



54ACT/74ACT534

Octal D Flip-Flop with TRI-STATE® Outputs

General Description

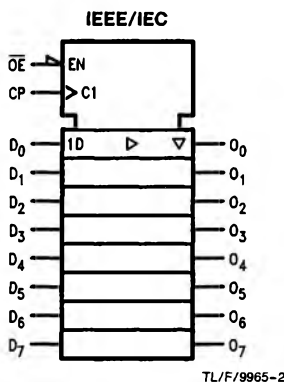
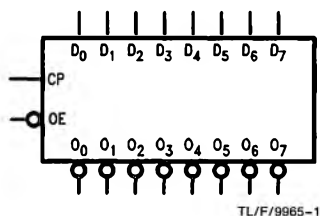
The 'ACT534 is a high-speed, low-power octal D-type flip-flop featuring separate D-type inputs for each flip-flop and TRI-STATE outputs for bus-oriented applications. A buffered Clock (CP) and Output Enable ($\overline{OE}$) are common to all flip-flops. The 'ACT534 is the same as the 'ACT374 except that the outputs are inverted.

Features

- Edge-triggered D-type inputs
- Buffered positive edge-triggered clock
- TRI-STATE outputs for bus-oriented applications
- Outputs source/sink 24 mA
- 'ACT534 has TTL-compatible inputs
- Inverted output version of 'ACT374

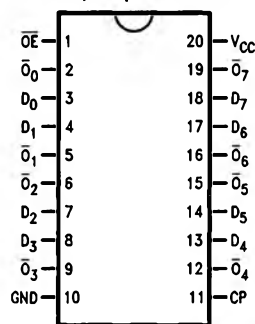
Ordering Code: See Section 8

Logic Symbols



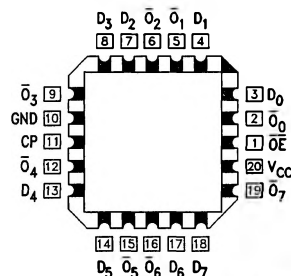
Connection Diagrams

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
O ₀ -O ₇	Complementary TRI-STATE Outputs

Pin Assignment for LCC

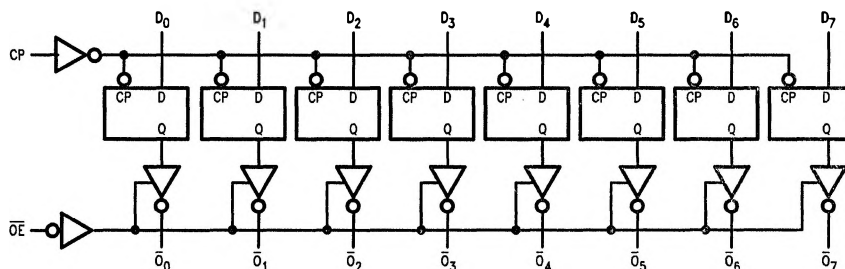


Functional Description

The 'ACT534 consists of eight edge-triggered flip-flops with individual D-type inputs and TRI-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 the $\overline{OE}$ 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.

Logic Diagram



TL/F/9965-5

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

Function Table

Inputs			Output
CP	OE	D	$\overline{Q}$
	L	H	L
	L	L	H
L	L	X	$\overline{Q}_0$
X	H	X	Z

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

= LOW-to-HIGH Clock Transition

Z = High Impedance

$\overline{Q}_0$ = Value stored from previous clock cycle

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 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°C		T _A = − 55°C to + 125°C		T _A = − 40°C to + 85°C			
			Typ	Guaranteed Limits						
V _{IH}	Minimum High Level Input Voltage	4.5	1.5	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			
V _{IL}	Maximum Low Level Input Voltage	4.5	1.5	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			
V _{OH}	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4		4.4		V	I _{OUT} = − 50 μA
		5.5	5.49	5.4	5.4		5.4			
		4.5		3.86	3.70		3.76		V	*V _{IN} = V _{IL} or V _{IH} − 24 mA I _{OH} − 24 mA
		5.5		4.86	4.70		4.76			
V _{OL}	Maximum Low Level Output Voltage	4.5	0.001	0.1	0.1		0.1		V	I _{OUT} = 50 μA
		5.5	0.001	0.1	0.1		0.1			
		4.5		0.36	0.50		0.44		V	*V _{IN} = V _{IL} or V _{IH} 24 mA I _{OL} 24 mA
		5.5		0.36	0.50		0.44			
I _{IN}	Maximum Input Leakage Current	5.5		± 0.1	± 1.0		± 1.0		μA	V _I = V _{CC} , GND
I _{OZ}	Maximum TRI-STATE® Current	5.5		± 0.5	± 10.0		± 5.0		μA	V _I = V _{IL} , V _{IH} V _O = V _{CC} , GND
I _{CCT}	Maximum I _{CC} /Input	5.5	0.6		1.6		1.5		mA	V _I = V _{CC} − 2.1V

*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 _{OLD}	†Minimum Dynamic Output Current	5.5			50		75		mA	V _{OLD} = 1.65V Max
I _{OHD}		5.5			− 50		− 75		mA	V _{OHD} = 3.85V Min
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	100			85		120		MHz	
t _{PLH}	Propagation Delay CP to Q _n	5.0	2.5	6.5	11.5	1.0	14.0	2.0	12.5	ns	2-3, 4
t _{PHL}	Propagation Delay CP to Q _n	5.0	2.0	6.0	10.5	1.0	13.0	2.0	12.0	ns	2-3, 4
t _{PZH}	Output Enable Time	5.0	2.5	6.5	12.0	1.0	14.0	2.0	12.5	ns	2-5
t _{PZL}	Output Enable Time	5.0	2.0	6.0	11.0	1.0	13.0	2.0	11.5	ns	2-6
t _{PHZ}	Output Disable Time	5.0	1.5	7.0	12.5	1.0	14.5	1.0	13.5	ns	2-5
t _{PLZ}	Output Disable Time	5.0	1.5	5.5	10.5	1.0	11.5	1.0	10.5	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	3.5	5.0	4.0	ns	2-7
t _h	Hold Time, HIGH or LOW D _n to CP	5.0	-1.0	1.0	3.0	1.5	ns	2-7
t _w	CP Pulse Width HIGH or LOW	5.0	2.0	3.5	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	40.0	pF	V _{CC} = 5.0V