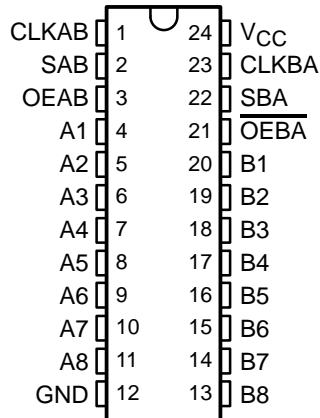


SN54HC652, SN74HC652 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

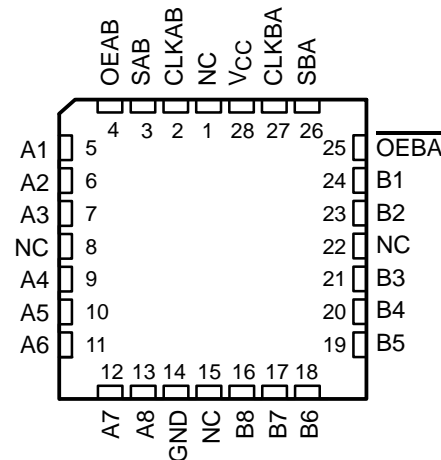
SCLS151E – DECEMBER 1982 – REVISED MARCH 2003

- Wide Operating Voltage Range of 2 V to 6 V
- High-Current 3-State Outputs Can Drive Up To 15 LSTTL Loads
- Low Power Consumption, 80- μ A Max I_{CC}
- Typical $t_{pd} = 11$ ns
- ± 6 -mA Output Drive at 5 V
- Low Input Current of 1 μ A Max
- Independent Registers and Enables for A and B Buses
- Multiplexed Real-Time and Stored Data
- True Data Paths

SN54HC652 . . . JT OR W PACKAGE
SN74HC652 . . . DW OR NT PACKAGE
(TOP VIEW)



SN54HC652 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description/ordering information

The 'HC652 devices consist of bus-transceiver circuits, D-type flip-flops, and control circuitry arranged for multiplexed transmission of data directly from the data bus or from the internal storage registers. Output-enable (OEAB and OEBA) inputs are provided to control the transceiver functions. Select-control (SAB and SBA) inputs are provided to select real-time or stored-data transfer. A low input level selects real-time data, and a high input level selects stored data. Figure 1 illustrates the four fundamental bus-management functions that can be performed with these devices.

ORDERING INFORMATION

TA	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	PDIP – NT	Tube	SN74HC652NT	SN74HC652NT
	SOIC – DW	Tube	SN74HC652DW	HC652
		Tape and reel	SN74HC652DWR	
-55°C to 125°C	CDIP – JT	Tube	SNJ54HC652JT	SNJ54HC652JT
	CFP – W	Tube	SNJ54HC652W	SNJ54HC652W
	LCCC – FK	Tube	SNJ54HC652FK	SNJ54HC652FK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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.

UNLESS OTHERWISE NOTED this document contains PRODUCTION DATA information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2003, Texas Instruments Incorporated

SN54HC652, SN74HC652 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCLS151E – DECEMBER 1982 – REVISED MARCH 2003

description/ordering information (continued)

Data on the A or B data bus, or both, can be stored in the internal D-type flip-flops by low-to-high transitions at the appropriate clock (CLKAB or CLKBA) terminals, regardless of the select- or output-control terminals. When SAB and SBA are in the real-time transfer mode, it is possible to store data without using the internal D-type flip-flops by simultaneously enabling OEAB and \overline{OEBA} . In this configuration, each output reinforces its input. When all other data sources to the two sets of bus lines are at high impedance, each set of bus lines remains at its last state.

To ensure the high-impedance state during power up or power down, \overline{OEBA} should be tied to V_{CC} through a pullup resistor, and OEAB should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sinking/current-sourcing capability of the driver.

FUNCTION TABLE

INPUTS						DATA I/O†		OPERATION OR FUNCTION
OEAB	\overline{OEBA}	CLKAB	CLKBA	SAB	SBA	A1–A8	B1–B8	
L	H	H or L	H or L	X	X	Input	Input	Isolation
L	H	↑	↑	X	X	Input	Input	Store A and B data
X	H	↑	H or L	X	X	Input	Unspecified‡	Store A, hold B
H	H	↑	↑	X‡	X	Input	Output	Store A in both registers
L	X	H or L	↑	X	X	Unspecified‡	Input	Hold A, store B
L	L	↑	↑	X	X‡	Output	Input	Store B in both registers
L	L	X	X	X	L	Output	Input	Real-time B data to A bus
L	L	X	H or L	X	H	Output	Input	Stored B data to A bus
H	H	X	X	L	X	Input	Output	Real-time A data to B bus
H	H	H or L	X	H	X	Input	Output	Stored A data to B bus
H	L	H or L	H or L	H	H	Output	Output	Stored A data to B bus and stored B data to A bus

† The data-output functions are enabled or disabled by a variety of level combinations at OEAB or \overline{OEBA} . Data-input functions always are enabled; i.e., data at the bus terminals is stored on every low-to-high transition on the clock inputs.

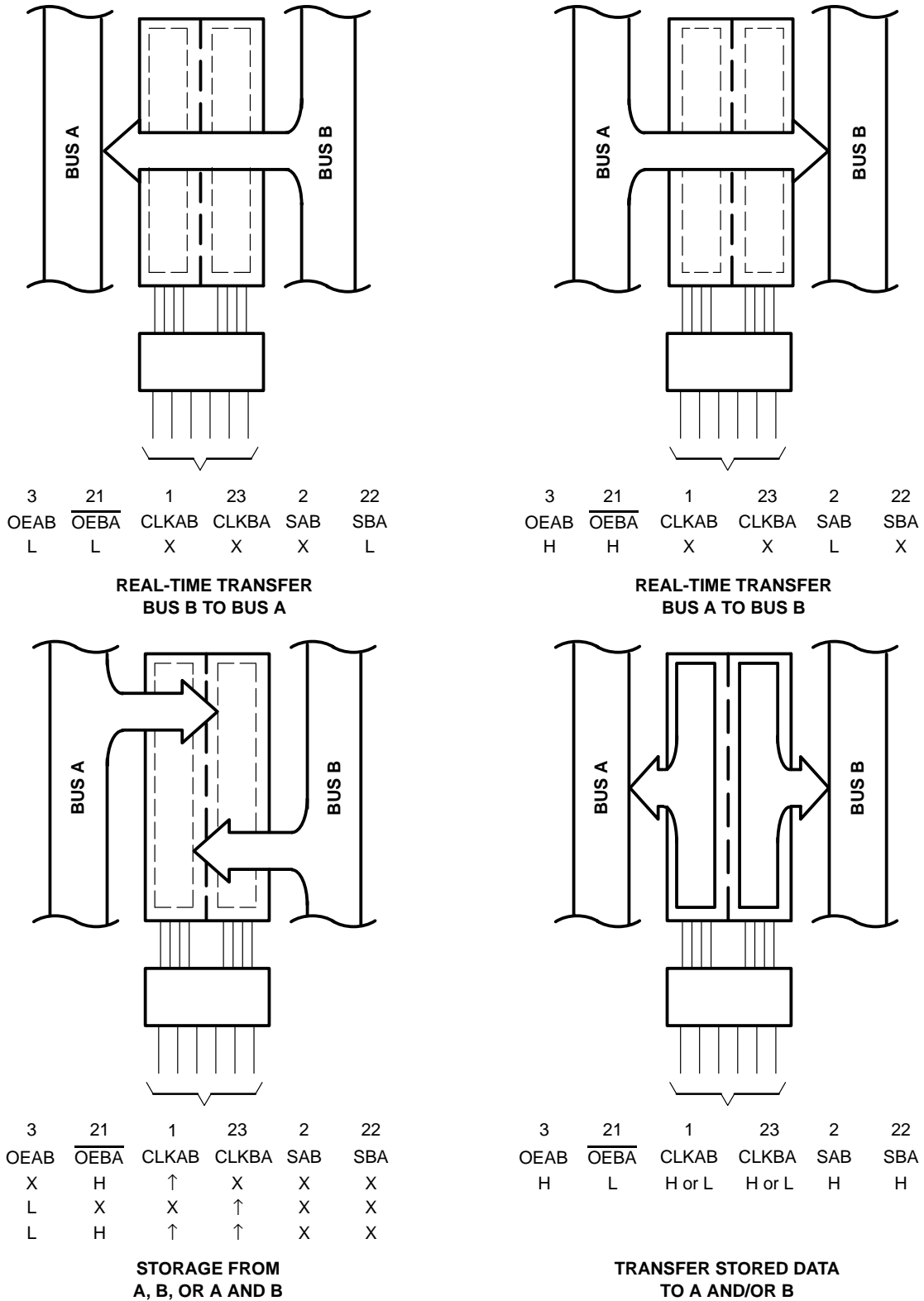
‡ Select control = L: clocks can occur simultaneously.

Select control = H: clocks must be staggered to load both registers.



SN54HC652, SN74HC652 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCLS151E – DECEMBER 1982 – REVISED MARCH 2003



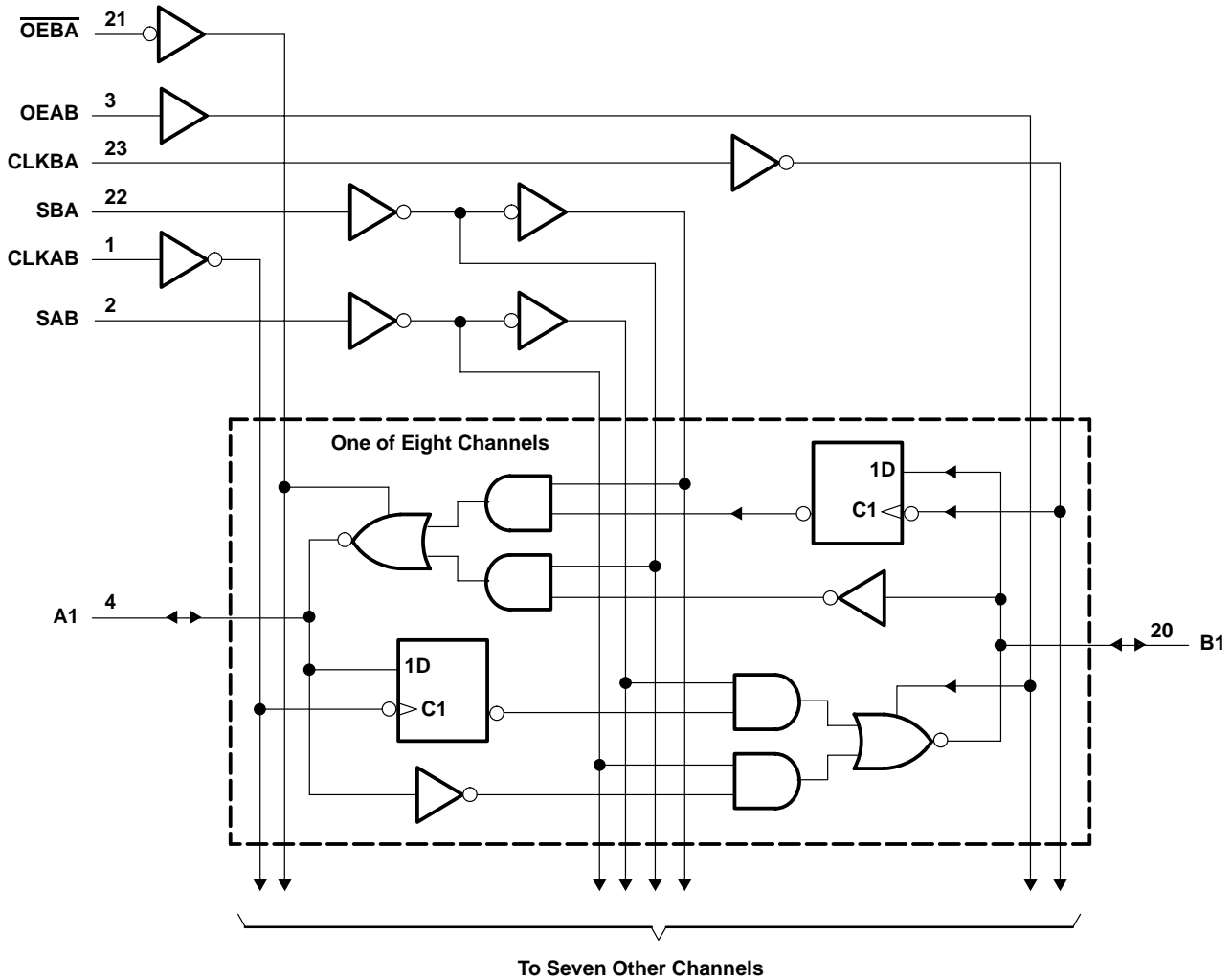
Pin numbers shown are for the DW, JT, NT, and W packages.

Figure 1. Bus-Management Functions

SN54HC652, SN74HC652 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCLS151E – DECEMBER 1982 – REVISED MARCH 2003

logic diagram (positive logic)



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

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

Supply voltage range, V_{CC}	-0.5 V to 7 V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (see Note 1)	± 20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) (see Note 1)	± 20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	± 35 mA
Continuous current through V_{CC} or GND	± 70 mA
Package thermal impedance, θ_{JA} (see Note 2): DW package	46°C/W
(see Note 3): NT package	67°C/W
Storage temperature range, T_{stg}	-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.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
 2. The package thermal impedance is calculated in accordance with JESD 51-7.
 3. The package thermal impedance is calculated in accordance with JESD 51-3.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

SN54HC652, SN74HC652 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCLS151E – DECEMBER 1982 – REVISED MARCH 2003

recommended operating conditions (see Note 4)

		SN54HC652			SN74HC652			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	2	5	6	2	5	6	V
V _{IH}	High-level input voltage	V _{CC} = 2 V		1.5	1.5		V	
		V _{CC} = 4.5 V		3.15	3.15			
		V _{CC} = 6 V		4.2	4.2			
V _{IL}	Low-level input voltage	V _{CC} = 2 V			0.5	0.5	V	
		V _{CC} = 4.5 V			1.35	1.35		
		V _{CC} = 6 V			1.8	1.8		
V _I	Input voltage	0		V _{CC}	0	V _{CC}	V	
V _O	Output voltage	0		V _{CC}	0	V _{CC}	V	
t _t	Input transition (rise and fall) time	V _{CC} = 2 V			1000	1000	ns	
		V _{CC} = 4.5 V			500	500		
		V _{CC} = 6 V			400	400		
T _A	Operating free-air temperature	-55		125	-40	85	°C	

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS		V _{CC}	T _A = 25°C			SN54HC652		SN74HC652		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	V _I = V _{IH} or V _{IL}	I _{OH} = -20 μA	2 V	1.9	1.998		1.9	1.9	V		
			4.5 V	4.4	4.499		4.4	4.4			
			6 V	5.9	5.999		5.9	5.9			
		I _{OH} = -6 mA	4.5 V	3.98	4.3		3.7	3.84			
		I _{OH} = -7.8 mA	6 V	5.48	5.8		5.2	5.34			
V _{OL}	V _I = V _{IH} or V _{IL}	I _{OL} = 20 μA	2 V		0.002	0.1		0.1	0.1	V	
			4.5 V		0.001	0.1		0.1	0.1		
			6 V		0.001	0.1		0.1	0.1		
		I _{OL} = 6 mA	4.5 V		0.17	0.26		0.4	0.33		
		I _{OL} = 7.8 mA	6 V		0.15	0.26		0.4	0.33		
I _I	Control inputs	V _I = V _{CC} or 0	6 V		±0.1	±100		±1000	±1000	nA	
I _{OZ}	A or B	V _O = V _{CC} or GND	6 V		±0.01	±0.5		±10	±5	μA	
I _{CC}		V _I = V _{CC} or 0, I _O = 0	6 V			8		160	80	μA	
C _i	Control inputs		2 V to 6 V		3	10		10	10	pF	

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.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

SN54HC652, SN74HC652 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCLS151E – DECEMBER 1982 – REVISED MARCH 2003

timing requirements over recommended operating free-air temperature range (unless otherwise noted)

	V _{CC}	T _A = 25°C		SN54HC652		SN74HC652		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock} Clock frequency	2 V		6		4.3		5.5	MHz
	4.5 V		31		22		27	
	6 V		36		25		31	
t _w Pulse duration, CLKBA or CLKAB high or low	2 V		80		115		95	ns
	4.5 V		16		23		19	
	6 V		14		20		16	
t _{su} Setup time, A before CLKAB↑ or B before CLKBA↑	2 V		100		150		125	ns
	4.5 V		20		30		25	
	6 V		17		26		21	
t _h Hold time, A after CLKAB↑ or B after CLKBA↑	2 V		5		5		5	ns
	4.5 V		5		5		5	
	6 V		5		5		5	

switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25°C			SN54HC652		SN74HC652		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f _{max}			2 V	6	10		4.3		5.5	MHz	
			4.5 V	31	40		22		27		
			6 V	36	45		25		31		
t _{pd}	CLKBA or CLKAB	A or B	2 V		65	180		270		225	ns
			4.5 V		18	36		54		45	
			6 V		14	31		46		38	
	A or B	B or A	2 V		50	135		205		170	
			4.5 V		14	27		41		34	
			6 V		11	23		35		29	
	SBA or SAB†	A or B	2 V		70	190		285		240	
			4.5 V		20	38		57		48	
			6 V		16	32		48		41	
t _{en}	OEBA or OEAB	A or B	2 V		85	245		370		305	ns
			4.5 V		25	49		74		61	
			6 V		20	42		63		52	
t _{dis}	OEBA or OEAB	A or B	2 V		50	245		370		305	ns
			4.5 V		23	49		74		61	
			6 V		20	42		63		52	
t _t		Any	2 V		28	60		90		75	ns
	4.5 V			8	12		18		15		
	6 V			6	10		15		13		

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

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.



SN54HC652, SN74HC652 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCLS151E – DECEMBER 1982 – REVISED MARCH 2003

switching characteristics over recommended operating free-air temperature range, $C_L = 150 \text{ pF}$ (unless otherwise noted) (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC652		SN74HC652		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	CLKBA or CLKAB	A or B	2 V	90	265	400	330	ns			
			4.5 V	24	53	80	66				
			6 V	18	46	68	57				
	A or B	B or A	2 V	70	220	335	275				
			4.5 V	20	44	70	55				
			6 V	15	38	57	48				
	SBA or SAB [†]	A or B	2 V	80	275	415	345				
			4.5 V	24	55	83	69				
			6 V	20	47	70	60				
t_{en}	$\overline{\text{OEBA}}$ or OEAB	A or B	2 V	100	330	500	410	ns			
			4.5 V	33	66	100	82				
			6 V	27	57	85	71				
t_t		Any	2 V	45	210	315	265	ns			
			4.5 V	17	42	63	53				
			6 V	13	36	53	43				

[†] These parameters are measured with the internal output state of the storage register opposite that of the bus input.

operating characteristics, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TYP	UNIT
C_{pd} Power dissipation capacitance	No load	50	pF

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.

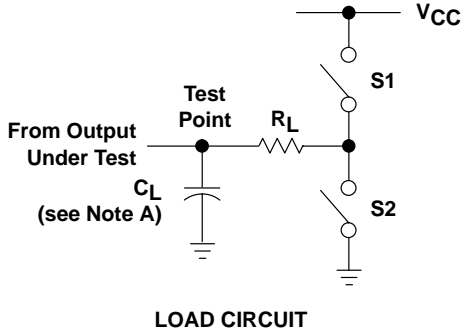


POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

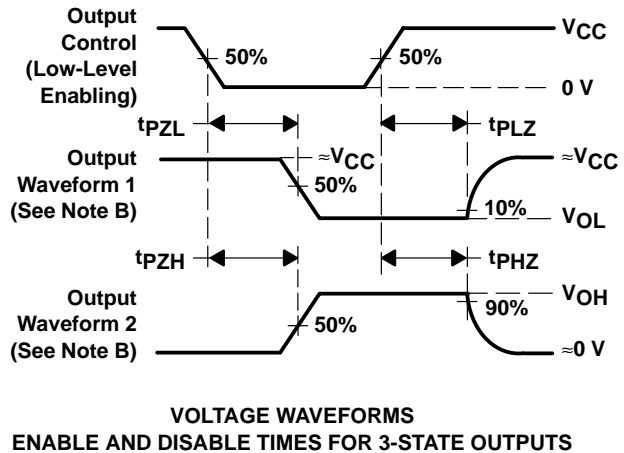
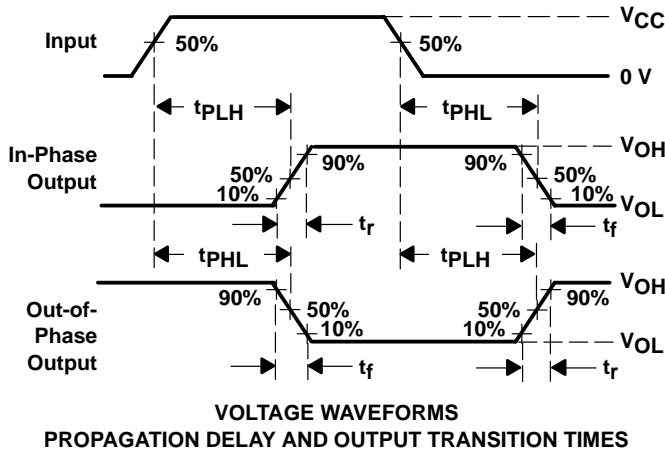
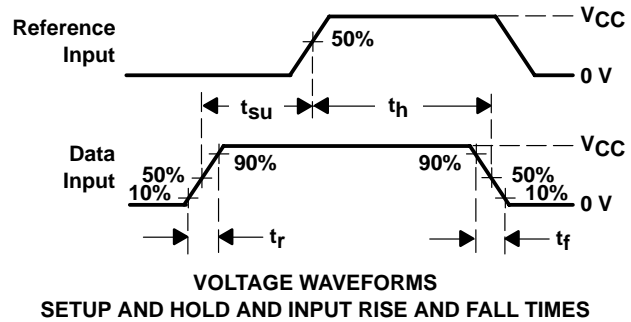
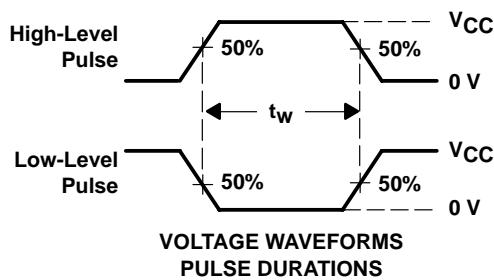
SN54HC652, SN74HC652 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

SCLS151E – DECEMBER 1982 – REVISED MARCH 2003

PARAMETER MEASUREMENT INFORMATION



PARAMETER	R_L	C_L	S1	S2
t_{en}	1 k Ω	50 pF or 150 pF	Open	Closed
			Closed	Open
t_{dis}	1 k Ω	50 pF	Open	Closed
			Closed	Open
t_{pd} or t_t	—	50 pF or 150 pF	Open	Open



- NOTES: A. C_L includes probe and test-fixture capacitance.
 B. 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.
 C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
 D. For clock inputs, f_{max} is measured when the input duty cycle is 50%.
 E. The outputs are measured one at a time with one input transition per measurement.
 F. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 G. t_{PZL} and t_{PZH} are the same as t_{en} .
 H. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 2. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74HC652DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC652	Samples
SN74HC652DWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC652	Samples
SN74HC652DWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC652	Samples
SN74HC652NT	LIFEBUY	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC652NT	
SN74HC652NT3	OBSOLETE	PDIP	NT	24		TBD	Call TI	Call TI	-40 to 85		
SN74HC652NTE4	LIFEBUY	PDIP	NT	24	15	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC652NT	

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

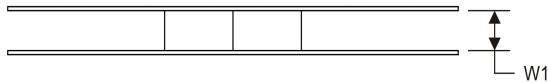
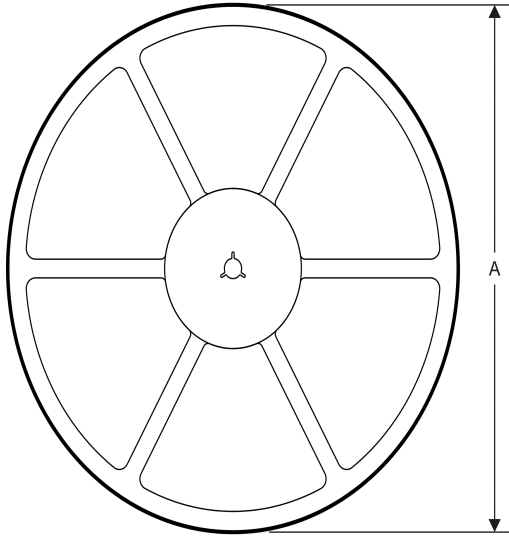
⁽⁶⁾ Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

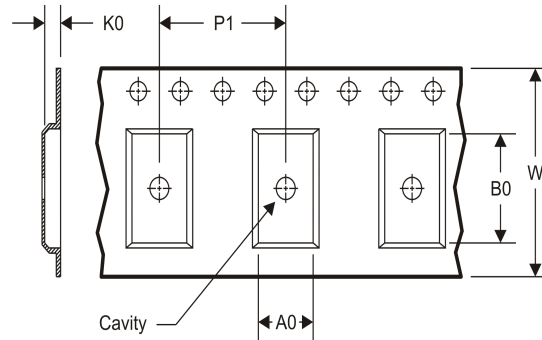
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

TAPE AND REEL INFORMATION

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HC652DWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS



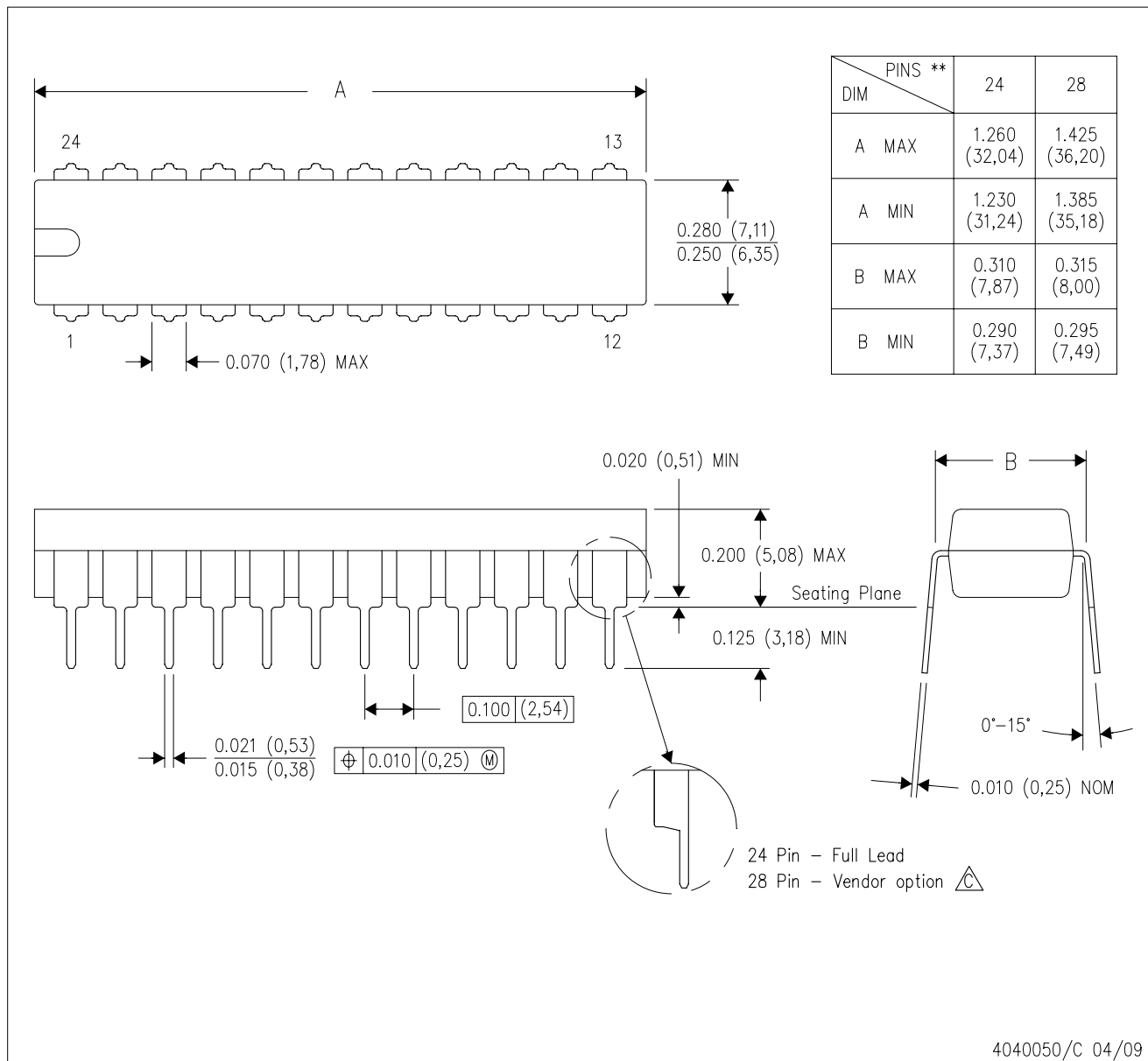
*All dimensions are nominal


Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC652DWR	SOIC	DW	24	2000	367.0	367.0	45.0

MECHANICAL DATA

NT (R-PDIP-T**) 24 PINS SHOWN

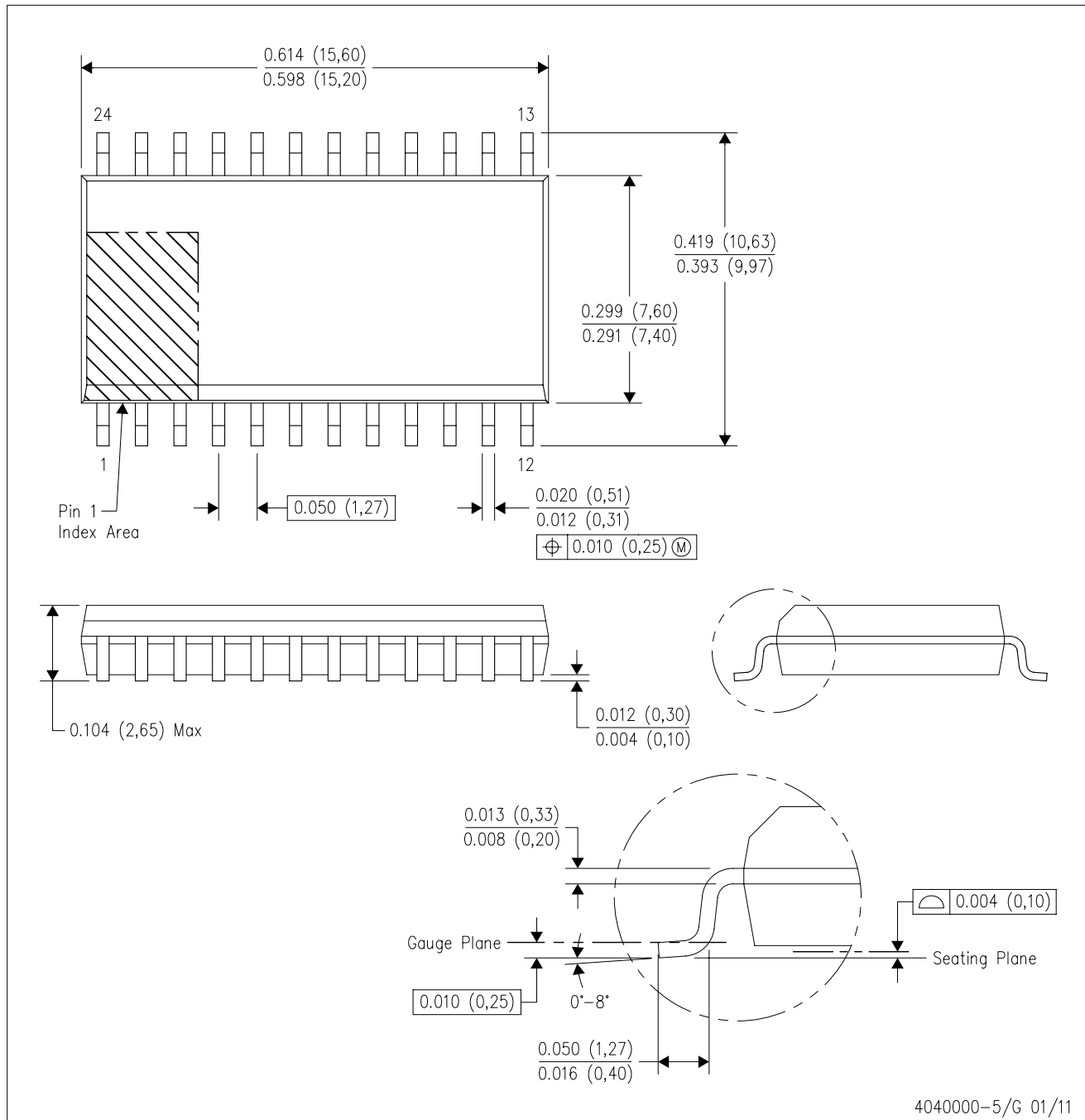
PLASTIC DUAL-IN-LINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 -  The 28 pin end lead shoulder width is a vendor option, either half or full width.

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-013 variation AD.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not 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 relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license 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 significant portions 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. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.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
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com