

Low Voltage SPST 0.8Ω Analog Switch

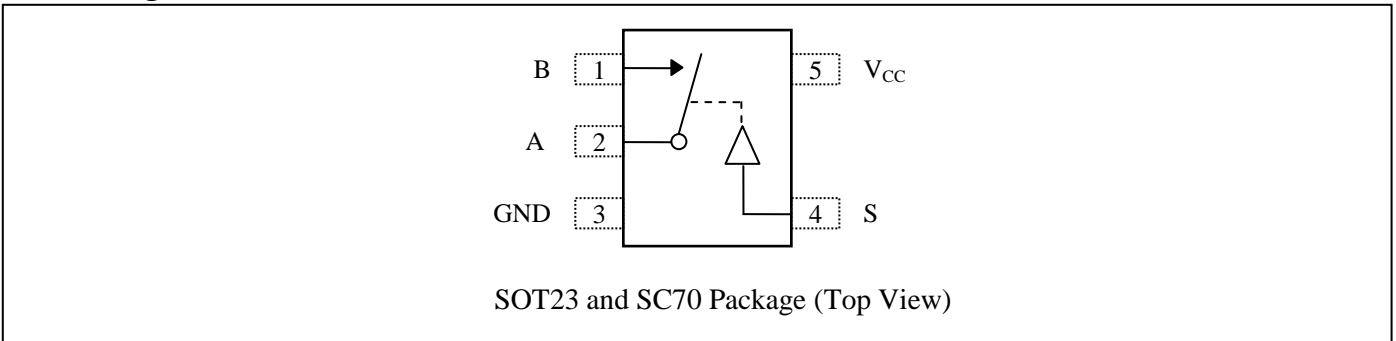
Features

- ➔ CMOS Technology for Bus and Analog Applications
- ➔ Low On-Resistance: 0.8Ω at 3.0V
- ➔ Wide V_{CC} Range: 1.65V to 5.5V
- ➔ Rail-to-Rail Signal Range
- ➔ Control Input Overvoltage Tolerance: 5.5V
- ➔ Fast Transition Speed: 2ns at 5.0V
- ➔ High Bandwidth: 200MHz
- ➔ Extended Industrial Temperature Range: -40°C to 85°C
- ➔ I/O pins Has Power-off Protection Function
- ➔ Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- ➔ Halogen and Antimony Free. “Green” Device (Note 3)
- ➔ Packaging (Pb-free & Green):
 - ◆ 5-pin SOT23
 - ◆ 5-pin SC70

Applications

- ➔ Cell Phones
- ➔ PDAs
- ➔ Portable Instrumentation
- ➔ Battery powered Communications
- ➔ Computer Peripherals

Pin Configuration



Pin Description

| Pin No | Pin Name | Description |
|--------|----------|-------------------------|
| 1 | B | Data Port |
| 2 | A | Common Output/Data Port |
| 3 | GND | Ground |
| 4 | S | Logic Control |
| 5 | VCC | Positive Power Supply |

Logic Function Table

| Logic Input(S) | Function(A to B) |
|----------------|------------------|
| 0 | OFF |
| 1 | ON |

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated’s definitions of Halogen- and Antimony-free, “Green” and Lead-free.
3. Halogen- and Antimony-free “Green” products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Maximum Ratings

| | |
|---|---------------------------|
| Storage Temperature..... | -65°C to +150°C |
| Ambient Temperature with Power Applied..... | -40°C to +85°C |
| Supply Voltage V_{CC} | -0.5V to +7.0V |
| DC Switch Voltage V_S | -0.5V to +7.0V |
| DC Input Voltage V_{IN} | -0.5V to +7.0V |
| DC Output Current V_{OUT} | 128mA |
| DC V_{CC} or Ground Current I_{CC}/I_{GND} | ±100mA |
| Junction Temperature under Bias (T_J)..... | 150°C |
| Junction Lead Temperature (T_L) (Soldering, 10 seconds)..... | 260°C |
| ESD (HBM)..... | 4KV |
| Power Dissipation (PD) @ +85°C..... | SOT23 250mW SC70 200mW |

Note:

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Recommended Operating Conditions

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|------------|--------------------------|---|------|------|----------|------|
| V_{CC} | Operating Voltage | - | 1.65 | - | 5.5 | V |
| V_{IN} | DC Input Voltage | - | 0 | - | V_{CC} | V |
| V_S | Switch Input Voltage | - | 0 | - | 5.5 | V |
| V_{OUT} | Output Voltage | - | 0 | - | V_{CC} | V |
| T_A | Operating Temperature | - | -40 | 25 | 85 | °C |
| t_r, t_f | Input Rise and Fall Time | Control Input $V_{CC} = 2.7V$ to $3.6V$ | 0 | - | 10 | ns/V |
| | | Control Input $V_{CC} = 4.5V$ to $5.5V$ | 0 | - | 5 | ns/V |

Note: Control input must be held HIGH or LOW; it must not float.

DC Electrical Characteristics

($T_A = -40°C$ to $85°C$, unless otherwise noted.)

| Parameter | Description | Test Conditions | Supply Voltage | Min | Typ | Max | Units |
|----------------------------|---------------------------------------|-------------------------------------|------------------|-----|-----|----------|-------|
| V_{IAR} | Analog Input Signal Range | - | V_{CC} | 0 | - | V_{CC} | V |
| R_{ON} | ON Resistance ⁽¹⁾ | $I_A = 100mA, V_B = 0V$ | 4.5V | - | 0.7 | 1.1 | Ω |
| | | $I_A = 100mA, V_B = 2.4V$ | | - | 0.6 | 1.0 | |
| | | $I_A = 100mA, V_B = 4.5V$ | | - | 0.8 | 1.2 | |
| | | $I_A = 100mA, V_B = 0V$ | 3.0V | - | 0.8 | 1.3 | |
| | | $I_A = 100mA, V_B = 3.0V$ | | - | 0.9 | 1.9 | |
| | | $I_A = 100mA, V_B = 0V$ | 2.3V | - | 1.0 | 1.5 | |
| | | $I_A = 100mA, V_B = 2.3V$ | | - | 1.2 | 1.8 | |
| | | $I_A = 100mA, V_B = 0V$ | 1.65V | - | 1.3 | 1.9 | |
| $I_A = 100mA, V_B = 1.65V$ | - | 2.0 | | 2.8 | | | |
| R_{ONF} | ON Resistance Flatness ⁽²⁾ | $I_A = 100mA, V_B = 0V, 2.4V, 4.5V$ | 4.5V | - | 0.2 | 0.4 | Ω |
| | | $I_A = 100mA, V_B = 0V, 1.5V, 3.3V$ | 3.3V | - | 0.2 | 0.4 | |
| | | $I_A = 100mA, V_B = 0V, 1.1V, 2.5V$ | 2.5V | - | 0.4 | 0.6 | |
| | | $I_A = 100mA, V_B = 0V, 0.7V, 1.8V$ | 1.8V | - | 1.0 | 1.4 | |
| V_{IH} | Input High Voltage | Logic High Level | $V_{CC} = 1.65V$ | 1 | - | - | V |
| | | | $V_{CC} = 2.3V$ | 1.2 | - | - | |
| | | | $V_{CC} = 3V$ | 1.3 | - | - | |
| | | | $V_{CC} = 4.2V$ | 1.5 | - | - | |
| | | | $V_{CC} = 5.5V$ | 1.8 | - | - | |

| | | | | | | | |
|----------------|-------------------------------------|---|---------------------------|-----|-------|-----|---------|
| V_{IL} | Input Low Voltage | Logic Low Level | $V_{CC} = 1.65V$ | - | - | 0.4 | V |
| | | | $V_{CC} = 2.3V$ | - | - | 0.6 | |
| | | | $V_{CC} = 3V$ | - | - | 0.8 | |
| | | | $V_{CC} = 4.2V$ | - | - | 1 | |
| | | | $V_{CC} = 5.5V$ | - | - | 1.2 | |
| $I_{OFF(B)}$ | Source Off Leakage Current | $V_{CC}=5.5V, V_A=1V, 4.5V$ $V_B=1V, 4.5V$ | $V_{CC} = 3V$ | -20 | - | +20 | nA |
| $I_{NC(A, B)}$ | Channel On Leakage Current | - | $V_{CC} = 1.65$ to $5.5V$ | -40 | - | +40 | |
| I_{PWROFF} | Input Leakage Current for Power off | $0 \leq V_A \leq 5.5V$ $0 \leq V_B \leq 5.5V$ | $V_{CC} = 0V$ | -5 | - | 5 | μA |
| I_{CC} | Quiescent Supply Current | All channels ON or OFF, $V_B = V_{CC}$ or GND, $I_{OUT}=0$ | $V_{CC} = 3.6V$ | - | 0.002 | 0.1 | μA |
| | | | $V_{CC} = 5.5V$ | - | 0.002 | 0.1 | |

Notes:

- Measured by voltage drop between A and B pins at the indicated current through the device. ON resistance is determined by the lower of the voltages on two ports (A or B).
- Flatness is defined as difference between maximum and minimum value of ON resistance over the specified range of conditions. Guaranteed by design.

Capacitance⁽¹⁾

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|--------------|------------------------|--|------|------|------|-------|
| C_{IN} | Control Input | $V_{CC} = 5.0V, f = 1 \text{ MHz}, T_A = 25^\circ C$ | - | 3.5 | - | pF |
| C_{IO-B} | For B Port, Switch OFF | | - | 15.0 | - | |
| C_{IOA-ON} | For A Port, Switch ON | | - | 34.0 | - | |

Notes:

- Capacitance is characterized but not tested in production

Switch and AC Characteristics⁽¹⁾

| Parameter | Description | Test Conditions | Supply Voltage | Min | Typ | Max | Units |
|-----------|---------------------------|--|----------------------------|-----|-------|-----|-------|
| t_{ON} | Turn on Time | See Figure 1 | $V_{CC} = 2.7V$ to $3.6V$ | - | 3 | - | ns |
| | | | $V_{CC} = 4.5V$ to $5.5V$ | - | 2 | - | |
| t_{OFF} | Turn off Time | See Figure 1 | $V_{CC} = 2.7V$ to $3.6V$ | - | 9 | - | ns |
| | | | $V_{CC} = 4.5V$ to $5.5V$ | - | 5 | - | |
| Q | Charge Injection | $C_L = 1nF, V_{GEN} = 0V,$ $R_{GEN} = 0\Omega.$ See Figure 2 | $V_{CC} = 5.0V$ | - | 35 | - | pC |
| | | | $V_{CC} = 3.3V$ | - | 25 | - | |
| O_{IRR} | Off Isolation | $R_L = 50\Omega, V_{GEN} = 0V,$ $R_{GEN} = 0\Omega, f = 1MHz.$ See Figure 3 ⁽²⁾ | $V_{CC} = 1.65V$ to $5.5V$ | - | -70 | - | dB |
| f_{3dB} | -3dB Bandwidth | See Figure 6 | $V_{CC} = 1.65V$ to $5.5V$ | - | 200 | - | MHz |
| T_{HD} | Total Harmonic Distortion | $R_L = 600\Omega, V_{IN} = 0.5V_{pp}, f = 20Hz$ to $20kHz$ See Figure 7 | $V_{CC} = 2.7V$ to $4.2V$ | - | 0.015 | - | % |

Notes:

- Guaranteed by design.
- Off Isolation = $20 \text{ Log}_{10}[V_B/V_A]$ and is measured in dB.

Test Circuits and Timing Diagrams

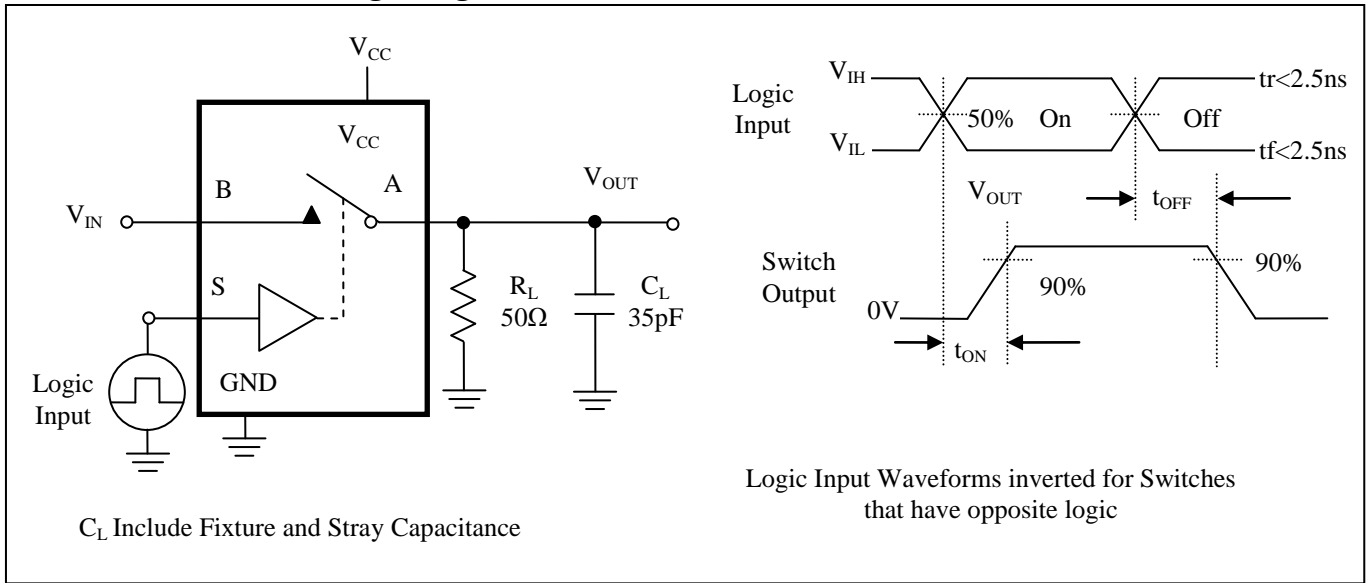


Figure 1. Turn ON/OFF Timing

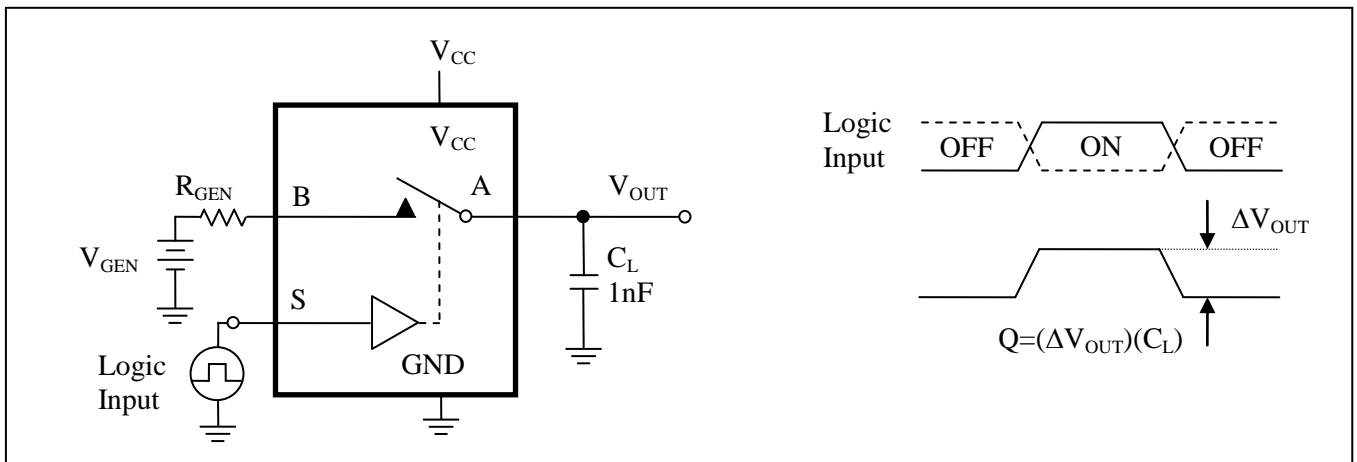


Figure 2. Charge Injection Test

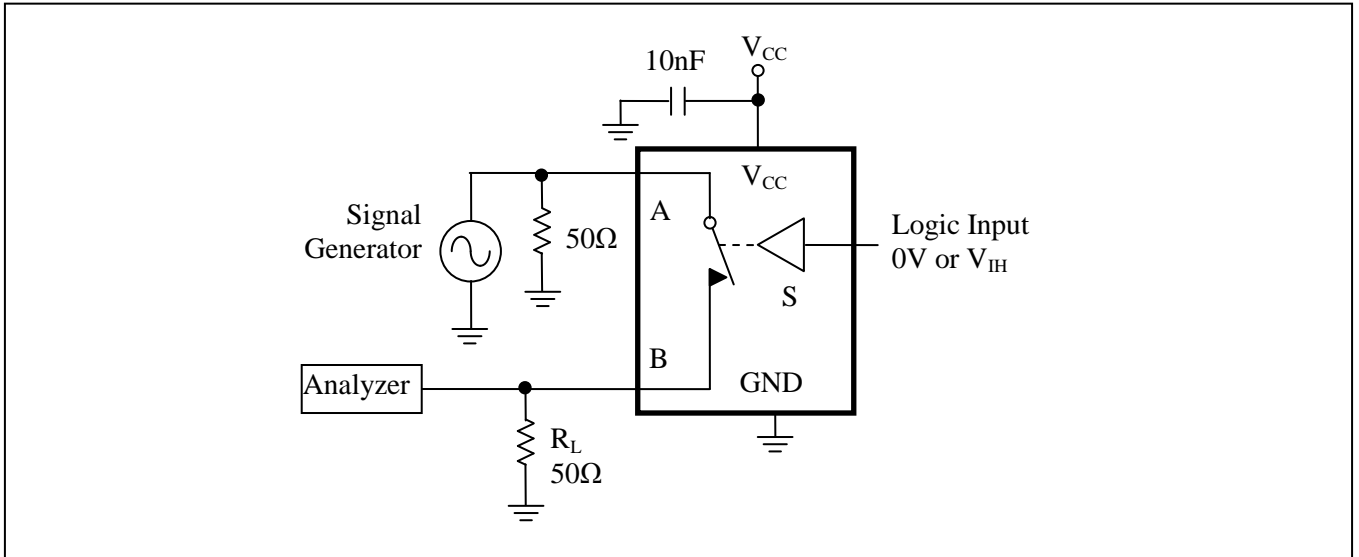


Figure 3. Off Isolation

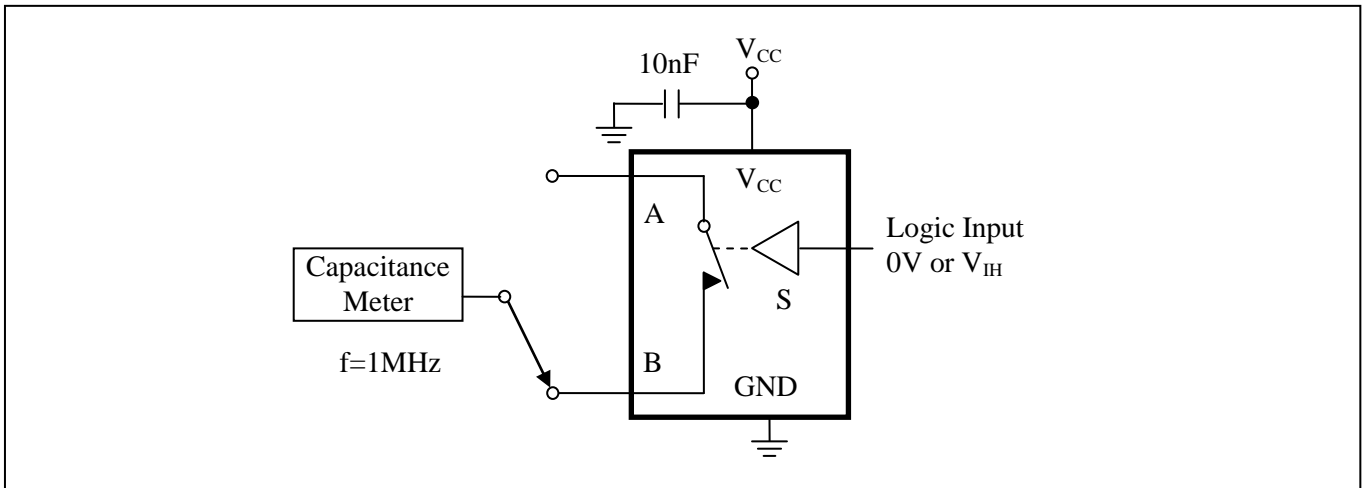


Figure 4. Channel Off Capacitance

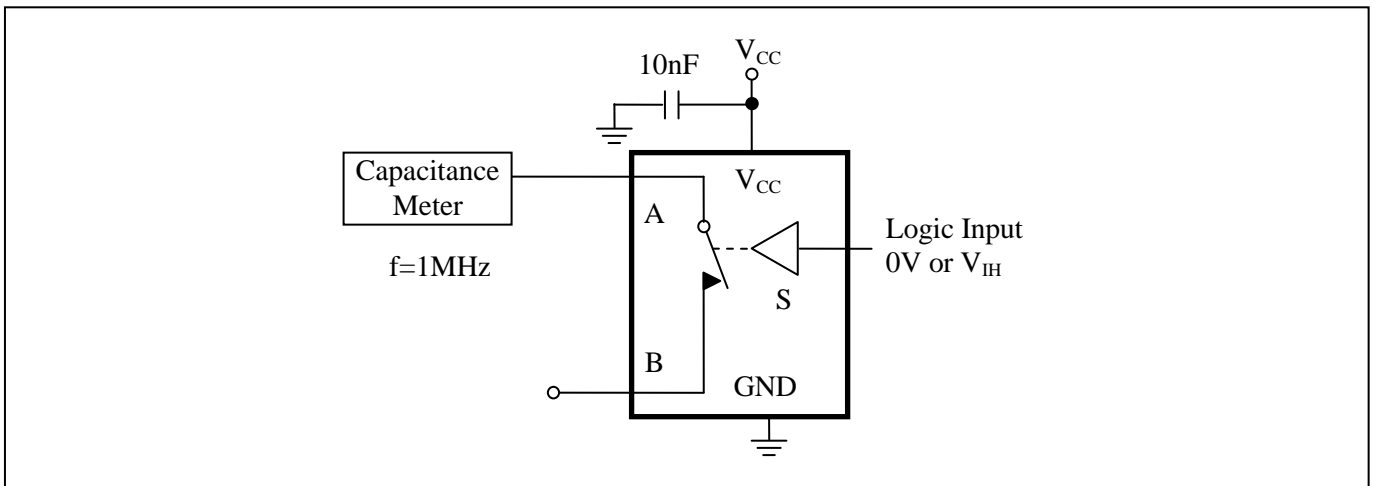


Figure 5. Channel On Capacitance

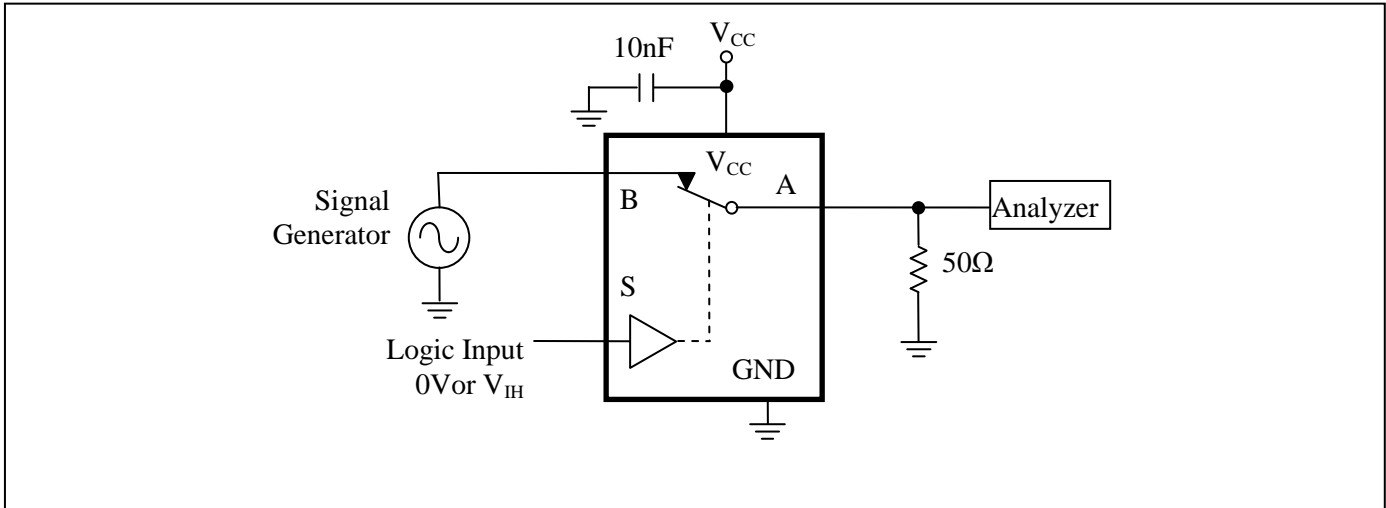


Figure 6. Bandwidth

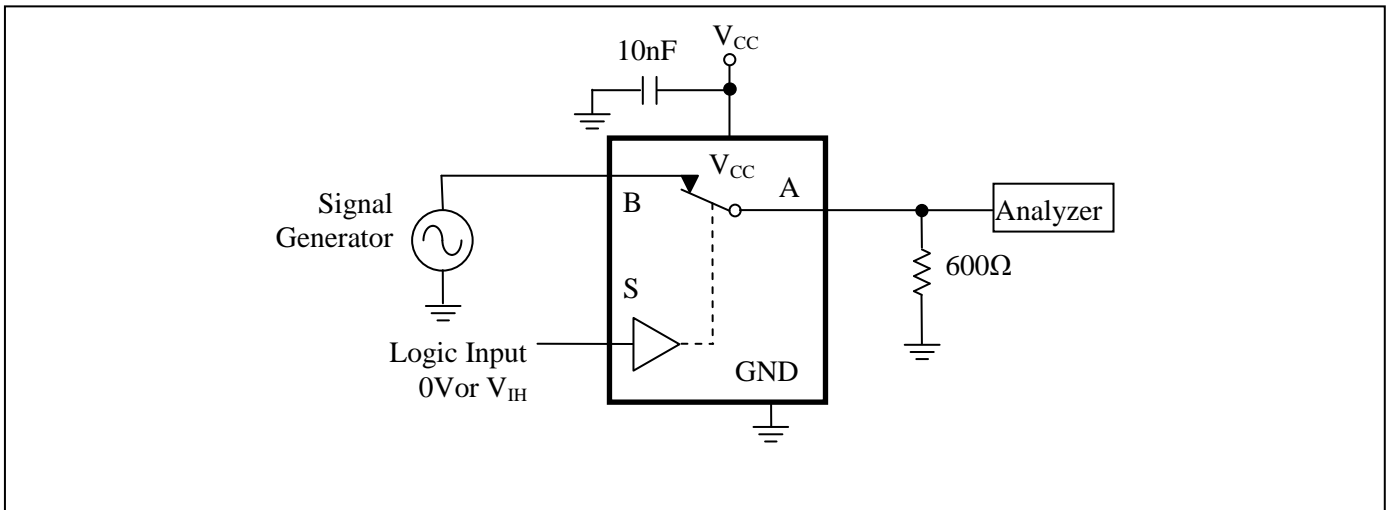
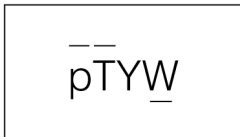


Figure 7. Harmonic Distortion

Part Marking

TA Package

pT: PI5A3166TAE

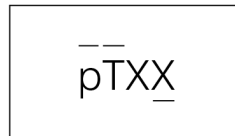


Y: Year

W: Workweek

Bar above "T" means Fab3 of MGN

C Package

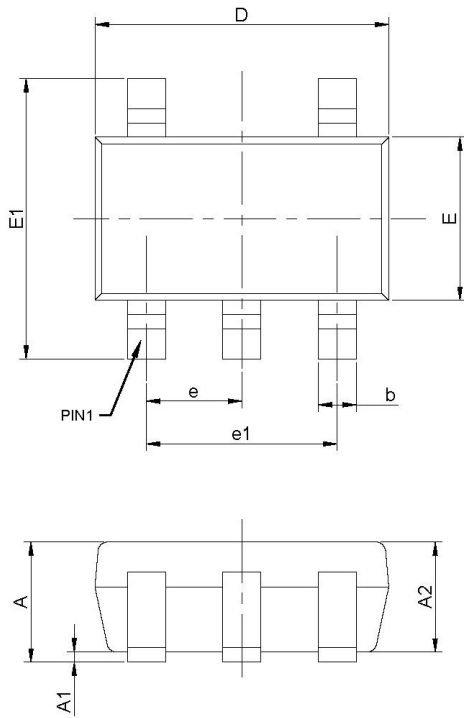


pT: Top Mark

XX: Date Code (Year & Work Week)

Bar above "T" means Fab3 of MGN

Packaging Mechanical
SOT23-5 (TA)



| PKG. DIMENSIONS(MM) | | |
|---------------------|----------|------|
| SYMBOL | Min | Max |
| A | - | 1.45 |
| A1 | 0.00 | 0.15 |
| A2 | 0.90 | 1.30 |
| b | 0.30 | 0.50 |
| c | 0.08 | 0.22 |
| D | 2.75 | 3.05 |
| E | 1.45 | 1.75 |
| E1 | 2.60 | 3.00 |
| e | 0.95 BSC | |
| e1 | 1.90 BSC | |
| L | 0.30 | 0.60 |
| θ | 0° | 8° |

Note:

1. Ref. JEDEC MO-178C/AA
2. PACKAGE OUTLINE DIMENSIONS DO NOT INCLUDE MOLD FLASH AND METAL BUR



DATE: 03/29/16

DESCRIPTION: 5-Pin, Small Outline Transistor Plastic Package (SOT23)

PACKAGE CODE: TA (TA5)

DOCUMENT CONTROL #: PD-2144

REVISION: A

16-0081

SC70-5 (C)

| PKG. DIMENSIONS(MM) | | |
|---------------------|----------|------|
| SYMBOL | Min | Max |
| A | - | 1.10 |
| A1 | 0.00 | 0.10 |
| A2 | 0.70 | 1.00 |
| b | 0.15 | 0.30 |
| c | 0.08 | 0.22 |
| D | 1.80 | 2.20 |
| E | 1.10 | 1.40 |
| E1 | 1.80 | 2.40 |
| e | 0.65 BSC | |
| e1 | 1.30 BSC | |
| L | 0.26 | 0.46 |
| θ | 0° | 8° |

Notes:
 1. Comply with MO-203C/AA, except D Min and D Max
 2. PACKAGE OUTLINE DIMENSIONS DO NOT INCLUDE MOLD FLASH AND METAL BUR

| | | |
|-----------------------------------|-------------|----------------|
| | | DATE: 03/29/16 |
| DESCRIPTION: 5-Pin, SOT353 (SC70) | | |
| PACKAGE CODE: C (C5) | | |
| DOCUMENT CONTROL#: PD-1901 | REVISION: E | |

16-0091

For latest package information:
 Please see <http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/>.

Ordering Information

| Part Number | Package Code | Description |
|--------------|--------------|---|
| PI5A3166CEX | C | 5-Pin, SOT353 (SC70) |
| PI5A3166TAEX | TA | 5-Pin, Small Outline Transistor Plastic Package (SOT23) |

- Notes:**
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 - See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead free.
 - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 - E = Pb-free and Green
 - X suffix = Tape/Reel

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