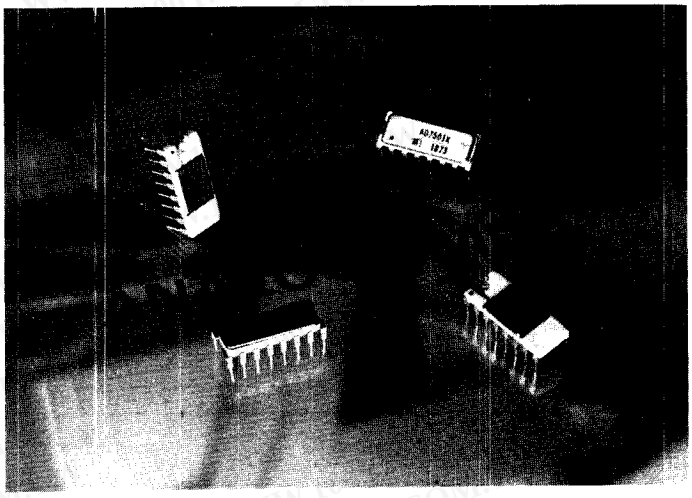
ANALOG DEVICES

CMOS 4/8 Channel Analog Multiplexers

FEATURES
DTL/TTL/CMOS Direct Interface
Power Dissipation: 30μW
R_{ON}: 170Ω
Output "Enable" Control
AD7503 Replaces HI-1818



GENERAL DESCRIPTION

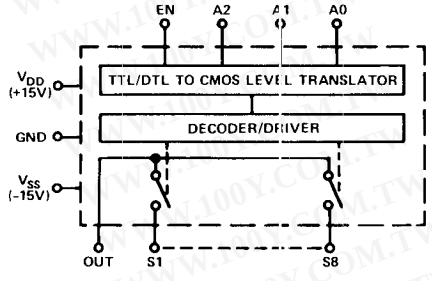
The AD7501 and AD7503 are monolithic CMOS, 8 channel analog multiplexers which switches one of 8 inputs to a common output depending on the state of three binary address lines and an "enable" input. The AD7503 is identical to the AD7501 except its "enable" logic is inverted. All digital inputs are TTL/DTL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

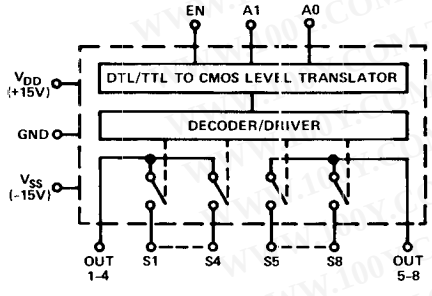
The AD7502 is an excellent example of a high breakdown CMOS process combined with a double layer interconnect for high density. Silicon nitride passivation ensures long term stability and reliability.

FUNCTIONAL DIAGRAMS

AD7501, AD7503



AD7502



ABSOLUTE MAXIMUM RATINGS

(T_A = +25°C unless otherwise noted)

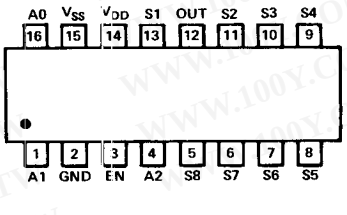
V_{DD} – GND	+17V
V_{SS} – GND	-17V
V Between Any Switch Terminals	25V
Switch Current (I_S, Continuous)	35mA
Switch Current (I_S, Surge)	
1ms duration, 10% duty cycle	50mA
Digital Input Voltage Range	V_{DD} to GND
Power Dissipation (package)	
16 pin Ceramic DIP	
Up to +75°C	450mW
Derates above +75°C by	6mW/°C
16 pin Plastic DIP	
Up to +70°C	670mW
Derates above +70°C by	8.3mW/°C
Operating Temperature	
Plastic	0 to +75°C
Ceramic (J, K versions)	-25°C to +85°C
Ceramic (S version)	-55°C to +125°C
Storage Temperature	-65°C to +150°C

CAUTION:

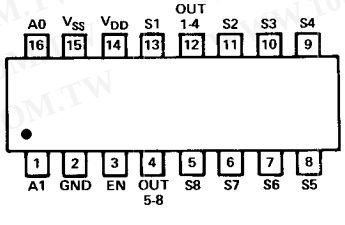
1. Do not apply voltages higher than V_{DD} and V_{SS} to any other terminal, especially when V_{SS} = V_{DD} = 0V all other pins should be at 0V.
2. The digital control inputs are zener protected; however, permanent damage may occur on unconnected units under high energy electrostatic fields. Keep unused 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 AD7501, AD7503	@25°C AD7502	OVER SPECIFIED TEMP. RANGE AD7501, AD7503	OVER SPECIFIED TEMP. RANGE AD7502	TEST CONDITIONS
ANALOG SWITCH							
R_{ON}	All	ON	170Ω typ, 300Ω max	*			$-10V \leq V_S \leq +10V$
R_{ON} vs. V_S	All	ON	20% typ	*			I_S = 1.0mA
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	OFF	0.2nA typ, 2nA max	*	50nA max	*	V_S = -10V, V_{OUT} = +10V and V_S = +10V, V_{OUT} = -10V
	S	OFF	0.5nA max	*	50nA max	*	
I_{OUT}	J, K	OFF	1nA typ, 10nA max	0.6nA typ, 5nA max	250nA max	125nA max	V_S = -10V, V_{OUT} = +10V and V_S = +10V, V_{OUT} = -10V
	S	OFF	5nA max	3nA max	250nA max	125nA max	AD7501: Enable HIGH AD7502, 03: Enable LOW
$\lvert I_{OUT} - I_S \rvert$	J, K	ON	12nA max	7nA max	300nA max	175nA max	V_S = 0
	S	ON	5.5nA max	3.5nA max	300nA max	175nA max	
DIGITAL CONTROL							
V_{INL}	All				0.8V max	*	
V_{INH}	J				3.0V min	*	Note 2
	K, S				2.4V min	*	
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_{S-OUT}	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

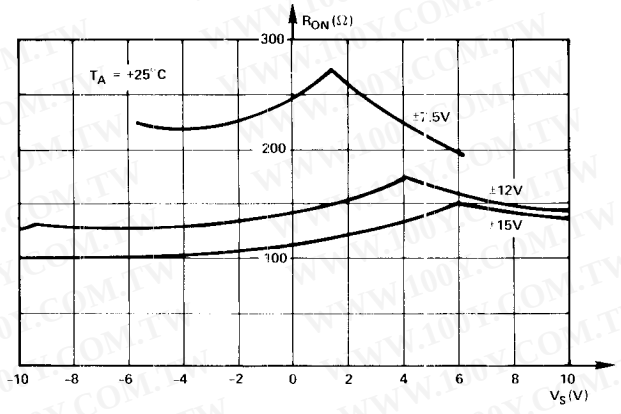
AD7503				
A_2	A_1	A_0	E_N	"ON"
0	0	0	0	1
0	0	1	0	2
0	1	0	0	3
0	1	1	0	4
1	0	0	0	5
1	0	1	0	6
1	1	0	0	7
1	1	1	0	8
X	X	X	1	None

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

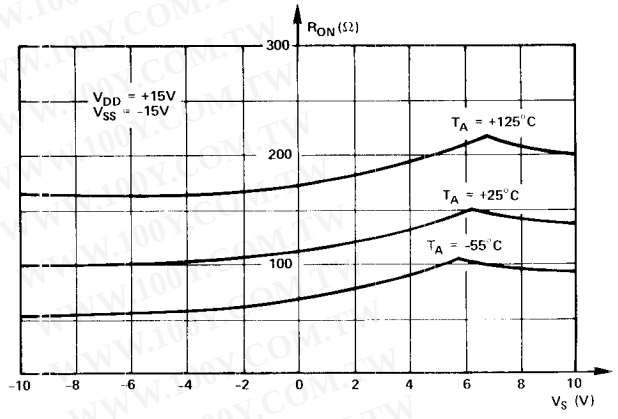
ORDERING INFORMATION

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

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

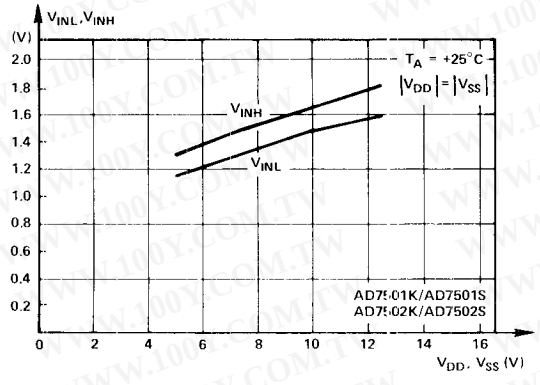


At Different Power Supplies

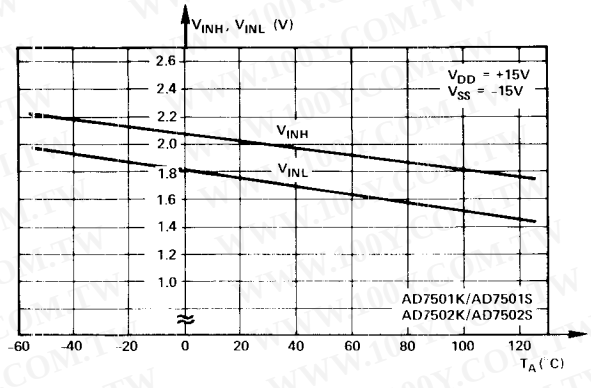


At Different Temperatures

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

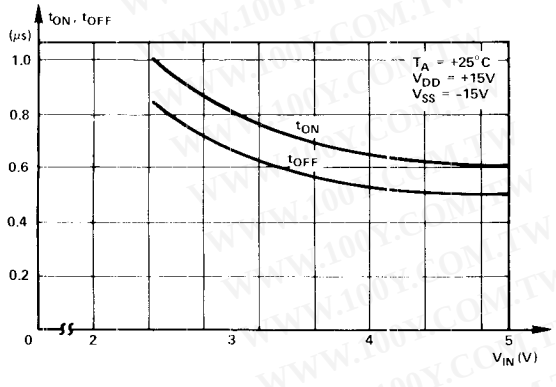


vs. Power Supply



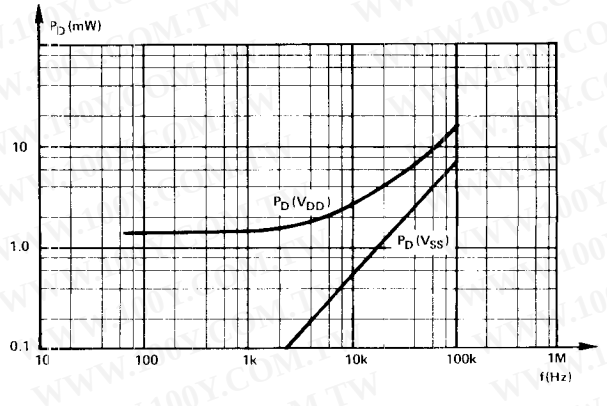
vs. Temperature

3. T_{ON}, T_{OFF}



vs. Digital Input Voltage

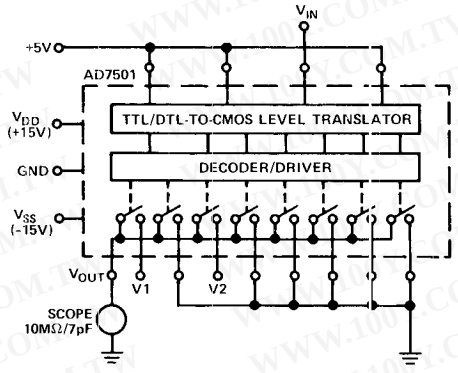
4. Power Dissipation

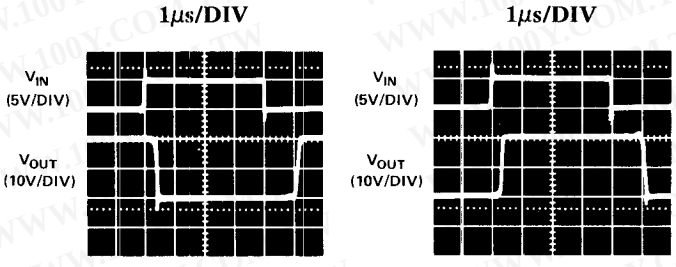


vs. Logic Frequency (50% Duty Cycle)

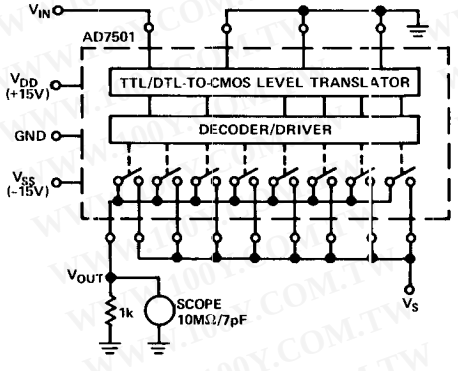
TYPICAL SWITCHING CHARACTERISTICS

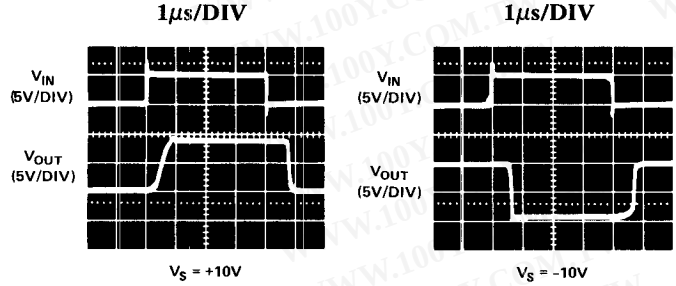
TEST CIRCUIT 1

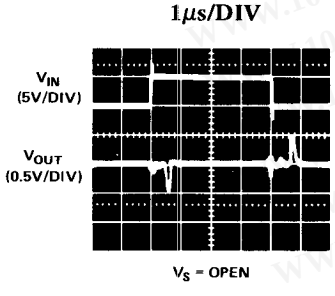




TEST CIRCUIT 2



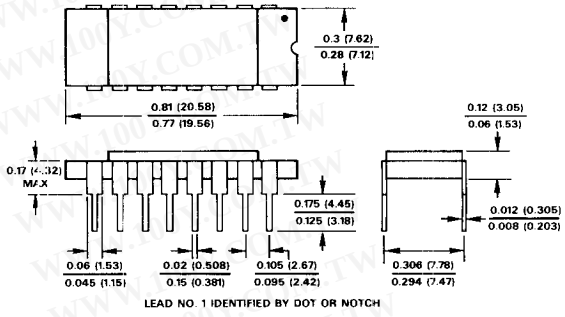




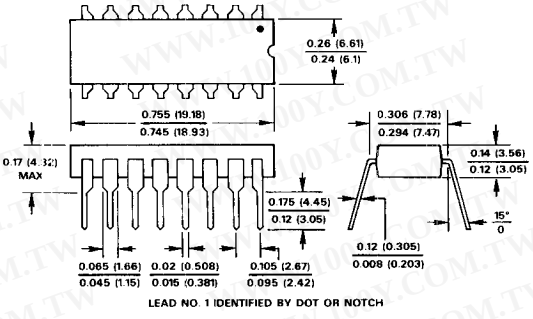
OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

16-PIN CERAMIC DIP (SUFFIX D)

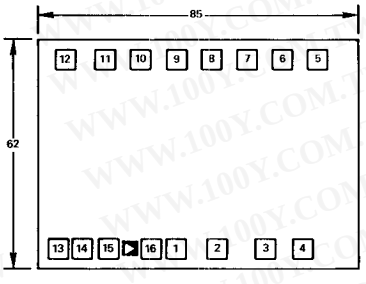


16-PIN PLASTIC DIP (SUFFIX N)

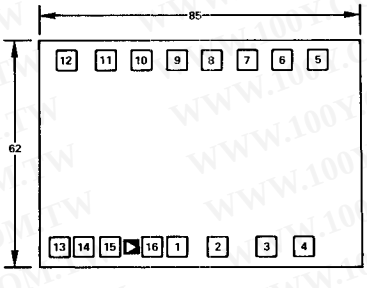


BONDING DIAGRAMS

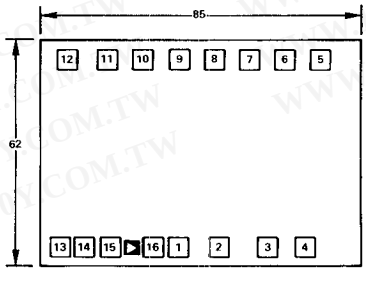
AD7501



AD7502



AD7503



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