

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

1 FEATURES

- **-3dB Bandwidth: 110MHz**
- **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: UQFN1.4X1.8-10**

2 APPLICATIONS

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

3 DESCRIPTIONS

The RS2323 is a dual, low on-resistance, single-pole double-throw (SPDT) analog switch that is designed to operate from 1.8 V to 5.5 V.

The RS2323 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.

Device Information ⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS2323	UQFN1.4X1.8-10	1.80mm×1.40mm

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

4 FUNCTIONAL BLOCK DIAGRAM

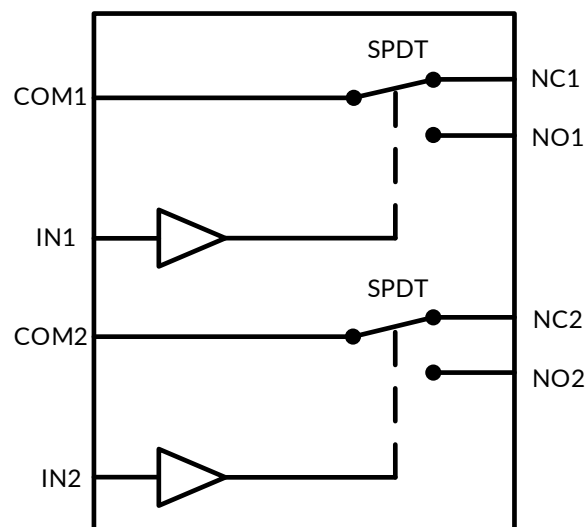


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5 REVISION HISTORY

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

VERSION	Change Date	Change Item
D.1	2021/11/22	Version updated
D.1.1	2024/03/07	Modify packaging naming
D.2	2024/05/06	1. Add MSL on Page 5@RevD.1.1 2. Add Package thermal impedance on Page 4@RevD.1.1 3. Update PACKAGE note

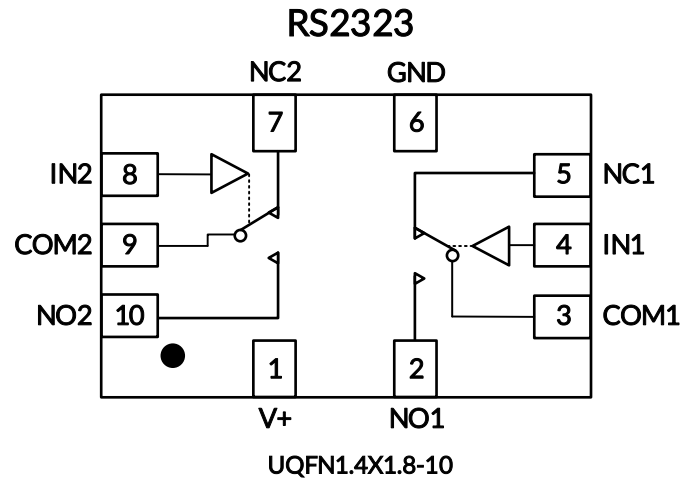
6 PACKAGE/ORDERING INFORMATION ⁽¹⁾

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING ⁽²⁾	MSL ⁽³⁾	PACKAGE OPTION
RS2323	RS2323XUTQK10	-40°C ~125°C	UQFN1.4X1.8-10	2323	MSL3	Tape and Reel, 4000

NOTE:

- (1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the right-hand navigation.
- (2) 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.
- (3) MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

7 PIN CONFIGURATION AND FUNCTIONS (TOP VIEW)



7.1 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 to connect COM terminal to NO or NC terminals
NC1, NC2	5,7	Normally-closed terminal
GND	6	Ground

7.2 Function Table

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

8 SPECIFICATIONS

8.1 Absolute Maximum Ratings

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

SYMBOL	PARAMETER	MIN	MAX	UNIT
V ₊	Supply voltage ⁽²⁾	-0.3	6	V
V _{IN}	Control Input voltage ⁽²⁾	-0.3	6	
V _{I/O}	Switch I/O voltage ⁽³⁾⁽⁴⁾	-0.3	(V ₊)+0.3	
I _{IN}	Continuous Current NO, NC or COM	-500	+500	mA
I _{I/O}	Peak Current NO, NC, or COM	-800	+800	
θ _{JA}	Package thermal impedance ⁽⁵⁾	UQFN1.4X1.8-10		°C/W
T _J	Junction temperature ⁽⁶⁾		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) All voltages are with respect to ground, unless otherwise specified.

(3) The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

(4) This value is limited to 5.5 V maximum.

(5) The package thermal impedance is calculated in accordance with JESD-51.

(6) The maximum power dissipation is a function of T_{J(MAX)}, R_{θJA}, and T_A. The maximum allowable power dissipation at any ambient temperature is P_D = (T_{J(MAX)} - T_A) / R_{θJA}. All numbers apply for packages soldered directly onto a PCB.

8.2 ESD Ratings

The following ESD information is provided for handling of ESD-sensitive devices in an ESD protected area only.

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



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.

8.3 Recommended Operating Conditions

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

SYMBOL	PARAMETER	MIN	MAX	UNIT
V ₊	Supply voltage	1.8	5.5	V
I _N	Analog voltage	0	5.5	V
NO, NC, COM	Analog voltage	0	V ₊	V
T _A	Operating temperature	-40	+125	°C

8.4 Electrical Characteristics

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

PARAMETER	SYMBOL	CONDITIONS	V+	T _A	MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	UNIT
ANALOG SWITCH								
Analog Signal Range	V _{NO} , V _{NC} , V _{COM}			FULL	0		V+	V
On-Resistance	R _{ON}	0 ≤ (V _{NO} or V _{NC}) ≤ V+, I _{COM} = -10mA, Switch ON, See Figure 16	5V	+25°C		0.6	1.0	Ω
				FULL			1.2	Ω
		V _{NO} or V _{NC} = 2V, I _{COM} = -10mA, Switch ON, See Figure 16	3.3V	+25°C		1.4	1.8	Ω
				FULL			2.0	Ω
On-Resistance Match Between Channels	ΔR _{ON}	0 ≤ (V _{NO} or V _{NC}) ≤ V+, I _{COM} = -10mA, Switch ON, See Figure 16	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 ≤ (V _{NO} or V _{NC}) ≤ V+, I _{COM} = -10mA, Switch ON, See Figure 16	5V	+25°C		0.18	0.3	Ω
				FULL			0.4	Ω
		3.3V	+25°C		0.85	1.0	Ω	
			FULL			1.2	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 17	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} or V _{NC} = 0.3V, Open V _{COM} = Open, 0.3V See Figure 18	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} 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.

(2) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

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 20	5V	+25°C		35		ns	
				FULL			50		
			3.3V	+25°C		55			70
				FULL					
Turn-Off Time	t _{OFF}	V _{COM} = V+, R _L = 300Ω, C _L = 35pF, See Figure 20	5V	+25°C		7.5		ns	
				FULL			15		
			3.3V	+25°C		12			17
				FULL					
Crosstalk	X _{TALK}	V+=5.5V, Switch on, R _L =50Ω, F=100KHz	5.5V	+25°C		-80		dB	
Break before make time	t _{BBM}	V+=V _{COM} =5V, R _L =300Ω, C _L =35pF	5V	+25°C		2.5		ns	
				FULL	1				
Off Isolation	O _{ISO}	R _L = 50Ω, Switch ON, See Figure 23	5.5V	+25°C		-70		dB	
				f= 10KHz	5.5V	+25°C		-86	
-3dB Bandwidth	BW	Switch ON, R _L = 50Ω, See Figure 22	5.5V	+25°C		110		MHz	
NC, NO OFF Capacitance	C _{NC(OFF)} , C _{NO(OFF)}	V _{NC} or V _{NO} =V+/2 or GND, Switch OFF See Figure 19	5V	+25°C		30		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 19	5V	+25°C		100		pF	
POWER REQUIREMENTS									
Power Supply Range	V+			FULL	1.8		5.5	V	
Power Supply Current	I+	V _{IN} = GND or V+	5.5V	+25°C			1	μA	
				FULL			1		
Supply-Current Change	ΔI+	V+=5.5V, V _{IN} =3.4V	5.5V	FULL			10	μA	

8.5 Typical Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

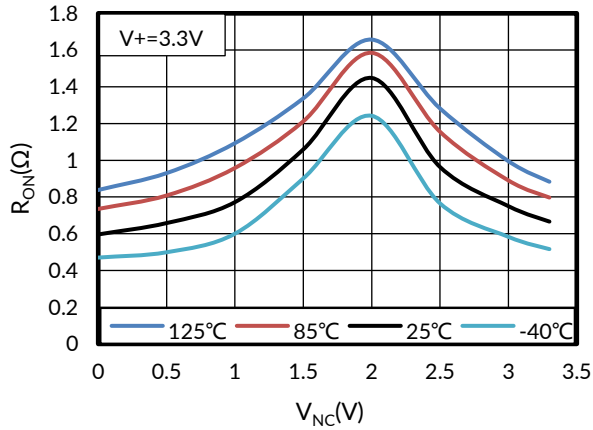


Figure 1. On-Resistance vs NC Voltage

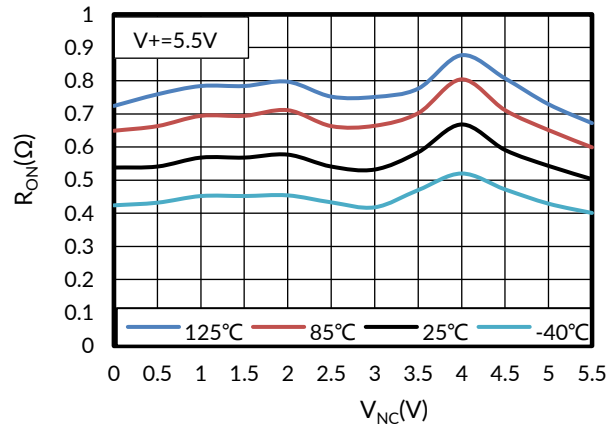


Figure 2. On-Resistance vs NC Voltage

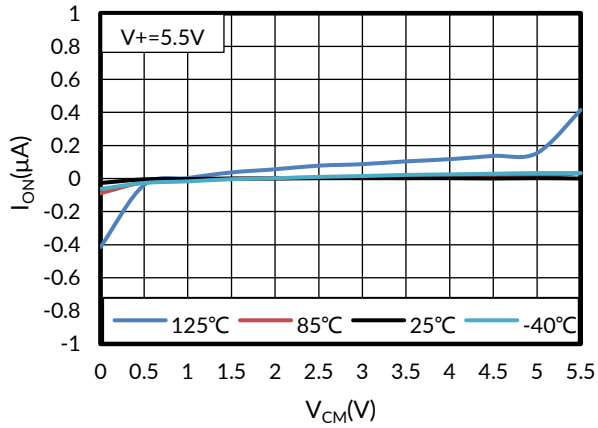


Figure 3. ON-State Leakage Current vs Common-Mode Voltage

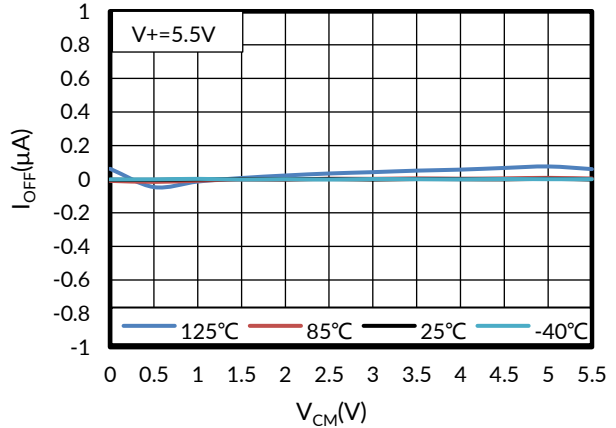


Figure 4. OFF-State Leakage Current vs Common-Mode Voltage

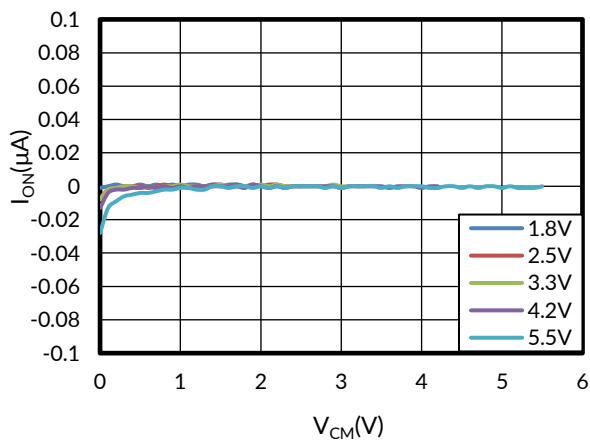


Figure 5. ON-State Leakage Current vs Common-Mode Voltage

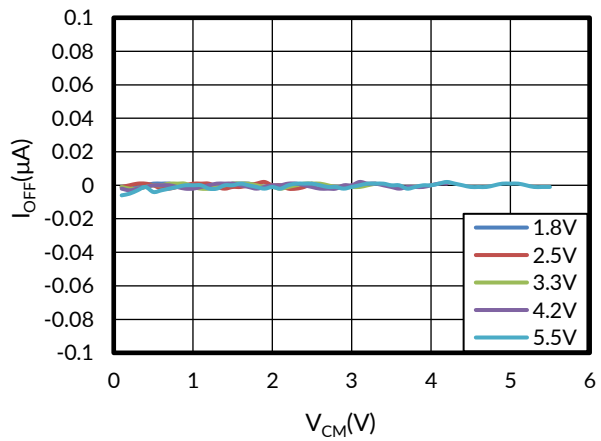


Figure 6. OFF-State Leakage Current vs Common-Mode Voltage

Typical Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

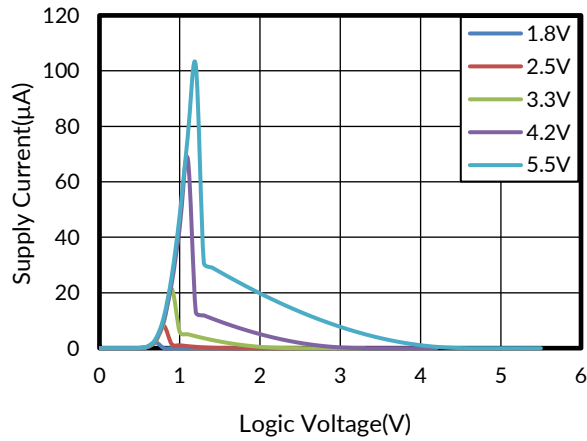


Figure 7. Supply Current vs Logic Voltage

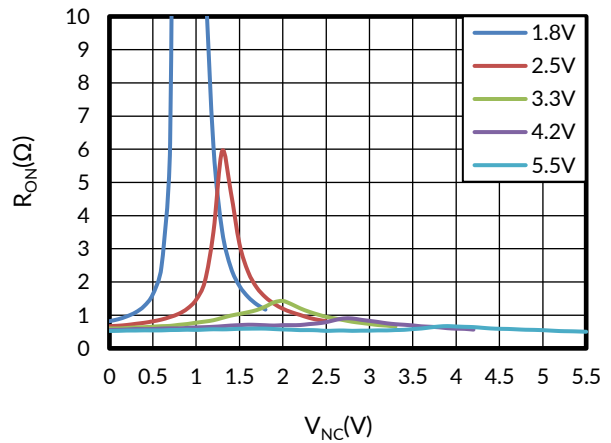


Figure 8. On-Resistance vs NC Voltage

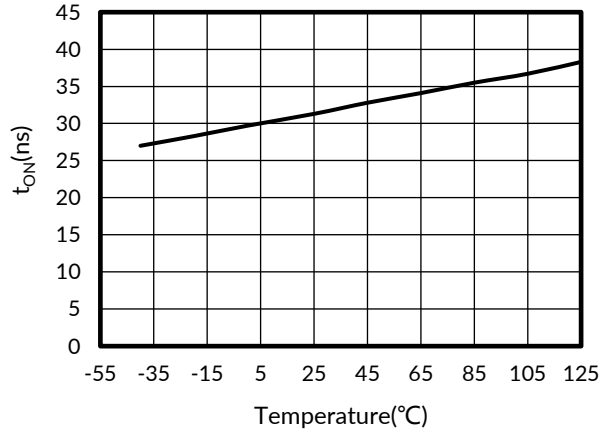


Figure 9. Turn on Time vs Temperature

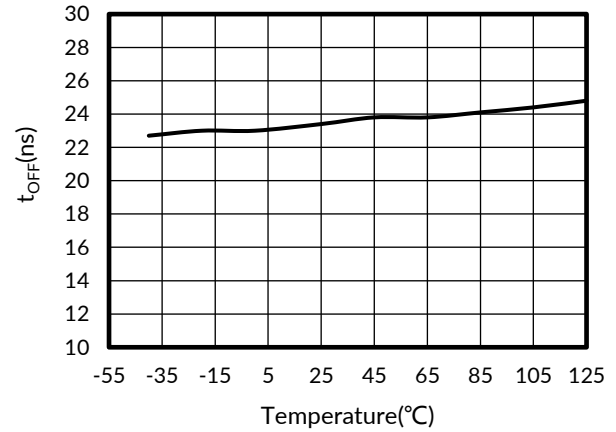


Figure 10. Turn-off Time vs Temperature

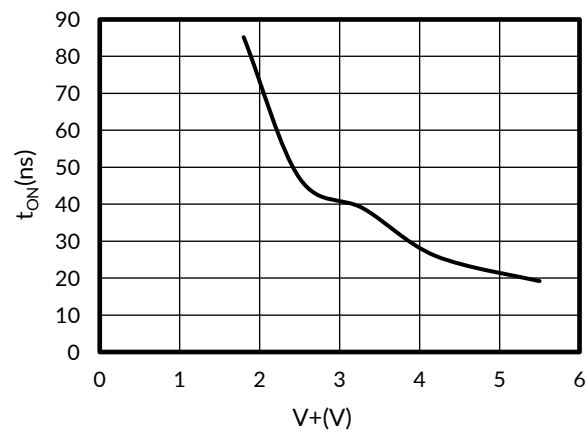


Figure 11. Turn On Time vs Supply Voltage

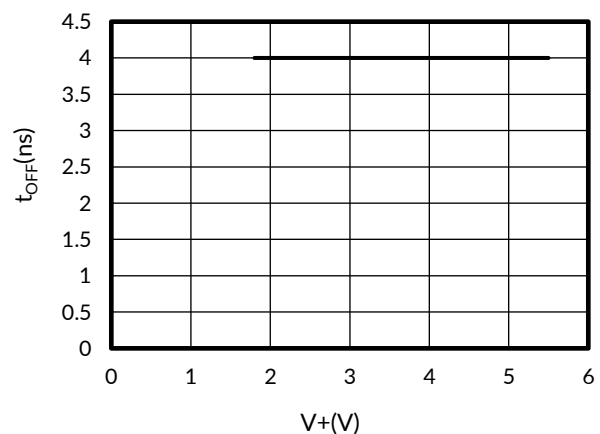


Figure 12. Turn-Off Time vs Supply Voltage

Typical Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

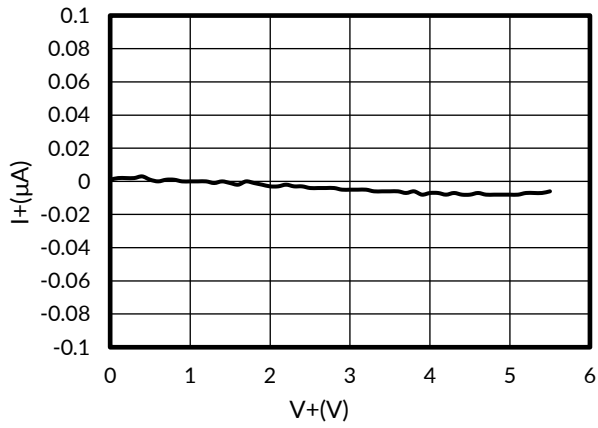


Figure 13. Supply Current vs Supply Voltage

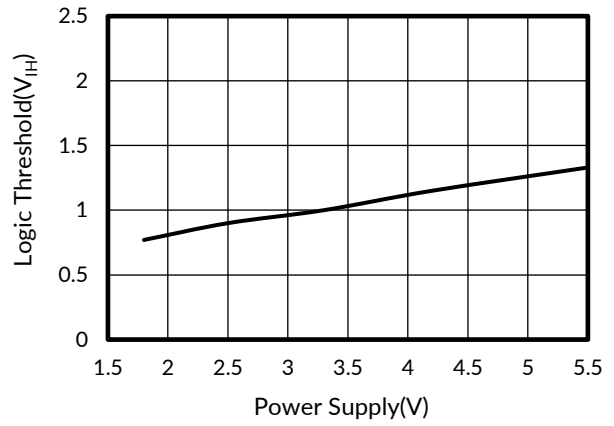


Figure 14. Logic Threshold vs Power Supply

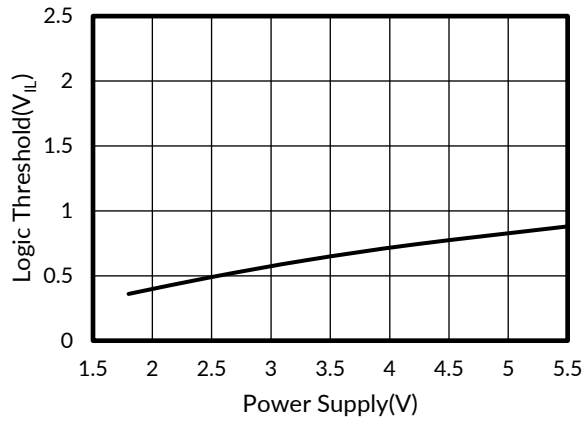


Figure 15. Logic Threshold vs Power Supply

9 PARAMETER MEASUREMENT INFORMATION

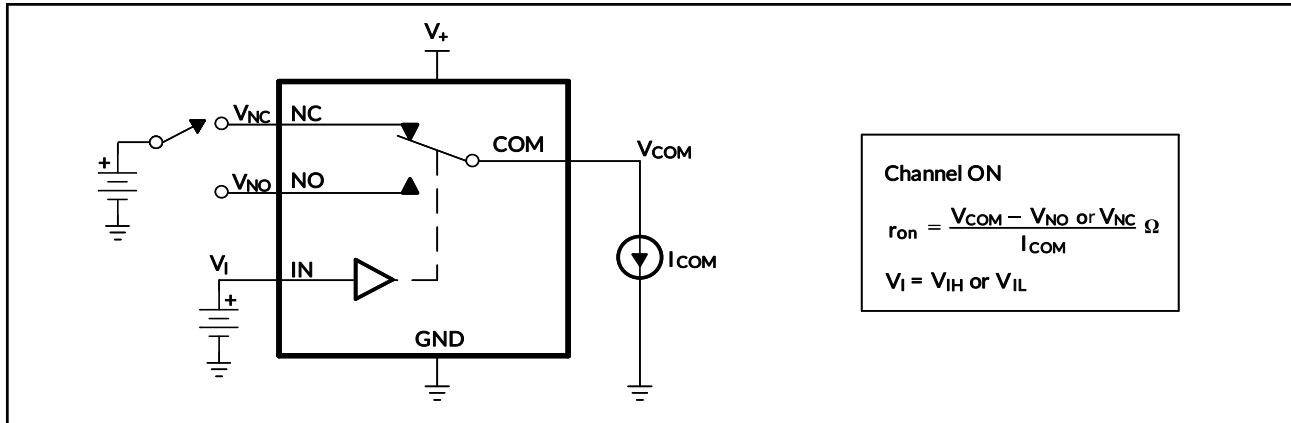


Figure 16. ON-State Resistance (r_{on})

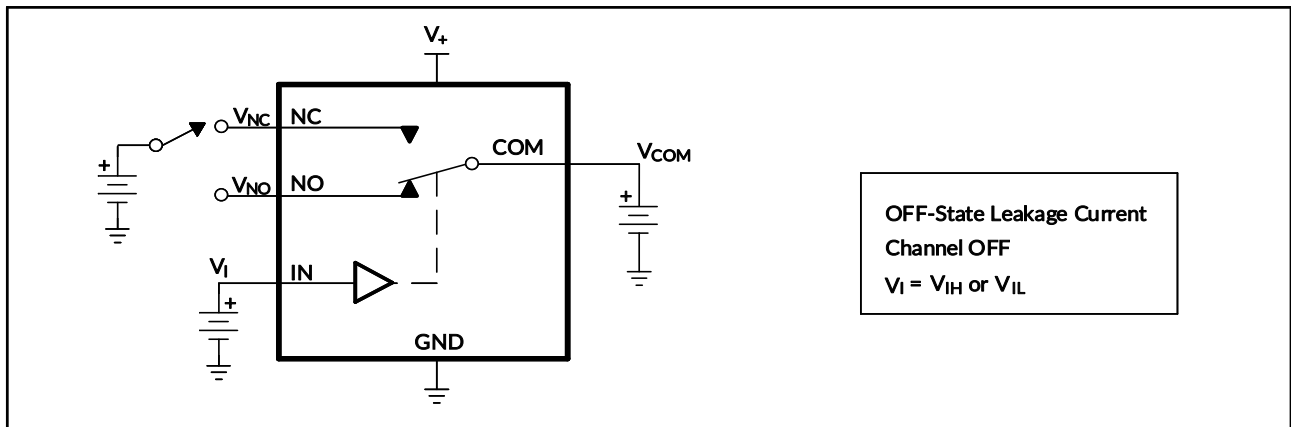


Figure 17. OFF-State Leakage Current ($I_{NC(OFF)}$, $I_{NO(OFF)}$)

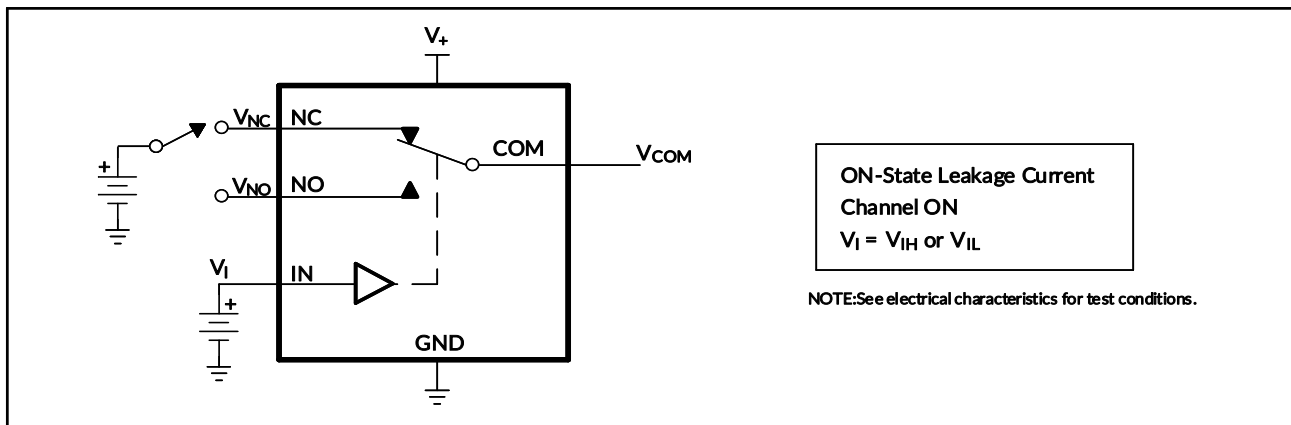
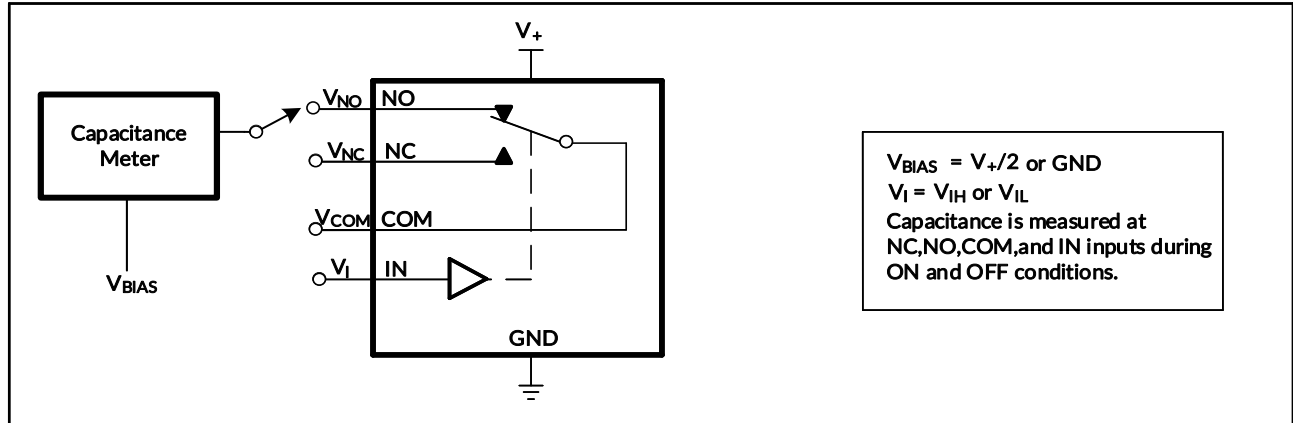
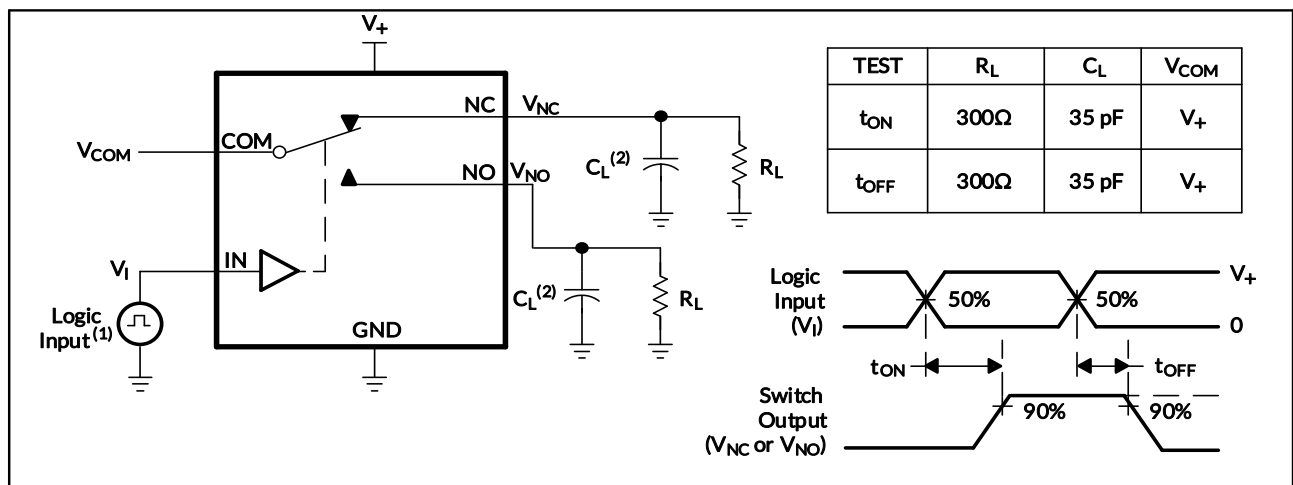
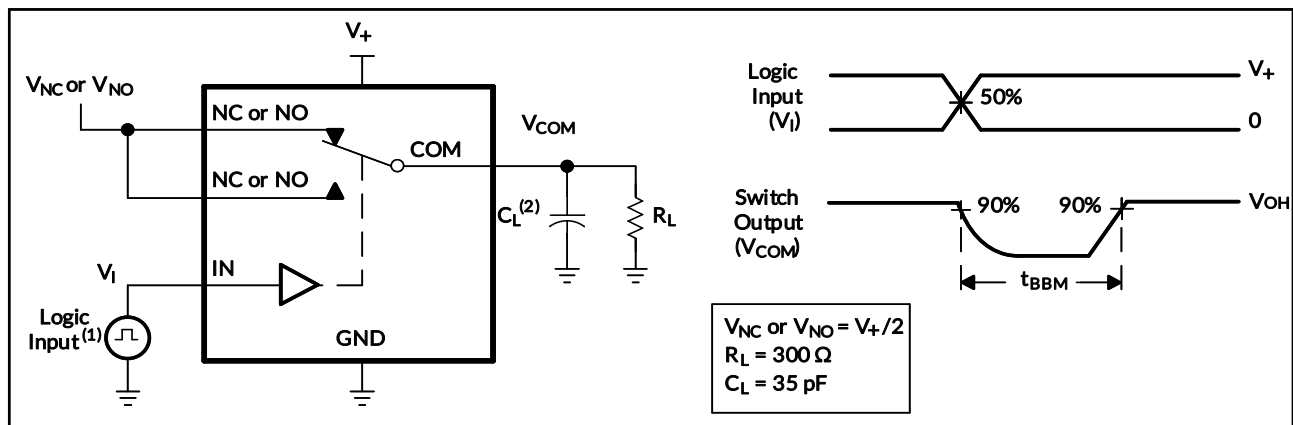
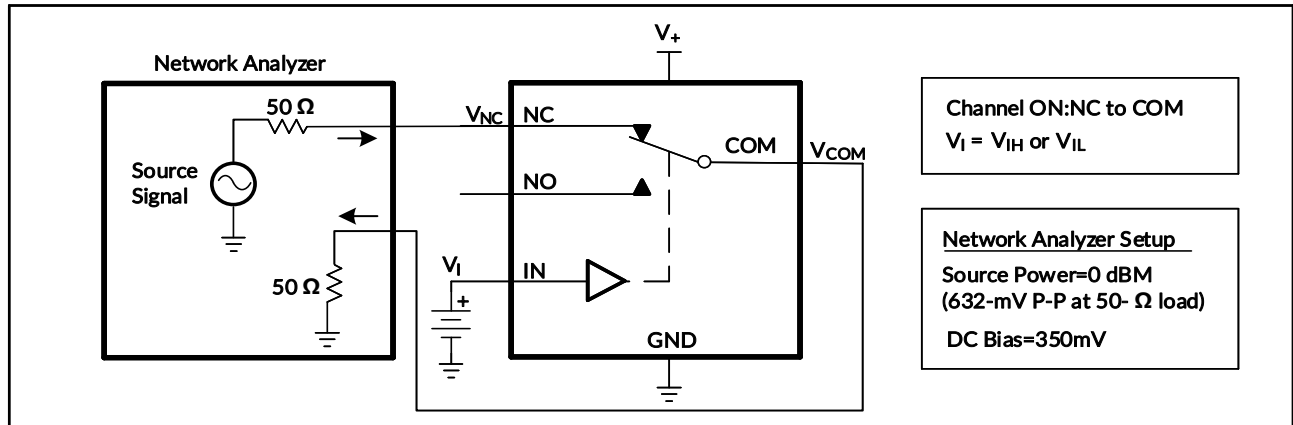
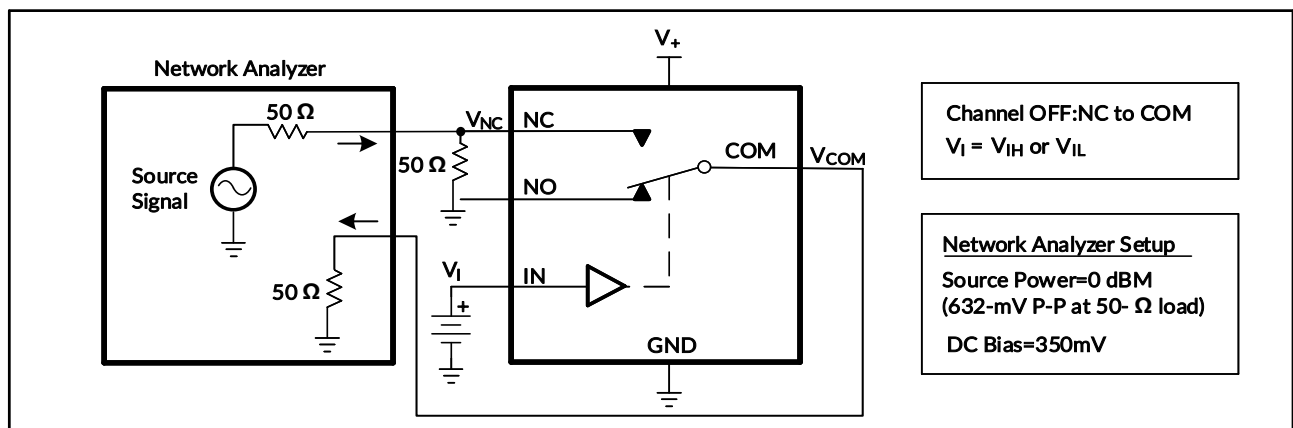
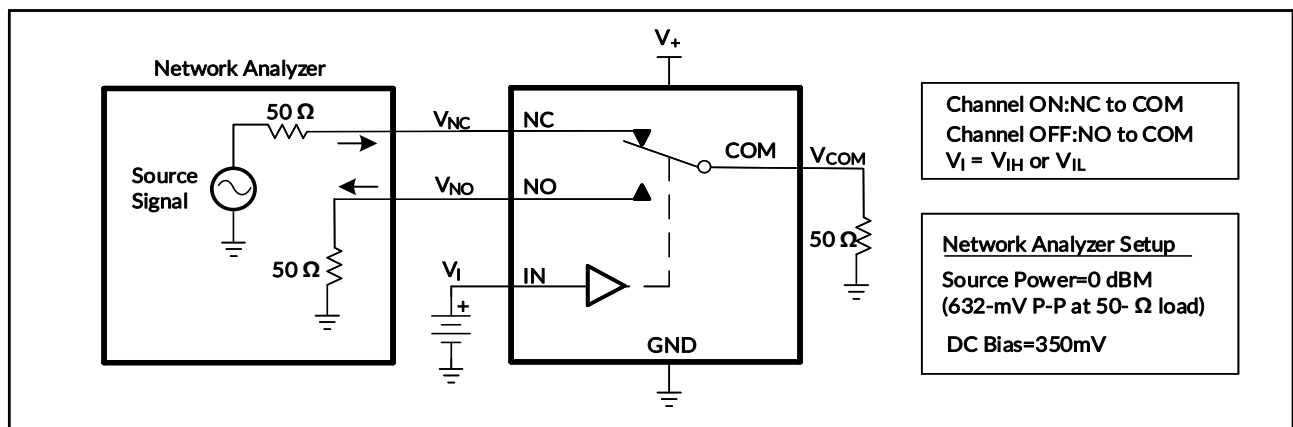


Figure 18. ON-State Leakage Current ($I_{COM(ON)}$, $I_{NC(ON)}$, $I_{NO(ON)}$)


Figure 19. Capacitance (C_I , $C_{COM(ON)}$, $C_{NC(OFF)}$, $C_{NC(ON)}$, $C_{NO(OFF)}$, $C_{NO(ON)}$)

Figure 20. Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})

Figure 21. Break-Before-Make Time (t_{BBM})


Figure 22. Bandwidth (BW)

Figure 23. OFF Isolation (O_{Iso})

Figure 24. Crosstalk (X_{TALK})

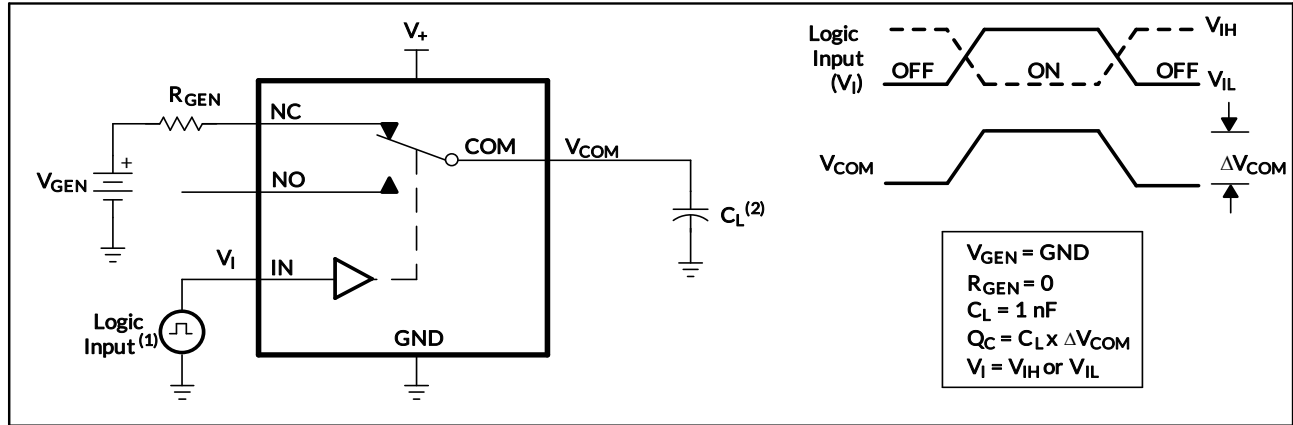


Figure 25. Charge Injection (Q_c)

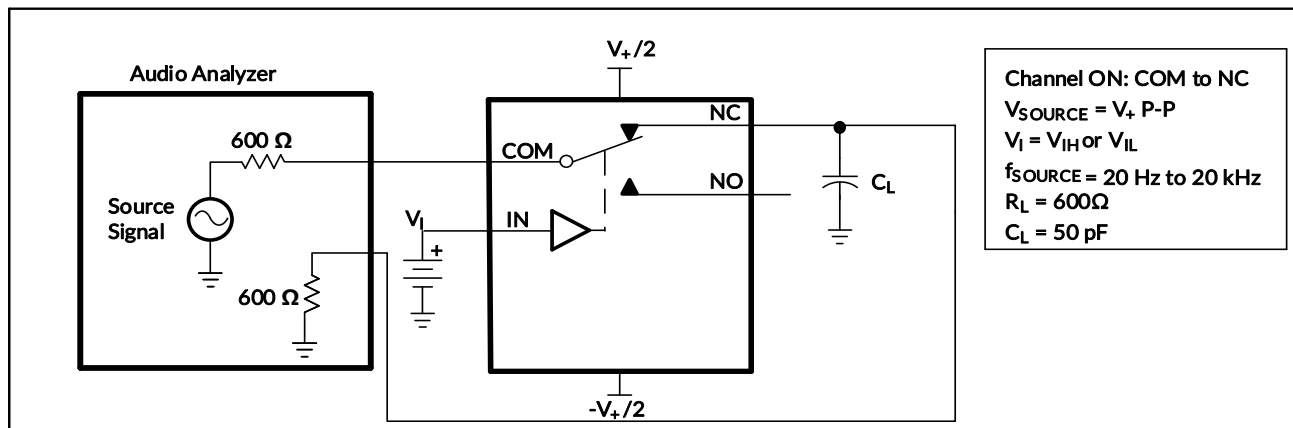
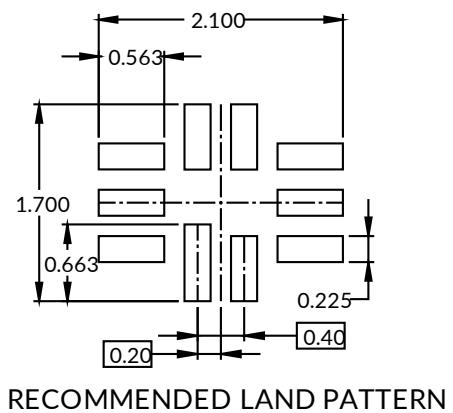
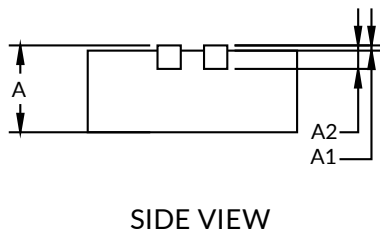
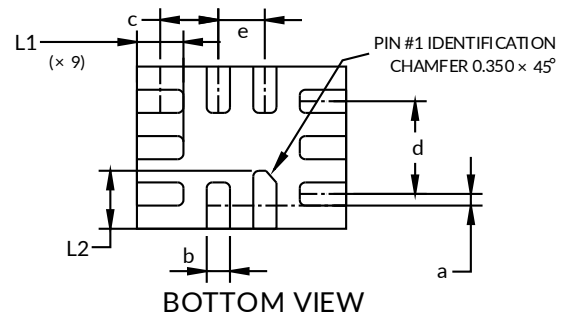
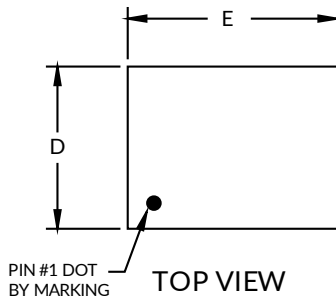


Figure 26. Total Harmonic Distortion (THD)

10 PACKAGE OUTLINE DIMENSIONS

UQFN1.4X1.8-10⁽³⁾



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A ⁽¹⁾	0.500	0.600	0.020	0.024
A1	0.000	0.050	0.000	0.002
A2	0.203 REF ⁽²⁾		0.008 REF ⁽²⁾	
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 ⁽²⁾		0.031 REF ⁽²⁾	
D ⁽¹⁾	1.350	1.450	0.053	0.057
E ⁽¹⁾	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

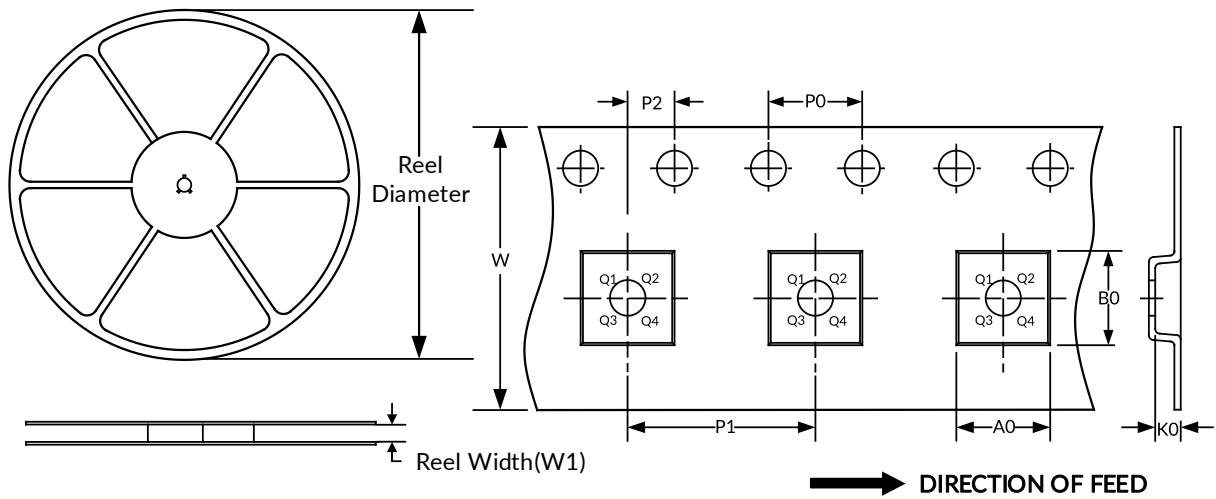
NOTE:

1. Plastic or metal protrusions of 0.075mm maximum per side are not included.
2. REF is the abbreviation for Reference.
3. This drawing is subject to change without notice.

11 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

NOTE:

1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.

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