

**U7SB3157**

Preliminary

CMOS IC

10-Ω 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.

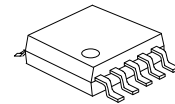
■ FEATURES

*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



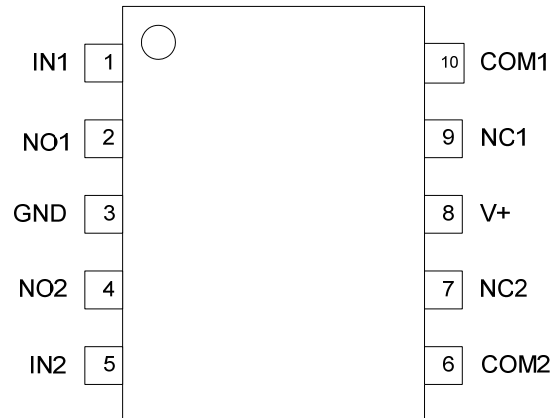
MSOP-10

■ ORDERING INFORMATION

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

U7SB3157L-SM2-R	(1) Packing Type (2) Package Type (3) Lead Free	(1) R: Tape Reel (2) SM2: MSOP-10 (3) G: Halogen Free, L: Lead Free
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PIN CONFIGURATION

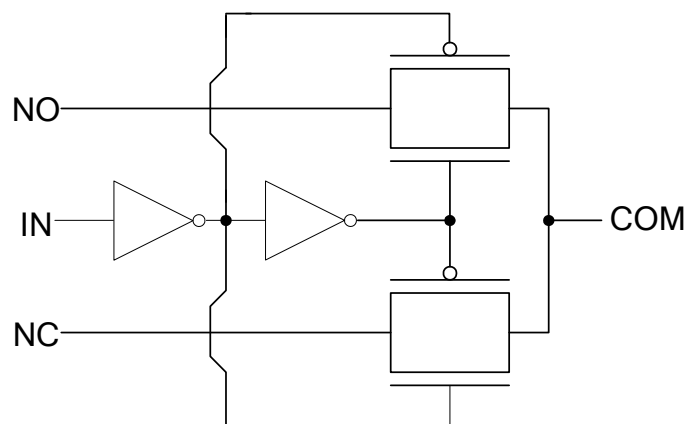


FUNCTION TABLE

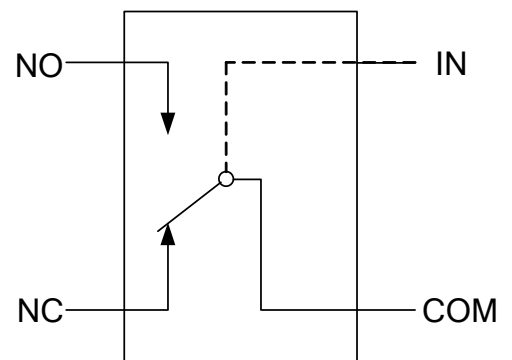
INPUTS(IN)	FUNCTION
H	NO Connected to COM
L	NC Connected to COM

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

LOGIC DIAGRAM (each channel)



Logic Symbol



Analog Symbol

■ **ABSOLUTE MAXIMUM RATING** (Ta = 25°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/O}	±50	mA
On-State Switch Current (V _{NC} V _{NO} V _{COM} = 0 to V ₊)	I _{NC} I _{NO} I _{COM}	±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 ₊	±100	mA
Operating Temperature	T _{OPR}	-40 ~ + 85	°C
Storage Temperature	T _{STG}	-65 ~ + 150	°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	θ _{JA}	165	°C/W

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

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

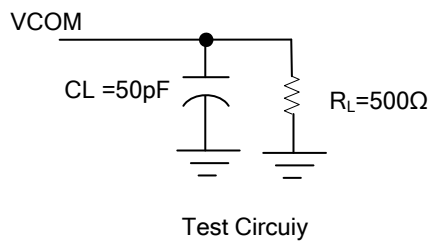
SWITCHING CHARACTERISTICS (Ta = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Turn ON Time	t_{ON}	$V_+ = 1.65 \sim 1.95V$	7		24	ns
		$V_+ = 2.3 \sim 2.7V$	3.5		14	ns
		$V_+ = 3.0 \sim 3.6V$	2.5		7.6	ns
		$V_+ = 4.5 \sim 5.5V$	1.7		5.7	ns
Turn OFF Time	t_{OFF}	$V_+ = 1.65 \sim 1.95V$	3		13	ns
		$V_+ = 2.3 \sim 2.7V$	2		7.5	ns
		$V_+ = 3.0 \sim 3.6V$	1.5		5.3	ns
		$V_+ = 4.5 \sim 5.5V$	0.8		3.8	ns
Break-Before-Make Time	t_{BBM}	$V_+ = 1.65 \sim 1.95V$	0.5			ns
		$V_+ = 2.3 \sim 2.7V$	0.5			ns
		$V_+ = 3.0 \sim 3.6V$	0.5			ns
		$V_+ = 4.5 \sim 5.5V$	0.5			ns
Charge Injection	Q_C	$V_+ = 3.3V$		3		pC
		$V_+ = 5V$		7		pC
Bandwith	BW	$V_+ = 1.65 \sim 5.5V$		220		MHz
OFF Isolation	O_{ISO}	$V_+ = 1.8V$		-60		dB
		$V_+ = 2.3V$		-65		dB
		$V_+ = 3V$		-65		dB
		$V_+ = 4.5V$		-65		dB
Crosstalk	X_{TALK}	$V_+ = 1.8V$		-66		dB
		$V_+ = 2.3V$		-66		dB
		$V_+ = 3V$		-66		dB
		$V_+ = 4.5V$		-66		dB
Total Harmonic Distortion	THD	$V_+ = 1.8V$		0.015		%
		$V_+ = 2.3V$		0.025		%
		$V_+ = 3V$		0.015		%
		$V_+ = 4.5V$		0.01		%

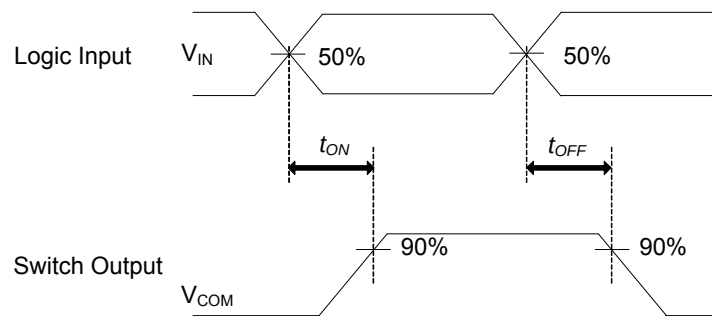
CAPACITANCE CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
NC,NO OFF Capacitance	$C_{NC(OFF)}$ $C_{NO(OFF)}$	$V_+ = 5V$ V_{NO} or $V_{NC} = V_+$ or GND		5.5		pF
NC,NO ON Capacitance	$C_{NC(ON)}$ $C_{NO(ON)}$	$V_+ = 5V$ V_{NO} or $V_{NC} = V_+$ or GND		17.5		pF
COM ON Capacitance	$C_{COM(ON)}$	$V_+ = 5V$ $V_{COM} = V_+$ or GND		17.5		pF
Digital Input Capacitance	C_{IN}	$V_+ = 5V$ $V_{IN} = V_+$ or GND		2.8		pF

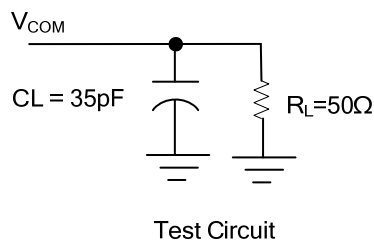
■ TEST CIRCUIT AND WAVEFORMS



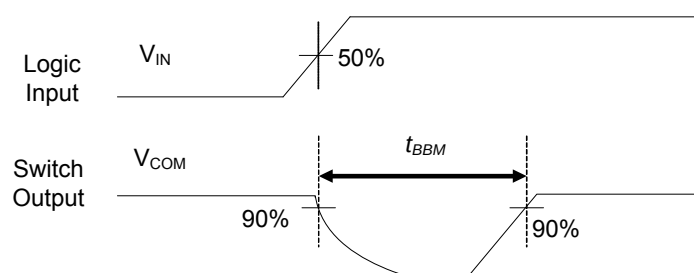
TEST	V_{IN}	V_{NC}	V_{NO}
t_{ON}	L→H	GND	V+
	H→L	V+	GND
t_{OFF}	H→L	GND	V+
	L→H	V+	GND



Voltage Waveforms
 T_{ON} & T_{OFF} Times



TEST	V_{IN}	V_{NC}	V_{NO}
t_{BBM}	L→H	$V+/2$	$V+/2$



Voltage Waveforms
 T_{BBM} Time

Note: CL includes probe and jig capacitance.
 $PRR \leq 1\text{MHz}$, $Z_O = 50\Omega$, $t_r \leq 5\text{ns}$, $t_f \leq 5\text{ns}$.

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