CD54/74AC563, CD54/74AC573
CD54/74ACT563, CD54/74ACT573

TEXAS INSTRUMENTS

Octal Transparent Latch, 3-State

CD54/74AC/ACT563 – Inverting
CD54/74AC/ACT573 – Non-Inverting

FUNCTIONAL DIAGRAM

Type Features:

■ Buffered inputs
■ Typical propagation delay:
4.3 ns @ V_{CC} = 5 V, T_A = 25°C, C_L = 50 pF

The RCA-CD54/74AC563 and CD54/74AC573 and the CD54/74ACT563 and CD54/74ACT573 octal transparent 3-state latches use the RCA ADVANCED CMOS technology. The outputs are transparent to the inputs when the Latch Enable ($\overline{LE}$) is HIGH. When the Latch Enable ($\overline{LE}$) goes LOW, the data is latched. The Output Enable ($\overline{OE}$) controls the 3-state outputs. When the Output Enable ($\overline{OE}$) is HIGH, the outputs are in the high-impedance state. The latch operation is independent of the state of the Output Enable.

The CD74AC/ACT563 and CD74AC/ACT573 are supplied in 20-lead dual-in-line plastic packages (E suffix) and in 20-lead dual-in-line small-outline plastic packages (M suffix). Both package types are operable over the following temperature ranges: Commercial (0 to 70°C); Industrial (-40 to +85°C); and Extended Industrial/Military (-55 to +125°C).

The CD54AC/ACT563 and CD54AC/ACT573, available in chip form (H suffix), are operable over the -55 to +125°C temperature range.

Family Features:

■ Exceeds 2-kV ESD Protection - MIL-STD-883, Method 3015
■ SCR-Latchup-resistant CMOS process and circuit design
■ Speed of bipolar FAST*/AS/S with significantly reduced power consumption
■ Balanced propagation delays
■ AC types feature 1.5-V to 5.5-V operation and balanced noise immunity at 30% of the supply
■ ± 24-mA output drive current
   - Fanout to 15 FAST* ICs
   - Drives 50-ohm transmission lines

*FAST is a Registered Trademark of Fairchild Semiconductor Corp.

TRUTH TABLE

Output Enable	Latch Enable	Data	AC/ACT563 Output	AC/ACT573 Output
L	H	H	L	H
L	H	L	H	L
L	L	l	H	L
L	L	h	L	H
H	X	X	Z	Z

Note:
L = Low voltage level
H = High voltage level
l = Low voltage level one set-up time prior to the high to low latch enable transition

h = High voltage level one set-up time prior to the high to low latch enable transition
X = Don't Care
Z = High Impedance State

This data sheet is applicable to the CD74AC563, CD54/74AC573, and CD54/74ACT573. The CD54AC563 and CD54/74ACT563 were not acquired from Harris Semiconductor.

File Number **1956**

CD54/74AC563, CD54/74AC573
CD54/74ACT563, CD54/74ACT573

MAXIMUM RATINGS, *Absolute-Maximum Values:*

DC SUPPLY-VOLTAGE (V$_{CC}$) .... –0.5 to 6 V
DC INPUT DIODE CURRENT, I$_{IK}$ (for V$_i$ < –0.5 V or V$_i$ > V$_{CC}$ + 0.5 V) .... ±20 mA
DC OUTPUT DIODE CURRENT, I$_{OK}$ (for V$_O$ < –0.5 V or V$_O$ > V$_{CC}$ + 0.5 V) .... ±50 mA
DC OUTPUT SOURCE OR SINK CURRENT per Output Pin, I$_O$ (for V$_O$ > –0.5 V or V$_O$ < V$_{CC}$ + 0.5 V) .... ±50 mA
DC V$_{CC}$ or GROUND CURRENT (I$_{CC}$ or I$_{GND}$) .... ±100 mA*
POWER DISSIPATION PER PACKAGE (P$_D$):
    For T$_A$ = –55 to +100°C (PACKAGE TYPE E) .... 500 mW
    For T$_A$ = +100 to +125°C (PACKAGE TYPE E) .... Derate Linearly at 8 mW/°C to 300 mW
    For T$_A$ = –55 to +70°C (PACKAGE TYPE M) .... 400 mW
    For T$_A$ = +70 to +125°C (PACKAGE TYPE M) .... Derate Linearly at 6 mW/°C to 70 mW
OPERATING-TEMPERATURE RANGE (T$_A$):
    PACKAGE TYPE F .... –55 to +125°C
    PACKAGE TYPE E, M .... –40 to +125°C
STORAGE TEMPERATURE (T$_{stg}$) .... –65 to +150°C
LEAD TEMPERATURE (DURING SOLDERING):
    At distance 1/16 ± 1/32 in. (1.59 ± 0.79 mm) from case for 10 s maximum .... +265°C
    Unit inserted into PC board min. thickness 1/16 in. (1.59 mm) with solder contacting lead tips only .... +300°C

*For up to 4 outputs per device; add ± 25 mA for each additional output.

RECOMMENDED OPERATING CONDITIONS:
For maximum reliability, normal operating conditions should be selected so that operation is always within the following ranges:

| CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range, V$_{CC}$*:			
(For T$_A$ = Full Package-Temperature Range)			
AC Types	1.5	5.5	V
ACT Types	4.5	5.5	V
DC Input or Output Voltage, V$_i$, V$_O$	0	V$_{CC}$	V
Operating Temperature, T$_A$:	–55	+125	°C
Input Rise and Fall Slew Rate, dt/dv			
at 1.5 V to 3 V(AC Types)	0	50	ns/V
at 3.6 V to 5.5 V(AC Types)	0	20	ns/V
at 4.5 V to 5.5 V(ACT Types)	0	10	ns/V

*Unless otherwise specified, all voltages are referenced to ground.

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TERMINAL ASSIGNMENT DIAGRAMS
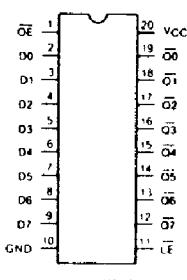
CD54/74AC563, CD54/74ACT563
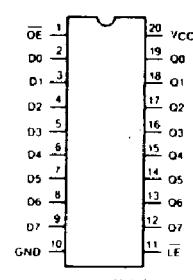
CD54/74AC573, CD54/74ACT573

CD54/74AC563, CD54/74AC573
CD54/74ACT563, CD54/74ACT573

STATIC ELECTRICAL CHARACTERISTICS: AC Series

CHARACTERISTICS	TEST CONDITIONS		V_{CC} (V)	AMBIENT TEMPERATURE (T_A) - °C						UNITS
	V_I (V)	I_O (mA)		+25		-40 to +85		-55 to +125		
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
High-Level Input Voltage V_{IH}			1.5	1.2	—	1.2	—	1.2	—	V
			3	2.1	—	2.1	—	2.1	—	
			5.5	3.85	—	3.85	—	3.85	—	
Low-Level Input Voltage V_{IL}			1.5	—	0.3	—	0.3	—	0.3	V
			3	—	0.9	—	0.9	—	0.9	
			5.5	—	1.65	—	1.65	—	1.65	
High-Level Output Voltage V_{OH}	V_{IH} or V_{IL}	-0.05	1.5	1.4	—	1.4	—	1.4	—	V
		-0.05	3	2.9	—	2.9	—	2.9	—	
		-0.05	4.5	4.4	—	4.4	—	4.4	—	
		-4	3	2.58	—	2.48	—	2.4	—	
		-24	4.5	3.94	—	3.8	—	3.7	—	
	#, * {	-75	5.5	—	—	3.85	—	—	—	
		-50	5.5	—	—	—	—	3.85	—	
Low-Level Output Voltage V_{OL}	V_{IH} or V_{IL}	0.05	1.5	—	0.1	—	0.1	—	0.1	V
		0.05	3	—	0.1	—	0.1	—	0.1	
		0.05	4.5	—	0.1	—	0.1	—	0.1	
		12	3	—	0.36	—	0.44	—	0.5	
		24	4.5	—	0.36	—	0.44	—	0.5	
	#, * {	75	5.5	—	—	—	1.65	—	—	
		50	5.5	—	—	—	—	—	1.65	
Input Leakage Current I_I	V_{CC} or GND		5.5	—	±0.1	—	±1	—	±1	μA
3-State Leakage Current I_{OZ}	V_{IH} or V_{IL} $V_O =$ V_{CC} or GND		5.5	—	±0.5	—	±5	—	±10	μA
Quiescent Supply Current, MSI I_{CC}	V_{CC} or GND	0	5.5	—	8	—	80	—	160	μA

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

*Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

CD54/74AC563, CD54/74AC573
CD54/74ACT563, CD54/74ACT573

STATIC ELECTRICAL CHARACTERISTICS: ACT Series

CHARACTERISTICS	TEST CONDITIONS		V_{CC} (V)	AMBIENT TEMPERATURE (T_A) - °C						UNITS
				+25		-40 to +85		-55 to +125		
	V_I (V)	I_O (mA)		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
High-Level Input Voltage V_{IH}			4.5 to 5.5	2	—	2	—	2	—	V
Low-Level Input Voltage V_{IL}			4.5 to 5.5	—	0.8	—	0.8	—	0.8	V
High-Level Output Voltage V_{OH}	V_{IH} or V_{IL} #, * {	-0.05	4.5	4.4	—	4.4	—	4.4	—	V
		-24	4.5	3.94	—	3.8	—	3.7	—	
		-75	5.5	—	—	3.85	—	—	—	
		-50	5.5	—	—	—	—	3.85	—	
Low-Level Output Voltage V_{OL}	V_{IH} or V_{IL} #, * {	0.05	4.5	—	0.1	—	0.1	—	0.1	V
		24	4.5	—	0.36	—	0.44	—	0.5	
		75	5.5	—	—	—	1.65	—	—	
		50	5.5	—	—	—	—	—	1.65	
Input Leakage Current I_I	V_{CC} or GND		5.5	—	±0.1	—	±1	—	±1	μA
3-State Leakage Current I_{OZ}	V_{IH} or V_{IL} V_O = V_{CC} or GND		5.5	—	±0.5	—	±5	—	±10	μA
Quiescent Supply Current, MSI I_{CC}	V_{CC} or GND	0	5.5	—	8	—	80	—	160	μA
Additional Quiescent Supply Current per Input Pin TTL Inputs High ΔI_{CC} 1 Unit Load	V_{CC}-2.1		4.5 to 5.5	—	2.4	—	2.8	—	3	mA

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

* Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

ACT INPUT LOADING TABLE

INPUT	UNIT LOAD*	
	ACT563	ACT573
OE	0.87	0.87
Dn	0.5	0.5
LE	0.8	0.8

*Unit load is ΔI_{CC} limit specified in Static Characteristics Chart, e.g., 2.4 mA max. @ 25°C.

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CD54/74AC563, CD54/74AC573
CD54/74ACT563, CD54/74ACT573

PREREQUISITE FOR SWITCHING: AC Series

| CHARACTERISTICS | SYMBOL | V_cc (V) | AMBIENT TEMPERATURE (T_A) -°C | | | | UNITS |
| | | | -40 to +85 | | -55 to +125 | | |
			MIN.	MAX.	MIN.	MAX.	
LE Pulse Width	t_W	1.5 3.3* 5†	44 4.9 3.5	— — —	50 5.6 4	— — —	ns
Setup Time Data to LE	t_SU	1.5 3.3 5	2 2 2	— — —	2 2 2	— — —	ns
Hold Time Data to LE	t_H	1.5 3.3 5	33 3.7 2.6	— — —	38 4.2 3	— — —	ns

*3.3 V: min. is @ 3 V
†5 V: min. is @ 4.5 V

SWITCHING CHARACTERISTICS: AC Series; t_r, t_f = 3 ns, C_L = 50 pF

| CHARACTERISTICS | SYMBOL | V_cc (V) | AMBIENT TEMPERATURE (T_A) - °C | | | | UNITS |
| | | | -40 to +85 | | -55 to +125 | | |
			MIN.	MAX.	MIN.	MAX.	
Propagation Delays: Data to Qn AC563	t_PLH t_PHL	1.5 3.3* 5†	— 3.8 2.7	119 13.4 9.5	— 3.7 2.6	131 14.7 10.5	ns
AC573	t_PLH t_PHL	1.5 3.3 5	— 3.1 2.2	96 10.8 7.7	— 3 2.1	106 11.9 8.5	ns
LE on Qn AC563	t_PLH t_PHL	1.5 3.3 5	— 4.3 3.1	136 15.3 10.9	— 4.2 3	150 16.8 12	ns
AC573	t_PLH t_PHL	1.5 3.3 5	— 4.3 3.1	136 15.3 10.9	— 4.2 3	150 16.8 12	ns
Output Enable Times	t_PZL t_PZH	1.5 3.3 5	— 4.1 2.7	119 14.4 9.5	— 4 2.6	131 15.8 10.5	ns
Output Disable Times	t_PLZ t_PHZ	1.5 3.3 5	— 3.7 3	131 13.1 10.5	— 3.6 2.9	144 14.4 11.5	ns
Power Dissipation Capacitance	C_PD§	—	63 Typ.		63 Typ.		pF
Min. (Valley) V_OH During Switching of Other Outputs (Output Under Test Not Switching)	V_OHV See Fig. 1	5	4 Typ. @ 25°C				V
Max. (Peak) V_OL During Switching of Other Outputs (Output Under Test Not Switching)	V_OLP See Fig. 1	5	1 Typ. @ 25°C				V
Input Capacitance	C_I	—	—	10	—	10	pF
3-State Output Capacitance	C_O	—	—	15	—	15	pF

*3.3 V: min. is @ 3.6 V
    max. is @ 3 V
†5 V: min. is @ 5.5 V
    max. is @ 4.5 V

§C_{PD} is used to determine the dynamic power consumption, per latch.
$P_D = V_{cc}^2 f_i (C_{PD} + C_L)$ where f_i = input frequency
C_L = output load capacitance
V_{cc} = supply voltage.

CD54/74AC563, CD54/74AC573
CD54/74ACT563, CD54/74ACT573

PREREQUISITE FOR SWITCHING: ACT Series

CHARACTERISTICS	SYMBOL	V_{CC} (V)	AMBIENT TEMPERATURE (T_A) - °C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
$\overline{LE}$ Pulse Width	t_W	5†	3.5	—	4	—	ns
Setup Time Data to $\overline{LE}$	t_{SU}	5	2	—	2	—	ns
Hold Time Data to $\overline{LE}$	t_H	5	2.6	—	3	—	ns

†5 V: min. is @ 4.5 V

SWITCHING CHARACTERISTICS: ACT Series; t_r, t_f = 3 ns, C_L = 50 pF

CHARACTERISTICS	SYMBOL	V_{CC} (V)	AMBIENT TEMPERATURE (T_A) - °C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
Propagation Delays: Data to Qn 563	t_{PLH} t_{PHL}	5†	2.9	10.4	2.9	11.4	ns
573			2.7	9.4	2.6	10.4	
$\overline{LE}$ to Qn 563 573	t_{PLH} t_{PHL}	5	3.2	11.4	3.1	12.5	ns
Output Enable Times	t_{PZL} t_{PZH}	5	3.5	12.3	3.4	13.5	ns
Output Disable Times	t_{PLZ} t_{PHZ}	5	3.2	11.4	3.1	12.5	ns
Power Dissipation Capacitance	C_{PD}§	—	63 Typ.		63 Typ.		pF
Min. (Valley) V_{OH} During Switching of Other Outputs (Output Under Test Not Switching)	V_{OHV} See Fig. 1	5	4 Typ. @ 25°C				V
Max. (Peak) V_{OL} During Switching of Other Outputs (Output Under Test Not Switching)	V_{OLP} See Fig. 1	5	1 Typ. @ 25°C				V
Input Capacitance	C_I	—	—	10	—	10	pF
3-State Output Capacitance	C_O	—	—	15	—	15	pF

†5 V: min. is @ 5.5 V
       max. is @ 4.5 V

§C_{PD} is used to determine the dynamic power consumption, per latch.
$P_D = V_{CC}^2 f_i (C_{PD} + C_L) + V_{CC}\Delta I_{CC}$ where f_i = input frequency
$\qquad\qquad\qquad\qquad\qquad$ C_L = output load capacitance
$\qquad\qquad\qquad\qquad$ V_{CC} = supply voltage.

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CD54/74AC563, CD54/74AC573
CD54/74ACT563, CD54/74ACT573

PARAMETER MEASUREMENT INFORMATION
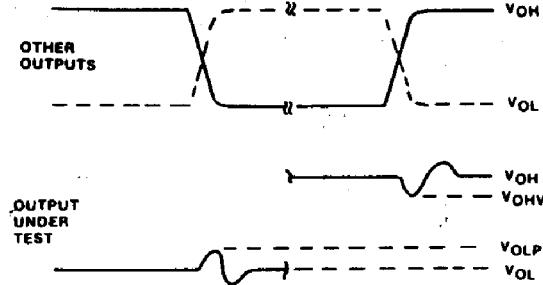
NOTES:
1. V_{OHV} AND V_{OLP} ARE MEASURED WITH RESPECT TO A GROUND REFERENCE NEAR THE OUTPUT UNDER TEST.
2. INPUT PULSES HAVE THE FOLLOWING CHARACTERISTICS: PRR 1 MHz, t_r 3 ns, t_f 3 ns, SKEW 1 ns.
3. R.F. FIXTURE WITH 700-MHz DESIGN RULES REQUIRED. IC SHOULD BE SOLDERED INTO TEST BOARD AND BYPASSED WITH 0.1 μF CAPACITOR. SCOPE AND PROBES REQUIRE 700-MHz BANDWIDTH.

Fig. 1 - Simultaneous switching transient waveforms.
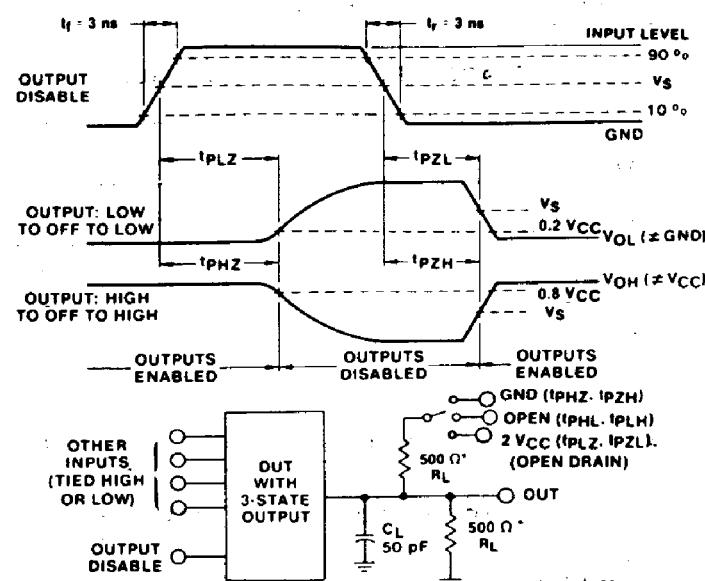
*FOR AC SERIES ONLY: WHEN V_{CC} 1.5 V, R_L 1 kΩ

Fig. 2 - Three-state propagation delay waveforms and test circuit.
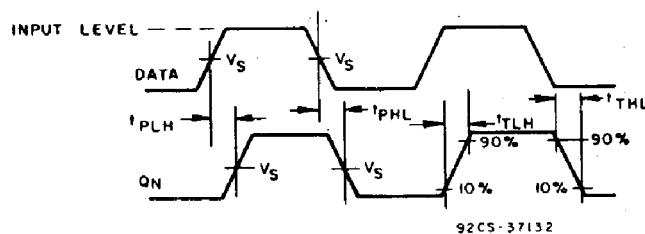
Fig. 3 - Data to Qn output propagation delays.
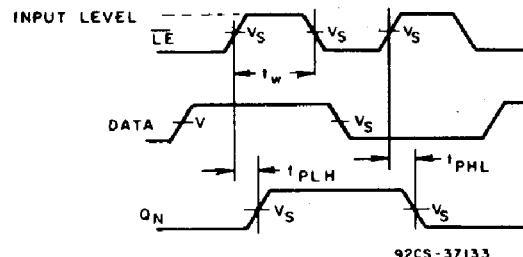
Fig. 4 - Latch enable propagation delays.
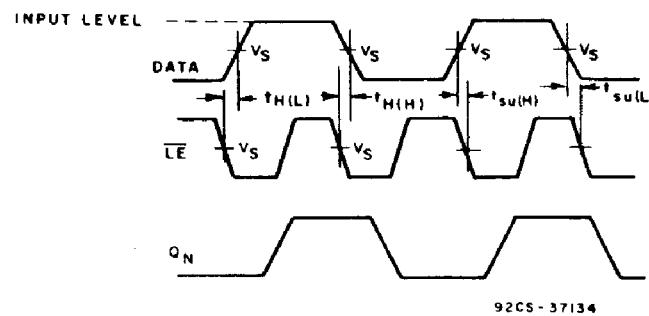
Fig. 5 - Latch enable prerequisite times.
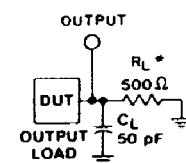
*FOR AC SERIES ONLY: WHEN V_{CC} 1.5 V, R_L 1 kΩ

Fig. 6 - Test circuit.

	CD54/74AC	CD54/74ACT
Input Level	V_{CC}	3 V
Input Switching Voltage, V_S	0.5 V_{CC}	1.5 V
Output Switching Voltage, V_S	0.5 V_{CC}	0.5 V_{CC}