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FAIRCHILD SEMICONDUCTOR®

May 2007

74VHCT245A
Octal Buffer/Line Driver with 3-STATE Outputs

Features

- High Speed: t_{PD} = 5.4ns (Typ.) at V_{CC} = 5V
- Power Down Protection on Inputs and Outputs
- Low Power Dissipation: I_{CC} = 4μA (Max.) @ T_A = 25°C
- Pin and Function Compatible with 74HCT245

General Description

The VHCT245A is an advanced high speed CMOS octal bus transceiver fabricated with silicon gate CMOS technology. It achieves high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation. The VHCT245A is intended for bidirectional asynchronous communication between data busses. The direction of data transmission is determined by the level of the T/R input. The enable input can be used to disable the device so that the busses are effectively isolated.

Protection circuits ensure that 0V to 7V can be applied to the input and output(1) pins without regard to the supply voltage. These circuits prevent device destruction due to mismatched supply and input/output voltages. This device can be used to interface 5V to 3V systems and two supply systems such as battery back up.

Note:

1. Outputs in OFF-State

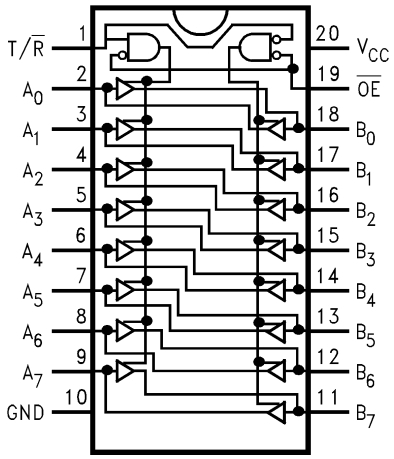
Ordering Information

Order Number	Package Number	Package Description
74VHCT245AM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74VHCT245ASJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74VHCT245AMTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

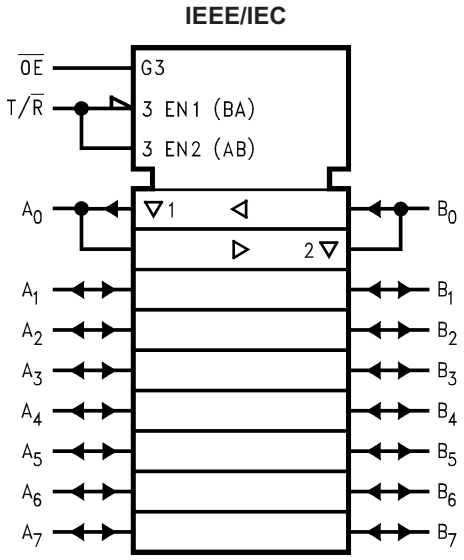
Surface mount packages are also available on Tape and Reel. Specify by appending the suffix letter “X” to the ordering number. Pb-Free package per JEDED J-STD-020B.

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Connection Diagram



Logic Symbol



Pin Description

Pin Names	Description
$\overline{OE}$	Output Enable Input
T/$\overline{R}$	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

Truth Table

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

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

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Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	–0.5V to +7.0V
V_{IN}	DC Input Voltage	–0.5V to +7.0V
V_{OUT}	DC Output Voltage	
	Note 2	–0.5V to V_{CC} + 0.5V
	Note 3	–0.5V to +7.0V
I_{IK}	Input Diode Current	–20mA
I_{OK}	Output Diode Current(4)	±20mA
I_{OUT}	DC Output Current	±25mA
I_{CC}	DC V_{CC} / GND Current	±75mA
T_{STG}	Storage Temperature	–65°C to +150°C
T_L	Lead Temperature (Soldering, 10 seconds)	260°C

Recommended Operating Conditions(5)

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	4.5V to +5.5V
V_{IN}	Input Voltage	0V to +5.5V
V_{OUT}	Output Voltage	
	Note 2	0V to V_{CC}
	Note 3	0V to +5.5V
T_{OPR}	Operating Temperature	–40°C to +85°C
t_r, t_f	Input Rise and Fall Time, V_{CC} = 5.0V ± 0.5V	0ns/V ~ 20ns/V

Notes:

2. HIGH or LOW state. I_{OUT} absolute maximum rating must be observed.
3. When outputs are in OFF-State or when V_{CC} = 0V.
4. V_{OUT} < GND, V_{OUT} > V_{CC} (Outputs Active).
5. Unused inputs must be held HIGH or LOW. They may not float.

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DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	Conditions		$T_A = 25°C$			$T_A = -40°C$ to $+85°C$		Units
					Min.	Typ.	Max.	Min.	Max.	
V_{IH}	HIGH Level Input Voltage	4.5			2.0			2.0		V
		5.5			2.0			2.0		
V_{IL}	LOW Level Input Voltage	4.5					0.8		0.8	V
		5.5					0.8		0.8	
V_{OH}	HIGH Level Output Voltage	4.5	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -50\mu A$	4.40	4.50		4.40		V
				$I_{OH} = -8mA$	3.94			3.80		
V_{OL}	LOW Level Output Voltage	4.5	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 50\mu A$		0.0	0.1		0.1	V
				$I_{OL} = 8mA$			0.36		0.44	
I_{OZ}	3-STATE Output Off-State Current	5.5	$V_{IN} = V_{IH}$ or V_{IL}, $V_{OUT} = V_{CC}$ or GND				±0.25		±2.5	μA
I_{IN}	Input Leakage Current	0–5.5	$V_{IN} = 5.5V$ or GND				±0.1		±1.0	μA
I_{CC}	Quiescent Supply Current	5.5	$V_{IN} = V_{CC}$ or GND				4.0		40.0	μA
I_{CCT}	Maximum I_{CC}/Input	5.5	$V_{IN} = 3.4V$, Other Input = V_{CC} or GND				1.35		1.50	mA
I_{OFF}	Output Leakage Current (Power Down State)	0.0	$V_{OUT} = 5.5V$				0.5		5.0	μA

Noise Characteristics

Symbol	Parameter	V_{CC} (V)	Conditions	$T_A = 25°C$		Units
				Typ.	Limits	
V_{OLP}[6]	Quiet Output Maximum Dynamic V_{OL}	5.0	$C_L = 50pF$	1.2	1.6	V
V_{OLV}[6]	Quiet Output Minimum Dynamic V_{OL}	5.0	$C_L = 50pF$	–1.2	–1.6	V
V_{IHD}[6]	Minimum HIGH Level Dynamic Input Voltage	5.0	$C_L = 50pF$		2.0	V
V_{ILD}[6]	Maximum LOW Level Dynamic Input Voltage	5.0	$C_L = 50pF$		0.8	V

Note:

6. Parameter guaranteed by design.

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AC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	Conditions		$T_A = 25°C$			$T_A = –40°C$ to +85°C		Units
					Min.	Typ.	Max.	Min.	Max.	
t_{PLH}, t_{PHL}	Propagation Delay Time	5.0 ± 0.5		C_L = 15pF		4.9	7.7	1.0	8.5	ns
				C_L = 50pF		5.4	8.7	1.0	9.5	
t_{PZL}, t_{PZH}	3-STATE Output Enable Time	5.0 ± 0.5	R_L = 1kΩ	C_L = 15pF		9.4	13.8	1.0	15.0	ns
				C_L = 50pF		9.9	14.8	1.0	16.0	
t_{PLZ}, t_{PHZ}	3-STATE Output Disable Time	5.0 ± 0.5	R_L = 1kΩ	C_L = 50pF		10.1	15.4	1.0	16.5	ns
t_{OSLH}, t_{OSHL}	Output to Output Skew	5.0 ± 0.5	(7)				1.0		1.0	ns
C_{IN}	Input Capacitance		V_{CC} = Open			4	10		10	pF
C_{OUT}	Output Capacitance		V_{CC} = 5.0V			13				pF
C_{PD}	Power Dissipation Capacitance		(8)			16				pF

Notes:

7. Parameter guaranteed by design. $t_{OSLH} = |t_{PLH\ max} - t_{PLH\ min}|$; $t_{OSHL} = |t_{PHL\ max} - t_{PHL\ min}|$

8. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I_{CC} (Opr.) = C_{PD} • V_{CC} • f_{IN} + I_{CC} / 8 (per F/F). The total C_{PD} when n pcs. of the Octal D Flip-Flop operates can be calculated by the equation: C_{PD} (total) = 20 + 12n.

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Physical Dimensions

Dimensions are in millimeters unless otherwise noted.

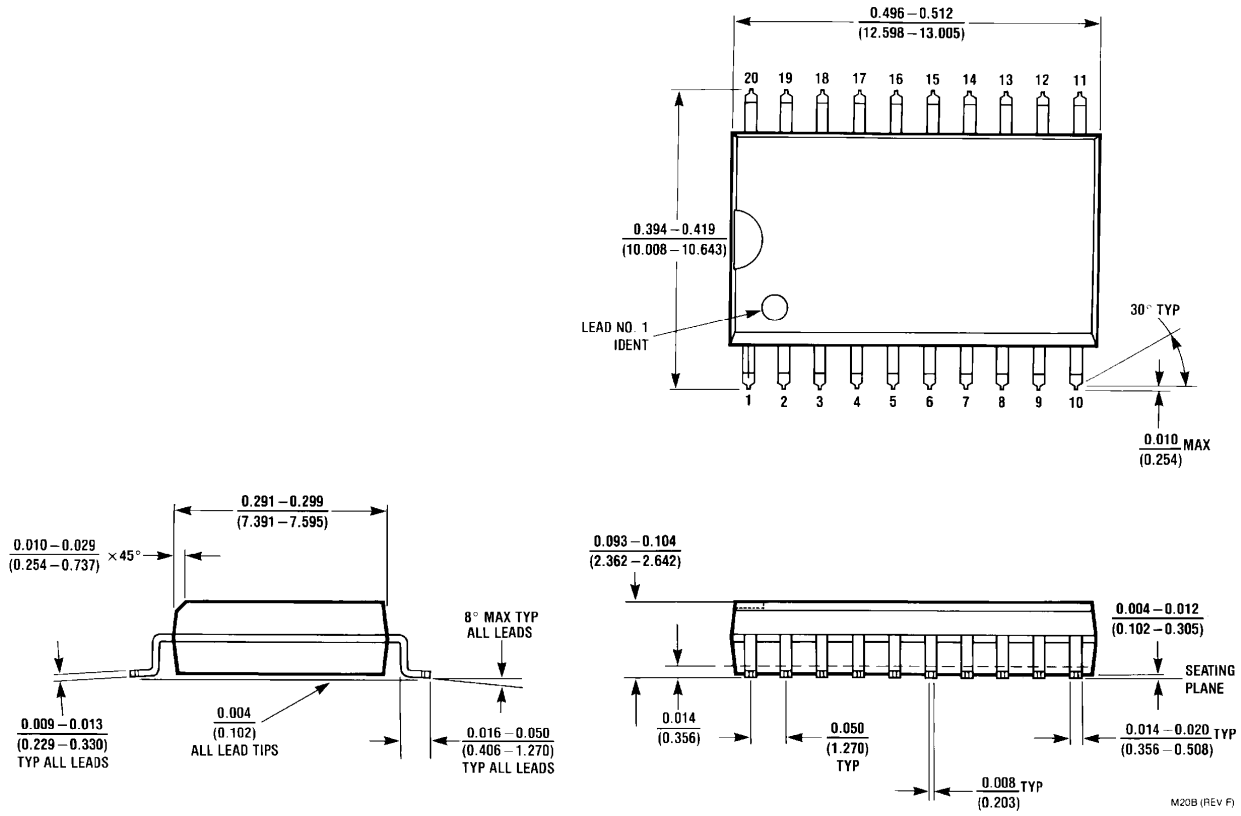
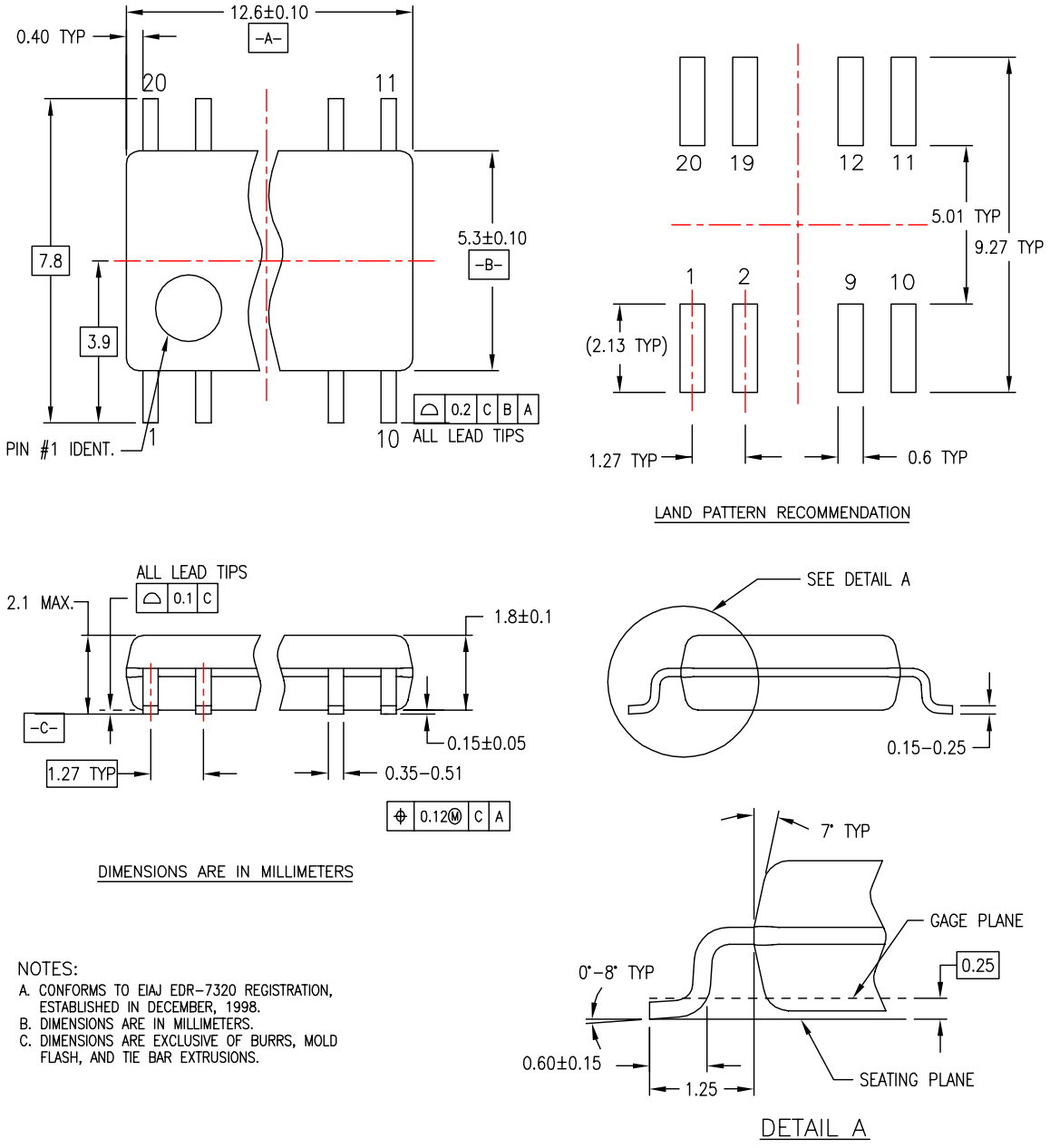


Figure 1. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
Package Number M20B

Physical Dimensions (Continued)

Dimensions are in millimeters unless otherwise noted.



NOTES:

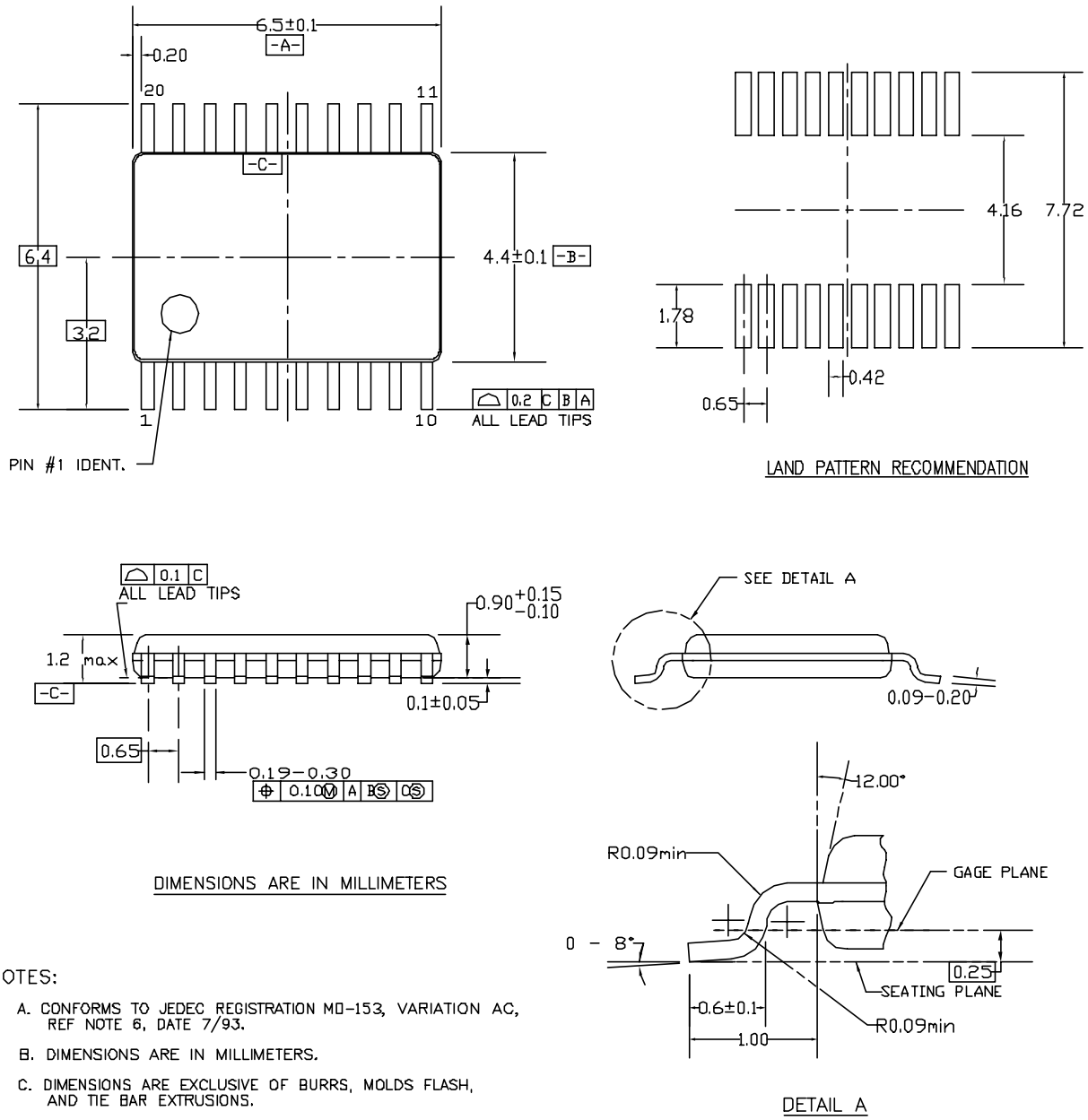
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B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DREVC

Figure 2. 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M20D

Physical Dimensions (Continued)

Dimensions are in millimeters unless otherwise noted.



NOTES:

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MTC20REVD1

Figure 3. 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC20

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