

T-46-07-07

CD4027A Types

CMOS Dual J-K Master-Slave Flip-Flop

The RCA-CD4027A is a single monolithic chip integrated circuit containing two identical complementary-symmetry J-K master-slave flip-flops. Each flip-flop has provisions for individual J, K, Set, Reset, and Clock input signals. Buffered Q and $\bar{Q}$ signals are provided as outputs. This input-output arrangement provides for compatible operation with the RCA-CD4013A dual D-type flip-flop.

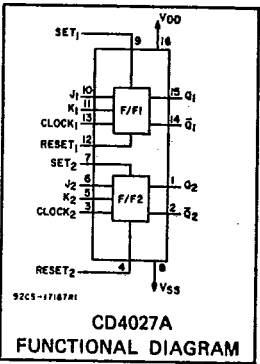
The CD4027A is useful in performing control, register, and toggle functions. Logic levels present at the J and K inputs along with internal self-steering control the state of each flip-flop; changes in the flip-flop state are synchronous with the positive-going transition of the clock pulse. Set and reset functions are independent of the clock and are initiated when a high level signal is present at either the Set or Reset input.

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 +80°C (PACKAGE TYPE E) 500 mW
 FOR $T_A = +80$ 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 $T_A = \text{FULL PACKAGE-TEMPERATURE RANGE (ALL PACKAGE TYPES)}$ 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

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	V _{DD} (V)	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
Data Setup Time, t _S	5 10	150 50	— —	200 75	— —	ns
Clock Pulse Width, t _W	5 10	330 110	— —	500 165	— —	ns
Clock Input Frequency (Toggle Mode) f _{CL}	5 10	dc	1.5 4.5	dc	1 3	MHz
Clock Rise or Fall Time, t _{rCL} ,* t _{fCL}	5 10	— —	15 5	— —	15 5	μs
Set or Reset Pulse Width, t _W	5 10	200 80	— —	300 120	— —	ns

*If more than one unit is cascaded in a parallel clocked operation, t_{CL} should be made less than or equal to the sum of the fixed propagation delay time at 15 pF and the transition time of the output driving stage for the estimated capacitive load.



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:**
- Set-Reset capability
 - Static flip-flop operation—retains state indefinitely with clock level either "high" or "low"
 - Medium-speed operation—10 MHz (typ.) clock toggle rate at 10V
 - Quiescent current specified to 15 V
 - Maximum input leakage of 1 μA at 15 V (full package-temperature range)
 - 1-V noise margin (full package-temperature range)

Applications

- Registers, counters, control circuits

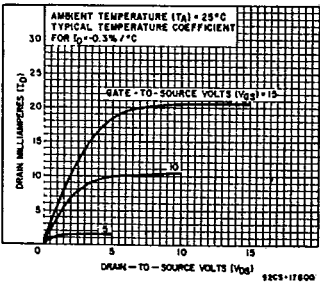


Fig. 1 — Typical n-channel drain characteristics.

CD4027A Types

STATIC ELECTRICAL CHARACTERISTICS

CHARACTERISTICS	CONDITIONS		LIMITS AT INDICATED TEMPERATURES (°C)								UNITS	
			D, F, K, H PACKAGES				E PACKAGE					
			-65	+25		+125	-40	+25		+85		
V _O (V)	V _{IN} (V)	V _{DD} (V)		TYP.	LIMIT			TYP.	LIMIT			
Quiescent Device Current, I _L Max.			5	1	0.005	1	60	10	0.01	10	140	μA
			10	2	0.005	2	120	20	0.05	20	280	
			15	25	0.5	25	1000	250	2.5	250	2500	
Output Voltage: Low Level, V _{OL}	-	0.5	5	0 Typ.; 0.05 Max								V
	-	0.10	10	0 Typ.; 0.05 Max								
High Level V _{OH}	-	0.5	5	5 Typ.; 4.95 Min.								V
	-	0.10	10	10 Typ.; 9.95 Min.								
Noise Immunity: Inputs Low, V _{NL}	4.2	-	5	2.25 Typ.; 1.5 Min.								V
	9	-	10	4.5 Typ.; 3 Min.								
Inputs High V _{NH}	0.8	-	5	2.25 Typ.; 1.5 Min.								V
	1	-	10	4.5 Typ.; 3 Min.								
Noise Margin: Inputs Low, V _{NML}	4.5	-	5	1 Min.								V
	9	-	10	1 Min.								
Inputs High, V _{NMH}	0.5	-	5	1 Min.								V
	1	-	10	1 Min.								
Output Drive Current: N Channel (Sink), I _D N Min.	0.5	-	5	0.65	1	0.5	0.35	0.35	1	0.3	0.24	mA
	0.5	-	10	1.25	2.5	1	0.75	0.72	2.5	0.6	0.5	
P-Channel (Source): I _D P Min.	4.5	-	5	-0.31	-0.5	-0.25	-0.175	-0.17	-0.5	-0.14	-0.12	mA
	9.5	-	10	-0.8	-1.3	-0.65	-0.45	-0.4	-1.3	-0.33	-0.27	
Input Leakage Current, I _{IL} , I _{IH}	Any Input		15	±10 ⁻⁵ Typ., ±1 Max.								μA

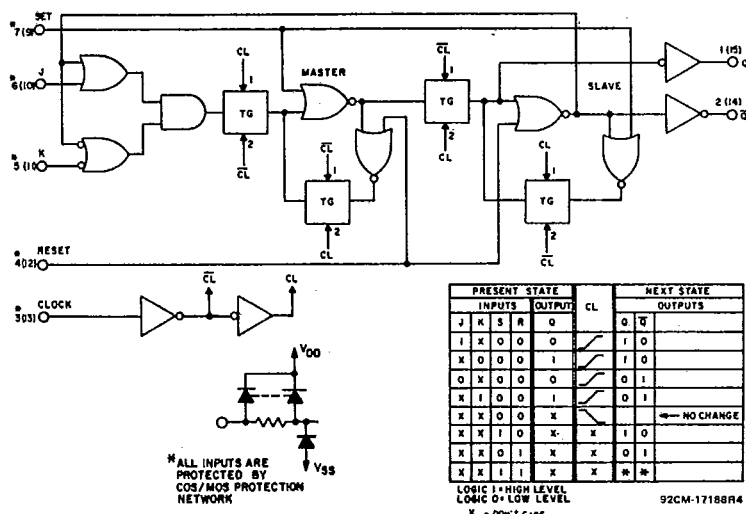


Fig. 2 — Logic diagram & truth table for CD4027A (one of two identical J-K flip flops).

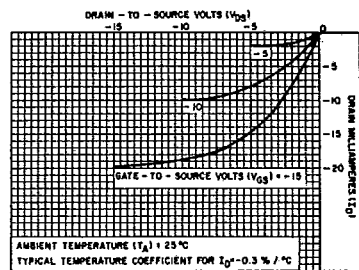


Fig. 3 — Typical p-channel drain characteristics.

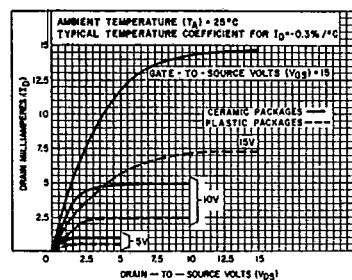


Fig. 4 — Minimum n-channel drain characteristics.

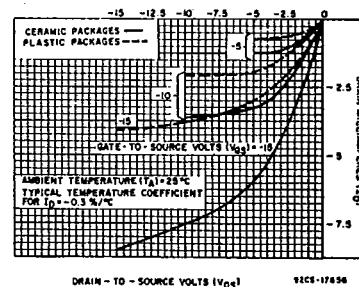
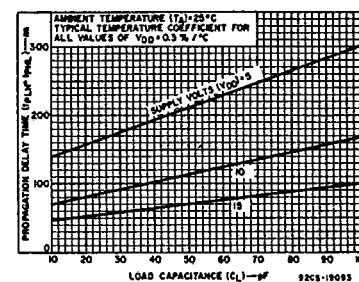


Fig. 5 — Minimum p-channel drain characteristics.

Fig. 6 — Typical propagation delay time vs. C_L.

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CD4027A 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	V _{DD} (V)	LIMITS						UNITS
		D, F, K, H PACKAGES			E PACKAGE			
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Propagation Delay Time: Clock to Q or $\bar{Q}$ Outputs t _{PHL} , t _{PLH}	5 10	— —	200 100	400 200	— —	150 75	400 150	ns
Set to Q or Reset to $\bar{Q}$, t _{PLH}	5 10	— —	175 75	225 110	— —	175 75	350 150	ns
Set to $\bar{Q}$ or Reset to Q, t _{PHL}	5 10	— —	175 75	225 110	— —	175 75	350 150	ns
Transition Time t _{THL} , t _{TLH}	5 10	— —	75 50	125 70	— —	75 50	250 140	ns
Maximum Clock Input Frequency (Toggle Mode) f _{CL}	5 10	1.5 4.5	3 8	— —	1 3	3 8	— —	MHz
Minimum Clock Pulse Width, t _W	5 10	— —	165 65	330 110	— —	165 65	500 165	ns
Minimum Set or Reset Pulse Width, t _W	5 10	— —	125 50	200 80	— —	125 50	300 120	ns
Minimum Data Setup Time, t _S	5 10	— —	70 25	150 50	— —	70 25	200 75	ns
Clock Rise or Fall Time, t _{rCL} , t _{fCL}	5 10	— —	— —	15 5	— —	— —	15 5	us
Average Input Capacitance, C _I	Any Input	—	5	—	—	5	—	pF

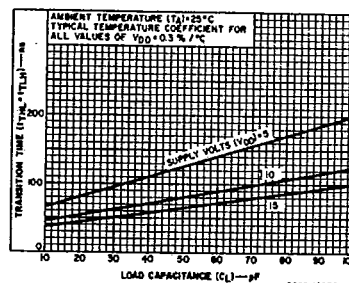
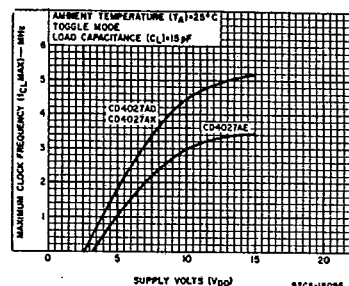
Fig. 7 - Typical transition time vs. C_L .

Fig. 8 - Typical maximum clock input frequency vs. supply voltage.

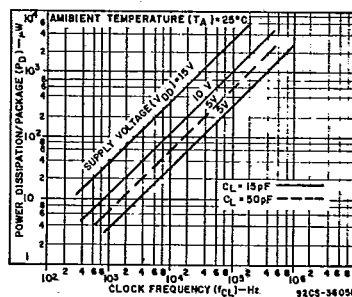


Fig. 9 - Typical dissipation characteristics.

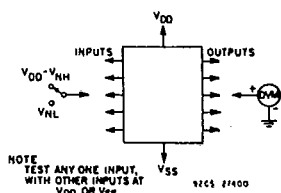


Fig. 10 - Noise immunity test circuit.

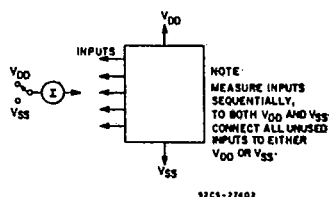


Fig. 11 - Input leakage current test circuit.

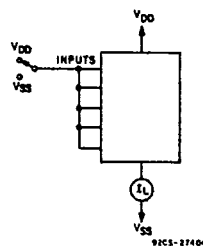


Fig. 12 - Quiescent device current test circuit.

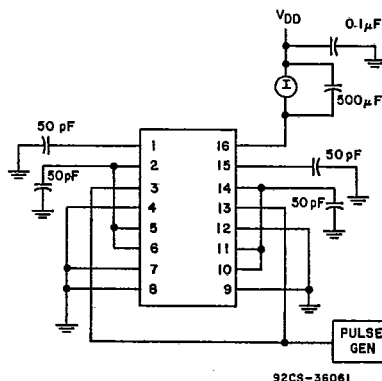
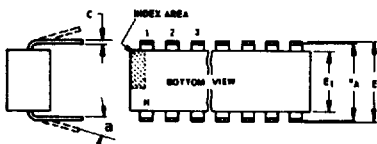
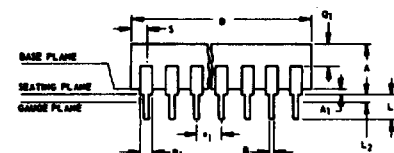


Fig. 13 - Dynamic power dissipation test circuit.

Dimensional Outlines

Dual-In-Line Welded-Seal Ceramic Packages



NOTES:

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

- When this device is supplied solder-dipped, the maximum lead thickness (narrow portion) will not exceed 0.013" (0.33 mm).
- Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
- e_A applies in zone L₂ when unit installed.
- a applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- N₁ is the quantity of allowable missing leads.

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

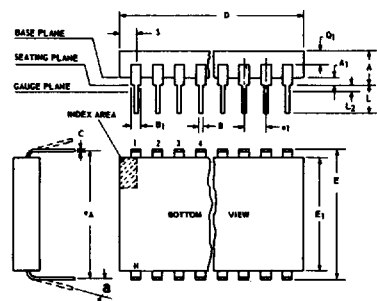
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.160		3.05	4.06
A ₁	0.020	0.065		0.51	1.65
B	0.014	0.020		0.356	0.508
B ₁	0.060	0.065		1.27	1.65
C	0.008	0.012	1	0.204	0.304
D	0.745	0.770		18.93	19.55
E	0.300	0.325		7.62	8.25
E ₁	0.240	0.260		6.10	6.60
e ₁	0.100 TP		2	2.54 TP	
e _A	0.300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

92SS-4411R2

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

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

92SS-4266R5



NOTES:

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

- When this device is supplied solder-dipped, the maximum lead thickness (narrow portion) will not exceed 0.013" (0.33 mm).
- Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
- e_A applies in zone L₂ when unit installed.
- a applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- N₁ is the quantity of allowable missing leads.

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

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

92CS-19948R4

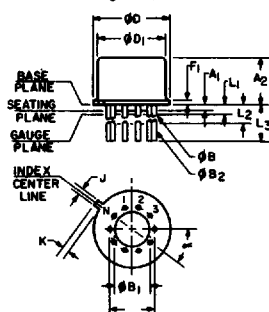
(D) SUFFIX (JEDEC MO-015-AH)
28-Lead Dual-In-Line Welded-Seal
Ceramic Package

SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.090	0.200		2.29	5.08
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

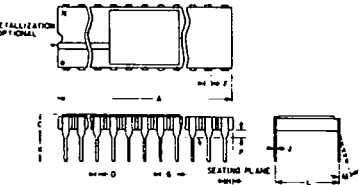
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
a	0.230		2	5.84 TP	
A ₁	0	0		0	0
A ₂	0.165	0.185		4.19	4.70
ØB	0.016	0.019	3	0.407	0.482
ØB ₁	0	0		0	0
ØB ₂	0.016	0.021	3	0.407	0.533
ØD	0.335	0.370		8.51	9.39
ØD ₁	0.305	0.335		7.75	8.50
F ₁	0.020	0.040		0.51	1.01
J	0.028	0.034		0.712	0.863
k	0.029	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.
- ØB applies between L₁ and L₂. ØB₂ 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. ØD.
- 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-26186R2

(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

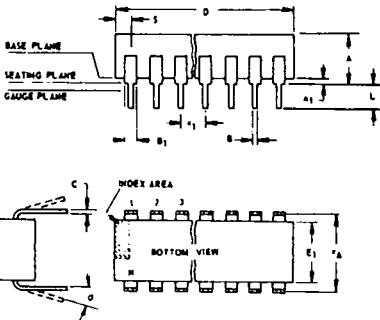
(D) SUFFIX
40-Lead Dual-In-Line
Side-Brazed Ceramic Package

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



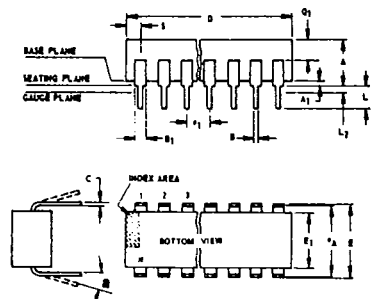
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.155	0.200		3.94	5.08
A ₁	0.020	0.050		0.508	1.27
B	0.014	0.020		0.356	0.508
B ₁	0.035	0.065		0.889	1.65
C	0.008	0.012	1	0.203	0.304
D	0.370	0.400		9.40	10.16
E	0.300	0.325		7.62	8.25
E ₁	0.240	0.260		6.10	6.60
e ₁	0.100	TP	2	2.54	TP
e _A	0.300	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.
- e_1 applies in zone L₂ 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.

(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
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	0.040	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
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	0.040	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
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
a	0°	15°	4	0°	15°
N	18	5	18		
N ₁	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 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
e_1	0.100 TP		2	2.54 TP	
e_A	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		
N ₁	0	6	0		
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		7.60	8.25
E ₁	0.245	0.300		6.23	7.62
e_1	0.100 TP		2	2.54 TP	
e_A	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		
N ₁	0	6	0		
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
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	5.00
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	0.040	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

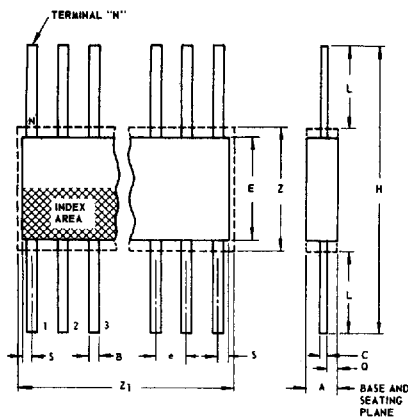
SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.120	0.250		3.10	6.30
A ₁	0.020	0.070		0.51	1.77
B	0.016	0.020		0.407	0.508
B ₁	0.028	0.070		0.72	1.77
C	0.008	0.012	1	0.204	0.304
D	2.000	2.090		50.80	53.09
E ₁	0.515	0.580		13.09	14.73
e_1	0.100 TP		2	2.54 TP	
e_A	0.600 TP		2, 3	15.24 TP	
L	0.100	0.200		2.54	5.00
L ₂	0.000	0.030		0.00	0.76
a	0°	15°	4	0°	15°
N	40	5	40		
N ₁	0	6	0		
Q ₁	0.065	0.095		1.66	2.41
S	0.040	0.100		1.02	2.54

92CS-30959

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	
Z1	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	
Z1	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	
Z1	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	
Z1	0.750		4	19.05	

92CS-20972