



DIO3157E

Enhanced Low Voltage SPDT Analog Switch with Power On and Power Off Protection

Features

- Low on capacitance: 30 pF (typical)
- Low on resistance: 6 Ω (maximum) at 4.5 V
- Low power consumption:
Maximum 1 μ A I_{CC} over an expanded voltage range
- Wide -3 dB bandwidth: 230 MHz
- Wide supply range: 1.65 ~ 5.5 V
- Packaged in: 6-lead SC70 and SOT23
- ± 8 kV HBM ESD rating, ± 2 kV CDM ESD rating

Applications

- Cell phones
- PDAs
- Portable instrumentation
- Battery powered communications
- Computer peripherals

Descriptions

The DIO3157E is an enhanced single-pole double-throw (SPDT) CMOS analog switch. It features power ON/OFF protection on common ports effectively protecting device against external signal perturbation. It also offers excellent -3 dB bandwidth and lower ON resistance, which can be used as analog switch in multiple applications.

The DIO3157E operates under wide V_{CC} supply from 1.65 V to 5.5 V, consuming very low quiescent current even when the voltage of S pin is lower than V_{CC} supply. This new feature services the mobile handset applications very well allowing for the direct interface with baseband processor general purpose I/Os with no need of level translator.

Ordering Information

Ordering Part No.	Top Marking	MSL	RoHS	T_A	Package	
DIO3157ESC6	YWXB	3	Green	-40 to 85°C	SC70-6	Tape & Reel, 3000
DIO3157EST6	YWXB	3	Green	-40 to 85°C	SOT23-6	Tape & Reel, 3000

Pin Assignment

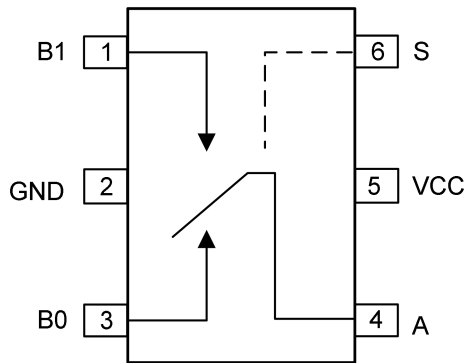


Figure 1. Top view

Pin Descriptions

Pin Name	Description
B1	Data port
GND	Ground
B0	Data port, normally connect to A
A	Common port
VCC	Power supply
S	Control port

Truth Table

S	Function
1	B1 connected to A
0	B0 connected to A



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Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Rating" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. DIOO does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply voltage	-0.5	6	V
V_S	DC switch voltage	-0.5	$V_{CC} + 0.5$	V
V_{IN}	DC input voltage	-0.5	6	V
I_{IK}	DC input diode current	-50		mA
I_{SW}	Switch current		100	mA
I_{SWpeak}	Peak switch current (pulse at 1 ms duration, <10% duty cycle)		200	mA
P_D	Power dissipation at 85°C		180	mW
T_{STG}	Storage temperature range	-65	150	°C
T_J	Junction temperature		150	°C
T_L	Lead temperature range		260	°C
ESD	HBM, JEDEC : JESD22-A114		±8	kV
	CDM, JEDEC : JESD22-C101		±2	

Recommend Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation to ensure optimal performance to the datasheet specifications.

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply voltage	1.65	5.5	V
V_{CNTRL}	Control input voltage	1.65	5.5	V
V_{SW}	Switch input voltage	1.65	5.5	V
T_A	Operating temperature	-40	85	°C
θ_{JA}	Thermal resistance in still air		350	°C/W

DC Electrical Characteristics

All typical value are at $T_A = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Vcc(V)	Min	Typ	Max	Unit
V_{IH}	Input voltage high	$T_A = -40^\circ\text{C}$ to 85°C	1.8	1.1			V
			2.3	1.3			
			2.7	1.4			
			3.6	1.7			
			4.5	2.1			
			5.5	2.4			
V_{IL}	Input voltage low	$T_A = -40^\circ\text{C}$ to 85°C	1.8			0.3	V
			2.3			0.4	
			2.7			0.5	
			3.6			0.6	
			4.5			0.7	
			5.5			0.8	
I_{IN}	Control input leakage	$T_A = -40^\circ\text{C}$ to 85°C $V_{IN} = 0\text{ V}$ to V_{CC}	2.7 ~ 3.6	-1		1	μA
			4.5 ~ 5.5	-1		1	
I_{OFF}	Switch off leakage current	$A = 1\text{ V}$, 4.5 V, B0 or B1 = 4.5 V, 1 V	5.5	-2		2	nA
		$T_A = -40^\circ\text{C}$ to 85°C , $A = 1\text{ V}$, 4.5 V, B0 or B1 = 4.5 V, 1 V	5.5	-20		20	
$I_{A(ON)}$	Switch on leakage current of poart A	$A = 1\text{ V}$, 4.5 V, B0 or B1 = 4.5 V, 1 V, 4.5 V or floating	5.5	-4		4	nA
		$T_A = -40^\circ\text{C}$ to 85°C					
		$A = 1\text{ V}$, 4.5 V, B0 or B1 = 4.5 V, 1 V, 4.5 V or floating	5.5	-40		40	
R_{ON}	Switch on resistance (see figure 2)	$I_{OUT} = 30\text{ mA}$, B0 or B1 = 1.5 V	2.7		11		Ω
		$I_{OUT} = 30\text{ mA}$, B0 or B1 = 3.5 V	4.5		4		
		$T_A = -40^\circ\text{C}$ to 85°C , $I_{OUT} = 30\text{ mA}$, B0 or B1 = 1.5 V	2.7			20	
		$T_A = -40^\circ\text{C}$ to 85°C , $I_{OUT} = 30\text{ mA}$, B0 or B1 = 3.5 V	4.5			6	
ΔR_{ON}	On resistance matching between channels	$I_{OUT} = 30\text{ mA}$, B0 or B1 = 1.5 V	4.5			0.2	Ω
		$T_A = -40^\circ\text{C}$ to 85°C , $I_{OUT} = 30\text{ mA}$, B0 or B1 = 1.5 V	4.5			0.4	
$R_{FLT(ON)}$	On resistance flatness	$I_{OUT} = 30\text{ mA}$, B0 or B1 = 0 V, 0.75 V, 1.5 V	2.7		8		Ω
		$I_{OUT} = 30\text{ mA}$, B0 or B1 = 0 V, 1 V, 2 V	4.5		1		
		$T_A = -40^\circ\text{C}$ to 85°C					
		$I_{OUT} = 30\text{ mA}$, B0 or B1 = 0 V, 0.75 V, 1.5 V	2.7		8		

		$T_A = -40^{\circ}\text{C to } 85^{\circ}\text{C}$ $I_{OUT} = 30 \text{ mA, B0 or B1} = 0 \text{ V, } 1 \text{ V, } 2 \text{ V}$	4.5		1		
I_{CC}	Quiescent supply current	$V_{IN} = 0 \text{ V or } V_{CC}, I_{OUT} = 0$	3.6		0.1		μA
			5.5		0.1		
		$T_A = -40^{\circ}\text{C to } 85^{\circ}\text{C}$ $V_{IN} = 0 \text{ V or } V_{CC}, I_{OUT} = 0$	3.6			1	
			5.5			1	

AC Electrical Characteristics

All typical value are for $V_{CC} = 3.3 \text{ V}$ at $T_A = 25^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Vcc(V)	Min	Typ	Max	Unit
t_{ON}	Turn-on time (see figure 3)	$B0 \text{ or } B1 = 1.5 \text{ V, } R_L = 50 \Omega, C_L = 35 \text{ pF}$	2.7 ~ 3.6		25		ns
		$B0 \text{ or } B1 = 1.5 \text{ V, } R_L = 50 \Omega, C_L = 35 \text{ pF}$	4.5 ~ 5.5		20		
t_{OFF}	Turn-off time (see figure 3)	$B0 \text{ or } B1 = 1.5 \text{ V, } R_L = 50 \Omega, C_L = 35 \text{ pF}$	2.7 ~ 3.6		20		ns
		$B0 \text{ or } B1 = 1.5 \text{ V, } R_L = 50 \Omega, C_L = 35 \text{ pF}$	4.5 ~ 5.5		15		
t_{bbm}	Break-before -make time (see figure 4)	$T_A = -40^{\circ}\text{C to } 85^{\circ}\text{C}$	2.7 ~ 3.6		5		ns
			4.5 ~ 5.5		5		
OIRR	Off isolation (see figure 6)	$f = 1 \text{ MHz, } R_L = 50 \Omega$	2.7 ~ 3.6		-75		dB
			4.5 ~ 5.5		-76		
BW	-3 dB bandwidth (see figure 7)	$R_L = 50 \Omega$	2.7 ~ 5.5		230		MHz
THD	Total harmon distortion (see figure 8)	$R_L = 600 \Omega, V_{IN} = 0.5 \text{ Vpp}$ $f = 20 \text{ Hz to } 20 \text{ kHz}$	2.7 ~ 5.5		0.02		%

Capacitance

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_{ON}	On capacitance	$V_{CC} = 4.5 \text{ V, } f = 1 \text{ MHz}$		30		pF

Test Diagrams

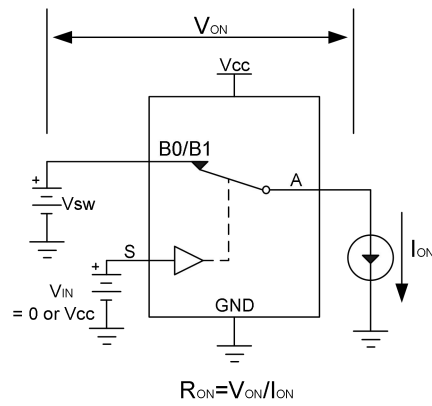


Figure 2. On resistance

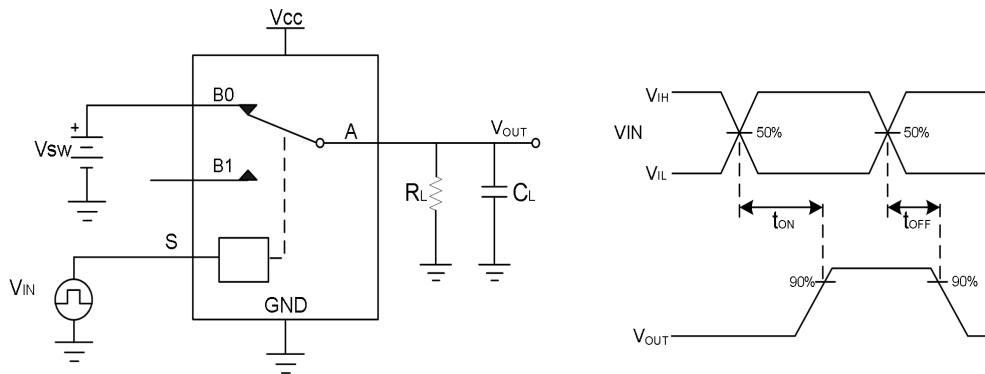


Figure 3. Turn on/off time

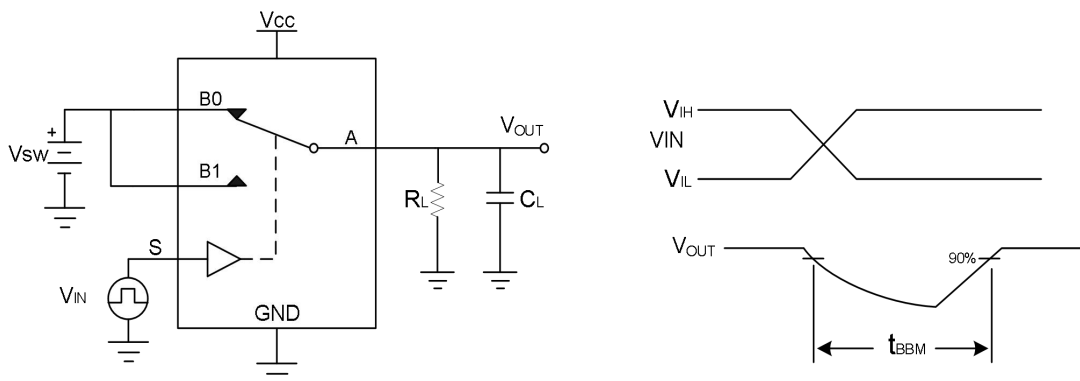


Figure 4. Break-before-make time

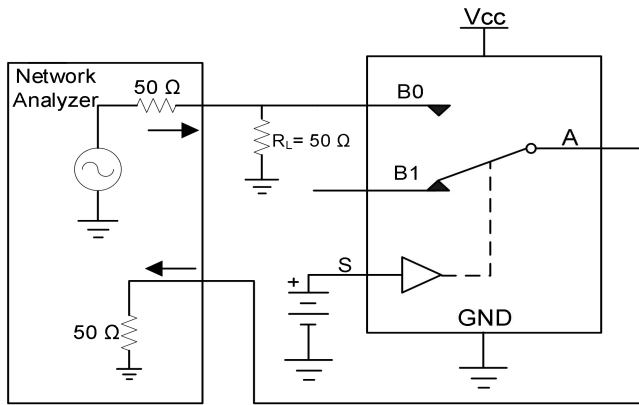


Figure 6. Off isolation

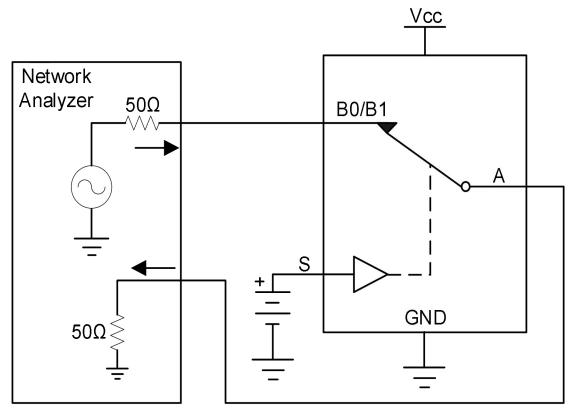


Figure 7. -3 dB bandwidth

Typical Characteristics

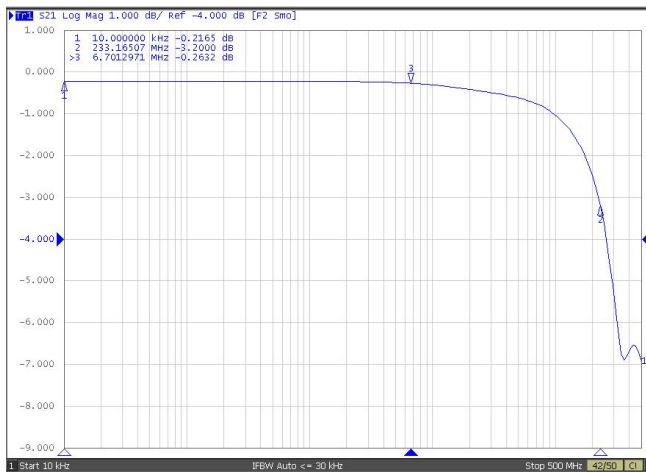


Figure 8. -3 dB bandwidth

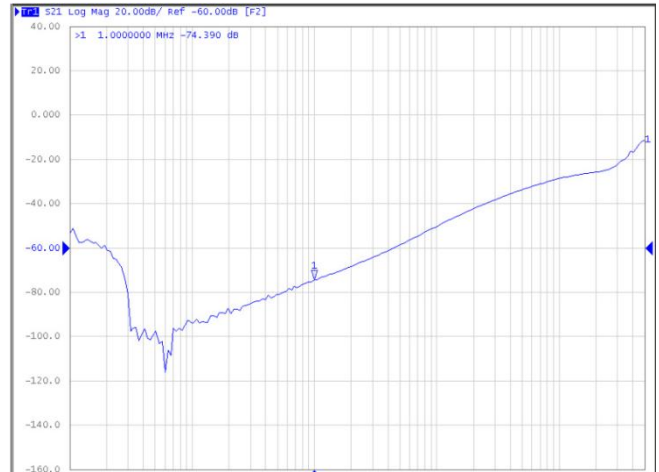
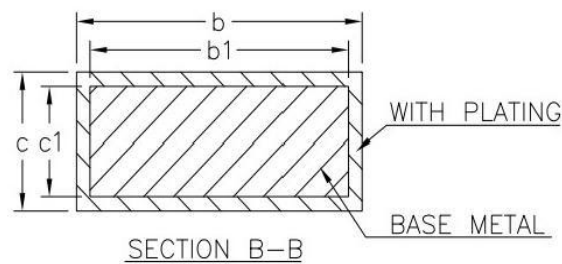
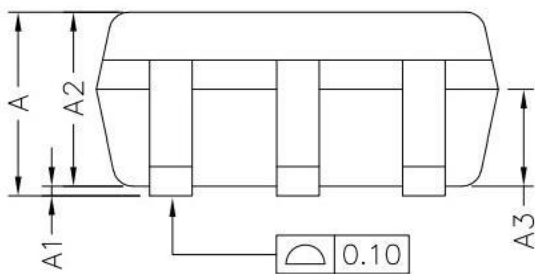
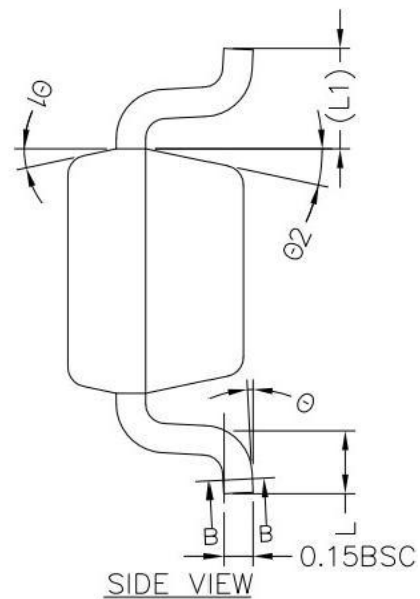
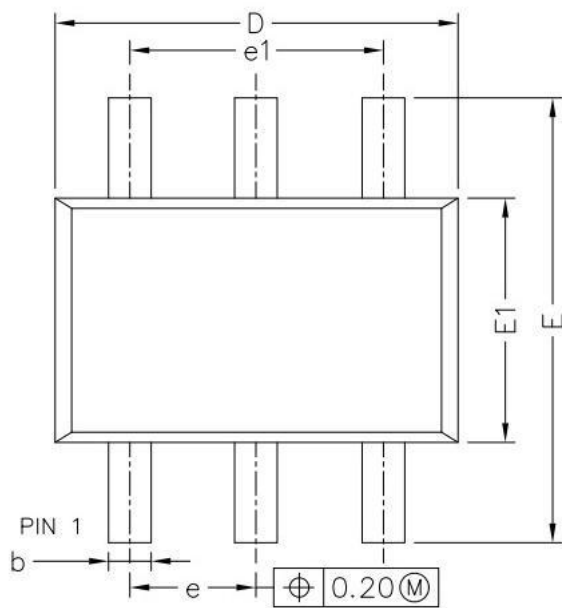


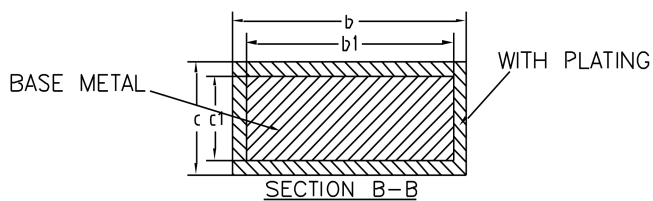
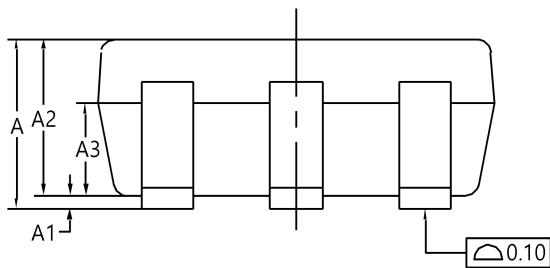
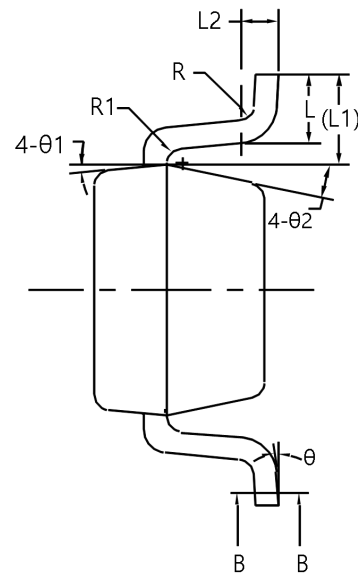
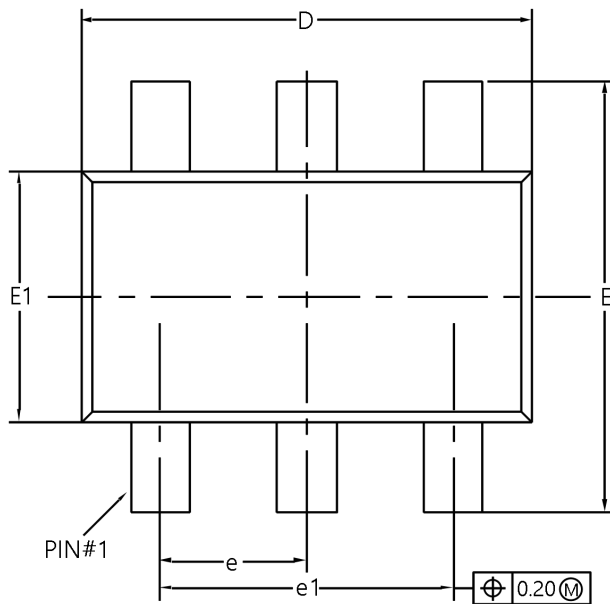
Figure 9. Off isolation

Physical Dimensions: SC70-6



Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	0.80	-	1.10
A1	0	-	0.10
A2	0.80	0.90	1.00
A3	0.40	0.50	0.60
b	0.17	-	0.30
b1	0.17	0.22	0.25
C	0.12	-	0.20
c1	0.12	0.15	0.16
D	2.02	2.07	2.12
E	2.20	2.30	2.40
E1	1.21	1.26	1.31
e	0.60	0.65	0.70
e1	1.20	1.30	1.40
L	0.26	0.33	0.46
L1	0.52 REF		
θ	0°	-	8°
θ1	10°	12°	14°
θ2	10°	12°	14°

Physical Dimensions: SOT-23-6



Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	-	-	1.25
A1	0	-	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.34	-	0.45
b1	0.34	0.38	0.41
c	0.12	-	0.20
c1	0.12	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.700
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
L	0.30	0.45	0.60
L1		0.59 REF	
L2		0.25 BSC	
R	0.05	-	0.20
R1	0.05	-	0.20
θ	0°	-	8°
θ1	8°	10°	12°
θ2	10°	12°	14°

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CONTACT US

Dioo is a professional design and sales corporation for high-quality and performance analog semiconductors. The company focuses on industry markets, such as, cell phone, handheld products, laptop, and medical equipments and so on. Dioo's product families include analog signal processing and amplifying, LED drivers and charger IC. Go to <http://www.dioo.com> for a complete list of Dioo product families.

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