



## High-Speed Quad SPST CMOS Analog Switch

### DESCRIPTION

The DG201HS is an improved monolithic device containing four independent analog switches. It is designed to provide high speed, low error switching of analog signals. Combining low on-resistance (25  $\Omega$ ) with high speed ( $t_{ON}$ : 38 ns), the DG201HS is ideally suited for high speed data acquisition requirements.

To achieve high voltage ratings and superior switching performance, the DG201HS is built on a proprietary 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 values, when off.

勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-34970699  
勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

### FEATURES

- Fast Switching- $t_{ON}$ : 38 ns
- Low On-Resistance: 25  $\Omega$
- Low Leakage: 100 pA
- Low Charge Injection
- TTL/CMOS Logic Compatible
- Single Supply Compatibility
- High Current Rating: - 30 mA



RoHS\*  
COMPLIANT

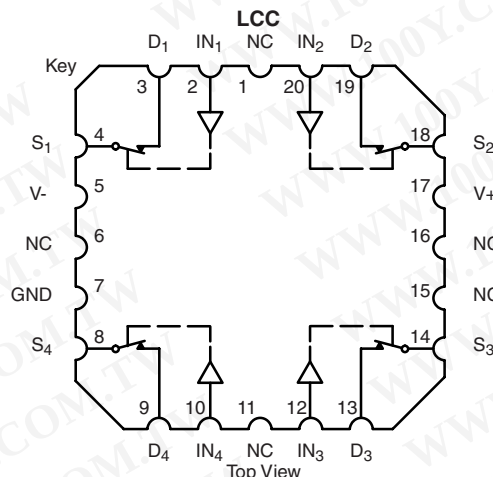
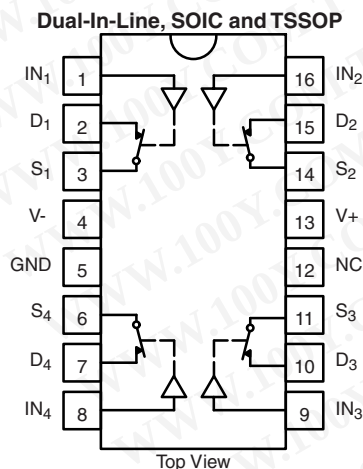
### BENEFITS

- Faster Throughput
- Higher Accuracy
- Reduced Pedestal Error
- Upgrades Existing Designs
- Simple Interfacing
- Replaces HI201HS, ADG201HS
- Space Savings (TSSOP)

### APPLICATIONS

- Data Acquisition
- Hi-Rel Systems
- Sample-and-Hold Circuits
- Communication Systems
- Automatic Test Equipment
- Integrator Reset Circuits
- Choppers
- Gain Switching
- Avionics

### FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



#### TRUTH TABLE

| Logic | Switch |
|-------|--------|
| 0     | ON     |
| 1     | OFF    |

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

\* Pb containing terminations are not RoHS compliant, exemptions may apply

**ORDERING INFORMATION**

| Temp Range    | Package            | Part Number                                                  |
|---------------|--------------------|--------------------------------------------------------------|
| - 40 to 85 °C | 16-Pin Plastic DIP | DG201HSDJ<br>DG201HSDJ-E3                                    |
|               | 16-Pin Narrow SOIC | DG201HSDY<br>DG201HSDY-E3<br>DG201HSDY-T1<br>DG201HSDY-T1-E3 |
|               | 16-Pin TSSOP       | DG201HSDQ<br>DG201HSDQ-E3<br>DG201HSDQ-T1<br>DG201HSDQ-T1-E3 |

**ABSOLUTE MAXIMUM RATINGS**

| Parameter                                                     | Limit                                                    | Unit        |
|---------------------------------------------------------------|----------------------------------------------------------|-------------|
| V+ to V-                                                      | 44                                                       | V           |
| GND to V-                                                     | 25                                                       |             |
| Digital Inputs <sup>a</sup> , V <sub>S</sub> , V <sub>D</sub> | (V-) - 4 to (V+) + 4 or<br>30 mA, whichever occurs first |             |
| Continuous Current (Any Terminal)                             | 30                                                       | mA          |
| Current, S or D (Pulsed at 1 ms, 10 % duty cycle)             | 100                                                      |             |
| Storage Temperature                                           | (A Suffix)                                               | - 65 to 150 |
|                                                               | (D Suffix)                                               | - 65 to 125 |
| Power Dissipation (Package) <sup>b</sup>                      | 16-Pin Plastic DIP <sup>c</sup>                          | 470         |
|                                                               | 16-Pin CerDIP <sup>d</sup>                               | 900         |
|                                                               | 16-Pin Narrow Body SOIC and TSSOP <sup>e</sup>           | 600         |
|                                                               | LCC-20 <sup>d</sup>                                      | 900         |

Notes:

- a. Signals on S<sub>X</sub>, D<sub>X</sub>, or I<sub>NX</sub> exceeding V+ or V- will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
- b. All leads welded or soldered to PC board.
- c. Derate 6 mW/°C above 75 °C.
- d. Derate 12 mW/°C above 75 °C.
- e. Derate 7.6 mW/°C above 75 °C.

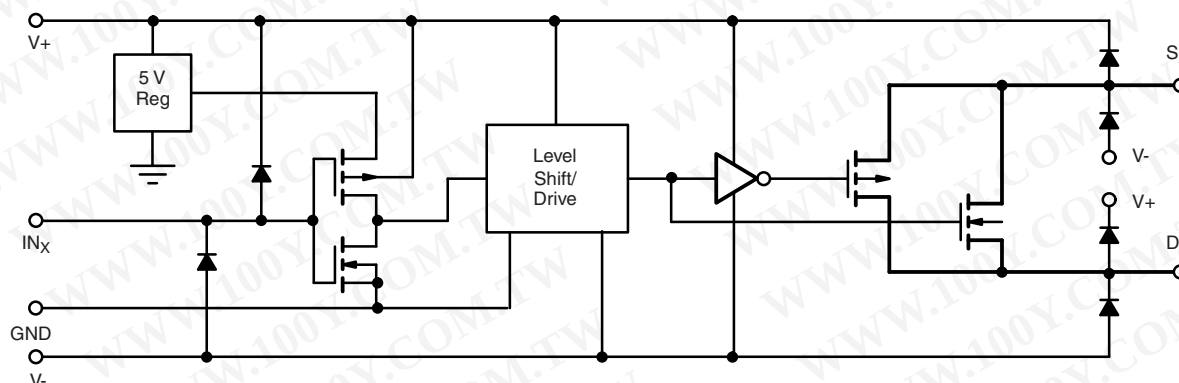
**SCHEMATIC DIAGRAM (TYPICAL CHANNEL)**

Figure 1.

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**DG201HS**  
 Vishay Siliconix

## SPECIFICATIONS<sup>a</sup>

| Parameter                        | Symbol                               | Test Conditions<br>Unless Specified<br>V <sub>+</sub> = 15 V, V <sub>-</sub> = - 15 V<br>V <sub>IN</sub> = 3 V, 0.8 V <sup>f</sup> | Temp <sup>b</sup> | Typ <sup>c</sup> | A Suffix<br>- 55 to 125 °C |                  | D Suffix<br>- 40 to 85 °C |                  | Unit |
|----------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|----------------------------|------------------|---------------------------|------------------|------|
|                                  |                                      |                                                                                                                                    |                   |                  | Min <sup>d</sup>           | Max <sup>d</sup> | Min <sup>d</sup>          | Max <sup>d</sup> |      |
| Analog Switch                    |                                      |                                                                                                                                    |                   |                  |                            |                  |                           |                  |      |
| Analog Signal Range <sup>e</sup> | V <sub>ANALOG</sub>                  |                                                                                                                                    | Full              |                  | V <sub>-</sub>             | V <sub>+</sub>   | V <sub>-</sub>            | V <sub>+</sub>   | V    |
| Drain-Source On-Resistance       | r <sub>DS(on)</sub>                  | I <sub>S</sub> = - 10 mA, V <sub>D</sub> = ± 8.5 V<br>V <sub>+</sub> = 13.5 V, V <sub>-</sub> = - 13.5 V                           | Room Full         | 25               |                            | 50<br>75         |                           | 50<br>75         | Ω    |
| r <sub>DS(on)</sub> Match        |                                      |                                                                                                                                    | Room              | 3                |                            |                  |                           |                  | %    |
| Switch Off Leakage Current       | I <sub>S(off)</sub>                  | V <sub>+</sub> = 16.5 V, V <sub>-</sub> = - 16.5 V<br>V <sub>D</sub> = ± 15.5 V<br>V <sub>S</sub> = ± 15.5 V                       | Room Full         | 0.1              | - 1<br>- 60                | 1<br>60          | - 1<br>- 20               | 1<br>20          | nA   |
|                                  | I <sub>D(off)</sub>                  |                                                                                                                                    | Room Full         | 0.1              | - 1<br>- 60                | 1<br>60          | - 1<br>- 20               | 1<br>20          |      |
| Channel On Leakage Current       | I <sub>D(on)</sub>                   | V <sub>+</sub> = 16.5 V, V <sub>-</sub> = - 16.5 V<br>V <sub>S</sub> = V <sub>D</sub> = ± 15.5 V                                   | Room Full         | 0.1              | - 1<br>- 60                | 1<br>60          | - 1<br>- 20               | 1<br>20          |      |
| Digital Control                  |                                      |                                                                                                                                    |                   |                  |                            |                  |                           |                  |      |
| Input, High Voltage              | V <sub>INH</sub>                     |                                                                                                                                    | Full              |                  | 2.4                        |                  | 2.4                       |                  | V    |
| Input, Low Voltage               | V <sub>INL</sub>                     |                                                                                                                                    | Full              |                  |                            | 0.8              |                           | 0.8              |      |
| Input Capacitance                | C <sub>IN</sub>                      |                                                                                                                                    | Full              | 5                |                            |                  |                           |                  | pF   |
| Input Current                    | I <sub>INH</sub> or I <sub>INL</sub> | V <sub>IN</sub> under test = 0.8 V, 3 V                                                                                            | Full              |                  | - 1                        | 1                | - 1                       | 1                | μA   |
| Dynamic Characteristics          |                                      |                                                                                                                                    |                   |                  |                            |                  |                           |                  |      |
| Turn-On Time                     | t <sub>ON</sub>                      | R <sub>L</sub> = 1 kΩ, C <sub>L</sub> = 35 pF<br>V <sub>S</sub> = ± 10 V, V <sub>INH</sub> = 3 V<br>See Figure 2                   | Room Full         | 48               |                            | 60<br>75         |                           | 60<br>75         | ns   |
| Turn-Off Time                    | t <sub>OFF1</sub>                    |                                                                                                                                    | Room Full         | 30               |                            | 50<br>70         |                           | 50<br>70         |      |
|                                  | t <sub>OFF2</sub>                    |                                                                                                                                    | Room              | 150              |                            |                  |                           |                  |      |
| Output Settling Time to 0.1 %    | t <sub>s</sub>                       |                                                                                                                                    | Room              | 180              |                            |                  |                           |                  |      |
| Charge Injection                 | Q                                    | C <sub>L</sub> = 1 nF, V <sub>S</sub> = 0 V<br>V <sub>gen</sub> = 0 V, R <sub>gen</sub> = 0 Ω                                      | Room              | - 5              |                            |                  |                           |                  | pC   |
| Off Isolation                    | OIRR                                 | R <sub>L</sub> = 1 kΩ, C <sub>L</sub> = 10 pF<br>f = 100 kHz                                                                       | Room              | 85               |                            |                  |                           |                  | dB   |
| Crosstalk (Channel-to-Channel)   | X <sub>TALK</sub>                    | Any Other Channel Switches<br>R <sub>L</sub> = 1 kΩ, C <sub>L</sub> = 10 pF<br>f = 100 kHz                                         | Room              | 100              |                            |                  |                           |                  |      |
| Source Off Capacitance           | C <sub>S(off)</sub>                  | V <sub>S</sub> , V <sub>D</sub> = 0 V, f = 1 MHz                                                                                   | Room              | 8                |                            |                  |                           |                  | pF   |
| Drain Off Capacitance            | C <sub>D(off)</sub>                  |                                                                                                                                    | Room              | 8                |                            |                  |                           |                  |      |
| Channel On Capacitance           | C <sub>D(on)</sub>                   |                                                                                                                                    | Room              | 30               |                            |                  |                           |                  |      |
| Drain-to-Source Capacitance      | C <sub>DS(off)</sub>                 |                                                                                                                                    | Room              | 0.5              |                            |                  |                           |                  |      |
| Power Supplies                   |                                      |                                                                                                                                    |                   |                  |                            |                  |                           |                  |      |
| Positive Supply Current          | I <sub>+</sub>                       | V <sub>+</sub> = 15 V, V <sub>-</sub> = - 15 V<br>V <sub>IN</sub> = 0 or 5 V                                                       | Room Full         | 4.5              |                            | 10               |                           | 10               | mA   |
| Negative Supply Current          | I <sub>-</sub>                       |                                                                                                                                    | Room Full         | 3.5              | - 6                        |                  | - 6                       |                  |      |
| Power Consumption <sup>c</sup>   | P <sub>C</sub>                       |                                                                                                                                    |                   | Full             |                            |                  | 240                       |                  | 240  |

Notes:

a. Refer to PROCESS OPTION FLOWCHART.

b. Room = 25 °C, Full = as determined by the operating temperature suffix.

c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

d. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.

e. Guaranteed by design, not subject to production test.

f. V<sub>IN</sub> = input voltage to perform proper function.

**SPECIFICATIONS<sup>a</sup> FOR SINGLE SUPPLY**

| Parameter                         | Symbol                                  | Test Conditions<br>Unless Specified<br>V+ = 10.8 V to 16.5 V,<br>V- = GND = 0 V, VIN = 3 V, 0.8 V <sup>f</sup> | Temp <sup>b</sup> | Typ <sup>c</sup> | A Suffix<br>- 55 to 125 °C |                  | D Suffix<br>- 40 to 85 °C |                  | Unit |
|-----------------------------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------|------------------|----------------------------|------------------|---------------------------|------------------|------|
|                                   |                                         |                                                                                                                |                   |                  | Min <sup>d</sup>           | Max <sup>d</sup> | Min <sup>d</sup>          | Max <sup>d</sup> |      |
| Analog Switch                     |                                         |                                                                                                                |                   |                  |                            |                  |                           |                  |      |
| Analog Signal Range <sup>e</sup>  | V <sub>ANALOG</sub>                     |                                                                                                                | Full              |                  | 0                          | V+               | 0                         | V+               | V    |
| Drain-Source<br>On-Resistance     | r <sub>DS(on)</sub>                     | I <sub>S</sub> = - 10 mA, V <sub>D</sub> = 8.5 V<br>V+ = 10.8 V                                                | Room<br>Full      | 65               |                            | 90<br>120        |                           | 90<br>120        | Ω    |
| Switch Off Leakage Current        | I <sub>S(off)</sub>                     | V+ = 16.5 V<br>V <sub>S</sub> = 0.5 V, 10 V<br>V <sub>D</sub> = 10 V, 0.5 V                                    | Room<br>Full      | 0.1              | - 1<br>- 60                | 1<br>60          | - 1<br>- 20               | 1<br>20          | nA   |
|                                   | I <sub>D(off)</sub>                     |                                                                                                                | Room<br>Full      | 0.1              | - 1<br>- 60                | 1<br>60          | - 1<br>- 20               | 1<br>20          |      |
| Channel On Leakage<br>Current     | I <sub>D(on)</sub> + I <sub>S(on)</sub> | V+ = 16.5 V<br>V <sub>D</sub> = 0.5 V, 10 V                                                                    | Room<br>Full      | 0.1              | - 1<br>- 60                | 1<br>60          | - 1<br>- 20               | 1<br>20          |      |
| Digital Control                   |                                         |                                                                                                                |                   |                  |                            |                  |                           |                  |      |
| Input, High Voltage               | V <sub>INH</sub>                        |                                                                                                                | Full              |                  | 2.4                        |                  | 2.4                       |                  | V    |
| Input, Low Voltage                | V <sub>INL</sub>                        |                                                                                                                | Full              |                  |                            | 0.8              |                           | 0.8              |      |
| Input Capacitance                 | C <sub>IN</sub>                         |                                                                                                                | Full              | 5                |                            |                  |                           |                  | pF   |
| Input Current                     | I <sub>INH</sub> or I <sub>INL</sub>    | V+ = 16.5 V<br>VIN under test = 0.8 V, 3 V                                                                     | Full              |                  | - 1                        | 1                | - 1                       | 1                | μA   |
| Dynamic Characteristics           |                                         |                                                                                                                |                   |                  |                            |                  |                           |                  |      |
| Turn-On Time                      | t <sub>ON</sub>                         | R <sub>L</sub> = 1 kΩ, C <sub>L</sub> = 35 pF<br>V <sub>S</sub> = 2 V, V = 10.8 V<br>See Figure 2              | Room<br>Full      |                  |                            | 50<br>70         |                           | 50<br>70         | ns   |
| Turn-Off Time                     | t <sub>OFF1</sub>                       |                                                                                                                | Room<br>Full      |                  |                            | 50<br>70         |                           | 50<br>70         |      |
|                                   | t <sub>OFF2</sub>                       |                                                                                                                | Room              | 150              |                            |                  |                           |                  |      |
| Output Settling Time to 0.1 %     | t <sub>s</sub>                          |                                                                                                                | Room              | 180              |                            |                  |                           |                  |      |
| Charge Injection                  | Q                                       | C <sub>L</sub> = 1 nF, V <sub>S</sub> = 0 V<br>V <sub>gen</sub> = 0 V, R <sub>gen</sub> = 0 Ω                  | Room              | 10               |                            |                  |                           |                  | pC   |
| Off Isolation                     | OIRR                                    | R <sub>L</sub> = 1 kΩ, C <sub>L</sub> = 10 pF<br>f = 100 kHz                                                   | Room              | 85               |                            |                  |                           |                  | dB   |
| Crosstalk<br>(Channel-to-Channel) | X <sub>TALK</sub>                       | Any Other Channel Switches<br>R <sub>L</sub> = 1 kΩ, C <sub>L</sub> = 10 pF<br>f = 100 kHz                     | Room              | 100              |                            |                  |                           |                  |      |
| Source Off Capacitance            | C <sub>S(off)</sub>                     | f = 1 MHz                                                                                                      | Room              | 10               |                            |                  |                           |                  | pF   |
| Drain Off Capacitance             | C <sub>D(off)</sub>                     |                                                                                                                | Room              | 10               |                            |                  |                           |                  |      |
| Channel On Capacitance            | C <sub>D(on)</sub>                      | V <sub>ANALOG</sub> = 0 V                                                                                      | Room              | 30               |                            |                  |                           |                  |      |
| Power Supply                      |                                         |                                                                                                                |                   |                  |                            |                  |                           |                  |      |
| Positive Supply Current           | I+                                      | V+ = 15 V, VIN = 0 or 5 V                                                                                      | Full              |                  |                            | 10               |                           | 10               | mA   |
| Power Consumption <sup>c</sup>    | P <sub>C</sub>                          |                                                                                                                | Full              |                  |                            | 150              |                           | 150              | mW   |

## Notes:

a. Refer to PROCESS OPTION FLOWCHART.

b. Room = 25 °C, Full = as determined by the operating temperature suffix.

c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

d. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.

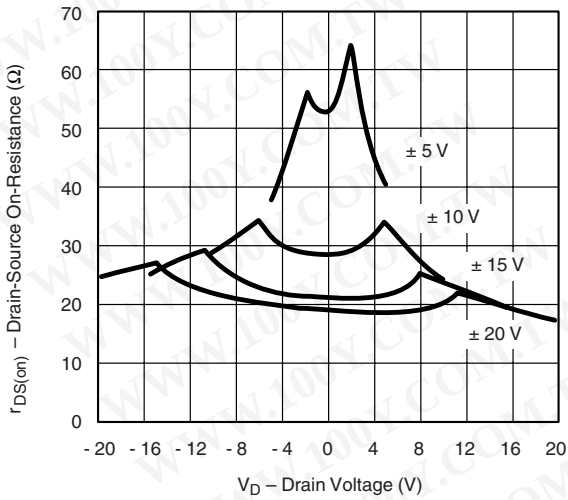
e. Guaranteed by design, not subject to production test.

f.  $V_{\text{IN}}$  = input voltage to perform proper function.

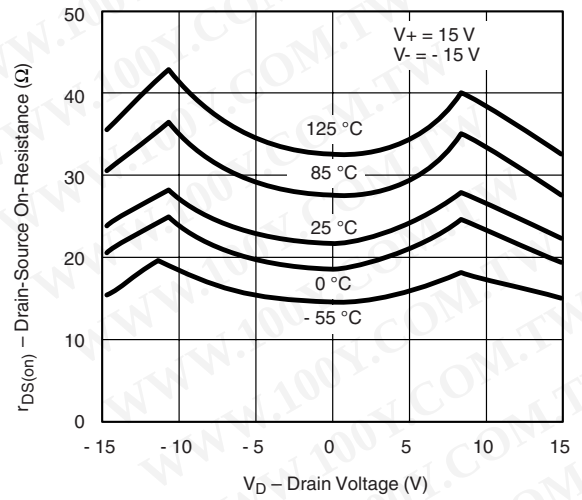
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



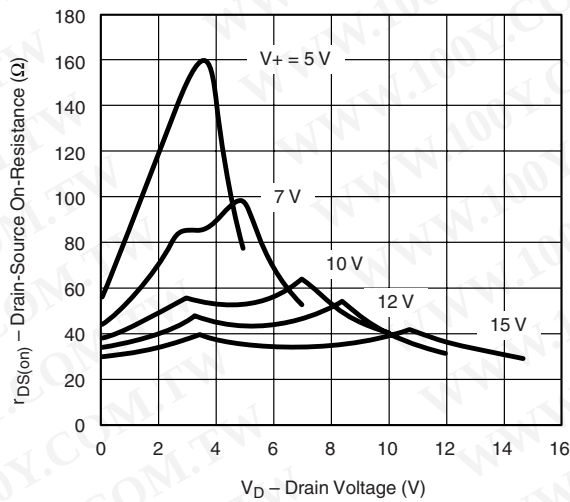
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



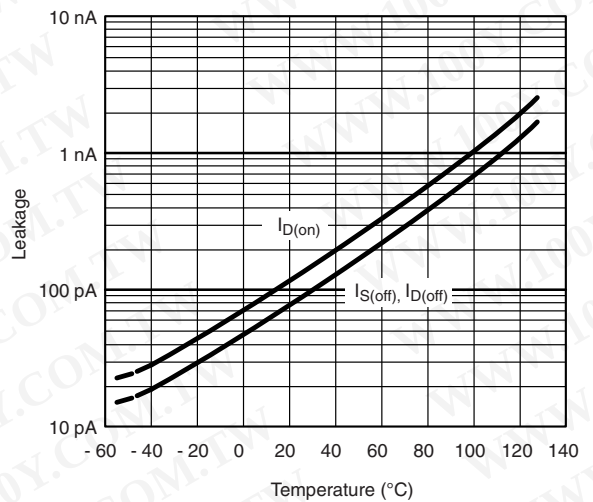
**$r_{DS(on)}$  vs.  $V_D$  and Power Supply Voltages**



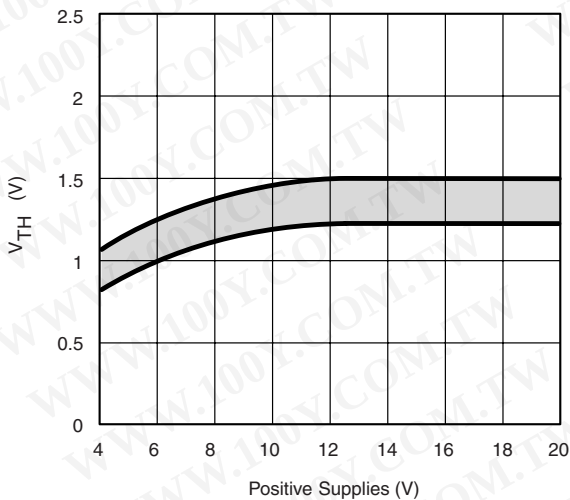
**$r_{DS(on)}$  vs.  $V_D$  and Temperature**



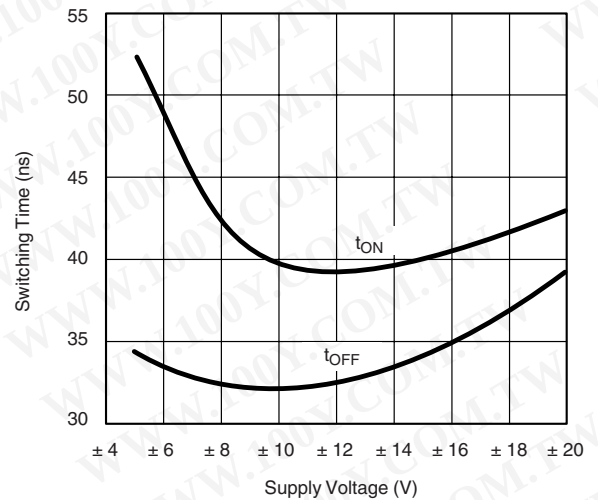
**$r_{DS(on)}$  vs.  $V_D$  and Single Power Supply Voltages**



**Leakage Currents vs. Temperature**

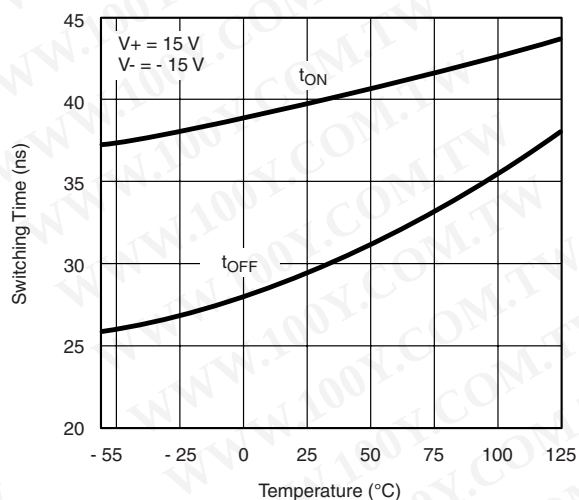


**Input Switching Threshold vs. Supply Voltage**

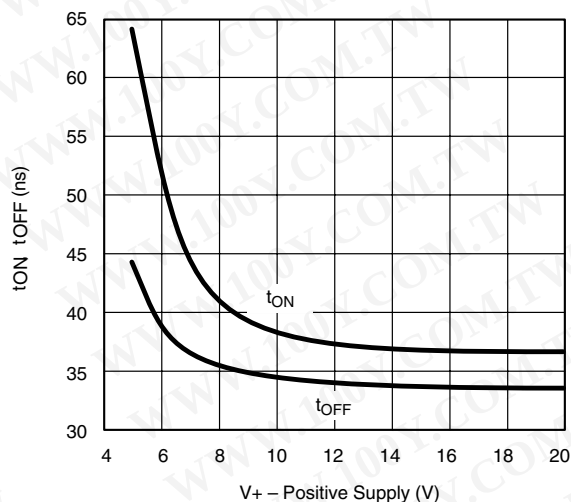


**Switching Time vs. Power Supply Voltage**

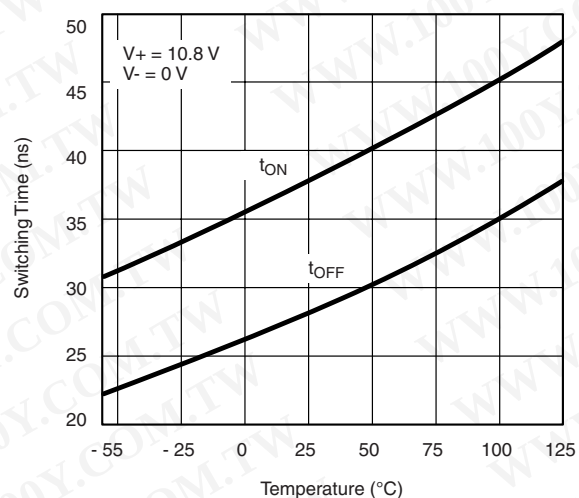
### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



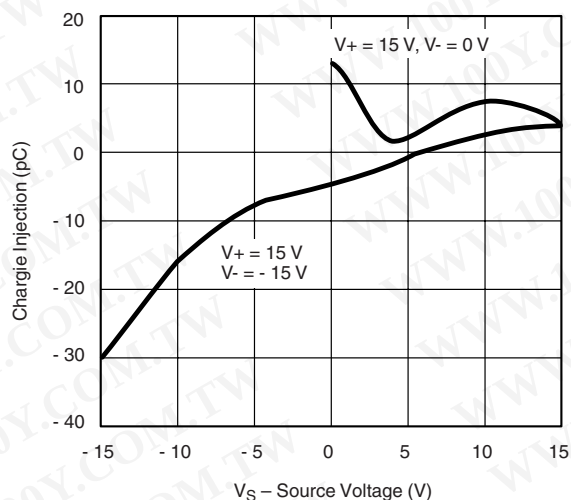
Switching Times vs. Temperature



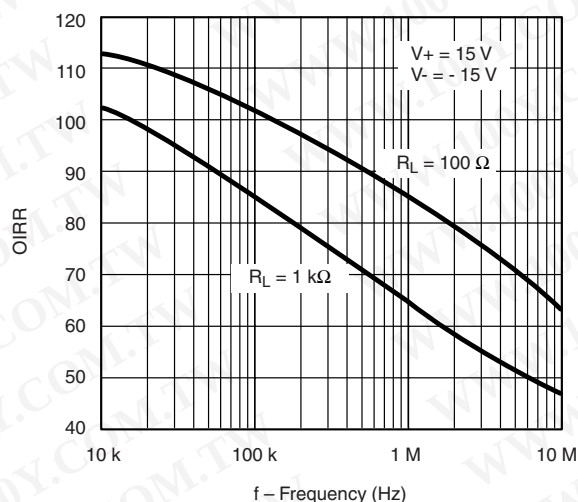
Switching Times vs. Power Supply Voltage



Switching Times vs. Temperature



Charge Injection vs. Source Voltage



Off Isolation vs. Frequency

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## TEST CIRCUITS

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 Vishay Siliconix

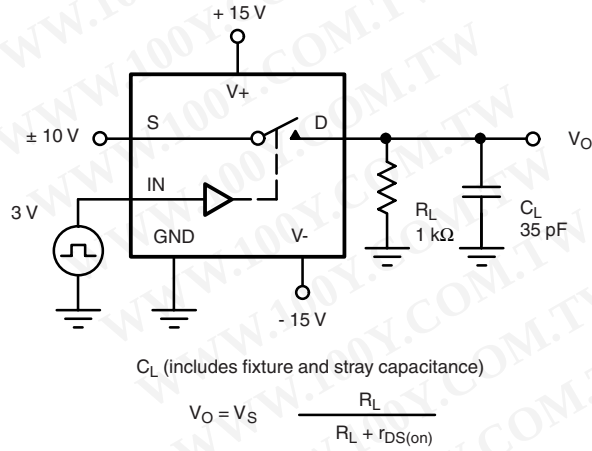


Figure 2. Switching Time

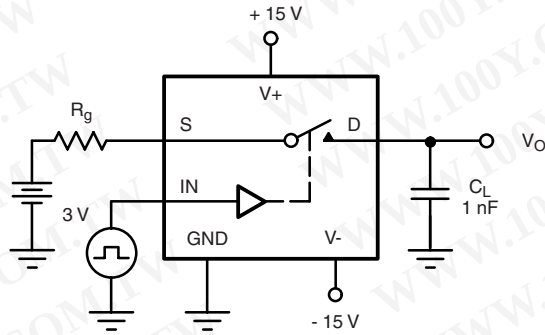
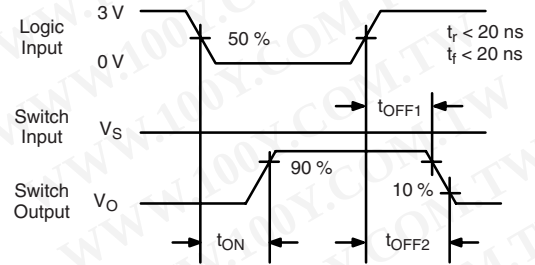


Figure 3. Charge Injection

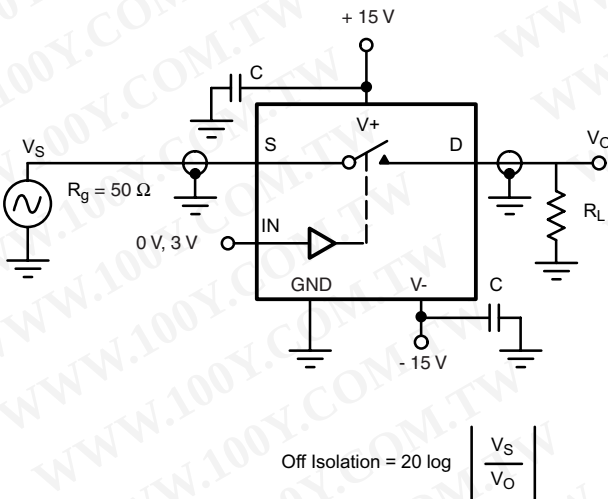
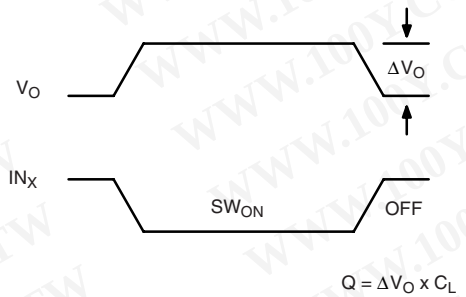


Figure 4. Off Isolation

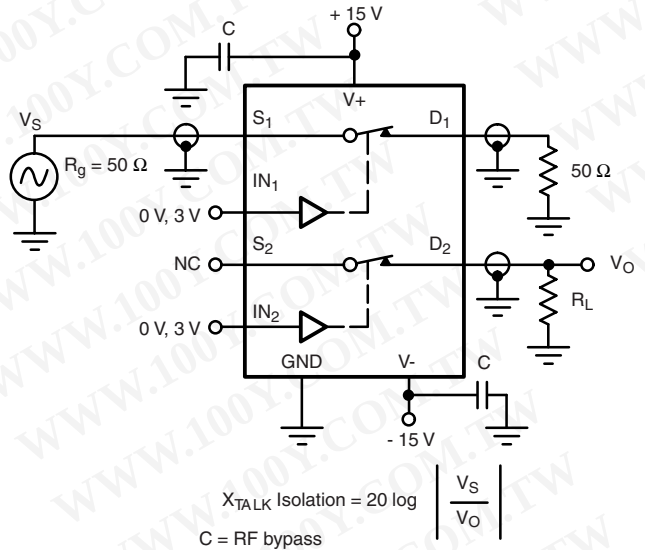
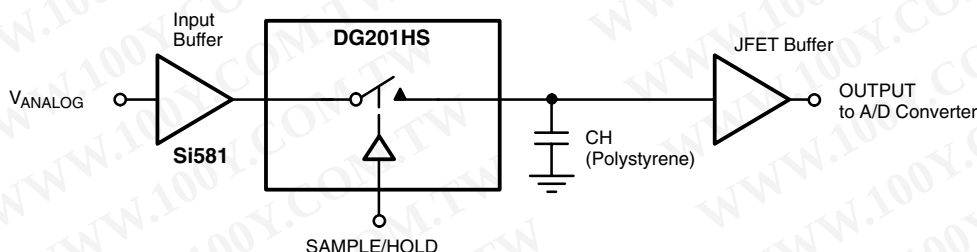


Figure 5. Crosstalk

### APPLICATIONS

A high-speed, low-glitch analog switch such as Vishay Siliconix's DG201HS improves the accuracy and shortens the acquisition and settling times of a sample-and-hold circuit.



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