



# U74LVC3157

CMOS IC

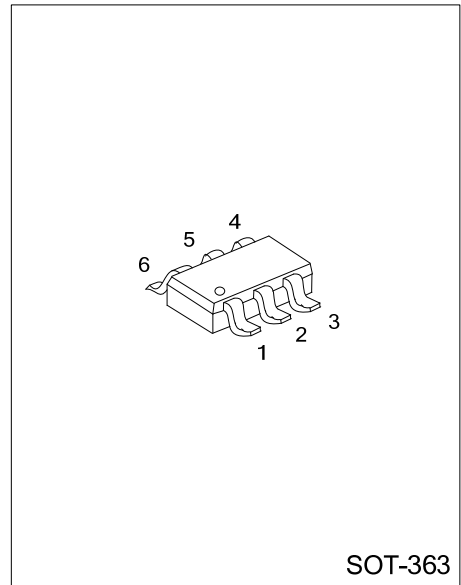
## SINGLE-POLE, DOUBLE-THROW ANALOG SWITCH

### DESCRIPTION

The UTC **U74LVC3157** is a low voltage single-pole, double-throw (SPDT) analog switch intending for use in chopping, modem, signal gating, and signal multiplexing for analog-to-digital and digital-to-analog conversion systems.

### FEATURES

- \* Useful in Both Analog and Digital Applications
- \* Rail-to-Rail Signal Handling
- \* Low ON Resistance: < 10Ω on Typical @ 3.3V V<sub>CC</sub>
- \* Broad V<sub>CC</sub> Operating Range: 1.65V to 5.5V
- \* Over-Voltage Tolerance of Control Input to 7.0V

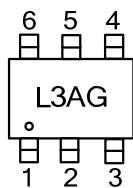


### ORDERING INFORMATION

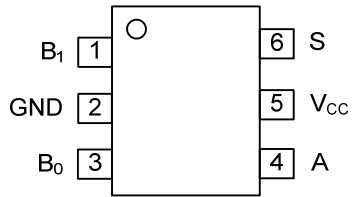
Ordering Number	Package	Packing
U74LVC3157G-AL6-R	SOT-363	Tape Reel

<p>U74LVC3157G-AL6-R</p> <p>(1) Packing Type (2) Package Type (3) Halogen Free</p>	<p>(1) R: Tape Reel (2) AL6: SOT-363 (3) G: Halogen Free</p>
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### MARKING



■ PIN CONFIGURATION

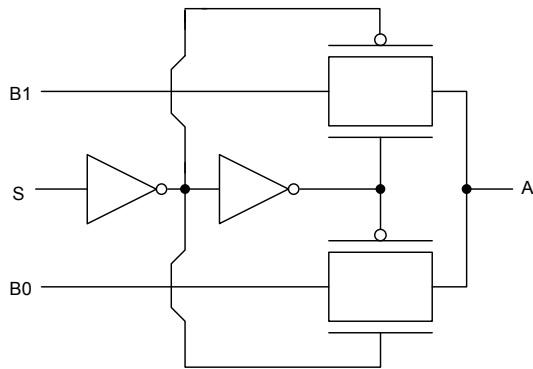


■ FUNCTION TABLE

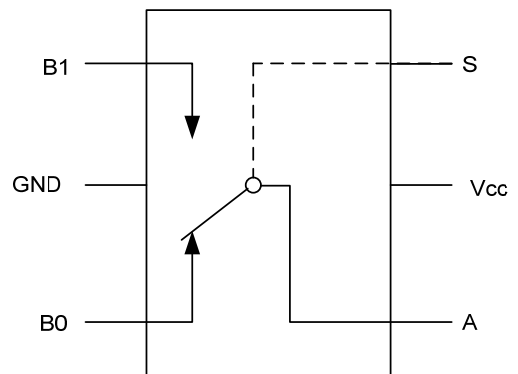
INPUT(S)	OUTPUT(Y)
L	B0 Connected to A
H	B1 Connected to A

H=High Level  
L=Low Level

■ LOGIC DIAGRAM



Logic Symbol



Analog Symbol

## ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{CC}$	-0.5 ~ +7.0	V
Switch Voltage	$V_S$	-0.5 ~ $V_{CC}+0.5$	V
Input Voltage	$V_{IN}$	-0.5 ~ +7.0	V
$V_{CC}$ or GND Current	$I_{CC}$	±100	mA
Continuous Output Current	$I_{OUT}$	128	mA
Input Clamp Current ( $V_{IN}<0V$ )	$I_{IK}$	-50	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.

## ■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	270	°C/W

## ■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	$V_{CC}$		1.65		5.5	V
Control Input Voltage	$V_{IN}$	(Note)	0		$V_{CC}$	V
Switch Input Voltage	$V_{IN}$	(Note)	0		$V_{CC}$	V
Output Voltage	$V_{OUT}$	(Note)	0		$V_{CC}$	V
High-level Input Voltage	$V_{IH}$	$V_{CC}=1.65V$ to $1.95V$	$0.75 \times V_{CC}$			V
		$V_{CC}=2.3V$ to $5.5V$	$0.7 \times V_{CC}$			V
Low-level Input Voltage	$V_{IL}$	$V_{CC}=1.65V$ to $1.95V$			$0.25 \times V_{CC}$	V
		$V_{CC}=2.3V$ to $5.5V$			$0.3 \times V_{CC}$	V
Input Rise or Fall Times	$\frac{\Delta t}{\Delta V}$	Control Input $V_{CC}=2.3V \sim 3.6V$			10	ns/V
		Control Input $V_{CC}=4.5V \sim 5.5V$			5	ns/V

Note: Control input must be held HIGH or LOW; it must not float

## ■ ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Switch On Resistance	$R_{ON}$	$V_{CC}=4.5V, V_{IN}=0V, I_{OUT}=30mA$		3.0	7.0	$\Omega$
		$V_{CC}=4.5V, V_{IN}=2.4V, I_{OUT}=-30mA$		5.0	12.0	$\Omega$
		$V_{CC}=4.5V, V_{IN}=4.5V, I_{OUT}=-30mA$		7.0	15.0	$\Omega$
		$V_{CC}=3V, V_{IN}=0V, I_{OUT}=24mA$		4.0	9.0	$\Omega$
		$V_{CC}=3V, V_{IN}=3V, I_{OUT}=-24mA$		10.0	20.0	$\Omega$
		$V_{CC}=2.3V, V_{IN}=0V, I_{OUT}=8mA$		5.0	12.0	$\Omega$
		$V_{CC}=2.3V, V_{IN}=2.3V, I_{OUT}=-8mA$		13.0	30.0	$\Omega$
		$V_{CC}=1.65V, V_{IN}=0V, I_{OUT}=4mA$		6.5	20.0	$\Omega$
		$V_{CC}=1.65V, V_{IN}=1.65V, I_{OUT}=-4mA$		17.0	50.0	$\Omega$
On Resistance Match Between Channel	$\Delta R_{ON}$	$V_{CC}=4.5V, V_{BN}=3.15V, I_A=-30mA$		0.15		$\Omega$
		$V_{CC}=3V, V_{BN}=2.1V, I_A=-24mA$		0.2		$\Omega$
		$V_{CC}=2.3V, V_{BN}=1.6V, I_A=-8mA$		0.5		$\Omega$
		$V_{CC}=1.65V, V_{BN}=1.15V, I_A=-4mA$		0.5		$\Omega$
Input Leakage Current	$I_{I(LEAK)}$	$V_{CC}=0$ to $5.5V, 0 \leq V_{IN} \leq 5.5V$			±0.1	$\mu A$
Off State Leakage Current	$I_{OFF}$	$V_{CC}=1.65$ to $5.5V, 0 \leq A, B \leq V_{CC}$			±0.1	$\mu A$
Quiescent Supply Current	$I_Q$	$V_{CC}=5.5V, V_{IN}=V_{CC}$ or GND, $I_{OUT}=0$			1	$\mu A$
Analog Signal Range		$V_{CC}=V_{CC}, V_{IN}=V_{CC}$ or GND	0		$V_{CC}$	V

■ SWITCHING CHARACTERISTICS (see TEST CIRCUIT AND WAVEFORMS)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay Bus to Bus(Note)	t <sub>PLH</sub> t <sub>PHL</sub>	C <sub>L</sub> =50 pF, R <sub>L</sub> =500Ω	V <sub>CC</sub> =1.65 ~ 1.95V		3.5	ns
			V <sub>CC</sub> =2.3 ~ 2.7V		1.2	ns
			V <sub>CC</sub> =3.0 ~ 3.6V		0.8	ns
			V <sub>CC</sub> =4.5 ~ 5.5V		0.3	ns
Output Enable Time Turn-On Time (A to B <sub>N</sub> )	t <sub>PZL</sub> t <sub>PZH</sub>	C <sub>L</sub> =50 pF, R <sub>L</sub> =500Ω	V <sub>CC</sub> =1.65 ~ 1.95V	7.0	23.0	ns
			V <sub>CC</sub> =2.3 ~ 2.7V	3.5	13.0	ns
			V <sub>CC</sub> =3.0 ~ 3.6V	2.5	6.9	ns
			V <sub>CC</sub> =4.5 ~ 5.5V	1.7	5.2	ns
Output Enable Time Turn-Off Time (A to B <sub>N</sub> )	t <sub>PHZ</sub> t <sub>PLZ</sub>	C <sub>L</sub> =50 pF, R <sub>L</sub> =500Ω	V <sub>CC</sub> =1.65 ~ 1.95V	3.0	12.5	ns
			V <sub>CC</sub> =2.3 ~ 2.7V	2.0	7.0	ns
			V <sub>CC</sub> =3.0 ~ 3.6V	1.2	5.0	ns
			V <sub>CC</sub> =4.5 ~ 5.5V	0.8	3.5	ns

Note: Guaranteed by design.

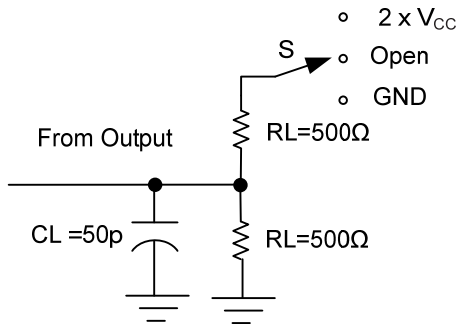
■ DYNAMIC CHARACTERISTICS (T<sub>a</sub>=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Bandwidth	BW	R <sub>L</sub> =50Ω, Switch ON	V <sub>CC</sub> =1.8V		220	MHz
			V <sub>CC</sub> =2.3V		220	MHz
			V <sub>CC</sub> =3.0V,		220	MHz
			V <sub>CC</sub> =4.5V		220	MHz
OFF Isolation	O <sub>ISO</sub>	R <sub>L</sub> =50Ω, f=10MHz, Switch OFF	V <sub>CC</sub> =1.8V,		-60	dB
			V <sub>CC</sub> =2.3V		-65	dB
			V <sub>CC</sub> =3.0V		-65	dB
			V <sub>CC</sub> =4.5V		-65	dB
Crosstalk	X <sub>TALK</sub>	R <sub>L</sub> =50Ω, f=10MHz, Switch ON	V <sub>CC</sub> =1.8V		-66	dB
			V <sub>CC</sub> =2.3V		-66	dB
			V <sub>CC</sub> =3.0V		-66	dB
			V <sub>CC</sub> =4.5V		-66	dB
Total Harmonic Distortion	THD	R <sub>L</sub> =600Ω, C <sub>L</sub> =50pF, f=600Hz~20KHz	V <sub>CC</sub> =1.8V		0.015	%
			V <sub>CC</sub> =2.3V		0.025	%
			V <sub>CC</sub> =3.0V		0.015	%
			V <sub>CC</sub> =4.5V		0.01	%

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

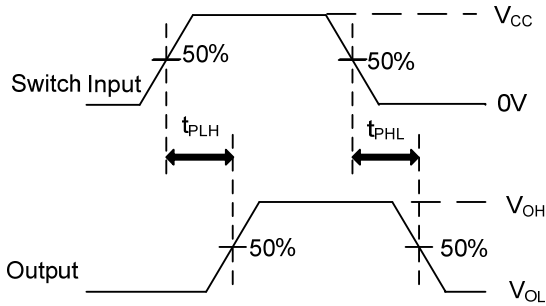
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Control Pin Input Capacitance	C <sub>IN</sub>	V <sub>CC</sub> =0V		2.3		pF
B Port Off Capacitance	C <sub>IO-B</sub>	V <sub>CC</sub> =5.0V		6.5		pF
A Port Capacitance When Switch Is Enabled	C <sub>IOA-ON</sub>	V <sub>CC</sub> =5.0V		18.5		pF

■ TEST CIRCUIT AND WAVEFORMS

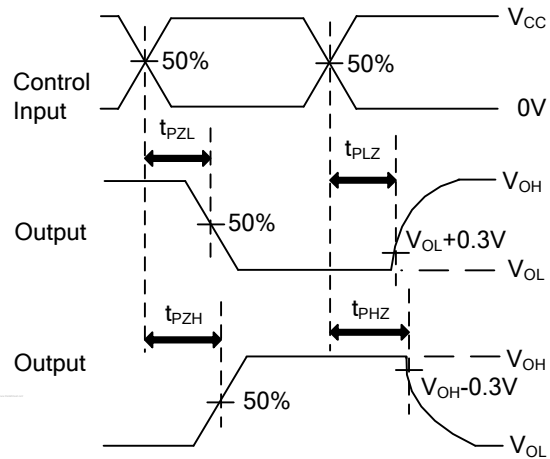


TEST CIRCUIT

TEST	S
$t_{PLH}/t_{PHL}$	Open
$t_{PHZ}/t_{PZH}$	GND
$t_{PLZ}/t_{PZL}$	$2 \times V_{CC}$



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES

Note:  $C_L$  includes probe and jig capacitance.  
 $PRR \leq 1\text{MHz}$ ,  $Z_0 = 50\Omega$ ,  $t_R \leq 2.5\text{ns}$ ,  $t_F \leq 2.5\text{ns}$ .

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