



CMOS 4/8 Channel Analog Multiplexers

FEATURES

DTL/TTL/CMOS Direct Interface

Power Dissipation: $30\mu\text{W}$

R_{ON} : 170Ω

Output "Enable" Control

AD7503 Replaces HI-1818

GENERAL DESCRIPTION

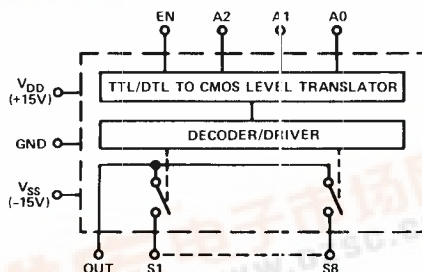
The AD7501 and AD7503 are monolithic CMOS, 8 channel analog multiplexers which switches one of 8 inputs to a common output depending on the state of three binary address lines and an "enable" input. The AD7503 is identical to the AD7501 except its "enable" logic is inverted. All digital inputs are TTL/DTL and CMOS logic compatible.

The AD7502 is a monolithic CMOS dual 4-channel analog multiplexer. Depending on the state of 2 binary address inputs and an "enable", it switches two output busses to two of 8 inputs.

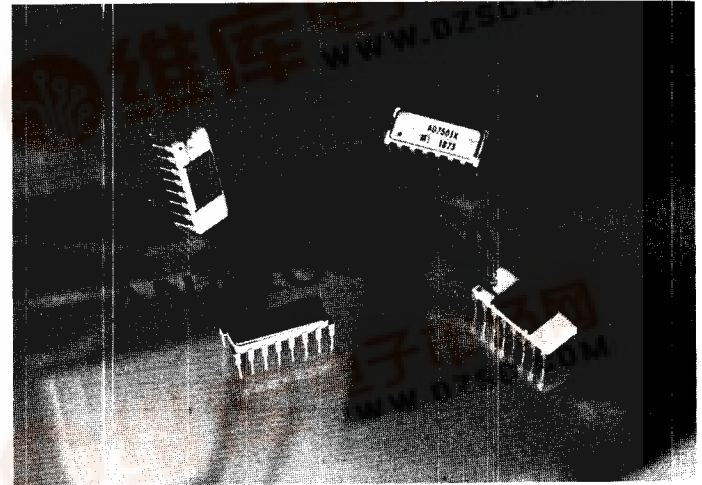
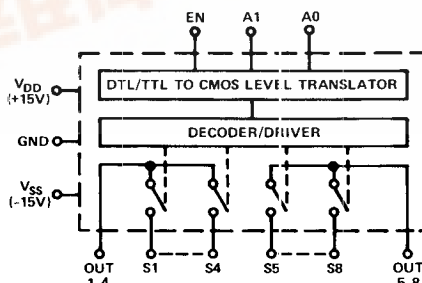
The AD7502 is an excellent example of a high breakdown CMOS process combined with a double layer interconnect for high density. Silicon nitride passivation ensures long term stability and reliability.

FUNCTIONAL DIAGRAMS

AD7501, AD7503



AD7502



ABSOLUTE MAXIMUM RATINGS

($T_A = +25^\circ\text{C}$ unless otherwise noted)

$V_{\text{DD}} - \text{GND}$ +17V

$V_{\text{SS}} - \text{GND}$ -17V

V Between Any Switch Terminals.25V

Switch Current (I_S , Continuous) 35mA

Switch Current (I_S , Surge) 50mA

1ms duration, 10% duty cycle

Digital Input Voltage Range V_{DD} to GND

Power Dissipation (package)

16 pin Ceramic DIP

Up to $+75^\circ\text{C}$ 450mW

Derates above $+75^\circ\text{C}$ by $.6\text{mW}/^\circ\text{C}$

16 pin Plastic DIP

Up to $+70^\circ\text{C}$ 670mW

Derates above $+70^\circ\text{C}$ by $.8.3\text{mW}/^\circ\text{C}$

Operating Temperature

Plastic. 0 to $+75^\circ\text{C}$

Ceramic (J, K versions). -25°C to $+85^\circ\text{C}$

Ceramic (S version) -55°C to $+125^\circ\text{C}$

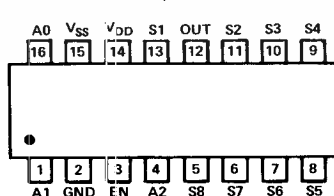
Storage Temperature -65°C to $+150^\circ\text{C}$

CAUTION:

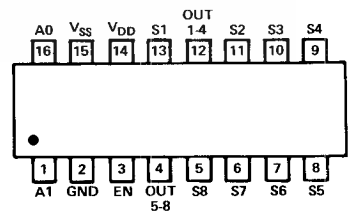
1. Do not apply voltages higher than V_{DD} and V_{SS} to any other terminal, especially when $V_{\text{SS}} = V_{\text{DD}} = 0\text{V}$ all other pins should be at 0V.
2. The digital control inputs are zener protected; however, permanent damage may occur on unconnected units under high energy electrostatic fields. Keep unused units in conductive foam at all times.

PIN CONFIGURATIONS (Top View)

AD7501, AD7503



AD7502



SPECIFICATIONS

($V_{DD} = +15V$, $V_{SS} = -15V$ unless otherwise noted)

PARAMETER	VERSION ¹	SWITCH CONDITION	@25°C		OVER SPECIFIED TEMP. RANGE		TEST CONDITIONS
			AD7501, AD7503	AD7502	AD7501, AD7503	AD7502	
ANALOG SWITCH							
R _{ON}	All	ON	170Ω typ, 300Ω max	*			-10V ≤ V _S ≤ +10V I _S = 1.0mA
R _{ON} vs. V _S	All	ON	20% typ	*			
R _{ON} vs. Temperature	All	ON	0.5%/°C typ	*			V _S = 0V, I _S = 1.0mA
ΔR _{ON} Between Switches	All	ON	4% typ	*			
R _{ON} vs. Temperature Between Switches	All	ON	±0.01%/°C	*			
I _S	J, K S	OFF OFF	0.2nA typ, 2nA max 0.5nA max	* *	50nA max 50nA max	* *	V _S = -10V, V _{OUT} = +10V and V _S = +10V, V _{OUT} = -10V
I _{OUT}	J, K S	OFF OFF	1nA typ, 10nA max 5nA max	0.6nA typ, 5nA max 3nA max	250nA max 250nA max	125nA max 125nA max	V _S = -10V, V _{OUT} = +10V and V _S = +10V, V _{OUT} = -10V AD7501: Enable HIGH AD7502, 03: Enable LOW
I _{OUT} - I _S	J, K S	ON ON	12nA max 5.5nA max	7nA max 3.5nA max	300nA max 300nA max	175nA max 175nA max	V _S = 0
DIGITAL CONTROL							
V _{INL}	All				0.8V max	*	
V _{INH}	J K, S				3.0V min 2.4V min	* *	Note 2
I _{INL} or I _{INH}	All		10nA typ	*			
C _{IN}	All		3pF typ	*			
DYNAMIC CHARACTERISTICS ³							
t _{ON}	All		0.8μs typ	*			V _{IN} = 0 to +5.0V (See Test Circuit 2)
t _{OFF}	All		0.8μs typ	*			
C _S	All	OFF	5pF typ	*			
C _{OUT}	All	OFF	30pF typ	15pF typ			
C _{SOUT}	All	OFF	0.5pF typ	*			
C _{SS} Between Any Two Switches	All	OFF	0.5pF typ	*			
POWER SUPPLY							
I _{DD}	J, K		1μA typ, 100μA max	*			All Digital Inputs Low
I _{SS}	J, K		1μA typ, 100μA max	*			
I _{DD}	S		500μA max	*	500μA max	*	
I _{SS}	S		500μA max	*	500μA max	*	
I _{DD}	J, K		200μA typ, 500μA max	*			All Digital Inputs High
I _{SS}	J, K		1μA typ, 100μA max	*			
I _{DD}	S		800μA max	*	800μA max	*	
I _{SS}	S		800μA max	*	800μA max	*	

NOTES:

*Same specifications as AD7501 and AD7503.

¹ JN, KN versions specified for 0 to +75°C; JD, KD versions for -25°C to +85°C; and SD versions for -55°C to +125°C.

² A pullup resistor, typically 1-2kΩ is required to make the AD7501J, AD7502J and AD7503J compatible with TTL/DTL levels. The maximum value is determined by the output leakage current of the driver gate when in the high state.

³ AC parameters are sample tested to ensure conformance to specifications.

Specifications subject to change without notice.

TRUTH TABLES

AD7501				
A ₂	A ₁	A ₀	E _N	"ON"
0	0	0	1	1
0	0	1	1	2
0	1	0	1	3
0	1	1	1	4
1	0	0	1	5
1	0	1	1	6
1	1	0	1	7
1	1	1	1	8
X	X	X	0	None

AD7503				
A ₂	A ₁	A ₀	E _N	"ON"
0	0	0	0	1
0	0	1	0	2
0	1	0	0	3
0	1	1	0	4
1	0	0	0	5
1	0	1	0	6
1	1	0	0	7
1	1	1	0	8
X	X	X	1	None

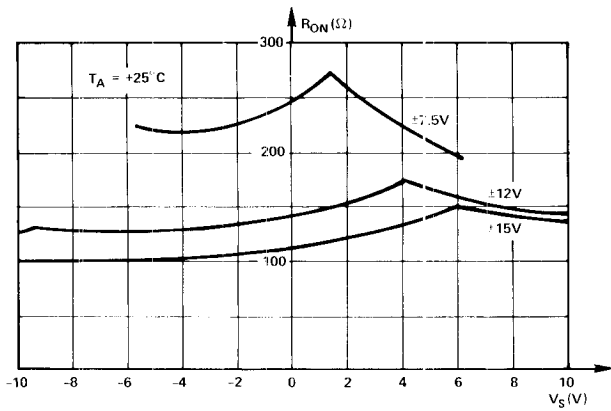
AD7502			
A ₁	A ₀	E _N	"ON"
0	0	1	1 & 5
0	1	1	2 & 6
1	0	1	3 & 7
1	1	1	4 & 8
X	X	0	None

ORDERING INFORMATION

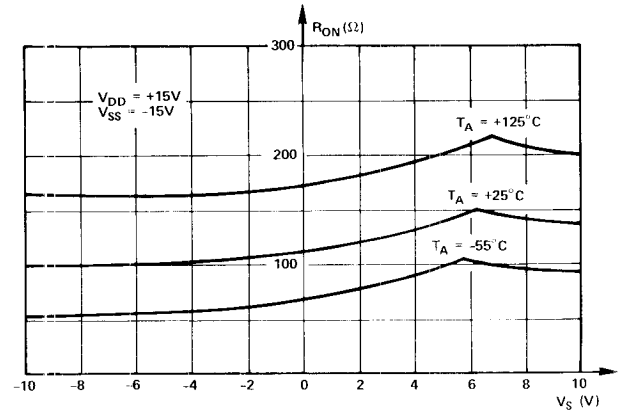
Plastic (Suffix N)	Ceramic (Suffix D)	Operating Temperature Range
AD7501JN AD7501KN AD7503JN AD7503KN		0 to +75°C
	AD7501JD AD7501KD AD7503JD AD7503KD	-25°C to +85°C
	AD7501SD AD7503SD	-55°C to +125°C
AD7502JN AD7502KN		0 to +75°C
	AD7502JD AD7502KD	-25°C to +85°C
	AD7502SD	-55°C to +125°C

Typical Performance Characteristics

1. R_{ON} As A Function Of Switch Voltage (V_S)

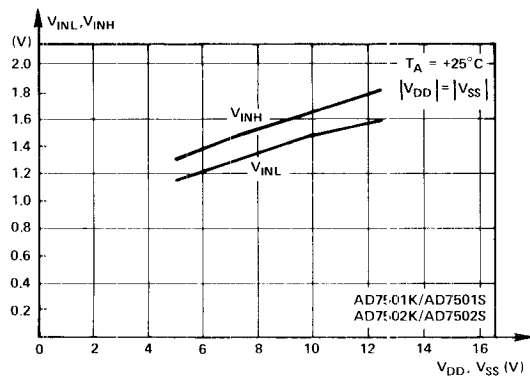


At Different Power Supplies

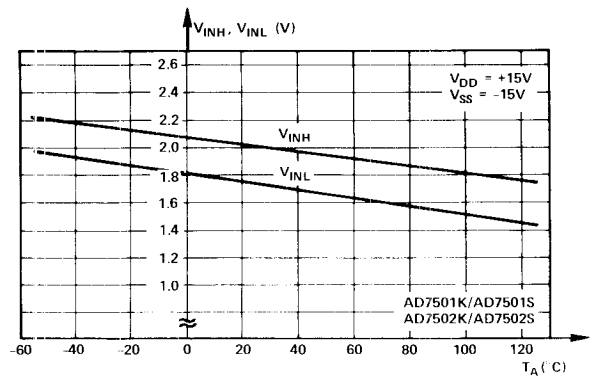


At Different Temperatures

2. Digital Threshold Voltage (V_{INH} , V_{INL})

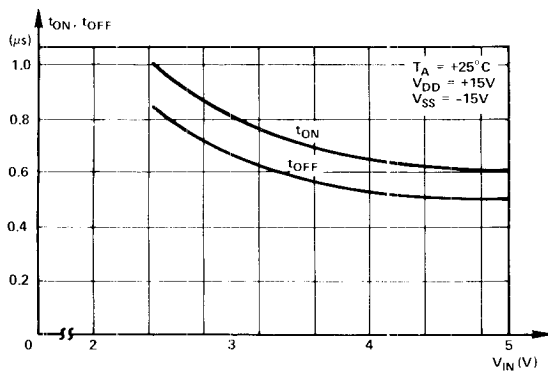


vs. Power Supply



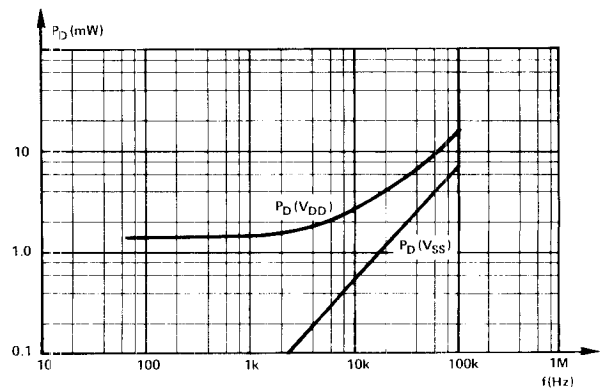
vs. Temperature

3. T_{ON} , T_{OFF}



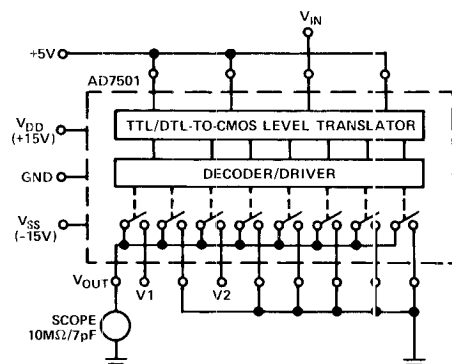
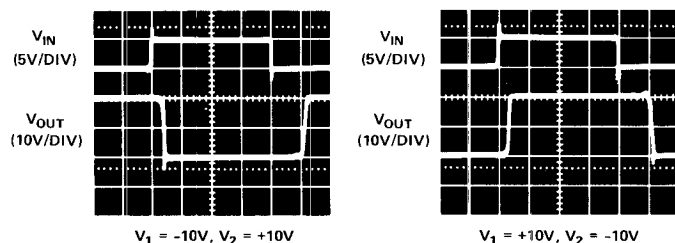
vs. Digital Input Voltage

4. Power Dissipation

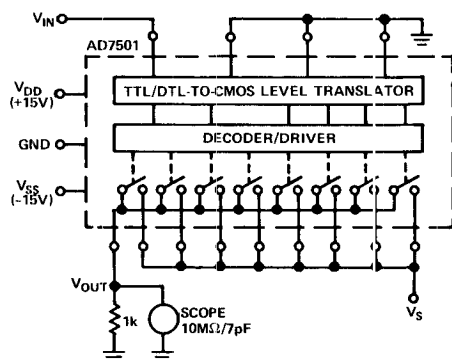


vs. Logic Frequency (50% Duty Cycle)

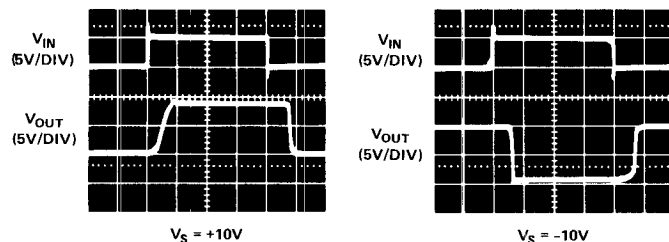
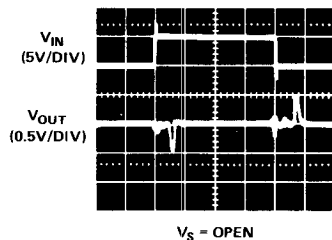
TEST CIRCUIT 1

 $1\mu\text{s}/\text{DIV}$ $1\mu\text{s}/\text{DIV}$ 

TEST CIRCUIT 2

 $1\mu s/DIV$

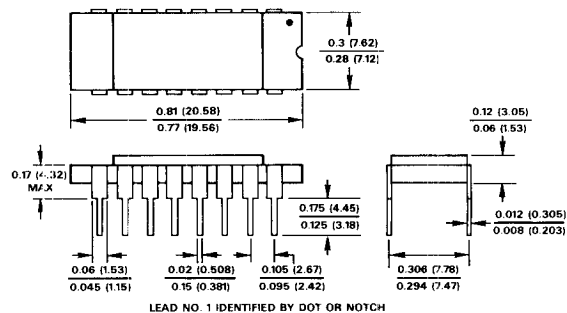
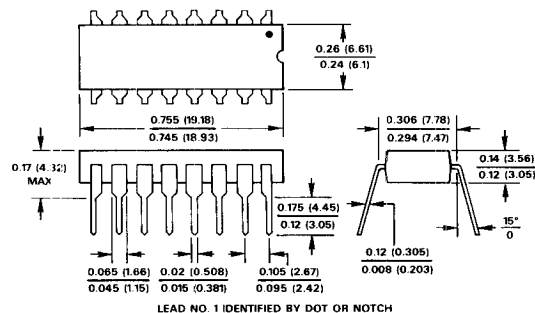
1μs/DIV

 $1\mu s/DIV$ 

OUTLINE DIMENSIONS

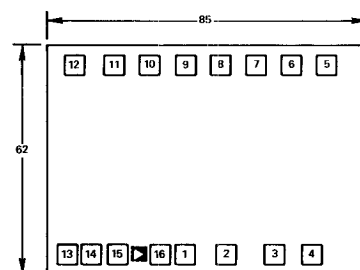
Dimensions shown in inches and (mm).

16-PIN CERAMIC DIP (SUFFIX D)

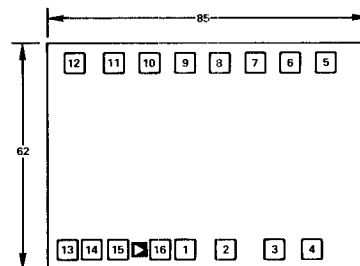
**16-PIN PLASTIC DIP (SUFFIX N)**

BONDING DIAGRAMS

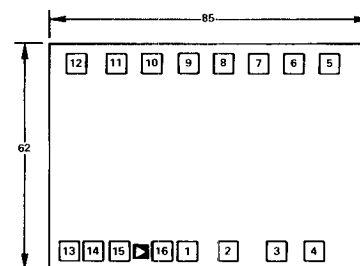
AD7501



AD7502



AD7503



All bonding pads are 4 x 4 MIL.
All pad numbers correspond with DIP package pin configuration.