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NX3L2T66

Dual low-ohmic single-pole single-throw analog switch

Rev. 7 — 8 February 2013

Product data sheet

1. General description

The NX3L2T66 is a dual low-ohmic single-pole single-throw analog switch. Each switch has two input/output terminals (nY and nZ) and an active HIGH enable input (nE). When pin nE is LOW, the analog switch is turned off.

Schmitt trigger action at the enable input (nE) makes the circuit tolerant to slower input rise and fall times. A low input voltage threshold allows pin nE to be driven by lower level logic signals without a significant increase in supply current I_{CC} . This makes it possible for the NX3L2T66 to switch 4.3 V signals with a 1.8 V digital controller, eliminating the need for logic level translation.

The NX3L2T66 allows signals with amplitude up to V_{CC} to be transmitted from nY to nZ; or from nZ to nY. Its low ON resistance (0.5 Ω) and flatness (0.13 Ω) ensures minimal attenuation and distortion of transmitted signals.

2. Features and benefits

- Wide supply voltage range from 1.4 V to 4.3 V
- Very low ON resistance (peak):
 - 1.6 Ω (typical) at $V_{CC} = 1.4 \text{ V}$
 - 1.0 Ω (typical) at $V_{CC} = 1.65 \text{ V}$
 - 0.55 Ω (typical) at $V_{CC} = 2.3 \text{ V}$
 - 0.50 Ω (typical) at V_{CC} = 2.7 V
 - 0.50 Ω (typical) at $V_{CC} = 4.3 \text{ V}$
- High noise immunity
- ESD protection:
 - ◆ HBM JESD22-A114F Class 3A exceeds 7500 V
 - MM JESD22-A115-A exceeds 200 V
 - CDM AEC-Q100-011 revision B exceeds 1000 V
 - ◆ IEC61000-4-2 contact discharge exceeds 4000 V for switch ports
- CMOS low-power consumption
- Latch-up performance exceeds 100 mA per JESD 78 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



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3. Applications

- Cell phone
- PDA
- Portable media player

4. Ordering information

Table 1. Ordering information

Type number	Package	Package								
	Temperature range	Name	Description	Version						
NX3L2T66GT	–40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 \times 1.95 \times 0.5 mm	SOT833-1						
NX3L2T66GD	–40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 3 \times 2 \times 0.5 mm	SOT996-2						
NX3L2T66GM	–40 °C to +125 °C	XQFN8	plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 \times 1.6 \times 0.5 mm	SOT902-2						

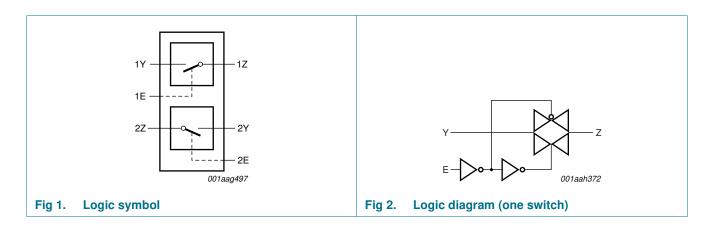
5. Marking

Table 2. Marking codes[1]

Type number	Marking code
NX3L2T66GT	DOO
NX3L2T66GD	DOO
NX3L2T66GM	D00

^[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

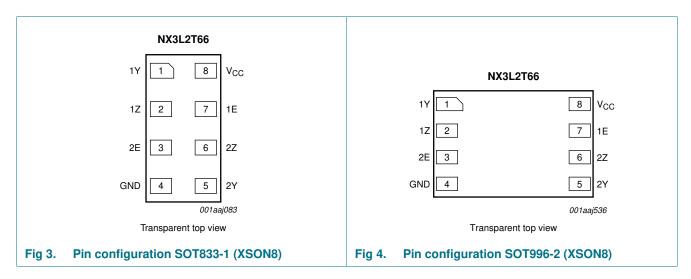
6. Functional diagram

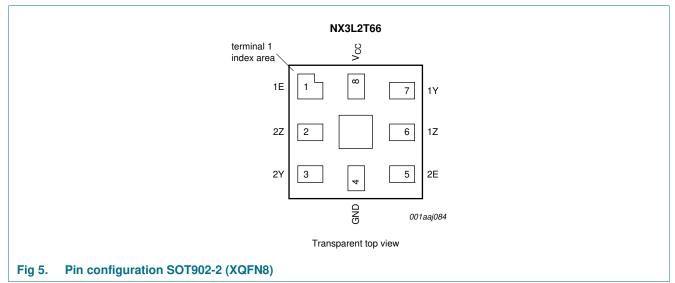


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7. Pinning information

7.1 Pinning





7.2 Pin description

Table 3. Pin description

Symbol	Pin		Description				
	SOT833-1 and SOT996-2 SOT902-2						
1Y, 2Y	1, 5	7, 3	independent input or output				
1Z, 2Z	2, 6	6, 2	independent input or output				
GND	4	4	ground (0 V)				
1E, 2E	7, 3	1, 5	enable input (active HIGH)				
V_{CC}	8	8	supply voltage				

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8. Functional description

Table 4. Function table[1]

Input nE	Switch
L	OFF-state
Н	ON-state

^[1] H = HIGH voltage level;

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	+4.6	V
V _I	input voltage	enable input nE	<u>[1]</u> –0.5	+4.6	V
V _{SW}	switch voltage		[<u>2</u>] –0.5	$V_{CC} + 0.5$	V
I _{IK}	input clamping current	$V_1 < -0.5 \text{ V}$	-50	-	mA
I _{SK}	switch clamping current	$V_I < -0.5 \text{ V or } V_I > V_{CC} + 0.5 \text{ V}$	-	±50	mA
I_{SW}	switch current	$V_{SW} > -0.5 \text{ V or } V_{SW} < V_{CC} + 0.5 \text{ V};$ source or sink current	-	±350	mA
		$V_{SW} > -0.5$ V or $V_{SW} < V_{CC} + 0.5$ V; pulsed at 1 ms duration, < 10 % duty cycle; peak current	-	±500	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	[3] _	250	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	Тур	Max	Unit
V_{CC}	supply voltage		1.4	-	4.3	V
VI	input voltage	enable input nE	0	-	4.3	V
V_{SW}	switch voltage		<u>[1]</u> 0	-	V_{CC}	V
T _{amb}	ambient temperature		-40	-	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$	[2] -	-	200	ns/V

^[1] To avoid sinking GND current from terminal nZ when switch current flows in terminal nY, 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 nY. In this case, there is no limit for the voltage drop across the switch.

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L = LOW voltage level.

^[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 XSON8 and XQFN8 packages: above 118 °C the value of Ptot derates linearly with 7.8 mW/K.

^[2] Applies to control signal levels.

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11. Static characteristics

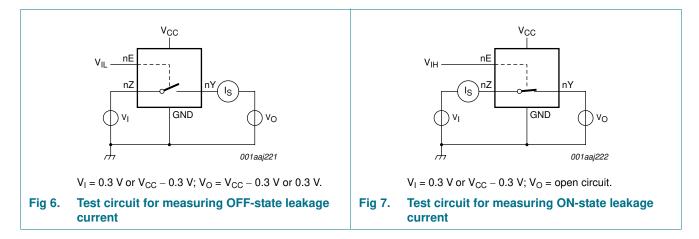
Table 7. Static characteristics

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

Symbol	Parameter	Conditions	T _{amb} = 25 °C		°C	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$			Unit
			Min	Тур	Max	Min	Max (85 °C)	Max (125 °C)	
V_{IH}	HIGH-level	$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	0.9	-	-	0.9	-	-	٧
	input voltage	V _{CC} = 1.65 V to 1.95 V	0.9	-	-	0.9	-	-	V
		V _{CC} = 2.3 V to 2.7 V	1.1	-	-	1.1	-	-	V
		V _{CC} = 2.7 V to 3.6 V	1.3	-	-	1.3	-	-	V
		V _{CC} = 3.6 V to 4.3 V	1.4	-	-	1.4	-	-	V
V_{IL}	LOW-level	V _{CC} = 1.4 V to 1.6 V	-	-	0.3	-	0.3	0.3	V
	input voltage	V _{CC} = 1.65 V to 1.95 V	-	-	0.4	-	0.4	0.3	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.4	-	0.4	0.4	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.5	-	0.5	0.5	V
		V _{CC} = 3.6 V to 4.3 V	-	-	0.6	-	0.6	0.6	V
I _I	input leakage current	enable input nE; $V_I = GND \text{ to } 4.3 \text{ V};$ $V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$	-	-	-	-	±0.5	±1	μΑ
I _{S(OFF)} OFF-state leakage current	nY port; see Figure 6								
		$V_{CC} = 1.4 \text{ V to } 3.6 \text{ V}$	-	-	±5	-	±50	±500	nA
	current	$V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$	-	-	±10	-	±50	±500	nA
I _{S(ON)}	ON-state	nZ port; see Figure 7							
	leakage	$V_{CC} = 1.4 \text{ V to } 3.6 \text{ V}$	-	-	±5	-	±50	±500	nA
	current	$V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$	-	-	±10	-	±50	±500	nΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $V_{SW} = GND$ or V_{CC}							
		V _{CC} = 3.6 V	-	-	100	-	690	6000	nΑ
		V _{CC} = 4.3 V	-	-	150	-	800	7000	nΑ
ΔI_{CC}	additional	$V_{SW} = GND \text{ or } V_{CC}$							
	supply current	$V_1 = 2.6 \text{ V}; V_{CC} = 4.3 \text{ V}$	-	2.0	4.0	-	7	7	μΑ
		$V_1 = 2.6 \text{ V}; V_{CC} = 3.6 \text{ V}$	-	0.35	0.7	-	1	1	μΑ
		$V_{I} = 1.8 \text{ V}; V_{CC} = 4.3 \text{ V}$	-	7.0	10.0	-	15	15	μΑ
		$V_{I} = 1.8 \text{ V}; V_{CC} = 3.6 \text{ V}$	-	2.5	4.0	-	5	5	μΑ
		$V_{I} = 1.8 \text{ V}; V_{CC} = 2.5 \text{ V}$	-	50	200	-	300	500	nA
C _I	input capacitance		-	1.0	-	-	-	-	pF
C _{S(OFF)}	OFF-state capacitance		-	35	-	-	-	-	pF
C _{S(ON)}	ON-state capacitance		-	110	-	-	-	-	pF

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11.1 Test circuits



11.2 ON resistance

Table 8. ON resistance

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see Figure 9 to Figure 15.

Symbol	Parameter	Conditions		T _{amb} :	= −40 °C °C	to +85		-40 °C to 5 °C	Unit
			N		Typ[1]	Max	Min	Max	
R _{ON(peak)} ON resistance (peak		V_I = GND to V_{CC} ; I_{SW} = 100 mA; see <u>Figure 8</u>							'
		$V_{CC} = 1.4 \text{ V}$		-	1.6	3.7	-	4.1	Ω
		V _{CC} = 1.65 V		-	1.0	1.6	-	1.7	Ω
		$V_{CC} = 2.3 \text{ V}$		-	0.55	0.8	-	0.9	Ω
		$V_{CC} = 2.7 \text{ V}$		-	0.5	0.75	-	0.9	Ω
		$V_{CC} = 4.3 \text{ V}$		-	0.5	0.75	-	0.9	Ω
ΔR_{ON}	ON resistance mismatch between channels	$V_I = GND \text{ to } V_{CC};$ $I_{SW} = 100 \text{ mA}$	[2]						
		$V_{CC} = 1.4 \text{ V}$		-	0.04	0.3	-	0.3	Ω
		$V_{CC} = 1.65 \text{ V}$		-	0.04	0.2	-	0.3	Ω
		$V_{CC} = 2.3 \text{ V}$		-	0.02	0.08	-	0.1	Ω
		$V_{CC} = 2.7 \text{ V}$		-	0.02	0.075	-	0.1	Ω
		$V_{CC} = 4.3 \text{ V}$		-	0.02	0.075	-	0.1	Ω

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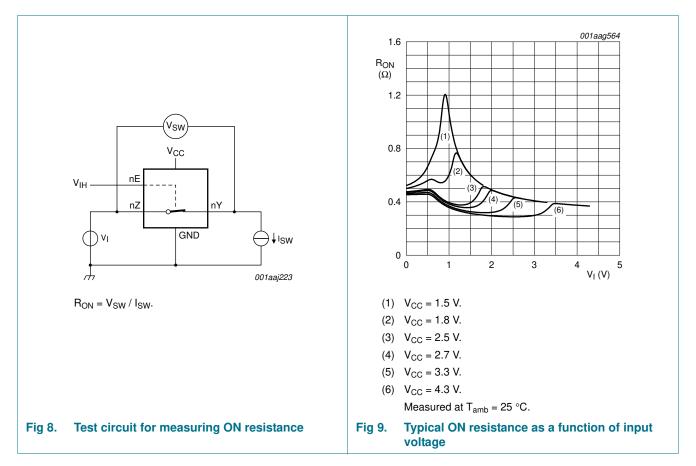
Table 8. ON resistance ... continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see Figure 9 to Figure 15.

Symbol	Parameter	Conditions T _{ar}		T _{amb} = -40 °C to +85 °C			T _{amb} = -40 °C to +125 °C		Unit
				Min	Typ[1]	Max	Min	Max	
$R_{ON(flat)}$	ON resistance (flatness)	$V_I = GND \text{ to } V_{CC};$ $I_{SW} = 100 \text{ mA}$	<u>[3]</u>						
		$V_{CC} = 1.4 \text{ V}$		-	1.0	3.3	-	3.6	Ω
		V _{CC} = 1.65 V		-	0.5	1.2	-	1.3	Ω
		$V_{CC} = 2.3 \text{ V}$		-	0.15	0.3	-	0.35	Ω
		$V_{CC} = 2.7 \text{ V}$		-	0.13	0.3	-	0.35	Ω
		$V_{CC} = 4.3 \text{ V}$		-	0.2	0.4	-	0.45	Ω

^[1] Typical values are measured at T_{amb} = 25 °C.

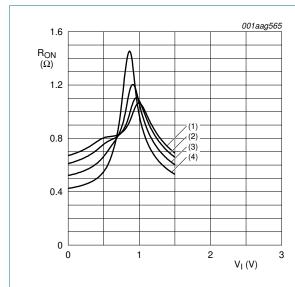
11.3 ON resistance test circuit and graphs



^[2] Measured at identical V_{CC} , temperature and input voltage.

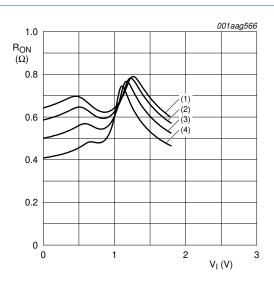
^[3] Flatness is defined as the difference between the maximum and minimum value of ON resistance measured at identical V_{CC} and temperature.

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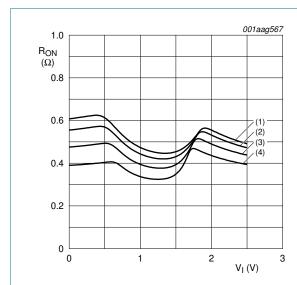
- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig 10. ON resistance as a function of input voltage; $V_{CC} = 1.5 \text{ V}$



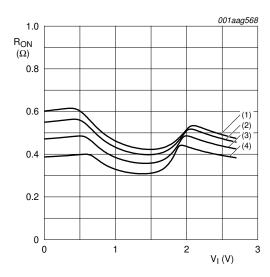
- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig 11. ON resistance as a function of input voltage; $V_{CC} = 1.8 \text{ V}$



- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

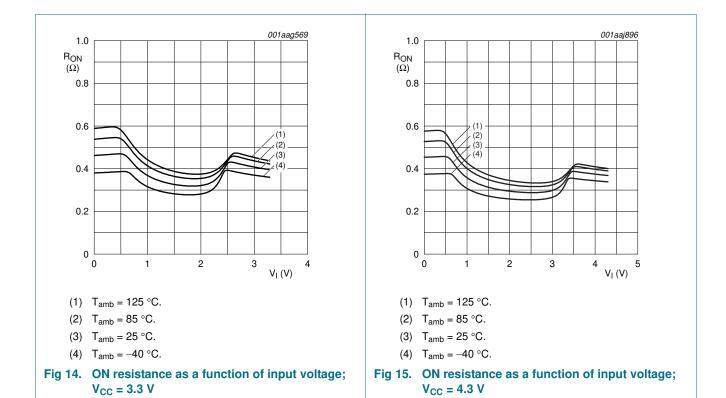
Fig 12. ON resistance as a function of input voltage; $V_{CC} = 2.5 \text{ V}$



- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig 13. ON resistance as a function of input voltage; $V_{CC} = 2.7 \text{ V}$

Dual low-ohmic single-pole single-throw analog switch



12. Dynamic characteristics

Table 9. Dynamic characteristics

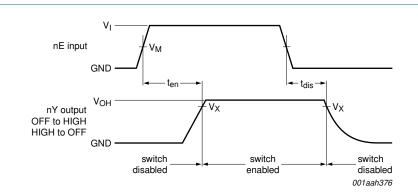
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for load circuit see Figure 17.

Symbol Parameter		Conditions	Ta	_{mb} = 25	°C	T _{amb} =	–40 °C to	+125 °C	Unit
			Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
t _{en}	enable time	nE to nZ or nY; see Figure 16	•		•				
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	-	35	49	-	53	57	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	-	28	40	-	43	48	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	-	20	30	-	32	35	ns
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	-	18	28	-	30	32	ns
		$V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$	-	18	28	-	30	32	ns
t _{dis}	disable time	nE to nZ or nY; see <u>Figure 16</u>							
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	-	32	70	-	80	90	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	-	23	55	-	60	65	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	-	14	25	-	30	35	ns
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	-	11	20	-	25	30	ns
		$V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$	-	11	20	-	25	30	ns

^[1] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 1.5 V, 1.8 V, 2.5 V, 3.3 V and 4.3 V respectively.

Dual low-ohmic single-pole single-throw analog switch

12.1 Waveform and test circuits



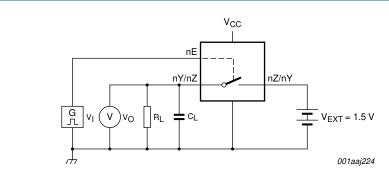
Measurement points are given in Table 10.

Logic level: V_{OH} is the typical output voltage level that occurs with the output load.

Fig 16. Enable and disable times

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}



Test data is given in Table 11.

Definitions test circuit:

 R_{l} = Load resistance.

 C_L = Load capacitance including jig and probe capacitance.

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

Fig 17. Test circuit for measuring switching times

Table 11. Test data

Supply voltage	Input		Load	
V _{CC}	VI	V _I t _r , t _f		R _L
1.4 V to 4.3 V	V_{CC}	≤ 2.5 ns	35 pF	50 Ω

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12.2 Additional dynamic characteristics

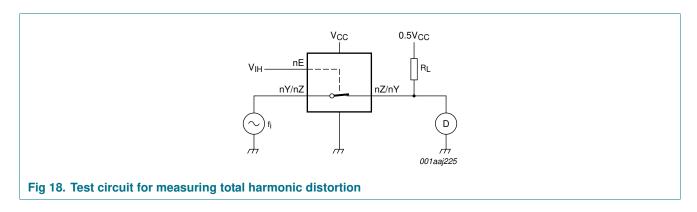
Table 12. Additional dynamic characteristics

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

Symbol	Parameter	Conditions	T _{amb} = 25 °C			Unit	
				Min	Тур	Max	
THD	total harmonic distortion	f_i = 20 Hz to 20 kHz; R_L = 32 Ω ; see Figure 18	[1]		•	'	
		$V_{CC} = 1.4 \text{ V}; V_I = 1 \text{ V (p-p)}$		-	0.15	-	%
		$V_{CC} = 1.65 \text{ V}; V_I = 1.2 \text{ V (p-p)}$		-	0.10	-	%
		$V_{CC} = 2.3 \text{ V}; V_I = 1.5 \text{ V (p-p)}$		-	0.02	-	%
		$V_{CC} = 2.7 \text{ V}; V_1 = 2 \text{ V (p-p)}$		-	0.02	-	%
		$V_{CC} = 4.3 \text{ V}; V_1 = 2 \text{ V (p-p)}$		-	0.02	-	%
f _(-3dB)	–3 dB frequency response	$R_L = 50 \Omega$; see Figure 19	[1]				
		V _{CC} = 1.4 V to 4.3 V		-	60	-	MHz
$lpha_{iso}$	isolation (OFF-state)	f_i = 100 kHz; R_L = 50 Ω ; see Figure 20	[1]				
		V _{CC} = 1.4 V to 4.3 V		-	-90	-	dB
V _{ct}	crosstalk voltage	between digital inputs and switch; $f_i = 1 \text{ MHz}$; $C_L = 50 \text{ pF}$; $R_L = 50 \Omega$; see Figure 21					
		$V_{CC} = 1.4 \text{ V to } 3.6 \text{ V}$		-	0.2	-	V
		V _{CC} = 3.6 V to 4.3 V		-	0.2	-	V
Xtalk	crosstalk	between switches; $f_i = 100 \text{ kHz}$; $R_L = 50 \Omega$; see Figure 22	[1]				
		V _{CC} = 1.4 V to 4.3 V		-	-90	-	dB
Q _{inj}	charge injection	f_i = 1 MHz; C_L = 0.1 nF; R_L = 1 M Ω ; V_{gen} = 0 V; R_{gen} = 0 Ω ; see Figure 23					
		V _{CC} = 1.5 V		-	3	-	рС
		V _{CC} = 1.8 V		-	3	-	рС
		V _{CC} = 2.5 V		-	3	-	рС
		V _{CC} = 3.3 V		-	3	-	рС
		V _{CC} = 4.3 V		-	6	-	рС

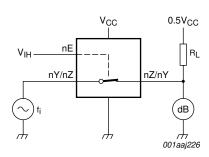
^[1] f_i is biased at $0.5V_{CC}$.

12.3 Test circuits



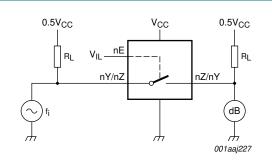
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Adjust f_i voltage to obtain 0 dBm level at output. Increase f_i frequency until dB meter reads -3 dB.

Fig 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.

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

Dual low-ohmic single-pole single-throw analog switch

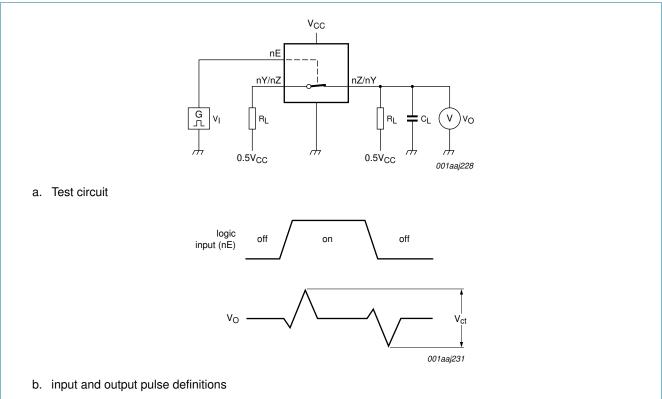
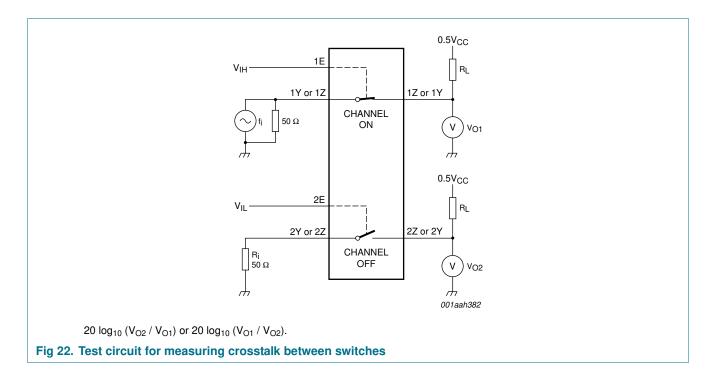
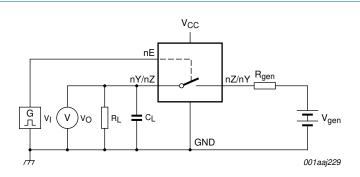


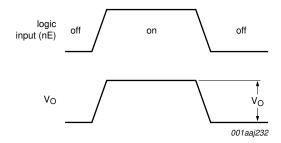
Fig 21. Test circuit for measuring crosstalk voltage between digital inputs and switch



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a. Test circuit



b. Input and output pulse definitions

Definition: $Q_{inj} = \Delta V_O \times C_L$.

 ΔV_{O} = output voltage variation.

R_{gen} = generator resistance.

 V_{gen} = generator voltage.

Fig 23. Test circuit for measuring charge injection

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XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm SOT833-1 е e₁ terminal 1 index area scale **DIMENSIONS** (mm are the original dimensions) A⁽¹⁾ max A₁ max UNIT Е b e₁ L_{1} 0.25 1.05 0.04 mm 0.6 0.5 0.17 0.95 Notes Including plating thickness. Can be visible in some manufacturing processes. REFERENCES OUTLINE **EUROPEAN** ISSUE DATE VERSION **JEDEC** IEC **JEITA** 07-11-14 - - -SOT833-1 - - -MO-252 07-12-07

Fig 24. Package outline SOT833-1 (XSON8)

13. Package outline

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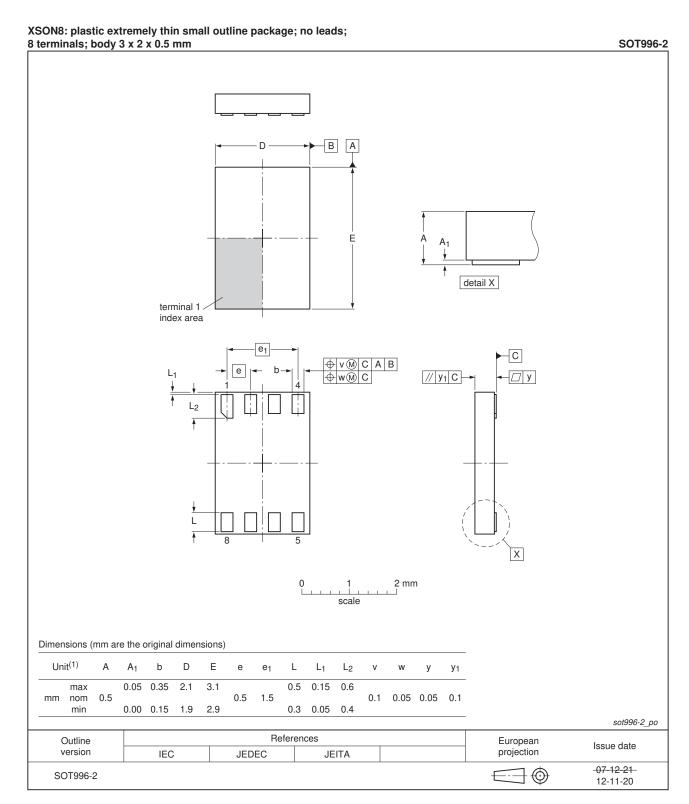


Fig 25. Package outline SOT996-2 (XSON8)

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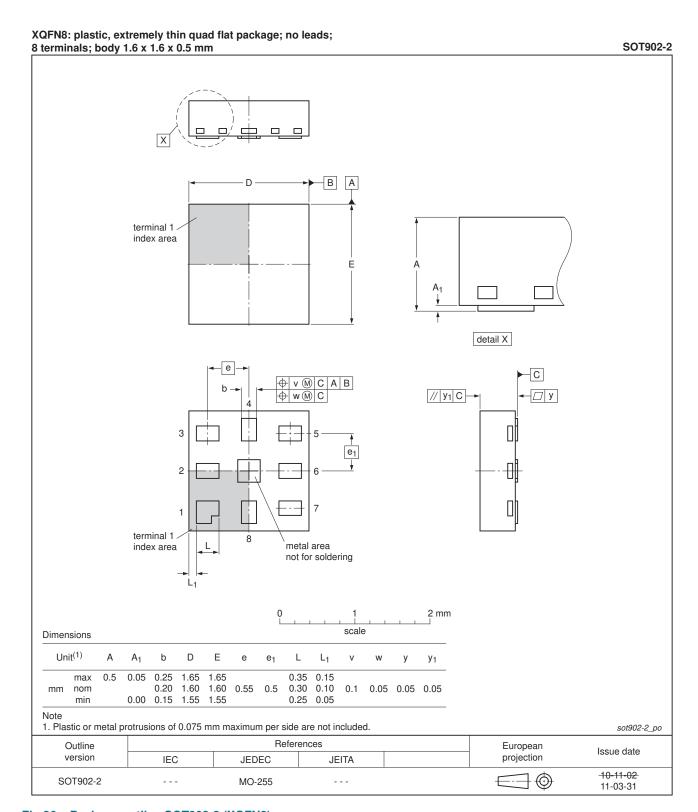


Fig 26. Package outline SOT902-2 (XQFN8)

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14. Abbreviations

Table 13. Abbreviations

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

15. Revision history

Table 14. Revision history

	•			
Document ID	Release date	Data sheet status	Change notice	Supersedes
NX3L2T66 v.7	20130208	Product data sheet	-	NX3L2T66 v.6
Modifications:	 For type nur 	mber NX3L2T66GD XSON	8U has changed to XSON	N8.
NX3L2T66 v.6	20120606	Product data sheet	-	NX3L2T66 v.5
NX3L2T66 v.5	20111107	Product data sheet	-	NX3L2T66 v.4
NX3L2T66 v.4	20101229	Product data sheet	-	NX3L2T66 v.3
NX3L2T66 v.3	20090828	Product data sheet	-	NX3L2T66 v.2
NX3L2T66 v.2	20090420	Product data sheet	-	NX3L2T66 v.1
NX3L2T66 v.1	20081204	Product data sheet	-	-

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16.1 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 URL http://www.nxp.com.

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