

DIO1159

Low On-Resistance, Low THD Analog Switch

Features

- 5.5V tolerant on control pin
- Voltage Operation: 1.65V to 5.5V
- Low On Resistance: $1\Omega @ 4.2V V_{CC}$
- Excellent On Resistance Matching
- Low Total Harmonic Distortion (THD)
- Low Charge Injection
- Low power consumption
- Green or RoHS Packaged:
SC70-6, SOT23-6, DFN-6 1.8*2 and
DFN-6 1.45*1
- 1.5KV CDM ESD Rating,
8kV HBM ESD

Descriptions

The DIO1159 is a low power, single pole double throw analog switch, which is designed to operate from a single 1.65V to 5.5V supply.

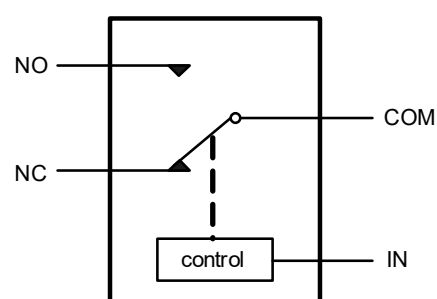
DIO1159 has low on resistance, excellent on resistance matching and very low total harmonic distortion performance to prevent signal distortion during signals transferring. All these features make DIO1159 suitable for portable audio applications.

DIO1159 is available in four types of packages: SC70-6, SOT23-6, DFN-6 1.8*2 and DFN-6 1.45*1.

Applications

- Cell Phones
- PDAs and MP3s
- Portable Instrumentation
- Battery Powered Communications
- Computer Peripherals

Block Diagram



Ordering Information

Order Part Number	Top Marking		T _A	Package	
DIO1159SC6	YWXZ	Green or RoHS	-40 to 85 °C	SC70-6	Tape & Reel, 3000
DIO1159ST6	YWXZ	Green or RoHS	-40 to 85 °C	SOT23-6	Tape & Reel, 3000
DIO1159CN6	1159	Green or RoHS	-40 to 85 °C	DFN-6 1.8*2	Tape & Reel, 3000
DIO1159QN6	YW9	Green or RoHS	-40 to 85 °C	DFN-6 1.45*1	Tape & Reel, 5000

Pin Assignment

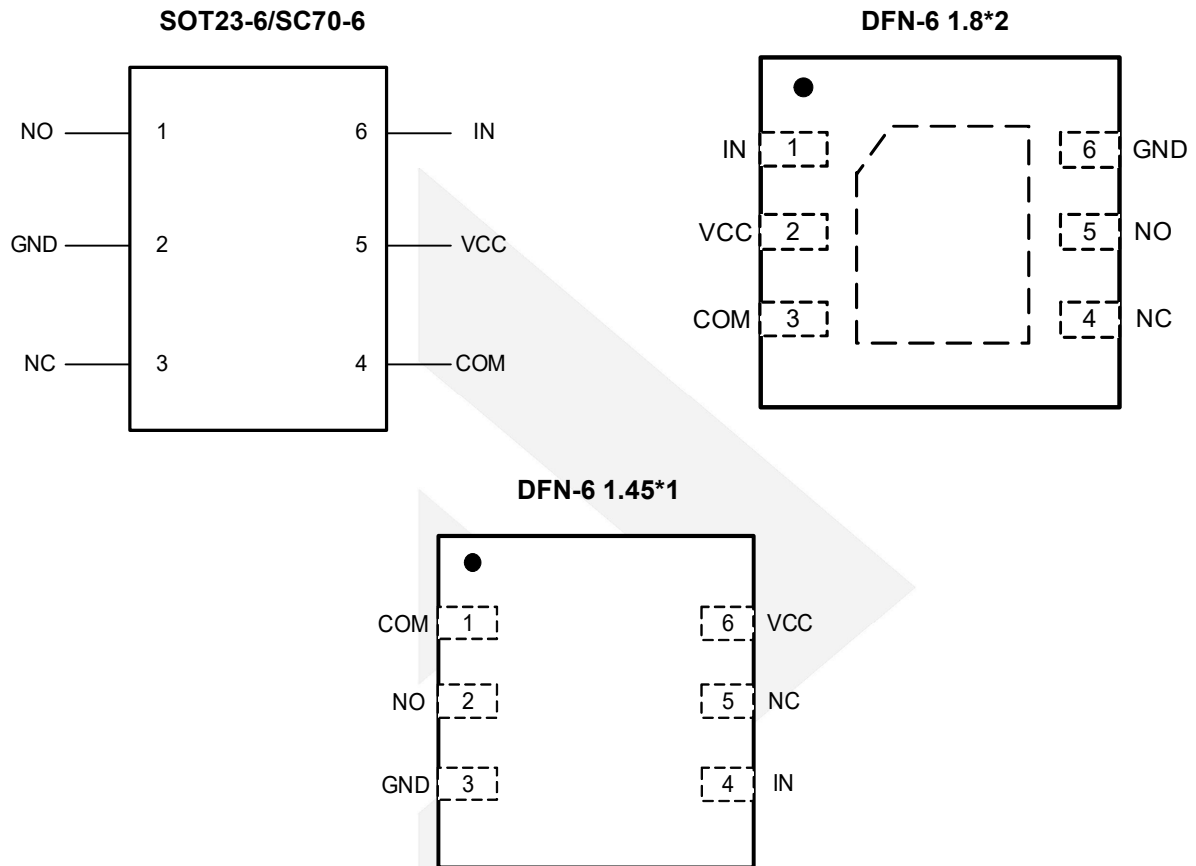


Figure 1 Top View

Pin Descriptions

Pin Name	Description
NO	Normally open
GND	Ground
NC	Normally closed
COM	Common
VCC	Power supply
IN	Control

Truth Table

IN	Function
L	COM to NC
H	COM to NO



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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.

Parameter		Min.	Max.	Unit
Supply Voltage(V_{CC})		-0.5	6.5	V
DC Switch Voltage(V_{SW})		-0.5	$V_{CC}+0.5$	V
DC Control Voltage(V_{IN})		-0.5	6.5	V
On-state Switch Current (I_{SW})		-200	200	mA
On-state peak Switch Current (I_{SW})		-400	400	
Continuous current through GND		-100	100	mA
Storage Temperature Range (T_{STG})		-65	150	°C
SC70-6 Package (θ_{JA})			259	°C/W
SOT23-6 Package (θ_{JA})			165	
ESD	HBM, JEDEC:JESD22-A114		8	kV
	CDM, JEDEC: JESD22-C101		1.5	

Recommend Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation to ensure optimal performance to the datasheet specifications. DIOO does not recommend exceeding them or designing to Absolute Maximum Ratings.

Parameter	Min.	Max.	Unit
Supply Voltage (V_{CC})	1.65	5.5	V
Control Input Voltage (V_{IN})	0	5.5	V
Switch Input Voltage (V_{SW}, V_{COM})	0	V_{CC}	V
Operating Temperature (T_A)	-40	85	°C



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Electrical Characteristics

All typical value are at $V_{CC}=4.2V$; $T_A=25^{\circ}C$, unless otherwise specified.

Symbol	Parameter	Conditions	Temp.	Min	Typ	Max	Unit
V_{IH}	Input voltage high		-40 to 85°C	2.4			V
V_{IL}	Input voltage low		-40 to 85°C			0.8	V
I_{IN}	Control input leakage	$V_{IN}=4.2V$ or 0V, $V_{CC}=4.2V$	25°C	-2		2	nA
			-40 to 85°C	-100		100	
$I_{NC(OFF)}$ $I_{NO(OFF)}$	NC, NO, COM off leakage current See Figure 3	$V_{SW}=0.3V, 3.3V,$ $V_{COM}=3.3V, 0.3V, V_{CC}=4.2V$	25°C	-20	2	20	nA
			-40 to 85°C	-100		100	
$I_{NC(PW OFF)}$ $I_{NO(PW OFF)}$ $I_{COM(PW OFF)}$		$V_{SW}=0V$ to 4.2V, $V_{COM}=4.2V$ to 0V; $V_{CC}=0V$	25°C	-1	0.2	1	μA
			-40 to 85°C	-20		20	
$I_{COM(ON)}$	COM on leakage current	$V_{COM}=0.3V, 3.3V, V_{SW}=0.3V, 3.3V,$ or floating, $V_{CC}=4.2V$	25°C	-20	2	20	nA
			-40 to 85°C	-100		100	
I_{CC}	Quiescent supply current	$V_{CC}=4.2V, V_{IN}=V_{CC}$ or GND, Switch ON or OFF	25°C		10	50	nA
			-40 to 85°C			500	
R_{ON}	Switch on Resistance See Figure 2	$V_{CC}=4.2V, V_{SW}=1V, I_{SW}=-100mA$	25°C		1	1.5	Ω
			-40 to 85°C			2.0	
ΔR_{ON}	On Resistance Matching between Channels	$V_{CC}=4.2V, V_{SW}=1V, I_{SW}=-100mA$	25°C		0.05	0.2	Ω
			-40 to 85°C			0.3	
$R_{FLT(ON)}$	On Resistance Flatness	$V_{CC}=4.2V, V_{SWC}=1V, 3.5V,$ $I_{SW}=-100mA$	-40 to 85°C		0.8	1.2	Ω
T_{ON}	Turn-On Time See Figure 9	$V_{SW}=1.5V$ or 0V, $R_L = 50\Omega, C_L = 35pF$ See Figure 9	25°C		12	35	ns
T_{OFF}	Turn-Off Time See Figure 9	$V_{SW}=1.5V$ or 0V, $R_L = 50\Omega, C_L = 35pF$ See Figure 9	25°C		5	30	ns
T_{BBM}	Break before make time See Figure 8	$V_{SW}=V_{CC}, R_L = 50\Omega, C_L = 35pF$ See Figure 9	25°C		6	20	ns
OIRR	Off Isolation See Figure 7	$R_L = 50\Omega, \text{Signal}=0dBm, f=1MHz$ See Figure 7	25°C		-70		dB
BW	-3dB bandwidth See Figure 5	$R_L = 50\Omega, \text{Signal}=0dBm,$ See Figure 5	25°C		100		MHz
THD	Total harmonic distortion	$R_L = 600\Omega, C_L=50pF,$ $f=20Hz$ to 20kHz, See Figure 5	25°C		0.004		%
C_{IN}	Control Pin input Capacitance	$V_{IN}=V_{CC}$ or 0V	25°C		1.5		pF
C_{OFF}	OFF Capacitance See Figure 4	Switch Off, $V_{SW}=V_{CC}$ or 0V See Figure 4	25°C		22		pF
C_{ON}	On Capacitance See Figure 4	Switch On, $V_{COM}=V_{CC}$ or 0V See Figure 4	25°C		49		pF



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Electrical Characteristics

All typical value are at $V_{CC}=2.7V$ to $3.6V$; $T_A=25^{\circ}C$, unless otherwise specified.

Symbol	Parameter	Conditions	Temp.	Min	Typ	Max.	Unit
V_{IH}	Input voltage high		-40 to $85^{\circ}C$	2.4			V
V_{IL}	Input voltage low		-40 to $85^{\circ}C$			0.8	V
I_{IN}	Control input leakage	$V_{IN}=2.7V$ or $0V$, $V_{CC}=2.7V$	$25^{\circ}C$	-2		2	nA
			-40 to $85^{\circ}C$	-100		100	
$I_{NC(OFF)}$ $I_{NO(OFF)}$	NC, NO, COM off leakage current	$V_{SW}=0.3V, 3.3V$; $V_{COM}=3.3$ to $0.3V$ $V_{CC}=3.6V$	$25^{\circ}C$	-20	2	20	nA
			-40 to $85^{\circ}C$	-50		50	
$I_{NC(PWOFF)}$ $I_{NO(PWOFF)}$ $I_{COM(PWOFF)}$	See Figure 3	$V_{SW}=0V$ to $3.3V$, $V_{COM}=3.3V$ to $0V$; $V_{CC}=0V$	$25^{\circ}C$	-1	0.2	1	μA
			-40 to $85^{\circ}C$	-15		15	
$I_{COM(ON)}$	COM on leakage current	$V_{COM}=0.3V, 3.3V$, $V_{SW}=0.3V, 3.3V$, or floating, $V_{CC}=3.6V$	$25^{\circ}C$	-10	2	10	nA
			-40 to $85^{\circ}C$	-20		20	
I_{CC}	Quiescent supply current	$V_{CC}=3.6V$, $V_{IN}=V_{CC}$ or GND, Switch ON or OFF	$25^{\circ}C$		10	25	nA
			-40 to $85^{\circ}C$			100	
R_{ON}	Switch on Resistance See Figure 2	$V_{CC}=2.7V$, $V_{SW}=1.0V$, $I_{SW}=-100mA$	$25^{\circ}C$		1.5	2.2	Ω
			-40 to $85^{\circ}C$			2.6	
ΔR_{ON}	On Resistance Matching between Channels	$V_{CC}=2.7V$, $V_{SW}=1.0V$, $I_{SW}=-100mA$	$25^{\circ}C$		0.1	0.3	
			-40 to $85^{\circ}C$			0.5	
$R_{FLT(ON)}$	On Resistance Flatness	$V_{CC}=2.7V$, $V_{SW}=1V, 2V$, $I_{SW}=-100mA$	-40 to $85^{\circ}C$		0.9	1.5	Ω
T_{ON}	Turn-On Time See Figure 9	$V_{SW}=1.5V$ or $0V$, $R_L = 50\Omega$, $C_L = 35pF$ See Figure 9	$25^{\circ}C$		16	35	ns
T_{OFF}	Turn-Off Time See Figure 9	$V_{SW}=1.5V$ or $0V$, $R_L = 50\Omega$, $C_L = 35pF$ See Figure 9	$25^{\circ}C$		9	30	ns
T_{BBM}	Break before make time See Figure 8	$V_{SW}=V_{CC}$, $R_L = 50\Omega$, $C_L = 35pF$ See Figure 9	$25^{\circ}C$		9	40	ns
OIRR	Off Isolation See Figure 7	$R_L = 50\Omega$, Signal=0dBm, $f=1MHz$ See Figure 7	$25^{\circ}C$		-70		dB
BW	-3dB bandwidth See Figure 5	$R_L = 50\Omega$, Signal=0dBm, See Figure 5	$25^{\circ}C$		100		MHz
THD	Total harmonic distortion	$R_L = 600\Omega$, $C_L=50pF$, $f=20Hz$ to $20kHz$ See Figure 5	$25^{\circ}C$		0.01		%
C_{IN}	Control Pin input Capacitance	$V_{IN}=V_{CC}$ or $0V$	$25^{\circ}C$		1.5		pF
C_{OFF}	OFF Capacitance See Figure 4	Switch Off, $V_{SW}=V_{CC}$ or $0V$ See Figure 4	$25^{\circ}C$		22		pF
C_{ON}	On Capacitance See Figure 4	Switch On, $V_{COM}=V_{CC}$ or $0V$ See Figure 4	$25^{\circ}C$		49		pF

Test Diagrams

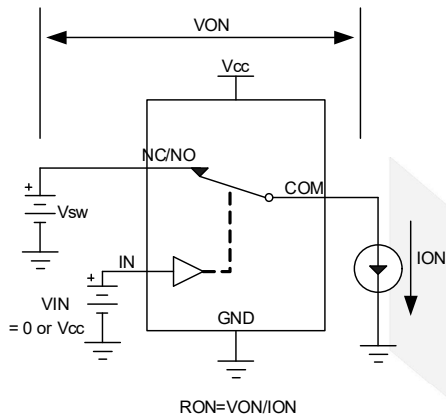


Figure 2 Switch on resistor

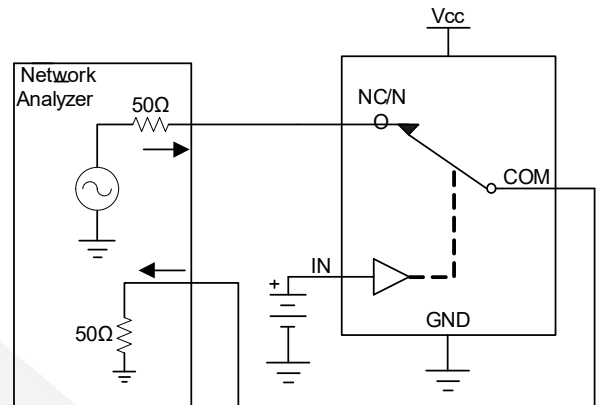


Figure 5 Bandwidth

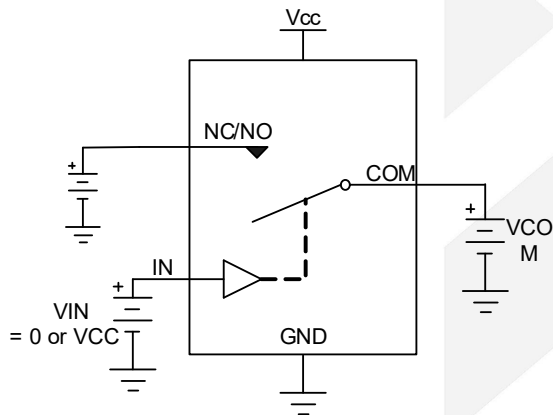


Figure 3 Switch Off Leakage

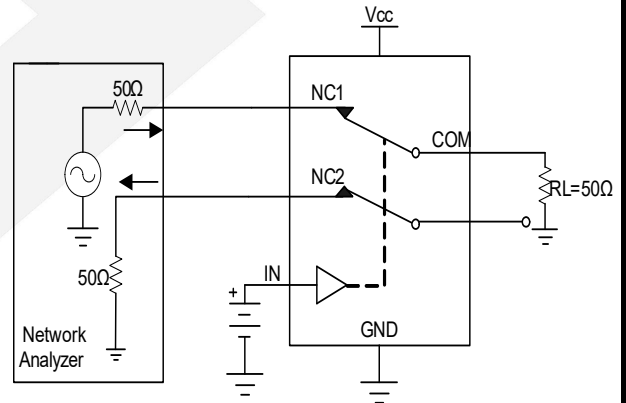


Figure 6 Channel-to-channel crosstalk

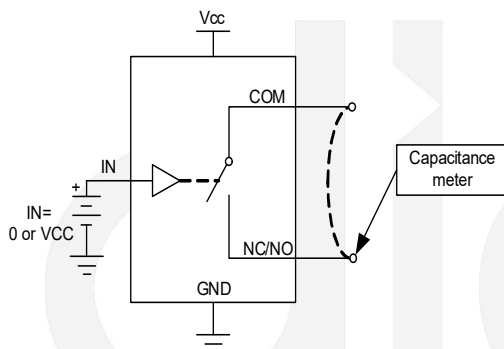


Figure 4 On/off Capacitance test

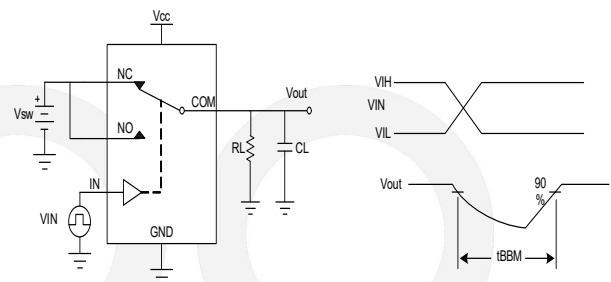


Figure 8 Break-Before-Make

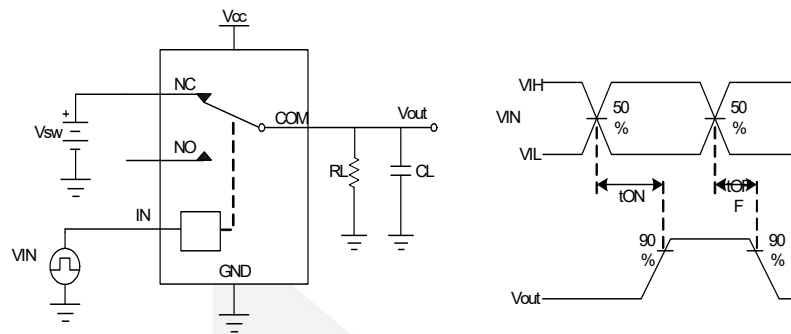


Figure 9 Turn-On/Turn-Off

CONTACT US

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