

## 74ABT16952 16-Bit Registered Transceiver with 3-STATE Outputs

### General Description

The ABT16952 is a 16-bit registered transceiver. Two 8-bit back to back registers store data flowing in both directions between two bidirectional buses. Separate clock, clock enable and 3-STATE output enable signals are provided for each register. The output pins are guaranteed to source 32 mA and to sink 64 mA.

### Features

- Separate clock, clock enable and 3-STATE output enable provided for each register
- A and B output sink capability of 64 mA source capability of 32 mA
- Guaranteed latchup protection
- High impedance glitch free bus loading during entire power up and power down cycle
- Nondestructive hot insertion capability

### Ordering Code:

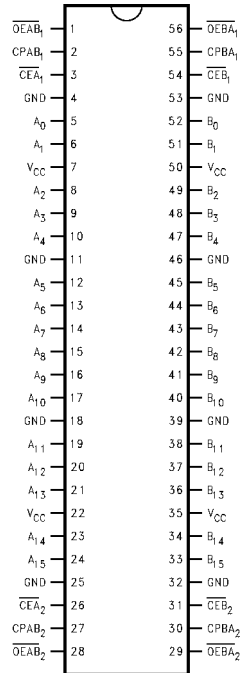
Order Number	Package Number	Package Description
74ABT16952CSSC	MS56A	56-Lead Shrink Small Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
74ABT16952CMTD	MTD56	56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

Devices also available in Tape and Reel. Specify by appending the letter suffix "X" to the ordering code.

### Pin Descriptions

Pin Names	Description
A <sub>0</sub> -A <sub>15</sub>	Data Register A Inputs/ B-Register 3-STATE Outputs
B <sub>0</sub> -B <sub>15</sub>	Data Register B Inputs/ A-Register 3-STATE Outputs
CPAB <sub>n</sub> , CPBA <sub>n</sub>	Clock Pulse Inputs
$\overline{CEA}_n$ , $\overline{CEB}_n$	Clock Enable
$\overline{OEAB}_n$ , $\overline{OEBA}_n$	Output Enable Inputs

### Connection Diagram



### Output Control

$\overline{OE}$	Internal Q	Output	Function
H	X	Z	Disable Outputs
L	L	L	Enable Outputs
L	H	H	

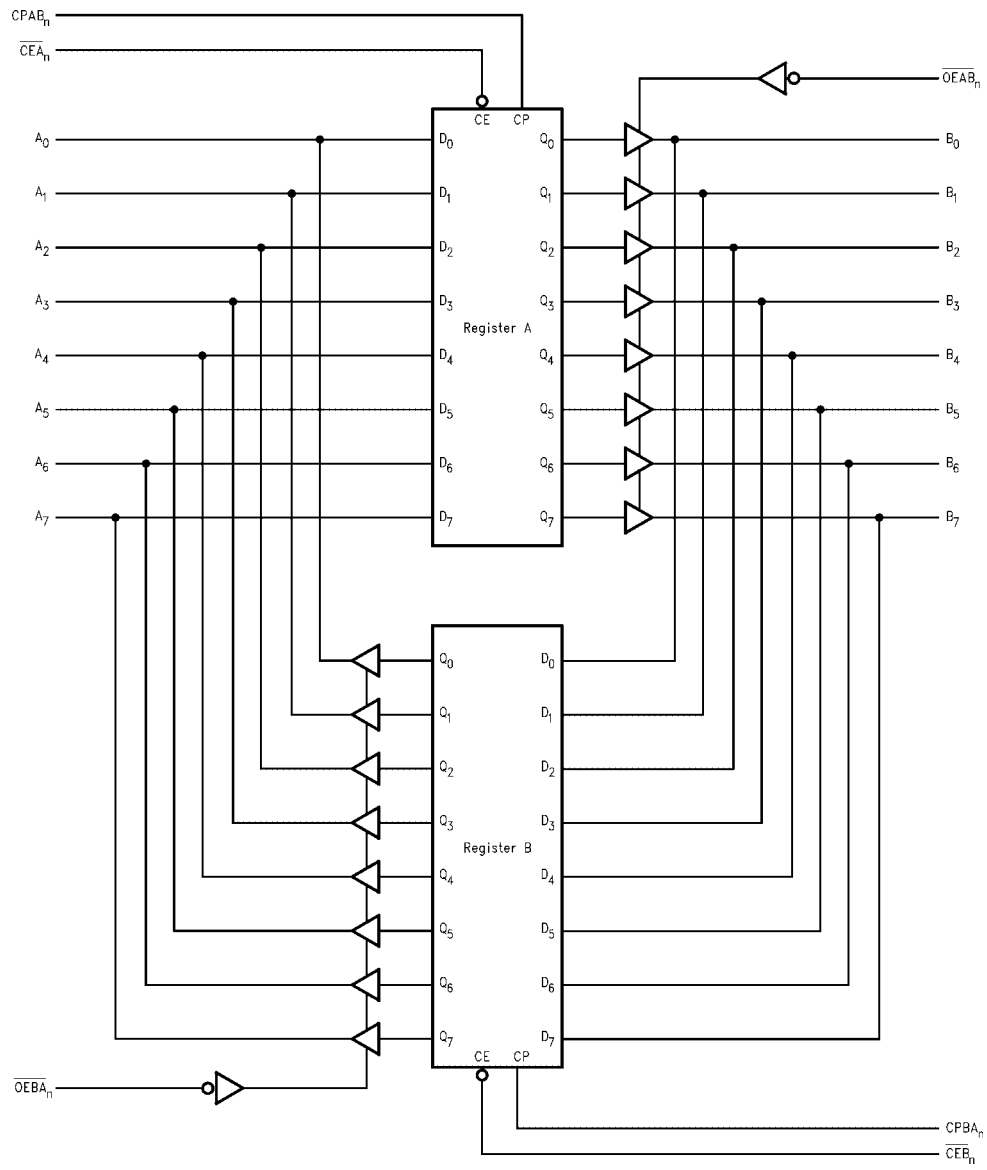
### Register Function Table

(Applies to A or B Register)

Inputs			Internal Q	Function
D	CP	$\overline{CE}$		
X	X	H	NC	Hold Data
L	↗	L	L	Load Data
H	↗	L	H	

H = HIGH Voltage Level      Z = HIGH Impedance  
L = LOW Voltage Level      ↗ = LOW-to-HIGH Transition  
X = Immaterial              NC = No Change

**Block Diagram**

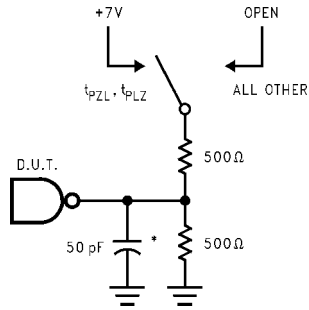


n for either byte 1 or byte 2

Absolute Maximum Ratings <sup>(Note 1)</sup>				Recommended Operating Conditions			
Storage Temperature	-65°C to +150°C			Free Air Ambient Temperature	-40°C to +85°C		
Ambient Temperature under Bias	-55°C to +125°C			Supply Voltage	+4.5V to +5.5V		
Junction Temperature under Bias	-55°C to +150°C			Minimum Input Edge Rate ( $\Delta V/\Delta t$ )			
$V_{CC}$ Pin Potential to Ground Pin	-0.5V to +7.0V			Data Input	50 mV/ns		
Input Voltage (Note 2)	-0.5V to +7.0V			Enable Input	20 mV/ns		
Input Current (Note 2)	-30 mA to +5.0 mA			Clock Input	100 mV/ns		
Voltage Applied to Any Output in the Disable 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)			<b>Note 1:</b> 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.			
DC Latchup Source Current	-500 mA			<b>Note 2:</b> Either voltage limit or current limit is sufficient to protect inputs.			
Over Voltage Latchup (I/O)	10V						
<b>DC Electrical Characteristics</b>							
Symbol	Parameter	Min	Typ	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 (Non I/O Pins)
$V_{OH}$	Output HIGH Voltage	2.5 2.0			V	Min	$I_{OH} = -3$ mA ( $A_n, B_n$ ) $I_{OH} = -32$ mA ( $A_n, B_n$ )
$V_{OL}$	Output LOW Voltage			0.55	V	Min	$I_{OL} = 64$ mA ( $A_n, B_n$ )
$V_{ID}$	Input Leakage Test	4.75			V	0.0	$I_{ID} = 1.9$ $\mu$ A (Non-I/O Pins) All Other Pins Grounded
$I_{IH}$	Input HIGH Current			1 1	$\mu$ A	Max	$V_{IN} = 2.7$ V (Non-I/O Pins) (Note 4) $V_{IN} = V_{CC}$ (Non-I/O Pins)
$I_{BVI}$	Input HIGH Current Breakdown Test			7	$\mu$ A	Max	$V_{IN} = 7.0$ V (Non-I/O Pins)
$I_{BVI(T)}$	Input HIGH Current Breakdown Test (I/O)			100	$\mu$ A	Max	$V_{IN} = 5.5$ V ( $A_n, B_n$ )
$I_{IL}$	Input LOW Current			-1 -1	$\mu$ A	Max	$V_{IN} = 0.5$ V (Non-I/O Pins) (Note 4) $V_{IN} = 0.0$ V (Non-I/O Pins)
$I_{IH} + I_{OZH}$	Output Leakage Current			10	$\mu$ A	0V-5.5V	$V_{OUT} = 2.7$ V ( $A_n, B_n$ ); $\overline{OE}A$ or $\overline{OE}B = 2.0$ V
$I_{IL} + I_{OZL}$	Output Leakage Current			-10	$\mu$ A	0V-5.5V	$V_{OUT} = 0.5$ V ( $A_n, B_n$ ); $\overline{OE}A$ or $\overline{OE}B = 2.0$ V
$I_{OS}$	Output Short-Circuit Current	-100		-275	mA	Max	$V_{OUT} = 0$ V ( $A_n, B_n$ )
$I_{CEX}$	Output HIGH Leakage Current			50	$\mu$ A	Max	$V_{OUT} = V_{CC}$ ( $A_n, B_n$ )
$I_{ZZ}$	Bus Drainage Test			100	$\mu$ A	0.0V	$V_{OUT} = 5.5$ V ( $A_n, B_n$ ); All Others GND
$I_{CCH}$	Power Supply Current			1.0	mA	Max	All Outputs HIGH
$I_{CCL}$	Power Supply Current			60	mA	Max	All Outputs LOW
$I_{CCZ}$	Power Supply Current			1.0	mA	Max	Outputs 3-STATE; All Others GND
$I_{CCT}$	Additional $I_{CC}$ /Input			2.5	mA	Max	$V_I = V_{CC} - 2.1$ V; All Others at $V_{CC}$ or GND
$I_{CCD}$	Dynamic $I_{CC}$ (Note 4)	No Load		0.18	mA/ MHz	Max	Outputs OPEN $\overline{OE}A$ or $\overline{OE}B =$ GND, Non-I/O = GND or $V_{CC}$ One Bit toggling, 50% duty cycle (Note 3)
<b>Note 3:</b> For 8-bit toggling, $I_{CCD} < 1.4$ mA/MHz.							
<b>Note 4:</b> Guaranteed, but not tested.							

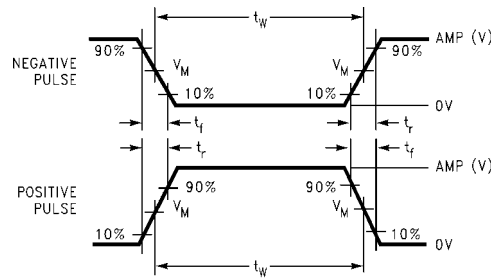
AC Electrical Characteristics						
(SSOP Package)						
Symbol	Parameter	$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$		$T_A = -40^\circ\text{C to } +85^\circ\text{C}$ $V_{CC} = 4.5\text{V to } 5.5\text{V}$ $C_L = 50\text{ pF}$		Units
		Min	Max	Min	Max	
$f_{MAX}$	Maximum Clock Frequency	200		200		MHz
$t_{PLH}$	Propagation Delay	1.5	5.3	1.5	5.3	ns
$t_{PHL}$	$\overline{CPAB}_n$ or $\overline{CPBA}_n$ to $A_n$ or $B_n$	1.5	5.3	1.5	5.3	
$t_{PZH}$	Output Enable Time	1.5	5.5	1.5	5.5	ns
$t_{PZL}$	$\overline{OEAB}_n$ or $\overline{OEBA}_n$ to $A_n$ or $B_n$	1.5	5.5	1.5	5.5	
$t_{PHZ}$	Output Disable Time	1.5	6.0	1.5	6.0	ns
$t_{PLZ}$	$\overline{OEAB}_n$ or $\overline{OEBA}_n$ to $A_n$ or $B_n$	1.5	6.0	1.5	6.0	
AC Operating Requirements						
Symbol	Parameter	$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$		$T_A = -40^\circ\text{C to } +85^\circ\text{C}$ $V_{CC} = 4.5\text{V to } 5.5\text{V}$ $C_L = 50\text{ pF}$		Units
		Min	Max	Min	Max	
$t_S(H)$	Setup Time, HIGH	2.5		2.5		ns
$t_S(L)$	or LOW $A_n$ or $B_n$ to $\overline{CPAB}_n$ or $\overline{CPBA}_n$	2.5		2.5		
$t_H(H)$	Hold Time, HIGH	1.5		1.5		ns
$t_H(L)$	or LOW $A_n$ or $B_n$ to $\overline{CPAB}_n$ or $\overline{CPBA}_n$	1.5		1.5		
$t_S(H)$	Setup Time, HIGH	2.5		2.5		ns
$t_S(L)$	or LOW $\overline{CEA}_n$ or $\overline{CEB}_n$ to $\overline{CPAB}_n$ or $\overline{CPBA}_n$	2.5		2.5		
$t_H(H)$	Hold Time, HIGH	1.5		1.5		ns
$t_H(L)$	or LOW $\overline{CEA}_n$ or $\overline{CEB}_n$ to $\overline{CPAB}_n$ or $\overline{CPBA}_n$	1.5		1.5		
$t_W(H)$	Pulse Width, HIGH	3.0		3.0		ns
$t_W(L)$	or LOW to $\overline{CPAB}_n$ or $\overline{CPBA}_n$	3.0		3.0		
Capacitance						
Symbol	Parameter	Typ	Units	Conditions $T_A = 25^\circ\text{C}$		
$C_{IN}$	Input Capacitance	5	pF	$V_{CC} = 0\text{V}$ (Non I/O Pins)		
$C_{IO}$ (Note 5)	Output Capacitance	11	pF	$V_{CC} = 5.0\text{V}$ ( $A_n$ , $B_n$ )		
<b>Note 5:</b> $C_{IO}$ is measured at frequency $f = 1\text{ MHz}$ , per MIL-STD-883, Method 3012.						

**AC Loading**



\*Includes jig and probe capacitance

**FIGURE 1. Standard AC Test Load**

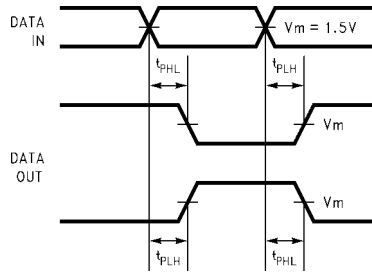


**FIGURE 2. Test Input Signal Levels**

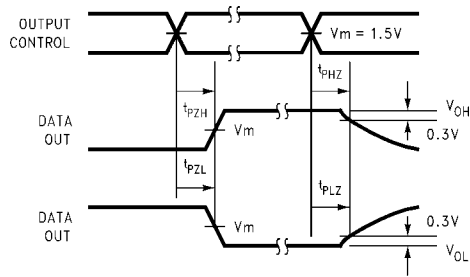
Amplitude	Rep. Rate	$t_w$	$t_r$	$t_f$
3.0V	1 MHz	500 ns	2.5 ns	2.5 ns

**FIGURE 3. Input Signal Requirements**

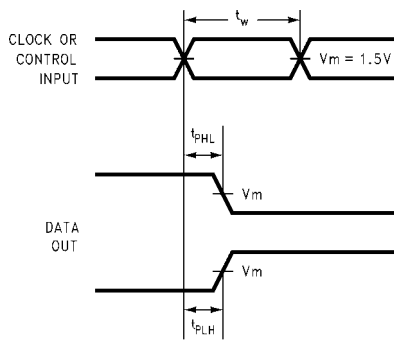
**AC Waveforms**



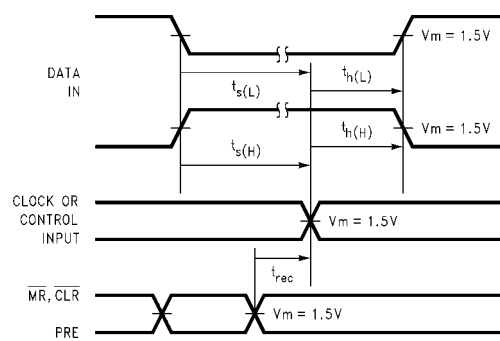
**FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions**



**FIGURE 6. 3-STATE Output HIGH and LOW Enable and Disable Times**

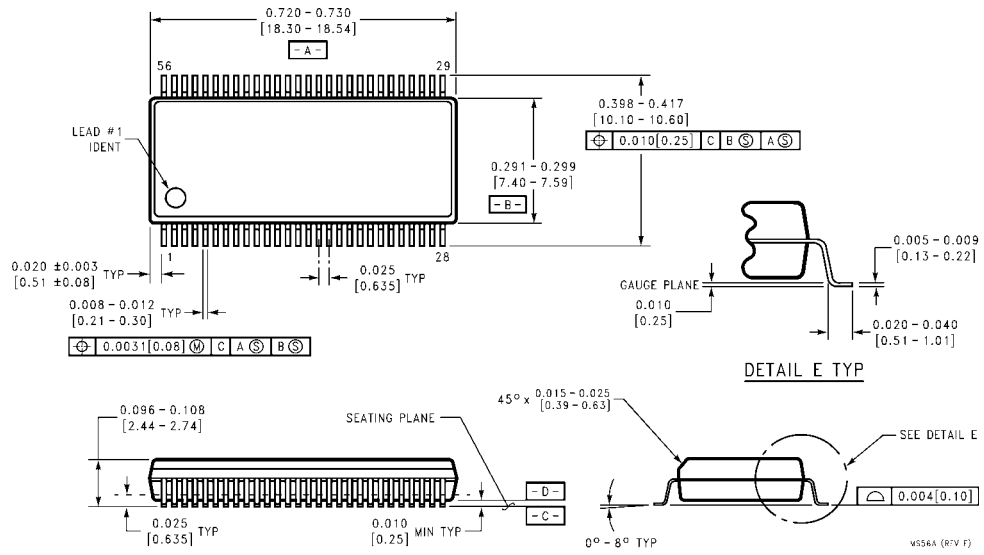


**FIGURE 5. Propagation Delay, Pulse Width Waveforms**



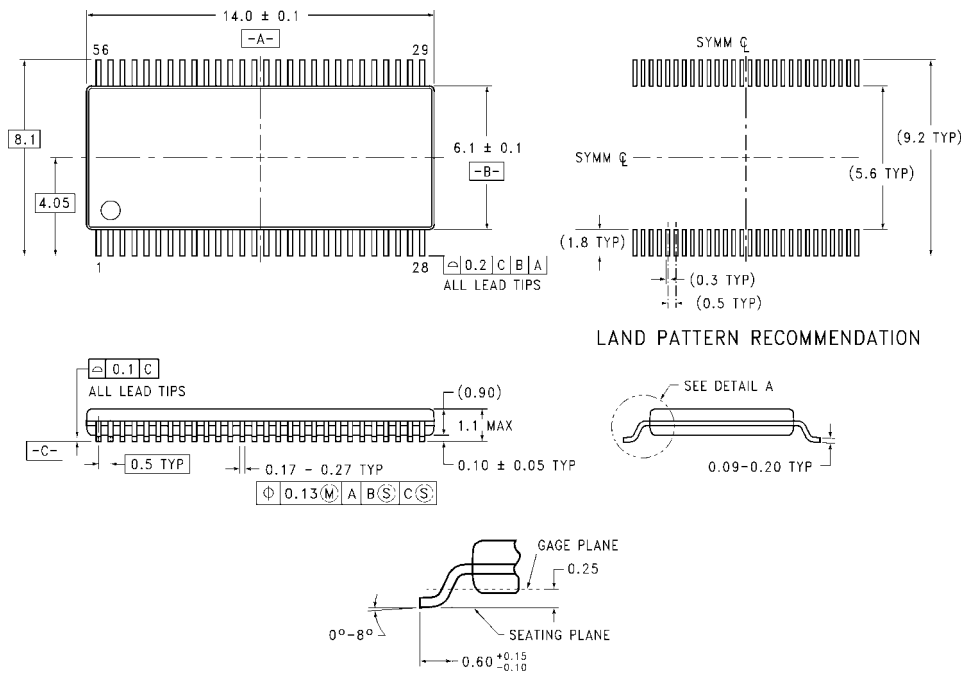
**FIGURE 7. Setup Time, Hold Time and Recovery Time Waveforms**

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



**56-Lead Shrink Small Outline Package (SSOP), JEDEC MO-118, 0.300" Wide  
Package Number MS56A**

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



**56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide  
Package Number MTD56**

MTD56 (REV B)

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