

## 4.5Ω Low Voltage SPDT Analog Switch

### FEATURES

- **High Bandwidth: 300MHz**
- **High Speed, Typically 30ns**
- **Supply Range: +1.8V to +5.5V**
- **Low ON-State Resistance, 4.5Ω(TYP)**
- **Break-Before-Make Switching**
- **Rail-to-Rail Operation**
- **TTL/CMOS Compatible**
- **Extended Industrial Temperature Range: -40°C to +125°C**
- **MicroSIZE PACKAGES: SOT363 (SC70-6), SOT23-6**

### DESCRIPTION

The RS2057 is a single-pole double-throw (SPDT) analog switch that is designed to operate from 1.8 V to 5.5 V.

The RS2057 device can handle both analog and digital signals. It features high-bandwidth(300MHz) and low on-resistance (4.5Ω TYP).

Applications include signal gating, chopping, modulation or demodulation (modem), and signal multiplexing for analog-to-digital and digital-to-analog conversion systems.

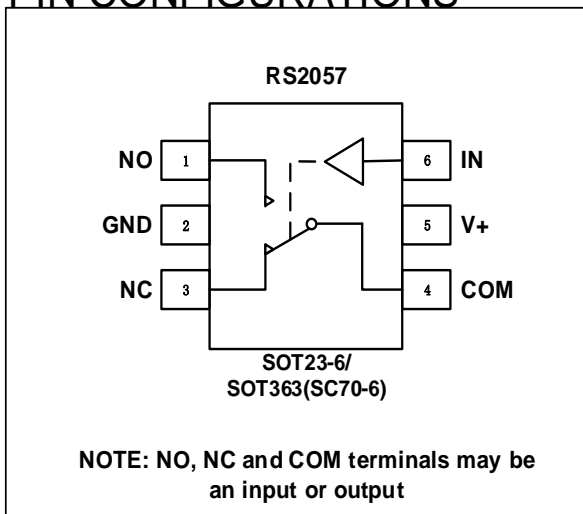
### APPLICATIONS

- **Wearable Devices**
- **Battery-Operated Equipment**
- **Signal Gating, Chopping, Modulation or Demodulation (Modem)**
- **Portable Computing**
- **Cell Phones**

### FUNCTION TABLE

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

### PIN CONFIGURATIONS



### PIN DESCRIPTION

NAME	PIN	FUNCTION
NO	1	Normally-Open Terminal
GND	2	Ground
NC	3	Normally-Closed Terminal
COM	4	Common Terminal
V+	5	Power Supply
IN	6	Digital Control Pin

### ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>

V+, IN to GND.....	-0.3V to 7.0V
Analog, Digital Voltage Range <sup>(2)</sup> .....	- 0.3 to (V+) + 0.3V
Continuous Current NO, NC, or COM.....	±300mA
Peak Current NO, NC, or COM.....	±500mA
Storage Temperature .....	-65°C to +150°C
Operating Temperature .....	-40°C to +125°C
Junction Temperature.....	150°C
Package Thermal Resistance @ T <sub>A</sub> = +25°C	
SOT23-5, SOT23-6.....	200°C/W
MSOP-10, SOIC-8 ,TSSOP-8.....	150°C/W
SOIC-14, TSSOP-14.....	100°C/W
Lead Temperature (Soldering, 10s) .....	260°C
ESD Susceptibility	
HBM .....	1000V
MM .....	100V



### ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

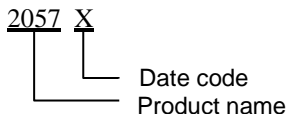
- (1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.
- (2) Input terminals are diode-clamped to the power-supply rails. Input signals that can swing more than 0.3V beyond the supply rails should be current-limited to 10mA or less.

### PACKAGE/ORDERING INFORMATION

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING	PACKAGE OPTION
RS2057	RS2057XC6	-40°C~125°C	SOT363 (SC70-6)	2057X	Tape and Reel,3000
	RS2057XH	-40°C~125°C	SOT23-6	2057	Tape and Reel,3000

NOTE: X = Date Code

### MARKING INFORMATION





**ELECTRICAL CHARACTERISTICS**

V+ = 5.0 V, TA= -40°C to 125°C (unless otherwise noted))

PARAMETER	SYMBOL	CONDITIONS	V+	TA	MIN	TYP	MAX	UNITS
<b>ANALOG SWITCH</b>								
Analog Signal Range	VNO, VNC, VCOM			FULL	0		V+	V
On-Resistance	RON	VNO or VNC = V+/2, ICOM = -10mA, Switch ON, See Figure 1	5V	+25°C		4.5	8	Ω
				FULL			8.5	Ω
			3.3V	+25°C		7	10	Ω
				FULL			10.5	Ω
On-Resistance Match Between Channels	RON	VNO or VNC = V+/2, ICOM = -10mA, Switch ON, See Figure 1	5V	+25°C		0.15	0.3	Ω
				FULL			0.4	Ω
			3.3V	+25°C		0.15	0.3	Ω
				FULL			0.4	Ω
On-Resistance Flatness	RFLAT(ON)	0 ≤ (VNO or VNC) ≤ V+/2, ICOM = -10mA, Switch ON, See Figure 1	5V	+25°C		2	3	Ω
				FULL			3.3	Ω
			3.3V	+25°C		3	4	Ω
				FULL			4.3	Ω
NC,NO OFF Leakage Current	INC(OFF), INO(OFF)	VNO or VNC = 0.3V, V+/2 VCOM = V+/2, 0.3V See Figure 2	1.8 to 5.5V	FULL			1	μA
NC,NO,COM ON Leakage Current	INC(ON), INO(ON), ICOM(ON)	VNO or VNC = 0.3V, Open VCOM = Open, 0.3V See Figure 2	1.8 to 5.5V	FULL			1	μA
<b>DIGITAL CONTROL INPUTS<sup>(1)</sup></b>								
Input High Voltage	VINH		5V	FULL	1.5			V
			3.3V	FULL	1.3			V
Input Low Voltage	VINL		5V	FULL			0.6	V
			3.3V	FULL			0.5	V
Input Leakage Current	IN	VIN = VIO or 0	1.8 to 5.5V	FULL			1	μA

(1) All unused digital inputs of the device must be held at VIO or GND to ensure proper device operation.

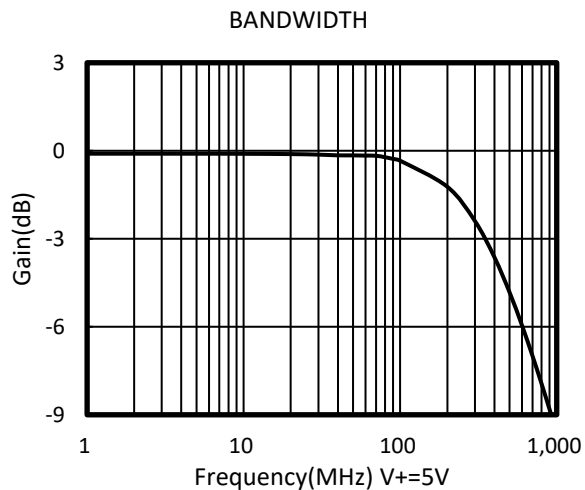
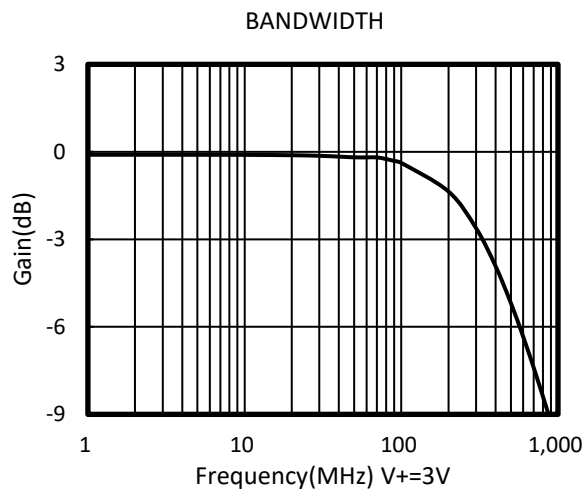


**ELECTRICAL CHARACTERISTICS (continued)**

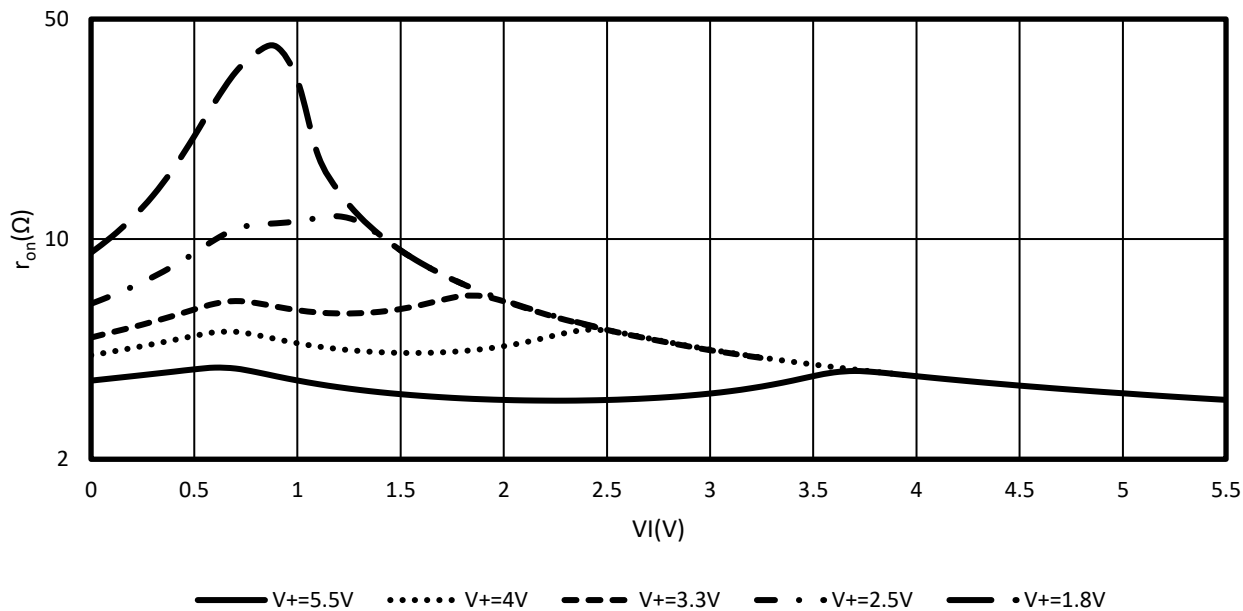
V+ = 5.0 V, TEMP= -40°C to 125°C (unless otherwise noted)

PARAMETER	SYMBOL	CONDITIONS	V+	TEMP	MIN	TYP	MAX	UNITS
<b>DYNAMIC CHARACTERISTICS</b>								
Turn-On Time	t <sub>ON</sub>	V <sub>COM</sub> = V+, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, See Figure 5	5V	+25°C		30		ns
			3.3V			40		
Turn-Off Time	t <sub>OFF</sub>	V <sub>COM</sub> = V+, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, See Figure 5	5V	+25°C		25		ns
			3.3V			30		
Break-Before-Make Time Delay	t <sub>BBM</sub>	V <sub>NO1</sub> = V <sub>NC1</sub> = V <sub>NO2</sub> = V <sub>NC2</sub> = 3V, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, See Figure 6	5V	+25°C		5		ns
			3.3V			8		
Off Isolation	O <sub>ISO</sub>	R <sub>L</sub> = 50Ω, Switch OFF, See Figure 8	f = 10MHz	+25°C		-52		dB
			f = 1MHz	+25°C		-71		dB
-3dB Bandwidth	BW	Switch ON, R <sub>L</sub> = 50Ω See Figure 7		+25°C		300		MHz
NC,NO OFF Capacitance	C <sub>NC(OFF)</sub> , C <sub>NO(OFF)</sub>	V <sub>NC</sub> or V <sub>NO</sub> =V+/2 or GND, Switch OFF See Figure 4		+25°C		5		pF
NC,NO,COM ON Capacitance	C <sub>NC(ON)</sub> , C <sub>NO(ON)</sub> , C <sub>COM(ON)</sub>	V <sub>NC</sub> or V <sub>NO</sub> =V+/2 or GND, Switch ON See Figure 4		+25°C		15		pF
<b>POWER REQUIREMENTS</b>								
Power Supply Range	V+			FULL	1.8		5.5	V
Power Supply Current	I+	V <sub>IN</sub> = GND or V+	5.5V	FULL			1	μA

### TYPICAL CHARACTERISTICS



Typical  $r_{on}$  as a Function of Input Voltage ( $V_I$ ) for  $V_I = 0$  to  $V_+$



## Parameter Measurement Information

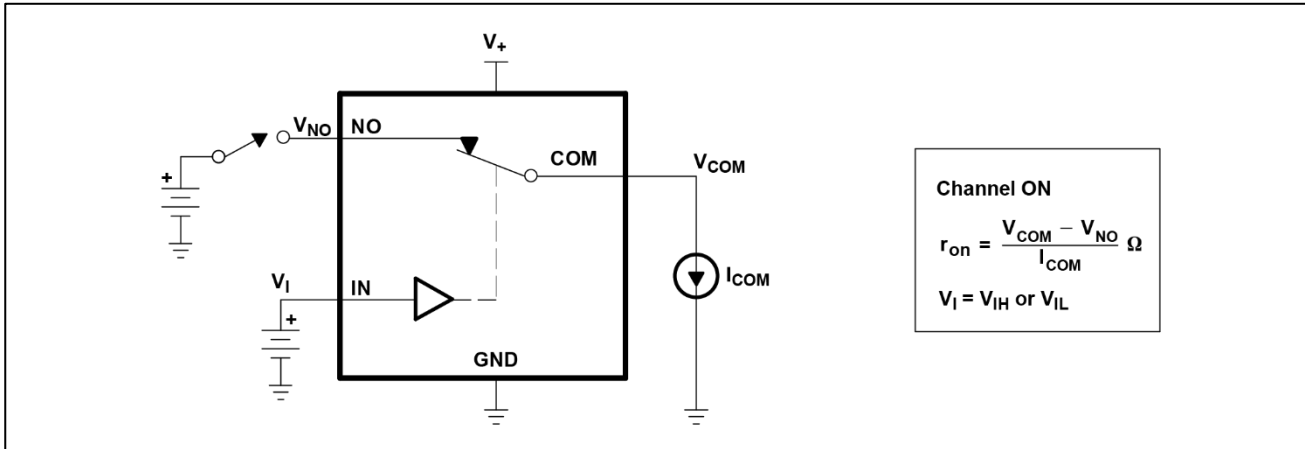


Figure 1.ON-State Resistance ( $r_{on}$ )

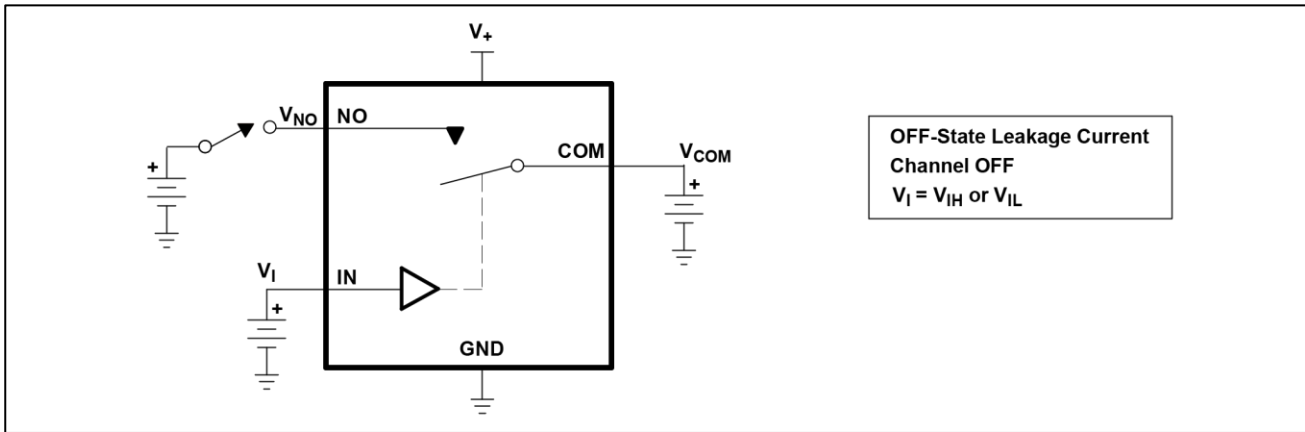


Figure 2.OFF-State Leakage Current ( $I_{COM(OFF)}$ ,  $I_{NO(OFF)}$ )

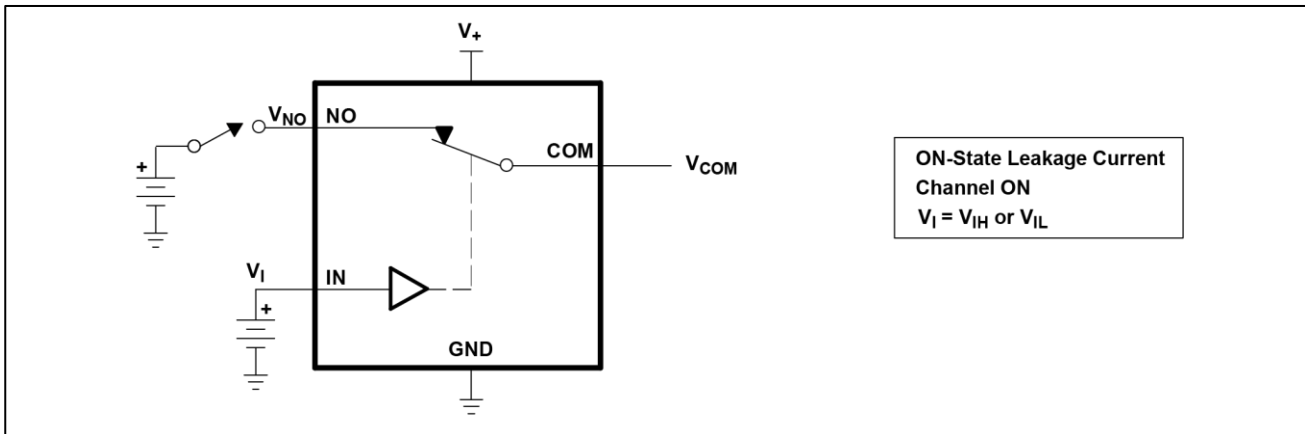


Figure 3.ON-State Leakage Current ( $I_{COM(ON)}$ ,  $I_{NO(ON)}$ )

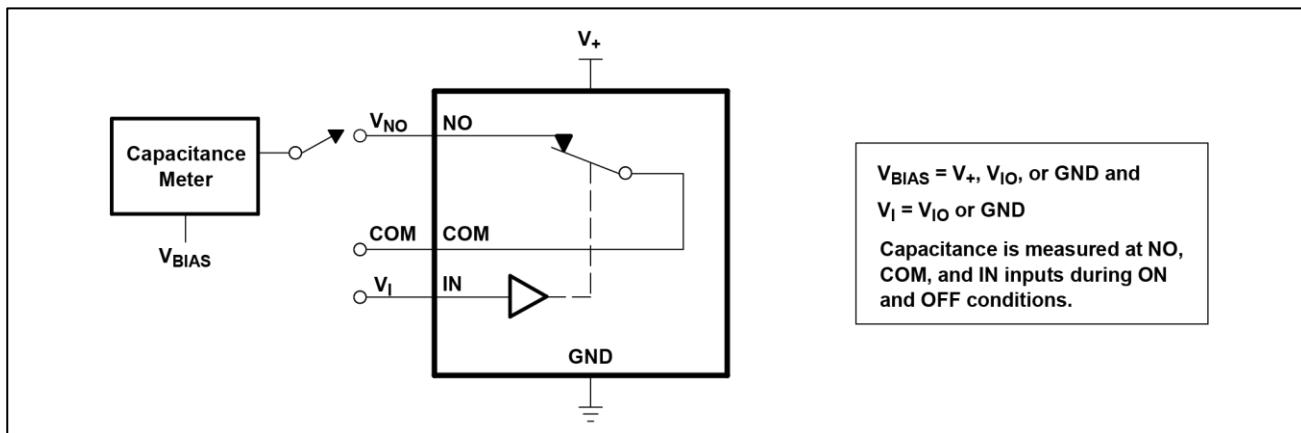


Figure 4. Capacitance ( $C_I$ ,  $C_{COM(OFF)}$ ,  $C_{COM(ON)}$ ,  $C_{NO(OFF)}$ ,  $C_{NO(ON)}$ )

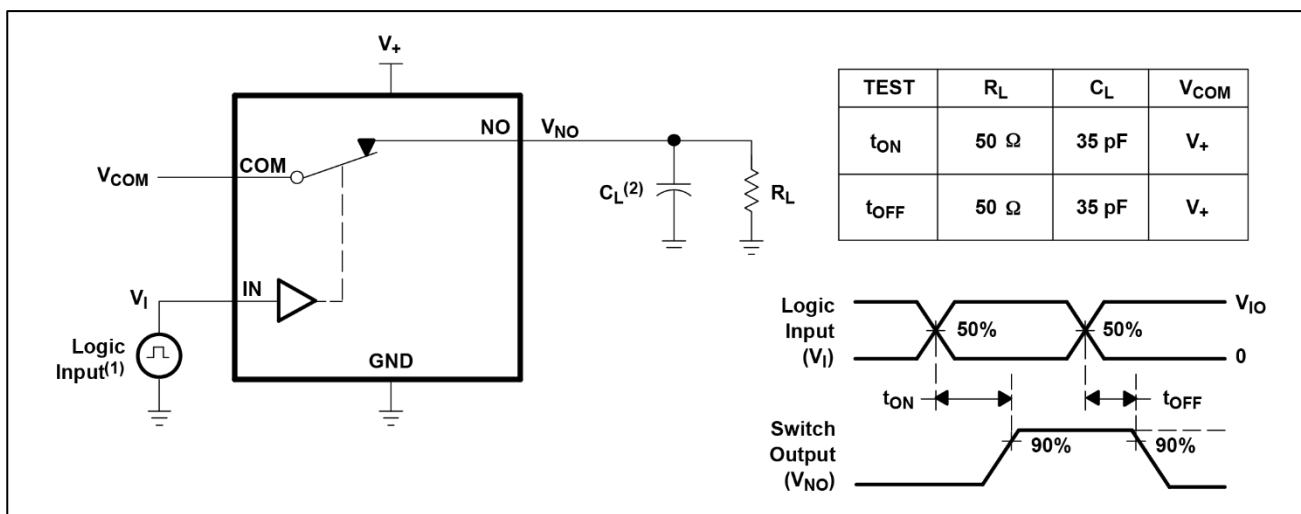


Figure 5. Turn-On ( $t_{ON}$ ) and Turn-Off Time ( $t_{OFF}$ )

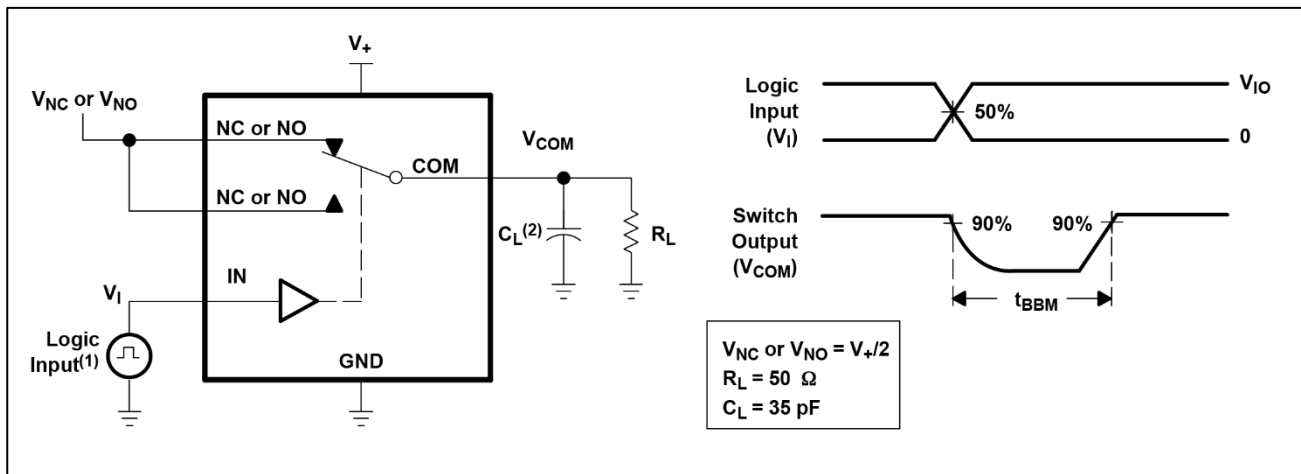


Figure 6. Break-Before-Make Time ( $t_{BBM}$ )

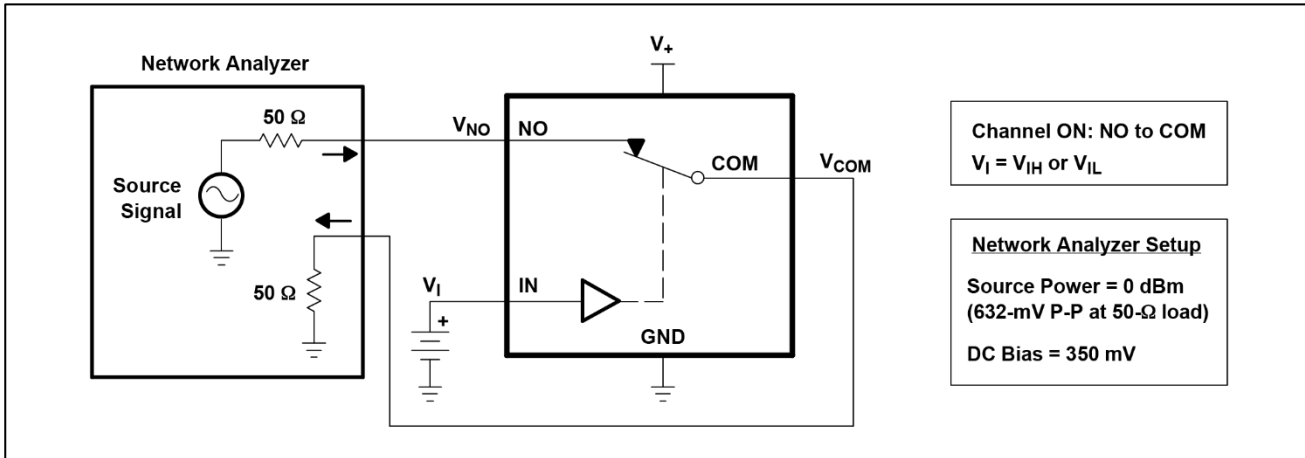


Figure 7. Bandwidth (BW)

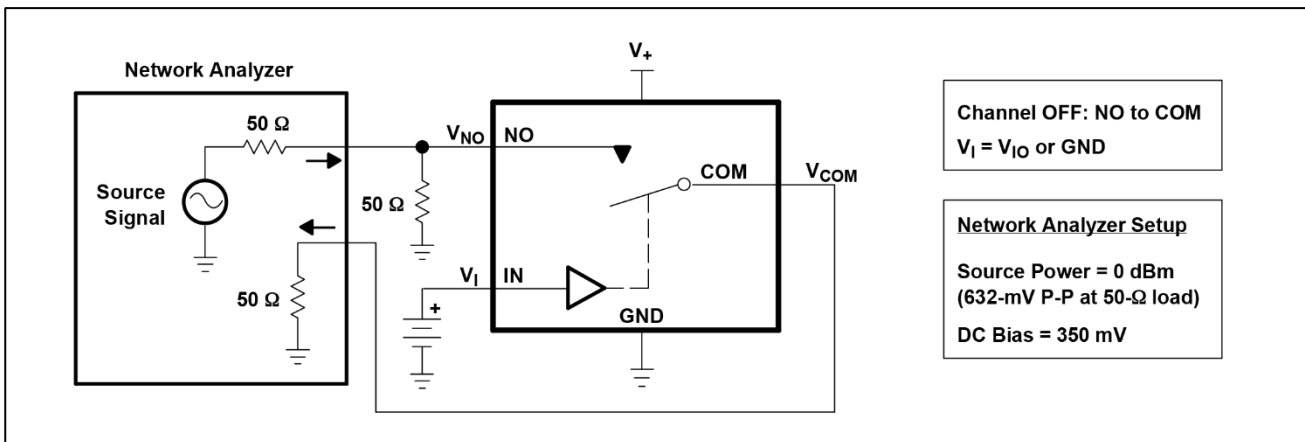


Figure 8. OFF Isolation ( $O_{iso}$ )

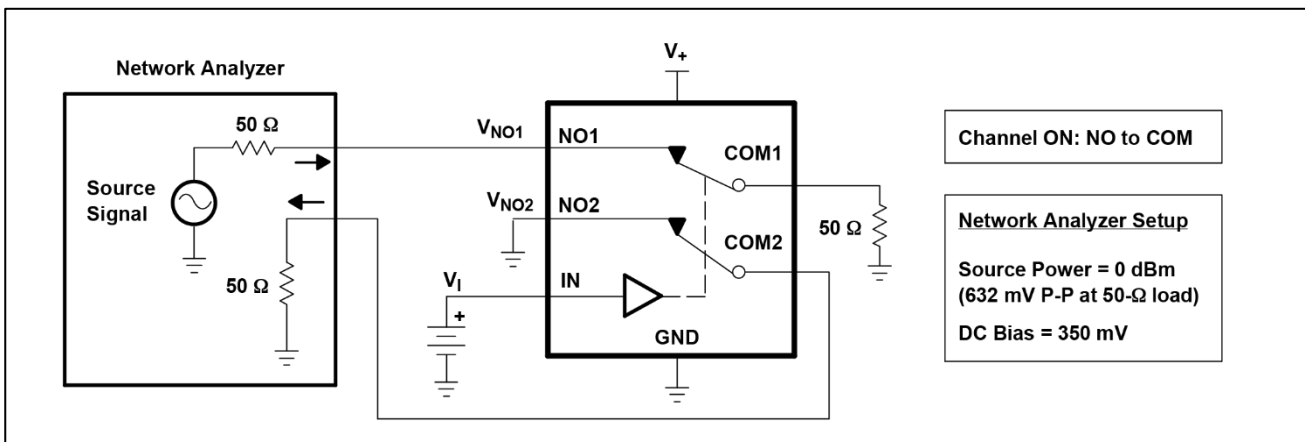


Figure 9. Crosstalk ( $X_{TALK}$ )



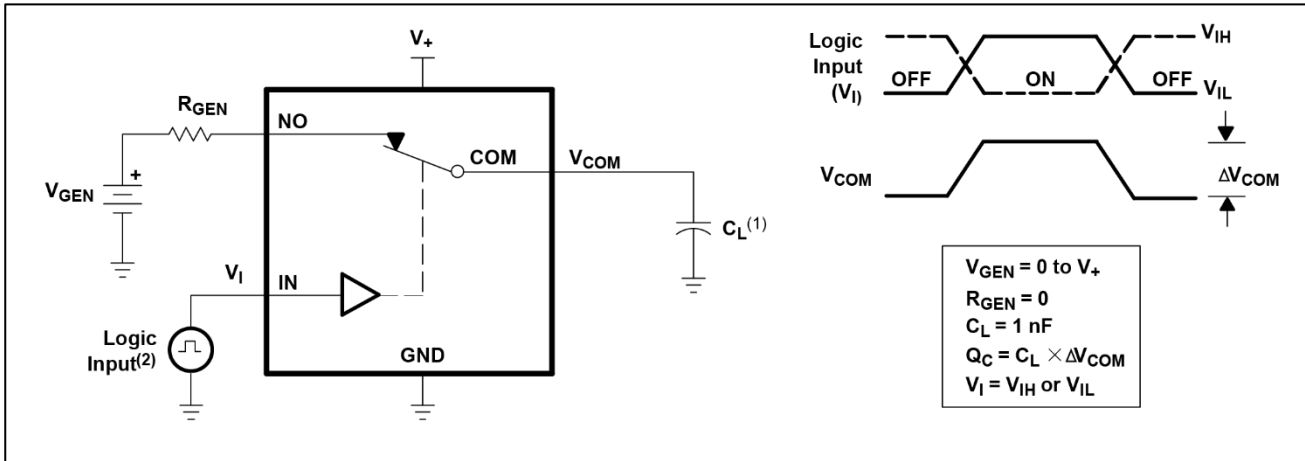


Figure 10.Charge Injection ( $Q_c$ )

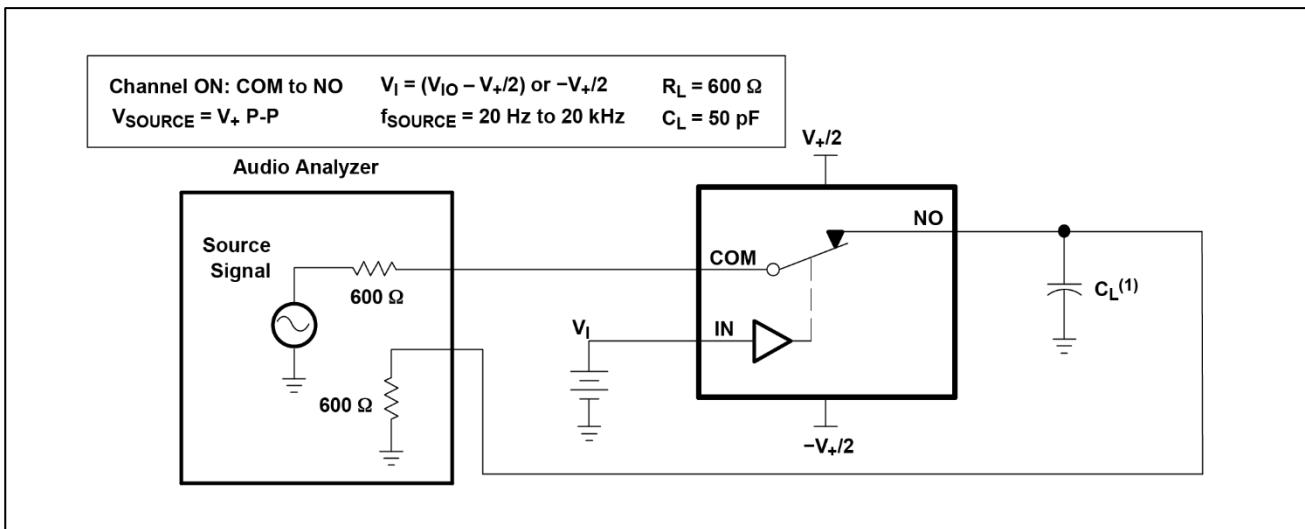
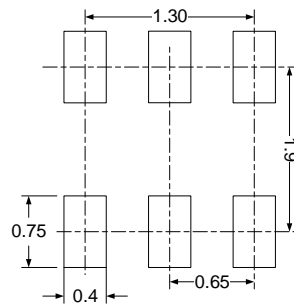
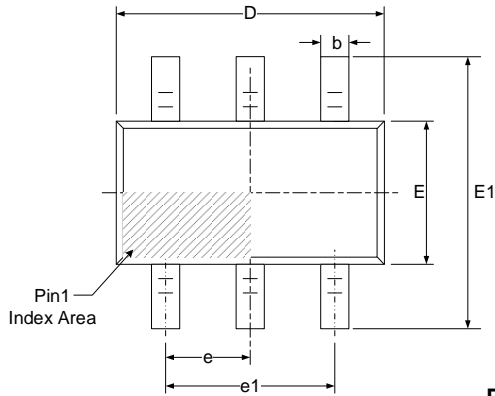


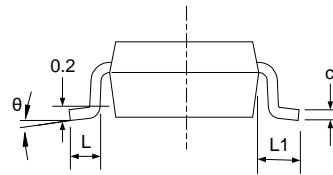
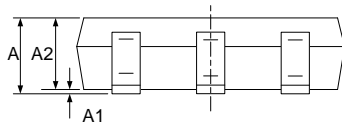
Figure11.Total Harmonic Distortion (THD)

# PACKAGE OUTLINE DIMENSIONS

## SOT363 (SC70-6)

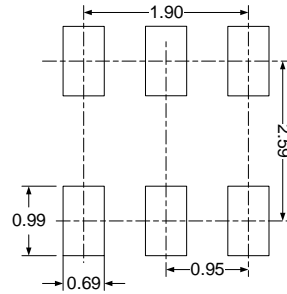
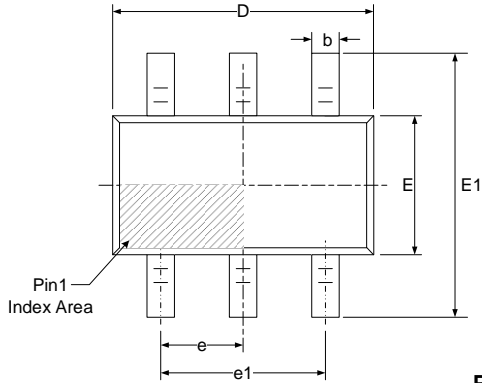


RECOMMENDED LAND PATTERN (Unit: mm)

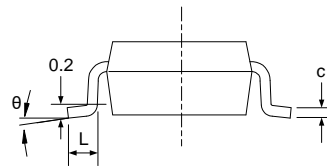
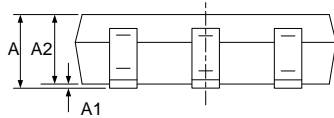


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650(BSC)		0.026(BSC)	
e1	1.300(BSC)		0.051(BSC)	
L	0.260	0.460	0.010	0.018
L1	0.525		0.021	
θ	0°	8°	0°	8°

# SOT23-6



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
$\theta$	0°	8°	0°	8°