NX3L2267

Low-ohmic dual single-pole double-throw analog switch

Rev. 5 — 18 June 2012

Product data sheet

1. General description

The NX3L2267 is a dual low-ohmic single-pole double-throw analog switch suitable for use as an analog or digital 2:1 multiplexer/demultiplexer. Each switch has a digital select input (nS), two independent inputs/outputs (nY0 and nY1) and a common input/output (nZ).

Schmitt trigger action at the digital inputs makes the circuit tolerant to slower input rise and fall times. Low threshold digital inputs allows this device to be driven by 1.8 V logic levels in 3.3 V applications without significant increase in supply current I_{CC} . This makes it possible for the NX3L2267 to switch 4.3 V signals with a 1.8 V digital controller, eliminating the need for logic level translation. The NX3L2267 allows signals with amplitude up to V_{CC} to be transmitted from nZ to nY0 or nY1, or from nY0 or nY1 to nZ. 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):
 - 1.65 Ω (typical) at $V_{CC} = 1.4 \text{ V}$
 - 0.95 Ω (typical) at $V_{CC} = 1.65 \text{ V}$
 - 0.55 Ω (typical) at V_{CC} = 2.3 V
 - 0.50 Ω (typical) at V_{CC} = 2.7 V
 - 0.50 Ω (typical) at $V_{CC} = 4.3 \text{ V}$
- Break-before-make switching
- 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 6000 V for switch ports
- 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



Low-ohmic dual single-pole double-throw analog switch

3. Applications

- Cell phone
- PDA
- Portable media player

4. Ordering information

Table 1. Ordering information

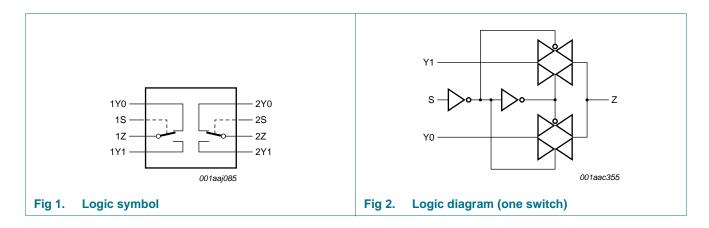
Type number	Package							
	Temperature range	Name	Description	Version				
NX3L2267GM	–40 °C to +125 °C	XQFN10	plastic extremely thin quad flatpackage; no leads; 10 terminals; body $2 \times 1.55 \times 0.5$ mm	SOT1049-3				
NX3L2267GU	–40 °C to +125 °C	XQFN10	plastic, extremely thin quad flat package; no leads; 10 terminals; body $1.40 \times 1.80 \times 0.50$ mm	SOT1160-1				

5. Marking

Table 2. Marking

Type number	Marking code
NX3L2267GM	M67
NX3L2267GU	M7

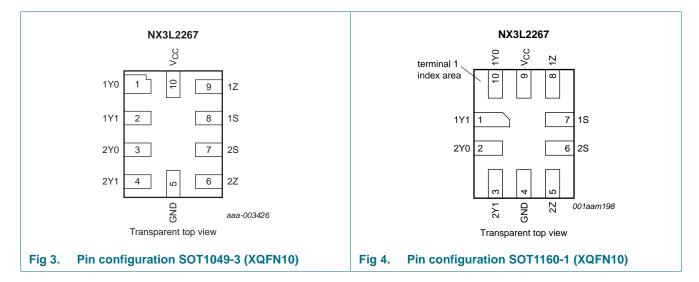
6. Functional diagram



Low-ohmic dual single-pole double-throw analog switch

7. Pinning information

7.1 Pinning



7.2 Pin description

Table 3. Pin description

Symbol	Pin		Description
	SOT1049-3	SOT1160-1	
1Y0	1	10	independent input or output
1Y1	2	1	independent input or output
2Y0	3	2	independent input or output
2Y1	4	3	independent input or output
GND	5	4	ground (0 V)
2Z	6	5	common output or input
2S	7	6	select input
1S	8	7	select input
1Z	9	8	common output or input
V _{CC}	10	9	supply voltage

Low-ohmic dual single-pole double-throw analog switch

8. Functional description

Table 4. Function table[1]

Input nS	Channel on
L	nY0 = nZ
Н	nY1 = nZ

^[1] H = HIGH voltage level; L = LOW 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
VI	input voltage	select input nS	<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	-	mΑ
I _{SK}	switch clamping current	$V_I < -0.5 \text{ V or } V_I > V_{CC} + 0.5 \text{ V}$	-	±50	mΑ
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][4]	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	Max	Unit
V_{CC}	supply voltage		1.4	4.3	V
V_{I}	input voltage	select input nS	0	4.3	V
V_{SW}	switch voltage	switch input nY0 or nY1	<u>[1]</u> 0	V_{CC}	V
T _{amb}	ambient temperature		-40	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 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.

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^[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 XQFN10 (SOT1049-3) package: above 132 °C the value of Ptot derates linearly with 14.1 mW/K.

^[4] For XQFN10 (SOT1160-1) package: above 128 °C the value of Ptot derates linearly with 11.5 mW/K.

^[2] Applies to select input nS signal levels.

Low-ohmic dual single-pole double-throw analog switch

11. Static characteristics

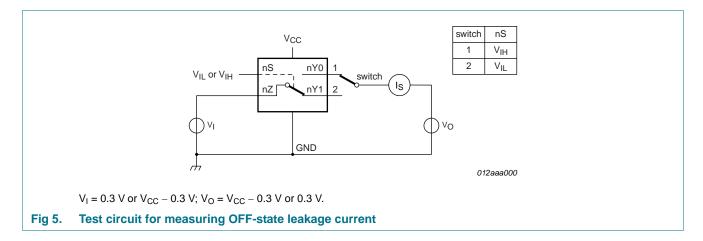
Table 7. Static characteristics

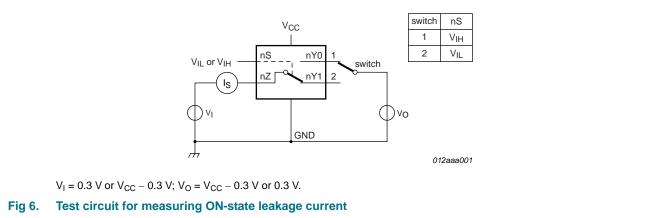
At recommended operating conditions; voltages are referenced to GND (ground 0 V).

Symbol	Parameter	Conditions	Ta	_{mb} = 25	°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 V to 1.6 V	0.9	-	-	0.9	-	-	V
	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	-	-	0.5	-	0.5	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
l _l	input leakage current	select input nS; V _I = GND to 4.3 V; V _{CC} = 1.4 V to 4.3 V	-	-	-	-	±0.5	±1	μΑ
I _{S(OFF)}	OFF-state	nYn port; see Figure 5							
leal	eakage	$V_{CC} = 1.4 \text{ V to } 3.6 \text{ V}$	-	-	±5	-	±10	±100	nA
	current	$V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$	-	-	±10	-	±50	±200	nΑ
I _{S(ON)}	ON-state	nZ port; see Figure 6							
	leakage	$V_{CC} = 1.4 \text{ V to } 3.6 \text{ V}$	-	-	±5	-	±20	±200	nΑ
	current	$V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$	-	-	±10	-	±50	±400	nΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $V_{SW} = GND$ or V_{CC}							
		V _{CC} = 3.6 V	-	-	100	-	300	3000	nΑ
		V _{CC} = 4.3 V	-	-	150	-	500	5000	nΑ
Δl _{CC}	additional	$V_{SW} = GND \text{ or } V_{CC}$							
	supply current	$V_{I} = 2.6 \text{ V}; V_{CC} = 4.3 \text{ V}$	-	2.0	4.0	-	7	7	μΑ
		$V_{I} = 2.6 \text{ V}; V_{CC} = 3.6 \text{ V}$	-	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	nΑ
Cı	input capacitance		-	1.0	-	-	-	-	pF
C _{S(OFF)}	OFF-state capacitance	port nYn	-	35	-	-	-	-	pF
C _{S(ON)}	ON-state capacitance	port nYn	-	135	-	-	-	-	pF

Low-ohmic dual single-pole double-throw analog switch

11.1 Test circuits





Low-ohmic dual single-pole double-throw analog switch

11.2 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	-40	-40 °C to +85 °C			-40 °C to +125 °C	
			Min	Typ[1]	Max	Min	Max	
R _{ON(peak)}	ON resistance (peak)	port nYn; $V_I = GND$ to V_{CC} ; $I_{SW} = 100$ mA; see Figure 7						
		$V_{CC} = 1.4 \text{ V}$	-	1.65	3.7	-	4.1	Ω
		$V_{CC} = 1.65 \text{ V}$	-	0.95	1.6	-	1.7	Ω
		V _{CC} = 2.3 V	-	0.55	0.8	-	0.9	Ω
		$V_{CC} = 2.7 \text{ V}$	-	0.50	0.75	-	0.9	Ω
		V _{CC} = 4.3 V	-	0.50	0.75	-	0.9	Ω
ΔR_{ON}	ON resistance mismatch between channels	$V_I = GND \text{ to } V_{CC};$ $I_{SW} = 100 \text{ mA}$						
		V _{CC} = 1.4 V	-	0.20	0.35	-	0.35	Ω
		V _{CC} = 1.65 V	-	0.20	0.25	-	0.30	Ω
		V _{CC} = 2.3 V	-	0.09	0.13	-	0.15	Ω
		$V_{CC} = 2.7 \text{ V}$	-	0.09	0.125	-	0.15	Ω
		V _{CC} = 4.3 V	-	0.09	0.125	-	0.15	Ω
R _{ON(flat)}	ON resistance (flatness)	port nYn; $V_I = GND$ to V_{CC} ; $I_{SW} = 100 \text{ mA}$						
		V _{CC} = 1.4 V	-	1.05	3.35	-	3.65	Ω
		V _{CC} = 1.65 V	-	0.55	1.25	-	1.35	Ω
		V _{CC} = 2.3 V	-	0.20	0.35	-	0.40	Ω
		V _{CC} = 2.7 V	-	0.18	0.35	-	0.40	Ω
		V _{CC} = 4.3 V	-	0.23	0.40	-	0.45	Ω

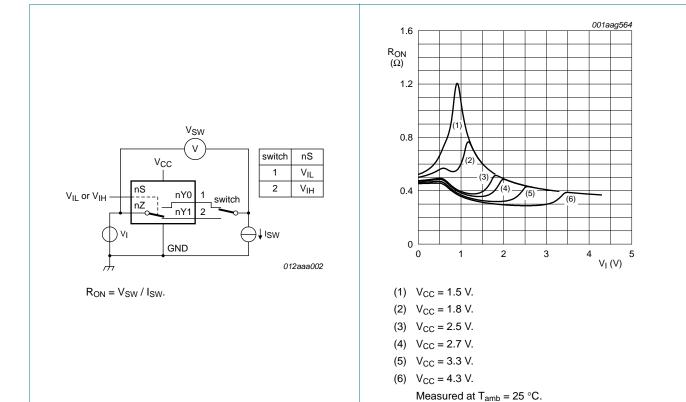
^[1] Typical values are measured at T_{amb} = 25 °C.

^[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.

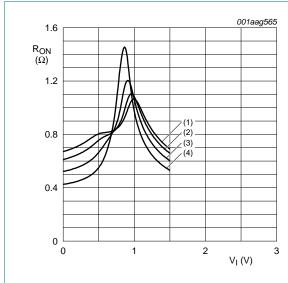
Low-ohmic dual single-pole double-throw analog switch

11.3 ON resistance test circuit and graphs



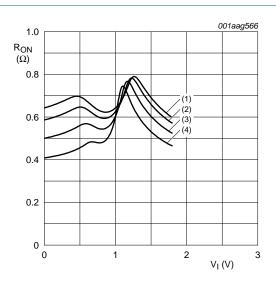
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Low-ohmic dual single-pole double-throw analog switch



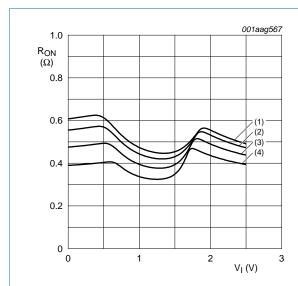
- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig 9. ON resistance as a function of input voltage; $V_{CC} = 1.5 \text{ V (nYn port)}$



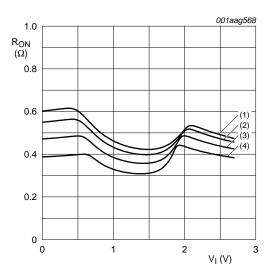
- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig 10. ON resistance as a function of input voltage; $V_{CC} = 1.8 \text{ V (nYn port)}$



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

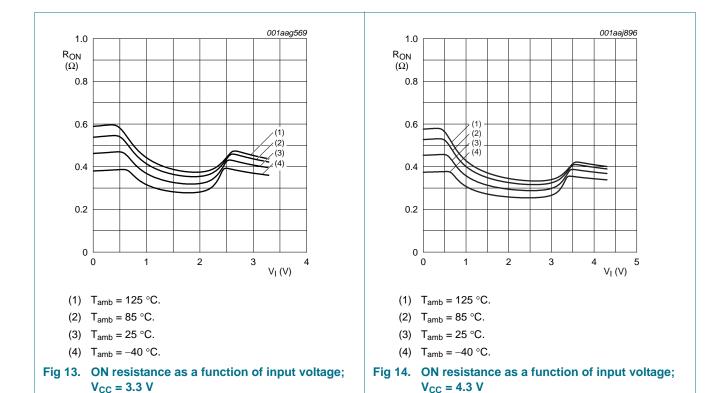
Fig 11. ON resistance as a function of input voltage; $V_{CC} = 2.5 \text{ V (nYn port)}$



- (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; $V_{CC} = 2.7 \text{ V (nYn port)}$

Low-ohmic dual single-pole double-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	T _{amb} = 25 °C			$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$			Unit
			Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
t _{en}	enable time	nS to nZ or nYn; see <u>Figure 15</u>							
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	-	50	90	-	120	120	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	-	36	70	-	80	90	ns
		V_{CC} = 2.3 V to 2.7 V	-	24	45	-	50	55	ns
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	-	22	40	-	45	50	ns
		$V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$	-	22	40	-	45	50	ns
t _{dis}	disable time	nS to nZ or nYn; see <u>Figure 15</u>							
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	-	32	70	-	80	90	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	-	20	55	-	60	65	ns
		V_{CC} = 2.3 V to 2.7 V	-	12	25	-	30	35	ns
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	-	10	20	-	25	30	ns
		$V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$	-	10	20	-	25	30	ns

Low-ohmic dual single-pole double-throw analog switch

 Table 9.
 Dynamic characteristics ...continued

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

Symbol	Symbol Parameter Conditions		T _{amb} = 25 °C			$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$			Unit
			Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
t _{b-m} break-before-make time	see Figure 16 [2]								
	time	$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	-	19	-	9	-	-	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	-	17	-	7	-	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	-	13	-	4	-	-	ns
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	-	10	-	3	-	-	ns
		$V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$	-	10	-	2	-	-	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.

12.1 Waveform and test circuits

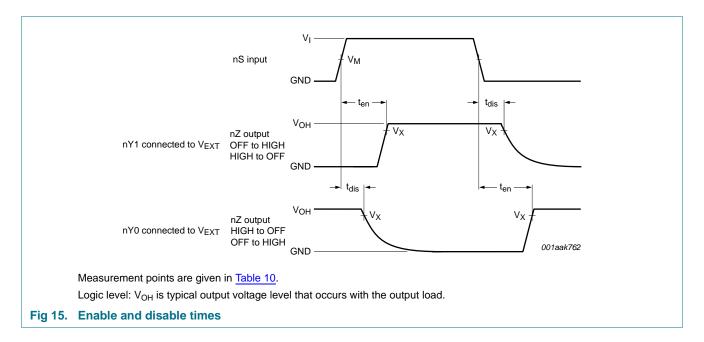
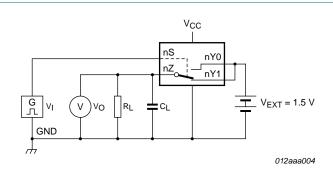


Table 10. Measurement points

Supply voltage	Input	Output
V _{CC}	V _M	V _X
1.4 V to 4.3 V	0.5V _{CC}	0.9V _{OH}

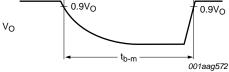
^[2] Break-before-make guaranteed by design.

Low-ohmic dual single-pole double-throw analog switch



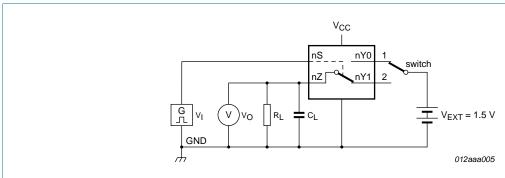
a. Test circuit.





b. Input and output measurement points

Fig 16. Test circuit for measuring break-before-make timing



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

NX3L2267

Low-ohmic dual single-pole double-throw analog switch

12.2 Additional dynamic characteristics

Table 12. Additional dynamic characteristics

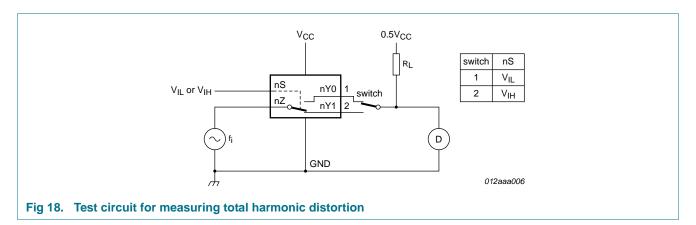
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); $V_l = \text{GND}$ or V_{CC} (unless otherwise specified); $t_r = t_f \le 2.5$ ns.

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	<u>[1]</u>		•		
		$V_{CC} = 1.4 \text{ V}; V_I = 1 \text{ V (p-p)}$		-	0.15	-	%
		V _{CC} = 1.65 V; V _I = 1.2 V (p-p)		-	0.10	-	%
		$V_{CC} = 2.3 \text{ V}; V_I = 1.5 \text{ V (p-p)}$		-	0.02	-	%
		$V_{CC} = 2.7 \text{ V}; V_I = 2 \text{ V (p-p)}$		-	0.02	-	%
		$V_{CC} = 4.3 \text{ V}; V_I = 2 \text{ V (p-p)}$		-	0.02	-	%
		$V_{CC} = 3.0 \text{ V}; V_{I} = 1 \text{ V (p-p)}; R_{L} = 600 \Omega$		-	0.01	-	%
f _(-3dB)	-3 dB frequency	$R_L = 50 \Omega$; see Figure 19	<u>[1]</u>				
	response	port nYn; 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	<u>[1]</u>				
		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 V to 3.6 V		-	0.21	-	V
		V _{CC} = 3.6 V to 4.3 V		-	0.30	-	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		-	4	-	рС
		V _{CC} = 1.8 V		-	6	-	рС
		V _{CC} = 2.5 V		-	16	-	рС
		V _{CC} = 3.3 V		-	24	-	рС
		V _{CC} = 4.3 V		-	37	-	рС

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

Low-ohmic dual single-pole double-throw analog switch

12.3 Test circuits



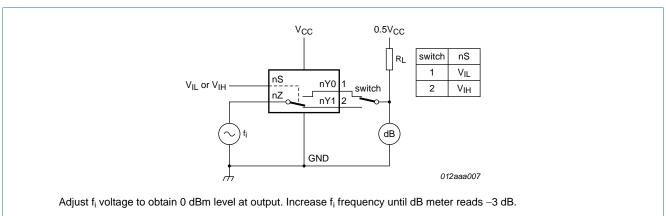
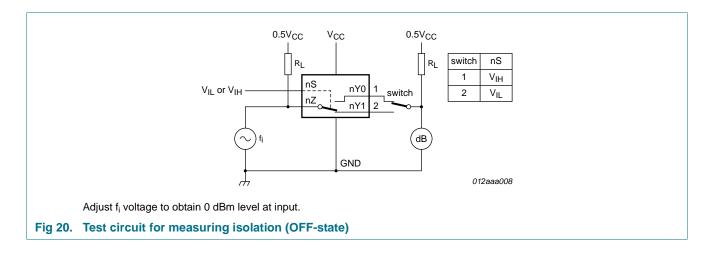
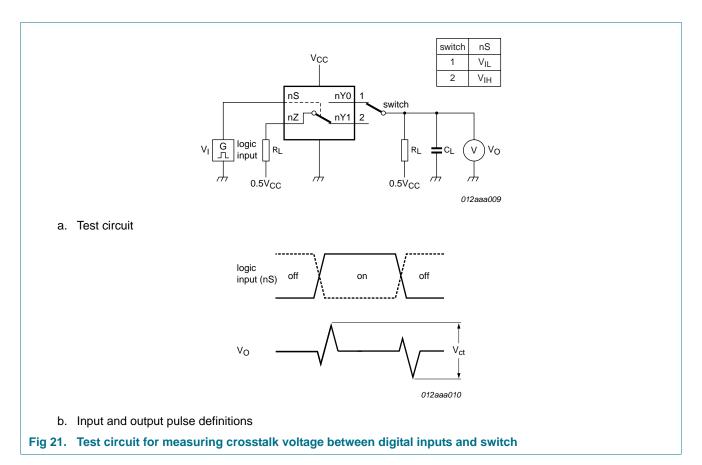
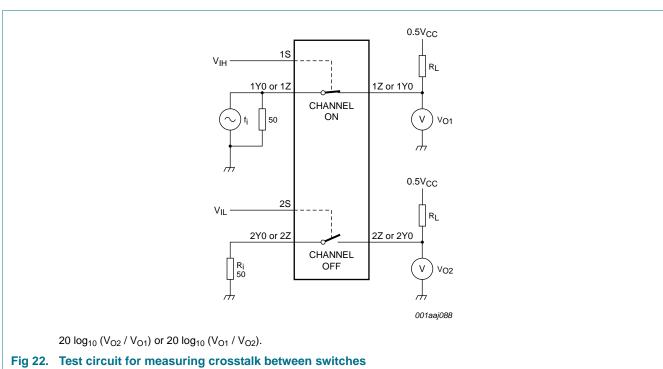


Fig 19. Test circuit for measuring the frequency response when channel is in ON-state

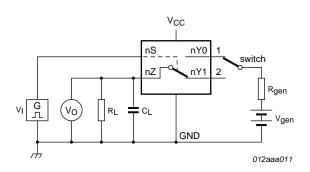


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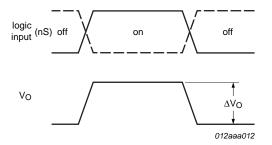




Low-ohmic dual single-pole double-throw analog switch



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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13. Package outline

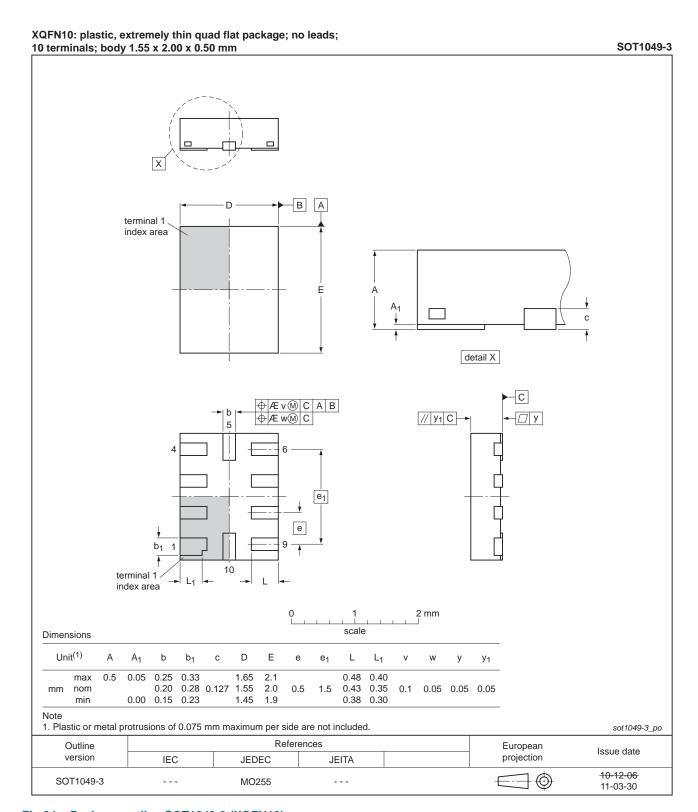


Fig 24. Package outline SOT1049-3 (XQFN10)

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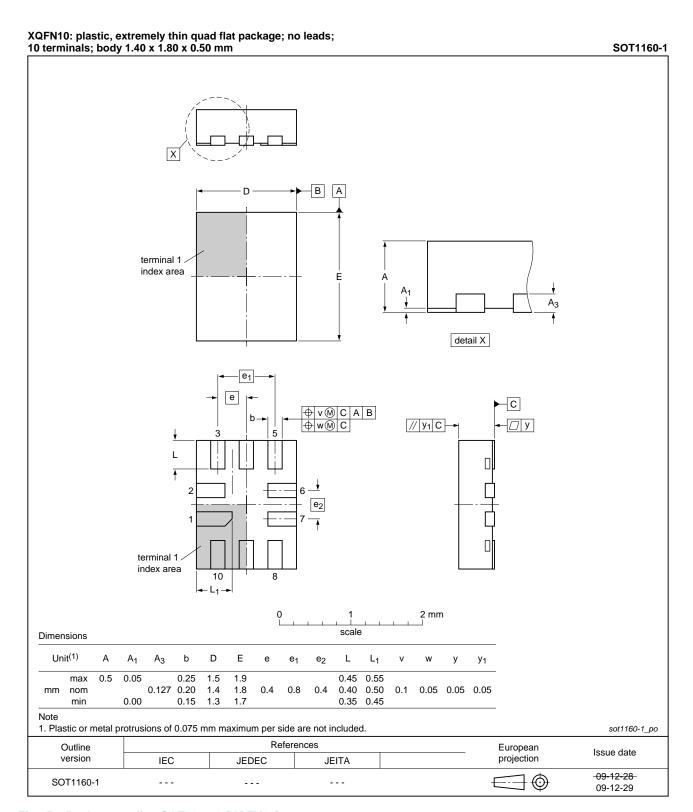


Fig 25. Package outline SOT1160-1 (XQFN10)

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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

15. Revision history

Table 14. Revision history

Document ID Release date Data sheet status Change notice Supersedes NX3L2267 v.5 20120618 Product data sheet - NX3L2267 v.4 Modifications: • Package outline drawing SOT1049-2 changed to SOT1049-3 (Figure 24). NX3L2267 v.4 20111108 Product data sheet - NX3L2267 v.3 Modifications: • Legal pages updated. NX3L2267 v.3 20101223 Product data sheet - NX3L2267 v.2 NX3L2267 v.2 20100713 Product data sheet - NX3L2267 v.1 NX3L2267 v.1 20091109 Product data sheet - -		•			
Modifications: ● Package outline drawing SOT1049-2 changed to SOT1049-3 (Figure 24). NX3L2267 v.4 20111108 Product data sheet - NX3L2267 v.3 Modifications: ● Legal pages updated. NX3L2267 v.3 20101223 Product data sheet - NX3L2267 v.2 NX3L2267 v.2 20100713 Product data sheet - NX3L2267 v.1	Document ID	Release date	Data sheet status	Change notice	Supersedes
NX3L2267 v.4 20111108 Product data sheet - NX3L2267 v.3 Modifications: • Legal pages updated. NX3L2267 v.3 20101223 Product data sheet - NX3L2267 v.2 NX3L2267 v.2 20100713 Product data sheet - NX3L2267 v.1	NX3L2267 v.5	20120618	Product data sheet	-	NX3L2267 v.4
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NX3L2267 v.2 20100713 Product data sheet - NX3L2267 v.2 NX3L2267 v.1	NX3L2267 v.4	20111108	Product data sheet	-	NX3L2267 v.3
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NX3L2267 v.1 20091109 Product data sheet	NX3L2267 v.2	20100713	Product data sheet	-	NX3L2267 v.1
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Document status[1][2]	Product status[3]	Definition
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Low-ohmic dual single-pole double-throw analog switch

18. Contents

General description
Features and benefits
Applications
Ordering information 2
Marking 2
Functional diagram 2
Pinning information 3
Pinning
Pin description
Functional description 4
Limiting values 4
Recommended operating conditions 4
Static characteristics 5
Test circuits 6
ON resistance
ON resistance test circuit and graphs 8
Dynamic characteristics 10
Waveform and test circuits 11
Additional dynamic characteristics 13
Test circuits14
Package outline
Abbreviations
Revision history
Legal information
Data sheet status 20
Definitions
Disclaimers
Trademarks21
Contact information
Contents

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