

CD4504 CMOS Hex Voltage Level Shifter for TTL-to-CMOS or CMOS-to-CMOS Operation

1. General Description

1.1 Description

CD4504 hex voltage level shifter consists of six circuits which shift input signals from the VCC logic level to the VDD logic level. To shift TTL signals to CMOS logic levels, the SELECT input is at the VCC HIGH logic state. When the SELECT input is at a LOW logic state, each circuit translates signals from one CMOS level to another.

- Shiftable Input Threshold for Either CMOS or TTL Compatibility
- 100% Tested for Quiescent Current at 18V
- 5V, 10V and 15V Parametric Ratings
- Standardized Symmetrical Output Characteristics
- Maximum Input Current of 1μA at 18V and +25°C

1.2 Features

- High Voltage Type (18V Rating)
- Independence of Power Supply Sequence Considerations
 - VCC can Exceed VDD
- Up and Down Level Shifting Capability

1.3 Device Information

PART NUMBER	PACKAGE
CD4504	DIP
	SOP
	TSSOP

2. Pin Description and Functional Diagram

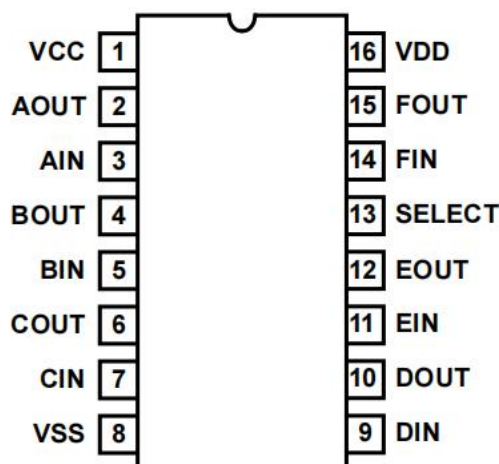


Figure 2.1 Top View

PIN No.	NAME	I/O	FUNCTION
1	VCC	I	Supply Voltage
2	AOUT	O	Data Output
3	AIN	I	Parallel Data Input
4	BOUT	O	Data Output
5	BIN	I	Data Input
6	COUT	O	Data Output
7	CIN	I	Data Input
8	VSS		Ground
9	DIN	I	Data Input
10	DOUT	O	Data Output
11	EIN	I	Data Input
12	EOUT	O	Data Output
13	SELECT	I	Select the level conversion mode
14	FIN	I	Data Input
15	FOUT	O	Data Output
16	VDD		Supply Voltage

3. System Diagram

3.1 Logic Diagram

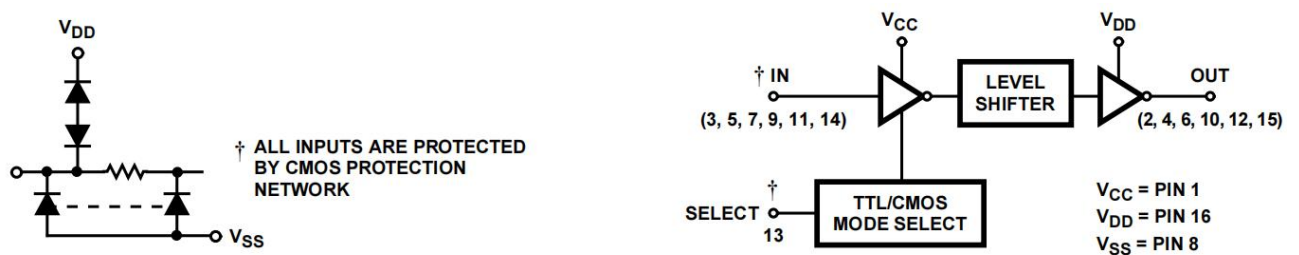


Figure 3.1: CD4504 Logic Diagram



4. Specifications

4.1 Absolute Maximum Ratings

Symbol	Parameter	MIN	MAX	Unit
V _{DD}	DC Supply Voltage Range (Voltage Referenced to VSS Terminals)	-0.5	20	V
V _I	Input Voltage Range, All Inputs	0.5	VDD+0.5	V
P _D	Power Dissipation		500	mW
T _J	Junction Temperature		125	°C
T _{OP}	Operating Temperature	-40	85	°C

Absolute maximum ratings are those values beyond which the device could be permanently damaged, These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions.

4.2 Electrical Characteristics

4.2.1 DC Specifications

(T_a=25°C, voltages are referenced to VSS (ground=0V), unless otherwise specified)

Symbol	Parameter	Test Condition				MIN	TYP	MAX	Unit
		VO	VIN	VCC	VDD				
I _{DD} /I _{CC}	Supply Current(CMOS)	--	0,5	5	5	--	0	1	uA
		--	0,10	5	10	--	0	1	uA
		--	0,18	5	18	--	0	1	uA
I _{CC}	Supply Current(TTL)	--	0,5	5	5	--	0	1	uA
		--	0,10	5	10	--	0	1	uA
		--	0,18	5	18	--	0	1	uA
I _{OL}	Low Level Output Current	0.4	0,5		5	1	3	--	mA
		0.5	0,10		10	4	8	--	mA
		1.5	0,15		15	15	30	--	mA
I _{OH}	High Level Output Current	4.6	0,5		5	-0.5	-1.8	--	mA
		2.5	0,5		5	-3	-7	--	mA
		9.5	0,10		10	-2	-4	--	mA
		13.5	0,15		15	-7	-14	--	mA
V _{OL}	Low Level Output Voltage	--	0,5		5	--	0	0.05	V
		--	0,10		10	--	0	0.05	V
		--	0,15		15	--	0	0.05	V
V _{OH}	High Level Output Voltage	--	0,5		5	4.95	5	--	V
		--	0,10		10	9.95	10	--	V
		--	0,15		15	14.95	15	--	V
V _{IL}	Low Level Input Voltage (TTL-CMOS)	1	--	5	10	--	--	0.8	V
		1	--	5	15	--	--	0.8	V
V _{IL}	Low Level Input Voltage(COMS-CMOS)	1	--	5	10	--	--	1.5	V
		1.5	--	5	15	--	--	1.2	
		1.5	--	10	15	--	--	3	



Symbol	Parameter	Test Condition				MIN	TYP	MAX	Unit
		VO	VI	VCC	VDD				
V _{IH}	High Level Input Voltage (TTL-CMOS)	9	--	5	10	2	--	--	V
		13.5	--	5	15	2	--	--	V
V _{IH}	High Level Input Voltage(COMS-CMOS)	9	--	5	10	3.5	--	--	V
		13.5	--	5	15	3.5	--	--	
		13.5	--	10	15	7	--	--	
I _{IN}	Input Leakage Current	--	0,18		18	--	0	±1	uA

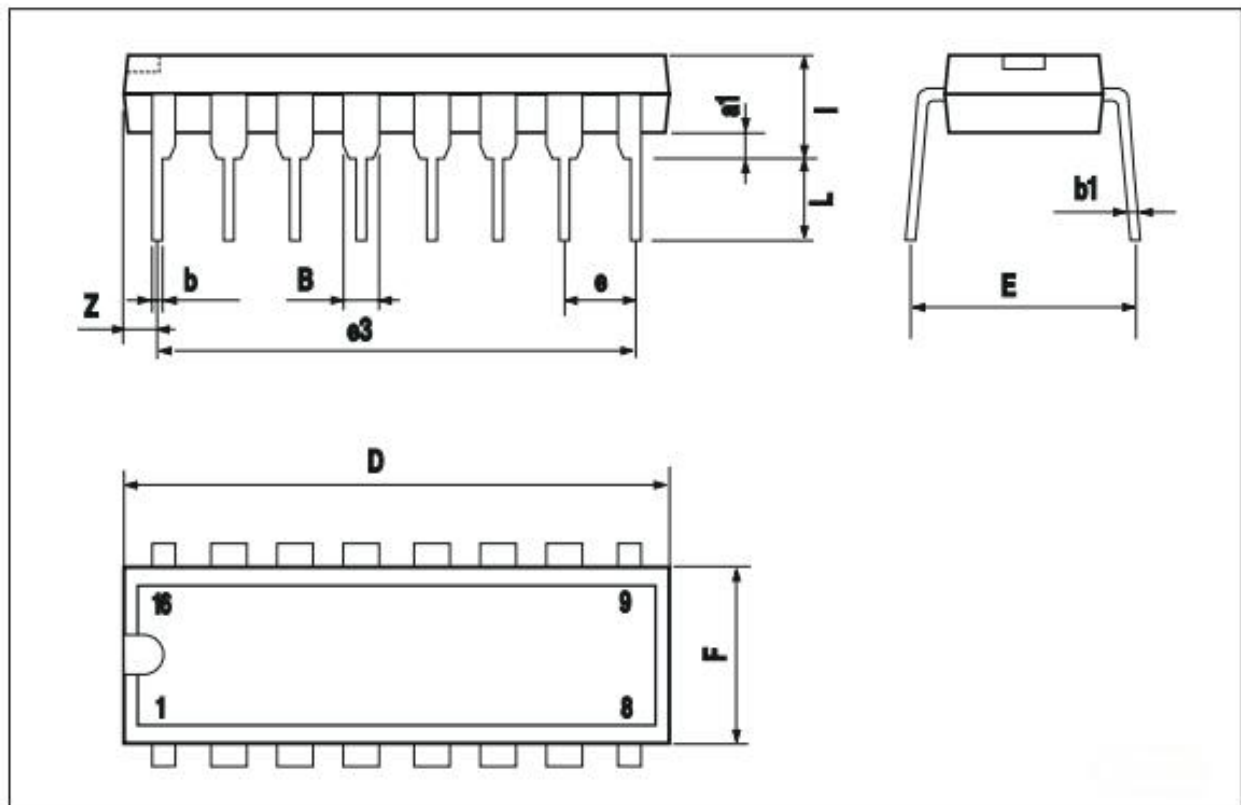
5. Ordering Information

Orderable Device	Package Type	Pins	Packing	Package Qty
CD4504ND16ATBE	DIP	16	Tube	25
CD4504NS16ARDQ	SOP	16	Tape & Reel	4000
CD4504TS16ARDQ	TSSOP	16	Tape & Reel	4000

6. Package Information

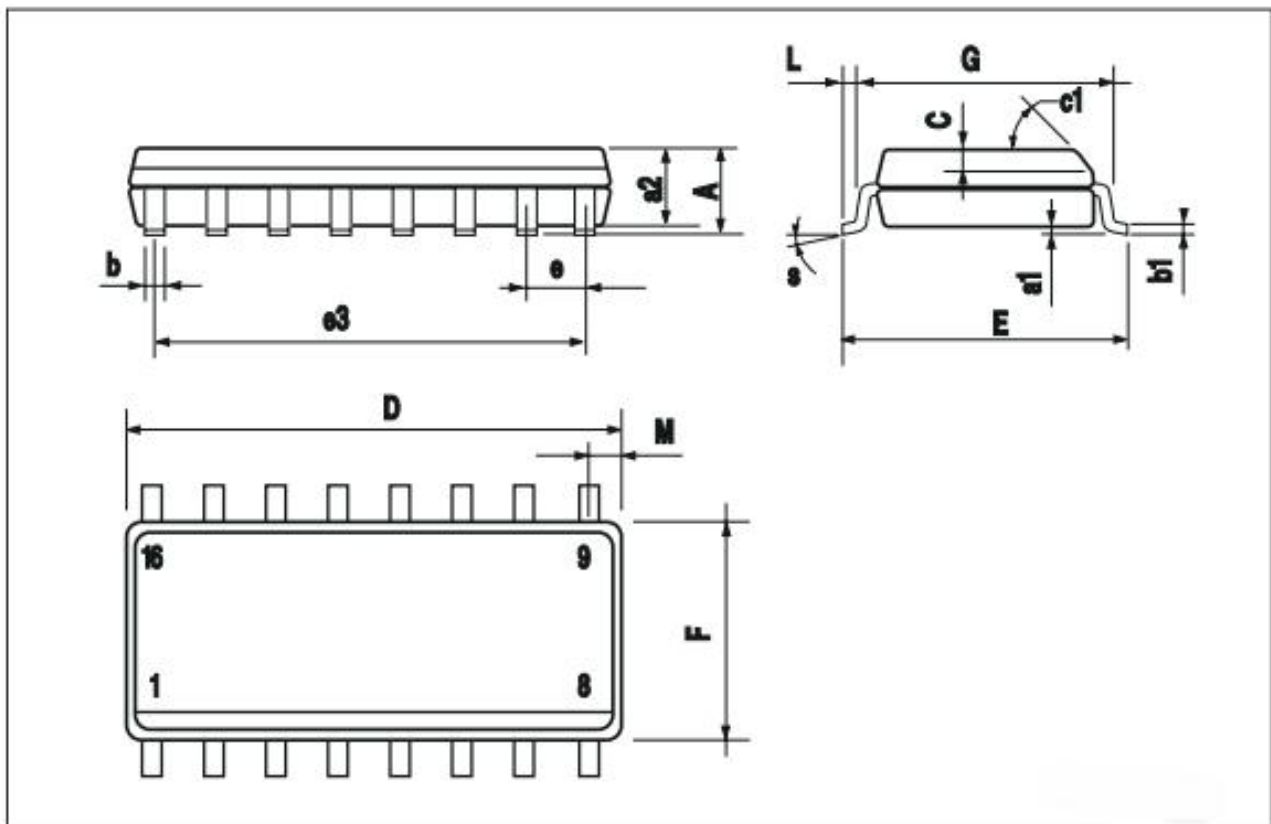
6.1 DIP16

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



6.2 SOP16

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.068
a1	0.1		0.25	0.004		0.010
a2			1.64			0.063
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



6.3 TSSOP16

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0079
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030

