



Low-Voltage Single-Supply, SPDT Analog Switch in SC-70

DESCRIPTION

The DG4599 is a cost effective upgrade to other types of 4599 low-voltage, single-pole/double-throw analog switches available in the industry today.

Combining low power, high speed, low on-resistant and small physical size, the DG4599 is ideal for portable and battery powered applications.

The DG4599 is built on Vishay Siliconix's low voltage CMOS process. An epitaxial layer prevents latchup. Break-before - make is guaranteed for DG4599.

Each switch conducts equally well in both directions when on, and blocks up to the power supply level when off.

FEATURES

- 6-Pin SC-70 Package
- 60 Ω Max. (26 Typ.) On-Resistance
- 2 Ω Typ. R_{ON} Flatness
- Fast Switching: t_{ON} = 30 ns (Max.)
 t_{OFF} = 25 ns (Max.)
- 2.25 V to 5.5 V Single Supply Operation
- Break-Before-Make Switching
- TTL/CMOS-Logic Compatible

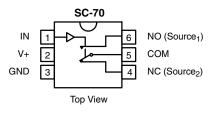
BENEFITS

- Reduced Power Consumption
- · Simple Logic Interface
- High Accuracy
- Reduce Board Space

APPLICATIONS

- · Battery-Operated Equipment
- · Audio and Video Signal Routing
- · Cellular Phones
- · Low-Voltage Data-Acquistion Systems
- · Sample-and-Hold Circuits
- Communications Systems

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



Device Marking: 4J

TRUTH TABLE					
Logic	NC	NO			
0	ON	OFF			
1	OFF	ON			

 $\begin{array}{l} \text{Logic "0"} \leq 0.8 \text{ V} \\ \text{Logic "1"} \geq 2.4 \text{ V} \end{array}$

ORDERING INFORMATION						
Temp Range	Package	Part Number				
- 40 to 85 °C	SC70-6	DG4599DL-T1 DG4599DL-T1-E3				

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^{*} Pb containing terminations are not RoHS compliant, exemptions may apply



ABSOLUTE MAXIMUM RATINGS							
Parameter	Limit	Unit					
Referenced V+ to GND	- 0.3 to + 6	V					
IN, COM, NC, NO ^a	- 0.3 to (V+ + 0.3)	V					
Continuous Current (Any Terminal)	± 50	A					
Peak Current (Pulsed at 1 ms, 10 % du	± 200	mA					
Storage Temperature (D Suffix)	rage Temperature (D Suffix)		°C				
Power Dissipation (Packages) ^b	6-Pin SO70 ^c	250	mW				

Notes:

- a. Signals on NC, NO, or COM or IN exceeding 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 6.5 mW/°C above 25 °C.

Parameter		Test Conditions		Limits			
		Otherwise Unless Specified			40 to 85 °		
	Symbol	$V+ = 5 V$, $\pm 10 \%$, $V_{IN} = 0.8 \text{ or } 2.4 V^e$	Temp ^a	Min ^b	Typ ^c	Max ^b	Unit
Analog Switch			1			ı	1
Analog Signal Range ^d	V_{NO}, V_{NC} V_{COM}		Full	0		V+	V
Drain-Source On-Resistance	r _{DS(on)}	$V+ = 4.5 V$, $V_D = 3 V$, $I_S = 10 mA$	Room Full		7 10	60 65	0
r _{DS(on)} Flatness ^d	r _{DS(on)} Flatness	V+ = 2.5 V	Room		2		Ω
Switch Off Leakage Current	I _{S(off)}	V+ = 5.5 V	Room Full	- 1.0 - 4.0		1.0 4.0	nA
Owner on Leakage ourient	I _{D(off)}	$V_S = 1 \text{ V}/4.5 \text{ V}, V_D = 4.5 \text{ V}/1 \text{ V}$	Room Full	- 1.0 - 4.0		1.0 4.0	
Channel-On Leakage Current	I _{D(on)}	$V+ = 5.5 V$, $V_S = V_D = 1 V/4.5 V$	Room Full	- 1.0 - 3.0		1.0 4.5	
Digital Control							
Input High Voltage	V _{INH}		Full	2.4			V
Input Low Voltage	V _{INL}		Full			0.8	ľ
Input Capacitance	C _{in}		Full		3		pF
Input Current	I _{INL} or I _{INH}	V _{IN} = 0 or V+	Full	- 1		1	μΑ
Dynamic Characteristics							
Turn-On Time ^d	t _{ON}	V 27V 0 V D 000 0 0 05 75	Room Full		9	30 40	
Turn-Off Time ^d	t _{OFF}	V_D or V_S = 3 V, R_L = 300 Ω , C_L = 35 pF Figures 1 and 2	Room Full		5	25 30	ns
Break-Before-Make Time ^d	t _d		Room	1	4		1
Charge Injection ^d	Q _{INJ}	C_L = 1 nF, V_S = 0 V V_{GEN} = 0 V, R_{GEN} = 0 Ω , Figure 3	Room		5	10	рС
Off-Isolation ^d	OIRR	D 5000 5 754 4 MU-	Room		- 73		T
Crosstalk ^d	X _{TALK}	$R_L = 50 \Omega$, $C_L = 5 pF$, $f = 1 MHz$	Room		- 70		dB
Source-Off Capacitance ^d	C _{S(off)}		Room		7		
Channel-On Capacitance ^d	C _{D(on)}	V _{IN} = 0 or V+, f = 1 MHz	Room		20		pF
Drain-to-Source Capacitance ^d	C _{DS(off)}		Room		20		
Power Supply	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \					l .	
Power Supply Range	V+			4.5		5.5	V
Power Supply Current	l+	V = 0 or V:			0.01	1.0	μΑ
Power Consumption	P _C	$V_{IN} = 0$ or $V+$				5.5	μW





DG4599 Vishay Siliconix

SPECIFICATIONS (V+ = 3 V)								
		Test Conditions Otherwise Unless Specified		Limits - 40 to 85 °C				
Parameter	Symbol	$V+ = 3 V, \pm 10 \%, V_{IN} = 0.4 \text{ or } 2.0 V^{e}$	Temp ^a	Min ^b	Typ ^c	Max ^b	Unit	
Analog Switch								
Analog Signal Range ^d	V_{NO}, V_{NC} V_{COM}		Full	0		V+	V	
Drain-Source On-Resistance ^d	r _{DS(on)}	$V_{+} = 2.7 \text{ V, } V_{D} = 1.5 \text{ V, } I_{S} = 10 \text{ mA}$ $V_{C} = 0 \text{ to } V_{+} I_{S} = 10 \text{ mA}$	Room Full		15 19	95 105	Ω	
r _{DS(on)} Flatness ^d	r _{DS(on)} Flatness		Room		7.5		52	
Digital Control								
Input High Voltage	V _{INH}		Full	2			V	
Input Low Voltage	V _{INL}		Full			0.8	v	
Input Current	I _{INL} or I _{INH}	V _{IN} = 0 or V+	Full	- 1		1	μΑ	
Dynamic Characteristics				•				
Turn-On Time ^d	t _{ON}	V_D or V_S = 2.0 V, R_L = 300 Ω , C_L = 35 pF Figures 1 and 2	Room Full		12	45 55		
Turn-Off Time ^d	t _{OFF}		Room Full		6	35 40	ns	
Break-Before-Make Time ^d	t _d		Room	1	7			
Charge Injection ^d	Q _{INJ}	$C_L = 1 \text{ nF, } V_{GEN} = 0 \text{ V, } V_S = 0 \text{ V}$ $R_{GEN} = 0 \Omega$, Figure 3	Room		5	10	рС	
Power Supply	•		•					
Power Supply Range	V+			2.7		3.3	V	
Power Supply Current	l+	V _{IN} = 0 or V+			0.01	1.0	μΑ	
Power Consumption	P _C	v IV – 0 01 v +				3.3	μW	



SPECIFICATIONS (V	/+ = 2.5 V)					
		Test Conditions Otherwise Unless Specified		Limits - 40 to 85 °C			
Parameter	Symbol	$V+ = 2.5 V$, $\pm 10 \%$, $V_{IN} = 0.4 \text{ or } 2.0 V^e$	Temp ^a	Min ^b	Typ ^c	Max ^b	Unit
Analog Switch					•		
Analog Signal Range ^d	$V_{NO}, V_{NC} $ V_{COM}		Full	0		V+	V
Drain-Source On-Resistance	r _{DS(on)}	$V+ = 2.25 \text{ V}, V_D = 1.0 \text{ V}, I_S = 10 \text{ mA}$	Room Full ^d		26 29	110 120	Ω
r _{DS(on)} Flatness ^d	r _{DS(on)} Flatness	V+ = 2.5 V	Room		10		22
Digital Control							
Input High Voltage	V _{INH}		Full	2			V
Input Low Voltage	V _{INL}		Full			0.4	ľ
Input Current	I _{INL} or I _{INH}	V _{IN} = 0 or V+	Full	- 1		1	μΑ
Dynamic Characteristics							
Turn-On Time	t _{ON}	V_D or V_S = 1.5 V, R_L = 300 Ω , C_L = 35 pF Figures 1 and 2	Room Full ^d		16	50 60	
Turn-Off Time	t _{OFF}		Room Full ^d		7	35 45	ns
Break-Before-Make Time	t _d		Room	1	12		
Power Supply			•	•	•	•	•
Power Supply Range	V+			2.25		2.75	V
Power Supply Current ^d	I+	V _{IN} = 0 or V+			0.01	1.0	μΑ
Power Consumption	P _C	VIN = 0.01 V+				2.75	μW

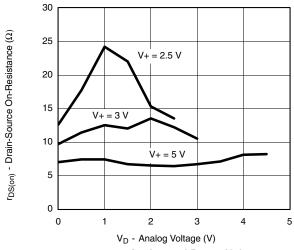
Notes:

- a. Room = 25 °C, Full = as determined by the operating suffix.
- 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. Typical values are for design aid only, not guaranteed nor subject to production testing.
- d. Guarantee by design, nor subjected to production test.
- e. V_{IN} = input voltage to perform proper function.
- f. Guaranteed by 5 V leakage testing, not production tested.

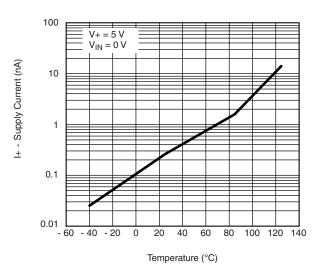
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



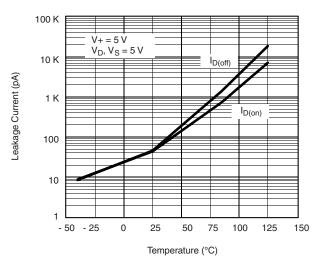
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



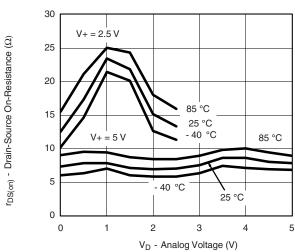
r_{DS(on)} vs. Analog and Power Voltage



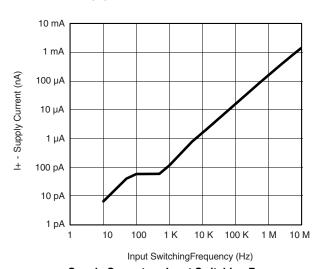
Supply Current vs. Temperature



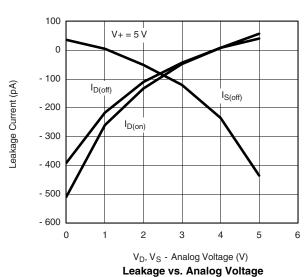
Leakage Current vs. Temperature



r_{DS(on)} vs. Analog Voltage and Temperature

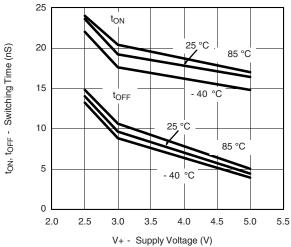


Supply Current vs. Input Switching Frequency

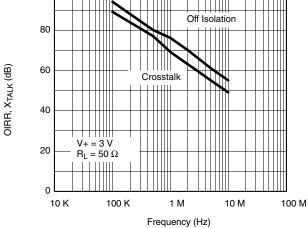


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TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

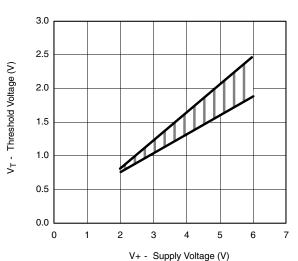


Switching Time vs. Temperature and Supply Voltage

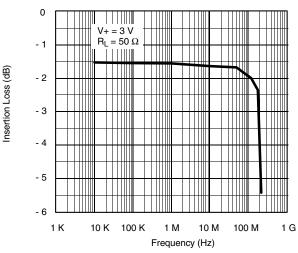


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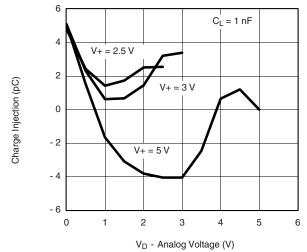
Crosstalk and Off Isolation vs. Frequency



Input Switching Threshold vs. Supply Voltage



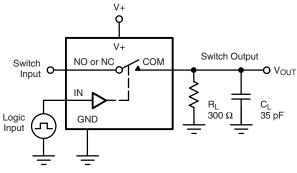
Insertion Loss vs. Frequency



Charge Injection vs. Analog Voltage

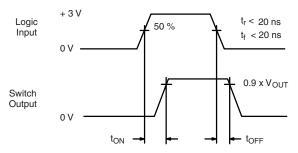


TEST CIRCUITS



C_L (includes fixture and stray capacitance)

$$V_{OUT} = V_{COM} \left(\frac{R_L}{R_L + R_{ON}} \right)$$



Logic "1" = Switch On Logic input waveforms inverted for switches that have the opposite logic sense.

Figure 1. Switching Time

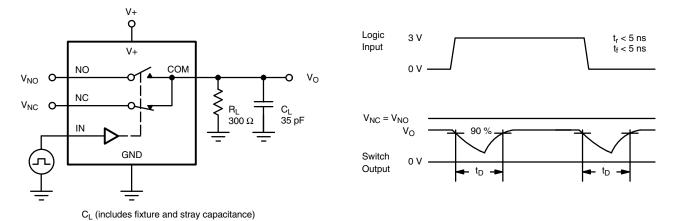


Figure 2. Break-Before-Make Interval

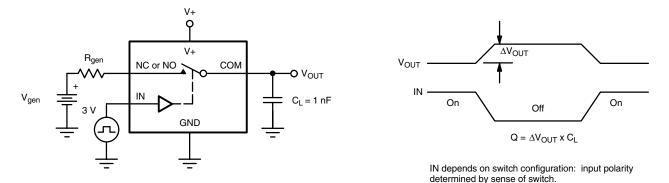


Figure 3. Charge Injection



TEST CIRCUITS

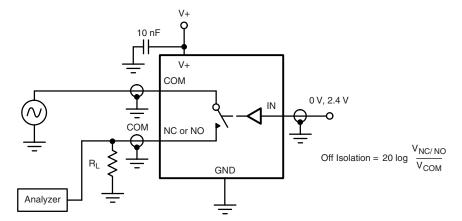


Figure 4. Off-Isolation

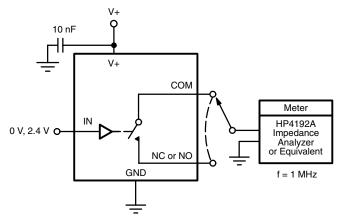


Figure 5. Channel Off/On Capacitance

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