

# CD4007A Types

## CMOS Dual Complementary Pair Plus Inverter

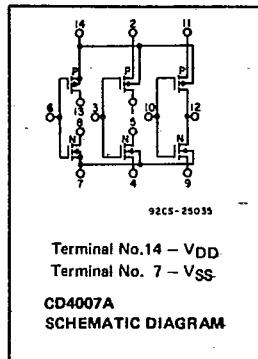
The RCA-CD4007A types are comprised of three n-channel and three p-channel enhancement-type MOS transistors. The transistor elements are accessible through the package terminals to provide a convenient means for constructing the various typical circuits as shown in Fig. 2.

More complex functions are possible using multiple packages. Numbers shown in parentheses indicate terminals that are connected together to form the various configurations listed.

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:

- Medium-speed operation. . . . .  
 $t_{PHL} = t_{PLH} = 20$  ns (typ.) at  $C_L = 15$  pF,  $+V_{DD} = 10$  V
- Low "high" and "low" output impedance. 500  $\Omega$  (typ.) at  $V_{DD} = V_{SS} = 10$  V
- Quiescent current specified to 15 V
- Maximum input leakage current of 1  $\mu$ A at 15 V (full package-temperature range)
- 1-V noise margin (full package-temperature range)



### 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

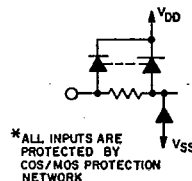
### RECOMMENDED OPERATING CONDITIONS

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

CHARACTERISTIC	LIMITS				UNITS
	D, F, K, H Packages		E Package		
	Min.	Max.	Min.	Max.	
Supply-Voltage Range (For $T_A =$ Full Package Temperature Range)	3	12	3	12	V

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

CHARACTERISTIC	TEST CONDITIONS	LIMITS						UNITS	
		$V_{DD}$ (V)	D, F, K, H Packages			E Package			
			Min.	Typ.	Max.	Min.	Typ.		Max.
Propagation Delay Time; $t_{PLH}, t_{PHL}$		5	-	35	60	-	35	75	ns
		10	-	20	40	-	20	50	
Transition Time; $t_{THL}, t_{TLH}$		5	-	50	75	-	50	100	ns
		10	-	30	40	-	30	50	
Average Input Capacitance, $C_i$	Any Input	-	5	-	-	5	-	pF	



### Applications:

- Extremely high-input impedance amplifiers
- Shapers
- Inverters
- Threshold detector
- Linear amplifiers

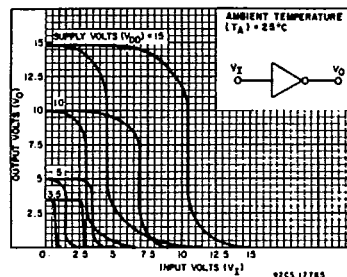


Fig. 1 - Minimum and maximum voltage-transfer characteristics for inverter.

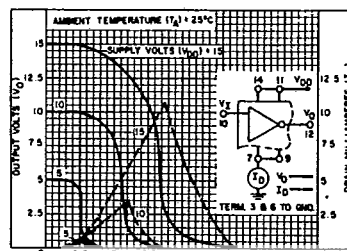


Fig. 2 - Typical current and voltage-transfer characteristics for inverter.

STATIC ELECTRICAL CHARACTERISTICS

Characteristic	Conditions		Limits at Indicated Temperatures (°C)								Units	
			D, F, K, H Packages				E Package					
			-55	+25		+125	-40	+25		+85		
Quiescent Device Current:	$V_O$ (V)	$V_{IN}$ (V)	$V_{DD}$ (V)	0.05	0.001	0.05	3	0.5	0.005	0.5	15	$\mu A$
$I_L$ Max.	-	-	10	0.1	0.001	0.1	6	1	0.005	1	30	
Output Voltage Low Level	-	5	5	0 Typ.; 0.05 Max.								V
$V_{OL}$	-	10	10	0 Typ.; 0.05 Max.								
High Level	-	0	5	4.95 Min.; 5 Typ.								V
$V_{OH}$	-	0	10	9.95 Min.; 10 Typ.								
Noise Immunity: Inputs Low	3.6	-	5	1.5 Min.; 2.25 Typ.								V
$V_{NL}$	7.2	-	10	3 Min.; 4.5 Typ.								
Inputs High	1.4	-	5	1.5 Min.; 2.25 Typ.								V
$V_{NH}$	2.8	-	10	3 Min.; 4.5 Typ.								
Noise Margin: Inputs Low	4.5	-	5	1 Min.								V
$V_{NML}$	9	-	10	1 Min.								
Inputs High	0.6	-	5	1 Min.								V
$V_{NMH}$	1	-	10	1 Min.								
Output Drive Current: N-Channel (Sink)	$0.4^* V_I$	$V_I = 5$	5	0.75	1	0.6	0.4	0.35	1	0.3	0.24	$mA$
$I_{DN}$ Min.	$0.5 V_{DD}$	$V_{DD} = 10$	10	1.6	2.5	1.3	0.95	1.2	2.5	1	0.8	
P-Channel (Source):	$2.5^† V_I$	$V_I = 5$	5	-1.75	-4	-1.4	-1	-1.3	-4	-1.1	-0.9	$mA$
$I_{DP}$ Min.	$9.5 V_{DD}$	$V_{DD} = 10$	10	-1.35	-2.5	-1.1	-0.75	-0.65	-2.5	-0.65	-0.45	
Input Leakage Current:	Any Input										$\mu A$	
$I_{IL}, I_{IH}$	-	-	15	$\pm 10^{-5}$ Typ., $\pm 1$ Max.								

\*Maximum noise-free low-level bipolar output voltage. †Minimum noise-free high-level bipolar output voltage.

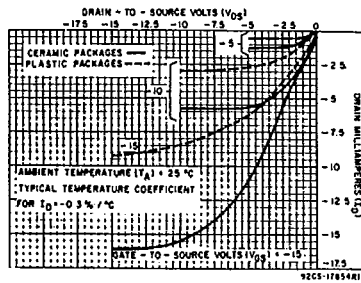


Fig. 5 - Minimum output p-channel drain characteristics.

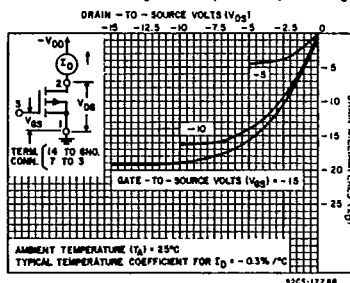


Fig. 6 - Typical output p-channel drain characteristics.

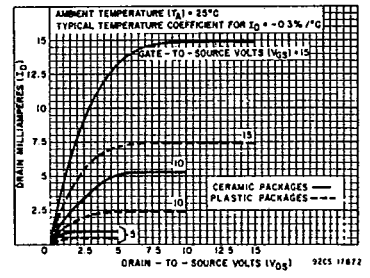


Fig. 7 - Minimum output n-channel drain characteristics.

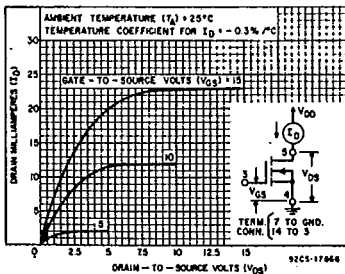


Fig. 8 - Typical output n-channel drain characteristics.

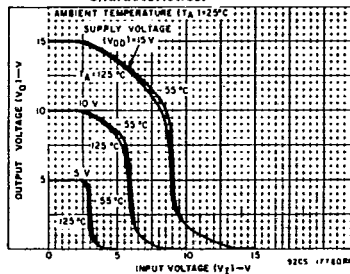


Fig. 9 - Typical voltage-transfer characteristics as a function of temperature.

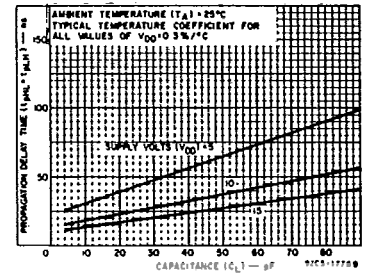


Fig. 10 - Typical propagation delay time vs load capacitance.

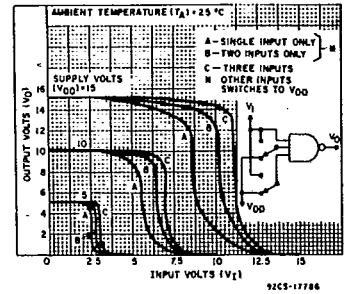


Fig. 3 - Typical voltage-transfer characteristics for NAND gate.

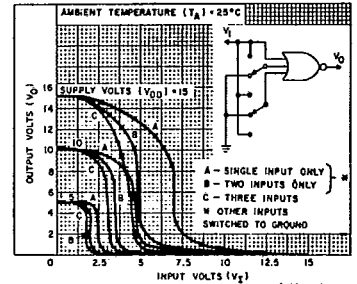


Fig. 4 - Typical voltage-transfer characteristics for NOR gate.

# CD4007A Types

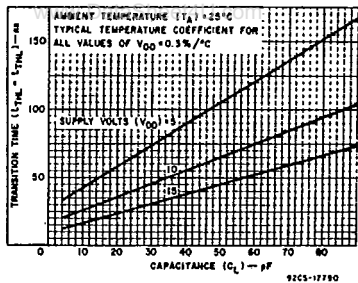


Fig. 11 — Typical transition time vs. load capacitance.

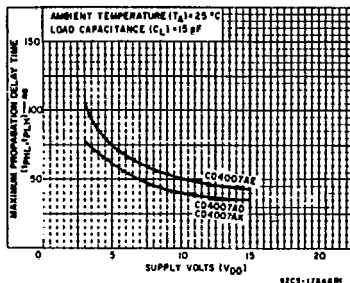


Fig. 12 — Maximum propagation-delay time vs. supply voltage.

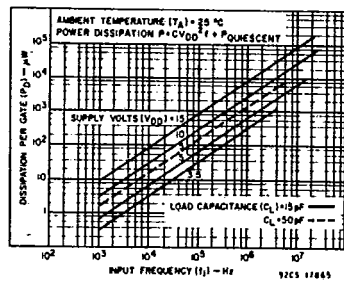
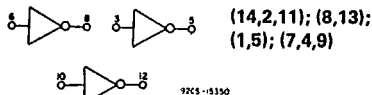


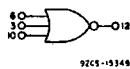
Fig. 13 — Typical dissipation characteristics.



a) Triple Inverters

(14,2,11); (8,13);  
(1,5); (7,4,9)

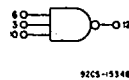
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b) 3-Input NOR Gate

(13,2); (1,11);  
(12,5,8); (7,4,9)

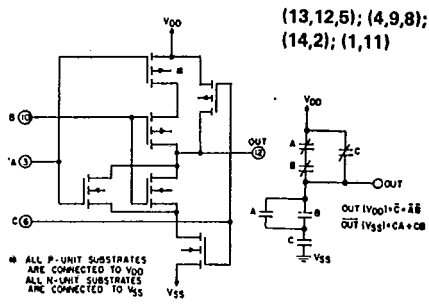
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c) 3-Input NAND Gate

(1,12,13); (2,14,11);  
(4,8); (5,9)

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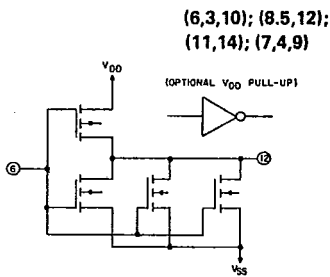


d) Tree (Relay) Logic

(13,12,5); (4,9,8);  
(14,2); (1,11)

ALL P-UNIT SUBSTRATES  
ARE CONNECTED TO VDD  
ALL N-UNIT SUBSTRATES  
ARE CONNECTED TO VSS

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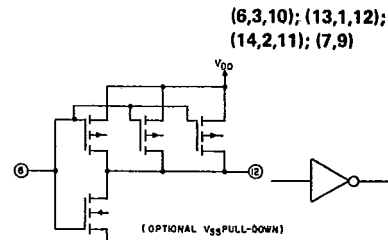


e) High Sink-Current Driver

(6,3,10); (8,5,12);  
(11,14); (7,4,9)

(OPTIONAL VDD PULL-UP)

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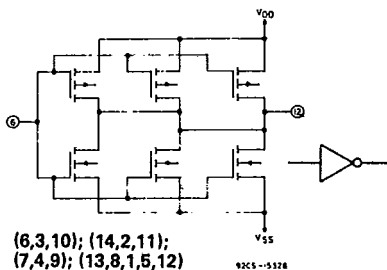


f) High Source-Current Driver

(6,3,10); (13,1,12);  
(14,2,11); (7,9)

(OPTIONAL VSS PULL-DOWN)

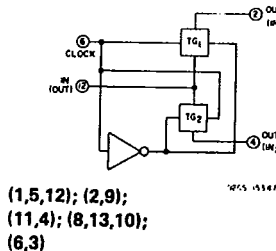
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g) High Sink- and Source-Current Driver

(6,3,10); (14,2,11);  
(7,4,9); (13,8,1,5,12)

92CS-15328



h) Dual Bi-Directional Transmission Gating

(1,5,12); (2,9);  
(11,4); (8,13,10);  
(6,3)

92CS-15347

Fig. 14 — Sample COS/MOS logic circuit arrangements using type CD4007A.

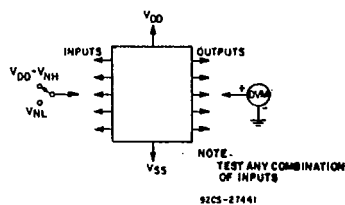


Fig. 15 — Noise-immunity test circuit:

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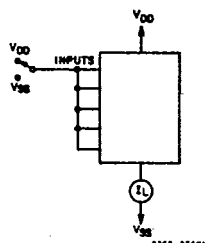


Fig. 16 — Quiescent-device-current test circuit.

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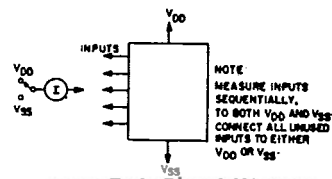


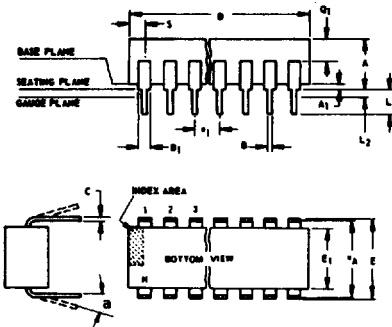
Fig. 17 — Input-leakage-current test circuit.

NOTE: MEASURE INPUTS SEQUENTIALLY, TO BOTH VDD AND VSS. CONNECT ALL UNUSED INPUTS TO EITHER VDD OR VSS.

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# Dimensional Outlines

## Dual-In-Line Welded-Seal Ceramic Packages



- NOTES:  
Refer to Rules for Dimensioning (JEDEC Publication No. 96) 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<sub>A</sub> applies in zone L<sub>2</sub> when unit installed.
  - a applies to spread leads prior to installation.
  - N is the maximum quantity of lead positions.
  - N<sub>1</sub> is the quantity of allowable missing leads.

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

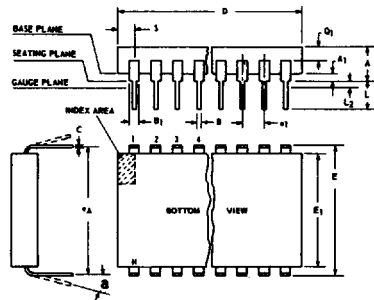
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.160		3.05	4.06
A <sub>1</sub>	0.020	0.065		0.51	1.65
B	0.014	0.020		0.356	0.508
B <sub>1</sub>	0.050	0.065		1.27	1.65
C	0.008	0.012	1	0.204	0.304
D	0.745	0.770		18.93	19.56
E	0.300	0.325		7.62	8.25
E <sub>1</sub>	0.240	0.260		6.10	6.60
e <sub>1</sub>	0.100 TP		2	2.54 TP	
e <sub>A</sub>	0.300 TP		2, 3	7.62 TP	
L	0.125	0.150		3.18	3.81
L <sub>2</sub>	0.000	0.030		0.000	0.76
a	0°	15°	4	0°	15°
N	14		5	14	
N <sub>1</sub>	0		6	0	
Q <sub>1</sub>	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 <sub>1</sub>	0.020	0.065		0.51	1.65
B	0.014	0.020		0.356	0.508
B <sub>1</sub>	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 <sub>1</sub>	0.240	0.260		6.10	6.60
e <sub>1</sub>	0.100 TP		2	2.54 TP	
e <sub>A</sub>	0.300 TP		2, 3	7.62 TP	
L	0.125	0.150		3.18	3.81
L <sub>2</sub>	0.000	0.030		0.000	0.76
a	0°	15°	4	0°	15°
N	16		5	16	
N <sub>1</sub>	0		6	0	
Q <sub>1</sub>	0.050	0.085		1.27	2.15
S	0.015	0.060		0.39	1.52

92SS-4286R5



- NOTES:  
Refer to Rules for Dimensioning (JEDEC Publication No. 96) 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<sub>A</sub> applies in zone L<sub>2</sub> when unit installed.
  - a applies to spread leads prior to installation.
  - N is the maximum quantity of lead positions.
  - N<sub>1</sub> 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 <sub>1</sub>	0.020	0.070		0.51	1.78
B	0.015	0.020		0.381	0.508
B <sub>1</sub>	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 <sub>1</sub>	0.480	0.520		12.20	13.20
e <sub>1</sub>	0.100 TP		2	2.54 TP	
e <sub>A</sub>	0.600 TP		2, 3	15.24 TP	
L	0.100	0.180		2.54	4.57
L <sub>2</sub>	0.000	0.030		0.00	0.76
a	0°	15°	4	0°	15°
N	24		5	24	
N <sub>1</sub>	0		6	0	
Q <sub>1</sub>	0.020	0.080		0.51	2.03
S	0.020	0.060		0.51	1.52

92CS-19948R4

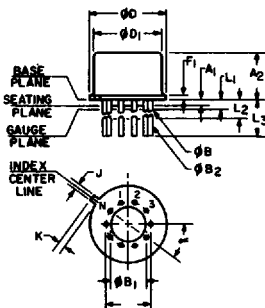
(D) SUFFIX (JEDEC MO-015-AH)  
28-Lead Dual-In-Line Welded-Seal  
Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.090	0.200		2.29	5
A <sub>1</sub>	0	0.070	2	0	1.77
B	0.015	0.020		0.381	0.508
B <sub>1</sub>	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 <sub>1</sub>	0.485	0.515		12.32	13.08
e <sub>1</sub>	0.100 TP		2	2.54 TP	
e <sub>A</sub>	0.600 TP		2, 3	15.24 TP	
L	0.100	0.200		2.54	5
L <sub>2</sub>	0	0.030		0	0.76
a	0°	15°	4	0°	15°
N	28		5	28	
N <sub>1</sub>	0		6	0	
Q <sub>1</sub>	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

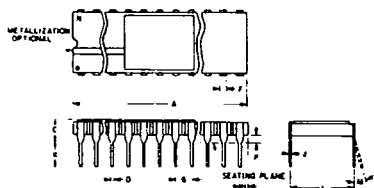
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
a	0.230		2	5.84 TP	
A <sub>1</sub>	0	0		0	0
A <sub>2</sub>	0.165	0.185		4.19	4.70
φB	0.016	0.019	3	0.407	0.482
φB <sub>1</sub>	0	0		0	0
φB <sub>2</sub>	0.016	0.021	3	0.407	0.533
φD	0.335	0.370		8.51	9.39
φD <sub>1</sub>	0.305	0.335		7.75	8.50
F <sub>1</sub>	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 <sub>1</sub>	0.000	0.050	3	0.00	1.27
L <sub>2</sub>	0.250	0.500	3	6.4	12.7
L <sub>3</sub>	0.500	0.562	3	12.7	14.27
a	30° TP			30° TP	
N	12		6	12	
N <sub>1</sub>	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 L<sub>1</sub> and L<sub>2</sub>. φB<sub>2</sub> applies between L<sub>2</sub> and 0.500" (12.70 mm) from seating plane. Diameter is uncontrolled in L<sub>1</sub> and beyond 0.500" (12.70 mm).
- Measure from Max. φD.
- N<sub>1</sub> 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:

- Leads within 0.005" (0.13 mm)-radius of True Position at maximum material condition.
- Dimension "L" to center of leads when formed parallel.
- 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	—	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	1.085	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

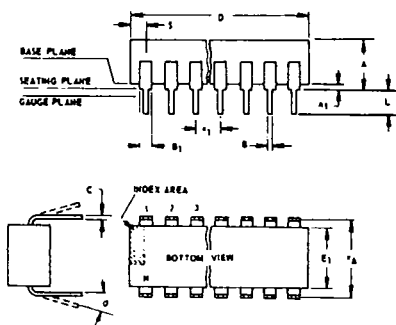
### (D) SUFFIX 40-Lead Dual-In-Line Side-Brazed Ceramic Package

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	0.56
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 <sub>1</sub>	0.020	0.050		0.508	1.27
B	0.014	0.020		0.356	0.508
B <sub>1</sub>	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 <sub>1</sub>	0.240	0.260		6.10	6.60
e <sub>1</sub>	0.100	TP	2	2.54	TP
e <sub>A</sub>	0.300	TP	2, 3	7.62	TP
L	0.125	0.150		3.18	3.81
L <sub>2</sub>	0.000	0.030		0.000	0.762
a	0	15	4	0	15
N	8		5	8	
N <sub>1</sub>	0		6	0	
Q <sub>1</sub>	0.040	0.075		1.02	1.90
S	0.015	0.060		0.381	1.52

### NOTES:

Refer to Rules for Dimensioning (JEDEC Publication No. 95) for Axial Lead Product Outlines.

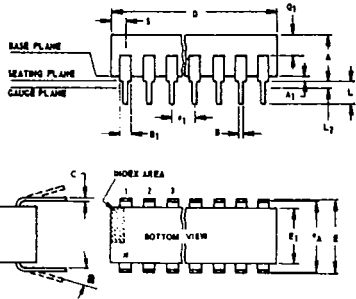
- When this device is supplied solder-dipped, the maximum lead thickness (narrow portion) will not exceed 0.013".
- Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
- e<sub>A</sub> applies in zone L<sub>2</sub> when unit installed.
- a applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- N<sub>1</sub> is the quantity of allowable missing leads.

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92CS-24026R1

# 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.
- e<sub>A</sub> applies in zone L<sub>2</sub> when unit installed.
- a applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- N<sub>1</sub> 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	0.165	0.200		3.94	5.08
A <sub>1</sub>	0.020	0.060		0.51	1.27
B	0.014	0.020		0.356	0.508
B <sub>1</sub>	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
E <sub>1</sub>	0.240	0.260		6.10	6.60
e <sub>1</sub>	0.100 TP		2	2.54 TP	
e <sub>A</sub>	0.300 TP		2, 3	7.62 TP	
L	0.125	0.150		3.18	3.81
L <sub>2</sub>	0.000	0.030		0.000	0.76
a	0°	15°	4	0°	15°
N	14		5	14	
N <sub>1</sub>	0		6	0	
Q <sub>1</sub>	0.040	0.075		1.02	1.90
S	0.065	0.090		1.66	2.28

92SC-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	0.165	0.200		3.94	5.08
A <sub>1</sub>	0.020	0.050		0.51	1.27
B	0.014	0.020		0.356	0.508
B <sub>1</sub>	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 <sub>1</sub>	0.240	0.260		6.10	6.60
e <sub>1</sub>	0.100 TP		2	2.54 TP	
e <sub>A</sub>	0.300 TP		2, 3	7.62 TP	
L	0.125	0.150		3.18	3.81
L <sub>2</sub>	0.000	0.030		0.000	0.76
a	0°	15°	4	0°	15°
N	16		5	16	
N <sub>1</sub>	0		6	0	
Q <sub>1</sub>	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 <sub>1</sub>	0.020	0.050		0.508	1.27
B	0.014	0.020		0.356	0.508
B <sub>1</sub>	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 <sub>1</sub>	0.240	0.260		6.10	6.60
e <sub>1</sub>	0.100 TP		2	2.54 TP	
e <sub>A</sub>	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	
N <sub>1</sub>	0		6	0	
S	0.015	0.060		0.39	1.52

92CS-30630

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

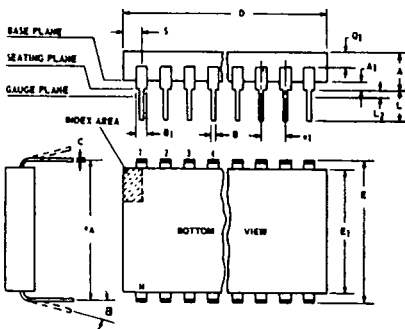
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.155	0.200		3.94	5.08
A <sub>1</sub>	0.020	0.050		0.508	1.27
B	0.016	0.020		0.381	0.508
B <sub>1</sub>	0.035	0.065		0.89	1.65
C	0.008	0.012	1	0.204	0.304
D		1.120			28.44
E	0.390	0.420		9.91	10.66
E <sub>1</sub>	0.345	0.355		8.77	9.01
e <sub>1</sub>	0.100 TP		2	2.54 TP	
e <sub>A</sub>	0.400 TP		2, 3	10.16 TP	
L	0.125	0.150		3.18	3.81
L <sub>2</sub>	0	0.030		0	0.762
a	2°	15°	4	2°	15°
N	22		5	22	
N <sub>1</sub>	0		6	0	
Q <sub>1</sub>	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
A <sub>1</sub>	0.015	0.045		0.381	1.14
B	0.015	0.020		0.381	0.508
B <sub>1</sub>	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 <sub>1</sub>	0.245	0.300		6.23	7.62
e <sub>1</sub>	0.100 TP		2	2.54 TP	
e <sub>A</sub>	0.300 TP		2, 3	7.62 TP	
L	0.120	0.160		3.05	4.06
L <sub>2</sub>	0.000	0.030		0.000	0.76
a	2°	15°	4	2°	15°
N	16		5	16	
N <sub>1</sub>	0		6	0	
Q <sub>1</sub>	0.050	0.080		1.27	2.03
S	0.010	0.060		0.254	1.52

92CM-22284R1



### 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".
- Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
- e<sub>A</sub> applies in zone L<sub>2</sub> when unit installed.
- a applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- N<sub>1</sub> is the quantity of allowable missing leads.

### (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 <sub>1</sub>	0.020	0.070		0.51	1.77
B	0.016	0.020		0.407	0.508
B <sub>1</sub>	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 <sub>1</sub>	0.515	0.580		13.09	14.73
e <sub>1</sub>	0.100 TP		2	2.54 TP	
e <sub>A</sub>	0.600 TP		2, 3	15.24 TP	
L	0.100	0.200		2.54	5.00
L <sub>2</sub>	0.000	0.030		0.00	0.76
a	0°	15°	4	0°	15°
N	24		5	24	
N <sub>1</sub>	0		6	0	
Q <sub>1</sub>	0.040	0.075		1.02	1.90
S	0.040	0.100		1.02	2.54

92CS-26938R2

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

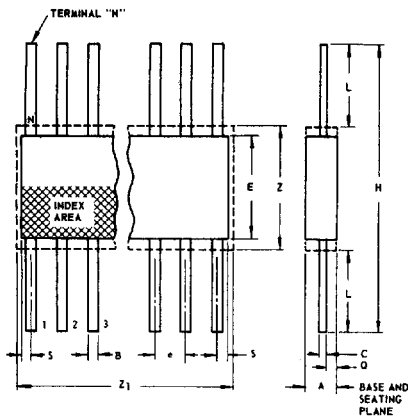
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.250		3.10	6.30
A <sub>1</sub>	0.020	0.070		0.51	1.77
B	0.016	0.020		0.407	0.508
B <sub>1</sub>	0.028	0.070		0.72	1.77
C	0.008	0.012	1	0.204	0.304
D	2.000	2.090		50.80	53.09
E <sub>1</sub>	0.615	0.680		13.09	14.73
e <sub>1</sub>	0.100 TP		2	2.54 TP	
e <sub>A</sub>	0.600 TP		2, 3	15.24 TP	
L	0.100	0.200		2.54	5.00
L <sub>2</sub>	0.000	0.030		0.00	0.76
a	0°	15°	4	0°	15°
N	40		5	40	
N <sub>1</sub>	0		6	0	
Q <sub>1</sub>	0.065	0.095		1.66	2.41
S	0.040	0.100		1.02	2.54

92CS-30959

## 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 <sub>1</sub>	0.400		4	10.16	

92SS-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 Z<sub>1</sub> 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 <sub>1</sub>	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 <sub>1</sub>	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 <sub>1</sub>	0.750		4	19.05	