

CD4037A Types

CMOS Triple AND/OR Bi-Phase Pairs

The RCA-CD4037A consists of three AND/OR pairs driven by common control signals A and B.

Each circuit has a data input (C), and two output terminals (D and E) that provide outputs in accordance with the truth table shown in Fig. 1. The circuit is useful for coding or decoding signals for split-phase (Bi-phase) communication systems, magnetic recording, and plated wire and core memory systems. A separate V<sub>CC</sub> terminal is provided to allow level conversion to any voltage from 3 volts to V<sub>DD</sub>. These types are supplied in 14-lead hermetic dual-in-line ceramic packages (D and F suffixes), 14-lead dual-in-line plastic package (E suffix), 14-lead ceramic flat package (K suffix), and in chip form (H suffix).

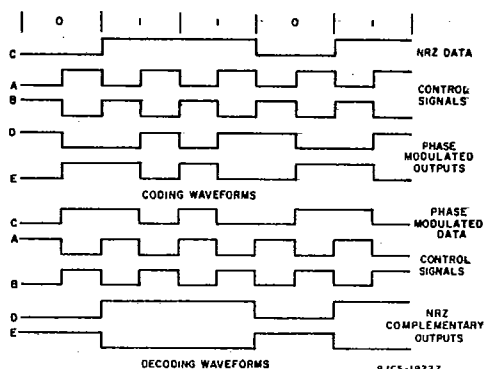
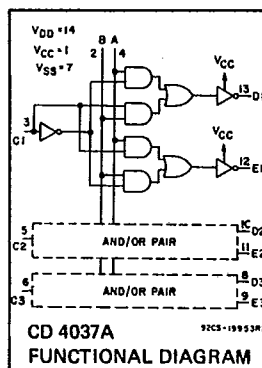
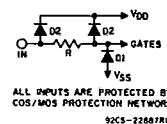


Fig. 1 - Coding and decoding waveforms.



TRUTH TABLE

INPUT	OUTPUT		
A	B	D	E
0	0	1	1
1	0	C	C
0	1	C	C
1	1	0	0



RECOMMENDED OPERATING CONDITIONS. For maximum reliability, nominal operating conditions should be selected to that operation is always within the following ranges:

CHARACTERISTIC	V <sub>DD</sub> (V)	LIMITS				UNITS
		D, F, K, H PACKAGES		E PACKAGE		
		MIN.	MAX.	MIN.	MAX.	
Supply-Voltage Range (For T <sub>A</sub> = Full Package-Temperature Range)		3	12	3	12	V

Features:

- Outputs compatible with low-power TTL systems.
- High sink and source current (1.6 mA typ.) capability at V<sub>DD</sub> = V<sub>CC</sub> = 10V and V<sub>DS</sub> = 0.5 V.
- Microwatt quiescent power dissipation: P<sub>D</sub> = 0.5 μW/ceramic pkg. (typ.), P<sub>D</sub> = 2 μW/plastic pkg. (typ.) at V<sub>DD</sub> = 10 V
- Quiescent current specified to 15 V
- Maximum input leakage current of 1 μA at 15 V (full package-temperature range)
- 1-V noise margin (full package-temperature range)

CAUTION: V<sub>CC</sub> VOLTAGE LEVEL MUST BE EQUAL TO OR LESS POSITIVE THAN V<sub>DD</sub>

DYNAMIC ELECTRICAL CHARACTERISTICS

at T<sub>A</sub> = 25°C, Input t<sub>r</sub>, t<sub>f</sub> = 20 ns, C<sub>L</sub> = 16 pF, R<sub>L</sub> = 200 kΩ

CHARACTERISTIC	TEST CONDITIONS	V <sub>DD</sub> (V)	LIMITS						UNITS
			D, F, K, H PACKAGES			E PACKAGE			
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Propagation Delay Time: A and B Inputs t <sub>PHL</sub> , t <sub>PLH</sub>		5	-	225	450	-	325	650	ns
		10	-	75	150	-	100	200	
C Inputs t <sub>PHL</sub> t <sub>PLH</sub>		5	-	250	500	-	350	700	ns
		10	-	75	150	-	100	200	
		5	-	225	450	-	325	650	
		10	-	90	180	-	125	250	
Transition Time: High-to-Low Level, t <sub>THL</sub>		5	-	40	80	-	60	120	ns
		10	-	15	30	-	20	40	
Low-to-High Level, t <sub>TLH</sub>		5	-	75	150	-	100	200	ns
		10	-	60	120	-	90	180	
Input Capacitance, C <sub>I</sub>	Any Input		-	5	-	-	5	-	pF

Applications:

- Split-phase (Bi-Phase) communication systems.
- Disc, drum, and tape digital recording systems.
- Plated wire and core memory systems.
- High-to-low logic level converter.

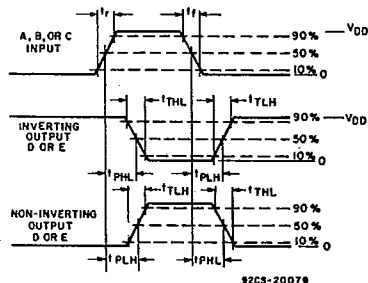


Fig. 2 - Waveforms for measurement of dynamic characteristics.

### CD4037A Types

**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 ± 1/32 inch (1.59 ± 0.79 mm) from case for 10 s max	+265 °C

**STATIC ELECTRICAL CHARACTERISTICS**

CHARACTERISTICS	CONDITIONS			LIMITS AT INDICATED TEMPERATURES (°C)								UNITS
	$V_O$ (V)	$V_{IN}$ (V)	$V_{DD}$ (V)	D, F, K, H PACKAGES				E PACKAGE				
				-55	+25		+125	-40	+25		+85	
Quiescent Device Current, $I_L$ Max.	-	-	5	5	0.03	5	300	50	0.1	50	700	$\mu A$
	-	-	10	10	0.05	10	600	100	0.2	100	1400	
	-	-	15	50	1	50	2000	500	5	500	5000	
Output Voltage: Low Level, $V_{OL}$	-	5	5	0 Typ.; 0.05 Max								V
	-	10	10	0 Typ.; 0.05 Max								
	-	0	6	4.95 Min.; 5 Typ.								
High Level $V_{OH}$	-	0	10	9.95 Min.; 10 Typ.								V
	-	0	10	9.95 Min.; 10 Typ.								
Noise Immunity: Inputs Low, $V_{NL}$	4.2	-	5	1.5 Min.; 2.25 Typ.								V
	9	-	10	3 Min.; 4.5 Typ.								
	0.8	-	5	1.5 Min.; 2.25 Typ.								
Inputs High $V_{NH}$	1	-	10	3 Min.; 4.5 Typ.								V
	1	-	10	3 Min.; 4.5 Typ.								
Noise Margin: Inputs Low, $V_{NML}$	4.5	-	5	1 Min.								V
	9	-	10	1 Min.								
	0.5	-	6	1 Min.								
Inputs High, $V_{NMH}$	1	-	10	1 Min.								V
	1	-	10	1 Min.								
Output Drive Current: N-Channel (Sink), $I_{DN}$ Min.	0.5	-	5	0.85	0.7	1.2	0.45	0.4	0.35	0.7	0.3	mA
	0.5	-	10	1.3	1.1	2	0.7	0.65	0.55	1.1	0.45	
	4.5	-	6	-0.65	-0.55	-1	-0.35	-0.35	-0.3	-0.55	-0.2	
P-Channel (Source): $I_{DP}$ Min.	9.5	-	10	-0.9	-0.75	-1.6	-0.45	-0.5	-0.4	-0.75	-0.3	mA
	9.5	-	10	-0.9	-0.75	-1.6	-0.45	-0.5	-0.4	-0.75	-0.3	
Input Leakage Current, $I_{IL}, I_{IH}$	-	-	15	$\pm 10^{-6}$ Typ., $\pm 1$ Max.								$\mu A$

For quiescent device current, noise immunity, and input leakage current test circuits see "Ratings and Characteristics" at the beginning of the CMOS section.

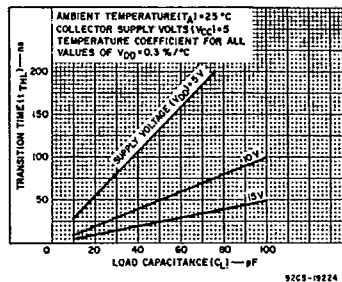


Fig. 3 - Typical transition time vs. load capacitance.

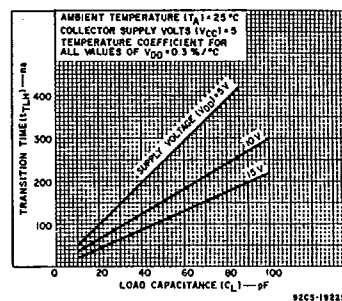


Fig. 4 - Typical transition time vs. load capacitance.

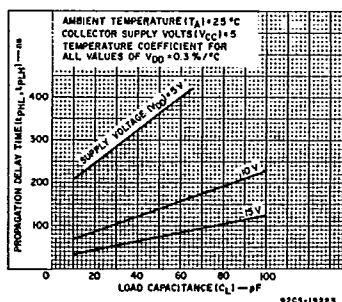


Fig. 5 - Typical propagation delay time vs. load capacitance.

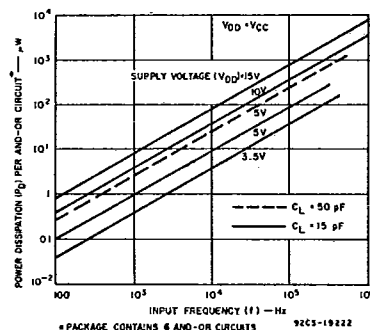
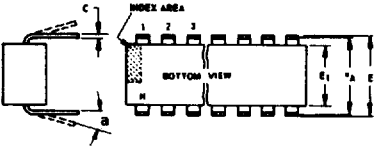
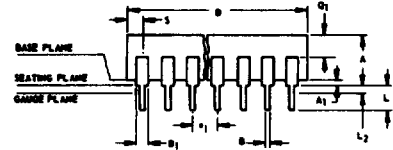


Fig. 6 - Typical dissipation characteristics.

## 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<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

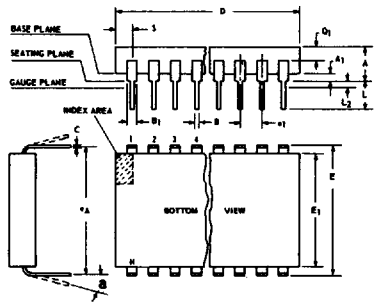
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.160		3.05	4.06
A <sub>1</sub>	0.020	0.065		0.51	1.65
B	0.014	0.020		0.356	0.508
B <sub>1</sub>	0.060	0.065		1.27	1.65
C	0.008	0.012	1	0.204	0.304
D	0.745	0.770		18.93	19.55
E	0.300	0.325		7.62	8.25
E <sub>1</sub>	0.240	0.260		6.10	6.60
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-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<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

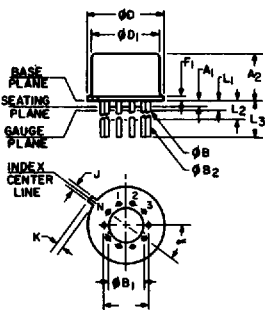
(D) SUFFIX (JEDEC MO-015-AH)  
28-Lead Dual-In-Line Welded-Seal  
Ceramic Package

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		2.6	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

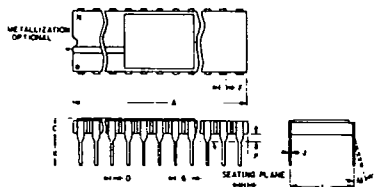
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
a	0.230		2	5.84 TP	
A <sub>1</sub>	0	0		0	0
A <sub>2</sub>	0.165	0.185		4.19	4.70
φB	0.016	0.019	3	0.407	0.482
φB <sub>1</sub>	0	0		0	0
φB <sub>2</sub>	0.016	0.021	3	0.407	0.533
φD	0.335	0.370		8.51	9.39
φD <sub>1</sub>	0.305	0.335		7.75	8.50
F <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



(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:

- 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  
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

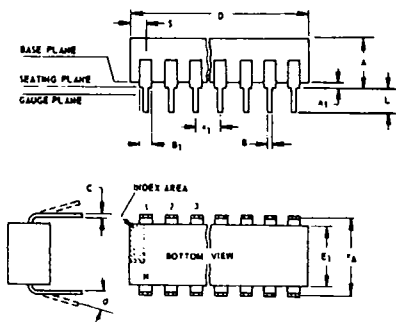
(D) SUFFIX  
40-Lead Dual-in-Line  
Side-Brazed Ceramic Package

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 <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	
O <sub>1</sub>	0.040	0.075		1.02	1.90
S	0.015	0.060		0.381	1.52

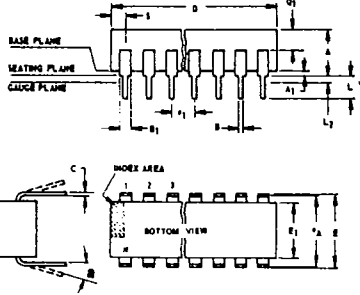
92CS-24026R1

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.

### 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.
  - eA 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	0.155	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>	0.050	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	0.085	0.090		1.66	2.28

92CS-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 <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	0.015	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

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

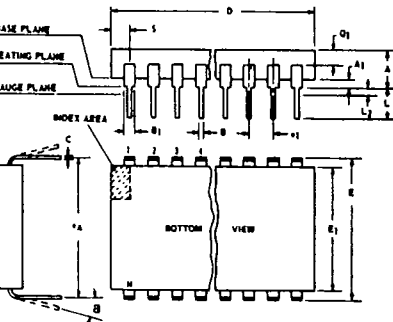
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.250		3.10	6.30
A <sub>1</sub>	0.020	0.070		0.51	1.77
B	0.016	0.020		0.407	0.508
B <sub>1</sub>	0.028	0.070		0.72	1.77
C	0.008	0.012	1	0.204	0.304
D	1.20	1.29		30.48	32.76
E	0.600	0.625		15.24	15.87
E <sub>1</sub>	0.515	0.580		13.09	14.73
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

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 <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>	0.515	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	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



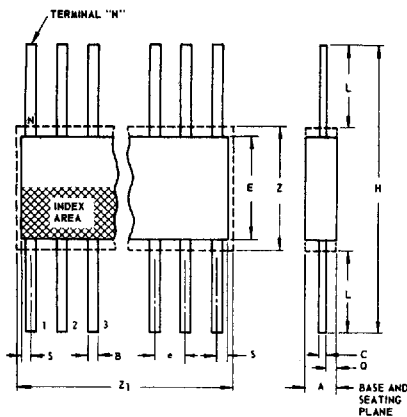
- NOTES:  
Refer to Rules for Dimensioning (JEDEC Publication No. 95) for Axial Lead Product Outlines.
- When this device is supplied solder dipped, the maximum lead thickness (narrow portion) will not exceed 0.013".
  - Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
  - eA 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.

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 <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	

92CS-20972