



## 6 Ω On-Resistance, +12 V / ± 5 V / +5 V / +3 V, SPST and SPDT Switches

### DESCRIPTION

DG417LE, DG418LE, DG419LE analog switches are designed to operate from +3 V to +16 V single supply or ± 3 V to ± 8 V dual supply and are fully specified at +12 V, ± 5 V, +5 V, and +3 V.

The DG417LE, DG418LE, DG419LE are lower voltage pin-for-pin compatible companion devices to the industry standard DG417, DG418, and DG419. Each switch conducts equally well in both directions when on, blocks input voltages up to the supply level when off, and exhibits break before switching action.

Fabricated with advanced CMOS technology, the parts provide low on resistance and fast switching speed with low power dissipation.

The DG417LE, DG418LE, DG419LE operating temperature range is -40 °C to +85 °C and devices are available in 8 lead TSSOP and SOIC packages.

### FEATURES

- +3 V to +16 V single supply, or ± 3 V to ± 8 V dual supply
- On resistance: 6 Ω for DG417LE, DG418LE  
11 Ω for DG419LE
- Fast switching speeds:  $t_{ON} = 20 \text{ ns}$ ,  $t_{OFF} = 15 \text{ ns}$
- Break-before-make switching for DG419LE
- Fully specified at +12 V, ± 5 V, +5 V, and +3 V
- V+ to V- analog signal range
- CMOS / TTL compatible
- 8 pin TSSOP and 8 pin SOIC packages
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



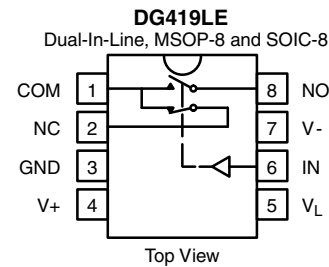
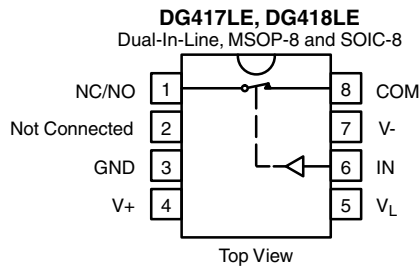
### Note

\* 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

### APPLICATIONS

- Data acquisition systems
- Medical instruments
- Precision instruments
- Communications systems
- Automated test equipment
- Sample and hold circuit
- Audio and video signal routing

### FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



| TRUTH TABLE (DG417LE, DG418LE) |         |         |
|--------------------------------|---------|---------|
| LOGIC                          | DG417LE | DG418LE |
| 0                              | ON      | OFF     |
| 1                              | OFF     | ON      |

| TRUTH TABLE (DG419LE) |     |     |
|-----------------------|-----|-----|
| LOGIC                 | NC  | NO  |
| 0                     | ON  | OFF |
| 1                     | OFF | ON  |

| ORDERING INFORMATION (DG417LE, DG418LE) |                   |                  |
|---|-------------------|------------------|
| TEMP. RANGE                             | PACKAGE           | PART NUMBER      |
| -40 °C to +85 °C                        | 8-pin narrow SOIC | DG417LEDY-T1-GE4 |
|   |                   | DG418LEDY-T1-GE4 |
|   | 8-pin MSOP        | DG417LEDQ-T1-GE3 |
|   |                   | DG418LEDQ-T1-GE3 |

| ORDERING INFORMATION (DG419LE) |                   |                  |
|--------------------------------|-------------------|------------------|
| TEMP. RANGE                    | PACKAGE           | PART NUMBER      |
| -40 °C to +85 °C               | 8-pin narrow SOIC | DG419LEDY-T1-GE4 |
|                                | 8-pin MSOP        | DG419LEDQ-T1-GE3 |



| ABSOLUTE MAXIMUM RATINGS                            |                         |   |      |
|---|-------------------------|---|------|
| PARAMETER   |                         | LIMIT   | UNIT |
| V+ to V-  |                         | -0.3 to +18   | V    |
| GND to V-   |                         | 18  |      |
| V <sub>L</sub>                                      |                         | (GND - 0.3) to (V+) + 0.3                           |      |
| I <sub>N</sub> , COM, NC, NO <sup>a</sup>           |                         | -0.3 to (V+ + 0.3) or 30 mA, whichever occurs first |      |
| Continuous current (any terminal)                   |                         | 30  | mA   |
| Peak current, S or D (pulsed 1 ms, 10 % duty cycle) |                         | 100   |      |
| Storage temperature                                 | (DQ, DY suffix)         | -65 to +150   | °C   |
| Power dissipation (packages) <sup>b</sup>           | 8-pin MSOP <sup>c</sup> | 320   | mW   |
|   | 8-pin SOIC <sup>c</sup> | 400   |      |
| ESD / HBM   | EIA / JESD22-A114-A     | 2K  | V    |
| ESD / CDM   | EIA / JESD22-C101-A     | 750   |      |
| Latch up  | JESD78                  | 300   | mA   |

Notes

- a. Signals on NC, NO, COM, or I<sub>N</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 6.5 mW/°C above 25 °C



| SPECIFICATIONS (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>L</sub> = 5 V, V <sub>IN</sub> = 2.4 V, 0.8 V <sup>f</sup> | TEMP. <sup>b</sup> | TYP. <sup>c</sup> | E SUFFIX<br>LIMITS<br>-40 °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> |      |
| <b>Analog Switch</b>                      |  |  |                    |                   |   |                   |  |                   |      |
| 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>NO</sub> , I <sub>NC</sub> = 5 mA, V <sub>COM</sub> = 2 V / 9 V,<br>DG417LE / DG418LE only                   | Room               | 6                 | -                                       | 7                 | -                                      | 7                 | Ω    |
|   |  |  | Full               | -                 | -                                       | 10                | -                                      | 9                 |      |
|   |  |  | Room               | 11                | -                                       | 14                | -                                      | 14                |      |
|   |  |  | Full               | -                 | -                                       | 20                | -                                      | 18                |      |
| Switch off leakage current                | I <sub>NO(off)</sub><br>I <sub>NC(off)</sub> | V <sub>COM</sub> = 1 V / 11 V<br>V <sub>NO</sub> , V <sub>NC</sub> = 11 V / 1 V  | Room               | ± 0.002           | -2                                      | 2                 | -2                                     | 2                 | nA   |
|   |  |  | Full               | -                 | -20                                     | 20                | -10                                    | 10                |      |
|   | Room   |  | ± 0.003            | -2                | 2                                       | -2                | 2                                      |                   |      |
|   | Full   |  | -                  | -20               | 20                                      | -10               | 10                                     |                   |      |
| Switch on leakage current                 | I <sub>COM(on)</sub>                         | V <sub>NO</sub> , V <sub>NC</sub> = V <sub>COM</sub> = 11 V / 1 V  | Room               | ± 0.006           | -2                                      | 2                 | -2                                     | 2                 |      |
|   |  |  | Full               | -                 | -20                                     | 20                | -10                                    | 10                |      |
| <b>Digital Control</b>                    |  |  |                    |                   |   |                   |  |                   |      |
| Input current                             | I <sub>INL</sub> or I <sub>INH</sub>         |  | Full               | 0.02              | -1.5                                    | 1.5               | -1                                     | 1                 | μA   |
| <b>Dynamic Characteristics</b>            |  |  |                    |                   |   |                   |  |                   |      |
| Turn-on time                              | t <sub>ON</sub>                              | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>V <sub>NO</sub> , V <sub>NC</sub> = 5 V  | Room               | 20                | -                                       | 38                | -                                      | 38                | ns   |
|   |  |  | Full               | -                 | -                                       | 42                | -                                      | 40                |      |
| Turn-off time                             | t <sub>OFF</sub>                             |  | Room               | 15                | -                                       | 32                | -                                      | 32                |      |
|   |  |  | Full               | -                 | -                                       | 38                | -                                      | 35                |      |
| Break-before-make time                    | t <sub>BBM</sub>                             | DG419LE only, V <sub>NC</sub> , V <sub>NO</sub> = 5 V<br>R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF  | Room               | 7                 | -                                       | -                 | -                                      | -                 |      |
| Charge injection <sup>e</sup>             | Q <sub>INJ</sub>                             | V <sub>GEN</sub> = 0 V, R <sub>GEN</sub> = 0 Ω, C <sub>L</sub> = 1 nF  | Room               | 26                | -                                       | -                 | -                                      | -                 | 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 crosstalk <sup>e</sup> | X <sub>TALK</sub>                            |  | Room               | -72               | -                                       | -                 | -                                      | -                 |      |
| Source off capacitance <sup>e</sup>       | C <sub>NO(off)</sub><br>C <sub>NC(off)</sub> | V <sub>IN</sub> = 0 V or V <sub>+</sub> , f = 1 MHz,<br>DG417LE / DG418LE only   | Room               | 11                | -                                       | -                 | -                                      | -                 | pF   |
| Drain-on capacitance <sup>e</sup>         | C <sub>ON</sub>                              |  | Room               | 32                | -                                       | -                 | -                                      | -                 |      |
| Source off capacitance <sup>e</sup>       | C <sub>NO(off)</sub><br>C <sub>NC(off)</sub> | V <sub>IN</sub> = 0 V or V <sub>+</sub> , f = 1 MHz,<br>DG419LE only   | Room               | 6                 | -                                       | -                 | -                                      | -                 |      |
| Drain-on capacitance <sup>e</sup>         | C <sub>ON</sub>                              |  | Room               | 20                | -                                       | -                 | -                                      | -                 |      |
| <b>Power Supplies</b>                     |  |  |                    |                   |   |                   |  |                   |      |
| Positive supply current                   | I <sub>+</sub>                               | V <sub>IN</sub> = 0 V or V <sub>L</sub>  | Room               | 0.00009           | -                                       | 1                 | -                                      | 1                 | μA   |
|   |  |  | Full               | -                 | -                                       | 5                 | -                                      | 5                 |      |
| Negative supply current                   | I <sub>-</sub>                               |  | Room               | -0.00009          | -1                                      | -                 | -1                                     | -                 |      |
|   |  |  | Full               | -                 | -5                                      | -                 | -5                                     | -                 |      |
| Logic supply current                      | I <sub>L</sub>                               |  | Room               | 0.00002           | -                                       | 1                 | -                                      | 1                 |      |
|   |  |  | Full               | -                 | -                                       | 5                 | -                                      | 5                 |      |
| Ground current                            | I <sub>GND</sub>                             |  | Room               | -0.00002          | -1                                      | -                 | -1                                     | -                 |      |
|   |  |  | Full               | -                 | -5                                      | -                 | -5                                     | -                 |      |



| SPECIFICATIONS (Dual Supply $\pm 5$ V)    |                                |  |                    |                   |                                      |                   |                                    |                   |          |
|---|--------------------------------|--|--------------------|-------------------|--------------------------------------|-------------------|------------------------------------|-------------------|----------|
| PARAMETER                                 | SYMBOL                         | TEST CONDITIONS<br>UNLESS OTHERWISE<br>SPECIFIED<br>$V_+ = 5$ V, $V_- = -5$ V<br>$V_L = 5$ V, $V_{IN} = 2.4$ V, $0.8$ V <sup>f</sup> | TEMP. <sup>b</sup> | TYP. <sup>c</sup> | E SUFFIX LIMITS<br>-40 °C to +125 °C |                   | DSUFFIX LIMITS<br>-40 °C to +85 °C |                   | UNIT     |
|   |                                |  |                    |                   | MIN. <sup>d</sup>                    | MAX. <sup>d</sup> | MIN. <sup>d</sup>                  | MAX. <sup>d</sup> |          |
|   |                                |  |                    |                   | <b>Analog Switch</b>                 |                   |                                    |                   |          |
| Analog signal range <sup>e</sup>          | $V_{ANALOG}$                   |  | Full               | -                 | -5                                   | 5                 | -5                                 | 5                 | V        |
| Drain-source on-resistance                | $R_{DS(on)}$                   | $V_+ = 5$ V, $V_- = -5$ V<br>$I_{NO}, I_{NC} = 5$ mA, $V_{COM} = \pm 3.5$ V<br>DG417LE / DG418LE only                                | Room               | 6                 | -                                    | 8                 | -                                  | 8                 | $\Omega$ |
|   |                                |  | Full               | -                 | -                                    | 12                | -                                  | 10                |          |
|   |                                | $V_+ = 5$ V, $V_- = -5$ V<br>$I_{NO}, I_{NC} = 5$ mA, $V_{COM} = \pm 3.5$ V<br>DG419LE only  | Room               | 12                | -                                    | 15                | -                                  | 15                |          |
|   |                                |  | Full               | -                 | -                                    | 24                | -                                  | 21                |          |
| Switch off leakage current <sup>a</sup>   | $I_{NO(off)}$<br>$I_{NC(off)}$ | $V_+ = 5.5$ V, $V_- = -5.5$ V<br>$V_{COM} = \pm 4.5$ V<br>$V_{NO}, V_{NC} = \pm 4.5$ V   | Room               | $\pm 0.001$       | -2                                   | 2                 | -2                                 | 2                 | nA       |
|   |                                |  | Full               | -                 | -20                                  | 20                | -10                                | 10                |          |
|   | $I_{COM(off)}$                 |  | Room               | $\pm 0.002$       | -2                                   | 2                 | -2                                 | 2                 |          |
|   |                                |  | Full               | -                 | -20                                  | 20                | -10                                | 10                |          |
| Channel on leakage current <sup>a</sup>   | $I_{COM(on)}$                  | $V_+ = 5.5$ V, $V_- = -5.5$ V<br>$V_{NO}, V_{NC} = V_{COM} = \pm 4.5$ V  | Room               | $\pm 0.003$       | -2                                   | 2                 | -2                                 | 2                 |          |
|   |                                |  | Full               | -                 | -20                                  | 20                | -10                                | 10                |          |
| <b>Digital Control</b>                    |                                |  |                    |                   |                                      |                   |                                    |                   |          |
| Input current <sup>a</sup>                | $I_{INL}$ or $I_{INH}$         |  | Full               | 0.02              | -1.5                                 | 1.5               | -1                                 | 1                 | $\mu$ A  |
| <b>Dynamic Characteristics</b>            |                                |  |                    |                   |                                      |                   |                                    |                   |          |
| Turn-on time <sup>e</sup>                 | $t_{ON}$                       | $R_L = 300 \Omega$ , $C_L = 35$ pF<br>$V_{NO}, V_{NC} = \pm 3.5$ V   | Room               | 21                | -                                    | 38                | -                                  | 38                | ns       |
|   |                                |  | Full               | -                 | -                                    | 43                | -                                  | 40                |          |
| Turn-off time <sup>e</sup>                | $t_{OFF}$                      |  | Room               | 20                | -                                    | 45                | -                                  | 45                |          |
|   |                                |  | Full               | -                 | -                                    | 55                | -                                  | 50                |          |
| Break-before-make time <sup>e</sup>       | $t_{BBM}$                      | DG419LE only, $V_{NO}, V_{NC} = 3.5$ V<br>$R_L = 300 \Omega$ , $C_L = 35$ pF   | Room               | 7                 | -                                    | -                 | -                                  | -                 |          |
| Transition time                           | $t_{TRANS}$                    | $R_L = 300 \Omega$ , $C_L = 35$ pF<br>$V_{S1} = \pm 3.5$ V, $V_{S2} = \pm 3.5$ V   | Room               | 21                | -                                    | -                 | -                                  | -                 |          |
| Charge injection <sup>e</sup>             | $Q_{INJ}$                      | $V_{GEN} = 0$ V, $R_{GEN} = 0 \Omega$ , $C_L = 1$ nF   | Room               | -17               | -                                    | -                 | -                                  | -                 | pC       |
| Off-isolation <sup>e</sup>                | OIRR                           | $R_L = 50 \Omega$ , $C_L = 5$ pF, $f = 1$ MHz  | Room               | -69               | -                                    | -                 | -                                  | -                 | dB       |
| Channel-to-channel crosstalk <sup>e</sup> | $X_{TALK}$                     |  | Room               | -73               | -                                    | -                 | -                                  | -                 |          |
| Source off capacitance <sup>e</sup>       | $C_{NO(off)}$<br>$C_{NC(off)}$ | $V_{IN} = 0$ V or $V_+$ , $f = 1$ MHz<br>DG417LE / DG418LE only  | Room               | 11                | -                                    | -                 | -                                  | -                 | pF       |
| Drain-on capacitance <sup>e</sup>         | $C_{ON}$                       |  | Room               | 33                | -                                    | -                 | -                                  | -                 |          |
| Source off capacitance <sup>e</sup>       | $C_{NO(off)}$<br>$C_{NC(off)}$ | $V_{IN} = 0$ V or $V_+$ , $f = 1$ MHz<br>DG419LE only  | Room               | 6                 | -                                    | -                 | -                                  | -                 |          |
| Drain-on capacitance <sup>e</sup>         | $C_{ON}$                       |  | Room               | 20                | -                                    | -                 | -                                  | -                 |          |
| <b>Power Supplies</b>                     |                                |  |                    |                   |                                      |                   |                                    |                   |          |
| Positive supply current <sup>e</sup>      | I+                             | $V_{IN} = 0$ V or $V_L$  | Room               | 0.00007           | -                                    | 1                 | -                                  | 1                 | $\mu$ A  |
|   |                                |  | Full               | -                 | -                                    | 5                 | -                                  | 5                 |          |
| Negative supply current <sup>e</sup>      | I-                             |  | Room               | -0.00009          | -1                                   | -                 | -1                                 | -                 |          |
|   |                                |  | Full               | -                 | -5                                   | -                 | -5                                 | -                 |          |
| Logic supply current <sup>e</sup>         | $I_L$                          |  | Room               | 0.00002           | -                                    | 1                 | -                                  | 1                 |          |
|   |                                |  | Full               | -                 | -                                    | 5                 | -                                  | 5                 |          |
| Ground current <sup>e</sup>               | $I_{GND}$                      |  | Room               | -0.00003          | -1                                   | -                 | -1                                 | -                 |          |
|   |                                |  | Full               | -                 | -5                                   | -                 | -5                                 | -                 |          |



| SPECIFICATIONS (Single Supply 5 V)        |  |   |                    |                   |                                      |                   |                                     |                   |      |
|---|--|---|--------------------|-------------------|--------------------------------------|-------------------|-------------------------------------|-------------------|------|
| PARAMETER                                 | SYMBOL                                       | TEST CONDITIONS<br>UNLESS OTHERWISE<br>SPECIFIED<br>V+ = 5 V, V- = 0 V<br>V <sub>L</sub> = 5 V, V <sub>IN</sub> = 2.4 V, 0.8 V <sup>f</sup> | TEMP. <sup>b</sup> | TYP. <sup>c</sup> | E SUFFIX LIMITS<br>-40 °C to +125 °C |                   | D SUFFIX LIMITS<br>-40 °C to +85 °C |                   | UNIT |
|   |  |   |                    |                   | MIN. <sup>d</sup>                    | MAX. <sup>d</sup> | MIN. <sup>d</sup>                   | MAX. <sup>d</sup> |      |
| <b>Analog Switch</b>                      |  |   |                    |                   |                                      |                   |                                     |                   |      |
| Analog signal range <sup>e</sup>          | V <sub>ANALOG</sub>                          |   | Full               | -                 | 0                                    | 5                 | 0                                   | 5                 | V    |
| Drain-source on-resistance <sup>e</sup>   | R <sub>DSON</sub>                            | V+ = 4.5 V, I <sub>NO</sub> , I <sub>NC</sub> = 5 mA<br>V <sub>COM</sub> = 1 V, 3.5 V<br>DG417LE / DG418LE only                             | Room               | 12                | -                                    | 16                | -                                   | 16                | Ω    |
|   |  |   | Full               | -                 | -                                    | 20                | -                                   | 18                |      |
|   |  | V+ = 4.5 V, I <sub>NO</sub> , I <sub>NC</sub> = 5 mA<br>V <sub>COM</sub> = 1 V, 3.5 V<br>DG419LE only                                       | Room               | 24                | -                                    | 35                | -                                   | 35                |      |
|   |  |   | Full               | -                 | -                                    | 40                | -                                   | 37                |      |
| Switch off leakage current <sup>a</sup>   | I <sub>NO(off)</sub><br>I <sub>NC(off)</sub> | V+ = 5.5 V, V- = 0 V<br>V <sub>COM</sub> = 1 V / 4.5 V<br>V <sub>NO</sub> , V <sub>NC</sub> = 4.5 V / 1 V                                   | Room               | ± 0.002           | -1                                   | 1                 | -1                                  | 1                 | nA   |
|   |  |   | Full               | -                 | -15                                  | 15                | -10                                 | 10                |      |
|   | I <sub>COM(off)</sub>                        |   | Room               | ± 0.001           | -1                                   | 1                 | -1                                  | 1                 |      |
|   |  |   | Full               | -                 | -15                                  | 15                | -10                                 | 10                |      |
| Switch on leakage current <sup>a</sup>    | I <sub>COM(on)</sub>                         | V+ = 5.5 V, V- = 0 V<br>V <sub>NO</sub> , V <sub>NC</sub> = V <sub>COM</sub> = 1 V / 4.5 V  | Room               | ± 0.003           | -1                                   | 1                 | -1                                  | 1                 |      |
|   |  |   | Full               | -                 | -15                                  | 15                | -10                                 | 10                |      |
| <b>Digital Control</b>                    |  |   |                    |                   |                                      |                   |                                     |                   |      |
| Input current <sup>a</sup>                | I <sub>INL</sub> or I <sub>INH</sub>         |   | Full               | 0.02              | -1.5                                 | 1.5               | -1                                  | 1                 | μA   |
| <b>Dynamic Characteristics</b>            |  |   |                    |                   |                                      |                   |                                     |                   |      |
| 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>NO</sub> , V <sub>NC</sub> = 3.5 V   | Room               | 29                | -                                    | 46                | -                                   | 46                | ns   |
|   |  |   | Full               | -                 | -                                    | 51                | -                                   | 49                |      |
| Turn-off time <sup>e</sup>                | t <sub>OFF</sub>                             |   | Room               | 16                | -                                    | 28                | -                                   | 28                |      |
|   |  |   | Full               | -                 | -                                    | 35                | -                                   | 32                |      |
| Break-before-make time <sup>e</sup>       | t <sub>BMM</sub>                             | DG419LE only, V <sub>NO</sub> , V <sub>NC</sub> = 3.5 V<br>R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF                                   | Room               | 16                | -                                    | -                 | -                                   | -                 |      |
| Charge injection <sup>e</sup>             | Q <sub>INJ</sub>                             | V <sub>GEN</sub> = 0 V, R <sub>GEN</sub> = 0 Ω, C <sub>L</sub> = 1 nF   | Room               | 10                | -                                    | -                 | -                                   | -                 | pC   |
| Off-isolation <sup>e</sup>                | OIRR   |   | Room               | -68               | -                                    | -                 | -                                   | -                 | dB   |
| Channel-to-channel crosstalk <sup>e</sup> | X <sub>TALK</sub>                            | R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, f = 1 MHz   | Room               | -72               | -                                    | -                 | -                                   | -                 |      |
| Source off capacitance <sup>e</sup>       | C <sub>NO(off)</sub><br>C <sub>NC(off)</sub> | V <sub>IN</sub> = 0 V or V+, f = 1 MHz<br>DG417LE / DG418LE only  | Room               | 13                | -                                    | -                 | -                                   | -                 | pF   |
| Drain-on capacitance <sup>e</sup>         | C <sub>ON</sub>                              |   | Room               | 34                | -                                    | -                 | -                                   | -                 |      |
| Source off capacitance <sup>e</sup>       | C <sub>NO(off)</sub><br>C <sub>NC(off)</sub> | V <sub>IN</sub> = 0 V or V+, f = 1 MHz<br>DG419LE only  | Room               | 7                 | -                                    | -                 | -                                   | -                 |      |
| Drain-on capacitance <sup>e</sup>         | C <sub>ON</sub>                              |   | Room               | 22                | -                                    | -                 | -                                   | -                 |      |
| <b>Power Supplies</b>                     |  |   |                    |                   |                                      |                   |                                     |                   |      |
| Positive supply current <sup>e</sup>      | I+   | V <sub>IN</sub> = 0 V or V <sub>L</sub>   | Room               | 0.00006           | -                                    | 1                 | -                                   | 1                 | μA   |
|   |  |   | Full               | -                 | -                                    | 5                 | -                                   | 5                 |      |
| Negative supply current <sup>e</sup>      | I-   |   | Room               | -0.00006          | -1                                   | -                 | -1                                  | -                 |      |
|   |  |   | Full               | -                 | -5                                   | -                 | -5                                  | -                 |      |
| Logic supply current <sup>e</sup>         | I <sub>L</sub>                               |   | Room               | 0.00002           | -                                    | 1                 | -                                   | 1                 |      |
|   |  |   | Full               | -                 | -                                    | 5                 | -                                   | 5                 |      |
| Ground current <sup>e</sup>               | I <sub>GND</sub>                             |   | Room               | -0.00002          | -1                                   | -                 | -1                                  | -                 |      |
|   |  |   | Full               | -                 | -5                                   | -                 | -5                                  | -                 |      |

| SPECIFICATIONS (Single Supply 3 V) |        |   |                    |                   |                                      |                   |                                     |                   |      |
|------------------------------------|--------|---|--------------------|-------------------|--------------------------------------|-------------------|-------------------------------------|-------------------|------|
| PARAMETER                          | SYMBOL | TEST CONDITIONS<br>UNLESS OTHERWISE<br>SPECIFIED<br>V+ = 3 V, V- = 0 V<br>V <sub>L</sub> = 3 V, V <sub>IN</sub> = 2 V, 0.4 V <sup>f</sup> | TEMP. <sup>b</sup> | TYP. <sup>c</sup> | E SUFFIX LIMITS<br>-40 °C to +125 °C |                   | D SUFFIX LIMITS<br>-40 °C to +85 °C |                   | UNIT |
|                                    |        |   |                    |                   | MIN. <sup>d</sup>                    | MAX. <sup>d</sup> | MIN. <sup>d</sup>                   | MAX. <sup>d</sup> |      |
| <b>Analog Switch</b>               |        |   |                    |                   |                                      |                   |                                     |                   |      |



| SPECIFICATIONS (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>L</sub> = 3 V, V <sub>IN</sub> = 2 V, 0.4 V <sup>f</sup> | TEMP. <sup>b</sup> | TYP. <sup>c</sup> | E SUFFIX LIMITS<br>-40 °C to +125 °C |                   | D SUFFIX 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 signal range <sup>e</sup>          | V <sub>ANALOG</sub>                          |   | Full               | -                 | 0                                    | 3                 | 0                                   | 3                 | V    |
| Drain-source on-resistance                | R <sub>DS(on)</sub>                          | V <sub>+</sub> = 2.7 V, V <sub>-</sub> = 0 V<br>I <sub>NO</sub> , I <sub>NC</sub> = 5 mA, V <sub>COM</sub> = 0.5 V, 2.2 V<br>DG417LE / DG418LE only               | Room               | 22                | -                                    | 34                | -                                   | 34                | Ω    |
|   |  |   | Full               | -                 | -                                    | 40                | -                                   | 38                |      |
|   |  | V <sub>+</sub> = 2.7 V, V <sub>-</sub> = 0 V<br>I <sub>NO</sub> , I <sub>NC</sub> = 5 mA, V <sub>COM</sub> = 0.5 V, 2.2 V<br>DG419LE only                         | Room               | 43                | -                                    | 68                | -                                   | 68                |      |
|   |  |   | Full               | -                 | -                                    | 80                | -                                   | 75                |      |
| Switch off leakage current <sup>a</sup>   | I <sub>NO(off)</sub><br>I <sub>NC(off)</sub> | V <sub>+</sub> = 3.3 V, V <sub>-</sub> = 0 V<br>V <sub>COM</sub> = 1 V, 2 V,<br>V <sub>NO</sub> , V <sub>NC</sub> = 2 V, 1 V                                      | Room               | ± 0.002           | -1                                   | 1                 | -1                                  | 1                 | nA   |
|   |  |   | Full               | -                 | -15                                  | 15                | -10                                 | 10                |      |
|   | I <sub>COM(off)</sub>                        |   | Room               | ± 0.001           | -1                                   | 1                 | -1                                  | 1                 |      |
|   |  |   | Full               | -                 | -15                                  | 15                | -10                                 | 10                |      |
| Channel on leakage current <sup>a</sup>   | I <sub>COM(on)</sub>                         | V <sub>+</sub> = 3.3 V, V <sub>-</sub> = 0 V<br>V <sub>NO</sub> , V <sub>NC</sub> = V <sub>COM</sub> = 1 V, 2 V   | Room               | ± 0.002           | -1                                   | 1                 | -1                                  | 1                 |      |
|   |  |   | Full               | -                 | -15                                  | 15                | -10                                 | 10                |      |
| <b>Digital Control</b>                    |  |   |                    |                   |                                      |                   |                                     |                   |      |
| Input current <sup>a</sup>                | I <sub>INL</sub> or I <sub>INH</sub>         |   | Full               | 0.02              | -1.5                                 | 1.5               | -1                                  | 1                 | μA   |
| <b>Dynamic Characteristics</b>            |  |   |                    |                   |                                      |                   |                                     |                   |      |
| Turn-on time                              | t <sub>ON</sub>                              | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>V <sub>NO</sub> , V <sub>NC</sub> = 1.5 V   | Room               | 59                | -                                    | 77                | -                                   | 77                | ns   |
|   |  |   | Full               | -                 | -                                    | 83                | -                                   | 81                |      |
| Turn-off time                             | t <sub>OFF</sub>                             |   | Room               | 33                | -                                    | 54                | -                                   | 54                |      |
|   |  |   | Full               | -                 | -                                    | 75                | -                                   | 69                |      |
| Break-before-make time <sup>e</sup>       | t <sub>BBM</sub>                             | DG419LE only, V <sub>NO</sub> , V <sub>NC</sub> = 1.5 V<br>R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF   | Room               | 31                | -                                    | -                 | -                                   | -                 |      |
| Charge injection <sup>e</sup>             | Q <sub>INJ</sub>                             | V <sub>GEN</sub> = 0 V, R <sub>GEN</sub> = 0 Ω, C <sub>L</sub> = 10 nF  | Room               | 6                 | -                                    | -                 | -                                   | -                 | 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 crosstalk <sup>e</sup> | X <sub>TALK</sub>                            |   | Room               | -71               | -                                    | -                 | -                                   | -                 |      |
| Source off capacitance <sup>e</sup>       | C <sub>NO(off)</sub><br>C <sub>NC(off)</sub> | V <sub>IN</sub> = 0 V or V <sub>+</sub> , f = 1 MHz<br>DG417LE / DG418LE only   | Room               | 14                | -                                    | -                 | -                                   | -                 | pF   |
| Channel on capacitance <sup>e</sup>       | C <sub>D(on)</sub>                           |   | Room               | 35                | -                                    | -                 | -                                   | -                 |      |
| Source off capacitance <sup>e</sup>       | C <sub>NO(off)</sub><br>C <sub>NC(off)</sub> | V <sub>IN</sub> = 0 V or V <sub>+</sub> , f = 1 MHz<br>DG419LE only   | Room               | 8                 | -                                    | -                 | -                                   | -                 |      |
| Channel on capacitance <sup>e</sup>       | C <sub>D(on)</sub>                           |   | Room               | 23                | -                                    | -                 | -                                   | -                 |      |
| <b>Power Supplies</b>                     |  |   |                    |                   |                                      |                   |                                     |                   |      |
| Positive supply current <sup>e</sup>      | I <sub>+</sub>                               | V <sub>IN</sub> = 0 V or V <sub>L</sub>   | Room               | 0.00005           | -                                    | 1                 | -                                   | 1                 | μA   |
|   |  |   | Full               | -                 | -                                    | 5                 | -                                   | 5                 |      |
| Negative supply current <sup>e</sup>      | I <sub>-</sub>                               |   | Room               | -0.00007          | -1                                   | -                 | -1                                  | -                 |      |
|   |  |   | Full               | -                 | -5                                   | -                 | -5                                  | -                 |      |
| Logic supply current <sup>e</sup>         | I <sub>L</sub>                               |   | Room               | 0.00002           | -                                    | 1                 | -                                   | 1                 |      |
|   |  |   | Full               | -                 | -                                    | 5                 | -                                   | 5                 |      |
| Ground current <sup>e</sup>               | I <sub>GND</sub>                             |   | Room               | -0.00002          | -1                                   | -                 | -1                                  | -                 |      |
|   |  |   | Full               | -                 | -5                                   | -                 | -5                                  | -                 |      |

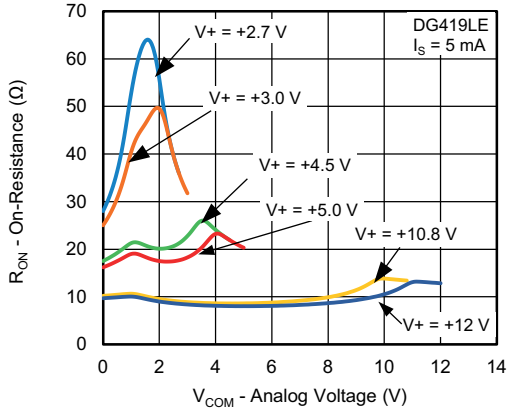
**Notes**

- a. Leakage parameters are guaranteed by worst case test condition and not subject to production test
- 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 datasheet
- e. Guaranteed by design, not subject to production test
- f. V<sub>IN</sub> = input voltage to perform proper function

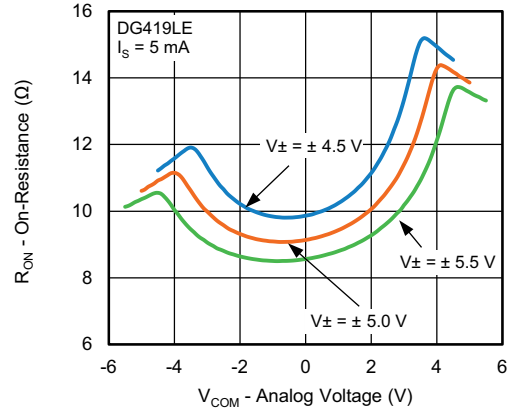
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



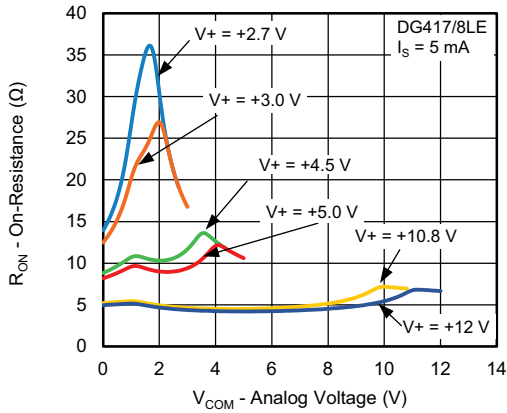
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



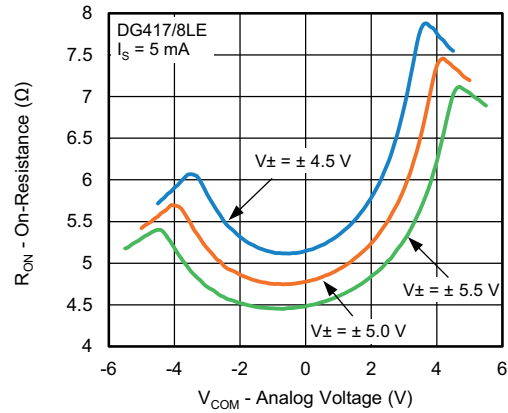
R<sub>DS(on)</sub> vs. V<sub>COM</sub> and Supply Voltage



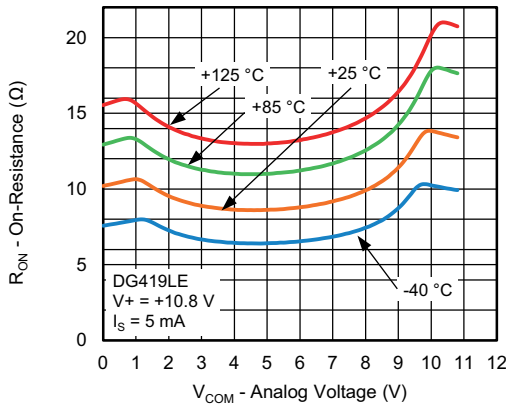
R<sub>DS(on)</sub> vs. V<sub>COM</sub> and Supply Voltage



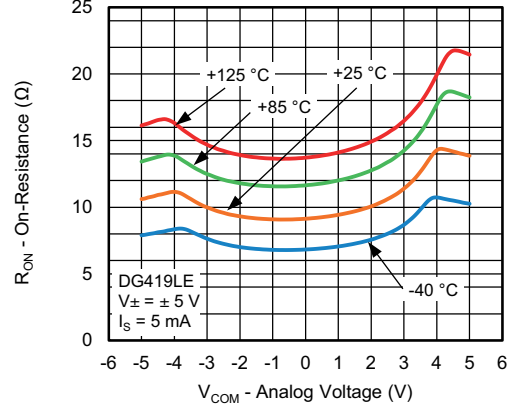
R<sub>DS(on)</sub> vs. V<sub>COM</sub> and Supply Voltage



R<sub>DS(on)</sub> vs. V<sub>COM</sub> and Supply Voltage



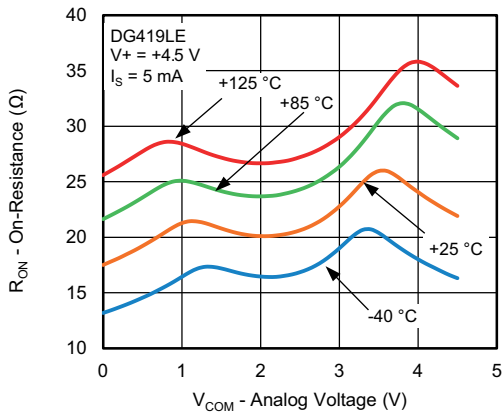
R<sub>DS(on)</sub> vs. Analog Voltage and Temperature



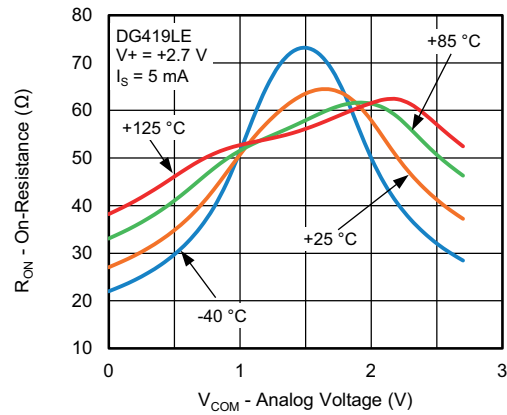
R<sub>DS(on)</sub> vs. Analog Voltage and Temperature



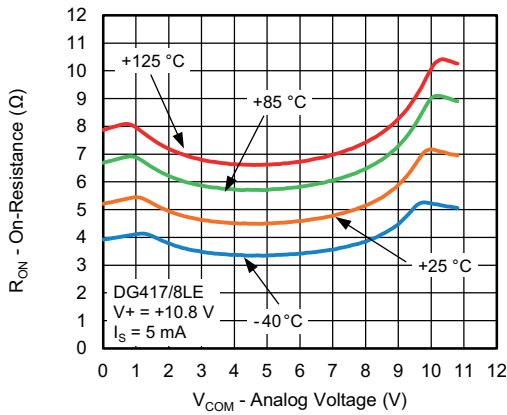
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



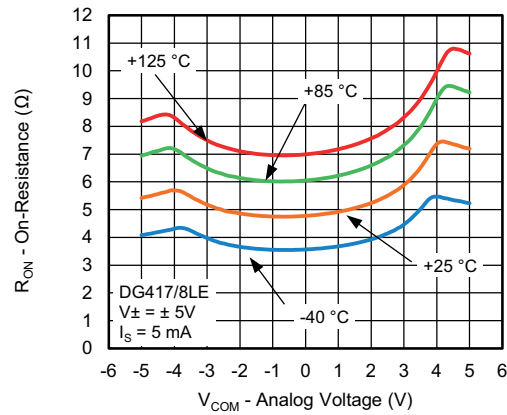
**R<sub>DS(on)</sub> vs. Analog Voltage and Temperature**



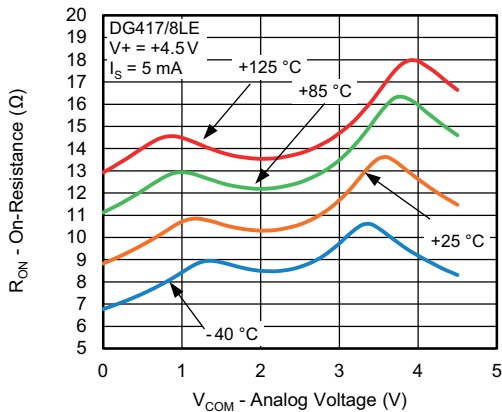
**R<sub>DS(on)</sub> vs. Analog Voltage and Temperature**



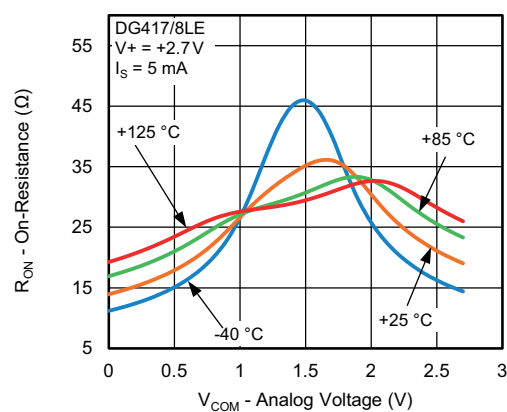
**R<sub>DS(on)</sub> vs. Analog Voltage and Temperature**



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



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

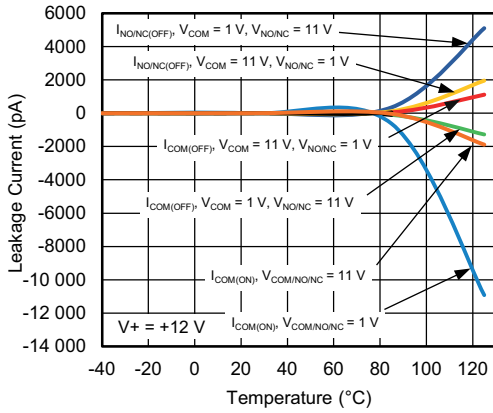


**R<sub>DS(on)</sub> vs. Analog Voltage and Temperature**

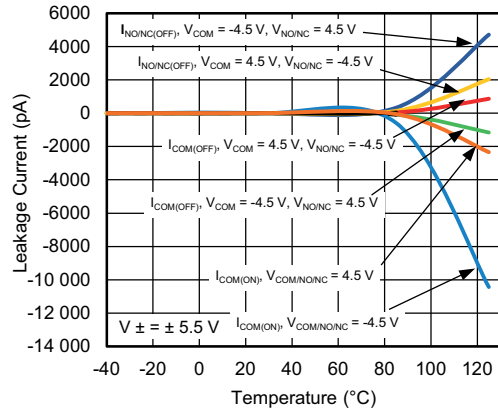




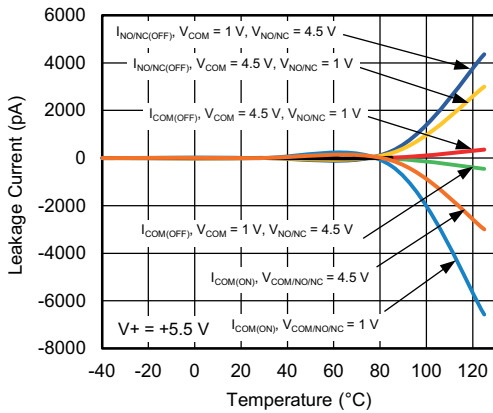
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



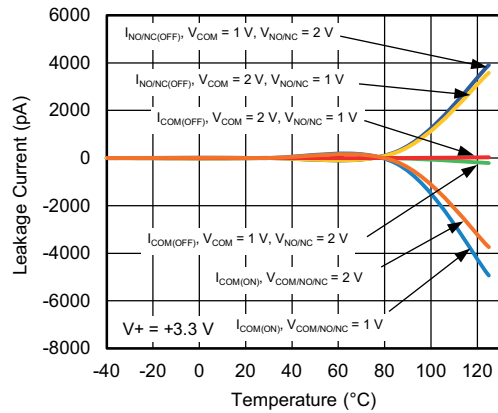
Leakage Current vs. Temperature



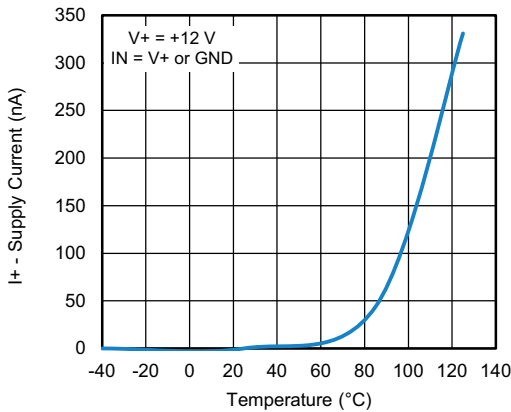
Leakage Current vs. Temperature



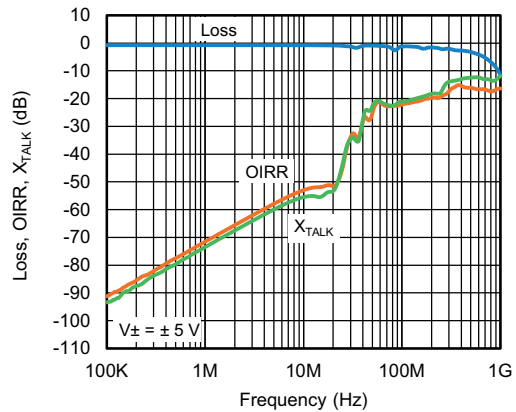
Leakage Current vs. Temperature



Leakage Current vs. Temperature



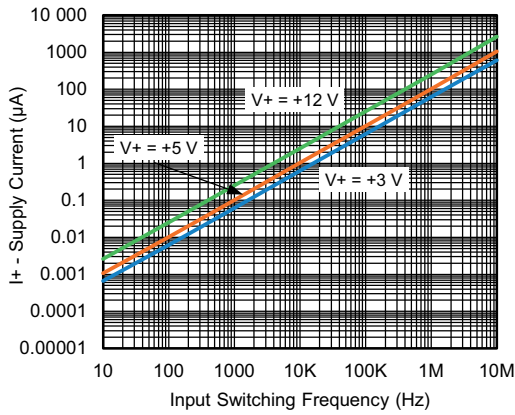
Supply Current vs. Temperature



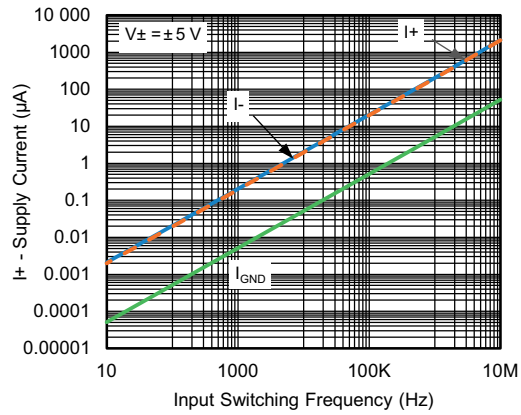
Insertion Loss, Off-Isolation Crosstalk vs. Frequency



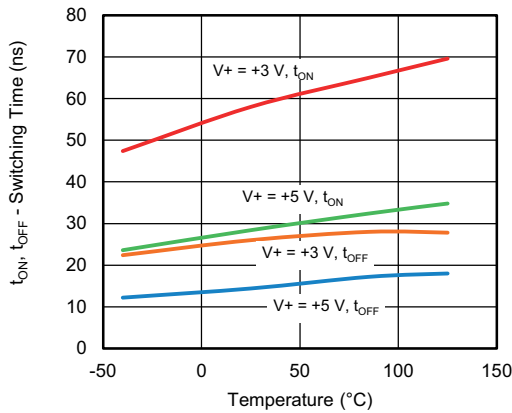
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



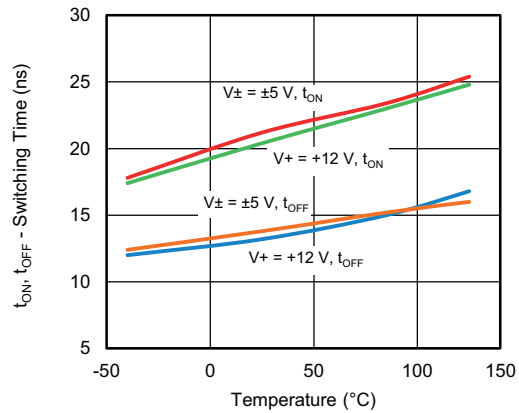
**Supply Current vs. Input Switching Frequency**



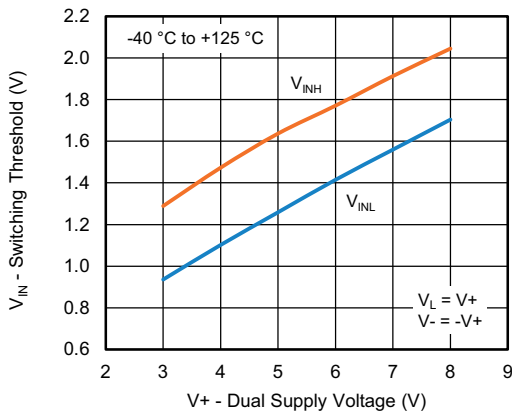
**Supply Current vs. Input Switching Frequency**



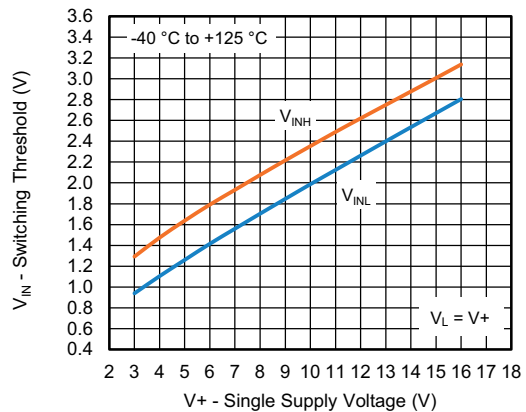
**Switching Time vs. Temperature**



**Switching Time vs. Temperature**



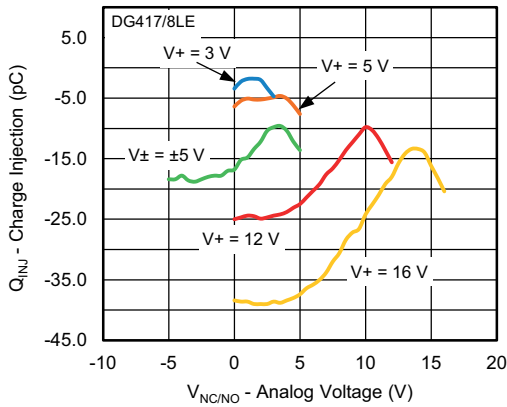
**Switching Threshold vs. Dual Supply Voltage**



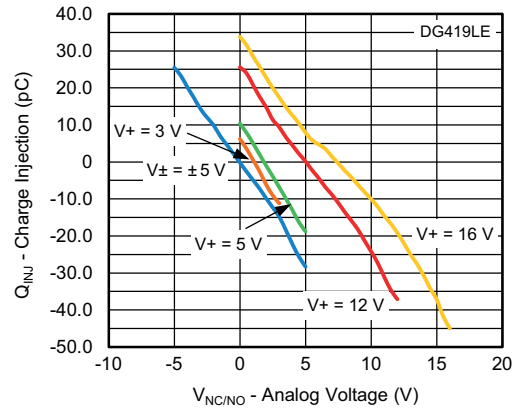
**Switching Threshold vs. Single Supply Voltage**



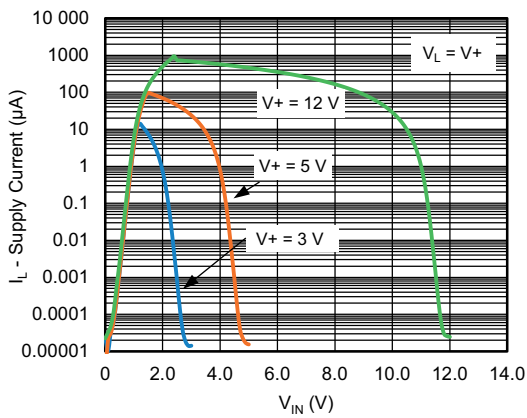
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Charge Injection vs. Analog Voltage



Charge Injection vs. Analog Voltage



Supply Current vs. Enable Input Voltage

**SCHEMATIC DIAGRAM** (Typical Channel)

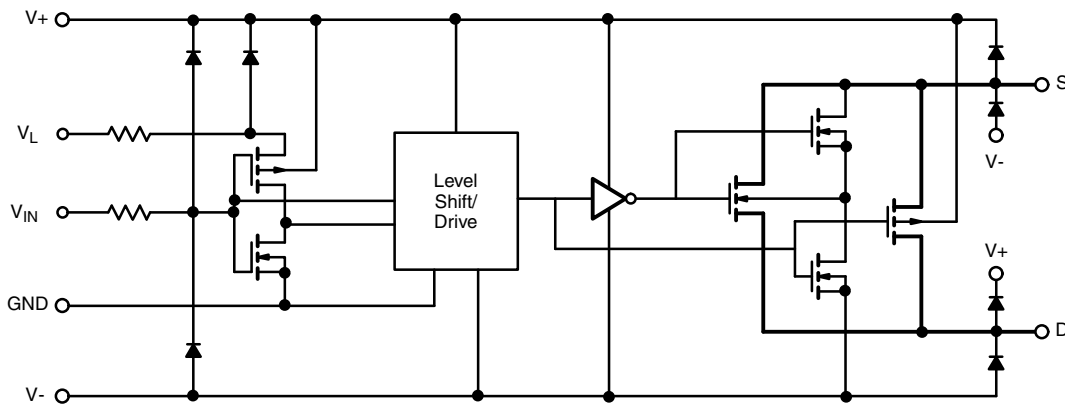
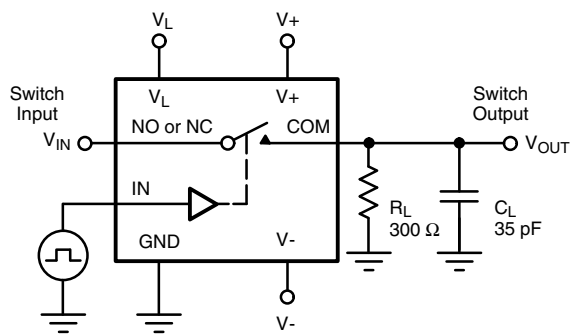


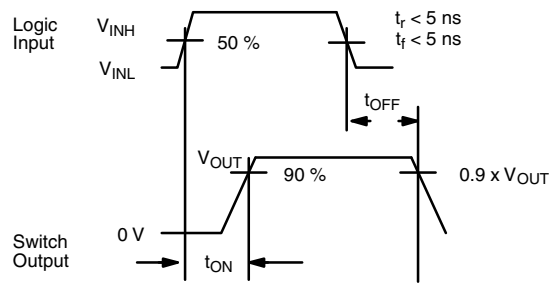
Fig. 1 - Schematic Diagram

**TEST CIRCUITS**



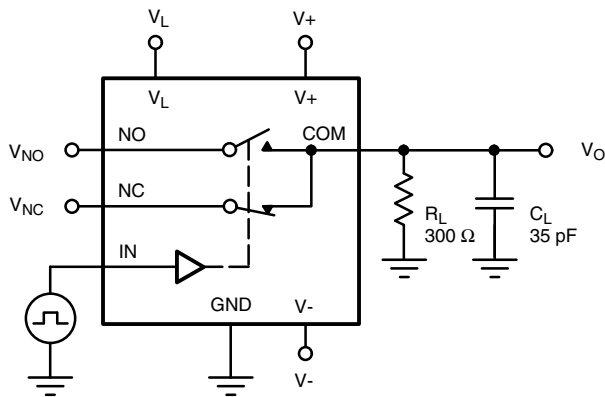
$C_L$  (includes fixture and stray capacitance)

$$V_{OUT} = V_{IN} \frac{R_L}{R_L + R_{ON}}$$



Note: Logic input waveform is inverted for switches that have the opposite logic sense control

Fig. 2 - Switching Time



$C_L$  (includes fixture and stray capacitance)

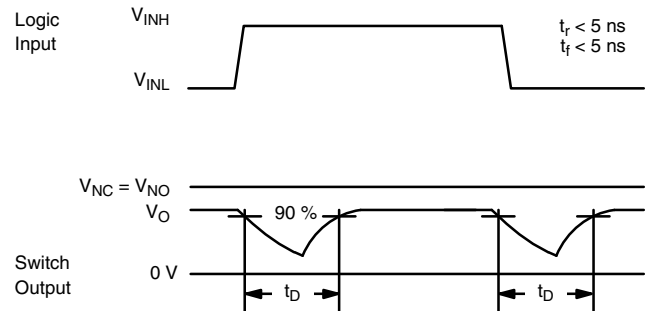
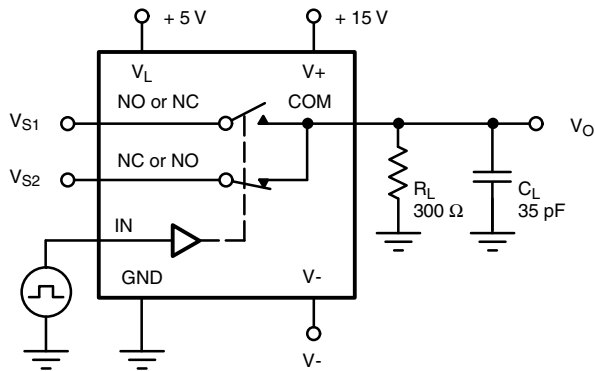


Fig. 3 - Break-Before-Make (DG419LE)

## TEST CIRCUITS



$C_L$  (includes fixture and stray capacitance)

$$V_O = V_S \frac{R_L}{R_L + R_{ON}}$$

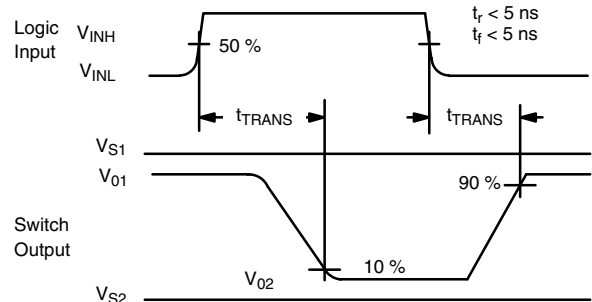
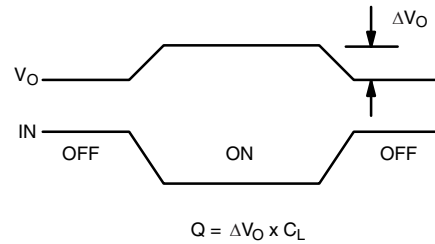
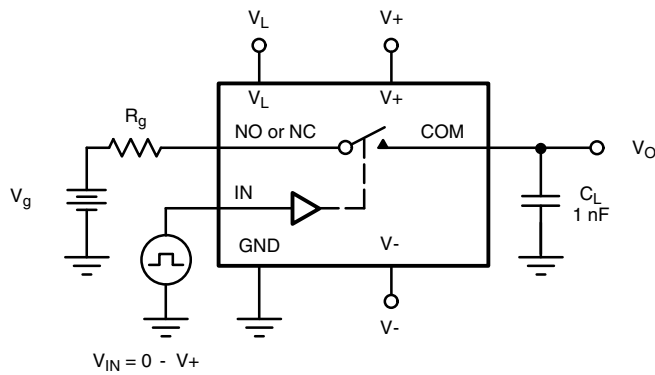
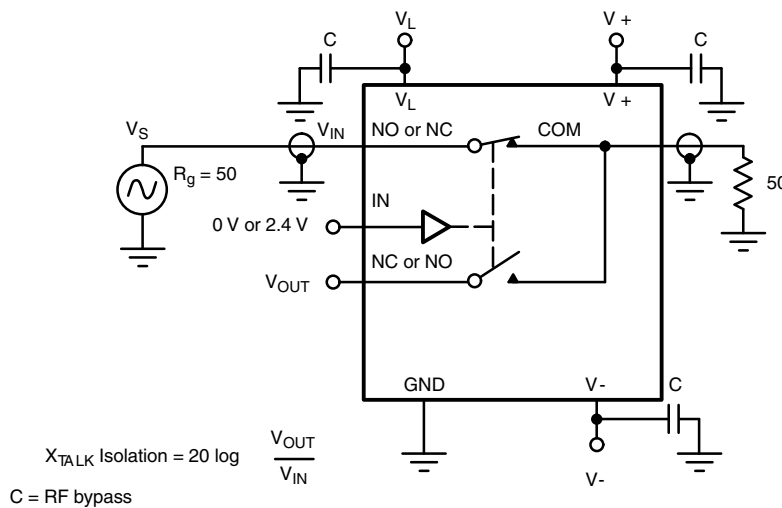


Fig. 4 - Transition Time (DG419LE)



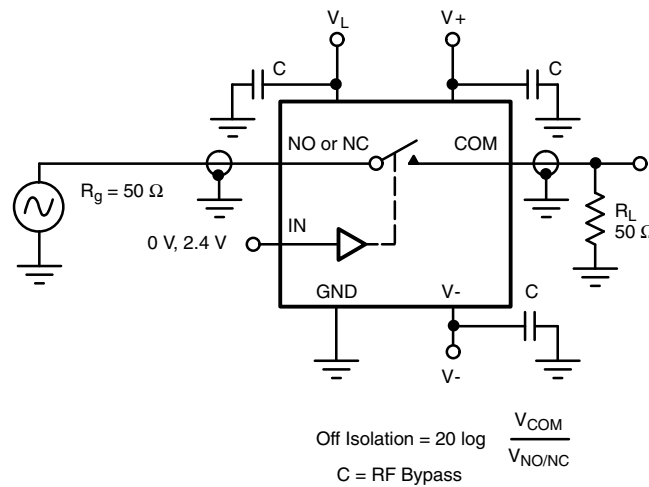
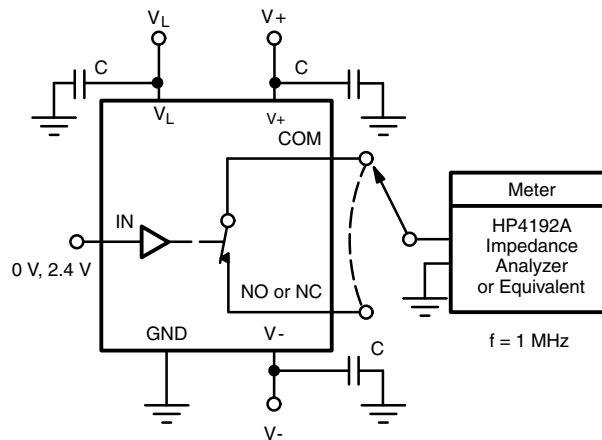
IN dependent on switch configuration input polarity determined by sense of switch.

Fig. 5 - Charge Injection



$X_{TALK} \text{ Isolation} = 20 \log \frac{V_{OUT}}{V_{IN}}$   
C = RF bypass

Fig. 6 - Crosstalk (DG419LE)

**TEST CIRCUITS**

**Fig. 7 - Off Isolation**

**Fig. 8 - Source / Drain Capacitances**

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