

Low Voltage, 0.6 Ω , Dual SPDT Analog Switch

DESCRIPTION

The DG2735, DG2736 are low voltage, low on-resistance, dual single-pole/double-throw (SPDT) monolithic CMOS analog switches designed for high performance switching of analog signals. Combining low-power, high speed, low on-resistance, and small package size, the DG2735, DG2736 are ideal for portable and battery power applications.

The DG2735, DG2736 have an operation range from 1.65 V to 4.3 V single supply. The DG2735 has two separate control pins with for the separated two SPDT switched. The DG2736 has an EN pin. All switches are at high impedance mode when the EN is high.

The DG2735, DG2736 are guaranteed 1.65 V logic compatible, allowing the easy interface with low voltage DSP or MCU control logic and ideal for one cell Li-ion battery direct power.

The switch conducts signals within power rails equally well in both directions when on, and blocks up to the power supply level when off. Break-before-make is guaranteed.

The DG2735, DG2736 are built on Vishay Siliconix's sub micron CMOS low voltage process technology and provides greater than 300 mA latch-up protection, as tested per JESD78.

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with lead (Pb)-free device terminations. DG2735, DG2736 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 4.3 V)
- Low on-resistance - R_{ON} : 0.6 Ω at 2.7 V
- Fast switching: t_{ON} = 55 ns at 2.7 V
- T_{OFF} = 40 ns at 2.7 V
- Latch-up current > 300 mA (JESD78)
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

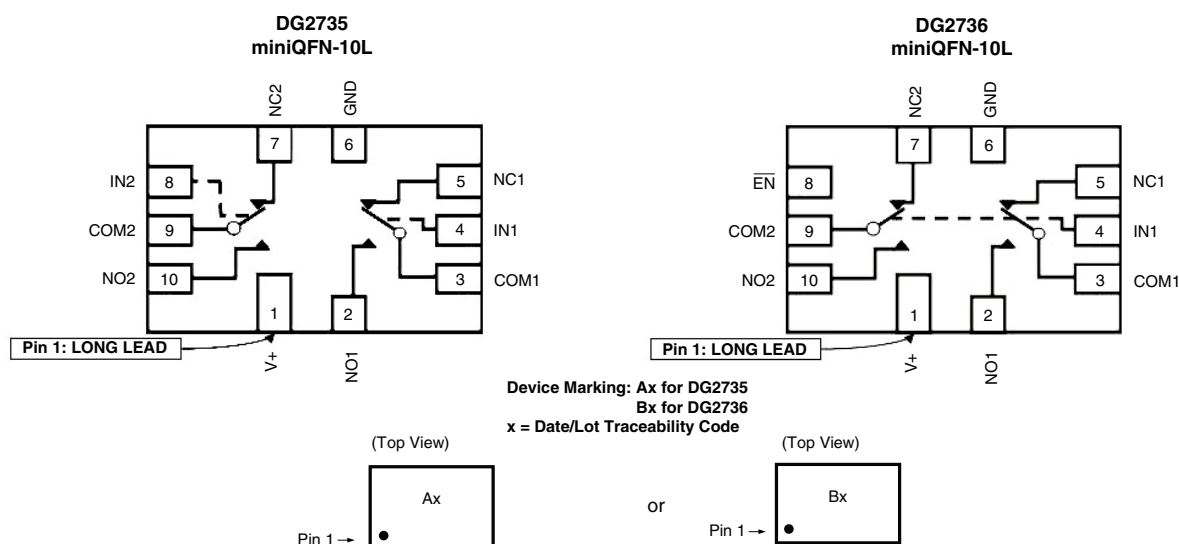
BENEFITS

- Reduced power consumption
- High accuracy
- Reduce board space
- TTL/1.65 V logic compatible

APPLICATIONS

- Cellular phones
- Speaker headset switching
- Audio and video signal routing
- PCMCIA cards
- Battery operated systems
- Portable media player Handheld test instruments

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



Note: Pin 1 has long lead

| TRUTH TABLE | | | |
|-------------|------------------|--------|--------|
| Logic | EN (DG2736 only) | NC1, 2 | NO1, 2 |
| 0 | 1 | OFF | OFF |
| 1 | 1 | OFF | OFF |
| 0 | 0 | ON | OFF |
| 1 | 0 | OFF | ON |

| ORDERING INFORMATION | | |
|----------------------|-----------|----------------------------------|
| Temp. Range | Package | Part Number |
| - 40 °C to 85 °C | miniQFN10 | DG2735DN-T1-E4 DG2736DN-T1-E4 |

| ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted) | | | | |
|---|------------------------------|------------------------|---------------------------------|------|
| Parameter | | Symbol | Limit | Unit |
| Reference to GND | V+ | | - 0.3 to 5 | V |
| | IN, COM, NC, NO ^a | | - 0.3 to (V ₊ + 0.3) | |
| Current (Any terminal except NO, NC or COM) | | | 30 | mA |
| Continuous Current (NO, NC, or COM) | | | ± 250 | |
| Peak Current (Pulsed at 1 ms, 10 % duty cycle) | | | ± 500 | |
| Storage Temperature (D Suffix) | | | - 65 to 150 | °C |
| Power Dissipation (Packages) ^b | | miniQFN10 ^c | 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 mW/C above 70 °C.

| SPECIFICATIONS (V+ = 3 V) | | | | | | | | |
|--|--------------------------|--|--------------------|----------------------------|-------------------|-------------------|------|----|
| Parameter | Symbol | Test Conditions Unless Otherwise Specified V+ = 3 V, ± 10 %,V _{IN} = 0.4 V or 1.65 V ^e | Temp. ^a | Limits - 40 °C to 85 °C | | | Unit | |
| | | | | Min. ^b | Typ. ^c | Max. ^b | | |
| Analog Switch | | | | | | | | |
| Analog Signal Range ^d | V _{analog} | R _{DS(on)} | Full | 0 | | V+ | V | |
| On-Resistance | R _{DS(on)} | V+ = 2.7 V, I _{NO/NC} = 100 mA, V _{COM} = 0.5 V | Room | | 0.5 | 0.6 | Ω | |
| | | V+ = 2.7 V, I _{NO/NC} = 100 mA, V _{COM} = 1.5 V | | | | | | |
| | | V+ = 2.7 V, I _{NO/NC} = 100 mA, V _{COM} = 0.5 V | Full | | 0.5 | | | |
| | | V+ = 2.7 V, I _{NO/NC} = 100 mA, V _{COM} = 1.5 V | | | | | | |
| | | V+ = 4.3 V, I _{NO/NC} = 100 mA, V _{COM} = 0.9 V | Room | | 0.4 | 0.5 | | |
| | | V+ = 4.3 V, I _{NO/NC} = 100 mA, V _{COM} = 2.5 V | | 0.3 | | | | |
| | | V+ = 4.3 V, I _{NO/NC} = 100 mA, V _{COM} = 0.9 V | Full | | 0.5 | | | |
| | | V+ = 4.3 V, I _{NO/NC} = 100 mA, V _{COM} = 2.5 V | | | | | | |
| R _{ON} Match ^d | ΔR _{ON} | V+ = 2.7 V, I _{NO/NC} = 100 mA, V _{COM} = 0.5 V, 1.5 V | Room | | 0.06 | 0.08 | | |
| | | V+ = 4.3 V, I _{NO/NC} = 100 mA, V _{COM} = 0.9 V, 2.5 V | | | | | | |
| R _{ON} resistance flatness ^d | R _{ON} flatness | V+ = 2.7 V, I _{NO/NC} = 100 mA, V _{COM} = 0.5 V, 1.5 V | Room | | | 0.15 | | |
| Switch Off Leakage Current | I _{NO/NC(off)} | V+ = 4.3 V, V _{NO/NC} = 0.3 V/4 V, V _{COM} = 4 V/0.3 V | Room | - 2 | | 2 | | nA |
| | | | Full | - 10 | | 10 | | |
| | I _{COM(off)} | | Room | - 2 | | 2 | | |
| | | | Full | - 10 | | 10 | | |
| Channel-On Leakage Current | I _{COM(on)} | V+ = 4.3 V, V _{NO/NC} = V _{COM} = 4 V/0.3 V | Room | - 5 | | 5 | | |
| | | | Full | - 20 | | 20 | | |



| SPECIFICATIONS (V+ = 3 V) | | | | | | | |
|--|--------------------------------------|---|--------------------|----------------------------|-------------------|-------------------|------|
| Parameter | Symbol | Test Conditions Unless Otherwise Specified V+ = 3 V, ± 10 %, V _{IN} = 0.4 V or 1.65 V ^e | Temp. ^a | Limits - 40 °C to 85 °C | | | Unit |
| | | | | Min. ^b | Typ. ^c | Max. ^b | |
| Digital Control | | | | | | | |
| Input High Voltage | V _{INH} | | Full | 1.65 | | | V |
| Input Low Voltage | V _{INL} | | Full | | | 0.4 | |
| Input Capacitance | C _{IN} | | Full | | 6 | | pF |
| Input Current | I _{INL} or I _{INH} | V _{IN} = 0 or V+ | Full | - 1 | | 1 | μA |
| Dynamic Characteristics | | | | | | | |
| Break-Before-Make Time ^e | t _{BBM} | V+ = 3.6 V, V _{NO} , V _{NC} = 1.5 V, R _L = 50 Ω, C _L = 35 pF | Room | 1 | 5 | | ns |
| Turn-On Time ^e | t _{ON} | | Room | | 50 | 78 | |
| | | | Full | | | 80 | |
| Turn-Off Time ^e | t _{OFF} | | Room | | 35 | 58 | |
| | | | Full | | | 60 | |
| Enable Turn-On Time ^e DG2736 (EN) | t _{ON(EN)} | | Room | | 50 | 78 | |
| | | | Full | | | 80 | |
| Enable Turn-Off Time ^e DG2736 (EN) | t _{OFF(EN)} | | Room | | 35 | 58 | |
| | | Full | | | 60 | | |
| Off-Isolation ^d | O _{IRR} | R _L = 50 Ω, C _L = 5 pF, f = 100 kHz | Room | | - 70 | | dB |
| Crosstalk ^d | X _{TALK} | | | | - 70 | | |
| 3dB bandwidth ^d | | R _L = 50 Ω, C _L = 5 pF | Room | | 50 | | MHz |
| NO, NC Off Capacitance ^d | C _{NO(off)} | V _{IN} = 0 V, or V+, f = 1 MHz | Room | | 55 | | pF |
| | C _{NC(off)} | | | | 55 | | |
| Channel On Capacitance ^d | C _{NO(on)} | | | | 130 | | |
| | C _{NC(on)} | | | | 130 | | |
| Power Supply | | | | | | | |
| Power Supply Range | V+ | | | 1.65 | | 4.3 | V |
| Power Supply Current | I+ | V _{IN} = 0 or V+ | Full | | | 1 | μA |

Notes:

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

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

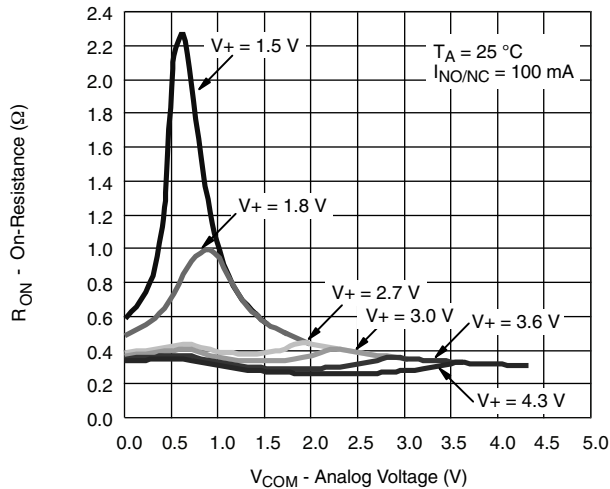
c. Typical values are for design aid only, not guaranteed nor subject to production testing.

d. Guarantee by design, not subjected to production test.

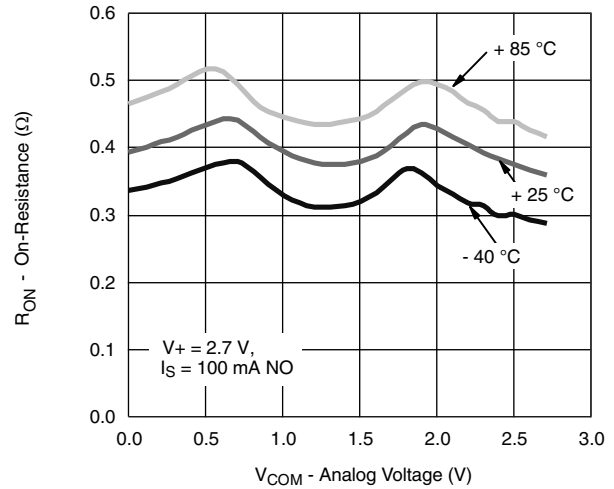
e. V_{IN} = input voltage to perform proper function.

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.

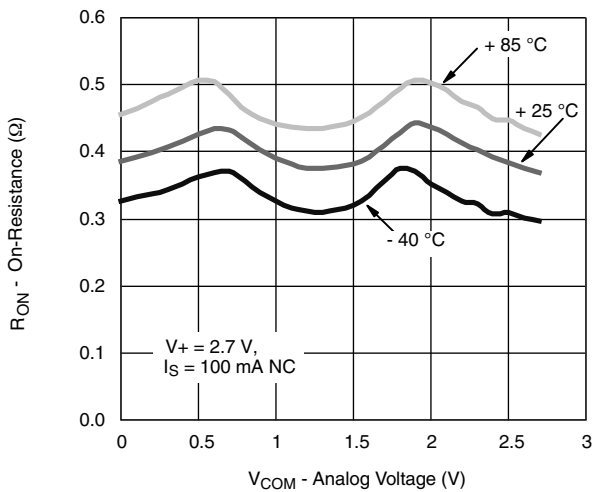
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)



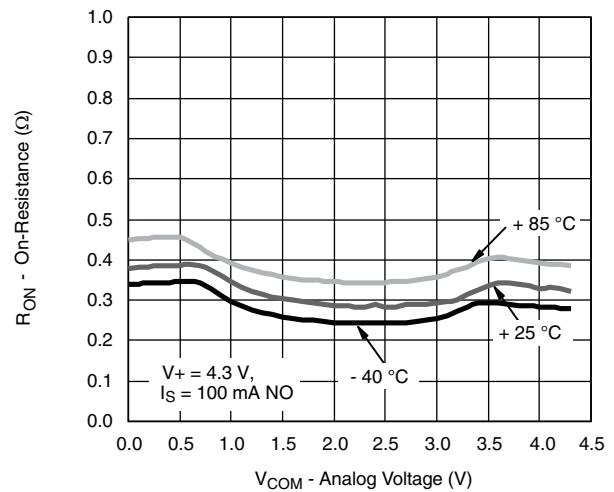
R_{ON} vs. V_{COM} and Supply Voltage



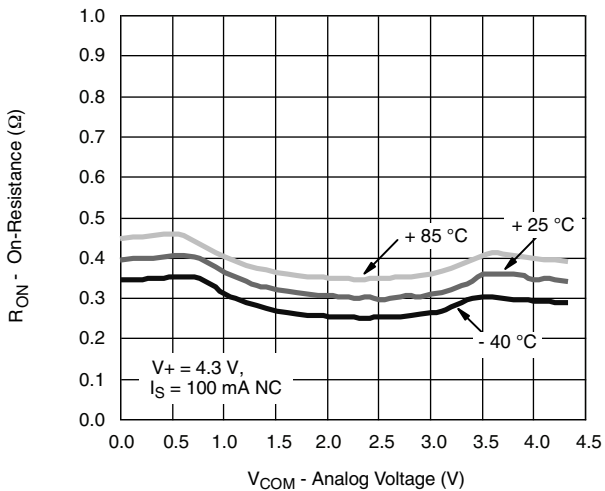
R_{ON} vs. Analog Voltage and Temperature



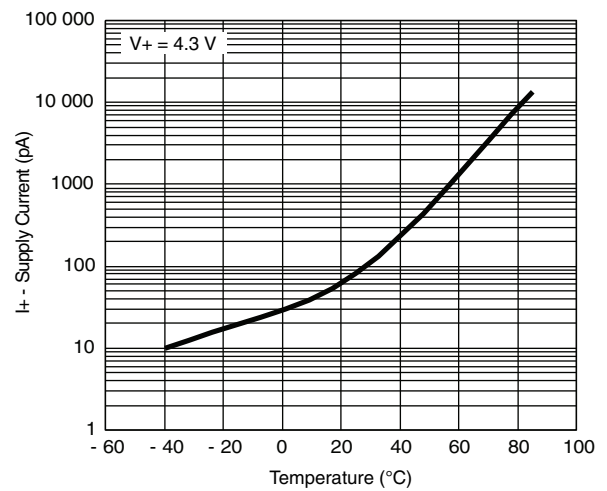
R_{ON} vs. Analog Voltage and Temperature



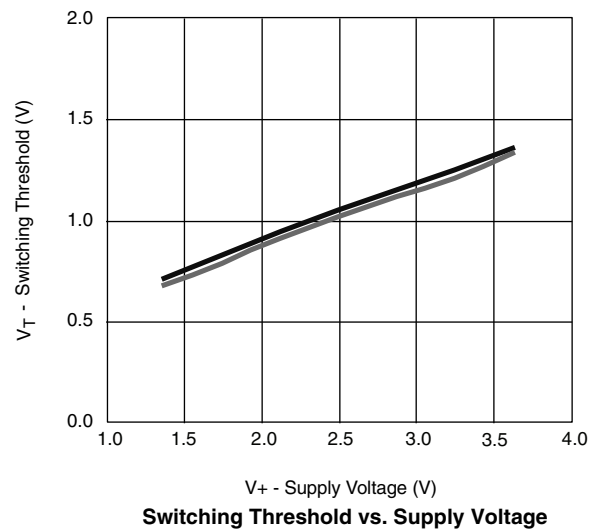
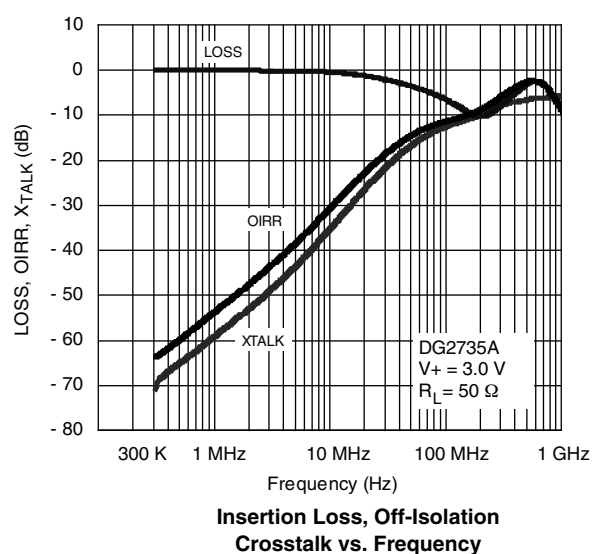
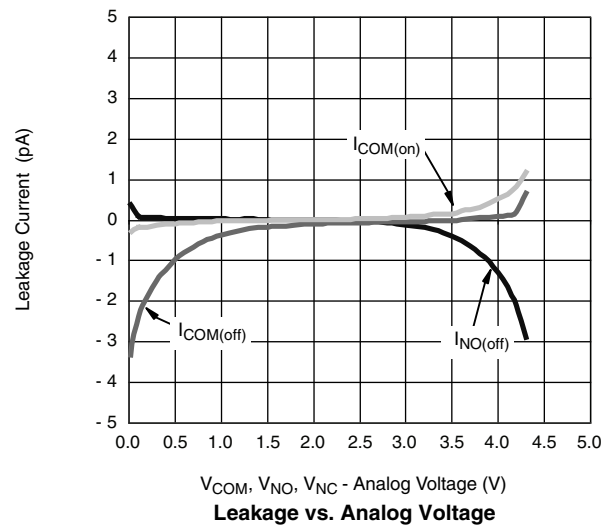
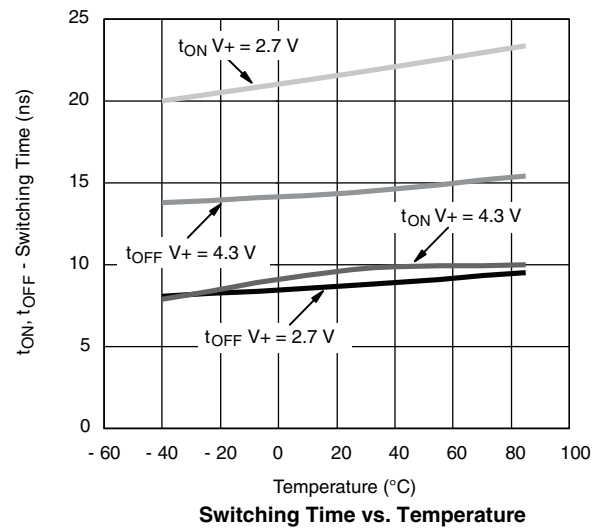
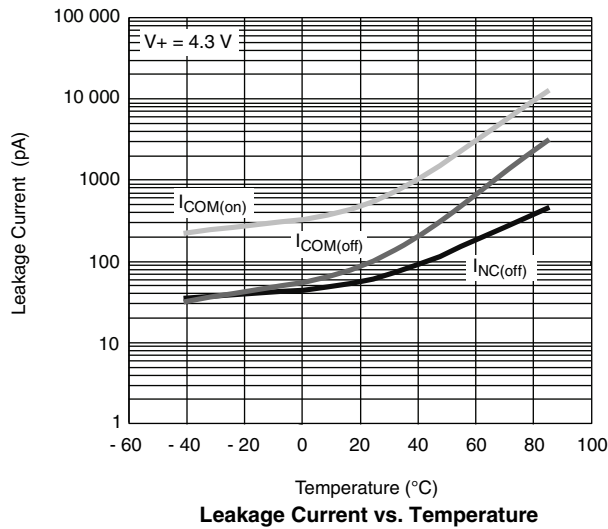
R_{ON} vs. Analog Voltage and Temperature



R_{ON} vs. Analog Voltage and Temperature



Supply Current vs. Temperature

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


TEST CIRCUITS

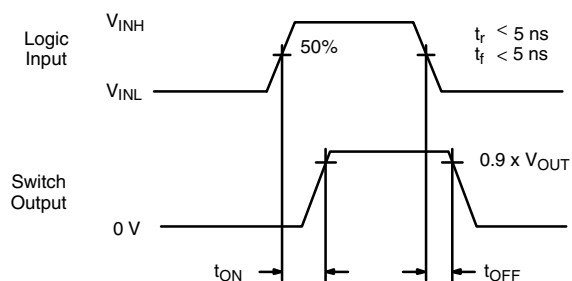
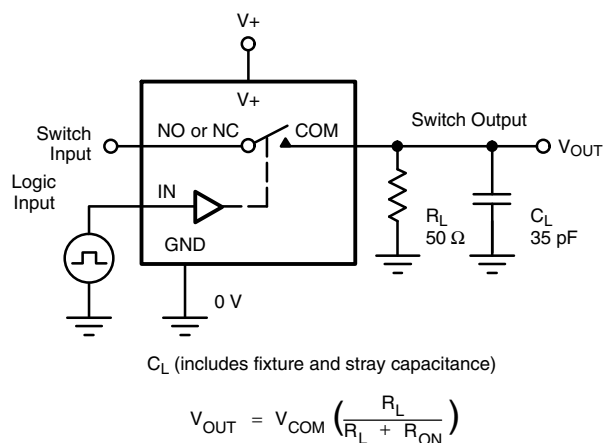


Figure 1. Switching Time

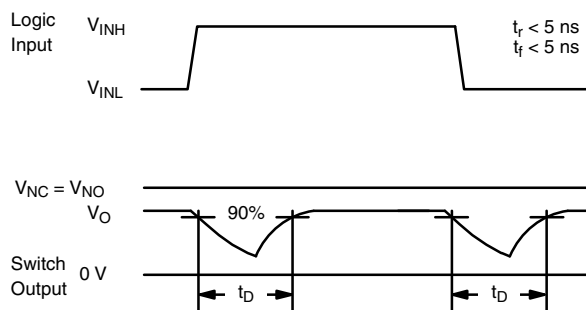
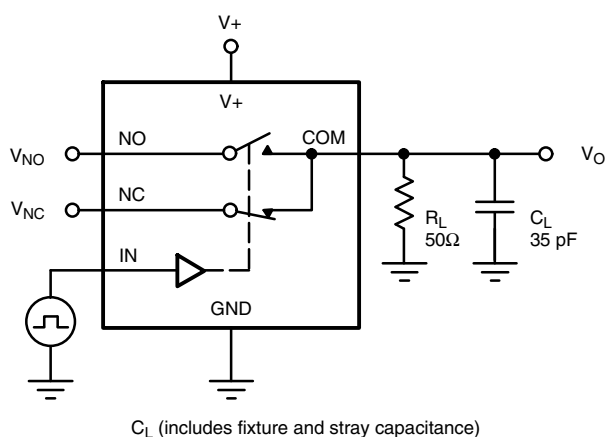
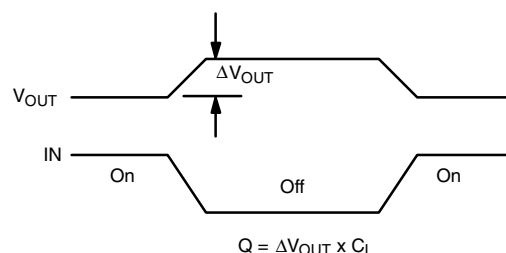
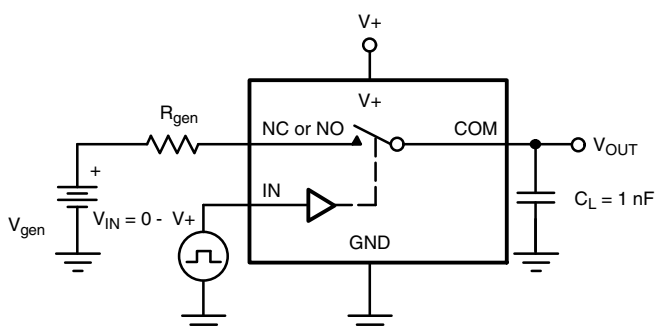
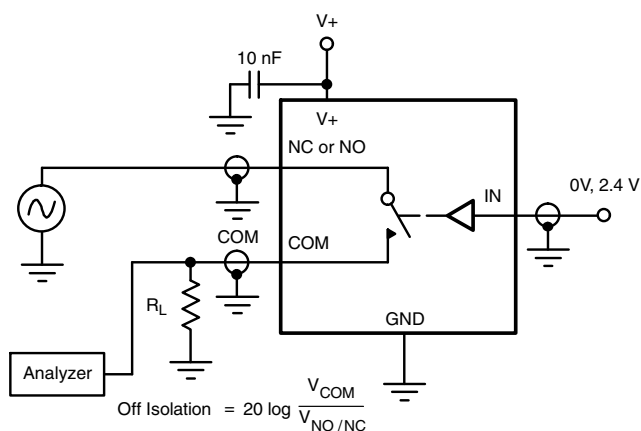
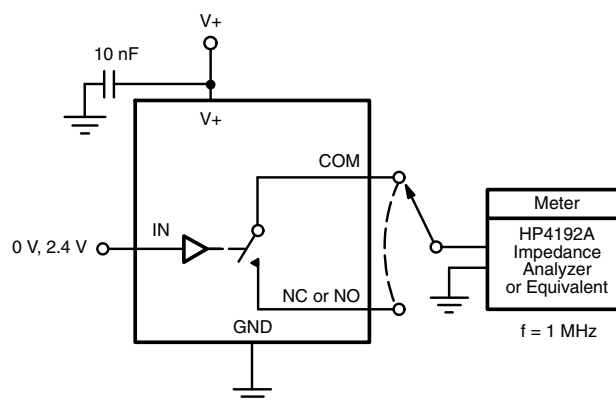


Figure 2. Break-Before-Make Interval

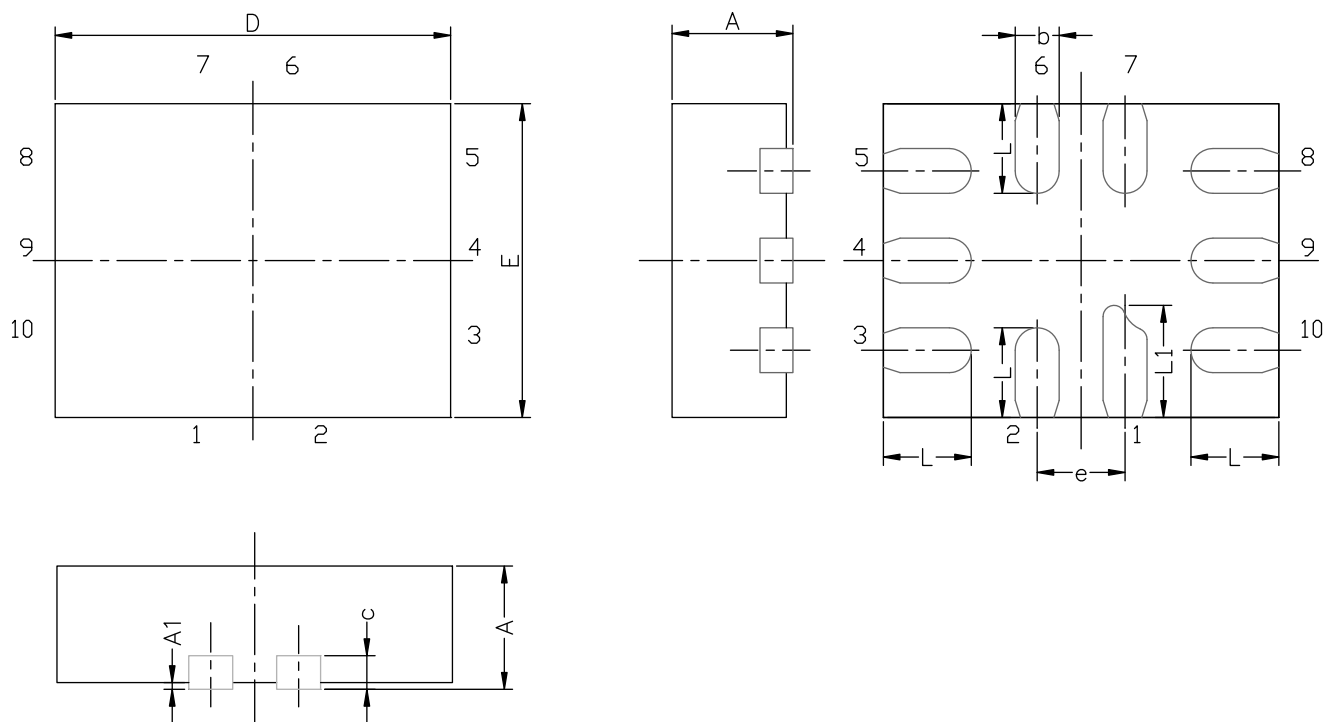
TEST CIRCUITS


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

Figure 3. Charge Injection

Figure 4. Off-Isolation

Figure 5. Channel Off/On Capacitance

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MINI QFN-10L CASE OUTLINE



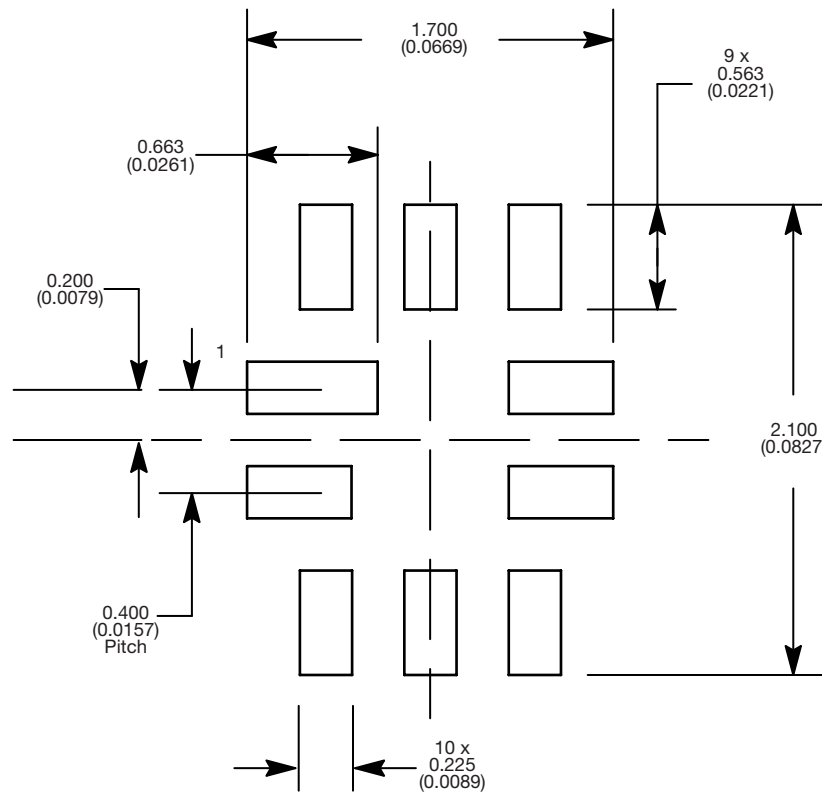
| DIM | MILLIMETERS | | | INCHES | | |
|-----|-----------------------------------|------|------|-----------------------------------|--------|--------|
| | MIN. | NAM. | MAX. | MIN. | NAM. | MAX. |
| A | 0.45 | 0.55 | 0.60 | 0.0177 | 0.0217 | 0.0236 |
| A1 | 0.00 | - | 0.05 | 0.000 | - | 0.002 |
| b | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| c | 0.150 or 0.127 REF ⁽¹⁾ | | | 0.006 or 0.005 REF ⁽¹⁾ | | |
| D | 1.70 | 1.80 | 1.90 | 0.067 | 0.071 | 0.075 |
| E | 1.30 | 1.40 | 1.50 | 0.051 | 0.055 | 0.059 |
| 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 |

Note

⁽¹⁾ The dimension depends on the leadframe that assembly house used.

ECN T16-0163-Rev. B, 16-May-16
DWG: 5957

RECOMMENDED MINIMUM PADS FOR MINI QFN 10L



Mounting Footprint
Dimensions in mm (inch)



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