

### AD7506/AD7507

#### FEATURES

**$R_{ON}$ : 300 $\Omega$**   
**Power Dissipation: 1.5mW**  
**TTL/DTL/CMOS Direct Interface**  
**Break-Before-Make Switching**  
**Standard 28-Pin DIPs and 28-Terminal Surface Mount Packages**

#### GENERAL DESCRIPTION

The AD7506 is a monolithic CMOS 16-channel analog multiplexer packaged in a 28-pin DIP or a 28-terminal surface mount package. It switches a common output to one of 16 inputs, depending on the state of four address lines and an "enable." The AD7507 is identical to the AD7506 except it has two outputs switched to two of 16 inputs depending on three binary address states and an "enable."

#### ABSOLUTE MAXIMUM RATINGS\*

( $T_A = +25^\circ\text{C}$  unless otherwise noted)  
 $V_{DD} - GND$  . . . . . +17V  
 $V_{SS} - GND$  . . . . . -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) . . . . . 20mA  
 Switch Current ( $I_S$ , Surge One Channel)  
   1ms Duration, 10% Duty Cycle . . . . . 35mA  
 Power Dissipation (Any Package)  
   Up to  $+50^\circ\text{C}$  . . . . . 1000mW  
   Derates above  $+50^\circ\text{C}$  by . . . . . 10mW/ $^\circ\text{C}$   
 Operating Temperature  
   Commercial (KN Versions) . . . . . 0 to  $+70^\circ\text{C}$   
   Industrial (KQ Versions) . . . . .  $-25^\circ\text{C}$  to  $+85^\circ\text{C}$   
   Extended (TQ, TE Versions) . . . . .  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$   
 Storage Temperature . . . . .  $-65^\circ\text{C}$  to  $+150^\circ\text{C}$   
 Lead Temperature (Soldering, 10sec) . . . . .  $+300^\circ\text{C}$

#### CAUTION:

<sup>1</sup>Do not apply voltage higher than  $V_{DD}$  and  $V_{SS}$  to any other terminal, especially when  $V_{SS} = V_{DD} = 0\text{V}$  all other pins should be at 0V.

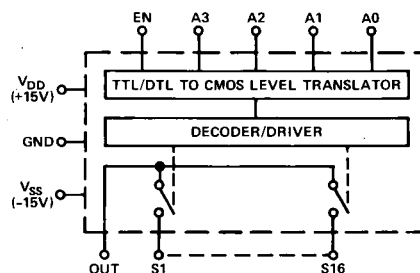
<sup>2</sup>The digital control inputs are diode protected; however, permanent damage may occur on unconnected units under high energy electrostatic fields. Keep unused units in conductive foam at all times.

\*Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Only one Absolute Maximum Rating may be applied at any one time.

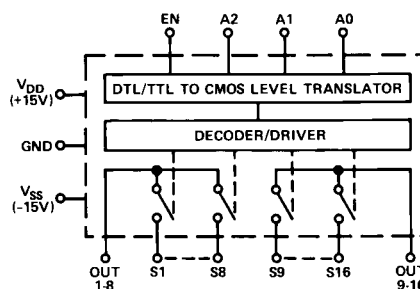
#### REV. A

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#### FUNCTIONAL DIAGRAMS



AD7506



AD7507

#### ORDERING GUIDE

| Model <sup>1</sup> | Temperature Range                           | Package Option <sup>2</sup> |
|--------------------|---------------------------------------------|-----------------------------|
| AD7506KN           | 0°C to $+70^\circ\text{C}$                  | N-28                        |
| AD7506KQ           | $-25^\circ\text{C}$ to $+85^\circ\text{C}$  | Q-28                        |
| AD7506TQ           | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ | Q-28                        |
| AD7506TE           | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ | E-28A                       |
| AD7507KN           | 0°C to $+70^\circ\text{C}$                  | N-28                        |
| AD7507KQ           | $-25^\circ\text{C}$ to $+85^\circ\text{C}$  | Q-28                        |
| AD7507TQ           | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ | Q-28                        |
| AD7507TE           | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ | E-28A                       |

#### NOTES

<sup>1</sup>To order MIL-STD-883, Class B, processed parts, add/883B to part number. See Analog Devices Military Products Databook (1990) for military data sheet.

<sup>2</sup>N = Plastic DIP; Q = Cerdip; E = Leadless Ceramic Chip Carrier (LCCC).

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# AD7506/AD7507 — SPECIFICATIONS ( $V_{DD} = +15V$ , $V_{SS} = -15V$ unless otherwise noted.)

| Parameter                                           | Version <sup>1</sup> | Switch Condition | @ +25°C                                    | Over Specified Temperature Range           | Test Conditions                                                                                       |
|-----------------------------------------------------|----------------------|------------------|--------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------|
| ANALOG SWITCH                                       |                      |                  |                                            |                                            |                                                                                                       |
| R <sub>ON</sub>                                     | K<br>T               | ON<br>ON         | 300Ω typ, 450Ω max<br>400Ω max             | 550Ω max<br>500Ω max                       | V <sub>S</sub> =−10V to +10V, I <sub>S</sub> =1mA                                                     |
| R <sub>ON</sub> vs. V <sub>S</sub>                  | All                  | ON               | 15% typ                                    |                                            | V <sub>S</sub> =0V, I <sub>S</sub> =1mA                                                               |
| R <sub>ON</sub> vs. Temperature                     | All                  | ON               | 0.5%/°C typ                                |                                            |                                                                                                       |
| ΔR <sub>ON</sub> Between Switches                   | All                  | ON               | 4% typ                                     |                                            |                                                                                                       |
| R <sub>ON</sub> vs. Temperature Between Switches    | All                  | ON               | 0.05%/°C typ                               |                                            |                                                                                                       |
| I <sub>S</sub> (OFF)                                | K<br>T               | OFF<br>OFF       | 0.05nA typ, 5nA max<br>0.05nA typ, 1nA max | 50nA max<br>50nA max                       | V <sub>S</sub> =−10V, V <sub>OUT</sub> =+10V and                                                      |
| I <sub>OUT</sub> (OFF)                              | AD7506               | K<br>T           | OFF<br>OFF                                 | 0.3nA typ, 20nA max<br>0.3nA typ, 10nA max | V <sub>S</sub> =+10V, V <sub>OUT</sub> =−10V<br>“Enable” Low                                          |
|                                                     | AD7507               | K<br>T           | OFF<br>OFF                                 | 0.3nA typ, 10nA max<br>0.3nA typ, 5nA max  |                                                                                                       |
| I <sub>OUT</sub> −I <sub>S</sub><br>(Any Switch ON) | AD7506               | K<br>T           | ON<br>ON                                   | 0.3nA typ, 20nA max<br>0.3nA typ, 10nA max | V <sub>S</sub> =0V                                                                                    |
|                                                     | AD7507               | K<br>T           | ON<br>ON                                   | 0.3nA typ, 10nA max<br>0.3nA typ, 5nA max  |                                                                                                       |
| DIGITAL CONTROL                                     |                      |                  |                                            |                                            |                                                                                                       |
| V <sub>INL</sub>                                    | All                  |                  |                                            | 0.8V max                                   |                                                                                                       |
| V <sub>INH</sub>                                    | All                  |                  |                                            | 2.4V min                                   |                                                                                                       |
| I <sub>INL</sub> or I <sub>INH</sub>                | All                  |                  | 10μA max                                   | 30μA max                                   |                                                                                                       |
| C <sub>IN</sub>                                     | All                  |                  | 3pF typ                                    |                                            |                                                                                                       |
| DYNAMIC CHARACTERISTICS <sup>2</sup>                |                      |                  |                                            |                                            |                                                                                                       |
| t <sub>TRANSITION</sub>                             | All                  |                  | 700ns typ, 1000ns max                      |                                            | V <sub>IN</sub> : 0 to 3.0V                                                                           |
| t <sub>OPEN</sub>                                   | All                  |                  | 100ns typ                                  |                                            |                                                                                                       |
| t <sub>ON</sub> (En)                                | All                  |                  | 1.5μs max                                  |                                            | V <sub>EN</sub> : 0 to 3.0V                                                                           |
| t <sub>OFF</sub> (En)                               | All                  |                  | 1μs max                                    |                                            |                                                                                                       |
| “OFF” Isolation                                     | All                  |                  | 70dB typ                                   |                                            | V <sub>EN</sub> =0, R <sub>L</sub> =200Ω, C <sub>L</sub> =3.0pF,<br>V <sub>S</sub> =3.0V rms, f=50kHz |
| C <sub>S</sub>                                      | All                  | OFF              | 5pF typ                                    |                                            |                                                                                                       |
| C <sub>OUT</sub>                                    | AD7506               | All              | OFF                                        | 40pF typ                                   |                                                                                                       |
|                                                     | AD7507               | All              | OFF                                        | 20pF typ                                   |                                                                                                       |
| C <sub>S-OUT</sub>                                  | All                  | OFF              | 0.5pF typ                                  |                                            |                                                                                                       |
| C <sub>SS</sub> Between Any Two Switches            | All                  | OFF              | 0.5pF typ                                  |                                            |                                                                                                       |
| POWER SUPPLY                                        |                      |                  |                                            |                                            |                                                                                                       |
| I <sub>DD</sub>                                     | K<br>T               | OFF<br>OFF       | 0.05mA typ, 1mA max<br>0.05mA typ, 1mA max | 2mA max                                    | All Digital Inputs Low                                                                                |
| I <sub>SS</sub>                                     | K<br>T               | OFF<br>OFF       | 0.05mA typ, 1mA max<br>0.05mA typ, 1mA max | 2mA max                                    |                                                                                                       |
| I <sub>DD</sub>                                     | K<br>T               | ON<br>ON         | 0.3mA typ, 1mA max<br>0.3mA typ, 1mA max   | 2mA max                                    | All Digital Inputs High                                                                               |
| I <sub>SS</sub>                                     | K<br>T               | ON<br>ON         | 0.05mA typ, 1mA max<br>0.05mA typ, 1mA max | 2mA max                                    |                                                                                                       |

## NOTES

<sup>1</sup>KN Version specified for 0 to +70°C; KQ Version for -25°C to +85°C; and TQ, TE Versions for -55°C to +125°C.

<sup>2</sup>Sample tested to ensure compliance.

Specifications subject to change without notice.

## 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 removed.

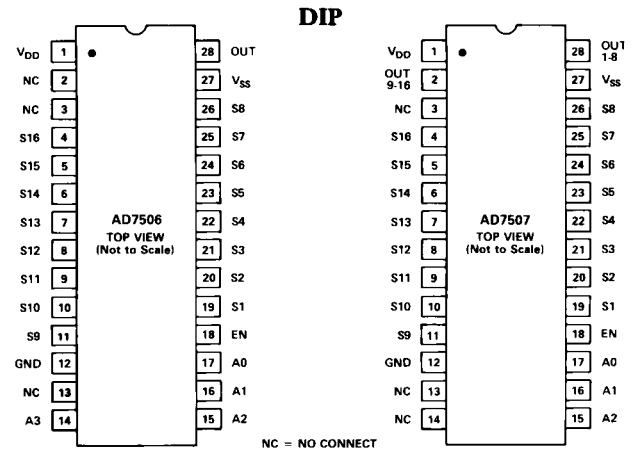


## TRUTH TABLES

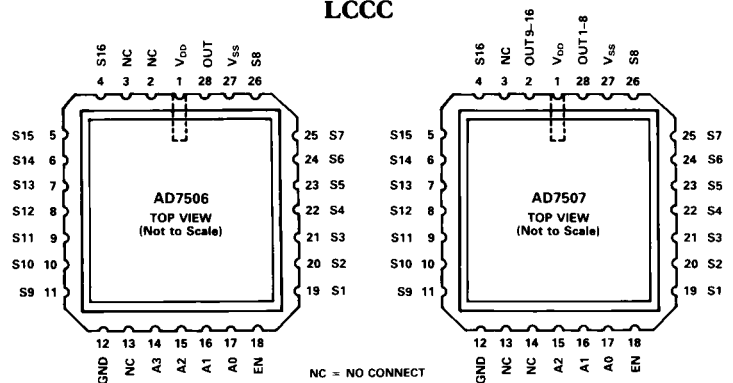
| AD7506         |                |                |                |                |      |
|----------------|----------------|----------------|----------------|----------------|------|
| A <sub>3</sub> | A <sub>2</sub> | A <sub>1</sub> | A <sub>0</sub> | E <sub>N</sub> | "ON" |
| 0              | 0              | 0              | 0              | 1              | 1    |
| 0              | 0              | 0              | 1              | 1              | 2    |
| 0              | 0              | 1              | 0              | 1              | 3    |
| 0              | 0              | 1              | 1              | 1              | 4    |
| 0              | 1              | 0              | 0              | 1              | 5    |
| 0              | 1              | 0              | 1              | 1              | 6    |
| 0              | 1              | 1              | 0              | 1              | 7    |
| 0              | 1              | 1              | 1              | 1              | 8    |
| 1              | 0              | 0              | 0              | 1              | 9    |
| 1              | 0              | 0              | 1              | 1              | 10   |
| 1              | 0              | 1              | 0              | 1              | 11   |
| 1              | 0              | 1              | 1              | 1              | 12   |
| 1              | 1              | 0              | 0              | 1              | 13   |
| 1              | 1              | 0              | 1              | 1              | 14   |
| 1              | 1              | 1              | 0              | 1              | 15   |
| 1              | 1              | 1              | 1              | 1              | 16   |
| X              | X              | X              | X              | 0              | None |

| AD7507         |                |                |                |        |
|----------------|----------------|----------------|----------------|--------|
| A <sub>2</sub> | A <sub>1</sub> | A <sub>0</sub> | E <sub>N</sub> | "ON"   |
| 0              | 0              | 0              | 1              | 1 & 9  |
| 0              | 0              | 1              | 1              | 2 & 10 |
| 0              | 1              | 0              | 1              | 3 & 11 |
| 0              | 1              | 1              | 1              | 4 & 12 |
| 1              | 0              | 0              | 1              | 5 & 13 |
| 1              | 0              | 1              | 1              | 6 & 14 |
| 1              | 1              | 0              | 1              | 7 & 15 |
| 1              | 1              | 1              | 1              | 8 & 16 |
| X              | X              | X              | 0              | None   |

## PIN CONFIGURATIONS

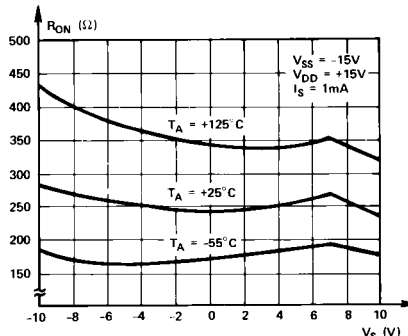
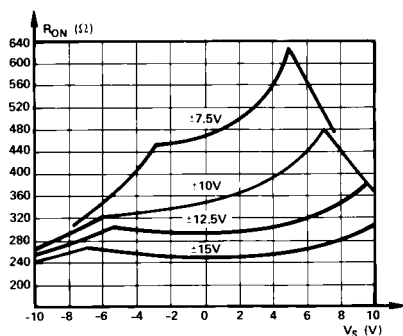


## LCCC

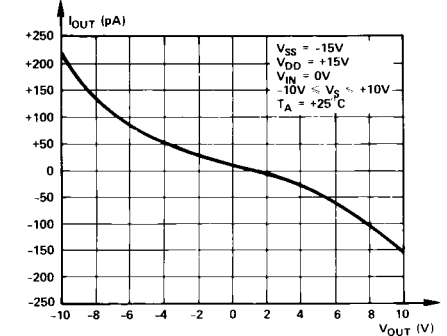


## Typical Performance Characteristics

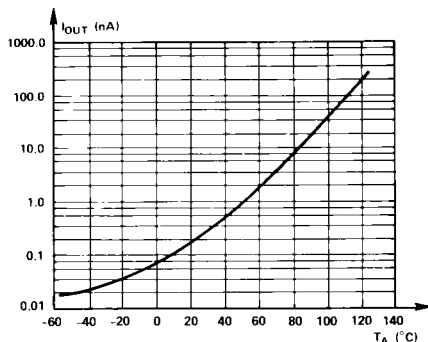
### 1. R<sub>ON</sub> vs. V<sub>S</sub>



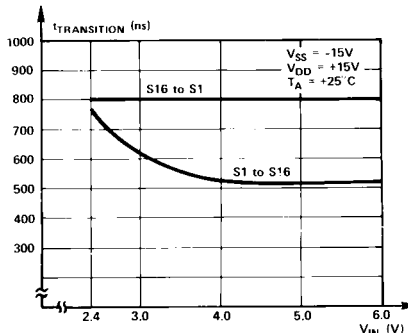
### 2. I<sub>OUT</sub> vs. V<sub>OUT</sub>



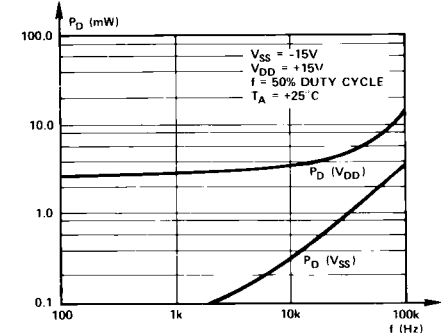
### 3. I<sub>OUT</sub> vs. T<sub>A</sub>



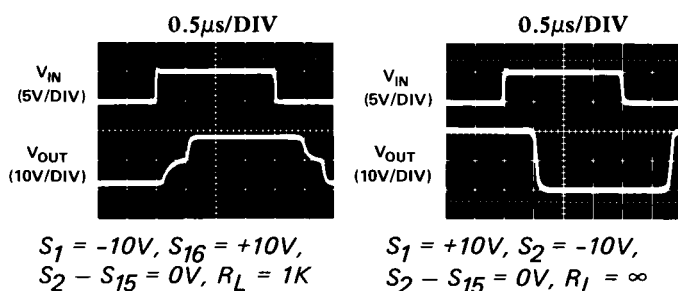
### 4. t<sub>TRANSITION</sub> vs. V<sub>IN</sub>



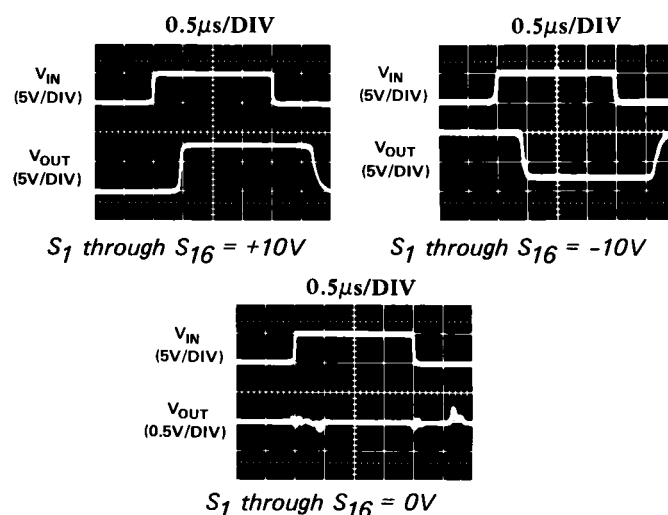
### 5. P<sub>D</sub> vs. Logic Frequency



### TEST CIRCUIT 1



### TEST CIRCUIT 2



Dimensions shown in inches and (mm).

Figure 1: Dimensions of the 16-Lead Plastic DIP. The diagram shows a top view and a side view of the component. The top view includes dimensions for the body width (0.55 inches / 13.97 mm and 0.53 inches / 13.47 mm), the lead pitch (0.105 inches / 2.67 mm), and the lead width (0.065 inches / 1.66 mm). The side view shows the lead height (0.175 inches / 4.45 mm) and the lead angle (15 degrees).

1 LEAD NO. 1 IDENTIFIED BY DOT OR NOTCH  
 CERDIP LEADS WILL BE EITHER TIN PLATED OR SOLDER DIPPED  
 IN ACCORDANCE WITH MIL-M-38510 REQUIREMENTS

[illegible]

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