0.8Ω, Low Ron, Dual SPDT Analog Switch with Negative Rail Capability

FEATURES

- **Low ON-State Resistance:0.8Ω (TYP)**
- **Supply Range: +2.5V to +5.5V**
- **Negative Signal Swing Capability: -2V to V_+**
- **Break-Before-Make Switching**
- **Fast Switching Times**
- **1.8V Logic Control**
- **Rail-to-Rail Input and Output Operation**
- **Extended Industrial Temperature Range: -40°C to +85°C**
- **Available in Green UQFN1.4X1.8-10 Package**

APPLICATIONS

- **Wearable Devices**
- **Battery-Operated Equipment**
- **Portable Instrumentation**
- **Cell Phones**
- **Automation Test Equipment**
- **Relay Replacement**

DESCRIPTION

The RS2118 is a bidirectional, 2-channel single-pole double-throw (SPDT) analog switch that is designed to operate from 2.5V to 5.5V. The device features negative signal capability that allows signals below ground to pass through the switch without distortion.

The break-before-make feature prevents signal distortion during the transferring of a signal from one path to another. Low ON-state resistance, excellent channel-to-channel ON-state resistance matching, and minimal total harmonic distortion (THD) performance are ideal for audio applications This device is available packaged in UQFN1.4X1.8-10.

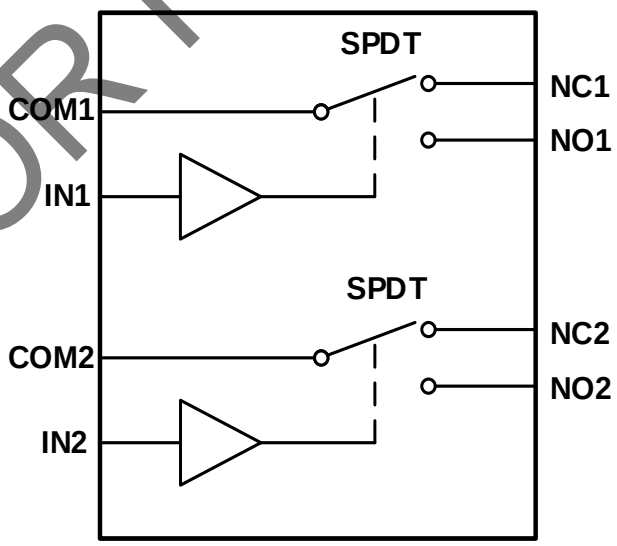
Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS2118	UQFN1.4X1.8-10	1.80mm×1.40mm

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

NOT RECOMMENED FOR NEW DESIGN

Functional Block Diagram



Revision History

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

Version	Change Date	Change Item
B.2	2021/11/26	Added the TAPE AND REEL INFORMATION
B.2.1	2024/03/11	Modify packaging naming

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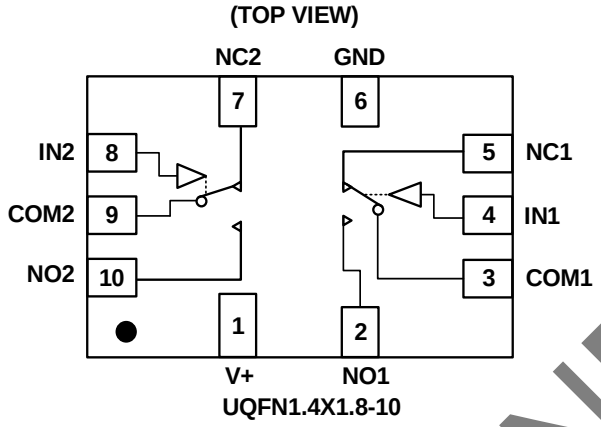
PIN CONFIGURATIONS



PIN DESCRIPTION

NAME	PIN	FUNCTION
	UQFN1.4X1.8-10	
V+	1	Power Supply
NO1, NO2	2,10	Normally-Open Terminal
COM1, COM2	3,9	Common Terminal
IN1, IN2	4,8	Digital Control Pin
NC1, NC2	5,7	Normally-Closed Terminal
GND	6	Ground

NOTE: NOX, NCX and COMX terminals may be an input or output.

FUNCTION TABLE

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

NOTE: Switches shown for logic "0" input.

NOT RECOMMENED FOR NEW DESIGN

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 Voltage Range (2)	-2.0	$(V_+)+0.3$	
	Digital Voltage Range (2)	-0.3	$(V_+)+0.3$	
	Continuous Current NO, NC, or COM	-250	+250	mA
I_{PEAK}	Peak Current NO, NC, or COM	-350	+350	
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)	±2000	V
		Machine Model (MM)	±200	V

Recommended Operating Conditions

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

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{CC}	Supply Voltage	2.5	5.5	V
T_A	Operating temperature	-40	+85	°C

Thermal Information

THERMAL METRIC		RS2118 10 PINS UQFN1.4X1.8-10	UNIT
$R_{\Theta JA}$	Junction-to-ambient thermal resistance	120	°C/W
$R_{\Theta JC(top)}$	Junction-to-case(top) thermal resistance	46.0	°C/W
$R_{\Theta JB}$	Junction-to-board thermal resistance	44.5	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	1.5	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	44.5	°C/W
$R_{\Theta JC(bot)}$	Junction-to-case(bottom) thermal resistance	31.2	°C/W

NOT RECOMMENED FOR NEW DESIGN

PACKAGE/ORDERING INFORMATION

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING(1/2)	PACKAGE OPTION
RS2118	RS2118YUTQK10	-40°C ~+85°C	UQFN1.4X1.8-10	2118X	Tape and Reel,4000

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

2118 X

Date code
Product name

NOT RECOMMENED FOR NEW DESIGN

ELECTRICAL CHARACTERISTICS

V+ = 5.0 V, T_A= -40°C to 85°C (unless otherwise noted)

PARAMETER	SYMBOL	CONDITIONS	V+	T_A	MIN	TYP	MAX	UNIT
ANALOG SWITCH								
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}	2.5V ≤V+≤3.5V		FULL	-2.0		V+	V
		3.5V ≤V+≤5.5V			(V+)-5.5		V+	
On-Resistance	R_{ON}	0 ≤ (V_{NO} or V_{NC}) ≤V+, I_{COM} = -10mA, Switch ON, See Figure 4	5V	+25°C		0.8	1.1	Ω
				FULL			1.3	Ω
			3.3V	+25°C		1.3	1.8	Ω
				FULL			2	Ω
On-Resistance Match Between Channels	ΔR_{ON}	0 ≤ (V_{NO} or V_{NC}) ≤V+, I_{COM} = -10mA, Switch ON, See Figure 4	5V	+25°C		0.15	0.25	Ω
				FULL			0.3	Ω
			3.3V	+25°C		0.15	0.25	Ω
				FULL			0.3	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	0 ≤ (V_{NO} or V_{NC}) ≤V+, I_{COM} = -10mA, Switch ON, See Figure 4	5V	+25°C		0.15	0.25	Ω
				FULL			0.3	Ω
			3.3V	+25°C		0.4	0.6	Ω
				FULL			0.7	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	2.5V 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	2.5V 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			0.5	V
			3.3V	FULL			0.4	V
Input Leakage Current	I_{IN}	V_{IN} = V_{IO} or 0	2.5V 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.

NOT RECOMMENED FOR NEW DESIGN

ELECTRICAL CHARACTERISTICS (continued)

V+ = 5.0 V, T_A= -40°C to 85°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°C		15		ns
			3.3V			25		
Turn-Off Time	t_{OFF}	V_{COM} = V+, R_L = 300Ω, C_L = 35pF, See Figure 8	5V	+25°C		10		ns
			3.3V			15		
Break-Before-Make Time Delay	t_{BBM}	V_{NO1} = V_{NC1} = V_{NO2} = V_{NC2} = V+/2, R_L = 300Ω, C_L = 35pF,See Figure 9	5V	+25°C		5		ns
			3.3V			10		
Charge Injection	Q	V_G=GND, R_G=0Ω, C_L=1.0nF, See Figure 13.	5V	+25°C		80		pC
			3.3V	+25°C		74		
Off Isolation	O_{ISO}	R_L = 50Ω, Switch OFF, See Figure 11, f = 1MHz		+25°C		-70		dB
		f = 10MHz		+25°C		-50		dB
-3dB Bandwidth	BW	Switch ON, R_L = 50Ω See Figure 10		+25°C		80		MHz
Channel-to-Channel Crosstalk	X_{TALK}	Signal=0dBm, R_L = 50Ω, C_L = 5pF, See Figure 12, f = 1MHz		+25°C		-72		dB
		f = 10MHz		+25°C		-52		dB
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°C		40		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°C		85		pF
POWER REQUIREMENTS								
Power Supply Range	V_+			FULL	2.5		5.5	V
Power Supply Current	I_+	V_{IN} = GND or V_+	5.5V	FULL			1	uA

NOT RECOMMENED FOR NEW DESIGN

TYPICAL CHARACTERISTICS

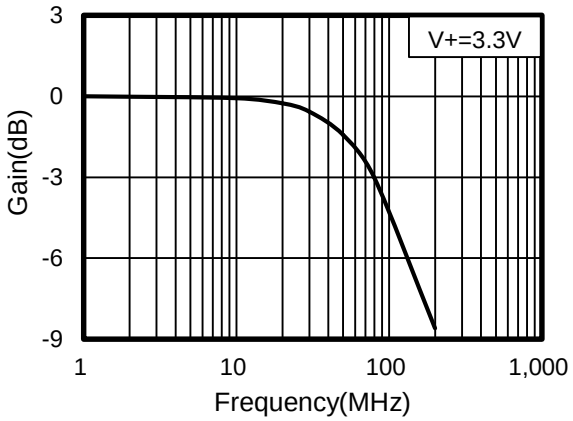


Figure 1. Bandwidth vs Frequency

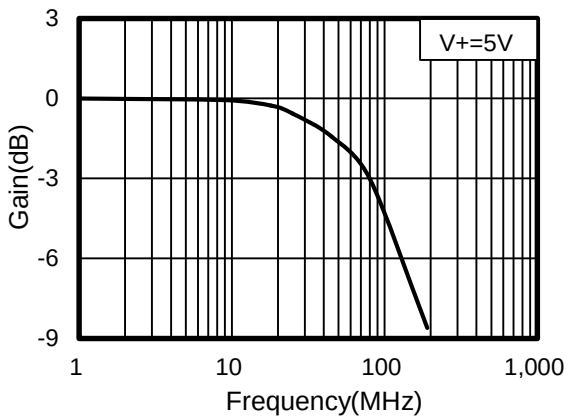


Figure 2. Bandwidth vs Frequency

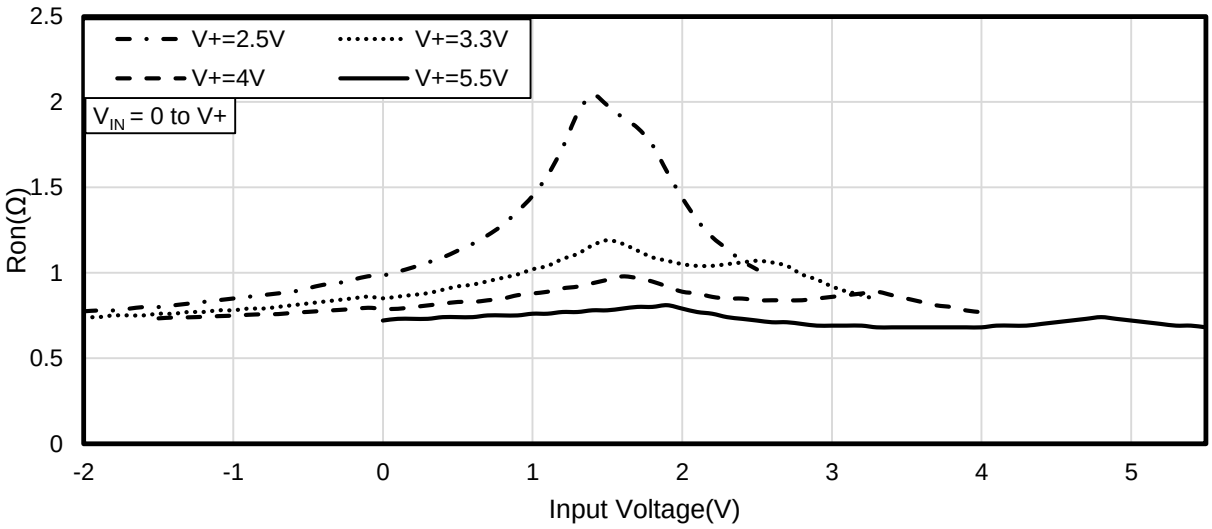


Figure 3. Typical Ron as a Function of Input Voltage

NOT RECOMMENED FOR NEW DESIGN

Parameter Measurement Information

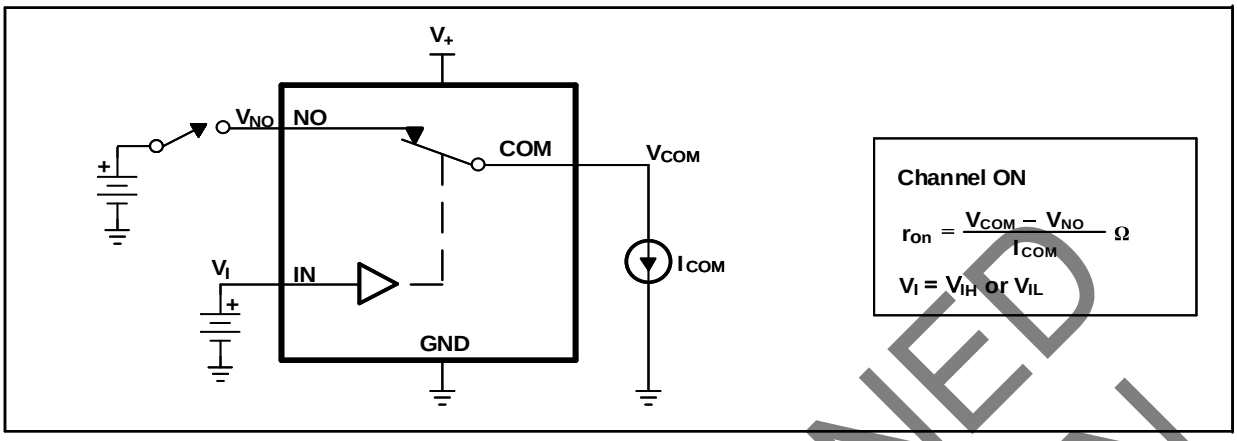


Figure 4. ON-State Resistance (R_{on})

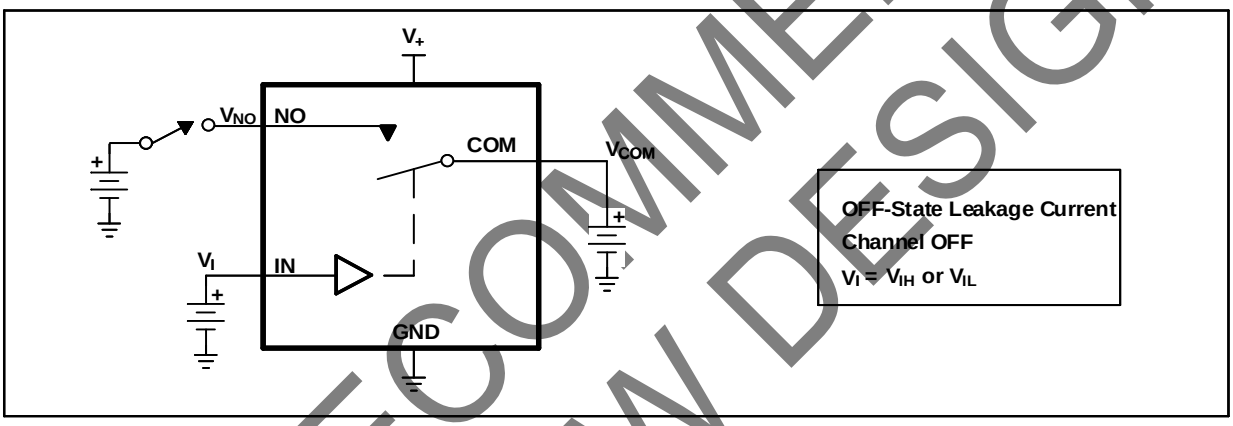


Figure 5. OFF-State Leakage Current ($I_{COM\ (OFF)}$, $I_{NO\ (OFF)}$)

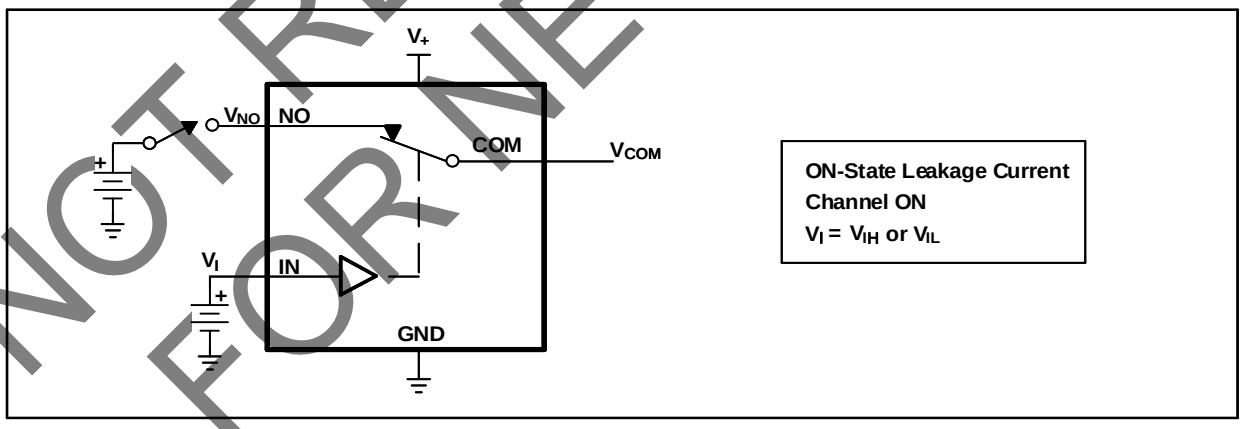


Figure 6. ON-State Leakage Current ($I_{COM\ (ON)}$, $I_{NO\ (ON)}$)

NOT RECOMMENED FOR NEW DESIGN

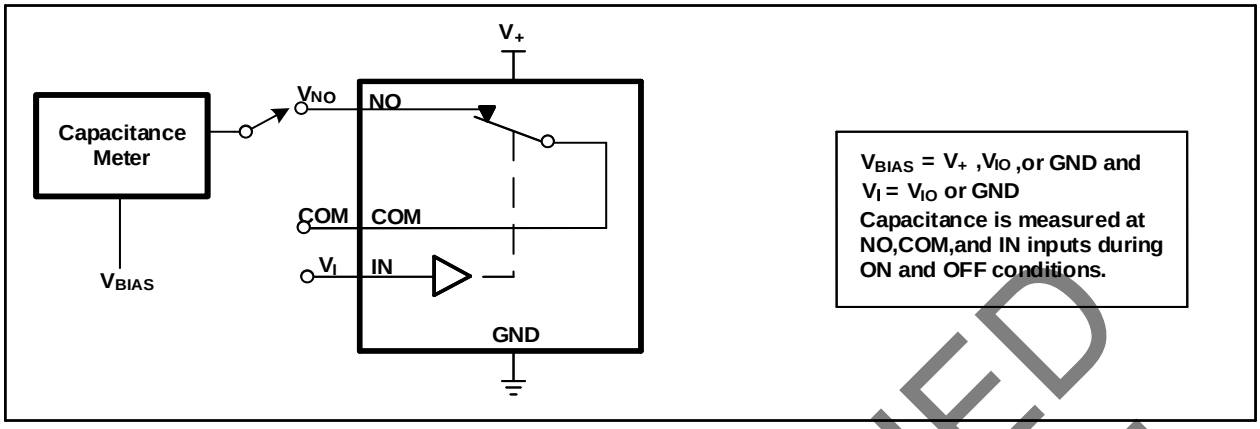


Figure 7. Capacitance (C_I, $C_{COM\ (OFF)}$, $C_{COM\ (ON)}$, $C_{NO\ (OFF)}$, $C_{NO\ (ON)}$)

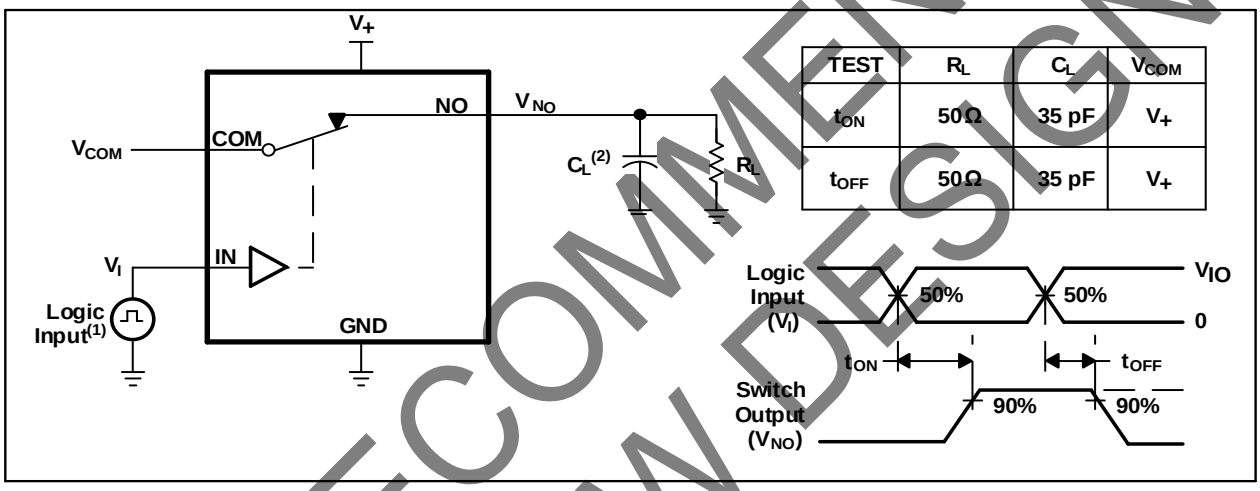


Figure 8. Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})

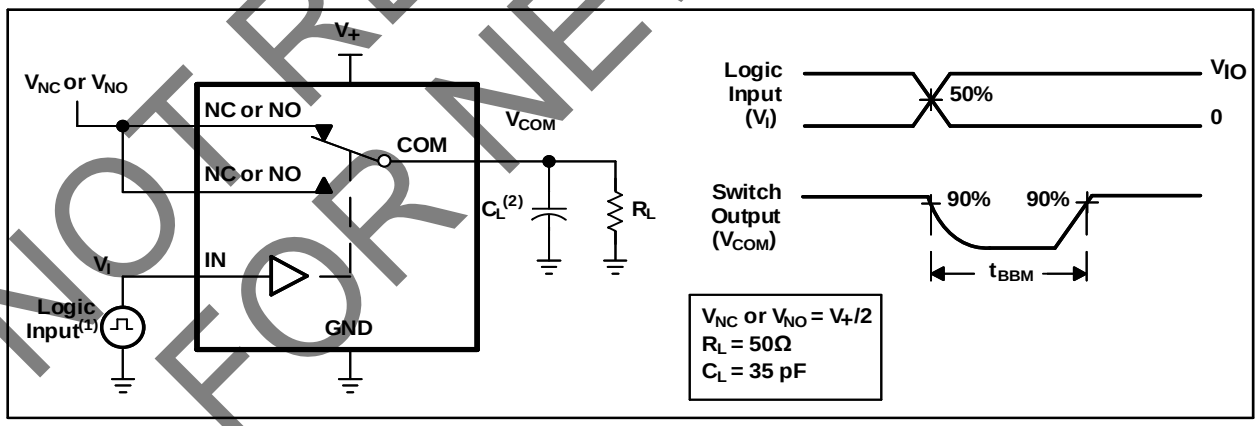


Figure 9. Break-Before-Make Time (t_{BBM})

NOT RECOMMENED FOR NEW DESIGN

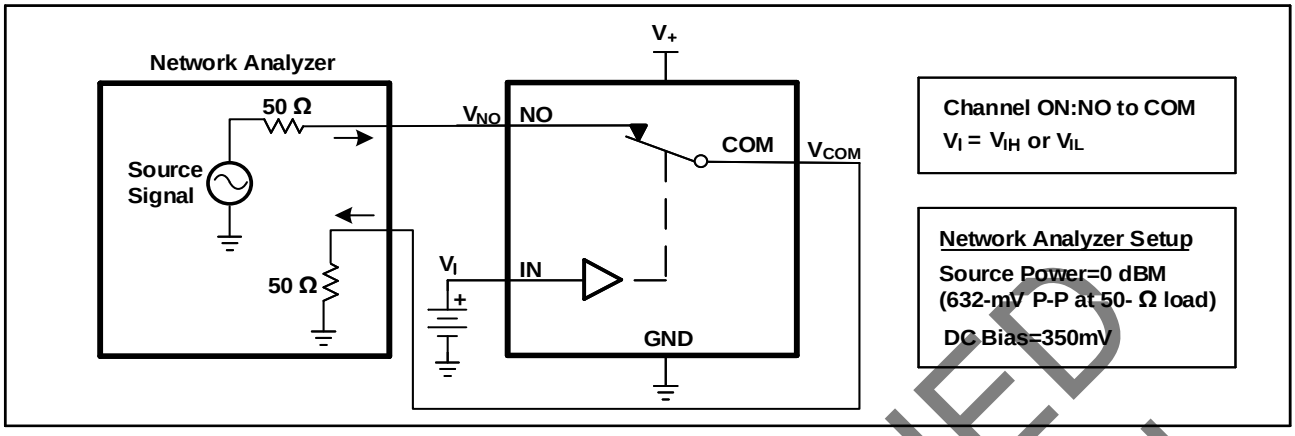


Figure 10. Bandwidth (BW)

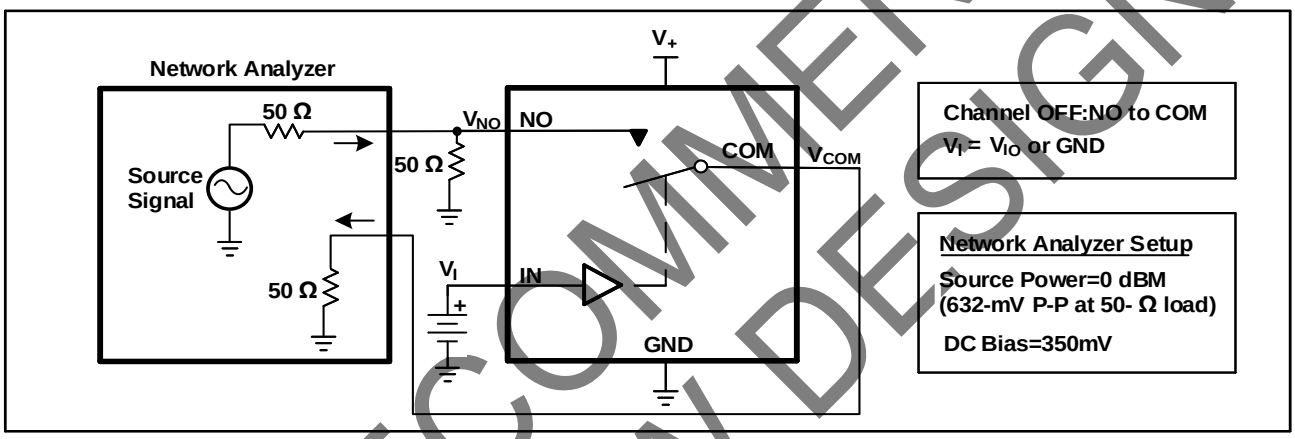


Figure 11. OFF Isolation (O_{ISO})

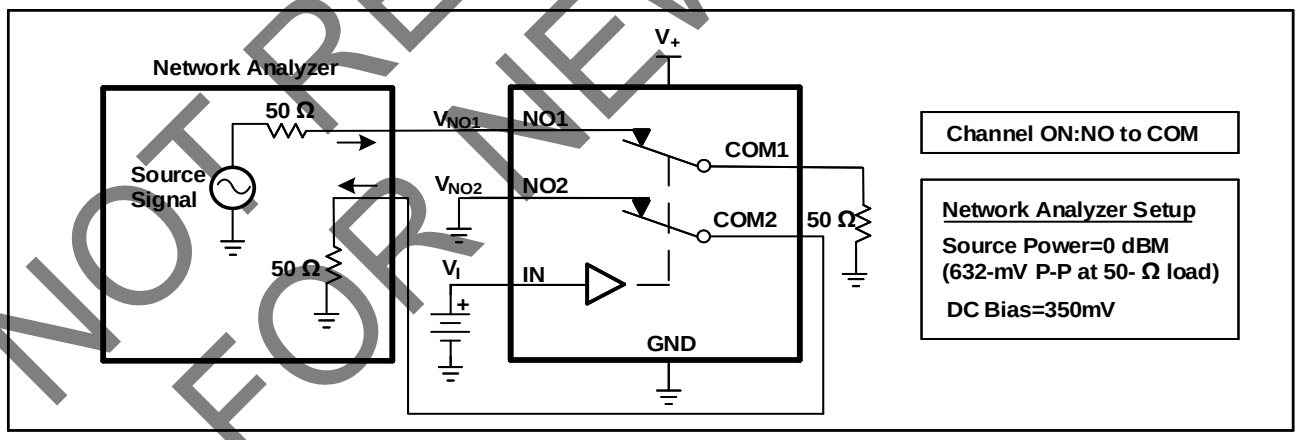


Figure 12. Crosstalk (X_{TALK})

NOT RECOMMENED FOR NEW DESIGN

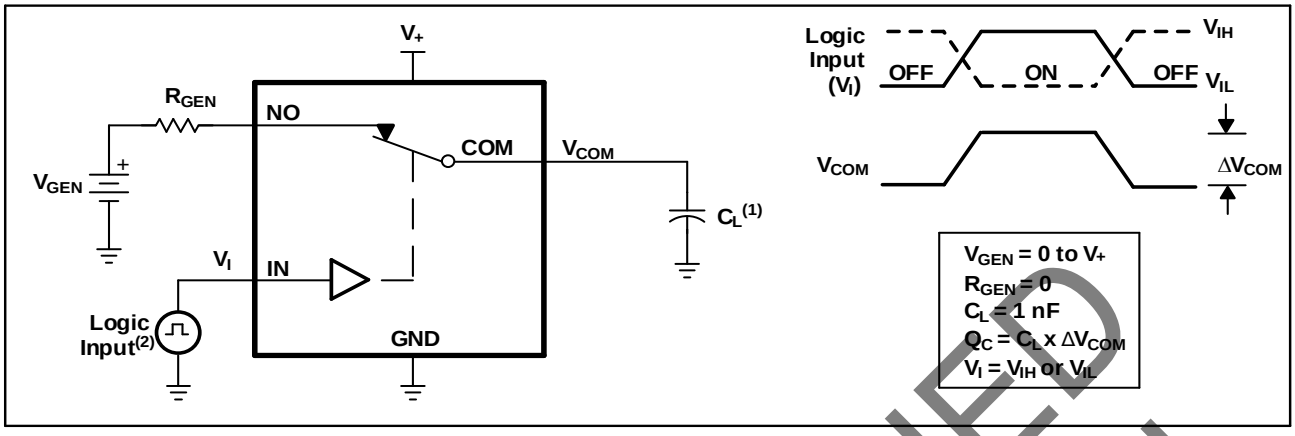


Figure 13. Charge Injection (Q_C)

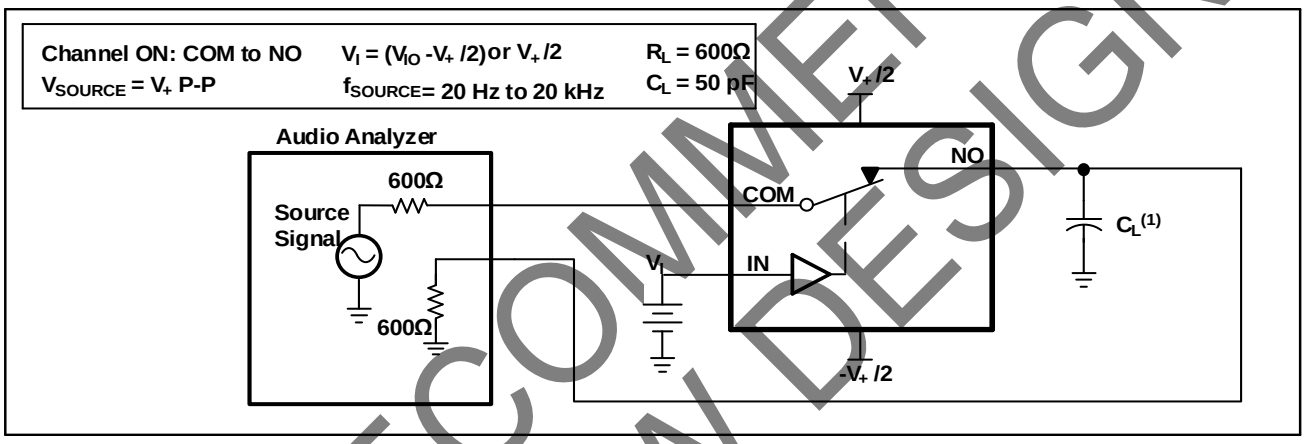


Figure 14. Total Harmonic Distortion (THD)

NOT RECOMMENED FOR NEW DESIGN

TYPICAL APPLICATION

Ensure that the device is powered up with a supply voltage on VCC before a voltage can be applied to the signal paths NC and NO. All unused digital inputs of the device must be held at VCC or GND to ensure proper device operation. Tie the digitally controlled inputs select pins IN1 and IN2 to VCC or GND to avoid unwanted switch states that could result if the logic control pins are left floating.

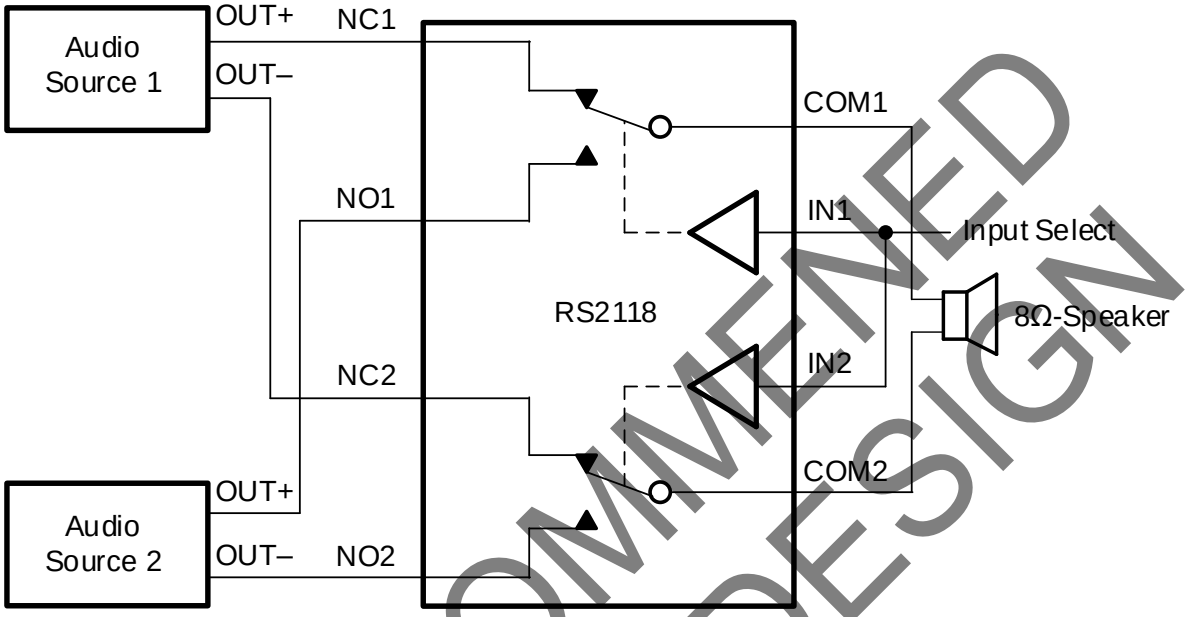
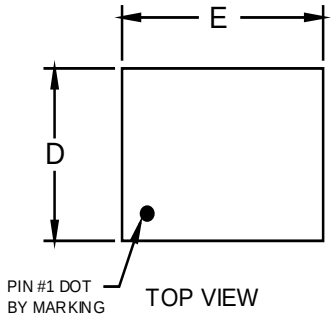


Figure 15. Typical Application Schematic

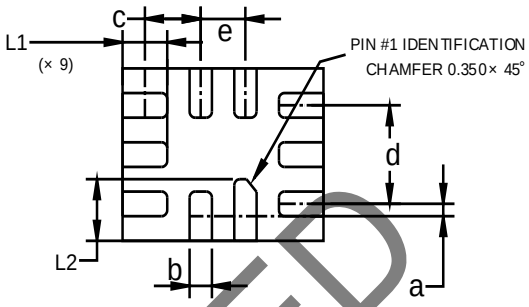
NOT RECOMMENED FOR NEW DESIGN

PACKAGE OUTLINE DIMENSIONS

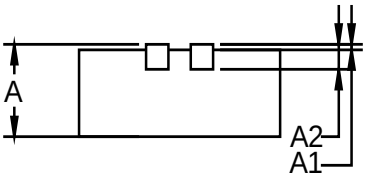
UQFN1.4X1.8-10



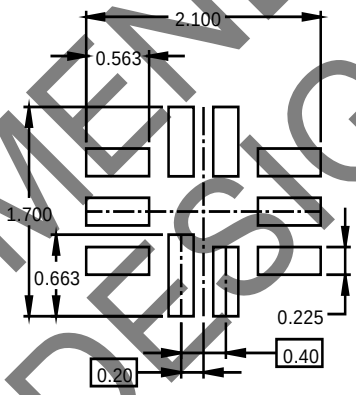
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN

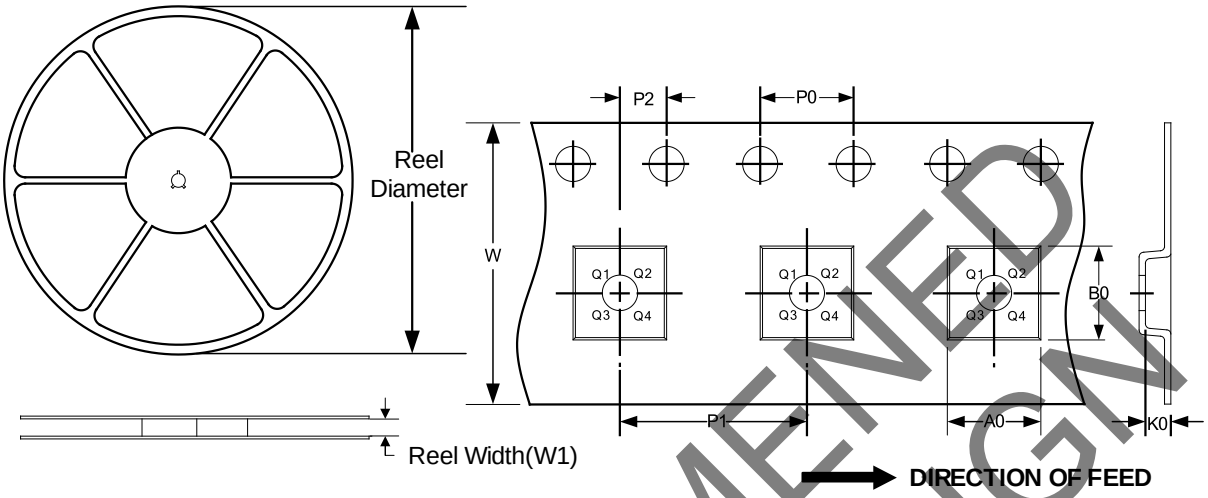
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.500	0.600	0.020	0.024
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
a	0.050	0.150	0.002	0.006
b	0.150	0.250	0.006	0.010
c	0.450	0.550	0.018	0.022
d	0.800 REF		0.031 REF	
D	1.350	1.450	0.053	0.057
E	1.750	1.850	0.069	0.073
e	0.400 TYP		0.016 TYP	
L1	0.350	0.450	0.014	0.018
L2	0.450	0.550	0.018	0.022

NOT RECOMMENED FOR NEW DESIGN

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
UQFN1.4X1.8-10	7''	9.0	1.60	2.00	0.85	4.0	4.0	2.0	8.0	Q1

NOT RECOMMENED FOR NEW DESIGN