

TS5A3167 0.9Ω 1 通道 1:1 SPST 模拟开关

1 特性

- 断电模式下的隔离, $V_{CC} = 0$
- 低导通状态电阻 (0.9Ω)
- 控制输入可承受 5.5V 电压
- 低电荷注入
- 低总谐波失真 (THD)
- 1.65V 至 5.5V 单电源运行
- 锁断性能超过 100mA (符合 JESD 78, II 类规范的要求)
- 静电放电 (ESD) 性能测试符合 JESD 22 规范
 - 2000V 人体放电模式 (A114-B, II 类)
 - 1000V 充电器件模型 (C101)

2 应用

- 手机
- 掌上电脑 (PDA)
- 便携式仪表
- 音频和视频信号路由
- 低压数据采集系统
- 通信电路
- 调制解调器
- 硬盘
- 计算机外设
- 无线终端和外设
- 麦克风开关 – 笔记本电脑扩展坞

3 说明

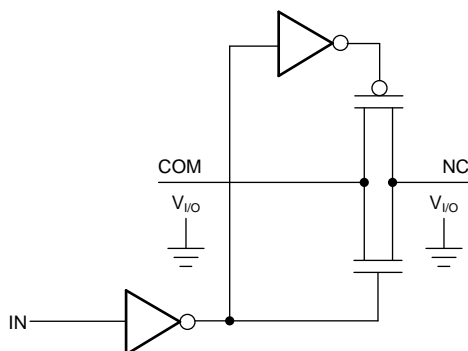
TS5A3167 是一款工作电压范围为 1.65V 至 5.5V 的双向、单通道、单刀双掷 (SPDT) 模拟开关。TS5A3167 器件具有较低的导通状态电阻。该器件具有出色的总谐波失真 (THD) 性能和极低的功耗。这些特性再加上低功耗性能, 使得这款器件适合于便携式音频应用。

器件信息⁽¹⁾

| 器件型号 | 封装 | 封装尺寸 (标称值) |
|----------|--------|-----------------|
| TS5A3167 | SOT-23 | 2.90mm x 1.60mm |
| | SC70 | 2.00mm x 1.25mm |
| | DSBGA | 1.50mm x 0.90mm |

(1) 如需了解所有可用封装, 请参阅数据表末尾的可订购产品附录。

简单原理图



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4 修订历史记录

注：之前版本的页码可能与当前版本有所不同。

Changes from Revision B (March 2017) to Revision C Page

- 在器件信息表中将 DSBGA 封装尺寸从 1.50mm x 9.00mm 更改成了 1.50mm x 0.90mm
- Changed the YZP package pinout view From: Top View To: Bottom View

Changes from Revision A (October 2012) to Revision B Page

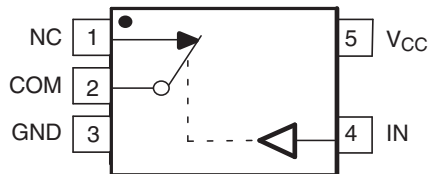
- 添加了器件信息表、引脚配置和功能、ESD 额定值、建议运行条件、热性能信息、详细说明、特性说明、器件功能模式、应用和实施、电源建议、布局、器件和文档支持
- 删除了订购信息表

Changes from Original (February 2005) to Revision A Page

- 更新了订购信息表

5 Pin Configuration and Functions

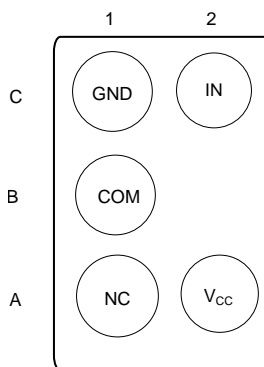
DBV or DCK Package
5-Pin (SOT-23 or SC70)
Top View



Pin Functions

| PIN NUMBER | NAME | DESCRIPTION |
|------------|-----------------|---|
| 1 | NC | Normally Closed |
| 2 | COM | Common |
| 3 | GND | Ground |
| 4 | IN | Digital control pin, COM connected to NC when logic low |
| 5 | V _{CC} | Power Supply |

YZP Package
5-Pin (DSBGA)
Bottom View



Pin Functions

| PIN NUMBER | NAME | DESCRIPTION |
|------------|-----------------|---|
| A1 | NC | Normally Closed |
| B1 | COM | Common |
| C1 | GND | Ground |
| A2 | V _{CC} | Power Supply |
| C2 | IN | Digital control pin, COM connected to NC when logic low |

6 Specifications

6.1 Absolute Maximum Ratings⁽¹⁾⁽²⁾

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

| | | MIN | MAX | UNIT |
|-----------------------|---|--------------|----------------|------|
| V_{CC} | Supply voltage range ⁽³⁾ | -0.5 | 6.5 | V |
| V_{NC} V_{COM} | Analog voltage range ⁽³⁾⁽⁴⁾⁽⁵⁾ | -0.5 | $V_{CC} + 0.5$ | V |
| I_K | Analog port diode current $V_{NC}, V_{COM} < 0$ | -50 | | mA |
| I_{NC} I_{COM} | On-state switch current On-state peak switch current ⁽⁶⁾ $V_{NC}, V_{COM} = 0$ to V_{CC} | -200 -400 | 200 400 | mA |
| V_I | Digital input voltage range ⁽³⁾⁽⁴⁾ | -0.5 | 6.5 | V |
| I_{IK} | Digital clamp current $V_I < 0$ | -50 | | mA |
| I_{CC} | Continuous current through V_{CC} | | 100 | mA |
| I_{GND} | Continuous current through GND | -100 | | mA |
| T_{stg} | 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.

6.2 ESD Ratings

| | | VALUE | UNIT |
|--|---|-------|------|
| $V_{(ESD)}$ | Electrostatic discharge | | |
| | Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾ | ±2000 | V |
| Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾ | ±1000 | | |

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6.3 Recommended Operating Conditions

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

| | | MIN | MAX | UNIT |
|-----------------------|-----------------------------|------|----------|------|
| V_{CC} | Supply voltage range | 1.65 | 5.5 | V |
| V_{NC} V_{COM} | Analog voltage range | 0 | V_{CC} | V |
| V_I | Digital input voltage range | 0 | V_{CC} | V |

6.4 Thermal Information

| THERMAL METRIC ⁽¹⁾ | TS5A3167 | | | UNIT | |
|-------------------------------|--|--------------|-------------|-------|------|
| | DBV (SOT-23) | DCK (SOT-23) | YZP (DSBGA) | | |
| | 5 PINS | 5 PINS | 5 PINS | | |
| $R_{\theta JA}$ | Junction-to-ambient thermal resistance | 230.3 | 268.0 | 146.2 | °C/W |
| $R_{\theta JC(top)}$ | Junction-to-case (top) thermal resistance | 111.9 | 171.8 | 1.4 | °C/W |
| $R_{\theta JB}$ | Junction-to-board thermal resistance | 69.5 | 64.5 | 39.3 | °C/W |
| Ψ_{JT} | Junction-to-top characterization parameter | 33.0 | 40.5 | 0.7 | °C/W |
| Ψ_{JB} | Junction-to-board characterization parameter | 69.0 | 62.9 | 39.8 | °C/W |
| $R_{\theta JC(bot)}$ | Junction-to-case (bottom) thermal resistance | n/a | n/a | n/a | °C/W |

- (1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report.

6.5 Electrical Characteristics for 5-V Supply⁽¹⁾

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

| PARAMETER | SYMBOL | TEST CONDITIONS | T_A | V_{CC} | MIN | TYP | MAX | UNIT | |
|------------------------------------|--------------------------------|---|--|----------|-------|------|------|----------|---------------|
| Analog Switch | | | | | | | | | |
| Peak ON resistance | r_{peak} | $0 \leq V_{\text{NC}} \leq V_{\text{CC}}$, $I_{\text{COM}} = -100\text{ mA}$, | Switch ON, See Figure 13 | 25°C | 4.5 V | 0.8 | 1.1 | Ω | |
| | | | | Full | | 1.2 | | | |
| ON-state resistance | r_{on} | $V_{\text{NC}} = 2.5\text{ V}$, $I_{\text{COM}} = -100\text{ mA}$, | Switch ON, See Figure 13 | 25°C | 4.5 V | 0.75 | 0.9 | Ω | |
| | | | | Full | | 1 | | | |
| ON-state resistance flatness | $r_{\text{on(flat)}}$ | $0 \leq V_{\text{NC}} \leq V_{\text{CC}}$, $I_{\text{COM}} = -100\text{ mA}$, $V_{\text{NC}} = 1\text{ V}, 1.5\text{ V}, 2.5\text{ V}$, $I_{\text{COM}} = -100\text{ mA}$, | Switch ON, See Figure 13 | 25°C | 4.5 V | 0.2 | | Ω | |
| | | | | 25°C | | 0.15 | 0.25 | | |
| | | | | Full | | 0.25 | | | |
| NC OFF leakage current | $I_{\text{NC(OFF)}}$ | $V_{\text{NC}} = 1\text{ V}$, $V_{\text{COM}} = 4.5\text{ V}$, or $V_{\text{NC}} = 4.5\text{ V}$, $V_{\text{COM}} = 1\text{ V}$, | Switch OFF, See Figure 14 | 25°C | 5.5 V | 0 | 4 | 20 | nA |
| | | | | Full | | -150 | 150 | | |
| | $I_{\text{NC(PWROFF)}}$ | $V_{\text{NC}} = 0\text{ to }5.5\text{ V}$, $V_{\text{COM}} = 5.5\text{ V to }0$, | | 25°C | 0 V | -10 | 0.2 | 10 | μA |
| | | | | Full | | -50 | 50 | | |
| COM OFF leakage current | $I_{\text{COM(OFF)}}$ | $V_{\text{COM}} = 1\text{ V}$, $V_{\text{NC}} = 4.5\text{ V}$, or $V_{\text{COM}} = 4.5\text{ V}$, $V_{\text{NC}} = 1\text{ V}$, | Switch OFF, See Figure 14 | 25°C | 5.5 V | 0 | 4 | 20 | nA |
| | | | | Full | | -150 | 150 | | |
| | $I_{\text{COM(PWROFF)}}$ | $V_{\text{COM}} = 5.5\text{ V to }0$, $V_{\text{NC}} = 0\text{ to }5.5\text{ V}$, | | 25°C | 0 V | -10 | 0.2 | 10 | μA |
| | | | | Full | | -50 | 50 | | |
| NC ON leakage current | $I_{\text{NC(ON)}}$ | $V_{\text{NC}} = 1\text{ V}$, $V_{\text{COM}} = \text{Open}$, or $V_{\text{NC}} = 4.5\text{ V}$, $V_{\text{COM}} = \text{Open}$, | Switch ON, See Figure 15 | 25°C | 5.5 V | -5 | 0.4 | 5 | nA |
| | | | | Full | | -50 | 50 | | |
| COM ON leakage current | $I_{\text{COM(ON)}}$ | $V_{\text{COM}} = 1\text{ V}$, $V_{\text{NC}} = \text{Open}$, or $V_{\text{COM}} = 4.5\text{ V}$, $V_{\text{NC}} = \text{Open}$, | Switch ON, See Figure 15 | 25°C | 5.5 V | -5 | 0.4 | 5 | nA |
| | | | | Full | | -20 | 20 | | |
| Digital Control Inputs (IN) | | | | | | | | | |
| Input logic high | V_{IH} | | | Full | | 2.4 | 5.5 | V | |
| Input logic low | V_{IL} | | | Full | | 0 | 0.8 | V | |
| Input leakage current | $I_{\text{IH}}, I_{\text{IL}}$ | $V_{\text{I}} = 5.5\text{ V or }0$ | | 25°C | 5.5 V | -2 | 0.3 | 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.

6.6 Electrical Characteristics for 5-V Supply⁽¹⁾ (continued)

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

| PARAMETER | SYMBOL | TEST CONDITIONS | T_A | VCC | MIN | TYP | MAX | UNIT | |
|------------------------------|----------------|---|---|------|-------------------|-----|--------|------|---------------|
| Dynamic | | | | | | | | | |
| Turn-on time | t_{ON} | $V_{COM} = V_{CC}$, $R_L = 50 \Omega$, | $C_L = 35 \text{ pF}$, See Figure 17 | 25°C | 5 V | 1 | 4.5 | 7.5 | ns |
| | | | | Full | 4.5 V to 5.5 V | 1 | | 9 | |
| Turn-off time | t_{OFF} | $V_{COM} = V_{CC}$, $R_L = 50 \Omega$, | $C_L = 35 \text{ pF}$, See Figure 17 | 25°C | 5 V | 4.5 | 8 | 11 | ns |
| | | | | Full | 4.5 V to 5.5 V | 3.5 | | 13 | |
| Charge injection | Q_C | $V_{GEN} = 0$, $R_{GEN} = 0$, | $C_L = 1 \text{ nF}$, See Figure 20 | 25°C | 5 V | | 6 | pC | |
| NC OFF capacitance | $C_{NC(OFF)}$ | $V_{NC} = V_{CC}$ or GND, | Switch OFF, See Figure 16 | 25°C | 5 V | | 19 | pF | |
| COM OFF capacitance | $C_{COM(OFF)}$ | $V_{COM} = V_{CC}$ or GND, | Switch OFF, See Figure 16 | 25°C | 5 V | | 18 | pF | |
| NC ON capacitance | $C_{NC(ON)}$ | $V_{NC} = V_{CC}$ or GND, | Switch ON, See Figure 16 | 25°C | 5 V | | 35.5 | pF | |
| COM ON capacitance | $C_{COM(ON)}$ | $V_{COM} = V_{CC}$ or GND, | Switch ON, See Figure 16 | 25°C | 5 V | | 35.5 | pF | |
| Digital input capacitance | C_I | $V_I = V_{CC}$ or GND, | See Figure 16 | 25°C | 5 V | | 2 | pF | |
| Bandwidth | BW | $R_L = 50 \Omega$, | Switch ON, See Figure 18 | 25°C | 5 V | | 150 | MHz | |
| OFF isolation | O_{ISO} | $R_L = 50 \Omega$, $f = 1 \text{ MHz}$, | Switch OFF, See Figure 19 | 25°C | 5 V | | -62 | dB | |
| Total harmonic distortion | THD | $R_L = 600 \Omega$, $C_L = 50 \text{ pF}$, | $f = 20 \text{ Hz to } 20 \text{ kHz}$, See Figure 21 | 25°C | 5 V | | 0.005% | | |
| Supply | | | | | | | | | |
| Positive supply current | I_{CC} | $V_I = V_{CC}$ or GND, | Switch ON or OFF | 25°C | 5.5 V | | 0.01 | 0.1 | μA |
| | | | | Full | | | | 1 | |

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

6.7 Electrical Characteristics for 3.3-V Supply⁽¹⁾

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

| PARAMETER | SYMBOL | TEST CONDITIONS | T_A | V_{CC} | MIN | TYP | MAX | UNIT | |
|------------------------------------|-------------------|--|--|----------|-------|------|------|----------|---------------|
| Analog Switch | | | | | | | | | |
| Peak ON resistance | r_{peak} | $0 \leq V_{NC} \leq V_{CC}$, $I_{COM} = -100\text{ mA}$, | Switch ON, See Figure 13 | 25°C | 3 V | 1.3 | 1.6 | Ω | |
| | | | | Full | | 1.8 | | | |
| ON-state resistance | r_{on} | $V_{NC} = 2\text{ V}$, $I_{COM} = -100\text{ mA}$, | Switch ON, See Figure 13 | 25°C | 3 V | 1.1 | 1.5 | Ω | |
| | | | | Full | | 1.7 | | | |
| ON-state resistance flatness | $r_{on(flat)}$ | $0 \leq V_{NC} \leq V_{CC}$, $I_{COM} = -100\text{ mA}$, | Switch ON, See Figure 13 | 25°C | 3 V | 0.3 | | Ω | |
| | | | | 25°C | | 0.15 | 0.25 | | |
| | | Full | 0.25 | | | | | | |
| NC OFF leakage current | $I_{NC(OFF)}$ | $V_{NC} = 1\text{ V}$, $V_{COM} = 3\text{ V}$, or $V_{NC} = 3\text{ V}$, $V_{COM} = 1\text{ V}$, | Switch OFF, See Figure 14 | 25°C | 3.6 V | -5 | 0.5 | 5 | nA |
| | | | | Full | | -50 | 50 | | |
| | $I_{NC(PWROFF)}$ | $V_{NC} = 0\text{ to }3.6\text{ V}$, $V_{COM} = 3.6\text{ V to }0$, | | 25°C | 0 V | -5 | 0.1 | 5 | μA |
| | | | | Full | | -25 | 25 | | |
| COM OFF leakage current | $I_{COM(OFF)}$ | $V_{COM} = 1\text{ V}$, $V_{NC} = 3\text{ V}$, or $V_{COM} = 3\text{ V}$, $V_{NC} = 1\text{ V}$, | Switch OFF, See Figure 14 | 25°C | 3.6 V | -5 | 0.5 | 5 | nA |
| | | | | Full | | -50 | 50 | | |
| | $I_{COM(PWROFF)}$ | $V_{COM} = 3.6\text{ V to }0$, $V_{NC} = 0\text{ to }3.6\text{ V}$, | | 25°C | 0 V | -5 | 0.1 | 5 | μA |
| | | | | Full | | -25 | 25 | | |
| NC ON leakage current | $I_{NC(ON)}$ | $V_{NC} = 1\text{ V}$, $V_{COM} = \text{Open}$, or $V_{NC} = 3\text{ V}$, $V_{COM} = \text{Open}$, | Switch ON, See Figure 15 | 25°C | 3.6 V | -2 | 0.3 | 2 | nA |
| | | | | Full | | -20 | 20 | | |
| COM ON leakage current | $I_{COM(ON)}$ | $V_{COM} = 1\text{ V}$, $V_{NC} = \text{Open}$, or $V_{COM} = 3\text{ V}$, $V_{NC} = \text{Open}$, | Switch ON, See Figure 15 | 25°C | 3.6 V | -2 | 0.3 | 2 | nA |
| | | | | Full | | -20 | 20 | | |
| Digital Control Inputs (IN) | | | | | | | | | |
| Input logic high | V_{IH} | | | Full | | 2 | 5.5 | V | |
| Input logic low | V_{IL} | | | Full | | 0 | 0.8 | V | |
| Input leakage current | I_{IH}, I_{IL} | $V_I = 5.5\text{ V or }0$ | | 25°C | 3.6 V | -2 | 0.3 | 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.

6.8 Electrical Characteristics for 3.3-V Supply⁽¹⁾ (continued)

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

| PARAMETER | SYMBOL | TEST CONDITIONS | T_A | VCC | MIN | TYP | MAX | UNIT | |
|------------------------------|----------------|---|--|------|-----------------|-------|-------|---------------|----|
| Dynamic | | | | | | | | | |
| Turn-on time | t_{ON} | $V_{COM} = V_{CC}$, $R_L = 50\ \Omega$, | $C_L = 35\text{ pF}$, See Figure 17 | 25°C | 3.3 V | 1.5 | 5 | 9.5 | ns |
| | | | | Full | 3 V to 3.6 V | 1.0 | | 10 | |
| Turn-off time | t_{OFF} | $V_{COM} = V_{CC}$, $R_L = 50\ \Omega$, | $C_L = 35\text{ pF}$, See Figure 17 | 25°C | 3.3 V | 4.5 | 8.5 | 11 | ns |
| | | | | Full | 3 V to 3.6 V | 3 | | 12.5 | |
| Charge injection | Q_C | $V_{GEN} = 0$, $R_{GEN} = 0$, | $C_L = 1\text{ nF}$, See Figure 20 | 25°C | 3.3 V | | 6 | pC | |
| NC OFF capacitance | $C_{NC(OFF)}$ | $V_{NC} = V_{CC}$ or GND, | Switch OFF, See Figure 16 | 25°C | 3.3 V | | 19.5 | pF | |
| COM OFF capacitance | $C_{COM(OFF)}$ | $V_{COM} = V_{CC}$ or GND, | Switch OFF, See Figure 16 | 25°C | 3.3 V | | 18.5 | pF | |
| NC ON capacitance | $C_{NC(ON)}$ | $V_{NC} = V_{CC}$ or GND, | Switch ON, See Figure 16 | 25°C | 3.3 V | | 36 | pF | |
| COM ON capacitance | $C_{COM(ON)}$ | $V_{COM} = V_{CC}$ or GND, | Switch ON, See Figure 16 | 25°C | 3.3 V | | 36 | pF | |
| Digital input capacitance | C_I | $V_I = V_{CC}$ or GND, | See Figure 16 | 25°C | 3.3 V | | 2 | pF | |
| Bandwidth | BW | $R_L = 50\ \Omega$, | Switch ON, See Figure 18 | 25°C | 3.3 V | | 150 | MHz | |
| OFF isolation | O_{ISO} | $R_L = 50\ \Omega$, $f = 1\text{ MHz}$, | Switch OFF, See Figure 19 | 25°C | 3.3 V | | -62 | dB | |
| Total harmonic distortion | THD | $R_L = 600\ \Omega$, $C_L = 50\text{ pF}$, | $f = 20\text{ Hz to }20\text{ kHz}$, See Figure 21 | 25°C | 3.3 V | | 0.01% | | |
| Supply | | | | | | | | | |
| Positive supply current | I_{CC} | $V_I = V_{CC}$ or GND, | Switch ON or OFF | 25°C | 3.6 V | 0.001 | 0.05 | μA | |
| | | | | Full | | | 0.3 | | |

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

6.9 Electrical Characteristics for 2.5-V Supply⁽¹⁾

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

| PARAMETER | SYMBOL | TEST CONDITIONS | T_A | V_{CC} | MIN | TYP | MAX | UNIT | |
|------------------------------------|-------------------|--|--|----------|-------|-----|------|----------|---------------|
| Analog Switch | | | | | | | | | |
| Peak ON resistance | r_{peak} | $0 \leq V_{NC} \leq V_{CC}$, $I_{COM} = -100 \text{ mA}$, | Switch ON, See Figure 13 | 25°C | 2.3 V | 1.8 | 2.4 | Ω | |
| | | | | Full | | 2.6 | | | |
| ON-state resistance | r_{on} | $V_{NC} = 2 \text{ V}$, $I_{COM} = -100 \text{ mA}$, | Switch ON, See Figure 13 | 25°C | 2.3 V | 1.2 | 2.1 | Ω | |
| | | | | Full | | 2.4 | | | |
| ON-state resistance flatness | $r_{on(Flat)}$ | $0 \leq V_{NC} \leq V_{CC}$, $I_{COM} = -100 \text{ mA}$, | Switch ON, See Figure 13 | 25°C | 2.3 V | 0.7 | | Ω | |
| | | | | 25°C | | 0.4 | 0.6 | | |
| | | Full | | | | 0.6 | | | |
| NC OFF leakage current | $I_{NC(OFF)}$ | $V_{NC} = 1 \text{ V}$, $V_{COM} = 3 \text{ V}$, or $V_{NC} = 3 \text{ V}$, $V_{COM} = 1 \text{ V}$, | Switch OFF, See Figure 14 | 25°C | 2.7 V | -5 | 0.3 | 5 | nA |
| | | | | Full | | -50 | | 50 | |
| | $I_{NC(PWROFF)}$ | $V_{NC} = 0 \text{ to } 3.6 \text{ V}$, $V_{COM} = 3.6 \text{ V to } 0$, | | 25°C | 0 V | -2 | 0.05 | 2 | μA |
| | | | | Full | | -15 | | 15 | |
| COM OFF leakage current | $I_{COM(OFF)}$ | $V_{COM} = 1 \text{ V}$, $V_{NC} = 3 \text{ V}$, or $V_{COM} = 3 \text{ V}$, $V_{NC} = 1 \text{ V}$, | Switch OFF, See Figure 14 | 25°C | 2.7 V | -5 | 0.3 | 5 | nA |
| | | | | Full | | -50 | | 50 | |
| | $I_{COM(PWROFF)}$ | $V_{COM} = 3.6 \text{ V to } 0$, $V_{NC} = 0 \text{ to } 3.6 \text{ V}$, | | 25°C | 0 V | -2 | 0.05 | 2 | μA |
| | | | | Full | | -15 | | 15 | |
| NC ON leakage current | $I_{NC(ON)}$ | $V_{NC} = 1 \text{ V}$, $V_{COM} = \text{Open}$, or $V_{NC} = 3 \text{ V}$, $V_{COM} = \text{Open}$, | Switch ON, See Figure 15 | 25°C | 2.7 V | -2 | 0.3 | 2 | nA |
| | | | | Full | | -20 | | 20 | |
| COM ON leakage current | $I_{COM(ON)}$ | $V_{COM} = 1 \text{ V}$, $V_{NC} = \text{Open}$, or $V_{COM} = 3 \text{ V}$, $V_{NC} = \text{Open}$, | Switch ON, See Figure 15 | 25°C | 2.7 V | -2 | 0.3 | 2 | nA |
| | | | | Full | | -20 | | 20 | |
| Digital Control Inputs (IN) | | | | | | | | | |
| Input logic high | V_{IH} | | | Full | | 1.8 | 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 | 2.7 V | -2 | 0.3 | 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.

6.10 Electrical Characteristics for 2.5-V Supply⁽¹⁾ (continued)

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

| PARAMETER | SYMBOL | TEST CONDITIONS | T_A | VCC | MIN | TYP | MAX | UNIT |
|------------------------------|----------------|--|-------|-------------------|-------|-------|------|---------------|
| Dynamic | | | | | | | | |
| Turn-on time | t_{ON} | $V_{COM} = V_{CC}$, $R_L = 50 \Omega$, $C_L = 35 \text{ pF}$, See Figure 17 | 25°C | 2.5 V | 2 | 6 | 10 | ns |
| | | | Full | 2.3 V to 2.7 V | 1 | | 12 | |
| Turn-off time | t_{OFF} | $V_{COM} = V_{CC}$, $R_L = 50 \Omega$, $C_L = 35 \text{ pF}$, See Figure 17 | 25°C | 2.5 V | 4.5 | 8 | 10.5 | ns |
| | | | Full | 2.3 V to 2.7 V | 3 | | 15 | |
| Charge injection | Q_C | $V_{GEN} = 0$, $R_{GEN} = 0$, $C_L = 1 \text{ nF}$, See Figure 20 | 25°C | 2.5 V | | 4 | | pC |
| NC OFF capacitance | $C_{NC(OFF)}$ | $V_{NC} = V_{CC}$ or GND, Switch OFF, See Figure 16 | 25°C | 2.5 V | | 19.5 | | pF |
| COM OFF capacitance | $C_{COM(OFF)}$ | $V_{COM} = V_{CC}$ or GND, Switch OFF, See Figure 16 | 25°C | 2.5 V | | 18.5 | | pF |
| NC ON capacitance | $C_{NC(ON)}$ | $V_{NC} = V_{CC}$ or GND, Switch ON, See Figure 16 | 25°C | 2.5 V | | 36.5 | | pF |
| COM ON capacitance | $C_{COM(ON)}$ | $V_{COM} = V_{CC}$ or GND, Switch ON, See Figure 16 | 25°C | 2.5 V | | 36.5 | | pF |
| Digital input capacitance | C_I | $V_I = V_{CC}$ or GND, See Figure 16 | 25°C | 2.5 V | | 2 | | pF |
| Bandwidth | BW | $R_L = 50 \Omega$, Switch ON, See Figure 18 | 25°C | 2.5 V | | 150 | | MHz |
| OFF isolation | O_{ISO} | $R_L = 50 \Omega$, $f = 1 \text{ MHz}$, Switch OFF, See Figure 19 | 25°C | 2.5 V | | -62 | | dB |
| Total harmonic distortion | THD | $R_L = 600 \Omega$, $C_L = 50 \text{ pF}$, $f = 20 \text{ Hz to } 20 \text{ kHz}$, See Figure 21 | 25°C | 2.5 V | | 0.02% | | |
| Supply | | | | | | | | |
| Positive supply current | I_{CC} | $V_I = V_{CC}$ or GND, Switch ON or OFF | 25°C | 2.7 V | 0.001 | 0.02 | | μA |
| | | | Full | | | 0.25 | | |

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

6.11 Electrical Characteristics for 1.8-V Supply⁽¹⁾

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

| PARAMETER | SYMBOL | TEST CONDITIONS | T_A | V_{CC} | MIN | TYP | MAX | UNIT | |
|------------------------------------|-------------------|--|--|----------|--------|-----|-----|---------------|----|
| Analog Switch | | | | | | | | | |
| Peak ON resistance | r_{peak} | $0 \leq V_{NC} \leq V_{CC}$, $I_{COM} = -100\text{ mA}$, | Switch ON, See Figure 13 | 25°C | 1.65 V | 4.2 | 25 | Ω | |
| | | | | Full | | | 30 | | |
| ON-state resistance | r_{on} | $V_{NC} = 2\text{ V}$, $I_{COM} = -100\text{ mA}$, | Switch ON, See Figure 13 | 25°C | 1.65 V | 1.6 | 3.9 | Ω | |
| | | | | Full | | | 4.0 | | |
| ON-state resistance flatness | $r_{on(flat)}$ | $0 \leq V_{NC} \leq V_{CC}$, $I_{COM} = -100\text{ mA}$, | Switch ON, See Figure 13 | 25°C | 1.65 V | 2.8 | | Ω | |
| | | | | 25°C | | 4.1 | 22 | | |
| | | Full | | | | 27 | | | |
| NC OFF leakage current | $I_{NC(OFF)}$ | $V_{NC} = 1\text{ V}$, $V_{COM} = 3\text{ V}$, or $V_{NC} = 3\text{ V}$, $V_{COM} = 1\text{ V}$, | Switch OFF, See Figure 14 | 25°C | 1.95 V | -5 | 5 | nA | |
| | | | | Full | | | -50 | | 50 |
| | $I_{NC(PWROFF)}$ | $V_{NC} = 0\text{ to }3.6\text{ V}$, $V_{COM} = 3.6\text{ V to }0$, | | 25°C | 0 V | -2 | 2 | μA | |
| | | | | Full | | | -10 | | 10 |
| COM OFF leakage current | $I_{COM(OFF)}$ | $V_{COM} = 1\text{ V}$, $V_{NC} = 3\text{ V}$, or $V_{COM} = 3\text{ V}$, $V_{NC} = 1\text{ V}$, | Switch OFF, See Figure 14 | 25°C | 1.95 V | -5 | 5 | nA | |
| | | | | Full | | | -50 | | 50 |
| | $I_{COM(PWROFF)}$ | $V_{COM} = 0\text{ to }3.6\text{ V}$, $V_{NC} = 3.6\text{ V to }0$, | | 25°C | 0 V | -2 | 2 | μA | |
| | | | | Full | | | -10 | | 10 |
| NC ON leakage current | $I_{NC(ON)}$ | $V_{NC} = 1\text{ V}$, $V_{COM} = \text{Open}$, or $V_{NC} = 3\text{ V}$, $V_{COM} = \text{Open}$, | Switch ON, See Figure 15 | 25°C | 1.95 V | -2 | 2 | nA | |
| | | | | Full | | | -20 | | 20 |
| COM ON leakage current | $I_{COM(ON)}$ | $V_{COM} = 1\text{ V}$, $V_{NC} = \text{Open}$, or $V_{COM} = 3\text{ V}$, $V_{NC} = \text{Open}$, | Switch ON, See Figure 15 | 25°C | 1.95 V | -2 | 2 | nA | |
| | | | | Full | | | -20 | | 20 |
| Digital Control Inputs (IN) | | | | | | | | | |
| 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 | 0.3 | 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.

6.12 Electrical Characteristics for 1.8-V Supply⁽¹⁾ (continued)

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

| PARAMETER | SYMBOL | TEST CONDITIONS | T_A | V_{CC} | MIN | TYP | MAX | UNIT | |
|------------------------------|----------------|---|--|----------|---------------------|-------|--------|---------------|----|
| Dynamic | | | | | | | | | |
| Turn-on time | t_{ON} | $V_{COM} = V_{CC}$, $R_L = 50\ \Omega$, | $C_L = 35\text{ pF}$, See Figure 17 | 25°C | 1.8 V | 3 | 9 | 18 | ns |
| | | | | Full | 1.65 V to 1.95 V | 1 | | 20 | |
| Turn-off time | t_{OFF} | $V_{COM} = V_{CC}$, $R_L = 50\ \Omega$, | $C_L = 35\text{ pF}$, See Figure 17 | 25°C | 1.8 V | 5 | 10 | 15.5 | ns |
| | | | | Full | 1.65 V to 1.95 V | 4 | | 18.5 | |
| Charge injection | Q_C | $V_{GEN} = 0$, $R_{GEN} = 0$, | $C_L = 1\text{ nF}$, See Figure 20 | 25°C | 1.8 V | | 2 | pC | |
| NC OFF capacitance | $C_{NC(OFF)}$ | $V_{NC} = V_{CC}$ or GND, | Switch OFF, See Figure 16 | 25°C | 1.8 V | | 19.5 | pF | |
| COM OFF capacitance | $C_{COM(OFF)}$ | $V_{COM} = V_{CC}$ or GND, | Switch OFF, See Figure 16 | 25°C | 1.8 V | | 18.5 | pF | |
| NC ON capacitance | $C_{NC(ON)}$ | $V_{NC} = V_{CC}$ or GND, | Switch ON, See Figure 16 | 25°C | 1.8 V | | 36.5 | pF | |
| COM ON capacitance | $C_{COM(ON)}$ | $V_{COM} = V_{CC}$ or GND, | Switch ON, See Figure 16 | 25°C | 1.8 V | | 36.5 | pF | |
| Digital input capacitance | C_I | $V_I = V_{CC}$ or GND, | See Figure 16 | 25°C | 1.8 V | | 2 | pF | |
| Bandwidth | BW | $R_L = 50\ \Omega$, | Switch ON, See Figure 18 | 25°C | 1.8 V | | 150 | MHz | |
| OFF isolation | O_{ISO} | $R_L = 50\ \Omega$, $f = 1\text{ MHz}$, | Switch OFF, See Figure 19 | 25°C | 1.8 V | | -62 | dB | |
| Total harmonic distortion | THD | $R_L = 600\ \Omega$, $C_L = 50\text{ pF}$, | $f = 20\text{ Hz to }20\text{ kHz}$ See Figure 21 | 25°C | 1.8 V | | 0.055% | | |
| Supply | | | | | | | | | |
| Positive supply current | I_{CC} | $V_I = V_{CC}$ or GND, | Switch ON or OFF | 25°C | 1.95 V | 0.001 | 0.01 | μA | |
| | | | | Full | | | 0.15 | | |

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

6.13 Typical Performance

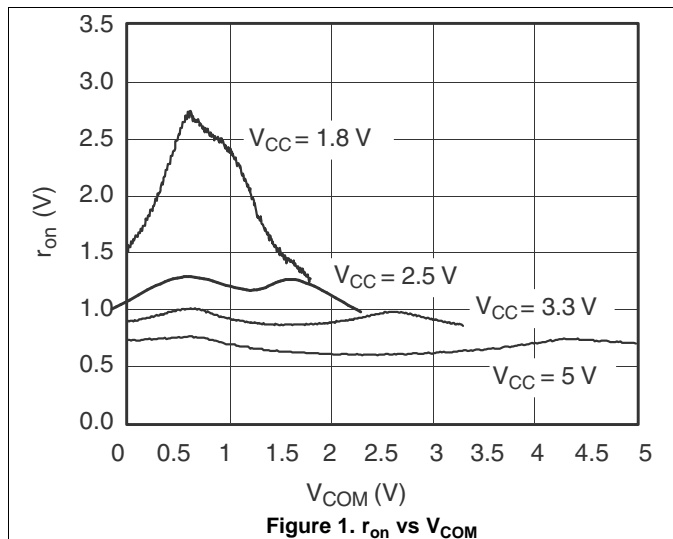


Figure 1. r_{on} vs V_{COM}

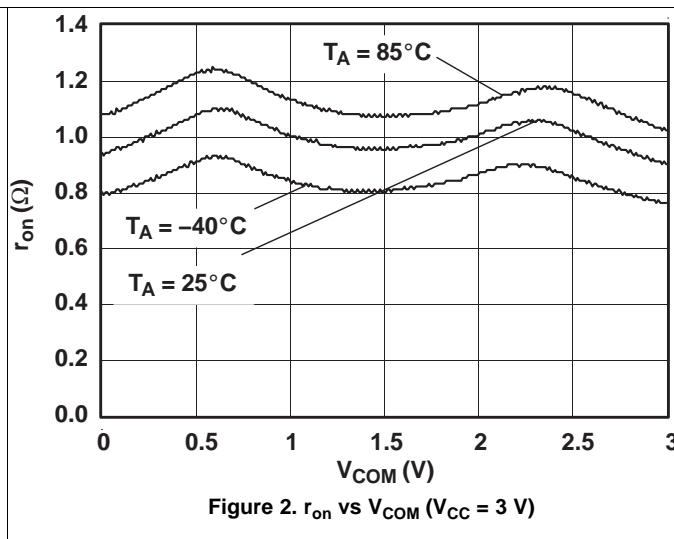


Figure 2. r_{on} vs V_{COM} ($V_{CC} = 3\text{ V}$)

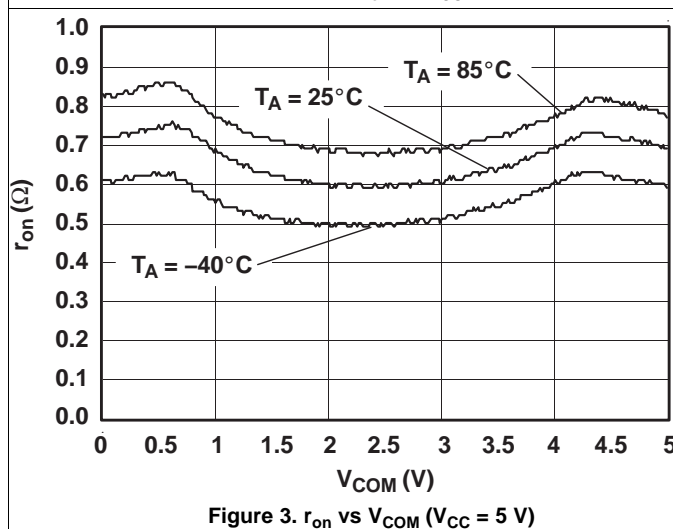


Figure 3. r_{on} vs V_{COM} ($V_{CC} = 5\text{ V}$)

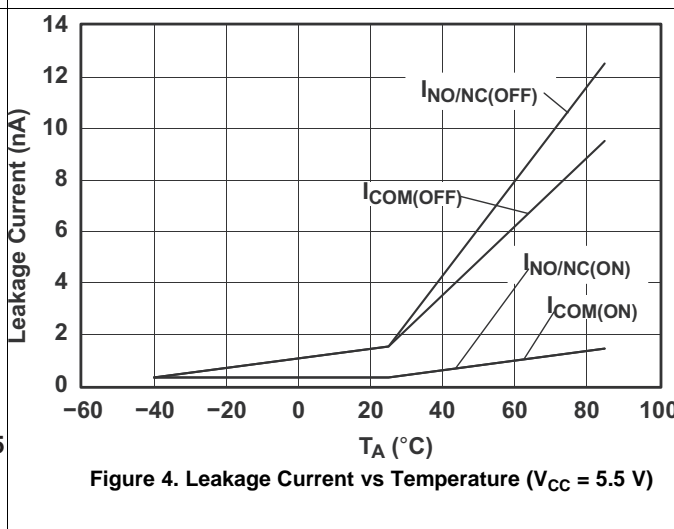


Figure 4. Leakage Current vs Temperature ($V_{CC} = 5.5\text{ V}$)

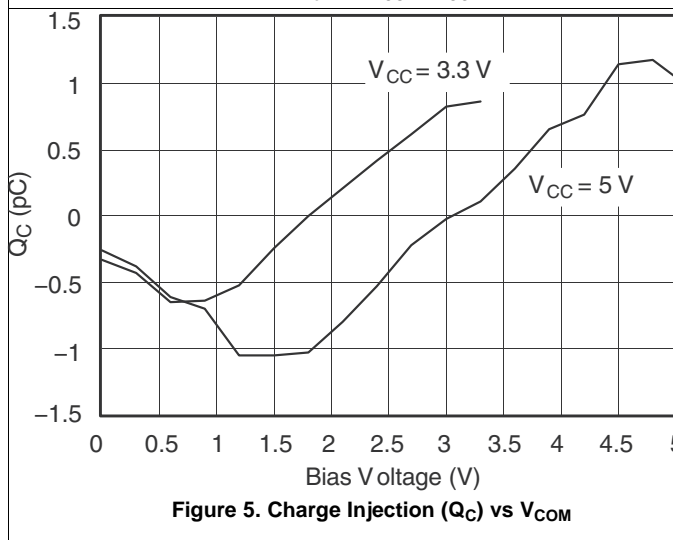


Figure 5. Charge Injection (Q_C) vs V_{COM}

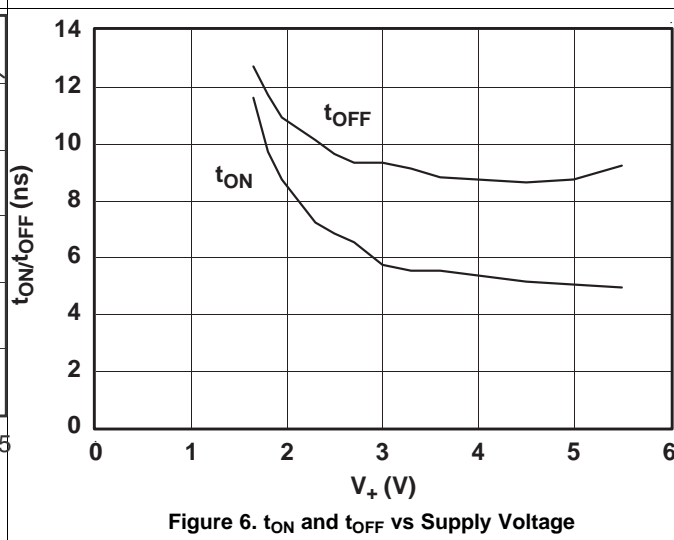


Figure 6. t_{ON} and t_{OFF} vs Supply Voltage

Typical Performance (continued)

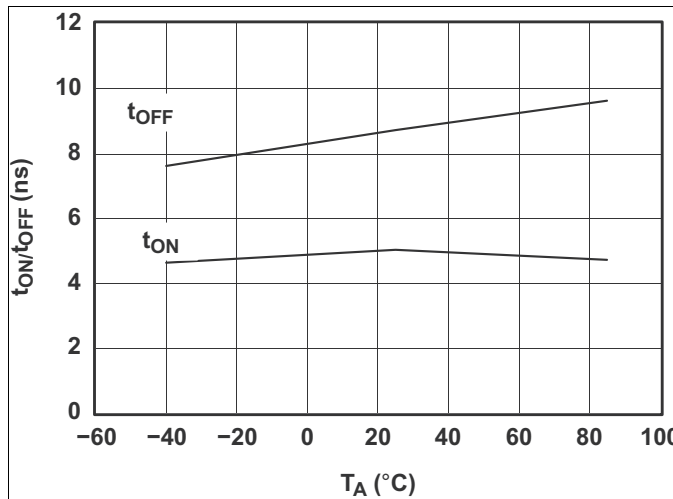


Figure 7. t_{ON} and t_{OFF} vs Temperature ($V_{CC} = 5\text{ V}$)

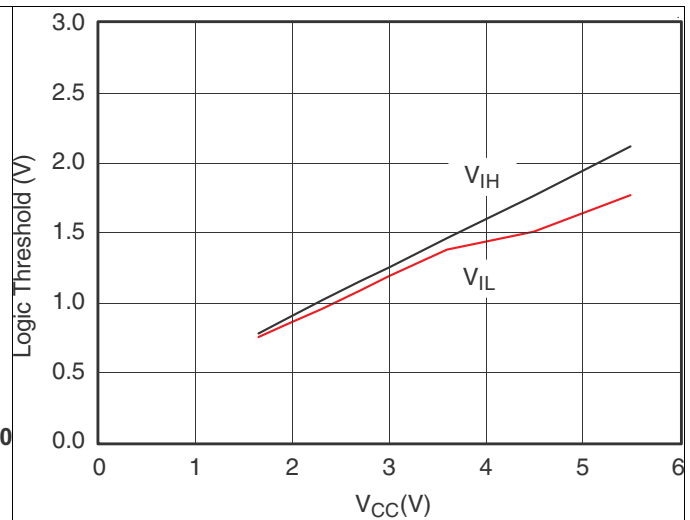


Figure 8. Logic Threshold vs V_{CC}

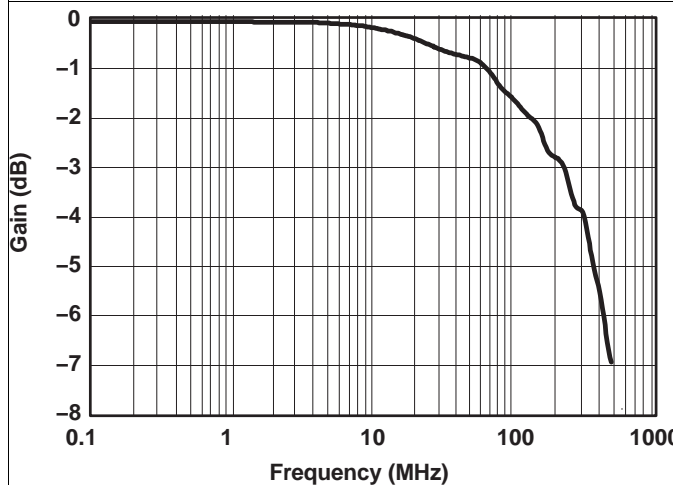


Figure 9. Gain vs Frequency ($V_{CC} = 5\text{ V}$)

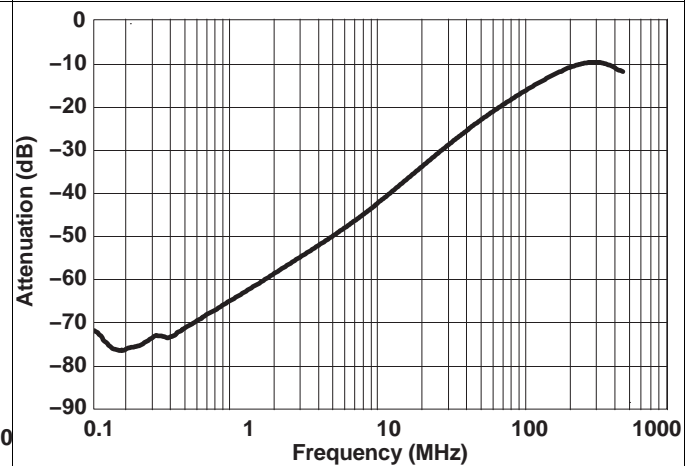


Figure 10. OFF Isolation vs Frequency ($V_{CC} = 5\text{ V}$)

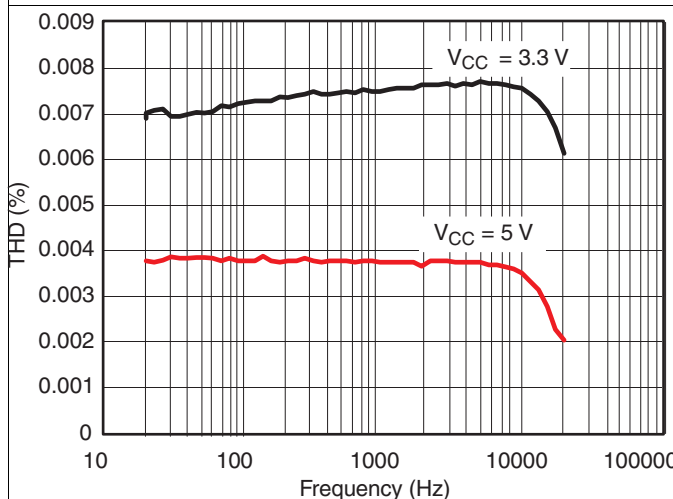


Figure 11. Total Harmonic Distortion vs Frequency ($V_{CC} = 5\text{ V}$)

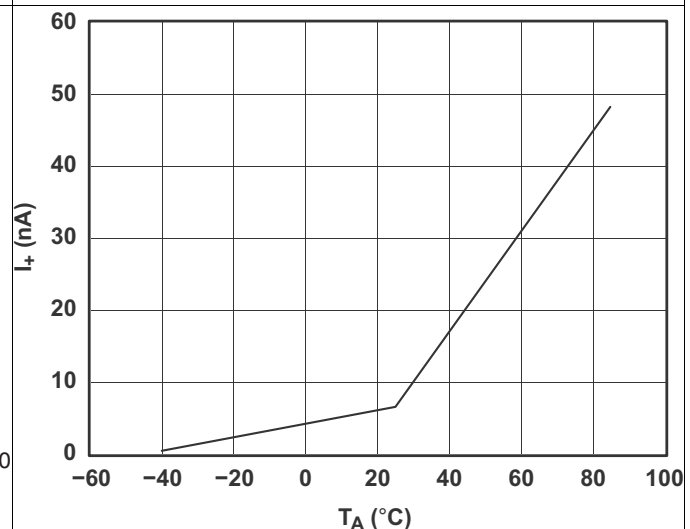


Figure 12. Power-Supply Current vs Temperature ($V_{CC} = 5\text{ V}$)

7 Parameter Measurement Information

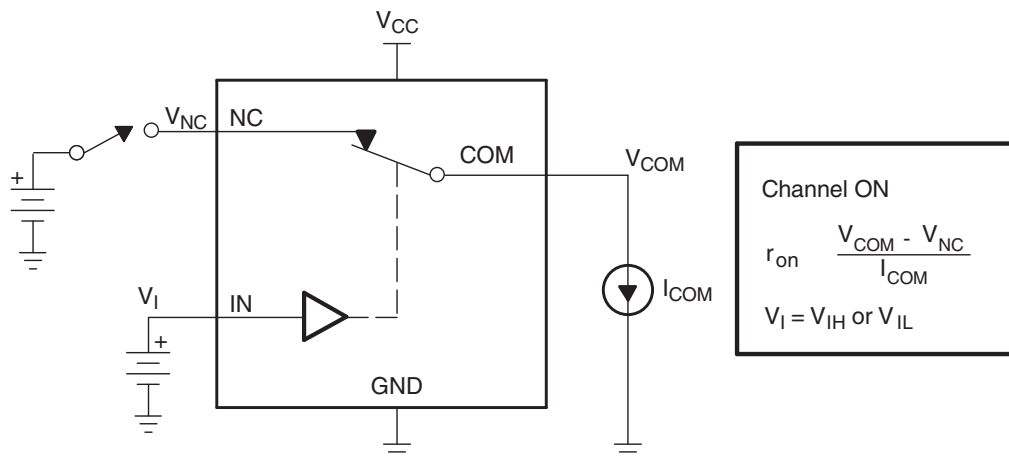


Figure 13. ON-State Resistance (r_{on})

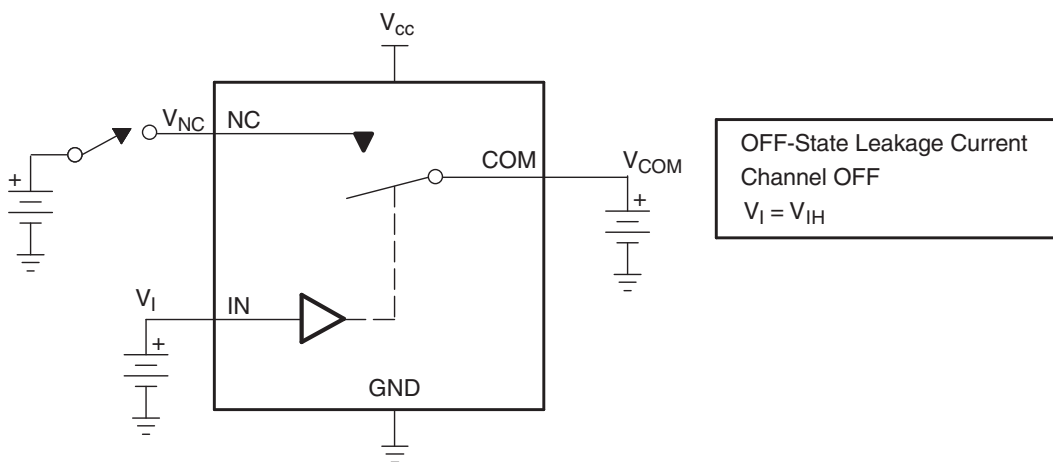


Figure 14. OFF-State Leakage Current ($I_{COM(OFF)}$, $I_{NC(OFF)}$, $I_{COM(PWROFF)}$, $I_{NC(PWROFF)}$)

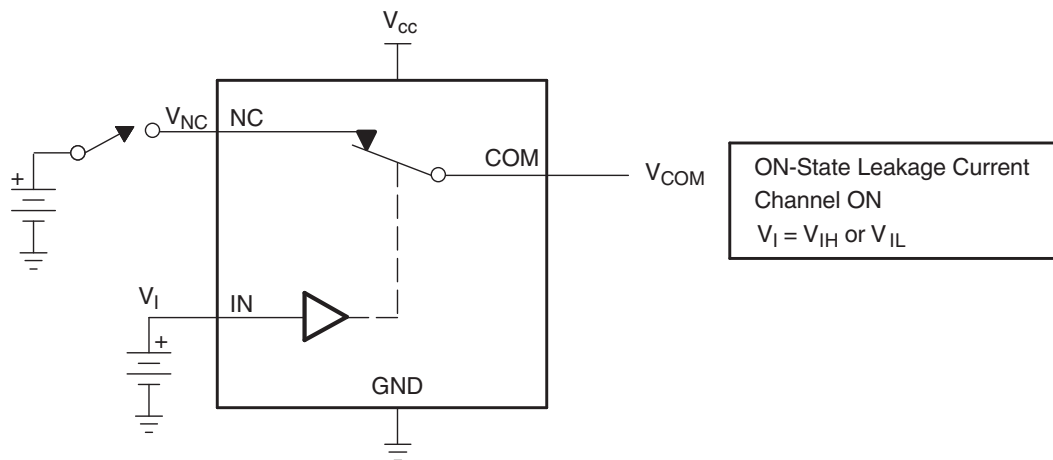


Figure 15. ON-State Leakage Current ($I_{COM(ON)}$, $I_{NC(ON)}$)

Parameter Measurement Information (continued)

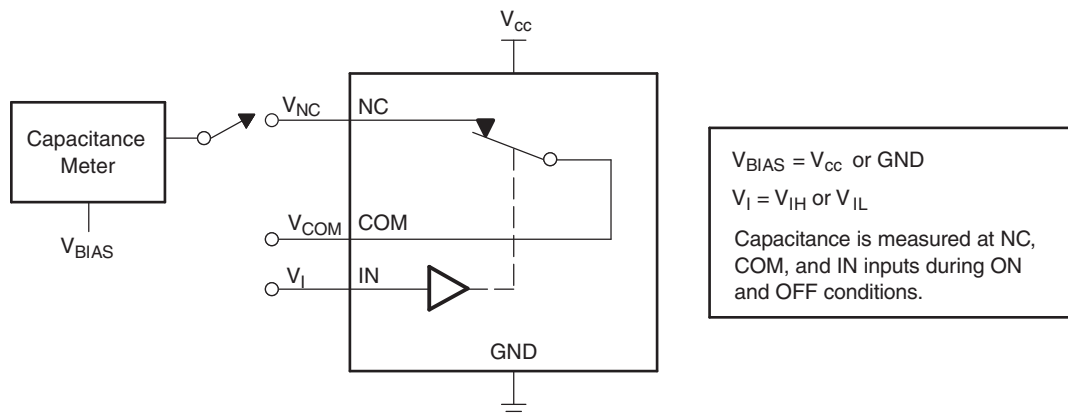
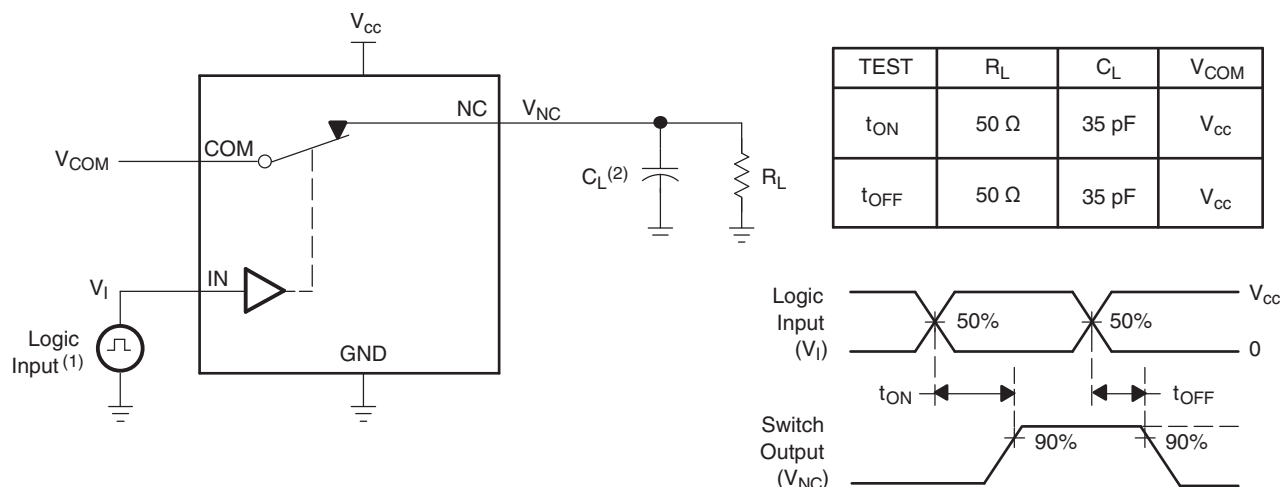


Figure 16. Capacitance (C_I , $C_{COM(OFF)}$, $C_{COM(ON)}$, $C_{NC(OFF)}$, $C_{NC(ON)}$)



- (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 17. Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})

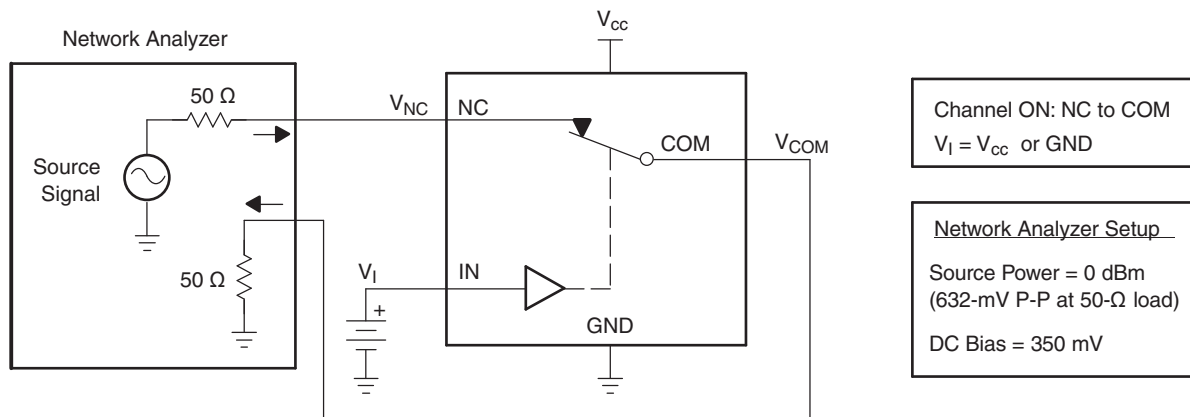


Figure 18. Bandwidth (BW)

Parameter Measurement Information (continued)

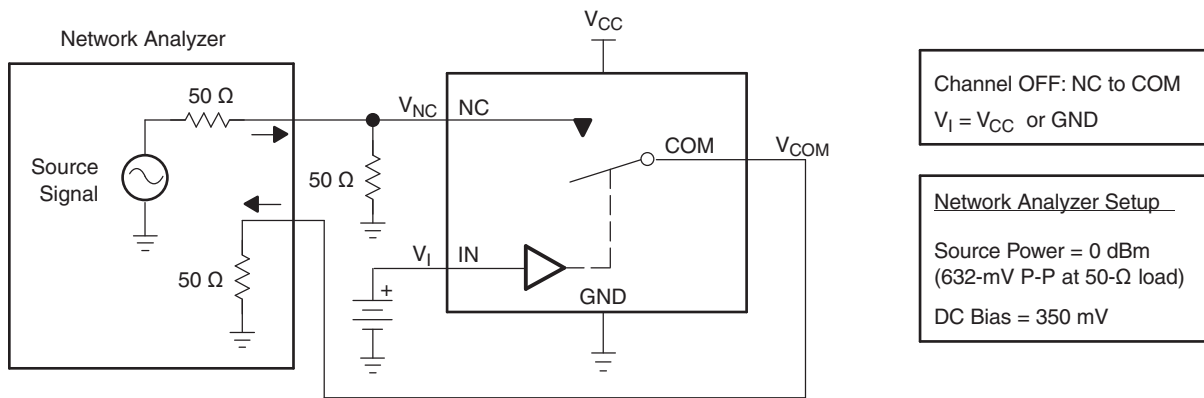
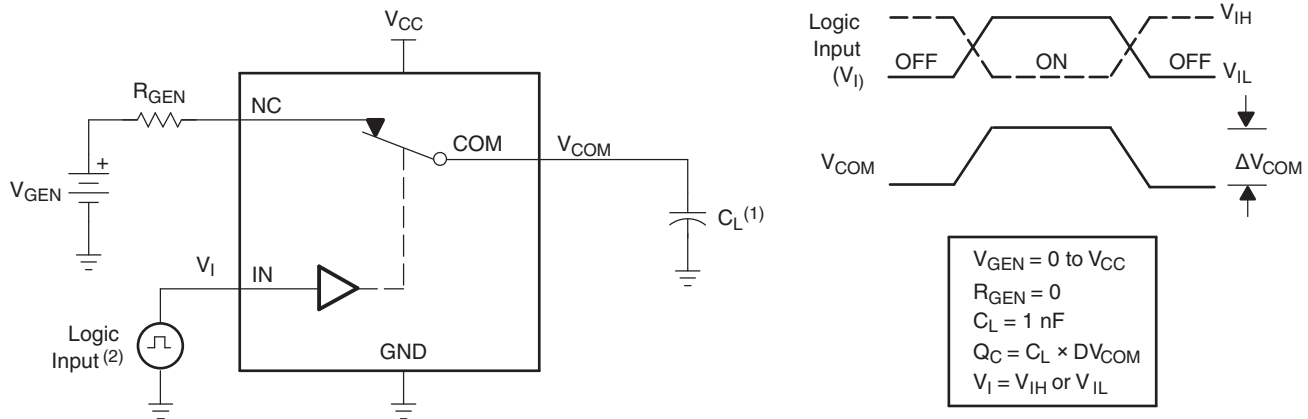
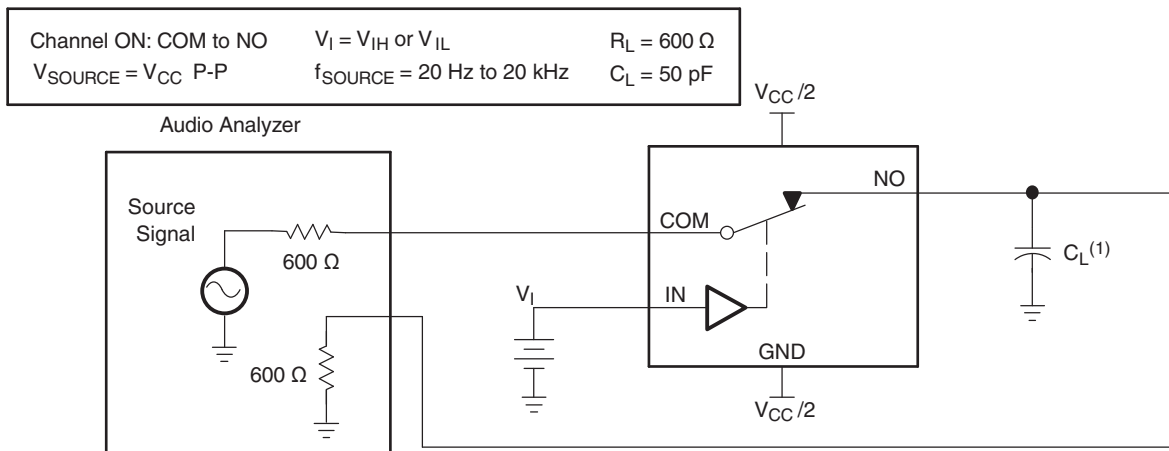


Figure 19. OFF Isolation (O_{Iso})



- (1) C_L includes probe and jig capacitance.
- (2) 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.

Figure 20. Charge Injection (Q_C)



- (1) C_L includes probe and jig capacitance.

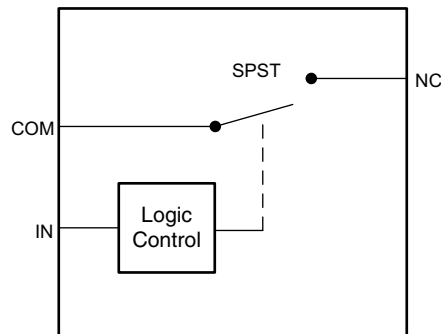
Figure 21. Total Harmonic Distortion (THD)

8 Detailed Description

8.1 Overview

The TS5A3167 is a bidirectional, single-channel, single-pole single-throw (SPST) analog switch that is designed to operate from 1.65 V to 5.5 V. This device provides a signal switching solution while maintaining excellent signal integrity, which makes the TS5A3167 suitable for a wide range of applications in various markets including personal electronics, portable instrumentation, and test and measurement equipment. The device maintains the signal integrity by its low ON-state resistance, excellent ON-state resistance matching, and total harmonic distortion (THD) performance. The device consumes very low power and provides isolation when $V_{CC} = 0$.

8.2 Functional Block Diagram



8.3 Feature Description

8.3.1 Isolation in Powered-Off Mode, $V_{CC} = 0$

When power is not supplied to the V_{CC} pin, $V_{CC} = 0$, the signal paths NC and COM are high impedance. This is specified in the electrical characteristics table under the COM and NC OFF leakage current when $V_{CC} = 0$. Because the device is high impedance when it is not powered, you may connect other signals to the signal chain without interference of the TS5A3167.

8.4 Device Functional Modes

Placing a logic low signal on the IN pin of the device will turn on the switch and provide a low impedance path from NC to COM.

Table 1. Function Table

| IN | NC TO COM, COM TO NC |
|----|-------------------------|
| L | ON |
| H | OFF |

9 Application and Implementation

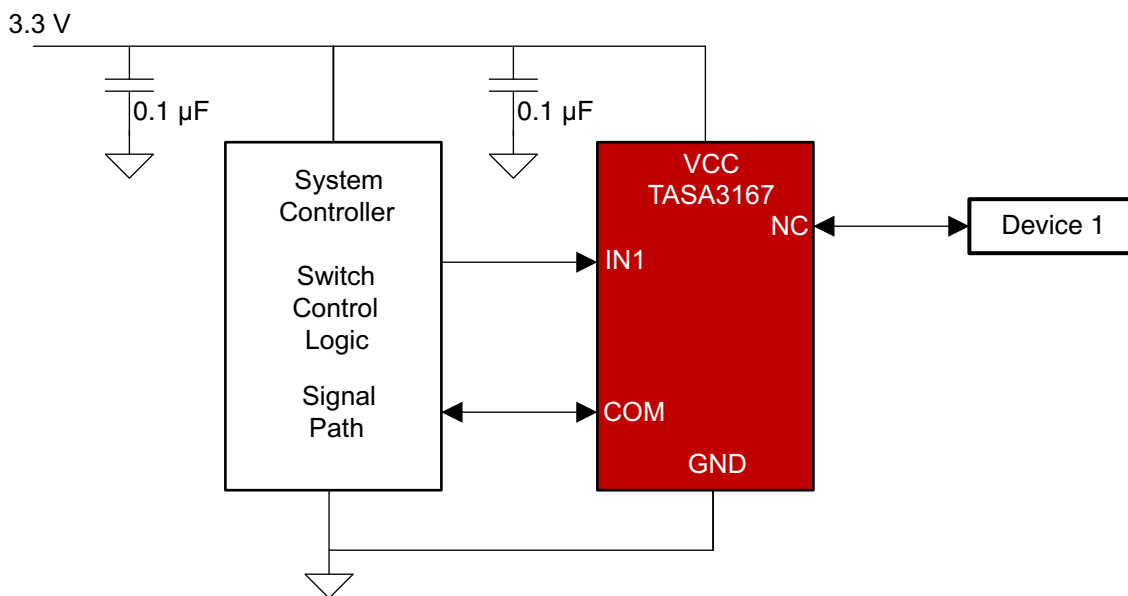
NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

9.1 Application Information

The TS5A3167 switch is bidirectional, so the NC and COM pins can be used as either inputs or outputs. This switch is typically used when there is one signal path that needs to be isolated at certain times.

9.2 Typical Application



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Figure 22. Typical Application

9.2.1 Design Requirements

The TS5A3167 device can be properly operated without any external components.

Unused pin may be left floating or connected to ground.

TI recommends pulling up the digital control pin (IN) to V_{CC} or pulling down to GND to avoid undesired switch positions that could result from the floating pin. A floating digital pin could cause excess current consumption refer to [Implications of Slow or Floating CMOS Inputs](#).

9.2.2 Detailed Design Procedure

Select the appropriate supply voltage to cover the entire voltage swing of the signal passing through the switch because the TS5A3167 input and output signal swing through NC and COM are dependent on the supply voltage V_{CC} . For example, if the desired signal level to pass through the switch is 5 V, V_{CC} must be greater than or equal to 5 V. $V_{CC} = 3.3$ V would not be valid for passing a 5-V signal since the analog signal voltage cannot exceed the supply.

Typical Application (continued)

9.2.3 Application Curves

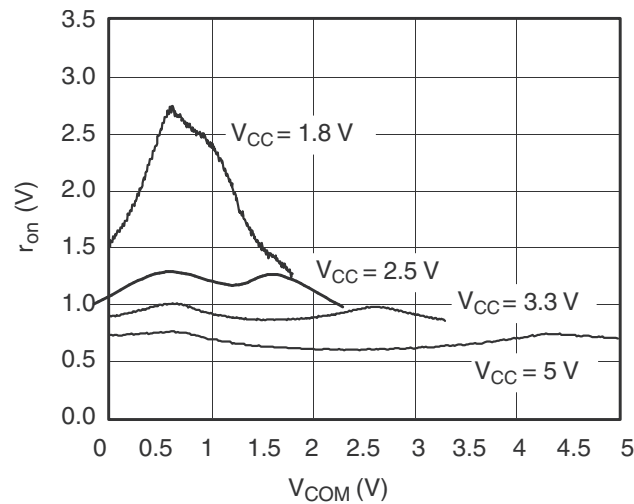


Figure 23. r_{on} vs V_{COM}

10 Power Supply Recommendations

TI recommends proper power-supply sequencing for all CMOS devices. Do not exceed the absolute maximum ratings, because stresses beyond the listed ratings can cause permanent damage to the device. It is recommended that V_{CC} is powered on first, followed by NC or COM but not required because of the Isolation in Powered-Off Mode, $V_{CC} = 0$ feature.

Although it is not required, power-supply bypassing improves noise margin and prevents switching noise propagation from the V_{CC} supply to other components. A 0.1- μ F capacitor, connected from V_{CC} to GND, is adequate for most applications.

11 Layout

11.1 Layout Guidelines

TI recommends following common printed-circuit board layout guidelines to ensure reliability of the device.

- Bypass capacitors should be used on power supplies.
- Short trace lengths should be used to avoid excessive loading.

11.2 Layout Example

 = VIA to GND Plane

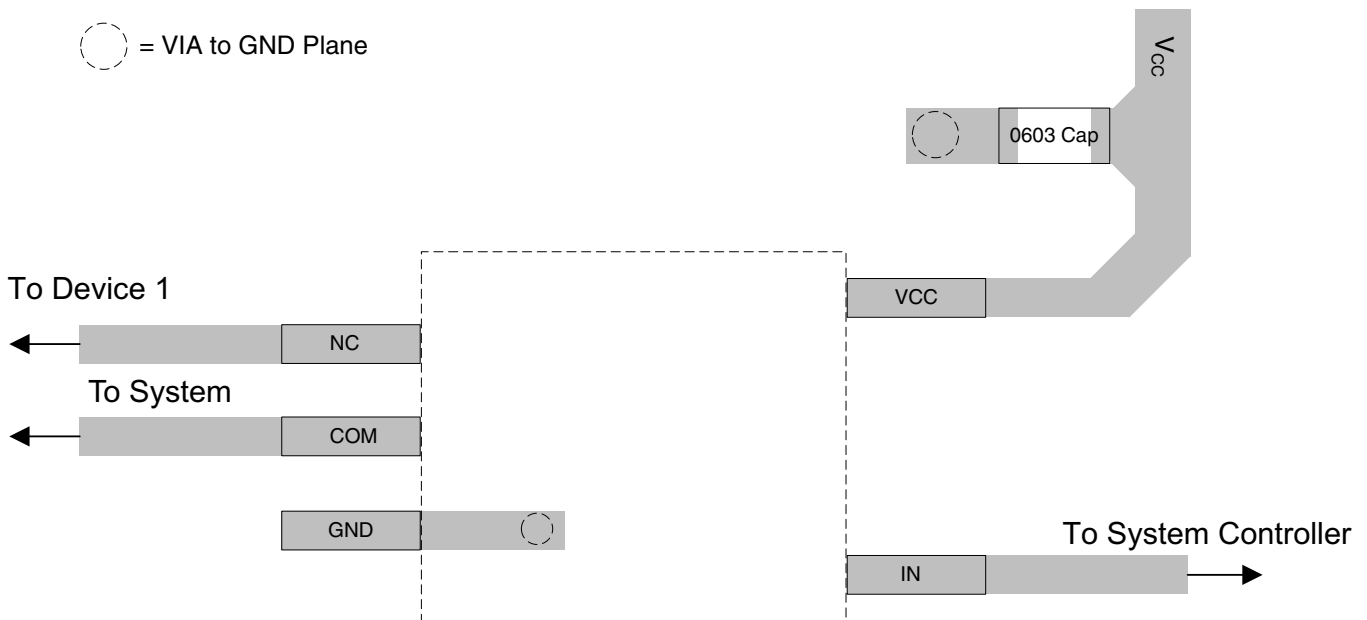


Figure 24. Example Layout

12 器件和文档支持

12.1 文档支持

表 2. 参数说明

| 符号 | 说明 |
|-------------------|---|
| V_{COM} | COM 处的电压。 |
| V_{NC} | NC 处的电压。 |
| r_{on} | 通道导通时 COM 和 NC 端口之间的电阻。 |
| r_{peak} | 额定电压范围的通态电阻峰值。 |
| $r_{on(Flat)}$ | 额定条件范围内，同一通道内 r_{on} 最大值与最小值之间的差值。 |
| $I_{NC(OFF)}$ | 相应通道 (NC 到 COM) 处于关断状态时，在 NC 端口测得的泄漏电流 (在最坏输入和输出条件下)。 |
| $I_{NC(PWROFF)}$ | 在电源关闭状态下， $V_{CC} = 0$ 时，在 NC 端口测得的泄漏电流。 |
| $I_{COM(OFF)}$ | 在最坏的输入和输出条件下，相应通道 (COM 到 NC) 处于关断状态时，在 COM 端口测得的泄漏电流。 |
| $I_{COM(PWROFF)}$ | 在电源关闭状态下， $V_{CC} = 0$ 时，在 COM 端口测得的泄漏电流。 |
| $I_{NC(ON)}$ | 相应通道 (NC 到 COM) 处于导通状态且输出 (COM) 处于开路状态时，在 NC 端口测得的泄漏电流。 |
| $I_{COM(ON)}$ | 相应通道 (COM 到 NC) 处于导通状态且输出 (NC) 处于开路状态时，在 COM 端口测得的泄漏电流。 |
| V_{IH} | 控制输入 (IN) 逻辑高电平的最小输入电压。 |
| V_{IL} | 控制输入 (IN) 逻辑低电平的最大输入电压。 |
| V_I | 控制输入 (IN) 处的电压。 |
| I_{IH}, I_{IL} | 控制输入 (IN) 处测量的泄漏电流。 |
| t_{ON} | 开关导通时间。此参数是在特定条件范围内，开关导通时，通过数字控制 (IN) 信号和模拟输出 (COM 或 NC) 信号之间的传播延迟测得的。 |
| t_{OFF} | 开关关断时间。此参数是在特定条件范围内，开关关断时，通过数字控制 (IN) 信号和模拟输出 (COM 或 NC) 信号之间的传播延迟测得的。 |
| Q_C | 电荷注入是测量从控制 (IN) 输入到模拟 (NC 或 COM) 输出产生的不需要的信号耦合的方法。电荷注入以库仑 (C) 为单位，可通过测量开关控制输入产生的总感应电荷得出该值。电荷注入， $Q_C = C_L \times \Delta V_{COM}$ ， C_L 是负载电容， ΔV_{COM} 是模拟输出电压的变化。 |
| $C_{NC(OFF)}$ | 相应通道 (NC 到 COM) 关闭时 NC 端口的电容。 |
| $C_{COM(OFF)}$ | 相应通道 (COM 到 NC) 关闭时 COM 端口的电容。 |
| $C_{NC(ON)}$ | 相应通道 (NC 到 COM) 开启时 NC 端口的电容。 |
| $C_{COM(ON)}$ | 相应通道 (COM 到 NC) 开启时 COM 端口的电容。 |
| C_I | 控制输入 (IN) 电容。 |
| O_{ISO} | 开关关断隔离用于衡量关断状态开关阻抗的大小。关断隔离以 dB 为单位，当相应通道 (NC 到 COM) 处于关断状态时，在额定频率下测量得出。 |
| BW | 开关带宽。这是导通通道增益低于直流增益 -3dB 时的频率。 |
| THD | 总谐波失真用于描述由模拟开关导致的信号失真。其定义为二次、三次和更高次谐波与基波绝对幅度之比的均方根 (RMS) 值。 |
| I_{CC} | 控制 (IN) 引脚处于 V_{CC} 或 GND 状态时的静态电源电流。 |

12.2 接收文档更新通知

要接收文档更新通知，请导航至 TI.com.cn 上的器件产品文件夹。单击右上角的 *通知我* 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

12.3 社区资源

下列链接提供到 TI 社区资源的连接。链接的内容由各个分销商“按照原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的 [《使用条款》](#)。

TI E2E™ 在线社区 *TI 的工程师对工程师 (E2E) 社区*。此社区的创建目的在于促进工程师之间的协作。在 e2e.ti.com 中，您可以咨询问题、分享知识、拓展思路并与同行工程师一道帮助解决问题。

社区资源 (接下页)

设计支持 TI 参考设计支持 可帮助您快速查找有帮助的 E2E 论坛、设计支持工具以及技术支持的联系信息。

12.4 商标

E2E is a trademark of Texas Instruments.

12.5 静电放电警告



ESD 可能会损坏该集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理措施和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

12.6 术语表

SLYZ022 — TI 术语表。

这份术语表列出并解释术语、缩写和定义。

13 机械、封装和可订购信息

以下页面包含机械、封装和可订购信息。这些信息是指定器件的最新可用数据。数据如有变更，恕不另行通知，且不会对此文档进行修订。如需获取此数据表的浏览器版本，请查阅左侧的导航栏。

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|------------------------------------|-------------------------|
| TS5A3167DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | RoHS & Green | NIPDAU SN | Level-1-260C-UNLIM | -40 to 85 | (JATF, JATR) (JATH, JATP) | Samples |
| TS5A3167DCKR | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | (JG5, JGF, JGR) (JGH, JGP, JGS) | Samples |
| TS5A3167YZPR | ACTIVE | DSBGA | YZP | 5 | 3000 | RoHS & Green | SNAGCU | Level-1-260C-UNLIM | -40 to 85 | JGN | Samples |

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices 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.

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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*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 |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TS5A3167DBVR | SOT-23 | DBV | 5 | 3000 | 178.0 | 9.0 | 3.23 | 3.17 | 1.37 | 4.0 | 8.0 | Q3 |
| TS5A3167DCKR | SC70 | DCK | 5 | 3000 | 178.0 | 9.0 | 2.4 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| TS5A3167YZPR | DSBGA | YZP | 5 | 3000 | 178.0 | 9.2 | 1.02 | 1.52 | 0.63 | 4.0 | 8.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TS5A3167DBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 180.0 | 18.0 |
| TS5A3167DCKR | SC70 | DCK | 5 | 3000 | 180.0 | 180.0 | 18.0 |
| TS5A3167YZPR | DSBGA | YZP | 5 | 3000 | 220.0 | 220.0 | 35.0 |

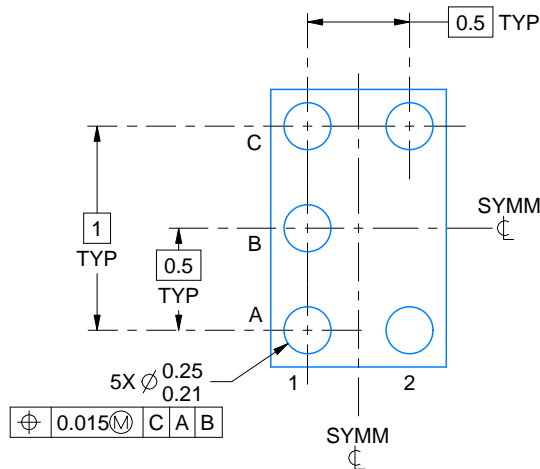
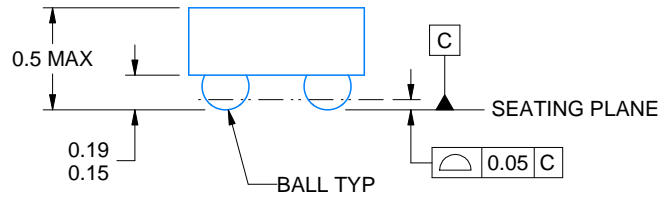
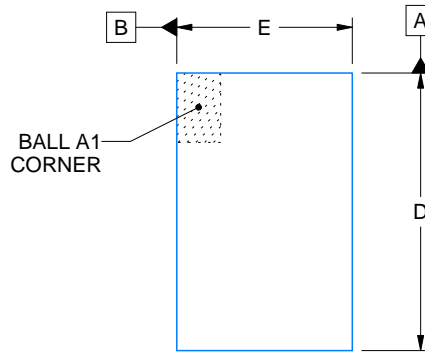
YZP0005



PACKAGE OUTLINE

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



D: Max = 1.418 mm, Min =1.358 mm
E: Max = 0.918 mm, Min =0.858 mm

4219492/A 05/2017

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.

EXAMPLE BOARD LAYOUT

YZP0005

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE
SCALE:40X



SOLDER MASK DETAILS
NOT TO SCALE

4219492/A 05/2017

NOTES: (continued)

3. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SNVA009 (www.ti.com/lit/snva009).

EXAMPLE STENCIL DESIGN

YZP0005

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY

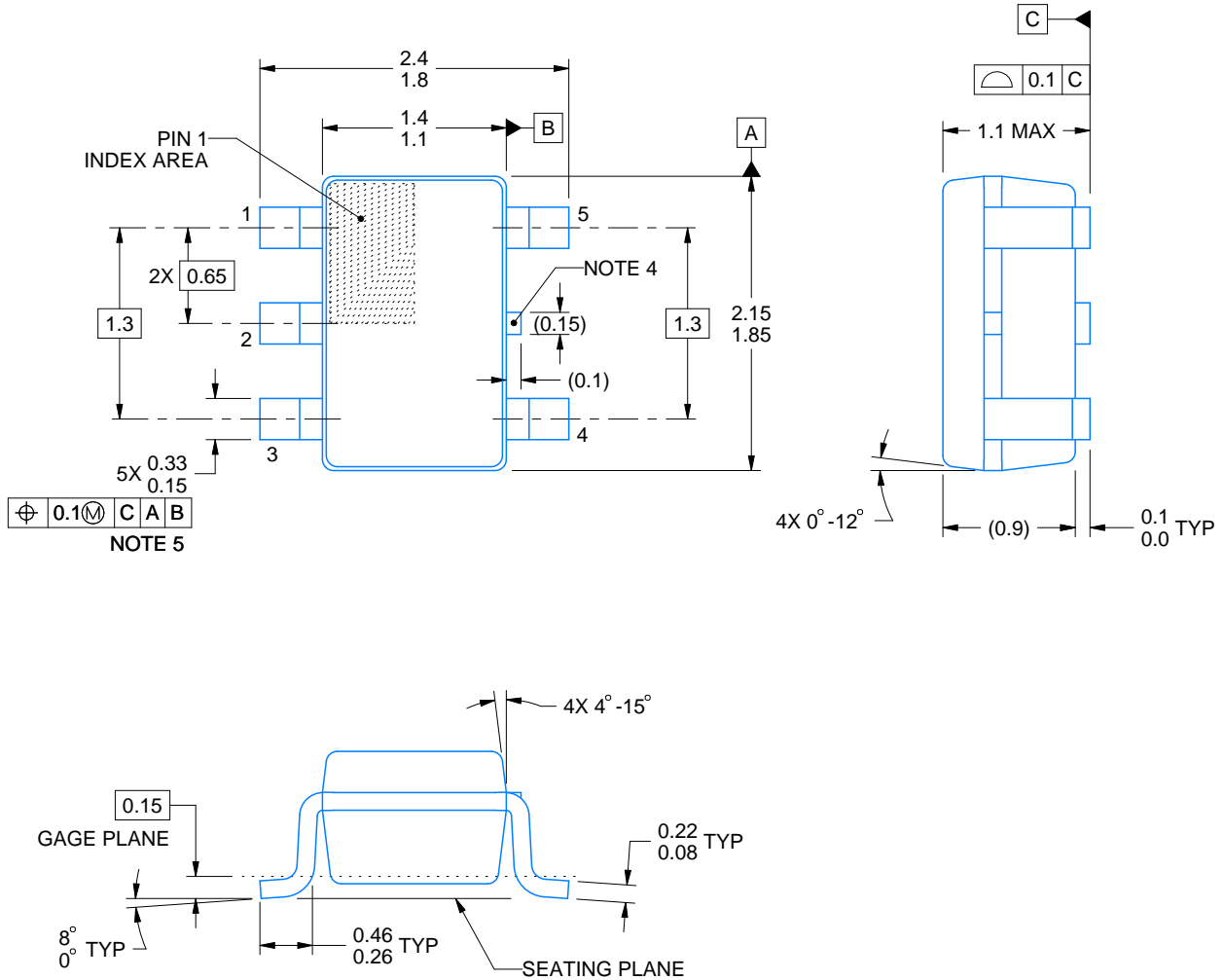


SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL
SCALE:40X

4219492/A 05/2017

NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.



4214834/G 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. Reference JEDEC MO-203.
4. Support pin may differ or may not be present.
5. Lead width does not comply with JEDEC.
6. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side

EXAMPLE BOARD LAYOUT

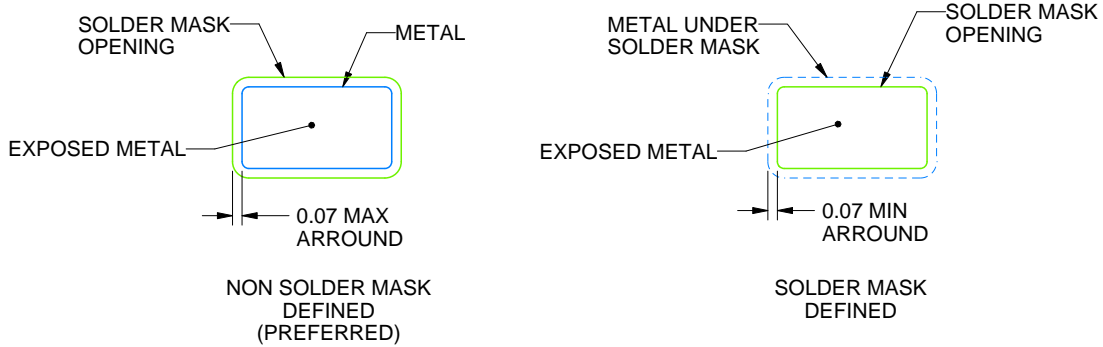
DCK0005A

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:18X



SOLDER MASK DETAILS

4214834/G 11/2024

NOTES: (continued)

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

EXAMPLE STENCIL DESIGN

DCK0005A

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



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

4214834/G 11/2024

NOTES: (continued)

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

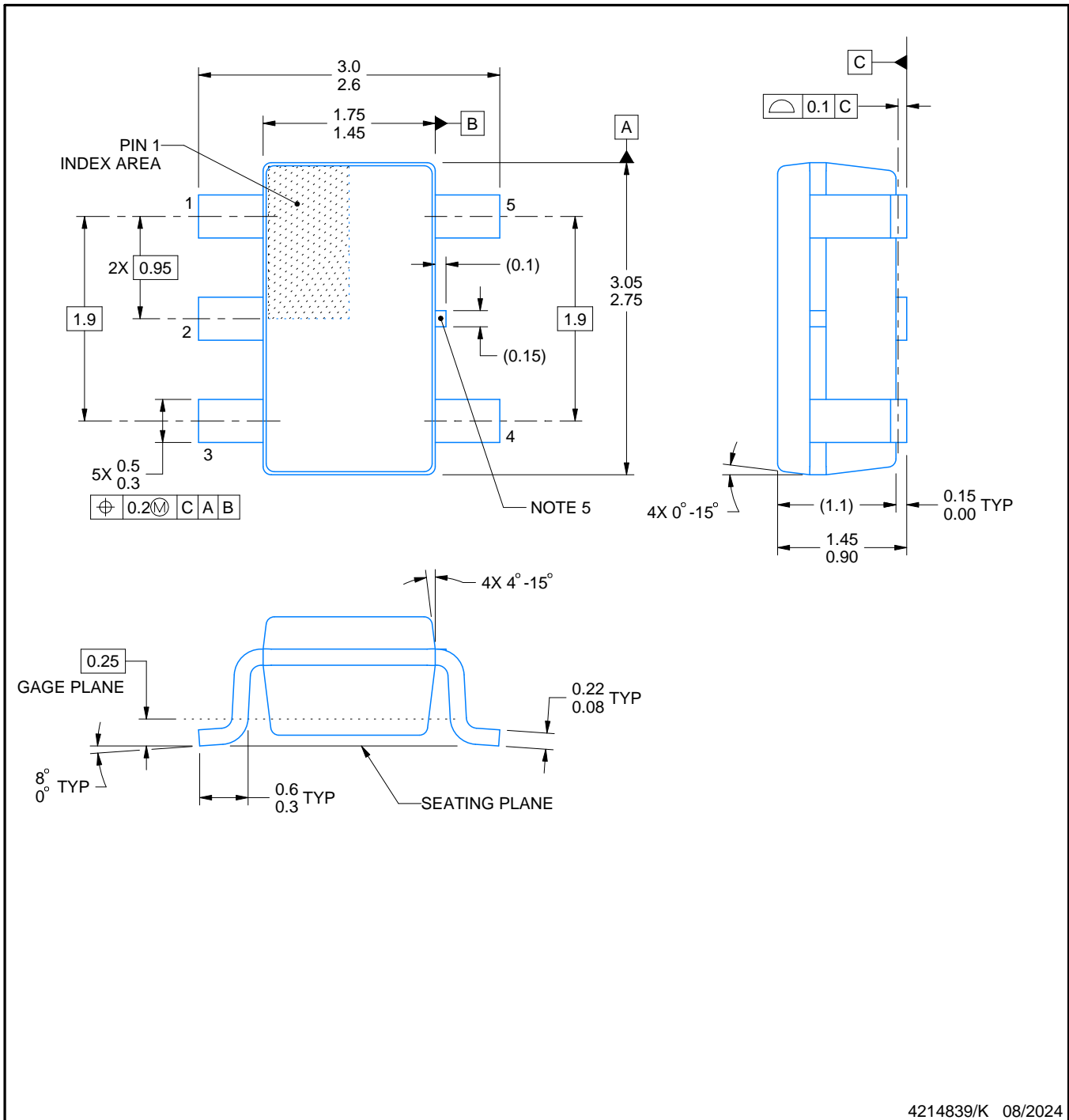
DBV0005A



PACKAGE OUTLINE

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



4214839/K 08/2024

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. Reference JEDEC MO-178.
4. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.
5. Support pin may differ or may not be present.

EXAMPLE BOARD LAYOUT

DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

4214839/K 08/2024

NOTES: (continued)

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

EXAMPLE STENCIL DESIGN

DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

4214839/K 08/2024

NOTES: (continued)

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

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