



SINGLE-POLE DOUBLE-THROW ANALOG SWITCH

Description

The 74LVC1G3157 is a single-pole, double-throw analog switch. The device is designed for operation with a power supply range of 1.65V to 5.5V. The bidirectional switch can handle signal amplitudes between Vcc and Ground. The OFF state impedance of the switch is typically $50M\Omega$ while the ON state is typically 6Ω .

Pin Assignments

Applications

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Multiplexing of Analog Signals

Multiplexing of Digital Signals

Wide array of products such as:

Tablets, E-readers, Wearables

TV. DVD. DVR. Set Top Boxes

Cell Phones, Personal Navigation / GPS MP3 Players, Cameras, Video Recorders

Computer Peripherals, Hard Drives, CD/DVD ROMs

PCs, Networking, Notebooks, Netbooks, PDAs





Packages not to scale

Features

- Wide Supply Voltage Range from 1.65 to 5.5V
- Control Pin Includes Hysteresis Allowing for Slower Input Rise and Fall Times
- CMOS Low Power Consumption
- Very Low ON-State Resistance
- 7.5 Ω (typical) at V_{CC} = 2.7V
- 6.5Ω (typical) at V_{CC} = 3.3V
- 6Ω (typical) at V_{CC} = 4.5V
- Break Before Make Switching
- Control Input accepts up to 5.5V Regardless of Vcc.
- Direct Interface with TTL Levels when V_{cc} = 3.3V
- ESD Protection Tested per JESD 22
- Exceeds 2,000-V Human Body Model (A114)
- Exceeds 1,000-V Charged Device Model (C101)
- Latch-Up Exceeds 100mA per JESD 78, Class I
- Range of Package Options
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please <u>contact</u> <u>us</u> or your local Diodes representative.

https://www.diodes.com/guality/product-definitions/

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 - 2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 - 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

74LVC1G3157 Document number: DS38099 Rev. 4 - 2



Ordering Information (Note 4)



Device	Package	Package	Package	7" Tape and R	teel (Note 6)
Device	Code	(Note 5)	Size	Quantity	Part Number Suffix
74LVC1G3157DW-7	DW	SOT363	2.0mm x 2.0mm x 1.1mm 0.65 mm lead pitch	3,000/Tape & Reel	-7
74LVC1G3157FZ4-7	FZ4	X2-DFN1410-6	1.4mm x 1.0mm x 0.4mm 0.5 mm pad pitch	5,000/Tape & Reel	-7

4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/. For a packaging detains, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.
Pad layout as shown in Diodes Incorporated's package outline PDFs, which can be found on our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.
The taping orientation is located on our website at https://www.diodes.com/assets/Packaging-Support-Docs/ap02007.pdf.

Pin Descriptions

Notes:

Pin Name	Description
B1	Selectable Data I/0
GND	Ground
B0	Selectable Data I/0
А	Common Data I/0
V _{cc}	Supply Voltage
Select	Selection Pin

Function Table

Select	Status
Ц	B1 connected to A;
П	B0 high impedance
	B0 connected to A;
L	B1 high impedance

Logic Diagram



Simplified Schematic





Absolute Maximum Ratings (Note 7)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
V _{cc}	Supply Voltage Range	-0.5 to 6.5	V
V _{IN}	Input Voltage Range Applicable to Select Pin	-0.5 to 6.5	V
V _{SW}	Voltage Range Applicable to B0, B1, and A Pins	-0.5 to V _{cc} +0.5	V
I _{IK}	Input Clamp Current V _I <0 Applicable to Select Pin	-50	mA
l _{io}	Continuous Current Applicable to B0,B1, and A Pins	±50	mA
I _{CC,} I _{GND}	Continuous current through V _{cc} or GND	±100	mA
TJ	Operating Junction Temperature	-40 to +150	°C
T _{STG}	Storage Temperature	-65 to +150	°C

Note: 7. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

Recommended Operating Conditions

Symbol		Min	Мах	Unit	
V _{cc}	Operating Voltage	1.65	5.5	V	
V _{IN}	Select Input Voltage	0	5.5	V	
V_{SW}	Switch Voltage (applicable to pin	-0.2	V _{cc}	V	
	Input Transition Rise or Fall	V _{CC} = 1.65 to 2.7V	-	20	
Δt/ΔV	Rate – Select Pin	V _{CC} = 2.7V to 5.5V	-	10	ns/V
T _A	Operating Free-Air Temperature	-	-40	+125	°C



Electrical Characteristics (All typical values are at, T_J = +25°C)

				TA	= -40 to +85°	°C	T _A = -40	to +125°C	
Symbol	Parameter	Test Condition	V _{cc} (V)	Min	Typical (Note 8)	Мах	Min	Max	Unit
			1.65 to 1.95	0.65V _{CC}	-	-	$0.65V_{CC}$	-	
	High Level		2.3 to 2.7	1.7	-	-	1.7	-	v
VIH	Input Voltage Select Pin	-	3 to 3.6	2.0	-	-	2.0	-	
			4.5 to 5.5	0.7V _{CC}	-	-	$0.7V_{CC}$	-	1
			1.65 to 1.95	-	-	$0.35V_{CC}$	-	0.35V _{cc}	
V _{IL}	Low Level		2.3 to 2.7	-	-	0.7	-	0.7	
	Input Voltage Select Pin	-	3 to 3.6	-	-	0.8	-	0.8	V
			4.5 to 5.5	-	-	0.3V _{CC}	-	0.3V _{CC}	1
I _{IN}	Input Leakage Current Select Pin	0 ≤ Select ≤ 5.5V	0 to 5.5	-	±0.05	±1	-	±10	μA
$I_{S(OFF)}$	OFF State Leakage Current	0V ≤ A, B _n ≤ V _{CC} Figure 1	1.65 to 5.5	-	±0.05	±1	-	±10	μA
I _{S(ON)}	ON State Leakage Current	$0V \le A, B_n \le V_{CC}$ Figure 2	1.65 to 5.5	-	±0.05	±1	-	±10	μA
I _{S(ON)}	ON State Leakage Current	-0.1V \leq A, B _n \leq V _{CC} Figure 2	1.65 to 5.5	-	±0.05	±2	-	±20	μA
I _{CC}	Quiescent Supply Current	Select = V_{cc} or GND A, Bn = V_{cc} or GND I_{OUT} = 0	5.5	-	1.0	10	-	40	μA
Δl _{cc}	Additional Supply Current	Select= $V_{CC} - 0.6V$ A, B _n = V_{CC} or GND $I_{OUT} = 0$	5.5	-	30	500	-	5,000	μA
Cı	Input Capacitance Select Pin	-	3.3	-	2.5	-	-	-	pF
$C_{S(OFF)}$	OFF State Capacitance	Select = V_{CC} or GND A, B _n = V_{CC} or GND I_{OUT} = 0	3.3	-	6.0	-	-	-	pF
$C_{S(ON)}$	ON State Capacitance	Select = V_{CC} or GND A, B _n = V_{CC} or GND I_{OUT} = 0	3.3	-	18	-	-	-	pF

Note: 8. Typical performance information is included in figures 11 to 34 on pages 11 to 14.



		Test Condition		T	= -40 to +85	°C	T _A = -40	to +125°C	
Symbol Parameter	(Note 9)	V _{cc} (V)	Min	Тур	Max	Min	Max	Unit	
		V _I = 0V, I _O = 4mA	4.05	-	12.5	18	-	27	
		V _I = 1.65V, I _O = -4mA	1.65	-	14	18	-	35	
		V ₁ = 0V, I ₀ = 8mA	2.3	-	9.0	16	-	24	-
		V _I = 2.3V, I _O =-8mA		-	9.0	16	-	30	
		V _I = 0V, I _O = 12mA	0.7	-	8.0	14	-	21	
R _{on}	ON Resistance	V ₁ = 2.7V, I ₀ =-12mA	2.7	-	8.0	14	-	27	Ω
		V _I = 0V, I _O = 24mA		-	7.0	12	-	18	
		V _I = 3.0V, I _O =-24mA	3.0	-	7.0	12	-	23	
		V _I = 0V, I _O = 32mA		-	5.5	10	-	15	
		V ₁ = 2.7V, I ₀ =-32mA	4.5	-	6.0	12	-	17	
		V ₁ = 4.5V, I ₀ =-32mA		-	5.5	10	-	15	
	On Resistance Over Signal	$I_A = 4mA, 0 \le V_{BN} \le V_{CC}$	1.65	-	34	130	-	195	
		$I_A = 8mA, 0 \le V_{BN} \le V_{CC}$	2.3	-	5	30	-	45	
R _{RANGE}		Resistance Over Signal	I_A = 12mA, 0 ≤ V_{BN} ≤ V_{CC}	2.7	-	4	25	-	38
	Range	$I_A = 24mA, 0 \le V_{BN} \le V_{CC}$	3.0	-	7.8	20	-	30	
		$I_A = 32mA, 0 \le V_{BN} \le V_{CC}$	4.5	-	6.2	15	-	23	
		I _A = -4mA, V _{BN} = 1.15 V	1.65	-	0.25	-	-	-	
	On Resistance	I _A = -8mA, V _{BN} = 1.6 V	2.3	-	0.25	-	-	-	
ΔR_{ON}	Match Between	$I_{A} = -12mA,$ $V_{BN} = 1.9 V$	2.7	-	0.25	-	-	-	Ω
	Channels (Note 10)	$I_A = -24$ mA, $V_{BN} = 2.1$	3.0	-	0.25	-	-	-	
		I _A = -32mA, V _{BN} = 3.15	4.5	-	025	-	-	-	
		I_A = -4mA, 0 ≤ V_{BN} ≤ V_{CC}	1.65	-	26	110	-	150	
	On	$I_A = -8mA, 0 \le V_{BN} \le V_{CC}$	2.3	-	5.0	26	-	105	Ω
R _{flat}	Resistance Flatness	$I_A = -24mA, 0 \le V_{BN} \le V_{CC}$	2.7	-	3.5	16	-	35	
	(Note 11)	$I_A = -24mA, 0 \le V_{BN} \le V_{CC}$	3.3	-	2.0	9	-	15	
		$I_A = -32mA, 0 \le V_{BN} \le V_{CC}$	5.0	-	1.5	4	-	8	

Electrical Characteristics (All typical values are at T₁ = +25°C)

Note:

9. Switch resistance test is measured per Figure 3. 10. ΔR_{ON} is measured at identical V_{CC}, temperature and voltage levels. 11. Flatness is defined as the difference between the maximum and minimum of ON resistance measured at identical V_{CC} and temperature.



Switching Characteristics

Symbol	Parameter	Test Condition	V _{cc}	T _A =	= -40 to +	·85°C	T _A = +1	-40 to 25°C	Unit	Figure
Symbol	Falameter	Test condition	Volts	Min	Тур	Мах	Min	Max		Number
-			1.65 to 1.95 -				-	3.0		
t _{PHL} t _{PLH}	Propagation		2.3 to 2.7	-	-	1.2	-	2.0		
	Delay	V _I = OPEN (Note 12)	2.7	-	-	1.0	-	1.5	ns	Figure 4
	A to B _n	(**********	3.0 to 3.6	-	-	0.8	-	1.5		
			4.5 to 5.5	-	-	0.6	-	1.0		
			1.65 to 1.95	1.0	8.7	14.0	1.0	14.0		
	Output	$V = 2 \times V$ for t	2.3 to 2.7	1.0	5.3	7.5	1.0	7.5		
t _{PZL} t _{PZH}	Enable Time	$V_1 = 2 \times V_{CC}$ for t_{PZL} $V_1 = 0V$ for t_{PZH}	2.7	1.0	4.9	6.0	1.0	6.0	ns	Figure 4
	Switch to Bn	(Note 13)	3.0 to 3.6	0.5	4.0	5.5	0.5	5.5		
			4.5 to 5.5	0.5	3.0	4.0	0.5	4.0		
			1.65 to 1.95	2.5	6.0	8.5	2.5	8.5		
	Output Disable Time Switch to B _n		2.3 to 2.7	2.0	4.4	8.2	2.0	8.2		
t _{PLZ} t _{PHZ}			2.7	1.5	4.2	8.0	1.5	8.0	ns	Figure 4
			3.0 to 3.6	1.5	3.6	7.8	1.5	7.8		
			4.5 to 5.5	0.8	2.9	7.5	0.8	7.5		
			1.65 to 1.95	0.5	-		0.5	-		
	Break Before		2.3 to 2.7	0.5	-	-	0.5	-		
t _{B-M}	Make Time	-	2.7	0.5	-	-	0.5	-	ns	Figure 5
	(Note 9)		3.0 to 3.6	0.5		-	0.5	-		
			4.5 to 5.5	0.5	-	-	0.5			
0	Charge	$C_L = 0.1 \text{ nF},$ $V_{GEN} = 0V$	5.0	-	7.0	-	-	-		Figure 6
Q	Injection (Note 9)	$R_{GEN} = 0 \Omega$	3.3		3.0	-	-	-	рС	Figure 6
QIRR	Off Isolation (Note 11)	$R_L = 50 \Omega$, f = 10MHz	1.65 ~ 5.5	-	-42	-	-	-	dB	Figure 7
Xtalk	Crosstalk	$R_L = 50 \Omega$, f = 10MHz	1.65 ~ 5.5	-	-42	-	-	-	dB	Figure 8
BW	-3dB Bandwidth	R _L = 50 Ω	1.65 ~ 5.5	-	300	-	-	-	MHz	Figure 9
THD	Total Harmonic Distortion (Note 9)	R _L = 600 Ω, 0.5 V _{P-P} , f = 600Hz to 20kHz	5.0	-	0.1	-	-	-	%	Figure 10

 Due to the symmetry of the part, the direction of the propagation delay applies to either direction A to B_n or B_n to A. Propagation time is the calculated RC time constant of the typical ON resistance of the switch and the specified load capacitance when capacitance when driven by an ideal voltage source.
The Switch signal enable and disables time are the same for Bn and A if they are reversed at input and output. Notes:



Parameter Measurement Information



Condition 1: $V_I = GND, V_O = V_{CC}$ Condition 2: $V_I = V_{CC}, V_O = GND$



Figure 1 OFF –State Leakage Curent Test



Figure 2 ON –State Leakage Curent Test



Figure 3 ON State Resistance Test



Parameter Measurement Information (Notes 15-19)



TEST	S1	RL
t _{PLH} /t _{PHL}	Open	500Ω
t _{PLZ} /t _{PZL}	Vload	500Ω
t _{PHZ} /t _{PZH}	GND	500Ω

M	Inputs		M	V	CL	VΔ
Vcc	VI	t _r /t _f	VM	VLOAD	(Note 14)	VΔ
1.8V ± 0.15V	V _{CC}	≤2ns	V _{CC} /2	$2 \times V_{CC}$	50pF	0.1V
2.5V ± 0.2V	V _{CC}	≤2ns	V _{CC} /2	$2 \times V_{CC}$	50pF	0.1V
3.3V ± 0.3V	V _{CC}	≤2.5ns	V _{CC} /2	$2 \times V_{CC}$	50pF	0.1V
5V ± 0.5V	V _{CC}	≤2.5ns	V _{CC} /2	$2 \times V_{CC}$	50pF	0.1V



Voltage Waveform Propagation Delay Times



Voltage Waveform Enable and Disable Times

Figure 4 Load Circuit and Voltage Waveforms

14. Includes test lead and test apparatus capacitance. Notes:

- 15. All pulses are supplied at pulse repetition rate ≤ 10MHz.
- 16. Inputs are measured separately one transition per measurement.
- 17. t_{PLZ} and t_{PHZ} are the same as $t_{dis.}$
- 18. t_{PZL} and t_{PZH} are the same as t_{EN} . 19. t_{PLH} and t_{PHL} are the same as t_{PD} .



Parameter Measurement Information (continued)







Figure 6 Charge Injection







Parameter Measurement Information (continued)



Figure 8 Cross Talk



Adjust fin voltage to obtain 0 dBm level at input. Adjust fin frequency until dB meter reads -3 dB.

Figure 9 Bandwdith





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Typical Performance Characteristics

















Figure 14 ON state Resistance Vcc = 2.5 V; I_{Bn} = 8ma



Figure 16 ON state Resistance Vcc = 3 V; I_{Bn} = 24ma



Typical Performance Characteristics (continued)

















Figure 20 △Ron-Resistance Match Between Channels



Figure 22 $I_{S(OFF)}$ OFF state leakage V_{IN} = -0.1 V

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Typical Performance Characteristics (continued)











Figure 28 Delta Icc verses Temperture



Typical Performance Characteristics (continued)











Figure 30 $\,V_{IH},\,V_{IL},\,Hysteresis\,V_{CC}$ = 2.3 V and V_{CC} = 2.7 V



Figure 32 V_{IH}, V_{IL}, Hysteresis V_{cc} = 4.5 V and V_{cc}= 5.5 V



Marking Information

(1) SOT363



Part Number	Package	Identification Code
74LVC1G3157DW	SOT363	J7

(2) X2-DFN1410-6



Package Characteristics (All typical values are at V_{CC} = 3.3V, T_A = +25°C)

Symbol	Parameter	Test Conditions	Vcc	Min	Тур.	Мах	Unit
0	Thermal Resistance	SOT363	() - (- 00)	-	371	-	°0111
θ_{JA}	Junction-to-Ambient	X2-DFN1410-6	(Note 20)	-	460	-	°C/W
0	Thermal Resistance	SOT363	(Nists 00)	-	143	-	
θ_{JC}	Junction-to-Case	X2-DFN1410-6	(Note 20)	-	265	-	°C/W

Note: 20. Test condition SOT363, and X2-DFN1410-6: Device mounted on FR-4 substrate PC board, 2oz. copper, with minimum recommended pad layout.



SOT363 Package Outline Dimensions and Suggested Pad Layout

 $\label{eq:plases} Please see \ http://www.diodes.com/package-outlines.html \ for \ the \ latest \ version.$





SOT363					
Dim	Min	Max	Тур		
A1	0.00	0.10	0.05		
A2	0.90	1.00	1.00		
b	0.10	0.30	0.25		
С	0.10	0.22	0.11		
D	1.80	2.20	2.15		
E	2.00	2.20	2.10		
E1	1.15	1.35	1.30		
е	0.650 BSC				
F	0.40	0.45	0.425		
L	0.25	0.40	0.30		
а	0°	8°			
All Dimensions in mm					



Dimensions	Value (in mm)	
С	0.650	
G	1.300	
Х	0.420	
Y	0.600	
Y1	2.500	



X2-DFN1410-6 Package Outline Dimensions and Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.



X2-DFN1410-6					
Dim	Min	Max	Тур		
Α	-	0.40	0.39		
A1	0.00	0.05	0.02		
A3			0.13		
b	0.15	0.25	0.20		
D	1.35	1.45	1.40		
E	0.95	1.05	1.00		
е	-		0.50		
L	0.25	0.35	0.30		
Z	_	_	0.10		
Z1	0.045	0.105	0.075		
All	All Dimensions in mm				



Dimensions	Value (in mm)	
С	0.500	
G	0.250	
Х	0.250	
X1	1.250	
Y	0.525	
Y1	1.250	

Mechanical Data

SOT363

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish Mate Tin Plated Leads, Solderable per MIL-STD-202, Method 208 3
- Weight: 0.0064 grams (Approximate)

X2-DFN1410-6

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish NiPdAu Nickel Palladium Gold, Solderable per MIL-STD-202, Method 208 @
- Weight: 0.002 grams (Approximate)



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