



## U7SB3157

CMOS IC

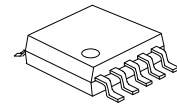
### 10Ω SPDT Analog Switch

#### DESCRIPTION

The UTC U7SB3157 is a dual, single-pole, double-throw(SPDT) analog switch or 2:1 multiplexer/de-multiplexer bus switch which can handle both digital and analog signals. This device operates from 1.65V to 5.5V.

#### FEATURES

- \*Useful in Both Analog and Digital Applications
- \*Specified Break-Before-Make Switching
- \*Low ON-State Resistance: 10Ω
- \*Wide Single-Supply Operation: 1.65V to 5.5V



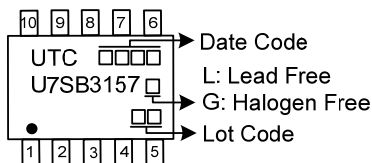
MSOP-10

#### ORDERING INFORMATION

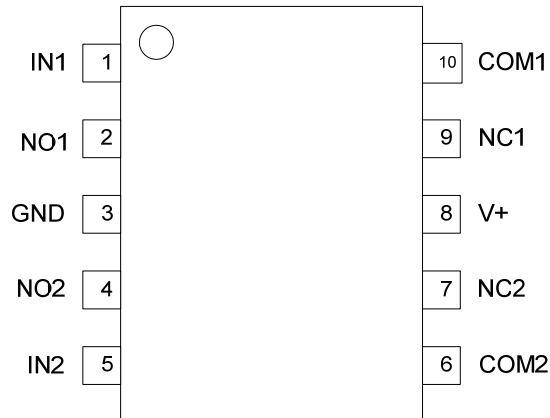
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U7SB3157L-SM2-R	U7SB3157G-SM2-R	MSOP-10	Tape Reel

<p>U7SB3157G-SM2-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) SM2: MSOP-10 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



## ■ PIN CONFIGURATION

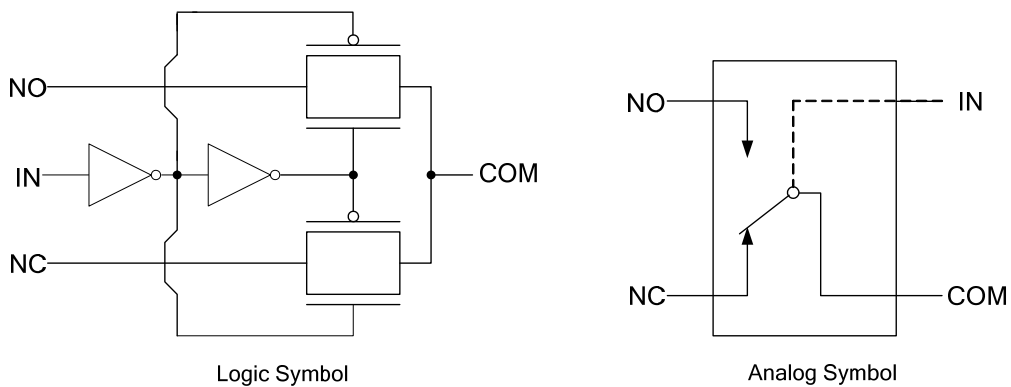


## ■ FUNCTION TABLE

INPUTS(IN)	FUNCTION
H	NO Connected to COM
L	NC Connected to COM

Note:H: HIGH voltage level; L: LOW voltage level.

## ■ LOGIC DIAGRAM (each channel)



■ **ABSOLUTE MAXIMUM RATING** ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_+$	-0.5 ~ +6.5	V
Analog Voltage (NC, NO, COM)	$V_{NC} V_{NO} V_{COM}$	-0.5 ~ $V_+ + 0.5V$	V
Analog Port Diode Current ( $V_{NC} V_{NO} V_{COM} < 0$ or $V_{NC} V_{NO} V_{COM} > V_+$ )	$I_{I/OK}$	$\pm 50$	mA
On-State Switch Current ( $V_{NC} V_{NO} V_{COM} = 0$ to $V_+$ )	$I_{NC} I_{NO} I_{COM}$	$\pm 50$	mA
Digital Input Voltage	$V_{IN}$	-0.5 ~ +6.5	V
Digital Input Clamp Current ( $V_{IN} < 0$ )	$I_{IK}$	-50	mA
$V_+$ or GND Current	$I_+$	$\pm 100$	mA
Operating Temperature	$T_{OPR}$	-40 ~ +85	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-65 ~ +150	$^\circ\text{C}$

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ **OPERATING RATINGS**

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_+$	1.65 ~ 5.5	V
Analog Signal Voltage	$V_{NC} V_{NO} V_{COM}$	0 ~ $V_+$	V

■ **THERMAL DATA**

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	165	$^\circ\text{C/W}$

■ **ELECTRICAL CHARACTERISTICS**(Ta = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
<b>ANALOG SWITCH</b>							
Switch On Resistance	R <sub>ON</sub>	V <sub>+</sub> =1.65V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> I <sub>COM</sub> =-4mA			140	Ω
		V <sub>+</sub> =2.3V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> I <sub>COM</sub> =-8mA			45	Ω
		V <sub>+</sub> =3V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> I <sub>COM</sub> =-24mA			18	Ω
		V <sub>+</sub> = 4.5V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> I <sub>COM</sub> =-30mA			10	Ω
On Resistance Match Between Channel	ΔR <sub>ON</sub>	V <sub>+</sub> =1.65V	V <sub>NO</sub> or V <sub>NC</sub> =1.15V, I <sub>COM</sub> =-4mA		1		Ω
		V <sub>+</sub> =2.3V	V <sub>NO</sub> or V <sub>NC</sub> =1.6V, I <sub>COM</sub> =-8mA		0.5		Ω
		V <sub>+</sub> =3V	V <sub>NO</sub> or V <sub>NC</sub> =2.1V, I <sub>COM</sub> =-24mA		0.2		Ω
		V <sub>+</sub> = 4.5V	V <sub>NO</sub> or V <sub>NC</sub> =3.15V, I <sub>COM</sub> =-30mA		0.15		Ω
On Resistance Flatness	R <sub>ON(flat)</sub>	V <sub>+</sub> =1.65V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> I <sub>COM</sub> =-4mA		110		Ω
		V <sub>+</sub> =2.3V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> I <sub>COM</sub> =-8mA		27		Ω
		V <sub>+</sub> =3V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> I <sub>COM</sub> =-24mA		9		Ω
		V <sub>+</sub> = 4.5V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> I <sub>COM</sub> =-30mA		4		Ω
NC,NO OFF Leakage Current	I <sub>NC</sub> (OFF)	V <sub>+</sub> =1.95V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> , V <sub>COM</sub> =0~V <sub>+</sub>	-1	0.05	1	uA
		V <sub>+</sub> =2.7V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> , V <sub>COM</sub> =0~V <sub>+</sub>	-1	0.05	1	uA
	I <sub>NO</sub> (OFF)	V <sub>+</sub> =3.6V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> , V <sub>COM</sub> =0~V <sub>+</sub>	-1	0.05	1	uA
		V <sub>+</sub> = 5.5V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> , V <sub>COM</sub> =0~V <sub>+</sub>	-1	0.05	1	uA
NC,NO ON Leakage Current	I <sub>NC</sub> (ON)	V <sub>+</sub> =1.95V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> , V <sub>COM</sub> =OPEN	-0.1		0.1	uA
		V <sub>+</sub> =2.7V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> , V <sub>COM</sub> =OPEN	-0.1		0.1	uA
	I <sub>NO</sub> (ON)	V <sub>+</sub> =3.6V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> , V <sub>COM</sub> =OPEN	-0.1		0.1	uA
		V <sub>+</sub> = 5.5V	V <sub>NO</sub> or V <sub>NC</sub> =0~V <sub>+</sub> , V <sub>COM</sub> =OPEN	-0.1		0.1	uA
COM ON Leakage Current	I <sub>COM</sub> (ON)	V <sub>+</sub> =1.95V	V <sub>NO</sub> or V <sub>NC</sub> =OPEN, V <sub>COM</sub> =0~V <sub>+</sub>	-0.1		0.1	uA
		V <sub>+</sub> =2.7V	V <sub>NO</sub> or V <sub>NC</sub> =OPEN, V <sub>COM</sub> =0~V <sub>+</sub>	-0.1		0.1	uA
		V <sub>+</sub> =3.6V	V <sub>NO</sub> or V <sub>NC</sub> =OPEN, V <sub>COM</sub> =0~V <sub>+</sub>	-0.1		0.1	uA
		V <sub>+</sub> = 5.5V	V <sub>NO</sub> or V <sub>NC</sub> =OPEN, V <sub>COM</sub> =0~V <sub>+</sub>	-0.1		0.1	uA
<b>DIGITAL INPUTS(IN1,IN2)</b>							
Input Logic High	V <sub>IH</sub>	V <sub>+</sub> =1.65V~5.5V		0.7V <sub>+</sub>			V
Input Logic Low	V <sub>IL</sub>	V <sub>+</sub> =1.65V~5.5V				0.3V <sub>+</sub>	V
Input Leakage Current	I <sub>IH</sub> , I <sub>IL</sub>	V <sub>+</sub> =1.65V~5.5V	V <sub>IN</sub> =5.5V or 0	-1	0.05	1	uA
<b>SUPPLY</b>							
Quiescent Supply Current	I <sub>+</sub>	V <sub>+</sub> =1.65V~5.5V	V <sub>IN</sub> = V <sub>+</sub> or GND			1	μA
Additional Quiescent Supply Current	ΔI <sub>+</sub>	V <sub>+</sub> =1.65V~5.5V	V <sub>IN</sub> = V <sub>+</sub> - 0.6V			500	uA

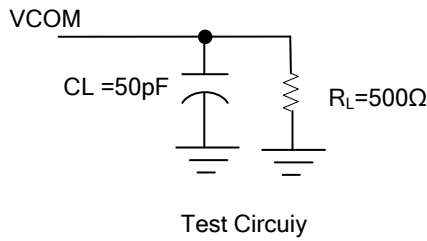
### ■ SWITCHING CHARACTERISTICS (T<sub>a</sub> = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Turn ON Time	t <sub>ON</sub>	V <sub>+</sub> =1.65 ~ 1.95V	C <sub>L</sub> =50pF R <sub>L</sub> =500Ω	7	24	ns
		V <sub>+</sub> =2.3 ~ 2.7V		3.5	14	ns
		V <sub>+</sub> =3.0 ~ 3.6V		2.5	7.6	ns
		V <sub>+</sub> =4.5 ~ 5.5V		1.7	5.7	ns
Turn OFF Time	t <sub>OFF</sub>	V <sub>+</sub> =1.65 ~ 1.95V	C <sub>L</sub> =50pF R <sub>L</sub> =500Ω	3	13	ns
		V <sub>+</sub> =2.3 ~ 2.7V		2	7.5	ns
		V <sub>+</sub> =3.0 ~ 3.6V		1.5	5.3	ns
		V <sub>+</sub> =4.5 ~ 5.5V		0.8	3.8	ns
Break-Before-Make Time	t <sub>BBM</sub>	V <sub>+</sub> =1.65 ~ 1.95V	C <sub>L</sub> =35pF R <sub>L</sub> =50Ω	0.5		ns
		V <sub>+</sub> =2.3 ~ 2.7V		0.5		ns
		V <sub>+</sub> =3.0 ~ 3.6V		0.5		ns
		V <sub>+</sub> =4.5 ~ 5.5V		0.5		ns
Charge Injection	Q <sub>C</sub>	V <sub>+</sub> =3.3V	C <sub>L</sub> =0.1nF R <sub>L</sub> =1MΩ		3	pC
		V <sub>+</sub> =5V			7	pC
Bandwidth	BW	V <sub>+</sub> =1.65 ~ 5.5V	R <sub>L</sub> =50Ω		220	MHz
OFF Isolation	O <sub>ISO</sub>	V <sub>+</sub> =1.8V	R <sub>L</sub> =50Ω f=10MHz		-60	dB
		V <sub>+</sub> =2.3V			-65	dB
		V <sub>+</sub> =3V			-65	dB
		V <sub>+</sub> =4.5V			-65	dB
Crosstalk	X <sub>TALK</sub>	V <sub>+</sub> =1.8V	R <sub>L</sub> =50Ω f=10MHz		-66	dB
		V <sub>+</sub> =2.3V			-66	dB
		V <sub>+</sub> =3V			-66	dB
		V <sub>+</sub> =4.5V			-66	dB
Total Harmonic Distortion	THD	V <sub>+</sub> =1.8V	C <sub>L</sub> =50pF R <sub>L</sub> =600Ω f=600Hz~20kHz		0.015	%
		V <sub>+</sub> =2.3V			0.025	%
		V <sub>+</sub> =3V			0.015	%
		V <sub>+</sub> =4.5V			0.01	%

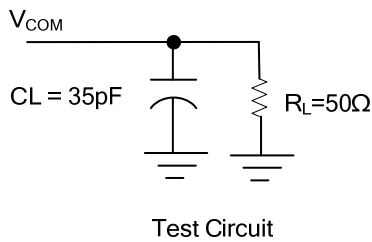
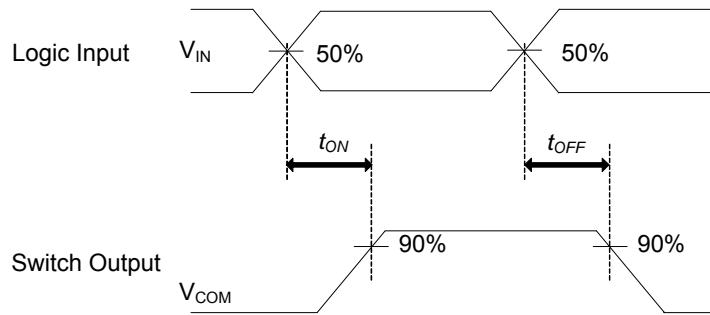
### ■ CAPACITANCE CHARACTERISTICS (T<sub>a</sub>=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
NC,NO OFF Capacitance	C <sub>NC</sub> (OFF)	V <sub>+</sub> = 5V		5.5		pF
	C <sub>NO</sub> (OFF)	V <sub>NO</sub> or V <sub>NC</sub> = V <sub>+</sub> or GND				
NC,NO ON Capacitance	C <sub>NC</sub> (ON)	V <sub>+</sub> = 5V		17.5		pF
	C <sub>NO</sub> (ON)	V <sub>NO</sub> or V <sub>NC</sub> = V <sub>+</sub> or GND				
COM ON Capacitance	C <sub>COM</sub> (ON)	V <sub>+</sub> = 5V V <sub>COM</sub> = V <sub>+</sub> or GND		17.5		pF
Digital Input Capacitance	C <sub>IN</sub>	V <sub>+</sub> = 5V V <sub>IN</sub> = V <sub>+</sub> or GND		2.8		pF

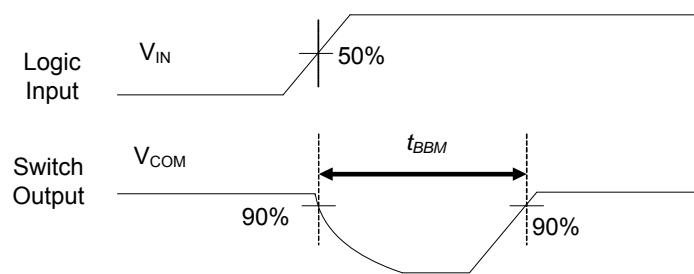
## TEST CIRCUIT AND WAVEFORMS



TEST	V <sub>IN</sub>	V <sub>NC</sub>	V <sub>NO</sub>
t <sub>ON</sub>	L->H	GND	V+
	H->L	V+	GND
t <sub>OFF</sub>	H->L	GND	V+
	L->H	V+	GND



TEST	V <sub>IN</sub>	V <sub>NC</sub>	V <sub>NO</sub>
t <sub>BBM</sub>	L->H	V+/2	V+/2



Note: CL includes probe and jig capacitance.  
 PRR ≤ 1MHz, Z<sub>O</sub> = 50Ω, tr ≤ 5ns, tf ≤ 5ns.

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