

NX3L2T66

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

Rev. 7.1 — 12 August 2020

Product data sheet

1 General description

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.

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 $V_{CC} = 1.4$ V
 - 1.0 Ω (typical) at $V_{CC} = 1.65$ 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 $V_{CC} = 4.3$ 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



3 Applications

- Cell phone
- PDA
- Portable media player

4 Ordering information

Table 1. Ordering information

Type number	Topside marking [1]	Package		
		Name	Description	Version
NX3L2T66GT	DOO	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm	SOT833-1
NX3L2T66GM	DOO	XQFN8	plastic extremely thin quad flat package; no leads; 8 terminals; body 1.6 × 1.6 × 0.5 mm	SOT902-2

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

4.1 Ordering options

Table 2. Ordering options

Type number	Orderable part number	Package	Packing method	Minimum order quantity	Temperature
NX3L2T66GT	NX3L2T66GT,115	XSON8	REEL 7" Q1 NDP	5000	T _{amb} = -40 °C to +125 °C
NX3L2T66GM	NX3L2T66GM,125	XQFN8	REEL 7" Q3 NDP	4000	T _{amb} = -40 °C to +125 °C

5 Functional diagram

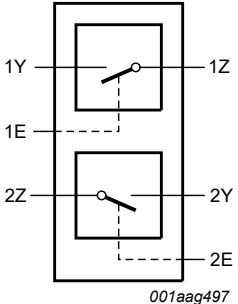


Figure 1. Logic symbol

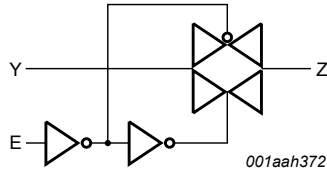
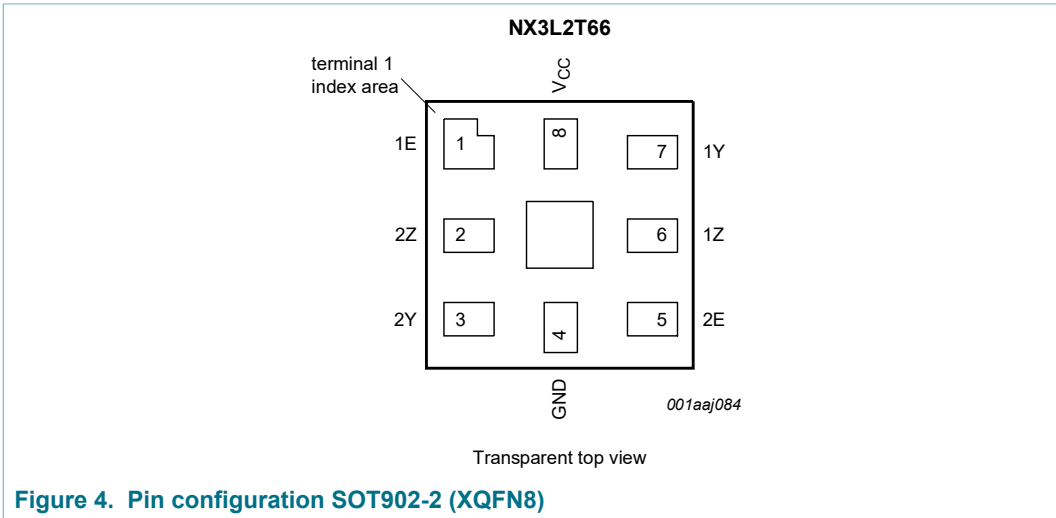
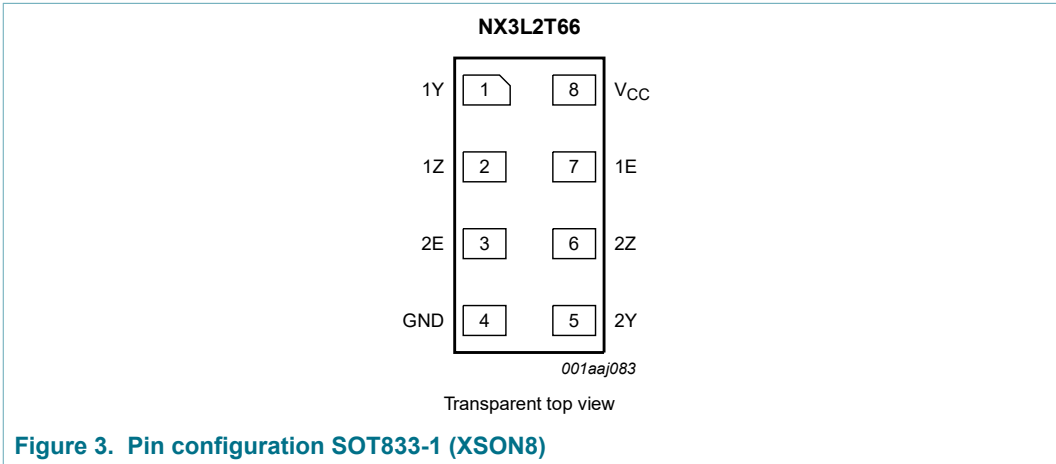


Figure 2. Logic diagram (one switch)

6 Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

Symbol	Pin		Description
	SOT833-1	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

7 Functional description

Table 4. Function table ^[1]

Input nE	Switch
L	OFF-state
H	ON-state

[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 _{CC}	supply voltage		-0.5	+4.6	V
V _I	input voltage	enable input nE	^[1] -0.5	+4.6	V
V _{SW}	switch voltage		^[2] -0.5	V _{CC} + 0.5	V
I _{IK}	input clamping current	V _I < -0.5 V	-50	-	mA
I _{SK}	switch clamping current	V _I < -0.5 V or V _I > V _{CC} + 0.5 V	-	±50	mA
I _{SW}	switch current	V _{SW} > -0.5 V or V _{SW} < V _{CC} + 0.5 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 °C to +125 °C	^[3] -	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 XSON8 and XQFN8 packages: Above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

9 Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CC}	supply voltage		1.4	-	4.3	V
V _I	input voltage	enable input nE	0	-	4.3	V
V _{SW}	switch voltage		^[1] 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 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.

[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 _{amb} = 25 °C			T _{amb} = -40 °C to +125 °C			Unit
			Min	Typ	Max	Min	Max (85 °C)	Max (125 °C)	
V _{IH}	HIGH-level input voltage	V _{CC} = 1.4 V to 1.6 V	0.9	-	-	0.9	-	-	V
		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 input voltage	V _{CC} = 1.4 V to 1.6 V	-	-	0.3	-	0.3	0.3	V
		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 to 4.3 V; V _{CC} = 1.4 V to 4.3 V	-	-	-	-	±0.5	±1	µA
I _{S(OFF)}	OFF-state leakage current	nY port; see Figure 5							
		V _{CC} = 1.4 V to 3.6 V	-	-	±5	-	±50	±500	nA
		V _{CC} = 3.6 V to 4.3 V	-	-	±10	-	±50	±500	nA
I _{S(ON)}	ON-state leakage current	nZ port; see Figure 6							
		V _{CC} = 1.4 V to 3.6 V	-	-	±5	-	±50	±500	nA
		V _{CC} = 3.6 V to 4.3 V	-	-	±10	-	±50	±500	nA
I _{CC}	supply current	V _I = V _{CC} or GND; V _{SW} = GND or V _{CC}							
		V _{CC} = 3.6 V	-	-	100	-	690	6000	nA
		V _{CC} = 4.3 V	-	-	150	-	800	7000	nA
ΔI _{CC}	additional supply current	V _{SW} = GND or V _{CC}							
		V _I = 2.6 V; V _{CC} = 4.3 V	-	2.0	4.0	-	7	7	µA
		V _I = 2.6 V; V _{CC} = 3.6 V	-	0.35	0.7	-	1	1	µA
		V _I = 1.8 V; V _{CC} = 4.3 V	-	7.0	10.0	-	15	15	µA
		V _I = 1.8 V; V _{CC} = 3.6 V	-	2.5	4.0	-	5	5	µA
C _I	input capacitance	V _I = 1.8 V; V _{CC} = 2.5 V	-	50	200	-	300	500	nA
			-	1.0	-	-	-	-	pF
C _{S(OFF)}	OFF-state capacitance		-	35	-	-	-	-	pF

Symbol	Parameter	Conditions	T _{amb} = 25 °C			T _{amb} = -40 °C to +125 °C			Unit
			Min	Typ	Max	Min	Max (85 °C)	Max (125 °C)	
C _{S(ON)}	ON-state capacitance		-	110	-	-	-	-	pF

10.1 Test circuits

V_I = 0.3 V or V_{CC} - 0.3 V; V_O = V_{CC} - 0.3 V or 0.3 V.

Figure 5. Test circuit for measuring OFF-state leakage current

V_I = 0.3 V or V_{CC} - 0.3 V; V_O = open circuit.

Figure 6. Test circuit for measuring ON-state leakage current

10.2 ON resistance

Table 8. ON resistance

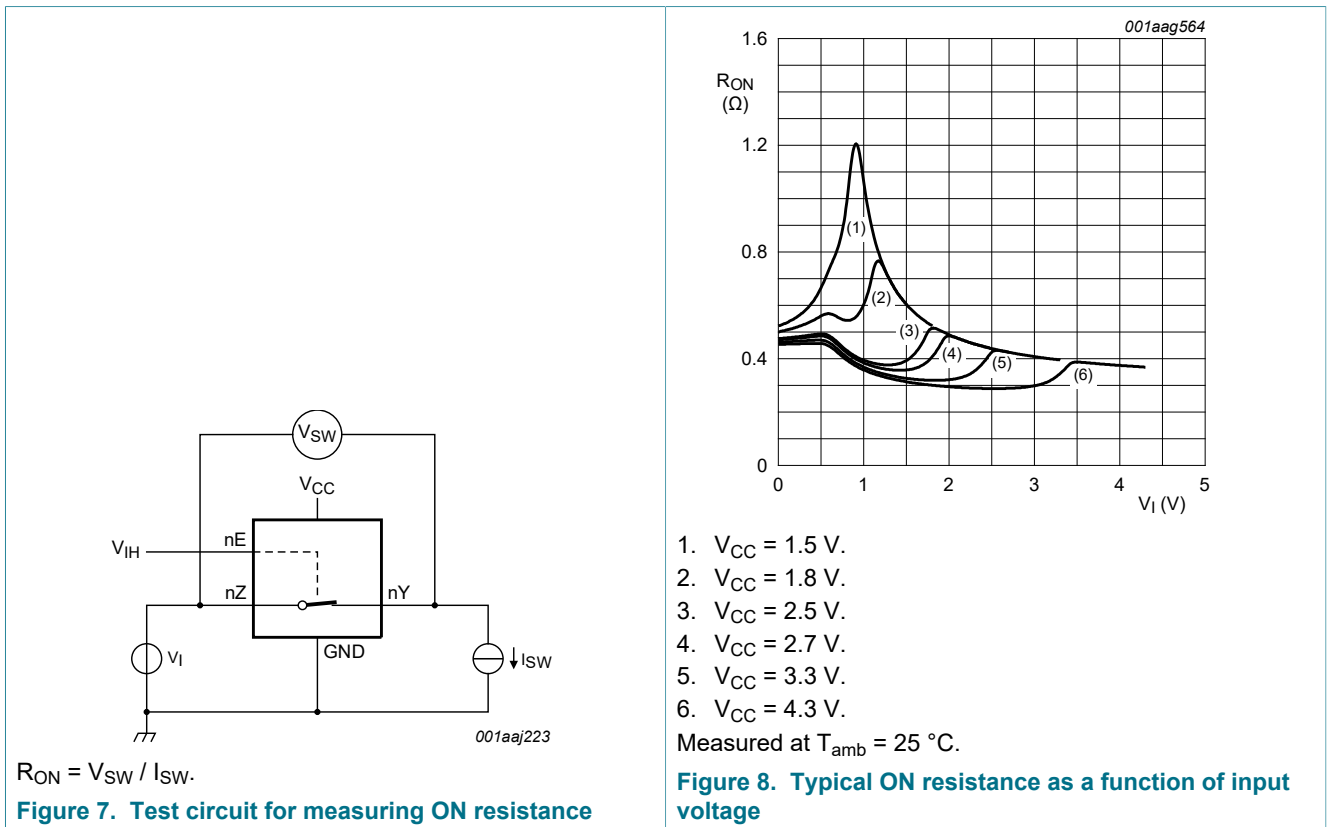
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see Figure 8 to Figure 14.

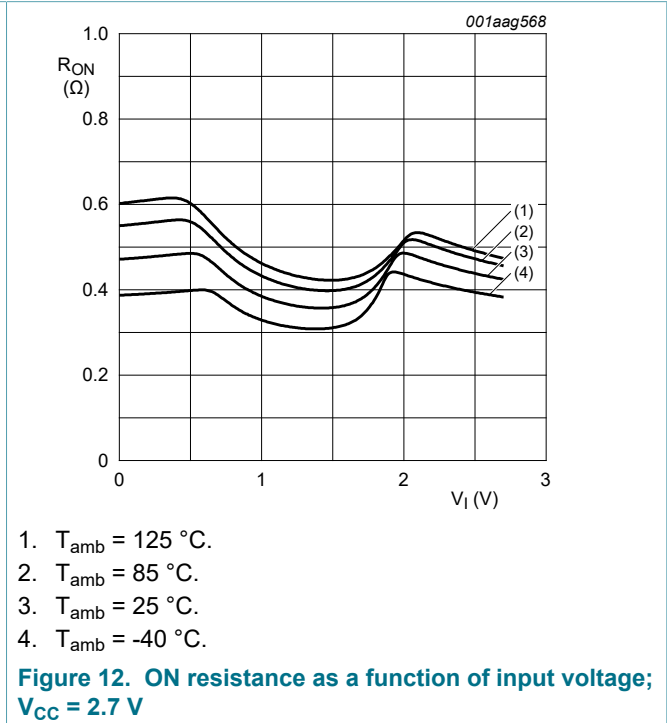
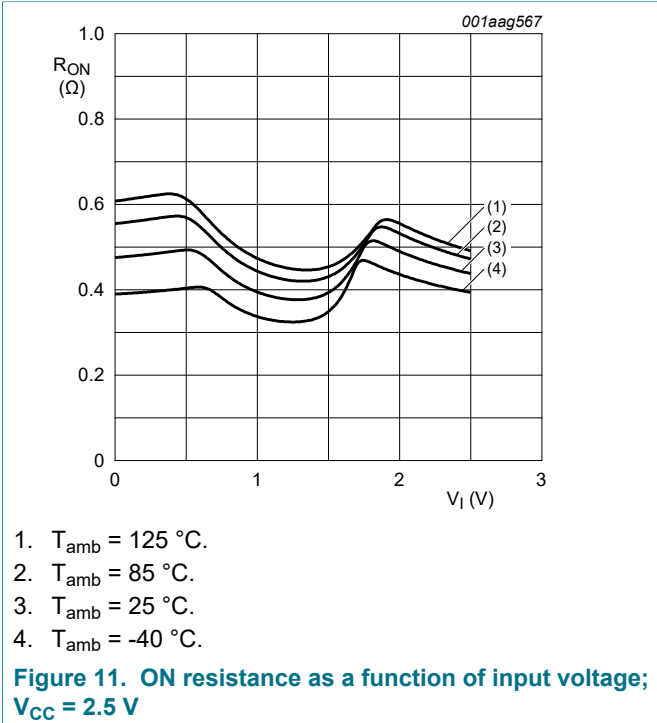
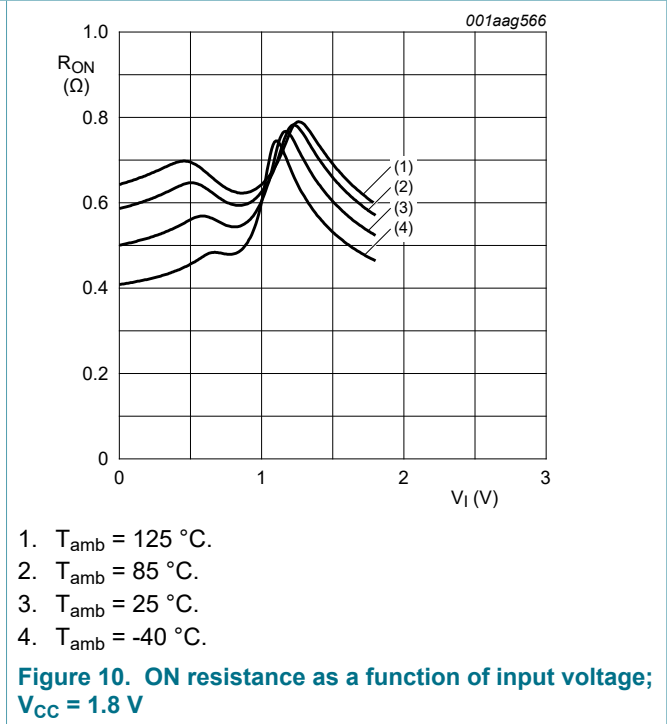
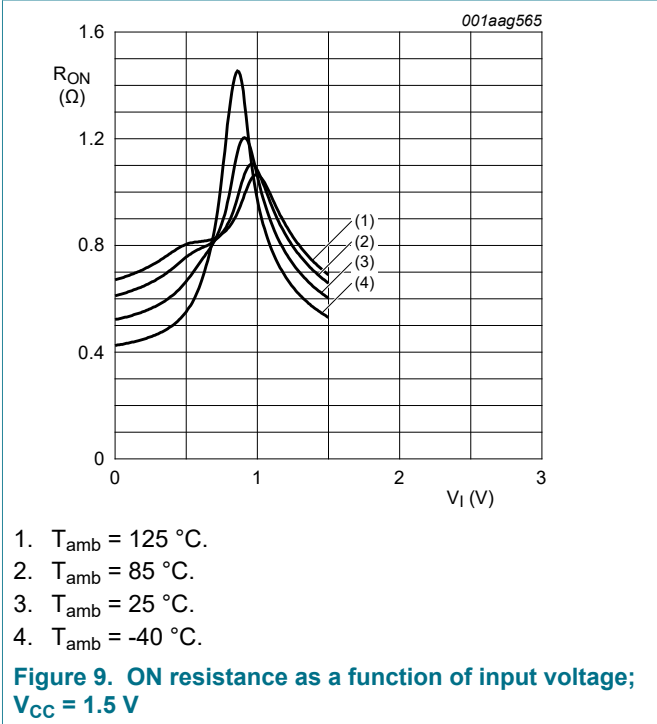
Symbol	Parameter	Conditions	T _{amb} = -40 °C to +85 °C			T _{amb} = -40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
R _{ON(peak)}	ON resistance (peak)	V _I = GND to V _{CC} ; I _{SW} = 100 mA; see Figure 7						
		V _{CC} = 1.4 V	-	1.6	3.7	-	4.1	Ω
		V _{CC} = 1.65 V	-	1.0	1.6	-	1.7	Ω
		V _{CC} = 2.3 V	-	0.55	0.8	-	0.9	Ω
		V _{CC} = 2.7 V	-	0.5	0.75	-	0.9	Ω
ΔR _{ON}	ON resistance mismatch between channels	V _I = GND to V _{CC} ; I _{SW} = 100 mA	[2]					
		V _{CC} = 1.4 V	-	0.04	0.3	-	0.3	Ω
		V _{CC} = 1.65 V	-	0.04	0.2	-	0.3	Ω
		V _{CC} = 2.3 V	-	0.02	0.08	-	0.1	Ω
		V _{CC} = 2.7 V	-	0.02	0.075	-	0.1	Ω
R _{ON(flat)}	ON resistance (flatness)	V _I = GND to V _{CC} ; I _{SW} = 100 mA	[3]					
		V _{CC} = 1.4 V	-	1.0	3.3	-	3.6	Ω

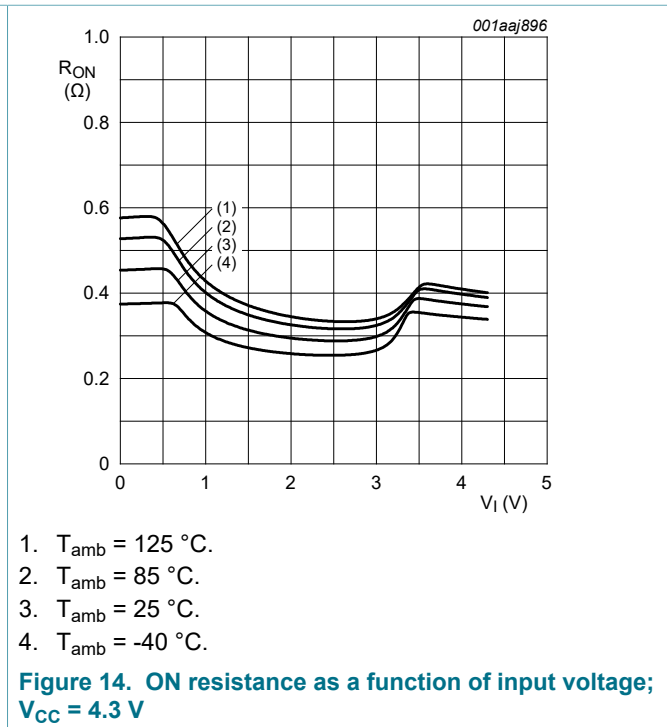
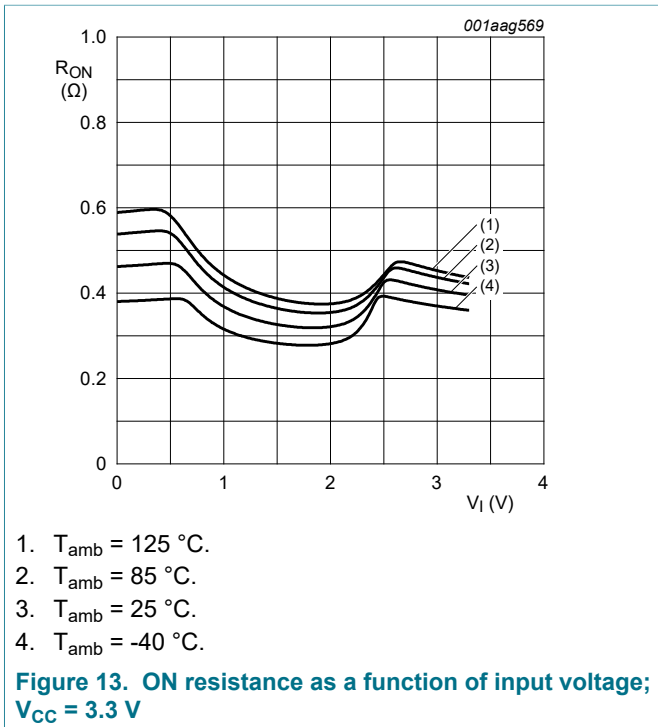
Symbol	Parameter	Conditions	T _{amb} = -40 °C to +85 °C			T _{amb} = -40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
		V _{CC} = 1.65 V	-	0.5	1.2	-	1.3	Ω
		V _{CC} = 2.3 V	-	0.15	0.3	-	0.35	Ω
		V _{CC} = 2.7 V	-	0.13	0.3	-	0.35	Ω
		V _{CC} = 4.3 V	-	0.2	0.4	-	0.45	Ω

- [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.

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 load circuit see [Figure 16](#).

Symbol	Parameter	Conditions	T _{amb} = 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 15							
		V _{CC} = 1.4 V to 1.6 V	-	35	49	-	53	57	ns
		V _{CC} = 1.65 V to 1.95 V	-	28	40	-	43	48	ns
		V _{CC} = 2.3 V to 2.7 V	-	20	30	-	32	35	ns
		V _{CC} = 2.7 V to 3.6 V	-	18	28	-	30	32	ns
		V _{CC} = 3.6 V to 4.3 V	-	18	28	-	30	32	ns
t _{dis}	disable time	nE to nZ or nY; see Figure 15							
		V _{CC} = 1.4 V to 1.6 V	-	32	70	-	80	90	ns
		V _{CC} = 1.65 V to 1.95 V	-	23	55	-	60	65	ns
		V _{CC} = 2.3 V to 2.7 V	-	14	25	-	30	35	ns
		V _{CC} = 2.7 V to 3.6 V	-	11	20	-	25	30	ns
		V _{CC} = 3.6 V to 4.3 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.

11.1 Waveform and test circuits

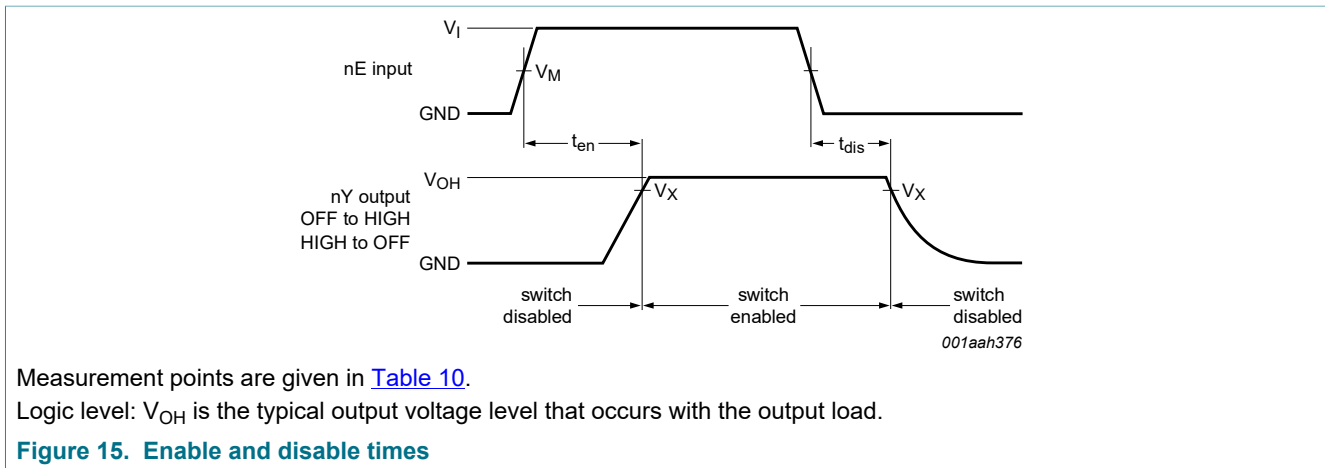


Table 10. Measurement points

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

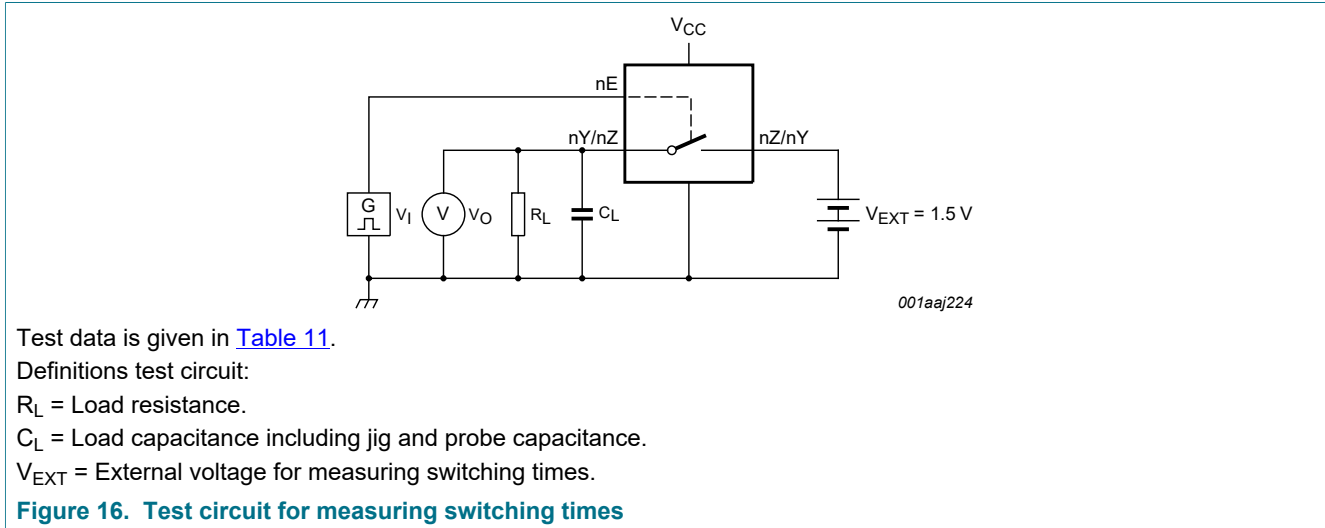


Table 11. Test data

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

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); $t_r = t_f \leq 2.5 \text{ ns}$.

Symbol	Parameter	Conditions	$T_{amb} = 25 \text{ }^\circ\text{C}$			Unit	
			Min	Typ	Max		
THD	total harmonic distortion	$f_i = 20 \text{ Hz to } 20 \text{ kHz}; R_L = 32 \Omega$; see Figure 17	[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	-	%
		$V_{CC} = 2.7 \text{ V}; V_I = 2 \text{ V (p-p)}$		-	0.02	-	%
		$V_{CC} = 4.3 \text{ V}; V_I = 2 \text{ V (p-p)}$		-	0.02	-	%
$f_{(-3dB)}$	-3 dB frequency response	$R_L = 50 \Omega$; see Figure 18	[1]				
		$V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$		-	60	-	MHz
α_{iso}	isolation (OFF-state)	$f_i = 100 \text{ kHz}; R_L = 50 \Omega$; see Figure 19	[1]				

Symbol	Parameter	Conditions	T _{amb} = 25 °C			Unit
			Min	Typ	Max	
		V _{CC} = 1.4 V to 4.3 V	-	-90	-	dB
V _{ct}	crosstalk voltage	between digital inputs and switch; f _i = 1 MHz; C _L = 50 pF; R _L = 50 Ω; see Figure 20				
		V _{CC} = 1.4 V to 3.6 V	-	0.2	-	V
		V _{CC} = 3.6 V to 4.3 V	-	0.2	-	V
Xtalk	crosstalk	between switches; f _i = 100 kHz; R _L = 50 Ω; see Figure 21	[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 MΩ; V _{gen} = 0 V; R _{gen} = 0 Ω; see Figure 22				
		V _{CC} = 1.5 V	-	3	-	pC
		V _{CC} = 1.8 V	-	3	-	pC
		V _{CC} = 2.5 V	-	3	-	pC
		V _{CC} = 3.3 V	-	3	-	pC
		V _{CC} = 4.3 V	-	6	-	pC

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

11.3 Test circuits

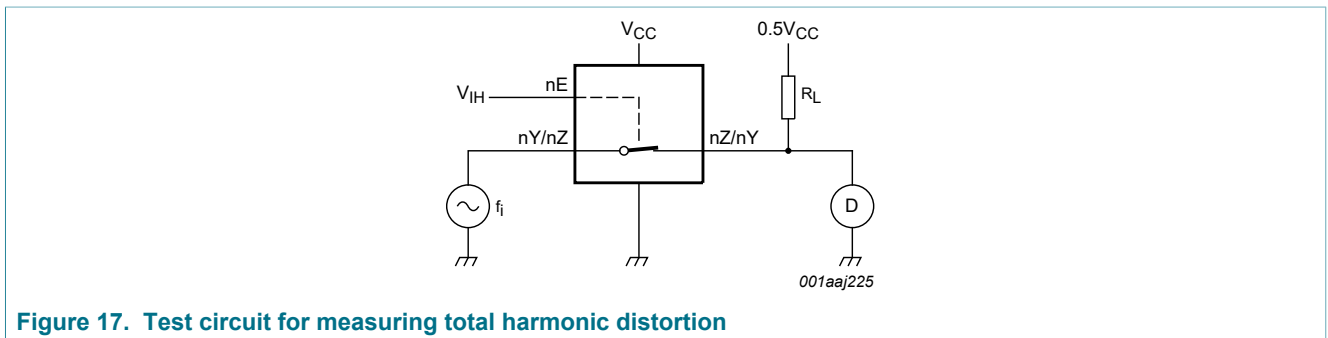
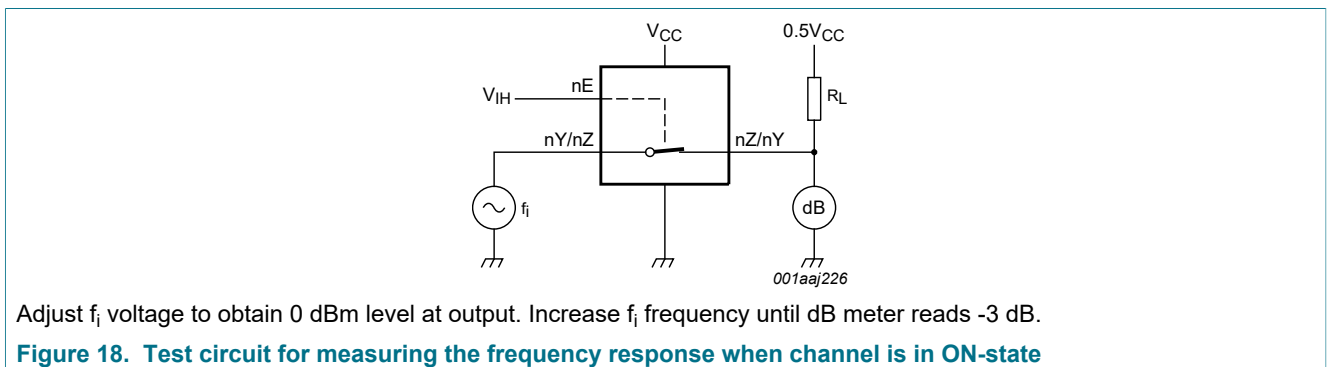


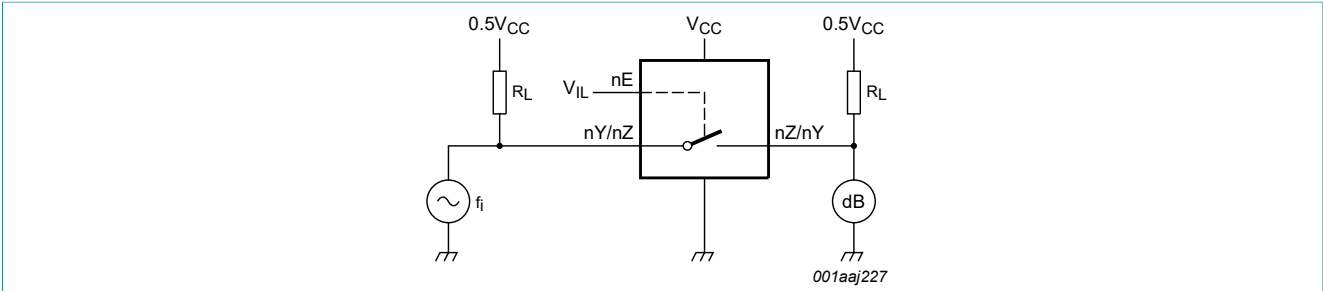
Figure 17. Test circuit for measuring total harmonic distortion



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

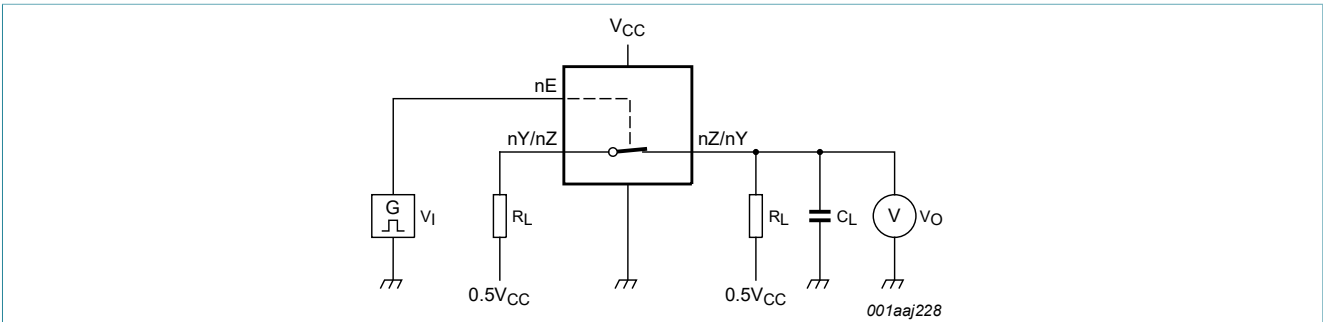
Figure 18. Test circuit for measuring the frequency response when channel is in ON-state

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

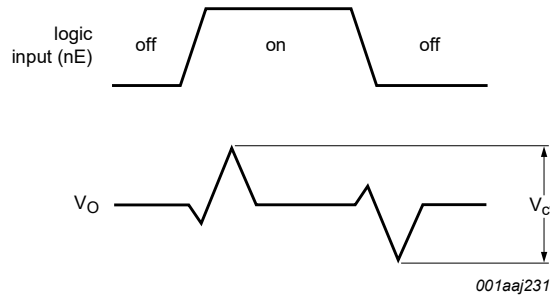


Adjust f_i voltage to obtain 0 dBm level at input.

Figure 19. Test circuit for measuring isolation (OFF-state)

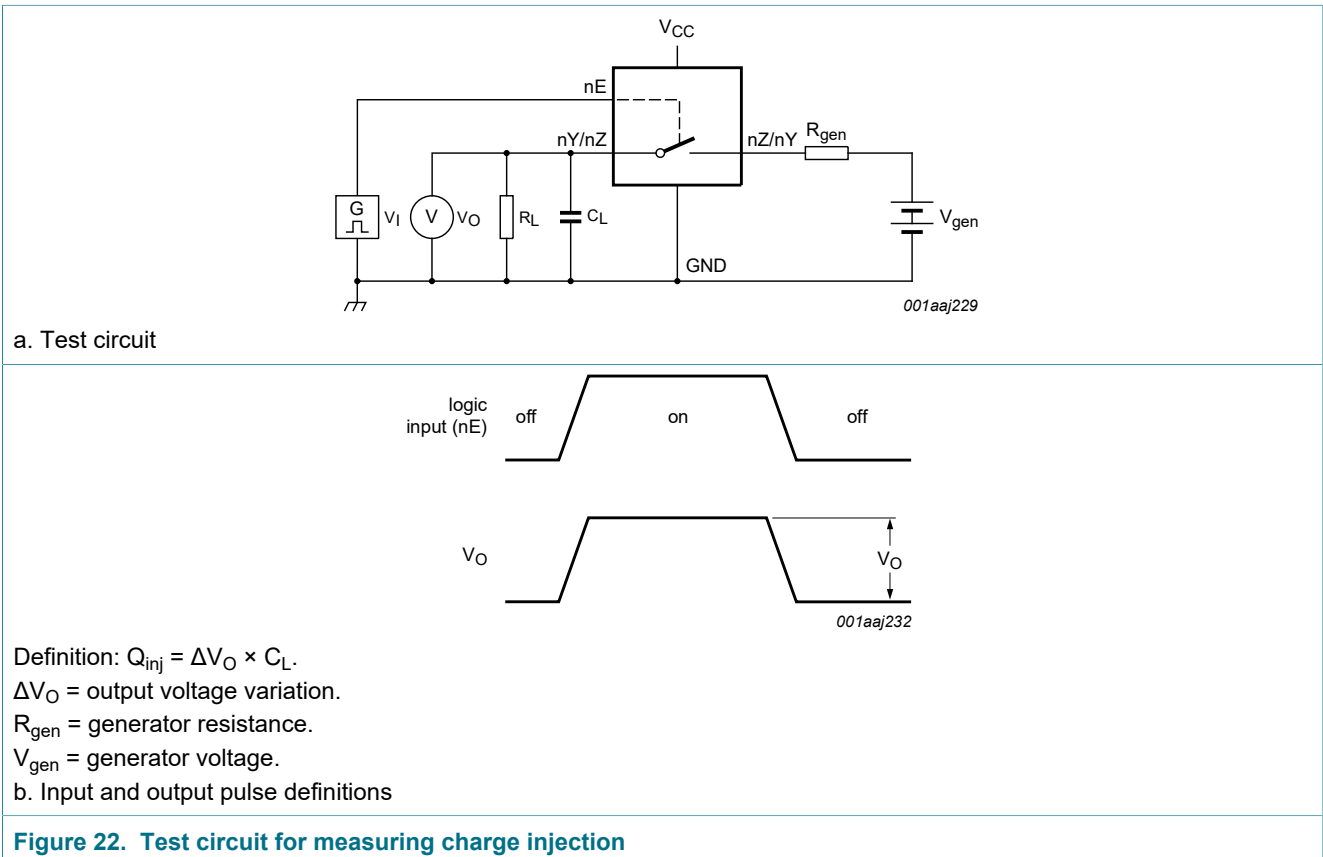
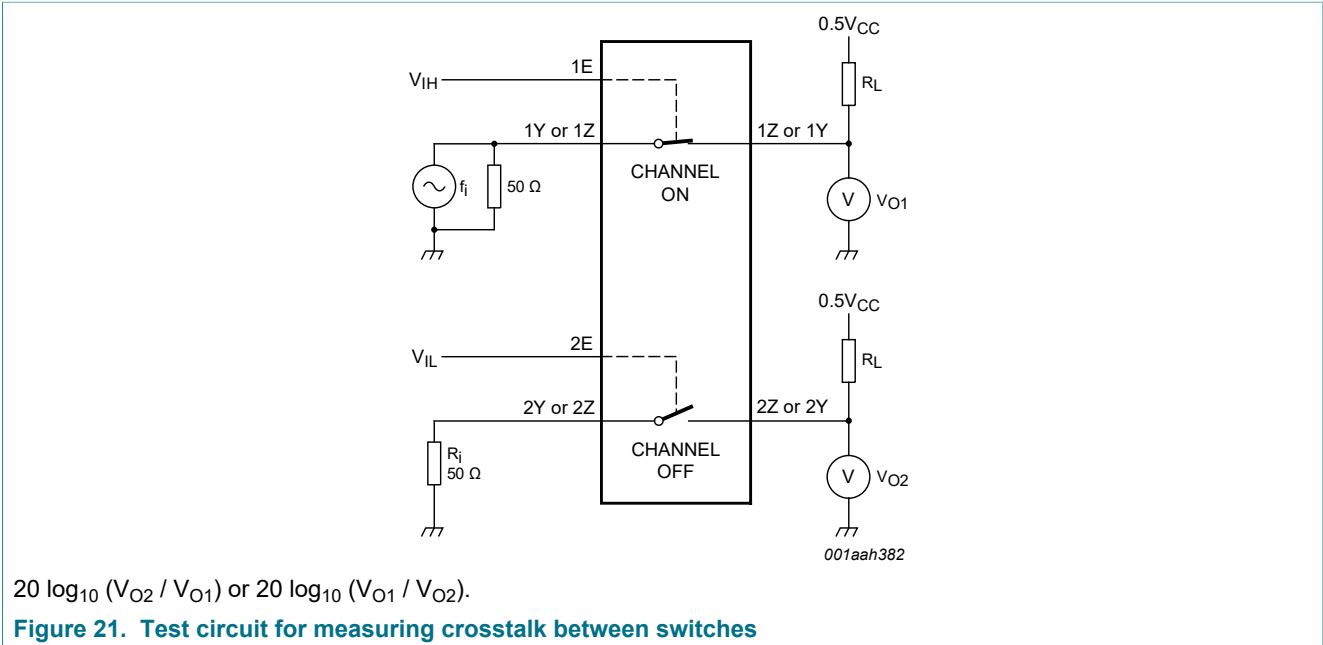


a. Test circuit



b. input and output pulse definitions

Figure 20. Test circuit for measuring crosstalk voltage between digital inputs and switch



12 Package outline

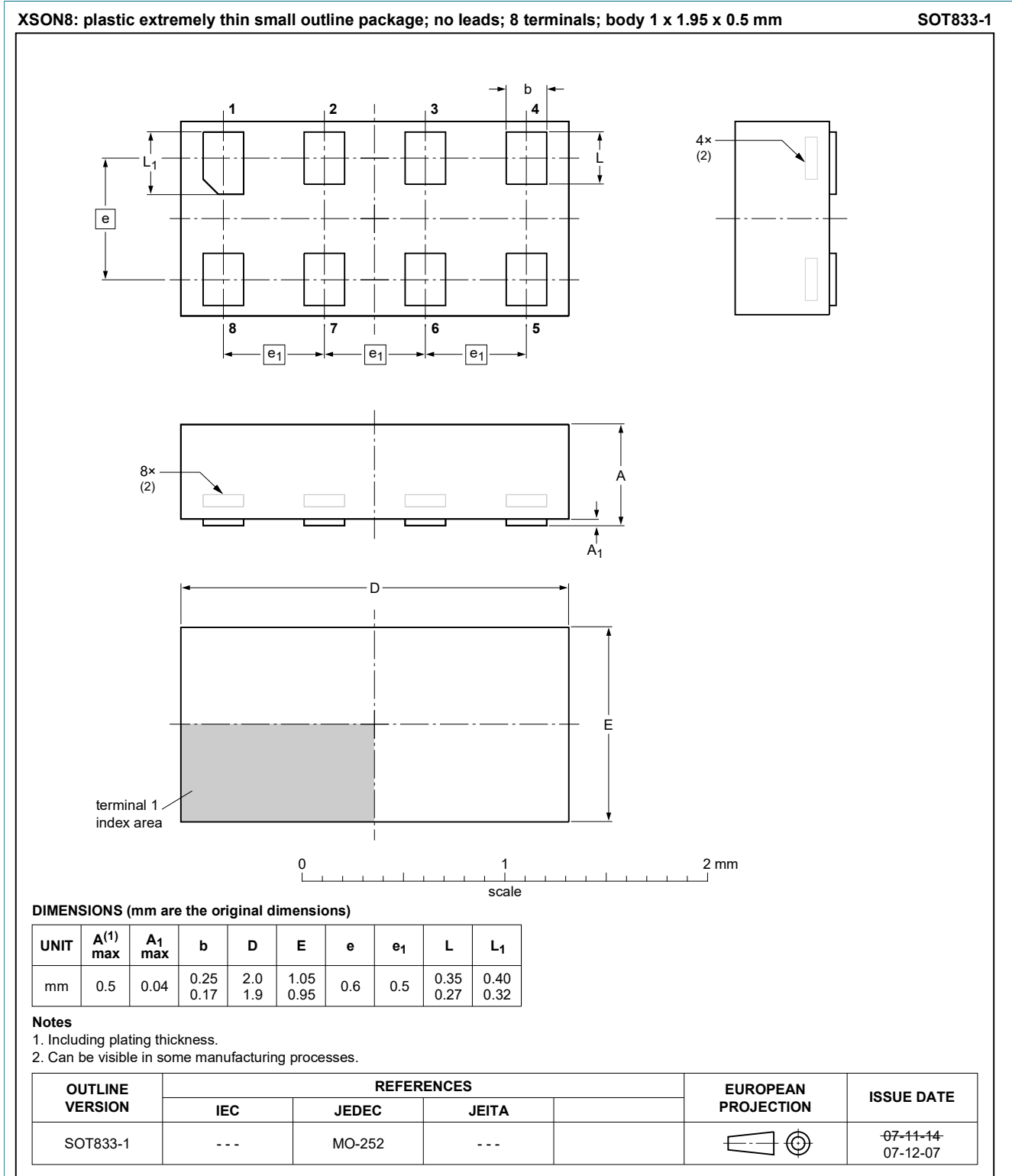


Figure 23. Package outline SOT833-1 (XSON8)

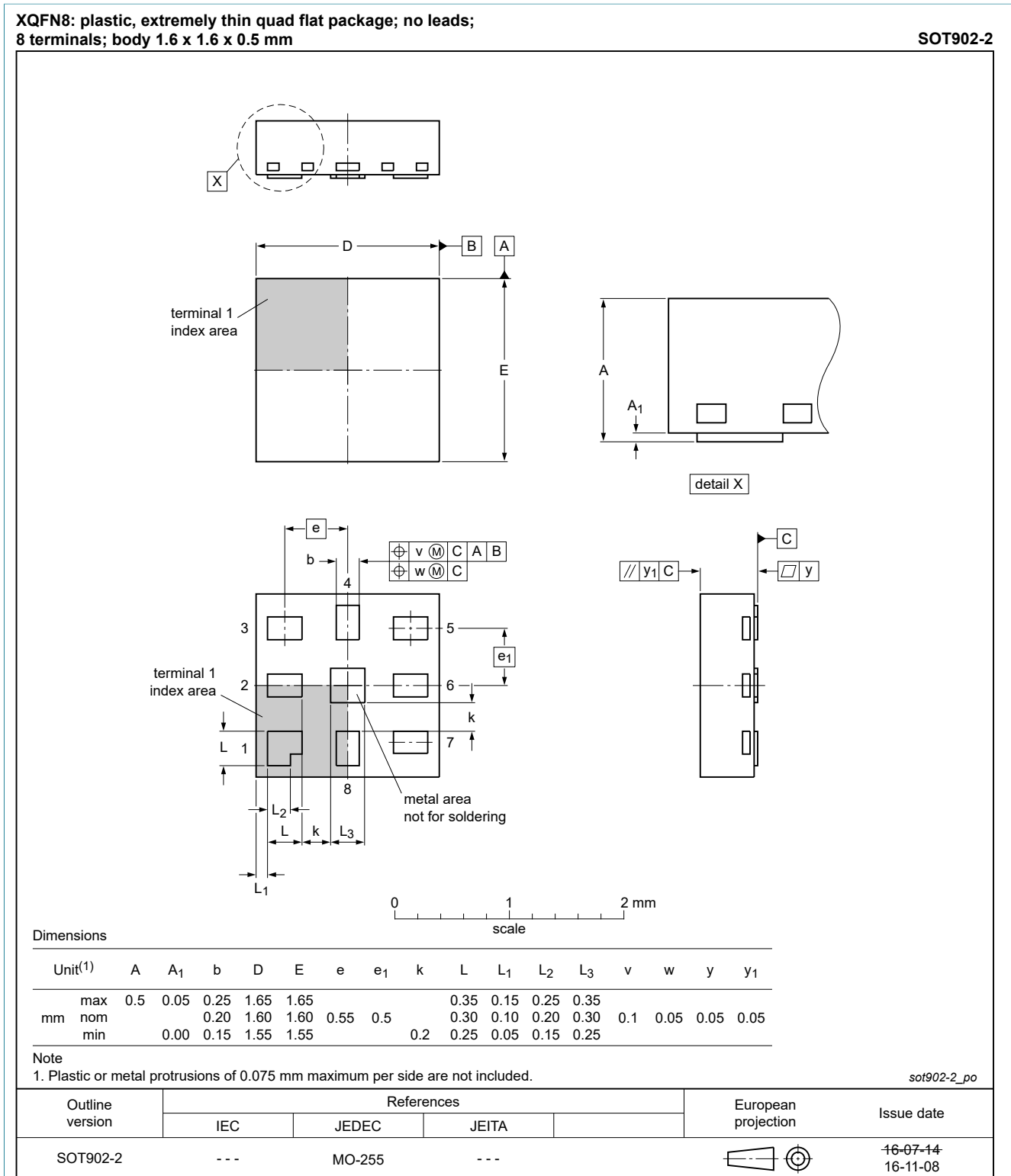


Figure 24. Package outline SOT902-2 (XQFN8)

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	Data sheet status	Change notice	Supersedes
NX3L2T66 v.7.1	20200811	Product data sheet	-	-
Modifications:	<ul style="list-style-type: none"> Removed NX3L2T66GD package option Updated Figure 24 			
NX3L2T66 v.7	20130208	Product data sheet	-	NX3L2T66 v.6
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	-	-

15 Legal information

15.1 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".

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