



钜地半导体
Tudi Semiconductor

Product Specification

TUDI-TPW3157A

Low Voltage 5Ω SPDT Analog Switch

网址 www.sztdbdt.com Q

用芯智造 · 卓越品质

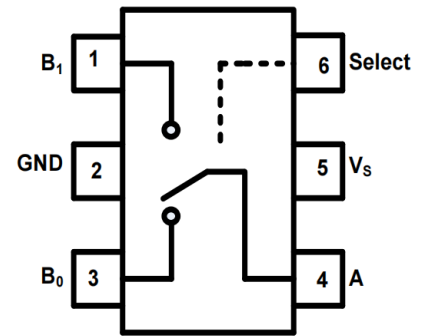
**semiconductor device
manufacturer**

- Design
- research and development
- production
- and sales



Features

- Latch-Up Performance Exceeds 800 mA
- Supply Voltage: 1.65V to 5.5V
- Low ON-State Resistance: maximum 3Ω at $V_s = 4.5V$
- Bandwidth: 300 MHz
- Fast switching times: $t_{ON} = 40\text{ ns}$, $t_{OFF} = 15\text{ ns}$
- Break-Before-Make Switching
- Operation Temperature Range: -40°C to 125°C



6Pin SC70, SOT23-C and -T Suffixes

Applications

- Industry control systems
- Battery-powered systems
- Audio Signal Routing
- Portable Instruments and Mobile Device

Description

TPW3157A is high performance Single Pole/Double Throw (SPDT) analog switches. The devices feature ultra low R_{ON} of 3Ω maximum at $4.5V V_{CC}$ and will operate over the wide V_{CC} range of 1.65V to 5.5V.

The TPW3157A features very low quiescent current even when the control voltage is lower than the V_{CC} supply. This feature services the portable applications very well allowing for the direct interface with processor general purpose I/Os.



Absolute Maximum Ratings ^{Note 1}

Parameters	Rating
Supply Voltage, V_{CC}	-0.5V to 6V
Select Input Voltage	-0.5V to 6V
Select Input Diode Current	-50mA
Switch I/O Port Voltage	-0.5 to $V_{CC} + 0.5$
Switch I/O Port diode current	± 50 mA
Switch Current	120mA
Maximum Junction Temperature	150°C
Storage Temperature Range	-65 to 150°C
Lead Temperature (Soldering, 10 sec)	260°C

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

ESD and Latch Up Rating

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001	4	Kv
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002	2	Kv
LU	Latch Up	JESD 78, 25°C	800	mA
		JESD 78, 125°C	800	mA

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
6-Pin SC70	400		°C/W
6-Pin SOT	250	81	°C/W

Recommended Operating Conditions ^{Note 1}

Over operating temperature range

Parameters	Min	Max	Unit
Supply Voltage, V_{CC}	1.65	5.5	V
Select Input Voltage	0	V_{CC}	V
Input Transition Rise and Fall Rate		100	ns/V
Switch I/O Port Voltage	0V	V_{CC}	V
Operating Temperature Range	-40	125	°C

Note 1: Select input must be held HIGH or LOW and it must not float.



Electrical Characteristics

$V_{CC} = 4.5$ to $5.5V$, unless otherwise noted.

Symbol	Parameter	Conditions	V_{CC} (V)	25°C	-40°C to 85°C	-40°C to 125°C	Limit	Unit
Power Supply								
I_{CC}	Quiescent Supply Current	$V_{IN} = 0V$ or V_{CC}	5.5	0.3	0.5	1.5	Max	μA
Digital Input								
V_{IH}	Input Voltage High				2.4	2.4	Min	V
V_{IL}	Input Voltage Low				0.8	0.8	Max	V
I_{IN}	Control Input Leakage	$V_{IN} = 0V$ or V_{CC}	5.5		± 1	± 1	Max	μA
Analog Switch								
R_{ON}		$I_{OUT} = 100mA$, B0 or B1 = 3.5V	4.5	1.5			Typ	Ω
R_{ON}		$I_{OUT} = 100mA$, B0 or B1 = 3.5V	4.5	2	3	3	Max	Ω
ΔR_{ON}	Maximum ON resistance	$I_{OUT} = 100mA$, B0 or B1 = 3.5V	4.5	0.3	0.4	0.4	Max	Ω
$R_{FLAT(ON)}$	On Resistance Flatness	$I_{OUT} = 100mA$, B0 or B1 = 0V, 1V, 2V	4.5	0.5	0.6	0.6	Max	Ω
$I_{NO(OFF)}$, $I_{NC(OFF)}$	Switch OFF Leakage Current on B0, B1	A = 1V, 4.5V, B0 or B1 = 4.5V, 1V	5.5	± 10	± 50	± 100	Max	nA
$I_{A(OFF)}$	Switch OFF Leakage Current on A	A = 1V, 4.5V, B0 or B1 = 4.5V, 1V	5.5	± 20	± 100	± 200	Max	nA
$I_{A(ON)}$	Switch ON Leakage Current on A	A = 1V, 4.5V, B0 or B1 = 1V, 4.5V or Floating	5.5	± 20	± 100	± 200	Max	nA
Dynamic Characteristics								
t_{PHL} , t_{PLH}	Switch IN to OUT time	B0 or B1 = 3V, $R_L = 50\Omega$, $C_L = 35pF$, Figure 3	4.5	5			Max	ns
t_{PZH} , t_{PZL}	Switch turn-on time	B0 or B1 = 3V, $R_L = 50\Omega$, $C_L = 35pF$, Figure 3	4.5	40	50	50	Max	ns
t_{PHZ} , t_{PLZ}	Switch turn-off time	B0 or B1 = 3V, $R_L = 50\Omega$, $C_L = 35pF$, Figure 3	4.5	20	25	25	Max	ns
t_B	Break before make time	B0 or B1 = 3V, $R_L = 50\Omega$, $C_L = 35pF$, Figure 4	4.5	20	40	40	Typ	ns
Q	Charge Injection	$C_L = 1.0nF$, $V_{GEN} = 0V$, $R_{GEN} = 0\Omega$, Figure 5	5	20			Typ	pC
	OFF-Isolation	$f = 1MHz$, $R_L = 50\Omega$, Figure 6	5	-65			Typ	dB
	Crosstalk	$f = 1MHz$, $R_L = 50\Omega$, Figure 7	5	-65			Typ	dB
BW	Bandwidth	$R_L = 50\Omega$	5	100			Typ	MHz
THD	Total Harmonic Distortion	$R_L = 600\Omega$, $V_{IN} = 0.5V_{PP}$, $f = 20Hz$ to 20kHz	5	0.008			Typ	%
Capacitance								
C_{IN}	Select Input capacitance		5	5			Typ	pF
C_{OFF}	B-Port Off capacitance		5	12			Typ	pF
C_{ON}	ON Capacitance		5	40			Typ	pF



V_{CC} = 2.7 to 3.6V, unless otherwise noted.

Symbol	Parameter	Conditions	V _{CC} (V)	25°C	-40°C to 85°C	-40°C to 125°C	Limit	Unit
Power Supply								
I _{CC}	Quiescent Supply Current	V _{IN} = 0V or V _{CC}	3.6	0.3	0.5	1.5	Max	μA
Digital Input								
V _{IH}	Input Voltage High				1.65	1.65	Min	V
V _{IL}	Input Voltage Low				0.6	0.6	Max	V
I _{IN}	Control Input Leakage	V _{IN} = 0V or V _{CC}	3.6		±1	±1	Max	μA
Analog Switch								
R _{ON}		I _{OUT} = 100mA, B0 or B1 = 1.5V	2.7	3			Typ	Ω
R _{ON}		I _{OUT} = 100mA, B0 or B1 = 1.5V	2.7	5	8	8	Max	Ω
ΔR _{ON}	Maximum ON resistance	I _{OUT} = 100mA, B0 or B1 = 1.5V	2.7	0.5	0.6	0.6	Max	Ω
R _{FLAT(ON)}	On Resistance Flatness	I _{OUT} = 100mA, B0 or B1 = 0V, 0.75V, 1.5V	2.7	1.5	2	2	Max	Ω
I _{NO(OFF)} , I _{NC(OFF)}	Switch OFF Leakage Current on B0, B1	A = 1V, 4.5V, B0 or B1 = 4.5V, 1V	3.6	±10	±50	±100	Max	nA
I _{A(OFF)}	Switch OFF Leakage Current on A	A = 1V, 4.5V, B0 or B1 = 4.5V, 1V	3.6	±20	±100	±200	Max	nA
I _{A(ON)}	Switch ON Leakage Current on A	A = 1V, 4.5V, B0 or B1 = 1V, 4.5V or Floating	3.6	±20	±100	±200	Max	nA
Dynamic Characteristics								
t _{PHL} , t _{PLH}	Switch IN to OUT time	B0 or B1 = 1.5V, R _L = 50Ω, C _L = 35pF, Figure 3	2.7	10			Typ	ns
t _{PZH} , t _{PZL}	Switch turn-on time	B0 or B1 = 1.5V, R _L = 50Ω, C _L = 35pF, Figure 3	2.7	70	80	80	Max	ns
t _{PHZ} , t _{PLZ}	Switch turn-off time	B0 or B1 = 1.5V, R _L = 50Ω, C _L = 35pF, Figure 3	2.7	25	40	40	Max	ns
t _B	Break before make time	B0 or B1 = 1.5V, R _L = 50Ω, C _L = 35pF, Figure 4	2.7	20			Typ	ns
Q	Charge Injection	C _L = 1.0nF, V _{GEN} = 0V, R _{GEN} = 0Ω, Figure 5	3	20			Typ	pC
	OFF-Isolation	f = 1MHz, R _L = 50Ω, Figure 6	3	-65			Typ	dB
	Crosstalk	f = 1MHz, R _L = 50Ω, Figure 7	3	-65			Typ	dB
BW	Bandwidth	R _L = 50Ω	3	100			Typ	MHz
THD	Total Harmonic Distortion	R _L = 600Ω, V _{IN} = 0.5V _{PP} , f = 20Hz to 20kHz	3	0.01			Typ	%



$V_{CC} = 1.65$ to $1.95V$, unless otherwise noted.

Symbol	Parameter	Conditions	V_{CC} (V)	25°C	-40°C to 85°C	-40°C to 125°C	Limit	Unit
Power Supply								
I_{CC}	Quiescent Supply Current	$V_{IN} = 0V$ or V_{CC}	1.95	0.3	0.5	1.5	Max	μA
Digital Input								
V_{IH}	Input Voltage High				1.4	1.4	Min	V
V_{IL}	Input Voltage Low				0.4	0.4	Max	V
I_{IN}	Control Input Leakage	$V_{IN} = 0V$ or V_{CC}	1.95		± 1	± 1	Max	μA
Analog Switch								
R_{ON}		$I_{OUT} = 10mA$, B0 or B1 = 0.9V	1.65	15			Typ	Ω
R_{ON}		$I_{OUT} = 10mA$, B0 or B1 = 0.9V	1.65	20	25	25	Max	Ω
ΔR_{ON}	Maximum ON resistance	$I_{OUT} = 10mA$, B0 or B1 = 0.9V	1.65	3	5	5	Max	Ω
$I_{NO(OFF)}$, $I_{NC(OFF)}$	Switch OFF Leakage Current on B0, B1	A = 0V, 1.95V, B0 or B1 = 1.95V, 0V	1.95	± 10	± 50	± 100	Max	nA
$I_{A(OFF)}$	Switch OFF Leakage Current on A	A = 0V, 1.95V, B0 or B1 = 1.95V, 0V	1.95	± 20	± 100	± 200	Max	nA
$I_{A(ON)}$	Switch ON Leakage Current on A	A = 0V, 1.95V, B0 or B1 = 0V, 1.95V or Floating	1.95	± 20	± 100	± 200	Max	nA
Dynamic Characteristics								
t_{PHL} , t_{PLH}	Switch IN to OUT time	B0 or B1 = 1.0V, $R_L = 50\Omega$, $C_L = 35pF$, Figure 3	1.65	10			Typ	ns
t_{PZH} , t_{PZL}	Switch turn-on time	B0 or B1 = 1.0V, $R_L = 50\Omega$, $C_L = 35pF$, Figure 3	1.65	80	90	90	Max	ns
t_{PHZ} , t_{PLZ}	Switch turn-off time	B0 or B1 = 1.0V, $R_L = 50\Omega$, $C_L = 35pF$, Figure 3	1.65	50	70	70	Max	ns
t_B	Break before make time	B0 or B1 = 1.0V, $R_L = 50\Omega$, $C_L = 35pF$, Figure 4	1.65	20			Max	ns
Q	Charge Injection	$C_L = 1.0nF$, $V_{GEN} = 0V$, $R_{GEN} = 0\Omega$, Figure 5	1.8	20			Typ	pC
	OFF-Isolation	$f = 1MHz$, $R_L = 50\Omega$, Figure 6	1.8	-65			Typ	dB
	Crosstalk	$f = 1MHz$, $R_L = 50\Omega$, Figure 7	1.8	-65			Typ	dB
BW	Bandwidth	$R_L = 50\Omega$	1.8	100			Typ	MHz
THD	Total Harmonic Distortion	$R_L = 600\Omega$, $V_{IN} = 0.5V_{PP}$, $f = 20Hz$ to 20kHz	1.8	0.01			Typ	%



T_A = 0°C to 50°C, unless otherwise noted.

Symbol	Parameter	Conditions	V _{CC} (V)	Spec	Limit	Unit
I _{NO(OFF)} , I _{NC(OFF)}	Switch OFF Leakage Current on B0, B1	A = 1V, 4.5V, B0 or B1 = 4.5V, 1V	3.6	±10	Max	nA
I _{A(OFF)}	Switch OFF Leakage Current on A	A = 1V, 4.5V, B0 or B1 = 4.5V, 1V	3.6	±20	Max	nA
I _{A(ON)}	Switch ON Leakage Current on A	A = 1V, 4.5V, B0 or B1 = 1V, 4.5V or Floating	3.6	±20	Max	nA
I _{NO(OFF)} , I _{NC(OFF)}	Switch OFF Leakage Current on B0, B1	A = 1V, 4.5V, B0 or B1 = 4.5V, 1V	5.5	±10	Max	nA
I _{A(OFF)}	Switch OFF Leakage Current on A	A = 1V, 4.5V, B0 or B1 = 4.5V, 1V	5.5	±20	Max	nA
I _{A(ON)}	Switch ON Leakage Current on A	A = 1V, 4.5V, B0 or B1 = 1V, 4.5V or Floating	5.5	±20	Max	nA



Test Circuit and Waveforms

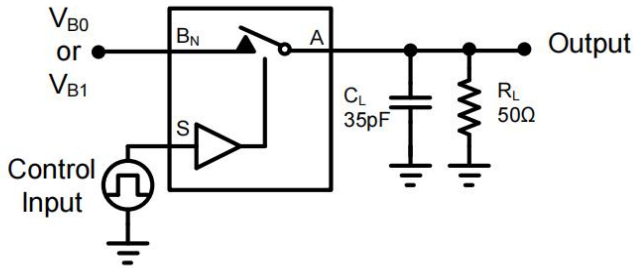


Figure 3 AC Test Circuit and Test Waveforms

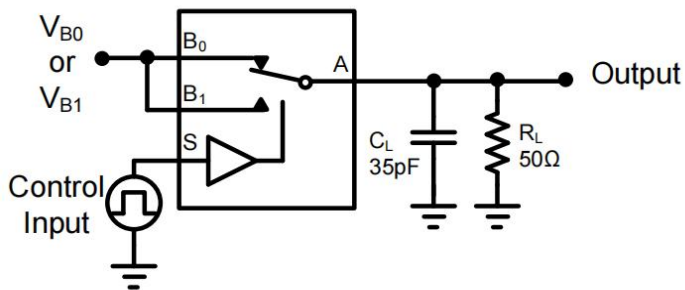


Figure 4 Switch Break Time

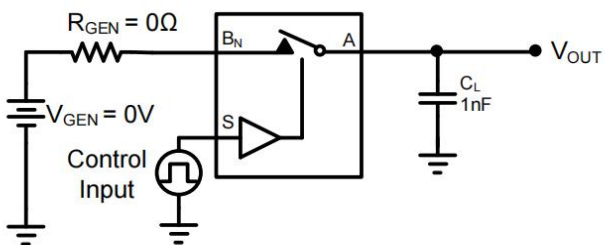


Figure 5 Charge Injection

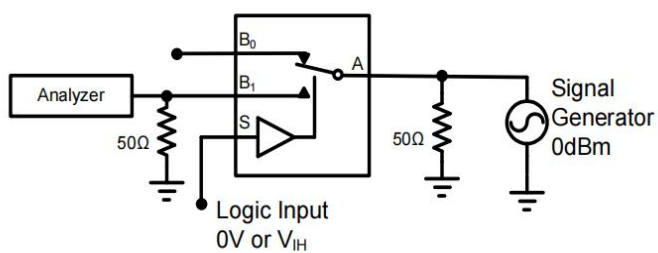


Figure 6 Off Isolation

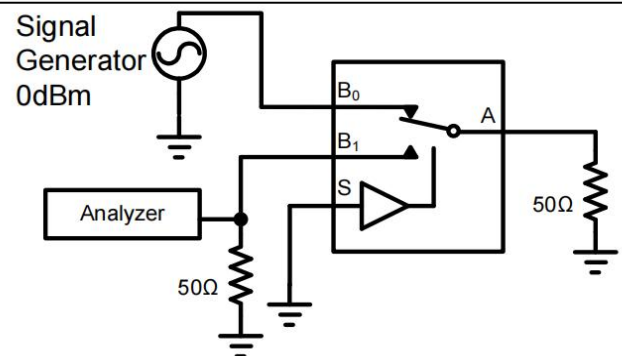


Figure 7 Crosstalk

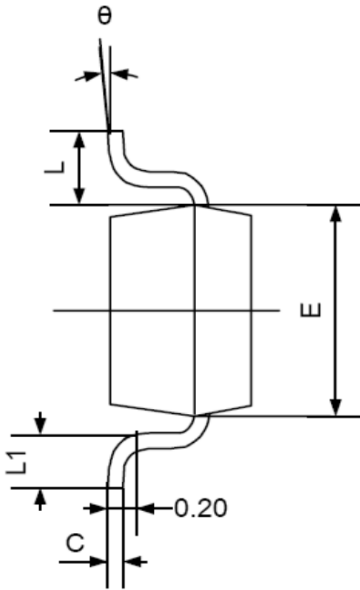
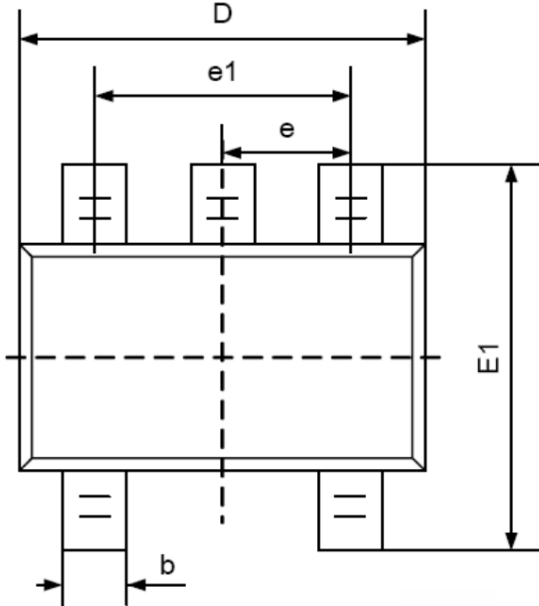


Order information

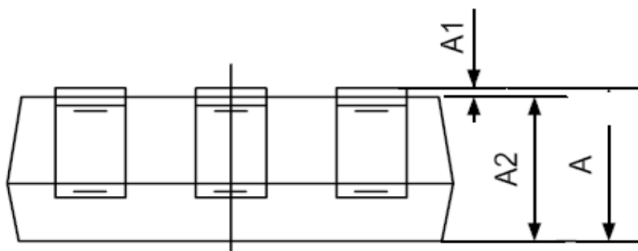
Order Number	Package	Package Quantity	Marking On The park
TPW3157A-CR-TUDI	SC70	Tape,Reel,3000	TPW3157A-CR



Package SC70-5



Symbol	DimensionsIn Millimeters		DimensionsIn Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
C	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650TYP		0.026TYP	
e1	1.200	1.400	0.047	0.055
L	0.525REF		0.021REF	
L1	0.260	0.460	0.010	0.018
theta	0°	8°	0°	8°





Important statement:

- TUDI Semiconductor reserves the right to modify the product manual without prior notice! Before placing an order, customers need to confirm whether the obtained information is the latest version and verify the completeness of the relevant information.
- Any semi-guide product is subject to failure or malfunction under specified conditions. It is the buyer's responsibility to comply with safety standards when using TUDI Semiconductor products for system design and whole machine manufacturing. And take the appropriate safety measures to avoid the potential in the risk of loss of personal injury or loss of property situation!
- TUDI Semiconductor products have not been licensed for life support, military, and aerospace applications, and therefore TUDI Semiconductor is not responsible for any consequences arising from the use of this product in these areas.
- If any or all TUDI Semiconductor products (including technical data, services) described or contained in this document are subject to any applicable local export control laws and regulations, they may not be exported without an export license from the relevant authorities in accordance with such laws.
- The specifications of any and all TUDI Semiconductor products described or contained in this document specify the performance, characteristics, and functionality of said products in their standalone state, but do not guarantee the performance, characteristics, and functionality of said products installed in Customer's products or equipment. In order to verify symptoms and conditions that cannot be evaluated in a standalone device, the Customer should ultimately evaluate and test the device installed in the Customer's product device.
- TUDI Semiconductor documentation is only allowed to be copied without any alteration of the content and with the relevant authorization. TUDI Semiconductor assumes no responsibility or liability for altered documents.
- TUDI Semiconductor is committed to becoming the preferred semiconductor brand for customers, and TUDI Semiconductor will strive to provide customers with better performance and better quality products.