NX5L2750C

Analog switch with negative swing audio capability

Rev. 2 — 7 May 2014 **Product data sheet**

1. General description

The NX5L2750C 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).

The NX5L2750C can switch audio signals with negative swing without the need of a coupling capacitor.

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}. It makes it possible for the NX5L2750C to switch 5 V audio signals with a 1.8 V digital controller, eliminating the need for logic level translation.

2. Features and benefits

- Supply voltage range from 1.8 V to 5.0 V
- 0.8 Ω typical ON resistance
- 100 MHz typical bandwidth or data frequency
- CMOS low-power consumption
- 1.8 V control logic at V_{CC} = 3.6 V
- Break-before-make switching
- ESD protection:
  - HBM JESD22-A114F Class 3A exceeds 4000 V
  - CDM AEC-Q100-011 revision B exceeds 1000 V
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- Specified from –40 °C to +85 °C

3. Applications

- Cellular phones, PDA
- Portable media players
- Personal media players

4. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
NX5L2750CGU	–40 °C to +85 °C	XQFN10	plastic, extremely thin quad flat package; no leads; 10 terminals; body 1.40 × 1.80 × 0.50 mm	SOT1160-1

5. Marking

Table 2. Marking

Type number	Marking code
NX5L2750CGU	LA

6. Functional diagram

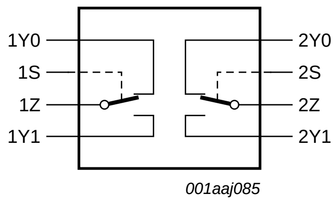


Fig 1. Logic symbol

7. Pinning information

7.1 Pinning

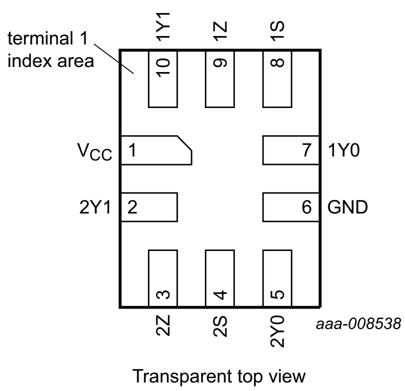


Fig 2. Pin configuration SOT1160-1 (XQFN10)

7.2 Pin description

Table 3. Pin description

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

8. Functional description

Table 4. Function table[1]

Input (nS)	Channel on
L	nY0 = nZ
H	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	+5.5	V
V_I	input voltage	pins nS [1]	–0.5	+5.5	V
V_{SW}	switch voltage		–4.0	V_{CC} + 0.5	V
I_{IK}	input clamping current	V_I < –0.5 V	–50	-	mA
I_{SK}	switch clamping current	V_I < –4.0 V or V_I > V_{CC} + 0.5 V	-	±50	mA
I_{SW}	switch current	T_{amb} = 25 °C	-	±250	mA
		T_{amb} = 25 °C; peak current (pulsed at 1 ms duration; < 10 % duty cycle)	-	±500	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	-	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		1.8	5.0	V

Table 6. Recommended operating conditions *...continued*

Symbol	Parameter	Conditions	Min	Max	Unit
V_I	input voltage	pins nS	0	5.0	V
V_{SW}	switch voltage	[1]	–2.5	V_{CC}	V
T_{amb}	ambient temperature		–40	+85	°C

[1] The voltage across the switch should be < 5.5 V.

11. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	T_{amb} = –40 °C to +85 °C			Unit
			Min	Typ[1]	Max	
V_{IH}	HIGH-level input voltage	V_{CC} = 2.7 V to 4.3 V	1.4	-	-	V
		V_{CC} = 4.3 V to 5.0 V	1.5	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.7 V to 4.3 V	-	-	0.6	V
		V_{CC} = 4.3 V to 5.0 V	-	-	0.6	V
V_{IK}	input clamping voltage	V_{CC} = 3.0 V; I_I = –18 mA	-	-	–1.2	V
I_I	input leakage current	pins nS; V_I = 0 V to V_{CC}; V_{CC} = 0 V to 4.3 V	-	-	±1	μA
$I_{S(OFF)}$	OFF-state leakage current	V_{CC} = 2.7 V; V_I = –2.5 V or 2.5 V; V_O = 2.5 V or –2.5 V; see Figure 3	-	-	±250	nA
I_{CC}	supply current	V_I = V_{CC} or GND; V_{SW} = GND or V_{CC}; V_{CC} = 2.7 V	-	-	2	μA
ΔI_{CC}	additional supply current	V_I = 2.6 V; V_{SW} = GND or V_{CC}; V_{CC} = 4.3 V	-	-	10	μA
		V_I = 1.8 V; V_{SW} = GND or V_{CC}; V_{CC} = 4.3 V	-	-	15	μA
C_I	input capacitance	pins nS	-	1.5	-	pF
$C_{S(OFF)}$	OFF-state capacitance	pins nY0 and nY1; V_{CC} = 3.3 V; V_I = 0 V to 3.3 V	-	35	-	pF
$C_{S(ON)}$	ON-state capacitance	pins nZ; V_{CC} = 3.3 V; V_I = 0 V to 3.3 V	-	75	-	pF

[1] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 3.3 V.

11.1 Test circuits

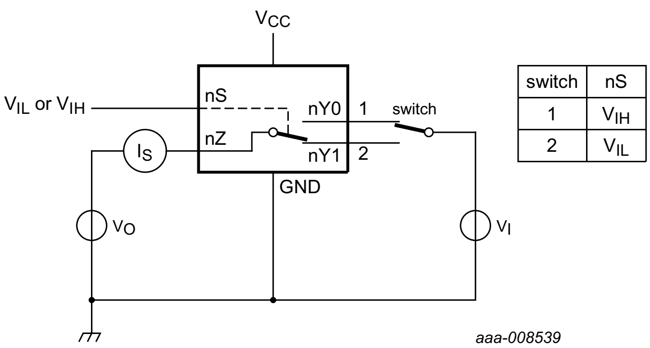


Fig 3. Test circuit for measuring OFF-state leakage current

11.2 ON resistance

Table 8. ON resistance

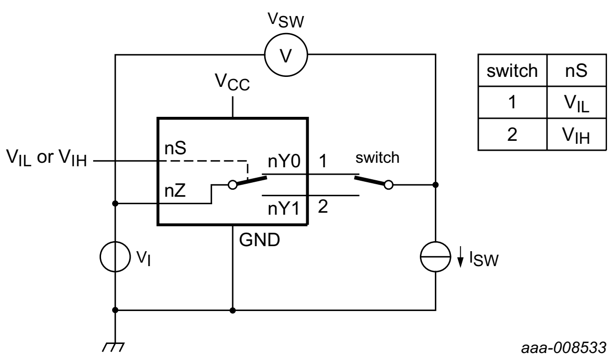
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	–40 °C to +85 °C			Unit
			Min	Typ[1]	Max	
R_{ON}	ON resistance	$V_I = V_{CC}$–4.5 V to V_{CC}; I_{SW} = 100 mA; V_{CC} = 2.7 V; see Figure 4	-	0.8	1.3	Ω
$R_{ON(flat)}$	ON resistance (flatness)	$V_I = V_{CC}$–4.5 V to V_{CC}; I_{SW} = 100 mA; V_{CC} = 2.7 V; see Figure 4	-	0.3	-	Ω
ΔR_{ON}	ON resistance mismatch between channels	$V_I = V_{CC}$–4.5 V; I_{SW} = 100 mA; V_{CC} = 2.7 V; see Figure 4	-	0.1	-	Ω

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

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

11.3 ON resistance test circuit and graphs



$R_{ON} = V_{SW} / I_{SW}$.

Fig 4. Test circuit for measuring ON resistance

12. Dynamic characteristics

Table 9. Dynamic characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit, see Figure 7.

Symbol	Parameter	Conditions		T_{amb} = –40 °C to +85 °C			Unit
				Min	Typ[1]	Max	
t_{en}	enable time	nS to nZ; see Figure 5					
		V_{CC} = 2.7 V to 3.6 V	[2]	-	80	160	ns
		V_{CC} = 3.6 V to 4.3 V	[3]	-	70	120	ns
t_{dis}	disable time	nS to nZ; see Figure 5					
		V_{CC} = 2.7 V to 3.6 V	[2]	-	25	50	ns
		V_{CC} = 3.6 V to 4.3 V	[3]	-	25	50	ns
t_{b-m}	break-before-make time	see Figure 6	[4]				
		V_{CC} = 2.7 V to 3.6 V		15	55	-	ns
		V_{CC} = 3.6 V to 4.3 V		12	45	-	ns

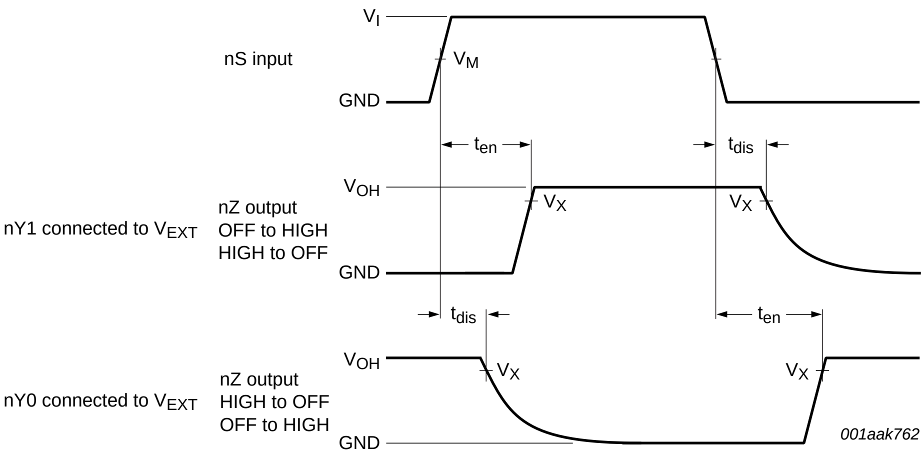
[1] Typical values are measured at T_{amb} = 25 °C.

[2] Typical values are measured at V_{CC} = 3.3 V.

[3] Typical values are measured at V_{CC} = 4.3 V.

[4] Guaranteed by design.

12.1 Waveform and test circuits



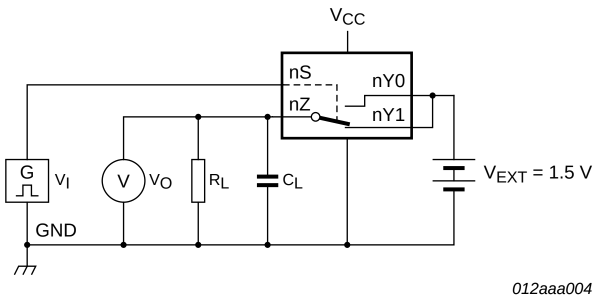
Measurement points are given in Table 10.

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

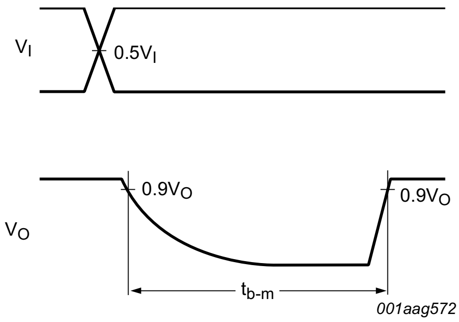
Fig 5. Enable and disable times

Table 10. Measurement points

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

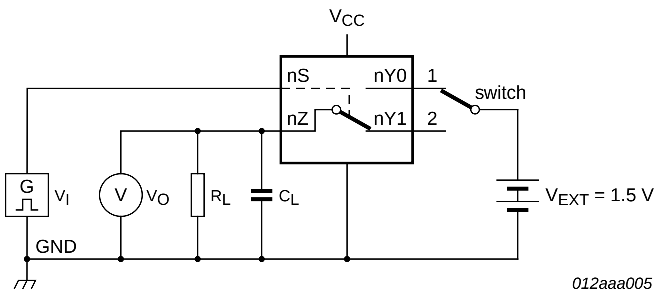


a. Test circuit.



b. Input and output measurement points

Fig 6. 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 7. 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
2.7 V to 4.3 V	V_{CC}	≤ 2.5 ns	35 pF	50 Ω

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; T_{amb} = 25 °C.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
THD	total harmonic distortion	f_i = 20 Hz to 20 kHz; R_L = 32 Ω; see Figure 8				
		V_{CC} = 2.7 V; V_I = 2 V (p-p)	-	0.07	-	%
		V_{CC} = 4.3 V; V_I = 2 V (p-p)	-	0.03	-	%
$f_{(-3dB)}$	−3 dB frequency response	R_L = 50 Ω; see Figure 9				
		V_{CC} = 2.7 V to 4.3 V	-	100	-	MHz
α_{iso}	isolation (OFF-state)	f_i = 100 kHz; R_L = 50 Ω; see Figure 10				
		V_{CC} = 2.7 V to 4.3 V	-	−60	-	dB
Xtalk	crosstalk	between switches; f_i = 100 kHz; R_L = 50 Ω; see Figure 11				
		V_{CC} = 2.7 V to 4.3 V	-	−60	-	dB
Q_{inj}	charge injection	f_i = 1 MHz; C_L = 0.1 nF; R_L = 1 MΩ; V_{gen} = 0 V; R_{gen} = 0 Ω; see Figure 12				
		V_{CC} = 2.7 V	-	3	-	pC
		V_{CC} = 3.3 V	-	4	-	pC
		V_{CC} = 4.3 V	-	5	-	pC

12.3 Test circuits

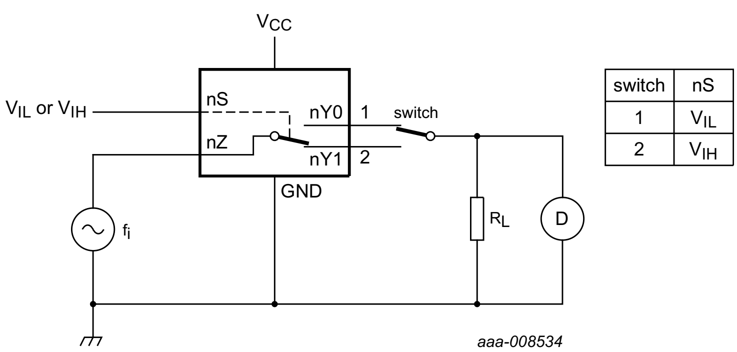
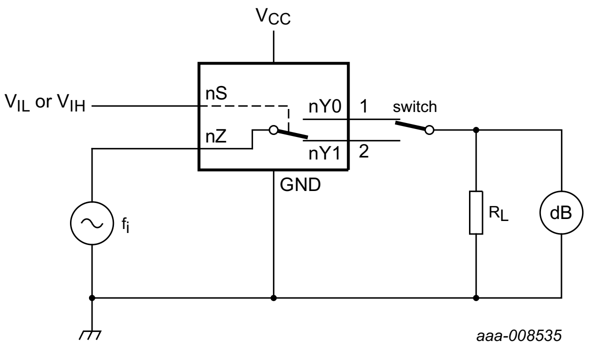


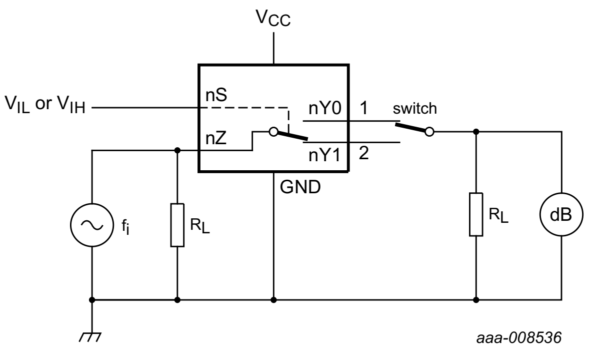
Fig 8. Test circuit for measuring total harmonic distortion



switch	nS
1	V_{IL}
2	V_{IH}

To obtain 0 dBm level at output, adjust f_i voltage. Increase f_i frequency until dB meter reads −3 dB.

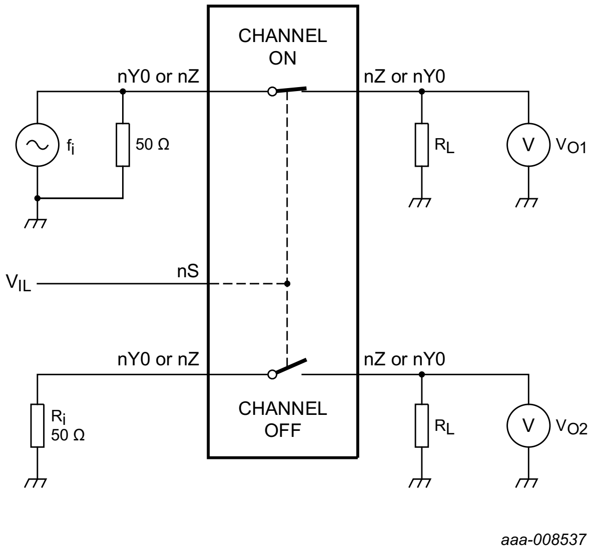
Fig 9. Test circuit for measuring the frequency response when channel is in ON-state



switch	nS
1	V_{IH}
2	V_{IL}

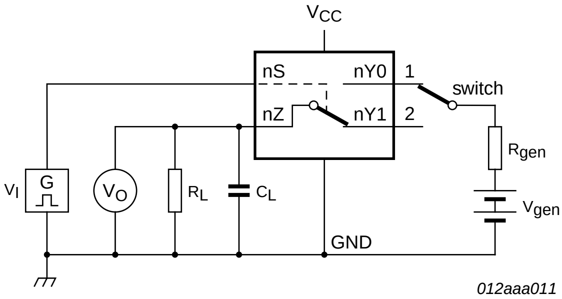
To obtain 0 dBm level at output, adjust f_i voltage.

Fig 10. Test circuit for measuring isolation (OFF-state)

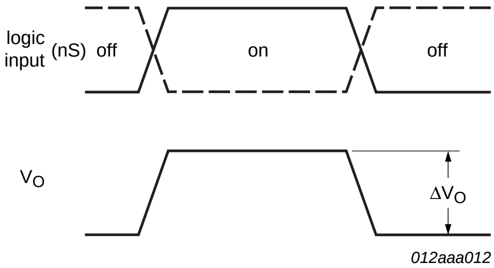


20 $\log_{10}$ (V_{O2} / V_{O1}) or 20 $\log_{10}$ (V_{O1} / V_{O2}).

Fig 11. Test circuit for measuring crosstalk between switches



a. Test circuit



b. Input and output pulse definitions

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

ΔV_O = output voltage variation.

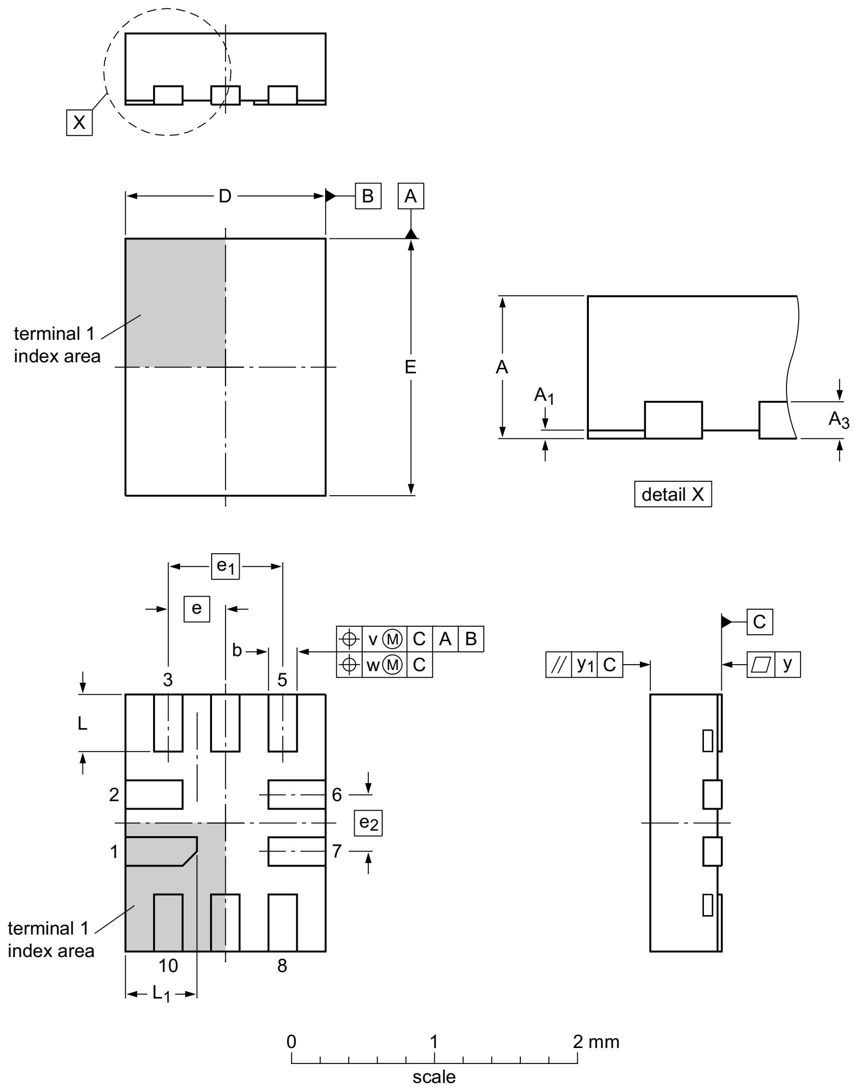
R_{gen} = generator resistance.

V_{gen} = generator voltage.

Fig 12. Test circuit for measuring charge injection

13. Package outline

XQFN10: plastic, extremely thin quad flat package; no leads; 10 terminals; body 1.40 x 1.80 x 0.50 mm **SOT1160-1**



Dimensions

Unit[1]		A	A_1	A_3	b	D	E	e	e_1	e_2	L	L_1	v	w	y	y_1
	max	0.5	0.05		0.25	1.5	1.9				0.45	0.55				
mm	nom			0.127	0.20	1.4	1.8	0.4	0.8	0.4	0.40	0.50	0.1	0.05	0.05	0.05
	min		0.00		0.15	1.3	1.7				0.35	0.45				

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

sot1160-1_po

Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOT1160-1	- - -	- - -	- - -		~~09-12-28~~ 09-12-29

Fig 13. Package outline SOT1160-1 (XQFN10)

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
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus

15. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
NX5L2750C v.2	20140507	Product data sheet	-	NX5L2750C v.1
Modifications:	• Table 7: minimum V_{IH} level added at V_{CC} = 4.3 V to 5.0 V • Table 7: minimum V_{IL} level added at V_{CC} = 4.3 V to 5.0 V			
NX5L2750C v.1	20130906	Product data sheet	-	-

16. Legal information

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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18. Contents

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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

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