

## 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

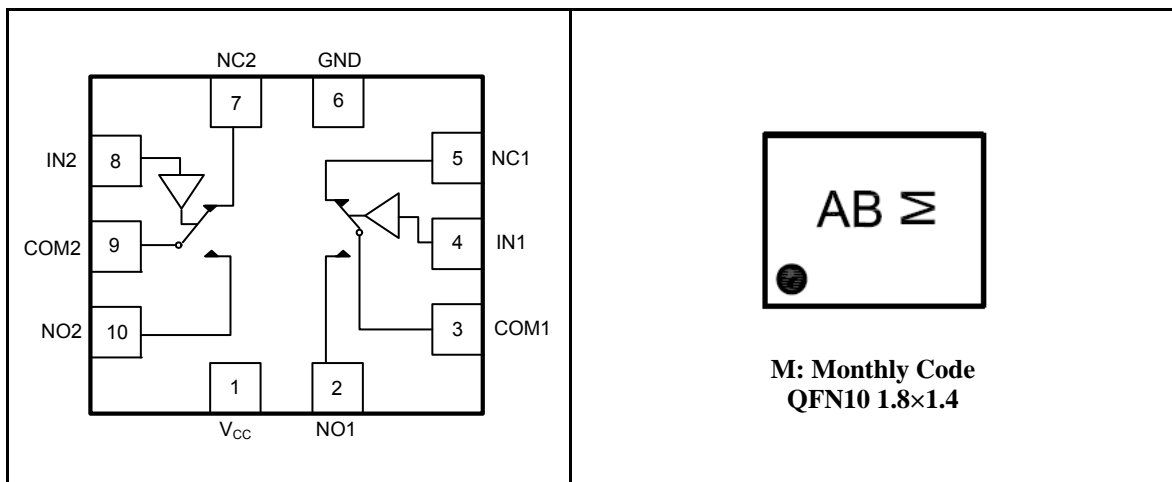
- Cell Phone Audio Block
- Speaker and Earphone Switching
- Portable Instrumentation
- Battery-Operated Equipment
- Modems
- Medical Equipment
- Computer Peripherals
- Ring-Tone Chip/Amplifier Switching

#### 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 (Note1)	- 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, 10seconds)	+300	
ESD	ESD Method 3015.7	>2000	V

Note1: 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	Vcc(V)	Temp	Limits (-40 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	$\mu A$
$I_{OFF}$	Power Off Leakage Current	$V_{IN} = 3.6V$ or GND	0	Room Full	-0.5 -2.0		0.5 2.0	$\mu A$
$I_{COM(ON)}$	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	$\mu A$
$I_{NO/NC(OFF)}$	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	$\mu A$
$I_{CC}$	Quiescent Supply Current	Select and $V_{IS} = V_{CC}$ or GND	1.65 to 3.6	Room Full	-1.0 -2.0		1.0 2.0	$\mu A$
$V_{IH}$	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 (Note2)	$V_{IN} = V_{IL}$ or $V_{IH}$ $V_{IS} = V_{CC}$ to GND $I_{COM} = 100mA$	3.0	Room Full		0.5 0.6		$\Omega$
			3.6	Room Full		0.5 0.6		
$\Delta R_{ON}$	On Resistance Match Between Channels (Note2,3,4)	$V_{IS} = 1.5V$ $I_{COM} = 100mA$ ; $V_{IS} = 1.8V$ $I_{COM} = 100mA$	3.0	Room Full			0.05 0.05	$\Omega$
			3.6	Room Full			0.05 0.05	
$R_{FLAT}$	On Resistance Flatness (Note2,3,5)	$V_{IS} = V_{CC}$ to GND $I_{COM} = 100mA$	3.0	Room Full			0.15 0.15	$\Omega$
			3.6	Room Full			0.15 0.15	

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

3: Parameter is characterized but not tested in production.

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

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	Vcc(V)	Temp	Limits (-40 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> = 1.0 nF, V <sub>GEN</sub> = 0 V 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	-3 dB Bandwidth		1.65 to 3.6	Room		75		MHz
THD	Total Harmonic Distortion (Note6)	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 (Note8)	V <sub>CC</sub> = 3.6V				4.5		pF
C <sub>NO/NC</sub>	NO/NC Port Off Capacitance (Note8)	V <sub>CC</sub> = 3.6V				20		pF
C <sub>COM</sub>	COM Port Capacitance when Switch is Enabled (Note8)	V <sub>CC</sub> = 3.6V				55		pF

6: Guaranteed by Design.

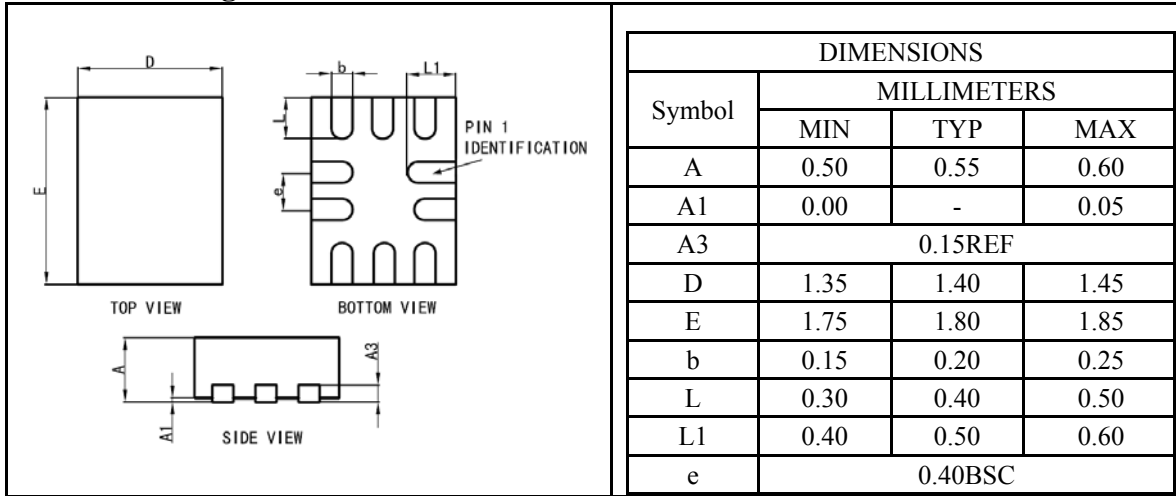
7: Off Isolation = 20 log<sub>10</sub> [V<sub>COM</sub>/V<sub>NO/NC</sub>].

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

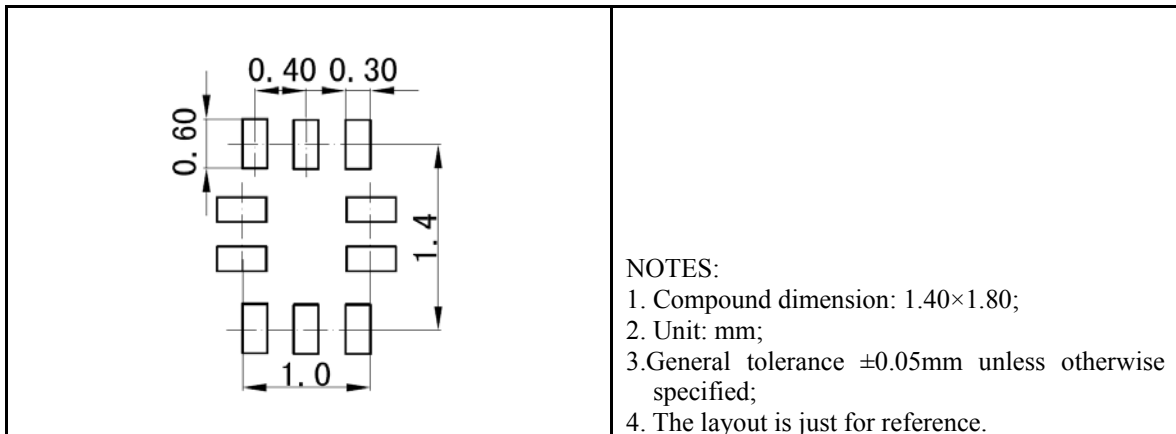
## Package Information

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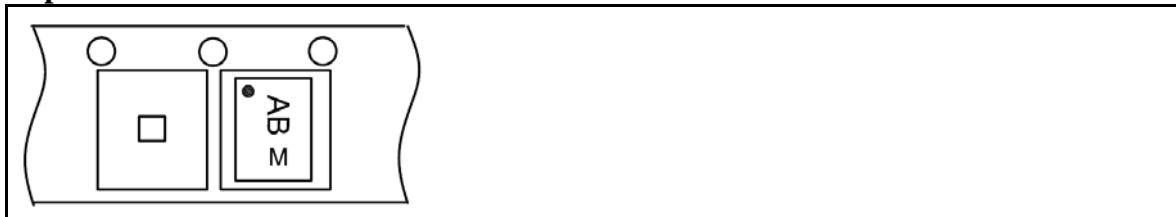
#### Outline Drawing



#### Land Pattern



#### Tape and Reel Orientation



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