National Semiconductor

October 1995

74ABT2240
Octal Buffer/Line Driver with 25Ω Series Resistors in the Outputs

General Description

The 'ABT2240 is an inverting octal buffer and line driver designed to drive the capacitive inputs of MOS memory drivers, address drivers, clock drivers, and bus-oriented transmitters/receivers.

The 25Ω series resistors in the outputs reduce ringing and eliminate the need for external resistors.

Features

- Guaranteed latchup protection
- High impedance glitch-free bus loading during entire power up and power down cycle
- Nondestructive hot insertion capability

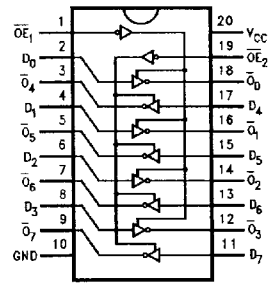
Commercial	Package Number	Package Description
74ABT2240CSC (Note 1)	M20B	20-Lead (0.300" Wide) Molded Small Outline, JEDEC
74ABT2240CSJ (Note 1)	M20D	20-Lead (0.300" Wide) Molded Small Outline, EIAJ
74ABT2240CMSA (Note 1)	MSA20	20-Lead Molded Shrink Small Outline, EIAJ Type II
74ABT2240CMTC (Notes 1, 2)	MTC20	20-Lead Molded Thin Shrink Small Outline, JEDEC

Note 1: Devices also available in 13" reel Use suffix = SCX, SJX, MSAX, and MTCX.

Note 2: Contact factory for package availability

Connection Diagram

Pin Assignment for SOIC and SSOP



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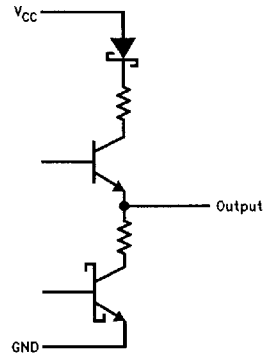
Schematic of Each Output



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Pin Names	Description
$\overline{OE}_1$, $\overline{OE}_2$	Output Enable Input (Active Low)
D_0–D_7	Data Inputs
$\overline{O}_0$–$\overline{O}_7$	Outputs

Truth Table

$\overline{OE}_1$	I_{0-3}	$\overline{O}_{0-3}$	$\overline{OE}_2$	I_{4-7}	$\overline{O}_{4-7}$
H	X	Z	H	X	Z
L	H	L	L	H	L
L	L	H	L	L	H

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

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RRD-B30M125/Printed in U S A

Absolute Maximum Ratings (Note 1)

Storage Temperature	−65°C to +150°C
Ambient Temperature under Bias	−55°C to +125°C
Junction Temperature under Bias	
Plastic	−55°C to +150°C
V_{CC} Pin Potential to Ground Pin	−0.5V to +7.0V
Input Voltage (Note 2)	−0.5V to +7.0V
Input Current (Note 2)	−30 mA to +5.0 mA
Voltage Applied to Any Output	
in the Disabled or Power-off State	−0.5V to 5.5V
in the HIGH State	−0.5V to V_{CC}
Current Applied to Output in LOW State (Max)	twice the rated I_{OL} (mA)
DC Latchup Source Current (Across Comm Operating Range)	−300 mA
Over Voltage Latchup (I/O)	10V

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

Recommended Operating Conditions

Free Air Ambient Temperature	
Commercial	−40°C to +85°C
Supply Voltage	
Commercial	+4.5V to +5.5V
Minimum Input Edge Rate	(ΔV/Δt)
Data Input	50 mV/ns
Enable Input	20 mV/ns

DC Electrical Characteristics

Symbol	Parameter		ABT2240 Min	ABT2240 Typ	ABT2240 Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage		2.0			V		Recognized HIGH Signal
V_{IL}	Input LOW Voltage				0.8	V		Recognized LOW Signal
V_{CD}	Input Clamp Diode Voltage				−1.2	V	Min	I_{IN} = −18 mA
V_{OH}	Output HIGH Voltage	74ABT	2.5			V	Min	I_{OH} = −3 mA
		74ABT	2.0			V	Min	I_{OH} = −32 mA
V_{OL}	Output LOW Voltage	74ABT			0.8	V	Min	I_{OL} = 15 mA
I_{IH}	Input HIGH Current				5 5	μA	Max	V_{IN} = 2.7V (Note 2) V_{IN} = V_{CC}
I_{BVI}	Input HIGH Current Breakdown Test				7	μA	Max	V_{IN} = 7.0V
I_{IL}	Input LOW Current				−5 −5	μA	Max	V_{IN} = 0.5V (Note 2) V_{IN} = 0.0V
V_{ID}	Input Leakage Test		4.75			V	0.0	I_{ID} = 1.9 μA All Other Pins Grounded
I_{OZH}	Output Leakage Current				50	μA	0 − 5.5V	V_{OUT} = 2.7V; $\overline{OE}n$ = 2.0V
I_{OZL}	Output Leakage Current				−50	μA	0 − 5.5V	V_{OUT} = 0.5V; $\overline{OE}n$ = 2.0V
I_{OS}	Output Short-Circuit Current		−100		−275	mA	Max	V_{OUT} = 0.0V
I_{CEX}	Output High Leakage Current				50	μA	Max	V_{OUT} = V_{CC}
I_{ZZ}	Bus Drainage Test				100	μA	0.0	V_{OUT} = 5.5V; All Others GND
I_{CCH}	Power Supply Current				50	μA	Max	All Outputs HIGH
I_{CCL}	Power Supply Current				30	mA	Max	All Outputs LOW
I_{CCZ}	Power Supply Current				50	μA	Max	$\overline{OE}n$ = V_{CC} All Others at V_{CC} or GND
I_{CCT}	Additional I_{CC}/Input	Outputs Enabled			1.5	mA	Max	V_I = V_{CC} − 2.1V
		Outputs TRI-STATE®			1.5	mA		Enable Input V_I = V_{CC} − 2.1V
		Outputs TRI-STATE			50	μA		Data Input V_I = V_{CC} − 2.1V All Others at V_{CC} or GND
I_{CCD}	Dynamic I_{CC} (Note 2)	No Load			0.1	mA/MHz	Max	Outputs Open $\overline{OE}n$ = GND (Note 1) One Bit Toggling, 50% Duty Cycle

Note 1: For 8 bits toggling, I_{CCD} < 0.8 mA/MHz

Note 2: Guaranteed, but not tested.

AC Electrical Characteristics (SOIC and SSOP package)

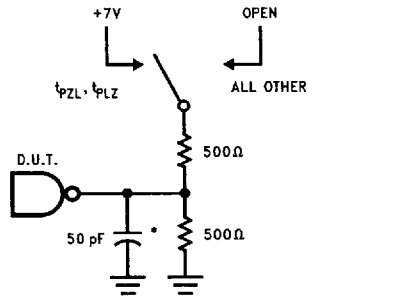
Symbol	Parameter	74ABT $T_A = +25°C$, $V_{CC} = +5V$, $C_L = 50$ pF			74ABT $T_A = -40°C$ to $+85°C$, $V_{CC} = 4.5V-5.5V$, $C_L = 50$ pF		Units
		Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay Data to Outputs	1.0 1.5		4.9 5.3	1.0 1.5	4.9 5.3	ns
t_{PZH} t_{PZL}	Output Enable Time	1.5 2.7		6.6 6.9	1.5 2.7	6.6 6.9	ns
t_{PHZ} t_{PLZ}	Output Disable Time	1.9 1.9		6.4 6.4	1.9 1.9	6.4 6.4	ns

Capacitance

Symbol	Parameter	Typ	Units	Conditions $T_A = 25°C$
C_{IN}	Input Capacitance	5.0	pF	$V_{CC} = 0V$
C_{OUT} (Note 1)	Output Capacitance	9.0	pF	$V_{CC} = 5.0V$

Note 1: C_{OUT} is measured at frequency f = 1 MHz, per MIL-STD-883B, Method 3012.

AC Loading



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*Includes jig and probe capacitance

FIGURE 1. Standard AC Test Load

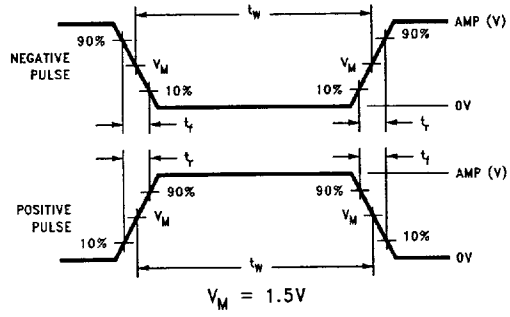

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FIGURE 2a. Test Input Signal Levels

Amplitude	Rep. Rate	t_w	t_r	t_f
3.0V	1 MHz	500 ns	2.5 ns	2.5 ns

FIGURE 2b. Test Input Signal Requirements

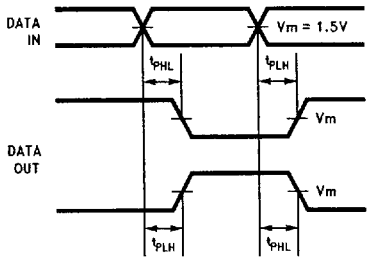

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FIGURE 3. Propagation Delay Waveforms for Inverting and Non-Inverting Functions

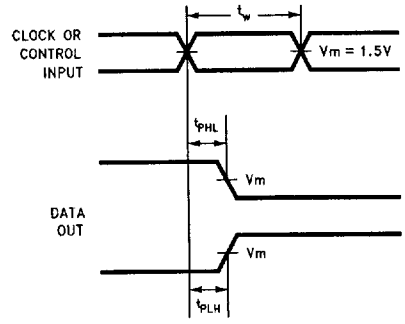

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FIGURE 4. Propagation Delay, Pulse Width Waveforms

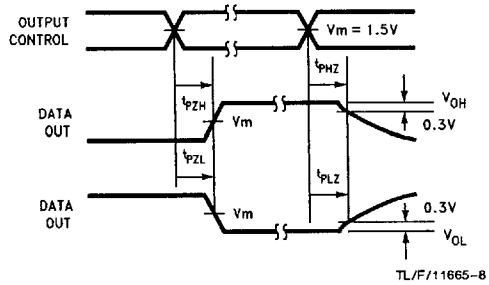

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FIGURE 5. TRI-STATE Output HIGH and LOW Enable and Disable Times

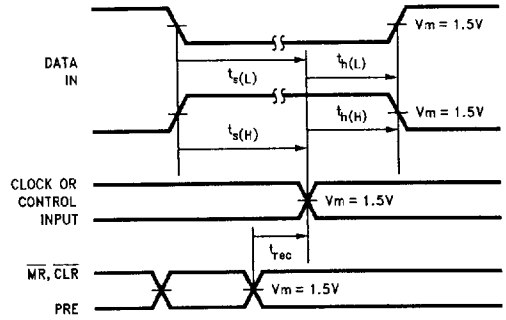

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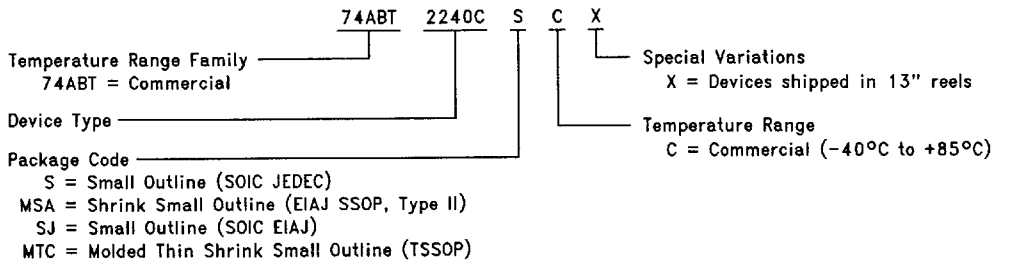
FIGURE 6. Setup Time, Hold Time and Recovery Time Waveforms

Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



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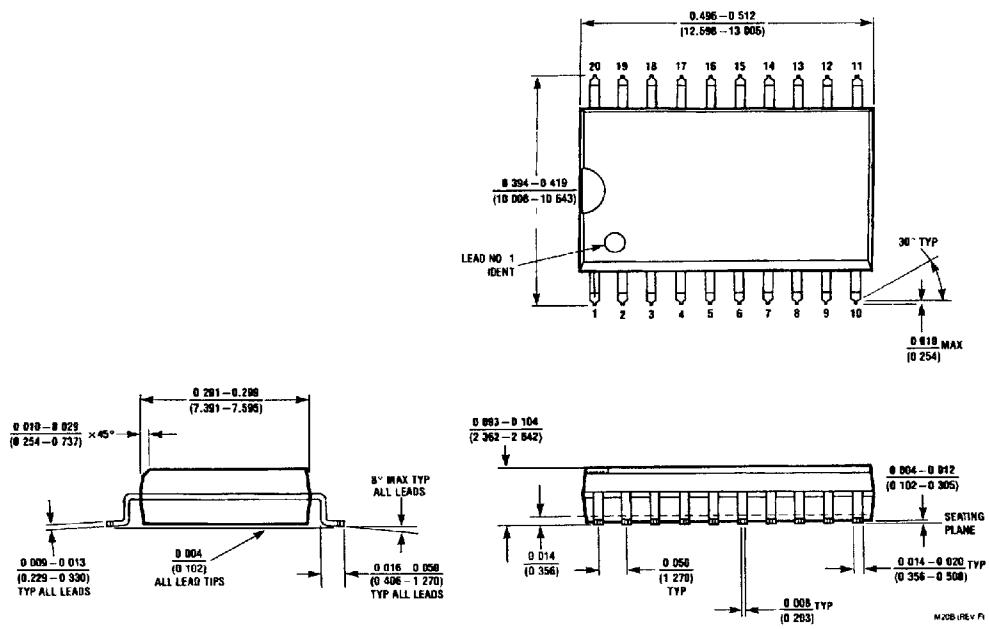
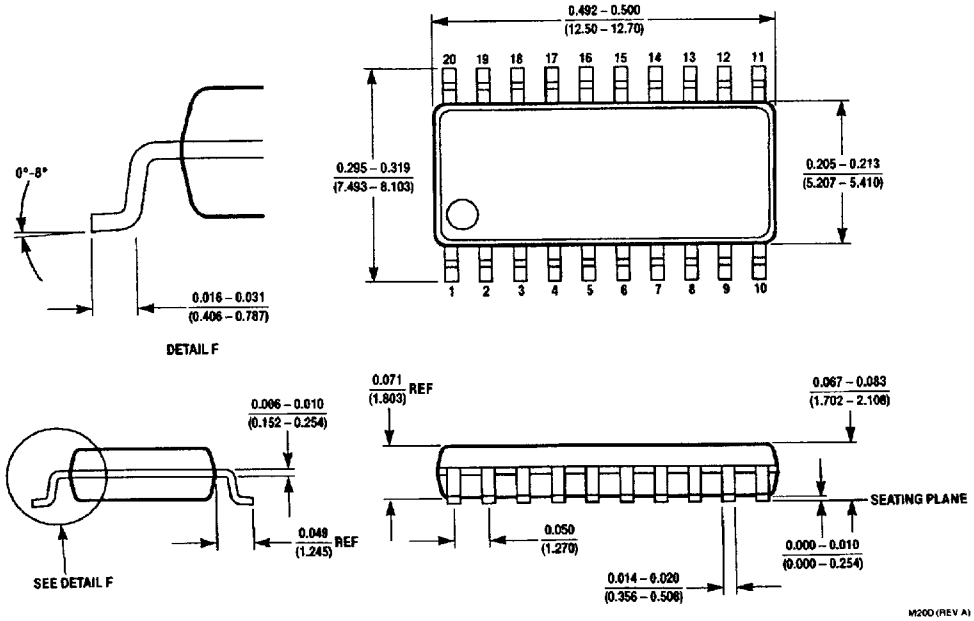
Physical Dimensions inches (millimeters)

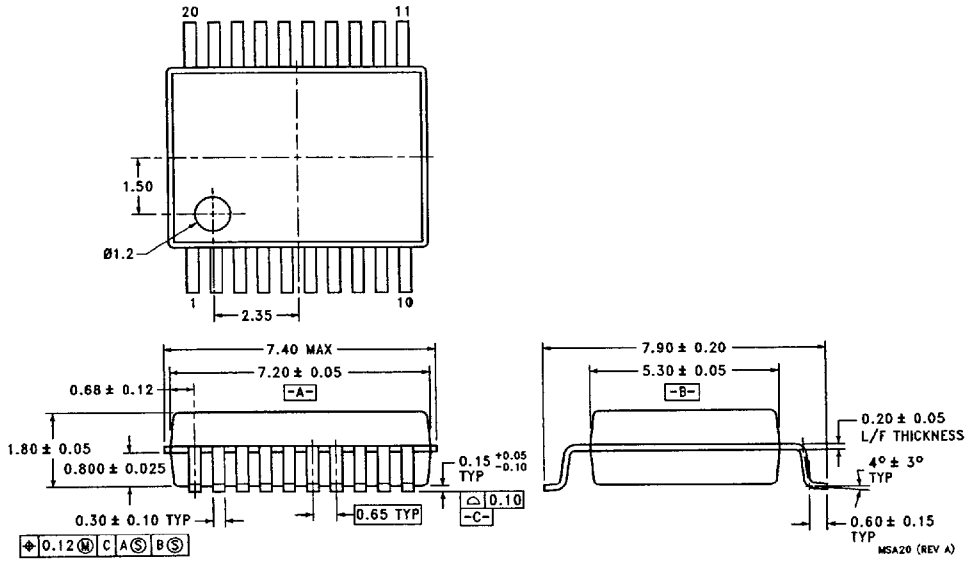


20-Lead Small Outline Integrated Circuit JEDEC (S)
NS Package Number M20B

Physical Dimensions inches (millimeters) (Continued)

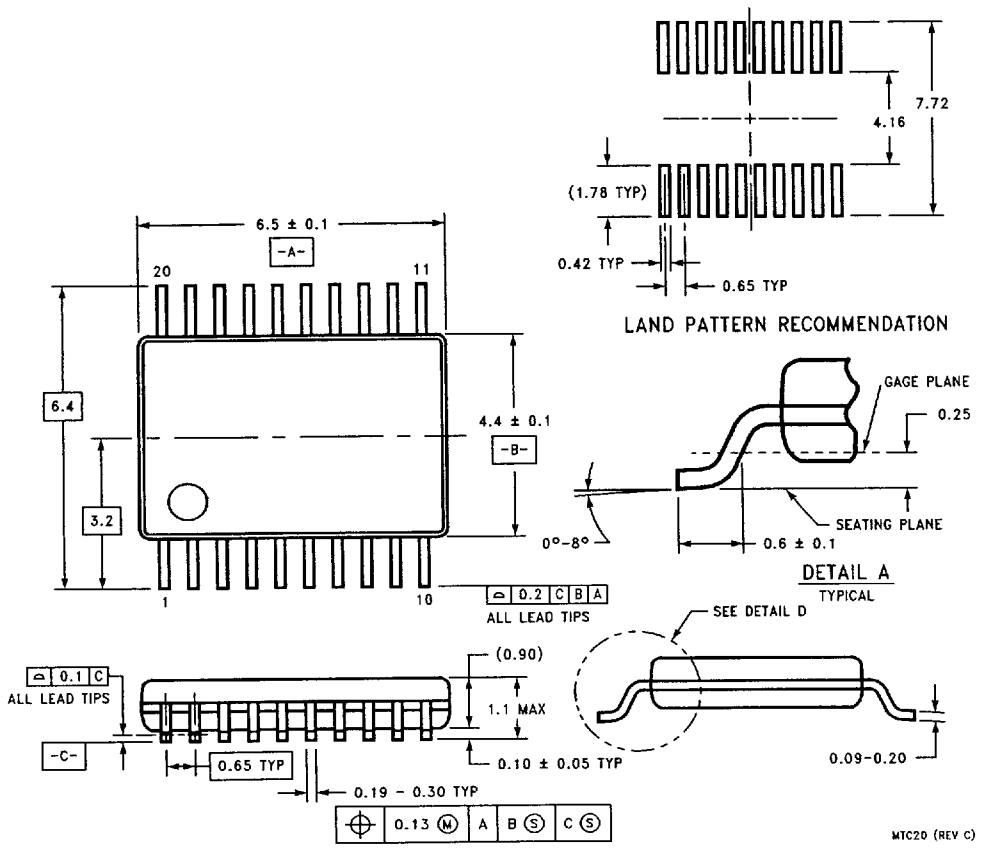


20-Lead Small Outline Integrated Circuit EIAJ (SJ)
NS Package Number M20D



20-Lead Plastic EIAJ SSOP, Type II (MSA)
NS Package Number MSA20

Physical Dimensions millimeters (Continued)



20-Lead Molded Thin Shrink Small Outline Package, JEDEC
NS Package Number MTC20

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