

## Low Voltage, 1.2 $\Omega$ , Dual SPDT Analog Switch

### DESCRIPTION

The DG2725 is a CMOS Dual SPDT (Dual Single Pole Double Throw) analog switch. It features low on-resistance of 0.7  $\Omega$  at 3 V power supply, fast switching speed, and low power consumption.

The DG2725 conducts signals equally at both directions and protects COM1 and COM2 pins at Power Off condition. The COM1 and COM2 leakage is guaranteed to be less than 1  $\mu$ A when V+ is at 0 V. The DG2725 operates in a wide voltage range of 1.65 V to 5 V, and can be controlled by low voltage logic signals.

The DG2725 also features supply current even with control signal is at low voltage below the V+ voltage. The well matched dual SPDT is designed for break before make switching operation.

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with lead (Pb)-free device terminations. DG2725 are offered in a miniQFN package. The miniQFN package has a nickel-palladium-gold device termination and is represented by the lead (Pb)-free “-E4” suffix. The nickel-palladium-gold device terminations meet all JEDEC standards for reflow and MSL ratings.

### FEATURES

- Low Voltage Operation (1.65 V to 5 V)
- Low On-Resistance - 1.2  $\Omega$  at V+ = 3 V
- Power Off Protection on COM1 and COM2 pins
- Latch up current great than 300 mA per JESD78
- **Halogen-free according to IEC 61249-2-21 definition**
- **Compliant to RoHS Directive 2002/95/EC**

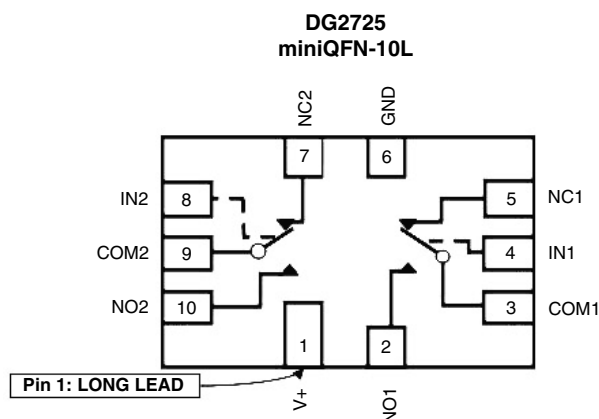


**RoHS**  
COMPLIANT  
**HALOGEN**  
**FREE**

### APPLICATIONS

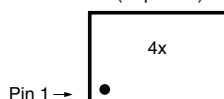
- PMPs and PDAs
- Modems and peripherals
- Computers and ebooks
- Tablet devices
- Displays and gaming
- STB

### FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



Device Marking: 4x for DG2725  
x = Date/Lot Traceability Code

(Top View)



Pin 1 →

Note: Pin 1 has long lead

| TRUTH TABLE |        |        |
|-------------|--------|--------|
| Logic       | NC1, 2 | NO1, 2 |
| 0           | ON     | OFF    |
| 1           | OFF    | ON     |

| ORDERING INFORMATION |           |                 |
|----------------------|-----------|-----------------|
| Temp. Range          | Package   | Part Number     |
| - 40 °C to 85°C      | miniQFN10 | DG2725DN-T1-GE4 |

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

| Parameter                                      | Symbol                       | Limit               | Unit |
|------------------------------------------------|------------------------------|---------------------|------|
| Reference to GND                               | V+                           | - 0.3 to 5.5        | V    |
|                                                | IN, COM, NC, NO <sup>a</sup> | - 0.3 to (V+ + 0.3) |      |
| Current (Any terminal except NO, NC or COM)    |                              | 30                  | mA   |
| Continuous Current (NO, NC, or COM)            |                              | ± 350               |      |
| Peak Current (Pulsed at 1 ms, 10 % duty cycle) |                              | ± 500               |      |
| Storage Temperature (D Suffix)                 |                              | - 65 to 150         | °C   |
| Power Dissipation (Packages) <sup>b</sup>      | miniQFN10 <sup>c</sup>       | 208                 | mW   |

Notes:

a. Signals on NC, NO, or COM or IN exceeding 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 4.0 mW/°C above 70 °C.

**SPECIFICATIONS** ( $V_+ = 3\text{ V}$ )

| Parameter                                        | Symbol                               | Test Conditions<br>Unless Otherwise Specified<br>V+ = 3 V, ± 10 %,V <sub>IN</sub> = 0.4 V or 1.65 V <sup>e</sup> | Temp. <sup>a</sup> | Limits<br>- 40 °C to 85 °C |                   |                   | Unit |
|--------------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------|-------------------|-------------------|------|
|                                                  |                                      |                                                                                                                  |                    | Min. <sup>b</sup>          | Typ. <sup>c</sup> | Max. <sup>b</sup> |      |
| Analog Switch                                    |                                      |                                                                                                                  |                    |                            |                   |                   |      |
| Analog Signal Range <sup>d</sup>                 | V <sub>ANALOG</sub>                  | R <sub>DS(on)</sub>                                                                                              | Full               | 0                          |                   | V+                | V    |
| On-Resistance                                    | R <sub>DS(on)</sub>                  | V+ = 3 V, I <sub>NO/NC</sub> = 100 mA, V <sub>COM</sub> = 0.7 V                                                  |                    |                            | 0.7               | 1.2               | Ω    |
|                                                  |                                      | V+ = 3 V, I <sub>NO/NC</sub> = 100 mA, V <sub>COM</sub> = 2.3 V                                                  |                    |                            | 0.65              |                   |      |
|                                                  |                                      | V+ = 4.3 V, I <sub>NO/NC</sub> = 100 mA, V <sub>COM</sub> = 0.9 V                                                |                    |                            | 0.55              | 1                 |      |
|                                                  |                                      | V+ = 4.3 V, I <sub>NO/NC</sub> = 100 mA, V <sub>COM</sub> = 2.5 V                                                |                    |                            | 0.42              |                   |      |
| R <sub>ON</sub> Match <sup>d</sup>               | ΔR <sub>ON</sub>                     | V+ = 3 V, I <sub>NO/NC</sub> = 100 mA,<br>V <sub>COM</sub> = 0.7 V                                               |                    |                            | 0.02              | 0.25              |      |
|                                                  |                                      | V+ = 4.3 V, I <sub>NO/NC</sub> = 100 mA,<br>V <sub>COM</sub> = 0.9 V                                             |                    |                            |                   |                   |      |
| R <sub>ON</sub> resistance flatness <sup>d</sup> | R <sub>ON</sub> flatness             | V+ = 3 V and 4.3 V, I <sub>NO/NC</sub> = 100 mA                                                                  |                    |                            | 0.13              | 0.4               |      |
| Switch Off Leakage Current                       | I <sub>NO/NC(off)</sub>              | V+ = 4.3 V, V <sub>NO/NC</sub> = 0.3 V/4.0 V,<br>V <sub>COM</sub> = 4.0 V/0.3 V                                  | Room               | - 10                       |                   | 10                | nA   |
|                                                  |                                      |                                                                                                                  | Full               | - 50                       |                   | 50                |      |
|                                                  | I <sub>COM(off)</sub>                |                                                                                                                  | Room               | - 10                       |                   | 10                |      |
|                                                  |                                      |                                                                                                                  | Full               | - 50                       |                   | 50                |      |
| Channel-On Leakage Current                       | I <sub>COM(on)</sub>                 | V+ = 4.3 V, V <sub>NO/NC</sub> = V <sub>COM</sub> = 4.0 V/0.3 V                                                  | Room               | - 10                       |                   | 10                |      |
|                                                  |                                      |                                                                                                                  | Full               | - 50                       |                   | 50                |      |
| Digital Control                                  |                                      |                                                                                                                  |                    |                            |                   |                   |      |
| Input High Voltage                               | V <sub>INH</sub>                     | V+ = 1.65 V to 4.3 V                                                                                             | Full               | 1.7                        |                   |                   | V    |
| Input Low Voltage                                | V <sub>INL</sub>                     |                                                                                                                  | Full               |                            |                   | 0.4               |      |
| Input Capacitance                                | C <sub>IN</sub>                      |                                                                                                                  | Full               |                            | 6                 |                   | pF   |
| Input Current                                    | I <sub>INL</sub> or I <sub>INH</sub> | V <sub>IN</sub> = 0 or V+                                                                                        | Full               | - 1                        |                   | 1                 | μA   |
| Dynamic Characteristics                          |                                      |                                                                                                                  |                    |                            |                   |                   |      |
| Break-Before-Make Time <sup>e</sup>              | t <sub>BBM</sub>                     | V+ = 3.6 V, V <sub>NO</sub> , V <sub>NC</sub> = 1.5 V, R <sub>L</sub> = 50 Ω,<br>C <sub>L</sub> = 35 pF          | Room               | 2                          |                   |                   | ns   |
| Turn-On Time <sup>e</sup>                        | t <sub>ON</sub>                      |                                                                                                                  | Room               |                            |                   | 95                |      |
|                                                  |                                      |                                                                                                                  | Full               |                            |                   | 100               |      |
|                                                  |                                      |                                                                                                                  | Room               |                            |                   | 50                |      |
| Turn-Off Time <sup>e</sup>                       | t <sub>OFF</sub>                     |                                                                                                                  | Full               |                            |                   | 55                |      |
| Off-Isolation <sup>d</sup>                       | O <sub>IRR</sub>                     | R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, f = 100 kHz                                                        | Room               |                            | - 85              |                   | dB   |
| Crosstalk <sup>d</sup>                           | X <sub>TALK</sub>                    |                                                                                                                  |                    |                            | - 95              |                   |      |
| 3dB bandwidth <sup>d</sup>                       |                                      | R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF                                                                     | Room               |                            | 62                |                   | MHz  |

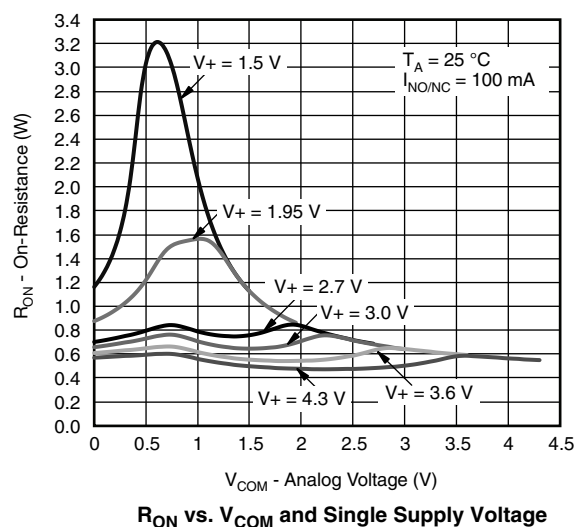
| SPECIFICATIONS (V+ = 3 V)           |          |                                                                                                      |                    |                            |                   |                   |      |
|-------------------------------------|----------|------------------------------------------------------------------------------------------------------|--------------------|----------------------------|-------------------|-------------------|------|
| Parameter                           | Symbol   | Test Conditions<br>Unless Otherwise Specified<br>V+ = 3 V, ± 10 %,VIN = 0.4 V or 1.65 V <sup>e</sup> | Temp. <sup>a</sup> | Limits<br>- 40 °C to 85 °C |                   |                   | Unit |
|                                     |          |                                                                                                      |                    | Min. <sup>b</sup>          | Typ. <sup>c</sup> | Max. <sup>b</sup> |      |
| Dynamic Characteristics             |          |                                                                                                      |                    |                            |                   |                   |      |
| NO, NC Off Capacitance <sup>d</sup> | CNO(off) | VIN = 0 V, or V+, f = 1 MHz                                                                          | Room               |                            | 24                |                   | pF   |
|                                     | CNC(off) |                                                                                                      |                    |                            | 30                |                   |      |
| Channel On Capacitance <sup>d</sup> | CNO(on)  |                                                                                                      |                    |                            | 100               |                   |      |
|                                     | CNC(on)  |                                                                                                      |                    |                            | 100               |                   |      |
| Power Supply                        |          |                                                                                                      |                    |                            |                   |                   |      |
| Power Supply Range                  | V+       |                                                                                                      |                    | 1.65                       |                   | 4.3               | V    |
| Power Supply Current                | I+       | VIN = 0 or V+                                                                                        | Full               | - 1                        | 0.01              | 1.0               | µA   |
| Supply Current per Logic Input      | I+T      | V+ = 4.3 V, VINx = 2.6 V                                                                             | Room               |                            | 7                 |                   |      |
|                                     |          | V+ = 4.3 V, VINx = 1.8 V                                                                             | Room               |                            | 15                |                   |      |
| Power OFF COM pin Leakage           | IOFF     | V = 0 V, VIN = 4.3 V, NCx, NOx floating                                                              | Full               | - 1                        |                   | + 1               |      |

Notes:

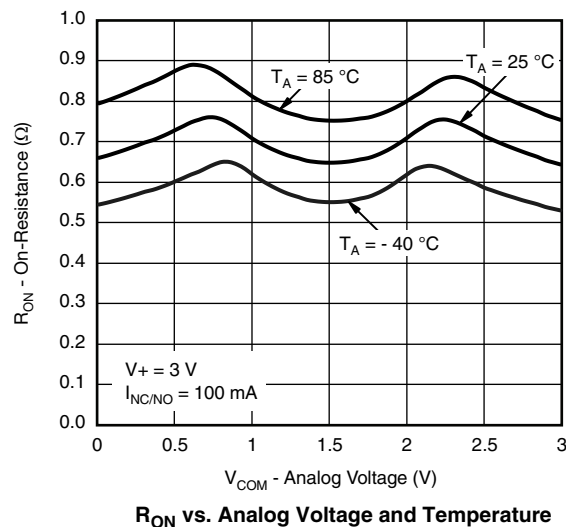
- Room = 25 °C, Full = as determined by the operating suffix.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- Typical values are for design aid only, not guaranteed nor subject to production testing.
- Guarantee by design, not subjected to production test.
- $V_{IN}$  = input voltage to perform proper function.

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

## TYPICAL CHARACTERISTICS ( $T_A = 25\text{ °C}$ , unless otherwise noted)

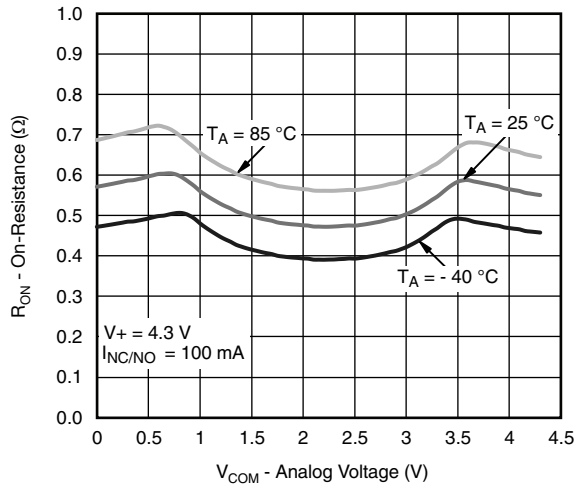


**$R_{ON}$  vs.  $V_{COM}$  and Single Supply Voltage**

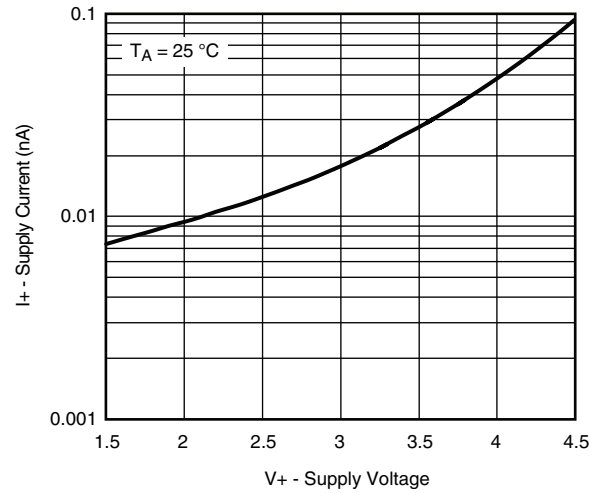


**$R_{ON}$  vs. Analog Voltage and Temperature**

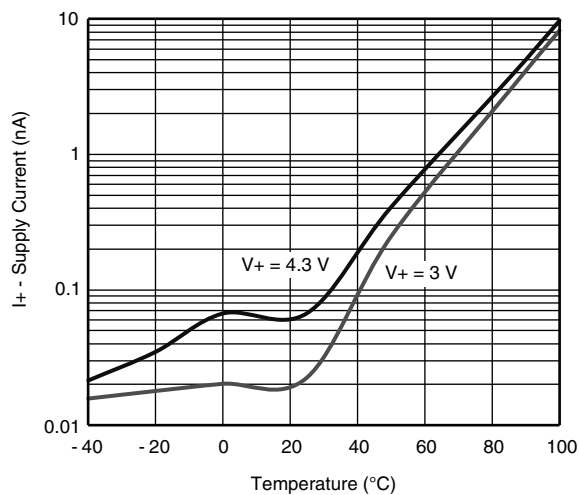
**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



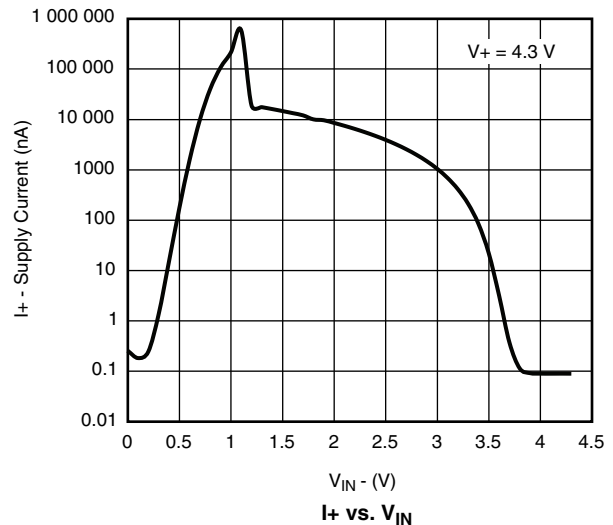
**$R_{ON}$  vs. Analog Voltage and Temperature**



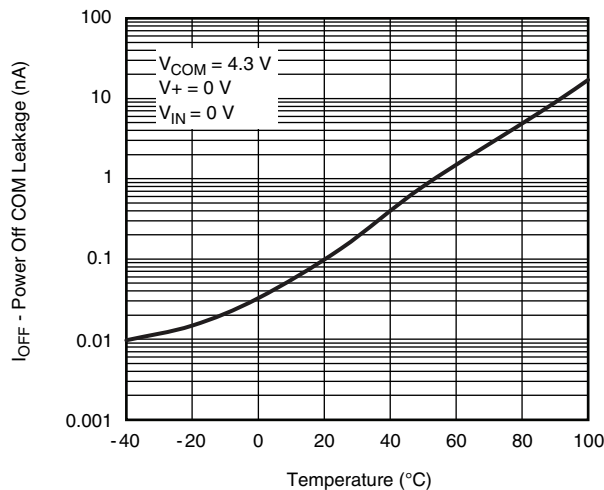
**$I_+$  vs.  $V_+$**



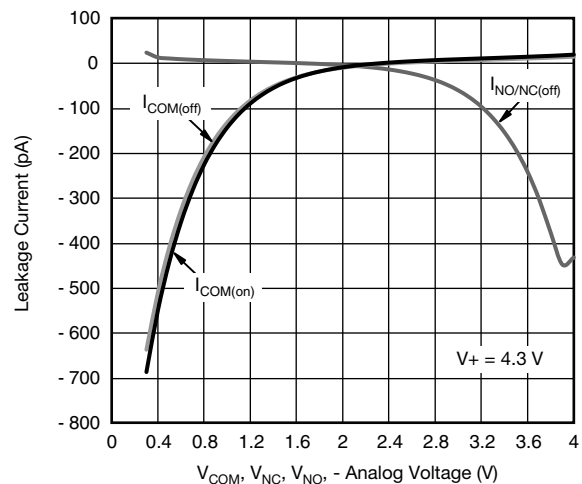
**$I_+$  Supply Current vs. Temperature**



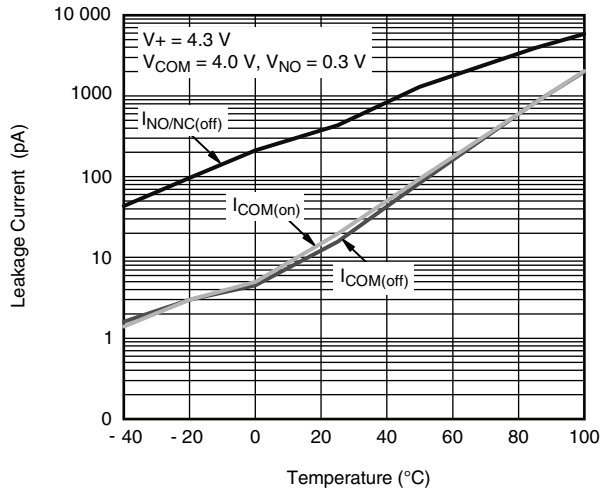
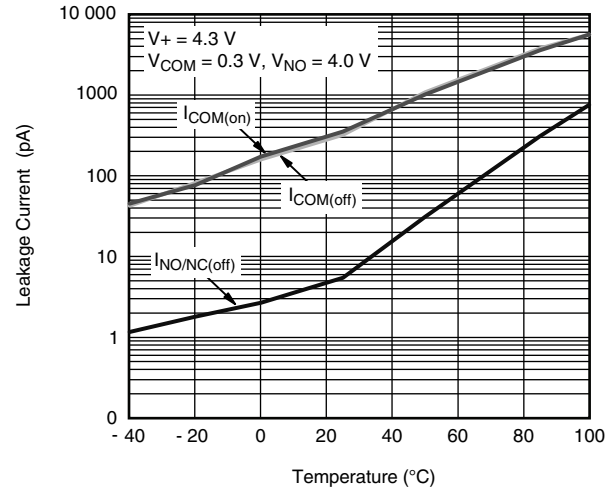
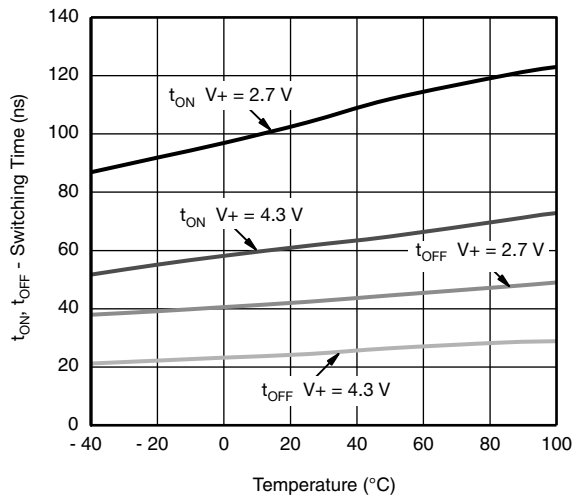
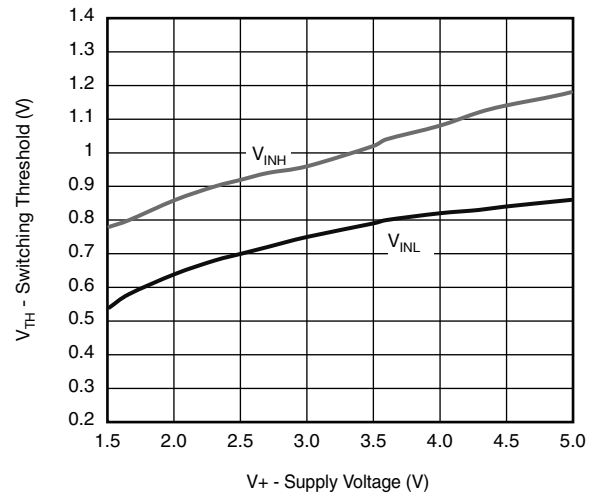
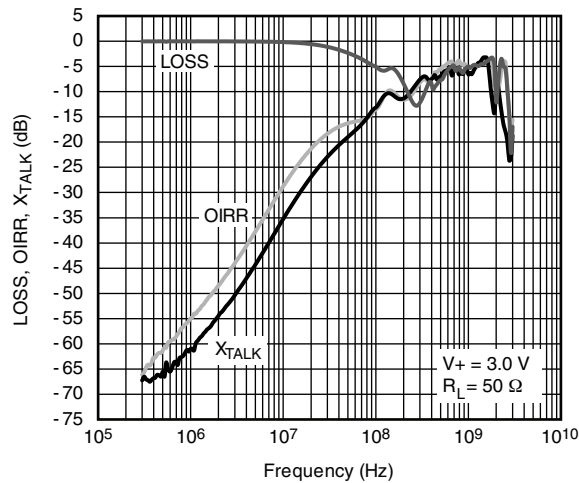
**$I_+$  vs.  $V_{IN}$**



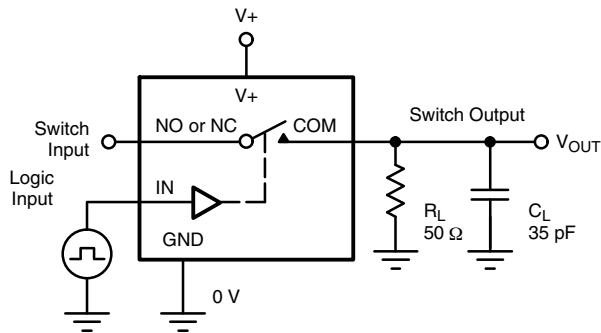
**Power Off Leakage  $I_{OFF}$  ( $I_{COM}$ ) vs. Temperature**



**Leakage vs. Analog Voltage,  $V_+ = 4.3\text{ V}$**

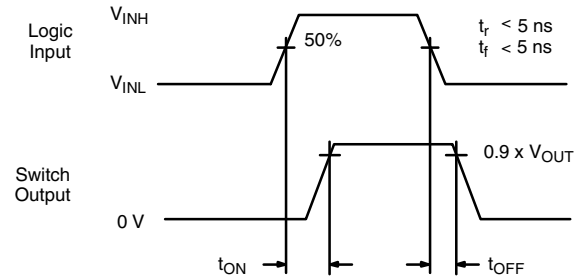
**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

**Leakage Current vs. Temperature**

**Leakage Current vs. Temperature**

 **$t_{\text{ON}}$ ,  $t_{\text{OFF}}$  Switching Time vs. Temperature**

**Switching Threshold vs. Supply Voltage**

**PABK-A Insertion Loss, Off Isolation and Crosstalk**

### TEST CIRCUITS



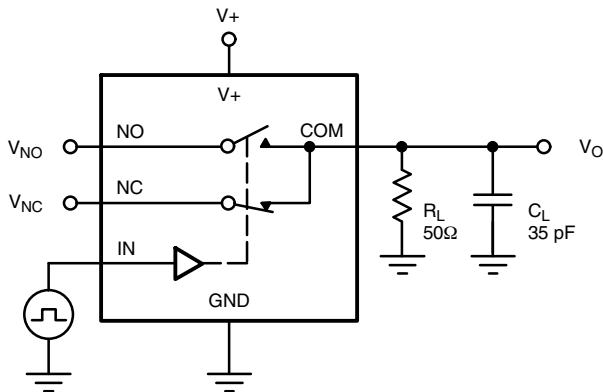
$C_L$  (includes fixture and stray capacitance)

$$V_{OUT} = V_{COM} \left( \frac{R_L}{R_L + R_{ON}} \right)$$



Logic "1" = Switch On  
Logic input waveforms inverted for switches that have the opposite logic sense.

Figure 1. Switching Time



$C_L$  (includes fixture and stray capacitance)

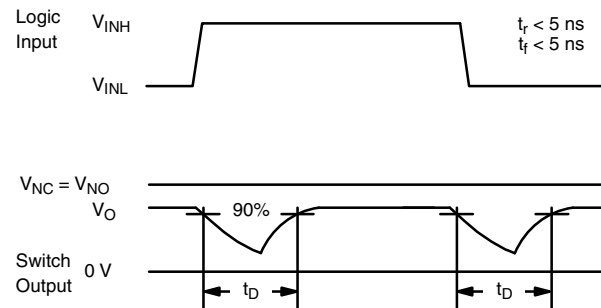
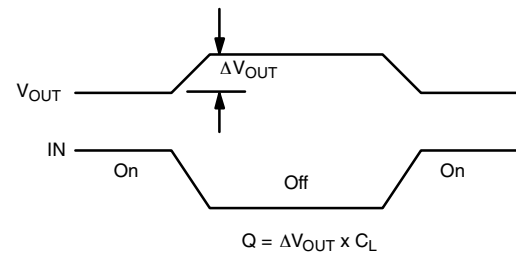
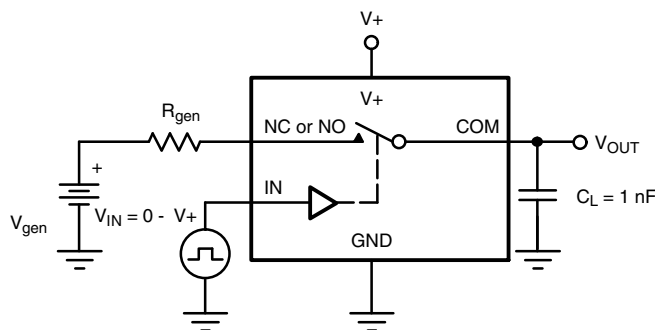
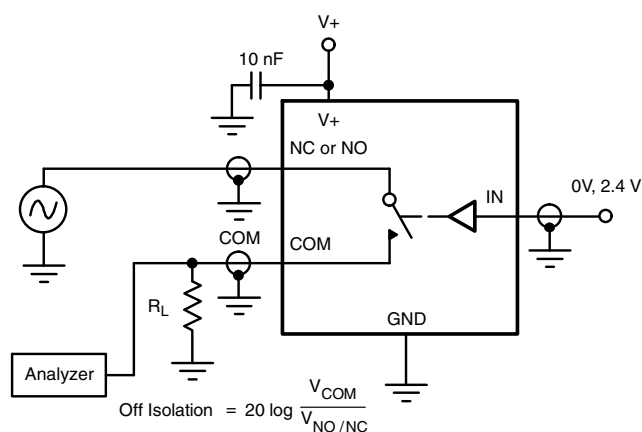
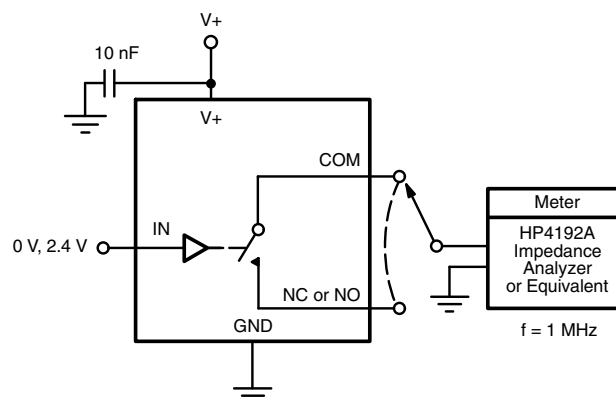


Figure 2. Break-Before-Make Interval



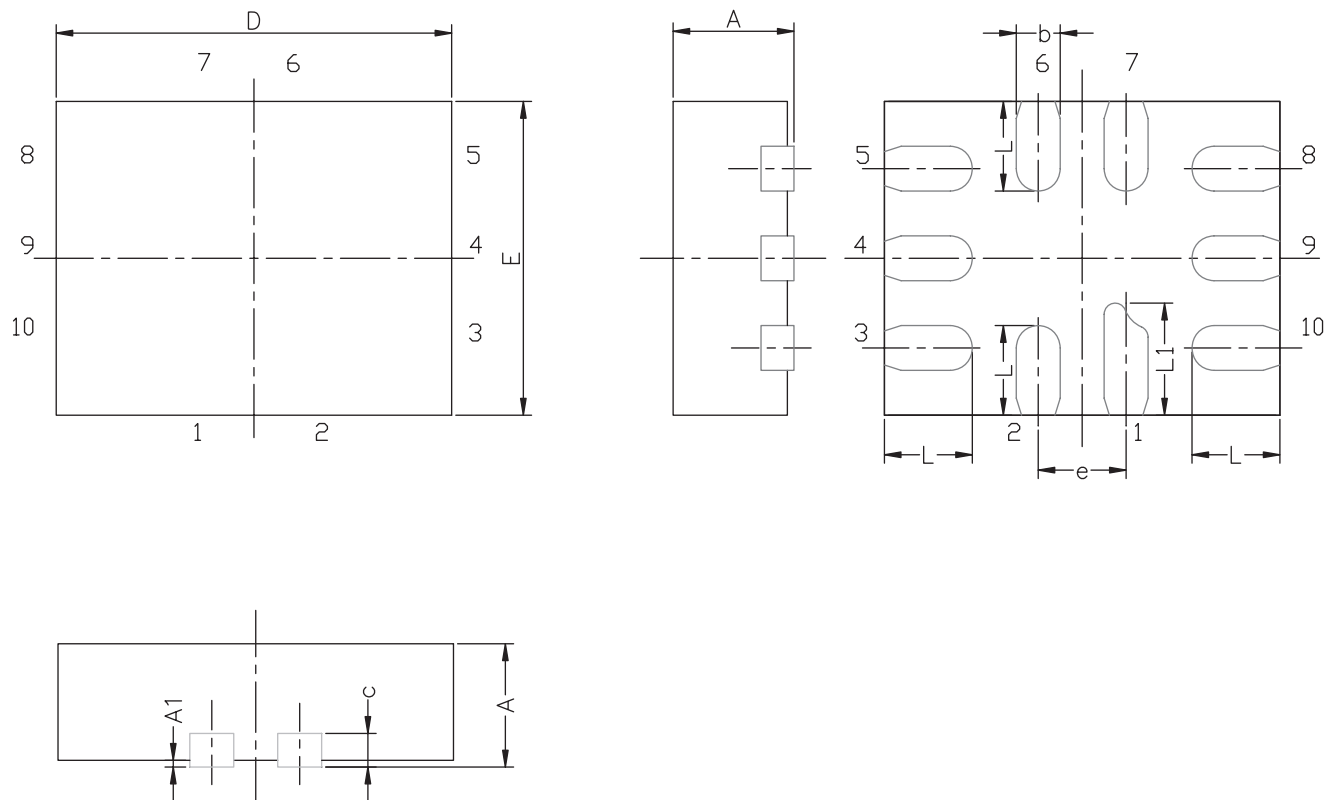
IN depends on switch configuration: input polarity determined by sense of switch.

Figure 3. Charge Injection

**TEST CIRCUITS**

**Figure 4. Off-Isolation**

**Figure 5. Channel Off/On Capacitance**

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see [www.vishay.com/ppg?67647](http://www.vishay.com/ppg?67647).

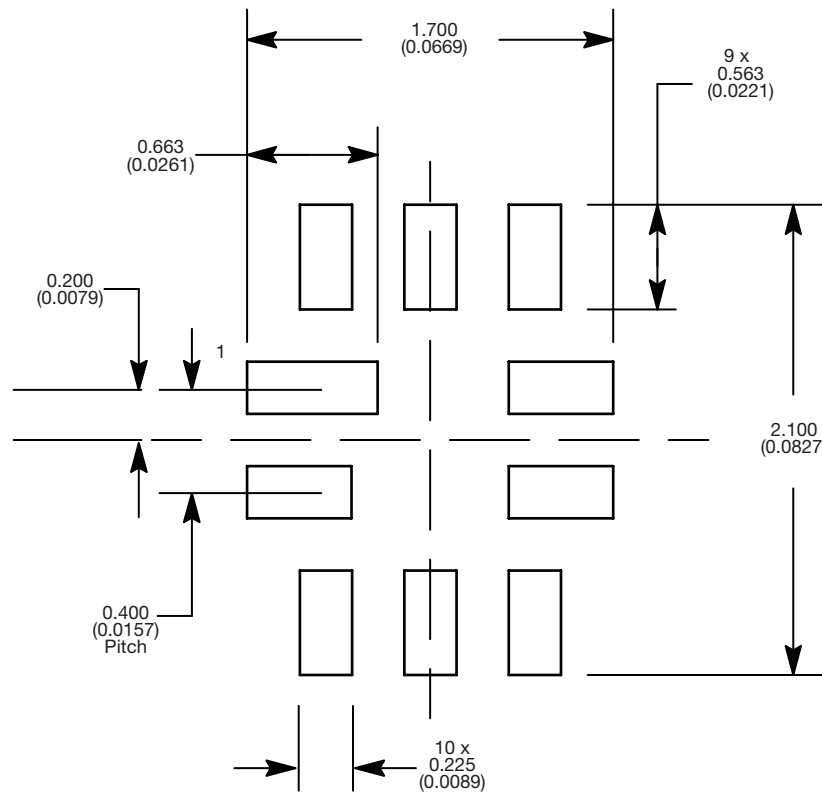
## MINI QFN-10L CASE OUTLINE



| DIM | MILLIMETERS |      |      | INCHES    |        |        |
|-----|-------------|------|------|-----------|--------|--------|
|     | MIN.        | NAM. | MAX. | MIN.      | NAM.   | MAX.   |
| A   | 0.50        | 0.55 | 0.60 | 0.0197    | 0.0217 | 0.0236 |
| A1  | 0.00        | -    | 0.05 | 0.000     | -      | 0.002  |
| b   | 0.15        | 0.20 | 0.25 | 0.006     | 0.008  | 0.010  |
| c   | 0.15 REF    |      |      | 0.006 REF |        |        |
| D   | 1.75        | 1.80 | 1.85 | 0.069     | 0.071  | 0.073  |
| E   | 1.35        | 1.40 | 1.45 | 0.053     | 0.055  | 0.057  |
| e   | 0.40 BSC    |      |      | 0.016 BSC |        |        |
| L   | 0.35        | 0.40 | 0.45 | 0.014     | 0.016  | 0.018  |
| L1  | 0.45        | 0.50 | 0.55 | 0.0177    | 0.0197 | 0.0217 |

ECN T-07039-Rev. A, 12-Feb-07  
DWG: 5957

## RECOMMENDED MINIMUM PADS FOR MINI QFN 10L



Mounting Footprint  
Dimensions in mm (inch)



## Disclaimer

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**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**