

# LM98620

## 10-bit 70 MSPS 6 Channel Imaging Signal Processor with LVDS Output

### General Description

The LM98620 is a fully integrated, 10-Bit, 70 MSPS signal processing solution for high performance digital color copiers, scanners, and other image processing applications. High-speed signal throughput is achieved with an innovative six channel architecture utilizing Correlated Double Sampling (CDS), or Sample and Hold (SH) type sampling. 1x or 2x gain settings are available in the CDS/SH input stage. Each channel has a dedicated 1x to 10x (8 bit) PGA that allows accurate gain adjustment of each channel. The Digital White Level auto calibration loop can automatically set the PGA value to achieve a selected white target level. Each channel also has a  $\pm 4$  bit coarse and  $\pm 10$ -bit fine analog offset correction DAC that allows offset correction before the sample-and-hold amplifier. These correction values can be controlled by an automated Digital Black Level correction loop. The PGA and offset DACs for each channel are programmed independently allowing unique values of gain and offset for each of the six channels. A 2-to-1 multiplexing scheme routes the signals to three 70MHz high performance ADCs. The fully differential processing channels achieve exceptional noise immunity, having a very low noise floor of -68.5dB. The 10-bit analog-to-digital converters have excellent dynamic performance making the LM98620 transparent in the image reproduction chain.

### Features

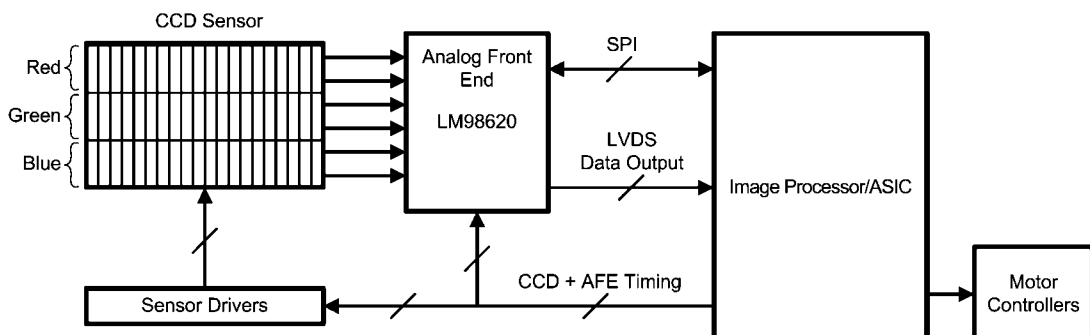
- 3.3V Single Supply Operation
- CDS or S/H Processing
- 35 MHz Channel Rate
- Enhanced ESD Protection on Timing, Control and LVDS Pins

- Low Power CMOS Design
- 12 pin to 16 pin (selectable) LVDS serialized data output
- 4-Wire Serial interface
- 2 Channel Symmetrical Architecture
- Independent Gain and Offset Correction for each Channel
- Digital Black Level Calibration for each Channel
- Digital White Level Calibration for each Channel
- Programmable Input Clamp

### Key Specifications

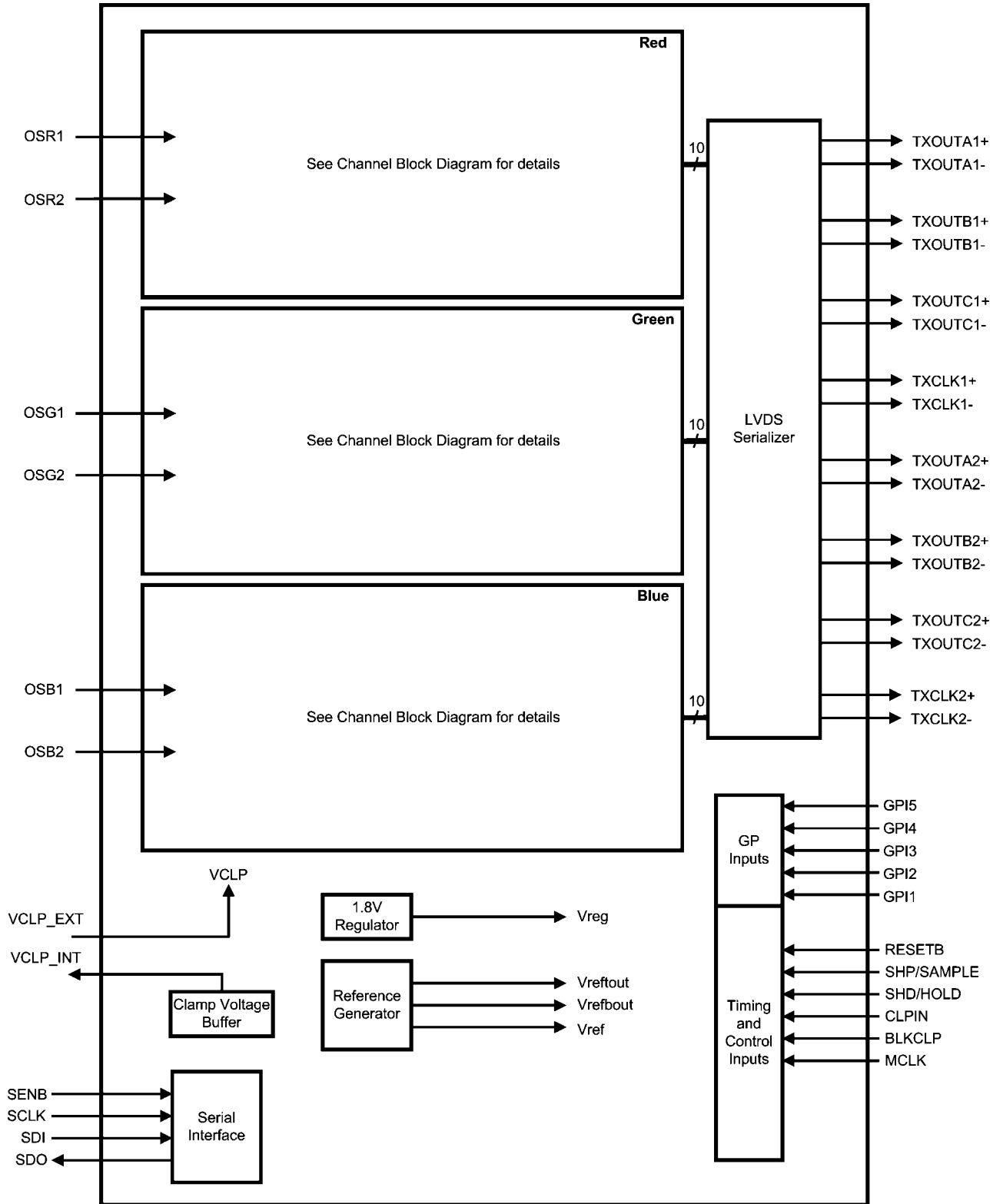
- |                         |  |
|-------------------------|--|
| ■ Maximum Input Level   | 1.2 V <sub>p-p</sub> (CDS gain = 1.0)  |
| ■                       | 0.58 V <sub>p-p</sub> (CDS gain = 2.0) |
| ■ Input Sample Rate     | 5 to 35 MSPS - 6ch mode                |
| ■                       | 10 to 35 MSPS - 3ch mode               |
| ■ PGA Gain Range        | 1x to 10x (0 to 20 dB)                 |
| ■ CDS/SH Gain Settings  | 1x or 2.1x                             |
| ■ Total Channel Gain    | 1x to 21x (0 to 26 dB)                 |
| ■ PGA Gain Resolution   | 8 bits - Analog                        |
| ■ ADC Resolution        | 10 bits                                |
| ■ ADC Sampling Rate     | 10 to 70 MSPS                          |
| ■ SNR                   | 68.5 dB (Gain = 1x)                    |
| ■ Offset DAC Range      | $\pm 111$ mV or $\pm 59.5$ mV- FDAC    |
| ■                       | $\pm 281$ mV - CDAC                    |
| ■ Offset DAC Resolution | $\pm 10$ bits - FDAC                   |
| ■                       | $\pm 4$ bits - CDAC                    |
| ■ Supply voltage        | 3.0V to 3.6V                           |
| ■ Power Dissipation     | 1.02 W (typical)                       |

### System Block Diagram



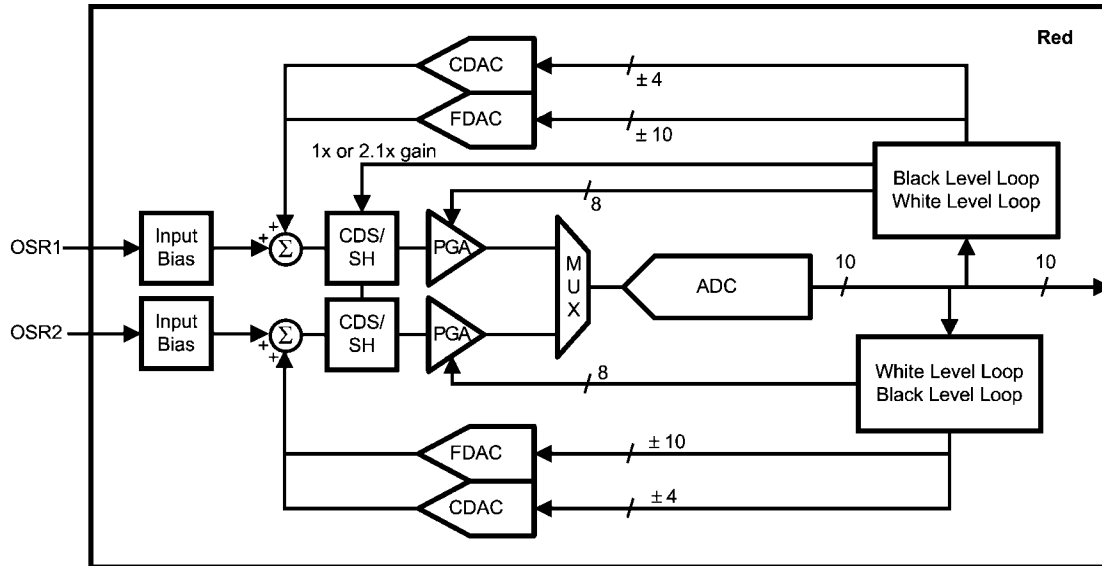
30032304

# Chip Block Diagram



30032301

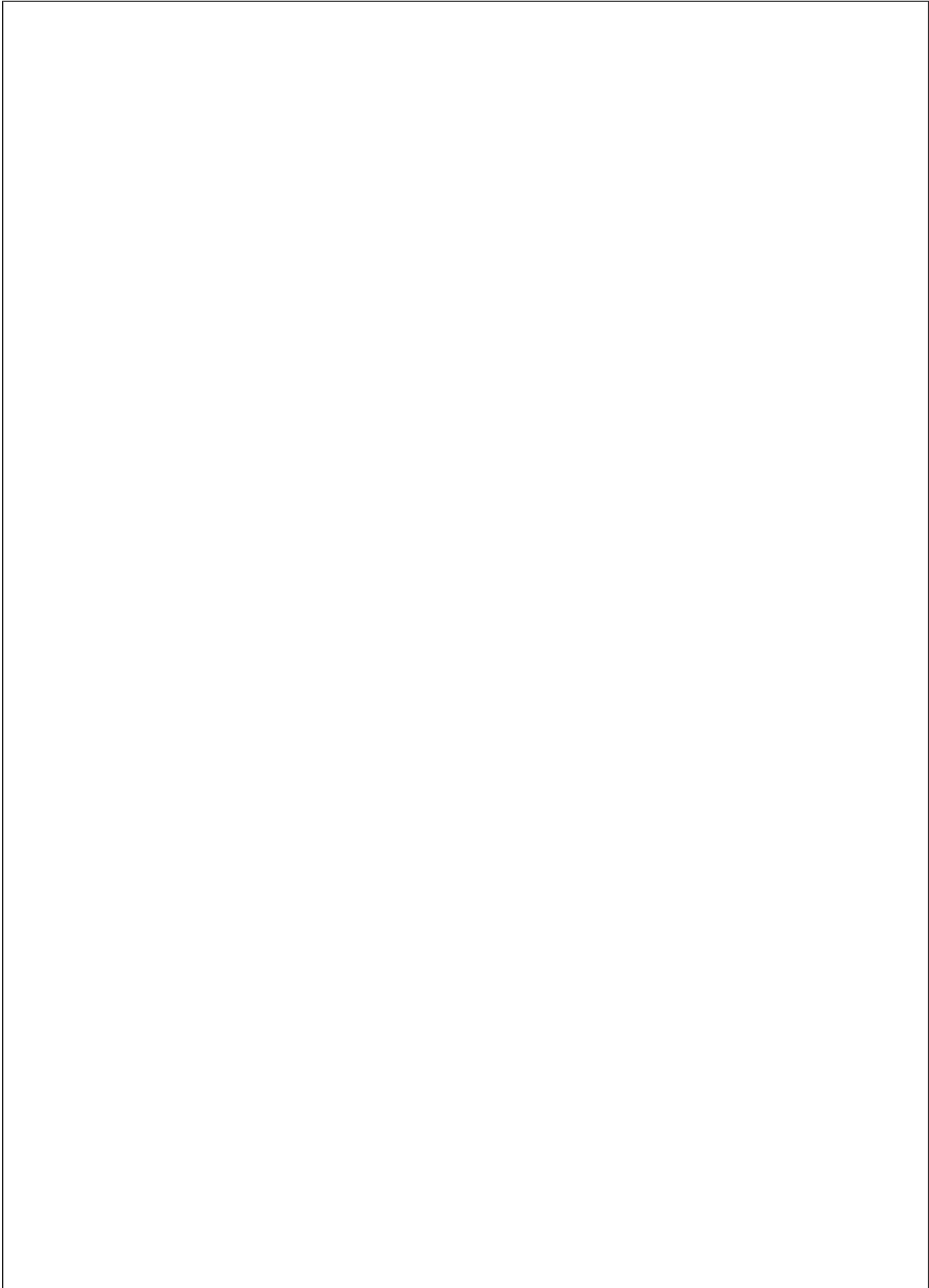
# Channel Block Diagram



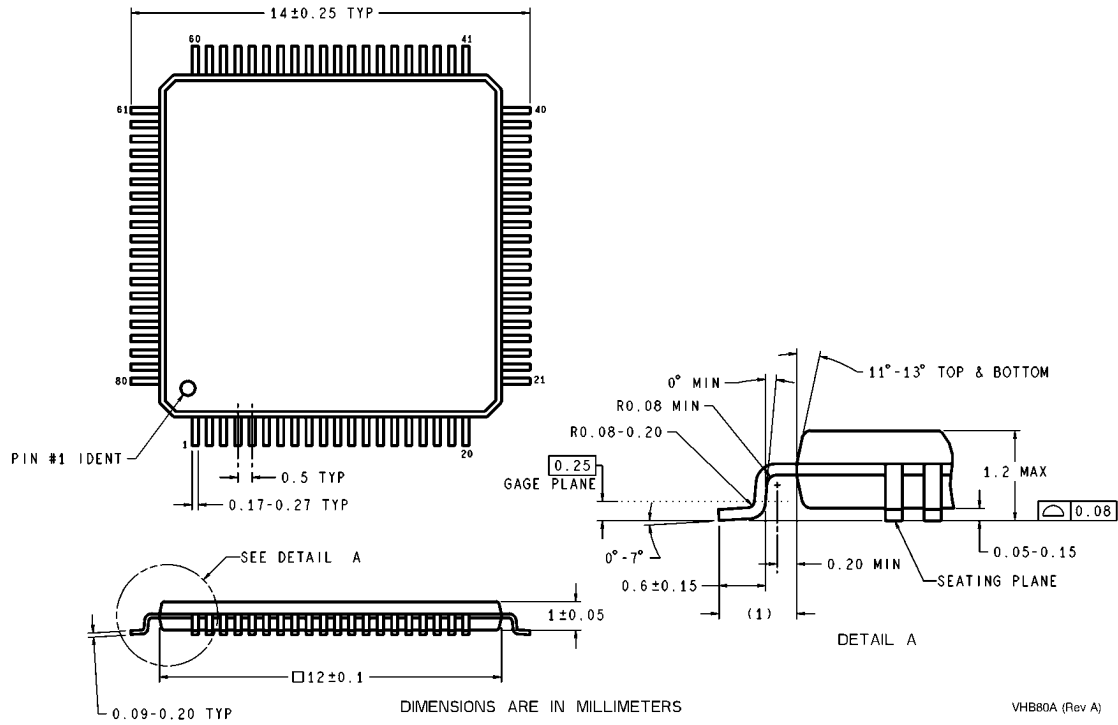
30032302

## Ordering Information

Commercial Temperature Range	NS Package
LM98620VHB	80-Pin TQFP



**Physical Dimensions** inches (millimeters) unless otherwise noted



**80-Lead TQFP  
NS Package Number VHB80A**

## Notes

For more National Semiconductor product information and proven design tools, visit the following Web sites at:

Products		Design Support	
Amplifiers	<a href="http://www.national.com/amplifiers">www.national.com/amplifiers</a>	WEBENCH	<a href="http://www.national.com/webench">www.national.com/webench</a>
Audio	<a href="http://www.national.com/audio">www.national.com/audio</a>	Analog University	<a href="http://www.national.com/AU">www.national.com/AU</a>
Clock Conditioners	<a href="http://www.national.com/timing">www.national.com/timing</a>	App Notes	<a href="http://www.national.com/appnotes">www.national.com/appnotes</a>
Data Converters	<a href="http://www.national.com/adc">www.national.com/adc</a>	Distributors	<a href="http://www.national.com/contacts">www.national.com/contacts</a>
Displays	<a href="http://www.national.com/displays">www.national.com/displays</a>	Green Compliance	<a href="http://www.national.com/quality/green">www.national.com/quality/green</a>
Ethernet	<a href="http://www.national.com/ethernet">www.national.com/ethernet</a>	Packaging	<a href="http://www.national.com/packaging">www.national.com/packaging</a>
Interface	<a href="http://www.national.com/interface">www.national.com/interface</a>	Quality and Reliability	<a href="http://www.national.com/quality">www.national.com/quality</a>
LVDS	<a href="http://www.national.com/lvds">www.national.com/lvds</a>	Reference Designs	<a href="http://www.national.com/refdesigns">www.national.com/refdesigns</a>
Power Management	<a href="http://www.national.com/power">www.national.com/power</a>	Feedback	<a href="http://www.national.com/feedback">www.national.com/feedback</a>
Switching Regulators	<a href="http://www.national.com/switchers">www.national.com/switchers</a>		
LDOs	<a href="http://www.national.com/ldo">www.national.com/ldo</a>		
LED Lighting	<a href="http://www.national.com/led">www.national.com/led</a>		
PowerWise	<a href="http://www.national.com/powerwise">www.national.com/powerwise</a>		
Serial Digital Interface (SDI)	<a href="http://www.national.com/sdi">www.national.com/sdi</a>		
Temperature Sensors	<a href="http://www.national.com/tempsensors">www.national.com/tempsensors</a>		
Wireless (PLL/VCO)	<a href="http://www.national.com/wireless">www.national.com/wireless</a>		

THE CONTENTS OF THIS DOCUMENT ARE PROVIDED IN CONNECTION WITH NATIONAL SEMICONDUCTOR CORPORATION ("NATIONAL") PRODUCTS. NATIONAL MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE ACCURACY OR COMPLETENESS OF THE CONTENTS OF THIS PUBLICATION AND RESERVES THE RIGHT TO MAKE CHANGES TO SPECIFICATIONS AND PRODUCT DESCRIPTIONS AT ANY TIME WITHOUT NOTICE. NO LICENSE, WHETHER EXPRESS, IMPLIED, ARISING BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT.

TESTING AND OTHER QUALITY CONTROLS ARE USED TO THE EXTENT NATIONAL DEEMS NECESSARY TO SUPPORT NATIONAL'S PRODUCT WARRANTY. EXCEPT WHERE MANDATED BY GOVERNMENT REQUIREMENTS, TESTING OF ALL PARAMETERS OF EACH PRODUCT IS NOT NECESSARILY PERFORMED. NATIONAL ASSUMES NO LIABILITY FOR APPLICATIONS ASSISTANCE OR BUYER PRODUCT DESIGN. BUYERS ARE RESPONSIBLE FOR THEIR PRODUCTS AND APPLICATIONS USING NATIONAL COMPONENTS. PRIOR TO USING OR DISTRIBUTING ANY PRODUCTS THAT INCLUDE NATIONAL COMPONENTS, BUYERS SHOULD PROVIDE ADEQUATE DESIGN, TESTING AND OPERATING SAFEGUARDS.

EXCEPT AS PROVIDED IN NATIONAL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, NATIONAL ASSUMES NO LIABILITY WHATSOEVER, AND NATIONAL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY RELATING TO THE SALE AND/OR USE OF NATIONAL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

### LIFE SUPPORT POLICY

**NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS PRIOR WRITTEN APPROVAL OF THE CHIEF EXECUTIVE OFFICER AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION.** As used herein:

Life support devices or systems are devices which (a) are intended for surgical implant into the body, or (b) support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in a significant injury to the user. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness.

National Semiconductor and the National Semiconductor logo are registered trademarks of National Semiconductor Corporation. All other brand or product names may be trademarks or registered trademarks of their respective holders.

Copyright© 2008 National Semiconductor Corporation

For the most current product information visit us at [www.national.com](http://www.national.com)



**National Semiconductor  
Americas Technical  
Support Center**  
Email:  
[new.feedback@nsc.com](mailto:new.feedback@nsc.com)  
Tel: 1-800-272-9959

**National Semiconductor Europe  
Technical Support Center**  
Email: [europe.support@nsc.com](mailto:europe.support@nsc.com)  
German Tel: +49 (0) 180 5010 771  
English Tel: +44 (0) 870 850 4288

**National Semiconductor Asia  
Pacific Technical Support Center**  
Email: [ap.support@nsc.com](mailto:ap.support@nsc.com)

**National Semiconductor Japan  
Technical Support Center**  
Email: [jpn.feedback@nsc.com](mailto:jpn.feedback@nsc.com)