74LVC157A

Quad 2-input multiplexer

Rev. 10 — 20 September 2021

Product data sheet

1. General description

The 74LVC157A is a quad 2-input multiplexer. The device features select (S) and enable \overline{E} inputs. A HIGH on S selects data source 1, a LOW data source 0. A HIGH on E forces all the outputs (1Y to 4Y) LOW. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V applications.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

2. Features and benefits

- Overvoltage tolerant inputs to 5.5 V
- Wide supply voltage range from 1.2 V to 3.6 V
- CMOS low power consumption
- · Direct interface with TTL levels
- Complies with JEDEC standard:
- JESD8-7A (1.65 V to 1.95 V)
 - JESD8-5A (2.3 V to 2.7 V)
 - JESD8-C/JESD36 (2.7 V to 3.6 V)
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-B exceeds 200 V
 - CDM JESD22-C101E exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

3. Ordering information

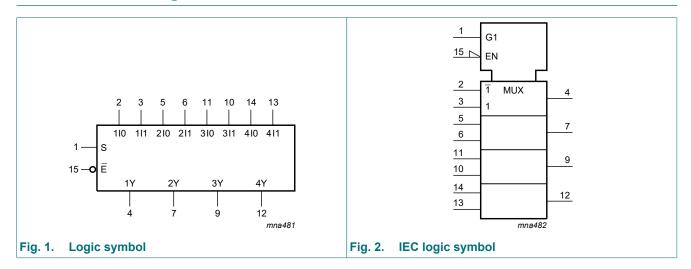
Table 1. Ordering information

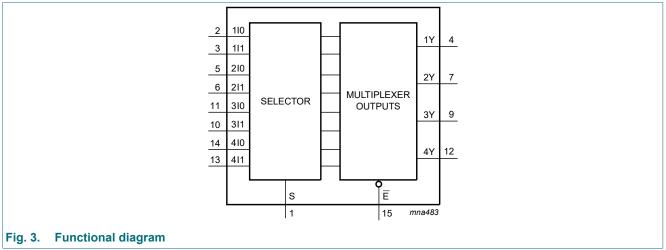
Type number	Package	Package									
	Temperature range	Name	Description	Version							
74LVC157AD	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1							
74LVC157APW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1							
74LVC157ABQ	-40 °C to +125 °C	DHVQFN16	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm	SOT763-1							



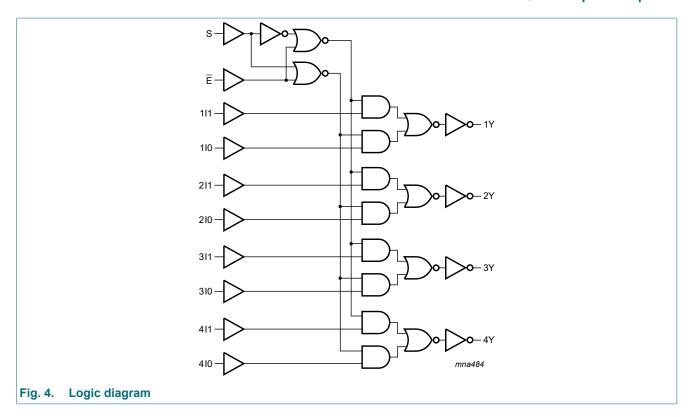
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4. Functional diagram



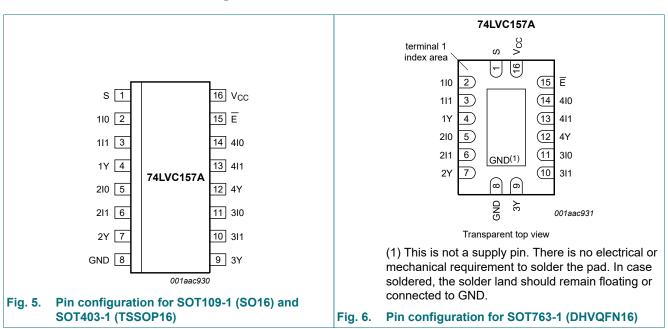


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5. Pinning information

5.1. Pinning



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5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
S	1	common data select input
110	2	data input from source 0
111	3	data input from source 1
1Y	4	multiplexer output
210	5	data input from source 0
211	6	data input from source 1
2Y	7	multiplexer output
GND	8	ground (0 V)
3Y	9	multiplexer output
311	10	data input from source 1
310	11	data input from source 0
4Y	12	multiplexer output
411	13	data input from source 1
410	14	data input from source 0
Ē	15	enable input (active LOW)
V _{CC}	16	supply voltage

6. Functional description

Table 3. Function table

 $H = HIGH \ voltage \ level; \ L = LOW \ voltage \ level; \ X = don't \ care$

Input	nput							
Ē	S	nI0	nl1	nY				
Н	Х	Х	Х	L				
L	L	L	Х	L				
L	L	Н	X	Н				
L	Н	Х	L	L				
L	Н	Х	Н	Н				

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7. Limiting values

Table 4. 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
I _{IK}	input clamping current	V _I < 0		-50	-	mA
V _I	input voltage		[1]	-0.5	+6.5	V
lok	output clamping current	$V_O > V_{CC}$ or $V_O < 0$		-	±50	mA
Vo	output voltage		[2]	-0.5	V _{CC} + 0.5	V
Io	output current	$V_O = 0 V \text{ to } V_{CC}$		-	±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 °C to +125 °C	[3]	-	500	mW

^[1] The minimum input voltage ratings may be exceeded if the input current ratings are observed.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V _{CC}	supply voltage		1.65	-	3.6	V
		functional	1.2	-	-	V
VI	input voltage		0	-	5.5	V
Vo	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	-	+125	°C
Δt/ΔV	input transition rise and fall	V _{CC} = 1.65 V to 2.7 V	0	-	20	ns/V
	rate	V _{CC} = 2.7 V to 3.6 V	0	-	10	ns/V

^[2] The output voltage ratings may be exceeded if the output current ratings are observed.

^[3] For SOT109-1 (SO16) package: P_{tot} derates linearly with 12.4 mW/K above 110 °C. For SOT403-1 (TSSOP16) package: P_{tot} derates linearly with 8.5 mW/K above 91 °C. For SOT763-1 (DHVQFN16) package: P_{tot} derates linearly with 11.2 mW/K above 106 °C.

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9. Static characteristics

Table 6. Static characteristics

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40	°C to +85	5 °C	-40 °C to	+125 °C	Unit
			Min	Typ[1]	Max	Min	Max	1
V _{IH}	HIGH-level	V _{CC} = 1.2 V	1.08	-	-	1.08	-	V
	input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 x V _{CC}	-	-	0.65 x V _{CC}	-	V
		V _{CC} = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
V _{IL}	LOW-level	V _{CC} = 1.2 V	-	-	0.12	-	0.12	V
	input voltage	V _{CC} = 1.65 V to 1.95 V	-	-	0.35 x V _{CC}	-	0.35 x V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V
V _{OH}	HIGH-level	V _I = V _{IH} or V _{IL}						
	output voltage	I _O = -100 μA; V _{CC} = 1.65 V to 3.6 V	V _{CC} - 0.2	-	-	V _{CC} - 0.3	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	1.2	-	-	1.05	-	V
		$I_O = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.8	-	-	1.65	-	V
		$I_O = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	2.2	-	-	2.05	-	V
		$I_O = -18 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.4	-	-	2.25	-	V
		I_{O} = -24 mA; V_{CC} = 3.0 V	2.2	-	-	2.0	-	V
V _{OL}	LOW-level	V _I = V _{IH} or V _{IL}						
	output voltage	I _O = 100 μA; V _{CC} = 1.65 V to 3.6 V	-	-	0.2	-	0.3	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	-	0.65	V
		$I_O = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.6	-	0.8	V
		I_{O} = 12 mA; V_{CC} = 2.7 V	-	-	0.4	-	0.6	V
		I_{O} = 24 mA; V_{CC} = 3.0 V	-	-	0.55	-	0.8	V
I _I	input leakage current	$V_{CC} = 3.6 \text{ V}; V_{I} = 5.5 \text{ V or GND}$	-	±0.1	±5	-	±20	μA
I _{CC}	supply current	V_{CC} = 3.6 V; V_I = V_{CC} or GND; I_O = 0 A	-	0.1	10	-	40	μA
Δl _{CC}	additional supply current	per input pin; $V_I = V_{CC} - 0.6 \text{ V};$ $V_{CC} = 2.7 \text{ V to } 3.6 \text{ V};$ $I_O = 0 \text{ A}$	-	5	500	-	5000	μΑ
Cı	input capacitance	V_{CC} = 0 V to 3.6 V; V_I = GND to V_{CC}	-	5.0	-	-	-	pF

^[1] All typical values are measured at V_{CC} = 3.3 V (unless stated otherwise) and T_{amb} = 25 °C.

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10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit see Fig. 9.

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	nl0, nl1 to nY; see Fig. 7	[2]						
		V _{CC} = 1.2 V		-	16	-	-	-	ns
		V _{CC} = 1.65 V to 1.95 V		1.0	4.8	10.2	1.0	11.8	ns
		V _{CC} = 2.3 V to 2.7 V		1.5	2.8	5.8	1.5	6.7	ns
		V _{CC} = 2.7 V		1.0	2.9	5.9	1.0	7.5	ns
		V _{CC} = 3.0 V to 3.6 V		1.0	2.5	5.2	1.0	6.5	ns
		E to nY; see Fig. 8	[2]						
		V _{CC} = 1.2 V		-	17	-	-	-	ns
		V _{CC} = 1.65 V to 1.95 V		0.5	4.8	12.8	0.5	14.7	ns
		V _{CC} = 2.3 V to 2.7 V		1.5	2.8	7.2	1.5	8.3	ns
		V _{CC} = 2.7 V		1.0	2.9	7.8	1.0	10.0	ns
		V _{CC} = 3.0 V to 3.6 V		1.0	2.6	6.5	1.0	8.5	ns
		S to nY; see Fig. 7	[2]						
		V _{CC} = 1.2 V		-	16	-	-	-	ns
		V _{CC} = 1.65 V to 1.95 V		1.0	5.1	12.4	1.0	14.3	ns
		V _{CC} = 2.3 V to 2.7 V		1.5	3.0	7.0	1.5	8.1	ns
		V _{CC} = 2.7 V		1.0	3.1	7.3	1.0	9.5	ns
		V _{CC} = 3.0 V to 3.6 V		1.0	2.7	6.3	1.0	8.0	ns
t _{sk(o)}	output skew time	V _{CC} = 3.0 V to 3.6 V	[3]	-	-	1.0	-	1.5	ns
C _{PD}	power dissipation	per input; V_I = GND to V_{CC}	[4]						
	capacitance	V _{CC} = 1.65 V to 1.95 V		-	9.4	-	-	-	pF
		V _{CC} = 2.3 V to 2.7 V		-	12.8	-	-	-	pF
		V _{CC} = 3.0 V to 3.6 V		-	15.9	-	-	-	pF

Typical values are measured at T_{amb} = 25 °C and V_{CC} = 1.2 V, 1.8 V, 2.5 V, 2.7 V, and 3.3 V respectively.

 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$ where:

 f_i = input frequency in MHz; f_o = output frequency in MHz

C_L = output load capacitance in pF

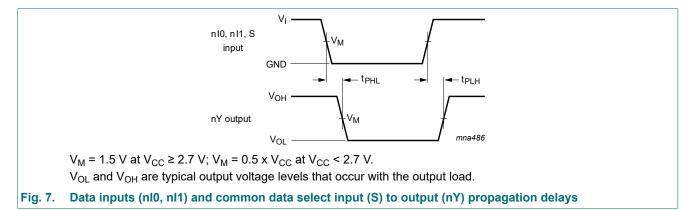
V_{CC} = supply voltage in V

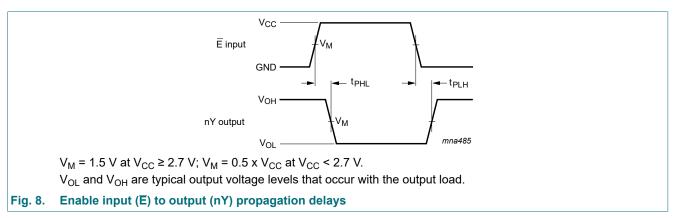
N = number of inputs switching $\sum (C_L \times V_{CC}^2 \times f_o) = \text{sum of outputs}$

 t_{pd} is the same as t_{PLH} and t_{PHL} . Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design. C_{PD} is used to determine the dynamic power dissipation (P_D in μ W).

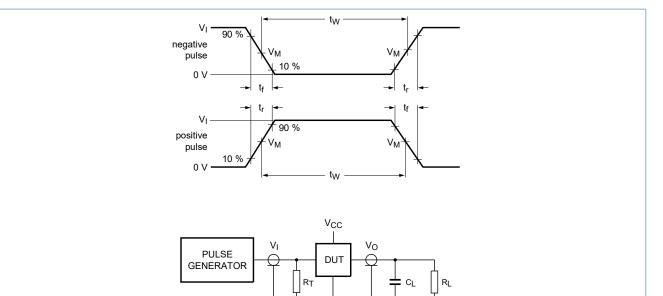
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10.1. Waveforms and test circuit





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Test data is given in <u>Table 8</u>. Definitions for test circuit:

 R_L = Load resistance.

 C_L = Load capacitance including jig and probe capacitance.

 R_{T} = Termination resistance should be equal to output impedance Z_{o} of the pulse generator.

Fig. 9. Test circuit for measuring switching times

Table 8. Test data

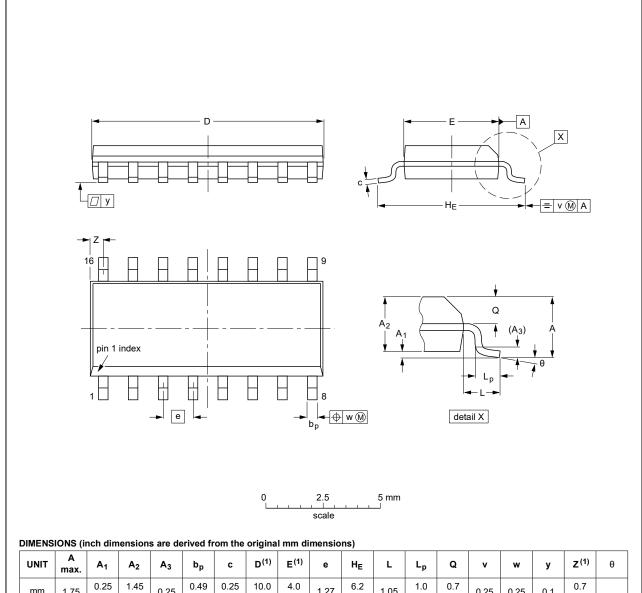
Supply voltage	Input		Load				
	V _I	t _r , t _f	CL	R _L			
1.2 V	V _{CC}	≤ 2 ns	30 pF	1 kΩ			
1.65 V to 1.95 V	V _{CC}	≤ 2 ns	30 pF	1 kΩ			
2.3 V to 2.7 V	V _{CC}	≤ 2 ns	30 pF	500 Ω			
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω			
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω			

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11. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1



UNIT	A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E ⁽¹⁾	е	HE	L	Lp	Q	v	w	у	Z ⁽¹⁾	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8°
inches	0.069	0.010 0.004	0.057 0.049	0.01		0.0100 0.0075		0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	0°

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

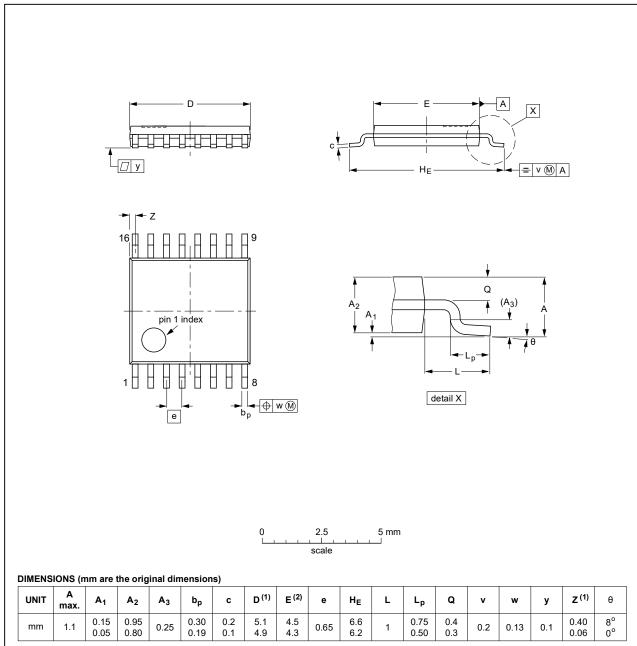
OUTLINE		REFER	RENCES	EUROPEAN ISSUE DAT		
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT109-1	076E07	MS-012				99-12-27 03-02-19

Fig. 10. Package outline SOT109-1 (SO16)

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TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1



Notes

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

OUTLINE		REFER	ENCES	EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA	PROJECTION	ISSUE DATE
SOT403-1		MO-153			99-12-27 03-02-18

Fig. 11. Package outline SOT403-1 (TSSOP16)

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DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm SOT763-1

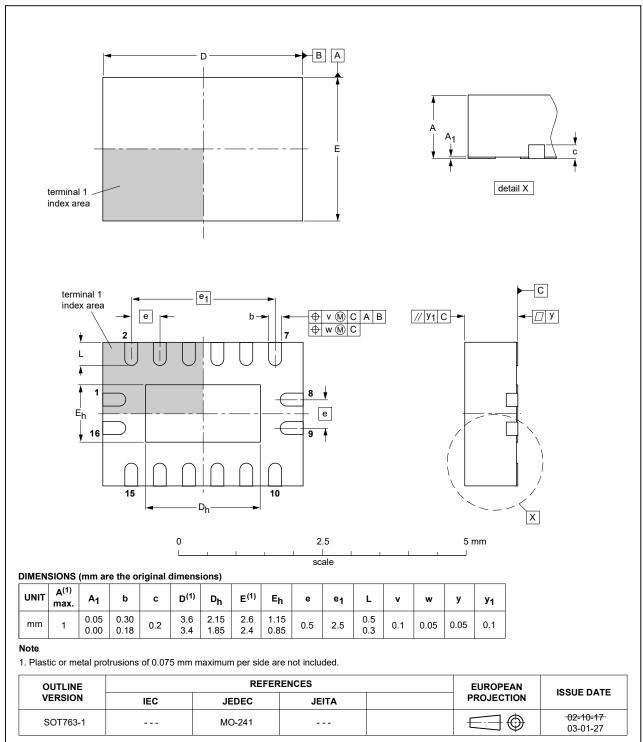


Fig. 12. Package outline SOT763-1 (DHVQFN16)

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12. Abbreviations

Table 9. Abbreviations

able of 7 tobil of tations						
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					

13. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74LVC157A v.10	20210920	Product data sheet	-	74LVC157A v.9		
Modifications:	* *	 Type number 74LVC157ADB (SOT338-1/SSOP16) removed. Section 1 updated. 				
74LVC157A v.9	20200319	Product data sheet	-	74LVC157A v.8		
Modifications:	• <u>Table 4</u> : Derating	<u>Table 4</u> : Derating values for P _{tot} total power dissipation updated.				
74LVC157A v.8	20171011	Product data sheet	-	74LVC157A v.7		
Modifications:	Nexperia.	 The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. 				
74LVC157A v.7	20111125	Product data sheet	-	74LVC157A v.6		
Modifications:	• <u>Table 7</u> : maximun	<u>Table 7</u> : maximum values for lower voltage ranges changed (errata).				
74LVC157A v.6	20111027	Product data sheet	-	74LVC157A v.5		
Modifications:	 The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors. Legal texts have been adapted to the new company name where appropriate. Table 4, Table 5, Table 6, Table 7, and Table 8: values added for lower voltage ranges. 					
74LVC157A v.5	031202	Product specification	-	74LVC157A v.4		
74LVC157A v.4	030617	Product specification	-	74LVC157A v.3		
74LVC157A v.3	020315	Product specification	-	74LVC157A v.2		
74LVC157A v.2	980729	Product specification	-	-		

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14. 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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