

## FEATURES

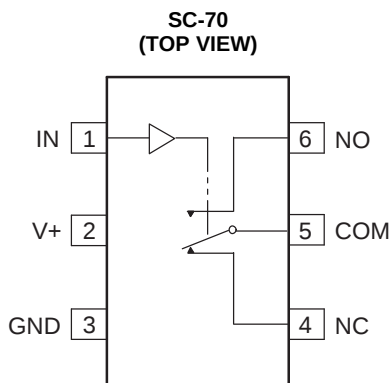
- Isolation in Power-Down Mode,  $V_+ = 0$
- Specified Break-Before-Make Switching
- Low ON-State Resistance ( $1\ \Omega$ )
- Control Inputs Are 5.5-V Tolerant
- Low Charge Injection
- Excellent ON-State Resistance Matching
- Low Total Harmonic Distortion (THD)
- 1.65-V to 5.5-V Single-Supply Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Performance Tested Per JESD
  - 2000-V Human-Body Model (A114-B, Class II)
  - 1000-V Charged-Device Model (C101)

## APPLICATIONS

- Cell Phones
- PDAs
- Portable Instrumentation
- Audio and Video Signal Routing
- Low-Voltage Data-Acquisition Systems
- Communication Circuits
- Modems
- Hard Drives
- Computer Peripherals
- Wireless Terminals and Peripherals

## DESCRIPTION

The TS5A4624 is a single-pole double-throw (SPDT) analog switch that is designed to operate from 1.65 V to 5.5 V. The device offers low ON-state resistance and excellent ON-state resistance matching with the break-before-make feature, to prevent signal distortion during the transferring of a signal from one channel to another. The device has an excellent total harmonic distortion (THD) performance and consumes very low power. These features make this device suitable for portable audio applications.



Switches are shown for logic 0 input.

**FUNCTION TABLE**

| IN | NC TO COM,<br>COM TO NC | NO TO COM,<br>COM TO NO |
|----|-------------------------|-------------------------|
| L  | ON                      | OFF                     |
| H  | OFF                     | ON                      |



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

**TS5A4624**  
**1-Ω SPDT ANALOG SWITCH**  
**5-V/3.3-V SINGLE-CHANNEL 2:1 MULTIPLEXER/DEMULTIPLEXER**

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**SUMMARY OF CHARACTERISTICS<sup>(1)</sup>**

|                                               |                                                 |
|-----------------------------------------------|-------------------------------------------------|
| Configuration                                 | 2:1 Multiplexer/<br>Demultiplexer<br>(1 × SPDT) |
| Number of channels                            | 1                                               |
| ON-state resistance $r_{on}$ )                | 1.1 Ω                                           |
| ON-state resistance match ( $\Delta r_{on}$ ) | 0.1 Ω                                           |
| ON-state resistance flatness $r_{on(flat)}$ ) | 0.15 Ω                                          |
| Turn-on/turn-off time ( $t_{ON/tOFF}$ )       | 20 ns/15 ns                                     |
| Break-before-make time ( $t_{BBM}$ )          | 12 ns                                           |
| Charge injection ( $Q_C$ )                    | –20 pC                                          |
| Bandwidth (BW)                                | 100 MHz                                         |
| OFF isolation ( $O_{ISO}$ )                   | –65 dB at 1 MHz                                 |
| Crosstalk ( $X_{TALK}$ )                      | –66 dB at 1 MHz                                 |
| Total harmonic distortion (THD)               | 0.01%                                           |
| Leakage current ( $I_{NO(OFF)}/I_{NC(OFF)}$ ) | ±20 nA                                          |
| Power-supply current ( $I_+$ )                | 0.1 μA                                          |
| Package options                               | 6-pin DCK                                       |

(1)  $V_+ = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

**ORDERING INFORMATION**

| $T_A$         | PACKAGE <sup>(1)</sup> |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING <sup>(2)</sup> |
|---------------|------------------------|---------------|-----------------------|---------------------------------|
| –40°C to 85°C | SOT (SC-70) – DCK      | Tape and reel | TS5A4624DCKR          | JW_                             |

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

(2) DCK: The actual top-side marking has one additional character that designates the assembly/test site.

## Absolute Minimum and Maximum Ratings<sup>(1)(2)</sup>

over operating free-air temperature range (unless otherwise noted)

|                                                        |                                               |                                                                            | MIN  | MAX                  | UNIT |
|--------------------------------------------------------|-----------------------------------------------|----------------------------------------------------------------------------|------|----------------------|------|
| V <sub>+</sub>                                         | Supply voltage range <sup>(3)</sup>           |                                                                            | –0.5 | 6.5                  | V    |
| V <sub>NO</sub><br>V <sub>NC</sub><br>V <sub>COM</sub> | Analog voltage range <sup>(3)(4)(5)</sup>     |                                                                            | –0.5 | V <sub>+</sub> + 0.5 | V    |
| I <sub>K</sub>                                         | Analog port diode current                     | V <sub>NC</sub> , V <sub>NO</sub> , V <sub>COM</sub> < 0                   | –50  |                      | mA   |
| I <sub>NO</sub><br>I <sub>NC</sub><br>I <sub>COM</sub> | On-state switch current                       | V <sub>NO</sub> , V <sub>NC</sub> , V <sub>COM</sub> = 0 to V <sub>+</sub> | –200 | 200                  | mA   |
|                                                        | On-state peak switch current <sup>(6)</sup>   |                                                                            | –400 | 400                  |      |
| V <sub>I</sub>                                         | Digital input voltage range <sup>(3)(4)</sup> |                                                                            | –0.5 | 6.5                  | V    |
| I <sub>IK</sub>                                        | Digital input clamp current                   | V <sub>I</sub> < 0                                                         | –50  |                      | mA   |
| I <sub>+</sub>                                         | Continuous current through V <sub>+</sub>     |                                                                            |      | 100                  | mA   |
| I <sub>GND</sub>                                       | Continuous current through GND                |                                                                            | –100 | 100                  | mA   |
| θ <sub>JA</sub>                                        | Package thermal impedance <sup>(7)</sup>      |                                                                            |      | 259                  | °C/W |
| T <sub>stg</sub>                                       | Storage temperature range                     |                                                                            | –65  | 150                  | °C   |

- (1) 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 under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum
- (3) All voltages are with respect to ground, unless otherwise specified.
- (4) The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
- (5) This value is limited to 5.5 V maximum.
- (6) Pulse at 1-ms duration < 10% duty cycle
- (7) The package thermal impedance is calculated in accordance with JESD 51-7.

**TS5A4624**  
**1-Ω SPDT ANALOG SWITCH**  
**5-V/3.3-V SINGLE-CHANNEL 2:1 MULTIPLEXER/DEMULTIPLEXER**

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**Electrical Characteristics for 5-V Supply<sup>(1)</sup>**

$V_+ = 4.5 \text{ V to } 5.5 \text{ V}$ ,  $T_A = -40^\circ\text{C to } 85^\circ\text{C}$  (unless otherwise noted)

| PARAMETER                                  | SYMBOL                                               | TEST CONDITIONS                                                                                                                                                        |                              | T <sub>A</sub> | V <sub>+</sub> | MIN  | TYP  | MAX            | UNIT |
|--------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------|----------------|------|------|----------------|------|
| Analog Switch                              |                                                      |                                                                                                                                                                        |                              |                |                |      |      |                |      |
| Analog signal range                        | V <sub>COM</sub> , V <sub>NO</sub> , V <sub>NC</sub> |                                                                                                                                                                        |                              |                |                | 0    |      | V <sub>+</sub> | V    |
| Peak ON resistance                         | r <sub>peak</sub>                                    | 0 ≤ (V <sub>NO</sub> or V <sub>NC</sub> ) ≤ V <sub>+</sub> ,<br>I <sub>COM</sub> = −100 mA,                                                                            | Switch ON,<br>See Figure 13  | 25°C<br>Full   | 4.5 V          | 0.8  | 1.1  |                | Ω    |
| ON-state resistance                        | r <sub>on</sub>                                      | V <sub>NO</sub> or V <sub>NC</sub> = 2.5 V,<br>I <sub>COM</sub> = −100 mA,                                                                                             | Switch ON,<br>See Figure 13  | 25°C<br>Full   | 4.5 V          | 0.7  | 0.9  | 1.1            | Ω    |
| ON-state resistance match between channels | Δr <sub>on</sub>                                     | V <sub>NO</sub> or V <sub>NC</sub> = 2.5 V,<br>I <sub>COM</sub> = −100 mA,                                                                                             | Switch ON,<br>See Figure 13  | 25°C<br>Full   | 4.5 V          | 0.05 | 0.1  |                | Ω    |
| ON-state resistance flatness               | r <sub>on(flat)</sub>                                | 0 ≤ (V <sub>NO</sub> or V <sub>NC</sub> ) ≤ V <sub>+</sub> ,<br>I <sub>COM</sub> = −100 mA,                                                                            | Switch ON,<br>See Figure 13  | 25°C           | 4.5 V          | 0.15 |      |                | Ω    |
|                                            |                                                      | V <sub>NO</sub> or V <sub>NC</sub> = 1 V, 1.5 V, 2.5 V,<br>I <sub>COM</sub> = −100 mA,                                                                                 | Switch ON,<br>See Figure 13  | 25°C           |                | 0.1  | 0.25 |                |      |
|                                            |                                                      |                                                                                                                                                                        |                              | Full           |                |      | 0.25 |                |      |
| NC, NO OFF leakage current                 | I <sub>NC(OFF)</sub> ,<br>I <sub>NO(OFF)</sub>       | V <sub>NC</sub> or V <sub>NO</sub> = 1 V,<br>V <sub>COM</sub> = 1 V to 4.5 V,<br>or<br>V <sub>NC</sub> or V <sub>NO</sub> = 4.5 V,<br>V <sub>COM</sub> = 1 V to 4.5 V, | Switch OFF,<br>See Figure 14 | 25°C           | 5.5 V          | −20  | 2    | 20             | nA   |
|                                            |                                                      |                                                                                                                                                                        |                              | Full           |                | −100 |      | 100            |      |
|                                            | I <sub>NC(PWROFF)</sub> ,<br>I <sub>NO(PWROFF)</sub> | V <sub>NC</sub> or V <sub>NO</sub> = 0 to 5.5 V,<br>V <sub>COM</sub> = 5.5 V to 0,                                                                                     | Switch OFF,<br>See Figure 14 | 25°C           | 0 V            | −1   | 0.2  | 1              | μA   |
|                                            |                                                      |                                                                                                                                                                        |                              | Full           |                | −20  |      | 20             |      |
| NC, NO ON leakage current                  | I <sub>NC(ON)</sub> ,<br>I <sub>NO(ON)</sub>         | V <sub>NC</sub> or V <sub>NO</sub> = 1 V, V <sub>COM</sub> = Open,<br>or<br>V <sub>NC</sub> or V <sub>NO</sub> = 4.5 V, V <sub>COM</sub> = Open,                       | Switch ON,<br>See Figure 15  | 25°C           | 5.5 V          | −20  | 2    | 20             | nA   |
|                                            |                                                      |                                                                                                                                                                        |                              | Full           |                | −100 |      | 100            |      |
| COM OFF leakage current                    | I <sub>COM(PWROFF)</sub>                             | V <sub>NC</sub> or V <sub>NO</sub> = 0 to 5.5 V,<br>V <sub>COM</sub> = 5.5 V to 0,                                                                                     | Switch OFF,<br>See Figure 14 | 25°            | 0 V            | −1   | 0.1  | 1              | μA   |
|                                            |                                                      |                                                                                                                                                                        |                              | Full           |                | −20  |      | 20             |      |
| COM ON leakage current                     | I <sub>COM(ON)</sub>                                 | V <sub>NC</sub> or V <sub>NO</sub> = Open, V <sub>COM</sub> = 1 V,<br>or<br>V <sub>NC</sub> or V <sub>NO</sub> = Open, V <sub>COM</sub> = 4.5 V,                       | Switch ON,<br>See Figure 15  | 25°C           | 5.5 V          | −20  | 2    | 20             | nA   |
|                                            |                                                      |                                                                                                                                                                        |                              | Full           |                | −100 |      | 100            |      |
| Digital Input (IN)                         |                                                      |                                                                                                                                                                        |                              |                |                |      |      |                |      |
| Input logic high                           | V <sub>IH</sub>                                      |                                                                                                                                                                        |                              | Full           |                | 2.4  |      | 5.5            | V    |
| Input logic low                            | V <sub>IL</sub>                                      |                                                                                                                                                                        |                              | Full           |                | 0    |      | 0.8            | V    |
| Input leakage current                      | I <sub>IH</sub> , I <sub>IL</sub>                    | V <sub>I</sub> = 5.5 V or 0                                                                                                                                            |                              | 25°C           | 5.5 V          | −2   |      | 2              | nA   |
|                                            |                                                      |                                                                                                                                                                        |                              | Full           |                | 100  |      | 100            |      |

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

## Electrical Characteristics for 5-V Supply<sup>(1)</sup> (Continued)

$V_+ = 4.5 \text{ V to } 5.5 \text{ V}$ ,  $T_A = -40^\circ\text{C to } 85^\circ\text{C}$  (unless otherwise noted)

| PARAMETER                 | SYMBOL                           | TEST CONDITIONS                                                                                               | $T_A$ | $V_+$          | MIN | TYP   | MAX | UNIT |
|---------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------|-------|----------------|-----|-------|-----|------|
| <b>Dynamic</b>            |                                  |                                                                                                               |       |                |     |       |     |      |
| Turn-on time              | $t_{ON}$                         | $V_{COM} = V_+$ ,<br>$R_L = 50 \Omega$ ,<br>$C_L = 35 \text{ pF}$ ,<br>See Figure 17                          | 25°C  | 5 V            | 4   | 12    | 22  | ns   |
|                           |                                  |                                                                                                               | Full  | 4.5 V to 5.5 V | 2   |       | 25  |      |
| Turn-off time             | $t_{OFF}$                        | $V_{COM} = V_+$ ,<br>$R_L = 50 \Omega$ ,<br>$C_L = 35 \text{ pF}$ ,<br>See Figure 17                          | 25°C  | 5 V            | 1   | 5     | 8   | ns   |
|                           |                                  |                                                                                                               | Full  | 4.5 V to 5.5 V | 1   |       | 10  |      |
| Break-before-make time    | $t_{BBM}$                        | $V_{NC} = V_{NO} = V_+$ ,<br>$R_L = 50 \Omega$ ,<br>$C_L = 35 \text{ pF}$ ,<br>See Figure 18                  | 25°C  | 5 V            | 1   | 8     | 13  | ns   |
|                           |                                  |                                                                                                               | Full  | 4.5 V to 5.5 V | 1   |       | 15  |      |
| Charge injection          | $Q_C$                            | $V_{GEN} = 0$ ,<br>$R_{GEN} = 0$ ,<br>$C_L = 1 \text{ nF}$ ,<br>See Figure 22                                 | 25°C  | 5 V            |     | 15.5  |     | pC   |
| NC, NO OFF capacitance    | $C_{NC(OFF)}$ ,<br>$C_{NO(OFF)}$ | $V_{NC}$ or $V_{NO} = V_+$ or GND,<br>Switch OFF,<br>See Figure 16                                            | 25°C  | 5 V            |     | 18    |     | pF   |
| NC, NO ON capacitance     | $C_{NC(ON)}$ ,<br>$C_{NO(ON)}$   | $V_{NC}$ or $V_{NO} = V_+$ or GND,<br>Switch ON,<br>See Figure 16                                             | 25°C  | 5 V            |     | 55    |     | pF   |
| COM ON capacitance        | $C_{COM(ON)}$                    | $V_{COM} = V_+$ or GND,<br>Switch ON,<br>See Figure 16                                                        | 25°C  | 5 V            |     | 55    |     | pF   |
| Digital input capacitance | $C_I$                            | $V_I = V_+$ or GND,<br>See Figure 16                                                                          | 25°C  | 5 V            |     | 2     |     | pF   |
| Bandwidth                 | BW                               | $R_L = 50 \Omega$ ,<br>Switch ON,<br>See Figure 19                                                            | 25°C  | 5 V            |     | 90    |     | MHz  |
| OFF isolation             | $O_{ISO}$                        | $R_L = 50 \Omega$ ,<br>$f = 1 \text{ MHz}$ ,<br>Switch OFF,<br>See Figure 20                                  | 25°C  | 5 V            |     | -63   |     | dB   |
| Crosstalk                 | $X_{TALK}$                       | $R_L = 50 \Omega$ ,<br>$f = 1 \text{ MHz}$ ,<br>Switch ON,<br>See Figure 21                                   | 25°C  | 5 V            |     | -63   |     | dB   |
| Total harmonic distortion | THD                              | $R_L = 600 \Omega$ ,<br>$C_L = 50 \text{ pF}$ ,<br>$f = 200 \text{ Hz to } 20 \text{ kHz}$ ,<br>See Figure 23 | 25°C  | 5 V            |     | 0.004 |     | %    |
| <b>Supply</b>             |                                  |                                                                                                               |       |                |     |       |     |      |
| Positive supply current   | $I_+$                            | $V_I = V_+$ or GND,<br>Switch ON or OFF                                                                       | 25°C  | 5.5 V          |     | 10    | 50  | nA   |
|                           |                                  |                                                                                                               | Full  |                |     |       | 500 |      |

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

**Electrical Characteristics for 3.3-V Supply<sup>(1)</sup>**
 $V_+ = 3\text{ V to }3.6\text{ V}$ ,  $T_A = -40^\circ\text{C to }85^\circ\text{C}$  (unless otherwise noted)

| PARAMETER                                  | SYMBOL                                               | TEST CONDITIONS                                                                                                                                            |                                                                                    | T <sub>A</sub>               | V <sub>+</sub> | MIN  | TYP  | MAX            | UNIT |
|--------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------|----------------|------|------|----------------|------|
| Analog Switch                              |                                                      |                                                                                                                                                            |                                                                                    |                              |                |      |      |                |      |
| Analog signal range                        | V <sub>COM</sub> , V <sub>NO</sub> , V <sub>NC</sub> |                                                                                                                                                            |                                                                                    |                              |                | 0    |      | V <sub>+</sub> | V    |
| Peak ON resistance                         | r <sub>peak</sub>                                    | 0 ≤ (V <sub>NO</sub> or V <sub>NC</sub> ) ≤ V <sub>+</sub> ,<br>I <sub>COM</sub> = −100 mA,                                                                | Switch ON,<br>See Figure 13                                                        | 25°C<br>Full                 | 3 V            | 1.3  | 1.6  | 2              | Ω    |
| ON-state resistance                        | r <sub>on</sub>                                      | V <sub>NO</sub> or V <sub>NC</sub> = 2 V,<br>I <sub>COM</sub> = −100 mA,                                                                                   | Switch ON,<br>See Figure 13                                                        | 25°C<br>Full                 | 3 V            | 1.2  | 1.5  | 1.7            | Ω    |
| ON-state resistance match between channels | Δr <sub>on</sub>                                     | V <sub>NO</sub> or V <sub>NC</sub> = 2 V, 0.8 V,<br>I <sub>COM</sub> = −100 mA,                                                                            | Switch ON,<br>See Figure 13                                                        | 25°C<br>Full                 | 3 V            | 0.1  | 0.15 | 0.15           | Ω    |
| ON-state resistance flatness               | r <sub>on(flat)</sub>                                | 0 ≤ (V <sub>NO</sub> or V <sub>NC</sub> ) ≤ V <sub>+</sub> ,<br>I <sub>COM</sub> = −100 mA,                                                                | Switch ON,<br>See Figure 13                                                        | 25°C                         | 3 V            | 0.2  |      |                | Ω    |
|                                            |                                                      | V <sub>NO</sub> or V <sub>NC</sub> = 2 V, 0.8 V,<br>I <sub>COM</sub> = −100 mA,                                                                            | Switch ON,<br>See Figure 13                                                        | 25°C                         |                | 0.15 | 0.3  |                |      |
|                                            |                                                      |                                                                                                                                                            |                                                                                    | Full                         |                | 0.3  |      |                |      |
| NC, NO OFF leakage current                 | I <sub>NC(OFF)</sub> ,<br>I <sub>NO(OFF)</sub>       | V <sub>NC</sub> or V <sub>NO</sub> = 1 V, V <sub>COM</sub> = 1 V to 3 V,<br>or<br>V <sub>NC</sub> or V <sub>NO</sub> = 3 V, V <sub>COM</sub> = 1 V to 3 V, | Switch OFF,<br>See Figure 14                                                       | 25°C                         | 3.6 V          | −20  | 2    | 20             | nA   |
|                                            |                                                      |                                                                                                                                                            |                                                                                    | Full                         |                | −50  |      | 50             |      |
|                                            |                                                      | I <sub>NC(PWROFF)</sub> ,<br>I <sub>NO(PWROFF)</sub>                                                                                                       | V <sub>NC</sub> or V <sub>NO</sub> = 0 to 3.6 V,<br>V <sub>COM</sub> = 3.6 V to 0, | Switch OFF,<br>See Figure 14 | 25°C<br>Full   | 0 V  | −1   | 0.2            | 1    |
| NC, NO ON leakage current                  | I <sub>NC(ON)</sub> ,<br>I <sub>NO(ON)</sub>         | V <sub>NC</sub> or V <sub>NO</sub> = 1 V, V <sub>COM</sub> = Open,<br>or<br>V <sub>NC</sub> or V <sub>NO</sub> = 3 V, V <sub>COM</sub> = Open,             | Switch ON,<br>See Figure 15                                                        | 25°C                         | 3.6 V          | −10  | 2    | 10             | nA   |
|                                            |                                                      |                                                                                                                                                            |                                                                                    | Full                         |                | −20  |      | 20             |      |
| COM OFF leakage current                    | I <sub>COM(PWROFF)</sub>                             | V <sub>NC</sub> or V <sub>NO</sub> = 3.6 V to 0,<br>V <sub>COM</sub> = 0 to 3.6 V,                                                                         | Switch OFF,<br>See Figure 14                                                       | 25°                          | 0 V            | −1   | 0.2  | 1              | μA   |
|                                            |                                                      |                                                                                                                                                            |                                                                                    | Full                         |                | −15  |      | 15             |      |
| COM ON leakage current                     | I <sub>COM(ON)</sub>                                 | V <sub>NC</sub> or V <sub>NO</sub> = Open, V <sub>COM</sub> = 1 V,<br>or<br>V <sub>NC</sub> or V <sub>NO</sub> = Open, V <sub>COM</sub> = 3 V,             | Switch ON,<br>See Figure 15                                                        | 25°C                         | 3.6 V          | −10  | 2    | 10             | nA   |
|                                            |                                                      |                                                                                                                                                            |                                                                                    | Full                         |                | −20  |      | 20             |      |
| Digital Input (IN)                         |                                                      |                                                                                                                                                            |                                                                                    |                              |                |      |      |                |      |
| Input logic high                           | V <sub>IH</sub>                                      |                                                                                                                                                            |                                                                                    | Full                         |                | 2.4  |      | 5.5            | V    |
| Input logic low                            | V <sub>IL</sub>                                      |                                                                                                                                                            |                                                                                    | Full                         |                | 0    |      | 0.8            | V    |
| Input leakage current                      | I <sub>IH</sub> , I <sub>IL</sub>                    | V <sub>I</sub> = 5.5 V or 0                                                                                                                                |                                                                                    | 25°C                         | 3.6 V          | −2   |      | 2              | nA   |
|                                            |                                                      |                                                                                                                                                            |                                                                                    | Full                         |                | −100 |      | 100            |      |

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

## Electrical Characteristics for 3.3-V Supply<sup>(1)</sup> (Continued)

$V_+ = 3\text{ V to }3.6\text{ V}$ ,  $T_A = -40^\circ\text{C to }85^\circ\text{C}$  (unless otherwise noted)

| PARAMETER                 | SYMBOL                           | TEST CONDITIONS                                                                                           | $T_A$ | $V_+$        | MIN | TYP  | MAX | UNIT |
|---------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------|-------|--------------|-----|------|-----|------|
| <b>Dynamic</b>            |                                  |                                                                                                           |       |              |     |      |     |      |
| Turn-on time              | $t_{ON}$                         | $V_{COM} = V_+$ ,<br>$R_L = 50\ \Omega$ ,<br>$C_L = 35\text{ pF}$ ,<br>See Figure 17                      | 25°C  | 3.3 V        | 4   | 16   | 25  | ns   |
|                           |                                  |                                                                                                           | Full  | 3 V to 3.6 V | 2   |      | 27  |      |
| Turn-off time             | $t_{OFF}$                        | $V_{COM} = V_+$ ,<br>$R_L = 50\ \Omega$ ,<br>$C_L = 35\text{ pF}$ ,<br>See Figure 17                      | 25°C  | 3.3 V        | 1   | 5.5  | 8   | ns   |
|                           |                                  |                                                                                                           | Full  | 3 V to 3.6 V | 1   |      | 11  |      |
| Break-before-make time    | $t_{BBM}$                        | $V_{NC} = V_{NO} = V_+$ ,<br>$R_L = 50\ \Omega$ ,<br>$C_L = 35\text{ pF}$ ,<br>See Figure 18              | 25°C  | 3.3 V        | 2   | 12   | 20  | ns   |
|                           |                                  |                                                                                                           | Full  | 3 V to 3.6 V | 2   |      | 25  |      |
| Charge injection          | $Q_C$                            | $V_{GEN} = 0$ ,<br>$R_{GEN} = 0$ ,<br>$C_L = 1\text{ nF}$ ,<br>See Figure 22                              | 25°C  | 3.3 V        |     | 9    |     | pC   |
| NC, NO OFF capacitance    | $C_{NC(OFF)}$ ,<br>$C_{NO(OFF)}$ | $V_{NC}$ or $V_{NO} = V_+$ or GND,<br>Switch OFF,<br>See Figure 16                                        | 25°C  | 3.3 V        |     | 18   |     | pF   |
| NC, NO ON capacitance     | $C_{NC(ON)}$ ,<br>$C_{NO(ON)}$   | $V_{NC}$ or $V_{NO} = V_+$ or GND,<br>Switch ON,<br>See Figure 16                                         | 25°C  | 3.3 V        |     | 55   |     | pF   |
| COM ON capacitance        | $C_{COM(ON)}$                    | $V_{COM} = V_+$ or GND,<br>Switch ON,<br>See Figure 16                                                    | 25°C  | 3.3 V        |     | 55   |     | pF   |
| Digital input capacitance | $C_I$                            | $V_I = V_+$ or GND,<br>See Figure 16                                                                      | 25°C  | 3.3 V        |     | 2    |     | pF   |
| Bandwidth                 | BW                               | $R_L = 50\ \Omega$ ,<br>Switch ON,<br>See Figure 19                                                       | 25°C  | 3.3 V        |     | 90   |     | MHz  |
| OFF isolation             | $O_{ISO}$                        | $R_L = 50\ \Omega$ ,<br>$f = 1\text{ MHz}$ ,<br>Switch OFF,<br>See Figure 20                              | 25°C  | 3.3 V        |     | -63  |     | dB   |
| Crosstalk                 | $X_{TALK}$                       | $R_L = 50\ \Omega$ ,<br>$f = 1\text{ MHz}$ ,<br>Switch ON,<br>See Figure 21                               | 25°C  | 3.3 V        |     | -63  |     | dB   |
| Total harmonic distortion | THD                              | $R_L = 600\ \Omega$ ,<br>$C_L = 50\text{ pF}$ ,<br>$f = 20\text{ Hz to }20\text{ kHz}$ ,<br>See Figure 23 | 25°C  | 3.3 V        |     | 0.01 |     | %    |
| <b>Supply</b>             |                                  |                                                                                                           |       |              |     |      |     |      |
| Positive supply current   | $I_+$                            | $V_I = V_+$ or GND,<br>Switch ON or OFF                                                                   | 25°C  | 3.6 V        |     | 10   | 50  | nA   |
|                           |                                  |                                                                                                           | Full  |              |     |      | 100 |      |

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

**TS5A4624**  
**1-Ω SPDT ANALOG SWITCH**  
**5-V/3.3-V SINGLE-CHANNEL 2:1 MULTIPLEXER/DEMULTIPLEXER**

SLYS014A – DECEMBER 2005 – REVISED AUGUST 2006

**Electrical Characteristics for 2.5-V Supply<sup>(1)</sup>**

$V_+ = 2.3 \text{ V to } 2.7$ ,  $T_A = -40^\circ\text{C to } 85^\circ\text{C}$  (unless otherwise noted)

| PARAMETER                                  | SYMBOL                                               | TEST CONDITIONS                                                                                                                                                              |                              | T <sub>A</sub> | V <sub>+</sub> | MIN  | TYP | MAX            | UNIT |
|--------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------|----------------|------|-----|----------------|------|
| Analog Switch                              |                                                      |                                                                                                                                                                              |                              |                |                |      |     |                |      |
| Analog signal range                        | V <sub>COM</sub> , V <sub>NO</sub> , V <sub>NC</sub> |                                                                                                                                                                              |                              |                |                | 0    |     | V <sub>+</sub> | V    |
| Peak ON resistance                         | r <sub>peak</sub>                                    | 0 ≤ (V <sub>NO</sub> or V <sub>NC</sub> ) ≤ V <sub>+</sub> ,<br>I <sub>COM</sub> = −8 mA,                                                                                    | Switch ON,<br>See Figure 13  | 25°C           | 2.3 V          | 1.8  | 2.5 |                | Ω    |
|                                            |                                                      |                                                                                                                                                                              |                              | Full           |                |      | 2.7 |                |      |
| ON-state resistance                        | r <sub>on</sub>                                      | V <sub>NO</sub> or V <sub>NC</sub> = 1.8 V,<br>I <sub>COM</sub> = −8 mA,                                                                                                     | Switch ON,<br>See Figure 13  | 25°C           | 2.3 V          | 1.5  | 2   |                | Ω    |
|                                            |                                                      |                                                                                                                                                                              |                              | Full           |                |      | 2.4 |                |      |
| ON-state resistance match between channels | Δr <sub>on</sub>                                     | V <sub>NO</sub> or V <sub>NC</sub> = 1.8 V,<br>I <sub>COM</sub> = −8 mA,                                                                                                     | Switch ON,<br>See Figure 13  | 25°C           | 2.3 V          | 0.15 | 0.2 |                | Ω    |
|                                            |                                                      |                                                                                                                                                                              |                              | Full           |                |      | 0.2 |                |      |
| ON-state resistance flatness               | r <sub>on(flat)</sub>                                | 0 ≤ (V <sub>NO</sub> or V <sub>NC</sub> ) ≤ V <sub>+</sub> ,<br>I <sub>COM</sub> = −8 mA,                                                                                    | Switch ON,<br>See Figure 13  | 25°C           | 2.3 V          | 0.6  |     |                | Ω    |
|                                            |                                                      | V <sub>NO</sub> or V <sub>NC</sub> = 0.8 V, 1.8 V,<br>I <sub>COM</sub> = −8 mA,                                                                                              | Switch ON,<br>See Figure 13  | 25°C           |                | 0.6  | 1   |                |      |
|                                            |                                                      |                                                                                                                                                                              |                              | Full           |                |      | 1   |                |      |
| NC, NO OFF leakage current                 | I <sub>NC(OFF)</sub> ,<br>I <sub>NO(OFF)</sub>       | V <sub>NC</sub> or V <sub>NO</sub> = 0.5 V,<br>V <sub>COM</sub> = 0.5 V to 2.3 V,<br>or<br>V <sub>NC</sub> or V <sub>NO</sub> = 2.3 V,<br>V <sub>COM</sub> = 0.5 V to 2.3 V, | Switch OFF,<br>See Figure 14 | 25°C           | 2.7 V          | −20  | 2   | 20             | nA   |
|                                            |                                                      |                                                                                                                                                                              |                              | Full           |                | −50  |     | 50             |      |
|                                            | I <sub>NC(PWROFF)</sub> ,<br>I <sub>NO(PWROFF)</sub> | V <sub>NC</sub> or V <sub>NO</sub> = 0 to 3.6 V,<br>V <sub>COM</sub> = 3.6 V to 0,                                                                                           | Switch OFF,<br>See Figure 14 | 25°C           | 0 V            | −1   | 0.1 | 1              | μA   |
|                                            |                                                      |                                                                                                                                                                              |                              | Full           |                | −10  |     | 10             |      |
| NC, NO ON leakage current                  | I <sub>NC(ON)</sub> ,<br>I <sub>NO(ON)</sub>         | V <sub>NC</sub> or V <sub>NO</sub> = 0.5 V, V <sub>COM</sub> = Open,<br>or<br>V <sub>NC</sub> or V <sub>NO</sub> = 2.2 V, V <sub>COM</sub> = Open,                           | Switch ON,<br>See Figure 15  | 25°C           | 2.7 V          | −10  | 2   | 10             | nA   |
|                                            |                                                      |                                                                                                                                                                              |                              | Full           |                | −20  |     | 20             |      |
| COM OFF leakage current                    | I <sub>COM(PWROFF)</sub>                             | V <sub>NC</sub> or V <sub>NO</sub> = 2.7 V to 0,<br>V <sub>COM</sub> = 0 to 2.7 V,                                                                                           | Switch OFF,<br>See Figure 14 | 25°            | 0 V            | −1   | 0.1 | 10             | μA   |
|                                            |                                                      |                                                                                                                                                                              |                              | Full           |                | −10  |     | 10             |      |
| COM ON leakage current                     | I <sub>COM(ON)</sub>                                 | V <sub>NC</sub> or V <sub>NO</sub> = Open, V <sub>COM</sub> = 0.5 V,<br>or<br>V <sub>NC</sub> or V <sub>NO</sub> = Open, V <sub>COM</sub> = 2.2 V,                           | Switch ON,<br>See Figure 15  | 25°C           | 2.7 V          | −10  | 2   | 10             | nA   |
|                                            |                                                      |                                                                                                                                                                              |                              | Full           |                | −20  |     | 20             |      |
| Digital Input (IN)                         |                                                      |                                                                                                                                                                              |                              |                |                |      |     |                |      |
| Input logic high                           | V <sub>IH</sub>                                      |                                                                                                                                                                              |                              | Full           |                | 1.8  |     | 5.5            | V    |
| Input logic low                            | V <sub>IL</sub>                                      |                                                                                                                                                                              |                              | Full           |                | 0    |     | 0.6            | V    |
| Input leakage current                      | I <sub>IH</sub> , I <sub>IL</sub>                    | V <sub>I</sub> = 5.5 V or 0                                                                                                                                                  |                              | 25°C           | 2.7 V          | −2   |     | 2              | nA   |
|                                            |                                                      |                                                                                                                                                                              |                              | Full           |                | 20   |     | 20             |      |

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

## Electrical Characteristics for 2.5-V Supply<sup>(1)</sup> (Continued)

$V_+ = 2.3 \text{ V to } 2.7 \text{ V}$ ,  $T_A = -40^\circ\text{C to } 85^\circ\text{C}$  (unless otherwise noted)

| PARAMETER                 | SYMBOL                           | TEST CONDITIONS                                                                                              | $T_A$ | $V_+$          | MIN | TYP  | MAX | UNIT |
|---------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------|-------|----------------|-----|------|-----|------|
| <b>Dynamic</b>            |                                  |                                                                                                              |       |                |     |      |     |      |
| Turn-on time              | $t_{ON}$                         | $V_{COM} = V_+$ ,<br>$R_L = 50 \Omega$ ,<br>$C_L = 35 \text{ pF}$ ,<br>See Figure 17                         | 25°C  | 2.5 V          | 10  | 22   | 32  | ns   |
|                           |                                  |                                                                                                              | Full  | 2.3 V to 2.7 V | 8   |      | 35  |      |
| Turn-off time             | $t_{OFF}$                        | $V_{COM} = V_+$ ,<br>$R_L = 50 \Omega$ ,<br>$C_L = 35 \text{ pF}$ ,<br>See Figure 17                         | 25°C  | 2.5 V          | 3   | 6    | 11  | ns   |
|                           |                                  |                                                                                                              | Full  | 2.3 V to 2.7 V | 2   |      | 12  |      |
| Break-before-make time    | $t_{BBM}$                        | $V_{NC} = V_{NO} = V_+$ ,<br>$R_L = 50 \Omega$ ,<br>$C_L = 35 \text{ pF}$ ,<br>See Figure 18                 | 25°C  | 2.5 V          | 5   | 19   | 30  | ns   |
|                           |                                  |                                                                                                              | Full  | 2.3 V to 2.7 V | 5   |      | 35  |      |
| Charge injection          | $Q_C$                            | $V_{GEN} = 0$ ,<br>$R_{GEN} = 0$ ,<br>$C_L = 1 \text{ nF}$ ,<br>See Figure 22                                | 25°C  | 2.5 V          |     | -7   |     | pC   |
| NC, NO OFF capacitance    | $C_{NC(OFF)}$ ,<br>$C_{NO(OFF)}$ | $V_{NC}$ or $V_{NO} = V_+$ or GND,<br>Switch OFF,<br>See Figure 16                                           | 25°C  | 2.5 V          |     | 18   |     | pF   |
| NC, NO ON capacitance     | $C_{NC(ON)}$ ,<br>$C_{NO(ON)}$   | $V_{NC}$ or $V_{NO} = V_+$ or GND,<br>Switch ON,<br>See Figure 16                                            | 25°C  | 2.5 V          |     | 55   |     | pF   |
| COM ON capacitance        | $C_{COM(ON)}$                    | $V_{COM} = V_+$ or GND,<br>Switch ON,<br>See Figure 16                                                       | 25°C  | 2.5 V          |     | 55   |     | pF   |
| Digital input capacitance | $C_I$                            | $V_I = V_+$ or GND,<br>See Figure 16                                                                         | 25°C  | 2.5 V          |     | 2    |     | pF   |
| Bandwidth                 | BW                               | $R_L = 50 \Omega$ ,<br>Switch ON,<br>See Figure 19                                                           | 25°C  | 2.5 V          |     | 90   |     | MHz  |
| OFF isolation             | $O_{ISO}$                        | $R_L = 50 \Omega$ ,<br>$f = 1 \text{ MHz}$ ,<br>Switch OFF,<br>See Figure 20                                 | 25°C  | 2.5 V          |     | -63  |     | dB   |
| Crosstalk                 | $X_{TALK}$                       | $R_L = 50 \Omega$ ,<br>$f = 1 \text{ MHz}$ ,<br>Switch ON,<br>See Figure 21                                  | 25°C  | 2.5 V          |     | -63  |     | dB   |
| Total harmonic distortion | THD                              | $R_L = 600 \Omega$ ,<br>$C_L = 50 \text{ pF}$ ,<br>$f = 20 \text{ Hz to } 20 \text{ kHz}$ ,<br>See Figure 23 | 25°C  | 2.5 V          |     | 0.02 |     | %    |
| <b>Supply</b>             |                                  |                                                                                                              |       |                |     |      |     |      |
| Positive supply current   | $I_+$                            | $V_I = V_+$ or GND,<br>Switch ON or OFF                                                                      | 25°C  | 2.7 V          |     | 10   | 20  | nA   |
|                           |                                  |                                                                                                              | Full  |                |     |      | 150 |      |

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

**Electrical Characteristics for 1.8-V Supply<sup>(1)</sup>**
 $V_+ = 1.65\text{ V to }1.95\text{ V}$ ,  $T_A = -40^\circ\text{C to }85^\circ\text{C}$  (unless otherwise noted)

| PARAMETER                                  | SYMBOL                           | TEST CONDITIONS                                                                                                                                                                                                                   | $T_A$        | $V_+$  | MIN       | TYP         | MAX     | UNIT          |
|--------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------|-----------|-------------|---------|---------------|
| <b>Analog Switch</b>                       |                                  |                                                                                                                                                                                                                                   |              |        |           |             |         |               |
| Analog signal range                        | $V_{COM}, V_{NO}, V_{NC}$        |                                                                                                                                                                                                                                   |              |        | 0         |             | $V_+$   | V             |
| Peak ON resistance                         | $r_{peak}$                       | $0 \leq (V_{NO} \text{ or } V_{NC}) \leq V_+$ ,<br>$I_{COM} = -2\text{ mA}$ ,<br>Switch ON,<br>See Figure 13                                                                                                                      | 25°C<br>Full | 1.65 V |           | 5<br>15     |         | $\Omega$      |
| ON-state resistance                        | $r_{on}$                         | $V_{NO} \text{ or } V_{NC} = 1.5\text{ V}$ ,<br>$I_{COM} = -2\text{ mA}$ ,<br>Switch ON,<br>See Figure 13                                                                                                                         | 25°C<br>Full | 1.65 V |           | 2<br>3.5    | 2.5     | $\Omega$      |
| ON-state resistance match between channels | $\Delta r_{on}$                  | $V_{NO} \text{ or } V_{NC} = 1.5\text{ V}$ ,<br>$I_{COM} = -2\text{ mA}$ ,<br>Switch ON,<br>See Figure 13                                                                                                                         | 25°C<br>Full | 1.65 V |           | 0.15<br>0.4 | 0.4     | $\Omega$      |
| ON-state resistance flatness               | $r_{on(Flat)}$                   | $0 \leq (V_{NO} \text{ or } V_{NC}) \leq V_+$ ,<br>$I_{COM} = -8\text{ mA}$ ,<br>Switch ON,<br>See Figure 13                                                                                                                      | 25°C<br>Full | 1.65 V |           | 5<br>4.5    |         | $\Omega$      |
| NC, NO OFF leakage current                 | $I_{NC(OFF)}, I_{NO(OFF)}$       | $V_{NC} \text{ or } V_{NO} = 0.3\text{ V}$ ,<br>$V_{COM} = 0.3\text{ V to }1.65\text{ V}$ ,<br>or<br>$V_{NC} \text{ or } V_{NO} = 1.65\text{ V}$ ,<br>$V_{COM} = 0.3\text{ V to }1.65\text{ V}$ ,<br>Switch OFF,<br>See Figure 14 | 25°C<br>Full | 1.95 V | -5<br>-20 | 2           | 5<br>20 | nA            |
|                                            | $I_{NC(PWROFF)}, I_{NO(PWROFF)}$ | $V_{NC} \text{ or } V_{NO} = 0 \text{ to }1.95\text{ V}$ ,<br>$V_{COM} = 1.95\text{ V to }0$ ,<br>Switch OFF,<br>See Figure 14                                                                                                    | 25°C<br>Full | 0 V    | -1<br>-5  | 0.1         | 1<br>5  | $\mu\text{A}$ |
| NC, NO ON leakage current                  | $I_{NC(ON)}, I_{NO(ON)}$         | $V_{NC} \text{ or } V_{NO} = 0.3\text{ V}$ ,<br>$V_{COM} = \text{Open}$ ,<br>or<br>$V_{NC} \text{ or } V_{NO} = 1.65\text{ V}$ ,<br>$V_{COM} = \text{Open}$ ,<br>Switch ON,<br>See Figure 15                                      | 25°C<br>Full | 1.95 V | -5<br>-20 | 2           | 5<br>20 | nA            |
| COM OFF leakage current                    | $I_{COM(PWROFF)}$                | $V_{NC} \text{ or } V_{NO} = 1.95\text{ V to }0$ ,<br>$V_{COM} = 0 \text{ to }1.95\text{ V}$ ,<br>Switch OFF,<br>See Figure 14                                                                                                    | 25°C<br>Full | 0 V    | -1<br>-5  | 0.1         | 1<br>5  | $\mu\text{A}$ |
| COM ON leakage current                     | $I_{COM(ON)}$                    | $V_{NC} \text{ or } V_{NO} = \text{Open}$ ,<br>$V_{COM} = 0.3\text{ V}$ ,<br>or<br>$V_{NC} \text{ or } V_{NO} = \text{Open}$ ,<br>$V_{COM} = 1.65\text{ V}$ ,<br>Switch ON,<br>See Figure 15                                      | 25°C<br>Full | 1.95 V | -5<br>-20 | 2           | 5<br>20 | nA            |
| <b>Digital Input (IN)</b>                  |                                  |                                                                                                                                                                                                                                   |              |        |           |             |         |               |
| Input logic high                           | $V_{IH}$                         |                                                                                                                                                                                                                                   | Full         |        | 1.5       |             | 5.5     | V             |
| Input logic low                            | $V_{IL}$                         |                                                                                                                                                                                                                                   | Full         |        | 0         |             | 0.6     | V             |
| Input leakage current                      | $I_{IH}, I_{IL}$                 | $V_I = 5.5\text{ V or }0$                                                                                                                                                                                                         | 25°C         | 1.95 V | -2        |             | 2       | nA            |
|                                            |                                  |                                                                                                                                                                                                                                   | Full         |        | 20        |             | 20      |               |

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

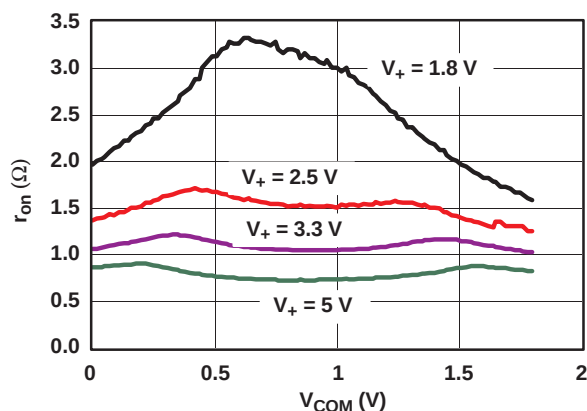
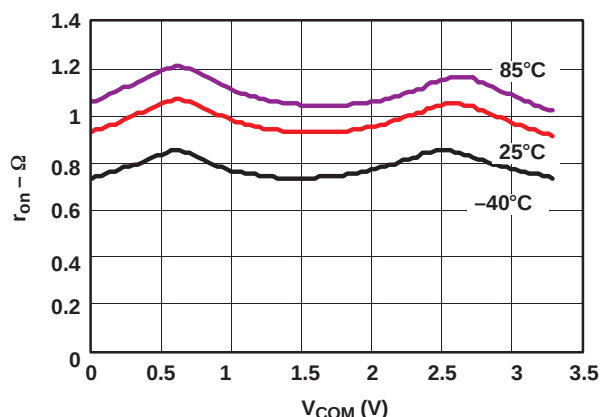
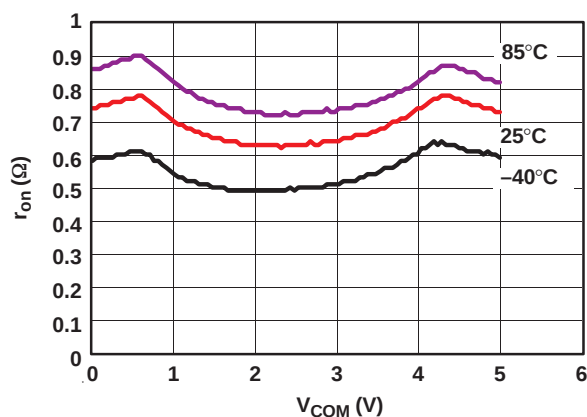
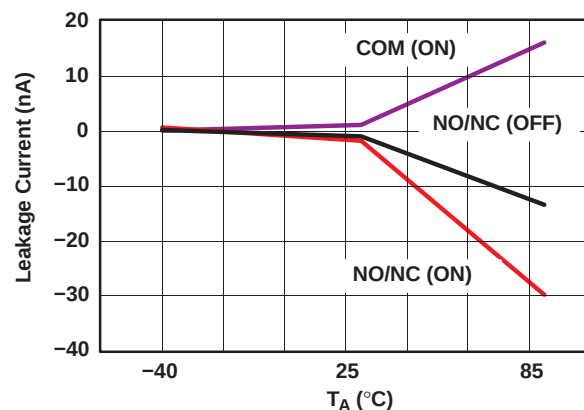
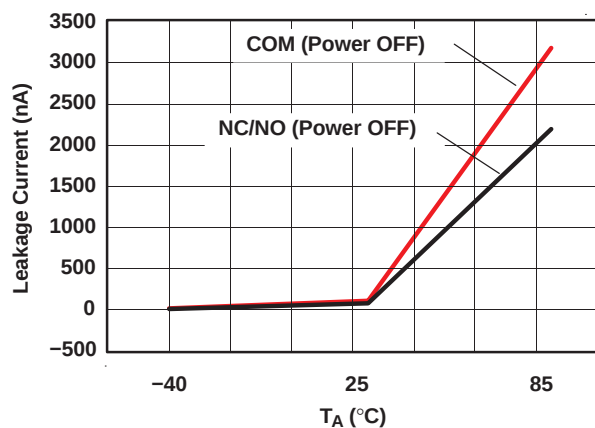
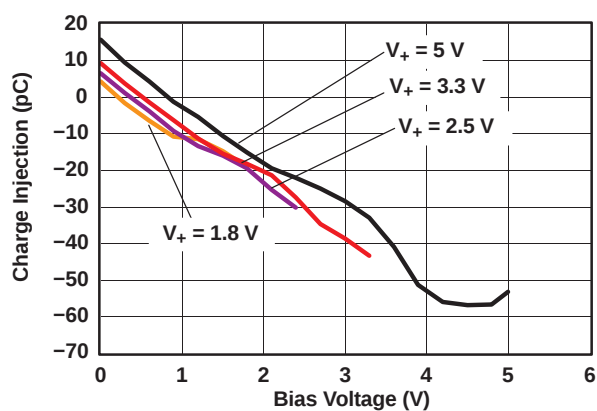
## Electrical Characteristics for 1.8-V Supply<sup>(1)</sup> (Continued)

$V_+ = 1.65 \text{ V to } 1.95 \text{ V}$ ,  $T_A = -40^\circ\text{C to } 85^\circ\text{C}$  (unless otherwise noted)

| PARAMETER                 | SYMBOL                           | TEST CONDITIONS                                                                                              | $T_A$ | $V_+$            | MIN | TYP  | MAX | UNIT          |
|---------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------|-------|------------------|-----|------|-----|---------------|
| <b>Dynamic</b>            |                                  |                                                                                                              |       |                  |     |      |     |               |
| Turn-on time              | $t_{ON}$                         | $V_{COM} = V_+$ ,<br>$R_L = 50 \Omega$ ,<br>$C_L = 35 \text{ pF}$ ,<br>See Figure 17                         | 25°C  | 1.8 V            | 17  | 35   | 65  | ns            |
|                           |                                  |                                                                                                              | Full  | 1.65 V to 1.95 V | 15  |      | 70  |               |
| Turn-off time             | $t_{OFF}$                        | $V_{COM} = V_+$ ,<br>$R_L = 50 \Omega$ ,<br>$C_L = 35 \text{ pF}$ ,<br>See Figure 17                         | 25°C  | 1.8 V            | 3   | 7    | 13  | ns            |
|                           |                                  |                                                                                                              | Full  | 1.65 V to 1.95 V | 2   |      | 15  |               |
| Break-before-make time    | $t_{BBM}$                        | $V_{NC} = V_{NO} = V_+$ ,<br>$R_L = 50 \Omega$ ,<br>$C_L = 35 \text{ pF}$ ,<br>See Figure 18                 | 25°C  | 1.8 V            | 15  | 33   | 60  | ns            |
|                           |                                  |                                                                                                              | Full  | 1.65 V to 1.95 V | 15  |      | 65  |               |
| Charge injection          | $Q_C$                            | $V_{GEN} = 0$ ,<br>$R_{GEN} = 0$ ,<br>$C_L = 1 \text{ nF}$ ,<br>See Figure 22                                | 25°C  | 1.8 V            |     | 4    |     | pC            |
| NC, NO OFF capacitance    | $C_{NC(OFF)}$ ,<br>$C_{NO(OFF)}$ | $V_{NC}$ or $V_{NO} = V_+$ or GND,<br>Switch OFF,<br>See Figure 16                                           | 25°C  | 1.8 V            |     | 18   |     | pF            |
| NC, NO ON capacitance     | $C_{NC(ON)}$ ,<br>$C_{NO(ON)}$   | $V_{NC}$ or $V_{NO} = V_+$ or GND,<br>Switch ON,<br>See Figure 16                                            | 25°C  | 1.8 V            |     | 55   |     | pF            |
| COM ON capacitance        | $C_{COM(ON)}$                    | $V_{COM} = V_+$ or GND,<br>Switch ON,<br>See Figure 16                                                       | 25°C  | 1.8 V            |     | 55   |     | pF            |
| Digital input capacitance | $C_I$                            | $V_I = V_+$ or GND,<br>See Figure 16                                                                         | 25°C  | 1.8 V            |     | 2    |     | pF            |
| Bandwidth                 | BW                               | $R_L = 50 \Omega$ ,<br>Switch ON,<br>See Figure 19                                                           | 25°C  | 1.8 V            |     | 90   |     | MHz           |
| OFF isolation             | $O_{ISO}$                        | $R_L = 50 \Omega$ ,<br>$f = 1 \text{ MHz}$ ,<br>Switch OFF,<br>See Figure 20                                 | 25°C  | 1.8 V            |     | 63   |     | dB            |
| Crosstalk                 | $X_{TALK}$                       | $R_L = 50 \Omega$ ,<br>$f = 1 \text{ MHz}$ ,<br>Switch ON,<br>See Figure 21                                  | 25°C  | 1.8 V            |     | 63   |     | dB            |
| Total harmonic distortion | THD                              | $R_L = 600 \Omega$ ,<br>$C_L = 50 \text{ pF}$ ,<br>$f = 20 \text{ Hz to } 20 \text{ kHz}$ ,<br>See Figure 23 | 25°C  | 1.8 V            |     | 0.05 |     | %             |
| <b>Supply</b>             |                                  |                                                                                                              |       |                  |     |      |     |               |
| Positive supply current   | $I_+$                            | $V_I = V_+$ or GND,<br>Switch ON or OFF                                                                      | 25°C  | 1.95 V           |     | 5    | 15  | $\mu\text{A}$ |
|                           |                                  |                                                                                                              | Full  |                  |     |      | 50  |               |

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

## TYPICAL PERFORMANCE

Figure 1.  $r_{on}$  vs  $V_{COM}$ Figure 2.  $r_{on}$  vs  $V_{COM}$  ( $V_+ = 3.3$  V)Figure 3.  $r_{on}$  vs  $V_{COM}$  ( $V_+ = 5$  V)Figure 4. Leakage Current vs Temperature  
( $V_+ = 3.3$  V)Figure 5. Leakage Current vs Temperature  
( $V_+ = 5$  V)Figure 6. Charge Injection ( $Q_c$ ) vs  $V_{COM}$

TYPICAL PERFORMANCE (continued)

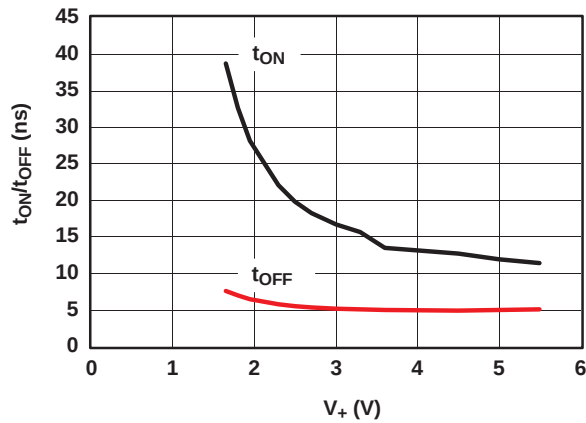


Figure 7.  $t_{ON}$  and  $t_{OFF}$  vs Supply Voltage

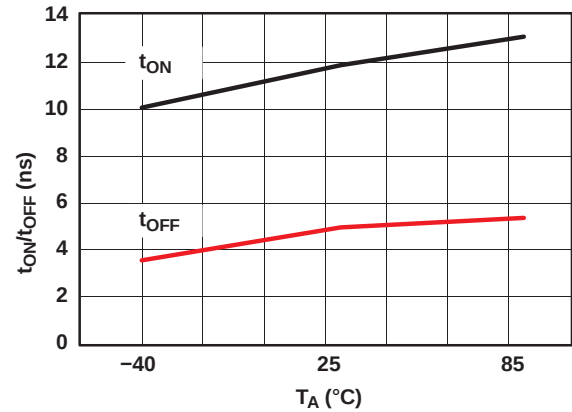


Figure 8.  $t_{ON}$  and  $t_{OFF}$  vs Temperature

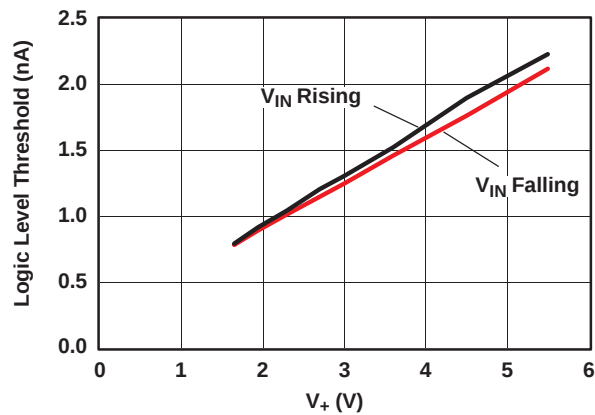


Figure 9.  $V_{IN}$  and  $t_{OFF}$  vs Supply Voltage

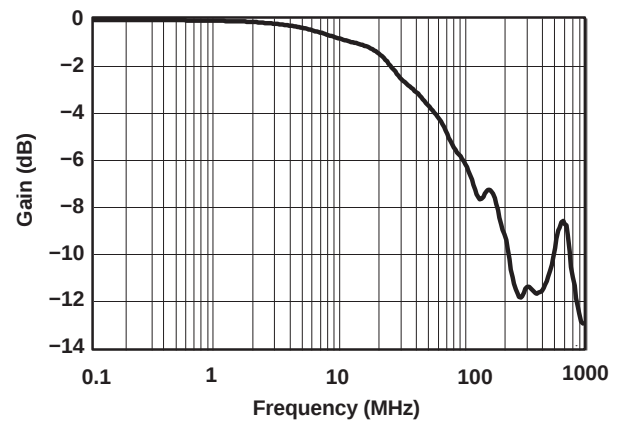


Figure 10. Bandwidth ( $V_+ = 5\text{ V}$ )

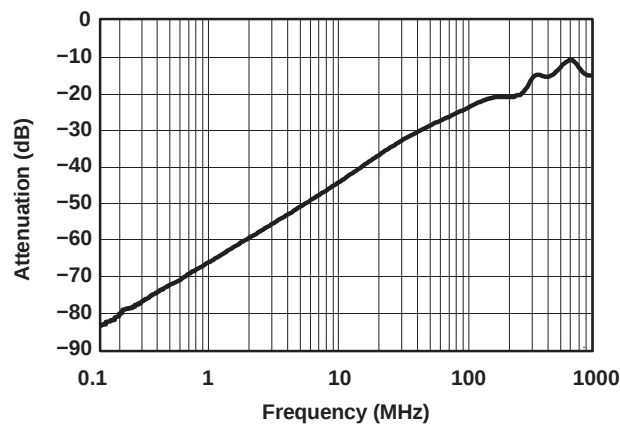


Figure 11. OFF Isolation vs Frequency

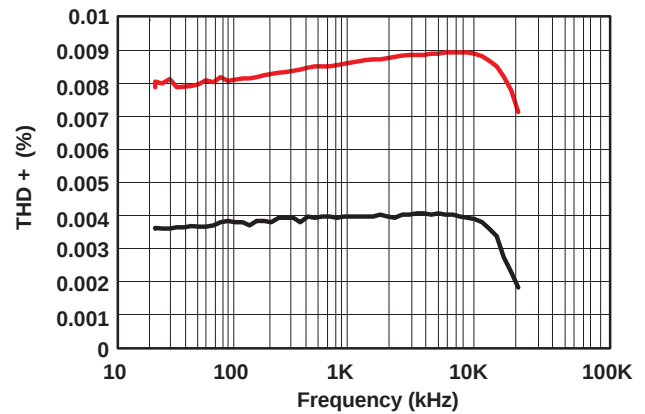
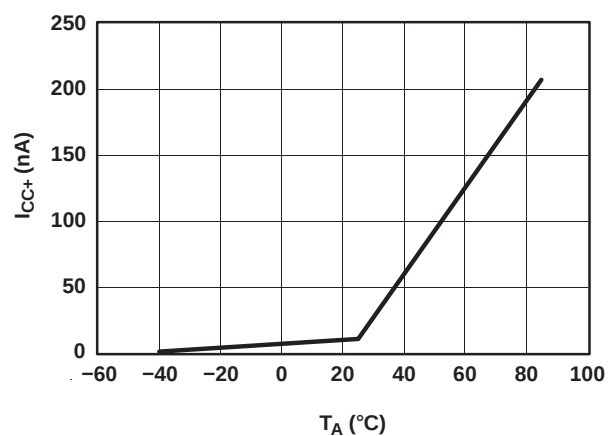


Figure 12. Total Harmonic Distortion vs Frequency ( $V_+ = 5\text{ V}$ )

**TYPICAL PERFORMANCE (continued)**



**Figure 13. Current vs Temperature ( $V_+ = 5$  V)**

**PIN DESCRIPTION**

| PIN NO. | NAME           | DESCRIPTION                          |
|---------|----------------|--------------------------------------|
| 1       | IN             | Digital control to connect COM to NO |
| 2       | V <sub>+</sub> | Power supply                         |
| 3       | GND            | Digital ground                       |
| 4       | NC             | Normally closed                      |
| 5       | COM            | Common                               |
| 6       | NO             | Normally open                        |

## PARAMETER DESCRIPTION

| SYMBOL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $V_{COM}$         | Voltage at COM                                                                                                                                                                                                                                                                                                                                                                            |
| $V_{NC}$          | Voltage at NC                                                                                                                                                                                                                                                                                                                                                                             |
| $V_{NO}$          | Voltage at NO                                                                                                                                                                                                                                                                                                                                                                             |
| $r_{on}$          | Resistance between COM and NC or COM and NO ports when the channel is ON                                                                                                                                                                                                                                                                                                                  |
| $r_{peak}$        | Peak ON-state resistance over a specified voltage range                                                                                                                                                                                                                                                                                                                                   |
| $\Delta r_{on}$   | Difference of $r_{on}$ between channels                                                                                                                                                                                                                                                                                                                                                   |
| $r_{on(flat)}$    | Difference between the maximum and minimum value of $r_{on}$ in a channel over the specified range of conditions                                                                                                                                                                                                                                                                          |
| $I_{NC(OFF)}$     | Leakage current measured at the NC port, with the corresponding channel (NC to COM) in the OFF state under worst-case input and output conditions                                                                                                                                                                                                                                         |
| $I_{NC(PWROFF)}$  | Leakage current measured at the NC port during the power-down condition, $V_+ = 0$                                                                                                                                                                                                                                                                                                        |
| $I_{NO(OFF)}$     | Leakage current measured at the NO port, with the corresponding channel (NO to COM) in the OFF state under worst-case input and output conditions                                                                                                                                                                                                                                         |
| $I_{NO(PWROFF)}$  | Leakage current measured at the NO port during the power-down condition, $V_+ = 0$                                                                                                                                                                                                                                                                                                        |
| $I_{NC(ON)}$      | Leakage current measured at the NC port, with the corresponding channel (NC to COM) in the ON state and the output (COM) being open                                                                                                                                                                                                                                                       |
| $I_{NO(ON)}$      | Leakage current measured at the NO port, with the corresponding channel (NO to COM) in the ON state and the output (COM) being open                                                                                                                                                                                                                                                       |
| $I_{COM(ON)}$     | Leakage current measured at the COM port, with the corresponding channel (COM to NO or COM to NC) in the ON state and the output (NC or NO) being open                                                                                                                                                                                                                                    |
| $I_{COM(PWROFF)}$ | Leakage current measured at the COM port during the power-down condition, $V_+ = 0$                                                                                                                                                                                                                                                                                                       |
| $V_{IH}$          | Minimum input voltage for logic high for the control input (IN)                                                                                                                                                                                                                                                                                                                           |
| $V_{IL}$          | Maximum input voltage for logic low for the control input (IN)                                                                                                                                                                                                                                                                                                                            |
| $V_I$             | Voltage at IN                                                                                                                                                                                                                                                                                                                                                                             |
| $I_{IH}, I_{IL}$  | Leakage current measured at IN                                                                                                                                                                                                                                                                                                                                                            |
| $t_{ON}$          | Turn-on time for the switch. This parameter is measured under the specified range of conditions and by the propagation delay between the digital control (IN) signal and analog outputs (COM, NC, or NO) signal when the switch is turning ON.                                                                                                                                            |
| $t_{OFF}$         | Turn-off time for the switch. This parameter is measured under the specified range of conditions and by the propagation delay between the digital control (IN) signal and analog outputs (COM, NC, or NO) signal when the switch is turning OFF.                                                                                                                                          |
| $t_{BBM}$         | Break-before-make time. This parameter is measured under the specified range of conditions and by the propagation delay between the output of two adjacent analog channels (NC and NO) when the control signal changes state.                                                                                                                                                             |
| $Q_C$             | Charge injection is a measurement of unwanted signal coupling from the control (IN) input to the analog (NC, NO, or COM) output. This is measured in coulomb (C) and measured by the total charge induced due to switching of the control input. Charge injection, $Q_C = C_L \times \Delta V_O$ , $C_L$ is the load capacitance and $\Delta V_O$ is the change in analog output voltage. |
| $C_{NC(OFF)}$     | Capacitance at the NC port when the corresponding channel (NC to COM) is OFF                                                                                                                                                                                                                                                                                                              |
| $C_{NO(OFF)}$     | Capacitance at the NO port when the corresponding channel (NO to COM) is OFF                                                                                                                                                                                                                                                                                                              |
| $C_{NC(ON)}$      | Capacitance at the NC port when the corresponding channel (NC to COM) is ON                                                                                                                                                                                                                                                                                                               |
| $C_{NO(ON)}$      | Capacitance at the NO port when the corresponding channel (NO to COM) is ON                                                                                                                                                                                                                                                                                                               |
| $C_{COM(ON)}$     | Capacitance at the COM port when the corresponding channel (COM to NC or COM to NO) is ON                                                                                                                                                                                                                                                                                                 |
| $C_{IN}$          | Capacitance of IN                                                                                                                                                                                                                                                                                                                                                                         |
| OISO              | OFF isolation of the switch is a measurement OFF-state switch impedance. This is measured in dB in a specific frequency, with the corresponding channel (NC to COM or NO to COM) in the OFF state.                                                                                                                                                                                        |
| $X_{TALK}$        | Crosstalk is a measurement of unwanted signal coupling from an ON channel to an OFF channel (NC to NO or NO to NC). This is measured in a specific frequency and in dB.                                                                                                                                                                                                                   |
| BW                | Bandwidth of the switch. This is the frequency in which the gain of an ON channel is –3 dB below the DC gain.                                                                                                                                                                                                                                                                             |
| THD               | Total harmonic distortion describes the signal distortion caused by the analog switch. This is defined as the ratio or root mean square (RMS) value of the second, third, and higher harmonic to the absolute magnitude of the fundamental harmonic.                                                                                                                                      |
| $I_+$             | Static power-supply current with the control (IN) pin at $V_+$ or GND                                                                                                                                                                                                                                                                                                                     |

## PARAMETER MEASUREMENT INFORMATION

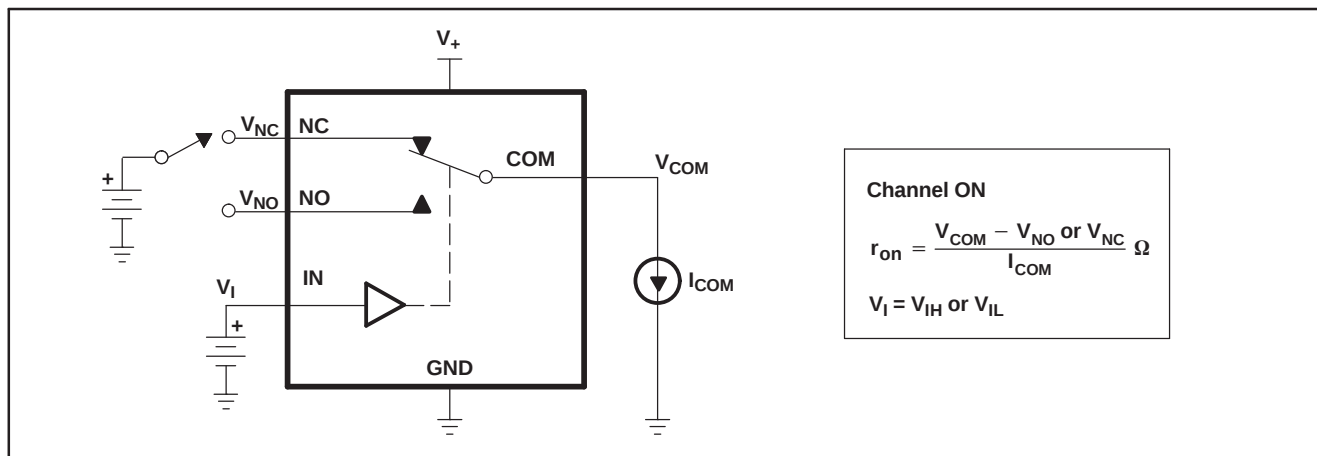


Figure 14. ON-State Resistance ( $r_{on}$ )

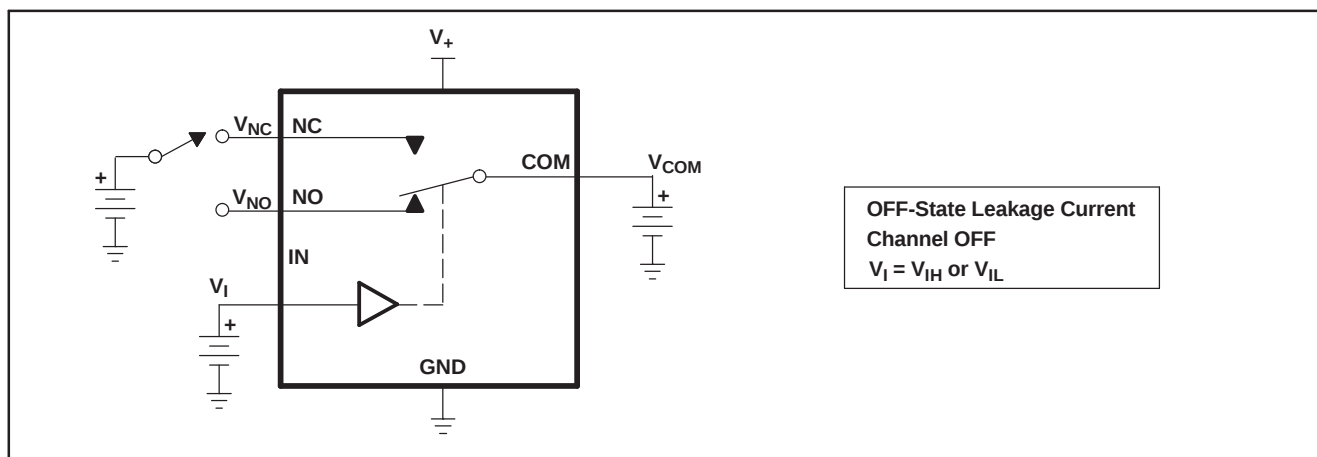


Figure 15. OFF-State Leakage Current ( $I_{NC(OFF)}$ ,  $I_{NC(PWROFF)}$ ,  $I_{NO(OFF)}$ ,  $I_{NO(PWROFF)}$ ,  $I_{COM(OFF)}$ ,  $I_{COM(PWROFF)}$ )

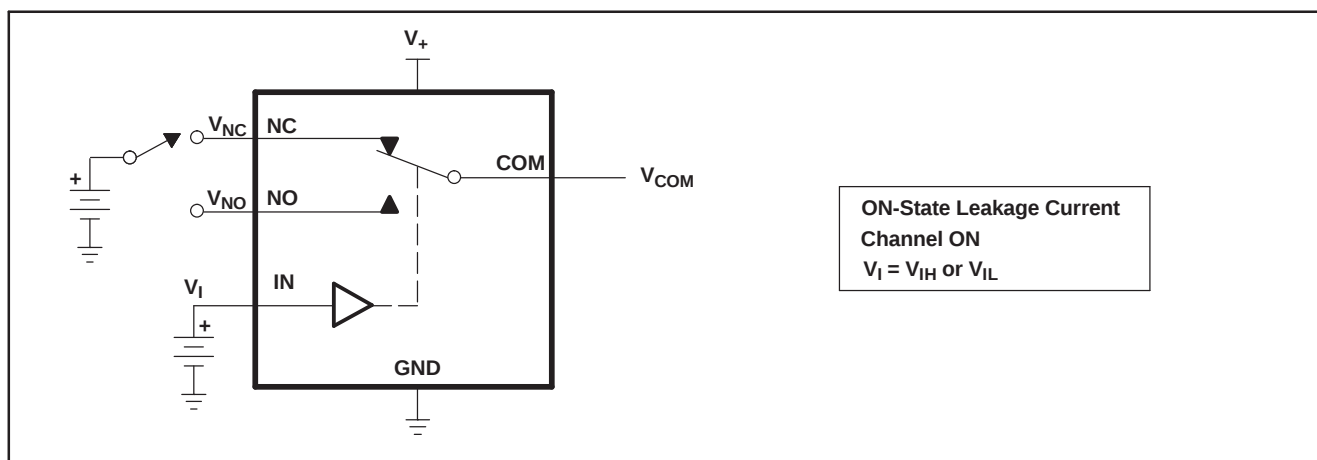
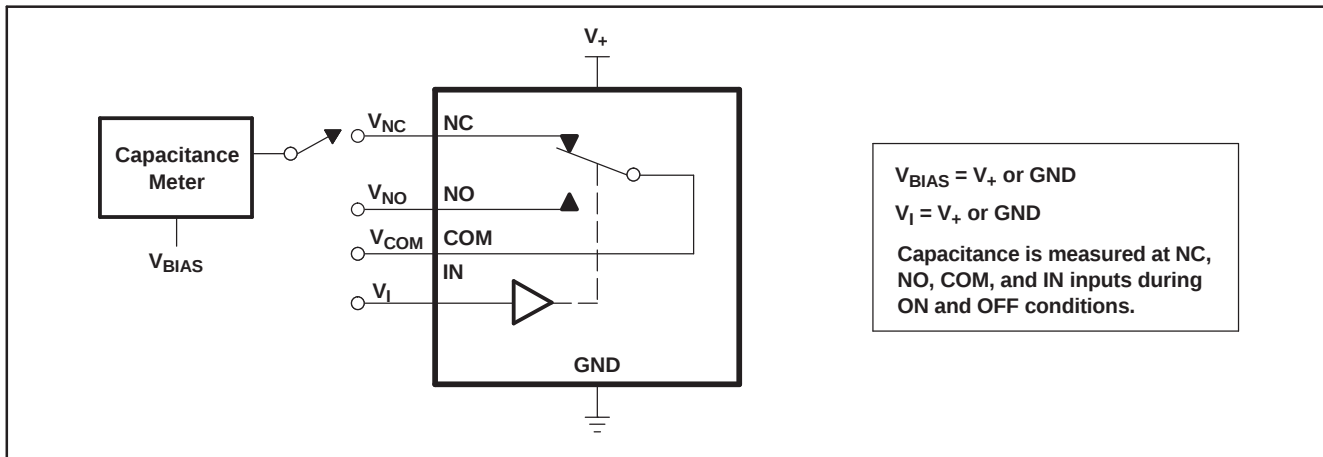
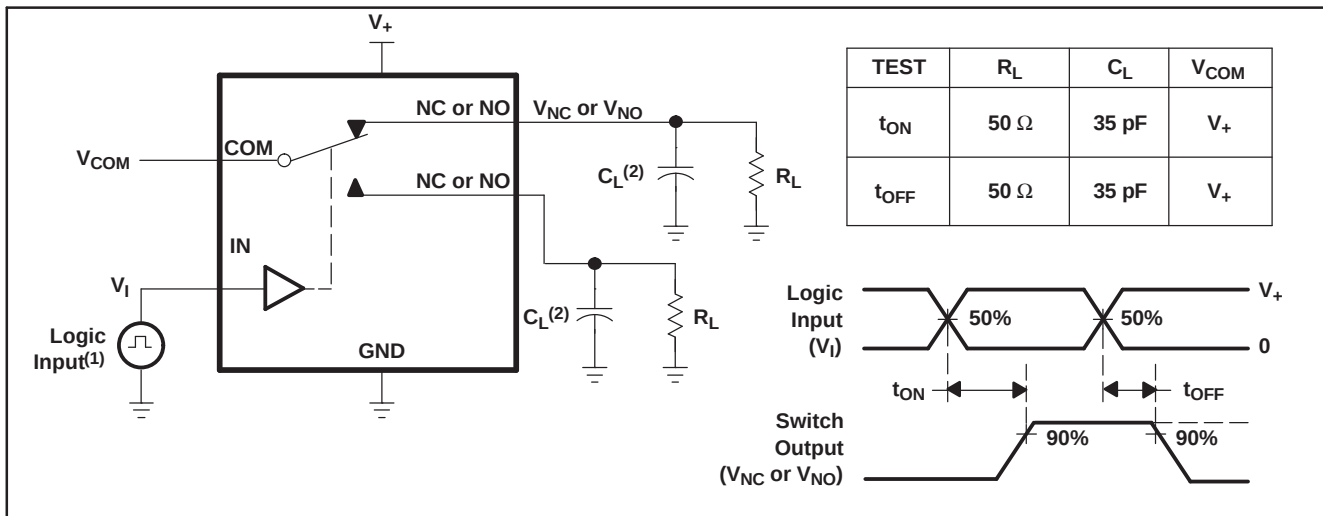


Figure 16. ON-State Leakage Current ( $I_{COM(ON)}$ ,  $I_{NC(ON)}$ ,  $I_{NO(ON)}$ )

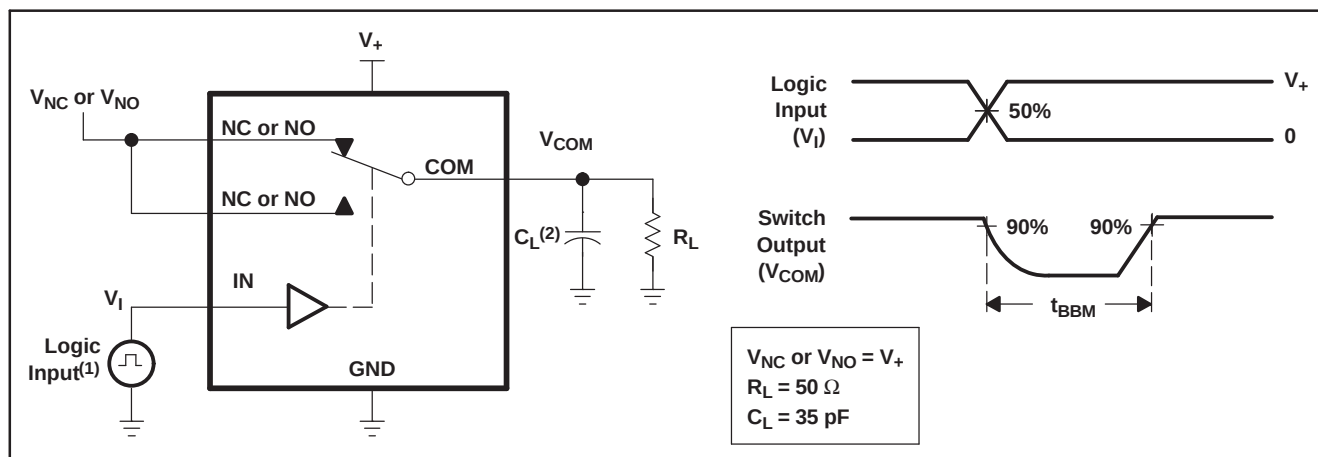


**Figure 17. Capacitance ( $C_I$ ,  $C_{COM(ON)}$ ,  $C_{NC(OFF)}$ ,  $C_{NO(OFF)}$ ,  $C_{NC(ON)}$ ,  $C_{NO(ON)}$ )**



- (1) All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10 MHz,  $Z_O = 50 \Omega$ ,  $t_r < 5$  ns,  $t_f < 5$  ns.
- (2)  $C_L$  includes probe and jig capacitance.

**Figure 18. Turn-On ( $t_{ON}$ ) and Turn-Off Time ( $t_{OFF}$ )**



- (1) All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\ \text{MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r < 5\ \text{ns}$ ,  $t_f < 5\ \text{ns}$ .
- (2)  $C_L$  includes probe and jig capacitance.

Figure 19. Break-Before-Make Time ( $t_{BBM}$ )

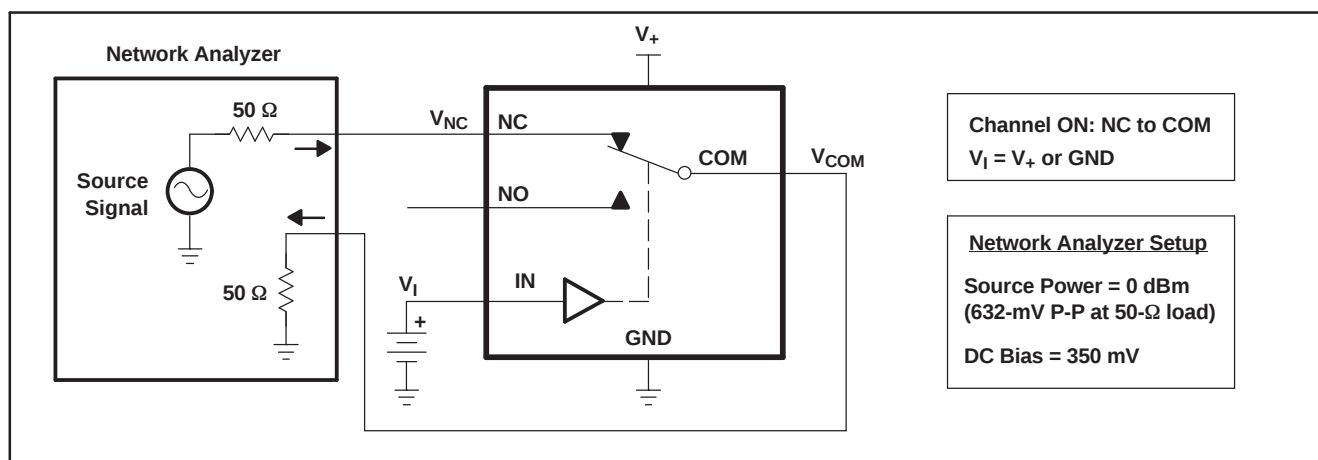


Figure 20. Bandwidth (BW)

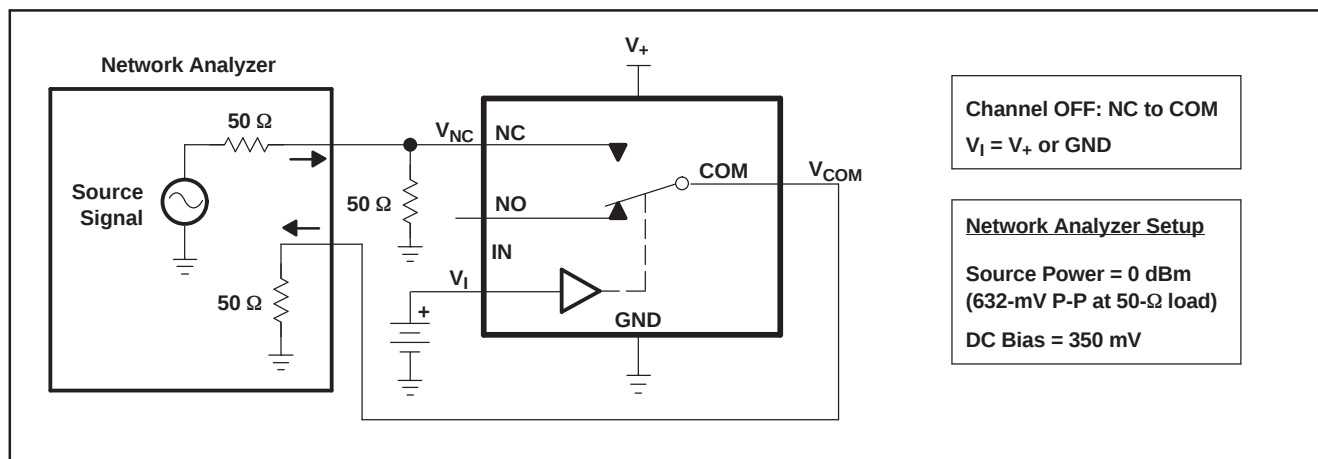
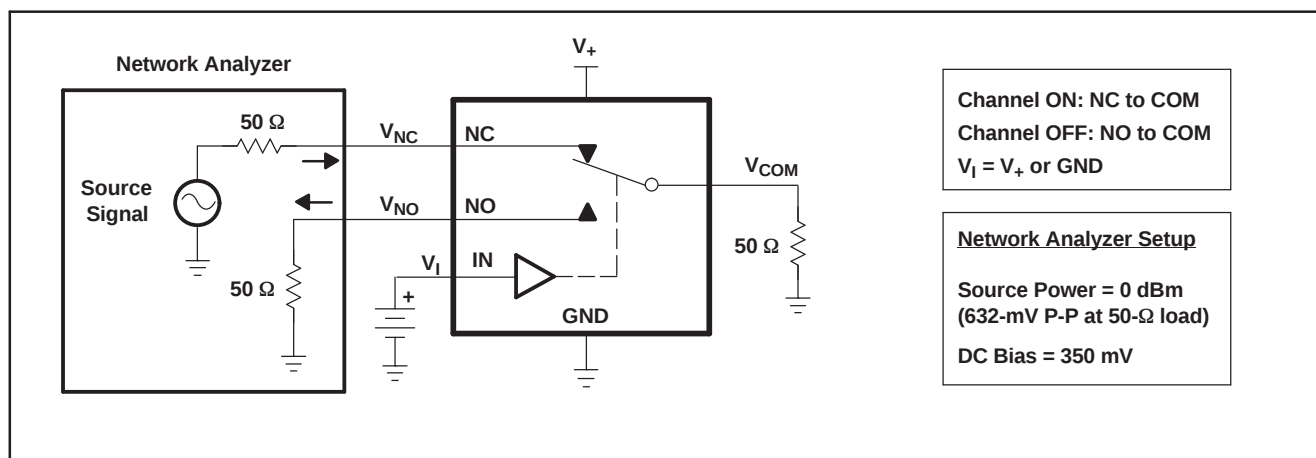
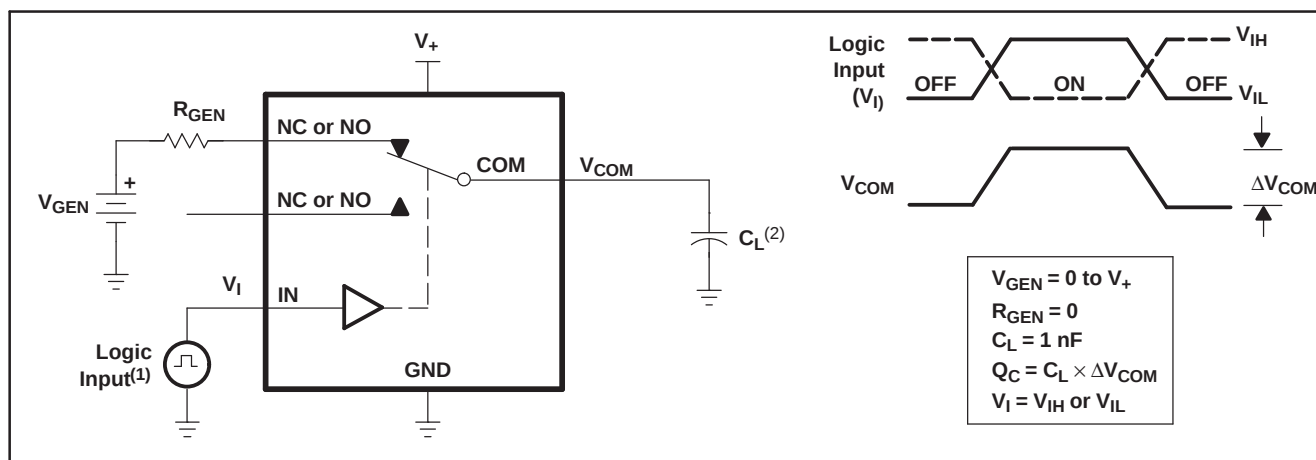


Figure 21. OFF Isolation (OISO)

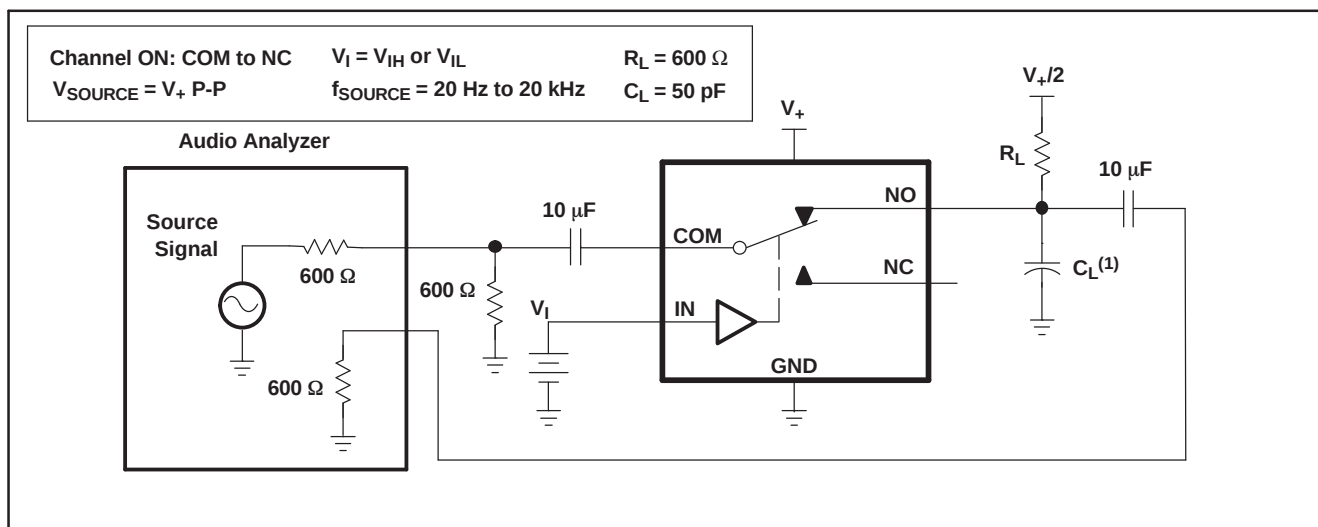


**Figure 22. Crosstalk ( $X_{\text{TALK}}$ )**



- (1) All input pulses are supplied by generators having the following characteristics:  $\text{PRR} \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r < 5 \text{ ns}$ ,  $t_f < 5 \text{ ns}$ .
- (2)  $C_L$  includes probe and jig capacitance.

**Figure 23. Charge Injection ( $Q_C$ )**



(1)  $C_L$  includes probe and jig capacitance.

**Figure 24. Total Harmonic Distortion (THD)**

## PACKAGING INFORMATION

| Orderable part number        | Status<br>(1) | Material type<br>(2) | Package   Pins | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|------------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| <a href="#">TS5A4624DCKR</a> | Active        | Production           | SC70 (DCK)   6 | 3000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | (JWF, JWR)          |
| TS5A4624DCKR.B               | Active        | Production           | SC70 (DCK)   6 | 3000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | (JWF, JWR)          |
| TS5A4624DCKRG4               | Active        | Production           | SC70 (DCK)   6 | 3000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | JWF                 |
| TS5A4624DCKRG4.B             | Active        | Production           | SC70 (DCK)   6 | 3000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | JWF                 |
| <a href="#">TS5A4624DCKT</a> | Obsolete      | Production           | SC70 (DCK)   6 | -                     | -           | Call TI                              | Call TI                           | -40 to 85    | JWR                 |

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

## TAPE AND REEL INFORMATION



\*All dimensions are nominal

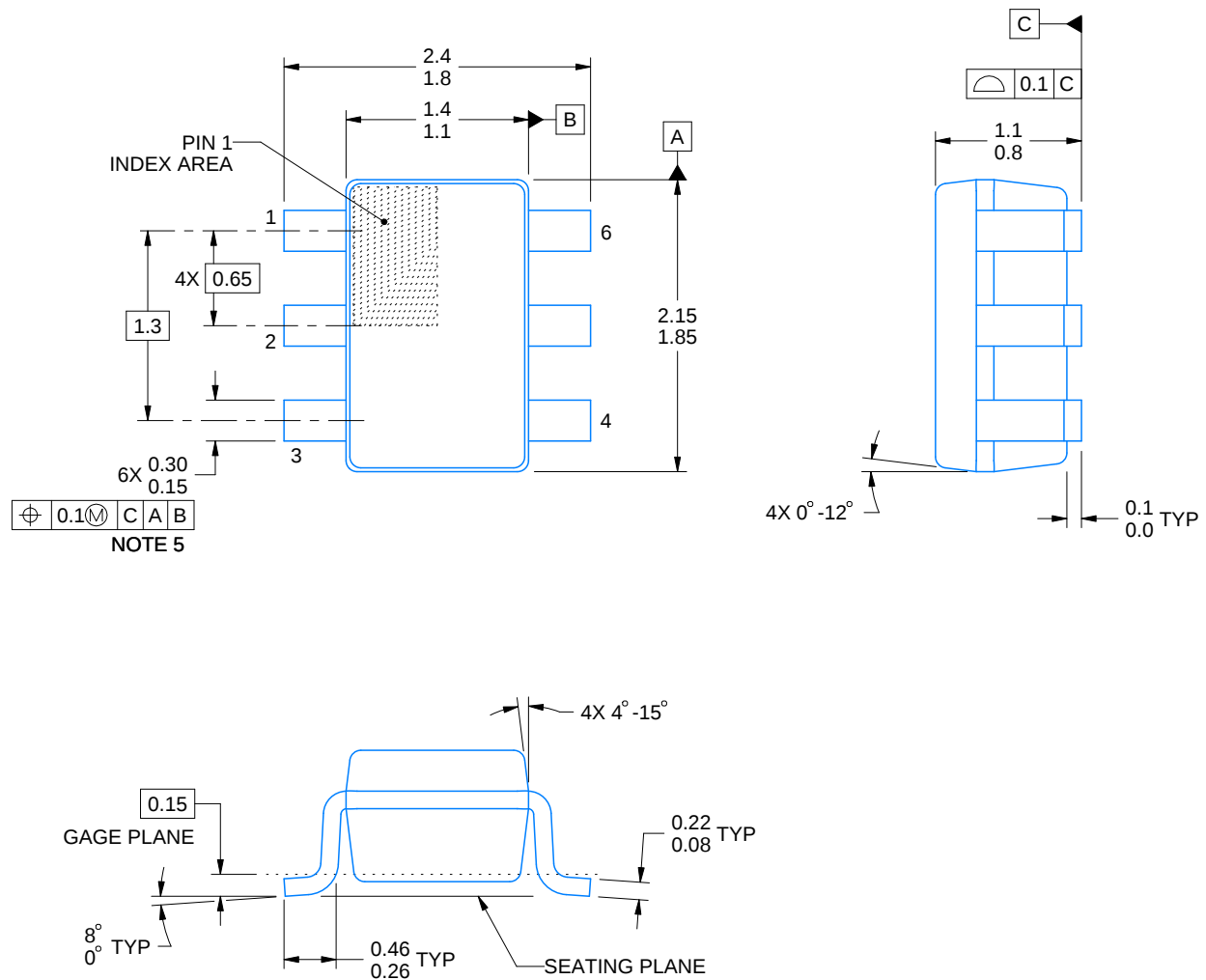
| Device         | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TS5A4624DCKR   | SC70         | DCK             | 6    | 3000 | 178.0              | 9.0                | 2.4     | 2.5     | 1.2     | 4.0     | 8.0    | Q3            |
| TS5A4624DCKRG4 | SC70         | DCK             | 6    | 3000 | 178.0              | 9.0                | 2.4     | 2.5     | 1.2     | 4.0     | 8.0    | Q3            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

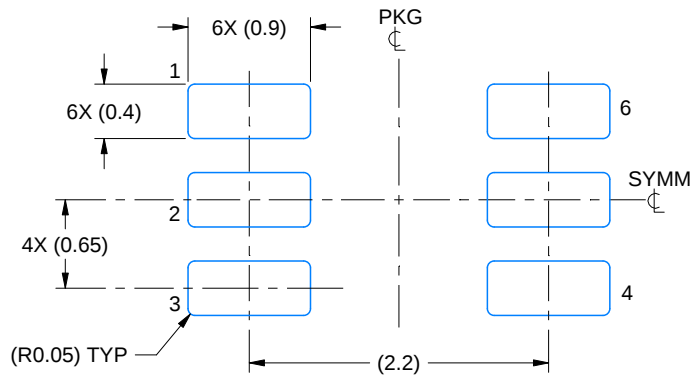
| Device         | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TS5A4624DCKR   | SC70         | DCK             | 6    | 3000 | 180.0       | 180.0      | 18.0        |
| TS5A4624DCKRG4 | SC70         | DCK             | 6    | 3000 | 180.0       | 180.0      | 18.0        |



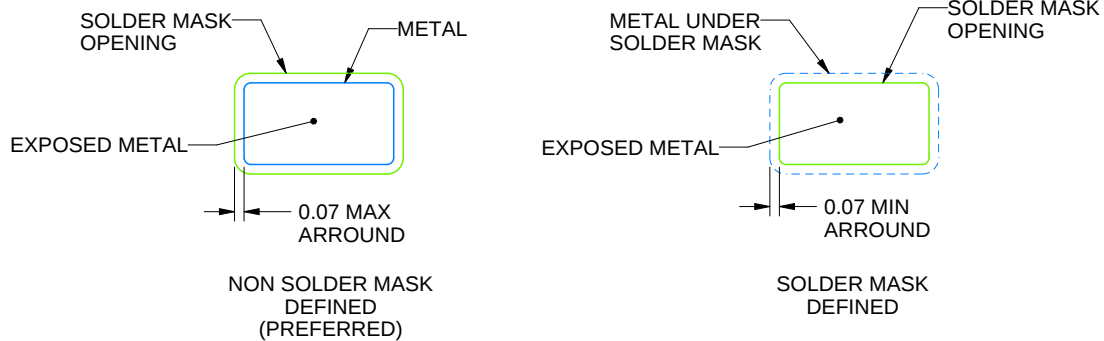
4214835/D 11/2024

## NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
4. Falls within JEDEC MO-203 variation AB.



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:18X

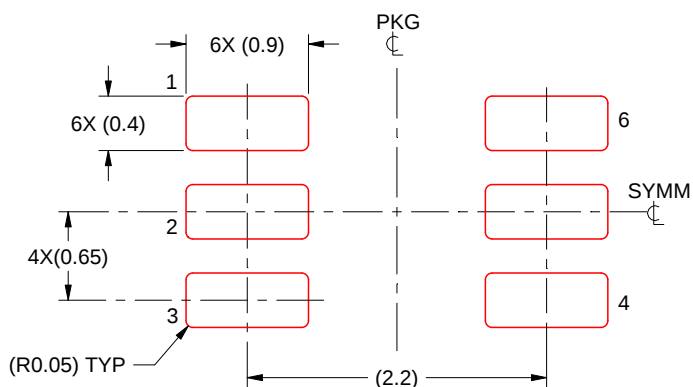


SOLDER MASK DETAILS

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NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE  
BASED ON 0.125 THICK STENCIL  
SCALE:18X

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### NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

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