

CMOS

Hex Buffers/Converters

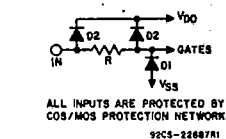
Inverting Type: CD4009A

Non-Inverting Type: CD4010A

The RCA-CD4009A and CD4010A Hex Buffer/Converters may be used as CMOS to TTL or DTL logic-level converters or CMOS high sink-current drivers.

The CD4049A and CD4050A are preferred hex buffer replacements for the CD4009A and CD4010A, respectively, in all applications except multiplexers. For applications not requiring high sink current or voltage conversion, the CD4069B Hex Inverter is recommended.

These types are supplied in 16-lead hermetic dual-in-line ceramic packages (D and F suffixes), 16-lead dual-in-line plastic package (E suffix), 16-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)
- High sink current for driving 2 TTL loads
- High-to-low level logic conversion

Applications:

- CMOS to DTL/TTL hex converter
- CMOS current "sink" or "source" driver
- CMOS high-to-low logic-level converter
- Multiplexer — 1 to 6 or 6 to 1

RECOMMENDED OPERATING CONDITIONS at $T_A = 25^\circ\text{C}$, Except as Noted.
For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTIC	LIMITS		UNITS
	Min.	Max.	
Supply-Voltage Range (For T_A = Full Package-Temperature Range: V_{DD}, V_{CC})	3	12	V
Input Voltage Range (V_I)	V_{CC}^*	12	V

* The CD4009 and CD4010 have high-to-low level voltage conversion capability but not low-to-high level, therefore it is recommended that $V_{DD} \geq V_I \geq V_{CC}$.

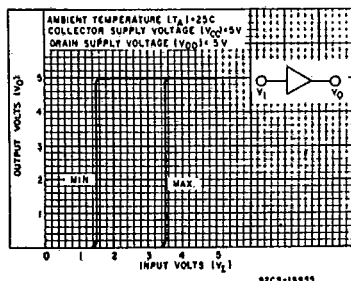


Fig. 4 — Minimum & maximum voltage transfer characteristics ($V_{DD} = 5$) — CD4010A.

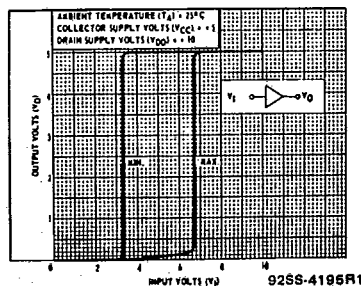


Fig. 5 — Minimum & maximum voltage transfer characteristics ($V_{DD} = 10$) — CD4010A.

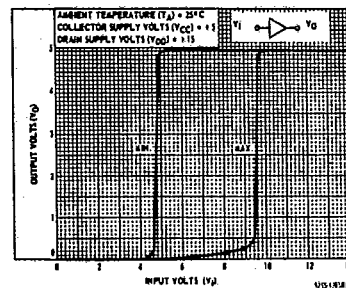


Fig. 6 — Minimum & maximum voltage transfer characteristics ($V_{DD} = 15$) — CD4010A.

CD4009A, CD4010A Types

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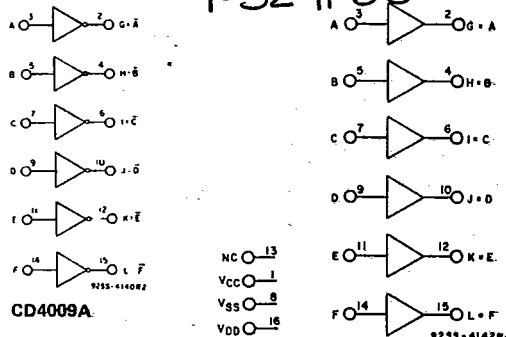


Fig. 1 — Logic diagrams.

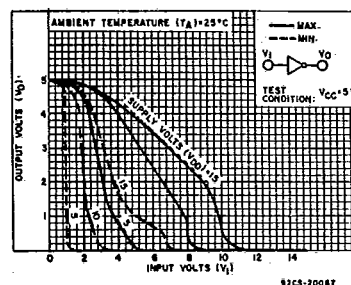


Fig. 2 — Minimum & maximum voltage transfer characteristics — CD4009A.

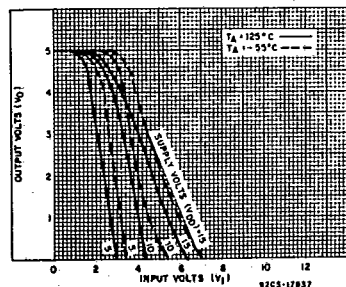


Fig. 3 — Typical voltage transfer characteristics as function of temp. — CD4009A.

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CD4009A, CD4010A 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 _{CC} * (V)	-55	+25		+125	-40	+25		+85		
					Typ.	Limit			Typ.	Limit			
Quiescent Device Current, I _L Max.	—	—	5	0.3	0.01	0.3	20	3	0.03	3	42	μA	
	—	—	10	0.5	0.01	0.5	30	5	0.05	5	70		
	—	—	15	10	0.02	10	100	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.									
High Level VOH	—	0.5	5	4.95 Min.; 5 Typ.									V
	—	0.10	10	9.95 Min.; 10 Typ.									
Noise Immunity: Inputs Low, VNL	3.6	—	5	1.5 Min.; 2.25 Typ.									V
	7.2	—	10	3 Min.; 4.5 Typ.									
Inputs High VNH	1.4	—	5	1.5 Min.; 2.25 Typ.									V
	2.8	—	10	3 Min.; 4.5 Typ.									
Inputs Low, VNL	3.6	—	5	1 Min.; 1.5 Typ.									V
	7.2	—	10	2 Min.; 3 Typ.									
Noise Margin: Inputs Low, VNML	4.5	—	5	1 Min.									V
	9	—	10	1 Min.									
	0.5	—	5	1 Min.									
	1	—	10	1 Min.									
Output Drive Current : N-Channel (Sink), I _{DN} Min.	0.4	—	5	3.75	4	3	2.1	3.6	4	3	2.4	mA	
	0.5	—	10	10	10	8	5.6	9.6	10	8	6.4		
	4.6	—	5	-0.31	-0.5	-0.25	-0.175	-0.3	-0.5	-0.25	-0.2		
	2.5	—	5	-1.85	-1.75	-1.25	-0.9	-1.5	-1.75	-1.25	-1		
	9.5	—	10	-0.9	-0.8	-0.6	-0.4	-0.72	-0.8	-0.6	-0.48		
Input Leakage Current, I _{IL} , I _{IH}	Any Input	15	±10 ⁻⁵ Typ.; ±1 Max.									μA	

* V_{CC} = V_{DD}

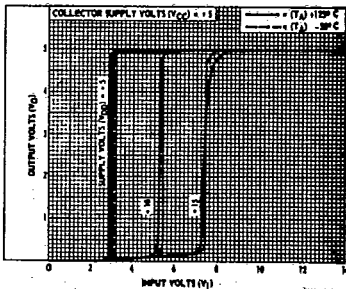


Fig. 7 — Typical voltage transfer characteristics as a function of temperature — CD4010A.

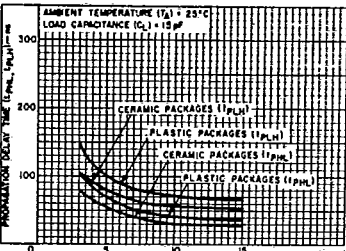


Fig. 8 — Maximum propagation delay time vs. V_{DD} — CD4010A.

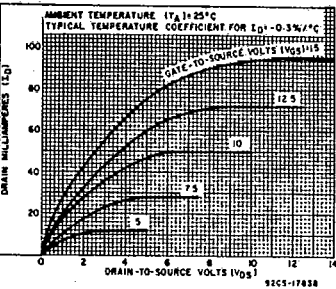


Fig. 9 — Typical n-channel drain characteristics.

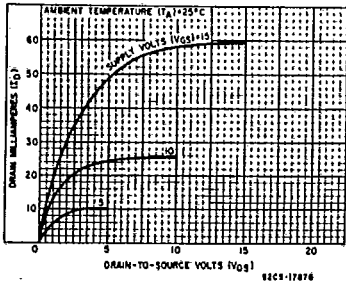


Fig. 10 — Minimum n-channel drain characteristics.

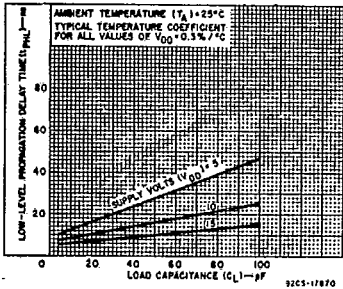


Fig. 11 — Typical high-to-low level propagation delay time vs. C_L.

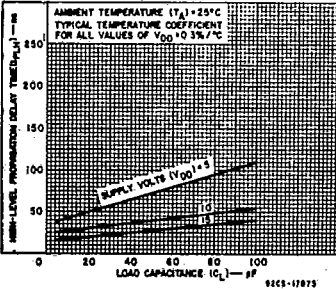


Fig. 12 — Typical low-to-high level propagation delay time vs. C_L.

T-5Z-11-00

CD4009A, CD4010A Types

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

CHARACTERISTIC	CONDITION			LIMIT		UNITS
	V _{DD} (V)	V _I (V)	V _{CC} (V)	Typ.	Max.	
D, F, K, H Packages						
Propagation Delay Time: Low-to-High, t _{PLH}	5	5	5	50	80	ns
	10	10	10	25	55	
	10	10	5	15	30	
High-to-Low, t _{PHL}	5	5	5	15	55	ns
	10	10	10	10	30	
	10	10	5	10	25	
Transition Time: Low-to-High, t _{TLH}	5	5	5	80	125	ns
	10	10	10	50	100	
High-to-Low, t _{THL}	5	5	5	20	45	ns
	10	10	10	16	40	
Input Capacitance, C _i CD4009A	—	—	—	15	—	pF
CD4010A	—	—	—	5	—	
E Package						
Propagation Delay Time: Low-to-high, t _{PLH}	5	5	5	50	100	ns
	10	10	10	25	70	
	10	10	5	15	40	
High-to-Low, t _{PHL}	5	5	5	15	70	ns
	10	10	10	10	40	
	10	10	5	10	35	
Transition Time: Low-to-High, t _{PLH}	5	5	5	80	160	ns
	10	10	10	50	120	
High-to-Low, t _{THL}	5	5	5	20	60	ns
	10	10	10	16	50	
Input Capacitance, C _i CD4009A	—	—	—	15	—	pF
CD4010A	—	—	—	5	—	

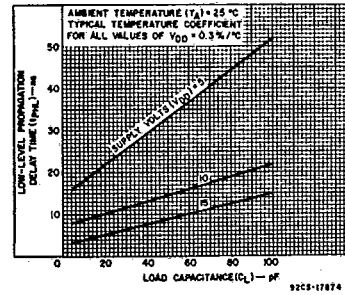


Fig. 13 - Typical high-to-low level propagation delay time vs. C_L (driving TTL, DTL).

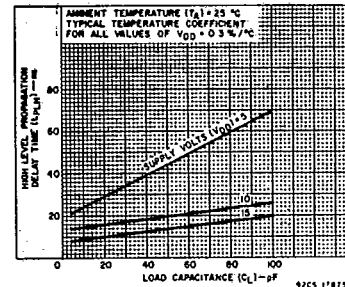


Fig. 14 - Typical low-to-high level propagation delay time vs. C_L (driving TTL, DTL)

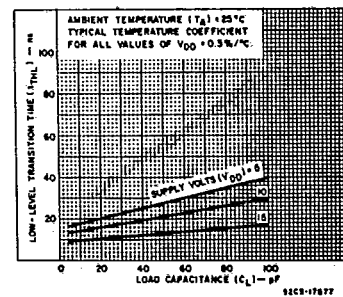


Fig. 15 - Typical high-to-low level transition time vs. C_L .

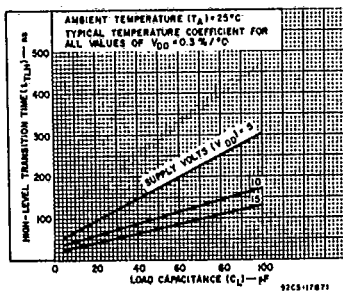


Fig. 16 - Typical low-to-high level transition time vs. C_L .

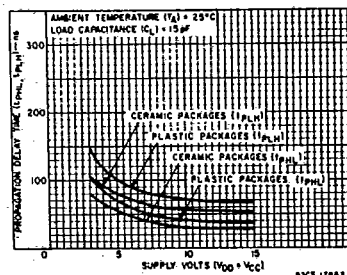


Fig. 17 - Maximum propagation delay time vs. V_{DD} - CD4009A.

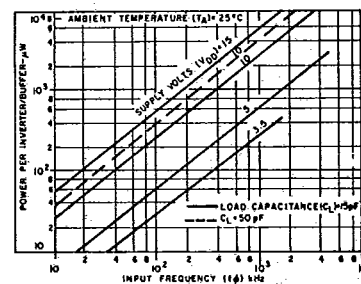
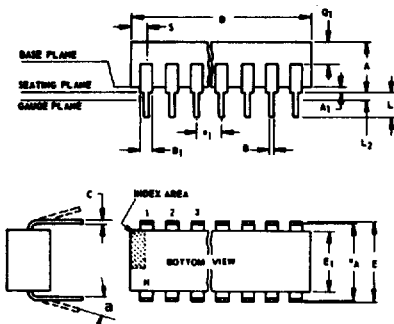


Fig. 18 - Typical dissipation characteristics.

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 L_2 when unit installed.
- a applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- N_1 is the quantity of allowable missing leads.

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

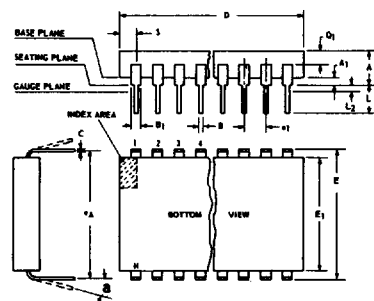
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.160		3.05	4.06
A ₁	0.020	0.065		0.51	1.65
B	0.014	0.020		0.356	0.508
B ₁	0.060	0.065		1.27	1.65
C	0.008	0.012	1	0.204	0.304
D	0.745	0.770		18.93	19.55
E	0.300	0.325		7.62	8.25
E ₁	0.240	0.260		6.10	6.60
e ₁	0.100 TP		2	2.54 TP	
e _A	0.300 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 L_2 when unit installed.
- a applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- N_1 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

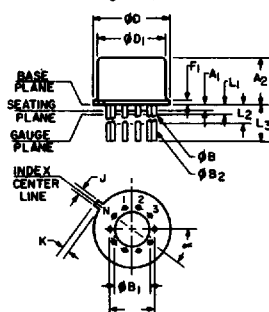
(D) SUFFIX (JEDEC MO-015-AH)
28-Lead Dual-In-Line Welded-Seal
Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.090	0.200		2.29	5.08
A ₁	0.020	0.070	2	0.51	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		2.54	5.08
L ₂	0.000	0.030		0.00	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

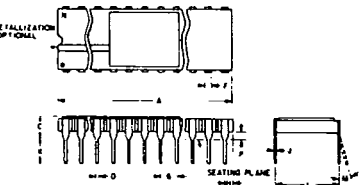
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
a	0.230		2	5.84 TP	
A ₁	0	0		0	0
A ₂	0.165	0.185		4.19	4.70
φB	0.016	0.019	3	0.407	0.482
φB ₁	0	0		0	0
φB ₂	0.016	0.021	3	0.407	0.533
φD	0.335	0.370		8.51	9.39
φD ₁	0.305	0.335		7.75	8.50
F ₁	0.020	0.040		0.51	1.01
J	0.028	0.034		0.712	0.863
k	0.029	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



- 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
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

(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-30986R1

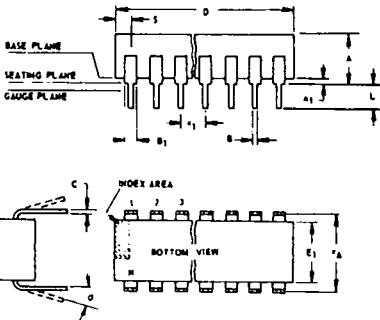
(D) SUFFIX
40-Lead Dual-In-Line
Side-Brazed Ceramic Package

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

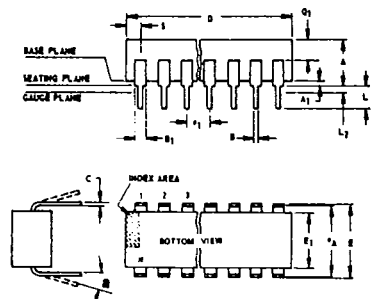
NOTES:

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.

- 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.
- ϕA applies in zone L₂ when unit installed.
- ϕ applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- 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
A ₁	0.020	0.060		0.51	1.27
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
$\phi 1$	0.100 TP		2	2.54 TP	
ϕA	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	5
N ₁	0	6		0	6
Q ₁	0.040	0.075		1.02	1.90
S	0.065	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
A ₁	0.020	0.050		0.51	1.27
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
$\phi 1$	0.100 TP		2	2.54 TP	
ϕA	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	5
N ₁	0	6		0	6
Q ₁	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
A ₁	0.020	0.060		0.508	1.27
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	0.845	0.885		21.47	22.47
E ₁	0.240	0.260		6.10	6.60
$\phi 1$	0.100 TP		2	2.54 TP	
ϕA	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	5
N ₁	0	6		0	6
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
A ₁	0.020	0.050		0.508	1.27
B	0.015	0.020		0.381	0.508
B ₁	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
E ₁	0.345	0.355		8.77	9.01
$\phi 1$	0.100 TP		2	2.54 TP	
ϕA	0.400 TP		2, 3	10.16 TP	
L	0.125	0.150		3.18	3.81
L ₂	0	0.030		0	0.762
a	2°	15°	4	2°	15°
N	22	5		22	5
N ₁	0	6		0	6
Q ₁	0.065	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
A ₁	0.015	0.045		0.381	1.14
B	0.015	0.020		0.381	0.508
B ₁	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
E ₁	0.245	0.300		6.23	7.62
$\phi 1$	0.100 TP		2	2.54 TP	
ϕA	0.300 TP		2, 3	7.62 TP	
L	0.120	0.160		3.05	4.06
L ₂	0.000	0.030		0.000	0.76
a	2°	15°	4	2°	15°
N	16	5		16	5
N ₁	0	6		0	6
Q ₁	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
A ₁	0.020	0.070		0.51	1.77
B	0.016	0.020		0.407	0.508
B ₁	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
E ₁	0.515	0.580		13.09	14.73
$\phi 1$	0.100 TP		2	2.54 TP	
ϕA	0.600 TP		2, 3	15.24 TP	
L	0.100	0.200		2.54	5.00
L ₂	0.000	0.030		0.00	0.76
a	0°	15°	4	0°	15°
N	24	5		24	5
N ₁	0	6		0	6
Q ₁	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

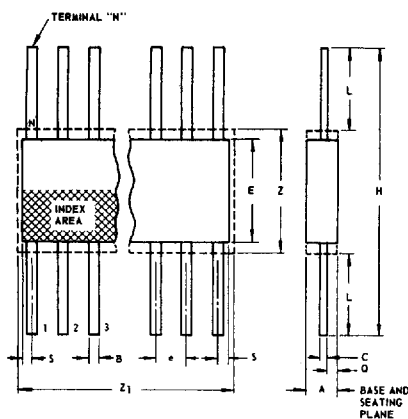
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.250		3.10	6.30
A ₁	0.020	0.070		0.51	1.77
B	0.016	0.020		0.407	0.508
B ₁	0.028	0.070		0.72	1.77
C	0.008	0.012	1	0.204	0.304
D	2.000	2.090		50.80	53.09
E ₁	0.515	0.580		13.09	14.73
$\phi 1$	0.100 TP		2	2.54 TP	
ϕA	0.600 TP		2, 3	15.24 TP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

92CS-30959

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	

92S8-4300R3

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