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# MC74ACT564

## Octal D-Type Flip-Flop with 3-State Outputs

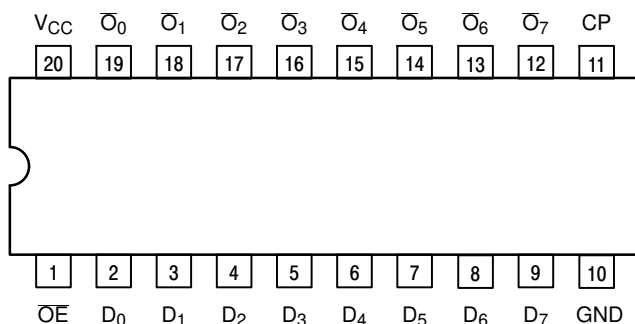
The MC74ACT564 is a high-speed, low power octal flip-flop with a buffered common Clock (CP) and a buffered common Output Enable ( $\overline{OE}$ ).

The information presented to the D inputs is stored in the flip-flops on the LOW-to-HIGH Clock (CP) transition.

The MC74ACT564 device is functionally identical to the MC74ACT574, but with inverted outputs.

### Features

- Inputs and Outputs on the Opposite Sides of the Package Allowing Easy Interface with Microprocessors
- Useful as Input or Output Port for Microprocessor
- Functionally Identical to the MC74ACT574 but with Inverted Outputs
- 3-State Outputs for Bus-Oriented Applications
- Outputs Source/Sink 24 mA
- TTL Compatible Inputs
- These are Pb-Free Devices



**Figure 1. Pinout: 20-Lead Packages Conductors**  
(Top View)

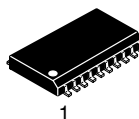
### PIN ASSIGNMENT

PIN	FUNCTION
D <sub>0</sub> –D <sub>7</sub>	Data Inputs
CP	Clock Pulse Input
$\overline{OE}$	3-State Output Enable Input
$\overline{O}_0$ – $\overline{O}_7$	3-State Outputs



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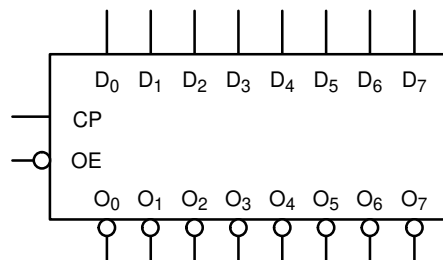
SOIC-20W  
DW SUFFIX  
CASE 751D

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

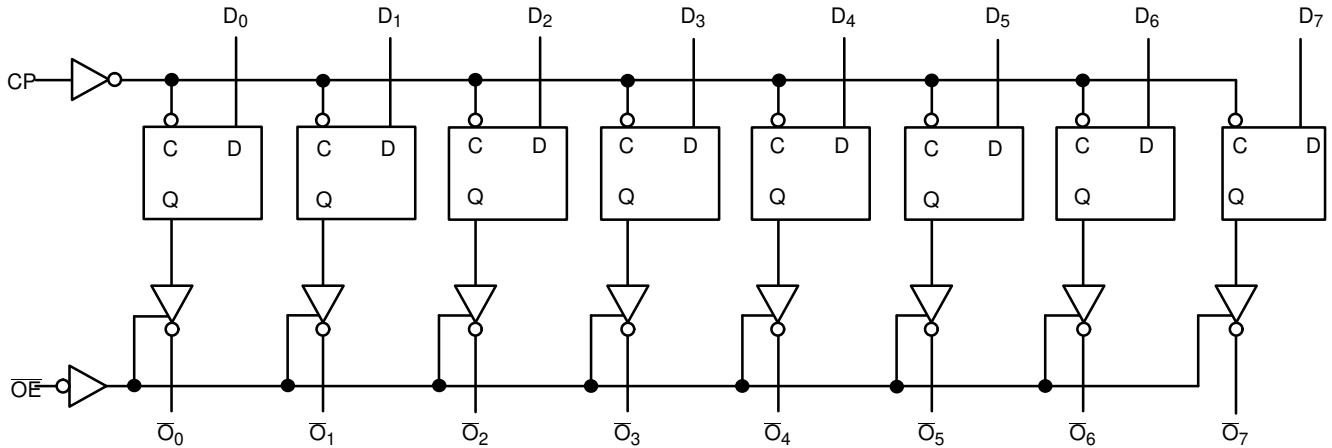
### DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 5 of this data sheet.



**Figure 2. Logic Symbol**

# MC74ACT564



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

**Figure 3. Logic Diagram**

## FUNCTION TABLE

Inputs			Internal	Outputs	Function
$\overline{OE}$	CP	D	Q	O	
H	H	L	NC	Z	Hold
H	H	H	NC	Z	Hold
H	$\downarrow$	L	H	Z	Load
H	$\downarrow$	H	L	Z	Load
L	$\downarrow$	L	H	H	Data Available
L	$\downarrow$	H	L	L	Data Available
L	H	L	NC	NC	No Change in Data
L	H	H	NC	NC	No Change in Data

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial  
 Z = High Impedance  
 $\downarrow$  = LOW-to-HIGH Transition  
 NC = No Change

## FUNCTIONAL DESCRIPTION

The MC74ACT564 consists of eight edge-triggered flip-flops with individual D-type inputs and 3-state complementary outputs. The buffered clock and buffered Output Enable are common to all flip-flops. The eight flip-flops will store the state of their individual D inputs that

meet the setup and hold times requirements on the LOW-to-HIGH Clock (CP) transition. With the Output Enable ( $\overline{OE}$ ) LOW, the contents of the eight flip-flops are available at the outputs. When  $\overline{OE}$  is HIGH, the outputs go to the high impedance state. Operation of the  $\overline{OE}$  input does not affect the state of the flip-flops.

# MC74ACT564

## 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) (Note 1)	-0.5 to $V_{CC} + 0.5$	V
$I_{IK}$	DC Input Diode Current	$\pm 20$	mA
$I_{OK}$	DC Output Diode Current	$\pm 50$	mA
$I_{OUT}$	DC Output Sink/Source Current	$\pm 50$	mA
$I_{CC}$	DC Supply Current, per Output Pin	$\pm 50$	mA
$I_{GND}$	DC Ground Current, per Output Pin	$\pm 100$	mA
$T_{STG}$	Storage Temperature Range	-65 to +150	°C
$T_L$	Lead temperature, 1 mm from Case for 10 Seconds	260	°C
$T_J$	Junction Temperature Under Bias	140	°C
$\theta_{JA}$	Thermal Resistance (Note 2)	65.8	°C/W
MSL	Moisture Sensitivity	Level 1	
$F_R$	Flammability Rating	Oxygen Index: 30% – 35% UL 94 V-0 @ 0.125 in	
$V_{ESD}$	ESD Withstand Voltage	Human Body Model (Note 3) Machine Model (Note 4) Charged Device Model (Note 5)	V
$I_{Latchup}$	Latchup Performance	Above $V_{CC}$ and Below GND at 85°C (Note 6)	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1.  $I_{OUT}$  absolute maximum rating must be observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.
3. Tested to EIA/JESD22-A114-A.
4. Tested to EIA/JESD22-A115-A.
5. Tested to JESD22-C101-A.
6. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit
V <sub>CC</sub>	DC Input Voltage (Referenced to GND)	4.5		5.5	V
V <sub>in</sub> , V <sub>out</sub>	DC Input Voltage, Output Voltage (Referenced to GND)	0		V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature, All Package Types	−40	25	+85	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 8) <div>V<sub>CC</sub> = 4.5 V V<sub>CC</sub> = 5.5 V</div>	0 0	10 8.0	10 8.0	ns/V
I <sub>OH</sub>	Output Current – High			−24	mA
I <sub>OL</sub>	Output Current – Low			24	mA

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

7. Unused Inputs may not be left open. All inputs must be tied to a high voltage level or low logic voltage level.
8.  $V_{in}$  from 0.8 V to 2.0 V; refer to individual Data Sheets for devices that differ from the typical input rise and fall times.



# MC74ACT564

## DC CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C		T <sub>A</sub> = –40°C to +85°C	Unit	Conditions
			Typ	Guaranteed Limits			
V <sub>IH</sub>	Minimum High Level Input Voltage	4.5 5.5	1.5 1.5	2.0 2.0	2.0 2.0	V V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> – 0.1 V
V <sub>IL</sub>	Maximum Low Level Input Voltage	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8	V V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> – 0.1 V
V <sub>OH</sub>	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	V V	I <sub>OUT</sub> = –50 μA
		4.5 5.5		3.86 4.86	3.76 4.76	V V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> –24 mA I <sub>OH</sub> –24 mA
V <sub>OL</sub>	Maximum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	V V	I <sub>OUT</sub> = 50 μA
		4.5 5.5		0.36 0.36	0.44 0.44	V V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> 24 mA I <sub>OL</sub> 24 mA
I <sub>IN</sub>	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V <sub>I</sub> = V <sub>CC</sub> , GND
ΔI <sub>CCT</sub>	Additional Max. I <sub>CC</sub> /Input	5.5	0.6		1.5	mA	V <sub>I</sub> = V <sub>CC</sub> – 2.1 V
I <sub>OZ</sub>	Maximum 3–State Current	5.5		±0.5	±5.0	μA	V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub> V <sub>I</sub> = V <sub>CC</sub> , GND V <sub>O</sub> = V <sub>CC</sub> , GND
I <sub>OLD</sub> I <sub>OHD</sub>	†Minimum Dynamic Output Current	5.5 5.5			75 –75	mA mA	V <sub>OLD</sub> = 1.65 V Max V <sub>OHD</sub> = 3.85 V Min
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5		8.0	80	μA	V <sub>IN</sub> = V <sub>CC</sub> 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 t<sub>r</sub> = t<sub>f</sub> = 3.0 ns (For Figures and Waveforms, See Figures 4, 5, and 6.)

Symbol	Parameter	V <sub>CC</sub> * (V)	T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF			T <sub>A</sub> = –40°C to +85°C C <sub>L</sub> = 50 pF		Unit
			Min	Typ	Max	Min	Max	
f <sub>max</sub>	Maximum Clock Frequency	5.0	85	–	–	75	–	MHz
t <sub>PLH</sub>	Propagation Delay CP to Q <sub>n</sub>	5.0	2.0	–	10.5	1.5	11.5	ns
t <sub>PHL</sub>	Propagation Delay CP to Q <sub>n</sub>	5.0	1.5	–	9.5	1.5	10.5	ns
t <sub>PZH</sub>	Output Enable Time	5.0	1.5	–	9.0	1.5	9.5	ns
t <sub>PZL</sub>	Output Enable Time	5.0	1.5	–	8.5	1.0	9.5	ns
t <sub>PHZ</sub>	Output Disable Time	5.0	1.5	–	10.5	1.5	11.5	ns
t <sub>PLZ</sub>	Output Disable Time	5.0	1.5	–	8.0	1.0	8.5	ns

\*Voltage Range 5.0 V is 5.0 V ±0.5 V

# MC74ACT564

## AC OPERATING REQUIREMENTS

Symbol	Parameter	V <sub>CC</sub> * (V)	T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = −40°C to +85°C C <sub>L</sub> = 50 pF		Unit
			Typ	Guaranteed Minimum			
t <sub>s</sub>	Setup Time, HIGH or LOW D <sub>n</sub> to C <sub>P</sub>	5.0	–	2.5	3.0	ns	
t <sub>h</sub>	Hold Time, HIGH or LOW D <sub>n</sub> to C <sub>P</sub>	5.0	–	1.0	1.0	ns	
t <sub>w</sub>	C <sub>P</sub> Pulse Width HIGH or LOW	5.0	–	3.0	3.5	ns	

\*Voltage Range 3.3 V is 3.3 V  $\pm$ 0.3 V.

\*Voltage Range 5.0 V is 5.0 V  $\pm$ 0.5 V.

## CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
$C_{IN}$	Input Capacitance	4.5	pF	$V_{CC} = 5.0\text{ V}$
$C_{PD}$	Power Dissipation Capacitance	50	pF	$V_{CC} = 5.0\text{ V}$

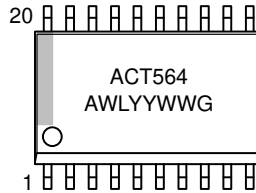
## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MC74ACT564DWR2G	SOIC–20 (Pb–Free)	1000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## MARKING DIAGRAMS

### SOIC–20W



A = Assembly Location  
 WL = Wafer Lot  
 YY = Year  
 WW = Work Week  
 G = Pb–Free Package

SWITCHING WAVEFORMS

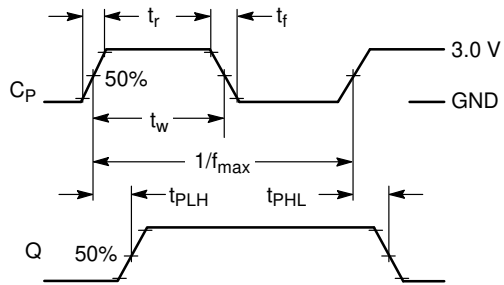


Figure 4.

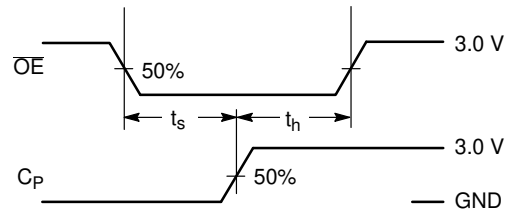


Figure 5.

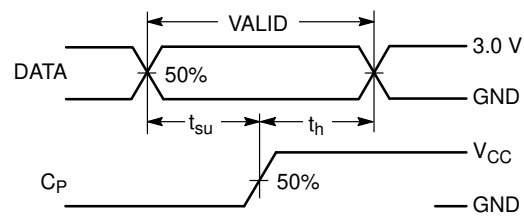
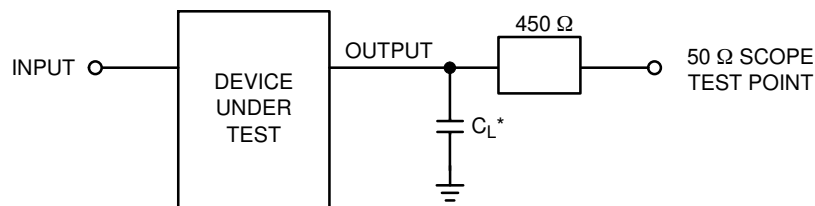


Figure 6.



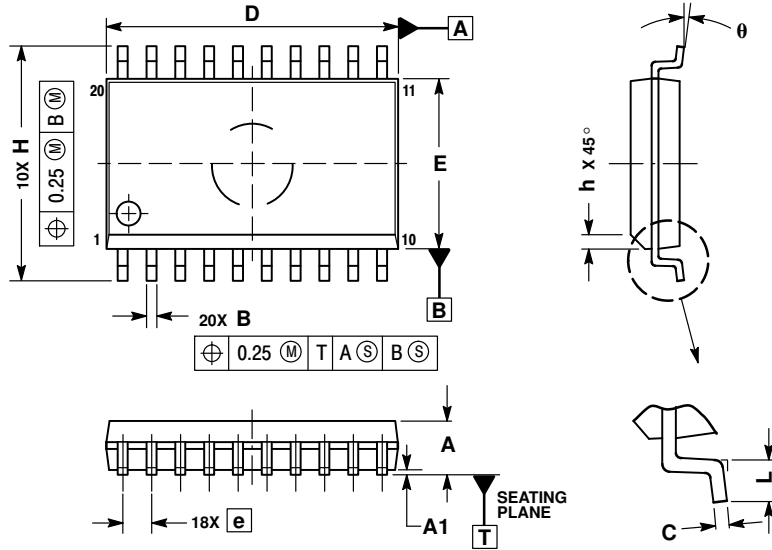
\*Includes all probe and jig capacitance

Figure 7. Test Circuit

# MC74ACT564

## PACKAGE DIMENSIONS


SOIC-20W  
DW SUFFIX  
CASE 751D-05  
ISSUE G



### NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	12.65	12.95
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
θ	0°	7°

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