

### FEATURES

- ±2 V to ±6 V Dual Supply
- 2 V to 12 V Single Supply
- Automotive Temperature Range -40°C to +125°C
- <0.1 nA Leakage Currents
- 45 Ω On Resistance over Full Signal Range
- Rail-to-Rail Switching Operation
- Single 8-to-1 Multiplexer ADG658
- Differential 4-to-1 Multiplexer ADG659
- 16-Lead LFCSP/TSSOP Packages
- Typical Power Consumption <0.1 μW
- TTL/CMOS Compatible Inputs
- Package Upgrades to 74HC4051/74HC4052 and MAX4051/MAX4052/MAX4581/MAX4582

### APPLICATIONS

- Automotive Applications
- Automatic Test Equipment
- Data Acquisition Systems
- Battery-Powered Systems
- Communication Systems
- Audio and Video Signal Routing
- Relay Replacement
- Sample-and-Hold Systems
- Industrial Control Systems

### GENERAL DESCRIPTION

The ADG658 and ADG659 are low voltage, CMOS analog multiplexers comprised of eight single channels and four differential channels, respectively. The ADG658 switches one of eight inputs (S1–S8) to a common output, D, as determined by the 3-bit binary address lines A0, A1, and A2. The ADG659 switches one of four differential inputs to a common differential output, as determined by the 2-bit binary address lines A0 and A1. An EN input on both devices is used to enable or disable the device. When disabled, all channels are switched off.

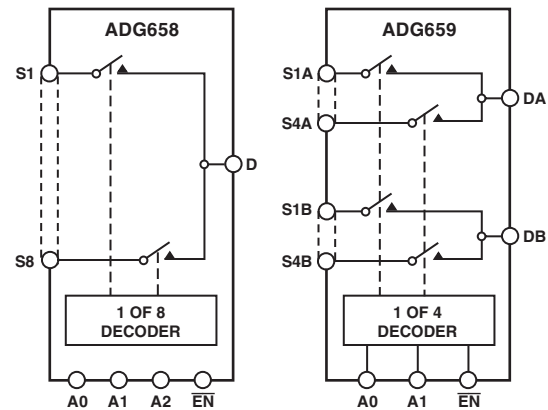
These parts are designed on an enhanced process that provides lower power dissipation yet gives high switching speeds. These parts can operate equally well as either multiplexers or demultiplexers and have an input range that extends to the supplies. All channels exhibit break-before-make switching action, preventing momentary shorting when switching channels. All digital inputs have 0.8 V to 2.4 V logic thresholds, ensuring TTL/CMOS logic compatibility when using single +5 V or dual ±5 V supplies.

The ADG658 and ADG659 are available in 16-lead TSSOP packages and 16-lead 4 mm × 4 mm LFCSP packages.

REV.0

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### FUNCTIONAL BLOCK DIAGRAM



SWITCHES SHOWN FOR A LOGIC 1 INPUT

### PRODUCT HIGHLIGHTS

1. Single- and dual-supply operation. The ADG658 and ADG659 offer high performance and are fully specified and guaranteed with ±5 V, +5 V, and +3 V supply rails.
2. Automotive temperature range -40°C to +125°C.
3. Low power consumption, typically <0.1 μW.
4. 16-lead 4 mm × 4 mm LFCSP packages and 16-lead TSSOP package.

# ADG658/ADG659—SPECIFICATIONS

**DUAL SUPPLY**<sup>1</sup> ( $V_{DD} = +5\text{ V} \pm 10\%$ ,  $V_{SS} = -5\text{ V} \pm 10\%$ ,  $GND = 0\text{ V}$ , unless otherwise noted.)

Parameter	B Version -40°C to +85°C			Y Version -40°C to +125°C		Unit	Test Conditions/Comments
	+25°C						
<b>ANALOG SWITCH</b>							
Analog Signal Range				$V_{SS}$ to $V_{DD}$		V	$V_{DD} = +4.5\text{ V}$ , $V_{SS} = -4.5\text{ V}$
On Resistance ( $R_{ON}$ )	45					$\Omega$ typ	$V_S = \pm 4.5\text{ V}$ , $I_S = 1\text{ mA}$ ;
	75	90	100			$\Omega$ max	Test Circuit 1
On Resistance Match between Channels ( $\Delta R_{ON}$ )	1.3					$\Omega$ typ	
On Resistance Flatness ( $R_{FLAT(ON)}$ )	3	3.2	3.5			$\Omega$ max	$V_S = 3.5\text{ V}$ , $I_S = 1\text{ mA}$
	10					$\Omega$ typ	$V_{DD} = +5\text{ V}$ , $V_{SS} = -5\text{ V}$ ;
	16	17	18			$\Omega$ max	$V_S = \pm 3\text{ V}$ , $I_S = 1\text{ mA}$
<b>LEAKAGE CURRENTS</b>							
Source OFF Leakage $I_S$ (OFF)	$\pm 0.005$					nA typ	$V_{DD} = +5.5\text{ V}$ , $V_{SS} = -5.5\text{ V}$
	$\pm 0.2$			$\pm 5$		nA max	$V_D = \pm 4.5\text{ V}$ , $V_S = \mp 4.5\text{ V}$ ;
Drain OFF Leakage $I_D$ (OFF)	$\pm 0.005$					nA typ	Test Circuit 2
ADG658	$\pm 0.2$			$\pm 5$		nA max	$V_D = \pm 4.5\text{ V}$ , $V_S = \mp 4.5\text{ V}$ ;
ADG659	$\pm 0.1$			$\pm 2.5$		nA max	Test Circuit 3
Channel ON Leakage $I_D$ , $I_S$ (ON)	$\pm 0.005$					nA typ	$V_D = V_S = \pm 4.5\text{ V}$ ; Test Circuit 4
ADG658	$\pm 0.2$			$\pm 5$		nA max	
ADG659	$\pm 0.1$			$\pm 2.5$		nA max	
<b>DIGITAL INPUTS</b>							
Input High Voltage, $V_{INH}$				2.4		V min	
Input Low Voltage, $V_{INL}$				0.8		V max	
Input Current							
$I_{INL}$ or $I_{INH}$	0.005					$\mu\text{A}$ typ	$V_{IN} = V_{INL}$ or $V_{INH}$
				$\pm 1$		$\mu\text{A}$ max	
$C_{IN}$ , Digital Input Capacitance	2					pF typ	
<b>DYNAMIC CHARACTERISTICS</b> <sup>2</sup>							
$t_{TRANS}$	80					ns typ	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$
	115	140	165			ns max	$V_S = 3\text{ V}$ ; Test Circuit 5
$t_{ON}(\overline{EN})$	80					ns typ	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$
	115	140	165			ns max	$V_S = 3\text{ V}$ ; Test Circuit 7
$t_{OFF}(\overline{EN})$	30					ns typ	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$
	45	50	55			ns max	$V_S = 3\text{ V}$ ; Test Circuit 7
Break-Before-Make Time Delay, $t_{BBM}$	50					ns typ	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$
				10		ns min	$V_{S1} = V_{S2} = 3\text{ V}$ ; Test Circuit 6
Charge Injection	2					pC typ	$V_S = 0\text{ V}$ , $R_S = 0\ \Omega$ ,
	4					pC max	$C_L = 1\text{ nF}$ ; Test Circuit 8
Off Isolation	-90					dB typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ,
							$f = 1\text{ MHz}$ ; Test Circuit 9
Total Harmonic Distortion, THD + N	0.025					% typ	$R_L = 600\ \Omega$ , 2V p-p,
							$f = 20\text{ Hz}$ to 20 kHz
Channel-to-Channel Crosstalk (ADG659)	-90					dB typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ,
							$f = 1\text{ MHz}$ ; Test Circuit 11
-3 dB Bandwidth							
ADG658	210					MHz typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ;
ADG659	400					MHz typ	Test Circuit 10
$C_S$ (OFF)	4					pF typ	$f = 1\text{ MHz}$
$C_D$ (OFF)							
ADG658	23					pF typ	$f = 1\text{ MHz}$
ADG659	12					pF typ	$f = 1\text{ MHz}$
$C_D$ , $C_S$ (ON)							
ADG658	28					pF typ	$f = 1\text{ MHz}$
ADG659	16					pF typ	$f = 1\text{ MHz}$
<b>POWER REQUIREMENTS</b>							
$I_{DD}$	0.01					$\mu\text{A}$ typ	$V_{DD} = +5.5\text{ V}$ , $V_{SS} = -5.5\text{ V}$
				1		$\mu\text{A}$ max	Digital Inputs = 0 V or 5.5 V
$I_{SS}$	0.01					$\mu\text{A}$ typ	Digital Inputs = 0 V or 5.5 V
				1		$\mu\text{A}$ max	

## NOTES

<sup>1</sup>Temperature range is as follows: B Version: -40°C to +85°C. Y Version: -40°C to +125°C.

<sup>2</sup>Guaranteed by design, not subject to production test.

Specifications subject to change without notice.

**SINGLE SUPPLY<sup>1</sup>** ( $V_{DD} = 5\text{ V} \pm 10\%$ ,  $V_{SS} = 0\text{ V}$ ,  $GND = 0\text{ V}$ , unless otherwise noted.)

Parameter	B Version -40°C to +85°C			Y Version -40°C to +125°C	Unit	Test Conditions/Comments
	+25°C					
<b>ANALOG SWITCH</b>						
Analog Signal Range				0 to $V_{DD}$	V	$V_{DD} = 4.5\text{ V}$ , $V_{SS} = 0\text{ V}$
On Resistance ( $R_{ON}$ )	85				$\Omega$ typ	$V_S = 0\text{ V}$ to $4.5\text{ V}$ , $I_S = 1\text{ mA}$ ; Test Circuit 1
	150	160	200		$\Omega$ max	Test Circuit 1
On Resistance Match between Channels ( $\Delta R_{ON}$ )	4.5				$\Omega$ typ	$V_S = 3.5\text{ V}$ , $I_S = 1\text{ mA}$
	8	9	10		$\Omega$ max	
On Resistance Flatness ( $R_{FLAT(ON)}$ )	13	14	16		$\Omega$ typ	$V_{DD} = 5\text{ V}$ , $V_{SS} = 0\text{ V}$ $V_S = 1.5\text{ V}$ to $4\text{ V}$ , $I_S = 1\text{ mA}$
<b>LEAKAGE CURRENTS</b>						
Source OFF Leakage $I_S$ (OFF)	$\pm 0.005$				nA typ	$V_{DD} = 5.5\text{ V}$ $V_S = 1\text{ V}/4.5\text{ V}$ , $V_D = 4.5\text{ V}/1\text{ V}$ ; Test Circuit 2
	$\pm 0.2$			$\pm 5$	nA max	
Drain OFF Leakage $I_D$ (OFF)	$\pm 0.005$				nA typ	$V_S = 1\text{ V}/4.5\text{ V}$ , $V_D = 4.5\text{ V}/1\text{ V}$ ; Test Circuit 3
ADG658	$\pm 0.2$			$\pm 5$	nA max	
ADG659	$\pm 0.1$			$\pm 2.5$	nA max	
Channel ON Leakage $I_D$ , $I_S$ (ON)	$\pm 0.005$				nA typ	$V_S = V_D = 1\text{ V}$ or $4.5\text{ V}$ , Test Circuit 4
ADG658	$\pm 0.2$			$\pm 5$	nA max	
ADG659	$\pm 0.1$			$\pm 2.5$	nA max	
<b>DIGITAL INPUTS</b>						
Input High Voltage, $V_{INH}$				2.4	V min	
Input Low Voltage, $V_{INL}$				0.8	V max	
Input Current						
$I_{INL}$ or $I_{INH}$	0.005				$\mu\text{A}$ typ	$V_{IN} = V_{INL}$ or $V_{INH}$
				$\pm 1$	$\mu\text{A}$ max	
$C_{IN}$ , Digital Input Capacitance	2				pF typ	
<b>DYNAMIC CHARACTERISTICS<sup>2</sup></b>						
$t_{TRANS}$	120				ns typ	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$
	200	270	300		ns max	$V_S = 3\text{ V}$ ; Test Circuit 5
$t_{ON}(\overline{EN})$	120				ns typ	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$
	190	245	280		ns max	$V_S = 3\text{ V}$ ; Test Circuit 7
$t_{OFF}(\overline{EN})$	35				ns typ	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$
	50	60	70		ns max	$V_S = 3\text{ V}$ ; Test Circuit 7
Break-Before-Make Time Delay, $t_{BBM}$	100				ns typ	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$
				10	ns min	$V_{S1} = V_{S2} = 3\text{ V}$ ; Test Circuit 6
Charge Injection	0.5				pC typ	$V_S = 2.5\text{ V}$ , $R_S = 0\ \Omega$ , $C_L = 1\text{ nF}$ ; Test Circuit 8
	1				pC max	Test Circuit 8
Off Isolation	-90				dB typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; Test Circuit 9
Channel-to-Channel Crosstalk (ADG659)	-90				dB typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ; $f = 1\text{ MHz}$ ; Test Circuit 11
-3 dB Bandwidth						
ADG658	180				MHz typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ; Test Circuit 10
ADG659	330				MHz typ	
$C_S$ (OFF)	5				pF typ	$f = 1\text{ MHz}$
$C_D$ (OFF)						
ADG658	29				pF typ	$f = 1\text{ MHz}$
ADG659	15				pF typ	$f = 1\text{ MHz}$
$C_D$ , $C_S$ (ON)						
ADG658	30				pF typ	$f = 1\text{ MHz}$
ADG659	16				pF typ	$f = 1\text{ MHz}$
<b>POWER REQUIREMENTS</b>						
$I_{DD}$	0.01				$\mu\text{A}$ typ	$V_{DD} = 5.5\text{ V}$ Digital Inputs = $0\text{ V}$ or $5.5\text{ V}$
				1	$\mu\text{A}$ max	

## NOTES

<sup>1</sup>Temperature range is as follows: B Version: -40°C to +85°C. Y Version: -40°C to +125°C.

<sup>2</sup>Guaranteed by design, not subject to production test.

Specifications subject to change without notice.

# ADG658/ADG659—SPECIFICATIONS

**SINGLE SUPPLY**<sup>1</sup> ( $V_{DD} = 2.7\text{ V to }3.6\text{ V}$ ,  $V_{SS} = 0\text{ V}$ ,  $GND = 0\text{ V}$ , unless otherwise noted.)

Parameter	B Version –40°C to +85°C			Y Version –40°C to +125°C			Unit	Test Conditions/Comments
	+25°C							
<b>ANALOG SWITCH</b>								
Analog Signal Range				0 to $V_{DD}$			V	$V_{DD} = 2.7\text{ V}$ , $V_{SS} = 0\text{ V}$ $V_S = 0\text{ V to }2.7\text{ V}$ , $I_S = 0.1\text{ mA}$ ; Test Circuit 1 $V_S = 1.5\text{ V}$ , $I_S = 0.1\text{ mA}$
On Resistance ( $R_{ON}$ )	185			$\Omega$ typ				
On Resistance Match between Channels ( $\Delta R_{ON}$ )	300	350	400	$\Omega$ max				
	2			$\Omega$ typ				
	4.5	6	7	$\Omega$ max				
<b>LEAKAGE CURRENTS</b>								
Source OFF Leakage $I_S$ (OFF)	$\pm 0.005$			nA typ			$V_{DD} = 3.3\text{ V}$ $V_S = 1\text{ V/3 V}$ , $V_D = 3\text{ V/1 V}$ ; Test Circuit 2 $V_S = 1\text{ V/3 V}$ , $V_D = 3\text{ V/1 V}$ ; Test Circuit 3  $V_S = V_D = 1\text{ V or }3\text{ V}$ ; Test Circuit 4	
Drain OFF Leakage $I_D$ (OFF)	$\pm 0.2$		$\pm 5$	nA max				
ADG658	$\pm 0.005$			nA typ				
ADG659	$\pm 0.2$		$\pm 5$	nA max				
Channel ON Leakage $I_D$ , $I_S$ (ON)	$\pm 0.1$		$\pm 2.5$	nA max				
ADG658	$\pm 0.005$			nA typ				
ADG659	$\pm 0.2$		$\pm 5$	nA max				
	$\pm 0.1$		$\pm 2.5$	nA max				
<b>DIGITAL INPUTS</b>								
Input High Voltage, $V_{INH}$				2.0			V min	$V_{IN} = V_{INL}$ or $V_{INH}$
Input Low Voltage, $V_{INL}$				0.5			V max	
Input Current								
$I_{INL}$ or $I_{INH}$	0.005			$\mu\text{A}$ typ				
$C_{IN}$ , Digital Input Capacitance				$\pm 1$			$\mu\text{A}$ max	
	2			pF typ				
<b>DYNAMIC CHARACTERISTICS</b> <sup>2</sup>								
$t_{TRANS}$	200			ns typ			$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$ $V_S = 1.5\text{ V}$ ; Test Circuit 7 $R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$ $V_S = 1.5\text{ V}$ ; Test Circuit 7 $R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$ $V_S = 1.5\text{ V}$ ; Test Circuit 7 $R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$ $V_{S1} = V_{S2} = 1.5\text{ V}$ ; Test Circuit 6 $V_S = 1.5\text{ V}$ , $R_S = 0\ \Omega$ , $C_L = 1\text{ nF}$ ; Test Circuit 8 $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; Test Circuit 9 $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; Test Circuit 11	
$t_{ON}$ ( $\overline{EN}$ )	370	440	490	ns max				
$t_{OFF}$ ( $\overline{EN}$ )	230			ns typ				
Break-Before-Make Time Delay, $t_{BBM}$	370	440	490	ns max				
Charge Injection	50			ns typ				
Off Isolation	80	90	110	ns max				
Channel-to-Channel Crosstalk (ADG659)	200			ns typ				
–3 dB Bandwidth				ns min				
ADG658	1			pC typ				
ADG659	2			pC max				
$C_S$ (OFF)	–90			dB typ				
$C_D$ (OFF)				dB typ				
ADG658								
ADG659								
$C_D$ , $C_S$ (ON)								
ADG658	160			MHz typ				
ADG659	300			MHz typ				
$C_S$ (OFF)	5			pF typ				
$C_D$ (OFF)								
ADG658	29			pF typ				
ADG659	15			pF typ				
$C_D$ , $C_S$ (ON)								
ADG658	30			pF typ				
ADG659	16			pF typ				
<b>POWER REQUIREMENTS</b>								
$I_{DD}$	0.01			$\mu\text{A}$ typ			$V_{DD} = 3.6\text{ V}$ Digital Inputs = 0 V or 3.6 V	
			1	$\mu\text{A}$ max				

## NOTES

<sup>1</sup>Temperature range is as follows: B Version: –40°C to +85°C. Y Version: –40°C to +125°C.

<sup>2</sup>Guaranteed by design, not subject to production test.

Specifications subject to change without notice.

# ADG658/ADG659

## ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

(T<sub>A</sub> = 25°C, unless otherwise noted.)

V <sub>DD</sub> to V <sub>SS</sub> .....	13 V
V <sub>DD</sub> to GND .....	-0.3 V to +13 V
V <sub>SS</sub> to GND .....	+0.3 V to -6.5 V
Analog Inputs <sup>2</sup> .....	V <sub>SS</sub> - 0.3 V to V <sub>DD</sub> + 0.3 V
Digital Inputs <sup>2</sup> .....	GND - 0.3 V to V <sub>DD</sub> + 0.3 V or 10 mA, whichever occurs first
Peak Current, S or D .....	40 mA (Pulsed at 1 ms, 10% duty cycle max)
Continuous Current, S or D .....	20 mA
Operating Temperature Range	
Automotive (Y Version) .....	-40°C to +125°C
Industrial (B Version) .....	-40°C to +85°C
Storage Temperature Range .....	-65°C to +150°C
Junction Temperature .....	150°C

θ <sub>JA</sub> Thermal Impedance, 16-Lead TSSOP .....	150.4°C/W
θ <sub>JA</sub> Thermal Impedance (4-Layer Board), 16-Lead LFCSP .....	70°C/W
Lead Temperature, Soldering	
Vapor Phase (60 sec) .....	215°C
Infrared (15 sec) .....	220°C
ESD .....	5.5 kV

## NOTES

<sup>1</sup>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.

<sup>2</sup>Overvoltages at A<sub>X</sub>,  $\overline{\text{EN}}$ , S, or D will be clamped by internal diodes. Current should be limited to the maximum ratings given.

## 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 ADG658/ADG659 feature 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.



## ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
ADG658YRU	-40°C to +125°C	Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG658YCP	-40°C to +85°C	Lead Frame Chip Scale Package (LFCSP)	CP-16
ADG659YRU	-40°C to +125°C	Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG659YCP	-40°C to +85°C	Lead Frame Chip Scale Package (LFCSP)	CP-16

Table I. ADG658 Truth Table

A2	A1	A0	$\overline{\text{EN}}$	Switch Condition
X	X	X	1	NONE
0	0	0	0	1
0	0	1	0	2
0	1	0	0	3
0	1	1	0	4
1	0	0	0	5
1	0	1	0	6
1	1	0	0	7
1	1	1	0	8

X = Don't Care

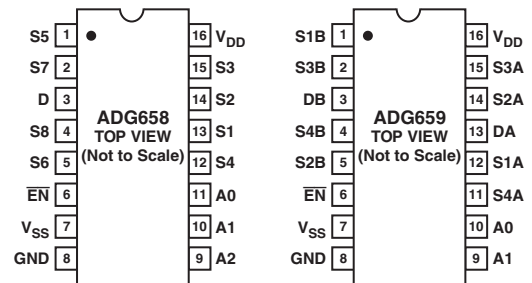
Table II. ADG659 Truth Table

A1	A0	$\overline{\text{EN}}$	On Switch Pair
X	X	1	NONE
0	0	0	1
0	1	0	2
1	0	0	3
1	1	0	4

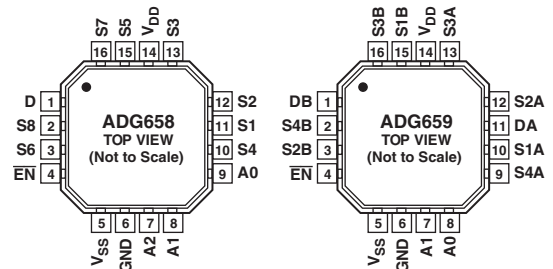
X = Don't Care

## PIN CONFIGURATIONS

### TSSOP



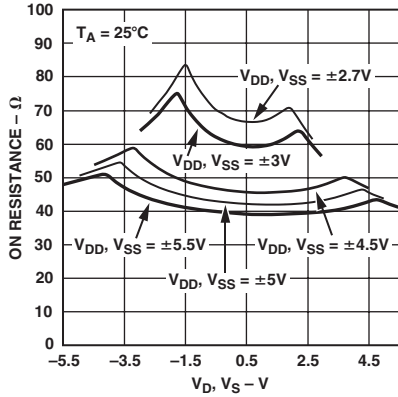
### LFCSP



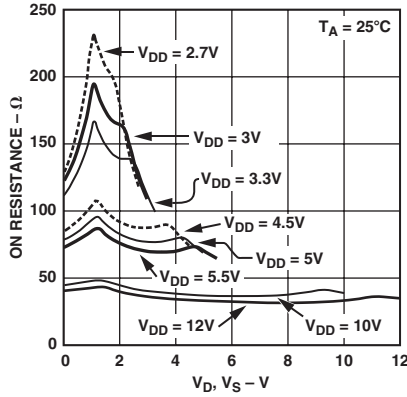
## TERMINOLOGY

Parameter	Description
$V_{DD}$	Most Positive Power Supply Potential.
$V_{SS}$	Most Negative Power Supply Potential.
$I_{DD}$	Positive Supply Current.
$I_{SS}$	Negative Supply Current.
GND	Ground (0V) Reference.
S	Source Terminal. May be an input or output.
D	Drain Terminal. May be an input or output.
$A_X$	Logic Control Input.
$\overline{EN}$	Active Low Digital Input. When high, device is disabled and all switches are OFF. When low, $A_X$ logic inputs determine ON switch.
$V_D (V_S)$	Analog Voltage on Terminals D, S.
$R_{ON}$	Ohmic Resistance between D and S.
$\Delta R_{ON}$	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.
$I_D (OFF)$	Drain Leakage Current with the Switch OFF.
$I_D, I_S (ON)$	Channel Leakage Current with the Switch ON.
$V_{INL}$	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. Measured with reference to ground.
$C_D (OFF)$	OFF Switch Drain Capacitance. Measured with reference to ground.
$C_D, C_S (ON)$	ON Switch Capacitance. Measured with reference to ground.
$C_{IN}$	Digital Input Capacitance.
$t_{ON}$	Delay between Applying the Digital Control Input and the Output Switching ON. See Test Circuit 7.
$t_{OFF}$	Delay between Applying the Digital Control Input and the Output Switching OFF.
$t_{BBM}$	ON Time. Measured between 80% points of both switches when switching from one address state to another.
Charge Injection	Measure of the Glitch Impulse Transferred from the Digital Input to the Analog Output during Switching.
Off Isolation	Measure of Unwanted Signal Coupling through an OFF Switch.
Crosstalk	Measure of Unwanted Signal Coupled through from One Channel to Another as a Result of Parasitic Capacitance.
Bandwidth	The Frequency at which the Output is Attenuated by 3 dB.
On Response	The Frequency Response of the ON Switch.
Insertion Loss	The Loss Due to the ON Resistance of the Switch.

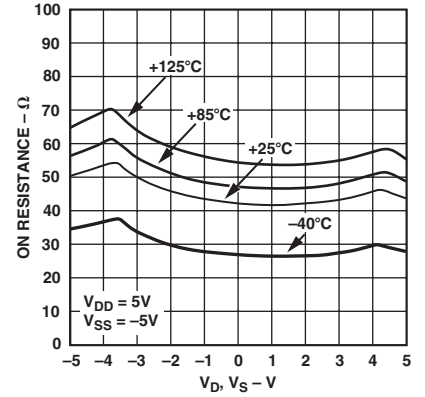
# Typical Performance Characteristics—ADG658/ADG659



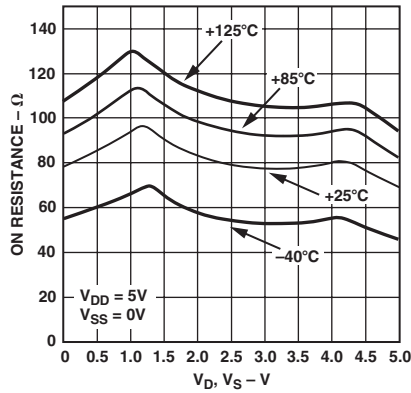
TPC 1. On Resistance vs.  $V_D$  ( $V_S$ ) for Dual Supply



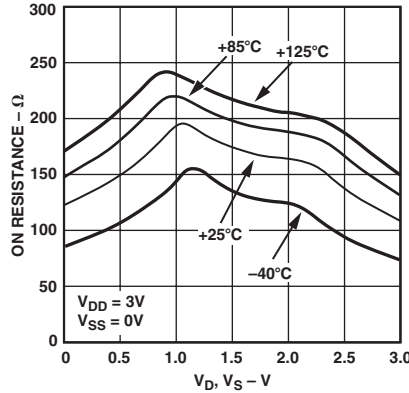
TPC 2. On Resistance vs.  $V_D$  ( $V_S$ ) for Single Supply



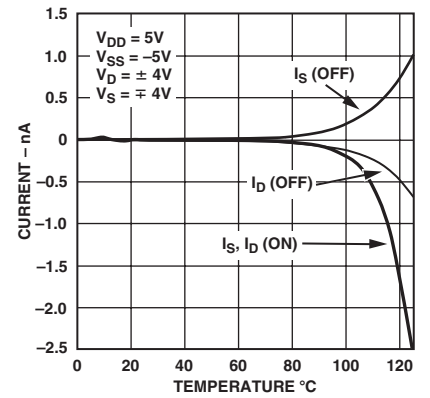
TPC 3. On Resistance vs.  $V_D$  ( $V_S$ ) for Different Temperatures (Dual Supply)



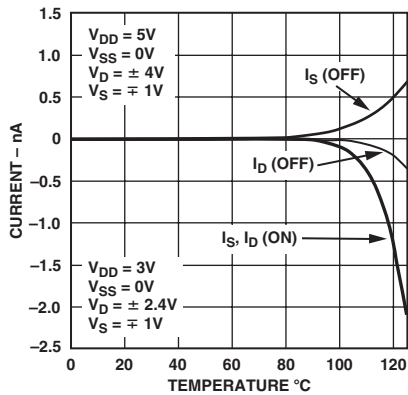
TPC 4. On Resistance vs.  $V_D$  ( $V_S$ ) for Different Temperatures (Single Supply)



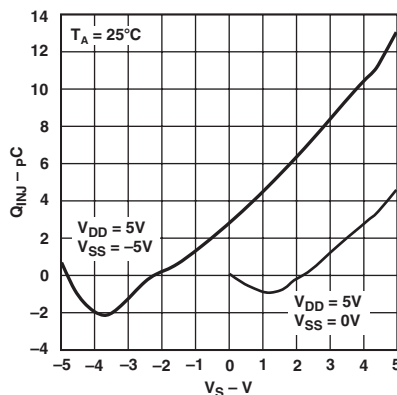
TPC 5. On Resistance vs.  $V_D$  ( $V_S$ ) for Different Temperatures (Single Supply)



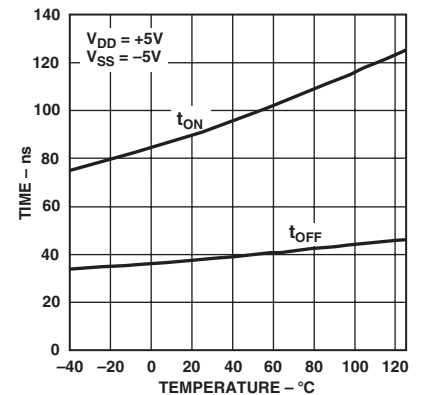
TPC 6. Leakage Currents vs. Temperature (Dual Supply)



TPC 7. Leakage Currents vs. Temperature (Single Supply)

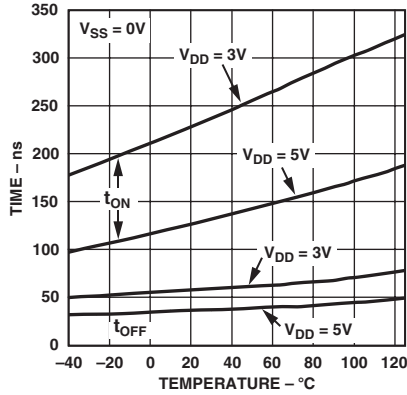


TPC 8. Charge Injection vs. Source Voltage

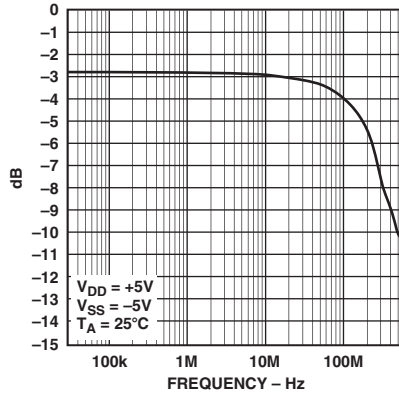


TPC 9.  $t_{ON}/t_{OFF}$  Times vs. Temperature (Dual Supply)

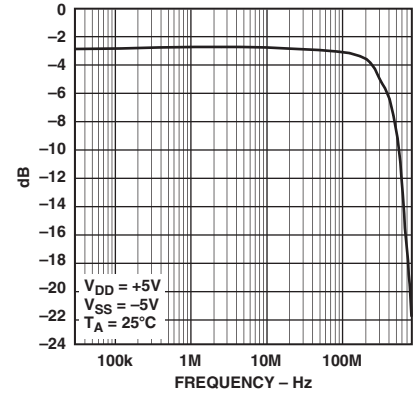
# ADG658/ADG659



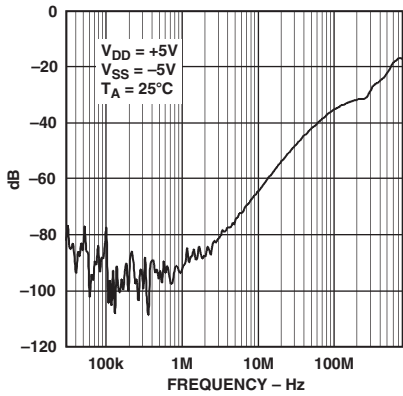
TPC 10.  $t_{ON}/t_{OFF}$  Times vs. Temperature (Single Supply)



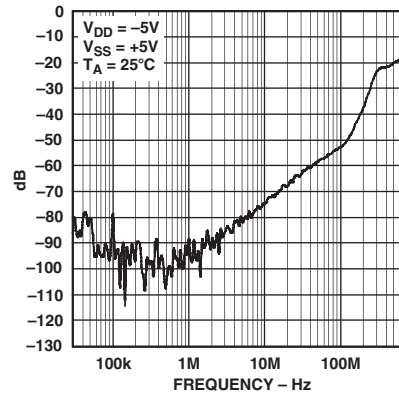
TPC 11. ON Response vs. Frequency (ADG658)



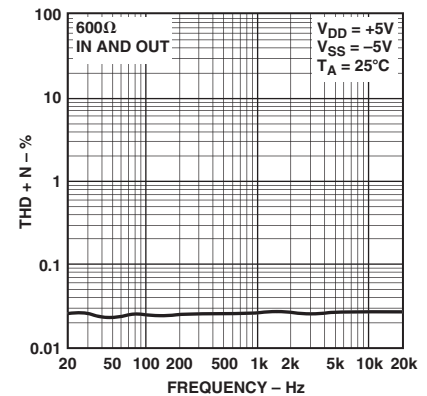
TPC 12. ON Response vs. Frequency (ADG659)



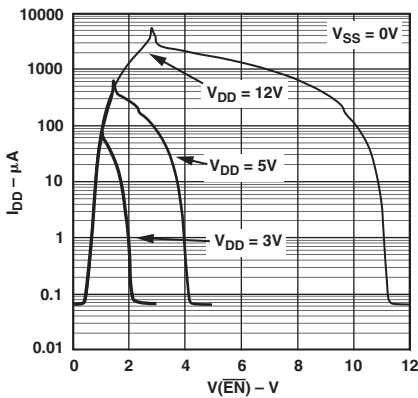
TPC 13. OFF Isolation vs. Frequency



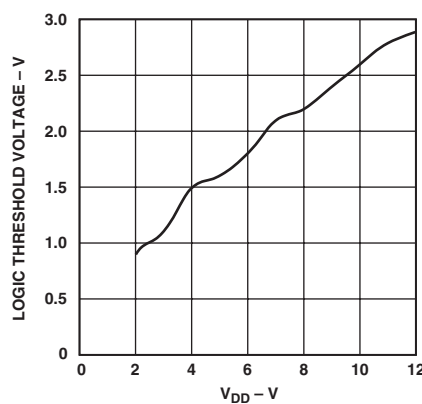
TPC 14. Crosstalk vs. Frequency



TPC 15. THD + Noise



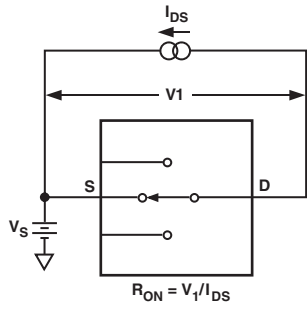
TPC 16.  $V_{DD}$  Current vs. Logic Level



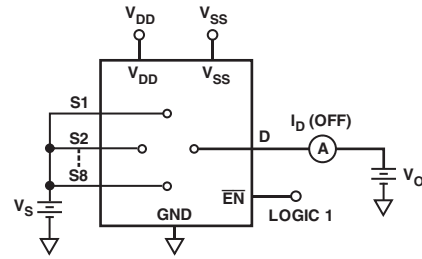
TPC 17. Logic Threshold Voltage vs. Supply Voltage



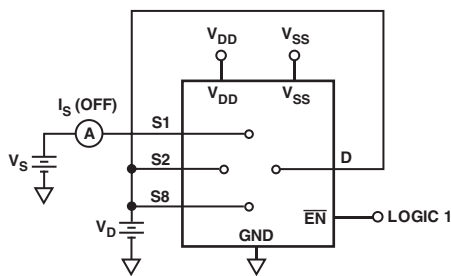
# Test Circuits



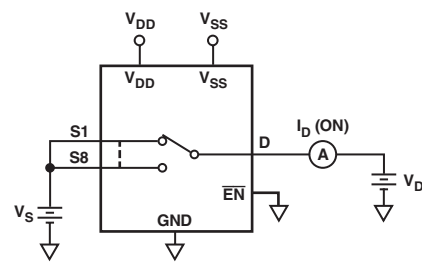
Test Circuit 1. On Resistance



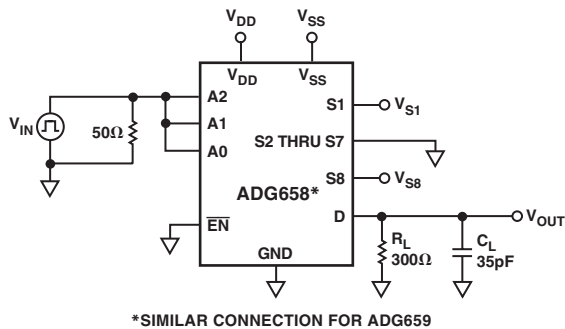
Test Circuit 3.  $I_D$  (OFF)



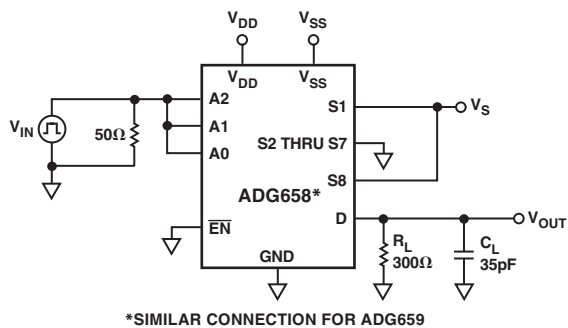
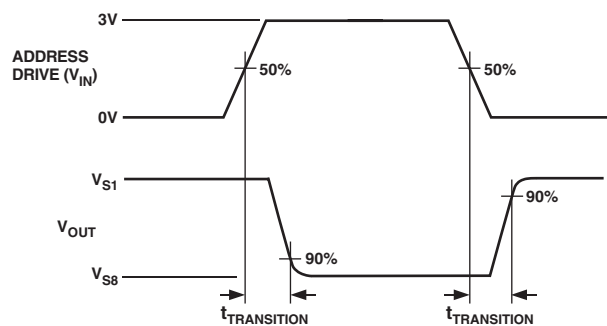
Test Circuit 2.  $I_S$  (OFF)



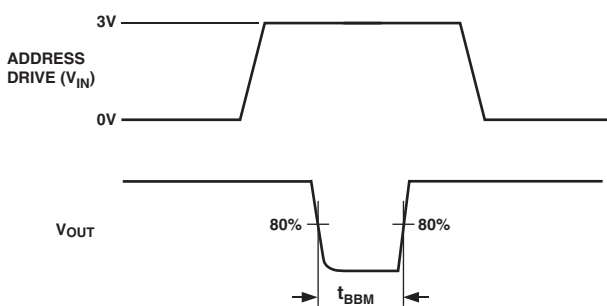
Test Circuit 4.  $I_D$  (ON)



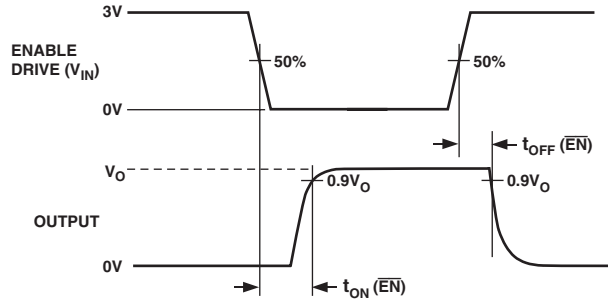
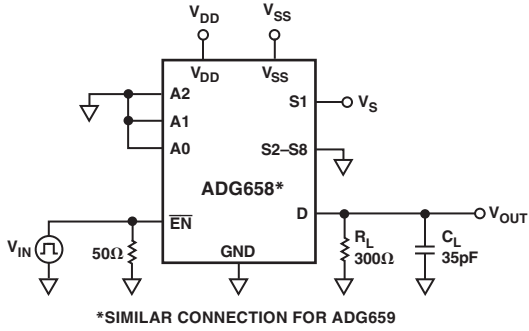
Test Circuit 5. Switching Time of Multiplexer,  $t_{TRANSITION}$



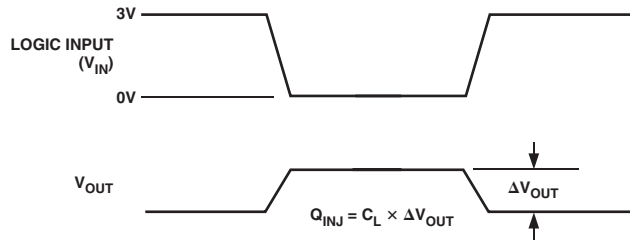
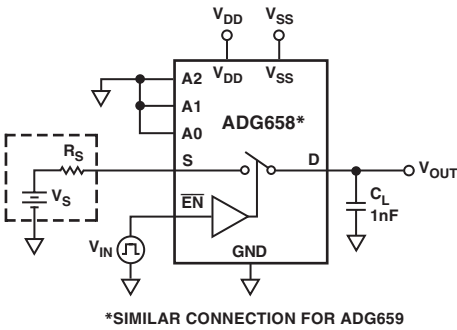
Test Circuit 6. Break-Before-Make Delay,  $t_{BBM}$



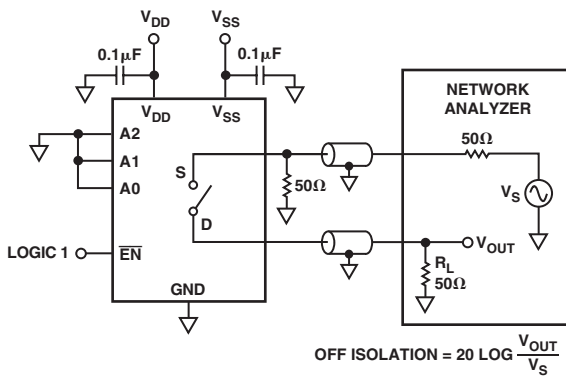
# ADG658/ADG659



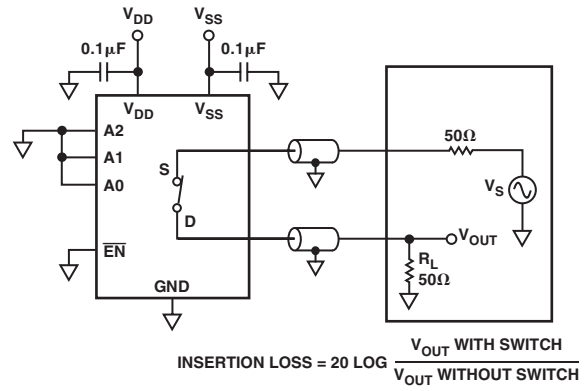
Test Circuit 7. Enable Delay,  $t_{ON}(\overline{EN})$ ,  $t_{OFF}(\overline{EN})$



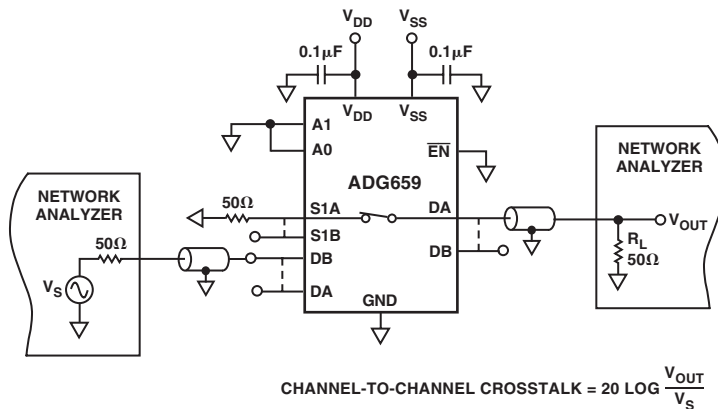
Test Circuit 8. Charge Injection



Test Circuit 9. OFF Isolation



Test Circuit 10. Bandwidth



Test Circuit 11. Channel-to-Channel Crosstalk



