Automotive Low Voltage SPDT Analog Switch

Features

- AEC-Q100 qualified:
  - Device ambient temperature: -40°C ≤ T_A ≤ 125°C
  - Device junction temperature: -40°C ≤ T_J ≤ 150°C
- Supply voltage range: 1.65 V to 5.5 V
- Low power consumption: 1 μA (Max.) over operating temperature range
- Low ON-state resistance: 9 Ω (Max.) at 4.5 V V_{CC}
- Wide -3 dB bandwidth: 950 MHz
- Control inputs are 5 V tolerant
- Low charge injection
- Great ON-resistance matching
- Break-before-make enable circuitry

Applications

- Automotive head units
- Automotive cluster displays
- Telematics control units
- Body control module and gateway
- Audio and video signal routing

Package Information

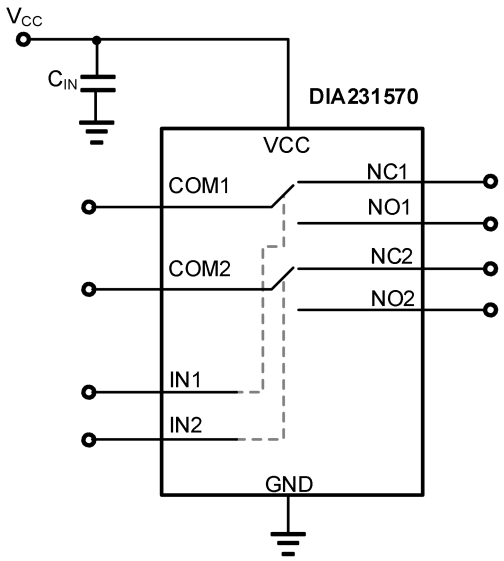
Part Number	Package	Body Size
DIA231570	MSOP-10	3 mm × 3 mm

Description

The DIA231570 is a high performance dual bidirectional SPDT (single-pole, dual-throw) analog switch that is designed to handle both digital and analog signals. The device operates from 1.65 V to 5.5 V and consumes very low quiescent current. It also offers excellent -3 dB bandwidth of 950 MHz and lower ON resistance, which can be used as analog switch in multiple applications.

The break-before-make select circuitry prevents disruption of signals on the COM port due to both switches temporarily being enabled during select pin switching. The control input tolerates voltages up to 5 V, independent of the V_{CC} operating range. It is specified over ambient temperature range from -40°C to 125°C, which makes it a perfect solution for automotive applications.

Simplified Schematic



Ordering Information

Ordering Part No.	Top Marking	MSL	RoHS	T_A	Package	
DIA231570MP10	DIAAE7V	1	Green	-40 to 125°C	MSOP10	Tape & Reel, 3000

If you encounter any issue in the process of using the device, please contact our customer service at marketing@dioo.com or phone us at (+86)-21-62116882. If you have any improvement suggestions regarding the datasheet, we encourage you to contact our technical writing team at docs@dioo.com. Your feedback is invaluable for us to provide a better user experience.

Table of Contents

List of Figures

List of Tables

1. Pin Assignment and Functions

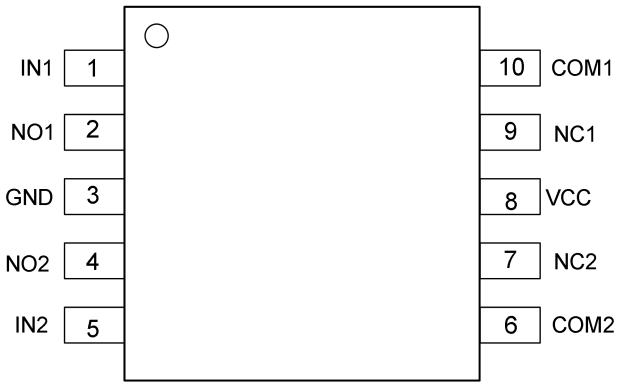


Figure 1. MSOP-10 (Top view)

Pin No.	Name	I/O	Description
1, 5	INx	I	Digital control to connect COM to NO or NC
3	GND	P	Ground
6, 10	COMx	I/O	Common
2, 4	NOx	I/O	Normally open
7, 9	NCx	I/O	Normally closed
8	VCC	P	Power supply

Note:

(1) x = 1, 2.

(2) I = input; I/O = input and output; P = power.

2. Absolute Maximum Ratings

Exceeding the maximum ratings listed under Absolute Maximum Ratings when designing is likely to damage the device permanently. Do not design to the maximum limits because long-time exposure to them might impact the device's reliability. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

Symbol	Parameter	Rating	Unit
V_{CC}	Supply voltage range	-0.5 to 6.5	V
V_{NC}, V_{NO}, V_{COM}	Analog voltage range	-0.5 to (V_{CC}) +0.5	V
$I_{I/OK}$	Analog port diode current; V_{NC}, V_{NO}, V_{COM} < 0 or V_{NC}, V_{NO}, V_{COM} > V_{CC}	±50	mA
I_{NC}, I_{NO}, I_{COM}	On-state switch current; V_{NC}, V_{NO}, V_{COM} = 0 to V_{CC}	±50	mA
V_{IN}	Digital input voltage range	-0.5 to 6.5	V
I_{IK}	Digital input clamp current; V_{IN} < 0	-50	mA
	Continuous current through V_{CC} or GND	±100	mA
T_{STG}	Storage temperature range	-65 to 150	°C

3. Recommended Operating Conditions

Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

Symbol	Parameter	Rating	Unit
V_{CC}	Supply voltage range	1.65 to 5.5	V
V_{NC}, V_{NO}, V_{COM}	Analog voltage range	0 to V_{CC}	V
V_{IN}	Digital input voltage range	0 to V_{CC}	V
T_A	Operating temperature	-40 to 125	°C

4. ESD Ratings

When a statically-charged person or object touches an electrostatic discharge sensitive device, the electrostatic charge might be drained through sensitive circuitry in the device. If the electrostatic discharge possesses sufficient energy, damage might occur to the device due to localized overheating.

Model	Condition	Value	Unit
HBM	ESDA/JEDEC JS-001	±5.5	kV
CDM	ESDA/JEDEC JS -002	±1.5	kV

5. Thermal Considerations

The thermal resistance determines the heat insulation property of a material. The higher the thermal resistance is, the lower the heat loss. Accumulation of heat energy degrades the performance of semiconductor components.

Symbol	Metric	Value	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance	165.3	°C/W

6. Electrical Characteristics

6.1. Electrical characteristics (5 V supply)

V_{CC} = 4.5 to 5.5 V, T_A = -40 to 125°C, unless otherwise noted. All typical values are at 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	T_A	V_{CC}	Min	Typ	Max	Unit
Analog switch								
V_{COM}, V_{NO}, V_{NC}	Analog signal range				0		V_{CC}	V
R_{ON}	ON-state resistance	0 ≤ V_{NO} or V_{NC} ≤ V_{CC}, I_{COM} = –30 mA. Switch ON	Full	4.5 V		5	9	Ω
ΔR_{ON}	ON-state resistance match between channels	V_{NO} or V_{NC} = 3.15 V, I_{COM} = –30 mA. Switch ON	25°C	4.5 V		0.2		Ω
$R_{ON(FLAT)}$	ON-state resistance flatness	0 ≤ V_{NO} or V_{NC} ≤ V_{CC}, I_{COM} = –30 mA. Switch ON	25°C	4.5 V		1.2		Ω
$I_{NC(OFF)}$, $I_{NO(OFF)}$	OFF leakage current (NC, NO)	V_{NC} or V_{NO} = 0 to V_{CC}, V_{COM} = 0 to V_{CC}. Switch OFF	25°C	5.5 V	-0.25		0.25	μA
			Full		-0.5		0.5	
$I_{NC(ON)}$, $I_{NO(ON)}$	ON leakage current (NC, NO)	V_{NC} or V_{NO} = 0 to V_{CC}, V_{COM} = Open. Switch ON	25°C	5.5 V	-0.25		0.25	μA
			Full		-0.5		0.5	
$I_{COM(ON)}$	ON leakage current (COM)	V_{NC} or V_{NO} = Open, V_{COM} = 0 to V_{CC}. Switch ON	25°C	5.5 V	-0.25		0.25	μA
			Full		-0.5		0.5	
Digital inputs (INx) (2)								
V_{IH}	Input logic high		Full		V_{CC} × 0.7			V
V_{IL}	Input logic low		Full				V_{CC} × 0.3	V

I_{IH}, I_{IL}	Input leakage current	V_{IN} = 5.5 V or 0	25°C	5.5 V	-0.25		0.25	μA
			Full		-0.5		0.5	
Dynamic								
t_{ON}	Turn-on time	V_{NC} = GND and V_{NO} = V_{CC}, or V_{NC} = V_{CC} and V_{NO} = GND, R_L = 50 Ω, C_L = 35 pF	25°C			4.8		ns
t_{OFF}	Turn-off time	V_{NC} = GND and V_{NO} = V_{CC}, or V_{NC} = V_{CC} and V_{NO} = GND, R_L = 50 Ω, C_L = 35 pF	25°C			3.0		ns
t_{BBM}	Break-before-make time	V_{NC} = V_{NO} = V_{CC}/2, R_L = 50 Ω, C_L = 35 pF	25°C			4.0		ns
Q_C (1)	Charge injection	V_{NC} = V_{NO} = V_{CC}/2, R_L = 50 Ω,	25°C	5 V		7		pC
$C_{NC(OFF)}$, $C_{NO(OFF)}$	OFF capacitance (NC, NO)	V_{NC} or V_{NO} = V_{CC} or GND. Switch OFF	25°C	5 V		2.7		pF
$C_{NC(ON)}$, $C_{NO(ON)}$	ON capacitance (NC, NO)	V_{NC} or V_{NO} = V_{CC} or GND. Switch ON	25°C	5 V		7.9		pF
$C_{COM(ON)}$	ON capacitance (COM)	V_{COM} = V_{CC} or GND. Switch ON	25°C	5 V		7.1		pF
C_{IN} (1)	Digital input capacitance	V_{IN} = V_{CC} or GND	25°C	5 V		2.8		pF
BW	Bandwidth	R_L = 50 Ω. Switch ON	25°C	4.5 V		950		MHz
OISO	Off-isolation	R_L = 50 Ω, f = 10 MHz. Switch OFF	25°C	4.5 V		-58		dB
X_{TALK}	Crosstalk	R_L = 50 Ω, f = 10 MHz. Switch ON	25°C	4.5 V		-60		dB
THD	Total harmonic distortion	R_L = 600 Ω, C_L = 50 pF, f = 600 Hz to 20 kHz	25°C	4.5 V		0.01		%
Supply								
I_{CC}	Positive supply current	V_{IN} = V_{CC} or GND. Switch OFF	25°C	5.5 V		0.05	0.5	μA
			Full				1	
I_{CCT}	Change in supply current	V_{IN} = V_{CC} – 0.6 V	Full	5.5 V			5	μA

Note:

(1) Guaranteed by design.

(2) Hold all unused digital inputs of the device at V_{CC} or GND to ensure proper device operation.

(3) Specifications subject to change without notice.

6.2. Electrical characteristics (3.3 V supply)

V_{CC} = 3 to 3.6 V, T_A = -40 to 125°C, unless otherwise noted. All typical values are at 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	T_A	V_{CC}	Min	Typ	Max	Unit
Analog switch								
V_{COM}, V_{NO}, V_{NC}	Analog signal range				0		V_{CC}	V
R_{ON}	ON-state resistance	0 ≤ V_{NO} or V_{NC} ≤ V_{CC}, I_{COM} = –24 mA. Switch ON	Full	3 V		9	14	Ω
ΔR_{ON}	ON-state resistance match between channels	V_{NO} or V_{NC} = 2.1 V, I_{COM} = –24 mA. Switch ON	25°C	3 V		0.2		Ω
$R_{ON(FLAT)}$	ON-state resistance flatness	0 ≤ V_{NO} or V_{NC} ≤ V_{CC}, I_{COM} = –24 mA. Switch ON	25°C	3 V		3		Ω
$I_{NC(OFF)}$, $I_{NO(OFF)}$	OFF leakage current (NC, NO)	V_{NC} or V_{NO} = 0 to V_{CC}, V_{COM} = 0 to V_{CC}. Switch OFF	25°C	3.6 V	-0.25		0.25	µA
			Full		-0.5		0.5	
$I_{NC(ON)}$, $I_{NO(ON)}$	ON leakage current (NC, NO)	V_{NC} or V_{NO} = 0 to V_{CC}, V_{COM} = Open. Switch ON	25°C	3.6 V	-0.25		0.25	µA
			Full		-0.5		0.5	
$I_{COM(ON)}$	ON leakage current (COM)	V_{NC} or V_{NO} = Open, V_{COM} = 0 to V_{CC}. Switch ON	25°C	3.6 V	-0.25		0.25	µA
			Full		-0.5		0.5	
Digital inputs (INx) [2]								
V_{IH}	Input logic high		Full		V_{CC} × 0.7			V
V_{IL}	Input logic low		Full				V_{CC} × 0.3	V
I_{IH}, I_{IL}	Input leakage current	V_{IN} = 5.5 V or 0	25°C	3.6 V	-0.25		0.25	µA
			Full		-0.5		0.5	
Dynamic								
t_{ON}	Turn-on time	V_{NC} = GND and V_{NO} = V_{CC}, or V_{NC} = V_{CC} and V_{NO} = GND, R_L = 50 Ω, C_L = 35 pF	25°C			6		ns
t_{OFF}	Turn-off time	V_{NC} = GND and V_{NO} = V_{CC}, or V_{NC} = V_{CC} and V_{NO} = GND, R_L = 50 Ω, C_L = 35 pF	25°C			3.6		ns

t_{BBM}	Break-before-make time	V_{NC} = V_{NO} = V_{CC}/2, R_L = 50 Ω, C_L = 35 pF	25°C			4.0		ns
Q_C (1)	Charge injection	R_L = 50 Ω, C_L = 0.1 nF	25°C	3.3 V		7		pC
BW	Bandwidth	R_L = 50 Ω. Switch ON	25°C	3 V		950		MHz
OISO	Off- isolation	R_L = 50 Ω, f = 10 MHz. Switch OFF	25°C	3 V		-58		dB
X_{TALK}	Crosstalk	R_L = 50 Ω, f = 10 MHz. Switch ON	25°C	3 V		-60		dB
THD	Total harmonic distortion	R_L = 600 Ω, C_L = 50 pF, f = 600 Hz to 20 kHz	25°C	3 V		0.03		%
Supply								
I_{CC}	Positive supply current	V_{IN} = V_{CC} or GND. Switch ON or OFF	25°C	3.6 V		0.05	0.5	μA
			Full				1	
I_{CCT}	Change in supply current	V_{IN} = V_{CC} – 0.6 V	Full	3.6 V			5	μA

Note:

(1) Guaranteed by design.

(2) Hold all unused digital inputs of the device at V_{CC} or GND to ensure proper device operation.

(3) Specifications subject to change without notice.

6.3. Electrical characteristics (2.5 V supply)

V_{CC} = 2.3 to 2.7 V, T_A = -40 to 125°C, unless otherwise noted. All typical values are at 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	T_A	V_{CC}	Min	Typ	Max	Unit
Analog switch								
V_{COM}, V_{NO}, V_{NC}	Analog signal range				0		V_{CC}	V
R_{ON}	ON-state resistance	0 ≤ V_{NO} or V_{NC} ≤ V_{CC}, I_{COM} = –24 mA. Switch ON	Full	2.3 V		17	28	Ω
ΔR_{ON}	ON-state resistance match between channels	V_{NO} or V_{NC} = 2.1 V, I_{COM} = –24 mA. Switch ON	25°C	2.3 V		0.3		Ω
$R_{ON(FLAT)}$	ON-state resistance flatness	0 ≤ V_{NO} or V_{NC} ≤ V_{CC}, I_{COM} = –24 mA. Switch ON	25°C	2.3 V		8.7		Ω
$I_{NC(OFF)}$, $I_{NO(OFF)}$	OFF leakage current (NC, NO)	V_{NC} or V_{NO} = 0 to V_{CC}, V_{COM} = 0 to V_{CC}. Switch OFF	25°C	2.7 V	-0.25		0.25	μA
			Full		-0.5		0.5	
$I_{NC(ON)}$,	ON leakage current	V_{NC} or V_{NO} = 0 to V_{CC},	25°C	2.7 V	-0.25		0.25	μA

$I_{NO(ON)}$	(NC, NO)	V_{COM} = Open. Switch ON	Full		-0.5		0.5	
$I_{COM(ON)}$	ON leakage current (COM)	V_{NC} or V_{NO} = Open, V_{COM} = 0 to V_{CC}. Switch ON	25°C	2.7 V	-0.25		0.25	µA
			Full		-0.5		0.5	
Digital inputs (INx) (2)								
V_{IH}	Input logic high		Full		V_{CC} × 0.7			V
V_{IL}	Input logic low		Full				V_{CC} × 0.3	V
I_{IH}, I_{IL}	Input leakage current	V_{IN} = 5.5 V or 0	25°C	2.7 V	-0.25		0.25	µA
			Full		-0.5		0.5	
Dynamic								
t_{ON}	Turn-on time	V_{NC} = GND and V_{NO} = V_{CC}, or V_{NC} = V_{CC} and V_{NO} = GND, R_L = 50 Ω, C_L = 35 pF	25°C			6.8		ns
t_{OFF}	Turn-off time	V_{NC} = GND and V_{NO} = V_{CC}, or V_{NC} = V_{CC} and V_{NO} = GND, R_L = 50 Ω, C_L = 35 pF	25°C			4.4		ns
t_{BBM}	Break-before-make time	V_{NC} = V_{NO} = V_{CC}/2, R_L = 50 Ω, C_L = 35 pF	25°C			4.0		ns
BW	Bandwidth	R_L = 50 Ω. Switch ON	25°C	2.3 V		950		MHz
OISO	Off-isolation	R_L = 50 Ω, f = 10 MHz. Switch OFF	25°C	2.3 V		-58		dB
X_{TALK}	Crosstalk	R_L = 50 Ω, f = 10 MHz. Switch ON	25°C	2.3 V		-60		dB
THD	Total harmonic distortion	R_L = 600 Ω, C_L = 50 pF, f = 600 Hz to 20 kHz	25°C	2.3 V		0.17		%
Supply								
I_{CC}	Positive supply current	V_{IN} = V_{CC} or GND. Switch ON or OFF	25°C	2.7 V		0.05	0.5	µA
			Full				1	
I_{CCT}	Change in supply current	V_{IN} = V_{CC} – 0.6 V	Full	2.7 V			5	µA

Note:

(1) Guaranteed by design.

(2) Hold all unused digital inputs of the device at V_{CC} or GND to ensure proper device operation.

(3) Specifications subject to change without notice.

6.4. Electrical characteristics (1.8 V supply)

V_{CC} = 1.65 to 1.95 V, T_A = -40 to 125°C, unless otherwise noted. All typical values are at 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	T_A	V_{CC}	Min	Typ	Max	Unit
Analog switch								
V_{COM}, V_{NO}, V_{NC}	Analog signal range				0		V_{CC}	V
R_{ON}	ON-state resistance	0 ≤ V_{NO} or V_{NC} ≤ V_{CC}, I_{COM} = –4 mA. Switch ON	Full	1.65 V		78	152	Ω
ΔR_{ON}	ON-state resistance match between channels	V_{NO} or V_{NC} = 2.1 V, I_{COM} = –4 mA. Switch ON	25°C	1.65 V		1		Ω
$R_{ON(FLAT)}$	ON-state resistance flatness	0 ≤ V_{NO} or V_{NC} ≤ V_{CC}, I_{COM} = –4 mA. Switch ON	25°C	1.65 V		70		Ω
$I_{NC(OFF)}$, $I_{NO(OFF)}$	OFF leakage current (NC, NO)	V_{NC} or V_{NO} = 0 to V_{CC}, V_{COM} = 0 to V_{CC}. Switch OFF	25°C	1.95 V	-0.25		0.25	µA
			Full		-0.5		0.5	
$I_{NC(ON)}$, $I_{NO(ON)}$	ON leakage current (NC, NO)	V_{NC} or V_{NO} = 0 to V_{CC}, V_{COM} = Open. Switch ON	25°C	1.95 V	-0.25		0.25	µA
			Full		-0.5		0.5	
$I_{COM(ON)}$	ON leakage current (COM)	V_{NC} or V_{NO} = Open, V_{COM} = 0 to V_{CC}. Switch ON	25°C	1.95 V	-0.25		0.25	µA
			Full		-0.5		0.5	
Digital inputs (INx) [2]								
V_{IH}	Input logic high		Full		V_{CC} × 0.75			V
V_{IL}	Input logic low		Full				V_{CC} × 0.25	V
I_{IH}, I_{IL}	Input leakage current	V_{IN} = 5.5 V or 0	25°C	1.95 V	-0.25		0.25	µA
			Full		-0.5		0.5	
Dynamic								
t_{ON}	Turn-on time	V_{NC} = GND and V_{NO} = V_{CC}, or V_{NC} = V_{CC} and V_{NO} = GND, R_L = 50 Ω, C_L = 35 pF	25°C			11		ns
t_{OFF}	Turn-off time	V_{NC} = GND and V_{NO} = V_{CC}, or V_{NC} = V_{CC} and V_{NO} = GND, R_L = 50 Ω, C_L = 35pF	25°C			6.7		ns

t_{BBM}	Break-before-make time	V_{NC} = V_{NO} = V_{CC}/2, R_L = 50 Ω, C_L = 35 pF	25°C			4.0		ns
BW	Bandwidth	R_L = 50 Ω. Switch ON	25°C	1.8 V		950		MHz
OISO	Off- isolation	R_L = 50 Ω, f = 10 MHz. Switch OFF	25°C	1.8 V		-58		dB
X_{TALK}	Crosstalk	R_L = 50 Ω, f = 10 MHz. Switch ON	25°C	1.8 V		-60		dB
THD	Total harmonic distortion	R_L = 600 Ω, C_L = 50 pF, f = 600 Hz to 20 kHz	25°C	1.8 V		1.3		%
Supply								
I_{CC}	Positive supply current	V_{IN} = V_{CC} or GND. Switch ON or OFF	25°C	1.95 V		0.05	0.5	μA
			Full				1	
I_{CCT}	Change in supply current	V_{IN} = V_{CC} – 0.6 V	Full	1.95 V			5	μA

Note:

(1) Guaranteed by design.

(2) Hold all unused digital inputs of the device at V_{CC} or GND to ensure proper device operation.

(3) Specifications subject to change without notice.

7. Typical Characteristics

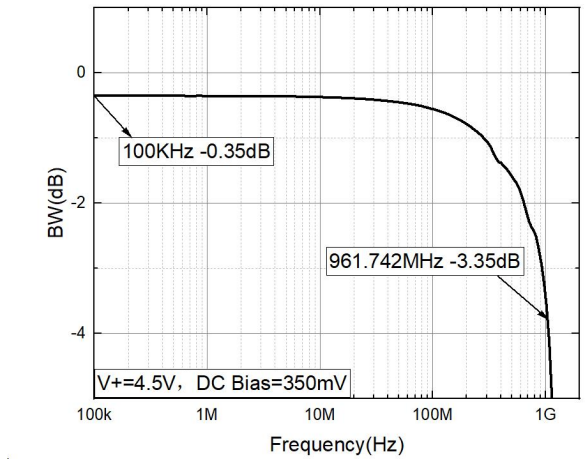


Figure 2. Bandwidth vs. Frequency

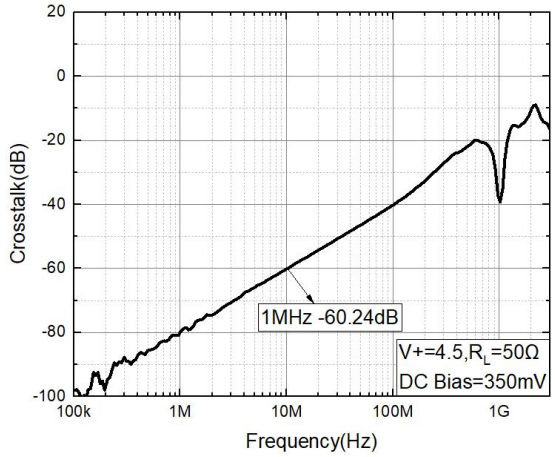


Figure 3. Crosstalk vs. Frequency

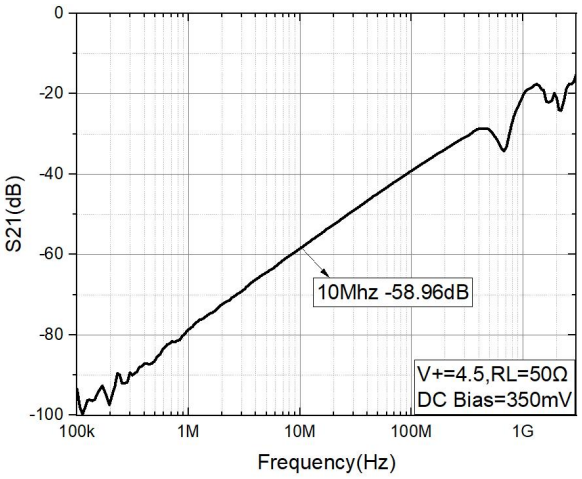


Figure 4. Off-isolation vs. Frequency

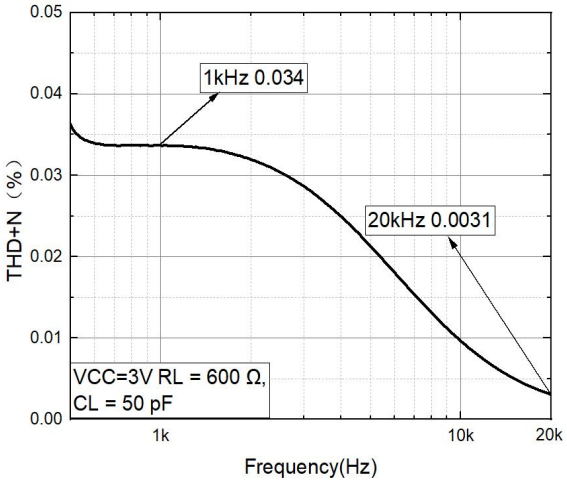


Figure 5. THD+N vs. Frequency

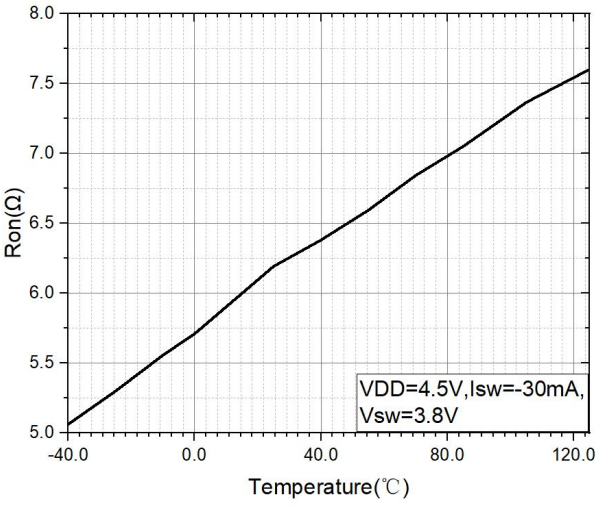


Figure 6. R_{ON} vs. Temperature

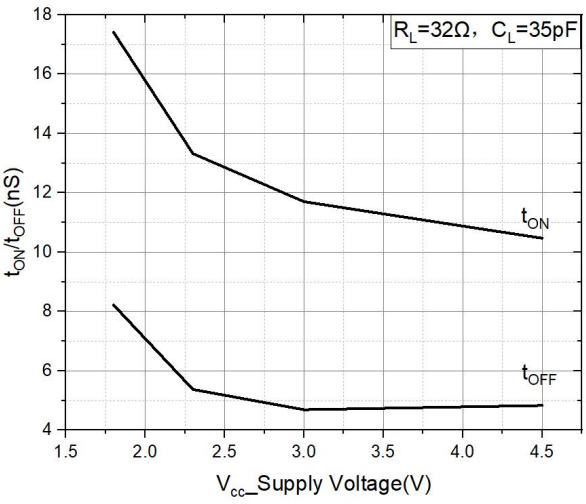


Figure 7. t_{ON} / t_{OFF} vs. V_{CC}

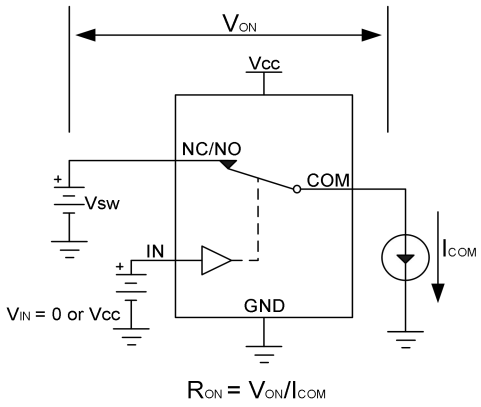


Figure 8. Switch on resistor

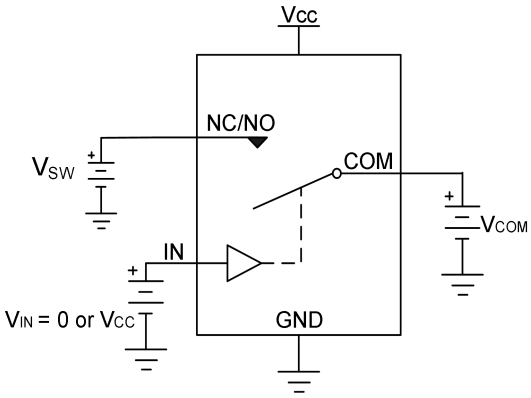


Figure 9. Switch off leakage

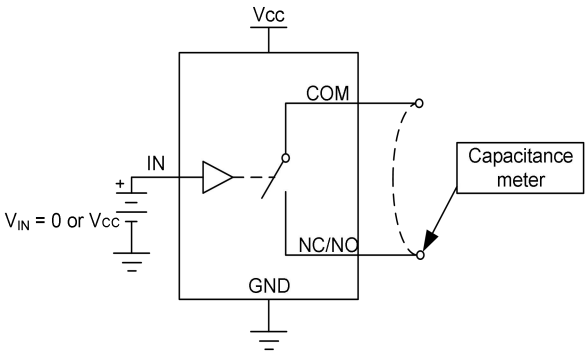


Figure 10. Channel On/Off capacitance

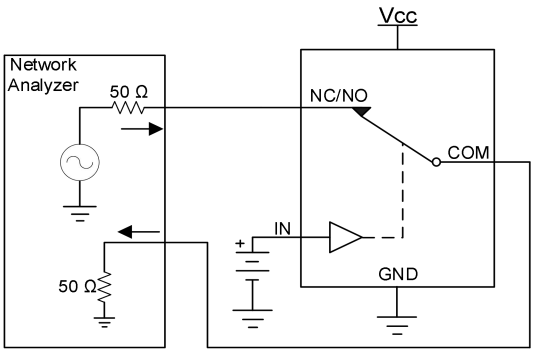


Figure 11. Bandwidth

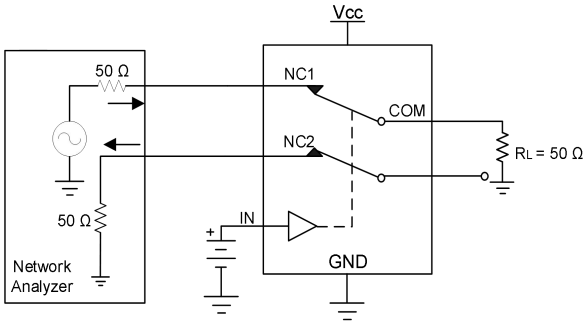


Figure 12. Channel-to-channel crosstalk

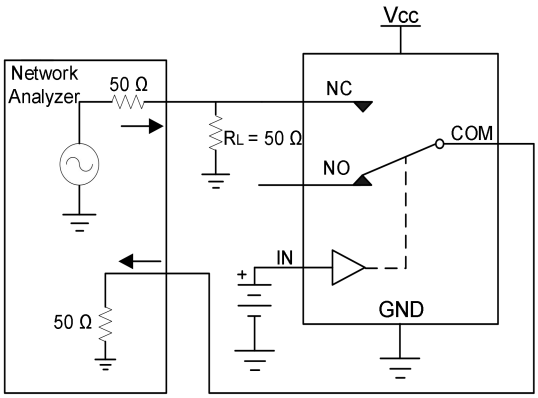


Figure 13. Off-isolation

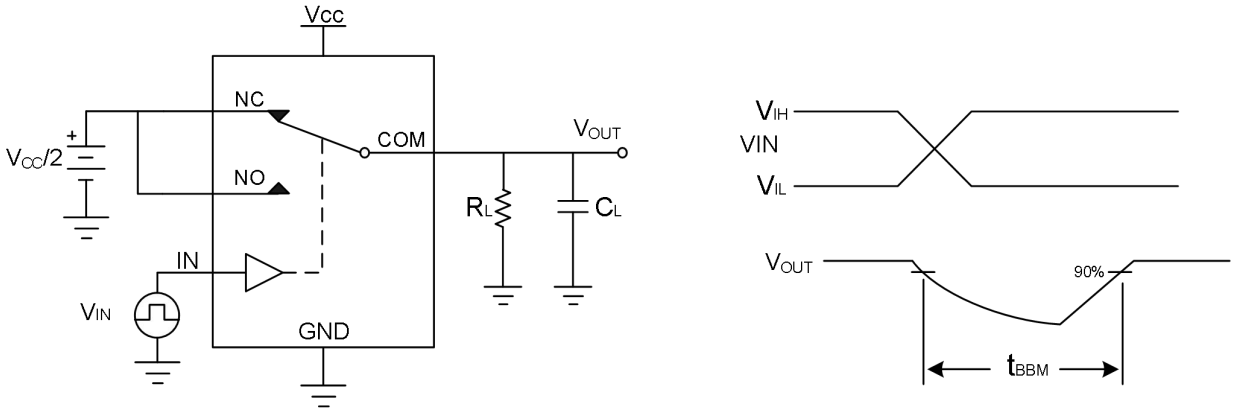


Figure 14. Break-before-make

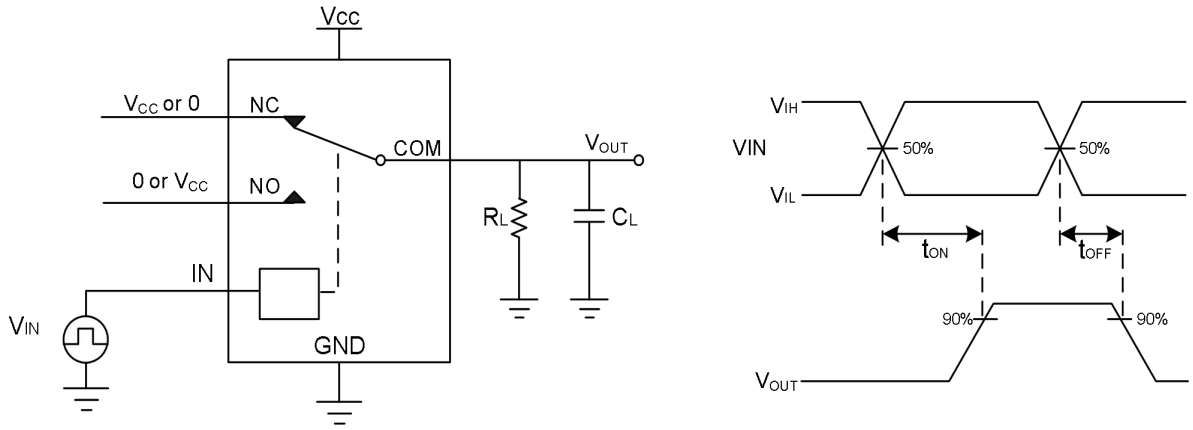
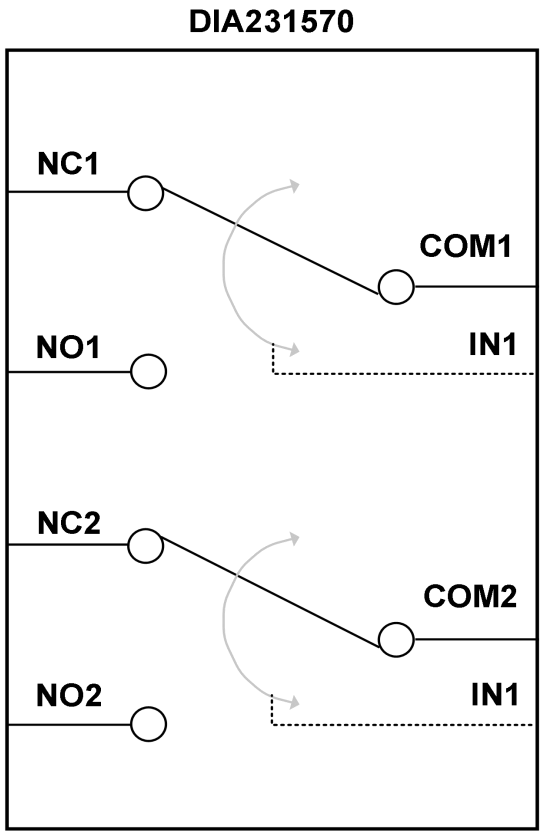


Figure 15. Turn-on/Turn-off

8. Block Diagram



9. Function Description

The DIA231570 is a high performance dual bidirectional SPDT (single-pole, dual-throw) analog switch. With a wide operating supply of 1.65 V to 5.5 V and very low quiescent current, it's suitable for use in multiple applications.

9.1. Bidirectional operation

Supporting bidirectional both analog and digital signals, the DIA231570 can operate well both from the source to drainpins and from drain to source pins. The source pins are NCx and NOx pins and the drain pins are COMx pins. In both directions, each channel has similar characteristics.

9.2. Functional modes

The INx pins are the digital logic pins that control their respective COMx pins (common connections) with both the NCx pins and the NOx pins. The NCx are normally closed while the NOx are normally open.

If either or both INx pins are pulled low, the respective COMx pins and NCx pins are connected. If either or both INx pins are pulled high, the respective COMx pins and NOx pins are connected.

Except for the supply decoupling capacitors, the DIA231570 can operate without any external components. If the logic control pins INx are not used, they should be tied to GND or VCC to ensure the device does not consume additional current. If the signal path inputs NCx, NOx, and COMx are not used, they should be connected to GND.

10. Application Information

Important notice: Validation and testing are the most reliable ways to confirm system functionality. The application information is not part of the specification and is for reference purposes only.

For common applications, it requires the DIA231570 to feature multiplexing various protocols from a processor MCU such as UART, I²C or standard GPIO signals. With the DIA231570's wide operating supply range, the various signal levels with UART, I²C and GPIO can all be passed and the supply voltage varies to match with the system needs.

A typical application (UART) is shown in Table 1 and Figure 16 below.

Table 1. Design parameters

Parameter		Value (V)
Supply voltage		3.3
Input/Output voltage		0 to 3.3
Logic input	High	2.31 to 3.3
	Low	0 to 0.99

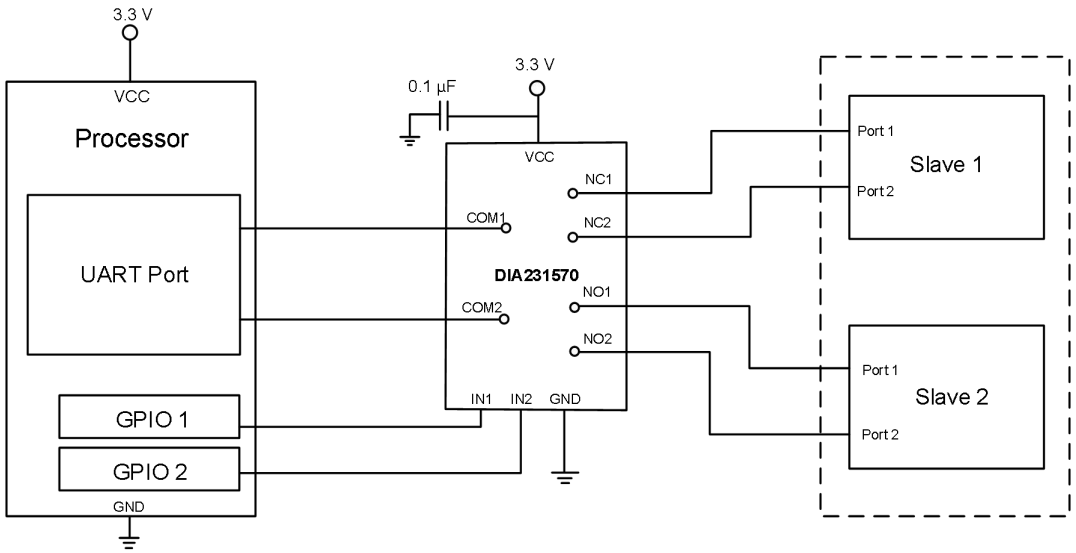


Figure 16. Typical application (UART)

10.1. Detailed design procedure

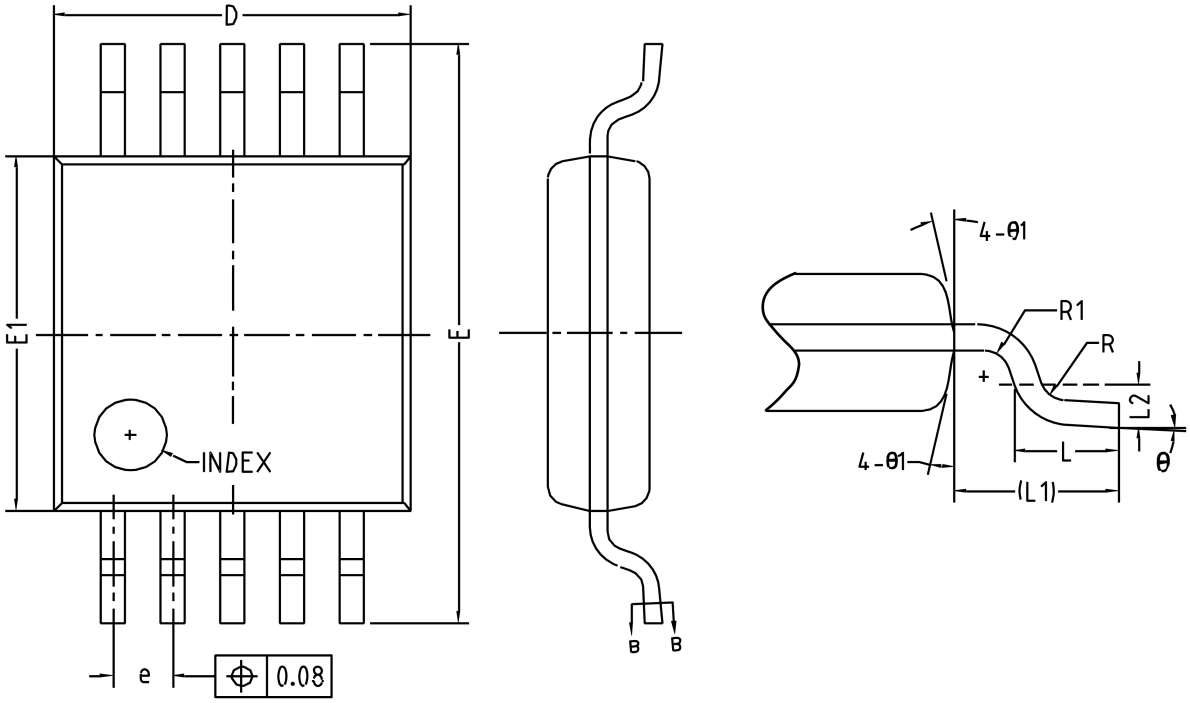
Except for the supply decoupling capacitors, the DIA231570 can operate without any external components. Use pull-down resistors (from 10 kΩ to 100 kΩ) on each INx pins in order to ensure known logic states at start-up. All inputs signals passing through the switch must not be beyond the recommend operating conditions. For example, if the supply voltage is 3.3 V, then the signals can range from 0 to 3.3 V. The wide voltage range and bandwidth enable the DIA231570 to support multiple applications.

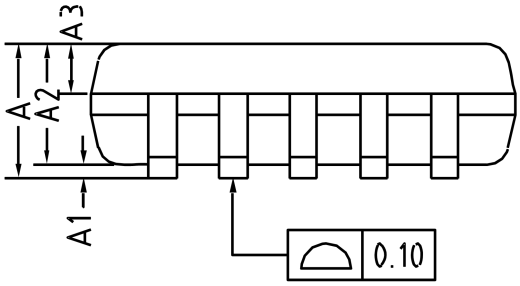
10.2. Power supply

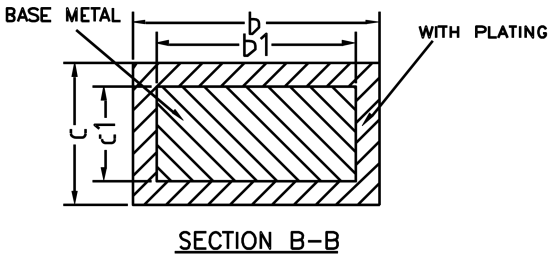
The DIA231570 operates across a wide supply range of 1.65 V to 5.5 V. Do not recommend to exceed the absolute maximum ratings because it is likely to damage the device permanently.

- Power-supply bypassing improves noise margin and prevents switching noise propagation from the VCC supply to other components. It's important to have a good power-supply decoupling to achieve optimum performance.
- It's recommended to use a supply decoupling capacitor (from 0.1 μF to 10 μF) from VCC to GND for improved supply noise immunity.
- Place the bypass capacitors as close to the power supply pins of the device as possible using low-impedance connections.
- It's recommended to use multi-layer ceramic chip capacitors that offer low equivalent series resistance (ESR) and inductance (ESL) characteristics for power-supply decoupling purposes.
- For the systems that are very sensitive or in harsh noise environments, please avoid the use of vias for connecting the capacitors to the device pins, it may offer superior noise immunity. The use of multiple vias in parallel lowers the overall inductance, which is good for connections to ground planes.

11. Physical Dimensions: MSOP-10







Common Dimensions (Units of measure = Millimeter)			
Symbol	**Min**	**Nom**	**Max**
A	-	-	1.10
A1	0.05	0.10	0.15
A2	0.75	0.85	0.95
A3	0.30	0.35	0.40
b	0.18	-	0.27
b1	0.17	0.20	0.23
c	0.15	-	0.20
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.75	4.90	5.05
E1	2.90	3.00	3.10
e	0.40	0.50	0.60
L	0.40	0.55	0.70
L1	0.95 REF		
L2	0.25 BSC		
R	0.07	-	-
R1	0.07	-	-
Θ	0°	-	8°
Θ1	9°	12°	15°

Disclaimer

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