# 6.8Ω, High Speed, Low Voltage, Dual, DPDT Analog Switch

**UM3671QAG** ***QFN16 2.6×1.8***
**UM3671QCG** ***QFN16 3.0×3.0***

## 1 Description

The UM3671 is a high speed, dual, dual-pole/double-throw (DPDT) analog switch. It operates from a single +1.65V to +5.5V power supply. Additionally, the UM3671 has only one select pin to control whether the COM port is connected to the NC or NO pin.

The UM3671 features dual 6.8Ω $R_{ON}$ (TYP) DPDT switches with 500MHz bandwidth and low crosstalk. The high performances and low power consumption make it a good choice for portable equipment, audio and video signal routing.

The UM3671 is available in QFN16 2.6×1.8 and QFN16 3.0×3.0 package. The device is characterized over ambient free-air temperatures from -40℃ to 125℃.

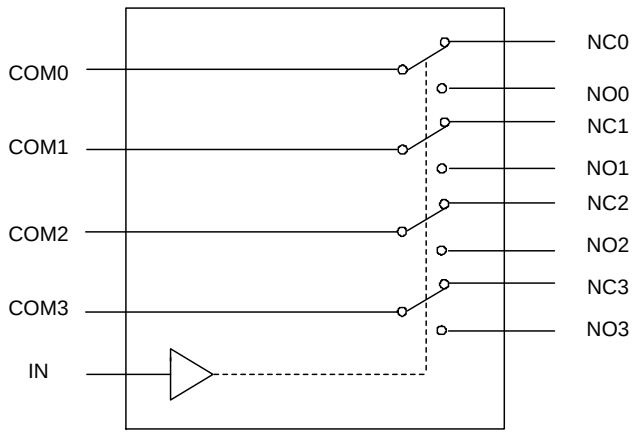
## 2 Applications

- Communication System
- Cell Phone
- Portable Equipment
- Audio Signal Routing
- Audio and Video Switching
- Computer Peripherals
- Modems
- PDAs

## 3 Features

- Single-Supply Operation: 1.65V to 5.5V
- -3dB Bandwidth: 500MHz
- Low On-Resistance: 6.8Ω (TYP)
- Low On-Resistance Flatness
- High Off-Isolation: -60dB (10MHz)
- Low Crosstalk: -60dB (10MHz)
- Fast Switching Time ($V_+$=5V):
  - $t_{ON}$: 29ns
  - $t_{OFF}$: 15ns
- Typical Power Consumption: 0.5μW
- Power OFF Protection: When $V_{CC}$=0V, input signal can tolerate up to 5.5V
- Rail-to-Rail Operation
- TTL/CMOS Compatible

## 4 Block Diagram



## 5 Order Information

| Part Number | Packaging Type | Marking Code | Shipping Qty |
|---|---|---|---|
| UM3671QAG | QFN16 2.6×1.8 | 3671 | 3000pcs/7 Inch Tape & Reel |
| UM3671QCG | QFN16 3.0×3.0 | UM3671 | 3000pcs/13 Inch Tape & Reel |

## 6 Pin Configuration and Function

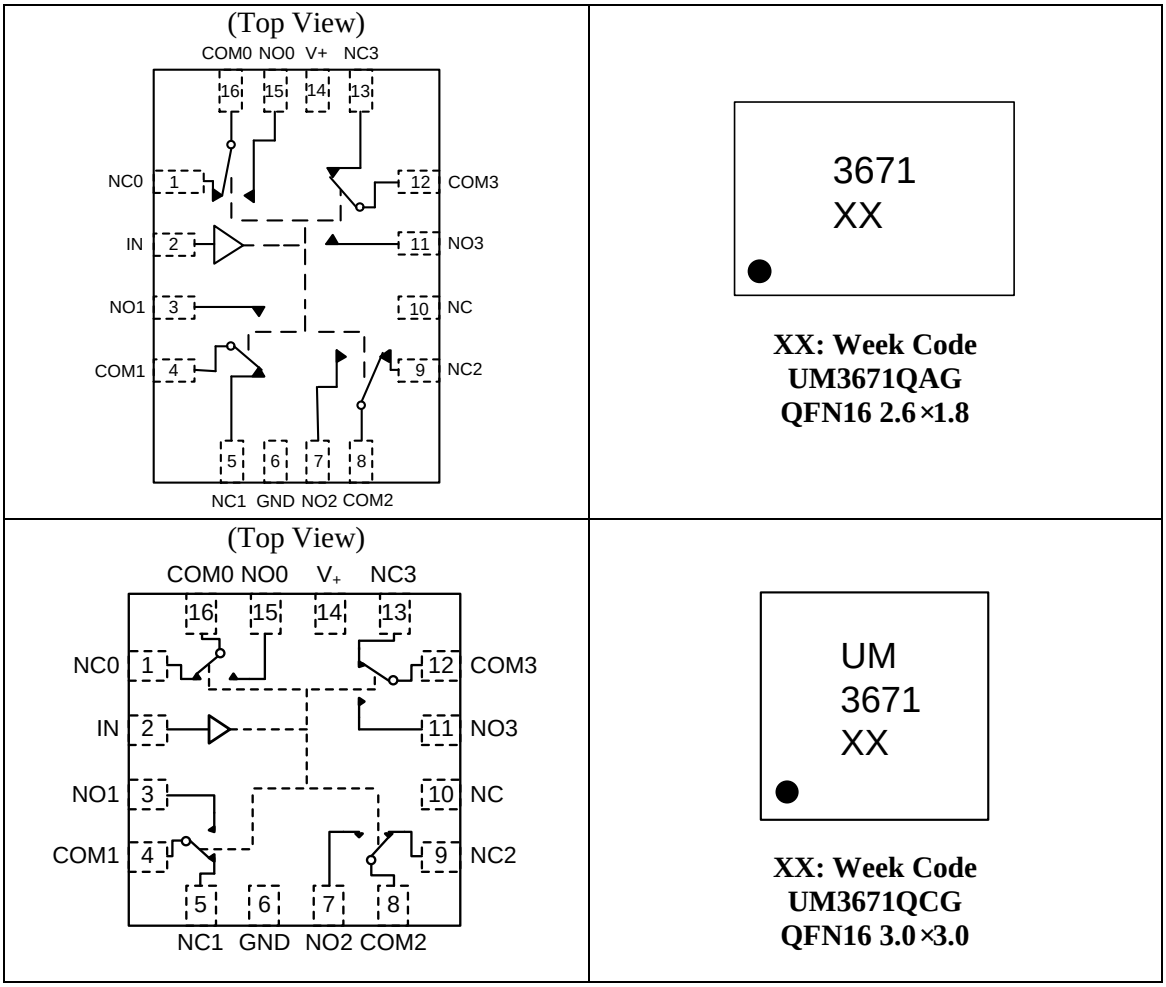



Table 6-1. Pin Functions

| Pin No. | Pin Name | Function |
|---|---|---|
| 1, 5, 9, 13 | NCx | Normally Closed Pins. |
| 2 | IN | Digital Control Input Pin to Connect the COM Pins to the NO or NC Pins. |
| 6 | GND | Ground. |
| 10 | NC | Not Internally Connected. |
| 14 | $V_+$ | Positive Power Supply. |
| 15, 3, 7, 11 | NOx | Normally Open Pins. |
| 16, 4, 8, 12 | COMx | Common Pins. |
| Exposed Pad | GND | Exposed Pad for QFN16 3.0×3.0 package. It should be soldered to PCB board and connected to GND. |

## 7 Function Table

| IN | Function | |
|---|---|---|
| | NC0, NC1, NC2, NC3 | NO0, NO1, NO2, NO3 |
| 0 | ON | OFF |
| 1 | OFF | ON |

## 8 Specifications

### 8.1 Absolute Maximum Ratings (Note1)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_+$ | Supply voltage | | -0.3 | | 6.0 | V |
| $V_I$ | Input Voltage on COMx, NCx, NOx pins | | -0.3 | | $V_+$+0.3 | V |
| | Input Voltage on IN pin | | -0.3 | | $V_+$+0.3 | V |
| $V_{ESD}$ | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 | All pins | | ±8 | | kV |
| $I_O$ | Continuous Current | | -200 | | 200 | mA |
| $T_A$ | Operating free-air temperature | | -40 | | 125 | ℃ |
| $T_J$ | Junction Temperature | | -40 | | 150 | ℃ |
| $T_{STG}$ | Storage temperature | | -65 | | 150 | ℃ |
| $T_L$ | Lead Temperature for Soldering 10 Seconds | | | | 260 | ℃ |

Note 1: Operation outside the Absolute Maximum Ratings may cause permanent device damage. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Operating the device in this manner may affect device reliability, functionality, performance, and shorten the device lifetime.

## 8.2 Electrical Characteristics

$V_+$=4.5V to 5.5V, $T_A$ = -40℃ to 125℃, unless otherwise noted. Typical values are at $V_+$=5V, $T_A$=25℃.

| Symbol | Parameter | Test Conditions | Temp | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Analog Switch** | | | | | | | |
| $V_{NO}$ | Analog Signal Range | | Full | 0 | | V+ | V |
| $V_{NO}$ | | | | 0 | | V+ | V |
| $V_{COM}$ | | | | 0 | | V+ | V |
| $R_{ON}$ | On-Resistance | $V_+$ = 4.5V,$V_{NO}$ or $V_{NC}$ = 1.2V, $I_{COM}$ = -100mA, see Figure 9-1 | 25℃ | | 6.8 | 9 | Ω |
| | | | Full | | | 10 | Ω |
| $\triangle R_{ON}$ | On-Resistance Match Between Channels | $V_+$ = 4.5V,$V_{NO}$ or $V_{NC}$ = 1.2V, $I_{COM}$ = -100mA, see Figure 9-1 | 25℃ | | 0.4 | 2.5 | Ω |
| | | | Full | | | 3 | Ω |
| $R_{FLAT(ON)}$ | Resistance Flatness | $V_+$ = 4.5V,$V_{NO}$ or $V_{NC}$ = 1.2V, 4.5V, $I_{COM}$ = -100mA, see Figure 9-1 | 25℃ | | 2 | 3 | Ω |
| | | | Full | | | 3.5 | Ω |
| $I_{NC(OFF)}$ | Source Off Leakage Current | $V_+$=5.5V, $V_{COM}$ =3.3V/0.3V, $V_{NO}$ or $V_{NC}$ =3.3V/0.3V | Full | | | 1 | μA |
| $I_{NO(OFF)}$ | | | | | | 1 | μA |
| $I_{NC(ON)}$ | Channel On Leakage Current | $V_+$=5.5V, $V_{COM}$ =3.3V/0.3V, $V_{NO}$ or $V_{NC}$ = floating | Full | | | 1 | μA |
| $I_{NO(ON)}$ | | | | | | 1 | μA |
| **Digital Inputs** | | | | | | | |
| $V_{IH}$ | Input High Voltage | | Full | 1.6 | | | V |
| $V_{IL}$ | Input Low Voltage | | Full | | | 0.5 | V |
| $I_{IN}$ | Input Leakage Current | $V_+$=5.5V, $V_{IN}$ =0V or 5.5V | Full | | | 1 | μA |
| **Dynamic Characteristics** | | | | | | | |
| $t_{ON}$ | Turn On Time | $V_{NC}$ or $V_{NO}$=3V, $R_L$=300Ω, $C_L$=35pF, see Figure 9-2 | 25℃ | | 29 | | ns |
| $t_{OFF}$ | Turn Off Time | | 25℃ | | 15 | | ns |
| $t_D$ | Break-Before-Make Time Delay | $V_{NC}$ or $V_{NO}$=3V,$R_L$=300Ω, $C_L$=35pF, see Figure 9-4 | 25℃ | | 14 | | ns |
| Q | Charge Injection | $V_S$=GND, $R_S$=0Ω, $V_{IH}$=3V, $V_{IL}$=0V, $C_L$=1nF, $Q=C_L \times V_{OUT}$, see Figure 9-3 | 25℃ | | 30 | | pC |
| $O_{ISO}$ | Off Isolation | Signal = 0dBm, $R_L$ = 50Ω, see Figure 9-5 — 1MHz | 25℃ | | -75 | | dB |
| | | 10MHz | 25℃ | | -55 | | dB |
| $X_{TALK}$ | Channel-to-Channel Crosstalk | Signal = 0dBm, $R_L$ = 50Ω, see Figure 9-6 — 1MHz | 25℃ | | -75 | | dB |
| | | 10MHz | 25℃ | | -60 | | dB |
| BW | -3dB Bandwidth | Signal = 0dBm, $R_L$ = 50Ω, see Figure 9-7 | 25℃ | | 500 | | MHz |

## 8.2 Electrical Characteristics (continued)

$V_+$=4.5V to 5.5V, $T_A$ = -40℃ to 125℃, unless otherwise noted. Typical values are at $V_+$=5V, $T_A$=25℃.

| Symbol | Parameter | Test Conditions | Temp | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Dynamic Characteristics** | | | | | | | |
| $C_{NC(ON)}$ | Channel On Capacitance | | 25℃ | | 43 | | pF |
| $C_{NO(ON)}$ | | | | | 43 | | pF |
| $C_{COM(ON)}$ | | | | | 43 | | pF |
| **Power Requirements** | | | | | | | |
| $V_+$ | Power Supply Range | | Full | 1.65 | | 5.5 | V |
| $I_+$ | Power Supply Current | $V_+$=5.5V, $V_{IN}$=0V or $V_+$ | Full | | | 1 | μA |

## 8.2 Electrical Characteristics (continued)

$V_+$=2.7V to 3.6V, $T_A$ = -40℃ to 125℃, unless otherwise noted. Typical values are at $V_+$=3V, $T_A$=25℃.

| Symbol | Parameter | Test Conditions | | Temp | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| **Analog Switch** | | | | | | | | |
| $V_{NO}$ | Analog Signal Range | | | Full | 0 | | V+ | V |
| $V_{NO}$ | | | | | 0 | | V+ | V |
| $V_{COM}$ | | | | | 0 | | V+ | V |
| $R_{ON}$ | On-Resistance | $V_+$ = 2.7V,$V_{NO}$ or $V_{NC}$ = 1.2V, $I_{COM}$ = -10mA, see Figure 9-1 | | 25℃ | | 15 | 17 | Ω |
| | | | | Full | | | 20 | Ω |
| $\triangle R_{ON}$ | On-Resistance Match Between Channels | $V_+$ = 2.7V,$V_{NO}$ or $V_{NC}$ = 1.2V, $I_{COM}$ = -10mA, see Figure 9-1 | | 25℃ | | 1 | 3 | Ω |
| | | | | Full | | | 4 | Ω |
| $R_{FLAT(ON)}$ | Resistance Flatness | $V_+$ = 4.5V,$V_{NO}$ or $V_{NC}$ = 1.2V, 4.5V, $I_{COM}$ = -10mA, see Figure 9-1 | | 25℃ | | 6 | 9 | Ω |
| | | | | Full | | | 12 | Ω |
| $I_{NC(OFF)}$ | Source Off Leakage Current | $V_+$=3.6V, $V_{COM}$ =3.3V/0.3V, $V_{NO}$ or $V_{NC}$ =3.3V/0.3V | | Full | | | 1 | μA |
| $I_{NO(OFF)}$ | | | | | | | 1 | μA |
| $I_{NC(ON)}$ | Channel On Leakage Current | $V_+$=3.6V, $V_{COM}$ =3.3V/0.3V, $V_{NO}$ or $V_{NC}$ = floating | | Full | | | 1 | μA |
| $I_{NO(ON)}$ | | | | | | | 1 | μA |
| **Digital Inputs** | | | | | | | | |
| $V_{IH}$ | Input High Voltage | | | Full | 1.5 | | | V |
| $V_{IL}$ | Input Low Voltage | | | Full | | | 0.4 | V |
| $I_{IN}$ | Input Leakage Current | $V_+$=5.5V, $V_{IN}$ =0V or 3.6V | | Full | | | 1 | μA |
| **Dynamic Characteristics** | | | | | | | | |
| $t_{ON}$ | Turn On Time | $V_{NC}$ or $V_{NO}$=1.5V, $R_L$=300Ω, $C_L$=35pF, see Figure 9-2 | | 25℃ | | 35 | | ns |
| $t_{OFF}$ | Turn Off Time | | | 25℃ | | 20 | | ns |
| $t_D$ | Break-Before-Make Time Delay | $V_{NC}$ or $V_{NO}$=1.5V, $R_L$=300Ω, $C_L$=35pF, see Figure 9-4 | | 25℃ | | 14 | | ns |
| Q | Charge Injection | $V_S$=GND, $R_S$=0Ω, $V_{IH}$=1.5V, $V_{IL}$=0V, $C_L$=1nF, $Q=C_L \times V_{OUT}$, see Figure 9-3 | | 25℃ | | 30 | | pC |
| $O_{ISO}$ | Off Isolation | Signal = 0dBm, $R_L$ = 50Ω, see Figure 9-5 | 1MHz | 25℃ | | -75 | | dB |
| | | | 10MHz | 25℃ | | -55 | | dB |
| $X_{TALK}$ | Channel-to-Channel Crosstalk | Signal = 0dBm, $R_L$ = 50Ω, see Figure 9-6 | 1MHz | 25℃ | | -75 | | dB |
| | | | 10MHz | 25℃ | | -60 | | dB |
| BW | -3dB Bandwidth | Signal = 0dBm, $R_L$ = 50Ω, see Figure 9-7 | | 25℃ | | 500 | | MHz |

## 8.2 Electrical Characteristics (continued)

$V_+$=2.7V to 3.6V, $T_A$ = -40℃ to 125℃, unless otherwise noted. Typical values are at $V_+$=3V, $T_A$=25℃.

| Symbol | Parameter | Test Conditions | Temp | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Dynamic Characteristics** | | | | | | | |
| $C_{NC(ON)}$ | Channel On Capacitance | | 25℃ | | 43 | | pF |
| $C_{NO(ON)}$ | | | | | 43 | | pF |
| $C_{COM(ON)}$ | | | | | 43 | | pF |

## 9 Parameter Measurement Information

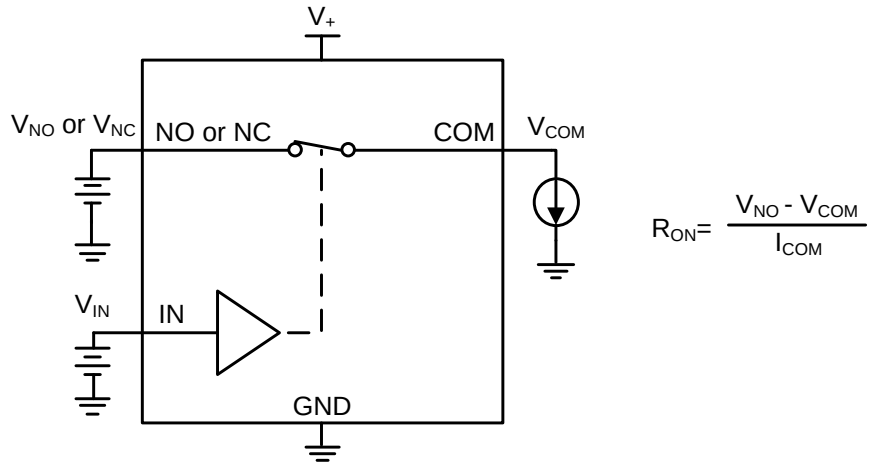



Figure 9-1. On-state Resistance ($R_{ON}$)

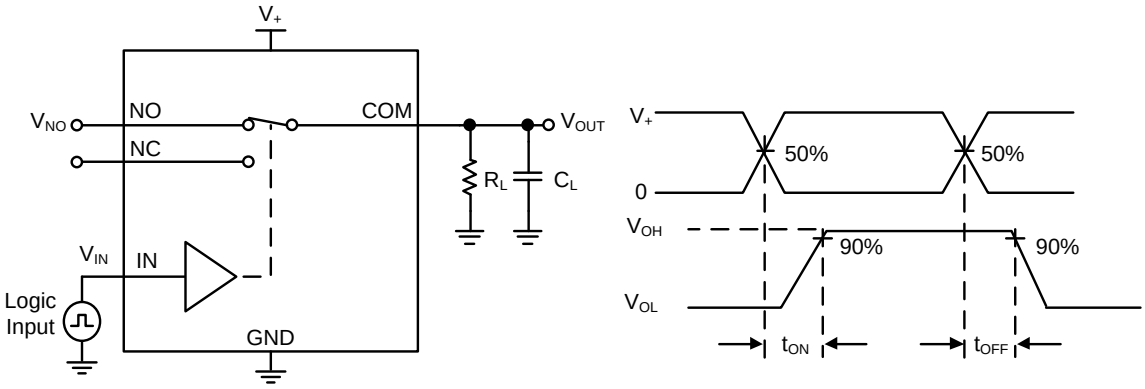



Figure 9-2. Switching Times ($t_{ON}$, $t_{OFF}$)

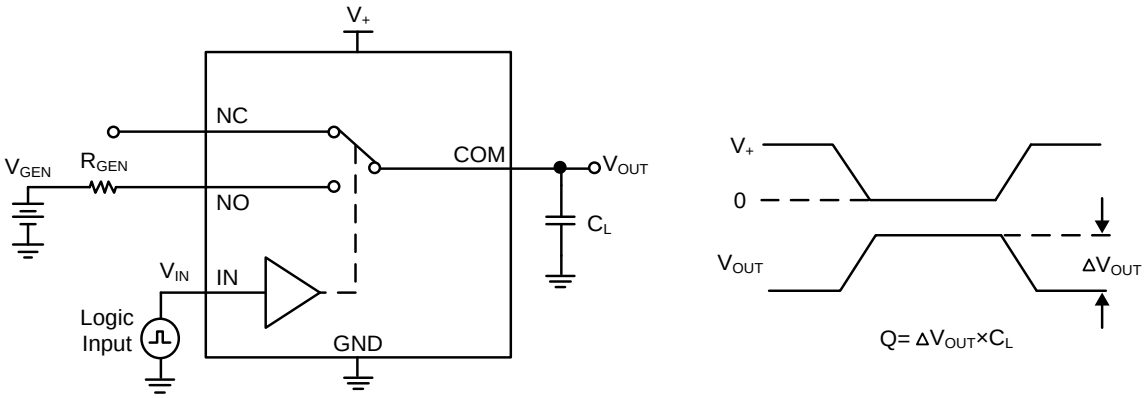



Figure 9-3. Charge Injection (Q)

## 9 Parameter Measurement Information (continued)

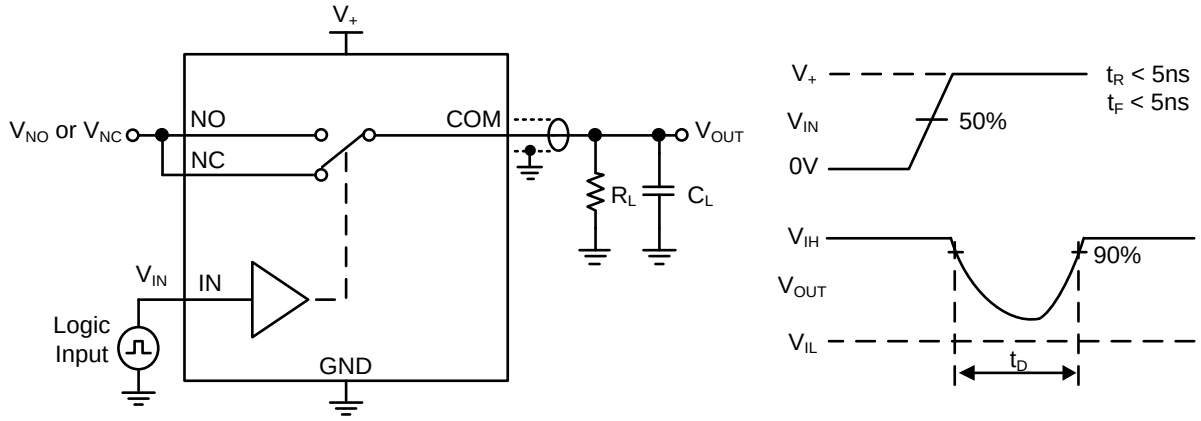



Figure 9-4. Break-Before-Make Time Delay ($t_D$)

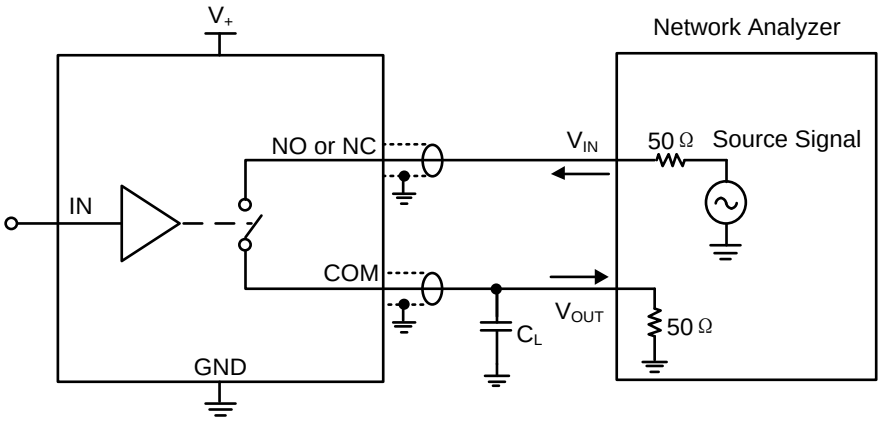
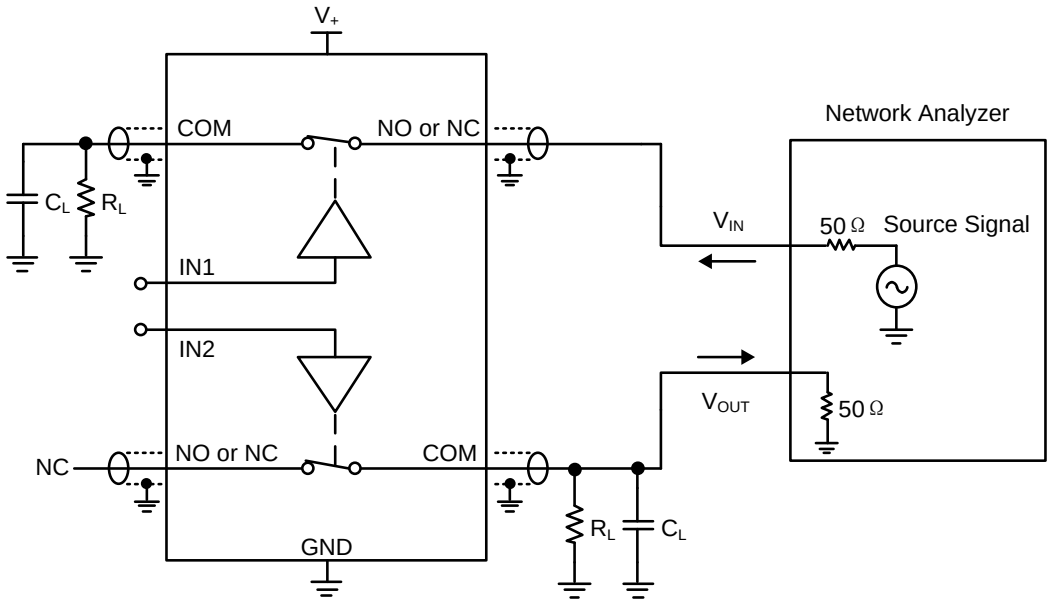



Figure 9-5. Off-Isolation ($O_{ISO}$)




Channel-to-Channel Crosstalk = -20 log($V_{NO}$/$V_{OUT}$)

Figure 9-6. Channel-to-Channel Crosstalk ($X_{TALK}$)

## 9 Parameter Measurement Information (continued)

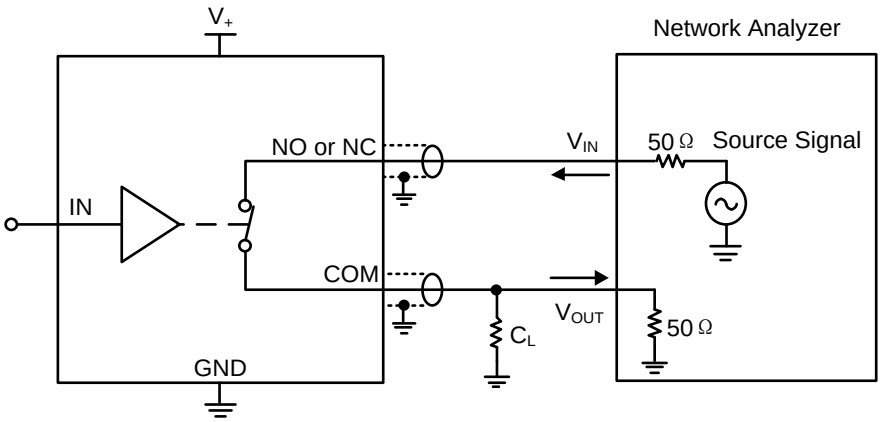
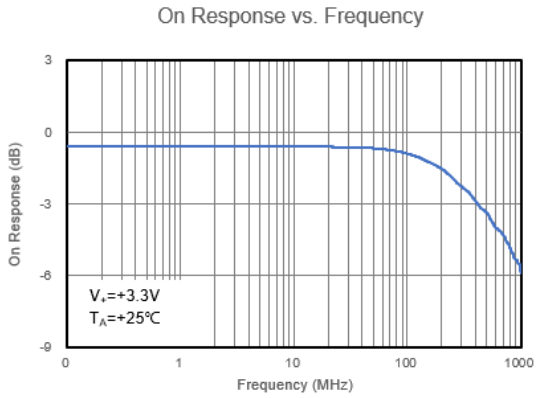
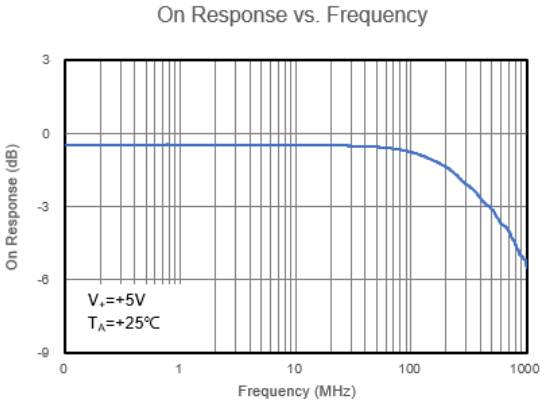
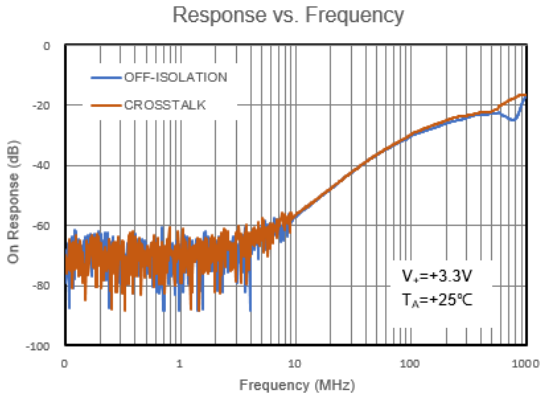


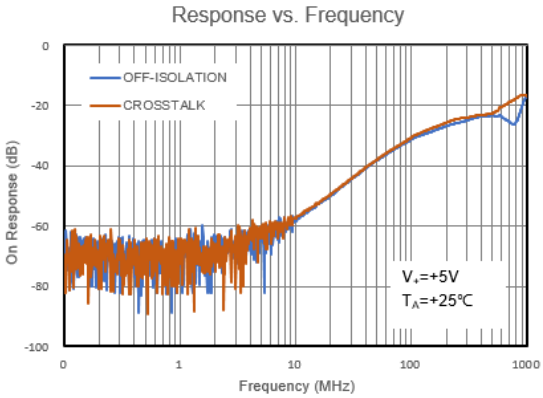

Figure 9-7. -3dB Bandwidth (BW)

## 10 Typical Performance Characteristics



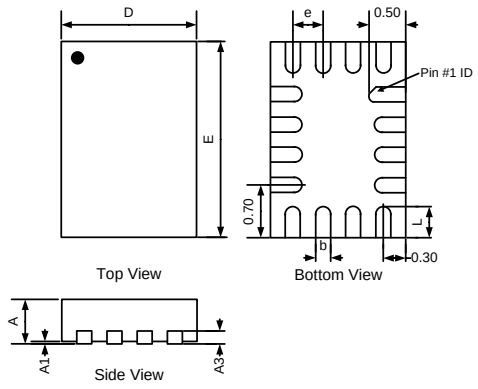



## Package Information

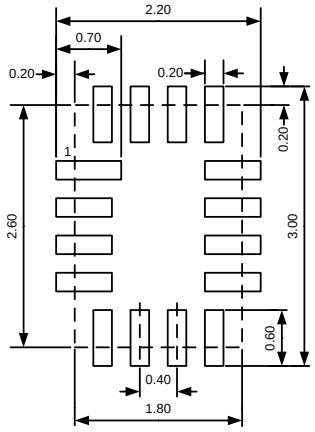
### QFN16 2.6×1.8

**Outline Drawing**




| DIMENSIONS | | | | | | |
|---|---|---|---|---|---|---|
| Symbol | MILLIMETERS | | | INCHES | | |
| | Min | Typ | Max | Min | Typ | Max |
| A | >0.50 | 0.55 | 0.60 | >0.020 | 0.022 | 0.024 |
| A1 | 0.00 | - | 0.05 | 0.000 | - | 0.002 |
| A3 | 0.15REF | | | 0.006REF | | |
| b | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| D | 1.75 | 1.80 | 1.85 | 0.069 | 0.071 | 0.073 |
| E | 2.55 | 2.60 | 2.65 | 0.100 | 0.102 | 0.104 |
| e | 0.40BSC | | | 0.016BSC | | |
| L | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 |

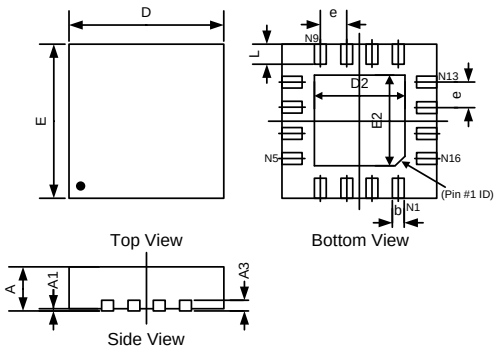
**Land Pattern**




NOTES:
1. Compound dimension: 2.60×1.80 ;
2. Unit: mm;
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

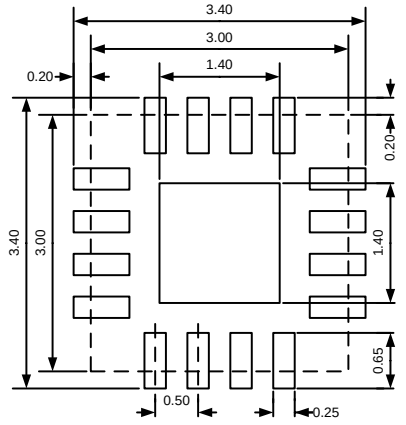
## QFN16 3.0×3.0

### Outline Drawing



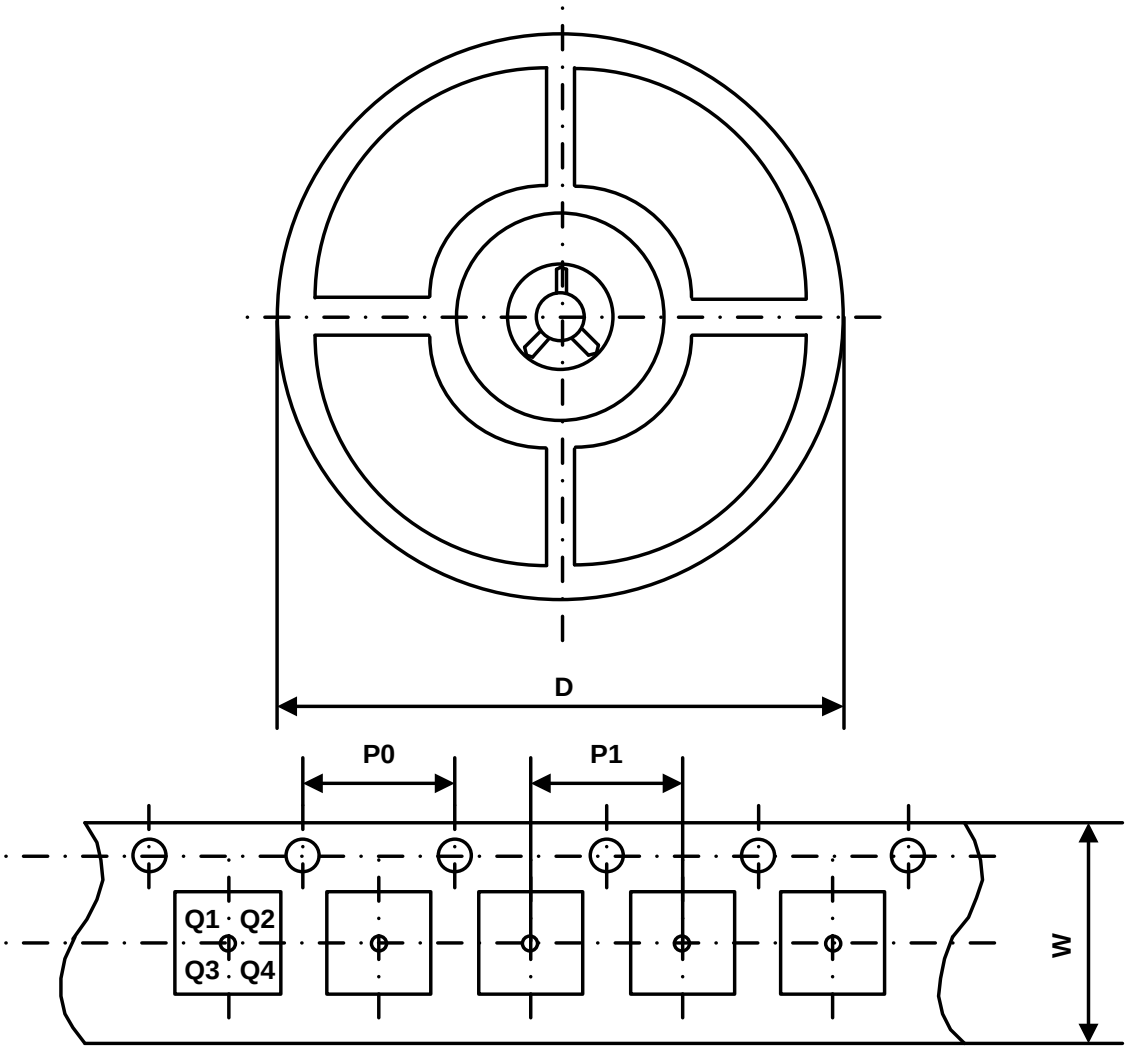

| DIMENSIONS | | | | | | |
|---|---|---|---|---|---|---|
| Symbol | MILLIMETERS | | | INCHES | | |
| | Min | Typ | Max | Min | Typ | Max |
| A | 0.55 | - | 0.80 | 0.022 | - | 0.031 |
| A1 | 0.00 | - | 0.05 | 0.000 | - | 0.002 |
| A3 | 0.20REF | | | 0.008REF | | |
| b | 0.18 | - | 0.30 | 0.007 | - | 0.012 |
| D | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| D2 | 1.55 | - | 1.86 | 0.061 | - | 0.073 |
| E | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| E2 | 1.55 | - | 1.86 | 0.061 | - | 0.073 |
| e | 0.50TYP | | | 0.020TYP | | |
| L | 0.25 | 0.40 | 0.55 | 0.010 | 0.016 | 0.022 |

### Land Pattern




NOTES:
1. Compound dimension: 3.00×3.00;
2. Unit: mm;
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

## Packing Information




| Part Number | Package Type | Carrier Width (W) | Pitch (P0) | Pitch (P1) | Reel Size (D) | PIN 1 Quadrant |
|---|---|---|---|---|---|---|
| UM3671QAG | QFN16 2.6×1.8 | 8 mm | 4 mm | 4 mm | 180 mm | Q1 |
| UM3671QCG | QFN16 3.0×3.0 | 12 mm | 4 mm | 8 mm | 330 mm | Q1 |

## GREEN COMPLIANCE

Union Semiconductor is committed to environmental excellence in all aspects of its operations including meeting or exceeding regulatory requirements with respect to the use of hazardous substances. Numerous successful programs have been implemented to reduce the use of hazardous substances and/or emissions.
All Union components are compliant with the RoHS directive, which helps to support customers in their compliance with environmental directives. For more green compliance information, please visit:
https://www.union-ic.com/Quality.html

## IMPORTANT NOTICE

The information in this document has been carefully reviewed and is believed to be accurate. Nonetheless, this document is subject to change without notice. Union assumes no responsibility for any inaccuracies that may be contained in this document, and makes no commitment to update or to keep current the contained information, or to notify a person or organization of any update. Union reserves the right to make changes, at any time, in order to improve reliability, function or design and to attempt to supply the best product possible.