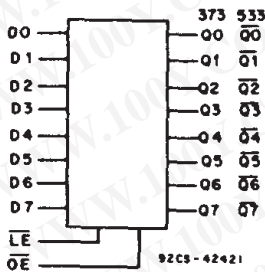


# CD54/74AC373, CD54/74AC533 CD54/74ACT373, CD54/74ACT533



Data sheet acquired from Harris Semiconductor  
SCHS289



## Octal Transparent Latch, 3-State

CD54/74AC/ACT373 - Non-Inverting  
CD54/74AC/ACT533 - Inverting

### Type Features:

- Buffered inputs
- Typical propagation delay:  
4.3 ns @  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$

### FUNCTIONAL DIAGRAM

The RCA-CD54/74AC373 and CD54/74AC533 and the CD54/74ACT373 and CD54/74ACT533 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/ACT373 and CD74AC/ACT533 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/ACT373 and CD54AC/ACT533, 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
- $\pm 24\text{-mA}$  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/ACT373 Output	AC/ACT533 Output
L	H	H	H	L
L	H	L	L	H
L	L	I	L	H
L	L	h	H	L
H	X	X	Z	Z

#### Note:

L = Low voltage level  
H = High voltage level  
I = 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

# Technical Data

## CD54/74AC373, CD54/74AC533 CD54/74ACT373, CD54/74ACT533

### 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)	$\pm 20$ mA
DC OUTPUT DIODE CURRENT, $I_{OK}$ (for $V_o < -0.5$ V or $V_o > V_{CC} + 0.5$ V)	$\pm 50$ 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)	$\pm 50$ mA
DC $V_{CC}$ or GROUND CURRENT ( $I_{CC}$ or $I_{GND}$ )	$\pm 100$ mA*
POWER DISSIPATION PER PACKAGE ( $P_D$ ):	
For $T_A = -55$ to $+100^\circ\text{C}$ (PACKAGE TYPE E)	500 mW
For $T_A = +100$ to $+125^\circ\text{C}$ (PACKAGE TYPE E)	Derate Linearly at 8 mW/ $^\circ\text{C}$ to 300 mW
For $T_A = -55$ to $+70^\circ\text{C}$ (PACKAGE TYPE M)	400 mW
For $T_A = +70$ to $+125^\circ\text{C}$ (PACKAGE TYPE M)	Derate Linearly at 6 mW/ $^\circ\text{C}$ to 70 mW
OPERATING-TEMPERATURE RANGE ( $T_A$ )	$-55$ to $+125^\circ\text{C}$
STORAGE TEMPERATURE ( $T_{stg}$ )	$-65$ to $+150^\circ\text{C}$
LEAD TEMPERATURE (DURING SOLDERING):	
At distance $1/16 \pm 1/32$ in. ( $1.59 \pm 0.79$ mm) from case for 10 s maximum	$+265^\circ\text{C}$
Unit inserted into PC board min. thickness $1/16$ in. ( $1.59$ mm) with solder contacting lead tips only	$+300^\circ\text{C}$

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

### RECOMMENDED OPERATING CONDITIONS:

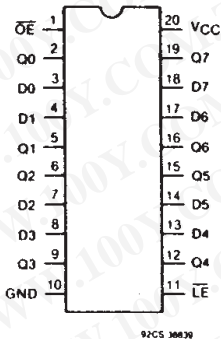
For maximum reliability, normal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range, $V_{CC}$ *: (For $T_A =$ Full Package-Temperature Range) AC Types ACT Types	1.5 4.5	5.5 5.5	V
DC Input or Output Voltage, $V_i, V_o$	0	$V_{CC}$	V
Operating Temperature, $T_A$	$-55$	$+125$	$^\circ\text{C}$
Input Rise and Fall Slew Rate, $dt/dv$ at 1.5 V to 3 V (AC Types) at 3.6 V to 5.5 V (AC Types) at 4.5 V to 5.5 V (ACT Types)	0 0 0	50 20 10	ns/V ns/V ns/V

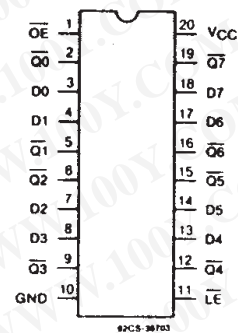
\*Unless otherwise specified, all voltages are referenced to ground.

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### TERMINAL ASSIGNMENT DIAGRAMS



CD54/74AC373, CD54/74ACT373



CD54/74AC533, CD54/74ACT533

# CD54/74AC373, CD54/74AC533 CD54/74ACT373, CD54/74ACT533

## STATIC ELECTRICAL CHARACTERISTICS: AC Series

CHARACTERISTICS	TEST CONDITIONS		V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C						UNITS
				+25		-40 to +85		-55 to +125		
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
High-Level Input Voltage V <sub>IH</sub>			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 <sub>IL</sub>			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 <sub>OH</sub>	V <sub>IH</sub> or V <sub>IL</sub>	-0.05	1.5	1.4	—	1.4	—	1.4	—	V
			3	2.9	—	2.9	—	2.9	—	
			4.5	4.4	—	4.4	—	4.4	—	
			3	2.58	—	2.48	—	2.4	—	
			4.5	3.94	—	3.8	—	3.7	—	
			5.5	—	—	3.85	—	—	—	
Low-Level Output Voltage V <sub>OL</sub>	V <sub>IH</sub> or V <sub>IL</sub>	0.05	1.5	—	0.1	—	0.1	—	0.1	V
			3	—	0.1	—	0.1	—	0.1	
			4.5	—	0.1	—	0.1	—	0.1	
			3	—	0.36	—	0.44	—	0.5	
			4.5	—	0.36	—	0.44	—	0.5	
			5.5	—	—	—	1.65	—	—	
Input Leakage Current I <sub>I</sub>	V <sub>CC</sub> or GND		5.5	—	±0.1	—	±1	—	±1	μA
3-State Leakage Current I <sub>OZ</sub>	V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND		5.5	—	±0.5	—	±5	—	±10	μA
Quiescent Supply Current, MSI I <sub>CC</sub>	V <sub>CC</sub> 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.

Technical Data

# CD54/74AC373, CD54/74AC533 CD54/74ACT373, CD54/74ACT533

STATIC ELECTRICAL CHARACTERISTICS: ACT Series

CHARACTERISTICS	TEST CONDITIONS		V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C						UNITS	
				+25		-40 to +85		-55 to +125			
	V <sub>I</sub> (V)	I <sub>O</sub> (mA)		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
High-Level Input Voltage	V <sub>IH</sub>		4.5 to 5.5	2	—	2	—	2	—	V	
Low-Level Input Voltage	V <sub>IL</sub>		4.5 to 5.5	—	0.8	—	0.8	—	0.8	V	
High-Level Output Voltage	V <sub>OH</sub>	V <sub>IH</sub> or V <sub>IL</sub> #, *	-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 <sub>OL</sub>	V <sub>IH</sub> or V <sub>IL</sub> #, *	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 <sub>I</sub>	V <sub>CC</sub> or GND	5.5	—	±0.1	—	±1	—	±1	μA	
3-State Leakage Current	I <sub>OZ</sub>	V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND	5.5	—	±0.5	—	±5	—	±10	μA	
Quiescent Supply Current, MSI	I <sub>CC</sub>	V <sub>CC</sub> or GND	0	5.5	—	8	—	80	—	160	μA
Additional Quiescent Supply Current per Input Pin TTL Inputs High 1 Unit Load	ΔI <sub>CC</sub>	V <sub>CC</sub> -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*	
	ACT373	ACT533
OE	0.87	0.87
Dn	0.5	0.5
LE	0.8	0.8

\*Unit load is ΔI<sub>CC</sub> limit specified in Static Characteristics Chart, e.g., 2.4 mA max. @ 25°C.

# CD54/74AC373, CD54/74AC533 CD54/74ACT373, CD54/74ACT533

PREREQUISITE FOR SWITCHING: AC Series

CHARACTERISTICS	SYMBOL	V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
LE Pulse Width	t <sub>w</sub>	1.5	44	—	50	—	ns
		3.3*	4.9	—	5.6	—	
		5†	3.5	—	4	—	
Setup Time Data to LE	t <sub>su</sub>	1.5	2	—	2	—	ns
		3.3	2	—	2	—	
		5	2	—	2	—	
Hold Time Data to LE	t <sub>h</sub>	1.5	33	—	38	—	ns
		3.3	3.7	—	4.2	—	
		5	2.6	—	3	—	

\*3.3 V: min. is @ 3 V

†5 V: min. is @ 4.5 V

SWITCHING CHARACTERISTICS: AC Series; t<sub>r</sub>, t<sub>f</sub> = 3 ns, C<sub>L</sub> = 50 pF

CHARACTERISTICS	SYMBOL	V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
Propagation Delays: Data to Qn 373	t <sub>PLH</sub> t <sub>PHL</sub>	1.5	—	96	—	106	ns
		3.3*	3.1	10.8	3	11.9	
		5†	2.2	7.7	2.1	8.5	
533	t <sub>PLH</sub> t <sub>PHL</sub>	1.5	—	119	—	131	ns
		3.3	3.8	13.4	3.7	14.7	
		5	2.7	9.5	2.6	10.5	
LE on Qn 373	t <sub>PLH</sub> t <sub>PHL</sub>	1.5	—	136	—	150	ns
		3.3	4.3	15.2	4.2	16.8	
		5	3.1	10.9	3	12	
533	t <sub>PLH</sub> t <sub>PHL</sub>	1.5	—	136	—	150	ns
		3.3	4.3	15.3	4.2	16.8	
		5	3.1	10.9	3	12	
Output Enable Times	t <sub>PZL</sub> t <sub>PZH</sub>	1.5	—	119	—	131	ns
		3.3	4.1	14.4	4	15.8	
		5	2.7	9.5	2.6	10.5	
Output Disable Times	t <sub>PLZ</sub> t <sub>PHZ</sub>	1.5	—	131	—	144	ns
		3.3	3.7	13.1	3.6	14.4	
		5	3	10.5	2.9	11.5	
Power Dissipation Capacitance	C <sub>PD</sub> §	—	63 Typ.		63 Typ.		pF
Min. (Valley) V <sub>OH</sub> During Switching of Other Outputs (Output Under Test Not Switching)	V <sub>OHV</sub> See Fig. 1	5	4 Typ. @ 25°C				V
Max. (Peak) V <sub>OL</sub> During Switching of Other Outputs (Output Under Test Not Switching)	V <sub>OLP</sub> See Fig. 1	5	1 Typ. @ 25°C				V
Input Capacitance	C <sub>I</sub>	—	—	10	—	10	pF
3-State Output Capacitance	C <sub>O</sub>	—	—	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<sub>PD</sub> 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.

# CD54/74AC373, CD54/74AC533 CD54/74ACT373, CD54/74ACT533

**PREREQUISITE FOR SWITCHING: ACT Series**

CHARACTERISTICS	SYMBOL	V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) -°C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
LE Pulse Width	t <sub>w</sub>	5†	3.6	—	4	—	ns
Setup Time Data to LE	t <sub>su</sub>	5	2	—	2	—	ns
Hold Time Data to LE	t <sub>h</sub>	5	2.7	—	3	—	ns

†5 V: min. is @ 4.5 V

**SWITCHING CHARACTERISTICS: ACT Series; t<sub>r</sub>, t<sub>f</sub> = 3 ns, C<sub>L</sub> = 50 pF**

CHARACTERISTICS	SYMBOL	V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) -°C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
Propagation Delays: Data to Qn 373	t <sub>PLH</sub>	5†	2.7	9.5	2.6	10.4	ns
	t <sub>PHL</sub>		3	10.4	2.9	11.4	
LE to Qn 373	t <sub>PLH</sub>	5	3.1	11.4	3	12.5	ns
	t <sub>PHL</sub>						
Output Enable Times	t <sub>PZL</sub> t <sub>PZH</sub>	5	3.5	12.3	3.4	13.5	ns
Output Disable Times	t <sub>PLZ</sub> t <sub>PHZ</sub>	5	3.2	11.4	3.1	12.5	ns
Power Dissipation Capacitance	C <sub>PD</sub> §	—	63 Typ.		63 Typ.		pF
Min. (Valley) V <sub>OH</sub> During Switching of Other Outputs (Output Under Test Not Switching)	V <sub>OHV</sub> See Fig. 1	5	4 Typ. @ 25°C				V
Max. (Peak) V <sub>OL</sub> During Switching of Other Outputs (Output Under Test Not Switching)	V <sub>OLP</sub> See Fig. 1	5	1 Typ. @ 25°C				V
Input Capacitance	C <sub>I</sub>	—	—	10	—	10	pF
3-State Output Capacitance	C <sub>O</sub>	—	—	15	—	15	pF

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

§C<sub>PD</sub> is used to determine the dynamic power consumption, per latch.

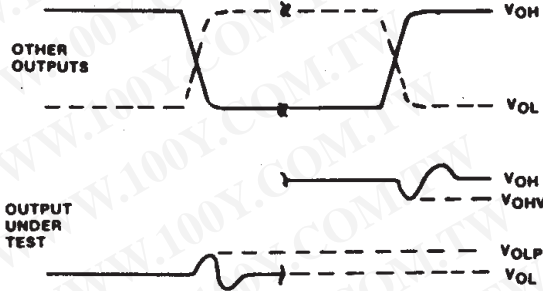
$$P_D = V_{CC}^2 f_i (C_{PD} + C_L) + V_{CC} \Delta I_{CC} \text{ where } f_i = \text{input frequency}$$

$$C_L = \text{output load capacitance}$$

$$V_{CC} = \text{supply voltage.}$$

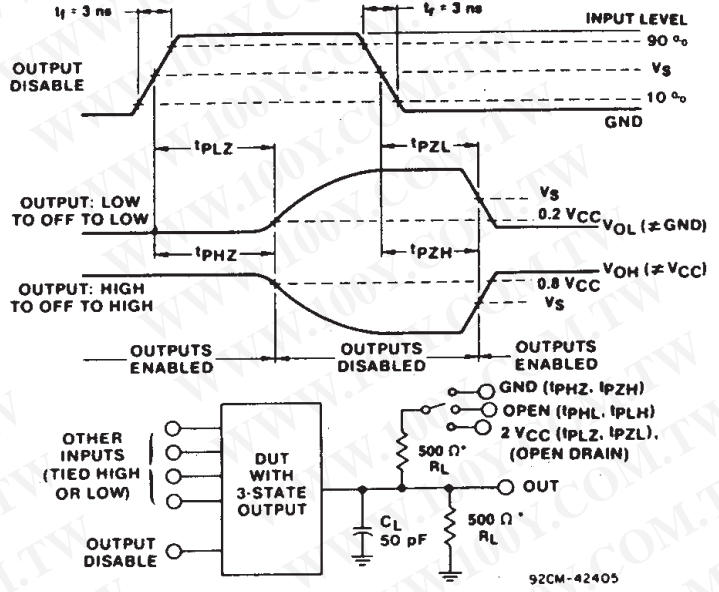
# CD54/74AC373, CD54/74AC533 CD54/74ACT373, CD54/74ACT533

## PARAMETER MEASUREMENT INFORMATION



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

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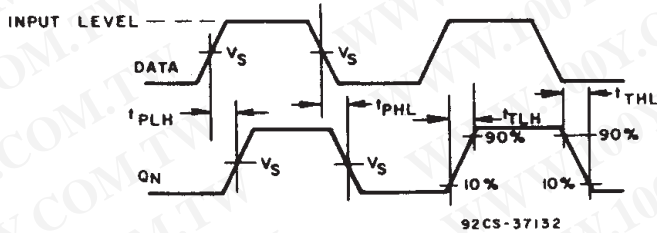


\*FOR AC SERIES ONLY: WHEN  $V_{CC} = 1.5$  V,  $R_L = 1$  k $\Omega$

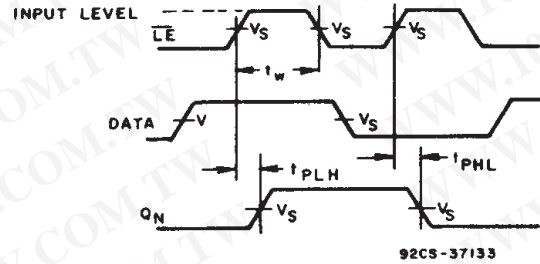
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Fig. 1 - Simultaneous switching transient waveforms.

Fig. 2 - Three-state propagation delay waveforms and test circuit.



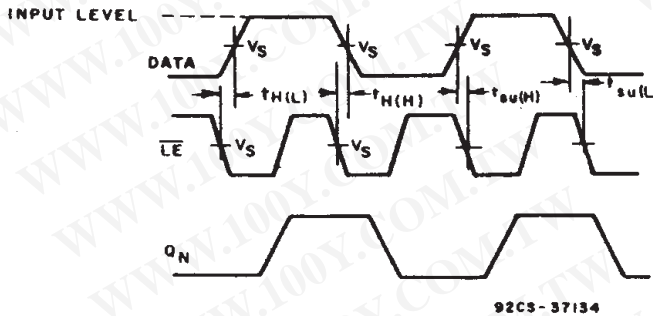
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92CS-37133

Fig. 3 - Data to  $Q_n$  output propagation delays and output transition times.

Fig. 4 - Latch enable propagation delays.



92CS-37134

Fig. 5 - Latch enable prerequisite times.

	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, $V_s$	$0.5 V_{CC}$	$0.5 V_{CC}$

PACKAGING INFORMATION

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
CD54AC373F3A	ACTIVE	CDIP	J	20	1	None	Call TI	Level-NC-NC-NC
CD54ACT373F3A	ACTIVE	CDIP	J	20	1	None	Call TI	Level-NC-NC-NC
CD54ACT533F3A	OBSOLETE	CDIP	J	20		None	Call TI	Call TI
CD74AC373E	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD74AC373M	ACTIVE	SOIC	DW	20	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
CD74AC373M96	ACTIVE	SOIC	DW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
CD74ACT373E	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD74ACT373M	ACTIVE	SOIC	DW	20	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
CD74ACT373M96	ACTIVE	SOIC	DW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - May not be currently available - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**None:** Not yet available Lead (Pb-Free).

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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