

## 74ABT273 Octal D-Type Flip-Flop

### General Description

The ABT273 has eight edge-triggered D-type flip-flops with individual D inputs and Q outputs. The common buffered Clock (CP) and Master Reset ( $\overline{MR}$ ) inputs load and reset (clear) all flip-flops simultaneously.

The register is fully edge-triggered. The state of each D input, one setup time before the LOW-to-HIGH clock transition, is transferred to the corresponding flip-flop's Q output.

All outputs will be forced LOW independently of Clock or Data inputs by a LOW voltage level on the  $\overline{MR}$  input. The device is useful for applications where the true output only is required and the Clock and Master Reset are common to all storage elements.

### Features

- Eight edge-triggered D-type flip-flops
- Buffered common clock
- Buffered, asynchronous Master Reset
- See ABT377 for clock enable version
- See ABT373 for transparent latch version
- See ABT374 for 3-STATE version
- Output sink capability of 64 mA, source capability of 32 mA
- Guaranteed latching protection
- High impedance glitch free bus loading during entire power up and power down cycle
- Non-destructive hot insertion capability
- Disable time less than enable time to avoid bus contention

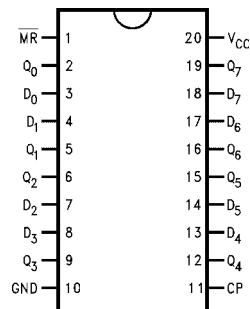
### Ordering Code:

Order Number	Package Number	Package Description
74ABT273CSC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74ABT273CSJ	M20D	Pb-Free 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74ABT273CMSA	MSA20	20-Lead Shrink Small Outline Package (SSOP), JEDEC MO-150, 5.3mm Wide
74ABT273CMTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74ABT273CMTCX_NL (Note 1)	MTC20	Pb-Free 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.  
Pb-Free package per JEDEC J-STD-020B.

**Note 1:** "\_NL" indicates Pb-Free package (per JEDEC J-STD-020B). Device available in Tape and Reel only.

### Connection Diagram



### Pin Descriptions

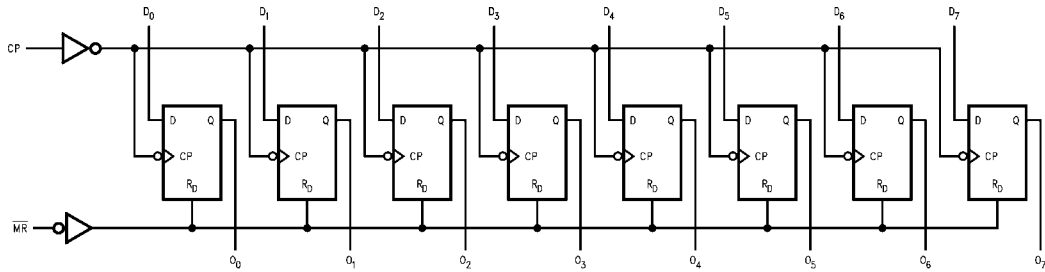
Pin Names	Description
$D_0$ - $D_7$	Data Inputs
$\overline{MR}$	Master Reset (Active LOW)
CP	Clock Pulse Input (Active Rising Edge)
$Q_0$ - $Q_7$	Data Outputs

**Truth Table**

Operating Mode	Inputs			Output
	$\overline{MR}$	CP	$D_n$	$Q_n$
Reset (Clear)	L	X	X	L
Load "1"	H	↗	h	H
Load "0"	H	↗	l	L

H = HIGH Voltage Level steady state  
h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH clock transition  
L = LOW Voltage Level steady state  
l = LOW Voltage Level one setup time prior to the LOW-to-HIGH clock transition  
X = Immaterial  
↗ = LOW-to-HIGH clock transition

**Logic Diagram**



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

**Absolute Maximum Ratings** (Note 2)

Storage Temperature	-65°C to +150°C
Ambient Temperature under Bias	-55°C to +125°C
Junction Temperature under Bias	-55°C to +150°C
V <sub>CC</sub> Pin Potential to Ground Pin	-0.5V to +7.0V
Input Voltage (Note 3)	-0.5V to +7.0V
Input Current (Note 3)	-30 mA to +5.0 mA
Voltage Applied to Any Output in the Disabled or Power-Off State	-0.5V to +4.75V
in the HIGH State	-0.5V to V <sub>CC</sub>
Current Applied to Output in LOW State (Max)	twice the rated I <sub>OL</sub> (mA)
DC Latchup Source Current (Across Comm Operating Range)	-500 mA
Over Voltage Latchup	V <sub>CC</sub> + 4.5V

**Recommended Operating Conditions**

Free Air Ambient Temperature	-40°C to +85°C
Supply Voltage	+4.5V to +5.5V
Minimum Input Edge Rate ( $\Delta V/\Delta t$ )	
Data Input	50 mV/ns
Enable Input	20 mV/ns

**Note 2:** 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 3:** Either voltage limit or current limit is sufficient to protect inputs.

**DC Electrical Characteristics**

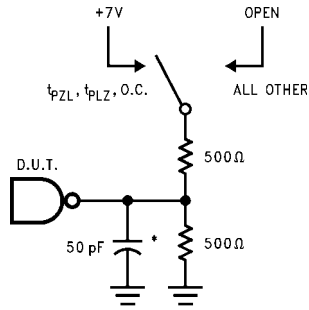
Symbol	Parameter	Min	Typ	Max	Units	V <sub>CC</sub>	Conditions
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized HIGH Signal
V <sub>IL</sub>	Input LOW Voltage			0.8	V		Recognized LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage			-1.2	V	Min	I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	2.5			V	Min	I <sub>OH</sub> = -3 mA I <sub>OH</sub> = -32 mA
V <sub>OL</sub>	Output LOW Voltage			0.55	V	Min	I <sub>OL</sub> = 64 mA
I <sub>IH</sub>	Input HIGH Current			1	μA	Max	V <sub>IN</sub> = 2.7V (Note 4) V <sub>IN</sub> = V <sub>CC</sub>
I <sub>BVI</sub>	Input HIGH Current Breakdown Test			7	μA	Max	V <sub>IN</sub> = 7.0V
I <sub>IL</sub>	Input LOW Current			-1	μA	Max	V <sub>IN</sub> = 0.5V (Note 4) V <sub>IN</sub> = 0.0V
V <sub>ID</sub>	Input Leakage Test	4.75			V	0.0	I <sub>ID</sub> = 1.9 μA All Other Pins Grounded
I <sub>OS</sub>	Output Short-Circuit Current	-100		-275	mA	Max	V <sub>OUT</sub> = 0.0V
I <sub>CEX</sub>	Output HIGH Leakage Current			50	μA	Max	V <sub>OUT</sub> = V <sub>CC</sub>
I <sub>CCH</sub>	Power Supply Current			50	μA	Max	All Outputs HIGH
I <sub>CCL</sub>	Power Supply Current			30	mA	Max	All Outputs LOW
I <sub>CCT</sub>	Maximum I <sub>CC</sub> /Input Outputs Enabled			1.5	mA	Max	V <sub>I</sub> = V <sub>CC</sub> - 2.1V Data Input V <sub>I</sub> = V <sub>CC</sub> - 2.1V All Others at V <sub>CC</sub> or GND
I <sub>CCD</sub>	Dynamic I <sub>CC</sub> No Load			0.3	mA/ MHz	Max	Outputs Open (Note 5) One Bit Toggling, 50% Duty Cycle

**Note 4:** Guaranteed but not tested.

**Note 5:** For 8 bits toggling, I<sub>CCD</sub> < 0.5 mA/MHz.

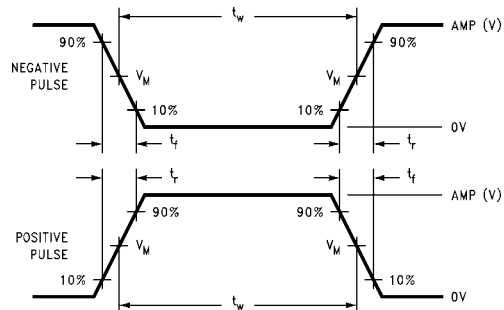
AC Electrical Characteristics									
(SSOIC package)									
Symbol	Parameter	T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> = -55°C to +125°C V <sub>CC</sub> = 4.5V to 5.5V C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C V <sub>CC</sub> = 4.5V to 5.5V C <sub>L</sub> = 50 pF		Units
		Min	Typ	Max	Min	Max	Min	Max	
f <sub>MAX</sub>	Maximum Clock Frequency	150	200		150		150		MHz
t <sub>PLH</sub>	Propagation Delay	2.0		6.0	1.0	7.0	2.0	6.0	ns
t <sub>PHL</sub>	CP to O <sub>n</sub>	2.8		6.8	1.0	7.5	2.8	6.8	
t <sub>PHL</sub>	Propagation Delay MR to O <sub>n</sub>	2.5		7.4	1.0	8.2	2.5	7.4	ns
AC Operating Requirements									
Symbol	Parameter	T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF		T <sub>A</sub> = -55°C to +125°C V <sub>CC</sub> = 4.5V to 5.5V C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C V <sub>CC</sub> = 4.5V to 5.5V C <sub>L</sub> = 50 pF		Units	
		Min	Max	Min	Max	Min	Max		
t <sub>S</sub> (H)	Setup Time, HIGH	2.0		2.0		2.0		ns	
t <sub>S</sub> (L)	or LOW D <sub>n</sub> to CP	2.5		2.5		2.5			
t <sub>H</sub> (H)	Hold Time, HIGH	1.2		1.4		1.2		ns	
t <sub>H</sub> (L)	or LOW D <sub>n</sub> to CP	1.2		1.4		1.2			
t <sub>W</sub> (H)	Pulse Width, CP,	3.3		3.3		3.3		ns	
t <sub>W</sub> (L)	HIGH or LOW	3.3		3.3		3.3			
t <sub>W</sub> (L)	Master Reset Pulse Width, LOW	3.3		3.3		3.3		ns	
t <sub>REC</sub>	Recovery Time MR to CP	2.0		2.0		2.0		ns	
Capacitance									
(SOIC package)									
Symbol	Parameter	Typ	Units	Conditions T <sub>A</sub> = 25°C					
C <sub>IN</sub>	Input Capacitance	5	pF	V <sub>CC</sub> = 0V					
C <sub>OUT</sub> (Note 6)	Output Capacitance	9	pF	V <sub>CC</sub> = 5.0V					
<b>Note 6:</b> C <sub>OUT</sub> is measured at frequency f = 1 MHz, per MIL-STD-833, Method 3012.									

**AC Loading**



\*Includes jig and probe capacitance

**FIGURE 1. Standard AC Test Load**

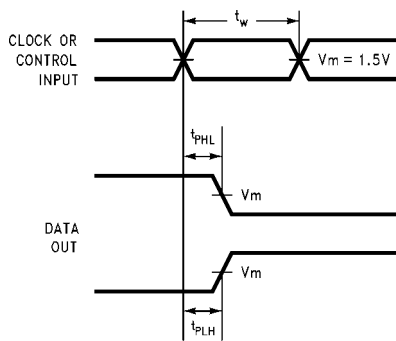


**FIGURE 2.  $V_M = 1.5V$   
Input Pulse Requirements**

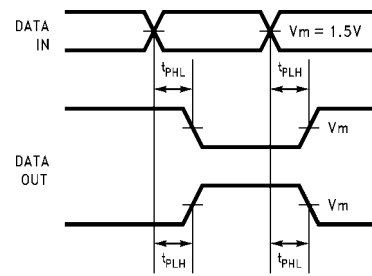
Amplitude	Rep. Rate	$t_w$	$t_r$	$t_f$
3.0V	1 MHz	500 ns	2.5 ns	2.5 ns

**FIGURE 3. Test Input Signal Requirements**

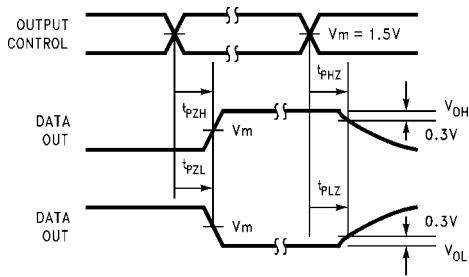
**AC Waveforms**



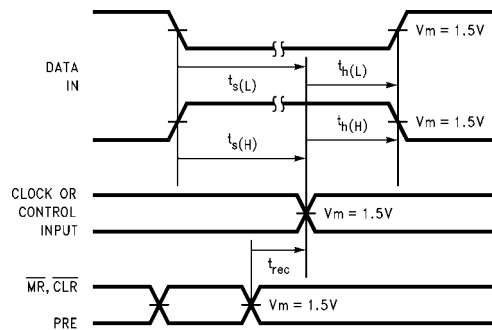
**FIGURE 4. Propagation Delay,  
Pulse Width Waveforms**



**FIGURE 6. Propagation Delay Waveforms for  
Inverting and Non-Inverting Functions**



**FIGURE 5. 3-STATE Output HIGH  
and LOW Enable and Disable Times**



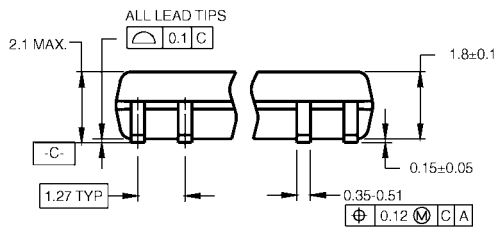
**FIGURE 7. Setup Time, Hold Time  
and Recovery Time Waveforms**



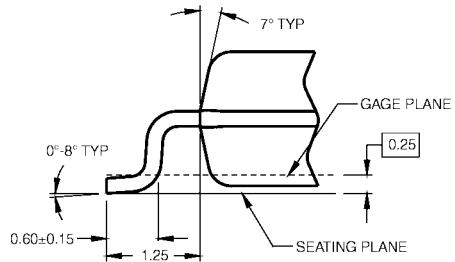
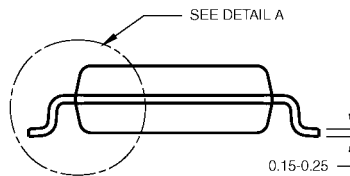
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



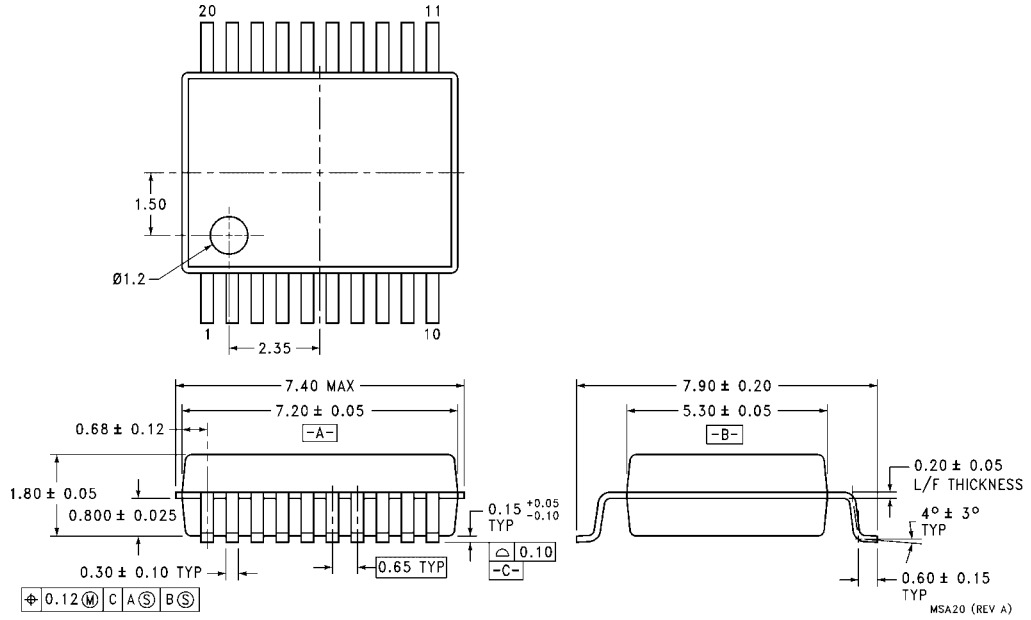
DETAIL A

- 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**

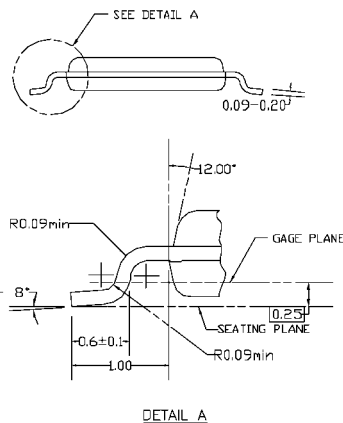
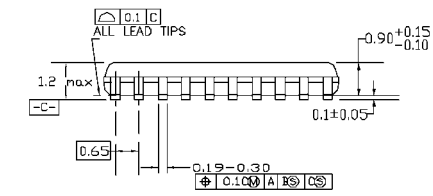
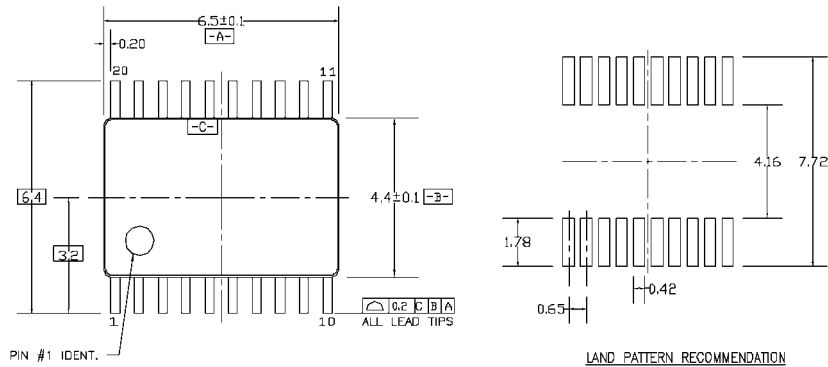
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**20-Lead Shrink Small Outline Package (SSOP), JEDEC MO-150, 5.3mm Wide  
Package Number MSA20**



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



DIMENSIONS ARE IN MILLIMETERS

- 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**

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