2-channel analog multiplexer/demultiplexer Rev. 5 — 6 December 2012

Product data sheet

1. **General description**

The 74LVC1G3157 provides one analog multiplexer/demultiplexer with one digital select input (S), two independent inputs/outputs (Y0, Y1) and a common input/output (Z).

Schmitt trigger action at the select input 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:
 - 7.5 Ω (typical) at V_{CC} = 2.7 V
 - 6.5 Ω (typical) at V_{CC} = 3.3 V
 - 6 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 meets requirements of JESD 78 Class I
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Control input accepts voltages up to 5.5 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C



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Ordering information 3.

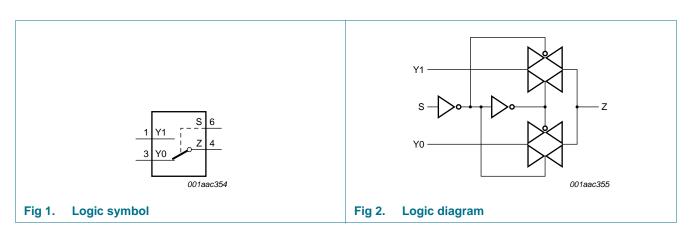
Table 1. Ordering	g information									
Type number	Package	Package								
	Temperature range	Name	Description	Version						
74LVC1G3157GW	–40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363						
74LVC1G3157GV	–40 °C to +125 °C	SC-74	plastic surface-mounted package (TSOP6); 6 leads	SOT457						
74LVC1G3157GM	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 \times 1.45 \times 0.5 mm	SOT886						
74LVC1G3157GF	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 \times 1 \times 0.5 mm	SOT891						
74LVC1G3157GN	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $0.9 \times 1.0 \times 0.35$ mm	SOT1115						
74LVC1G3157GS	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $1.0 \times 1.0 \times 0.35$ mm	SOT1202						

Marking 4.

Table 2. Marking	
Type number	Marking code ^[1]
74LVC1G3157GW	YJ
74LVC1G3157GV	YJ
74LVC1G3157GM	YJ
74LVC1G3157GF	YJ
74LVC1G3157GN	YJ
74LVC1G3157GS	YJ

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

Functional diagram 5.



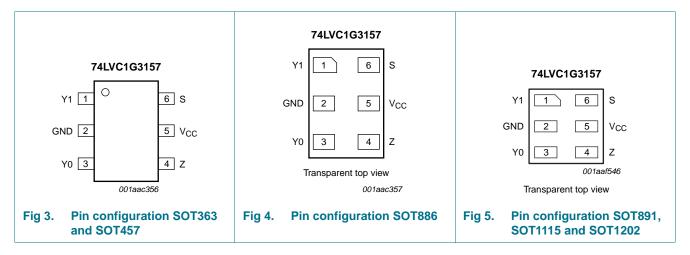
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6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3.	Pin description	
Symbol	Pin	Description
Y1	1	independent input or output
GND	2	ground (0 V)
Y0	3	independent input or output
Z	4	common output or input
V _{CC}	5	supply voltage
S	6	select input

7. Functional description

Table 4.Function table

Input S	Channel on
L	YO
Н	Y1

[1] H = HIGH voltage level; L = LOW voltage level.

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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		<u>[1]</u> –0.5	+6.5	V
I _{IK}	input clamping current	$V_{\rm I}$ < –0.5 V or $V_{\rm I}$ > $V_{\rm CC}$ + 0.5 V	-50	-	mA
I _{SK}	switch clamping current	$V_{\rm I}$ < –0.5 V or $V_{\rm I}$ > $V_{\rm CC}$ + 0.5 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 V or V_{SW} < V_{CC} + 0.5 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	$T_{amb} = -40 \ ^{\circ}C$ to +125 $^{\circ}C$	<u>[3]</u> _	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 SC-88 and SC-74 packages: above 87.5 °C the value of Ptot derates linearly with 4.0 mW/K.

For XSON6 package: above 118 °C the value of Ptot derates linearly with 7.8 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Мах	Unit
V _{CC}	supply voltage		1.65	-	5.5	V
VI	input voltage		0	-	5.5	V
V _{SW}	switch voltage	enable and disable mode	<u>[1]</u> 0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	-	+125	°C
$\Delta t / \Delta V$	input transition rise and fall rate	V_{CC} = 1.65 V to 2.7 V	[2] _	-	20	ns/V
		V_{CC} = 2.7 V to 5.5 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.

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10. Static characteristics

Table 7. Static characteristics

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

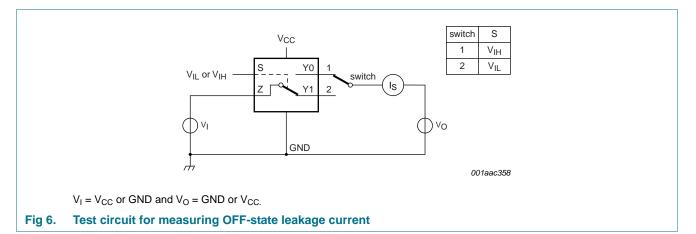
Symbol	Parameter	Conditions		-40 °	°C to +8	5 °C	–40 °C to	Unit	
				Min	Typ[1]	Max	Min	Max	
V _{IH}	HIGH-level	$V_{CC} = 1.65 \text{ V}$ to 1.95 V		$0.65V_{CC}$	-	-	0.65V _{CC}	-	V
	input voltage	V_{CC} = 2.3 V to 2.7 V		1.7	-	-	1.7	-	V
		V_{CC} = 3 V to 3.6 V		2.0	-	-	2.0	-	V
		V_{CC} = 4.5 V to 5.5 V		$0.7V_{CC}$	-	-	$0.7V_{CC}$	-	V
V _{IL}	LOW-level	V_{CC} = 1.65 V to 1.95 V		-	-	$0.35V_{CC}$	-	$0.35V_{CC}$	V
	input 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 _l	input leakage current	pin S; V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	[2]	-	±0.1	±2	-	±10	μA
I _{S(OFF)}	OFF-state leakage current	$V_{CC} = 5.5 V$; see <u>Figure 6</u>	[2]	-	±0.1	±5	-	±20	μΑ
I _{S(ON)}	ON-state leakage current	$V_{CC} = 5.5 \text{ V}; \text{ see } \frac{\text{Figure 7}}{1000}$	[2]	-	±0.1	±5	-	±20	μΑ
I _{CC}	supply current	$V_{\rm I}$ = 5.5 V or GND; $V_{\rm SW}$ = GND or $V_{\rm CC};$ $V_{\rm CC}$ = 1.65 V to 5.5 V	[2]	-	0.1	10	-	40	μΑ
ΔI_{CC}	additional supply current	pin S; V _I = V _{CC} – 0.6 V; V _{CC} = 5.5 V; V _{SW} = GND or V _{CC}	[2]	-	5	500	-	5000	μΑ
CI	input capacitance			-	2.5	-	-	-	pF
$C_{\text{S}(\text{OFF})}$	OFF-state capacitance			-	6.0	-	-	-	pF
C _{S(ON)}	ON-state capacitance			-	18	-	-	-	pF

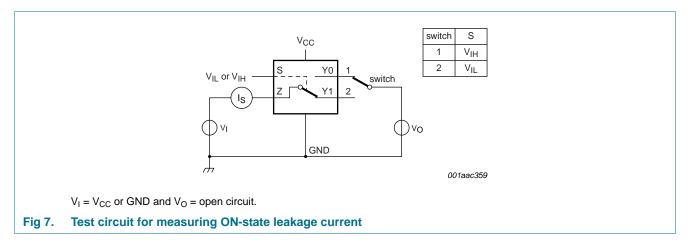
[1] Typical values are measured at $T_{amb} = 25 \ ^{\circ}C$.

[2] These typical values are measured at V_{CC} = 3.3 V

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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 Figure 9 to Figure 14.

Symbol	Parameter	Conditions	–40 °C to +85 °C		–40 °C to	+125 °C	Unit	
			Min	Typ <mark>[1]</mark>	Max	Min	Max	
R _{ON(peak)}	ON resistance (peak)	$V_I = GND$ to V_{CC} ; see Figure 8						
		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 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

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Symbol	Parameter	Conditions	-40	°C to +8	85 °C	-40 °C te	o +125 °C	Unit
				Typ <mark>[1]</mark>	Max	Min	Max	
R _{ON(rail)}	ON resistance (rail)	V _I = GND; see <u>Figure 8</u>		•				
		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 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>Figure 8</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 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
R _{ON(flat)}	ON resistance	$V_{I} = GND$ to V_{CC}	[2]					
(flatness)	(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 V to 3.6 V	-	2.0	-	-	-	Ω
		I_{SW} = 32 mA; V_{CC} = 4.5 V to 5.5 V	-	1.5	-	-	-	Ω

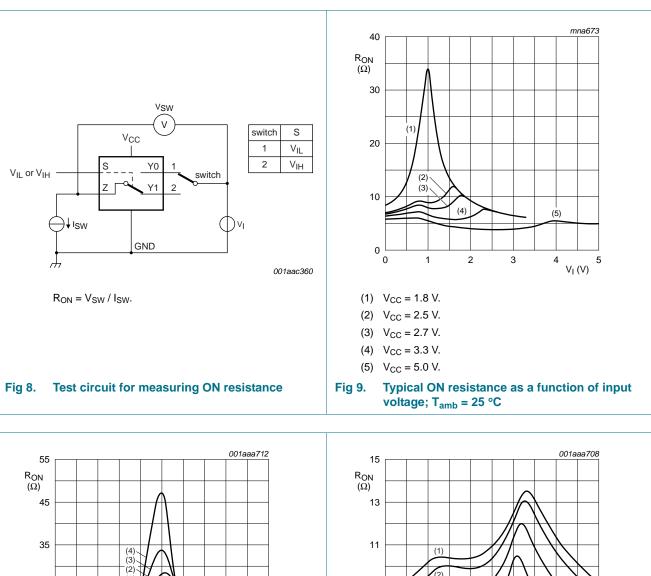
Table 8. ON resistance ...continued

At recommended operating conditions; voltages are referenced to GND (ground 0 V); for graphs see Figure 9 to Figure 14.

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

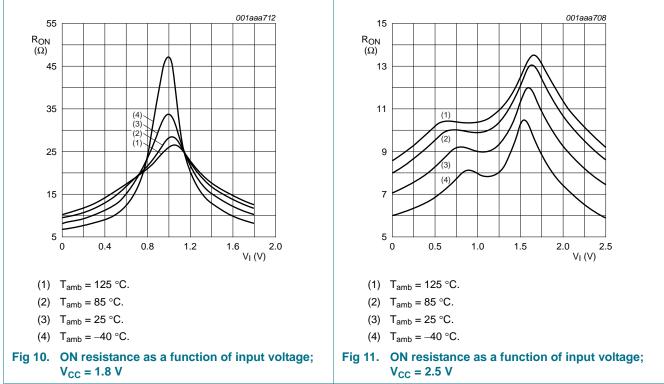
[2] Flatness is defined as the difference between the maximum and minimum value of ON resistance measured at identical V_{CC} and temperature.

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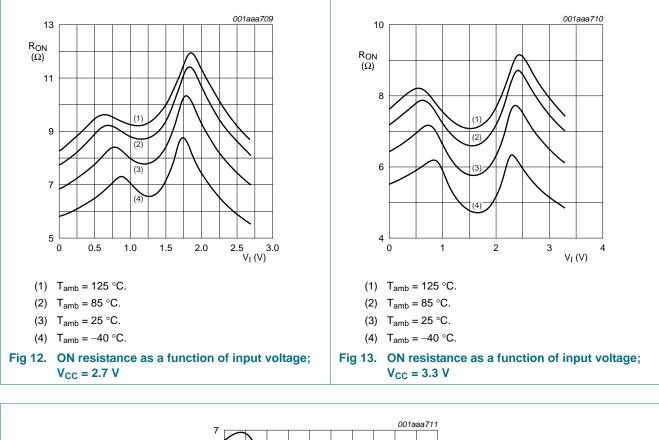


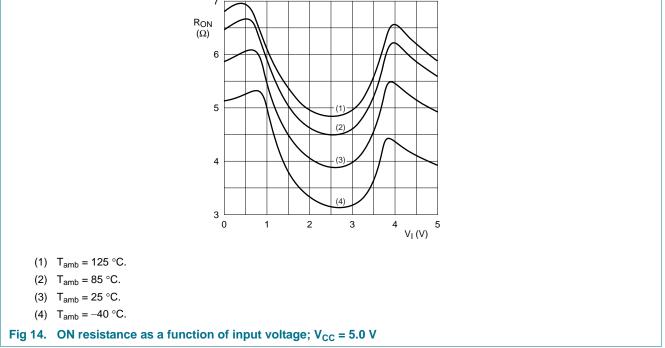
10.3 ON resistance test circuit and graphs

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11. Dynamic characteristics

Table 9. Dynamic characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for load circuit see Figure 18.

Symbol	Parameter	Conditions		-40	°C to +8	5 °C	–40 °C to +125 °C		Unit
				Min	Typ <mark>[1]</mark>	Max	Min	Max	
t _{pd}	propagation delay	Z to Yn or Yn to Z; see Figure 15	[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
		$V_{CC} = 3 V \text{ to } 3.6 V$		-	-	0.8	-	1.5	ns
		V_{CC} = 4.5 V to 5.5 V		-	-	0.6	-	1.0	ns
t _{en}	enable time	S to Yn; see Figure 16	[4]						
		V_{CC} = 1.65 V to 1.95 V		1.0	8.7	14	1.0	14.0	ns
		V_{CC} = 2.3 V to 2.7 V		1.0	5.3	7.5	1.0	7.5	ns
		$V_{CC} = 2.7 V$		1.0	4.9	6.0	1.0	6.0	ns
		$V_{CC} = 3 V \text{ to } 3.6 V$		0.5	4.0	5.5	0.5	5.5	ns
		V_{CC} = 4.5 V to 5.5 V		0.5	3.0	4.0	0.5	4.0	ns
dis	disable time	S to Yn; see Figure 16	<u>[5]</u>						
		V_{CC} = 1.65 V to 1.95 V		2.5	6.0	8.5	2.5	8.5	ns
		V_{CC} = 2.3 V to 2.7 V		2.0	4.4	6.0	2.0	6.0	ns
		$V_{CC} = 2.7 V$		1.5	4.2	5.0	1.5	5.0	ns
		$V_{CC} = 3 V \text{ to } 3.6 V$		1.5	3.6	4.5	1.5	4.5	ns
		V_{CC} = 4.5 V to 5.5 V		0.8	2.9	3.5	0.8	3.5	ns
t _{b-m}	break-before-make	see Figure 17	[6]						
	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}.

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

[3] 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).

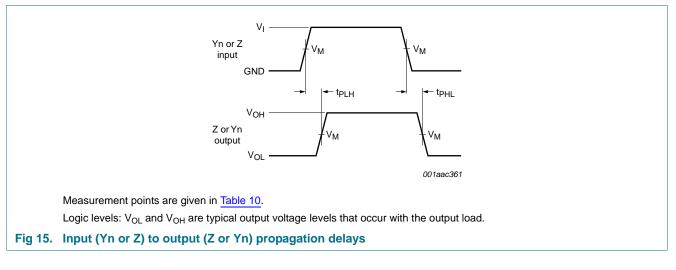
[4] t_{en} is the same as t_{PZH} and t_{PZL} .

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

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

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11.1 Waveforms and test circuits



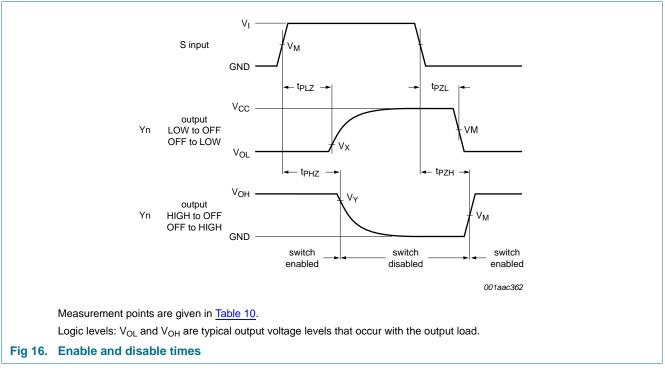
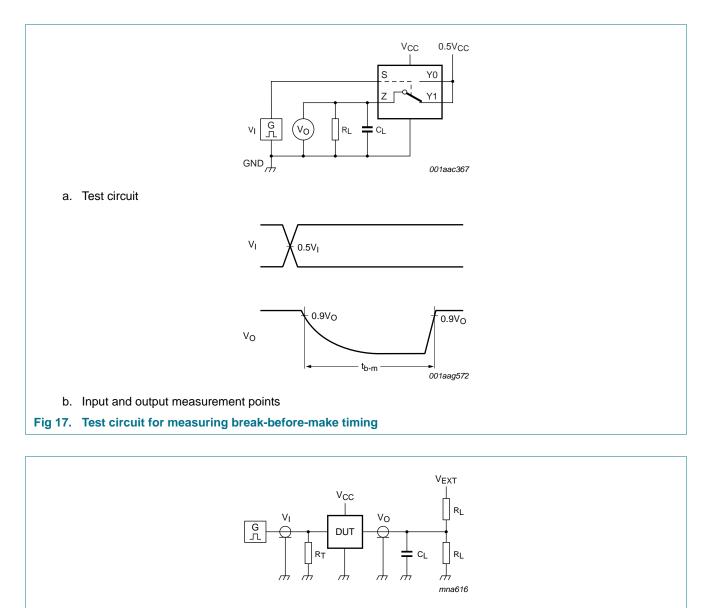


Table 10.Measurement points

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		

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Test data is given in Table 11.

Definitions test circuit:

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

 C_{L} = Load capacitance including jig and probe capacitance.

 R_L = Load resistance.

V_{EXT} = External voltage for measuring switching times.

Fig 18. Test circuit for measuring switching times

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Table 11. Test data

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

11.2 Additional dynamic characteristics

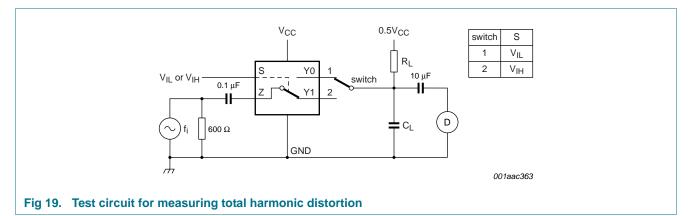
Table 12. Additional dynamic characteristics

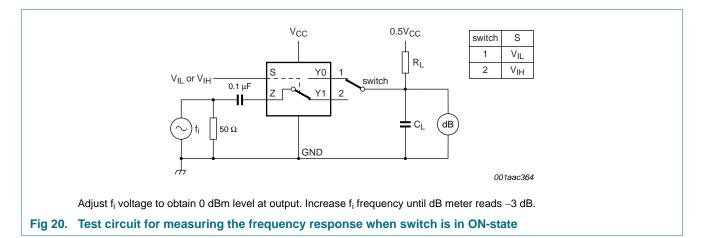
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); T_{amb} = 25 °C.

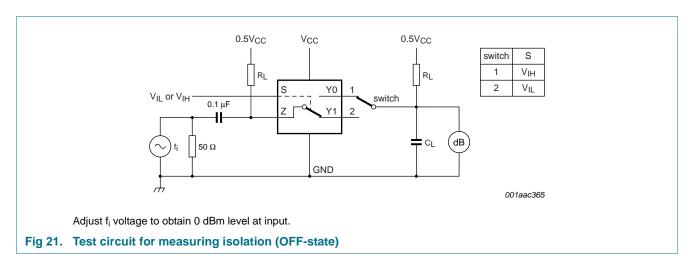
Symbol	Parameter	Conditions	Min	Тур	Max	Unit
THD	total harmonic distortion	$ f_i = 600 \text{ Hz to } 20 \text{ kHz; } R_L = 600 \Omega; \\ C_L = 50 \text{ pF; } V_I = 0.5 \text{ V (p-p);} \\ see Figure 19 $				
		V _{CC} = 1.65 V	-	0.260	-	%
		$V_{CC} = 2.3 V$	-	0.078	-	%
		$V_{CC} = 3.0 V$	-	0.078	-	%
		$V_{CC} = 4.5 V$	-	0.078	-	%
f _(-3dB)	–3 dB frequency response	$R_L = 50 \Omega$; $C_L = 5 pF$; see <u>Figure 20</u>				
		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)	$R_L = 50 \Omega$; $C_L = 5 pF$; $f_i = 10 MHz$; see <u>Figure 21</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
Q _{inj}	charge injection	$C_L = 0.1 \text{ nF}; V_{gen} = 0 \text{ V}; R_{gen} = 0 \Omega;$ $f_i = 1 \text{ MHz}; R_L = 1 \text{ M}\Omega; \text{ see } \frac{\text{Figure 22}}{10000000000000000000000000000000000$				
		V _{CC} = 1.8 V	-	3.3	-	рС
		$V_{CC} = 2.5 V$	-	4.1	-	рС
		V _{CC} = 3.3 V	-	5.0	-	рС
		$V_{CC} = 4.5 V$	-	6.4	-	рС
		V _{CC} = 5.5 V	-	7.5	-	рС

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11.3 Test circuits



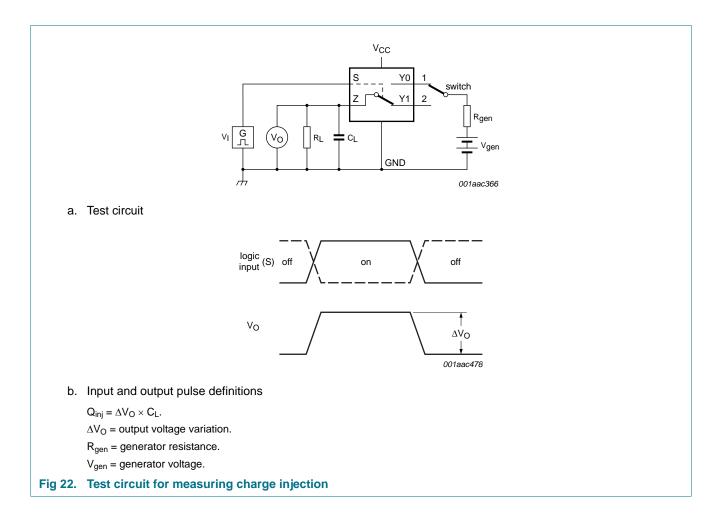




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12. Package outline

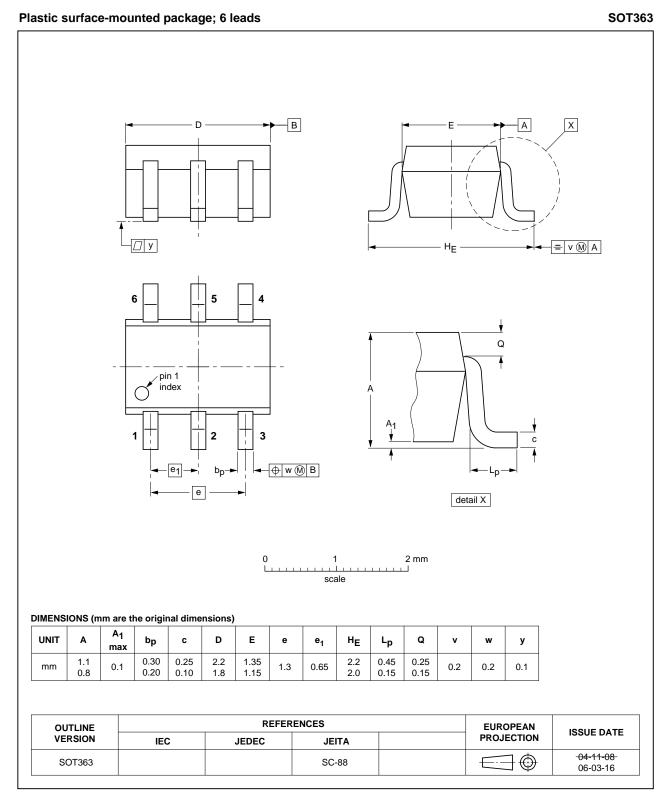
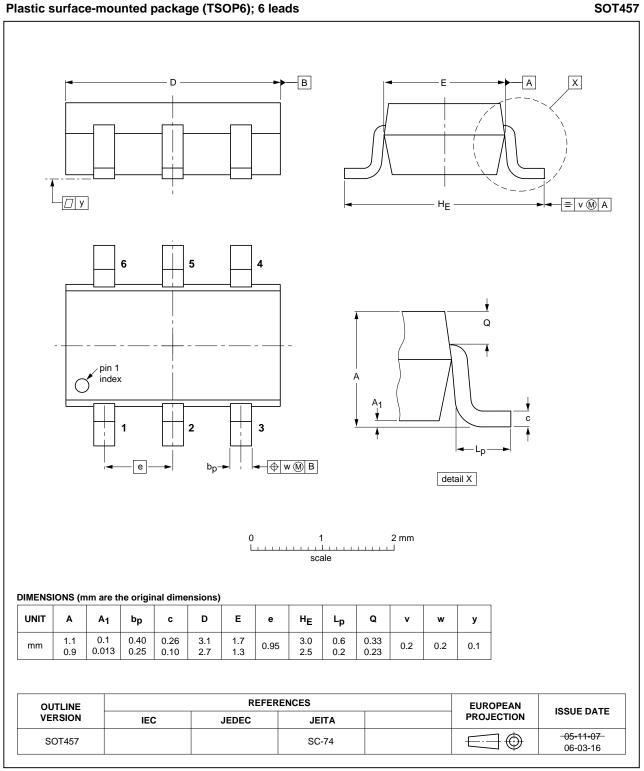


Fig 23. Package outline SOT363 (SC-88)

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Plastic surface-mounted package (TSOP6); 6 leads

Fig 24. Package outline SOT457 (SC-74)

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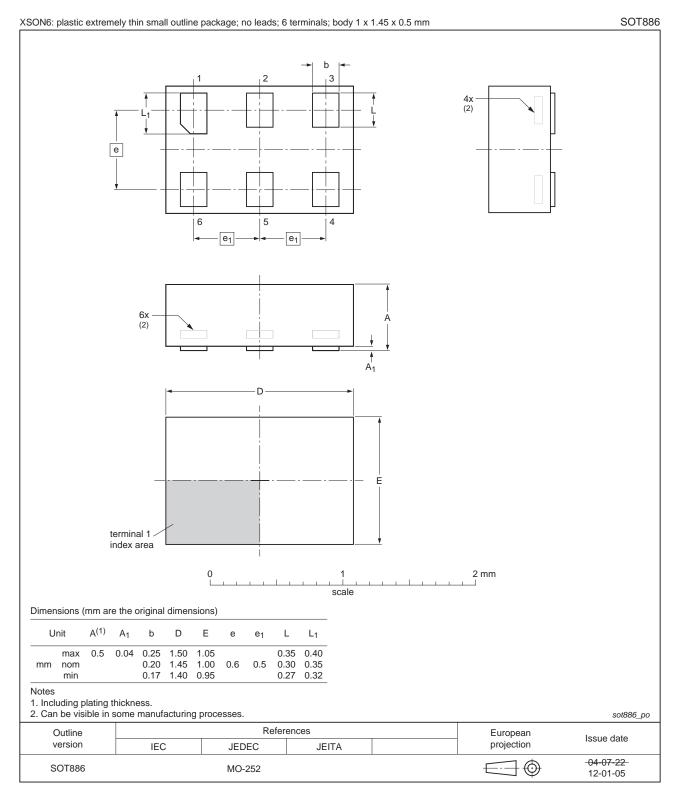


Fig 25. Package outline SOT886 (XSON6)

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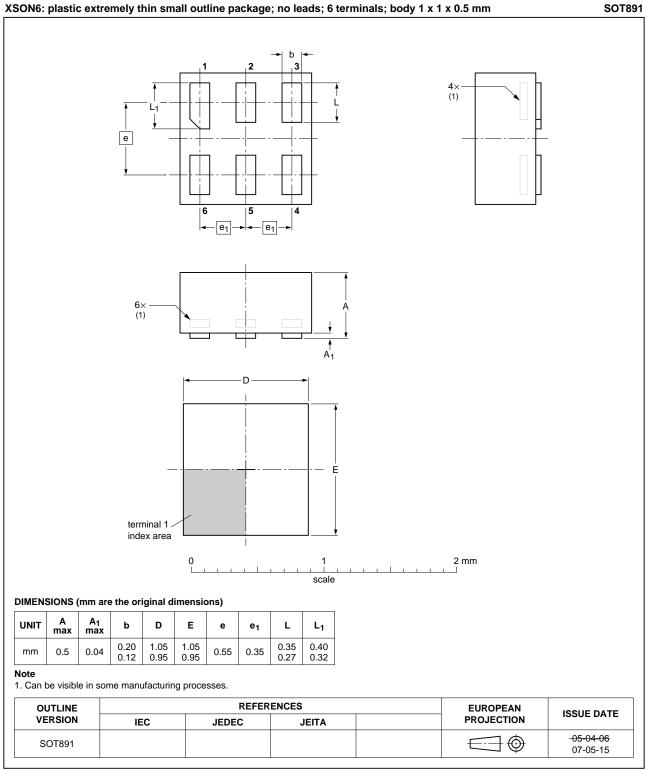
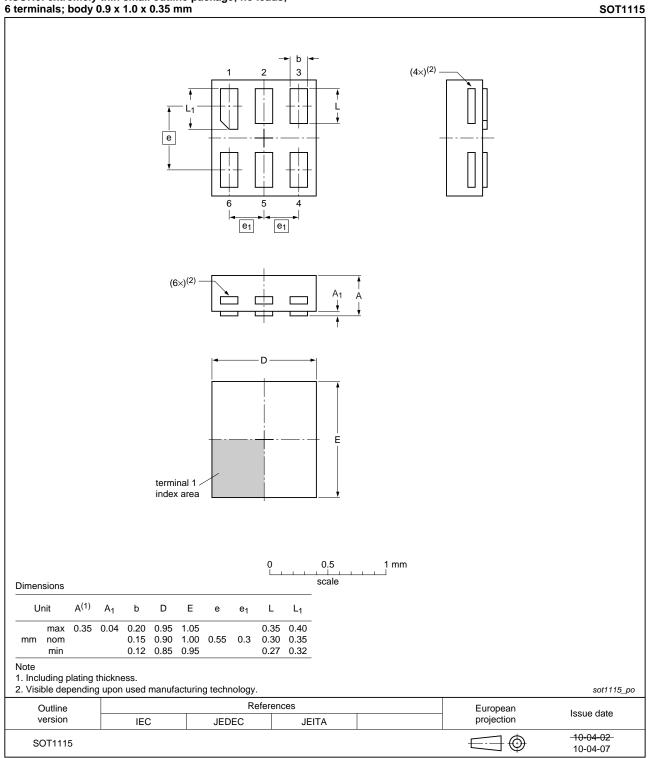


Fig 26. Package outline SOT891 (XSON6)

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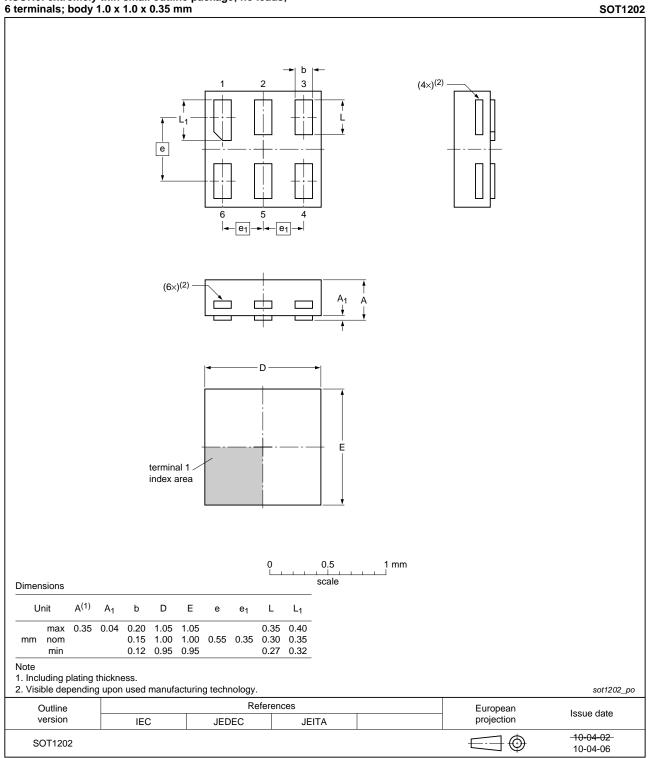
2-channel analog multiplexer/demultiplexer



XSON6: extremely thin small outline package; no leads; 6 terminals; body 0.9 x 1.0 x 0.35 mm

Fig 27. Package outline SOT1115 (XSON6)

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XSON6: extremely thin small outline package; no leads; 6 terminals; body 1.0 x 1.0 x 0.35 mm

Fig 28. Package outline SOT1202 (XSON6)

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13. Abbreviations

Table 13. Abbreviations		
Acronym	Description	
CMOS	Complementary Metal Oxide Semiconductor	
TTL	Transistor-Transistor Logic	
HBM	Human Body Model	
ESD	ElectroStatic Discharge	
MM	Machine Model	
DUT	Device Under Test	
-		

14. Revision history

Table 14. Revision his	tory			
Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC1G3157 v.5	20121206	Product data sheet	-	74LVC1G3157 v.4
Modifications:	 Package out 	ine drawing of SOT886 (Figur	e 25) modified.	
74LVC1G3157 v.4	20111206	Product data sheet	-	74LVC1G3157 v.3
74LVC1G3157 v.3	20100916	Product data sheet	-	74LVC1G3157 v.2
74LVC1G3157 v.2	20070918	Product data sheet	-	74LVC1G3157 v.1
74LVC1G3157 v.1	20050207	Product data sheet	-	-

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15. Legal information

15.1 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.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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