

SN54AS866, SN74AS866A 8-BIT MAGNITUDE COMPARATORS

SDAS183A – DECEMBER 1982 – REVISED JUNE 1990

- Package Options Include Plastic Small Outline Packages, Both Plastic and Ceramic Chip Carriers, and Standard Plastic and Ceramic DIPs
- Input and Output Latches with Active-High Enables
- Fast Compare to Zero
- Arithmetic and Logical Comparison
- Open-Collector P = Q Output

description

These Advanced Schottky devices are capable of performing high-speed arithmetic or logical comparisons on two 8-bit binary or two's complement words. Three fully decoded decisions about words P and Q are externally available at the outputs. These devices are fully expandable to any word length by connecting the totem pole P>Q and P<Q outputs of each stage to the P>Q and P<Q inputs of the next higher-order stage. The cascading paths are implemented with only a two-gate-level delay to reduce overall comparison times for long words. The open-collector P=Q output may be wire-ANDed together.

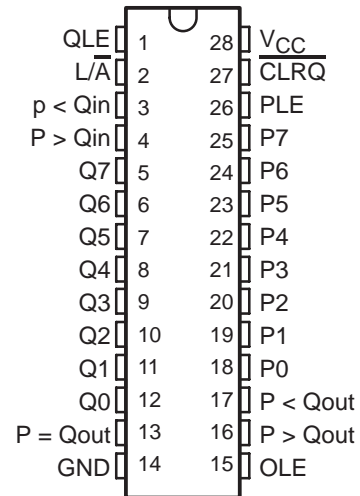
Both input words P and Q plus all three outputs (P>Q, P<Q, and P = Q) are equipped with latches to provide the designer with temporary data storage for avoiding race conditions. The enable circuitry is implemented with minimal delay times to enhance performance when the devices are cascaded for longer word lengths. Each latch is transparent when the appropriate latch enable, PLE, QLE, or OLE is high.

The enable inputs PLE and QLE and data inputs P and Q utilize pnp input transistors to reduce the low-level input current requirement to typically -0.25 mA, which minimizes loading effects.

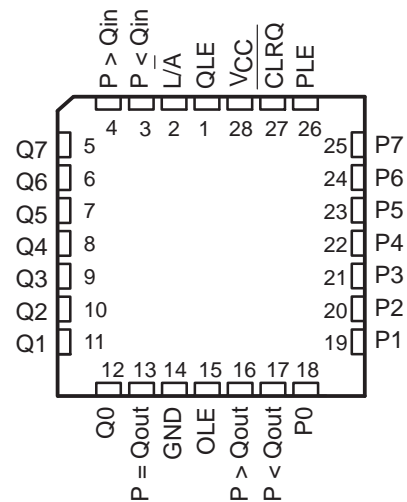
The Q register may be cleared to zero for a fast comparison of the P word to zero.

The SN54AS866 is characterized for operation over the full military temperature range of -55°C to 125°C. The SN74AS866A is characterized for operation from 0°C to 70°C.

SN54AS866 . . . JD PACKAGE
SN74AS866A . . . N PACKAGE
(TOP VIEW)



SN54AS866 . . . FK PACKAGE
SN74AS866A . . . FN PACKAGE
(TOP VIEW)

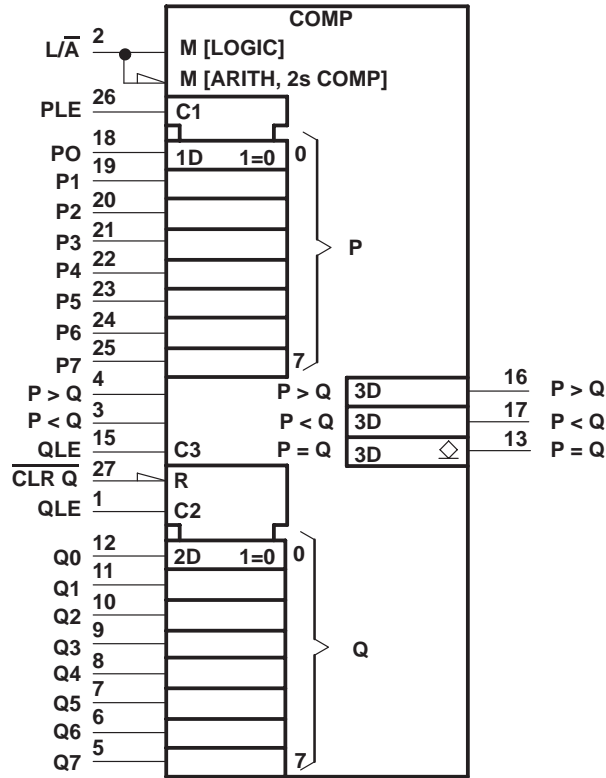


SN54AS866, SN74AS866A

8-BIT MAGNITUDE COMPARATORS

SDAS183A – DECEMBER 1982 – REVISED JUNE 1990

logic symbol†

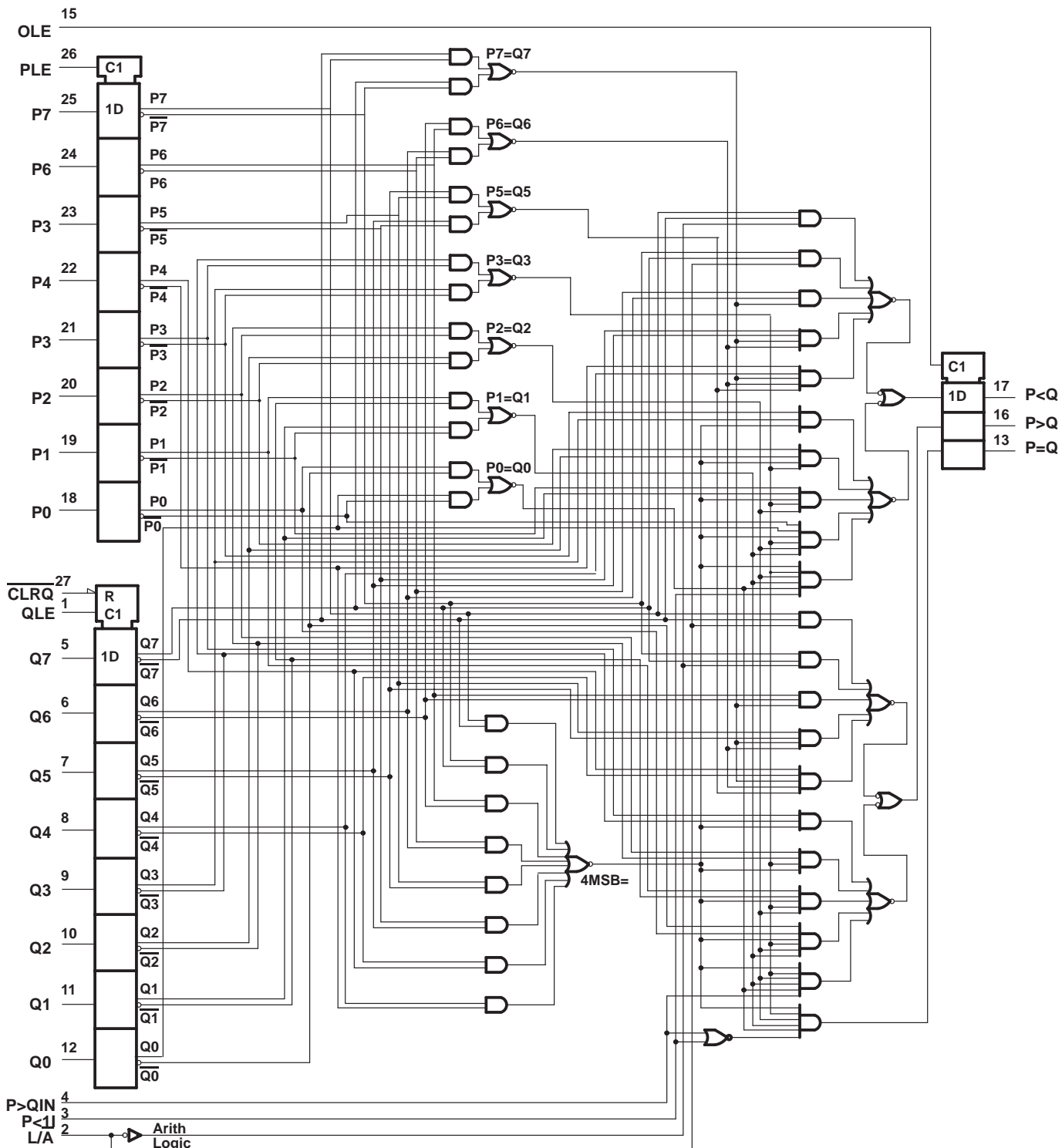


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

SN54AS866, SN74AS866A 8-BIT MAGNITUDE COMPARATORS

SDAS183A – DECEMBER 1982 – REVISED JUNE 1990

logic diagram (positive logic)



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265
POST OFFICE BOX 1443 • HOUSTON, TEXAS 77001

SN54AS866, SN74AS866A

8-BIT MAGNITUDE COMPARATORS

SDAS183A – DECEMBER 1982 – REVISED JUNE 1990

FUNCTION TABLE

| COMPARISON | $\overline{L/\overline{A}}$ | DATA INPUTS P0–P7, Q0–Q7 | INPUTS | | OUTPUTS | | |
|------------|-----------------------------|-----------------------------|--------|-----|---------|-----|-----|
| | | | P>Q | P<Q | P>Q | P<Q | P=Q |
| Logical | H | P>Q | X | X | H | L | L |
| Logical | H | P<Q | X | X | L | H | L |
| Logical | H | P=Q | L | L | L | L | H |
| Logical | H | P=Q | L | H | L | H | L |
| Logical | H | P=Q | H | L | H | L | L |
| Logical | H | P=Q | H | H | H | H | L |
| Arithmetic | L | P AG Q | X | X | H | L | L |
| Arithmetic | L | Q AG P | X | X | L | H | L |
| Arithmetic | L | P=Q | L | L | L | L | H |
| Arithmetic | L | P=Q | L | H | L | H | L |
| Arithmetic | L | P=Q | H | L | H | L | L |
| Arithmetic | L | P=Q | H | H | H | H | L |

AG = arithmetically greater than

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

| | |
|---|----------------|
| Supply voltage, V_{CC} | 7 V |
| Input voltage | 7 V |
| Off-state output voltage, P = Q output | 7 V |
| Operating free-air temperature range: SN54AS866 | –55°C to 125°C |
| SN74AS866A | 0°C to 70°C |
| Storage temperature range | –65°C to 150°C |

recommended operating conditions

| | SN54AS866 | | | SN74AS866A | | | UNIT |
|--|-----------|-----|-----|------------|-----|-----|------|
| | MIN | NOM | MAX | MIN | NOM | MAX | |
| V_{CC} Supply voltage | 4.5 | 5 | 5.5 | 4.5 | 5 | 5.5 | V |
| V_{IH} High-level input voltage | 2 | | | 2 | | | V |
| V_{IL} Low-level input voltage | | | 0.8 | | | 0.8 | V |
| I_{OH} High-level output current, all outputs except P=Q | | | –2 | | | –2 | mA |
| V_{OH} High-level output voltage, P=Q output | | | 5.5 | | | 5.5 | V |
| I_{OL} Low-level output current | | | 20 | | | 20 | mA |
| t_{su} Setup time to PLE, OLE, OLE↓ | 2 | | | 2 | | | ns |
| t_h Hold time after PLE, QLE, OLE↓ | 4 | | | 4 | | | |
| t_A Operating free-air temperature | –55 | | 125 | 0 | 70 | | °C |

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265
POST OFFICE BOX 1443 • HOUSTON, TEXAS 77001

SN54AS866, SN74AS866A 8-BIT MAGNITUDE COMPARATORS

SDAS183A – DECEMBER 1982 – REVISED JUNE 1990

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | SN54AS866 | | | SN74AS866A | | | UNIT | | | | | | | | |
|-----------------|---|---|------|------|--------------------|------|------|------|----|--|--|--|--|--|--|-------|
| | | MIN | TYP† | MAX | MIN | TYP† | MAX | | | | | | | | | |
| V _{IK} | V _{CC} = 4.5 V, I _I = -18 mA | | | -1.2 | | | -1.2 | V | | | | | | | | |
| V _{OH} | P>Q, P<Q V _{CC} = 4.5 V to 5.5 V, I _{OH} = -2 mA | V _{CC} -2 | | | V _{CC} -2 | | | | | | | | | | | |
| I _{OH} | P=Q only V _{CC} = 4.5 V, V _{OH} = 5.5 V | | | 0.25 | | | 0.25 | mA | | | | | | | | |
| V _{OL} | V _{CC} = 4.5 V, I _{OL} = 20 mA | 0.35 | 0.5 | | 0.35 | 0.5 | | V | | | | | | | | |
| I _I | V _{CC} = 5.5 V, V _I = 7 V | | | 0.1 | | | 0.1 | mA | | | | | | | | |
| I _{IH} | L/A, OLE | V _{CC} = 5.5 V, V _I = 2.7 V | | | | | | 40 | μA | | | | | | | |
| | Others | | | | | | | | | | | | | | | 20 |
| I _{IL} | L/A, OLE, P>Qin, P<Qin | V _{CC} = 5.5 V, V _I = 0.4 V | | | | | | -4 | mA | | | | | | | |
| | CLRQ | | | | | | | | | | | | | | | -2 |
| | P, Q, PLE, QLE | | | | | | | | | | | | | | | -0.25 |
| | | | | | | | | | | | | | | | | -1 |
| I _{O‡} | V _{CC} = 5.5 V, V _O = 2.25 V | -20 | | -112 | -20 | | -112 | mA | | | | | | | | |
| I _{CC} | V _{CC} = 5.5 V, See Note 1 | | 160 | 240 | | 160 | 240 | mA | | | | | | | | |

NOTE 1: I_{CC} is measured with all inputs high except L/A, which is low.

switching characteristics (see Note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 500 Ω, T _A = MIN to MAX§ | | | | | | UNIT |
|------------------|--------------------------|-------------|---|------|-----|------------|------|------|------|
| | | | SN54AS866 | | | SN74AS866A | | | |
| | | | MIN | TYP† | MAX | MIN | TYP† | MAX | |
| t _{PLH} | L/A | P<Q, P>Q | 1 | 8.5 | 14 | 1 | 8.5 | 19 | ns |
| t _{PHL} | | | 1 | 7.5 | 14 | 1 | 7 | 13 | |
| t _{PLH} | P<Q, P>Q | | 1 | 5 | 10 | 1 | 5 | 8 | ns |
| t _{PHL} | | | 1 | 5.5 | 10 | 1 | 5.5 | 8 | |
| t _{PLH} | Any P or Q Data Input | | 1 | 13.5 | 21 | 1 | 13.5 | 17.5 | ns |
| t _{PHL} | | | 1 | 10 | 17 | 1 | 10 | 15 | |
| t _{PLH} | CLRQ | | 1 | 16 | 21 | 1 | 16 | 20 | ns |
| t _{PHL} | | | 1 | 12 | 17 | 1 | 12 | 16 | |

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 280 Ω, T _A = MIN to MAX§ | | | | | | UNIT |
|------------------|--------------------------|-------------|---|------|-----|------------|------|-----|------|
| | | | SN54AS866 | | | SN74AS866A | | | |
| | | | MIN | TYP† | MAX | MIN | TYP† | MAX | |
| t _{PLH} | P<Q, P>Q | P=Q | 1 | 6.5 | 12 | 1 | 6.5 | 16 | ns |
| t _{PHL} | | | 1 | 8 | 14 | 1 | 8 | 14 | |
| t _{PLH} | Any P or Q Data Input | P=Q | 1 | 10 | 15 | 1 | 10 | 17 | ns |
| t _{PHL} | | | 1 | 9 | 14 | 1 | 9 | 14 | |
| t _{PLH} | CLRQ | P=Q | 1 | 12 | 17 | 1 | 12 | 24 | ns |
| t _{PHL} | | | 1 | 13 | 18 | 1 | 13 | 21 | |

† All typical values are at V_{CC} = 5 V, T_A = 25°C.

‡ The output conditions have been chosen to produce a current that closely approximates one-half of the true short-circuit, I_{OS}.

§ For conditions shown MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 2: Load circuit and voltage waveforms are shown in Section 1 of the ALS/AS Logic Data Book, 1986.

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265
POST OFFICE BOX 1443 • HOUSTON, TEXAS 77001

SN54AS866, SN74AS866A

8-BIT MAGNITUDE COMPARATORS

SDAS183A – DECEMBER 1982 – REVISED JUNE 1990

TYPICAL APPLICATION DATA

This sequence of comparisons illustrates how the $\overline{\text{CLRQ}}$ function can be used to perform dual comparisons of the varying P terms (P0, P1, etc.). When $\overline{\text{CLRQ}}$ is high, the P term is compared to the Q term. When $\overline{\text{CLRQ}}$ is taken low, the P term is compared to zero. This or similar sequences can enhance performance and reduce package count to perform value range checks.

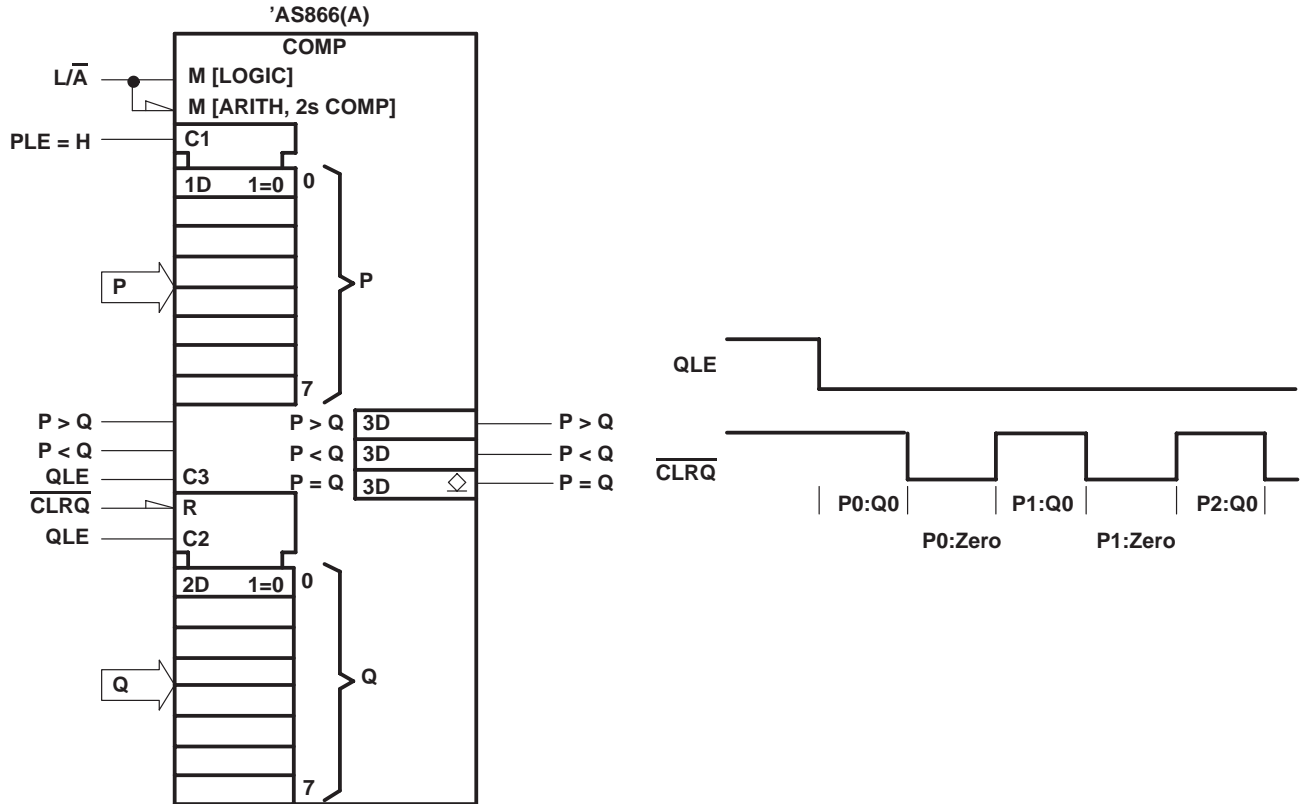


Figure 1. Magnitude Comparisons Combined With Quick Comparisons to Zero (Range Verifications)

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

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

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI 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 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. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

| | |
|-----------------------------|--|
| Amplifiers | amplifier.ti.com |
| Data Converters | dataconverter.ti.com |
| DSP | dsp.ti.com |
| Clocks and Timers | www.ti.com/clocks |
| Interface | interface.ti.com |
| Logic | logic.ti.com |
| Power Mgmt | power.ti.com |
| Microcontrollers | microcontroller.ti.com |
| RFID | www.ti-rfid.com |
| RF/IF and ZigBee® Solutions | www.ti.com/lprf |

Applications

| | |
|--------------------|--|
| Audio | www.ti.com/audio |
| Automotive | www.ti.com/automotive |
| Broadband | www.ti.com/broadband |
| Digital Control | www.ti.com/digitalcontrol |
| Medical | www.ti.com/medical |
| Military | www.ti.com/military |
| Optical Networking | www.ti.com/opticalnetwork |
| Security | www.ti.com/security |
| Telephony | www.ti.com/telephony |
| Video & Imaging | www.ti.com/video |
| Wireless | www.ti.com/wireless |

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2008, Texas Instruments Incorporated