



U7SB3157

CMOS IC

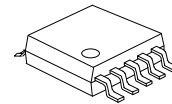
10Ω SPDT Analog Switch

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



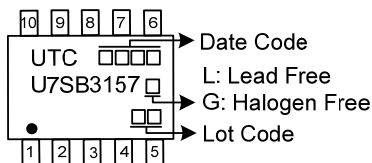
MSOP-10

ORDERING INFORMATION

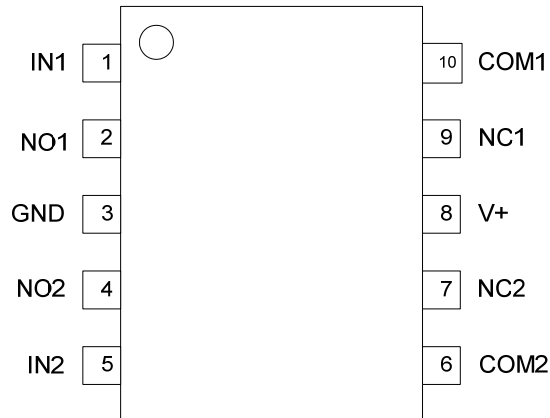
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U7SB3157L-SM2-R	U7SB3157G-SM2-R	MSOP-10	Tape Reel

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



■ PIN CONFIGURATION

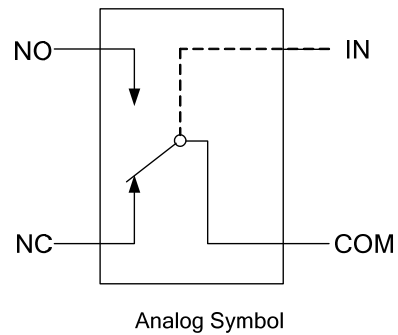
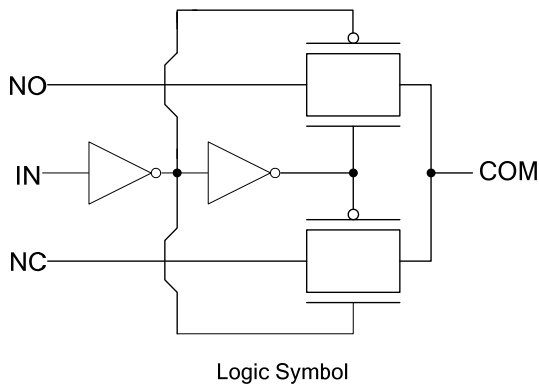


■ FUNCTION TABLE

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 $V_{NC} V_{NO} V_{COM} > V_+$)	$I_{I/OK}$	± 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	$^\circ\text{C}$
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	θ_{JA}	165	$^\circ\text{C/W}$

■ **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)	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
	I _{NO} (OFF)	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)	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
	I _{NO} (ON)	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	ΔI ₊	V ₊ =1.65V~5.5V	V _{IN} = V ₊ - 0.6V			500	uA

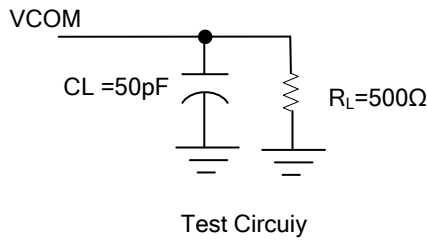
■ SWITCHING CHARACTERISTICS (Ta = 25°C, unless otherwise specified)

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

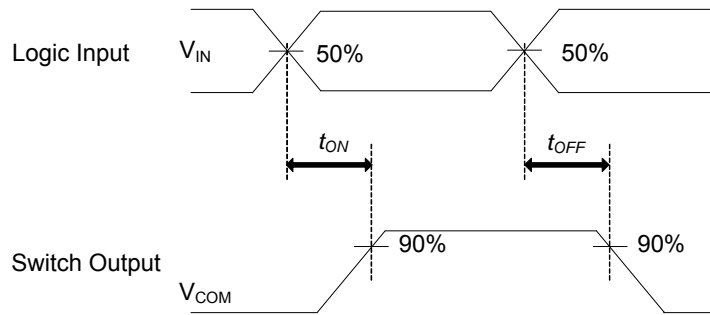
■ CAPACITANCE CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
NC,NO OFF Capacitance	C _{NC(OFF)}	V ₊ = 5V		5.5		pF
	C _{NO(OFF)}	V _{NO} or V _{NC} = V ₊ or GND				
NC,NO ON Capacitance	C _{NC(ON)}	V ₊ = 5V		17.5		pF
	C _{NO(ON)}	V _{NO} or V _{NC} = V ₊ or GND				
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

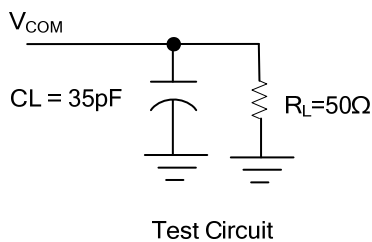
■ TEST CIRCUIT AND WAVEFORMS



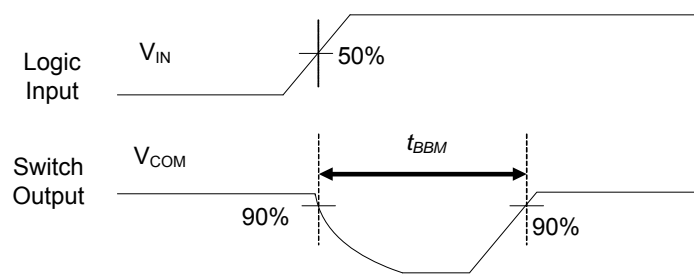
TEST	V _{IN}	V _{NC}	V _{NO}
t _{ON}	L->H	GND	V+
	H->L	V+	GND
t _{OFF}	H->L	GND	V+
	L->H	V+	GND



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 ≤ 1MHz, Z_o = 50Ω, tr ≤ 5ns, tf ≤ 5ns.

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