

Integrated Device Technology, Inc.

# HIGH-SPEED BiCMOS OCTAL BUFFER/LINE DRIVER

**ADVANCE INFORMATION**  
**IDT54/74FBT241**  
**IDT54/74FBT241A**  
**IDT54/74FBT241C**

## FEATURES:

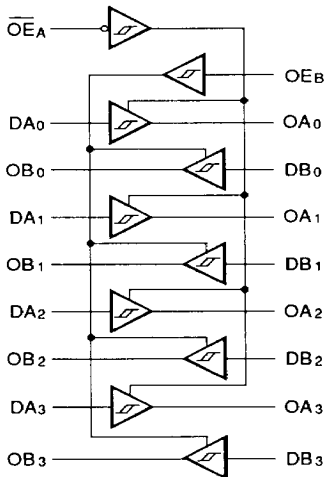
- IDT54/74FBT241 is equivalent to the 54/74BCT241
- IDT54/74FBT241A is 25% faster than the 241
- IDT54/74FBT241C is 10% faster than the 241A
- Significant reduction in ground bounce from standard CMOS devices
- TTL compatible input and output levels
- $\pm 10\%$  power supply for both military and commercial grades
- JEDEC standard pinout for DIP, SOIC and LCC packages
- Military product compliant to MIL-STD-883, Class B

## DESCRIPTION:

The FBT series of BiCMOS Octal Buffers and Line Drivers are built using advanced BiCEMOS™, a dual metal BiCMOS technology. This technology is designed to supply the highest device speeds while maintaining CMOS power levels.

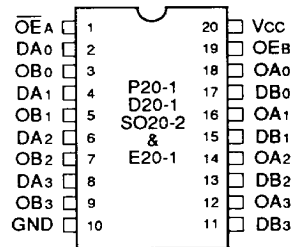
The FBT series of bus interface devices are ideal for use in designs needing to drive large capacitive loads, with low static (DC) current loading. All data inputs have a 200mV typical input hysteresis for improved noise rejection.

## FUNCTIONAL BLOCK DIAGRAM

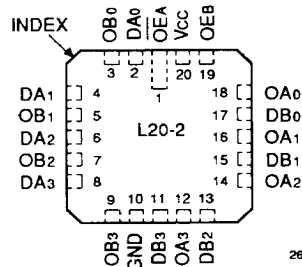


2639 drw 01

## PIN CONFIGURATIONS



DIP/SOIC/CERPACK  
TOP VIEW



LCC  
TOP VIEW

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**MILITARY AND COMMERCIAL TEMPERATURE RANGES**

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**PIN DESCRIPTION**

Pin Names	Description
$\overline{OE}A, OE_B$	3-State Output Enable Inputs
D <sub>0</sub> - D <sub>7</sub>	Inputs
O <sub>0</sub> - O <sub>7</sub>	Outputs

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

Inputs			Output
$\overline{OE}A$	$OE_B$	D	
L	H	L	L
L	H	H	H
H	L	X	Z

**NOTE:**

- H = HIGH  
L = LOW  
X = Don't Care  
Z = High Impedance

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

Symbol	Rating	Commercial	Military	Unit
VTERM	Terminal Voltage with Respect to GND	-0.5 to +7.0	-0.5 to +7.0	V
TA	Operating Temperature	0 to +70	-55 to +125	°C
TBIAS	Temperature Under Bias	-55 to +125	-65 to +135	°C
TSTG	Storage Temperature	-55 to +125	-65 to +150	°C
PT	Power Dissipation	0.5	0.5	W
IOUT	DC Output Current	120	120	mA

**NOTE:**

- 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 Vcc by +0.5V unless otherwise noted.

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**CAPACITANCE (TA = +25°C, f = 1.0MHz)**

Symbol	Parameter <sup>(1)</sup>	Conditions	Typ.	Unit
CIN	Input Capacitance	VIN = 0V	6	pF
COU	Output Capacitance	VOU = 0V	8	pF

**NOTE:**

- This parameter is measured at characterization but not tested.

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### DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Commercial: TA = 0°C to +70°C, VCC = 5.0V ± 10%; Military: TA = -55°C to +125°C, VCC = 5.0V ± 10%

Symbol	Parameter	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Unit
V <sub>IH</sub>	Input HIGH Level	Guaranteed Logic HIGH Level		2.0	—	—	V
V <sub>IL</sub>	Input LOW Level	Guaranteed Logic LOW Level		—	—	0.8	V
I <sub>IH</sub>	Input HIGH Current	V <sub>CC</sub> = Max., V <sub>I</sub> = 2.7V		—	—	10	μA
I <sub>IL</sub>	Input LOW Current	V <sub>CC</sub> = Max., V <sub>I</sub> = 0.5V		—	—	-10	μA
I <sub>OZH</sub>	High Impedance	V <sub>CC</sub> = Max.	V <sub>O</sub> = 2.7V	—	—	50	μA
I <sub>OZL</sub>	Output Current		V <sub>O</sub> = 0.5V	—	—	-50	μA
I <sub>I</sub>	Input HIGH Current	V <sub>CC</sub> = Max., V <sub>I</sub> = 5.5V		—	—	100	μA
V <sub>IK</sub>	Clamp Diode Voltage	V <sub>CC</sub> = Min., I <sub>N</sub> = -18mA		—	-0.7	-1.2	V
I <sub>OS</sub>	Short Circuit Current	V <sub>CC</sub> = Max., V <sub>O</sub> = GND <sup>(3)</sup>		-75	-150	-225	mA
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min. V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -12mA MIL.	2.4	3.3	—	V
			I <sub>OH</sub> = -15mA COM'L.				
			I <sub>OH</sub> = -18mA MIL.	2.0	3.0	—	V
			I <sub>OH</sub> = -24mA COM'L.				
V <sub>OL</sub>	Output LOW Voltage		I <sub>OL</sub> = 48mA MIL.	—	0.3	0.55	V
			I <sub>OL</sub> = 64mA COM'L.				
V <sub>H</sub>	Input Hysteresis	V <sub>CC</sub> = 5V		—	200	—	mV
I <sub>OFF</sub>	Bus Leakage Current	V <sub>CC</sub> = 0V, V <sub>O</sub> = 4.5V		—	—	100	μA
I <sub>CC</sub>	Quiescent Power Supply Current	V <sub>CC</sub> = Max. V <sub>IN</sub> = GND or V <sub>CC</sub>		—	0.2	1.5	mA

**NOTES:**

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1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V<sub>CC</sub> = 5.0V, +25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the short circuit test should not exceed one second.

**POWER SUPPLY CHARACTERISTICS**

Symbol	Parameter	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Unit
$\Delta I_{CC}$	Quiescent Power Supply Current (Inputs TTL HIGH)	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$		—	—	2.0	mA
$I_{CCD}$	Dynamic Power Supply Current <sup>(4)</sup>	$V_{CC} = \text{Max.}$ , Outputs Open $\overline{OE}A = OE_B = GND$ , One Input Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = GND$	—	—	0.25	mA/ MHz
$I_C$	Total Power Supply Current <sup>(6)</sup>	$V_{CC} = \text{Max.}$ , Outputs Open $f_i = 10\text{MHz}$ , 50% Duty Cycle $\overline{OE} = OE_B = GND$ One Bit Toggling	$V_{IN} = V_{CC}$ $V_{IN} = GND$	—	—	4.0	mA
			$V_{IN} = 3.4V$ $V_{IN} = GND$	—	—	5.0	
		$V_{CC} = \text{Max.}$ , Outputs Open $f_i = 2.5\text{MHz}$ , 50% Duty Cycle $\overline{OE}A = GND$ , $OE_B = V_{CC}$ All Bits Toggling	$V_{IN} = V_{CC}$ $V_{IN} = GND$	—	—	6.5 <sup>(5)</sup>	
			$V_{IN} = 3.4V$ $V_{IN} = GND$	—	—	14.5 <sup>(5)</sup>	

**NOTES:**

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 5.0V$ ,  $+25^\circ\text{C}$  ambient, and maximum loading.
- Per TTL driven input ( $V_{IN} = 3.4V$ ); all other inputs at  $V_{CC}$  or  $GND$ .
- This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
- Values for these conditions are examples of the  $I_{CC}$  formula. These limits are guaranteed but not tested.
- $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$   
 $I_C = I_{CC} + \Delta I_{CC} D_{HNT} + I_{CCD} (f_{CP}/2 + f_i N_i)$   
 $I_{CC} = \text{Quiescent Current}$   
 $\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = 3.4V)$   
 $D_H = \text{Duty Cycle for TTL Inputs High}$   
 $N_T = \text{Number of TTL Inputs at } D_H$   
 $I_{CCD} = \text{Dynamic Current Caused by an Input Transition Pair (HLH or LHL)}$   
 $f_{CP} = \text{Clock Frequency for Register Devices (Zero for Non-Register Devices)}$   
 $f_i = \text{Input Frequency}$   
 $N_i = \text{Number of Inputs at } f_i$   
 All currents are in milliamps and all frequencies are in megahertz.

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**SWITCHING CHARACTERISTICS OVER OPERATING RANGE**

Symbol	Parameter	Condition <sup>(1)</sup>	IDT54/74FBT241				IDT54/74FBT241A				IDT54/74FBT241C				Unit
			Com'l.		Mil.		Com'l.		Mil.		Com'l.		Mil.		
			Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	
$t_{PLH}$	Propagation Delay *Dn to On	$C_L = 50pF$ $R_L = 500\Omega$	1.5	5.9	—	—	1.5	4.8	—	—	1.5	4.1	—	—	ns
$t_{PZH}$			1.5	8.7	—	—	1.5	6.2	—	—	1.5	5.8	—	—	ns
$t_{PLZ}$			1.5	8.1	—	—	1.5	5.6	—	—	1.5	5.2	—	—	ns

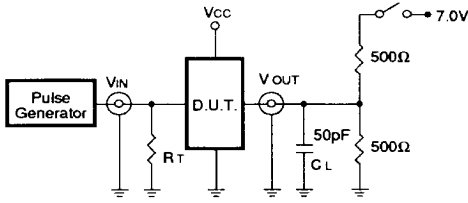
**NOTES:**

- See test circuit and waveforms.
- Minimum limits are guaranteed but not tested on Propagation Delays.

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TEST CIRCUITS AND WAVEFORMS

TEST CIRCUITS FOR ALL OUTPUTS



SWITCH POSITION

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

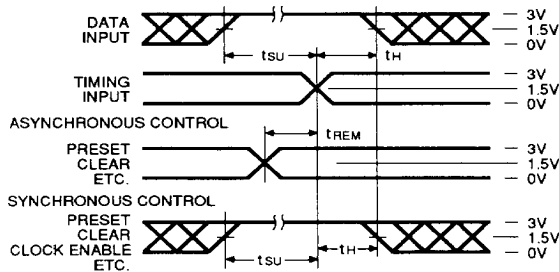
DEFINITIONS:

C<sub>L</sub> = Load capacitance: includes jig and probe capacitance.

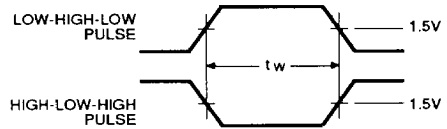
R<sub>T</sub> = Termination resistance: should be equal to Z<sub>OUT</sub> of the Pulse Generator.

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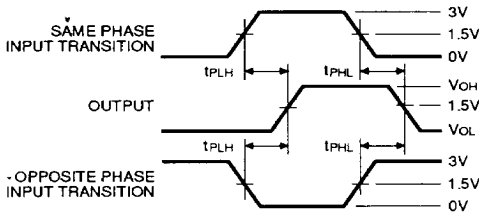
SET-UP, HOLD AND RELEASE TIMES



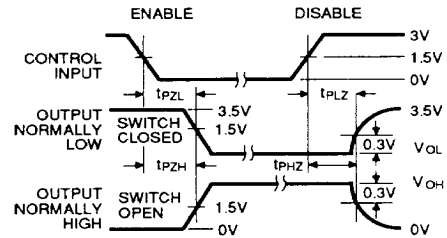
PULSE WIDTH



PROPAGATION DELAY



ENABLE AND DISABLE TIMES



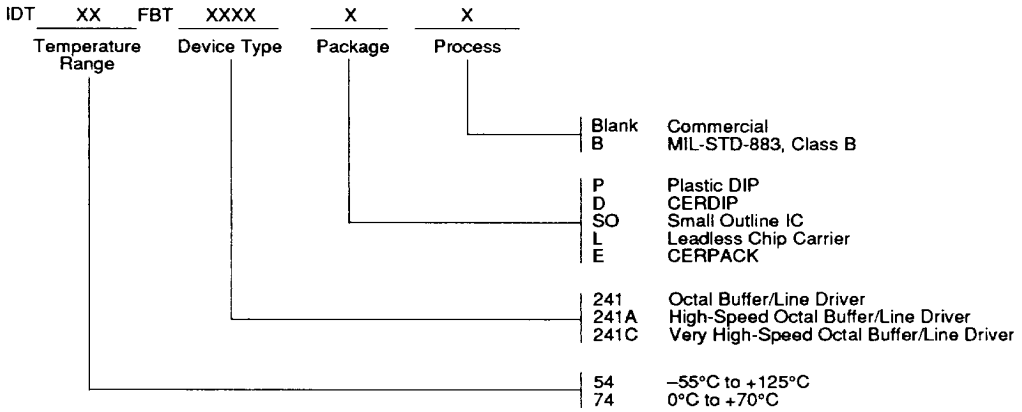
NOTES

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
2. Pulse Generator for All Pulses: Rate ≤ 1.0 MHz; Z<sub>o</sub> ≤ 50Ω; t<sub>r</sub> ≤ 2.5ns; t<sub>r</sub> ≤ 2.5ns.

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**ORDERING INFORMATION**



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