

## 54ABT377

### 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

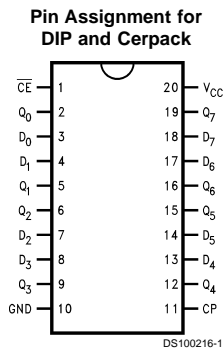
- Clock enable for address and data synchronization applications

- Eight edge-triggered D flip-flops
- Buffered common clock
- See 'ABT273 for master reset version
- See 'ABT373 for transparent latch version
- See 'ABT374 for TRI-STATE® version
- Output sink capability of 48 mA, source capability of 24 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
- Standard Microcircuit Drawing (SMD) 5962-9314801

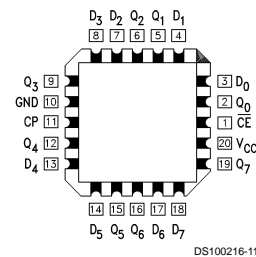
#### Ordering Code:

Military	Package Number	Package Description
54ABT377J-QML	J20A	20-Lead Ceramic Dual-In-Line
54ABT377W-QML	W20A	20-Lead Cerpac
54ABT377E-QML	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

#### Connection Diagram



#### Pin Assignment for LCC



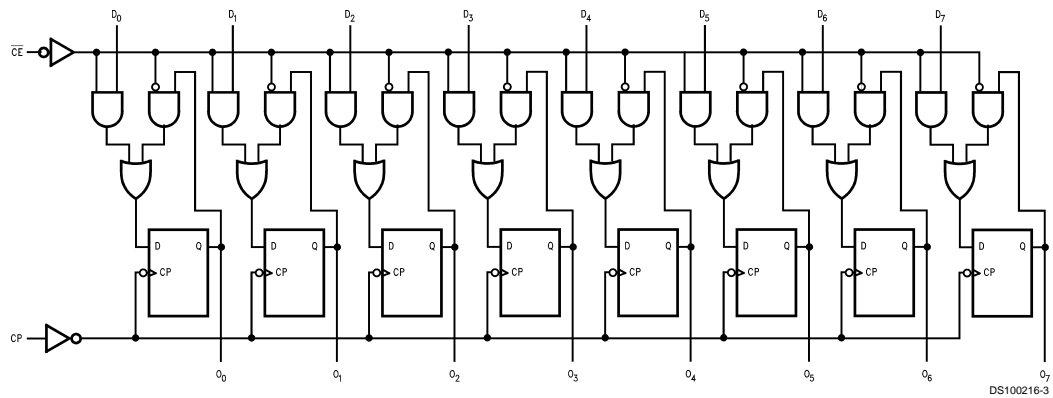
## Truth Table

Mode Select-Function Table

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

H = HIGH Voltage Level  
h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition  
L = LOW Voltage Level  
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 1)

Storage Temperature	-65°C to +150°C
Ambient Temperature under Bias	-55°C to +125°C
Junction Temperature under Bias	
Ceramic	-55°C to +175°C
V <sub>CC</sub> 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 <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	
Military	-55°C to +125°C
Supply Voltage	
Military	+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	ABT377			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
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	54ABT	2.5		V	Min	I <sub>OH</sub> = -3 mA
		54ABT	2.0				I <sub>OH</sub> = -24 mA
V <sub>OL</sub>	Output LOW Voltage	54ABT		0.55	V	Min	I <sub>OL</sub> = 48 mA
I <sub>IH</sub>	Input HIGH Current		5		μA	Max	V <sub>IN</sub> = 2.7V (Note 4)
			5				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		-5		μA	Max	V <sub>IN</sub> = 0.5V (Note 4)
			-5				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 3) One bit Toggling, 50% Duty Cycle

**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.

**Note 3:** For 8 bits toggling, I<sub>CCD</sub> < 0.5 mA/MHz.

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

## AC Electrical Characteristics

Symbol	Parameter	54ABT		Units
		$T_A = -55^\circ\text{C to }+125^\circ\text{C}$ $V_{CC} = 4.5\text{V to }5.5\text{V}$ $C_L = 50\text{ pF}$		
		Min	Max	
$f_{\text{max}}$	Max Clock Frequency	150		MHz
$t_{\text{PLH}}$	Propagation Delay	2.2	6.0	ns
$t_{\text{PHL}}$	CP to $O_n$	2.8	6.8	

## AC Operating Requirements

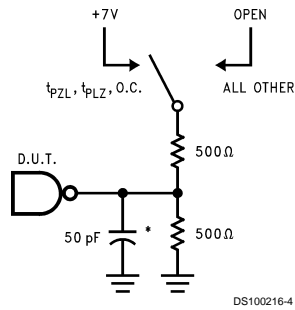
Symbol	Parameter	54ABT		Units
		$T_A = -55^\circ\text{C to }+125^\circ\text{C}$ $V_{CC} = 4.5\text{V to }5.5\text{V}$ $C_L = 50\text{ pF}$		
		Min	Max	
$t_s(\text{H})$	Setup Time, HIGH	2.0		ns
$t_s(\text{L})$	or LOW $D_n$ to CP	2.0		
$t_h(\text{H})$	Hold Time, HIGH	1.8		ns
$t_h(\text{L})$	or LOW $D_n$ to CP	1.8		
$t_s(\text{H})$	Setup Time, HIGH	3.0		ns
$t_s(\text{L})$	or LOW $\overline{\text{CE}}$ to CP	3.0		
$t_h(\text{H})$	Hold Time, HIGH	1.0		ns
$t_h(\text{L})$	or LOW $\overline{\text{CE}}$ to CP	1.0		
$t_w(\text{H})$	Pulse Width, CP,	3.3		ns
$t_w(\text{L})$	HIGH or LOW	3.3		

## Capacitance

Symbol	Parameter	Typ	Units	Conditions
$C_{\text{IN}}$	Input Capacitance	5	pF	$V_{CC} = 0\text{V}$ , $T_A = 25^\circ\text{C}$
$C_{\text{OUT}}$ (Note 5)	Output Capacitance	9	pF	$V_{CC} = 5.0\text{V}$

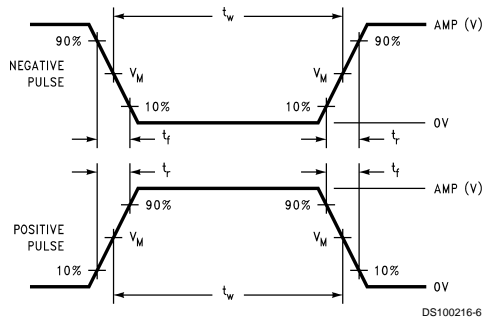
**Note 5:**  $C_{\text{OUT}}$  is measured at frequency  $f = 1\text{ MHz}$ , per MIL-STD-883B, Method 3012.

## AC Loading



\*Includes jig and probe capacitance

**FIGURE 1. Standard AC Test Load**

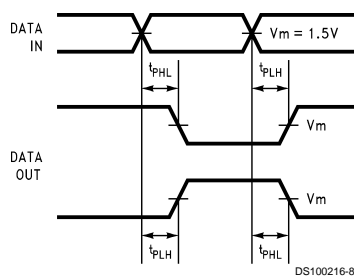


**FIGURE 2.  $V_M = 1.5V$**

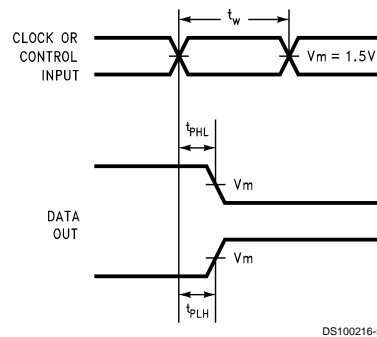
### Input Pulse Requirements

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

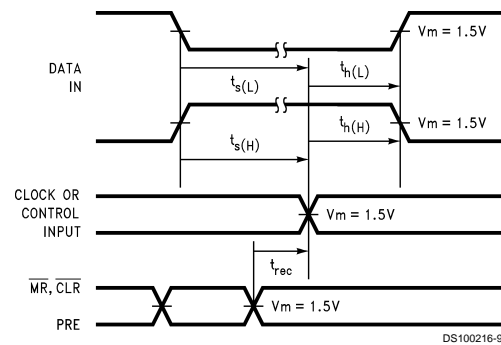
**FIGURE 3. Test Input Signal Requirements**



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

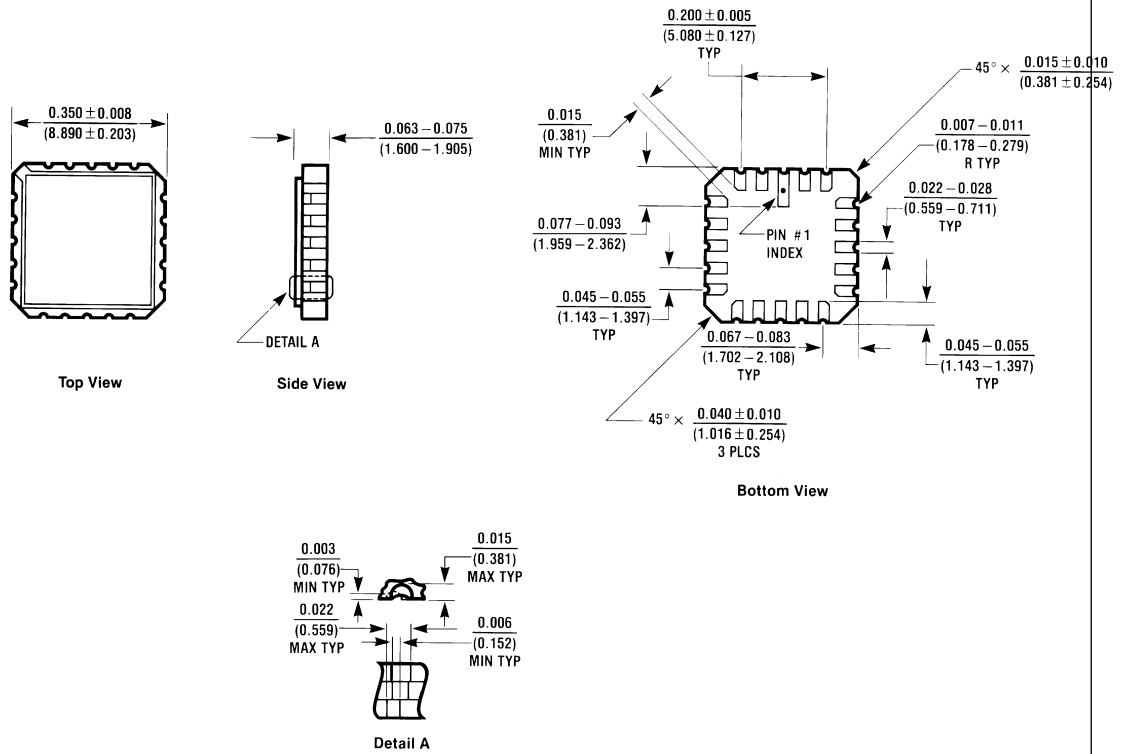


**FIGURE 5. Propagation Delay, Pulse Width Waveforms**



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

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



**20-Lead Ceramic Chip Carrier  
 NS Package Number E20A**

E20A (REV D)



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