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

Description

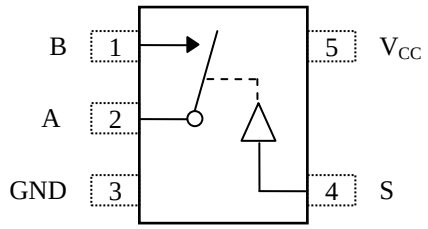
The PI5A3166 is a high-bandwidth, fast single-pole single-throw (SPST) CMOS switch. It can be used as an analog switch or as a low-delay bus switch. The device features ultra low RON of 0.8Ω typical at 3.0V VCC and will operate over the wide VCC range of 1.65V to 5.5V.

The PI5A3166 features very low quiescent current even when the control voltage is lower than the VCC supply. This feature services the mobile handset applications very well by allowing direct interface with baseband processor general purpose I/Os. The control input, S, is independent of supply voltage.

Applications

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

Pin Configuration



SOT23 and SC70 Package (Top View)

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℃ to +150℃
Ambient Temperature with Power Applied.....-40℃ to +85℃
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℃
Junction Lead Temperature (T_L)
(Soldering, 10 seconds) ..... 260℃
ESD（HBM）.....4KV
Power Dissipation (P_D) @ +85℃ 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	℃
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℃ to 85℃, unless otherwise noted.)

Parameter	Description	Test Conditions	Supply Voltage	Min	Typ	Max	Units
V_{IAR}	Analog Input Signal Range	-	V_{CC}	0	-	VCC	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≤V_A≤5.5V 0≤V_B≤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:

1. 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).
2. 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 MHz, T_A=25°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:

1. 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	-	
			V_{CC} = 4.5V to 5.5V	-	5	-	
Q	Charge Injection	C_L = 1nF, V_{GEN} = 0V, R_{GEN}=0Ω. See Figure 2	V_{CC} = 5.0V	-	35	-	pC
			V_{CC} = 3.3V	-	25	-	
O_{IRR}	Off Isolation	R_L=50Ω, V_{GEN}=0V, R_{GEN} =0Ω, 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=600Ω, V_{IN}=0.5Vpp, f=20Hz to 20kHz See Figure 7	V_{CC} =2.7V to 4.2V	-	0.015	-	%

Notes:

1. Guaranteed by design.
2. Off Isolation = 20 $Log_{10}[V_B/V_A]$ and is measured in dB.

Test Circuits and Timing Diagrams

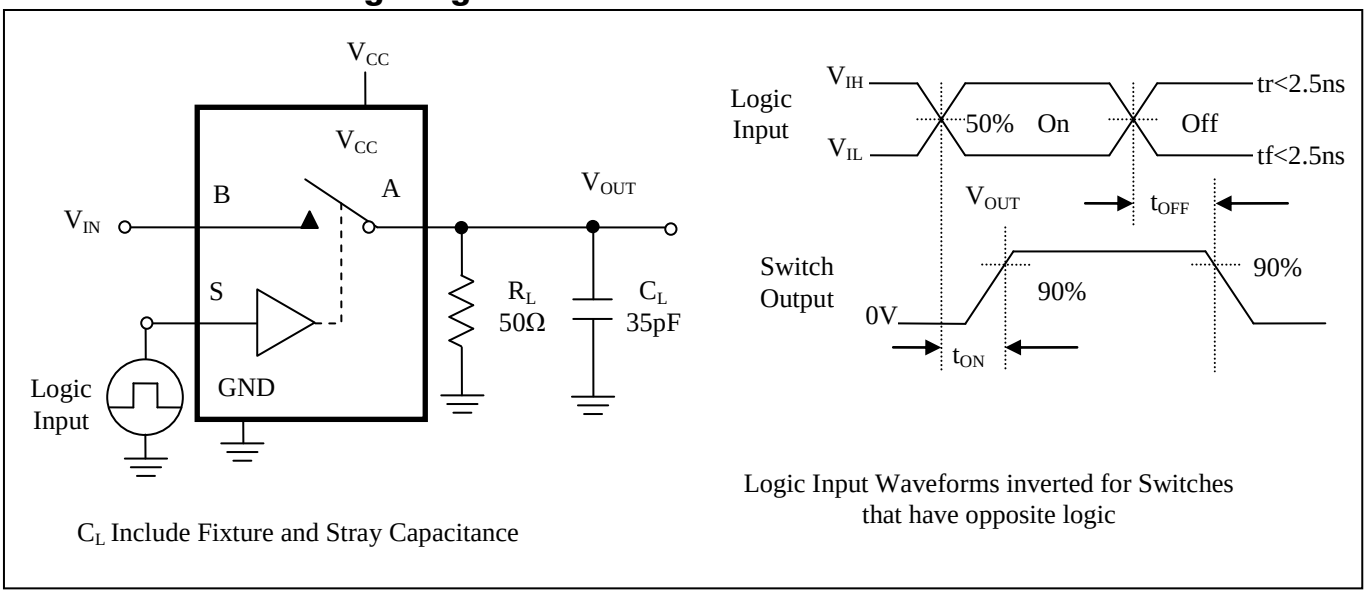


Figure 1. Turn ON/OFF Timing

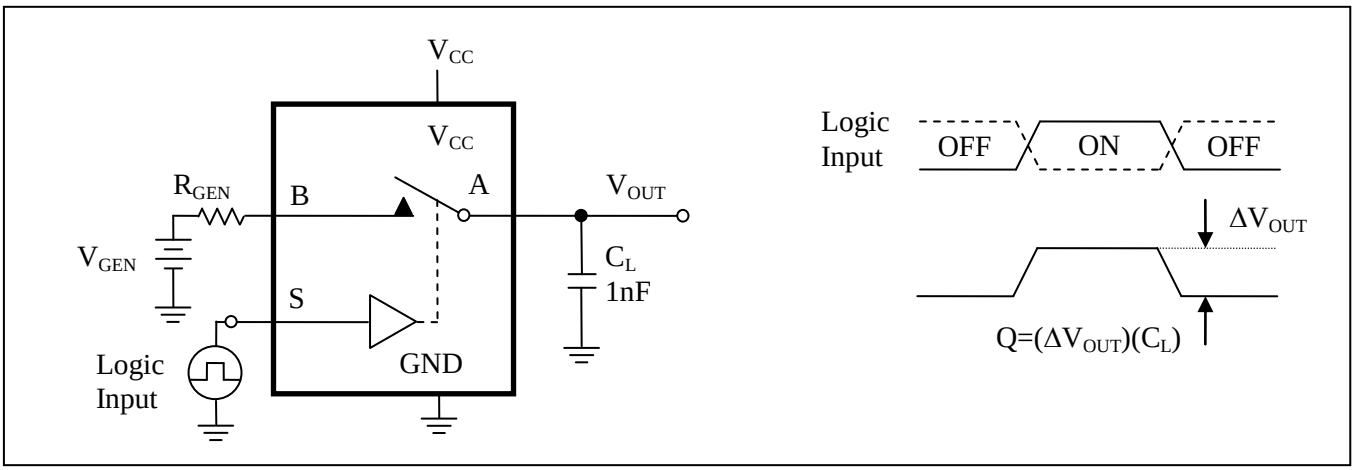


Figure 2. Charge Injection Test

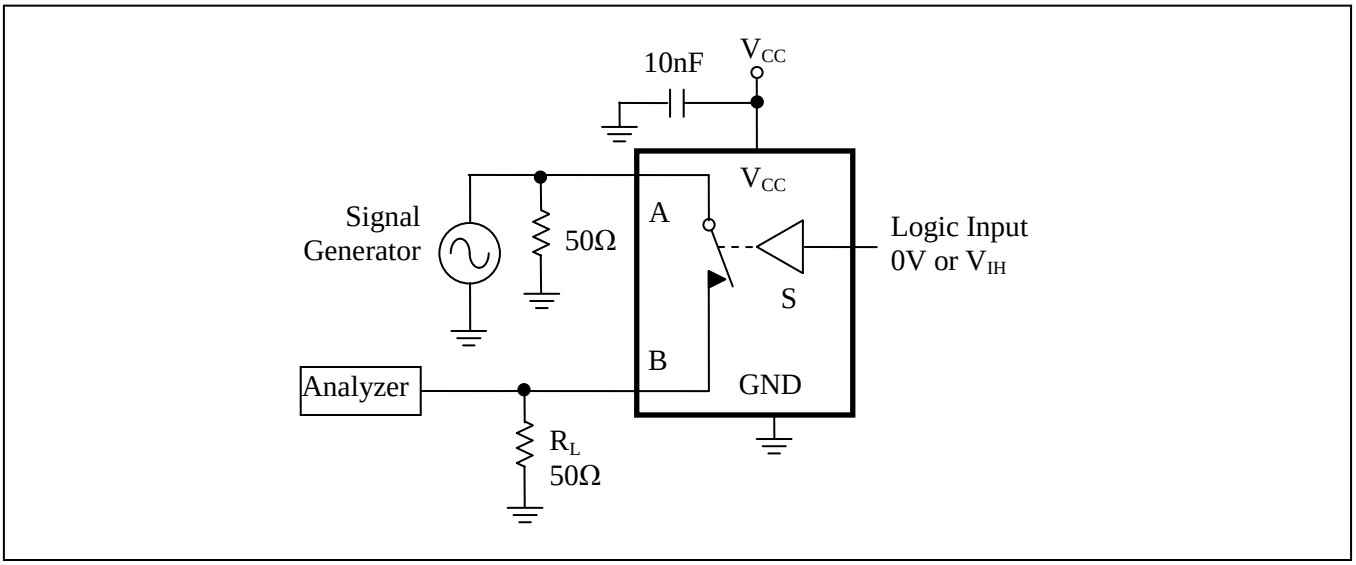


Figure 3. Off Isolation

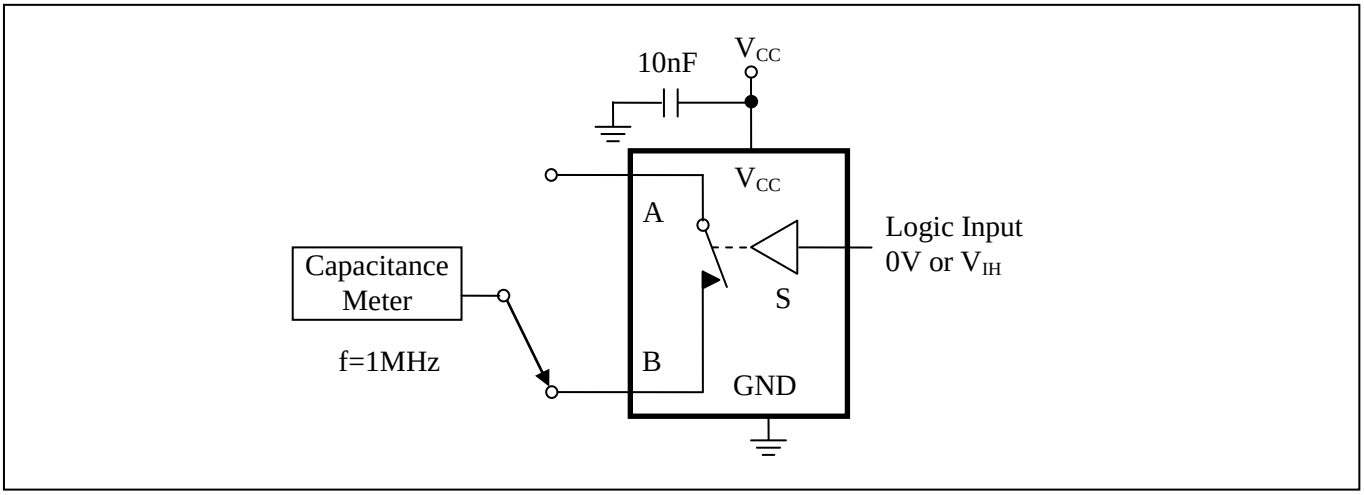


Figure 4. Channel Off Capacitance

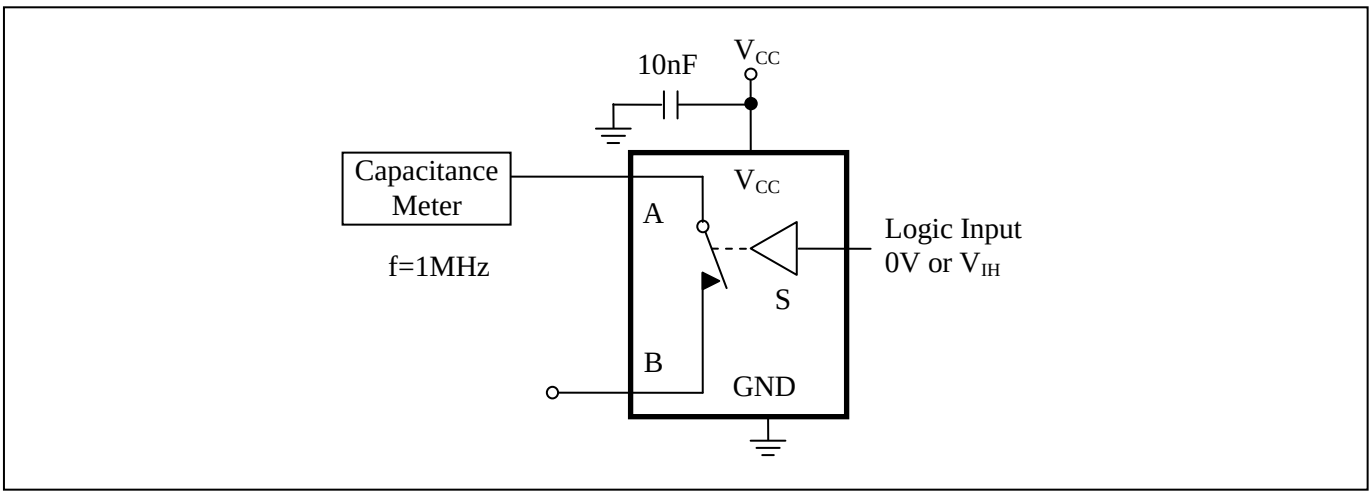


Figure 5. Channel On Capacitance

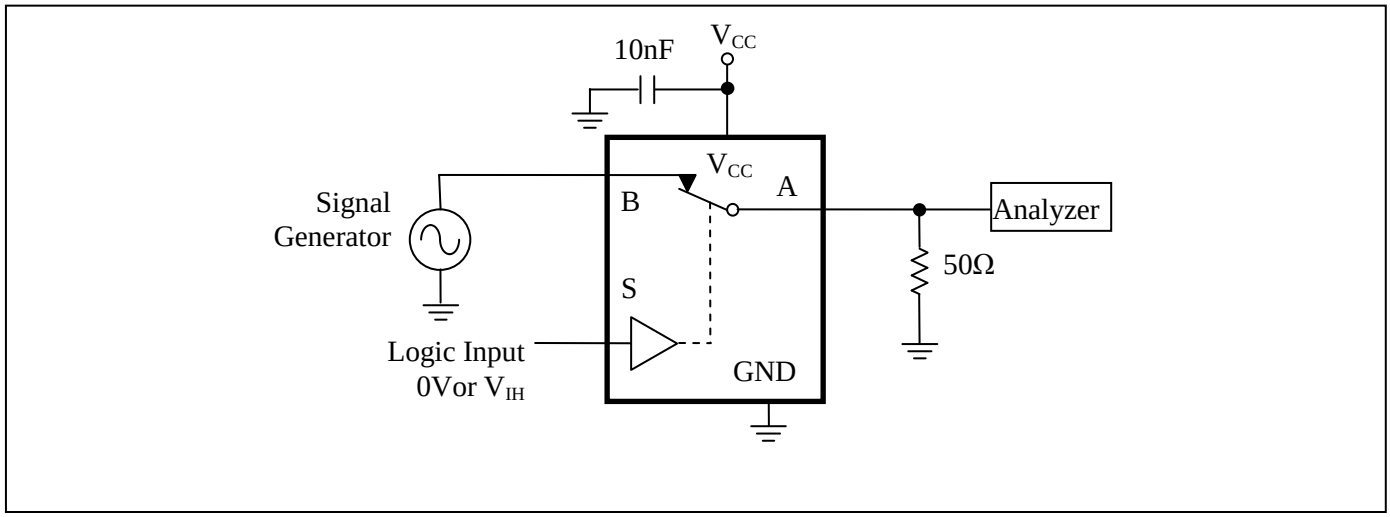


Figure 6. Bandwidth

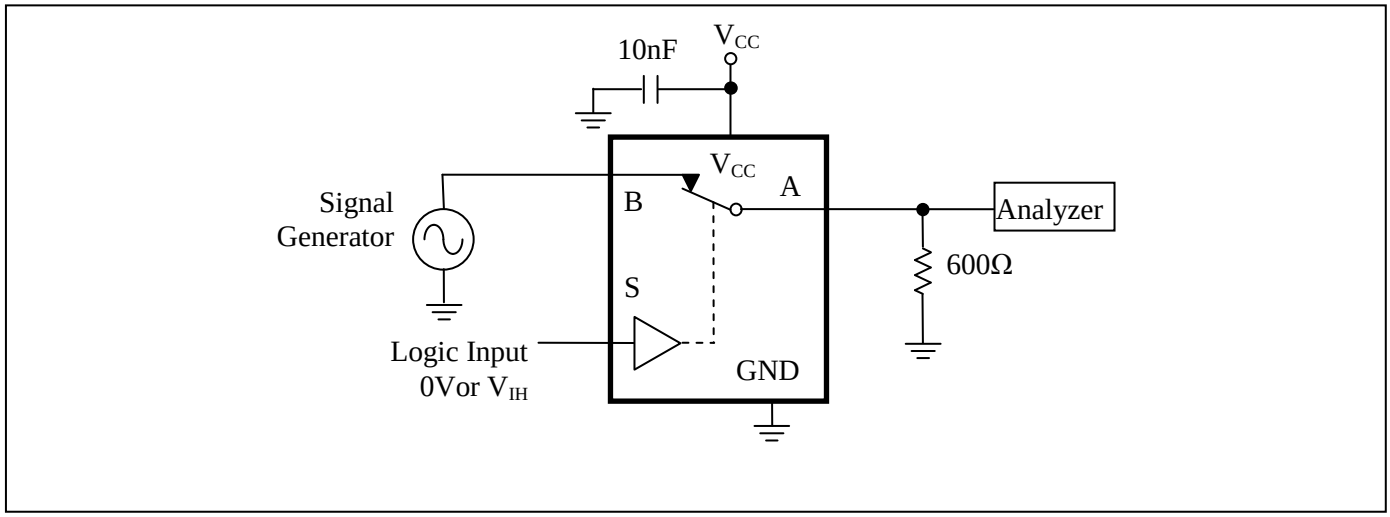
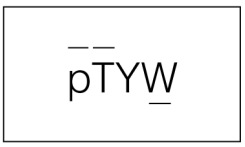


Figure 7. Harmonic Distortion

Part Marking

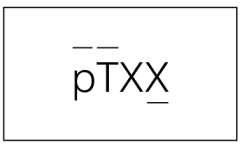
TA Package

pT: PI5A3166TAE



Y: Year
W: Workweek
Bar above "T" means Fab3 of MGN

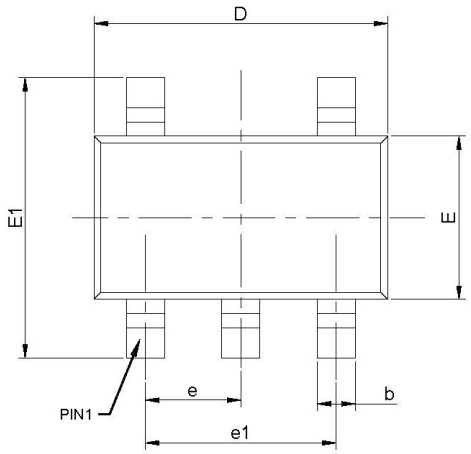
C Package

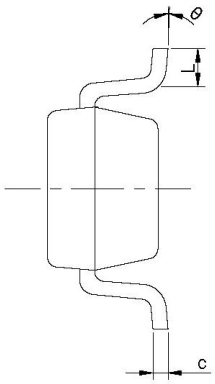


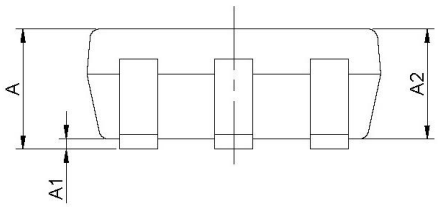
pT: Top Mark
XX: Date Code (Year & Work Week)
Bar above "T" means Fab3 of MGN

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

PERICOM Enabling Serial Connectivity

DATE: 03/29/16

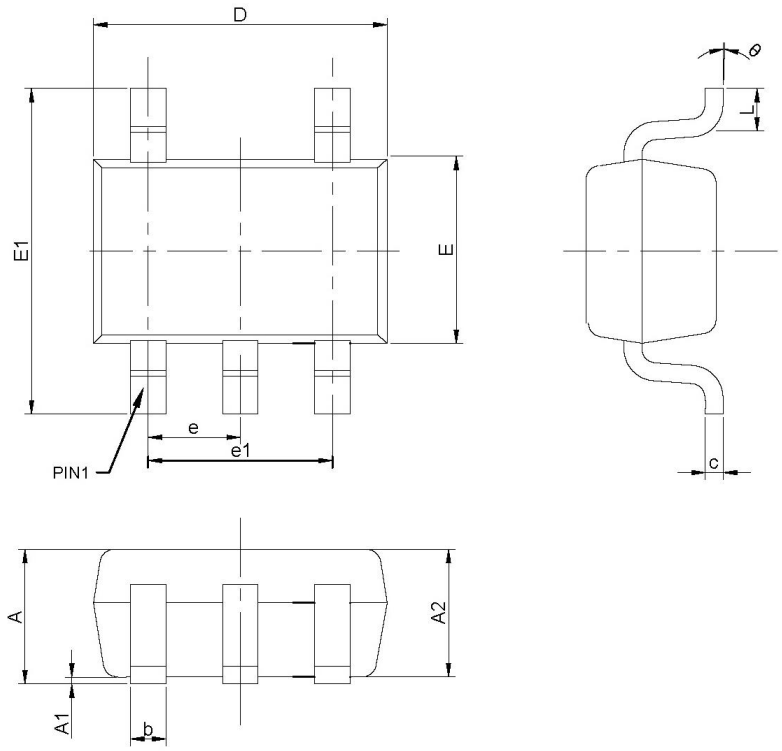
DESCRIPTION: 5-Pin, Small Outline Transistor Plastic Package (SOT23)

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

PERICOM Enabling Serial Connectivity — 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:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
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4. E = Pb-free and Green
5. X suffix = Tape/Reel

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