

# 54F823,74F823

*54F823 74F823 9-Bit D-Type Flip-Flop*



Literature Number: SNOS216A

# 54F/74F823 9-Bit D-Type Flip-Flop

## General Description

The 'F823 is a 9-bit buffered register. It features Clock Enable and Clear which are ideal for parity bus interfacing in high performance microprogramming systems.

The 'F823 is functionally and pin compatible with AMD's Am29823.

## Features

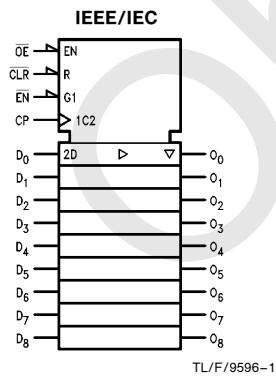
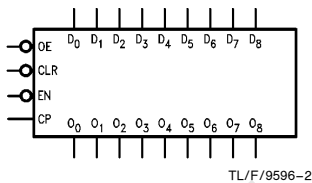
- TRI-STATE® outputs
- Clock Enable and Clear
- Direct replacement for AMD's Am29823

Commercial	Military	Package Number	Package Description
74F823SPC		N24C	24-Lead (0.300" Wide) Molded Dual-In-Line
	54F823SDM (Note 2)	J24F	24-Lead (0.300" Wide) Ceramic Dual-In-Line
74F823SC (Note 1)		M24B	24-Lead (0.300" Wide) Molded Small Outline, JEDEC
	54F823FM (Note 2)	W24C	24-Lead Cerpack
	54F823LM (Note 2)	E28A	24-Lead Ceramic Chip Carrier, Type C

**Note 1:** Devices also available in 13" reel. Use suffix = SCX.

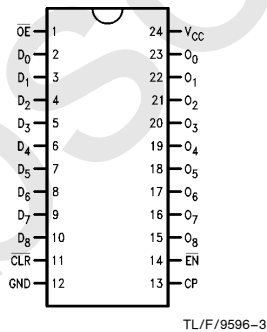
**Note 2:** Military grade device with environmental and burn-in processing. Use suffix = SDM QB, FM QB and LM QB.

## Logic Symbols

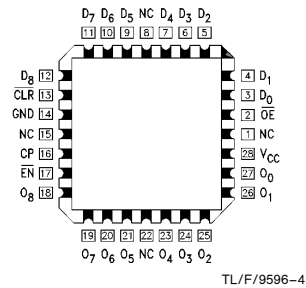


## Connection Diagrams

Pin Assignment for DIP, SOIC and Flatpak



Pin Assignment for LCC



TRI-STATE® is a registered trademark of National Semiconductor Corporation.

## Unit Loading/Fan Out

Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input $I_H/I_L$ Output $I_{OH}/I_{OL}$
$D_0-D_8$	Data Inputs	1.0/1.0	20 $\mu A$ / -0.6 mA
$\overline{OE}$	Output Enable Input	1.0/1.0	20 $\mu A$ / -0.6 mA
$\overline{CLR}$	Clear	1.0/1.0	20 $\mu A$ / -0.6 mA
CP	Clock Input	1.0/2.0	20 $\mu A$ / -1.2 mA
$\overline{EN}$	Clock Enable	1.0/1.0	20 $\mu A$ / -0.6 mA
$O_0-O_8$	TRI-STATE Outputs	150/40 (33.3)	-3 mA/24 mA (20 mA)

Obsolete

## Functional Description

The 'F823 device consists of nine D-type edge-triggered flip-flops. It has TRI-STATE true outputs and is organized in broadside pinning. The buffered Clock (CP) and buffered Output Enable ( $\overline{OE}$ ) are common to all flip-flops. The flip-flops will store the state of their individual D inputs that meet the setup and hold times requirements on the LOW-to-HIGH CP transition. With the  $\overline{OE}$  LOW the contents of the flip-flops are available at the outputs. When the  $\overline{OE}$  is HIGH, the outputs go to the high impedance state. Operation of the  $\overline{OE}$  input does not affect the state of the flip-flops. In addition to the Clock and Output Enable pins, the 'F823 has Clear ( $\overline{CLR}$ ) and Clock Enable ( $\overline{EN}$ ) pins.

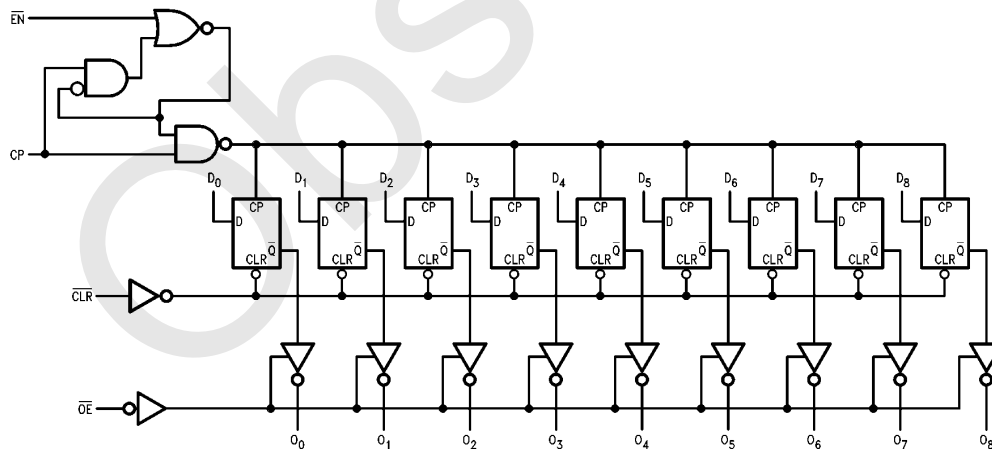
When the  $\overline{CLR}$  is LOW and the  $\overline{OE}$  is LOW, the outputs are LOW. When  $\overline{CLR}$  is HIGH, data can be entered into the flip-flops. When  $\overline{EN}$  is LOW, data on the inputs is transferred to the outputs on the LOW to HIGH clock transition. When the  $\overline{EN}$  is HIGH, the outputs do not change state regardless of the data or clock inputs transitions. This device is ideal for parity bus interfacing in high performance systems.

Function Table

Inputs					Internal	Output	Function
$\overline{OE}$	$\overline{CLR}$	$\overline{EN}$	CP	D	$\overline{Q}$	O	
H	H	L	H	X	NC	Z	Hold
H	H	L	L	X	NC	Z	Hold
H	H	H	X	X	NC	Z	Hold
L	H	H	X	X	NC	NC	Hold
H	L	X	X	X	H	Z	Clear
L	L	X	X	X	H	L	Clear
H	H	L	↗	H	H	Z	Load
H	H	L	↘	H	L	Z	Load
L	H	L	↗	L	H	L	Data Available
L	H	L	↘	H	L	H	Data Available
L	H	L	H	X	NC	NC	No Change in Data
L	H	L	L	X	NC	NC	No Change in Data

L = LOW Voltage Level  
H = HIGH Voltage Level  
X = Immaterial  
Z = High Impedance  
↗ = LOW-to-HIGH Transition  
↘ = HIGH-to-LOW Transition  
NC = No Change

## Logic Diagram



TL/F/9596-5

Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

## Absolute Maximum Ratings (Note 1)

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

Storage Temperature	-65°C to +150°C
Ambient Temperature under Bias	-55°C to +125°C
Junction Temperature under Bias	-55°C to +175°C
Plastic	-55°C to +150°C
V <sub>CC</sub> Pin Potential to Ground Pin	-0.5V to +7.0V
Input Voltage (Note 2)	-0.5V to +7.0V
Input Current (Note 2)	-30 mA to +5.0 mA
Voltage Applied to Output in HIGH State (with V <sub>CC</sub> = 0V)	
Standard Output	-0.5V to V <sub>CC</sub>
TRI-STATE Output	-0.5V to +5.5V
Current Applied to Output in LOW State (Max)	twice the rated I <sub>OL</sub> (mA)

**Note 1:** Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

**Note 2:** Either voltage limit or current limit is sufficient to protect inputs.

## Recommended Operating Conditions

Free Air Ambient Temperature	
Military	-55°C to +125°C
Commercial	0°C to +70°C
Supply Voltage	
Military	+4.5V to +5.5V
Commercial	+4.5V to +5.5V

## DC Electrical Characteristics

Symbol	Parameter	54F/74F			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage	0.8			V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage	-1.2			V	Min	I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	54F 10% V <sub>CC</sub>	2.5		V	Min	I <sub>OH</sub> = -1 mA
		54F 10% V <sub>CC</sub>	2.4				I <sub>OH</sub> = -3 mA
		74F 10% V <sub>CC</sub>	2.5				I <sub>OH</sub> = -1 mA
		74F 10% V <sub>CC</sub>	2.4				I <sub>OH</sub> = -3 mA
		74F 5% V <sub>CC</sub>	2.7				I <sub>OH</sub> = -1 mA
74F 5% V <sub>CC</sub>	2.7		I <sub>OH</sub> = -3 mA				
V <sub>OL</sub>	Output LOW Voltage	54F 10% V <sub>CC</sub>	0.5		V	Min	I <sub>OL</sub> = 20 mA
		74F 10% V <sub>CC</sub>	0.5				I <sub>OL</sub> = 24 mA
I <sub>IH</sub>	Input HIGH Current	54F	20.0		μA	Max	V <sub>IN</sub> = 2.7V
		74F	5.0				
I <sub>BVI</sub>	Input HIGH Current Breakdown Test	54F	100		μA	Max	V <sub>IN</sub> = 7.0V
		74F	7.0				
I <sub>CEX</sub>	Output HIGH Leakage Current	54F	250		μA	Max	V <sub>OUT</sub> = V <sub>CC</sub>
		74F	50				
V <sub>ID</sub>	Input Leakage Test	74F	4.75		V	0.0	I <sub>ID</sub> = 1.9 μA All Other Pins Grounded
I <sub>OD</sub>	Output Leakage Circuit Current	74F	3.75		μA	0.0	V <sub>IOD</sub> = 150 mV All Other Pins Grounded
I <sub>IL</sub>	Input LOW Current		-0.6		mA	Max	V <sub>IN</sub> = 0.5V ( $\overline{OE}$ , $\overline{CLR}$ , $\overline{EN}$ ) V <sub>IN</sub> = 0.5V (CP)
			-1.2				
I <sub>OZH</sub>	Output Leakage Current		50		μA	Max	V <sub>OUT</sub> = 2.7V
I <sub>OZL</sub>	Output Leakage Current		-50		μA	Max	V <sub>OUT</sub> = 0.5V
I <sub>OS</sub>	Output Short-Circuit Current		-60	-150	mA	Max	V <sub>OUT</sub> = 0V
I <sub>ZZ</sub>	Buss Drainage Test		500		μA	0.0V	V <sub>OUT</sub> = 5.25V
I <sub>CCZ</sub>	Power Supply Current		75	100	mA	Max	V <sub>O</sub> = HIGH Z

## AC Electrical Characteristics

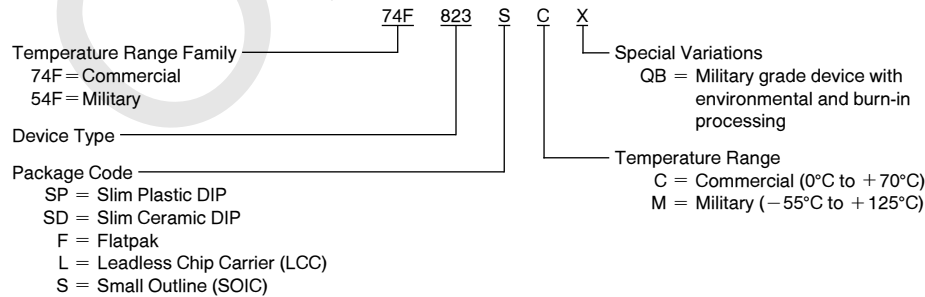
Symbol	Parameter	74F			54F		74F		Units
		$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$			$T_A, V_{CC} = \text{Mil}$ $C_L = 50\text{ pF}$		$T_A, V_{CC} = \text{Com}$ $C_L = 50\text{ pF}$		
		Min	Typ	Max	Min	Max	Min	Max	
$f_{\text{max}}$	Maximum Clock Frequency	100	160		60		70		MHz
$t_{\text{PLH}}$ $t_{\text{PHL}}$	Propagation Delay CP to $O_n$	2.0	5.6	9.5	2.0	10.5	2.0	10.5	ns
$t_{\text{PHL}}$	Propagation Delay $\overline{\text{CLR}}$ to $O_n$	4.0	7.1	12.0	4.0	13.0	4.0	13.0	ns
$t_{\text{PZH}}$ $t_{\text{PZL}}$	Output Enable Time $\overline{\text{OE}}$ to $O_n$	2.0	5.8	10.5	2.0	13.0	2.0	11.5	ns
$t_{\text{PHZ}}$ $t_{\text{P LZ}}$	Output Disable Time $\overline{\text{OE}}$ to $O_n$	1.5	2.9	7.0	1.0	7.5	1.5	7.5	

## AC Operating Requirements

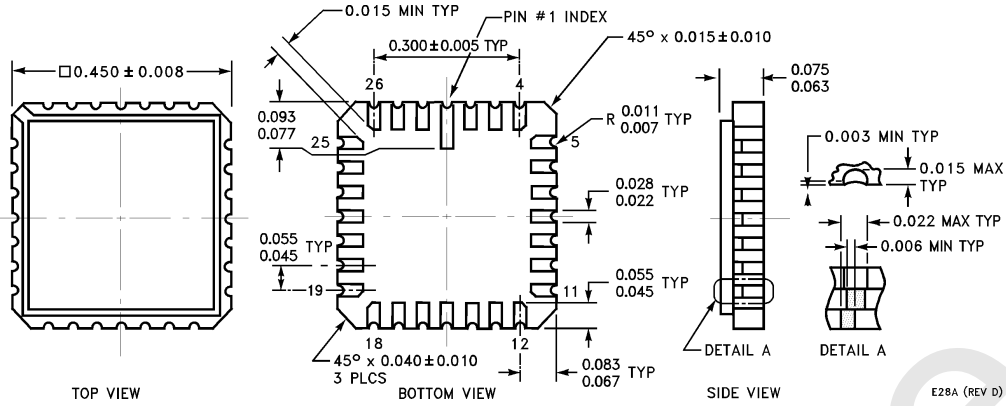
Symbol	Parameter	74F		54F		74F		Units
		$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A, V_{CC} = \text{Mil}$		$T_A, V_{CC} = \text{Com}$		
		Min	Max	Min	Max	Min	Max	
$t_s(\text{H})$ $t_s(\text{L})$	Setup Time, HIGH or LOW $D_n$ to CP	2.5		4.0		3.0		ns
$t_h(\text{H})$ $t_h(\text{L})$	Hold Time, HIGH or LOW $D_n$ to CP	2.5		2.5		2.5		
$t_s(\text{H})$ $t_s(\text{L})$	Setup Time, HIGH or LOW $\overline{\text{EN}}$ to CP	4.5		5.0		5.0		ns
$t_h(\text{H})$ $t_h(\text{L})$	Hold Time, HIGH or LOW $\overline{\text{EN}}$ to CP	2.0		3.0		2.0		
$t_w(\text{H})$ $t_w(\text{L})$	CP Pulse Width HIGH or LOW	5.0		6.0		6.0		ns
$t_w(\text{L})$	$\overline{\text{CLR}}$ Pulse Width, LOW	5.0		5.0		5.0		ns
$t_{\text{rec}}$	$\overline{\text{CLR}}$ Recovery Time	5.0		5.0		5.0		ns

## Ordering Information

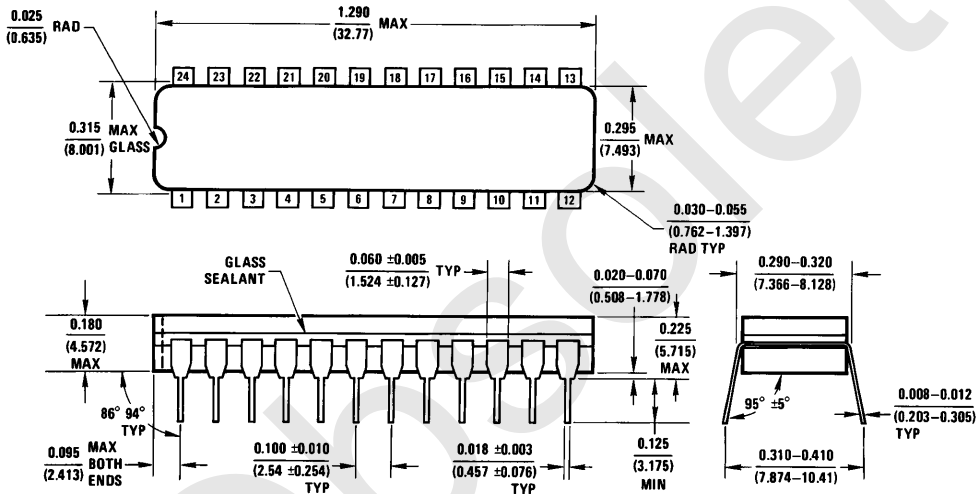
The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



**Physical Dimensions** inches (millimeters)

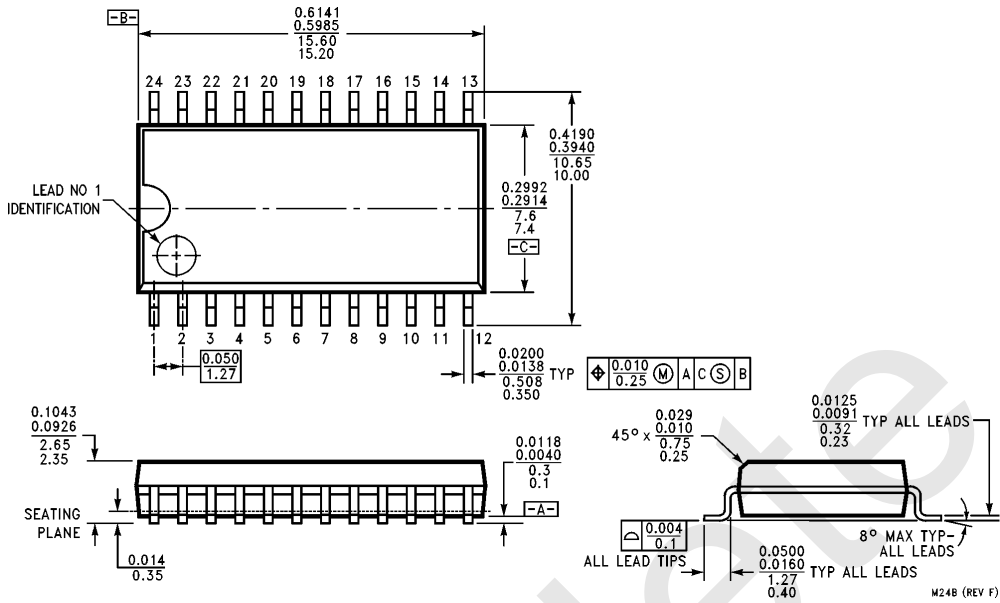


**28-Lead Ceramic Leadless Chip Carrier, Type C (L)  
 NS Package Number E28A**

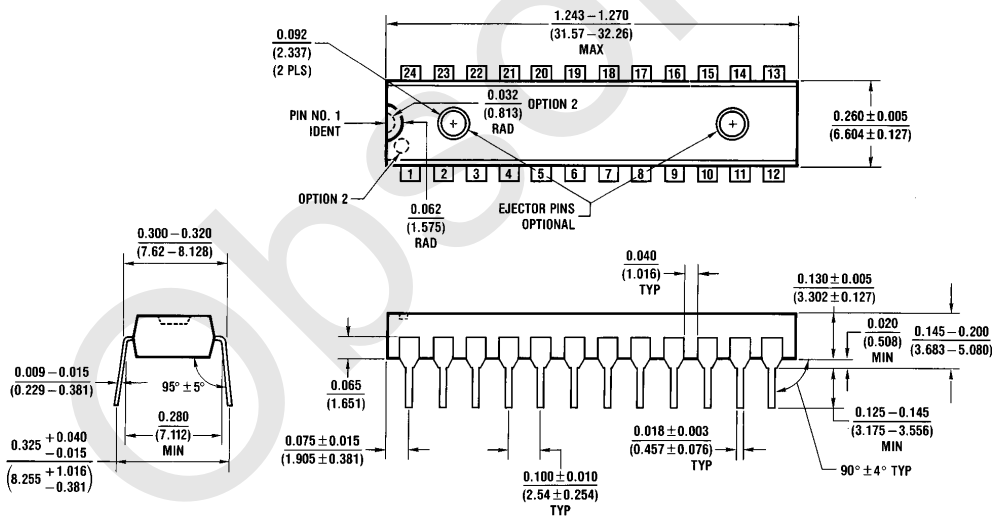


**24-Lead (0.300" Wide) Ceramic Dual-In-Line Package (SD)  
 NS Package Number J24F**

**Physical Dimensions** inches (millimeters) (Continued)



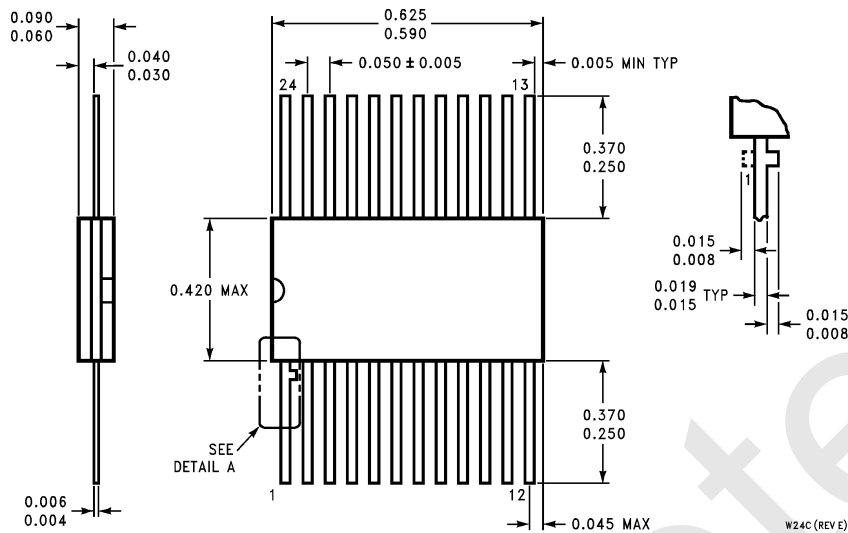
**24-Lead (0.300" Wide) Molded Small Outline Package, JEDEC (S)  
NS Package Number M24B**



**24-Lead (0.300" Wide) Molded Dual-In-Line Package (SP)  
NS Package Number N24C**



**Physical Dimensions** inches (millimeters) (Continued)



**24-Lead Ceramic Flatpak (F)  
NS Package Number W24C**

**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 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.

 <p><b>National Semiconductor Corporation</b> 2900 Semiconductor Drive P.O. Box 58090 Santa Clara, CA 95052-8090 Tel: 1(800) 272-9959 TWX: (910) 339-9240</p>	<p><b>National Semiconductor GmbH</b> Livry-Gargan-Str. 10 D-82256 Fürstenfeldbruck Germany Tel: (81-41) 35-0 Telex: 527849 Fax: (81-41) 35-1</p>	<p><b>National Semiconductor Japan Ltd.</b> Sumitomo Chemical Engineering Center Bldg. 7F 1-7-1, Nakase, Mihama-Ku Chiba-City, Ciba Prefecture 261 Tel: (043) 299-2300 Fax: (043) 299-2500</p>	<p><b>National Semiconductor Hong Kong Ltd.</b> 13th Floor, Straight Block, Ocean Centre, 5 Canton Rd. Tsimshatsui, Kowloon Hong Kong Tel: (852) 2737-1600 Fax: (852) 2736-9960</p>	<p><b>National Semicondutores Do Brazil Ltda.</b> Rue Deputado Lacorda Franco 120-3A Sao Paulo-SP Brazil 05418-000 Tel: (55-11) 212-5066 Telex: 391-1131931 NSBR BR Fax: (55-11) 212-1181</p>	<p><b>National Semiconductor (Australia) Pty. Ltd.</b> Building 16 Business Park Drive Monash Business Park Nottingham, Melbourne Victoria 3168 Australia Tel: (3) 558-9999 Fax: (3) 558-9998</p>
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.

## 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