



CD40107B Types

T-43-21

CMOS Dual 2-Input NAND Buffer/Driver

High-Voltage Type (20-Volt Rating)

■ CD40107B is a dual 2-input NAND buffer/driver containing two independent 2-input NAND buffers with open-drain single n-channel transistor outputs. This device features a wired-OR capability and high output sink current capability (136 mA typ. at $V_{DD} = 10$ V, $V_{DS} = 1$ V). The CD40107B is supplied in the 8-lead dual-in-line plastic (Mini-DIP) package (E suffix), 14-lead hermetic frit-seal ceramic package (F suffix), and in chip form (H suffix).

Features:

- 32 times standard B-Series output current drive sinking capability — 136 mA typ. @ $V_{DD} = 10$ V, $V_{DS} = 1$ V
- 100% tested for quiescent current at 20 V
- Maximum input current of $1 \mu\text{A}$ at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- 5-V, 10-V, and 15-V parametric ratings
- Noise margin, full package temperature range, R_L to $V_{DD} = 10$ k Ω :
1 V at $V_{DD} = 5$ V
2 V at $V_{DD} = 10$ V
2.5 V at $V_{DD} = 15$ V
- Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

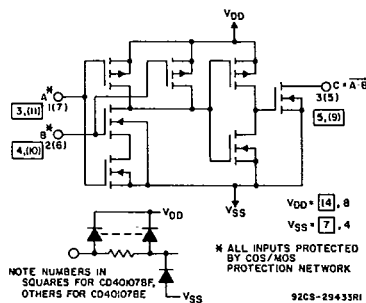


Fig. 1 — Schematic diagram of CD40107B (one of 2 gates)

TRUTH TABLE

A	B	C
0	0	1*
0	1	1*
1	0	1*
1	1	0

*Requires external pull-up resistor (R_L) to V_{DD} .

#Without pull-up resistor (3-state).

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 $V_{DD} + 0.5$ V

DC INPUT CURRENT, ANY ONE INPUT ± 10 mA

POWER DISSIPATION PER PACKAGE (P_D):

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

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

DEVICE DISSIPATION PER OUTPUT TRANSISTOR

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

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

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

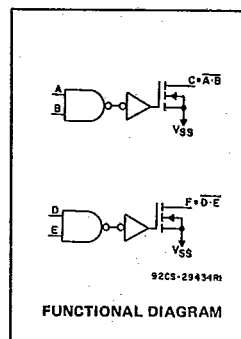
LEAD TEMPERATURE (DURING SOLDERING):

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

RECOMMENDED OPERATING CONDITIONS

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

CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range (For $T_A = \text{Full Package-Temperature Range}$)	3	18	V



Applications

- Driving relays, lamps, LEDs
- Line driver
- Level shifter (up or down)

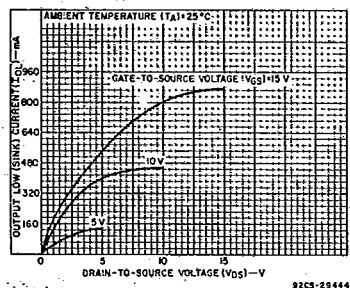


Fig. 2 — Typical output low (sink) current characteristics.

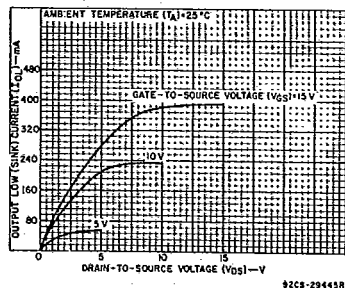


Fig. 3 — Minimum output low (sink) current characteristics.

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DYNAMIC ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$, $C_L = 50\text{ pF}$, Input $t_r, t_f = 20\text{ ns}$

CHARACTERISTIC	TEST CONDITIONS	LIMITS			UNITS
		VDD Volts	Typ.	Max.	
Propagation Delay: High-to-Low, t_{PHL}	$R_L^* = 120\ \Omega$	5	100	200	ns
		10	45	90	
		15	30	60	
Low-to-High, t_{PLH}	$R_L^* = 120\ \Omega$	5	100	200	ns
		10	60	120	
		15	50	100	
Transition Time: High-to-Low, t_{THL}	$R_L^* = 120\ \Omega$	5	50	100	ns
		10	20	40	
		15	10	20	
Low-to-High, t_{TLH}	$R_L^* = 120\ \Omega$	5	50	100	ns
		10	35	70	
		15	25	50	
Average Input Capacitance, C_{IN}	Any Input	5	7.5		pF
Average Output Capacitance, C_{OUT}	Any Output	30	—		pF

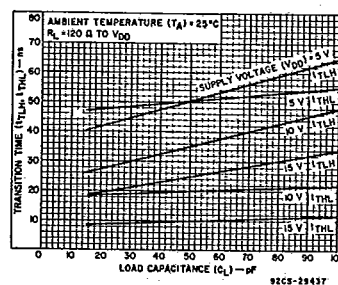
* R_L is external pull-up resistor to V_{DD} .

Fig. 4 — Typical transition time as a function of load capacitance.

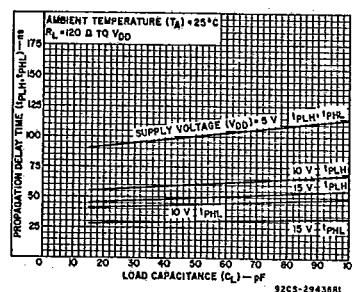


Fig. 5 — Typical propagation delay time as a function of load capacitance.

STATIC ELECTRICAL CHARACTERISTICS

CHARACTER- ISTIC	CONDITIONS			LIMITS AT INDICATED TEMPERATURES (°C)								UNITS
	V _O (V)	V _{IN} (V)	V _{DD} (V)									
				-55	-40	+85	+125	+25				
Quiescent Device Current I _{DD} Max.	—	0,5	5	1	1	30	30	—	0.02	1	μA	
	—	0,10	10	2	2	60	60	—	0.02	2		
	—	0,15	15	4	4	120	120	—	0.02	4		
	—	0,20	20	20	20	600	600	—	0.04	20		
Output Low (Sink) Current I _{OL} Min.	0.4	0,5	5	21	20	14	12	16	32	—	mA	
	1	0,5	5	44	42	30	25	34	68	—		
	0.5	0,10	10	49	46	32	28	37	74	—		
	1	0,10	10	89	85	60	51	68	136	—		
	0.5	0,15	15	66	63	44	38	50	100	—		
Output High (Source) Current I _{OH} Min.	No Internal Pull-Up Device											
Input Low Voltage V _{IL} Max.*	4.5	—	5	1.5			—	—	1.5	V		
	9	—	10	3			—	—	3			
	13.5	—	15	4			—	—	4			
Input High Voltage V _{IH} Min.*	0.5,4.5	—	5	3.5			3.5	—	—			
	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	
Output Leakage Current I _{OZ} Max.	18	0,18	18	2	2	20	20	—	10 ⁻⁴	2	μA	

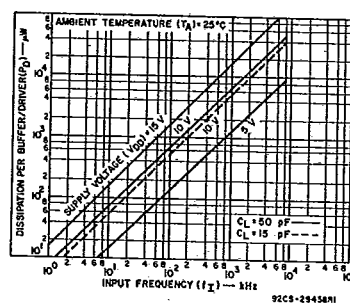
* Measured with external pull-up resistor, $R_L = 10\text{ k}\Omega$ to V_{DD} .

Fig. 6 — Typical power dissipation as a function of input frequency.

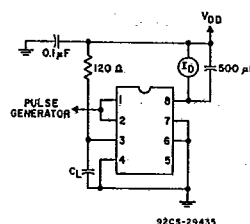


Fig. 7 — Power-dissipation test circuit for CD40107BE.

CD40107B Types

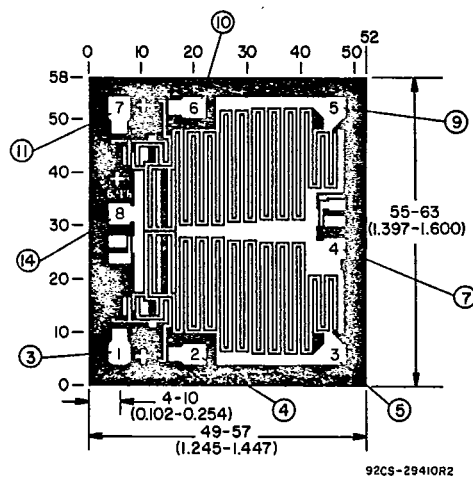


Fig. 8 — Quiescent-device current test circuit.

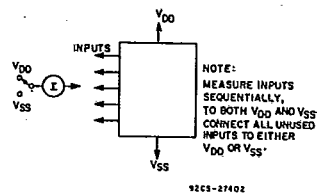


Fig. 9 — Input-current test circuit.

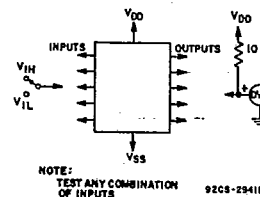
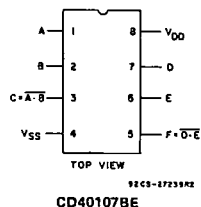


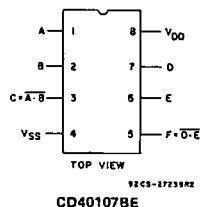
Fig. 10 — Input-voltage test circuit.



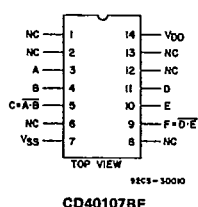
NOTE: NOS. IN PADS FOR CD40107BE
NOS. OUTSIDE CHIP FOR CD40107BF

Dimensions and Pad Layout for CD40107BH.

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



CD40107BE



CD40107BF

TERMINAL ASSIGNMENTS

Special Considerations for CD40107B

1. Limiting Capacitive Currents for $C_L > 500$ pF, $V_{DD} > 15$ V.

For $V_{DD} > 15$ V, and load capacitance (C_L) from output to ground > 500 pF, an external 25Ω series limiting resistor should be inserted between the output terminal and C_L . No external resistor is necessary if $C_L < 500$ pF or $V_{DD} < 15$ V.

2. Driving Inductive Loads

When using the CD40107B to drive inductive loads, the load should be shunted with a diode to prevent high voltages from developing across the CD40107B output.