

# NX3DV3899

## Dual double-pole double-throw analog switch

Rev. 3.2 — 21 June 2024

Product data sheet

## 1 General description

The NX3DV3899 is a dual double-pole double-throw analog data-switch suitable for use as an analog or digital multiplexer/demultiplexer. It consists of four switches, each with two independent input/outputs (nY0 and nY1) and a common input/output (nZ). The two digital inputs (1S and 2S) are used to select the switch position. Schmitt trigger action at the select input (nS) makes the circuit tolerant to slower input rise and fall times across the entire  $V_{CC}$  range from 1.4 V to 4.3 V.

A low input voltage threshold allows pin nS to be driven by lower level logic signals without a significant increase in supply current  $I_{CC}$ . This makes it possible for the NX3DV3899 to switch 4.3 V signals with a 1.8 V digital controller, eliminating the need for logic level translation. The NX3DV3899 allows signals with amplitude up to  $V_{CC}$  to be transmitted from nZ to nY0 or nY1; or from nY0 or nY1 to nZ.

## 2 Features and benefits

- Wide supply voltage range from 1.4 V to 4.3 V
- Very low ON resistance (peak):
  - 7.2  $\Omega$  (typical) at  $V_{CC} = 1.4$  V
  - 5.4  $\Omega$  (typical) at  $V_{CC} = 1.65$  V
  - 2.9  $\Omega$  (typical) at  $V_{CC} = 2.5$  V
  - 2.4  $\Omega$  (typical) at  $V_{CC} = 3.0$  V
  - 2.3  $\Omega$  (typical) at  $V_{CC} = 3.6$  V
  - 2.2  $\Omega$  (typical) at  $V_{CC} = 4.3$  V
- Break-before-make switching
- High noise immunity
- ESD protection:
  - HBM JESD22-A114F Class 2A exceeds 2000 V (all pins)
  - HBM JESD22-A114F Class 3A exceeds 5000 V (I/O pins to GND)
  - MM JESD22-A115-A exceeds 200 V
  - CDM AEC-Q100-011 revision B exceeds 1000 V
- CMOS low-power consumption
- Latch-up performance exceeds 100 mA per JESD 78B Class II Level A
- 1.8 V control logic at  $V_{CC} = 3.6$  V
- Control input accepts voltages above supply voltage
- Very low supply current, even when input is below  $V_{CC}$
- High current handling capability (350 mA continuous current under 3.3 V supply)
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

## 3 Applications

- Data switch
- Cell phone



- PDA
- Portable media player

4 Ordering information

Table 1. Ordering information

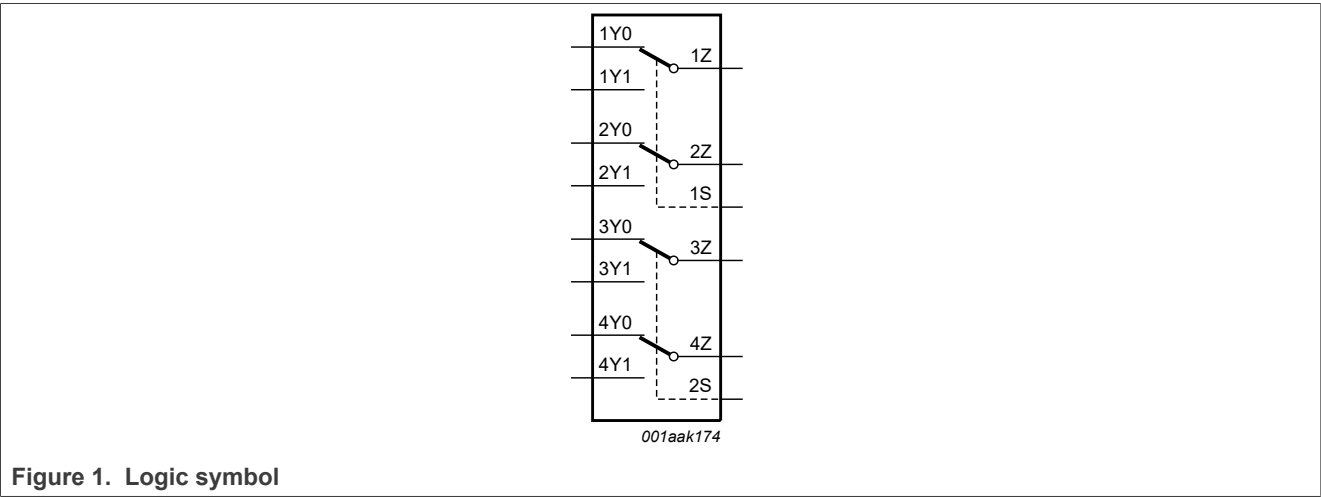
Type number	Topside marking	Package		
		Name	Description	Version
NX3DV3899HR	x99	HXQFN16(U)	plastic thermal enhanced extremely thin quad flat package; no leads; 16 terminals; body 3 mm x 3 mm x 0.5 mm	SOT1039-2
NX3DV3899GU	x9	XQFN16	plastic, extremely thin quad flat package; no leads; 16 terminals; body 1.80 x 2.60 x 0.50 mm	SOT1161-1

Table 2. Ordering options

Type number	Orderable part number	Package	Packing method	Minimum order quantity	Temperature range
NX3DV3899HR	NX3DV3899HR,115	HXQFN16(U)	REEL 7" Q1 NDP <sup>[1]</sup>	1500	-40°C to +125°C
	NX3DV3899HRZ	HXQFN16(U)	REEL 7" Q1 NDP SSB <sup>[2]</sup>	1500	-40°C to +125°C
NX3DV3899GU	NX3DV3899GU,115	XQFN16	REEL 7" Q1 NDP	4000	-40°C to +125°C

[1] Will go EOL - migrate to new leadframe NX3DV3899HRZ orderable part number.  
[2] This packing method uses a Static Shielding Bag (SSB) solution. Material is to be kept in the sealed bag between uses.

5 Functional diagram



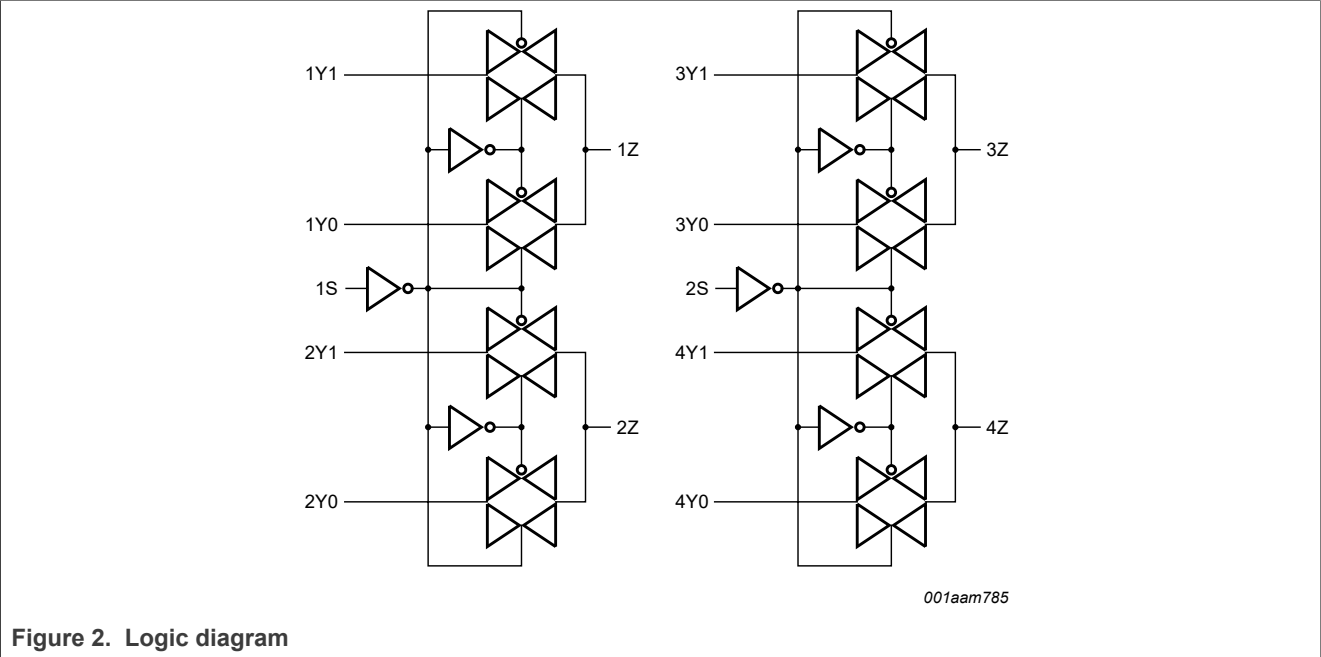


Figure 2. Logic diagram

6 Pinning information

6.1 Pinning

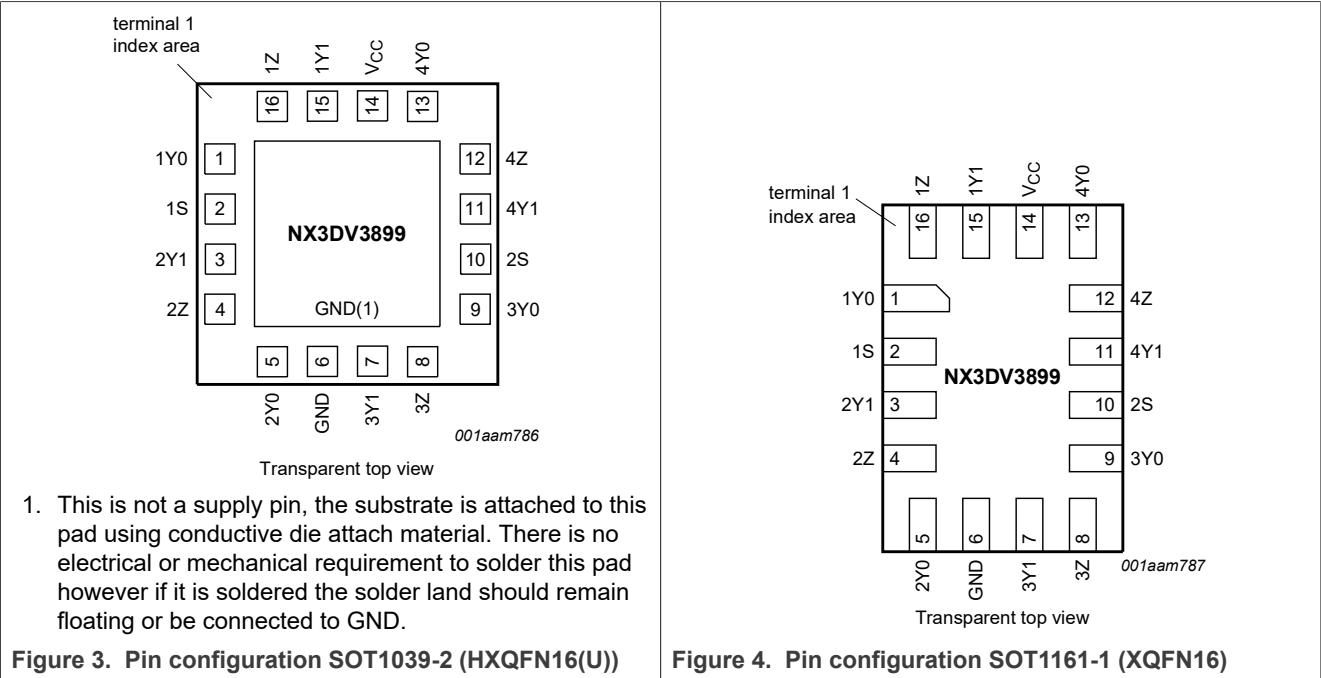


Figure 3. Pin configuration SOT1039-2 (HXQFN16(U))

Figure 4. Pin configuration SOT1161-1 (XQFN16)

6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
1Y0, 2Y0, 3Y0, 4Y0	1, 5, 9, 13	independent input or output
1S, 2S	2, 10	select input
1Y1, 2Y1, 3Y1, 4Y1	15, 3, 7, 11	independent input or output
1Z, 2Z, 3Z, 4Z	16, 4, 8, 12	common output or input
GND	6	ground (0 V)
V <sub>CC</sub>	14	supply voltage

7 Functional description

Table 4. Function table<sup>[1]</sup>

Input nS	Channel on
L	nY0
H	nY1

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

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 <sub>CC</sub>	supply voltage			-0.5	+4.6	V
V <sub>I</sub>	input voltage	select input nS	[1]	-0.5	+4.6	V
V <sub>SW</sub>	switch voltage		[2]	-0.5	V <sub>CC</sub> + 0.5	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 or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V		-	±50	mA
I <sub>SW</sub>	switch current	V <sub>SW</sub> > -0.5 V or V <sub>SW</sub> < V <sub>CC</sub> + 0.5 V; source or sink current		-	±350	mA
		V <sub>SW</sub> > -0.5 V or V <sub>SW</sub> < V <sub>CC</sub> + 0.5 V; pulsed at 1 ms duration, < 10 % duty cycle; peak current		-	±500	mA
T <sub>stg</sub>	storage temperature			-65	+150	°C
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +125 °C				
		HXQFN16(U)	[3]	-	250	mW
		XQFN16	[4]	-	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 but may not exceed 4.6 V.  
[3] For HXQFN16(U) package: above 135 °C the value of P<sub>tot</sub> derates linearly with 16.9 mW/K.  
[4] For XQFN16 package: above 133 °C the value of P<sub>tot</sub> derates linearly with 14.5 mW/K.

9 Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>CC</sub>	supply voltage			1.4	4.3	V
V <sub>I</sub>	input voltage	select input nS		0	4.3	V
V <sub>SW</sub>	switch voltage		[1]	0	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature			-40	+125	°C
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 1.4 V to 4.3 V	[2]	-	200	ns/V

- [1] To avoid sinking GND current from terminal nZ when switch current flows in terminal nYn, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal nZ, no GND current will flow from terminal nYn. In this case, there is no limit for the voltage drop across the switch.
- [2] Applies to control signal levels.

10 Static characteristics

Table 7. Static characteristics

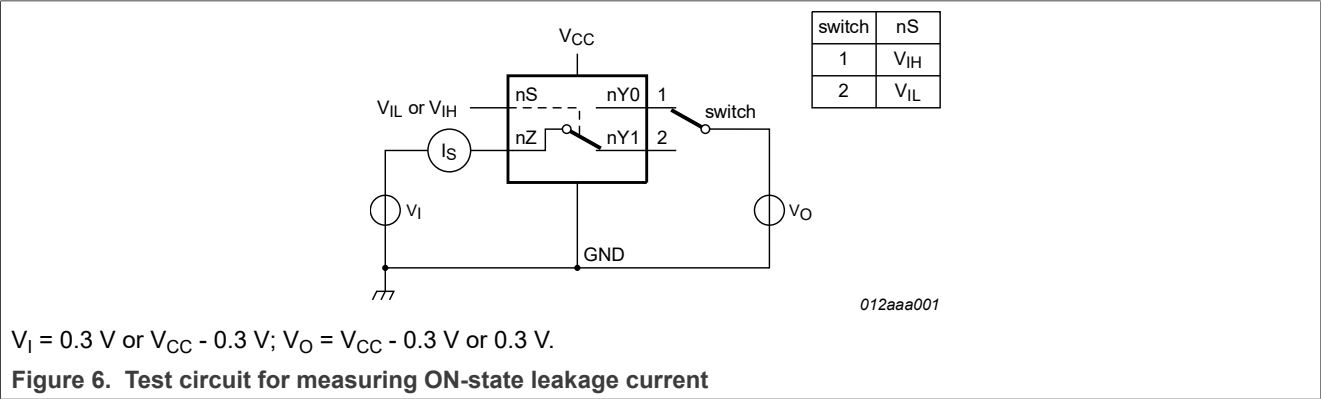
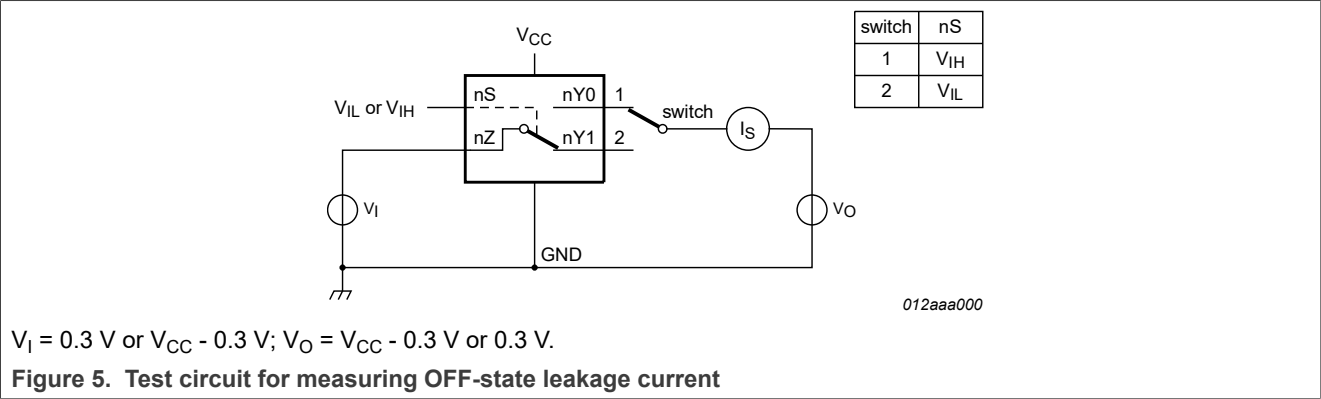
At recommended operating conditions; voltages are referenced to GND (ground 0 V).

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			T <sub>amb</sub> = -40 °C to +125 °C			Unit
			Min	Typ	Max	Min	Max (85 °C)	Max (125 °C)	
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 1.4 V to 1.6 V	0.9	-	-	0.9	-	-	V
		V <sub>CC</sub> = 1.65 V to 1.95 V	0.9	-	-	0.9	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.1	-	-	1.1	-	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	1.3	-	-	1.3	-	-	V
		V <sub>CC</sub> = 3.6 V to 4.3 V	1.4	-	-	1.4	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 1.4 V to 1.6 V	-	-	0.3	-	0.3	0.3	V
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.4	-	0.4	0.3	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.4	-	0.4	0.4	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.5	-	0.5	0.5	V
		V <sub>CC</sub> = 3.6 V to 4.3 V	-	-	0.6	-	0.6	0.6	V
I <sub>I</sub>	input leakage current	select input nS; V <sub>I</sub> = GND to 4.3 V; V <sub>CC</sub> = 1.4 V to 4.3 V	-	-	-	-	±0.5	±1	μA
I <sub>S(OFF)</sub>	OFF-state leakage current	nY0 and nY1 port; see <a href="#">Figure 5</a>							
		V <sub>CC</sub> = 1.4 V to 4.3 V	-	-	±5	-	±50	±500	nA
I <sub>S(ON)</sub>	ON-state leakage current	nZ port; see <a href="#">Figure 6</a>							
		V <sub>CC</sub> = 1.4 V to 4.3 V	-	-	±5	-	±50	±500	nA
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>SW</sub> = GND or V <sub>CC</sub>							
		V <sub>CC</sub> = 3.6 V	-	-	100	-	500	5000	nA

Table 7. Static characteristics...continued  
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 +125 °C			Unit
			Min	Typ	Max	Min	Max (85 °C)	Max (125 °C)	
		V <sub>CC</sub> = 4.3 V	-	-	150	-	800	6000	nA
ΔI <sub>CC</sub>	additional supply current	V <sub>SW</sub> = GND or V <sub>CC</sub>							
		V <sub>I</sub> = 2.6 V; V <sub>CC</sub> = 4.3 V	-	2.0	4.0	-	7	7	μA
		V <sub>I</sub> = 2.6 V; V <sub>CC</sub> = 3.6 V	-	0.35	0.7	-	1	1	μA
		V <sub>I</sub> = 1.8 V; V <sub>CC</sub> = 4.3 V	-	7.0	10.0	-	15	15	μA
		V <sub>I</sub> = 1.8 V; V <sub>CC</sub> = 3.6 V	-	2.5	4.0	-	5	5	μA
		V <sub>I</sub> = 1.8 V; V <sub>CC</sub> = 2.5 V	-	50	200	-	300	500	nA
C <sub>I</sub>	input capacitance		-	1.0	-	-	-	-	pF
C <sub>S(OFF)</sub>	OFF-state capacitance		-	8	-	-	-	-	pF
C <sub>S(ON)</sub>	ON-state capacitance		-	30	-	-	-	-	pF

10.1 Test circuits



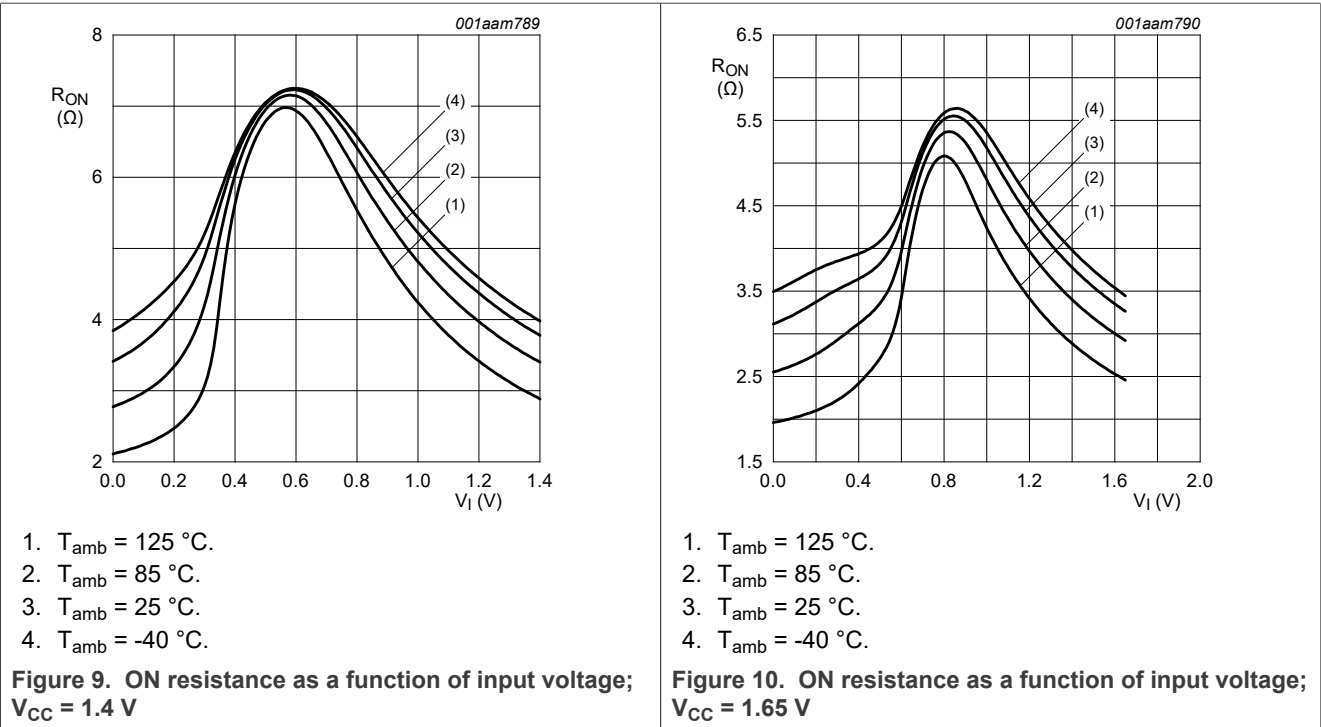
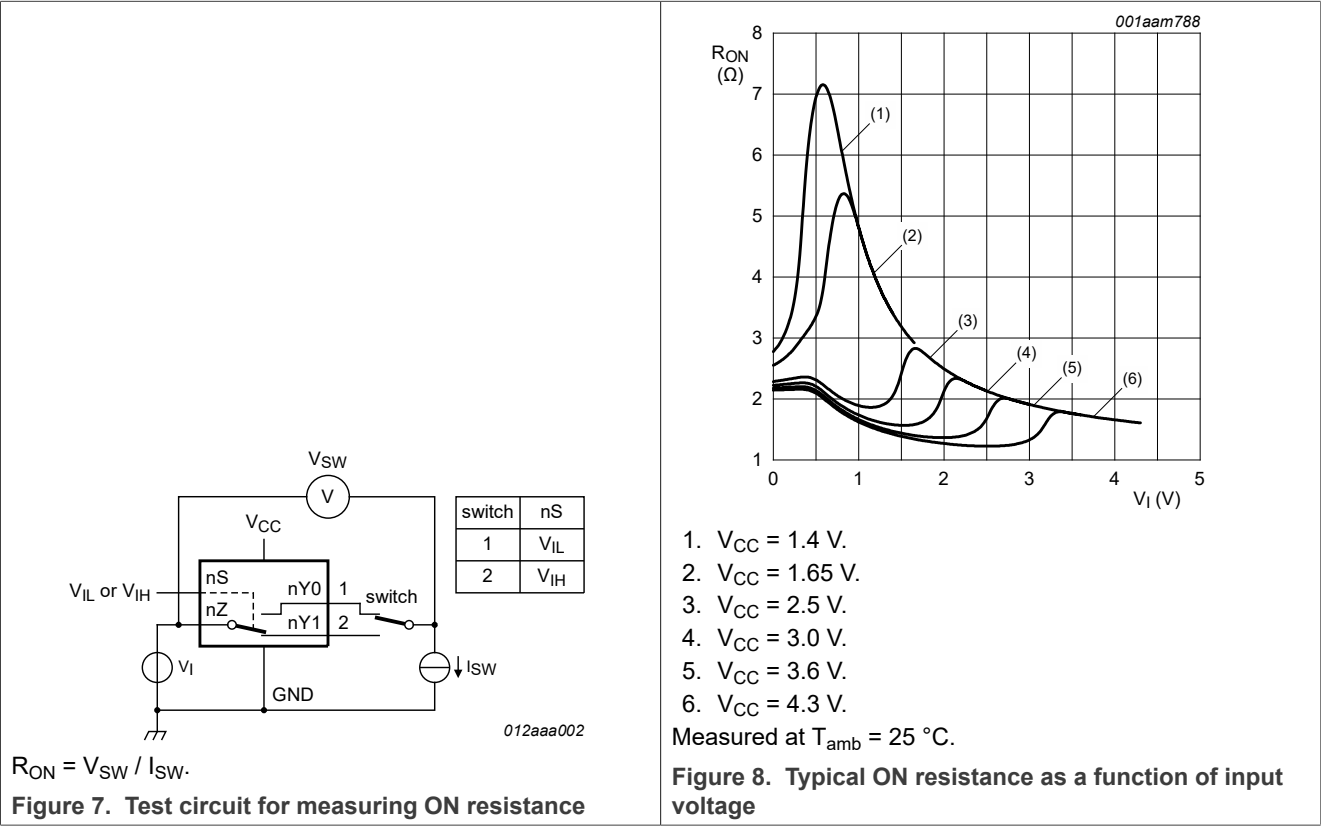
10.2 ON resistance

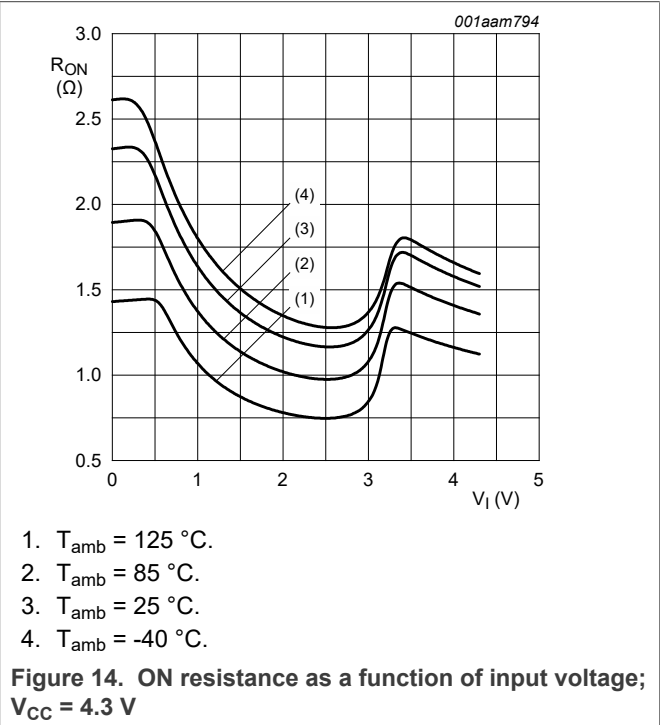
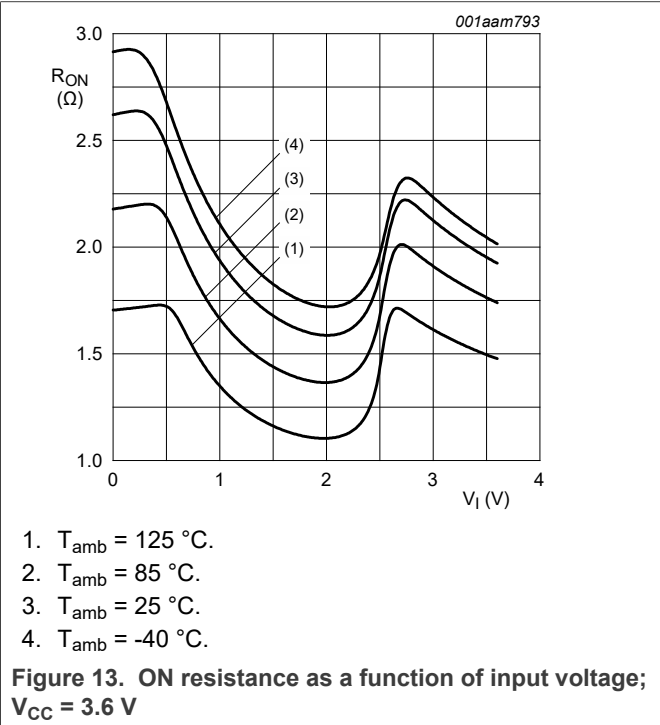
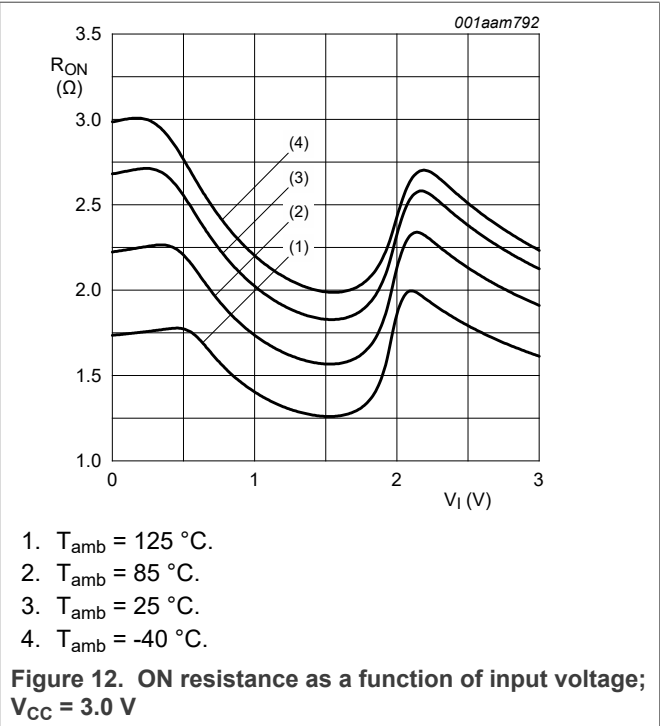
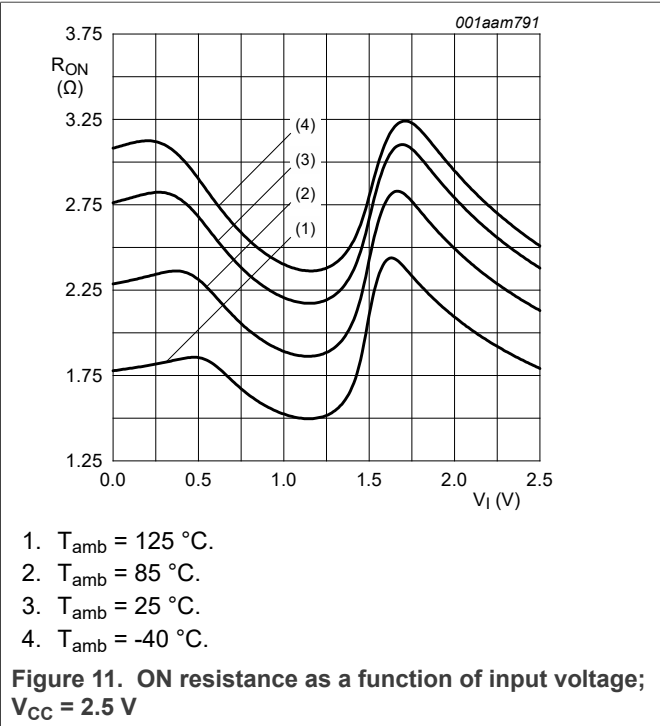
Table 8. ON resistance  
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see [Figure 8](#) to [Figure 14](#).

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C			T <sub>amb</sub> = -40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
R <sub>ON(peak)</sub>	ON resistance (peak)	V <sub>I</sub> = GND to V <sub>CC</sub> ; I <sub>SW</sub> = 100 mA; see <a href="#">Figure 7</a>						
		V <sub>CC</sub> = 1.4 V	-	7.2	9.3	-	10	Ω
		V <sub>CC</sub> = 1.65 V	-	5.4	7.3	-	8	Ω
		V <sub>CC</sub> = 2.5 V	-	2.9	3.9	-	4.5	Ω
		V <sub>CC</sub> = 3.0 V	-	2.4	3.4	-	4.5	Ω
		V <sub>CC</sub> = 3.6 V	-	2.3	3.3	-	4.2	Ω
		V <sub>CC</sub> = 4.3 V	-	2.2	3.3	-	4.2	Ω
ΔR <sub>ON</sub>	ON resistance mismatch between channels	V <sub>I</sub> = GND to V <sub>CC</sub> ; I <sub>SW</sub> = 100 mA <sup>[2]</sup>						
		V <sub>CC</sub> = 3.0 V	-	0.8	-	-	-	Ω
		V <sub>CC</sub> = 4.3 V	-	0.7	-	-	-	Ω
R <sub>ON(flat)</sub>	ON resistance (flatness)	V <sub>I</sub> = GND to V <sub>CC</sub> ; I <sub>SW</sub> = 100 mA <sup>[3]</sup>						
		V <sub>CC</sub> = 1.4 V	-	4.4	-	-	-	Ω
		V <sub>CC</sub> = 1.65 V	-	2.8	-	-	-	Ω
		V <sub>CC</sub> = 2.5 V	-	1.0	-	-	-	Ω
		V <sub>CC</sub> = 3.0 V	-	0.8	-	-	-	Ω
		V <sub>CC</sub> = 3.6 V	-	0.9	-	-	-	Ω
		V <sub>CC</sub> = 4.3 V	-	1.0	-	-	-	Ω

[1] Typical values are measured at T<sub>amb</sub> = 25 °C.  
[2] Measured at identical V<sub>CC</sub>, temperature and input voltage.  
[3] Flatness is defined as the difference between the maximum and minimum value of ON resistance measured at identical V<sub>CC</sub> and temperature.

10.3 ON resistance test circuit and graphs





11 Dynamic characteristics

Table 9. Dynamic characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 17](#).

Symbol	Parameter	Conditions		T <sub>amb</sub> = 25 °C			T <sub>amb</sub> = -40 °C to +125 °C			Unit
				Min	Typ <sup>[1]</sup>	Max	Min	Max (85 °C)	Max (125 °C)	
t <sub>en</sub>	enable time	nS to nZ or nYn; see <a href="#">Figure 15</a>								
		V <sub>CC</sub> = 1.4 V to 1.6 V		-	41	90	-	120	120	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V		-	30	70	-	80	90	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V		-	20	45	-	50	55	ns
		V <sub>CC</sub> = 2.7 V to 3.6 V		-	19	40	-	45	50	ns
		V <sub>CC</sub> = 3.6 V to 4.3 V		-	19	40	-	45	50	ns
t <sub>dis</sub>	disable time	nS to nZ or nYn; see <a href="#">Figure 15</a>								
		V <sub>CC</sub> = 1.4 V to 1.6 V		-	24	70	-	80	90	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V		-	15	55	-	60	65	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V		-	9	25	-	30	35	ns
		V <sub>CC</sub> = 2.7 V to 3.6 V		-	8	20	-	25	30	ns
		V <sub>CC</sub> = 3.6 V to 4.3 V		-	8	20	-	25	30	ns
t <sub>b-m</sub>	break-before-make time	see <a href="#">Figure 16</a>	<sup>[2]</sup>							
		V <sub>CC</sub> = 1.4 V to 1.6 V		-	20	-	9	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V		-	17	-	7	-	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V		-	13	-	4	-	-	ns
		V <sub>CC</sub> = 2.7 V to 3.6 V		-	11	-	3	-	-	ns
		V <sub>CC</sub> = 3.6 V to 4.3 V		-	11	-	2	-	-	ns

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.5 V, 1.8 V, 2.5 V, 3.3 V and 4.3 V respectively.

[2] Break-before-make guaranteed by design.

11.1 Waveform and test circuits

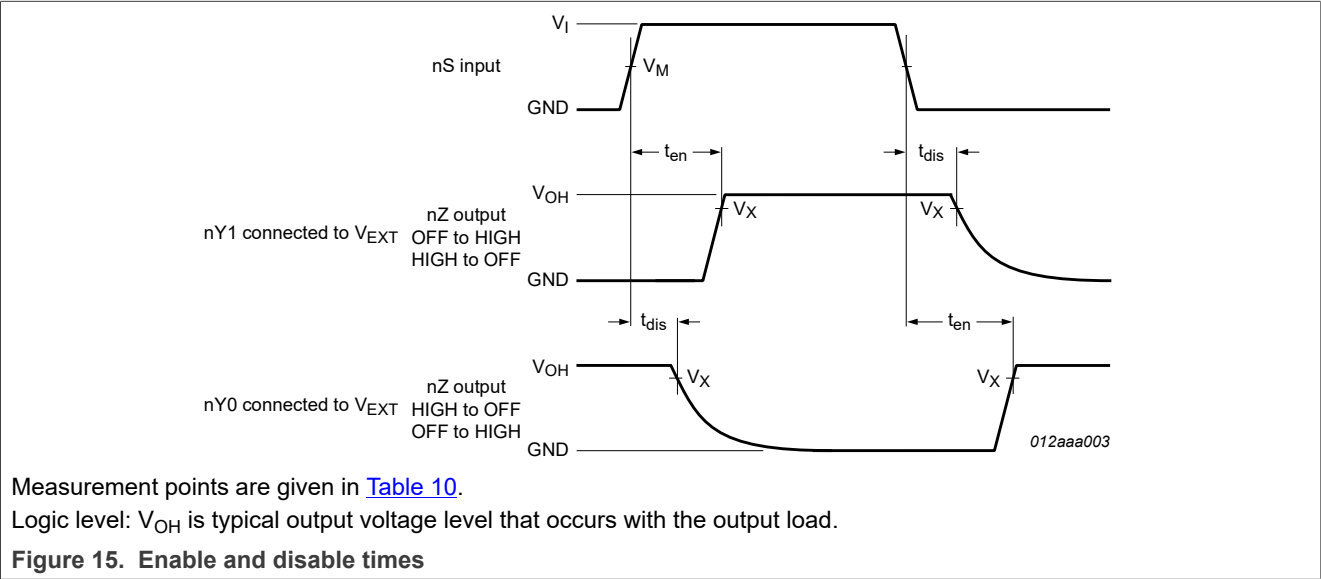


Table 10. Measurement points

Supply voltage	Input	Output
$V_{CC}$	$V_M$	$V_X$
1.4 V to 4.3 V	$0.5V_{CC}$	$0.9V_{OH}$

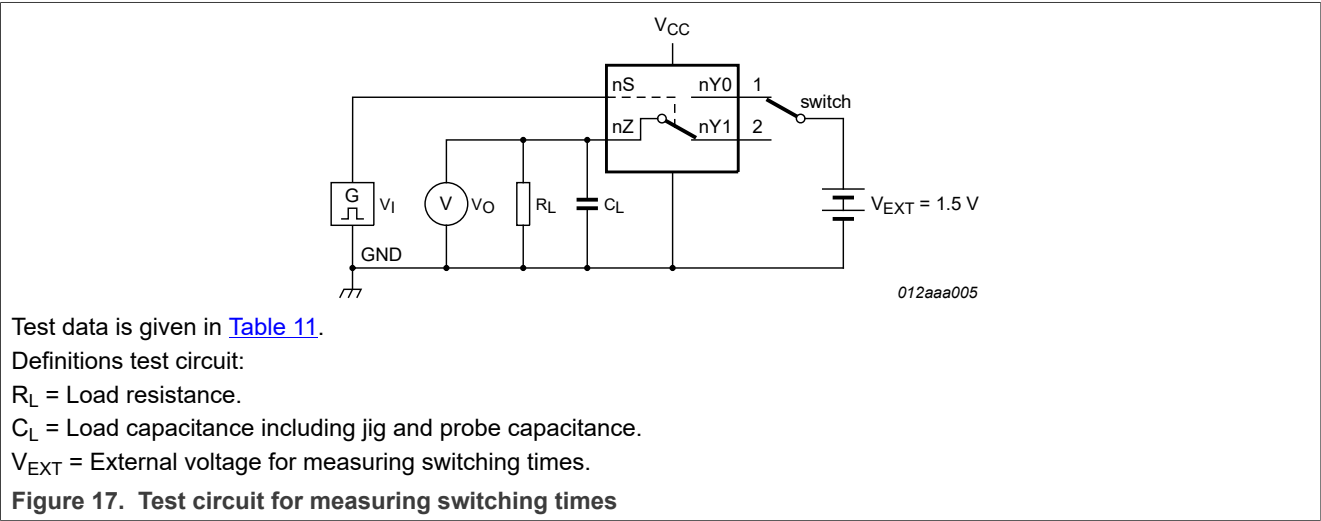
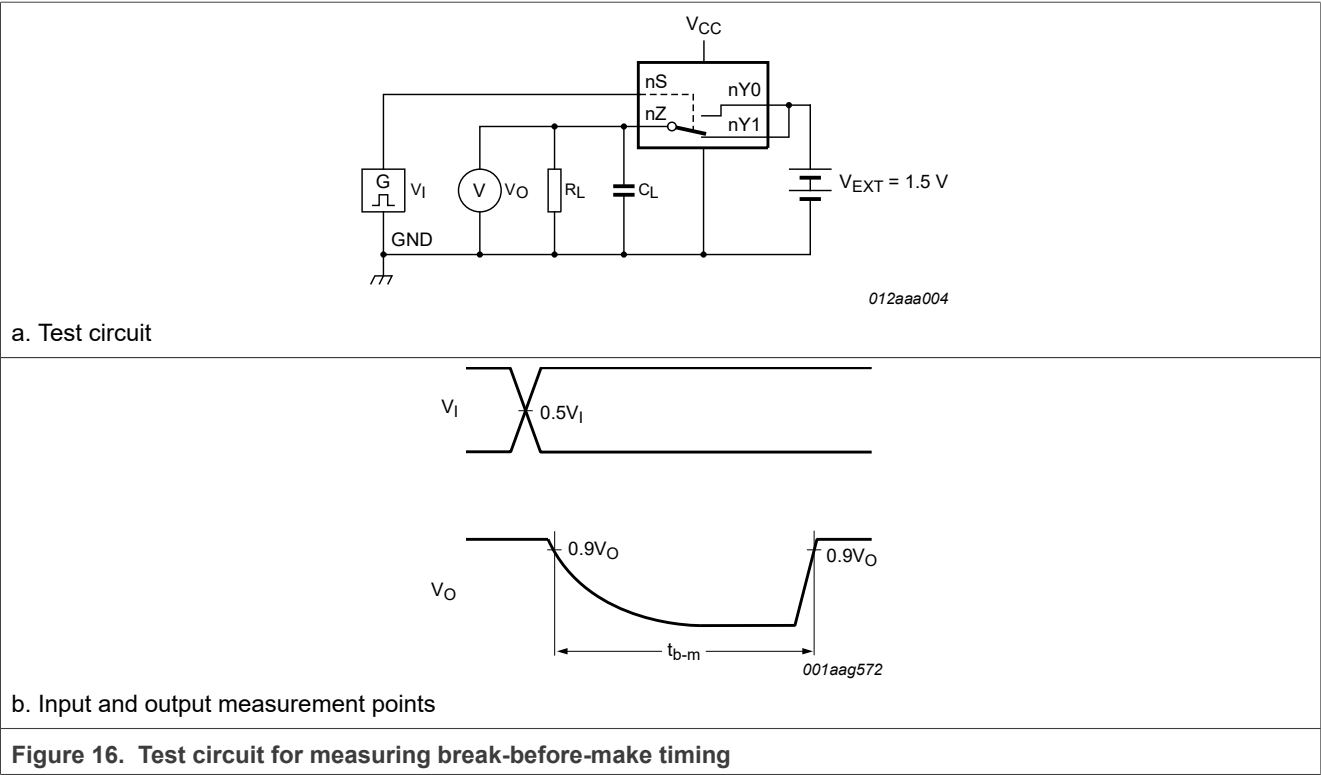


Table 11. Test data

Supply voltage	Input		Load	
$V_{CC}$	$V_I$	$t_r, t_f$	$C_L$	$R_L$
1.4 V to 4.3 V	$V_{CC}$	$\leq 2.5$ ns	35 pF	50 $\Omega$

## 11.2 Additional dynamic characteristics

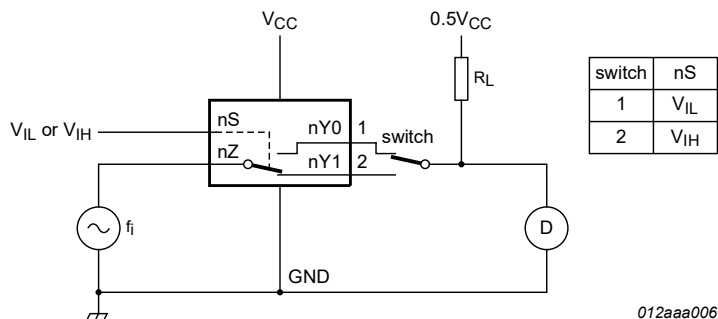
**Table 12. Additional dynamic characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  $V_I = \text{GND or } V_{CC}$  (unless otherwise specified);  $t_r = t_f \leq 2.5 \text{ ns}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$ .

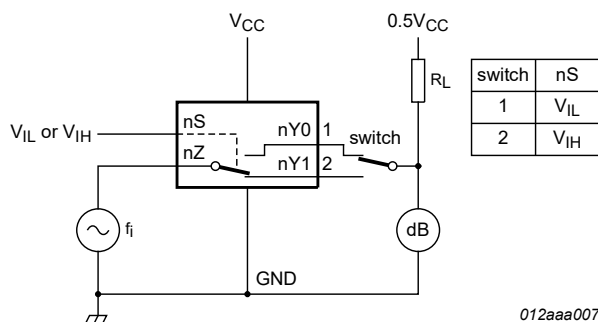
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
THD	total harmonic distortion	$f_i = 20 \text{ Hz to } 20 \text{ kHz}$ ; $R_L = 600 \text{ }\Omega$ ; see <a href="#">Figure 18</a>	[1]				
		$V_{CC} = 1.4 \text{ V}$ ; $V_I = 1 \text{ V (p-p)}$		-	0.05	-	%
		$V_{CC} = 1.65 \text{ V}$ ; $V_I = 1.2 \text{ V (p-p)}$		-	0.02	-	%
		$V_{CC} = 2.3 \text{ V}$ ; $V_I = 1.5 \text{ V (p-p)}$		-	0.01	-	%
		$V_{CC} = 2.7 \text{ V}$ ; $V_I = 2 \text{ V (p-p)}$		-	0.01	-	%
		$V_{CC} = 3.6 \text{ V}$ ; $V_I = 2 \text{ V (p-p)}$		-	0.01	-	%
		$V_{CC} = 4.3 \text{ V}$ ; $V_I = 2 \text{ V (p-p)}$		-	0.01	-	%
$f_{(-3\text{dB})}$	-3 dB frequency response	$R_L = 50 \text{ }\Omega$ ; see <a href="#">Figure 19</a>	[1]				
		$V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$		-	200	-	MHz
$\alpha_{iso}$	isolation (OFF-state)	$f_i = 1 \text{ MHz}$ ; $R_L = 50 \text{ }\Omega$ ; see <a href="#">Figure 20</a>	[1]				
		$V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$		-	-70	-	dB
$V_{ct}$	crosstalk voltage	between digital inputs and switch; $f_i = 1 \text{ MHz}$ ; $C_L = 50 \text{ pF}$ ; $R_L = 50 \text{ }\Omega$ ; see <a href="#">Figure 21</a>					
		$V_{CC} = 1.4 \text{ V to } 3.6 \text{ V}$		-	210	-	V
		$V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$		-	300	-	V
Xtalk	crosstalk	between switches; $f_i = 1 \text{ MHz}$ ; $R_L = 50 \text{ }\Omega$ ; see <a href="#">Figure 22</a>	[1]				
		$V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$		-	-90	-	dB
$Q_{inj}$	charge injection	$f_i = 1 \text{ MHz}$ ; $C_L = 0.1 \text{ nF}$ ; $R_L = 1 \text{ M}\Omega$ ; $V_{gen} = 0 \text{ V}$ ; $R_{gen} = 0 \text{ }\Omega$ ; see <a href="#">Figure 23</a>					
		$V_{CC} = 1.4 \text{ V}$		-	0.5	-	pC
		$V_{CC} = 1.65 \text{ V}$		-	0.7	-	pC
		$V_{CC} = 2.5 \text{ V}$		-	1.6	-	pC
		$V_{CC} = 3.0 \text{ V}$		-	2.1	-	pC
		$V_{CC} = 3.6 \text{ V}$		-	2.9	-	pC
		$V_{CC} = 4.3 \text{ V}$		-	4.0	-	pC

[1]  $f_i$  is biased at  $0.5V_{CC}$ .

### 11.3 Test circuits

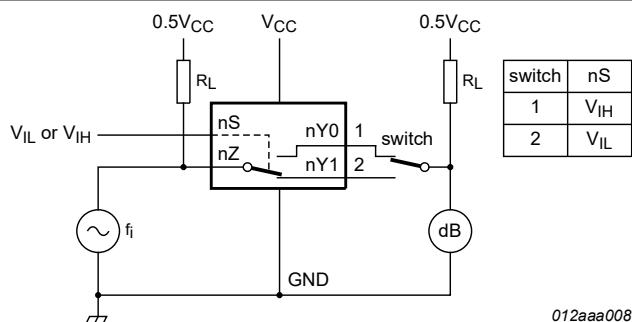


**Figure 18. Test circuit for measuring total harmonic distortion**



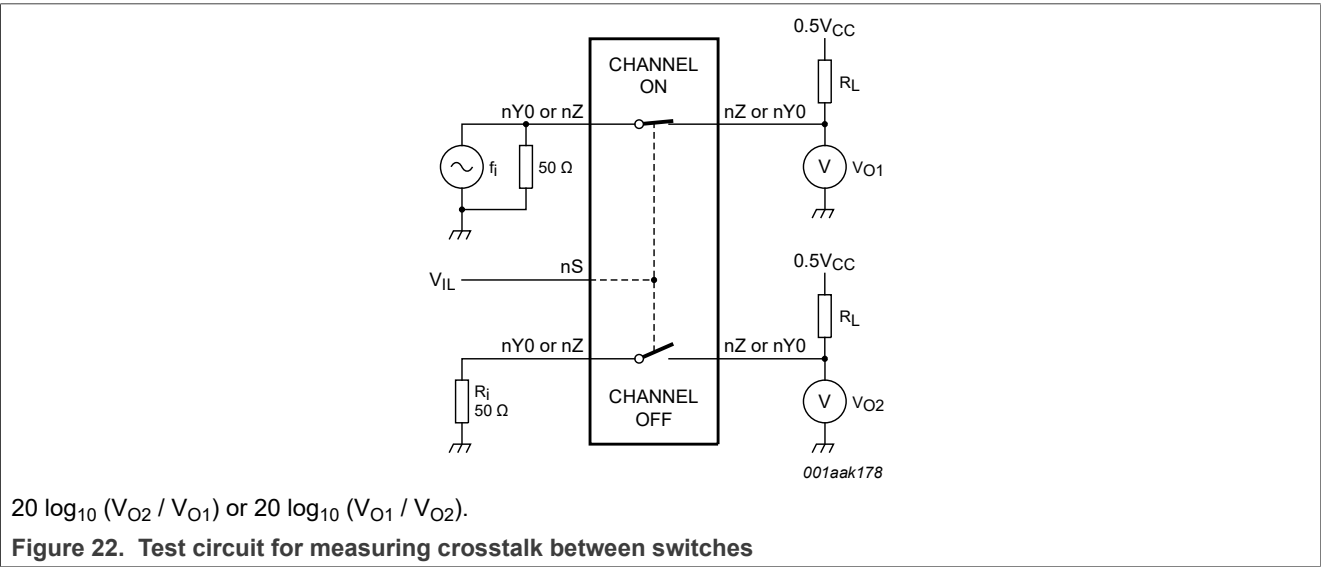
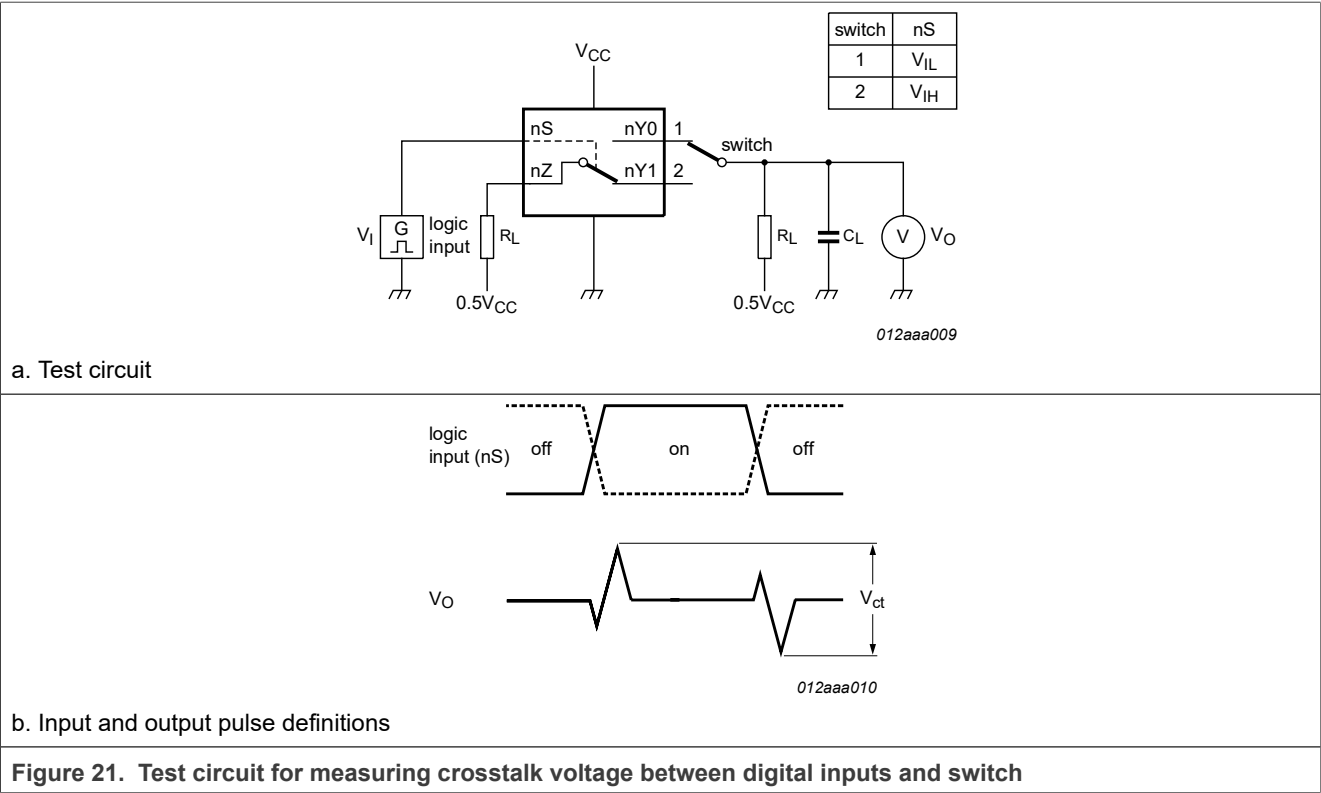
Adjust  $f_i$  voltage to obtain 0 dBm level at output. Increase  $f_i$  frequency until dB meter reads -3 dB.

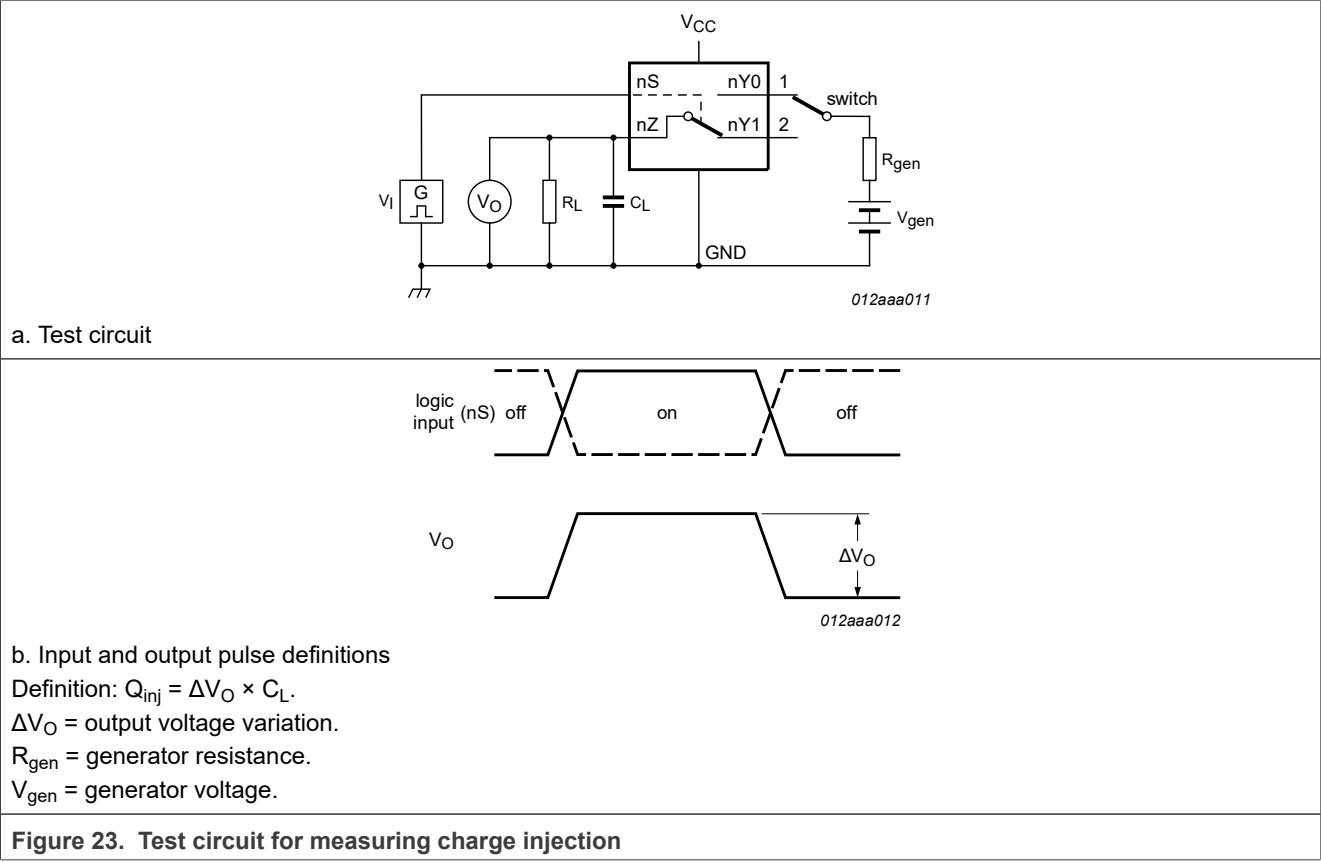
**Figure 19. Test circuit for measuring the frequency response when channel is in ON-state**



Adjust  $f_i$  voltage to obtain 0 dBm level at input.

**Figure 20. Test circuit for measuring isolation (OFF-state)**

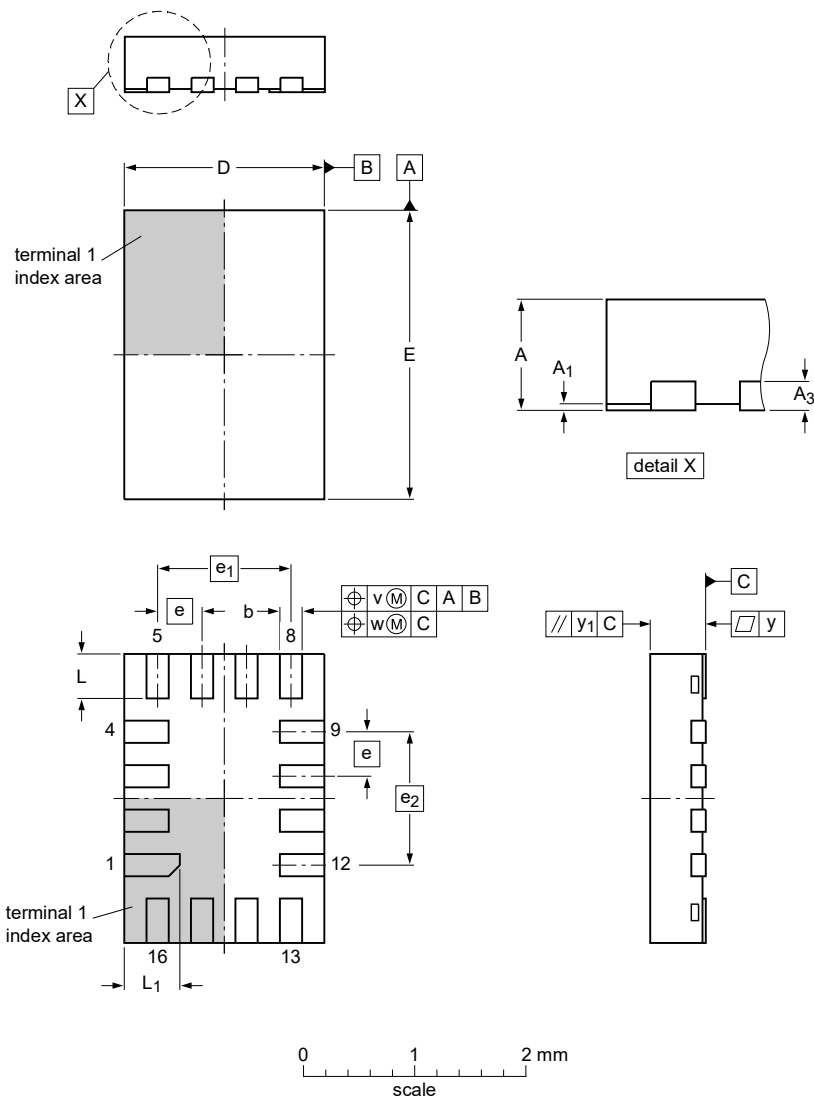






XQFN16: plastic, extremely thin quad flat package; no leads;  
16 terminals; body 1.80 x 2.60 x 0.50 mm

SOT1161-1



Dimensions

Unit <sup>(1)</sup>	A	A <sub>1</sub>	A <sub>3</sub>	b	D	E	e	e <sub>1</sub>	e <sub>2</sub>	L	L <sub>1</sub>	v	w	y	y <sub>1</sub>
max	0.5	0.05		0.25	1.9	2.7				0.45	0.55				
mm	nom		0.127	0.20	1.8	2.6	0.4	1.2	1.2	0.40	0.50	0.1	0.05	0.05	0.05
min		0.00		0.15	1.7	2.5				0.35	0.45				

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

sot1161-1\_po

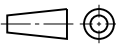
Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1161-1	---	---	---			-09-12-28- 09-12-29

Figure 25. Package outline SOT1161-1 (XQFN16)

### 13 Abbreviations

Table 13. Abbreviations

Acronym	Description
CDM	Charged Device Model
CMOS	Complementary Metal-Oxide Semiconductor
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
PDA	Personal Digital Assistant

### 14 Revision history

Table 14. Revision history

Document ID	Release date	Description
NX3DV3899 v.3.2	21 June 2024	Updated per CIN 202405025I: <ul style="list-style-type: none"><li>Corrected package outline from SOT1039-1 to SOT1039-2.</li></ul>
NX3DV3899 v.3.1	25 June 2021	Updated Section 4.
NX3DV3899 v.3	9 November 2011	Product data sheet; v.3
NX3DV3899 v.2	23 November 2010	Product data sheet; v.2
NX3DV3899 v.1	21 October 2010	Product data sheet; v.1

Legal information

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.

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

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