SECTION 11
PACKAGING

PACKAGING

Commercial/Industrial Outlines and Parameters

PART NUMBER SUFFIX DESIGNATIONS:

XXXXXXXXXX **-XX** **X** **/XX** **XXX**

Device Type | **Options** | **Speed or Frequency** | **Temperature** | **Package** | **Pattern**

Examples:

24LC65-I/SN
PIC16C54-RCI/SO

Memory Products

Device Type
C = CMOS
FC = 5.0, 1 MHz
LC = Low Power CMOS
AA = 1.8V
LV = Low Voltage EPROM
HC = High Speed EPROM
LCS = Low Power Security

Options
F = twc = 200 µs (28CXX devices)
X = Rotated pinout (93LCXX devices)
T = Tape and Reel

Speed (Parallel Devices Only)
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

Temperature
Blank = 0°C to +70°C
I = -40°C to +85°C
E = -40°C to +125°C

Package
L = Plastic Leaded Chip Carrier (PLCC)
P = Plastic Dual In-Line Package
S = Die in Waffle Pack
W = Die in Wafer Form
MR = 8-Contact Chip-On-Board 35 mm Tape
MT = 8-Contact Singulated Chip-On-Board
OT = 5-Lead Small Outline Transistor (SOT)
SL = 14/16-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 – 5.3 mm
ST = Thin Shrink Small Outline Package – 4.4 mm
TO = 3-Lead Plastic Transistor Outline
TS = Thin Small Outline (TSOP) – 8mm x 20mm
TT = 3-Lead Plastic Small Outline Transistor
VS = Very Small Outline – 8mm x 13.4mm
WF = Sawed Wafer on Frame

Pattern
QTP, SQTP, ROM Code or Special Requirements

Microcontroller Products

Device Type
C = CMOS
LC = Low Power CMOS
CR = CMOS ROM
LCR = Low Power CMOS ROM
LV = Low Voltage
F = Flash Program Memory
FR = Flex ROM

Options
T = Tape and Reel

Crystal Frequency Designator
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

Temperature
Blank = 0°C to +70°C
I = -40°C to +85°C
E = -40°C to +125°C

Package
L = Plastic Leaded Chip Carrier (PLCC)
P = Plastic Dual In-Line Package (PDIP)
S = Die in Waffle Pack
W = Die in Wafer Form
CL = 68-Lead Ceramic Quad (CERQUAD) with Window
JW = Ceramic Dual In-Line Package with Window
PQ = Plastic Metric Quad Flatpack (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) – 5.3 mm
TS = Thin Small Outline (TSOP) – 8mm x 20mm

Pattern
QTP, SQTP, ROM Code or Special Requirements

Packaging Diagrams and Parameters

CERAMIC SIDE BRAZED DUAL IN-LINE FAMILY

CERAMIC DUAL IN-LINE (CERDIP) FAMILY

CERAMIC CHIP CARRIER FAMILY

SMALL OUTLINE TRANSISTOR

PLASTIC DUAL IN-LINE (PDIP) FAMILY

PLASTIC LEADED CHIP CARRIER (PLCC) FAMILY

Packaging Diagrams and Parameters

PLASTIC SMALL OUTLINE (SOIC) FAMILY

PLASTIC SHRINK SMALL OUTLINE (SSOP) FAMILY

PLASTIC THIN SHRINK SMALL OUTLINE (TSSOP) FAMILY

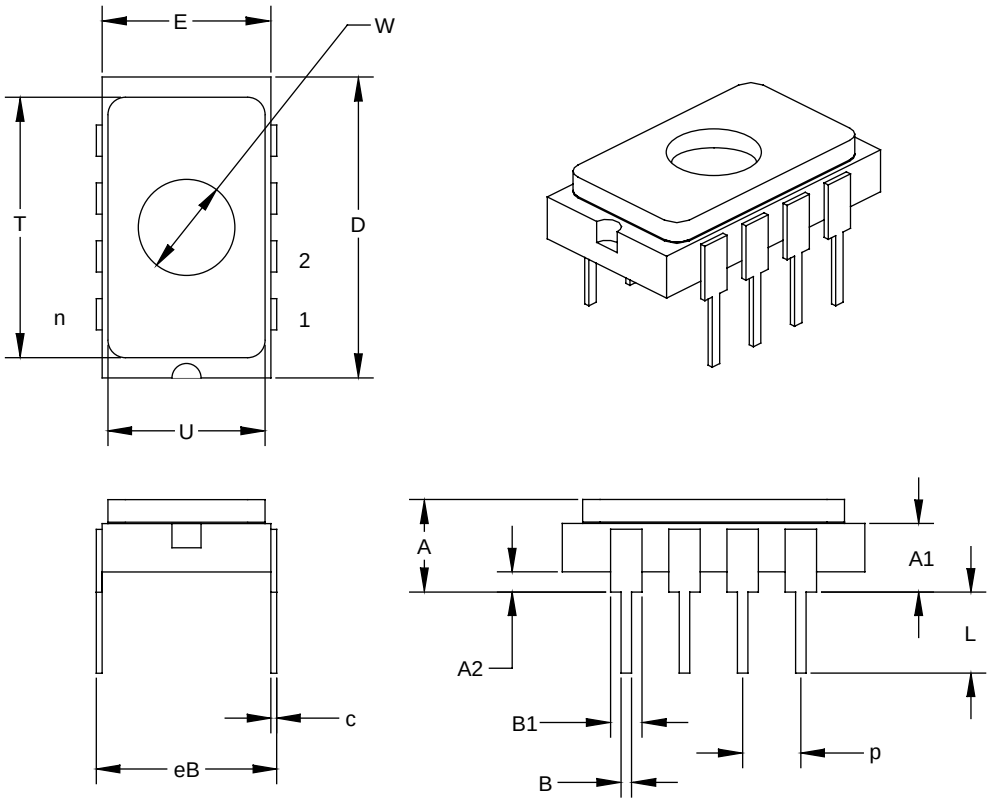
PLASTIC THIN SMALL OUTLINE (TSOP) AND VERY SMALL OUTLINE (VSOP) FAMILY

PLASTIC QUAD FLATPACK (QFP) FAMILY

PLASTIC THIN QUAD FLATPACK (TQFP) FAMILY

Packaging Diagrams and Parameters

Package Type: K04-083 8-Lead Ceramic Side Brazed Dual In-line with Window (JW) – 300 mil



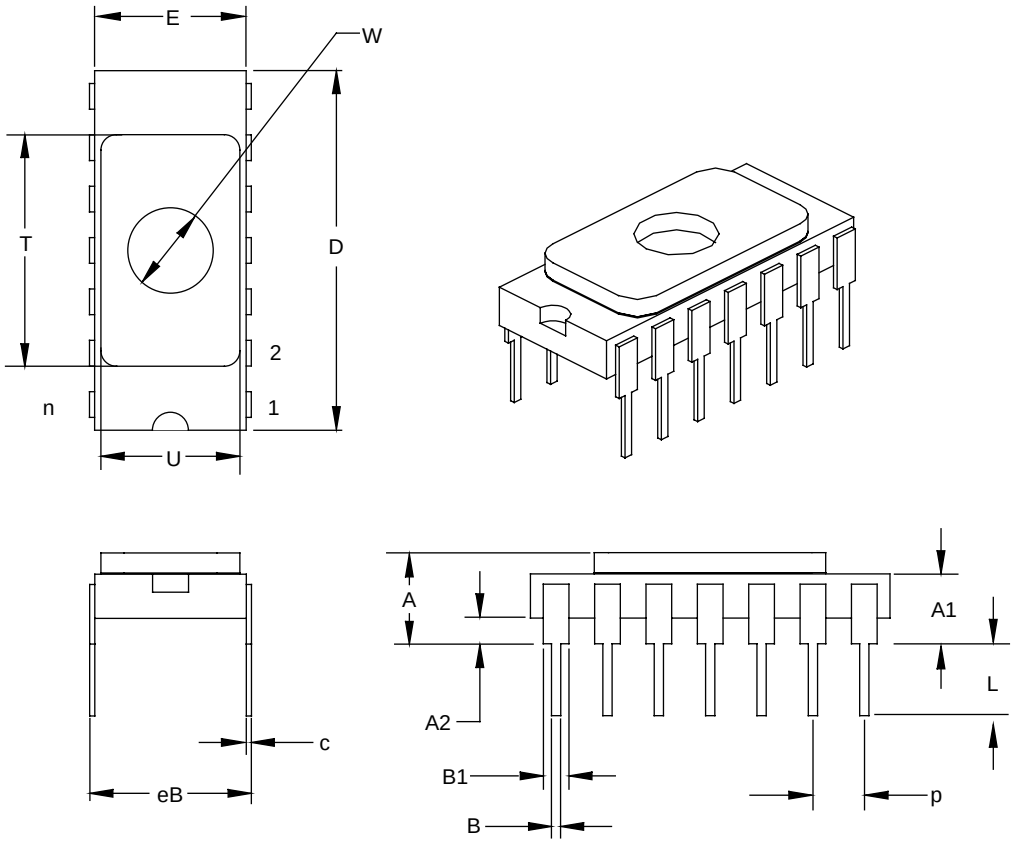
Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		8			8	
Pitch	p	0.098	0.100	0.102	2.49	2.54	2.59
Lower Lead Width	B	0.016	0.018	0.020	0.41	0.46	0.51
Upper Lead Width	B1	0.050	0.055	0.060	1.27	1.40	1.52
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Top to Seating Plane	A	0.145	0.165	0.185	3.68	4.19	4.70
Top of Body to Seating Plane	A1	0.103	0.123	0.143	2.62	3.12	3.63
Base to Seating Plane	A2	0.025	0.035	0.045	0.64	0.89	1.14
Tip to Seating Plane	L	0.130	0.140	0.150	3.30	3.56	3.81
Package Length	D	0.510	0.520	0.530	12.95	13.21	13.46
Package Width	E	0.280	0.290	0.300	7.11	7.37	7.62
Overall Row Spacing	eB	0.310	0.338	0.365	7.87	8.57	9.27
Window Diameter	W	0.161	0.166	0.171	4.09	4.22	4.34
Lid Length	T	0.440	0.450	0.460	11.18	11.43	11.68
Lid Width	U	0.260	0.270	0.280	6.60	6.86	7.11

* Controlling Parameter.

JEDEC equivalent: MS-015 AA

Packaging Diagrams and Parameters

Package Type: K04-107 14-Lead Ceramic Side Brazed Dual In-line with Window (JW) – 300 mil



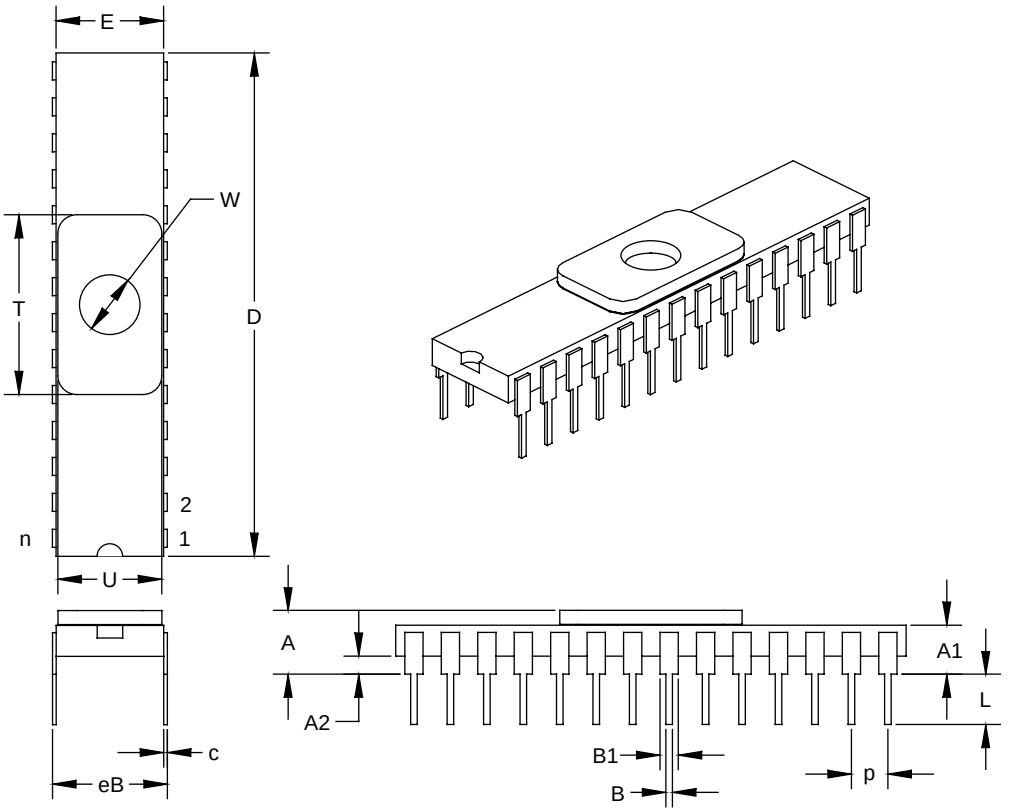
Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		14			14	
Pitch	p	0.098	0.100	0.102	2.49	2.54	2.59
Lower Lead Width	B	0.016	0.018	0.020	0.41	0.46	0.51
Upper Lead Width	B1	0.052	0.054	0.056	1.32	1.37	1.42
Lead Thickness	c	0.009	0.010	0.012	0.23	0.25	0.30
Top to Seating Plane	A	0.142	0.162	0.182	3.61	4.11	4.62
Top of Body to Seating Plane	A1	0.100	0.120	0.140	2.54	3.05	3.56
Base to Seating Plane	A2	0.025	0.035	0.045	0.64	0.89	1.14
Tip to Seating Plane	L	0.130	0.140	0.150	3.30	3.56	3.81
Package Length	D	0.693	0.700	0.707	17.60	17.78	17.96
Package Width	E	0.287	0.295	0.303	7.29	7.49	7.70
Overall Row Spacing	eB	0.300	0.310	0.320	7.62	7.87	8.13
Window Diameter	W	0.161	0.166	0.171	4.09	4.22	4.34
Lid Length	T	0.440	0.450	0.460	11.18	11.43	11.68
Lid Width	U	0.260	0.270	0.280	6.60	6.86	7.11

* Controlling Parameter.

JEDEC equivalent: MS-015 AB

Packaging Diagrams and Parameters

Package Type: K04-084 28-Lead Ceramic Side Brazed Dual In-line with Window (JW) – 300 mil



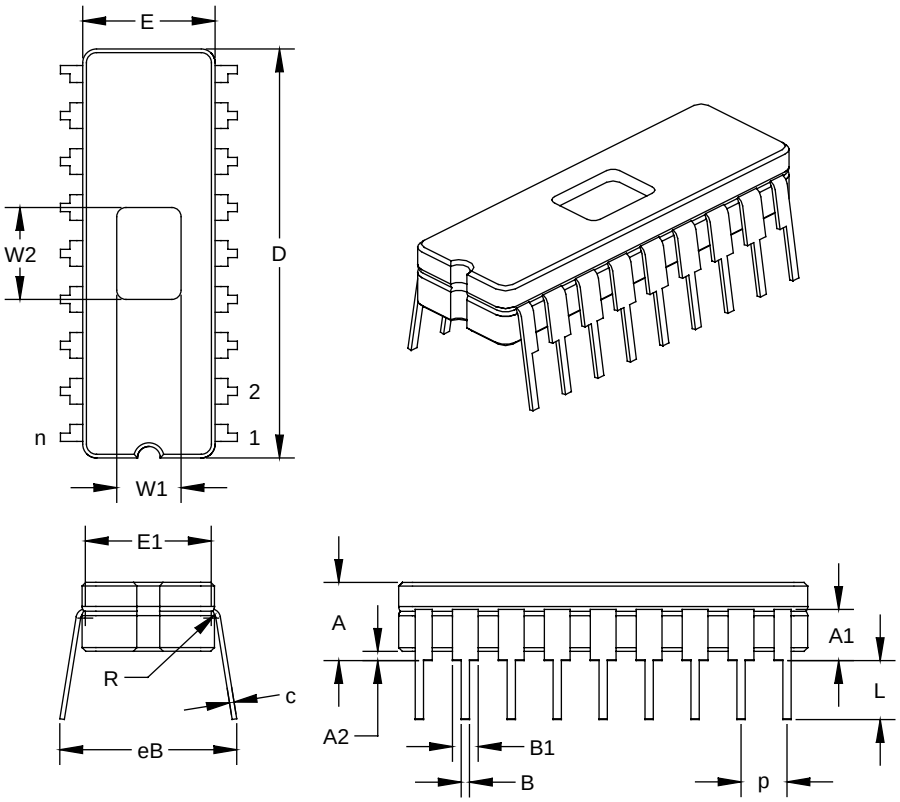
Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		28			28	
Pitch	p	0.098	0.100	0.102	2.49	2.54	2.59
Lower Lead Width	B	0.016	0.018	0.020	0.41	0.46	0.51
Upper Lead Width	B1	0.048	0.050	0.052	1.22	1.27	1.32
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Top to Seating Plane	A	0.155	0.177	0.198	3.94	4.48	5.03
Top of Body to Seating Plane	A1	0.115	0.135	0.155	2.91	3.42	3.92
Base to Seating Plane	A2	0.040	0.050	0.060	1.02	1.27	1.52
Tip to Seating Plane	L	0.130	0.140	0.150	3.30	3.56	3.81
Package Length	D	1.386	1.400	1.414	35.20	35.56	35.92
Package Width	E	0.280	0.290	0.300	7.11	7.37	7.62
Overall Row Spacing	eB	0.310	0.316	0.322	7.87	8.03	8.18
Window Diameter	W	0.161	0.166	0.171	4.09	4.22	4.34
Lid Length	T	0.490	0.500	0.510	12.45	12.70	12.95
Lid Width	U	0.275	0.285	0.295	6.99	7.24	7.49

* Controlling Parameter.

JEDEC equivalent: MS-015 AH

Packaging Diagrams and Parameters

Package Type: K04-010 18-Lead Ceramic Dual In-line with Window (JW) – 300 mil



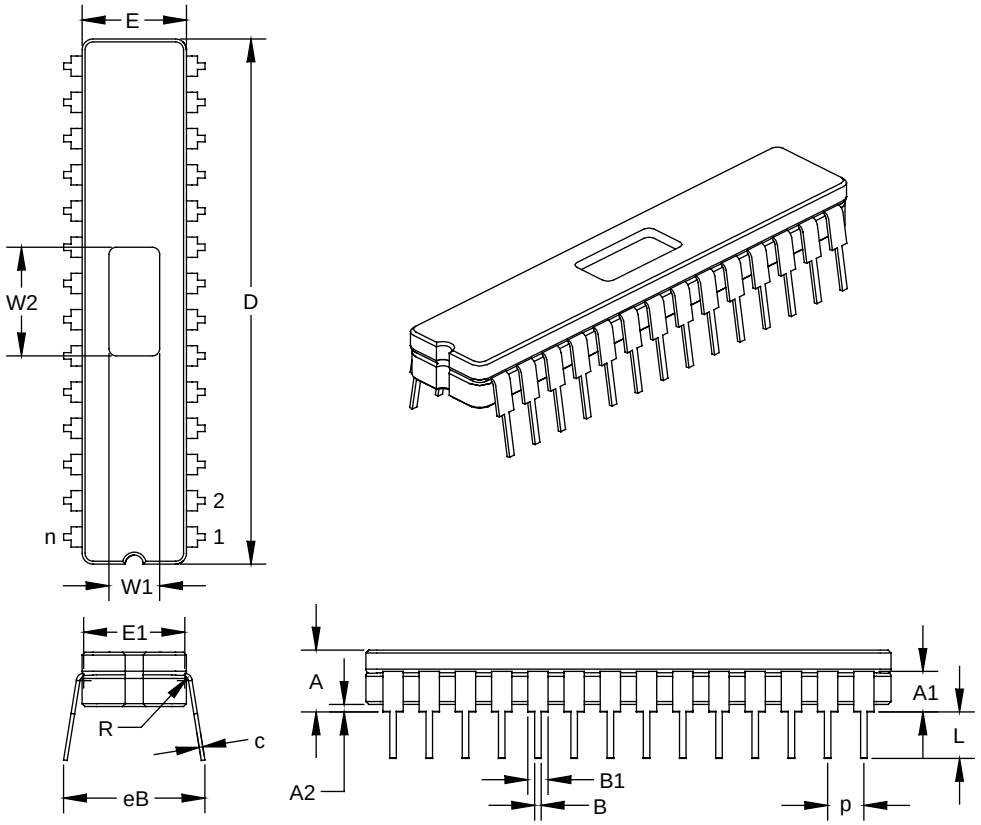
Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		18			18	
Pitch	p	0.098	0.100	0.102	2.49	2.54	2.59
Lower Lead Width	B	0.016	0.019	0.021	0.41	0.47	0.53
Upper Lead Width	B1	0.050	0.055	0.060	1.27	1.40	1.52
Shoulder Radius	R	0.010	0.013	0.015	0.25	0.32	0.38
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Top to Seating Plane	A	0.175	0.183	0.190	4.45	4.64	4.83
Top of Lead to Seating Plane	A1	0.091	0.111	0.131	2.31	2.82	3.33
Base to Seating Plane	A2	0.015	0.023	0.030	0.00	0.57	0.76
Tip to Seating Plane	L	0.125	0.138	0.150	3.18	3.49	3.81
Package Length	D	0.880	0.900	0.920	22.35	22.86	23.37
Package Width	E	0.285	0.298	0.310	7.24	7.56	7.87
Radius to Radius Width	E1	0.255	0.270	0.285	6.48	6.86	7.24
Overall Row Spacing	eB	0.345	0.385	0.425	8.76	9.78	10.80
Window Width	W1	0.130	0.140	0.150	0.13	0.14	0.15
Window Length	W2	0.190	0.200	0.210	0.19	0.2	0.21

* Controlling Parameter.

JEDEC equivalent: MO-036 AE

Packaging Diagrams and Parameters

Package Type: K04-080 28-Lead Ceramic Dual In-line with Window (JW) – 300 mil



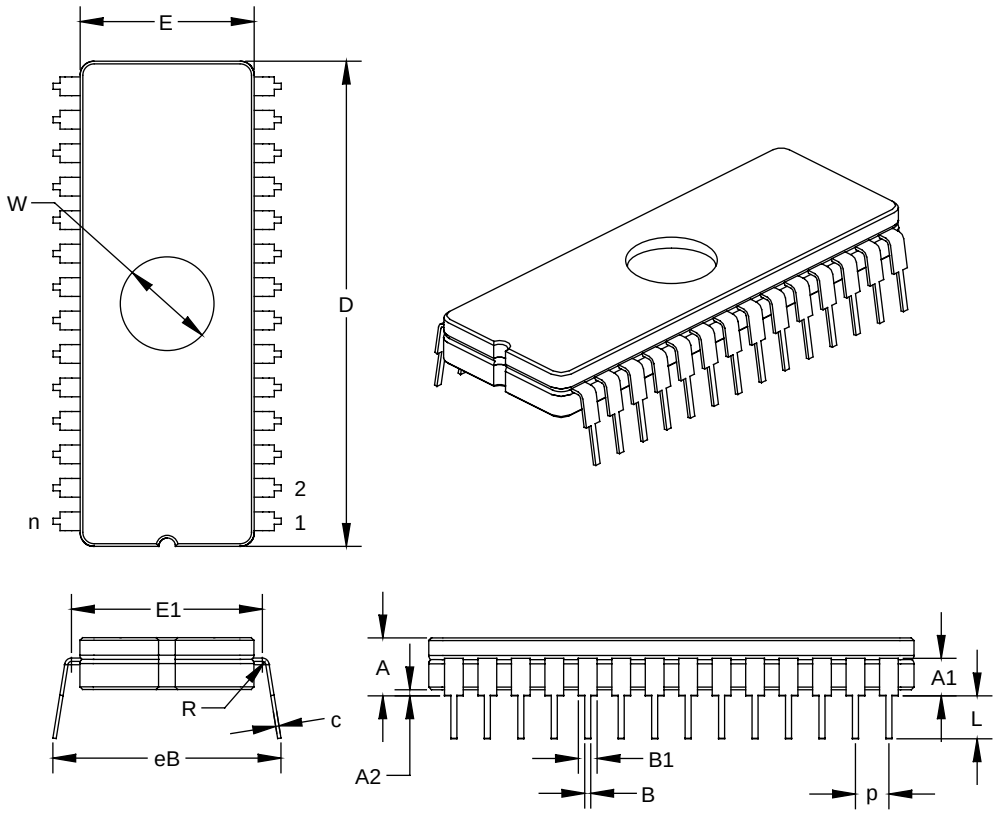
Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		28			28	
Pitch	p	0.098	0.100	0.102	2.49	2.54	2.59
Lower Lead Width	B	0.016	0.019	0.021	0.41	0.47	0.53
Upper Lead Width	B1	0.050	0.058	0.065	1.27	1.46	1.65
Shoulder Radius	R	0.010	0.013	0.015	0.25	0.32	0.38
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Top to Seating Plane	A	0.170	0.183	0.195	4.32	4.64	4.95
Top of Lead to Seating Plane	A1	0.107	0.125	0.143	2.72	3.18	3.63
Base to Seating Plane	A2	0.015	0.023	0.030	0.00	0.57	0.76
Tip to Seating Plane	L	0.135	0.140	0.145	3.43	3.56	3.68
Package Length	D	1.430	1.458	1.485	36.32	37.02	37.72
Package Width	E	0.285	0.290	0.295	7.24	7.37	7.49
Radius to Radius Width	E1	0.255	0.270	0.285	6.48	6.86	7.24
Overall Row Spacing	eB	0.345	0.385	0.425	8.76	9.78	10.80
Window Width	W1	0.130	0.140	0.150	0.13	0.14	0.15
Window Length	W2	0.290	0.300	0.310	0.29	0.3	0.31

* Controlling Parameter.

JEDEC equivalent: MO-058 AB

Packaging Diagrams and Parameters

Package Type: K04-013 28-Lead Ceramic Dual In-line with Window (JW) – 600 mil



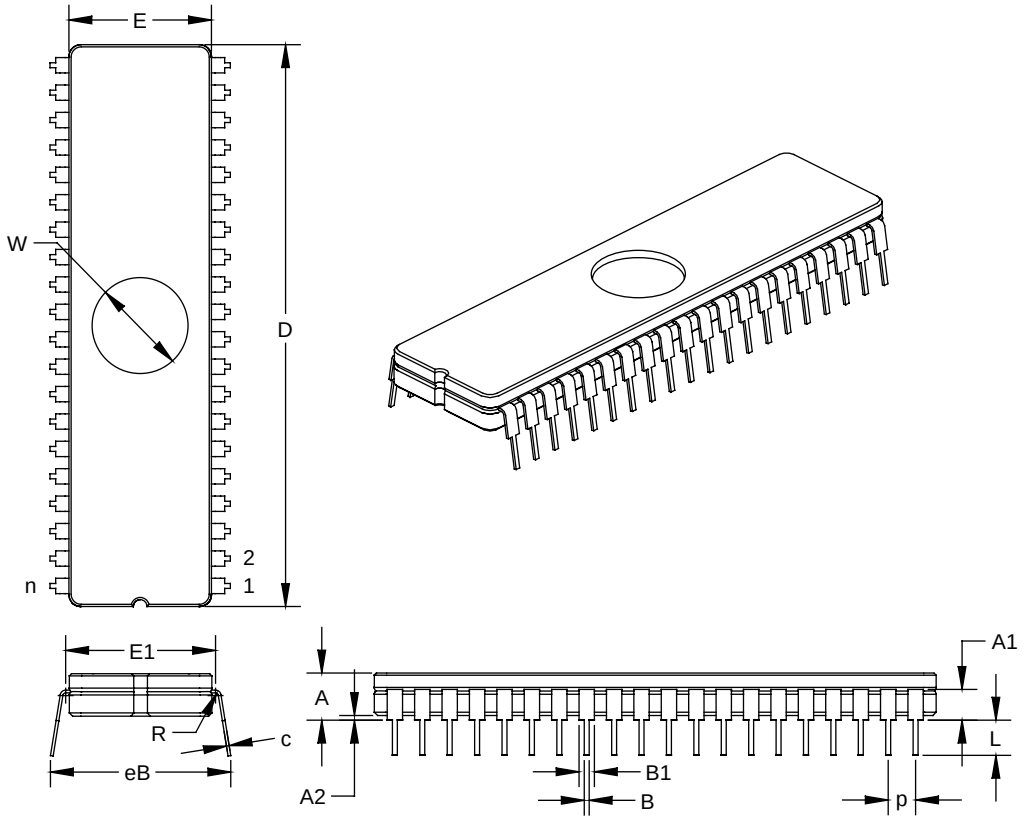
Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.600			15.24	
Number of Pins	n		28			28	
Pitch	p	0.098	0.100	0.102	2.49	2.54	2.59
Lower Lead Width	B	0.016	0.019	0.021	0.41	0.47	0.53
Upper Lead Width	B1	0.050	0.058	0.065	1.27	1.46	1.65
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Top to Seating Plane	A	0.170	0.185	0.200	4.32	4.70	5.08
Top of Lead to Seating Plane	A1	0.110	0.128	0.146	2.78	3.24	3.70
Base to Seating Plane	A2	0.015	0.035	0.055	0.38	0.89	1.40
Tip to Seating Plane	L	0.125	0.138	0.150	3.18	3.49	3.81
Package Length	D	1.430	1.460	1.490	36.32	37.08	37.85
Package Width	E	0.514	0.520	0.526	13.06	13.21	13.36
Radius to Radius Width	E1	0.560	0.580	0.600	14.22	14.73	15.24
Overall Row Spacing	eB	0.610	0.660	0.710	15.49	16.76	18.03
Window Diameter	W	0.270	0.280	0.290	6.86	7.11	7.37

* Controlling Parameter.

JEDEC equivalent: MO-103 AB

Packaging Diagrams and Parameters

Package Type: K04-014 40-Lead Ceramic Dual In-line with Window (JW) – 600 mil



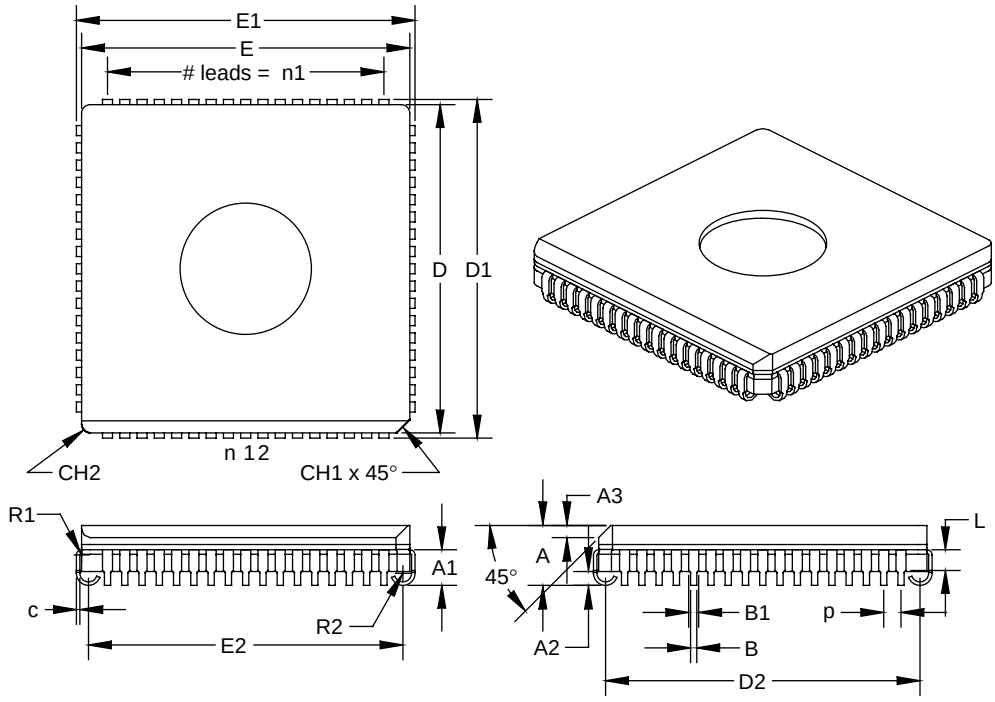
Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.600			15.24	
Number of Pins	n		40			40	
Pitch	p	0.098	0.100	0.102	2.49	2.54	2.59
Lower Lead Width	B	0.016	0.020	0.023	0.41	0.50	0.58
Upper Lead Width	B1	0.050	0.053	0.055	1.27	1.33	1.40
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.011	0.014	0.20	0.28	0.36
Top to Seating Plane	A	0.190	0.205	0.220	4.83	5.21	5.59
Top of Lead to Seating Plane	A1	0.117	0.135	0.153	2.97	3.43	3.89
Base to Seating Plane	A2	0.015	0.035	0.055	0.38	0.89	1.40
Tip to Seating Plane	L	0.135	0.140	0.145	3.43	3.56	3.68
Package Length	D	2.040	2.050	2.060	51.82	52.07	52.32
Package Width	E	0.514	0.520	0.526	13.06	13.21	13.36
Radius to Radius Width	E1	0.560	0.580	0.600	14.22	14.73	15.24
Overall Row Spacing	eB	0.610	0.660	0.710	15.49	16.76	18.03
Window Diameter	W	0.340	0.350	0.360	8.64	8.89	9.14

* Controlling Parameter.

JEDEC equivalent: MO-103 AC

Packaging Diagrams and Parameters

Package Type: K04-097 68-Lead Ceramic Leaded (CL) Chip Carrier with Window – Square

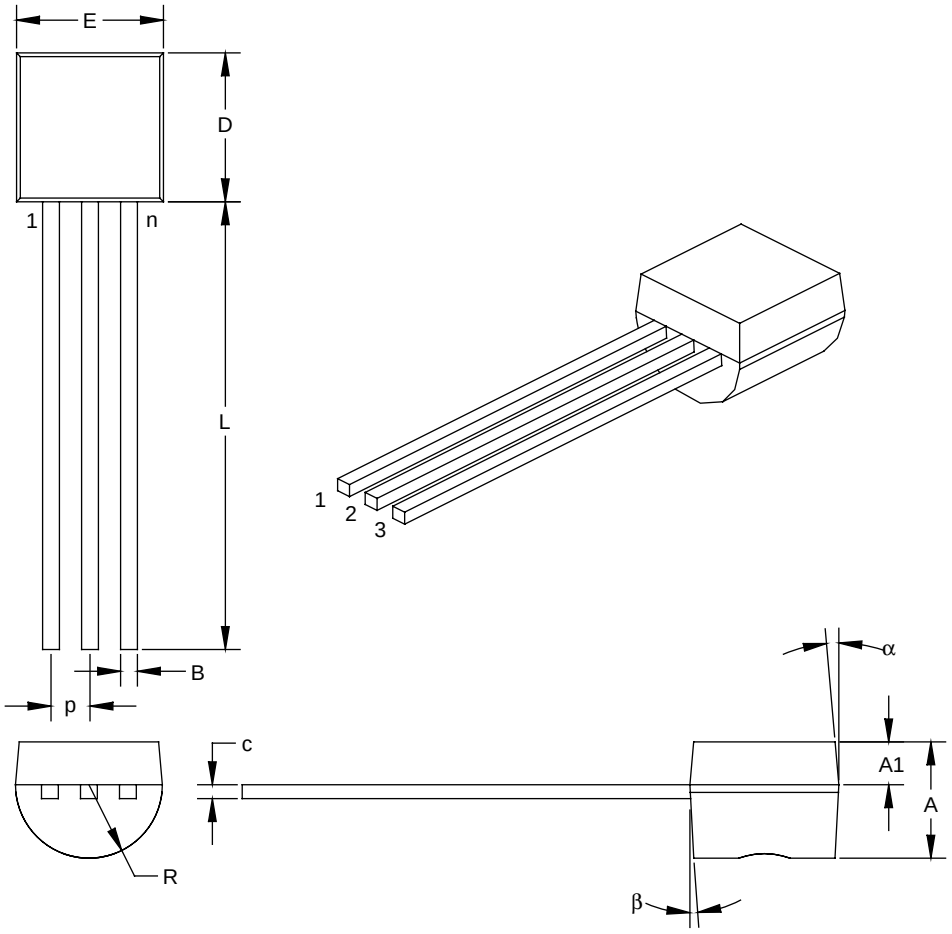


Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		68			68	
Pitch	p		0.050			1.27	
Overall Pack. Height	A	0.165	0.175	0.185	4.19	4.45	4.70
Shoulder Height	A1	0.090	0.105	0.120	2.29	2.67	3.05
Standoff	A2	0.03	0.040	0.050	0.76	1.02	1.27
Side 1 Chamfer Dim.	A3	0.030	0.035	0.040	0.76	0.89	1.02
Corner Chamfer (1)	CH1	0.030	0.040	0.050	0.76	1.02	1.27
Corner Chamfer(other)	CH2	0.020	0.025	0.030	0.51	0.64	0.76
Overall Pack. Width	E1	0.983	0.988	0.993	24.97	25.10	25.22
Overall Pack. Length	D1	0.983	0.988	0.993	24.97	25.10	25.22
Ceramic Pack. Width	E	0.942	0.950	0.958	23.93	24.13	24.33
Ceramic Pack. Length	D	0.942	0.950	0.958	23.93	24.13	24.33
Footprint Width	E2	0.890	0.910	0.930	22.61	23.11	23.62
Footprint Length	D2	0.890	0.910	0.930	22.61	23.11	23.62
Pins along Width	n1		17			17	
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Upper Lead Width	B1	0.026	0.029	0.031	0.66	0.72	0.79
Lower Lead Width	B	0.015	0.018	0.021	0.38	0.46	0.53
Upper Lead Length	L	0.045	0.050	0.055	1.14	1.27	1.40
Shoulder Inside Radius	R1	0.003	0.005	0.010	0.08	0.13	0.25
J-Bend Inside Radius	R2	0.020	0.030	0.040	0.51	0.76	1.02
Window Diameter	W	0.370	0.380	0.390	9.40	9.65	9.91

* Controlling Parameter.

Packaging Diagrams and Parameters

Package Type: K04-101 3-Lead Plastic Transistor Outline (TO)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		3			3	
Pitch	p		0.050			1.27	
Bottom to Package Flat	A	0.130	0.143	0.155	3.30	3.62	3.94
Top of Lead to Package Flat	A1	0.045	0.053	0.060	1.14	1.33	1.52
Molded Package Length	D‡	0.170	0.183	0.195	4.32	4.64	4.95
Molded Package Width	E‡	0.175	0.185	0.195	4.45	4.70	4.95
Molded Package Radius	R	0.085	0.090	0.095	2.16	2.29	2.41
Lead Width	B†	0.016	0.019	0.022	0.41	0.48	0.56
Lead Thickness	c	0.014	0.017	0.020	0.36	0.43	0.51
Tip to Seating Plane	L	0.500	0.555	0.610	12.70	14.10	15.49
Mold Draft Angle Top	α	4	5	6	4	5	6
Mold Draft Angle Bottom	β	2	3	4	2	3	4

* Controlling Parameter.

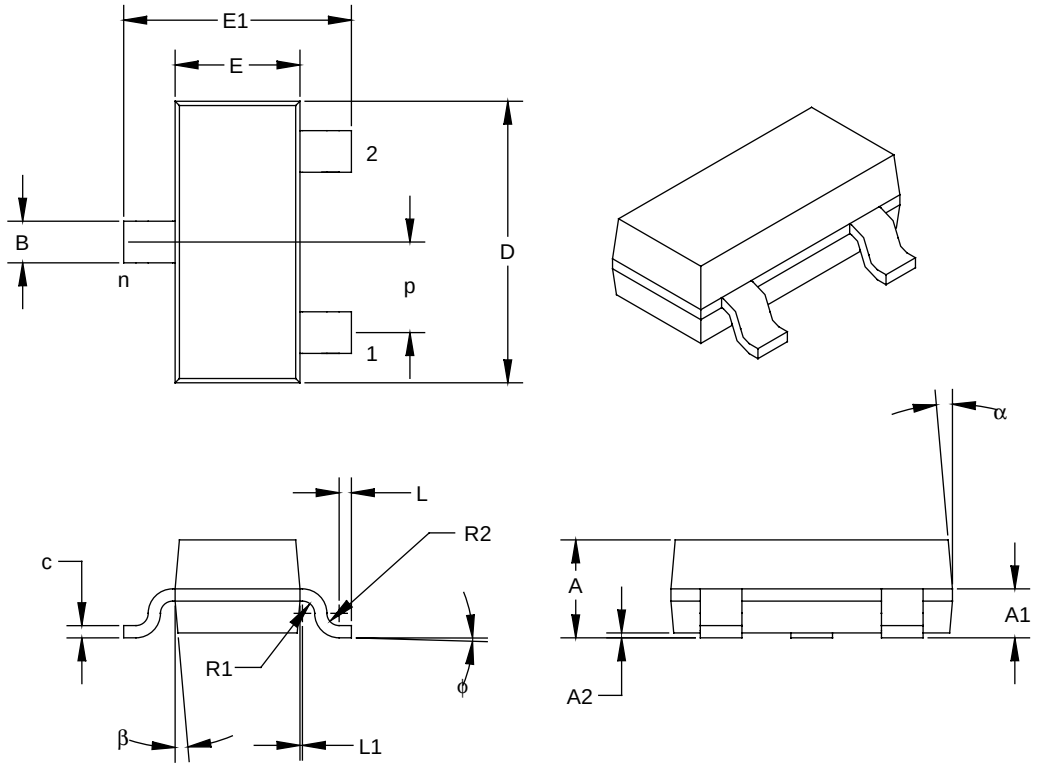
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: TO-92

Packaging Diagrams and Parameters

Package Type: K04-104 3-Lead Plastic Small Outline Transistor (TT)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.037			0.95	
Number of Pins	n		3			3	
Overall Pack. Height	A	0.035	0.040	0.044	0.89	1.01	1.12
Shoulder Height	A1	0.010	0.020	0.030	0.25	0.50	0.75
Standoff	A2	0.001	0.002	0.004	0.01	0.06	0.10
Molded Package Length	D‡	0.110	0.115	0.120	2.80	2.92	3.04
Molded Package Width	E‡	0.047	0.051	0.055	1.20	1.30	1.40
Outside Dimension	E1	0.083	0.093	0.104	2.10	2.37	2.64
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.002	0.006	0.011	0.04	0.16	0.28
Foot Angle	ϕ	0	5	10	0	5	10
Radius Centerline	L1	0.000	0.001	0.005	0.00	0.03	0.13
Lead Thickness	c	0.003	0.005	0.007	0.09	0.13	0.18
Lower Lead Width	B†	0.015	0.017	0.020	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.

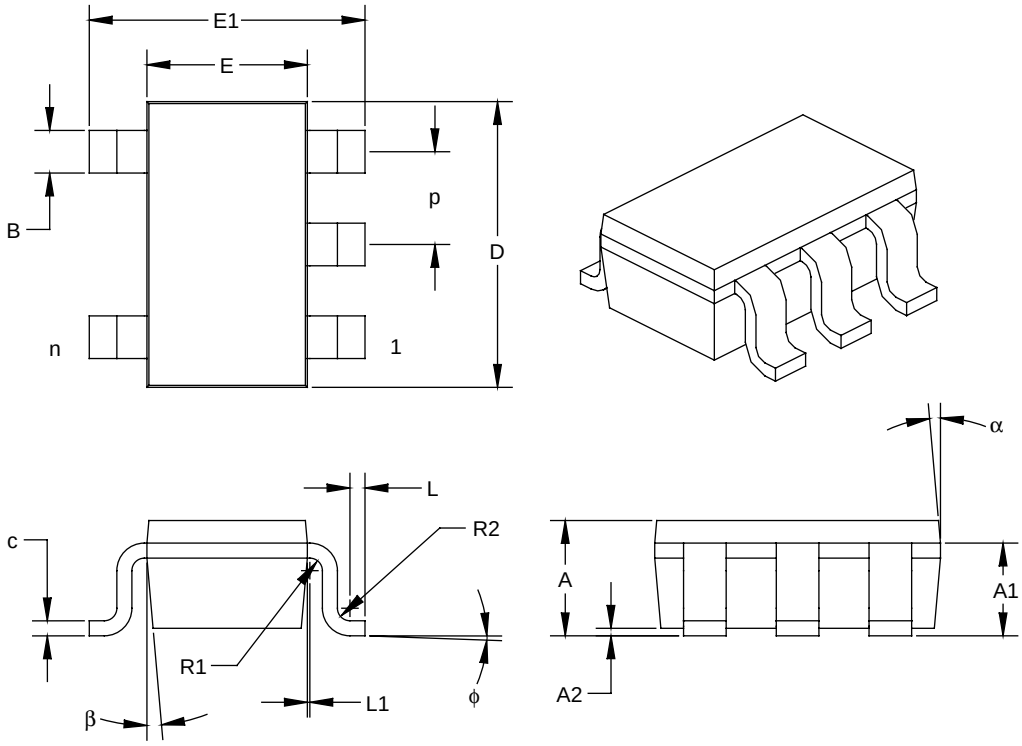
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: TO-236 AB

Packaging Diagrams and Parameters

Package Type: K04-091 5-Lead Plastic Small Outline Transistor (OT)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.037			0.95	
Number of Pins	n		5			5	
Overall Pack. Height	A	0.035	0.046	0.057	0.90	1.18	1.45
Shoulder Height	A1	0.027	0.037	0.047	0.69	0.94	1.19
Standoff	A2	0.000	0.003	0.006	0.00	0.08	0.15
Molded Package Length	D‡	0.110	0.114	0.118	2.80	2.90	3.00
Molded Package Width	E‡	0.059	0.064	0.069	1.50	1.63	1.75
Outside Dimension	E1	0.102	0.110	0.118	2.60	2.80	3.00
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.004	0.014	0.024	0.10	0.35	0.60
Foot Angle	ϕ	0	5	10	0	5	10
Radius Centerline	L1	0.000	0.001	0.005	0.00	0.03	0.13
Lead Thickness	c	0.004	0.006	0.008	0.09	0.15	0.20
Lower Lead Width	B†	0.014	0.017	0.020	0.35	0.43	0.50
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter.

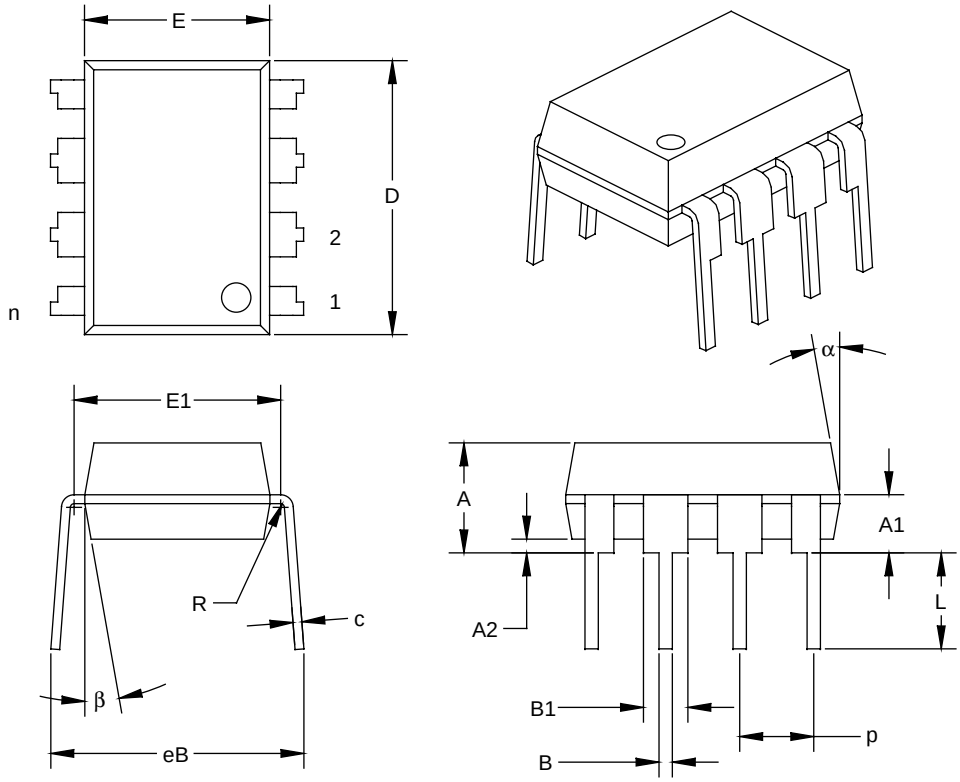
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-178 AA

Packaging Diagrams and Parameters

Package Type: K04-018 8-Lead Plastic Dual In-line (P) – 300 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		8			8	
Pitch	p		0.100			2.54	
Lower Lead Width	B	0.014	0.018	0.022	0.36	0.46	0.56
Upper Lead Width	B1†	0.055	0.060	0.065	1.40	1.52	1.65
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.006	0.012	0.015	0.20	0.29	0.38
Top to Seating Plane	A	0.140	0.150	0.160	3.56	3.81	4.06
Top of Lead to Seating Plane	A1	0.060	0.080	0.100	1.52	2.03	2.54
Base to Seating Plane	A2	0.005	0.020	0.035	0.13	0.51	0.89
Tip to Seating Plane	L	0.120	0.130	0.140	3.05	3.30	3.56
Package Length	D‡	0.355	0.370	0.385	9.02	9.40	9.78
Molded Package Width	E‡	0.245	0.250	0.260	6.22	6.35	6.60
Radius to Radius Width	E1	0.267	0.280	0.292	6.78	7.10	7.42
Overall Row Spacing	eB	0.310	0.342	0.380	7.87	8.67	9.65
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

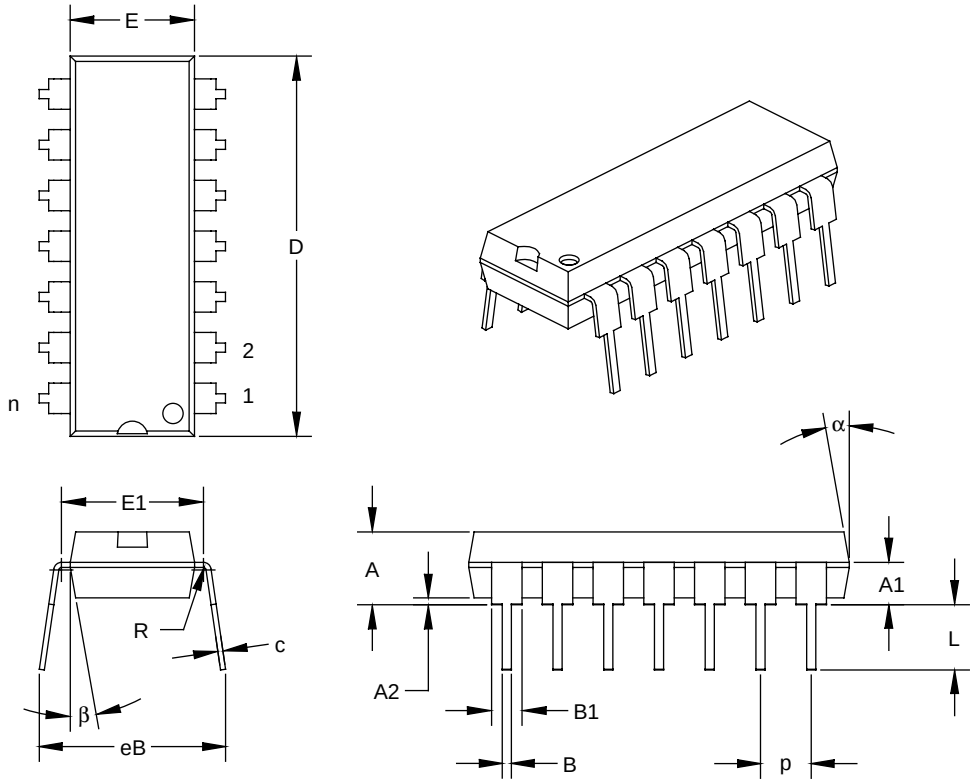
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-001 BA

Packaging Diagrams and Parameters

Package Type: K04-005 14-Lead Plastic Dual In-line (P) – 300 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		14			14	
Pitch	p		0.100			2.54	
Lower Lead Width	B	0.013	0.018	0.023	0.33	0.46	0.58
Upper Lead Width	B1†	0.055	0.060	0.065	1.40	1.52	1.65
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.006	0.010	0.012	0.20	0.25	0.30
Top to Seating Plane	A	0.120	0.145	0.170	3.05	3.68	4.32
Top of Lead to Seating Plane	A1	0.065	0.085	0.105	1.65	2.16	2.67
Base to Seating Plane	A2	0.000	0.015	0.035	0.00	0.38	0.89
Tip to Seating Plane	L	0.125	0.130	0.135	3.18	3.30	3.43
Package Length	D‡	0.740	0.750	0.760	18.80	19.05	19.30
Molded Package Width	E‡	0.240	0.245	0.250	6.10	6.22	6.35
Radius to Radius Width	E1	0.260	0.280	0.300	6.60	7.11	7.62
Overall Row Spacing	eB	0.310	0.368	0.425	7.87	9.33	10.80
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

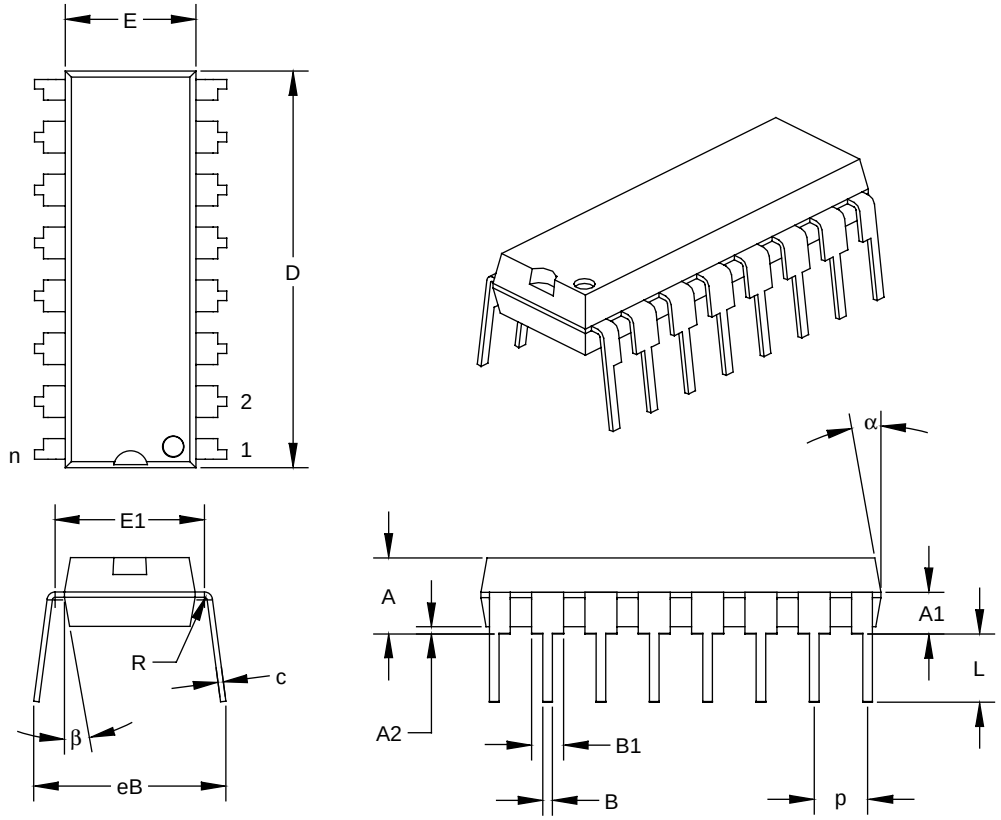
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010”(0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-001 AA

Packaging Diagrams and Parameters

Package Type: K04-017 16-Lead Plastic Dual In-line (P) – 300 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		16			16	
Pitch	p		0.100			2.54	
Lower Lead Width	B	0.013	0.018	0.023	0.33	0.46	0.58
Upper Lead Width	B1†	0.055	0.060	0.065	1.40	1.52	1.65
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.006	0.010	0.012	0.20	0.25	0.30
Top to Seating Plane	A	0.120	0.145	0.170	3.05	3.68	4.32
Top of Lead to Seating Plane	A1	0.060	0.080	0.100	1.52	2.03	2.54
Base to Seating Plane	A2	0.000	0.015	0.035	0.00	0.38	0.89
Tip to Seating Plane	L	0.125	0.130	0.135	3.18	3.30	3.43
Package Length	D‡	0.740	0.750	0.760	18.80	19.05	19.30
Molded Package Width	E‡	0.240	0.245	0.250	6.10	6.22	6.35
Radius to Radius Width	E1	0.260	0.280	0.300	6.60	7.11	7.62
Overall Row Spacing	eB	0.310	0.361	0.412	7.87	9.17	10.46
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

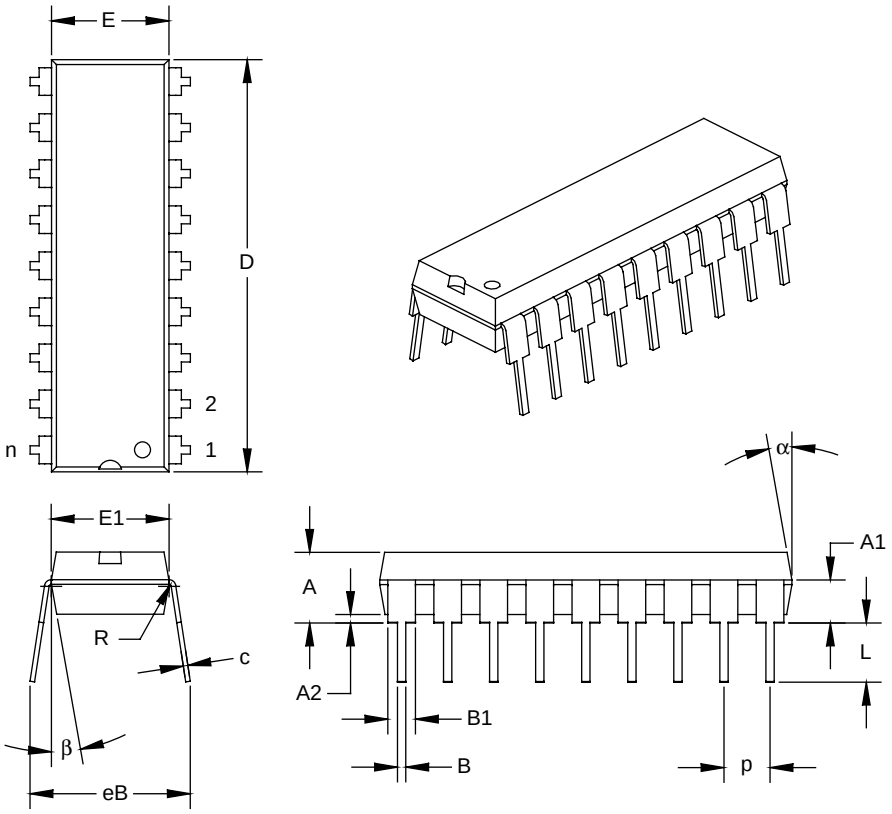
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-001 BB

Packaging Diagrams and Parameters

Package Type: K04-007 18-Lead Plastic Dual In-line (P) – 300 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		18			18	
Pitch	p		0.100			2.54	
Lower Lead Width	B	0.013	0.018	0.023	0.33	0.46	0.58
Upper Lead Width	B1†	0.055	0.060	0.065	1.40	1.52	1.65
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.005	0.010	0.015	0.13	0.25	0.38
Top to Seating Plane	A	0.110	0.155	0.155	2.79	3.94	3.94
Top of Lead to Seating Plane	A1	0.075	0.095	0.115	1.91	2.41	2.92
Base to Seating Plane	A2	0.000	0.020	0.020	0.00	0.51	0.51
Tip to Seating Plane	L	0.125	0.130	0.135	3.18	3.30	3.43
Package Length	D‡	0.890	0.895	0.900	22.61	22.73	22.86
Molded Package Width	E‡	0.245	0.255	0.265	6.22	6.48	6.73
Radius to Radius Width	E1	0.230	0.250	0.270	5.84	6.35	6.86
Overall Row Spacing	eB	0.310	0.349	0.387	7.87	8.85	9.83
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

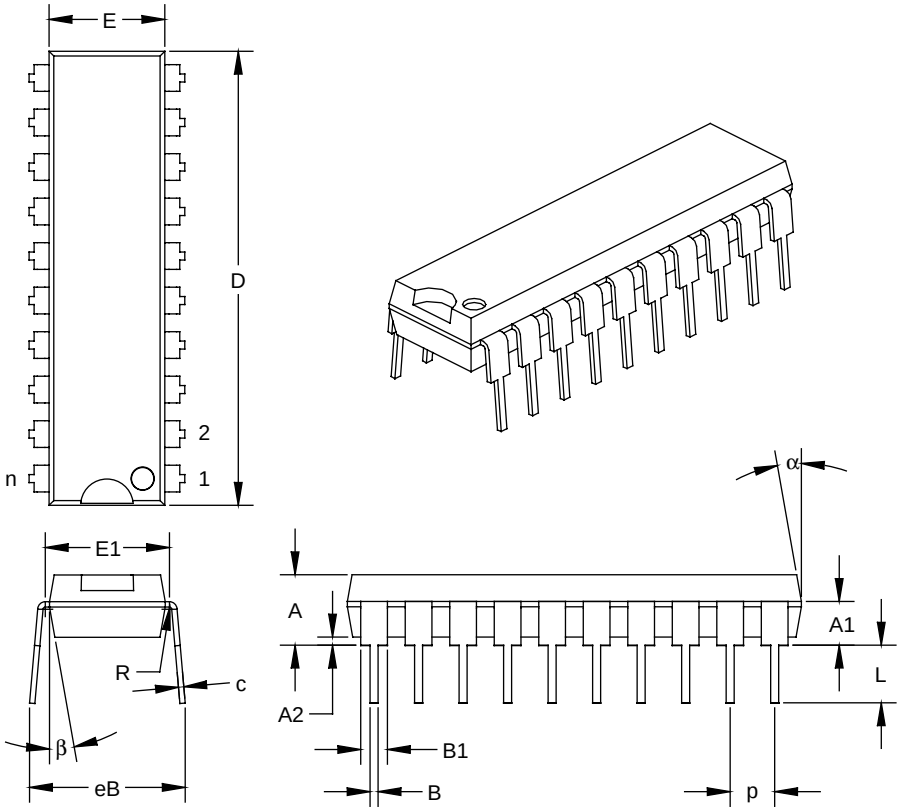
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-001 AC

Packaging Diagrams and Parameters

Package Type: K04-019 20-Lead Plastic Dual In-line (P) – 300 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		20			20	
Pitch	p	0.098	0.100	0.102	2.49	2.54	2.59
Lower Lead Width	B	0.014	0.018	0.022	0.36	0.46	0.56
Upper Lead Width	B1†	0.055	0.060	0.065	1.40	1.52	1.65
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.012	0.015	0.20	0.29	0.38
Top to Seating Plane	A	0.110	0.160	0.160	2.79	4.06	4.06
Top of Lead to Seating Plane	A1	0.080	0.100	0.120	2.03	2.54	3.05
Base to Seating Plane	A2	0.000	0.020	0.040	0.00	0.51	1.02
Tip to Seating Plane	L	0.120	0.130	0.140	3.05	3.30	3.56
Package Length	D‡	0.980	1.020	1.060	24.89	25.91	26.92
Molded Package Width	E‡	0.240	0.260	0.280	6.10	6.60	7.11
Radius to Radius Width	E1	0.267	0.280	0.292	6.78	7.10	7.42
Overall Row Spacing	eB	0.310	0.350	0.390	7.87	8.89	9.91
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

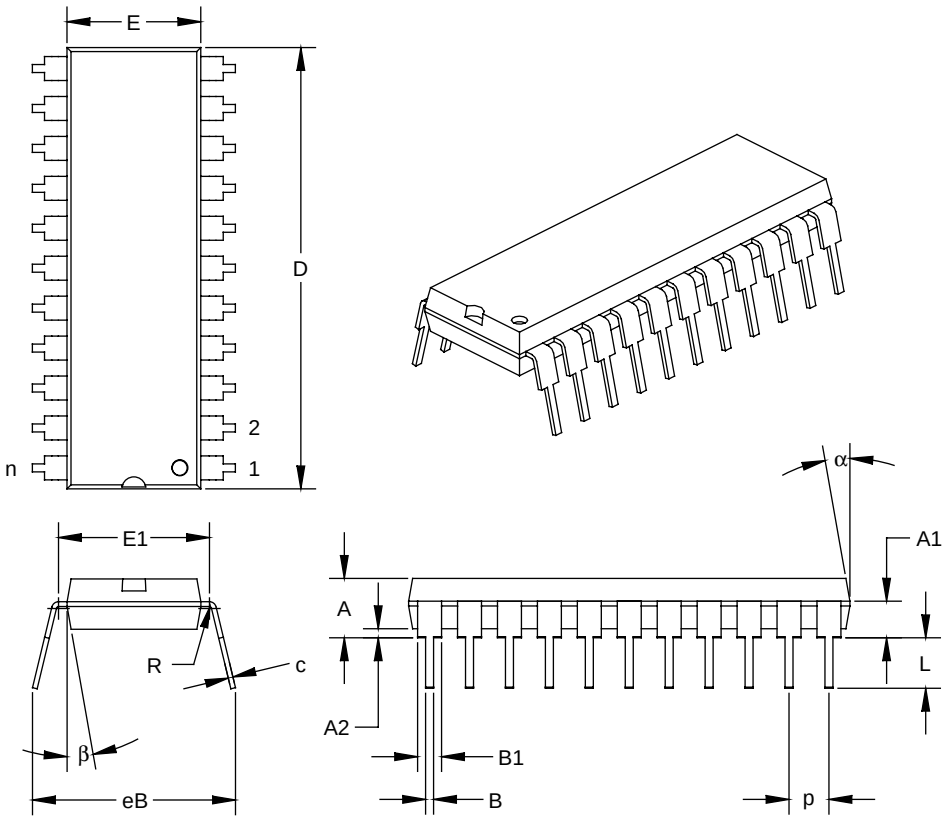
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-001 AD

Packaging Diagrams and Parameters

Package Type: K04-008 22-Lead Plastic Dual In-line (P) – 400 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.400			10.16	
Number of Pins	n		22			22	
Pitch	p		0.100			2.54	
Lower Lead Width	B	0.018	0.020	0.022	0.46	0.51	0.56
Upper Lead Width	B1†	0.058	0.060	0.062	1.47	1.52	1.57
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.012	0.015	0.20	0.29	0.38
Top to Seating Plane	A	0.150	0.152	0.154	3.81	3.86	3.91
Top of Lead to Seating Plane	A1	0.075	0.095	0.115	1.91	2.41	2.92
Base to Seating Plane	A2	0.023	0.026	0.029	0.58	0.66	0.74
Tip to Seating Plane	L	0.120	0.130	0.140	3.05	3.30	3.56
Package Length	D‡	1.100	1.105	1.110	27.94	28.07	28.19
Molded Package Width	E‡	0.330	0.335	0.340	8.38	8.51	8.64
Radius to Radius Width	E1	0.367	0.379	0.391	9.32	9.63	9.93
Overall Row Spacing	eB	0.500	0.512	0.524	12.70	13.00	13.31
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

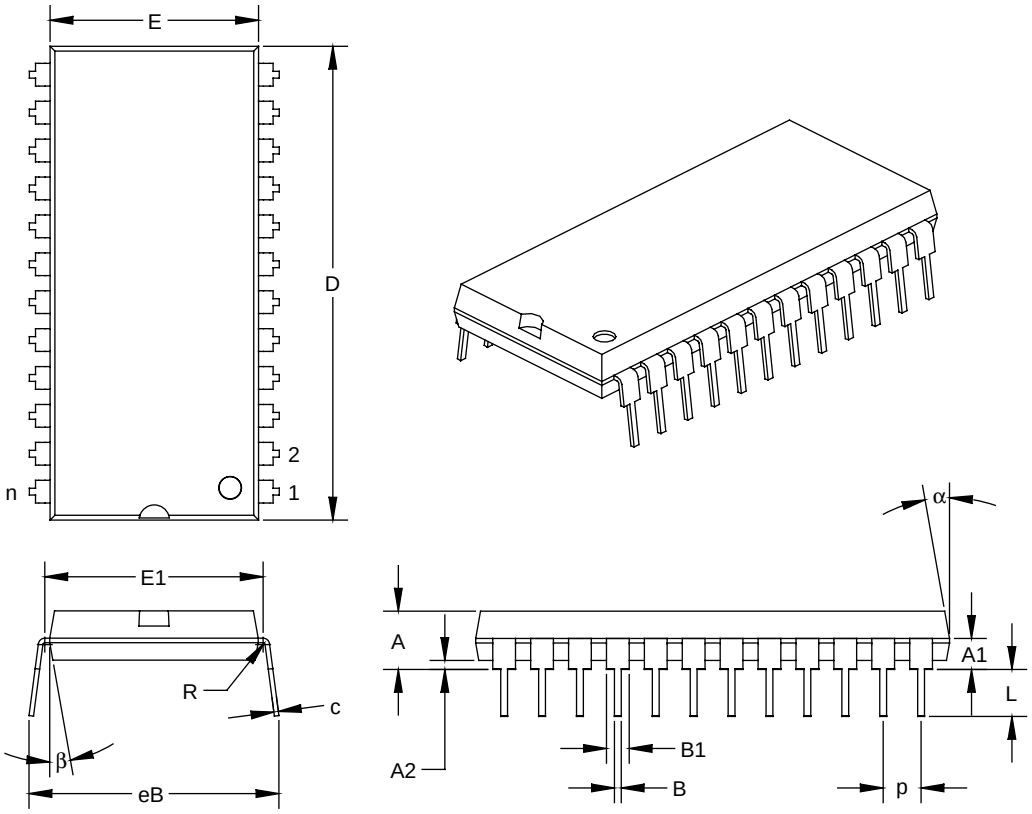
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-010 AA

Packaging Diagrams and Parameters

Package Type: K04-081 24-Lead Plastic Dual In-line (P) – 600 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.600			15.24	
Number of Pins	n		24			24	
Pitch	p		0.100			2.54	
Lower Lead Width	B	0.014	0.018	0.022	0.36	0.46	0.56
Upper Lead Width	B1†	0.055	0.060	0.065	1.40	1.52	1.65
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.012	0.015	0.20	0.29	0.38
Top to Seating Plane	A	0.140	0.165	0.190	3.56	4.19	4.83
Top of Lead to Seating Plane	A1	0.064	0.084	0.104	1.61	2.12	2.63
Base to Seating Plane	A2	0.020	0.025	0.030	0.51	0.64	0.76
Tip to Seating Plane	L	0.115	0.125	0.135	2.92	3.18	3.43
Package Length	D‡	1.245	1.250	1.255	31.62	31.75	31.88
Molded Package Width	E‡	0.540	0.550	0.560	13.72	13.97	14.22
Radius to Radius Width	E1	0.562	0.577	0.592	14.27	14.66	15.04
Overall Row Spacing	eB	0.630	0.660	0.690	16.00	16.76	17.53
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

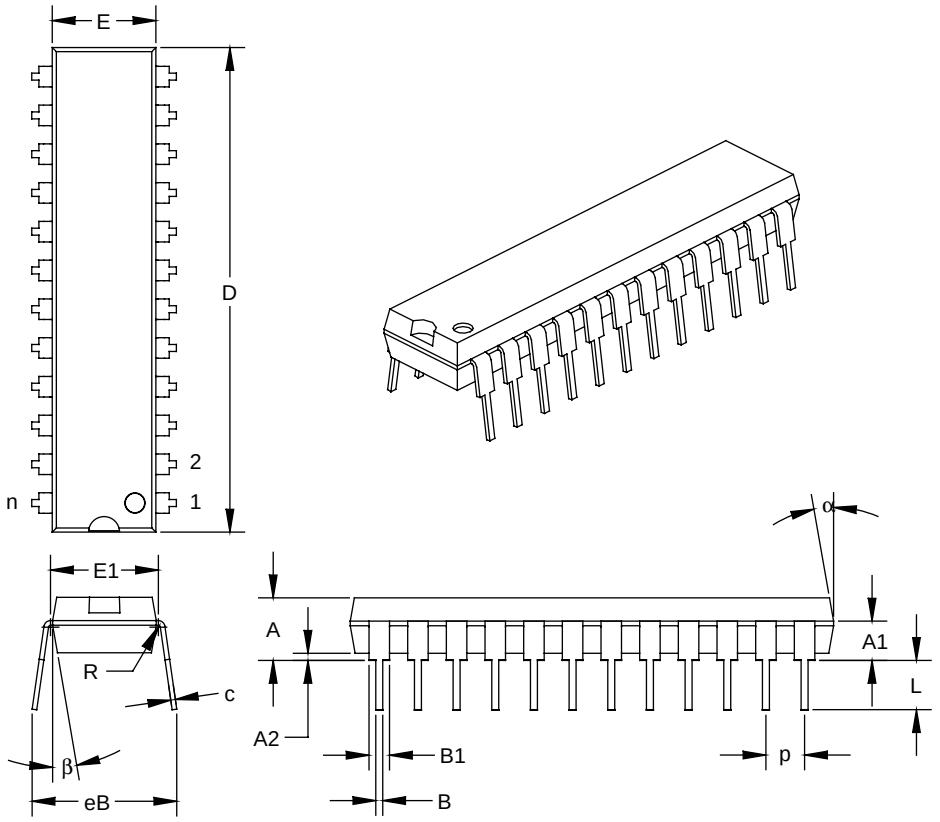
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-011 AA

Packaging Diagrams and Parameters

Package Type: K04-043 24-Lead Skinny Plastic Dual In-line (SP) – 300 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		24			24	
Pitch	p		0.100			2.54	
Lower Lead Width	B	0.014	0.018	0.022	0.36	0.46	0.56
Upper Lead Width	B1†	0.045	0.053	0.060	1.14	1.33	1.52
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.012	0.015	0.20	0.29	0.38
Top to Seating Plane	A	0.150	0.163	0.175	3.81	4.13	4.45
Top of Lead to Seating Plane	A1	0.083	0.103	0.123	2.10	2.60	3.11
Base to Seating Plane	A2	0.015	0.020	0.025	0.38	0.51	0.64
Tip to Seating Plane	L	0.120	0.130	0.140	3.05	3.30	3.56
Package Length	D‡	1.245	1.250	1.255	31.63	31.76	31.88
Molded Package Width	E‡	0.255	0.268	0.280	6.48	6.79	7.11
Radius to Radius Width	E1	0.267	0.280	0.292	6.78	7.10	7.42
Overall Row Spacing	eB	0.370	0.375	0.380	9.40	9.53	9.65
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

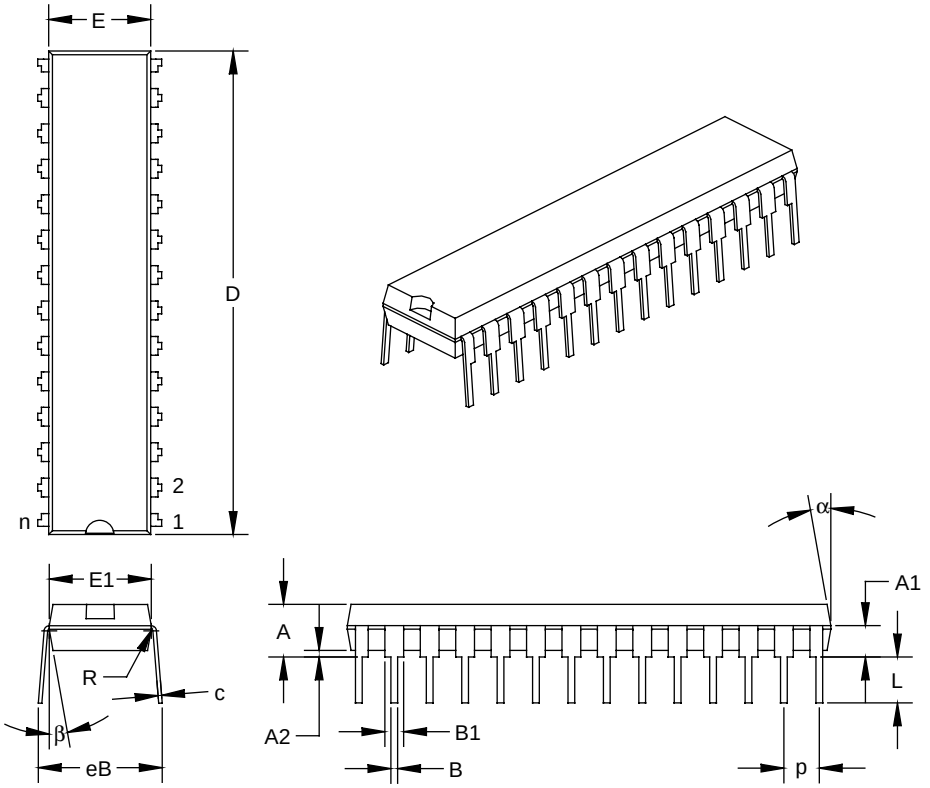
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-001 AF

Packaging Diagrams and Parameters

Package Type: K04-070 28-Lead Skinny Plastic Dual In-line (SP) – 300 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.300			7.62	
Number of Pins	n		28			28	
Pitch	p		0.100			2.54	
Lower Lead Width	B	0.016	0.019	0.022	0.41	0.48	0.56
Upper Lead Width	B1†	0.040	0.053	0.065	1.02	1.33	1.65
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Top to Seating Plane	A	0.140	0.150	0.160	3.56	3.81	4.06
Top of Lead to Seating Plane	A1	0.070	0.090	0.110	1.78	2.29	2.79
Base to Seating Plane	A2	0.015	0.020	0.025	0.38	0.51	0.64
Tip to Seating Plane	L	0.125	0.130	0.135	3.18	3.30	3.43
Package Length	D‡	1.345	1.365	1.385	34.16	34.67	35.18
Molded Package Width	E‡	0.280	0.288	0.295	7.11	7.30	7.49
Radius to Radius Width	E1	0.270	0.283	0.295	6.86	7.18	7.49
Overall Row Spacing	eB	0.320	0.350	0.380	8.13	8.89	9.65
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

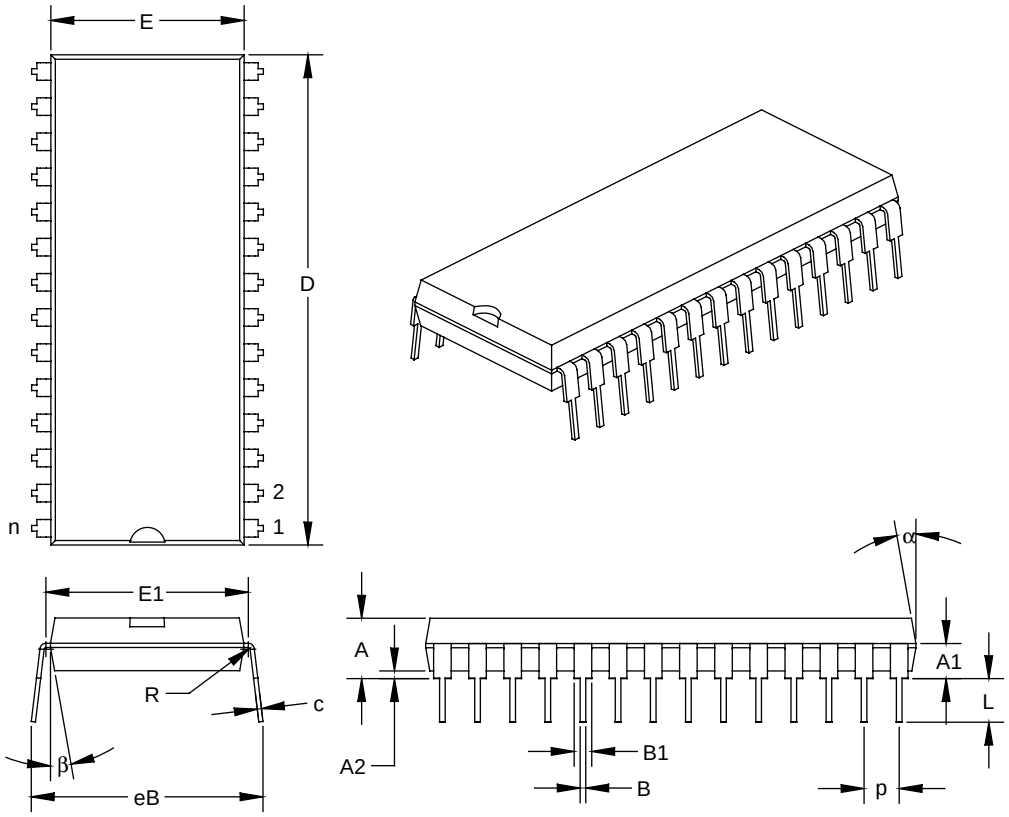
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-095 AH

Packaging Diagrams and Parameters

Package Type: K04-079 28-Lead Plastic Dual In-line (P) – 600 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.600			15.24	
Number of Pins	n		28			28	
Pitch	p		0.100			2.54	
Lower Lead Width	B	0.014	0.016	0.018	0.36	0.41	0.46
Upper Lead Width	B1†	0.040	0.050	0.060	1.02	1.27	1.52
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.012	0.015	0.20	0.29	0.38
Top to Seating Plane	A	0.160	0.173	0.185	4.06	4.38	4.70
Top of Lead to Seating Plane	A1	0.081	0.101	0.121	2.04	2.55	3.06
Base to Seating Plane	A2	0.015	0.023	0.030	0.38	0.57	0.76
Tip to Seating Plane	L	0.115	0.125	0.135	2.92	3.18	3.43
Package Length	D‡	1.380	1.395	1.465	35.05	35.43	37.20
Molded Package Width	E‡	0.505	0.550	0.555	12.80	13.97	14.10
Radius to Radius Width	E1	0.567	0.577	0.587	14.40	14.66	14.91
Overall Row Spacing	eB	0.640	0.660	0.680	16.26	16.76	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.

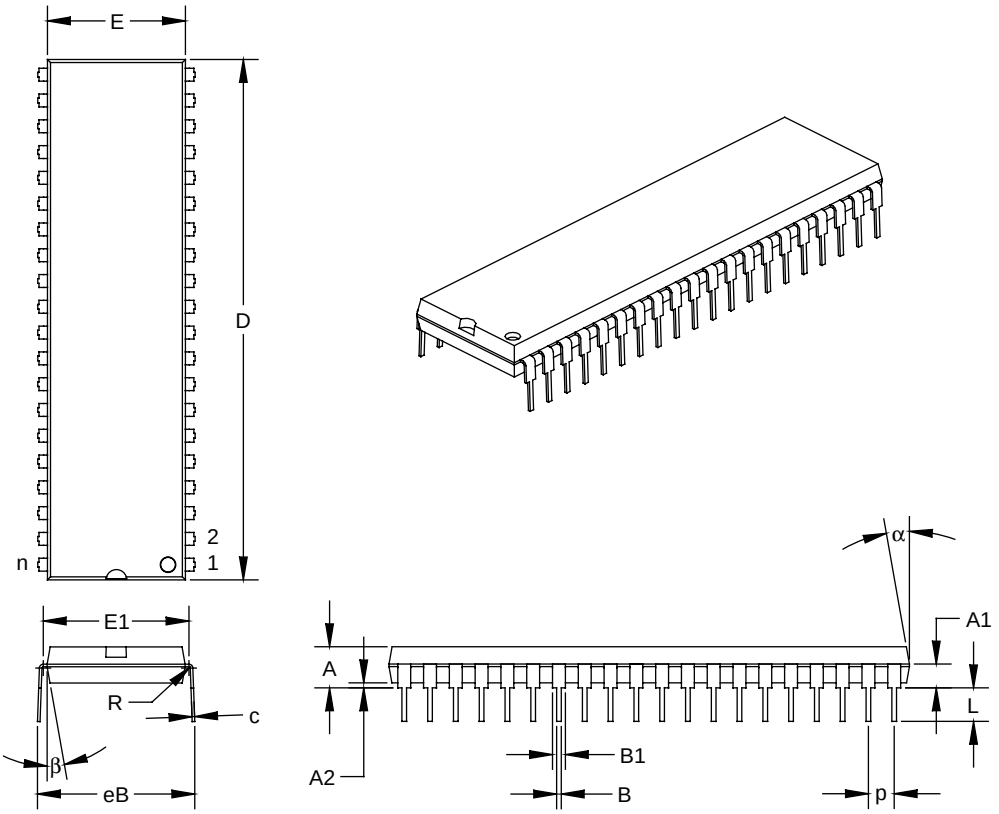
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-011 AB

Packaging Diagrams and Parameters

Package Type: K04-016 40-Lead Plastic Dual In-line (P) – 600 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.600			15.24	
Number of Pins	n		40			40	
Pitch	p		0.100			2.54	
Lower Lead Width	B	0.016	0.018	0.020	0.41	0.46	0.51
Upper Lead Width	B1†	0.045	0.050	0.055	1.14	1.27	1.40
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.009	0.010	0.011	0.23	0.25	0.28
Top to Seating Plane	A	0.110	0.160	0.160	2.79	4.06	4.06
Top of Lead to Seating Plane	A1	0.073	0.093	0.113	1.85	2.36	2.87
Base to Seating Plane	A2	0.020	0.020	0.040	0.51	0.51	1.02
Tip to Seating Plane	L	0.125	0.130	0.135	3.18	3.30	3.43
Package Length	D‡	2.013	2.018	2.023	51.13	51.26	51.38
Molded Package Width	E‡	0.530	0.535	0.540	13.46	13.59	13.72
Radius to Radius Width	E1	0.545	0.565	0.585	13.84	14.35	14.86
Overall Row Spacing	eB	0.630	0.610	0.670	16.00	15.49	17.02
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

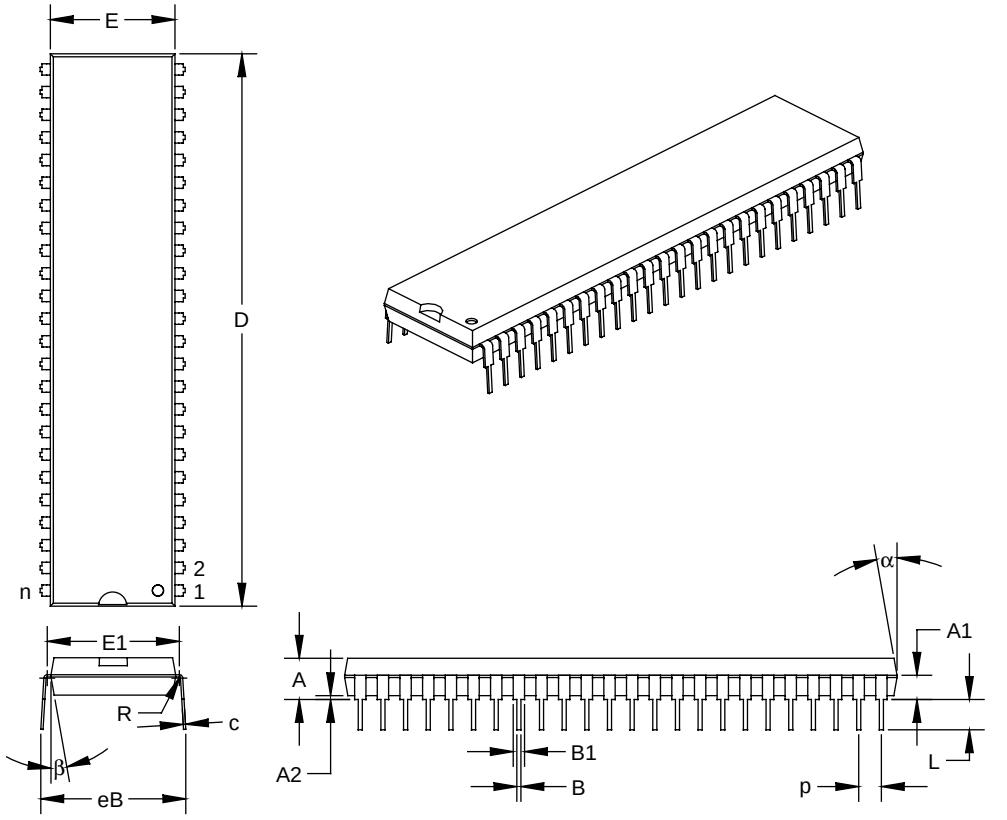
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-011 AC

Packaging Diagrams and Parameters

Package Type: K04-022 48-Lead Plastic Dual In-line (P) – 600 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.600			15.24	
Number of Pins	n		48			48	
Pitch	p		0.100			2.54	
Lower Lead Width	B	0.016	0.018	0.020	0.41	0.46	0.51
Upper Lead Width	B1†	0.045	0.050	0.055	1.14	1.27	1.40
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Top to Seating Plane	A	0.175	0.183	0.190	4.45	4.64	4.83
Top of Lead to Seating Plane	A1	0.088	0.108	0.128	2.22	2.73	3.24
Base to Seating Plane	A2	0.010	0.018	0.025	0.25	0.44	0.64
Tip to Seating Plane	L	0.125	0.134	0.142	3.18	3.39	3.61
Package Length	D‡	2.425	2.438	2.450	61.60	61.91	62.23
Molded Package Width	E‡	0.540	0.550	0.560	13.72	13.97	14.22
Radius to Radius Width	E1	0.570	0.583	0.595	14.48	14.80	15.11
Overall Row Spacing	eB	0.610	0.640	0.670	15.49	16.26	17.02
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

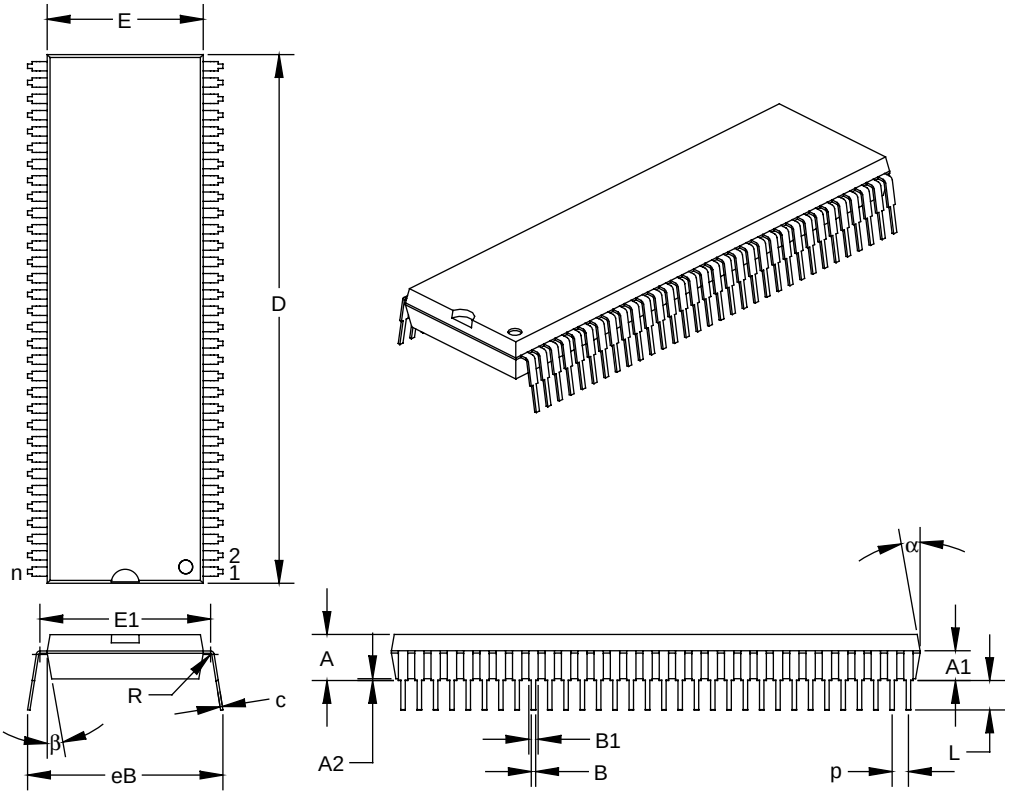
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-011 AD

Packaging Diagrams and Parameters

Package Type: K04-090 64-Lead Shrink Plastic Dual In-line (SP) – 750 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
PCB Row Spacing			0.750			19.05	
Number of Pins	n		64			64	
Pitch	p		0.070			1.78	
Lower Lead Width	B	0.015	0.019	0.022	0.38	0.47	0.56
Upper Lead Width	B1†	0.030	0.040	0.050	0.76	1.02	1.27
Shoulder Radius	R	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Top to Seating Plane	A	0.175	0.200	0.200	4.45	5.08	5.08
Top of Lead to Seating Plane	A1	0.110	0.130	0.150	2.79	3.30	3.81
Base to Seating Plane	A2	0.020	0.020	0.040	0.51	0.51	1.02
Tip to Seating Plane	L	0.120	0.128	0.135	3.05	3.24	3.43
Package Length	D‡	2.260	2.270	2.280	57.40	57.66	57.91
Molded Package Width	E‡	0.660	0.670	0.680	16.76	17.02	17.27
Radius to Radius Width	E1	0.720	0.733	0.745	18.29	18.61	18.92
Overall Row Spacing	eB	0.760	0.840	0.920	19.30	21.33	23.36
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter.

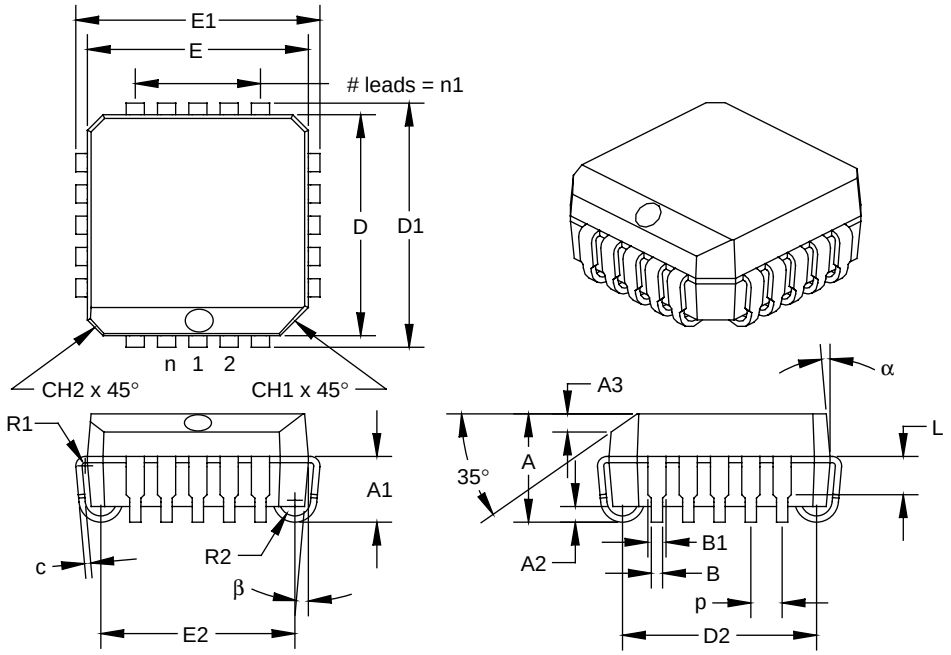
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-021 AA

Packaging Diagrams and Parameters

Package Type: K04-064 20-Lead Plastic Leaded Chip Carrier (L) – Square



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		20			20	
Pitch	p		0.050			1.27	
Overall Pack. Height	A	0.165	0.173	0.180	4.19	4.38	4.57
Shoulder Height	A1	0.095	0.105	0.115	2.41	2.67	2.92
Standoff	A2	0.020	0.025	0.030	0.51	0.64	0.76
Side 1 Chamfer Dim.	A3	0.024	0.029	0.034	0.61	0.74	0.86
Corner Chamfer (1)	CH1	0.040	0.045	0.050	1.02	1.14	1.27
Corner Chamfer (other)	CH2	0.020	0.025	0.030	0.51	0.64	0.76
Overall Pack. Width	E1	0.385	0.390	0.395	9.78	9.91	10.03
Overall Pack. Length	D1	0.385	0.390	0.395	9.78	9.91	10.03
Molded Pack. Width	E‡	0.350	0.353	0.356	8.89	8.97	9.04
Molded Pack. Length	D‡	0.350	0.353	0.356	8.89	8.97	9.04
Footprint Width	E2	0.295	0.310	0.325	7.49	7.87	8.26
Footprint Length	D2	0.295	0.310	0.325	7.49	7.87	8.26
Pins along Width	n1		5			5	
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Upper Lead Width	B1†	0.026	0.029	0.032	0.66	0.74	0.81
Lower Lead Width	B	0.016	0.018	0.020	0.41	0.46	0.51
Upper Lead Length	L	0.050	0.058	0.065	1.27	1.46	1.65
Shoulder Inside Radius	R1	0.003	0.005	0.010	0.08	0.13	0.25
J-Bend Inside Radius	R2	0.015	0.025	0.035	0.38	0.64	0.89
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter.

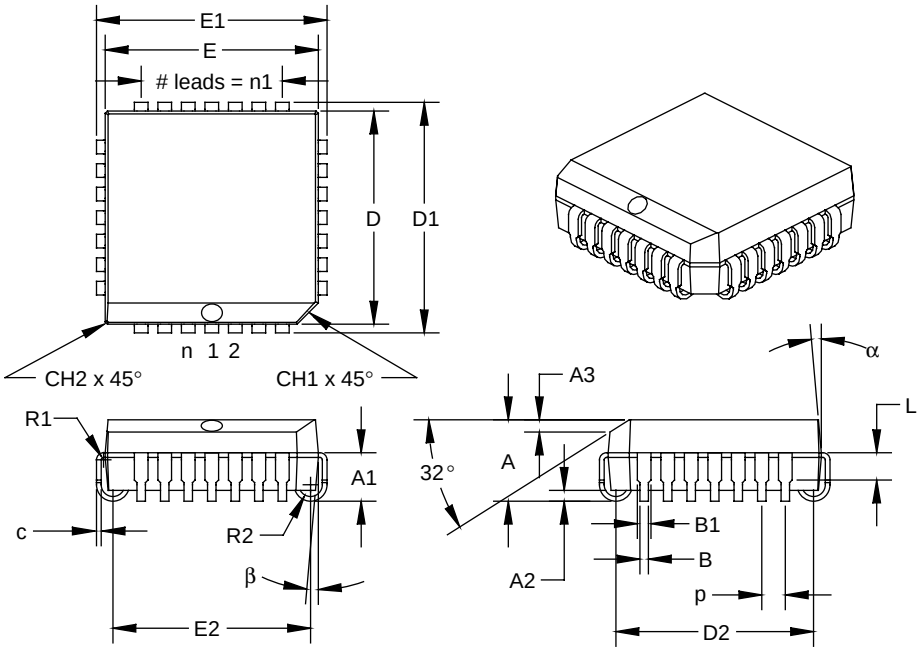
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-047 AA

Packaging Diagrams and Parameters

Package Type: K04-026 28-Lead Plastic Leaded Chip Carrier (L) – Square



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		28			28	
Pitch	p		0.050			1.27	
Overall Pack. Height	A	0.165	0.173	0.180	4.19	4.38	4.57
Shoulder Height	A1	0.095	0.103	0.110	2.41	2.60	2.79
Standoff	A2	0.015	0.023	0.030	0.38	0.57	0.76
Side 1 Chamfer Dim.	A3	0.021	0.026	0.031	0.53	0.66	0.79
Corner Chamfer (1)	CH1	0.035	0.045	0.055	0.89	1.14	1.40
Corner Chamfer (other)	CH2	0.000	0.005	0.010	0.00	0.13	0.25
Overall Pack. Width	E1	0.485	0.490	0.495	12.32	12.45	12.57
Overall Pack. Length	D1	0.485	0.490	0.495	12.32	12.45	12.57
Molded Pack. Width	E‡	0.450	0.453	0.456	11.43	11.51	11.58
Molded Pack. Length	D‡	0.450	0.453	0.456	11.43	11.51	11.58
Footprint Width	E2	0.410	0.420	0.430	10.41	10.67	10.92
Footprint Length	D2	0.410	0.420	0.430	10.41	10.67	10.92
Pins along Width	n1		7			7	
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Upper Lead Width	B1†	0.026	0.029	0.032	0.66	0.74	0.81
Lower Lead Width	B	0.015	0.018	0.021	0.38	0.46	0.53
Upper Lead Length	L	0.050	0.058	0.065	1.27	1.46	1.65
Shoulder Inside Radius	R1	0.003	0.005	0.010	0.08	0.13	0.25
J-Bend Inside Radius	R2	0.015	0.025	0.035	0.38	0.64	0.89
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter.

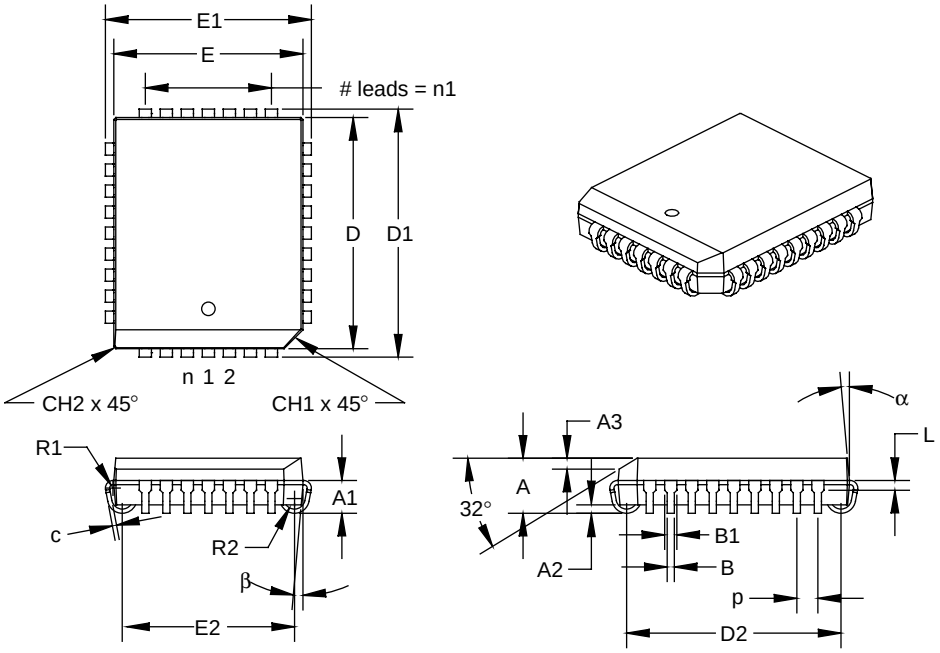
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-047 AB

Packaging Diagrams and Parameters

Package Type: K04-023 32-Lead Plastic Leaded Chip Carrier (L) – Rectangle



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		32			32	
Pitch	p		0.050			1.27	
Overall Pack. Height	A	0.127	0.131	0.135	3.23	3.33	3.43
Shoulder Height	A1	0.060	0.078	0.095	1.52	1.97	2.41
Standoff	A2	0.015	0.020	0.025	0.38	0.51	0.64
Side 1 Chamfer Dim.	A3	0.021	0.026	0.031	0.53	0.66	0.79
Corner Chamfer (1)	CH1	0.035	0.045	0.055	0.89	1.14	1.40
Corner Chamfer (other)	CH2	0.000	0.005	0.010	0.00	0.13	0.25
Overall Pack. Width	E1	0.485	0.490	0.495	12.32	12.45	12.57
Overall Pack. Length	D1	0.585	0.590	0.595	14.86	14.99	15.11
Molded Pack. Width	E‡	0.447	0.450	0.453	11.35	11.43	11.51
Molded Pack. Length	D‡	0.547	0.550	0.553	13.89	13.97	14.05
Footprint Width	E2	0.380	0.410	0.440	9.65	10.41	11.18
Footprint Length	D2	0.480	0.510	0.540	12.19	12.95	13.72
Pins along Width	n1		7			7	
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Upper Lead Width	B1†	0.026	0.029	0.032	0.66	0.74	0.81
Lower Lead Width	B	0.013	0.017	0.021	0.33	0.43	0.53
Upper Lead Length	L	0.010	0.020	0.030	0.25	0.51	0.76
Shoulder Inside Radius	R1	0.003	0.008	0.013	0.08	0.20	0.33
J-Bend Inside Radius	R2	0.020	0.025	0.030	0.51	0.64	0.76
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter.

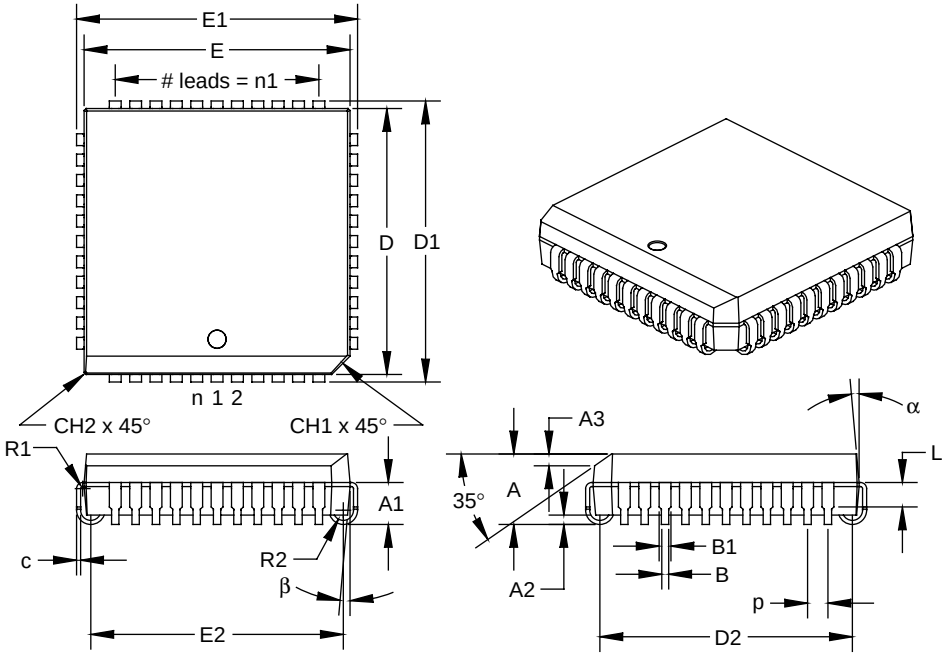
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-016 AE

Packaging Diagrams and Parameters

Package Type: K04-048 44-Lead Plastic Leaded Chip Carrier (L) – Square



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		44			44	
Pitch	p		0.050			1.27	
Overall Pack. Height	A	0.165	0.173	0.180	4.19	4.38	4.57
Shoulder Height	A1	0.095	0.103	0.110	2.41	2.60	2.79
Standoff	A2	0.015	0.023	0.030	0.38	0.57	0.76
Side 1 Chamfer Dim.	A3	0.024	0.029	0.034	0.61	0.74	0.86
Corner Chamfer (1)	CH1	0.040	0.045	0.050	1.02	1.14	1.27
Corner Chamfer (other)	CH2	0.000	0.005	0.010	0.00	0.13	0.25
Overall Pack. Width	E1	0.685	0.690	0.695	17.40	17.53	17.65
Overall Pack. Length	D1	0.685	0.690	0.695	17.40	17.53	17.65
Molded Pack. Width	E‡	0.650	0.653	0.656	16.51	16.59	16.66
Molded Pack. Length	D‡	0.650	0.653	0.656	16.51	16.59	16.66
Footprint Width	E2	0.610	0.620	0.630	15.49	15.75	16.00
Footprint Length	D2	0.610	0.620	0.630	15.49	15.75	16.00
Pins along Width	n1		11			11	
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Upper Lead Width	B1†	0.026	0.029	0.032	0.66	0.74	0.81
Lower Lead Width	B	0.015	0.018	0.021	0.38	0.46	0.53
Upper Lead Length	L	0.050	0.058	0.065	1.27	1.46	1.65
Shoulder Inside Radius	R1	0.003	0.005	0.010	0.08	0.13	0.25
J-Bend Inside Radius	R2	0.015	0.025	0.035	0.38	0.64	0.89
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter.

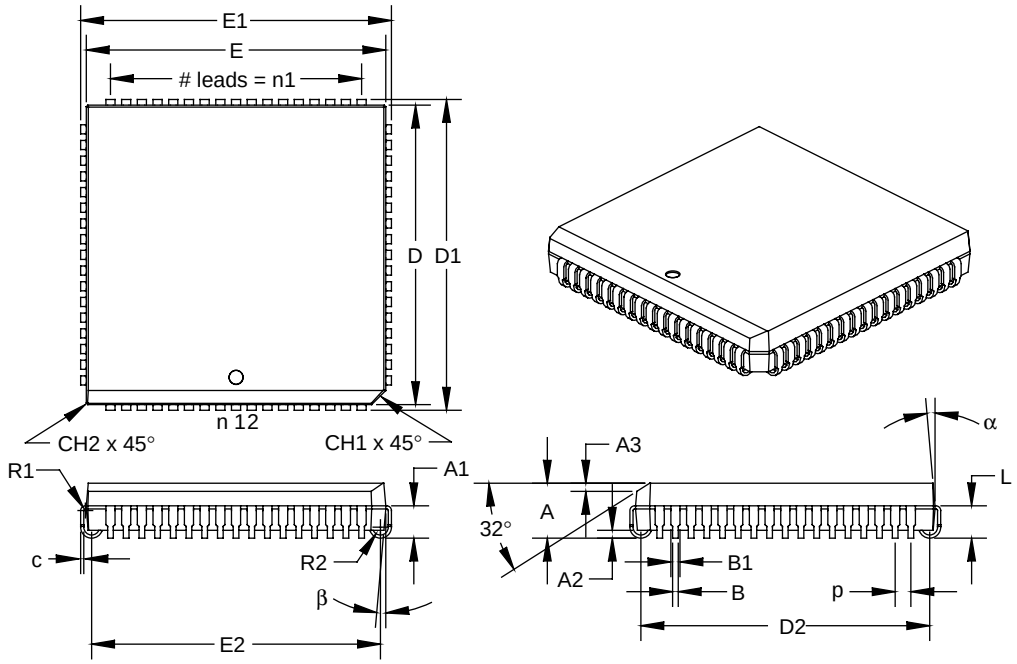
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010" (0.254 mm) per side or 0.020" (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-047 AC

Packaging Diagrams and Parameters

Package Type: K04-049 68-Lead Plastic Leaded Chip Carrier (L) – Square



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		68			68	
Pitch	p		0.050			1.27	
Overall Pack. Height	A	0.165	0.175	0.185	4.19	4.45	4.70
Shoulder Height	A1	0.095	0.103	0.110	2.41	2.60	2.79
Standoff	A2	0.017	0.025	0.032	0.43	0.62	0.81
Side 1 Chamfer Dim.	A3	0.021	0.026	0.031	0.53	0.66	0.79
Corner Chamfer (1)	CH1	0.035	0.045	0.055	0.89	1.14	1.40
Corner Chamfer (other)	CH2	0.000	0.005	0.010	0.00	0.13	0.25
Overall Pack. Width	E1	0.985	0.990	0.995	25.02	25.15	25.27
Overall Pack. Length	D1	0.985	0.990	0.995	25.02	25.15	25.27
Molded Pack. Width	E‡	0.950	0.954	0.958	24.13	24.23	24.33
Molded Pack. Length	D‡	0.950	0.954	0.958	24.13	24.23	24.33
Footprint Width	E2	0.910	0.920	0.930	23.11	23.37	23.62
Footprint Length	D2	0.910	0.920	0.930	23.11	23.37	23.62
Pins along Width	n1		17			17	
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Upper Lead Width	B1†	0.026	0.029	0.031	0.66	0.72	0.79
Lower Lead Width	B	0.015	0.018	0.021	0.38	0.46	0.53
Upper Lead Length	L	0.050	0.058	0.065	1.27	1.46	1.65
Shoulder Inside Radius	R1	0.003	0.005	0.010	0.08	0.13	0.25
J-Bend Inside Radius	R2	0.015	0.025	0.035	0.38	0.64	0.89
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter.

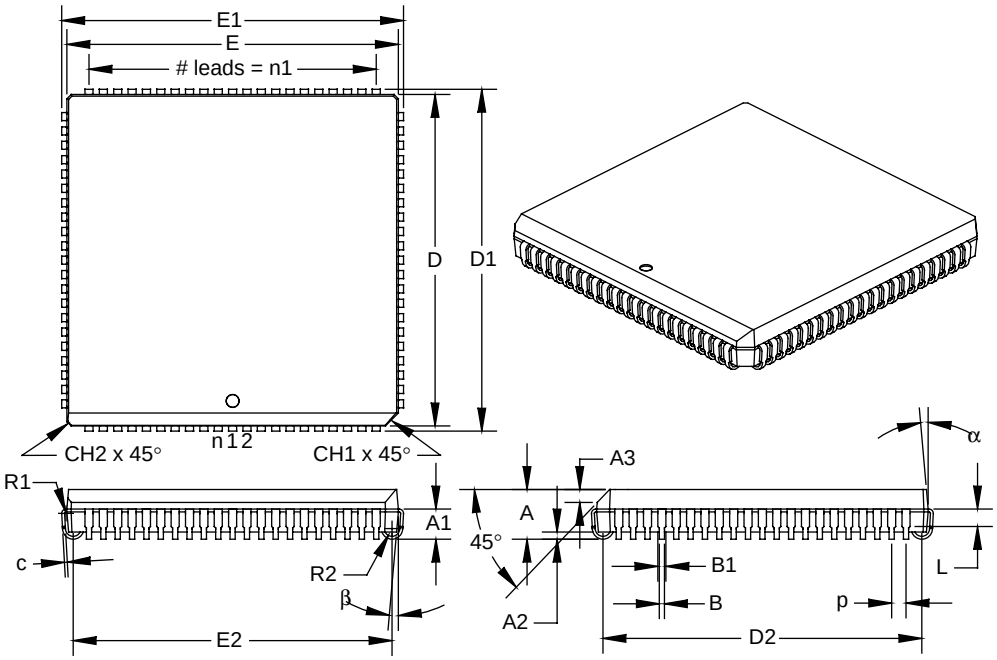
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010" (0.254 mm) per side or 0.020" (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-047 AE

Packaging Diagrams and Parameters

Package Type: K04-093 84-Lead Plastic Leaded Chip Carrier (L) – Square



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		84			84	
Pitch	p		0.050			1.27	
Overall Pack. Height	A	0.165	0.173	0.180	4.19	4.38	4.57
Shoulder Height	A1	0.090	0.105	0.120	2.29	2.67	3.05
Standoff	A2	0.020	0.025	0.030	0.51	0.64	0.76
Side 1 Chamfer Dim.	A3	0.042	0.045	0.048	1.07	1.14	1.22
Corner Chamfer (1)	CH1	0.042	0.045	0.048	1.07	1.14	1.22
Corner Chamfer(other)	CH2	0.010	0.015	0.020	0.25	0.38	0.51
Overall Pack. Width	E1	1.185	1.190	1.195	30.10	30.23	30.35
Overall Pack. Length	D1	1.185	1.190	1.195	30.10	30.23	30.35
Molded Pack. Width	E‡	1.150	1.154	1.158	29.21	29.31	29.41
Molded Pack. Length	D‡	1.150	1.154	1.158	29.21	29.31	29.41
Footprint Width	E2	1.095	1.110	1.125	27.81	28.19	28.58
Footprint Length	D2	1.095	1.110	1.125	27.81	28.19	28.58
Pins along Width	n1		21			21	
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Upper Lead Width	B1†	0.023	0.028	0.033	0.58	0.71	0.84
Lower Lead Width	B	0.013	0.018	0.023	0.33	0.46	0.58
Upper Lead Length	L	0.050	0.058	0.065	1.27	1.46	1.65
Shoulder Inside Radius	R1	0.003	0.005	0.010	0.08	0.13	0.25
J-Bend Inside Radius	R2	0.022	0.027	0.032	0.56	0.69	0.81
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter.

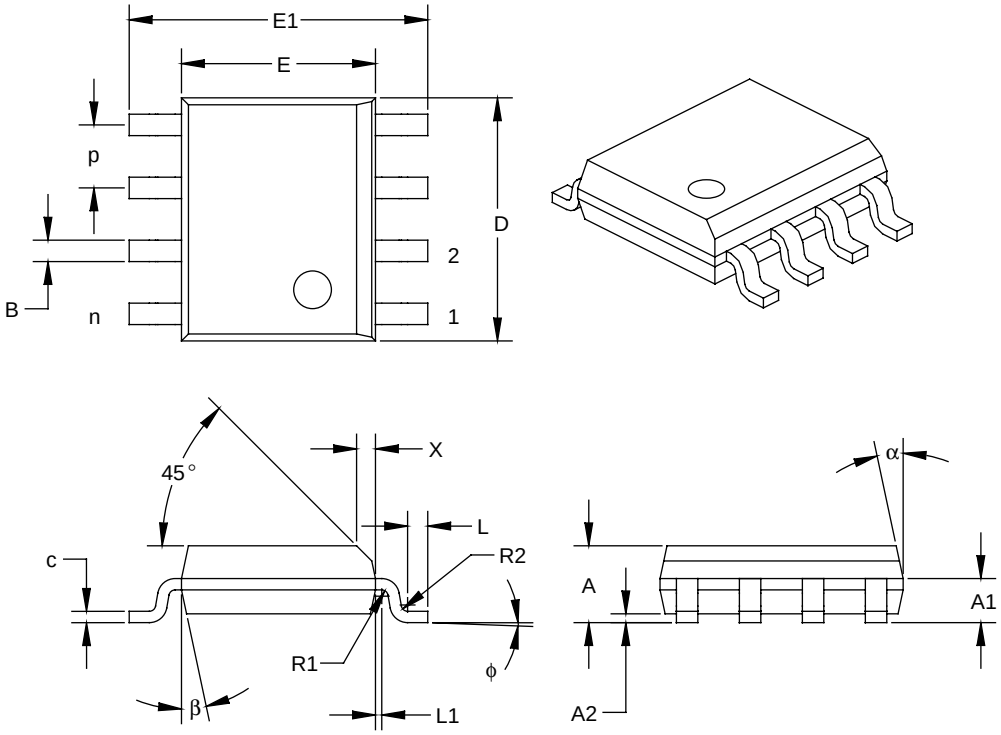
† Dimension “B1” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B1.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-047 AF

Packaging Diagrams and Parameters

Package Type: K04-057 8-Lead Plastic Small Outline (SN) – Narrow, 150 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.050			1.27	
Number of Pins	n		8			8	
Overall Pack. Height	A	0.054	0.061	0.069	1.37	1.56	1.75
Shoulder Height	A1	0.027	0.035	0.044	0.69	0.90	1.11
Standoff	A2	0.004	0.007	0.010	0.10	0.18	0.25
Molded Package Length	D‡	0.189	0.193	0.196	4.80	4.89	4.98
Molded Package Width	E‡	0.150	0.154	0.157	3.81	3.90	3.99
Outside Dimension	E1	0.229	0.237	0.244	5.82	6.01	6.20
Chamfer Distance	X	0.010	0.015	0.020	0.25	0.38	0.51
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.011	0.016	0.021	0.28	0.41	0.53
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.009	0.010	0.19	0.22	0.25
Lower Lead Width	B†	0.014	0.017	0.020	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.

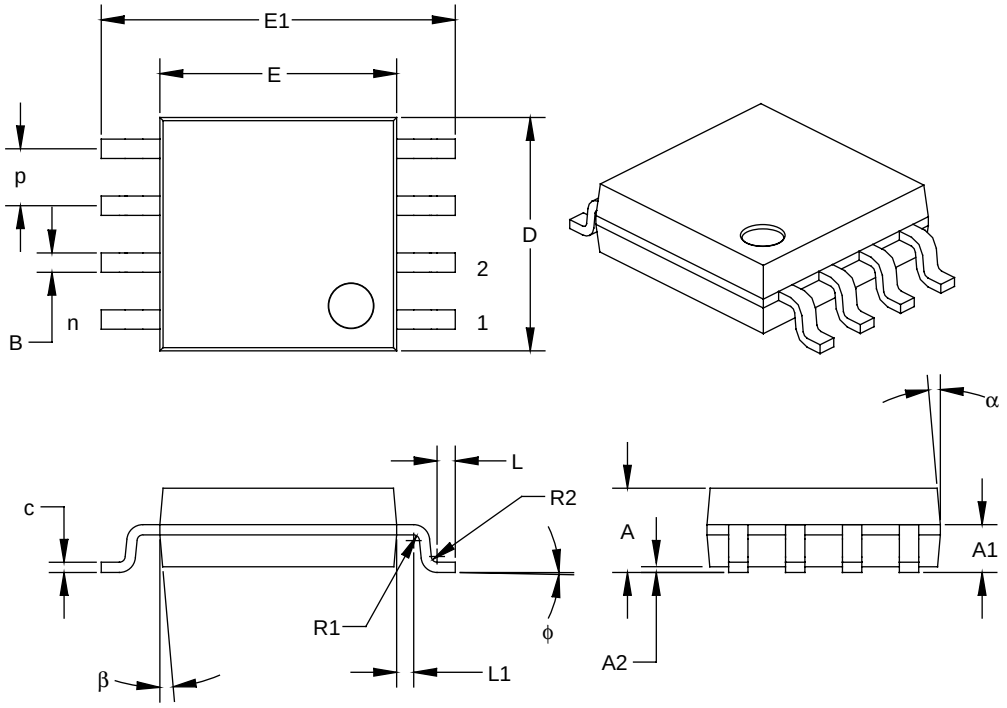
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-012 AA

Packaging Diagrams and Parameters

Package Type: K04-056 8-Lead Plastic Small Outline (SM) – Medium, 208 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.050			1.27	
Number of Pins	n		8			8	
Overall Pack. Height	A	0.070	0.074	0.079	1.78	1.89	2.00
Shoulder Height	A1	0.037	0.042	0.048	0.94	1.08	1.21
Standoff	A2	0.002	0.005	0.009	0.05	0.14	0.22
Molded Package Length	D‡	0.200	0.205	0.210	5.08	5.21	5.33
Molded Package Width	E‡	0.203	0.208	0.213	5.16	5.28	5.41
Outside Dimension	E1	0.300	0.313	0.325	7.62	7.94	8.26
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.011	0.016	0.021	0.28	0.41	0.53
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.010	0.015	0.020	0.25	0.38	0.51
Lead Thickness	c	0.008	0.009	0.010	0.19	0.22	0.25
Lower Lead Width	B†	0.014	0.017	0.020	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

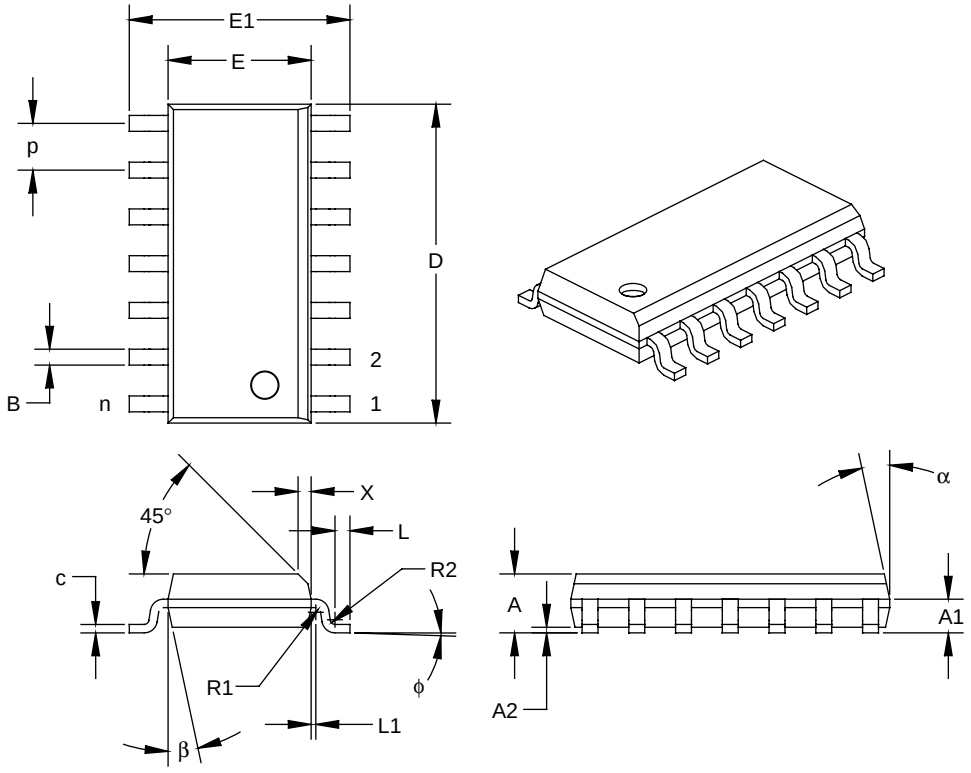
* Controlling Parameter.

† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

Packaging Diagrams and Parameters

Package Type: K04-065 14-Lead Plastic Small Outline (SL) – Narrow, 150 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.050			1.27	
Number of Pins	n		14			14	
Overall Pack. Height	A	0.058	0.063	0.068	1.47	1.60	1.73
Shoulder Height	A1	0.027	0.036	0.044	0.69	0.90	1.12
Standoff	A2	0.004	0.006	0.008	0.10	0.15	0.20
Molded Package Length	D‡	0.338	0.341	0.344	8.59	8.66	8.74
Molded Package Width	E‡	0.150	0.153	0.156	3.81	3.89	3.96
Outside Dimension	E1	0.230	0.236	0.242	5.84	5.99	6.15
Chamfer Distance	X	0.010	0.014	0.018	0.25	0.36	0.46
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.011	0.016	0.021	0.28	0.41	0.53
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.008	0.009	0.010	0.19	0.22	0.25
Lower Lead Width	B†	0.014	0.017	0.019	0.36	0.42	0.48
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter.

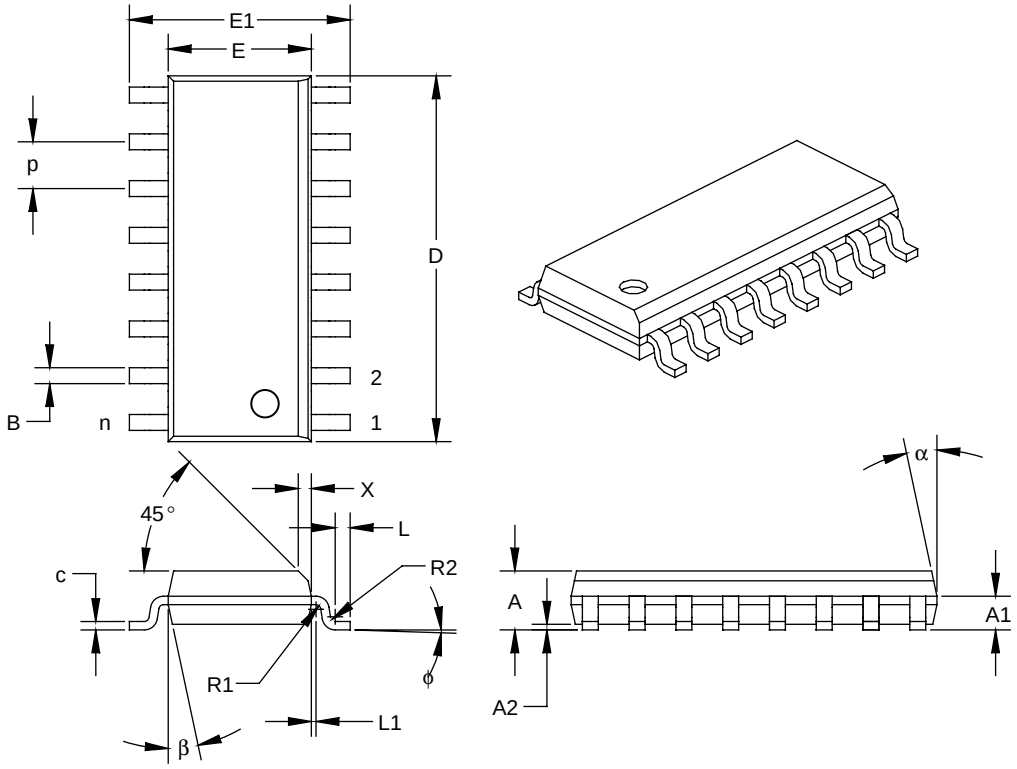
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-012 AB

Packaging Diagrams and Parameters

Package Type: K04-108 16-Lead Plastic Small Outline (SL) – Narrow 150 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.050			1.27	
Number of Pins	n		16			16	
Overall Pack. Height	A	0.058	0.063	0.068	1.47	1.60	1.73
Shoulder Height	A1	0.027	0.036	0.044	0.69	0.90	1.12
Standoff	A2	0.004	0.007	0.010	0.10	0.18	0.25
Molded Package Length	D‡	0.386	0.391	0.393	9.80	9.93	9.98
Molded Package Width	E‡	0.149	0.153	0.157	3.78	3.89	3.99
Outside Dimension	E1	0.230	0.236	0.244	5.84	5.99	6.20
Chamfer Distance	X	0.010	0.014	0.018	0.25	0.36	0.46
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.011	0.016	0.021	0.28	0.41	0.53
Foot Angle	ϕ	0	5	8	0	5	8
Radius Centerline	L1	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.007	0.008	0.010	0.18	0.20	0.25
Lower Lead Width	B†	0.014	0.016	0.019	0.36	0.41	0.48
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter.

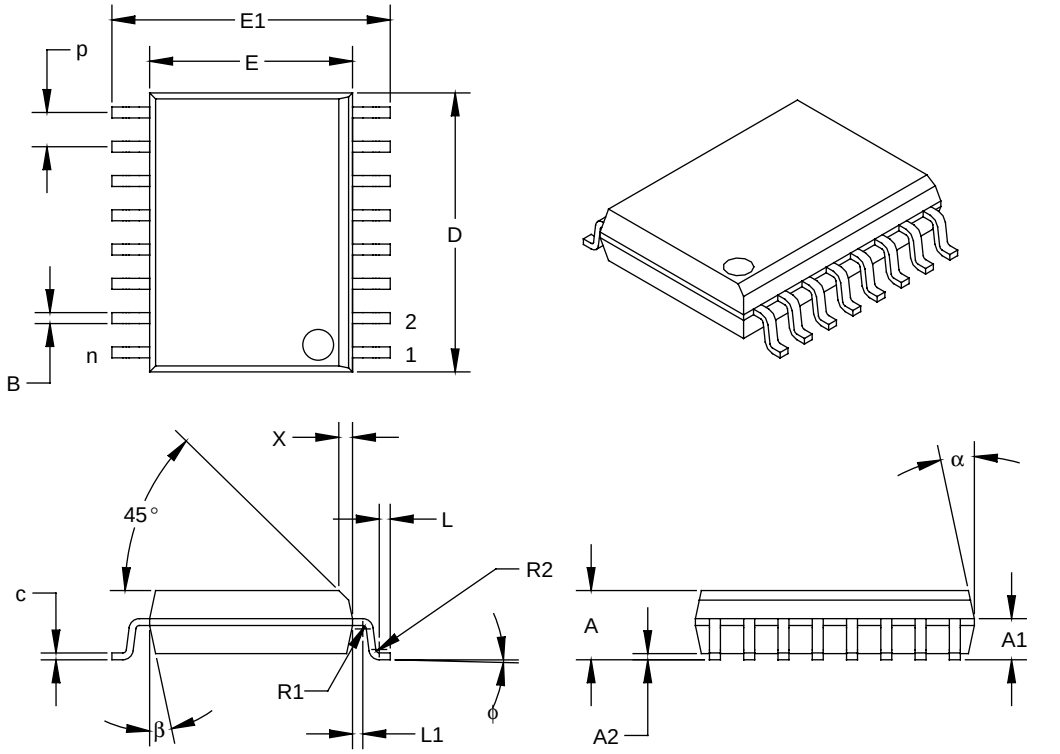
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-012 AC

Packaging Diagrams and Parameters

Package Type: K04-102 16-Lead Plastic Small Outline (SO) – Wide, 300 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.050			1.27	
Number of Pins	n		16			16	
Overall Pack. Height	A	0.097	0.101	0.104	2.46	2.55	2.64
Shoulder Height	A1	0.050	0.060	0.070	1.27	1.52	1.78
Standoff	A2	0.005	0.009	0.012	0.13	0.22	0.30
Molded Package Length	D‡	0.402	0.407	0.412	10.21	10.34	10.46
Molded Package Width	E‡	0.292	0.296	0.299	7.42	7.51	7.59
Outside Dimension	E1	0.400	0.405	0.410	10.16	10.29	10.41
Chamfer Distance	X	0.010	0.020	0.029	0.25	0.50	0.74
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.011	0.016	0.021	0.28	0.41	0.53
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.010	0.015	0.020	0.25	0.38	0.51
Lead Thickness	c	0.009	0.010	0.013	0.23	0.25	0.32
Lower Lead Width	B†	0.014	0.016	0.019	0.36	0.41	0.48
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter.

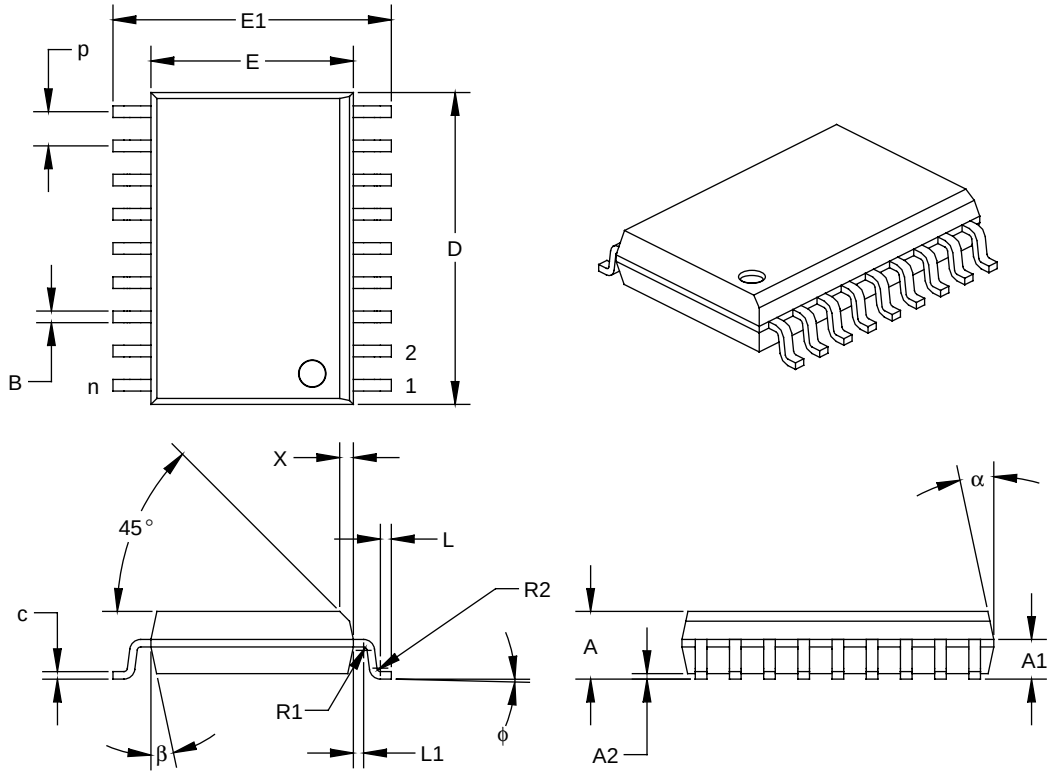
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-013 AA

Packaging Diagrams and Parameters

Package Type: K04-051 18-Lead Plastic Small Outline (SO) – Wide, 300 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.050			1.27	
Number of Pins	n		18			18	
Overall Pack. Height	A	0.093	0.099	0.104	2.36	2.50	2.64
Shoulder Height	A1	0.048	0.058	0.068	1.22	1.47	1.73
Standoff	A2	0.004	0.008	0.011	0.10	0.19	0.28
Molded Package Length	D‡	0.450	0.456	0.462	11.43	11.58	11.73
Molded Package Width	E‡	0.292	0.296	0.299	7.42	7.51	7.59
Outside Dimension	E1	0.394	0.407	0.419	10.01	10.33	10.64
Chamfer Distance	X	0.010	0.020	0.029	0.25	0.50	0.74
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.011	0.016	0.021	0.28	0.41	0.53
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.010	0.015	0.020	0.25	0.38	0.51
Lead Thickness	c	0.009	0.011	0.012	0.23	0.27	0.30
Lower Lead Width	B†	0.014	0.017	0.019	0.36	0.42	0.48
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter.

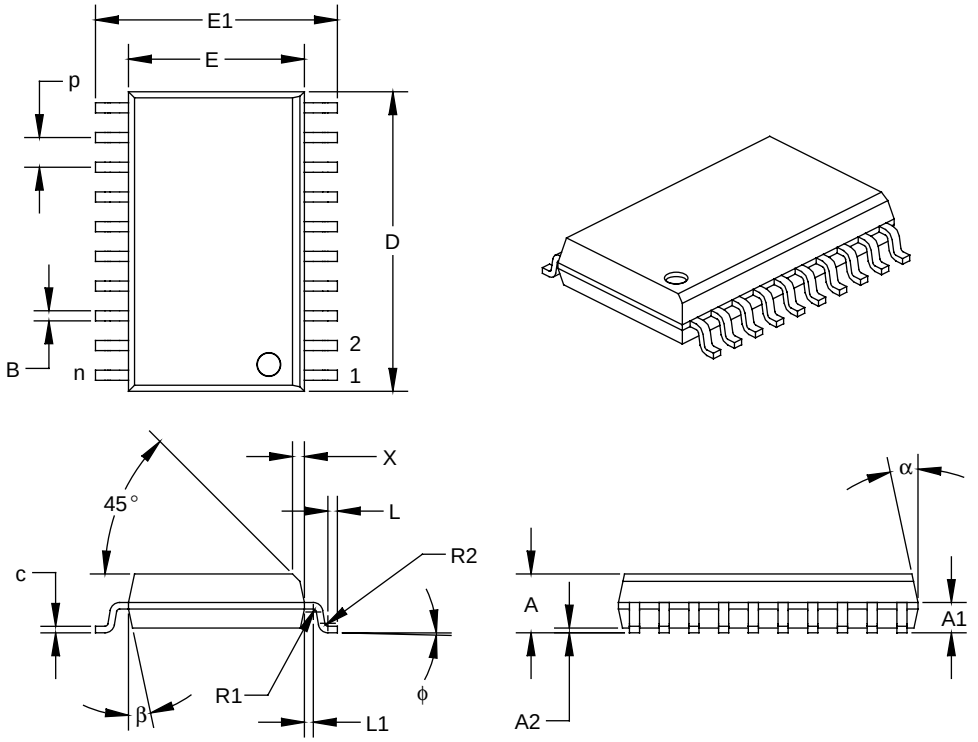
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-013 AB

Packaging Diagrams and Parameters

Package Type: K04-094 20-Lead Plastic Small Outline (SO) – Wide, 300 mil



Units		INCHES			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.050			1.27	
Number of Pins	n		20			20	
Overall Pack. Height	A	0.093	0.099	0.104	2.36	2.50	2.64
Shoulder Height	A1	0.041	0.051	0.061	1.04	1.30	1.55
Standoff	A2	0.004	0.008	0.011	0.10	0.19	0.28
Molded Package Length	D‡	0.496	0.504	0.512	12.60	12.80	13.00
Molded Package Width	E‡	0.292	0.296	0.299	7.42	7.51	7.59
Outside Dimension	E1	0.394	0.407	0.419	10.01	10.33	10.64
Chamfer Distance	X	0.010	0.020	0.029	0.25	0.50	0.74
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.011	0.016	0.021	0.28	0.41	0.53
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.010	0.015	0.020	0.25	0.38	0.51
Lead Thickness	c	0.009	0.011	0.012	0.23	0.27	0.30
Lower Lead Width	B†	0.013	0.017	0.020	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.

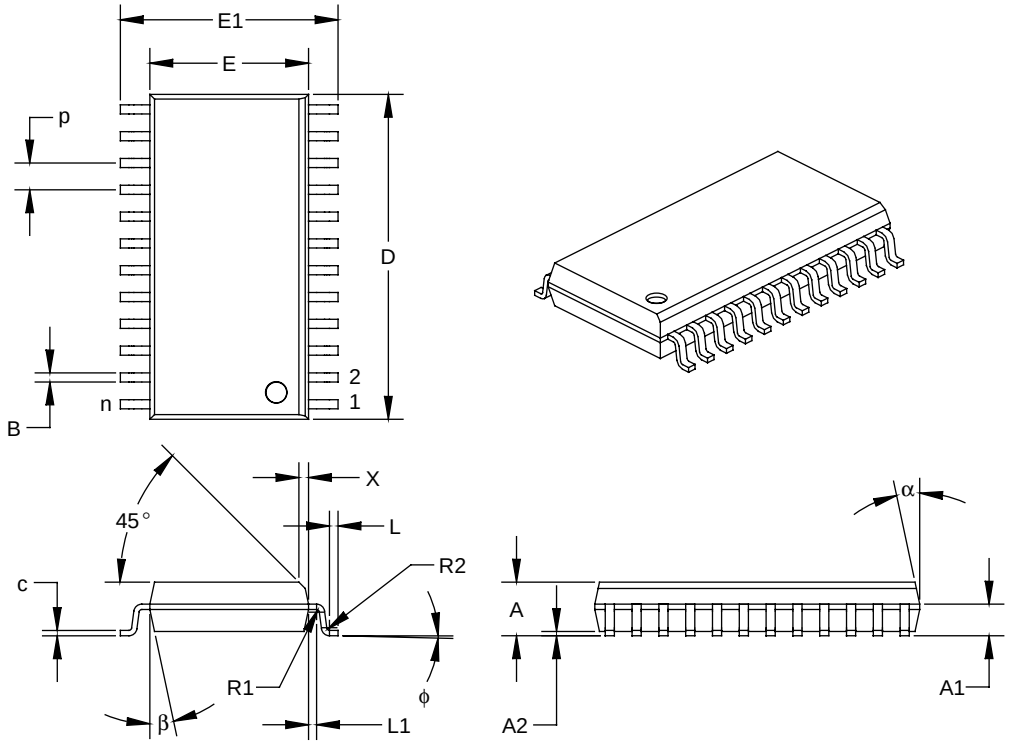
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-013 AC

Packaging Diagrams and Parameters

Package Type: K04-098 24-Lead Plastic Small Outline (SO) – Wide, 300 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.050			1.27	
Number of Pins	n		24			24	
Overall Pack. Height	A	0.095	0.100	0.105	2.41	2.54	2.67
Shoulder Height	A1	0.051	0.059	0.067	1.30	1.50	1.70
Standoff	A2	0.004	0.008	0.012	0.10	0.20	0.30
Molded Package Length	D‡	0.599	0.606	0.612	15.21	15.38	15.54
Molded Package Width	E‡	0.292	0.296	0.299	7.42	7.51	7.59
Outside Dimension	E1	0.396	0.406	0.416	10.06	10.31	10.57
Chamfer Distance	X	0.010	0.018	0.025	0.25	0.44	0.64
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.011	0.016	0.021	0.28	0.41	0.53
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.010	0.015	0.020	0.25	0.38	0.51
Lead Thickness	c	0.008	0.010	0.012	0.20	0.25	0.30
Lower Lead Width	B†	0.013	0.017	0.020	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.

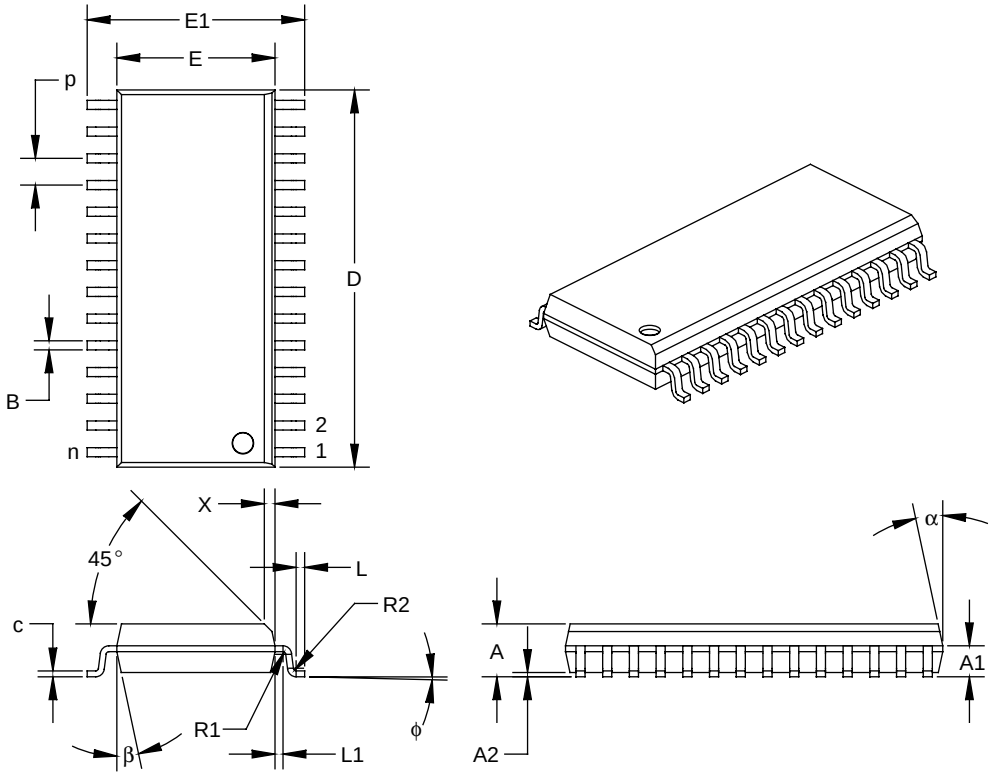
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-013 AD

Packaging Diagrams and Parameters

Package Type: K04-052 28-Lead Plastic Small Outline (SO) – Wide, 300 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.050			1.27	
Number of Pins	n		28			28	
Overall Pack. Height	A	0.093	0.099	0.104	2.36	2.50	2.64
Shoulder Height	A1	0.048	0.058	0.068	1.22	1.47	1.73
Standoff	A2	0.004	0.008	0.011	0.10	0.19	0.28
Molded Package Length	D‡	0.700	0.706	0.712	17.78	17.93	18.08
Molded Package Width	E‡	0.292	0.296	0.299	7.42	7.51	7.59
Outside Dimension	E1	0.394	0.407	0.419	10.01	10.33	10.64
Chamfer Distance	X	0.010	0.020	0.029	0.25	0.50	0.74
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.011	0.016	0.021	0.28	0.41	0.53
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.010	0.015	0.020	0.25	0.38	0.51
Lead Thickness	c	0.009	0.011	0.012	0.23	0.27	0.30
Lower Lead Width	B†	0.014	0.017	0.019	0.36	0.42	0.48
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter.

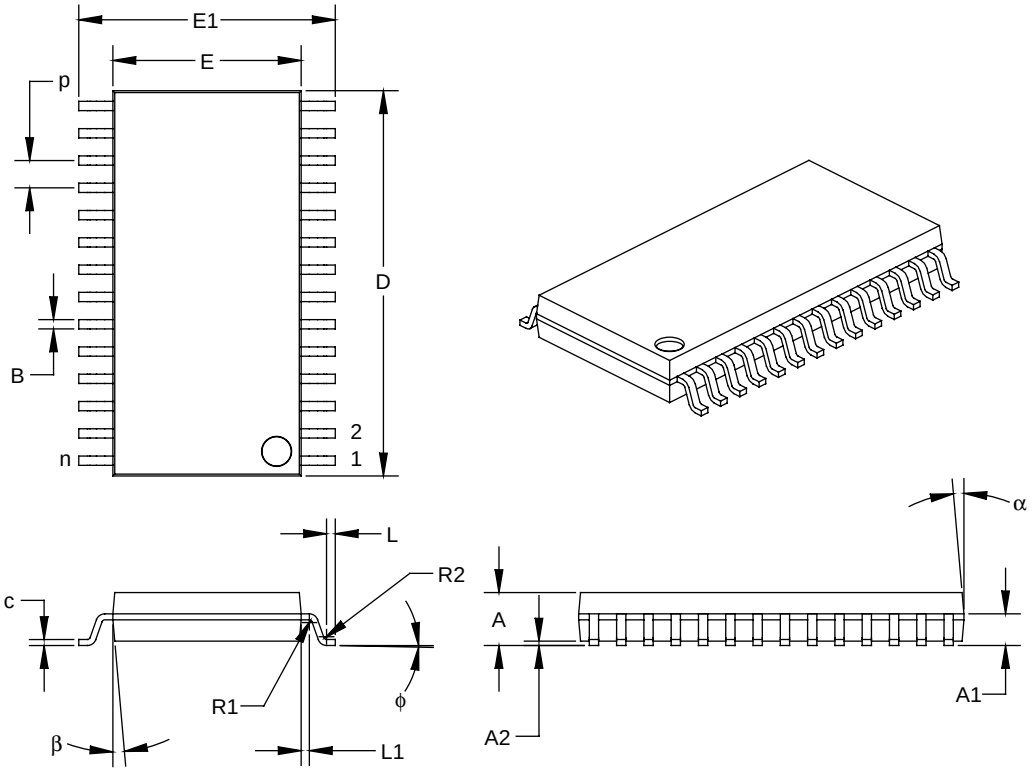
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-013 AE

Packaging Diagrams and Parameters

Package Type: K04-066 28-Lead Plastic Small Outline (SO) – Wide, 330 mil



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.050			1.27	
Number of Pins	n		28			28	
Overall Pack. Height	A	0.090	0.097	0.104	2.29	2.46	2.64
Shoulder Height	A1	0.048	0.058	0.068	1.22	1.47	1.73
Standoff	A2	0.004	0.008	0.011	0.10	0.19	0.28
Molded Package Length	D‡	0.700	0.706	0.712	17.78	17.93	18.08
Molded Package Width	E‡	0.340	0.345	0.350	8.64	8.76	8.89
Outside Dimension	E1	0.463	0.470	0.477	11.76	11.94	12.12
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.011	0.016	0.021	0.28	0.41	0.53
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.010	0.015	0.020	0.25	0.38	0.51
Lead Thickness	c	0.009	0.011	0.012	0.23	0.27	0.30
Lower Lead Width	B†	0.014	0.017	0.020	0.36	0.43	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.

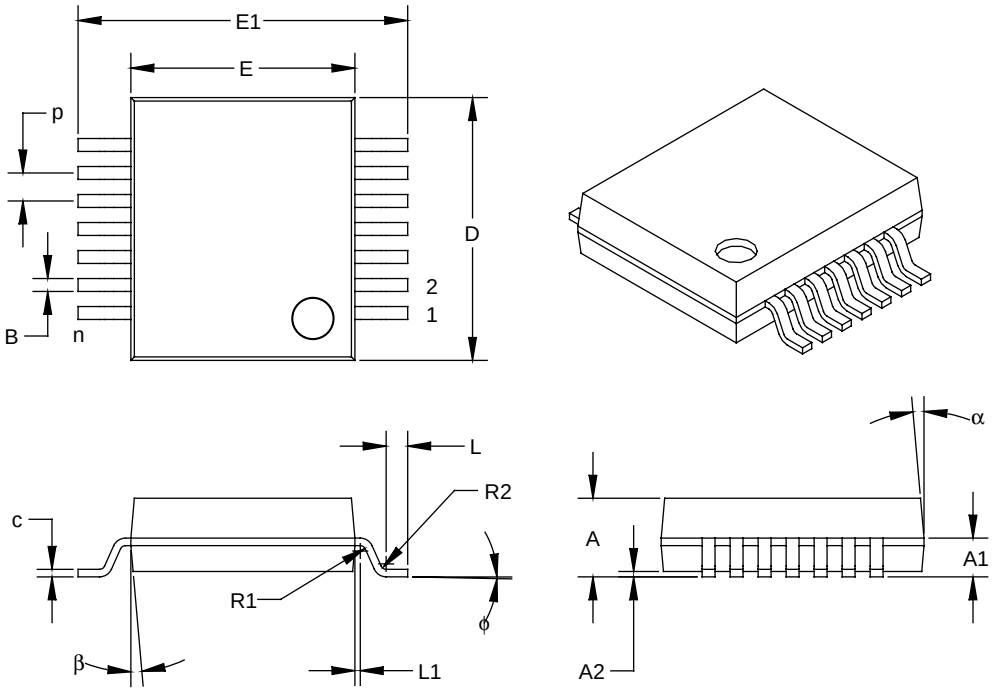
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-059 AC

Packaging Diagrams and Parameters

Package Type: K04-103 14-Lead Plastic Shrink Small Outline (SS) – 5.30 mm



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.026			0.65	
Number of Pins	n		14			14	
Overall Pack. Height	A	0.068	0.073	0.078	1.73	1.86	1.99
Shoulder Height	A1	0.026	0.036	0.046	0.66	0.91	1.17
Standoff	A2	0.002	0.005	0.008	0.05	0.13	0.21
Molded Package Length	D‡	0.239	0.244	0.249	6.07	6.20	6.33
Molded Package Width	E‡	0.205	0.208	0.212	5.20	5.29	5.38
Outside Dimension	E1	0.301	0.306	0.311	7.65	7.78	7.90
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.015	0.020	0.025	0.38	0.51	0.64
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.005	0.007	0.009	0.13	0.18	0.22
Lower Lead Width	B†	0.010	0.012	0.015	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.

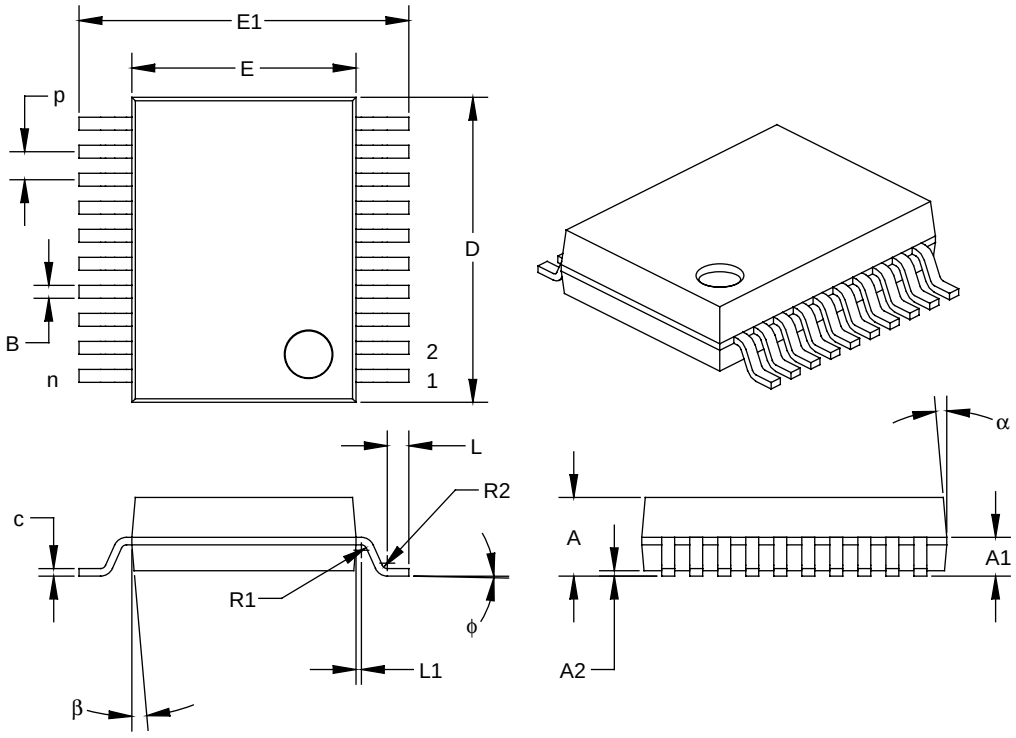
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-150 AB

Packaging Diagrams and Parameters

Package Type: K04-072 20-Lead Plastic Shrink Small Outine (SS) – 5.30 mm



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.026			0.65	
Number of Pins	n		20			20	
Overall Pack. Height	A	0.068	0.073	0.078	1.73	1.86	1.99
Shoulder Height	A1	0.026	0.036	0.046	0.66	0.91	1.17
Standoff	A2	0.002	0.005	0.008	0.05	0.13	0.21
Molded Package Length	D‡	0.278	0.283	0.289	7.07	7.20	7.33
Molded Package Width	E‡	0.205	0.208	0.212	5.20	5.29	5.38
Outside Dimension	E1	0.301	0.306	0.311	7.65	7.78	7.90
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.015	0.020	0.025	0.38	0.51	0.64
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.005	0.007	0.009	0.13	0.18	0.22
Lower Lead Width	B†	0.010	0.012	0.015	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.

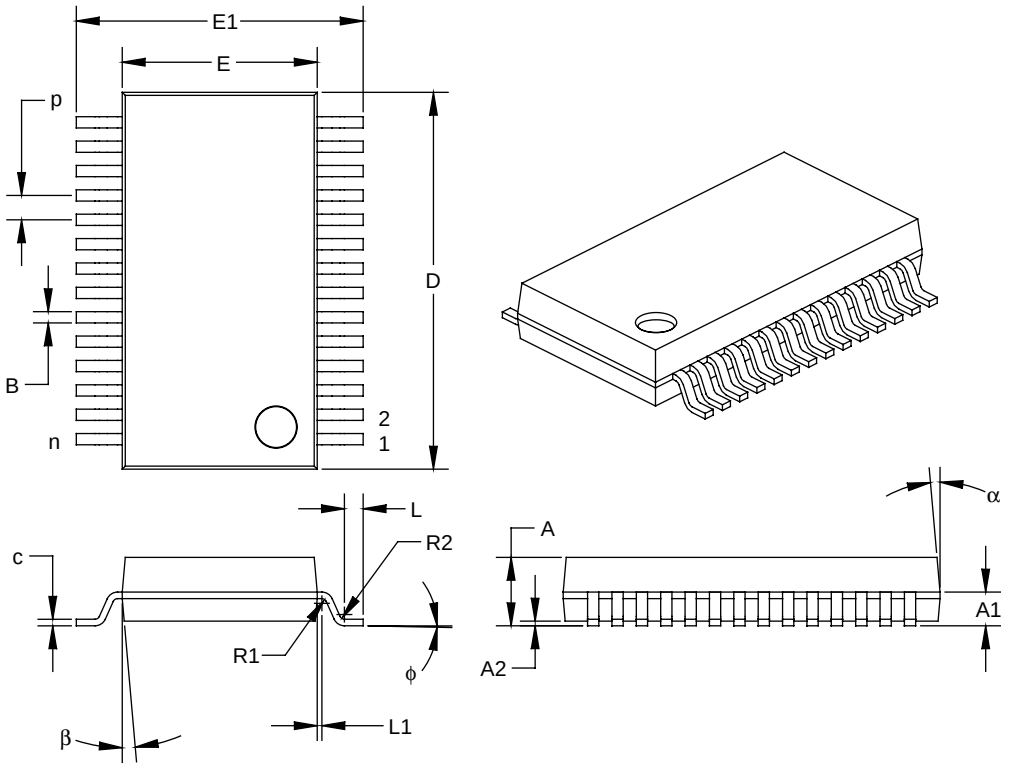
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-150 AE

Packaging Diagrams and Parameters

Package Type: K04-073 28-Lead Plastic Shrink Small Outline (SS) – 5.30 mm



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.026			0.65	
Number of Pins	n		28			28	
Overall Pack. Height	A	0.068	0.073	0.078	1.73	1.86	1.99
Shoulder Height	A1	0.026	0.036	0.046	0.66	0.91	1.17
Standoff	A2	0.002	0.005	0.008	0.05	0.13	0.21
Molded Package Length	D‡	0.396	0.402	0.407	10.07	10.20	10.33
Molded Package Width	E‡	0.205	0.208	0.212	5.20	5.29	5.38
Outside Dimension	E1	0.301	0.306	0.311	7.65	7.78	7.90
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.005	0.010	0.13	0.13	0.25
Foot Length	L	0.015	0.020	0.025	0.38	0.51	0.64
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.000	0.005	0.010	0.00	0.13	0.25
Lead Thickness	c	0.005	0.007	0.009	0.13	0.18	0.22
Lower Lead Width	B†	0.010	0.012	0.015	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.

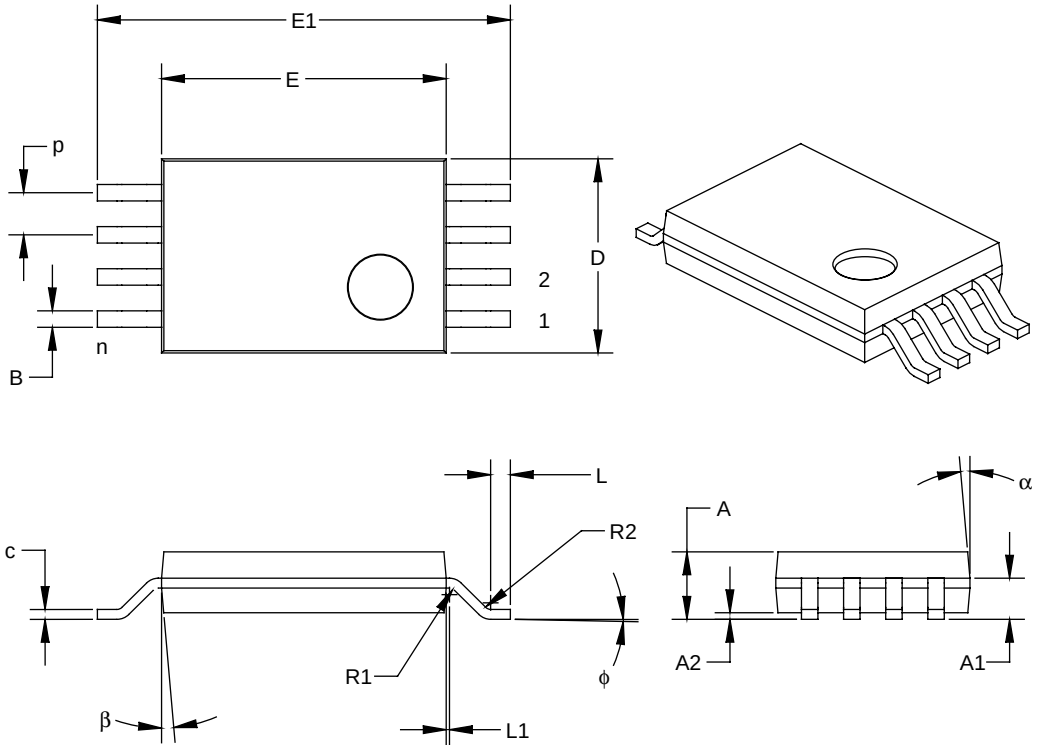
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-150 AH

Packaging Diagrams and Parameters

Package Type: K04-086 8-Lead Plastic Thin Shrink Small Outline (ST) – 4.4 mm



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.026			0.65	
Number of Pins	n		8			8	
Overall Package Height	A	0.039	0.041	0.043	1.00	1.05	1.10
Shoulder Height	A1	0.020	0.025	0.030	0.51	0.64	0.76
Standoff	A2	0.002	0.004	0.006	0.05	0.10	0.15
Molded Package Length	D‡	0.114	0.118	0.122	2.90	3.00	3.10
Molded Package Width	E‡	0.169	0.173	0.177	4.30	4.40	4.50
Outside Dimension	E1	0.246	0.251	0.256	6.25	6.38	6.50
Shoulder Radius	R1	0.000	0.004	0.010	0.00	0.10	0.25
Gull Wing Radius	R2	0.000	0.004	0.010	0.00	0.10	0.25
Foot Length	L	0.007	0.012	0.017	0.18	0.30	0.43
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.000	0.002	0.005	0.00	0.05	0.13
Lead Thickness	c	0.004	0.006	0.008	0.09	0.15	0.20
Lower Lead Width	B†	0.007	0.010	0.012	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.

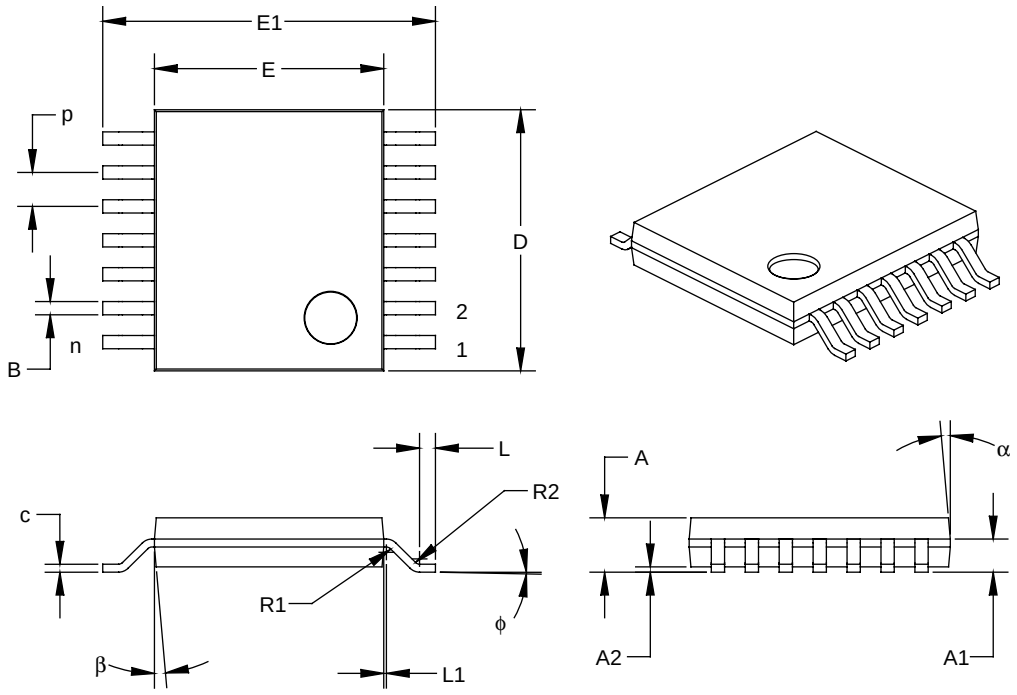
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-153 AA

Packaging Diagrams and Parameters

Package Type: K04-087 14-Lead Plastic Thin Shrink Small Outline (ST) – 4.4 mm



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.026			0.65	
Number of Pins	n		14			14	
Overall Package Height	A	0.039	0.041	0.043	1.00	1.05	1.10
Shoulder Height	A1	0.020	0.025	0.030	0.51	0.64	0.76
Standoff	A2	0.002	0.004	0.006	0.05	0.10	0.15
Molded Package Length	D‡	0.193	0.197	0.201	4.90	5.00	5.10
Molded Package Width	E‡	0.169	0.173	0.177	4.30	4.40	4.50
Outside Dimension	E1	0.246	0.251	0.256	6.25	6.38	6.50
Shoulder Radius	R1	0.000	0.004	0.010	0.00	0.10	0.25
Gull Wing Radius	R2	0.000	0.004	0.010	0.00	0.10	0.25
Foot Length	L	0.007	0.012	0.017	0.18	0.30	0.43
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.000	0.002	0.005	0.00	0.05	0.13
Lead Thickness	c	0.004	0.006	0.008	0.09	0.15	0.20
Lower Lead Width	B†	0.007	0.010	0.012	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.

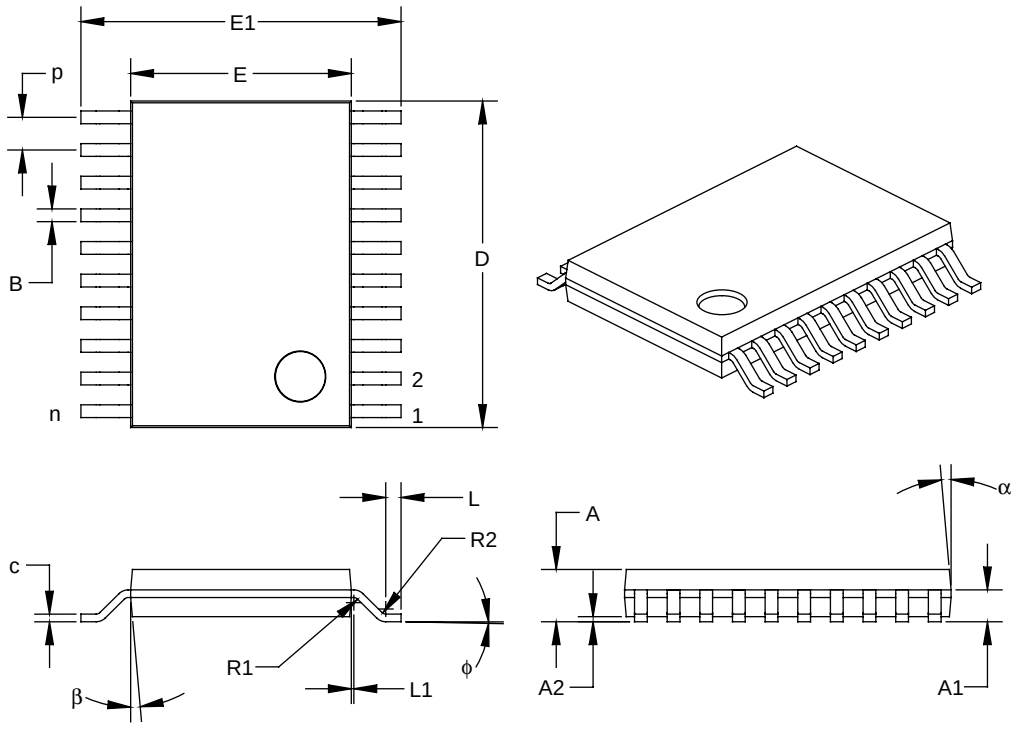
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-153 AB-1

Packaging Diagrams and Parameters

Package Type: K04-088 20-Lead Plastic Thin Shrink Small Outline (ST) – 4.4 mm



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.026			0.65	
Number of Pins	n		20			20	
Overall Package Height	A	0.039	0.041	0.043	1.00	1.05	1.10
Shoulder Height	A1	0.020	0.025	0.030	0.51	0.64	0.76
Standoff	A2	0.002	0.004	0.006	0.05	0.10	0.15
Molded Package Length	D‡	0.252	0.256	0.260	6.40	6.50	6.60
Molded Package Width	E‡	0.169	0.173	0.177	4.30	4.40	4.50
Outside Dimension	E1	0.246	0.251	0.256	6.25	6.38	6.50
Shoulder Radius	R1	0.000	0.004	0.010	0.00	0.10	0.25
Gull Wing Radius	R2	0.000	0.004	0.010	0.00	0.10	0.25
Foot Length	L	0.007	0.012	0.017	0.18	0.30	0.43
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.000	0.002	0.005	0.00	0.05	0.13
Lead Thickness	c	0.004	0.006	0.008	0.09	0.15	0.20
Lower Lead Width	B†	0.007	0.010	0.012	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.

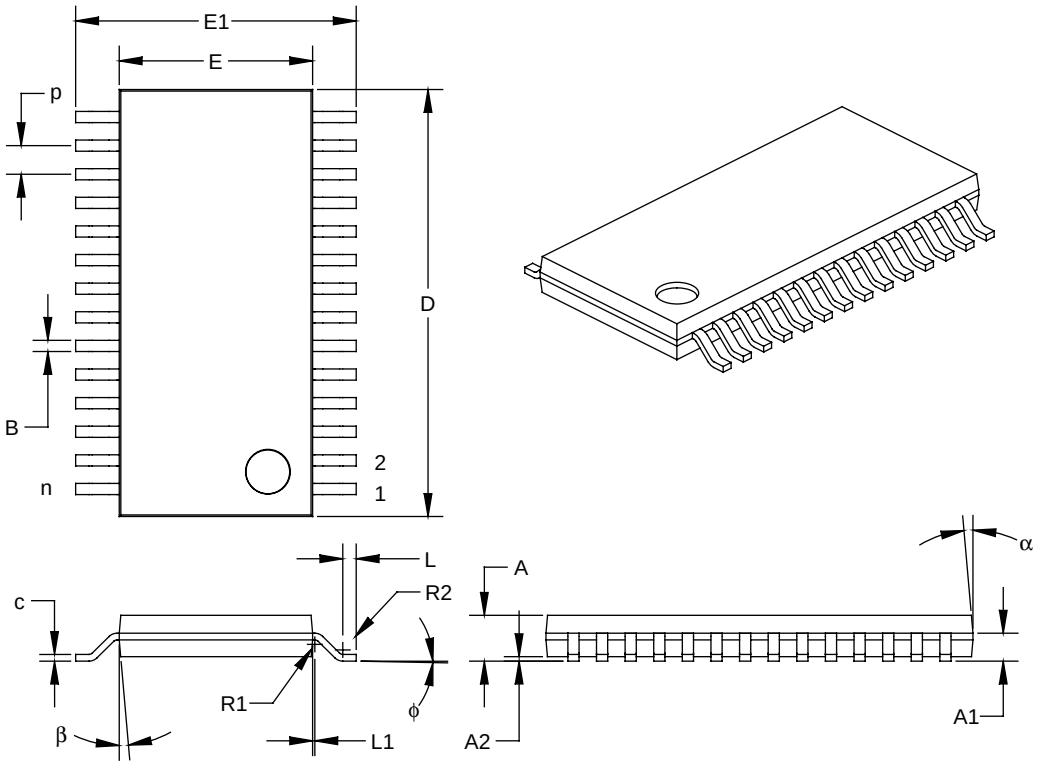
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-153 AC

Packaging Diagrams and Parameters

Package Type: K04-089 28-Lead Thin Shrink Small Outline (ST) – 4.4 mm



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.026			0.65	
Number of Pins	n		28			28	
Overall Package Height	A	0.039	0.041	0.043	1.00	1.05	1.10
Shoulder Height	A1	0.020	0.025	0.030	0.51	0.64	0.76
Standoff	A2	0.002	0.004	0.006	0.05	0.10	0.15
Molded Package Length	D‡	0.378	0.382	0.386	9.60	9.70	9.80
Molded Package Width	E‡	0.169	0.173	0.177	4.30	4.40	4.50
Outside Dimension	E1	0.246	0.251	0.256	6.25	6.38	6.50
Shoulder Radius	R1	0.000	0.004	0.010	0.00	0.10	0.25
Gull Wing Radius	R2	0.000	0.004	0.010	0.00	0.10	0.25
Foot Length	L	0.007	0.012	0.017	0.18	0.30	0.43
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.000	0.002	0.005	0.00	0.05	0.13
Lead Thickness	c	0.004	0.006	0.008	0.09	0.15	0.20
Lower Lead Width	B†	0.007	0.010	0.012	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.

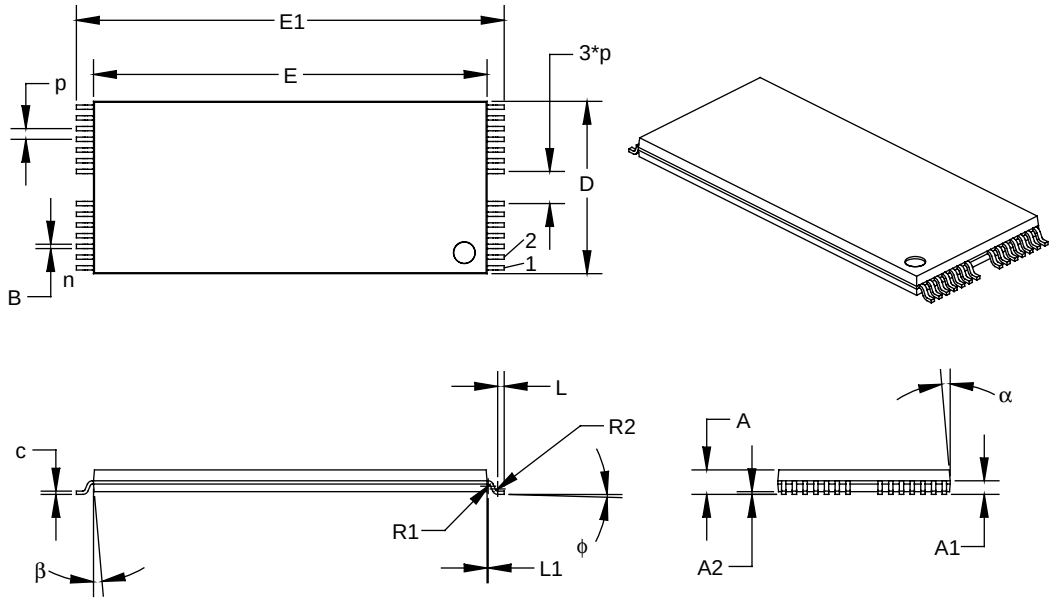
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MO-153 AE

Packaging Diagrams and Parameters

Package Type: K04-067 28-Lead Plastic Thin Small Outline (TS) – 8 x 20 mm



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.020			0.50	
Number of Pins	n		28			28	
Overall Package Height	A	0.039	0.045	0.050	1.00	1.14	1.27
Shoulder Height	A1	0.020	0.025	0.030	0.51	0.64	0.76
Standoff	A2	0.000	0.005	0.010	0.00	0.13	0.25
Molded Package Length	D‡	0.311	0.317	0.323	7.90	8.05	8.20
Molded Package Width	E‡	0.720	0.724	0.728	18.30	18.40	18.50
Outside Dimension	E1	0.780	0.787	0.795	19.80	20.00	20.20
Shoulder Radius	R1	0.000	0.004	0.010	0.00	0.10	0.25
Gull Wing Radius	R2	0.000	0.004	0.010	0.00	0.10	0.25
Foot Length	L	0.007	0.012	0.017	0.18	0.30	0.43
Foot Angle	ϕ	0	4	8	0	4	8
Radius Centerline	L1	0.000	0.002	0.005	0.00	0.05	0.13
Lead Thickness	c	0.004	0.006	0.008	0.10	0.15	0.20
Lower Lead Width	B†	0.006	0.008	0.010	0.15	0.20	0.25
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter.

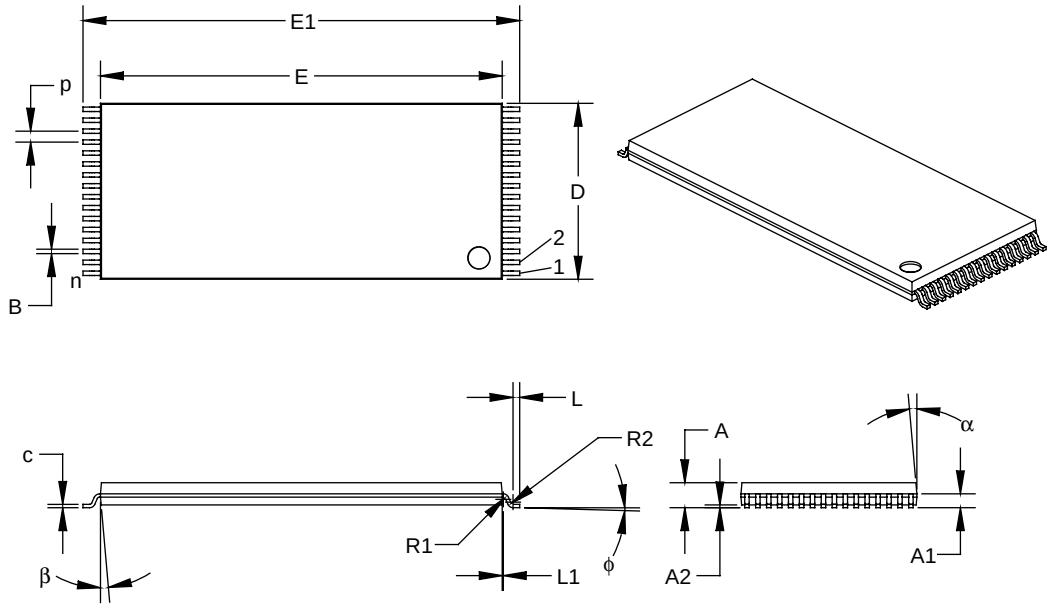
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

EIAJ equivalent: IC-74-2-3

Packaging Diagrams and Parameters

Package Type: K04-068 32-Lead Plastic Thin Small Outline (TS) – 8 x 20 mm



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.020			0.50	
Number of Pins	n		32			32	
Overall Package Height	A	0.039	0.045	0.050	1.00	1.14	1.27
Shoulder Height	A1	0.020	0.025	0.030	0.51	0.64	0.76
Standoff	A2	0.000	0.005	0.010	0.00	0.13	0.25
Molded Package Length	D‡	0.311	0.317	0.323	7.90	8.05	8.20
Molded Package Width	E‡	0.720	0.724	0.728	18.30	18.40	18.50
Outside Dimension	E1	0.780	0.787	0.795	19.80	20.00	20.20
Shoulder Radius	R1	0.000	0.004	0.010	0.00	0.10	0.25
Gull Wing Radius	R2	0.000	0.004	0.010	0.00	0.10	0.25
Foot Length	L	0.007	0.012	0.017	0.18	0.30	0.43
Foot Angle	ϕ	0	3	5	0	3	5
Radius Centerline	L1	0.000	0.002	0.005	0.00	0.05	0.13
Lead Thickness	c	0.004	0.006	0.008	0.10	0.15	0.20
Lower Lead Width	B†	0.006	0.008	0.010	0.15	0.20	0.25
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* Controlling Parameter.

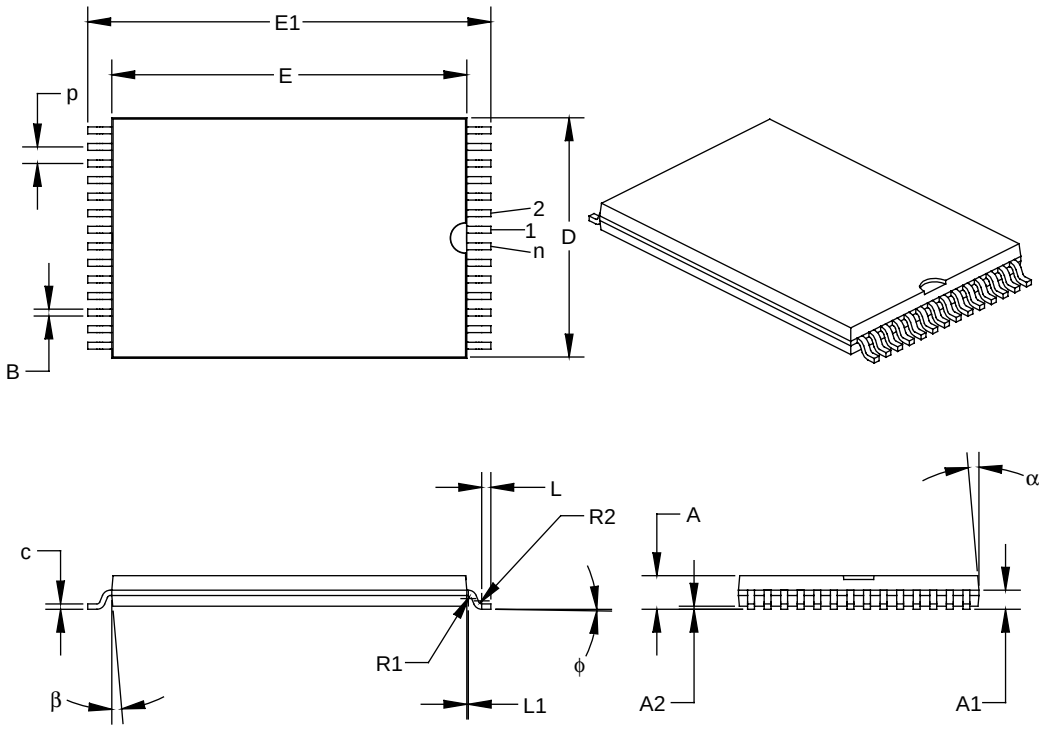
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

EIAJ equivalent: IC-74-2-3

Packaging Diagrams and Parameters

Package Type: K04-075 28-Lead Plastic Very Small Outline (VS) – 8 x 13.4 mm



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.022			0.55	
Number of Pins	n		28			28	
Overall Package Height	A	0.039	0.044	0.049	1.00	1.13	1.25
Shoulder Height	A1	0.020	0.025	0.030	0.51	0.64	0.76
Standoff	A2	0.000	0.004	0.008	0.00	0.10	0.20
Molded Package Length	D‡	0.311	0.315	0.319	7.90	8.00	8.10
Molded Package Width	E‡	0.461	0.465	0.469	11.70	11.80	11.90
Outside Dimension	E1	0.516	0.528	0.539	13.10	13.40	13.70
Shoulder Radius	R1	0.000	0.004	0.010	0.00	0.10	0.25
Gull Wing Radius	R2	0.000	0.004	0.010	0.00	0.10	0.25
Foot Length	L	0.007	0.012	0.017	0.18	0.30	0.43
Foot Angle	ϕ	0	3	5	0	3	5
Radius Centerline	L1	0.000	0.002	0.005	0.00	0.05	0.13
Lead Thickness	c	0.005	0.007	0.009	0.13	0.18	0.22
Lower Lead Width	B†	0.006	0.009	0.012	0.15	0.23	0.30
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	b	0	5	10	0	5	10

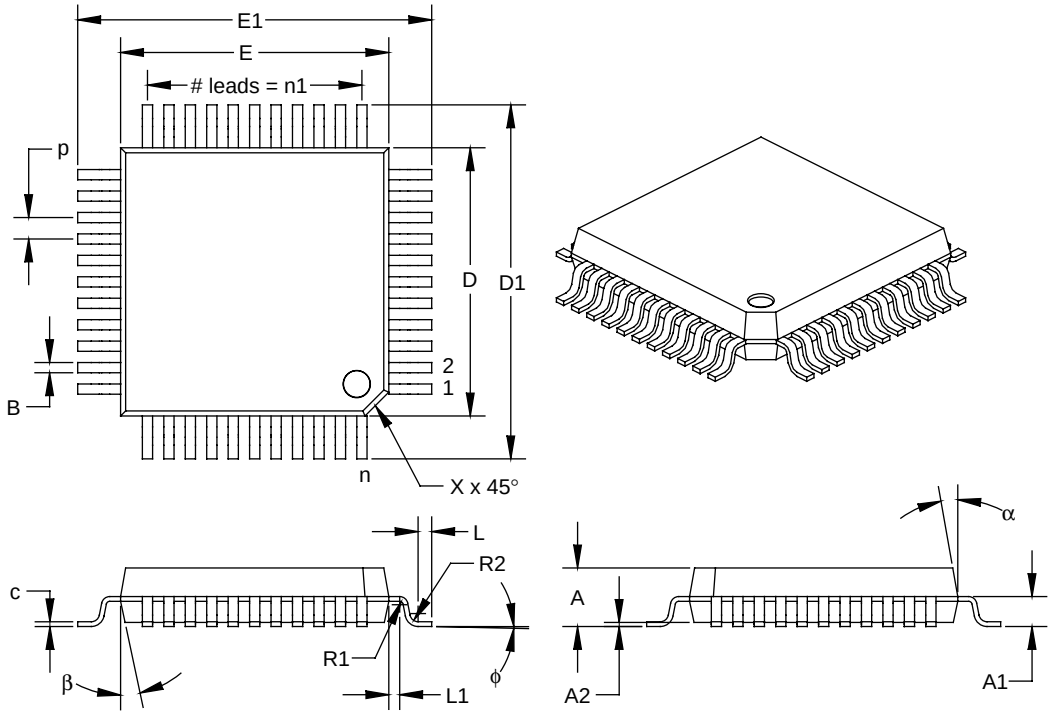
* Controlling Parameter.

† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

Packaging Diagrams and Parameters

Package Type: K04-071 44-Lead Plastic Quad Flatpack (PQ)
10x10x2 mm Body, 1.6/0.15 mm Lead Form



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.031			0.80	
Number of Pins	n		44			44	
Pins along Width	n1		11			11	
Overall Pack. Height	A	0.079	0.086	0.093	2.00	2.18	2.35
Shoulder Height	A1	0.032	0.044	0.056	0.81	1.11	1.41
Standoff	A2	0.002	0.006	0.010	0.05	0.15	0.25
Shoulder Radius	R1	0.005	0.005	0.010	0.13	0.13	0.25
Gull Wing Radius	R2	0.005	0.012	0.015	0.13	0.30	0.38
Foot Length	L	0.015	0.020	0.025	0.38	0.51	0.64
Foot Angle	ϕ	0	3.5	7	0	3.5	7
Radius Centerline	L1	0.011	0.016	0.021	0.28	0.41	0.53
Lead Thickness	c	0.005	0.007	0.009	0.13	0.18	0.23
Lower Lead Width	B†	0.012	0.015	0.018	0.30	0.37	0.45
Outside Tip Length	D1	0.510	0.520	0.530	12.95	13.20	13.45
Outside Tip Width	E1	0.510	0.520	0.530	12.95	13.20	13.45
Molded Pack. Length	D‡	0.390	0.394	0.398	9.90	10.00	10.10
Molded Pack. Width	E‡	0.390	0.394	0.398	9.90	10.00	10.10
Pin 1 Corner Chamfer	X	0.025	0.035	0.045	0.635	0.89	1.143
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	12	15	5	12	15

* Controlling Parameter.

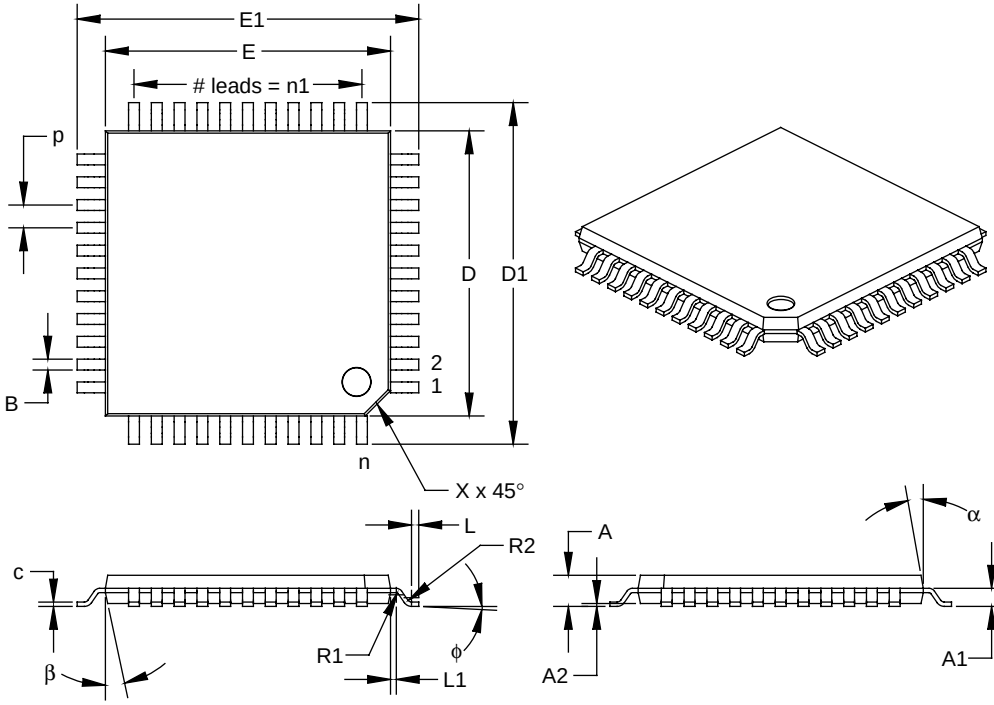
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-022 AB

Packaging Diagrams and Parameters

Package Type: K04-076 44-Lead Plastic Thin Quad Flatpack (PT)
10x10x1 mm Body, 1.0/0.1 mm Lead Form



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.031			0.80	
Number of Pins	n		44			44	
Pins along Width	n1		11			11	
Overall Pack. Height	A	0.039	0.043	0.047	1.00	1.10	1.20
Shoulder Height	A1	0.015	0.025	0.035	0.38	0.64	0.89
Standoff	A2	0.002	0.004	0.006	0.05	0.10	0.15
Shoulder Radius	R1	0.003	0.003	0.010	0.08	0.08	0.25
Gull Wing Radius	R2	0.003	0.006	0.008	0.08	0.14	0.20
Foot Length	L	0.005	0.010	0.015	0.13	0.25	0.38
Foot Angle	ϕ	0	3.5	7	0	3.5	7
Radius Centerline	L1	0.003	0.008	0.013	0.08	0.20	0.33
Lead Thickness	c	0.004	0.006	0.008	0.09	0.15	0.20
Lower Lead Width	B†	0.012	0.015	0.018	0.30	0.38	0.45
Outside Tip Length	D1	0.463	0.472	0.482	11.75	12.00	12.25
Outside Tip Width	E1	0.463	0.472	0.482	11.75	12.00	12.25
Molded Pack. Length	D‡	0.390	0.394	0.398	9.90	10.00	10.10
Molded Pack. Width	E‡	0.390	0.394	0.398	9.90	10.00	10.10
Pin 1 Corner Chamfer	X	0.025	0.035	0.045	0.64	0.89	1.14
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	12	15	5	12	15

* Controlling Parameter.

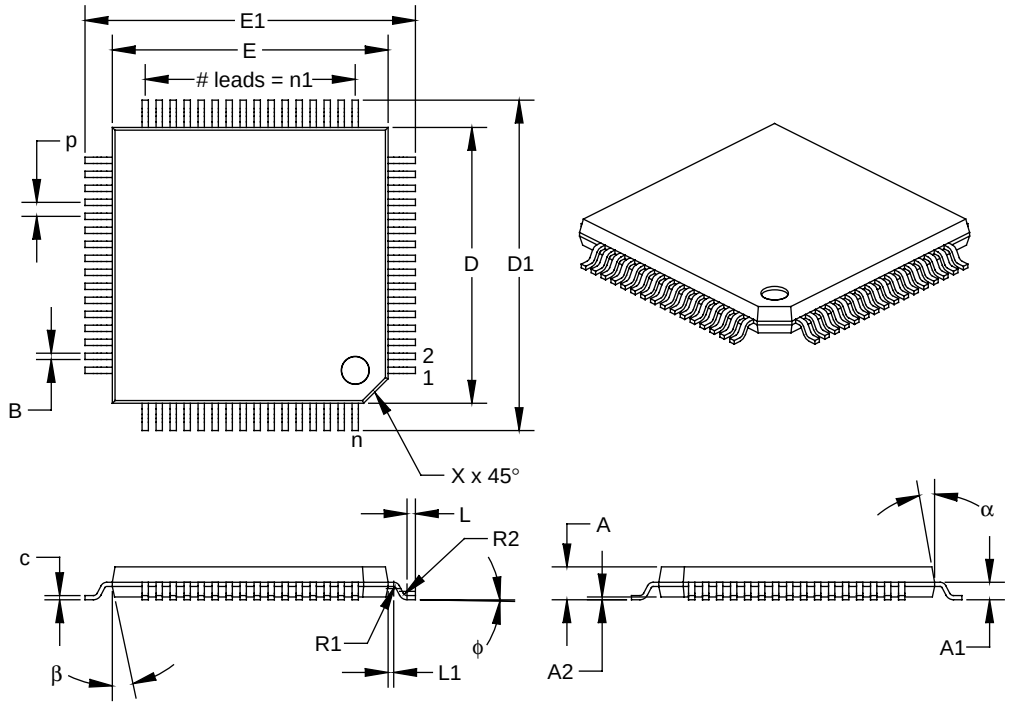
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-026 ACB

Packaging Diagrams and Parameters

Package Type: K04-085 64-Lead Plastic Thin Quad Flatpack (PT)
10x10x1 mm Body, 1.0/0.1 mm Lead Form



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.020			0.50	
Number of Pins	n		64			64	
Pins along Width	n1		16			16	
Overall Pack. Height	A	0.039	0.043	0.047	1.00	1.10	1.20
Shoulder Height	A1	0.015	0.025	0.035	0.38	0.64	0.89
Standoff	A2	0.002	0.004	0.006	0.05	0.10	0.15
Shoulder Radius	R1	0.003	0.003	0.010	0.08	0.08	0.25
Gull Wing Radius	R2	0.003	0.006	0.008	0.08	0.14	0.20
Foot Length	L	0.005	0.012	0.015	0.13	0.30	0.38
Foot Angle	ϕ	0	3.5	7	0	3.5	7
Radius Centerline	L1	0.003	0.008	0.013	0.08	0.20	0.33
Lead Thickness	c	0.004	0.006	0.008	0.09	0.15	0.20
Lower Lead Width	B†	0.007	0.009	0.011	0.17	0.22	0.27
Outside Tip Length	D1	0.463	0.472	0.482	11.75	12.00	12.25
Outside Tip Width	E1	0.463	0.472	0.482	11.75	12.00	12.25
Molded Pack. Length	D‡	0.390	0.394	0.398	9.90	10.00	10.10
Molded Pack. Width	E‡	0.390	0.394	0.398	9.90	10.00	10.10
Pin 1 Corner Chamfer	X	0.025	0.035	0.045	0.64	0.89	1.14
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	12	15	5	12	15

* Controlling Parameter.

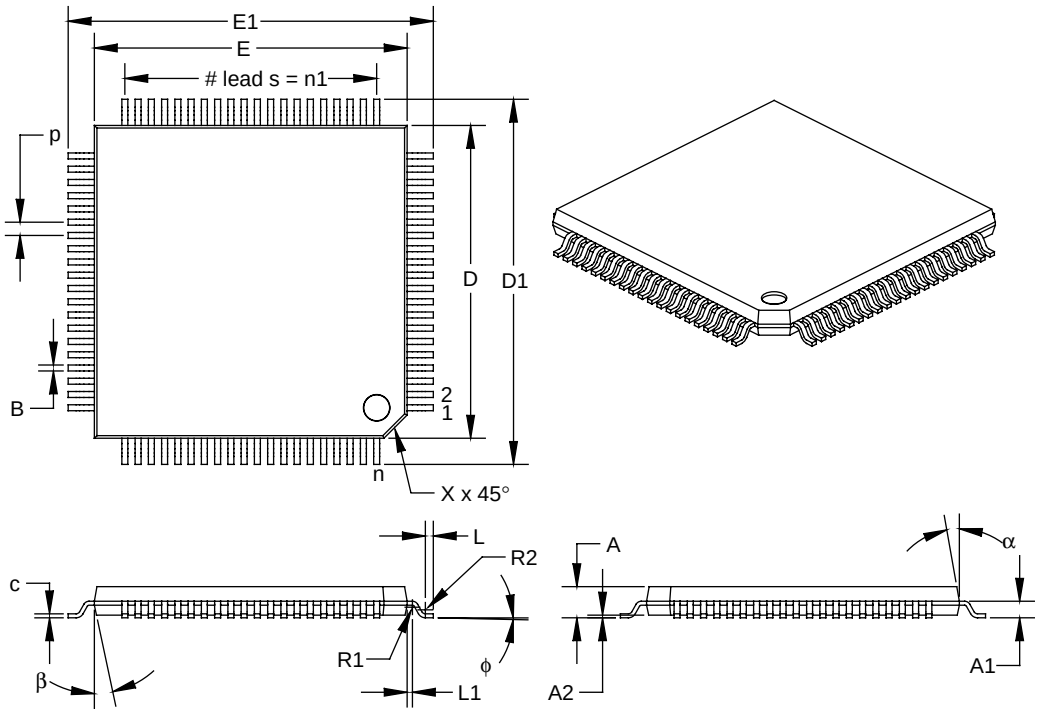
† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-026 ACD

Packaging Diagrams and Parameters

Package Type: K04-092 80-Lead Plastic Thin Quad Flatpack (PT)
12x12x1 mm Body, 1.0/0.1 mm Lead Form



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Pitch	p		0.020			0.50	
Number of Pins	n		80			80	
Pins along Width	n1		20			20	
Overall Pack. Height	A	0.039	0.043	0.047	1.00	1.10	1.20
Shoulder Height	A1	0.015	0.025	0.035	0.38	0.64	0.89
Standoff	A2	0.002	0.004	0.006	0.05	0.10	0.15
Shoulder Radius	R1	0.003	0.003	0.010	0.08	0.08	0.25
Gull Wing Radius	R2	0.003	0.006	0.008	0.08	0.14	0.20
Foot Length	L	0.005	0.012	0.015	0.13	0.30	0.38
Foot Angle	ϕ	0	3.5	7	0	3.5	7
Radius Centerline	L1	0.003	0.008	0.013	0.08	0.20	0.33
Lead Thickness	c	0.004	0.006	0.008	0.09	0.15	0.20
Lower Lead Width	B†	0.007	0.009	0.011	0.17	0.22	0.27
Outside Tip Length	D1	0.542	0.551	0.561	13.77	14.00	14.25
Outside Tip Width	E1	0.542	0.551	0.561	13.77	14.00	14.25
Molded Pack. Length	D‡	0.462	0.472	0.482	11.73	12.00	12.24
Molded Pack. Width	E‡	0.462	0.472	0.482	11.73	12.00	12.24
Pin 1 Corner Chamfer	X	0.025	0.035	0.045	0.64	0.89	1.14
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	12	15	5	12	15

* Controlling Parameter.

† Dimension “B” does not include dam-bar protrusions. Dam-bar protrusions shall not exceed 0.003” (0.076 mm) per side or 0.006” (0.152 mm) more than dimension “B.”

‡ Dimensions “D” and “E” do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010” (0.254 mm) per side or 0.020” (0.508 mm) more than dimensions “D” or “E.”

JEDEC equivalent: MS-026 ADD

Packaging Diagrams and Parameters

NOTES:

Product Tape and Reel Specifications

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

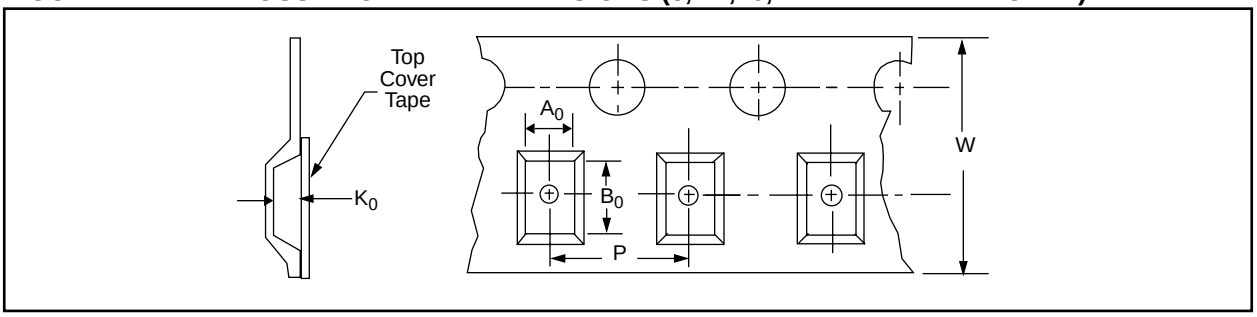
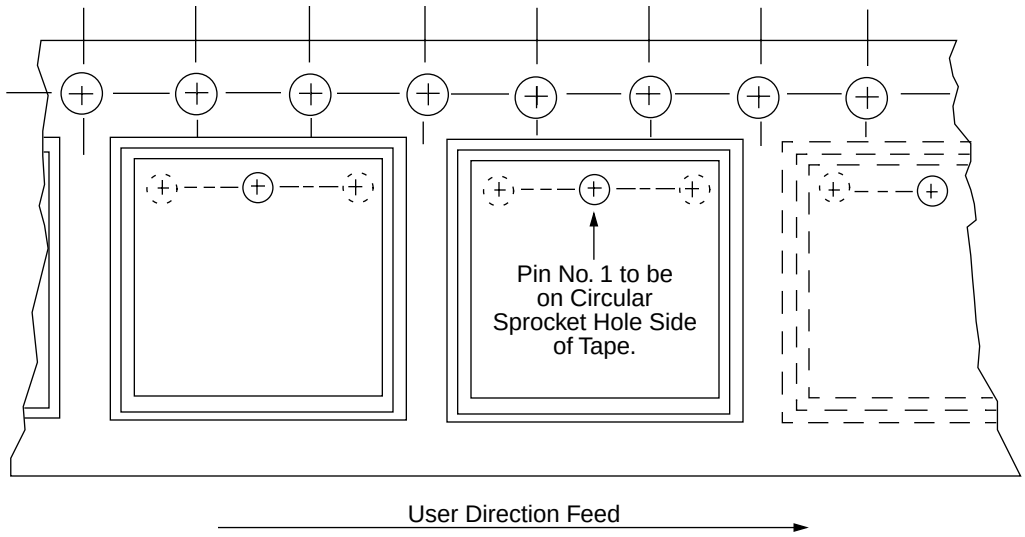


TABLE 2: CARRIER TAPE/CAVITY DIMENSIONS

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 24	12 16	10.9 11.1	13.3 12.0	3.0 2.8	1600 1100	330 330
SO	SOIC .300”	20L	24	12	10.9	13.3	3.0	1600	330
SO	SOIC .300”	28L	24 24	12 12	10.9 11.1	18.3 18.5	3.0 3.0	1600 1600	330 330
L	PLCC	28L	24	16	13.0	13.0	4.9	750	330
L	PLCC	32L	24	16	13.1	15.5	3.9	900	330
L	PLCC	44L	32 32	24 24	18.0 18.0	18.0 18.0	4.9 5.0	500 500	330
L	PLCC	68L	44	32	25.6	25.6	5.8	300	330
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

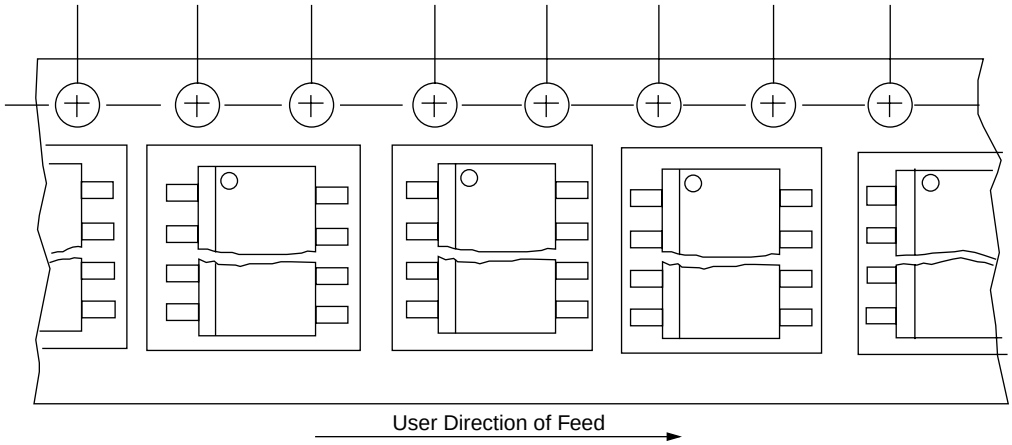
FIGURE 3: MECHANICAL POLARIZATION (PCC AND LCC DEVICES)



Note 1: Top view shown with cover tape removed.

2: Only single sprocket tape shown - polarization for double sprocket tape (32 mm and wider) is the same as shown.

FIGURE 4: MECHANICAL POLARIZATION (SOIC DEVICES)



Note 1: Top view shown with cover tape removed.

2: Only single sprocket tape shown – polarized for double sprocket tape (32 mm and wider) is the same as shown.

Overview of Microchip Die/Wafer Support

INTRODUCTION

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

PRODUCT INTEGRITY

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

CAUTION

Some EEPROM devices use EPROM cells for device configuration. Exposure to 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 re-programmable by the user (except for QTP and SQTP devices).

EEPROM

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

ROM

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

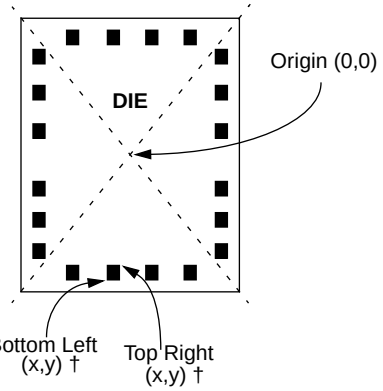
DIE MECHANICAL SPECIFICATIONS

Refer to the individual data sheet for these specifications.

BOND PAD COORDINATES

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

FIGURE 1: DIE COORDINATE ORIGIN



† All dimensions in μm unless specified otherwise.

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

SUBSTRATE BONDING

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

SHIPPING OPTIONS

DIE Form Shipping

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

These waffle packs are hermetically sealed in bags.

Wafer Form

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

Sawn Wafer on Frames

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

Storage Procedures

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

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

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