



# PACKAGING

## Commercial/Industrial Outlines and Parameters

### PART NUMBER SUFFIX DESIGNATIONS:

XXXXXXXXXX	-XX	X	/XX	XXX	Examples:
Device Type	Options	Speed or Frequency	Temperature	Package	Pattern
<b>Memory Products</b>					<b>Examples:</b> 24LC65-I/SN PIC16C54-RCI/SO
<b>Device Type</b> C = CMOS LC = Low Power CMOS AA = 1.8V LV = Low Voltage EPROM HC = High Speed EPROM LCS = Low Power Security					
<b>Options</b> Blank = t <sub>wc</sub> = 1 ms F = t <sub>wc</sub> = 200 us (28CXX devices) X = Rotated pinout (93LCXX devices) T = Tape and Reel					
<b>Speed</b> 55 = 55 ns 70 = 70 ns 90 = 90 ns 10 = 100 ns 12 = 120 ns 15 = 150 ns 17 = 170 ns 20 = 200 ns 25 = 250 ns 30 = 300 ns					
<b>Temperature</b> Blank = 0°C to +70°C I = -40°C to +85°C E = -40°C to +125°C					
<b>Package</b> L = Plastic Leaded Chip Carrier P = Plastic Dual In-Line Package S = Die in Waffle Pack W = Die in Wafer Form SL = 14-Lead Small Outline - 150 mil SM = 8-Lead Small Outline - 208 mil SN = 8-Lead Small Outline - 150 mil SO = Small Outline - 300 mil SS = Shrink Small Outline Package - 209 mil ST = Thin Shrink Small Outline Package - 4.4 mm TS = Thin Small Outline - 8mm x 20mm VS = Very Small Outline - 8mm x 13.4mm WF = Sawed Wafer on Frame					
<b>Pattern</b> QTP, SQTP, ROM Code or Special Requirements					
<b>Mircocontroller Products</b>					
<b>Device Type</b> C = CMOS LC = Low Power CMOS CR = CMOS ROM LCR = Low Power CMOS ROM LV = Low Voltage F = Flash Program Memory FR = Flex ROM					
<b>Options</b> T = Tape and Reel					
<b>Crystal Frequency Designator</b> LP = Low Power Crystal RC = Resistor Capacitor XT = Standard Crystal/Resonator HS = High Speed Crystal 02 = 2MHz 04 = 200kHz (LP mode) 04 = 4 MHz (XT & RC mode) 10 = 10 MHz 20 = 20 MHz 25 = 25 MHz 33 = 33 MHz					
<b>Temperature</b> Blank = 0°C to +70°C I = -40°C to +85°C E = -40°C to +125°C					
<b>Package</b> L = Plastic Leaded Chip Carrier (PLCC) P = Plastic Dual In-Line Package (PDIP) S = Die in Waffle Pack W = Die in Wafer Form CB = Chip On Board (COB) CL = 68-Lead Ceramic Quad (CERQUAD) with Window JW = Ceramic Dual In-Line Package (CERDIP) with Window PQ = Plastic Metric Quad Flat Pack (MQFP) PT = Thin Quad Flatpack (TQFP) SM = 8-Lead Small Outline - 208 mil SO = Small Outline (SOIC) - 300 mil SP = Skinny PDIP SS = Shrink Small Outline Package (SSOP) - 209 mil TS = Thin Small Outline (TSOP) - 8mm x 20mm TQ = Thin Quad Flatpack (TQFP)					
<b>Pattern</b> QTP, SQTP, ROM Code or Special Requirements					

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## Package Diagrams and Parameters

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## Packaging Diagrams and Parameters

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### Ceramic Side Brazed Dual In-Line Family

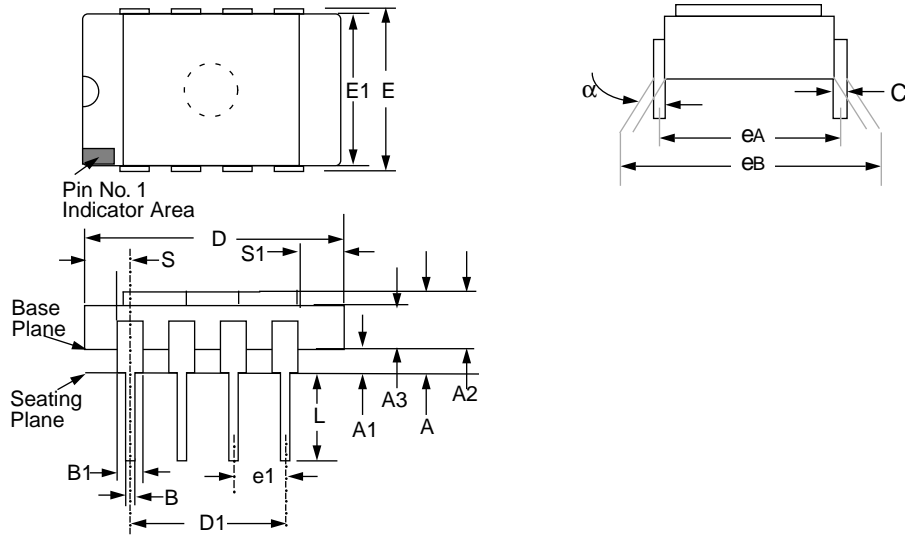
Symbol List for Ceramic Side Brazed Dual In-Line Package Parameters	
Symbol	Description of Parameters
$\alpha$	Angular spacing between min. and max. lead positions measured at the gauge plane
A	Distance between seating plane to highest point of body (lid)
A1	Distance between seating plane and base plane
A2	Distance from base plane to highest point of body (lid)
A3	Base body thickness
B	Width of terminal leads
B1	Width of terminal lead shoulder which locate seating plane (standoff geometry optional)
C	Thickness of terminal leads
D	Largest overall package parameter of length
D1	Body length parameter - end lead center to end lead center
E	Largest overall package width parameter outside of lead
E1	Body width parameters not including leads
eA	Linear spacing of true minimum lead position center line to center line
eB	Linear spacing between true lead position outside of lead to outside of lead
e1	Linear spacing between center lines of body standoffs (terminal leads)
L	Distance from seating plane to end of lead
S	Distance from true position center line of Number 1 lead to the extremity of the body
S1	Distance from other end lead edge positions to the extremity of the body

**Notes:**

1. Controlling parameter: inches.
2. Parameter "e1" ("e") is non-cumulative.
3. Seating plane (standoff) is defined by board hole size.
4. Parameter "B1" is nominal.

## Packaging Diagrams and Parameters

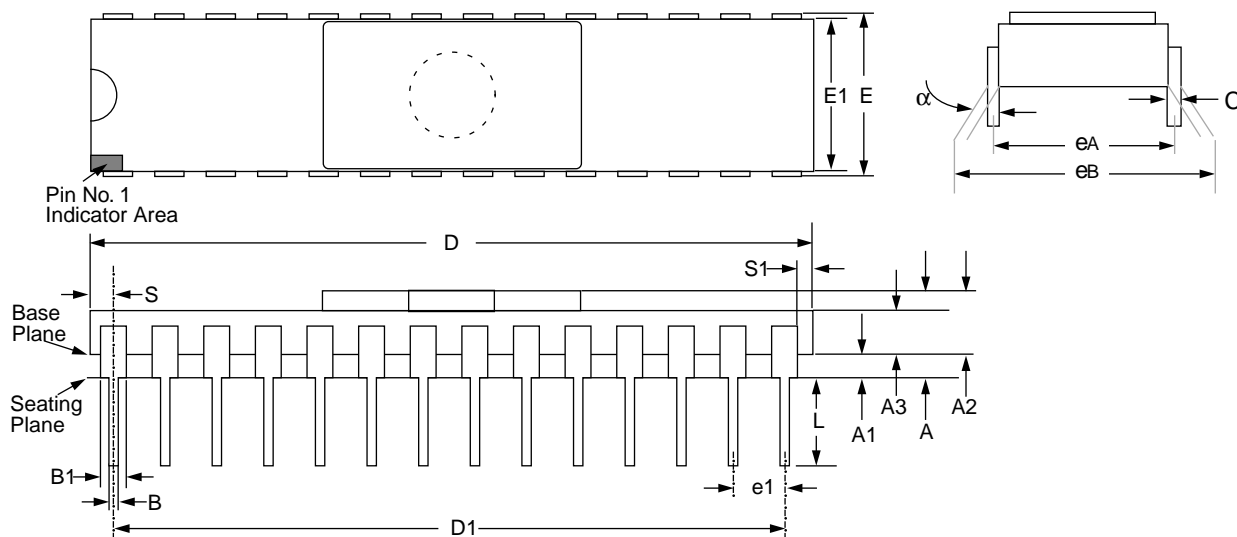
Package Type: 8-Lead Ceramic Side Brazed Dual In-Line with Window (JW) (300 mil)



Package Group: Ceramic Side Brazed Dual In-Line (CER)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	10°		0°	10°	
A	3.937	5.030		0.155	0.198	
A1	0.635	1.143		0.025	0.045	
A2	2.921	3.429		0.115	0.135	
A3	1.778	2.413		0.070	0.095	
B	0.406	0.508		0.016	0.020	
B1	1.371	1.371	Typical	0.054	0.054	
C	0.228	0.305	Typical	0.009	0.012	
D	13.004	13.412		0.512	0.528	
D1	7.416	7.824	BSC	0.292	0.308	
E	7.569	8.230		0.298	0.324	
E1	7.112	7.620		0.280	0.300	
e1	2.540	2.540	Typical	0.100	0.100	
eA	7.620	7.620	BSC	0.300	0.300	
eB	7.620	9.652		0.300	0.380	
L	3.302	4.064		0.130	0.160	
S	2.540	3.048		0.100	0.120	
S1	0.127	—		0.005	—	

# Packaging

## Package Type: 28-Lead Ceramic Side Brazed Dual In-Line with Window (JW) (300 mil)



Package Group: Ceramic Side Brazed Dual In-Line (CER)

Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	10°		0°	10°	
A	3.937	5.030		0.155	0.198	
A1	1.016	1.524		0.040	0.060	
A2	2.921	3.506		0.115	0.138	
A3	1.930	2.388		0.076	0.094	
B	0.406	0.508		0.016	0.020	
B1	1.219	1.321	Typical	0.048	0.052	
C	0.228	0.305	Typical	0.009	0.012	
D	35.204	35.916		1.386	1.414	
D1	32.893	33.147	BSC	1.295	1.305	
E	7.620	8.128		0.300	0.320	
E1	7.366	7.620		0.290	0.300	
e1	2.413	2.667	Typical	0.095	0.105	
eA	7.366	7.874	BSC	0.290	0.310	
eB	7.594	8.179		0.299	0.322	
L	3.302	4.064		0.130	0.160	
S	1.143	1.397		0.045	0.055	
S1	0.533	0.737		0.021	0.029	

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## Packaging Diagrams and Parameters

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### Ceramic Dual In-Line (CERDIP) Family

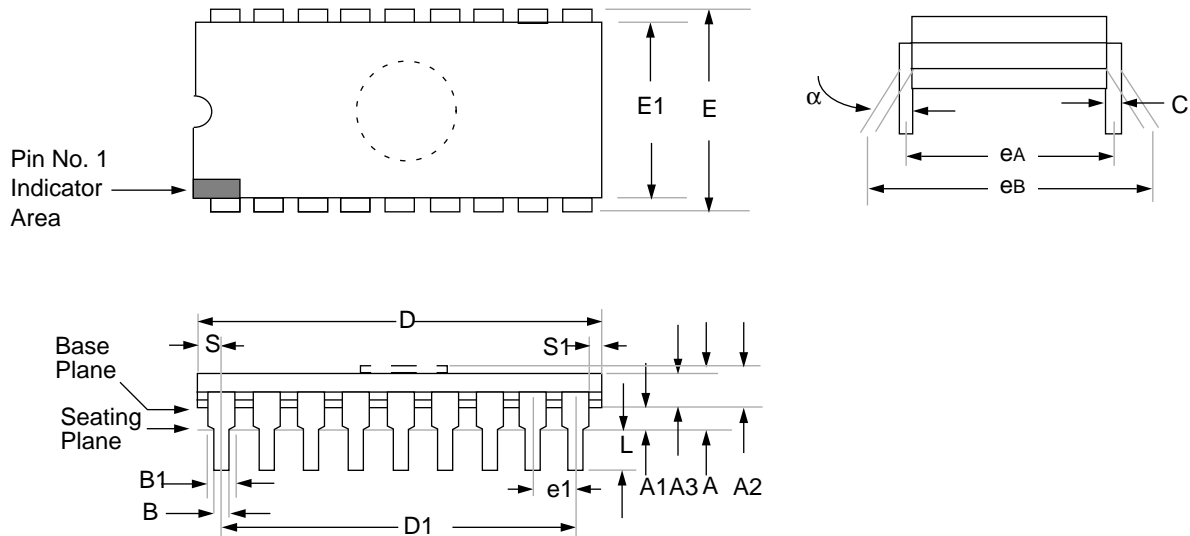
Symbol List for Ceramic CERDIP Dual In-Line Package Parameters	
Symbol	Description of Parameters
$\alpha$	Angular spacing between min. and max. lead positions measured at the gauge plane
A	Distance between seating plane to highest point of body (lid)
A1	Distance between seating plane and base plane
A2	Distance from base plane to highest point of body (lid)
A3	Base body thickness
B	Width of terminal leads
B1	Width of terminal lead shoulder which locate seating plane (standoff geometry optional)
C	Thickness of terminal leads
D	Largest overall package parameter of length
D1	Body length parameter - end lead center to end lead center
E	Largest overall package width parameter outside of lead
E1	Body width parameters not including leads
eA	Linear spacing of true minimum lead position center line to center line
eB	Linear spacing between true lead position outside of lead to outside of lead
e1	Linear spacing between center lines of body standoffs (terminal leads)
L	Distance from seating plane to end of lead
S	Distance from true position center line of Number 1 lead to the extremity of the body
S1	Distance from other end lead edge positions to the extremity of the body

**Notes:**

1. Controlling parameter: inches.
2. Parameter "e1" ("e") is non-cumulative.
3. Seating plane (standoff) is defined by board hole size.
4. Parameter "B1" is nominal.

## Packaging Diagrams and Parameters

Package Type: 18-Lead Ceramic Dual In-Line with Window (JW) - (300 mil)

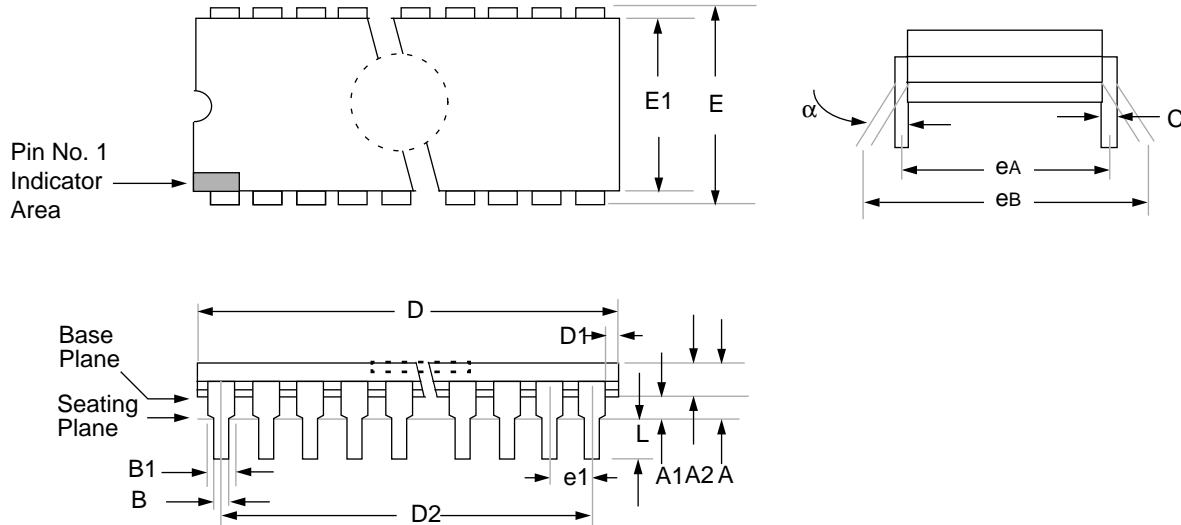


Package Group: Ceramic CERPDP Dual In-Line (CDP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	10°		0°	10°	
A	—	5.080		—	0.200	
A1	0.381	1.7780		0.015	0.070	
A2	3.810	4.699		0.150	0.185	
A3	3.810	4.445		0.150	0.175	
B	0.355	0.585		0.014	0.023	
B1	1.270	1.651	<b>Typical</b>	0.050	0.065	<b>Typical</b>
C	0.203	0.381	<b>Typical</b>	0.008	0.015	<b>Typical</b>
D	22.352	23.622		0.880	0.930	
D1	20.320	20.320	<b>BSC</b>	0.800	0.800	<b>BSC</b>
E	7.620	8.382		0.300	0.330	
E1	5.588	7.874		0.220	0.310	
e1	2.540	2.540	<b>BSC</b>	0.100	0.100	<b>BSC</b>
eA	7.366	8.128	<b>Typical</b>	0.290	0.320	<b>Typical</b>
eB	7.620	10.160		0.300	0.400	
L	3.175	3.810		0.125	0.150	
S	0.508	1.397		0.020	0.055	
S1	0.381	1.270		0.015	0.050	



## Packaging Diagrams and Parameters

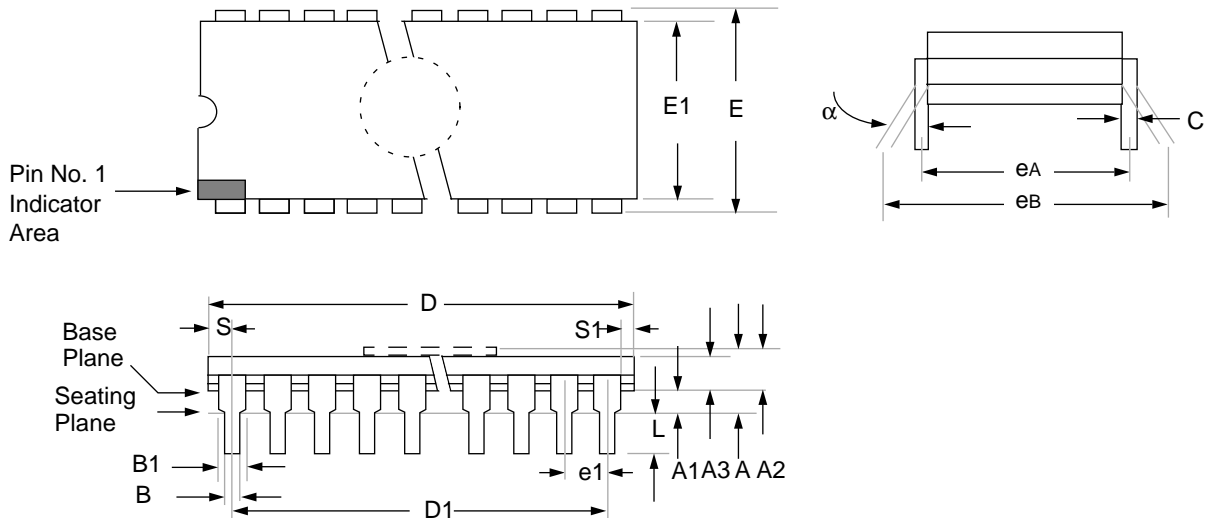
Package Type: 28-Lead Ceramic Dual In-Line with Window (JW) - (300 mil)



Package Group: Ceramic CERDIP Dual In-Line (CDP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	10°		0°	10°	
A	3.30	5.84		.130	0.230	
A1	0.38	—		0.015	—	
A2	2.92	4.95		0.115	0.195	
B	0.35	0.58		0.014	0.023	
B1	1.14	1.78	<b>Typical</b>	0.045	0.070	<b>Typical</b>
C	0.20	0.38	<b>Typical</b>	0.008	0.015	<b>Typical</b>
D	34.54	37.72		1.360	1.485	
D2	32.97	33.07	<b>BSC</b>	1.298	1.302	<b>BSC</b>
E	7.62	8.25		0.300	0.325	
E1	6.10	7.87		0.240	0.310	
e	2.54	2.54	<b>Typical</b>	0.100	0.100	<b>Typical</b>
eA	7.366	8.128	<b>BSC</b>	0.290	0.320	<b>BSC</b>
eB	7.620	11.430		0.300	0.450	
L	2.92	5.08		0.115	0.200	
D1	0.13	—		0.005	—	

## Packaging Diagrams and Parameters

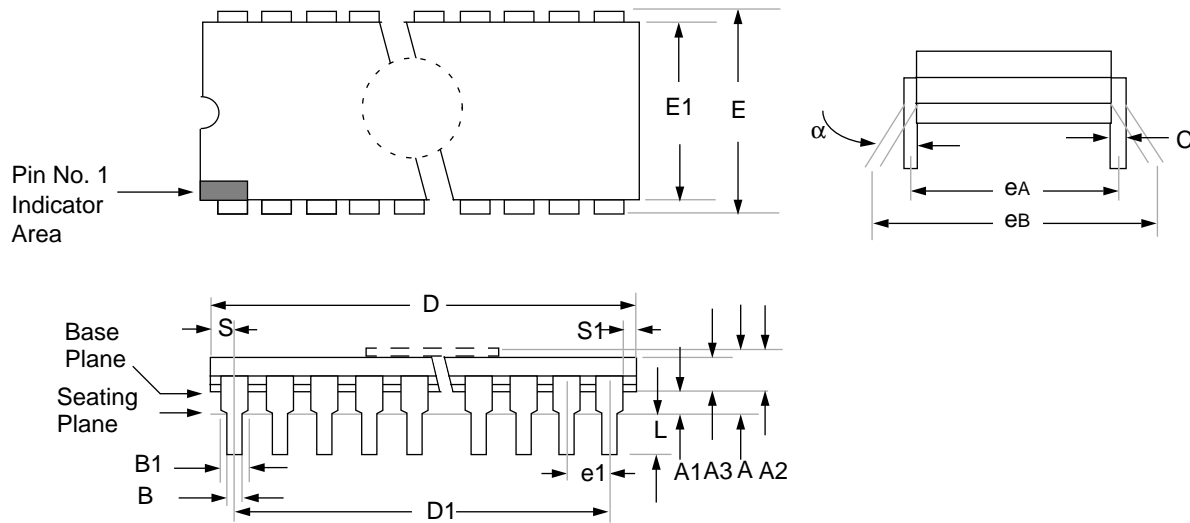
Package Type: 28-Lead Ceramic Dual In-Line with Window (JW) - (600 mil)



Package Group: Ceramic CERDIP Dual In-Line (CDP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	10°		0°	10°	
A	—	5.461		—	0.215	
A1	0.381	1.524		0.015	0.060	
A2	3.810	4.699		0.150	0.185	
A3	3.810	4.445		0.150	0.175	
B	0.355	0.585		0.014	0.023	
B1	1.270	1.651	Typical	0.050	0.065	Typical
C	0.203	0.381	Typical	0.008	0.015	Typical
D	36.195	37.465		1.425	1.475	
D1	33.020	33.020	BSC	1.300	1.300	BSC
E	15.240	15.875		0.600	0.625	
E1	12.954	15.240		0.510	0.600	
e1	2.540	2.540	Typical	0.100	0.100	Typical
eA	14.986	15.748	BSC	0.590	0.620	BSC
eB	15.240	18.034		0.600	0.710	
L	3.175	3.810		0.125	0.150	
S	1.016	2.286		0.040	0.090	
S1	0.381	1.778		0.015	0.070	

## Packaging Diagrams and Parameters

Package Type: 40-Lead Ceramic Dual In-Line with Window (JW) - (600 mil)



**Package Group: Ceramic CERDIP Dual In-Line (CDP)**

Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	10°		0°	10°	
A	4.318	5.715		0.170	0.225	
A1	0.381	1.778		0.015	0.070	
A2	3.810	4.699		0.150	0.185	
A3	3.810	4.445		0.150	0.175	
B	0.355	0.585		0.014	0.023	
B1	1.270	1.651	<b>Typical</b>	0.050	0.065	<b>Typical</b>
C	0.203	0.381	<b>Typical</b>	0.008	0.015	<b>Typical</b>
D	51.435	52.705		2.025	2.075	
D1	48.260	48.260	<b>BSC</b>	1.900	1.900	<b>BSC</b>
E	15.240	15.875		0.600	0.625	
E1	12.954	15.240		0.510	0.600	
e1	2.540	2.540	<b>BSC</b>	0.100	0.100	<b>BSC</b>
eA	14.986	16.002	<b>Typical</b>	0.590	0.630	<b>Typical</b>
eB	15.240	18.034		0.600	0.710	
L	3.175	3.810		0.125	0.150	
S	1.016	2.286		0.040	0.090	
S1	0.381	1.778		0.015	0.070	

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## Packaging Diagrams and Parameters

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### Ceramic Chip Carrier Family

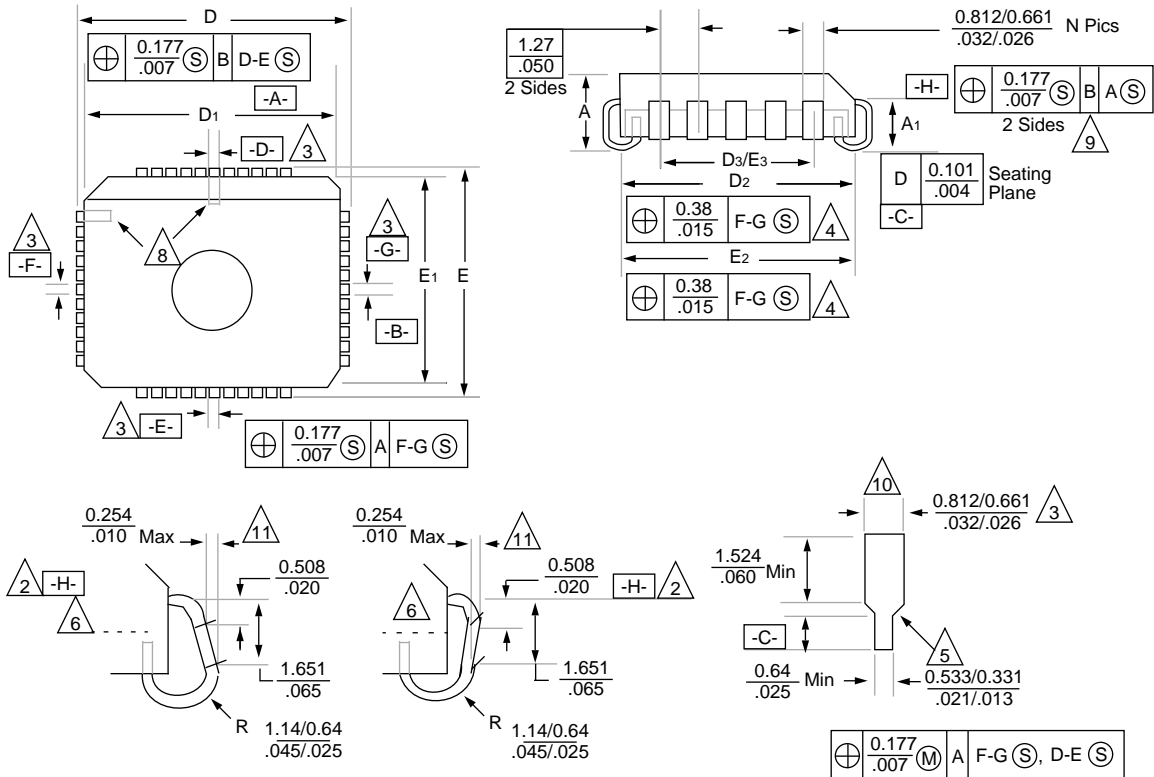
Symbol List for Ceramic Leaded Chip Carrier Package Parameters	
Symbol	Description of Parameters
A	Distance between seating plane to highest point of body
A1	Distance from lead shoulder to seating plane
CP	Seating plane coplanarity
D/E	Outside dimension
D1/E1	Body dimension
D2/E2	Footprint
D3/E3	Footprint
LT	Lead thickness

**Notes:**

5. All dimensions and tolerances conform to ANSI Y14.5M-1982.
6. Datum plane **-H-** located at top of parting line and coincident with top of lead. Where lead exits body.
7. Datums **D-E** and **F-G** to be determined where center leads exit body at datum plane **-H-**.
8. To be determined at seating plane **-C-**.
9. Transition is optional.
10. Square: Details of pin1 identifier are optional but must be located within one of the two zones indicated. If the number of terminals on a side is odd terminal 1 is the center terminal.  
 Rectangle: Details of pin1 are optional but must be located within zone indicated. If the number of terminals on a side is odd, terminal 1 is the center terminal.
11. Location to datums **-A-** and **-B-** to be determined at plane **-H-**.
12. All dimensions and tolerances include lead trim offset and lead finish.
13. These two dimensions determine maximum angle of the lead for certain socket applications. If unit is intended to be socketed, it is advisable to review these dimensions with the socket supplier.
14. Controlling dimension: inches.

## Packaging Diagrams and Parameters

Package Type: 68-Lead Ceramic Leaded (CL) Chip Carrier with Window



Package Group: Ceramic Leaded Chip Carrier (CLCC)

Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	4.191	4.699		0.165	0.185	
A1	2.286	3.048		0.090	0.120	
D	24.968	25.222		0.983	0.993	
D1	23.977	24.333		0.944	0.958	
D2	22.860	23.876		0.900	0.940	
D3	20.320	—	<b>BSC</b>	0.800	—	<b>BSC</b>
E	24.968	25.222		0.983	0.993	
E1	23.977	24.333		0.944	0.958	
E2	22.860	23.876		0.900	0.940	
E3	20.320	—	<b>BSC</b>	0.800	—	<b>BSC</b>
CP	—	0.102		—	0.004	
LT	0.152	0.204		0.006	0.008	

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## Packaging Diagrams and Parameters

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### Plastic Dual In-Line (PDIP) Family

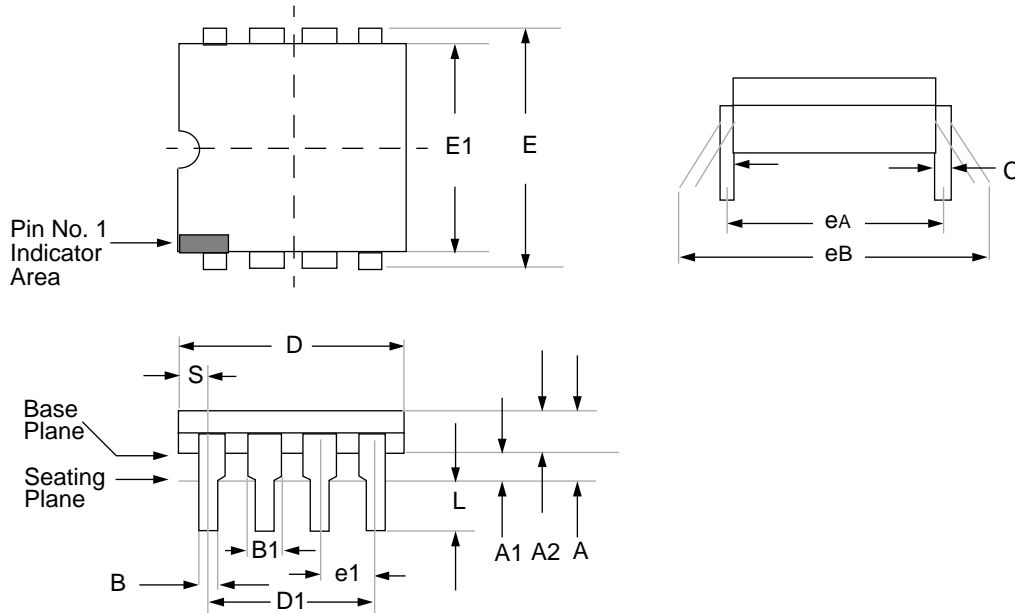
<b>Symbol List for Plastic In-Line Package Parameters</b>	
<b>Symbol</b>	<b>Description of Parameters</b>
$\alpha$	Angular spacing between min. and max. lead positions measured at the gauge plane
A	Distance between seating plane to highest point of body
A1	Distance between seating plane and base plane
A2	Base body thickness
B	Width of terminal leads
B1	Width of terminal lead shoulder which locate seating plane (standoff geometry optional)
C	Thickness of terminal leads
D	Largest overall package parameter of length
D1	Body length parameter - end lead center to end lead center
E	Largest overall package width parameter outside of lead
E1	Body width parameters not including leads
eA	Linear spacing of true minimum lead position center line to center line
eB	Linear spacing between true lead position outside of lead to outside of lead
e1	Linear spacing between center lines of body standoffs (terminal leads)
L	Distance from seating plane to end of lead
S	Distance from true position center line of Number 1 lead to the extremity of the body

**Notes:**

1. Controlling parameter: inches.
2. Parameter "e1" ("e") is non-cumulative.
3. Seating plane (standoff) is defined by board hole size.
4. Parameter "B1" is nominal.
5. Details of pin Number 1 identifier are optional.
6. Parameters "D + E1" do not include mold flash/protrusions. Mold flash or protrusions shall not exceed .010 inches.

## Packaging Diagrams and Parameters

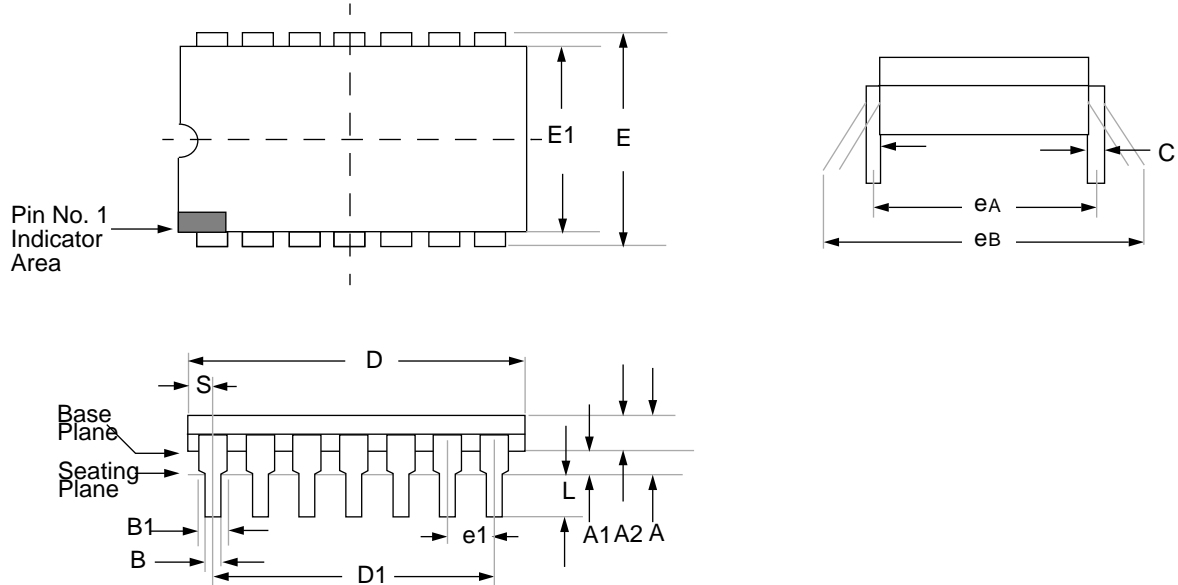
Package Type: 8-Lead Plastic Dual In-Line (P) - 300 mil



Package Group: Plastic Dual In-Line (PDIP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	—	4.064		—	0.160	
A1	0.381	—		0.015	—	
A2	3.048	3.810		0.120	0.150	
B	0.355	0.559		0.014	0.022	
B1	1.397	1.651		0.055	0.065	
C	0.203	0.381	<b>Typical</b>	0.008	0.015	<b>Typical</b>
D	9.017	10.922		0.355	0.430	
D1	7.620	7.620	<b>BSC</b>	0.300	0.300	<b>BSC</b>
E	7.620	8.255		0.300	0.325	
E1	6.096	7.112		0.240	0.280	
e1	2.489	2.591	<b>Typical</b>	0.098	0.102	<b>Typical</b>
eA	7.620	7.620	<b>BSC</b>	0.300	0.300	<b>BSC</b>
eB	8.128	9.906		0.320	0.390	
L	3.048	3.556		0.120	0.140	
S	0.889	—		0.035	—	

## Packaging Diagrams and Parameters

Package Type: 14-Lead Plastic Dual In-Line (P) - 300 mil

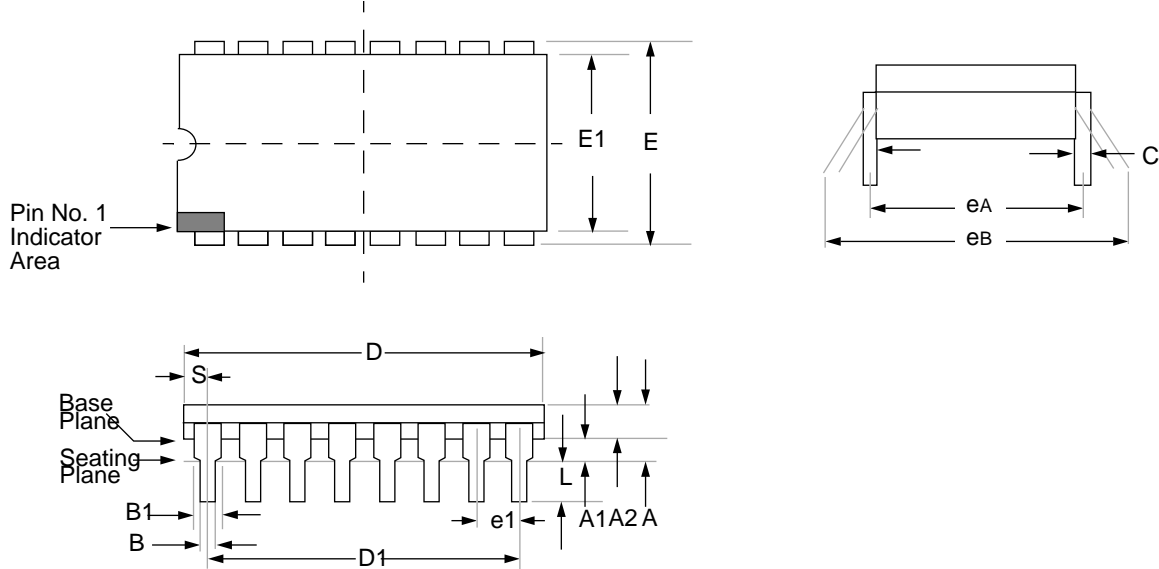


Package Group: Plastic Dual In-Line (PDIP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	—	4.064		—	0.160	
A1	0.381	—		0.015	—	
A2	3.048	3.810		0.120	0.150	
B	0.355	0.559		0.014	0.022	
B1	1.524	1.524	<b>BSC</b>	0.060	0.060	<b>BSC</b>
C	0.203	0.381	<b>Typical</b>	0.008	0.015	<b>Typical</b>
D	18.415	19.431		0.725	0.765	
D1	15.240	15.240	<b>BSC</b>	0.600	0.600	<b>BSC</b>
E	7.620	8.255		0.300	0.325	
E1	6.096	7.112		0.240	0.280	
e1	2.489	2.591	<b>Typical</b>	0.098	0.102	<b>Typical</b>
eA	7.620	7.620	<b>BSC</b>	0.300	0.300	<b>BSC</b>
eB	8.128	9.906		0.320	0.390	
L	3.048	3.556		0.120	0.140	
S	0.889	—		0.035	—	



## Packaging Diagrams and Parameters

Package Type: 16-Lead Plastic Dual In-Line (P) - 300 mil

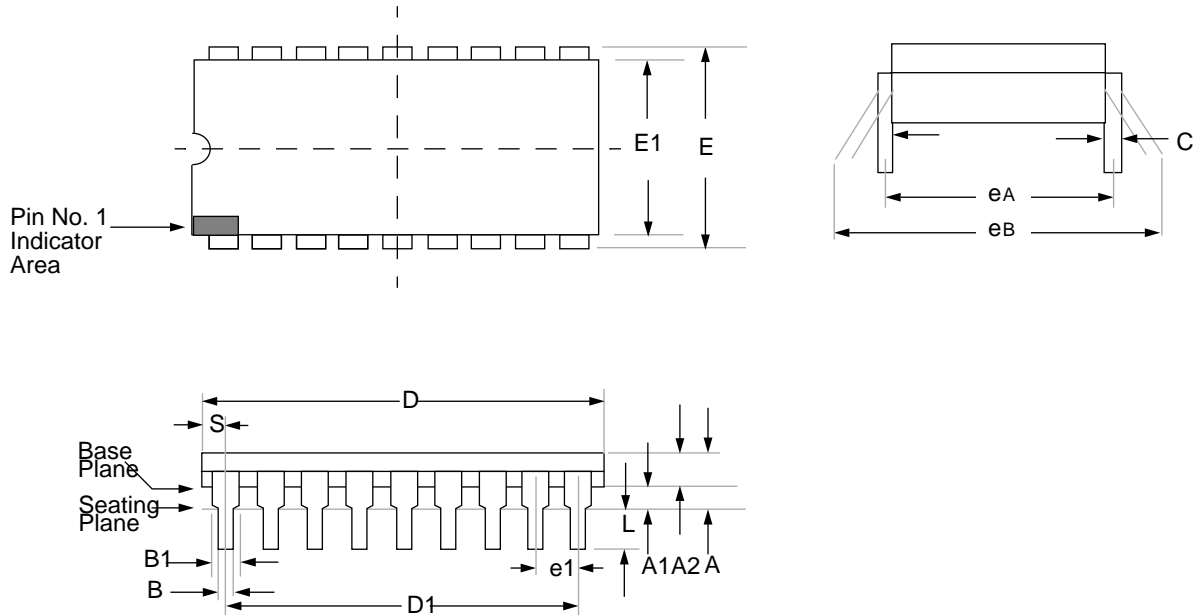


Package Group: Plastic Dual In-Line (PDIP)

Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	—	4.064		—	0.160	
A1	0.381	—		0.015	—	
A2	3.048	3.810		0.120	0.150	
B	0.355	0.559		0.014	0.022	
B1	1.524	1.524	<b>BSC</b>	0.060	0.060	<b>BSC</b>
C	0.203	0.381	<b>Typical</b>	0.008	0.015	<b>Typical</b>
D	18.923	19.939		0.745	0.785	
D1	17.780	17.780	<b>BSC</b>	0.700	0.700	<b>BSC</b>
E	7.620	8.255		0.300	0.325	
E1	6.096	7.112		0.240	0.280	
e1	2.489	2.591	<b>Typical</b>	0.098	0.102	<b>Typical</b>
eA	7.620	7.620	<b>BSC</b>	0.300	0.300	<b>BSC</b>
eB	8.128	9.906		0.320	0.390	
L	3.048	3.556		0.120	0.140	
S	0.889	—		0.035	—	

## Packaging Diagrams and Parameters

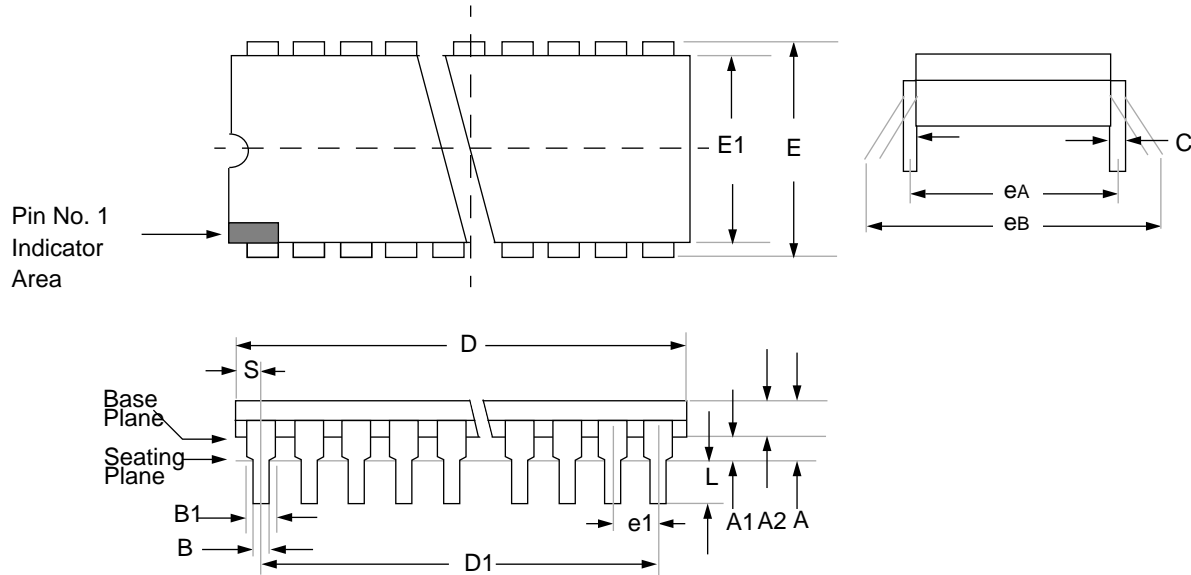
Package Type: 18-Lead Plastic Dual In-Line (P) - 300 mil



Package Group: Plastic Dual In-Line (PDIP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	—	4.064		—	0.160	
A1	0.381	—		0.015	—	
A2	3.048	3.810		0.120	0.150	
B	0.355	0.559		0.014	0.022	
B1	1.524	1.524	<b>BSC</b>	0.060	0.060	<b>BSC</b>
C	0.203	0.381	<b>Typical</b>	0.008	0.015	<b>Typical</b>
D	22.479	23.495		0.885	0.925	
D1	20.320	20.320	<b>BSC</b>	0.800	0.800	<b>BSC</b>
E	7.620	8.255		0.300	0.325	
E1	6.096	7.112		0.240	0.280	
e1	2.489	2.591	<b>Typical</b>	0.098	0.102	<b>Typical</b>
eA	7.620	7.620	<b>BSC</b>	0.300	0.300	<b>BSC</b>
eB	8.128	9.906		0.320	0.390	
L	3.048	3.556		0.120	0.140	
S	0.889	—		0.035	—	

## Packaging Diagrams and Parameters

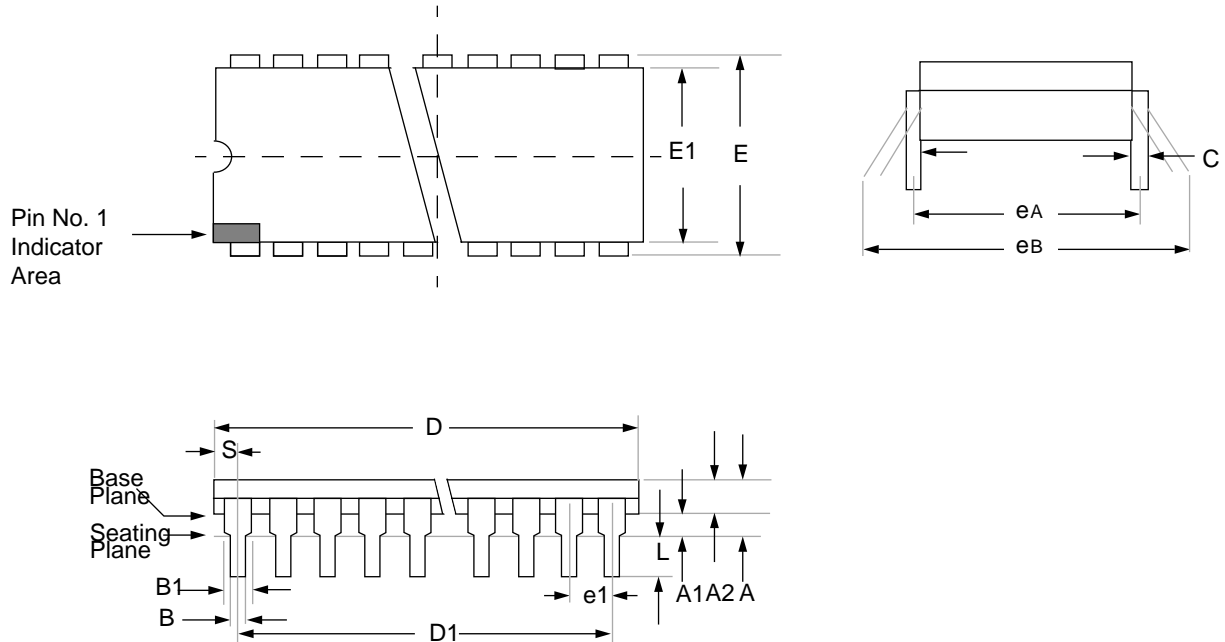
Package Type: 22-Lead Plastic Dual In-Line (P) - 400 mil



Package Group: Plastic Dual In-Line (PDIP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	—	4.572		—	0.180	
A1	0.381	—		0.015	—	
A2	3.175	3.810		0.125	0.150	
B	0.355	0.559		0.014	0.022	
B1	1.524	1.524	<b>BSC</b>	0.060	0.060	<b>BSC</b>
C	0.203	0.381	<b>Typical</b>	0.008	0.015	<b>Typical</b>
D	26.670	28.448		1.050	1.120	
D1	25.400	25.400	<b>BSC</b>	1.000	1.000	<b>BSC</b>
E	9.906	10.795		0.390	0.425	
E1	8.382	9.398		0.330	0.370	
e1	2.489	2.591	<b>Typical</b>	0.098	0.102	<b>Typical</b>
eA	10.160	10.160	<b>BSC</b>	0.400	0.400	<b>BSC</b>
eB	10.668	12.192		0.420	0.480	
L	3.048	3.556		0.120	0.140	
S	0.889	—		0.035	—	

## Packaging Diagrams and Parameters

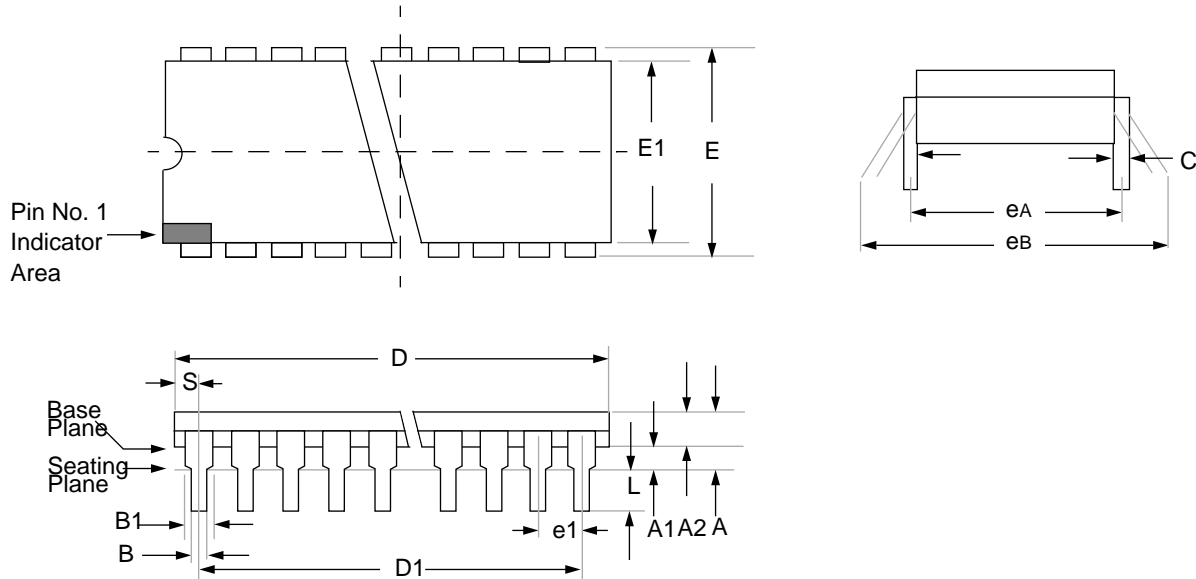
Package Type: 24-Lead Plastic Dual In-Line (P) - 600 mil



Package Group: Plastic Dual In-Line (PDIP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	—	5.080		—	0.200	
A1	0.508	—		0.020	—	
A2	3.175	4.064		0.125	0.160	
B	0.355	0.559		0.014	0.022	
B1	1.270	1.270	Typical	0.050	0.050	Typical
C	0.203	0.381	Typical	0.008	0.015	Typical
D	30.353	32.385		1.195	1.275	
D1	27.940	27.940	BSC	1.100	1.100	BSC
E	15.240	15.875		0.600	0.625	
E1	12.827	14.224		0.505	0.560	
e1	2.489	2.591	Typical	0.098	0.102	Typical
eA	15.240	15.240	BSC	0.600	0.600	BSC
eB	15.748	17.272		0.620	0.680	
L	3.048	3.556		0.120	0.140	
S	0.889	—		0.035	—	

## Packaging Diagrams and Parameters

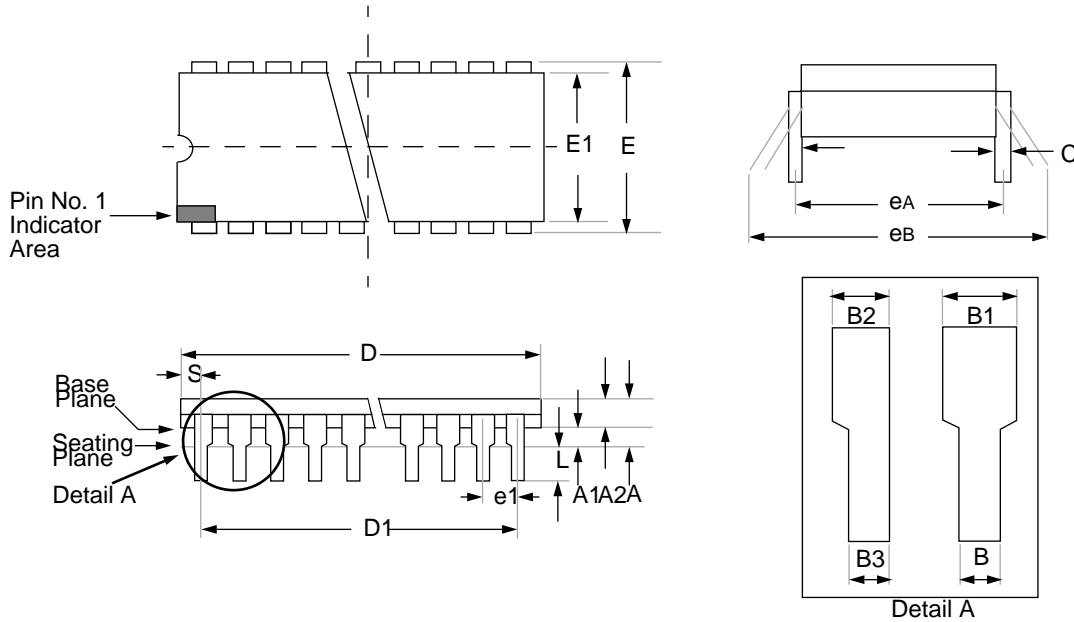
Package Type: 24-Lead Skinny Plastic Dual In-Line (SP) - 300 mil



Package Group: Plastic Dual In-Line (PDIP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	—	4.064		—	0.160	
A1	0.381	—		0.015	—	
A2	3.048	3.810		0.120	0.150	
B	0.355	0.559		0.014	0.022	
B1	1.524	1.524	<b>Typical</b>	0.060	0.060	<b>Typical</b>
C	0.203	0.381	<b>Typical</b>	0.008	0.015	<b>Typical</b>
D	31.242	32.258		1.230	1.270	
D1	27.940	27.940	<b>BSC</b>	1.100	1.100	<b>BSC</b>
E	7.620	8.255		0.300	0.325	
E1	6.096	7.112		0.240	0.280	
e1	2.489	2.591	<b>Typical</b>	0.098	0.102	<b>Typical</b>
eA	7.620	7.620	<b>BSC</b>	0.300	0.300	<b>BSC</b>
eB	8.128	9.906		0.320	0.390	
L	3.048	3.556		0.120	0.140	
S	0.889	—		0.035	—	

## Packaging Diagrams and Parameters

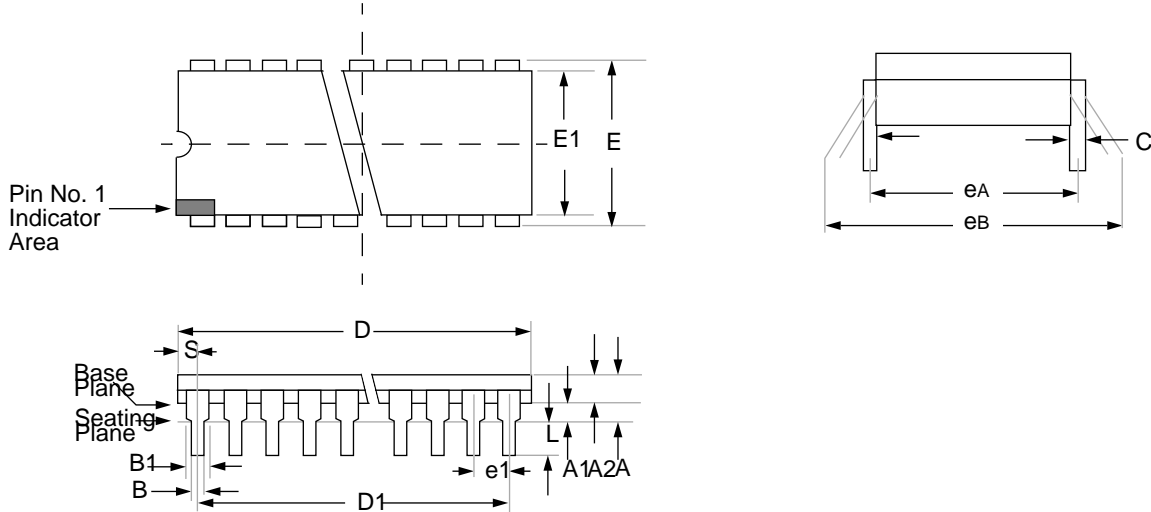
Package Type: 28-Lead Skinny Plastic Dual In-Line (SP) - 300 mil



Package Group: Plastic Dual In-Line (PDIP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	3.632	4.572		0.143	0.180	
A1	0.381	—		0.015	—	
A2	3.175	3.556		0.125	0.140	
B	0.406	0.559		0.016	0.022	
B1	1.016	1.651	<b>Typical</b>	0.040	0.065	<b>Typical</b>
B2	0.762	1.016	<b>4 places</b>	0.030	0.040	<b>4 places</b>
B3	0.203	0.508	<b>4 places</b>	0.008	0.020	<b>4 places</b>
C	0.203	0.331	<b>Typical</b>	0.008	0.013	<b>Typical</b>
D	34.163	35.179		1.385	1.395	
D1	33.020	33.020	<b>BSC</b>	1.300	1.300	<b>BSC</b>
E	7.874	8.382		0.310	0.330	
E1	7.112	7.493		0.280	0.295	
e1	2.540	2.540	<b>Typical</b>	0.100	0.100	<b>Typical</b>
eA	7.874	7.874	<b>BSC</b>	0.310	0.310	<b>BSC</b>
eB	8.128	9.906		0.320	0.390	
L	3.175	3.683		0.125	0.145	
S	0.584	1.220		0.023	0.048	

## Packaging Diagrams and Parameters

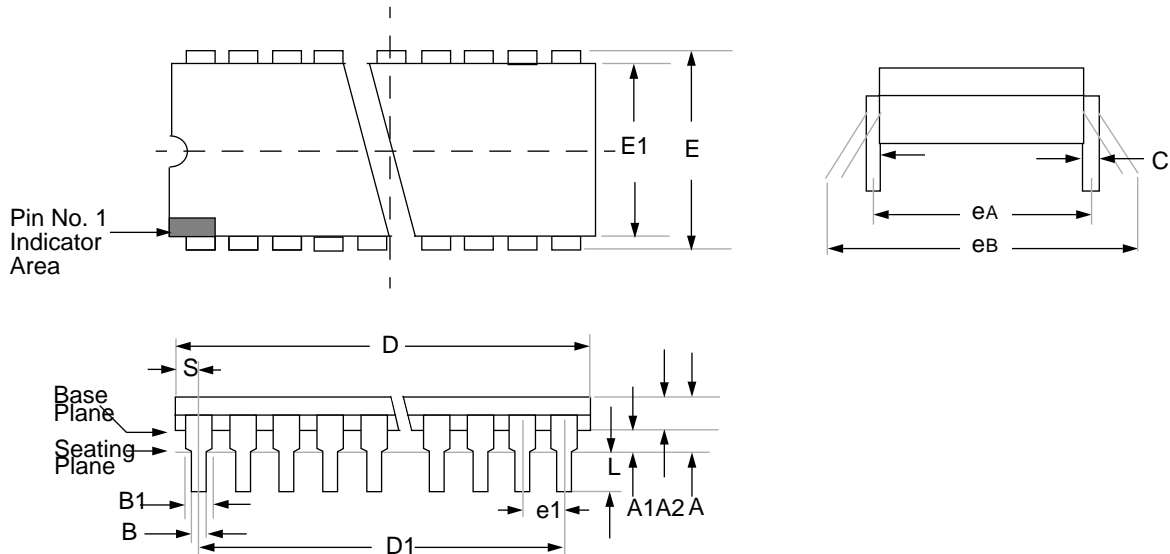
Package Type: 28-Lead Plastic Dual In-Line (P) - 600 mil



Package Group: Plastic Dual In-Line (PDIP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	—	5.080		—	0.200	
A1	0.508	—		0.020	—	
A2	3.175	4.064		0.125	0.160	
B	0.355	0.559		0.014	0.022	
B1	1.270	1.778	Typical	0.050	0.070	Typical
C	0.203	0.381	Typical	0.008	0.015	Typical
D	35.052	37.084		1.380	1.460	
D1	33.020	33.020	BSC	1.300	1.300	BSC
E	15.240	15.875		0.600	0.625	
E1	12.827	13.970		0.505	0.550	
e1	2.489	2.591	Typical	0.098	0.102	Typical
eA	15.240	15.240	BSC	0.600	0.600	BSC
eB	15.748	17.272		0.620	0.680	
L	2.921	3.683		0.115	0.145	
S	0.889	—		0.035	—	

## Packaging Diagrams and Parameters

Package Type: 40-Lead Plastic Dual In-Line (P) - 600 mil

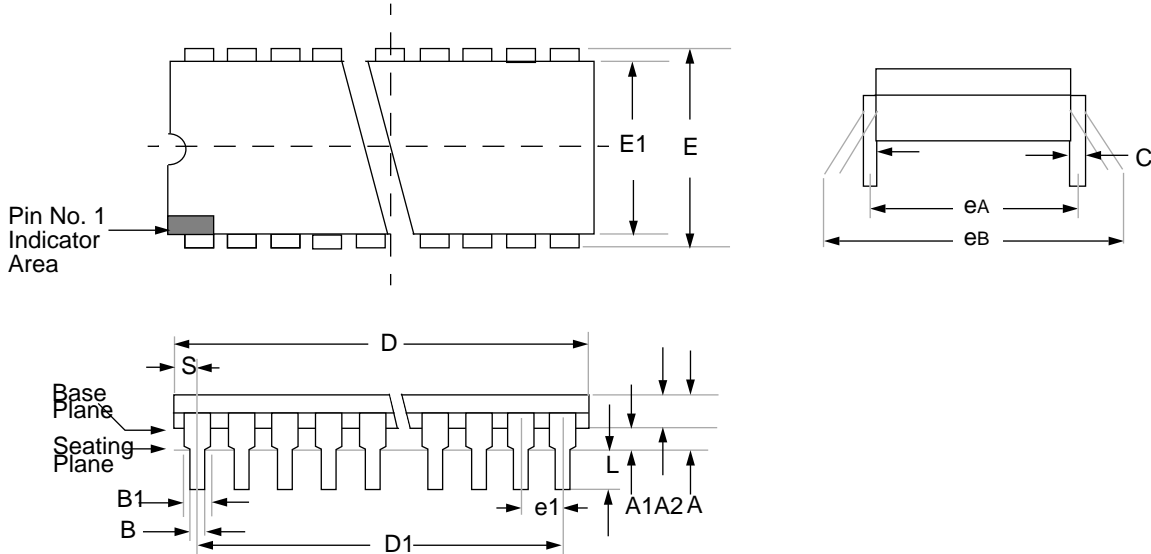


Package Group: Plastic Dual In-Line (PDIP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	—	5.080		—	0.200	
A1	0.381	—		0.015	—	
A2	3.175	4.064		0.125	0.160	
B	0.355	0.559		0.014	0.022	
B1	1.270	1.778	Typical	0.050	0.070	Typical
C	0.203	0.381	Typical	0.008	0.015	Typical
D	51.181	52.197		2.015	2.055	
D1	48.260	48.260	BSC	1.900	1.900	BSC
E	15.240	15.875		0.600	0.625	
E1	13.462	13.970		0.530	0.550	
e1	2.489	2.591	Typical	0.098	0.102	Typical
eA	15.240	15.240	BSC	0.600	0.600	BSC
eB	15.748	17.272		0.620	0.680	
L	2.921	3.683		0.115	0.145	
S	1.270	—		0.050	—	



## Packaging Diagrams and Parameters

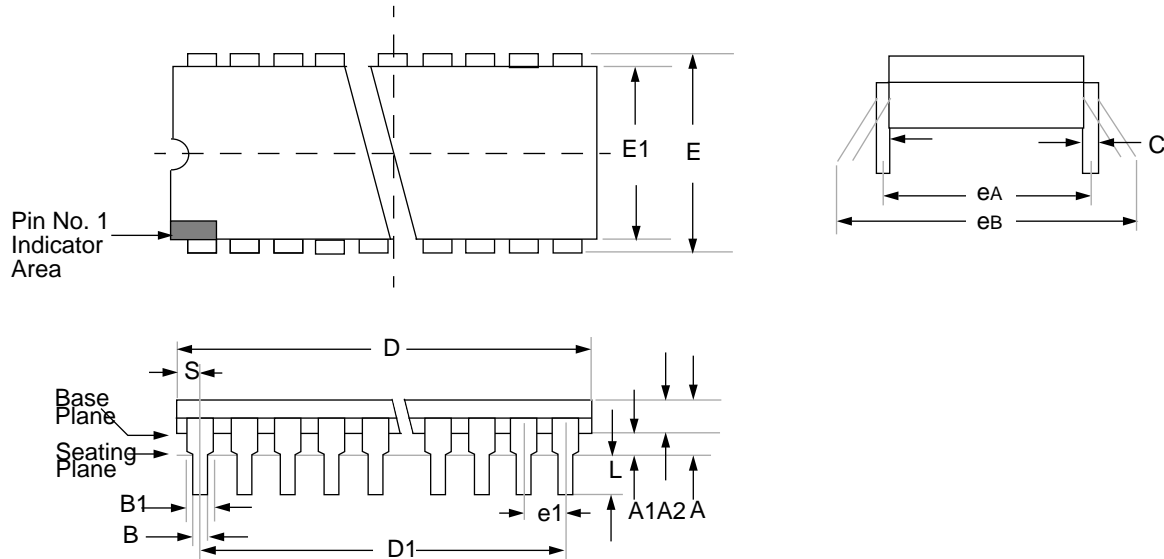
Package Type: 48-Lead Plastic Dual In-Line (P) - 600 mil



Package Group: Plastic Dual In-Line (PDIP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	—	5.080		—	0.200	
A1	0.381	—		0.015	—	
A2	3.175	4.064		0.125	0.160	
B	0.355	0.559		0.014	0.022	
B1	1.270	1.270	<b>Typical</b>	0.050	0.050	<b>Typical</b>
C	0.203	0.381	<b>Typical</b>	0.008	0.015	<b>Typical</b>
D	61.468	62.230		2.420	2.450	
D1	58.420	58.420	<b>BSC</b>	2.300	2.300	<b>BSC</b>
E	15.240	15.875		0.600	0.625	
E1	13.716	14.224		0.540	0.560	
e1	2.489	2.591	<b>Typical</b>	0.098	0.102	<b>Typical</b>
eA	15.240	15.240	<b>BSC</b>	0.600	0.600	<b>BSC</b>
eB	15.748	17.272		0.620	0.680	
L	2.921	3.683		0.115	0.145	
S	1.270	—		0.050	—	

## Packaging Diagrams and Parameters

Package Type: 64-Lead Shrink Plastic Dual In-Line (SP) - 750 mil



Package Group: Plastic Dual In-Line (SPDIP)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	—	5.08		—	0.200	
A1	0.51	—		0.020	—	
A2	3.38	4.27		0.133	0.168	
B	0.38	0.56		0.015	0.022	
B1	.076	1.27	<b>Typical</b>	0.030	0.050	<b>Typical</b>
C	0.20	0.30	<b>Typical</b>	0.008	0.012	<b>Typical</b>
D	57.40	57.91		2.260	2.280	
D1	55.12	55.12	<b>BSC</b>	2.170	2.170	<b>BSC</b>
E	19.05	19.69		0.750	0.775	
E1	16.76	17.27		0.660	0.680	
e1	1.73	1.83	<b>Typical</b>	0.068	0.072	<b>Typical</b>
eA	19.05	19.05	<b>BSC</b>	0.750	0.750	<b>BSC</b>
eB	19.05	21.08		0.750	0.830	
L	3.05	3.43		0.120	0.135	
S	1.19	—		0.047	—	

## Packaging Diagrams and Parameters

### Plastic Leaded Chip Carrier (PLCC) Family

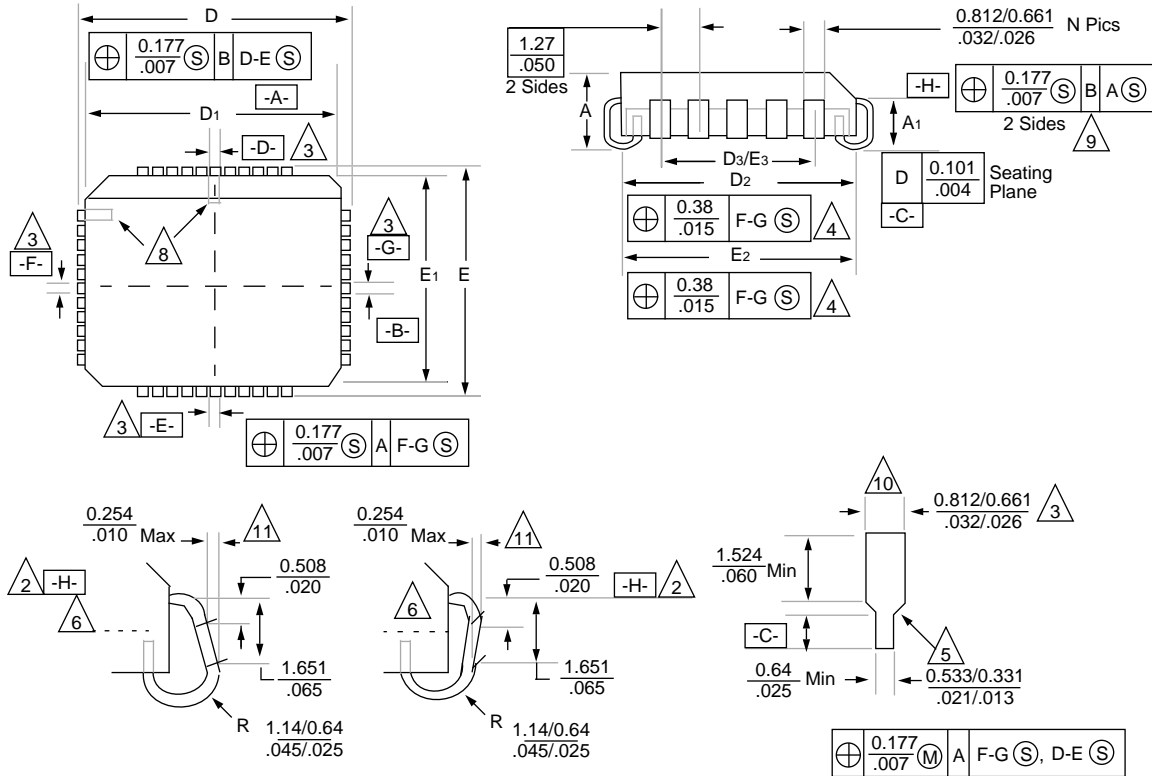
Symbol List for Plastic Leaded Chip Carrier Package Parameters	
Symbol	Description of Parameters
A	Distance between seating plane to highest point of body
A1	Distance between lead shoulder to seating plane
CP	Seating plane coplanarity
D/E	Outside dimension
D1/E1	Plastic body dimension
D2/E2	Footprint
D3/E3	Footprint
LT	Lead thickness

**Notes:**

7. All dimensions and tolerances conform to ANSI Y14.5M-1982.
8. Datum plane **-H-** located at top of mold parting line and coincident with top of lead where lead exits plastic body.
9. Datums **-D-E-** and **-F-G-** to be determined where center leads exit plastic body at datum plane **-H-**.
10. To be determined at seating plane **-C-**.
11. Transition is optional.
12. Plastic body details between leads are optional.
13. Dimension D1 and E1 do not include mold protrusion. Allowable mold protrusion is .254mm/.010in. per side. Dimensions D and E include mold mismatch and are determined at parting line.
14. Square: Details of pin 1 identifier are optional but must be located within one of the two zones indicated.  
Rectangle: Details of pin 1 identifier are optional but must be located within zone indicated. If the number of terminals on a side is odd, terminal 1 is the center terminal.
15. Location of datums **-A-** and **-B-** to be determined at plane **-H-**.
16. All dimensions and tolerances include lead trim offset and lead finish.
17. These two dimensions determine maximum angle of the lead for certain socket applications. If unit is intended to be socketed, it is advisable to review these dimensions with the socket supplier.
18. Controlling dimension: inches.
- X. Sum of dambar protrusions to be 0.17 (.007) max. per lead.
- Y. Feature is not required, but is optional at manufacturer's discretion.

## Packaging Diagrams and Parameters

### Package Type: 20-Lead Plastic Leaded Chip Carrier (L) -Square

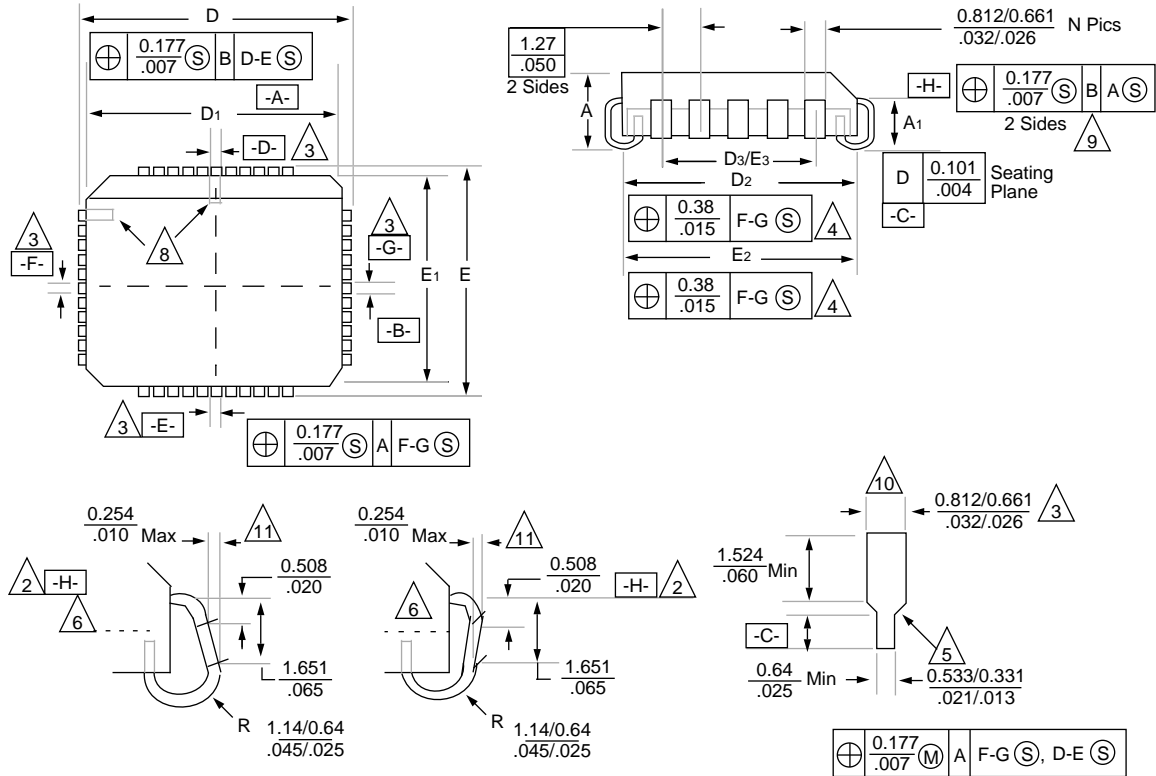


#### Package Group: Plastic Leaded Chip Carrier (PLCC)

Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	4.191	4.572		0.165	0.180	
A1	2.286	3.048		0.090	0.120	
D	9.779	10.033		0.385	0.395	
D1	8.89	9.042		0.350	0.356	
D2	7.366	8.382		0.290	0.330	
D3	5.080	5.080	<b>BSC</b>	0.200	0.200	<b>BSC</b>
E	9.779	10.033		0.385	0.395	
E1	8.89	9.042		0.350	0.356	
E2	7.366	8.382		0.290	0.330	
E3	5.080	5.080	<b>BSC</b>	0.200	0.200	<b>BSC</b>
CP	—	0.102		—	0.004	
LT	0.203	0.381		0.008	0.015	

## Packaging Diagrams and Parameters

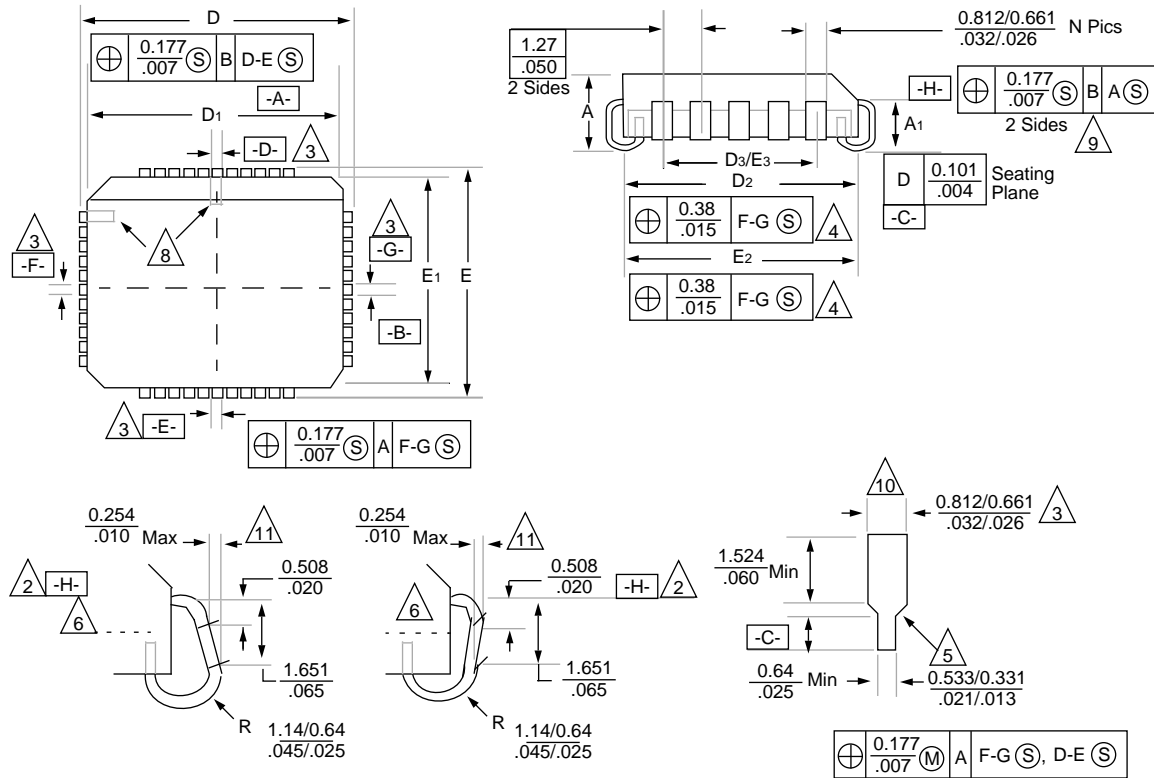
### Package Type: 28-Lead Plastic Leaded Chip Carrier (L) -Square



Package Group: Plastic Leaded Chip Carrier (PLCC)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	4.191	4.572		0.165	0.180	
A1	2.286	3.048		0.090	0.120	
D	12.319	12.573		0.485	0.495	
D1	11.430	11.583		0.450	0.456	
D2	10.414	10.922		0.410	0.430	
D3	7.620	7.620	<b>BSC</b>	0.300	0.300	<b>BSC</b>
E	12.319	12.573		0.485	0.495	
E1	11.430	11.583		0.450	0.456	
E2	10.414	10.922		0.410	0.430	
E3	7.620	7.620	<b>BSC</b>	0.300	0.300	<b>BSC</b>
CP	—	0.102		—	0.004	
LT	0.203	0.381		0.008	0.015	

## Packaging Diagrams and Parameters

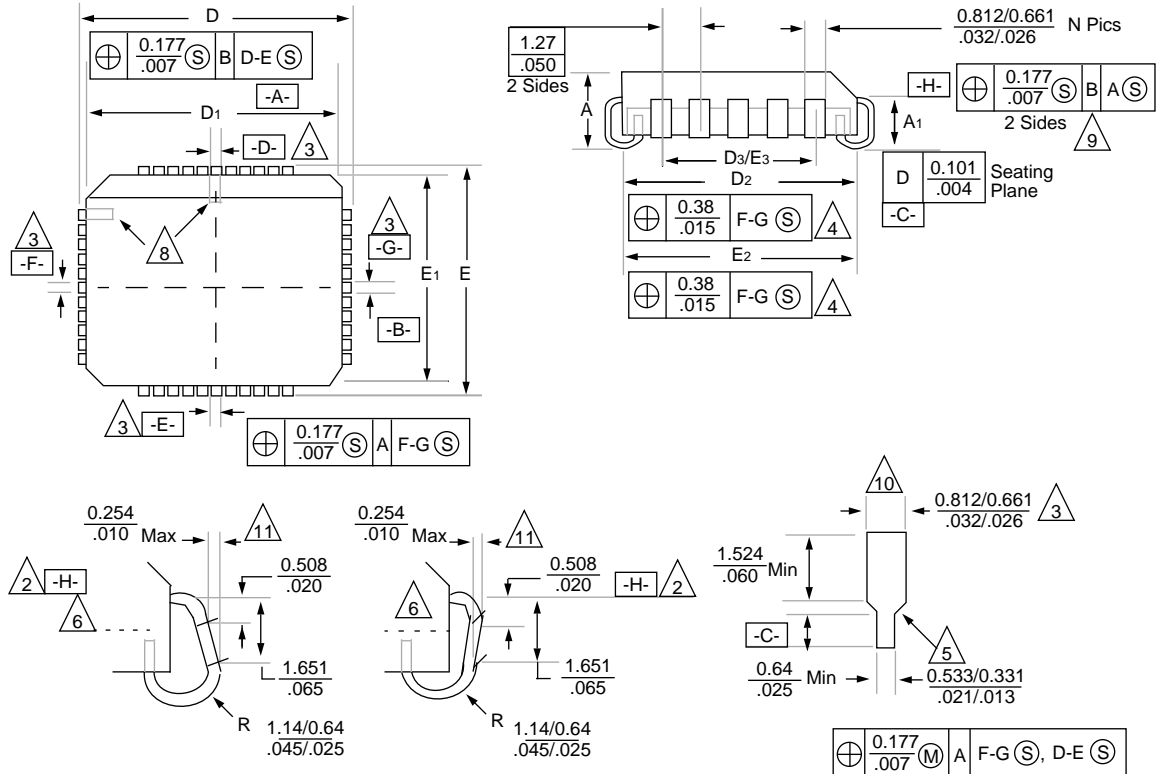
### Package Type: 32-Lead Plastic Leaded Chip Carrier (L) - Rectangle



Package Group: Plastic Leaded Chip Carrier (PLCC)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	3.048	3.556		0.120	0.140	
A1	1.905	2.413		0.075	0.095	
D	12.319	12.573		0.485	0.495	
D1	11.353	11.507		0.447	0.453	
D2	9.310	10.780		0.380	0.440	
D3	7.620	7.620	<b>BSC</b>	0.300	0.300	<b>BSC</b>
E	14.859	15.113		0.585	0.595	
E1	13.893	14.047		0.547	0.553	
E2	11.760	13.230		0.480	0.540	
E3	10.160	10.160	<b>BSC</b>	0.400	0.400	<b>BSC</b>
CP	—	0.102		—	0.004	
LT	0.203	0.381		0.008	0.015	

## Packaging Diagrams and Parameters

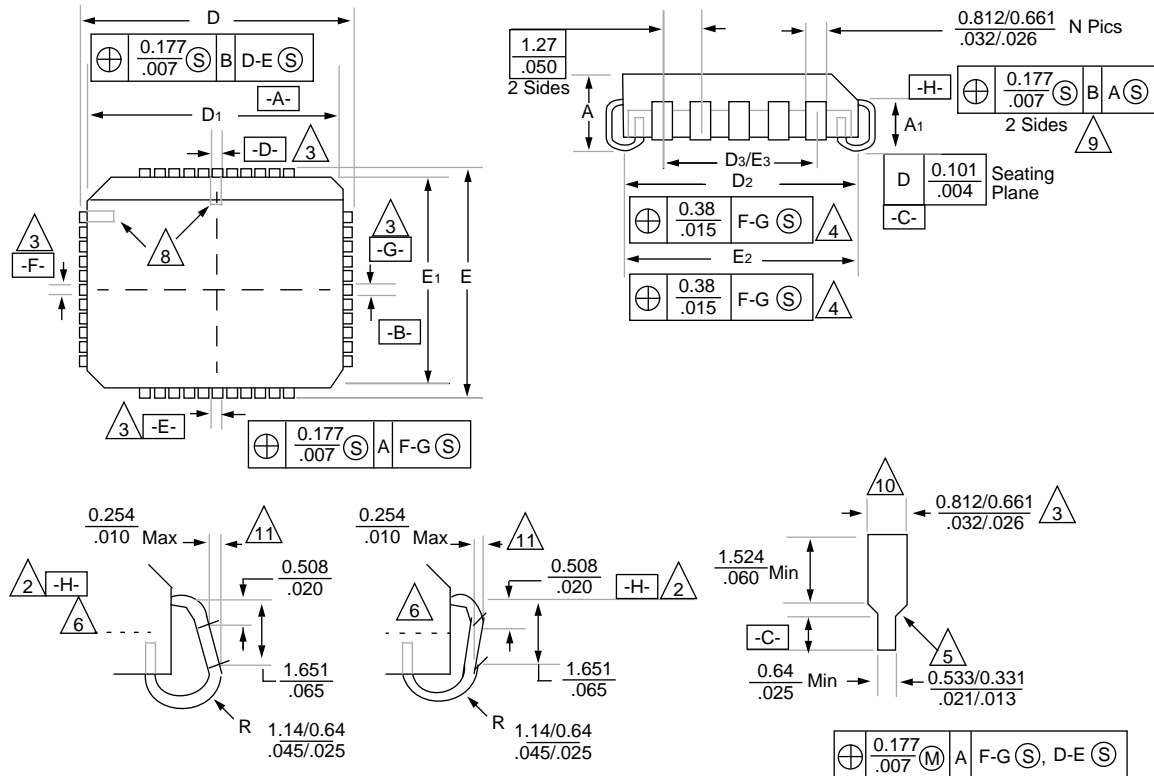
Package Type: 44-Lead Plastic Ledged Chip Carrier (L) - Square



Package Group: Plastic Ledged Chip Carrier (PLCC)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	4.191	4.572		0.165	0.180	
A1	2.413	2.921		0.095	0.115	
D	17.399	17.653		0.685	0.695	
D1	16.510	16.663		0.650	0.656	
D2	15.494	16.002		0.610	0.630	
D3	12.700	12.700	<b>BSC</b>	0.500	0.500	<b>BSC</b>
E	17.399	17.653		0.685	0.695	
E1	16.510	16.663		0.650	0.656	
E2	15.494	16.002		0.610	0.630	
E3	12.700	12.700	<b>BSC</b>	0.500	0.500	<b>BSC</b>
CP	—	0.102		—	0.004	
LT	0.203	0.381		0.008	0.015	

## Packaging Diagrams and Parameters

**Package Type: 68-Lead Plastic Leaded Chip Carrier (L) - Square**



Package Group: Plastic Leaded Chip Carrier (PLCC)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
A	4.191	4.699		0.165	0.185	
A1	2.286	2.794		0.090	0.110	
D	25.019	25.273		0.985	0.995	
D1	24.130	24.334		0.950	0.958	
D2	22.860	23.622		0.900	0.930	
D3	20.320	20.320	<b>BSC</b>	0.800	0.800	<b>BSC</b>
E	25.019	25.273		0.985	0.995	
E1	24.130	24.334		0.950	0.958	
E2	22.860	23.622		0.900	0.930	
E3	20.320	20.320	<b>BSC</b>	0.800	0.800	<b>BSC</b>
CP	—	0.102		—	0.004	
LT	0.203	0.254		0.008	0.010	



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## Packaging Diagrams and Parameters

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### Plastic Small Outline (SOIC) Family

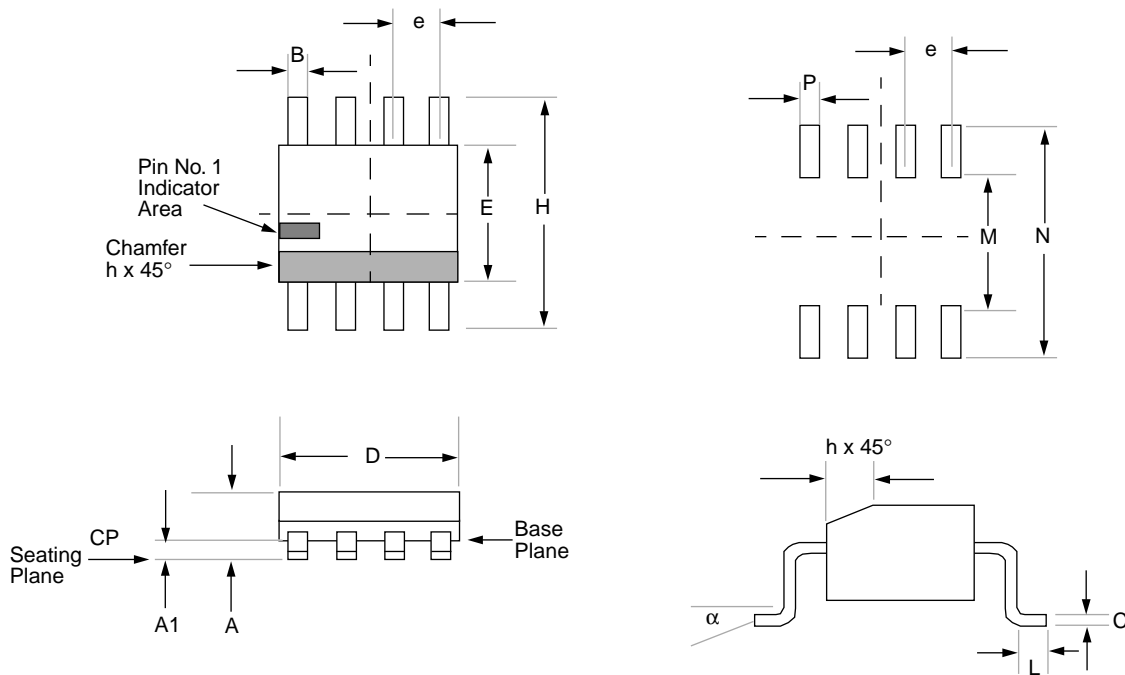
<b>Symbol List for Small Outline Package Parameters</b>	
<b>Symbol</b>	<b>Description of Parameters</b>
$\alpha$	Angular spacing between min. and max. lead positions measured at the gauge plane
A	Distance between seating plane to highest point of body
A1	Distance between seating plane and base plane
B	Width of terminals
C	Thickness of terminals
D	Largest overall package parameter of length
E	Largest overall package width parameter not including leads
e	Linear spacing of true minimum lead position center line to center line
H	Largest overall package dimension of width
L	Length of terminal for soldering to a substrate
CP	Seating plane coplanarity

**Notes:**

1. Controlling parameter: inches.
2. All packages are gull wing lead form.
3. "D" and "E" are reference datums and do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .006 package ends and .010 on sides.
4. The chamfer on the body is optional. If it is not present, a visual index feature must be located within the cross-hatched area to indicate pin1 position.
5. Terminal numbers are shown for reference.

## Packaging Diagrams and Parameters

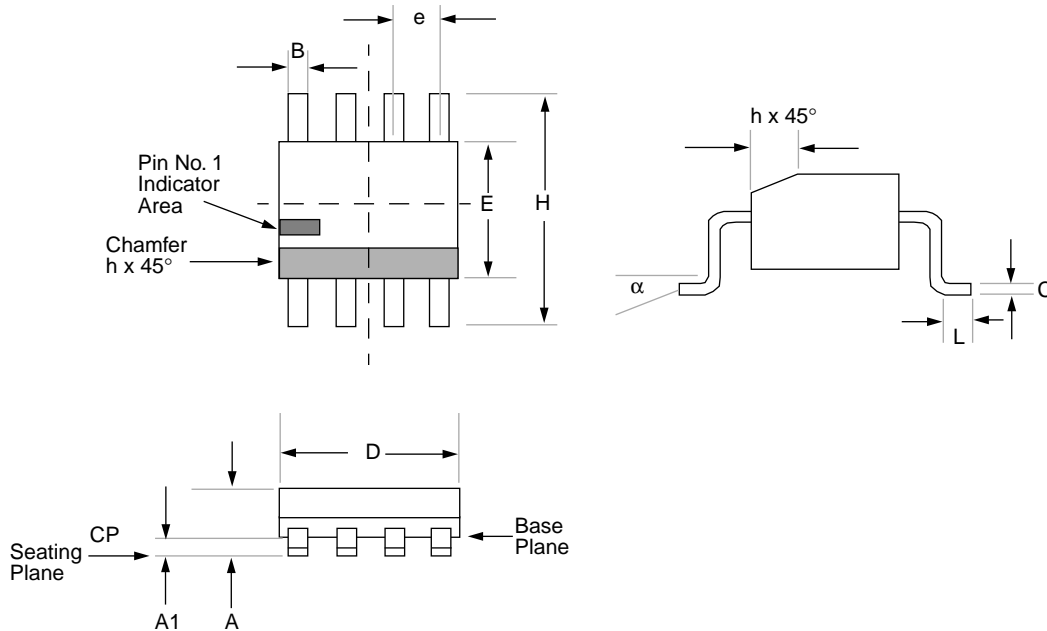
Package Type: 8-Lead Plastic Small Outline (SN) - Narrow, 150 mil Body



Package Group: Plastic SOIC (SN)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
α	0°	8°		0°	8°	
A	1.371	1.728		0.054	0.068	
A1	0.101	0.249		0.004	0.010	
B	0.355	0.483		0.014	0.019	
C	0.190	0.249		0.007	0.010	
D	4.800	4.979		0.189	0.196	
E	3.810	3.988		0.150	0.157	
e	1.270	1.270	<b>BSC</b>	0.050	0.050	<b>BSC</b>
H	5.816	6.198		0.229	0.244	
h	0.381	0.762		0.015	0.030	
L	0.508	1.016		0.020	0.040	
CP	—	0.102		—	0.004	
M	4.200	4.200	<b>Typical</b>	0.165	0.165	<b>Typical</b>
N	7.214	7.214	<b>Typical</b>	0.284	0.284	<b>Typical</b>
P	0.787	0.787	<b>Typical</b>	0.031	0.031	<b>Typical</b>

## Packaging Diagrams and Parameters

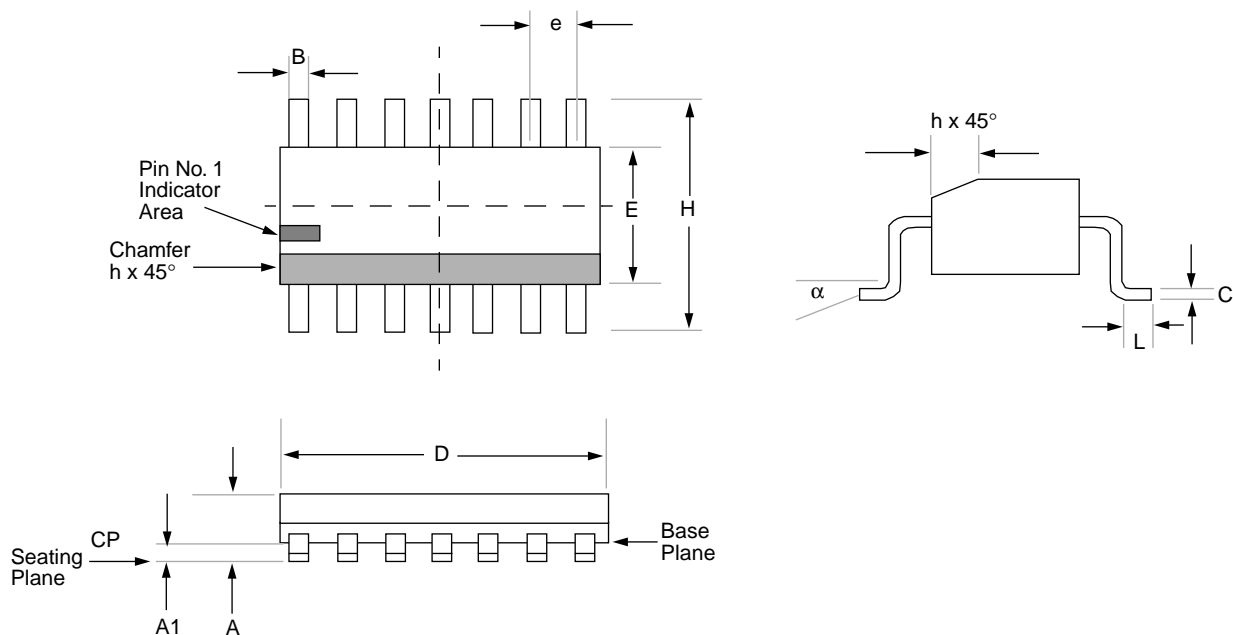
Package Type: 8-Lead Plastic Small Outline (SM) - Medium, 208 mil Body



Package Group: Plastic SOIC (SM)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	8°		0°	8°	
A	1.778	2.00		0.070	0.029	
A1	0.101	0.249		0.004	0.010	
B	0.355	0.483		0.014	0.019	
C	0.190	0.249		0.007	0.010	
D	5.080	5.334		0.200	0.210	
E	5.156	5.411		0.203	0.213	
e	1.270	1.270	<b>BSC</b>	0.050	0.050	<b>BSC</b>
H*	7.670	8.103		0.302	0.319	
h	0.381	0.762		0.015	0.030	
L	0.508	1.016		0.020	0.040	
CP	—	0.102		—	0.004	

## Packaging Diagrams and Parameters

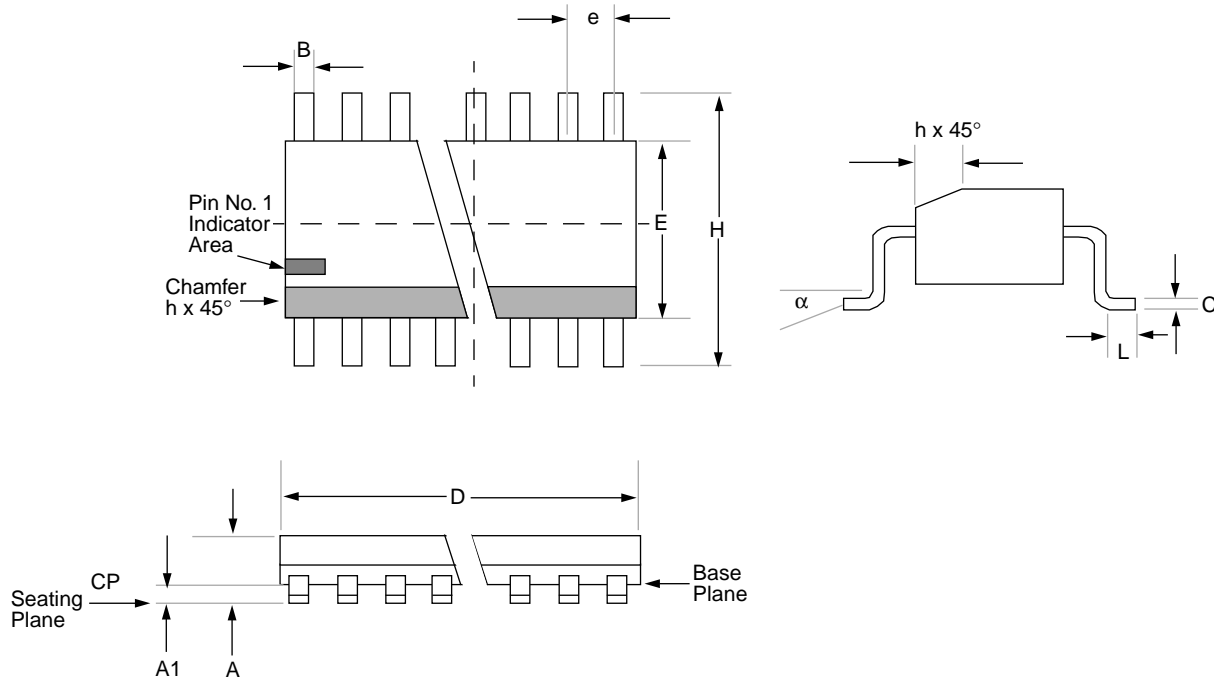
Package Type: 14-Lead Plastic Small Outline (SL) - Narrow, 150 mil Body



Package Group: Plastic SOIC (SL)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	8°		0°	8°	
A	1.371	1.728		0.054	0.068	
A1	0.101	0.249		0.004	0.010	
B	0.355	0.483		0.014	0.019	
C	0.190	0.249		0.008	0.010	
D	8.559	9.983		0.337	0.393	
E	3.810	3.988		0.150	0.157	
e	1.270	1.270	<b>BSC</b>	0.050	0.050	<b>BSC</b>
H	5.816	6.198		0.229	0.244	
h	0.381	0.762		0.015	0.030	
L	0.406	1.143		0.016	0.045	
CP	—	0.102		—	0.004	

## Packaging Diagrams and Parameters

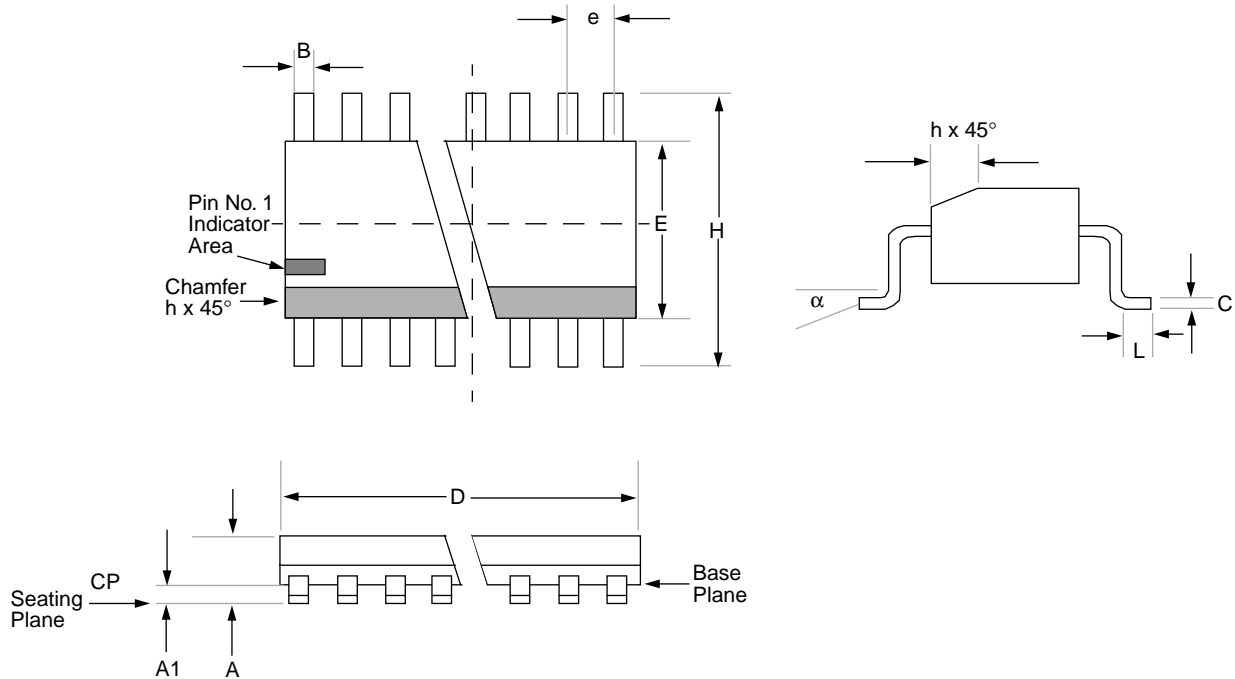
Package Type: 18-Lead Plastic Small Outline (SO) - Wide, 300 mil Body



Package Group: Plastic SOIC (SO)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	8°		0°	8°	
A	2.362	2.642		0.093	0.104	
A1	0.101	0.300		0.004	0.012	
B	0.355	0.483		0.014	0.019	
C	0.241	0.318		0.009	0.013	
D	11.353	11.735		0.447	0.462	
E	7.416	7.595		0.292	0.299	
e	1.270	1.270	<b>BSC</b>	0.050	0.050	<b>BSC</b>
H	10.007	10.643		0.394	0.419	
h	0.381	0.762		0.015	0.030	
L	0.406	1.143		0.016	0.045	
CP	—	0.102		—	0.004	

## Packaging Diagrams and Parameters

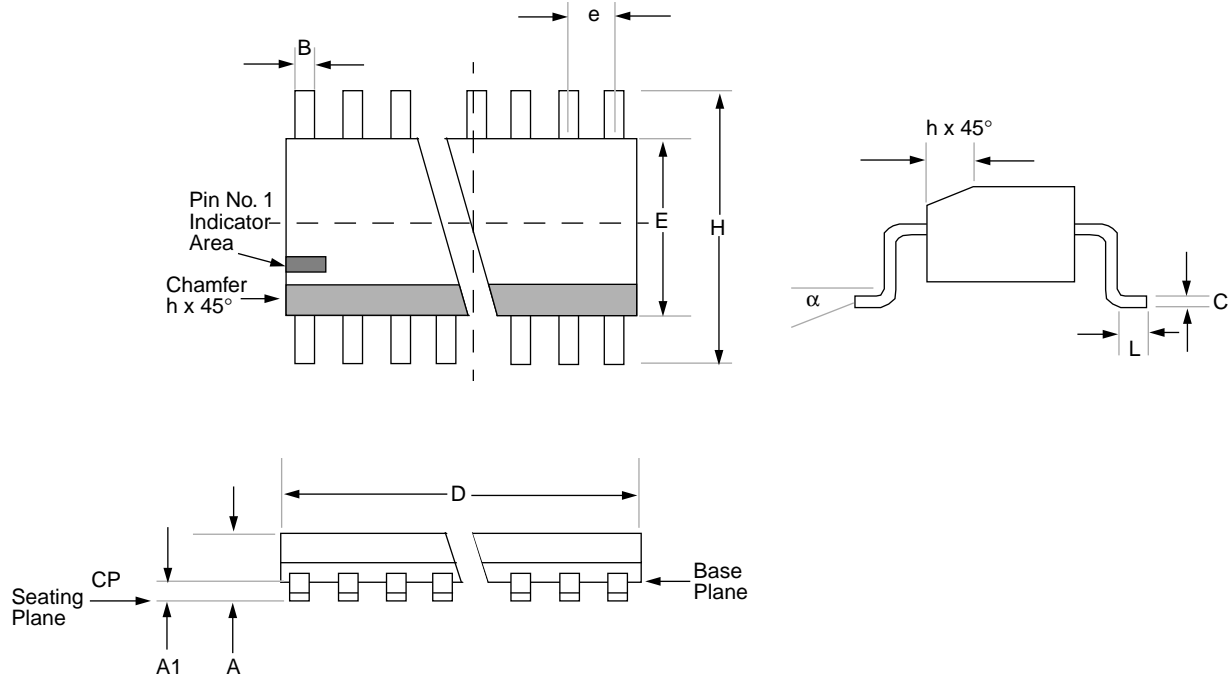
Package Type: 24-Lead Plastic Small Outline (SO) - Wide, 300 mil Body



Package Group: Plastic SOIC (SO)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	8°		0°	8°	
A	2.362	2.642		0.093	0.104	
A1	0.101	0.300		0.004	0.012	
B	0.355	0.483		0.014	0.019	
C	0.241	0.318		0.009	0.013	
D	15.214	15.596		0.599	0.614	
E	7.416	7.595		0.292	0.299	
e	1.270	1.270	<b>BSC</b>	0.050	0.050	<b>BSC</b>
H	10.007	10.643		0.394	0.419	
h	0.381	0.762		0.015	0.030	
L	0.406	1.143		0.016	0.045	
CP	—	0.102		—	0.004	

## Packaging Diagrams and Parameters

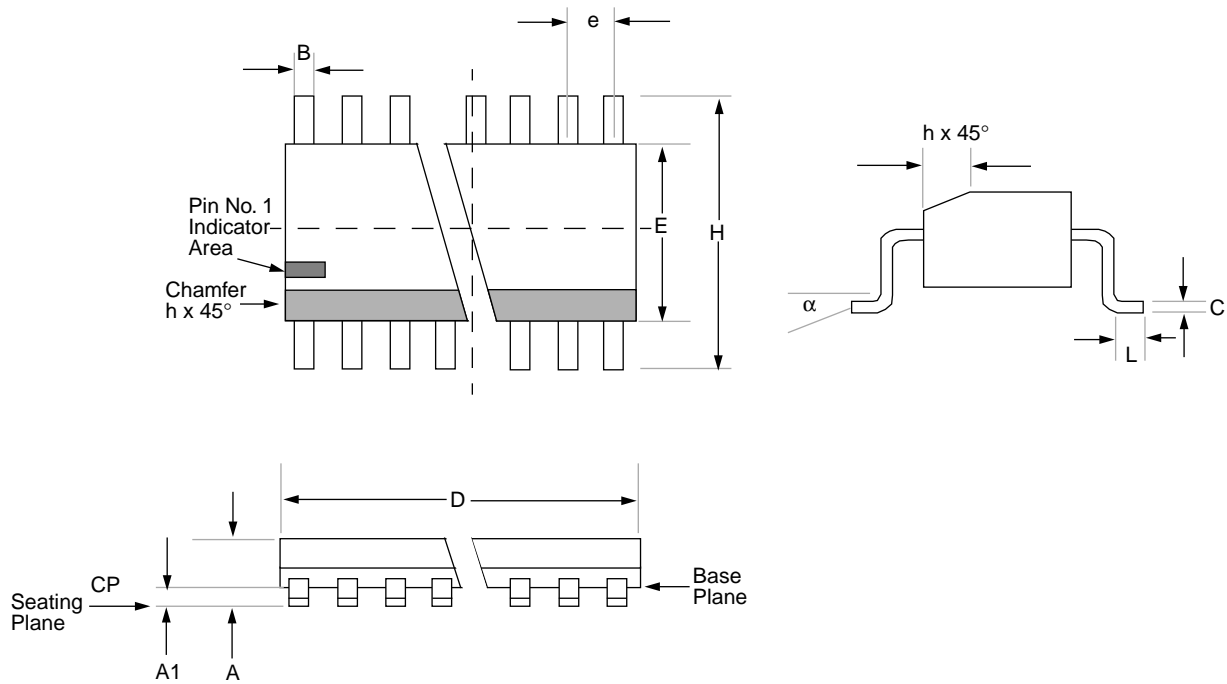
Package Type: 28-Lead Plastic Small Outline (SO) - Wide, 300 mil Body



Package Group: Plastic SOIC (SO)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	8°		0°	8°	
A	2.362	2.642		0.093	0.104	
A1	0.101	0.300		0.004	0.012	
B	0.355	0.483		0.014	0.019	
C	0.241	0.318		0.009	0.013	
D	17.703	18.085		0.697	0.712	
E	7.416	7.595		0.292	0.299	
e	1.270	1.270	<b>BSC</b>	0.050	0.050	<b>BSC</b>
H	10.007	10.643		0.394	0.419	
h	0.381	0.762		0.015	0.030	
L	0.406	1.143		0.016	0.045	
CP	—	0.102		—	0.004	

## Packaging Diagrams and Parameters

Package Type: 28-Lead Plastic Small Outline (SO) - Wide, 330 mil Body



Package Group: Plastic SOIC (SW)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0	8°		0	8°	
A	2.286	2.642		0.090	0.104	
A1	0.101	0.280		0.004	0.011	
B	0.355	0.508		0.014	0.020	
C	0.228	0.305		0.009	0.012	
D	17.780	18.085		0.700	0.712	
E	8.636	8.890		0.340	0.350	
e	1.270	1.270	<b>BSC</b>	0.050	0.050	<b>BSC</b>
H	11.760	12.116		0.463	0.477	
h	0.254	0.737		0.010	0.029	
L	0.508	1.067		0.020	0.042	
CP	—	0.102		—	0.004	



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## Packaging Diagrams and Parameters

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### Plastic Shrink Small Outline (SSOP) Family

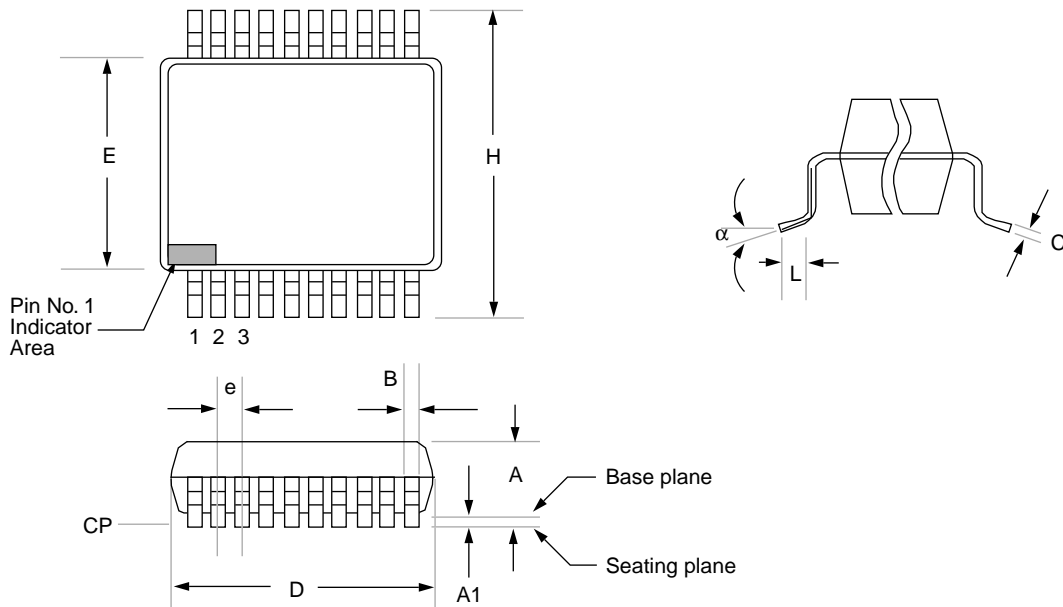
Symbol List for Shrink Small Outline Package Parameters	
Symbol	Description of Parameters
$\alpha$	Angular spacing between min. and max. lead positions measured at the gauge plane
A	Distance between seating plane to highest point of body
A1	Distance between seating plane and base plane
B	Width of terminals
C	Thickness of terminals
D	Largest overall package parameter of length
E	Largest overall package width parameter not including leads
e	Linear spacing of true minimum lead position center line to center line
H	Largest overall package dimension of width
L	Length of terminal for soldering to a substrate
CP	Seating plane coplanarity

**Notes:**

1. Controlling parameter: mm.
2. All packages are gull wing lead form.
3. "D" and "E" are reference datums and do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .015mm .006 package ends and .010" on sides.
4. A .25mm visual index feature must be located within the shaded area to indicate pin 1 position.
5. Terminal numbers are shown for reference.

## Packaging Diagrams and Parameters

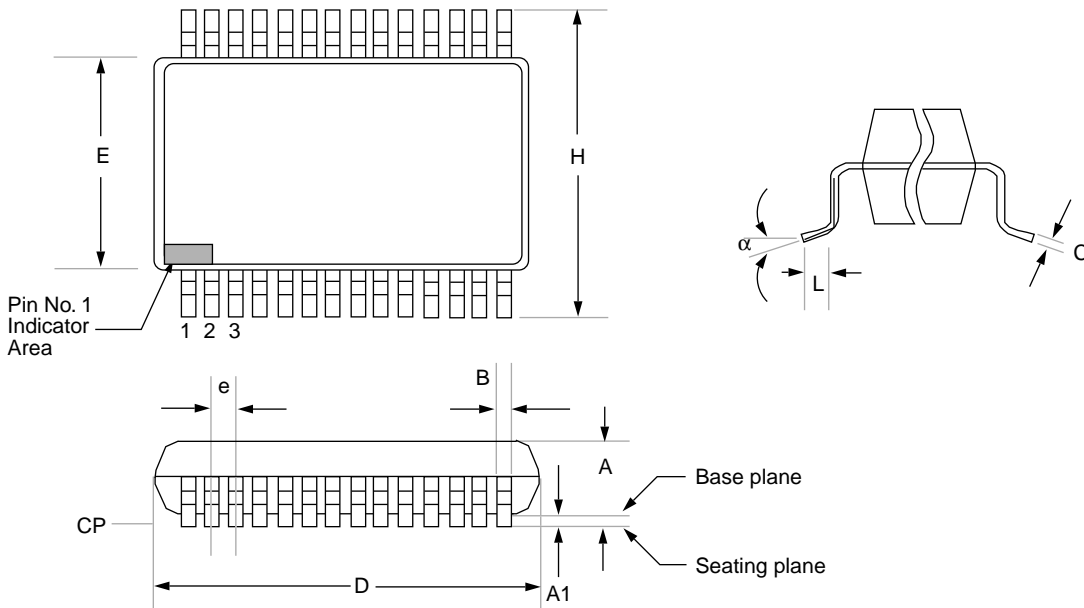
Package Type: 20-Lead Plastic Shrink Small Outline (SS) - 209 mil Body 5.30 mm



Package Group: Plastic SSOP (SS)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	8°		0°	8°	
A	1.730	1.990		0.068	0.078	
A1	0.050	0.210		0.002	0.008	
B	0.250	0.380		0.010	0.015	
C	0.130	0.220		0.005	0.009	
D	7.070	7.330		0.278	0.289	
E	5.200	5.380		0.205	0.212	
e	0.650	0.650	<b>BSC</b>	0.026	0.026	<b>BSC</b>
H	7.650	7.900		0.301	0.311	
L	0.550	0.950		0.022	0.037	
CP	—	0.102		—	0.004	

## Packaging Diagrams and Parameters

Package Type: 28-Lead Plastic Shrink Small Outline (SS) - 209 mil Body 5.30 mm



Package Group: Plastic SSOP (SS)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	8°		0°	8°	
A	1.730	1.990		0.068	0.078	
A1	0.050	0.210		0.002	0.008	
B	0.250	0.380		0.010	0.015	
C	0.130	0.220		0.005	0.009	
D	10.070	10.330		0.396	0.407	
E	5.200	5.380		0.205	0.212	
e	0.650	0.650	<b>BSC</b>	0.026	0.026	<b>BSC</b>
H	7.650	7.900		0.301	0.311	
L	0.550	0.950		0.022	0.037	
CP	—	0.102		—	0.004	

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## Packaging Diagrams and Parameters

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### Plastic Thin Shrink Small Outline (TSSOP) Family

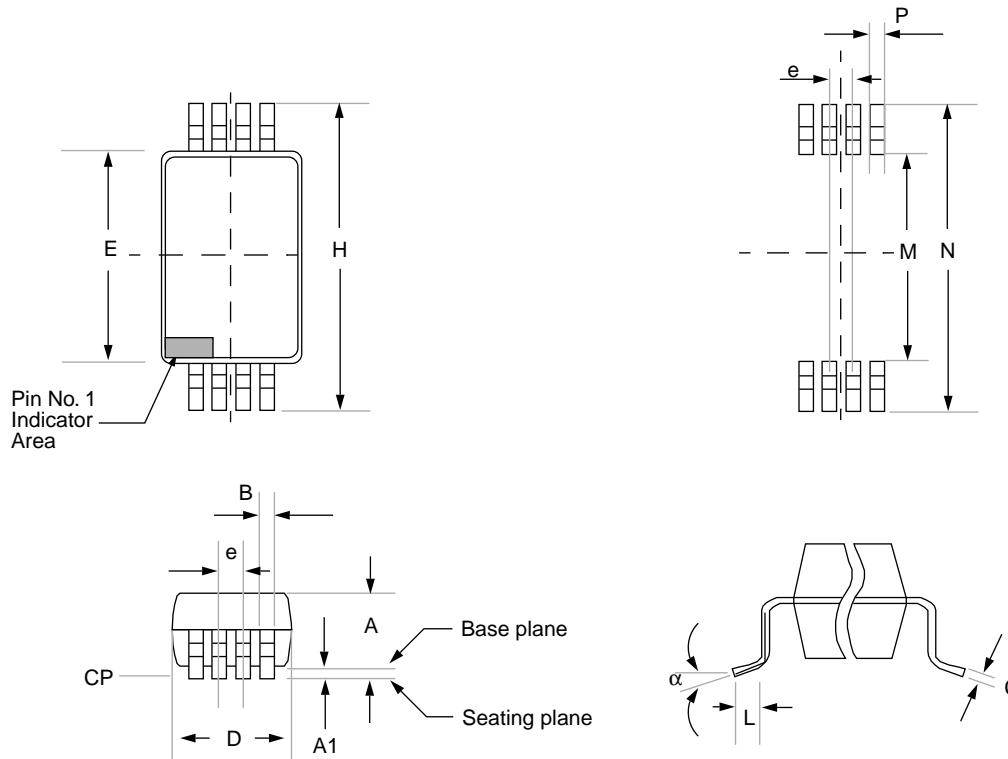
<b>Symbol List for Thin Shrink Small Outline Package Parameters</b>	
<b>Symbol</b>	<b>Description of Parameters</b>
$\alpha$	Angular spacing between min. and max. lead positions measured at the gauge plane
A	Distance between seating plane to highest point of body
A1	Distance between seating plane and base plane
B	Width of terminals
C	Thickness of terminals
D	Largest overall package parameter of length
E	Largest overall package width parameter not including leads
e	Linear spacing of true minimum lead position center line to center line
H	Largest overall package dimension of width
L	Length of terminal for soldering to a substrate
CP	Seating plane coplanarity

**Notes:**

1. Controlling parameter: mm.
2. All packages are gull wing lead form.
3. "D" and "E" are reference datums and do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .015mm per side.
4. The lead width dimension does not include dambar protrusion. Allowable dambar protrusion shall be 0.08mm total in excess of the lead width dimension at maximum material condition. Dambar cannot be located on the lower radius or the foot. Minimum space between protrusions and an adjacent lead to be 0.14mm.
5. A .25mm visual index feature must be located within the shaded area to indicate pin 1 position.
6. Terminal numbers are shown for reference.

## Packaging Diagrams and Parameters

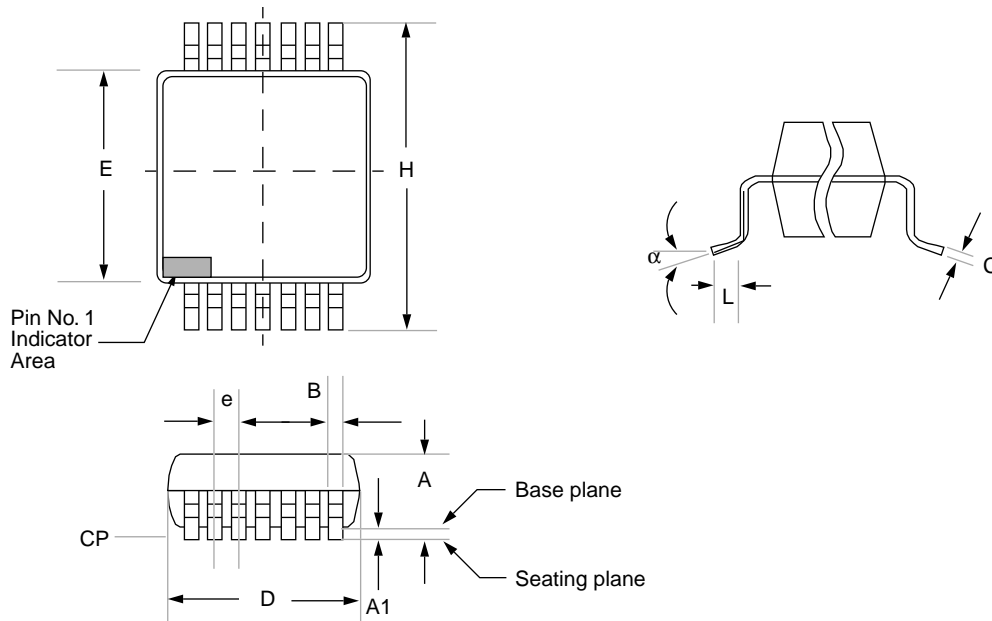
Package Type: 8-Lead Thin Shrink Small Outline (ST) - 4.4 mm



Package Group: Plastic TSSOP (ST)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	8°		0°	8°	
A	—	1.1000		—	0.0433	
A1	0.0500	0.1500		0.0020	0.0060	
B	0.1900	0.3000		0.0075	0.0118	
C	0.0900	0.2000		0.0035	0.0079	
D	2.9000	3.1000		0.1140	0.1220	
E	4.3000	4.5000		0.1690	0.1770	
e	0.6500	0.6500	<b>BSC</b>	0.0256	0.0256	<b>BSC</b>
H	6.2500	6.5000		0.2460	0.2560	
L	0.5000	0.7000		0.0200	0.0280	
CP	—	0.1020		—	0.0040	
M	5.0800	5.0800	<b>Typical</b>	0.2000	0.2000	<b>Typical</b>
N	7.5180	7.5180	<b>Typical</b>	0.2960	0.2960	<b>Typical</b>
P	0.4200	0.4200	<b>Typical</b>	0.0165	0.0165	<b>Typical</b>

## Packaging Diagrams and Parameters

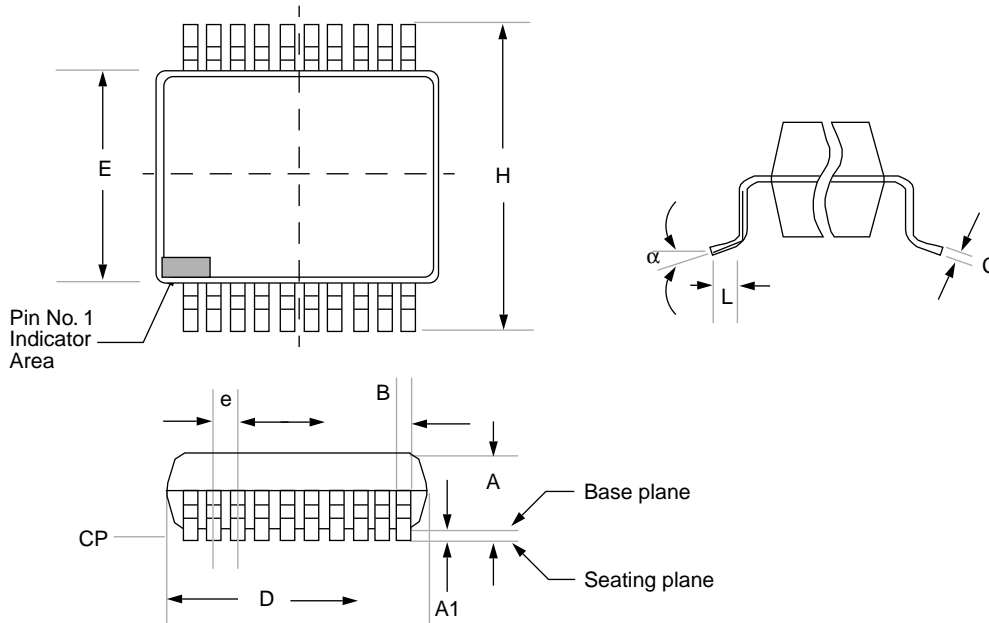
Package Type: 14-Lead Thin Shrink Small Outline (ST) - 4.4 mm



Package Group: Plastic TSSOP (ST)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	8°		0°	8°	
A	—	1.1000		—	0.0433	
A1	0.0500	0.1500		0.0020	0.0060	
B	0.1900	0.3000		0.0075	0.0118	
C	0.0900	0.2000		0.0035	0.0079	
D	4.9000	5.1000		0.1930	0.2010	
E	4.3000	4.5000		0.1690	0.1770	
e	0.6500	0.6500	<b>BSC</b>	0.0256	0.0256	<b>BSC</b>
H	6.2500	6.5000		0.2460	0.2560	
L	0.5000	0.7000		0.0200	0.0280	
CP	—	0.1020		—	0.0040	

## Packaging Diagrams and Parameters

Package Type: 20-Lead Thin Shrink Small Outline (ST) - 4.4 mm



Package Group: Plastic TSSOP (ST)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	8°		0°	8°	
A	—	1.1000		—	0.0433	
A1	0.0500	0.1500		0.0020	0.0060	
B	0.1900	0.3000		0.0075	0.0118	
C	0.0900	0.2000		0.0035	0.0079	
D	6.4000	6.6000		0.2520	0.2600	
E	4.3000	4.5000		0.1690	0.1770	
e	0.6500	0.6500	<b>BSC</b>	0.0256	0.0256	<b>BSC</b>
H	6.2500	6.5000		0.2460	0.2560	
L	0.5000	0.7000		0.0200	0.0280	
CP	—	0.1020		—	0.0040	

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## Packaging Diagrams and Parameters

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### Plastic Thin Small Outline (TSOP) and Very Small Outline (VSOP) Families

Symbol List for Thin Small Outline Package Parameters	
Symbol	Description of Parameters
$\alpha$	Angular spacing between min. and max. lead positions measured at the gauge plane
A	Distance between seating plane to highest point of body
A1	Distance between seating plane and base plane
B	Width of terminals
C	Thickness of terminals
D	Largest overall package parameter of length
E	Largest overall package width parameter not including leads
e	Linear spacing of true minimum lead position center line to center line
H	Largest overall package dimension of width
L	Length of terminal for soldering to a substrate
CP	Seating plane coplanarity

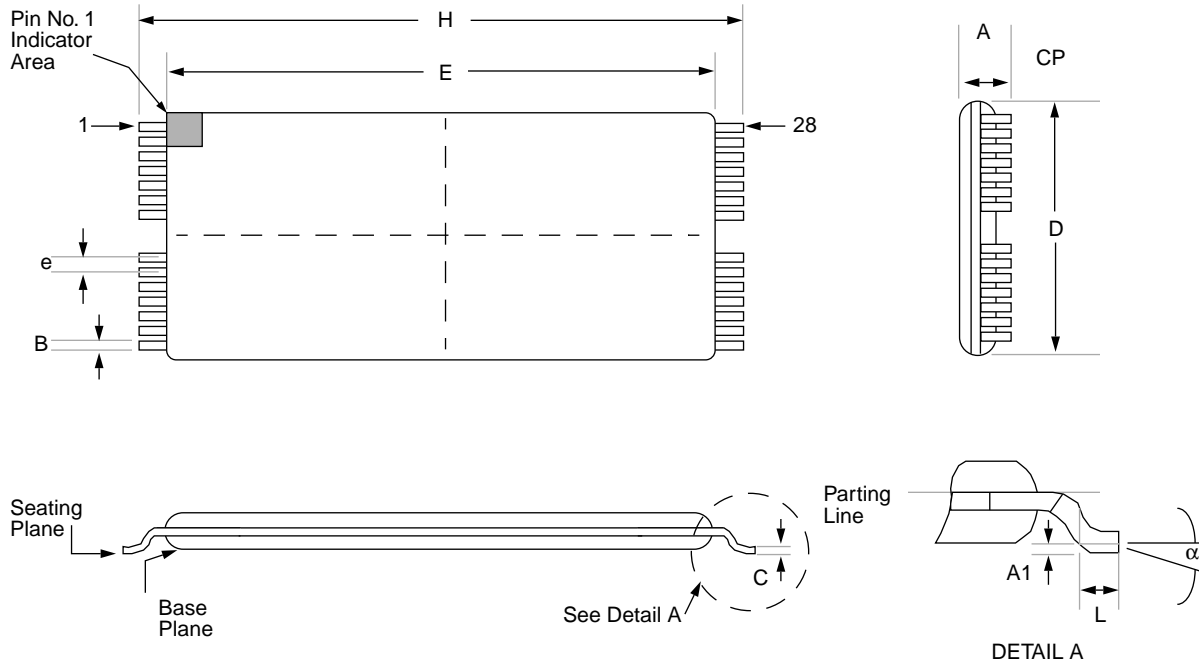
**Notes:**

1. Controlling parameter: inches.
2. All packages are gull wing lead form.
3. "D" and "E" are BSC datums and do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005 per side.
4. A visual index feature must be located within the crosshatched area to indicate pin 1 position.
5. Terminal numbers are shown for reference.



## Packaging Diagrams and Parameters

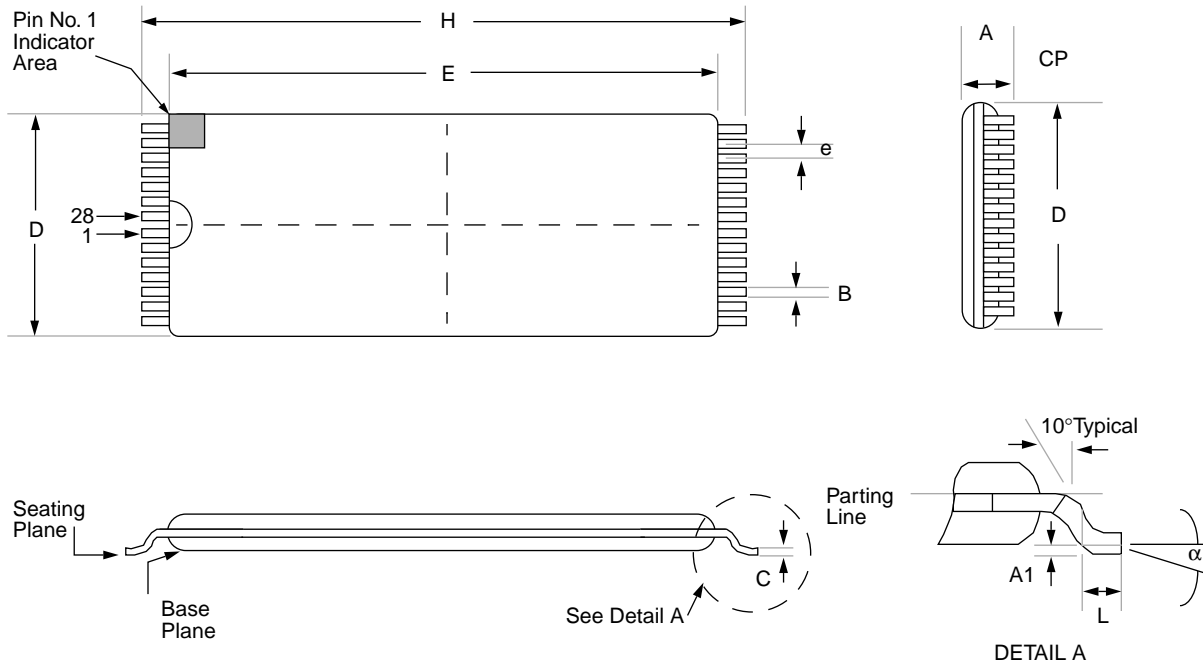
Package Type: 28-Lead Plastic Thin Small Outline (TS) - 8 x 20 mm



Package Group: Plastic TSOP (TS)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0	8°		0	8°	
A	—	1.190		—	0.047	
A1	0.050	0.150		0.002	0.006	
B	0.150	0.250		0.006	0.010	
C	0.100	0.200		0.004	0.008	
D	7.800	8.200		0.307	0.323	
E	18.290	18.490		0.720	0.728	
e	0.510	—	<b>BSC</b>	0.020	—	<b>BSC</b>
H	19.810	20.190		0.780	0.795	
L	0.410	0.610		0.016	0.024	
CP	—	0.102		—	0.004	

## Packaging Diagrams and Parameters

Package Type: 28-Lead Plastic Very Small Outline (VS) - 8 x 13.4 mm



Package Group: Plastic VSOP (VS)						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0	8°		0	8°	
A	1.000	1.250		0.039	0.049	
A1	0.000	0.200		0.000	0.008	
B	0.150	0.300		0.006	0.012	
C	0.130	0.220		0.005	0.009	
D	7.900	8.100		0.311	0.319	
E	11.700	11.900		0.460	0.468	
e	0.550	—	<b>BSC</b>	0.022	—	<b>BSC</b>
H	13.100	13.700		0.516	0.539	
L	0.300	0.700		0.012	0.027	
CP	—	0.102		—	0.004	

# Packaging Diagrams and Parameters

## Plastic Quad Flatpack (QFP) Family

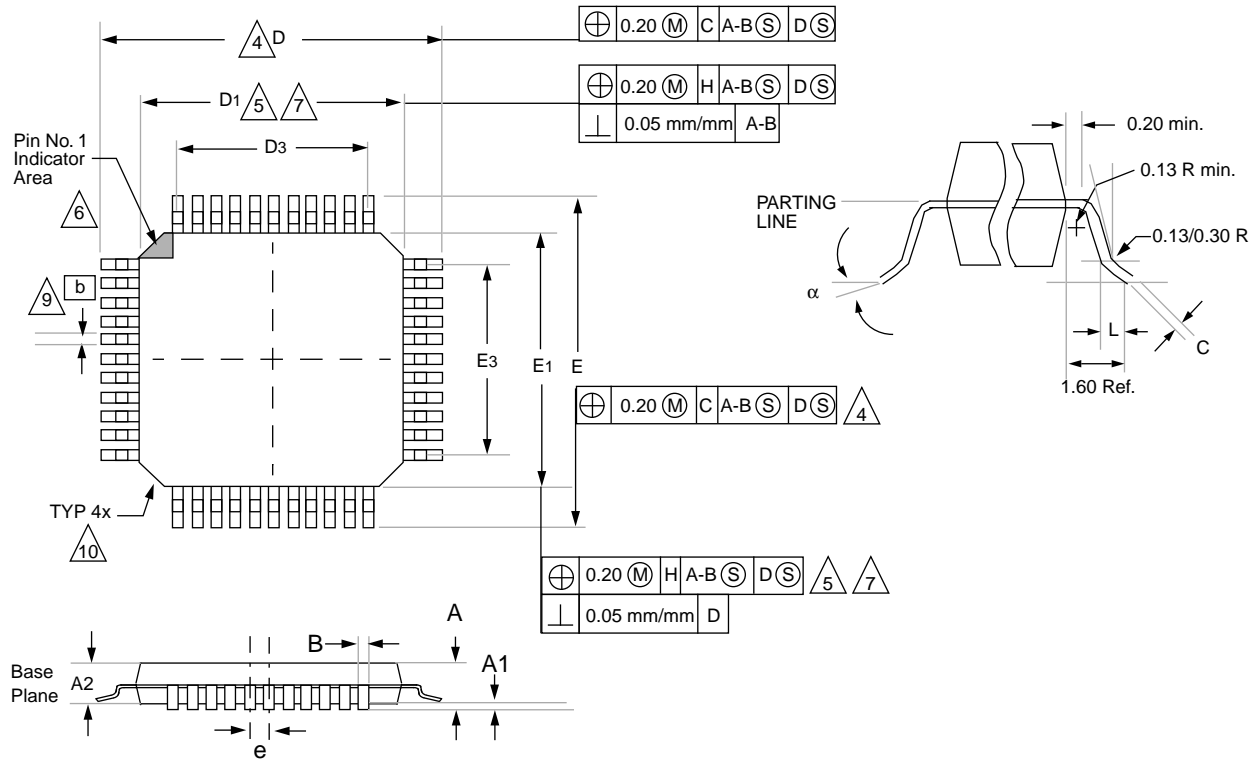
Symbol List for Metric Plastic Quad Flatpack Package Parameters	
Symbol	Description of Parameters
$\alpha$	Angular spacing between min. and max. lead positions measured at the gauge plane
A	Distance between seating plane to highest point of body
A1	Distance between seating plane and base plane
A2	Distance from base plane to highest point of body
b	Width of terminals
C	Thickness of terminals
D1/E1	Largest overall package parameter including leads
D/E	Largest overall package parameter including leads
D3/E3	Center of end lead to center of end lead
e	Linear spacing of true minimum lead position center line to center line
L	Length of terminal for soldering to a substrate
CP	Seating plane coplanarity

**Notes:**

6. All dimensions and tolerances conform to ANSI Y14.5M-1982.
7. Datum plane **-H-** is located at bottom of mold parting line and coincident with bottom of lead, where lead exits body.
8. Datums **A-B** and **-D-** to be determined at datum plane **-H-**.
9. To be determined at seating plane **-C-**.
10. Dimension D1 and E1 do not include mold protrusion. Allowable mold protrusion is 0.25mm per side. Dimensions D1 and E1 do not include mold mismatch and are determined at datum plane **-H-**.
11. Details of pin 1 identifier are optional but must be located within the zone indicated.
12. These dimensions to be determined at datum plane **-H-**.
13. All dimensions are in millimeters.
14. Dimension b does not include Dambar protrusion. Allowable Dambar protrusion shall be 0.08mm total in excess of the b dimension at maximum material condition. Dambar cannot be located on the lower radius or the lead foot.
15. Exact shape of this feature is optional.
16. Controlling parameter: millimeters.
17. All packages are gull wing lead form.

## Packaging Diagrams and Parameters

**Package Type: 44-Lead Plastic Quad Flatpack (PQ) - 10x10x2 mm Body 1.6/0.15 mm Lead Form**



Package Group: Plastic MQFP						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	7°		0°	7°	
A	2.000	2.350		0.078	0.093	
A1	0.050	0.250		0.002	0.010	
A2	1.950	2.100		0.768	0.083	
b	0.300	0.450	Typical	0.011	0.018	Typical
C	0.150	0.180		0.006	0.007	
D	12.950	13.450		0.510	0.530	
D1	9.900	10.100		0.390	0.398	
D3	8.000	8.000	BSC	0.315	0.315	BSC
E	12.950	13.450		0.510	0.530	
E1	9.900	10.100		0.390	0.398	
E3	8.000	8.000	BSC	0.315	0.315	BSC
e	0.800	0.800		0.031	0.032	
L	0.730	1.030		0.028	0.041	
CP	0.102	—		0.004	—	

# Packaging Diagrams and Parameters

## Thin Plastic Quad Flatpack (TQFP) Family

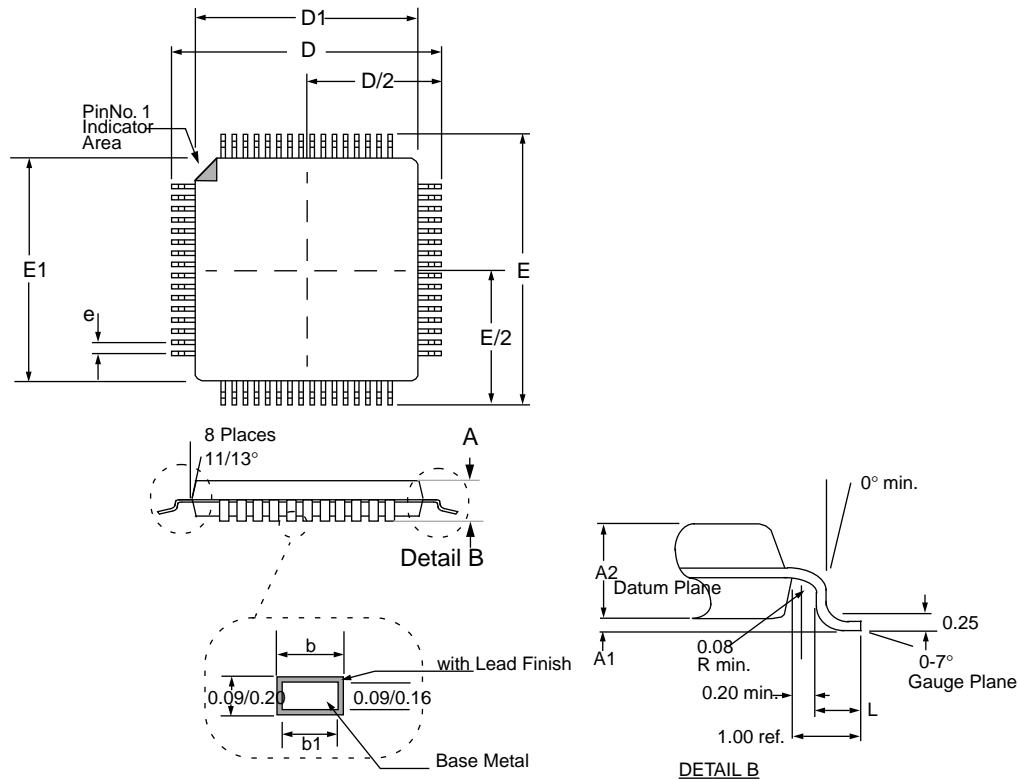
Symbol List for Metric Plastic Quad Flatpack Package Parameters	
Symbol	Description of Parameters
$\alpha$	Angular spacing between min. and max. lead positions measured at the gauge plane
A	Distance between seating plane to highest point of body
A1	Distance between seating plane and base plane
A2	Distance from base plane to highest point of body
b	Width of terminals
C	Thickness of terminals
D1/E1	Largest overall package parameter including leads
D/E	Largest overall package parameter including leads
D3/E3	Center of end lead to center of end lead
e	Linear spacing of true minimum lead position center line to center line
L	Length of terminal for soldering to a substrate
CP	Seating plane coplanarity

**Notes:**

1. All dimensions and tolerances conform to ANSI Y14.5M-1982.
2. Datum plane **-H-** is located at bottom of mold parting line and coincident with bottom of lead, where lead exits body.
3. Datums **A-B** and **-D-** to be determined at datum plane **-H-**.
4. To be determined at seating plane **-C-**.
5. Dimension D1 and E1 do not include mold protrusion. Allowable mold protrusion is 0.25mm per side. Dimensions D1 and E1 do not include mold mismatch and are determined at datum plane **-H-**.
6. Details of pin 1 identifier are optional but must be located within the zone indicated.
7. These dimensions to be determined at datum plane **-H-**.
8. All dimensions are in millimeters.
9. Dimension b does not include Dambar protrusion. Allowable Dambar protrusion shall be 0.08mm total in excess of the b dimension at maximum material condition. Dambar cannot be located on the lower radius or the lead foot.
10. Exact shape of this feature is optional.
11. Controlling parameter: millimeters.
12. All packages are gull wing lead form.

## Packaging Diagrams and Parameters

Package Type: 44-Lead Thin Plastic Quad Flatpack (PT/TQ) - 10x10x1 mm Body 1.0/0.10 mm Lead Form



Package Group: Plastic TQFP						
Symbol	Millimeters			Inches		
	Min	Max	Notes	Min	Max	Notes
$\alpha$	0°	7°		0°	7°	
A	—	1.200		—	0.047	
A1	0.050	0.150		0.002	0.006	
A2	0.950	1.050		0.037	0.041	
b	0.300	0.450		0.012	0.018	
b1	0.300	0.400		0.012	0.016	
D	12.0	12.0	<b>BSC</b>	0.472	0.0472	<b>BSC</b>
D1	10.0	10.0	<b>BSC</b>	0.394	0.394	<b>BSC</b>
E	12.0	12.0	<b>BSC</b>	0.472	0.472	<b>BSC</b>
E1	10.0	10.0	<b>BSC</b>	0.394	0.394	<b>BSC</b>
e	0.8	0.8	<b>BSC</b>	0.031	0.031	<b>BSC</b>
L	0.450	0.750		0.018	0.030	



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