Chipsmall

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DATA SHEET

74ABT377A

Octal D-type flip-flop with enable

Philips
Semiconductors

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Octal D-type flip-flop with enable

74ABT377A

FEATURES

● Ideal for addressable register applications

● 8-bit positive edge-triggered register

● Enable for address and data synchronization applications

● Output capability: +64mA/-32mA

● Latch-up protection exceeds 500mA per Jedec JC40.2 Std 17

● ESD protection exceeds 2000V per MIL STD 883 Method 3015 and 200V per Machine Model

● Power-up reset

DESCRIPTION

The 74ABT377A high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT377A has 8 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 Enable ($\overline{E}$) input is Low.

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

The $\overline{E}$ input must be stable one setup time prior to the Low-to-High clock transition for predictable operation.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T_{amb} = 25°C; GND = 0V	TYPICAL	UNIT
t_{PLH} t_{PHL}	Propagation delay CP to Qn	C_L = 50pF; V_{CC} = 5V	3.1 3.6	ns
C_{IN}	Input capacitance	V_I = 0V or V_{CC}	4	pF
I_{CCH}	Total current supply	Outputs High; V_{CC} = 5.5V	500	nA

ORDERING INFORMATION

| PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
20-Pin Plastic DIP	−40°C to +85°C	74ABT377A N	74ABT377A N	SOT146-1
20-Pin plastic SO	−40°C to +85°C	74ABT377A D	74ABT377A D	SOT163-1
20-Pin Plastic SSOP Type II	−40°C to +85°C	74ABT377A DB	74ABT377A DB	SOT339-1
20-Pin Plastic TSSOP Type I	−40°C to +85°C	74ABT377A PW	74ABT377PWA DH	SOT360-1

PIN CONFIGURATION

SA00155

LOGIC SYMBOL

SA00152
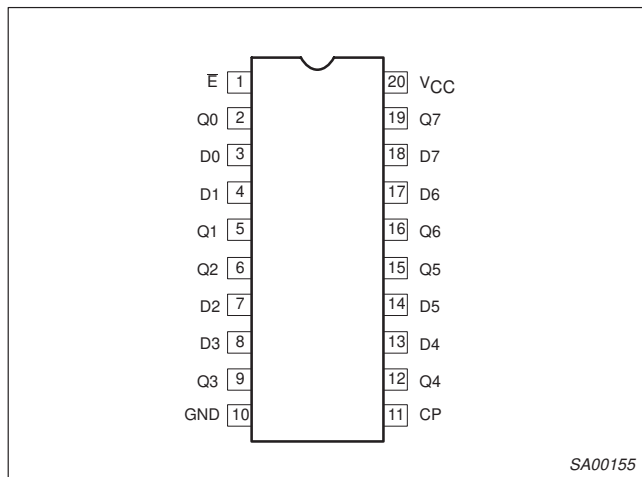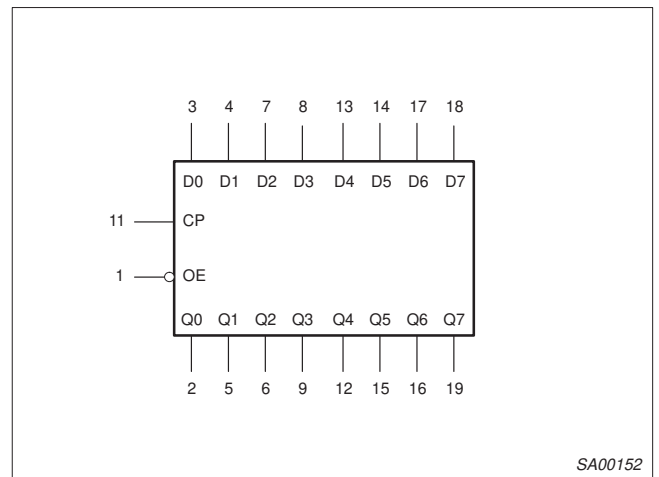
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LOGIC SYMBOL (IEEE/IEC)

SA00157
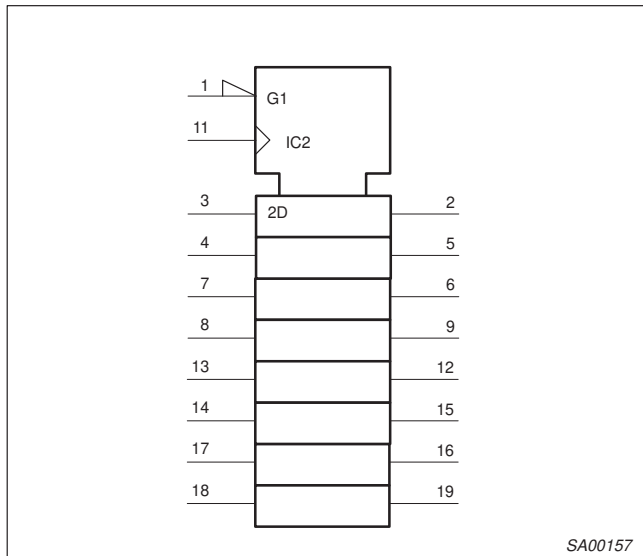
PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
1	$\overline{E}$	Enable input (active–Low)
3, 4, 7, 8, 13, 14, 17, 18	D0-D7	Data inputs
2, 5, 6, 9, 12, 15, 16, 19	Q0-Q7	Data outputs
11	CP	Clock Pulse input (active rising edge)
10	GND	Ground (0V)
20	V_{CC}	Positive supply voltage

LOGIC DIAGRAM

SA00158
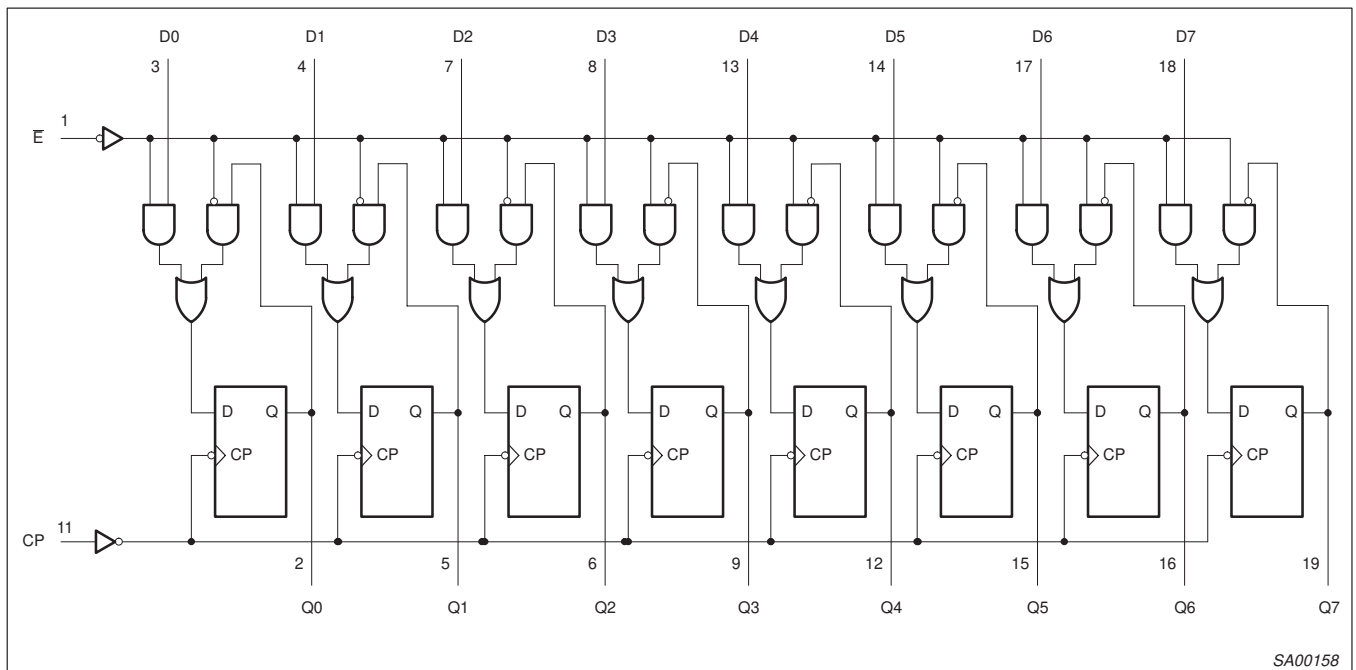
Octal D-type flip-flop with enable

FUNCTION TABLE

INPUTS			OUTPUTS	OPERATING MODE
$\overline{E}$	CP	Dn	Qn	
l	↑	h	H	Load "1"
l	↑	l	L	Load "0"
h H	↑ X	X X	no change no change	Hold (do nothing)

H = High voltage level
h = High voltage level one set-up time prior to the Low-to-High clock transition
L = Low voltage level
l = Low voltage level one set-up time prior to the Low-to-High clock transition
X = Don't care
↑ = Low-to-High clock transition

ABSOLUTE MAXIMUM RATINGS[1, 2]

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		−0.5 to +7.0	V
I_{IK}	DC input diode current	$V_I < 0$	−18	mA
V_I	DC input voltage[3]		−1.2 to +7.0	V
I_{OK}	DC output diode current	$V_O < 0$	−50	mA
V_{OUT}	DC output voltage[3]	output in Off or High state	−0.5 to +5.5	V
I_{OUT}	DC output current	output in Low state	128	mA
T_{stg}	Storage temperature range		−65 to 150	°C

NOTES:
1. Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
2. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
3. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		MIN	MAX	
V_{CC}	DC supply voltage	4.5	5.5	V
V_I	Input voltage	0	V_{CC}	V
V_{IH}	High-level input voltage	2.0		V
V_{IL}	Low-level input voltage		0.8	V
I_{OH}	High-level output current		−32	mA
I_{OL}	Low-level output current		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	0	5	ns/V
T_{amb}	Operating free-air temperature range	−40	+85	°C

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DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			T_{amb} = +25°C			T_{amb} = −40°C to +85°C		
			MIN	TYP	MAX	MIN	MAX	
V_{IK}	Input clamp voltage	V_{CC} = 4.5V; I_{IK} = −18mA		−0.9	−1.2		−1.2	V
V_{OH}	High–level output voltage	V_{CC} = 4.5V; I_{OH} = −3mA; V_I = V_{IL} or V_{IH}	2.5	2.9		2.5		V
		V_{CC} = 5.0V; I_{OH} = −3mA; V_I = V_{IL} or V_{IH}	3.0	3.4		3.0		V
		V_{CC} = 4.5V; I_{OH} = −32mA; V_I = V_{IL} or V_{IH}	2.0	2.4		2.0		V
V_{OL}	Low-level output voltage	V_{CC} = 4.5V; I_{OL} = 64mA; V_I = V_{IL} or V_{IH}		0.42	0.55		0.55	V
V_{RST}	Power-up output low voltage[3]	V_{CC} = 5.5V; I_O = 1mA; V_I = GND or V_{CC}		0.13	0.55		0.55	V
I_I	Input leakage current	V_{CC} = 5.5V; V_I = GND or 5.5V		±0.01	±1.0		±1.0	μA
I_{OFF}	Power-off leakage current	V_{CC} = 0.0V; V_O or $V_I \le$ 4.5V		±5.0	±100		±100	μA
I_{CEX}	Output High leakage current	V_{CC} = 5.5V; V_O = 5.5V; V_I = GND or V_{CC}		5.0	50		50	μA
I_O	Output current[1]	V_{CC} = 5.5V; V_O = 2.5V	−50	−100	−180	−50	−180	mA
I_{CCH}	Quiescent supply current	V_{CC} = 5.5V; Outputs High, V_I = GND or V_{CC}		0.5	250		250	μA
I_{CCL}		V_{CC} = 5.5V; Outputs Low, V_I = GND or V_{CC}		24	30		30	mA
ΔI_{CC}	Additional supply current per input pin[2]	V_{CC} = 5.5V; one input at 3.4V, other inputs at V_{CC} or GND		0.5	1.5		1.5	mA

NOTES:
1. Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
2. This is the increase in supply current for each input at 3.4V.
3. For valid test results, data must not be loaded into the flip-flops (or latches) after applying the power.

AC CHARACTERISTICS
GND = 0V, t_R = t_F = 2.5ns, C_L = 50pF, R_L = 500Ω

SYMBOL	PARAMETER	WAVEFORM	LIMITS[1]					UNIT
			T_{amb} = +25°C V_{CC} = +5.0V			T_{amb} = -40 to +85°C V_{CC} = +5.0V ±0.5V		
			MIN	TYP	MAX	MIN	MAX	
f_{MAX}	Maximum clock frequency	1	150	250		150		MHz
t_{PLH} t_{PHL}	Propagation delay CP to Qn	1	1.8 2.2	3.1 3.6	4.0 4.7	1.8 2.2	4.8 4.9	ns

NOTE:
1. Limits may vary among suppliers.
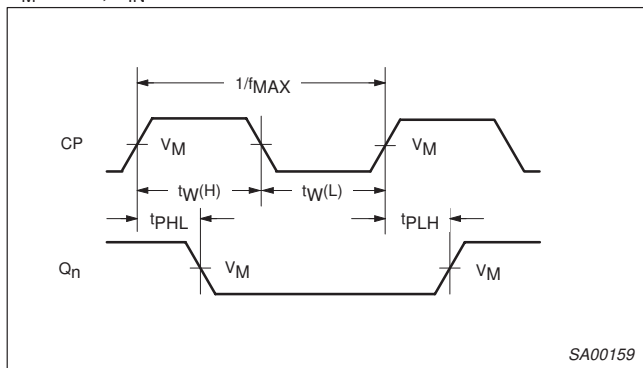
Octal D-type flip-flop with enable

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AC SETUP REQUIREMENTS

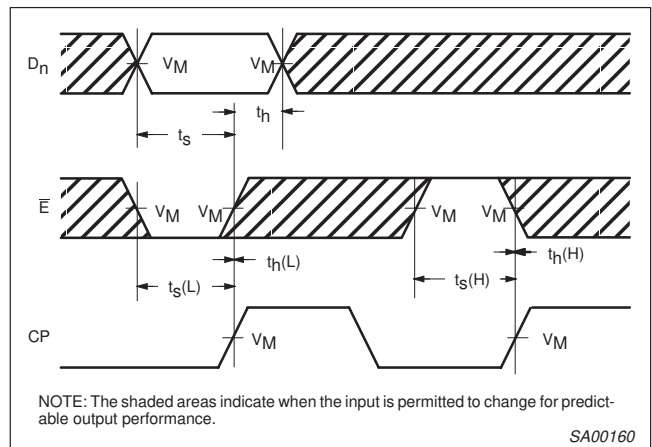GND = 0V, t_R = t_F = 2.5ns, C_L = 50pF, R_L = 500Ω

SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			T_{amb} = +25°C V_{CC} = +5.0V		T_{amb} = -40 to +85°C V_{CC} = +5.0V $\pm$0.5V	
			MIN	TYP	MIN	
$t_s(H)$ $t_s(L)$	Setup time, High or Low Dn to CP	2	1.5 1.5	0.7 0.5	1.5 1.5	ns
$t_h(H)$ $t_h(L)$	Hold time, High or Low Dn to CP	2	1.0 1.0	−0.4 −0.6	1.0 1.0	ns
$t_s(H)$ $t_s(L)$	Setup time, High or Low $\overline{E}$ to CP	2	2.0 2.0	1.1 1.0	2.0 2.0	ns
$t_h(H)$ $t_h(L)$	Hold time, High or Low $\overline{E}$ to CP	2	1.0 1.0	−0.9 −0.1	1.0 1.0	ns
$t_w(H)$ $t_w(L)$	Clock Pulse width High or Low	1	1.5 2.0	0.7 1.0	1.5 2.0	ns

AC WAVEFORMS

V_M = 1.5V, V_{IN} = GND to 3.0V

Waveform 1. Propagation Delay, Clock Input to Output, Clock Pulse Width and Maximum Clock Frequency

NOTE: The shaded areas indicate when the input is permitted to change for predictable output performance.

Waveform 2. Data and Enable Setup and Hold Times

Octal D-type flip-flop with enable

TEST CIRCUIT AND WAVEFORM
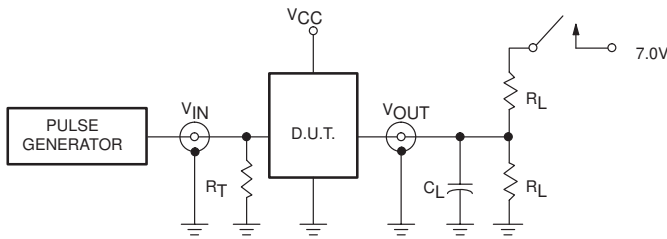
Test Circuit for 3-State Outputs

$V_M = 1.5V$

Input Pulse Definition

SWITCH POSITION

TEST	SWITCH
All	open

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	t_W	t_R	t_F
74ABT	3.0V	1MHz	500ns	2.5ns	2.5ns

SA00057

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DIP20: **plastic dual in-line package; 20 leads (300 mil)**

SOT146-1

Octal D-type flip-flop with enable

74ABT377

SO20:   plastic small outline package; 20 leads; body width 7.5 mm   **SOT163-1**

Octal D-type flip-flop with enable

74ABT377

SSOP20:   plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1

Octal D-type flip-flop with enable

74ABT377

TSSOP20: **plastic thin shrink small outline package; 20 leads; body width 4.4 mm**

SOT360-1