



Monolithic CMOS Analog Multiplexers

General Description

Maxim's DG506A and DG507A are monolithic CMOS analog multiplexers. The DG506A is a single 16 channel (1 of 16) multiplexer, and the DG507A is a differential 8 channel (2 of 16) multiplexer.

Both devices feature break-before-make switching. Maxim guarantees that these multiplexers will not latch-up if the power supplies are turned off with the input signals still present as long as absolute maximum ratings are not violated. The multiplexers operate over a wide range of power supplies from $\pm 4.5V$ to $\pm 18V$.

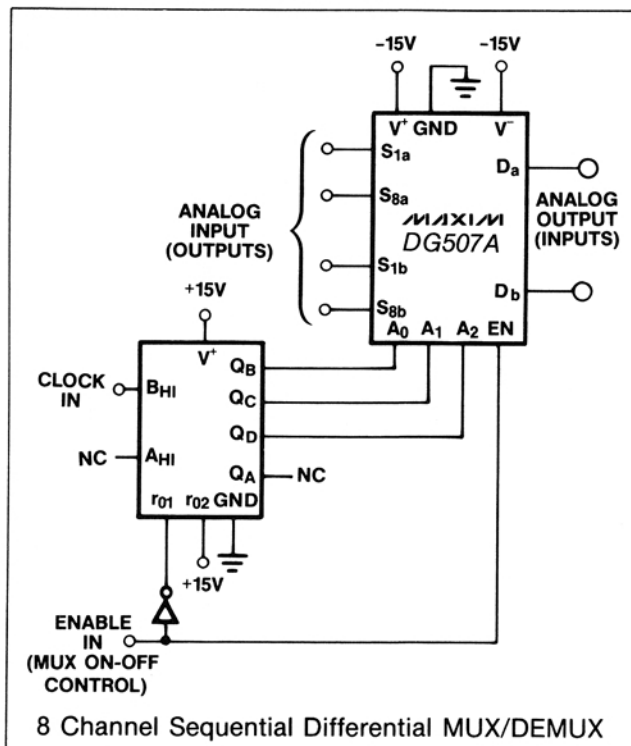
Compared to the original manufacturer's devices, Maxim's DG506A and DG507A consume significantly less power, making them ideal for portable equipment.

Maxim's DG506A and DG507A meet or exceed the specifications of, and are drop-in replacements for, Intersil's IH6116 and IH6216, Siliconix's DG506A and DG507A, and Harris' HI506 and HI507.

Applications

Control Systems
Data Logging Systems
Aircraft Heads Up Displays
Data Acquisition Systems
Signal Routing

Typical Operating Circuit



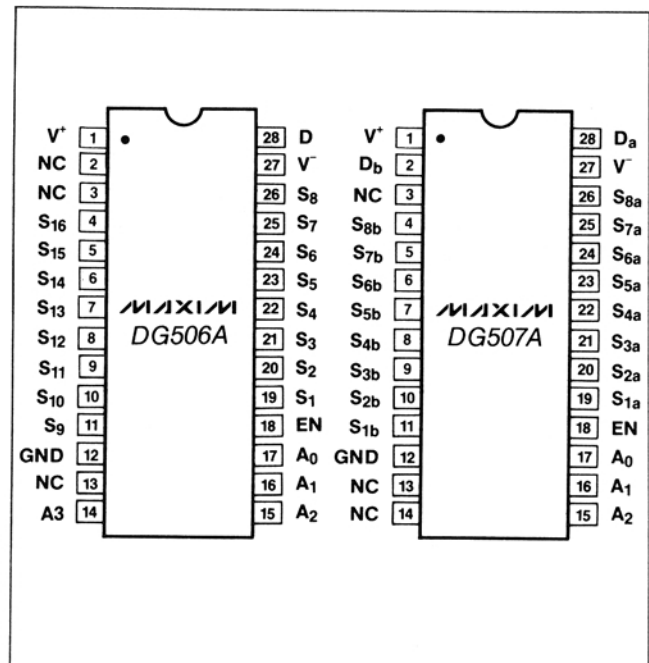
Features

- ◆ Improved 2nd Source!
- ◆ Pin compatible with Harris, Siliconix, Intersil
- ◆ Operable with $\pm 4.5V$ to $\pm 18V$ Supplies
- ◆ Symmetrical, Bi-Directional Operation
- ◆ Logic and Enable inputs, TTL and CMOS Compatible
- ◆ Latch-Up Proof Construction
- ◆ Monolithic, Low-Power CMOS Design

Ordering Information

PART	TEMP. RANGE	PACKAGE
DG506AAK	-55°C to +125°C	28 Lead Cerdip
DG506ABK	-20°C to +85°C	28 Lead Cerdip
DG506AC/D	0°C to +70°C	Dice
DG506ACJ	0°C to +70°C	28 Lead Plastic DIP
DG506ACK	0°C to +70°C	28 Lead Cerdip
DG506ACWI	0°C to +70°C	28 Lead Wide SO
DG507AAK	-55°C to +125°C	28 Lead Cerdip
DG507ABK	-20°C to +85°C	28 Lead Cerdip
DG507AC/D	0°C to +70°C	Dice
DG507ACJ	0°C to +70°C	28 Lead Plastic DIP
DG507ACK	0°C to +70°C	28 Lead Cerdip
DG507ACWI	0°C to +70°C	28 Lead Wide SO

Pin Configurations



Maxim Integrated Products 1

For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.

DG506A/DG507A

Monolithic CMOS Analog Multiplexers

ABSOLUTE MAXIMUM RATINGS

Voltage Referenced to V^-
 V^+ 44V
 GND 25V
 Digital Inputs V_S , V_D (Note 1) -2V to ($V^+ + 2V$) or 20mA, whichever occurs first.
 Current, Any Terminal Except S or D 30mA
 Continuous Current, S or D 20mA
 Peak Current, S or D
 (Pulsed at 1msec, 10% duty cycle max) 40mA
 Storage Temperature (A & B Suffix) -65°C to 150°C
 (C Suffix) -65°C to 125°C

Operating Temperature (A Suffix) -55°C to 125°C
 (B Suffix) -25°C to 85°C
 (C Suffix) 0°C to 70°C

Power Dissipation (Package)*
 28 Pin Ceramic DIP** 1200mW
 28 Pin Plastic DIP*** 625mW

*All leads soldered or welded to PC board.

**Derate 16mW/°C above 75°C

***Derate 8.3mW/°C above 75°C

Stresses listed under "Absolute Maximum Ratings" may be applied (one at a time) to devices without resulting in permanent damage. These are stress ratings only, and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum ratings conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS ($V^+ = 15V$, $V^- = -15V$, GND = 0V, $T_A = 25^\circ C$, unless otherwise indicated.)

PARAMETER	SYMBOL	TEST CONDITIONS		DG506AA DG507AA			DG506AB/C DG507AB/C			UNITS
				MIN (Note 2)	TYP (Note 3)	MAX	MIN (Note 2)	TYP (Note 3)	MAX	
SWITCH										
Analog Signal Range	V _{ANALOG}			-15		15	-15		15	V
Drain-Source ON Resistance	r _{DS(on)}	Sequence Each Switch On V _{AL} = 0.8V, V _{AH} = 2.4V, V _{EN} = 2.4V	V _D = 10V, I _S = -200μA	270	400		270	450	Ω	
			V _D = -10V, I _S = -200μA	230	400		230	450		
Greatest Change in Drain-Source ON Resistance Between Channels	Δr _{DS(on)}	$\Delta r_{DS(on)} = \left(\frac{r_{DS(on)}^{MAX} - r_{DS(on)}^{MIN}}{r_{DS(on)}^{AVE}} \right)$ -10V ≤ V _S ≤ 10V		6			6			%
Source OFF Leakage Current	I _{S(off)}	V _{EN} = 0.8V V _{AL} = 0.8V	V _S = 10V, V _D = -10V	-1	0.002	1	-5	0.002	5	nA
Drain OFF Leakage Current	I _{D(off)}		V _S = -10V, V _D = 10V	-1	-0.005	1	-5	-0.005	5	
			V _D = 10V, V _S = -10V	-10	0.02	10	-20	0.02	20	
			V _D = -10V, V _S = 10V	-10	-0.03	10	-20	-0.03	20	
			V _D = 10V, V _S = -10V	-5	0.007	5	-10	0.007	10	
			V _D = -10V, V _S = 10V	-5	-0.015	5	-10	-0.015	10	
Channel ON Leakage Current	I _{D(on)} ⁴	Sequence Each Switch On V _{AL} = 0.8V, V _{AH} = 2.4V, V _{EN} = 2.4V	V _{S(all)} = V _D = 10V	-10	0.03	10	-20	0.03	20	
		V _{S(all)} = V _D = -10V	-10	-0.06	10	-20	-0.06	20		
		V _{S(all)} = V _D = 10V	-5	0.015	5	-10	0.015	10		
		V _{S(all)} = V _D = -10V	-5	-0.03	5	-10	-0.03	10		
INPUT										
Address Input Current, Input Voltage High	I _{AH}	V _A = 2.4V		-10	-0.002		-10	-0.002		μA
		V _A = 15V			0.006	10		0.006	10	
Address Input Current, Input Voltage Low	I _{AL}	All V _A = 0	V _{EN} = 2.4V	-10	-0.002		-10	-0.002		
			V _{EN} = 0	-10	-0.002		-10	-0.002		

Monolithic CMOS Analog Multiplexers

ELECTRICAL CHARACTERISTICS (Continued)

($V^+ = 15V$, $V^- = -15V$, GND = 0V, $T_A = 25^\circ C$, unless otherwise indicated.)

PARAMETER	SYMBOL	TEST CONDITIONS	DG506AA DG507AA			DG506AB/C DG507AB/C			UNITS
			MIN (Note 2)	TYP (Note 3)	MAX	MIN (Note 2)	TYP (Note 3)	MAX	
DYNAMIC									
Switching Time Of Multiplexer	t _{transition}	See Figure 1		0.6	1	0.6		μs	
Break-Before-Make Interval	t _{open}	See Figure 3		0.2		0.2			
Enable Turn-ON Time	t _{on(EN)}	See Figure 2		1		1			
Enable Turn-OFF Time	t _{off(EN)}			0.4		0.4			
OFF Isolation ²	OIRR	V _{EN} = 0, R _L = 1kΩ, C _L = 15pF V _S = 7Vrms, f = 500kHz		68		68		dB	
Source OFF Capacitance		C _{S(off)}	V _{EN} = 0, f = 140kHz	V _S = 0		6	6		pF
Drain OFF Capacitance	DG506A	C _{D(off)}		V _D = 0		45	45		
	DG507A					23	23		
SUPPLY									
Positive Supply Current	I ⁺	V _{EN} = 0V or 5V, All V _A = 0		.13	.25	.13		.3	mA
Negative Supply Current	I ⁻			-.15	-.07	-.25		-.07	

Note 1: Signals on S_X , D_X , or IN_X exceeding V^+ or V^- will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

Note 2: The algebraic convention whereby the most negative value is a minimum, and the most positive value is a maximum, is used in this data sheet.

Note 3: Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

Note 4: $I_{D(\text{on})}$ is leakage from driver into "ON" switch.

Note 5: OFF isolation = $20 \log \frac{V_D}{V_S}$, V_S = input to "OFF" switch, V_D = output due to V_S .

DG506A/DG507A

Monolithic CMOS Analog Multiplexers

ELECTRICAL CHARACTERISTICS (Over Temperature)

($V^+ = 15V$, $V^- = -15V$, GND = 0V, T_A = Over Temperature Range, unless otherwise indicated.)

PARAMETER		SYMBOL	TEST CONDITIONS		DG506AA DG507AA		DG506AB/C DG507AB/C		UNITS	
					MIN (Note 2)	TYP (Note 3)	MAX	MIN (Note 2)		TYP (Note 3)
SWITCH										
Analog Signal Range		V _{ANALOG}			-15		15	-15	15	V
Drain-Source ON Resistance		r _{DS(on)}	Sequence Each Switch On V _{AL} = 0.8V, V _{AH} = 2.4V, V _{EN} = 2.4V	V _D = 10V, I _S = -200μA		500		550	Ω	
				V _D = -10V, I _S = -200μA		500		550		
Source OFF Leakage Current		I _{S(off)}	V _{EN} = 0.8V V _{AL} = 0.8V	V _S = 10V, V _D = -10V	-50		50	-50	50	nA
				V _S = -10V, V _D = 10V	-50		50	-50	50	
Drain OFF Leakage Current	DG506A	I _{D(off)}		V _D = 10V, V _S = -10V	-300		300	-300	300	
	DG507A			V _D = -10V, V _S = 10V	-300		300	-300	300	
				V _D = 10V, V _S = -10V	-200		200	-200	200	
				V _D = -10V, V _S = 10V	-200		200	-200	200	
Channel ON Leakage Current	DG506A	I _{D(on)} ⁴	V _{S(all)} = V _D = 10V	-300		300	-300	300		
	DG507A		V _{S(all)} = V _D = -10V	-300		300	-300	300		
			V _{S(all)} = V _D = 10V	-200		200	-200	200		
			V _{S(ALL)} = V _D = -10V	-200		200	-200	200		
INPUT										
Address Input Current, Input Voltage High		I _{AH}	V _A = 2.4V		-30		-30		μA	
			V _A = 15V		30		30			
Address Input Current, Input Voltage Low		I _{AL}	All V _A = 0	V _{EN} = 2.4V	-30		-30			
				V _{EN} = 0	30		30			

Note 1: Signals on S_X , D_X , or IN_X exceeding V^+ or V^- will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

Note 2: The algebraic convention whereby the most negative value is a minimum, and the most positive value is a maximum, is used in this data sheet.

Note 3: Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

Note 4: $I_{D(on)}$ is leakage from driver into "ON" switch.

Note 5: OFF isolation = $20 \log \frac{V_D}{V_S}$, V_S = input to "OFF" switch, V_D = output due to V_S .

Monolithic CMOS Analog Multiplexers

DG506A/DG507A

Truth Tables

DG506A

A ₃	A ₂	A ₁	A ₀	EN	ON SWITCH
X	X	X	X	0	NONE
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

DG507A

A ₂	A ₁	A ₀	EN	ON SWITCH
X	X	X	0	NONE
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

Logic "0" = $V_{AL} \leq 0.8V$, Logic "1" = $V_{AH} \geq 2.4V$
 "0" = DON'T CARE

Switching Time Test Circuit

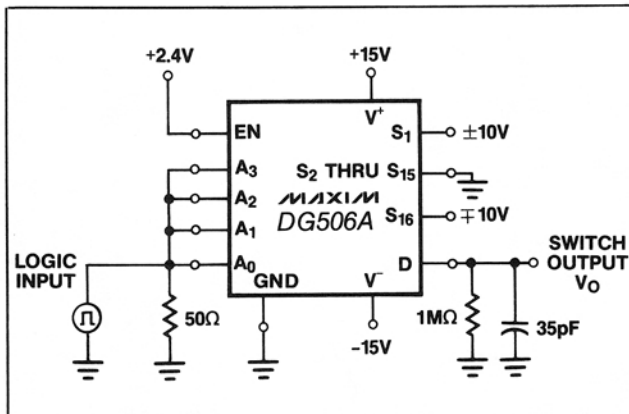


Figure 1A. Transition Switching Time

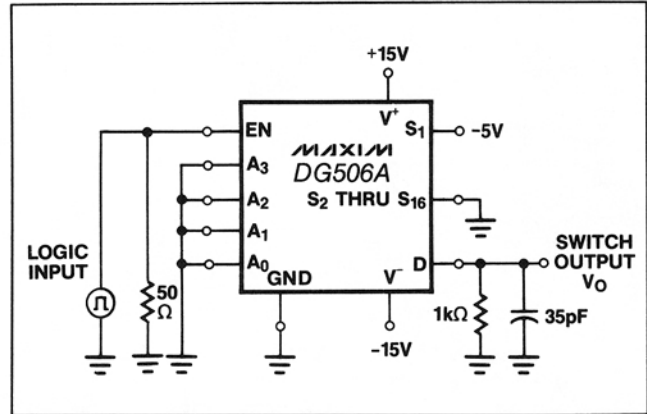


Figure 2A. Enable Switching Time

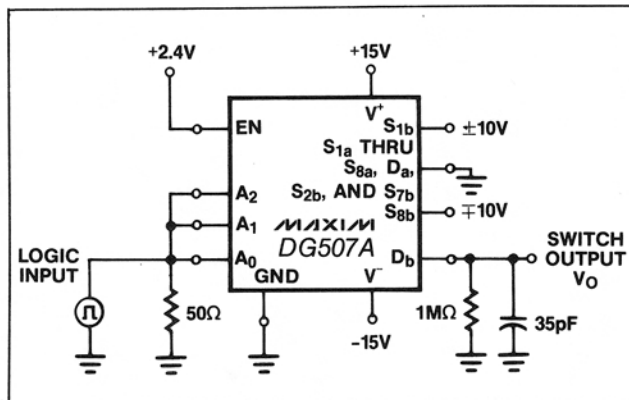


Figure 1B. Transition Switching Time

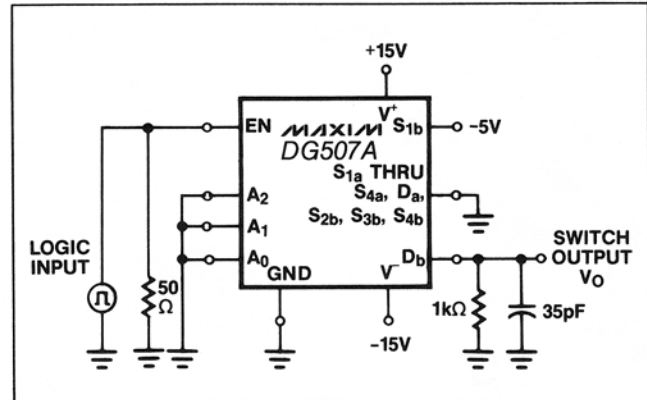


Figure 2B. Enable Switching Time

Monolithic CMOS Analog Multiplexers

Switching Time Test Circuit (continued)

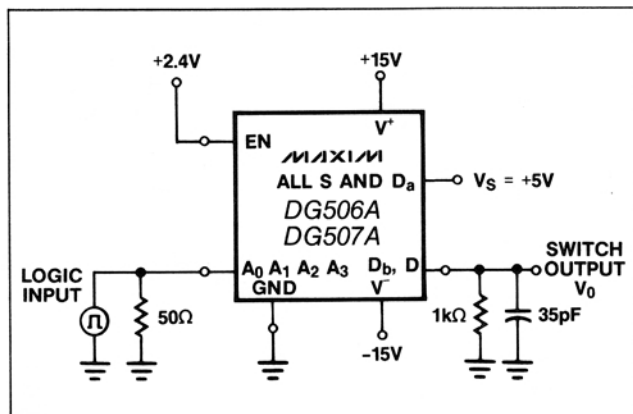


Figure 3. Break-Before-Make

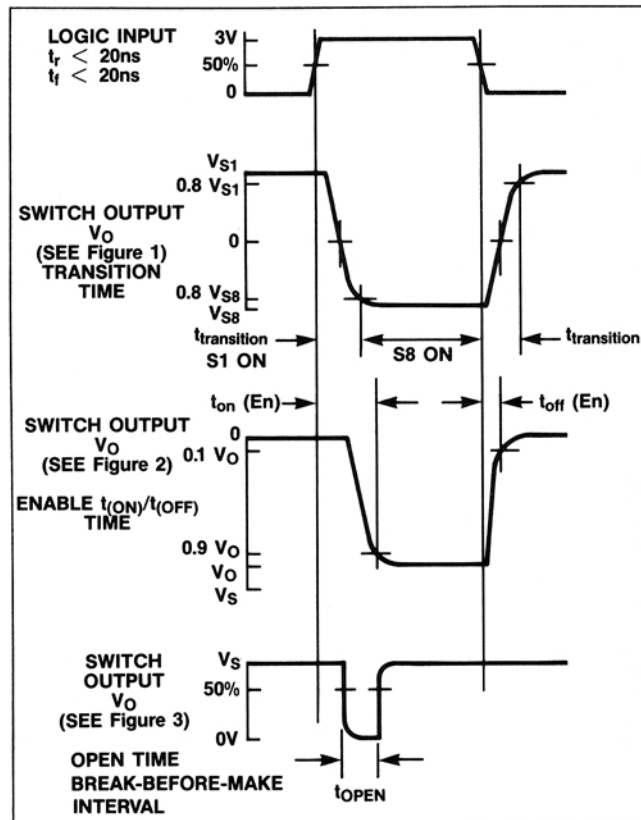
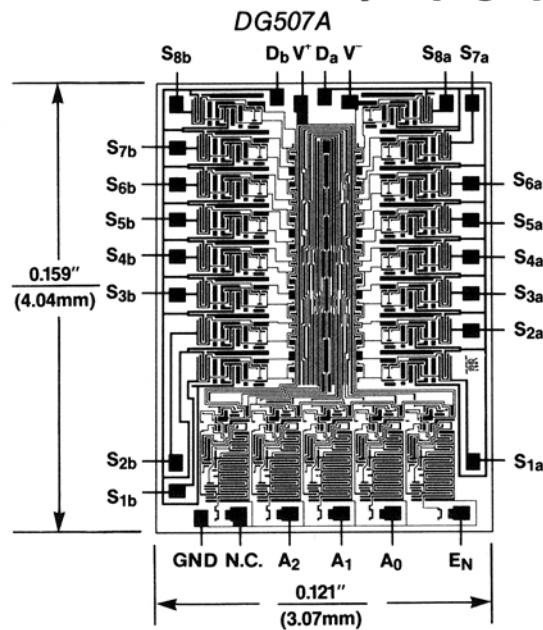
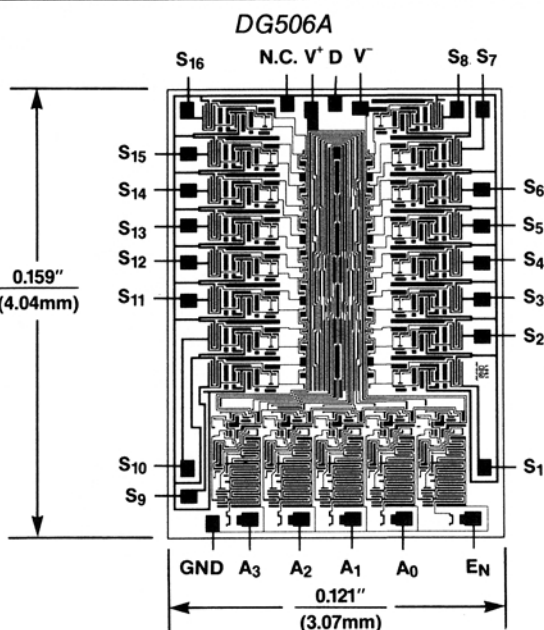


Figure 4. Timing Diagrams for Figures 1, 2, and 3

Chip Topography



Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.