

NCX8200

Audio jack configuration switch matrix

Rev. 1 — 15 May 2015

Product data sheet

1. General description

The NCX8200 is an advanced audio jack configuration switch matrix device that supports 3- and 4-pole connectors. It allows reconfiguration of the GND, microphone-bias contact to comply with the American Headset Jack (AHJ) and the Open Mobile Terminal Platform (OMTP) pinout. Furthermore, a GND sense path supports quasi-differential amplifier architectures. The device contains Human Body Model compliant ESD protection diodes rated 8 kV at all pins. The device can be operated from a supply in the range of 1.6 V to 3.6 V. It supports a broad variety of after-market headphones.

2. Features and benefits

- AHJ and OMTP headset jack pinout support
- Low supply current
- Sense path to GND for quasi differential amplifier configuration
- Low THD and noise microphone pass through channel
- Ultra low R_{DSon} of ground and sense switches
- High power supply ripple rejection
- ESD protection: HBM JEDEC JDS-001 Class 3B exceeds 8 kV
- Operating ambient temperature: -40°C to $+85^{\circ}\text{C}$
- $1.22\text{ mm} \times 1.22\text{ mm} \times 0.5\text{ mm}$ WLCSP9 package

3. Applications

- Headphones with integrated microphone and remote control buttons

4. Ordering information

Table 1. Ordering information

| Type number | Package | | |
|-------------|---------|--|-----------|
| | Name | Description | Version |
| NCX8200UK | WLCSP9 | wafer chip-scale package; 9 bumps; $1.22 \times 1.22 \times 0.5\text{ mm}$ | NCX8200UK |

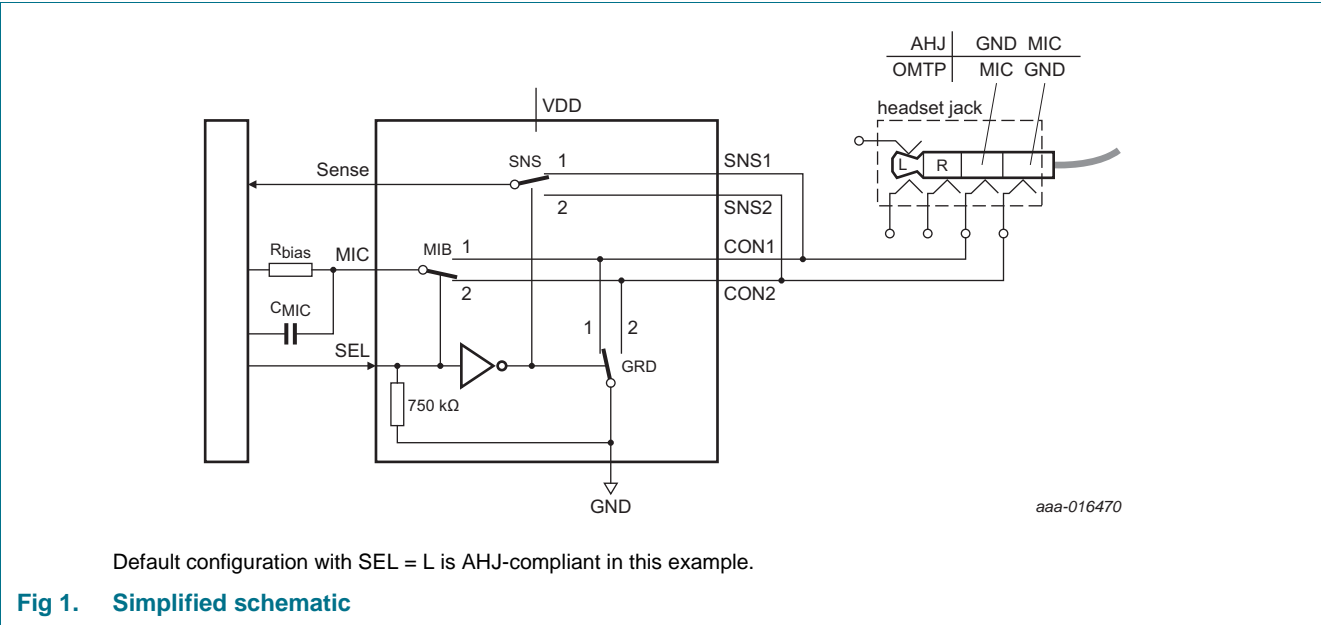
5. Marking

Table 2. Marking codes

| Type number | Marking code |
|-------------|--------------|
| NCX8200UK | qx82 |

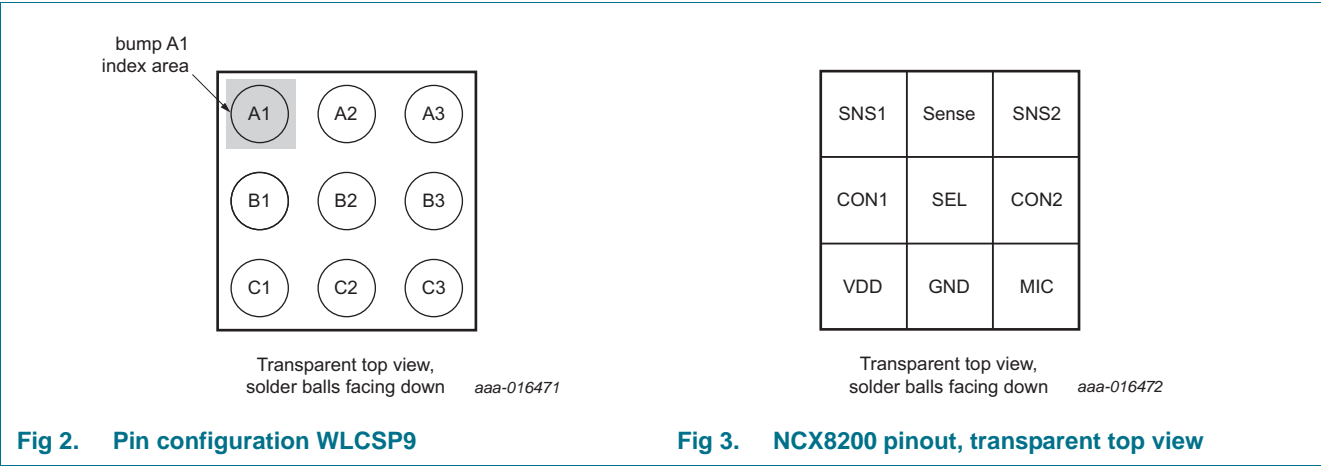


6. Functional diagram



7. Pinning information

7.1 Pinning



7.2 Pin description

Table 3. Pin description

| Symbol | Pin | Type | Description |
|--------|-----|--------|---|
| SNS1 | A1 | I/O | analog sense path 1 to headset jack GND |
| Sense | A2 | I/O | analog sense path for GND sensing |
| SNS2 | A3 | I/O | analog sense path 2 to headset jack GND |
| CON1 | B1 | I/O | headset jack pin 1 |
| SEL | B2 | I | configuration select input: SEL = L: CON1 = GND, CON2 = MIC, Sense = SNS1 SEL = H: CON1 = MIC, CON2 = GND, Sense = SNS2 |
| CON2 | B3 | I/O | headset jack pin 2 |
| VDD | C1 | power | core supply |
| GND | C2 | ground | ground |
| MIC | C3 | I/O | microphone bias connection audio codec side |

8. Functional description

The basic application of the NCX8200 device is shown in [Figure 1](#).

There is a 750 kW pull down resistor at SEL pin, for setting SEL default LOW.

If SEL is at low level, CON1 is connected to GND, the MIC channel is routed to CON2, and the Sense channel switches to SNS1. If SEL is at high level, CON2 is connected to GND, the MIC channel is routed to CON1, and the Sense channel switches to SNS2.

9. Application diagram

A capacitor of value not less than 1 μF , should be placed between VDD and GND for stable operation of the NCX8200. The bypass capacitor should be placed close to the device with low-ohmic connection from the power supply and GND connection.

SNS1 should be for sensing CON1 connection and SNS2 should be for sensing CON2 connection. In PCB design, CONx routes from the headset jack should be as low-ohmic as possible. SNSx sensing nodes should be as close to the headset jack as possible with low-ohmic connection, so that the star connection is recommended. The routes from sensing nodes to SNSx should be as low-ohmic as possible.

When VDD is not powered, all the FETs become open by default. Thus, the ground return path becomes floating. Noise might be heard if a speaker (with external powered amplified) is plugged in the audio jack. It is highly recommended when the audio jack detects a plug-in, the NCX8200 is kept powered until unplug.

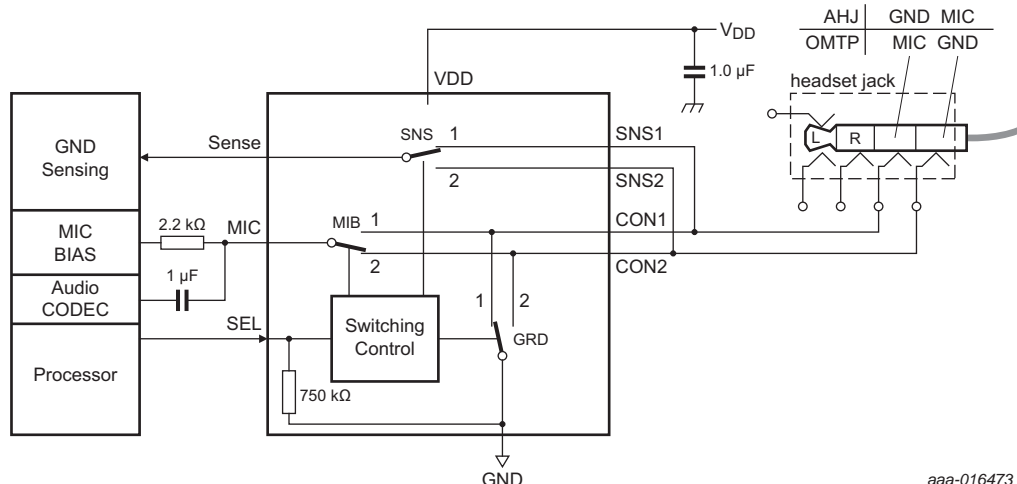


Fig 4. NCX8200 application diagram

10. Limiting values

Table 4. 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_{DD} | supply voltage | | -0.5 | +3.6 | V |
| $V_{I/O}$ | input/output voltage | MIC, CON1, CON2, Sense, SNS1, SNS2 | -0.5 | V_{DD} | V |
| V_I | input voltage | SEL | -0.5 | $V_{DD} + 0.1$ | V |
| $I_{SW(GRD)}$ | switch current | continuous current from CON1 or CON2 to GND | - | 100 | mA |
| $I_{SW(MIB)}$ | switch current | continuous current from MIC to CON1 or CON2 | - | 50 | mA |
| $I_{SW(SNS)}$ | switch current | continuous current from Sense to SNS1 or SNS2 | - | 50 | mA |
| $T_{j(max)}$ | maximum junction temperature | | -40 | +125 | °C |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| P_{tot} | total power dissipation | | - | 530 | mW |

11. Recommended operating conditions

Table 5. Recommended operating conditions

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|----------------------|------------------------------------|------|----------|------|
| V_{DD} | supply voltage | | 1.6 | 3.6 | V |
| $V_{I/O}$ | input/output voltage | MIC, CON1, CON2, Sense, SNS1, SNS2 | -0.3 | V_{DD} | V |
| V_I | input voltage | SEL | -0.3 | V_{DD} | V |
| T_{amb} | ambient temperature | | -40 | +85 | °C |

12. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Typ | Unit |
|---------------|---|------------|------|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | [1][2] | 75.5 | K/W |

- [1] The overall $R_{th(j-a)}$ can vary depending on the board layout. To minimize the effective $R_{th(j-a)}$, all pins must have a solid connection to larger Cu layer areas e.g. to the power and ground layer. In multi-layer PCB applications, the second layer should be used to create a large heat spreader area right below the device. If this layer is either ground or power, it should be connected with several vias to the top layer connecting to the device ground or supply. Try not to use any solder-stop varnish under the chip.
- [2] Rely on the measurement data given for rough estimation of the $R_{th(j-a)}$ in your application. The actual $R_{th(j-a)}$ value may vary in applications using different layer stacks and layouts.

13. Static characteristics

Table 7. Static characteristics

At recommended operating conditions $T_{amb} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ unless otherwise specified. Typical values are measured with $V_{DD} = 3.0\text{ V}$ and $T_{amb} = 25\text{ }^{\circ}\text{C}$. Voltages are referenced to GND (ground = 0 V).

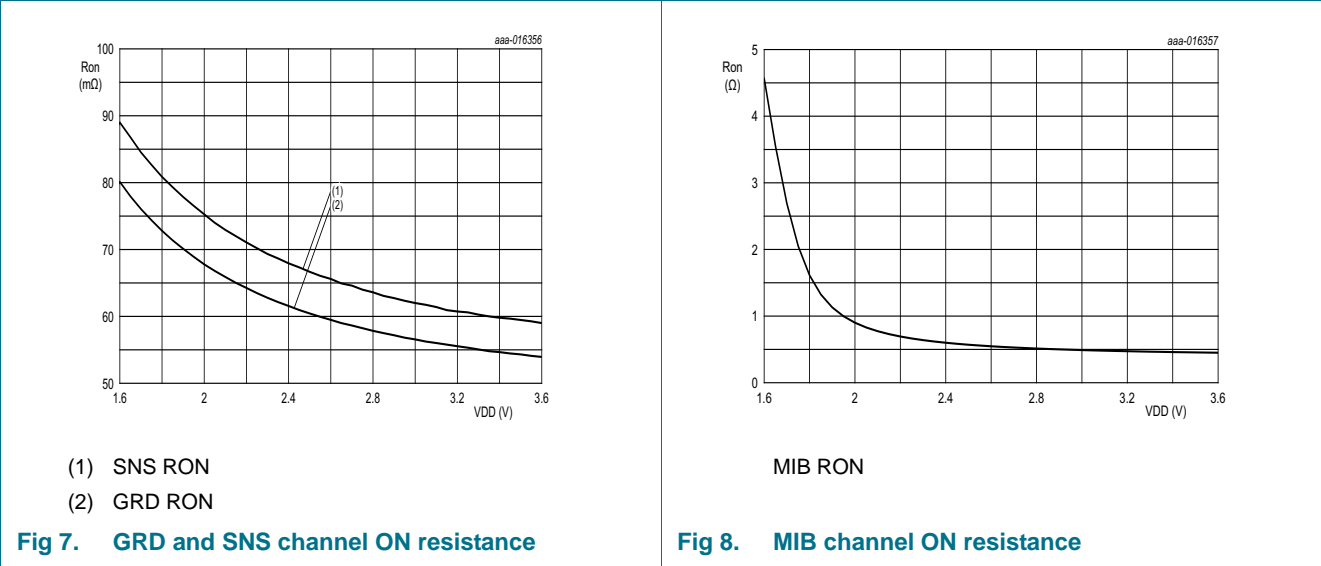
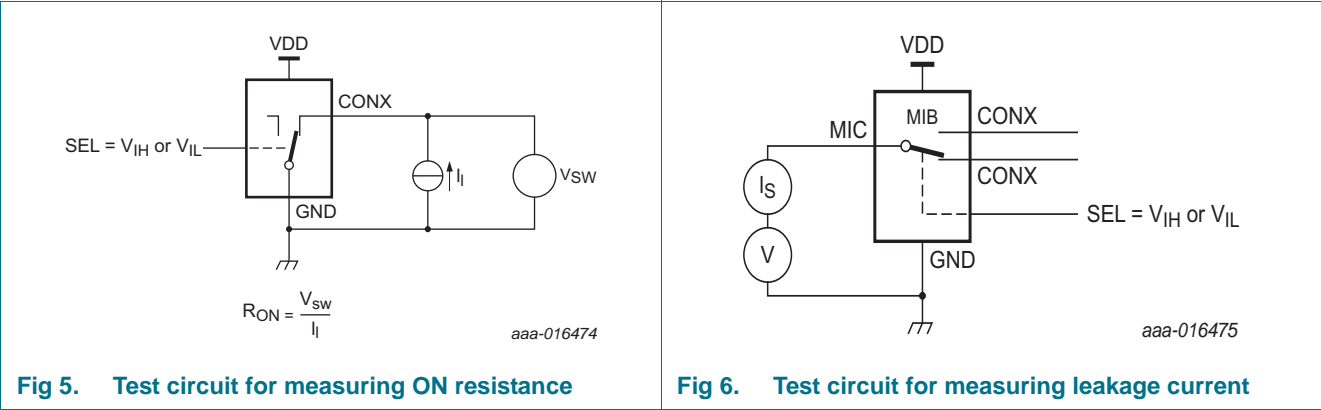
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------------------|--|---|-----|-------|-----|------|
| Digital control | | | | | | |
| V _{IH} | HIGH-level input voltage | SEL input | 1.0 | - | - | V |
| V _{IL} | LOW-level input voltage | SEL input | - | - | 0.4 | V |
| R _{pd} | pull-down Resistor | SEL input | - | 750 | - | kΩ |
| Current consumption | | | | | | |
| I _{DD} | Quiescent current | V _{DD} = 3.0 V; T _{amb} = 25 °C | - | 0.1 | 1 | μA |
| | | V _{DD} = 3.0 V; T _{amb} = 85 °C | - | - | 5 | μA |
| Microphone bias switch MIB | | | | | | |
| I _{S(MIB)} | MIB Path leakage current | MIC; V _{MIC} = 850 mV; CONx open; SEL = H or L | - | - | 1.5 | μA |
| R _{ON(MIB)} | MIB switch-on resistance | I _O = 30 mA, V _I = 850 mV | | | | |
| | | V _{DD} = 1.8 V | - | 1.6 | 2.5 | Ω |
| | | V _{DD} = 3.0 V | - | 0.5 | 0.8 | Ω |
| | | V _{DD} = 3.6 V | - | 0.46 | 0.7 | Ω |
| R _{ON(MIB_flat)} | MIB switch-on resistance flatness | I _O = 30 mA, 0.8 V < V _I < 1.2 V | | | | |
| | | V _{DD} = 1.8 V | - | - | 5 | Ω |
| | | V _{DD} = 3.0 V | - | - | 0.1 | Ω |
| | | V _{DD} = 3.6 V | - | - | 0.1 | Ω |
| C _S | input/output capacitance | MIC; CONx open; SEL = H or L | - | 250 | - | pF |
| THD | total harmonic distortion of the conducting MIB switch | R _S = R _L = 600 Ω, f _{AC} = 20 kHz, V _{AC} = 0.5 V _{PP} , V _{DC} = 1.7 V, V _{DD} = 3.0 V; SEL = H or L | - | 0.005 | - | % |
| PSRR | power supply ripple rejection ratio of the conducting MIB switch | R _S = R _L = 600 Ω, f = 217 Hz, V _{DD} = 3.0 V, V _{DC} = 2.1 V, V _{AC} = 0.3 V _{PP} ; SEL = H or L | - | -80 | - | dB |
| Ground switch GRD | | | | | | |
| R _{ON(GRD)} | GRD switch on resistance | I _{ICONx} = 100 mA | | | | |
| | | V _{DD} = 1.8 V | - | 70 | 120 | mΩ |
| | | V _{DD} = 3.0 V | - | 60 | 90 | mΩ |
| | | V _{DD} = 3.6 V | - | 57 | 82 | mΩ |
| R _{ON(GRD_flat)} | GRD switch-on resistance flatness | I _{ICONx} = 10 mA, V _{DD} = 1.8 V ~ 3.6 V | - | - | 50 | mΩ |
| | | I _{ICONx} = 1 mA, V _{DD} = 1.8 V ~ 3.6 V | - | - | 50 | mΩ |
| PSRR | power supply ripple rejection ratio of the conducting GRD switch | V _S = 1 V, R _S = 8 Ω, V _{DD} = 3.0 V, V _{AC} = 0.3 V _{PP} , f = 217 Hz; SEL = H or L | - | -60 | - | dB |

Table 7. Static characteristics ...continued

At recommended operating conditions $T_{amb} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ unless otherwise specified. Typical values are measured with $V_{DD} = 3.0\text{ V}$ and $T_{amb} = 25\text{ }^{\circ}\text{C}$. Voltages are referenced to GND (ground = 0 V). ...continued

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------|-----------------------------------|---|-----|-----|-----|------------------|
| Sense switch SNS | | | | | | |
| $R_{ON(SNS)}$ | SNS switch on resistance | $I_{sense} = 30\text{ mA}$, $SNSx = 0\text{ V}$ | | | | |
| | | $V_{DD} = 1.8\text{ V}$ | - | 80 | 130 | $\text{m}\Omega$ |
| | | $V_{DD} = 3.0\text{ V}$ | - | 60 | 90 | $\text{m}\Omega$ |
| | | $V_{DD} = 3.6\text{ V}$ | - | 57 | 82 | $\text{m}\Omega$ |
| $R_{ON(SNS_flat)}$ | SNS switch-on resistance flatness | $I_{sense} = 10\text{ mA}$, $SNSx = 0\text{ V}$, $V_{DD} = 1.8\text{ V} \sim 3.6\text{ V}$ | - | - | 50 | $\text{m}\Omega$ |
| | | $I_{sense} = 1\text{ mA}$, $SNSx = 0\text{ V}$, $V_{DD} = 1.8\text{ V} \sim 3.6\text{ V}$ | - | - | 50 | $\text{m}\Omega$ |
| $I_{S(SNS_OFF)}$ | SNS switch leakage current | Sense; $V_{sense} = 1\text{ V}$ | | | | |
| | | SEL = H; SNS1 = GND; SNS2 = OPEN | - | - | 1 | μA |
| | | SEL = L; SNS1 = OPEN; SNS2 = GND | - | - | 1 | μA |

13.1 Test circuit and graphs



14. Dynamic characteristics

Table 8. Dynamic characteristics
At recommended operating conditions $T_{amb} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ unless otherwise specified. Typical values are measured with $V_{DD} = 3.0\text{ V}$ and $T_{amb} = 25\text{ }^{\circ}\text{C}$. Voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | Min | Typ | Max ^[1] | Unit |
|-----------|------------------------|--|-------------------|-----|--------------------|------|
| t_{ON} | Turn-ON Time | $V_{MIC} = V_{DD}$, $V_{sense} = 0\text{ V}$, $R_L = 50\text{ }\Omega$, $C_L = 35\text{ pF}$ | - | 215 | 400 | ns |
| t_{OFF} | Turn-OFF Time | $V_{MIC} = V_{DD}$, $V_{sense} = 0\text{ V}$, $R_L = 50\text{ }\Omega$, $C_L = 35\text{ pF}$ | - | 35 | 120 | ns |
| t_{BBM} | break-before-make time | $V_{MIC} = V_{DD}$, $V_{sense} = 0\text{ V}$, $R_L = 50\text{ }\Omega$, $C_L = 35\text{ pF}$ | 70 ^[1] | 180 | 320 | ns |

[1] Guaranteed by design

14.1 Waveform

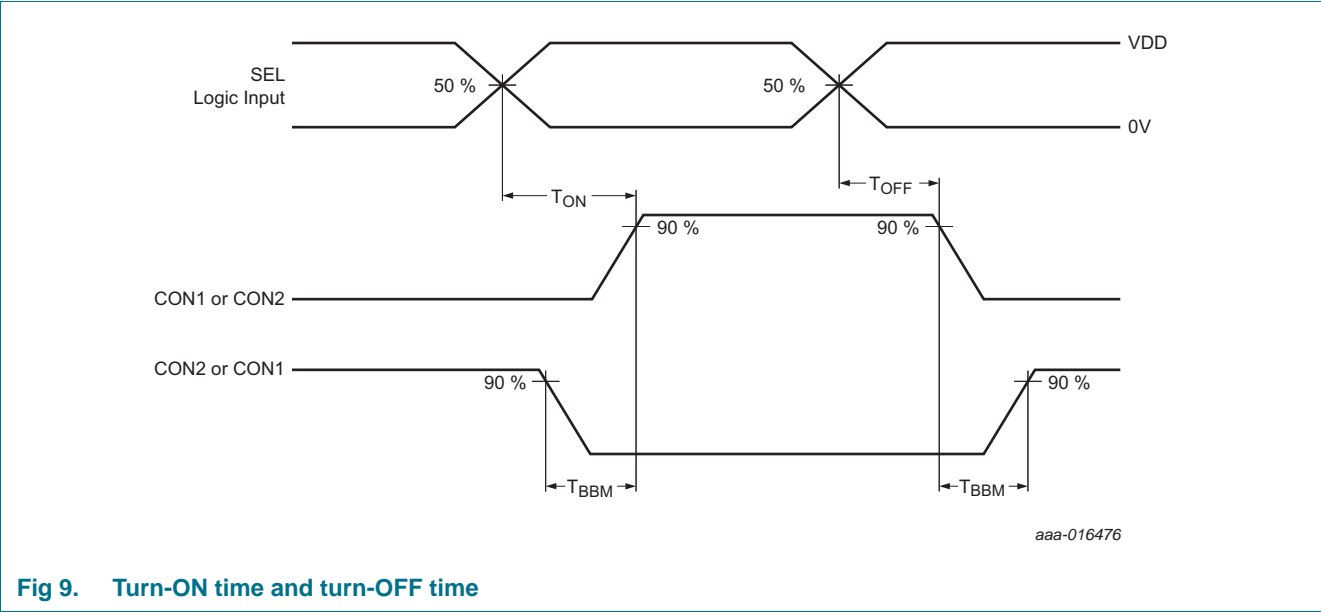


Fig 9. Turn-ON time and turn-OFF time

15. Package outline

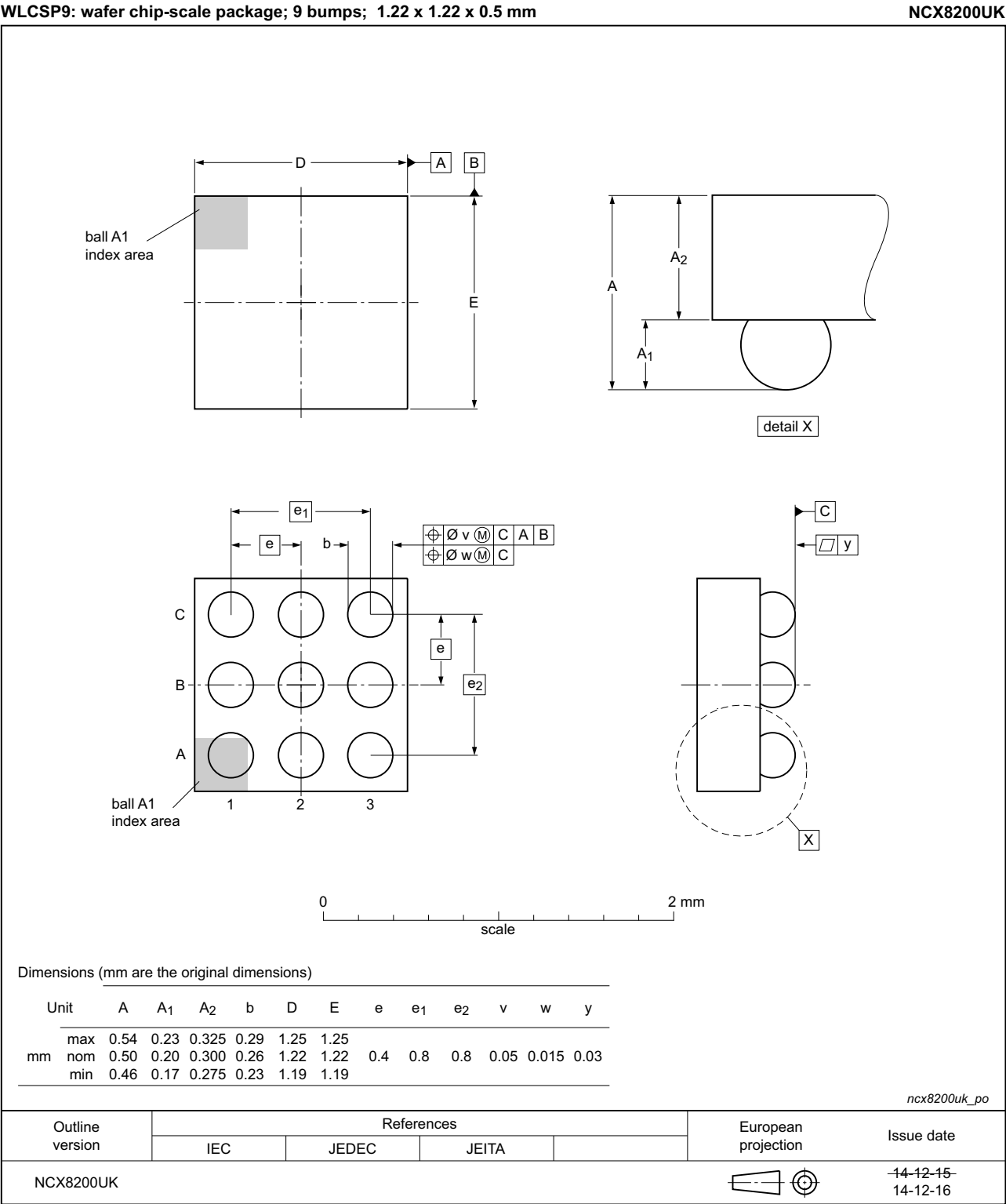


Fig 10. Package outline NCX8200 (WLCSP9)

16. Abbreviations

Table 9. Abbreviations

| Acronym | Description |
|---------|---|
| THD | Total Harmonic Distortion |
| CDM | Charged Device Model |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MOSFET | Metal-Oxide Semiconductor Field Effect Transistor |

17. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------|--------------|--------------------|---------------|------------|
| NCX8200 v.1 | 20150515 | Product data sheet | - | - |

18. Legal information

18.1 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>.

18.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

18.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Non-automotive qualified products — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond

NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

18.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

19. Contact information

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: salesaddresses@nxp.com

20. Contents

| | | |
|-----------|---|-----------|
| 1 | General description | 1 |
| 2 | Features and benefits | 1 |
| 3 | Applications | 1 |
| 4 | Ordering information | 1 |
| 5 | Marking | 1 |
| 6 | Functional diagram | 2 |
| 7 | Pinning information | 3 |
| 7.1 | Pinning | 3 |
| 7.2 | Pin description | 3 |
| 8 | Functional description | 3 |
| 9 | Application diagram | 4 |
| 10 | Limiting values | 5 |
| 11 | Recommended operating conditions | 5 |
| 12 | Thermal characteristics | 5 |
| 13 | Static characteristics | 6 |
| 13.1 | Test circuit and graphs | 8 |
| 14 | Dynamic characteristics | 9 |
| 14.1 | Waveform | 9 |
| 15 | Package outline | 10 |
| 16 | Abbreviations | 11 |
| 17 | Revision history | 11 |
| 18 | Legal information | 12 |
| 18.1 | Data sheet status | 12 |
| 18.2 | Definitions | 12 |
| 18.3 | Disclaimers | 12 |
| 18.4 | Trademarks | 13 |
| 19 | Contact information | 13 |
| 20 | Contents | 14 |

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© NXP Semiconductors N.V. 2015.

All rights reserved.

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 15 May 2015

Document identifier: NCX8200



**Стандарт
Электрон
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331