

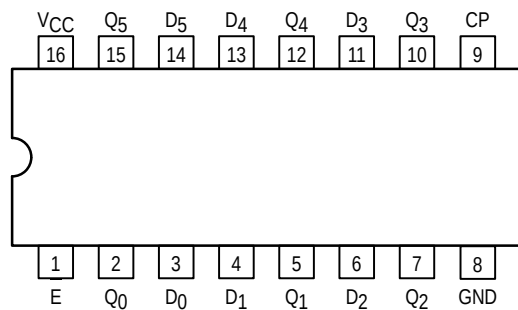


MC74AC378 MC74ACT378

Parallel D Register with Enable

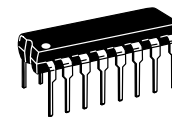
The MC74AC378/74ACT378 is a 6-bit register with a buffered common Enable. This device is similar to the MC74AC174/74ACT174, but with common Enable rather than common Master Reset.

- 6-Bit High-Speed Parallel Register
- Positive Edge-Triggered D-Type Inputs
- Fully Buffered Common Clock and Enable Inputs
- Outputs Source/Sink 24 mA
- 'ACT378 Has TTL Compatible Inputs

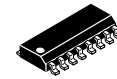


PIN NAMES

$\bar{E}$ Enable Input
D₀–D₅ Data Inputs
CP Clock Pulse Input
Q₀–Q₅ Outputs



N SUFFIX
CASE 648-08
PLASTIC



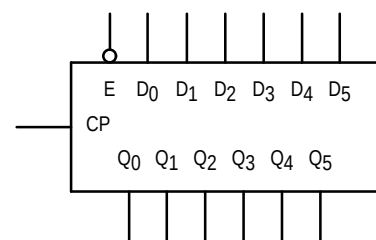
D SUFFIX
CASE 751B-05
PLASTIC

TRUTH TABLE

Inputs			Outputs
$\bar{E}$	CP	D _n	Q _n
H	$\lceil$	X	No Change
L	$\lceil$	H	H
L	$\lceil$	L	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
 $\lceil$ = LOW-to-HIGH Transition

LOGIC SYMBOL



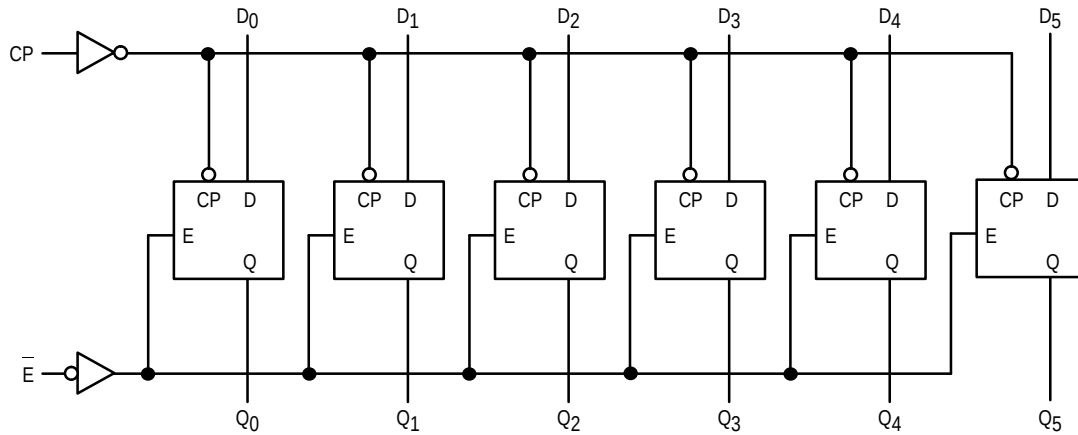
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FUNCTIONAL DESCRIPTION

The MC74AC378/74ACT378 consists of six edge-triggered D-type flip-flops with individual D inputs and Q outputs. The Clock (CP) and Enable (E) inputs are common to all flip-flops.

When the $\bar{E}$ input is LOW, new data is entered into the register on the LOW-to-HIGH transition of the CP input. When the E input is HIGH, the register will retain the present data independent of the CP input.

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.

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	-0.5 to +7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	-0.5 to $V_{CC} + 0.5$	V
V_{out}	DC Output Voltage (Referenced to GND)	-0.5 to $V_{CC} + 0.5$	V
I_{in}	DC Input Current, per Pin	± 20	mA
I_{out}	DC Output Sink/Source Current, per Pin	± 50	mA
I_{CC}	DC V_{CC} or GND Current per Output Pin	± 50	mA
T_{stg}	Storage Temperature	-65 to +150	°C

* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

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RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit
V _{CC}	Supply Voltage	'AC	2.0	5.0	V
		'ACT	4.5	5.0	
V _{in} , V _{out}	DC Input Voltage, Output Voltage (Ref. to GND)	0		V _{CC}	V
t _r , t _f	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	V _{CC} @ 3.0 V	150		ns/V
		V _{CC} @ 4.5 V	40		
		V _{CC} @ 5.5 V	25		
t _r , t _f	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	V _{CC} @ 4.5 V	10		ns/V
		V _{CC} @ 5.5 V	8.0		
T _J	Junction Temperature (PDIP)			140	°C
T _A	Operating Ambient Temperature Range	−40	25	85	°C
I _{OH}	Output Current — High			−24	mA
I _{OL}	Output Current — Low			24	mA

1. V_{in} from 30% to 70% V_{CC}; see individual Data Sheets for devices that differ from the typical input rise and fall times.

2. V_{in} from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

DC CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	74AC		74AC		Unit	Conditions
			T _A = +25°C		T _A = −40°C to +85°C			
			Typ	Guaranteed Limits				
V _{IH}	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1	V	V _{OUT} = 0.1 V or V _{CC} − 0.1 V	
		4.5	2.25	3.15	3.15			
		5.5	2.75	3.85	3.85			
V _{IL}	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9	V	V _{OUT} = 0.1 V or V _{CC} − 0.1 V	
		4.5	2.25	1.35	1.35			
		5.5	2.75	1.65	1.65			
V _{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	V	I _{OUT} = −50 μA	
		4.5	4.49	4.4	4.4			
		5.5	5.49	5.4	5.4			
		3.0		2.56	2.46	V	*V _{IN} = V _{IL} or V _{IH} −12 mA I _{OH} −24 mA −24 mA	
		4.5		3.86	3.76			
		5.5		4.86	4.76			
V _{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	V	I _{OUT} = 50 μA	
		4.5	0.001	0.1	0.1			
		5.5	0.001	0.1	0.1			
		3.0		0.36	0.44	V	*V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA	
		4.5		0.36	0.44			
		5.5		0.36	0.44			
I _{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V _I = V _{CC} , GND	
I _{OLD}	†Minimum Dynamic Output Current	5.5			75	mA	V _{OLD} = 1.65 V Max	
I _{OHD}		5.5			−75	mA	V _{OHD} = 3.85 V Min	
I _{CC}	Maximum Quiescent Supply Current	5.5		8.0	80	μA	V _{IN} = V _{CC} or GND	

* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

Note: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

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AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V _{CC} * (V)	74AC			74AC		Unit	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
f _{max}	Maximum Clock Frequency	3.3 5.0	125 160			110 145		MHz	3-3
t _{PLH}	Propagation Delay CP to Q _N	3.3 5.0	2.5 1.5		11 8.0	2.5 1.5	12.5 9.0	ns	3-6
t _{PHL}	Propagation Delay CP to Q _N	3.3 5.0	2.5 1.5		10.5 7.5	2.5 1.5	11 8.0	ns	3-6

* Voltage Range 3.3 V is 3.3 V ±0.3 V.
Voltage Range 5.0 V is 5.0 V ±0.5 V.

AC OPERATING REQUIREMENTS

Symbol	Parameter	V _{CC} * (V)	74AC		74AC	Unit	Fig. No.
			T _A = +25°C C _L = 50 pF		T _A = -40°C to +85°C C _L = 50 pF		
			Typ	Guaranteed Minimum			
t _s	Setup Time, HIGH or LOW D _n to CP	3.3 5.0		3.0 2.0	3.5 2.5	ns	3-9
t _h	Hold Time, HIGH or LOW D _n to CP	3.3 5.0		2.0 2.0	2.0 2.0	ns	3-9
t _s	Setup Time, HIGH or LOW E to CP	3.3 5.0		2.0 2.0	2.0 2.0	ns	3-9
t _h	Hold Time, HIGH or LOW E to CP	3.3 5.0		2.0 2.0	2.0 2.0	ns	3-9
t _w	CP Pulse Width HIGH or LOW	3.3 5.0		4.5 3.5	5.5 4.0	ns	3-6

* Voltage Range 3.3 V is 3.3 V ±0.3 V.
Voltage Range 5.0 V is 5.0 V ±0.5 V.

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DC CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	74ACT		74ACT		Unit	Conditions
			T _A = +25°C		T _A = –40°C to +85°C			
			Typ	Guaranteed Limits				
V _{IH}	Minimum High Level Input Voltage	4.5 5.5	1.5 1.5	2.0 2.0	2.0 2.0	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V	
V _{IL}	Maximum Low Level Input Voltage	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V	
V _{OH}	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	V	I _{OUT} = –50 μA	
		4.5 5.5		3.86 4.86	3.76 4.76	V	*V _{IN} = V _{IL} or V _{IH} –24 mA I _{OH} –24 mA	
V _{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	V	I _{OUT} = 50 μA	
		4.5 5.5		0.36 0.36	0.44 0.44	V	*V _{IN} = V _{IL} or V _{IH} 24 mA I _{OL} 24 mA	
I _{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V _I = V _{CC} , GND	
ΔI _{CCT}	Additional Max. I _{CC} /Input	5.5	0.6		1.5	mA	V _I = V _{CC} – 2.1 V	
I _{OLD}	†Minimum Dynamic Output Current	5.5			75	mA	V _{OLD} = 1.65 V Max	
I _{OHD}		5.5			–75	mA	V _{OHD} = 3.85 V Min	
I _{CC}	Maximum Quiescent Supply Current	5.5		8.0	80	μA	V _{IN} = V _{CC} or GND	

* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V _{CC} * (V)	74ACT			74ACT		Unit	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = −40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
f _{max}	Maximum Clock Frequency	5.0	140			120		MHz	3-3
t _{PLH}	Propagation Delay CP to O _N	5.0	2.0		10	1.5	11	ns	3-6
t _{PHL}	Propagation Delay CP to O _N	5.0	2.0		11	1.5	12	ns	3-6

* Voltage Range 5.0 V is 5.0 V ±0.5 V.

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AC OPERATING REQUIREMENTS

Symbol	Parameter	V _{CC} * (V)	74ACT		74ACT	Unit	Fig. No.
			T _A = +25°C C _L = 50 pF		T _A = -40°C to +85°C C _L = 50 pF		
			Typ	Guaranteed Minimum			
t _s	Setup Time, HIGH or LOW D _n to CP	5.0	-0.5	1.0	1.0	ns	3-9
t _h	Hold Time, HIGH or LOW D _n to CP	5.0	1.0	1.5	1.5	ns	3-9
t _s	Setup Time, HIGH or LOW E to CP	5.0	-0.5	1.0	1.0	ns	3-9
t _h	Hold Time, HIGH or LOW E to CP	5.0	2.5	3.5	4.0	ns	3-9
t _w	CP Pulse Width HIGH or LOW	5.0		3.0	3.5	ns	3-6

* Voltage Range 5.0 V is 5.0 V ±0.5 V.

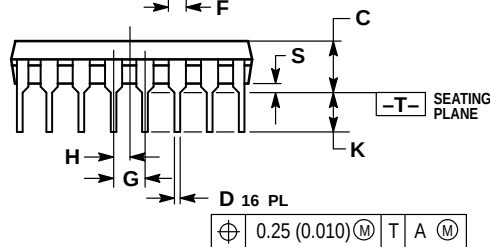
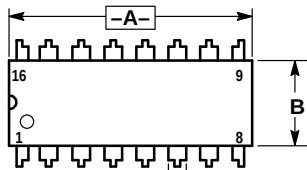
CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = 5.0 V
C _{PD}	Power Dissipation Capacitance	28	pF	V _{CC} = 5.0 V

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OUTLINE DIMENSIONS

N SUFFIX PLASTIC DIP PACKAGE CASE 648-08 ISSUE R

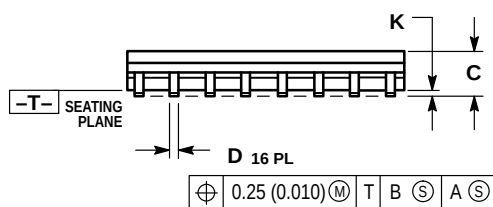
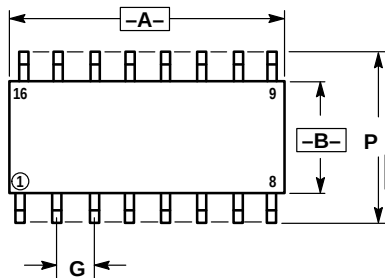


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01

D SUFFIX PLASTIC SOIC PACKAGE CASE 751B-05 ISSUE J



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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MC74AC378/D

