



DG548/549

8-Channel and Dual 4-Channel CMOS Analog Multiplexers with Overvoltage Protection

T-51-11

FEATURES

- Analog/Digital Overvoltage Protection
- Fail Safe With Power Loss (No Latchup)
- Break-Before-Make Switching
- TTL and CMOS Compatible Inputs

BENEFITS

- Improved Ruggedness
- Power Loss Protected
- Prevents Adjacent Channel Crosstalk
- Standard Logic Interface

APPLICATIONS

- Data Acquisition Systems
- Industrial Process Control
- Avionics Test Equipment
- High Rel Control Systems

DESCRIPTION

The DG548 and DG549 are dielectrically isolated 8- and 4-channel analog multiplexers, respectively, incorporating overvoltage protection. They withstand analog input voltages greater than the supplies. This is advantageous in systems where the analog inputs originate outside the equipment. The DG548/DG549 can withstand continuous inputs up to 10 volts greater than either supply, which eliminates the possibility of damage when supplies are lost, while input signals are still present. These multiplexers can withstand brief input transient spikes of several hundred volts which otherwise

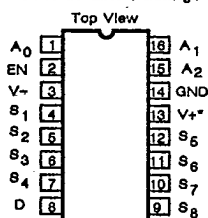
would require complex external protection networks. Necessarily, ON resistance is higher than the DG508A/DG509A but very low leakage currents combine to produce low errors.

The DG548 and DG549 are pin compatible with the industry-standard DG508A and DG509A multiplexers.

The DG548 and DG549 are offered in 16-pin plastic and CerDIP packages for operation over the commercial, C suffix (0 to 70°C) and military, A suffix (-55 to 125°C) temperature ranges.

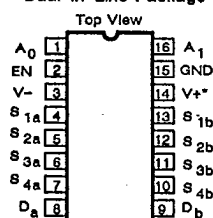
PIN CONFIGURATION

Dual-In-Line Package



Order Numbers:
 DG548AK, DG548BK
 DG548CK, DG548CJ

Dual-In-Line Package



Order Numbers:
 DG549AK, DG549BK
 DG549CK, DG549CJ

Preliminary

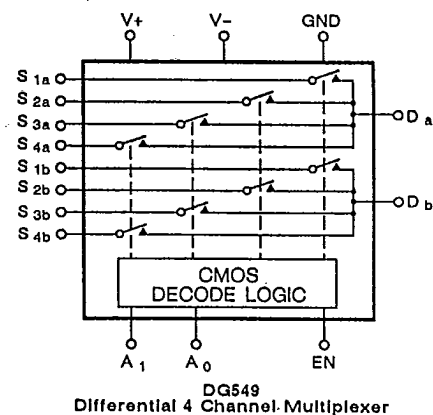
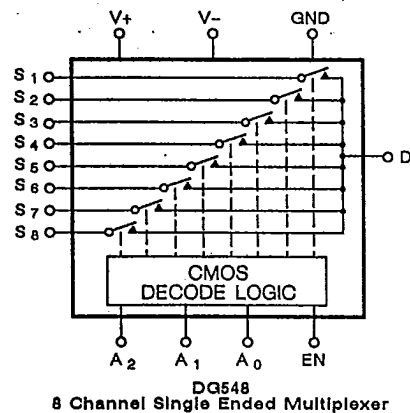
5-369

8254735 SILICONIX INC

03E 12398 D

DG548/549**FUNCTIONAL BLOCK DIAGRAM**

T-51-11

**ABSOLUTE MAXIMUM RATINGS**

Voltage Referenced to V-

V+ 44 V

GND 25 V

VEN, VA, Digital Input (V-) -4 V to (V+) +4 V

VS, Analog Input Overvoltage with Power ON
..... (V-) -20 V to (V+) +20 VVS, Analog Input Overvoltage with Power OFF
..... -35 V to +35 V

Continuous Current, S or D 20 mA

Peak current, S or D
(Pulsed at 1 ms, 10% duty cycle max) 40 mAOperating Temperature (A Suffix) -55 to 125°C
(C Suffix) 0 to 70°CStorage Temperature (A Suffix) -65 to 150°C
(C Suffix) -65 to 125°C

Power Dissipation (Package)*

16-Pin Ceramlo DIP** 900 mW

16-Pin Plastro DIP*** 600 mW

* All leads soldered or welded to PC board.

** Derate 12 mW/°C above 75°C.

*** Derate 6.3 mW/°C above 25°C.

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. Exposure to absolute maximum ratings conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS^a

PARAMETER	SYMBOL	Test Conditions Unless Otherwise Specified: V+ = 15 V, V- = -15 V GND = 0 V V _{AH} = 4.0 V, V _{AL} = 0.8 V	LIMITS						UNIT
			1=25°C 2=125,70°C 3=-55,-0°C		A SUFFIX -55 to 125°C		C SUFFIX 0 to 70°C		
			TEMP	TYP ^d	MIN ^b	MAX ^b	MIN ^b	MAX ^b	
			SWITCH						
Analog Signal Range °	V _{ANALOG}		1,2,3		-15	15	-15	15	V
ON Resistance [®]	r _{DS(ON)}	V _D = ±10 V, I _D = -100 μA	1 2,3	1.2		1.5 1.8		1.8 2.0	kΩ
r _{DS(ON)} Match Between Channels ^f	Δ r _{DS(ON)}	V _S = 0 V, I _D = -100 μA	1	6					%

5-370

Preliminary

8254735 SILICONIX INC

03E 12399 D

**DG548/549****ELECTRICAL CHARACTERISTICS ^a**

T-51-11

PARAMETER	SYMBOL	Test Conditions Unless Otherwise Specified: V ₊ = 15 V, V ₋ = -15 V GND = 0 V V _{AH} = 4.0 V, V _{AL} = 0.8 V	LIMITS								UNIT
			1=25°C 2=125,70°C 3=-55,-0°C		A SUFFIX -55 to 125°C		C SUFFIX 0 to 70°C				
			TEMP	TYP ^d	MIN ^b	MAX ^b	MIN ^b	MAX ^b			
SWITCH (Cont'd)											
Source OFF Leakage Current	I _{S(OFF)}	V _{EN} = 0 V	V _S = ±10 V V _D = ∓10 V	1 2,3	0.03	-0.5 -50	0.5 50	-0.5 -50	0.5 50	nA	
Drain OFF Leakage Current	DG548		I _{D(OFF)}	V _D = ±10 V V _S = ∓10 V	1 2,3	1	-5 -250	5 250	-5 -250		5 250
	DG549			V _D = ±10 V V _S = ∓10 V	1 2,3	0.5	-2.5 -125	2.5 125	-2.5 -125		2.5 125
I _{D(OFF)} with Input Overvoltage Applied	I _{DOV}	Analog Overvoltage = ±33 V (See Figure 1)		1 2,3	4	-20 -2000	20 2000	-20 -2000	20 2000		
Differential OFF Drain Leakage Current	I _{DIFF}	DG549 Only		1,2,3		-50 50	50 -50	-50 50	50 -50		
Drain ON Leakage Current	DG548	I _{D(ON)}	V _S = V _D = ±10 V	Sequence Each Switch ON V _{AL} = 0.8 V V _{AH} = 2.4 V	1 2,3	0.1	-1 -250	1 250	-1 -250	1 250	
	DG549				1 2,3	0.05	-0.5 -125	0.5 125	-0.5 -125	0.5 125	
INPUT											
Input LOW Threshold	V _{AL}			1,2,3			0.8		0.8	V	
Input HIGH Threshold	V _{AH}			1,2,3		2.4		2.4			
Logic Input Current	I _A	V _A = 2.4 V or 0.8 V		1,2,3		-1	1	-1	1	μA	
DYNAMIC											
Access Time	t _A	See Figure 2		1	0.5		1		1	μs	
Break-Before-Make Interval	t _{OPEN}	See Figure 3		1	80	25		25		ns	
Enable Delay Turn ON Time	t _{ON(EN)}	See Figure 4		1 2,3	300		500 1000		500 1000		
Enable Delay Turn OFF Time	t _{OFF(EN)}			1 2,3	300		500 1000		500 1000		
Settling Time	t _s	0.1 %		1	1.2					μs	
		0.025%		1	3.5						
OFF Isolation		V _{EN} = 7 V, R _L = 1 kΩ C _L = 3 pF, V _S = 3 V _{RMS} f = 500 kHz		1	68					dB	
Logic Input Capacitance	C _{in}	f = 1 MHz		1	5					pF	

Preliminary

5-371

DG548/549**B** Siliconix
incorporated**ELECTRICAL CHARACTERISTICS^a**

T-51-11

1-51-11

PARAMETER	SYMBOL	Test Conditions Unless Otherwise Specified: $V_+ = 15\text{ V}$, $V_- = -15\text{ V}$ $GND = 0\text{ V}$ $V_{AH} = 4.0\text{ V}$, $V_{AL} = 0.8\text{ V}$	LIMITS						UNIT
			1=25°C		2=125, 85°C		3=-55, -40°C		
			TEMP	TYP ^d	MIN ^b	MAX ^b	MIN ^b	MAX ^b	
DYNAMIC (Cont'd)									
Source OFF Capacitance	$C_{S(OFF)}$		1	5					pF
Drain OFF Capacitance	DG548	$C_{D(OFF)}$	1	25					
	DG549		1	12					
ON State Input Capacitance	DG548	$C_{S(ON)}$	1	30					
	DG549		1	17					
Positive Supply Current	I_+	$V_{EN} = \text{HIGH or LOW}$ $V_A = 0\text{ V}$	1,2,3	0.5		2.0		2.0	mA
Negative Supply Current	I_-		1,2,3	-0.02	-1		-1		

NOTES

NOTES:

- a. Refer to PROCESS OPTION FLOWCHART for additional information.
b. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
c. Guaranteed by design, not subject to production test.
d. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

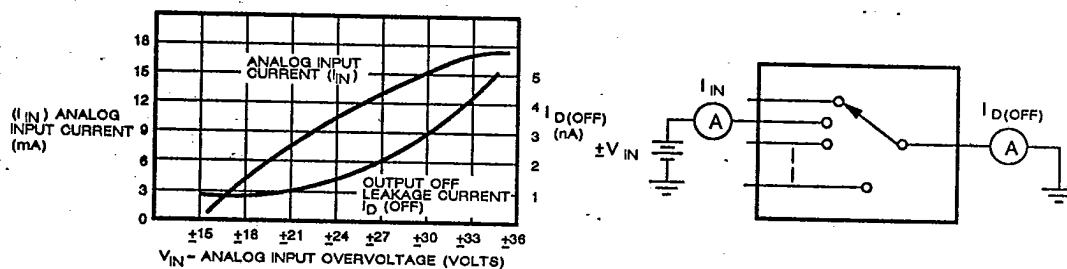
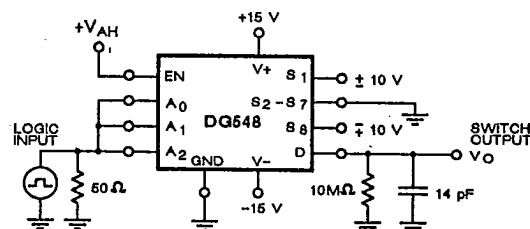
SWITCHING TIME TEST CIRCUITS

Figure 1. Analog Input Overvoltage Characteristics

**DG548/549****SWITCHING TIME TEST CIRCUITS (Cont'd)**

T-51-11



* Similar Connection for DG549

Figure 2. Access Time vs. Logic Level (Hlgh)

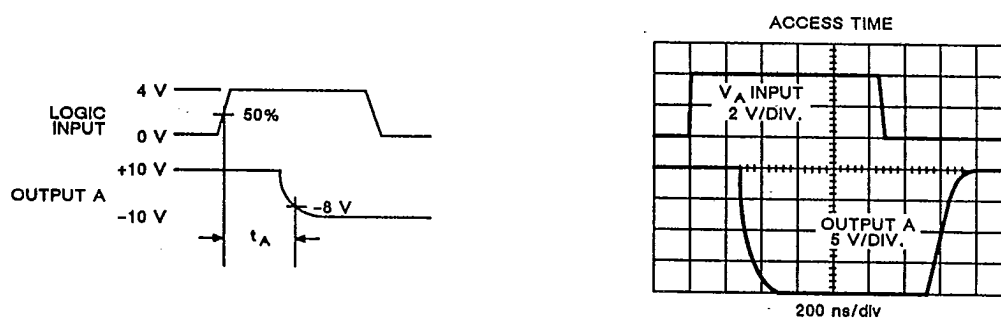
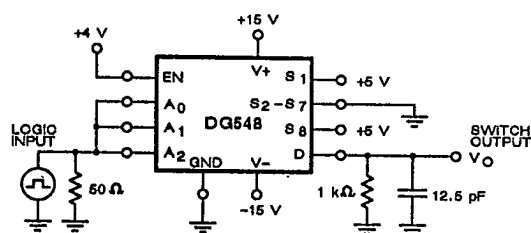


Figure 3. Access Time



* Similar Connection for DG549

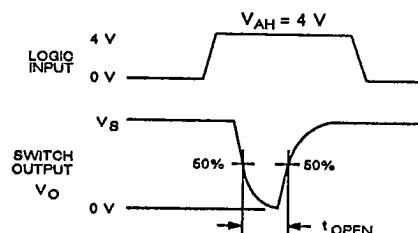


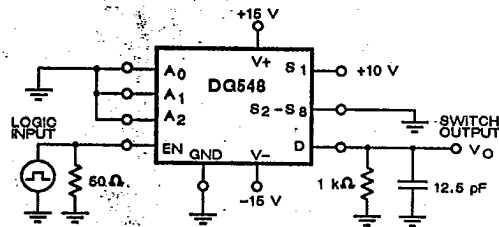
Figure 4. Break-Before-Make Delay

Preliminary

5-373

DG548/549**B** Siliconix Incorporated**SWITCHING TIME TEST CIRCUITS (Cont'd)**

T-51-11



* Similar Connection for DG549

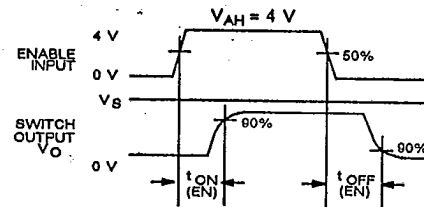


Figure 5. Enable Delay

TRUTH TABLES**DG548**

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

DG549

A ₁	A ₀	EN	ON SWITCH
X	X	0	NONE
0	0	1	1
0	1	1	2
1	0	1	3
1	1	1	4

Logic "0" = $V_{AL} \leq 0.8$ Logic "1" = $V_{AH} \geq 2.4$ V