

Ultra-Low ON-Resistance, Low Voltage, SPDT Analog Switch

FEATURES

- **-3dB Bandwidth: 30MHz**
- **High Speed, Typically 50ns**
- **Supply Range: +1.8V to +5.5V**
- **Low ON-State Resistance, 0.6Ω(TYP)**
- **Break-Before-Make Switching**
- **Rail-to-Rail Operation**
- **TTL/CMOS Compatible**
- **Extended Industrial Temperature Range: -40°C to +125°C**
- **Micro SIZE PACKAGES: SOT363 (SC70-6), SOT23-6**

DESCRIPTION

The RS2257 is a single-pole double-throw (SPDT) analog switch that is designed to operate from 1.8 V to 5.5 V.

The RS2257 device can handle both analog and digital signals. It features fast switching speeds (50ns) and low on-resistance (0.6Ω 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**

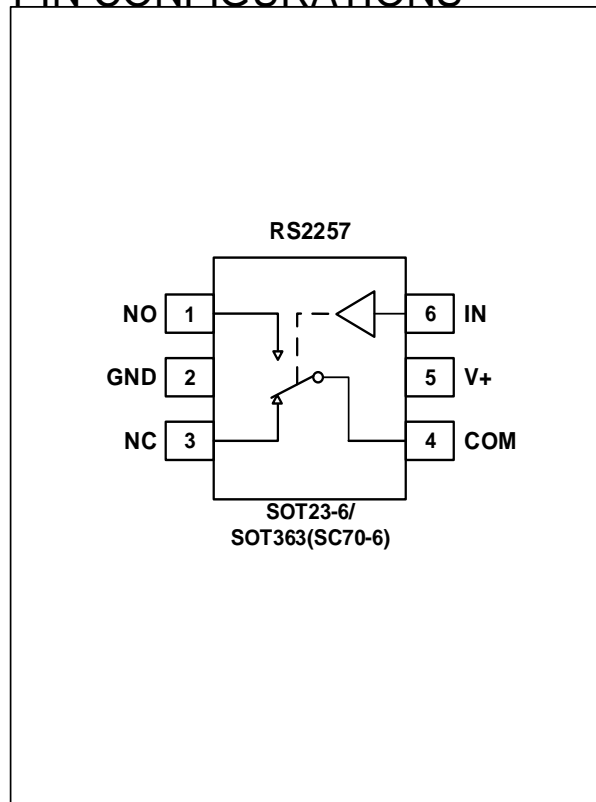
FUNCTION TABLE

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

PIN 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

PIN CONFIGURATIONS



SPECIFICATIONS

Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted) ⁽¹⁾

SYMBOL	PARAMETER	MIN	MAX	UNIT
V ₊	Supply Voltage	-0.3	6	V
V _{IN}	Input Voltage (All inputs)	-0.3	(V ₊)+0.3	
I _{IN}	Continuous Current NO, NC, or COM	-500	+500	mA
I _{PEAK}	Peak Current NO, NC, or COM	-800	+800	
T _J	Junction Temperature		150	°C
T _{stg}	Storage temperature	-65	+150	

(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.

ESD Ratings

		VALUE	UNIT	
V _(ESD)	Electrostatic discharge	Human-body model (HBM)	±1000	V
		Machine Model (MM)	±100	V

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted) ⁽³⁾

SYMBOL	PARAMETER	MIN	MAX	UNIT
V _{CC}	Supply Voltage	1.8	5.5	V
T _A	Operating temperature	-40	+125	°C

Thermal Information

THERMAL METRIC		RS2257		UNIT
		6 PINS		
		SOT23-6	SOT363(SC70-6)	
R _{θJA}	Junction-to-ambient thermal resistance	200	250	°C/W

PACKAGE/ORDERING INFORMATION

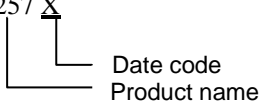
PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING ^(1/2)	PACKAGE OPTION
RS2257	RS2257XC6	-40°C~125°C	SOT363 (SC70-6)	2257 <u>X</u>	Tape and Reel,3000
	RS2257XH	-40°C~125°C	SOT23-6	2257	Tape and Reel,3000

NOTE:

- (1) There may be additional marking, which relates to the lot trace code information(data code and vendor code), the logo or the environmental category on the device.
- (2) X = Date Code

MARKING INFORMATION

2257 X



ELECTRICAL CHARACTERISTICS

$V_+ = 5.0\text{ V}$, $T_A = -40^\circ\text{C}$ to 125°C (unless otherwise noted)

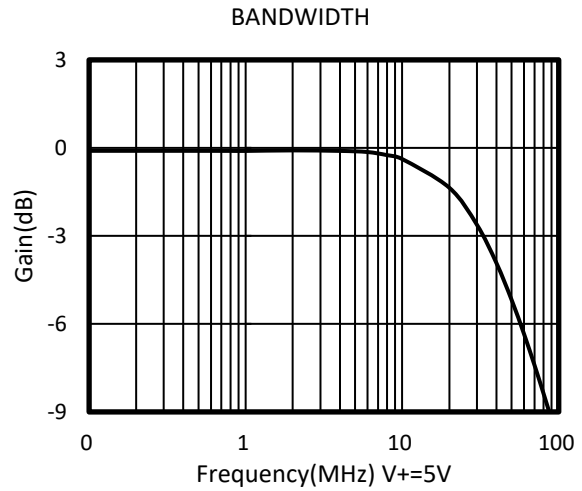
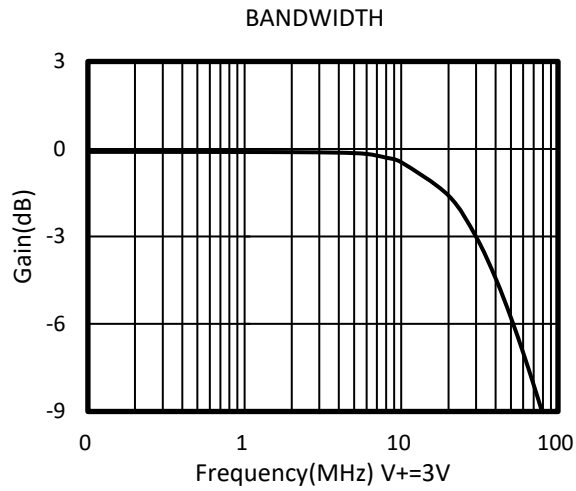
PARAMETER	SYMBOL	CONDITIONS	V+	T _A	MIN	TYP	MAX	UNITS
ANALOG SWITCH								
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}			FULL	0		V_+	V
On-Resistance	R_{ON}	$0 \leq (V_{NO} \text{ or } V_{NC}) \leq V_+$, $I_{COM} = -10\text{mA}$, Switch ON, See Figure 1	5V	+25°C		0.6	1.0	Ω
				FULL			1.2	Ω
			3.3V	+25°C		1.0	1.5	Ω
				FULL			1.7	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$0 \leq (V_{NO} \text{ or } V_{NC}) \leq V_+$, $I_{COM} = -10\text{mA}$, Switch ON, See Figure 1	5V	+25°C		0.04	0.1	Ω
				FULL			0.12	Ω
			3.3V	+25°C		0.04	0.1	Ω
				FULL			0.12	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$0 \leq (V_{NO} \text{ or } V_{NC}) \leq V_+$, $I_{COM} = -10\text{mA}$, Switch ON, See Figure 1	5V	+25°C		0.18	0.3	Ω
				FULL			0.4	Ω
			3.3V	+25°C		0.54	0.7	Ω
				FULL			0.8	Ω
NC,NO OFF Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_{NO} \text{ or } V_{NC} = 0.3\text{V}$, $V_+/2$ $V_{COM} = V_+/2$, 0.3V See Figure 2	1.8 to 5.5V	FULL			1	μA
NC,NO,COM ON Leakage Current	$I_{NC(ON)}, I_{NO(ON)}, I_{COM(ON)}$	$V_{NO} \text{ or } V_{NC} = 0.3\text{V}$, Open $V_{COM} =$ Open, 0.3V See Figure 2	1.8 to 5.5V	FULL			1	μA
DIGITAL CONTROL INPUTS⁽¹⁾								
Input High Voltage	V_{INH}		5V	FULL	1.5			V
			3.3V	FULL	1.3			V
Input Low Voltage	V_{INL}		5V	FULL			0.6	V
			3.3V	FULL			0.5	V
Input Leakage Current	I_{IN}	$V_{IN} = V_{IO} \text{ or } 0$	1.8 to 5.5V	FULL			1	μA

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

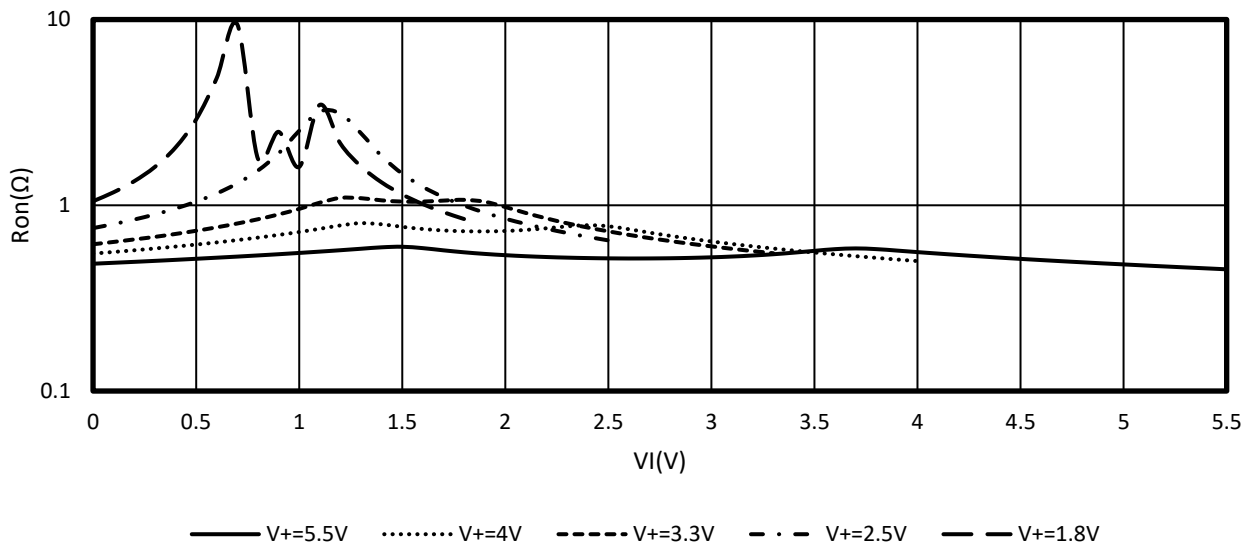
ELECTRICAL CHARACTERISTICS (continued)
 $V_+ = 5.0\text{ V}$, TEMP= -40°C to 125°C (unless otherwise noted)

PARAMETER	SYMBOL	CONDITIONS	V+	TEMP	MIN	TYP	MAX	UNITS
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	$V_{COM} = V_+$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, See Figure 5	5V	+25°C		50		ns
			3.3V			50		
Turn-Off Time	t_{OFF}	$V_{COM} = V_+$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, See Figure 5	5V	+25°C		15		ns
			3.3V			17		
Break-Before-Make Time Delay	t_{BBM}	$V_{NO1} = V_{NC1} = V_{NO2} = V_{NC2} = 3\text{V}$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, See Figure 6	5V	+25°C		10		ns
			3.3V			11		
Off Isolation	O_{ISO}	$R_L = 50\Omega$, Switch OFF, See Figure 8	f = 100KHz	+25°C		-68		dB
			f = 10KHz	+25°C		-86		dB
-3dB Bandwidth	BW	Switch ON, $R_L = 50\Omega$ See Figure 7		+25°C		30		MHz
NC,NO OFF Capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or $V_{NO}=V_+/2$ or GND, Switch OFF See Figure 4		+25°C		80		pF
NC,NO,COM ON Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	V_{NC} or $V_{NO}=V_+/2$ or GND, Switch ON See Figure 4		+25°C		350		pF
POWER REQUIREMENTS								
Power Supply Range	V_+			FULL	1.8		5.5	V
Power Supply Current	I_+	$V_{IN} = \text{GND}$ or V_+	5.5V	FULL			1	μA

TYPICAL CHARACTERISTICS



Typical ron as a Function of Input Voltage (VI) for VI = 0 to V+



Parameter Measurement Information

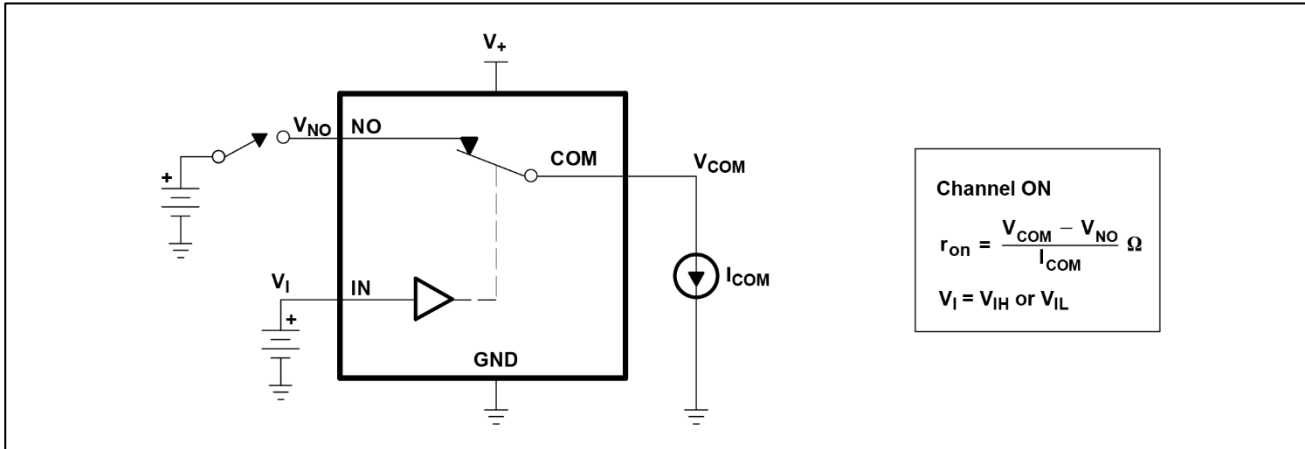


Figure 1.ON-State Resistance (r_{on})

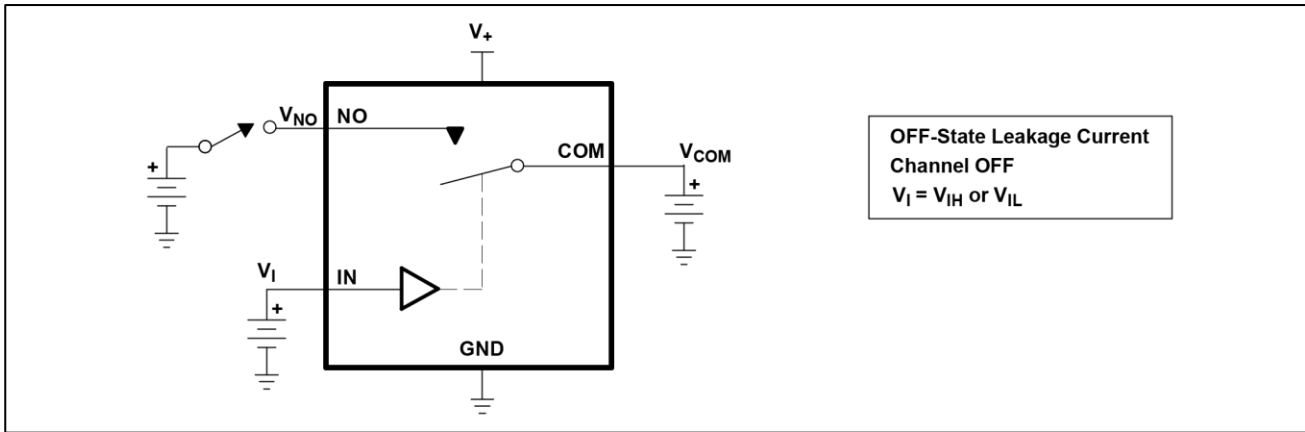


Figure 2.OFF-State Leakage Current ($I_{COM(OFF)}$, $I_{NO(OFF)}$)

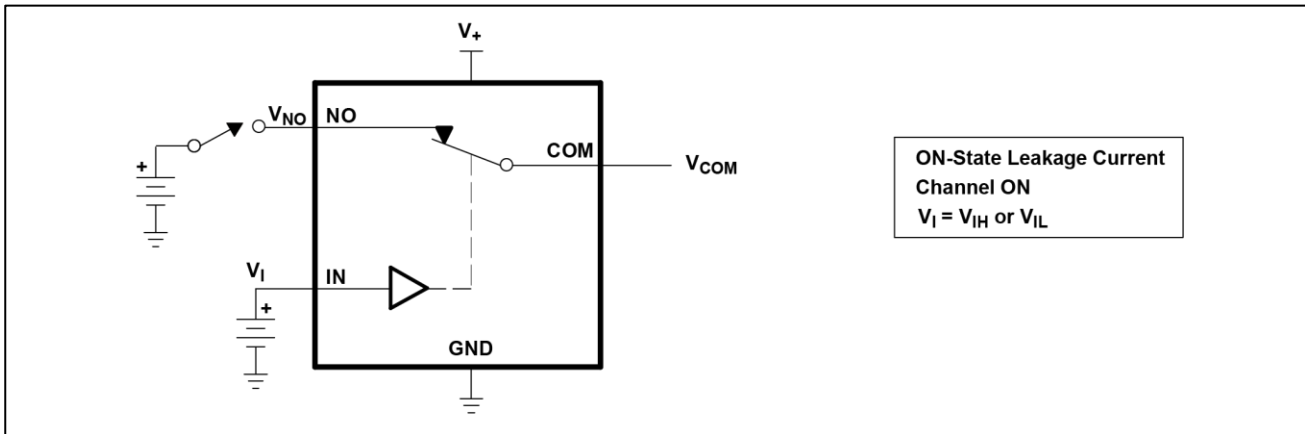


Figure 3.ON-State Leakage Current ($I_{COM(ON)}$, $I_{NO(ON)}$)

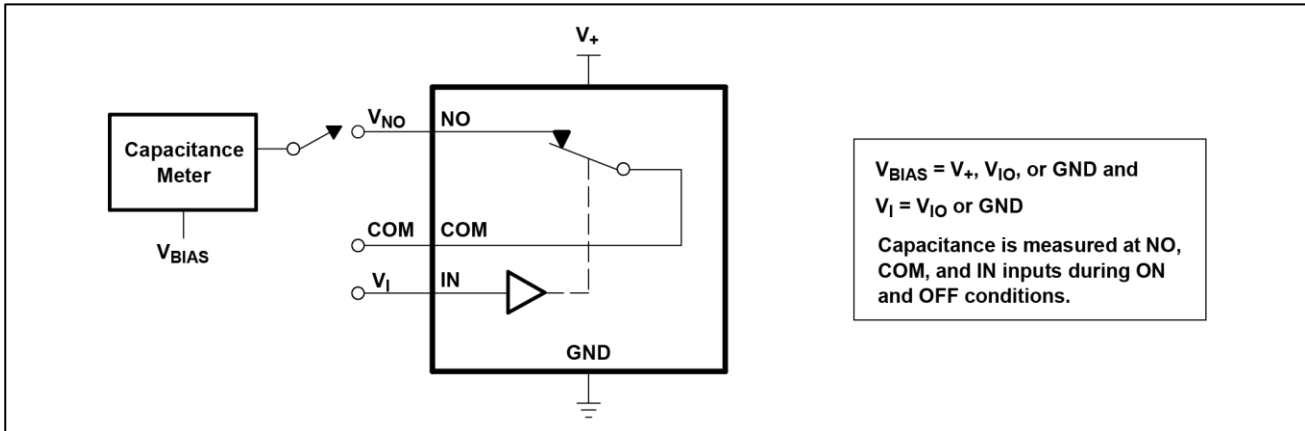


Figure 4. Capacitance (C_I , $C_{COM(OFF)}$, $C_{COM(ON)}$, $C_{NO(OFF)}$, $C_{NO(ON)}$)

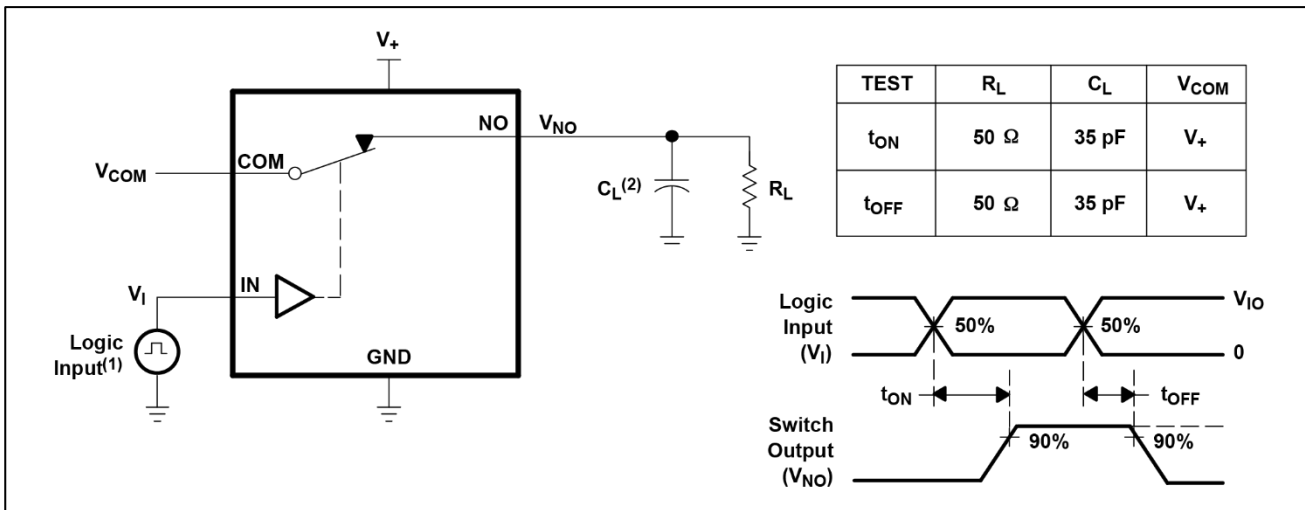


Figure 5. Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})

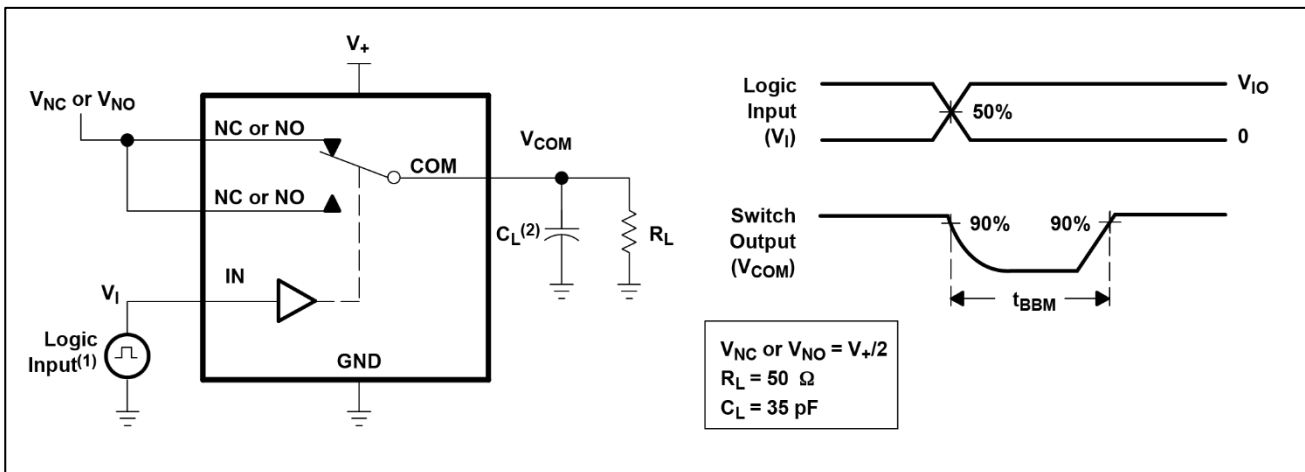


Figure 6. Break-Before-Make Time (t_{BBM})

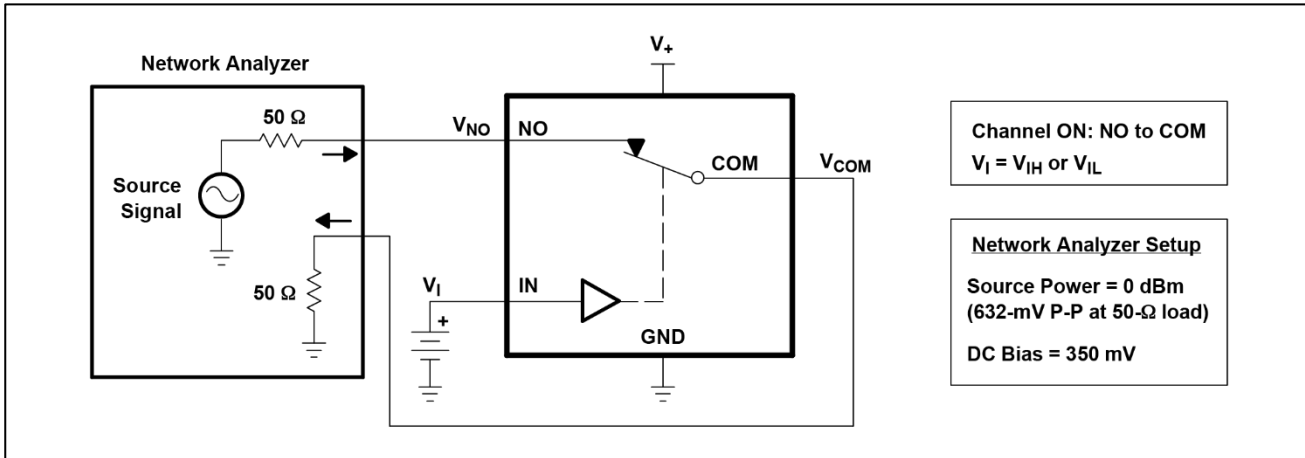


Figure 7. Bandwidth (BW)

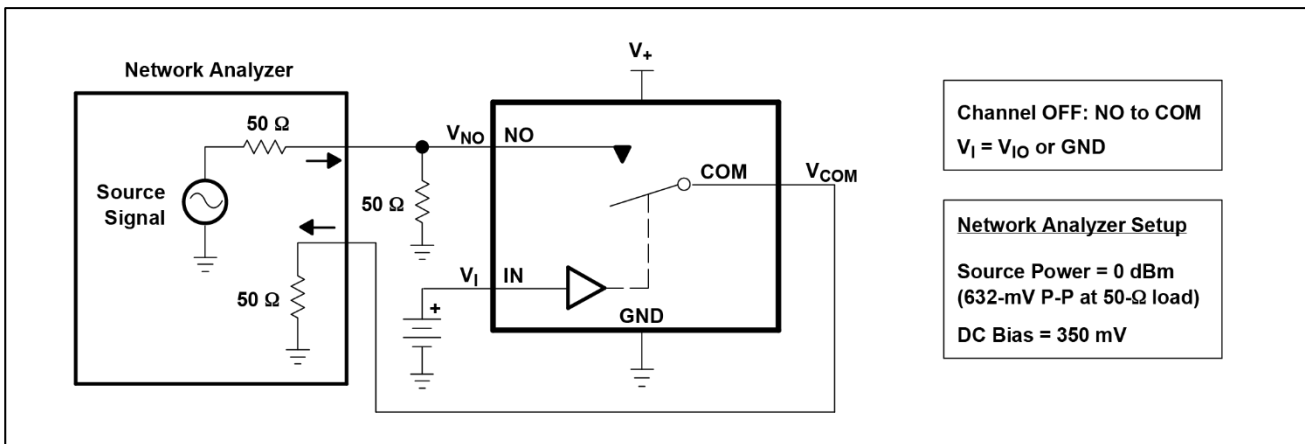


Figure 8. OFF Isolation (O_{Iso})

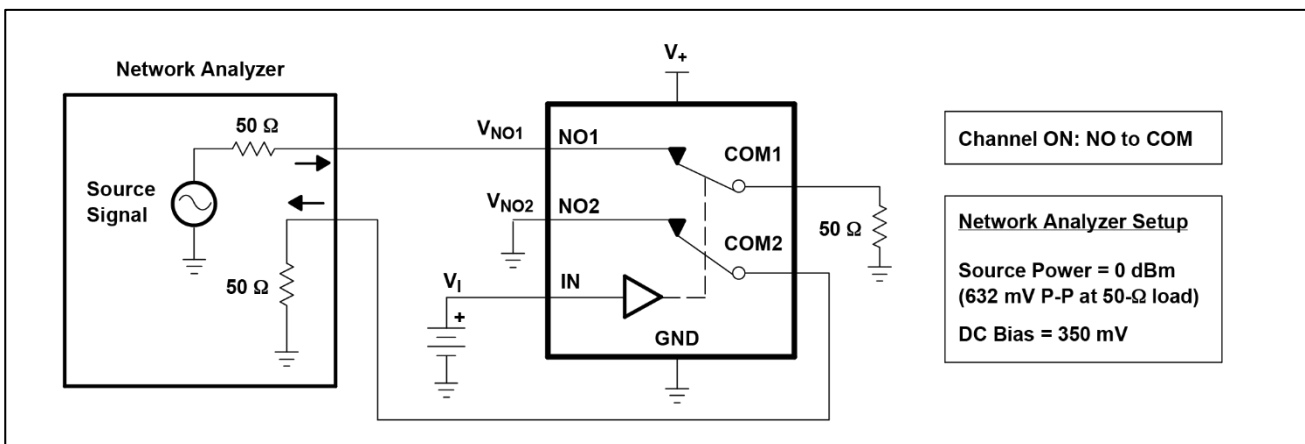


Figure 9. Crosstalk (X_{TALK})

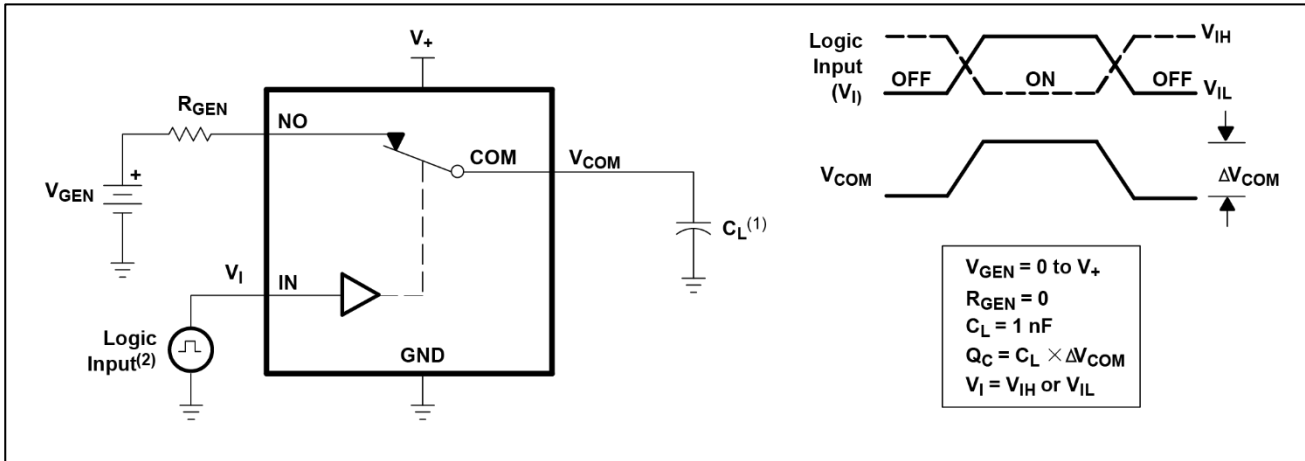


Figure 10. Charge Injection (Q_C)

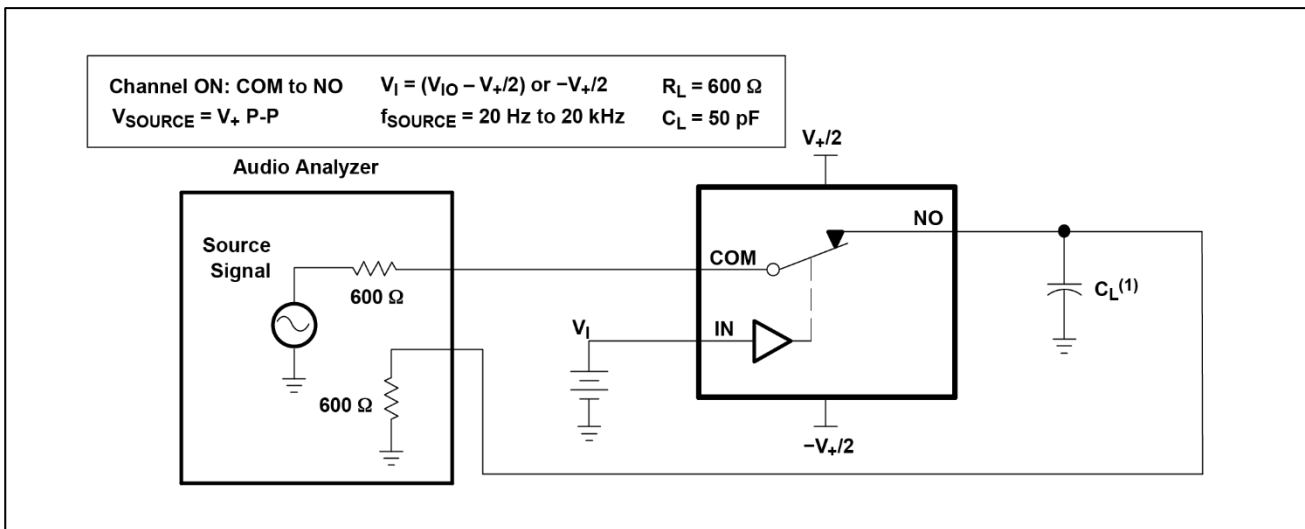
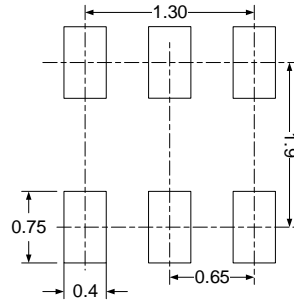
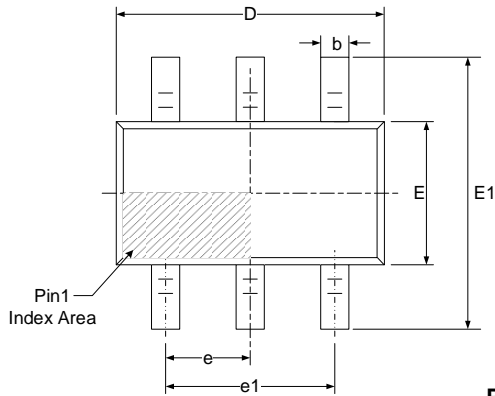
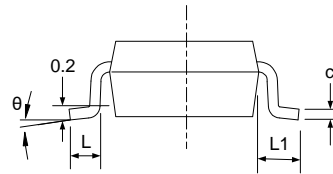
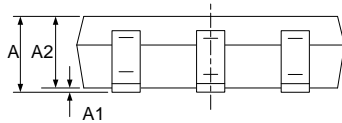


Figure 11. Total Harmonic Distortion (THD)

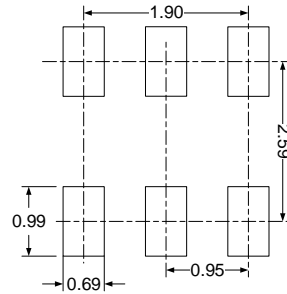
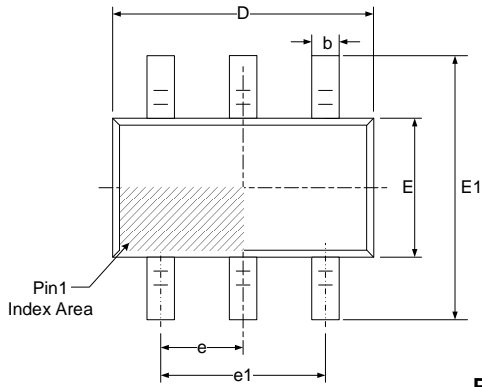
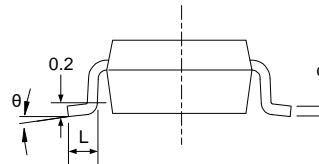
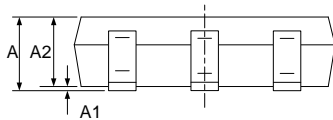
PACKAGE OUTLINE DIMENSIONS

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
θ	0°	8°	0°	8°