0.5Ω Ultra Low On-Resistance Dual SPDT Analog Switch

UM5223 *QFN10 1.8×1.4*

General Description

The UM5223 is a low on-resistance (R_{ON}), dual single-pole/double-throw (SPDT) analog switch operates from a single +1.65V to +4.5V supply. The device's targeted applications include battery powered equipment that benefit from its low on-resistance.

The UM5223 features two 0.5Ω R_{ON}(max) SPDT switches with 0.15Ω flatness and 0.05Ω matching between channels. The switch offers break-before-make switching (1ns) with t_{ON}<60ns and t_{OFF}<40ns at +2.7V.

The switch is available in Pb-free QFN10 package.

Applications

- Cell Phone Audio Block
- Speaker and Earphone Switching
- Portable Instrumentation
- Battery-Operated Equipment
- Modems
- Medical Equipment
- Computer Peripherals
- Ring-Tone Chip/Amplifier Switching

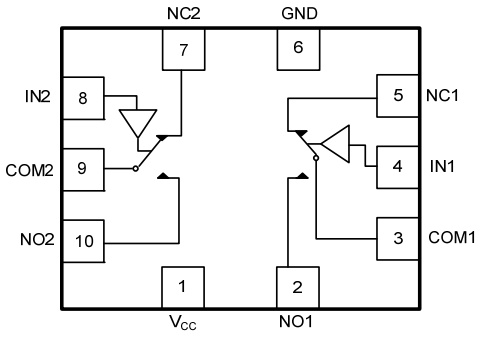
Features

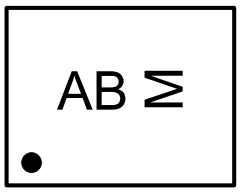
- Ultra-Low R_{ON}<0.5Ω at V_{CC}=3.0±0.3V
- R_{ON} Flatness of 0.15Ω
- Single-Supply Operation from +1.65V to +4.5V
- Interfaces with 2.8V Chipset
- Full 0-Vcc Signal Handing Capability
- Power Off Protection:
  When V_{CC}=0V, Input Signal can Tolerate up to 4.5V
- High Off-Isolation: -78dB (100kHz)
- Low Crosstalk: -92dB (100kHz)
- Low Distortion: 0.12%
- High Continuous Current Capability: ±300mA through Each Switch
- Lead (Pb)-Free QFN10 Package

Pin Configurations

Top View

(Top View)





M: Month Code
UM5223
QFN10 1.8×1.4

Pin Description

Pin	Name	Function
1	V_{CC}	Positive Supply Voltage
2	NO1	Analog Switch 1-Normally Open Terminal
3	COM1	Analog Switch 1-Common Terminal
4	IN1	Analog Switch 1-Digital Control Input
5	NC1	Analog Switch 1-Normally Closed Terminal
6	GND	Ground Connection
7	NC2	Analog Switch 2-Normally Closed Terminal
8	IN2	Analog Switch 2-Digital Control Input
9	COM2	Analog Switch 2-Common Terminal
10	NO2	Analog Switch 2-Normally Open Terminal

Ordering Information

Part Number	Packaging Type	Marking Code	Shipping Qty
UM5223	QFN10 1.8×1.4	AB	3000pcs/7 Inch Tape & Reel

Function Table

IN_	NO_	NC_
0	OFF	ON
1	ON	OFF

Absolute Maximum Ratings

Symbol	Parameter	Limit	Unit
V_+	Supply Voltage	-0.3 to +5.5	V
V_S	DC Switch Voltage (Note 1)	-0.3 to (V_++0.3)	
IN_	DC IN Voltage	-0.3 to +5.5	
Io	Continuous Current (COM_, NO_, NC_)	±300	mA
I_P	Peak Current (Pulsed at 1ms, 10% Duty Cycle)	±500	
T_O	Operating Temperature Range	-40 to +85	°C
T_J	Junction Temperature	+150	
T_{STG}	Storage Temperature Range	-65 to +150	
T_L	Junction Lead Temperature (Soldering, 10 Seconds)	+300	
ESD	ESD Method 3015.7	>2000	V

Note 1: Signals on COM_, NO_, or NC_ exceeding V_+ or GND are clamped by internal diodes. Limit forward-diode current to maximum current rating.

DC Electrical Characteristics

Symbol	Parameter	Test Conditions	V_{CC} (V)	Temp	Limits (–40°C to 85°C)			Unit
					Min	Typ	Max	
I_{IN}	Input Leakage Current	V_{IN}=3.6V or GND	3.6	Room Full	-0.1 -1.0		0.1 1.0	μA
I_{OFF}	Power Off Leakage Current	V_{IN}=3.6V or GND	0	Room Full	-0.5 -2.0		0.5 2.0	μA
$I_{COM(ON)}$	COM ON Leakage Current	V_{IN}=V_{IL} or V_{IH} V_{NO} 0.3V or 3.3V with V_{NC} Floating or V_{NC} 0.3V or 3.3V with V_{NO} Floating V_{COM}=0.3V or 3.3V	3.6	Room Full	-0.01 -0.1		0.01 0.1	μA
$I_{NO/NC(OFF)}$	OFF State Leakage Current	V_{IN}=V_{IL} or V_{IH} V_{NO} or V_{NC}=0.3V V_{COM}=3.3V	3.6	Room Full	-0.3		0.3	μA
I_{CC}	Quiescent Supply Current	Select V_{IS}=V_{CC} or GND	1.65 to 3.6	Room Full	-1.0 -2.0		1.0 2.0	μA
V_{IH}	Input High Voltage		3.0	Full	1.4			V
			3.6		1.7			
V_{IL}	Input Low Voltage		3.0	Full			0.7	V
			3.6				0.8	
R_{ON}	On-Resistance (Note 2)	V_{IN}=V_{IL} or V_{IH} V_{IS}=V_{CC} to GND I_{COM}=100mA	3.0	Room Full		0.5 0.6		Ω
			3.6	Room Full		0.5 0.6		
ΔR_{ON}	On Resistance Match Between Channels (Note 2,3,4)	V_{IS}=1.5V I_{COM}=100mA; V_{IS}=1.8V I_{COM}=100mA	3.0	Room Full			0.05 0.05	Ω
			3.6	Room Full			0.05 0.05	
R_{FLAT}	On Resistance Flatness (Note 2,3,5)	V_{IS}=V_{CC} to GND I_{COM}=100mA	3.0	Room Full			0.15 0.15	Ω
			3.6	Room Full			0.15 0.15	

Note 2: Guaranteed by design. Resistance measurements do not include test circuit or package resistance.

Note 3: Parameter is characterized but not tested in production.

Note 4: $\Delta R_{ON}=R_{ON\,(B0)}-R_{ON(B1)}$ measured at identical V_{CC}, temperature and voltage levels.

Note 5: Flatness is defined as the difference between the maximum and minimum value of On Resistance over the specified range of conditions.

AC Electrical Characteristics

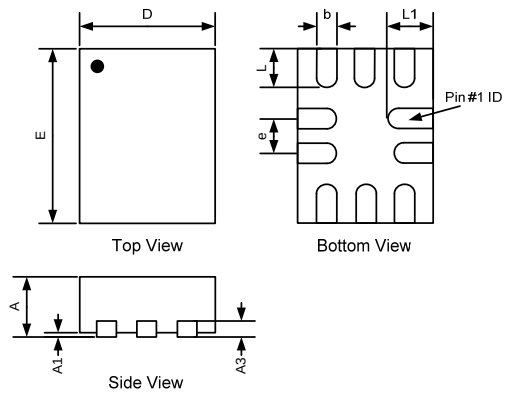
Symbol	Parameter	Test Conditions	V_{CC} (V)	Temp	Limits (–40°C to 85°C)			Unit
					Min	Typ	Max	
t_{ON}	Turn On Time	V_{IS}=1.5V R_L=50Ω, C_L=35pF	2.3 to 3.6	Room Full		50 60		ns
t_{OFF}	Turn Off Time	V_{IS}=1.5V R_L=50Ω, C_L=35pF	2.3 to 3.6	Room Full		30 40		ns
t_{BBM}	Break Before Make Time (Note 6)	V_{IS}=3.0V R_L=50Ω, C_L=35pF	3.0	Room Full	2	15		ns
Q_{INJ}	Charge Injection (Note 6)	C_L=1.0nF, V_{GEN}=0V, R_{GEN}=0Ω	1.65 to 3.6	Room		38		pC
V_{ISO}	Off Isolation (Note 7)	C_L=5.0pF, f=100kHz	1.65 to 3.6	Room		-78		dB
VCT	Crosstalk	R_L=50Ω, C_L=5.0pF, f=100kHz	1.65 to 3.6	Room		-92		dB
BW	-3dB Bandwidth		1.65 to 3.6	Room		75		MHz
THD	Total Harmonic Distortion (Note 6)	f_{IS}=20Hz to 20kHz, R_L=R_{GEN}=600Ω C_L=50pF, V_{IS}=2.0V RMS	3.0	Room		0.12		%
Capacitance								
C_{IN}	IN Pin Input Capacitance (Note 8)	V_{CC}=3.6V				4.5		pF
$C_{NO/NC}$	NO/NC Port Off Capacitance (Note 8)	V_{CC}=3.6V				20		pF
C_{COM}	COM Port Capacitance when Switch is Enabled (Note 8)	V_{CC}=3.6V				55		pF

Note 6: Guaranteed by design.
Note 7: Off Isolation=20 log10 [$V_{COM}/V_{NO/NC}$].
Note 8: T_A=+25°C, f=1MHz, Capacitance is characterized but not tested in production.

Package Information

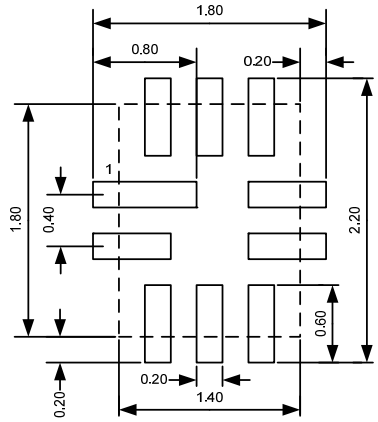
UM5223 QFN10 1.8×1.4

Outline Drawing



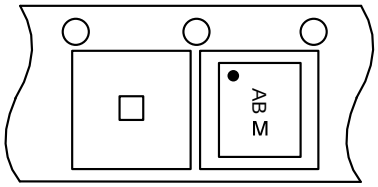
DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	0.50	0.55	0.60	0.020	0.022	0.024
A1	0.00	-	0.05	0.000	-	0.002
A3	0.15REF			0.006REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D	1.35	1.40	1.45	0.053	0.055	0.057
E	1.75	1.80	1.85	0.069	0.071	0.073
e	0.40BSC			0.016BSC		
L	0.30	0.40	0.50	0.012	0.016	0.020
L1	0.40	0.50	0.60	0.016	0.020	0.024

Land Pattern



NOTES:
1. Compound dimension: 1.80×1.40;
2. Unit: mm
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

Tape and Reel Orientation



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