



FAST CMOS OCTAL BIDIRECTIONAL TRANSCEIVER

IDT54/74FCT245/A/C

FEATURES:

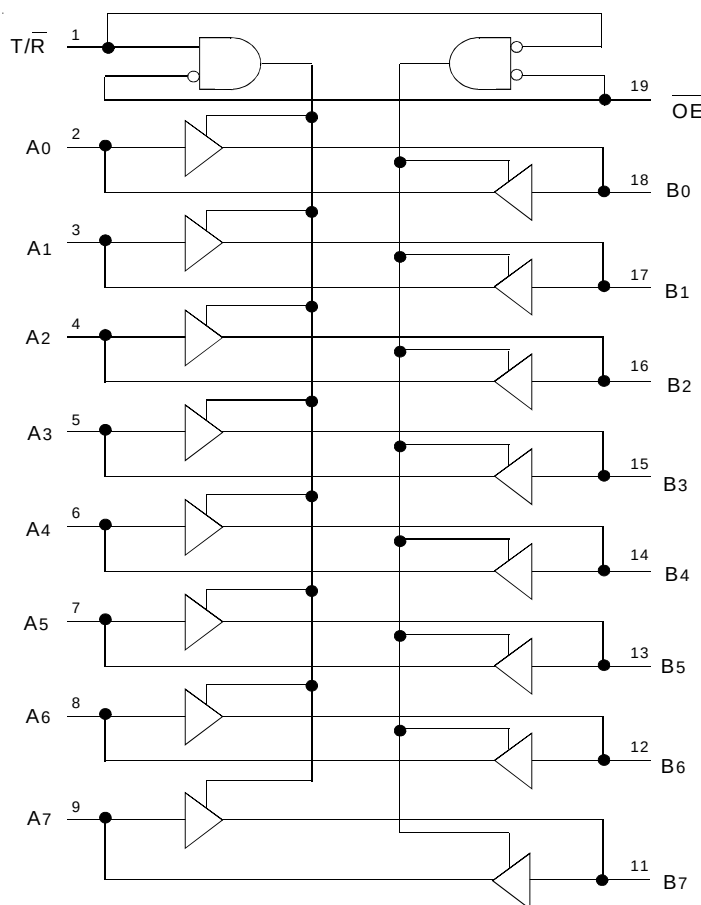
- IDT54FCT245 equivalent to FAST™ speed and drive
- IDT54/74FCT245A 25% faster than FAST
- IDT74FCT245C 40% faster than FAST
- TTL input and output compatible
- CMOS output level compatible
- $I_{OL} = 64\text{mA}$ (commercial) and 48mA (military)
- Current levels only $5\mu\text{A}$ max.
- CMOS power levels (2.5mW typ. static)
- Direction control and overriding 3-state control
- Military product compliant to MIL-STD-883, Class B
- Meets or exceeds JEDEC Standard 18 specifications
- Available in the following packages:
 - Commercial: SOIC
 - Military: CERDIP, LCC

DESCRIPTION:

The IDT octal bidirectional transceivers are built using an advanced dual metal CMOS technology. The FCT245 is designed for asynchronous two-way communication between data buses. The transmit/receive ($T/\bar{R}$) input determines the direction of data flow through the bidirectional transceiver. Transmit (active high) enables data from A ports to B ports, and receive (active low) from B ports to A ports. The output enable ($\overline{OE}$) input, when high, disables both A and B ports by placing them in High-Z condition.

The FCT245 transceivers have non-inverting outputs.

FUNCTIONAL BLOCK DIAGRAM

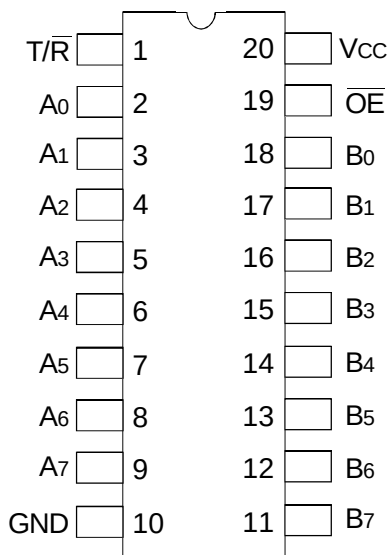


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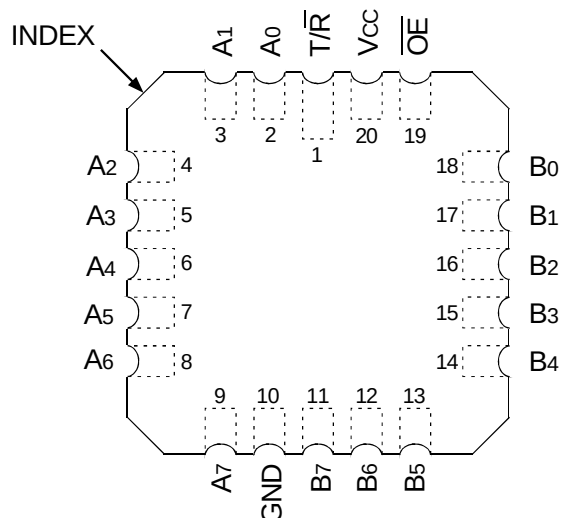
MILITARY AND COMMERCIAL TEMPERATURE RANGES

JUNE 2002

PIN CONFIGURATION



CERDIP/ SOIC
TOP VIEW



LCC
TOP VIEW

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Symbol	Rating	Commercial	Military	Unit
V _{TERM} ⁽²⁾	Terminal Voltage with Respect to GND	-0.5 to +7	-0.5 to +7	V
V _{TERM} ⁽³⁾	Terminal Voltage with Respect to GND	-0.5 to V _{CC}	-0.5 to V _{CC}	V
T _A	Operating Temperature	0 to +70	-55 to +125	°C
T _{BIAS}	Temperature under BIAS	-55 to +125	-65 to +135	°C
T _{STG}	Storage Temperature	-55 to +125	-65 to +150	°C
P _T	Power Dissipation	0.5	0.5	W
I _{OUT}	DC Output Current	120	120	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. No terminal voltage may exceed V_{CC} by +0.5V unless otherwise noted.
- Input and V_{CC} terminals only.
- Output and I/O terminals only.

CAPACITANCE (T_A = +25°C, F = 1.0MHz)

Symbol	Parameter ⁽¹⁾	Conditions	Typ.	Max.	Unit
C _{IN}	Input Capacitance	V _{IN} = 0V	6	10	pF
C _{I/O}	I/O Capacitance	V _{OUT} = 0V	8	12	pF

NOTE:

- This parameter is measured at characterization but not tested.

PIN DESCRIPTION

Pin Names	Description
$\overline{OE}$	Output Enable Input (Active LOW)
$\overline{T/R}$	Transmit/Receive Input
A ₀ - A ₇	Side A Inputs or 3-State Outputs
B ₀ - B ₇	Side B Inputs or 3-State Outputs

FUNCTION TABLE⁽¹⁾

Inputs		Outputs
$\overline{OE}$	$\overline{T/R}$	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	High Z State

NOTE:

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

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified: $V_{LC} = 0.2V$; $V_{HC} = V_{CC} - 0.2V$

Commercial: $T_A = 0^\circ C$ to $+70^\circ C$, $V_{CC} = 5.0V \pm 5\%$, Military: $T_A = -55^\circ C$ to $+125^\circ C$, $V_{CC} = 5.0V \pm 10\%$

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Unit
V_{IH}	Input HIGH Level	Guaranteed Logic HIGH Level		2	—	—	V
V_{IL}	Input LOW Level	Guaranteed Logic LOW Level		—	—	0.8	V
I_{IH}	Input HIGH Current	$V_{CC} = \text{Max.}$	$V_I = V_{CC}$	—	—	5	μA
			$V_I = 2.7V$	—	—	5 ⁽⁴⁾	
I_{IL}	Input LOW Current		$V_I = 0.5V$	—	—	-5 ⁽⁴⁾	
			$V_I = GND$	—	—	-5	
I_{OZH}	Off State (High Impedance) Output Current	$V_{CC} = \text{Max.}$	$V_O = V_{CC}$	—	—	15	μA
			$V_O = 2.7V$	—	—	15 ⁽⁴⁾	
I_{OZL}			$V_O = 0.5V$	—	—	-15 ⁽⁴⁾	
			$V_O = GND$	—	—	-15	
V_{IK}	Clamp Diode Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18mA$		—	-0.7	-1.2	V
I_{OS}	Short Circuit Current	$V_{CC} = \text{Max.}, V_O = GND^{(3)}$		-60	-120	—	mA
V_{OH}	Output HIGH Voltage	$V_{CC} = 3V, V_{IN} = V_{LC} \text{ or } V_{HC}, I_{OH} = -32\mu A$		V_{HC}	V_{CC}	—	V
		$V_{CC} = \text{Min}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -300\mu A$	V_{HC}	V_{CC}	—	
			$I_{OH} = -12mA \text{ MIL}$	2.4	4.3	—	
			$I_{OH} = -15mA \text{ COM'L}$	2.4	4.3	—	
V_{OL}	Output LOW Voltage	$V_{CC} = 3V, V_{IN} = V_{LC} \text{ or } V_{HC}, I_{OL} = 300\mu A$		—	GND	V_{LC}	V
		$V_{CC} = \text{Min}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 300\mu A$	—	GND	$V_{LC}^{(4)}$	
			$I_{OL} = 32mA \text{ MIL}$	—	0.3	0.55	
			$I_{OL} = 48mA \text{ COM'L}$	—	0.3	0.55	

NOTES:

1. For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC} = 5.0V$, $+25^\circ C$ ambient and maximum loading.
3. Not more than one output should be tested at one time. Duration of the test should not exceed one second.
4. This parameter is guaranteed but not tested.

POWER SUPPLY CHARACTERISTICS

$V_{LC} = 0.2V$; $V_{HC} = V_{CC} - 0.2V$

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Unit
I _{CC}	Quiescent Power Supply Current	V _{CC} = Max. V _{IN} ≥ V _{HC} ; V _{IN} ≤ V _{LC}		—	0.2	1.5	mA
ΔI _{CC}	Quiescent Power Supply Current TTL Inputs HIGH	V _{CC} = Max. V _{IN} = 3.4V ⁽³⁾		—	0.5	2	mA
I _{CCD}	Dynamic Power Supply Current ⁽⁴⁾	V _{CC} = Max. Outputs Open $\overline{OE} = GND$ T/R = GND or V _{CC} One Input Toggling 50% Duty Cycle	V _{IN} ≥ V _{HC} V _{IN} ≤ V _{LC}	—	0.15	0.25	mA/ MHz
I _C	Total Power Supply Current ⁽⁶⁾	V _{CC} = Max. Outputs Open f _i = 10MHz 50% Duty Cycle T/R = $\overline{OE} = GND$ One Bit Toggling	V _{IN} ≥ V _{HC} V _{IN} ≤ V _{LC} (FCT)	—	2	4	mA
			V _{IN} = 3.4V V _{IN} = GND	—	2.3	5	
		V _{CC} = Max. Outputs Open f _i = 2.5MHz 50% Duty Cycle T/R = $\overline{OE} = GND$ Eight Bits Toggling	V _{IN} ≥ V _{HC} V _{IN} ≤ V _{LC} (FCT)	—	3.5	6.5 ⁽⁵⁾	
			V _{IN} = 3.4V V _{IN} = GND	—	5.5	14.5 ⁽⁵⁾	

NOTES:

1. For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.

2. Typical values are at V_{CC} = 5.0V, +25°C ambient.

3. Per TTL driven input (V_{IN} = 3.4V). All other inputs at V_{CC} or GND.

4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.

5. Values for these conditions are examples of ΔI_{CC} formula. These limits are guaranteed but not tested.

6. I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}

I_C = I_{CC} + ΔI_{CC} D_HN_T + I_{CCD} (f_{CP}/2 + f_iN_i)

I_{CC} = Quiescent Current

ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = 3.4V)

D_H = Duty Cycle for TTL Inputs High

N_T = Number of TTL Inputs at D_H

I_{CCD} = Dynamic Current caused by an Input Transition Pair (HLH or LHL)

f_{CP} = Clock Frequency for register devices (zero for non-register devices)

f_i = Input Frequency

N_i = Number of Inputs at f_i

All currents are in milliamps and all frequencies are in megahertz.

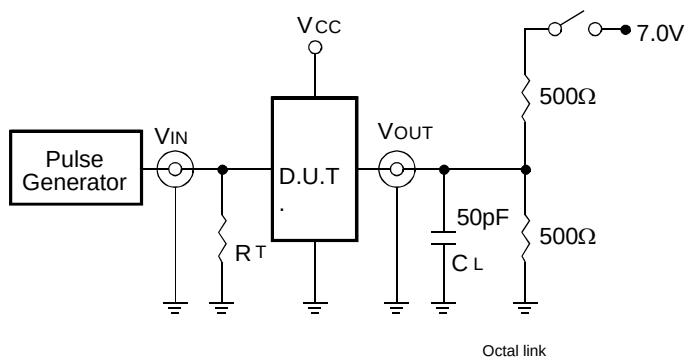
SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Symbol	Parameter	Condition ⁽¹⁾	54FCT245		54/74FCT245A				74FCT245C		Unit
			Mil.		Com'l.		Mil.		Com'l.		
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
tPLH	Propagation Delay	CL = 50pF RL = 500Ω	1.5	7.5	1.5	4.6	1.5	4.9	1.5	4.1	ns
tPHL	A to B, B to A										
tPZH	Output Enable Time		1.5	10	1.5	6.2	1.5	6.5	1.5	5.8	ns
tPZL	OE to A or B										
tPHZ	Output Disable Time		1.5	10	1.5	5	1.5	6	1.5	4.8	ns
tPLZ	OE to A or B										
tPZH	Output Enable Time		1.5	10	1.5	6.2	1.5	6.5	1.5	5.8	ns
tPZL	T/R to A or B ⁽³⁾										
tPHZ	Output Disable Time		1.5	10	1.5	5	1.5	6	1.5	4.8	ns
tPLZ	T/R to A or B ⁽³⁾										

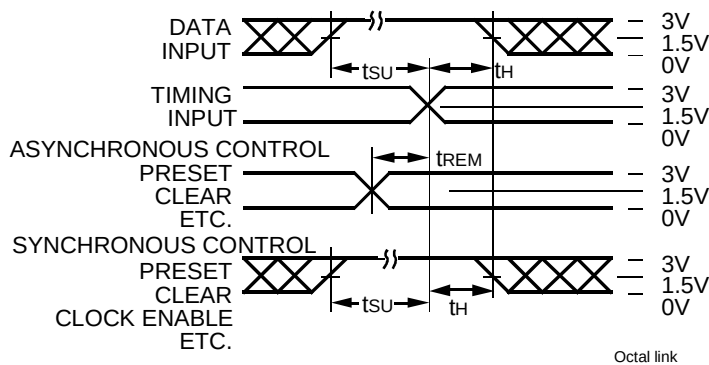
NOTES:

1. See test circuit and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not tested.

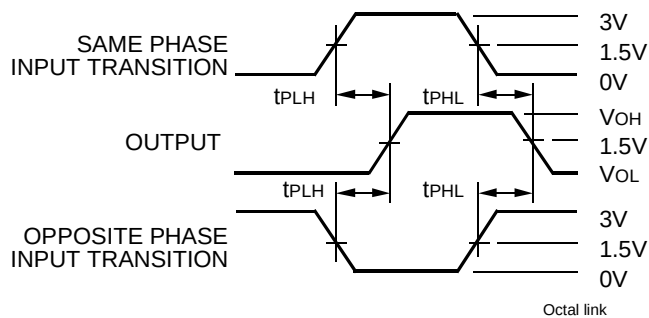
TEST CIRCUITS AND WAVEFORMS



Test Circuits for All Outputs



Set-Up, Hold, and Release Times



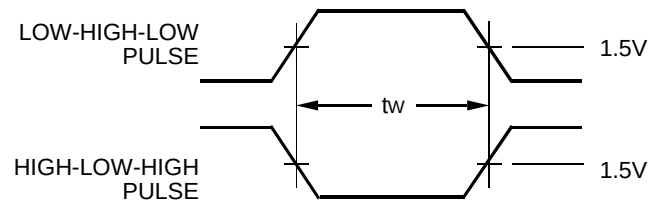
Propagation Delay

SWITCH POSITION

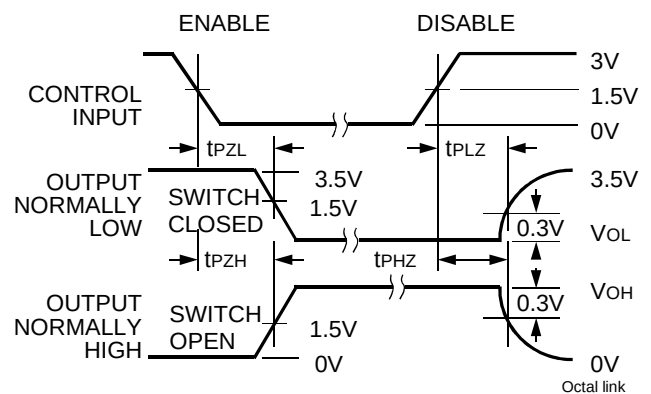
Test	Switch
Open Drain Disable Low Enable Low	Closed
All Other Tests	Open

DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.
RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.



Pulse Width



Enable and Disable Times

NOTES:

- Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
- Pulse Generator for All Pulses: Rate $\leq 1.0\text{MHz}$; $Z_o \leq 50\Omega$; $t_r \leq 2.5\text{ns}$; $t_f \leq 2.5\text{ns}$.

ORDERING INFORMATION

IDT	XX	FCT	XXXX	XX	X	
Temp. Range	Device Type	Package	Process			
				Blank	Commercial	
				B	MIL-STD-883, Class B	
				SO	<u>Commercial Options</u>	
					Small Outline IC	
				D	<u>Military Options</u>	
				L	CERDIP	
					Leadless Chip Carrier	
				245	Octal Bidirectional Transceiver	
				245A		
				245C		
				54	– 55°C to +125°C	
				74	0°C to +70°C	



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