

Vishay Siliconix

Quad SPST CMOS Analog Switches

APPLICATIONS

- Audio switching
- Battery powered systems
- Data acquisition
- Sample-and-hold circuits
- Telecommunication systems
- Automatic test equipment
- Single supply circuits
- · Hard disk drives

DESCRIPTION

The DG444, DG445 monolithic quad analog switches are designed to provide high speed, low error switching of analog signals. The DG444 has a normally closed function. The DG445 has a normally open function. Combining low power (22 nW, typ) with high speed (t_{ON} : 120 ns, typ.), the DG444, DG445 are ideally suited for upgrading DG211, DG212 sockets. Charge injection has been minimized on the drain for use in sample-and-hold circuits.

To achieve high-voltage ratings and superior switching performance, the DG444, DG445 are built on Vishay Siliconix's high-voltage silicon-gate process. An epitaxial layer prevents latchup.

Each switch conducts equally well in both directions when on, and blocks input voltages to the supply levels when off.

FEATURES

- Low on-resistance: 50 Ω
- Low leakage: 80 pA
- Low power consumption: 22 nW
- Fast switching action t_{ON}: 120 ns
- Low charge injection
- DG211, DG212 upgrades
- TTL/CMOS logic compatible

BENEFITS

- · Low signal errors and distortion
- Reduced power supply requirements
- Faster throughput
- Improved reliability
- Reduced pedestal errors
- Simple interfacing

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



TRUTH TABLE						
Logic	DG444	DG445				
0	On	Off				
1	Off	On				

Logic "0" ≤ 0.8 V Logic "1" ≥ 2.4 V

ORDERING INFORMATION					
Temp. Range Package Part Number					
- 40 °C to 85 °C	16-pip plastic DIP	DG444DJ			
	TO-pill plastic Dil	DG445DJ			
	16 pip parrow SOIC	DG444DY			
	10-pin harlow 3010	DG445DY			

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ABSOLUTE MAXIMUM RATINGS ($T_A = 25 \text{ °C}$, unless otherwise noted)						
Parameter		Limit	Unit			
V+ to V-		44				
GND to V-		25				
VL		(GND - 0.3) to (V+) + 0.3	V			
Digital Inputs ^a , V _S , V _D		(V-) - 2 to (V+) + 2 or 30 mA, whichever occurs first				
Continuous Current (Any Terminal)		30	m۸			
Current, S or D (Pulsed at 1 ms, 10 °	% Duty Cycle)	100	ША			
Storage Temperature		- 65 to 125	°C			
	16-Pin Plastic DIP ^c	450	m\\/			
Power Dissipation (Package)	16-Pin Narrow Body SOIC ^d	640	11100			

Notes:

a. 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. b. All leads welded or soldered to PC board.

c. Derate 6 mW/°C above 75°C.

d. Derate 8 mW/°C above 75°C.

SPECIFICATIONS for Dual Supplies								
		Test Conditions Unless Otherwise Specified			D Suffix - 40 °C °C to 85 °C			
Parameter	Symbol	$V_{\rm L} = 15 \text{ V}, V_{\rm I} = -15 \text{ V}$ $V_{\rm L} = 5 \text{ V}, V_{\rm IN} = 2.4 \text{ V}, 0.8 \text{ V}^{\rm e}$		Temp. ^a	Min. ^b	Typ. ^c	Max. ^b	Unit
Analog Switch								
Analog Signal Range ^d	V _{ANALOG}			Full	- 15		15	V
Drain-Source On-Resistance	R _{DS(on)}	I _S = - 10 mA, V _D = ± 8.5 V V+ = 13.5 V V- = - 13.5 V		Room Full		50	85 100	Ω
Switch Off Leakage Current	I _{S(off)}	V+ = 16.5, V- = - 16.5 V		Room Full	- 0.5 - 5	± 0.01	0.5 5	
Switch On Leakage Current	I _{D(off)}	$V_D = \pm 15.5 \text{ V}, \text{ V}_S = \pm 15.5 \text{ V}$		Room Full	- 0.5 - 5	± 0.01	0.5 5	nA
Channel On Leakage Current	I _{D(on)}	V+ = 16.5 V, V- = - 16.5 V V _S = V _D = ± 15.5 V		Room Full	- 0.5 - 10	± 0.08	0.5 10	
Digital Control								
Input Current V _{IN} Low	I _{IL}	V _{IN} under test = 0.8 V All Other = 2.4 V		Full	- 500	- 0.01	500	۳A
Input Current V _{IN} High	I _{IH}	V _{IN} under test = 2.4 V All Other = 0.8 V	V _{IN} under test = 2.4 V All Other = 0.8 V		- 500	0.01	500	
Dynamic Characteristics								
Turn-On Time	t _{ON}	$B_1 = 1 \text{ k}\Omega_2 C_1 = 35 \text{ pF}$		Room		120	250	
Turn-Off Time	torr	$V_{s} = \pm 10$ V. See Figure 2	$V_{c} = \pm 10$ V See Figure 2 DG444			110	140	ns
	-0FF	3 - , 3	DG445	Room		160	210	
Charge Injection ^e	Q	$C_L = 1 \text{ nF}, V_S = 0 \text{ V}$ $V_{gen} = 0 \text{ V}, \text{ R}_{gen} = 0 \Omega$		Room		- 1		рС
Off Isolation ^e	OIRR	$R_L = 50 \ \Omega$, $C_L = 5 \ pF$, f =1 MHz		Room		60		٩D
Crosstalk (Channel-to-Channel) d	X _{TALK}			Room		100		uБ
Source Off Capacitance	C _{S(off)}	f – 1 MHz		Room		4		pF
Drain Off Capacitance	C _{D(off)}			Room		4		
Channel On Capacitance	C _{D(on)}	V _{ANALOG} = 0 V		Room		16		



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SPECIFICATIONS for Dual Supplies								
		Test Conditions Unless Otherwise Specified		D Suffix - 40 °C °C to 85 °C				
Parameter	Symbol	V+ = 15 V, V- = - 15 V V ₁ = 5 V, V _{1N} = 2.4 V, 0.8 V ^e	Temp. ^a	Min. ^b	Tvp. ^c	Max. ^b	Unit	
Power Supplies								
Positive Supply Current	l+	V+ = 16.5 V, V- = - 16.5 V V _{IN} = 0 or 5 V	Room Full		0.001	1 5		
Negative Supply Current	I-		Room Full	- 1 - 5	- 0.0001			
Logic Supply Current	ΙL		Room Full		0.001	1 5	μΑ	
Ground Current	I _{GND}		Room Full	- 1 - 5	- 0.001			

SPECIFICATIONS for Unipolar Supplies							
		Test Conditions Unless Otherwise Specified		Limits - 40 °C °C to 85 °C			
		V + = 12 V, V - = 0 V		h		b	
Parameter	Symbol	$v_{\rm L} = 5 v, v_{\rm IN} = 2.4 v, 0.8 v$	Temp."	Min. ⁹	Тур."	Max. ⁹	Unit
Analog Switch	-						
Analog Signal Range ^d	V _{ANALOG}		Full	0		12	V
Drain-Source	Brach	I _S = - 10 mA, V _D = 3 V, 8 V	Room		100	160	0
On-Resistance ^d	DS(on)	V + = 10.8 V, V_L = 5.25 V	Full			200	52
Dynamic Characteristics							
Turn-On Time	t _{ON}	R_L = 1 k Ω , C_L = 35 pF, V_S = 8 V	Room		300	450	ne
Turn-Off Time	t _{OFF}	See Figure 2	Room		60	200	115
Charge Injection	Q	$C_L = 1 \text{ nF}, V_{gen} = 6 \text{ V}, \text{ R}_{gen} = 0 \Omega$	Room		2		рС
Power Supplies							
Positive Supply Current	l+	V+ = 13.2 V. V _{IN} = 0 or 5 V	Room		0.001	1	
		- 7 114	Full			5	
Negative Supply Current	1-	$V_{INI} = 0 \text{ or } 5 \text{ V}$	Room	- 1	- 0.0001		
	•		Full	- 5			μА
Logic Supply Current	Ь	V ₁ = 5.25 V. V _{1N} = 0 or 5 V	Room		0.001	1	μ
	E.		Full			5	
Ground Current	I _{GND}	V _{IN} = 0 or 5 V	Full	- 1 - 5	- 0.001		

Notes:

a. Room = 25 °C, Full = as determined by the operating temperature suffix.

b. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this datasheet.

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

d. Guaranteed by design, not subject to production test.

e. V_{IN} = input voltage to perform proper function.

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.







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SCHEMATIC DIAGRAM Typical Channel





TEST CIRCUITS



C_L (includes fixture and stray capacitance)



Note:



Logic input waveform is inverted for DG445.





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DG444, DG445 Vishay Siliconix

TEST CIRCUITS





Figure 6. Source/Drain Capacitances

APPLICATIONS



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APPLICATIONS



Figure 8. Precision-Weighted Resistor Programmable-Gain Amplifier





Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?70054.

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SOIC (NARROW): 16-LEAD

JEDEC Part Number: MS-012







PDIP: 16-LEAD







	MILLIM	IETERS	INC	CHES		
Dim	Min	Max	Min	Max		
Α	3.81	5.08	0.150	0.200		
A ₁	0.38	1.27	0.015	0.050		
В	0.38	0.51	0.015	0.020		
B ₁	0.89	1.65	0.035	0.065		
С	0.20	0.30	0.008	0.012		
D	18.93	21.33	0.745	0.840		
E	7.62	8.26	0.300	0.325		
E ₁	5.59	7.11	0.220	0.280		
e ₁	2.29	2.79	0.090	0.110		
e _A	7.37	7.87	0.290	0.310		
L	2.79	3.81	0.110	0.150		
Q ₁	1.27	2.03	0.050	0.080		
S	0.38	1.52	.015	0.060		
ECN: S-03946—Rev. D, 09-Jul-01 DWG: 5482						

Application Note 826

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RECOMMENDED MINIMUM PADS FOR SO-16



Recommended Minimum Pads Dimensions in Inches/(mm)

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