



74AHCT595

8-BIT SHIFT REGISTER 8-BIT OUTPUT REGISTER

Description

The 74AHCT595 is an advanced high speed CMOS device that is designed to be pin compatable with 74LS low power Schottky types.

An eight bit shift register accepts data from the serial input (DS) on each positive transition of the shift register clock (STCP). When asserted low, the reset function ($\overline{\text{MR}}$) sets all shift register values to zero and is independent of all clocks.

Data from the input serial shift register is placed in the output register with a rising pulse on the storages resister clock (SHCP). With the output enable $(\overline{\text{OE}})$ asserted low the 3-state outputs Q0-Q7 become active and present.

All registers capture data on rising edge and change output on the falling edge. If both clocks are connected together, the input shift register is always one clock cycle ahead of the output register.

Features

- Supply Voltage Range from 4.5V to 5.5V
- Sinks or sources 8mA at $V_{CC} = 4.5V$
- CMOS low power consumption
- Schmitt Trigger Action at All Inputs
- Inputs accept up to 5.5V
- ESD Protection Tested per JESD 22
 - Exceeds 200-V Machine Model (A115-A)
 - Exceeds 2000-V Human Body Model (A114-A)
 - Exceeds 1000-V Charged Device Model (C101C)
- Latch-Up Exceeds 250mA per JESD 78, Class II
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

Pin Assignments



Applications

- General Purpose Logic
- Serial to Parallel Data conversion
- Capture and hold data for extended periods of time.
- Allow simple serial bit streams from a microcontroller to control as many peripheral lines as needed.
- Wide array of products such as:
 - Computer peripherals
 - Appliances
 - Industrial control

Notes: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.

 See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.

3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Click here for ordering information, located at the end of datasheet



Pin Descriptions

Pin Number	Pin Name	Description
1	Q1	Parallel Data Output 1
2	Q2	Parallel Data Output 2
3	Q3	Parallel Data Output 3
4	Q4	Parallel Data Output 4
5	Q5	Parallel Data Output 5
6	Q6	Parallel Data Output 6
7	Q7	Parallel Data Output 7
8	GND	Ground
9	Q7S	Serial Data Output
10	MR	Master Reset Input
11	SHCP	Shift Register Clock Input
12	STCP	Storage Register Clock Input
13	OE	Output Enable Input
14	DS	Serial Data Input
15	Q0	Parallel Data Output 0
16	Vcc	Supply Voltage

Functional Diagram



Logic Diagram





Functional Description and Timing Diagram

	Con	trol		Input	0	utput	Function
SHCP	STCP	OE	MR	DS	Q7S	Qn	Function
х	х	L	L	-	I NC		Low-level asserted on MR clears shift register. Storage register is unchanged
Х	1	L	L	-	L L		Empty shift register transferred to storage register
Х	Х	Н	L	-	L Z		Shift register remains clear;: All Q ouputs in Z state.
Ť	x	L	н	_	Q6S	NC	HIGH is shifted into first stage of Shift Register Contents of each register shifted to next register The content of Q6S has been shifted to Q7S and now appears on device pin Q7S
х	1	L	н	_	NC	QnS	Contents of shift register copied to storage register. With output now in active state the storage resister contents appear on Q outputs.
1	1	L	Н	-	Q6S QnS		Contents of shift register copied to output register then shift register shifted.

H=HIGH voltage state L=LOW voltage state ↑=LOW to HIGH transition X= don't care – high or low (not floating) NC= No change Z= high-impedance state

SHCP	
DS	
STCP	
MR	
ŌĒ	
Q0	
Q1	Z-state
Q6	Z-state
Q7	Z-state
Q7S	



Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
ESD MM	Machine Model ESD Protection	200	V
V _{CC}	Supply Voltage Range	-0.5 to +7.0	V
VI	Input Voltage Range	-0.5 to +7.0	V
Vo	Voltage applied to output in high or low state	-0.5 to V _{CC} +0.5	V
l _{IK}	Input Clamp Current VI < -0.5V	-20	mA
I _{OK}	Output Clamp Current V _O <-0.5V	-20	mA
I _{OK}	Output Clamp Current $V_O > V_{CC} + 0.5V$	20	mA
lo	Continuous output current	±25	mA
Icc	Continuous current through Vcc or GND	75	mA
I _{GND}	Continuous current through Vcc or GND	-75	mA
TJ	Operating Junction Temperature	-40 to +150	°C
T _{STG}	Storage Temperature	-65 to +150	°C
Ртот	Total Power Dissipation	500	mW

Absolute Maximum Ratings (Note 4) (@T_A = +25°C, unless otherwise specified.)

Notes: 4. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

Recommended Operating Conditions (Note 5) (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	Supply Voltage	_	4.5	5.5	V
VI	Input Voltage	-	0	5.5	V
Vo	Output Voltage	Active Mode	0	V _{CC}	V
Δt/ΔV	Input transition rise or fall rate	V _{CC} = 4.5V to 5.5V	-	20	ns/V
T _A	Operating free-air temperature	-	-40	+125	°C

Note: 5. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics ($@T_A = +25^{\circ}C$, unless otherwise specified.)

Sumbal	Deremeter	Toot Conditions	N	T _A = +25°C			T _A = -40°	C to +85°C	T _A = -40°	C to +125°C	Unit
Symbol			Min	Тур	Max	Min	Max	Min	Max	Unit	
V _{IH}	High-Level Input Voltage	_	4.5V to 5.5V	2.0	-	-	2.0	-	2.0	_	V
VIL	Low-Level Input voltage	_	4.5V to 5.5V	-	-	0.8	-	0.8	-	0.8	V
V	High-Level	I _{OH} = -50μA	4.5V	4.4	4.5	-	4.4	-	4.4	-	v
V _{OH}	Output Voltage	I _{OH} = -8mA	4.5V	3.94	-	-	3.80	-	3.70	-	v
	Low-Level	I _{OL} = 50μΑ	4.5V	-	0	0.1	-	0.1	-	0.1	v
V _{OL}	Output Voltage	I _{OL} = 8mA		-	-	0.36	-	0.44	-	0.55	v
lı	Input Current	V _I =GND to 5.5V	0 to 5.5V	_	0.1	± 1	_	± 1	-	± 2	μA
I _{OZ}	Z-state Leakage Current	$V_0 = Vcc \text{ or GND}$ $\overline{OE} = HIGH$	5.5V	_	_	± 0.25	-	2.5	-	10	μA
I _{CC}	Supply Current	$V_I = GND \text{ or } V_{CC}$ $I_O = 0$	5.5V	_	_	4.0	_	40	_	80	μA
ΔI_{CC}	Additional Supply Current per Input	$V_{I} = Vcc - 2.1V$ $I_{O} = 0$	4.5V to 5.5V	_	_	1.35	-	1.5	-	1.5	mA
Ci	Input Capacitance	$V_i = V_{CC}$ or GND	5.5V	-	4	10	_	10	-	10	pF



Switching Characteristics

Symbol /	Pins	Test Conditions	V	Т	A = +25°	С	-40°C to +85°C		-40°C to	+125°C	Unit
Parameter	Pins	Test Conditions	V _{CC}	Min	Тур	Max	Min	Max	Min	Max	Unit
f _{MAX} Maximum Frequency	SHCP or STCP	Figure 1	4.5V to 5.5V	130	170	_	110	_	90	_	MHz
	SHCP HIGH or LOW	Figure 1	4.5V to 5.5V	5.0	-	-	5.0	-	5.0	-	
t _W Pulse Width	STCP HIGH or LOW	Figure 1	4.5V to 5.5V	5.0	-	-	5.0	-	5.0	-	ns
	MR LOW	Figure 1	4.5V to 5.5V	5.0	-	-	5.0	-	5.0	-	
tsu	DS to SHCP	Figure 1	4.5V to 5.5V	3.0	-	-	3.0	-	3.0	-	ns
Set-up Time	SHCP to STCP	Figure 1	4.5V to 5.5V	5.0	-	-	5.0	-	5.0	-	ns
t _H Hold Time	DS to SHCP	Figure 1	4.5V to 5.5V	2.0	-	-	2.0	-	2.0	-	ns
t _{REC} Recovery Time	MR to SHCP	Figure 1	4.5V to 5.5V	3.0	_	_	3.0	-	3.0	-	ns
	SHCP to Q7S	Figure 1 C _L = 15pF	4.5V to 5.5V	_	3.8	8.2	1.0	9	1.0	10	ns
		Figure 1 C _L = 50pF	4.5V to 5.5V	-	5.2	10	1.0	11	1.0	12	
t _{PD}	STCP to Qn	Figure 1 C _L = 15pF	4.5V to 5.5V	-	4	7.4	1.0	8.5	1.0	9.5	
Propagation Delay		Figure 1 C _L = 50pF	4.5V to 5.5V	-	5.3	9	1.0	10.5	1.0	11.5	— ns
	MR to Q7S	Figure 1 C _L = 15pF	4.5V to 5.5V	-	4.6	8.2	1.0	9.5	1.0	10.5	ns
	MR to Q75	Figure 1 C _L = 50pF	4.5V to 5.5V	-	5.8	10.5	1.0	11.5	1.0	12.5	115
t _{EN}		Figure 1 C _L = 15pF	4.5V to 5.5V	-	4.8	9	1.0	11	1.0	12	20
Enable Time	OE to Qn	Figure 1 C _L = 50pF	4.5V to 5.5V	-	6.2	11.6	1.0	13	1.0	14.5	ns
tDIS		Figure 1 C _L = 15pF	4.5V to 5.5V	-	3.6	6.9	1.0	8	1.0	9	20
Disable Time	OE to Qn	Figure 1 C _L = 50pF	4.5V to 5.5V	-	5.8	10.3	1.0	11	1.0	12	ns

Operating Characteristics (@T_A = +25°C, unless otherwise specified.)

Parameter		Test Conditions	V _{CC} = 5V Typ	Unit
C_{pd}	Power dissipation capacitance	f = 1 MHz all outputs switching-no load	42	pF



Parameter Measurement Information



TEST	Vload		
t _{PLH} /t _{PHL}	Open		
t _{PLZ} /t _{PZL}	V _{CC}		
t _{PHZ} /t _{PZH}	GND		

V	Inputs		v	м	C	
V _{cc}	VI	t _r /t _f	Input	Output	υL	
4.5V to 5.5V	3.0V	3ns	1.5V	V _{CC} /2	15pF, 50pF	



Pulse Duration and Recovery Time



Voltage Waveform Set-up and Hold Times



Notes:

A. Includes test lead and test apparatus capacitance.

- B. Output Waveform 1 depends on the internal Q_N node being low and behaves in this manner based on OE pin.
 Output Waveform 2 depends on the internal Q_N node being high and behaves in this manner based on OE pin.
 C. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
- D. Inputs are measured separately one transition per measurement.
- E. t_{PLH} and t_{PHL} are the same as t_{PD} .

Figure 1 Load Circuit and Voltage Waveforms



Ordering Information



Part Number	Baakaga Cada	Bookoging	7" Tape and Reel (Note 6)			
Fait Nulliber	Package Code	Packaging	Quantity	Part Number Suffix		
74AHCT595S16-13	S16	SO-16	2500/Tape & Reel	-13		
74AHCT595T16-13	T16	TSSOP-16	2500/Tape & Reel	-13		

Note: 6. The taping orientation is located on our website at http://www.diodes.com/datasheets/ap02007.pdf

Marking Information

(1) SO-16, TSSOP16



Part Number	Package		
74AHCT595S16	SO-16		
74AHCT595T16	TSSOP-16		



Package Outline Dimensions (All dimensions in mm.)

Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

Package Type: SO-16



SO-16				
Dim	Min	Max		
Α	1.40	1.75		
A1	0.10	0.25		
A2	1.30	1.50		
в	0.33	0.51		
С	0.19	0.25		
D	9.80	10.00		
Е	3.80	4.00		
е	1.27 Тур			
н	5.80	6.20		
L	0.38	1.27		
Θ	0°	8°		
All Dimensions in mm				

Package Type: TSSOP-16



TSSOP-16				
Dim	Min	Max	Тур	
Α	-	1.08	-	
A1	0.05	0.15	-	
A2	0.80	0.93	-	
b	0.19	0.30	-	
C	0.09	0.20	-	
D	4.90	5.10	-	
Ε	6.40 BSC			
E1		4.50	-	
е	0.65 BSC			
L	0.45	0.75	-	
L1	1.00 REF			
L2	0.25 BSC			
R	0.09	-	-	
R1	0.09	-	-	
Х	-	-	1.350	
Y	-	-	1.050	
Θ	0°	8°	-	
Θ1	5°	15°	-	
Θ2	0°	-	-	
All Dimensions in mm				



Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

Package Type: SO-16



Dimensions	Value (in mm)	
С	1.270	
Х	0.670	
X1	9.560	
Y	1.450	
Y1	6.400	

Package Type: TSSOP-16



Dimensions	Value (in mm)	
С	0.650	
Х	0.350	
X1	4.900	
Y	1.400	
Y1	6.800	



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