

#### **1** General description

The 74LVC157A is a quad 2-input multiplexer which select four bits of data from two sources under the control of a common select input (S). The four outputs present the selected data in the true (non-inverted) form. The enable input ( $\overline{E}$ ) is active LOW. When pin  $\overline{E}$  is HIGH, all of the outputs (1Y to 4Y) are forced LOW regardless of all the other input conditions. Moving the data from two groups of registers to four common output buses is a common use of the 74LVC157A. The state of the common data select input (S) determines the particular register from which the data comes. It can also be used as function generator.

It is useful for implementing highly irregular logic by generating any 4 of the 16 different functions of two variables with one variable common.

The device is the logic implementation of a 4-pole, 2-position switch, where the position of the switch is determined by the logic levels applied to pin S.

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.

#### 2 Features and benefits

- 5 V tolerant inputs for interfacing with 5 V logic
- 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
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

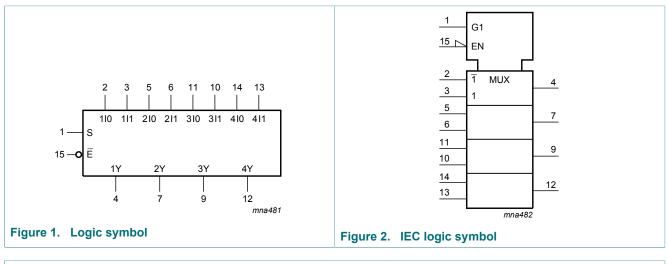
# ne<mark>x</mark>peria

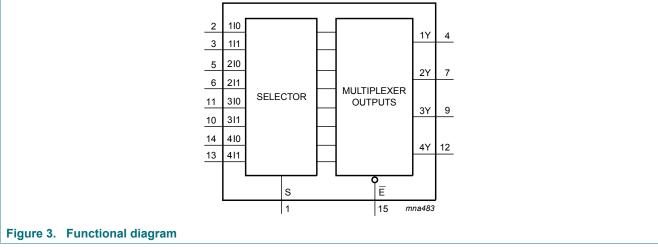
## **3** Ordering information

#### Table 1. Ordering information

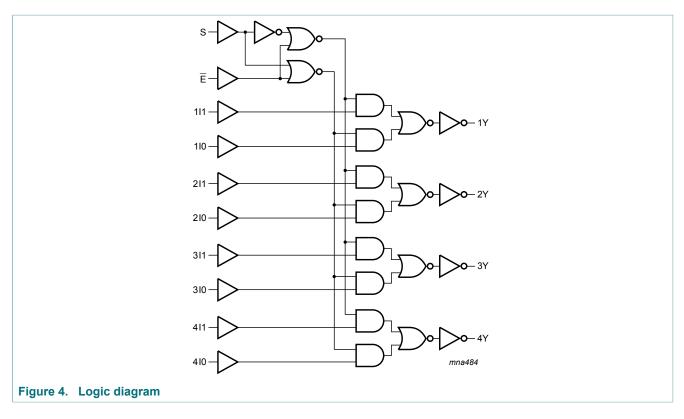
Type number	Package						
	Temperature range	Name	Description	Version			
74LVC157AD	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1			
74LVC157ADB	-40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1			
74LVC157APW	-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 x 3.5 x 0.85 mm	SOT763-1			

## 4 Functional diagram



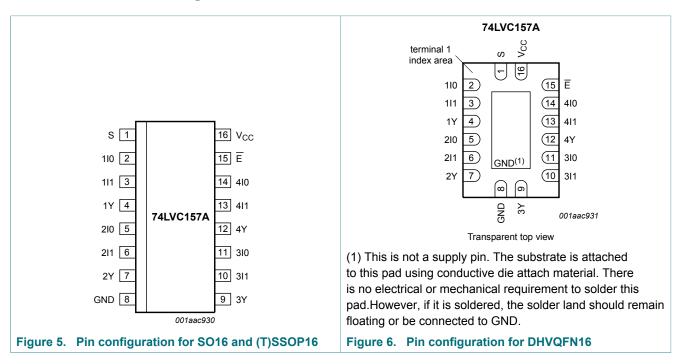


#### Nexperia



### **5** Pinning information

#### 5.1 Pinning



### 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
3I1	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 <sub>CC</sub>	16	supply voltage

## 6 Functional description

Table 3. Function table <sup>[1]</sup>					
Input				Output	
E	S	nl0	nl1	nY	
Н	X	Х	Х	L	
L	L	L	Х	L	
L	L	Н	Х	Н	
L	Н	Х	L	L	
L	Н	Х	Н	Н	

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care

#### **Limiting values** 7

#### 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 <sub>CC</sub>	supply voltage		-0.5	+6.5	V
I <sub>IK</sub>	input clamping current	V <sub>1</sub> < 0	-50	-	mA
VI	input voltage	[1]	-0.5	+6.5	V
I <sub>OK</sub>	output clamping current	$V_{\rm O}$ > $V_{\rm CC}$ or $V_{\rm O}$ < 0	-	±50	mA
Vo	output voltage	[2]	-0.5	V <sub>CC</sub> + 0.5	V
I <sub>O</sub>	output current	$V_{O}$ = 0 V to $V_{CC}$	-	±50	mA
I <sub>CC</sub>	supply current		-	100	mA
I <sub>GND</sub>	ground current		-100	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	$T_{amb} = -40 \ ^{\circ}C \ to \ +125 \ ^{\circ}C$ <sup>[3]</sup>	-	500	mW

The minimum input voltage ratings may be exceeded if the input current ratings are observed.
 The output voltage ratings may be exceeded if the output current ratings are observed.
 For SO16 packages: above 70 °C the value of P<sub>D</sub> derates linearly with 8 mW/K.

For (T)SSOP16 packages: above 60 °C the value of P<sub>D</sub> derates linearly with 5.5 mW/K.

For DHVQFN16 packages: above 60 °C the value of P<sub>D</sub> derates linearly with 4.5 mW/K.

#### **Recommended operating conditions** 8

#### Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V <sub>CC</sub>	supply voltage		1.65	-	3.6	V
		functional	1.2	-	-	V
VI	input voltage		0	-	5.5	V
Vo	output voltage		0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	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 <sub>CC</sub> = 2.7 V to 3.6 V	0	-	10	ns/V

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

[1] All typical values are measured at V<sub>CC</sub> = 3.3 V (unless stated otherwise) and T<sub>amb</sub> = 25 °C.

## **10** Dynamic characteristics

#### Table 7. Dynamic characteristics

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

Symbol	Parameter	Conditions		-40 °C to +85 °C			-40 °C to +125 °C		Unit
				Min	Typ <sup>[1]</sup>	Мах	Min	Max	
t <sub>pd</sub>	propagation delay	nI0, nI1 to nY; see Figure 7	[2]						
		V <sub>CC</sub> = 1.2 V		-	16	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V		1.0	4.8	10.2	1.0	11.8	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V		1.5	2.8	5.8	1.5	6.7	ns
		V <sub>CC</sub> = 2.7 V		1.0	2.9	5.9	1.0	7.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V		1.0	2.5	5.2	1.0	6.5	ns
		Ē to nY; see <u>Figure 8</u>	[2]						
		V <sub>CC</sub> = 1.2 V		-	17	-	-	-	ns
		V <sub>CC</sub> = 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 <sub>CC</sub> = 2.7 V		1.0	2.9	7.8	1.0	10.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V		1.0	2.6	6.5	1.0	8.5	ns
		S to nY; see <u>Figure 7</u>	[2]						
		V <sub>CC</sub> = 1.2 V		-	16	-	-	-	ns
		V <sub>CC</sub> = 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 <sub>CC</sub> = 2.7 V		1.0	3.1	7.3	1.0	9.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V		1.0	2.7	6.3	1.0	8.0	ns
t <sub>sk(o)</sub>	output skew time	V <sub>CC</sub> = 3.0 V to 3.6 V	[3]	-	-	1.0	-	1.5	ns
C <sub>PD</sub>	power dissipation	per input; $V_I$ = GND to $V_{CC}$	[4]						
	capacitance	V <sub>CC</sub> = 1.65 V to 1.95 V		-	9.4	-	-	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V		-	12.8	-	-	-	pF
		V <sub>CC</sub> = 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. [1]

[2]

 $t_{pd}$  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. [3] Skew between any two outputs of the same package switching in un [4]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu$ W).

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

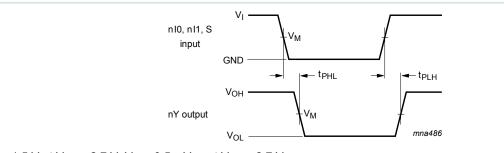
f<sub>i</sub> = input frequency in MHz; f<sub>o</sub> = output frequency in MHz

C<sub>L</sub> = output load capacitance in pF

V<sub>CC</sub> = supply voltage in V

N = number of inputs switching  $\sum (C_L \times V_{CC}^2 \times f_0)$  = sum of outputs

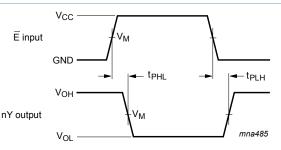
### 10.1 Waveforms and test circuit



 $V_{M}$  = 1.5 V at  $V_{CC}$  ≥ 2.7 V;  $V_{M}$  = 0.5 x  $V_{CC}$  at  $V_{CC}$  < 2.7 V.

 $V_{\text{OL}}$  and  $V_{\text{OH}}$  are typical output voltage levels that occur with the output load.

Figure 7. Data inputs (nl0, nl1) and common data select input (S) to output (nY) propagation delays

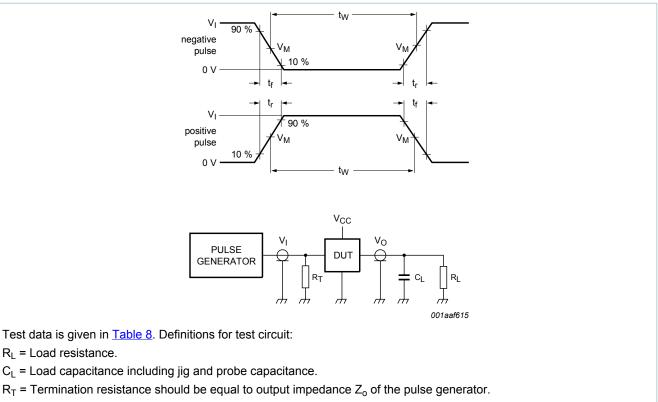


 $V_M = 1.5 V$  at  $V_{CC} \ge 2.7 V$ ;  $V_M = 0.5 x V_{CC}$  at  $V_{CC} < 2.7 V$ .  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load. Figure 8. Enable input (E) to output (nY) propagation delays

#### Nexperia

## 74LVC157A

#### Quad 2-input multiplexer



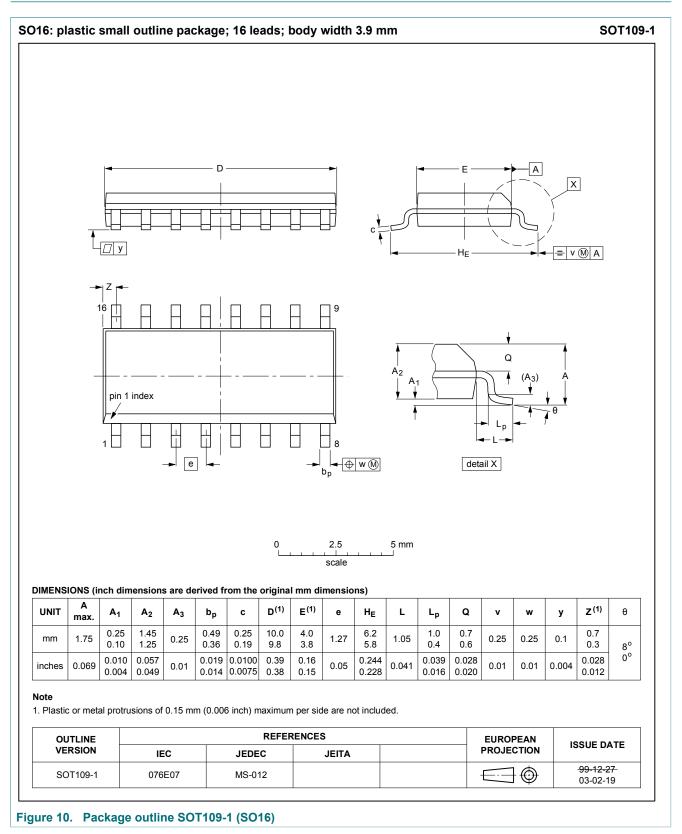
#### Figure 9. Test circuit for measuring switching times

#### Table 8. Test data

Supply voltage	Input		Load	Load		
	VI	t <sub>r</sub> , t <sub>f</sub>	CL	RL		
1.2 V	V <sub>CC</sub>	≤ 2 ns	30 pF	1 kΩ		
1.65 V to 1.95 V	V <sub>CC</sub>	≤ 2 ns	30 pF	1 kΩ		
2.3 V to 2.7 V	V <sub>CC</sub>	≤ 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		

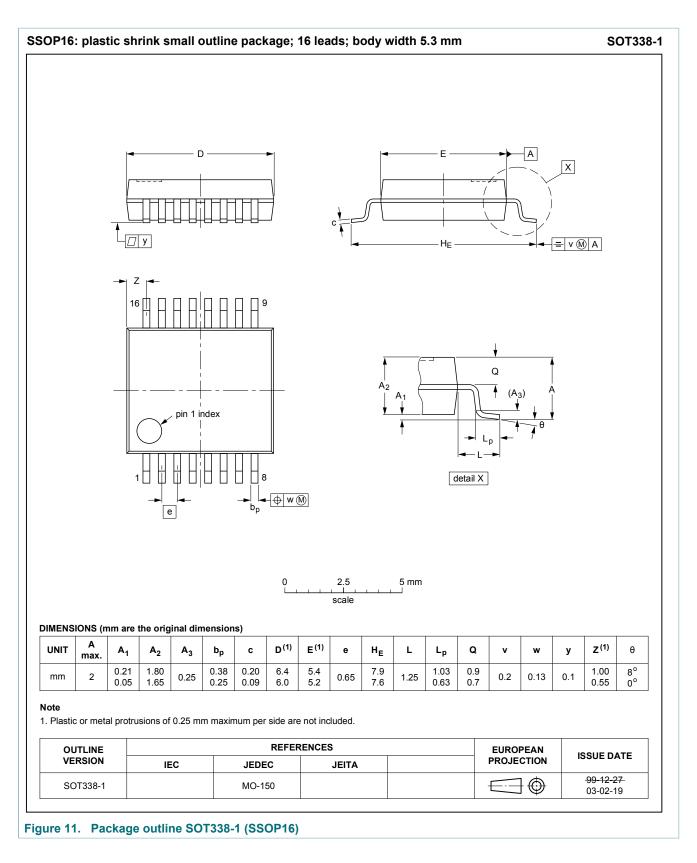
74LVC157A Quad 2-input multiplexer

## 11 Package outline



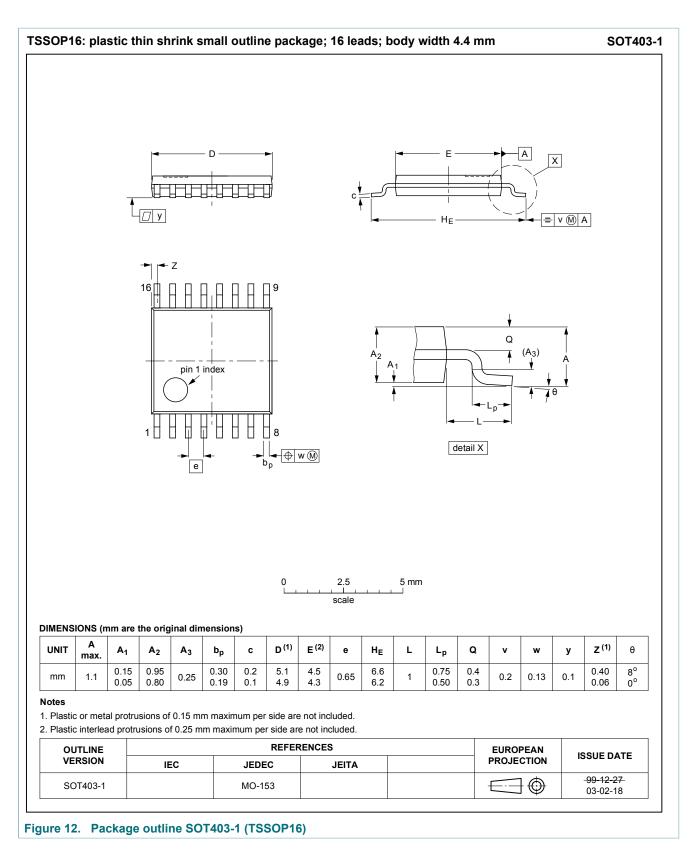
## 74LVC157A

#### Quad 2-input multiplexer



## 74LVC157A

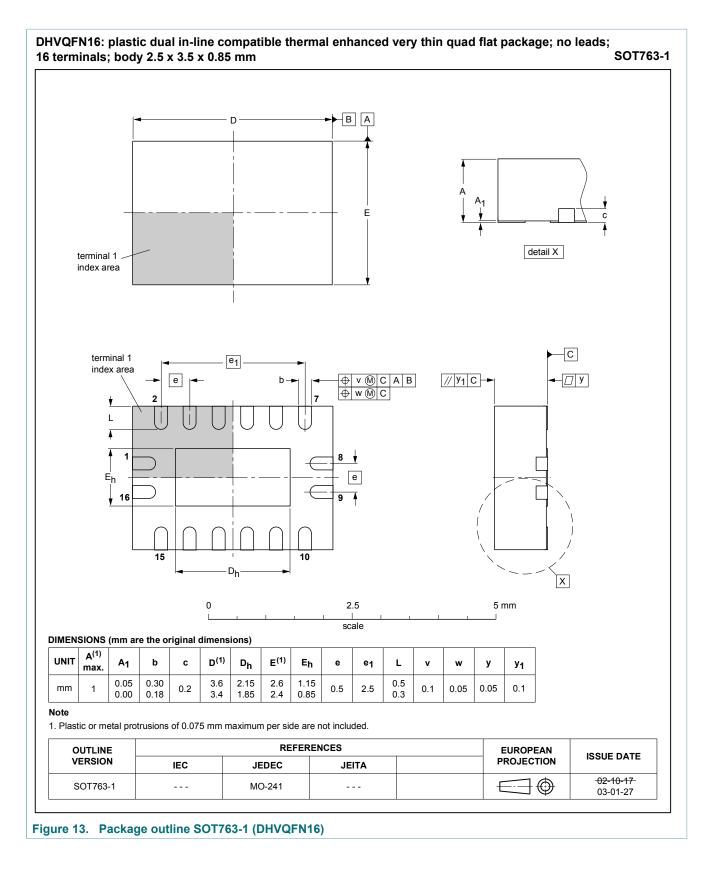
#### **Quad 2-input multiplexer**



74LVC157A
Product data sheet

74LVC157A

#### **Quad 2-input multiplexer**



74LVC157A
Product data sheet

## **12 Abbreviations**

Table 9. Abbreviations				
Acronym	Description			
CDM	Charged Device Model			
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.8	20171011	Product data sheet	-	74LVC157A v.7			
Modifications:	<ul> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>						
74LVC157A v.7	20111125	Product data sheet	-	74LVC157A v.6			
Modifications:	• <u>Table 7</u> : maxim	• <u>Table 7</u> : maximum values for lower voltage ranges changed (errata).					
74LVC157A v.6	20111027	Product data sheet	-	74LVC157A v.5			
Modifications:	NXP Semicond <ul> <li>Legal texts have</li> </ul>	<ul> <li>The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Table 4, Table 5, Table 6, Table 7, and Table 8: values added for lower voltage ranges.</li> </ul>					
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	-	-			

## 14 Legal information

#### 14.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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. [1]

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

[2] [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.nexperia.com.

#### 14.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

#### 14.3 Disclaimers

Limited warranty and liability - Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia. In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory. Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of Nexperia

Right to make changes - Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use - Nexperia products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products. Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale - Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at http://www.nexperia.com/profile/terms, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer

No offer to sell or license - Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

## 74LVC157A Quad 2-input multiplexer

Non-automotive qualified products — Unless this data sheet expressly states that this specific Nexperia product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. Nexperia accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications. In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without Nexperia's warranty of the product for such automotive applications, use and specifications beyond Nexperia's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Nexperia for any liability, damages or failed product claims resulting from customer

design and use of the product for automotive applications beyond Nexperia's standard warranty and Nexperia's product specifications.

**Translations** — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

#### 14.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

#### Nexperia

## 74LVC157A Quad 2-input multiplexer

#### Contents

1	General description	1
2	Features and benefits	1
3	Ordering information	2
4	Functional diagram	2
5	Pinning information	3
5.1	Pinning	
5.2	Pin description	4
6	Functional description	4
7	Limiting values	5
8	Recommended operating conditions	5
9	Static characteristics	6
10	Dynamic characteristics	7
10.1	Waveforms and test circuit	
11	Package outline	
12	Abbreviations	14
13	Revision history	14
14	Legal information	15

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© Nexperia B.V. 2017.

All rights reserved.

For more information, please visit: http://www.nexperia.com For sales office addresses, please send an email to: salesaddresses@nexperia.com

Date of release: 11 October 2017 Document identifier: 74LVC157A