

DG243

Monolithic General Purpose CMOS Analog Switch

T-51-11

FEATURES

- PLUS-40 Process
- Make-Before-Break Operation
- Full Rail-to-Rail Analog Signal Range
- True TTL Compatibility

BENEFITS

- Reduced Power Supply Considerations
- Reduced Switching Noise
- Reduced Need for Buffers
- Pull-Up Resistors Not Required

APPLICATIONS

- Programmable Gain Amplifiers
- Analog Multiplexing
- Servo Control Systems

DESCRIPTION

The DG243 is a monolithic dual SPDT analog switch designed for general switching applications in communication, instrumentation, and process control systems. Featuring make-before-break action, the DG243 can be used in closed loop systems to switch gain or bandwidth networks without opening the loop.

The DG243 is designed on the Siliconix PLUS-40 CMOS process to combine low power dissipation

with a high breakdown voltage rating of 40 V. An epitaxial layer prevents latchup.

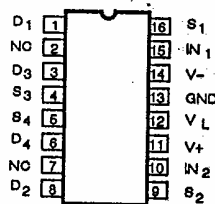
Each switch conducts equally well in both directions when ON, and blocks up to 30 Volts peak-to-peak when OFF. ON resistance is fairly flat over the full ± 15 V analog signal range.

Packaging for this device includes a 16-pin CerDIP and plastic options. Performance grades include military, A suffix (-55 to 125°C) and commercial, C suffix (0 to 70°C) temperature ranges.

PIN CONFIGURATION

FUNCTIONAL BLOCK DIAGRAM

Dual-In-Line Package

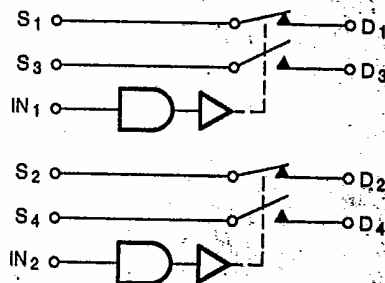


Top View

Order Numbers:

CerDIP: DG243AK, DG243AK/883

Plastic: DG243CK, DG243CJ



Two SPST Switches per Package*

Truth Table

LOGIC	SW1 SW2	SW3 SW4
0	OFF	ON
1	ON	OFF

Logic "0" ≤ 0.8 V
Logic "1" ≥ 2.0 V

*Switches Shown for Logic "1" Input

DG243



ABSOLUTE MAXIMUM RATINGS

T-51-11

Voltages referenced to V-

V+ 44 V

V_L (GND -0.3 V) to 44 V

GND 25 V

Digital Inputs^a V_S, V_D -2 V to (V+ +2V) or
..... 30 mA, whichever occurs first

Current, Any Terminal Except S or D 30 mA

Continuous Current, S or D 30 mA

Peak Current, S or D

(Pulsed at 1 ms, 10% duty cycle max) 100 mA

Storage Temperature (A Suffix) -65 to 150°C
(C Suffix) -65 to 125°C

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

Power Dissipation^a

16-Pin CerDIP^{a*} 900 mW

16-Pin Plastic DIP^{a**} 450 mW

* All leads soldered or welded to PC board.

** Derate 12 mW/°C above 75°C.

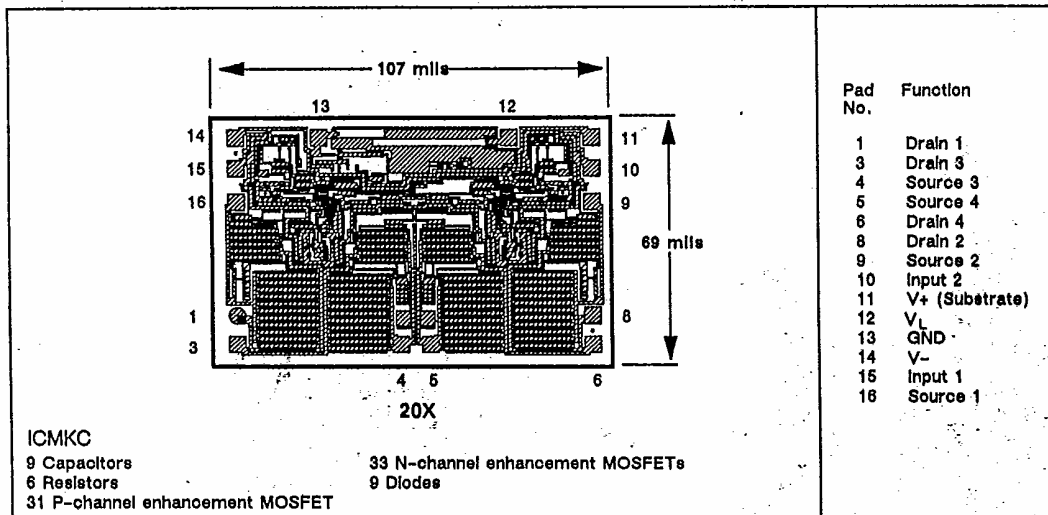
*** Derate 6 mW/°C above 75°C.

ELECTRICAL CHARACTERISTICS ^a										
PARAMETER	SYMBOL	Test Conditions Unless Otherwise Specified: V ₊ = +15 V V ₋ = -15 V GND = 0 V _L = 5 V	LIMITS						UNIT	
			1=25°C 2=125,85,70°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 ^o	V _{ANALOG}		1,2,3		-15	15	-15	15	V	
Drain-Source ON Resistance	r _{DS(ON)}	V _D = ± 10 V I _S = 10 mA	1,3 2	30		50 75		50 75	Ω	
Source OFF Leakage Current	I _{S(OFF)}	V _S = 14 V V _D = -14 V	1 2	0.2		1 100		1 100	nA	
		V _S = -14 V V _D = 14 V	1 2	-0.3	-1 -100		-1 -100			
Drain OFF Leakage Current	I _{D(OFF)}	V _S = -14 V V _D = 14 V	1 2	0.17		1 100		1 100		
		V _S = 14 V V _D = -14 V	1 2	-0.35	-1 -100		-1 -100			
Drain ON Leakage Current	I _{D(ON)}	V _S = V _D = 14 V	1 2	0.05		2 200		2 200		
		V _S = V _D = -14 V	1 2	-0.04	-2 -200		-2 -200			
INPUT										
Input Current with Input Voltage HIGH	I _{INH}	V _{IN} = 2.0 V	1 2	-0.01	-1 -1	1 1	-1 -1	1 1	μA	
Input Current with Input Voltage LOW	I _{INL}	V _{IN} = 0.8 V	1 2	-0.005	-1 -1	1 1	-1 -1	1 1		

ELECTRICAL CHARACTERISTICS ^a									
PARAMETER	SYMBOL	Test Conditions Unless Otherwise Specified: V ₊ = +15 V V ₋ = -15 V GND = 0 V _L = 5 V	LIMITS						UNIT
			1=25°C 2=125,85,70°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	
DYNAMIC									
Turn-ON Time	t _{ON}	See Switching Time Test Circuit	1	250		500		700	ns
Turn-OFF Time	t _{OFF}		1	390		1000		1200	
Charge Injection	Q	C _L = 1000 pF, V _{gen} = 0 V R _{gen} = 0 Ω	1	60					pC
Source-OFF Capacitance	C _{S(OFF)}	V _D = V _S = 0 V V _{IN} = 0 V f = 1 MHz	1	15					pF
Drain-OFF Capacitance	C _{D(OFF)}		1	17					
Channel ON Capacitance	C _{D(ON)} + C _{S(ON)}		1	45					
OFF Isolation ^e		V _{IN} = 5 V, Z _L = 75 Ω	1	75					dB
Crosstalk (Channel-to-Channel)		V _S = 2.0 V, f = 1MHz	1	89					
SUPPLY									
Positive Supply Current	I ₊	All Channels ON or OFF	1	180		300		300	μA
Negative Supply Current	I ₋		1	-150	-300		-300		
Logio Supply Current	I _L		1	100		300		300	
Ground Supply Current	I _{GND}		1	-140	-300		-300		

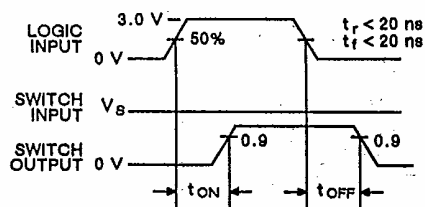
NOTES:

- 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.
e. V_{IN} = input voltage to perform proper function.
For Logio *1* - V_{INH} = 2.0 V
For Logio *0* - V_{INL} = 0.8 V

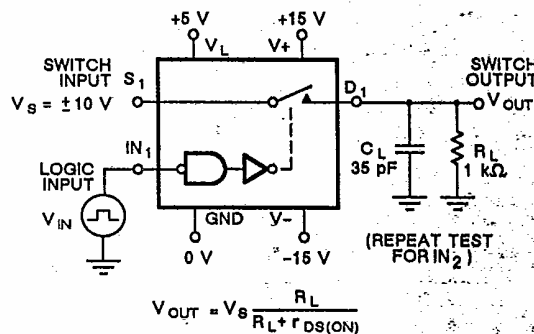


SWITCHING TIME TEST CIRCUIT

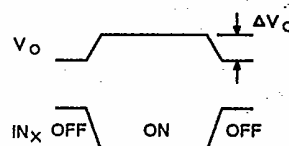
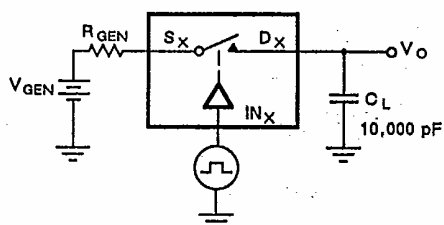
Switch output waveform shown for $V_S = \text{constant}$ with logic input waveform as shown. Note that V_S may be + or - as per switching time test circuit. V_O is the steady state output with switch ON. Feedthrough via gate capacitance may result in spikes at leading and trailing edge of output waveform.



NOTE: Logic input waveform is inverted for switches that have the opposite logic sense control.



CHARGE INJECTION TEST CIRCUIT



ΔV_O = measured voltage error due to charge injection.
The charge injection in coulombs is $\Delta Q = C_L \times \Delta V_O$.

