



## 3.3V CMOS OCTAL BUS TRANSCEIVER WITH 3-STATE OUTPUTS

**IDT74ALVC245**

### FEATURES:

- 0.5 MICRON CMOS Technology
- Typical  $t_{sk(o)}$  (Output Skew) < 250ps
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- $V_{CC} = 3.3V \pm 0.3V$ , Normal Range
- $V_{CC} = 2.7V$  to  $3.6V$ , Extended Range
- $V_{CC} = 2.5V \pm 0.2V$
- CMOS power levels (0.4μ W typ. static)
- Rail-to-Rail output swing for increased noise margin
- Available in SOIC and TSSOP packages

### DRIVE FEATURES:

- High Output Drivers:  $\pm 24mA$
- Suitable for Heavy Loads

### APPLICATIONS:

- 3.3V high speed systems
- 3.3V and lower voltage computing systems

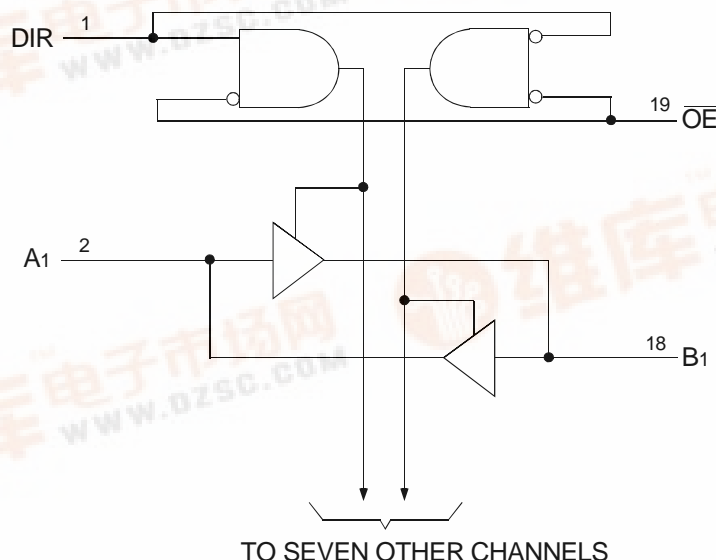
### DESCRIPTION:

This octal bus transceiver is built using advanced dual metal CMOS technology. The three-state controls are designed to operate this device in a single-byte mode. All inputs are designed with hysteresis for improved noise margin.

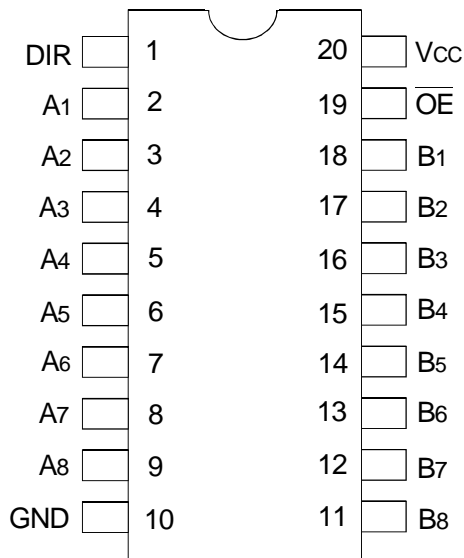
The ALVC245 is designed for asynchronous communication between data buses. The device transmits data from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input.

The ALVC245 has been designed with a  $\pm 24mA$  output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

### FUNCTIONAL BLOCK DIAGRAM



## PIN CONFIGURATION

ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

Symbol	Description	Max	Unit
V <sub>TERM</sub> <sup>(2)</sup>	Terminal Voltage with Respect to GND	-0.5 to +4.6	V
V <sub>TERM</sub> <sup>(3)</sup>	Terminal Voltage with Respect to GND	-0.5 to V <sub>CC</sub> +0.5	V
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C
I <sub>OUT</sub>	DC Output Current	-50 to +50	mA
I <sub>IK</sub>	Continuous Clamp Current, V <sub>I</sub> < 0 or V <sub>I</sub> > V <sub>CC</sub>	±50	mA
I <sub>OK</sub>	Continuous Clamp Current, V <sub>O</sub> < 0	-50	mA
I <sub>CC</sub> I <sub>SS</sub>	Continuous Current through each V <sub>CC</sub> or GND	±100	mA

## NOTES:

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
- V<sub>CC</sub> terminals.
- All terminals except V<sub>CC</sub>.

CAPACITANCE (T<sub>A</sub> = +25°C, F = 1.0MHz)

Symbol	Parameter <sup>(1)</sup>	Conditions	Typ.	Max.	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = 0V	5	7	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>OUT</sub> = 0V	7	9	pF
C <sub>I/O</sub>	I/O Port Capacitance	V <sub>IN</sub> = 0V	7	9	pF

## NOTE:

- As applicable to the device type.

## PIN DESCRIPTION

Pin Names	Description
$\overline{OE}$	3-State Output Enable Input (Active LOW)
DIR	Direction-Control Input
A <sub>x</sub>	Side A Inputs or 3-State Outputs
B <sub>x</sub>	Side B Inputs or 3-State Outputs

FUNCTION TABLE<sup>(1)</sup>

Inputs		Operation
$\overline{OE}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

## NOTE:

- H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Don't Care

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Condition:  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ 

Symbol	Parameter	Test Conditions		Min.	Typ. <sup>(1)</sup>	Max.	Unit
$V_{IH}$	Input HIGH Voltage Level	$V_{CC} = 2.3\text{V}$ to $2.7\text{V}$		1.7	—	—	V
		$V_{CC} = 2.7\text{V}$ to $3.6\text{V}$		2	—	—	
$V_{IL}$	Input LOW Voltage Level	$V_{CC} = 2.3\text{V}$ to $2.7\text{V}$		—	—	0.7	V
		$V_{CC} = 2.7\text{V}$ to $3.6\text{V}$		—	—	0.8	
$I_{IH}$	Input HIGH Current	$V_{CC} = 3.6\text{V}$	$V_I = V_{CC}$	—	—	$\pm 5$	$\mu\text{A}$
$I_{IL}$	Input LOW Current	$V_{CC} = 3.6\text{V}$	$V_I = \text{GND}$	—	—	$\pm 5$	$\mu\text{A}$
$I_{OZH}$ $I_{OZL}$	High Impedance Output Current (3-State Output pins)	$V_{CC} = 3.6\text{V}$	$V_O = V_{CC}$	—	—	$\pm 10$	$\mu\text{A}$
			$V_O = \text{GND}$	—	—	$\pm 10$	
$V_{IK}$	Clamp Diode Voltage	$V_{CC} = 2.3\text{V}$ , $I_{IN} = -18\text{mA}$		—	-0.7	-1.2	V
$V_H$	Input Hysteresis	$V_{CC} = 3.3\text{V}$		—	100	—	mV
$I_{CCL}$ $I_{CCH}$ $I_{CCZ}$	Quiescent Power Supply Current	$V_{CC} = 3.6\text{V}$ $V_{IN} = \text{GND}$ or $V_{CC}$		—	0.1	40	$\mu\text{A}$
$\Delta I_{CC}$	Quiescent Power Supply Current Variation	One input at $V_{CC} - 0.6\text{V}$ , other inputs at $V_{CC}$ or $\text{GND}$		—	—	750	$\mu\text{A}$

## NOTE:

1. Typical values are at  $V_{CC} = 3.3\text{V}$ ,  $+25^{\circ}\text{C}$  ambient.

## OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions <sup>(1)</sup>		Min.	Max.	Unit
$V_{OH}$	Output HIGH Voltage	$V_{CC} = 2.3\text{V}$ to $3.6\text{V}$	$I_{OH} = -0.1\text{mA}$	$V_{CC} - 0.2$	—	V
		$V_{CC} = 2.3\text{V}$	$I_{OH} = -6\text{mA}$	2	—	
		$V_{CC} = 2.3\text{V}$	$I_{OH} = -12\text{mA}$	1.7	—	
		$V_{CC} = 2.7\text{V}$		2.2	—	
		$V_{CC} = 3\text{V}$		2.4	—	
		$V_{CC} = 3\text{V}$	$I_{OH} = -24\text{mA}$	2	—	
$V_{OL}$	Output LOW Voltage	$V_{CC} = 2.3\text{V}$ to $3.6\text{V}$	$I_{OL} = 0.1\text{mA}$	—	0.2	V
		$V_{CC} = 2.3\text{V}$	$I_{OL} = 6\text{mA}$	—	0.4	
			$I_{OL} = 12\text{mA}$	—	0.7	
		$V_{CC} = 2.7\text{V}$	$I_{OL} = 12\text{mA}$	—	0.4	
		$V_{CC} = 3\text{V}$	$I_{OL} = 24\text{mA}$	—	0.55	

## NOTE:

1.  $V_{IH}$  and  $V_{IL}$  must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate  $V_{CC}$  range.  
 $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

**IDT74ALVC245****3.3V CMOS OCTAL BUS TRANSCEIVER WITH 3-STATE OUTPUTS****INDUSTRIAL TEMPERATURE RANGE****OPERATING CHARACTERISTICS,  $T_A = 25^\circ\text{C}$** 

Symbol	Parameter	Test Conditions	$V_{CC} = 2.5V \pm 0.2V$	$V_{CC} = 3.3V \pm 0.3V$	Unit
			Typical	Typical	
CPD	Power Dissipation Capacitance Outputs enabled	$C_L = 0\text{pF}$ , $f = 10\text{MHz}$			pF
CPD	Power Dissipation Capacitance Outputs disabled				

**SWITCHING CHARACTERISTICS<sup>(1)</sup>**

Symbol	Parameter	$V_{CC} = 2.5V \pm 0.2V$		$V_{CC} = 2.7V$		$V_{CC} = 3.3V \pm 0.3V$		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Ax to Bx or Bx to Ax	1.5	7	1.5	5.6	1.5	5	ns
$t_{PZH}$ $t_{PZL}$	Output Enable Time $\overline{OE}$ or DIR to Ax or Bx	1.5	9.5	1.5	6.2	1.5	5.8	ns
$t_{PHZ}$ $t_{PLZ}$	Output Disable Time $\overline{OE}$ or DIR to Ax or Bx	1.5	7.5	1.5	5	1.5	4.8	ns
$t_{SK(0)}$	Output Skew <sup>(2)</sup>	—	—	—	—	—	500	ps

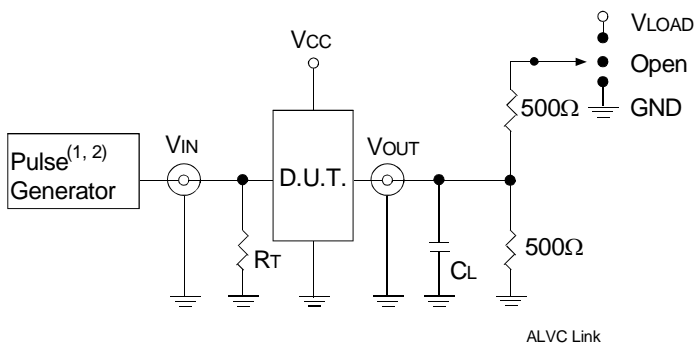
**NOTES:**

1. See TEST CIRCUITS AND WAVEFORMS.  $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ .
2. Skew between any two outputs of the same package and switching in the same direction.

## TEST CIRCUITS AND WAVEFORMS

### TEST CONDITIONS

Symbol	$V_{CC}^{(1)} = 3.3V \pm 0.3V$	$V_{CC}^{(1)} = 2.7V$	$V_{CC}^{(2)} = 2.5V \pm 0.2V$	Unit
$V_{LOAD}$	6	6	$2 \times V_{CC}$	V
$V_{IH}$	2.7	2.7	$V_{CC}$	V
$V_T$	1.5	1.5	$V_{CC} / 2$	V
$V_{LZ}$	300	300	150	mV
$V_{HZ}$	300	300	150	mV
CL	50	50	30	pF



Test Circuit for All Outputs

#### DEFINITIONS:

$C_L$  = Load capacitance: includes jig and probe capacitance.

$R_T$  = Termination resistance: should be equal to  $Z_{OUT}$  of the Pulse Generator.

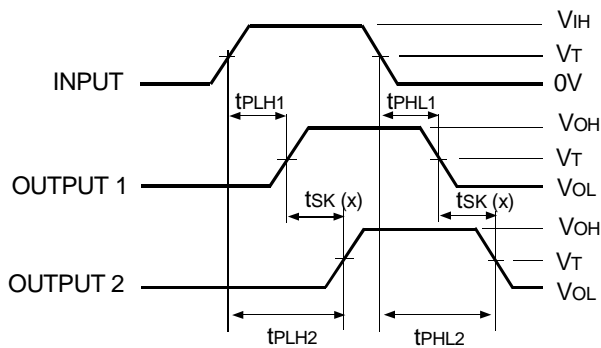
#### NOTES:

1. Pulse Generator for All Pulses: Rate  $\leq 10\text{MHz}$ ;  $t_r \leq 2.5\text{ns}$ ;  $t_f \leq 2.5\text{ns}$ .

2. Pulse Generator for All Pulses: Rate  $\leq 10\text{MHz}$ ;  $t_r \leq 2\text{ns}$ ;  $t_f \leq 2\text{ns}$ .

### SWITCH POSITION

Test	Switch
Open Drain Disable Low Enable Low	$V_{LOAD}$
Disable High Enable High	GND
All Other Tests	Open



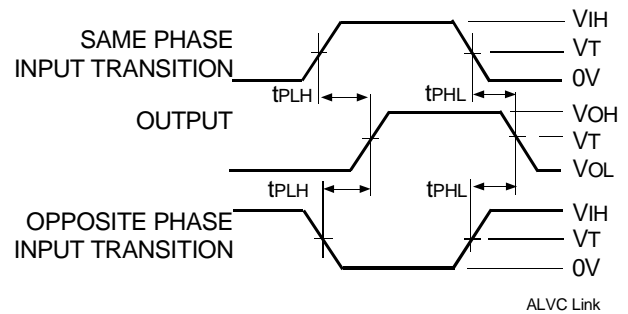
$$t_{SK}(x) = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

Output Skew -  $t_{SK}(x)$

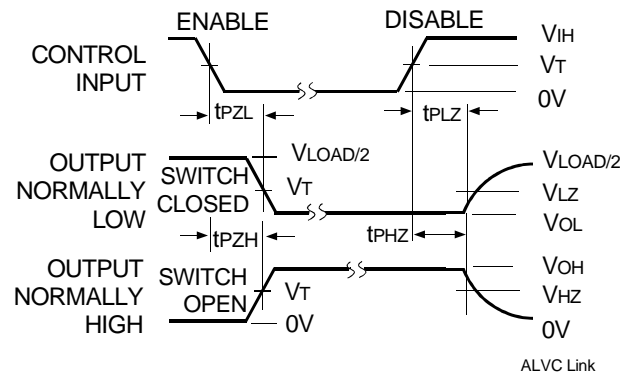
#### NOTES:

1. For  $t_{SK}(o)$  OUTPUT1 and OUTPUT2 are any two outputs.

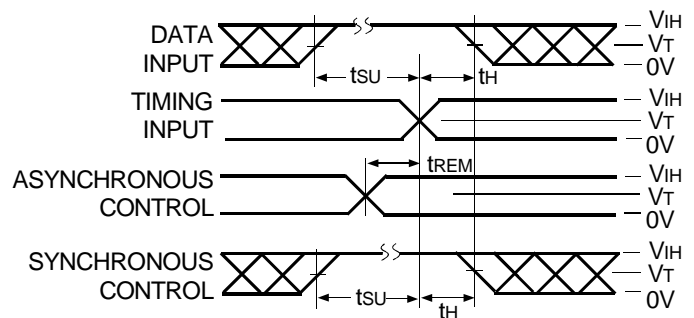
2. For  $t_{SK}(b)$  OUTPUT1 and OUTPUT2 are in the same bank.



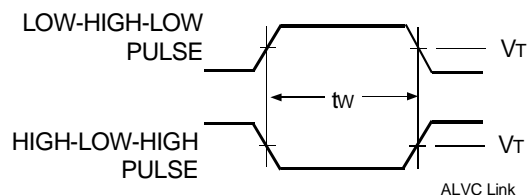
Propagation Delay



Enable and Disable Times



Set-up, Hold, and Release Times



Pulse Width

## ORDERING INFORMATION

IDT	XX	ALVC	X	XXX	XX	
Temp. Range		Bus-Hold		Device Type	Package	
					SO	Small Outline IC
					PG	Thin Shrink Small Outline Package
					245	Octal Bus Transceiver with 3-State Outputs, $\pm 24\text{mA}$
					Blank	No Bus-Hold
					74	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$



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