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**DG2707**

Vishay Siliconix

## High Speed, Low Voltage, 3 $\Omega$ , Differential 4:1 CMOS Analog Multiplexer/Switch

### DESCRIPTION

The DG2707 is a high speed, low voltage, 3  $\Omega$ , differential 4:1 multiplexer. It operates from a 1.65 V to 4.3 V single power supply. All channels guaranteed break before make switching. When powered with single 3.15 V supply, channel to channel ON Resistance matching is within 0.3  $\Omega$ .

All control logic input has 0.5 V to 1.65 V threshold. The EN pin enables cascading of the multiplexers. It features a 120 MHz - 3 dB bandwidth, - 90 dB crosstalk and - 70 dB off-isolation at 1 MHz.

The DG2707 comes in a small miniQFN-16 lead package (1.8 mm x 2.6 mm x 0.75 mm). As a committed partner to community and the environment, Vishay Siliconix manufactures this product with the lead (Pb)-free device terminations and is 100 % RoHS compliant.

### FEATURES

- Low voltage operation (1.65 V to 4.3 V)
- Low on-resistance -  $R_{ON}$ : 2.8  $\Omega$  typ. at 3.15 V
- Low voltage logic threshold
- Low crosstalk: - 70 dB
- High off-isolation: - 90 dB
- Ultra small package: miniQFN16 of 1.8 mm x 2.6 mm

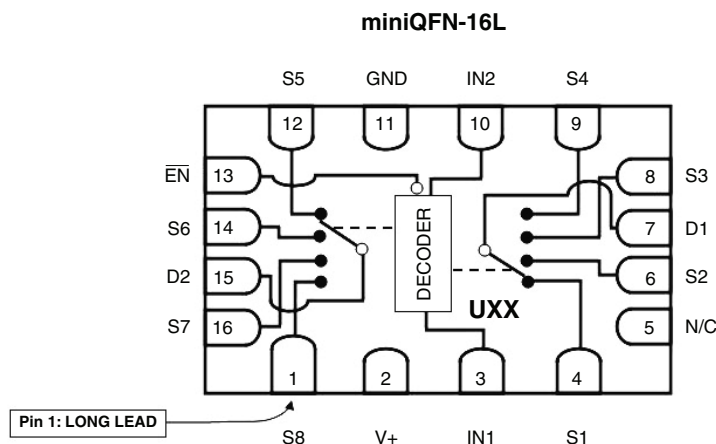


**RoHS**  
COMPLIANT

### APPLICATIONS

- A/V and analog signal routing
- Battery operated devices
- Data acquisition systems
- Communications systems
- Medical and ATE equipments

### FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



Top View

Device Marking: **UXX**  
Traceability Code:  
U is DG2707DN  
XX = Date/Lot

### ORDERING INFORMATION

| Temp. Range      | Package    | Part Number    |
|------------------|------------|----------------|
| - 40 °C to 85 °C | miniQFN-16 | DG2707DN-T1-E4 |

## DG2707

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| TRUTH TABLE DG2707 MULTIPLEXER, MINIQFN-16L |              |             |                      |              |
|---------------------------------------------|--------------|-------------|----------------------|--------------|
| Enable Input                                | Select Input |             | On Switches (Pin)    |              |
| EN (Pin 13)                                 | IN2 (Pin 10) | IN1 (Pin 3) | Description (Pin)    | Common (Pin) |
| 0                                           | 0            | 0           | S5 (Pin 12)          | D2 (Pin 15)  |
| 0                                           | 0            | 1           | S6 (Pin 14)          |              |
| 0                                           | 1            | 0           | S7 (Pin 16)          |              |
| 0                                           | 1            | 1           | S8 (Pin 1)           |              |
| 0                                           | 0            | 0           | S1 (Pin 4)           | D1 (Pin 7)   |
| 0                                           | 0            | 1           | S2 (Pin 6)           |              |
| 0                                           | 1            | 0           | S3 (Pin 8)           |              |
| 0                                           | 1            | 1           | S4 (Pin 9)           |              |
| 1                                           | X            | X           | All Switches are off |              |
| Pin 5 N/C                                   |              |             |                      |              |

| ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted) |                                                      |                     |      |
|---------------------------------------------------------------------------|------------------------------------------------------|---------------------|------|
| Parameter                                                                 |                                                      | Limit               | Unit |
| Reference to GND                                                          | V+                                                   | - 0.3 to 5.0        | V    |
|                                                                           | EN, IN, D <sub>X</sub> , S <sub>X</sub> <sup>a</sup> | - 0.3 to (V+ + 0.3) |      |
| Current (Any terminal except S <sub>X</sub> or D <sub>X</sub> )           |                                                      | 30                  | mA   |
| Continuous Current (S <sub>X</sub> or D <sub>X</sub> )                    |                                                      | ± 300               |      |
| Peak Current (Pulsed at 1 ms, 10 % Duty Cycle)                            |                                                      | ± 500               |      |
| Storage Temperature (D Suffix)                                            |                                                      | - 65 to 150         | °C   |
| Thermal Resistance (Package) <sup>b</sup>                                 | miniQFN-16                                           | 152                 | °C/W |
| Power Dissipation (Packages) <sup>b</sup>                                 | miniQFN-16 <sup>c, d</sup>                           | 525                 | mW   |

Notes:

- Signals on S<sub>X</sub> or D<sub>X</sub>, or IN<sub>X</sub> or EN exceeding V+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
- All leads welded or soldered to PC board.
- Derate 6.6 mW/°C above 70 °C
- Manual soldering with iron is not recommended for leadless components. The miniQFN-16 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper lip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.



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| SPECIFICATIONS (V+ = 3.15 V)                                 |                                      |                                                                        |                    |                            |                   |                   |      |
|--------------------------------------------------------------|--------------------------------------|------------------------------------------------------------------------|--------------------|----------------------------|-------------------|-------------------|------|
| Parameter                                                    | Symbol                               | Test Conditions<br>Otherwise Unless Specified                          | Temp. <sup>b</sup> | Limits<br>- 40 °C to 85 °C |                   |                   | Unit |
|                                                              |                                      |                                                                        |                    | Min. <sup>d</sup>          | Typ. <sup>c</sup> | Max. <sup>d</sup> |      |
| Analog Switch                                                |                                      |                                                                        |                    |                            |                   |                   |      |
| Analog Signal Range <sup>e</sup>                             | V <sub>analog</sub>                  | R <sub>DS(on)</sub>                                                    | Full               | 0                          |                   | V+                | V    |
| On Resistance                                                | R <sub>DS(on)</sub>                  | V+ = 3.15 V, I <sub>SX</sub> = 10 mA, V <sub>DX</sub> = 1.0 V          | Room               |                            | 2.8               | 5.5               | Ω    |
|                                                              |                                      |                                                                        | Full               |                            |                   | 6                 |      |
| R <sub>ON</sub> Match                                        | ΔR <sub>(on)</sub>                   | V+ = 3.15 V, I <sub>SX</sub> = 10 mA, V <sub>DX</sub> = 1.0 V          | Room               |                            | 0.3               |                   |      |
| R <sub>ON</sub> Resistance Flatness                          | R <sub>(on)</sub> Flatness           | V+ = 3.15 V, I <sub>SX</sub> = 10 mA, V <sub>DX</sub> = 0.0 V, 1.0 V   | Room               |                            | 0.6               |                   |      |
| Channel-Off Leakage Current                                  | I <sub>SX(off)</sub>                 | V+ = 3.6 V, V <sub>SX</sub> = 0.5 V/3 V, V <sub>DX</sub> = 3 V/0.5 V   | Room               | - 5                        |                   | 5                 | nA   |
|                                                              | I <sub>DX(off)</sub>                 |                                                                        | Full               | - 10                       |                   | 10                |      |
| Channel-On Leakage Current                                   | I <sub>DX(on)</sub>                  | V+ = 3.6 V, V <sub>SX</sub> , V <sub>DX</sub> = 3 V/0.5 V              | Room               | - 10                       |                   | 10                |      |
|                                                              |                                      |                                                                        | Full               | - 20                       |                   | 20                |      |
| Digital Control                                              |                                      |                                                                        |                    |                            |                   |                   |      |
| Input High Voltage                                           | V <sub>INH</sub>                     | V <sub>IN</sub> = 0 or V+                                              | Full               | 1.65                       |                   |                   | V    |
| Input Low Voltage                                            | V <sub>INL</sub>                     |                                                                        |                    |                            |                   | 0.4               |      |
| Input Current                                                | I <sub>INL</sub> or I <sub>INH</sub> |                                                                        |                    | - 1                        |                   | 1                 | μA   |
| Input Capacitance                                            | C <sub>IN</sub>                      |                                                                        |                    | V+ = 3.15, f = 1 MHz       |                   |                   | 5.1  |
| Dynamic Characteristics                                      |                                      |                                                                        |                    |                            |                   |                   |      |
| Break-Before-Make Time                                       | t <sub>BBM</sub>                     | V <sub>SX</sub> = 1.5 V, R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 35 pF | Room               |                            | 1                 |                   | ns   |
|                                                              |                                      |                                                                        | Full               | 5                          |                   |                   |      |
| Enable Turn-On Time                                          | t <sub>ON(EN)</sub>                  |                                                                        | Room               |                            | 20                | 45                |      |
|                                                              |                                      |                                                                        | Full               |                            |                   | 55                |      |
| Enable Turn-Off Time                                         | t <sub>OFF(EN)</sub>                 |                                                                        | Room               |                            | 15                | 35                |      |
|                                                              |                                      |                                                                        | Full               |                            |                   | 45                |      |
| Transition Time                                              | t <sub>TRANS</sub>                   |                                                                        | Room               |                            | 35                | 55                |      |
|                                                              |                                      |                                                                        | Full               |                            |                   | 65                |      |
| Charge Injection <sup>d</sup>                                | Q <sub>INJ</sub>                     | C <sub>L</sub> = 1 nF, R <sub>GEN</sub> = 0 Ω, V <sub>SX</sub> = 2 V   | Room               |                            | - 14              |                   | pC   |
| Off-Isolation <sup>d</sup>                                   | OIRR                                 | V+ = 3.15 V, f = 1 MHz, R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF   | Room               |                            | - 70              |                   | dB   |
| Crosstalk <sup>d, f</sup>                                    | X <sub>TALK</sub>                    |                                                                        |                    |                            | - 90              |                   |      |
| Bandwidth <sup>d</sup>                                       | BW                                   | V+ = 3.15 V, R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, - 3 dB      | Room               |                            | 120               |                   | MHz  |
| Total Harmonic Distortion <sup>d</sup>                       | THD                                  | V+ = 3.15 V, R <sub>load</sub> = 600 Ω                                 | Room               |                            | 0.02              |                   | %    |
| S <sub>X</sub> , D <sub>X</sub> Off Capacitance <sup>d</sup> | C <sub>S(off)</sub>                  | V+ = 3.15 V, f = 1 MHz                                                 | Room               |                            | 16                |                   | pF   |
|                                                              | CD <sub>X(off)</sub>                 |                                                                        |                    |                            | 42                |                   |      |
| Channel-On Capacitance <sup>d</sup>                          | CD <sub>X(on)</sub>                  |                                                                        |                    |                            | 49                |                   |      |
|                                                              |                                      |                                                                        |                    |                            |                   |                   |      |
| Power Supply                                                 |                                      |                                                                        |                    |                            |                   |                   |      |
| Power Supply Range                                           | V+                                   |                                                                        |                    | 1.65                       |                   | 4.3               | V    |
| Power Supply Current                                         | I+                                   | V <sub>IN</sub> = 0 V or V+                                            | Full               |                            |                   | 1                 | μA   |

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.
- $V_{\text{IN}}$  = input voltage to perform proper function.
- Crosstalk measured between channels.

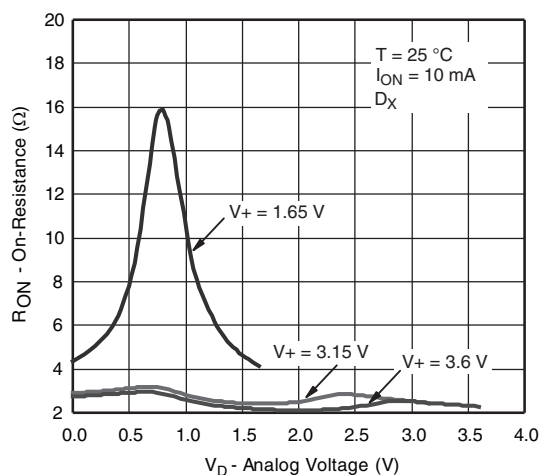
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

## DG2707

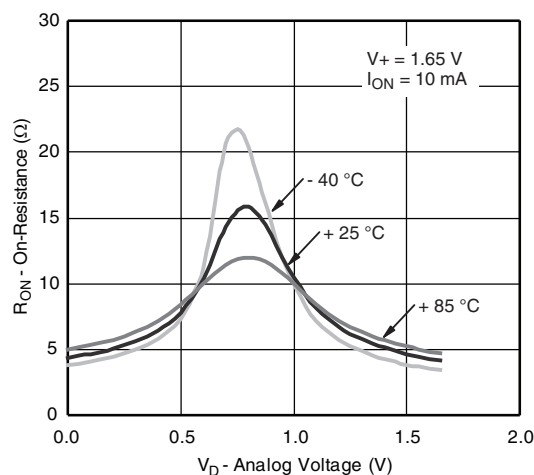
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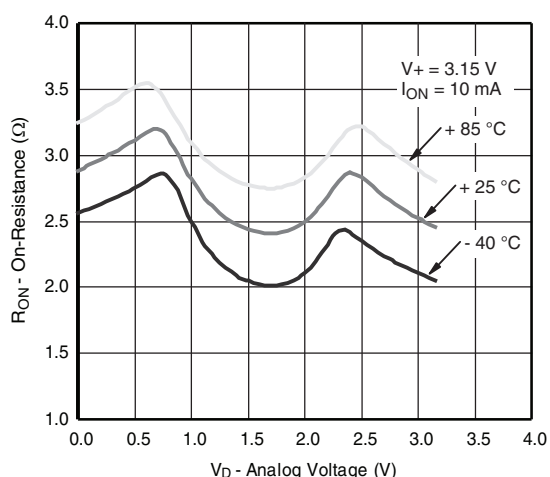
### TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



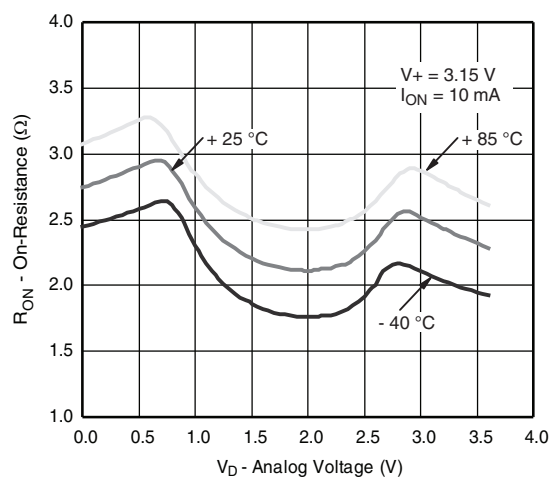
**$R_{ON}$  vs.  $V_D$  and Single Supply Voltage**



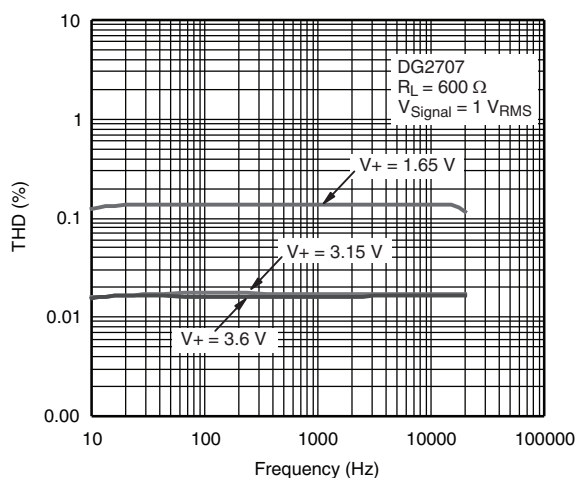
**$R_{ON}$  vs. Analog Voltage and Temperature**



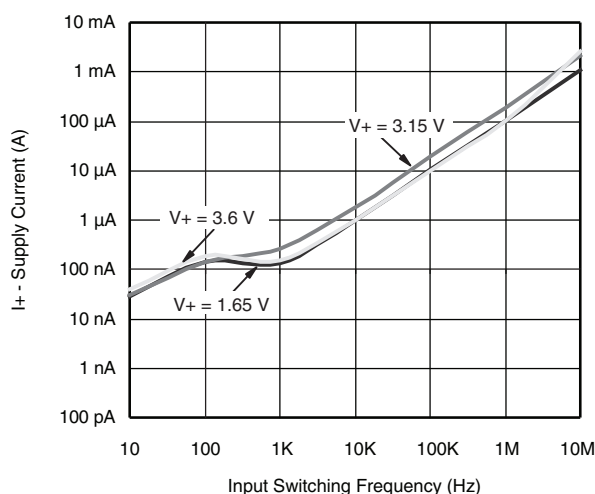
**$R_{ON}$  vs. Analog Voltage and Temperature**



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



**Switching Threshold vs. Supply Voltage**



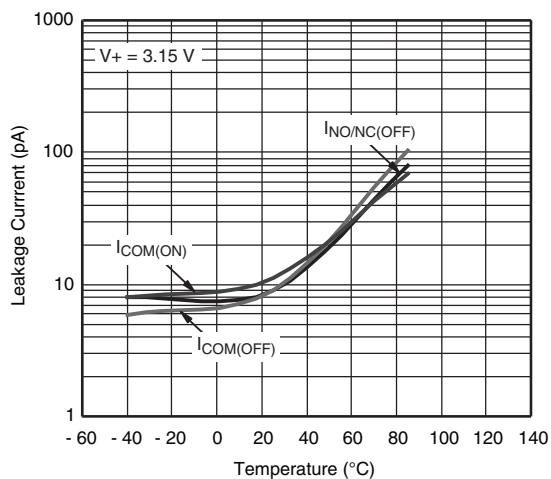
**Supply Current vs. Input Switching Frequency**



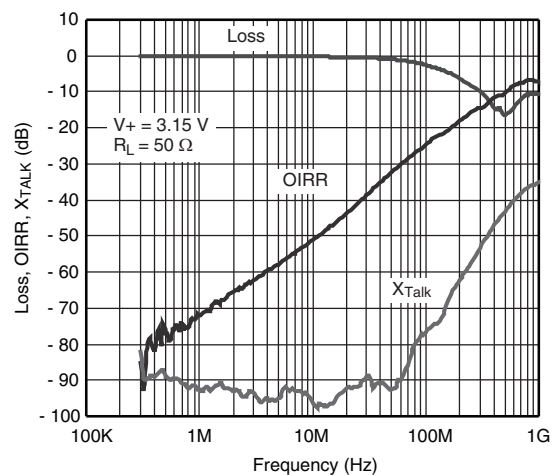
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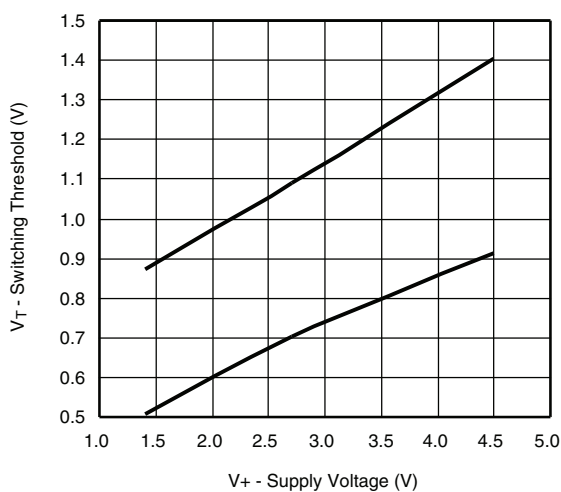
**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



**Leakage Current vs. Temperature**



**Insertion Loss, Off-Isolation Crosstalk vs. Frequency**



**Switching Threshold vs. Supply Voltage**

## DG2707

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### TEST CIRCUITS

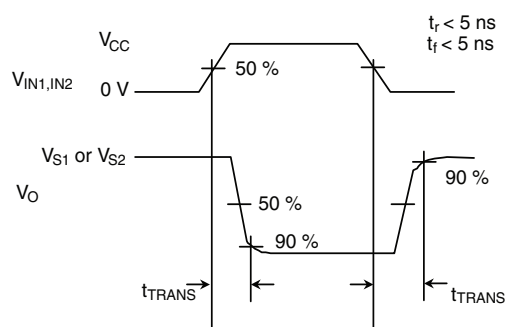
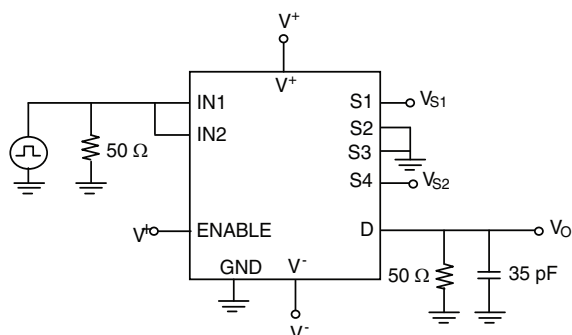


Figure 1. Transition Time

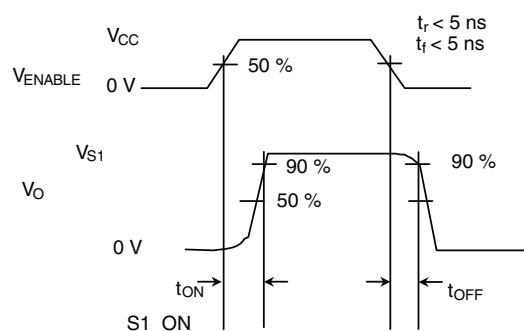
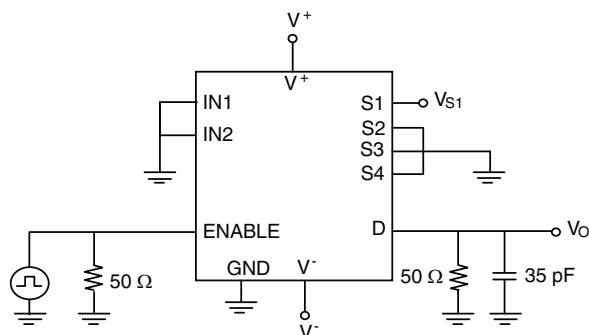


Figure 2. Enable Switching Time

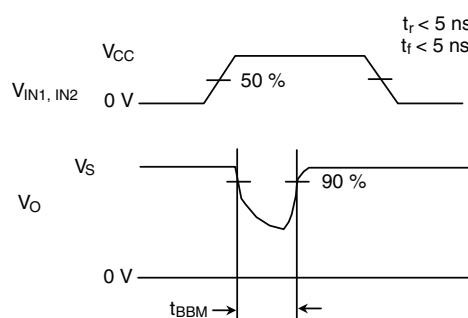
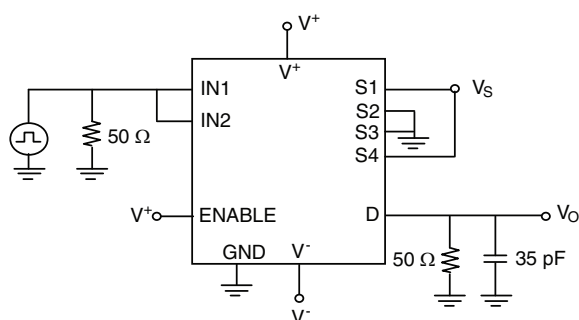


Figure 3. Break-Before Make



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## TEST CIRCUITS

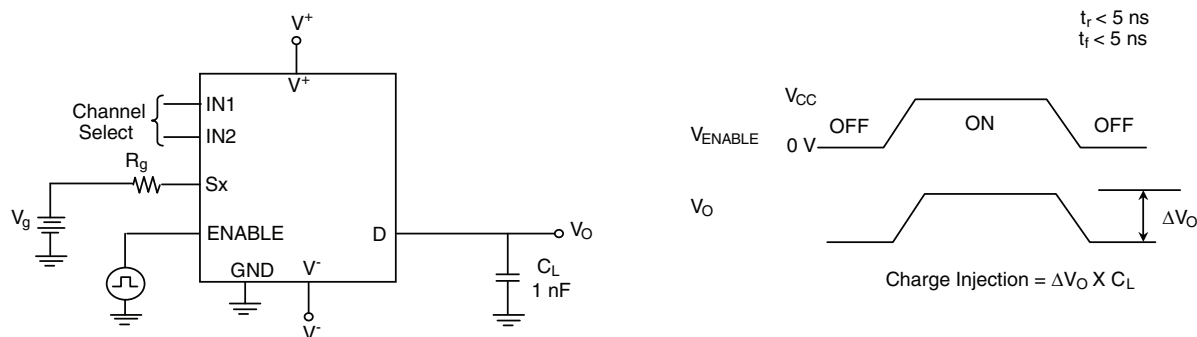


Figure 4. Charge Injection

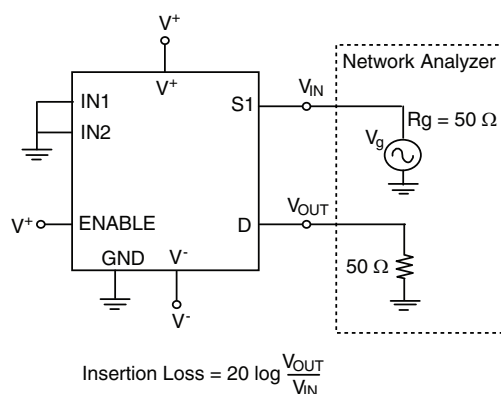


Figure 5. Insertion Loss

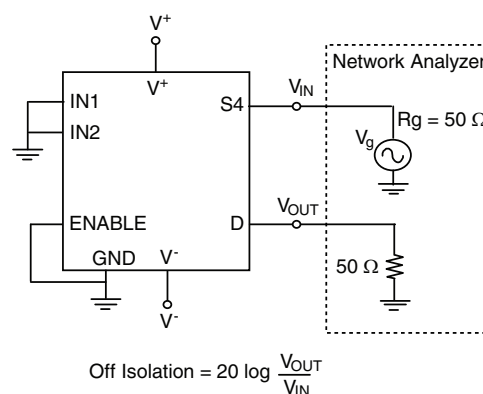


Figure 6. Off-Isolation

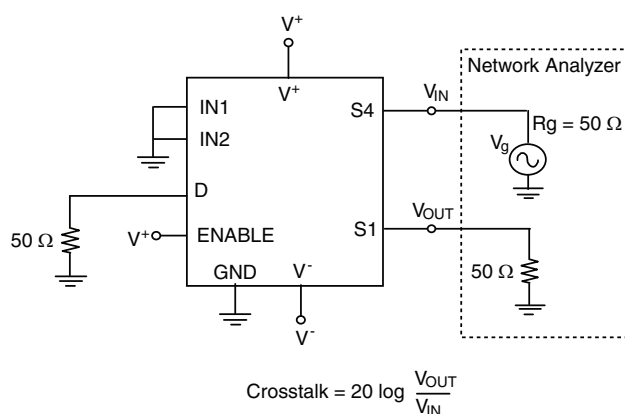


Figure 7. Crosstalk

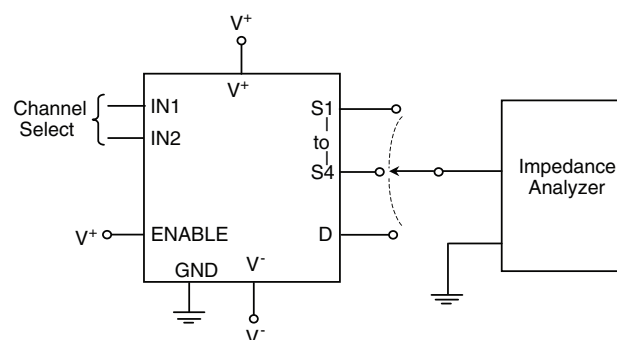


Figure 8. Source, Drain Capacitance

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/ppg268397](http://www.vishay.com/ppg268397).



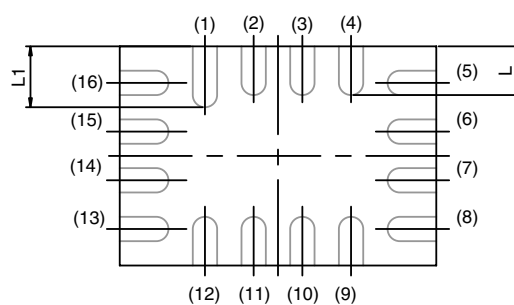
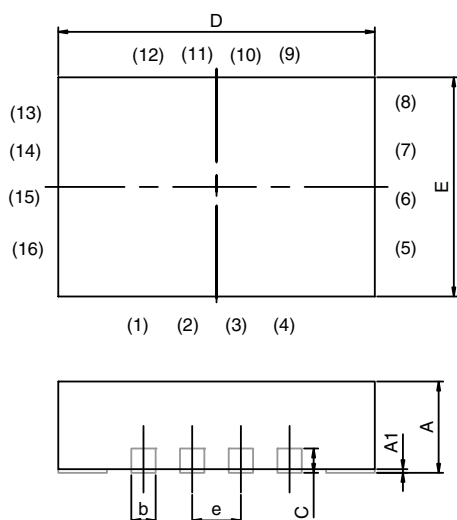


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## Package Information

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### miniQFN-16L



BACK SIDE VIEW

| DIM | MILLIMETERS |      |      | INCHES     |        |        |
|-----|-------------|------|------|------------|--------|--------|
|     | MIN.        | NAM  | MAX. | MIN.       | NAM    | MAX.   |
| A   | 0.70        | 0.75 | 0.80 | 0.0275     | 0.0295 | 0.0315 |
| A1  | 0           | -    | 0.05 | 0          | -      | 0.002  |
| b   | 0.15        | 0.20 | 0.25 | 0.0059     | 0.0078 | 0.0098 |
| C   | 0.15        | 0.20 | 0.25 | 0.0059     | 0.0078 | 0.0098 |
| D   | 2.50        | 2.60 | 2.70 | 0.0984     | 0.1023 | 0.1063 |
| E   | 1.70        | 1.80 | 1.90 | 0.0669     | 0.0708 | 0.0748 |
| e   | 0.40 BSC    |      |      | 0.0157 BSC |        |        |
| L   | 0.35        | 0.40 | 0.45 | 0.0137     | 0.0157 | 0.0177 |
| L1  | 0.45        | 0.50 | 0.55 | 0.0177     | 0.0196 | 0.0216 |

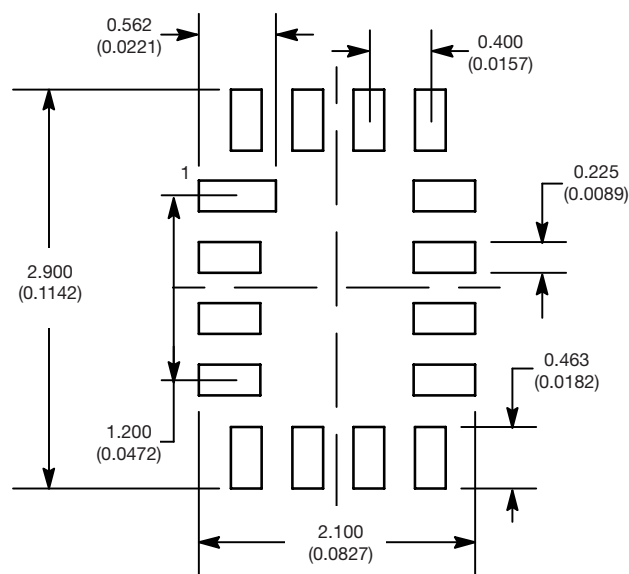
ECN T16-0234-Rev. B, 09-May-16  
DWG: 5954



## PAD Pattern

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### RECOMMENDED MINIMUM PADS FOR MINI QFN 16L



Mounting Footprint  
Dimensions in mm (inch)



## Disclaimer

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