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FAIRCHILD SEMICONDUCTOR®

June 1997
Revised April 2005

74VHCT541A
Octal Buffer/Line Driver with 3-STATE Outputs

General Description

The VHCT541A is an advanced high-speed CMOS device fabricated with silicon gate CMOS technology. It achieves the high-speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

The VHCT541A is an octal buffer/line driver designed to be employed as memory and address drivers, clock drivers and bus oriented transmitter/receivers.

This device is similar in function to the VHCT244A while providing flow-through architecture (inputs on opposite side from outputs). This pinout arrangement makes this device especially useful as an output port for microprocessors, allowing ease of layout and greater PC board density.

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

Note 1: Outputs in OFF-state.

Features

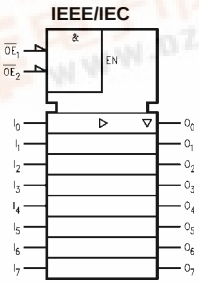
- High Speed: t_{PD} = 5.5 ns (typ) at V_{CC} = 5V
- Low power dissipation: I_{CC} = 4 μA (max) at T_A = 25°C
- Power down protection is provided on all inputs and outputs
- Pin and function compatible with 74HCT541

Ordering Code:

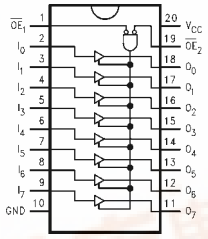
Order Number	Package Number	Package Description
74VHCT541AM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74VHCT541ASJ	M20D	Pb-Free 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74VHCT541AMTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74VHCT541AN	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

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

Logic Symbol



Connection Diagram



Pin Descriptions

Pin Names	Description
$\overline{OE}_1$, $\overline{OE}_2$	3-STATE Output Enable Inputs
I_0 - I_7	Inputs
O_0 - O_7	3-STATE Outputs

Truth Table

Inputs			Outputs
$\overline{OE}_1$	$\overline{OE}_2$	I	
L	L	H	H
H	X	X	Z
X	H	X	Z
L	L	L	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
Z = High Impedance

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Absolute Maximum Ratings (Note 2)

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Input Voltage (V_{IN})	−0.5V to +7.0V
DC Output Voltage (V_{OUT})	
(Note 3)	−0.5V to 7.0V
(Note 4)	−0.5V to V_{CC} + 0.5V
Input Diode Current (I_{IK})	−20 mA
Output Diode Current (I_{OK})	
(Note 5)	±20 mA
DC Output Current (I_{OUT})	±25 mA
DC V_{CC}/GND Current (I_{CC})	±75 mA
Storage Temperature (T_{STG})	−65°C to +150°C
Lead Temperature (T_L)	
(Soldering, 10 seconds)	260°C

Recommended Operating Conditions (Note 6)

Supply Voltage (V_{CC})	4.5V to +5.5V
Input Voltage (V_{IN})	0V to +5.5V
Output Voltage (V_{OUT})	
(Note 4)	0V to V_{CC}
(Note 3)	0V to 5.5V
Operating Temperature (T_{OPR})	−40°C to +85°C
Input Rise and Fall Time (t_r, t_f)	
V_{CC} = 5.0V ±0.5V	0 ~ 20 ns/V

Note 2: Absolute Maximum Ratings are values beyond which the device may be damaged or have its useful life impaired. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation outside databook specifications.

Note 3: When Outputs are in OFF-State OR when V_{CC} = 0V.

Note 4: HIGH or LOW state I_{OUT} absolute maximum rating must be observed.

Note 5: V_{OUT} <GND,.V_{OUT} > V_{CC} (Outputs Active).

Note 6: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	T_A = 25°C			T_A = −40°C to +85°C		Units	Conditions	
			Min	Typ	Max	Min	Max			
V_{IH}	HIGH Level Input Voltage	4.5 – 5.5	2.0			2.0		V		
V_{IL}	LOW Level Input Voltage	4.5 – 5.5			0.8		0.8	V		
V_{OH}	HIGH Level Output Voltage	4.5	4.4	4.5		4.4		V	V_{IN} = V_{IH}	I_{OH} = −50 μA
		4.5	3.94			3.80		V		I_{OH} = −8 mA
V_{OL}	LOW Level Output Voltage	4.5		0.0	0.1		0.1	V	V_{IN} = V_{IL}	I_{OL} = +50 μA
		4.5			0.36		0.44	V		I_{OL} = +8 mA
I_{OZ}	3-STATE Output Off-State Current	5.5			±0.25		±2.5	μA	V_{IN} = V_{IH} or V_{IL} V_{OUT} = V_{CC} or GND	
I_{IN}	Input Leakage Current	0 – 5.5			±0.1		±1.0	μA	V_{IN} = 5.5V or GND	
I_{CC}	Quiescent Supply Current	5.5			4.0		40.0	μA	V_{IN} = V_{CC} or GND	
I_{CCT}	Maximum I_{CC}/Input	5.5			1.35		1.50	mA	V_{IN} = 3.4V Other Inputs = V_{CC} or GND	
I_{OFF}	Output Leakage Current	0			0.5		5.0	μA	V_{OUT} = 5.5V	

Noise Characteristics

Symbol	Parameter	V_{CC} (V)	$T_A = 25°C$		Units	Conditions
			Typ	Limits		
V_{OLP} (Note 7)	Quiet Output Maximum Dynamic V_{OL}	5.0	1.2	1.6	V	$C_L = 50$ pF
V_{OLV} (Note 7)	Quiet Output Minimum Dynamic V_{OL}	5.0	−1.2	−1.6	V	$C_L = 50$ pF
V_{IHD} (Note 7)	Minimum HIGH Level Dynamic Input Voltage	5.0		2.0	V	$C_L = 50$ pF
V_{ILD} (Note 7)	Maximum HIGH Level Dynamic Input Voltage	5.0		0.8	V	$C_L = 50$ pF

Note 7: Parameter guaranteed by design.

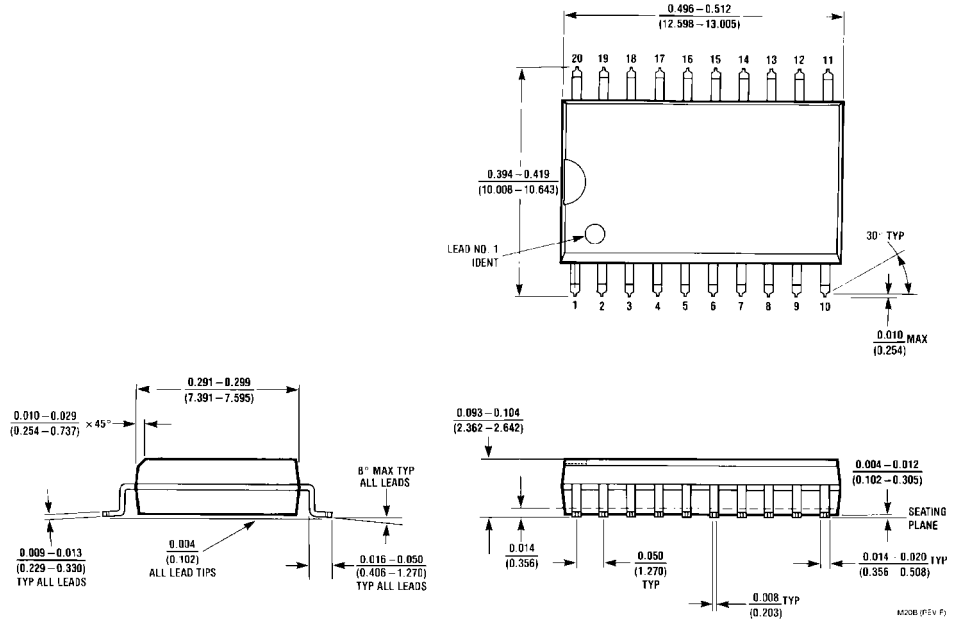
AC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	$T_A = 25°C$			$T_A = -40°C$ to $+85°C$		Units	Conditions	
			Min	Typ	Max	Min	Max			
t_{PLH}	Propagation Delay	5.0 ± 0.5		5.0	6.9	1.0	8.0	ns		$C_L = 15$ pF
t_{PHL}	Time			5.5	7.9	1.0	9.0			$C_L = 50$ pF
t_{PZL}	3-STATE Output	5.0 ± 0.5		8.3	11.3	1.0	13.0	ns	$R_L = 1$ kΩ	$C_L = 15$ pF
t_{PZH}	Enable Time			8.8	12.3	1.0	14.0			$C_L = 50$ pF
t_{PLZ}	3-STATE Output	5.0 ± 0.5		9.4	11.9	1.0	13.5	ns	$R_L = 1$ kΩ	$C_L = 50$ pF
t_{PHZ}	Disable Time									
t_{OSLH}	Output to Output Skew	5.0 ± 0.5			1.0		1.0	ns	(Note 8)	$C_L = 50$ pF
t_{OSHL}										
C_{IN}	Input Capacitance			4	10		10	pF	V_{CC} = Open	
C_{OUT}	Output Capacitance			9				pF	$V_{CC} = 5.0$V	
C_{PD}	Power Dissipation Capacitance			19				pF	(Note 9)	

Note 8: Parameter guaranteed by design. $t_{OSLH} = |t_{PLHmax} - t_{PLHmin}|$; $t_{OSHL} = |t_{PHLmax} - t_{PHLmin}|$.

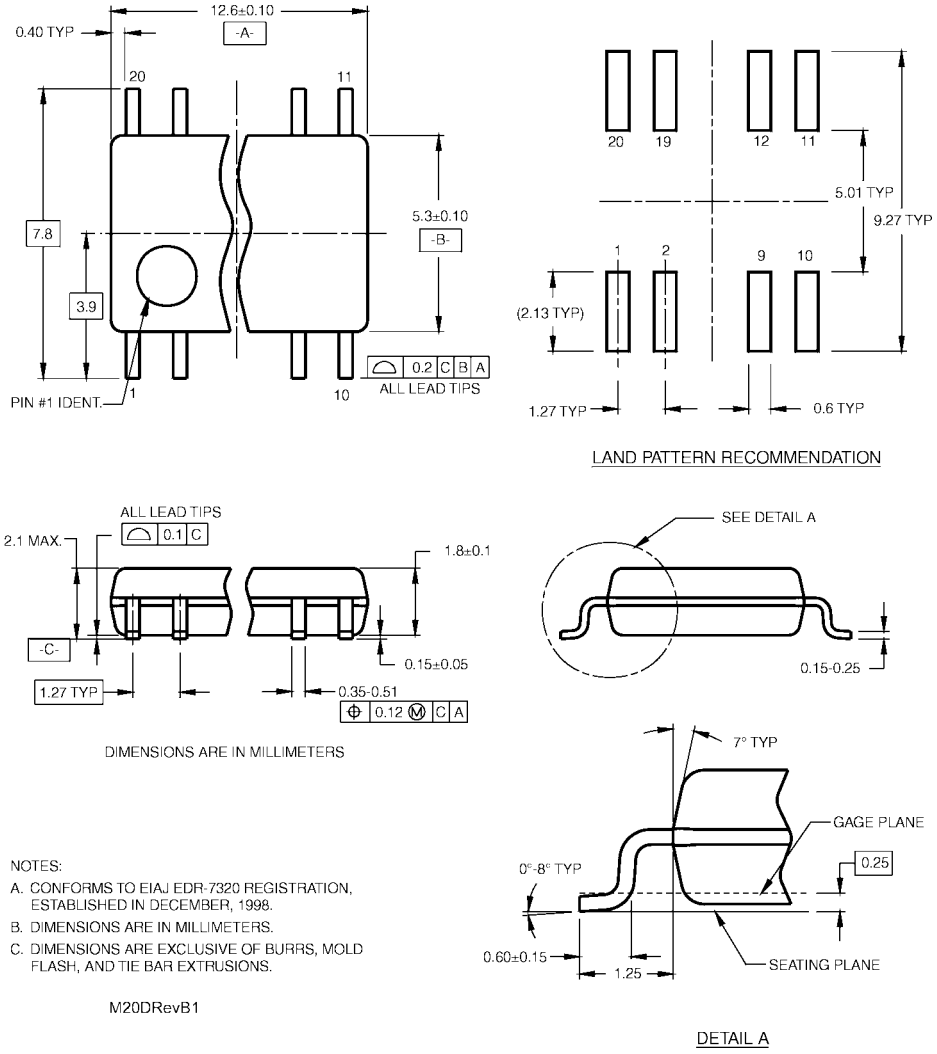
Note 9: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I_{CC} (OPR.) = $C_{PD} * V_{CC} * f_{IN} + I_{CC}/8$ (per bit).

Physical Dimensions inches (millimeters) unless otherwise noted



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

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



NOTES:

A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.

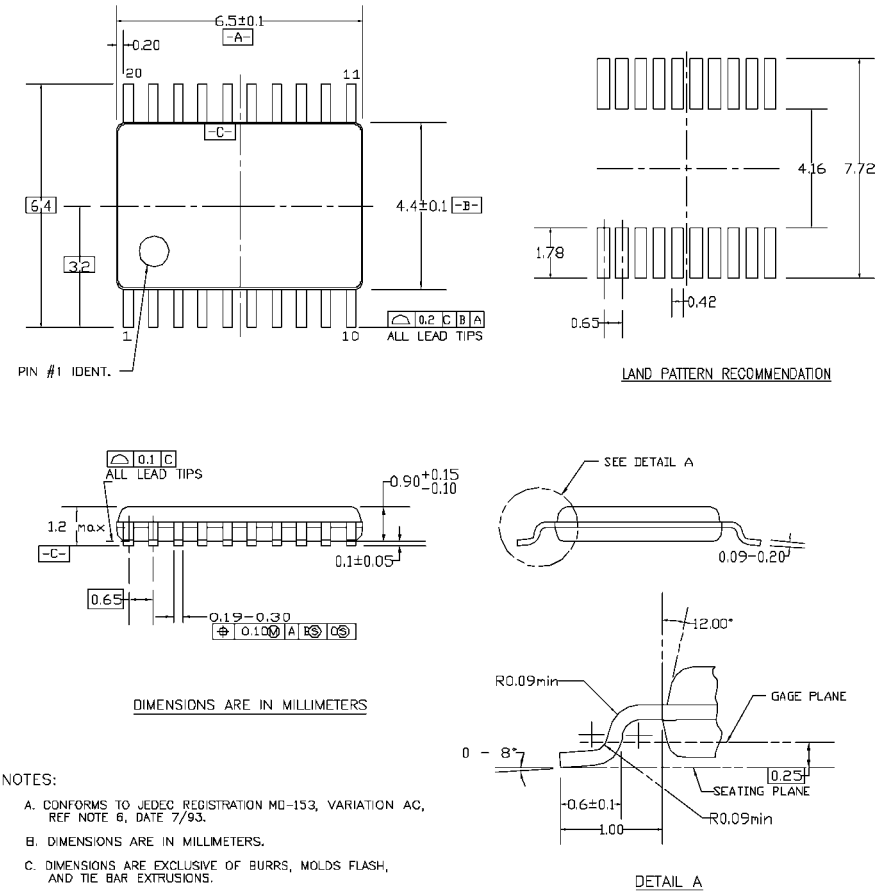
B. DIMENSIONS ARE IN MILLIMETERS.

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

M20DRevB1

Pb-Free 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M20D

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC, REF NOTE 6, DATE 7/93.

B. DIMENSIONS ARE IN MILLIMETERS.

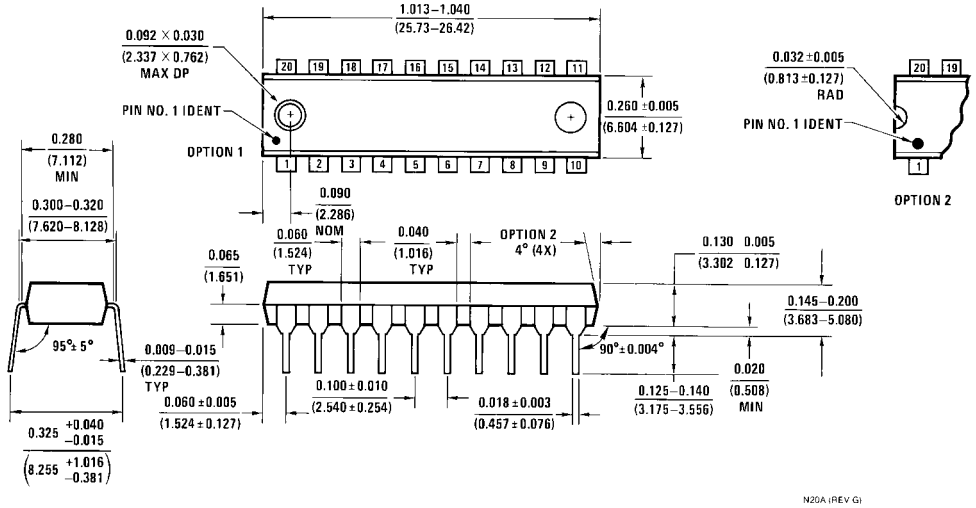
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH, AND TIE BAR EXTRUSIONS.

D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REVD1

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

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N20A

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