



## 16 $\Omega$ , Low Charge Injection and Leakage, +12 V / +5 V / +3 V / $\pm$ 5 V Quad SPST Switches

### DESCRIPTION

The DG441LE, DG442LE monolithic quad single-pole-single-throw analog switches are designed to provide high speed, low error switching of analog signals. The DG441LE has a normally closed function. The DG442LE has a normally open function.

The DG441LE, DG442LE feature low charge injection of a few picocoulombs over the full analog switch range. Combining low on resistance (16  $\Omega$ , typ.), low parasitic capacitance ( $C_{D(ON)}$  15 pF), and fast switching speed ( $t_{ON}$ , 18 ns, typ.), the devices are ideal for data acquisition, sample-and-hold, and ADC input circuit designs.

The DG441LE, DG442LE operate on single and dual supplies. Single supply voltage ranges from 3 V to 16 V while dual supply operation is recommended with  $\pm$  3 V to  $\pm$  8 V. Each switch conducts equally well in both direction when on, and blocks input voltages up to the supply levels when off.

The DG441LE, DG442LE are available in 16 lead TSSOP, SOIC, and PDIP packages.

### FEATURES

- 3 V to 16 V single supply or  $\pm$  3 V to  $\pm$  8 V dual supply
- On-resistance  $R_{DS(on)}$ : 16  $\Omega$
- Fast switching  $t_{ON}$ : 18 ns, typ.
- Low parasitic capacitance:  
 $C_{D(ON)}$ : 15 pF  
 $C_{S(OFF)}$ : 5 pF
- Less than 8 pC charge injection over the full signal swing range
- Low leakage: < 10 pA, typ.
- TTL, CMOS compatible
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details.

### BENEFITS

- Wide operation voltage range
- Low signal errors and distortion
- Fast switching time
- Minimized switching glitch

### APPLICATIONS

- Automatic test equipment
- Process control and automation
- Data acquisition systems
- Meters and instruments
- Medical and healthcare systems
- Communication systems
- Audio and video signal routing
- Relay replacement
- Battery powered systems

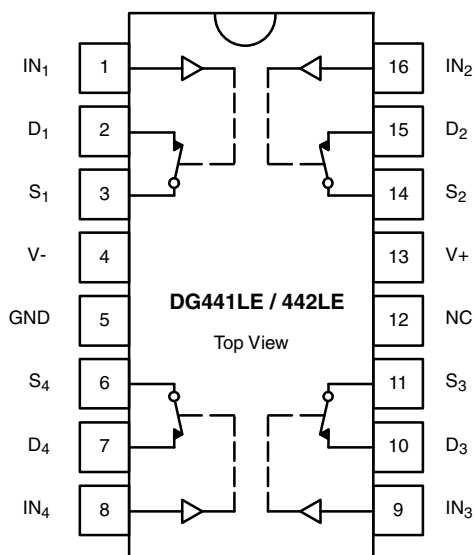


RoHS\*  
Available

HALOGEN  
FREE  
Available

### FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

Dual-In-Line, TSSOP and SOIC



### TRUTH TABLE

| LOGIC | DG441LE | DG442LE |
|-------|---------|---------|
| 0     | On      | Off     |
| 1     | Off     | On      |

Logic "0"  $\leq$  0.8 V

Logic "1"  $\geq$  2.4 V

**ORDERING INFORMATION**

| TEMP. RANGE                        | CONFIGURATION | PACKAGE      | PART NUMBER      | MIN. ORDER / PACK. QUANTITY |
|------------------------------------|---------------|--------------|------------------|-----------------------------|
| -40 °C to +85 °C<br>Lead (Pb)-free | DG441LE       | 16-pin TSSOP | DG441LEDQ-GE3    | Tube 360 units              |
|                                    |               |              | DG441LEDQ-T1-GE3 | Tape and reel, 3000 units   |
|                                    |               | 16-pin SOIC  | DG441LEDY-GE3    | Tube 500 units              |
|                                    |               |              | DG441LEDY-T1-GE3 | Tape and reel, 2500 units   |
|                                    |               | 16-pin PDIP  | DG441LEDJ-GE3    | Tube 500 units              |
|                                    |               |              |                  |                             |
|                                    | DG442LE       | 16-pin TSSOP | DG442LEDQ-GE3    | Tube 360 units              |
|                                    |               |              | DG442LEDQ-T1-GE3 | Tape and reel, 3000 units   |
|                                    |               | 16-pin SOIC  | DG442LEDY-GE3    | Tube 500 units              |
|                                    |               |              | DG442LEDY-T1-GE3 | Tape and reel, 2500 units   |
|                                    |               | 16-pin PDIP  | DG442LEDJ-GE3    | Tube 500 units              |
|                                    |               |              |                  |                             |

**ABSOLUTE MAXIMUM RATINGS** ( $T_A = 25\text{ °C}$ , unless otherwise noted)

| PARAMETER                                                   | SYMBOL                               | LIMIT                                                                   | UNIT |
|-------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------|------|
| V+ to V-                                                    |                                      | -0.3 to +18                                                             | V    |
| GND to V <sub>A</sub>                                       |                                      | 18                                                                      |      |
| Digital Inputs <sup>a</sup> V <sub>S</sub> , V <sub>D</sub> |                                      | GND -0.3 to (V <sub>+</sub> ) + 0.3<br>or 30 mA, whichever occurs first |      |
| Continuous Current (any terminal)                           |                                      | 30                                                                      | mA   |
| Current, S or D (pulsed 1 ms, 10 % duty cycle)              |                                      | 100                                                                     |      |
| Storage Temperature                                         | (DQ, DY suffix)                      | -65 to +125                                                             | °C   |
|                                                             | (AK suffix)                          | -65 to +150                                                             |      |
| Power Dissipation (packages) <sup>b</sup>                   | 16-pin TSSOP <sup>c</sup>            | 450                                                                     | mW   |
|                                                             | 16-pin narrow body SOIC <sup>d</sup> | 650                                                                     |      |
|                                                             | 16-pin CerDIP <sup>e</sup>           | 900                                                                     |      |
| ESD Human Body Model (HBM); per ANSI / ESDA / JEDEC® JS-001 |                                      | 2500                                                                    | V    |
| Latch Up Current, per JESD78D                               |                                      | 400                                                                     | mA   |

**Notes**

- a. Signals on S<sub>X</sub>, D<sub>X</sub>, or IN<sub>X</sub> exceeding V<sub>+</sub> or V<sub>-</sub> 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 7 mW/°C above 75 °C.
- d. Derate 7.6 mW/°C above 75 °C.
- e. Derate 12 mW/°C above 75 °C.

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.



| SPECIFICATIONS <sup>a</sup> (single supply 12 V)     |                      |                                                                                                                                                |                    |                   |                                         |                   |                                        |                   |      |
|------------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|-----------------------------------------|-------------------|----------------------------------------|-------------------|------|
| PARAMETER                                            | SYMBOL               | TEST CONDITIONS<br>UNLESS OTHERWISE<br>SPECIFIED<br>V <sub>+</sub> = 12 V, V <sub>-</sub> = 0 V<br>V <sub>IN</sub> = 2.4 V, 0.8 V <sup>f</sup> | TEMP. <sup>b</sup> | TYP. <sup>c</sup> | A SUFFIX<br>LIMITS<br>-55 °C to +125 °C |                   | D SUFFIX<br>LIMITS<br>-40 °C 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                                       | 12                | 0                                      | 12                | V    |
| Drain-Source<br>On-Resistance                        | R <sub>DS(on)</sub>  | V <sub>+</sub> = 10.8 V, V <sub>-</sub> = 0 V<br>I <sub>S</sub> = 10 mA, V <sub>D</sub> = 2 V / 9 V                                            | Room               | 16                | -                                       | 26                | -                                      | 26                | Ω    |
|                                                      |                      |                                                                                                                                                | Full               | -                 | -                                       | 40                | -                                      | 35                |      |
| On-Resistance Match<br>Between Channels <sup>e</sup> | ΔR <sub>DS(on)</sub> | I <sub>S</sub> = 10 mA, V <sub>D</sub> = 9 V                                                                                                   | Room               | 0.1               | -                                       | 0.5               | -                                      | 0.5               |      |
| Switch Off Leakage Current                           | I <sub>S(off)</sub>  | V <sub>D</sub> = 1 V / 11 V,<br>V <sub>S</sub> = 11 V / 1 V                                                                                    | Room               | -                 | -1                                      | 1                 | -1                                     | 1                 | nA   |
|                                                      | I <sub>D(off)</sub>  |                                                                                                                                                | Full               | -                 | -15                                     | 15                | -10                                    | 10                |      |
|                                                      |                      |                                                                                                                                                | Room               | -                 | -1                                      | 1                 | -1                                     | 1                 |      |
|                                                      |                      |                                                                                                                                                | Full               | -                 | -15                                     | 15                | -10                                    | 10                |      |
| Channel On Leakage Current                           | I <sub>D(on)</sub>   | V <sub>S</sub> = V <sub>D</sub> = 11 V / 1 V                                                                                                   | Room               | -                 | -1                                      | 1                 | -1                                     | 1                 |      |
|                                                      |                      |                                                                                                                                                | Full               | -                 | -15                                     | 15                | -10                                    | 10                |      |
| Digital Control                                      |                      |                                                                                                                                                |                    |                   |                                         |                   |                                        |                   |      |
| Input Current, V <sub>IN</sub> Low                   | I <sub>IL</sub>      | V <sub>IN</sub> under test = 0.8 V                                                                                                             | Full               | 0.01              | -1.5                                    | 1.5               | -1                                     | 1                 | μA   |
| Input Current, V <sub>IN</sub> High                  | I <sub>IH</sub>      | V <sub>IN</sub> under test = 2.4 V                                                                                                             | Full               | -                 | -1.5                                    | 1.5               | -1                                     | 1                 |      |
| Dynamic Characteristics                              |                      |                                                                                                                                                |                    |                   |                                         |                   |                                        |                   |      |
| Turn-On Time                                         | t <sub>ON</sub>      | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>V <sub>S</sub> = 5 V, see figure 2                                                           | Room               | 18                | -                                       | 60                | -                                      | 60                | ns   |
| Turn-Off Time                                        | t <sub>OFF</sub>     |                                                                                                                                                | Full               | -                 | -                                       | 80                | -                                      | 70                |      |
|                                                      |                      |                                                                                                                                                | Room               | 18                | -                                       | 35                | -                                      | 35                |      |
|                                                      |                      |                                                                                                                                                | Full               | -                 | -                                       | 50                | -                                      | 45                |      |
| Charge Injection <sup>e</sup>                        | Q                    | V <sub>g</sub> = 0 V, R <sub>g</sub> = 0 Ω, C <sub>L</sub> = 10 nF                                                                             | Room               | 6.6               | -                                       | -                 | -                                      | -                 | pC   |
| Off Isolation <sup>e</sup>                           | OIRR                 | R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF,<br>f = 1 MHz                                                                                     | Room               | 68.4              | -                                       | -                 | -                                      | -                 | dB   |
| Channel-to-Channel Crosstalk <sup>e</sup>            | X <sub>TALK</sub>    |                                                                                                                                                | Room               | 114               | -                                       | -                 | -                                      | -                 |      |
| Source Off Capacitance <sup>e</sup>                  | C <sub>S(off)</sub>  | f = 1 MHz                                                                                                                                      | Room               | 5                 | -                                       | -                 | -                                      | -                 | pF   |
| Drain Off Capacitance <sup>e</sup>                   | C <sub>D(off)</sub>  |                                                                                                                                                | Room               | 6                 | -                                       | -                 | -                                      | -                 |      |
| Channel On Capacitance <sup>e</sup>                  | C <sub>D(on)</sub>   |                                                                                                                                                | Room               | 15                | -                                       | -                 | -                                      | -                 |      |
| Power Supplies                                       |                      |                                                                                                                                                |                    |                   |                                         |                   |                                        |                   |      |
| Positive Supply Current                              | I <sub>+</sub>       | V <sub>IN</sub> = 0 V or 12 V                                                                                                                  | Full               | 0.03              | -                                       | 1.5               | -                                      | 1                 | μA   |
| Negative Supply Current                              | I <sub>-</sub>       |                                                                                                                                                | Room               | -                 | -1                                      | -                 | -1                                     | -                 |      |
|                                                      |                      |                                                                                                                                                | Full               | 0.002             | -7.5                                    | -                 | -5                                     | -                 |      |
| Ground Current                                       | I <sub>GND</sub>     |                                                                                                                                                | Full               | 0.002             | -1.5                                    | -                 | -1                                     | -                 |      |



| SPECIFICATIONS <sup>a</sup> (dual supply $\pm 5$ V)  |                     |                                                                                                                         |                    |                   |                                         |                   |                                        |                   |          |
|------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|-----------------------------------------|-------------------|----------------------------------------|-------------------|----------|
| PARAMETER                                            | SYMBOL              | TEST CONDITIONS<br>UNLESS OTHERWISE<br>SPECIFIED<br>$V_+ = 5$ V, $V_- = -5$ V<br>$V_{IN} = 2.4$ V, $0.8$ V <sup>f</sup> | TEMP. <sup>b</sup> | TYP. <sup>c</sup> | A SUFFIX<br>LIMITS<br>-55 °C to +125 °C |                   | D SUFFIX<br>LIMITS<br>-40 °C 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>                     | $V_{ANALOG}$        |                                                                                                                         | Full               | -                 | -5                                      | 5                 | -5                                     | 5                 | V        |
| Drain-Source<br>On-Resistance                        | $R_{DS(on)}$        | $V_+ = 5$ V, $V_- = -5$ V<br>$I_S = 10$ mA, $V_D = \pm 3.5$ V                                                           | Room               | 18                | -                                       | 30                | -                                      | 30                | $\Omega$ |
|                                                      |                     |                                                                                                                         | Full               | -                 | -                                       | 42                | -                                      | 37                |          |
| On-Resistance Match<br>Between Channels <sup>e</sup> | $\Delta R_{DS(on)}$ | $I_S = 10$ mA, $V_D = \pm 3.5$ V                                                                                        | Room               | 0.1               | -                                       | 0.5               | -                                      | 0.5               |          |
| Switch Off<br>Leakage Current <sup>g</sup>           | $I_{S(off)}$        | $V_+ = 5.5$ , $V_- = -5.5$ V<br>$V_D = \pm 4.5$ V, $V_S = \pm 4.5$ V                                                    | Room               | -                 | -1                                      | 1                 | -1                                     | 1                 | nA       |
|                                                      | $I_{D(off)}$        |                                                                                                                         | Full               | -                 | -15                                     | 15                | -10                                    | 10                |          |
|                                                      |                     |                                                                                                                         | Room               | -                 | -1                                      | 1                 | -1                                     | 1                 |          |
|                                                      |                     |                                                                                                                         | Full               | -                 | -15                                     | 15                | -10                                    | 10                |          |
| Channel On<br>Leakage Current <sup>g</sup>           | $I_{D(on)}$         | $V_+ = 5.5$ V, $V_- = -5.5$ V<br>$V_S = V_D = \pm 4.5$ V                                                                | Room               | -                 | -1                                      | 1                 | -1                                     | 1                 |          |
|                                                      |                     |                                                                                                                         | Full               | -                 | -15                                     | 15                | -10                                    | 10                |          |
| Digital Control                                      |                     |                                                                                                                         |                    |                   |                                         |                   |                                        |                   |          |
| Input Current, $V_{IN}$ Low <sup>e</sup>             | $I_{IL}$            | $V_{IN}$ under test = 0.8 V                                                                                             | Full               | 0.05              | -1.5                                    | 1.5               | -1                                     | 1                 | $\mu$ A  |
| Input Current, $V_{IN}$ High <sup>e</sup>            | $I_{IH}$            | $V_{IN}$ under test = 2.4 V                                                                                             | Full               | 0.05              | -1.5                                    | 1.5               | -1                                     | 1                 |          |
| Dynamic Characteristics                              |                     |                                                                                                                         |                    |                   |                                         |                   |                                        |                   |          |
| Turn-On Time                                         | $t_{ON}$            | $R_L = 300 \Omega$ , $C_L = 35$ pF<br>$V_S = \pm 3.5$ V, see figure 2                                                   | Room               | 42                | -                                       | 65                | -                                      | 65                | ns       |
|                                                      |                     |                                                                                                                         | Full               | -                 | -                                       | 90                | -                                      | 75                |          |
| Turn-Off Time                                        | $t_{OFF}$           |                                                                                                                         | Room               | 34                | -                                       | 45                | -                                      | 45                |          |
|                                                      |                     |                                                                                                                         | Full               | -                 | -                                       | 65                | -                                      | 55                |          |
| Charge Injection <sup>e</sup>                        | Q                   | $V_g = 0$ V, $R_g = 0 \Omega$ , $C_L = 10$ nF                                                                           | Room               | 5.8               | -                                       | -                 | -                                      | -                 | pC       |
| Off Isolation <sup>e</sup>                           | OIRR                | $R_L = 50 \Omega$ , $C_L = 5$ pF, $f = 1$ MHz                                                                           | Room               | 68.4              | -                                       | -                 | -                                      | -                 | dB       |
| Channel-to-Channel<br>Crosstalk <sup>e</sup>         | $X_{TALK}$          |                                                                                                                         | Room               | 113               | -                                       | -                 | -                                      | -                 |          |
| Source Off Capacitance <sup>e</sup>                  | $C_{S(off)}$        | $f = 1$ MHz                                                                                                             | Room               | 5                 | -                                       | -                 | -                                      | -                 | pF       |
| Drain Off Capacitance <sup>e</sup>                   | $C_{D(off)}$        |                                                                                                                         | Room               | 6                 | -                                       | -                 | -                                      | -                 |          |
| Channel On Capacitance <sup>e</sup>                  | $C_{D(on)}$         |                                                                                                                         | Room               | 14                | -                                       | -                 | -                                      | -                 |          |
| Power Supplies                                       |                     |                                                                                                                         |                    |                   |                                         |                   |                                        |                   |          |
| Positive Supply Current <sup>e</sup>                 | I +                 | $V_{IN} = 0$ V or 5 V                                                                                                   | Full               | 0.002             | -                                       | 1.5               | -                                      | 1                 | $\mu$ A  |
| Negative Supply Current <sup>e</sup>                 | I -                 |                                                                                                                         | Room               | -0.002            | -1                                      | -                 | -1                                     | -                 |          |
|                                                      |                     |                                                                                                                         | Full               | -                 | -7.5                                    | -                 | -5                                     | -                 |          |
| Ground Current <sup>e</sup>                          | $I_{GND}$           |                                                                                                                         | Full               | -0.002            | -1.5                                    | -                 | -1                                     | -                 |          |



| SPECIFICATIONS <sup>a</sup> (single supply ± 5 V)    |                      |                                                                                                                                               |                    |                   |                                         |                   |                                        |                   |      |
|------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|-----------------------------------------|-------------------|----------------------------------------|-------------------|------|
| PARAMETER                                            | SYMBOL               | TEST CONDITIONS<br>UNLESS OTHERWISE<br>SPECIFIED<br>V <sub>+</sub> = 5 V, V <sub>-</sub> = 0 V<br>V <sub>IN</sub> = 2.4 V, 0.8 V <sup>f</sup> | TEMP. <sup>b</sup> | TYP. <sup>c</sup> | A SUFFIX<br>LIMITS<br>-55 °C to +125 °C |                   | D SUFFIX<br>LIMITS<br>-40 °C 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               | -                 | -                                       | 5                 | -                                      | 5                 | V    |
| Drain-Source<br>On-Resistance <sup>e</sup>           | R <sub>DS(on)</sub>  | V <sub>+</sub> = 4.5 V<br>I <sub>S</sub> = 5 mA, V <sub>D</sub> = 1 V, 3.5 V                                                                  | Room               | 36                | -                                       | 50                | -                                      | 50                | Ω    |
|                                                      |                      |                                                                                                                                               | Full               | -                 | -                                       | 88                | -                                      | 75                |      |
| On-Resistance Match<br>Between Channels <sup>e</sup> | ΔR <sub>DS(on)</sub> | I <sub>S</sub> = 10 mA, V <sub>D</sub> = 3.5 V                                                                                                | Room               | 0.5               | -                                       | 1                 | -                                      | 1                 |      |
| Dynamic Characteristics                              |                      |                                                                                                                                               |                    |                   |                                         |                   |                                        |                   |      |
| Turn-On Time <sup>e</sup>                            | t <sub>ON</sub>      | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>V <sub>S</sub> = 3.5 V, see figure 2                                                        | Room               | 53                | -                                       | 70                | -                                      | 70                | ns   |
|                                                      |                      |                                                                                                                                               | Hot                | -                 | -                                       | 90                | -                                      | 80                |      |
| Turn-Off Time <sup>e</sup>                           | t <sub>OFF</sub>     |                                                                                                                                               | Room               | 34                | -                                       | 50                | -                                      | 50                |      |
|                                                      |                      |                                                                                                                                               | Hot                | -                 | -                                       | 70                | -                                      | 60                |      |
| Charge Injection <sup>e</sup>                        | Q                    | V <sub>g</sub> = 0 V, R <sub>g</sub> = 0 Ω, C <sub>L</sub> = 10 nF                                                                            | Room               | 3.3               | -                                       | -                 | -                                      | -                 | pC   |
| Power Supplies                                       |                      |                                                                                                                                               |                    |                   |                                         |                   |                                        |                   |      |
| Positive Supply Current <sup>e</sup>                 | I <sub>+</sub>       | V <sub>IN</sub> = 0 V or 5 V                                                                                                                  | Full               | 10                | -                                       | 200               | -                                      | 100               | μA   |
| Negative Supply Current <sup>e</sup>                 | I <sub>-</sub>       |                                                                                                                                               | Room               | -0.002            | -1                                      | -                 | -1                                     | -                 |      |
|                                                      |                      |                                                                                                                                               | Full               | -                 | -7.5                                    | -                 | -5                                     | -                 |      |
| Ground Current <sup>e</sup>                          | I <sub>GND</sub>     |                                                                                                                                               | Full               | -10               | -200                                    | -                 | -100                                   | -                 |      |



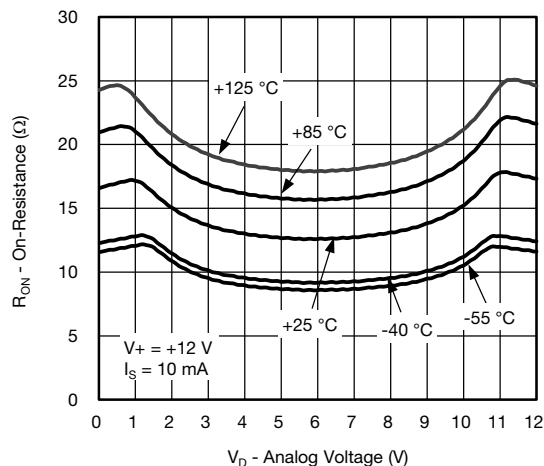
| SPECIFICATIONS <sup>a</sup> (single supply 3 V)      |                      |                                                                                                                                        |                    |                   |                                         |                   |                                        |                   |      |
|------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|-----------------------------------------|-------------------|----------------------------------------|-------------------|------|
| PARAMETER                                            | SYMBOL               | TEST CONDITIONS<br>UNLESS OTHERWISE<br>SPECIFIED<br>V <sub>+</sub> = 3 V, V <sub>-</sub> = 0 V<br>V <sub>IN</sub> = 0.4 V <sup>f</sup> | TEMP. <sup>b</sup> | TYP. <sup>c</sup> | A SUFFIX<br>LIMITS<br>-55 °C to +125 °C |                   | D SUFFIX<br>LIMITS<br>-40 °C 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                                       | 3                 | 0                                      | 3                 | V    |
| Drain-Source<br>On-Resistance                        | R <sub>DS(on)</sub>  | V <sub>+</sub> = 2.7 V, V <sub>-</sub> = 0 V<br>I <sub>S</sub> = 5 mA, V <sub>D</sub> = 0.5 V, 2.2 V                                   | Room               | 106               | -                                       | 130               | -                                      | 130               | Ω    |
|                                                      |                      |                                                                                                                                        | Full               | -                 | -                                       | 150               | -                                      | 140               |      |
| On-Resistance Match<br>Between Channels <sup>e</sup> | ΔR <sub>DS(on)</sub> | I <sub>S</sub> = 5 mA, V <sub>D</sub> = 2.2 V                                                                                          | Room               | 1                 | -                                       | 3                 | -                                      | 3                 |      |
| Switch Off<br>Leakage Current <sup>g</sup>           | I <sub>S(off)</sub>  | V <sub>+</sub> = 3.3, V <sub>-</sub> = 0 V<br>V <sub>D</sub> = 1 V, 2 V, V <sub>S</sub> = 2 V, 1 V                                     | Room               | -                 | -1                                      | 1                 | -1                                     | 1                 | nA   |
|                                                      |                      |                                                                                                                                        | Full               | -                 | -15                                     | 15                | -10                                    | 10                |      |
|                                                      | I <sub>D(off)</sub>  |                                                                                                                                        | Room               | -                 | -1                                      | 1                 | -1                                     | 1                 |      |
|                                                      |                      |                                                                                                                                        | Full               | -                 | -15                                     | 15                | -10                                    | 10                |      |
| Channel On<br>Leakage Current <sup>g</sup>           | I <sub>D(on)</sub>   | V <sub>+</sub> = 3.3 V, V <sub>-</sub> = 0 V<br>V <sub>S</sub> = V <sub>D</sub> = 1 V, 2 V                                             | Room               | -                 | -1                                      | 1                 | -1                                     | 1                 |      |
|                                                      |                      |                                                                                                                                        | Full               | -                 | -15                                     | 15                | -10                                    | 10                |      |
| Digital Control                                      |                      |                                                                                                                                        |                    |                   |                                         |                   |                                        |                   |      |
| Input Current, V <sub>IN</sub> Low <sup>e</sup>      | I <sub>IL</sub>      | V <sub>IN</sub> under test = 0.4 V                                                                                                     | Full               | 0.005             | -1.5                                    | 1.5               | -1                                     | 1                 | μA   |
| Input Current, V <sub>IN</sub> High <sup>e</sup>     | I <sub>IH</sub>      | V <sub>IN</sub> under test = 2.4 V                                                                                                     | Full               | 0.005             | -1.5                                    | 1.5               | -1                                     | 1                 |      |
| Dynamic Characteristics                              |                      |                                                                                                                                        |                    |                   |                                         |                   |                                        |                   |      |
| Turn-On Time                                         | t <sub>ON</sub>      | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>V <sub>S</sub> = 1.5 V, see figure 2                                                 | Room               | 141               | -                                       | 200               | -                                      | 200               | ns   |
|                                                      |                      |                                                                                                                                        | Full               | -                 | -                                       | 220               | -                                      | 210               |      |
| Turn-Off Time                                        | t <sub>OFF</sub>     |                                                                                                                                        | Room               | 84                | -                                       | 120               | -                                      | 120               |      |
|                                                      |                      |                                                                                                                                        | Full               | -                 | -                                       | 140               | -                                      | 130               |      |
| Charge Injection <sup>e</sup>                        | Q                    | V <sub>g</sub> = 0 V, R <sub>g</sub> = 0 Ω, C <sub>L</sub> = 10 nF                                                                     | Room               | 2                 | -                                       | -                 | -                                      | -                 | pC   |
| Off Isolation <sup>e</sup>                           | OIRR                 | R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, f = 1 MHz                                                                                | Room               | 68                | -                                       | -                 | -                                      | -                 | dB   |
| Channel-to-Channel<br>Crosstalk <sup>e</sup>         | X <sub>TALK</sub>    |                                                                                                                                        | Room               | 107               | -                                       | -                 | -                                      | -                 |      |
| Source Off Capacitance <sup>e</sup>                  | C <sub>S(off)</sub>  | f = 1 MHz                                                                                                                              | Room               | 6                 | -                                       | -                 | -                                      | -                 | pF   |
| Drain Off Capacitance <sup>e</sup>                   | C <sub>D(off)</sub>  |                                                                                                                                        | Room               | 7                 | -                                       | -                 | -                                      | -                 |      |
| Channel On Capacitance <sup>e</sup>                  | C <sub>D(on)</sub>   |                                                                                                                                        | Room               | 15                | -                                       | -                 | -                                      | -                 |      |

**Notes**

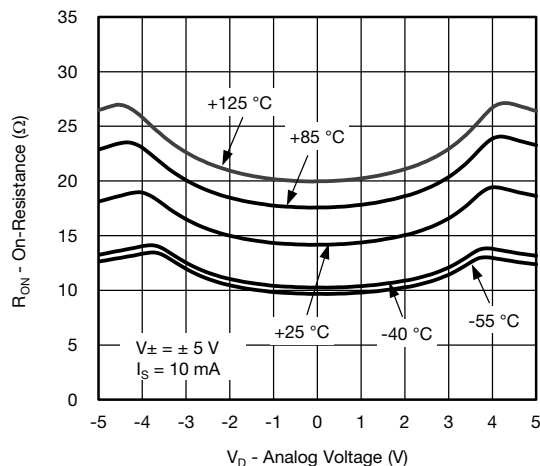
- Refer to PROCESS OPTION FLOWCHART.
- Room = 25 °C, full = as determined by the operating temperature suffix.
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum,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



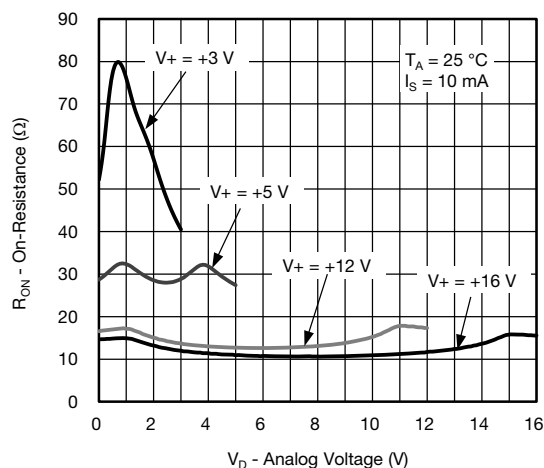
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



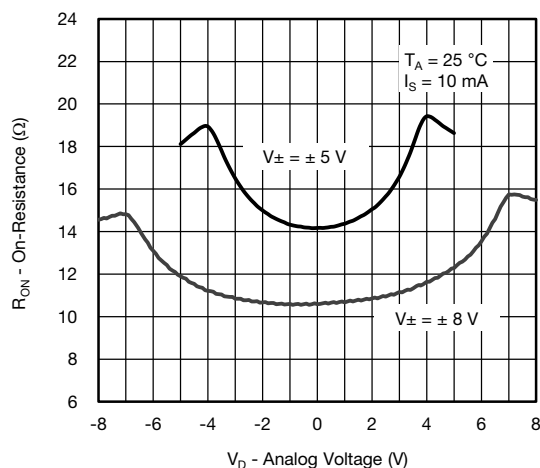
**$R_{DS(on)}$  vs. Analog Voltage and Temperature**



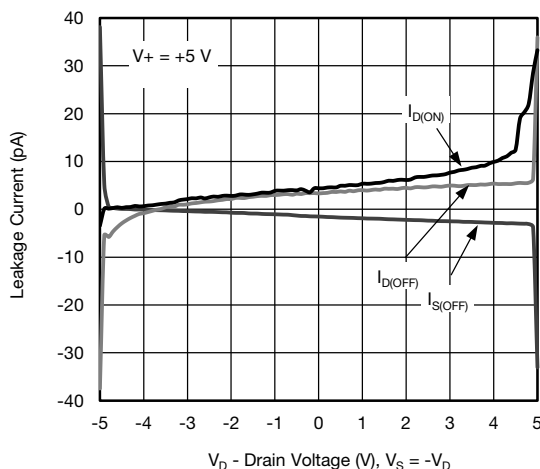
**$R_{DS(on)}$  vs. Drain Voltage and Temperature**



**$R_{DS(on)}$  vs. Analog Voltage**



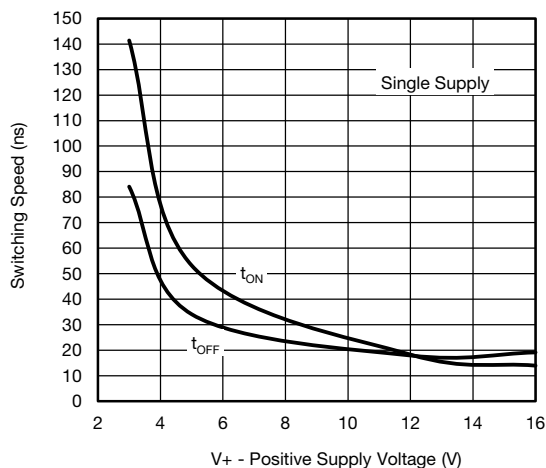
**$R_{DS(on)}$  vs. Analog Voltage**



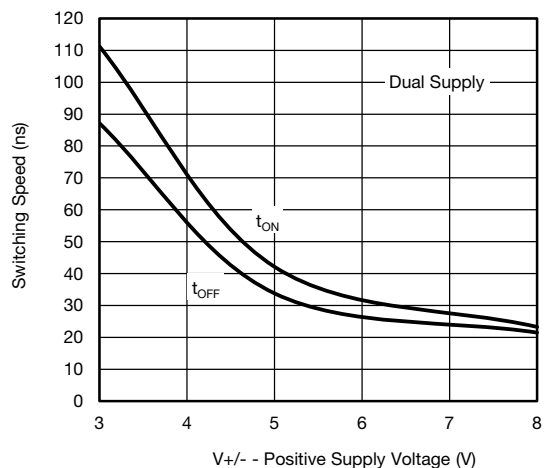
**Leakage Current vs. Drain Voltage  
(Dual Supply)**



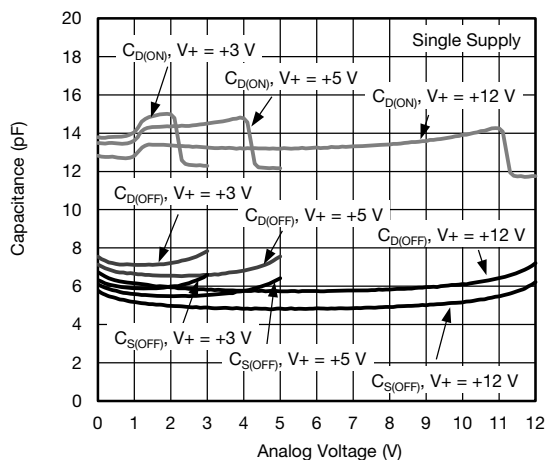
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



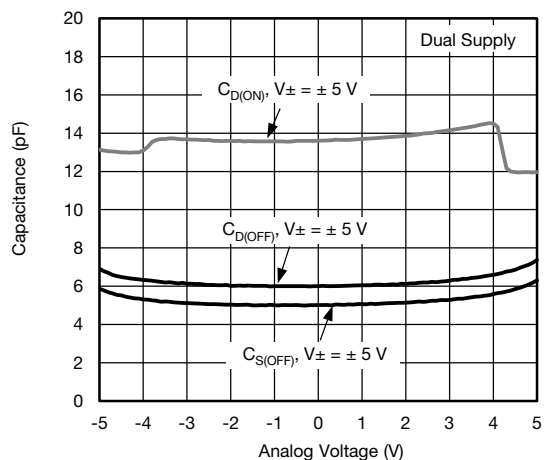
**Switching Time vs. Single Supply**



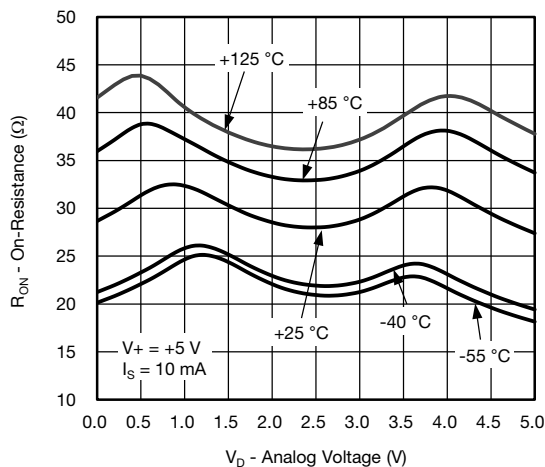
**Switching Time vs. Dual Supply**



**Capacitance vs. Analog Voltage  
(Single Supply)**



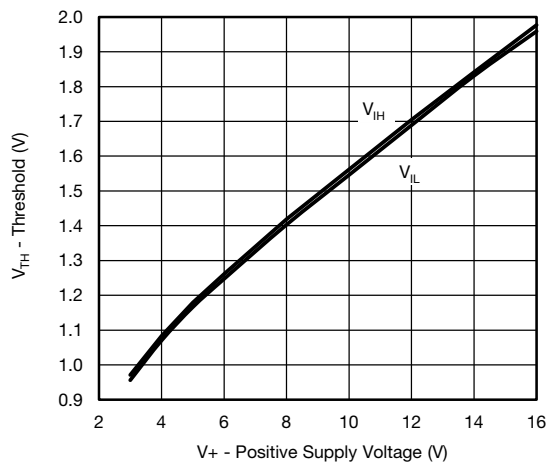
**Capacitance vs. Analog Voltage  
(Dual Supply)**



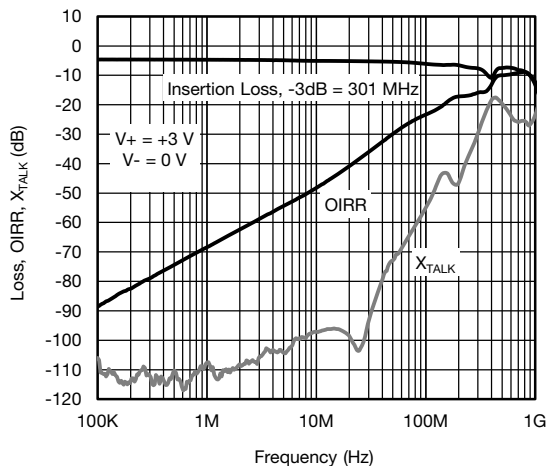
**R<sub>DS(on)</sub> vs. Analog Voltage and Temperature**



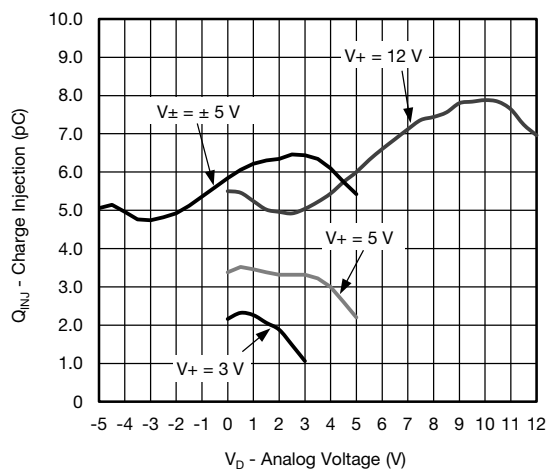
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



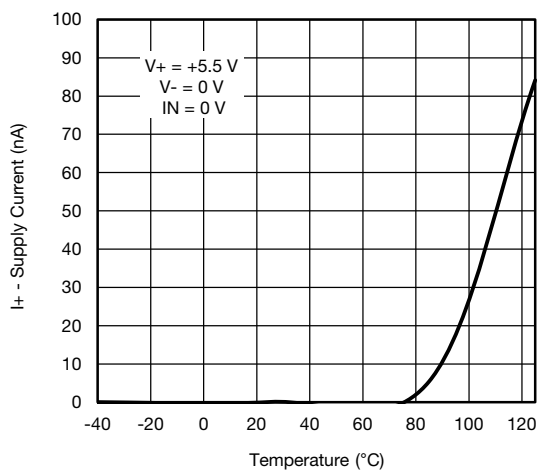
**Input Threshold vs. Single Supply Voltage**



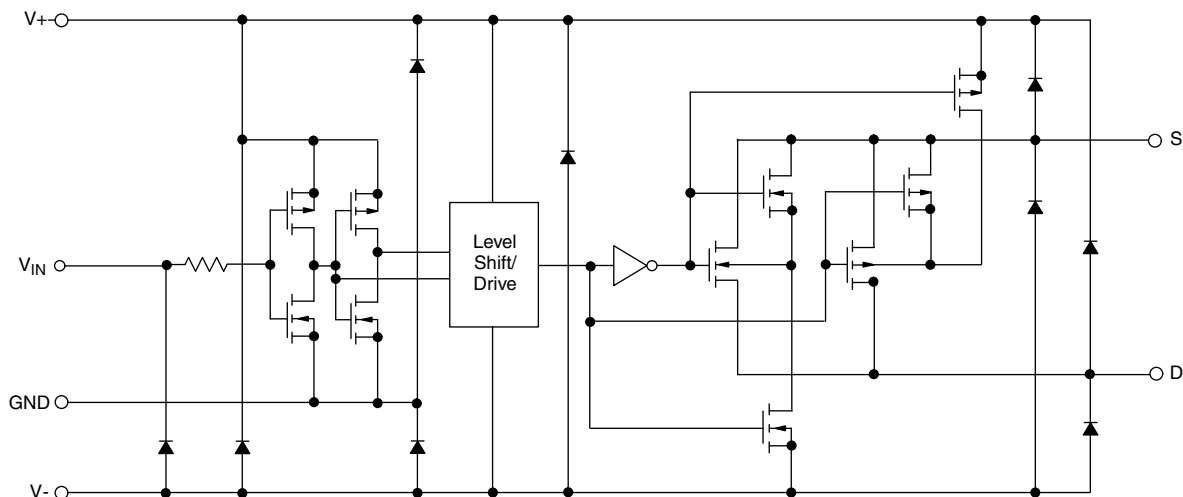
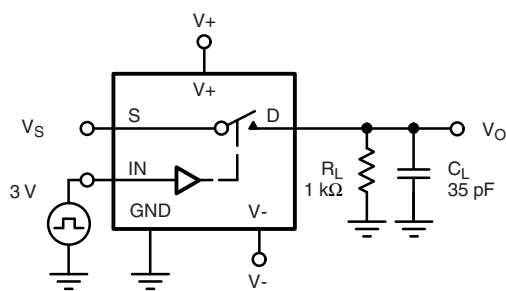
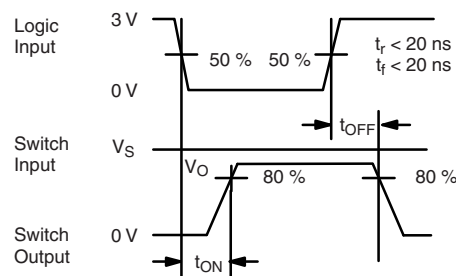
**Insertion Loss, Off Isolation and Crosstalk vs. Frequency (Single Supply)**



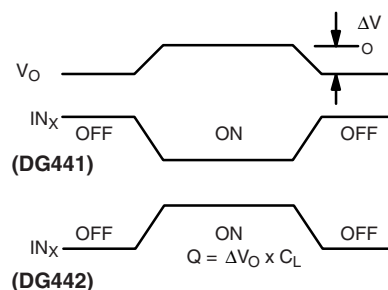
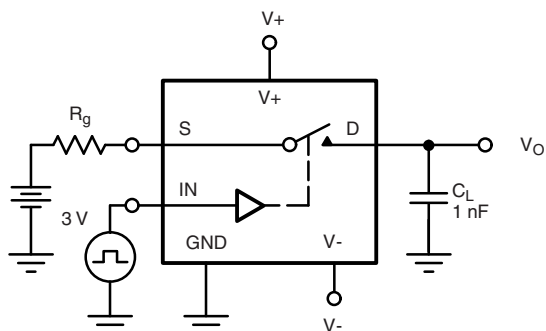
**Charge Injection vs. Analog Voltage**

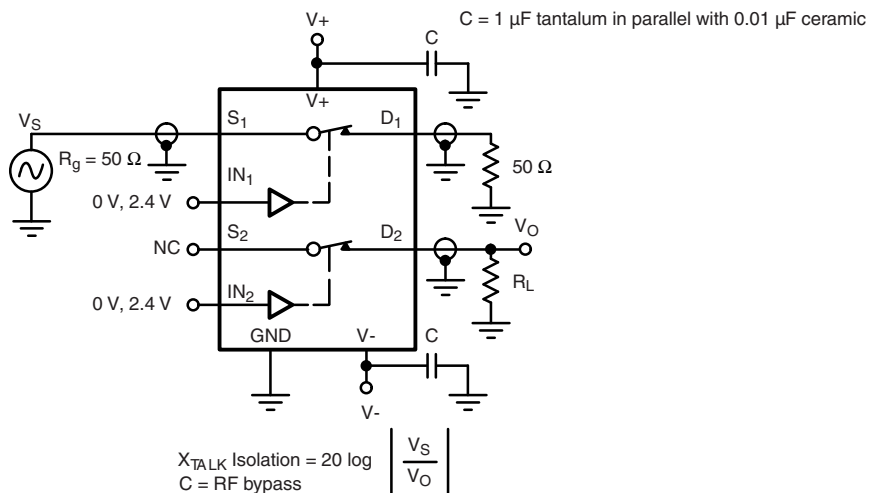
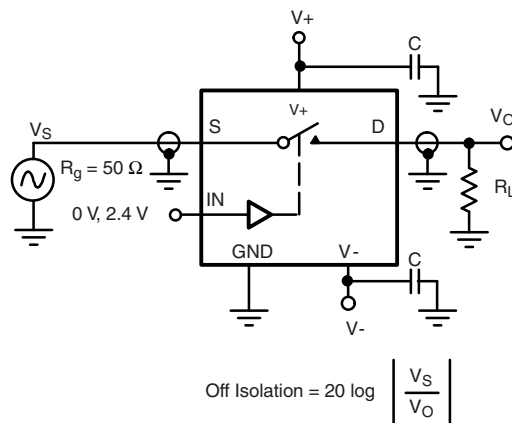
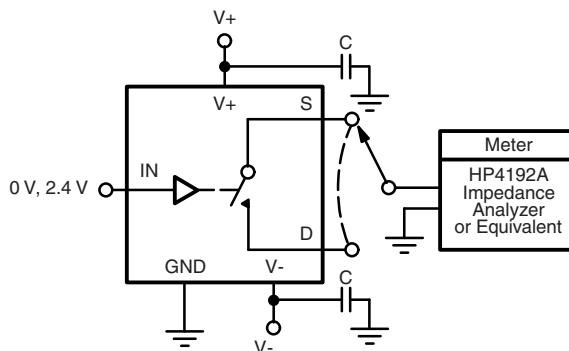


**Supply Current vs. Temperature**

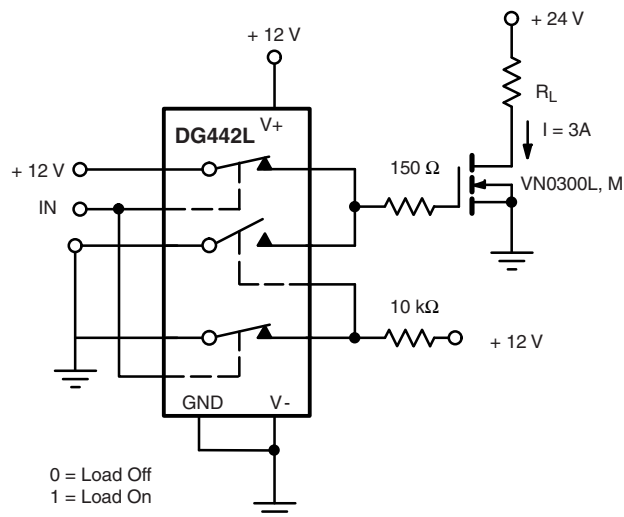
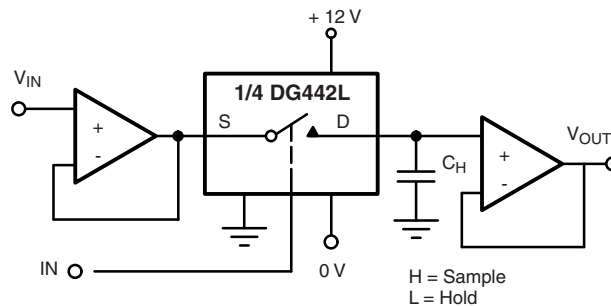
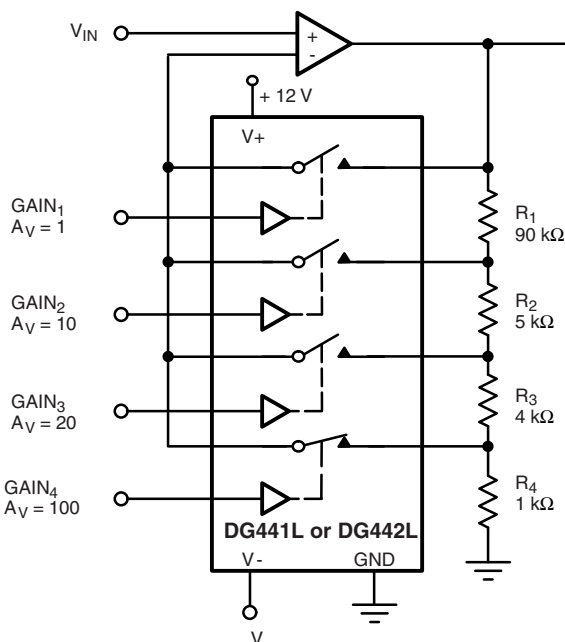
**SCHEMATIC DIAGRAM** (typical channel)

**Fig. 1**
**TEST CIRCUITS**

 $C_L$  (includes fixture and stray capacitance)


Note: Logic input waveform is inverted for DG442.

**Fig. 2 - Switching Time**

**Fig. 3 - Charge Injection**

**TEST CIRCUITS**

**Fig. 4 - Crosstalk**

**Fig. 5 - Off Isolation**

**Fig. 6 - Source / Drain Capacitances**

## APPLICATIONS


**Fig. 7 - Power MOSFET Driver**

**Fig. 8 - Open Loop Sample-and-Hold**


Gain error is determined only by the resistor tolerance. Op amp offset and CMRR will limit accuracy of circuit.

With SW<sub>4</sub> Closed

$$\frac{V_{OUT}}{V_{IN}} = \frac{R_1 + R_2 + R_3 + R_4}{R_4} = 100$$

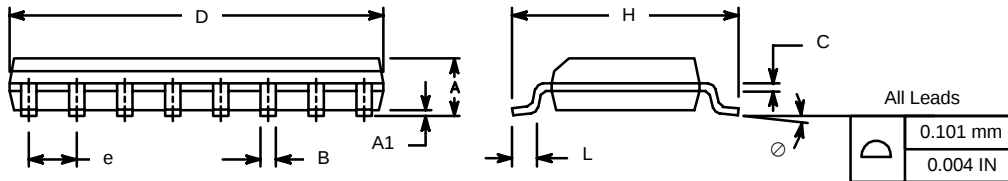
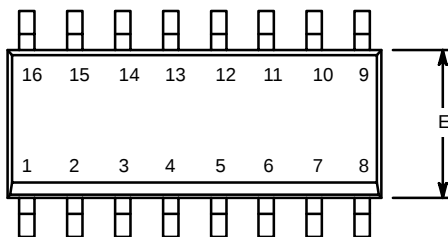
**Fig. 9 - Precision-Weighted Resistor Programmable-Gain Amplifier**

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### SOIC (NARROW): 16-LEAD

JEDEC Part Number: MS-012



| Dim            | MILLIMETERS |       | INCHES    |       |
|----------------|-------------|-------|-----------|-------|
|                | Min         | Max   | Min       | Max   |
| A              | 1.35        | 1.75  | 0.053     | 0.069 |
| A <sub>1</sub> | 0.10        | 0.20  | 0.004     | 0.008 |
| B              | 0.38        | 0.51  | 0.015     | 0.020 |
| C              | 0.18        | 0.23  | 0.007     | 0.009 |
| D              | 9.80        | 10.00 | 0.385     | 0.393 |
| E              | 3.80        | 4.00  | 0.149     | 0.157 |
| e              | 1.27 BSC    |       | 0.050 BSC |       |
| H              | 5.80        | 6.20  | 0.228     | 0.244 |
| L              | 0.50        | 0.93  | 0.020     | 0.037 |
| Ø              | 0°          | 8°    | 0°        | 8°    |

ECN: S-03946—Rev. F, 09-Jul-01  
DWG: 5300



**PDIP: 16-LEAD**



| Dim            | MILLIMETERS |       | INCHES |       |
|----------------|-------------|-------|--------|-------|
|                | Min         | Max   | Min    | Max   |
| A              | 3.81        | 5.08  | 0.150  | 0.200 |
| A <sub>1</sub> | 0.38        | 1.27  | 0.015  | 0.050 |
| B              | 0.38        | 0.51  | 0.015  | 0.020 |
| B <sub>1</sub> | 0.89        | 1.65  | 0.035  | 0.065 |
| C              | 0.20        | 0.30  | 0.008  | 0.012 |
| D              | 18.93       | 21.33 | 0.745  | 0.840 |
| E              | 7.62        | 8.26  | 0.300  | 0.325 |
| E <sub>1</sub> | 5.59        | 7.11  | 0.220  | 0.280 |
| e <sub>1</sub> | 2.29        | 2.79  | 0.090  | 0.110 |
| e <sub>A</sub> | 7.37        | 7.87  | 0.290  | 0.310 |
| L              | 2.79        | 3.81  | 0.110  | 0.150 |
| Q <sub>1</sub> | 1.27        | 2.03  | 0.050  | 0.080 |
| S              | 0.38        | 1.52  | .015   | 0.060 |

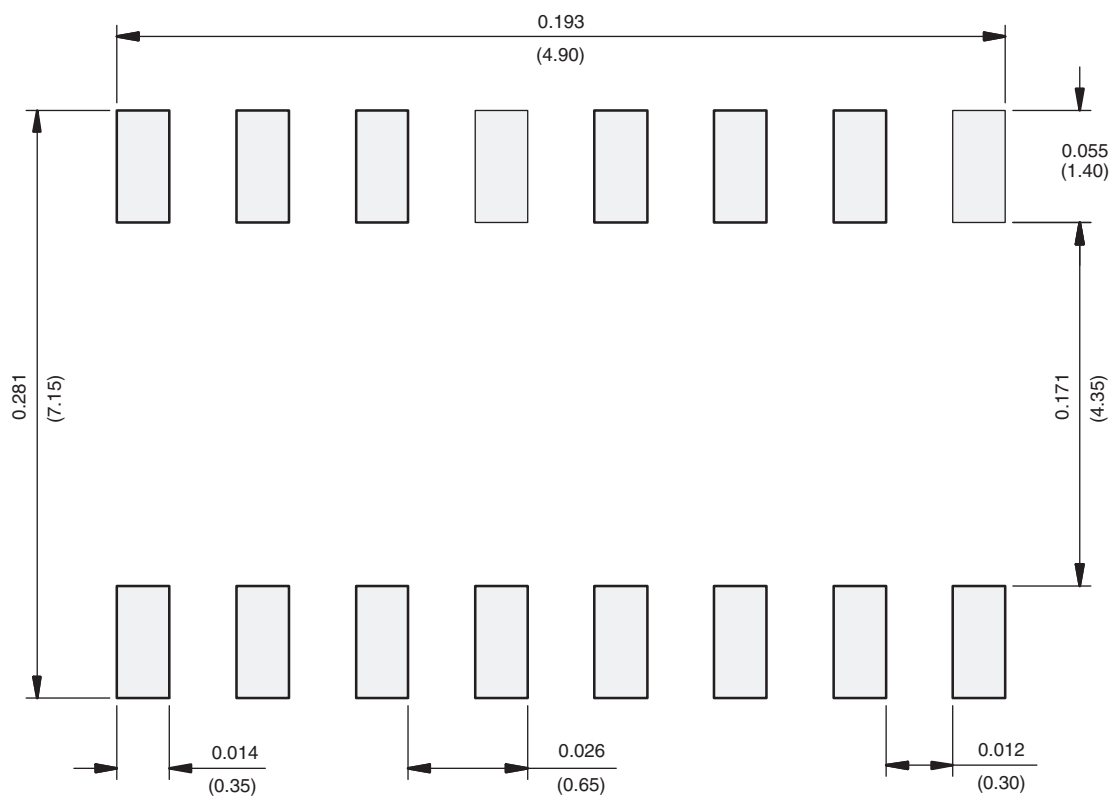
ECN: S-03946—Rev. D, 09-Jul-01  
DWG: 5482

## TSSOP: 16-LEAD



| Symbols                        | DIMENSIONS IN MILLIMETERS |       |      |
|--------------------------------|---------------------------|-------|------|
|                                | Min                       | Nom   | Max  |
| A                              | -                         | 1.10  | 1.20 |
| A1                             | 0.05                      | 0.10  | 0.15 |
| A2                             | -                         | 1.00  | 1.05 |
| B                              | 0.22                      | 0.28  | 0.38 |
| C                              | -                         | 0.127 | -    |
| D                              | 4.90                      | 5.00  | 5.10 |
| E                              | 6.10                      | 6.40  | 6.70 |
| E1                             | 4.30                      | 4.40  | 4.50 |
| e                              | -                         | 0.65  | -    |
| L                              | 0.50                      | 0.60  | 0.70 |
| L1                             | 0.90                      | 1.00  | 1.10 |
| y                              | -                         | -     | 0.10 |
| θ1                             | 0°                        | 3°    | 6°   |
| ECN: S-61920-Rev. D, 23-Oct-06 |                           |       |      |
| DWG: 5624                      |                           |       |      |

### RECOMMENDED MINIMUM PAD FOR TSSOP-16



Recommended Minimum Pads  
Dimensions in inches (mm)

## RECOMMENDED MINIMUM PADS FOR SO-16



Recommended Minimum Pads  
Dimensions in Inches/(mm)

[Return to Index](#)



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