

Low ON-Resistance, Low Voltage, SPDT Analog Switch

FEATURES

- **-3dB Bandwidth: 120MHz**
- **High Speed, Typically 29ns**
- **Supply Range: +1.8V to +5.5V**
- **Low ON-State Resistance, 3.0Ω(TYP)**
- **Break-Before-Make Switching**
- **Rail-to-Rail Operation**
- **TTL/CMOS Compatible**
- **MicroSIZE PACKAGE: SOT363(SC70-6)**
- **Extended Industrial Temperature Range: -40°C to +125°C**

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

DESCRIPTION

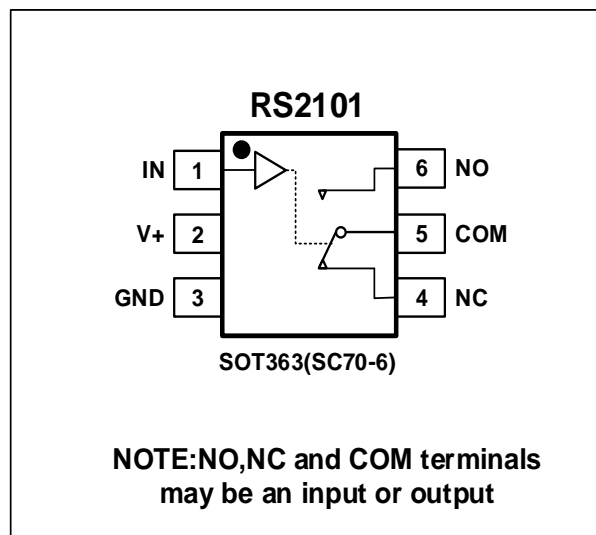
The RS2101 is a low on-resistance, single-pole double-throw (SPDT) analog switch that is designed to operate from 1.8 V to 5.5 V.

The RS2101 device can handle both analog and digital signals. It features fast switching speeds ($t_{ON} = 29ns$, $t_{OFF} = 17ns$) and low on-resistance (3.0Ω TYP).

These features make this device suitable for a wide variety of portable applications including cell phones, audio devices, and instrumentation.

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

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	6.0	V
V _{IN}	Input Voltage ⁽²⁾	-0.3	6.0	
	Analog, Digital Voltage Range	-0.3	(V ₊)+0.3	
	Continuous Current NO, NC, or COM	-300	+300	mA
I _{PEAK}	Peak Current NO, NC, or COM	-500	+500	
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.

(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.

ESD Ratings

		VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human-body model (HBM)	±3000
		Machine Model (MM)	±200

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		RS2101	UNIT
		6 PINS	
		SOT363(SC70-6)	
R _{θJA}	Junction-to-ambient thermal resistance	250	°C/W

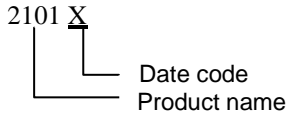
PACKAGE/ORDERING INFORMATION

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING ^(1/2)	PACKAGE OPTION
RS2101	RS2101XC6	-40°C~125°C	SOT363 (SC70-6)	2101 <u>X</u>	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



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		3.0	4.0	Ω
				FULL			5.0	Ω
			3.3V	+25°C		5.5	7.0	Ω
				FULL			7.5	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		0.1	0.8	Ω
				FULL			0.9	Ω
			3.3V	+25°C		0.1	0.8	Ω
				FULL			0.9	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		0.7	0.85	Ω
				FULL			0.95	Ω
			3.3V	+25°C		2.5	3.0	Ω
				FULL			3.2	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

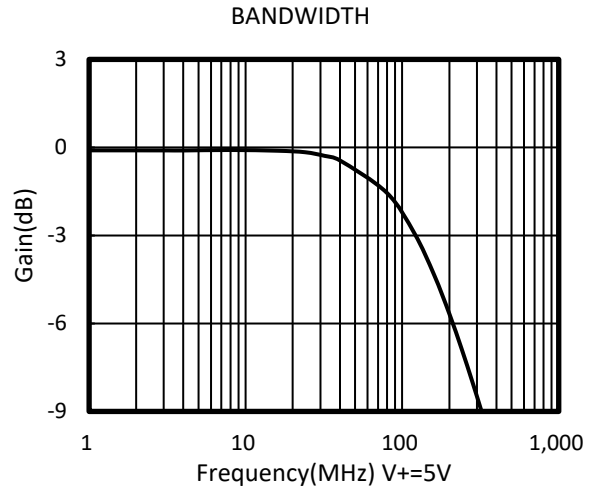
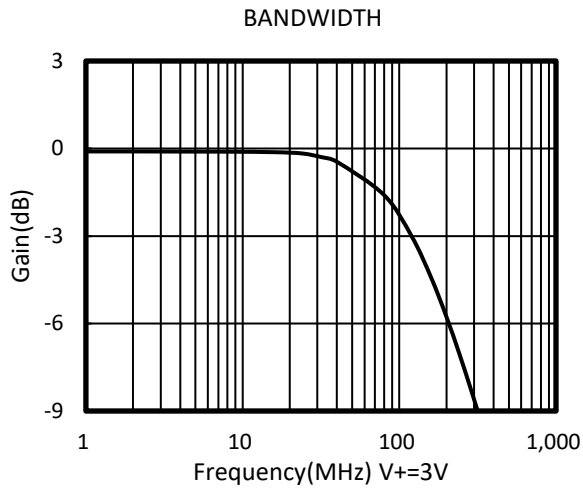
(1) All unused digital inputs of the device must be held at V_{IO} or GND to ensure proper device operation.

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

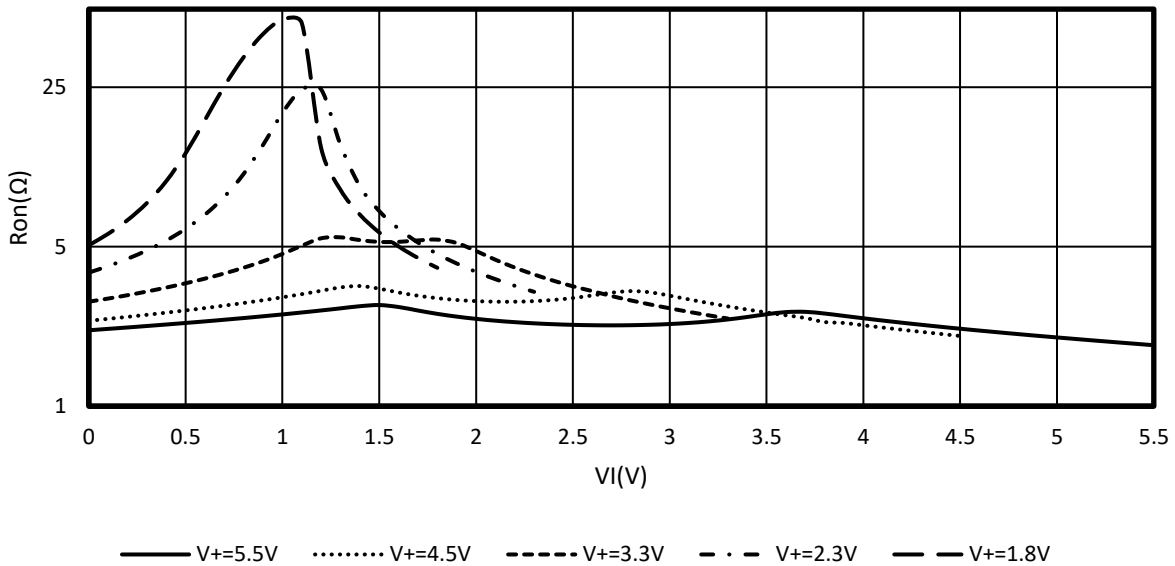
PARAMETER	SYMBOL	CONDITIONS	V+	TEMP	MIN	TYP	MAX	UNITS
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	$V_{COM} = V_+$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, See Figure 5	5V	+25°C		29		ns
			3.3V			33		
Turn-Off Time	t_{OFF}	$V_{COM} = V_+$, $R_L = 300\Omega$, $C_L = 35\text{pF}$, See Figure 5	5V	+25°C		17		ns
			3.3V			18		
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 = 10MHz	+25°C		-43		dB
			f = 1MHz	+25°C		-67		dB
-3dB Bandwidth	BW	Switch ON, $R_L = 50\Omega$ See Figure 7		+25°C		120		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		15		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		50		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

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



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



Parameter Measurement Information

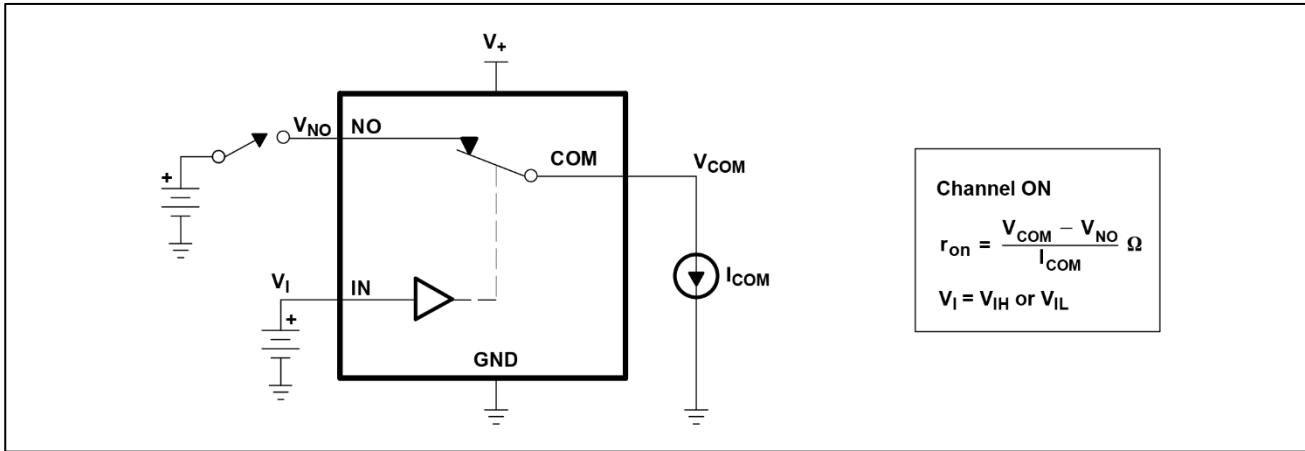


Figure 1.ON-State Resistance (r_{on})

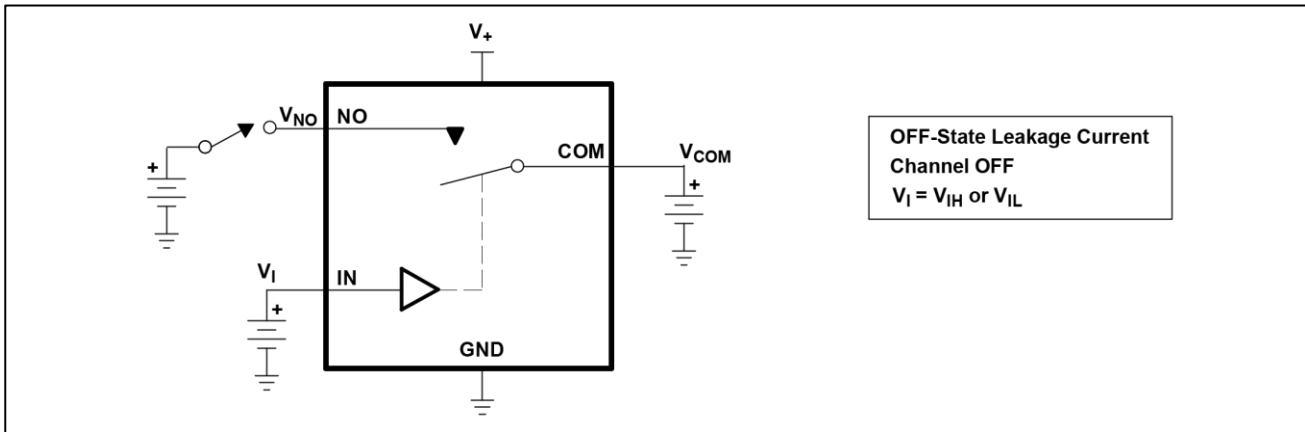


Figure 2.OFF-State Leakage Current ($I_{COM(OFF)}$, $I_{NO(OFF)}$)

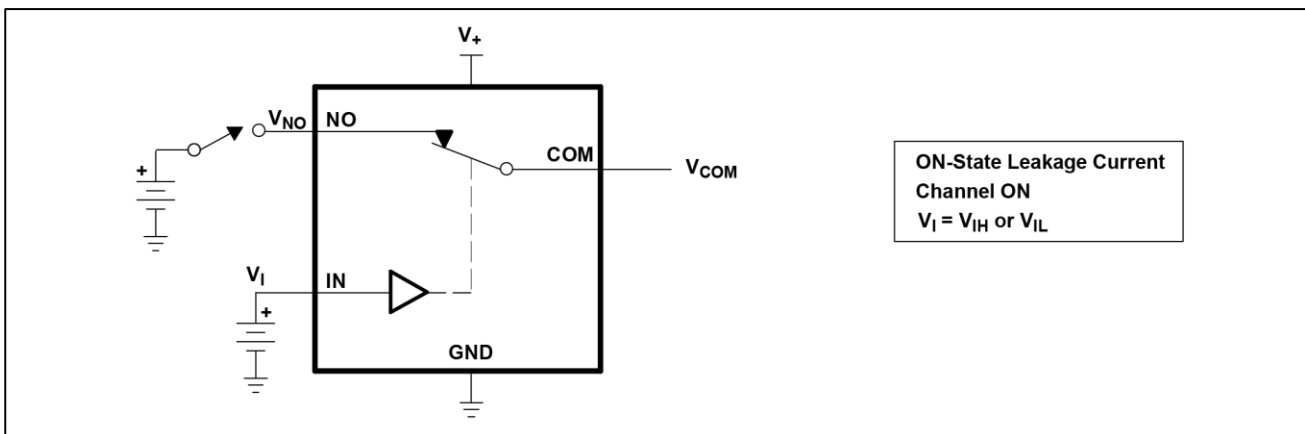


Figure 3.ON-State Leakage Current ($I_{COM(ON)}$, $I_{NO(ON)}$)

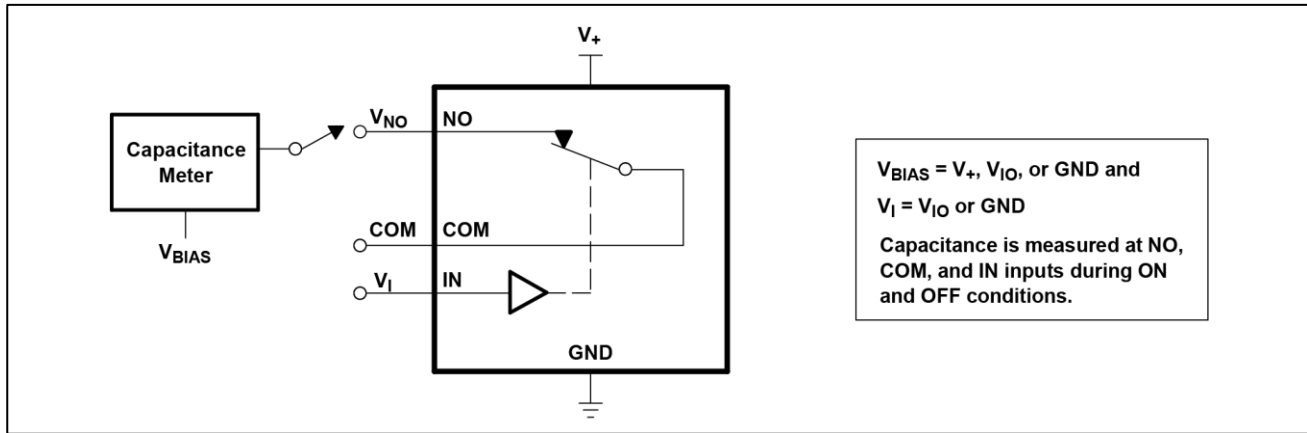


Figure 4. Capacitance (C_I , $C_{COM(OFF)}$, $C_{COM(ON)}$, $C_{NO(OFF)}$, $C_{NO(ON)}$)

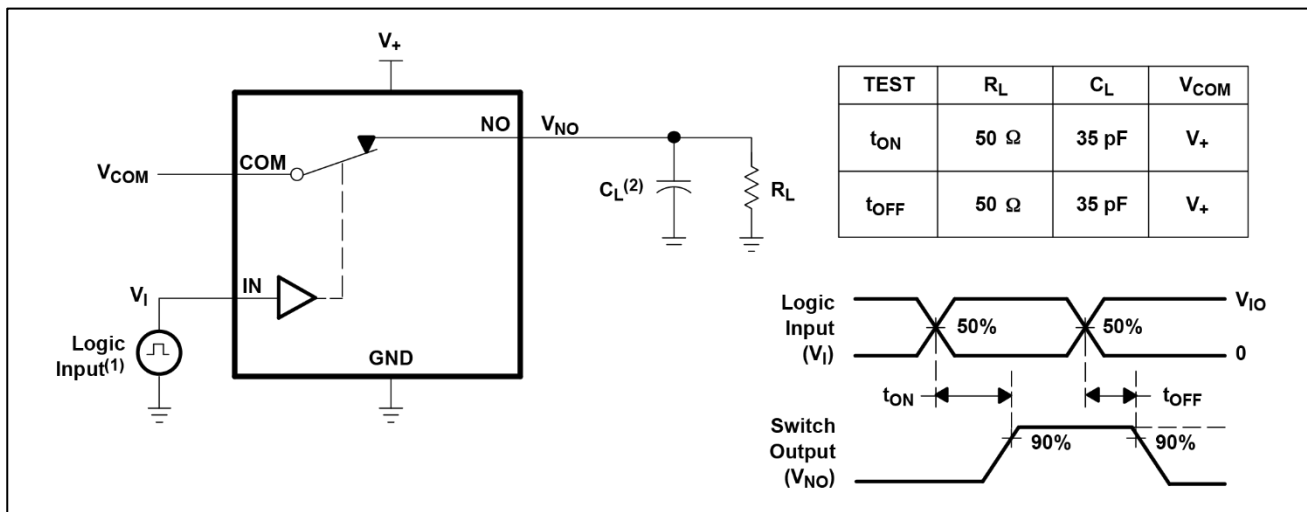


Figure 5. Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})

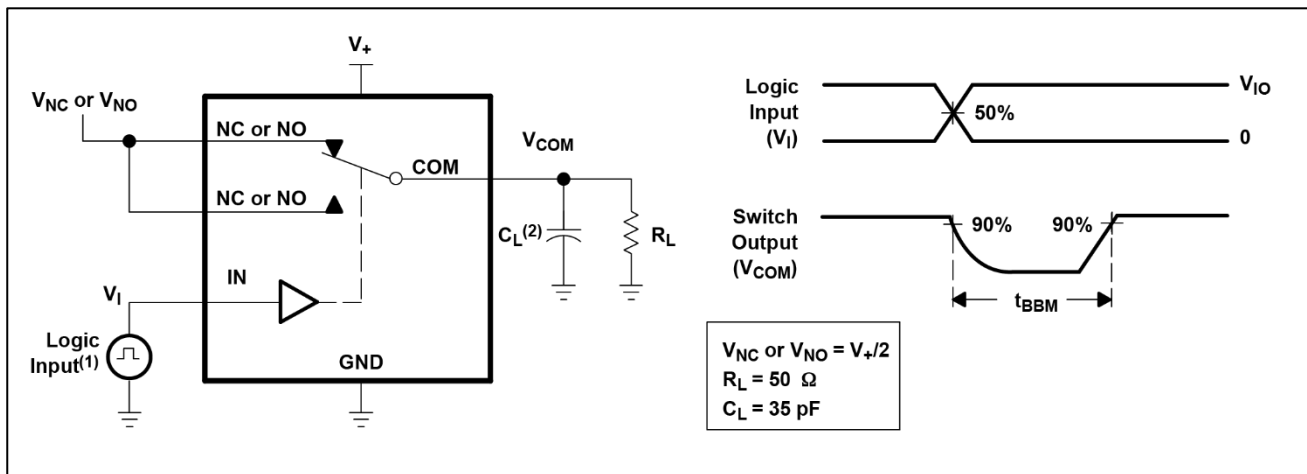


Figure 6. Break-Before-Make Time (t_{BBM})

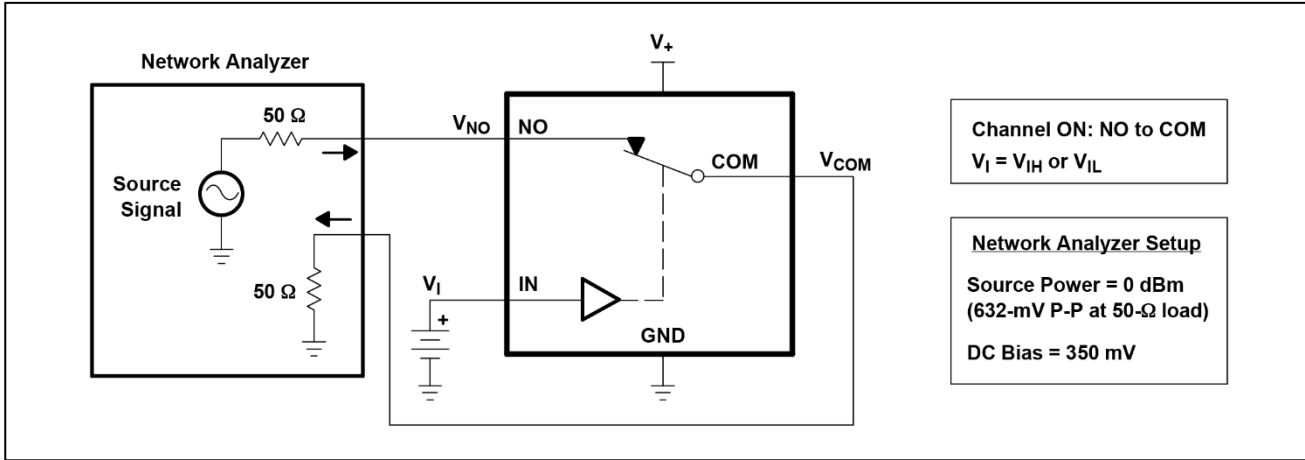


Figure 7. Bandwidth (BW)

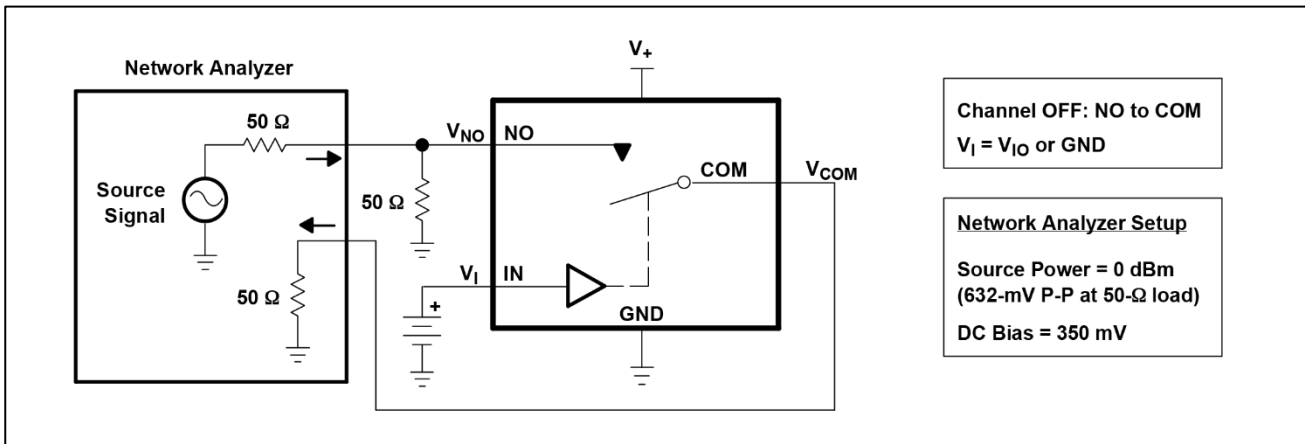


Figure 8. OFF Isolation (O_{iso})

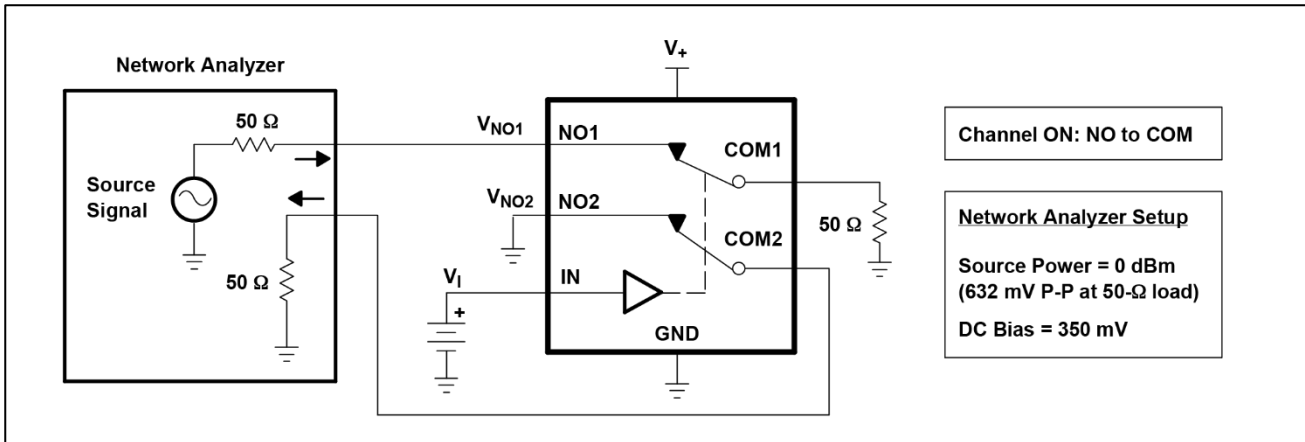


Figure 9. Crosstalk (X_{TALK})

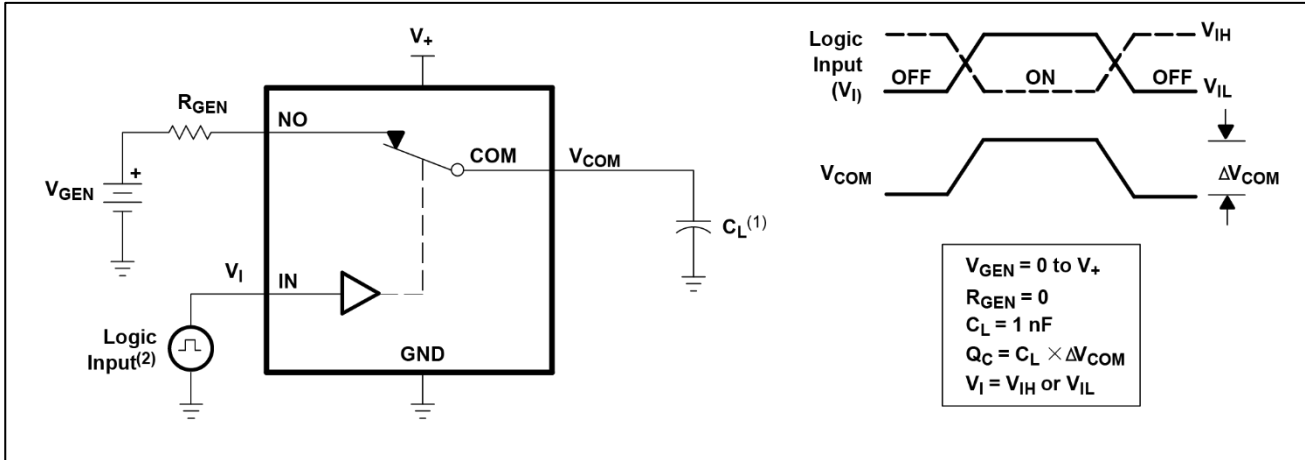


Figure 10. Charge Injection (Q_c)

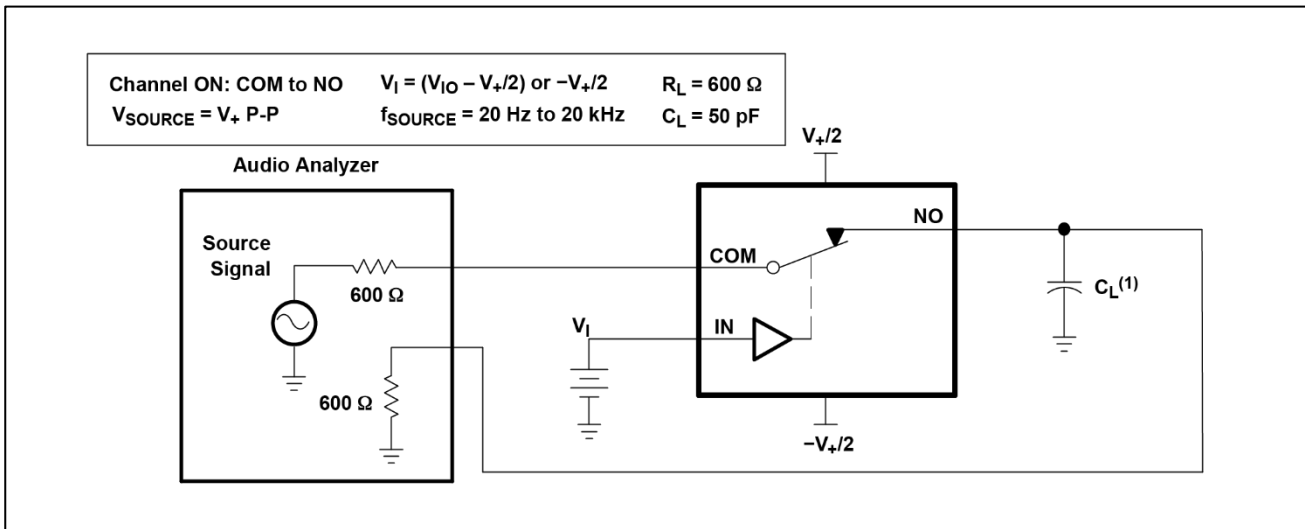
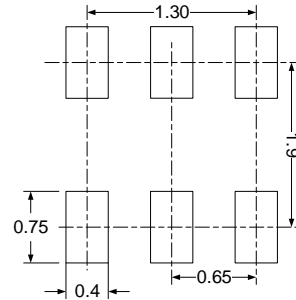
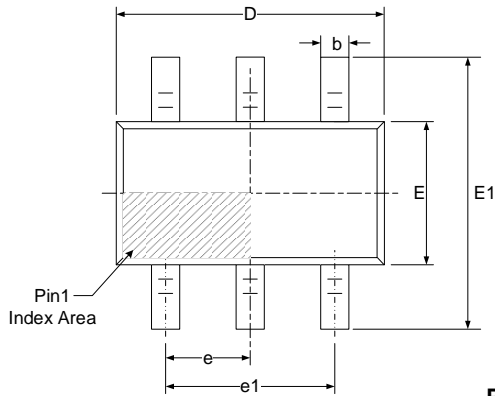


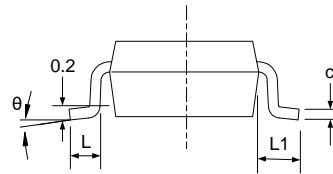
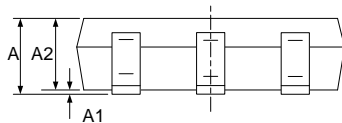
Figure 11. Total Harmonic Distortion (THD)

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°