

**PI5A3157**

**SOTiny™ Low Voltage Dual SPDT Analog Switch 2:1 Mux/DeMux Bus Switch**

**Features**

- CMOS Technology for Bus and Analog Applications
- Low On-Resistance: 8Ω at 3.0V
- Wide V<sub>DD</sub> Range: 1.65V to 5.5V
- Rail-to-Rail Signal Range
- Control Input Overvoltage Tolerance: 5.5V min.
- Fast Transition Speed: 5.2ns max. at 5V
- High Off Isolation: 57dB at 10MHz
- 54dB (10MHz) Crosstalk Rejection Reduces Signal Distortion
- Break-Before-Make Switching
- High Bandwidth: 250 MHz
- Extended Industrial Temperature Range: -40°C to 85°C
- Improved Direct Replacement for NC7SB3157
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. “Green” Device (Note 3)
- Packaging (Pb-free & Green available):
  - 6-pin SC70 (C)

**Description**

The PI5A3157 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. Specified over a wide operating power supply voltage range, 1.65V to 5.5V, the PI5A3157 has a maximum ON resistance of 12-ohms at 1.65V, 9-ohms at 2.3V & 6-ohms at 4.5V. Break-before-make switching prevents both switches being enabled simultaneously. This eliminates signal disruption during switching. The control input, S, tolerates input drive signals up to 5.5V, independent of supply voltage. PI5A3157 is an improved direct replacement for the NC7SB3157.

**Applications**

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

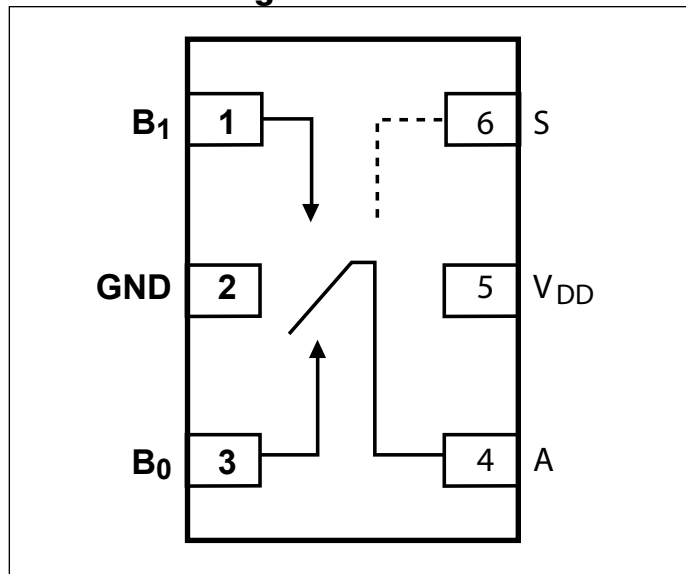
**Pin Description**

Pin Number	Name	Description
1	B <sub>1</sub>	Data port
2	GND	Ground
3	B <sub>0</sub>	Data port (Normally Closed)
4	A	Common Output/Data port
5	V <sub>CC</sub>	Positive Power Supply
6	S	Logic Control

**Logic Function Table**

Logic Input(s)	Function
0	B <sub>0</sub> Connection to A
1	B <sub>1</sub> Connected to A

**Connection Diagram**



**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.

**Absolute Maximum Ratings<sup>(1)</sup>**

Supply Voltage $V_{DD}$	-0.5V to +7V
DC Switch Voltage ( $V_S$ ) <sup>(2)</sup>	-0.5V to $V_{DD} + 0.5V$
DC Input Voltage ( $V_{IN}$ ) <sup>(2)</sup>	-0.5V to +7.0V
DC Output Current ( $V_{OUT}$ )	128mA
DC $V_{DD}$ or Ground Current ( $I_{CC}/I_{GND}$ )	$\pm 100mA$
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C
Junction Temperature under Bias ( $T_J$ )	150°C
Junction Lead Temperature ( $T_L$ )	
(Soldering, 10 seconds)	260°C
Power Dissipation ( $P_D$ ) @ +85°C	180mW

**Recommended Operating Conditions<sup>(3)</sup>**

Supply Voltage Operating ( $V_{DD}$ )	1.65V to 5.5V
Control Input Voltage ( $V_{IN}$ )	0V to $V_{DD}$
Switch Input Voltage ( $V_{IN}$ )	0V to $V_{DD}$
Output Voltage ( $V_{OUT}$ )	0V to $V_{DD}$
Operating Temperature ( $T_A$ )	-40°C to +85°C
Input Rise and Fall Time ( $t_r, t_f$ )	
Control Input $V_{DD} = 2.3V - 3.6V$	0ns/V to 10ns/V
Control Input $V_{DD} = 4.5V - 5.5V$	0ns/V to 5ns/V
Thermal Resistance ( $\theta_{JA}$ )	350°C/W

**Notes:**

1. Absolute Maximum Ratings<sup>1</sup> may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied.
2. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.
3. Control input must be held HIGH or LOW; it must not float.

**DC Electrical Characteristics** (Over the Operating temperature range,  $T_A = -40^\circ C$  to  $85^\circ C$ )

Parameters	Description	Test Conditions	Supply Voltage	Temp	Min.	Typ.	Max.	Units	
$V_{IAR}$	Analog Input Signal Range		$V_{DD}$	$T_A = 25^\circ C$ & $-40^\circ C$ to $85^\circ C$	0		$V_{DD}$	V	
$R_{ON}$	On-Resistance <sup>(4)</sup>	$I_O = 30mA, V_{IN} = 0V$	4.5V	$T_A = 25^\circ C$		4	6	$\Omega$	
		$I_O = -30mA, V_{IN} = 2.4V$				5	8		
		$I_O = -30mA, V_{IN} = 4.5V$				8	13		
$R_{ON}$		$I_O = 30mA, V_{IN} = 0V$	4.5V	$T_A = -40^\circ C$ to $85^\circ C$					6
		$I_O = -30mA, V_{IN} = 2.4V$					8		
		$I_O = -30mA, V_{IN} = 4.5V$					13		
$R_{ON}$		$I_O = 24mA, V_{IN} = 0V$	3.0V	$T_A = 25^\circ C$		5	8		
		$I_O = -24mA, V_{IN} = 3.0V$				12	19		
$R_{ON}$		$I_O = 24mA, V_{IN} = 0V$	3.0V	$T_A = -40^\circ C$ to $85^\circ C$					8
		$I_O = -24mA, V_{IN} = 3.0V$					19		
$R_{ON}$		$I_O = 24mA, V_{IN} = 0V$	2.3V	$T_A = 25^\circ C$		6	9		
		$I_O = -24mA, V_{IN} = 2.3V$				16	24		
$R_{ON}$	$I_O = 24mA, V_{IN} = 0V$	2.3V	$T_A = -40^\circ C$ to $85^\circ C$				9		
	$I_O = -24mA, V_{IN} = 2.4V$					24			
$R_{ON}$	$I_O = 24mA, V_{IN} = 0V$	1.65V	$T_A = 25^\circ C$		8	12			
	$I_O = -24mA, V_{IN} = 1.65V$				27	39			
$R_{ON}$	$I_O = 24mA, V_{IN} = 0V$	1.65V	$T_A = -40^\circ C$ to $85^\circ C$				12		
	$I_O = -24mA, V_{IN} = 1.65V$					39			

**DC Electrical Characteristics Cont.** (Over the Operating temperature range,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$ )

Parameters	Description	Test Conditions	Supply Voltage	Temp	Min.	Typ.	Max.	Units
$\Delta R_{ON}$	On-Resistance Match Between Channels <sup>(4, 5, 6)</sup>	$I_A = -30\text{mA}$ , $V_{BN} = 3.15\text{V}$	4.5V	$T_A = 25^\circ\text{C}$		0.15		$\Omega$
		$I_A = -24\text{mA}$ , $V_{BN} = 2.1\text{V}$	3.0V			0.2		
		$I_A = -8\text{mA}$ , $V_{BN} = 1.6\text{V}$	2.3V			0.3		
		$I_A = -4\text{mA}$ , $V_{BN} = 1.15\text{V}$	1.65V			0.3		
$R_{ONF}$	On-Resistance Flatness <sup>(4, 5, 7)</sup>	$I_A = -30\text{mA}$ , $0 \leq V_{BN} \leq V_{DD}$	5.0V	$T_A = 25^\circ\text{C}$		6		$\Omega$
		$I_A = -24\text{mA}$ , $0 \leq V_{BN} \leq V_{DD}$	3.3V			12		
		$I_A = -8\text{mA}$ , $0 \leq V_{BN} \leq V_{DD}$	2.5V			22		
		$I_A = -4\text{mA}$ , $0 \leq V_{BN} \leq V_{DD}$	1.8V			90		
$V_{IH}$	Input High Voltage	Logic High Level	$V_{CC} = 1.65\text{V}$ to $1.95\text{V}$	$T_A = 25^\circ\text{C}$ & $-40^\circ\text{C}$ to $85^\circ\text{C}$	$0.75 V_{CC}$			V
			$V_{CC} = 2.3\text{V}$ to $5.5\text{V}$		$0.7 V_{CC}$			
$V_{IL}$	Input Low Voltage	Logic LowLevel	$V_{CC} = 1.65\text{V}$ to $1.95\text{V}$				$0.25 V_{CC}$	V
			$V_{CC} = 2.3\text{V}$ to $5.5\text{V}$				$0.25 V_{CC}$	
	Input Leakage Current	$0 \leq V_{IN} \leq 5.5\text{V}$	$V_{CC} \leq 0\text{V} \leq 5.5\text{V}$	$T_A = 25^\circ\text{C}$			$\pm 0.1$	$\mu\text{A}$
				$T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$			$\pm 1.0$	
$I_{OFF}$	OFF State Leakage Current	$0 \leq V_{IN} \leq 5.5\text{V}$	$V_{CC} \leq 1.65\text{V} \leq 5.5\text{V}$	$T_A = 25^\circ\text{C}$			$\pm 0.1$	
				$T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$			$\pm 10$	
$I_{CC}$	Quiescent Supply Current	All Channels ON or OFF, $V_{IN} = V_{DD}$ or GND, $I_{OUT} = 0$	$V_{CC} = 5.5\text{V}$	$T_A = 25^\circ\text{C}$			1	$\mu\text{A}$
				$T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$			10	

**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).
- Parameter is characterized but not tested in production.
- $\Delta R_{ON} = R_{ON \text{ max}} - R_{ON \text{ min}}$ , measured at identical  $V_{DD}$ , temperature and voltage levels.
- Flatness is defined as difference between maximum and minimum value of On-Resistance over the specified range of conditions.
- Guaranteed by design.

**Capacitance<sup>(12)</sup>**

Parameters	Description	Test Conditions	Supply Voltage	Temp	Min.	Typ.	Max.	Units	
$C_{IN}$	Controll Input		$V_{CC} = 5.0\text{V}$	$T_A = 25^\circ\text{C}$		2.3		pF	
$C_{IO-B}$	For B Port, Switch OFF	$f = 1 \text{ MHz}^{(12)}$					6.5		
$C_{IOA-ON}$	For A Port, Switch ON						18.5		

### Switch and AC Characteristics

Parameters	Description	Test Conditions	Supply Voltage	Temp	Min.	Typ.	Max.	Units
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay: A to Bn	See test circuit diagram 1 and 2 V <sub>I</sub> = 2 V <sub>Open</sub> <sup>(10)</sup>	V <sub>CC</sub> = 2.3V to 2.7V	T <sub>A</sub> = 25°C & -40°C to 85°C		1.2		
			V <sub>CC</sub> = 3.0V to 3.6V			0.8		
			V <sub>CC</sub> = 4.5V to 5.5V			0.3		
t <sub>PZL</sub> t <sub>PZH</sub>	Output Enable Turn ON Time: A to Bn	See test circuit diagram 1 and 2 V <sub>I</sub> = 2 V <sub>CC</sub> for t <sub>PZL</sub> , V <sub>I</sub> = 0V for t <sub>PZH</sub>	V <sub>CC</sub> = 1.65V to 1.95V	T <sub>A</sub> = 25°C	7		23	
			V <sub>CC</sub> = 2.3V to 2.7V		3.5		13	
			V <sub>CC</sub> = 3.0V to 3.6V		2.5		6.9	
			V <sub>CC</sub> = 4.5V to 5.5V		1.7		5.2	
t <sub>PZL</sub> t <sub>PZH</sub>	Output Enable Turn ON Time: A to Bn	See test circuit diagram 1 and 2 V <sub>I</sub> = 2 V <sub>CC</sub> for t <sub>PZL</sub> , V <sub>I</sub> = 0V for t <sub>PZH</sub>	V <sub>CC</sub> = 2.5V	T <sub>A</sub> = 25°C & -40°C to 85°C			24	
			V <sub>CC</sub> = 3.3V				14	
			V <sub>CC</sub> = 3.0V to 3.6V				7.6	
			V <sub>CC</sub> = 4.5V to 5.5V				5.7	
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable-Turn OFF Time: A to Bn	See test circuit diagram 1 and 2 V <sub>I</sub> = 2 V <sub>CC</sub> for t <sub>PLZ</sub> , V <sub>I</sub> = 0V for t <sub>PZH</sub>	V <sub>CC</sub> = 1.65V to 1.95V	T <sub>A</sub> = 25°C	3		12.5	ns
			V <sub>CC</sub> = 2.3V to 2.7V		2		7	
			V <sub>CC</sub> = 3.0V to 3.6V		1.5		5	
			V <sub>CC</sub> = 4.5V to 5.5V		0.8		3.5	
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable-Turn OFF Time: A to Bn	See test circuit diagram 1 and 2 V <sub>I</sub> = 2 V <sub>CC</sub> for t <sub>PLZ</sub> , V <sub>I</sub> = 0V for t <sub>PZH</sub>	V <sub>CC</sub> = 2.5V	T <sub>A</sub> = 25°C & -40°C to 85°C			13	
			V <sub>CC</sub> = 3.3V				7.5	
			V <sub>CC</sub> = 3.0V to 3.6V				5.3	
			V <sub>CC</sub> = 4.5V to 5.5V				3.8	
t <sub>BM</sub>	Break Before Make Time	See Test Circuit diagram 9. <sup>(9)</sup>	V <sub>CC</sub> = 2.5V	T <sub>A</sub> = 25°C & -40°C to 85°C	0.5			
			V <sub>CC</sub> = 3.3V		0.5			
			V <sub>CC</sub> = 3.0V to 3.6V		0.5			
			V <sub>CC</sub> = 4.5V to 5.5V		0.5			
Q	Charge Injection	C <sub>L</sub> = 0.1nF, V <sub>GEN</sub> = 0V, R <sub>GEN</sub> = 0Ω, See test circuit 4	V <sub>CC</sub> = 5.0V	T <sub>A</sub> = 25°C		7		pC
			V <sub>CC</sub> = 3.3V			3		
O <sub>IRR</sub>	Off Isolation	R <sub>L</sub> = 50Ω, V <sub>GEN</sub> = 0V, R <sub>GEN</sub> = 0Ω, See test circuit 5 <sup>(11)</sup>	V <sub>CC</sub> = 1.65V to 5.5V	T <sub>A</sub> = 25°C		-57		dB
X <sub>TALK</sub>	Crosstalk Isolation	See test circuit 6	V <sub>CC</sub> = 1.65V to 5.5V	T <sub>A</sub> = 25°C		-54		
f <sub>3dB</sub>	-3dB Bandwidth	See test circuit 9	V <sub>CC</sub> = 1.65V to 5.5V	T <sub>A</sub> = 25°C		250		MHz

**Notes:**

9. Guaranteed by design.
10. Guaranteed by design but not production tested. The device contributes no other propagation delay other than the RC delay of the switch On-Resistance and the 50pF load capacitance, when driven by an ideal voltage source with zero output impedance.
11. Off Isolation = 20 Log<sub>10</sub> [ V<sub>A</sub> / V<sub>Bn</sub> ] and is measured in dB.
12. T<sub>A</sub> = 25°C, f = 1MHz. Capacitance is characterized but not tested in production.

**Test Circuits and Timing Diagrams**

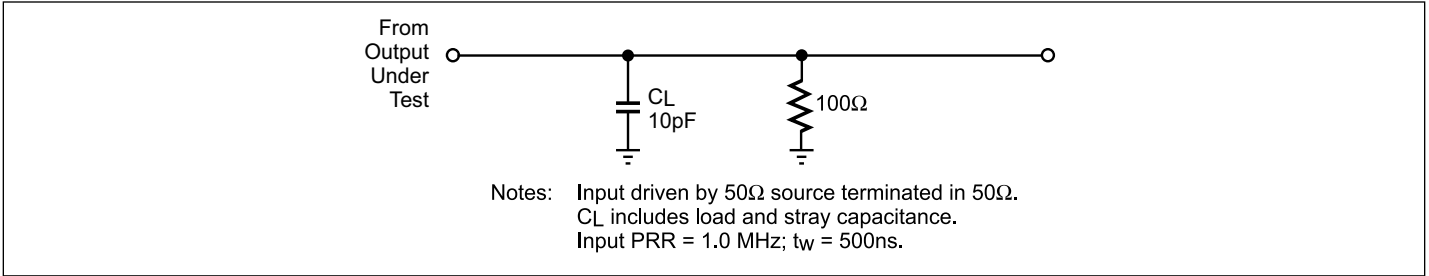


Figure 1. AC Test Circuit

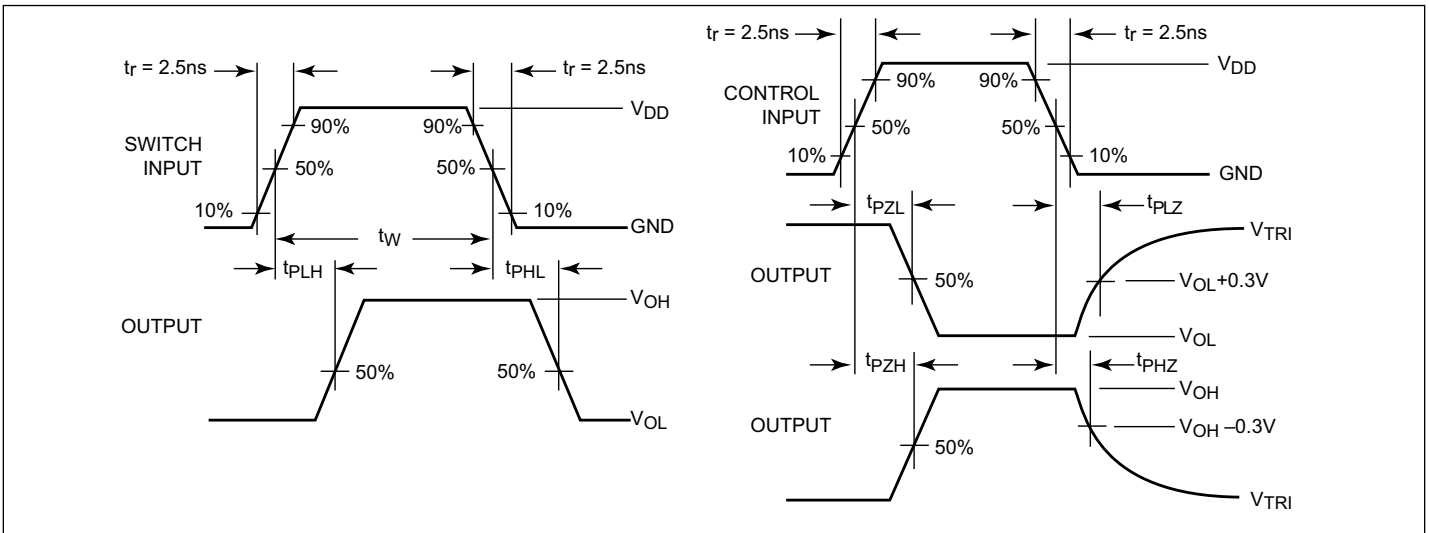


Figure 2. AC Waveforms

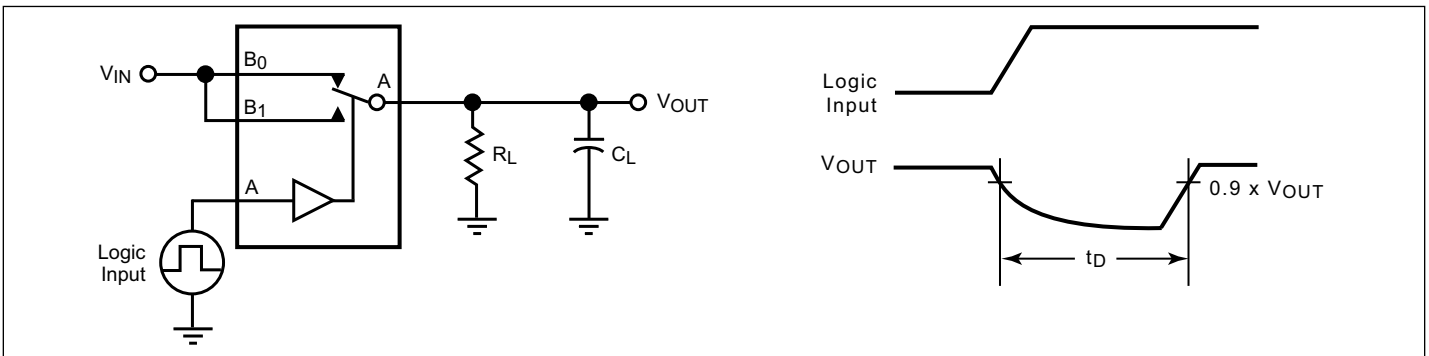


Figure 3. Break Before Make Interval Timing

**PI5A3157**

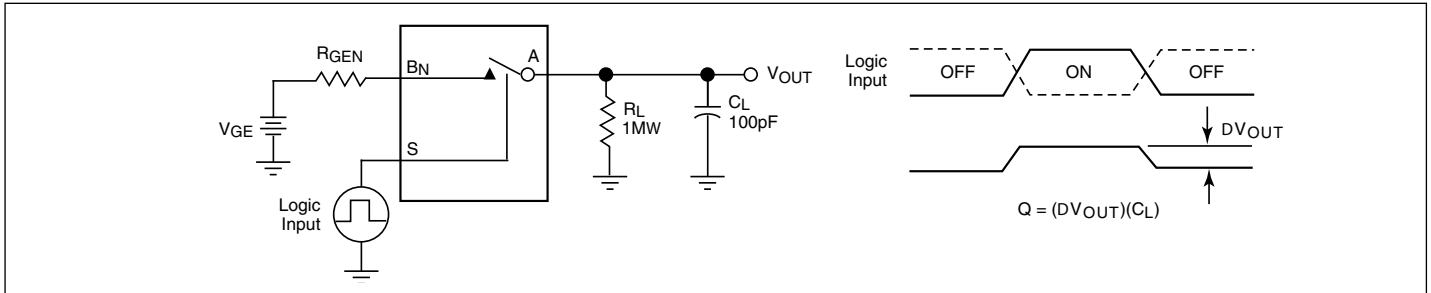


Figure 4. Charge Injection Test

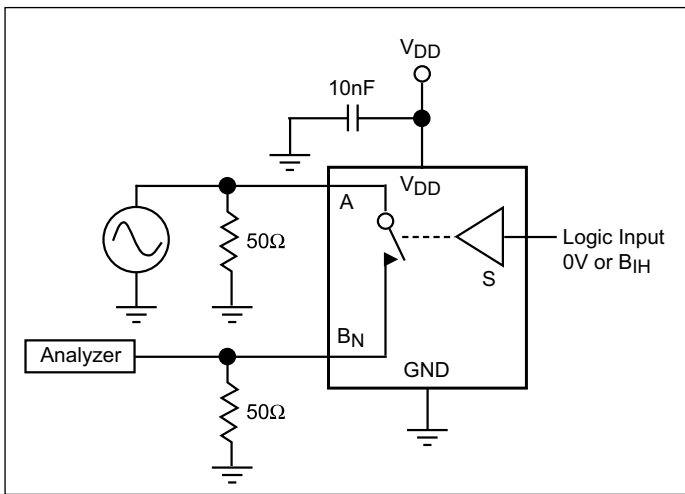


Figure 5. Off Isolation

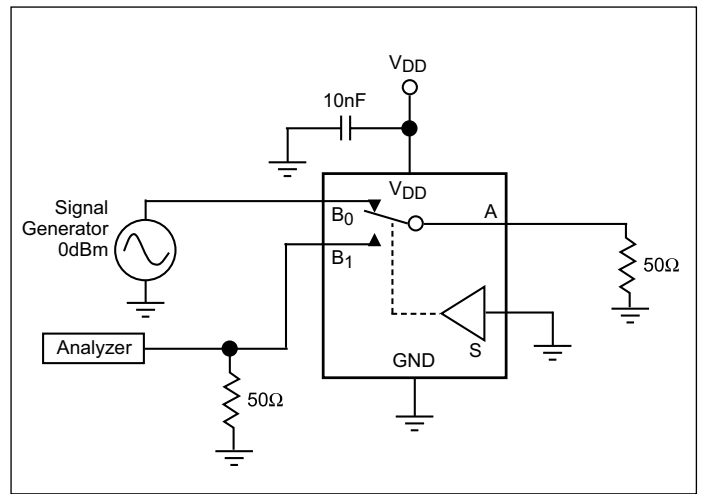


Figure 6. Crosstalk

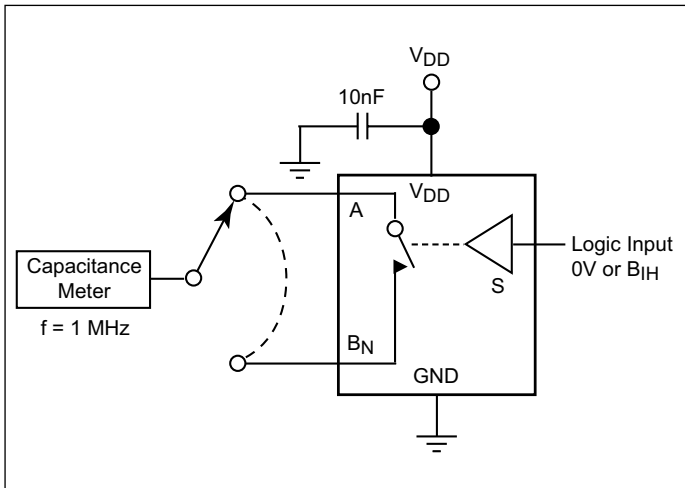


Figure 7. Channel Off Capacitance

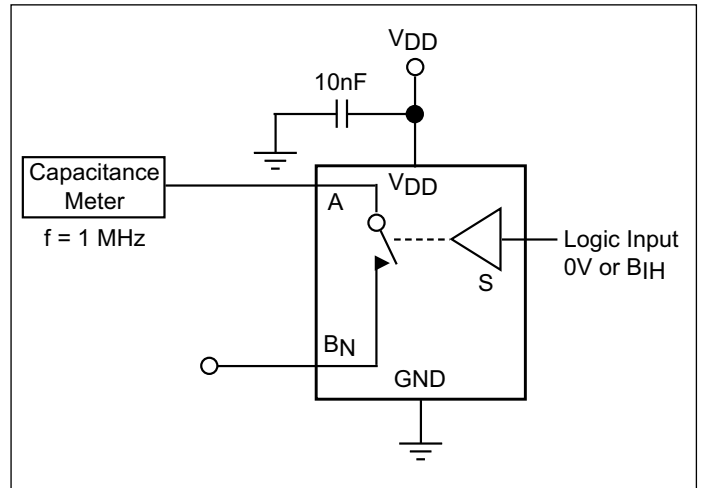


Figure 8. Channel On Capacitance

**PI5A3157**

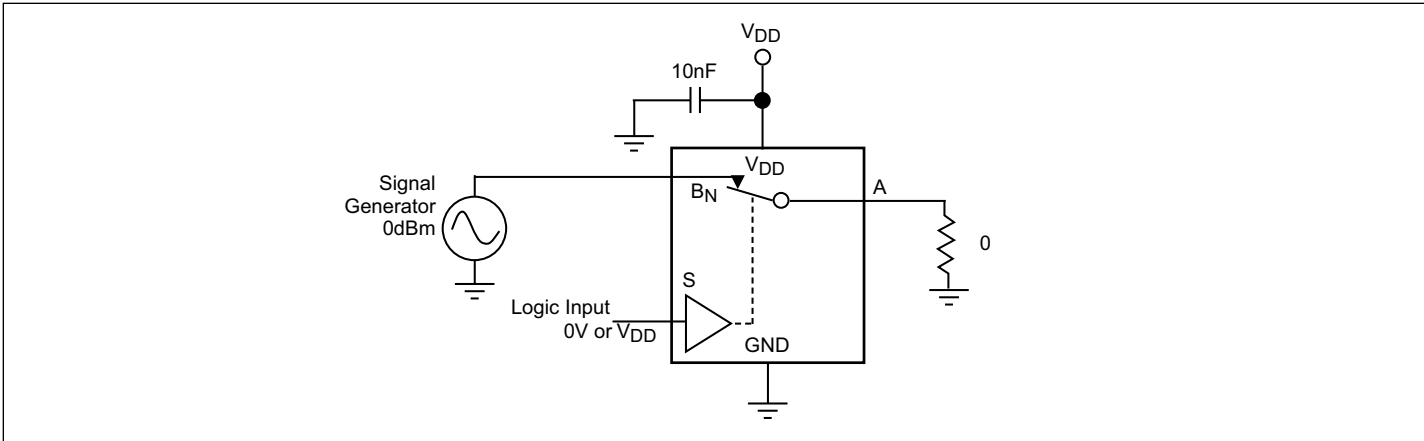


Figure 9. Bandwidth

**Part Marking**

C Package



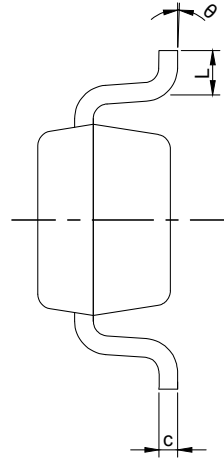
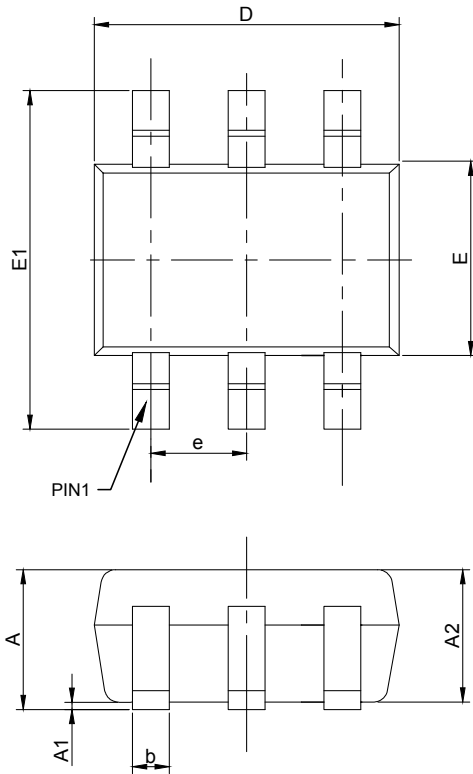
kD: PI5A3157BC6E

XX: Date Code (Year & Workweek)

The Bar of "D" means Fab3 of Magnachip

PI5A3157

**Packaging Mechanical: 6-SC70 (C)**



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



DATE: 03/29/16

DESCRIPTION: 6-Pin, SOT363 (SC70)

PACKAGE CODE: C (C6)

DOCUMENT CONTROL#: PD-1902

REVISION: B

16-0078

For latest package info.

please check: <http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/>

**Ordering Information**

Ordering Code	Packaging Code	Package Description	Top Mark
PI5A3157CEX	C	6-pin, SOT363 (SC70)	ZM

**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.
4. E = Pb-free and Green
5. X suffix = Tape/Reel



**IMPORTANT NOTICE**

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and definitive format released by Diodes Incorporated.

**LIFE SUPPORT**

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2016, Diodes Incorporated  
[www.diodes.com](http://www.diodes.com)

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А