2.7Ω,300MHz Bandwidth Dual SPDT Analog Switch

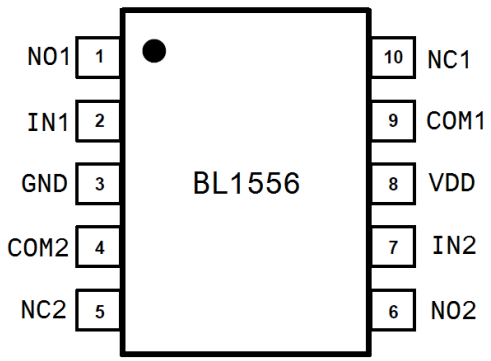
Features

- Wide Power Supply Range: 1.8V to 5.5V
- High Bandwidth: 300MHz
- High Off-Isolation:
  84dB at 1MHz
  51dB at 10MHz
- Low Crosstalk: 80dB at 1MHz
- On-Resistance: 2.7Ω (typ) at 5.0V
- Fast Switching Time
  t_{on} = 12.0ns; t_{off} = 5.0ns
- TTL/CMOS Compatible
- Break-Before-Make Switching
- Rail-to-Rail Signal Range
- Operation Temperature Range:
  -40℃ to 85℃
- MSOP10 Package

Applications

- Wireless Handsets
- MP3 Players
- Portable Electronic Devices
- Relay Replacement
- PDAs
- Audio & Video Signal Routing
- PCMCIA Cards
- Computer Peripherals
- Modems

Pin Configuration (Top View)

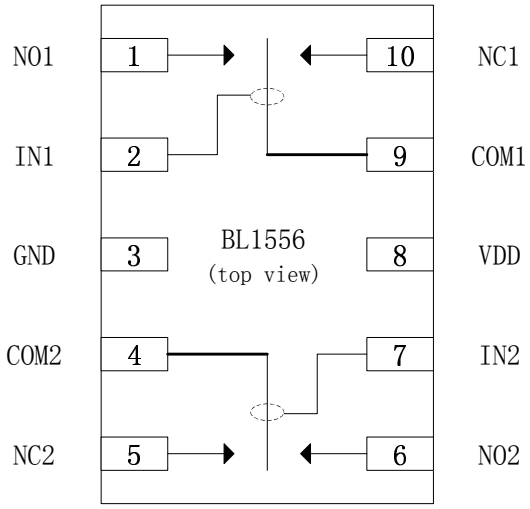


Description

The BL1556 is a Dual Wide-Bandwidth, fast single-pole double-throw (SPDT) CMOS switch featuring an On-Resistance of 2.7 ohm at V_{DD}=5.0V and wide power supply range from 1.8V to 5.5V. It can be used as an analog switch or as a low-delay bus switch. The 300MHz high bandwidth performance supports the high frequency application.

Break-before-make function for both parts eliminates signal disruption during switching from preventing both switches being enabled simultaneously.

Block Diagram



Function Table

IN1	Function
1	NO1 Connected to COM1
0	NC1 Connected to COM1

IN2	Function
1	NO2 Connected to COM2
0	NC2 Connected to COM2

Pin Description

Pin Name	Type	Description
VDD	Power	Power Supply
GND	Ground	Ground
COM2,COM2	Input/Output	Data Port
NO1,NO2	Input/Output	Data Port
NC1,NC2	Input/Output	Data Port
IN1,IN2	Input	Logic Control Signal

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Units
DC Supply Voltage	V_{DD}	-0.3	6	V
DC Switch Voltage	V_{NO}/ V_{NC}/ V_{COM}	-0.3	V_{SUP} + 0.3	V
DC Input Voltage	V_{IN}	-0.3	V_{SUP} + 0.3	V
Continuous Current	$I_{(NO/NC/COM)}$	-200	+200	mA
Peak Current(1)	$I_{PEAK(NO/NC/COM)}$	-300	+300	mA
Operating Temperature Range	T_A	-40	85	℃

Notes:

(1) Pulsed at 1ms, 50% duty circle

(2) Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(3) Control input(V_{IN}) must be held HIGH or LOW, and mustn’t be floated.

RECOMMENDED OPERATING CONDITIONS

DC Supply Voltage (V_{DD}) ……1.8V to 5.5V

Switch Input Voltage (V_S) ……...0V to V_{DD}

Control Input Voltage (V_{IN})…… 0V to V_{DD}

Operation Temperature (TA)……..-40℃ to +85℃

ORDERING INFORMATION

MODEL	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	PACKAGE MARKING	PACKAGE OPTION
BL1556	MSOP10	- 40°C to +85°C	1556 YYWW	Tape and Reel, 3000

DC ELECTRICAL CHARACTERISTICS @ +2.7V Supply

Parameter	Symbol	Conditions	Guaranteed Limit			Unit
			Min.	Typ.(1)	Max.	
Analog Switch						
Analog Signal Range	$V_{NO}/V_{NC}/V_{COM}$		0		V_{DD}	V
NO On-Resistance	$R_{ON(NO)}$	V_{DD} = 2.7V; I_{COM} =-10mA ; V_{NO}=1.5V		6.5		Ω
NC On-Resistance	$R_{ON(NC)}$	V_{DD} = 2.7V; I_{COM} =-10mA ; V_{NC} =1.5V		6.5		Ω
NO On-Resistance Flatness(2)	$R_{FLAT(NO)}$	V_{DD} = 2.7V; I_{COM} =-10mA ; V_{NO} =1.5V		2.3		Ω
NC On-Resistance Flatness(2)	$R_{FLAT(NC)}$	V_{DD} = 2.7V; I_{COM} =-10mA ; V_{NC} =1.5V		2.3		Ω
On-Resistance Match Between Channels(3)	$\triangle R_{ON}$	V_{DD} = 2.7V; I_B =-10mA ; V_{NO} /V_{NC}=1.5		0.15	1	Ω
NO or NC Off Leakage Current	$I_{OFF(NO)}$ or $I_{OFF(NC)}$	V_{DD} = 3.6V; V_{NO} or V_{NC} = 3V, 0.3V; V_{COM} = 0.3V, 3 V		0.01	1	uA
COM On Leakage Current	$I_{ON(COM)}$	V_{DD} = 3.6V; V_{NO} or V_{NC} = 3.3V, 0.3V; V_{COM} = 0.3V, 3.3 V or floating		0.01	1	uA
Digital I/O						
Input Voltage High	V_{IH}	Minimum High Level Input Voltage	1			V
Input Voltage Low	V_{IL}	Maximum Low Level Input Voltage			0.5	V
Input Leakage Current	I_{IN}	V_{IN} = 0 or VDD		0.01	1	uA

Note:

(1) Typical characteristics are at +3V supply and +25°C

(2) Flatness is defined as the difference between the maximum and minimum value of on resistance as measured over the specified analog signal ranges.

(3) $\triangle R_{ON}$= $R_{ON(MAX)}$ - $R_{ON(MIN)}$, between NO and NC .

DYNAMIC CHARACTERISTICS @ +2.7V Supply

Parameter	Symbol	Conditions		Guaranteed Limit			Unit
				Min.	Typ. (1)	Max.	
AC ELECTRICAL CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{DD} = 2.7V; V_{NO} or V_{NC} = 1.5V, R_L = 300Ω; C_L = 35pF, V_{IH}=1.5V,V_{IL}=0V			17.0		ns
Turn-Off Time	t_{OFF}	V_{DD} = 2.7V; V_{NO} or V_{NC} = 1.5V, R_L = 300Ω; C_L = 35pF, V_{IH}=1.5V,V_{IL}=0V			9.0		ns
Break-Before-Make Time	t_{BBM}	V_{DD} = 2.7V; V_{NO} or V_{NC} = 1.5V, R_L = 300Ω; C_L = 35pF			15.0		ns
NC OFF Capacitance	$C_{OFF(NC)}$	f = 1MHz			5.5		pF
NO OFF Capacitance	$C_{OFF(NO)}$	f = 1MHz			5.5		pF
NC ON Capacitance	$C_{ON(NC)}$	f = 1MHz			15.5		pF
NO ON Capacitance	$C_{ON(NO)}$	f = 1MHz			15.5		pF
ADDITIONAL APPLICATION CHARACTERISTICS							
3dB Bandwidth	f_{3dB}	Signal = 0dBm, R_L = 50Ω, C_L = 5pF			300		MHz
Off Isolation(2)	V_{Iso}	R_L = 50Ω, C_L = 5pF, Signal = 0dBm	f = 1MHz		-84		dB
			f =10MHz		-51		dB
Crosstalk	XTALK	R_L = 50Ω, C_L = 5pF	f = 1MHz		-80		dB
			f = 10MHz		-78		dB
Supply							
Power Supply Range	V_{DD}			1.8		5.5	V

Note:

(1) Typical characteristics are at +3V supply and 25°C

(2) Off Channel Isolation = $20\log_{10}$ [($V_{NO\backslash NC}$)/V_{COM}]

DC ELECTRICAL CHARACTERISTICS @ +5.0V Supply

Parameter	Symbol	Conditions	Guaranteed Limit			Unit
			Min.	Typ.(1)	Max.	
Analog Switch						
Analog Signal Range	$V_{NO}/V_{NC}/V_{COM}$		0		V_{DD}	V
NO On-Resistance	$R_{ON(NO)}$	V_{DD} = 5.0V; I_{COM} =-10mA ; V_{NO}=3.5V		2.7		Ω
NC On-Resistance	$R_{ON(NC)}$	V_{DD} = 5.0V; I_{COM} =-10mA ; V_{NC} =3.5V		2.7		Ω
NO On-Resistance Flatness(2)	$R_{FLAT(NO)}$	V_{DD} = 5.0V; I_{COM} =-10mA ; V_{NO}=3.5V		0.8		Ω
NC On-Resistance Flatness(2)	$R_{FLAT(NC)}$	V_{DD} = 5.0V; I_{COm} =-10mA ; V_{NC} =3.5V		0.8		Ω
On-Resistance Match Between Channels(3)	$\triangle R_{ON}$	V_{DD} = 5.0V; I_{COM} =-10mA ; V_{NO} /V_{NC}=3.5		0.15		Ω
NO or NC Off Leakage Current	$I_{OFF(NO)}$ or $I_{OFF(NC)}$	V_{DD}= 5.5V; V_{NO} or V_{NC} = 4.5V, 1.0V; V_{COM} = 1.0V, 4.5 V		0.01	1	uA
COM On Leakage Current	$I_{ON(B)}$	V_{DD} = 5.5V; V_{NO} or V_{NC} = 4.5V, 1.0V; V_{COM} = 1.0V, 4.5 V or floating		0.01	1	uA
Digital I/O						
Input Voltage High	V_{IH}	Minimum High Level Input Voltage	1			V
Input Voltage Low	V_{IL}	Maximum Low Level Input Voltage			0.5	V
Input Leakage Current	I_{IN}	V_{IN} = 0 or VDD		0.01	1	uA

Note:

(1) Typical characteristics are at +5.0V supply and +25°C

(2) Flatness is defined as the difference between the maximum and minimum value of on resistance as measured over the specified analog signal ranges.

(3) $\triangle R_{ON}$= $R_{ON(MAX)}$ - $R_{ON(MIN)}$, between NO and NC .

DYNAMIC CHARACTERISTICS @ +5.0V Supply

Parameter	Symbol	Conditions		Guaranteed Limit			Unit
				Min.	Typ. (1)	Max.	
AC ELECTRICAL CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{DD} = 5.0V; V_{NO} or V_{NC} = 3.0V, R_L = 300Ω; C_L = 35pF, V_{IH}=1.5V,V_{IL}=0V			12.0		ns
Turn-Off Time	t_{OFF}	V_{DD} = 5.0V; V_{NO} or V_{NC} = 3.5V, R_L = 300Ω; C_L = 35pF, V_{IH}=1.5V,V_{IL}=0V			5.0		ns
Break-Before-Make Time	t_{BBM}	V_{DD} = 5.0V; V_{NO} or V_{NC} = 3.5V, R_L = 300Ω; C_L = 35pF			8.5		ns
NC OFF Capacitance	$C_{OFF(NC)}$	f = 1MHz			5.5		pF
NO OFF Capacitance	$C_{OFF(NO)}$	f = 1MHz			5.5		pF
NC ON Capacitance	$C_{ON(NC)}$	f = 1MHz			15.5		pF
NO ON Capacitance	$C_{ON(NO)}$	f = 1MHz			15.5		pF
ADDITIONAL APPLICATION CHARACTERISTICS							
3dB Bandwidth	f_{3dB}	Signal = 0dBm, R_L = 50Ω, C_L = 5pF			300		MHz
Off Isolation(2)	V_{Iso}	R_L = 50Ω, C_L = 5pF, Signal = 0dBm	f = 1MHz		-84		dB
			f =10MHz		-51		dB
Crosstalk	XTALK	R_L = 50Ω, C_L = 5pF	f = 1MHz		-78		dB
			f = 10MHz		-80		dB
Supply							
Power Supply Range	V_{DD}			1.8		5.5	V

Note:

(1) Typical characteristics are at +5.0V supply and 25°C

(2) Off Channel Isolation = $20\log_{10}$ [($V_{NO\backslash NC}$)/V_{COM}]

TEST SETUP CIRCUITS

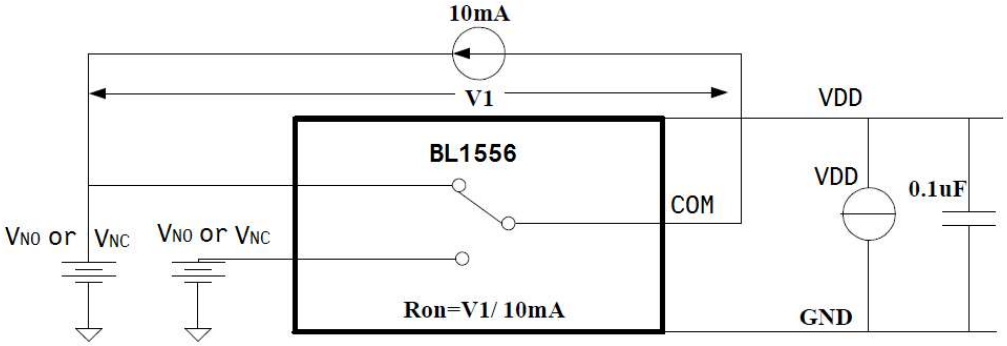


Figure1. Test Circuit for On Resister

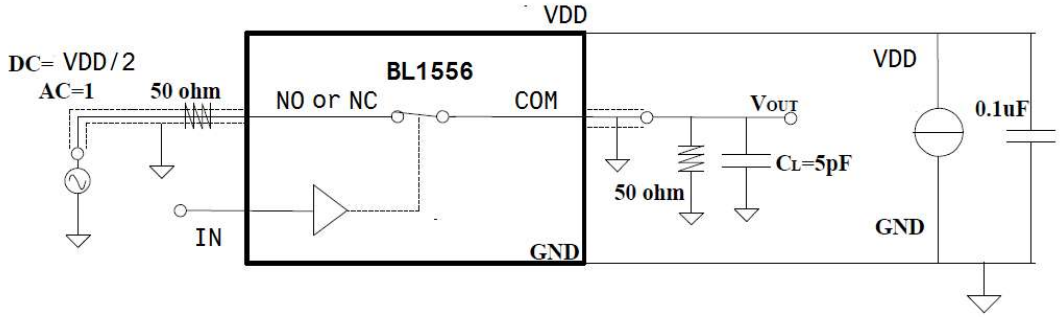


Figure2. Test Circuit for Bandwidth

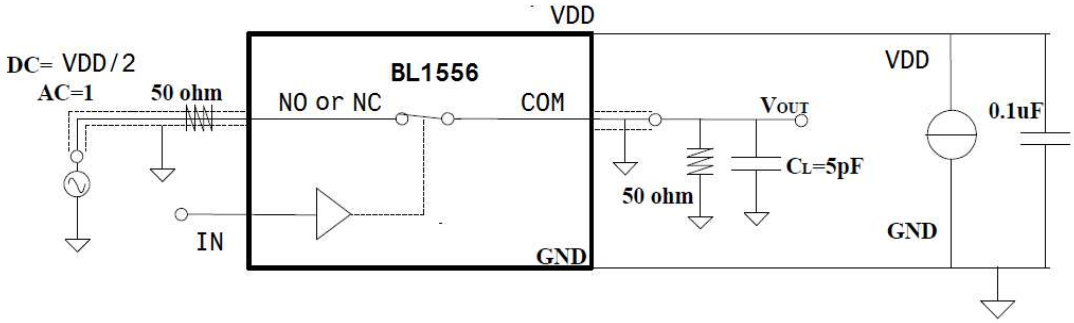
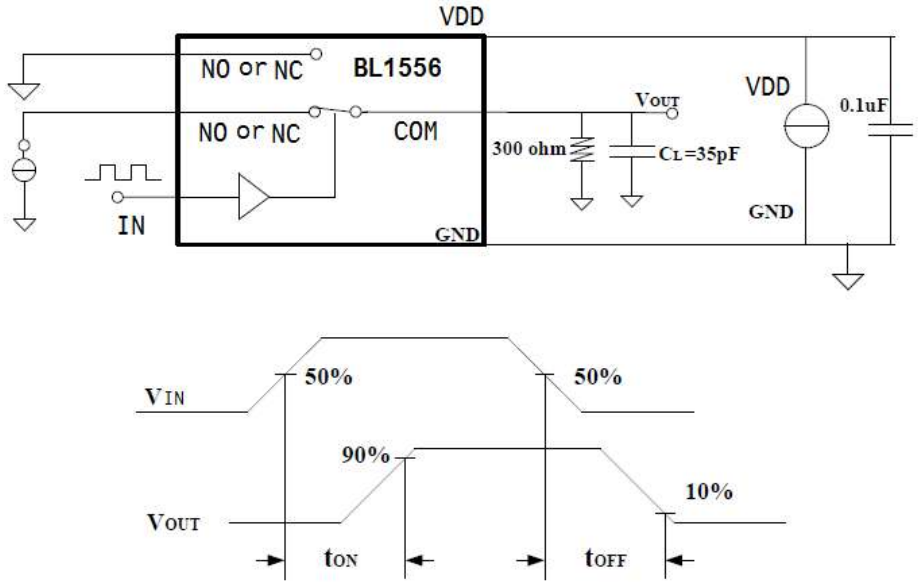
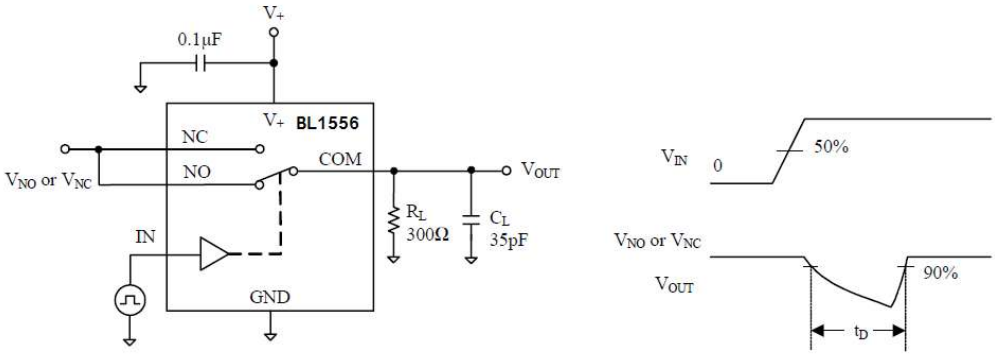


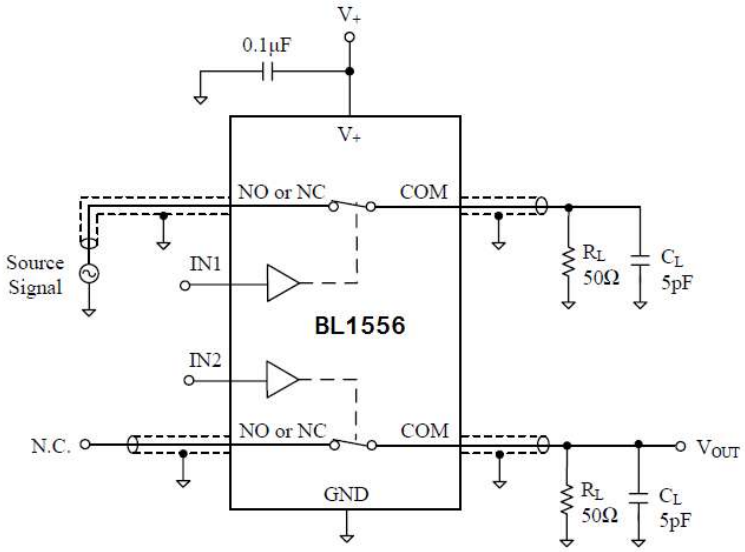
Figure3. Test Circuit for Off Isolation



Test Circuit 4. Test Circuit for Switch Times



Test Circuit 5. Test Circuit for Break-Before-Make Time Delay, t_D



Test Circuit 6. Test Circuit for Crosstalk

PACKAGE OUTLINE DIMENSIONS (MSOP10)