

## 双通道、超低导通电阻、双刀双掷 (DPDT) 模拟开关

UM3699A QFN16 3.0×3.0

### 描述

UM3699A是一款双独立通道、超低导通电阻、双刀双掷 (DPDT) 模拟开关。该器件专为手机应用中的低压、高电流扬声器输出开关而设计。它们能够切换平衡立体声输出，并且在单声道模式下切换平衡麦克风、扬声器和铃声发生器。UM3699A 没有内部分流电阻，因此可用于在不连接 NO 或 NC 端子时作为保持特定电压的数据线开关，避免分流电阻上的功率损耗。这些设备还具有“先断后合”功能，可进一步减少器件损坏的风险。

### 应用

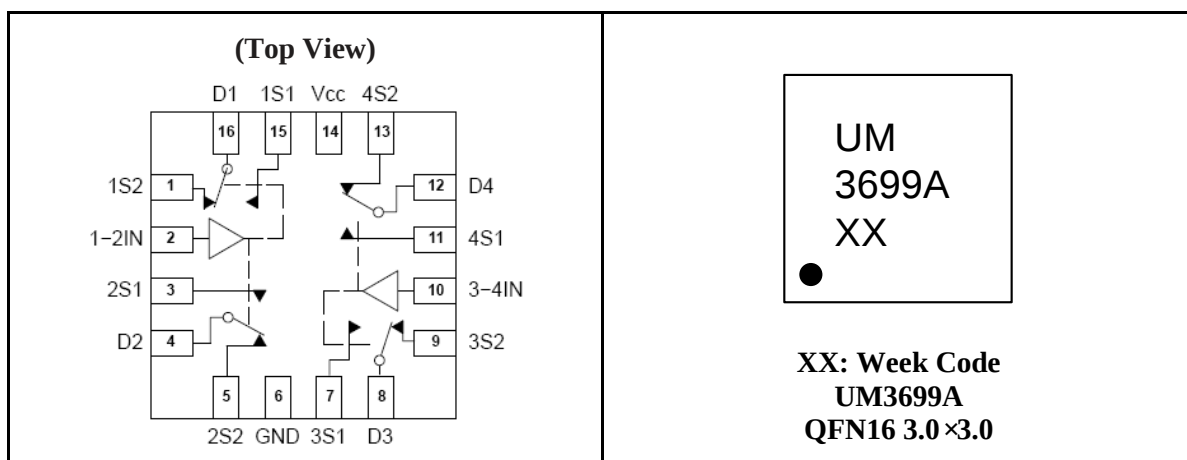
- 手机扬声器/麦克风切换
- 铃声芯片/放大器切换
- 四个非平衡（单端）开关
- 平衡立体声(推挽)开关

### 特性

- 单电源供电：1.65V 至 5.5V
- 可直接由电池供电
- 最大击穿电压：6 V
- 低静态功耗
- 无铅微型QFN16 3.0×3.0封装

### 引脚配置

### 顶部视图



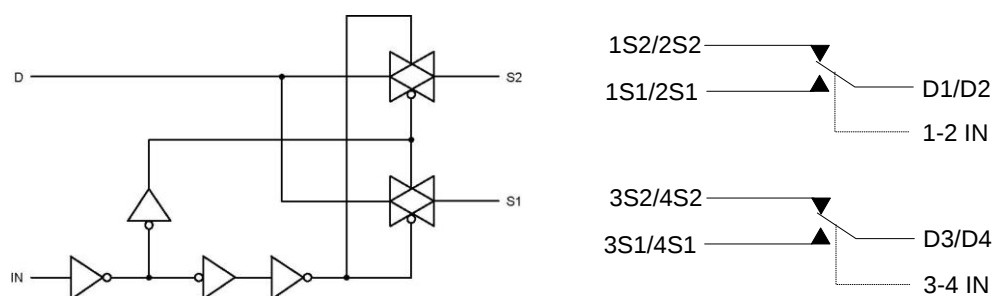
### 订购信息

| 芯片型号    | 封装类型          | 丝印编码    | 发货数量                        |
|---------|---------------|---------|-----------------------------|
| UM3699A | QFN16 3.0×3.0 | UM3699A | 3000pcs/13 Inch Tape & Reel |

## Pin Description

| Pin Number                | Symbol                 | Name and Function       |
|---------------------------|------------------------|-------------------------|
| 1, 3, 5, 7, 9, 11, 13, 15 | 1S1 to 4S1, 1S2 to 4S2 | Independent Channels    |
| 2, 10                     | 1-2IN, 3-4IN           | Controls                |
| 4, 8, 12, 16              | D1 to D4               | Common Channels         |
| 6                         | GND                    | Ground (V)              |
| 14                        | V <sub>CC</sub>        | Positive Supply Voltage |

## Internal Circuit and Diagram of UM3699A



## Truth Table

| IN | S1  | S2  |
|----|-----|-----|
| H  | ON  | OFF |
| L  | OFF | ON  |

## Absolute Maximum Ratings

| Symbol                          | Parameter                                                                          | Value                                    | Unit |
|---------------------------------|------------------------------------------------------------------------------------|------------------------------------------|------|
| V <sub>CC</sub>                 | Positive DC Supply Voltage                                                         | -0.5 to +5.5                             | V    |
| V <sub>IS</sub>                 | Analog Input Voltage (V <sub>NO_</sub> , V <sub>NC_</sub> , or V <sub>COM_</sub> ) | -0.5 ≤ V <sub>IS</sub> ≤ V <sub>CC</sub> | V    |
| V <sub>IN</sub>                 | Digital Select Input Voltage                                                       | -0.5 ≤ V <sub>IN</sub> ≤ 5.5             | V    |
| I <sub>anl1</sub>               | Continuous DC Current from COM to NC/NO                                            | ±300                                     | mA   |
| I <sub>anl-pk</sub>             | Peak Current from COM to NC/NO, 10 Duty Cycle (Note 1)                             | ±500                                     | mA   |
| I <sub>clmp</sub>               | Continuous DC Current into COM/NO/NC with Respect to V <sub>CC</sub> or GND        | ±100                                     | mA   |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise or Fall Time, V <sub>CC</sub> =3.0 V to 4.5V                            | 0    10                                  | ns/V |

## Recommended Operating Conditions

| Symbol     | Parameter                                      | Min  | Max      | Unit |
|------------|------------------------------------------------|------|----------|------|
| $V_{CC}$   | DC Supply Voltage                              | 1.65 | 5.5      | V    |
| $V_{IN}$   | Digital Select Input Voltage                   | GND  | $V_{CC}$ | V    |
| $V_{IS}$   | Analog Input Voltage (NC, NO, COM)             | GND  | $V_{CC}$ | V    |
| $T_A$      | Operating Temperature Range                    | -40  | +85      | °C   |
| $t_r, t_f$ | Input Rise or Fall Time, $V_{CC}=3.0V$ to 4.5V | 0    | 10       | ns/V |

## DC Characteristics – Digital Section (Voltages Referenced to GND)

| Symbol    | Parameter                                       | Condition                         | $V_{CC}$    | Guaranteed Limit |       | Unit |
|-----------|-------------------------------------------------|-----------------------------------|-------------|------------------|-------|------|
|           |                                                 |                                   |             | -40 °C to 25 °C  | 85 °C |      |
| $V_{IH}$  | Minimum High Level Input Voltage, Select Inputs |                                   | 1.8         | 1.2              | 1.2   | V    |
|           |                                                 |                                   | 2.5         | 1.5              | 1.5   |      |
|           |                                                 |                                   | 2.8         | 1.6              | 1.6   |      |
|           |                                                 |                                   | 3.6         | 2.8              | 2.8   |      |
| $V_{IL}$  | Maximum Low Level Input Voltage, Select Inputs  |                                   | 1.8         | 0.4              | 0.4   | V    |
|           |                                                 |                                   | 2.5         | 0.5              | 0.5   |      |
|           |                                                 |                                   | 2.8         | 0.6              | 0.6   |      |
|           |                                                 |                                   | 3.6         | 1.0              | 1.0   |      |
| $I_{IN}$  | Maximum Input Leakage Current, Select Inputs    | $V_{IN}=V_{CC}$ or GND            | 3.6         | 0.1              | 1.0   | μA   |
| $I_{OFF}$ | Power Off Leakage Current                       | $V_{IN}=V_{CC}$ or GND            | 0           | 0.5              | 2.0   | μA   |
| $I_{CC}$  | Maximum Quiescent Supply Current (Note 1)       | Select and $V_{IS}=V_{CC}$ or GND | 1.65 to 5.5 | 1.0              | 2.0   | μA   |

## DC Electrical Characteristics – Analog Section

| Symbol                                       | Parameter                                                 | Condition                                                                                                                                             | V <sub>CC</sub> | Guaranteed<br>Maximum Limit |      |       |      | Unit |
|----------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------|------|-------|------|------|
|                                              |                                                           |                                                                                                                                                       |                 | -40 °C to<br>25 °C          |      | 85 °C |      |      |
|                                              |                                                           |                                                                                                                                                       |                 | Min                         | Max  | Min   | Max  |      |
| R <sub>ON</sub>                              | NC/NO On<br>Resistance (Note 1)                           | V <sub>IN</sub> ≤V <sub>IL</sub> or<br>V <sub>IN</sub> ≥V <sub>IH</sub><br>V <sub>IS</sub> =GND to V <sub>CC</sub> ,<br>I <sub>IN</sub> ≤100mA        | 2.5             |                             | 0.65 |       | 0.75 | Ω    |
|                                              |                                                           |                                                                                                                                                       | 3.0             |                             | 0.6  |       | 0.75 |      |
|                                              |                                                           |                                                                                                                                                       | 3.6             |                             | 0.55 |       | 0.7  |      |
| R <sub>FLAT</sub>                            | NC/NO On<br>Resistance Flatness<br>(Note 1, 3)            | I <sub>COM</sub> =100mA<br>V <sub>IS</sub> =0 to V <sub>CC</sub>                                                                                      | 2.5             |                             | 0.15 |       | 0.15 | Ω    |
|                                              |                                                           |                                                                                                                                                       | 3.0             |                             | 0.15 |       | 0.15 |      |
|                                              |                                                           |                                                                                                                                                       | 3.6             |                             | 0.15 |       | 0.15 |      |
| Δ R <sub>ON</sub>                            | On-Resistance<br>Match Between<br>Channels<br>(Note 1, 2) | V <sub>IS</sub> =1.3V,<br>I <sub>COM</sub> =100mA                                                                                                     | 2.5             |                             | 0.06 |       | 0.06 | Ω    |
|                                              |                                                           | V <sub>IS</sub> =1.5V,<br>I <sub>COM</sub> =100mA                                                                                                     | 3.0             |                             | 0.05 |       | 0.05 |      |
|                                              |                                                           | V <sub>IS</sub> =2.2V,<br>I <sub>COM</sub> =100mA                                                                                                     | 3.6             |                             | 0.05 |       | 0.05 |      |
| I <sub>NC(OFF)</sub><br>I <sub>NO(OFF)</sub> | NC or NO Off<br>Leakage Current<br>(Note 1)               | V <sub>IN</sub> =V <sub>IL</sub> or V <sub>IH</sub><br>V <sub>COM</sub> =3.3V                                                                         | 3.6             | -0.1                        | 0.1  | -1    | 1    | μA   |
| I <sub>COM(ON)</sub>                         | COM ON Leakage<br>Current (Note 1)                        | V <sub>IN</sub> =V <sub>IL</sub> or V <sub>IH</sub><br>V <sub>COM</sub> =0.3V/3.3V<br>V <sub>NO</sub> or V <sub>NC</sub><br>=0.3V/3.3V or<br>Floating | 3.6             | -0.1                        | 0.1  | -1    | 1    | μA   |

Note 1: Guaranteed by design. Resistance measurements do not include test circuit or package resistance.

Note 2: Δ R<sub>ON</sub> = R<sub>ON(MAX)</sub> - R<sub>ON(MIN)</sub> between nS1 or nS2.

Note 3: Flatness is defined as the difference between the maximum and minimum value of on resistance as measured over the specified analog signal ranges.

**AC Electrical Characteristics (Input  $t_r=t_f=3.0ns$ )**

| Symbol    | Parameter                      | Test Conditions                                | $V_{CC}$ (V) | $V_{IS}$ (V) | Guaranteed Maximum Limit |       | Unit |
|-----------|--------------------------------|------------------------------------------------|--------------|--------------|--------------------------|-------|------|
|           |                                |                                                |              |              | -40 °C to 25 °C          | 85 °C |      |
| $t_{ON}$  | Turn-On Time                   | $R_L=50\Omega$ ,<br>$C_L=35pF$<br>(Figure 2&3) | 2.3 to 4.5   | 1.5          | 50                       | 60    | ns   |
| $t_{OFF}$ | Turn-Off Time                  | $R_L=50\Omega$ ,<br>$C_L=35pF$<br>(Figure 2&3) | 2.3 to 4.5   | 1.5          | 30                       | 40    | ns   |
| $t_{BBM}$ | Minimum Break-Before-Make Time | $R_L=50\Omega$ ,<br>$C_L=35pF$<br>(Figure 1)   | 3.0          | 1.5          | 15                       | 15    | ns   |

| Symbol   | Parameter                                 | Typical @ 25 °C $V_{CC}=4.5V$ | Unit |
|----------|-------------------------------------------|-------------------------------|------|
| $C_{IN}$ | Control Pin Input Capacitance             | 7.0                           | pF   |
| $C_{SN}$ | Sn Port Capacitance                       | 72                            | pF   |
| $C_D$    | D Port Capacitance When Switch is Enabled | 230                           | pF   |

**Additional Application Characteristics (Voltages Referenced to GND Unless Noted)**

| Symbol    | Parameter                                                                  | Condition                                                                                                   | $V_{CC}$ (V) | Typ  | Unit |
|-----------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------|------|------|
| BW        | Maximum On-Channel -3dB Bandwidth or Minimum Frequency Response (Figure 7) | $V_{IN}$ Centered between $V_{CC}$ and GND                                                                  | 1.65 to 4.5  | 20   | MHz  |
| $V_{ISO}$ | Off-Channel Isolation (Figure 8)                                           | $f=100kHz$ , $V_{IS}=1VRMS$ ,<br>$C_L=5pF$<br>$V_{IN}$ Centered between $V_{CC}$ and GND                    | 1.65 to 4.5  | -62  | dB   |
| Q         | Charge Injection Select Input to Common I/O                                | $V_{IN}=V_{CC}$ to GND, $R_{IS}=0\Omega$ ,<br>$C_L=1nF$<br>$Q=C_L \times V_{OUT}$                           | 1.65 to 4.5  | 50   | pC   |
| THD       | Total Harmonic Distortion THD+ Noise                                       | $f_{IS}=20Hz$ to 20kHz,<br>$R_L=R_{GEN}=600\Omega$ ,<br>$C_L=50pF$ , $V_{IS}=2V_{PP}$                       | 4.5          | 0.01 | %    |
| $V_{CT}$  | Channel-to-Channel Crosstalk (Figure 9)                                    | $f=100kHz$ , $V_{IS}=1VRMS$ ,<br>$C_L=5pF$ , $R_L=50\Omega$ ,<br>$V_{IN}$ Centered between $V_{CC}$ and GND | 1.65 to 4.5  | -62  | dB   |

## Test Circuits

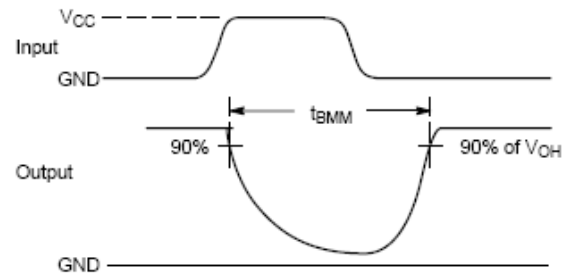
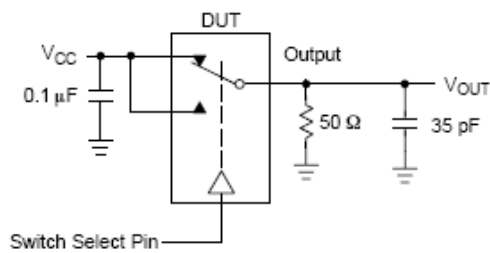


Figure 1.  $t_{BBM}$  (Time Break-Before-Make)

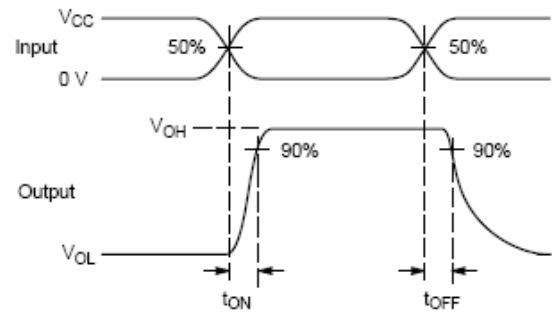
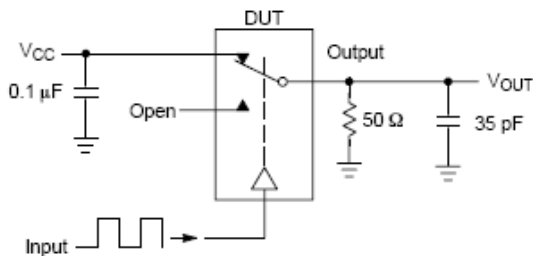


Figure 2.  $t_{ON}/t_{OFF}$

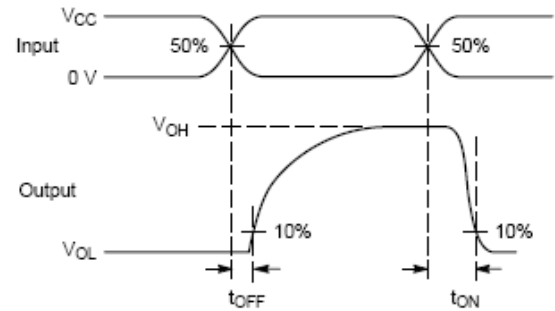
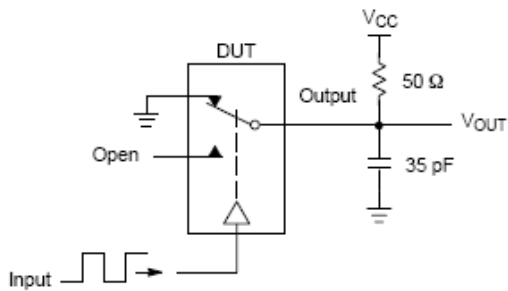
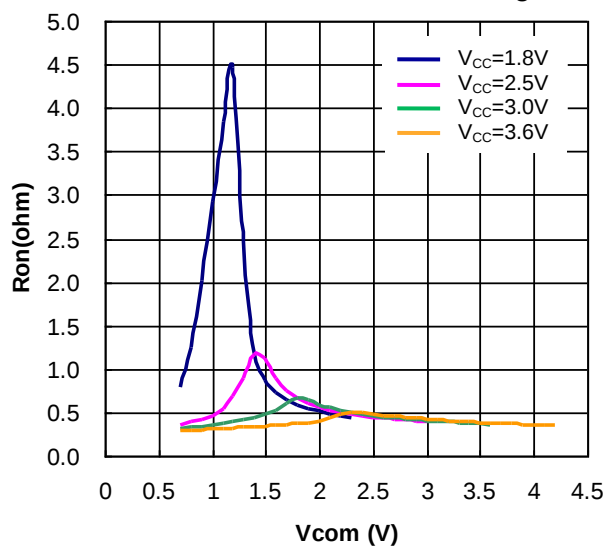


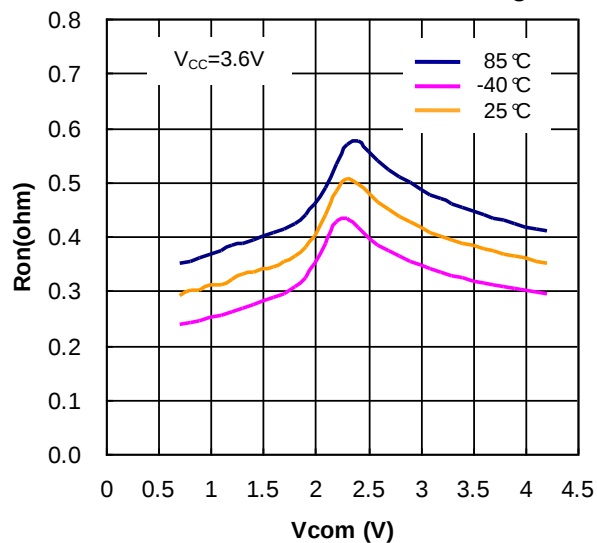
Figure 3.  $t_{ON}/t_{OFF}$

## Typical Operating Characteristics

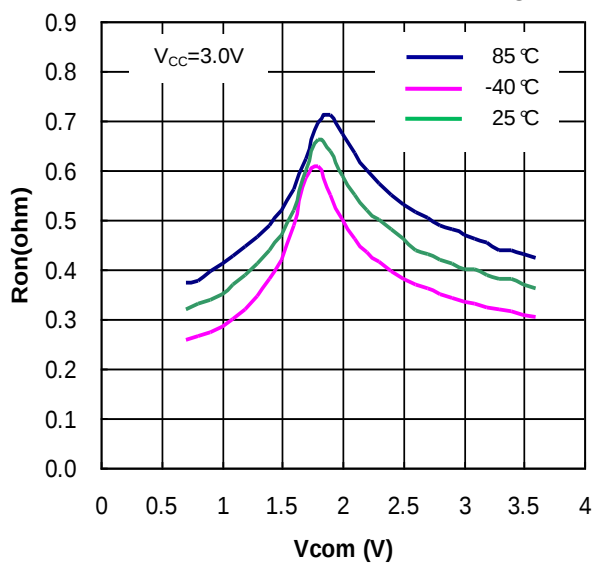
On Resistance vs. COM Voltage



On Resistance vs. COM Voltage

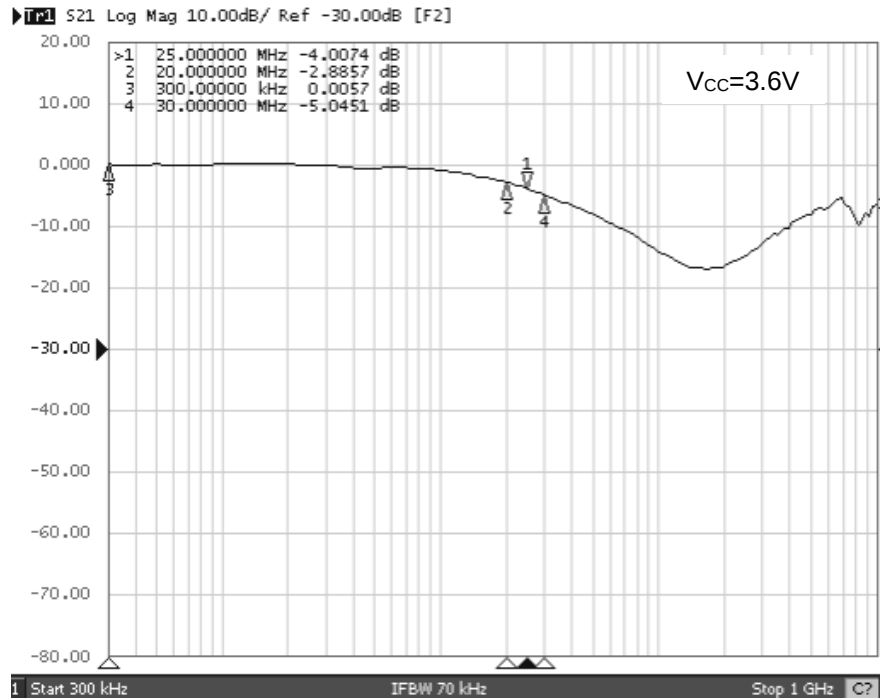


On Resistance vs. COM Voltage

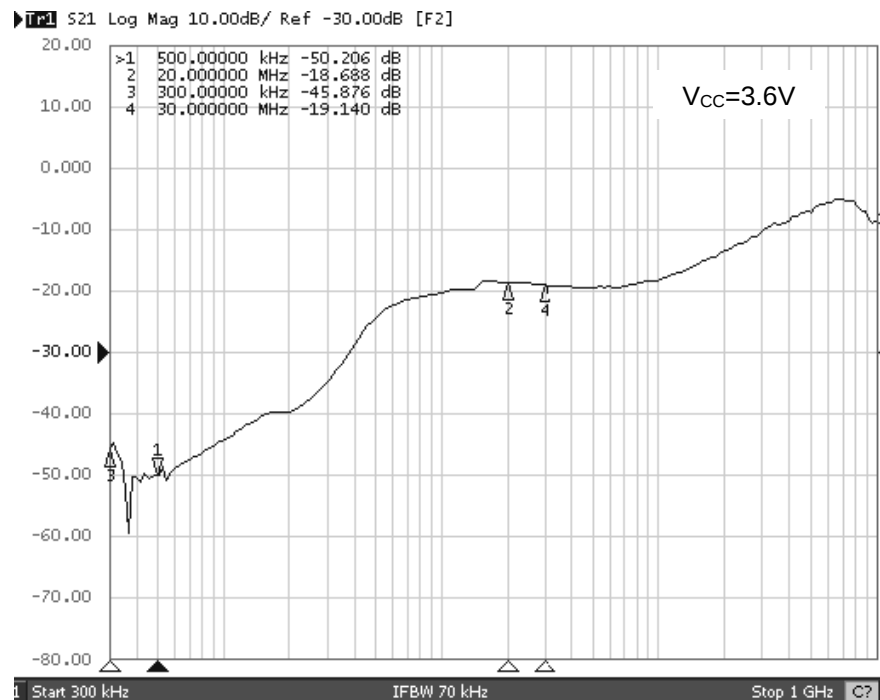


## Typical Operating Characteristics (Continued)

### Bandwidth vs. Frequency

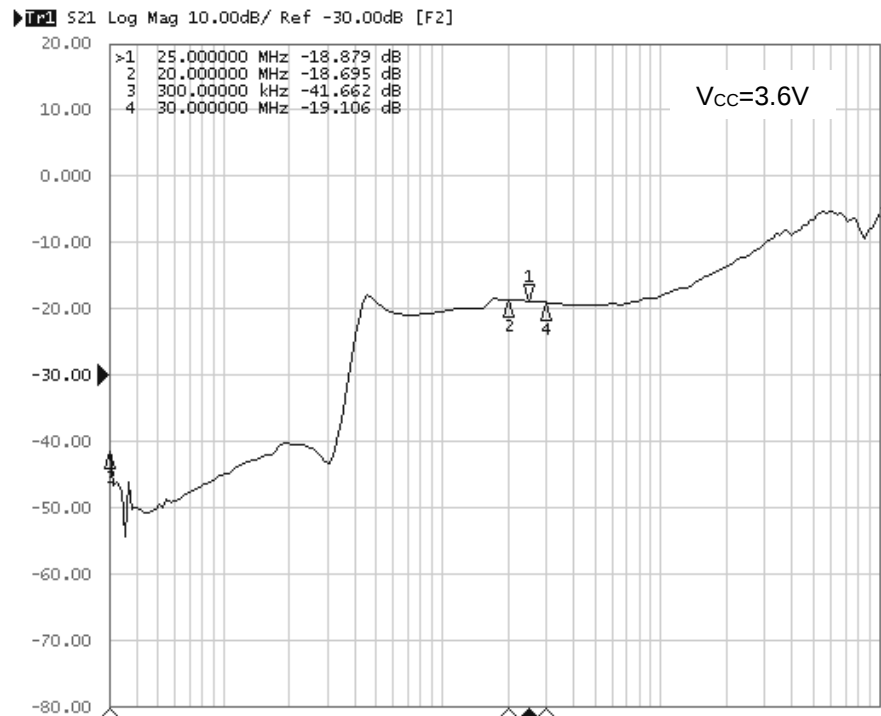


### Off-Isolation vs. Frequency



## Typical Operating Characteristics (Continued)

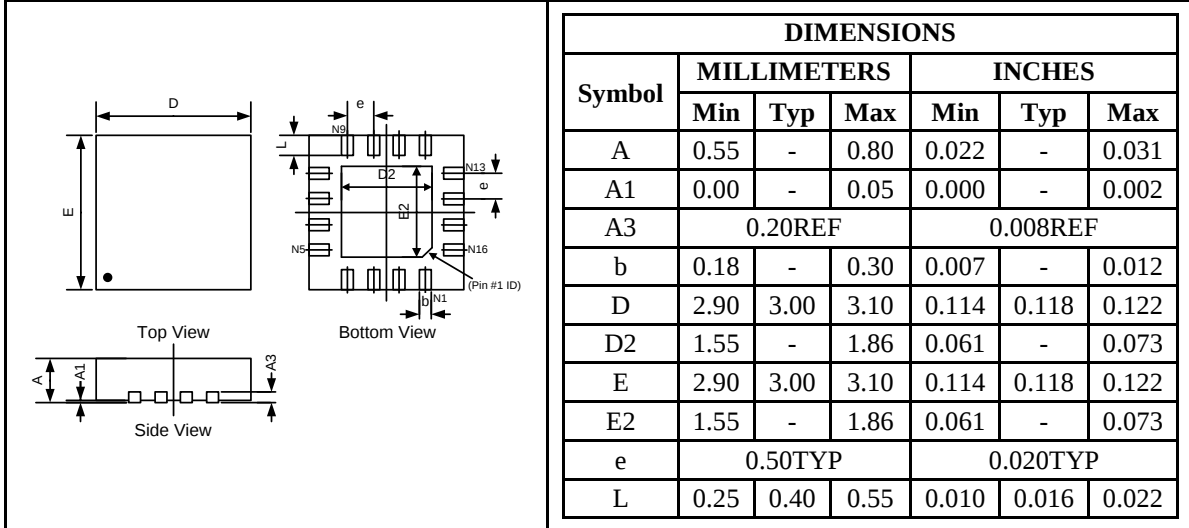
### Crosstalk vs. Frequency



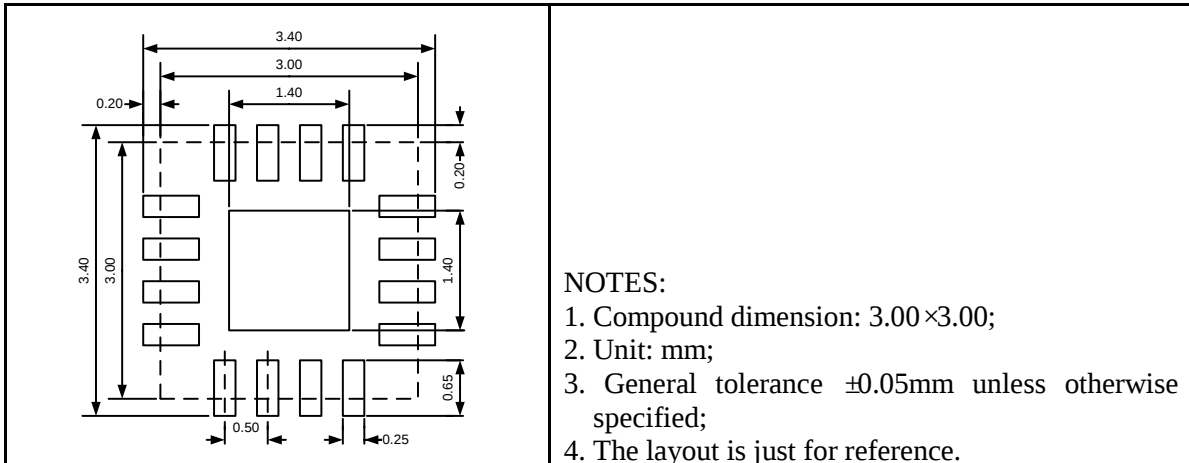
## Package Information

### UM3699A QFN16 3.0 × 3.0

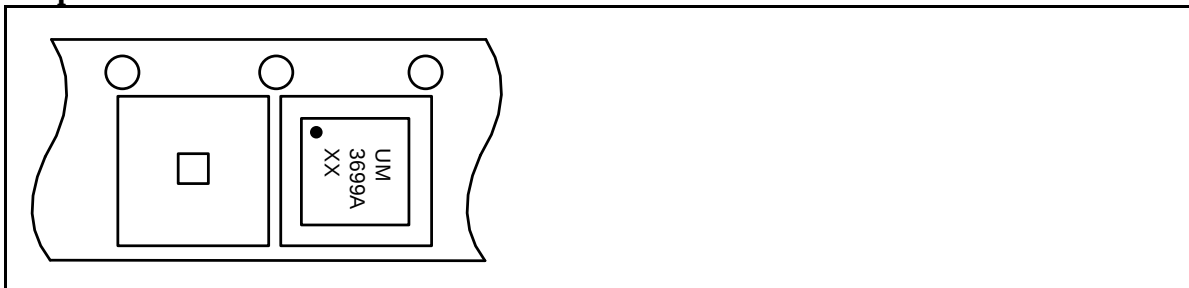
#### Outline Drawing



#### Land Pattern



#### Tape and Reel Orientation



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