

CD4076B Types

CMOS 4-Bit D-Type Registers

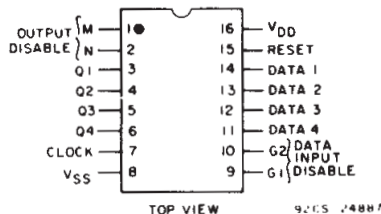
High-Voltage Types (20-Volt Rating)

■ CD4076B types are four-bit registers consisting of D-type flip-flops that feature three-state outputs. Data Disable inputs are provided to control the entry of data into the flip-flops. When both Data Disable inputs are low, data at the D inputs are loaded into their respective flip-flops on the next positive transition of the clock input. Output Disable inputs are also provided. When the Output Disable inputs are both low, the normal logic states of the four outputs are available to the load. The outputs are disabled independently of the clock by a high logic level at either Output Disable input, and present a high impedance.

The CD4076B types are supplied in 16-lead hermetic dual-in-line ceramic packages (F3A suffix), 16-lead dual-in-line plastic packages (E suffix), 16-lead small-outline packages (M, M96, MT, and NSR suffixes), and 16-lead thin shrink small-outline packages (PW and PWR suffixes).

Features:

- Three-state outputs
- Input disabled without gating the clock
- Gated output control lines for enabling or disabling the outputs
- Standardized, symmetrical output characteristics
- 100% tested for quiescent current at 20 V
- Maximum input current of 1 μ A at 18 V over full package temperature range; 100 nA at 18 V and 25°C
- Noise margin over full package temperature range:
 - 1 V at $V_{DD} = 5$ V
 - 2 V at $V_{DD} = 10$ V
 - 2.5 V at $V_{DD} = 15$ V
- 5-V, 10-V, and 15-V parametric ratings
- Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"



TERMINAL ASSIGNMENT

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
		Min.	Max.	
Supply Voltage Range (For T_A = Full Package Temperature Range)		3	18	V
Data Setup Time, t_S	5	200	—	ns
	10	80	—	
	15	60	—	
Clock Pulse Width, t_{WP}	5	200	—	ns
	10	100	—	
	15	80	—	
Clock Input Frequency, f_{CL}	5	—	3	MHz
	10	dc	6	
	15	—	8	
Clock Input Rise or Fall Time, t_{rCL}, t_{fCL}	5	—	15	μ s
	10	—	5	
	15	—	5	
Reset Pulse Width, t_{WP}	5	120	—	ns
	10	50	—	
	15	40	—	
Data Input Disable Setup Time, t_S	5	180	—	ns
	10	100	—	
	15	70	—	

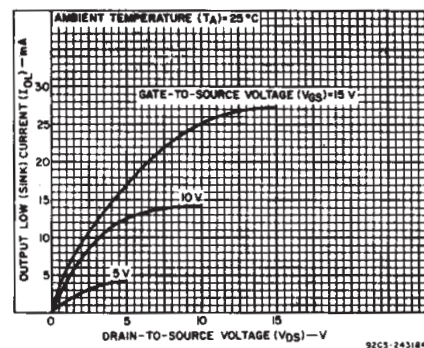
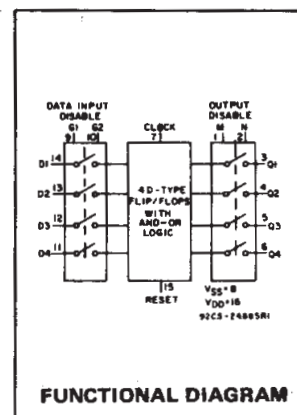


Fig.1 — Typical output low (sink) current characteristics.

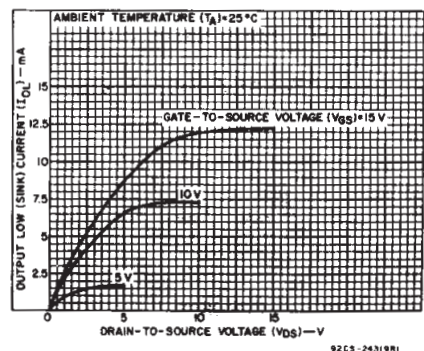


Fig.2 — Minimum output low (sink) current characteristics.

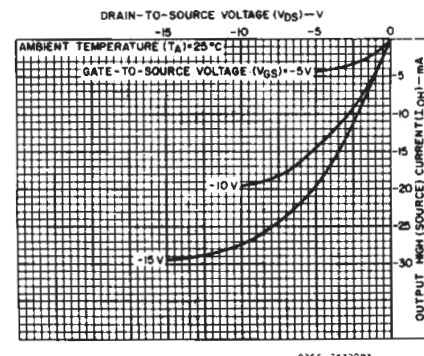


Fig.3 — Typical output high (source) current characteristics.

CD4076B Types

MAXIMUM RATINGS, Absolute-Maximum Values:

DC SUPPLY-VOLTAGE RANGE, (V_{DD})

Voltages referenced to V_{SS} Terminal) -0.5V to +20V

INPUT VOLTAGE RANGE, ALL INPUTS -0.5V to $V_{DD} + 0.5V$

DC INPUT CURRENT, ANY ONE INPUT $\pm 10mA$

POWER DISSIPATION PER PACKAGE (P_D):

For $T_A = -55^\circ C$ to $+100^\circ C$ 500mW

For $T_A = +100^\circ C$ to $+125^\circ C$ Derate Linearly at 12mW/ $^\circ C$ to 200mW

DEVICE DISSIPATION PER OUTPUT TRANSISTOR

FOR $T_A =$ FULL PACKAGE-TEMPERATURE RANGE (All Package Types) 100mW

OPERATING-TEMPERATURE RANGE (T_A) $-55^\circ C$ to $+125^\circ C$

STORAGE TEMPERATURE RANGE (T_{stg}) $-65^\circ C$ to $+150^\circ C$

LEAD TEMPERATURE (DURING SOLDERING):

At distance $1/16 \pm 1/32$ inch ($1.59 \pm 0.79mm$) from case for 10s max $+265^\circ C$

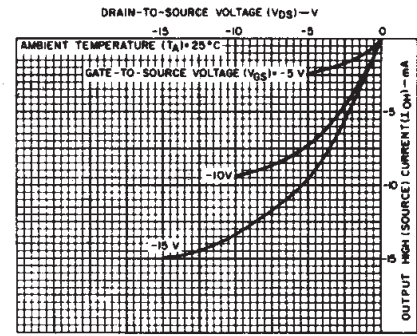
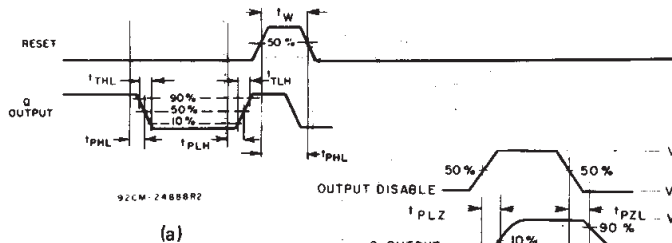
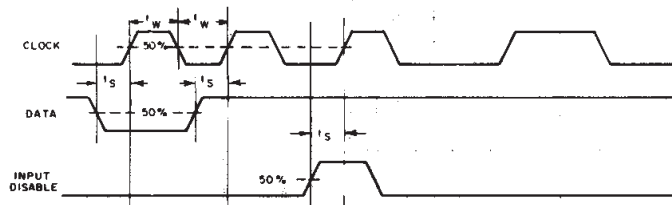


Fig.4 — Minimum output high (source) current characteristics.



CHAR.	TEST	VOLT.
t_{PHZ}	AT D	V_{SS}
t_{PLZ}	V_{SS}	V_{DD}
t_{PZH}	V_{DD}	V_{SS}

92CS-29299

(b)

Fig.5 — Functional waveforms for CD4076B.

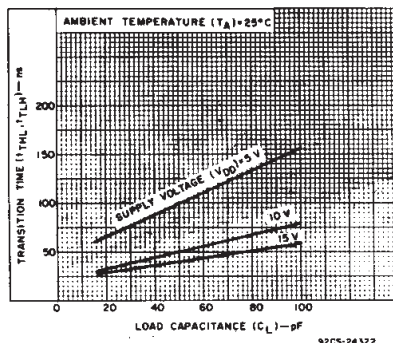


Fig.7 — Typical transition time vs. load capacitance.

Truth Table

Reset	Clock	Data Input Disable G1	Data Input Disable G2	Data D	Next State Output Q	
1	X	X	X	X	0	
0	0	X	X	X	Q	NC
0	1	1	X	X	Q	NC
0	0	X	1	X	Q	NC
0	0	0	0	1	1	
0	0	0	0	0	0	
0	1	X	X	X	Q	NC
0	0	X	X	X	Q	NC

When either Output Disable M or N is high, the outputs are disabled (high impedance state), however sequential operation of the flip flops is not affected.

1 = High Level
0 = Low Level

X = Don't Care
NC = No Change

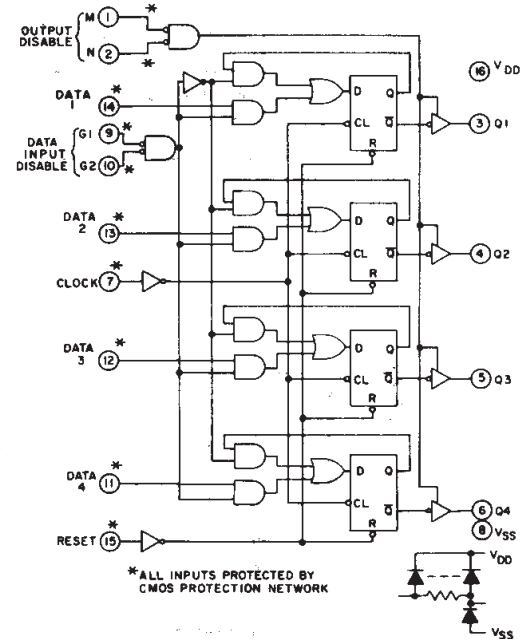


Fig.8 — CD4076B logic diagram.

CD4076B Types

DYNAMIC ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$, Input $t_r, t_f = 20\text{ ns}$,
 $C_L = 50\text{ pF}$, $R_L = 200\text{ k}\Omega$ (Unless otherwise noted)

CHARACTERISTIC	TEST CONDITIONS	LIMITS			UNITS
		V_{DD} V	Min.	Typ.	Max.
Propagation Delay Time: Clock to Q Output, t_{PHL} , t_{PLH}		5		300	600
		10		125	250
		15		90	180
Reset, t_{PHL}		5		230	460
		10		100	200
		15		75	150
3-State Output 1 or 0 to High Impedance, t_{PHZ} , t_{PLZ}	$R_L = 1\text{ k}\Omega$	5		150	300
		10		75	150
		15		60	120
3-State High Impedance to 1 or 0 Output, t_{PZH} , t_{PZL}	$R_L = 1\text{ k}\Omega$	5		150	300
		10		75	150
		15		60	120
Transition Time, t_{THL} , t_{TLH}		5		100	200
		10		50	100
		15		40	80
Maximum Clock Input Frequency, f_{CL}		5	3	6	
		10	6	12	
		15	8	16	
Minimum Clock Pulse Width, t_W		5		100	200
		10		50	100
		15		40	80
Maximum Clock Input Rise or Fall Time, t_{rcl} , t_{fcl}		5	15	—	—
		10	5	—	—
		15	5	—	—
Minimum Reset Pulse Width, t_W		5	—	60	120
		10	—	25	50
		15	—	20	40
Minimum Data Setup Time, t_S		5	—	100	200
		10	—	40	80
		15	—	30	60
Minimum Data Input Disable Setup Time, t_S		5	—	90	180
		10	—	50	100
		15	—	35	70
Input Capacitance, C_{IN}	Any Input	—	—	5	7.5

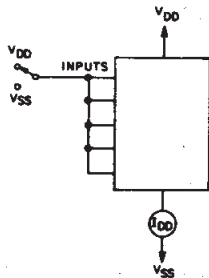


Fig. 11 - Quiescent device current test circuit.

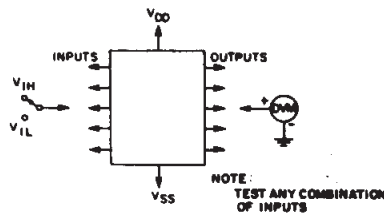


Fig. 12 - Input voltage test circuit.

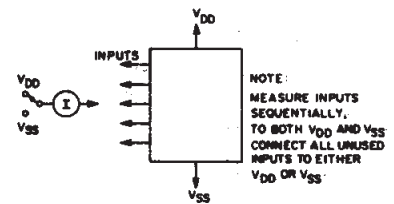


Fig. 13 - Input current test circuit.

CD4076B Types

STATIC ELECTRICAL CHARACTERISTICS

CHARACTER- ISTIC	CONDITIONS			LIMITS AT INDICATED TEMPERATURES (°C)							UNITS
	V _O (V)	V _{IN} (V)	V _{DD} (V)					+25			
				-55	-40	+85	+125	Min.	Typ.	Max.	
Quiescent Device Current, I _{DD} Max.	—	0,5	5	5	5	150	150	—	0.04	5	μA
	—	0,10	10	10	10	300	300	—	0.04	10	
	—	0,15	15	20	20	600	600	—	0.04	20	
	—	0,20	20	100	100	3000	3000	—	0.08	100	
Output Low (Sink) Current I _{OL} Min.	0.4	0,5	5	0.64	0.61	0.42	0.36	0.51	1	—	mA
	0.5	0,10	10	1.6	1.5	1.1	0.9	1.3	2.6	—	
	1.5	0,15	15	4.2	4	2.8	2.4	3.4	6.8	—	
Output High (Source) Current, I _{OH} Min.	4.6	0,5	5	-0.64	-0.61	-0.42	-0.36	-0.51	-1	—	mA
	2.5	0,5	5	-2	-1.8	-1.3	-1.15	-1.6	-3.2	—	
	9.5	0,10	10	-1.6	-1.5	-1.1	-0.9	-1.3	-2.6	—	
	13.5	0,15	15	-4.2	-4	-2.8	-2.4	-3.4	-6.8	—	
Output Voltage: Low-Level, V _{OL} Max.	—	0,5	5	0.05				—	0	0.05	V
	—	0,10	10	0.05				—	0	0.05	
	—	0,15	15	0.05				—	0	0.05	
Output Voltage: High-Level, V _{OH} Min.	—	0,5	5	4.95				4.95	5	—	V
	—	0,10	10	9.95				9.95	10	—	
	—	0,15	15	14.95				14.95	15	—	
Input Low Voltage, V _{IL} Max.	0.5, 4.5	—	5	1.5				—	—	1.5	V
	1, 9	—	10	3				—	—	3	
	1.5, 13.5	—	15	4				—	—	4	
Input High Voltage, V _{IH} Min.	0.5, 4.5	—	5	3.5				3.5	—	—	V
	1, 9	—	10	7				7	—	—	
	1.5, 13.5	—	15	11				11	—	—	
Input Current I _{IN} Max.	—	0,18	18	±0.1	±0.1	±1	±1	—	±10 ⁻⁵	±0.1	μA
3-State Output Leakage Current I _{OUT} Max.	0,18	0,18	18	±0.4	±0.4	±12	±12	—	±10 ⁻⁴	±0.4	μA

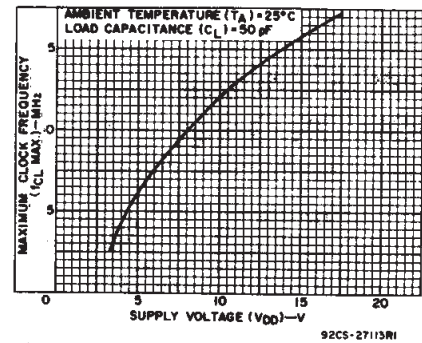


Fig.9 — Typical maximum clock input frequency vs. supply voltage.

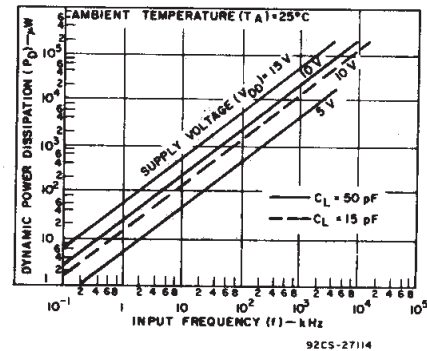
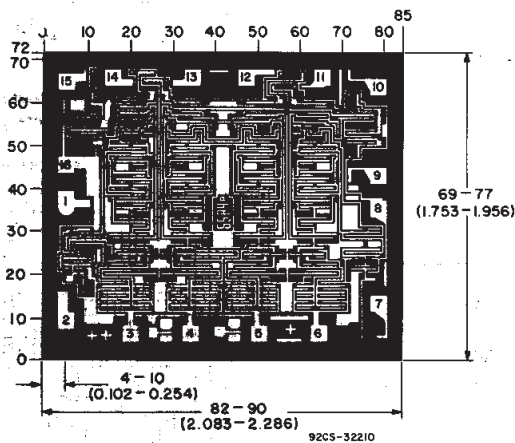


Fig.10 — Typical dynamic power dissipation vs. frequency.



Dimensions and pad layout for CD4076BH

Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils (10⁻³ inch).

3

COMMERCIAL CMOS
HIGH VOLTAGE ICs

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
CD4076BE	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	-55 to 125	CD4076BE
CD4076BE.A	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	-55 to 125	CD4076BE
CD4076BF	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	CD4076BF
CD4076BF.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	CD4076BF
CD4076BF3A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	CD4076BF3A
CD4076BF3A.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	CD4076BF3A
CD4076BM	Active	Production	SOIC (D) 16	40 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	CD4076BM
CD4076BM.A	Active	Production	SOIC (D) 16	40 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	CD4076BM
CD4076BMT	Active	Production	SOIC (D) 16	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	CD4076BM
CD4076BMT.A	Active	Production	SOIC (D) 16	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	CD4076BM

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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OTHER QUALIFIED VERSIONS OF CD4076B, CD4076B-MIL :

- Catalog : [CD4076B](#)
- Military : [CD4076B-MIL](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

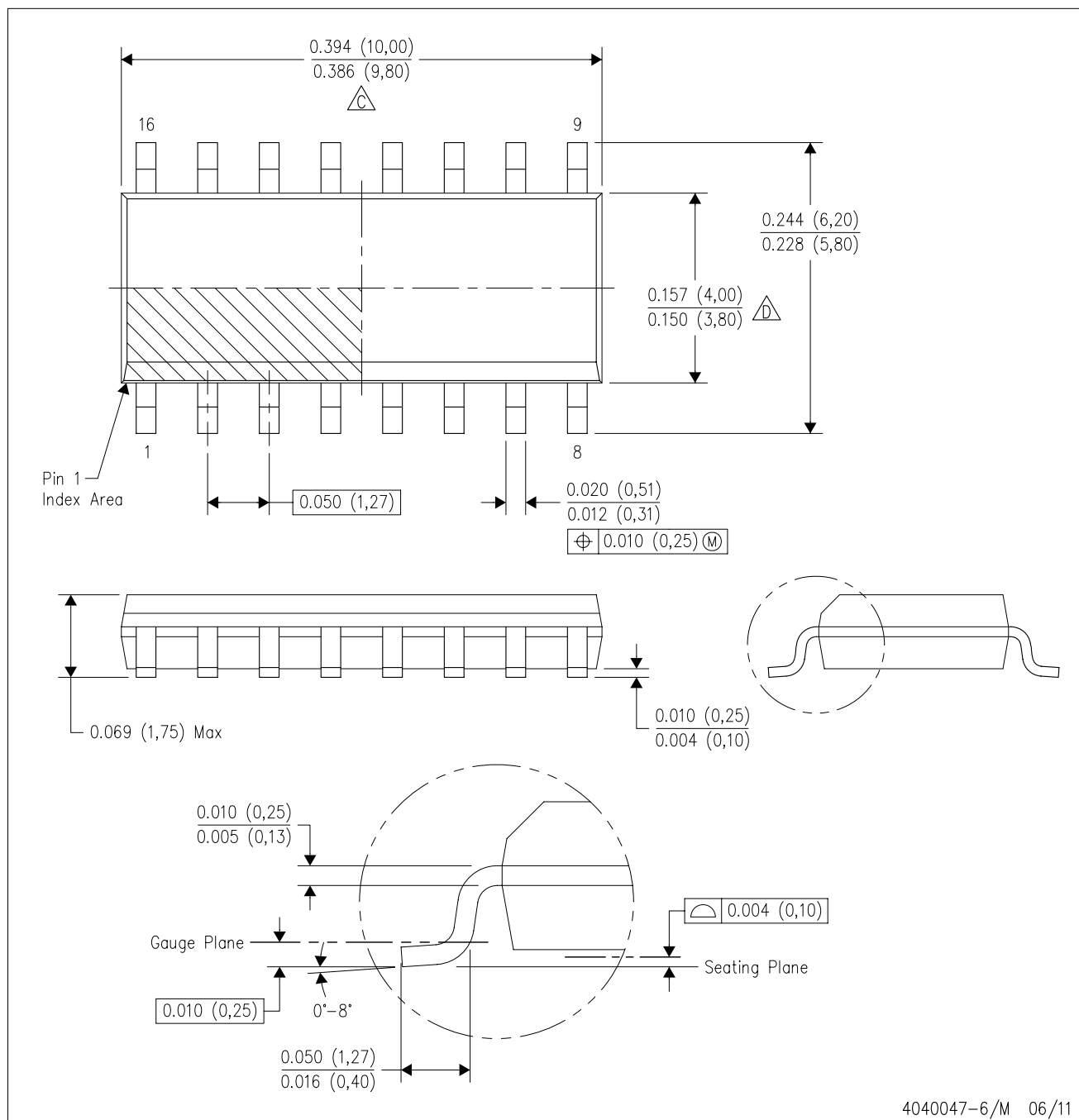
TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
CD4076BE	N	PDIP	16	25	506	13.97	11230	4.32
CD4076BE	N	PDIP	16	25	506	13.97	11230	4.32
CD4076BE.A	N	PDIP	16	25	506	13.97	11230	4.32
CD4076BE.A	N	PDIP	16	25	506	13.97	11230	4.32
CD4076BM	D	SOIC	16	40	507	8	3940	4.32
CD4076BM.A	D	SOIC	16	40	507	8	3940	4.32

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



NOTES:

- A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
E. Reference JEDEC MS-012 variation AC.

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package is hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



4040049/E 12/2002

NOTES:

- A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
-  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 The 20 pin end lead shoulder width is a vendor option, either half or full width.

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