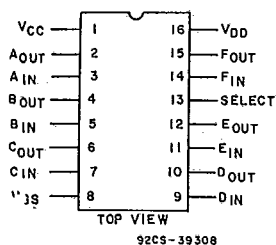


T-52-11



CD4504B Types



TERMINAL ASSIGNMENT

CMOS Hex Voltage-Level Shifter for TTL-to-CMOS or CMOS-to-CMOS Operation

Features:

- Independence of power-supply sequence considerations— V_{CC} can exceed V_{DD} ; input signals can exceed both V_{CC} and V_{DD}
- Up and down level-shifting capability
- Shiftable input threshold for either CMOS or TTL compatibility
- Standardized symmetrical output characteristics
- 100% tested for quiescent current @ 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
- 5 V, 10 V, and 15 V parametric ratings
- Meets all requirements of JEDEC Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

■ CD4504B hex voltage level-shifter consists of six circuits which shift input signals from the V_{CC} logic level to the V_{DD} logic level. To shift TTL signals to CMOS logic levels, the SELECT input is at the V_{CC} HIGH logic state. When the SELECT input is at a LOW logic state, each circuit translates signals from one CMOS level to another.

The CD4504B device is supplied in 16-lead ceramic dual-in-line packages (D and F suffixes), 16-lead plastic dual-in-line packages (E suffix), 16-lead dual-in-line surface-mount plastic packages (M suffix), and in chip form (H suffix).

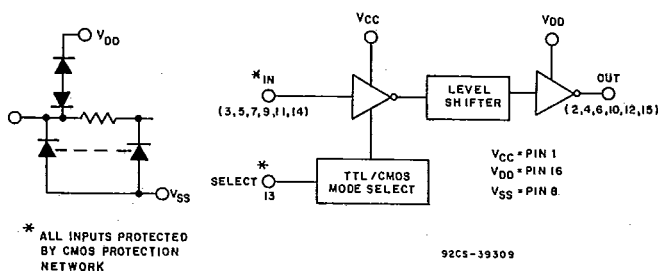


Fig. 1 - Functional diagram for CD4504B.

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 ± 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 $+265^\circ\text{C}$

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HIGH VOLTAGE ICs

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STATIC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC		CONDITIONS				LIMITS AT INDICATED TEMPERATURES (°C)							UNITS
		V _O (V)	V _{IN} (V)	V _{CC} (V)	V _{DD} (V)	-55	-40	+85	+125	+25			
										MIN	TYP	MAX	
Quiescent Device Current, I _{DD} Max and I _{CC} In CMOS-CMOS Mode		—	0,5	5	5	1	1	30	30	—	0.02	1	μA
		—	0,10	5	10	2	2	60	60	—	0.02	2	
		—	0,15	5	15	4	4	120	120	—	0.02	4	
		—	0,20	5	20	20	20	600	600	—	0.04	20	
Quiescent Device Current, I _{CC} Max TTL-CMOS Mode		—	0,5	5	5	5	5	6	6	—	2.5	5	mA
		—	0,10	5	10	5	5	6	6	—	2.5	5	
		—	0,15	5	15	5	5	6	6	—	2.5	5	
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 Note 1	TTL-CMOS	1	—	5	10	0.8				—	—	0.8	V
	TTL-CMOS	1	—	5	15	0.8				—	—	0.8	
	CMOS-CMOS	1	—	5	10	1.5				—	—	1.5	
	CMOS-CMOS	1.5	—	5	15	1.5				—	—	1.5	
	CMOS-CMOS	1.5	—	10	15	3				—	—	3	
Input High Voltage, V _{IH} Min Note 1	TTL-CMOS	9	—	5	10	2				2	—	—	V
	TTL-CMOS	13.5	—	5	15	2				2	—	—	
	CMOS-CMOS	9	—	5	10	3.5				3.5	—	—	
	CMOS-CMOS	13.5	—	5	15	3.5				3.5	—	—	
	CMOS-CMOS	13.5	—	10	15	7				7	—	—	
Input Current, I _{IN} Max		—	0,18	—	18	±0.1	±0.1	±1	±1	—	±10 ⁻⁵	±0.1	μA

Note 1: Applies to the 6 input signals. For mode control (P13), only the CMOS-CMOS ratings apply.

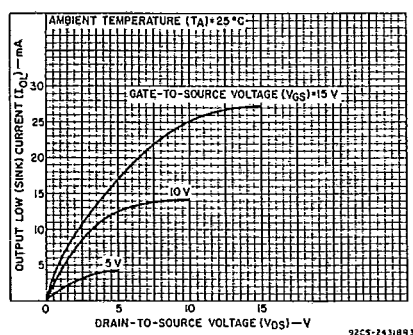


Fig. 2 - Typical output low (sink) current characteristics.

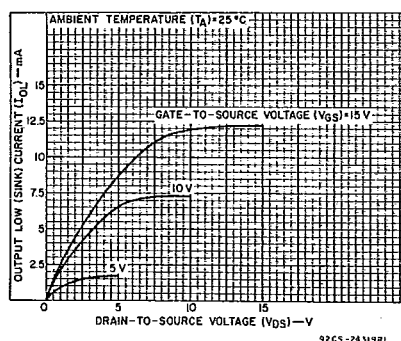
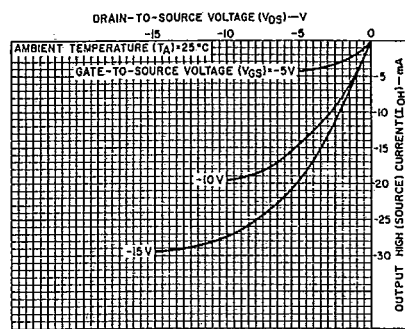


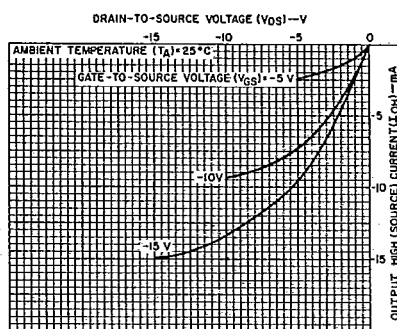
Fig. 3 - Minimum output low (sink) current characteristics.

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92CS-24320R3



92CS-24320R2

Fig. 4 - Typical output high (source) current characteristics.

Fig. 5 - Minimum output high (source) current characteristics.

RECOMMENDED OPERATING CONDITIONS

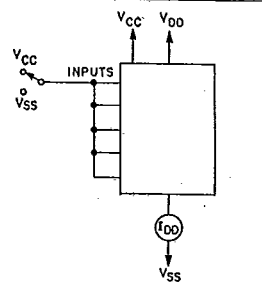
For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTIC	VDD (V)	LIMITS		UNITS
		Min.	Max.	
Supply-Voltage Range (For T_A = Full Package-Temperature Range)	—	3	18	V

DYNAMIC ELECTRICAL CHARACTERISTICS, At $T_A = 25^\circ\text{C}$; Input $t_r, t_f = 20\text{ ns}$, $C_L = 50\text{ pF}$, $R_L = 200\ \Omega$

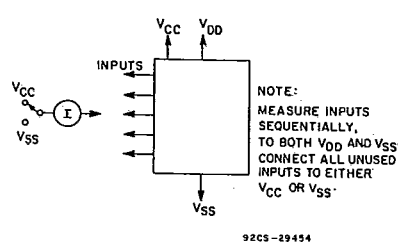
CHARACTERISTIC	SHIFTING MODE	VCC (V)	VDD (V)	LIMITS		UNITS
				TYP.	MAX.	
Propagation Delay: High-to-Low, t_{PHL}	TTL to CMOS $V_{DD} > V_{CC}$	5	10	140	280	ns
	CMOS to CMOS $V_{DD} > V_{CC}$	5	15	140	280	
	CMOS to CMOS $V_{CC} > V_{DD}$	5	10	120	240	
		5	15	120	240	
		10	15	70	140	
		10	5	275	550	
Low-to-High, t_{PLH}	TTL to CMOS $V_{DD} > V_{CC}$	5	10	140	280	
	CMOS to CMOS $V_{DD} > V_{CC}$	5	15	140	280	
	CMOS to CMOS $V_{CC} > V_{DD}$	5	10	120	240	
		5	15	120	240	
		10	15	70	140	
		10	5	200	400	
Transition Time, t_{THL}, t_{TLH}	All Modes	15	5	200	400	
		15	10	60	120	
		15	10	40	80	
Input Capacitance, C_{IN}	Any Input			5	7.5	pF

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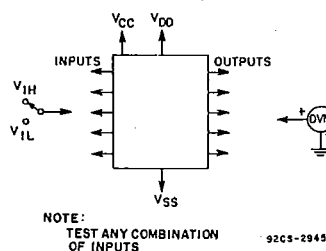
92CS-29452

Fig. 6 - Quiescent device current.



92CS-29454

Fig. 7 - Input current.



92CS-29453

Fig. 8 - Input voltage.

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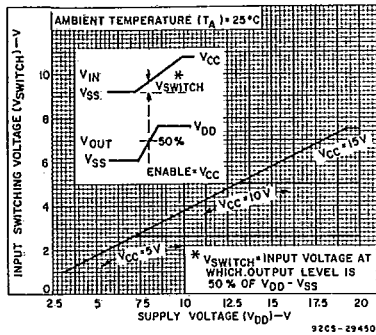


Fig. 9 - Typical input switching as a function of high-level supply voltage. (SELECT at V_{CC} -CMOS mode).

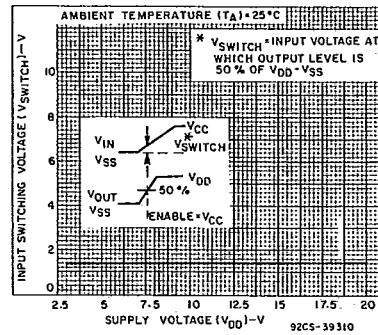


Fig. 10 - Typical input switching as a function of high-level supply voltage (SELECT at V_{SS} -TTL mode).

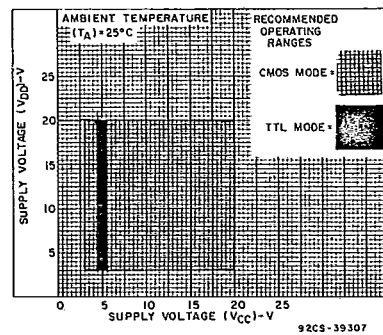
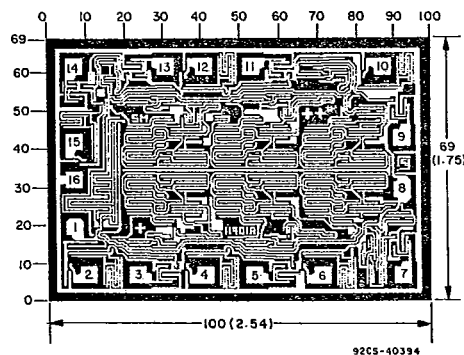


Fig. 11 - High-level supply voltage vs. low-level supply voltage.



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

Dimensions and pad layout for CD4504BH.