

SN54BCT648, SN74BCT648 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCBS050B - MAY 1990 - REVISED APRIL 1994

- State-of-the-Art BiCMOS Design Significantly Reduces I_{CCZ}
- Independent Registers for A and B Buses
- Multiplexed Real-Time and Stored Data
- Inverting Data Paths
- Power-Up High-Impedance Mode
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK) and Flatpacks (W), and Standard Plastic and Ceramic 300-mil DIPS (JT, NT)

description

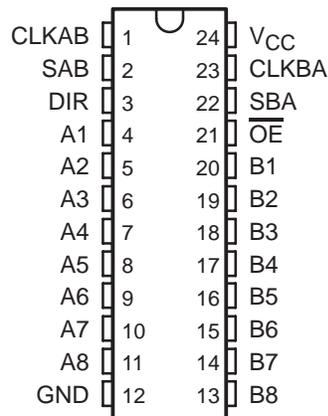
These devices consist of bus transceiver circuits with 3-state outputs, D-type flip-flops, and control circuitry arranged for multiplexed transmission of data directly from the input bus or from the internal registers. Data on the A or B bus will be clocked into the registers on the low-to-high transition of the appropriate clock (CLKAB or CLKBA) input. Figure 1 illustrates the four fundamental bus-management functions that can be performed with the 'BCT648.

Output-enable (\overline{OE}) and direction-control (DIR) inputs are provided to control the transceiver functions. In the transceiver mode, data present at the high-impedance port may be stored in either register or in both. The select control (SAB and SBA) can multiplex stored and real-time (transparent mode) data. The direction control determines which bus will receive data when \overline{OE} is active (low). In the isolation mode (\overline{OE} high), A data may be stored in one register and/or B data may be stored in the other register.

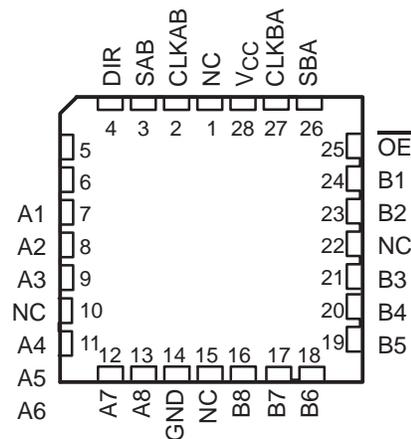
When an output function is disabled, the input function is still enabled and may be used to store and transmit data. Only one of the two buses, A or B, may be driven at a time.

The SN54BCT648 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74BCT648 is characterized for operation from 0°C to 70°C .

SN54BCT648 . . . JT OR W PACKAGE
SN74BCT648 . . . DW OR NT PACKAGE
(TOP VIEW)



SN54BCT648 . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

SN54BCT648, SN74BCT648 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCBS050B – MAY 1990 – REVISED APRIL 1994

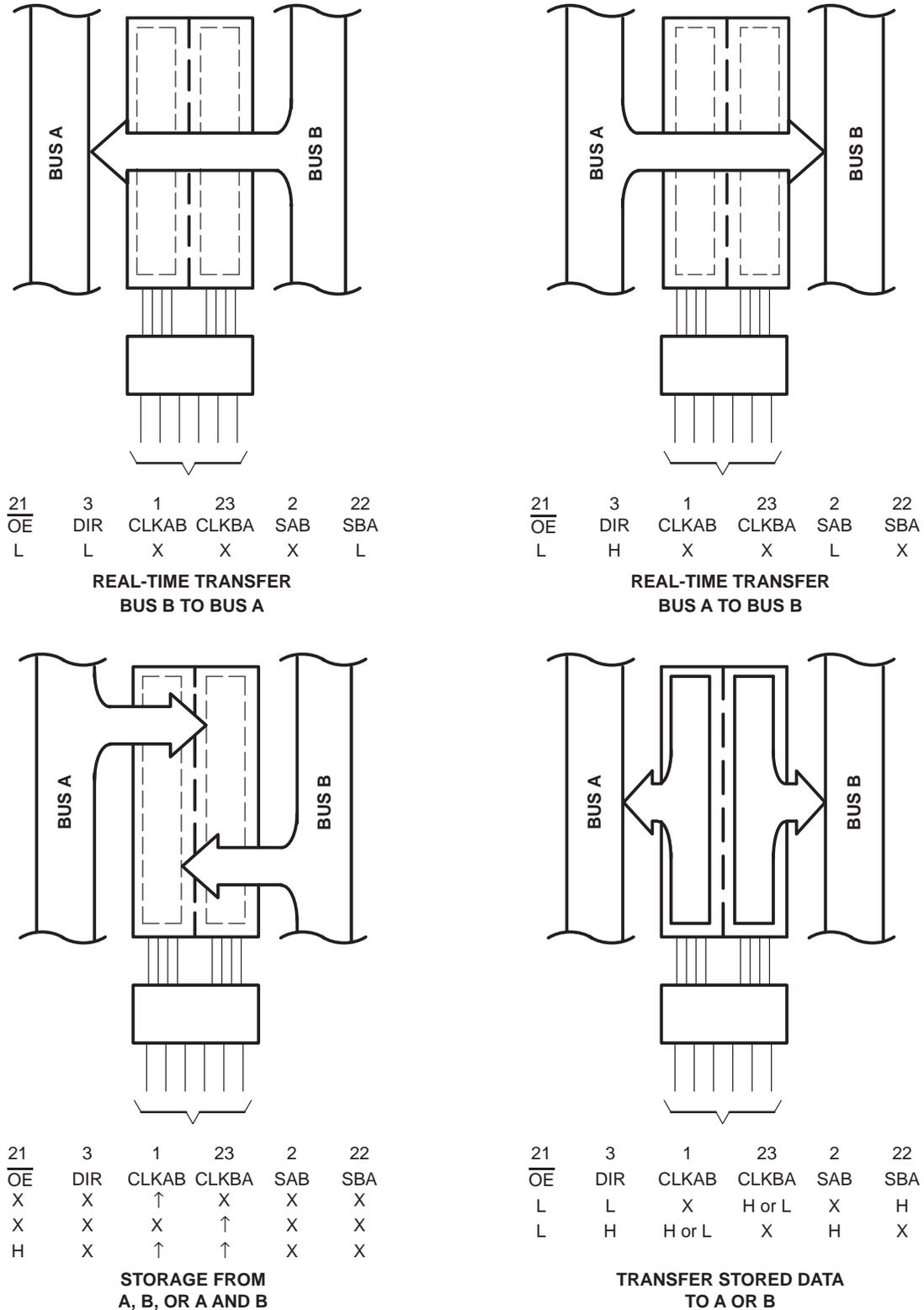


Figure 1. Bus-Management Functions

Pin numbers shown are for the DW, JT, NT, and W packages.



SN54BCT648, SN74BCT648 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

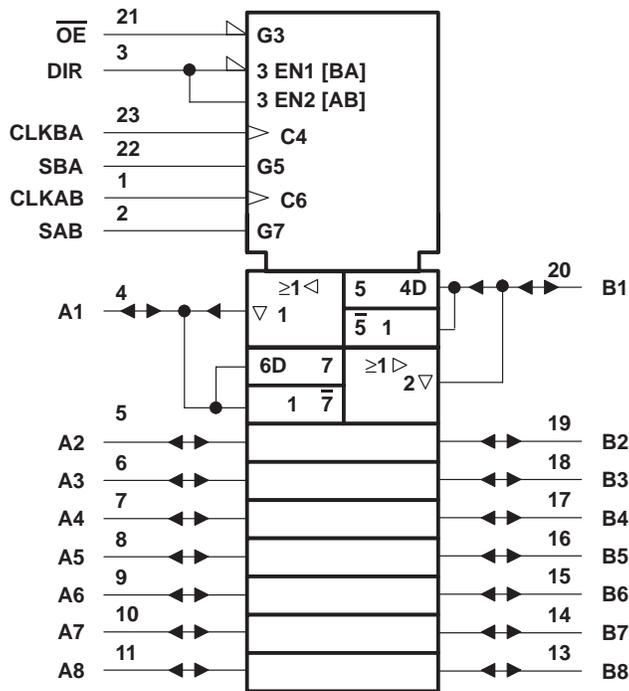
SCBS050B – MAY 1990 – REVISED APRIL 1994

FUNCTION TABLE

INPUTS						DATA I/O		OPERATION OR FUNCTION
\overline{OE}	DIR	CLKAB	CLKBA	SAB	SBA	A1 THRU A8	B1 THRU B8	
X	X	↑	X	X	X	Input	Unspecified [†]	Store A, B unspecified [†]
X	X	X	↑	X	X	Unspecified [†]	Input	Store B, A unspecified [†]
H	X	↑	↑	X	X	Input	Input	Store A and B data
H	X	H or L	H or L	X	X	Input	Input	Isolation, hold storage
L	L	X	X	X	L	Output	Input	Real-time \overline{B} data to A Bus
L	L	X	H or L	X	H	Output	Input	Stored \overline{B} data to A Bus
L	H	X	X	L	X	Input	Output	Real-time \overline{A} data to B Bus
L	H	H or L	X	H	X	Input	Output	Stored \overline{A} data to B Bus

[†] The data output functions may be enabled or disabled by various signals at the \overline{OE} and DIR inputs. Data input functions are always enabled; i.e., data at the bus pins will be stored on every low-to-high transition of the clock inputs.

logic symbol[‡]

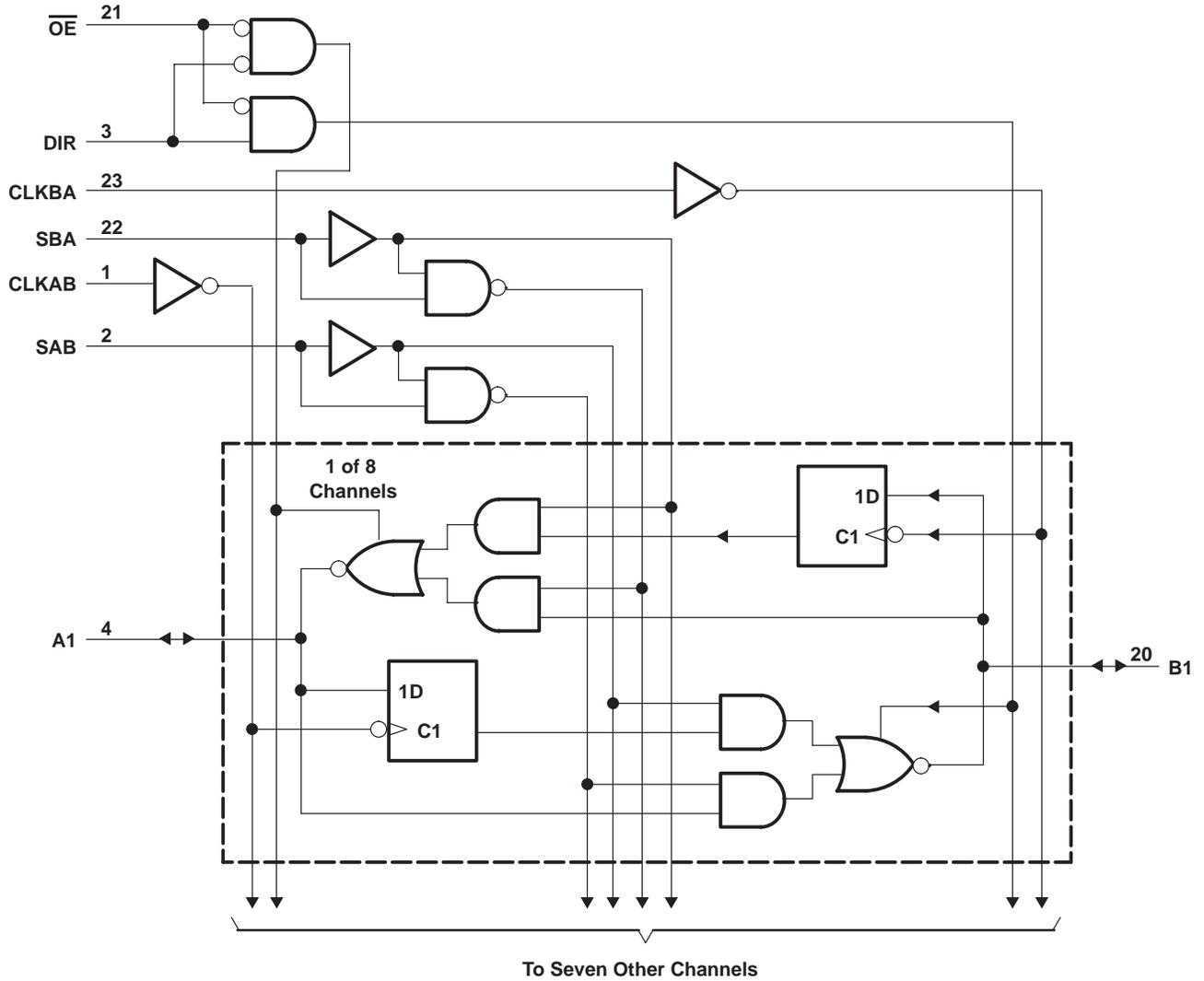


[‡] This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the DW, JT, NT, and W packages.

SN54BCT648, SN74BCT648 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCBS050B - MAY 1990 - REVISED APRIL 1994

logic diagram (positive logic)



Pin numbers shown are for the DW, JT, NT, and W packages.

SN54BCT648, SN74BCT648 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCBS050B – MAY 1990 – REVISED APRIL 1994

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

Supply voltage range, V_{CC}	– 0.5 V to 7 V
Input voltage range (I/O ports) (see Note 1)	– 0.5 V to 5.5 V
Input voltage range (excluding I/O ports) (see Note 1)	– 0.5 V to 7 V
Voltage range applied to any output in the disabled or power-off state, V_O	– 0.5 V to 5.5 V
Voltage range applied to any output in the high state, V_O	– 0.5 V to V_{CC}
Current into any output in the low state: SN54BCT648	96 mA
SN74BCT648	128 mA
Operating free-air temperature range: SN54BCT648	– 55°C to 125°C
SN74BCT648	0°C to 70°C
Storage temperature range	– 65°C to 150°C

† 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.

NOTE 1: The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

recommended operating conditions

		SN54BCT648			SN74BCT648			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_{IK}	Input clamp current			–18			–18	mA
I_{OH}	High-level output current			–12			–15	mA
I_{OL}	Low-level output current			48			64	mA
T_A	Operating free-air temperature	–55		125	0		70	°C



SN54BCT648, SN74BCT648 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCBS050B – MAY 1990 – REVISED APRIL 1994

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

PARAMETER	TEST CONDITIONS	SN54BCT648		SN74BCT648		UNIT	
		MIN	TYP†	MAX	MIN		TYP†
V_{IK}	$V_{CC} = 4.5\text{ V}$, $I_I = -18\text{ mA}$			-1.2		-1.2	V
V_{OH}	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -3\text{ mA}$		2.4	3.3	2.4	3.3
		$I_{OH} = -12\text{ mA}$		2	3.2		
		$I_{OH} = -15\text{ mA}$				2	3.1
V_{OL}	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 48\text{ mA}$		0.38	0.55		
		$I_{OL} = 64\text{ mA}$				0.42	0.55
I_I	A or B port	$V_{CC} = 5.5\text{ V}$,	$V_I = 5.5\text{ V}$			1	1
	Control inputs					1	1
$I_{IH}‡$	A or B port	$V_{CC} = 5.5\text{ V}$,	$V_I = 2.7\text{ V}$			70	70
	Control inputs					20	20
$I_{IL}‡$	A or B port	$V_{CC} = 5.5\text{ V}$,	$V_I = 0.5\text{ V}$			-0.7	-0.7
	Control inputs					-0.7	-0.7
$I_{OS}§$		$V_{CC} = 5.5\text{ V}$,	$V_O = 0$	-100	-225	-100	-225
I_{CCL}	A or B port	$V_{CC} = 5.5\text{ V}$,	$V_I = \text{GND}$	42	66	42	66
I_{CCH}	A or B port	$V_{CC} = 5.5\text{ V}$,	$V_I = 4.5\text{ V}$	8	13	8	13
I_{CCZ}	A or B port	$V_{CC} = 5.5\text{ V}$,	$V_I = \text{GND}$	10	16	10	16
C_i	Control inputs	$V_{CC} = 5\text{ V}$,	$V_I = 2.5\text{ V}$ or 0.5 V			6	6
C_{io}	A or B port	$V_{CC} = 5\text{ V}$,	$V_O = 2.5\text{ V}$ or 0.5 V			12	12

† All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

‡ For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.

§ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

		$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$		SN54BCT648		SN74BCT648		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
f_{clock}	Clock frequency	0	67	0	67	0	67	MHz
t_w	Pulse duration	CLK high	7.5	4.3	7.5			ns
		CLK low	7.5	7.5	7.5			
t_{su}	Setup time, A or B before $\text{CLK}\uparrow$	6		6	6	6	ns	
t_h	Hold time, A or B after $\text{CLK}\uparrow$	1		1	1	1	ns	



SN54BCT648, SN74BCT648 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCBS050B – MAY 1990 – REVISED APRIL 1994

switching characteristics over recommended ranges of supply voltage and operating free-air temperature, $C_L = 50$ pF (unless otherwise noted) (see Note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5$ V, $T_A = 25^\circ$ C			SN54BCT648		SN74BCT648		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f_{max}			67	110		67		67		MHz
t_{PLH}	CLKBA or CLKAB	A or B	3.7	7.4	10.3	3.7	13.4	3.7	12.1	ns
t_{PHL}			4.3	7.8	10.6	4.3	13.2	4.3	12.5	
t_{PLH}	A or B	B or A	3.8	7.4	9.9	3.8	12.8	3.8	12.2	ns
t_{PHL}			3.3	6.5	8.9	3.3	11.2	3.3	10.1	
t_{PLH}	SAB or SBA \dagger (with A or B high)	A or B	3.3	6.2	8.4	3.3	10.7	3.3	9.7	ns
t_{PHL}			5.3	9.6	12.6	5.3	16.5	5.3	15.5	
t_{PLH}	SBA or SAB \dagger (with A or B low)	A or B	4.6	8.8	11.7	4.6	16.5	4.6	14.3	ns
t_{PHL}			4.9	8.4	11.1	4.9	13.8	4.9	13	
t_{PZH}	\overline{OE}	A or B	4.5	8.4	11	4.5	14.4	4.5	13.5	ns
t_{PZL}			4.9	9.2	12.2	4.9	16	4.9	15	
t_{PHZ}	\overline{OE}	A or B	4	7.3	9.7	4	12	4	11.2	ns
t_{PLZ}			3.5	6.6	9.3	3.5	11.6	3.5	10.5	
t_{PZH}	DIR	A or B	3.1	7.4	11	3.1	14.1	3.1	13.4	ns
t_{PZL}			3.8	8.3	12.2	3.8	15.5	3.8	14.7	
t_{PHZ}	DIR	A or B	4.3	8.3	11.6	3.5	14.3	4.3	13.9	ns
t_{PLZ}			2.7	6.7	9.9	2.7	12.8	2.7	11.9	

\dagger These parameters are measured with the internal output state of the storage register opposite to that of the bus input.

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.



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