Low Voltage SPDT 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(Min)
- Fast Transition Speed: 12ns at 5.0V
- High Bandwidth: 150 MHz
- Extended Industrial Temperature Range: -40℃ to 85℃
- Packaging (Pb-free & Green):
  - -6-pin SOT23
  - -6-pin SC70
  - -6-Pin UDFN 1mm×1mm

Applications

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

Description

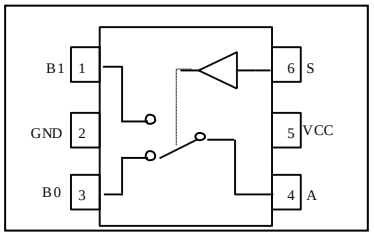
The PI5A4157 is a high-bandwidth, fast single-pole double-throw (SPDT) CMOS switch. It can be used as an analog switch or as a low-delay bus switch. The device features ultra low RON of 0.8Ω typical at 3.0V VCC and will operate over the wide VCC range of 1.65V to 5.5V.

The PI5A4157 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.

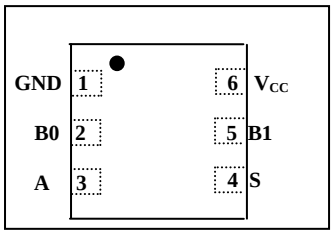
Break-before-make switching prevents both switches being enabled simultaneously. This eliminates signal disruption during switching.

The control input, S, is independent of supply voltage.

Pin Assignment



SOT23-6 and SC70-6(Top View)



UDFN-6 1×1 (Top View)

Pin Description

Pin No		Pin Name	Description
SOT23-6 SC70-6	UDFN-6 1×1		
1	5	B1	Data Port
2	1	GND	Ground
3	2	B0	Data Port (Normally connected)
4	3	A	Common Output/Data Port
5	6	V_{CC}	Positive Power Supply
6	4	S	Logic control

Logic Function Table

Logic Inputs(S)	Function
0	B_0 connect to A
1	B_1 connect to A

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 V_{CC}+0.5V
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）.....5KV
Power Dissipation (P_D) @ +85 ℃ SOT23 250mW
SC70 200mW
UDFN1x1 150mW

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}	Control Input Voltage	-	0	-	V_{CC}	V
V_S	Switch Input Voltage	-	0	-	V_{CC}	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	-	V_{CC}	V
R_{ON}	ON Resistance (1)	I_O = 100mA, V_{IN} = 0V	4.5V	-	0.7	1.1	Ω
		I_O = 100mA, V_{IN} = 2.4V		-	0.6	1.0	
		I_O = 100mA, V_{IN} = 4.5V		-	0.8	1.2	
		I_O = 100mA, V_{IN} = 0V	3.0V	-	0.8	1.3	
		I_O = 100mA, V_{IN} = 3.0V		-	0.9	1.9	
		I_O = 100mA, V_{IN} = 0V	2.3V	-	1.0	1.5	
		I_O = 100mA, V_{IN} = 2.3V		-	1.2	1.8	
		I_O = 100mA, V_{IN} = 0V	1.65V	-	1.3	1.9	
		I_O = 100mA, V_{IN} = 1.65V		-	2.0	2.8	
ΔR_{ON}	ON Resistance Match Between Channels(1,2,3)	I_A =100mA, V_{Bn} =3.15V	4.5V	-	0.01	0.03	Ω
		I_A = 100mA, V_{Bn} = 2.1V	3.0V	-	0.02	0.04	
		I_A =100mA, V_{Bn} = 1.6V	2.3V	-	0.03	0.06	
		I_A = 100mA, V_{Bn} = 1.15V	1.65V	-	0.03	0.06	
R_{ONF}	ON Resistance Flatness(1,2,4)	I_A = 100mA, V_{Bn} = 0V,2.4V,4.5V	4.5V	-	0.2	0.4	Ω
		I_A = 100mA, V_{Bn} = 0V,1.5V,3.3V	3.3V	-	0.2		
		I_A = 100mA, V_{Bn} = 0V,1.1V,2.5V	2.5V	-	0.4	0.6	
		I_A = 100mA, V_{Bn} = 0V, 0.7V,1.8V	1.8V	-	1.0	1.4	
V_{IH}	Input High Voltage	Logic High Level	V_{CC} = 1.65V	0.9	-	-	V
			V_{CC} = 2.3V	1.0	-	-	
			V_{CC} = 3V	1.1	-	-	
			V_{CC} = 4.2V	1.2	-	-	
			V_{CC} = 5.5V	1.3	-	-	
V_{IL}	Input Low Voltage	Logic Low Level	V_{CC} = 1.65V	-	-	0.6	V
			V_{CC} = 2.3V	-	-	0.6	
			V_{CC} = 3V	-	-	0.6	
			V_{CC} = 4.2V	-	-	0.8	
			V_{CC} = 5.5V	-	-	0.8	
$I_{OFF\ (NO)}$ or $I_{OFF\ (NC)}$	Source Off Leakage Current	V_{CC}=5.5V, V_A =1V, 4.5V V_{Bn} =1V, 4.5V	V_{CC} = 3V	-20	-	+20	nA
$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM\ (ON)}$	Channel On Leakage Current	-	V_{CC} = 1.65 to 5.5V	-40	-	+40	
I_{CC}	Quiescent Supply Current	All channels ON or OFF, V_{IN} = V_{CC} or GND, I_{OUT}=0	V_{CC} = 3.6V	-	0.002	0.1	µA
			V_{CC} = 5.5V	-	0.002	0.1	
I_{CCT}	Increase in I_{CC} per Input	Input at 2.7V	V_{CC} = 4.3V	-	0.2	10.0	µA

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. Parameter is characterized but not tested in production.
3. $\Delta R_{ON} = R_{ON}$ max $– R_{ON}$ min. measured at identical V_{CC}, temperature and voltage levels.
4. Flatness is defined as difference between maximum and minimum value of ON resistance over the specified range of conditions.

Capacitance (1)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{IN}	Control Input	V_{CC} = 5.0V, f =1 MHz, T_A=25℃	-	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_{BBM}	Break Before Make Time	See Figure 2	V_{CC} = 2.7V to 3.6V	-	10	20	ns
			V_{CC} = 4.5V to 5.5V	-	6	12	
t_{ON}	Turn on Time	See Figure 1	V_{CC} = 2.7V to 3.6V	-	12	25	
			V_{CC} = 4.5V to 5.5V	-	9	18	
t_{OFF}	Turn off Time	See Figure 1	V_{CC} = 2.7V to 3.6V	-	17	35	
			V_{CC} = 4.5V to 5.5V	-	10	20	
Q	Charge Injection	C_L = 1nF, V_{GEN} = 0V, R_{GEN}=0Ω. See Figure 3	V_{CC} = 5.0V	-	35	-	pC
			V_{CC} = 3.3V	-	25	-	
OIRR	Off Isolation	R_L=50Ω, V_{GEN}=0V, R_{GEN} =0Ω, f =1MHz. See Figure 4 (2)	V_{CC} =1.65V to 5.5V	-	-70	-	dB
X_{TALK}	Crosstalk Isolation	f=1MHz, See Figure 5	V_{CC} =1.65V to 5.5V	-	-70	-	
f_{3dB}	–3dB Bandwidth	See Figure 8	V_{CC} =1.65V to 5.5V	-	150	-	MHz
T_{HD}	Total Harmonic Distortion	R_L=600Ω, V_{IN}=0.5Vpp, f=20Hz to 20kHz See Figure 9	V_{CC} =2.7V to 4.2V	-	0.015	-	%

Notes:
1. Guaranteed by design.
2. Off Isolation = 20 Log_{10} [V_{Bn}/V_A] and is measured in dB.

Test Circuits and Timing Diagrams

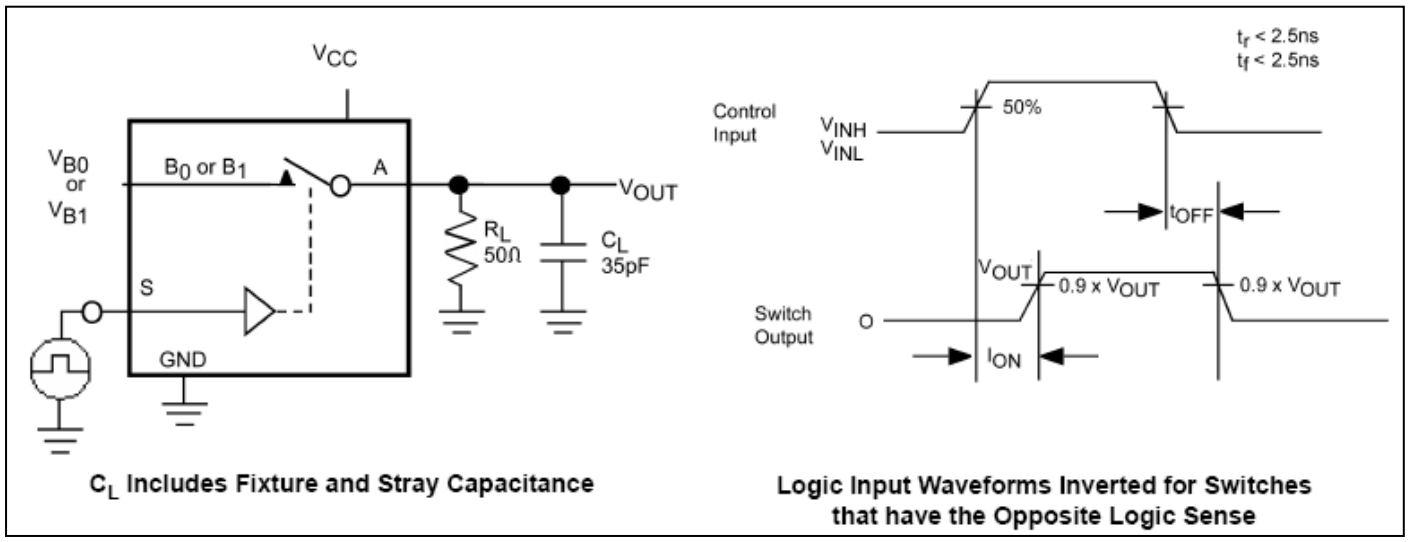


Figure 1. Turn ON/OFF Timing

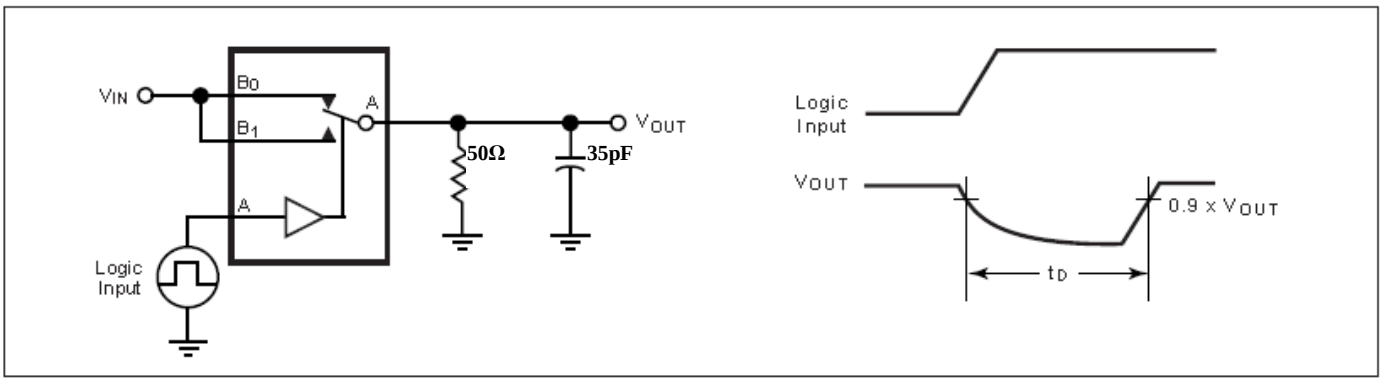


Figure 2. Break Before Make Interval Timing

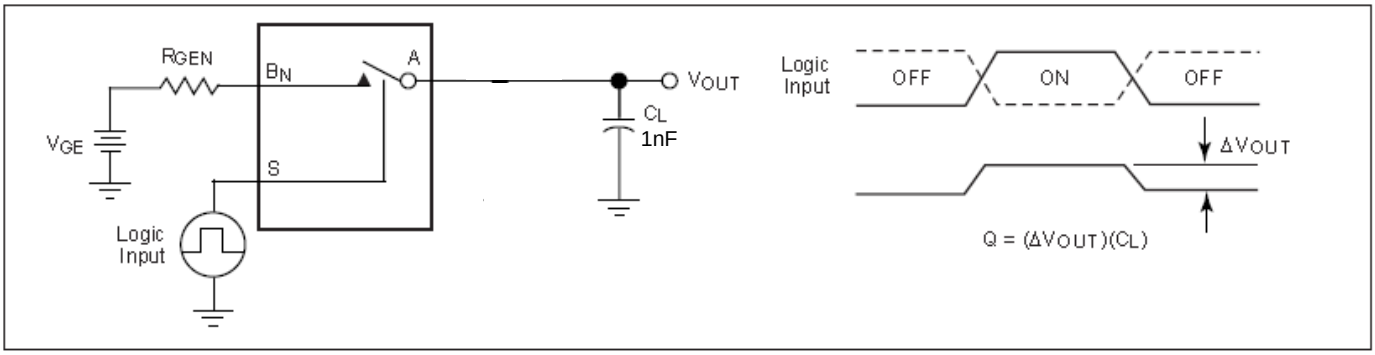


Figure 3. Charge Injection Test

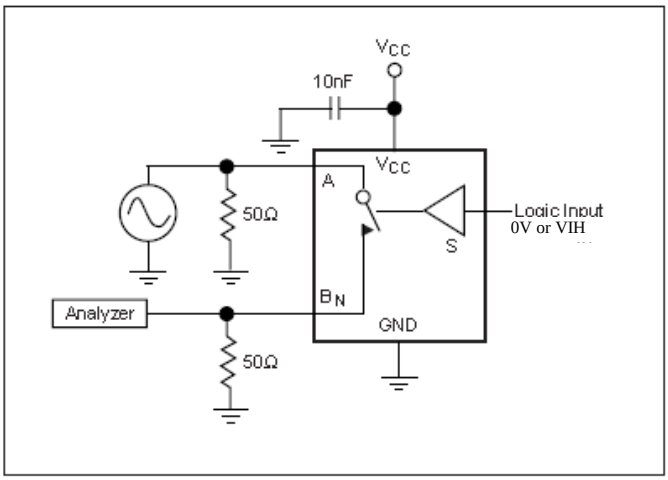


Figure 4. Off Isolation

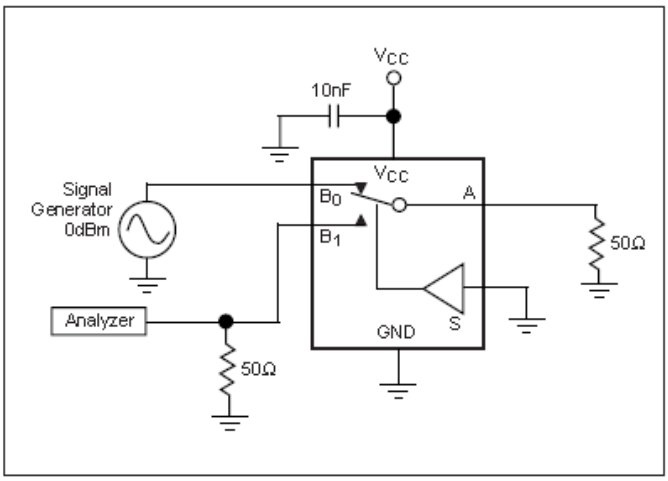


Figure 5. Crosstalk

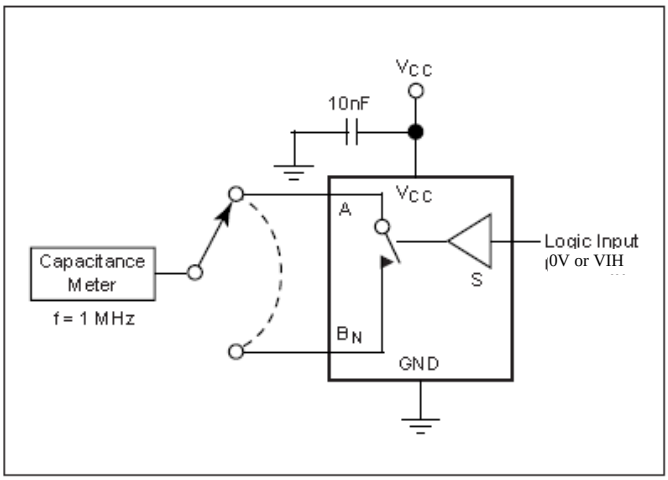


Figure 6. Channel Off Capacitance

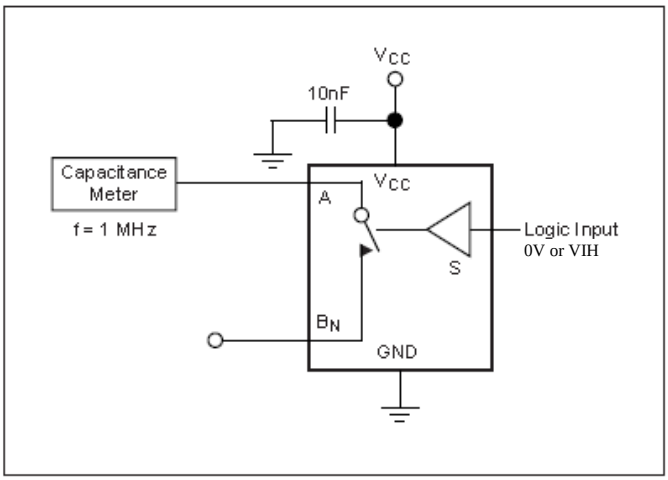


Figure 7. Channel On Capacitance

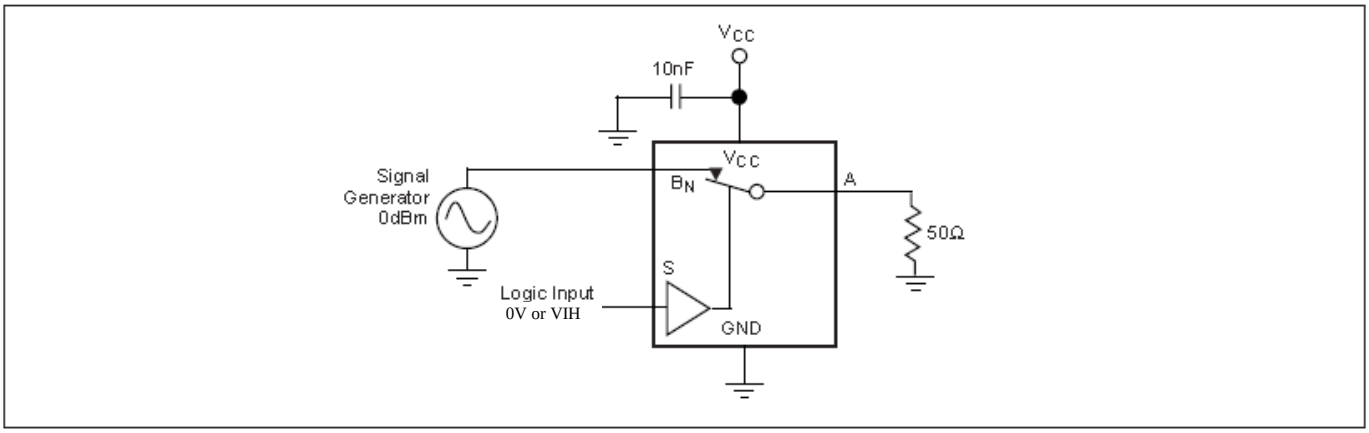


Figure 8. Bandwidth

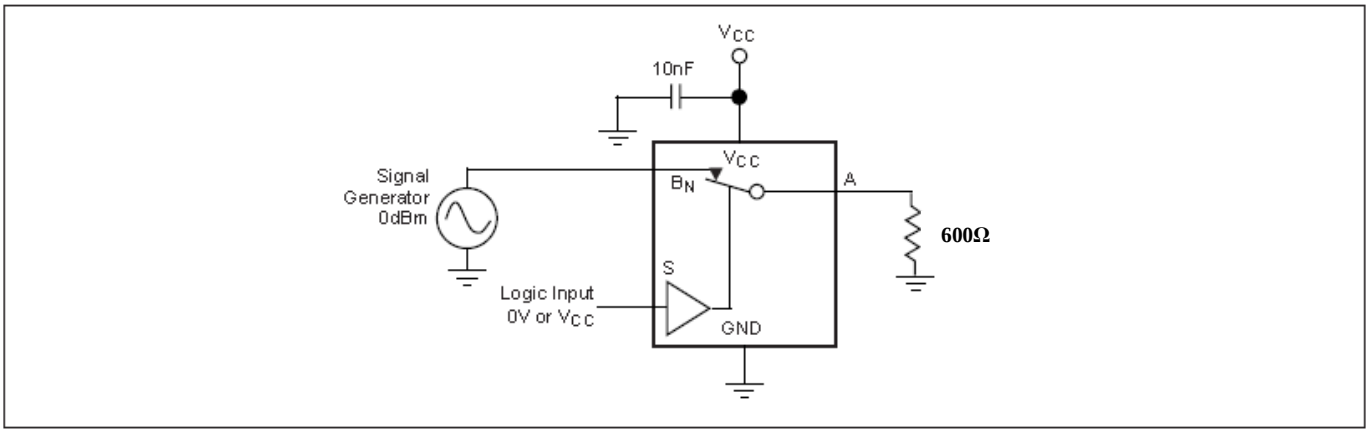
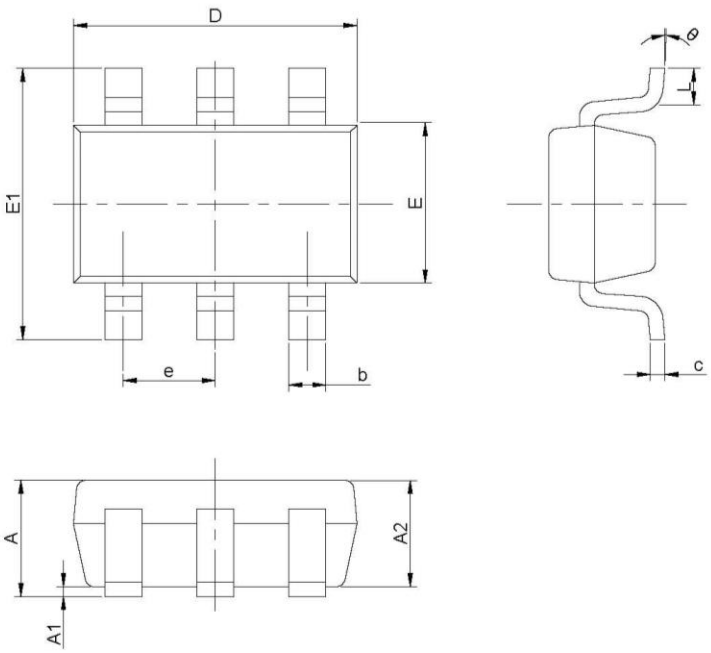


Figure 9. Harmonic Distortion

Mechanical Information

TA (6-pin SOT23)



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	
L	0.30	0.60
θ	0°	8°

Note:
1. Ref: JEDEC MO-178C/AB
2.PACKAGE OUTLINE DIMENSIONS DO NOT INCLUDE MOLD FLASH AND METAL BURR

PERICOM Enabling Serial Connectivity — DATE: 03/29/16

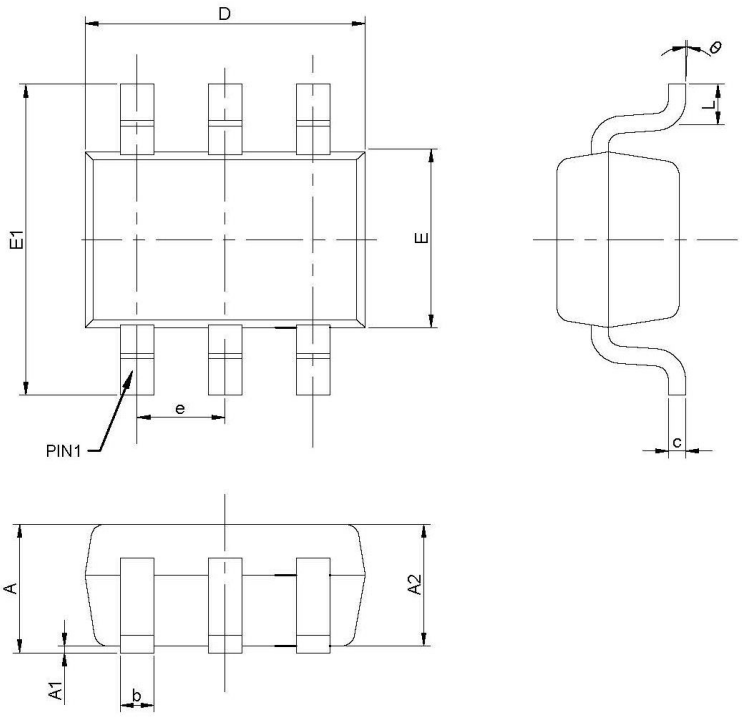
DESCRIPTION: 6-Pin, Small Outline Transistor Plastic Package (SOT23)

PACKAGE CODE: TA (TA6)

DOCUMENT CONTROL #: PD-2145 REVISION:A

16-0082

C (6-pin SC70)



PKG. DIMENSIONS(MM)		
SYMBOL	Min	Max
A	-	1.10
A1	0.00	0.10
A2	0.70	1.00
b	0.15	0.40
c	0.08	0.22
D	1.80	2.20
E	1.10	1.40
E1	1.80	2.40
e	0.65 BSC	
L	0.26	0.46
θ	0°	8°

Notes:

1. Comply with MO-203C/AB, except b Max, D Min and D Max.
2. PACKAGE OUTLINE DIMENSIONS DO NOT INCLUDE MOLD FLASH AND METAL BURR

PERICOM Enabling Serial Connectivity — DATE: 03/29/16

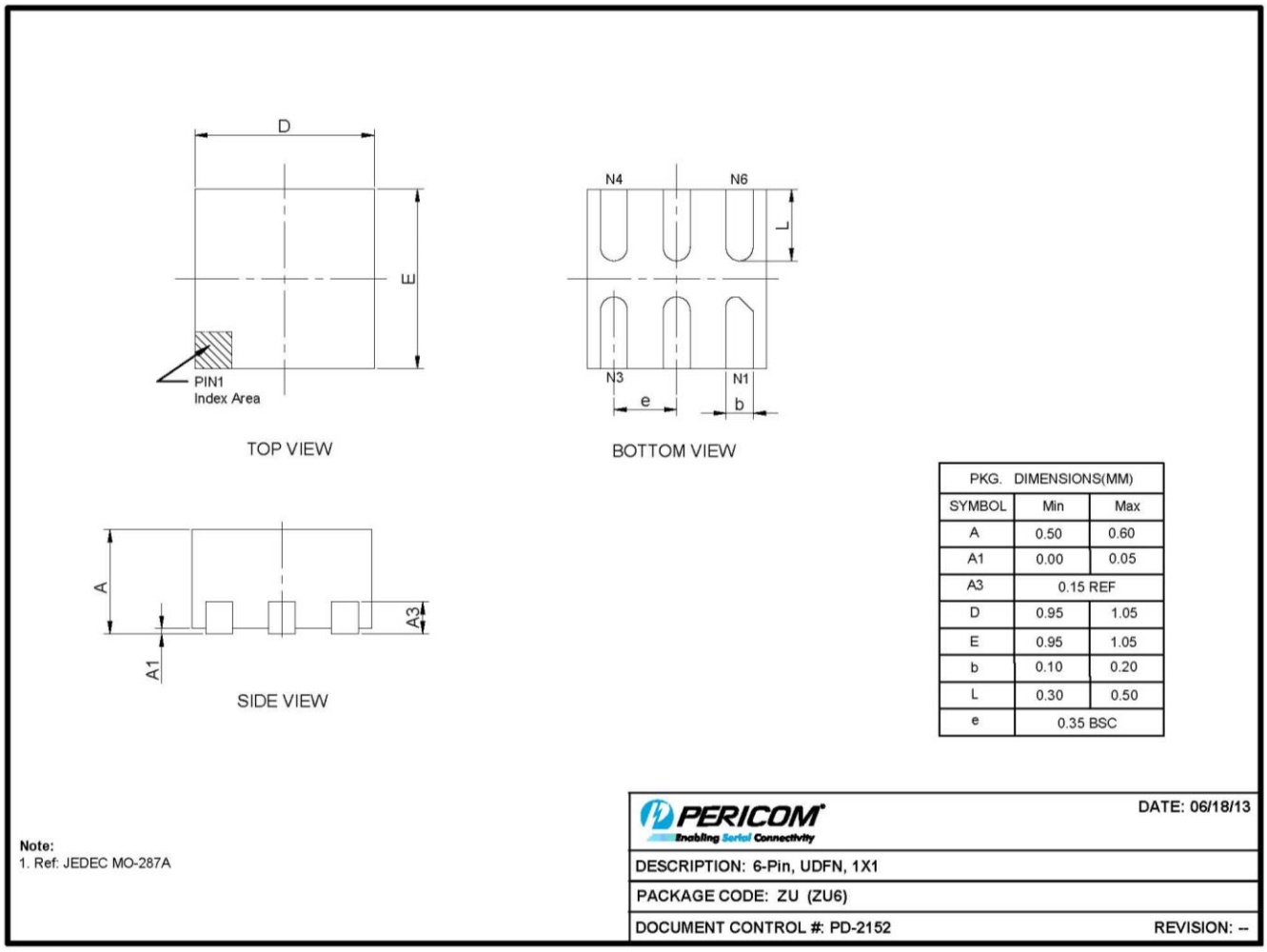
DESCRIPTION: 6-Pin, SOT363 (SC70)

PACKAGE CODE: C (C6)

DOCUMENT CONTROL#: PD-1902 REVISION:B

16-0078

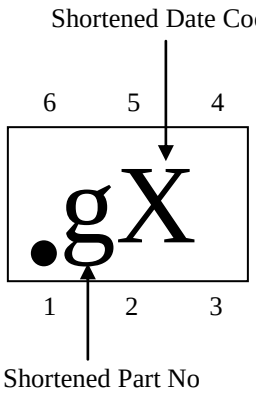
ZU (6-pin UDFN 1x1)



PKG. DIMENSIONS(MM)		
SYMBOL	Min	Max
A	0.50	0.60
A1	0.00	0.05
A3	0.15 REF	
D	0.95	1.05
E	0.95	1.05
b	0.10	0.20
L	0.30	0.50
e	0.35 BSC	

13-0191

Marking Description



Note: For latest package info, please check: http://www.pericom.com/products/packaging/mechanicals.php

Ordering Information

Part Number	Package Code	Package	Top Marking
PI5A4157CEX	C	6-Pin, SOT363 (SC70), Tape & Reel	mA
PI5A4157TAEX	TA	6-Pin, Small Outline Transistor Plastic Package (SOT23), Tape & reel	mA
PI5A4157ZUEX	ZU	6-Pin, 1x1 (UDFN), Tape & reel	g

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free and Green
- X suffix = Tape/Reel

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