High Speed Dual SPDT Analog Switch with True Isolation In Power-Down Mode

Descriptions

The RLCS23159 is a dual SPDT low on-resistance analog switch. It can operate from a single 1.5V to 5.5V power supply. The device offers low ON-state resistance and excellent ON-state resistance matching with break-before-make feature, to prevent signal distortion during the transferring of a signal from one channel to another. The device is capable of true isolation. Even when COMx overrides VCC, very little current will flow back to the supply.

Features

- QFN-2x1.5-10L and MSOP-10 Package
- Low On-resistance, Ron=1.5Ω when COM_X=5V
- 1.8V Logic Compatible Control Pin
- COMx Overrides VCC to Achieve True Isolation Even When Supply Is Dead
- High Off-Isolation: **-100**dB @ 100KHz
- Low Channel-to-Channel Crosstalk: **-97**dB @ 100KHz
- High Bandwidth (-3dB @700MHz) Suitable For USB2.0 High-Speed Routing
- Low Quiescent Current (<2uA) With Very Wide Supply Range (1.5V ~ 5.5V)

Applications

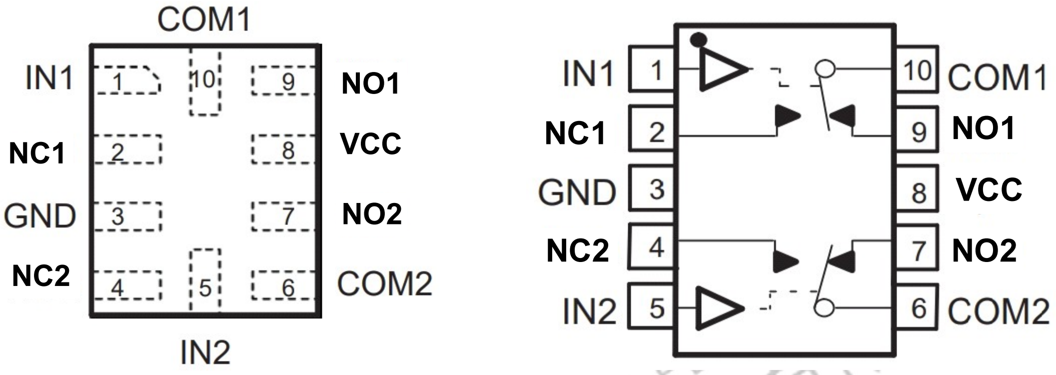
- Audio
- Video
- UART, USB2.0 Signal and Supply Routing
- Cell phones
- TWS headset
- USB Type-C Mic/Gnd Switch
- DC Motor Drive

Order Information

Package		Part Number	Quantity Per Reel
QFN 2.0 x 1.5 -10L	Tape and Reel	RLCS23159QN10/R6	3,000PCS
MSOP -10L	Tape and Reel	RLCS23159MP10/R6	3,000PCS

Functions and Pin Configuration

Pin Number	Symbol	Descriptions
1, 5	IN_X	Logic Input Control
2, 4	NC_X	Analog/Digital Signal Ports (Normally closed)
3	GND	Ground
6, 10	COMX	Common Signal Ports
7, 9	NOX	Analog/Digital Signal Ports (Normally open)
8	VCC	Single Power Supply

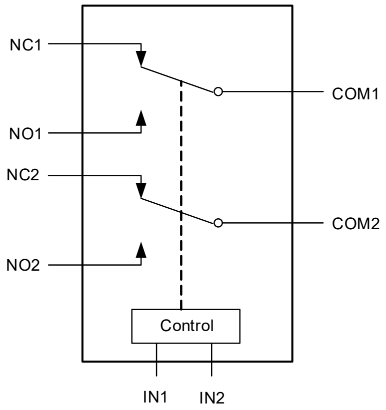


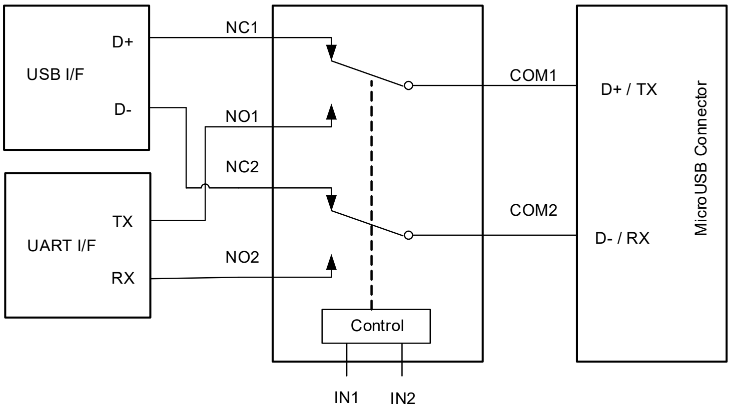
Pin configuration (Top view)

Function Descriptions

Logic Input(IN_X)	Function
0	NC1=COM1 and NC2=COM2
1	NO1=COM1 and NO2=COM2

Note: X= 1 or 2





Typical Application: Configured as USB2.0 Mux

Absolute Maximum Ratings (1)

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	-0.3 ~ 6.5	V
Control Input Voltage	V_{IN}	-0.3 ~ 6.5	V
Continuous Current Through NO, NC, COM		±100	mA
Peak Current Through NO, NC, COM (pulsed at 1ms 50% duty cycle)		±200	mA
Storage Temperature Range	T_{STG}	-55 ~ 150	°C
Junction Temperature under Bias	T_J	150	°C
Lead Temperature (Soldering, 10 seconds)	T_L	260	°C
Power Dissipation	P_D	250	mW

Recommend operating ratings (2)

Parameter	Symbol	Value	Unit
Supply Voltage Operating	V_{CC}	1.5 ~ 5.5	V
Control Input Voltage	V_{IN}	-0.3 ~ 5.5	V
Input Signal Voltage	V_{COM}	-0.3 ~ 5.5	V
Operating Temperature	T_A	-40 ~ 85	°C
Thermal Resistance	$R_{\theta JA}$	360	°C/W

Note:

1. "Absolute Maximum Ratings" 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.

DC Electronics Characteristics (Ta=25°C, VCC=3.3V, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input logic high level	V_{IH}	VCC: 3.3 ~ 5.5V	1.6			V
		VCC: 1.5 ~ 3.3V	1.4			V
Input logic low level	V_{IL}	VCC: 3.3 ~ 5.5V			0.6	V
		VCC: 1.5 ~ 3.3V			0.4	V
Supply quiescent current	I_{CC}	I_{COM}=0, V_{IN} =0 or V_{IN} =VCC			1.0	uA
Increase in I_{CC} per input	I_{CCT}	I_{COM}=0, VCC=4.5V V_{IN}>1.8 or V_{IN}<0.5			1.0	uA
Off state leakage from COM$_X$ to NC$_X$ (or NO$_X$)	I_{COMx}	V_{COM} = 5.5V , $V_{NC(or\ NO)}$ = 0V			±2.0	uA
On-Resistance	R_{ON1}	V_{COM}=0 ~ 0.5V, I_{COM}=30mA		3.0	3.5	Ω
	R_{ON2}	V_{COM}=0.5 ~ 2.0V, I_{COM}=30mA		3.6	3.9	Ω
	R_{ON3}	V_{COM}=2.0 ~ 4.0V, I_{COM}=30mA		2.5	3.5	Ω
	R_{ON4}	V_{COM}=4.0 ~ 5.5V, I_{COM}=30mA		1.5	1.8	Ω
On-Resistance Flatness	R_{FLAT1}	V_{COM}=0 ~ 0.5V, I_{COM}=30mA		0.7		Ω
	R_{FLAT2}	V_{COM}=0.5 ~ 2.0V, I_{COM}=30mA		0.5		Ω
	R_{FLAT3}	V_{COM}=2.0 ~ 4.0V, I_{COM}=30mA		1.6		Ω
	R_{FLAT4}	V_{COM}=4.0 ~ 5.5V, I_{COM}=30mA		0.3		Ω
On-Resistance Matching Between Channels	Δ R_{ON}	V_{COM}=0~5.5V, I_{COM}=30mA,		0.1	0.2	Ω

AC Electronics Characteristics (Ta=25°C, VCC=3.3V, unless otherwise noted)

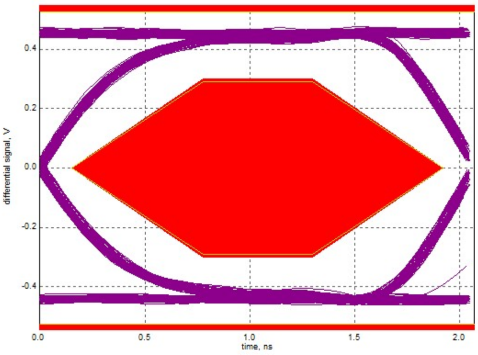
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Time	T_{ON}	V_{COM}=1.5V, C_L=35pF, R_L=50Ω		200		ns
Turn-Off Time	T_{OFF}	V_{COM}=1.5V, C_L=35pF, R_L=50Ω		200		ns
Break-Before-Make time	T_{BBM}	V_{COM}=1.5V, C_L=35pF, R_L=50Ω		500		ns
-3dB Bandwidth	BW	R_L=50Ω, C_L=0pF		850		MHz
Off isolation	OIRR	F=1KHz, R_L=50Ω		-81		dB
		F=10KHz, R_L=50Ω		-80		dB
Crosstalk	Xtalk	F=1KHz, R_L=50Ω		-83		dB
		F=10KHz, R_L=50Ω		-82		dB
Total Harmonic Distortion	THD	F=20Hz to 20KHz V_{COM}=600mVp-p @R_L=32Ω,		-80		dB

Capacitance (Ta=25°C, VCC=3.3V, unless otherwise noted)

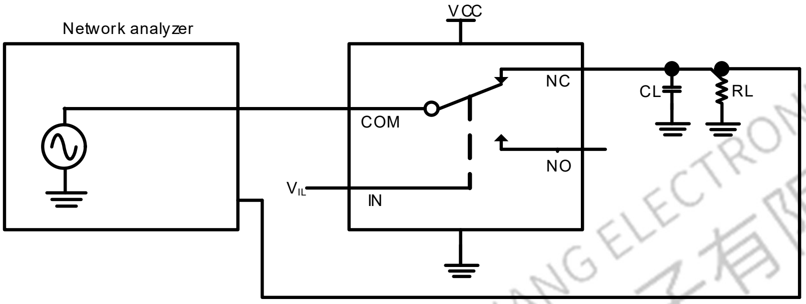
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Off capacitance	C_{OFF}	F=100KHz		5		pF
On capacitance	C_{ON}	F=100KHz		7		pF

Typical Characteristics (Ta=25ºC, VCC=3.3V, unless otherwise noted)

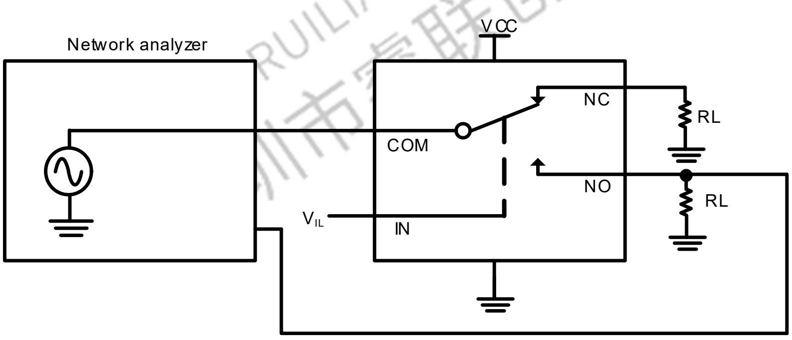
Bandwidth



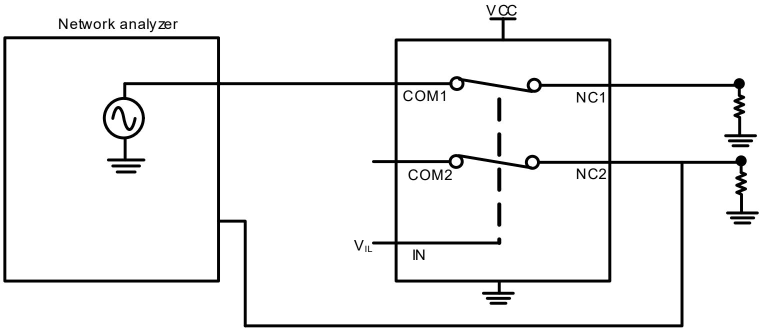
Eye Diagram (480Mbps)



Bandwidth



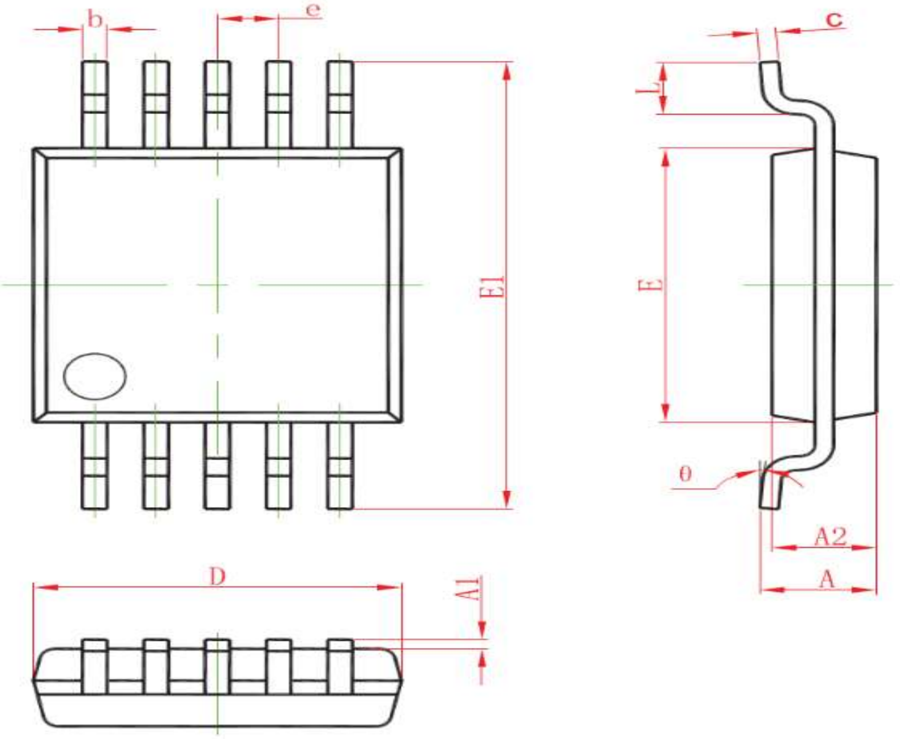
Off isolation



Crosstalk

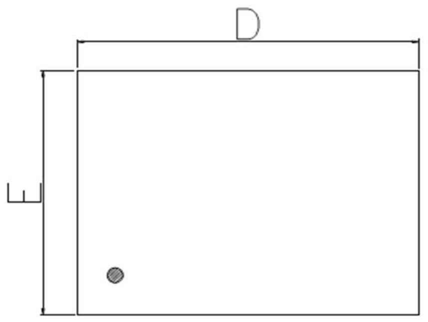
Package Outline Dimensions

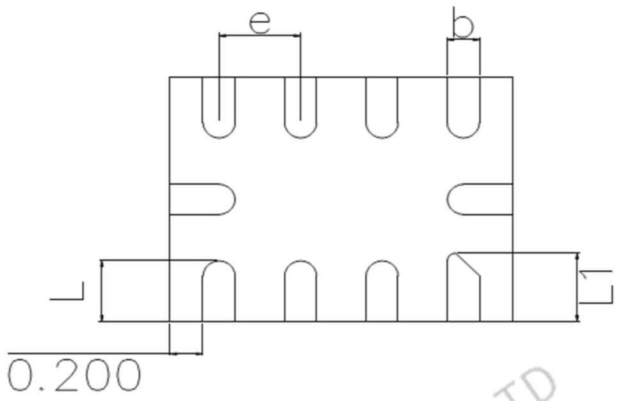
MSOP-10L

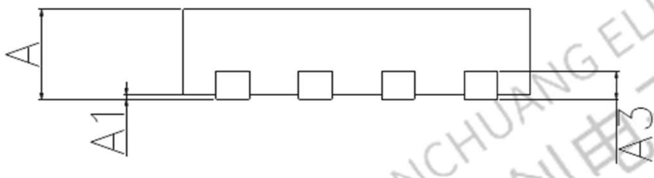


Symbol	Dimension in Millimeters	
	Min.	Max.
A	0.820	1.100
A1	0.020	0.150
A2	0.750	0.950
b	0.180	0.280
c	0.090	0.230
D	2.900	3.100
e	0.50(BSC)	
E	2.900	3.100
E1	4.750	5.050
L	0.400	0.800
θ	0°	6°

QFN 2.0 x 1.5 -10L







Symbol	Dimension in Millimeters		
	Min.	Typ.	Max.
A	0.500	0.550	0.600
A1	0.000		0.050
A3	0.150 Ref.		
D	1.950	2.000	2.050
E	1.450	1.500	1.550
b	0.150	0.200	0.250
e	0.500 (BSC)		
L	0.300	0.350	0.400
L1	0.350	0.400	0.450

Important Note

As the RLC product continues to improve gradually, we may experience significant changes. RLC reserves the right to correct, modify, enhance, and amend the products and services they provide, as well as the right to discontinue any product or service. Before placing an order, customers should obtain the latest information to verify that it is current and complete. All products sold must comply with RLC's terms and conditions in order to ensure proper processing of orders. RLC guarantees that the products they sell conform to the terms and conditions applicable to semiconductor sales. Only under this guarantee does RLC consider it necessary to employ testing and quality control measures for their products. Unless mandated by applicable laws requiring strict compliance, there is no obligation for testing all product parameters. RLC does not assume responsibility for customer product design or application. The materials provided contain circuit examples and usage methods solely for reference purposes; they do not guarantee suitability for volume production designs. Additionally, these materials may contain errors that could result in damages incurred by customers; therefore, RLC disclaims any liability in such cases. Customers are advised to use products within the limits specified in these materials while paying particular attention to absolute maximum ratings, operating voltages, and voltage characteristics. Any use of products outside of these specifications absolves RLC from responsibility; customers must accept full responsibility themselves. To minimize risks associated with customer-designed applications, adequate design safety measures should be implemented. When using RLC products, please ensure compliance with relevant laws and regulations pertaining to your country or region regarding application standards as well as testing requirements related to safety performance. For exports of RLC products overseas, it is essential that you adhere strictly to foreign exchange regulations and transaction laws throughout all necessary procedures involved in exportation processes. In case of disposal of any abandoned RLC product(s), please follow appropriate rules and regulations for proper disposal.

RLC products are not designed to be radiation - resistant. Based on the intended usage, customers can incorporate radiation protection measures during the product design process. Under normal circumstances, RLC products do not harm human health. However, since they contain chemicals and heavy metals, do not put them in your mouth. Additionally, the fracture surfaces of wafers and chips can be sharp. When touching them with bare hands, please be careful to avoid injury.Semiconductor products have a certain probability of failure or malfunction. To prevent disruptions and social damages resulting from personal accidents, fire accidents, etc., as well as to avoid malfunctions, customers are required to be responsible for comprehensive design, implementing fire - spread prevention measures, and safety design against misoperation. Please conduct a full assessment of the entire system, and customers can determine its applicability on their own.

This material also includes content related to the company's copyright and know - how. The records in this material are not intended to promise or guarantee the implementation and use of the company's and third - party intellectual property and other rights. Without the permission of our company, it is strictly prohibited to reprint, copy any part of this work, or disclose the material information to third parties.

RLC shall not be held responsible for any damage or harm that occurs which is not related to the product itself, as well as for any infringement of third - party rights such as intellectual property rights.

For more details about this material, please contact our sales office.