

## X4 SRAM Nonvolatile Controller Unit

### Features

- Power monitoring and switching for 3-volt battery-backup applications
- Write-protect control
- 2-input decoder for control of up to 4 banks of SRAM
- 3-volt primary cell inputs
- Less than 10ns chip-enable propagation delay
- 5% or 10% supply operation

### General Description

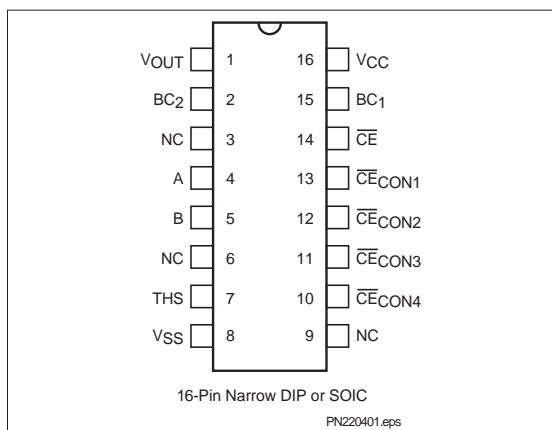
The CMOS bq2204A SRAM Nonvolatile Controller Unit provides all necessary functions for converting up to four banks of standard CMOS SRAM into nonvolatile read/write memory.

A precision comparator monitors the 5V VCC input for an out-of-tolerance condition. When out-of-tolerance is detected, the four conditioned chip-enable outputs are forced inactive to write-protect up to four banks of SRAM.

During a power failure, the external SRAMs are switched from the VCC supply to one of two 3V backup supplies. On a subsequent power-up, the SRAMs are write-protected until a power-valid condition exists.

During power-valid operation, a two-input decoder transparently selects one of up to four banks of SRAM.

### Pin Connections



### Pin Names

|   |                                   |
|---|-----------------------------------|
| VOUT  | Supply output                     |
| BC <sub>1</sub> –BC <sub>2</sub>  | 3 volt primary backup cell inputs |
| THS   | Threshold select input            |
| $\overline{\text{CE}}$  | chip-enable active low input      |
| $\overline{\text{CE}}_{\text{CON1}}$ – $\overline{\text{CE}}_{\text{CON4}}$ | Conditioned chip-enable outputs   |
| A–B   | Decoder inputs                    |
| NC  | No connect                        |
| VCC   | +5 volt supply input              |
| VSS   | Ground                            |

### Functional Description

Up to four banks of CMOS static RAM can be battery-backed using the VOUT and conditioned chip-enable output pins from the bq2204A. As VCC slews down during a power failure, the conditioned chip-enable outputs  $\overline{\text{CE}}_{\text{CON1}}$  through  $\overline{\text{CE}}_{\text{CON4}}$  are forced inactive independent of the chip-enable input  $\overline{\text{CE}}$ .

This activity unconditionally write-protects the external SRAM as VCC falls below an out-of-tolerance threshold VPFD. VPFD is selected by the threshold select input pin, THS. If THS is tied to VSS, the power-fail detection occurs at 4.62V typical for 5% supply operation.

If THS is tied to VCC, power-fail detection occurs at 4.37V typical for 10% supply operation. The THS pin must be tied to VSS or VCC for proper operation.

If a memory access is in process to any of the four external banks of SRAM during power-fail detection, that memory cycle continues to completion before the memory is write-protected. If the memory cycle is not terminated within time  $t_{\text{WPT}}$ , all four chip-enable outputs are unconditionally driven high, write-protecting the controlled SRAMs.

## bq2204A

As the supply continues to fall past  $V_{PFD}$ , an internal switching device forces  $V_{OUT}$  to one of the two external backup energy sources.  $\overline{CECON1}$  through  $\overline{CECON4}$  are held high by the  $V_{OUT}$  energy source.

During power-up,  $V_{OUT}$  is switched back to the 5V supply as  $V_{CC}$  rises above the backup cell input voltage sourcing  $V_{OUT}$ . Outputs  $\overline{CECON1}$  through  $\overline{CECON4}$  are held inactive for time  $t_{CER}$  (120ms maximum) after the power supply has reached  $V_{PFD}$ , independent of the  $\overline{CE}$  input, to allow for processor stabilization.

During power-valid operation, the  $\overline{CE}$  input is passed through to one of the four  $\overline{CECON}$  outputs with a propagation delay of less than 10ns. The  $\overline{CE}$  input is output on one of the four  $\overline{CECON}$  output pins depending on the level of the decode inputs at A and B as shown in the Truth Table.

The A and B inputs are usually tied to high-order address pins so that a large nonvolatile memory can be designed using lower-density memory devices. Nonvolatility and decoding are achieved by hardware hookup as shown in Figure 1.

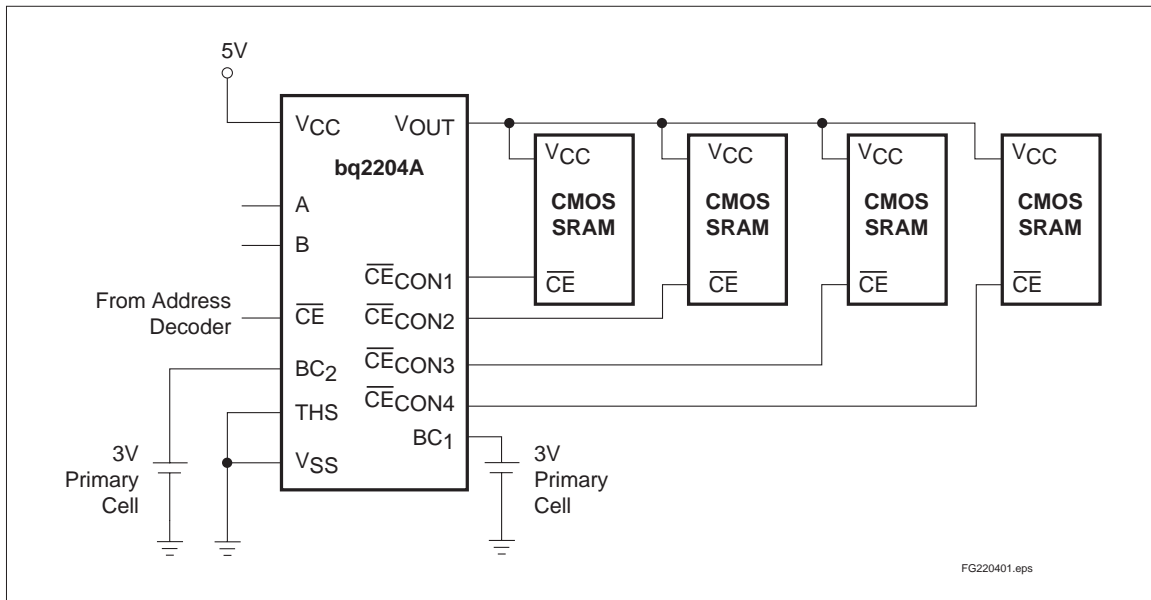


Figure 1. Hardware Hookup (5% Supply Operation)

## Energy Cell Inputs—BC<sub>1</sub>, BC<sub>2</sub>

Two backup energy source inputs are provided on the bq2204A. The BC<sub>1</sub> and BC<sub>2</sub> inputs accept a 3V primary battery (non-rechargeable), typically some type of lithium chemistry. If no primary cell is to be used on either BC<sub>1</sub> or BC<sub>2</sub>, the unused input should be tied to V<sub>SS</sub>.

V<sub>CC</sub> falling below V<sub>VPFD</sub> starts the comparison of BC<sub>1</sub> and BC<sub>2</sub>. The BC input comparison continues until V<sub>CC</sub> rises above V<sub>SO</sub>. Power to V<sub>OUT</sub> begins with BC<sub>1</sub> and switches to BC<sub>2</sub> only when V<sub>BC1</sub> is less than V<sub>BC2</sub> minus V<sub>B<sub>SO</sub></sub>. The controller alternates to the higher BC voltage only when the difference between the BC input voltages is greater than V<sub>B<sub>SO</sub></sub>. Alternating the backup batteries allows one-at-a-time battery replacement and efficient use of both backup batteries.

To prevent battery drain when there is no valid data to retain, V<sub>OUT</sub> and  $\overline{\text{CE}}_{\text{CON1-4}}$  are internally isolated from BC<sub>1</sub> and BC<sub>2</sub> by either of the following conditions:

- Initial connection of a battery to BC<sub>1</sub> or BC<sub>2</sub>, or
- Presentation of an isolation signal on  $\overline{\text{CE}}$ .

A valid isolation signal requires  $\overline{\text{CE}}$  low as V<sub>CC</sub> crosses both V<sub>VPFD</sub> and V<sub>SO</sub> during a power-down. See Figure 2. Between these two points in time,  $\overline{\text{CE}}$  must be brought to the point of (0.48 to 0.52)\*V<sub>CC</sub> and held for at least 700ns. The isolation signal is invalid if  $\overline{\text{CE}}$  exceeds 0.54\*V<sub>CC</sub> at any point between V<sub>CC</sub> crossing V<sub>VPFD</sub> and V<sub>SO</sub>.

The appropriate battery is connected to V<sub>OUT</sub> and  $\overline{\text{CE}}_{\text{CON1-4}}$  immediately on subsequent application and removal of V<sub>CC</sub>.

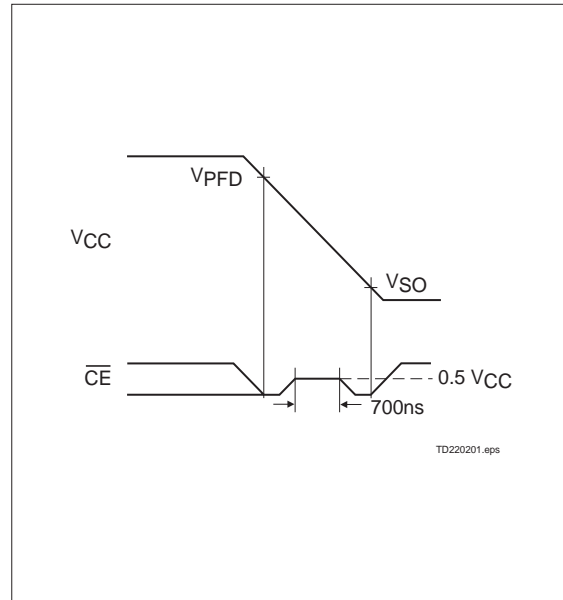


Figure 2. Battery Isolation Signal

## Truth Table

| Input                  |   |   | Output                               |                                      |                                      |                                      |
|------------------------|---|---|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| $\overline{\text{CE}}$ | A | B | $\overline{\text{CE}}_{\text{CON1}}$ | $\overline{\text{CE}}_{\text{CON2}}$ | $\overline{\text{CE}}_{\text{CON3}}$ | $\overline{\text{CE}}_{\text{CON4}}$ |
| H                      | X | X | H                                    | H                                    | H                                    | H                                    |
| L                      | L | L | L                                    | H                                    | H                                    | H                                    |
| L                      | H | L | H                                    | L                                    | H                                    | H                                    |
| L                      | L | H | H                                    | H                                    | L                                    | H                                    |
| L                      | H | H | H                                    | H                                    | H                                    | L                                    |

## bq2204A

---

### Absolute Maximum Ratings

| Symbol              | Parameter   | Value        | Unit | Conditions                             |
|---------------------|---|--------------|------|--|
| V <sub>CC</sub>     | DC voltage applied on V <sub>CC</sub> relative to V <sub>SS</sub>                   | -0.3 to +7.0 | V    |  |
| V <sub>T</sub>      | DC voltage applied on any pin excluding V <sub>CC</sub> relative to V <sub>SS</sub> | -0.3 to +7.0 | V    | V <sub>T</sub> ≤ V <sub>CC</sub> + 0.3 |
| T <sub>OPR</sub>    | Operating temperature   | 0 to 70      | °C   | Commercial                             |
|                     |   | -40 to +85   | °C   | Industrial "N"                         |
| T <sub>STG</sub>    | Storage temperature   | -55 to +125  | °C   |  |
| T <sub>BIAS</sub>   | Temperature under bias  | -40 to +85   | °C   |  |
| T <sub>SOLDER</sub> | Soldering temperature   | 260          | °C   | For 10 seconds                         |
| I <sub>OUT</sub>    | V <sub>OUT</sub> current  | 200          | mA   |  |

**Note:** Permanent device damage may occur if **Absolute Maximum Ratings** are exceeded. Functional operation should be limited to the Recommended DC Operating Conditions detailed in this data sheet. Exposure to conditions beyond the operational limits for extended periods of time may affect device reliability.

### Recommended DC Operating Conditions (T<sub>A</sub> = T<sub>OPR</sub>)

| Symbol                                 | Parameter           | Minimum | Typical | Maximum               | Unit | Notes                             |
|--|---------------------|---------|---------|-----------------------|------|-----------------------------------|
| V <sub>CC</sub>                        | Supply voltage      | 4.75    | 5.0     | 5.5                   | V    | THS = V <sub>SS</sub>             |
|  |                     | 4.50    | 5.0     | 5.5                   | V    | THS = V <sub>CC</sub>             |
| V <sub>SS</sub>                        | Supply voltage      | 0       | 0       | 0                     | V    |                                   |
| V <sub>IL</sub>                        | Input low voltage   | -0.3    | -       | 0.8                   | V    |                                   |
| V <sub>IH</sub>                        | Input high voltage  | 2.2     | -       | V <sub>CC</sub> + 0.3 | V    |                                   |
| V <sub>BC1</sub> ,<br>V <sub>BC2</sub> | Backup cell voltage | 2.0     | -       | 4.0                   | V    | V <sub>CC</sub> < V <sub>BC</sub> |
| THS                                    | Threshold select    | -0.3    | -       | V <sub>CC</sub> + 0.3 | V    |                                   |

**Note:** Typical values indicate operation at T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5V or V<sub>BC</sub>.

**DC Electrical Characteristics** ( $T_A = T_{OPR}$ ,  $V_{CC} = 5V \pm 10\%$ )

| Symbol | Parameter                   | Minimum        | Typical   | Maximum | Unit    | Conditions/Notes  |
|--------|-----------------------------|----------------|-----------|---------|---------|---|
| ILI    | Input leakage current       | -              | -         | $\pm 1$ | $\mu A$ | $V_{IN} = V_{SS}$ to $V_{CC}$                                       |
| VOH    | Output high voltage         | 2.4            | -         | -       | V       | $I_{OH} = -2.0mA$   |
| VOHB   | VOH, BC supply              | $V_{BC} - 0.3$ | -         | -       | V       | $V_{BC} > V_{CC}$ , $I_{OH} = -10\mu A$                             |
| VOL    | Output low voltage          | -              | -         | 0.4     | V       | $I_{OL} = 4.0mA$  |
| ICC    | Operating supply current    | -              | 3         | 6       | mA      | No load on outputs.   |
| VPFD   | Power-fail detect voltage   | 4.55           | 4.62      | 4.75    | V       | $THS = V_{SS}$  |
|        |                             | 4.30           | 4.37      | 4.50    | V       | $THS = V_{CC}$  |
| VSO    | Supply switch-over voltage  | -              | $V_{BC}$  | -       | V       |   |
| ICCDR  | Data-retention mode current | -              | -         | 100     | nA      | $V_{OUT}$ data-retention current to additional memory not included. |
| VBC    | Active backup cell voltage  | -              | $V_{BC1}$ | -       | V       | $V_{BC1} > V_{BC2} + V_{BSO}$                                       |
|        |                             | -              | $V_{BC2}$ | -       | V       | $V_{BC2} > V_{BC1} + V_{BSO}$                                       |
| VBSO   | Battery switch-over voltage | 0.25           | 0.4       | 0.6     | V       |   |
| IOUT1  | $V_{OUT}$ current           | -              | -         | 160     | mA      | $V_{OUT} > V_{CC} - 0.3V$   |
| IOUT2  | $V_{OUT}$ current           | -              | 100       | -       | $\mu A$ | $V_{OUT} > V_{BC} - 0.2V$   |

**Note:** Typical values indicate operation at  $T_A = 25^\circ C$ ,  $V_{CC} = 5V$  or  $V_{BC}$ .

**Capacitance** ( $T_A = 25^\circ C$ ,  $F = 1MHz$ ,  $V_{CC} = 5.0V$ )

| Symbol | Parameter          | Minimum | Typical | Maximum | Unit | Conditions          |
|--------|--------------------|---------|---------|---------|------|---------------------|
| CIN    | Input capacitance  | -       | -       | 8       | pF   | Input voltage = 0V  |
| COUT   | Output capacitance | -       | -       | 10      | pF   | Output voltage = 0V |

**Note:** This parameter is sampled and not 100% tested.

# bq2204A

## AC Test Conditions

| Parameter                                | Test Conditions                   |
|--|-----------------------------------|
| Input pulse levels                       | 0V to 3.0V                        |
| Input rise and fall times                | 5ns                               |
| Input and output timing reference levels | 1.5V (unless otherwise specified) |

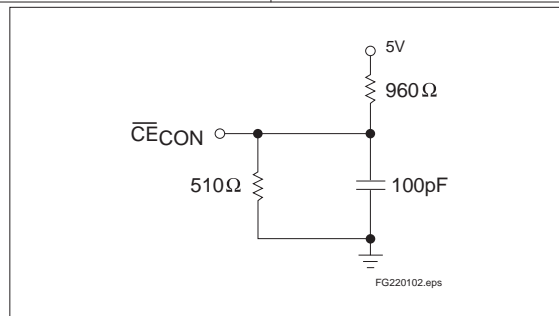


Figure 3. Output Load

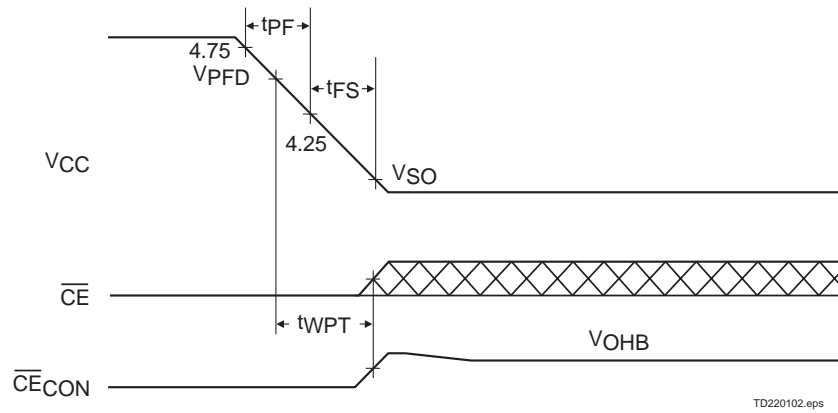
## Power-Fail Control ( $T_A = T_{OPR}$ )

| Symbol | Parameter                     | Minimum | Typical | Maximum | Unit | Notes  |
|--------|-------------------------------|---------|---------|---------|------|--|
| tPF    | VCC slew, 4.75V to 4.25V      | 300     | -       | -       | μs   |  |
| tFS    | VCC slew, 4.25V to VSO        | 10      | -       | -       | μs   |  |
| tPU    | VCC slew, 4.25V to 4.75V      | 0       | -       | -       | μs   |  |
| tCED   | chip-enable propagation delay | -       | 7       | 10      | ns   |  |
| tAS    | A,B set up to $\overline{CE}$ | 0       | -       | -       | ns   |  |
| tCER   | chip-enable recovery          | 40      | 80      | 120     | ms   | Time during which SRAM is write-protected after VCC passes V <sub>PDF</sub> on power-up. |
| tWPT   | Write-protect time            | 40      | 100     | 150     | μs   | Delay after VCC slews down past V <sub>PDF</sub> before SRAM is write-protected.         |

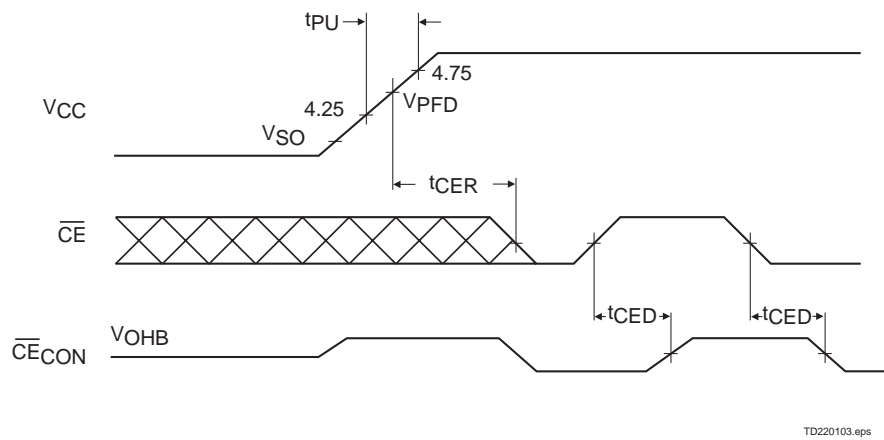
**Note:** Typical values indicate operation at  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$ .

**Caution:** Negative undershoots below the absolute maximum rating of -0.3V in battery-backup mode may affect data integrity.

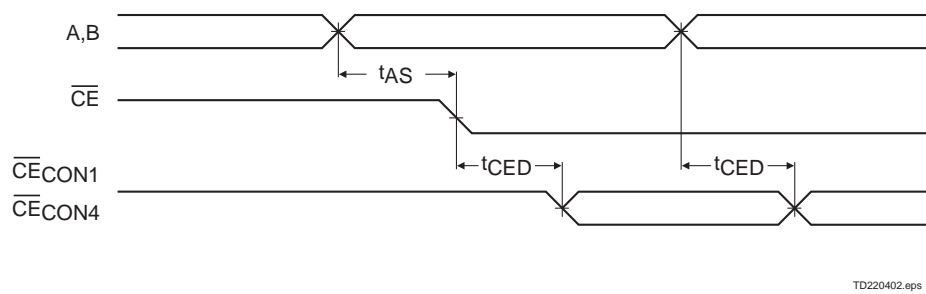
## Power-Down Timing



## Power-Up Timing



## Address-Decode Timing



## bq2204A

---

### Data Sheet Revision History

| Change No. | Page No. | Description of Change  | Nature of Change |
|------------|----------|--|------------------|
| 1          | All      | bq2204A replaces bq2204.   |                  |
| 1          | 1, 4-5   | 10% tolerance requires the THS pin to be tied to VCC, not VOUT.                              |                  |
| 1          | 3        | Energy cell input selection process alternates between BC <sub>1</sub> and BC <sub>2</sub> . |                  |

**Note:** Change 1 = Dec. 1992 changes from Sept. 1991



**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| BQ2204APN        | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)             | CU NIPDAU            | N / A for Pkg Type           |                             |
| BQ2204ASN        | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| BQ2204ASN-N      | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| BQ2204ASN-NG4    | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| BQ2204ASNG4      | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| BQ2204ASNTR      | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| BQ2204ASNTRG4    | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and



www.ti.com

## PACKAGE OPTION ADDENDUM

3-Dec-2011

---

continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


|    |   |
|----|---|
| A0 | Dimension designed to accommodate the component width     |
| B0 | Dimension designed to accommodate the component length    |
| K0 | Dimension designed to accommodate the component thickness |
| W  | Overall width of the carrier tape                         |
| P1 | Pitch between successive cavity centers                   |

**TAPE AND REEL INFORMATION**

\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| BQ2204ASNTR | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| BQ2204ASNTR | SOIC         | D               | 16   | 2500 | 367.0       | 367.0      | 38.0        |

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46C and to discontinue any product or service per JESD48B. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components which meet ISO/TS16949 requirements, mainly for automotive use. Components which have not been so designated are neither designed nor intended for automotive use; and TI will not be responsible for any failure of such components to meet such requirements.

### Products

|                        |  |
|------------------------|--|
| Audio                  | <a href="http://www.ti.com/audio">www.ti.com/audio</a>                               |
| Amplifiers             | <a href="http://amplifier.ti.com">amplifier.ti.com</a>                               |
| Data Converters        | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>                       |
| DLP® Products          | <a href="http://www.dlp.com">www.dlp.com</a>   |
| DSP                    | <a href="http://dsp.ti.com">dsp.ti.com</a>   |
| Clocks and Timers      | <a href="http://www.ti.com/clocks">www.ti.com/clocks</a>                             |
| Interface              | <a href="http://interface.ti.com">interface.ti.com</a>                               |
| Logic                  | <a href="http://logic.ti.com">logic.ti.com</a>                                       |
| Power Mgmt             | <a href="http://power.ti.com">power.ti.com</a>                                       |
| Microcontrollers       | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a>                   |
| RFID                   | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>                                 |
| OMAP Mobile Processors | <a href="http://www.ti.com/omap">www.ti.com/omap</a>                                 |
| Wireless Connectivity  | <a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a> |

### Applications

|                               |  |
|-------------------------------|--|
| Automotive and Transportation | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>                         |
| Communications and Telecom    | <a href="http://www.ti.com/communications">www.ti.com/communications</a>                 |
| Computers and Peripherals     | <a href="http://www.ti.com/computers">www.ti.com/computers</a>                           |
| Consumer Electronics          | <a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>                   |
| Energy and Lighting           | <a href="http://www.ti.com/energy">www.ti.com/energy</a>                                 |
| Industrial                    | <a href="http://www.ti.com/industrial">www.ti.com/industrial</a>                         |
| Medical                       | <a href="http://www.ti.com/medical">www.ti.com/medical</a>                               |
| Security                      | <a href="http://www.ti.com/security">www.ti.com/security</a>                             |
| Space, Avionics and Defense   | <a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a> |
| Video and Imaging             | <a href="http://www.ti.com/video">www.ti.com/video</a>                                   |

**TI E2E Community** [e2e.ti.com](http://e2e.ti.com)

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

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

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9