

## **SECTION 11 PACKAGING**

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## Packaging Diagrams and Parameters

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# Packaging

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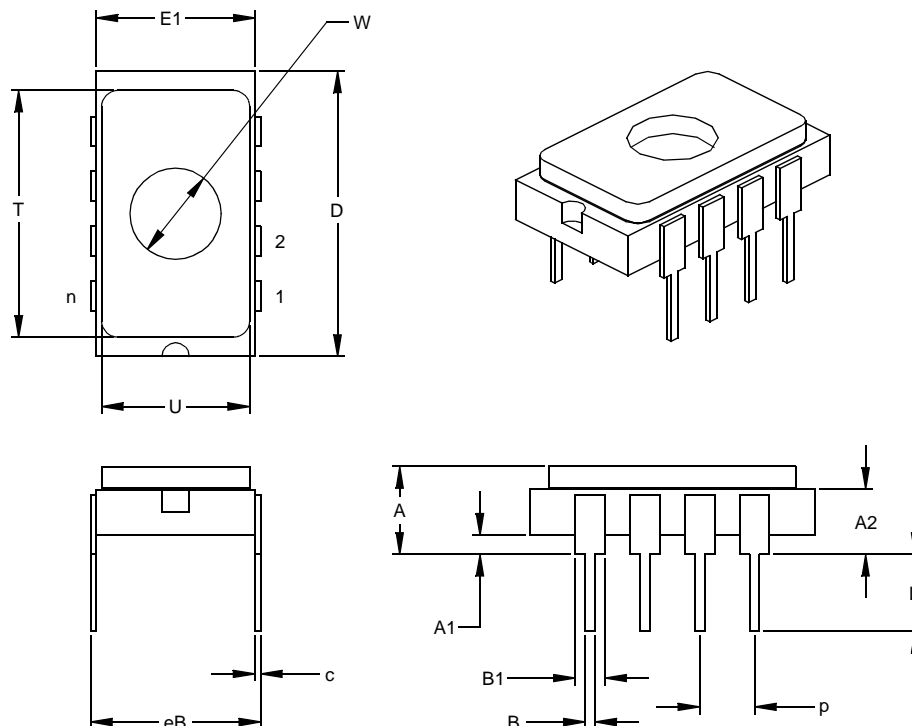
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## Packaging Diagrams and Parameters

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

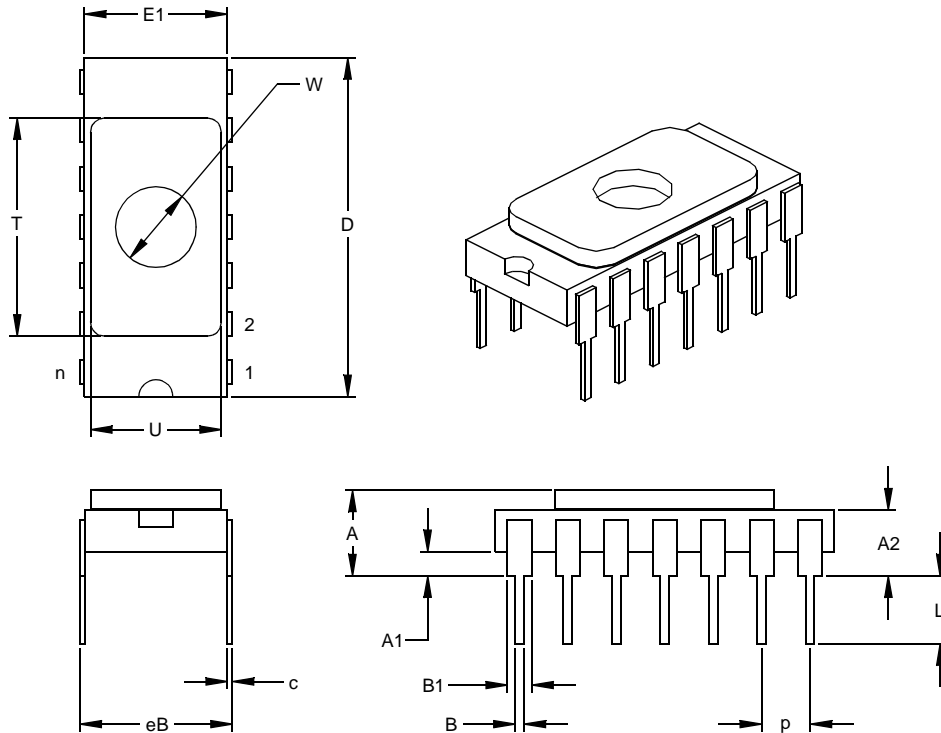


Dimension Limits	Units	INCHES*			MILLIMETERS		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.145	.165	.185	3.68	4.19	4.70
Top of Body to Seating Plane	A2	.103	.123	.143	2.62	3.12	3.63
Standoff	A1	.025	.035	.045	0.64	0.89	1.14
Package Width	E1	.280	.290	.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  
 JEDC Equivalent: MS-015  
 Drawing No. C04-083

## Packaging Diagrams and Parameters

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



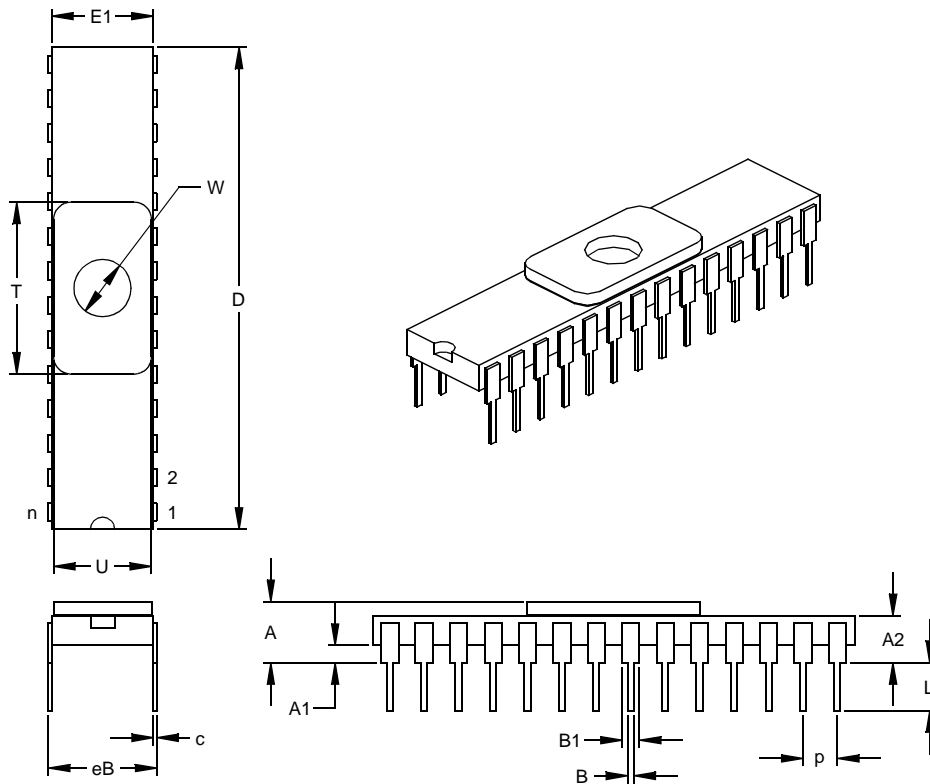
Dimension Limits	Units	INCHES*			MILLIMETERS		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		14			14	
Pitch	P		.100			2.54	
Top to Seating Plane	A	.142	.162	.182	3.61	4.11	4.62
Top of Body to Seating Plane	A2	.100	.120	.140	2.54	3.05	3.56
Standoff	A1	.025	.035	.045	0.64	0.89	1.14
Package Width	E1	.280	.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



## Packaging Diagrams and Parameters

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

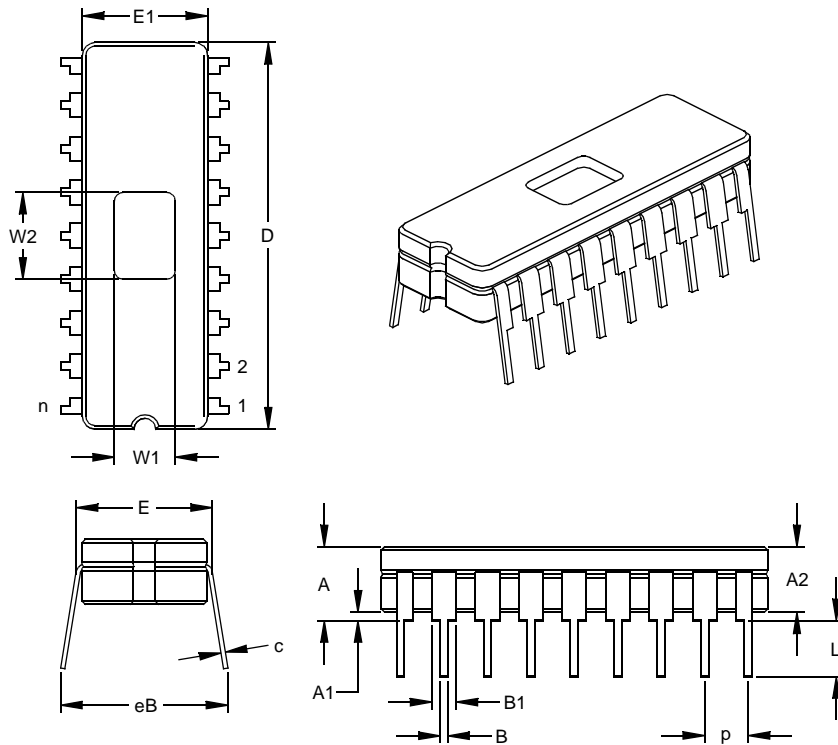


Units		INCHES*			MILLIMETERS		
Dimension	Limits	MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.155	.177	.198	3.94	4.48	5.03
Top of Body to Seating Plane	A2	.115	.135	.155	2.92	3.43	3.94
Standoff	A1	.040	.050	.060	1.02	1.27	1.52
Package Width	E1	.280	.290	.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

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

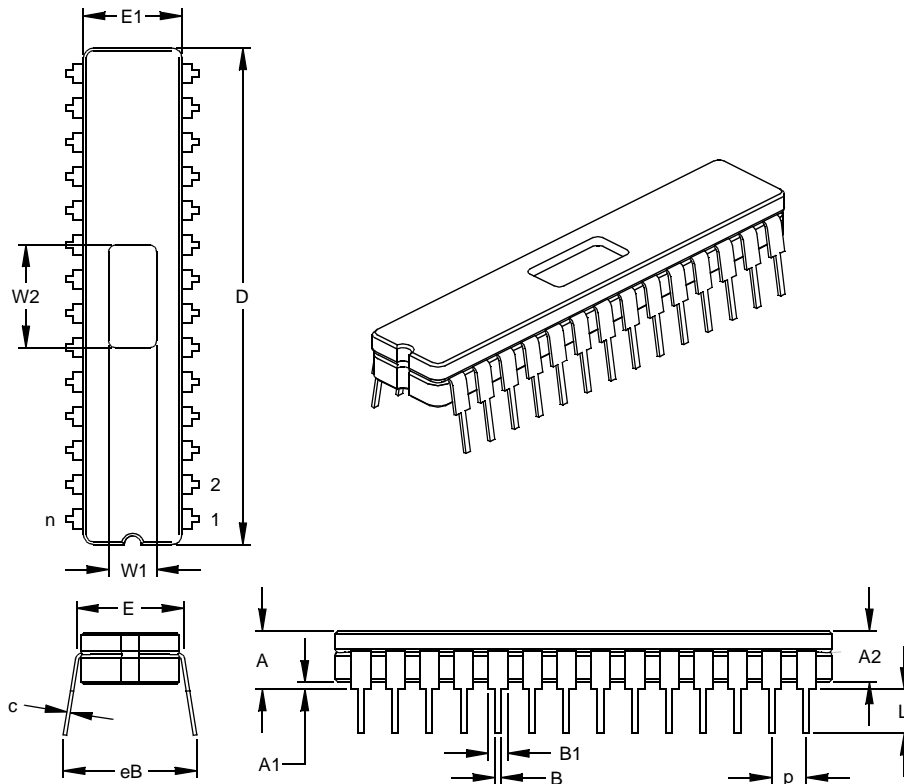


Dimension Limits	Units	INCHES*			MILLIMETERS		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		18			18	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.170	.183	.195	4.32	4.64	4.95
Ceramic Package Height	A2	.155	.160	.165	3.94	4.06	4.19
Standoff	A1	.015	.023	.030	0.38	0.57	0.76
Shoulder to Shoulder Width	E	.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

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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

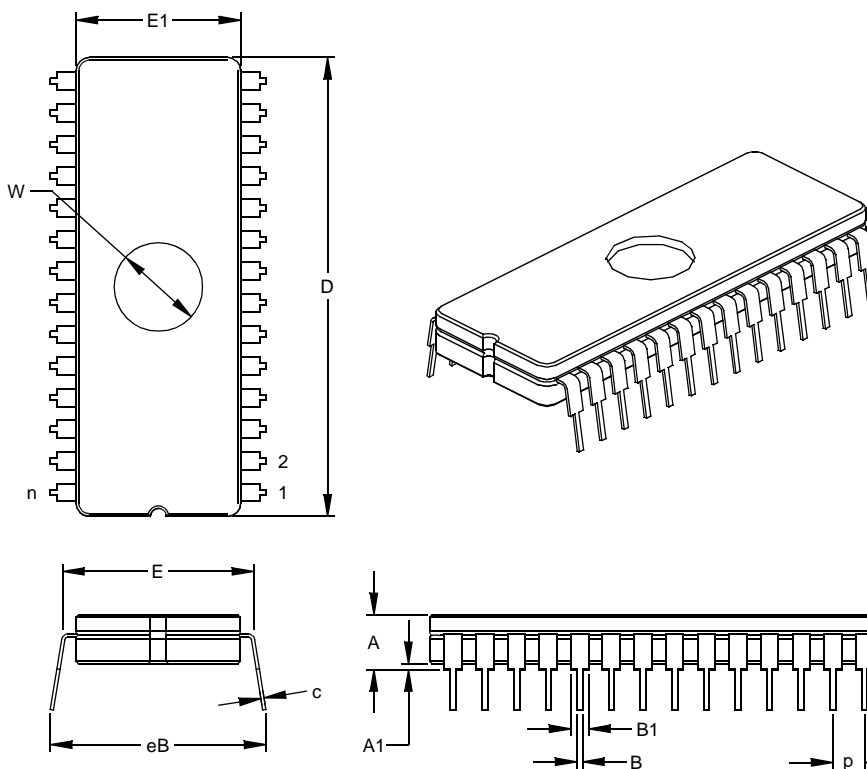
§ Significant Characteristic

JEDEC Equivalent: MO-058

Drawing No. C04-080

## Packaging Diagrams and Parameters

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

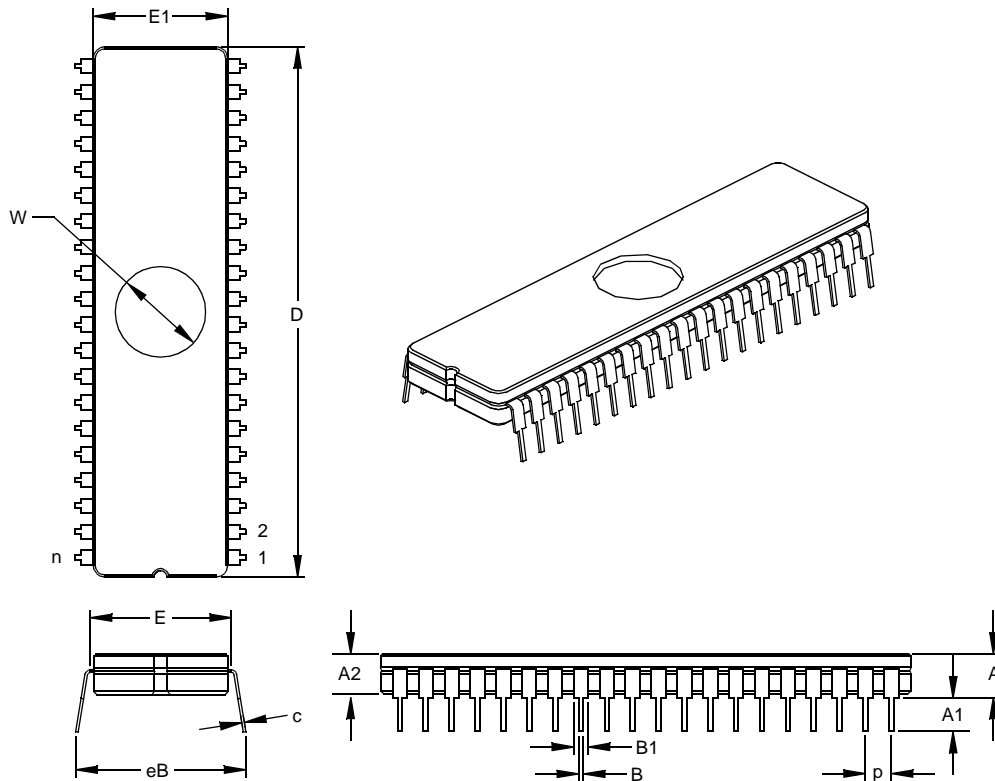


Dimension Limits		INCHES*			MILLIMETERS		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.195	.210	.225	4.95	5.33	5.72
Ceramic Package Height	A2	.155	.160	.165	3.94	4.06	4.19
Standoff	A1	.015	.038	.060	0.38	0.95	1.52
Shoulder to Shoulder Width	E	.595	.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 with Window (JW) – 600 mil (CERDIP)

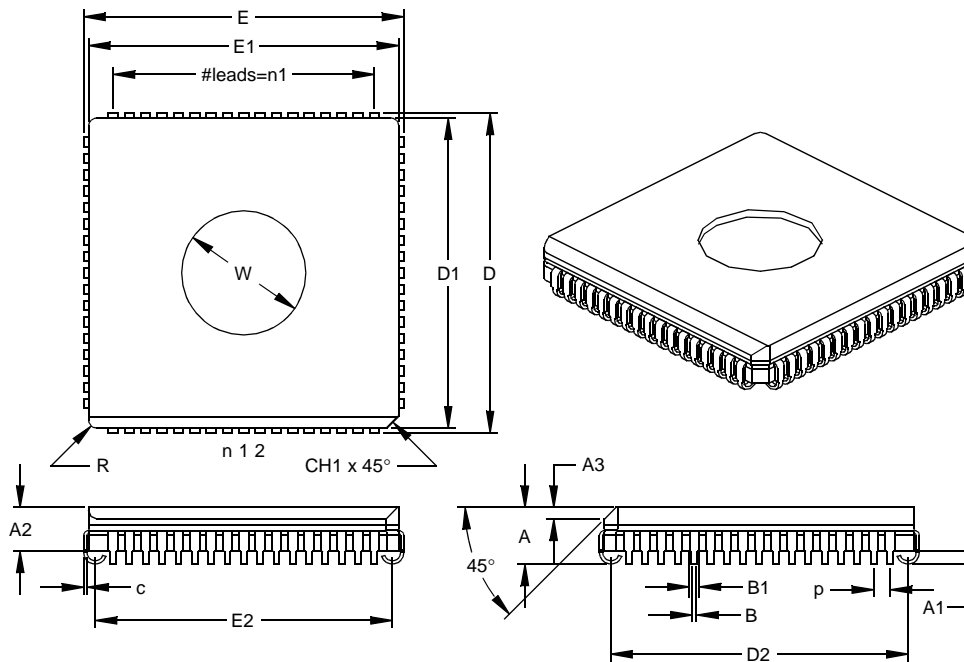


		Units	INCHES*			MILLIMETERS		
Dimension Limits			MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n			40			40	
Pitch	p			.100			2.54	
Top to Seating Plane	A		.185	.205	.225	4.70	5.21	5.72
Ceramic Package Height	A2		.155	.160	.165	3.94	4.06	4.19
Standoff	A1		.030	.045	.060	0.76	1.14	1.52
Shoulder to Shoulder Width	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

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

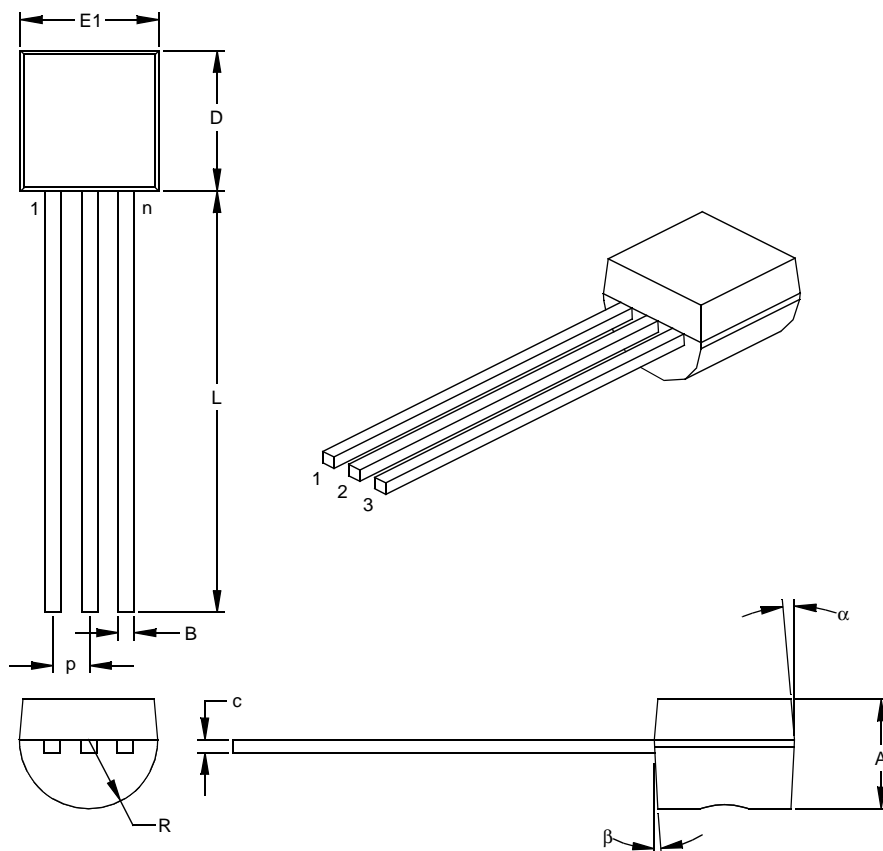


Dimension Limits	Units	INCHES*			MILLIMETERS		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		68			68	
Pitch	p		.050			1.27	
Overall Height	A	.165	.175	.185	4.19	4.45	4.70
Package Thickness	A2	.118	.137	.155	3.00	3.48	3.94
Standoff §	A1	.030	.040	.050	0.76	1.02	1.27
Side One Chamfer Dim.	A3	.030	.035	.040	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	.983	.988	.993	24.97	25.10	25.22
Overall Package Length	D	.983	.988	.993	24.97	25.10	25.22
Ceramic Package Width	E1	.942	.950	.958	23.93	24.13	24.33
Ceramic Package Length	D1	.942	.950	.958	23.93	24.13	24.33
Footprint Width	E2	.890	.910	.930	22.61	23.11	23.62
Footprint Length	D2	.890	.910	.930	22.61	23.11	23.62
Pins each side	n1		17			17	
Lead Thickness	c	.008	.010	.012	0.20	0.25	0.30
Upper Lead Width	B1	.026	.029	.031	0.66	0.72	0.79
Lower Lead Width	B	.015	.018	.021	0.38	0.46	0.53
Window Diameter	W	.370	.380	.390	9.40	9.65	9.91

\* Controlling Parameter  
 § Significant Characteristic  
 JEDEC Equivalent: MO-087  
 Drawing No. C04-097

## Packaging Diagrams and Parameters

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



Dimension	Units	INCHES*			MILLIMETERS		
		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	$\alpha$	4	5	6	4	5	6
Mold Draft Angle Bottom	$\beta$	2	3	4	2	3	4

\*Controlling Parameter

Notes:

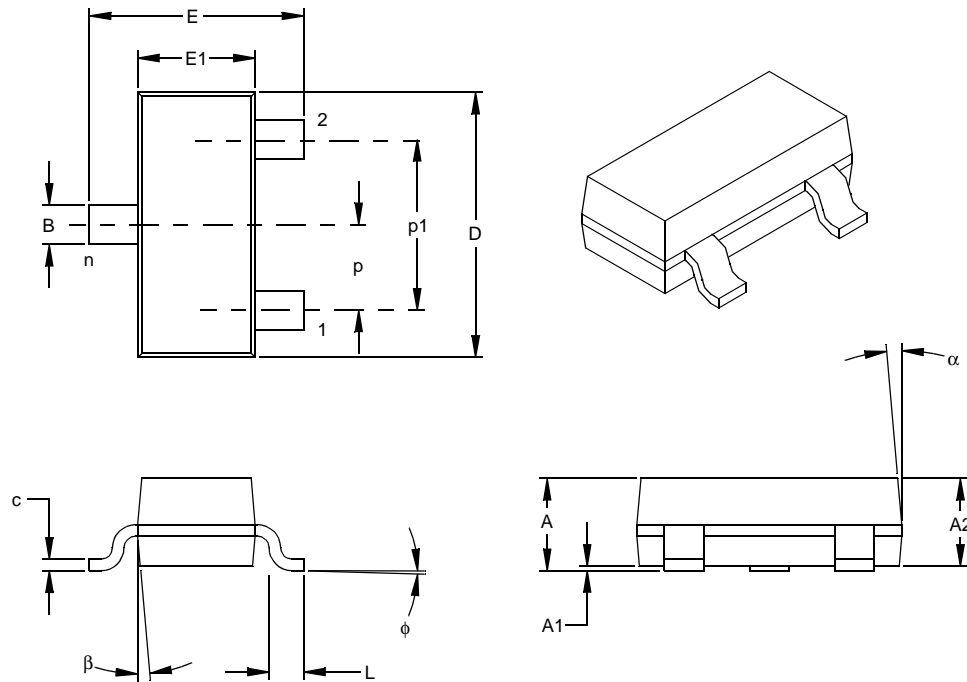
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: TO-92

Drawing No. C04-101

## Packaging Diagrams and Parameters

### 3-Lead Plastic Small Outline Transistor (TT) (SOT23)



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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

§ 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.

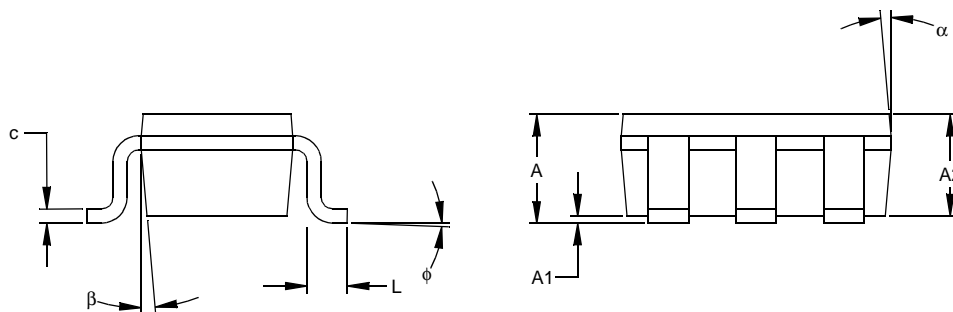
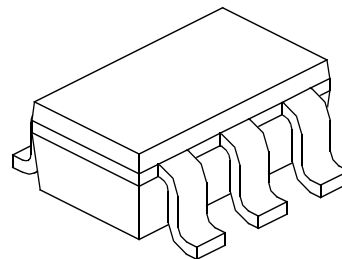
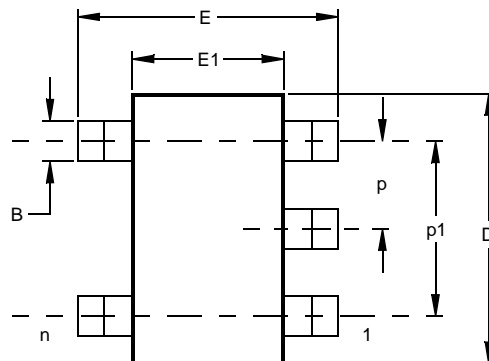
JEDEC Equivalent: TO-236

Drawing No. C04-104



## Packaging Diagrams and Parameters

### 5-Lead Plastic Small Outline Transistor (OT) (SOT23)



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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	$\phi$	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	$\alpha$	0	5	10	0	5	10
Mold Draft Angle Bottom	$\beta$	0	5	10	0	5	10

\* Controlling Parameter

§ Significant Characteristic

Notes:

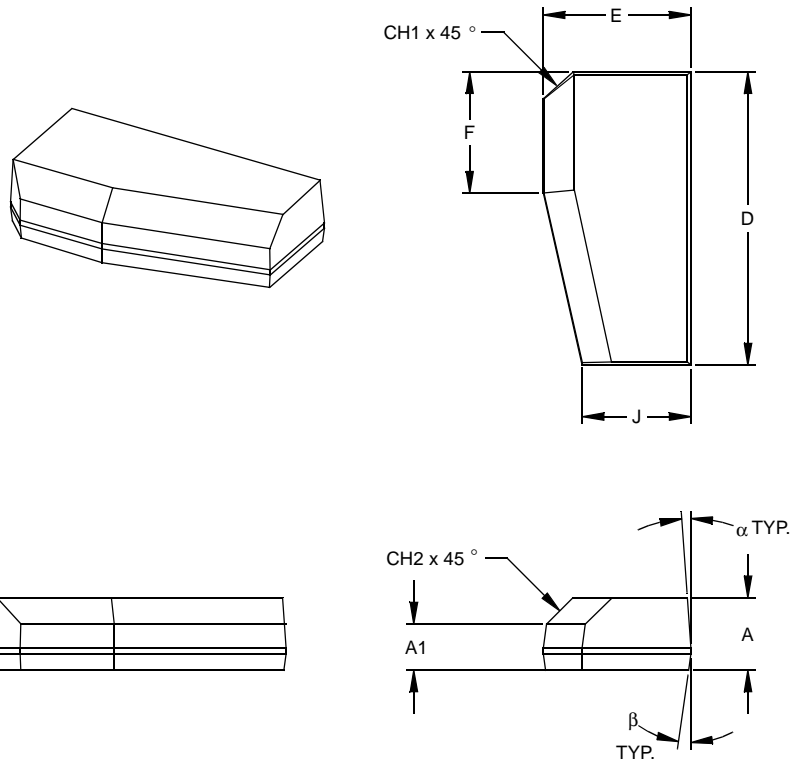
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MO-178

Drawing No. C04-091

## Packaging Diagrams and Parameters

### Leadless Wedge Module Plastic Small Outline Transistor (WM) (SOT385)



Dimension Limits	Units	INCHES			MILLIMETERS*		
		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	$\alpha$	4	6	8	4	6	8
Mold Draft Angle Bottom	$\beta$	4	6	8	4	6	8

\*Controlling Parameter

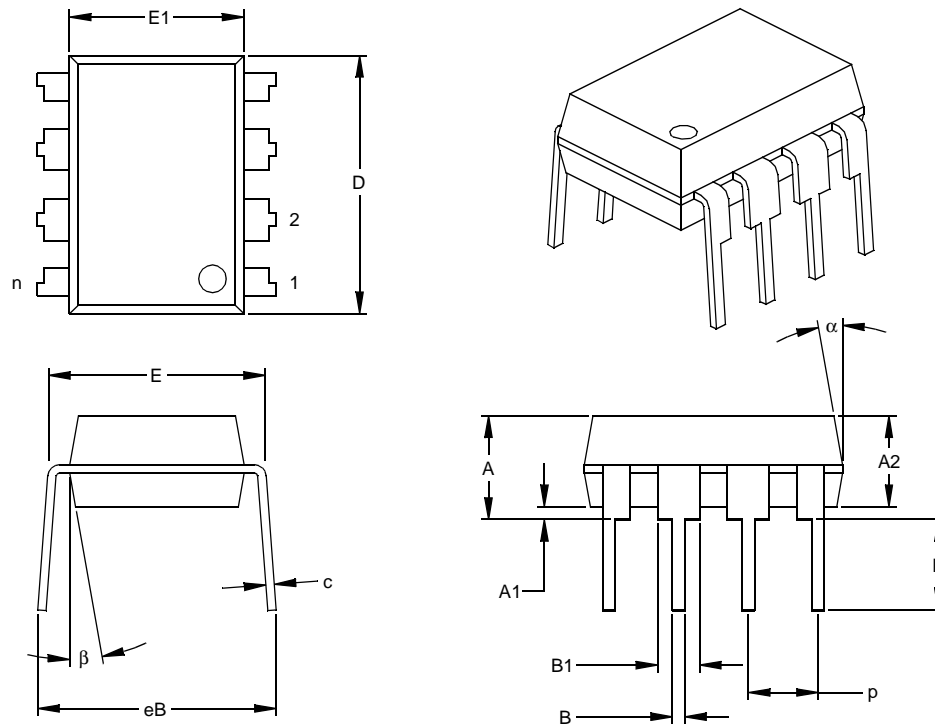
Notes:

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

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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

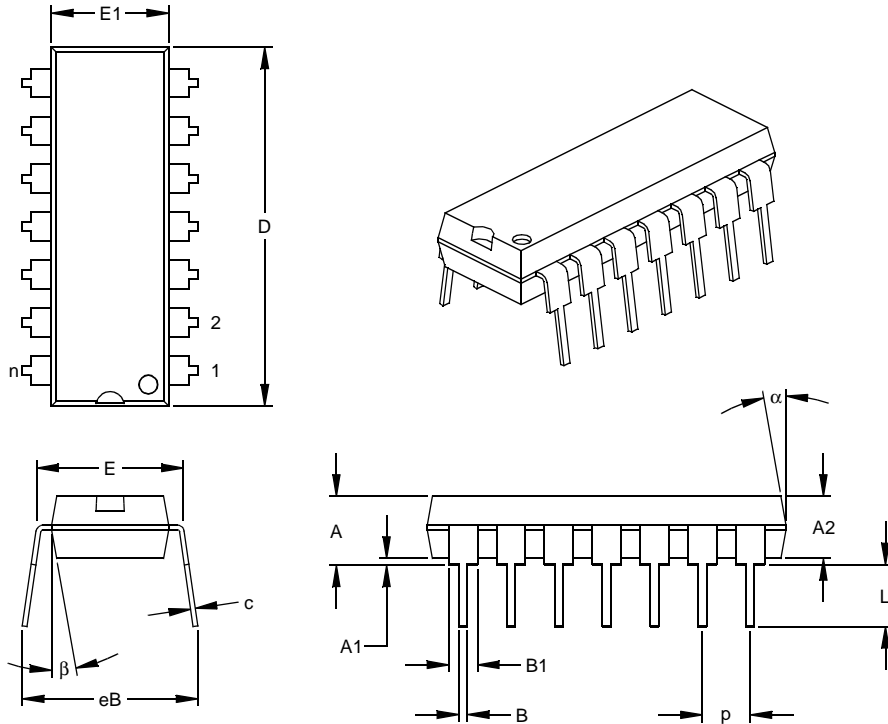
\* Controlling Parameter  
 § Significant Characteristic

**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 (PDIP)



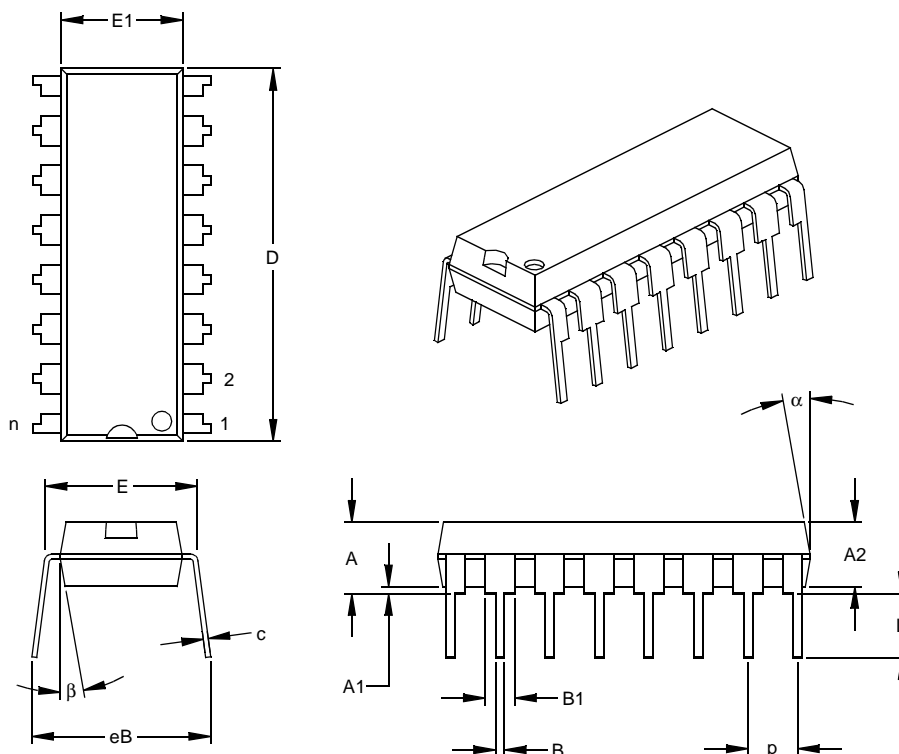
Dimension Limits	Units	INCHES*			MILLIMETERS		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		14			14	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.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

## Packaging Diagrams and Parameters

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

§ Significant Characteristic

Notes:

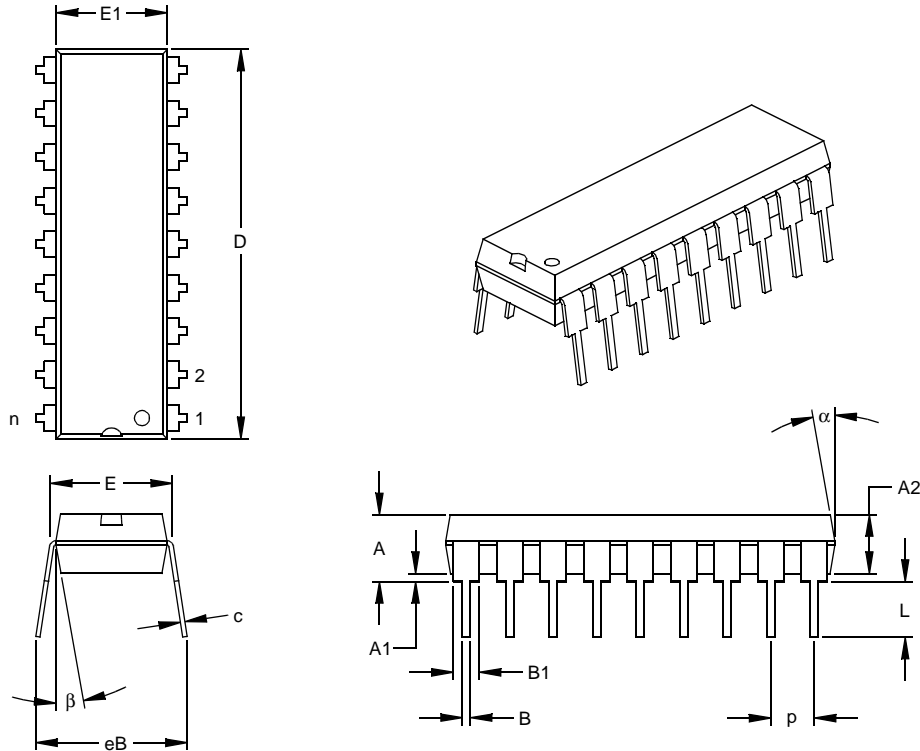
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-001

Drawing No. C04-017

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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:

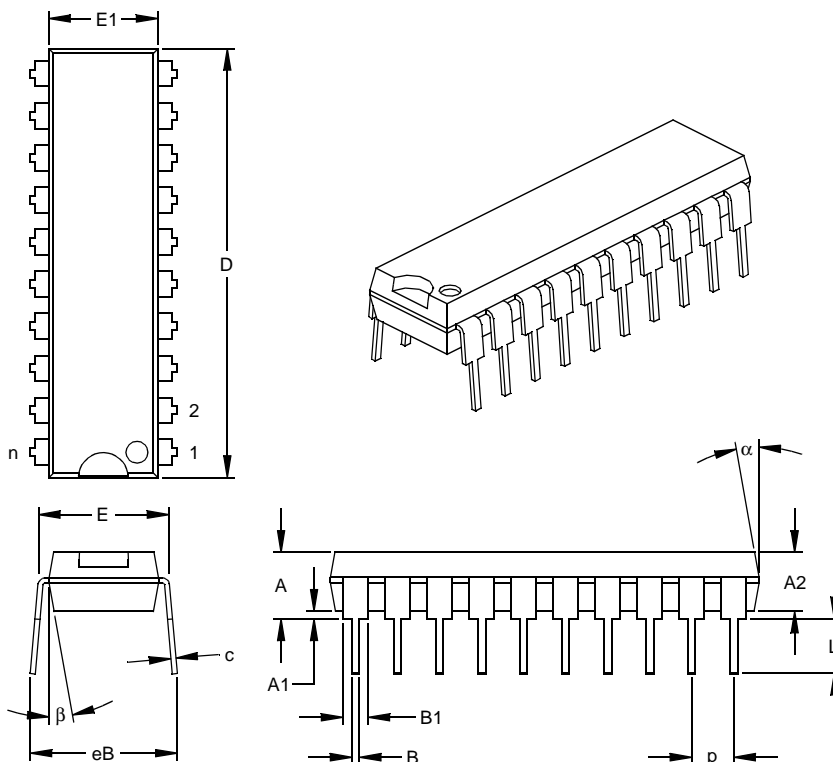
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-001

Drawing No. C04-007

## Packaging Diagrams and Parameters

### 20-Lead Plastic Dual In-line (P) – 300 mil (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:

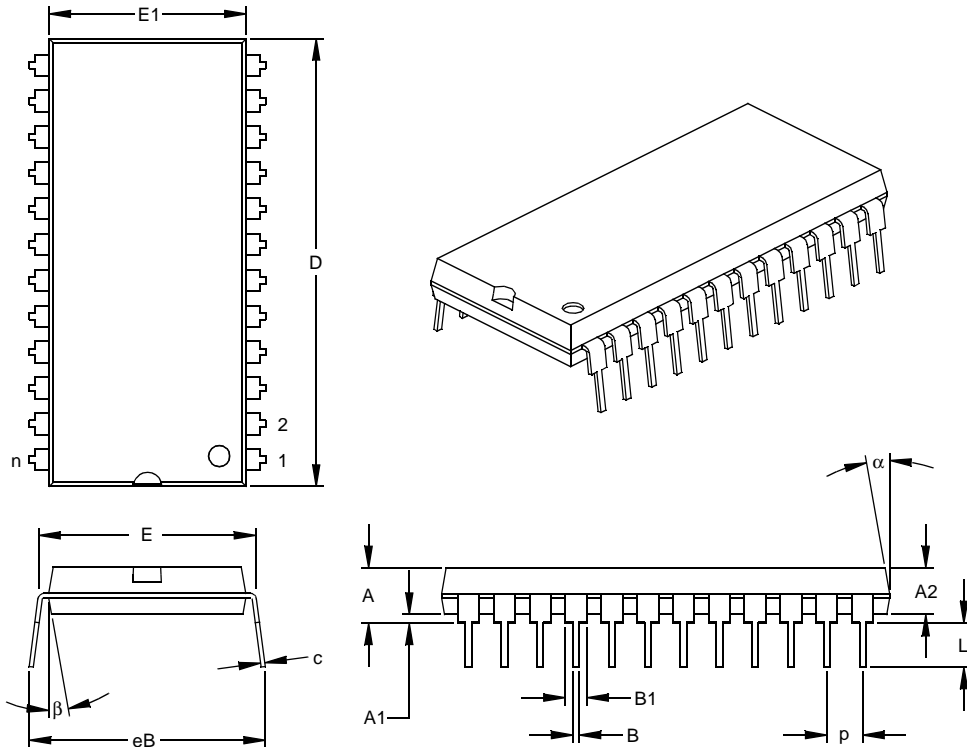
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-001

Drawing No. C04-019

## Packaging Diagrams and Parameters

### 24-Lead Plastic Dual In-line (P) – 600 mil (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.

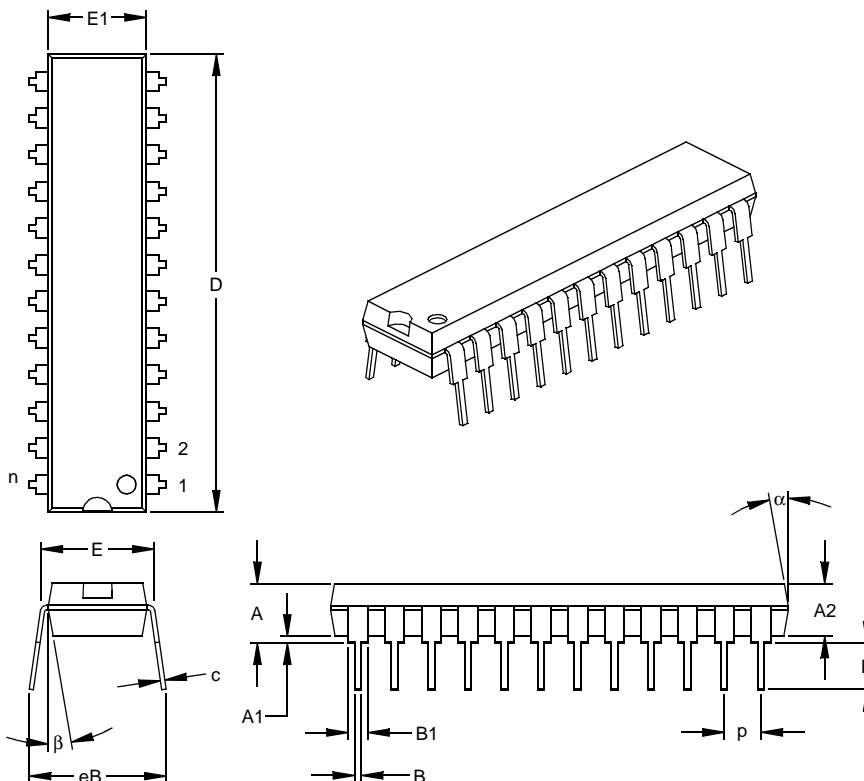
JEDEC Equivalent: MS-011

Drawing No. C04-081



## Packaging Diagrams and Parameters

### 24-Lead Skinny Plastic Dual In-line (SP) – 300 mil (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  
 § Significant Characteristic

Notes:

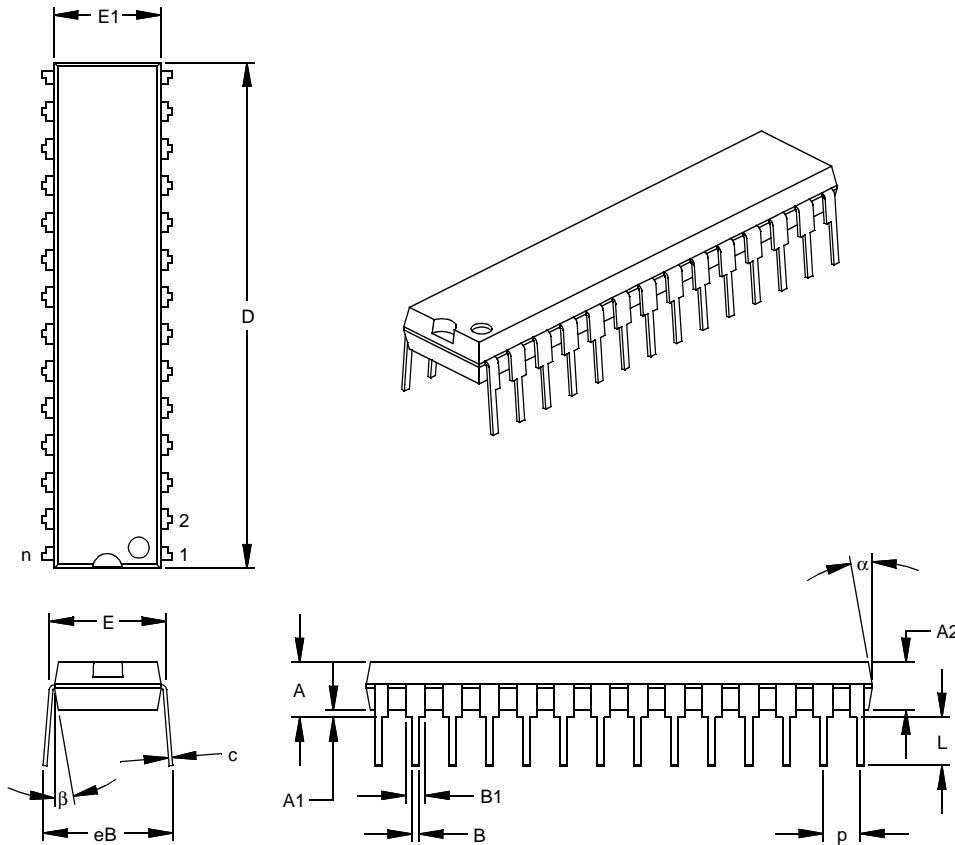
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MO-001

Drawing No. C04-043

## Packaging Diagrams and Parameters

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

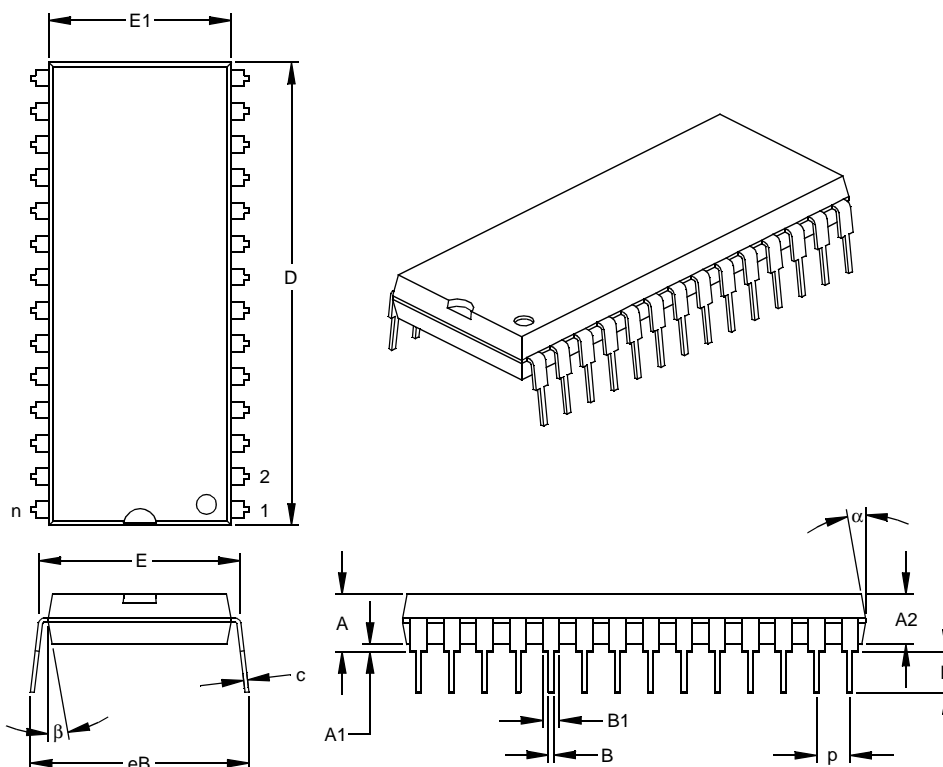
.010" (0.254mm) per side.

JEDEC Equivalent: MO-095

Drawing No. C04-070

## Packaging Diagrams and Parameters

### 28-Lead Plastic Dual In-line (P) – 600 mil (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:

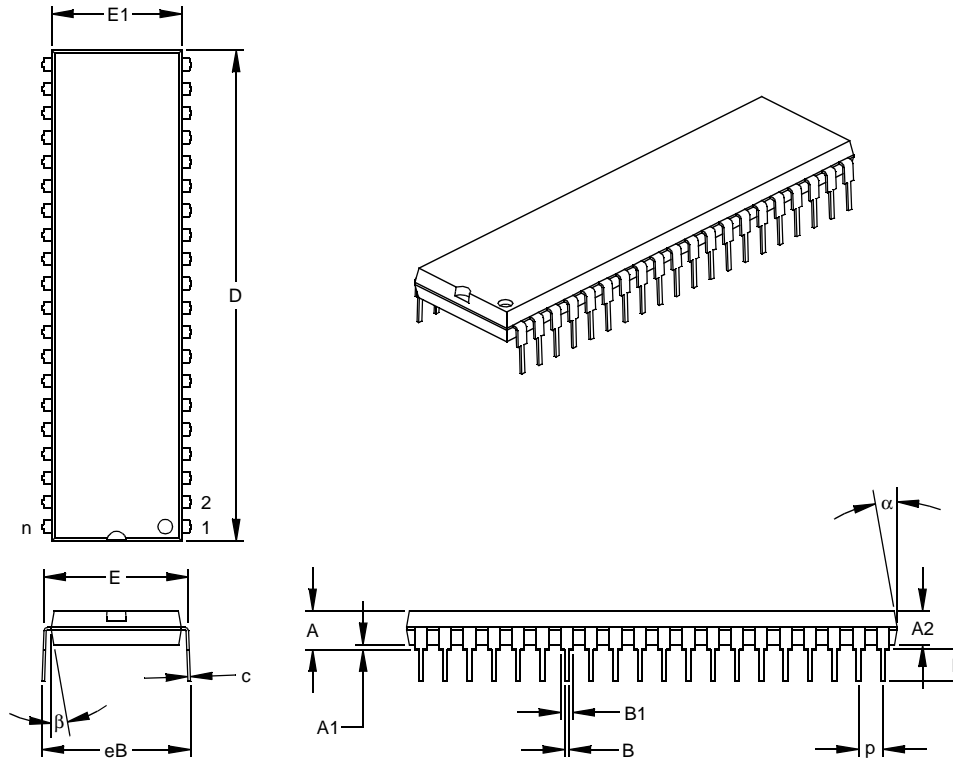
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MO-011

Drawing No. C04-079

## Packaging Diagrams and Parameters

### 40-Lead Plastic Dual In-line (P) – 600 mil (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:

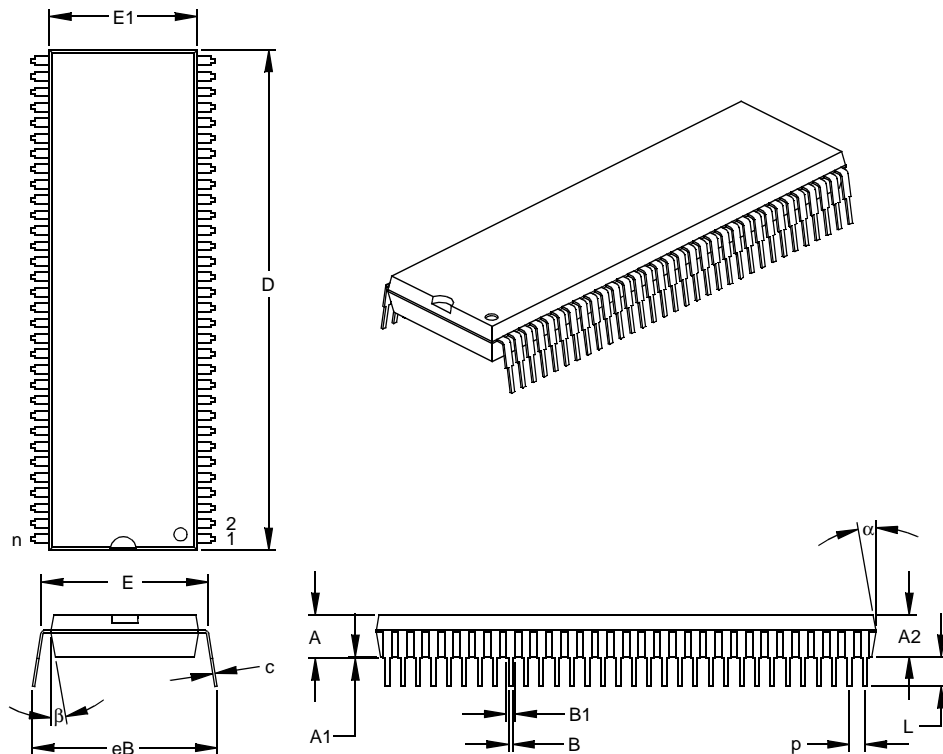
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MO-011

Drawing No. C04-016

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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  
 § Significant Characteristic

Notes:

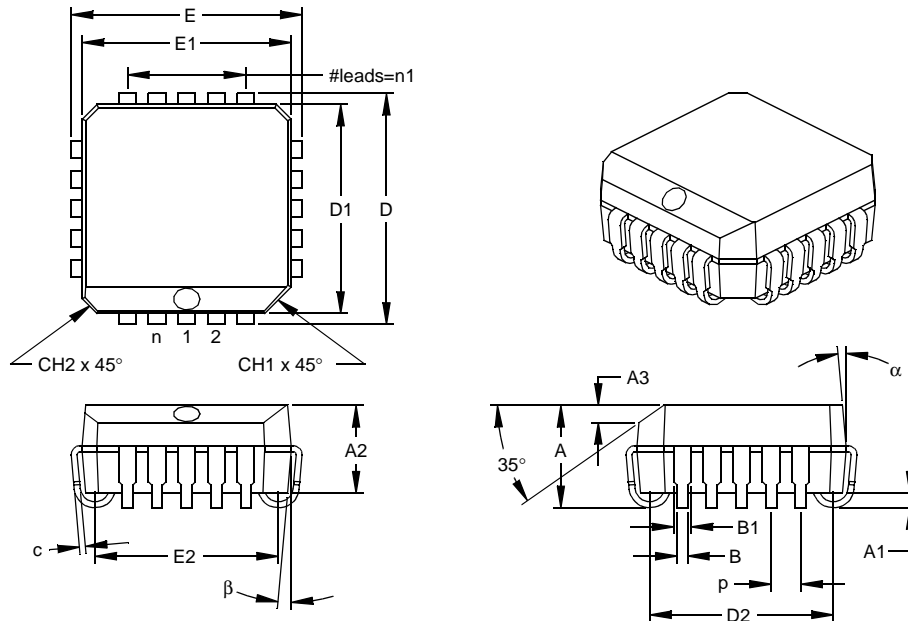
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MO-021

Drawing No. C04-090

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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:

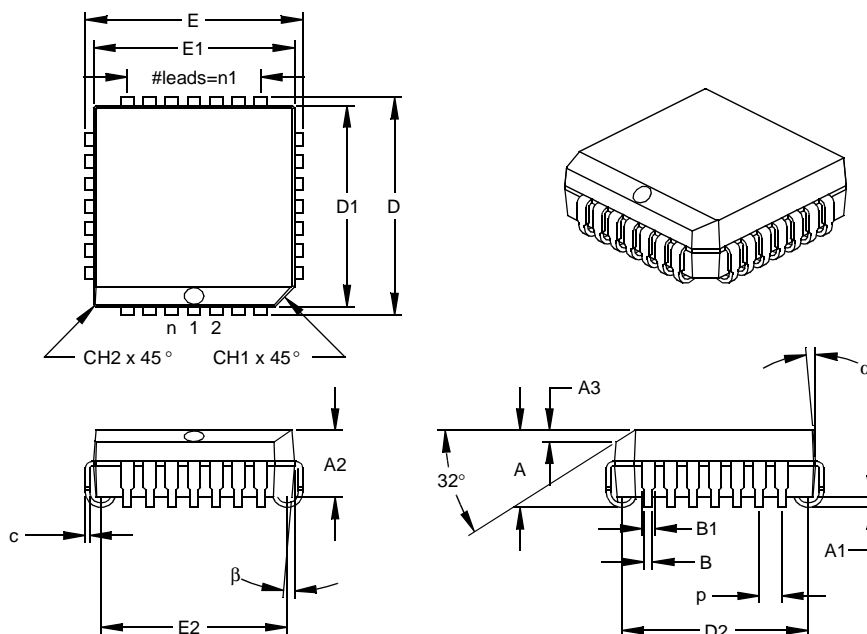
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

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:

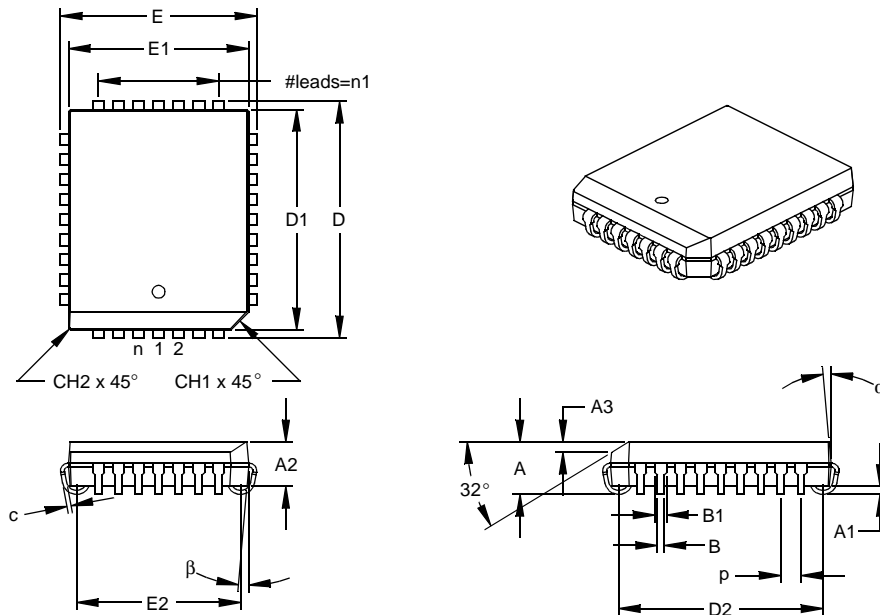
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MO-047

Drawing No. C04-026

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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.

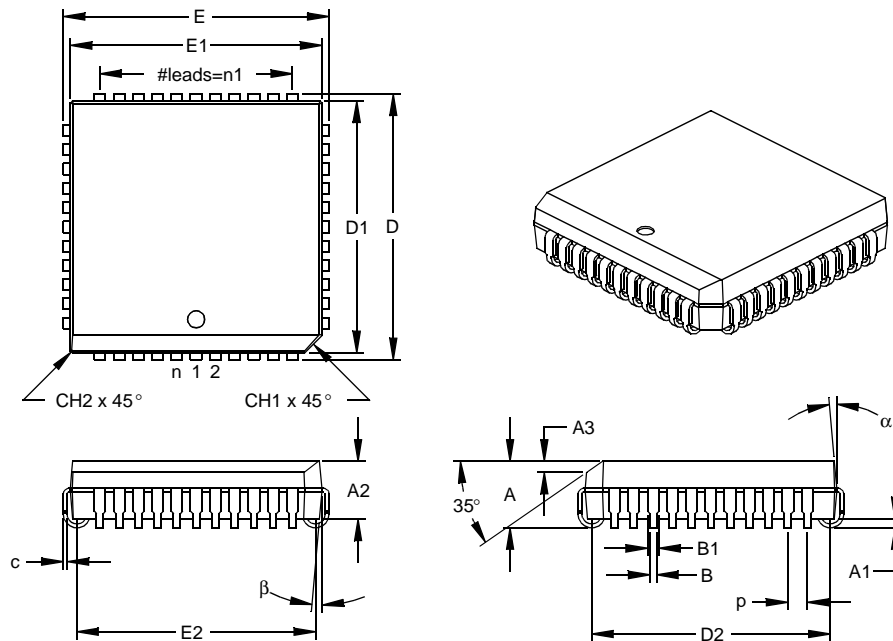
JEDEC Equivalent: MO-016

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:

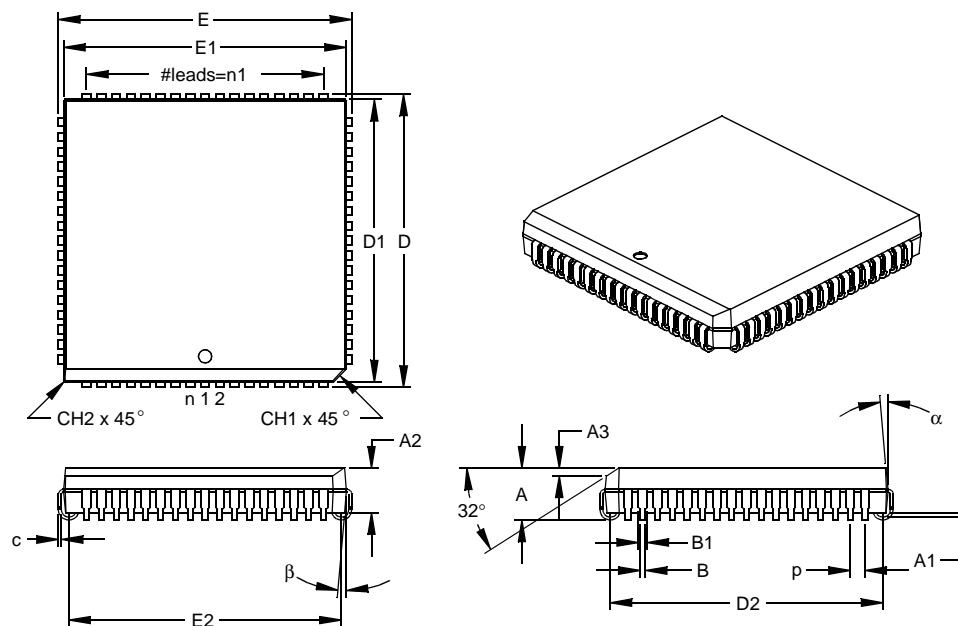
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MO-047

Drawing No. C04-048

## Packaging Diagrams and Parameters

### 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:

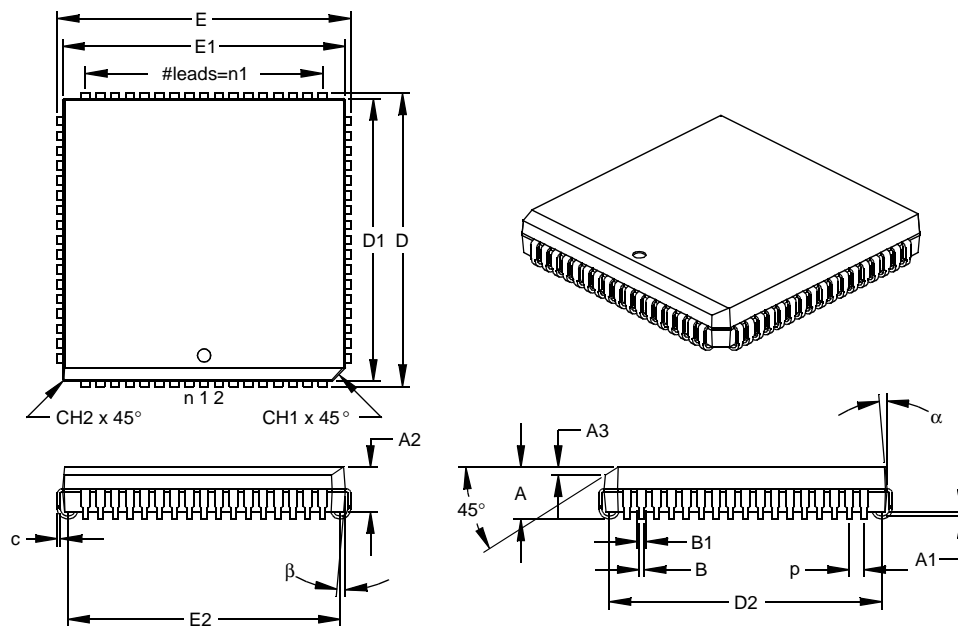
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

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:

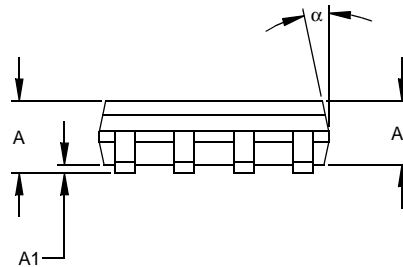
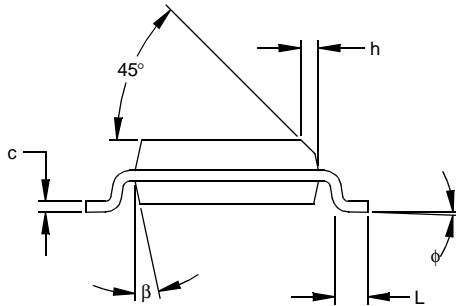
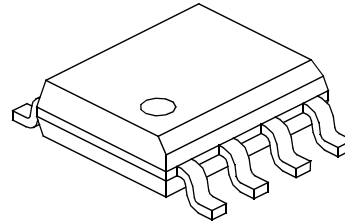
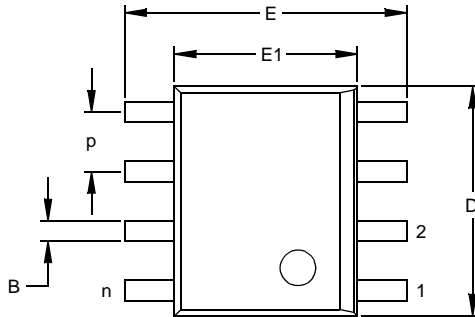
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MO-047

Drawing No. C04-093

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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:**

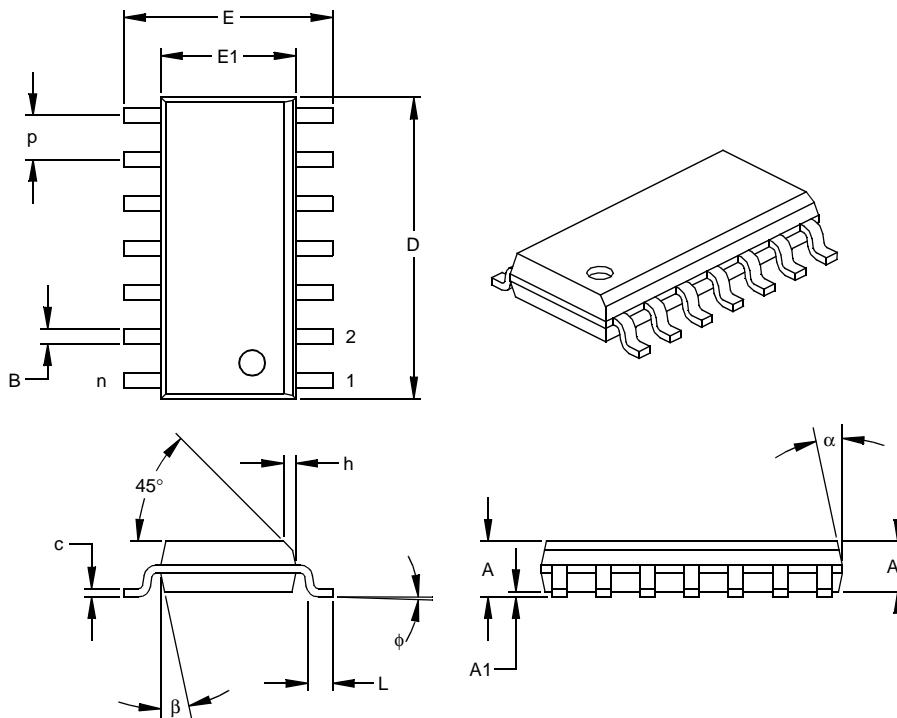
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-012

Drawing No. C04-057

## Packaging Diagrams and Parameters

### 14-Lead Plastic Small Outline (SL) – Narrow, 150 mil (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:**

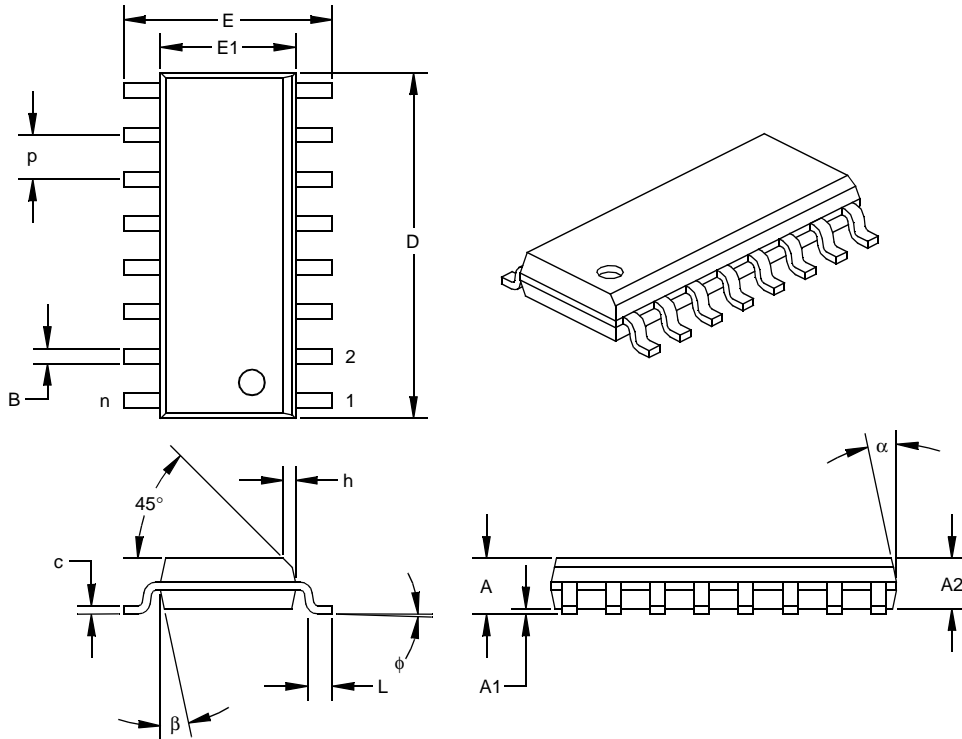
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-012

Drawing No. C04-065

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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:**

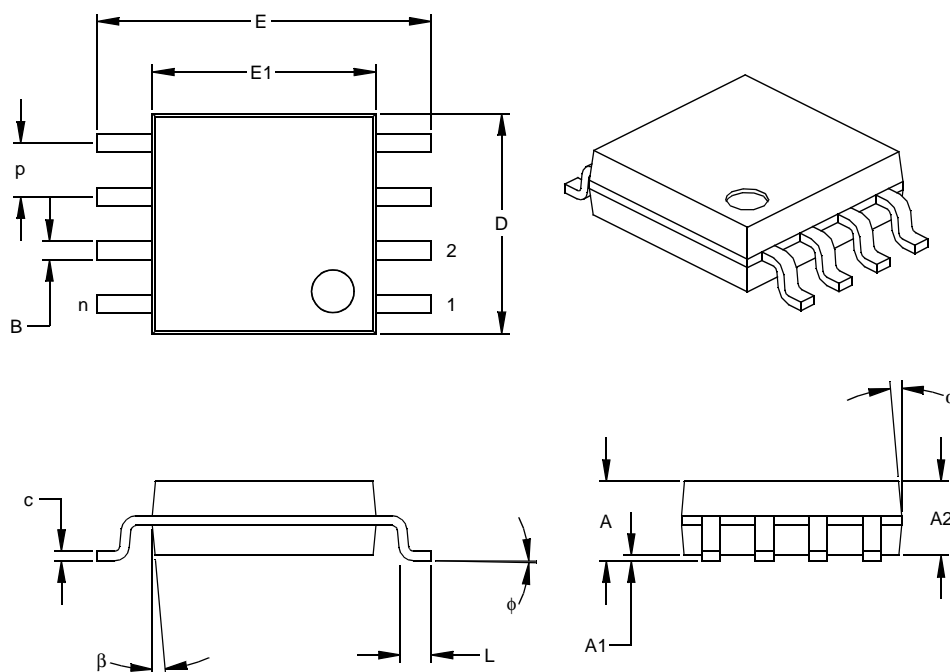
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-012

Drawing No. C04-108

## Packaging Diagrams and Parameters

### 8-Lead Plastic Small Outline (SM) – Medium, 208 mil (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  
 § Significant Characteristic

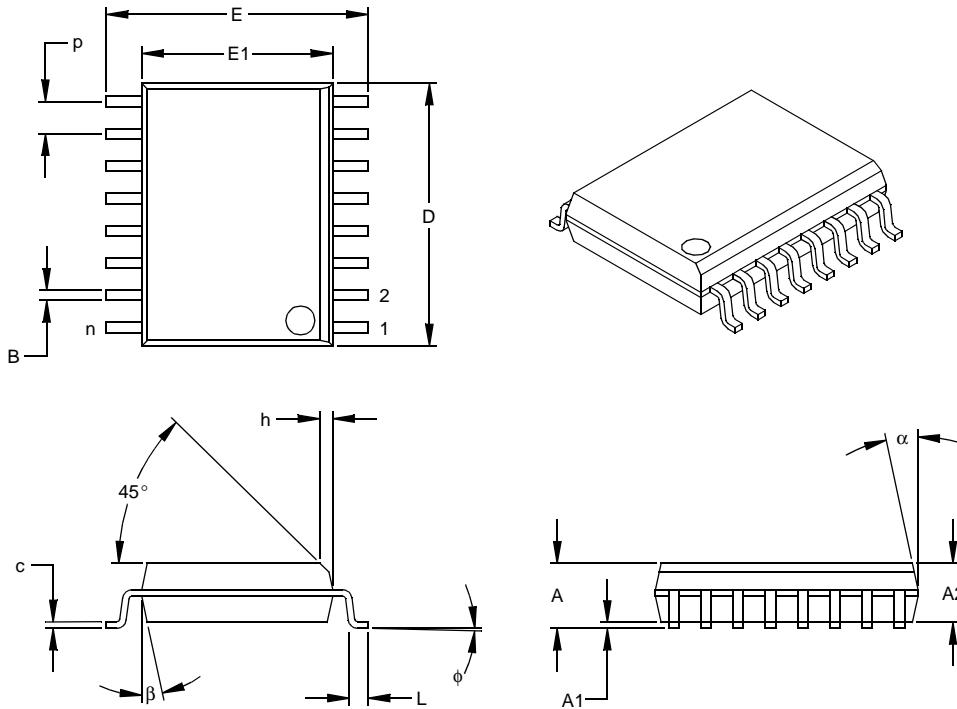
Notes:

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

Drawing No. C04-056

## Packaging Diagrams and Parameters

### 16-Lead Plastic Small Outline (SO) – Wide, 300 mil (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.

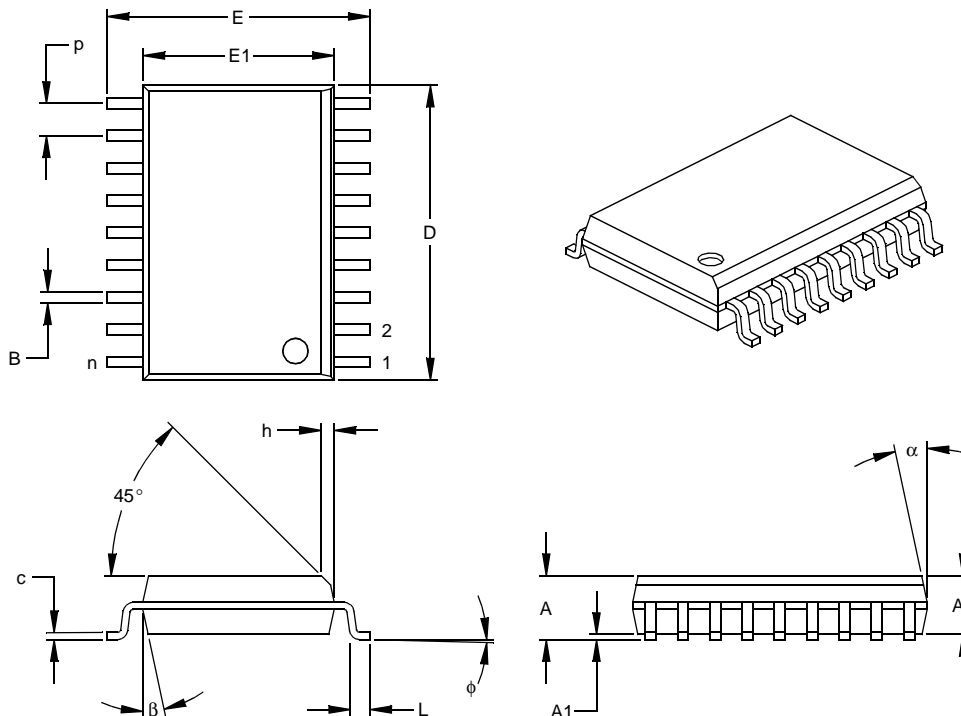
JEDEC Equivalent: MS-013

Drawing No. C04-102



## Packaging Diagrams and Parameters

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



Dimension	Units	INCHES*			MILLIMETERS		
		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:

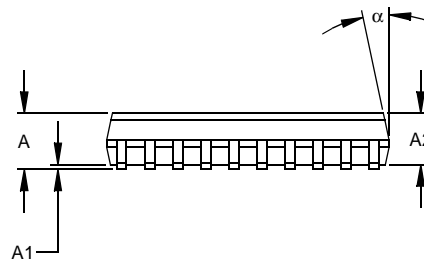
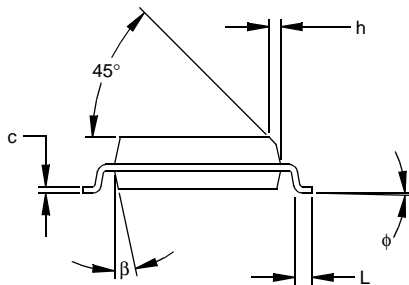
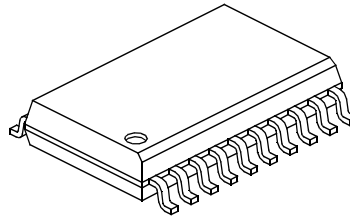
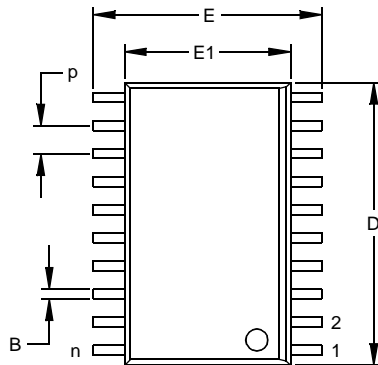
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-013

Drawing No. C04-051

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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

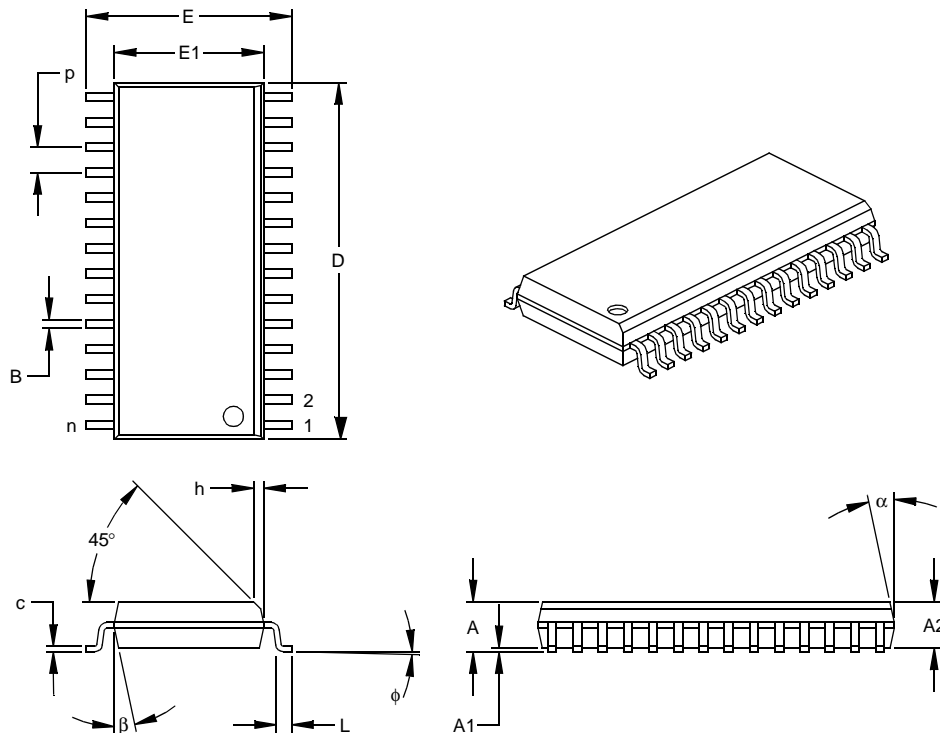
\* Controlling Parameter  
 § Significant Characteristic

**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

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES*			MILLIMETERS		
		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:**

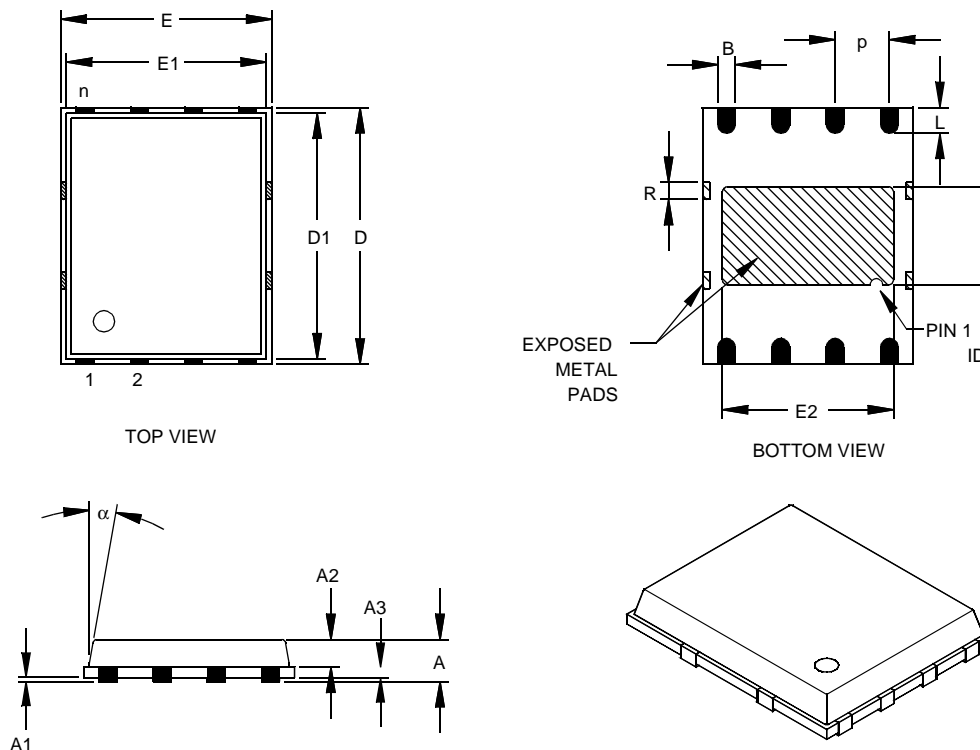
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-013

Drawing No. C04-052

## Packaging Diagrams and Parameters

### 8-Lead Plastic Micro Leadframe Package (MF) 6x5 mm Body (MLF-S)



Dimension Limits	Units	INCHES			MILLIMETERS*		
		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	$\alpha$			12°			12°

\*Controlling Parameter

Notes:

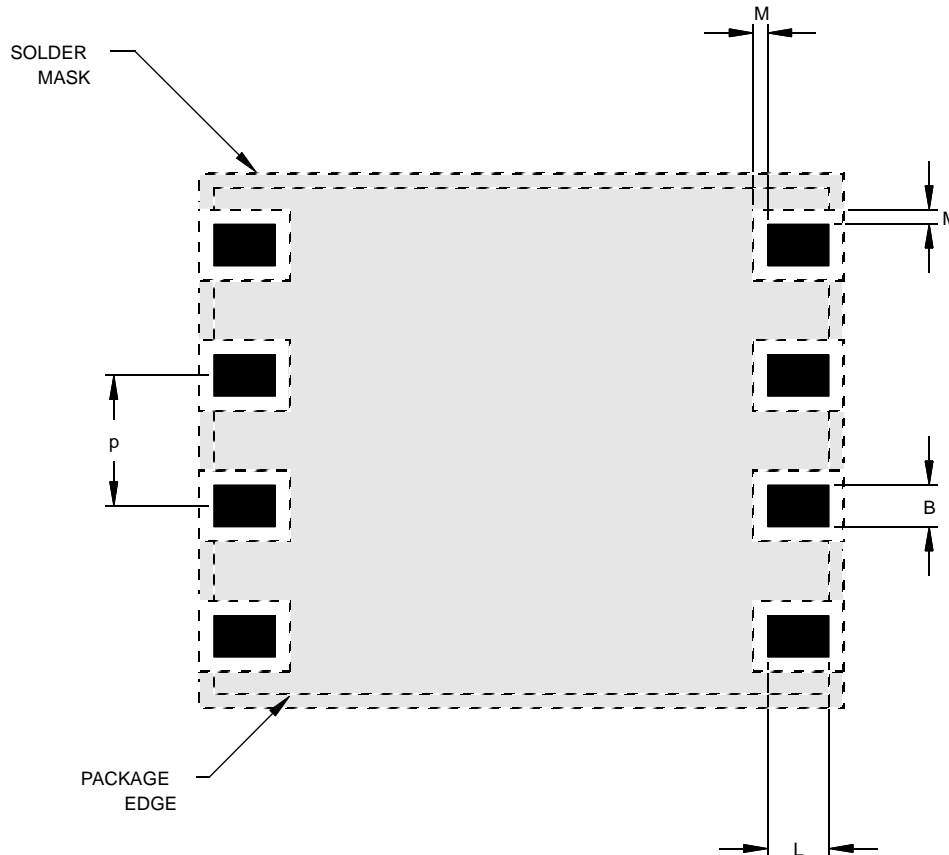
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC equivalent: pending

Drawing No. C04-113

## Packaging Diagrams and Parameters

### 8-Lead Plastic Micro Leadframe Package (MF) 6x5 mm Body (MLF-S)



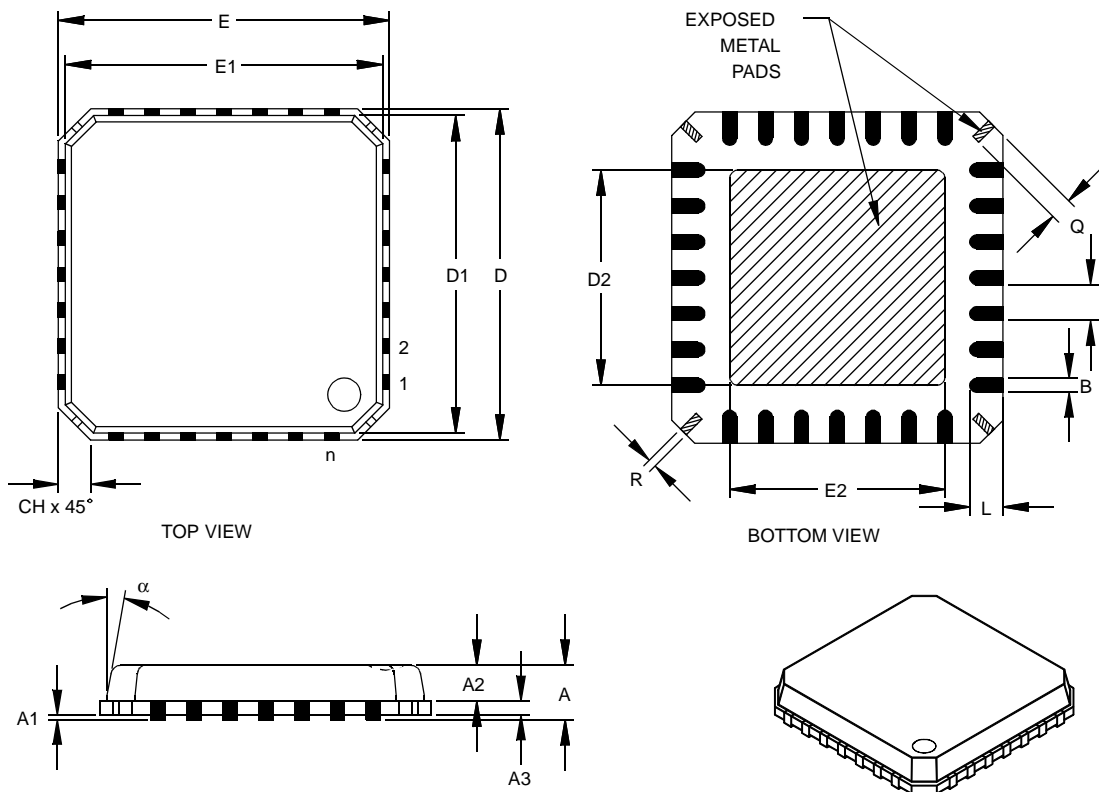
Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	P	.050 BSC			1.27 BSC		
Pad Width	B	.014	.016	.019	0.35	0.40	0.47
Pad Length	L	.020	.024	.030	0.50	0.60	0.75
Pad to Solder Mask	M	.005		.006	0.13		0.15

\*Controlling Parameter

Drawing No. C04-2113

## Packaging Diagrams and Parameters

### 28-Lead Plastic Micro Leadframe Package (MF) 6x6 mm Body (MLF)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p	.026 BSC			0.65 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 Width	E	.236 BSC			6.00 BSC		
Molded Package Width	E1	.226 BSC			5.75 BSC		
Exposed Pad Width	E2	.140	.146	.152	3.55	3.70	3.85
Overall Length	D	.236 BSC			6.00 BSC		
Molded Package Length	D1	.226 BSC			5.75 BSC		
Exposed Pad Length	D2	.140	.146	.152	3.55	3.70	3.85
Lead Width	B	.009	.011	.014	0.23	0.28	0.35
Lead Length	L	.020	.024	.030	0.50	0.60	0.75
Tie Bar Width	R	.005	.007	.010	0.13	0.17	0.23
Tie Bar Length	Q	.012	.016	.026	0.30	0.40	0.65
Chamfer	CH	.009	.017	.024	0.24	0.42	0.60
Mold Draft Angle Top	$\alpha$			12°			12°

\*Controlling Parameter

**Notes:**

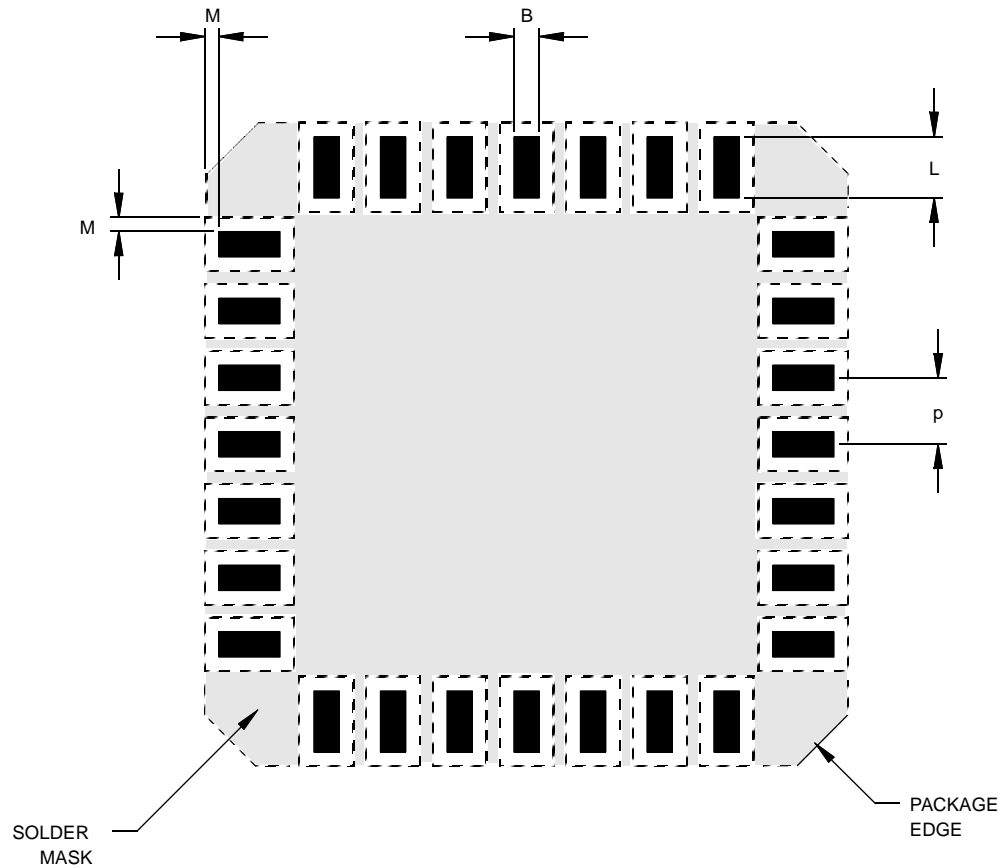
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC equivalent: pending

Drawing No. C04-114

## Packaging Diagrams and Parameters

### 28-Lead Plastic Micro Leadframe Package (MF) 6x6 mm Body (MLF)



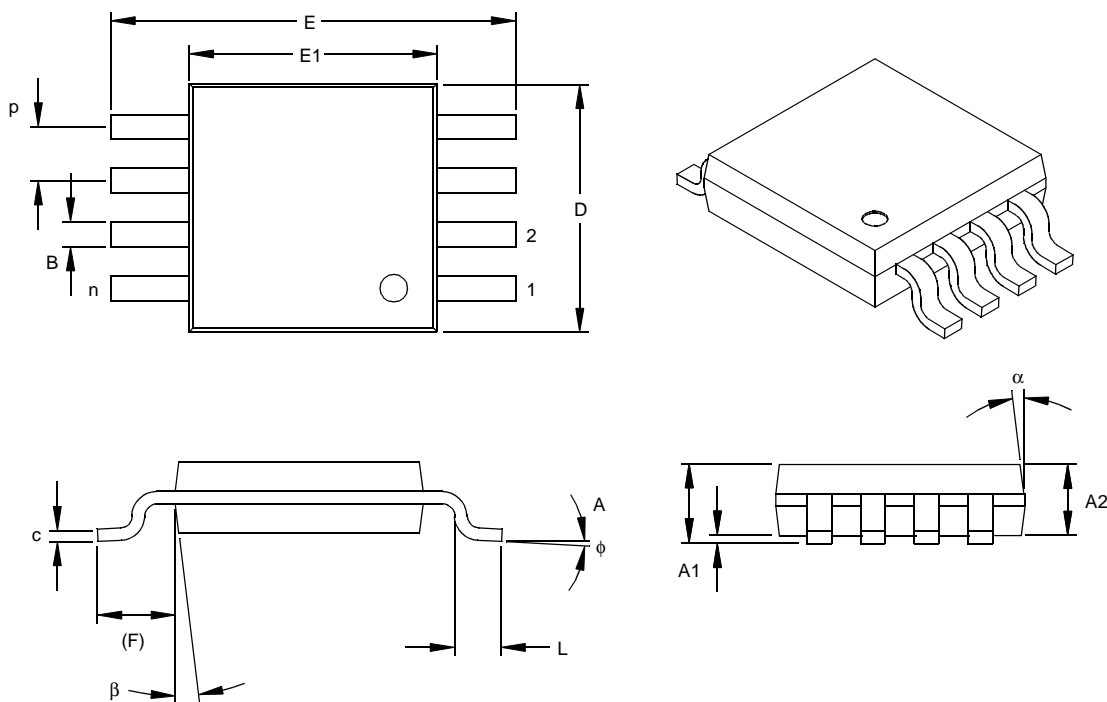
Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	P	.026 BSC			0.65 BSC		
Pad Width	B	.009	.011	.014	0.23	0.28	0.35
Pad Length	L	.020	.024	.030	0.50	0.60	0.75
Pad to Solder Mask	M	.005		.006	0.13		0.15

\*Controlling Parameter

Drawing No. C04-2114

## 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			0.65		
Overall Height	A			.044			1.18
Molded Package Thickness	A2	.030	.034	.038	0.76	0.86	0.97
Standoff §	A1	.002		.006	0.05		0.15
Overall Width	E	.184	.193	.200	4.67	4.90	5.08
Molded Package Width	E1	.114	.118	.122	2.90	3.00	3.10
Overall Length	D	.114	.118	.122	2.90	3.00	3.10
Foot Length	L	.016	.022	.028	0.40	0.55	0.70
Footprint (Reference)	F	.035	.037	.039	0.90	0.95	1.00
Foot Angle	φ	0		6	0		6
Lead Thickness	c	.004	.006	.008	0.10	0.15	0.20
Lead Width	B	.010	.012	.016	0.25	0.30	0.40
Mold Draft Angle Top	α		7			7	
Mold Draft Angle Bottom	β		7			7	

\*Controlling Parameter  
 § Significant Characteristic

Notes:

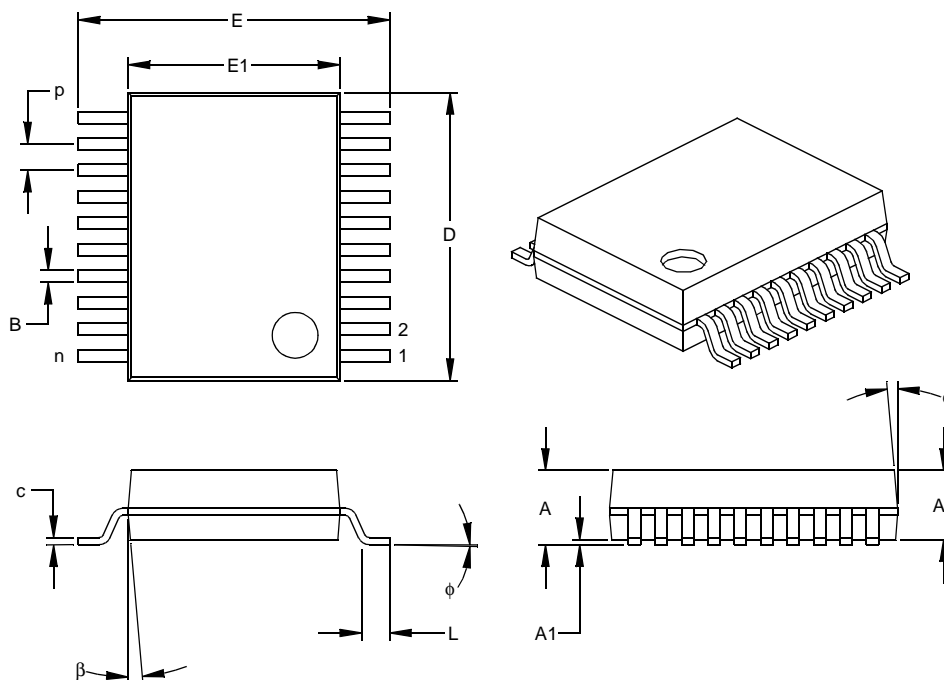
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

Drawing No. C04-111



## Packaging Diagrams and Parameters

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



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	.068	.073	.078	1.73	1.85	1.98
Molded Package Thickness	A2	.064	.068	.072	1.63	1.73	1.83
Standoff §	A1	.002	.006	.010	0.05	0.15	0.25
Overall Width	E	.299	.309	.322	7.59	7.85	8.18
Molded Package Width	E1	.201	.207	.212	5.11	5.25	5.38
Overall Length	D	.278	.284	.289	7.06	7.20	7.34
Foot Length	L	.022	.030	.037	0.56	0.75	0.94
Lead Thickness	c	.004	.007	.010	0.10	0.18	0.25
Foot Angle	φ	0	4	8	0.00	101.60	203.20
Lead Width	B	.010	.013	.015	0.25	0.32	0.38
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:**

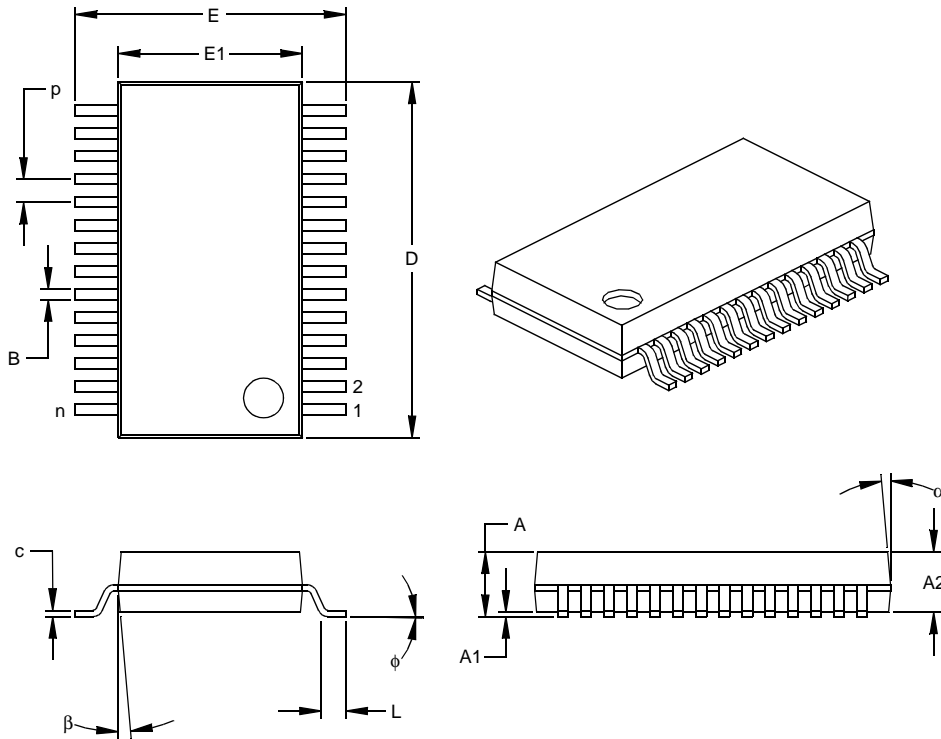
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MO-150

Drawing No. C04-072

## Packaging Diagrams and Parameters

### 28-Lead Plastic Shrink Small Outline (SS) – 209 mil, 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	.068	.073	.078	1.73	1.85	1.98
Molded Package Thickness	A2	.064	.068	.072	1.63	1.73	1.83
Standoff §	A1	.002	.006	.010	0.05	0.15	0.25
Overall Width	E	.299	.309	.319	7.59	7.85	8.10
Molded Package Width	E1	.201	.207	.212	5.11	5.25	5.38
Overall Length	D	.396	.402	.407	10.06	10.20	10.34
Foot Length	L	.022	.030	.037	0.56	0.75	0.94
Lead Thickness	c	.004	.007	.010	0.10	0.18	0.25
Foot Angle	φ	0	4	8	0.00	101.60	203.20
Lead Width	B	.010	.013	.015	0.25	0.32	0.38
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:**

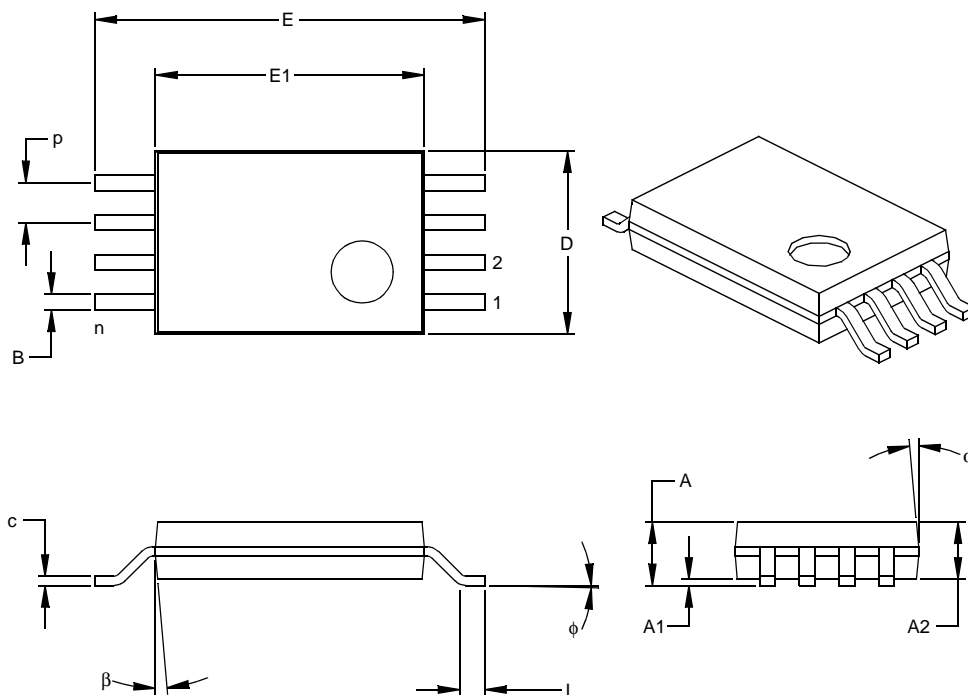
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-150

Drawing No. C04-073

## Packaging Diagrams and Parameters

### 8-Lead Plastic Thin Shrink Small Outline (ST) – 4.4 mm (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			.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	.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

§ Significant Characteristic

**Notes:**

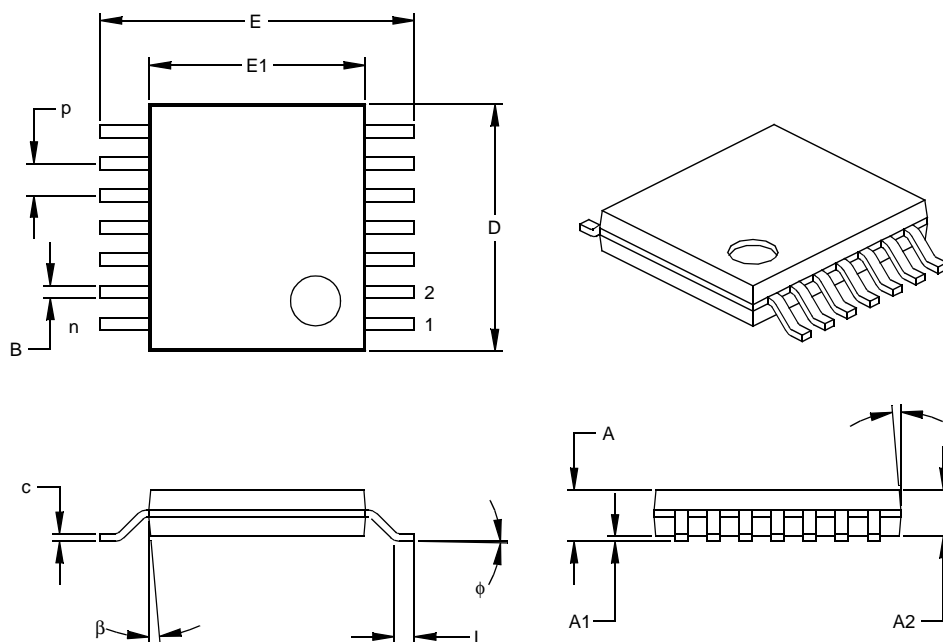
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

JEDEC Equivalent: MO-153

Drawing No. C04-086

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES			MILLIMETERS*		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		14			14	
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	.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	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

\* Controlling Parameter

§ Significant Characteristic

Notes:

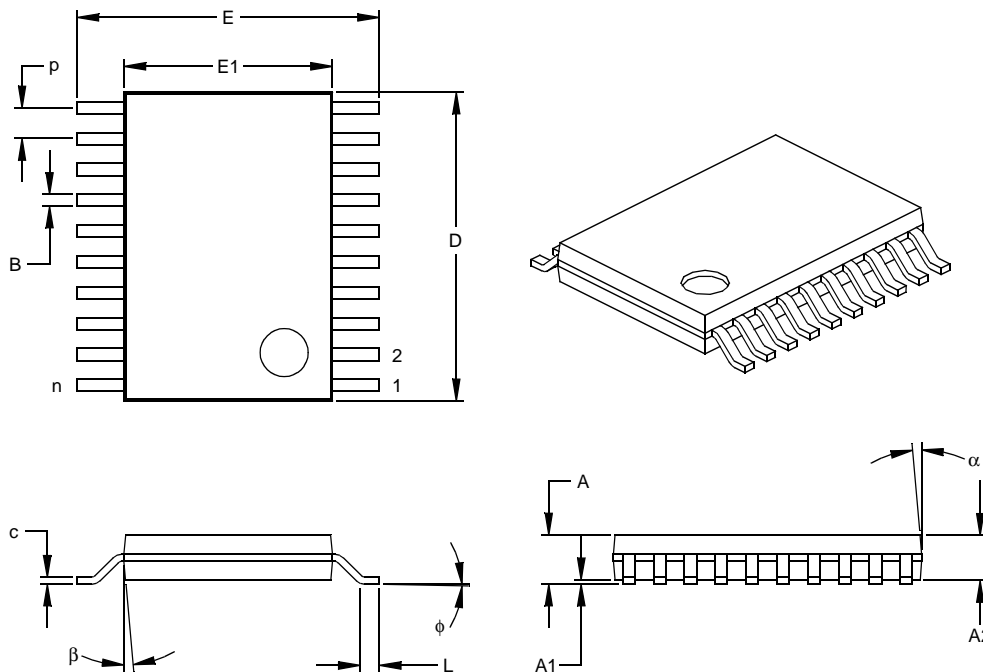
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

JEDEC Equivalent: MO-153

Drawing No. C04-087

## Packaging Diagrams and Parameters

### 20-Lead Plastic Thin Shrink Small Outline (ST) – 4.4 mm (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:**

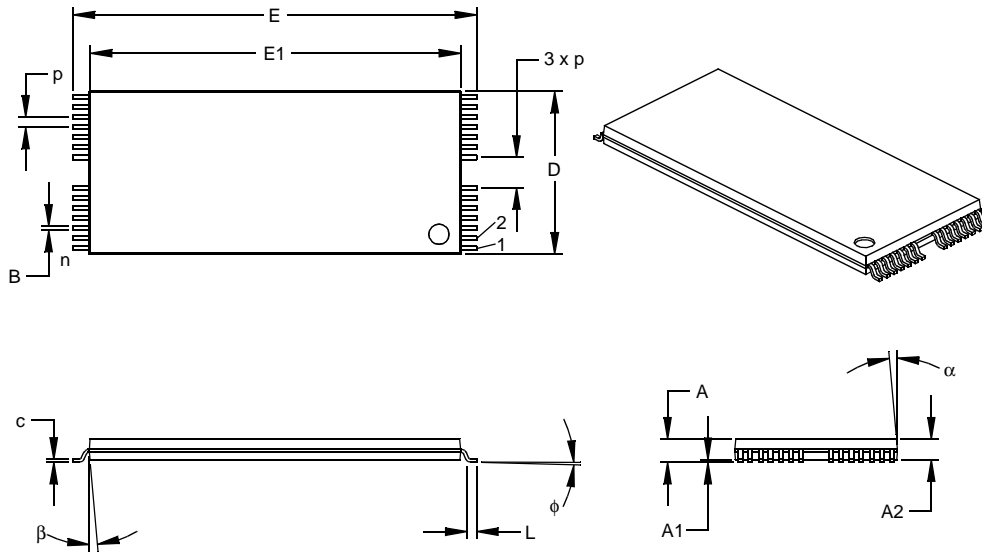
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

JEDEC Equivalent: MO-153

Drawing No. C04-088

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES			MILLIMETERS*		
		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	$\phi$	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	$\alpha$	0	5	10	0	5	10
Mold Draft Angle Bottom	$\beta$	0	5	10	0	5	10

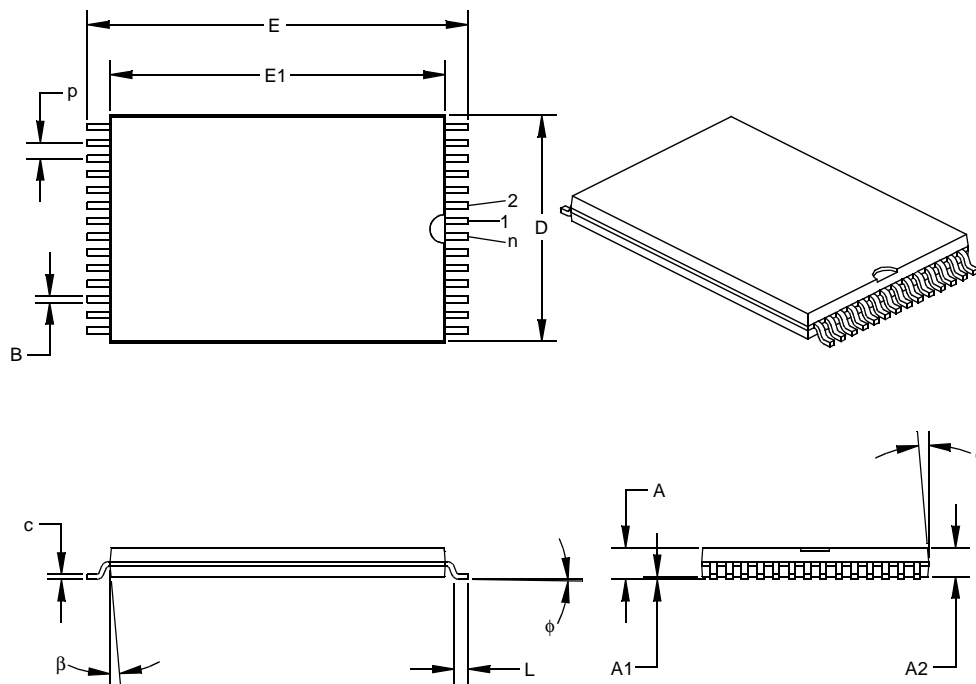
\* Controlling Parameter  
 § Significant Characteristic

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

## Packaging Diagrams and Parameters

### 28-Lead Plastic Very Small Outline (VS) – 8 x 13.4 mm (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	$\phi$	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	$\alpha$	0	5	10	0	5	10
Mold Draft Angle Bottom	$\beta$	0	5	10	0	5	10

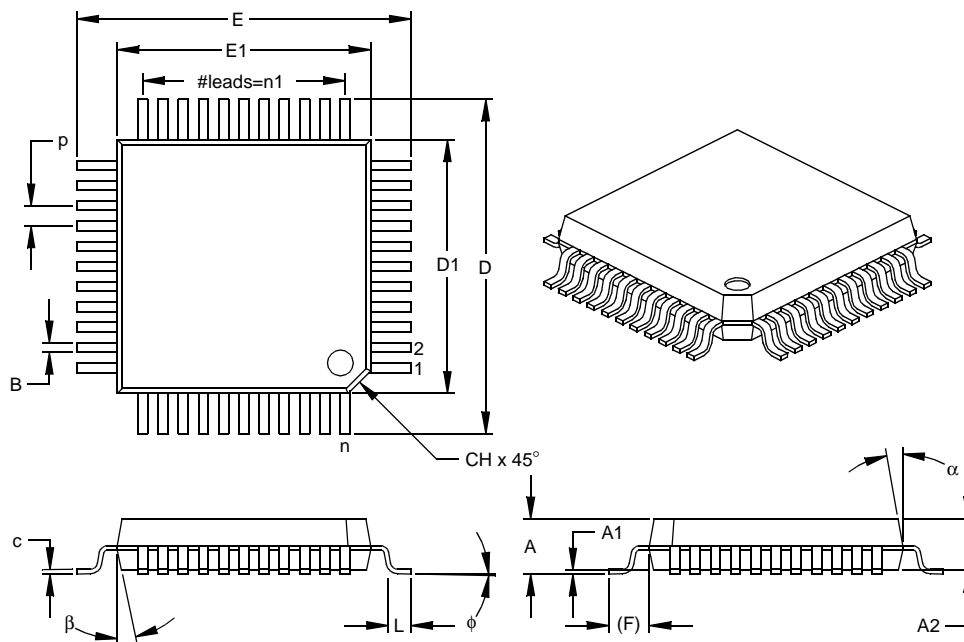
\* Controlling Parameter  
 § Significant Characteristic

**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

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES			MILLIMETERS*		
		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 (Reference)	(F)		.063			1.60	
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  
 § 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.

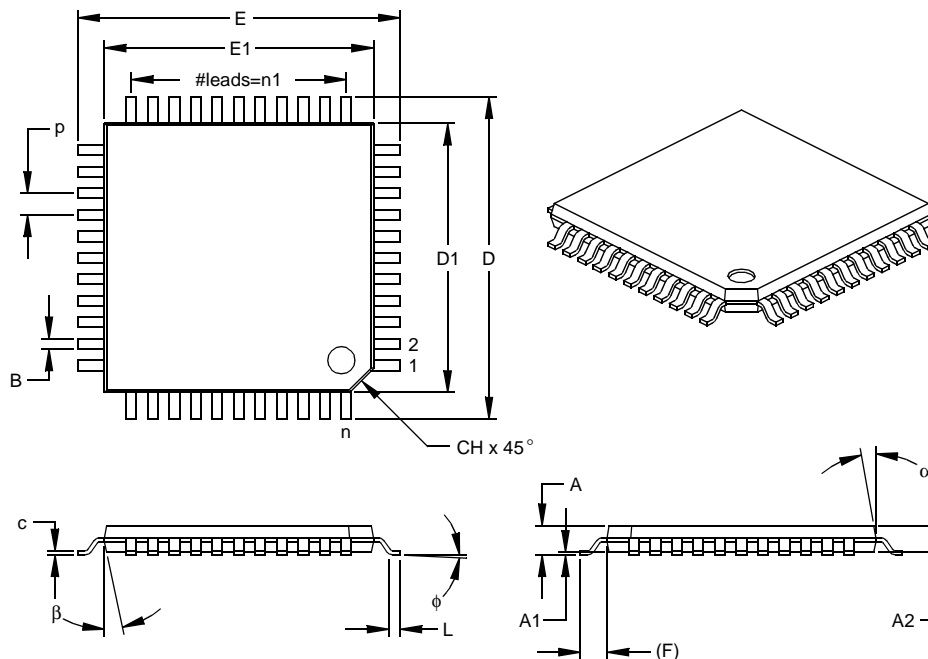
JEDEC Equivalent: MS-022

Drawing No. C04-071



## 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		1.00		
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

§ Significant Characteristic

**Notes:**

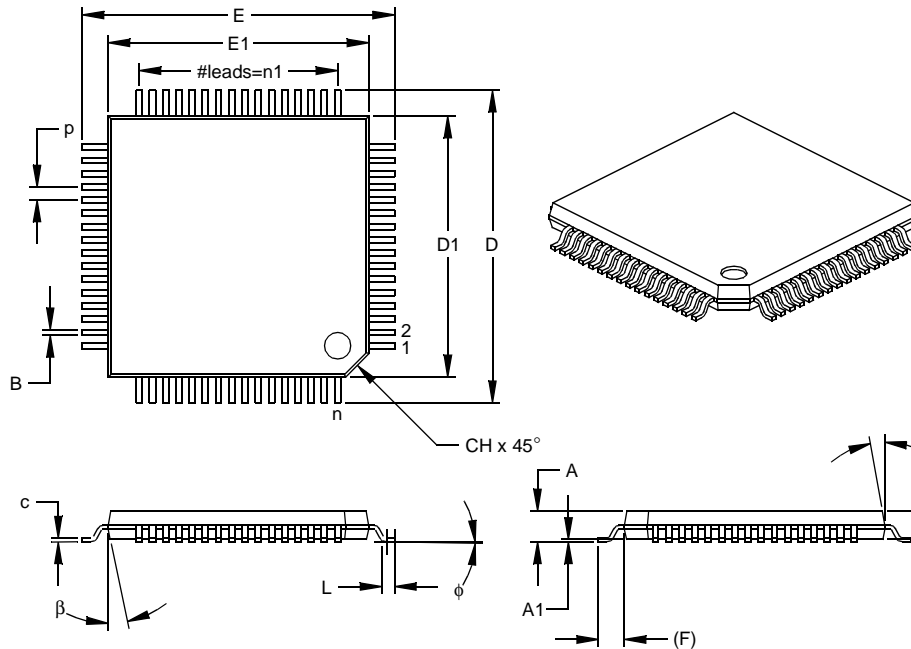
Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-026

Drawing No. C04-076

## Packaging Diagrams and Parameters

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



Dimension Limits	Units	INCHES			MILLIMETERS*		
		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 (Reference)	(F)		.039			1.00	
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  
 § Significant Characteristic

Notes:

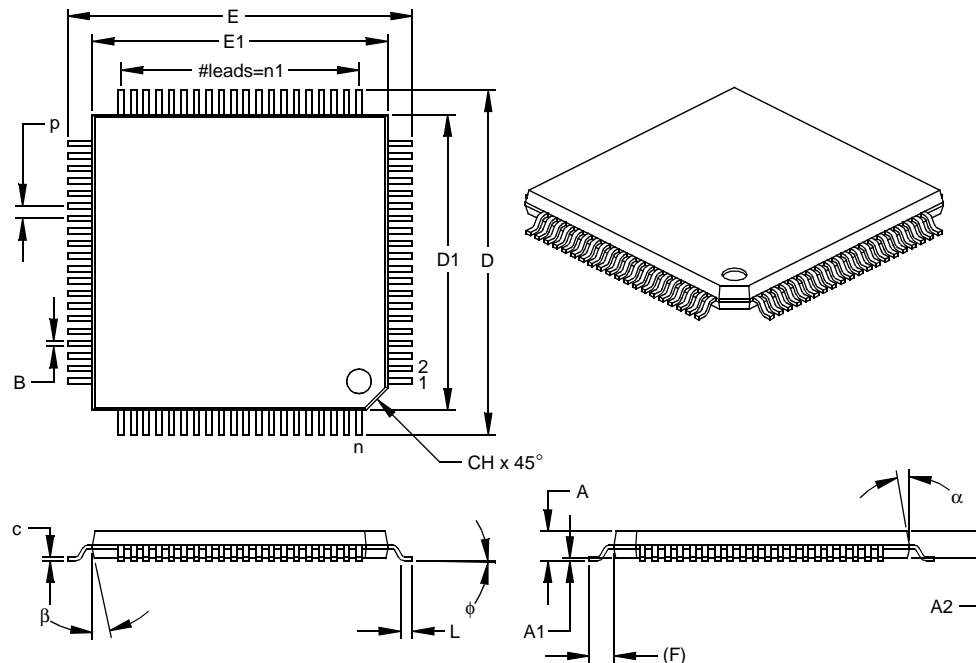
Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-026

Drawing No. C04-085

## 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			0.50	
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 (Reference)	(F)			.039			1.00	
Foot Angle	φ		0	3.5	7	0	3.5	7
Overall Width	E		.541	.551	.561	13.75	14.00	14.25
Overall Length	D		.541	.551	.561	13.75	14.00	14.25
Molded Package Width	E1		.463	.472	.482	11.75	12.00	12.25
Molded Package Length	D1		.463	.472	.482	11.75	12.00	12.25
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  
 § Significant Characteristic

**Notes:**

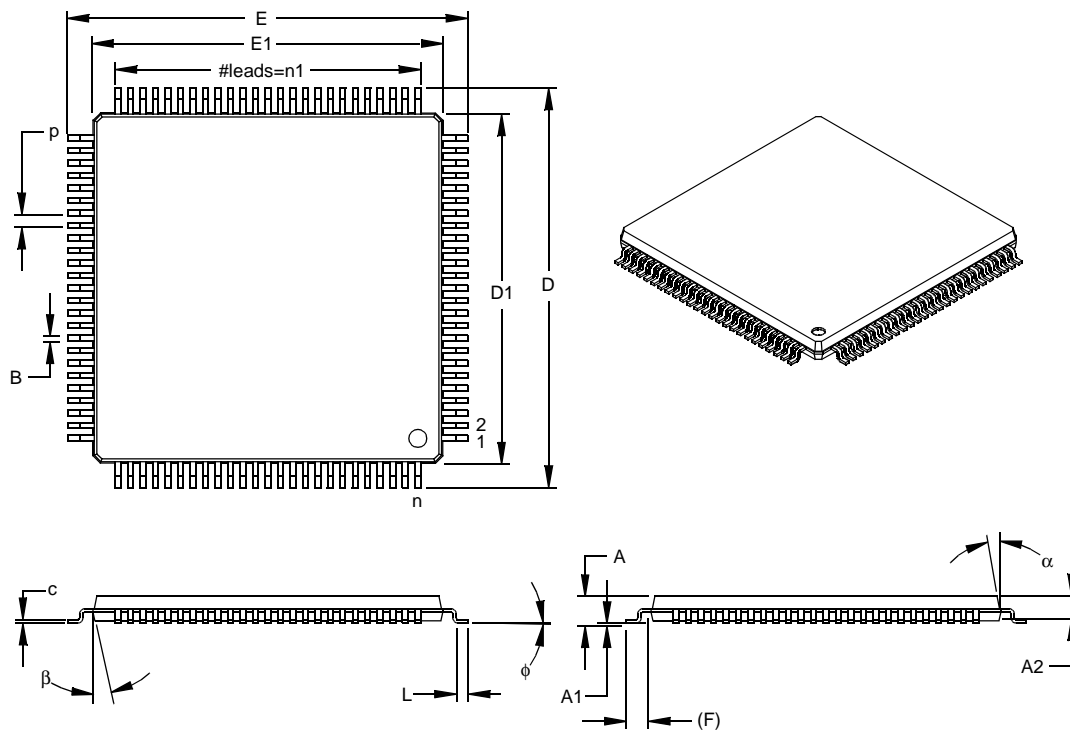
Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-026

Drawing No. C04-092

## Packaging Diagrams and Parameters

100-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		100			100	
Pitch	p		.020			0.50	
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 (Reference)	(F)		.039			1.00	
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  
§ Significant Characteristic

Notes:

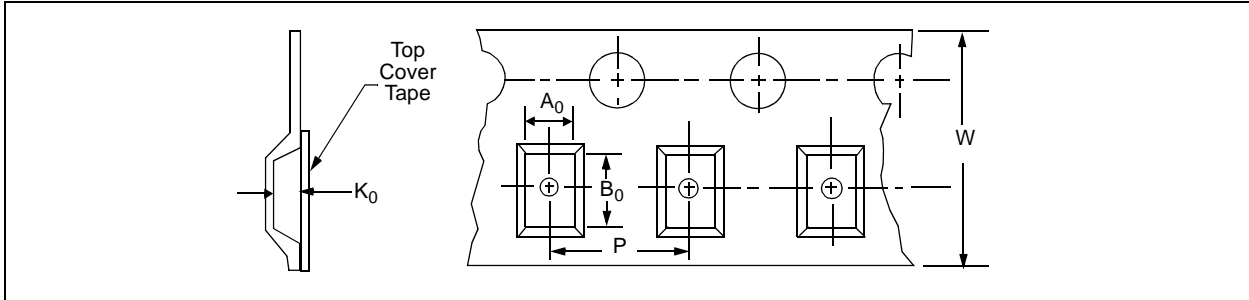
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-026

Drawing No. C04-110

## Product Tape and Reel Specifications

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

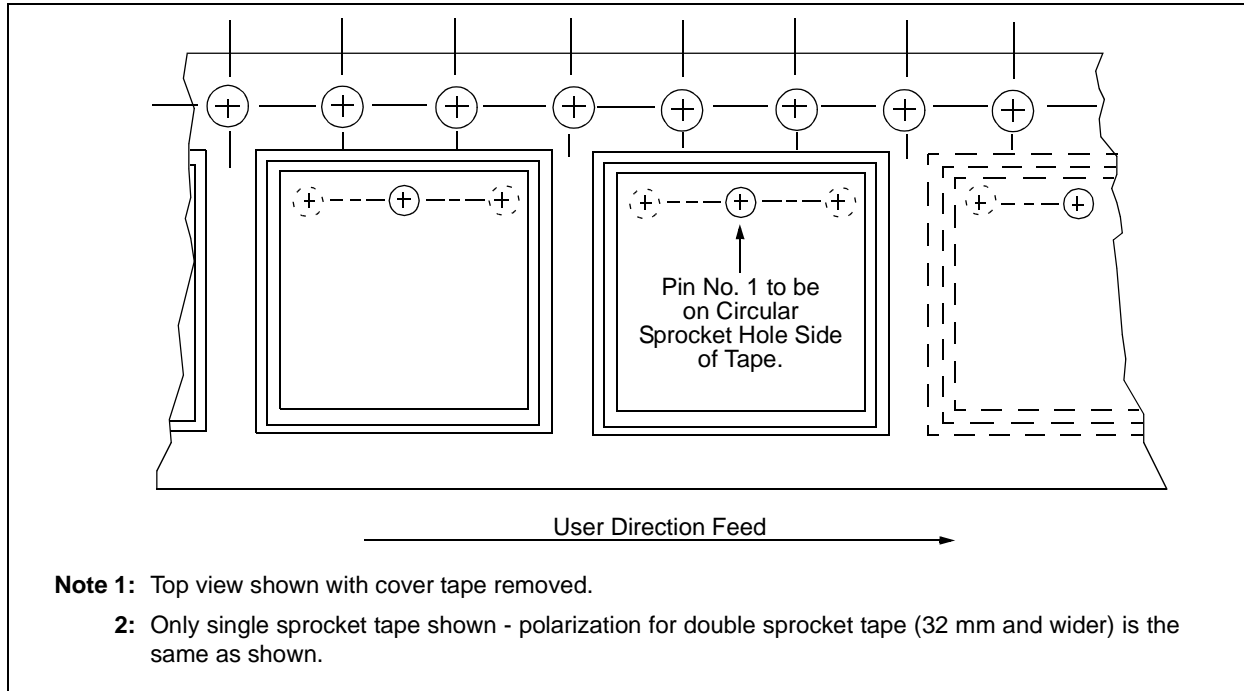


**TABLE 1: CARRIER TAPE/CAVITY DIMENSIONS**

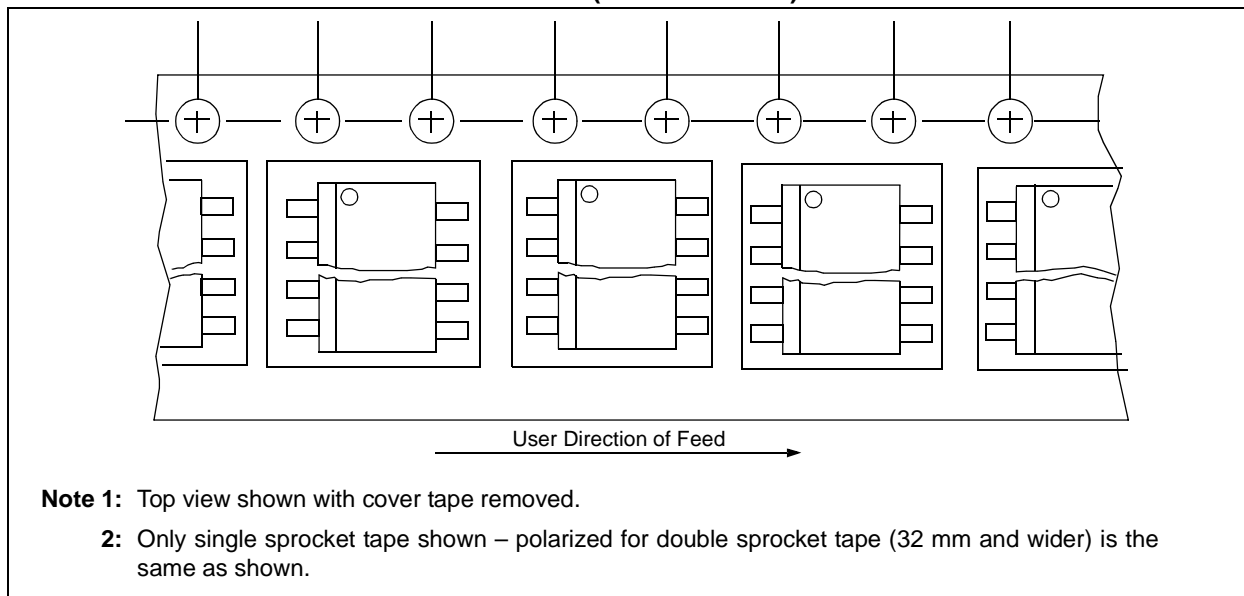
Case Outline	Package Type		Carrier Dimensions		Cavity Dimensions			Output Quantity Units	Reel Diameter in mm
			W mm	P mm	A0 mm	B0 mm	K0 mm		
SN	SOIC .150"	8L	12	8	6.4	5.2	2.1	3300	330
SO	SOIC .300"	18L	24	12	10.9	13.3	3.0	1600	330
			24	16	11.1	12.0	2.8	1100	330
SO	SOIC .300"	20L	24	12	10.9	13.3	3.0	1600	330
SO	SOIC .300"	28L	24	12	10.9	18.3	3.0	1600	330
			24	12	11.1	18.5	3.0	1600	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	24	18.0	18.0	4.9	500	330
			32	24	18.0	18.0	5.0	500	330
L	PLCC	68L	44	32	25.6	25.6	5.8	300	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
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	12.35	12.35	2.2	1200	330
VS	VSOP	28L	24	12	8.7	13.9	2.1	2500	330

# Packaging

**FIGURE 2: MECHANICAL POLARIZATION (PCC AND LCC DEVICES)**



**FIGURE 3: MECHANICAL POLARIZATION (SOIC DEVICES)**



## 1.0 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, tolerances, and component positioning requirements are those which are specified per EIAJ Standard RC-1009B, current revision.

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## Thermal Characteristics

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### THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Average Junction Temperature	T <sub>J</sub>	T <sub>A</sub> + (P <sub>D</sub> × θ <sub>ja</sub> )	°C
Ambient Temperature	T <sub>A</sub>	User-determined	°C
Total Power Dissipation <sup>1</sup>	P <sub>D</sub>	P <sub>INT</sub> + P <sub>I/O</sub>	W
Device Internal Power Dissipation	P <sub>INT</sub>	I <sub>DD</sub> × V <sub>DD</sub>	W
I/O Pin Power Dissipation	P <sub>I/O</sub>	User-determined	W

# Packaging

## THERMAL RESISTANCE

Item	Leads	Package	Package Body	$\Theta_{Jc}$ (°C/W)	$\Theta_{Ja}$ (°C/W)
Package Thermal Resistance <sup>(2)</sup>	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	4.4mm	36.6	123.7
	14	TSSOP	4.4mm	31.7	100.4
	20	TSSOP	4.4mm	17	90.2
	28	TSSOP	4.4mm	13.3	75.5
	20	SSOP	.209"	32.2	108.1
	28	SSOP	.209"	23.9	89.4
	3	SOT23		110.12	336
	5	SOT23		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	10x10x1mm	14.5	45.79
64	TQFP	10x10x1mm	24.4	76.6	
80	TQFP	12x12x1mm	24.4	69.4	
100	TQFP	14x14x1mm	24.4	50	
44	MQFP	10x10x2mm	14.8	57.8	

**Note 1:** Approximate value, disregarding P/I/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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## Overview of Microchip Die/Wafer Support

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### 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, "World-wide 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 ultra-violet light must be avoided. Exposure to ultra-violet 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 reprogrammable 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

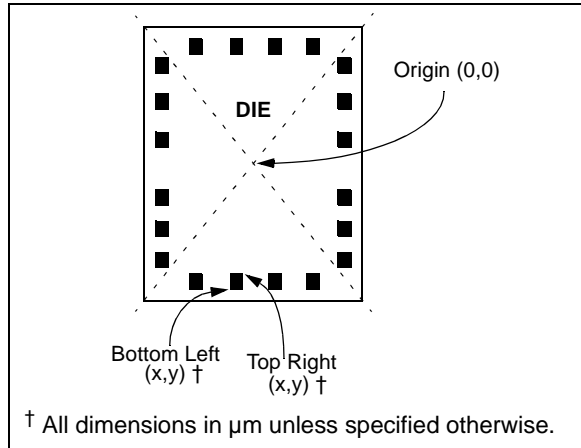
Refer to the individual data sheet for these specifications.

# Packaging

## 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 ( $\mu\text{m}$ ) 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**



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 ( $25^{\circ}\text{C}$  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,  $25^{\circ}\text{C}$  and 25% humidity).