



Integrated Device Technology, Inc.

# HIGH-SPEED BiCMOS 10-BIT MEMORY LATCHES

IDT54/74FBT2841A  
IDT54/74FBT2841B

## FEATURES:

- 25Ω output resistors reduce overshoot and undershoot when driving MOS RAMs
- Significant reduction in ground bounce from standard CMOS devices
- TTL compatible input and output levels
- Low power in all three states
- ± 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

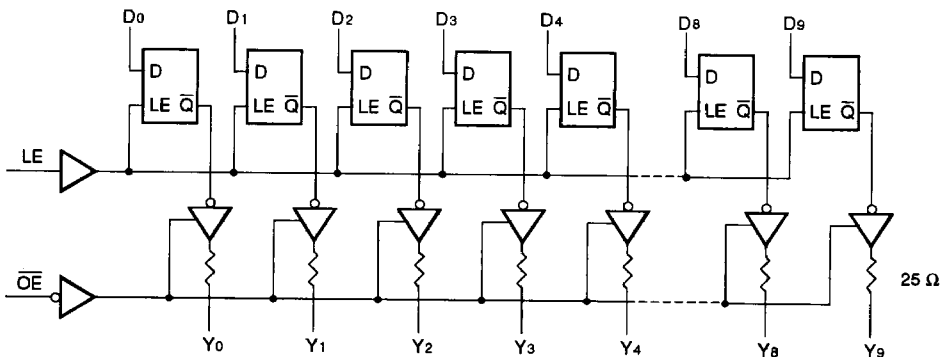
## DESCRIPTION:

The FBT series of BiCMOS Memory 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 IDT54/74FBT2841 series are 3-state, 10-bit latches where each output is terminated with a 25Ω series resistor.

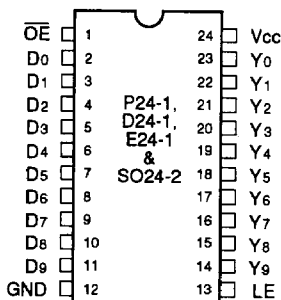
The FBT series of memory line drivers are ideal for use in designs needed to drive large capacitive loads with low static (DC) current loading. They are also designed for rail-to-rail output switching. This higher output level in the high state will result in a significant reduction in overall system power dissipation.

## FUNCTIONAL BLOCK DIAGRAM

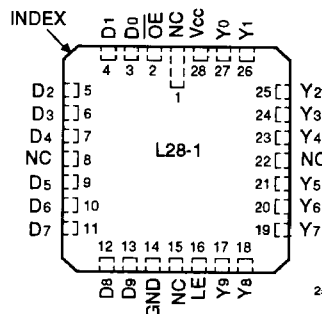


## PIN CONFIGURATIONS

2599 drw 01



DIP/SOIC/CERPACK  
TOP VIEW



LCC  
TOP VIEW

2599 drw 02

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## MILITARY AND COMMERCIAL TEMPERATURE RANGES

APRIL 1992

**PIN DESCRIPTION**

Name	I/O	Description
D <sub>0</sub> – D <sub>9</sub>	I	The latch data inputs.
LE	I	The latch enable input. The latches are transparent when LE is HIGH. Input data is latched on the HIGH-to-LOW transition.
Y <sub>0</sub> – Y <sub>9</sub>	O	The 3-state latch outputs.
$\overline{OE}$	I	The output enable control. When $\overline{OE}$ is LOW, the outputs are enabled. When $\overline{OE}$ is HIGH, the outputs Y <sub>i</sub> are in the high-impedance (off) state.

2599 tbl 05

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

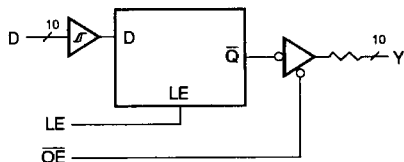
Inputs			Internal	Outputs	
$\overline{OE}$	LE	D <sub>i</sub>	Q <sub>i</sub>	Y <sub>i</sub>	Function
H	X	X	X	Z	High Z
H	H	L	L	Z	High Z
H	H	H	H	Z	High Z
H	L	X	NC	Z	Latched (High Z)
L	H	L	L	L	Transparent
L	H	H	H	H	Transparent
L	L	X	NC	NC	Latched

**NOTE:**

1. H = HIGH, L = LOW, X = Don't Care, NC = No Change, Z = High Impedance

2599 tbl 06

**LOGIC SYMBOL**



2599 drw 03

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

Symbol	Rating	Commercial	Military	Unit
V <sub>TERM</sub> <sup>(2)</sup>	Terminal Voltage with Respect to GND	-0.5 to +7.0	-0.5 to +7.0	V
V <sub>TERM</sub> <sup>(3)</sup>	Terminal Voltage with Respect to GND	-0.5 to V <sub>CC</sub>	-0.5 to V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature	0 to +70	-55 to +125	°C
T <sub>BIAS</sub>	Temperature Under Bias	-55 to +125	-65 to +135	°C
T <sub>STG</sub>	Storage Temperature	-55 to +125	-65 to +150	°C
P <sub>T</sub>	Power Dissipation	0.5	0.5	W
I <sub>OUT</sub>	DC Output Current	120	120	mA

2599 tbl 01

**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<sub>CC</sub> by +0.5V unless otherwise noted.
- Inputs and V<sub>CC</sub> terminals only.
- Outputs and I/O terminals only.

**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	6	10	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>OUT</sub> = 0V	8	12	pF

**NOTE:**

1. This parameter is measured at characterization but not tested.

2599 tbl 02



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

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Min.	Typ. <sup>(2)</sup>	Max.	Unit	
$V_{IH}$	Input HIGH Level	Guaranteed Logic HIGH Level	2.0	—	—	V	
$V_{IL}$	Input LOW Level	Guaranteed Logic LOW Level	—	—	0.8	V	
$I_{IH}$	Input HIGH Current	$V_{CC} = \text{Max.}, V_i = 2.7V$	—	—	10	$\mu A$	
$I_{IL}$	Input LOW Current	$V_{CC} = \text{Max.}, V_i = 0.5V$	—	—	-10	$\mu A$	
$I_{OZH}$	High Impedance	$V_{CC} = \text{Max.}$	—	—	50	$\mu A$	
$I_{OZL}$	Output Current	$V_O = 2.7V$					
		$V_O = 0.5V$	—	—	-50		
$I_I$	Input HIGH Current	$V_{CC} = \text{Max.}, V_{CC} (\text{Max.})$	—	—	100	$\mu A$	
$V_{IK}$	Clamp Diode Voltage	$V_{CC} = \text{Min.}, I_N = -18mA$	—	-0.7	-1.2	V	
$I_{ODH}$	Output Drive Current	$V_{CC} = \text{Min.}, V_O = 2.25V$	-35	—	—	mA	
$I_{ODL}$	Output Drive Current	$V_{CC} = \text{Min.}, V_O = 2.25V$	50	—	—	mA	
$I_{OS}$	Short Circuit Current	$V_{CC} = \text{Max.}, V_O = GND^{(3)}$	-75	—	-225	mA	
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -300\mu A^{(4)}$	$V_{HC}$	$V_{CC}$	—	V
			$I_{OH} = -1mA$	2.7	3.8	—	
			$I_{OH} = -8mA$	2.4	3.3	—	
			$I_{OH} = -12mA$	2.0	3.2	—	
$V_{OL}$	Output LOW Voltage	$V_{CC} = \text{Min.}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 300\mu A^{(4)}$	—	GND	$V_{LC}$	V
			$I_{OL} = 1mA$	—	0.1	0.5	
			$I_{OL} = 12mA$	—	0.35	0.8	
				—	—	—	
$V_H$	Input Hysteresis	—	—	200	—	mV	
$I_{CCH}$ $I_{CCL}$ $I_{CCL}$	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$ $V_{IN} = GND \text{ or } V_{CC}$	—	0.2	1.5	mA	

**NOTES:**

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  $V_{CC} = 5.0V$ ,  $+25^{\circ}C$  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.
4. This condition is guaranteed but not tested.

2599 tbi 03

**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)	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$		—	0.5	2.0	mA
$I_{CCD}$	Dynamic Power Supply Current <sup>(4)</sup>	$V_{CC} = \text{Max.}$ , Outputs Open $\overline{OE} = \text{GND}$ One Input Toggling $LE = V_{CC}$ 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	0.3	0.4	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 $\overline{OE} = \text{GND}$ , $LE = V_{CC}$ One Bit Toggling	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	3.2	5.5	mA
			$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$	—	3.5	6.5	
		$V_{CC} = \text{Max.}$ , Outputs Open $f_i = 2.5\text{MHz}$ , 50% Duty Cycle $\overline{OE} = \text{GND}$ , $LE = V_{CC}$ Ten Bits Toggling	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	7.7	11.5 <sup>(5)</sup>	
			$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$	—	10.2	21.5 <sup>(5)</sup>	

- NOTES:** 2599 tbl 04
- 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.
  - Per TTL driven input ( $V_{IN} = 3.4V$ ); all other inputs at  $V_{CC}$  or  $\text{GND}$ .
  - 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.
  - $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$   
 $I_C = I_{CC} + \Delta I_{CCDHNT} + I_{CCD}(f_{CP}/2 + f_i N_i)$   
 $I_{CC} = \text{Quiescent Current}$   
 $\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = 3.4V)$   
 $DH = \text{Duty Cycle for TTL Inputs High}$   
 $N_T = \text{Number of TTL Inputs at } DH$   
 $I_{CCD} = \text{Dynamic Current Caused by an Input Transition Pair (HLH or LHL)}$   
 $f_{CP} = \text{Clock Frequency for Register Devices (Zero for Non-Register Devices)}$   
 $f_i = \text{Input Frequency}$   
 $N_i = \text{Number of Inputs at } f_i$   
 All currents are in milliamperes and all frequencies are in megahertz.

**SWITCHING CHARACTERISTICS OVER OPERATING RANGE**

Symbol	Parameter	Condition <sup>(1)</sup>	54/74FBT2841A				54/74FBT2841B				Unit
			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.	
$t_{PLH}$ $t_{PHL}$	Propagation Delay $D_i$ to $Y_i$ ( $LE = \text{HIGH}$ )	$CL = 50pF$ $RL = 500\Omega$	1.5	9.0	1.5	10.0	1.5	6.5	1.5	7.5	ns
$t_{SU}$	Data to $LE$ Set-up Time		2.5	—	2.5	—	2.5	—	2.5	—	ns
$t_H$	Data to $LE$ Hold Time		2.5	—	3.0	—	2.5	—	2.5	—	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $LE$ to $Y_i$		1.5	12.0	1.5	13.0	1.5	8.0	1.5	10.5	ns
$t_W$	$LE$ Pulse Width <sup>(3)</sup> HIGH		4.0	—	5.0	—	4.0	—	4.0	—	ns
$t_{PZH}$ $t_{PZL}$	Output Enable Time $\overline{OE}$ to $Y_i$		1.5	11.5	1.5	13.0	1.5	8.0	1.5	8.5	ns
$t_{PHZ}$ $t_{PLZ}$	Output Disable Time $\overline{OE}$ to $Y_i$		1.5	8.0	1.5	10.0	1.5	7.0	1.5	7.5	ns

- NOTES:** 2599 tbl 07
- See test circuits and waveforms.
  - Minimum limits are guaranteed but not tested on Propagation Delays.
  - These parameters are guaranteed, but not tested.

