CMOS, ±5 V/+5 V/+3 V, Triple SPDT Switch

Data Sheet **ADG633**

FEATURES

- **±2 V to ±6 V dual-supply operation**
- **2 V to 12 V single-supply operation**
- **Temperature range: −40°C to +125°C**
- **<0.2 nA leakage currents**
- **52 Ω on resistance over full signal range**
- **Rail-to-rail switching operation**
- **16-lead LFCSP and TSSOP packages**
- **Typical power consumption: <0.1 μW**
- **TTL-/CMOS-compatible inputs**
- **Package upgrades to 74HC4053 and MAX4053/MAX4583**

APPLICATIONS

- **Automatic test equipment**
- **Data acquisition systems**
- **Battery-powered systems**
- **Communications systems**
- **Audio and video signal routing**
- **Relay replacement**
- **Sample-and-hold systems**
- **Industrial control systems**

FUNCTIONAL BLOCK DIAGRAM

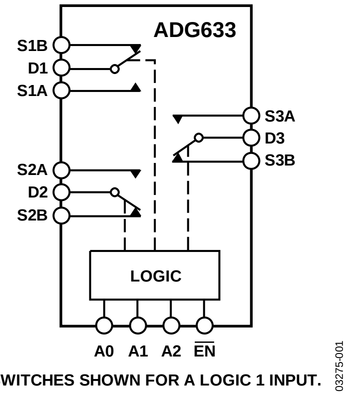

Figure 1.

GENERAL DESCRIPTION

The ADG633 is a low voltage CMOS device comprising three independently selectable single-pole, double-throw (SPDT) switches. The device is fully specified for ±5 V, +5 V, and +3 V supplies. The ADG633 switches are turned on with a logic low (or high) on the appropriate control input. Each switch conducts equally well in both directions when on and has an input signal range that extends to the supplies. An $\overline{\text{EN}}$ input is used to enable or disable the device. When the device is disabled, all channels are switched off.

The ADG633 is designed on an enhanced process that provides lower power dissipation, yet is capable of high switching speeds. Low power consumption and an operating supply range of 2 V to 12 V make the ADG633 ideal for battery-powered, portable instruments. 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 ADG633 is available in a small, 16-lead TSSOP package and a 16-lead, 4 mm × 4 mm LFCSP package.

PRODUCT HIGHLIGHTS

1. Single- and dual-supply operation. The ADG633 offers high performance and is fully specified and guaranteed with ±5 V, +5 V, and +3 V supply rails.
2. Temperature range: −40°C to +125°C.
3. Guaranteed break-before-make switching action.
4. Low power consumption, typically <0.1 μW.
5. Small, 16-lead TSSOP and 16-lead, 4 mm × 4 mm LFCSP packages.

Rev. B **Document Feedback**

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700

Technical Support **www.analog.com**

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SPECIFICATIONS

DUAL-SUPPLY OPERATION

V_{DD} = +5 V, V_{SS} = −5 V, GND = 0 V, T_A = −40°C to +125°C, unless otherwise noted.

Table 1.

Parameter	+25°C	−40°C to +85°C	−40°C to +125°C	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			V_{SS} to V_{DD}	V	V_{DD} = +4.5 V, V_{SS} = −4.5 V
On Resistance, R_{ON}	52			Ω typ	V_S = ±4.5 V, I_S = 1 mA; see Figure 20
	75	90	100	Ω max	V_S = ±4.5 V, I_S = 1 mA; see Figure 20
On-Resistance Match Between Channels, ΔR_{ON}	0.8			Ω typ	V_S = +3.5 V, I_S = 1 mA
	1.3	1.8	2	Ω max	V_S = +3.5 V, I_S = 1 mA
On-Resistance Flatness, $R_{FLAT(ON)}$	9			Ω typ	V_{DD} = +5 V, V_{SS} = −5 V, V_S = ±3 V, I_S = 1 mA
	12	13	14	Ω max	V_{DD} = +5 V, V_{SS} = −5 V, V_S = ±3 V, I_S = 1 mA
LEAKAGE CURRENTS					V_{DD} = +5.5 V, V_{SS} = −5.5 V
Source Off Leakage, $I_{S(OFF)}$	±0.005			nA typ	V_D = ±4.5 V, V_S = ∓4.5 V; see Figure 21
	±0.2		±5	nA max	V_D = ±4.5 V, V_S = ∓4.5 V; see Figure 21
Drain Off Leakage, $I_{D(OFF)}$	±0.005			nA typ	V_D = ±4.5 V, V_S = ∓ 4.5 V; see Figure 22
	±0.2		±5	nA max	V_D = ±4.5 V, V_S = ∓ 4.5 V; see Figure 22
Channel On Leakage, $I_{D(ON)}$, $I_{S(ON)}$	±0.005			nA typ	V_D = V_S = ±4.5 V; see Figure 23
	±0.2		±5	nA max	V_D = V_S = ±4.5 V; see Figure 23
DIGITAL INPUTS					
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			μA typ	V_{IN} = V_{INL} or V_{INH}
			±1	μA max	V_{IN} = V_{INL} or V_{INH}
Digital Input Capacitance, C_{IN}	2			pF typ	
DYNAMIC CHARACTERISTICS[1]					
$t_{TRANSITION}$	60			ns typ	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 24
	90	110	130	ns max	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 24
t_{ON} ($\overline{EN}$)	70			ns typ	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 26
	95	120	135	ns max	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 26
t_{OFF} ($\overline{EN}$)	25			ns typ	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 26
	40	45	50	ns max	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 26
Break-Before-Make Time Delay, t_{BBM}	40			ns typ	R_L = 300 Ω, C_L = 35 pF, V_{S1} = V_{S2} = 3 V; see Figure 25
			10	ns min	R_L = 300 Ω, C_L = 35 pF, V_{S1} = V_{S2} = 3 V; see Figure 25
Charge Injection	2			pC typ	V_S = 0 V, R_S = 0 Ω, C_L = 1 nF; see Figure 27
	4			pC max	V_S = 0 V, R_S = 0 Ω, C_L = 1 nF; see Figure 27
Off Isolation	−90			dB typ	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 28
Total Harmonic Distortion, THD + N	0.025			% typ	R_L = 600 Ω, 2 V p-p, f = 20 Hz to 20 kHz
Channel-to-Channel Crosstalk	−90			dB typ	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 30
−3 dB Bandwidth	580			MHz typ	R_L = 50 Ω, C_L = 5 pF; see Figure 29
$C_{S(OFF)}$	4			pF typ	f = 1 MHz
$C_{D(OFF)}$	7			pF typ	f = 1 MHz
$C_{D(ON)}$, $C_{S(ON)}$	12			pF typ	f = 1 MHz
POWER REQUIREMENTS[2]					V_{DD} = +5.5 V, V_{SS} = −5.5 V
I_{DD}	0.01			μA typ	Digital inputs = 0 V or 5.5 V
			1	μA max	Digital inputs = 0 V or 5.5 V
I_{SS}	0.01			μA typ	Digital inputs = 0 V or 5.5 V
			1	μA max	Digital inputs = 0 V or 5.5 V

[1] Guaranteed by design; not subject to production test.

[2] The device is fully specified at a ±5 V dual supply and at 5 V and 3.3 V single supplies. It is possible to operate the ADG633 with unbalanced supplies or at other voltage supplies (±2 V to ±6 V, and 2 V to 12 V); however, the switch characteristics change. These changes include, but are not limited to: analog signal range, on resistance, leakage, V_{INL}, V_{INH}, and switching times. The optimal power-up sequence for the device is: ground, V_{DD}, V_{SS}, and then the digital inputs, before applying the analog input signal.

SINGLE-SUPPLY OPERATION

V_{DD} = 5 V, V_{SS} = 0 V, GND = 0 V, T_A = −40°C to +125°C, unless otherwise noted.

Table 2.

Parameter	+25°C	−40°C to +85°C	−40°C to +125°C	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			0 to V_{DD}	V	V_{DD} = 4.5 V, V_{SS} = 0 V
On Resistance, R_{ON}	85			Ω typ	V_S = 0 V to 4.5 V, I_S = 1 mA; see Figure 20
	150	160	200	Ω max	V_S = 0 V to 4.5 V, I_S = 1 mA; see Figure 20
On-Resistance Match Between Channels, ΔR_{ON}	4.5			Ω typ	V_S = +3.5 V, I_S = 1 mA
	8	9	10	Ω max	V_S = +3.5 V, I_S = 1 mA
On-Resistance Flatness, $R_{FLAT(ON)}$	13	14	16	Ω typ	V_{DD} = 5 V, V_{SS} = 0 V, V_S = 1.5 V to 4 V, I_S = 1 mA
LEAKAGE CURRENTS					V_{DD} = 5.5 V
Source Off Leakage, $I_{S(OFF)}$	±0.005			nA typ	V_S = 1 V/4.5 V, V_D = 4.5 V/1 V; see Figure 21
	±0.2		±5	nA max	V_S = 1 V/4.5 V, V_D = 4.5 V/1 V; see Figure 21
Drain Off Leakage, $I_{D(OFF)}$	±0.005			nA typ	V_S = 1 V/4.5 V, V_D = 4.5 V/1 V; see Figure 22
	±0.2		±5	nA max	V_S = 1 V/4.5 V, V_D = 4.5 V/1 V; see Figure 22
Channel On Leakage, $I_{D(ON)}$, $I_{S(ON)}$	±0.005			nA typ	V_S = V_D = 1 V or 4.5 V; see Figure 23
	±0.2		±5	nA max	V_S = V_D = 1 V or 4.5 V; see Figure 23
DIGITAL INPUTS					
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			µA typ	V_{IN} = V_{INL} or V_{INH}
			±1	µA max	V_{IN} = V_{INL} or V_{INH}
Digital Input Capacitance, C_{IN}	2			pF typ	
DYNAMIC CHARACTERISTICS[1]					
$t_{TRANSITION}$	100			ns typ	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 24
	150	190	220	ns max	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 24
t_{ON} ($\overline{EN}$)	100			ns typ	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 26
	150	190	220	ns max	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 26
t_{OFF} ($\overline{EN}$)	25			ns typ	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 26
	35	45	50	ns max	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V; see Figure 26
Break-Before-Make Time Delay, t_{BBM}	90			ns typ	R_L = 300 Ω, C_L = 35 pF, V_{S1} = V_{S2} = 3 V; see Figure 25
			10	ns min	R_L = 300 Ω, C_L = 35 pF, V_{S1} = V_{S2} = 3 V; see Figure 25
Charge Injection	0.5			pC typ	V_S = 2.5 V, R_S = 0 Ω, C_L = 1 nF; see Figure 27
	1			pC max	V_S = 2.5 V, R_S = 0 Ω, C_L = 1 nF; see Figure 27
Off Isolation	−90			dB typ	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 28
Channel-to-Channel Crosstalk	−90			dB typ	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 30
−3 dB Bandwidth	520			MHz typ	R_L = 50 Ω, C_L = 5 pF; see Figure 29
$C_{S(OFF)}$	5			pF typ	f = 1 MHz
$C_{D(OFF)}$	8			pF typ	f = 1 MHz
$C_{D(ON)}$, $C_{S(ON)}$	12			pF typ	f = 1 MHz
POWER REQUIREMENTS[2]					V_{DD} = 5.5 V
I_{DD}	0.01			µA typ	Digital inputs = 0 V or 5.5 V
			1	µA max	Digital inputs = 0 V or 5.5 V

[1] Guaranteed by design; not subject to production test.

[2] The device is fully specified at a ±5 V dual supply and at 5 V and 3.3 V single supplies. It is possible to operate the ADG633 with unbalanced supplies or at other voltage supplies (±2 V to ±6 V, and 2 V to 12 V); however, the switch characteristics change. These changes include, but are not limited to: analog signal range, on resistance, leakage, V_{INL}, V_{INH}, and switching times. The optimal power-up sequence for the device is: ground, V_{DD}, V_{SS}, and then the digital inputs, before applying the analog input signal.

V_{DD} = 2.7 V to 3.6 V, V_{SS} = 0 V, GND = 0 V, T_A = −40°C to +125°C, unless otherwise noted.

Table 3.

Parameter	+25°C	−40°C to +85°C	−40°C to +125°C	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			0 to V_{DD}	V	V_{DD} = 2.7 V, V_{SS} = 0 V
On Resistance, R_{ON}	185			Ω typ	V_S = 0 V to 2.7 V, I_S = 0.1 mA; see Figure 20
	300	350	400	Ω max	V_S = 0 V to 2.7 V, I_S = 0.1 mA; see Figure 20
On-Resistance Match Between Channels, ΔR_{ON}	2			Ω typ	V_S = +1.5 V, I_S = 0.1 mA
	4.5	6	7	Ω max	V_S = +1.5 V, I_S = 0.1 mA
LEAKAGE CURRENTS					V_{DD} = 3.3 V
Source Off Leakage, $I_{S(OFF)}$	±0.005			nA typ	V_S = 1 V/3 V, V_D = 3 V/1 V; see Figure 21
	±0.2		±5	nA max	V_S = 1 V/3 V, V_D = 3 V/1 V; see Figure 21
Drain Off Leakage, $I_{D(OFF)}$	±0.005			nA typ	V_S = 1 V/3 V, V_D = 3 V/1 V; see Figure 22
	±0.2		±5	nA max	V_S = 1 V/3 V, V_D = 3 V/1 V; see Figure 22
Channel On Leakage, $I_{D(ON)}$, $I_{S(ON)}$	±0.005			nA typ	V_S = V_D = 1 V or 3 V; see Figure 23
	±0.2		±5	nA max	V_S = V_D = 1 V or 3 V; see Figure 23
DIGITAL INPUTS					
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			µA typ	V_{IN} = V_{INL} or V_{INH}
			±1	µA max	V_{IN} = V_{INL} or V_{INH}
Digital Input Capacitance, C_{IN}	2			pF typ	
DYNAMIC CHARACTERISTICS[1]					
$t_{TRANSITION}$	170			ns typ	R_L = 300 Ω, C_L = 35 pF, V_S = 1.5 V; see Figure 24
	300	370	400	ns max	R_L = 300 Ω, C_L = 35 pF, V_S = 1.5 V; see Figure 24
t_{ON} ($\overline{EN}$)	200			ns typ	R_L = 300 Ω, C_L = 35 pF, V_S = 1.5 V; see Figure 26
	310	380	420	ns max	R_L = 300 Ω, C_L = 35 pF, V_S = 1.5 V; see Figure 26
t_{OFF} ($\overline{EN}$)	30			ns typ	R_L = 300 Ω, C_L = 35 pF, V_S = 1.5 V; see Figure 26
	40	55	75	ns max	R_L = 300 Ω, C_L = 35 pF, V_S = 1.5 V; see Figure 26
Break-Before-Make Time Delay, t_{BBM}	180			ns typ	R_L = 300 Ω, C_L = 35 pF, V_{S1} = V_{S2} = 1.5 V; see Figure 25
			10	ns min	R_L = 300 Ω, C_L = 35 pF, V_{S1} = V_{S2} = 1.5 V; see Figure 25
Charge Injection	1			pC typ	V_S = 1.5 V, R_S = 0 Ω, C_L = 1 nF; see Figure 27
	2			pC max	V_S = 1.5 V, R_S = 0 Ω, C_L = 1 nF; see Figure 27
Off Isolation	−90			dB typ	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 28
Channel-to-Channel Crosstalk	−90			dB typ	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 30
−3 dB Bandwidth	500			MHz typ	R_L = 50 Ω, C_L = 5 pF; see Figure 29
$C_{S(OFF)}$	5			pF typ	f = 1 MHz
$C_{D(OFF)}$	8			pF typ	f = 1 MHz
$C_{D(ON)}$, $C_{S(ON)}$	12			pF typ	f = 1 MHz
POWER REQUIREMENTS[2]					V_{DD} = 3.3 V
I_{DD}	0.01			µA typ	Digital inputs = 0 V or 3.3 V
			1	µA max	Digital inputs = 0 V or 3.3 V

[1] Guaranteed by design; not subject to production test.

[2] The device is fully specified at a ±5 V dual supply and at 5 V and 3.3 V single supplies. It is possible to operate the ADG633 with unbalanced supplies or at other voltage supplies (±2 V to ±6 V, and 2 V to 12 V); however, the switch characteristics change. These changes include, but are not limited to: analog signal range, on resistance, leakage, V_{INL}, V_{INH}, and switching times. The optimal power-up sequence for the device is: ground, V_{DD}, V_{SS}, and then the digital inputs, before applying the analog input signal.

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C, unless otherwise noted.

Table 4.

Parameter	Rating
V_{DD} to V_{SS}[1]	13 V
V_{DD} to GND	−0.3 V to +13 V
V_{SS} to GND	+0.3 V to −6.5 V
Analog Inputs[2]	V_{SS} − 0.3 V to V_{DD} + 0.3 V
Digital Inputs[2]	GND − 0.3 V to V_{DD} + 0.3 V or 10 mA, whichever occurs first
Peak Current, S or D	40 mA (pulsed at 1 ms, 10% duty cycle maximum)
Continuous Current, S or D	20 mA
Operating Temperature Range	−40°C to +125°C
Storage Temperature Range	−65°C to +150°C
Junction Temperature	150°C
θ_{JA} Thermal Impedance	
16-Lead TSSOP	150.4°C/W
16-Lead LFCSP, 4-Layer Board	70°C/W
Lead Soldering	
Lead Temperature, Soldering (10 sec)	300°C
IR Reflow, Peak Temperature (<20 sec)	220°C
(Pb-Free) Soldering	
Reflow, Peak Temperature	260(+0/−5)°C
Time at Peak Temperature	20 sec to 40 sec
ESD	4 kV

[1] The device is fully specified at a ±5 V dual supply and at 5 V and 3.3 V single supplies. It is possible to operate the ADG633 with unbalanced supplies or at other voltage supplies (±2 V to ±6 V, and 2 V to 12 V); however, the switch characteristics change. These changes include, but are not limited to: analog signal range, on resistance, leakage, V_{INL}, V_{INH}, and switching times. The optimal power-up sequence for the device is: ground, V_{DD}, V_{SS}, and then the digital inputs, before applying the analog input signal.

[2] Overvoltages at Ax, $\overline{EN}$, S, or D are clamped by internal diodes. Limit current to the maximum ratings given.

Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

Only one absolute maximum rating can be applied at any one time.

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATIONS AND FUNCTION DESCRIPTIONS

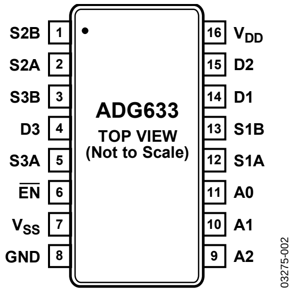
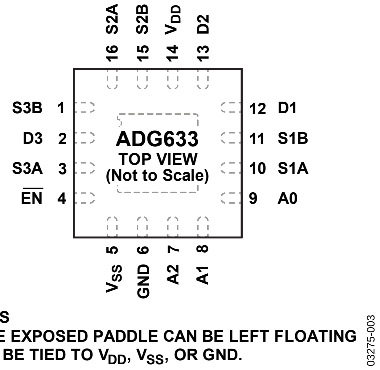


Figure 2. 16-Lead TSSOP Pin Configuration



NOTES
1. THE EXPOSED PADDLE CAN BE LEFT FLOATING OR BE TIED TO V_{DD}, V_{SS}, OR GND.

Figure 3. 16-Lead LFCSP Pin Configuration

Table 5. Pin Function Descriptions

Pin No.			
TSSOP	**LFCSP**	**Mnemonic**	**Description**
1	15	S2B	Source Terminal of Multiplexer 2. Can be an input or output.
2	16	S2A	Source Terminal of Multiplexer 2. Can be an input or output.
3	1	S3B	Source Terminal of Multiplexer 3. Can be an input or output.
4	2	D3	Drain Terminal of Multiplexer 3. Can be an input or output.
5	3	S3A	Source Terminal of Multiplexer 3. Can be an input or output.
6	4	$\overline{EN}$	Digital Control Input. Disables all multiplexers when set high.
7	5	V_{SS}	Most Negative Power Supply Terminal. Tie this pin to GND when using the device with single-supply voltages.
8	6	GND	Ground (0 V) Reference.
9	7	A2	Digital Control Input.
10	8	A1	Digital Control Input.
11	9	A0	Digital Control Input.
12	10	S1A	Source Terminal of Multiplexer 1. Can be an input or output.
13	11	S1B	Source Terminal of Multiplexer 1. Can be an input or output.
14	12	D1	Drain Terminal of Multiplexer 1. Can be an input or output.
15	13	D2	Drain Terminal of Multiplexer 2. Can be an input or output.
16	14	V_{DD}	Most Positive Power Supply Terminal.
Not applicable	EP	EP	Exposed Paddle. The exposed paddle can be left floating or be tied to V_{DD}, V_{SS}, or GND.

Table 6. ADG633 Truth Table

				Switch Condition					
A2	**A1**	**A0**	**$\overline{EN}$**	**Switch S1A/D1**	**Switch S1B/D1**	**Switch S2A/D2**	**Switch S2B/D2**	**Switch S3A/D3**	**Switch S3B/D3**
X[1]	X[1]	X[1]	1	Off	Off	Off	Off	Off	Off
0	0	0	0	On	Off	On	Off	On	Off
0	0	1	0	Off	On	On	Off	On	Off
0	1	0	0	On	Off	Off	On	On	Off
0	1	1	0	Off	On	Off	On	On	Off
1	0	0	0	On	Off	On	Off	Off	On
1	0	1	0	Off	On	On	Off	Off	On
1	1	0	0	On	Off	Off	On	Off	On
1	1	1	0	Off	On	Off	On	Off	On

[1] X means the logic state does not matter; it can be either 0 or 1.

TYPICAL PERFORMANCE CHARACTERISTICS

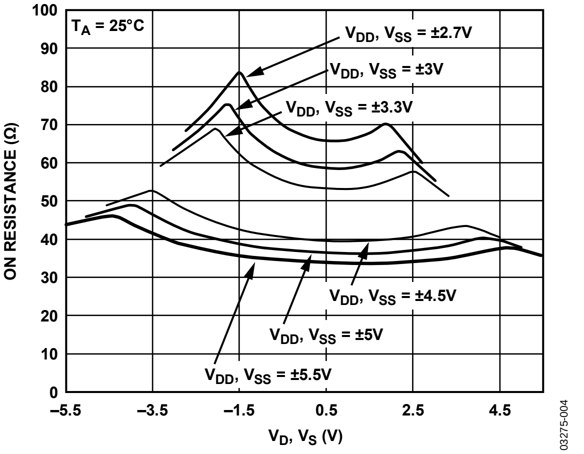


Figure 4. On Resistance vs. V_D (V_S), Dual Supplies

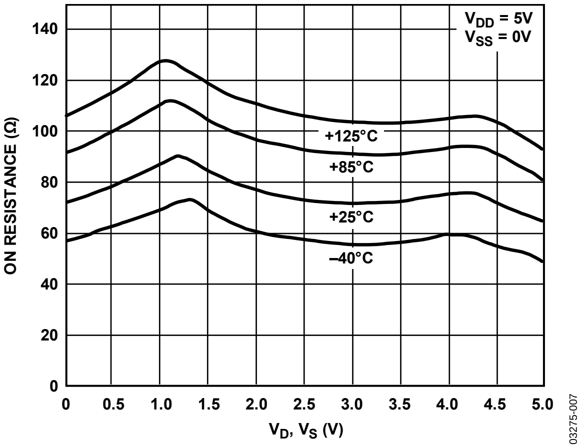


Figure 7. On Resistance vs. V_D (V_S) for Various Temperatures, Single Supply

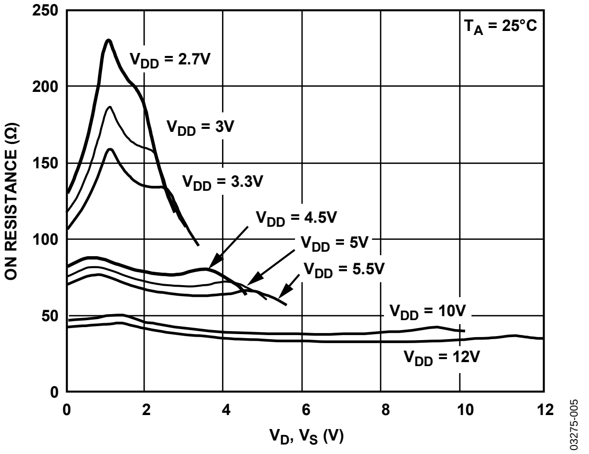


Figure 5. On Resistance vs. V_D (V_S), Single Supply

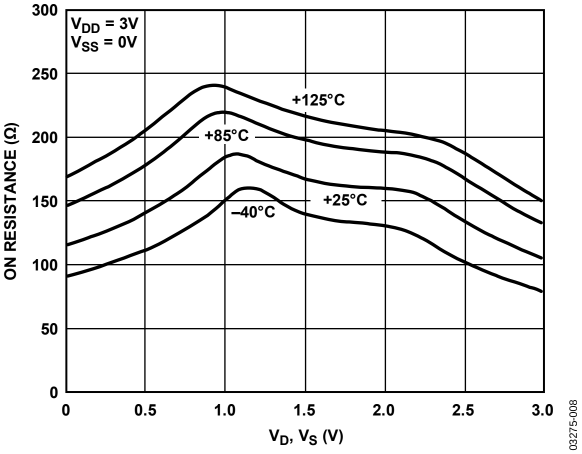


Figure 8. On Resistance vs. V_D (V_S) for Various Temperatures, Single Supply

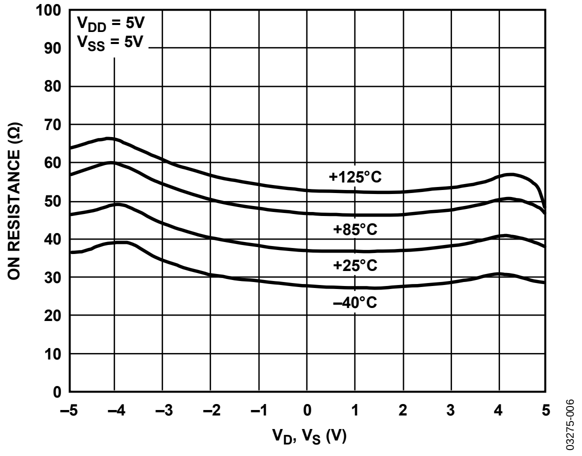


Figure 6. On Resistance vs. V_D (V_S) for Various Temperatures, Dual Supplies

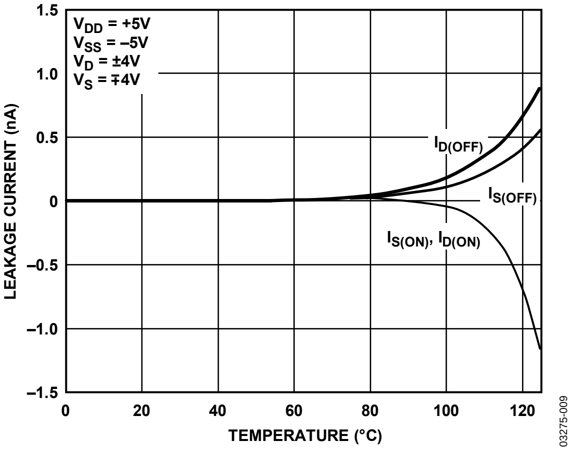


Figure 9. Leakage Current vs. Temperature, Dual Supplies

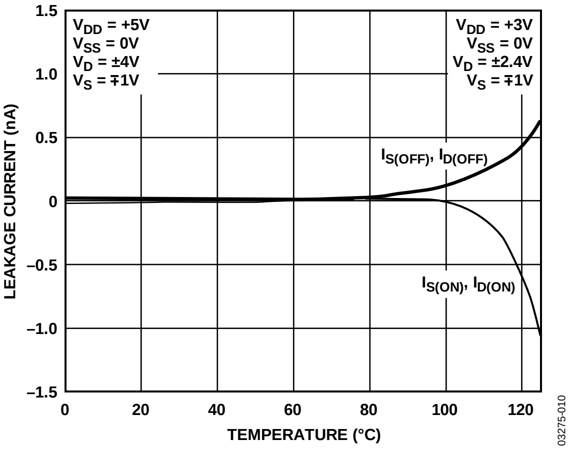


Figure 10. Leakage Current vs. Temperature, Single Supply

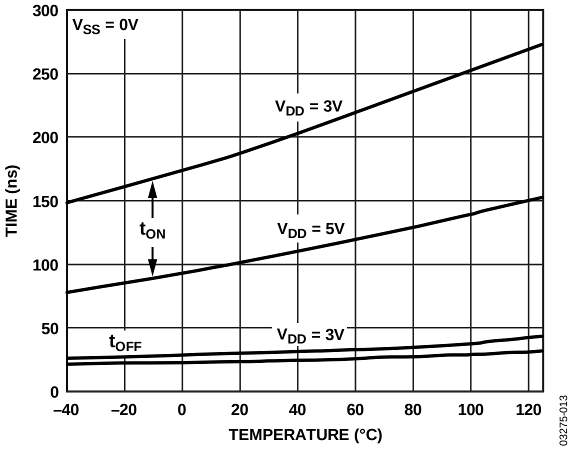


Figure 13. t_{ON}/t_{OFF} Times vs. Temperature, Single Supply

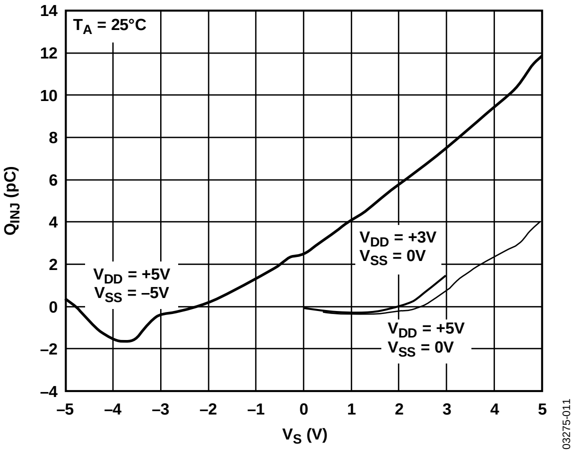


Figure 11. Charge Injection vs. Source Voltage

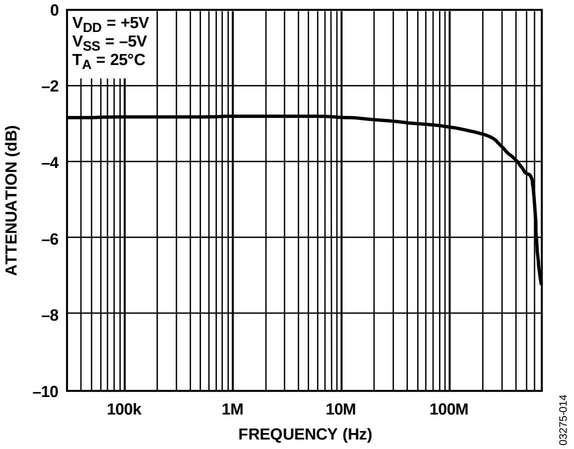


Figure 14. On Response vs. Frequency

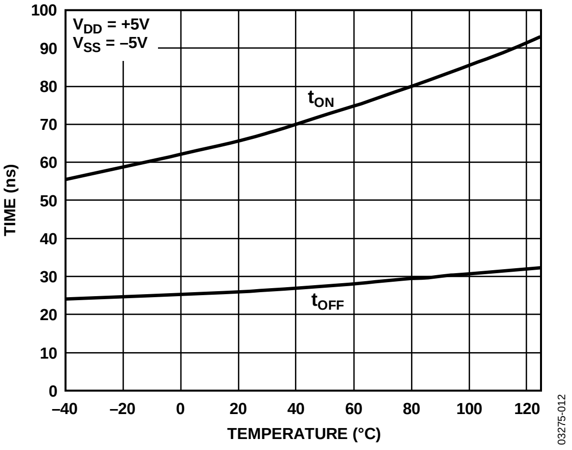


Figure 12. t_{ON}/t_{OFF} Times vs. Temperature, Dual Supplies

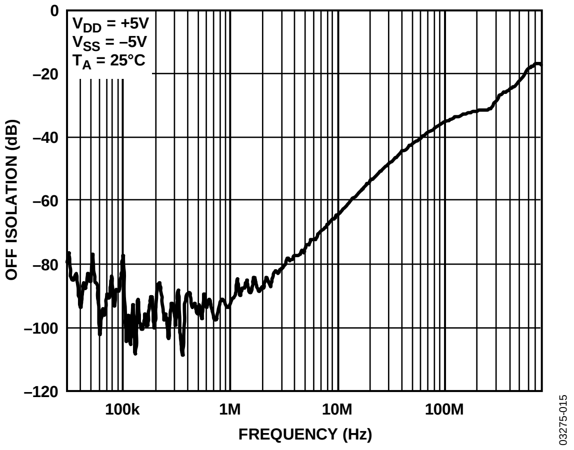


Figure 15. Off Isolation vs. Frequency

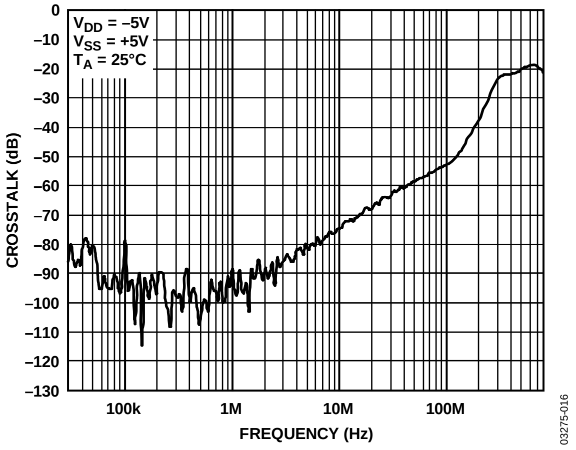


Figure 16. Crosstalk vs. Frequency

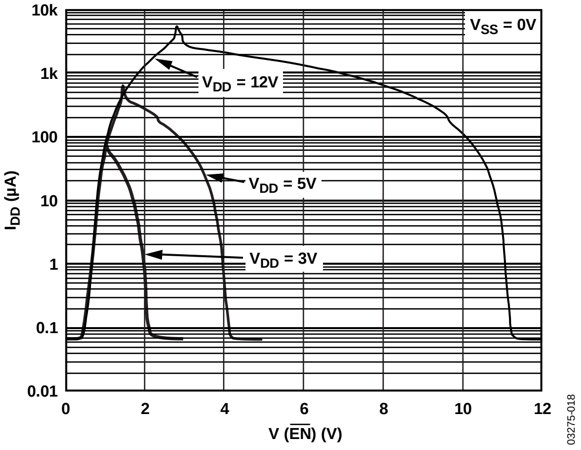


Figure 18. V_{DD} Current vs. Logic Level

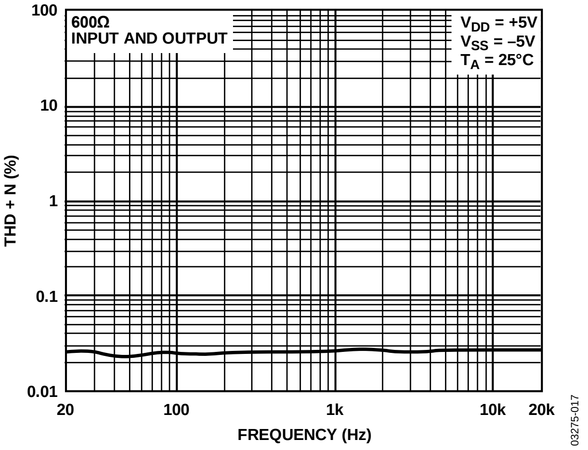


Figure 17. THD + Noise vs. Frequency

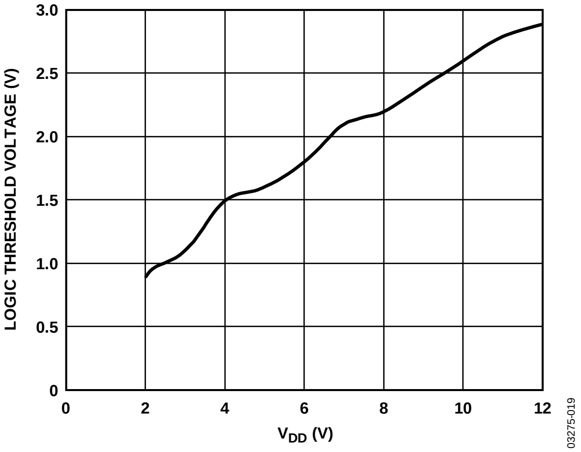


Figure 19. Logic Threshold Voltage vs. V_{DD}

TERMINOLOGY

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. Can be an input or output.

D
Drain terminal. Can be an input or output.

A_X
Logic control input.

$\overline{EN}$
Active low digital input. When $\overline{EN}$ is high, the device is disabled and all switches are off. When $\overline{EN}$ is low, the Ax logic inputs determine the on switches.

V_D, V_S
Analog voltage on Terminal D and Terminal S.

R_{ON}
Ohmic resistance between Terminal D and Terminal S.

ΔR_{ON}
On-resistance match between any two channels, that is, $R_{ONMAX} - R_{ONMIN}$.

$R_{FLAT(ON)}$
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.

$I_{D(ON)}$, $I_{S(ON)}$
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.

$C_{D(ON)}$, $C_{S(ON)}$
On switch capacitance. Measured with reference to ground.

C_{IN}
Digital input capacitance.

t_{ON} ($\overline{EN}$)
Delay between applying the digital control input and the output switching on (see Figure 26).

t_{OFF} ($\overline{EN}$)
Delay between applying the digital control input and the output switching off (see Figure 26).

t_{BBM}
On time, measured between 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.

Off Isolation
A measure of unwanted signal coupling through an off switch.

Crosstalk
A measure of unwanted signal that is 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.

TEST CIRCUITS

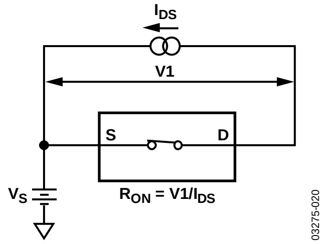


Figure 20. On Resistance

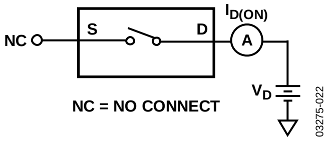


Figure 22. Drain Off Leakage

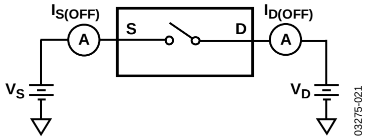


Figure 21. Source Off Leakage

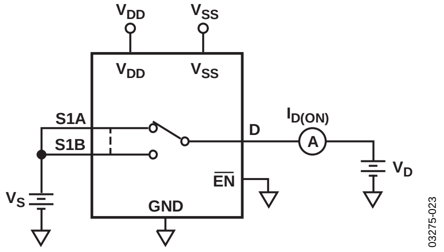


Figure 23. Channel On Leakage

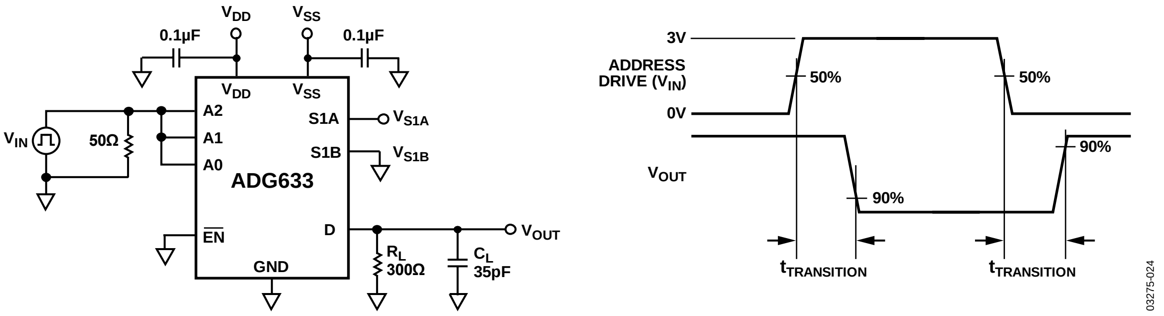


Figure 24. Transition Time, $t_{TRANSITION}$

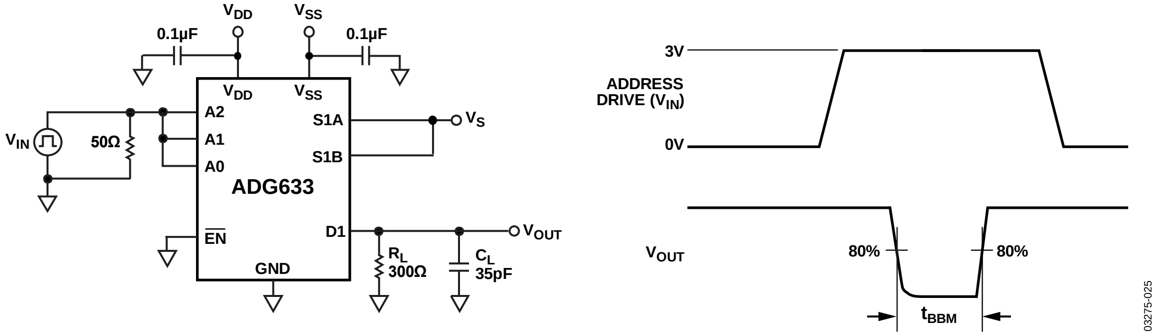


Figure 25. Break-Before-Make Delay, t_{BBM}

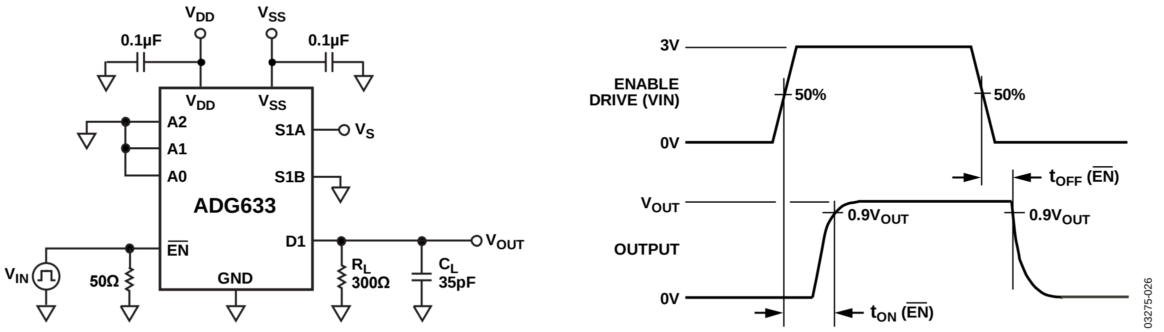


Figure 26. Enable Delay, t_{ON} ($\overline{EN}$), t_{OFF} ($\overline{EN}$)

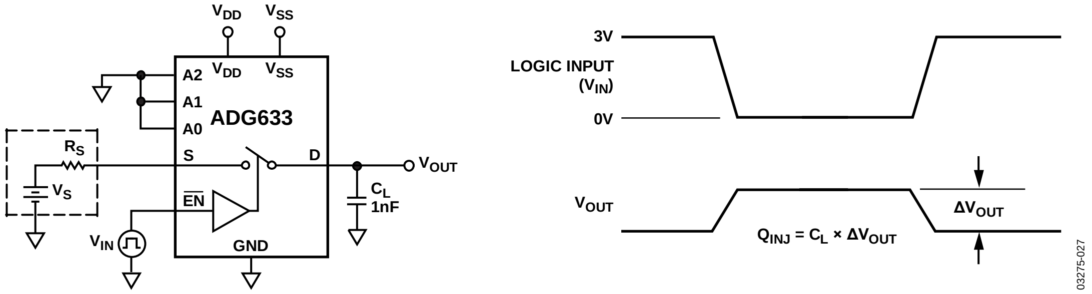


Figure 27. Charge Injection

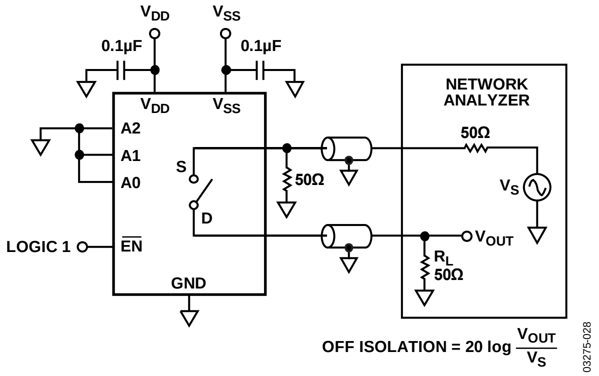


Figure 28. Off Isolation

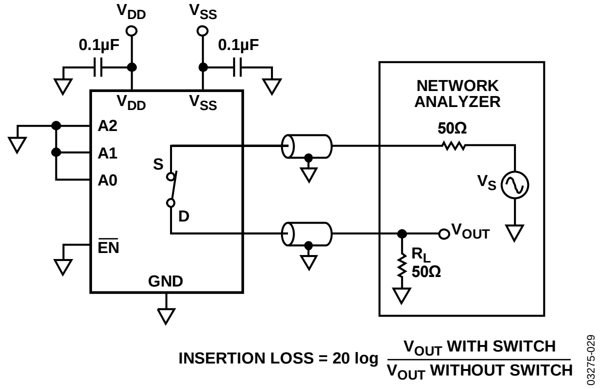


Figure 29. Bandwidth

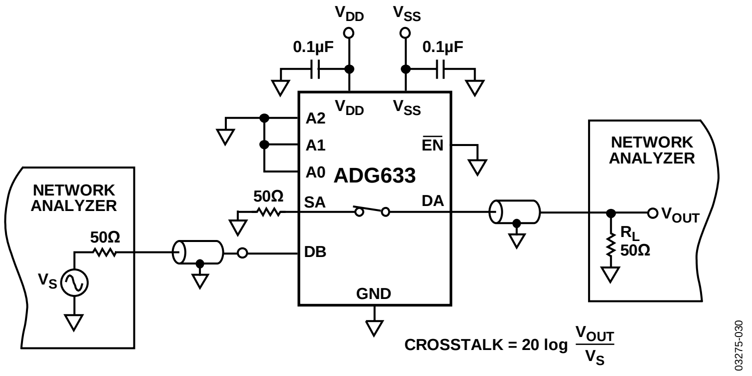
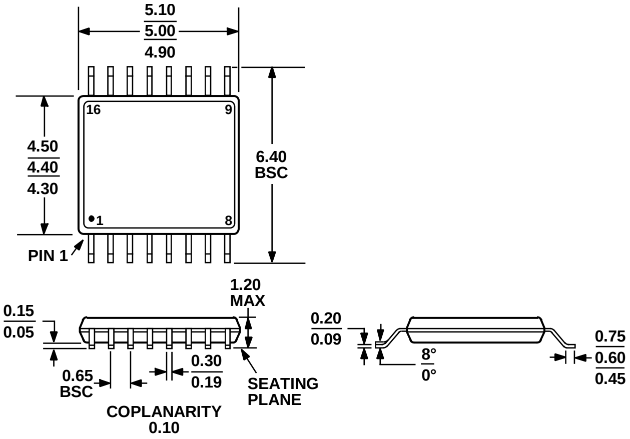


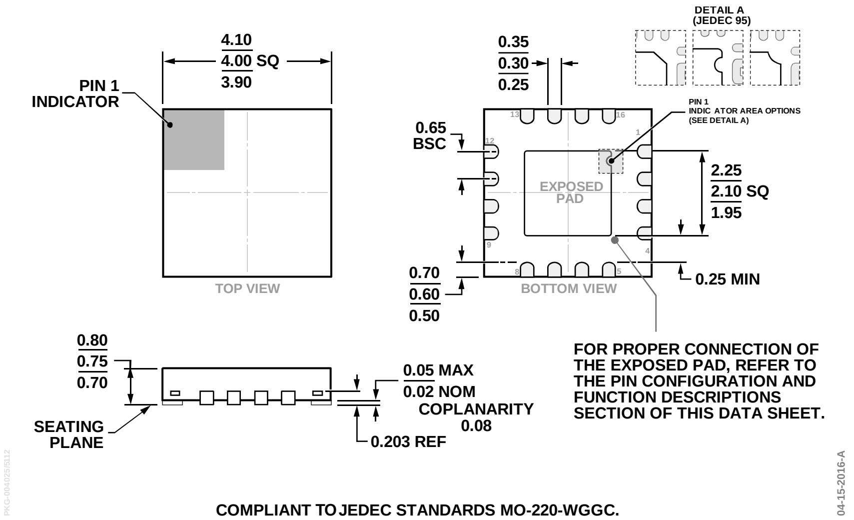
Figure 30. Channel-to-Channel Crosstalk

OUTLINE DIMENSIONS



COMPLIANT TO JEDEC STANDARDS MO-153-AB

Figure 31. 16-Lead Thin Shrink Small Outline Package [TSSOP]
(RU-16)
Dimensions shown in millimeters



FOR PROPER CONNECTION OF THE EXPOSED PAD, REFER TO THE PIN CONFIGURATION AND FUNCTION DESCRIPTIONS SECTION OF THIS DATA SHEET.

COMPLIANT TO JEDEC STANDARDS MO-220-WGGC.

Figure 32. 16-Lead Frame Chip Scale Package [LFCSP]
4 mm × 4 mm Body and 0.75 mm Package Height
(CP-16-23)
Dimensions shown in millimeters

ORDERING GUIDE

Model[1]	Temperature Range	Package Description	Package Option
ADG633YRU	−40°C to +125°C	16-Lead Thin Shrink Small Outline Package [TSSOP]	RU-16
ADG633YRU-REEL7	−40°C to +125°C	16-Lead Thin Shrink Small Outline Package [TSSOP]	RU-16
ADG633YRUZ	−40°C to +125°C	16-Lead Thin Shrink Small Outline Package [TSSOP]	RU-16
ADG633YRUZ-REEL7	−40°C to +125°C	16-Lead Thin Shrink Small Outline Package [TSSOP]	RU-16
ADG633YCPZ	−40°C to +85°C	16-Lead Lead Frame Chip Scale Package [LFCSP]	CP-16-23
ADG633YCPZ-REEL7	−40°C to +85°C	16-Lead Lead Frame Chip Scale Package [LFCSP]	CP-16-23

[1] Z = RoHS Compliant Part.

NOTES

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