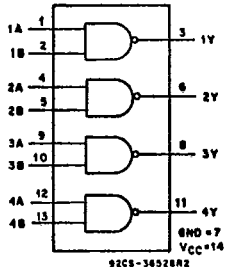


Technical Data

CD54/74AC00  
CD54/74ACT00

T-43-21



FUNCTIONAL DIAGRAM & TERMINAL ASSIGNMENT

Quad 2-Input NAND Gate

Type Features:

- Typical propagation delay (AC00):  
3.2ns @  $V_{cc} = 5V$ ,  $T_A = 25^\circ C$ ,  $C_L = 50 pF$

The RCA CD54/74AC00 and CD54/74ACT00 quad 2-input NAND gates use the RCA ADVANCED CMOS technology. The CD74AC00 and CD74ACT00 are supplied in 14-lead dual-in-line plastic packages (E suffix) and in 14-lead dual-in-line small-outline plastic packages (M suffix). Both package types are operable over the following temperature ranges: Commercial (0 to 70°C); Industrial (-40 to +85°C); and Extended Industrial/Military (-55 to +125°C).

The CD54AC00 and CD54ACT00, available in chip form (H suffix), are operable over the -55 to +125°C temperature range.

Family Features:

- Exceeds 2-kV ESD Protection - MIL-STD-883, Method 3015
- SCR-Latchup-resistant CMOS process and circuit design
- Speed of bipolar FAST®/AS/S with significantly reduced power consumption
- Balanced propagation delays
- AC types feature 1.5-V to 5.5-V operation and balanced noise immunity at 30% of the supply.
- ±24-mA output drive current
  - Fanout to 15 FAST® ICs
  - Drives 50-ohm transmission lines

INPUTS		OUTPUTS
A	B	Y
L	L	H
H	L	H
L	H	H
H	H	L

®FAST is a Registered Trademark of Fairchild Semiconductor Corp.

MAXIMUM RATINGS, Absolute-Maximum Values:

- DC SUPPLY-VOLTAGE ( $V_{cc}$ ) ..... -0.5 to 6 V
- DC INPUT DIODE CURRENT,  $I_{IK}$  (for  $V_I < -0.5V$  or  $V_I > V_{cc} + 0.5V$ ) ..... ±20 mA
- DC OUTPUT DIODE CURRENT,  $I_{OK}$  (for  $V_O < -0.5V$  or  $V_O > V_{cc} + 0.5V$ ) ..... ±50 mA
- DC OUTPUT SOURCE OR SINK CURRENT per Output Pin,  $I_O$  (for  $V_O > -0.5V$  or  $V_O < V_{cc} + 0.5V$ ) ..... ±50 mA
- DC  $V_{cc}$  or GROUND CURRENT ( $I_{CC}$  or  $I_{GND}$ ) ..... ±100 mA\*
- POWER DISSIPATION PER PACKAGE (PD):
  - For  $T_A = -55$  to  $+100^\circ C$  (PACKAGE TYPE E) ..... 500 mW
  - For  $T_A = +100$  to  $+125^\circ C$  (PACKAGE TYPE E) ..... Derate Linearly at 8 mW/°C to 300 mW
  - For  $T_A = -55$  to  $+70^\circ C$  (PACKAGE TYPE M) ..... 400 mW
  - For  $T_A = +70$  to  $+125^\circ C$  (PACKAGE TYPE M) ..... Derate Linearly at 6 mW/°C to 70 mW
- OPERATING-TEMPERATURE RANGE ( $T_A$ ) ..... -55 to +125°C
- STORAGE TEMPERATURE ( $T_{stg}$ ) ..... -65 to +150°C
- LEAD TEMPERATURE (DURING SOLDERING):
  - At distance  $1/16 \pm 1/32$  in. (1.59 ± 0.79 mm) from case for 10 s maximum ..... +265°C
  - Unit inserted into PC board min. thickness 1/16 in. (1.59 mm) with solder contacting lead tips only ..... +300°C

\* For up to 4 outputs per device; add ± 25 mA for each additional output.

File Number 1855

T-43-21

Technical Data  
**CD54/74AC00**  
**CD54/74ACT00**

**RECOMMENDED OPERATING CONDITIONS:**

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

CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range, $V_{CC}$ *: (For $T_A$ = Full Package-Temperature Range) AC Types ACT Types	1.5	5.5	V
	4.5	5.5	V
DC Input or Output Voltage, $V_i, V_o$	0	$V_{CC}$	
Operating Temperature, $T_A$	-55	+125	°C
Input Rise and Fall Slew Rate, $dl/dv$ at 1.5 V to 3 V (AC Types) at 3.6 V to 5.5 V (AC Types) at 4.5 V to 5.5 V (ACT Types)	0	50	ns/V
	0	20	ns/V
	0	10	ns/V

\*Unless otherwise specified, all voltages are referenced to ground.

**STATIC ELECTRICAL CHARACTERISTICS: AC Series**

CHARACTERISTICS	TEST CONDITIONS		$V_{CC}$ (V)	AMBIENT TEMPERATURE ( $T_A$ ) - °C						UNITS	
				+25		-40 to +85		-55 to +125			
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
High-Level Input Voltage $V_{IH}$			1.5	1.2	—	1.2	—	1.2	—	V	
			3	2.1	—	2.1	—	2.1	—		
			5.5	3.85	—	3.85	—	3.85	—		
Low-Level Input Voltage $V_{IL}$			1.5	—	0.3	—	0.3	—	0.3	V	
			3	—	0.9	—	0.9	—	0.9		
			5.5	—	1.65	—	1.65	—	1.65		
High-Level Output Voltage $V_{OH}$	$V_{IH}$ or $V_{IL}$ #,*		-0.05	1.5	1.4	—	1.4	—	1.4	—	V
			-0.05	3	2.9	—	2.9	—	2.9	—	
			-0.05	4.5	4.4	—	4.4	—	4.4	—	
			-4	3	2.58	—	2.48	—	2.4	—	
			-24	4.5	3.94	—	3.8	—	3.7	—	
			-75	5.5	—	—	3.85	—	—	—	
Low Level Output Voltage $V_{OL}$	$V_{IH}$ or $V_{IL}$ #,*		0.05	1.5	—	0.1	—	0.1	—	0.1	V
			0.05	3	—	0.1	—	0.1	—	0.1	
			0.05	4.5	—	0.1	—	0.1	—	0.1	
			12	3	—	0.36	—	0.44	—	0.5	
			24	4.5	—	0.36	—	0.44	—	0.5	
			75	5.5	—	—	—	1.65	—	—	
Input Leakage Current $I_i$	$V_{CC}$ or GND		5.5	—	±0.1	—	±1	—	±1	µA	
Quiescent Supply Current, SSI $I_{CC}$	$V_{CC}$ or GND	0	5.5	—	4	—	40	—	80	µA	

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

\* Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

T-43-21

Technical Data

**CD54/74AC00**  
**CD54/74ACT00**

STATIC ELECTRICAL CHARACTERISTICS: ACT Series

CHARACTERISTICS	TEST CONDITIONS		V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C						UNITS
				+25		-40 to +85		-55 to +125		
	V <sub>I</sub> (V)	I <sub>O</sub> (mA)		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
High-Level Input Voltage V <sub>IH</sub>			4.5 to 5.5	2	—	2	—	2	—	V
Low-Level Input Voltage V <sub>IL</sub>			4.5 to 5.5	—	0.8	—	0.8	—	0.8	V
High-Level Output Voltage V <sub>OH</sub>	V <sub>IH</sub> or V <sub>IL</sub> #1 *	-0.05	4.5	4.4	—	4.4	—	4.4	—	V
		-24	4.5	3.94	—	3.8	—	3.7	—	
		-75	5.5	—	—	3.85	—	—	—	
		-50	5.5	—	—	—	—	3.85	—	
Low-Level Output Voltage V <sub>OL</sub>	V <sub>IH</sub> or V <sub>IL</sub> #1 *	0.05	4.5	—	0.1	—	0.1	—	0.1	V
		24	4.5	—	0.36	—	0.44	—	0.5	
		75	5.5	—	—	—	1.65	—	—	
		50	5.5	—	—	—	—	—	1.65	
Input Leakage Current I <sub>I</sub>	V <sub>CC</sub> or GND		5.5	—	±0.1	—	±1	—	±1	μA
Quiescent Supply Current, SSI I <sub>CC</sub>	V <sub>CC</sub> or GND	0	5.5	—	4	—	40	—	80	μA
Additional Quiescent Supply Current per Input Pin TTL Inputs High 1 Unit Load ΔI <sub>CC</sub>	V <sub>CC</sub> -2.1		4.5 to 5.5	—	2.4	—	2.8	—	3	mA

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

\*Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

ACT INPUT LOADING TABLE

INPUT	UNIT LOAD*
All	0.15

\*Unit load is ΔI<sub>CC</sub> limit specified in Static Characteristics Chart, e.g., 2.4 mA max. @ 25°C.

**CD54/74AC00**  
**CD54/74ACT00**

SWITCHING CHARACTERISTICS: AC Series;  $t_r, t_f = 3 \text{ ns}$ ,  $C_L = 50 \text{ pF}$

CHARACTERISTICS	SYMBOL	V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) -°C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
Propagation Delay Input to Output	t <sub>PLH</sub> t <sub>PHL</sub>	1.5	—	83	—	91	ns
		3.3* 5†	2.7 1.9	9.3 6.6	2.6 1.8	10.2 7.3	
Power Dissipation Capacitance	C <sub>PD</sub> §	—	45 Typ.		45 Typ.		pF
Input Capacitance	C <sub>I</sub>	—	—	10	—	10	pF

SWITCHING CHARACTERISTICS: ACT Series;  $t_r, t_f = 3 \text{ ns}$ ,  $C_L = 50 \text{ pF}$

CHARACTERISTICS	SYMBOL	V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) -°C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
Propagation Delay Input to Output	t <sub>PHL</sub> t <sub>PLH</sub>	5†	2.8	9.8	2.7	10.8	ns
		5†	3.4	12	3.3	13.2	
Power Dissipation Capacitance	C <sub>PD</sub> §	—	45 Typ.		45 Typ.		pF
Input Capacitance	C <sub>I</sub>	—	—	10	—	10	pF

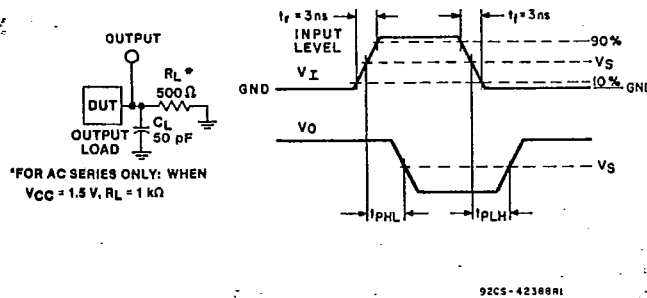
\*3.3 V: min. is @ 3.6 V  
max. is @ 3 V

†5 V: min. is @ 5.5 V  
max. is @ 4.5 V

§C<sub>PD</sub> is used to determine the dynamic power consumption per gate.

For AC,  $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$

For ACT,  $P_D = V_{CC}^2 f_i (C_{PD} + C_L) + V_{CC} \Delta I_{CC}$  where  
 $f_i$  = input frequency  
 $C_L$  = output load capacitance  
 $V_{CC}$  = supply voltage

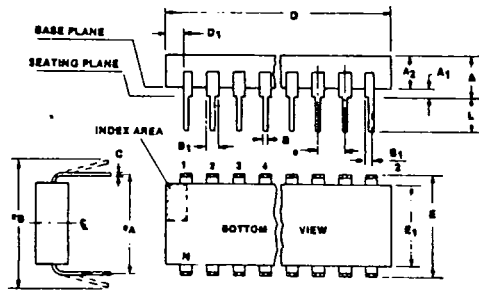


	54/74AC	54/74ACT
Input Level	V <sub>CC</sub>	3 V
Input Switching Voltage, V <sub>s</sub>	0.5 V <sub>CC</sub>	1.5 V
Output Switching Voltage, V <sub>s</sub>	0.5 V <sub>CC</sub>	0.5 V <sub>CC</sub>

Fig. 1 - Propagation delay times.

Dual-In-Line Plastic Packages

T-90-20



(E) Suffix (JEDEC MS-001-AC)  
14-Lead Dual-In-Line Plastic Package

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	—	0.210	—	5.33	9
A <sub>1</sub>	0.015	—	0.39	—	9
A <sub>2</sub>	0.115	0.195	2.93	4.95	
B	0.014	0.022	0.356	0.558	
B <sub>1</sub>	0.045	0.070	1.15	1.77	3
C	0.008	0.015	0.204	0.381	
D	0.725	0.795	18.42	20.19	4
D <sub>1</sub>	0.005	—	0.13	—	12
E	0.300	0.325	7.62	8.25	5
E <sub>1</sub>	0.240	0.280	6.10	7.11	6, 7
e	0.100 BSC		2.54 BSC		8
e <sub>A</sub>	0.300 BSC		7.62 BSC		9
e <sub>B</sub>	—	0.430	—	10.92	10
L	0.115	0.160	2.93	4.06	9
N	14		14		11

92CS-39901

(E) Suffix (JEDEC MS-001-AA)  
16-Lead Dual-In-Line Plastic Package

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	—	0.210	—	5.33	9
A <sub>1</sub>	0.015	—	0.39	—	9
A <sub>2</sub>	0.115	0.195	2.93	4.95	
B	0.014	0.022	0.356	0.558	
B <sub>1</sub>	0.045	0.070	1.15	1.77	3
C	0.008	0.015	0.204	0.381	
D	0.745	0.840	18.93	21.33	4
D <sub>1</sub>	0.005	—	0.13	—	12
E	0.300	0.325	7.62	8.25	5
E <sub>1</sub>	0.240	0.280	6.10	7.11	6, 7
e	0.100 BSC		2.54 BSC		8
e <sub>A</sub>	0.300 BSC		7.62 BSC		9
e <sub>B</sub>	—	0.430	—	10.92	10
L	0.115	0.160	2.93	4.06	9
N	16		16		11

92CS-39900

Notes:

1. Refer to JEDEC Publication No. 95 JEDEC Registered and Standard Outlines for Solid State Products, for rules and general information concerning registered and standard outlines, in Section 2.2.
2. Protrusions (flash) on the base plane surface shall not exceed 0.010 in. (0.25 mm).
3. The dimension shown is for full leads. "Half" leads are optional at lead positions  
 $1, N, \frac{N}{2}, \frac{N}{2} + 1.$
4. Dimension D does not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010 in. (0.25 mm).
5. E is the dimension to the outside of the leads and is measured with the leads perpendicular to the base plane (zero lead spread).
6. Dimension E<sub>1</sub> does not include mold flash or protrusions.
7. Package body and leads shall be symmetrical around center line shown in end view.
8. Lead spacing e shall be non-cumulative and shall be measured at the lead tip. This measurement shall be made before insertion into gauges, boards or sockets.
9. This is a basic installed dimension. Measurement shall be made with the device installed in the seating plane gauge (JEDEC Outline No. GS-3, seating plane gauge). Leads shall be in true position within 0.010 in. (0.25 mm) diameter for dimension e<sub>A</sub>.
10. e<sub>B</sub> is the dimension to the outside of the leads and is measured at the lead tips before the device is installed. Negative lead spread is not permitted.
11. N is the maximum number of lead positions.
12. Dimension D<sub>1</sub> at the left end of the package must equal dimension D<sub>1</sub> at the right end of the package within 0.030 in. (0.76 mm).
13. For automatic insertion, any raised irregularity on the top surface (step, mesa, etc.) shall be symmetrical about the lateral and longitudinal package centerlines.

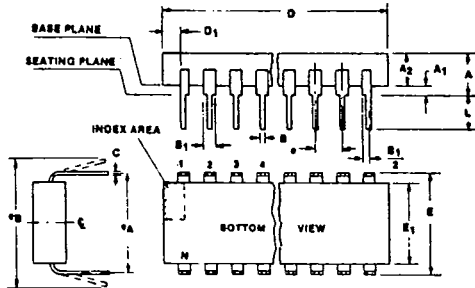
(E) Suffix (JEDEC MS-001-AE)  
20-Lead Dual-In-Line Plastic Package

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	—	0.210	—	5.33	9
A <sub>1</sub>	0.015	—	0.39	—	9
A <sub>2</sub>	0.115	0.195	2.93	4.95	
B	0.014	0.022	0.356	0.558	
B <sub>1</sub>	0.045	0.070	1.15	1.77	3
C	0.008	0.015	0.204	0.381	
D	0.925	1.060	23.5	26.9	4
D <sub>1</sub>	0.005	—	0.13	—	12
E	0.300	0.325	7.62	8.25	5
E <sub>1</sub>	0.240	0.280	6.10	7.11	6, 7
e	0.100 BSC		2.54 BSC		8
e <sub>A</sub>	0.300 BSC		7.62 BSC		9
e <sub>B</sub>	—	0.430	—	10.92	10
L	0.115	0.160	2.93	4.06	9
N	20		20		11

92CS-39997

# Dual-In-Line Plastic Packages T-90-20

(E) Suffix (JEDEC MS-001-AF)  
24-Lead Dual-In-Line Plastic Package



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	—	0.210	—	5.33	9
A <sub>1</sub>	0.015	—	0.39	—	9
A <sub>2</sub>	0.115	0.195	2.93	4.95	
B	0.014	0.022	0.356	0.558	
B <sub>1</sub>	0.045	0.070	1.15	1.77	3
C	0.008	0.015	0.204	0.381	
D	1.125	1.275	28.6	32.3	4
D <sub>1</sub>	0.005	—	0.13	—	12
E	0.300	0.325	7.62	8.25	5
E <sub>1</sub>	0.240	0.280	6.10	7.11	6, 7
e	0.100 BSC		2.54 BSC		8
e <sub>A</sub>	0.300 BSC		7.62 BSC		9
e <sub>B</sub>	—	0.430	—	10.92	10
L	0.115	0.160	2.93	4.06	9
N	24		24		11

92CS-39943

**Notes:**

1. Refer to JEDEC Publication No. 95 JEDEC Registered and Standard Outlines for Solid State Products, for rules and general information concerning registered and standard outlines, in Section 2.2.
2. Protrusions (flash) on the base plane surface shall not exceed 0.010 in. (0.25 mm).
3. The dimension shown is for full leads. "Half" leads are optional at lead positions  

$$1, N, \frac{N}{2}, \frac{N}{2} + 1.$$
4. Dimension D does not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010 in. (0.25 mm).
5. E is the dimension to the outside of the leads and is measured with the leads perpendicular to the base plane (zero lead spread).
6. Dimension E<sub>1</sub> does not include mold flash or protrusions.
7. Package body and leads shall be symmetrical around

center line shown in end view.

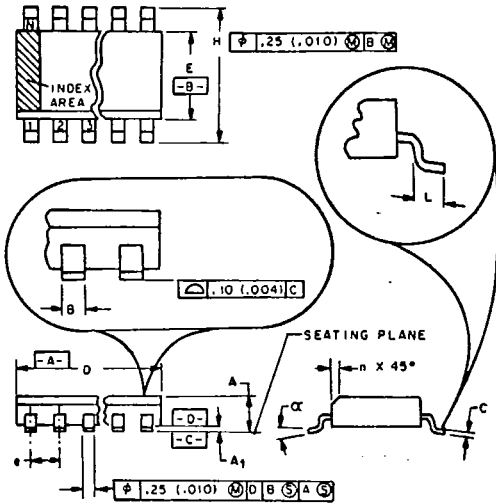
8. Lead spacing e shall be non-cumulative and shall be measured at the lead tip. This measurement shall be made before insertion into gauges, boards or sockets.
9. This is a basic installed dimension. Measurement shall be made with the device installed in the seating plane gauge (JEDEC Outline No. GS-3, seating plane gauge). Leads shall be in true position within 0.010 in. (0.25 mm) diameter for dimension e<sub>A</sub>.
10. e<sub>B</sub> is the dimension to the outside of the leads and is measured at the lead tips before the device is installed. Negative lead spread is not permitted.
11. N is the maximum number of lead positions.
12. Dimension D<sub>1</sub> at the left end of the package must equal dimension D<sub>1</sub> at the right end of the package within 0.030 in. (0.76 mm).
13. For automatic insertion, any raised irregularity on the top surface (step, mesa, etc.) shall be symmetrical about the lateral and longitudinal package centerlines.

13

Dimensional Outlines

# Dual-In-Line Small-Outline Plastic Packages

T-90-20



NOTES:

1. Refer to applicable symbol list.
2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
3. "D" is a reference datum.
4. "A" and "B" are reference datums and do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15 mm (0.006 in.).
5. The chamfer on the body is optional. If it is not present, a visual index feature must be located within the cross-hatched area.
6. "L" is the length of terminal for soldering to a substrate.
7. "N" is the number of terminal positions.
8. Terminal numbers are shown for reference only.
9. Controlling dimensions: MILLIMETERS.

M Suffix (JEDEC MS-012AB)  
14-Lead Dual-In-Line Small-Outline (SO) Package

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	0.0532	0.0688	1.35	1.75	
A <sub>1</sub>	0.0040	0.0098	0.10	0.25	
B	0.0138	0.020	0.35	0.508	
C	0.0075	0.0098	0.19	0.25	
D	0.3367	0.3444	8.55	8.75	4
E	0.1497	0.1574	3.80	4.00	4
e	0.050 BSC		1.27 BSC		
H	0.2284	0.2440	5.80	6.20	
h	0.0099	0.0196	0.25	0.50	5
L	0.016	0.050	0.40	1.27	6
N	14		14		7
α	0° 8°		0° 8°		

Notes: 1, 2, 3, 8, 9

92CS-38924R2

M Suffix (JEDEC MS-012AC)  
16-Lead Dual-In-Line Small-Outline (SO) Package

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	0.0532	0.0688	1.35	1.75	
A <sub>1</sub>	0.0040	0.0098	0.10	0.25	
B	0.0138	0.020	0.35	0.508	
C	0.0075	0.0098	0.19	0.25	
D	0.3859	0.3937	9.80	10.00	4
E	0.1497	0.1574	3.80	4.00	4
e	0.050 BSC		1.27 BSC		
H	0.2284	0.2440	5.80	6.20	
h	0.0099	0.0196	0.25	0.50	5
L	0.016	0.050	0.40	1.27	6
N	16		16		7
α	0° 8°		0° 8°		

Notes: 1, 2, 3, 8, 9

92CS-38925R2

M Suffix (JEDEC MS-013AC)  
20-Lead Dual-In-Line Small-Outline (SO) Package

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	0.0926	0.1043	2.35	2.65	
A <sub>1</sub>	0.0040	0.0118	0.10	0.30	
B	0.0138	0.020	0.35	0.508	
C	0.0091	0.0125	0.23	0.32	
D	0.4861	0.5118	12.60	13.00	4
E	0.2914	0.2992	7.40	7.60	4
e	0.050 BSC		1.27 BSC		
H	0.394	0.419	10.00	10.65	
h	0.010	0.029	0.25	0.75	5
L	0.016	0.050	0.40	1.27	6
N	20		20		7
α	0° 8°		0° 8°		

Notes: 1, 2, 3, 8, 9

92CS-38926R2

M Suffix (JEDEC MS-013AD)  
24-Lead Dual-In-Line Small-Outline (SO) Package

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	0.0926	0.1043	2.35	2.65	
A <sub>1</sub>	0.0040	0.0118	0.10	0.30	
B	0.0138	0.020	0.35	0.508	
C	0.0091	0.0125	0.23	0.32	
D	0.5985	0.6141	15.20	15.60	4
E	0.2914	0.2992	7.40	7.60	4
e	0.050 BSC		1.27 BSC		
H	0.394	0.419	10.00	10.65	
h	0.010	0.029	0.25	0.75	5
L	0.016	0.050	0.40	1.27	6
N	24		24		7
α	0° 8°		0° 8°		

Notes: 1, 2, 3, 8, 9

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