74LVC2G3157

Dual 10 Ω single-pole double-throw analog switch

Rev. 4 — 12 May 2021

Product data sheet

1. General description

The 74LVC2G3157 is a dual low-ohmic single-pole double-throw analog switch suitable for use as an analog or digital 2:1 multiplexer/demultiplexer. Each switch has a digital select input (nS), two independent inputs/outputs (nY0 and nY1) and a common input/output (nZ).

Schmitt trigger action at the select inputs makes the circuit tolerant of slower input rise and fall times across the entire V_{CC} range from 1.65 V to 5.5 V.

2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- · Very low ON resistance:
 - 10.4 Ω (typical) at V_{CC} = 2.7 V
 - 7.8 Ω (typical) at V_{CC} = 3.3 V
 - 6.2 Ω (typical) at V_{CC} = 5 V
- Switch current capability of 32 mA
- · Break-before-make switching
- · High noise immunity
- CMOS low power consumption
- TTL interface compatibility at 3.3 V
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- ESD protection:
 - HBM ANSI/ESDA/JEDEC JS-001 Class 2 exceeds 2 kV
 - MM JESD22-A115-C exceeds 200 V
 - CDM JESD22-C101E exceeds 1000 V
- Select input accepts voltages up to 5.5 V
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package								
	Temperature range	Name	Description	Version					
74LVC2G3157DP	-40 °C to +125 °C	TSSOP10	plastic thin shrink small outline package; 10 leads; body width 3 mm	SOT552-1					

4. Marking

Table 2. Marking codes

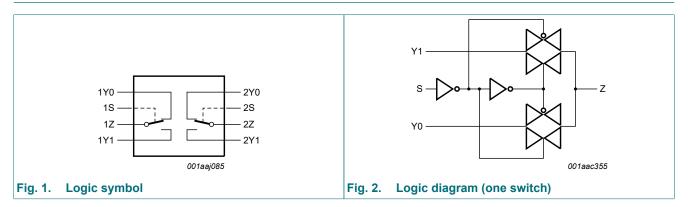
Type number	Marking code[1]
74LVC2G3157DP	YJ

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.



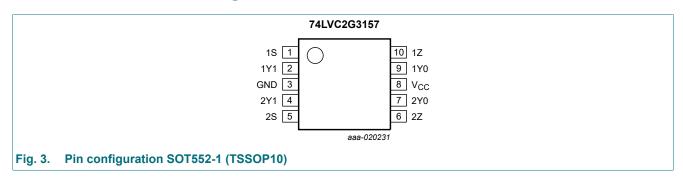
Dual 10 Ω single-pole double-throw analog switch

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
1S	1	select input
1Y1	2	independent input or output
GND	3	ground (0 V)
2Y1	4	independent input or output
2S	5	select input
2Z	6	common output or input
2Y0	7	independent input or output
Vcc	8	supply voltage
1Y0	9	independent input or output
1Z	10	common output or input

Dual 10 Ω single-pole double-throw analog switch

7. Functional description

Table 4. Function table

 $H = HIGH \ voltage \ level; \ L = LOW \ voltage \ level.$

Input nS	Channel on
L	nY0
Н	nY1

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		-0.5	+6.5	V
VI	input voltage	[1]	-0.5	+6.5	V
I _{IK}	input clamping current	V _I < -0.5 V	-50	-	mA
I _{SK}	switch clamping current	$V_{I} < -0.5 \text{ V or } V_{I} > V_{CC} + 0.5 \text{ V}$	-	±50	mA
V _{SW}	switch voltage	enable and disable mode [2]	-0.5	V _{CC} + 0.5	V
I _{SW}	switch current	$V_{SW} > -0.5 \text{ V or } V_{SW} < V_{CC} + 0.5 \text{ V}$	-	±50	mA
I _{CC}	supply current		-	100	mA
I_{GND}	ground current		-100	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$ [3]	-	250	mW

- [1] The minimum input voltage rating may be exceeded if the input current rating is observed.
- [2] The minimum and maximum switch voltage ratings may be exceeded if the switch clamping current rating is observed.
- [3] For SOT552-1 (TSSOP10) packages: P_{tot} derates linearly with 8.3 mW/K above 120 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V _{CC}	supply voltage		1.65	-	5.5	V
V_{I}	input voltage		0	-	5.5	V
V_{SW}	switch voltage	enable and disable mode [1]	0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	-	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 1.65 V to 2.7 V [2]	-	-	20	ns/V
		$V_{CC} = 2.7 \text{ V to } 5.5 \text{ V}$ [2]	-	-	10	ns/V

^[1] To avoid sinking GND current from terminal Z when switch current flows in terminal Yn, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal Z, no GND current will flow from terminal Yn. In this case, there is no limit for the voltage drop across the switch.

^[2] Applies to control signal levels.

Dual 10 Ω single-pole double-throw analog switch

10. Static characteristics

Table 7. Static characteristics

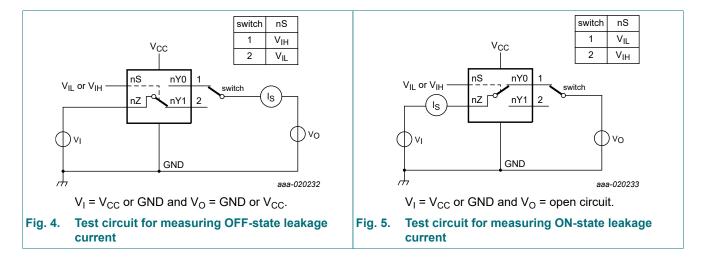
At recommended operating conditions; voltages are referenced to GND (ground 0 V).

Symbol	Parameter	Conditions		-40	°C to +8	5 °C	-40 °C to	Unit	
				Min	Typ[1]	Max	Min	Max	
V _{IH}	HIGH-level input	V _{CC} = 1.65 V to 1.95 V		0.65V _{CC}	-	-	0.65V _{CC}	-	V
	voltage	V _{CC} = 2.3 V to 2.7 V		1.7	-	-	1.7	-	V
		V _{CC} = 3 V to 3.6 V		2.0	-	-	2.0	-	V
		V _{CC} = 4.5 V to 5.5 V		0.7V _{CC}	-	-	0.7V _{CC}	-	V
V _{IL}	LOW-level input	V _{CC} = 1.65 V to 1.95 V		-	-	0.35V _{CC}	-	0.35V _{CC}	V
	voltage	V _{CC} = 2.3 V to 2.7 V		-	-	0.7	-	0.7	V
		V _{CC} = 3 V to 3.6 V		-	-	0.8	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V		-	-	0.3V _{CC}		0.3V _{CC}	V
l ₁	input leakage current	pin nS; V _I = 5.5 V or GND; [2] V _{CC} = 0 V to 5.5 V		-	±0.1	±1	-	±1	μΑ
I _{S(OFF)}	OFF-state leakage current	V _{CC} = 5.5 V; see <u>Fig. 4</u>	[2]	-	±0.1	±0.2	-	±0.5	μΑ
I _{S(ON)}	ON-state leakage current	V _{CC} = 5.5 V; see <u>Fig. 5</u>	[2]	-	±0.1	±1	-	±2	μΑ
I _{CC}	supply current	V_I = 5.5 V or GND; V_{SW} = GND or V_{CC} ; V_{CC} = 1.65 V to 5.5 V	[2]	-	0.1	4	-	4	μA
ΔI _{CC}	additional supply current	pin nS; $V_I = V_{CC} - 0.6 \text{ V}$; $V_{CC} = 5.5 \text{ V}$; $V_{SW} = \text{GND or } V_{CC}$	[2]	-	5	500	-	500	μΑ
Cı	input capacitance			-	2.5	-	-	-	pF
C _{S(OFF)}	OFF-state capacitance			-	6.0	-	-	-	pF
C _{S(ON)}	ON-state capacitance			-	18	-	-	-	pF

^[1] Typical values are measured at T_{amb} = 25 °C. [2] These typical values are measured at V_{CC} = 3.3 V

Dual 10 Ω single-pole double-throw analog switch

10.1. Test circuits



10.2. ON resistance

Table 8. ON resistance

At recommended operating conditions; voltages are referenced to GND (ground 0 V); for graphs see Fig. 7 to Fig. 12.

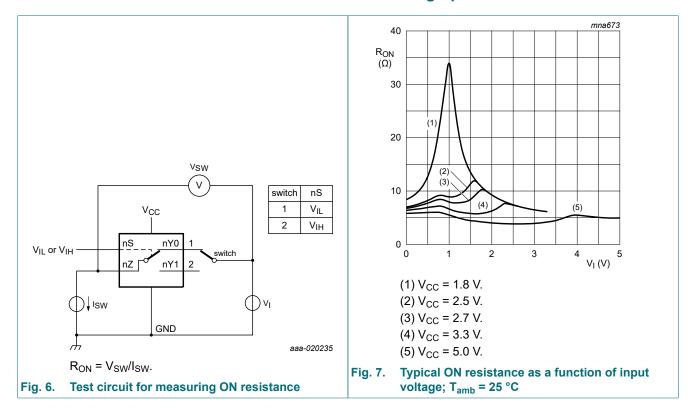
Symbol	Parameter	Conditions		-40 °C to +85 °C			-40 °C to +125 °C	
			Min	Typ[1]	Max	Min	Max	
R _{ON(peak)}		V _I = GND to V _{CC} ; see <u>Fig. 6</u>						
	(peak)	I _{SW} = 4 mA;V _{CC} = 1.65 V to 1.95 V	-	34.0	130	-	195	Ω
		I _{SW} = 8 mA; V _{CC} = 2.3 V to 2.7 V	-	12.0	30	-	45	Ω
		I _{SW} = 12 mA; V _{CC} = 2.7 V	-	10.4	25	-	38	Ω
		I _{SW} = 24 mA; V _{CC} = 3.0 V to 3.6 V	-	7.8	20	-	30	Ω
		I _{SW} = 32 mA; V _{CC} = 4.5 V to 5.5 V	-	6.2	15	-	23	Ω
R _{ON(rail)}	ON resistance	V _I = GND; see <u>Fig. 6</u>						
	(rail)	I _{SW} = 4 mA;V _{CC} = 1.65 V to 1.95 V	-	8.2	18	-	27	Ω
		I _{SW} = 8 mA; V _{CC} = 2.3 V to 2.7 V	-	7.1	16	-	24	Ω
		I _{SW} = 12 mA; V _{CC} = 2.7 V	-	6.9	14	-	21	Ω
		I _{SW} = 24 mA; V _{CC} = 3.0 V to 3.6 V	-	6.5	12	-	18	Ω
		I _{SW} = 32 mA; V _{CC} = 4.5 V to 5.5 V	-	5.8	10	-	15	Ω
		V _I = V _{CC} ; see <u>Fig. 6</u>						
		I _{SW} = 4 mA;V _{CC} = 1.65 V to 1.95 V	-	10.4	30	-	45	Ω
		I _{SW} = 8 mA; V _{CC} = 2.3 V to 2.7 V	-	7.6	20	-	30	Ω
		I _{SW} = 12 mA; V _{CC} = 2.7 V	-	7.0	18	-	27	Ω
		I _{SW} = 24 mA; V _{CC} = 3.0 V to 3.6 V	-	6.1	15	-	23	Ω
		I _{SW} = 32 mA; V _{CC} = 4.5 V to 5.5 V	-	4.9	10	-	15	Ω

Dual 10 Ω single-pole double-throw analog switch

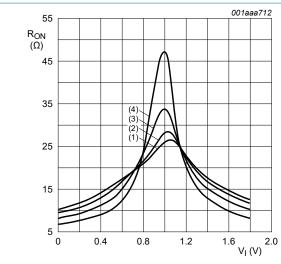
Symbol	Symbol Parameter Conditions		-40	°C to +8	5 °C	-40 °C to	+125 °C	Unit
			Min	Typ[1]	Max	Min	Max	
R _{ON(flat)}	ON resistance	$V_I = GND \text{ to } V_{CC}$ [2]						
	(flatness)	I _{SW} = 4 mA;V _{CC} = 1.65 V to 1.95 V	-	26.0	-	-	-	Ω
		I_{SW} = 8 mA; V_{CC} = 2.3 V to 2.7 V	-	5.0	-	-	-	Ω
		I_{SW} = 12 mA; V_{CC} = 2.7 V	-	3.5	-	-	-	Ω
		I_{SW} = 24 mA; V_{CC} = 3.0 V to 3.6 V	-	2.0	-	-	-	Ω
		I_{SW} = 32 mA; V_{CC} = 4.5 V to 5.5 V	-	1.5	-	-	-	Ω

- [1] Typical values are measured at T_{amb} = 25 °C and nominal V_{CC} .
- [2] Flatness is defined as the difference between the maximum and minimum value of ON resistance measured at identical V_{CC} and temperature.

10.3. ON resistance test circuit and graphs

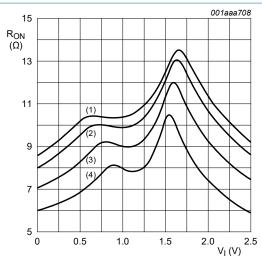


Dual 10 Ω single-pole double-throw analog switch



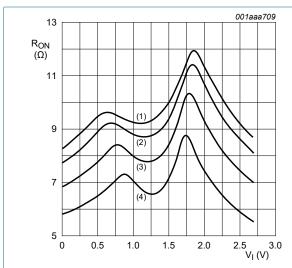
- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig. 8. ON resistance as a function of input voltage; $V_{CC} = 1.8 \text{ V}$



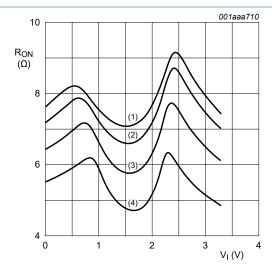
- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig. 9. ON resistance as a function of input voltage; $V_{CC} = 2.5 \text{ V}$



- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

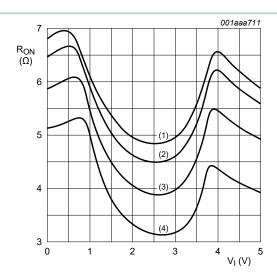
Fig. 10. ON resistance as a function of input voltage; $V_{CC} = 2.7 \text{ V}$



- (1) $T_{amb} = 125 \,^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig. 11. ON resistance as a function of input voltage; $V_{CC} = 3.3 \text{ V}$

Dual 10 Ω single-pole double-throw analog switch



- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) T_{amb} = 85 °C.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig. 12. ON resistance as a function of input voltage; V_{CC} = 5.0 V

Dual 10 Ω single-pole double-throw analog switch

11. Dynamic characteristics

Table 9. Dynamic characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 16.

Symbol	Parameter	Conditions		-40	°C to +8	5 °C	-40 °C to +125 °C		Unit
				Min	Typ[1]	Max	Min	Max	
t _{pd}	propagation delay	nYn to nZ or nZ to nYn; see Fig. 13	[2] [3]						
		V _{CC} = 1.65 V to 1.95 V		-	-	2	-	3.0	ns
		V _{CC} = 2.3 V to 2.7 V		-	-	1.2	-	2.0	ns
		V _{CC} = 2.7 V		-	-	1.0	-	1.5	ns
		V _{CC} = 3.0 V to 3.6 V		-	-	8.0	-	1.5	ns
		V _{CC} = 4.5 V to 5.5 V		-	-	0.6	-	1.0	ns
t _{en}	enable time	nS to nYn; see Fig. 14	[4]						
		V _{CC} = 1.65 V to 1.95 V		1	8.7	24	1	26.5	ns
		V _{CC} = 2.3 V to 2.7 V		1	5.3	14	1	15.5	ns
		V _{CC} = 2.7 V		1	4.9	14	1	15.5	ns
		V _{CC} = 3.0 V to 3.6 V		0.5	4	7.6	0.5	8.5	ns
		V _{CC} = 4.5 V to 5.5 V		0.5	3	5.7	0.5	6.6	ns
t _{dis}	disable time	nS to nYn; see Fig. 14	[5]						
		V _{CC} = 1.65 V to 1.95 V		2.5	6	13	2.5	14.5	ns
		V _{CC} = 2.3 V to 2.7 V		2	4.4	7.5	2	8.5	ns
		V _{CC} = 2.7 V		1.5	4.2	7.5	1.5	8.5	ns
		V _{CC} = 3.0 V to 3.6 V		1.5	3.6	5.3	1.5	6	ns
		V _{CC} = 4.5 V to 5.5 V		8.0	2.9	3.8	0.8	4.5	ns
t _{b-m}	break-before-	$C_L = 35 \text{ pF}; R_L = 50 \Omega; \text{ see } \frac{\text{Fig. } 15}{}$	[6]						
	make time	V _{CC} = 1.65 V to 1.95 V		0.5	-	-	0.5	-	ns
		V _{CC} = 2.3 V to 2.7 V		0.5	-	-	0.5	-	ns
		V _{CC} = 2.7 V		0.5	-	-	0.5	-	ns
		V _{CC} = 3 V to 3.6 V		0.5	-	-	0.5	-	ns
		V _{CC} = 4.5 V to 5.5 V		0.5	-	-	0.5	-	ns

^[1] Typical values are measured at T_{amb} = 25 °C and nominal V_{CC} .

Product data sheet

^[2] t_{pd} is the same as t_{PLH} and t_{PHL} .

Propagation delay is the calculated RC time constant of the typical ON resistance of the switch and the specified capacitance when driven by an ideal voltage source (zero output impedance).

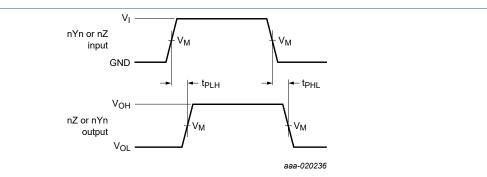
^[4] t_{en} is the same as t_{PZH} and t_{PZL} .

^[5] t_{dis} is the same as t_{PLZ} and t_{PHZ} .

^[6] Break-before-make specified by design.

Dual 10 Ω single-pole double-throw analog switch

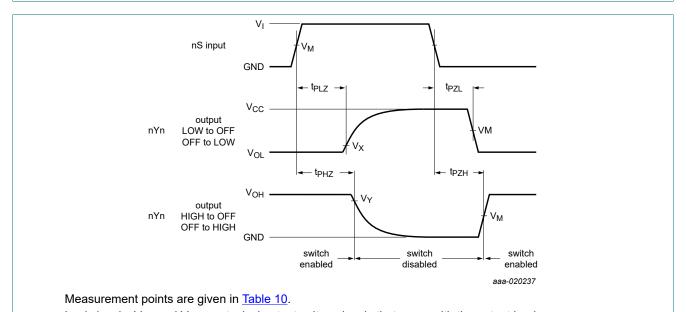
11.1. Waveforms and test circuits



Measurement points are given in Table 10.

Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 13. Input (nYn or nZ) to output (nZ or nYn) propagation delays



Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

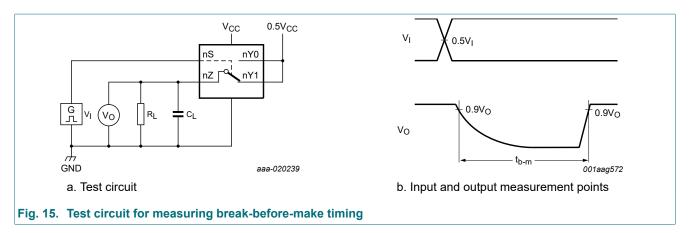
Table 10. Measurement points

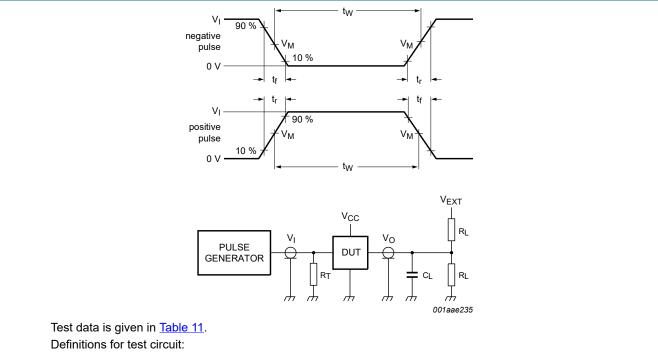
Fig. 14. Enable and disable times

Supply voltage	Input	Output		
V _{CC}	V _M	V _M	V_X	V _Y
1.65 V to 5.5 V	0.5V _{CC}	0.5V _{CC}	V _{OL} + 0.3 V	V _{OH} - 0.3 V

Product data sheet

Dual 10 Ω single-pole double-throw analog switch





R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

 R_T = Termination resistance should be equal to output impedance Z_0 of the pulse generator.

 V_{EXT} = Test voltage for switching times.

Fig. 16. Test circuit for measuring switching times

Table 11. Test data

Supply voltage	Input		Load		V _{EXT}	V _{EXT}			
V _{CC}	V _I	t _r , t _f	CL	R _L	t _{PLH} , t _{PHL}	t _{PZH,} t _{PHZ}	t _{PZL,} t _{PLZ}		
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	50 pF	500 Ω	open	GND	2V _{CC}		
2.3 V to 2.7 V	V _{CC}	≤ 2.0 ns	50 pF	500 Ω	open	GND	2V _{CC}		
2.7 V	V _{CC}	≤ 2.5 ns	50 pF	500 Ω	open	GND	2V _{CC}		
3 V to 3.6 V	V _{CC}	≤ 2.5 ns	50 pF	500 Ω	open	GND	2V _{CC}		
4.5 V to 5.5 V	V _{CC}	≤ 2.5 ns	50 pF	500 Ω	open	GND	2V _{CC}		

Dual 10 Ω single-pole double-throw analog switch

11.2. Additional dynamic characteristics

Table 12. Additional dynamic characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); T_{amb} = 25 °C.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
THD	total harmonic distortion	f_i = 600 Hz to 20 kHz; R_L = 600 Ω; C_L = 50 pF; V_I = 0.5 V (p-p); see Fig. 17				
		V _{CC} = 1.65 V	-	0.260	-	%
		V _{CC} = 2.3 V	-	0.078	-	%
		V _{CC} = 3.0 V	-	0.078	-	%
		V _{CC} = 4.5 V	-	0.078	-	%
f _(-3dB)	-3 dB frequency response	R_L = 50 Ω; see Fig. 18				
		V _{CC} = 1.65 V	-	200	-	MHz
		V _{CC} = 2.3 V	-	300	-	MHz
		V _{CC} = 3.0 V	-	300	-	MHz
		V _{CC} = 4.5 V	-	300	-	MHz
α_{iso}	isolation (OFF-state)	R_L = 50 Ω; C_L = 5 pF; f_i = 10 MHz; see <u>Fig. 19</u>				
		V _{CC} = 1.65 V	-	-42	-	dB
		V _{CC} = 2.3 V	-	-42	-	dB
		V _{CC} = 3.0 V	-	-40	-	dB
		V _{CC} = 4.5 V	-	-40	-	dB
Xtalk	crosstalk	between switches; f _i = 10 MHz; see <u>Fig. 20</u>				
		V _{CC} = 1.65 V	-	-54	-	dB
		V _{CC} = 2.3 V	-	-54	-	dB
		V _{CC} = 3.0 V	-	-54	-	dB
		V _{CC} = 4.5 V	-	-54	-	dB
Q _{inj}	charge injection	C_L = 0.1 nF; V_{gen} = 0 V; R_{gen} = 0 Ω ; f_i = 1 MHz; R_L = 1 M Ω ; see Fig. 21				
		V _{CC} = 1.8 V	-	3.3	-	рС
		V _{CC} = 2.5 V	-	4.1	-	pC
		V _{CC} = 3.3 V	-	5.0	-	рС
		V _{CC} = 4.5 V	-	6.4	-	pC
		V _{CC} = 5.5 V	-	7.5	-	рС

Product data sheet

Dual 10 Ω single-pole double-throw analog switch

11.3. Test circuits

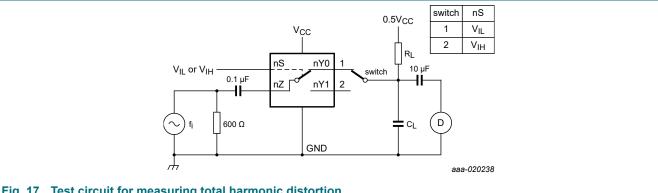
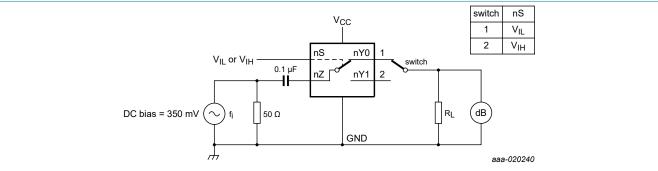


Fig. 17. Test circuit for measuring total harmonic distortion



Adjust f_i voltage to obtain 0 dBm level at output. Increase f_i frequency until dB meter reads -3 dB.

Fig. 18. Test circuit for measuring the frequency response when switch is in ON-state

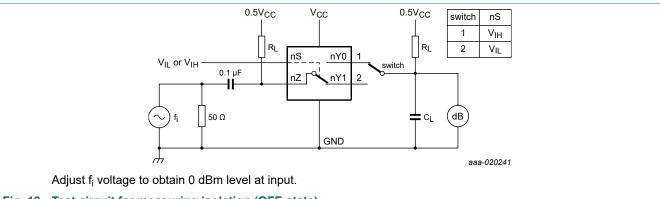
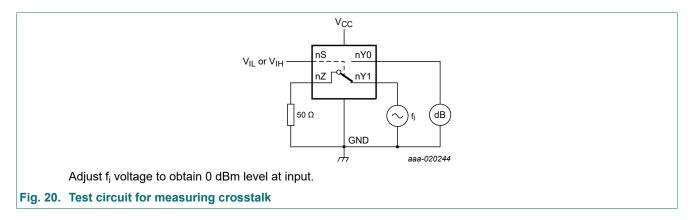
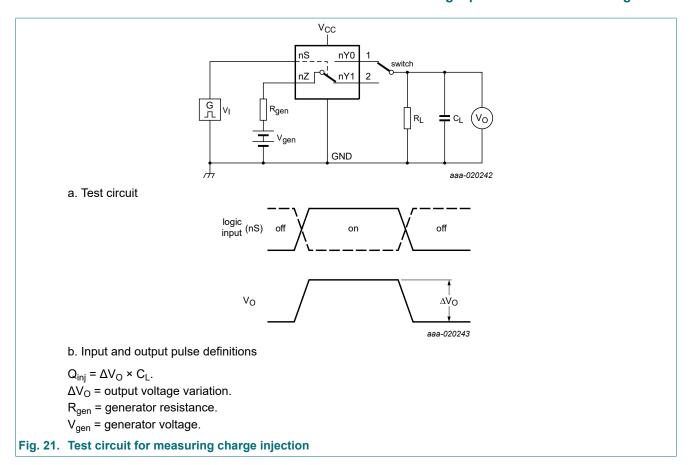


Fig. 19. Test circuit for measuring isolation (OFF-state)



Dual 10 Ω single-pole double-throw analog switch

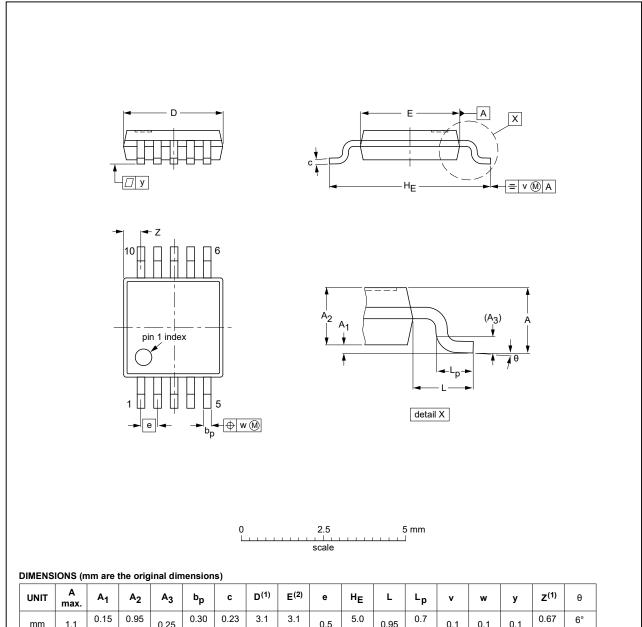


Dual 10 Ω single-pole double-throw analog switch

12. Package outline

TSSOP10: plastic thin shrink small outline package; 10 leads; body width 3 mm

SOT552-1



UNIT	A max.	A ₁	A ₂	А3	bp	С	D ⁽¹⁾	E ⁽²⁾	е	HE	L	Lp	v	w	у	Z ⁽¹⁾	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.15	0.23 0.15	3.1 2.9	3.1 2.9	0.5	5.0 4.8	0.95	0.7 0.4	0.1	0.1	0.1	0.67 0.34	6° 0°

Notes

- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT552-1						99-07-29 03-02-18

Fig. 22. Package outline SOT552-1 (TSSOP10)

Dual 10 Ω single-pole double-throw analog switch

13. Abbreviations

Table 13. Abbreviations

Acronym	Description
CDM	Charged Device Model
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

14. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74LVC2G3157 v.4	20210512	Product data sheet	-	74LVC2G3157 v.3		
Modifications:	* *	er 74LVC2G3157GM (SOT Derating values for P _{tot} tota		•		
74LVC2G3157 v.3	20190325	Product data sheet	-	74LVC2G3157 v.2		
Modifications: • The format of this data sh guidelines of Nexperia.			J	mply with the identity		
7411/0000457			Tiew Company har	T		
74LVC2G3157 v.2	20161215	Product data sheet	-	74LVC2G3157 v.1		
Modifications:	ations: • <u>Table 7</u> : The maximum limits for leakage current and supply current have changed.					
74LVC2G3157 v.1	20151214	Product data sheet	-	-		

15. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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Dual 10 Ω single-pole double-throw analog switch

Contents

1. General description	1
2. Features and benefits	1
3. Ordering information	1
4. Marking	1
5. Functional diagram	2
6. Pinning information	2
6.1. Pinning	2
6.2. Pin description	2
7. Functional description	3
8. Limiting values	3
9. Recommended operating conditions	3
10. Static characteristics	4
10.1. Test circuits	5
10.2. ON resistance	5
10.3. ON resistance test circuit and graphs	6
11. Dynamic characteristics	9
11.1. Waveforms and test circuits	10
11.2. Additional dynamic characteristics	12
11.3. Test circuits	13
12. Package outline	15
13. Abbreviations	16
14. Revision history	16
15. Legal information	17

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74LVC2G3157DPJ