrams and Parameters

NOTES:

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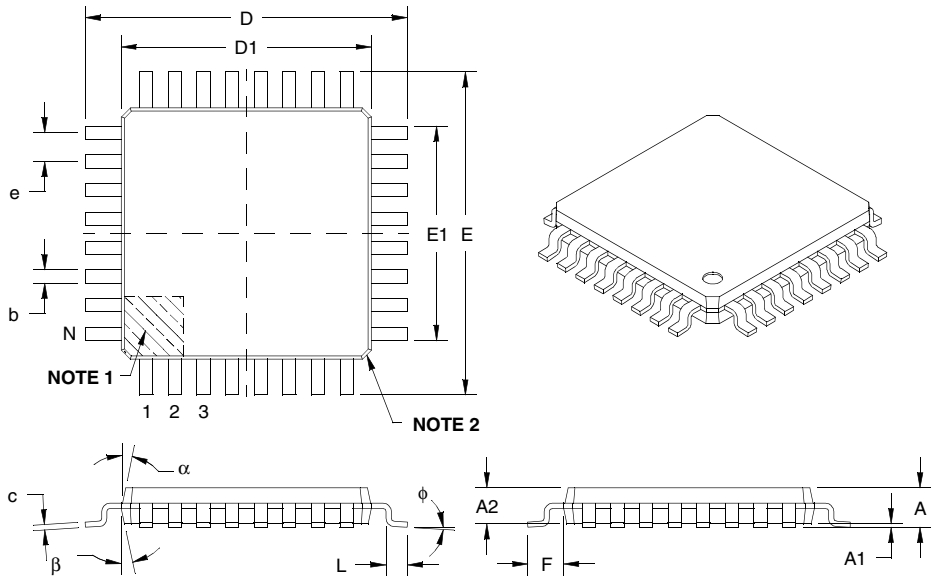
Packaging Diagrams and Parameters

32-Lead Thin-Quad Flatpack (PT) 7x7x1.0 mm Body, 1.0/0.10 mm Lead Form (TQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Leads	N		32			32	
Lead Pitch	e		.031 BSC			0.80 BSC	
Leads per Side			8			8	
Overall Height	A	–	–	.047	–	–	1.20
Standoff	A1	.002	–	.006	0.05	–	0.15
Molded Package Thickness	A2	.037	.039	.041	0.95	1.00	1.05
Foot Length	L	.018	.024	.030	0.45	0.60	0.75
Footprint	F		.039 REF			1.00 REF	
Foot Angle	ϕ	0°	3.5°	7°	0°	3.5°	7°
Overall Width	E		.354 BSC			9.00 BSC	
Overall Length	D		.354 BSC			9.00 BSC	
Molded Package Width	E1		.276 BSC			7.00 BSC	
Molded Package Length	D1		.276 BSC			7.00 BSC	
Lead Thickness	c	.004	.006	.008	0.09	0.15	0.20
Lead Width	b	.012	.015	.017	0.30	0.37	0.45
Mold Draft Angle Top	α	11°	12°	13°	11°	12°	13°
Mold Draft Angle Bottom	β	11°	12°	13°	11°	12°	13°

***** Controlling Parameter

Notes:

Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

1. Pin 1 visual index feature may vary, but must be located within the hatched area.

2. Chamfers at corners are optional; size may vary.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

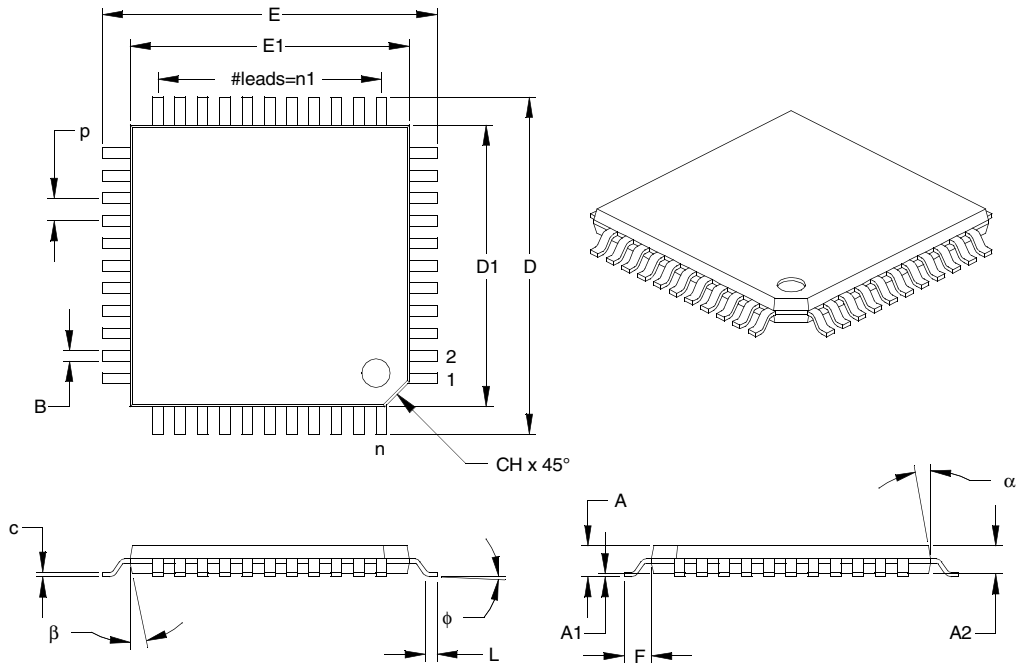
JEDEC Equivalent: MS-026 ABA

Drawing No. C04-074

Revised 09-15-05

Packaging Diagrams and Parameters

44-Lead Plastic Thin-Quad Flatpack (PT) 10x10x1 mm Body, 1.0/0.10 mm Lead Form (TQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		44			44	
Pitch	p		.031			0.80	
Pins per Side	n1		11			11	
Overall Height	A	.039	.043	.047	1.00	1.10	1.20
Molded Package Thickness	A2	.037	.039	.041	0.95	1.00	1.05
Standoff	A1	.002	.004	.006	0.05	0.10	0.15
Foot Length	L	.018	.024	.030	0.45	0.60	0.75
Footprint (Reference)	F		.039 REF.			1.00 REF.	
Foot Angle	ϕ	0	3.5	7	0	3.5	7
Overall Width	E	.463	.472	.482	11.75	12.00	12.25
Overall Length	D	.463	.472	.482	11.75	12.00	12.25
Molded Package Width	E1	.390	.394	.398	9.90	10.00	10.10
Molded Package Length	D1	.390	.394	.398	9.90	10.00	10.10
Lead Thickness	c	.004	.006	.008	0.09	0.15	0.20
Lead Width	B	.012	.015	.017	0.30	0.38	0.44
Pin 1 Corner Chamfer	CH	.025	.035	.045	0.64	0.89	1.14
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

REF: Reference Dimension, usually without tolerance, for information purposes only.

See ASME Y14.5M

JEDEC Equivalent: MS-026

Drawing No. C04-076

Revised 07-22-05

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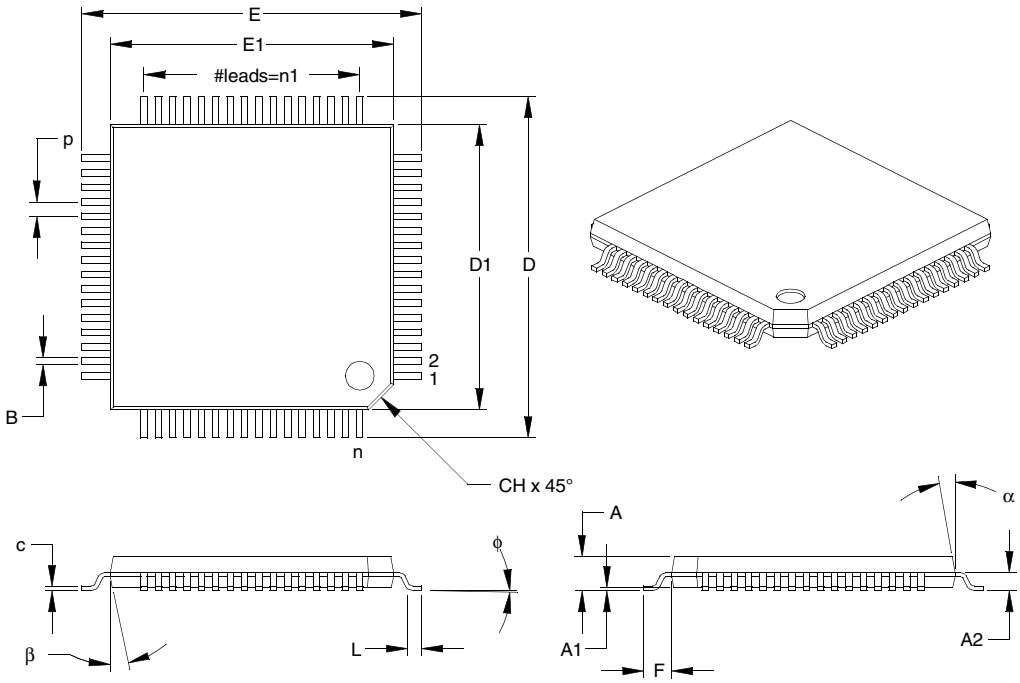
64-Lead Plastic Thin-Quad Flatpack (PT) 10x10x1 mm Body, 1.0/0.10 mm Lead Form (TQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		64			64	
Pitch	p		.020			0.50	
Pins per Side	n1		16			16	
Overall Height	A	.039	.043	.047	1.00	1.10	1.20
Molded Package Thickness	A2	.037	.039	.041	0.95	1.00	1.05
Standoff	A1	.002	.006	.010	0.05	0.15	0.25
Foot Length	L	.018	.024	.030	0.45	0.60	0.75
Footprint	F		.039 REF.			1.00 REF.	
Foot Angle	φ	0	3.5	7	0	3.5	7
Overall Width	E	.463	.472	.482	11.75	12.00	12.25
Overall Length	D	.463	.472	.482	11.75	12.00	12.25
Molded Package Width	E1	.390	.394	.398	9.90	10.00	10.10
Molded Package Length	D1	.390	.394	.398	9.90	10.00	10.10
Lead Thickness	c	.005	.007	.009	0.13	0.18	0.23
Lead Width	B	.007	.009	.011	0.17	0.22	0.27
Pin 1 Corner Chamfer	CH	.025	.035	.045	0.64	0.89	1.14
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

***** Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

REF: Reference Dimension, usually without tolerance, for information purposes only.

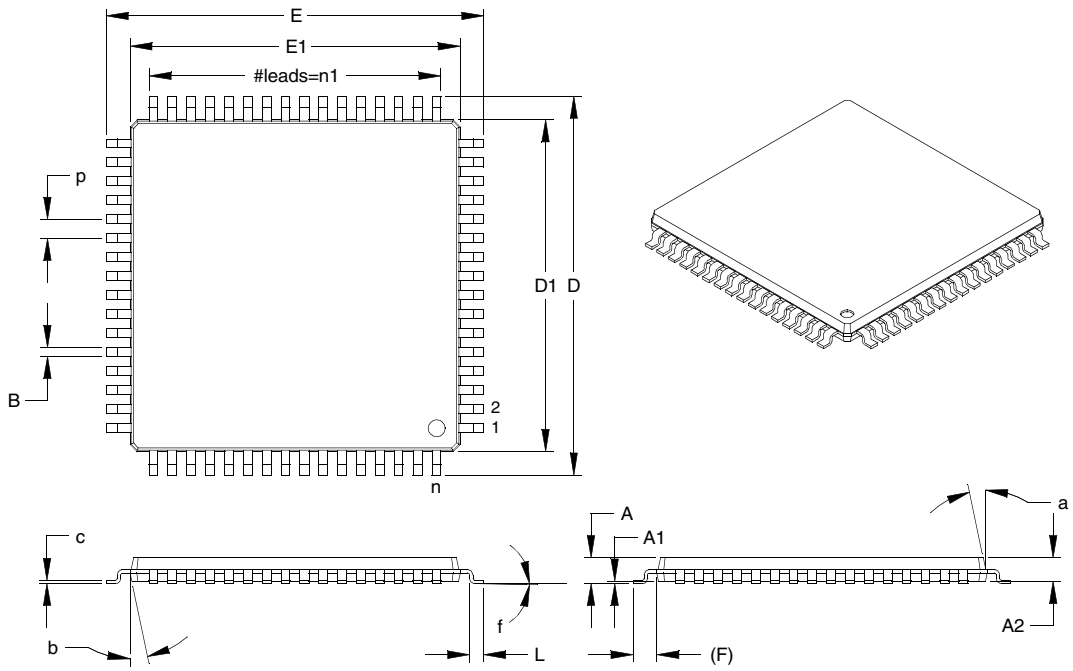
See ASME Y14.5M

JEDEC Equivalent: MS-026 Revised 07-22-05

Drawing No. C04-085

Packaging Diagrams and Parameters

64-Lead Plastic Thin-Quad Flatpack (PT) 14x14x1 mm Body, 1.0/0.10 mm Lead Form (TQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		64			64	
Pitch	p		.031 BSC			0.80 BSC	
Pins per Side	n1		16			16	
Overall Height	A			.047			1.20
Molded Package Thickness	A2	.037	.039	.041	0.95	1.00	1.05
Standoff	A1	.002		.006	0.05		0.15
Foot Length	L	.018	.024	.030	0.45	0.60	0.75
Footprint	(F)		.039 REF			1.00 REF	
Foot Angle	ϕ	0	3.5	7	0	3.5	7
Overall Width	E		.630 BSC			16.00 BSC	
Overall Length	D		.630 BSC			16.00 BSC	
Molded Package Width	E1		.551 BSC			14.00 BSC	
Molded Package Length	D1		.551 BSC			14.00 BSC	
Lead Thickness	c	.004		.008	0.09		0.20
Lead Width	B	.012	.015	.018	0.30	0.37	0.45
Mold Draft Angle Top	α	11	12	13	11	12	13
Mold Draft Angle Bottom	β	11	12	13	11	12	13

***** Controlling Parameter

Notes:

Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

JEDEC Equivalent: MS-026

Drawing No. C04-066

Revised 09-14-05

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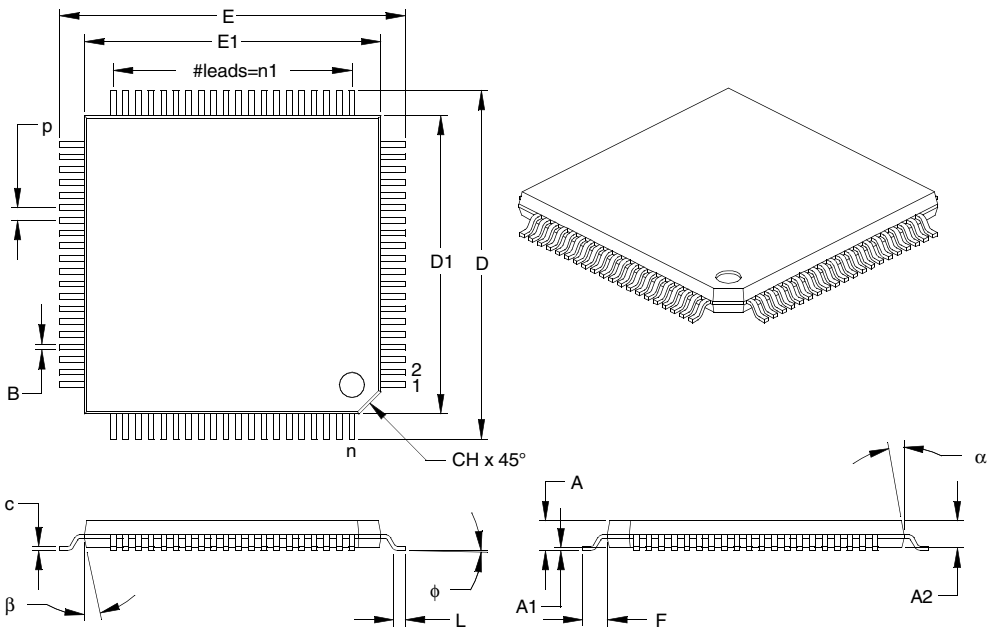
Packaging Diagrams and Parameters

80-Lead Plastic Thin-Quad Flatpack (PT) 12x12x1 mm Body, 1.0/0.10 mm Lead Form (TQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		80			80	
Pitch	p	.020 BSC			0.50 BSC		
Pins per Side	n1		20			20	
Overall Height	A	.039	.043	.047	1.00	1.10	1.20
Molded Package Thickness	A2	.037	.039	.041	0.95	1.00	1.05
Standoff	A1	.002	.004	.006	0.05	0.10	0.15
Foot Length	L	.018	.024	.030	0.45	0.60	0.75
Footprint	F	.039 REF.			1.00 REF.		
Foot Angle	ϕ	0°	3.5°	7°	0°	3.5°	7°
Overall Width	E	.551 BSC			14.00 BSC		
Overall Length	D	.551 BSC			14.00 BSC		
Molded Package Width	E1	.472 BSC			12.00 BSC		
Molded Package Length	D1	.472 BSC			12.00 BSC		
Lead Thickness	c	.004	.006	.008	0.09	0.15	0.20
Lead Width	B	.007	.009	.011	0.17	0.22	0.27
Pin 1 Corner Chamfer	CH	.025	.035	.045	0.64	0.89	1.14
Mold Draft Angle Top	α	5°	10°	15°	5°	10°	15°
Mold Draft Angle Bottom	β	5°	10°	15°	5°	10°	15°

***** Controlling Parameter

Notes:

Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

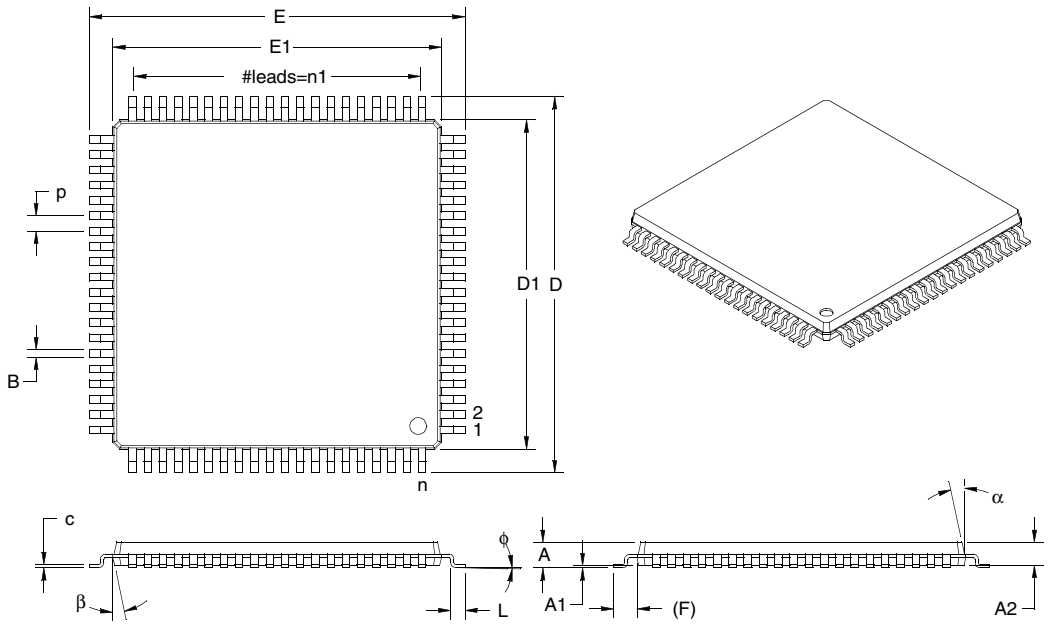
JEDEC Equivalent: MS-026

Drawing No. C04-092

Revised 07-22-05

Packaging Diagrams and Parameters

80-Lead Plastic Thin-Quad Flatpack (PF) 14x14x1 mm Body, 1.0/0.10 mm Lead Form (TQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		80			80	
Pitch	p		.026			0.65	
Pins per Side	n1		20			20	
Overall Height	A			.047			1.20
Molded Package Thickness	A2	.037	.039	.041	0.95	1.00	1.05
Standoff	A1	.002		.006	0.05		0.15
Foot Length	L	.018	.024	.030	0.45	0.60	0.75
Footprint	F		.039 REF.			1.00 REF.	
Foot Angle	φ	0°	3.5°	7°	0°	3.5°	7°
Overall Width	E		.630 BSC			16.00 BSC	
Overall Length	D		.630 BSC			16.00 BSC	
Molded Package Width	E1		.551 BSC			14.00 BSC	
Molded Package Length	D1		.551 BSC			14.00 BSC	
Lead Thickness	c	.004		.008	0.09		0.20
Lead Width	B	.011	.013	.015	0.27	0.32	0.37
Mold Draft Angle Top	α	11°	12°	13°	11°	12°	13°
Mold Draft Angle Bottom	β	11°	12°	13°	11°	12°	13°

***** Controlling Parameter

Notes:

Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent: MS-026

Drawing No. C04-116

Revised 09-16-05

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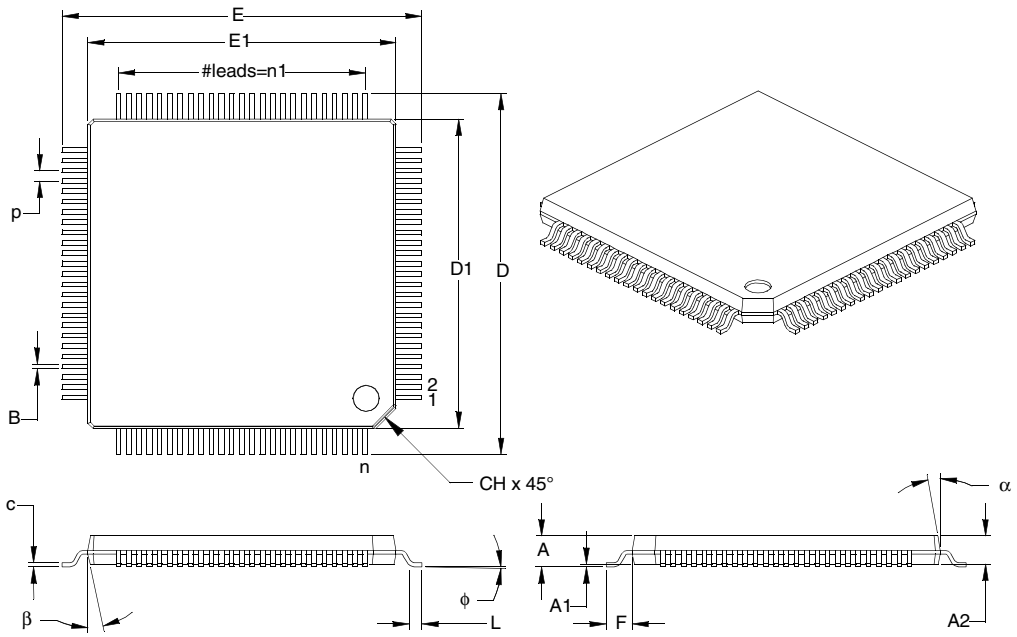
100-Lead Plastic Thin-Quad Flatpack (PT) 12x12x1 mm Body, 1.0/0.10 mm Lead Form (TQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		100			100	
Pitch	p		.016 BSC			0.40 BSC	
Pins per Side	n1		25			25	
Overall Height	A	.039	.043	.047	1.00	1.10	1.20
Molded Package Thickness	A2	.037	.039	.041	0.95	1.00	1.05
Standoff	A1	.002	.004	.006	0.05	0.10	0.15
Foot Length	L	.018	.024	.030	0.45	0.60	0.75
Footprint (Reference)	F		.039 REF.			1.00 REF.	
Foot Angle	ϕ	0°	3.5°	7°	0°	3.5°	7°
Overall Width	E		.551 BSC			14.00 BSC	
Overall Length	D		.551 BSC			14.00 BSC	
Molded Package Width	E1		.472 BSC			12.00 BSC	
Molded Package Length	D1		.472 BSC			12.00 BSC	
Lead Thickness	c	.004	.006	.008	0.09	0.15	0.20
Lead Width	B	.005	.007	.009	0.13	0.18	0.23
Mold Draft Angle Top	α	5°	10°	15°	5°	10°	15°
Mold Draft Angle Bottom	β	5°	10°	15°	5°	10°	15°

***** Controlling Parameter

Notes:

Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

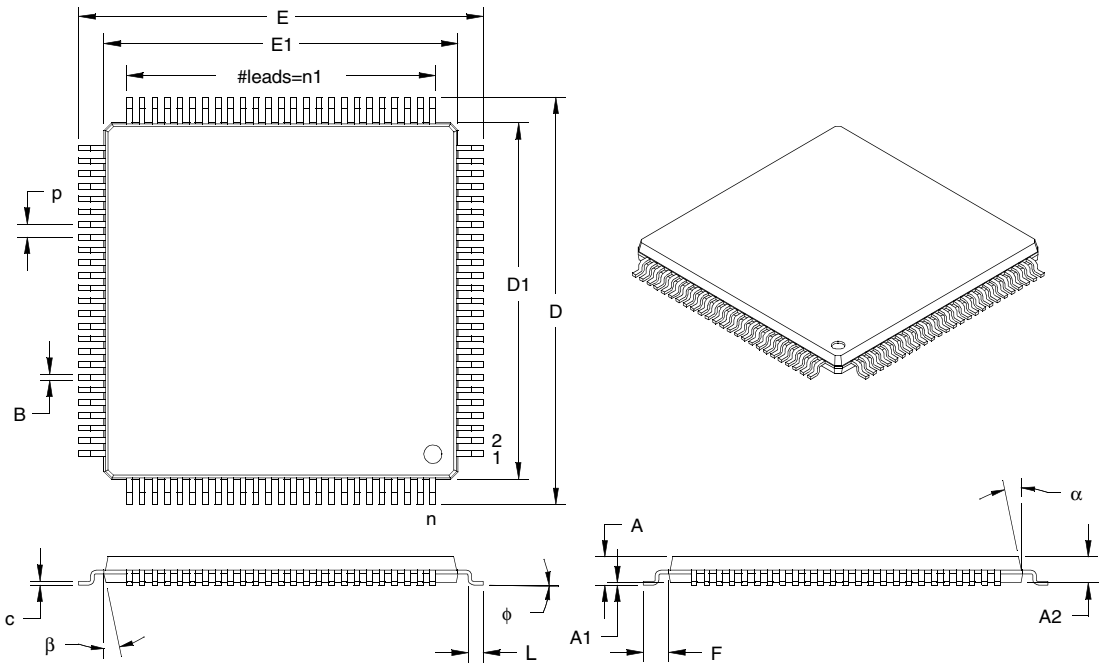
REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent: MS-026

Drawing No. C04-100

Revised 07-22-05

100-Lead Plastic Thin-Quad Flatpack (PF) 14x14x1 mm Body, 1.0/0.10 mm Lead Form (TQFP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		100			100	
Pitch	p		.020 BSC			0.50 BSC	
Pins per Side	n1		25			25	
Overall Height	A			.047			1.20
Molded Package Thickness	A2	.037	.039	.041	0.95	1.00	1.05
Standoff	A1	.002		.006	0.05		0.15
Foot Length	L	.018	.024	.030	0.45	0.60	0.75
Footprint	F		.039 REF			1.00 REF	
Foot Angle	ϕ	0°	3.5°	7°	0°	3.5°	7°
Overall Width	E		.630 BSC			16.00 BSC	
Overall Length	D		.630 BSC			16.00 BSC	
Molded Package Width	E1		.551 BSC			14.00 BSC	
Molded Package Length	D1		.551 BSC			14.00 BSC	
Lead Thickness	c	.004		.008	0.09		0.20
Lead Width	B	.007	.009	.011	0.17	0.22	0.27
Mold Draft Angle Top	α	11°	12°	13°	11°	12°	13°
Mold Draft Angle Bottom	β	11°	12°	13°	11°	12°	13°

* Controlling Parameter

Notes:

Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.
See ASME Y14.5M

JEDEC Equivalent: MS-026

Drawing No. C04-110

Revised 07-21-05

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Product Tape and Reel Specifications

FIGURE 1: EMBOSSED CARRIER DIMENSIONS (8, 12, 16, AND 24 MM TAPE ONLY)

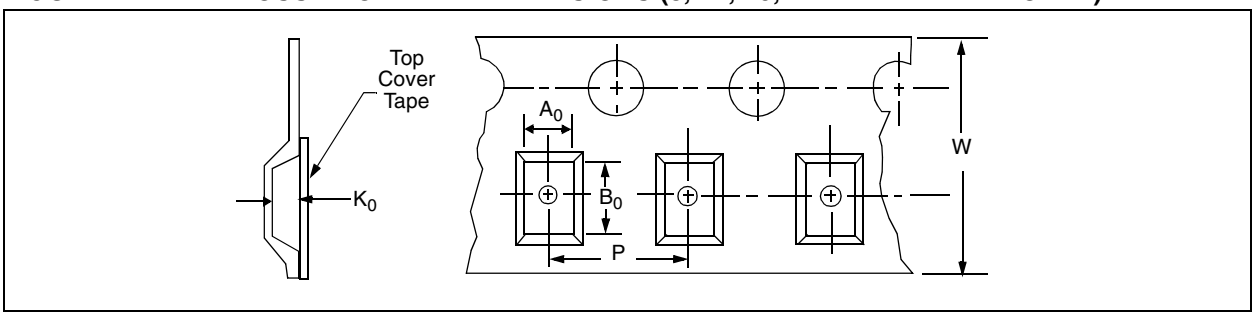

TABLE 1: CARRIER TAPE/CAVITY DIMENSIONS

Case Outline	Package Type		Carrier Dimensions		Cavity Dimensions			Output Quantity Units	Reel Diameter in mm
			W mm	P mm	A0 mm	B0 mm	K0 mm		
SN	SOIC .150”	8L	12	8	6.4	5.2	2.1	3300	330
SO	SOIC .300”	16L	16	12	10.9	10.7	3.0	1000	330
SO	SOIC .300”	18L	24 24	12 16	10.9 11.1	13.3 12.0	3.0 2.8	1600 1100	330 330
SO	SOIC .300”	20L	24	12	10.9	13.3	3.0	1600	330
SO	SOIC .300”	24L	24	12	10.9	16.0	3.0	1000	330
SO	SOIC .300”	28L	24 24	12 12	10.9 11.1	18.3 18.5	3.0 3.0	1600 1600	330 330
L	PLCC	28L	24	16	13.0	13.0	4.9	750	330
L	PLCC	32L	24	16	13.1	15.5	3.9	900	330
L	PLCC	44L	32 32	24 24	18.0 18.0	18.0 18.0	4.9 5.0	500 500	330
L	PLCC	68L	44	32	25.6	25.6	5.8	300	330
L	PLCC	84L	44	36	30.7	30.7	5.8	200	330
SM	SOIC .208”	8L	16	12	8.3	5.7	2.3	2100	330
SL	SOIC .150”	14L	16	8	6.5	9.5	2.1	2600	330
SL	SOIC .150”	16L	16	8	6.5	10.3	2.1	2600	330
TS	TSOP	28L/32L	32	16	8.6	20.6	2.1	1500	330
SS	SSOP	20L	16	12	8.4	7.7	2.5	1600	330
SS	SSOP	28L	24	12	8.4	10.9	2.4	2100	330
PQ	MQFP	44L	24	24	14.2	14.2	2.8	900	330
PT	TQFP	44L/64L	24	16	12.4	12.4	2.2	1200	330
VS	VSOP	28L	24	12	8.7	13.9	2.1	2500	330

TABLE 1: CARRIER TAPE/CAVITY DIMENSIONS (CONTINUED)

Case Outline	Package Type		Carrier Dimensions		Cavity Dimensions			Output Quantity Units	Reel Diameter in mm
			W mm	P mm	A0 mm	B0 mm	K0 mm		
ST	TSSOP	8L	12	8	7.0	3.6	1.6	2500	330
ST	TSSOP	14L	16	8	6.8	5.4	1.6	2500	330
ST	TSSOP	20L	16	8	6.8	6.9	1.6	2500	330
TT	SOT-23	3L	8	4	3.15	2.77	1.22	3000	180
OT	SOT-23	5L	8	4	3.2	3.2	1.4	3000	180
MS	MSOP	8L/10L	12	8	5.3	3.6	1.4	2500	330
LT	SC-70	5L	8	4	2.24	2.34	1.22	3000	180
MF	DFN 3x3		12	8	3.3	3.3	1.1	3300	330
MF	DFN 5x6		12	8	5.3	6.3	1.2	3300	330
ML	QFN 6x6		16	12	6.3	6.3	1.1	1600	330
ML	QFN 8x8		16	12	8.3	8.3	1.1	1600	330

FIGURE 2: SOP, SOIC, MSOP, QSOP DEVICES

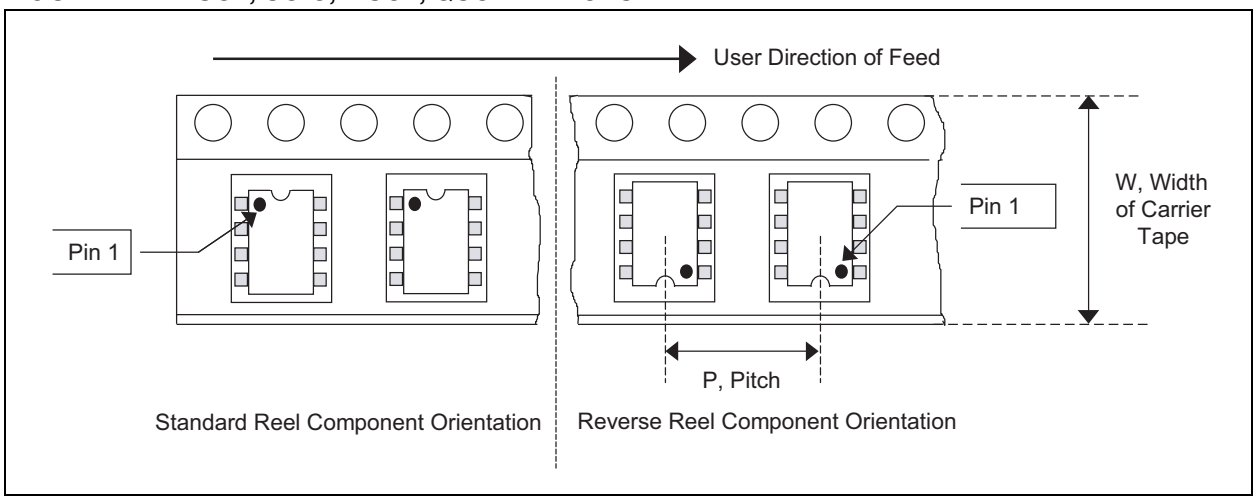

FIGURE 3: 3L SOT-23/SC-70 DEVICES

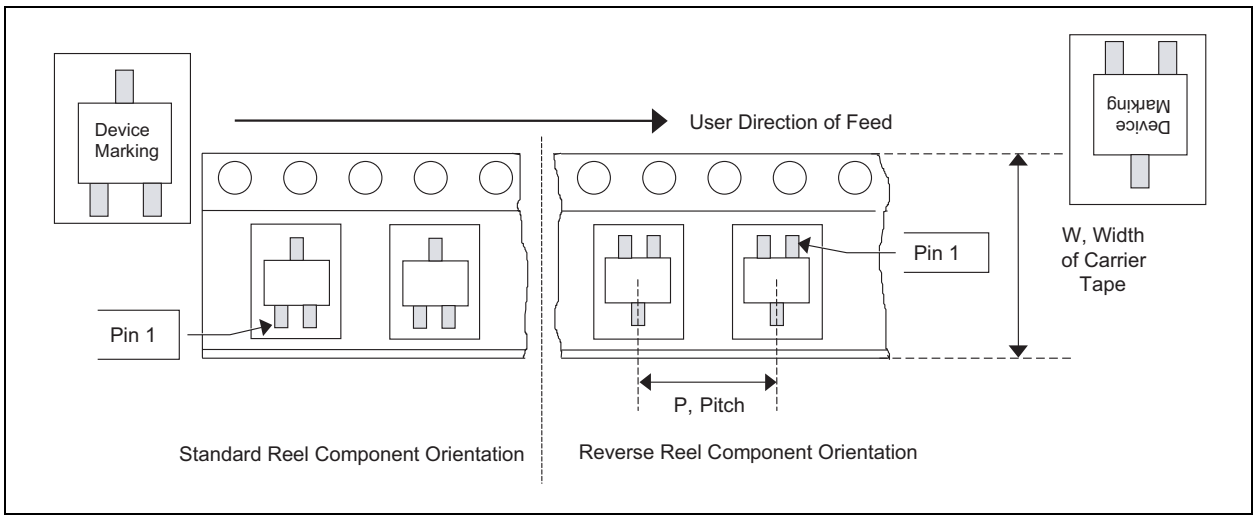

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FIGURE 4: 5L SOT-23/SC-70 DEVICES

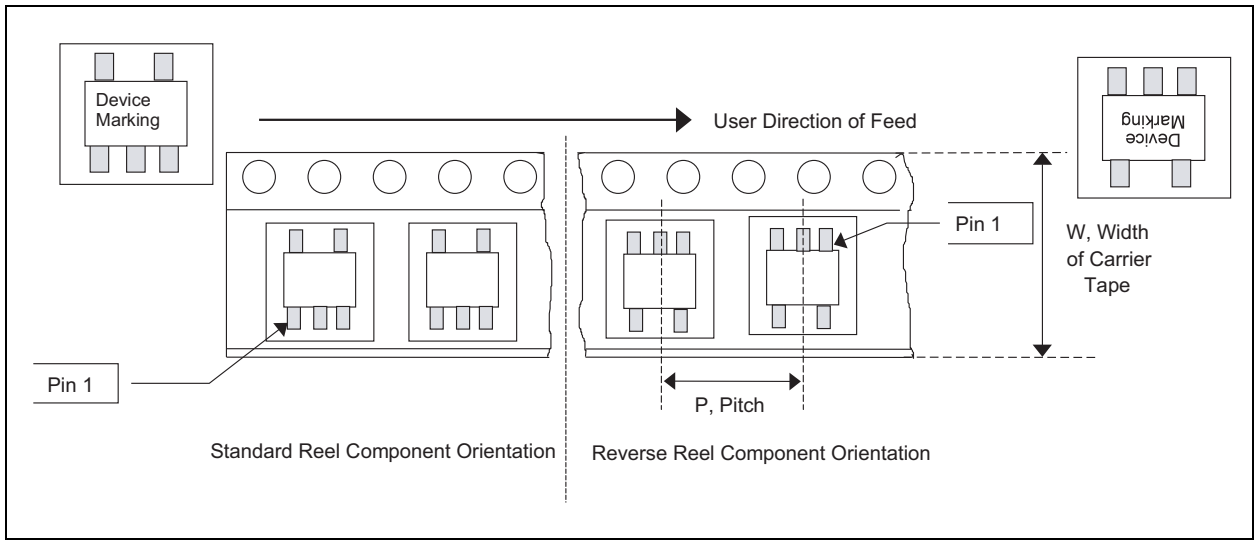

FIGURE 5: 6L SOT-23 DEVICES

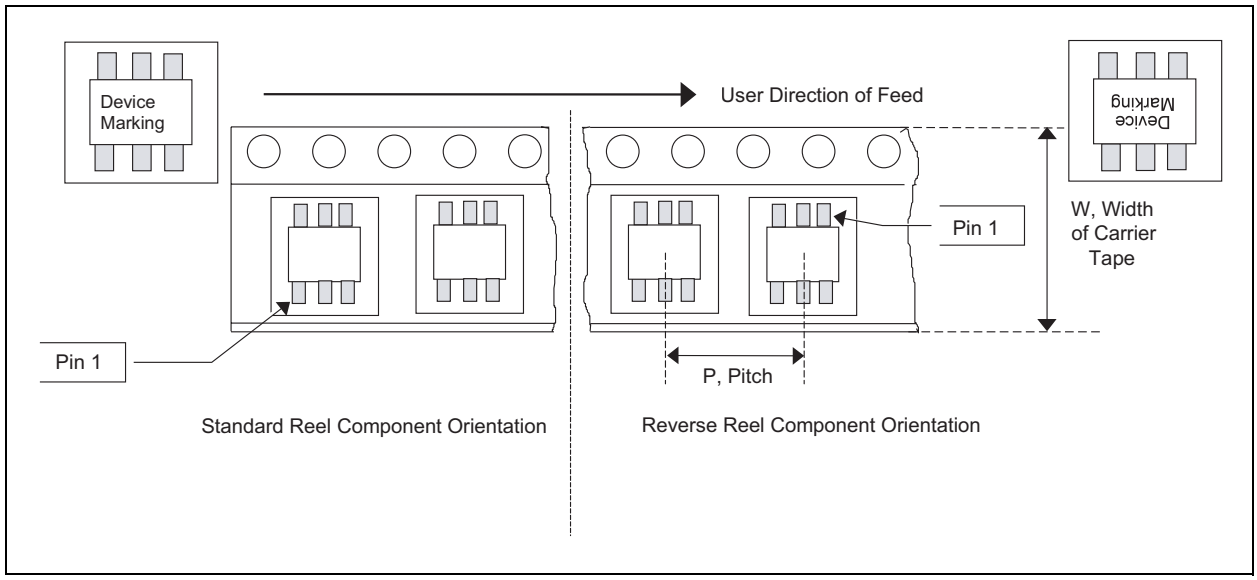

FIGURE 6: 3L SOT-223 DEVICES

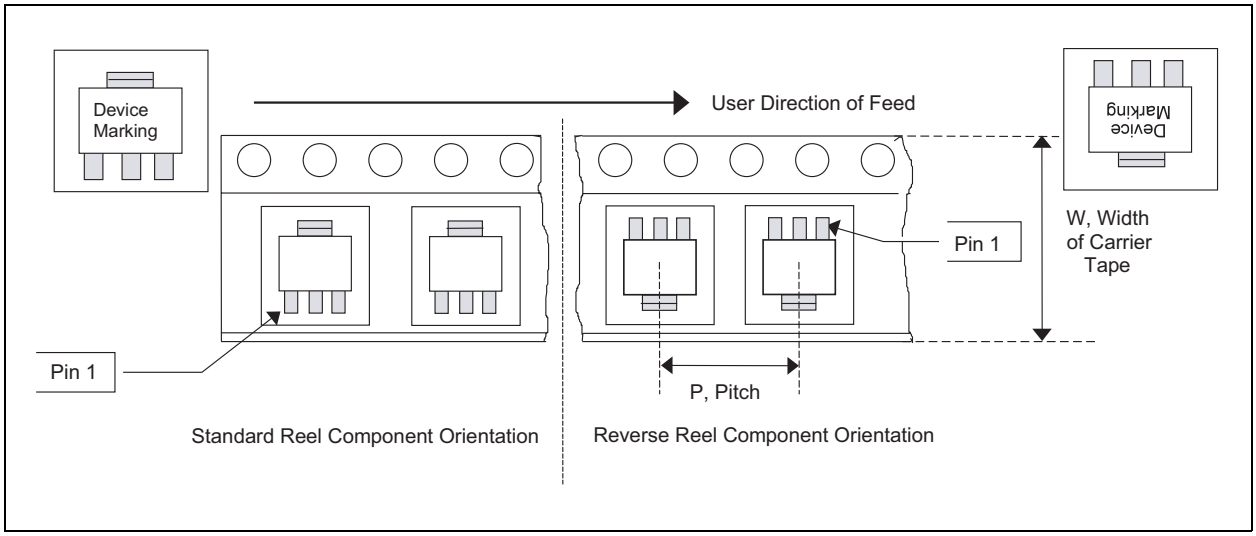

FIGURE 7: PLCC DEVICES

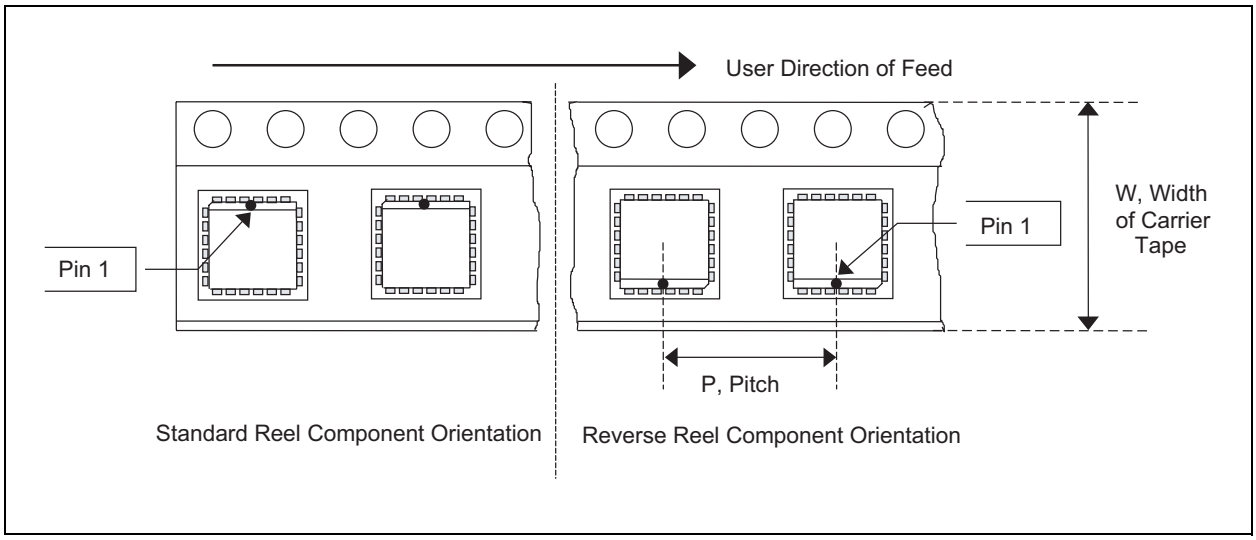

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FIGURE 8: MQFP DEVICES

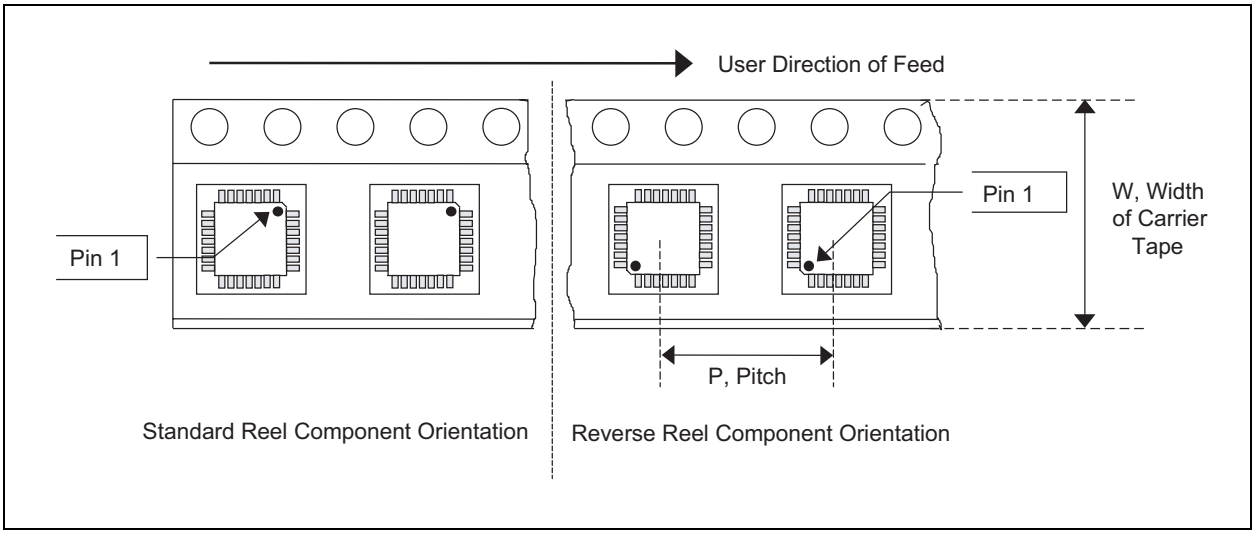

FIGURE 9: 4L SOT-143 DEVICES

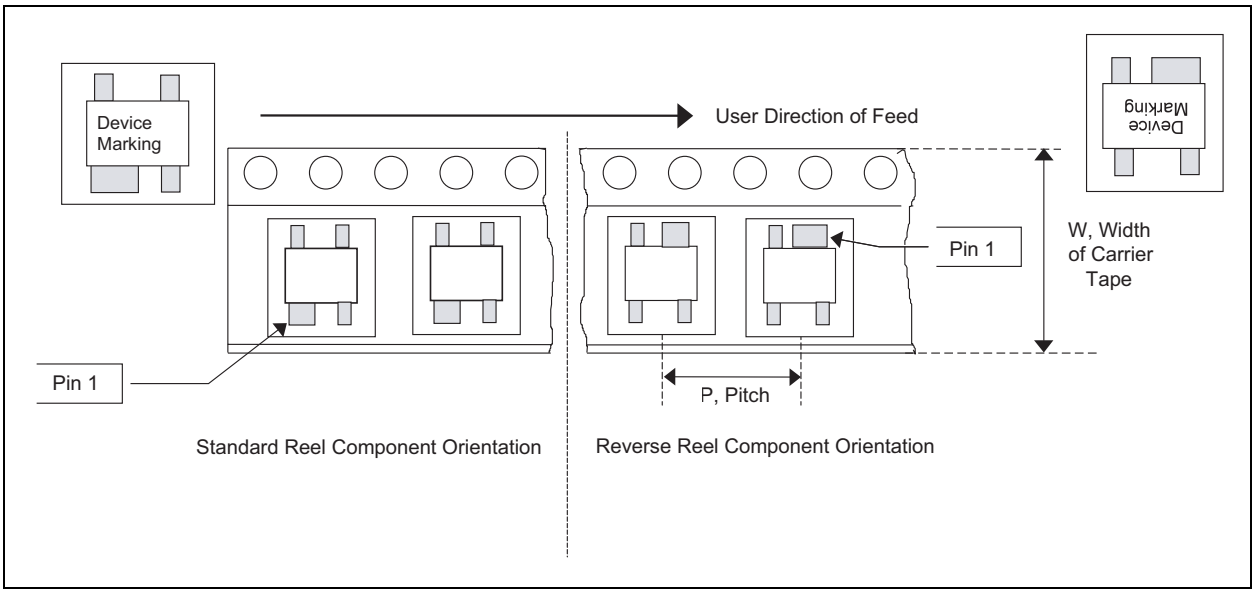

FIGURE 10: 3L/5L/7L DDPAK AND 3L DPAK DEVICES

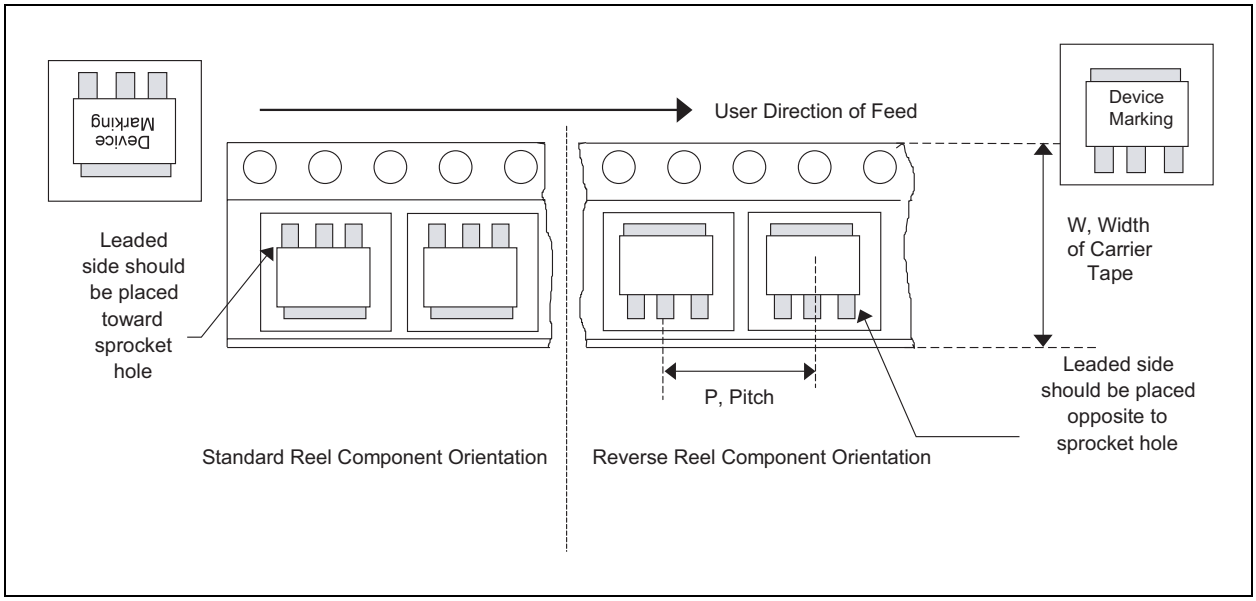

FIGURE 11: SOT-89 DEVICES

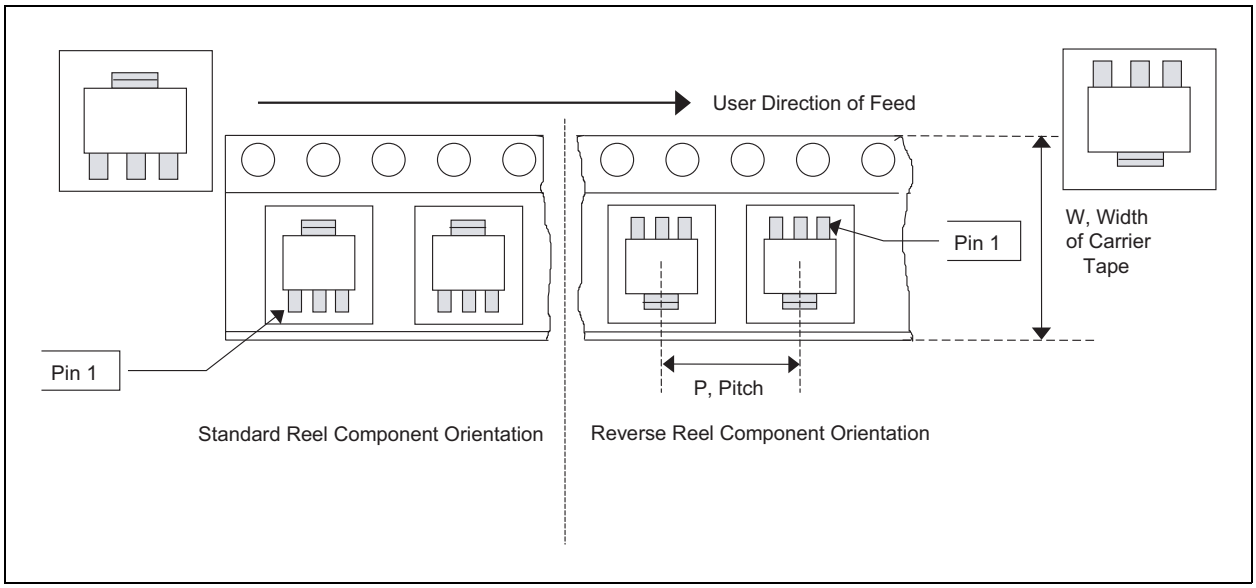

FIGURE 12: DFN/QFN DEVICES

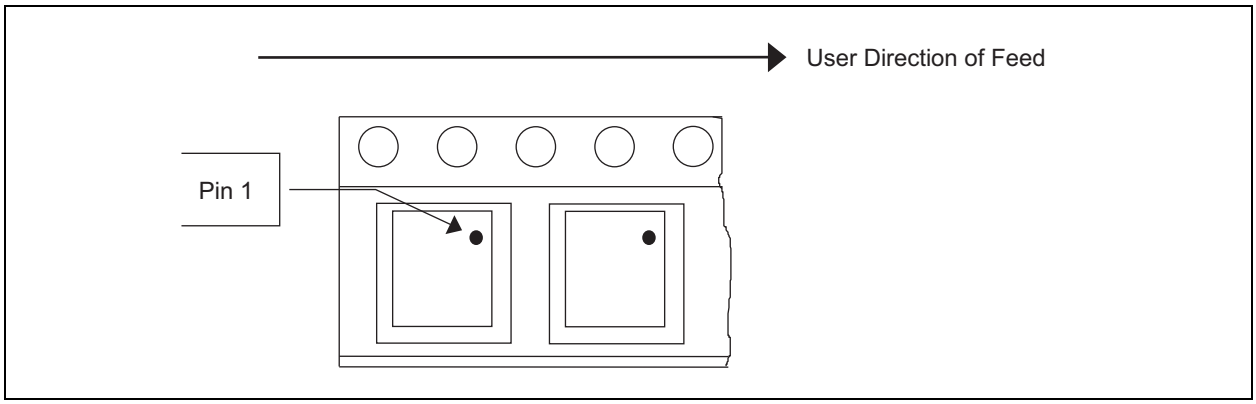

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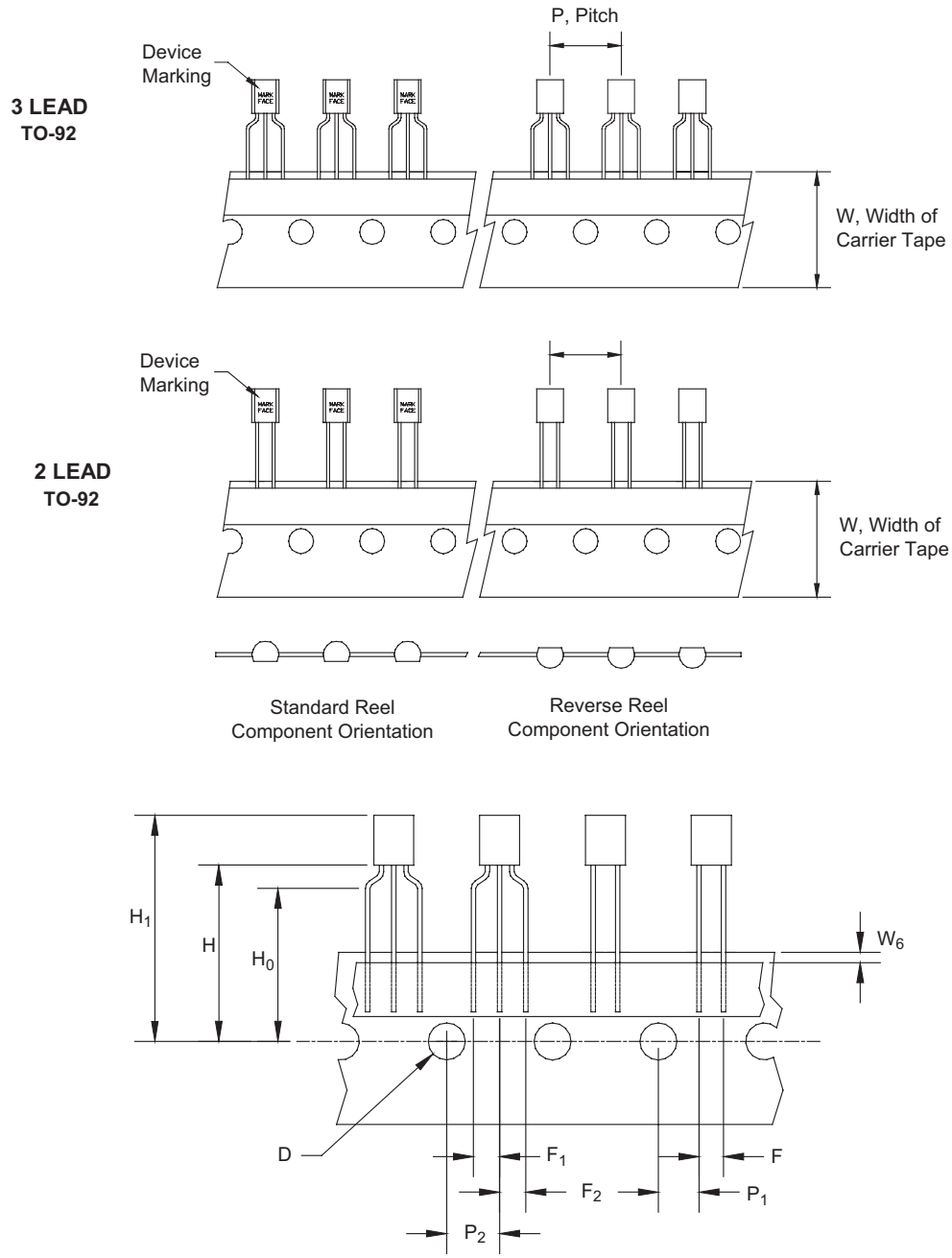
FIGURE 13: TO-92 DEVICES



Packaging

DIMENSIONS AND TOLERANCES

All component taping diagrams, dimensions, tolerances and component positioning requirements are those which are specified per EIA Standard EIA-481, current revision.

For the 8-lead SOIC EIAJ Type II Package and 16 mm Carrier Tape width, the component taping diagrams, dimensions and tolerances and component positioning requirements are those which are specified per EIAJ Standard RC-1009B, current revision.

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Thermal Characteristics

THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Average Junction Temperature	T_J	$T_A + (P_D \times \Theta ja)$	°C
Ambient Temperature	T_A	User Determined	°C
Total Power Dissipation1	P_D	$P_{INT} + P_{I/O}$	W
Device Internal Power Dissipation	P_{INT}	$I_{DD} \times V_{DD}$	W
I/O Pin Power Dissipation	$P_{I/O}$	User Determined	W

THERMAL RESISTANCE

Item	Leads	Package	Package Body	ΘJc (°C/W)	ΘJa (°C/W)
Package Thermal Resistance(2)	8	PDIP	.300”	41.2	84.6
	14	PDIP	.300”	32.5	69.8
	16	PDIP	.300”	34.1	69.9
	18	PDIP	.300”	29.4	65.9
	20	PDIP	.300”	28.1	62.4
	24	PDIP	.600”	21	63
	28	PDIP	.600”	31.4	59.1
	28	SPDIP	.300”	29	60
	40	PDIP	.600”	24.7	47.2
	8	SOIC	.150”	38.8	163
	8	SOIC	.208”	27.98	117.55
	16	SOIC	.300”	24.8	89.6
	18	SOIC	.300”	24.6	63.6
	20	SOIC	.300”	24.2	85.2
	28	SOIC	.300”	23.8	80.2
	8	MSOP	.118”	39.1	206.3
	8	TSSOP	4.4 mm	36.6	123.7
	14	TSSOP	4.4 mm	31.7	100.4
	20	TSSOP	4.4 mm	17	90.2
	28	TSSOP	4.4 mm	13.3	75.5
	20	SSOP	.209”	32.2	108.1
	28	SSOP	.209”	23.9	89.4
	3	SOT-23		110.12	336
	5	SOT-23		81	255.9
	3	TO-92		66.3	131.9
	20	PLCC		37.6	62.5
	28	PLCC		25.4	50.4
	32	PLCC		22.7	52.4
	44	PLCC		20.6	45.4
	68	PLCC		16.1	39.3
	84	PLCC		11.4	35.8
	44	TQFP	10x10x1 mm	14.5	45.79
	64	TQFP	10x10x1 mm	24.4	76.6
	80	TQFP	12x12x1 mm	24.4	69.4
	100	TQFP	14x14x1 mm	24.4	50
	44	MQFP	10x10x2 mm	14.8	57.8

Note 1: Approximate value, disregarding PI/O.

2: All thermal resistance values are estimated and are dependent on die and materials used. Variables include die and leadframe paddle sizes. Relative values are taken in still air.

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PACKAGING

Overview of Microchip Die/Wafer Support

INTRODUCTION

Microchip Technology Inc. devices are available in wafer form and in die form. All products sold in die or wafers have been characterized and qualified according to the requirements of Microchip Technology Inc. Specifications SPI-41014, “Characterization and Qualification of Integrated Circuits” and QCI-39000, “Worldwide Quality Conformance Requirements”.

PRODUCT INTEGRITY

Product supplied in die or wafer form are fully tested and characterized. Die or Wafers are inspected to Microchip Technology Inc. Specification, QCI-30014.

CAUTION

Some EEPROM devices use EPROM cells for device configuration. Exposure to ultraviolet light must be avoided. Exposure to ultraviolet light may cause the device to operate improperly.

Extreme care is urged in the handling and assembly of these products since they are susceptible to damage from electro-static discharge.

ORDERING INFORMATION

Die sales must be conducted by contacting your Microchip Sales Office.

To order or obtain information (on pricing or delivery) for a specific device, use one of the following part numbers:

Devices in Waffle Pack
DEVICE_NUMBER/S

Devices in Wafer form
DEVICE_NUMBER/W
DEVICE_NUMBER/WF

where DEVICE_NUMBER is the device that you require. The S specifies die in a waffle pack, while a W specifies wafer sales and WF specifies sawn wafer on frames.

ELECTRICAL SPECIFICATIONS

The functional and electrical specifications of Microchip devices in die form are identical to those of a packaged version. Please refer to individual data sheets for complete details.

QTP

Quick-Turnaround-Production (QTP) applies only to EPROM and EEPROM microcontrollers.

With QTP devices, the program memory array is only tested against the code provided. This method ensures that the device will operate correctly as programmed, but does not ensure that every program memory bit can be programmed to every state.

Note: Do not erase QTP devices and program them with a different code.

EPROM

EPROM devices are supplied as fully erased programmable parts that are UV erasable and re-programmable by the user (except for QTP and SQTP devices).

EEPROM

EEPROM devices may not be supplied in a fully erased state, but are reprogrammable by the user (except for QTP and SQTP devices).

ROM

ROM devices are supplied as fully programmed parts (program memory only). These are not reprogrammable by the user.

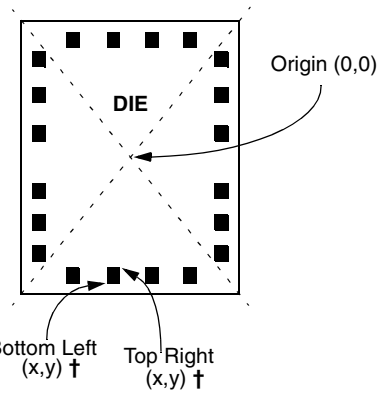
DIE MECHANICAL SPECIFICATIONS

Refer to the individual data sheet for these specifications.

BOND PAD COORDINATES

The die figures have associated bond pad coordinates. These coordinates assist in the attaching of the bond wire to the die. All the dimensions of these coordinates are in micrometers (μm) unless otherwise specified. The origin for the coordinates is the center of the die, as shown in Figure 1. Refer to the Microchip Die Specification sheet for openings and pitch.

FIGURE 1: DIE COORDINATE ORIGIN



† All dimensions in μm unless specified otherwise.

The die is capable of thermosonic gold or ultrasonic wire bonding. Die meet the minimum conditions of MIL-STD 883, Method 2011 on “Bond Strength (Destructive Bond Pull Test)”. The Bond Pad metallization is silicon doped aluminum.

SUBSTRATE BONDING

Substrate bonding may be required on certain product families. For more information, refer to the die specification sheet.

SHIPPING OPTIONS

Die Form Shipping

Microchip product in die form can be shipped in waffle pack. The waffle pack has sufficient cavity area to restrain the die, while maintaining their orientation. Lint free paper inserts are placed over the waffle packs, and each pack is secured with a plastic locking clip. Groups of waffle packs are assembled into sets for shipment. A label with lot number, quantity and part number is attached.

These waffle packs are hermetically sealed in bags.

Wafer Form

Products may also be shipped in wafer form (see ordering information). Wafers are shipped in a wafer tub. The tub is padded with non-conductive foam. Lint free paper inserts are placed around each wafer. A label with lot number, quantity and part number is attached.

Sawn Wafer on Frames

Products may also be shipped on wafer frames. Wafers are mounted on plastic frames and 100% sawn through. Sawn wafer on frames may be shipped in bulk (25 wafers per carrier) or in a single wafer in a carrier. A label with lot number, quantity and part number is attached with each shipment.

Storage Procedures

Temperature and humidity greatly affect the storage life of die. It is recommended that the die be used as soon as possible after receipt.

Upon receipt, the sealed bags should be stored in a cool and dry environment (25°C and 25% relative humidity). In these conditions, sealed bags have a shelf life of 12 months. Temperatures or humidities greater than these will reduce the storage life.

Once a bag containing waffle packs has been opened, the devices should be assembled and encapsulated within 48 hours (assuming 25°C and 25% humidity).

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APPENDIX A: REVISION HISTORY

Revision AE (September 2005)

The following is the list of modifications:

1. Added **Appendix A: Revision History**.
2. Revised dimensions D2 and E2 in the 8-Lead Plastic, No Lead (MC) 2x3x0.9 mm body (DFN) – Saw Singulated package diagram
3. Corrected graphic format in all packaging diagrams.
4. Added the following Packages:
   - 16-Lead Plastic Small Outline Narrow Body (QSOP)
   - 4-Lead Plastic Small Outline Transistor (SOT-143)
   - 3-Lead Plastic Small Outline Transistor (SOT-223)
   - 32-Lead Thin Quad Flatpack 7x7x1mm Body 1.0/0.10 Lead Form (TQFP)
   - 3-Lead SC-70 package diagram corrected.
5. The following package diagrams were replaced:
   - Drawing C04-142 replaced by C04-128 (5-Lead Small Outline Transistor) (TSOT)
   - Drawing C04-300 replaced by C04-132 (24-Lead Plastic Shrink Small Outline) (SSOP)
6. Added Part Number Designators DB, RC and QR to Part Number Suffix Designations table.

Revision AF (January 2006)

The following is the list of modifications:

1. Revised 28-Lead Plastic Shrink Small Outline (SS) – 209 mil body, 5.30 mm (SSOP)
2. Revised 28-Lead Plastic Quad Flat No Lead (MM) 6x6x0.9 mm body (QFN-S) with 0.40 mm Contact Length (Saw Singulated)

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