

T-43-21

CD4011A, CD4012A, CD4023A Types

CMOS NAND Gates

Quad 2 Input — CD4011A
 Dual 4 Input — CD4012A
 Triple 3 Input — CD4023A

The RCA-CD4011A, CD4012A, and CD4023A NAND gates provide the system designer with direct implementation of the NAND function and supplement the existing family of CMOS gates.

These types are supplied in 14-lead hermetic dual-in-line ceramic packages (D and F suffixes), 14-lead dual-in-line plastic packages (E suffix), 14-lead ceramic flat packages (K suffix), and in chip form (H suffix).

Features:

- Quiescent current specified to 15 V
- Maximum input leakage of 1 μ A at 15 V (full package-temperature range)
- 1-V noise margin (full package-temperature range)

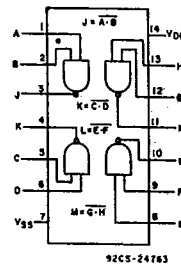
RECOMMENDED OPERATING CONDITIONS

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

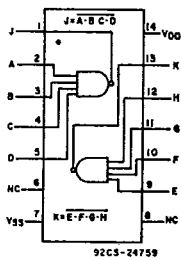
Characteristic	Min.	Max.	Units
Supply Voltage Range (over full package temperature range)	3	12	V

MAXIMUM RATINGS, Absolute-Maximum Values:

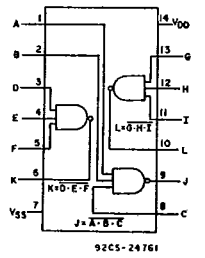
- STORAGE-TEMPERATURE RANGE (T_{stg}) -65 to +150°C
- OPERATING-TEMPERATURE RANGE (T_A):
- PACKAGE TYPES D, F, K, H -55 to +125°C
- PACKAGE TYPE E -40 to +85°C
- DC SUPPLY-VOLTAGE RANGE, (V_{DD})
- (Voltages referenced to V_{SS} Terminal): -0.5 to +15 V
- POWER DISSIPATION PER PACKAGE (P_D):
- FOR $T_A = -40$ to +60°C (PACKAGE TYPE E) 500 mW
- FOR $T_A = +60$ to +85°C (PACKAGE TYPE E) Derate Linearly at 12 mW/°C to 200 mW
- FOR $T_A = -55$ to +100°C (PACKAGE TYPES D, F, K) 500 mW
- FOR $T_A = +100$ to +125°C (PACKAGE TYPES D, F, K) Derate Linearly at 12 mW/°C to 200 mW
- DEVICE DISSIPATION PER OUTPUT TRANSISTOR
- FOR $T_A =$ FULL PACKAGE-TEMPERATURE RANGE (ALL PACKAGE TYPES) 100 mW
- INPUT VOLTAGE RANGE, ALL INPUTS -0.5 to $V_{DD} + 0.5$ V
- LEAD TEMPERATURE (DURING SOLDERING):
- At distance 1/16 \pm 1/32 inch (1.59 \pm 0.79 mm) from case for 10 s max +265°C



CD4011A

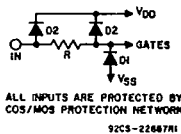


CD4012A



CD4023AH

Fig. 1 — Functional diagrams.



92CS-22687H1

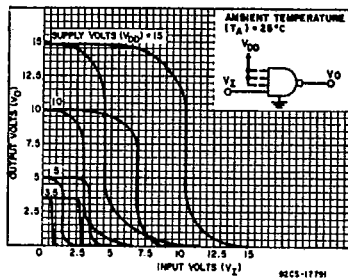


Fig. 2 — Minimum & maximum voltage transfer characteristics.

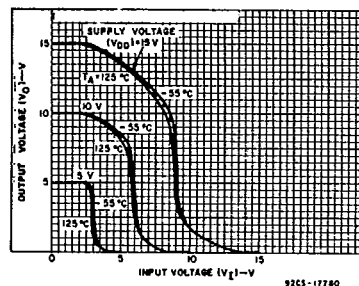


Fig. 3 — Typical voltage transfer characteristics as a function of temperature.

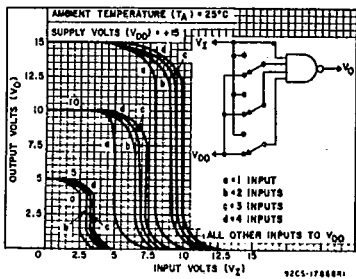


Fig. 4 — Typical multiple input switching transfer characteristics for CD4012A.

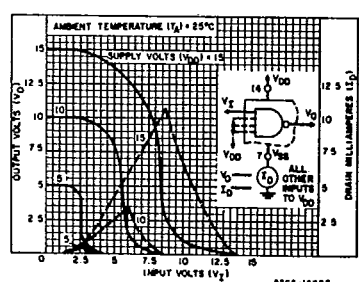


Fig. 5 — Typical current & voltage transfer characteristics.

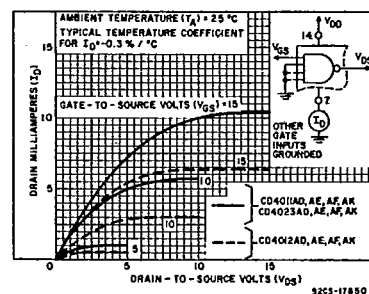


Fig. 6 — Typical n-channel drain characteristics.

CD4011A, CD4012A, CD4023A Types

STATIC ELECTRICAL CHARACTERISTICS

Characteristic	Conditions			Limits at Indicated Temperatures (°C)								Units	
				D, F, K, H Packages				E Package					
	V _O (V)	V _{IN} (V)	V _{DD} (V)	-55	+25		+125	-40	+25		+85		
Quiescent Device Current, I _Q Max.	-	-	5	0.05	0.001	0.05	3	0.5	0.005	0.5	15	μA	
	-	-	10	0.1	0.001	0.1	6	6	0.005	5	30		
	-	-	15	2	0.02	2	40	50	0.5	50	500		
Output Voltage: Low-Level VOL	-	0.5	5	0 Typ.; 0.05 Max.								V	
	-	0.10	10	0 Typ.; 0.05 Max.									
	-	0.5	5	4.95 Min.; 5 Typ.									
High Level, VOH	-	0.10	10	9.95 Min.; 10 Typ.								V	
	-	0.10	10	9.95 Min.; 10 Typ.									
Noise Immunity: Inputs Low, V _{NL}	3.6	-	5	1.5 Min.; 2.25 Typ.								V	
	7.2	-	10	3 Min.; 4.5 Typ.									
Inputs High, V _{NH}	1.4	-	5	1.5 Min.; 2.25 Typ.;								V	
	2.8	-	10	3 Min.; 4.5 Typ.									
Noise Margin: Inputs Low, V _{NML}	4.5	-	5	1 Min.								V	
	9	-	10	1 Min.									
Inputs High, V _{NMH}	0.5	-	5	1 Min.								V	
	1	-	10	1 Min.									
Output Drive Current: N-Channel (Sink) I _{DN} Min.	CD4011A	0.5	5	0.31	0.5	0.25	0.175	0.145	0.5	0.12	0.095	mA	
				CD4023A	0.5	10	0.62	0.6	0.5	0.35	0.3		0.8
	CD4012A	0.5	5	0.15	0.25	0.12	0.085	0.072	0.25	0.06	0.05		
		0.5	10	0.31	0.6	0.25	0.175	0.155	0.6	0.13	0.105		
	P-Channel (Source), I _{DP} Min.	All Types	4.5	5	-0.31	-0.5	-0.25	-0.175	-0.145	-0.5	-0.12		-0.095
			9.5	10	-0.75	-1.2	-0.6	-0.4	-0.35	-1.2	-0.3		-0.24
Input Leakage Current, I _{IL} , I _{IH}	Any Input	15	±10 ⁻⁵ Typ.; ±1 Max.								μA		

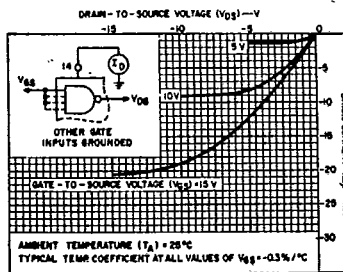


Fig. 7 - Typical p-channel drain characteristics.

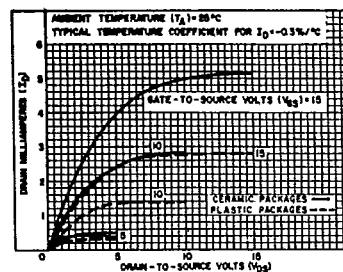


Fig. 8 - Minimum n-channel drain characteristics - CD4011A & CD4023A.

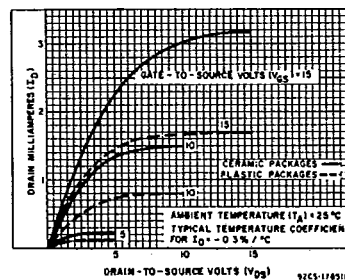


Fig. 9 - Minimum n-channel drain characteristics.

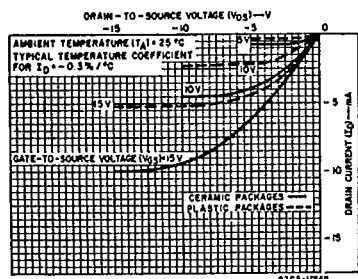


Fig. 10 - Minimum p-channel drain characteristics.

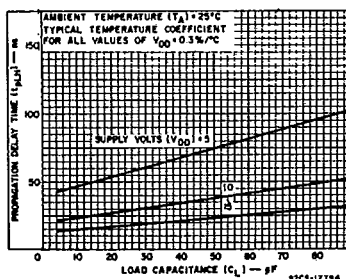


Fig. 11 - Typical low-to-high level propagation delay time vs. CL.

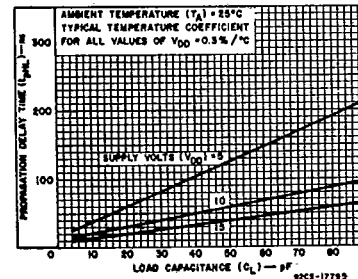


Fig. 12 - Typical high-to-low level propagation delay time vs. CL - CD4011A, & CD4023A.

CD4011A, CD4012A, CD4023A Types

DYNAMIC ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$, $C_L = 15\text{ pF}$, Input $t_r, t_f = 20\text{ ns}$, $R_L = 200\text{ K}\Omega$

CHARACTERISTICS	TEST CONDITIONS	LIMITS				UNITS	
		D, F, K, H Packages		E Package			
		VDD (V)	Typ.	Max.	Typ.		Max.
Propagation Delay Time: Low-to-High Level, t_{PLH}		5	50	75	50	100	ns
		10	25	40	25	50	
High-to-Low Level, t_{PHL} CD4011A and CD4023A		5	50	75	50	100	ns
		10	25	40	25	50	
CD4012A		5	100	150	100	200	ns
		10	50	75	50	100	
Transition Time: Low-to-High Level, t_{TLH}		5	75	100	75	125	ns
		10	40	60	40	75	
High-to-Low Level, t_{THL} CD4011A and CD4023A		5	75	125	75	150	ns
		10	50	75	50	100	
CD4012A		5	250	375	250	500	ns
		10	125	200	125	250	
Input Capacitance, C_i	Any Input	5	-	5	-	-	pF

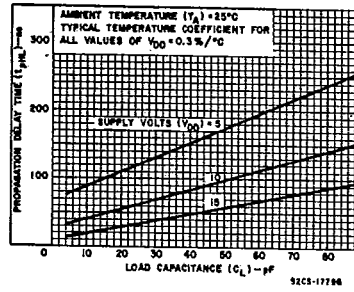


Fig. 13 - Typical high-to-low level propagation delay time vs. C_L - CD4012A.

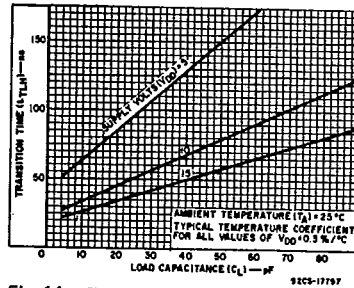


Fig. 14 - Typical low-to-high transition time vs. C_L .

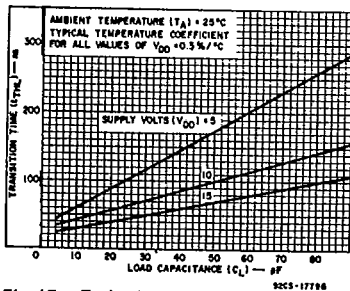


Fig. 15 - Typical high-to-low level transition time vs. C_L - CD4011A & CD4023A.

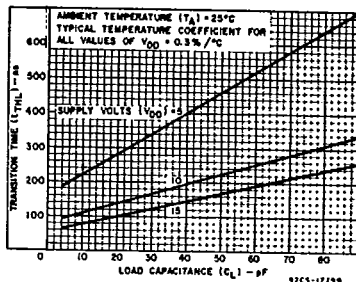


Fig. 16 - Typical high-to-low level transition time vs. C_L - CD4012A.

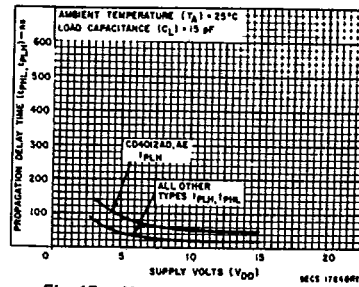


Fig. 17 - Minimum propagation delay time vs. V_{DD} .

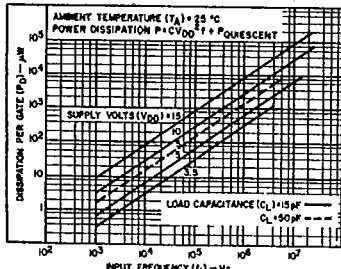


Fig. 18 - Typical dissipation characteristics.

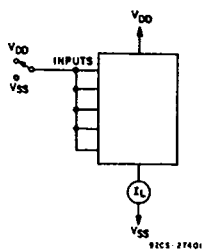


Fig. 19 - Quiescent device current test circuit.

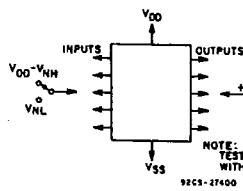


Fig. 20 - Noise immunity test circuit.

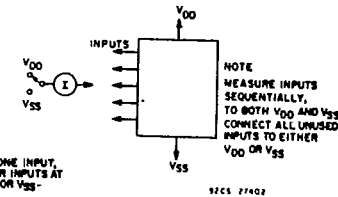
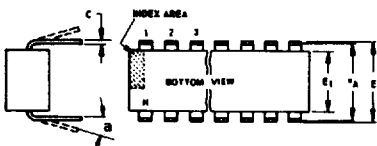
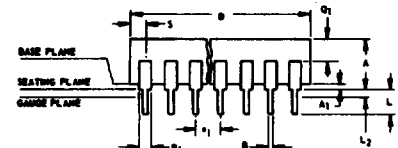


Fig. 21 - Input leakage current test circuit.

Dimensional Outlines

Dual-In-Line Welded-Seal Ceramic Packages



- NOTES:**
Refer to Rules for Dimensioning (JEDEC Publication No. 95) for Axial Lead Product Outlines.
- When this device is supplied solder-dipped, the maximum lead thickness (narrow portion) will not exceed 0.013" (0.33 mm).
 - Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
 - e_A applies in zone L₂ when unit installed.
 - a applies to spread leads prior to installation.
 - N is the maximum quantity of lead positions.
 - N₁ is the quantity of allowable missing leads.

(D) SUFFIX (JEDEC MO-001-AD)
14-Lead Dual-In-Line Welded-Seal Ceramic Package

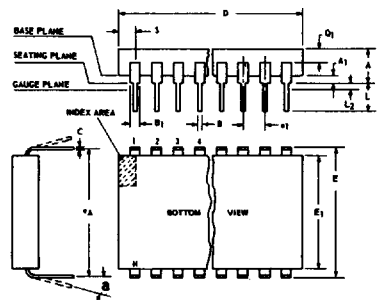
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.160		3.05	4.06
A ₁	0.020	0.065		0.51	1.65
B	0.014	0.020		0.356	0.508
B ₁	0.060	0.065		1.27	1.65
C	0.008	0.012	1	0.204	0.304
D	0.745	0.770		18.93	19.55
E	0.300	0.325		7.62	8.25
E ₁	0.240	0.260		6.10	6.60
e ₁	0.100 TP		2	2.54 TP	
e _A	0.300 TP		2, 3	7.62 TP	
L	0.125	0.150		3.18	3.81
L ₂	0.000	0.030		0.000	0.76
a	0°	15°	4	0°	15°
N	14		5	14	
N ₁	0		6	0	
Q ₁	0.050	0.085		1.27	2.15
S	0.065	0.090		1.66	2.28

92SS-4411R2

(D) SUFFIX (JEDEC MO-001-AE)
16-Lead Dual-In-Line Welded-Seal Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.160		3.05	4.06
A ₁	0.020	0.065		0.51	1.65
B	0.014	0.020		0.356	0.508
B ₁	0.035	0.065		0.89	1.65
C	0.008	0.012	1	0.204	0.304
D	0.745	0.785		18.93	19.93
E	0.300	0.325		7.62	8.25
E ₁	0.240	0.260		6.10	6.60
e ₁	0.100 TP		2	2.54 TP	
e _A	0.300 TP		2, 3	7.62 TP	
L	0.125	0.150		3.18	3.81
L ₂	0.000	0.030		0.000	0.76
a	0°	15°	4	0°	15°
N	16		5	16	
N ₁	0		6	0	
Q ₁	0.050	0.085		1.27	2.15
S	0.015	0.060		0.39	1.52

92SS-4266R5



- NOTES:**
Refer to Rules for Dimensioning (JEDEC Publication No. 95) for Axial Lead Product Outlines.
- When this device is supplied solder-dipped, the maximum lead thickness (narrow portion) will not exceed 0.013" (0.33 mm).
 - Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
 - e_A applies in zone L₂ when unit installed.
 - a applies to spread leads prior to installation.
 - N is the maximum quantity of lead positions.
 - N₁ is the quantity of allowable missing leads.

(D) SUFFIX (JEDEC MO-015-AG)
24-Lead Dual-In-Line Welded-Seal Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.090	0.200		2.29	5.08
A ₁	0.020	0.070		0.51	1.78
B	0.015	0.020		0.381	0.508
B ₁	0.045	0.055		1.143	1.397
C	0.008	0.012	1	0.204	0.304
D	1.15	1.22		29.21	30.98
E	0.600	0.625		15.24	15.87
E ₁	0.480	0.520		12.20	13.20
e ₁	0.100 TP		2	2.54 TP	
e _A	0.600 TP		2, 3	15.24 TP	
L	0.100	0.180		2.54	4.57
L ₂	0.000	0.030		0.00	0.76
a	0°	15°	4	0°	15°
N	24		5	24	
N ₁	0		6	0	
Q ₁	0.020	0.080		0.51	2.03
S	0.020	0.060		0.51	1.52

92CS-19948R4

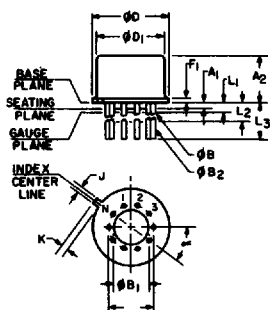
(D) SUFFIX (JEDEC MO-015-AH)
28-Lead Dual-In-Line Welded-Seal Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.090	0.200		2.29	5
A ₁	0	0.070	2	0	1.77
B	0.015	0.020		0.381	0.508
B ₁	0.015	0.065		0.39	1.39
C	0.008	0.012	1	0.204	0.304
D	1.380	1.420		35.06	36.06
E	0.600	0.625		15.24	15.87
E ₁	0.485	0.515		12.32	13.08
e ₁	0.100 TP		2	2.54 TP	
e _A	0.600 TP		2, 3	15.24 TP	
L	0.100	0.200		2.6	5
L ₂	0	0.030		0	0.76
a	0°	15°	4	0°	15°
N	28		5	28	
N ₁	0		6	0	
Q ₁	0.020	0.070		0.51	1.77
S	0.040	0.070		1.02	1.77

92CM-20250R2

TO-5 Style Package

(T) SUFFIX (JEDEC MO-006-AG)
12-Lead Metal Package



92CS-19774

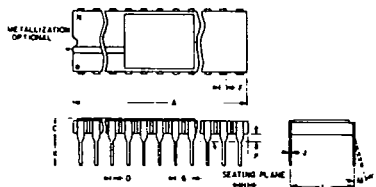
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
a	0.230		2	5.84 TP	
A ₁	0	0		0	0
A ₂	0.165	0.185		4.19	4.70
φB	0.016	0.019	3	0.407	0.482
φB ₁	0	0		0	0
φB ₂	0.016	0.021	3	0.407	0.533
φD	0.335	0.370		8.51	9.39
φD ₁	0.305	0.335		7.75	8.50
F ₁	0.020	0.040		0.51	1.01
j	0.028	0.034		0.712	0.863
k	0.029	0.045	4	0.74	1.14
L ₁	0.000	0.050	3	0.00	1.27
L ₂	0.250	0.500	3	6.4	12.7
L ₃	0.500	0.562	3	12.7	14.27
a	30° TP			30° TP	
N	12		6	12	
N ₁	1		5	1	

NOTES:

- Refer to Rules for Dimensioning Axial Lead Product Outlines.
- Leads at gauge plane within 0.007" (0.178 mm) radius of True Position (TP) at maximum material condition.
- φB applies between L₁ and L₂. φB₂ applies between L₂ and 0.500" (12.70 mm) from seating plane. Diameter is uncontrolled in L₁ and beyond 0.500" (12.70 mm).
- Measure from Max. φD.
- N₁ is the quantity of allowable missing leads.
- N is the maximum quantity of lead positions.

Dimensional Outlines (Cont'd)

DUAL-IN-LINE SIDE-BRAZED CERAMIC PACKAGES



(D) SUFFIX
18-Lead Dual-In-Line
Side-Brazed Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.890	0.915		22.606	23.241
C	—	0.200		—	5.080
D	0.015	0.021		0.381	0.533
F	0.054	REF.	1	1.371	REF.
G	0.100	BSC	1	2.54	BSC
H	0.035	0.065		0.889	1.651
J	0.008	0.012	3	0.203	0.304
K	0.125	0.150		3.175	3.810
L	0.290	0.310	2	7.366	7.874
M	0°	15°		0°	15°
P	0.025	0.045		0.635	1.143
N	18			18	

92CS-27231R1

(D) SUFFIX
22-Lead Dual-In-Line
Side-Brazed Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	1.065	1.100		27.05	27.94
C	0.085	0.145		2.16	3.68
D	0.017	0.023		0.43	0.58
F	0.040	REF.	1	1.02	REF.
G	0.100	BSC	1	2.54	BSC
H	0.030	0.070		0.76	1.78
J	0.008	0.012	3	0.20	0.30
K	0.125	0.175		3.18	4.45
L	0.380	0.420	2	9.65	10.67
M	—	7°		—	7°
P	0.025	0.050		0.64	1.27
N	22			22	

92CS-25186R2

NOTES:

1. Leads within 0.005" (0.13 mm)-radius of True Position at maximum material condition.
2. Dimension "L" to center of leads when formed parallel.
3. When this device is supplied solder-dipped, the maximum lead thickness (narrow portion) will not exceed 0.013" (0.33 mm).

(D) SUFFIX
24-Lead Dual-In-Line
Side-Brazed Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	1.180	1.220		29.98	30.98
C	0.085	0.145		2.16	3.68
D	0.015	0.023		0.39	0.58
F	0.040	REF.		1.02	REF.
G	0.100	BSC	1	2.54	BSC
H	0.030	0.070		0.77	1.77
J	0.008	0.012	3	0.21	0.30
K	0.125	0.175		3.18	4.44
L	0.580	0.620	2	14.74	15.74
M	—	7°		—	7°
P	0.025	0.050		0.64	1.27
N	24			24	

92CS-30968R1

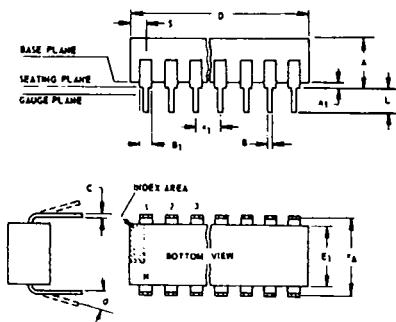
(D) SUFFIX
40-Lead Dual-In-Line
Side-Brazed Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	1.980	2.020		50.30	51.30
C	0.095	0.155		2.43	3.93
D	0.017	0.023		0.43	0.58
F	0.050	REF.		1.27	REF.
G	0.100	BSC	1	2.54	BSC
H	0.030	0.070		0.76	1.78
J	0.008	0.012	3	0.20	0.30
K	0.125	0.175		3.18	4.45
L	0.580	0.620	2	14.74	15.74
M	—	7°		—	7°
P	0.025	0.050		0.64	1.27
N	40			40	

92CM-27029R2

Dual-In-Line Plastic and Frit-Seal Ceramic Packages

(E) SUFFIX (JEDEC MO-001-AN)
8-Lead Dual-In-Line Plastic
(Mini-DIP) Package



SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.155	0.200		3.94	5.08
A ₁	0.020	0.050		0.508	1.27
B	0.014	0.020		0.356	0.508
B ₁	0.035	0.065		0.889	1.65
C	0.008	0.012	1	0.203	0.304
D	0.370	0.400		9.40	10.16
E	0.300	0.325		7.62	8.25
E ₁	0.240	0.260		6.10	6.60
e ₁	0.100	TP	2	2.54	TP
e _A	0.300	TP	2, 3	7.62	TP
L	0.125	0.150		3.18	3.81
L ₂	0.000	0.030		0.000	0.762
a	0	15	4	0	15
N	8		5	8	
N ₁	0		6	0	
O ₁	0.040	0.075		1.02	1.90
S	0.015	0.060		0.381	1.52

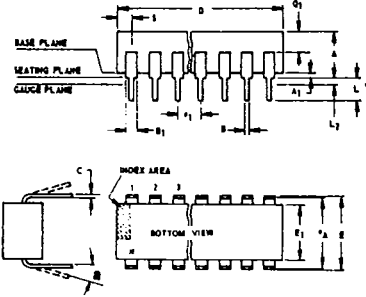
92CS-24026 R1

NOTES:

- Refer to Rules for Dimensioning (JEDEC Publication No. 95) for Axial Lead Product Outlines.
1. When this device is supplied solder-dipped, the maximum lead thickness (narrow portion) will not exceed 0.013".
 2. Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
 3. e_A applies in zone L₂ when unit installed.
 4. a applies to spread leads prior to installation.
 5. N is the maximum quantity of lead positions.
 6. N₁ is the quantity of allowable missing leads.

Dimensional Outlines (Cont'd)

Dual-In-Line Plastic and Frit-Seal Ceramic Packages (Cont'd)



NOTES:
 Refer to Rules for Dimensioning (JEDEC Publication No. 95) for Axial Lead Product Outlines.
 1. When this device is supplied solder dipped, the maximum lead thickness (narrow portion) will not exceed 0.013" (0.33 mm).
 2. Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
 3. eA applies in zone L2 when unit installed.
 4. alpha applies to spread leads prior to installation.
 5. N is the maximum quantity of lead positions.
 6. N1 is the quantity of allowable missing leads.

(E) and (F) SUFFIXES (JEDEC MO-001-AB)
 14-Lead Dual-In-Line Plastic or Frit-Seal Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.155	0.200		3.94	5.08
A1	0.020	0.050		0.51	1.27
B	0.014	0.020		0.356	0.508
B1	0.050	0.065		1.27	1.65
C	0.008	0.012	1	0.204	0.304
D	0.745	0.770		18.93	19.55
E	0.300	0.325		7.62	8.25
E1	0.240	0.260		6.10	6.60
e1	0.100 TP		2	2.54 TP	
eA	0.300 TP		2,3	7.62 TP	
L	0.125	0.150		3.18	3.81
L2	0.000	0.030		0.000	0.76
a	0°	15°	4	0°	15°
N	14		5	14	
N1	0		6	0	
Q1	0.040	0.075		1.02	1.90
S	0.085	0.090		1.66	2.28

92SS-4296R3

(E) and (F) SUFFIXES (JEDEC MO-001-AC)
 16-Lead Dual-In-Line Plastic or Frit-Seal Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.155	0.200		3.94	5.08
A1	0.020	0.050		0.51	1.27
B	0.014	0.020		0.356	0.508
B1	0.035	0.065		0.89	1.65
C	0.008	0.012	1	0.204	0.304
D	0.745	0.785		18.93	19.93
E	0.300	0.325		7.62	8.25
E1	0.240	0.260		6.10	6.60
e1	0.100 TP		2	2.54 TP	
eA	0.300 TP		2,3	7.62 TP	
L	0.125	0.150		3.18	3.81
L2	0.000	0.030		0.000	0.76
a	0°	15°	4	0°	15°
N	16		5	16	
N1	0		6	0	
Q1	0.040	0.075		1.02	1.90
S	0.015	0.060		0.39	1.52

92CM-15967R4

(E) SUFFIX
 18-Lead Dual-In-Line Plastic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.155	0.200		3.94	5.08
A1	0.020	0.050		0.508	1.27
B	0.014	0.020		0.356	0.508
B1	0.035	0.065		0.89	1.65
C	0.008	0.012	1	0.204	0.304
D	0.845	0.885		21.47	22.47
E1	0.240	0.260		6.10	6.60
e1	0.100 TP		2	2.54 TP	
eA	0.300 TP		2,3	7.62 TP	
L	0.125	0.150		3.18	3.81
a	0°	15°	4	0°	15°
N	18		5	18	
N1	0		6	0	
S	0.015	0.060		0.39	1.52

92CS-30630

(E) SUFFIX
 22-Lead Dual-In-Line Plastic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.155	0.200		3.94	5.08
A1	0.020	0.050		0.508	1.27
B	0.015	0.020		0.381	0.508
B1	0.035	0.065		0.89	1.65
C	0.008	0.012	1	0.204	0.304
D		1.120			28.44
E	0.390	0.420		9.91	10.66
E1	0.345	0.355		8.77	9.01
e1	0.100 TP		2	2.54 TP	
eA	0.400 TP		2,3	10.16 TP	
L	0.125	0.150		3.18	3.81
L2	0	0.030		0	0.762
a	2°	15°	4	2°	15°
N	22		5	22	
N1	0		6	0	
Q1	0.055	0.085		1.40	2.15
S	0.015	0.060		0.381	1.27

92CS-30830

(F) SUFFIX (JEDEC MO-001-AG)
 16-Lead Dual-In-Line Frit-Seal Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.165	0.210		4.20	5.33
A1	0.015	0.045		0.381	1.14
B	0.015	0.020		0.381	0.508
B1	0.045	0.070		1.15	1.77
C	0.009	0.011	1	0.229	0.279
D	0.750	0.795		19.05	20.19
E	0.295	0.325		7.50	8.25
E1	0.245	0.300		6.23	7.62
e1	0.100 TP		2	2.54 TP	
eA	0.300 TP		2,3	7.62 TP	
L	0.120	0.160		3.05	4.06
L2	0.000	0.030		0.000	0.76
a	2°	15°	4	2°	15°
N	16		5	16	
N1	0		6	0	
Q1	0.050	0.080		1.27	2.03
S	0.010	0.060		0.254	1.52

92CM-22284R1

(E) and (F) SUFFIXES (JEDEC MO-015-AA)
 24-Lead Dual-In-Line Plastic or Frit-Seal Ceramic Package

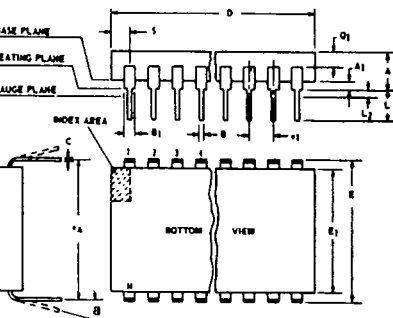
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.250		3.10	6.30
A1	0.020	0.070		0.51	1.77
B	0.016	0.020		0.407	0.508
B1	0.028	0.070		0.72	1.77
C	0.008	0.012	1	0.204	0.304
D	1.20	1.29		30.48	32.76
E	0.600	0.625		15.24	15.87
E1	0.515	0.580		13.09	14.73
e1	0.100 TP		2	2.54 TP	
eA	0.600 TP		2,3	15.24 TP	
L	0.100	0.200		2.54	5.00
L2	0.000	0.030		0.00	0.76
a	0°	15°	4	0°	15°
N	24		5	24	
N1	0		6	0	
Q1	0.040	0.075		1.02	1.90
S	0.040	0.100		1.02	2.54

92CS26938R2

(E) SUFFIX
 40-Lead Dual-In-Line Plastic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.250		3.10	6.30
A1	0.020	0.070		0.51	1.77
B	0.016	0.020		0.407	0.508
B1	0.028	0.070		0.72	1.77
C	0.008	0.012	1	0.204	0.304
D	2.000	2.090		50.80	53.09
E1	0.515	0.580		13.09	14.73
e1	0.100 TP		2	2.54 TP	
eA	0.600 TP		2,3	15.24 TP	
L	0.100	0.200		2.54	5.00
L2	0.000	0.030		0.00	0.76
a	0°	15°	4	0°	15°
N	40		5	40	
N1	0		6	0	
Q1	0.065	0.095		1.66	2.41
S	0.040	0.100		1.02	2.54

92CS-30959



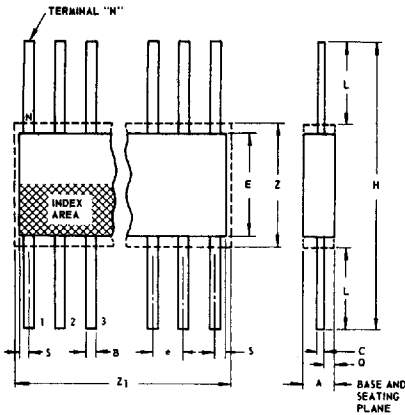
NOTES:
 Refer to Rules for Dimensioning (JEDEC Publication No. 95) for Axial Lead Product Outlines.
 1. When this device is supplied solder dipped, the maximum lead thickness (narrow portion) will not exceed 0.013".
 2. Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
 3. eA applies in zone L2 when unit installed.
 4. alpha applies to spread leads prior to installation.
 5. N is the maximum quantity of lead positions.
 6. N1 is the quantity of allowable missing leads.

T-90-20

Dimensional Outlines (Cont'd)

Ceramic Flat Packs

**(K) SUFFIX (JEDEC MO-004-AF)
14-Lead**



SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.008	0.100		0.21	2.54
B	0.015	0.019	1	0.381	0.482
C	0.003	0.006	1	0.077	0.152
e	0.050 TP		2	1.27 TP	
E	0.200	0.300		5.1	7.6
H	0.600	1.000		15.3	25.4
L	0.150	0.350		3.9	8.8
N	14		3	14	
Q	0.005	0.050		0.13	1.27
S	0.000	0.050		0.00	1.27
Z	0.300		4	7.62	
Z ₁	0.400		4	10.16	

9288-4300R3

NOTES:

1. Refer to JEDEC Publication No. 95 for Rules for Dimensioning Peripheral Lead Outlines.
2. Leads within 0.005" (0.12 mm) radius of True Position (TP) at maximum material condition.
3. N is the maximum quantity of lead positions.
4. Z and Z₁ determine a zone within which all body and lead irregularities lie.

**(K) SUFFIX (JEDEC MO-004-AG)
16-Lead**

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.008	0.100		0.21	2.54
B	0.015	0.019	1	0.381	0.482
C	0.003	0.006	1	0.077	0.152
e	0.050 TP		2	1.27 TP	
E	0.200	0.300		5.1	7.6
H	0.600	1.000		15.3	25.4
L	0.150	0.350		3.9	8.8
N	16		3	16	
Q	0.005	0.050		0.13	1.27
S	0.000	0.025		0.00	0.63
Z	0.300		4	7.62	
Z ₁	0.400		4	10.16	

92CS-17271R3

**(K) SUFFIX
24-Lead**

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.075	0.120		1.91	3.04
B	0.018	0.022	1	0.458	0.558
C	0.004	0.007	1	0.102	0.177
e	0.050 TP		2	1.27 TP	
E	0.600	0.700		15.24	17.78
H	1.150	1.350		29.21	34.29
L	0.225	0.325		5.72	8.25
N	24		3	24	
Q	0.035	0.070		0.89	1.77
S	0.060	0.110	1	1.53	2.79
Z	0.700		4	17.78	
Z ₁	0.750		4	19.05	

92CS-19949R2

**(K) SUFFIX
28-Lead**

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.075	0.120		1.91	3.04
B	0.018	0.022	1	0.458	0.558
C	0.004	0.007	1	0.102	0.177
e	0.050 TP		2	1.27 TP	
E	0.600	0.700		15.24	17.78
H	1.150	1.350		29.21	34.29
L	0.225	0.325		5.72	8.25
N	28		3	28	
Q	0.035	0.070		0.89	1.77
S	0	0.060	1	0	1.53
Z	0.700		4	17.78	
Z ₁	0.750		4	19.05	

92CS-20972