

### 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/QSOP 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  $\overline{EN}$  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/QSOP packages and 16-lead 4 mm × 4 mm LFCSP packages.

### 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, 16-lead TSSOP package and 16-lead QSOP package.

### FUNCTIONAL BLOCK DIAGRAM

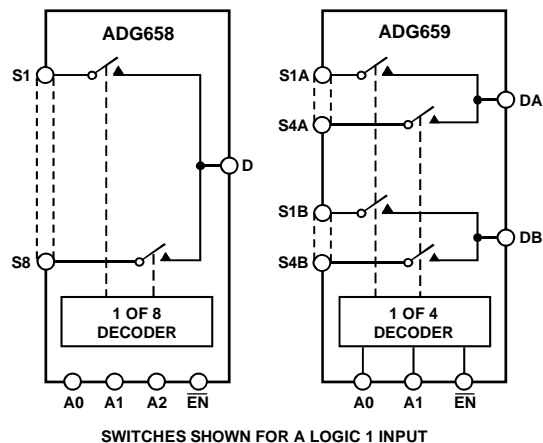


Figure 1.

### Rev. A

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## REVISION HISTORY

### 7/04—Data Sheet Changed from Rev. 0 to Rev. A

Updated Format .....	Universal
Added QSOP Package Outline .....	20
Changes to Ordering Guide .....	20

### 3/03—Rev. 0: Initial Version

## SPECIFICATIONS: DUAL SUPPLY

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

Table 1.

Parameter	B Version -40°C			Y Version -40°C		Unit	Test Conditions/Comments
	+25°C	to +85°C	to +125°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<sup>2</sup></b>							
$t_{TRANS}$	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	$R_L = 600\ \Omega$ , $2\text{ V p-p}$ , $f = 20\text{ Hz to } 20\text{ kHz}$
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	$f = 1\text{ MHz}$

# ADG658/ADG659

Parameter	B Version –40°C		Y Version –40°C	Unit	Test Conditions/Comments
	+25°C	to +85°C	to+125°C		
C <sub>D</sub> , C <sub>S</sub> (ON)					
ADG658	28			pF typ	f = 1 MHz
ADG659	16			pF typ	f = 1 MHz
POWER REQUIREMENTS					
I <sub>DD</sub>	0.01		1	μA typ μA max	V <sub>DD</sub> = +5.5 V, V <sub>SS</sub> = –5.5 V Digital Inputs = 0 V or 5.5 V
I <sub>SS</sub>	0.01		1	μA typ μA max	Digital Inputs = 0 V or 5.5 V

<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: SINGLE SUPPLY 5V

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

Table 2.

Parameter	B Version –40°C			Y Version –40°C	Unit	Test Conditions/Comments
	+25°C	to +85°C	to +125°C	to +125°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 $4.5\text{ V}$ , $I_S = 1\text{ mA}$ ;
	150	160	200		$\Omega$ max	Test Circuit 1
On Resistance Match between Channels ( $\Delta R_{ON}$ )	4.5				$\Omega$ typ	$V_S = 3.5\text{ V}$ , $I_S = 1\text{ mA}$
On Resistance Flatness ( $R_{FLAT(ON)}$ )	8	9	10		$\Omega$ max	
	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	$V_{DD} = 5.5\text{ V}$
	$\pm 0.2$			$\pm 5$	nA max	$V_S = 1\text{ V}/4.5\text{ V}$ , $V_D = 4.5\text{ V}/1\text{ V}$ ;
Drain OFF Leakage $I_D$ (OFF)	$\pm 0.005$				nA typ	Test Circuit 2
ADG658	$\pm 0.2$			$\pm 5$	nA max	$V_S = 1\text{ V}/4.5\text{ V}$ , $V_D = 4.5\text{ V}/1\text{ V}$ ;
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	$V_S = V_D = 1\text{ V}$ 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	$V_S = 2.5\text{ V}$ , $R_S = 0\ \Omega$ , $C_L = 1\text{ nF}$ ;
	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	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ; $f = 1\text{ MHz}$ ;
–3 dB Bandwidth						Test Circuit 11
ADG658	180				MHz typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ;
ADG659	330				MHz typ	Test Circuit 10
$C_S$ (OFF)	5				pF typ	$f = 1\text{ MHz}$
$C_D$ (OFF)						
ADG658	29				pF typ	$f = 1\text{ MHz}$
ADG659	15				pF typ	$f = 1\text{ MHz}$

# ADG658/ADG659

$C_D, C_S$ (ON) ADG658 ADG659	30 16	pF typ pF typ	f = 1 MHz f = 1 MHz
POWER REQUIREMENTS $I_{DD}$	0.01 1	$\mu$ A typ $\mu$ A max	$V_{DD} = 5.5$ V Digital Inputs = 0 V or 5.5 V

<sup>1</sup> Temperature range is as follows: B Version:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ . Y Version:  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

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

## SPECIFICATIONS: SINGLE SUPPLY 2.7 TO 3.6 V

$V_{DD} = 2.7$  to  $3.6$  V,  $V_{SS} = 0$  V,  $GND = 0$  V, unless otherwise noted.<sup>1</sup>

Table 3.

Parameter	B Version –40°C		Y Version –40°C	Unit	Test Conditions/Comments
	+25°C	to +85°C	to +125°C		
<b>ANALOG SWITCH</b>					
Analog Signal Range			0 to $V_{DD}$	V	$V_{DD} = 2.7$ V, $V_{SS} = 0$ V
On Resistance ( $R_{ON}$ )	185			$\Omega$ typ	$V_S = 0$ V to 2.7 V, $I_S = 0.1$ mA;
	300	350	400	$\Omega$ max	Test Circuit 1
On Resistance Match between Channels ( $\Delta R_{ON}$ )	2			$\Omega$ typ	$V_S = 1.5$ V, $I_S = 0.1$ mA
	4.5	6	7	$\Omega$ max	
<b>LEAKAGE CURRENTS</b>					
Source OFF Leakage $I_S$ (OFF)	$\pm 0.005$			nA typ	$V_{DD} = 3.3$ V
	$\pm 0.2$		$\pm 5$	nA max	$V_S = 1$ V/3 V, $V_D = 3$ V/1 V;
Drain OFF Leakage $I_D$ (OFF)	$\pm 0.005$			nA typ	Test Circuit 2
ADG658	$\pm 0.2$		$\pm 5$	nA max	$V_S = 1$ V/3 V, $V_D = 3$ V/1 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	$V_S = V_D = 1$ V or 3 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, $V_{INH}$			2.0	V min	
Input Low Voltage, $V_{INL}$			0.5	V max	
Input Current					
$I_{INL}$ or $I_{INH}$	0.005			$\mu$ A typ	$V_{IN} = V_{INL}$ or $V_{INH}$
			$\pm 1$	$\mu$ A max	
$C_{IN}$ , Digital Input Capacitance	2			pF typ	
<b>DYNAMIC CHARACTERISTICS<sup>2</sup></b>					
$t_{TRANS}$	200			ns typ	$R_L = 300$ $\Omega$ , $C_L = 35$ pF
	370	440	490	ns max	$V_S = 1.5$ V; Test Circuit 7
$t_{ON}(\overline{EN})$	230			ns typ	$R_L = 300$ $\Omega$ , $C_L = 35$ pF
	370	440	490	ns max	$V_S = 1.5$ V; Test Circuit 7
$t_{OFF}(\overline{EN})$	50			ns typ	$R_L = 300$ $\Omega$ , $C_L = 35$ pF
	80	90	110	ns max	$V_S = 1.5$ V; Test Circuit 7
Break-Before-Make Time Delay, $t_{BBM}$	200			ns typ	$R_L = 300$ $\Omega$ , $C_L = 35$ pF
			10	ns min	$V_{S1} = V_{S2} = 1.5$ V; Test Circuit 6
Charge Injection	1			pC typ	$V_S = 1.5$ V, $R_S = 0$ $\Omega$ , $C_L = 1$ nF;
	2			pC max	Test Circuit 8
Off Isolation	–90			dB typ	$R_L = 50$ $\Omega$ , $C_L = 5$ pF, $f = 1$ MHz; Test Circuit 9
Channel-to-Channel Crosstalk (ADG659)	–90			dB typ	$R_L = 50$ $\Omega$ , $C_L = 5$ pF; $f = 1$ MHz; Test Circuit 11
–3 dB Bandwidth					
ADG658	160			MHz typ	$R_L = 50$ $\Omega$ , $C_L = 5$ pF;
ADG659	300			MHz typ	Test Circuit 10
$C_S$ (OFF)	5			pF typ	$f = 1$ MHz
$C_D$ (OFF)					
ADG658	29			pF typ	$f = 1$ MHz
ADG659	15			pF typ	$f = 1$ MHz
$C_D, C_S$ (ON)					
ADG658	30			pF typ	$f = 1$ MHz
ADG659	16			pF typ	$f = 1$ MHz

# ADG658/ADG659

Parameter	B Version	Y Version	Unit	Test Conditions/Comments
	+25°C	-40°C to +85°C		
POWER REQUIREMENTS				$V_{DD} = 3.6\text{ V}$ Digital Inputs = 0 V or 3.6 V
$I_{DD}$	0.01	1	$\mu\text{A typ}$ $\mu\text{A max}$	

<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.



## ABSOLUTE MAXIMUM RATINGS

TA = 25°C, unless otherwise noted.

**Table 4.**

Parameters	Ratings
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>1</sup>	V <sub>SS</sub> −0.3 V to V <sub>DD</sub> +0.3 V
Digital Inputs <sup>1</sup>	GND −0.3 V to V <sub>DD</sub> +0.3 V or 10 mA, whichever occurs first
Peak Current, S or D (Pulsed at 1 ms, 10% duty cycle max)	40 mA
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 QSOP	104°C/W
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

<sup>1</sup> Over voltages at A<sub>x</sub>,  $\overline{\text{EN}}$ , S, or D are clamped by internal diodes. Current should be limited to the maximum ratings.

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 indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### ESD 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 this product 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.



# ADG658/ADG659

Table 5. ADG658 Truth Table

A2	A1	A0	$\overline{\text{EN}}$	Switch Condition
X <sup>1</sup>	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

<sup>1</sup>X = Don't Care

Table 6. ADG659 Truth Table

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

<sup>1</sup>X = Don't Care

## PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

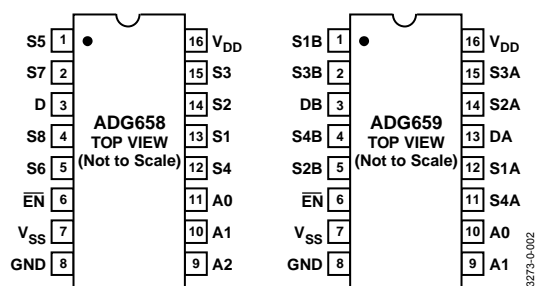


Figure 2. 16-Lead TSSOP/QSOP

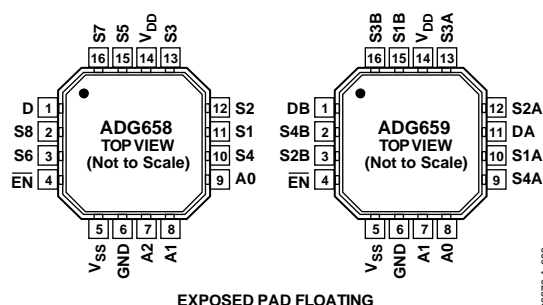


Figure 3. 4 mm x 4 mm LFCSP

Table 7. Functional Descriptions

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 (0 V) 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., $R_{ONmax} - R_{ONmin}$ .
$R_{FLAT(ON)}$	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.

## ADG658/ADG659

Parameter	Description
$C_D, C_S$ (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

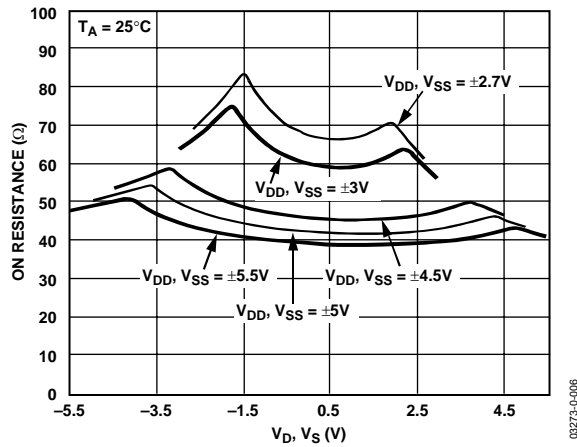


Figure 4. On Resistance vs.  $V_D$  ( $V_S$ ) for Dual Supply

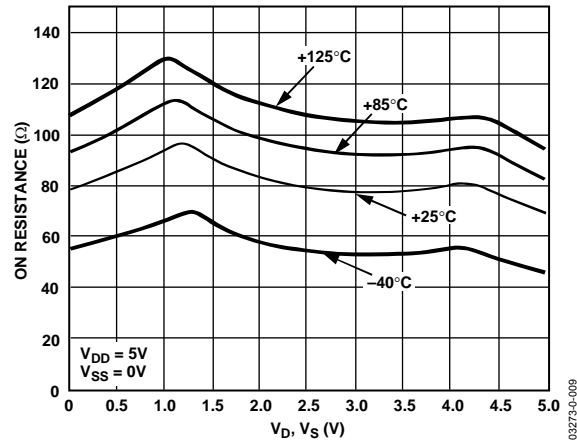


Figure 7. On Resistance vs.  $V_D$  ( $V_S$ ) for Different Temperatures (Single Supply)

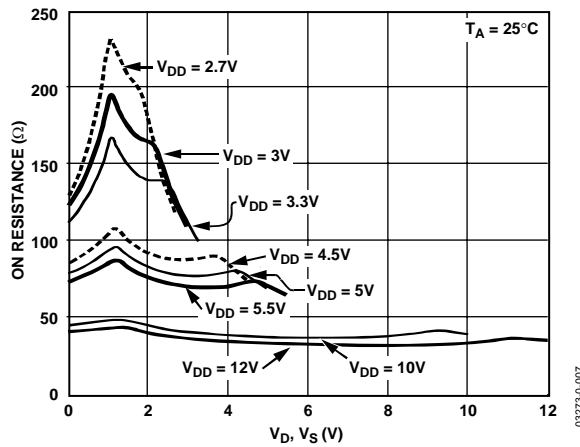


Figure 5. On Resistance vs.  $V_D$  ( $V_S$ ) for Single Supply

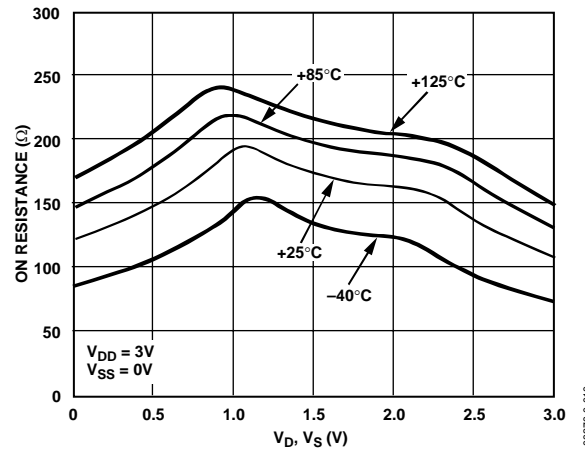


Figure 8. On Resistance vs.  $V_D$  ( $V_S$ ) for Different Temperatures (Single Supply)

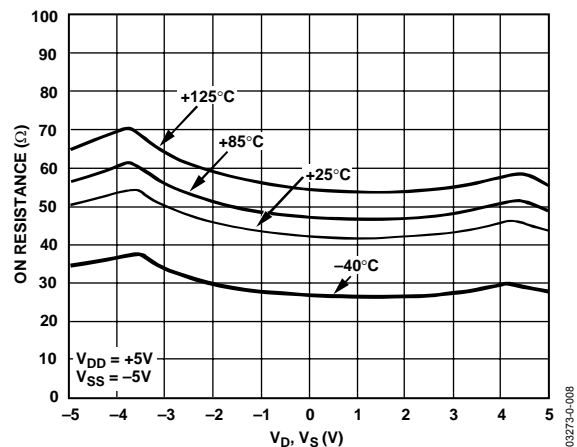


Figure 6. On Resistance vs.  $V_D$  ( $V_S$ ) for Different Temperatures (Dual Supply)

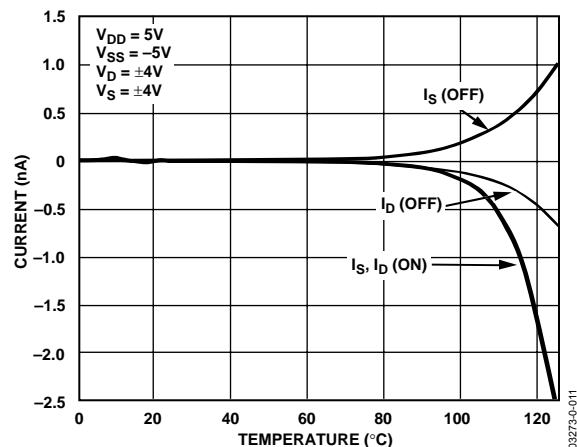


Figure 9. Leakage Current vs. Temperature (Dual Supply)

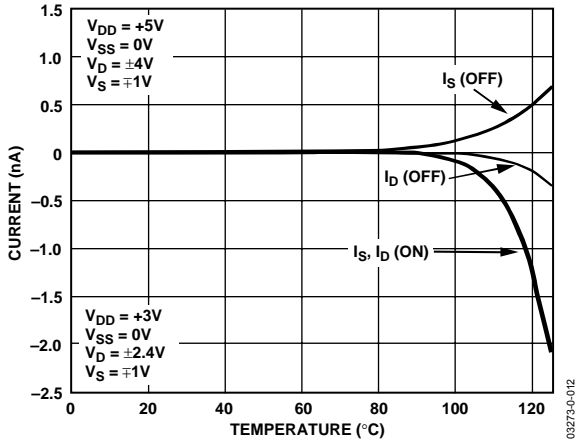


Figure 10. Leakage Current vs. Temperature (Single Supply)

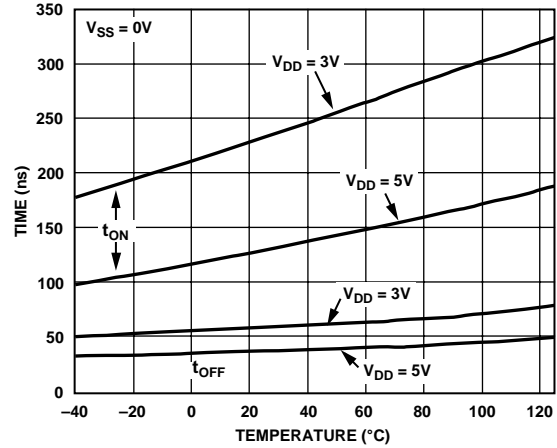


Figure 13.  $t_{ON}/t_{OFF}$  Times vs. Temperature (Single Supply)

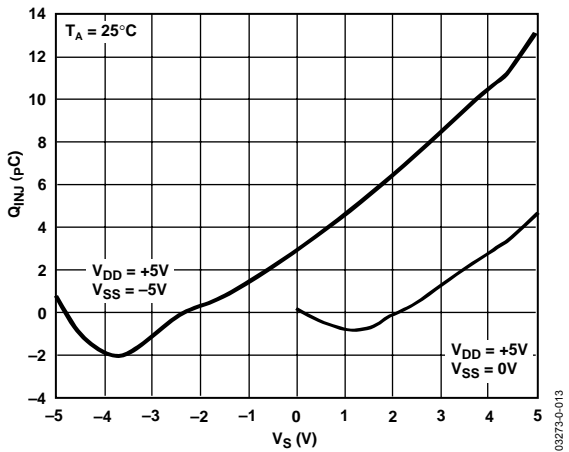


Figure 11. Charge Injection vs. Source Voltage

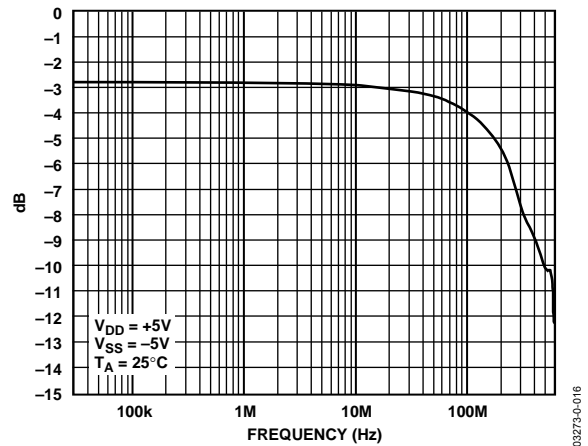


Figure 14. ON Response vs. Frequency (ADG658)

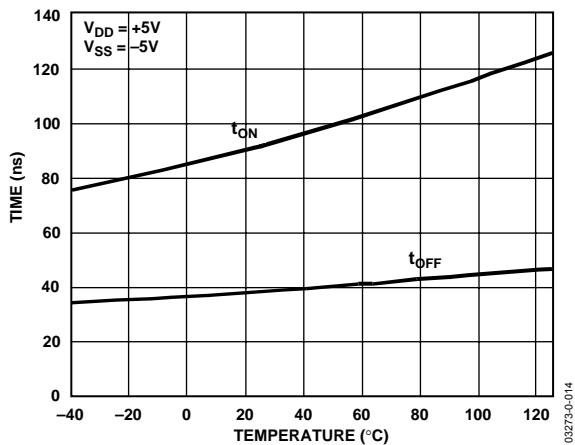


Figure 12.  $t_{ON}/t_{OFF}$  Times vs. Temperature (Dual Supply)

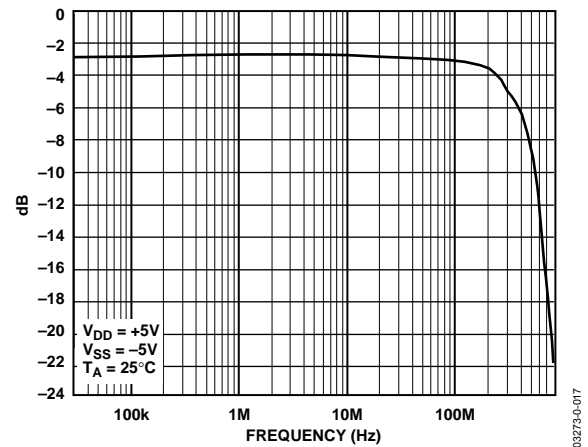


Figure 15. ON Response vs. Frequency (ADG659)

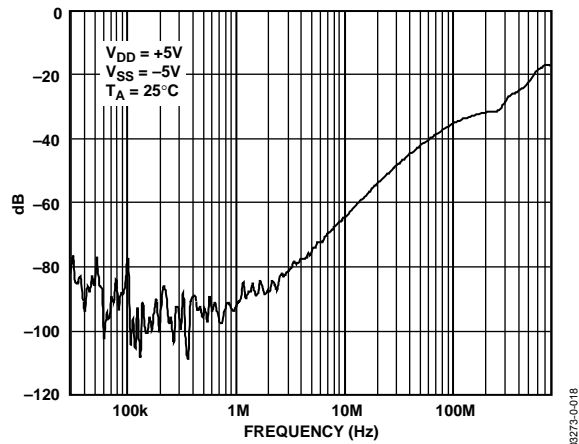


Figure 16. OFF Isolation vs. Frequency

03273-0-018

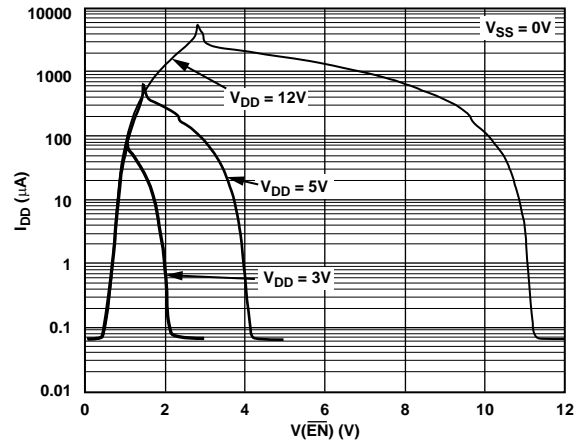


Figure 19.  $V_{DD}$  Current vs. Logic Level

03273-0-021

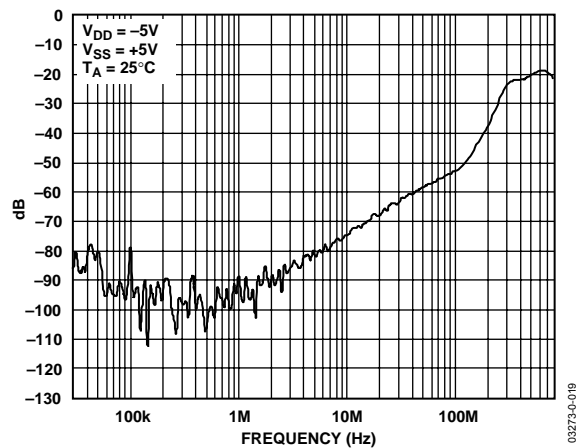


Figure 17. Crosstalk vs. Frequency

03273-0-019

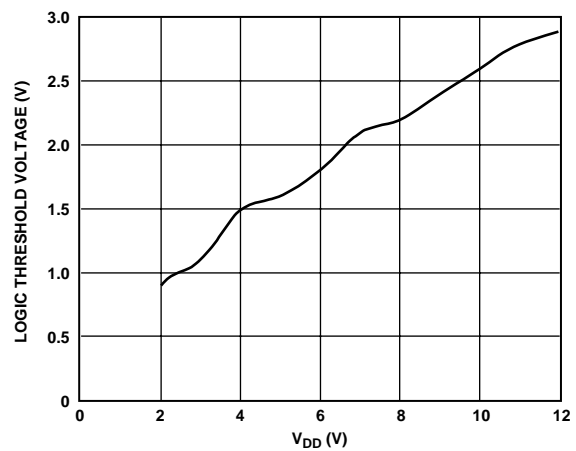


Figure 20. Logic Threshold Voltage vs. Supply Voltage

03273-0-022

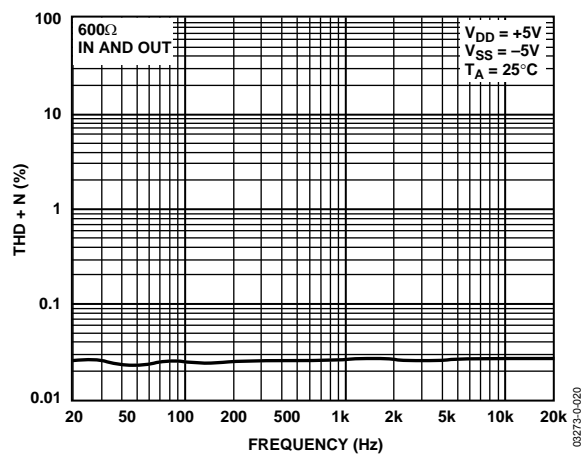


Figure 18. THD + Noise

03273-0-020

## TEST CIRCUITS

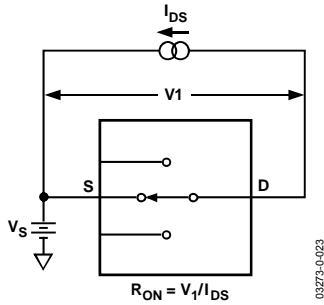


Figure 21. Test Circuit 1. ON Resistance

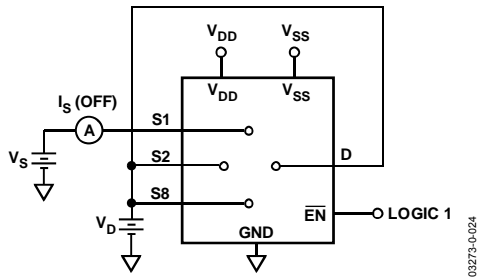


Figure 22. Test Circuit 2.  $I_S$  (OFF)

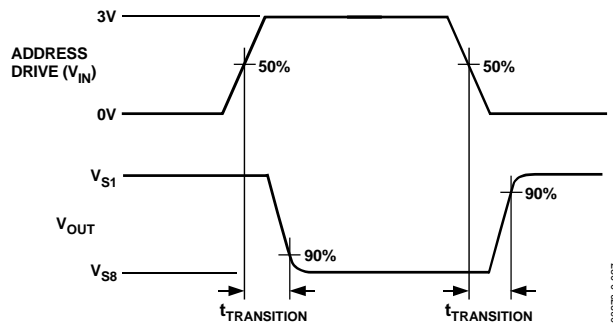
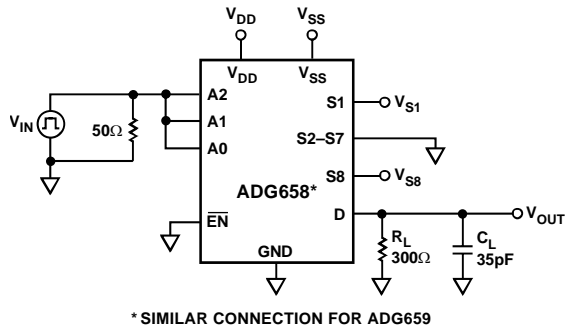


Figure 25. Test Circuit 5. Switching Time of Multiplexer,  $t_{\text{TRANSITION}}$

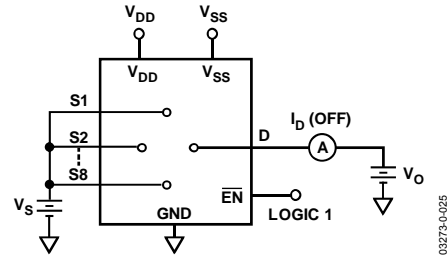


Figure 23. Test Circuit 3.  $I_D$  (OFF)

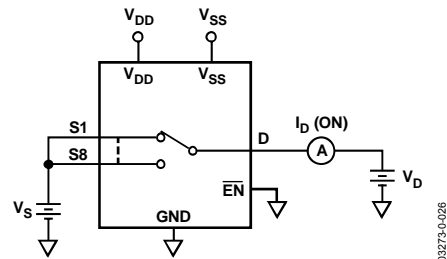


Figure 24. Test Circuit 4.  $I_D$  (ON)



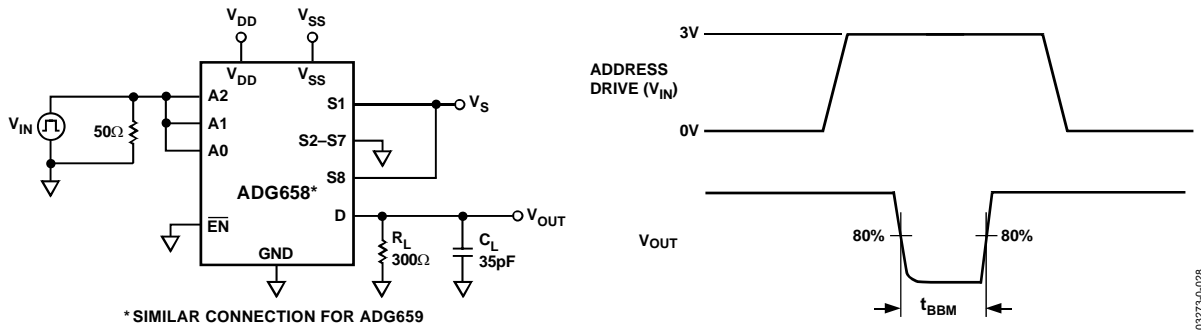


Figure 26. Test Circuit 6. Break-Before-Make Delay,  $t_{BBM}$

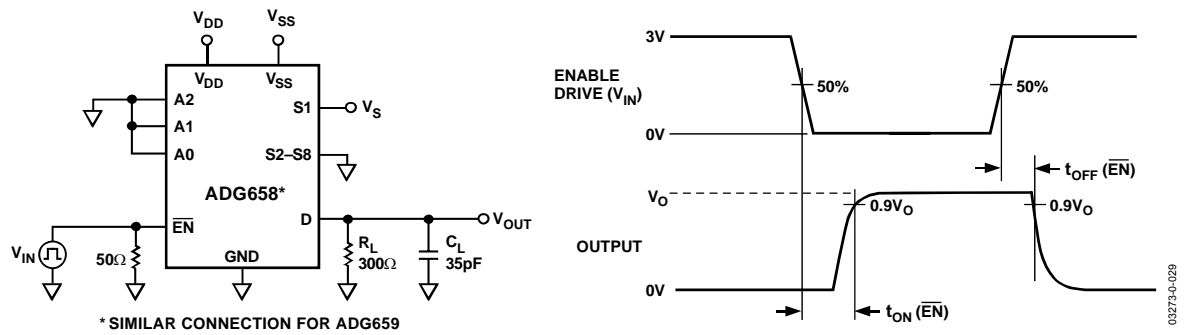


Figure 27. Test Circuit 7. Enable Delay,  $t_{ON}(\overline{EN})$ ,  $t_{OFF}(\overline{EN})$

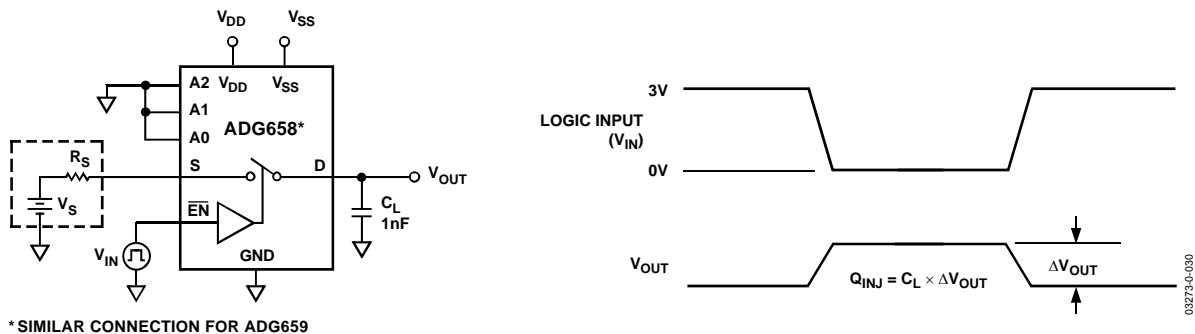


Figure 28. Test Circuit 8. Charge Injection

# ADG658/ADG659

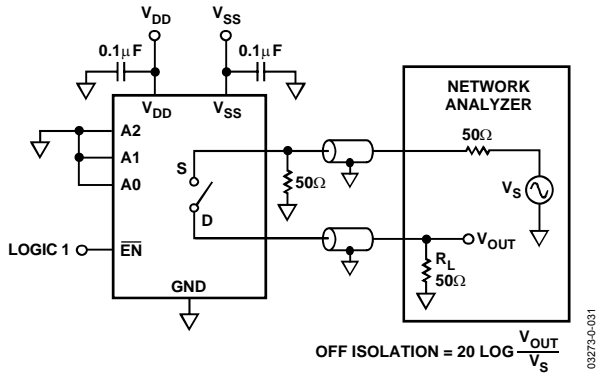


Figure 29. Test Circuit 9. Off Isolation

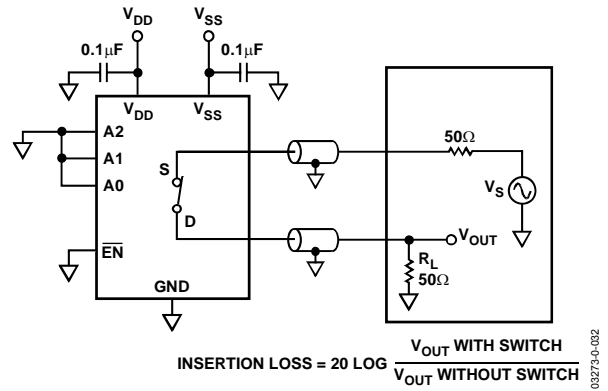


Figure 30. Test Circuit 10. Bandwidth

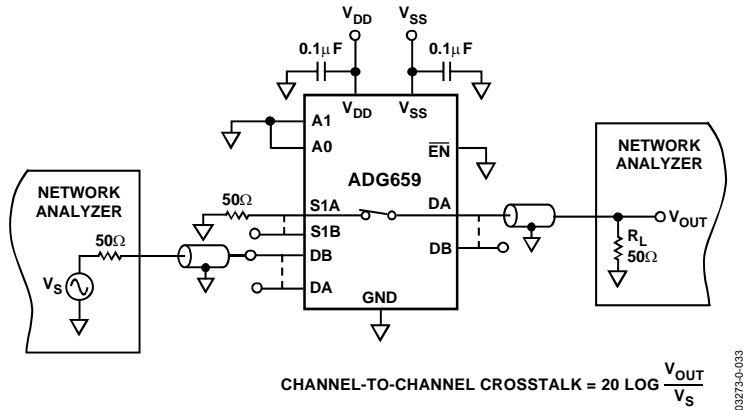
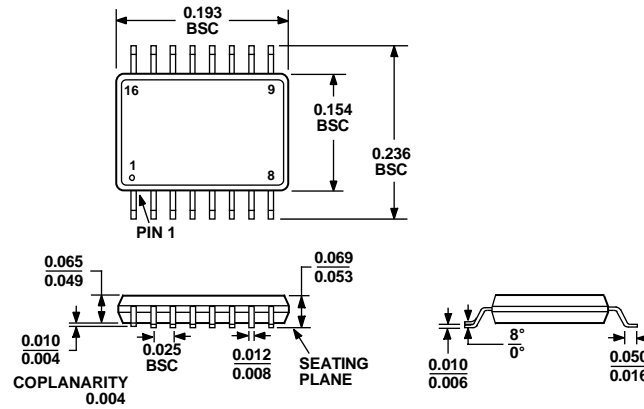


Figure 31. Test Circuit 11. Channel-to-Channel Crosstalk



# ADG658/ADG659



COMPLIANT TO JEDEC STANDARDS MO-137AB

Figure 34. 16-Lead Shrink Small Outline Package [QSOP] (RQ-16)  
Dimensions shown in millimeters

## ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
ADG658YRU	-40°C to +125°C	Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG658YRU-REEL7	-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
ADG658YCP-REEL7	-40°C to +85°C	Lead Frame Chip Scale Package (LFCSP)	CP-16
ADG658YRQ	-40°C to +125°C	Shrink Small Outline Package (QSOP)	RQ-16
ADG658YRQ-REEL	-40°C to +125°C	Shrink Small Outline Package (QSOP)	RQ-16
ADG658YRQ-REEL7	-40°C to +125°C	Shrink Small Outline Package (QSOP)	RQ-16
ADG659YRU	-40°C to +125°C	Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG659YRU-REEL7	-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
ADG659YCP-REEL7	-40°C to +85°C	Lead Frame Chip Scale Package (LFCSP)	CP-16
ADG659YCPZ <sup>1</sup>	-40°C to +85°C	Lead Frame Chip Scale Package (LFCSP)	CP-16
ADG659YCPZ-REEL7 <sup>1</sup>	-40°C to +85°C	Lead Frame Chip Scale Package (LFCSP)	CP-16
ADG659YRQ	-40°C to +125°C	Shrink Small Outline Package (QSOP)	RQ-16
ADG659YRQ-REEL	-40°C to +125°C	Shrink Small Outline Package (QSOP)	RQ-16
ADG659YRQ-REEL7	-40°C to +125°C	Shrink Small Outline Package (QSOP)	RQ-16

<sup>1</sup>Z = Pb-free part.