

## 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

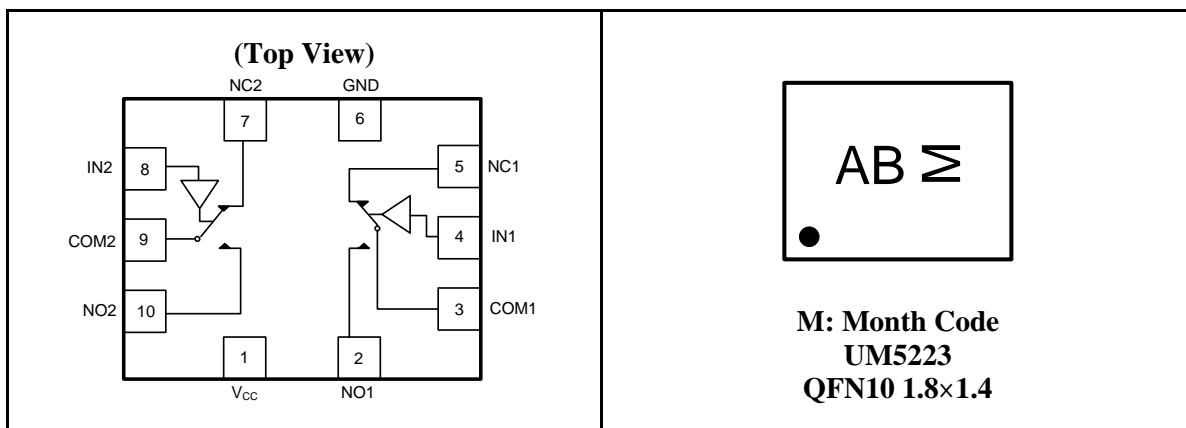
- Cell Phone Audio Block
- Speaker and Earphone Switching
- Portable Instrumentation
- Battery-Operated Equipment
- Modems
- Medical Equipment
- Computer Peripherals
- Ring-Tone Chip/Amplifier Switching

#### Features

- Ultra-Low  $R_{ON}<0.5\Omega$  at  $V_{CC}=3.0\pm 0.3V$
- $R_{ON}$  Flatness of 0.15Ω
- Single-Supply Operation from +1.65V to +4.5V
- Interfaces with 2.8V Chipset
- Full 0-V<sub>CC</sub> Signal Handling 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



## Pin Description

Pin	Name	Function
1	V <sub>CC</sub>	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 <sub>-</sub>	NO <sub>-</sub>	NC <sub>-</sub>
0	OFF	ON
1	ON	OFF

## Absolute Maximum Ratings

Symbol	Parameter	Limit	Unit
V <sub>+</sub>	Supply Voltage	-0.3 to +5.5	V
V <sub>S</sub>	DC Switch Voltage (Note 1)	-0.3 to (V <sub>+</sub> +0.3)	
IN <sub>-</sub>	DC IN Voltage	-0.3 to +5.5	
I <sub>O</sub>	Continuous Current (COM <sub>-</sub> , NO <sub>-</sub> , NC <sub>-</sub> )	±300	mA
I <sub>P</sub>	Peak Current (Pulsed at 1ms, 10% Duty Cycle)	±500	
T <sub>O</sub>	Operating Temperature Range	-40 to +85	°C
T <sub>J</sub>	Junction Temperature	+150	
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	
T <sub>L</sub>	Junction Lead Temperature (Soldering, 10 Seconds)	+300	
ESD	ESD Method 3015.7	>2000	V

Note 1: Signals on COM<sub>-</sub>, NO<sub>-</sub>, or NC<sub>-</sub> exceeding V<sub>+</sub> or GND are clamped by internal diodes. Limit forward-diode current to maximum current rating.

## DC Electrical Characteristics

Symbol	Parameter	Test Conditions	V <sub>CC</sub> (V)	Temp	Limits (-40°C to 85°C)			Unit
					Min	Typ	Max	
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> =3.6V or GND	3.6	Room Full	-0.1 -1.0		0.1 1.0	μA
I <sub>OFF</sub>	Power Off Leakage Current	V <sub>IN</sub> =3.6V or GND	0	Room Full	-0.5 -2.0		0.5 2.0	μA
I <sub>COM(ON)</sub>	COM ON Leakage Current	V <sub>IN</sub> =V <sub>IL</sub> or V <sub>IH</sub> V <sub>NO</sub> 0.3V or 3.3V with V <sub>NC</sub> Floating or V <sub>NC</sub> 0.3V or 3.3V with V <sub>NO</sub> Floating V <sub>COM</sub> =0.3V or 3.3V	3.6	Room Full	-0.01 -0.1		0.01 0.1	μA
I <sub>NO/NC(OFF)</sub>	OFF State Leakage Current	V <sub>IN</sub> =V <sub>IL</sub> or V <sub>IH</sub> V <sub>NO</sub> or V <sub>NC</sub> =0.3V V <sub>COM</sub> =3.3V	3.6	Room Full	-0.3		0.3	μA
I <sub>CC</sub>	Quiescent Supply Current	Select V <sub>IS</sub> =V <sub>CC</sub> or GND	1.65 to 3.6	Room Full	-1.0 -2.0		1.0 2.0	μA
V <sub>IH</sub>	Input High Voltage		3.0	Full	1.4			V
			3.6		1.7			
V <sub>IL</sub>	Input Low Voltage		3.0	Full			0.7	V
			3.6				0.8	
R <sub>ON</sub>	On-Resistance (Note 2)	V <sub>IN</sub> =V <sub>IL</sub> or V <sub>IH</sub> V <sub>IS</sub> =V <sub>CC</sub> to GND I <sub>COM</sub> =100mA	3.0	Room Full		0.5 0.6		Ω
			3.6	Room Full		0.5 0.6		
ΔR <sub>ON</sub>	On Resistance Match Between Channels (Note 2,3,4)	V <sub>IS</sub> =1.5V I <sub>COM</sub> =100mA; V <sub>IS</sub> =1.8V I <sub>COM</sub> =100mA	3.0	Room Full			0.05 0.05	Ω
			3.6	Room Full			0.05 0.05	
R <sub>FLAT</sub>	On Resistance Flatness (Note 2,3,5)	V <sub>IS</sub> =V <sub>CC</sub> to GND I <sub>COM</sub> =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: ΔR<sub>ON</sub>=R<sub>ON(B0)</sub>-R<sub>ON(B1)</sub> measured at identical V<sub>CC</sub>, 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 <sub>CC</sub> (V)	Temp	Limits (-40°C to 85°C)			Unit
					Min	Typ	Max	
t <sub>ON</sub>	Turn On Time	V <sub>IS</sub> =1.5V R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	2.3 to 3.6	Room Full		50 60		ns
t <sub>OFF</sub>	Turn Off Time	V <sub>IS</sub> =1.5V R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	2.3 to 3.6	Room Full		30 40		ns
t <sub>BBM</sub>	Break Before Make Time (Note 6)	V <sub>IS</sub> =3.0V R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	3.0	Room Full	2	15		ns
Q <sub>INJ</sub>	Charge Injection (Note 6)	C <sub>L</sub> =1.0nF, V <sub>GEN</sub> =0V, R <sub>GEN</sub> =0Ω	1.65 to 3.6	Room		38		pC
V <sub>ISO</sub>	Off Isolation (Note 7)	C <sub>L</sub> =5.0pF, f=100kHz	1.65 to 3.6	Room		-78		dB
V <sub>CT</sub>	Crosstalk	R <sub>L</sub> =50Ω, C <sub>L</sub> =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 <sub>IS</sub> =20Hz to 20kHz, R <sub>L</sub> =R <sub>GEN</sub> =600Ω C <sub>L</sub> =50pF, V <sub>IS</sub> =2.0V RMS	3.0	Room		0.12		%
<b>Capacitance</b>								
C <sub>IN</sub>	IN Pin Input Capacitance (Note 8)	V <sub>CC</sub> =3.6V				4.5		pF
C <sub>NO/NC</sub>	NO/NC Port Off Capacitance (Note 8)	V <sub>CC</sub> =3.6V				20		pF
C <sub>COM</sub>	COM Port Capacitance when Switch is Enabled (Note 8)	V <sub>CC</sub> =3.6V				55		pF

Note 6: Guaranteed by design.

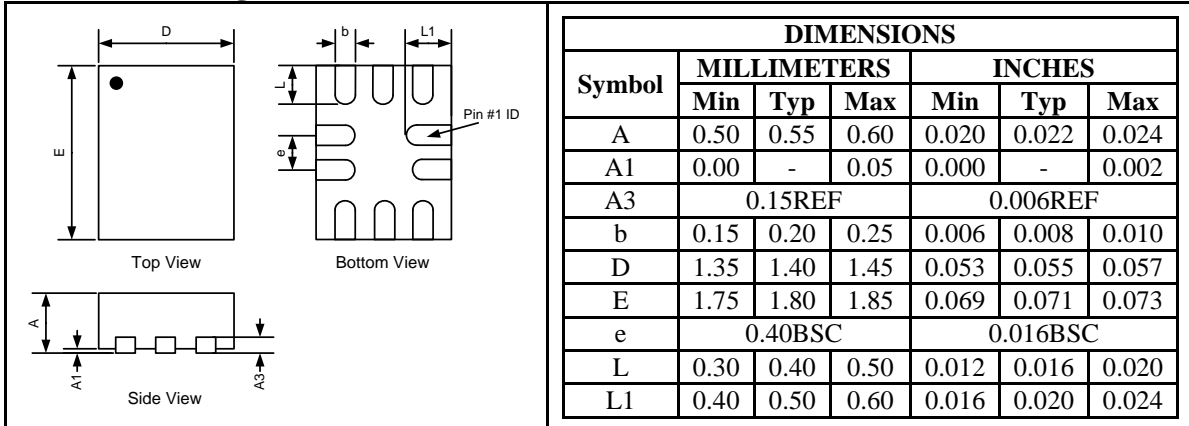
Note 7: Off Isolation=20 log<sub>10</sub> [V<sub>COM</sub>/V<sub>NO/NC</sub>].

Note 8: T<sub>A</sub>=+25°C, f=1MHz, Capacitance is characterized but not tested in production.

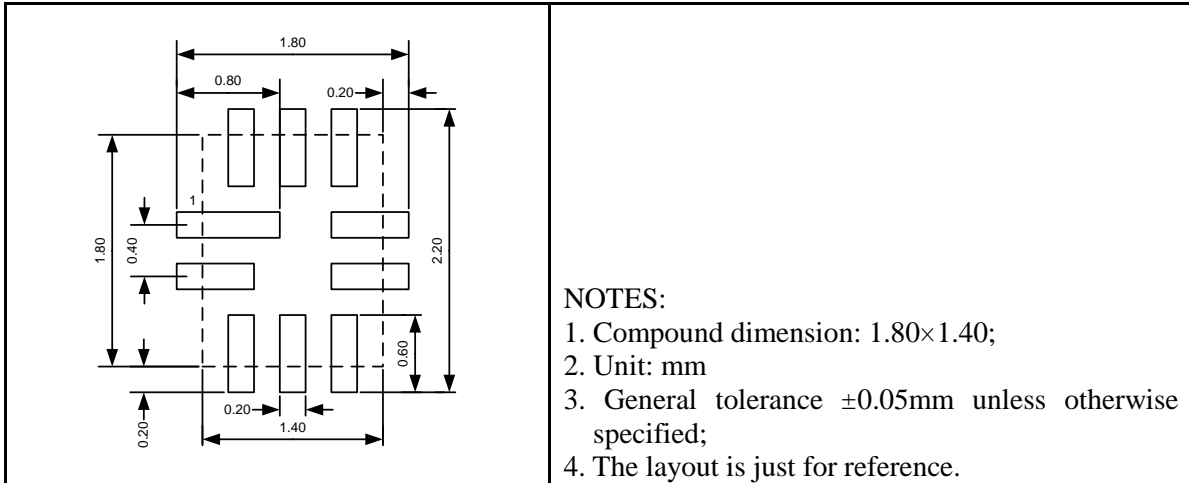
## Package Information

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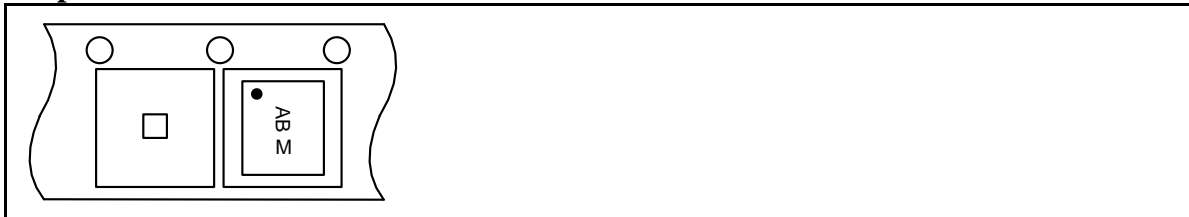
#### Outline Drawing



#### Land Pattern



#### Tape and Reel Orientation



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