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**
- ***Micro* SIZE PACKAGES: SOT363(SC70-6), SOT23-6**

APPLICATIONS

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

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.

Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS2057	SOT23-6	2.92mm×1.60mm
	SOT363(SC70-6)	2.10mm×1.25mm

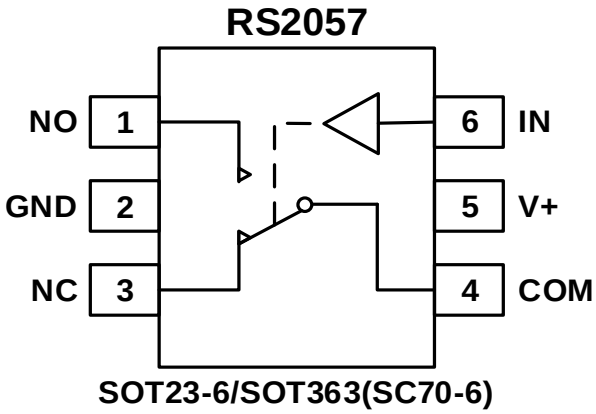
(1) For all available packages, see the orderable addendum at the end of the data sheet.

Revision History

Note: Page numbers for previous revisions may different from page numbers in the current version.

VERSION	Change Date	Change Item
C.3	2021/11/26	Added the TAPE AND REEL INFORMATION

Pin Configuration



NOTE: NO, NC and COM terminals may be an input or output

PIN DESCRIPTION

NAME	PIN	FUNCTION
	SOT23-6/SOT363(SC70-6)	
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

FUNCTION TABLE

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

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	-0.3	6.0	
	Analog, Digital Voltage Range (2)	-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)	±1000	V
		Machine Model (MM)	±100	V

Recommended Operating Conditions

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

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		RS2057		UNIT
		6 PINS		
		SOT23-6	SOT363(SC70-6)	
$R_{\Theta JA}$	Junction-to-ambient thermal resistance	187.3	214.7	°C/W
$R_{\Theta JC(top)}$	Junction-to-case(top) thermal resistance	126.5	127.1	°C/W
$R_{\Theta JB}$	Junction-to-board thermal resistance	32.6	60.0	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	24.1	33.4	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	32.1	59.8	°C/W
$R_{\Theta JC(bot)}$	Junction-to-case(bottom) thermal resistance	N/A	N/A	°C/W
$R_{\Theta JA}$	Junction-to-ambient thermal resistance	187.3	214.7	°C/W

PACKAGE/ORDERING INFORMATION

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING(1/2)	PACKAGE OPTION
RS2057	RS2057XC6	-40℃~125℃	SOT363(SC70-6)	2057X	Tape and Reel,3000
	RS2057XH	-40℃~125℃	SOT23-6	2057	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

2057 X

Date code

Product name

ELECTRICAL CHARACTERISTICS

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

PARAMETER	SYMBOL	CONDITIONS	V+	TA	MIN	TYP	MAX	UNIT
ANALOG SWITCH								
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}			FULL	0		V+	V
On-Resistance	R_{ON}	V_{NO} or V_{NC} = V+/2, I_{COM} = -10mA, Switch ON, See Figure 4	5V	+25℃		4.5	8	Ω
				FULL			8.5	Ω
			3.3V	+25℃		7	10	Ω
				FULL			10.5	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_{NO} or V_{NC} = V+/2, I_{COM} = -10mA, Switch ON, See Figure 4	5V	+25℃		0.15	0.3	Ω
				FULL			0.4	Ω
			3.3V	+25℃		0.15	0.3	Ω
				FULL			0.4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	0 ⩽ (V_{NO} or V_{NC}) ⩽V+/2, I_{COM} = -10mA, Switch ON, See Figure 4	5V	+25℃		2	3	Ω
				FULL			3.3	Ω
			3.3V	+25℃		3	4	Ω
				FULL			4.3	Ω
NC,NO OFF Leakage Current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_{NO} or V_{NC} = 0.3V, V+/2 V_{COM} = V+/2, 0.3V See Figure 5	1.8 to 5.5V	FULL			1	uA
NC,NO,COM ON Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_{NO} or V_{NC} = 0.3V, Open V_{COM} = Open, 0.3V See Figure 6	1.8 to 5.5V	FULL			1	uA
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} or 0	1.8 to 5.5V	FULL			1	uA

(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 V, T_A= -40°C to 125°C (unless otherwise noted)

PARAMETER	SYMBOL	CONDITIONS		V_+	T_A	MIN	TYP	MAX	UNIT
DYNAMIC CHARACTERISTICS									
Turn-On Time	t_{ON}	V_{COM} = V+, R_L = 300Ω, C_L = 35pF, See Figure 8		5V	+25℃		30		ns
				3.3V			40		
Turn-Off Time	t_{OFF}	V_{COM} = V+, R_L = 300Ω, C_L = 35pF, See Figure 8		5V	+25℃		25		ns
				3.3V			30		
Break-Before-Make Time Delay	t_{BBM}	V_{NO1} = V_{NC1} = V_{NO2} = V_{NC2} = 3V, R_L = 300Ω, C_L = 35pF, See Figure 9		5V	+25℃		5		ns
				3.3V			8		
Off Isolation	O_{ISO}	R_L = 50Ω, Switch OFF, See Figure 11	f = 10MHz		+25℃		-52		dB
			f = 1MHz		+25℃		-71		dB
-3dB Bandwidth	BW	Switch ON, R_L = 50Ω, See Figure 10			+25℃		300		MHz
NC, NO OFF Capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or V_{NO}=V+/2 or GND, Switch OFF, See Figure 7			+25℃		5		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 7			+25℃		15		pF
POWER REQUIREMENTS									
Power Supply Range	V_+				FULL	1.8		5.5	V
Power Supply Current	I_+	V_{IN} = GND or V_+		5.5V	FULL			1	uA

TYPICAL CHARACTERISTICS

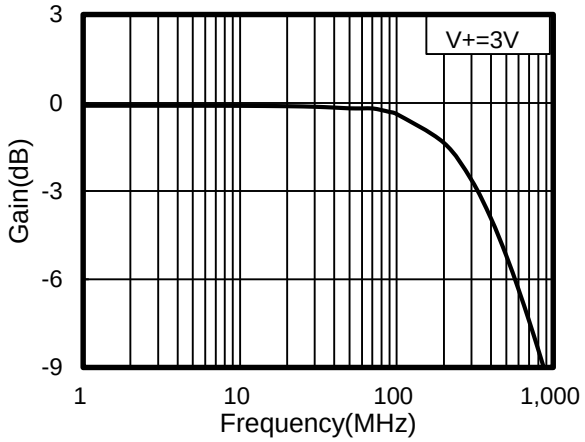


Figure 1. Bandwidth vs Frequency

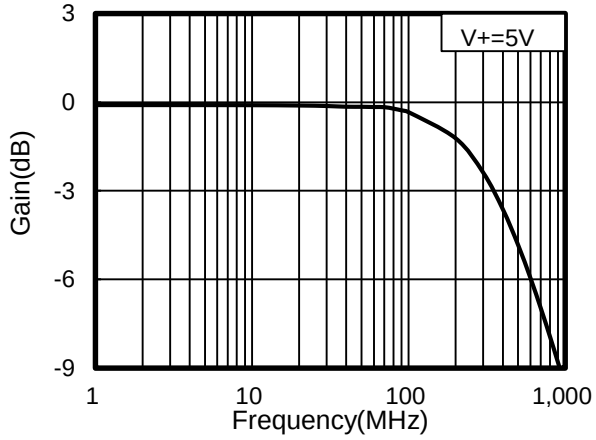


Figure 2. Bandwidth vs Frequency

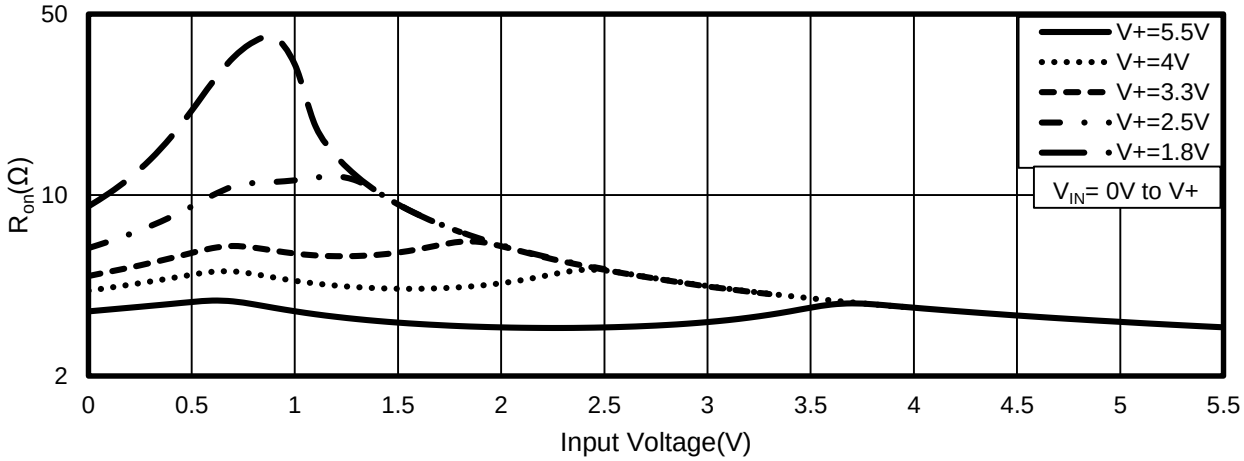


Figure 3. Typical Ron as a Function of Input Voltage

Parameter Measurement Information

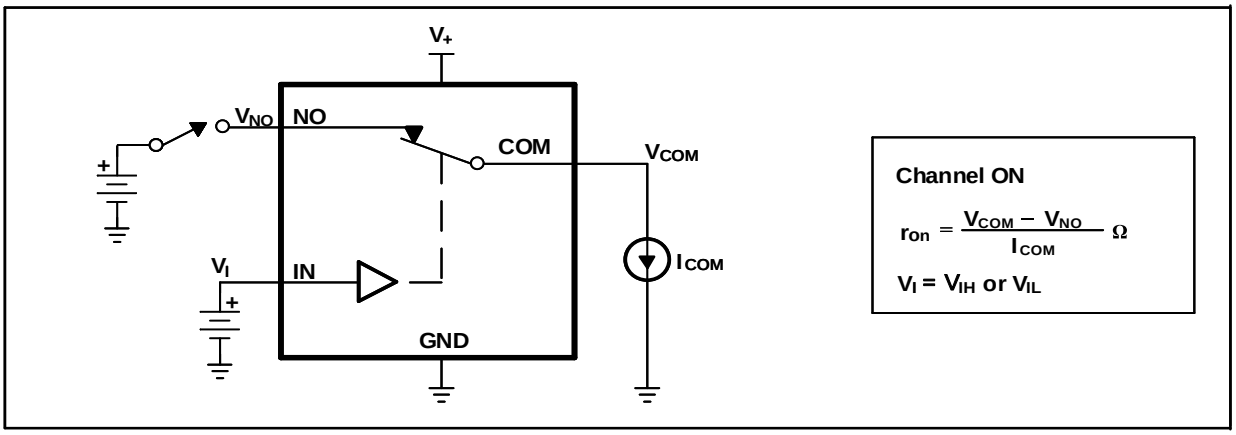


Figure 4. ON-State Resistance (R_{on})

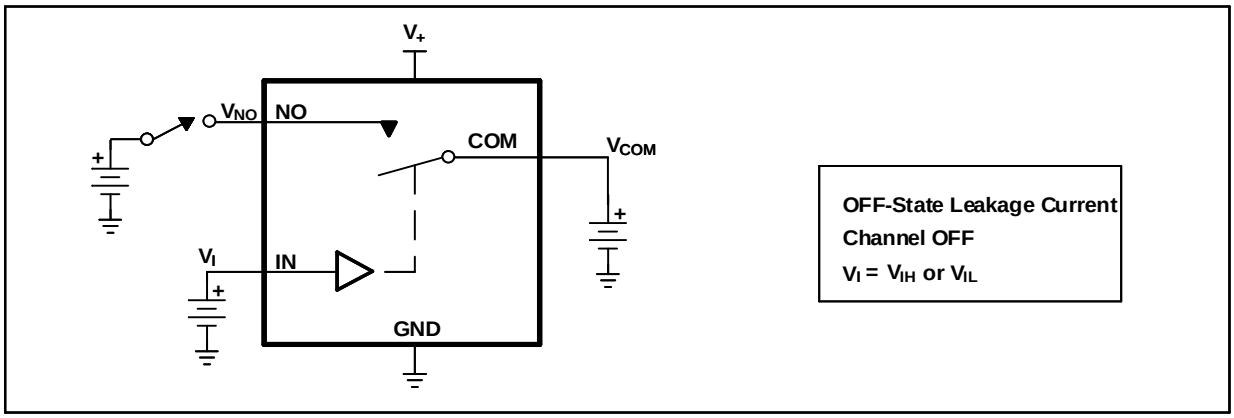


Figure 5. OFF-State Leakage Current ($I_{COM\ (OFF)}$, $I_{NO\ (OFF)}$)

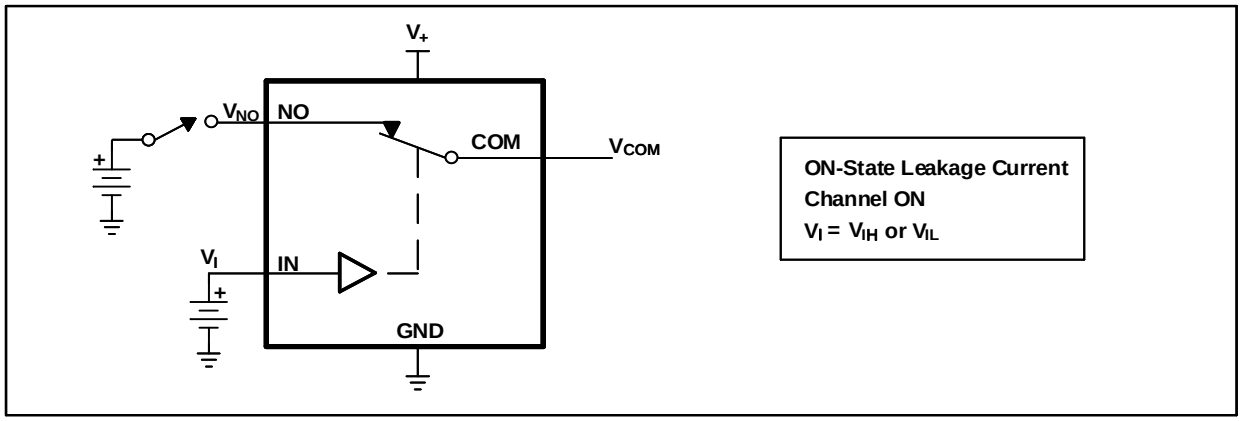


Figure 6. ON-State Leakage Current ($I_{COM\ (ON)}$, $I_{NO\ (ON)}$)

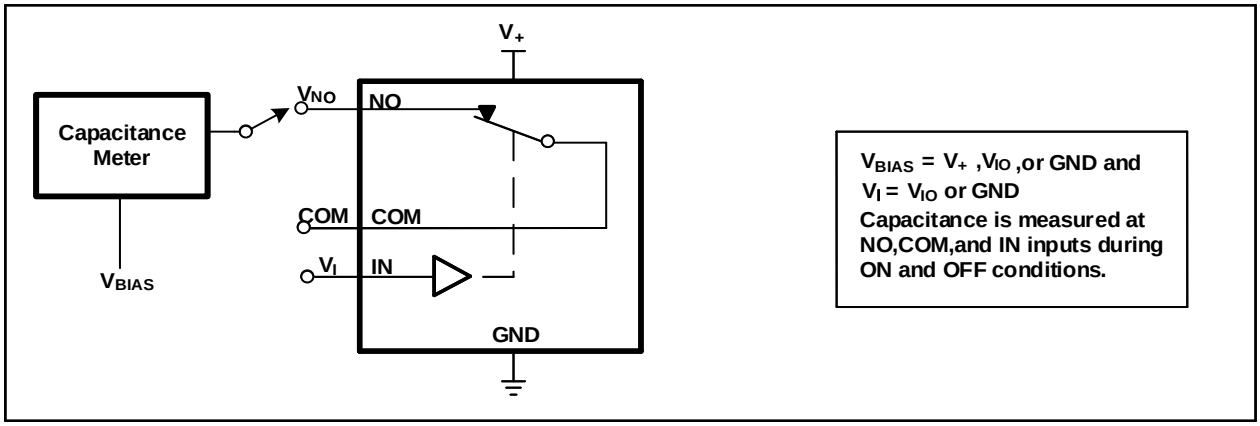


Figure 7. Capacitance (C_I, $C_{COM(OFF)}$, $C_{COM(ON)}$, $C_{NO(OFF)}$, $C_{NO(ON)}$)

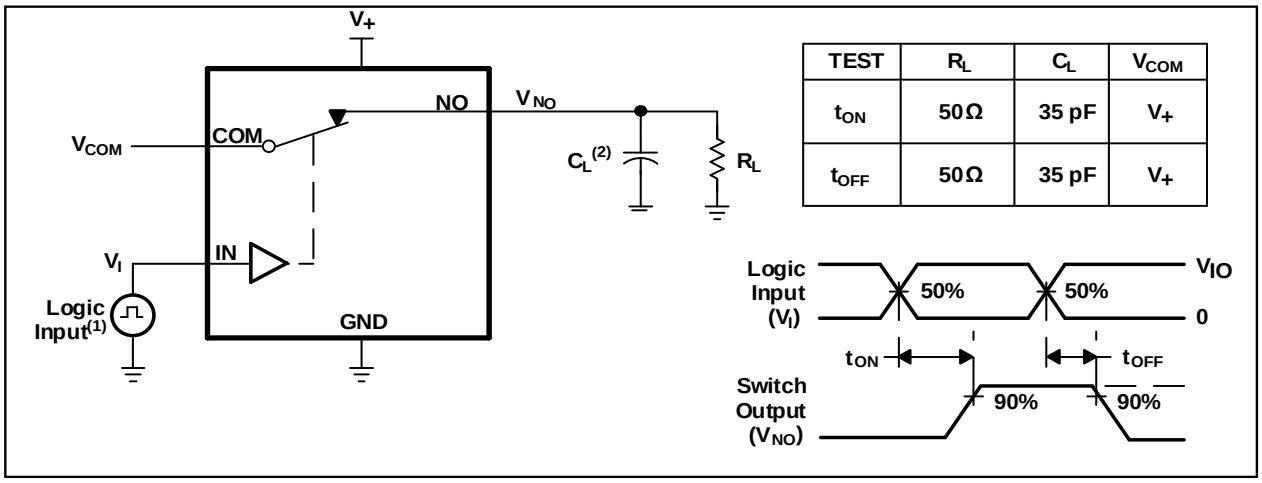


Figure 8. Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})

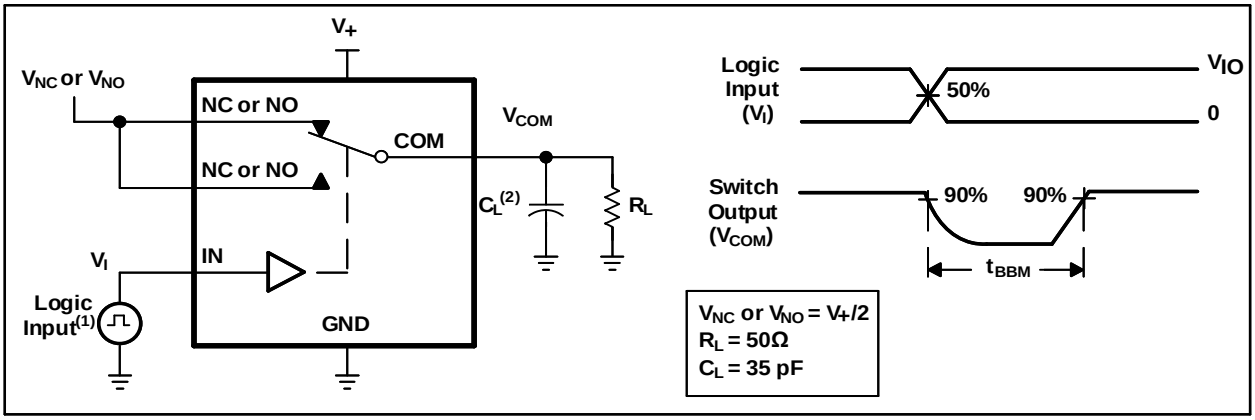


Figure 9. Break-Before-Make Time (t_{BBM})

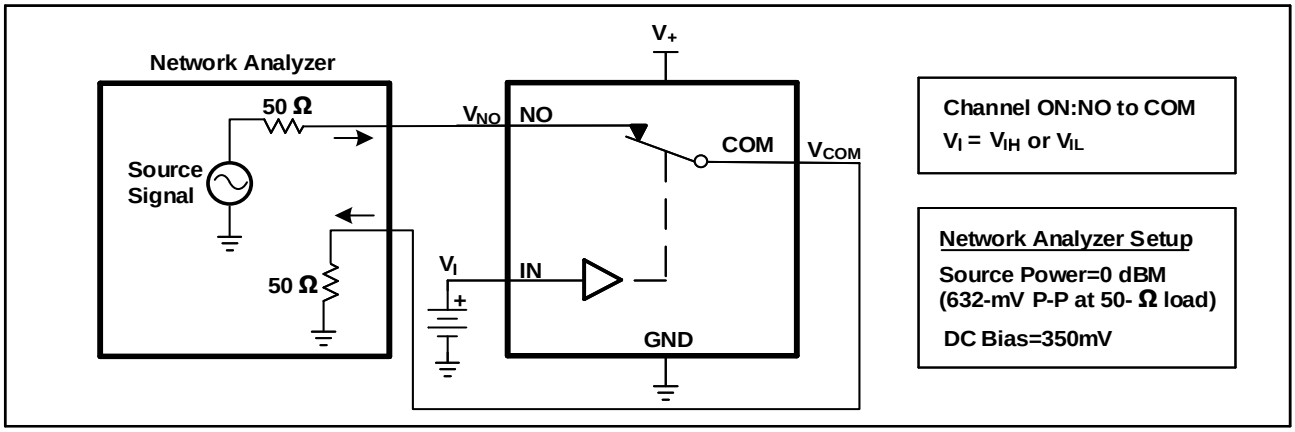


Figure 10. Bandwidth (BW)

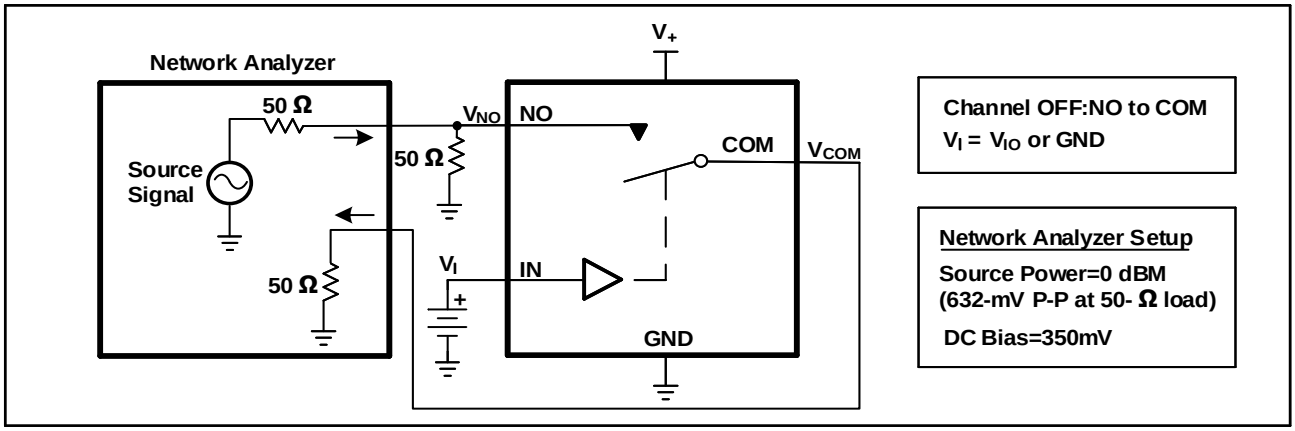


Figure 11. OFF Isolation (O_{ISO})

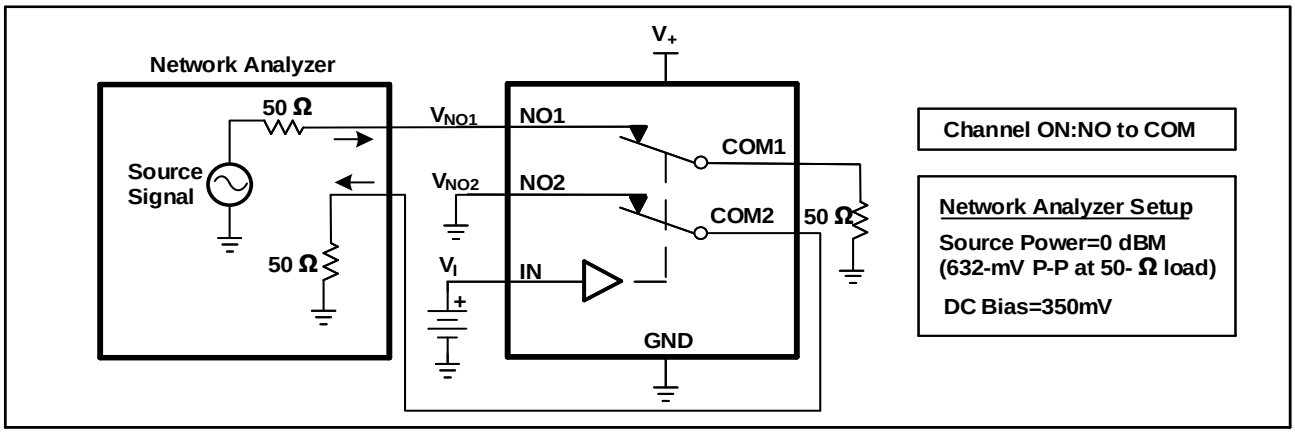


Figure 12. Crosstalk (X_{TALK})

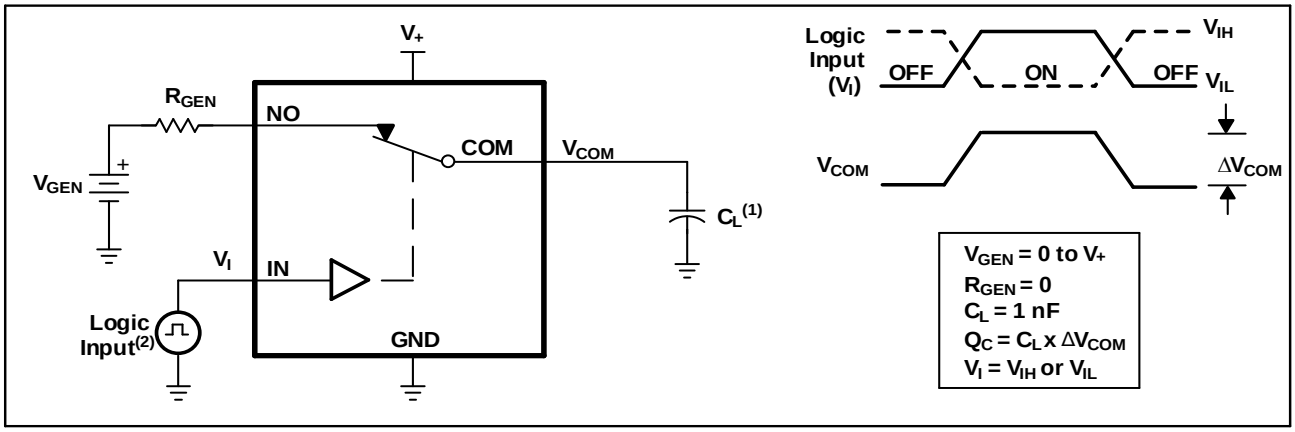


Figure 13. Charge Injection (Q_C)

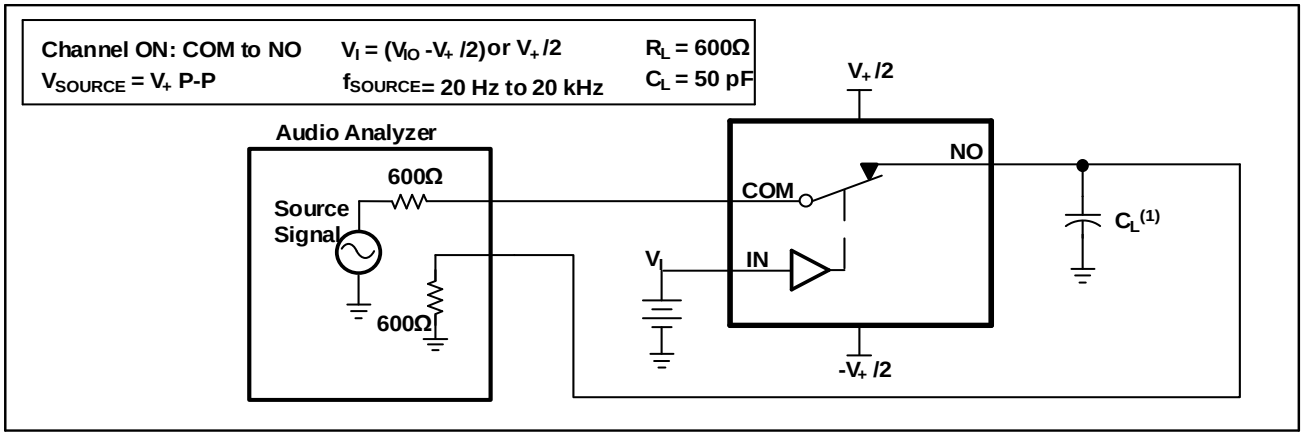
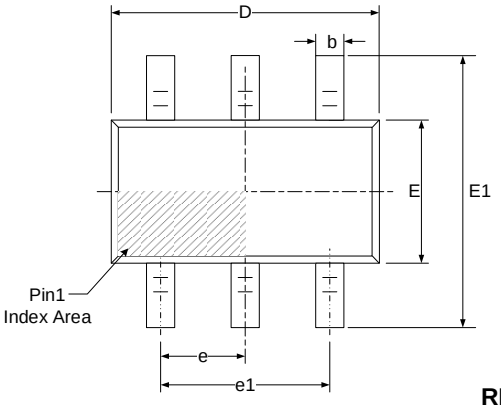
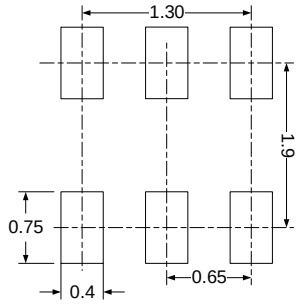


Figure 14. Total Harmonic Distortion (THD)

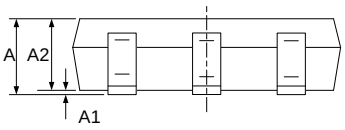
PACKAGE OUTLINE DIMENSIONS

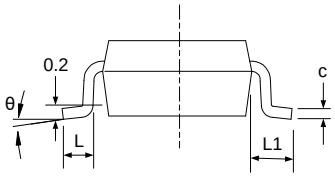
SOT363 (SC70-6)





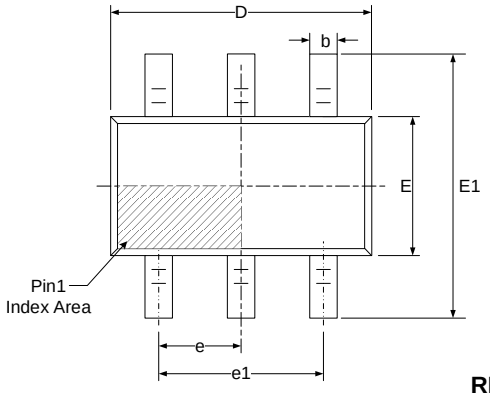
RECOMMENDED LAND PATTERN (Unit: mm)

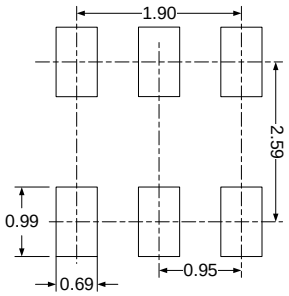




Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650(BSC)		0.026(BSC)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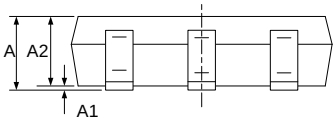
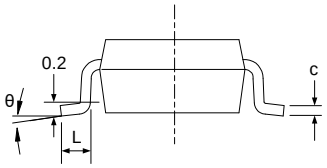


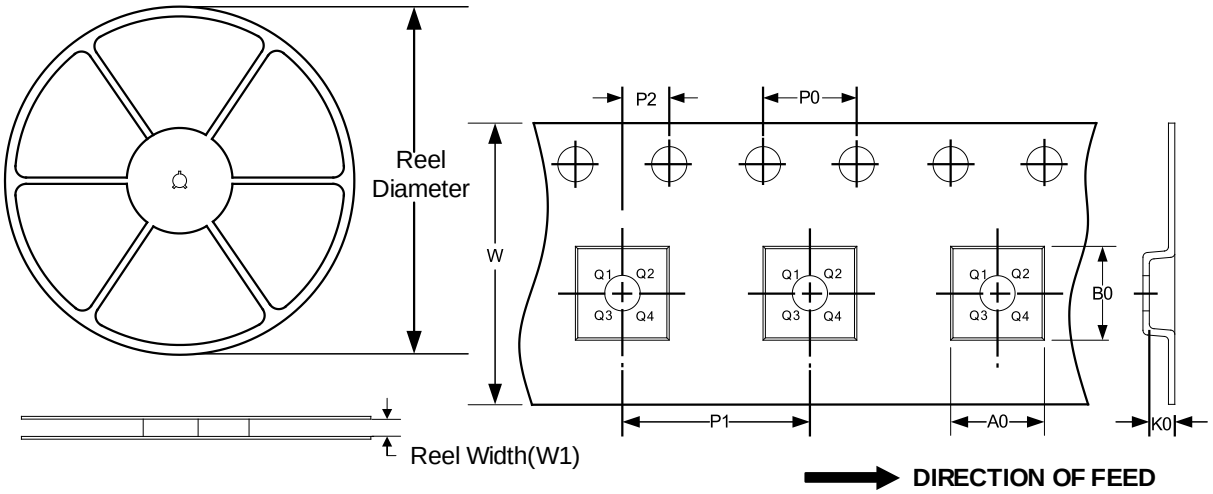


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

TAPE AND REEL INFORMATION

REEL DIMENSIONS

TAPE DIMENSION



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width(mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT363(SC70-6)	7”	9.5	2.40	2.50	1.20	4.0	4.0	2.0	8.0	Q3
SOT23-6	7”	9.5	3.17	3.23	1.37	4.0	4.0	2.0	8.0	Q3