

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**
- **MicroSIZE PACKAGES: SOT363 (SC70-6), SOT23-6**

DESCRIPTION

The RS2103 is a single-pole double-throw (SPDT) analog switch that is designed to operate from 1.8 V to 5.5 V.

The RS2103 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**

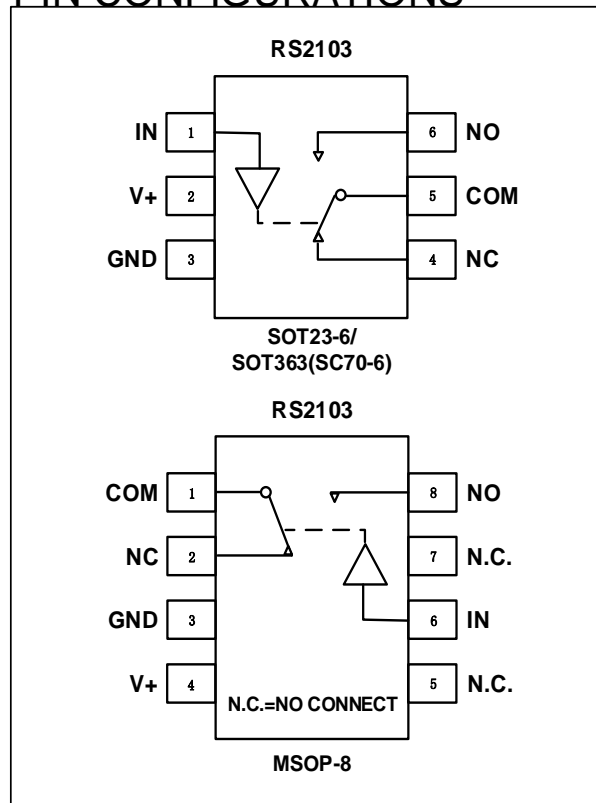
FUNCTION TABLE

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

PIN DESCRIPTION

NAME	PIN (6)	PIN (8)	FUNCTION
IN	1	6	Digital Control Pin
V+	2	4	Power Supply
GND	3	3	Ground
NC	4	2	Normally-Closed Terminal
COM	5	1	Common Terminal
NO	6	8	Normally-Open Terminal

PIN CONFIGURATIONS



ABSOLUTE MAXIMUM RATINGS (1)

V+, IN to GND.....	-0.3V to 7.0V
Analog, Digital Voltage Range (2)	- 0.3 to (V+) + 0.3V
Continuous Current NO, NC, or COM.....	±500mA
Peak Current NO, NC, or COM.....	±800mA
Storage Temperature	-65°C to +150°C
Operating Temperature	-40°C to +125°C
Junction Temperature.....	150°C
Package Thermal Resistance @ TA = +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.

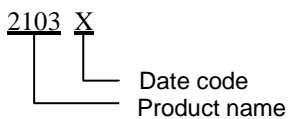
- (1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.
- (2) 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
RS2103	RS2103XC6	-40°C~125°C	SOT363 (SC70-6)	2103X	Tape and Reel,3000
	RS2103XH	-40°C~125°C	SOT23-6	2103	Tape and Reel,3000
	RS2103XM	-40°C~125°C	MSOP-8	RS2103	Tape and Reel,3000

NOTE: X = Date Code

MARKING INFORMATION



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

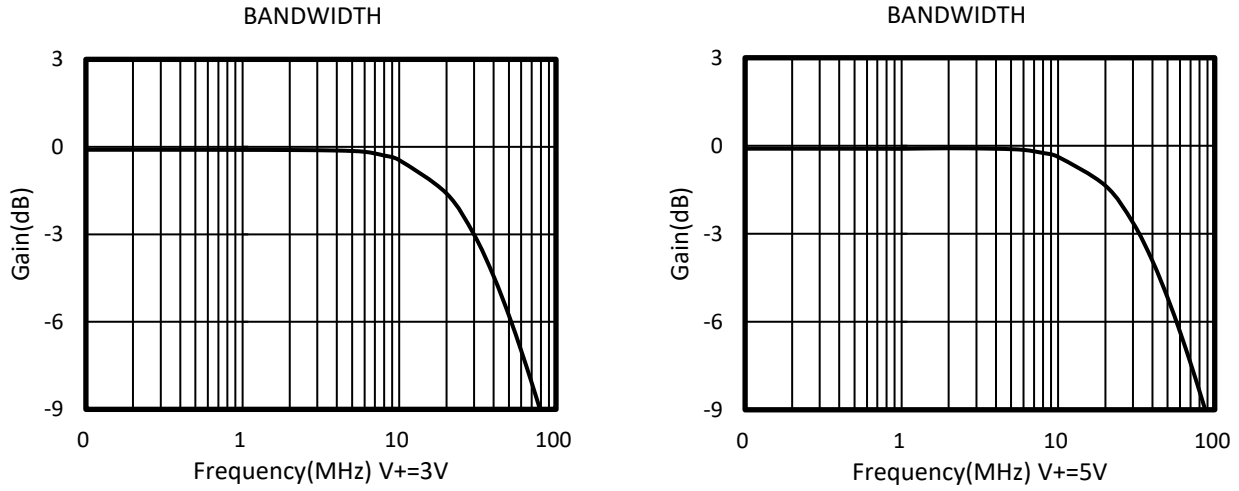
PARAMETER	SYMBOL	CONDITIONS	V+	T _A	MIN	TYP	MAX	UNITS
ANALOG SWITCH								
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}			FULL	0		V_+	V
On-Resistance	R_{ON}	$0 \leq (V_{NO} \text{ or } V_{NC}) \leq V_+$, $I_{COM} = -10\text{mA}$, Switch ON, See Figure 1	5V	+25°C		0.6	1.0	Ω
				FULL			1.2	Ω
			3.3V	+25°C		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 $V_{COM} = \text{Open}$, 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.

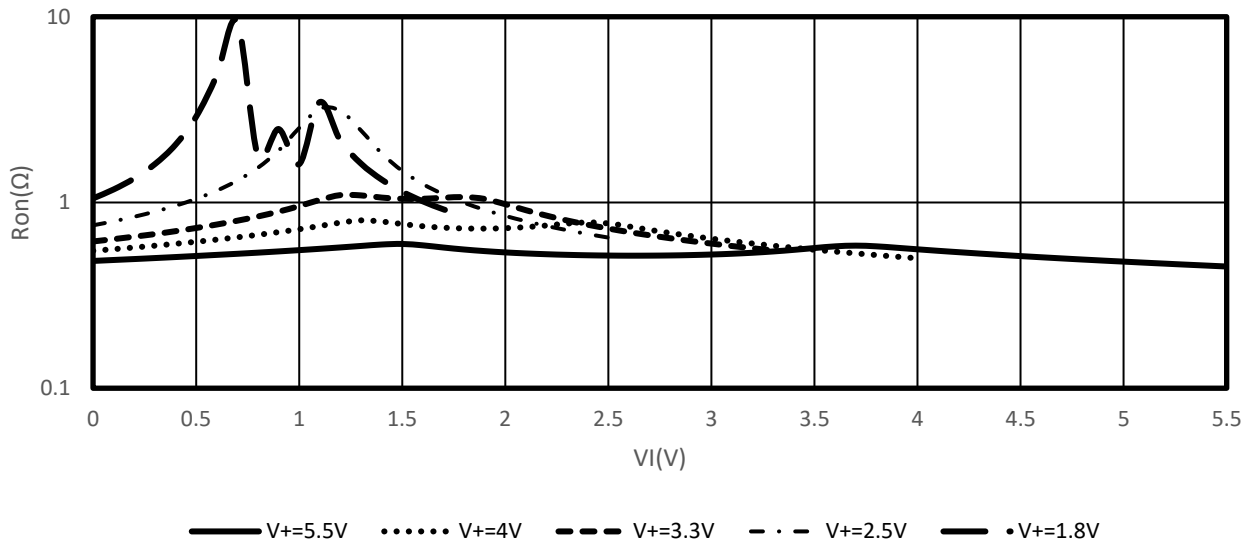
ELECTRICAL CHARACTERISTICS (continued)
 $V_+ = 5.0\text{ V}$, TEMP= -40°C to 125°C (unless otherwise noted)

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	$f = 100\text{KHz}$	+25°C		-68		dB
			$f = 10\text{KHz}$	+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 r_{on} as a Function of Input Voltage (V_I) for $V_I = 0$ to V_+



Parameter Measurement Information

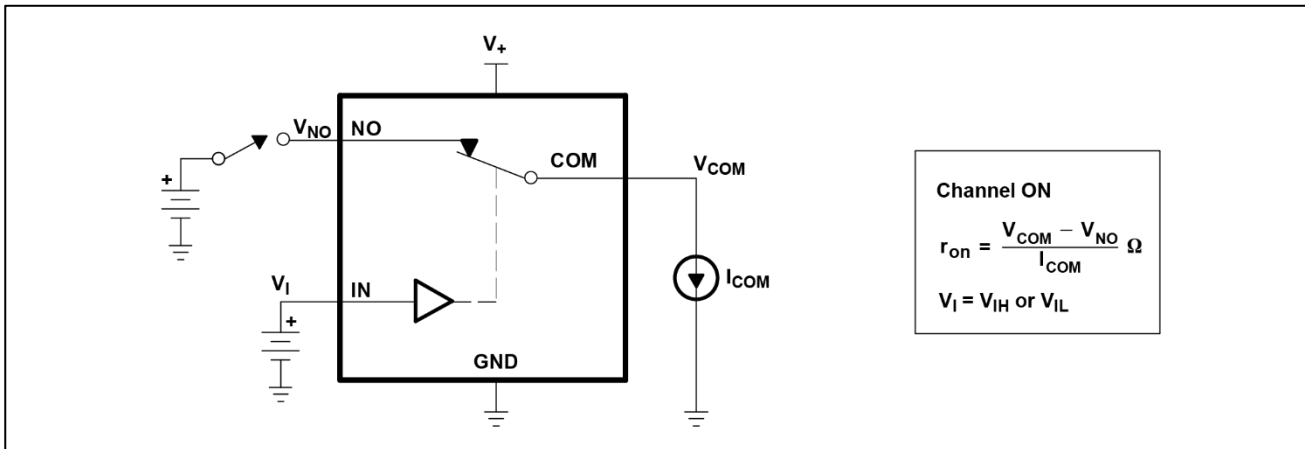


Figure 1.ON-State Resistance (r_{on})

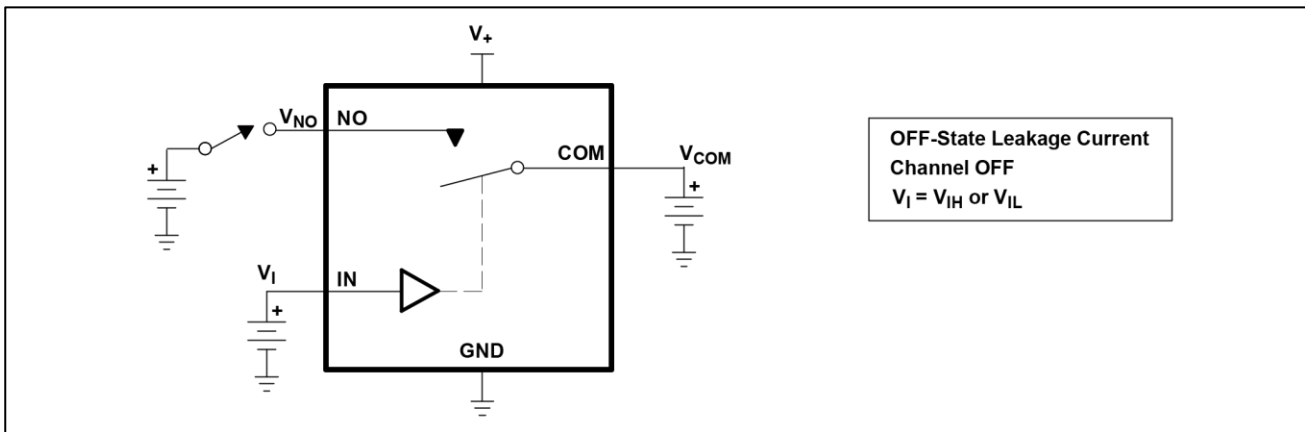


Figure 2.OFF-State Leakage Current ($I_{COM(OFF)}$, $I_{NO(OFF)}$)

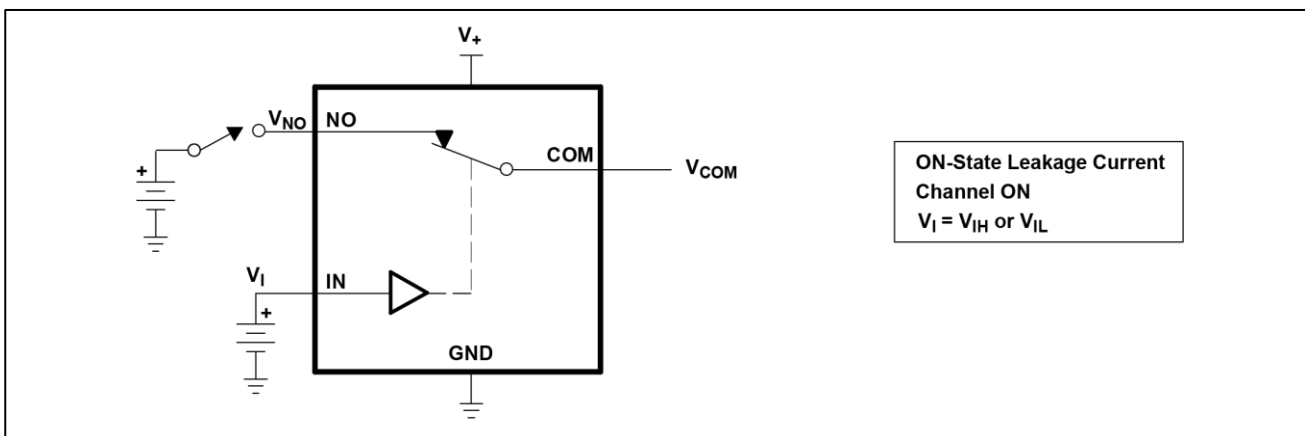


Figure 3.ON-State Leakage Current ($I_{COM(ON)}$, $I_{NO(ON)}$)

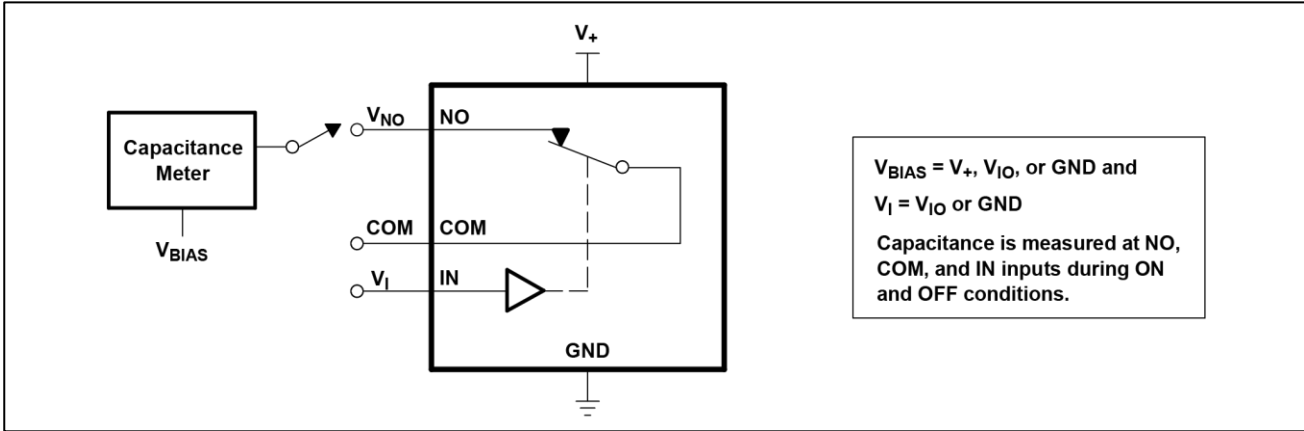


Figure 4. Capacitance (C_I , $C_{COM(OFF)}$, $C_{COM(ON)}$, $C_{NO(OFF)}$, $C_{NO(ON)}$)

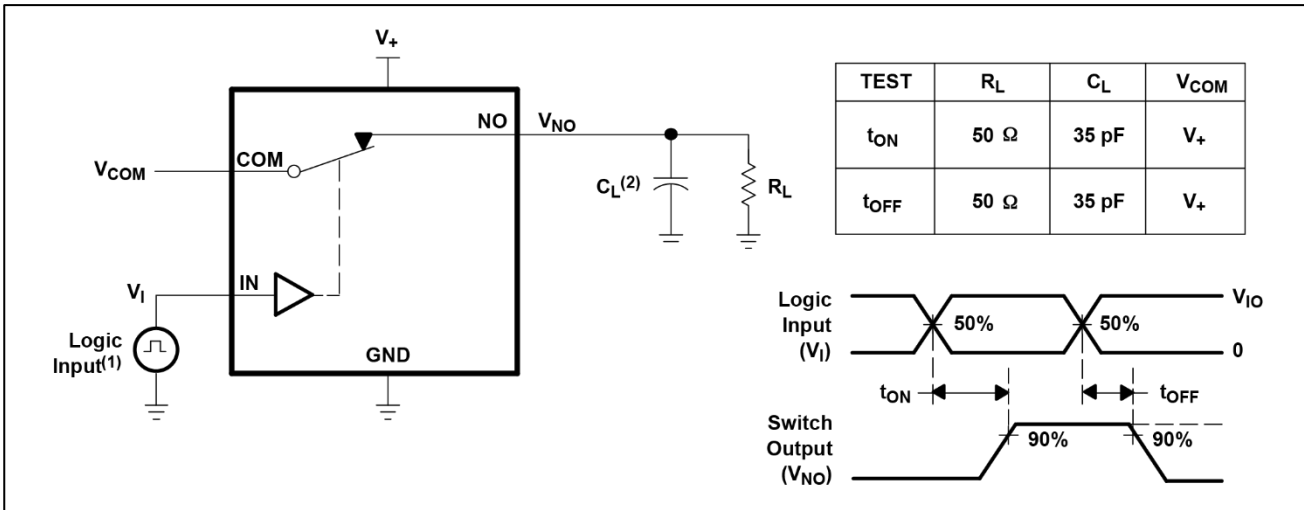


Figure 5. Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})

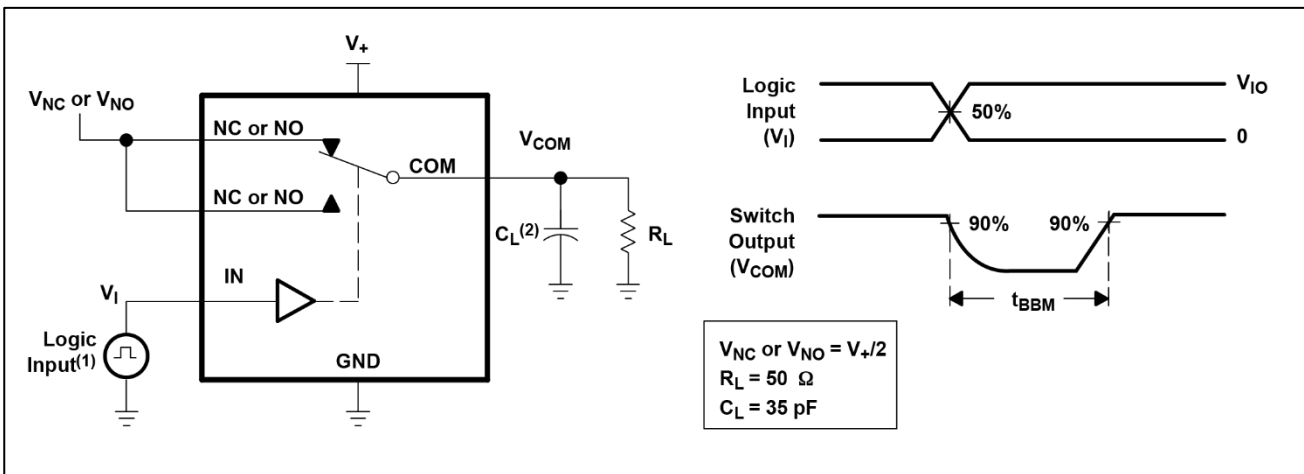


Figure 6. Break-Before-Make Time (t_{BBM})

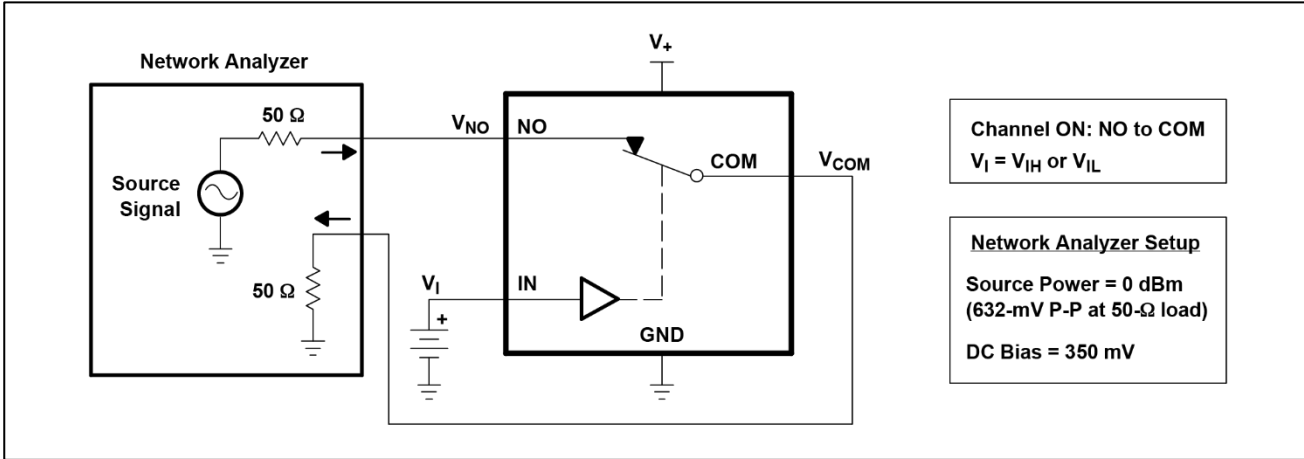


Figure 7. Bandwidth (BW)

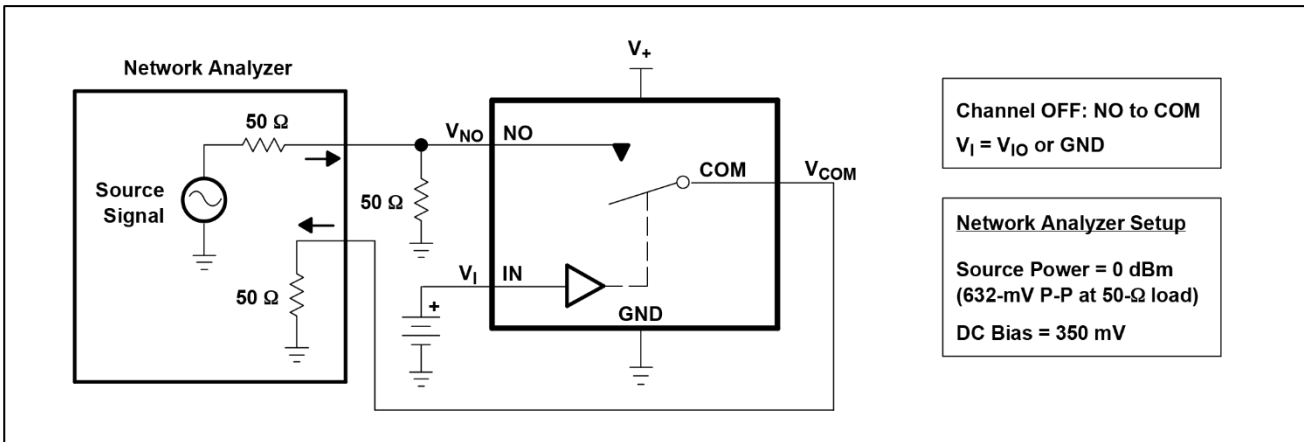


Figure 8. OFF Isolation (O_{iso})

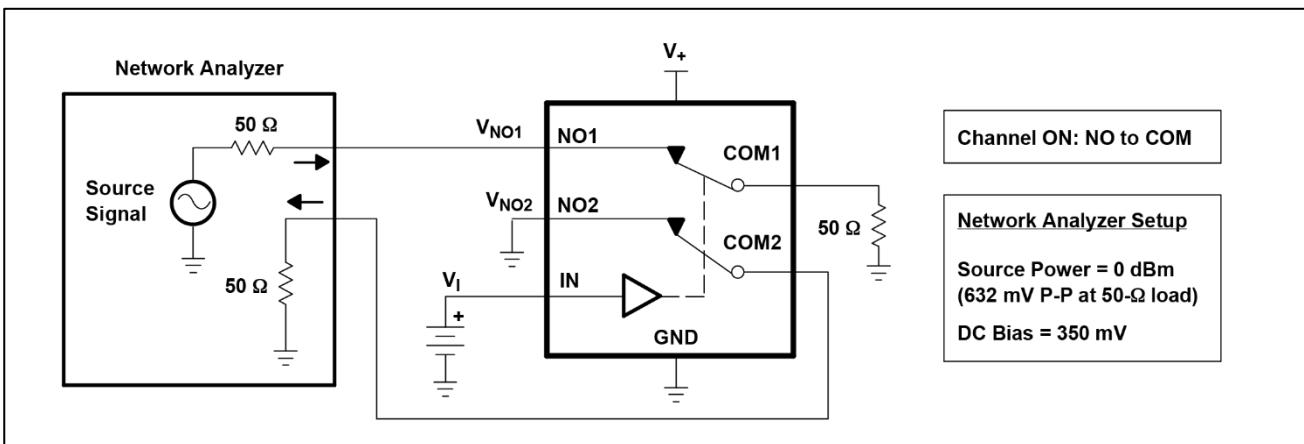


Figure 9. Crosstalk (X_{TALK})

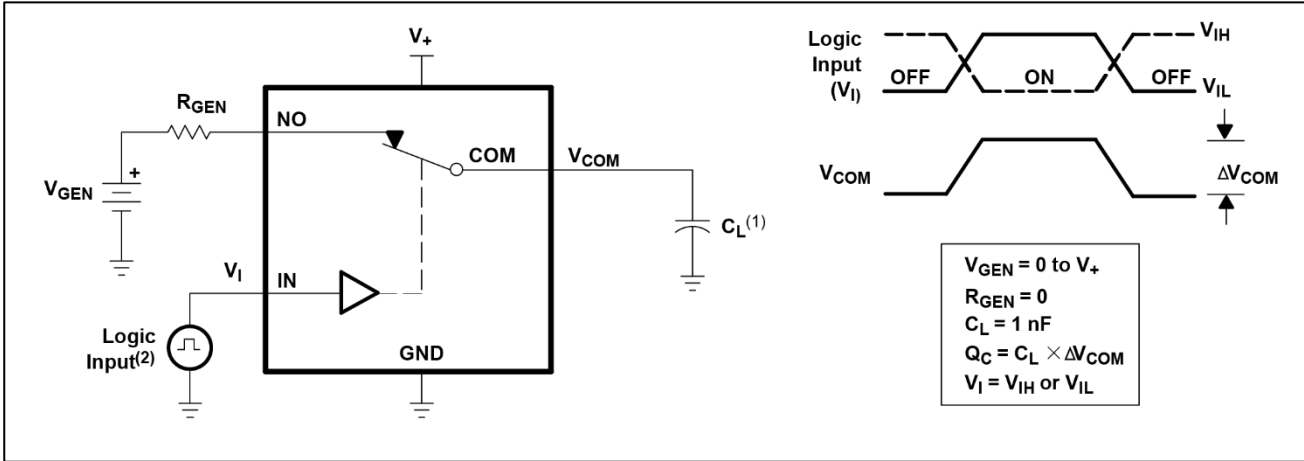


Figure 10.Charge Injection (Q_c)

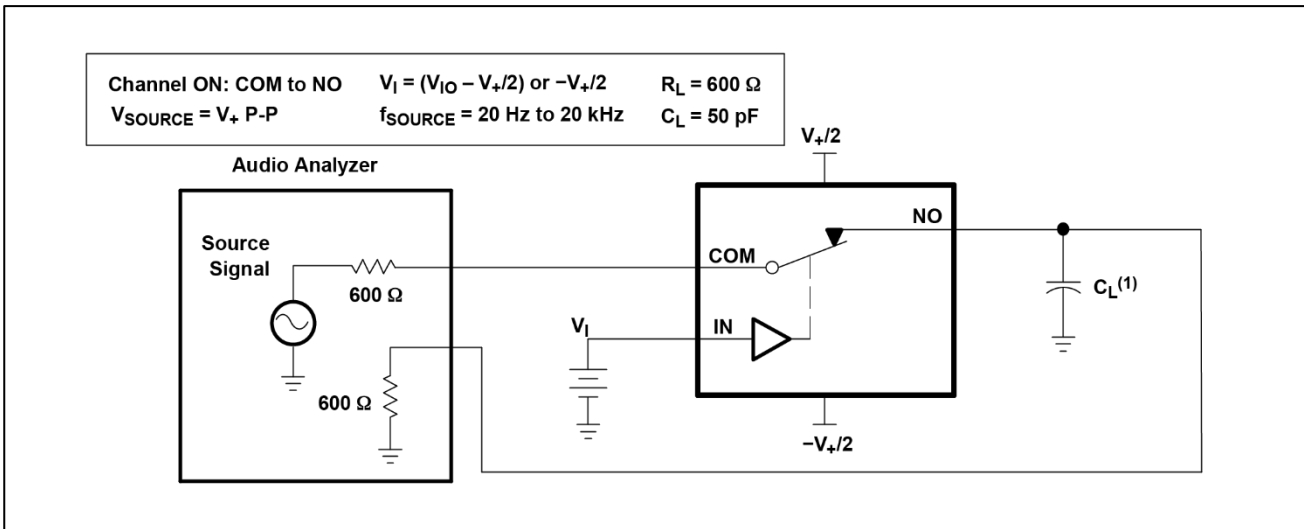
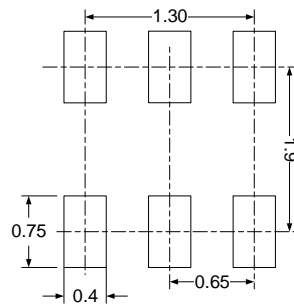
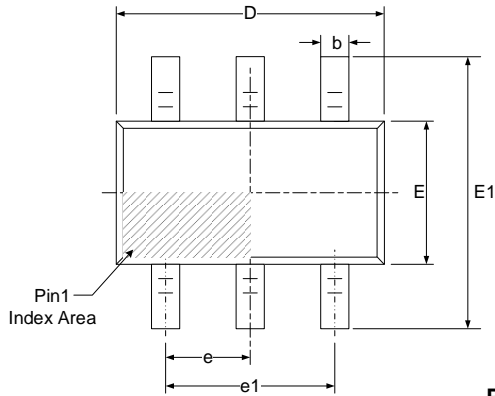


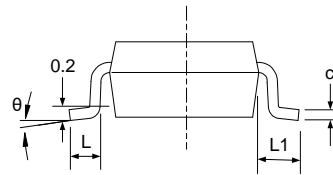
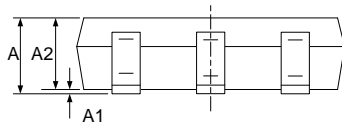
Figure11.Total Harmonic Distortion (THD)

PACKAGE OUTLINE DIMENSIONS

SOT363 (SC70-6)

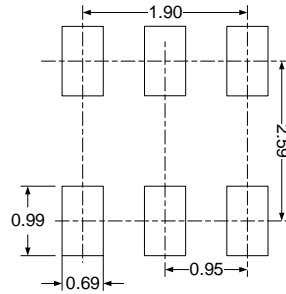
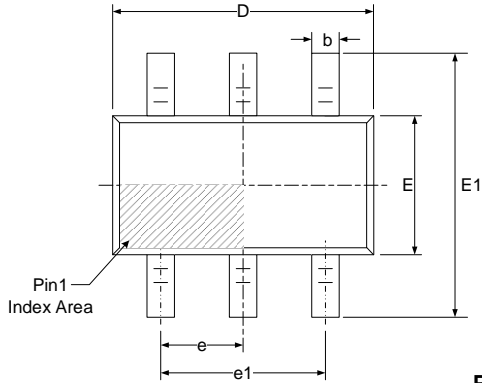


RECOMMENDED LAND PATTERN (Unit: mm)

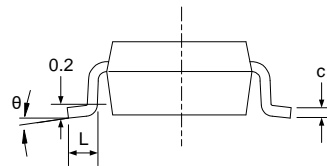
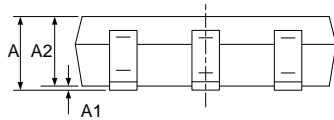


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650(BSC)		0.026(BSC)	
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

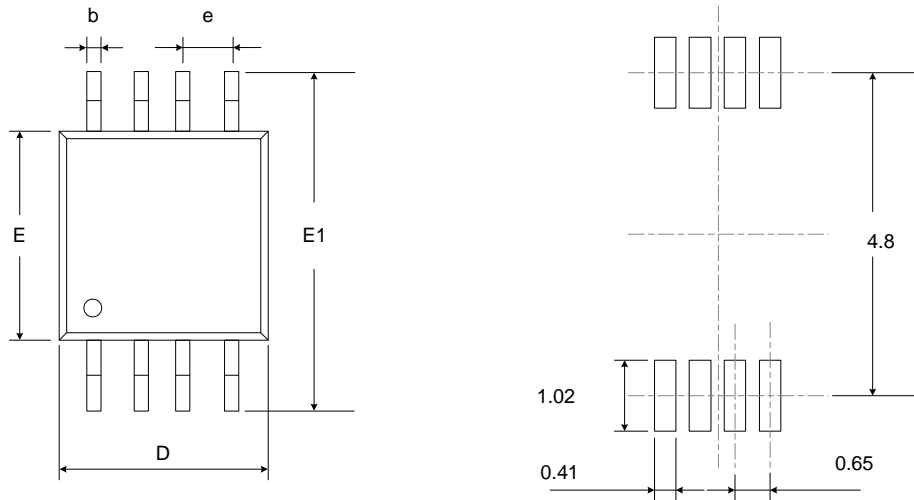


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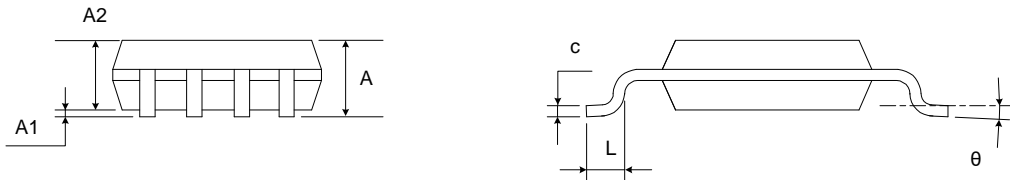


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

MSOP-8



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.650(BSC)		0.026(BSC)	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°