

# 74CB3Q3257-Q100

4-bit 1-of-2 FET multiplexer/demultiplexer with charge pump

Rev. 1 — 20 February 2019

Product data sheet

## 1. General description

The 74CB3Q3257-Q100 is a quad high-bandwidth single-pole, double-throw FET bus switch. The device features one select input (S) and one output enable input (OE). The switch is disabled when the OE input is HIGH. An internal charge-pump increases the gate voltage of the NMOS pass transistor. The result is improved  $R_{ON}$  and  $R_{ON(Flat)}$  performance and the ability to switch 5 V signals when  $V_{CC} = 3.3$  V.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 3) and is suitable for use in automotive applications.

## 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 3)
  - Specified from  $-40$  °C to  $+85$  °C
- Wide supply voltage range from 2.3 V to 3.6 V
- Overvoltage switching on switch ports:
  - 0 V to 5 V switching with  $V_{CC} = 2.5$  V
  - 0 V to 5 V switching with  $V_{CC} = 3.3$  V
- 4  $\Omega$  (typical) ON resistance
- 3.5 pF (typical) OFF-state capacitance
- High bandwidth 0.5 GHz (maximum)
- Low input/output capacitance minimizes loading and signal distortion
- Fast switching frequency  $f_{max} = 20$  MHz (maximum)
- Low power consumption  $I_{CC} = 0.4$  mA (typical)
- Control inputs can be driven by TTL or 5 V/3.3 V CMOS outputs
- $I_{OFF}$  supports partial power-down mode operation
- Latch-up performance exceeds 100 mA per JESD 78E Class II Level A
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM ANSI/ESDA/Jedec JS-001 Class 2 exceeds 2 kV

## 3. Applications

- Communication infrastructure
- Bus isolation
- Memory interleaving
- Sensor multiplexing

## 4. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74CB3Q3257PW-Q100	$-40$ °C to $+85$ °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1

### 5. Functional diagram

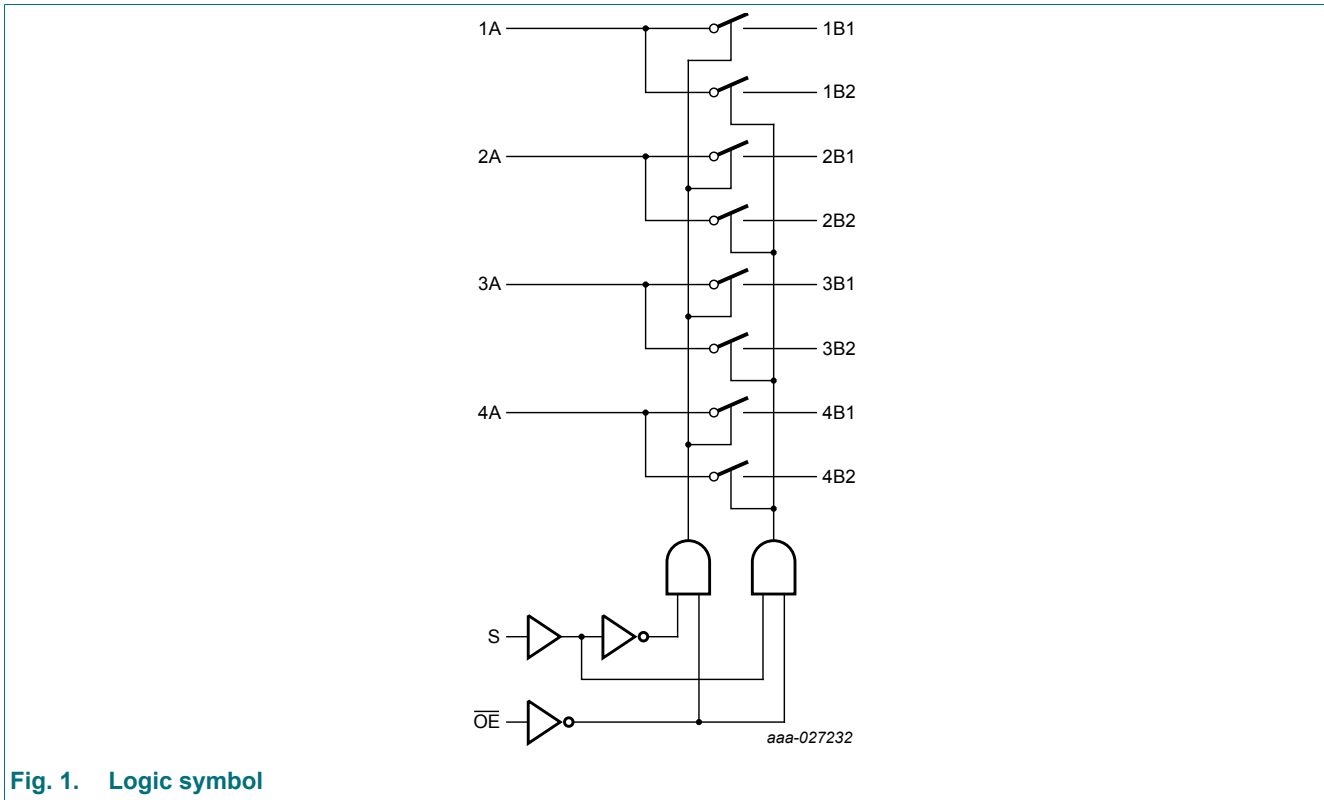


Fig. 1. Logic symbol

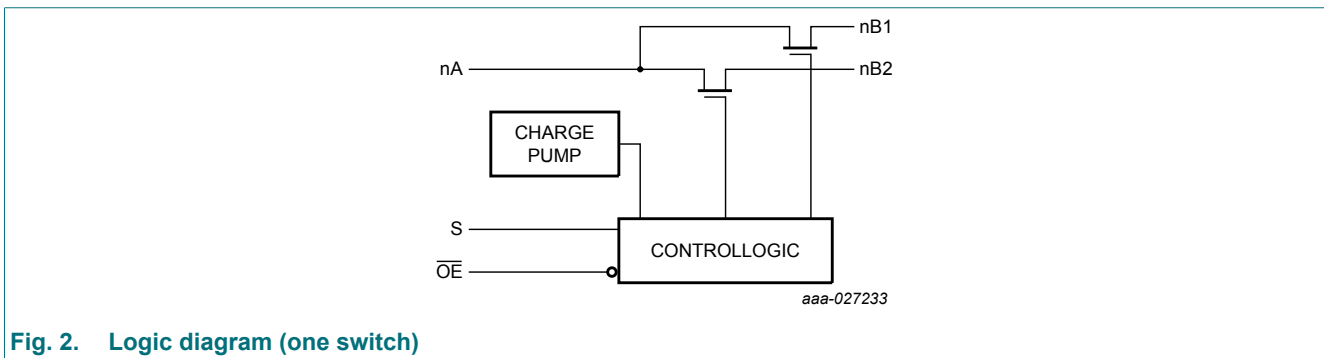


Fig. 2. Logic diagram (one switch)

## 6. Pinning information

### 6.1. Pinning

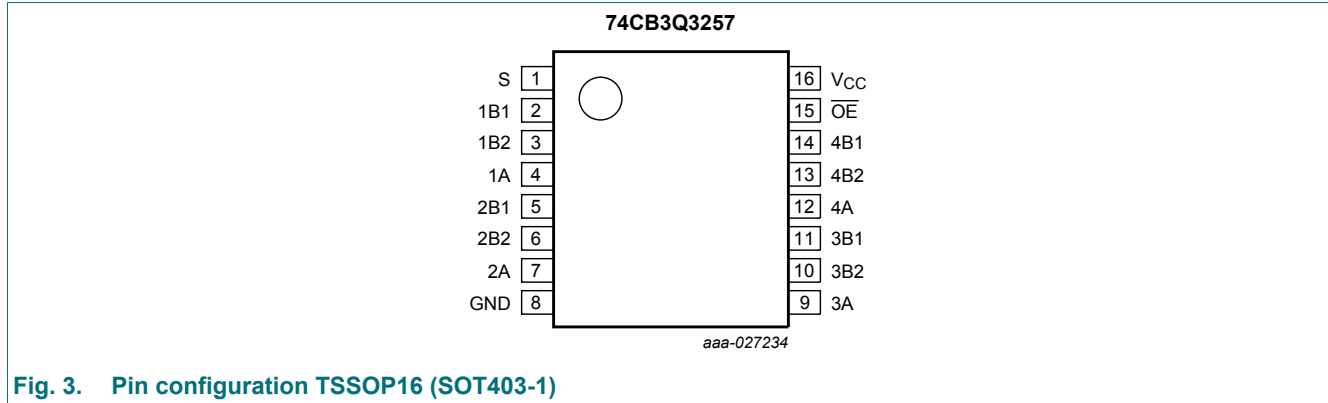


Fig. 3. Pin configuration TSSOP16 (SOT403-1)

### 6.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
S	1	select input
1B1	2	independent input or output
1B2	3	independent input or output
1A	4	common output or input
2B1	5	independent input or output
2B2	6	independent input or output
2A	7	common output or input
GND	8	ground (0 V)
3A	9	common output or input
3B2	10	independent input or output
3B1	11	independent input or output
4A	12	common output or input
4B2	13	independent input or output
4B1	14	independent input or output
$\overline{\text{OE}}$	15	output enable input (active-LOW)
V <sub>CC</sub>	16	supply voltage

## 7. Functional description

**Table 3. Function table**

*H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.*

Input		Channel on
S	OE	
L	L	nA = nB1
H	L	nA = nB2
X	H	Z (switch off)

## 8. 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 <sub>CC</sub>	supply voltage		-0.5	+4.6	V
V <sub>I</sub>	input voltage	S, $\overline{\text{OE}}$ input [1]	-0.5	+7.0	V
V <sub>SW</sub>	switch voltage	[2]	-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < -0.5 V	-50	-	mA
I <sub>SK</sub>	switch clamping current	V <sub>I</sub> < -0.5 V	-50	-	mA
I <sub>SW</sub>	switch current		-	±120	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 <sub>amb</sub> = -40 °C to +85 °C [3]	-	500	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 TSSOP16 package: P<sub>tot</sub> derates linearly with 5.5 mW/K above 60 °C.

## 9. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		2.3	3.6	V
V <sub>I</sub>	input voltage	S, $\overline{\text{OE}}$ input	0	5.5	V
V <sub>SW</sub>	switch voltage		0	5.5	V
T <sub>amb</sub>	ambient temperature		-40	+85	°C
Δt/ΔV	input transition rise and fall rate	S, $\overline{\text{OE}}$ input			
		V <sub>CC</sub> = 2.3 V to 2.7 V	0	20	ns/V
		V <sub>CC</sub> = 2.7 V to 3.6 V	0	10	ns/V

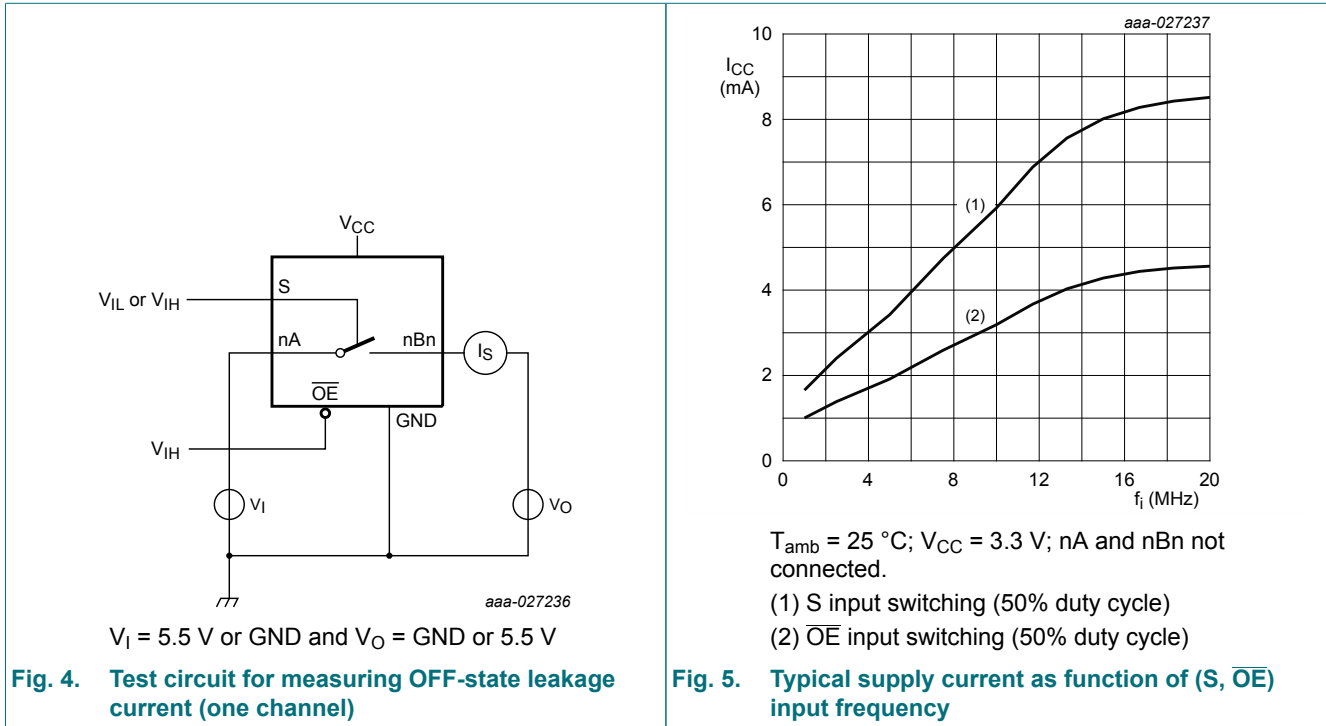
## 10. Static characteristics

**Table 6. Static characteristics**

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

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			T <sub>amb</sub> = -40 °C to +85°C		Unit
			Min	Typ	Max	Min	Max	
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	-	1.7	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	-	2	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	-	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	-	-	0.8	V
V <sub>IK</sub>	input clamping voltage	nA, nBn; V <sub>CC</sub> = 3.6 V; I <sub>I</sub> = -18 mA	-	-	-	-	-1.8	V
I <sub>I</sub>	input leakage current	S, $\overline{OE}$ ; V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = GND to 5.5 V	-	-	-	-	±1	µA
I <sub>OFF</sub>	power-off leakage current	per pin; V <sub>CC</sub> = 0 V; V <sub>SW</sub> or V <sub>I</sub> = 0 V to 5.5 V	-	-	-	-	±1	µA
I <sub>S(OFF)</sub>	OFF-state leakage current	nA, nBn; V <sub>CC</sub> = 3.6 V; see Fig. 4	-	-	-	-	±1	µA
I <sub>CC</sub>	supply current	V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>SW</sub> = GND or V <sub>CC</sub> ; V <sub>CC</sub> = 3.6 V	-	0.4	-	-	0.6	mA
ΔI <sub>CC</sub>	additional supply current	S, $\overline{OE}$ ; V <sub>CC</sub> = 3.6 V; one input at 3 V, other inputs at GND or V <sub>CC</sub>	-	-	-	-	30	µA
C <sub>I</sub>	input capacitance	V <sub>CC</sub> = 3.3 V; V <sub>SW</sub> = GND or V <sub>CC</sub> ; V <sub>I</sub> = 0 V, 3.3 V, 5.5 V						
		S, $\overline{OE}$	-	2.5	-	-	3.5	pF
C <sub>S(OFF)</sub>	OFF-state capacitance	V <sub>CC</sub> = 3.3 V; V <sub>SW</sub> = 0 V, 3.3 V, 5.5 V						
		nA	-	5.5	-	-	7	pF
		nBn	-	3.5	-	-	5	pF
C <sub>S(ON)</sub>	ON-state capacitance	V <sub>CC</sub> = 3.3 V; V <sub>SW</sub> = 0 V, 3.3 V, 5.5 V						
		nA, nBn	-	10.5	-	-	13	pF

10.1. Test circuit and graph



10.2. ON resistance

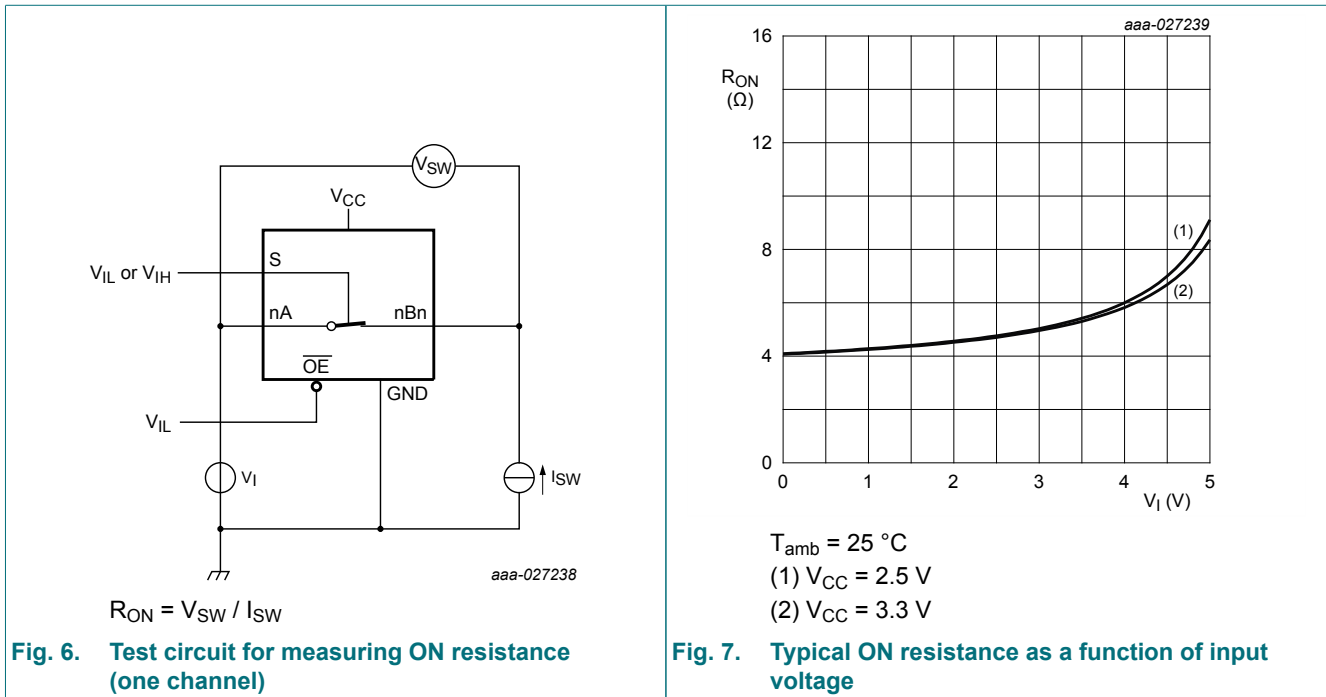
Table 7. ON resistance

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6.

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			T <sub>amb</sub> = -40 °C to +85 °C		Unit
			Min	Typ	Max	Min	Max	
R <sub>ON</sub>	ON resistance	V <sub>CC</sub> = 2.3 V; see Fig. 7						
		V <sub>I</sub> = 0 V; I <sub>SW</sub> = 30 mA [1]	-	4	-	-	8	Ω
		V <sub>I</sub> = 1.7 V; I <sub>SW</sub> = -15 mA [1]	-	4.4	-	-	9	Ω
		V <sub>CC</sub> = 3.0 V; see Fig. 7						
		V <sub>I</sub> = 0 V; I <sub>SW</sub> = 30 mA [2]	-	4	-	-	6	Ω
		V <sub>I</sub> = 2.4 V; I <sub>SW</sub> = -15 mA [2]	-	4.7	-	-	8	Ω

[1] Typical values are measured at V<sub>CC</sub> = 2.5 V.  
 [2] Typical values are measured at V<sub>CC</sub> = 3.3 V.

### 10.3. ON resistance test circuit and graph



## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit, see Fig. 10.

Symbol	Parameter	Conditions	$T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}$		Unit
			Min	Max	
$t_{pd}$	propagation delay	nA to nBn or nBn to nA; see Fig. 8 [1] [2]			
		$V_{CC} = 2.3\text{ V to } 2.7\text{ V}$	-	0.12	ns
		$V_{CC} = 3.0\text{ V to } 3.6\text{ V}$	-	0.20	ns
		S to nA; see Fig. 8 [1]			
		$V_{CC} = 2.3\text{ V to } 2.7\text{ V}$	1.5	6.5	ns
		$V_{CC} = 3.0\text{ V to } 3.6\text{ V}$	1.5	5.5	ns
$t_{en}$	enable time	$\overline{OE}$ to nA, nBn; see Fig. 9 [3]			
		$V_{CC} = 2.3\text{ V to } 2.7\text{ V}$	1.5	6.5	ns
		$V_{CC} = 3.0\text{ V to } 3.6\text{ V}$	1.5	5.5	ns
		S to nBn; see Fig. 9 [3]			
		$V_{CC} = 2.3\text{ V to } 2.7\text{ V}$	1.5	6.5	ns
		$V_{CC} = 3.0\text{ V to } 3.6\text{ V}$	1.5	5.5	ns

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C		Unit	
			Min	Max		
t <sub>dis</sub>	disable time	OĒ to nA, nBn; see Fig. 9 [4]				
			V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	6.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	6.0	ns	
		S to nBn; see Fig. 9 [4]				
			V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	6.0	ns
			V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	6.0	ns
f <sub>max</sub>	maximum frequency	S, OĒ; V <sub>O</sub> > V <sub>CC</sub> ; V <sub>I</sub> = 5 V; R <sub>L</sub> ≥ 1 MΩ; C <sub>L</sub> = 0 pF				
			V <sub>CC</sub> = 2.3 V to 2.7 V	-	10	MHz
			V <sub>CC</sub> = 3.0 V to 3.6 V	-	20	MHz

- [1] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- [2] The propagation delay is the calculated RC time constant of the typical ON resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).
- [3] t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.
- [4] t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.

### 11.1. Waveforms and test circuit

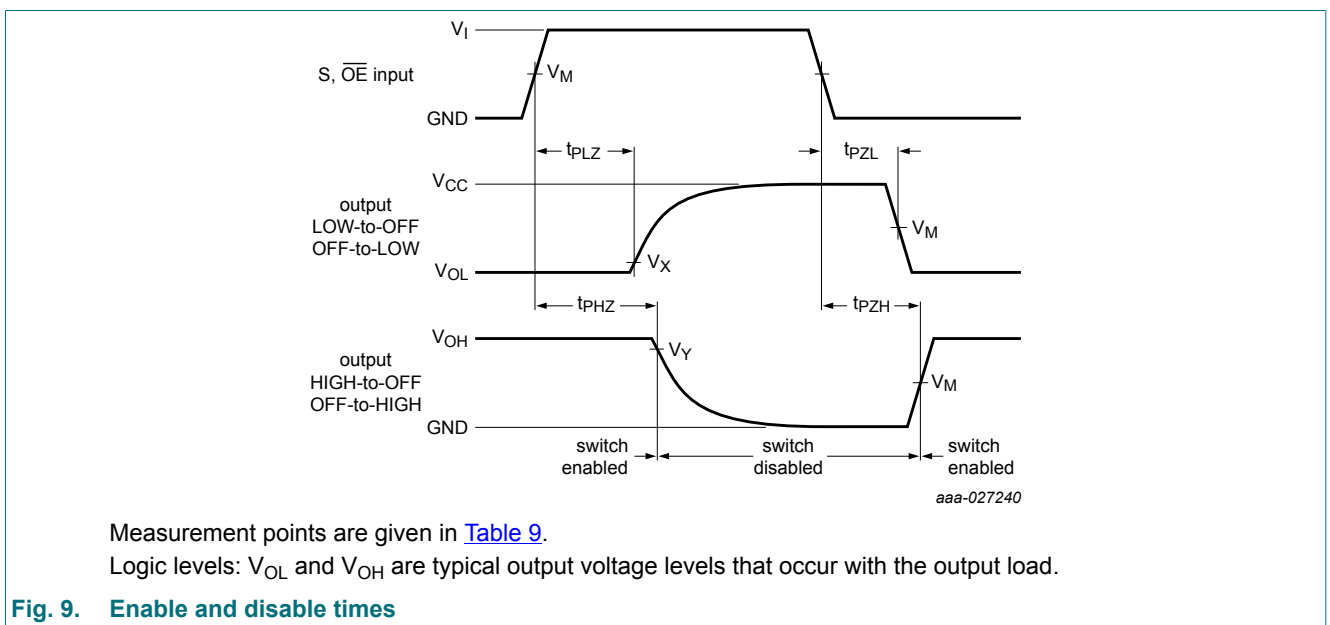
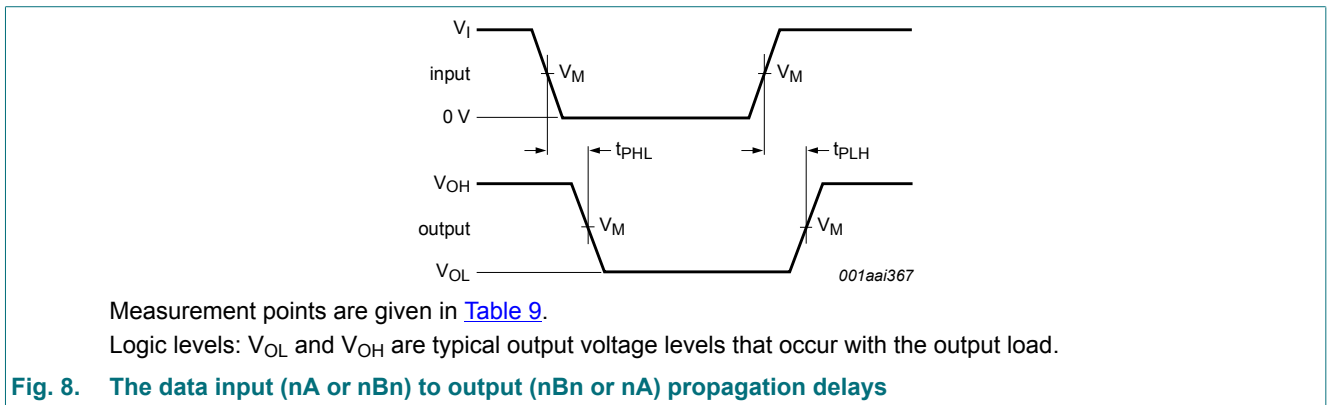
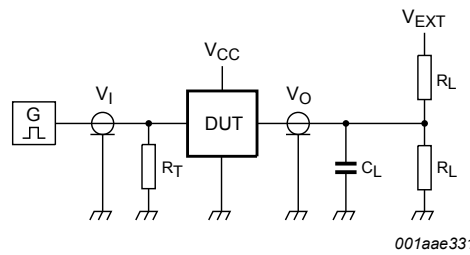
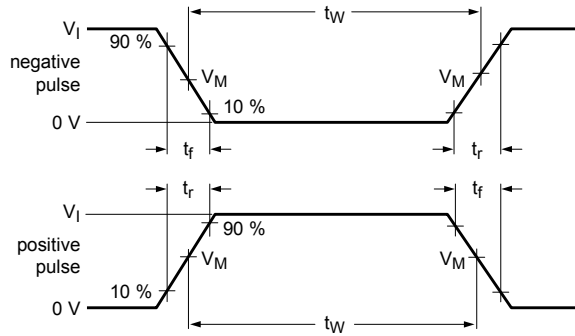




Table 9. Measurement points

Supply voltage	Input	Output		
$V_{CC}$	$V_M$	$V_M$	$V_X$	$V_Y$
2.3 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$
3.0 V to 3.6 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$



001aae331

Test data is given in [Table 10](#).

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 the output impedance  $Z_o$  of the pulse generator.

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

Fig. 10. Test circuit for measuring switching times

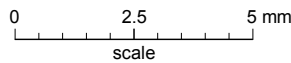
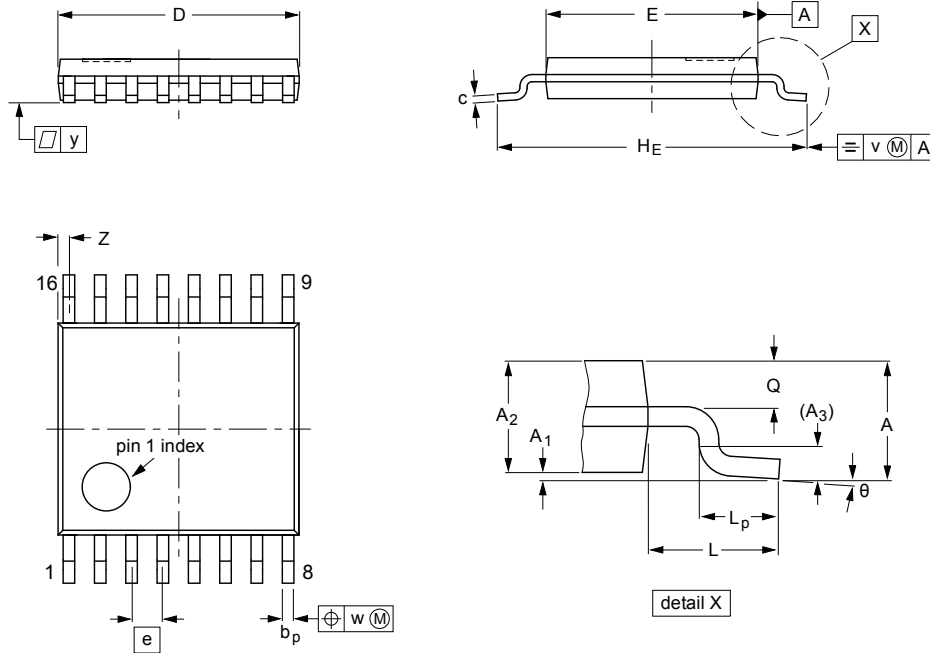
Table 10. Test data

Supply voltage	Input		Load		$V_{EXT}$		
$V_{CC}$	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PZH}, t_{PHZ}$
2.3 V to 2.7 V	$V_{CC}$	$\leq 2.5 \text{ ns}$	30 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND
3.0 V to 3.6 V	$V_{CC}$	$\leq 2.5 \text{ ns}$	50 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND

12. Package outline

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

SOT403-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

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

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

## 13. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charged Device Model
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model

## 14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74CB3Q3257_Q100 v.1	20190220	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.

- [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 <https://www.nexperia.com>.

### 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.

### 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 in automotive applications** — This Nexperia product has been qualified for use in automotive applications. Unless otherwise agreed in writing, the product is 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.

**Quick reference data** — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

**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.

**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.

### Trademarks

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

## Contents

<b>1. General description</b> .....	<b>1</b>
<b>2. Features and benefits</b> .....	<b>1</b>
<b>3. Applications</b> .....	<b>1</b>
<b>4. Ordering information</b> .....	<b>1</b>
<b>5. Functional diagram</b> .....	<b>2</b>
<b>6. Pinning information</b> .....	<b>3</b>
6.1. Pinning.....	3
6.2. Pin description.....	3
<b>7. Functional description</b> .....	<b>4</b>
<b>8. Limiting values</b> .....	<b>4</b>
<b>9. Recommended operating conditions</b> .....	<b>4</b>
<b>10. Static characteristics</b> .....	<b>5</b>
10.1. Test circuit and graph.....	6
10.2. ON resistance.....	6
10.3. ON resistance test circuit and graph.....	7
<b>11. Dynamic characteristics</b> .....	<b>7</b>
11.1. Waveforms and test circuit.....	8
<b>12. Package outline</b> .....	<b>10</b>
<b>13. Abbreviations</b> .....	<b>11</b>
<b>14. Revision history</b> .....	<b>11</b>
<b>15. Legal information</b> .....	<b>12</b>

© Nexperia B.V. 2019. All rights reserved

For more information, please visit: <http://www.nexperia.com>  
For sales office addresses, please send an email to: [salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)  
Date of release: 20 February 2019

## Данный компонент на территории Российской Федерации

### Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9