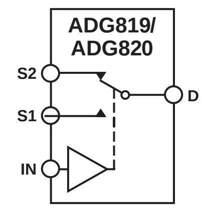
0.5 Ω CMOS 1.8 V to 5.5 V 2:1 Mux/SPDT Switches

ADG819/ADG820

FEATURES
Low On Resistance 0.8 Ω Max at 125°C
0.25 Ω Max On Resistance Flatness
1.8 V to 5.5 V Single Supply
200 mA Current Carrying Capability
Automotive Temperature Range: –40°C to +125°C
Rail-to-Rail Operation
6-Lead SOT-23 Package, 8-Lead μSOIC Package, and 6-Bump MicroCSP (Micro Chip Scale Package) ADG819
Fast Switching Times
Typical Power Consumption (<0.01 μW)
TTL-/CMOS-Compatible Inputs
Pin Compatible with the ADG719 (ADG819)

APPLICATIONS
Power Routing
Battery-Powered Systems
Communication Systems
Data Acquisition Systems
Cellular Phones
Modems
PCMCIA Cards
Hard Drives
Relay Replacement

FUNCTIONAL BLOCK DIAGRAM



GENERAL DESCRIPTION

The ADG819 and the ADG820 are monolithic, CMOS, SPDT (single-pole, double-throw) switches. These switches are designed on a submicron process that provides low power dissipation yet gives high switching speed, low On resistance, and low leakage currents.

Low power consumption and an operating supply range of 1.8 V to 5.5 V make the ADG819 and ADG820 ideal for battery-powered, portable instruments.

Each switch of the ADG819 and the ADG820 conducts equally well in both directions when on. The ADG819 exhibits break-before-make switching action, thus preventing momentary shorting when switching channels. The ADG820 exhibits make-before-break action.

The ADG819 and the ADG820 are available in a 6-lead SOT-23 package and an 8-lead μSOIC package. The ADG819 is also available in a 2 × 3 bump 1.14 mm × 2.18 mm MicroCSP package. This chip occupies only a 1.14 mm × 2.18 mm area, making it the ideal candidate for space-constrained applications.

PRODUCT HIGHLIGHTS

1. Very low ON resistance, 0.5 Ω typical
2. 1.8 V to 5.5 V single-supply operation
3. High current carrying capability
4. Tiny 6-lead SOT-23 package, 8-lead μSOIC package, and 2 × 3 bump 1.14 mm × 2.18 mm MicroCSP package (ADG819 only)

REV. 0

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ADG819/ADG820–SPECIFICATIONS[1] (V_{DD} = 5 V ± 10%, GND = 0 V.)

Parameter	25°C	–40°C to +85°C	–40°C to +125°C[2]	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			0 V to V_{DD}	V	
ON Resistance (R_{ON})	0.5			Ω typ	V_S = 0 V to V_{DD}, I_S = 100 mA;
	0.6	0.7	0.8	Ω max	Test Circuit 1
ON Resistance Match Between Channels (ΔR_{ON})	0.06			Ω typ	V_S = 0 V to V_{DD}, I_S = 100 mA
	0.08	0.1	0.12	Ω max	
ON Resistance Flatness ($R_{FLAT(ON)}$)	0.1			Ω typ	V_S = 0 V to V_{DD}, I_S = 100 mA
	0.17	0.2	0.25	Ω max	
LEAKAGE CURRENTS					V_{DD} = 5.5 V
Source OFF Leakage I_S (OFF)	±0.01			nA typ	V_S = 4.5 V/1 V, V_D = 1 V/4.5 V;
	±0.25	±3	±10	nA max	Test Circuit 2
Channel ON Leakage I_D, I_S (ON)	±0.01			nA typ	V_S = V_D = 1 V, or V_S = V_D = 4.5 V;
	±0.25	±3	±25	nA max	Test Circuit 3
DIGITAL INPUTS					
Input High Voltage, V_{INH}			2.0	V min	
Input Low Voltage, V_{INL}			0.8	V max	
Input Current					
I_{INL} or I_{INH}	0.005			µA typ	V_{IN} = V_{INL} or V_{INH}
			±0.1	µA max	
C_{IN}, Digital Input Capacitance	5			pF typ	
DYNAMIC CHARACTERISTICS[3]					
ADG819					
t_{ON}	35			ns typ	R_L = 50 Ω, C_L = 35 pF,
	45	50	55	ns max	V_S = 3 V; Test Circuit 4
t_{OFF}	10			ns typ	R_L = 50 Ω, C_L = 35 pF,
	16	18	21	ns max	V_S = 3 V; Test Circuit 4
Break-Before-Make Time Delay, t_{BBM}	5			ns typ	R_L = 50 Ω, C_L = 35 pF,
			1	ns min	V_{S1} = V_{S2} = 3 V; Test Circuit 5
ADG820					
t_{ON}	10			ns typ	R_L = 50 Ω, C_L = 35 pF,
	18	20	22	ns max	V_S = 3 V; Test Circuit 4
t_{OFF}	26			ns typ	R_L = 50 Ω, C_L = 35 pF,
	40	45	50	ns max	V_S = 3 V; Test Circuit 4
Make-Before-Break Time Delay, t_{MBB}	15			ns typ	R_L = 50 Ω, C_L = 35 pF,
			1	ns min	V_S = 0 V; Test Circuit 6
Charge Injection	20			pC typ	V_S = 2.5 V, R_S = 0 Ω, C_L = 1 nF; Test Circuit 7
Off Isolation	–71			dB typ	R_L = 50 Ω, C_L = 5 pF, f = 100 kHz; Test Circuit 8
Channel-to-Channel Crosstalk	–72			dB typ	R_L = 50 Ω, C_L = 5 pF, f = 100 kHz; Test Circuit 10
Bandwidth –3 dB	17			MHz typ	R_L = 50 Ω, C_L = 5 pF; Test Circuit 9
C_S (OFF)	80			pF typ	f = 1 MHz
C_D, C_S (ON)	300			pF typ	f = 1 MHz
POWER REQUIREMENTS					V_{DD} = 5.5 V
					Digital Inputs = 0 V or 5.5 V
I_{DD}	0.001			µA typ	
		1.0	2.0	µA max	

NOTES

[1]Temperature range is as follows: –40°C to +125°C.

[2]ON resistance parameters tested with I_S = 10 mA.

[3]Guaranteed by design, not subject to production test.

Specifications subject to change without notice.

SPECIFICATIONS[1] (V_{DD} = 2.7 V to 3.6 V, GND = 0 V.)

Parameter	25°C	–40°C to +85°C	–40°C to +125°C[2]	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			0 V to V_{DD}	V	
ON Resistance (R_{ON})	0.7			Ω typ	V_S = 0 V to V_{DD}, I_S = 100 mA;
	1.4	1.5	1.6	Ω max	Test Circuit 1
ON Resistance Match Between Channels (ΔR_{ON})	0.06			Ω typ	V_S = 0 V to V_{DD}, I_S = 100 mA
		0.13	0.13	Ω max	
ON Resistance Flatness ($R_{FLAT(ON)}$)	0.25			Ω typ	V_S = 0 V to V_{DD}, I_S = 100 mA
LEAKAGE CURRENTS					V_{DD} = 3.6 V
Source OFF Leakage I_S (OFF)	±0.01			nA typ	V_S = 3.3 V/1 V, V_D = 1 V/3.3 V;
	±0.25	±3	±10	nA max	Test Circuit 2
Channel ON Leakage I_D, I_S (ON)	±0.01			nA typ	V_S = V_D = 1 V, or V_S = V_D = 3.3 V;
	±0.25	±3	±25	nA max	Test Circuit 3
DIGITAL INPUTS					
Input High Voltage, V_{INH}			2.0	V min	
Input Low Voltage, V_{INL}			0.8	V max	
Input Current					
I_{INL} or I_{INH}	0.005			µA typ	V_{IN} = V_{INL} or V_{INH}
			±0.1	µA max	
C_{IN}, Digital Input Capacitance	5			pF typ	
DYNAMIC CHARACTERISTICS[3]					
ADG819					
t_{ON}	40			ns typ	R_L = 50 Ω, C_L = 35 pF,
	60	65	70	ns max	V_S = 1.5 V; Test Circuit 4
t_{OFF}	10			ns typ	R_L = 50 Ω, C_L = 35 pF,
	16	18	21	ns max	V_S = 1.5 V; Test Circuit
Break-Before-Make Time Delay, t_{BBM}	40			ns typ	R_L = 50 Ω, C_L = 35 pF,
			1	ns min	V_{S1} = V_{S2} = 1.5 V; Test Circuit 5
ADG820					
t_{ON}	20			ns typ	R_L = 50 Ω, C_L = 35 pF,
	35	40	45	ns max	V_S = 1.5 V; Test Circuit 4
t_{OFF}	30			ns typ	R_L = 50 Ω, C_L = 35 pF,
	45	50	55	ns max	V_S = 1.5 V; Test Circuit 4
Make-Before-Break Time Delay, t_{MBB}	10			ns typ	R_L = 50 Ω, C_L = 35 pF,
			1	ns min	V_S = 1.5 V; Test Circuit 6
Charge Injection	10			pC typ	V_S = 1.5 V, R_S = 0 Ω, C_L = 1 nF; Test Circuit 7
Off Isolation	–71			dB typ	R_L = 50 Ω, C_L = 5 pF, f = 100 kHz; Test Circuit 8
Channel-to-Channel Crosstalk	–72			dB typ	R_L = 50 Ω, C_L = 5 pF, f = 100 kHz; Test Circuit 10
Bandwidth –3 dB	17			MHz typ	R_L = 50 Ω, C_L = 5 pF; Test Circuit 9
C_S (OFF)	80			pF typ	f = 1 MHz
C_D, C_S (ON)	300			pF typ	f = 1 MHz
POWER REQUIREMENTS					V_{DD} = 3.6 V Digital Inputs = 0 V or 3.6 V
I_{DD}	0.001			µA typ	
		1.0	2.0	µA max	

NOTES

[1]Temperature range is as follows: –40°C to +125°C.

[2]ON resistance parameters tested with I_S = 10 mA.

[3]Guaranteed by design, not subject to production test.

Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS[1]

(T_A = 25°C, unless otherwise noted.)

V_{DD} to GND . . . . –0.3 V to +7 V
Analog Inputs[2] . . . . –0.3 V to V_{DD} + 0.3 V or
. . . . 30 mA, Whichever Occurs First
Digital Inputs[2] . . . . –0.3 V to V_{DD} + 0.3 V or
. . . . 30 mA, Whichever Occurs First
Peak Current, S or D . . . . 400 mA
. . . . (Pulsed at 1 ms, 10% Duty Cycle Max)
Continuous Current, S or D . . . . 200 mA
Operating Temperature Range
Industrial . . . . –40°C to +85°C
Automotive . . . . –40°C to +125°C
Storage Temperature Range . . . . –65°C to +150°C
Junction Temperature . . . . 150°C
µSOIC Package
θ_{JA} Thermal Impedance . . . . 206°C/W
θ_{JC} Thermal Impedance . . . . 44°C/W
SOT-23 Package (4-Layer Board)
θ_{JA} Thermal Impedance . . . . 119°C/W
MicroCSP Package
θ_{JA} Thermal Impedance . . . . TBD
Lead Temperature, Soldering (10 sec) . . . . 300°C
IR Reflow, Peak Temperature (<20 sec) . . . . 235°C

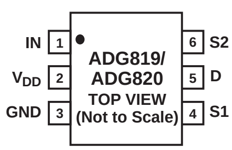
NOTES
[1] Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those listed in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Only one absolute maximum rating may be applied at any one time.
[2] Overvoltages at IN, S, or D will be clamped by internal diodes. Current should be limited to the maximum ratings given.

Table I. Truth Table for the ADG819/ADG820

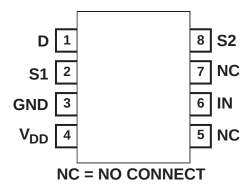
IN	Switch S1	Switch S2
0	ON	OFF
1	OFF	ON

PIN CONFIGURATIONS

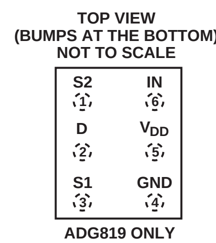
6-Lead SOT-23 (RJ-6)



8-Lead µSOIC (RM-8)



2 × 3 MicroCSP



ORDERING GUIDE

Model Option	Temperature Range	Brand[1]	Package Description	Package
ADG819BRM	–40°C to +125°C	SNB	µSOIC (MicroSmall Outline IC)	RM-8
ADG819BRT	–40°C to +125°C	SNB	SOT-23 (Plastic Surface-Mount)	RJ-6[2]
ADG819BCB	–40°C to +85°C	SNB	MicroCSP (Micro Chip Scale Package)	CB-6[2]
ADG820BRM	–40°C to +125°C	SPB	µSOIC (MicroSmall Outline IC)	RM-8
ADG820BRT	–40°C to +125°C	SPB	SOT-23 (Plastic Surface-Mount)	RJ-6[2]

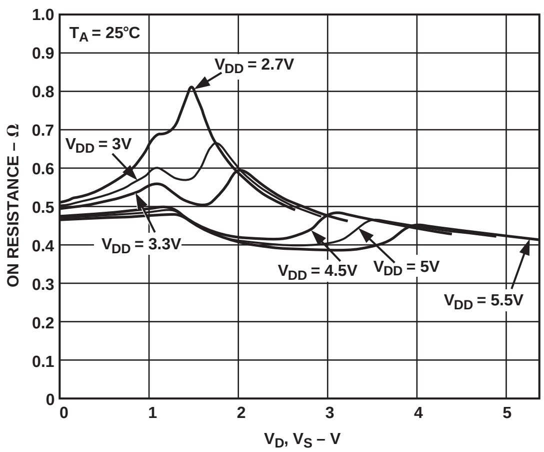
NOTES
[1]Branding on these packages is limited to three characters due to space constraints.
[2]Contact factory for availability.

TERMINOLOGY

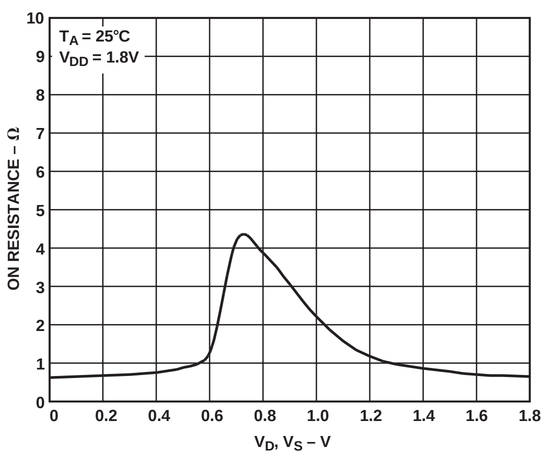
V_{DD}	Most Positive Power Supply Potential
GND	Ground (0 V) Reference
I_{DD}	Positive Supply Current
S	Source Terminal. May be an input or output.
D	Drain Terminal. May be an input or output.
IN	Logic Control Input
R_{ON}	Ohmic Resistance between D and S
ΔR_{ON}	ON Resistance Match between Any Two Channels, i.e., R_{ON} max – R_{ON} min
$R_{FLAT(ON)}$	Flatness is defined as the difference between the maximum and minimum value of ON resistance as measured over the specified analog signal range.
I_S (OFF)	Source Leakage Current with the Switch OFF
I_D, I_S (ON)	Channel Leakage Current with the Switch ON
V_D (V_S)	Analog Voltage on Terminals D, S
V_{INL}	Maximum Input Voltage for Logic "0"
V_{INH}	Minimum Input Voltage for Logic "1"
I_{INL}(I_{INH})	Input Current of the Digital Input
C_S (OFF)	OFF Switch Source Capacitance
C_D, C_S (ON)	ON Switch Capacitance
t_{ON}	Delay between applying the digital control input and the output switching ON.
t_{OFF}	Delay between applying the digital control input and the output switching OFF.
t_{BBM}	OFF time or ON time measured between the 90% points of both switches when switching from one address state to another.
t_{MBB}	ON time measured between the 80% points of both switches when switching from one address state to another.
Charge Injection	A measure of the glitch impulse transferred from the digital input to the analog output during switching.
Crosstalk	A measure of unwanted signal coupled through from one channel to another as a result of parasitic capacitance.
OFF Isolation	A measure of unwanted signal coupling through an OFF switch.
Bandwidth	Frequency at which the output is attenuated by –3 dB.
ON Response	Frequency Response of the ON Switch
Insertion Loss	Loss due to the ON Resistance of the Switch

CAUTION

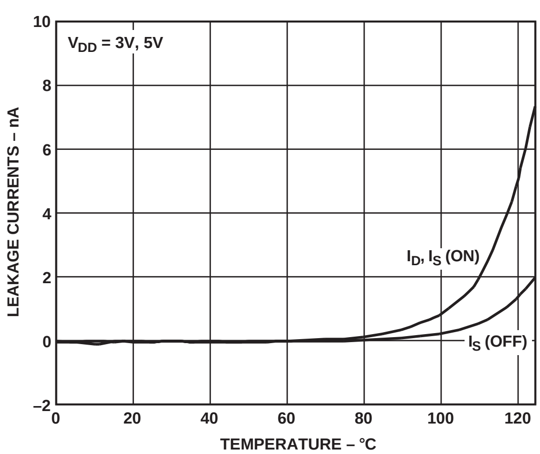
ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the ADG819/ADG820 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



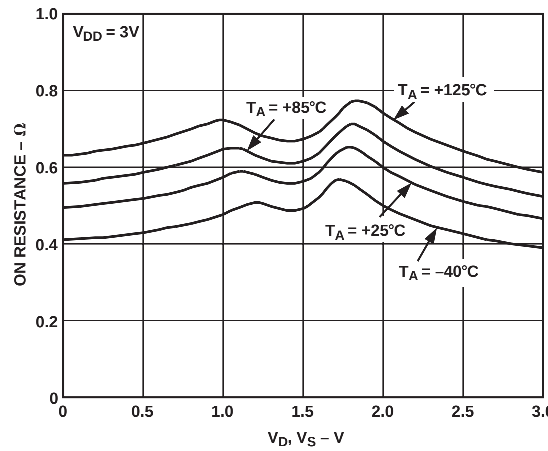
TPC 1. ON Resistance vs. V_D (V_S)



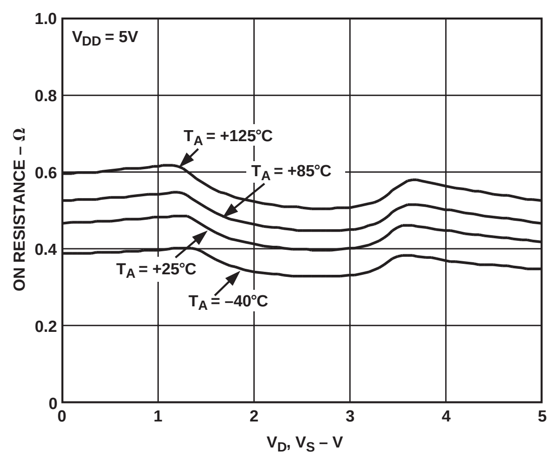
TPC 2. ON Resistance vs. V_D (V_S)



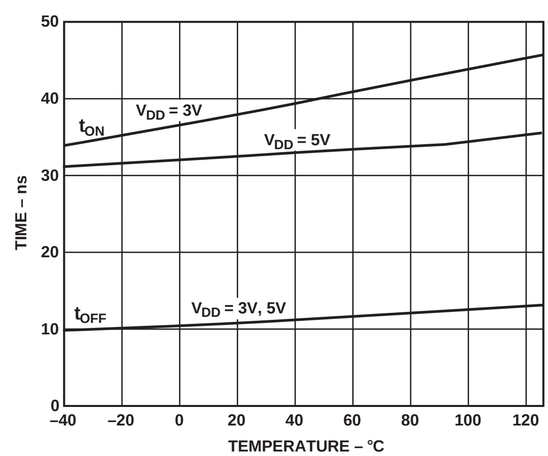
TPC 3. Leakage Currents vs. Temperatures



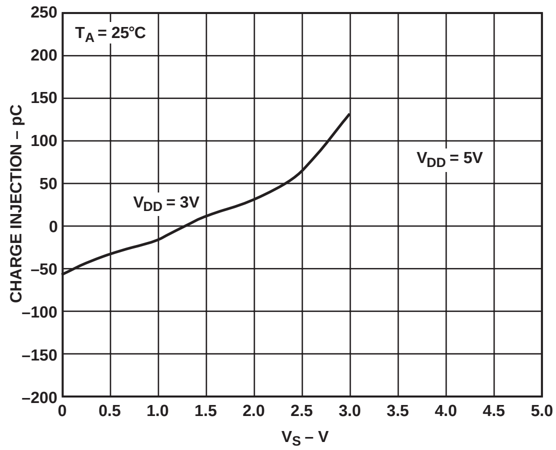
TPC 4. ON Resistance vs. V_D (V_S) for Different Temperatures



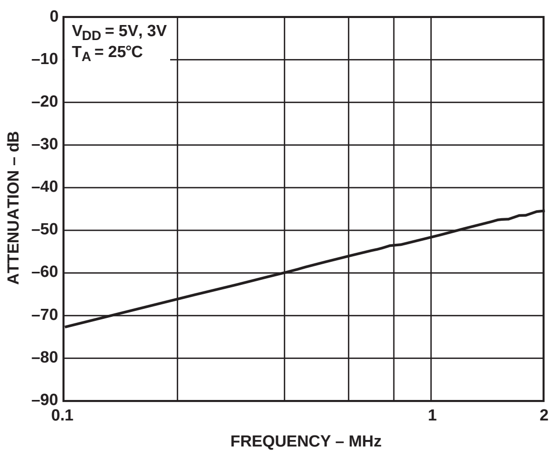
TPC 5. ON Resistance vs. V_D (V_S) for Different Temperatures



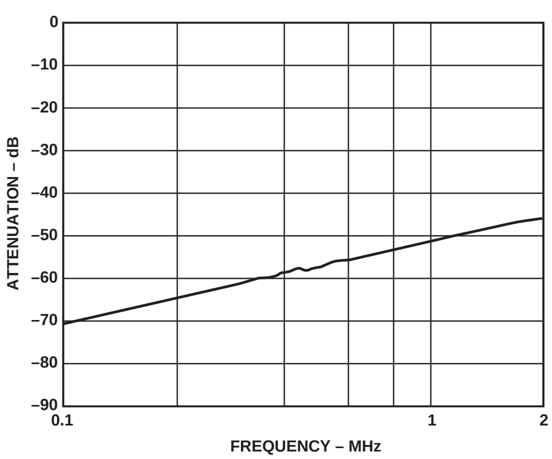
TPC 6. t_{ON}/t_{OFF} Times vs. Temperature (ADG819)



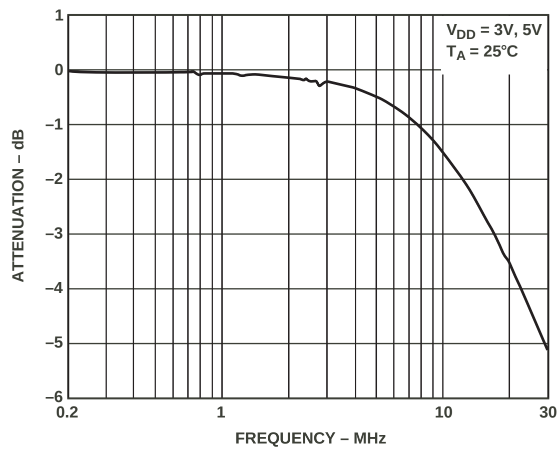
TPC 7. Charge Injection vs. Source Voltage



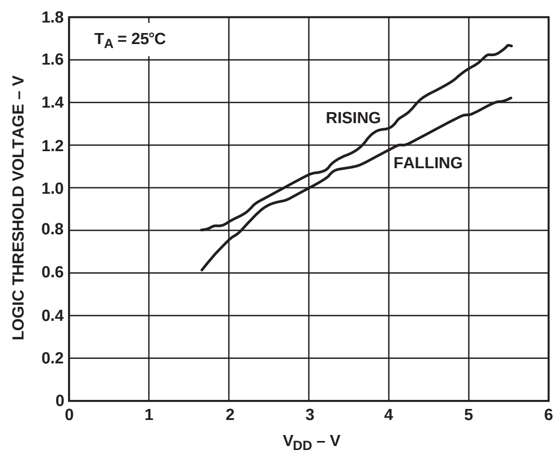
TPC 8. OFF Isolation vs. Frequency



TPC 9. Crosstalk vs. Frequency

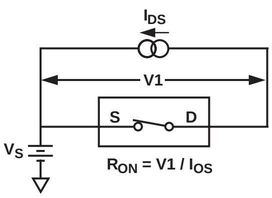


TPC 10. ON Response vs. Frequency

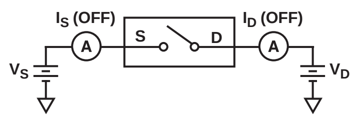


TPC 11. Logic Threshold vs. Supply Voltage

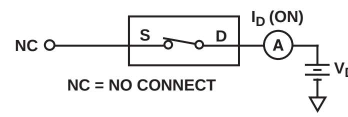
Test Circuits



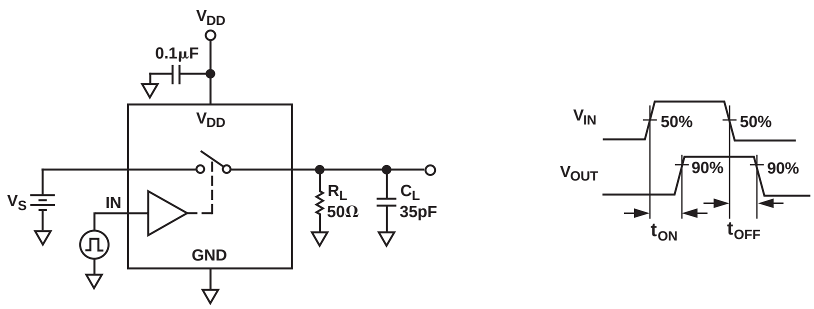
Test Circuit 1. ON Resistance



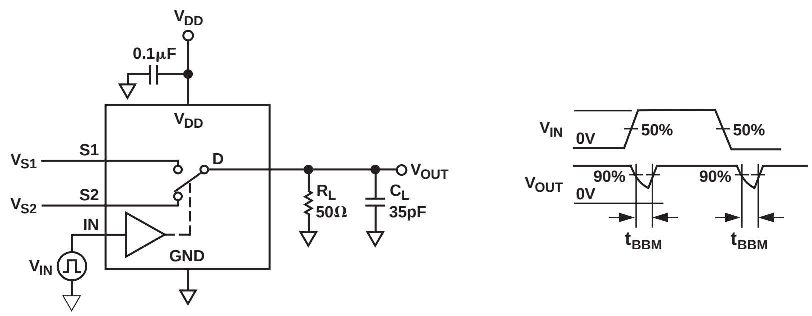
Test Circuit 2. OFF Leakage



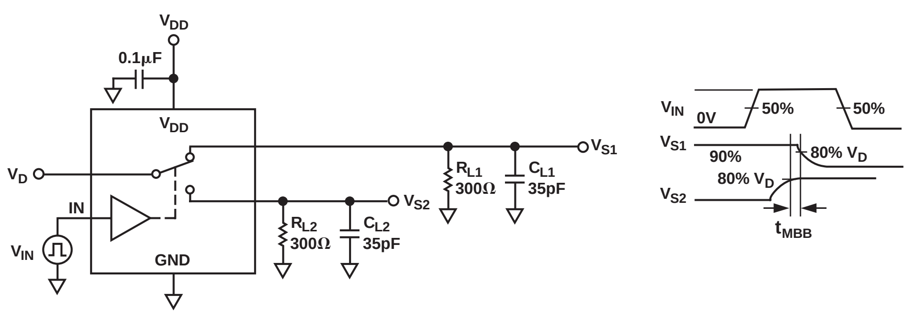
Test Circuit 3. ON Leakage



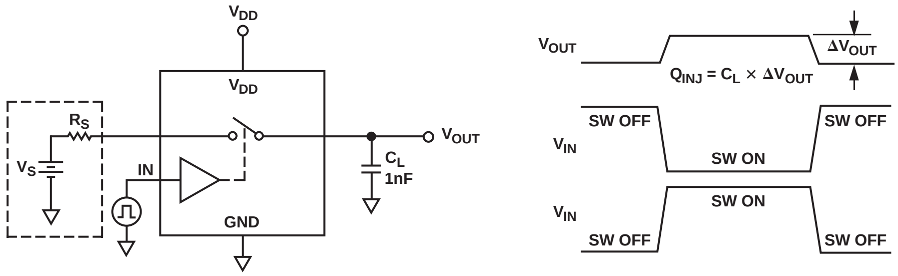
Test Circuit 4. Switching Times



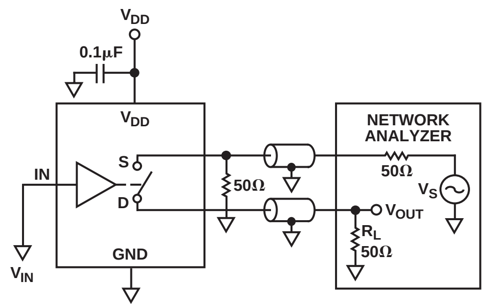
Test Circuit 5. Break-Before-Make Time Delay, t_{BBM} (ADG819 Only)



Test Circuit 6. Make-Before-Break Time Delay, t_{MBB} (ADG820 Only)

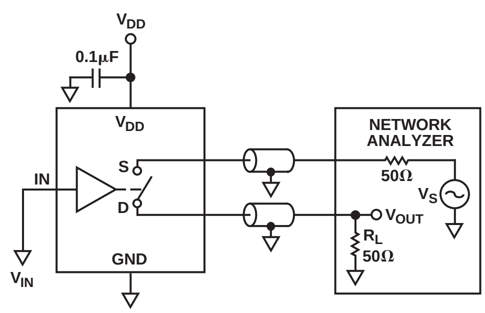


Test Circuit 7. Charge Injection



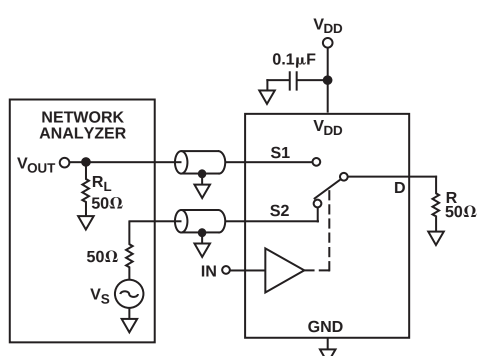
$$\text{OFF ISOLATION} = 20 \text{ LOG } \frac{V_{OUT}}{V_S}$$

Test Circuit 8. OFF Isolation



$$\text{INSERTION LOSS} = 20 \text{ LOG } \frac{V_{OUT} \text{ WITH SWITCH}}{V_{OUT} \text{ WITHOUT SWITCH}}$$

Test Circuit 9. Bandwidth



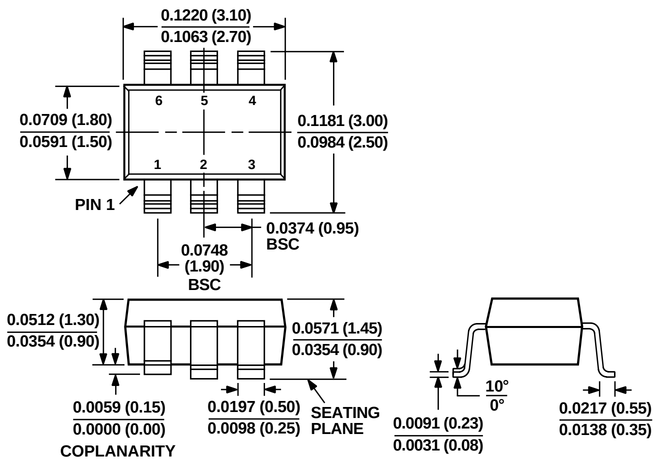
$$\text{CHANNEL-TO-CHANNEL CROSSTALK} = 20 \text{ LOG } \frac{V_{OUT}}{V_S}$$

Test Circuit 10. Channel-to-Channel Crosstalk

OUTLINE DIMENSIONS

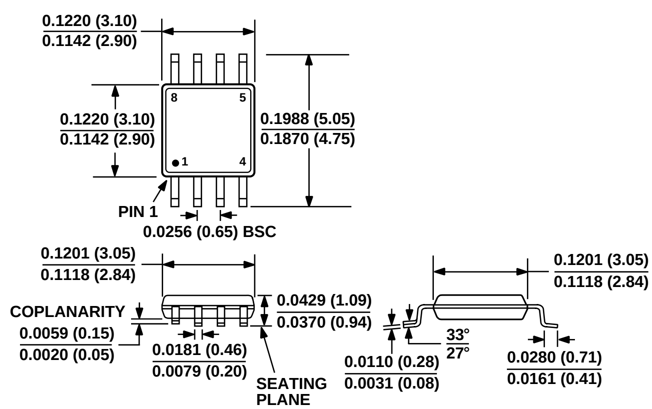
6-Lead Plastic Surface-Mount Package (RJ-6)

Dimensions shown in inches and (mm)



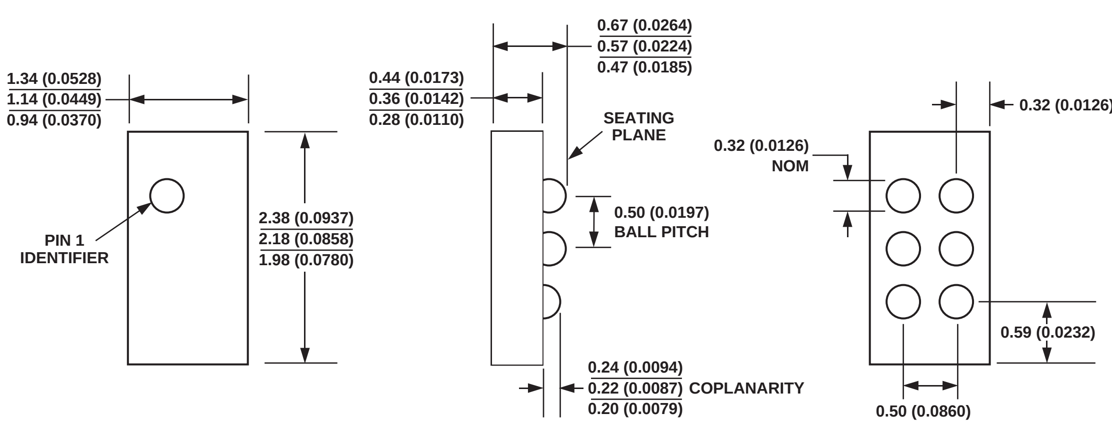
8-Lead μSOIC Package (RM-8)

Dimensions shown in inches and (mm)



2 × 3 Array for MicroCSP (CB-6)

Dimensions shown in millimeters and (inches)



CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS (IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN

Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

Как с нами связаться

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