

# 74ACT11648 OCTAL BUS TRANSCEIVER AND REGISTER WITH 3-STATE OUTPUTS

SCAS115 – D3458, MARCH 1990 – REVISED APRIL 1993

- Inputs Are TTL-Voltage Compatible
- Independent Registers A and B Buses
- Multiplexed Real-Time and Stored Data
- Inverting Data Paths
- Flow-Through Architecture to Optimize PCB Layout
- Center-Pin  $V_{CC}$  and GND Configurations Minimize High-Speed Switching Noise
- EPIC™ (Enhanced-Performance Implanted CMOS) 1- $\mu$ m Process
- 500-mA Typical Latch-Up Immunity at 125°C

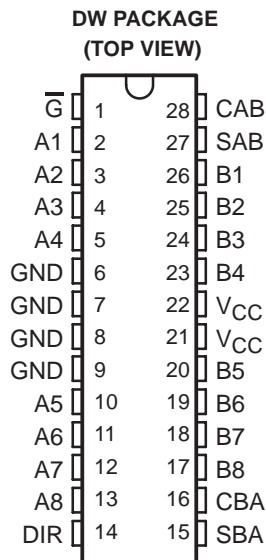
## description

The 74ACT11648 consists of bus transceiver circuits with 3-state outputs, D-type flip-flops, and control circuitry arranged for multiplexed transmission of data directly from the data bus or from the internal storage registers. Data on the A or B bus will be clocked into the registers on the low-to-high transition of the appropriate clock pin (CAB or CBA). Examples of the four fundamental bus-management functions that can be performed with the octal bus transceivers and registers are shown in Figure 1.

Enable ( $\overline{G}$ ) and direction (DIR) pins 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 controls (SAB and SBA) can multiplex stored and real-time (transparent mode) data. The circuitry used for select control will eliminate the typical decoding glitch that occurs in a multiplexer during the transition between stored and real-time data. The direction control determines which bus will receive data when enable  $\overline{G}$  is active (low). In the isolation mode (control  $\overline{G}$  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 74ACT11648 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .



EPIC is a trademark of Texas Instruments Incorporated.

PRODUCTION DATA information is 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.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1993, Texas Instruments Incorporated

# 74ACT11648 OCTAL BUS TRANSCEIVER AND REGISTER WITH 3-STATE OUTPUTS

SCAS115 – D3458, MARCH 1990 – REVISED APRIL 1993

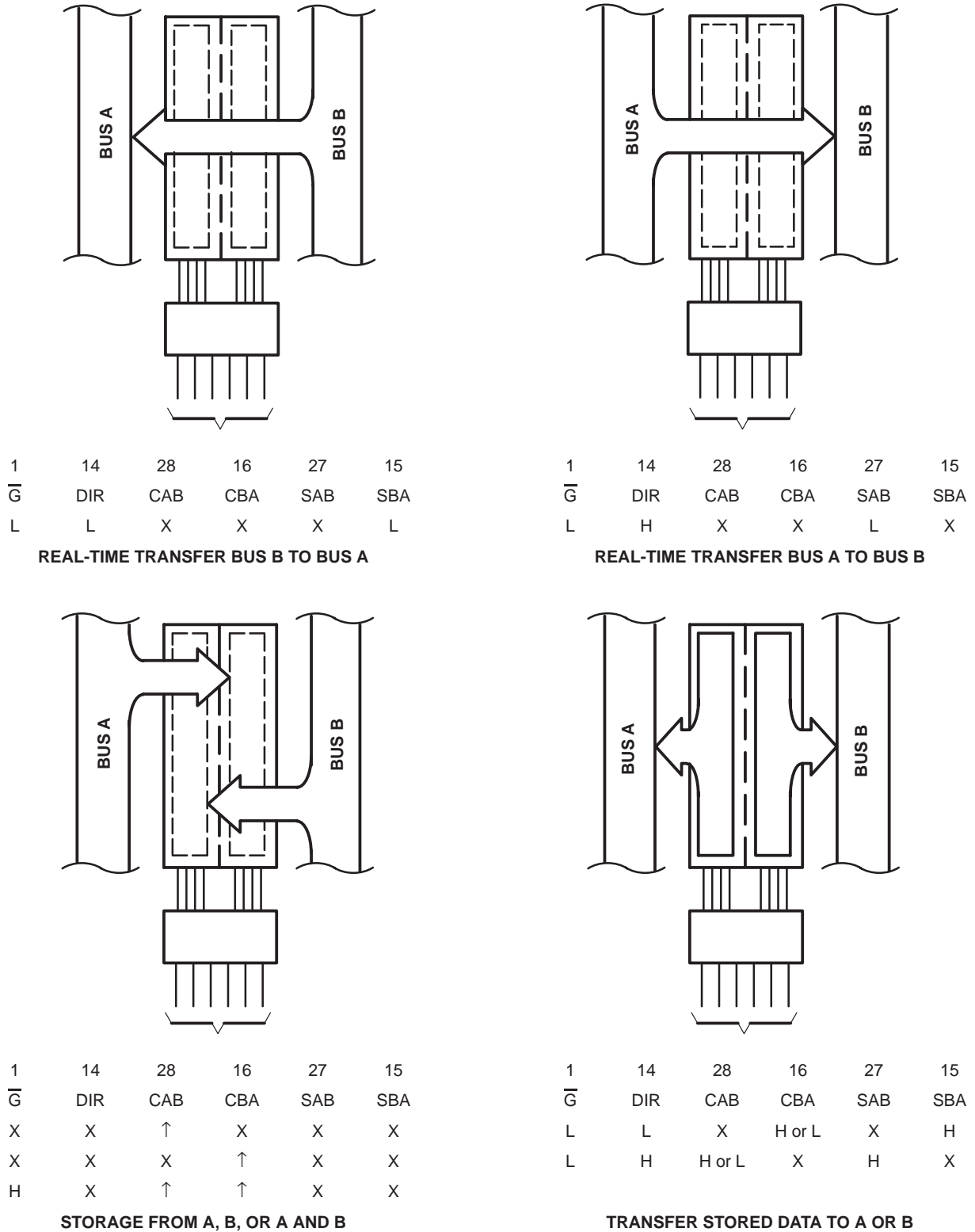


Figure 1. Bus-Management Functions

# 74ACT11648 OCTAL BUS TRANSCEIVER AND REGISTER WITH 3-STATE OUTPUTS

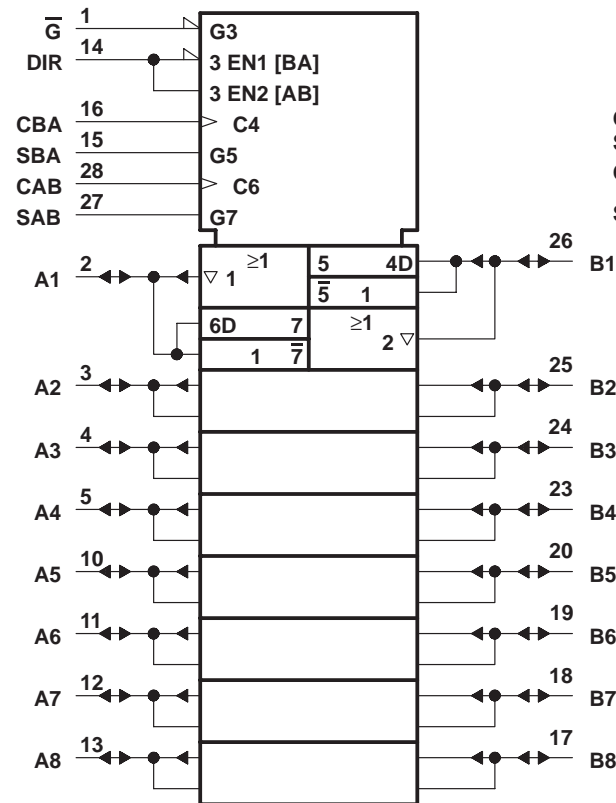
SCAS115 – D3458, MARCH 1990 – REVISED APRIL 1993

FUNCTION TABLE

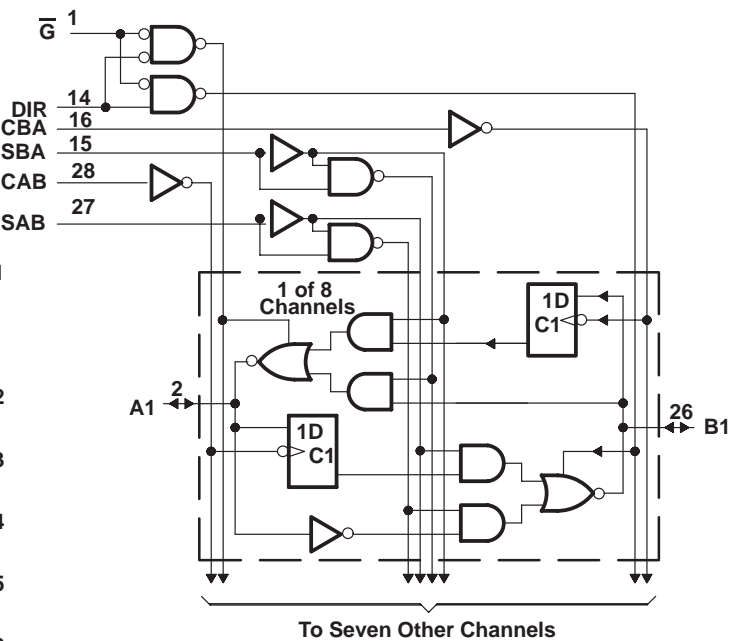
INPUTS						DATA I/O		OPERATION OR FUNCTION
$\overline{G}$	DIR	CAB	CBA	SAB	SBA	A1 THRU A8	B1 THRU B8	
X	X	↑	X	X	X	Input	Unspecified†	Store A, B unspecified†
X	X	X	↑	X	X	Unspecified†	Input	Store B, A unspecified†
H	X	↑	↑	X	X	Input	Input	Store A and B Data
H	X	H or L	H or L	X	X	Input	Input	Isolation, hold 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  $\overline{G}$  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 on the clock inputs.

## logic symbol‡



## logic diagram (positive logic)



‡ This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

# 74ACT11648

## OCTAL BUS TRANSCEIVER AND REGISTER WITH 3-STATE OUTPUTS

SCAS115 – D3458, MARCH 1990 – REVISED APRIL 1993

### 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, $V_I$ (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Output voltage range, $V_O$ (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ )	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ )	$\pm 50$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND	$\pm 200$ mA
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

	MIN	NOM	MAX	UNIT
$V_{CC}$ Supply voltage	4.5	5	5.5	V
$V_{IH}$ High-level input voltage	2			V
$V_{IL}$ Low-level input voltage			0.8	V
$V_I$ Input voltage	0		$V_{CC}$	V
$V_O$ Output voltage	0		$V_{CC}$	V
$I_{OH}$ High-level output current			–24	mA
$I_{OL}$ Low-level output current			24	mA
$\Delta t/\Delta v$ Input transition rise or fall rate	0		10	ns/V
$T_A$ Operating free-air temperature	–40		85	°C

**74ACT11648**  
**OCTAL BUS TRANSCEIVER AND REGISTER**  
**WITH 3-STATE OUTPUTS**

SCAS115 – D3458, MARCH 1990 – REVISED APRIL 1993

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			MIN	MAX	UNIT	
			MIN	TYP	MAX				
V <sub>OH</sub>	I <sub>OH</sub> = - 50 μA	4.5 V	4.4			4.4		V	
		5.5 V	5.4			5.4			
	I <sub>OH</sub> = - 24 mA	4.5 V	3.94			3.8			
		5.5 V	4.94			4.8			
I <sub>OH</sub> = - 75 mA <sup>†</sup>	5.5 V				3.85				
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	4.5 V				0.1		V	
		5.5 V				0.1			
	I <sub>OL</sub> = 24 mA	4.5 V				0.36			
		5.5 V				0.36			
I <sub>OL</sub> = 75 mA <sup>†</sup>	5.5 V				1.65				
I <sub>I</sub>	Control Inputs	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V	± 0.1			± 1		μA
I <sub>OZ</sub>	A or B ports <sup>‡</sup>	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V	± 0.5			± 5		μA
I <sub>CC</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V	8			80		μA
ΔI <sub>CC</sub> <sup>§</sup>		One input at 3.4 V, Other inputs at GND or V <sub>CC</sub>	5.5 V	0.9			1		mA
C <sub>i</sub>	Control Inputs	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V	4.5					pF
C <sub>io</sub>	A or B ports	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V	12					

<sup>†</sup> Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

<sup>‡</sup> For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current.

<sup>§</sup> This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or V<sub>CC</sub>.

timing requirements over recommended range of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 2)

		T <sub>A</sub> = 25°C		MIN	MAX	UNIT
		MIN	MAX			
f <sub>clock</sub>	Clock frequency	0	90	0	75	MHz
t <sub>w</sub>	Pulse duration, CAB or CBA high or low	6.7		6.7		ns
t <sub>su</sub>	Setup time, A before CAB <sup>↑</sup> or B before CBA <sup>↑</sup>	5		5		ns
t <sub>h</sub>	Hold time, A after CAB <sup>↑</sup> or B after CBA <sup>↑</sup>	2		2		ns

# 74ACT11648

## OCTAL BUS TRANSCEIVER AND REGISTER WITH 3-STATE OUTPUTS

SCAS115 – D3458, MARCH 1990 – REVISED APRIL 1993

switching characteristics over recommended ranges of supply voltage operating free-air temperature (unless otherwise noted) (see Figure 2)

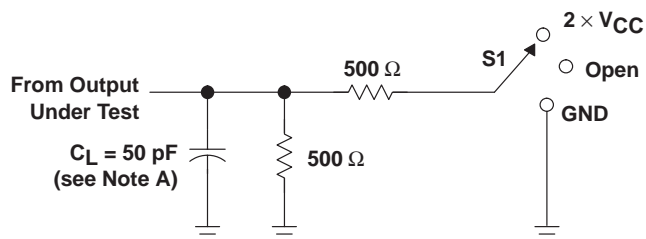
PARAMETER	FROM (INPUT)	TO (OUTPUT)	T <sub>A</sub> = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
f <sub>max</sub>			75			75		MHz
t <sub>PLH</sub>	A or B	B or A	2.4	6.5	9.5	2.4	10.7	ns
t <sub>PHL</sub>			4.4	8.5	11.3	4.4	12.7	
t <sub>PZH</sub>	$\bar{G}$	A or B	4.2	9.2	13	4.2	14.6	ns
t <sub>PZL</sub>			4.3	9.8	13.9	4.3	15.6	
t <sub>PHZ</sub>	$\bar{G}$	A or B	5.7	8.7	11.3	5.7	12.2	ns
t <sub>PLZ</sub>			5.3	8.1	10.5	5.3	11.4	
t <sub>PLH</sub>	CBA or CAB	A or B	5.2	9.4	12	5.2	13.7	ns
t <sub>PHL</sub>			6	10.5	13.5	6	15.2	
t <sub>PLH</sub>	SAB or SBA† (with A or B high)	A or B	4.7	8.6	11.3	4.7	12.9	ns
t <sub>PHL</sub>			3.8	8.6	12	3.8	13.4	
t <sub>PLH</sub>	SBA or SAB† (with A or B low)	A or B	2.6	7.1	10.2	2.6	11.5	ns
t <sub>PHL</sub>			5.4	9.7	12.6	5.4	14.1	
t <sub>PZH</sub>	DIR	A or B	3.9	9.8	14.9	3.9	16.9	ns
t <sub>PZL</sub>			3.9	10.8	15.1	3.9	17.2	
t <sub>PHZ</sub>	DIR	A or B	4.5	8.2	10.6	4.5	11.5	ns
t <sub>PLZ</sub>			3.9	7.3	9.6	3.9	11.3	

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

### operating characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C

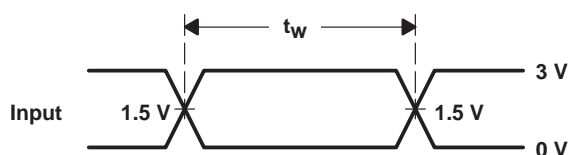
PARAMETER		TEST CONDITIONS	TYP	UNIT
C <sub>pd</sub>	Power dissipation capacitance per transceivers	C <sub>L</sub> = 50 pF, f = 1 MHz	61	pF
			15	

PARAMETER MEASUREMENT INFORMATION

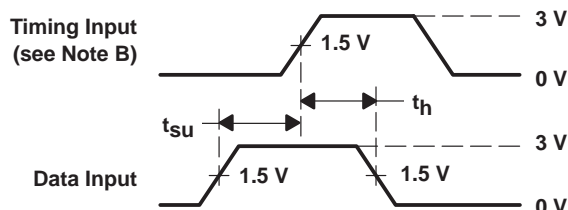


LOAD CIRCUIT

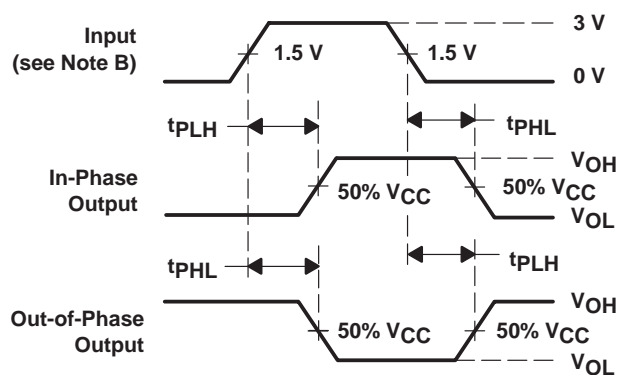
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	2 $\times V_{CC}$
$t_{PHZ}/t_{PZH}$	GND



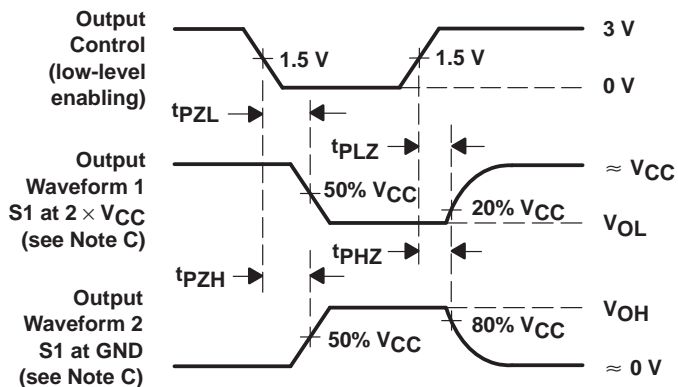
VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS

NOTES: A.  $C_L$  includes probe and jig capacitance.

B. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r = 3 \text{ ns}$ ,  $t_f = 3 \text{ ns}$ .

C. 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.

D. The outputs are measured one at a time with one input transition per measurement.

Figure 2. Load Circuit and Voltage Waveforms





**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
74ACT11648DW	OBSOLETE	SOIC	DW	28		TBD	Call TI	Call TI
74ACT11648DWR	OBSOLETE	SOIC	DW	28		TBD	Call TI	Call TI
74ACT11648DWR	OBSOLETE	SOIC	DW	28		TBD	Call TI	Call TI
74ACT11648NT	OBSOLETE	PDIP	NT	28		TBD	Call TI	Call TI
74ACT11648NT	OBSOLETE	PDIP	NT	28		TBD	Call TI	Call TI

<sup>(1)</sup> 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.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) 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.

**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)

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

**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.

## 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:

<b>Products</b>		<b>Applications</b>	
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>	Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>	Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>	Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>	Energy	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>	Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>	Space, Avionics & Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
RF/IF and ZigBee® Solutions	<a href="http://www.ti.com/lprf">www.ti.com/lprf</a>	Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
		Wireless	<a href="http://www.ti.com/wireless-apps">www.ti.com/wireless-apps</a>