



54ACT/74ACT564

Octal D Flip-Flop with TRI-STATE® Outputs

General Description

The 'ACT564 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.

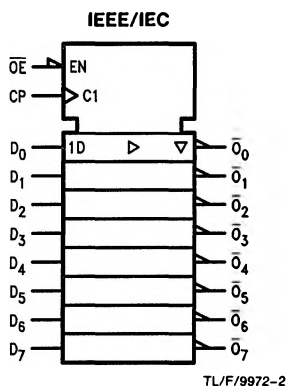
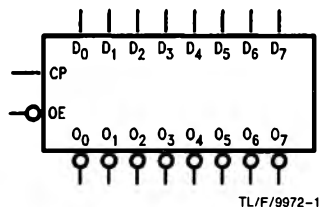
The 'ACT564 device is functionally identical to the 'ACT574, but with inverted outputs.

Features

- Inputs and outputs on opposite sides of package allow easy interface with microprocessors
- Useful as input or output port for microprocessors
- Functionally identical to 'ACT574 but with inverted outputs
- TRI-STATE outputs for bus-oriented applications
- Outputs source/sink 24 mA
- 'ACT564 has TTL-compatible inputs

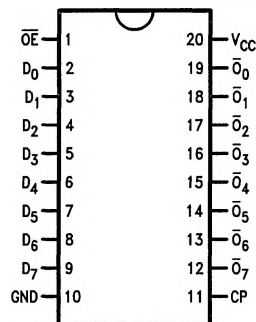
Ordering Code: See Section 8

Logic Symbols



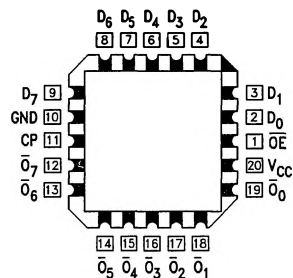
Connection Diagrams

Pin Assignment for DIP, Flatpak and SOIC



Pin Names	Description
D ₀ -D ₇	Data Inputs
CP	Clock Pulse Input
\overline{OE}	TRI-STATE Output Enable Input
\overline{O}_0 - \overline{O}_7	TRI-STATE Outputs

Pin Assignment for LCC



Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (V_{CC})	-0.5V to +7.0V
DC Input Diode Current (I_{IK})	
$V_I = -0.5V$	-20 mA
$V_I = V_{CC} + 0.5V$	+20 mA
DC Input Voltage (V_I)	-0.5V to $V_{CC} + 0.5V$
DC Output Diode Current (I_{OK})	
$V_O = -0.5V$	-20 mA
$V_O = V_{CC} + 0.5V$	+20 mA
DC Output Voltage (V_O)	-0.5V to $V_{CC} + 0.5V$
DC Output Source or Sink Current (I_O)	±50 mA
DC V_{CC} or Ground Current per Output Pin (I_{CC} or I_{GND})	±50 mA
Storage Temperature (T_{STG})	-65°C to +150°C
Junction Temperature (T_J)	
CDIP	175°C
PDIP	140°C

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

Recommended Operating Conditions

Supply Voltage (V_{CC})	
'AC	2.0V to 6.0V
'ACT	4.5V to 5.5V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	
74AC/ACT	-40°C to +85°C
54AC/ACT	-55°C to +125°C
Minimum Input Edge Rate ($\Delta V/\Delta t$)	
'AC Devices	
V_{IN} from 30% to 70% of V_{CC}	
V_{CC} @ 3.3V, 4.5V, 5.5V	125 mV/ns
Minimum Input Edge Rate ($\Delta V/\Delta t$)	
'ACT Devices	
V_{IN} from 0.8V to 2.0V	
V_{CC} @ 4.5V, 5.5V	125 mV/ns

DC Characteristics for 'ACT Family Devices

Symbol	Parameter	V_{CC} (V)	74ACT		54ACT		74ACT		Units	Conditions
			$T_A = +25^\circ\text{C}$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$		$T_A = -40^\circ\text{C to } +85^\circ\text{C}$			
			Typ	Guaranteed Limits						
V_{IH}	Minimum High Level Input Voltage	4.5	1.5	2.0	2.0	2.0	2.0	2.0	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		5.5	1.5	2.0	2.0	2.0	2.0	2.0		
V_{IL}	Maximum Low Level Input Voltage	4.5	1.5	0.8	0.8	0.8	0.8	0.8	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		5.5	1.5	0.8	0.8	0.8	0.8	0.8		
V_{OH}	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4	4.4	4.4	4.4	V	$I_{OUT} = -50 \mu\text{A}$
		5.5	5.49	5.4	5.4	5.4	5.4	5.4		
		4.5		3.86	3.70	3.76	3.76	3.76	V	* $V_{IN} = V_{IL}$ or V_{IH} -24 mA I_{OH} -24 mA
		5.5		4.86	4.70	4.76	4.76	4.76		
V_{OL}	Maximum Low Level Output Voltage	4.5	0.001	0.1	0.1	0.1	0.1	0.1	V	$I_{OUT} = 50 \mu\text{A}$
		5.5	0.001	0.1	0.1	0.1	0.1	0.1		
		4.5		0.36	0.50	0.44	0.44	0.44	V	* $V_{IN} = V_{IL}$ or V_{IH} 24 mA I_{OL} 24 mA
		5.5		0.36	0.50	0.50	0.50	0.50		
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	±1.0	±1.0	±1.0	μA	$V_I = V_{CC}, \text{GND}$
I_{OZ}	Maximum TRI-STATE® Leakage Current	5.5		±0.5	±10.0	±5.0	±5.0	±5.0	μA	$V_I = V_{IL}, V_{IH}$ $V_O = V_{CC}, \text{GND}$
I_{CCT}	Maximum I_{CC}/Input	5.5	0.6		1.6	1.5	1.5	1.5	mA	$V_I = V_{CC} - 2.1V$
I_{OLD}	†Minimum Dynamic Output Current	5.5			50	75	75	75	mA	$V_{OLD} = 1.65V \text{ Max}$
		5.5			-50	-75	-75	-75	mA	$V_{OHD} = 3.85V \text{ Min}$

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

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

DC Characteristics for 'ACT Family Devices (Continued)

Symbol	Parameter	V _{CC} (V)	74ACT		54ACT		74ACT		Units	Conditions
			T _A = +25°C		T _A = -55°C to +125°C		T _A = -40°C to +85°C			
			Typ	Guaranteed Limits						
I _{CC}	Maximum Quiescent Supply Current	5.5		8.0	160.0		80.0		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_{CC} for 54ACT @ 25°C is identical to 74ACT @ 25°C.

AC Electrical Characteristics: See Section 2 for Waveforms

Symbol	Parameter	V _{CC} * (V)	74ACT			54ACT		74ACT		Units	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = -55°C to +125°C C _L = 50 pF		T _A = -40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max	Min	Max		
f _{max}	Maximum Clock Frequency	5.0	85	90		65		75	MHz		
t _{PLH}	Propagation Delay, CP to \overline{O}_n	5.0	2.0	6.5	10.5	1.0	12.5	1.5	11.5	ns	2-3,4
t _{PHL}	Propagation Delay, CP to \overline{O}_n	5.0	1.5	6.0	9.5	1.0	11.5	1.5	10.5	ns	2-3,4
t _{pZH}	Output Enable Time	5.0	1.5	5.5	9.0	1.0	10.5	1.5	9.5	ns	2-5
t _{pZL}	Output Enable Time	5.0	1.5	5.5	8.5	1.0	10.5	1.0	9.5	ns	2-6
t _{PHZ}	Output Disable Time	5.0	1.5	7.0	10.5	1.0	12.5	1.5	11.5	ns	2-5
t _{PLZ}	Output Disable Time	5.0	1.5	5.0	8.0	1.0	9.5	1.0	8.5	ns	2-6

*Voltage Range 5.0 is 5.0V ±0.5V

AC Operating Requirements: See Section 2 for Waveforms

Symbol	Parameter	V _{CC} * (V)	74ACT		54ACT		74ACT		Units	Fig. No.
			T _A = +25°C C _L = 50 pF		T _A = -55°C to +125°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	1.0	2.5		3.5		3.0	ns	2-7
t _h	Hold Time, HIGH or LOW D _n to CP	5.0	-0.5	1.0		2.5		1.0	ns	2-7
t _w	LE Pulse Width, HIGH or LOW	5.0	2.5	3.0		5.0		3.5	ns	2-3

*Voltage Range 5.0 is 5.0V ±0.5V

Capacitance

Symbol	Parameter	Typ	Units	Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = 5.0V
C _{PD}	Power Dissipation Capacitance	50.0	pF	V _{CC} = 5.0V