



**MOTOROLA**

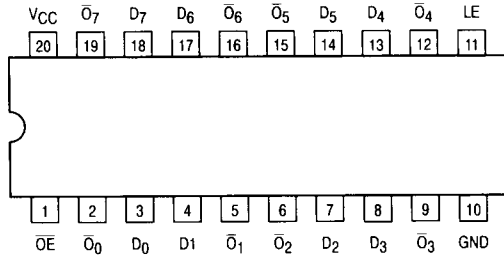
**MC74AC533  
MC74ACT533**

**OCTAL TRANSPARENT  
LATCH WITH  
3-STATE OUTPUTS**

**Octal Transparent Latch  
with 3-State Outputs**

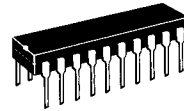
The MC74AC533/74ACT533 consists of eight latches with 3-state outputs for bus organized system applications. The flip-flops appear transparent to the data when Latch Enable (LE) is HIGH. When LE is LOW, the data that meets the setup time is latched. Data appears on the bus when the Output Enable ( $\bar{O}E$ ) is LOW. When  $\bar{O}E$  is HIGH, the bus output is in the high impedance state. The 'AC/ACT533 is the same as the 'AC/ACT373, except that the outputs are inverted. For description and logic diagram please see the 'AC/ACT373 data sheet.

- Eight Latches in a Single Package
- 3-State Outputs for Bus Interfacing
- 'ACT533 Has TTL Compatible Inputs
- Inverted Output Version of 'ACT373



**PIN NAMES**

- $D_0$ - $D_7$  Data Inputs
- LE Latch Enable Input
- $\bar{O}E$  Output Enable Input
- $O_0$ - $O_7$  Complementary 3-State Outputs

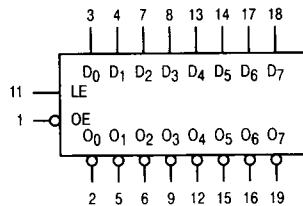


**N SUFFIX  
CASE 738-03  
PLASTIC**



**DW SUFFIX  
CASE 751D-04  
PLASTIC**

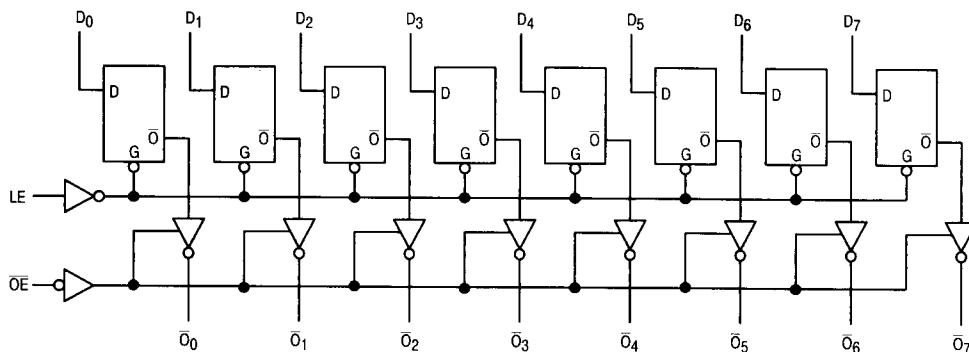
**LOGIC SYMBOL**



$V_{CC}$  = Pin 20  
 $GND$  = Pin 10

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## 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	$\pm 20$	mA
$I_{out}$	DC Output Sink/Source Current, per Pin	$\pm 50$	mA
$I_{CC}$	DC $V_{CC}$ or GND Current per Output Pin	$\pm 50$	mA
$T_{stg}$	Storage Temperature	-65 to +150	$^{\circ}C$

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

### RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit	
$V_{CC}$	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
$V_{in}, V_{out}$	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	$^{\circ}C$	
$T_A$	Operating Ambient Temperature Range	-40	25	85	$^{\circ}C$	
$I_{OH}$	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.

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## DC CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	74AC		74AC		Unit	Conditions
			T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C			
			Typ	Guaranteed Limits				
V <sub>IH</sub>	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1		V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V
		4.5	2.25	3.15	3.15			
		5.5	2.75	3.85	3.85			
V <sub>IL</sub>	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9		V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V
		4.5	2.25	1.35	1.35			
		5.5	2.75	1.65	1.65			
V <sub>OH</sub>	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9		V	I <sub>OUT</sub> = -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 <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> -12 mA I <sub>OH</sub> -24 mA -24 mA
		4.5		3.86	3.76			
		5.5		4.86	4.76			
V <sub>OL</sub>	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1		V	I <sub>OUT</sub> = 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 <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> 12 mA I <sub>OL</sub> 24 mA 24 mA
		4.5		0.36	0.44			
		5.5		0.36	0.44			
I <sub>IN</sub>	Maximum Input Leakage Current	5.5		±0.1	±1.0		μA	V <sub>I</sub> = V <sub>CC</sub> , GND
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>J</sub> = V <sub>CC</sub> , GND V <sub>O</sub> = V <sub>CC</sub> , GND
I <sub>OLD</sub>	†Minimum Dynamic Output Current	5.5			75		mA	V <sub>OLD</sub> = 1.65 V Max
I <sub>OHD</sub>		5.5			-75		mA	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.

Note: I<sub>IN</sub> and I<sub>CC</sub> @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V<sub>CC</sub>.

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

Symbol	Parameter	V <sub>CC</sub> * (V)	74AC		74AC		Unit	Fig. No.
			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			
			Min	Max	Min	Max		
t <sub>PLH</sub>	Propagation Delay D <sub>n</sub> to $\bar{O}_n$	3.3	2.0	14.0	1.5	16.0	ns	3-5
		5.0	2.0	10.0	1.5	11.0		
t <sub>PHL</sub>	Propagation Delay D <sub>n</sub> to $\bar{O}_n$	3.3	2.0	13.0	1.5	14.5	ns	3-5
		5.0	2.0	9.5	1.5	10.5		
t <sub>PLH</sub>	Propagation Delay LE to $\bar{O}_n$	3.3	2.0	14.5	1.5	16.5	ns	3-6
		5.0	2.0	10.5	1.5	11.5		
t <sub>PHL</sub>	Propagation Delay LE to $\bar{O}_n$	3.3	2.0	13.0	1.5	14.5	ns	3-6
		5.0	2.0	10.0	1.5	11.0		
t <sub>PZH</sub>	Output Enable Time	3.3	2.0	12.5	1.5	14.0	ns	3-7
		5.0	2.0	9.5	1.5	10.5		
t <sub>PZL</sub>	Output Enable Time	3.3	2.0	12.5	1.5	14.0	ns	3-8
		5.0	2.0	9.5	1.5	10.5		
t <sub>PHZ</sub>	Output Disable Time	3.3	2.0	13.0	1.5	14.5	ns	3-7
		5.0	2.0	10.0	1.5	11.0		
t <sub>PLZ</sub>	Output Disable Time	3.3	2.0	13.0	1.5	14.5	ns	3-8
		5.0	2.0	10.0	1.5	11.0		

\* 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 <sub>CC</sub> * (V)	74AC		74AC		Unit	Fig. No.
			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			
			Guaranteed Minimum					
t <sub>s</sub>	Setup Time, HIGH or LOW D <sub>n</sub> to LE	3.3	5.5	6.0	ns	3-9		
		5.0	4.0	4.5				
t <sub>h</sub>	Hold Time, HIGH or LOW D <sub>n</sub> to LE	3.3	1.5	1.0	ns	3-9		
		5.0	1.5	1.0				
t <sub>w</sub>	LE Pulse Width, HIGH	3.3	6.0	6.5	ns	3-6		
		5.0	4.5	5.0				

\* 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 <sub>CC</sub> (V)	74ACT		74ACT		Unit	Conditions
			T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C			
			Typ	Guaranteed Limits				
V <sub>IH</sub>	Minimum High Level Input Voltage	4.5	1.5	2.0	2.0		V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V
		5.5	1.5	2.0	2.0			
V <sub>IL</sub>	Maximum Low Level Input Voltage	4.5	1.5	0.8	0.8		V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V
		5.5	1.5	0.8	0.8			
V <sub>OH</sub>	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4		V	I <sub>OUT</sub> = -50 μA
		5.5	5.49	5.4	5.4			
		4.5		3.86	3.76		V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> -24 mA
		5.5		4.86	4.76			
V <sub>OL</sub>	Maximum Low Level Output Voltage	4.5	0.001	0.1	0.1		V	I <sub>OUT</sub> = 50 μA
		5.5	0.001	0.1	0.1			
		4.5		0.36	0.44		V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> 24 mA
		5.5		0.36	0.44			
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>CC</sub> T	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>	†Minimum Dynamic Output Current	5.5			75		mA	V <sub>OLD</sub> = 1.65 V Max
I <sub>OHD</sub>		5.5			-75		mA	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 (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V <sub>CC</sub> * (V)	74ACT			74ACT		Unit	Fig. No.
			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			
			Min	Typ	Max	Min	Max		
t <sub>PLH</sub>	Propagation Delay D <sub>n</sub> to O <sub>n</sub>	5.0	2.5		10.5	2.0	11.5	ns	3-5
t <sub>PHL</sub>	Propagation Delay D <sub>n</sub> to O <sub>n</sub>	5.0	2.5		10.0	2.0	11.0	ns	3-5
t <sub>PLH</sub>	Propagation Delay LE to O <sub>n</sub>	5.0	2.5		10.5	2.0	11.5	ns	3-6
t <sub>PHL</sub>	Propagation Delay LE to O <sub>n</sub>	5.0	2.5		10.5	2.0	11.5	ns	3-6
t <sub>PZH</sub>	Output Enable Time	5.0	2.0		10.0	1.5	11.0	ns	3-7
t <sub>PZL</sub>	Output Enable Time	5.0	2.0		10.0	1.5	11.0	ns	3-8
t <sub>PHZ</sub>	Output Disable Time	5.0	2.0		10.0	1.5	11.0	ns	3-7
t <sub>PLZ</sub>	Output Disable Time	5.0	2.0		10.0	1.5	11.0	ns	3-8

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

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## AC OPERATING REQUIREMENTS

Symbol	Parameter	V <sub>CC</sub> * (V)	74ACT		74ACT		Unit	Fig. No.
			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			
			Typ	Guaranteed Minimum				
t <sub>s</sub>	Setup Time, HIGH or LOW D <sub>n</sub> to LE	5.0		3.0	4.0	ns	3-9	
t <sub>h</sub>	Hold Time, HIGH or LOW D <sub>n</sub> to LE	5.0		2.0	2.5	ns	3-9	
t <sub>w</sub>	LE Pulse Width, HIGH	5.0		5.0	6.0	ns	3-6	

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

## CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C <sub>IN</sub>	Input Capacitance	4.5	pF	V <sub>CC</sub> = 5.0 V
C <sub>PD</sub>	Power Dissipation Capacitance	40	pF	V <sub>CC</sub> = 5.0 V