

# DP8310,DP8311

*DP8310/DP8311 Octal Latched Peripheral Drivers*



Literature Number: SNOSBE4

## DP8310/DP8311 Octal Latched Peripheral Drivers

### General Description

The DP8310 and DP8311 Octal Latched Peripheral Drivers provide the function of latching eight bits of data with open collector outputs, each driving up to 100 mA DC with an operating voltage range of 30V. Both devices are designed for low input currents, high input/output voltages, and feature a power up clear (outputs off) function.

The DP8310 is positive edge latching. Two active low write/enable inputs are available for convenient data bussing without external gating.

The DP8311 is positive edge latching. The active low strobe input latches data or allows fall through operation when held at logic "0". The latches are cleared (outputs off) with a logic "0" on the clear pin.

### Features

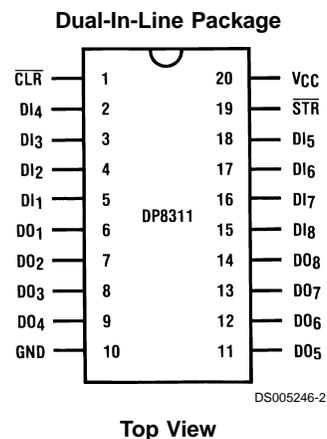
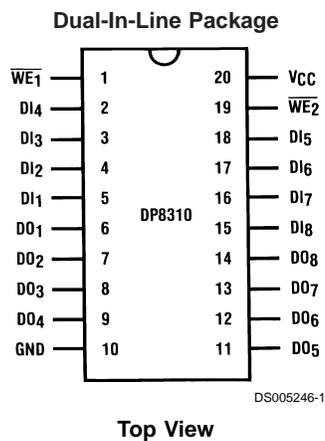
- High current, high voltage open collector outputs
- Low current, high voltage inputs

- All outputs simultaneously sink rated current "DC" with no thermal derating at maximum rated temperature
- Parallel latching or buffering
- Separate active low enables for easy data bussing
- Internal "glitch free" power up clear
- 10%  $V_{CC}$  tolerance

### Applications

- High current high voltage drivers
- Relay drivers
- Lamp drivers
- LED drivers
- TRIAC drivers
- Solenoid drivers
- Stepper motor drivers
- Level translators
- Fiber-optic LED drivers

### Connection Diagrams



**Order Number DP8310N or DP8311N  
See NS Package Number N20A**

**Absolute Maximum Ratings** (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7.0V
Input Voltage	35V
Output Voltage	35V
Maximum Power Dissipation* at $T_A = 25^\circ\text{C}$	
DP8310/DP8311	2005 mW
Storage Temperature Range	$-65^\circ\text{C}$ to $+150^\circ\text{C}$
Lead Temperature (Soldering, 4 sec.)	$260^\circ\text{C}$

Note: \*Derate N20A package 15.4 mW/ $^\circ\text{C}$  above  $T_A = 25^\circ\text{C}$ ,  $\theta_{JA} = 65^\circ\text{C/W}$ .

**Operating Conditions**

	Min	Max	Units
Supply Voltage ( $V_{CC}$ )	4.5	5.5	V
Temperature			
DP8310/DP8311	0	+70	$^\circ\text{C}$
Input Voltage		30	V
Output Voltage		30	V

**DC Electrical Characteristics**

DP8310 and DP8311 (Notes 2, 3)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$V_{IH}$	Logical "1" Input Voltage		2.0			V
$V_{IL}$	Logical "0" Input Voltage				0.8	V
$V_{OL}$	Logical "0" Output Voltage	Data outputs latched to logical "0", $V_{CC} = \text{Min}$ . $I_{OL} = 100 \text{ mA}$		0.35	0.5	V
$I_{OH}$	Logical "1" Output Current	Data outputs latched to logical "1", $V_{CC} = \text{Min}$ . $V_{OH} = 30\text{V}$		2.5	250	$\mu\text{A}$
$I_{IH}$	Logical "1" Input Current	$V_{IH} = 2.7\text{V}$ , $V_{CC} = \text{Max}$		0.1	25	$\mu\text{A}$
$I_i$	Input Current at Maximum Input Voltage	$V_{IN} = 30\text{V}$ , $V_{CC} = \text{Max}$		1	250	$\mu\text{A}$
$I_{iL}$	Logical "0" Input Current	$V_{IN} = 0.4\text{V}$ , $V_{CC} = \text{Max}$		-215	-300	$\mu\text{A}$
$V_{\text{clamp}}$	Input Clamp Voltage	$I_{iN} = 12 \text{ mA}$		-0.8	-1.5	V
$I_{CC0}$	Supply Current, Outputs On	Data outputs latched to a logical "0". All Inputs are at logical "1", $V_{CC} = \text{Max}$ .		100 88	152 125	mA mA
$I_{CC1}$	Supply Current, Outputs Off	Data outputs latched to a logic "1". Other conditions same as $I_{CC0}$ .		40 25	57 36	mA mA

**AC Electrical Characteristics**

DP8310 only:  $V_{CC} = 4.5\text{V}$ ,  $T_A = 25^\circ\text{C}$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{pd0}$	High to Low Propagation Delay Write Enable Input to Output	(Figure 1)		40	120	ns
$t_{pd1}$	Low to High Propagation Delay Write Enable Input to Output	(Figure 1)		70	150	ns
$t_{\text{SETUP}}$	Minimum Set-Up Time Data in to Write Enable Input	$t_{\text{HOLD}} = 0 \text{ ns}$ (Figure 1)	45	20		ns
$t_{\text{pWH}}, t_{\text{pWL}}$	Minimum Write Enable Pulse Width	(Figure 1)	60	25		ns
$t_{\text{THL}}$	High to Low Output Transition Time	(Figure 1)		16	35	ns
$t_{\text{TLH}}$	Low to High Output Transition Time	(Figure 1)		38	70	ns
$C_{\text{IN}}$	"N" Package (Note 4)			5	15	pF

## AC Electrical Characteristics

DP8311 only:  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{pd0}$	High to Low Propagation Delay Data In to Output	(Figure 2)		30	60	ns
$t_{pd1}$	Low to High Propagation Delay Data to Output	(Figure 2)		70	100	ns
$t_{SETUP}$	Minimum Set-Up Time Data in to Strobe Input	$t_{HOLD} = 0$ ns (Figure 2)	0	-25		ns
$t_{pWL}$	Minimum Strobe Enable Pulse Width	(Figure 2)	60	35		ns
$t_{pdC}$	Propagation Delay Clear to Data Output	(Figure 2)		70	135	ns
$t_{pWC}$	Minimum Clear Input Pulse Width	(Figure 2)	60	25		ns
$t_{THL}$	High to Low Output Transition Time	(Figure 2)		20	35	ns
$t_{TLH}$	Low to High Output Transition Time	(Figure 2)		38	60	ns
$C_{IN}$	Input Capacitance — Any Input	(Note 4)		5	15	pF

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

**Note 2:** Unless otherwise specified min/max limits apply across the  $0^\circ C$  to  $+70^\circ C$  for the DP8310/DP8311. All typical values are for  $T_A = 25^\circ C$ ,  $V_{CC} = 5V$ .

**Note 3:** All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted.

**Note 4:** Input capacitance is guaranteed by periodic testing.  $f_{TEST} = 10$  kHz at 300 mV,  $T_A = 25^\circ C$ .

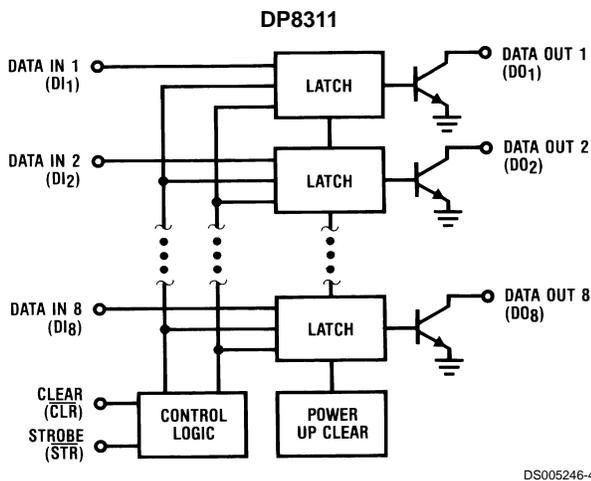
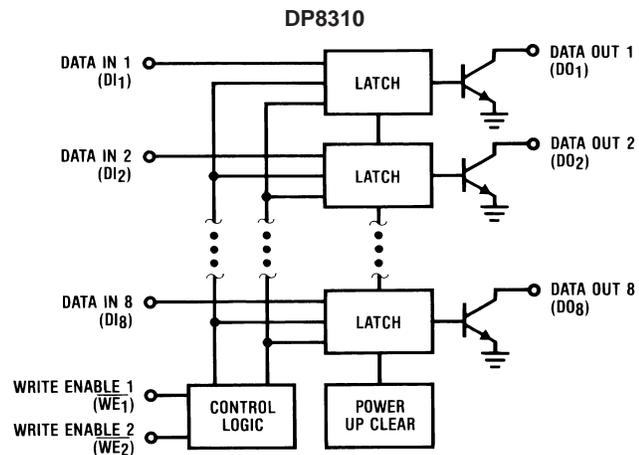
## Logic Table

DP8310			
Write Enable 1 $\overline{WE}_1$	Write Enable 2 $\overline{WE}_2$	Data Input $DI_{1-8}$	Data Output $DO_{1-8}$
0	0	X	Q
0	↗	0	1
0	↗	1	0
↗	0	0	1
↗	0	1	0
0	1	X	Q
1	0	X	Q
1	1	X	Q

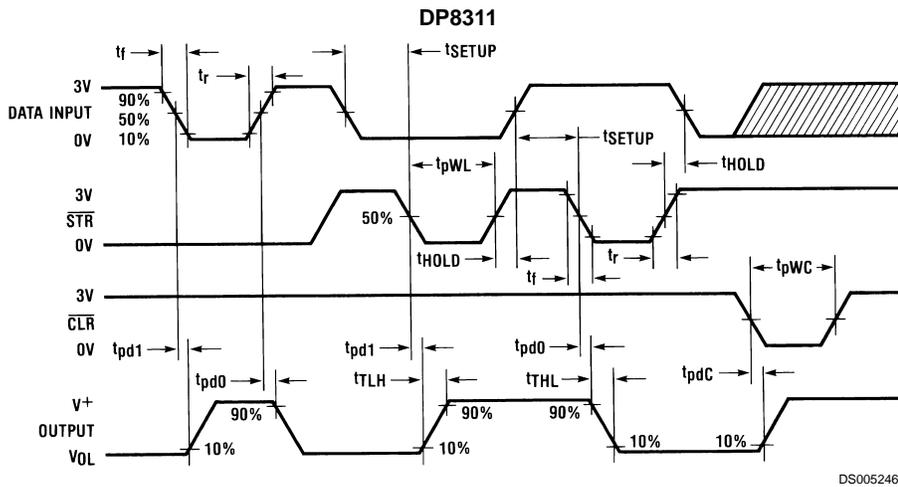
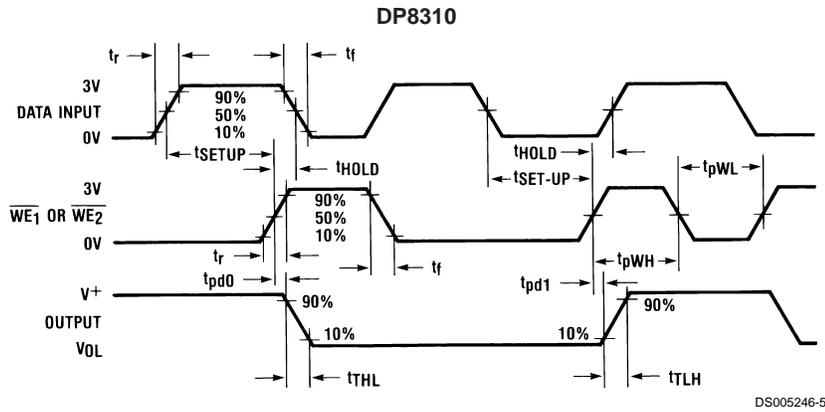
DP8311			
Clear $\overline{CLR}$	Strobe $\overline{STR}$	Data Input $DI_{1-8}$	Data Output $DO_{1-8}$
1	1	X	Q
1	0	0	1
1	0	1	0
0	X	X	1

X = Don't Care  
 1 = Outputs Off  
 0 = Outputs On  
 Q = Pre-existing Output  
 ↗ = Positive Edge Transition

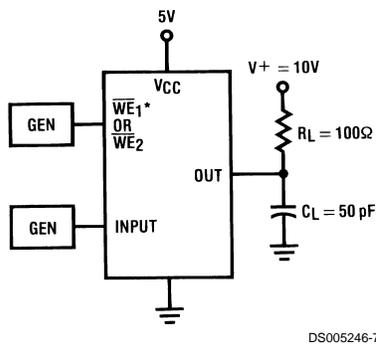
## Block Diagrams



# Switching Time Waveforms

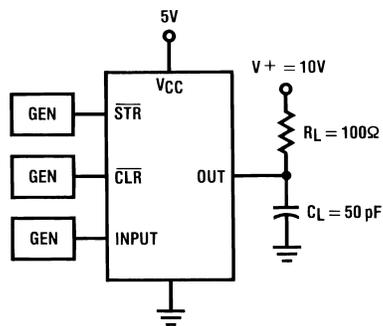


# Switching Time Test Circuits



\* $\overline{WE1} = 0V$  When the Input =  $\overline{WE2}$

**FIGURE 1. DP8310**

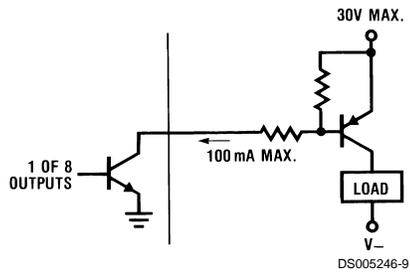


Pulse Generator Characteristics:  
 $Z_O = 50\Omega$ ,  $t_r = t_f = 5\text{ ns}$

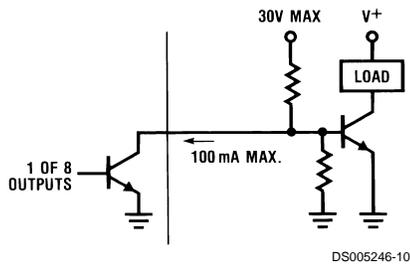
**FIGURE 2. DP8311**

# Typical Applications DP8310/11 Buffering High Current Device (Notes 5, 6)

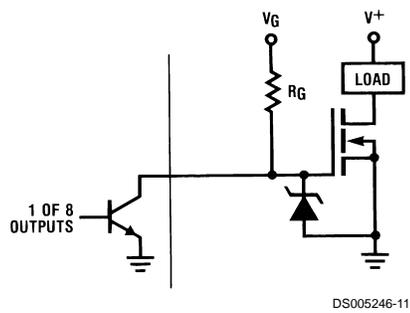
**PNP High Current Driver**



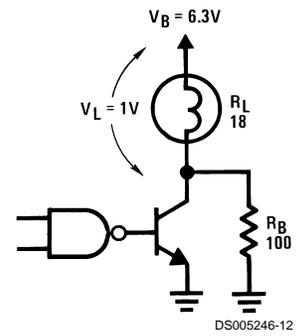
**NPN High Current Driver**



**VMOS High Current Driver**



**Circuit Used to Reduce Peak Transient Lamp Current**



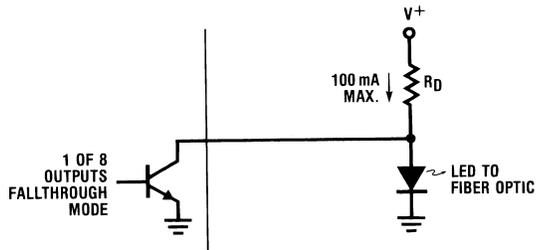
$$R_B = \left( \frac{V_B - V_L}{V_L} \right) R_L$$

$$R_B = \left( \frac{6.3 - 1}{1} \right) 18\Omega = 95.4 \approx 100\Omega$$

**Typical Applications** DP8310/11 Buffering High Current Device (Notes 5, 6) (Continued)

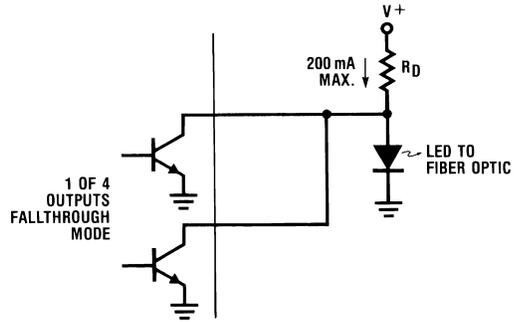
**Eight Output/Four Output Fiber Optic LED Driver**

**DP8311 100 mA Drivers**



DS005246-13

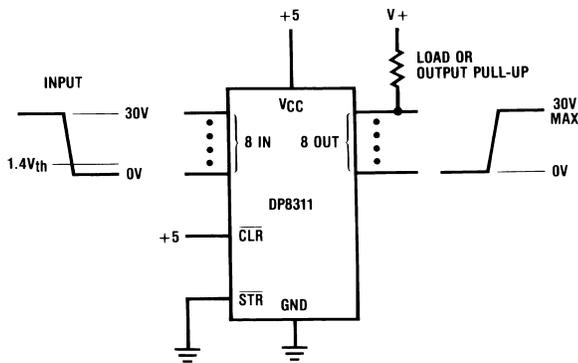
**DP8311 Parallel Outputs (200 mA) Drivers\***



DS005246-14

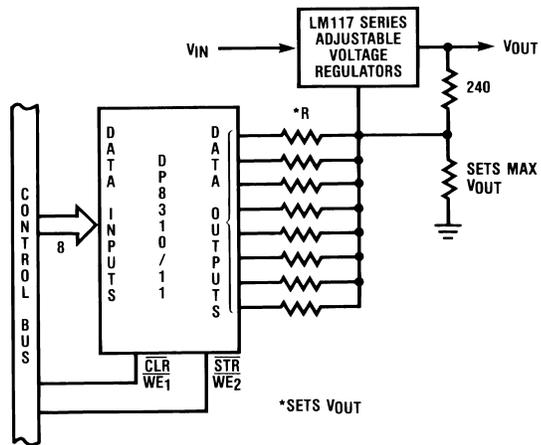
\*Parallel only adjacent outputs

**8-Bit Level Translator Driver**



DS005246-15

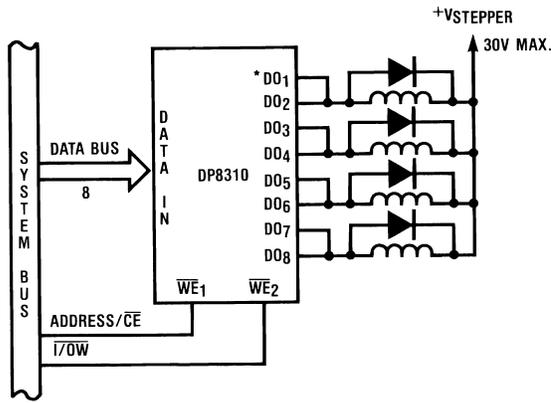
**Digital Controlled 256 Level Power Supply from 1.2V to 30V**



DS005246-16

# Typical Applications DP8310/11 Buffering High Current Device (Notes 5, 6) (Continued)

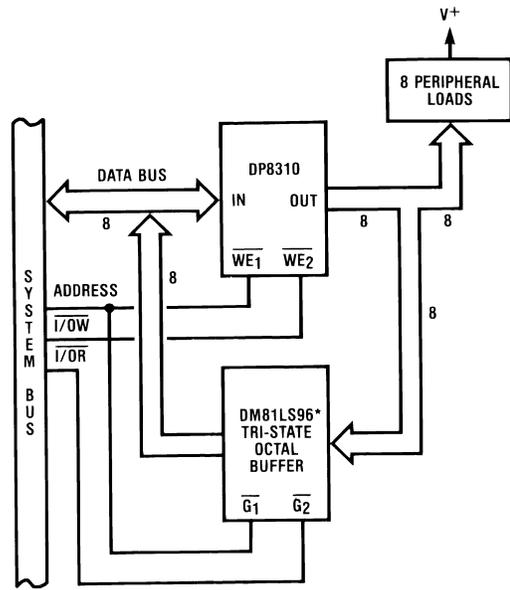
200 mA Drive for a 4 Phase Bifilar Stepper Motor



DS005246-17

\*Parallel only adjacent outputs

Reading the State of the Latched Peripherals



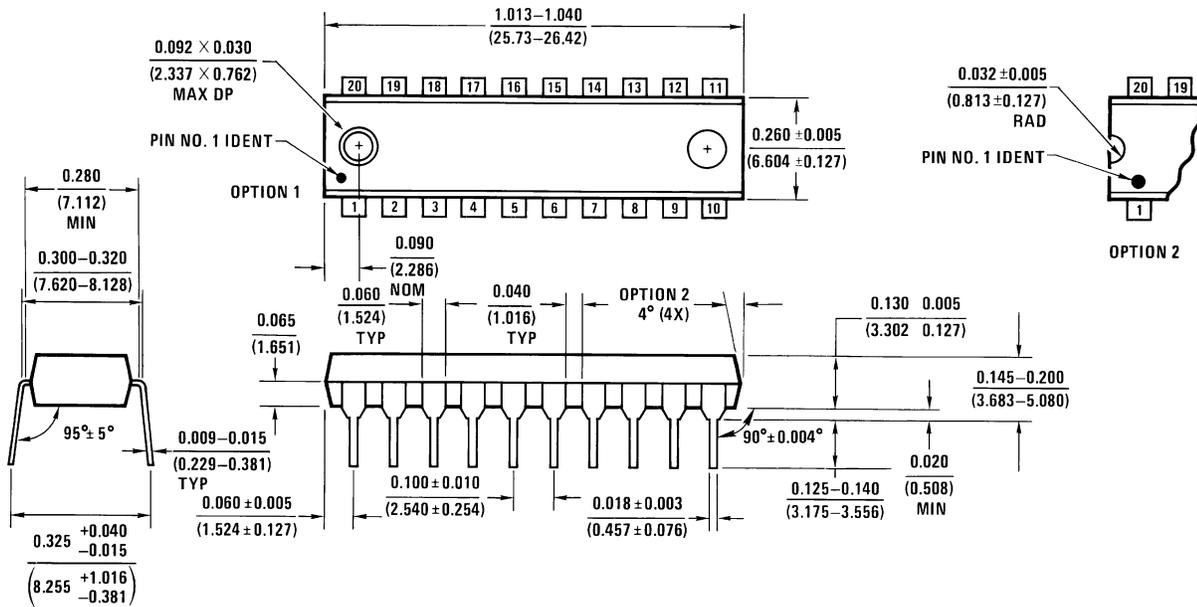
DS005246-18

\*High Level Input  
Voltage must not  
Exceed  $V_{CC}$  of the  
DM81LS96

**Note 5:** Always use good  $V_{CC}$  bypass and ground techniques to suppress transients caused by peripheral loads.

**Note 6:** Printed circuit board mounting is required if these devices are operated at maximum rated temperature and current (all outputs on DC).

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



N20A (REV G)

**Molded Dual-In-Line Package (N)**  
**Order Number DP8310N or DP8311N**  
**NS Package Number N20A**

**LIFE SUPPORT POLICY**

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

1. Life support devices or systems are devices or systems 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.
2. A critical component is any component of 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 Corporation**  
 Americas  
 Tel: 1-800-272-9959  
 Fax: 1-800-737-7018  
 Email: support@nsc.com  
 www.national.com

**National Semiconductor Europe**  
 Fax: +49 (0) 180-530 85 86  
 Email: europe.support@nsc.com  
 Deutsch Tel: +49 (0) 69 9508 6208  
 English Tel: +44 (0) 870 24 0 2171  
 Français Tel: +33 (0) 1 41 91 8790

**National Semiconductor Asia Pacific Customer Response Group**  
 Tel: 65-2544466  
 Fax: 65-2504466  
 Email: ap.support@nsc.com

**National Semiconductor Japan Ltd.**  
 Tel: 81-3-5639-7560  
 Fax: 81-3-5639-7507

## 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

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

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>
Transportation and Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>

TI E2E Community Home Page

[e2e.ti.com](http://e2e.ti.com)

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2011, Texas Instruments Incorporated