

# SN54AHC257, SN74AHC257 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SCLS349 – MAY 1996

- Operating Range 2-V to 5.5-V  $V_{CC}$
- **EPIC™** (Enhanced-Performance Implanted CMOS) Process
- Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

These quadruple 2-line to 1-line data selectors/multiplexers are designed for 2-V to 5.5-V  $V_{CC}$  operation.

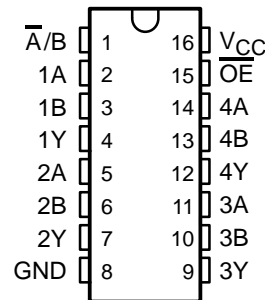
The 'AHC257 are designed to multiplex signals from 4-bit data sources to 4-output data lines in bus-organized systems. The 3-state outputs do not load the data lines when the output-enable ( $\overline{OE}$ ) input is at a high logic level.

The SN54AHC257 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74AHC257 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

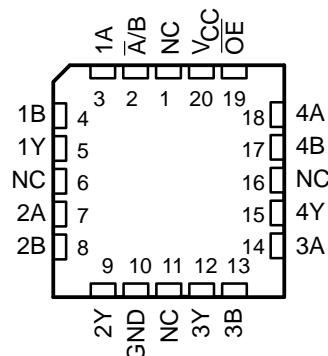
FUNCTION TABLE

INPUTS				OUTPUT Y
$\overline{OE}$	$\overline{A/B}$	A	B	
H	X	X	X	Z
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

SN54AHC257 . . . J OR W PACKAGE  
SN74AHC257 . . . D, DB, N, OR PW PACKAGE  
(TOP VIEW)



SN54AHC257 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

EPIC is a trademark of Texas Instruments Incorporated.

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.

**TEXAS  
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

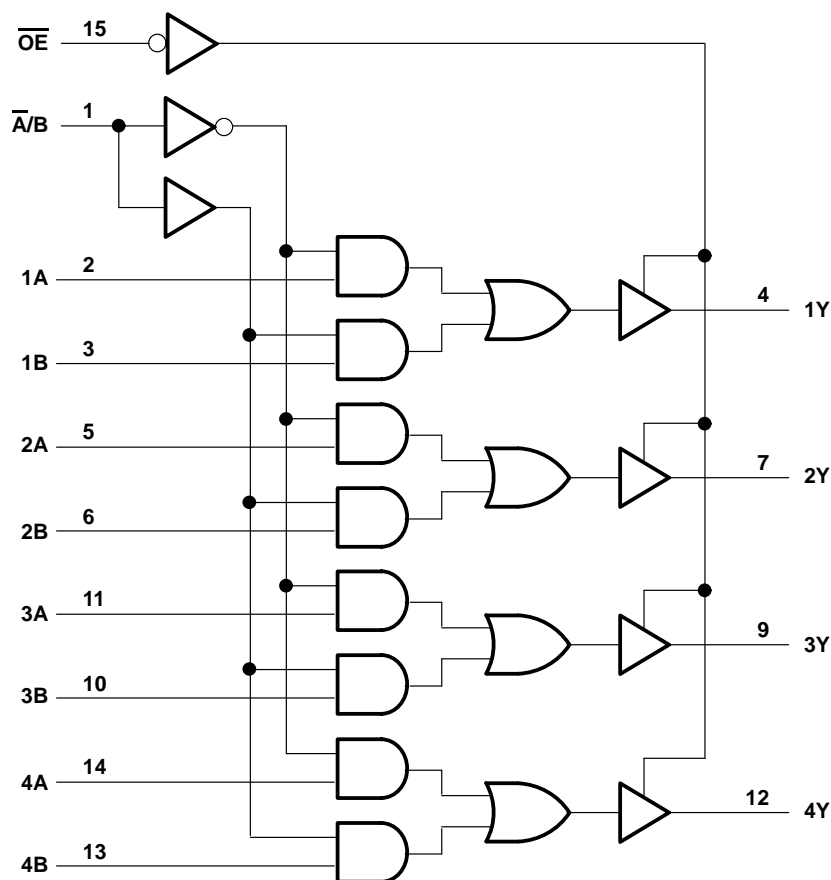
Copyright © 1996, Texas Instruments Incorporated

PRODUCT PREVIEW

## SCLS349 – MAY 1996

Pin diagram of the 74VHC151 8-to-1 multiplexer. The chip has 16 pins. Pin 15 is OE (Output Enable), active low. Pin 1 is A/B (Address/Bus), active low. Pin 2 is 1A. Pin 3 is 1B. Pin 5 is 2A. Pin 6 is 2B. Pin 11 is 3A. Pin 10 is 3B. Pin 14 is 4A. Pin 13 is 4B. Pin 4 is 1Y. Pin 7 is 2Y. Pin 9 is 3Y. Pin 12 is 4Y. The internal block diagram shows an EN input, a G1 input, and a MUX block with a select input 1 and a data input 1.

**logic diagram (positive logic)**



# PRODUCT PREVIEW

# SN54AHC257, SN74AHC257

## QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

### WITH 3-STATE OUTPUTS

SCLS349 – MAY 1996

#### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Supply voltage range, $V_{CC}$	–0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1)	–0.5 V to 7 V
Output voltage range, $V_O$ (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ )	–20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ )	±20 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	±25 mA
Continuous current through $V_{CC}$ or GND	±50 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2):	
D package	1.3 W
DB package	0.55 W
N package	1.1 W
PW package	0.5 W
Storage temperature range, $T_{stg}$	–65°C to 150°C

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

#### recommended operating conditions (see Note 3)

			SN54AHC257		SN74AHC257		UNIT
			MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage		2	5.5	2	5.5	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V	1.5		1.5		V
		V <sub>CC</sub> = 3 V	2.1		2.1		
		V <sub>CC</sub> = 5.5 V	3.85		3.85		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V	0.5		0.5		V
		V <sub>CC</sub> = 3 V	0.9		0.9		
		V <sub>CC</sub> = 5.5 V	1.65		1.65		
V <sub>I</sub>	Input voltage		0	5.5	0	5.5	V
V <sub>O</sub>	Output voltage		0	V <sub>CC</sub>	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 2 V	−50		−50		μA
		V <sub>CC</sub> = 3.3 V ± 0.3 V	−4		−4		mA
		V <sub>CC</sub> = 5 V ± 0.5 V	−8		−8		
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 2 V	50		50		μA
		V <sub>CC</sub> = 3.3 V ± 0.3 V	4		4		mA
		V <sub>CC</sub> = 5 V ± 0.5 V	8		8		
Δt/Δv	Input transition rise or fall rate	V <sub>CC</sub> = 3.3 V ± 0.3 V	100		100		ns/V
		V <sub>CC</sub> = 5 V ± 0.5 V	20		20		
T <sub>A</sub>	Operating free-air temperature		−55	125	−40	85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.

PRODUCT PREVIEW



# SN54AHC257, SN74AHC257

## QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

### WITH 3-STATE OUTPUTS

SCLS349 – MAY 1996

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54AHC257		SN74AHC257		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = -50 µA	2 V	1.9	2		1.9		1.9		V
		3 V	2.9	3		2.9		2.9		
		4.5 V	4.4	4.5		4.4		4.4		
	I <sub>OH</sub> = -4 mA	3 V	2.58			2.48		2.48		
	I <sub>OH</sub> = -8 mA	4.5 V	3.94			3.8		3.8		
V <sub>OL</sub>	I <sub>OL</sub> = 50 µA	2 V			0.1		0.1		0.1	V
		3 V			0.1		0.1		0.1	
		4.5 V			0.1		0.1		0.1	
	I <sub>OL</sub> = 4 mA	3 V			0.36		0.5		0.44	
	I <sub>OL</sub> = 8 mA	4.5 V			0.36		0.5		0.44	
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V			± 0.1		± 1		± 1	µA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V			4		40		40	µA
I <sub>OZ</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V			± 0.25		± 2.5		± 2.5	µA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V		4	10				10	pF

switching characteristics over recommended operating free-air temperature range, V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN54AHC257				UNIT	
				T <sub>A</sub> = 25°C			MIN		MAX
				MIN	TYP	MAX			
t <sub>PLH</sub> *	A or B	Y	C <sub>L</sub> = 15 pF					ns	
t <sub>PHL</sub> *									
t <sub>PLH</sub> *	$\overline{A}/B$	Y	C <sub>L</sub> = 15 pF					ns	
t <sub>PHL</sub> *									
t <sub>PZH</sub> *	$\overline{OE}$	Y	C <sub>L</sub> = 15 pF					ns	
t <sub>PZL</sub> *									
t <sub>PHZ</sub> *	$\overline{OE}$	Y	C <sub>L</sub> = 15 pF					ns	
t <sub>PLZ</sub> *									
t <sub>PLH</sub>	A or B	Y	C <sub>L</sub> = 50 pF					ns	
t <sub>PHL</sub>									
t <sub>PLH</sub>	$\overline{A}/B$	Y	C <sub>L</sub> = 50 pF					ns	
t <sub>PHL</sub>									
t <sub>PZH</sub>	$\overline{OE}$	Y	C <sub>L</sub> = 50 pF					ns	
t <sub>PZL</sub>									
t <sub>PHZ</sub>	$\overline{OE}$	Y	C <sub>L</sub> = 50 pF					ns	
t <sub>PLZ</sub>									

\* On products compliant to MIL-PRF-38535, this parameter is ensured but not production tested.

PRODUCT PREVIEW



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

# SN54AHC257, SN74AHC257

## QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

### WITH 3-STATE OUTPUTS

SCLS349 – MAY 1996

switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN74AHC257					UNIT
				T <sub>A</sub> = 25°C			MIN	MAX	
				MIN	TYP	MAX			
t <sub>PLH</sub>	A or B	Y	C <sub>L</sub> = 15 pF						ns
t <sub>PHL</sub>									
t <sub>PLH</sub>	$\overline{A}/B$	Y	C <sub>L</sub> = 15 pF						ns
t <sub>PHL</sub>									
t <sub>PZH</sub>	$\overline{OE}$	Y	C <sub>L</sub> = 15 pF						ns
t <sub>PZL</sub>									
t <sub>PHZ</sub>	$\overline{OE}$	Y	C <sub>L</sub> = 15 pF						ns
t <sub>PLZ</sub>									
t <sub>PLH</sub>	A or B	Y	C <sub>L</sub> = 50 pF						ns
t <sub>PHL</sub>									
t <sub>PLH</sub>	$\overline{A}/B$	Y	C <sub>L</sub> = 50 pF						ns
t <sub>PHL</sub>									
t <sub>PZH</sub>	$\overline{OE}$	Y	C <sub>L</sub> = 50 pF						ns
t <sub>PZL</sub>									
t <sub>PHZ</sub>	$\overline{OE}$	Y	C <sub>L</sub> = 50 pF						ns
t <sub>PLZ</sub>									

switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN54AHC257					UNIT
				T <sub>A</sub> = 25°C			MIN	MAX	
				MIN	TYP	MAX			
t <sub>PLH</sub> <sup>*</sup>	A or B	Y	C <sub>L</sub> = 15 pF					ns	
t <sub>PHL</sub> <sup>*</sup>									
t <sub>PLH</sub> <sup>*</sup>	A̅/B	Y	C <sub>L</sub> = 15 pF					ns	
t <sub>PHL</sub> <sup>*</sup>									
t <sub>PZH</sub> <sup>*</sup>	OE̅	Y	C <sub>L</sub> = 15 pF					ns	
t <sub>PZL</sub> <sup>*</sup>									
t <sub>PHZ</sub> <sup>*</sup>	OE̅	Y	C <sub>L</sub> = 15 pF					ns	
t <sub>PLZ</sub> <sup>*</sup>									
t <sub>PLH</sub>	A or B	Y	C <sub>L</sub> = 50 pF					ns	
t <sub>PHL</sub>									
t <sub>PLH</sub>	A̅/B	Y	C <sub>L</sub> = 50 pF					ns	
t <sub>PHL</sub>									
t <sub>PZH</sub>	OE̅	Y	C <sub>L</sub> = 50 pF					ns	
t <sub>PZL</sub>									
t <sub>PHZ</sub>	OE̅	Y	C <sub>L</sub> = 50 pF					ns	
t <sub>PLZ</sub>									

\* On products compliant to MIL-PRF-38535, this parameter is ensured but not production tested.

PRODUCT PREVIEW



# SN54AHC257, SN74AHC257

## QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

### WITH 3-STATE OUTPUTS

SCLS349 – MAY 1996

switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN74AHC257					UNIT
				T <sub>A</sub> = 25°C			MIN	MAX	
				MIN	TYP	MAX			
t <sub>PLH</sub>	A or B	Y	C <sub>L</sub> = 15 pF						ns
t <sub>PHL</sub>									
t <sub>PLH</sub>	$\overline{A}/B$	Y	C <sub>L</sub> = 15 pF						ns
t <sub>PHL</sub>									
t <sub>PZH</sub>	$\overline{OE}$	Y	C <sub>L</sub> = 15 pF						ns
t <sub>PZL</sub>									
t <sub>PHZ</sub>	$\overline{OE}$	Y	C <sub>L</sub> = 15 pF						ns
t <sub>PLZ</sub>									
t <sub>PLH</sub>	A or B	Y	C <sub>L</sub> = 50 pF						ns
t <sub>PHL</sub>									
t <sub>PLH</sub>	$\overline{A}/B$	Y	C <sub>L</sub> = 50 pF						ns
t <sub>PHL</sub>									
t <sub>PZH</sub>	$\overline{OE}$	Y	C <sub>L</sub> = 50 pF						ns
t <sub>PZL</sub>									
t <sub>PHZ</sub>	$\overline{OE}$	Y	C <sub>L</sub> = 50 pF						ns
t <sub>PLZ</sub>									

noise characteristics  $V_{CC} = 5\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$  (see Note 4)

PARAMETER		SN74AHC257			UNIT
		MIN	TYP	MAX	
$V_{OL(P)}$	Quiet output, maximum dynamic $V_{OL}$			0.8	V
$V_{OL(V)}$	Quiet output, minimum dynamic $V_{OL}$	-0.8			V
$V_{OH(V)}$	Quiet output, minimum dynamic $V_{OH}$				V
$V_{IH(D)}$	High-level dynamic input voltage	3.5			V
$V_{IL(D)}$	Low-level dynamic input voltage			1.5	V

NOTE 4: Characteristics are determined during product characterization and ensured by design for surface-mount packages only.

operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS		TYP	UNIT
$C_{pd}$	Power dissipation capacitance	No load,	$f = 1\text{ MHz}$	12	pF

PRODUCT PREVIEW

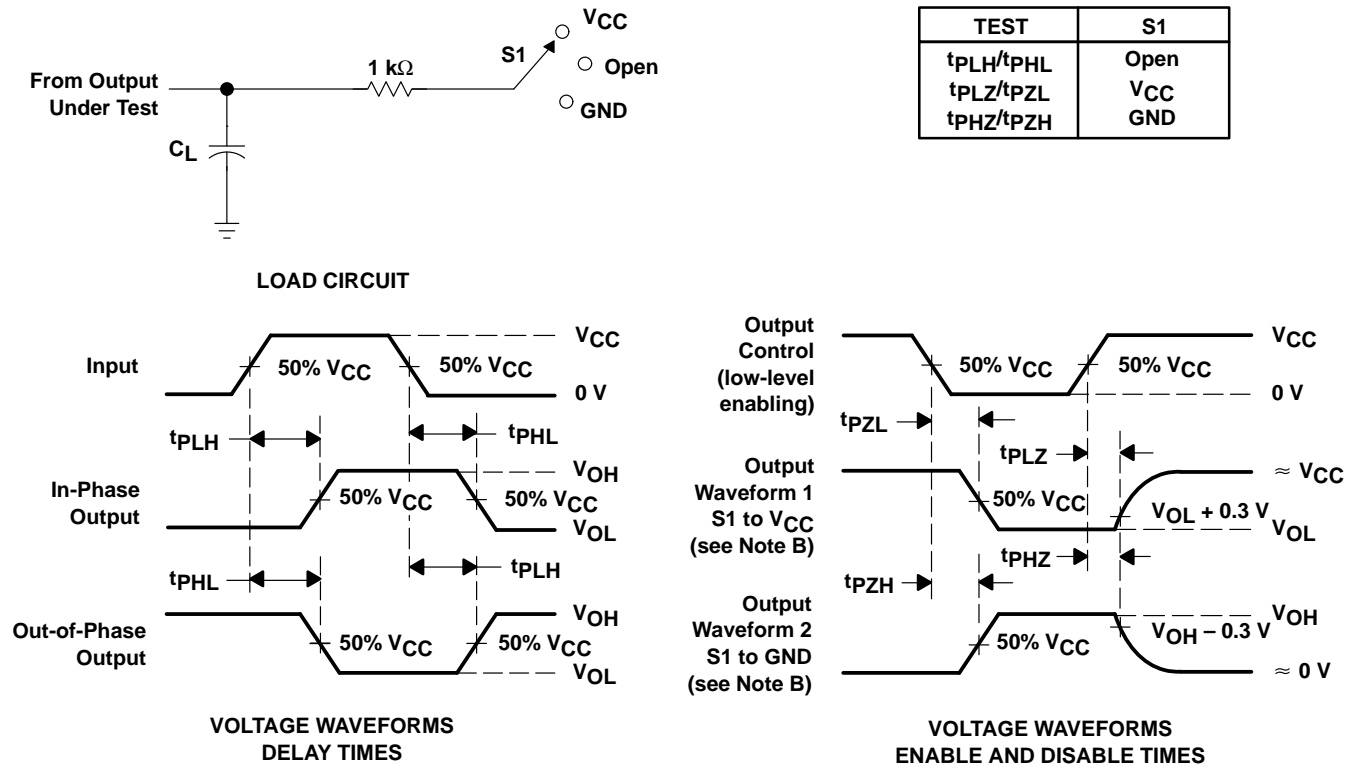


POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

# SN54AHC257, SN74AHC257 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SCLS349 – MAY 1996

## PARAMETER MEASUREMENT INFORMATION



- NOTES:
- $C_L$  includes probe and jig capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
  - All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  1 MHz,  $Z_O = 50 \Omega$ ,  $t_r = 3$  ns,  $t_f = 3$  ns.
  - The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PRODUCT PREVIEW

## **IMPORTANT NOTICE**

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

**TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.**

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI 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 of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.