

74ABT377

Octal D-Type Flip-Flop with Clock Enable

General Description

The ABT377 has eight edge-triggered, D-type flip-flops with individual D inputs and Q outputs. The common buffered Clock (CP) input loads all flip-flops simultaneously when the Clock Enable ($\overline{CE}$) is LOW.

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. The $\overline{CE}$ input must be stable only one setup time prior to the LOW-to-HIGH clock transition for predictable operation.

Features

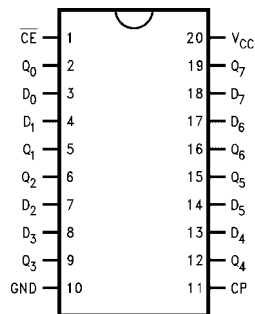
- Clock enable for address and data synchronization applications
- Eight edge-triggered D-type flip-flops
- Buffered common clock
- See ABT273 for master reset version
- See ABT373 for transparent latch version
- See ABT374 for 3-STATE version
- Output sink capability of 64 mA, source capability of 32 mA
- Guaranteed latchup 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
74ABT377CSC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body
74ABT377CSJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74ABT377CMSA	MSA20	20-Lead Shrink Small Outline Package (SSOP), EIAJ TYPE II, 5.3mm Wide
74ABT377CMTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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

Connection Diagram



Pin Descriptions

Pin Names	Descriptions
D_0-D_7	Data Inputs
$\overline{CE}$	Clock Enable (Active LOW)
CP	Clock Pulse Input
Q_0-Q_7	Data Outputs

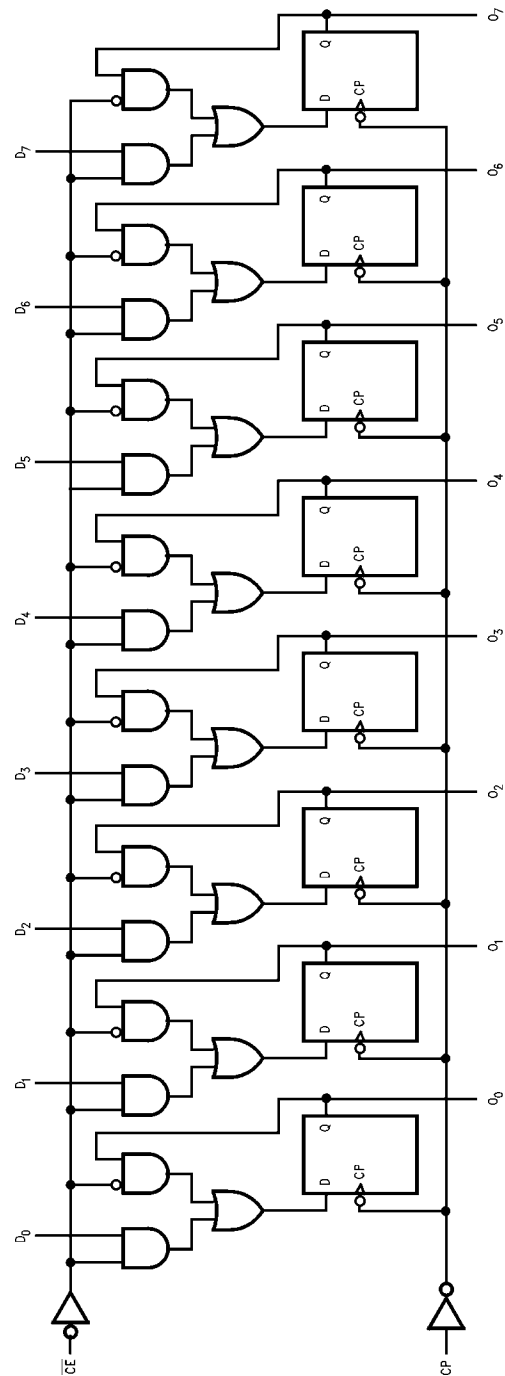
Truth Table

Operating Mode	Inputs			Output
	CP	$\overline{CE}$	D_n	Q_n
Load "1"	↗	L	h	H
Load "0"	↗	L	L	L
Hold (Do Nothing)	↗	h	X	No Change
	X	H	X	No Change

H = HIGH Voltage Level L = LOW Voltage Level
X = Immaterial ↗ = LOW-to-HIGH Clock Transition
h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition
L = LOW Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition

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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 1)

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 _{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 +4.75V
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)	–500 mA
Over Voltage Latchup	V _{CC} + 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 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

DC Electrical Characteristics

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
V _{OH}	Output HIGH Voltage	2.5 2.0			V	Min	I _{OH} = –3 mA I _{OH} = –32 mA
V _{OL}	Output LOW Voltage			0.55	V	Min	I _{OL} = 64 mA
I _{IH}	Input HIGH Current			1 1	μA	Max	V _{IN} = 2.7V (Note 3) V _{IN} = V _{CC}
I _{BVI}	Input HIGH Current Breakdown Test			7	μA	Max	V _{IN} = 7.0V
I _{IL}	Input LOW Current			–1 –1	μA	Max	V _{IN} = 0.5V (Note 3) V _{IN} = 0.0V
V _{ID}	Input Leakage Test	4.75			V	0.0	I _{ID} = 1.9 μA All Other Pins Grounded
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 _{CCH}	Power Supply Current			50	μA	Max	All Outputs HIGH
I _{CCL}	Power Supply Current			30	mA	Max	All Outputs LOW
I _{CCT}	Maximum I _{CC} /Input Outputs Enabled			1.5	mA	Max	V _I = V _{CC} – 2.1V Data Input V _I = V _{CC} – 2.1V All Others at V _{CC} or GND
I _{CCD}	Dynamic I _{CC} No Load			0.3	mA/ MHz	Max	Outputs Open (Note 4) One bit Toggling, 50% Duty Cycle

Note 3: Guaranteed but not tested.

Note 4: For 8 bits toggling, I_{CCD} < 0.5 mA/MHz.

AC Electrical Characteristics

(SOIC Package)

Symbol	Parameter	T _A = +25°C V _{CC} = +5.0V C _L = 50 pF			T _A = -40°C to +85°C V _{CC} = 4.5V to 5.5V C _L = 50 pF		Units
		Min	Typ	Max	Min	Max	
f _{MAX}	Maximum Clock Frequency	150	200		150		MHz
t _{PLH}	Propagation Delay	2.2		6.0	2.2	6.0	ns
t _{PHL}	CP to O _n	2.8		6.8	2.8	6.8	

AC Operating Requirements

Symbol	Parameter	T _A = +25°C V _{CC} = +5.0V C _L = 50 pF		T _A = -40°C to +85°C V _{CC} = 4.5V to 5.5V C _L = 50 pF		Units
		Min	Max	Min	Max	
t _S (H)	Setup Time, HIGH	2.0		2.0		ns
t _S (L)	or LOW D _n to CP	2.0		2.0		
t _H (H)	Hold Time, HIGH	1.8		1.8		ns
t _H (L)	or LOW D _n to CP	1.8		1.8		
t _S (H)	Setup Time, HIGH	3.0		3.0		ns
t _S (L)	or LOW $\overline{\text{CE}}$ to CP	3.0		3.0		
t _H (H)	Hold Time, HIGH	1.0		1.0		ns
t _H (L)	or LOW $\overline{\text{CE}}$ to CP	1.0		1.0		
t _W (H)	Pulse Width, CP,	3.3		3.3		ns
t _W (L)	HIGH or LOW	3.3		3.3		

Capacitance

(SOIC Package) (Note 5)

Symbol	Parameter	Typ	Units	Conditions
C _{IN}	Input Capacitance	5	pF	V _{CC} = 0V, T _A = 25°C
C _{OUT} (Note 5)	Output Capacitance	9	pF	V _{CC} = 5.0V

Note 5: C_{OUT} is measured at frequency f = 1 MHz, per MIL-STD-883, Method 3012.

AC Loading

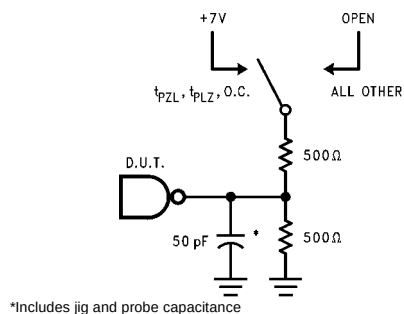


FIGURE 1. Standard AC Test Load

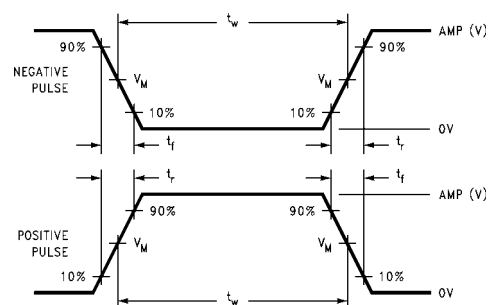


FIGURE 2. $V_M = 1.5V$

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

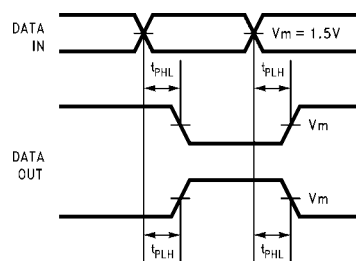


FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions

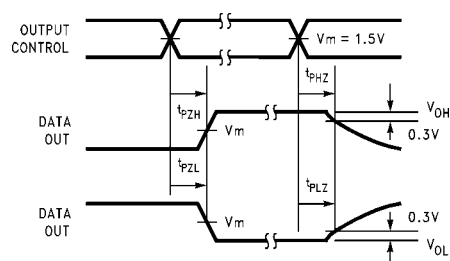


FIGURE 6. 3-STATE Output HIGH and LOW Enable and Disable Times

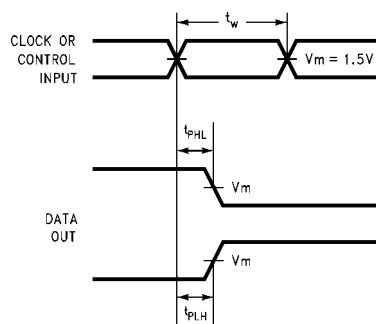


FIGURE 5. Propagation Delay, Pulse Width Waveforms

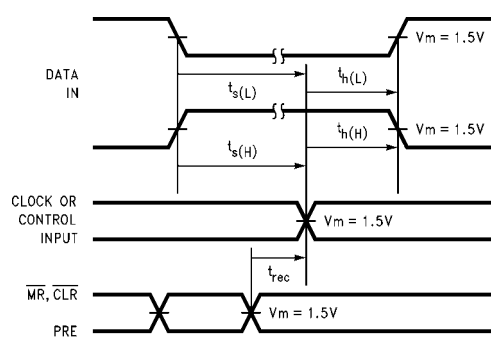
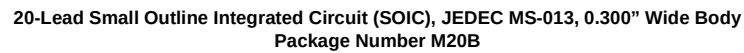
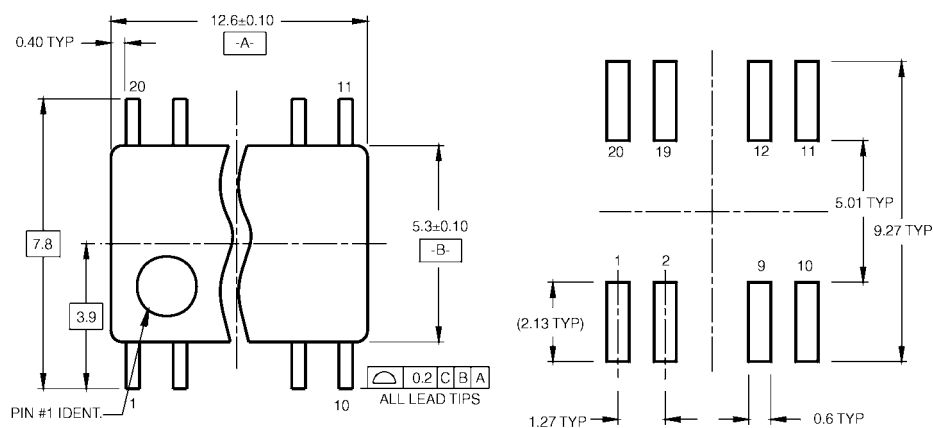
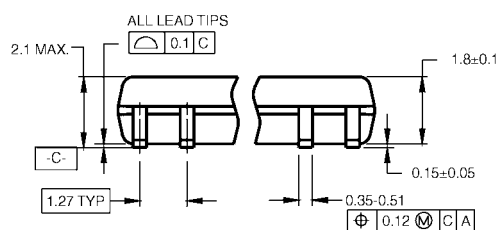
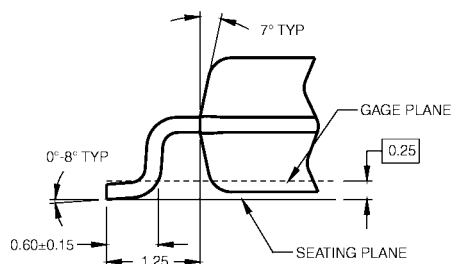
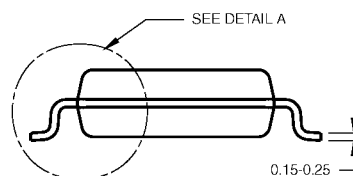


FIGURE 7. Setup Time, Hold Time and Recovery Time Waveforms



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

LAND PATTERN RECOMMENDATION


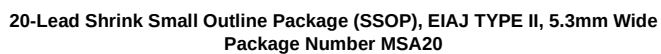
DIMENSIONS ARE IN MILLIMETERS


DETAIL A
NOTES:

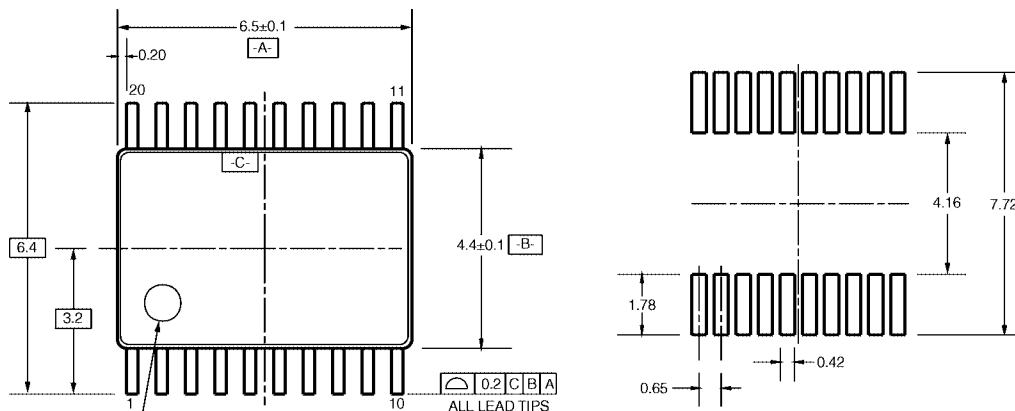
- CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

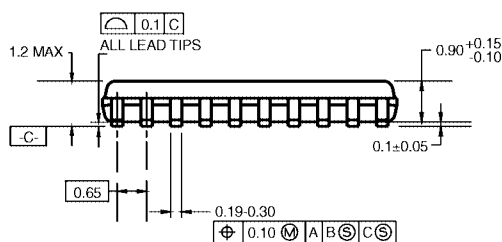
20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M20D



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



LAND PATTERN RECOMMENDATION

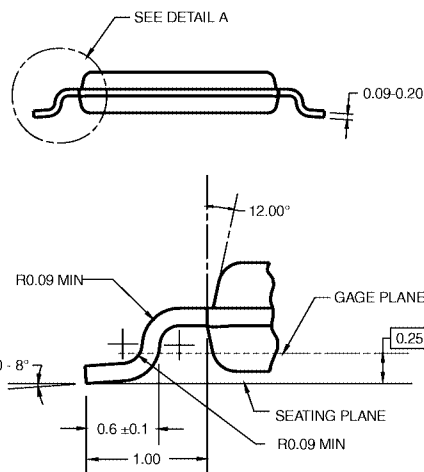


DIMENSIONS ARE IN MILLIMETERS

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, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20RevD1



DETAIL A

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

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