ANALOG DEVICES

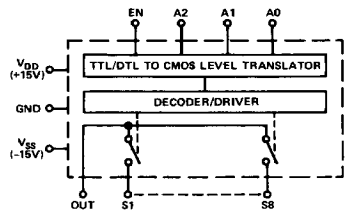
CMOS 4/8 Channel Analog Multiplexers

AD7501/AD7502/AD7503

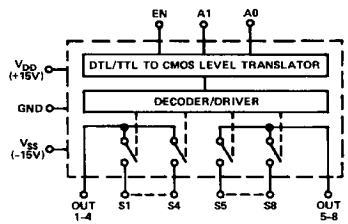
FEATURES
DTL/TTL/CMOS Direct Interface
Power Dissipation: 30μW
R_{ON}: 170Ω
Standard 16-Pin DIPs and 20-Terminal Surface Mount Packages

FUNCTIONAL BLOCK DIAGRAMS

AD7501/AD7503



AD7502



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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 buses to two of 8 inputs.

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

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AD7501/AD7502/AD7503—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 ≤ V_S ≤ +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	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}	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	AD7501/02: Enable LOW AD7503: Enable HIGH
$\lvert I_{OUT} - I_S \rvert$	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}	All				2.4V min	•	
I_{INL} or I_{INH}	All		10nA typ	•			
C_{IN}	All		3pF typ	•			
DYNAMIC CHARACTERISTICS							
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			
$C_{S\text{-}OUT}$	All	OFF	0.5pF typ	•			
C_{SS} Between Any Two Switches	All	OFF	0.5pF typ	•			
POWER SUPPLY							
I_{DD}	All		500μA max	•	500μA max	•	All Digital Inputs Low
I_{SS}	All		500μA max	•	500μA max	•	
I_{DD}	All		800μA max	•	800μA max	•	All Digital Inputs High
I_{SS}	All		800μA max	•	800μA max	•	

NOTES
*Same specifications as AD7501 and AD7503.
[1] KN version specified for 0 to +70°C, KQ version for −25°C to +85°C; and SQ, SE versions for −55°C to +125°C.

Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS*

(T_A = +25°C unless otherwise noted)

V_{DD} to GND . . . . . +17V
V_{SS} to GND . . . . . −17V
V Between Any Switch Terminals (see Note 1) 25V
Digital Input Voltage Range . . . . . V_{DD} to GND
Overvoltage at V_{OUT} (V_S) . . . . . V_{SS}, V_{DD}
Switch Current (I_S, Continuous One Channel) 35mA
Switch Current (I_S, Surge One Channel)
1ms Duration, 10% Duty Cycle 50mA
Power Dissipation (Any Package)
Up to +75°C 450mW
Derates above +75°C by . . . . . 6mW/°C

Operating Temperature
Commercial (KN Version) . . . . . 0 to +70°C
Industrial (KQ Version) . . . . . −25°C to +85°C
Extended (SQ, SE Versions) . . . . . −55°C to +125°C
Storage Temperature . . . . . −65°C to +150°C
Lead Temperature (Soldering, 10sec) . . . . . +300°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 diode protected; however, permanent damage may occur on unconnected units under high energy electrostatic fields. Keep unused units in conductive foam at all times.

CAUTION:
ESD (electrostatic discharge) sensitive device. The digital control inputs are diode protected; however, permanent damage may occur on unconnected devices subject to high energy electrostatic fields. Unused devices must be stored in conductive foam or shunts. The protective foam should be discharged to the destination socket before devices are inserted.

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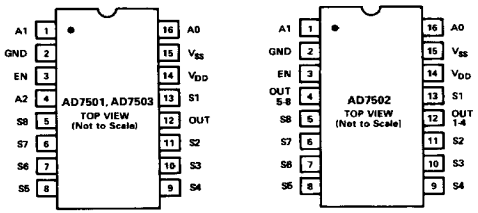
ORDERING GUIDE

Model[1]	Temperature Range	Package Option[2]
AD7501KN	0°C to +70°C	N-16
AD7501KQ	−25°C to +85°C	Q-16
AD7501SQ	−55°C to +125°C	Q-16
AD7501SE	−55°C to +125°C	E-20A
AD7502KN	0°C to +70°C	N-16
AD7502KQ	−25°C to +85°C	Q-16
AD7502SQ	−55°C to +125°C	Q-16
AD7502SE	−55°C to +125°C	E-20A
AD7503KN	0°C to +70°C	N-16
AD7503KQ	−25°C to +85°C	Q-16
AD7503SQ	−55°C to +125°C	Q-16
AD7503SE	−55°C to +125°C	E-20A

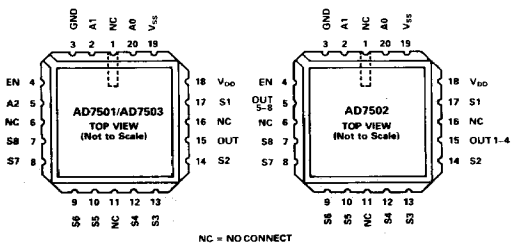
NOTES
[1]To order MIL-STD-883, Class B processed parts, add/883B to part number. See the Analog Devices' 1990 Military Databook for military data sheet.
[2]E = Leadless Ceramic Chip Carrier; N = Narrow Plastic DIP; Q = Cerdip. For outline information see Package Information section.

PIN CONFIGURATIONS

DIP



LCCC



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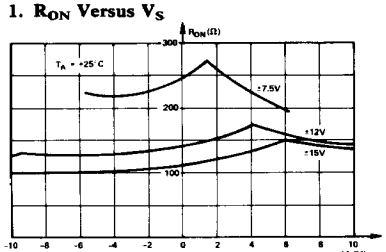
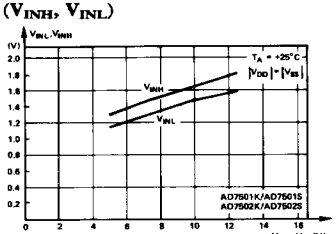
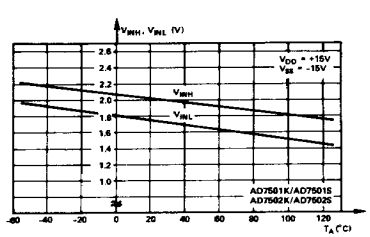
Typical Performance Characteristics

1. R_{ON} Versus V_S

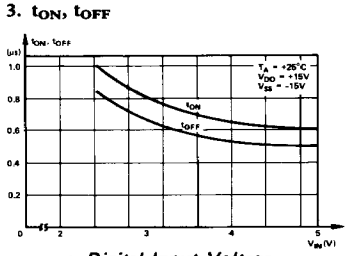


2. Digital Threshold Voltage (V_{INH}, V_{INL})

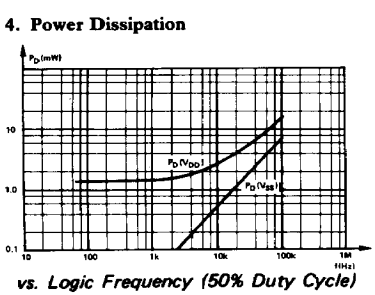




3. t_{ON}, t_{OFF}



4. Power Dissipation



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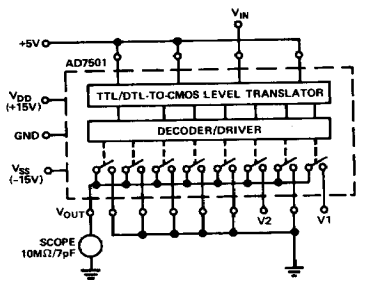
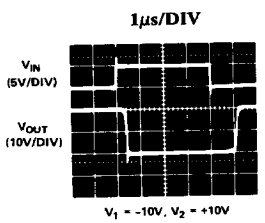
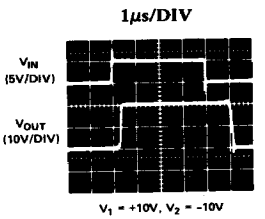
TYPICAL SWITCHING CHARACTERISTICS

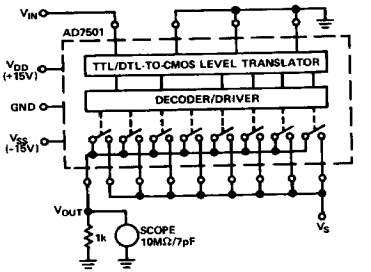
TEST CIRCUIT 1

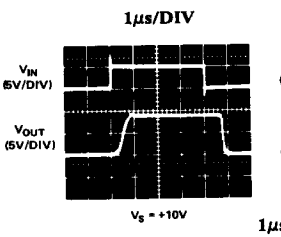


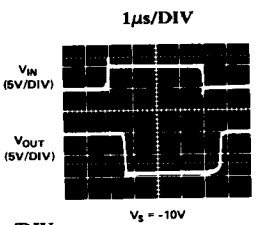


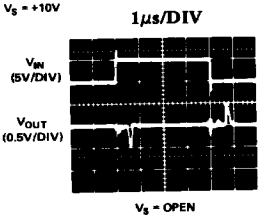


TEST CIRCUIT 2









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