

Quad SPST CMOS Analog Switches

Features

- Low On-Resistance: 50 Ω
- Low Leakage: 80 pA
- Low Power Consumption: 0.2 mW
- Fast Switching Action— t_{ON} : 150 ns
- Low Charge Injection—Q: -1 pC
- DG201A/DG202 Upgrades
- TTL/CMOS-Compatible Logic
- Single Supply Capability

Benefits

- Less Signal Errors and Distortion
- Reduced Power Supply Requirements
- Faster Throughput
- Improved Reliability
- Reduced Pedestal Errors
- Simplifies Retrofit
- Simple Interfacing

Applications

- Audio Switching
- Battery Powered Systems
- Data Acquisition
- Hi-Rel Systems
- Sample-and-Hold Circuits
- Communication Systems
- Automatic Test Equipment
- Medical Instruments

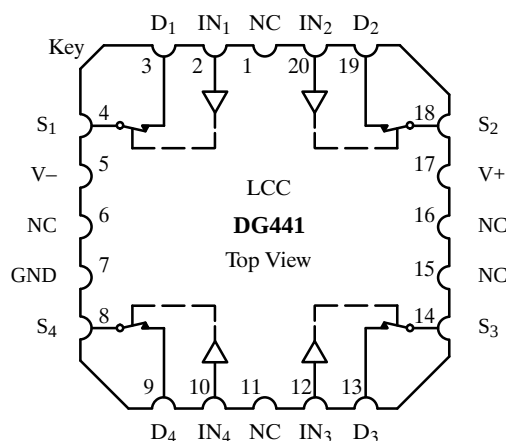
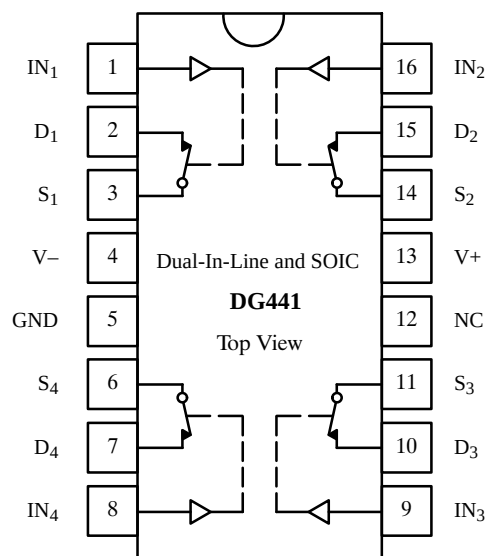
Description

The DG441/442 monolithic quad analog switches are designed to provide high speed, low error switching of analog and audio signals. The DG441 has a normally closed function. The DG442 has a normally open function. Combining low on-resistance (50 Ω , typ.) with high speed (t_{ON} 150 ns, typ.), the DG441/442 are ideally suited for upgrading DG201A/202 sockets. Charge injection has been minimized on the drain for use in sample-and-hold circuits.

To achieve high voltage ratings and superior switching performance, the DG441/442 are built on Siliconix's high-voltage silicon-gate process. An epitaxial layer prevents latchup.

Each switch conducts equally well in both directions when on, and blocks input voltages to the supply levels when off.

Functional Block Diagram and Pin Configuration



Truth Table

Logic	DG441	DG442
0	ON	OFF
1	OFF	ON

Logic "0" $\leq$ 0.8 V
Logic "1" $\geq$ 2.4 V

Updates to this data sheet may be obtained via facsimile by calling Siliconix FaxBack, 1-408-970-5600. Please request FaxBack document #70053.

Ordering Information

Temp Range	Package	Part Number
-40 to 85°C	16-Pin Plastic DIP	DG441DJ
		DG442DJ
	16-Pin Narrow SOIC	DG441DY
		DG442DY
-55 to 125°C	16-Pin CerDIP	DG441AK
		DG441AK/883
		5962-9204101MEA
		DG442AK
		DG442AK/883
		5962-9204102MEA
	LCC-20	5962-9204101M2A
		5962-9204102M2A

Absolute Maximum Ratings

V+ to V- 44 V
 GND to V- 25 V
 Digital Inputs^a V_S, V_D (V-) -2 V to (V+) +2 V
 or 30 mA, whichever occurs first
 Continuous Current (Any Terminal) 30 mA
 Current, S or D (Pulsed 1 ms, 10% duty cycle) 100 mA
 Storage Temperature (AK Suffix) -65 to 150°C
 (DJ, DY Suffix) -65 to 125°C

Power Dissipation (Package)^b
 16-Pin Plastic DIP^c 450 mW
 16-Pin CerDIP^d 900 mW
 16-Pin Narrow Body SOIC^d 900 mW
 LCC-20^d 1200 mW

Notes:

- Signals on S_X, D_X, or IN_X exceeding V+ or V- will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
- All leads welded or soldered to PC Board.
- Derate 6 mW/°C above 75°C
- Derate 12 mW/°C above 25°C

Schematic Diagram (Typical Channel)

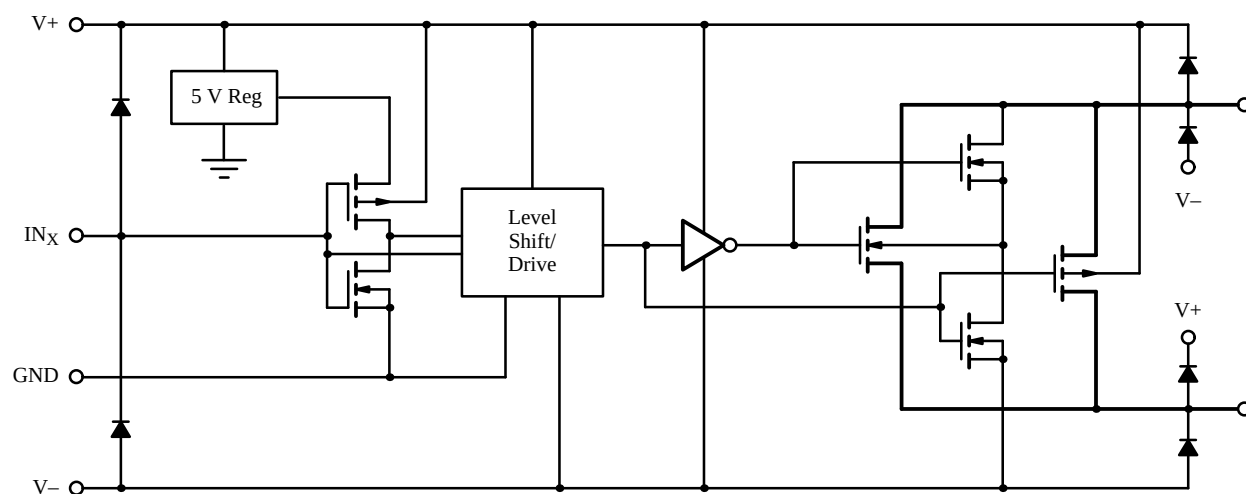


Figure 1.

Specifications^a for Dual Supplies

Parameter	Symbol	Test Conditions Unless Specified V+ = 15 V, V− = −15 V VIN = 2.4 V, 0.8 V ^f	Temp ^b	Typ ^c	A Suffix −55 to 125°C		D Suffix −40 to 85°C		Unit	
					Min ^d	Max ^d	Min ^d	Max ^d		
Analog Switch										
Analog Signal Range ^e	V _{ANALOG}		Full		−15	15	−15	15	V	
Drain-Source On-Resistance	r _{DS(on)}	I _S = −10 mA, V _D = ± 8.5 V V+ = 13.5 V, V− = −13.5 V	Room Full	50		85 100		85 100	Ω	
Switch Off Leakage Current	I _{S(off)}	V+ = 16.5, V− = −16.5 V V _D = ± 15.5 V, V _S = ∓ 15.5 V	Room Full	± 0.01	−0.5 −20	0.5 20	−0.5 −5	0.5 5	nA	
	I _{D(off)}		Room Full	± 0.01	−0.5 −20	0.5 20	−0.5 −5	0.5 5		
Channel On Leakage Current	I _{D(on)}	V+ = 16.5 V, V− = −16.5 V V _S = V _D = ± 15.5 V	Room Full	± 0.08	−0.5 −40	0.5 40	−0.5 −10	0.5 10		
Digital Control										
Input Current V _{IN} Low	I _{IL}	V _{IN} under test = 0.8 V All Other = 2.4 V	Full	−0.01	−500	500	−500	500	nA	
Input Current V _{IN} High	I _{IH}	V _{IN} under test = 2.4 V All Other = 0.8 V	Full	0.01	−500	500	−500	500		
Dynamic Characteristics										
Turn-On Time		t _{ON}	R _L = 1 kΩ, C _L = 35 pF V _S = ± 10 V, See Figure 2	Room	150		250		250	ns
Turn-Off Time	DG441	t _{OFF}		Room	90		120		120	
	DG442			Room	110		210		210	
Charge Injection ^e		Q	C _L = 1 nF, V _S = 0 V V _{gen} = 0 V, R _{gen} = 0 Ω	Room	−1					pC
Off Isolation ^e		OIRR	R _L = 50 Ω, C _L = 5 pF f = 1 MHz	Room	60					dB
Crosstalk (Channel-to-Channel)		X _{TALK}		Room	100					
Source Off Capacitance ^e		C _{S(off)}	f = 1 MHz	Room	4					pF
Drain Off Capacitance ^e		C _{D(off)}		Room	4					
Channel On Capacitance ^e		C _{D(on)}	V _{ANALOG} = 0 V	Room	16					
Power Supplies										
Positive Supply Current		I+	V+ = 16.5 V, V− = −16.5 V VIN = 0 or 5 V	Full	15		100		100	μA
Negative Supply Current		I−		Room Full	−0.0001	−1 −5		−1 −5		
Ground Current		I _{GND}		Full	−15	−100		−100		

Notes:

- Refer to PROCESS OPTION FLOWCHART.
- Room = 25°C, Full = as determined by the operating temperature suffix.
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- Guaranteed by design, not subject to production test.
- V_{IN} = input voltage to perform proper function.

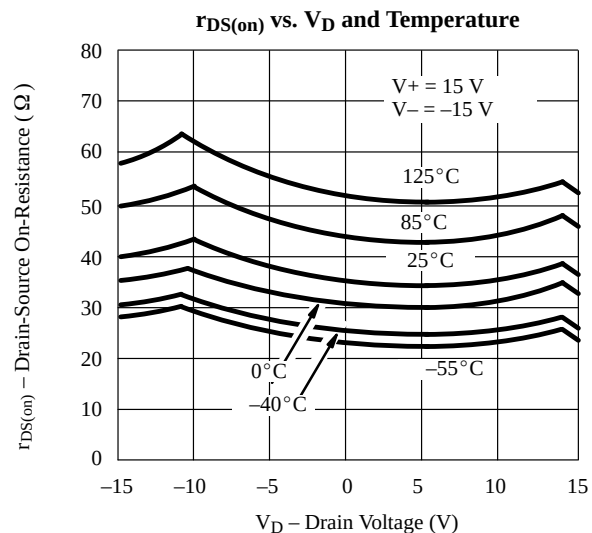
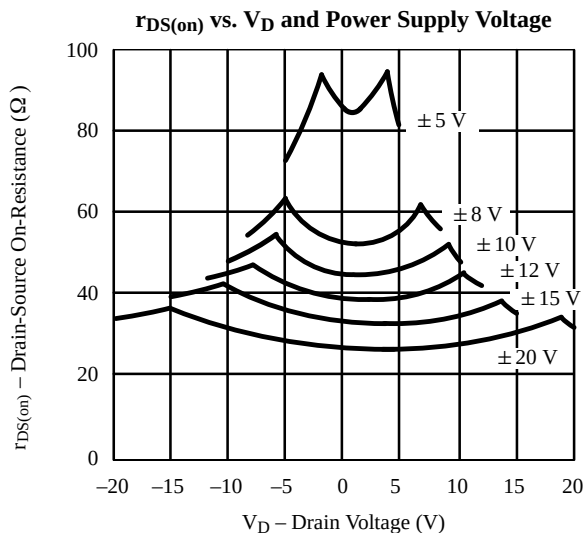
Specifications^a for Single Supply

Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 12 V, V– = 0 V VIN = 2.4 V, 0.8 V ^f	Temp ^b	Typ ^c	A Suffix –55 to 125°C		D Suffix –40 to 85°C		Unit
					Min ^d	Max ^d	Min ^d	Max ^d	
Analog Switch									
Analog Signal Range ^e	V _{ANALOG}		Full		0	12	0	12	V
Drain-Source On-Resistance	r _{DS(on)}	I _S = –10 mA, V _D = 3 V, 8 V V+ = 10.8 V	Room Full	100		160 200		160 200	Ω
Dynamic Characteristics									
Turn-On Time	t _{ON}	R _L = 1 kΩ, C _L = 35 pF V _S = 8 V, See Figure 2	Room	300		450		450	ns
Turn-Off Time	t _{OFF}		Room	60		200		200	
Charge Injection	Q	C _L = 1 nF V _{gen} = 6 V, R _{gen} = 0 Ω	Room	2					pC
Power Supplies									
Positive Supply Current	I+	V+ = 16.5 V, V– = –16.5 V VIN = 0 or 5 V	Full	15		100		100	μA
Negative Supply Current	I–		Room Full	–0.0001	–1 –100		–1 –100		
Ground Current	I _{GND}		Full	–15	–100		–100		

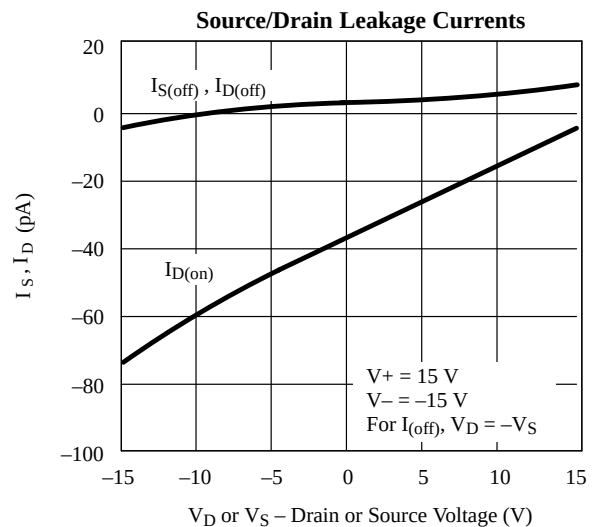
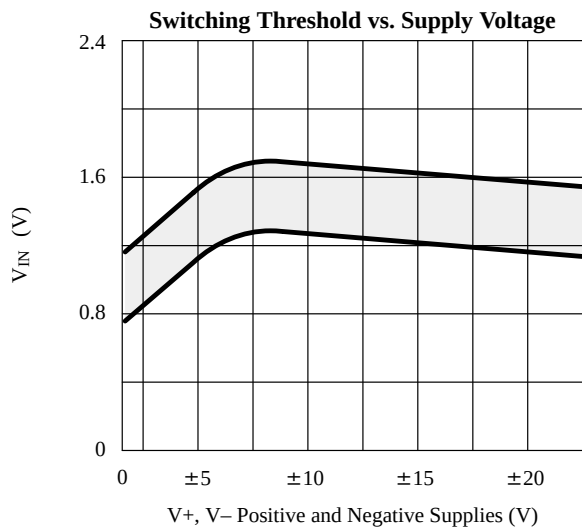
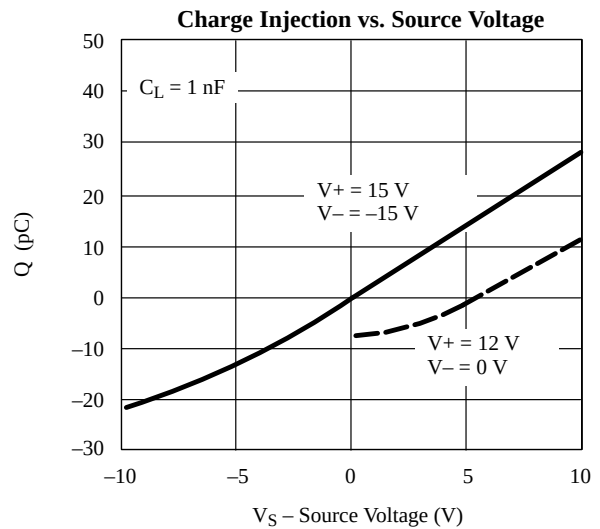
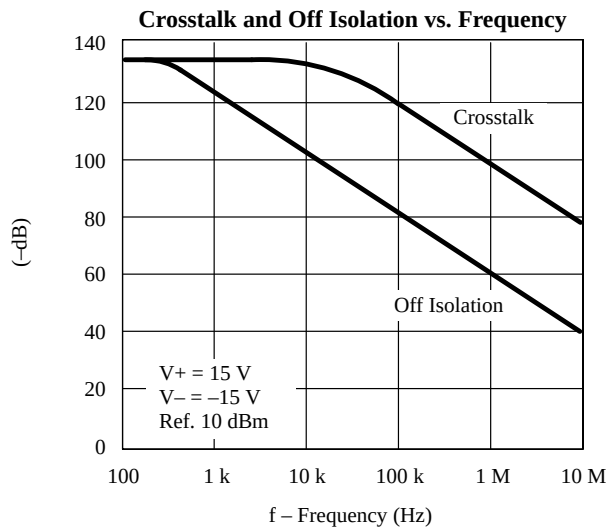
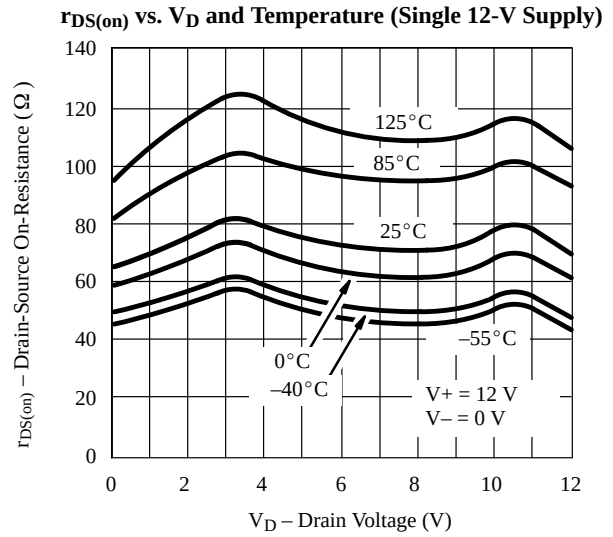
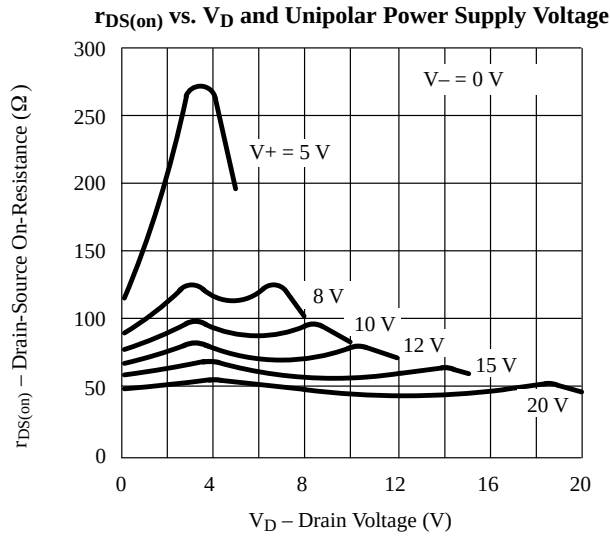
Notes:

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- Guaranteed by design, not subject to production test.
- V_{IN} = input voltage to perform proper function.

Typical Characteristics

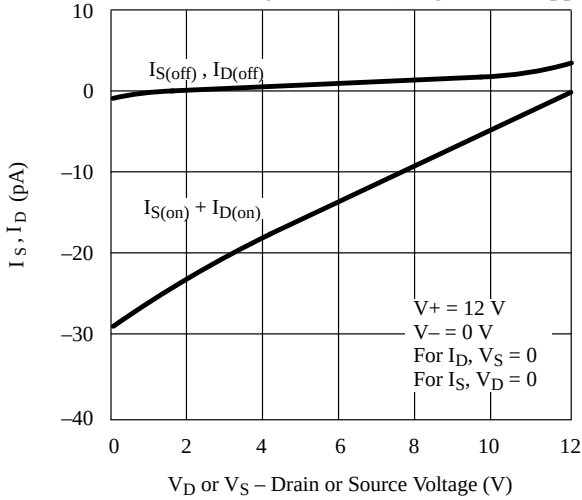


Typical Characteristics (Cont'd)

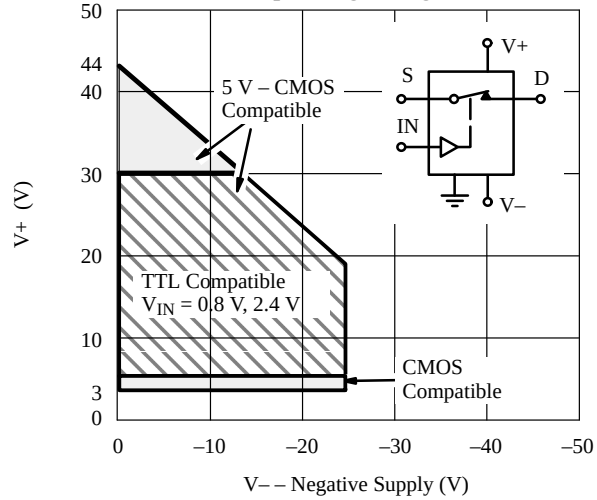


Typical Characteristics (Cont'd)

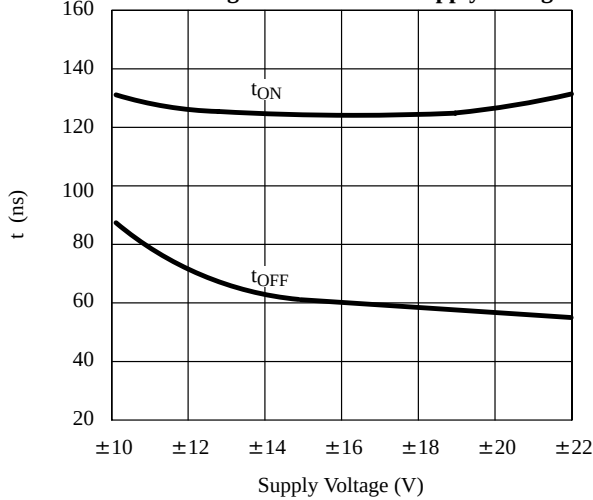
Source/Drain Leakage Currents (Single 12-V Supply)



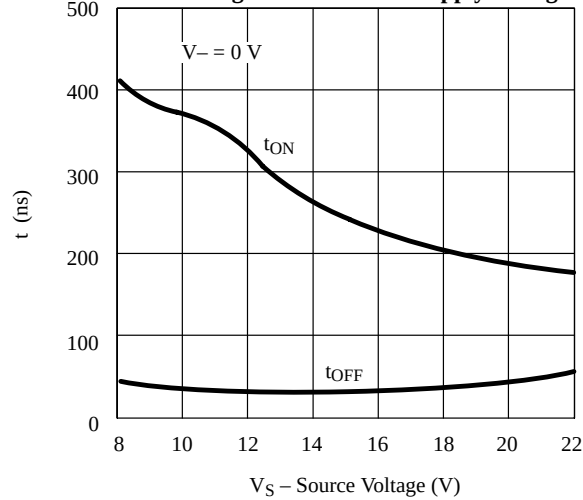
Operating Voltage



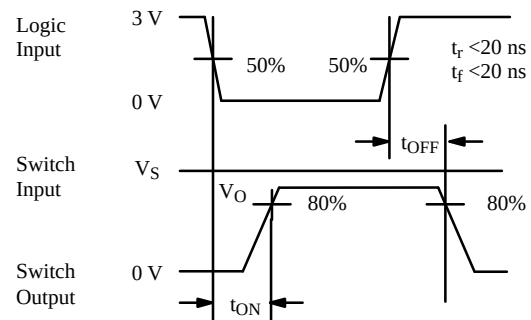
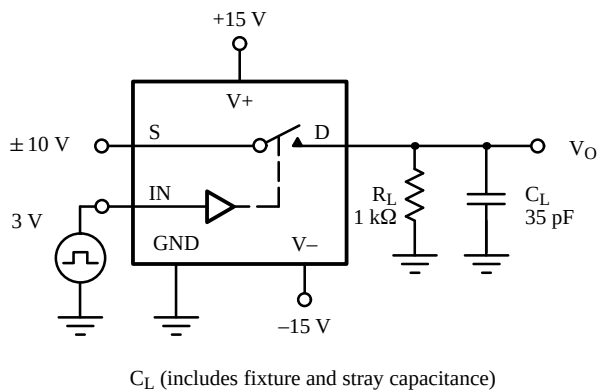
Switching Time vs. Power Supply Voltage



Switching Time vs. Power Supply Voltage



Test Circuits



Note: Logic input waveform is inverted for DG442.

Figure 2. Switching Time

Test Circuits (Cont'd)

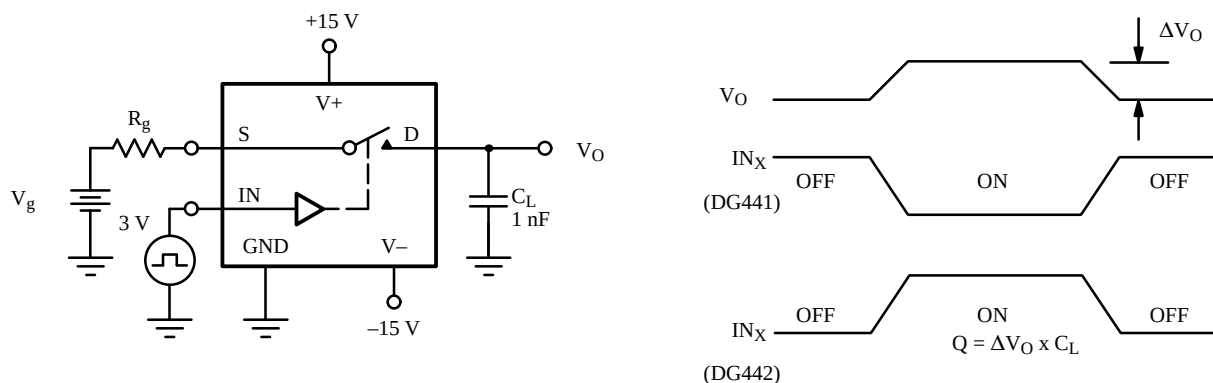


Figure 3. Charge Injection

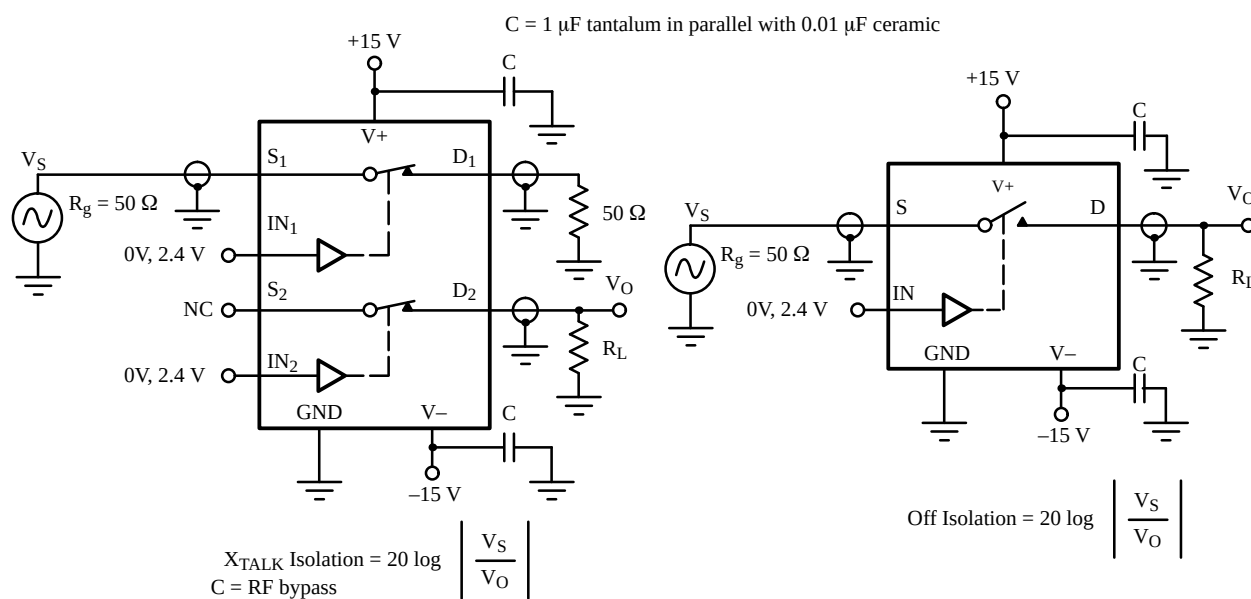


Figure 4. Crosstalk

Figure 5. Off Isolation

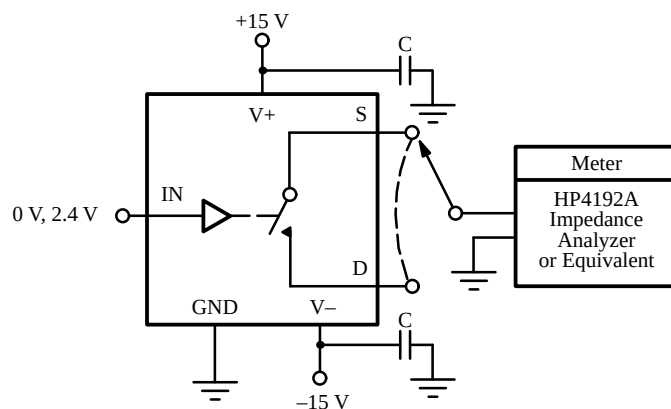


Figure 6. Source/Drain Capacitances

Applications

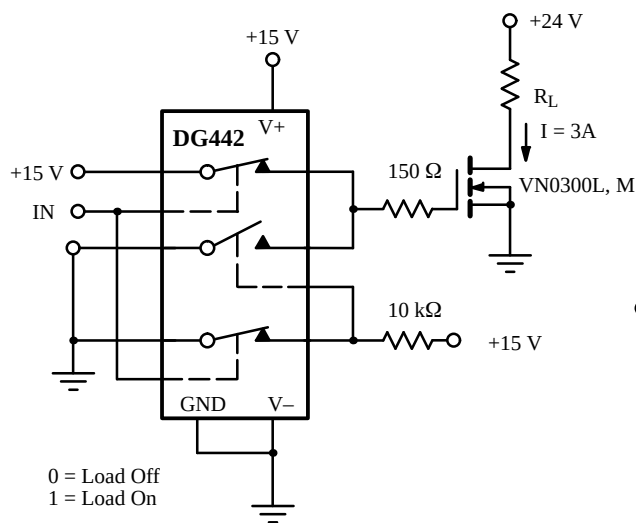


Figure 7. Power MOSFET Driver

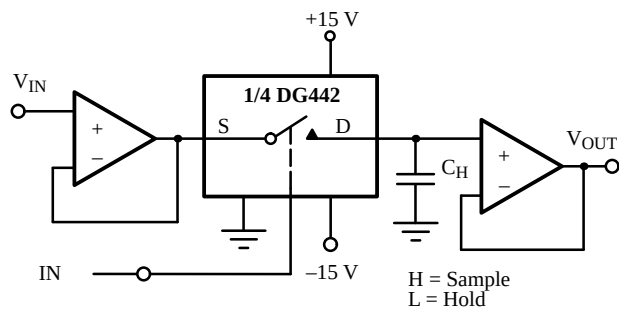


Figure 8. Open Loop Sample-and-Hold

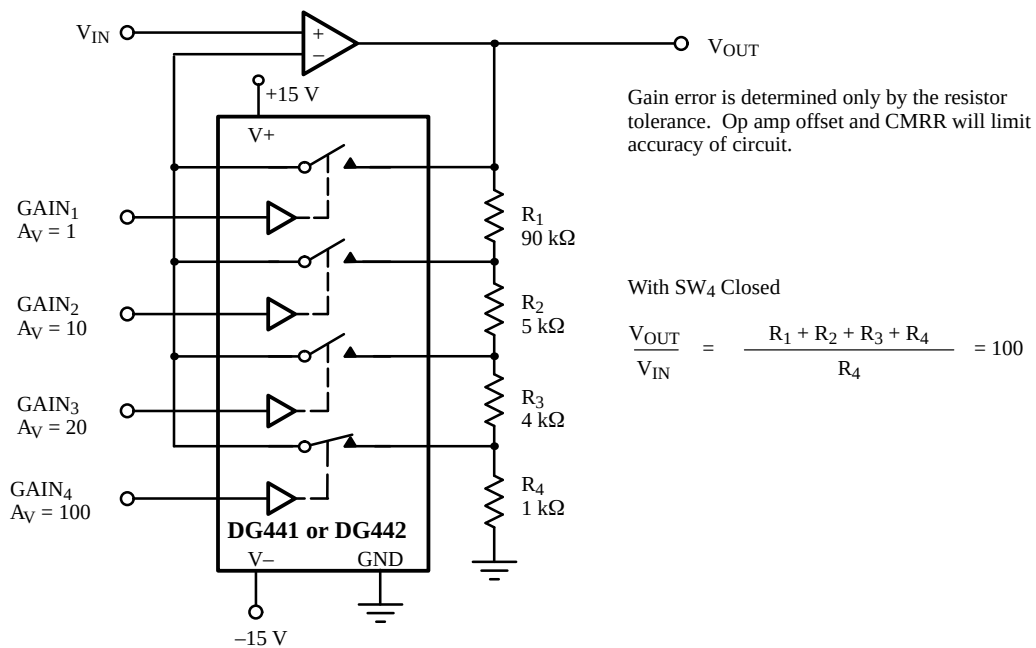


Figure 9. Precision-Weighted Resistor Programmable-Gain Amplifier