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# 74VHCT245A

## Octal Buffer/Line Driver with 3-STATE Outputs

### Features

- High Speed:  $t_{PD} = 5.4\text{ns}$  (Typ.) at  $V_{CC} = 5\text{V}$
- Power Down Protection on Inputs and Outputs
- Low Power Dissipation:  $I_{CC} = 4\mu\text{A}$  (Max.) @  $T_A = 25^\circ\text{C}$
- 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<sup>(1)</sup> 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:**

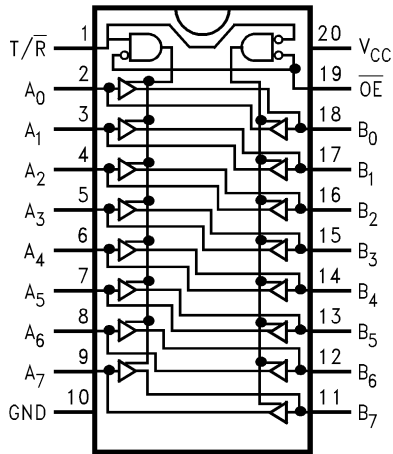
1. Outputs in OFF-State

### Ordering Information

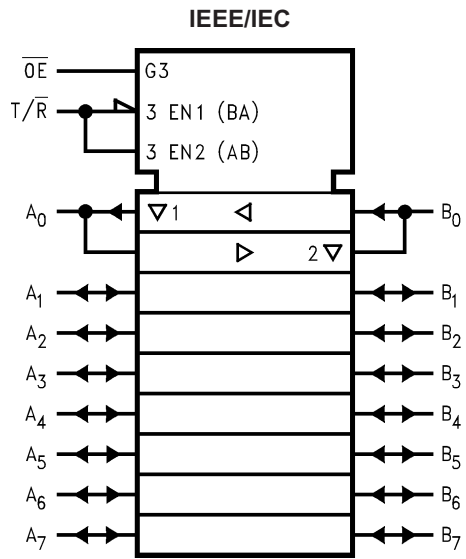
Order Number	Package Number	Package Description
74VHCT245AM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74VHCT245ASJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74VHCT245AMTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 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 JEDEC J-STD-020B.

### Connection Diagram



### Logic Symbol



### Pin Description

Pin Names	Description
$\overline{OE}$	Output Enable Input
$T/\overline{R}$	Transmit/Receive Input
A <sub>0</sub> –A <sub>7</sub>	Side A Inputs or 3-STATE Outputs
B <sub>0</sub> –B <sub>7</sub>	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

## 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 Note 3	-0.5V to $V_{CC} + 0.5V$ -0.5V to +7.0V
$I_{IK}$	Input Diode Current	-20mA
$I_{OK}$	Output Diode Current <sup>(4)</sup>	$\pm 20mA$
$I_{OUT}$	DC Output Current	$\pm 25mA$
$I_{CC}$	DC $V_{CC}$ / GND Current	$\pm 75mA$
$T_{STG}$	Storage Temperature	-65°C to +150°C
$T_L$	Lead Temperature (Soldering, 10 seconds)	260°C

## Recommended Operating Conditions<sup>(5)</sup>

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 Note 3	0V to $V_{CC}$ 0V to +5.5V
$T_{OPR}$	Operating Temperature	-40°C to +85°C
$t_r, t_f$	Input Rise and Fall Time, $V_{CC} = 5.0V \pm 0.5V$	0ns/V ~ 20ns/V

### Notes:

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

## DC Electrical Characteristics

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

## Noise Characteristics

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = 25°C		Units
				Typ.	Limits	
V <sub>OLP</sub> <sup>(6)</sup>	Quiet Output Maximum Dynamic V <sub>OL</sub>	5.0	C <sub>L</sub> = 50pF	1.2	1.6	V
V <sub>OLV</sub> <sup>(6)</sup>	Quiet Output Minimum Dynamic V <sub>OL</sub>	5.0	C <sub>L</sub> = 50pF	-1.2	-1.6	V
V <sub>IHD</sub> <sup>(6)</sup>	Minimum HIGH Level Dynamic Input Voltage	5.0	C <sub>L</sub> = 50pF		2.0	V
V <sub>ILD</sub> <sup>(6)</sup>	Maximum LOW Level Dynamic Input Voltage	5.0	C <sub>L</sub> = 50pF		0.8	V

**Note:**

6. Parameter guaranteed by design.

## AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = 25°C			T <sub>A</sub> = -40°C to +85°C		Units
				Min.	Typ.	Max.	Min.	Max.	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay Time	5.0 ± 0.5		C <sub>L</sub> = 15pF	4.9	7.7	1.0	8.5	ns
				C <sub>L</sub> = 50pF	5.4	8.7	1.0	9.5	
t <sub>PZL</sub> , t <sub>PZH</sub>	3-STATE Output Enable Time	5.0 ± 0.5	R <sub>L</sub> = 1kΩ	C <sub>L</sub> = 15pF	9.4	13.8	1.0	15.0	ns
				C <sub>L</sub> = 50pF	9.9	14.8	1.0	16.0	
t <sub>PLZ</sub> , t <sub>PHZ</sub>	3-STATE Output Disable Time	5.0 ± 0.5	R <sub>L</sub> = 1kΩ	C <sub>L</sub> = 50pF	10.1	15.4	1.0	16.5	ns
t <sub>OSLH</sub> , t <sub>OSHL</sub>	Output to Output Skew	5.0 ± 0.5	(7)			1.0		1.0	ns
C <sub>IN</sub>	Input Capacitance		V <sub>CC</sub> = Open			4	10		pF
C <sub>OUT</sub>	Output Capacitance		V <sub>CC</sub> = 5.0V			13			pF
C <sub>PD</sub>	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<sub>PD</sub> 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:  
 $I_{CC} (\text{Opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 8$  (per F/F). The total C<sub>PD</sub> when n pcs. of the Octal D Flip-Flop operates can be calculated by the equation: C<sub>PD</sub> (total) = 20 + 12n.

### Physical Dimensions

Dimensions are in millimeters unless otherwise noted.

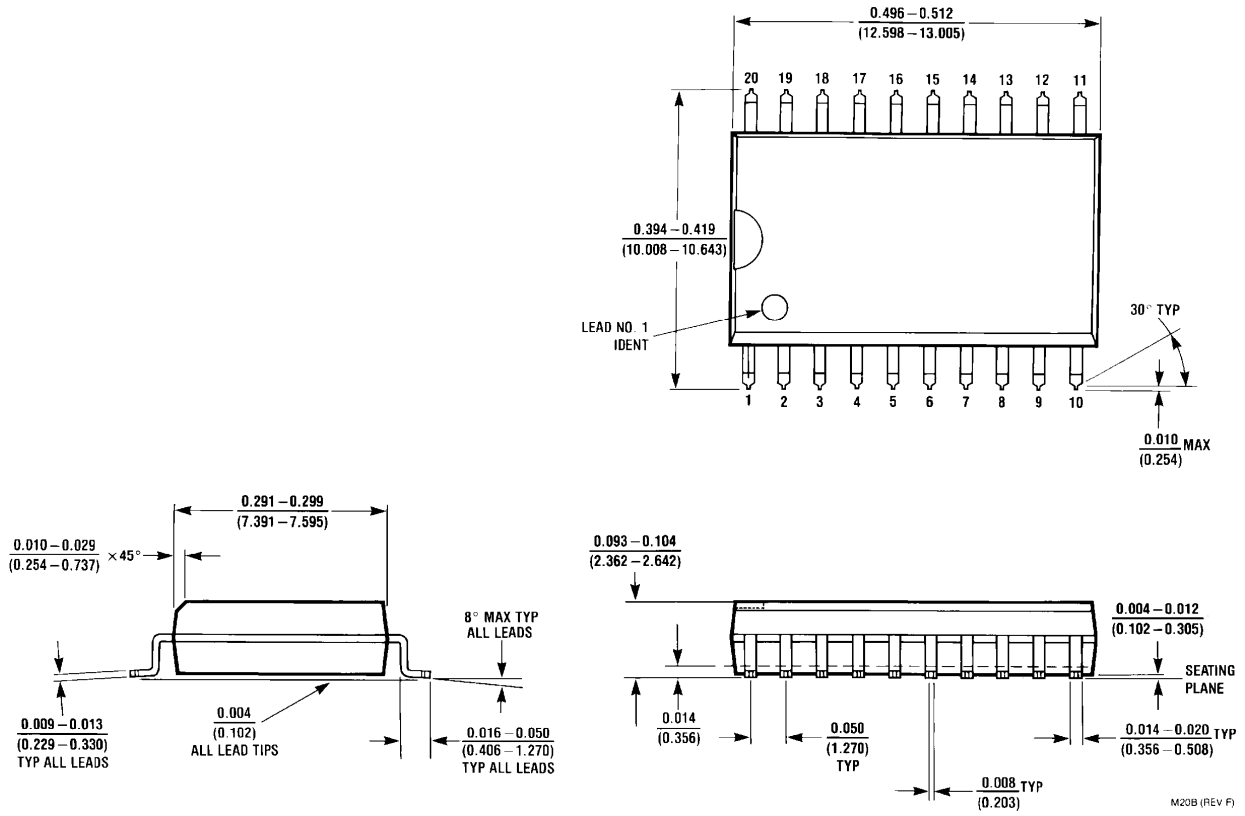


Figure 1. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Package Number M20B

**Physical Dimensions** (Continued)

Dimensions are in millimeters unless otherwise noted.



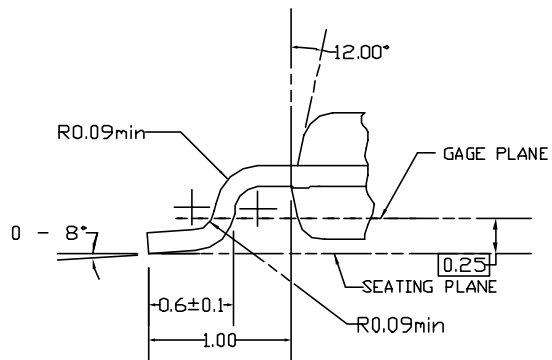
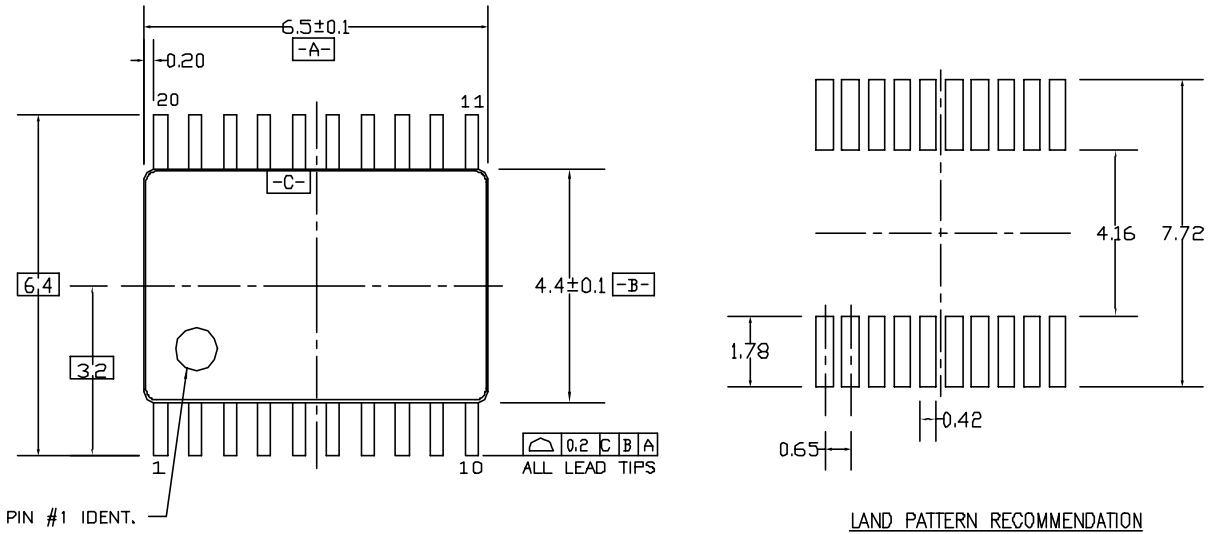
M20DREVC

**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.



DIMENSIONS ARE IN MILLIMETERS

NOTES:

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- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REVD1

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



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