

Monolithic CMOS Analog Multiplexers

General Description

Maxim's DG506A/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 $\pm 4.5\text{V}$ to $\pm 18\text{V}$.

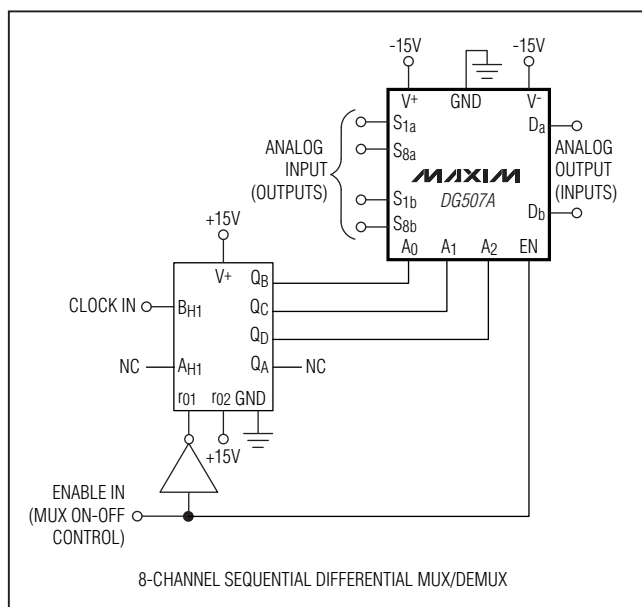
Compared to the original manufacturer's devices, Maxim's DG506A/DG507A consume significantly less power, making them ideal for portable equipment.

Maxim's DG506A/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

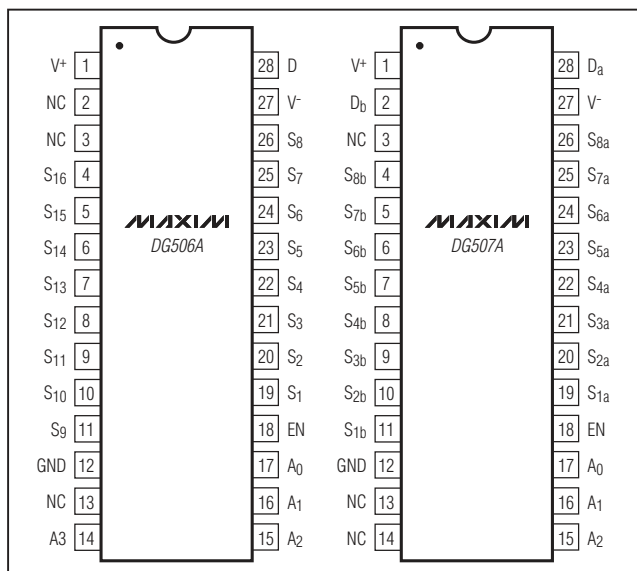
- ◆ Improved 2nd Source
- ◆ Pin Compatible with Harris, Siliconix, Intersil
- ◆ Operable with $\pm 4.5\text{V}$ to $\pm 18\text{V}$ Supplies
- ◆ Symmetrical, Bidirectional Operation
- ◆ Logic and Enable Inputs, TTL and CMOS Compatible
- ◆ Latch-Up Proof Construction
- ◆ Monolithic, Low-Power CMOS Design

Ordering Information

PART†	TEMP RANGE	PIN-PACKAGE
DG506AAK	-55°C to +125°C	28 CERDIP
DG506ABK	-25°C to +85°C	28 CERDIP
DG506AC/D	0°C to +70°C	Dice
DG506ACJ	0°C to +70°C	28 Plastic Dip
DG506ACK	0°C to +70°C	28 CERDIP
DG506ACWI	0°C to +70°C	28 Wide SO
DG506AMWI/PR	-55°C to +125°C	28 Wide SO
DG507AAK	-55°C to +125°C	28 CERDIP
DG507ABK	-25°C to +85°C	28 CERDIP
DG507AC/D	0°C to +70°C	Dice
DG507ACJ	0°C to +70°C	28 Plastic DIP
DG507ACK	0°C to +70°C	28 CERDIP
DG507ACWI	0°C to +70°C	28 Wide SO

†Devices are available in a lead(Pb)-free/RoHS-compliant package, specify lead-free by adding "+" to the part number when ordering.

Pin Configurations



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ABSOLUTE MAXIMUM RATINGS

(Voltages 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 1ms, 10% duty cycle max)... 40mA

Storage Temperature (A and B Suffix)..... -65°C to +150°C
 (C Suffix) -65°C to +125°C
 Operating Temperature Range (A Suffix) -55°C to +125°C
 (B Suffix) -25°C to +85°C
 (C Suffix) 0°C to +70°C
 Continuous Power Dissipation (Package)*
 28-Pin Ceramic DIP (derate 16.7mW/°C above +75°C).. 1333mW
 28-Pin Plastic DIP (derate 14.3mW/°C above +75°C)... 1143mW
 28-Pin Wide SO (derate 12.5mW/°C above +75°C).. 1000mW

*All leads soldered or welded to PCB.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(V⁺ = 15V, V⁻ = -15V, V_{GND} = 0V, T_A = +25°C, unless otherwise indicated.)

PARAMETER	SYMBOL	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-to-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	R _{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
			V _S = -10V, V _D = 10V	-1	-0.005	+1	-5	-0.005	+5	
Drain Off-Leakage Current	I _{D(OFF)}	DG506A, V _{EN} = 0.8V, V _{AL} = 0.8V	V _D = 10V, V _S = -10V	-10	0.02	+10	-20	0.02	+20	nA
			V _D = -10V, V _S = 10V	-10	-0.03	+10	-20	-0.03	+20	
		DG507A, V _{EN} = 0.8V, V _{AL} = 0.8V	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	

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ELECTRICAL CHARACTERISTICS (continued)

(V+ = 15V, V- = -15V, VGND = 0V, TA = +25°C, unless otherwise indicated.)

DG506A/DG507A

PARAMETER	SYMBOL	CONDITIONS		DG506AA DG507AA			DG506AB/C DG507AB/C			UNITS
				MIN (Note 2)	TYP (Note 3)	MAX	MIN (Note 2)	TYP (Note 3)	MAX	
Channel On-Leakage Current	ID(ON) (Note 4)	DG506A, sequence each switch on, VAL = 0.8V, VAH = 2.4V, VEN = 2.4V	VS(all) = VD = 10V	-10	0.03	+10	-20	0.03	+20	nA
			VS(all) = VD = -10V	-10	-0.06	+10	-20	-0.06	+20	
		DG507A, sequence each switch on, VAL = 0.8V, VAH = 2.4V, VEN = 2.4V	VS(all) = VD = 10V	-5	0.015	+5	-10	0.015	+10	
			VS(all) = VD = -10V	-5	-0.03	+5	-10	-0.03	+10	
INPUT										
Address Input Current, Input- Voltage High	IAH	VA = 2.4V		-10	-0.002		-10	-0.002		μA
		VA = 15V			0.006	10		0.006	10	
Address Input Current, Input- Voltage Low	IAL	All VA = 0V	VEN = 2.4V	-10	-0.002		-10	-0.002		μA
			VEN = 0V	-10	-0.002		-10	-0.002		
DYNAMIC										
Switching Time of Multiplexer	ttransition	Figure 1			0.6	1		0.06		μs
Break-Before- Make Interval	tOPEN	Figure 3			0.2			0.2		μs
Enable Turn- On Time	ton(EN)	Figure 2			1			1		μs
Enable Turn- Off Time	tOFF(EN)	Figure 2			0.4			0.4		μs
Off-Isolation (Note 5)	OIRR	VEN = 0V, RL = 1kΩ, CL = 15pF, VS = 7VRMS, f = 500kHz			68			68		dB
Source Off- Capacitance	CS(OFF)	VEN = 0V, f = 140kHz, VS = 0V			6			6		pF
Drain Off- Capacitance	CD(OFF)	VEN = 0V, f = 140kHz	DG506A, VD = 0V		45			45		pF
			DG507A, VD = 0V		23			23		
SUPPLY										
Positive Supply Current	I+	VEN = 0 or 5V, all VA = 0V			0.13	0.25		0.13	0.3	mA
Negative Supply Current	I-	VEN = 0 or 5V, all VA = 0V		-0.15	-0.07		-0.25	-0.07		

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DG506A/DG507A

ELECTRICAL CHARACTERISTICS (Overtemperature)

(V+ = 15V, V- = -15V, VGND = 0V, TA = overtemperature range, unless otherwise noted.)

PARAMETER	SYMBOL	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	VANALOG			-15		+15	-15		+15	V
Drain-to-Source On-Resistance	RDS(ON)	Sequence each switch on, VAL = 0.8V, VAH = 2.4V, VEN = 2.4V	VD = 10V, IS = -200μA			500			550	Ω
			VD = -10V, IS = -200μA			500			550	
Source Off-Leakage Current	IS(OFF)	VEN = 0.8V, VAL = 0.8V	VS = 10V, VD = -10V	-50		+50	-50		+50	nA
			VS = -10V, VD = 10V	-50		+50	-50		+50	
Drain Off-Leakage Current	ID(OFF)	DG506A, VEN = 0.8V, VAL = 0.8V	VD = 10V, VS = -10V	-300		+300	-300		+300	nA
			VD = -10V, VS = 10V	-300		+300	-300		+300	
		DG507A, VEN = 0.8V, VAL = 0.8V	VD = 10V, VS = -10V	-200		+200	-200		+200	
			VD = -10V, VS = 10V	-200		+200	-200		+200	
Channel On-Leakage Current	ID(ON) (Note 4)	DG506A, sequence each switch on, VAL = 0.8V, VAN = 2.4V, VEN = 2.4V	VS(all) = VD = 10V	-300		+300	-300		+300	nA
			VS(all) = VD = -10V	-300		+300	-300		+300	
		DG507A, sequence each switch on, VAL = 0.8V, VAN = 2.4V, VEN = 2.4V	VS(all) = VD = 10V	-200		+200	-200		+200	
			VS(all) = VD = -10V	-200		+200	-200		+200	
INPUT										
Address Input Current, Input-Voltage High	IAH	VA = 2.4V		-30			-30			μA
		VA = 15V				30		30		
Address Input Current, Input-Voltage Low	IAL	All VA = 0V	VEN = 2.4V	-30			-30			μA
			VEN = 0V				30		30	

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ELECTRICAL CHARACTERISTICS (Overtemperature) (continued)

(V+ = 15V, V- = -15V, VGND = 0V, TA = over temperature range, unless otherwise noted.)

- Note 1:** Signals on S_X, D_X, or I_{NX} 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 = 20log x V_O/V_S, V_S = input to off switch, V_D = output due to V_S.

Truth Tables

A3	A2	A1	A0	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

A2	A1	A0	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

Note: Logic "0" = V_{AL} ≤ 0.8V, Logic "1" = V_{AH} ≥ 2.4V, "0" = Don't Care.

Switching Time Test Circuits

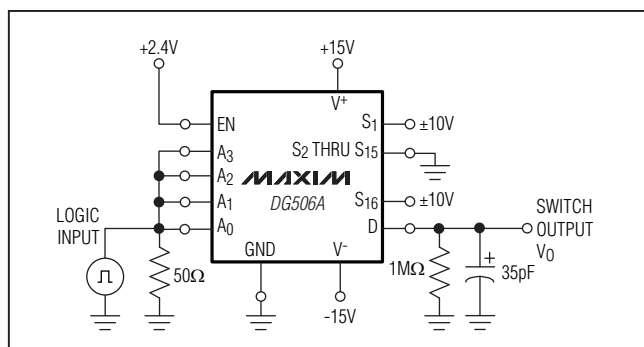


Figure 1a. Transition Switching Time

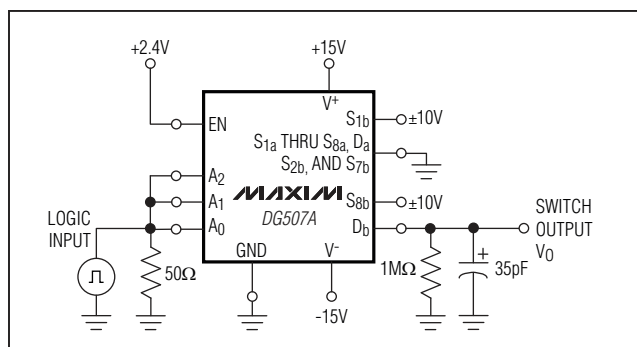


Figure 1b. Transition Switching Time

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Switching Time Test Circuits (continued)

DG506A/DG507A

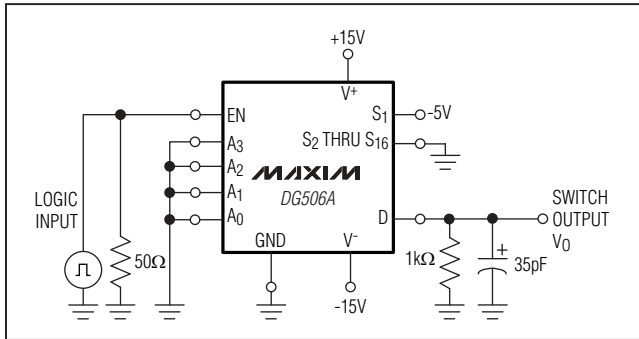


Figure 2a. Enable Switching Time

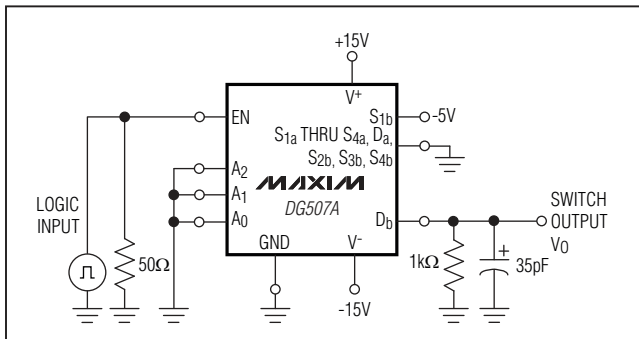


Figure 2b. Enable Switching Time

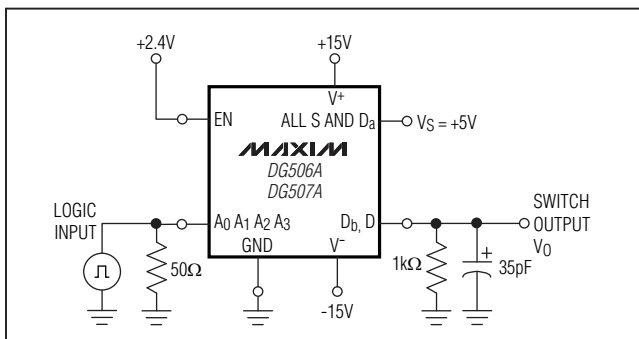


Figure 3. Break-Before-Make

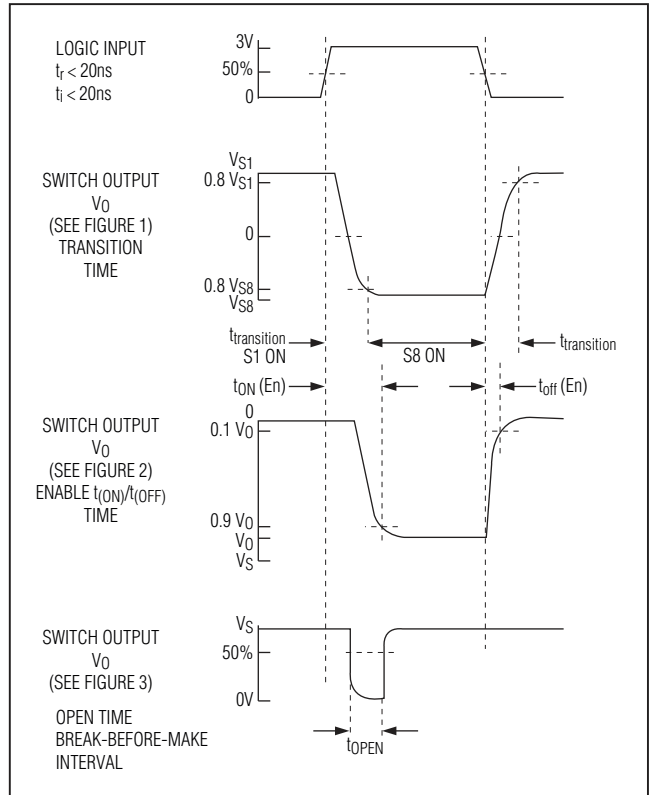


Figure 4. Timing Diagrams for Figures 1, 2, and 3

Package Information

For the latest package outline information and land patterns, go to www.maxim-ic.com/packages.

PACKAGE TYPE	PACKAGE CODE	DOCUMENT NO.
28 CERDIP	J28-2	21-0046
28 Plastic DIP	P28-2	21-0044
28 Wide SO	W28-5	21-0042

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Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/92	Initial release	—
1	1/99	Updated to Word format.	1-7
2	5/09	Added ruggedized plastic part.	1-4, 7

DG506A/DG507A

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