

# NX3DV642

## 3-lane high-speed MIPI compatible switch

Rev. 1 — 20 August 2012

Product data sheet

### 1. General description

The NX3DV642 is a high-speed triple-pole double-throw differential signal switch. The device is optimized for switching between two MIPI devices, such as cameras or LCD displays and on-board multimedia application processors.

The NX3DV642 is compatible with the requirements of Mobile Industry Processor Interface (MIPI). The low capacitance design allows the NX3DV642 to switch signals that exceed 500 MHz in frequency

### 2. Features and benefits

- Supply voltage range from 2.65 V to 4.3 V
- 7.5  $\Omega$  typical ON resistance
- 8.4 pF typical ON capacitance
- 950 MHz typical bandwidth or data frequency
- Low crosstalk of -55 dB at 100 MHz
- Break-before-make switching
- ESD protection:
  - ◆ HBM JESD22-A114F Class 2 exceeds 2000 V
  - ◆ CDM AEC-Q100-011 revision B exceeds 1000 V
  - ◆ HBM exceeds 12000 V for power to GND protection
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- Specified from -40 °C to +85 °C

### 3. Applications

- Dual camera applications for cell phones
- Dual LCD applications for cell phones, digital camera displays and viewfinders

### 4. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
NX3DV642GU	-40 °C to +85 °C	XQFN24	plastic, extremely thin quad flat package; no leads; 24 terminals; body 2.5 x 3.4 x 0.5 mm	SOT1310-1



## 5. Marking

Table 2. Marking

Type number	Marking code
NX3DV642GU	3DV642

## 6. Functional diagram

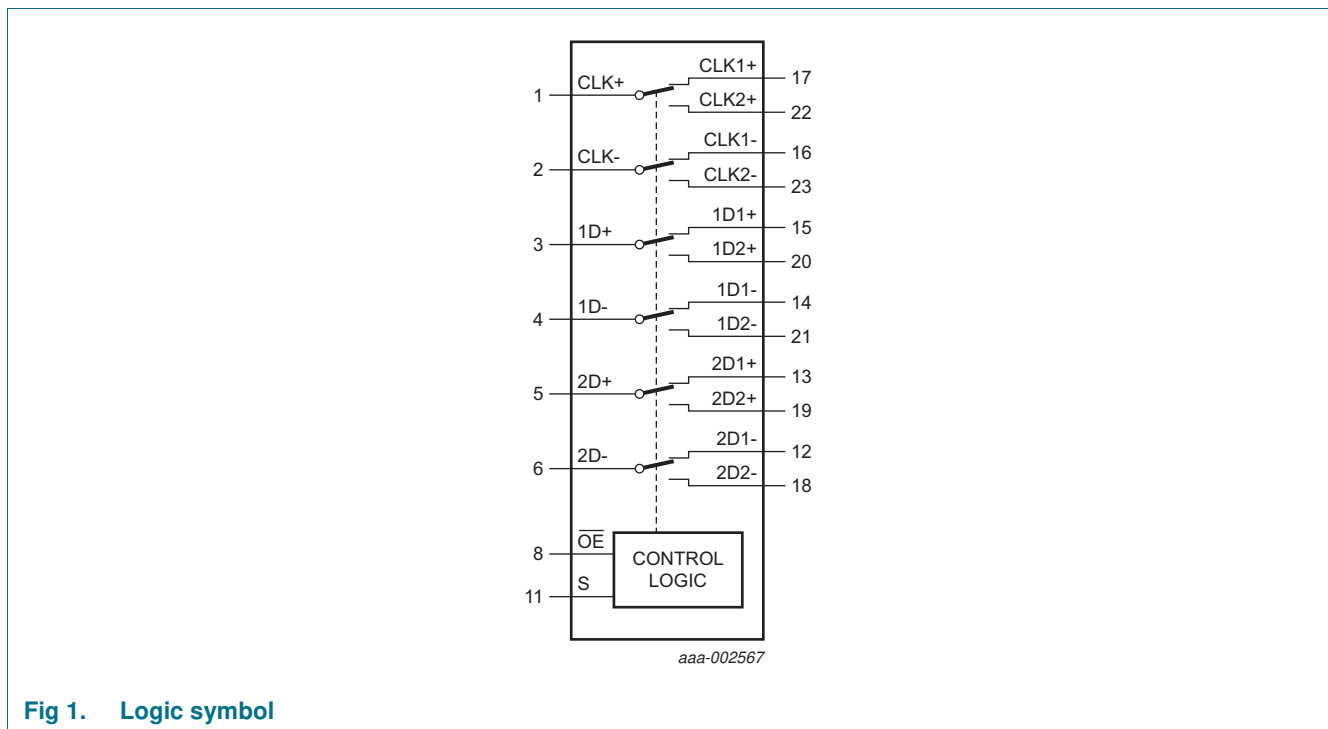


Fig 1. Logic symbol

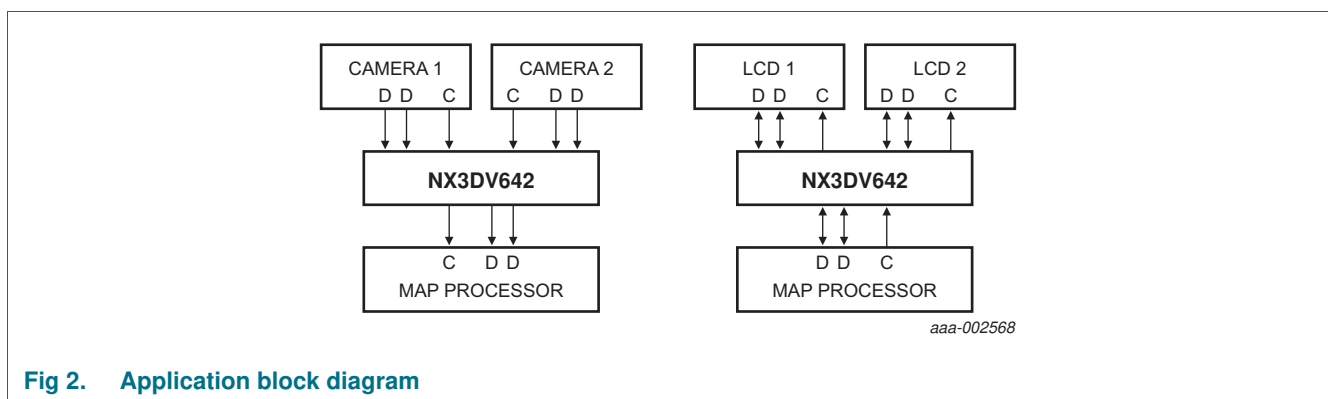
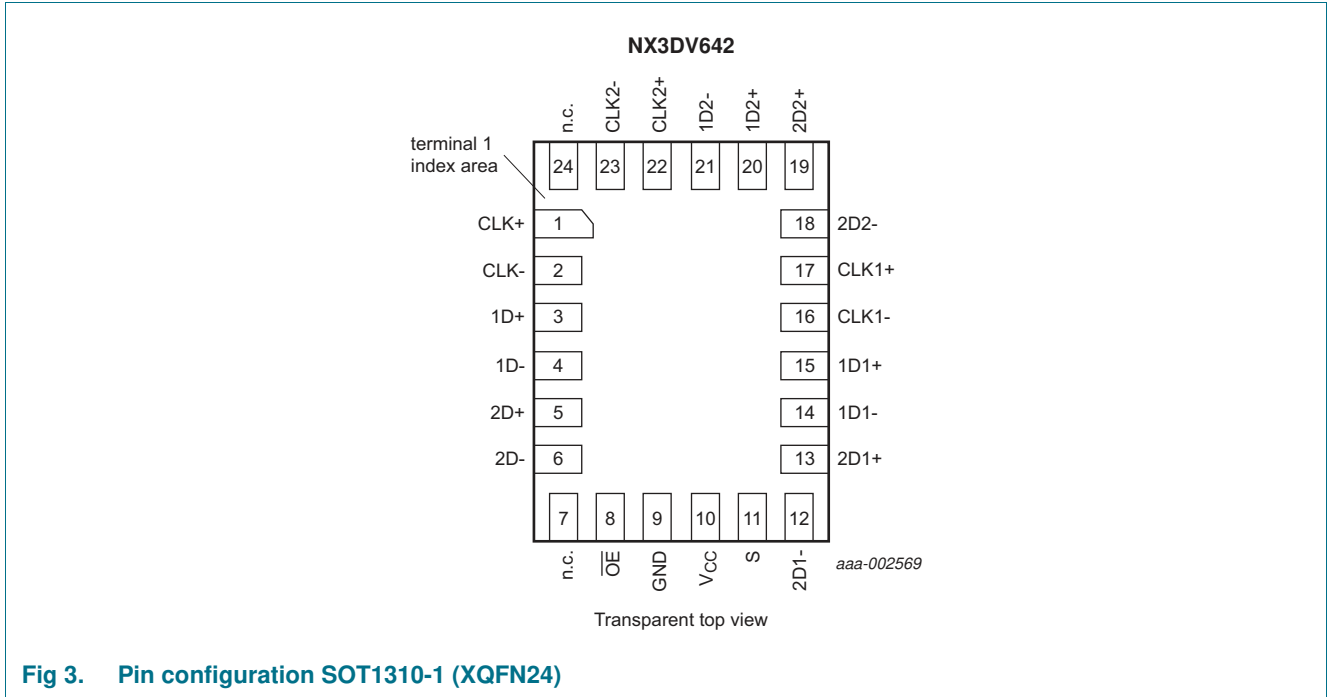


Fig 2. Application block diagram

## 7. Pinning information

### 7.1 Pinning



**Fig 3. Pin configuration SOT1310-1 (XQFN24)**

### 7.2 Pin description

**Table 3. Pin description**

Symbol	Pin	Description
CLK+, CLK-	1, 2	common output or input clock path
1D+, 1D-	3, 4	common output or input data path 1D
2D+, 2D-	5, 6	common output or input data path 2D
n.c.	7, 24	not connected
OE	8	output enable input (active LOW)
GND	9	ground (0 V)
V <sub>CC</sub>	10	supply voltage
S	11	select input
2D1+, 2D1-	13, 12	independent input or output data path 2D1
1D1+, 1D1-	15, 14	independent input or output data path 1D1
CLK1+, CLK1-	17, 16	independent input or output clock path CLK1
2D2+, 2D2-	19, 18	independent input or output data path 2D2
1D2+, 1D2-	20, 21	independent input or output data path 1D2
CLK2+, CLK2-	22, 23	independent input or output clock path CLK2

## 8. Functional description

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

Input		Channel on
S	$\overline{\text{OE}}$	
L	L	CLKn, 1Dn, 2Dn = CLK1n, 1D1n, 2D1n
H	L	CLKn, 1Dn, 2Dn = CLK2n, 1D2n, 2D2n
X	H	switch off

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care. (n = + or -)

## 9. 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	+5.5	V
$V_I$	input voltage	pins S and $\overline{\text{OE}}$	<sup>[1]</sup> -0.5	+5.5	V
$V_{SW}$	switch voltage		-0.5	+5.5	V
$I_{IK}$	input clamping current	$V_I < -0.5$ V	-50	-	mA
$I_{SK}$	switch clamping current	$V_I < -0.5$ V	-50	+50	mA
$I_{SW}$	switch current		-100	+100	mA
$I_{CC}$	supply current		-	+50	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40$ °C to +85 °C	-	533	mW

[1] The minimum input voltage rating may be exceeded if the input current rating is observed.

## 10. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		2.65	4.3	V
$V_I$	input voltage	pins S and $\overline{\text{OE}}$	0	4.3	V
$V_{SW}$	switch voltage		<sup>[1]</sup> 0	4.5	V
$T_{amb}$	ambient temperature		-40	+85	°C

[1] To avoid sinking GND current from terminals CLKn, 1Dn and 2Dn when switch current flows in terminals CLK1n, CLK2n, 1D1n 1D2n, 2D1n and 2D2n (n = + or -), the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminals CLKn, 1Dn and 2Dn, no GND current flows from terminals CLK1n, CLK2n, 1D1n 1D2n, 2D1n and 2D2n. In this case, there is no limit for the voltage drop across the switch.

## 11. Static characteristics

**Table 7. Static characteristics**

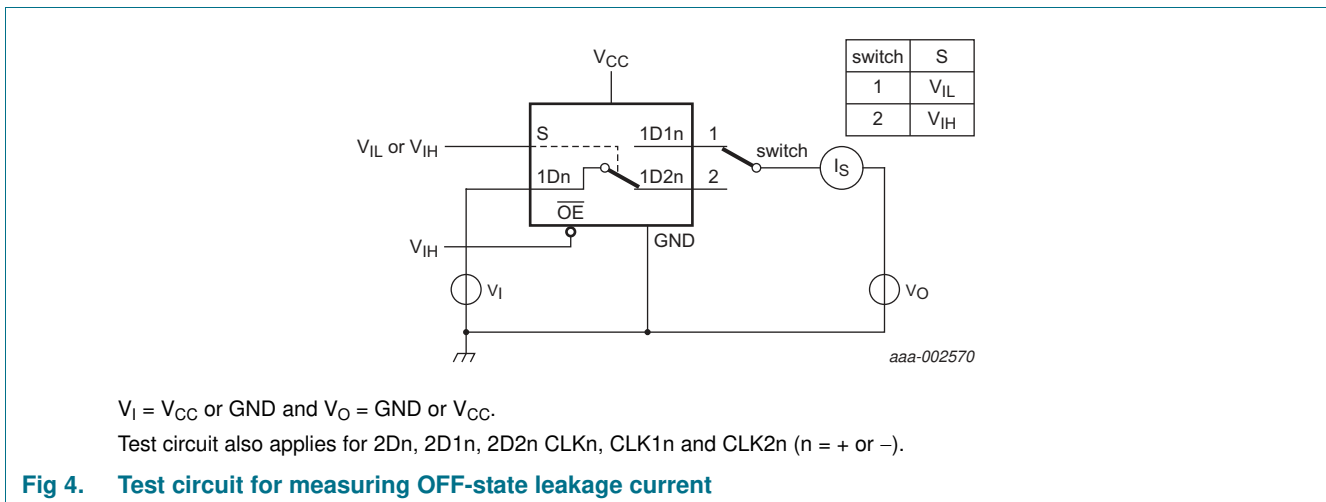
At recommended operating conditions; voltages are referenced to GND (ground 0 V).

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.65 V to 2.775 V	1.3	-	-	V
		V <sub>CC</sub> = 4.3 V	1.7	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.65 V to 2.775 V	-	-	0.5	V
		V <sub>CC</sub> = 4.3 V	-	-	0.7	V
V <sub>IK</sub>	input clamping voltage	V <sub>CC</sub> = 2.775 V; I <sub>I</sub> = -18 mA	-1.2	-	-	V
I <sub>I</sub>	input leakage current	pins S and $\overline{OE}$ ; V <sub>I</sub> = GND to 4.3 V; V <sub>CC</sub> = 4.3 V	-	-	±1	μA
I <sub>S(OFF)</sub>	OFF-state leakage current	V <sub>CC</sub> = 4.3 V; see <a href="#">Figure 4</a>	-	-	±2	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 4.3 V; V <sub>CC</sub> = 0 V	-	-	±2	μA
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> = 4.3 V	-	-	2	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>I</sub> = 1.8 V; V <sub>SW</sub> = GND or V <sub>CC</sub> ; V <sub>CC</sub> = 2.775 V	-	-	1.5	μA
C <sub>I</sub>	input capacitance	pins S and OE	-	1.3	-	pF
C <sub>S(OFF)</sub>	OFF-state capacitance	pins CLK1n, CLK2n, 1D1n 1D2n, 2D1n and 2D2n; V <sub>I</sub> = 0 V to 3.3 V	<sup>[2]</sup>	3.0	-	pF
C <sub>S(ON)</sub>	ON-state capacitance	pins CLKn, 1Dn and 2Dn; V <sub>I</sub> = 0 V to 3.3 V	<sup>[2]</sup>	8.4	-	pF

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 2.775 V.

[2] n = + or -.

### 11.1 Test circuits



### 11.2 ON resistance

**Table 8. ON resistance**

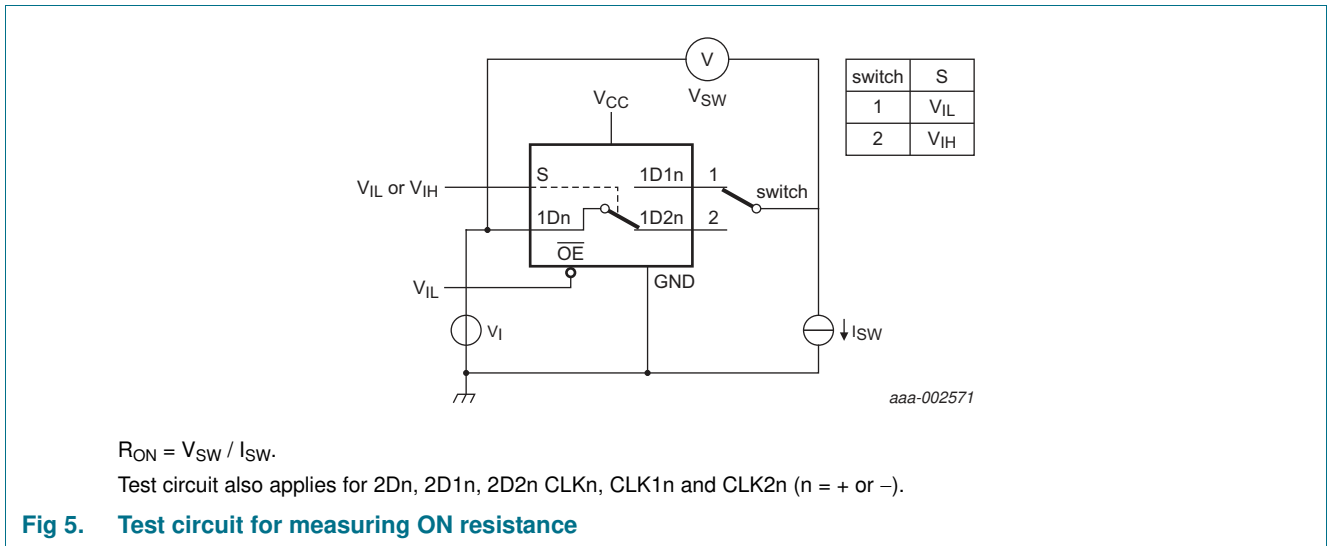
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	
<b>low speed mode</b>						
R <sub>ON</sub>	ON resistance	V <sub>I</sub> = 1.2 V; I <sub>SW</sub> = 10 mA; see <a href="#">Figure 5</a> V <sub>CC</sub> = 2.65 V	-	7.5	14	Ω
ΔR <sub>ON</sub>	ON resistance mismatch between channels	V <sub>I</sub> = 1.2 V; I <sub>SW</sub> = 10 mA V <sub>CC</sub> = 2.65 V	-	0.65	-	Ω
<b>High speed mode</b>						
R <sub>ON</sub>	ON resistance	V <sub>I</sub> = 0.1 V; I <sub>SW</sub> = 10 mA; see <a href="#">Figure 5</a> V <sub>CC</sub> = 2.65 V	-	5.5	9.5	Ω
ΔR <sub>ON</sub>	ON resistance mismatch between channels	V <sub>I</sub> = 0.1 V; I <sub>SW</sub> = 10 mA V <sub>CC</sub> = 2.65 V	-	0.65	-	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.

### 11.3 ON resistance test circuit and graphs



## 12. Dynamic characteristics

**Table 9. Dynamic characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for load circuit see [Figure 9](#).

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	
t <sub>pd</sub>	propagation delay	CLK <sub>n</sub> to CLK1 <sub>n</sub> or CLK2 <sub>n</sub> ; 1D <sub>n</sub> to 1D1 <sub>n</sub> or 1D2 <sub>n</sub> or 2D <sub>n</sub> to 2D1 <sub>n</sub> or 2D2 <sub>n</sub> ; see <a href="#">Figure 6</a> <sup>[2][3][4]</sup> V <sub>CC</sub> = 2.775 V	-	0.25	-	ns
t <sub>en</sub>	enable time	S or $\overline{OE}$ to CLK <sub>n</sub> , 1D <sub>n</sub> or 2D <sub>n</sub> ; see <a href="#">Figure 7</a> <sup>[2][3]</sup> V <sub>CC</sub> = 2.65 V to 2.775 V	-	13.5	37	ns
t <sub>dis</sub>	disable time	S or $\overline{OE}$ to CLK <sub>n</sub> , 1D <sub>n</sub> or 2D <sub>n</sub> ; see <a href="#">Figure 7</a> <sup>[2][3]</sup> V <sub>CC</sub> = 2.65 V to 2.775 V	-	5.5	27	ns
t <sub>b-m</sub>	break-before-make time	see <a href="#">Figure 8</a> <sup>[4]</sup> V <sub>CC</sub> = 2.65 V to 2.775 V	3	7	-	ns
t <sub>sk(p)</sub>	pulse skew time	V <sub>CC</sub> = 2.65 V to 2.775 V; V <sub>SW</sub> = 0.2 V (p-p) <sup>[4]</sup>	-	10	-	ps
t <sub>sk(o)</sub>	output skew time	V <sub>CC</sub> = 2.65 V to 2.775 V; V <sub>SW</sub> = 0.2 V (p-p) <sup>[4]</sup>	-	15	-	ps
t <sub>sk(pr)</sub>	process skew time	V <sub>CC</sub> = 2.65 V to 2.775 V; V <sub>SW</sub> = 0.2 V (p-p) <sup>[4]</sup>	-	40	-	ps

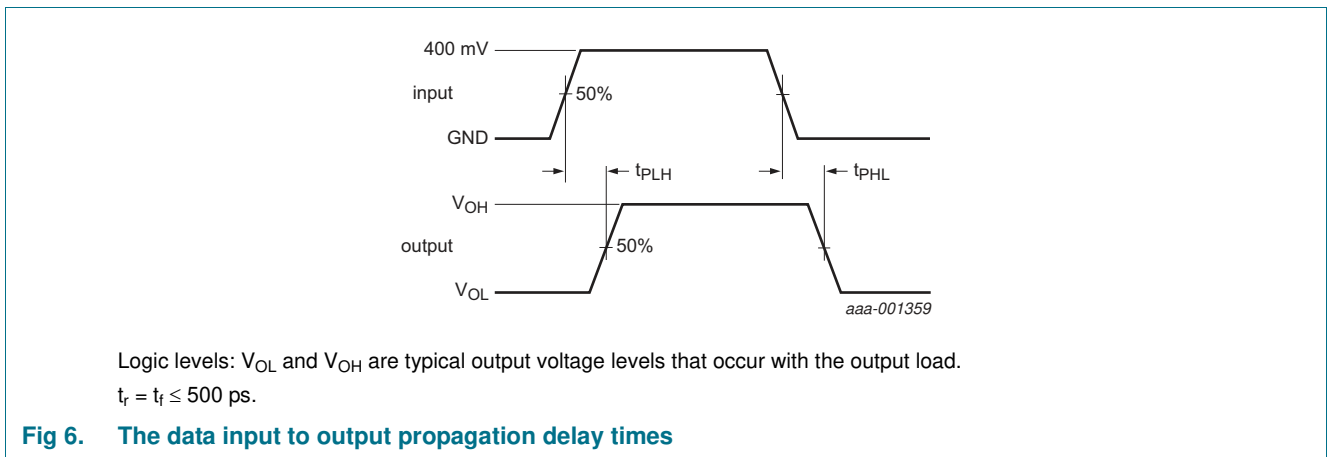
[1] Typical values are measured at T<sub>amb</sub> = 25 °C, C<sub>L</sub> = 5 pF and V<sub>CC</sub> = 2.775 V.

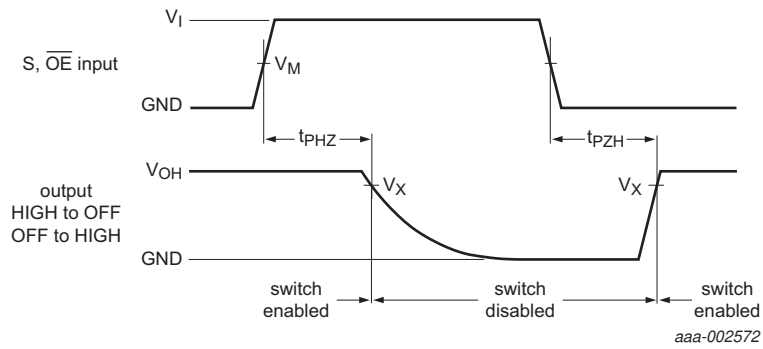
[2] n = + or -.

[3] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.  
t<sub>en</sub> is the same as t<sub>PZH</sub>  
t<sub>dis</sub> is the same as t<sub>PHZ</sub>

[4] Guaranteed by design.

### 12.1 Waveform and test circuits





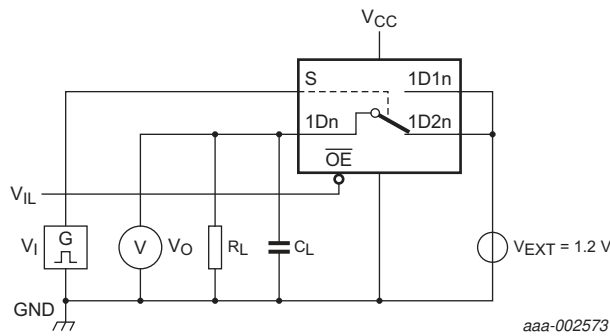
Measurement points are given in [Table 10](#).

Logic level:  $V_{OH}$  and  $V_{OL}$  are typical output voltage levels that occur with the output load.

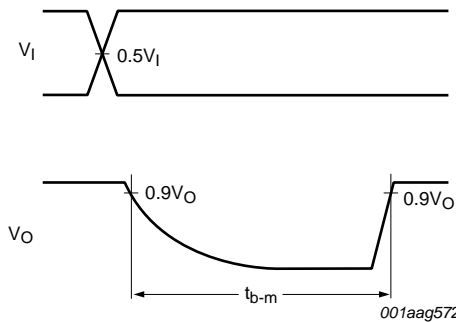
**Fig 7. Enable and disable times**

**Table 10. Measurement points**

Supply voltage	Input		Output
$V_{CC}$	$V_M$	$V_I$	$V_X$
2.65 V to 2.775 V	$0.5V_{CC}$	$V_{CC}$	$0.9V_{OH}$



a. Test circuit.

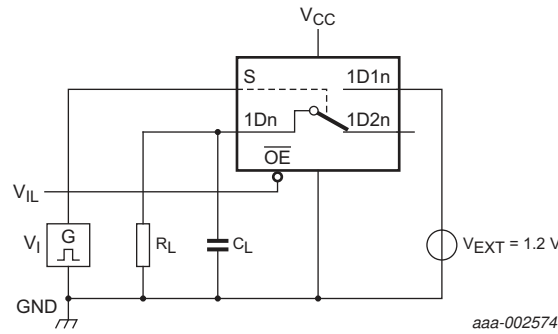


b. Input and output measurement points

Test circuit also applies for 2Dn, 2D1n, 2D2n CLKn, CLK1n and CLK2n (n = + or -).

**Fig 8. Test circuit for measuring break-before-make timing**





Test circuit also applies for 2Dn, 2D1n, 2D2n CLKn, CLK1n and CLK2n (n = + or -).

Test data is given in [Table 11](#).

Definitions test circuit:

$R_T$  = Termination resistance (should be equal to output impedance  $Z_o$  of the pulse generator).

$R_L$  = Load resistance.

$C_L$  = Load capacitance including jig and probe capacitance.

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

$V_I$  may be connected to S or  $\overline{OE}$ .

**Fig 9. Test circuit for measuring switching times**

**Table 11. Test data**

Supply voltage	Input		Load	
$V_{CC}$	$V_I$	$t_r, t_f$	$C_L$	$R_L$
2.65 V to 2.775 V	$V_{CC}$	$\leq 2.5$ ns	5 pF	50 $\Omega$

## 12.2 Additional dynamic characteristics

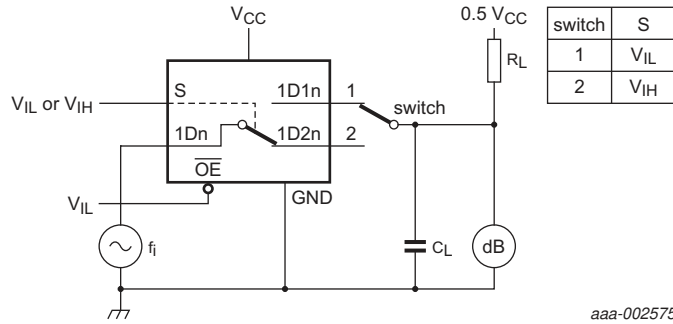
**Table 12. Additional dynamic characteristics**

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

Symbol	Parameter	Conditions	$T_{amb} = 25$ °C			Unit
			Min	Typ	Max	
$f_{(-3dB)}$	-3 dB frequency response	$R_L = 50 \Omega$ ; see <a href="#">Figure 10</a> $C_L = 0$ pF; $V_{CC} = 2.775$ V	-	950	-	MHz
$\alpha_{iso}$	isolation (OFF-state)	$f_i = 100$ MHz; $R_L = 50 \Omega$ ; see <a href="#">Figure 11</a> $V_{CC} = 2.775$ V	-	-35	-	dB
Xtalk	crosstalk	between switches; $f_i = 100$ MHz; $R_L = 50 \Omega$ ; see <a href="#">Figure 12</a> $V_{CC} = 2.775$ V	-	-55	-	dB

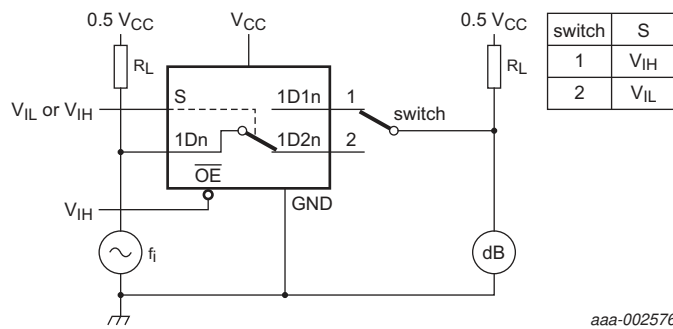
[1]  $f_i$  is biased at  $0.5V_{CC}$ .

12.3 Test circuits



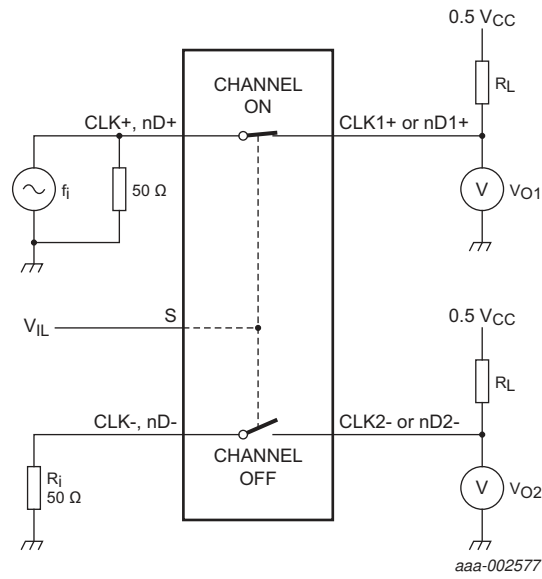
Adjust  $f_i$  voltage to obtain 0 dBm level at output. Increase  $f_i$  frequency until dB meter reads -3 dB.  
 Test circuit also applies for 2Dn, 2D1n, 2D2n CLKn, CLK1n and CLK2n (n = + or -).

**Fig 10. Test circuit for measuring the frequency response when channel is in ON-state**



Adjust  $f_i$  voltage to obtain 0 dBm level at input.  
 Test circuit also applies for 2Dn, 2D1n, 2D2n CLKn, CLK1n and CLK2n (n = + or -).

**Fig 11. Test circuit for measuring isolation (OFF-state)**



$20 \log_{10} (V_{O2} / V_{O1})$  or  $20 \log_{10} (V_{O1} / V_{O2})$ .

**Fig 12. Test circuit for measuring crosstalk between switches**

13. Package outline

XQFN24: plastic, extremely thin quad flat package; no leads; 24 terminals; body 2.5 x 3.4 x 0.5 mm

SOT1310-1

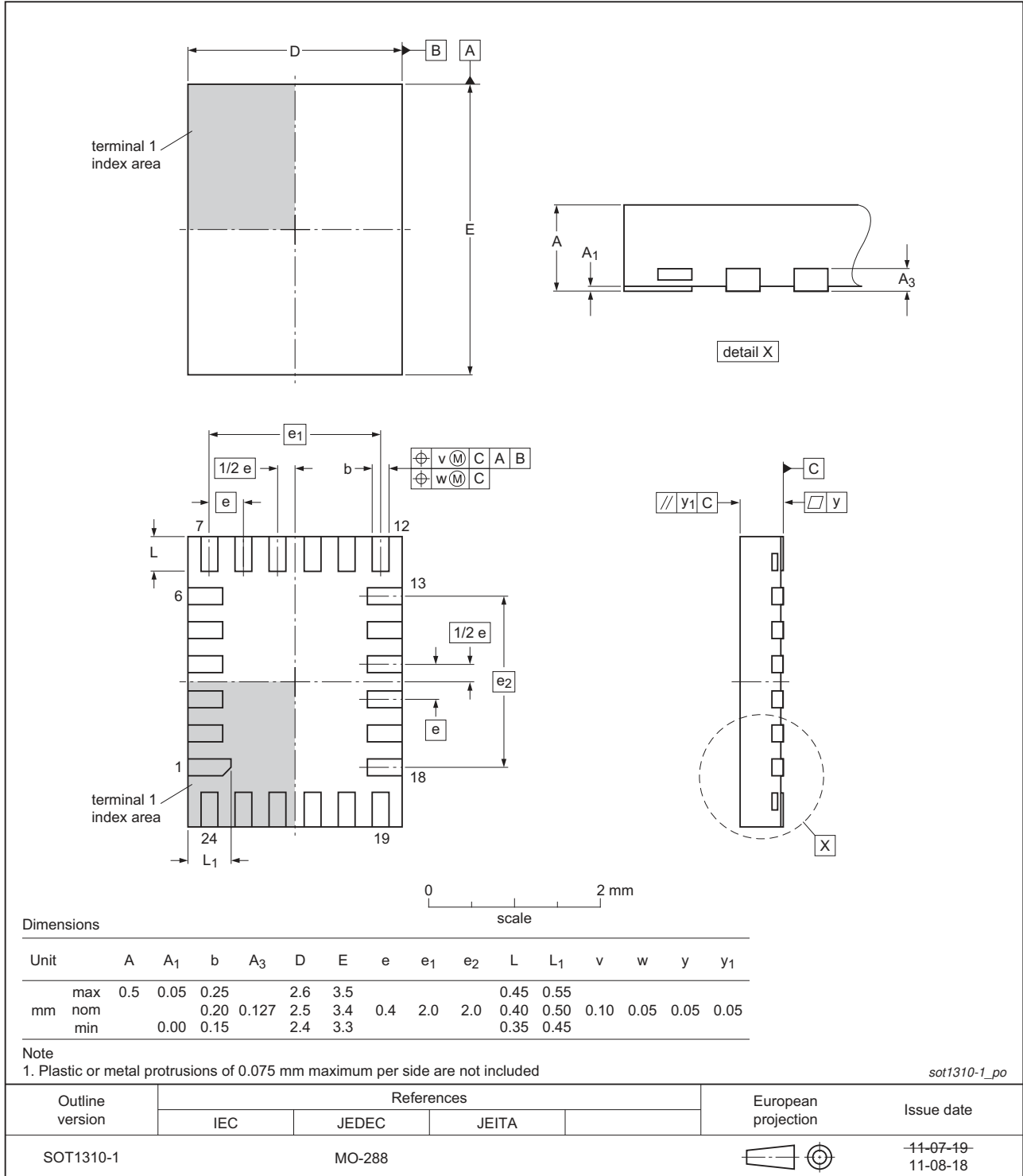


Fig 13. Package outline SOT1310-1 (XQFN24)

## 14. 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
TTL	Transistor-Transistor Logic

## 15. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
NX3DV642 v.1	20120820	Product data sheet	-	-

## 16. Legal information

### 16.1 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.
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